FOREWORD

This repair manual covers Disassembly, Inspection and Assembly procedures for the following Automatic Transaxles:

Automatic Transmission	Applicable Model
A540E A540H	’91 Camry

For On-vehicle Servicing (Inspection, Adjustment, Troubleshooting, Removal and Installation) of Automatic Transaxle, refer to the repair manual for the applicable vehicle model.

Pub. Name	Pub. No.
’91 Camry Repair Manual	RM199U

All information contained in this manual is the most up-to-data at the time of publication. However, specifications and procedures are subject to change without notice.

TOYOTA MOTOR CORPORATION

HOW TO USE THIS MANUAL

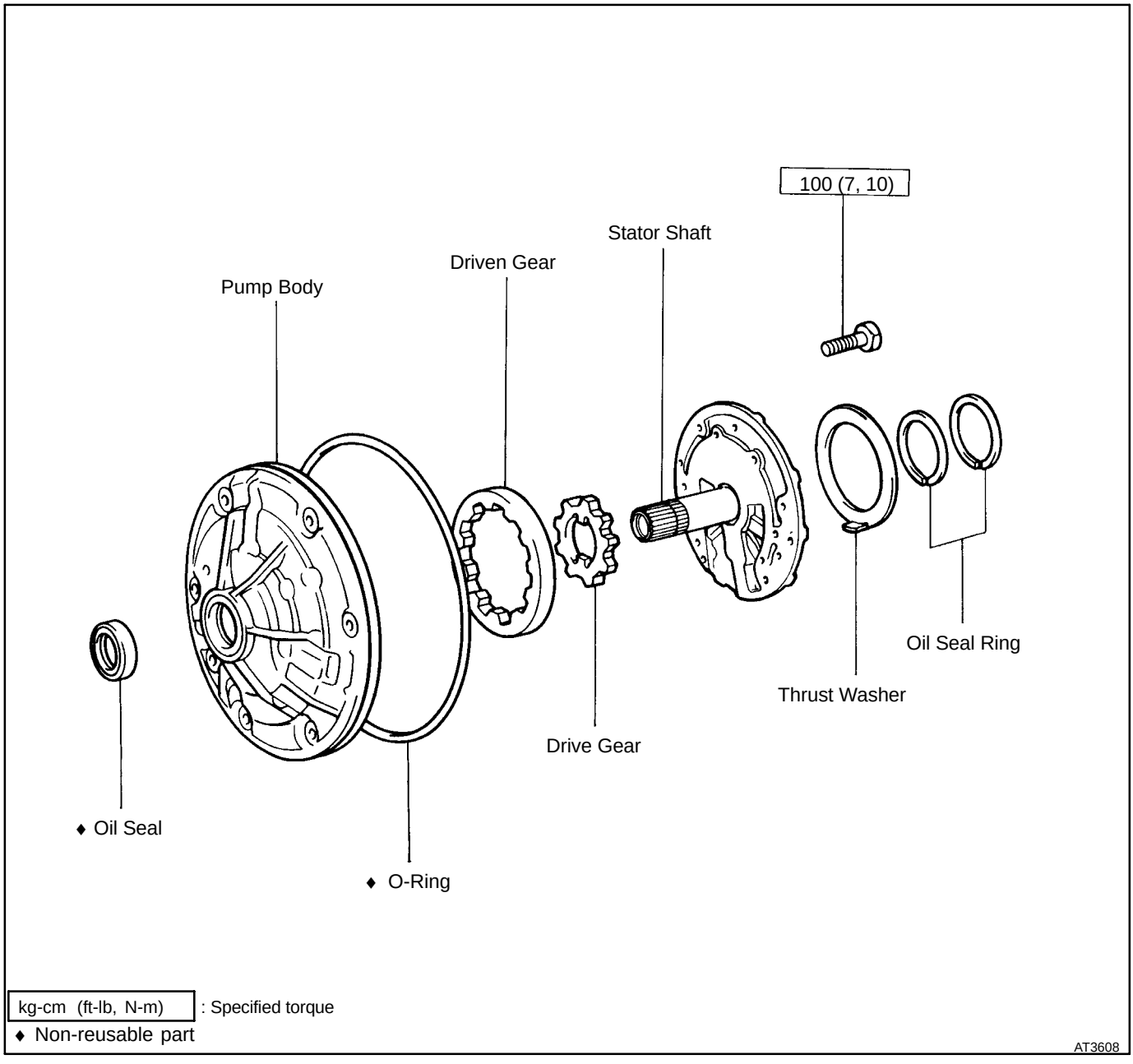
To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

An **INDEX** is provided on the 1st page of each section to guide you to the item to be repaired.

REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.

Example:



The procedures are presented in a step-by-step format:

- **Illustration shows *what* to do and *where* to do it.**
- **The task heading tells *what* to do.**
- **The detailed text tells *how* to perform the task and gives other information such as specifications and warnings.**

Example:

Illustration: what to do and where

Task heading: what to do

7. CHECK PISTON STROKE OF FORWARD CLUTCH

If replacing the disc, plate or flange, check the piston stroke:

Detail text: how to do it

Using a dial indicator (long type pick or SST), measure the forward clutch piston stroke applying and releasing the compressed air (4 - 8 kg/cm^2, 57 - 114 psi or 392 - 785 kPa) as shown.

SST 09350-32014 (09351-32190)

Set part No. *Component part No.*

Piston stroke: 1.41 - 1.82 mm (0.0555 - 0.0717 in.)

Specification

This format provides the experienced technician with a FAST TRACK to the information needed. The upper case task heading can be read at a glance and only when necessary, the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

REFERENCES

References have been kept to a minimum. However, when they are required you are given the *page* to go to.

SPECIFICATIONS

Specifications are presented in bold type throughout the text in the applicable step. You never have to leave the procedure to look up your specs. All specifications are also found in Appendix A, specifications for quick reference.

CAUTIONS, NOTICES, HINTS:

- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- HINTS are separated from the text but do not appear in bold. They provide additional information to help you efficiently perform the repair.

GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.

2. During disassembly, keep parts in order to facilitate reassembly.

3. Observe the following:

(a) Before performing electrical work, disconnect the negative cable four the battery terminal.

(b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (-) terminal which is grounded to the vehicle body.

(c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable straight up without twisting it or prying it.

(d) Clean the battery terminal posts and cable terminals with a shop rag. Do not scrape them with a file or other abrasive object.

(e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installation. Do not use a hammer or such to tap the terminal onto the post.

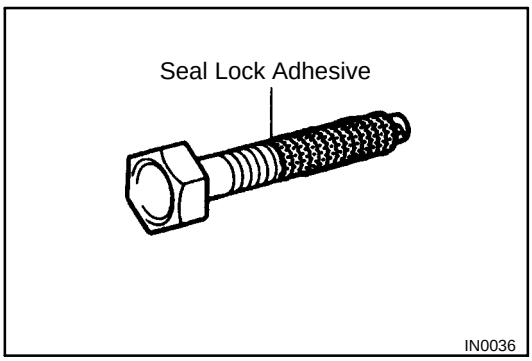
(f) Be sure the cover for the positive (+) terminals are properly in place.

4. Check hoses and wiring connectors to make sure that they are secure and correct.

5. Non-reusable parts

(a) Always replace cotter pins, gaskets, O-rings and oil seals etc. with new ones.

(b) Non-reusable parts are indicated in the component illustrations by the "♦" symbol.



6. Precoated parts

Precoated parts are the bolts and nuts, which have been coated with a seal lock adhesive at the factory.

(a) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.

(b) Recoating of precoated parts

(1) Clean off the old adhesive from the bolt, nut or installation part threads.

(2) Dry with compressed air.

(3) Apply the specified seal lock adhesive to the bolt or nut threads.

(c) Precoated parts are indicated in the component illustrations by the "○" symbol.

7. When necessary, use a sealer on gaskets to prevent leaks.

8. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.

9. Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found at the back of this manual.

10. When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the fuse amp rating or use one of a lower rating.

11. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations.

(a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels in order to ensure safety.

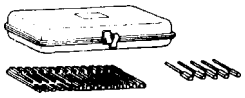
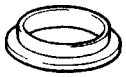
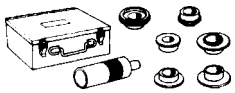
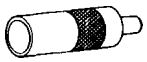
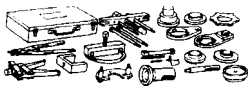
(b) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the vehicle raised on jack alone, even for a small job that can be finished quickly.

ABBREVIATIONS USED IN THIS MANUAL

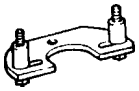
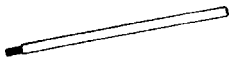
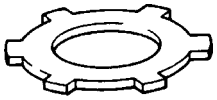
A/T ATM	Automatic Transmission
ATF	Automatic Transmission Fluid
B_0	Overdrive Brake
B_1	Second Coast Brake
B_2	Second Brake
B_3	First and Reverse Brake
C_0	Overdrive Clutch
C_1	Forward Clutch
C_2	Direct Clutch
D	Disc
D/F	Differential
LH	Left
MP	Multipurpose
O/D	Overdrive
P	Plate
RH	Right
SSM	Special Service Materials
SST	Special Service Tools

PREPARATION

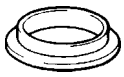
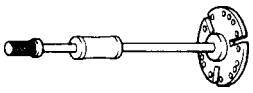
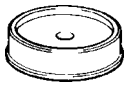
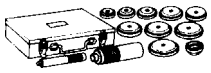
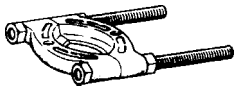
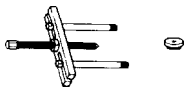
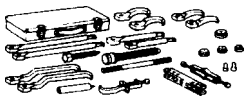
SST (SPECIAL SERVICE TOOLS)

Illustration	Part No.	Part Name	Note
	09226 - 10010	Crankshaft Front & Rear Bearing Replacer	A540H
	**09240 - 00020**	Wire Gauge Set	
	09308 - 00010	Oil Seal Puller	A540H
	**09316 - 12010**	Transfer Bearing Replacer	A540H
	09316 - 20011	Transfer Bearing Replacer	
	**09316 - 60010**	Transmission & Transfer Bearing Replacer	
	**(09316 - 00010)**	(Replacer Pipe)	
	(09316 - 00040)	(Replacer "C")	A540H
	(09316 - 00060)	(Replacer "E")	A540H
	09318 - 12010	Transfer Bearing Adjusting Nut Wrench	A540H
	09325 - 12010	Transmission Oil Plug	A540H
	09325 - 20010	Transmission Oil Plug	A540H
	09326 - 20011	Output Shaft Bearing Lock Nut Wrench	A540H
	09330 - 00021	Companion Flange Holding Tool	A540H
	**09350 - 32014**	TOYOTA Automatic Transmission Tool Set	

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Illustration	Part No.	Part Name	Note
	(09308 - 10010)	(Oil Seal Puller)	
	**(09351 - 32032)**	Counter Driven Gear Holding Tool	
	(09351 - 32040)	No. 1 Piston Spring Compressor	
	(09351 - 32050)	(Snap Ring Expander)	
	(09351 - 32061)	(Oil Pump Puller)	
	(09351 - 32070)	No. 2 Piston Spring Compressor	
	(09351 - 32080)	(Lock Nut Wrench)	
	(09351 - 32090)	Oil Seal Remover & Replacer	A540H
	(09351 - 32100)	Drive Pinion Bearing Replacer	
	(09351 - 32111)	Side Bearing Race Replacer	A540H
	(09351 - 32120)	Overdrive Bearing Replacer	
	(09351 - 32140)	(Oil Seal Replacer)	
	(09351 - 32150)	(Oil Seal Replacer)	
	**(09351 - 32190)**	(Measure Terminal)	
	**(09351 - 32200)**	No. 3 Piston Spring Compressor	

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Illustration	Part No.	Part Name	Note
	**09502 - 12010**	Differential Bearing Replacer	A540H
	09506 - 35010	Differential Drive Pinion Rear Bearing Replacer	A540H
	**09520 - 32012**	Differential Side Gear Shaft Puller	A540H
	09608 - 30022	Front Hub Bearing Replacer Set	A540H
	(09550 - 00050)	(Replacer)	A540H
	(09608 - 05010)	(Handle)	A540H
	**09608 - 32010**	Steering Knuckle Oil Seal Replacer	A540H
	**09608 - 35014**	Axle Hub & Drive Pinion Bearing Tool Set	A540H
	(09608 - 06020)	(Handle)	A540H
	(09608 - 06120)	Front Hub Outer Bearing Cup Replacer	A540H
	09612 - 65014	Steering Worm Bearing Puller	Remove pinion shaft Bearing outer race
	**09950 - 00020**	Bearing Remover	A540H
	**09950 - 00030**	Bearing Remover Attachment	A540H
	**09950 - 20017**	Universal Puller	

SSM (SPECIAL SERVICE MATERIALS)

Part Name	Part No.	Use etc.
Seal packing 1281, Three bond 1281 or equivalent	**08826 - 00090**	Transfer right case × Transfer left case (A540H) Transfer inspection hole cover (A540H) Transfer case × Differential carrier cover Differential LH bearing retainer (A540E, A540H) Differential RH retainer (A540E) Transaxle × Transfer assembly (A540H)
Adhesive 1324, Three bond 1324 or equivalent	**08833 - 00070**	Differential LH bearing retainer set bolt Differential carrier cover set bolt Torque converter mounting bolt Differential RH retainer set bolt (A540E) Transfer set bolt (A540H)

RECOMMENDED TOOL

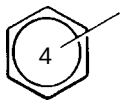
Illustration	Part No.	Part Name	Note
	09031 - 00030	Pin Punch	

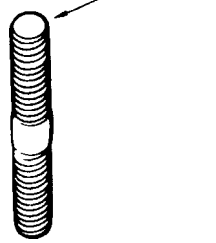
EQUIPMENT

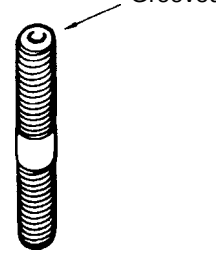
Part Name	Note
Feeler gauge	Check major clearance.
Vernier caliper with depth gauge	Check length of second coast brake piston rod.
Dial indicator with magnetic base	Check piston stroke and end play of the output shaft.
Dial indicator	Check inside diameter of major bushing.
Straight edge	Check side clearance of oil pump.
Torque wrench	

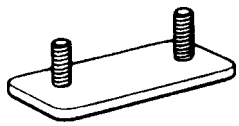
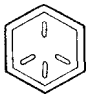
STANDARD BOLT TORQUE SPECIFICATIONS

HOW TO DETERMINE BOLT STRENGTH

<table>
<tr><th></th><th>Mark</th><th>Class</th><th></th><th>Mark</th><th>Class</th></tr>
<tr><td rowspan="2">Hexagon head bolt</td><td> 

4- 4T
5- 5T
6- 6T
7- 7T
8- 8T
9- 9T
10- 10T
11- 11T</td><td rowspan="2">Stud bolt</td><td rowspan="2"> 
</td><td rowspan="2">4T</td></tr>
<tr><td> No mark</td><td>4T</td></tr>
<tr><td>Hexagon flange bolt

w/ washer hexagon bolt</td><td> No mark</td><td>4T</td><td rowspan="3"> 
</td><td rowspan="3">6T</td></tr>
<tr><td>Hexagon head bolt</td><td> Two protruding lines</td><td>5T</td></tr>
<tr><td>Hexagon flange bolt

w/ washer hexagon bolt</td><td> Two protruding lines</td><td>6T</td></tr>
<tr><td>Hexagon head bolt</td><td> Three protruding lines</td><td>7T</td><td rowspan="2">Welded bolt</td><td rowspan="2">  </td><td rowspan="2">4T</td></tr>
<tr><td>Hexagon head bolt</td><td>  Four protruding lines</td><td>8T</td></tr>
</table>

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			kg-cm	ft-lb	N-m	kg-cm	ft-lb	N-m
4T	6	1	55	48 in.-lb	5	60	52 in.-lb	6
	8	1.25	130	9	12.5	145	10	14
	10	1.25	260	19	26	290	21	29
	12	1.25	480	35	47	540	39	53
	14	1.5	760	55	74	850	61	84
	16	1.5	1,150	83	115	-	-	-
5T	6	1	65	56 in.-lb	6.5	75	65 in.-lb	7.5
	8	1.25	160	12	15.5	175	13	17.5
	10	1.25	330	24	32	360	26	36
	12	1.25	600	43	59	670	48	65
	14	1.5	930	67	91	1,050	76	100
	16	1.5	1,400	101	140	-	-	-
6T	6	1	80	69 in.-lb	8	90	78 in.-lb	9
	8	1.25	195	14	19	210	15	21
	10	1.25	400	29	39	440	32	44
	12	1.25	730	53	71	810	59	80
	14	1.5	1,100	80	110	1,250	90	125
	16	1.5	1,750	127	170	-	-	-
7T	6	1	110	8	10.5	120	9	12
	8	1.25	260	19	25	290	21	28
	10	1.25	530	38	52	590	43	58
	12	1.25	970	70	95	1,050	76	105
	14	1.5	1,500	108	145	1,700	123	165
	16	1.5	2,300	166	230	-	-	-
8T	8	1.25	300	22	29	330	24	33
	10	1.25	620	45	61	690	50	68
	12	1.25	1,100	80	110	1,250	90	120
9T	8	1.25	340	25	34	380	27	37
	10	1.25	710	51	70	790	57	78
	12	1.25	1,300	94	125	1,450	105	140
10T	8	1.25	390	28	38	430	31	42
	10	1.25	800	58	78	890	64	88
	12	1.25	1,450	105	140	1,600	116	155
11T	8	1.25	430	31	42	480	35	47
	10	1.25	890	64	87	990	72	97
	12	1.25	1,600	116	155	1,800	130	175

AUTOMATIC TRANSAXLE (A540E)

Specifications

Second coast brake	Piston stroke		2.0 - 3.5 mm	0.079 - 0.138 in.
	Piston rod length		95.2 mm	3.748 in.
			96.3 mm	3.791 in.
Oil pump	Body clearance	STD	0.07 - 0.15 mm	0.0028 - 0.0059 in.
		Maximum	0.3 mm	0.012 in.
	Tip clearance	STD	0.11 - 0.14 mm	0.0043 - 0.0055 in.
		Maximum	0.3 mm	0.012 in.
	Side clearance	STD	0.02 - 0.05 mm	0.0008 - 0.0020 in.
		Maximum	0.1 mm	0.004 in.
	Pump body bushing inside diameter			
		Maximum	38.18 mm	1.5031 in.
	Stator shaft bushing inside diameter			
	Front side	Maximum	21.57 mm	0.8492 in.
	Rear side	Maximum	27.07 mm	1.0657 in.
Direct clutch	Piston stroke		0.91 - 1.35 mm	0.0358 - 0.0531 in.
	Drum bushing inside diameter	Maximum	48.27 mm	1.9004 in.
	Flange thickness		2.70 mm	0.1063 in.
			3.00 mm	0.1181 in.
Forward clutch	Piston stroke		1.41 - 1.82 mm	0.0555 - 0.0717 in.
	Flange thickness		3.00 mm	0.1181 in.
			3.37 mm	0.1327 in.
Front planetary gear	Sun gear bushing inside diameter	Maximum	22.59 mm	0.8894 in.
	Ring gear flange bushing inside diameter			
		Maximum	30.08 mm	1.1842 in.
	Planetary pinion gear thrust clearance			
		STD	0.16 - 0.56 mm	0.0063 - 0.0220 in.
		Maximum	0.61 mm	0.024 in.
Rear planetary gear	Planetary pinion gear thrust clearance			
		STD	0.16 - 0.56 mm	0.0063 - 0.0220 in.
		Maximum	0.61 mm	0.024 in.
First and reverse brake	Pack clearance		0.85 - 2.05 mm	0.033 - 0.081 in.
Overdrive unit	Direct clutch piston stroke		1.75 - 2.49 mm	0.0689 - 0.0980 in.
	Direct clutch bushing inside diameter			
		Maximum	22.13 mm	0.8713 in.
	Counter drive gear preload	at Starting	940 - 1,560 g	2.1 - 3.4 lb 9.2 - 15.3 N
	Planetary pinion gear thrust clearance			
		STD	0.16 - 0.56 mm	0.0063 - 0.0220 in.
		Maximum	0.61 mm	0.024 in.

Specifications (Cont'd)

Valve body spring	Spring	Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coils	Color
	(Upper valve body)				
	Second coast modulator valve	27.5 (1.083)	8.9 (0.350)	14.6	Brown
	B_1 orifice control valve	24.8 (0.976)	8.0 (0.315)	12.0	White
	Down-shift plug	29.8 (1.173)	8.7 (0.343)	13.5	Yellow
	Throttle valve	30.7 (1.209)	9.2 (0.362)	9.5	Purple
	Throttle modulator valve	21.7 (0.854)	9.5 (0.374)	9.5	Orange
	Cut-back valve	21.8 (0.858)	6.0 (0.236)	13.5	Red
	No. 1 accumulator control valve	28.1 (1.106)	10.6 (0.417)	13.0	Yellow
	Lock-up relay valve	26.6 (1.047)	10.2 (0.402)	11.5	Green
	(Lower valve body)				
	Pressure relief valve	11.2 (0.441)	6.4 (0.252)	7.5	None
	Check valve	19.9 (0.783)	11.0 (0.433)	8.5	None
	Secondary regulator valve	38.5 (1.516)	8.4 (0.331)	17.0	Purple
	No. 2 accumulator control valve	23.0 (0.906)	6.3 (0.248)	12.0	Gray
	Second lock valve	20.7 (0.815)	6.1 (0.240)	12.0	Orange
	3 - 4 shift valve	29.2 (1.150)	8.9 (0.350)	12.0	Light green
	Low coast modulator valve	20.2 (0.795)	7.9 (0.311)	11.9	Purple
	1 - 2 shift valve	29.2 (1.150)	8.9 (0.350)	12.0	Light green
	2 - 3 shift valve	28.0 (1.102)	9.4 (0.370)	10.3	None
	Primary regulator valve	64.2 (2.528)	18.6 (0.732)	12.5	None

Valve body retainer	Retainer	Height mm (in.)	Width mm (in.)	Thickness mm (in.)
	(Upper valve body)			
	Lock-up relay valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
	Throttle modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
	Second coast modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
	Cut-back valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	No. 1 accumulator control valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
	B_1 orifice control valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
	(Lower valve body)			
	Primary regulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	Secondary regulator valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)
	No. 2 accumulator control valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	Second lock valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
	Low coast modulator valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
	1 - 2 shift valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
	2 - 3 shift valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	3 - 4 shift valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)

Specifications (Cont'd)

Accumulator spring	Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coils	Color
	C_1	Inner	43.4 (1.709)	17.8 (0.701)	9.0	Light Green
		Outer	71.2 (2.803)	24.4 (0.961)	11.5	Blue
	C_2		51.0 (2.008)	18.0 (0.709)	10.2	Red
	C_0 (O/D case)	Inner	47.5 (1.870)	18.9 (0.744)	9.5	White
		Outer	59.3 (2.335)	25.5 (1.004)	9.5	Gray
	B_2		58.5 (2.303)	15.2 (0.598)	15.9	Orange
	B_0 (Valve body)		62.2 (2.449)	14.8 (0.583)	17.0	None

Differential	Drive pinion preload (at starting)			
	New Bearing	10 - 16 kg-cm	8.7 - 13.9 in.-lb	1.0 - 1.6 N-m
	Reused bearing	5 - 8 kg-cm	4.3 - 6.9 in.-lb	0.5 - 0.8 N-m
	Total preload (at starting)	Add drive pinion preload		
	New bearing	2.8 - 4.4 kg-cm	2.4 - 3.8 in.-lb	0.3 - 0.4 N-m
	Reused bearing	1.4 - 2.2 kg-cm	1.2 - 1.9 in.-lb	0.1 - 0.2 N -
	Pinion to side gear backlash	0.05 - 0.20 mm	0.0020 - 0.0079 in.	
	Side gear thrust washer thickness	0.80 mm	0.0315 in.	
		0.90 mm	0.0354 in.	
		1.00 mm	0.0394 in.	
		1.10 mm	0.0433 in.	
		1.20 mm	0.0472 in.	
		1.30 mm	0.0512 in.	
		1.40 mm	0.0551 in.	
	Side bearing adjusting shim thickness			
	Mark			
	0	2.00 mm	0.0787 in.	
	1	2.05 mm	0.0807 in.	
	2	2.10 mm	0.0827 in.	
	3	2.15 mm	0.0846 in.	
	4	2.20 mm	0.0866 in.	
	5	2.25 mm	0.0886 in.	
	6	2.30 mm	0.0906 in.	
	7	2.35 mm	0.0925 in.	
	8	2.40 mm	0.0945 in.	
	9	2.45 mm	0.0965 in.	
	A	2.50 mm	0.0984 in.	
	B	2.55 mm	0.1004 in.	
	C	2.60 mm	0.1024 in.	
	D	2.65 mm	0.1043 in.	
	E	2.70 mm	0.1063 in.	
	F	2.75 mm	0.1083 in.	
	G	2.80 mm	0.1103 in.	
	H	2.85 mm	0.1122 in.	

Torque Specifications

Part tightened	kg-cm	ft-lb	N-m
Oil cooler pipe union	275	20	27
Oil pan	50	43 in.-lb	4.9
Valve body × Transaxle case	110	8	11
Accumulator × Cover	100	7	10
Oil pump × Transaxle case	225	16	22
O/D case × Transaxle case	250	18	25
Differential LH side bearing retainer	195	14	19
Differential RH retainer	195	14	19
Differential carrier cover	400	29	39
Oil pump body × Stator shaft	100	7	10
Upper valve body × Lower valve body	67	58 in.-lb	6.6
Differential left case × Right case	640	46	63
Ring gear × Differential case	1,260	91	124

AUTOMATIC TRANSAXLE (A540H)

Specifications

Second coast brake	Same the A540E automatic transaxle (See page A-2)		
Oil pump	↑		
Direct clutch	Piston stroke	1.11 - 1.47 mm	0.0437 - 0.0579 in.
	Drum bushing inside diameter Maximum	48.27 mm	1.9004 in.
	Flange thickness	2.70 mm	0.1063 in.
		3.00 mm	0.1181 in.
Forward clutch	Same the A540E automatic transaxle (See page A-2)		
Front planetary gear	↑		
Rear planetary gear	↑		
First and reverse brake	Pack clearance	1.04 - 2.16 mm	0.0409 - 0.0850 in.
Over drive unit	Same the A540E automatic transaxle (See page A-2)		
Valve body spring	Same the A540E automatic transaxle (See page A-3)		
Valve body retainer	Same the A540E automatic transaxle (See page A-3)		
Accumulator spring	Same the A540E automatic transaxle (See page A-4)		

Specifications (Cont'd)

Differential	Drive pinion preload (at staring)				
	New bearing		10 - 16 kg-cm	8.7 - 13.9 in.-lb	1.0 - 1.6 N-m
	Reused bearing		5 - 8 kg-cm	4.3 - 6.9 in.-lb	0.5 - 0.8 N-m
	Total preload (at starting)				
	New bearing		2.3 - 3.7 kg-cm	2.0 - 3.2 in.-lb	0.2 - 0.4 N-m
	Reused bearing		1.2 - 1.9 kg-cm	1.0 - 1.6 in.-lb	0.1 - 0.2 N-m
	Pinion to side gear backlash		0.05 - 0.20 mm	0.0020 - 0.0079 in.	
	Side gear thrust washer thickness				
		Mark			
		A	1.00 mm	0.0394 in.	
		B	1.05 mm	0.0413 in.	
		C	1.10 mm	0.0433 in.	
		D	1.15 mm	0.0453 in.	
		E	1.20 mm	0.0472 in.	
		F	1.25 mm	0.0492 in.	
		G	1.30 mm	0.0512 in.	
	Side bearing adjusting shim thickness				
		Mark			
		0	2.00 mm	0.0787 in.	
		1	2.05 mm	0.0807 in.	
		2	2.10 mm	0.0827 in.	
		3	2.15 mm	0.0846 in.	
		4	2.20 mm	0.0866 in.	
		5	2.25 mm	0.0886 in.	
		6	2.30 mm	0.0906 in.	
		7	2.35 mm	0.0925 in.	
		8	2.40 mm	0.0945 in.	
		9	2.45 mm	0.0965 in.	
		A	2.50 mm	0.0984 in.	
		B	2.55 mm	0.1004 in.	
		C	2.60 mm	0.1024 in.	
		D	2.65 mm	0.1043 in.	
		E	2.70 mm	0.1063 in.	
		F	2.75 mm	0.1083 in.	
		G	2.80 mm	0.1103 in.	
		H	2.85 mm	0.1122 in.	
	Differential end play		0.18 - 0.82 mm	0.0071 - 0.0323 in.	

TRANSFER (A540H)

Specifications

Transfer	Driven pinion preload (at starting)	0.9 - 1.4 kg	2.0 - 3.1 lb	8.8 - 13.7 N
	Total preload (at starting)	0.5 - 0.9 kg	1.1 - 2.0 lb	4.9 - 8.8 N
	Ring gear backlash	0.13 - 0.18 mm	0.0051 - 0.0071 in.	
	Driven pinion bearing cage			
	Driven pinion preload (at starting)			
	New bearing	1.8 - 2.9 kg	4.0 - 6.4 lb	18 - 28 N
	Reused bearing	0.9 - 1.4 kg	2.0 - 3.1 lb	9 - 13 N
	Center differential side gear backlash	0.05 - 0.20 mm	0.0020 - 0.0079	

Specifications (Cont'd)

Transfer (Cont'd)	Center differential left side gear thrust washer thickness	Mark		
		A	1.00 mm	0.0394 in.
		B	1.05 mm	0.0413 in.
		C	1.10 mm	0.0433 in.
		D	1.15 mm	0.0453 in.
		E	1.20 mm	0.0472 in.
		F	1.25 mm	0.0492 in.
		G	1.30 mm	0.0512 in.
		H	1.35 mm	0.0531 in.
		J	1.40 mm	0.0551 in.
	Center differential side gear thrust clearance		0.18 - 0.63 mm	0.0071 - 0.0248 in.
	Center differential right side gear thrust washer thickness	Mark		
		A	1.00 mm	0.0394 in.
		B	1.05 mm	0.0413 in.
		C	1.10 mm	0.0433 in.
		D	1.15 mm	0.0453 in.
		E	1.20 mm	0.0472 in.
		F	1.25 mm	0.0492 in.
		G	1.30 mm	0.0512 in.
		H	1.35 mm	0.0531 in.
		J	1.40 mm	0.0551 in.
		K	1.45 mm	0.0571 in.
		L	1.50 mm	0.0591 in.

Transfer lower valve body spring	Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coils	Color
Transfer clutch modulator valve	32.2 (1.272)	7.6 (0.299)	16	None
No. 2 low-high shift valve	28.9 (1.138)	7.0 (0.276)	14	None
No. 1 low-high shift valve	28.9 (1.138)	7.0 (0.276)	14	None

Transfer lower valve body retainer	Height mm (in.)	Width mm (in.)	Thickness mm (in.)
Transfer clutch modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
No. 2 low-high shift valve	↑	↑	↑
No. 1 low-high shift valve	↑	↑	↑

Center differential plate washer	Mark		
	71	2.13 mm	0.0839 in.
	72	2.16 mm	0.0850 in.
	73	2.19 mm	0.0862 in.
	74	2.22 mm	0.0874 in.
	75	2.25 mm	0.0886 in.
	76	2.28 mm	0.0898 in.
	77	2.31 mm	0.0909 in.
	78	2.34 mm	0.0921 in.
	79	2.37 mm	0.0933 in.
	80	2.40 mm	0.0945 in.

Specifications (Cont'd)

Transfer (Cont'd)		81	2.43 mm	0.0957 in.
		82	2.46 mm	0.0969 in.
		83	2.49 mm	0.0980 in.
		84	2.52 mm	0.0992 in.
		85	2.55 mm	0.1004 in.
		86	2.58 mm	0.1016 in.
		87	2.61 mm	0.1028 in.
		88	2.64 mm	0.1039 in.
		89	2.67 mm	0.1051 in.
		90	2.70 mm	0.1063 in.
		91	2.73 mm	0.1075 in.
		92	2.76 mm	0.1087 in.
		93	2.79 mm	0.1098 in.
		94	2.82 mm	0.1110 in.
	Ring gear adjusting shim	Mark		
		A	0.30 mm	0.0118 in.
		B	0.33 mm	0.0130 in.
		C	0.36 mm	0.0142 in.
		D	0.39 mm	0.0154 in.
		E	0.42 mm	0.0165 in.
		F	0.45 mm	0.0177 in.
		G	0.48 mm	0.0189 in.
		H	0.51 mm	0.0201 in.
		J	0.54 mm	0.0213 in.
		K	0.57 mm	0.0224 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N-m
Oil cooler pipe union and elbow		275	20	27
Oil pan		50	43 in.-lb	4.9
Valve body × Transaxle case		110	8	11
Accumulator × Cover		100	7	10
Oil pump × Transaxle case		225	16	22
O/D case × Transaxle case		250	18	25
Differential LH side bearing retainer		195	14	19
Differential carrier cover		400	29	39
Oil pump body × Stator shaft		100	7	10
Upper valve body × Lower valve body		67	58 in.-lb	6.6
Front differential right case × Front differential left case		340	25	33
Ring gear × Ring gear mounting case		1,260	91	124
Transfer right case retainer × Transfer right case		300	22	29
Transfer right case × Adjusting nut lock plate lock bolt		73	63 in.-lb	7.2
Transfer right case × Transfer left case		450	33	44
Transfer right case × Mode select lever and rod	Ⓐ	55	48 in.-lb	5.4
	Ⓑ	115	8	11

Torque Specifications (Cont'd)

Part tightened	kg-cm	ft-lb	N-m
Transfer right case × Oil strainer	55	48 in.-lb	5.4
Transfer left case × Rear wheel speed sensor	55	48 in.-lb	5.4
Transfer left case × Transfer inspection hole cover	160	12	16
Transfer left case × Drain plug	400	29	39
Transfer left case × Driven pinion bearing cage	400	29	39
Driven pinion bearing cage × Transfer extension housing	260	19	25
Transfer extension housing × Dynamic damper	260	19	25
Transfer right case × Oil pump cover	80	69 in.-lb	7.8
Transfer ring gear × Ring gear mounting case	985	71	97
Center differential control solenoid × Transfer valve body	145	10	14
Transfer valve body × Transfer left case	110	8	11
Neutral start switch bolt	55	48 in.-lb	5.4
Neutral start switch nut	70	61 in.-lb	6.9
Transfer assembly × Transaxle case	700	51	69

LUBRICANT

Item		Capacity			Classification
		Liters	US qts	Imp. qts	
Automatic transaxle fluid (w/o Differential oil)	A540E				ATF DEXRON○ II
	Dry fill	5.9	6.2	5.2	
	Drain and refill	2.5	2.6	2.2	
	A54H				ATF type T (08886 - 00405) or equivalent
	Dry fill	7.0	7.4	6.2	
	Drain and refill	3.3	3.5	2.9	
Differential oil (w/ Automatic transaxle)					ATF DEXRON○ II
	SV21 series	1.6	1.7	1.4	
	VZV21 series	1.0	1.1	0.9	
Transfer oil (A540H)		0.7	0.74	0.62	Transaxle oil E50 (08885 - 80206) or equivalent (Recommended oil Oil grade: API GL-5 Viscosity: SAE 75W-90 or 80W-90 SAE 90W [above -18˚C (0˚F)] SAE 80W [below -18˚C (0˚F)])

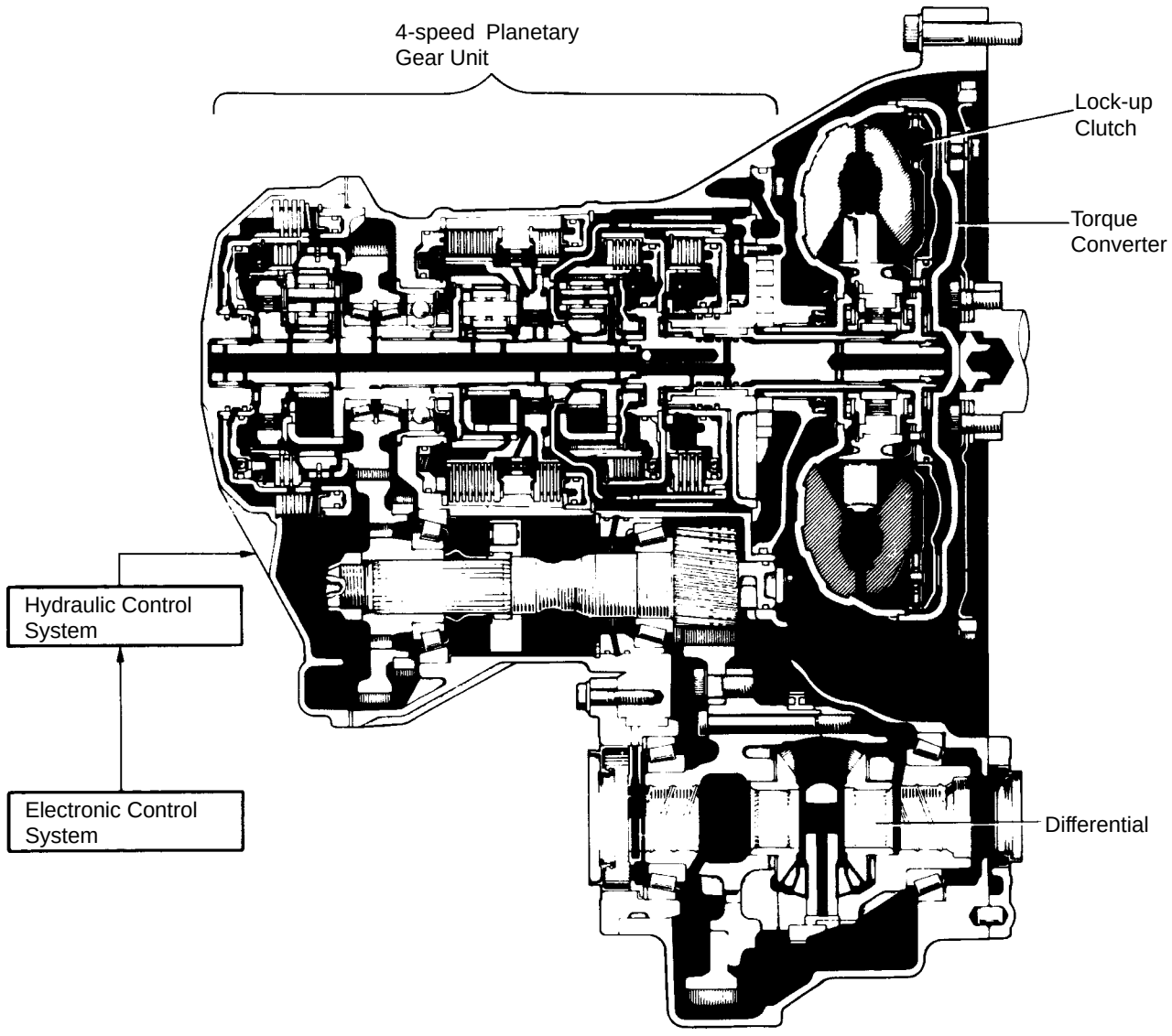
DESCRIPTION

GENERAL

(A540E)

The A540E is a 4-speed, Electronic Controlled Transaxle (hereafter called ECT) developed exclusively for use with a transversely-mounted engine. A lock-up is built into the torque converter.
The A540E transaxle is mainly composed of the torque converter, the 4-speed planetary gear unit, the differential, the hydraulic control system and the electronic control system.

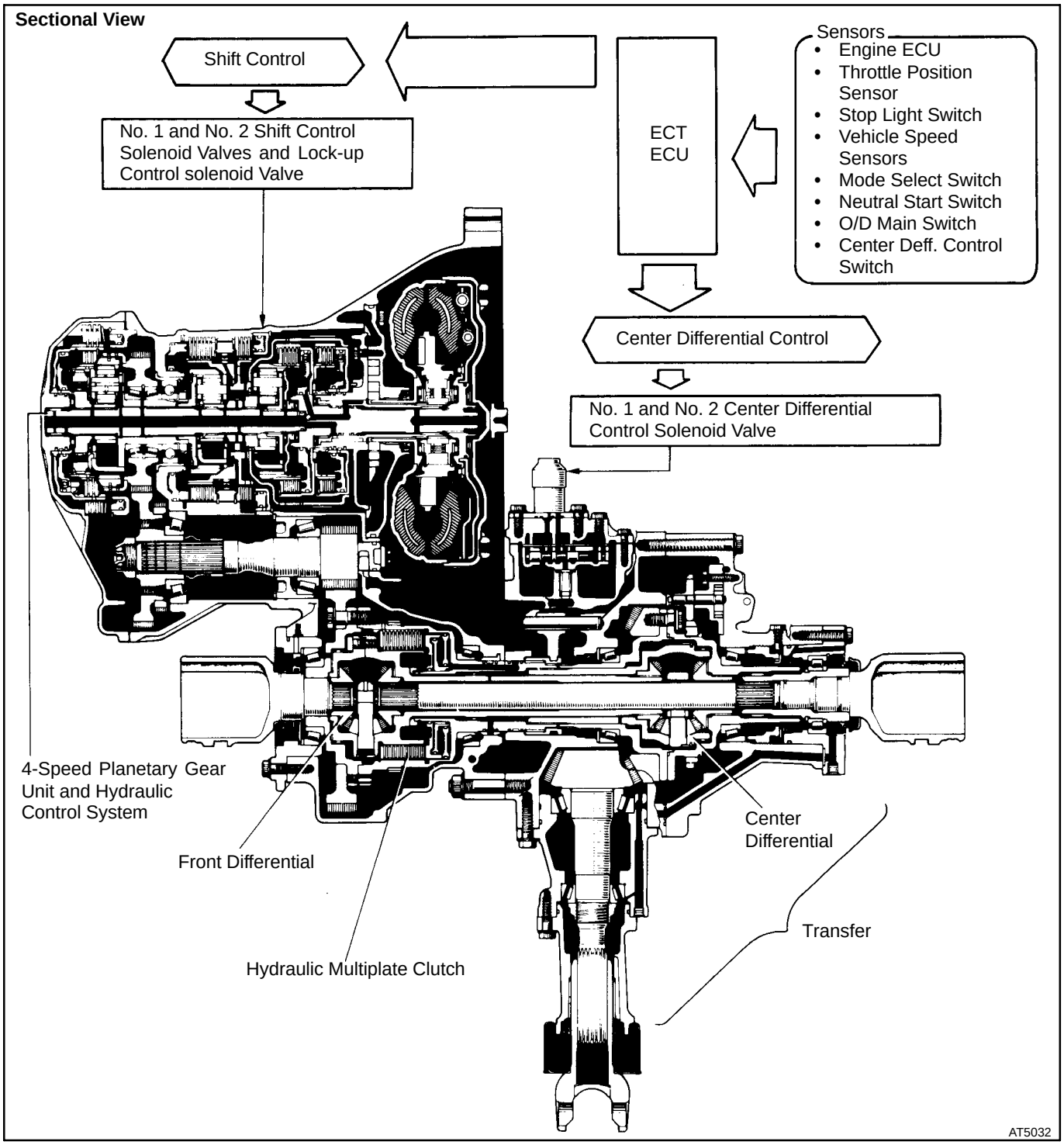
Sectional View



(A540H)

The A540H automatic transaxle design is based on the A540E automatic transaxle and equipped with a center differential and transfer.
This transaxle has the same hydraulic multiplate clutch in the center differential limiting control mechanism as the A241H automatic transaxle on the Corolla All-Trac/4WD Station Wagon. The fluid pressure acting on the hydraulic multiplate clutch of the A540H is controlled by the ECT ECU (Electronic Control Unit) according to the vehicle driving conditions. As a result, torque is distributed to the front and rear wheels appropriately at all times to maximize the overall performance of the 4WD vehicle.
NOTICE: Special handling methods are necessary for full-time 4WD vehicles during inspection and maintenance. Instructions concerning these handling methods are given on Camry Repair Manual (Pub. No. RM199U) on page IN-8.

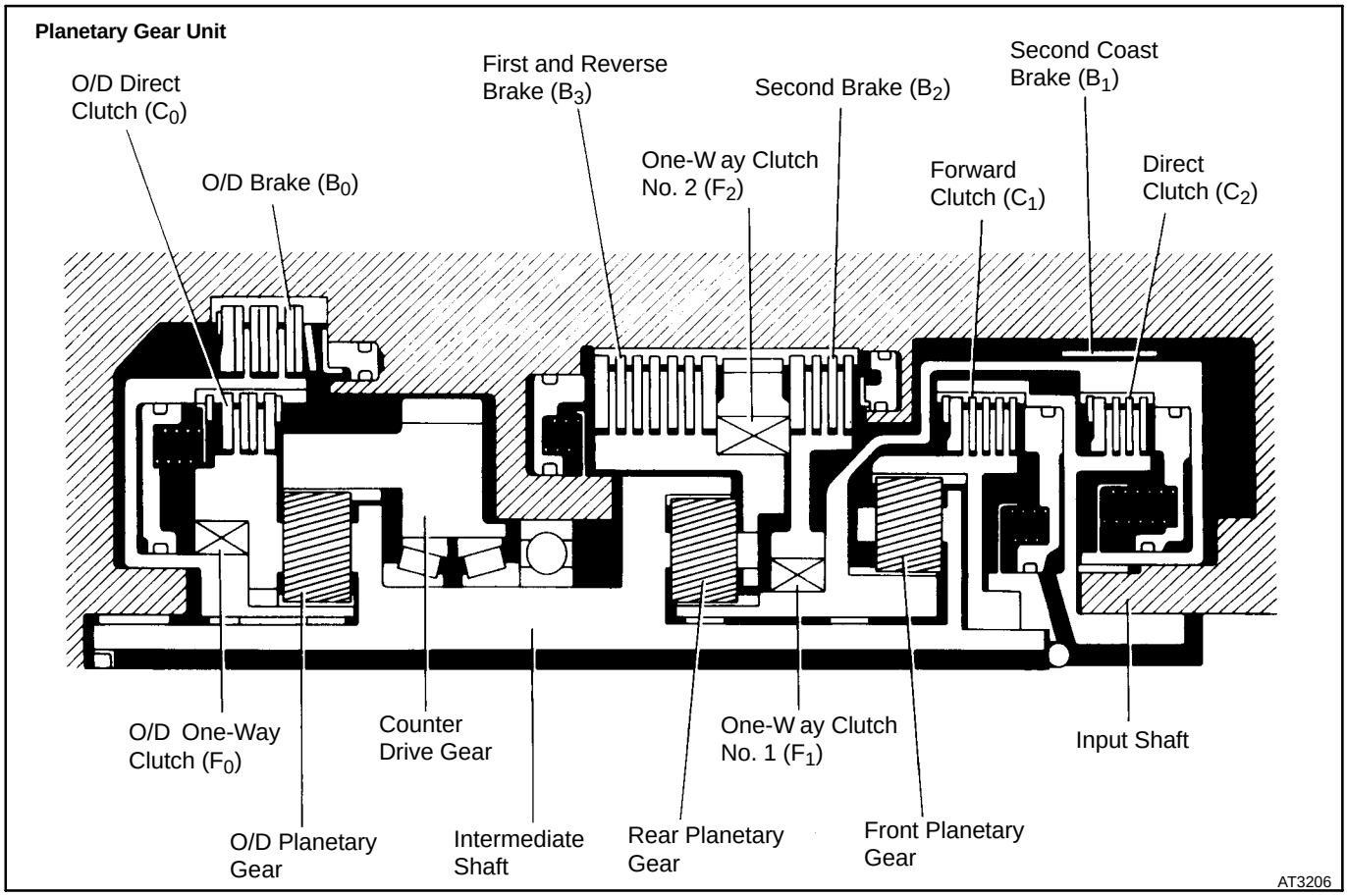
Sectional View



General Specification

Type of Transmission				A540E	A540H
Type of Engine				2VZ-FE	3S-FE
Torque Converter	Stall Torque Ratio			1.9 : 1	2.0 : 1
	Lock-Up Mechanism			Equipped	←
Gear Ratio	1st Gear			2.810	←
	2nd Gear			1.549	←
	3rd Gear			1.000	←
	O/D Gear			0.734	←
	Reverse Gear			2.296	←
Number of Discs and Plates (Disc/Plate)	C_0	O/D Direct Clutch		2/2	←
	C_1	Forward Clutch		4/4	←
	C_2	Direct Clutch		3/3	←
	B_2	2nd Brake		3/3	←
	B_3	First & Reverse Brake		7/7	6/6
	B_0	O/D Brake		3/3	←
B_1 Band Width			mm (in.)	38 (1.50)	25 (0.98)
ATF	Type			ATF DEXRON★ II	ATF Type T or equivalent
	Capacity liter (US qts, Imp. qts)		A/T	5.9 (6.2, 5.2)	7.0 (7.4, 6.2)
			D/F	1.0 (1.1, 0.9)	—
Transfer Oil	Type			—	Transaxle oil E50, API GL5, SAE 75W-90 or equivalent
	Capacity liter (US qts, Imp. qts)			—	0.7 (0.7, 0.6)

OPERATION



A540E, A540H

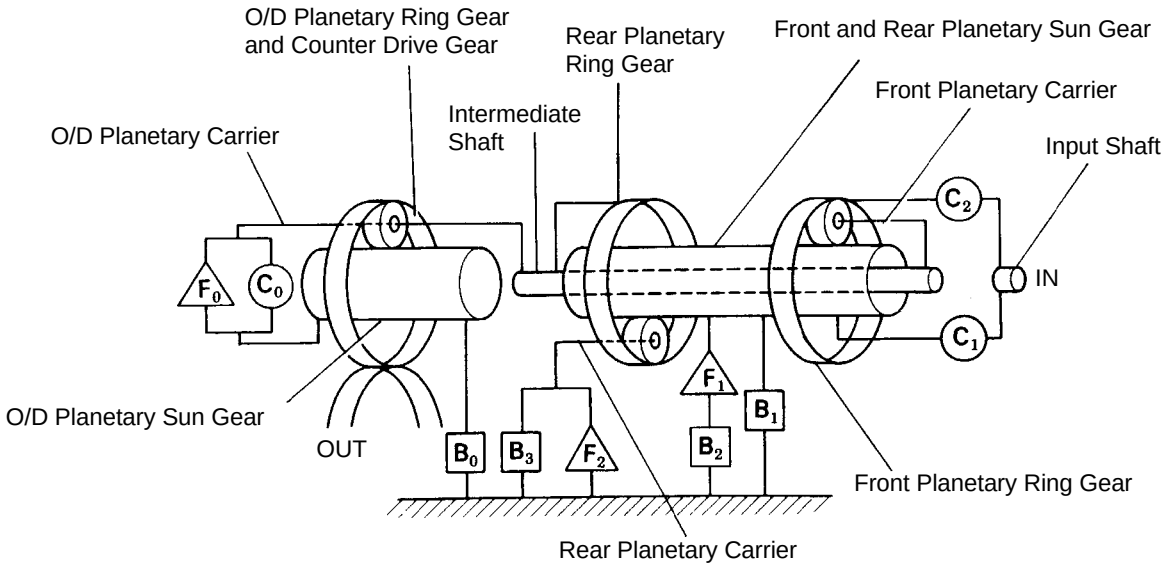
○..... Operating

Shift lever position	Gear position	C_0	C_1	C_2	B_0	B_1	B_2	B_3	F_0	F_1	F_2
P	Parking	○									
R	Reverse	○		○				○			
N	Neutral	○									
D	1st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1st	○	○						○		○
	2nd	○	○			○	○		○	○	
	*3rd	○	○	○			○		○		
L	1st	○	○					○	○		○
	*2nd	○	○			○	○		○	○	

*Down-shift only-no up-shift

FUNCTION OF COMPONENTS

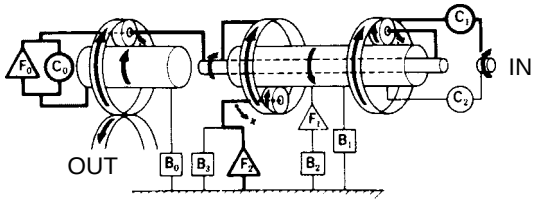
NOMENCLATURE		OPERATION
Forward Clutch	C_1	Connects input shaft and front planetary ring gear
Direct Clutch	C_2	Connects input shaft and front & rear planetary sun gear
2nd Coast Brake	B_1	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise
2nd Brake	B_2	Prevents outer race of F_1 from turning either clockwise or counterclockwise, thus preventing front & rear planetary sun gear from turning counterclockwise
1st & Reverse Brake	B_3	Prevents rear planetary carrier from turning either clockwise or counterclockwise
No. 1 One-Way Clutch	F_1	When B_2 is operating, prevents front & rear planetary sun gear from turning counterclockwise
No. 2 One-Way Clutch	F_2	Prevents rear planetary carrier from turning counterclockwise
O/D Direct Clutch	C_0	Connects overdrive sun gear and overdrive-planetary carrier
O/D Brake	B_0	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One-Way Clutch	B_0	When transmission is being driven by engine, connects overdrive sun gear and overdrive carrier
Planetary Gears		These gears change the route through which driving force is transmitted in accordance with the operation of each clutch and brake in order to increase or reduce the input and output speed



AT3207

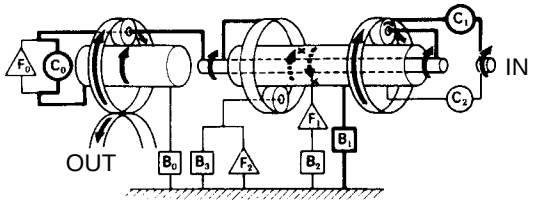
Power from the engine transmitted to the input shaft via the torque converter is then transmitted to the planetary gears by the operation of the clutch.
By operation of the brake and one-way clutch, either the planetary carrier or the planetary sun gear are immobilized, altering the speed of revolution of the planetary gear unit.
Shift change is carried out by altering the combination of clutch and brake operation.
Each clutch and brake operates by hydraulic pressure; gear position is decided according to the throttle opening angle and vehicle speed, and shift change automatically occurs.
The conditions of operation for each gear position are shown on the following illustrations:

D or 2 Range 1st Gear



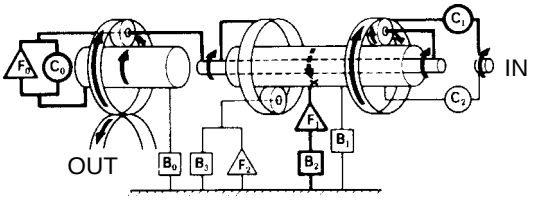
AT1097

2 Range 2nd Gear



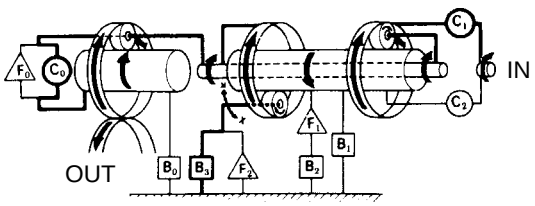
AT1102

D Range 2nd Gear



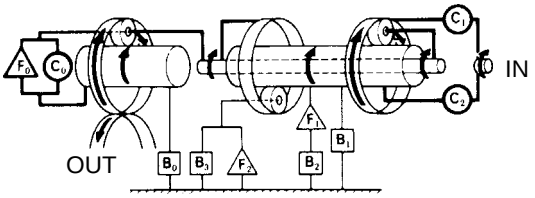
AT1098

L Range 1st Gear



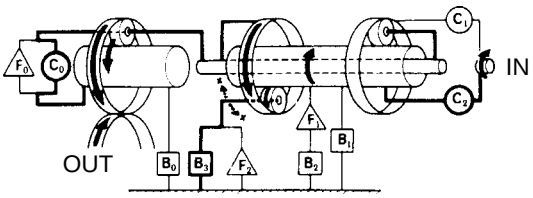
AT1103

D Range 3rd Gear



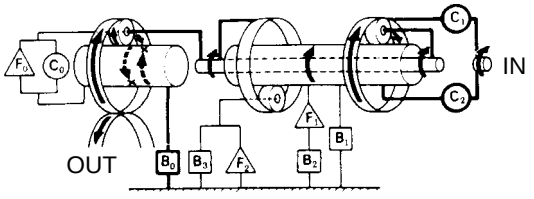
AT1099

R Range Reverse Gear



AT1101

D Range O/D Gear



AT1100

Hydraulic Control System

® **A540E, A540H**

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, the accumulators, the clutches and brakes, and the governor valve as well as the fluid passages which connect all of these components.

Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter, clutches and brakes in accordance with the vehicle driving conditions.

There are three solenoid valves on the valve body.

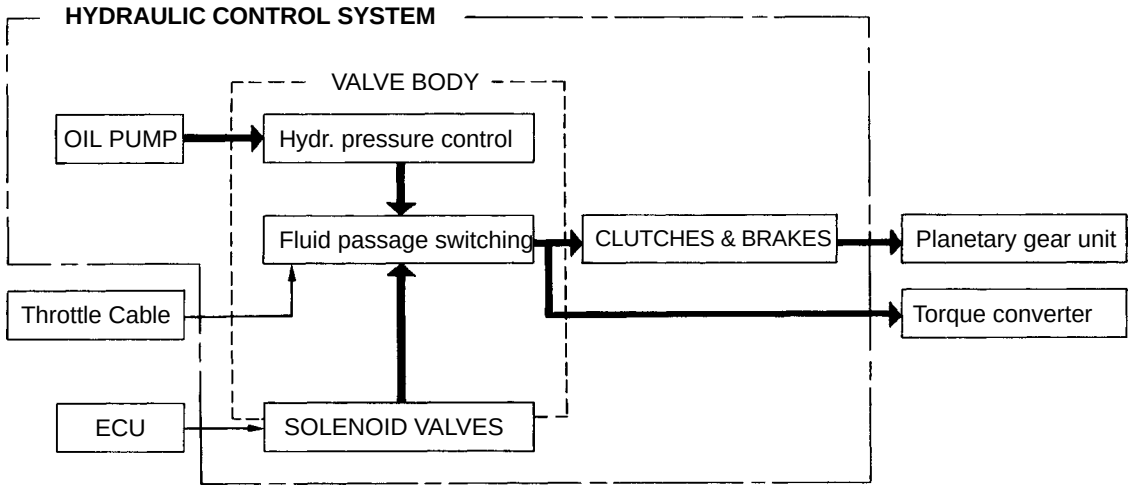
The No. 1 and No. 2 solenoid valves are turned on and off by signals from ECU to operate the shift valves and change the gear shift position.

The No. 3 solenoid valve is operated by signals from the ECU to engage or disengage the lock-up clutch of the torque converter.

® **A540H**

There are two center differential control solenoid valves on the transfer.

The solenoid valves are adjusting the center differential control pressure.



COMPONENT PARTS

General Notes

The instructions here are organized so that you work on only one component group at a time. This will help avoid confusion from similar-looking parts of different subassemblies being on your workbench at the same time.
The component groups are inspected and repaired from the converter housing side.
As much as possible, complete the inspection, repair and assembly before proceeding to the next component group. If a component group can not be assembled because parts are being ordered, be sure to keep all parts of that group in a separate container while proceeding with disassembly, inspection, repair and assembly of other component groups.
Recommended fluid for the automatic transaxle: A540E ATF DEXRON® II
A540H ATF Type T or equivalent
Recommended oil for the transfer: Transaxle oil E50, API GL5, SAE 75W-90 or equivalent

GENERAL CLEANING NOTES:

1. **All disassembled parts should be washed clean, with any fluid passages and holes blown through with compressed air.**
2. **When using compressed air to dry parts, always aim away from yourself to prevent accidentally spraying automatic transaxle fluid or kerosene in your face.**
3. **The recommended automatic transaxle fluid or kerosene should be used for cleaning.**

PARTS ARRANGEMENT:

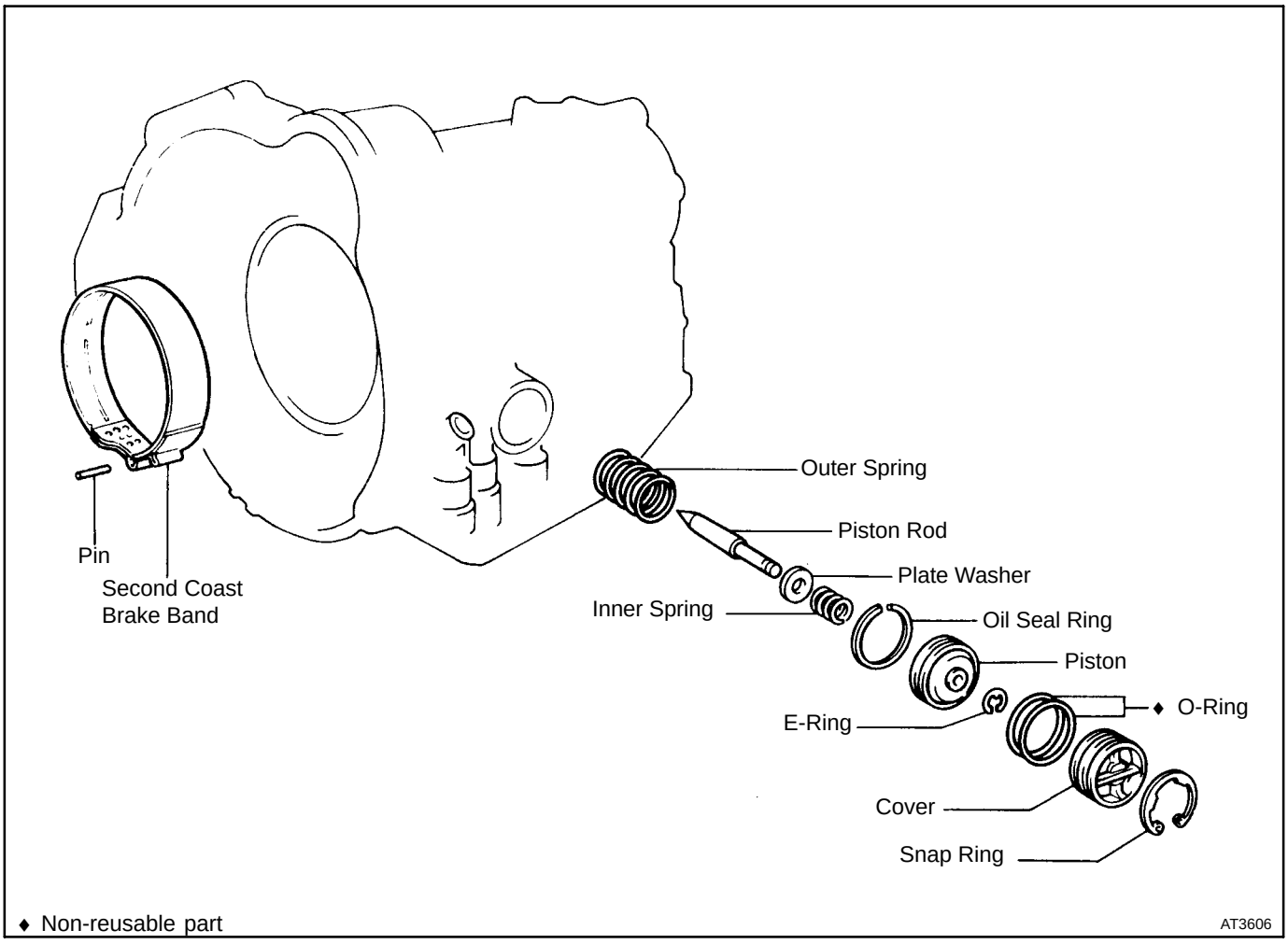
1. **After cleaning, the parts should be arranged in proper order to allow efficient inspection, repairs, and reassembly.**
2. **When disassembling a valve body, be sure to keep each valve together with the corresponding spring.**
3. **New brakes and clutches that are to be used for replacement must be soaked in transaxle fluid for at least fifteen minutes before assembly.**

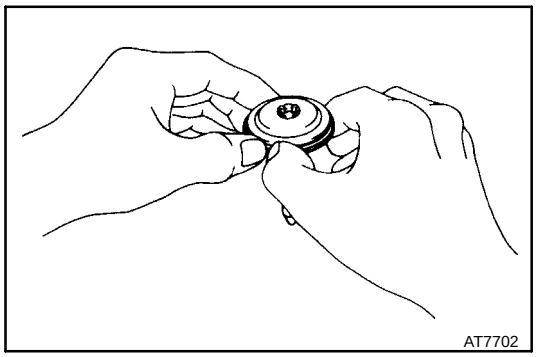
GENERAL ASSEMBLY:

1. **All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with transmission fluid prior to reassembly.**
2. **All gaskets and rubber O-rings should be replaced.**
3. **Make sure that the ends of a snap ring are not aligned with one of the cutouts and are installed in the groove correctly.**
4. **If a worn bushing is to be replaced, the subassembly containing that bushing must be replaced.**
5. **Check thrust bearings and races for wear or damage. Replace if necessary.**
6. **Use petroleum jelly to keep parts in place.**

Second Coast Brake

COMPONENTS

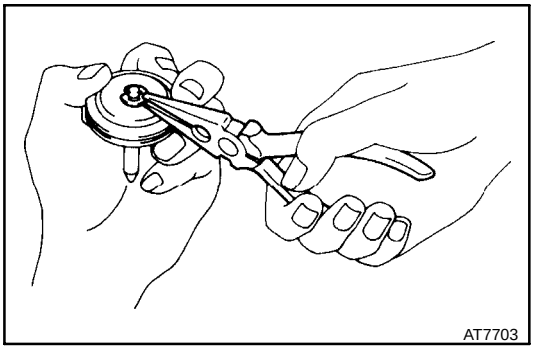




DISASSEMBLY OF SECOND COAST BRAKE PISTON

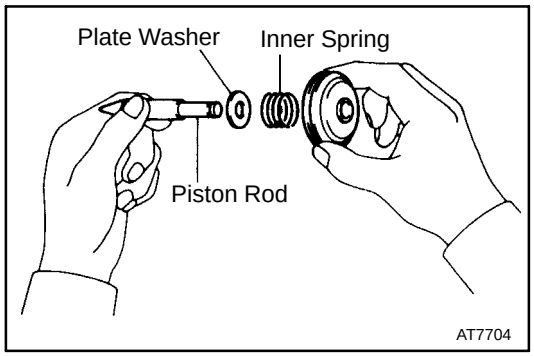
1. REMOVE OIL SEAL RING

Remove the oil seal ring from the piston.

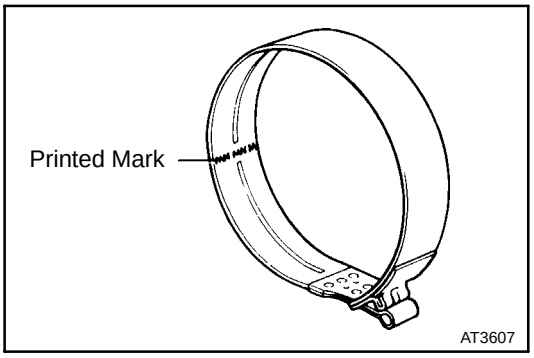


2. REMOVE PISTON ROD

(a) Remove the E-ring while pushing the piston with needle-nose pliers.

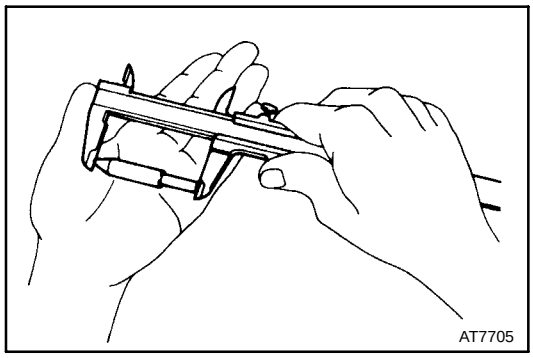


(b) Remove the inner spring, plate washer and piston rod.



INSPECTION OF SECOND COAST BRAKE COMPONENT

If the lining of the brake band is exfoliated or discolored, or even part of the printed marks is defaced, replace the brake band.



ASSEMBLY OF SECOND COAST BRAKE PISTON

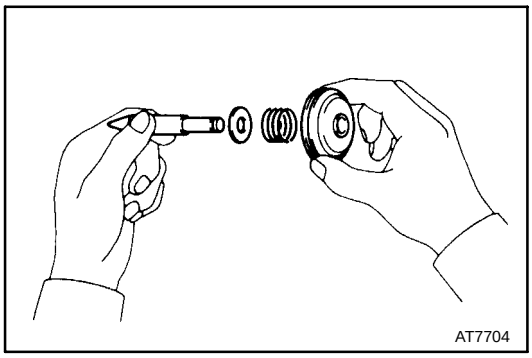
1. SELECT PISTON ROD

If the band is OK but piston stroke not within the standard value, select the piston rod.

Piston stroke: 2.0 - 3.5 mm (0.079 - 0.138 in.)

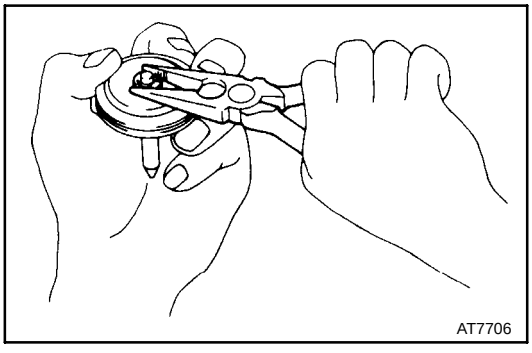
There are two lengths of piston rod.

Piston rod length: 95.2 mm (3.748 in.)
96.3 mm (3.791 in.)

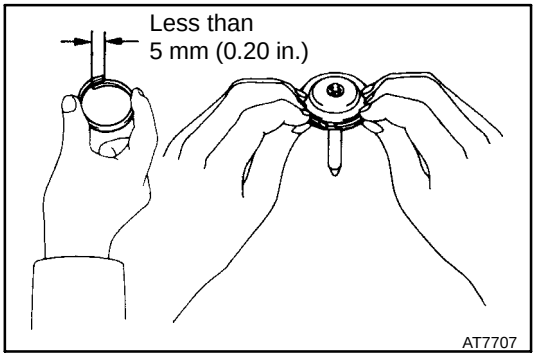


2. INSTALL PISTON ROD

(a) Install the plate washer and inner spring to the piston rod.



(b) Install the E-ring while pushing the piston.



3. INSTALL OIL SEAL RING

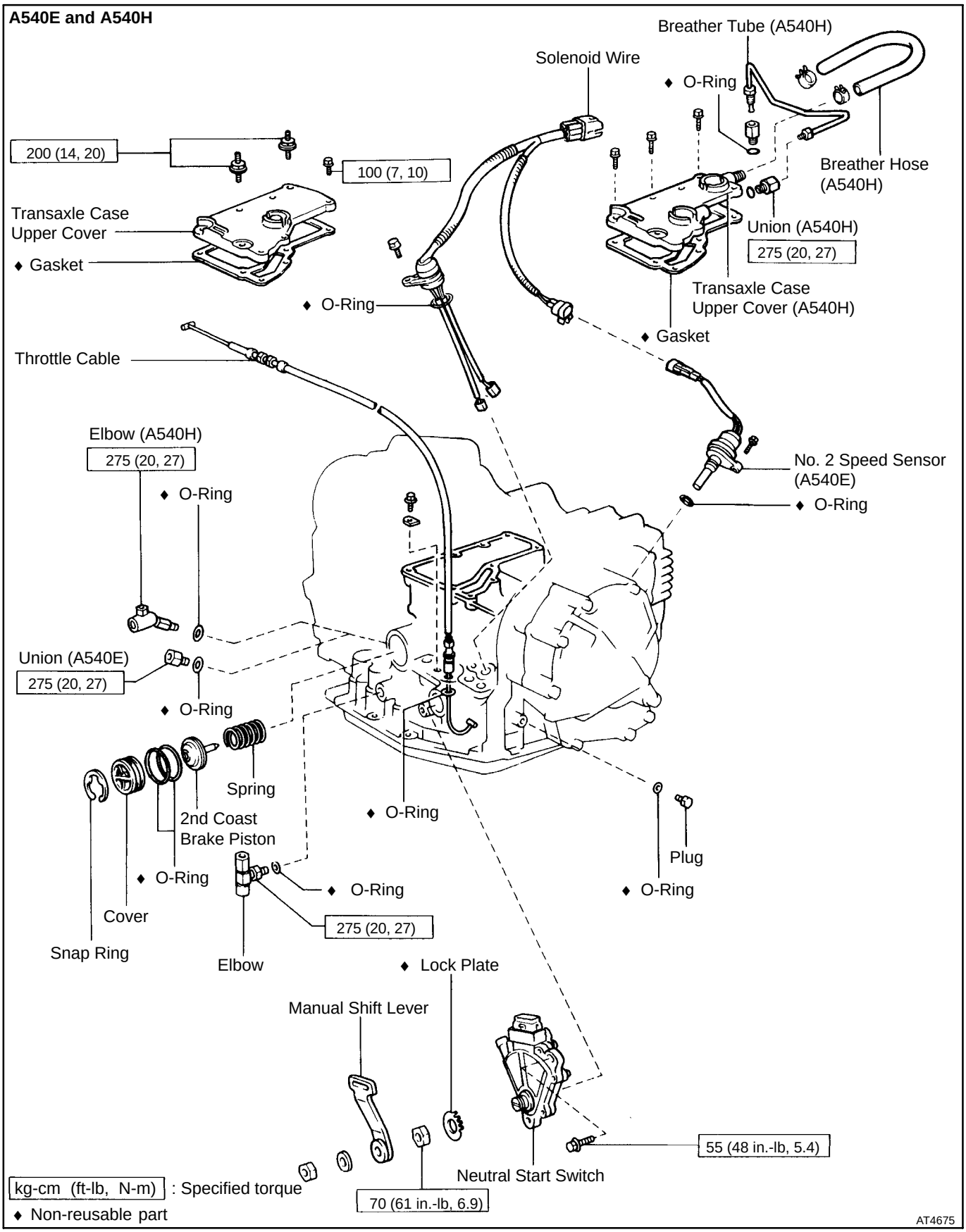
(a) Apply ATF to the oil seal ring.

(b) Install the oil seal ring to the piston.

NOTICE: Do not spread the ring ends more than necessary.

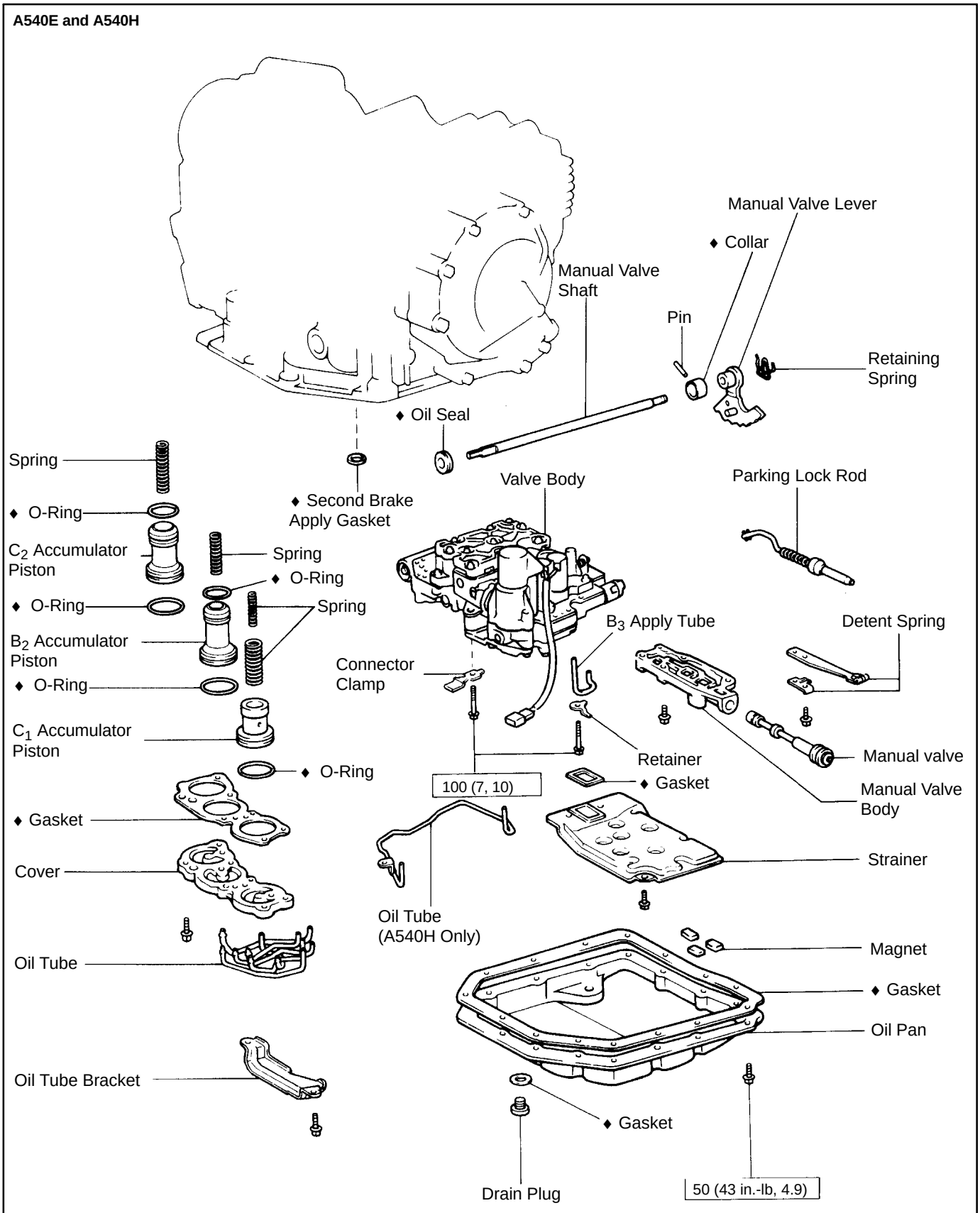
REMOVAL OF COMPONENT PARTS

COMPONENTS



COMPONENTS (Cont'd)

A540E and A540H



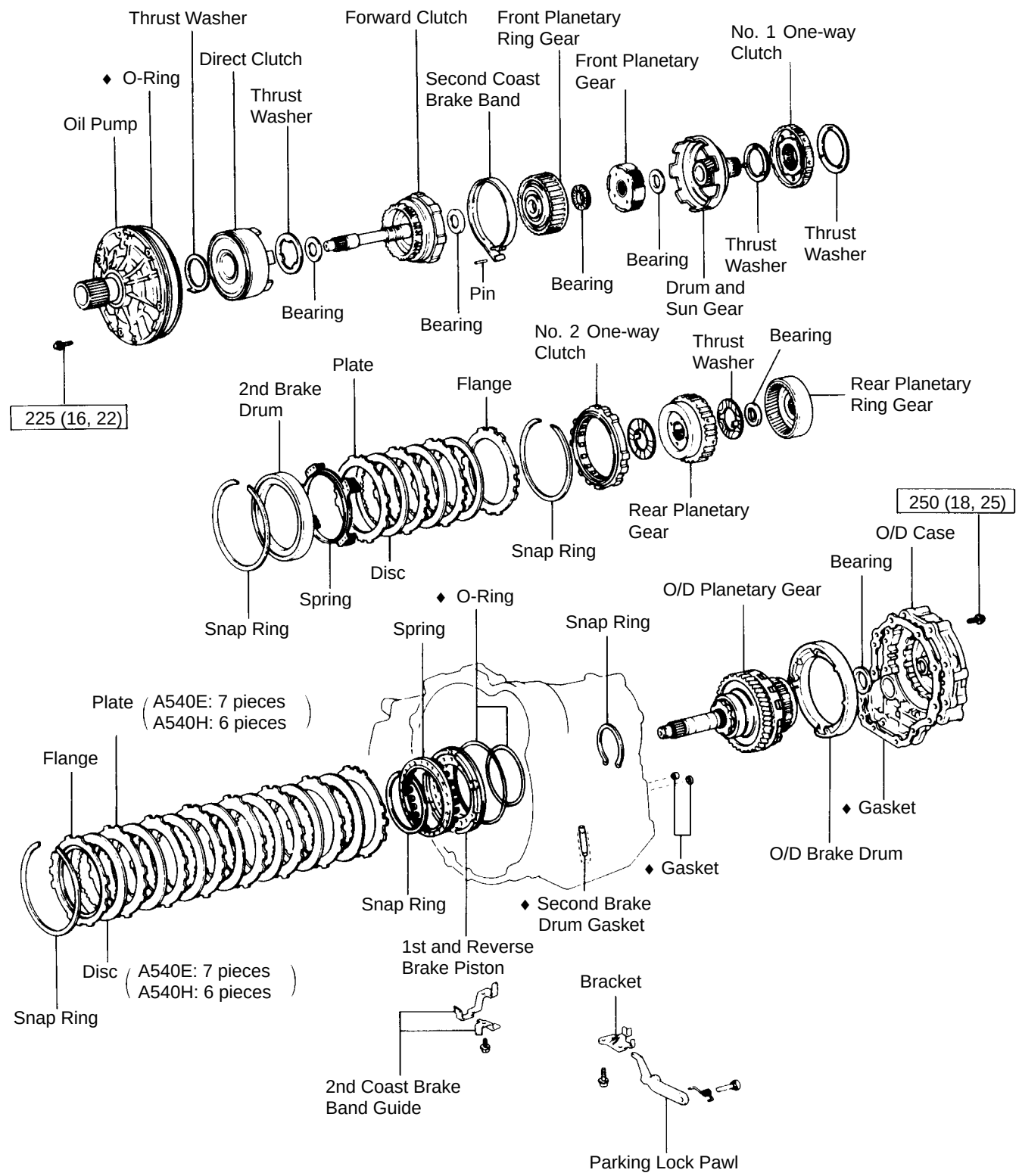
kg-cm (ft-lb, N-m) : Specified torque

♦ Non-reusable part

AT4676

COMPONENTS (Cont'd)

A540E and A540H



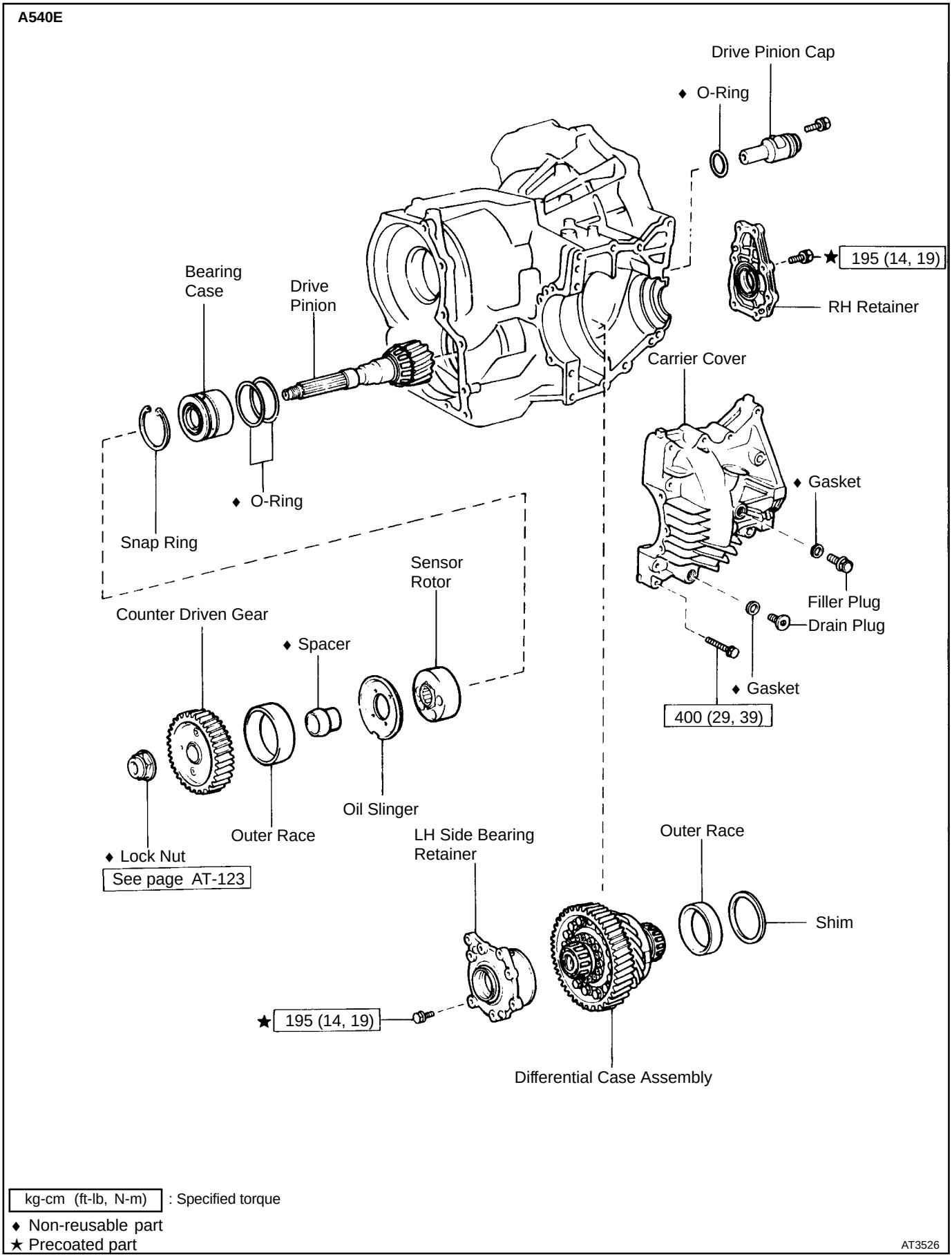
kg-cm (ft-lb, N-m) : Specified torque

♦ Non-reusable part

AT5020

COMPONENTS (Cont'd)

A540E



kg-cm (ft-lb, N-m) : Specified torque

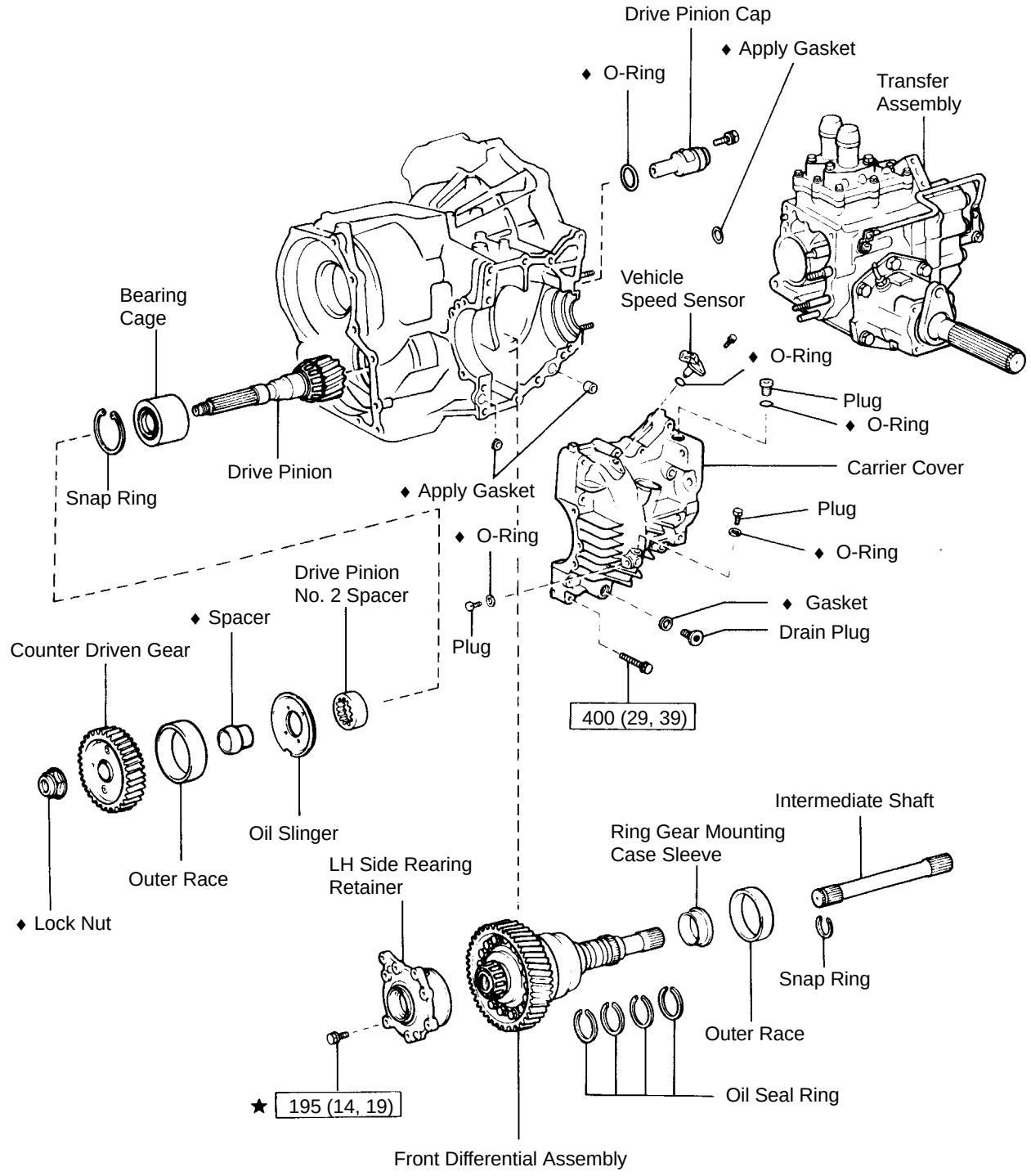
♦ Non-reusable part

★ Precoated part

AT3526

COMPONENTS (Cont'd)

A540H

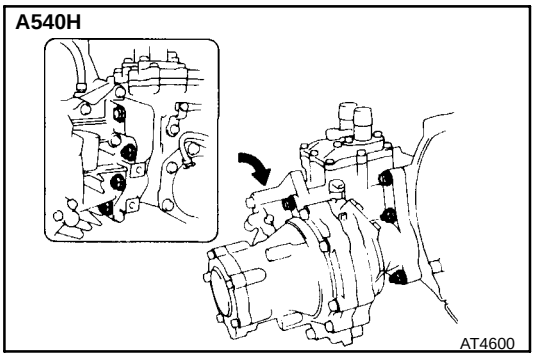


kg-cm (ft-lb, N-m) : Specified torque

♦ Non-reusable part

★Precoated part

AT4677

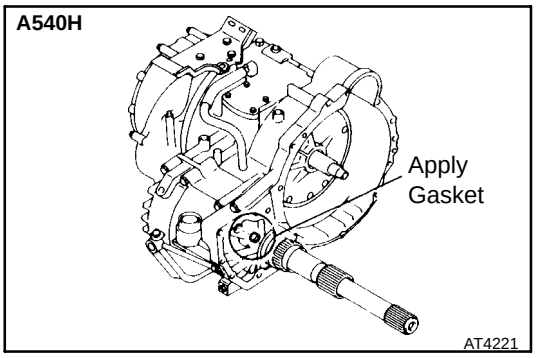


SEPARATE BASIC SUBASSEMBLY

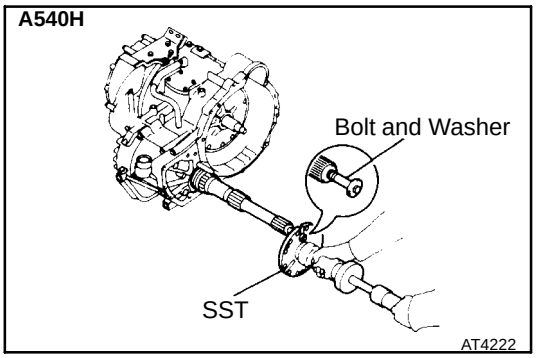
1. (A540H)
REMOVE TRANSFER ASSEMBLY

(a) Remove the five nuts and three bolts.

(b) Using a plastic hammer, remove the transfer assembly form the transaxle.



2. (A540H)
REMOVE APPLY GASKET

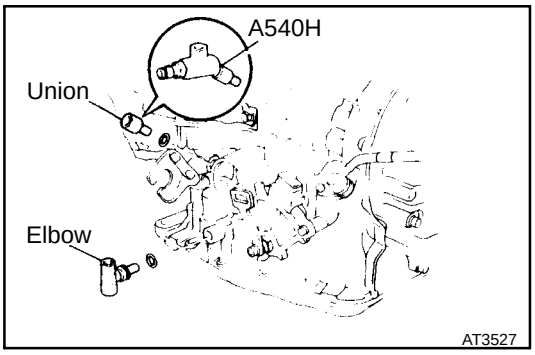


3. (A540H)
REMOVE DIFFERENTIAL SIDE GEAR INTERMEDIATE SHAFT

(a) Screw in suitable bolt with washer into the side gear intermediate shaft.

(b) Using SST, remove the side gear intermediate shaft.

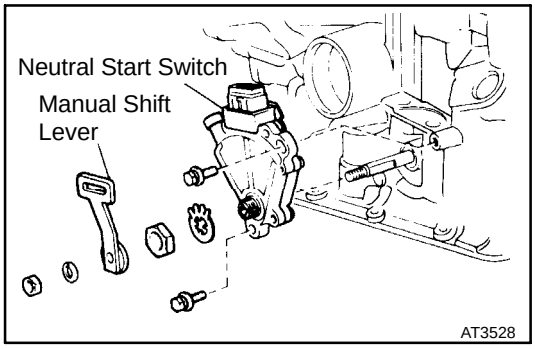
SST 09520-32012



4. REMOVE UNION AND ELBOW

(a) Using an open end wrench, remove the union and elbow.

(b) Remove the O-rings from the union and elbow.

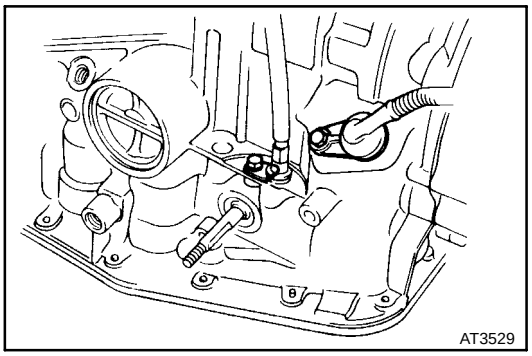


5. REMOVE NEUTRAL START SWITCH

(a) Remove the manual shift lever.

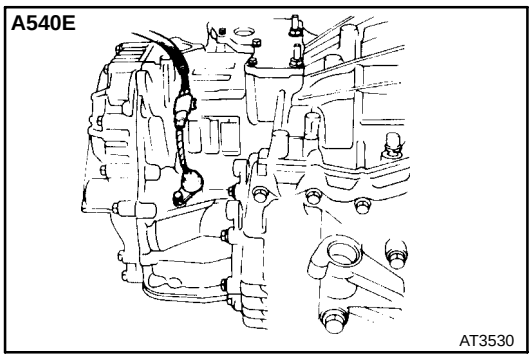
(b) Pry off the lock washer and remove the manual valve shaft nut.

(c) Remove the two bolts and pull out the neutral start switch.



6. REMOVE THROTTLE CABLE RETAINING BOLT AND PLATE

7. REMOVE SOLENOID WIRE RETAINING BOLT

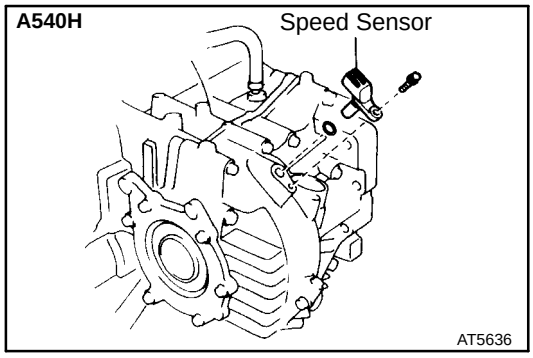


8. (A540E)
REMOVE NO. 2 SPEED SENSOR

(a) Disconnect the connector.

(b) Remove the bolt and pull out the speed sensor.

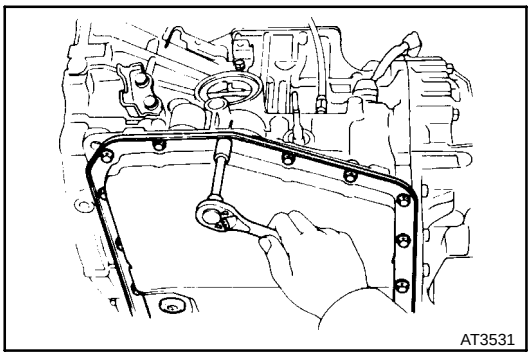
(c) Remove the O-ring from speed sensor.



9. (A540H)
REMOVE VEHICLE SPEED SENSOR

(a) Remove the bolt and pull out the speed sensor.

(b) Remove the O-ring from speed sensor.



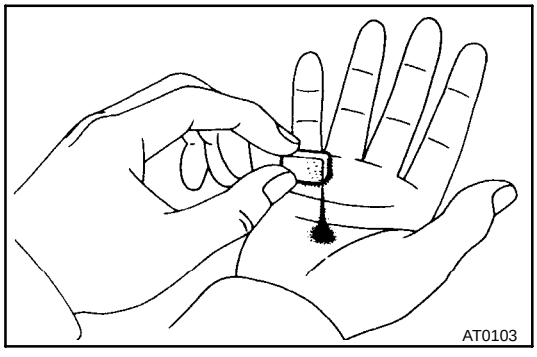
10. REMOVE OIL PAN AND GASKET

(a) Remove the seventeen bolts.

(b) Remove the oil pan by lifting transaxle case.

NOTICE: Do not turn the transaxle over as this will contaminate the valve body with the foreign materials in the bottom of the oil pan.

(c) Place the transaxle on wooden blocks to prevent damage to the oil tube bracket.

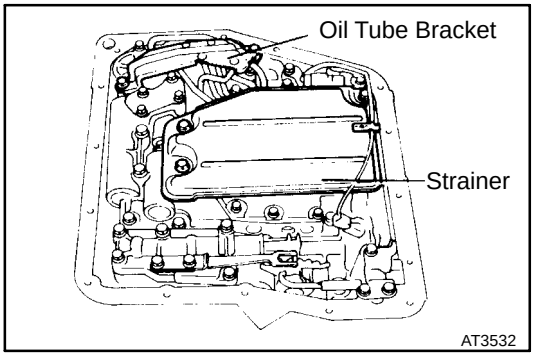


11. EXAMINE PARTICLES IN PAN

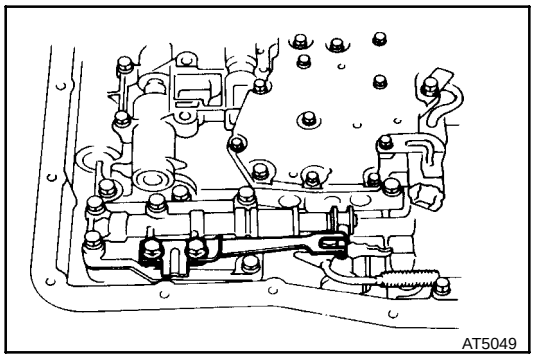
Remove the magnet and use it to collect any steel chips. Look carefully at the chips and particles in the oil pan and on the magnet to anticipate what type of wear you will find in the transaxle.

Steel (magnetic)... bearing, gear and plate wear

Brass (non-magnetic)... bushing wear

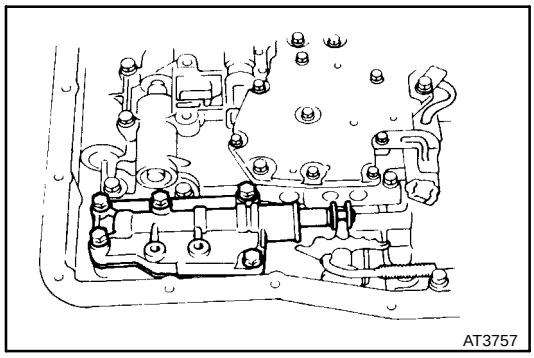


12. REMOVE OIL TUBE BRACKET AND STRAINER



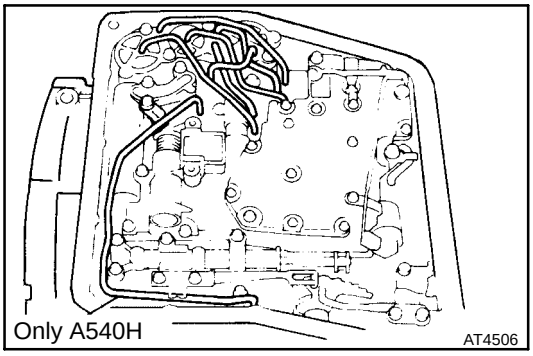
13. REMOVE MANUAL VALVE BODY

(a) Remove the two bolts and detent spring.



(b) Remove the five bolts and manual valve body with the manual valve.

(c) Remove the manual valve from the manual valve body.

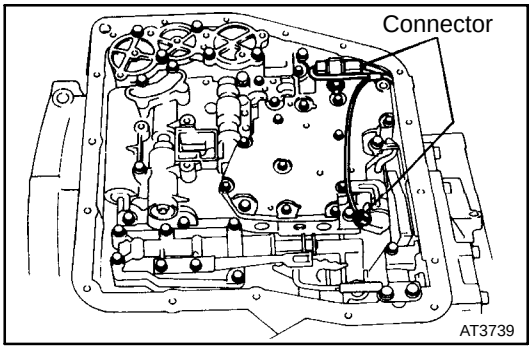


14. REMOVE OIL TUBES

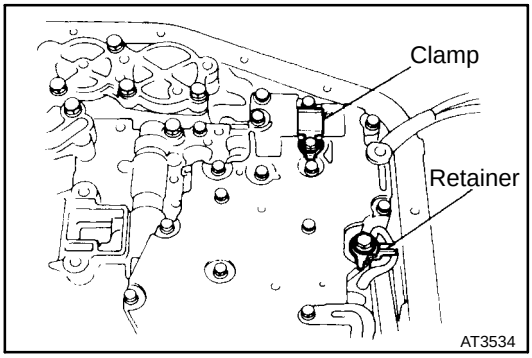
(A540E)
Pry up both tube ends with a large screwdriver and remove the six tubes.
(A540H)

(a) Remove the bolt.

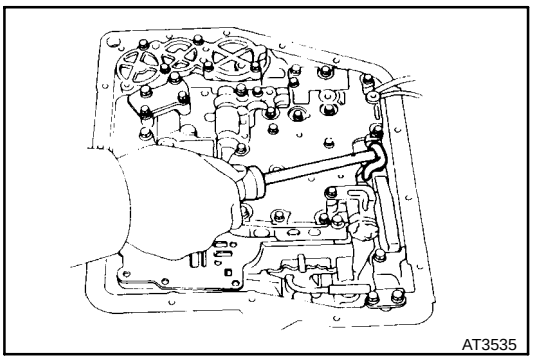
(b) Pry up both tube ends with a large screwdriver and remove the seven tubes.



15. DISCONNECT SOLENOID CONNECTORS

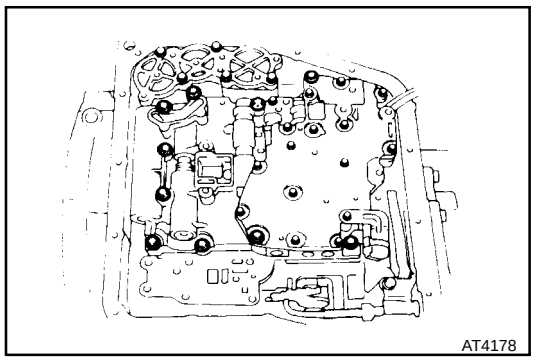


16. REMOVE CONNECTOR CLAMP AND TUBE RETAINER



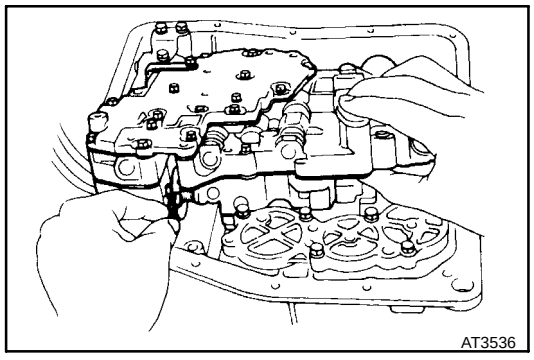
17. REMOVE B_3 APPLY TUBE

Pry up the tube with a screwdriver and remove the tube.

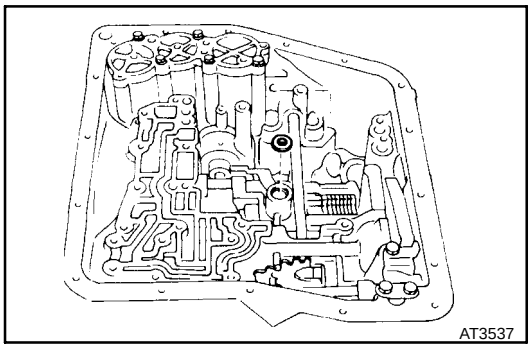


18. REMOVE VALVE BODY

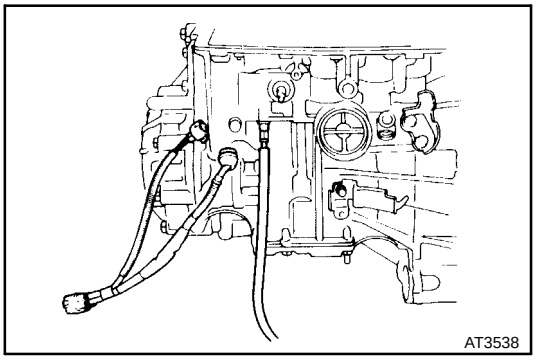
(a) Remove the ten bolts.



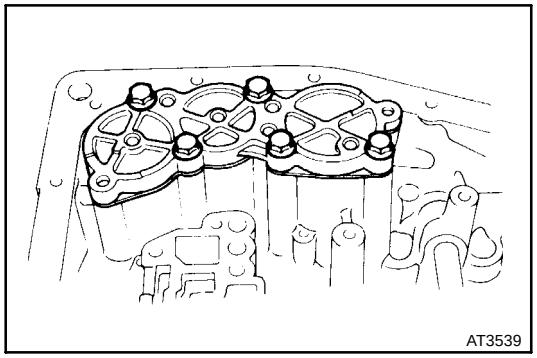
(b) Disconnect the throttle cable from the cam and remove the valve body.



19. REMOVE SECOND BRAKE APPLY GASKET



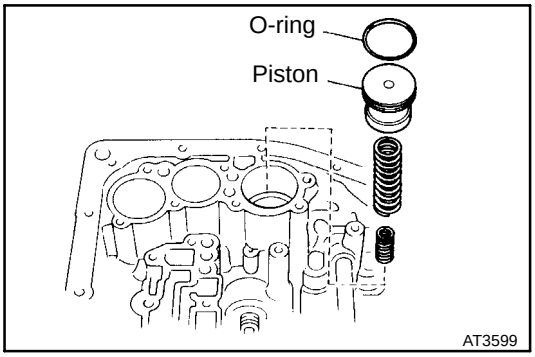
20. REMOVE THROTTLE CABLE AND SOLENOID WIRE



21. REMOVE ACCUMULATOR PISTONS AND SPRINGS

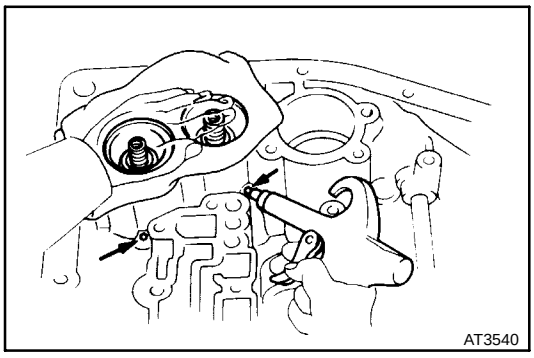
(a) Loosen the five bolts one turn at a time until the spring tension is released.

(b) Remove the cover and gasket.



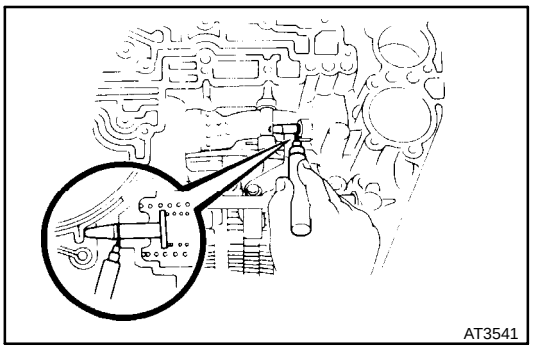
(c) Remove the C_1 accumulator piston.

(d) Remove the O-ring.



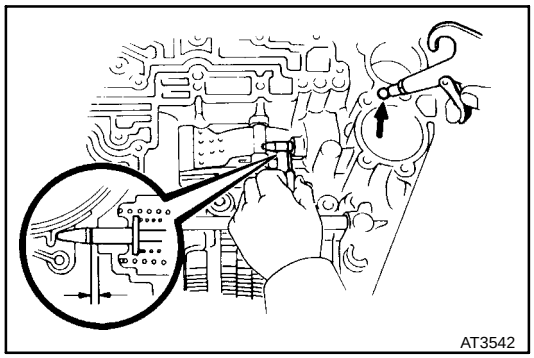
(e) Pop out pistons for C_2 and B_2 into a rag, using low-pressure compressed air (1 kg/cm^2, 14 psi or 98 kPa). Force air into the holes shown and remove the pistons and springs.

(f) Remove the O-rings from the pistons.



22. MEASURE PISTON STROKE OF SECOND COAST BRAKE

(a) Apply a small amount of paint to the piston rod at the point it meets the case as shown in the illustration.

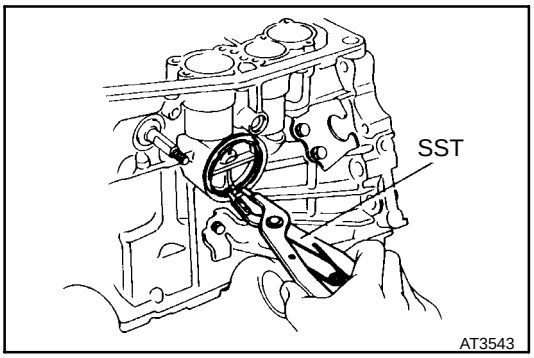


(b) Using SST, measure the piston stroke applying and releasing the compressed air (4 - 8 kg/cm^2 57 - 114 psi or 392 - 785 kPa) as shown.

SST 09240-00020

Piston stroke: 2.0 - 3.5 mm (0.079 - 0.138 in.)

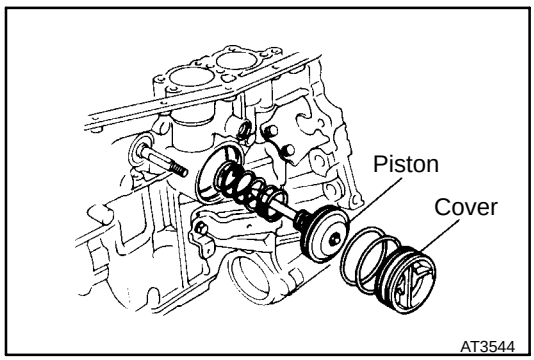
If the piston stroke exceeds the limit, inspect the second coast brake band (See page AT-41).



23. REMOVE SECOND COAST BRAKE PISTON

(a) Using SST, remove the snap ring.

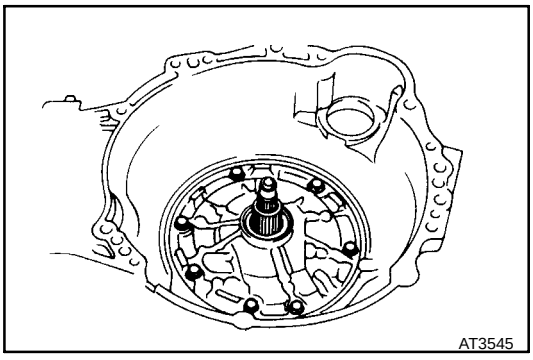
SST 09350-32014 (09351-32050)



(b) Remove the cover.

(c) Remove the piston and outer return spring.

(d) Remove the two O-rings from the cover.

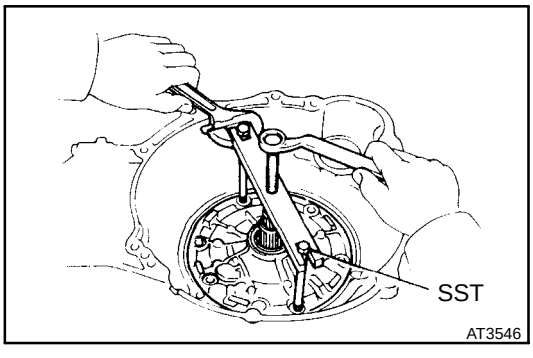


24. STAND TRANSAXLE ENGINE SIDE UPWARD

25. REMOVE OIL PUMP

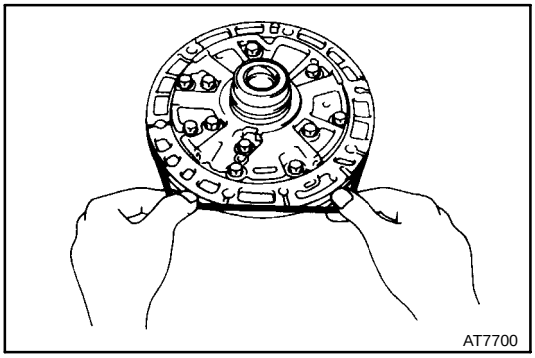
NOTICE: Before removing the oil pump, remove the second coast brake piston.

(a) Remove the seven bolts.

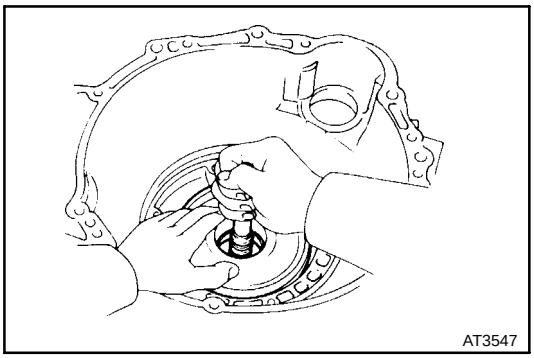


(b) Using SST, pull out the oil pump from the transaxle case.

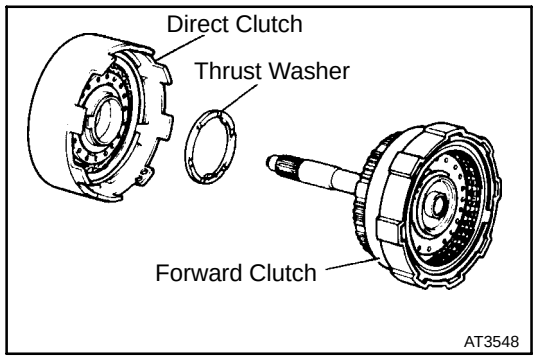
SST 09350-32014 (09351-32061)



26. REMOVE O-RING FROM OIL PUMP



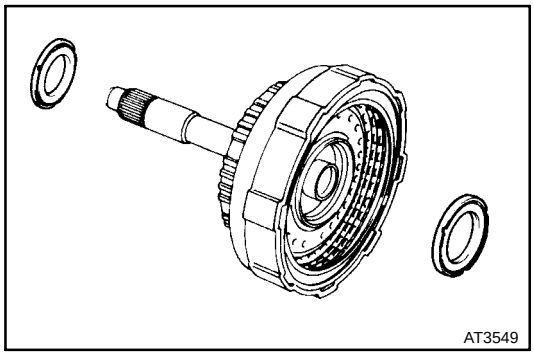
27. REMOVE DIRECT CLUTCH AND FORWARD CLUTCH



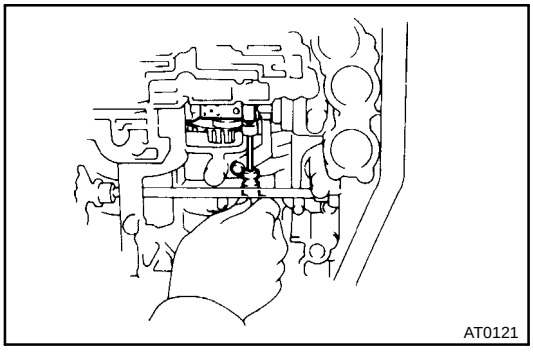
28. SEPARATE DIRECT CLUTCH AND FORWARD CLUTCH

(a) Separate the direct clutch and forward clutch.

(b) Remove the thrust washer from direct clutch.



29. REMOVE BEARINGS FROM FORWARD CLUTCH

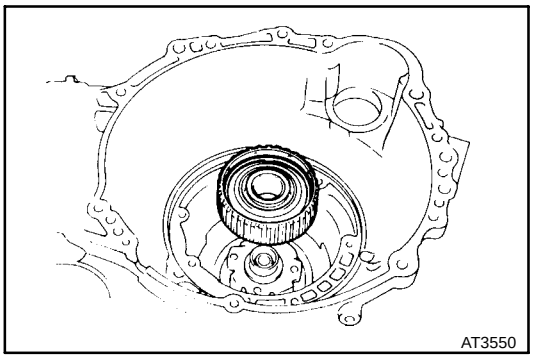


30. REMOVE SECOND COAST BRAKE BAND

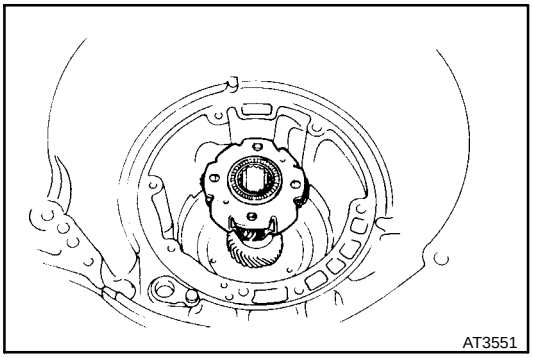
(a) Push the pin with a small screwdriver and remove it from the bolt hole of the oil pump mounting.

(b) Remove the brake band.

HINT: For the method of inspection, refer to page AT-41.

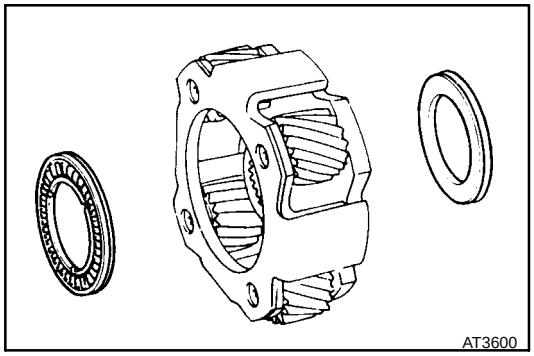


31. REMOVE FRONT PLANETARY RING GEAR

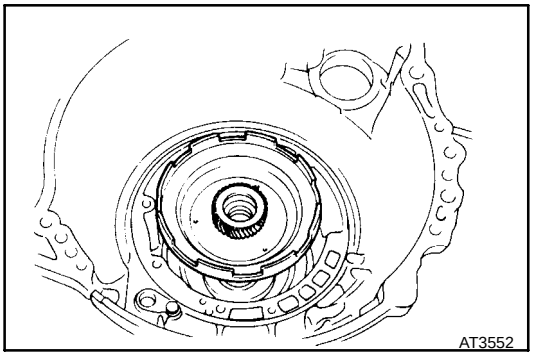


32. REMOVE FRONT PLANETARY GEAR

(a) Remove the front planetary gear.

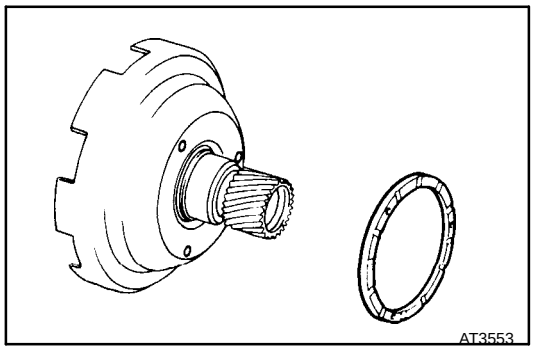


(b) Remove the two bearings from the planetary gear

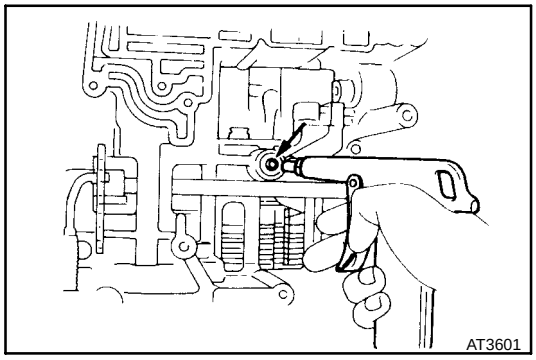


33. REMOVE SUN GEAR AND SUN GEAR INPUT DRUM

(a) Remove the sun gear and sun gear input drum.

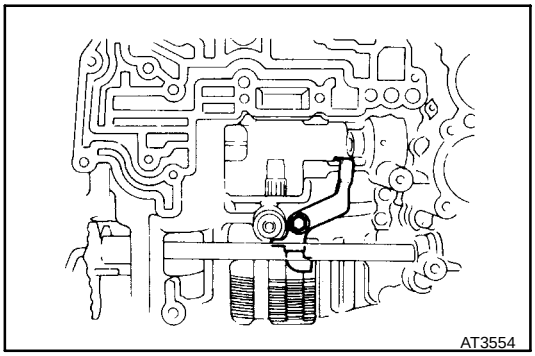


(b) Remove the thrust washer from sun gear input drum.

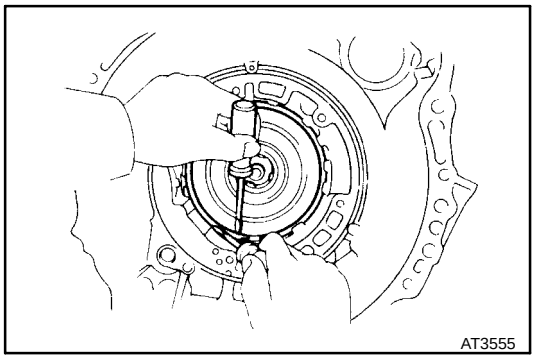


34. CHECK OPERATION OF SECOND BRAKE PISTON

Apply compressed air into the case passage and confirm that the piston moves.
If the piston does not move, disassemble and inspect.

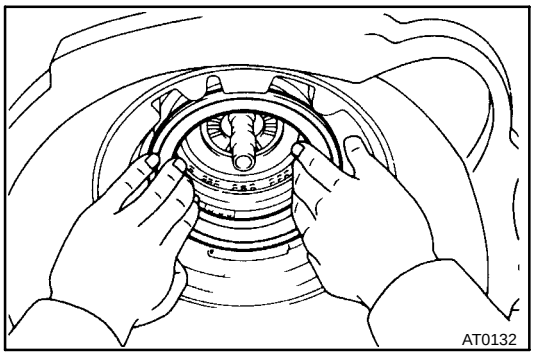


35. REMOVE SECOND COAST BRAKE BAND GUIDE

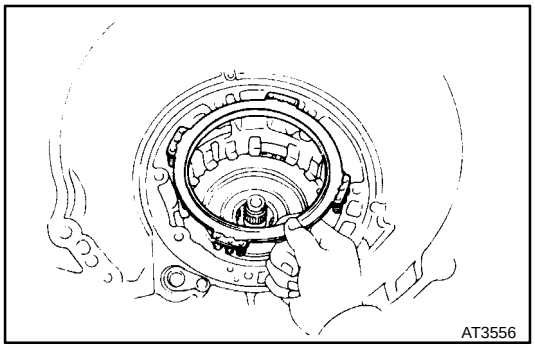


36. REMOVE SECOND BRAKE DRUM

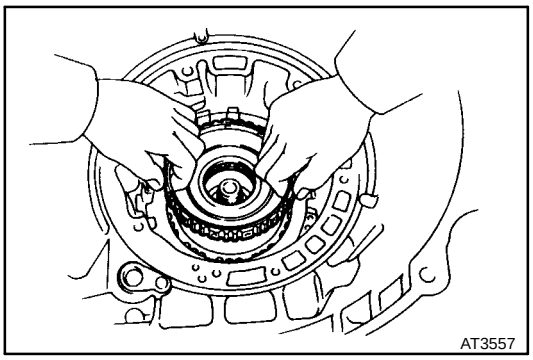
(a) Remove the snap ring.



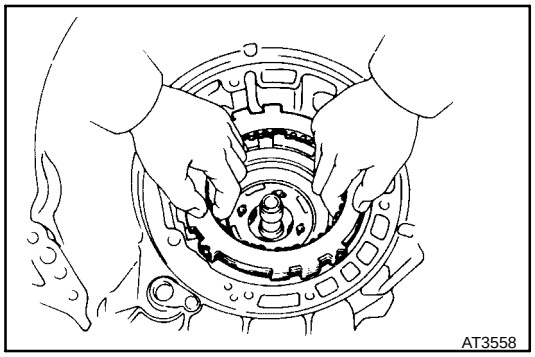
(b) Remove the second brake drum.



37. REMOVE SECOND BRAKE PISTON RETURN SPRING

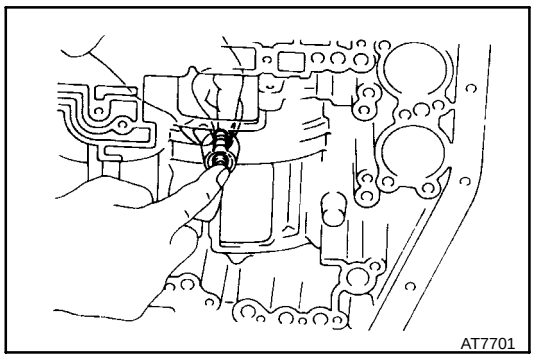


38. REMOVE NO. 1 ONE-WAY CLUTCH



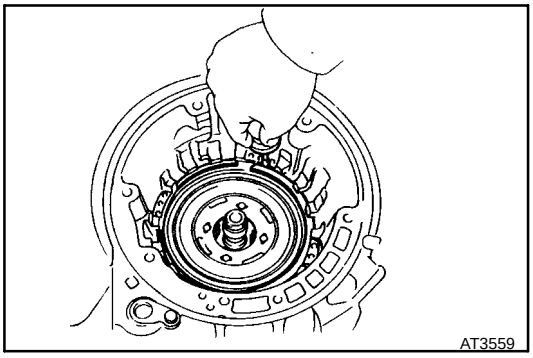
39. REMOVE PLATES, DISCS AND FLANGE

HINT: For the method of inspection, refer to page AT-62.



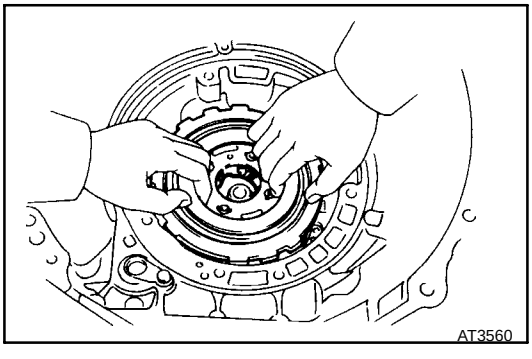
40. REMOVE SECOND BRAKE DRUM GASKET

Remove the gasket.

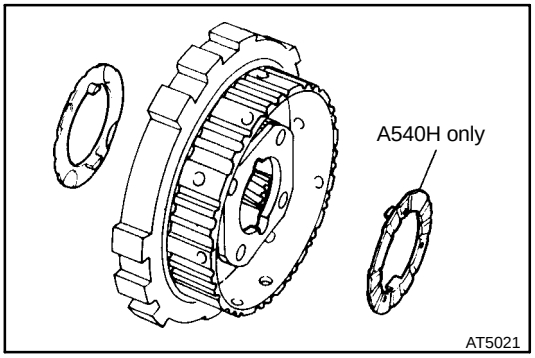


41. REMOVE NO. 2 ONE-WAY CLUTCH AND REAR PLANETARY GEAR

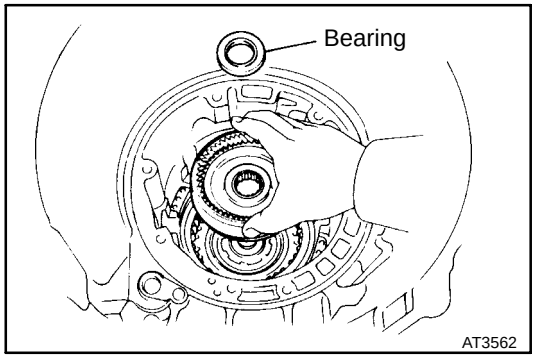
(a) Remove the snap ring.



(b) Remove the No. 2 one-way clutch and rear planetary gear.



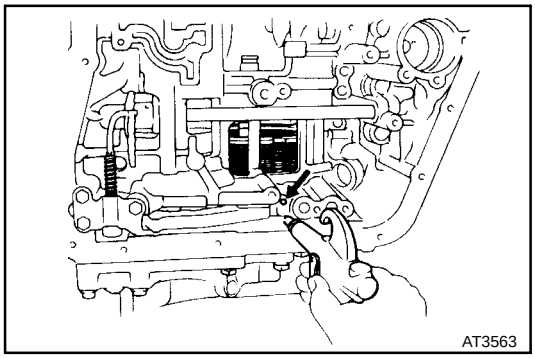
(c) Remove the thrust washer from the rear planetary gear.



42. REMOVE REAR PLANETARY RING GEAR

(a) Remove the rear planetary ring gear.

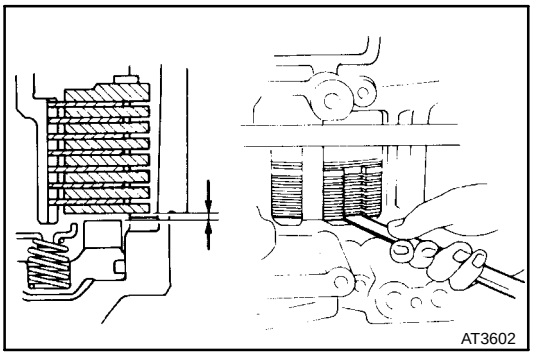
(b) Remove the bearing from the ring gear.



43. CHECK FIRST AND REVERSE BRAKE

(a) Check the operation of the first and reverse brake piston

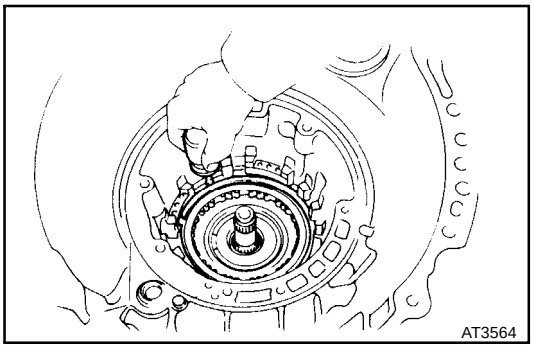
Apply compressed air into the case passage and confirm that the piston moves.
If the piston does not move, disassemble and inspect.



(b) Using a filler gauge, check the pack clearance of the first and reverse brake.

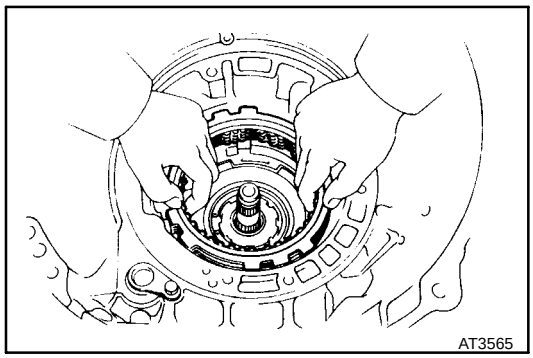
Clearance: A540E
0.85 - 2.05 mm (0.033 - 0.081 in.)
A540H
1.04 - 2.16 mm (0.041 - 0.085 in.)

If the pack clearance is not within specification, disassemble and inspect.

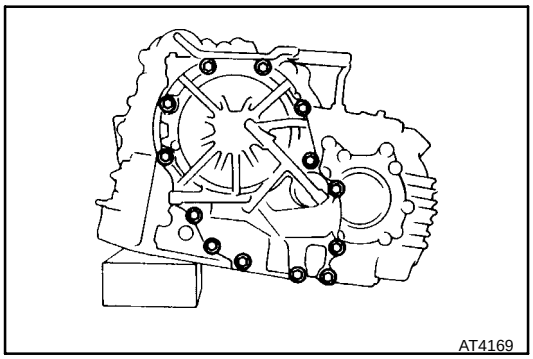


44. REMOVE FLANGE, DISCS AND PLATES OF FIRST AND REVERSE BRAKE

(a) Remove the snap ring.



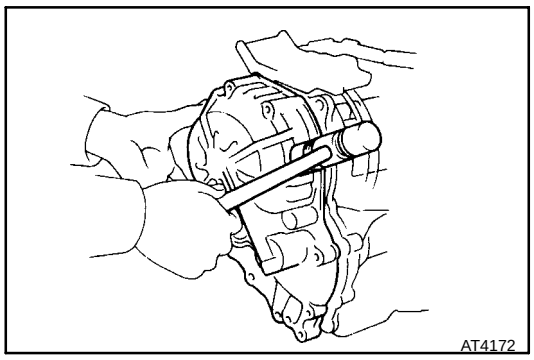
(b) Remove the flange, seven discs and seven plates.
HINT: For the method of inspection, refer to AT-66.



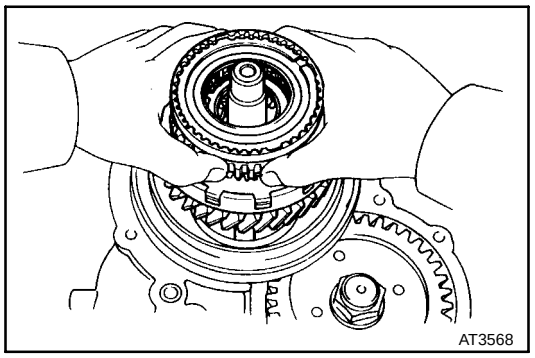
45. TURN TRANSAXLE CASE AROUND

46. REMOVE OVERDRIVE UNIT

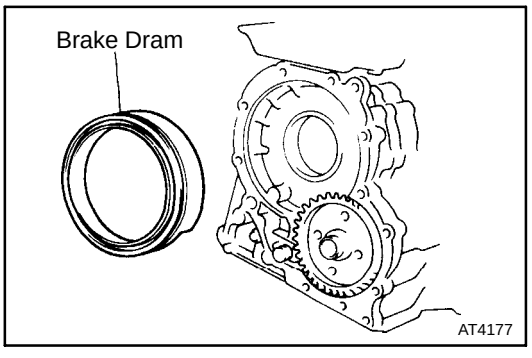
(a) Remove the thirteen bolts.



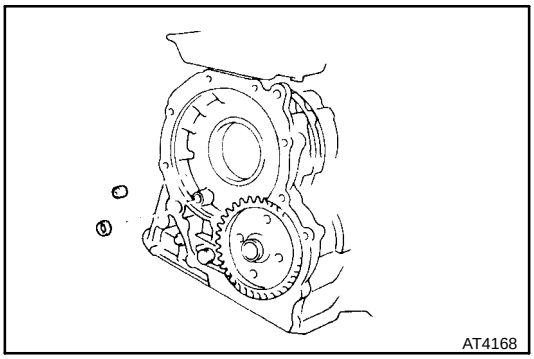
(b) Tap on the circumference of the overdrive case with a plastic hammer to remove the overdrive case and gasket.



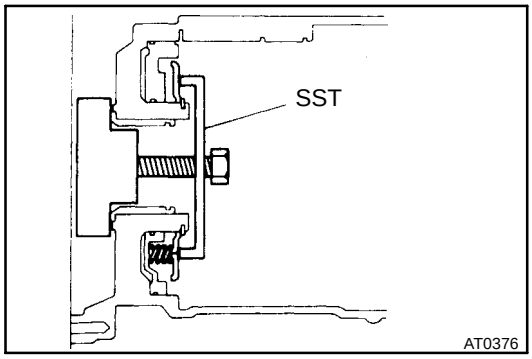
(c) Remove the overdrive planetary gear from transaxle case.



(d) Remove the overdrive brake drum from the transaxle case.



(e) Remove the overdrive clutch apply gasket and overdrive brake apply gasket.

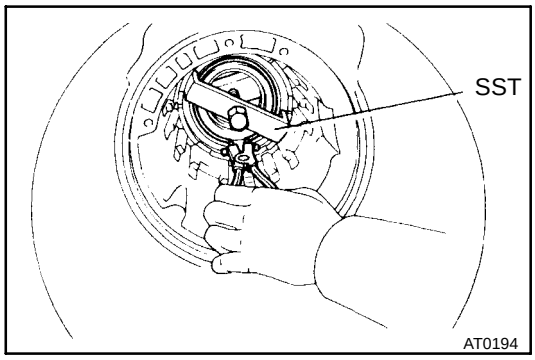


47. REMOVE FIRST AND REVERSE BRAKE PISTON

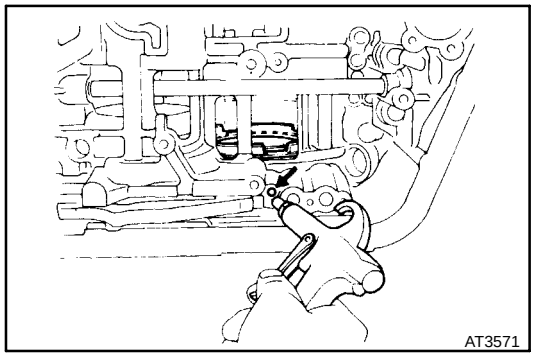
(a) Remove the piston return spring.

® **Place SST, and compress the return spring evenly by tightening the bolt gradually.**

SST 09350-32014 (09351-32040)

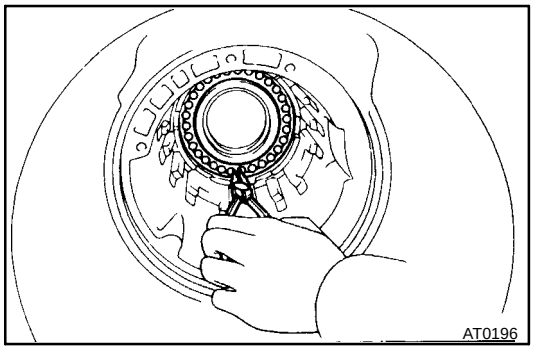


® **Using snap ring pliers, remove the snap ring.**
® **Remove SST.**
® **Remove the return spring from the case.**

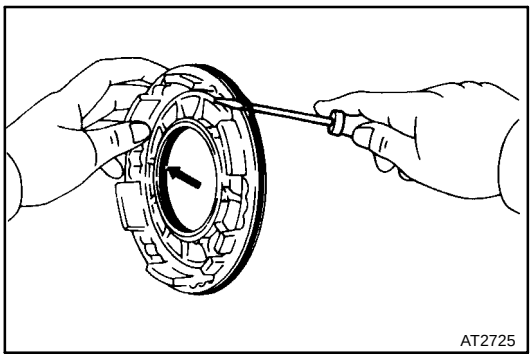


(b) Apply compressed air into the passage of the case to remove the piston.

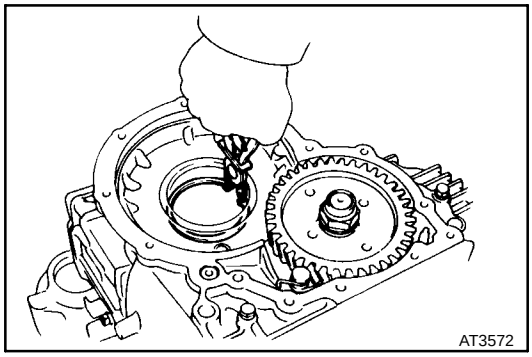
HINT: Hold the piston so it is not slanted and blow with the gun slightly away from the oil hole.



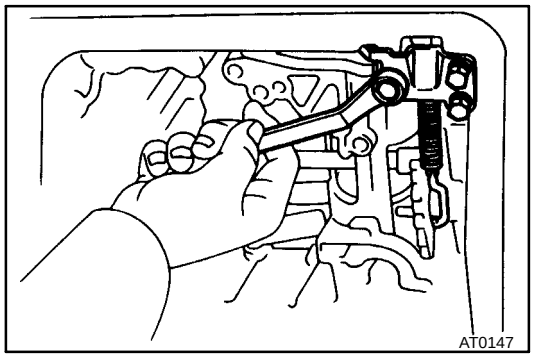
(c) If the piston does not pop out with compressed air, use needle-nose pliers to remove it.



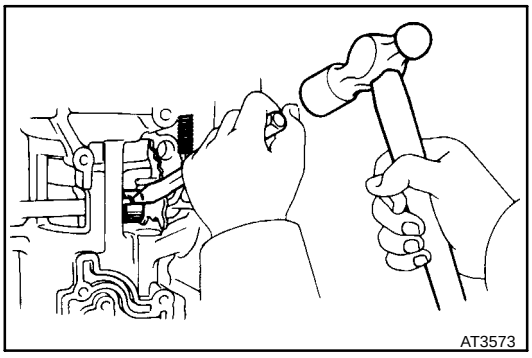
(d) Remove the two O-rings from the piston.



48. REMOVE SNAP RING FROM TRANSAXLE CASE

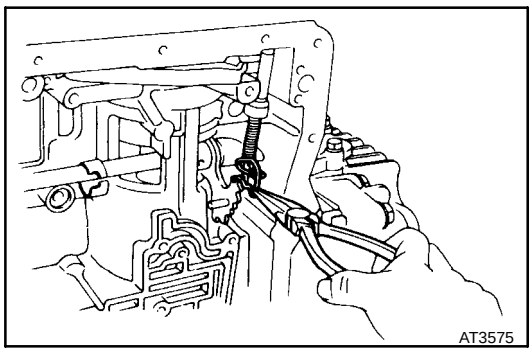


49. REMOVE PARKING LOCK PAWL BRACKET

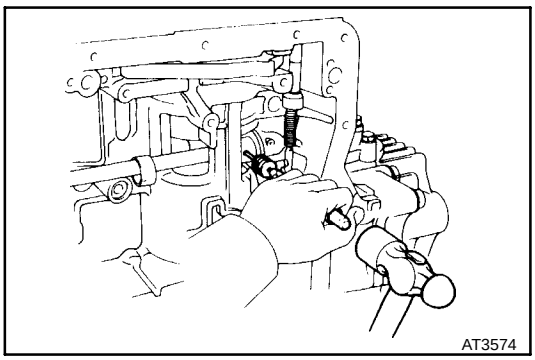


50. REMOVE MANUAL VALVE SHAFT

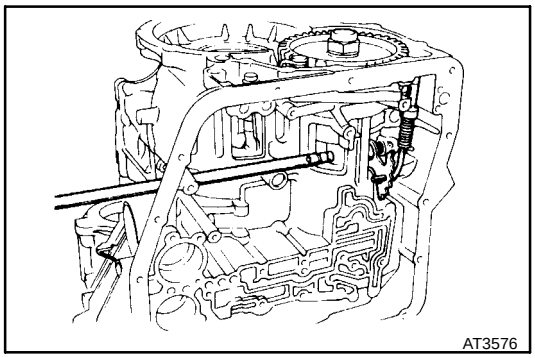
(a) Using a cold chisel and hammer, cut the collar.



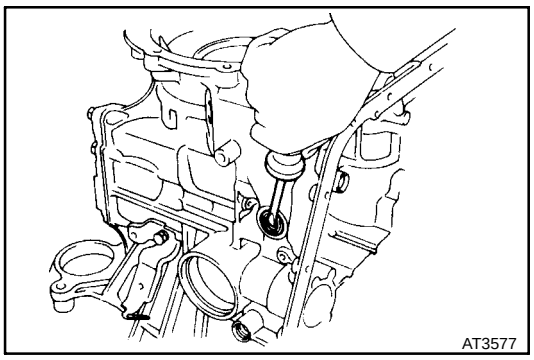
(b) Remove the retaining spring.



(c) Using a hammer and pin punch, drive out the pin.

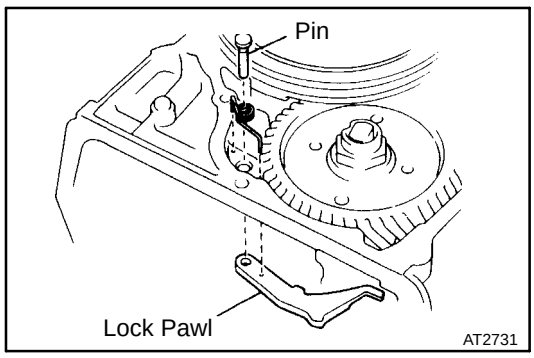


(d) Slide out the shaft from the transaxle case and remove the manual valve lever and parking lock rod.

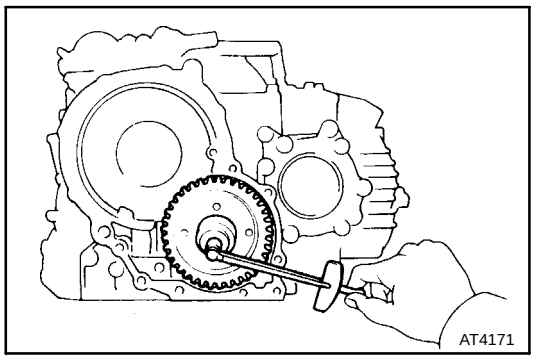


51. REMOVE MANUAL VALVE SHAFT OIL SEAL

Using a screwdriver, remove the oil seal.



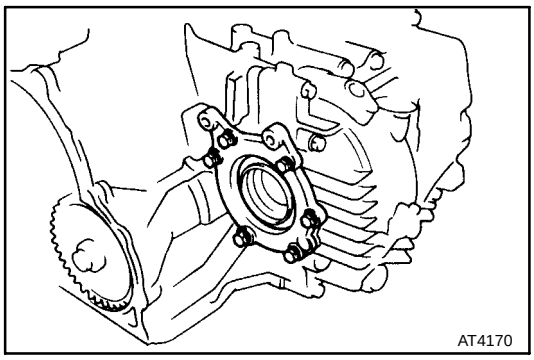
52. REMOVE PIN, SPRING AND PARKING LOCK PAWL



REMOVAL OF DIFFERENTIAL COMPONENT PARTS

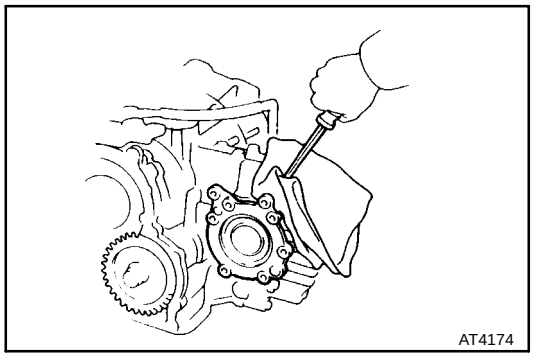
1. MEASURE DIFFERENTIAL TOTAL PRELOAD

Using a torque meter measure the total preload, and make a note of it.



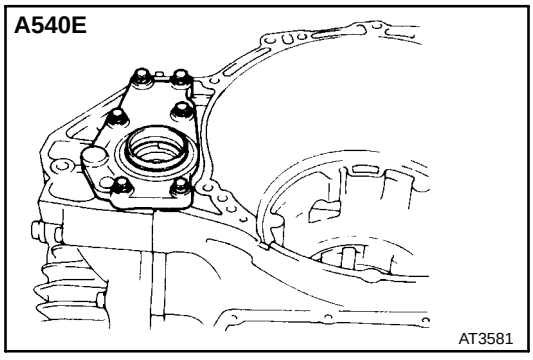
2. REMOVE LH BEARING RETAINER

(a) Remove the six bolts.



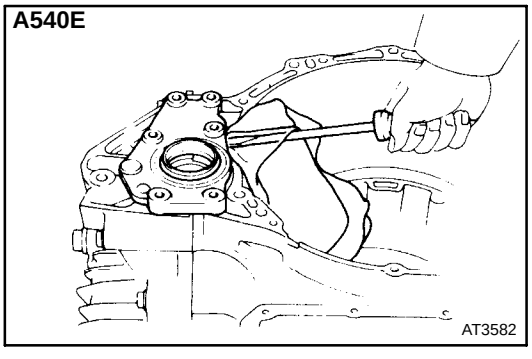
(b) Using a large screwdriver, remove the LH bearing retainer.

NOTICE: Wrap the screwdriver in a rag, etc. to avoid damage to the case and retainer.



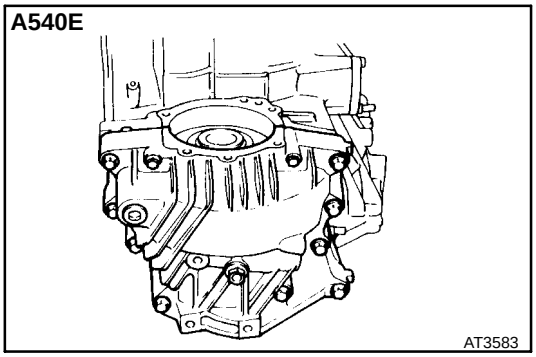
3. (A540E) REMOVE RH RETAINER

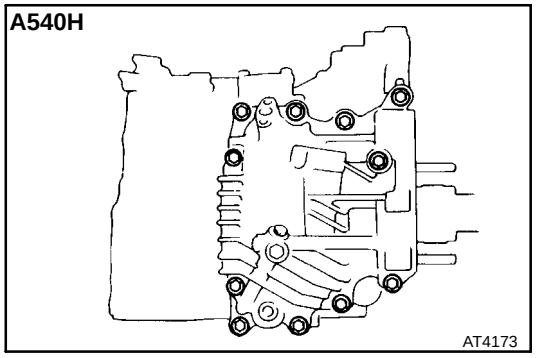
(a) Remove the six bolts.



(b) Using a large screwdriver, remove the RH retainer.

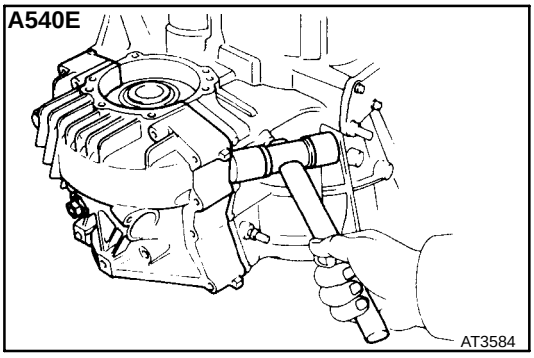
NOTICE: Wrap the screwdriver in a rag, etc. to avoid damage to the case and retainer.



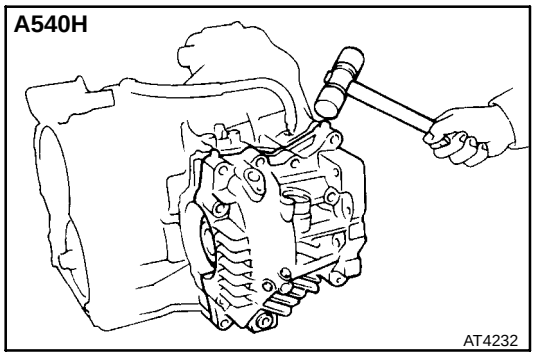


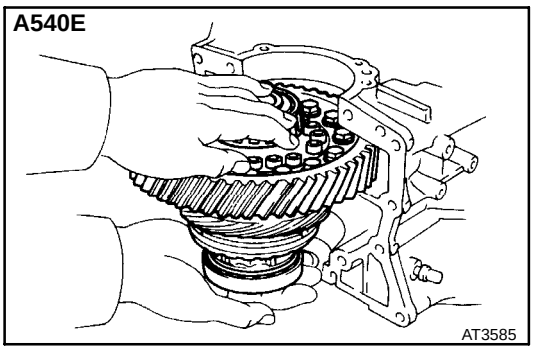
4. REMOVE CARRIER COVER

(a) Remove the eleven bolts.



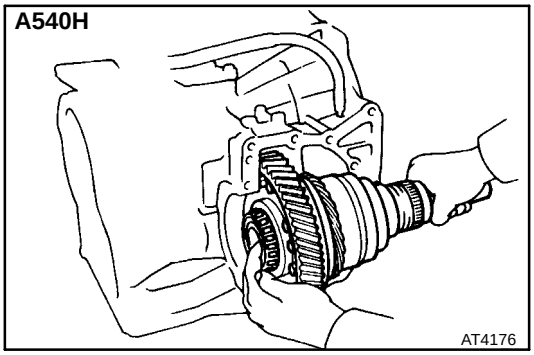
(b) Tap the carrier cover with a plastic hammer to remove it.



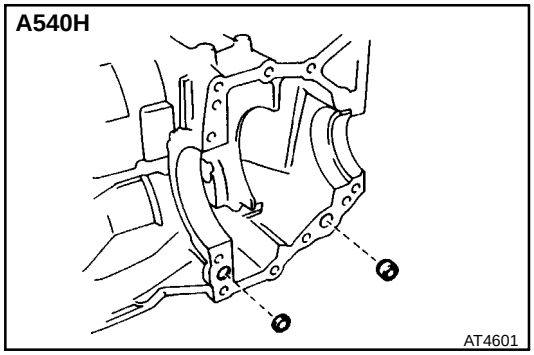


5. REMOVE DIFFERENTIAL CASE

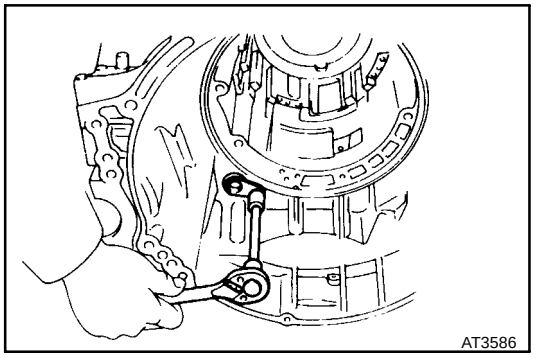
(a) (A540E)
Remove the differential case, outer race and shim from the transaxle case.



(A540H)
Remove the differential assembly.

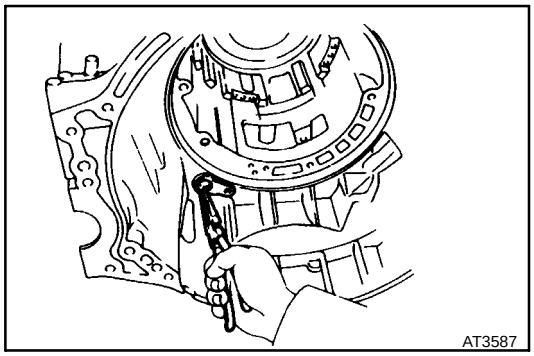


(b) Remove the two apply gaskets.



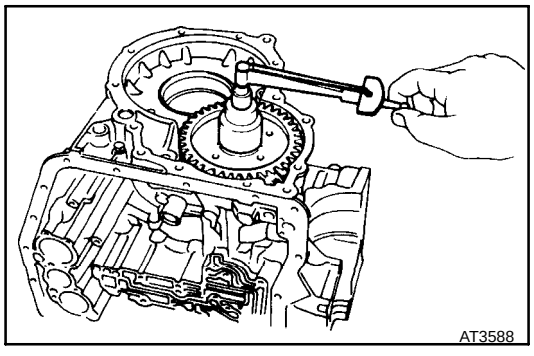
6. REMOVE DRIVE PINION CAP

(a) Remove the bolt.



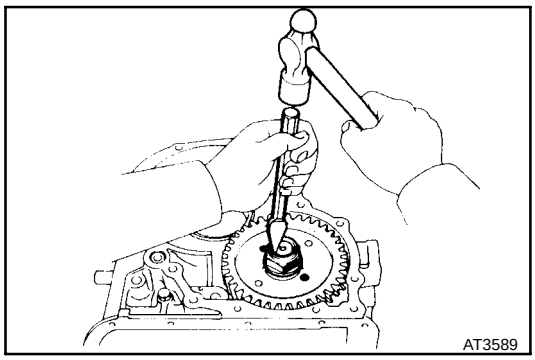
(b) Using pliers, pull out the drive pinion cap.

(c) Remove the O-rings from the cap.



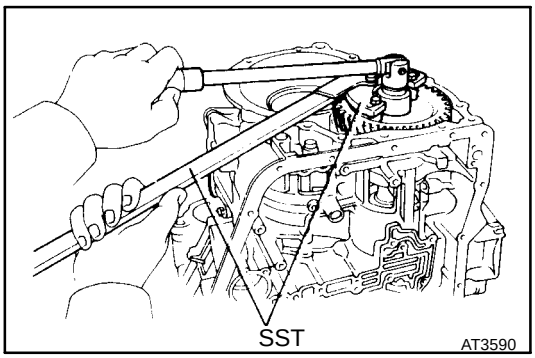
7. MEASURE DRIVE PINION PRELOAD

Using a torque meter, measure the drive pinion preload.
Preload (at starting): Reused bearing
5 - 8 kg-cm (4.3 - 6.9 in.-lb, 0.5 - 0.8 N-m)
The total preload measured in step 1 minus the drive pinion preload equals 1.3 - 2.0 kg-cm (1.1 - 1.7 in.-lb, 0.1 - 0.2 N-m). If the result is not within this specification, the side bearing preload is bad.

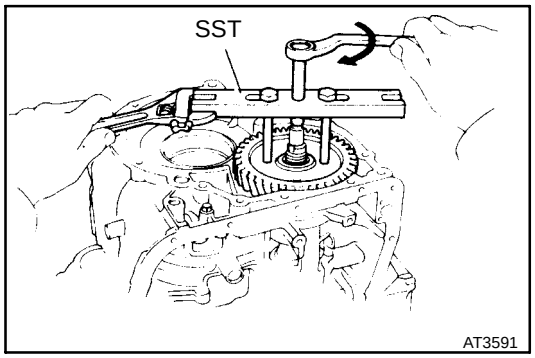


8. REMOVE COUNTER DRIVEN GEAR

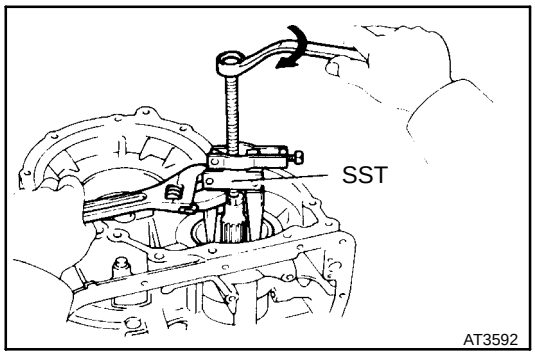
(a) Using a chisel, loosen the staked part of the nut.



(b) Using SST to hold the gear, remove the nut.
SST 09330-00021,09350-32014 (09351-32032)

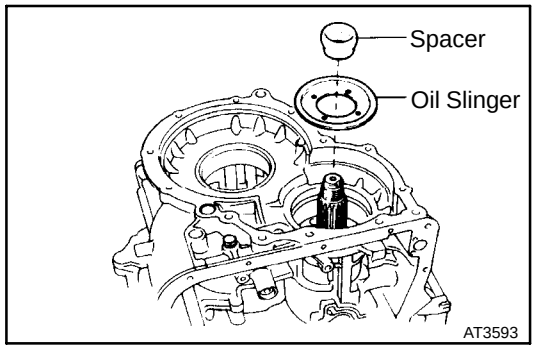


(c) Using SST, remove the gear and bearing.
SST 09350-32014 (09351-32061)

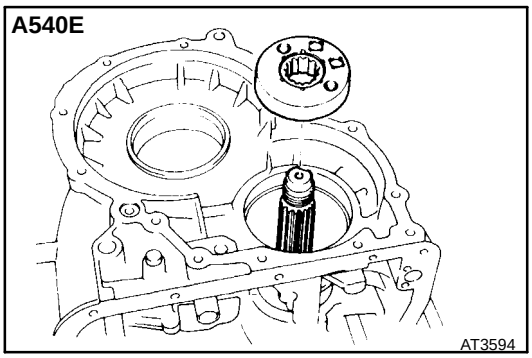


9. REMOVE OUTER RACE, SPACER AND OIL SLINGER

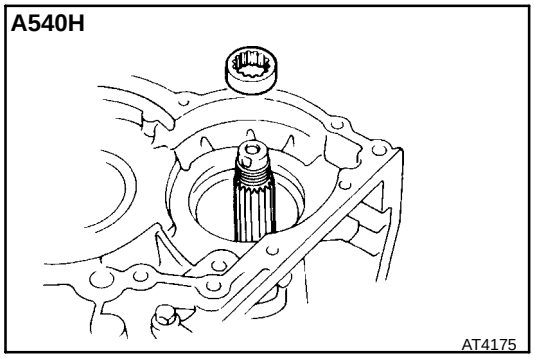
(a) Using SST, remove the outer race.
SST 09350-32014 (09308-10010)



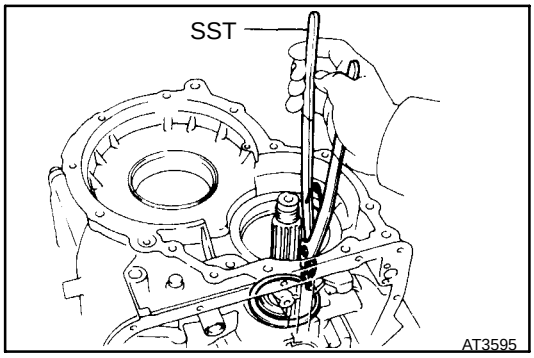
(b) Remove the spacer and oil slinger.



10. (A540E)
REMOVE SENSOR ROTOR



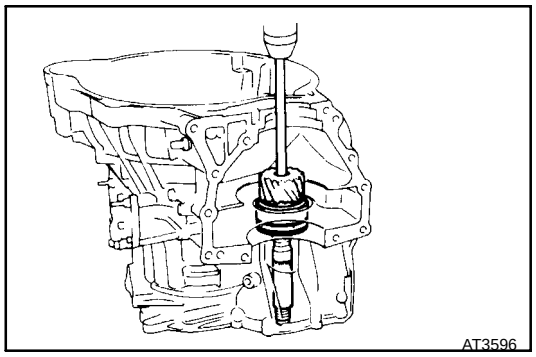
11. (A540H)
REMOVE DRIVE PINION BEARING NO. 2 SPACER



12. REMOVE DRIVE PINION

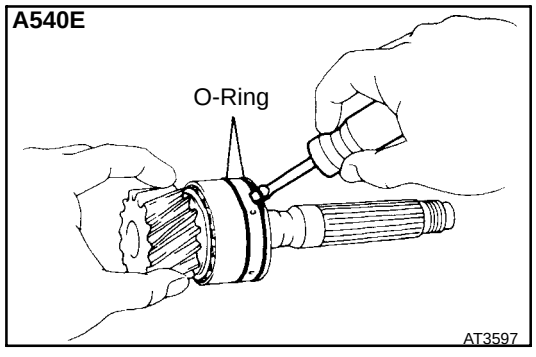
(a) Using SST, remove the snap ring.

SST 09350-32014 (09351-32050)

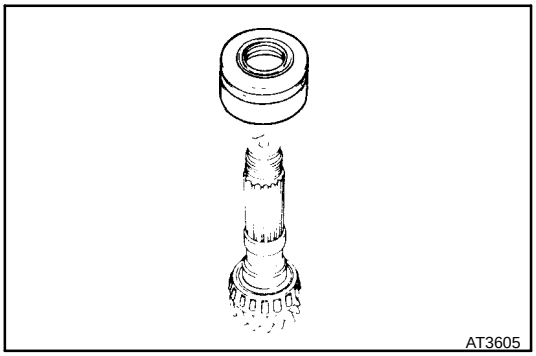


(b) Insert the bar into the case hole to drive out the drive pinion.

(c) Using a press, drive out the drive pinion from transaxle case.



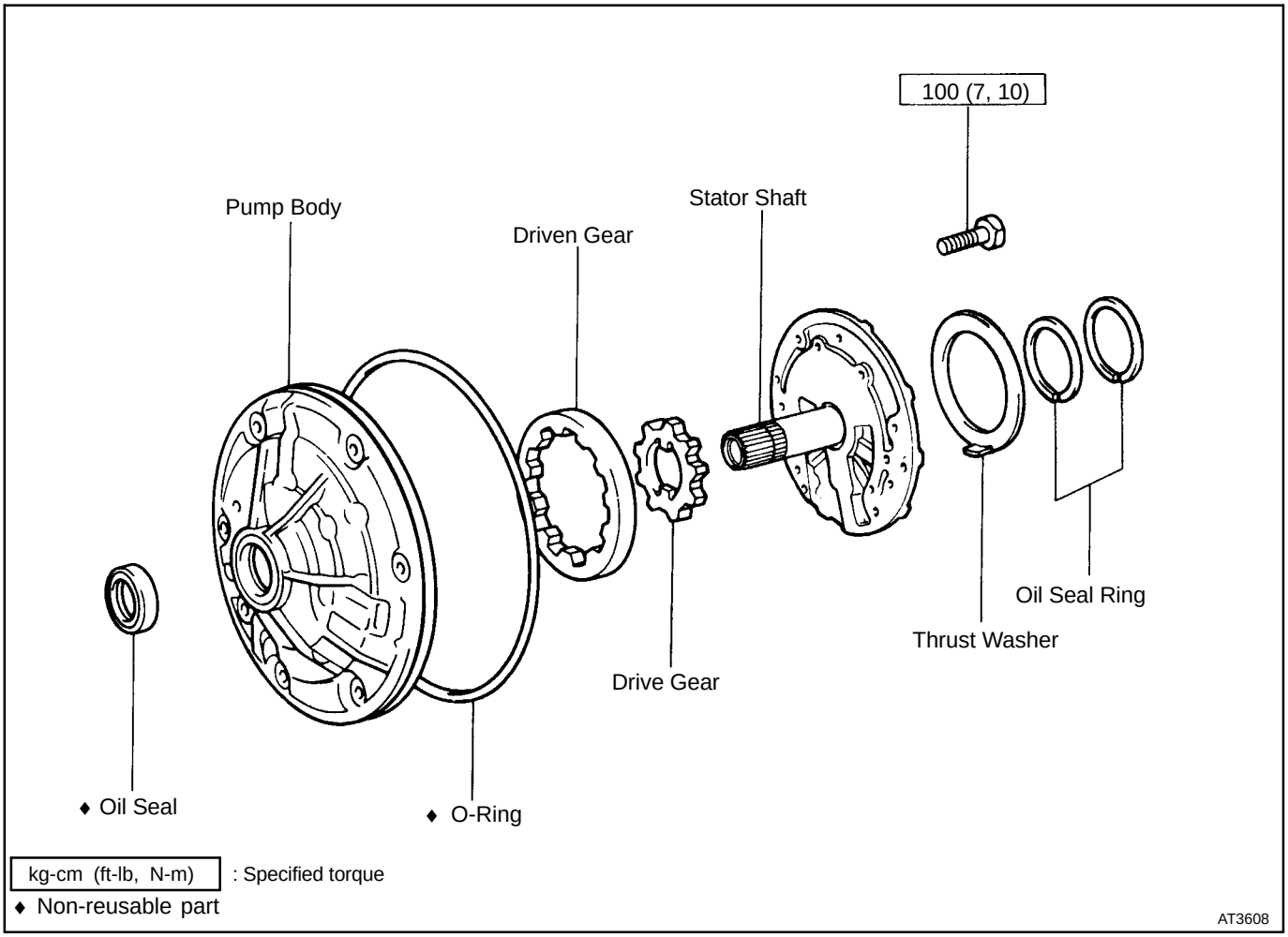
(d) (A540E)
Remove the two O-rings from the bearing cage.

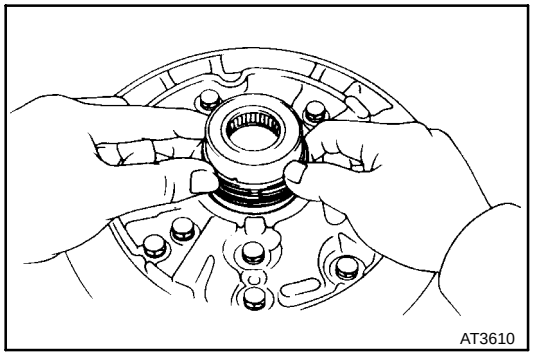

AT3605

(e) Remove the bearing cage from drive pinion.

Oil Pump

COMPONENTS

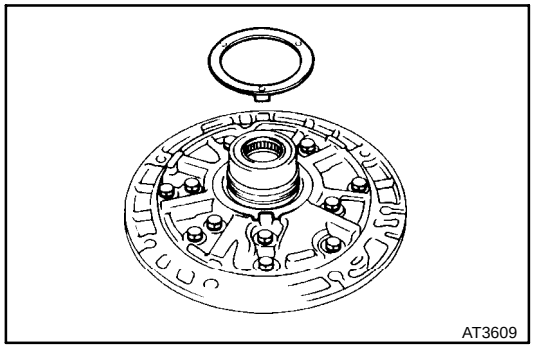




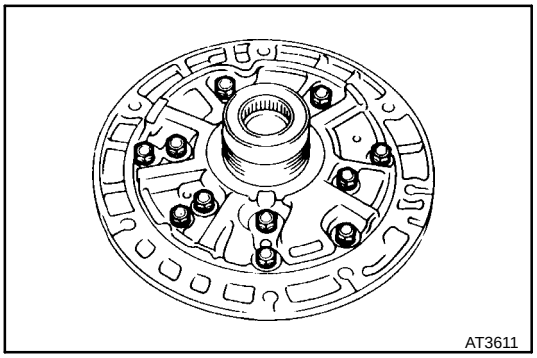
DISASSEMBLY OF OIL PUMP

1. REMOVE OIL SEAL RINGS

Remove the two oil seal rings from the stator shaft back side.

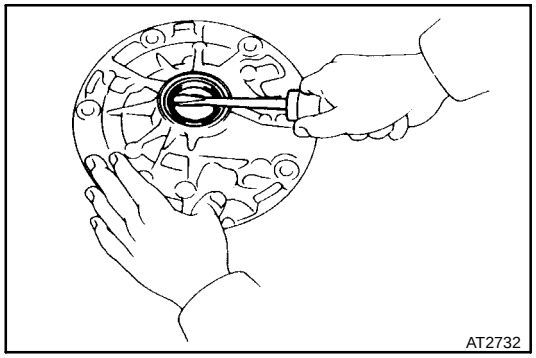


2. REMOVE THRUST WASHER FROM STATOR SHAFT BACK SIDE



3. REMOVE STATOR SHAFT

Remove the eleven bolts and stator shaft.
HINT: Keep the gears in assembly order.



4. REMOVE FRONT OIL SEAL

Pry off the oil seal with a screwdriver.

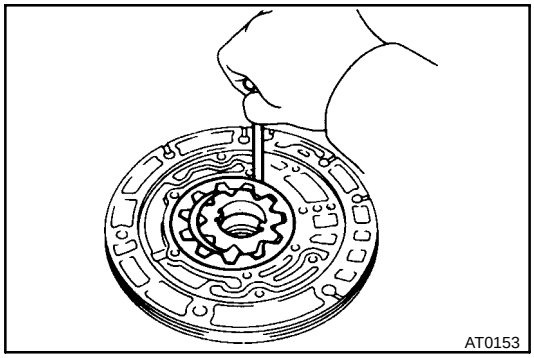
INSPECTION OF OIL PUMP

1. CHECK BODY CLEARANCE OF DRIVEN GEAR

Push the driven gear to one side of the body.
Using a feeler gauge, measure the clearance.

Standard body clearance: 0.07 - 0.15 mm (0.0028 - 0.0059 in.)
Maximum body clearance: 0.3 mm (0.012 in.)

If the body clearance is greater than the maximum, replace the oil pump body subassembly.

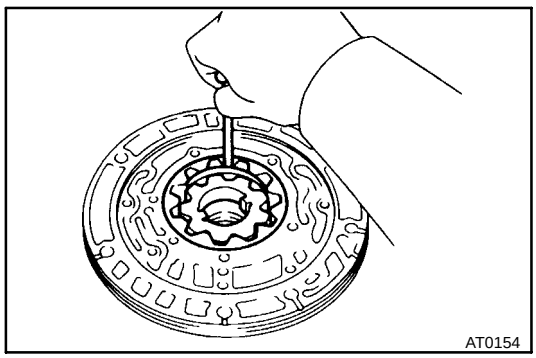


2. CHECK TIP CLEARANCE OF DRIVEN GEAR

Measure between the driven gear teeth and the crescent-shaped part of the pump body.

Standard tip clearance: 0.11 - 0.14 mm (0.0043 - 0.0055 in.)
Maximum tip clearance: 0.3 mm (0.012 in.)

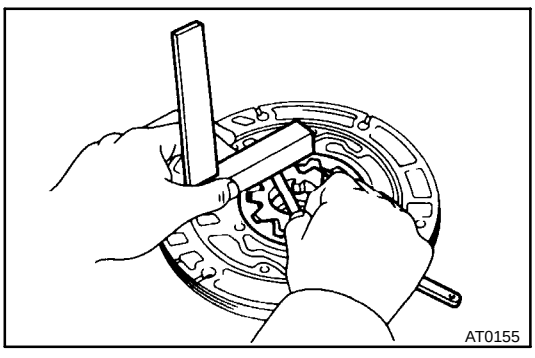
If the tip clearance is greater than the maximum, replace the oil pump body subassembly.



3. CHECK SIDE CLEARANCE OF BOTH GEARS

Using a steel straightedge and a feeler gauge, measure the side clearance of both gears.

Standard side clearance: 0.002 - 0.005 mm (0.0008 - 0.0020 in.)
Maximum side clearance: 0.1 mm (0.004 in.)

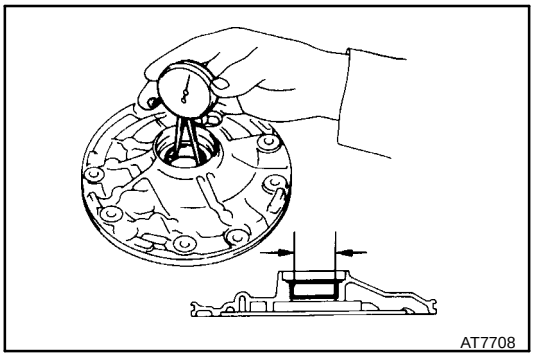


There are three different thicknesses for drive and driven gears.

Drive and driven gear thickness

Mark	Thickness
A	**9.440 - 9.456 mm (0.3717 - 0.3723 in.)**
B	**9.456 - 9.474 mm (0.3723 - 0.3730 in.)**
C	**9.474 - 9.490 mm (0.3730 - 0.3736 in.)**

If the thickest gear can not make the side clearance within standard specification, replace the oil pump body subassembly.

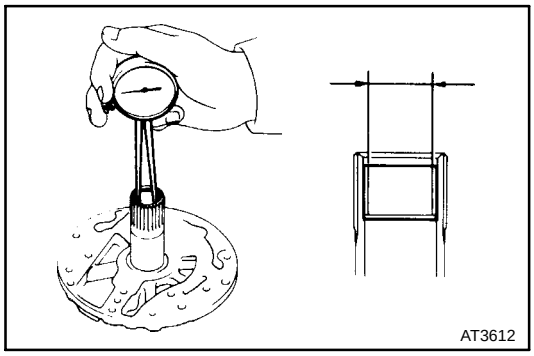

AT7708

4. CHECK OIL PUMP BODY BUSHING

Using a dial indicator, measure the inside diameter of the oil pump body bushing.

Maximum inside diameter: 38.18 mm (1.5031 in.)

If the inside diameter is greater than the maximum, replace the oil pump body subassembly.


AT3612

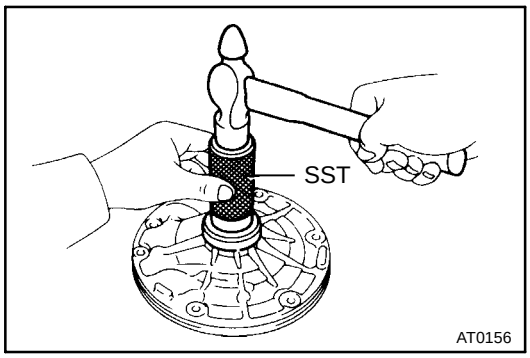
5. CHECK STATOR SHAFT BUSHING

Using a dial indicator, measure the inside diameter stator shaft bushing.

Maximum inside diameter: 21.57 mm (0.8492 in.)

If the inside diameter is greater than the maximum, replace the stator shaft.

ASSEMBLY OF OIL PUMP

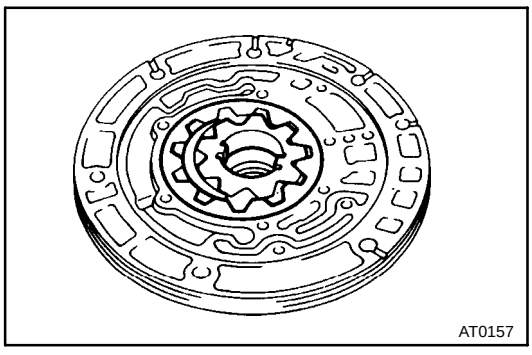


AT0156

1. INSTALL FRONT OIL SEAL

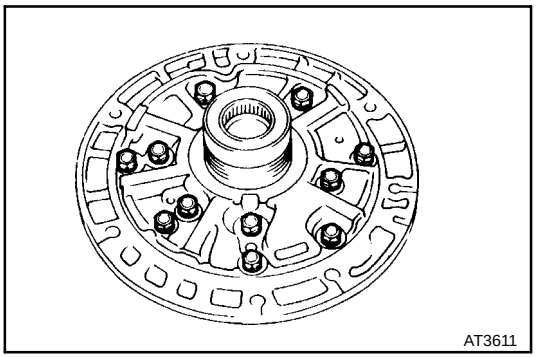
Using SST and a hammer, install a new oil seal. The seal end should be flush with the outer edge of the pump body.

SST 09350-32014 (09351-32140)


AT0157

2. INSTALL DRIVEN GEAR AND DRIVE GEAR

Make sure the top of the gears are facing upward.

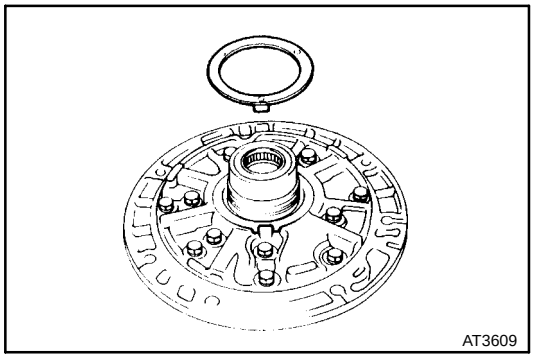


3. INSTALL STATOR SHAFT TO PUMP BODY

(a) Align the stator shaft with each bolt hole.

(b) Torque the eleven bolts.

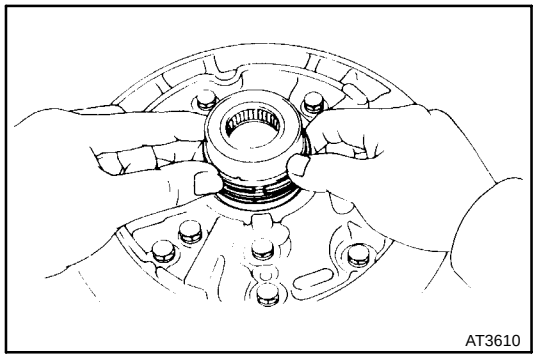
Torque: 100 kg-cm (7 ft-lb, 10 N-m)



4. INSTALL THRUST WASHER

(a) Coat the thrust washer with petroleum jelly.

(b) Align the tab of the washer with the hollow of the pump body.

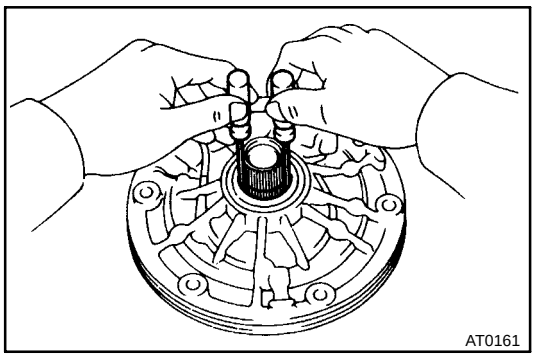


5. INSTALL OIL SEAL RINGS

Install the two oil seal rings to the stator shaft back side.

NOTICE: Do not spread the ring ends more than necessary.

HINT: After installing the oil seal rings, check that they move smoothly.



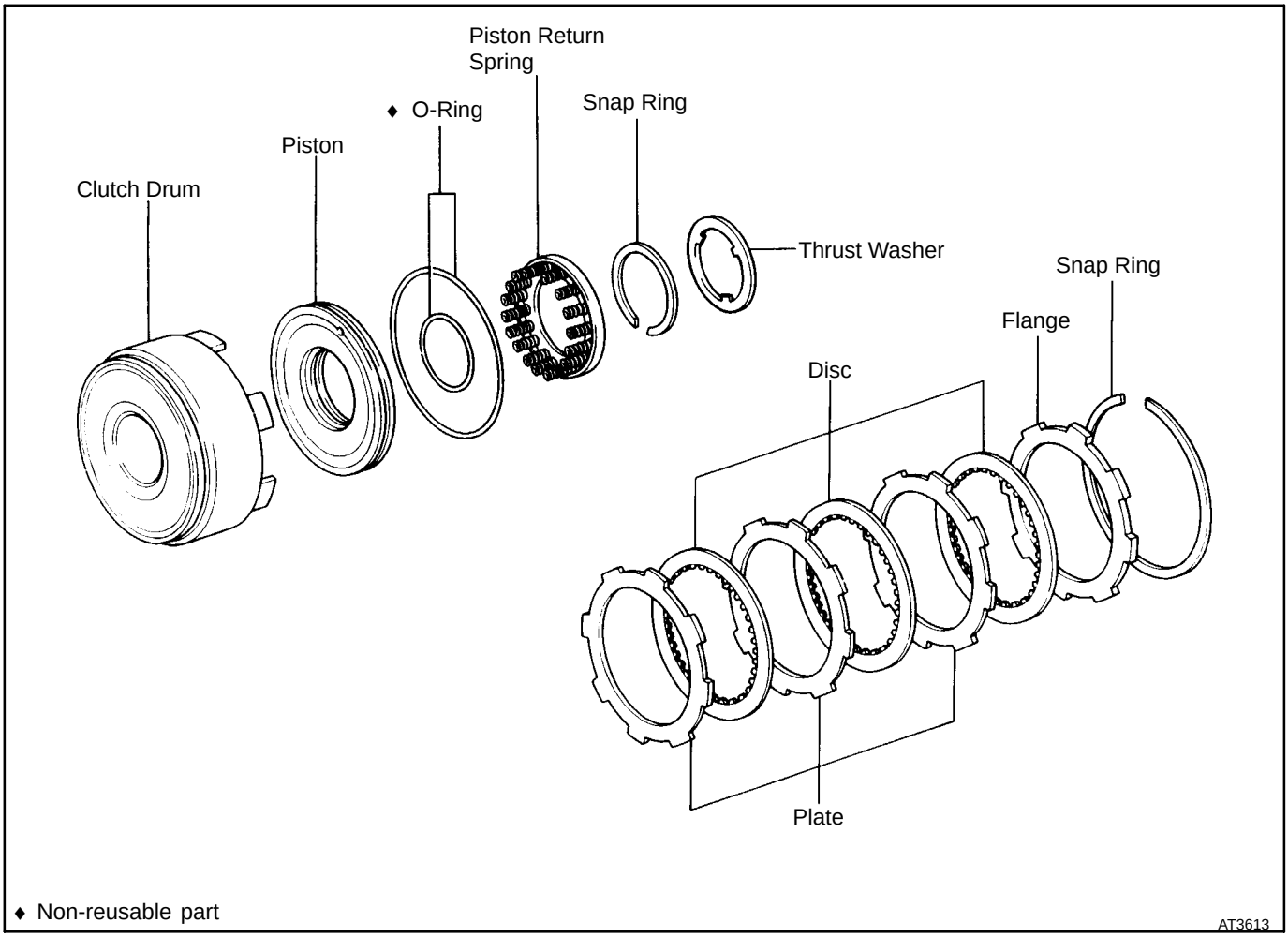
6. CHECK PUMP DRIVE GEAR ROTATION

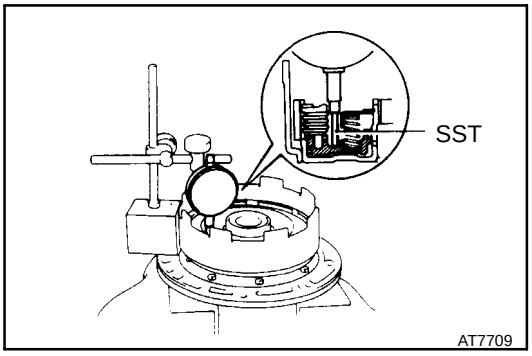
Turn the drive gear with two screwdrivers and make sure it rotates smoothly.

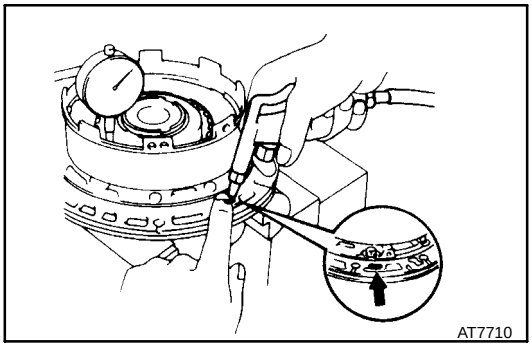
NOTICE: Be careful not to damage the oil seal lip.

Direct Clutch

COMPONENTS







DISASSEMBLY OF DIRECT CLUTCH

1. CHECK PISTON STROKE OF DIRECT CLUTCH

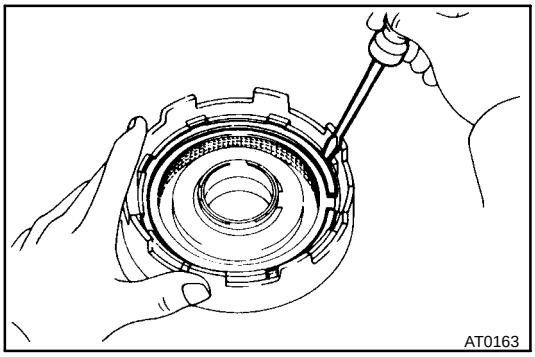
(a) Install the direct clutch on the oil pump.

(b) Using a dial indicator (long type pick or SST), measure the direct clutch piston stroke applying and releasing the compressed air (4 - 8 kg/cm^2, 57 - 114 psi, 392 - 785 kPa) as shown.

SST 09350-32014 (09351-32190)

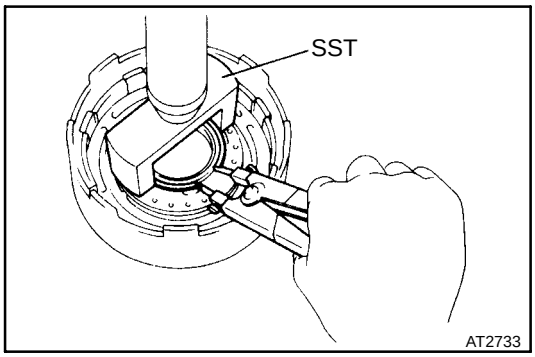
Piston stroke: A540E 0.91 - 1.35 mm (0.0358 - 0.0531 in.)
A540H 1.11 - 1.47 mm (0.0437 - 0.0579 in.)

If the piston stroke is greater than the maximum, inspect each component.



2. REMOVE SNAP RING FROM CLUTCH DRUM

3. REMOVE FLANGE, DISCS AND PLATES

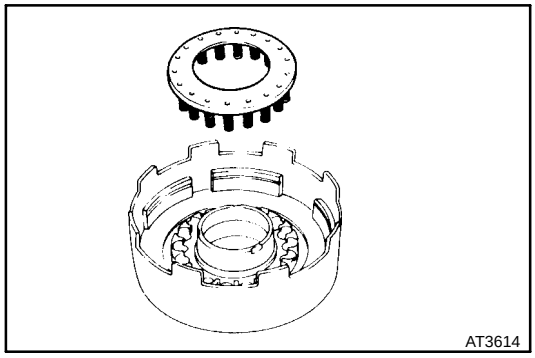


4. REMOVE PISTON RETURN SPRING

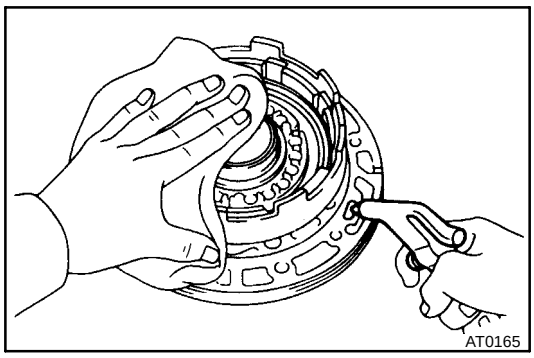
(a) Place SST on the spring retainer and compress the springs with a shop press.

SST 09350-32014 (09351-32070)

(b) Remove the snap ring with snap ring pliers.



(c) Remove the piston return spring.

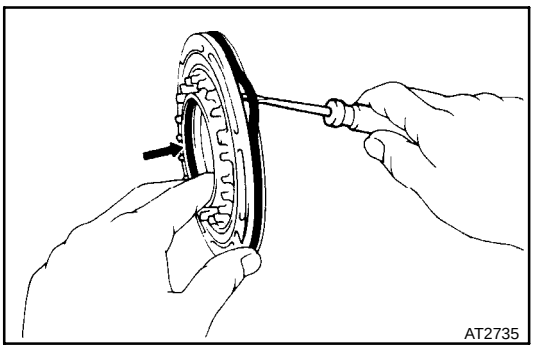


5. REMOVE CLUTCH PISTON

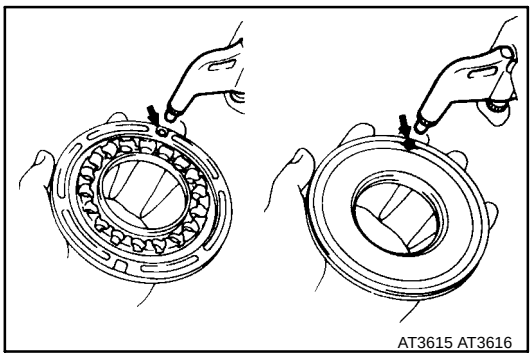
(a) Install the direct clutch onto the oil pump.

(b) Apply compressed air to the oil pump to remove the piston. (If the piston does not come out completely, use needle-nose pliers to remove it.)

(c) Remove the direct clutch from the oil pump.



(d) Remove the two O-rings from the piston.

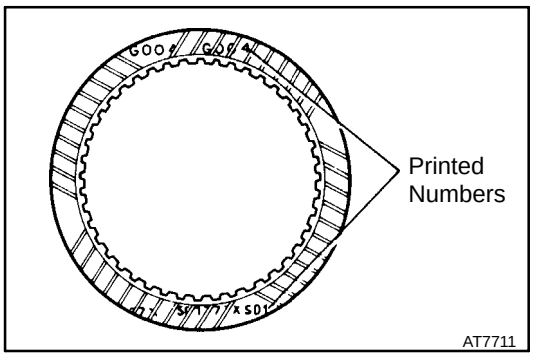

AT3615 AT3616

INSPECTION OF DIRECT CLUTCH

1. INSPECT CLUTCH PISTON

(a) Check that the check ball is free by shaking the piston.

(b) Check that the valve does not leak by applying low-pressure compressed air.



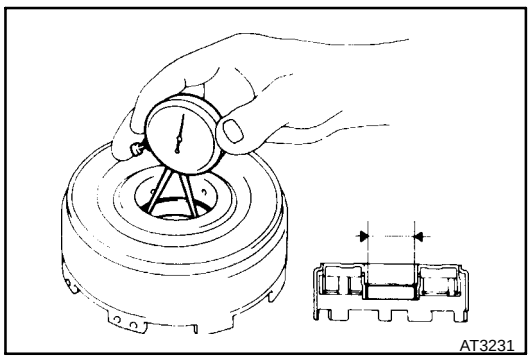
AT7711

2. INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates and flange are worn or burnt. If necessary, replace them.
HINT:

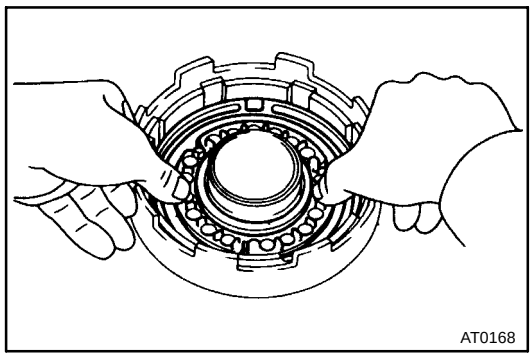
® If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.

® Before assembling new discs, soak them in ATF for at least fifteen minutes.


AT3231

3. CHECK DIRECT CLUTCH BUSHING

Using a dial indicator, measure the inside diameter of the direct clutch bushing.
Maximum inside diameter: 48.27 mm (1.9004 in.)
If the inside diameter is greater than the maximum, replace the direct clutch.

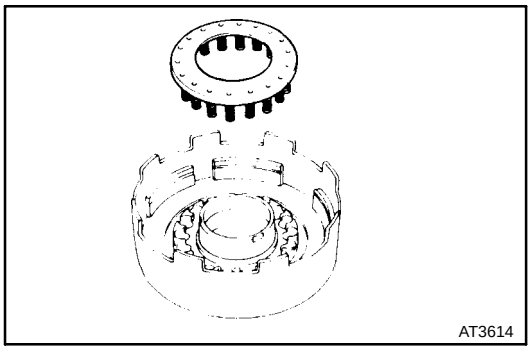

AT0168

ASSEMBLY OF DIRECT CLUTCH

1. INSTALL CLUTCH PISTON IN DIRECT CLUTCH DRUM

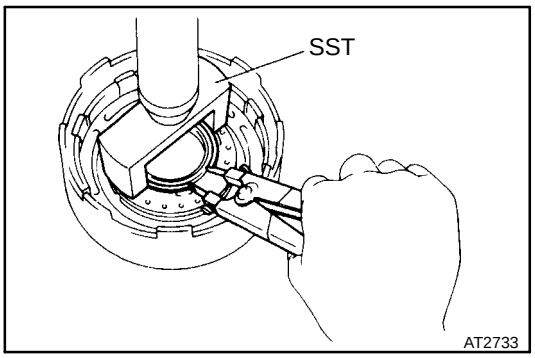
(a) Install new O-rings to the piston. Coat the O-rings with ATF.

(b) Being careful not to damage the O-rings, press the piston into the drum with the cup side up.


AT3614

2. INSTALL PISTON RETURN SPRING

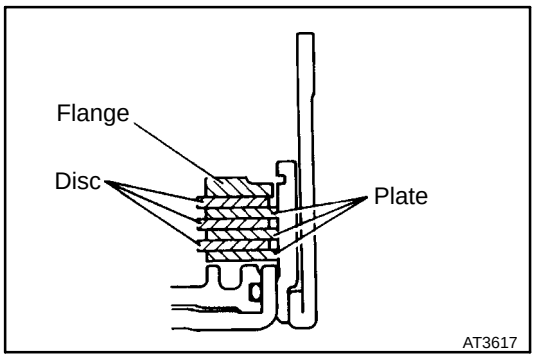
(a) Place the return spring and snap ring onto the piston.



(b) Place SST on the spring retainer, and compress the return spring with a shop press.

SST 09350-32014 (09351-32070)

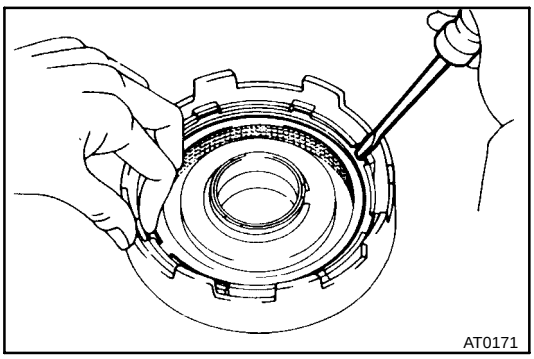
(c) Install the snap ring using snap ring pliers. Be sure the end gap of snap ring is not aligned with the spring retainer claw.



3. INSTALL PLATES, DISCS AND FLANGE

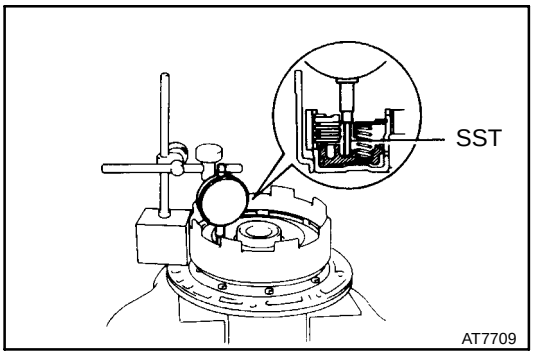
(a) Install plates and discs.
Install in order: P = Plate D = Disc
P-D-P-D-P-D

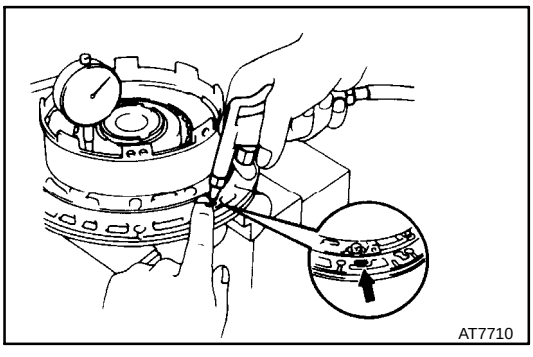
(b) Install the flange with the flat end facing downward.



4. INSTALL SNAP RING

Check that the end gap of the snap ring is not aligned with one of the cutouts.





5. RECHECK PISTON STROKE OF DIRECT CLUTCH

(a) Install the direct clutch on the oil pump.

(b) Using a dial indicator (long type pick or SST), measure the direct clutch piston stroke applying and releasing the compressed air (4 - 8 kg/cm^2, 57 - 114 psi, 392 - 785 kPa) as shown.

SST 09350-32014 (09351-32190)

Piston stroke: A540E 0.91 - 1.35 mm (0.0358 - 0.0531 in.)
A540H 1.11 - 1.47 mm (0.0437 - 0.0579 in.)

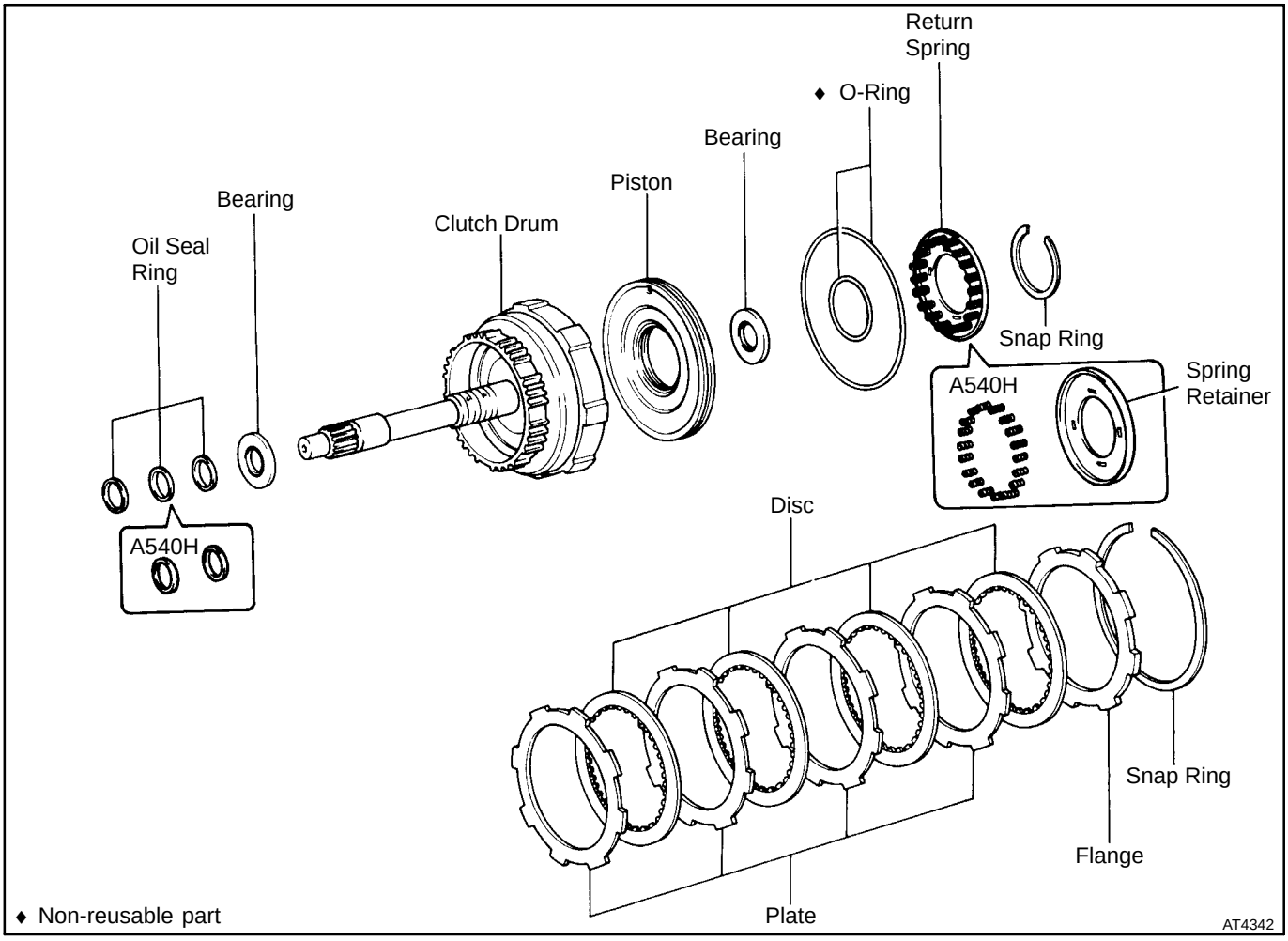
If the piston stroke is nonstandard, select another flange.

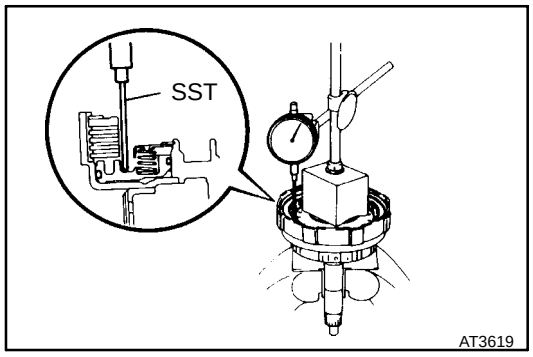
HINT: There are two different thicknesses for the flange.

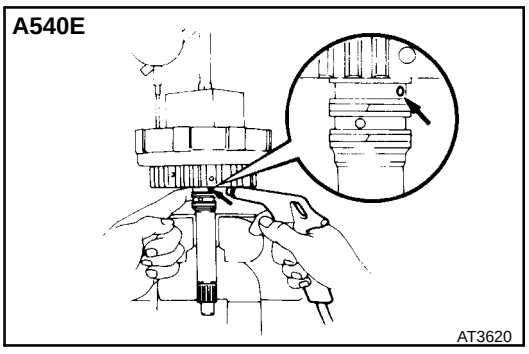
Flange thickness: 2.70 mm (0.1063 in.)
3.00 mm (0.1181 in.)

Forward Clutch

COMPONENTS







DISASSEMBLY OF FORWARD CLUTCH

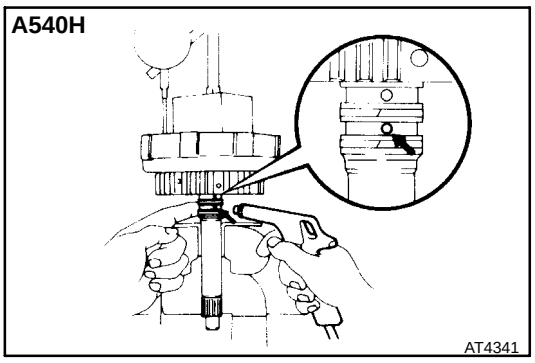
1. CHECK PISTON STROKE OF FORWARD CLUTCH

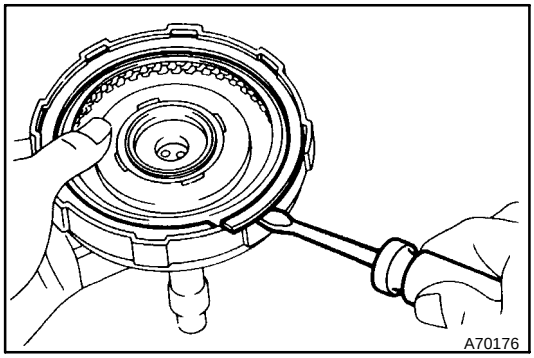
Using a dial indicator (long type pick or SST), measure the forward clutch piston stroke applying and releasing the compressed air (4 - 8 kg/cm^2, 57 - 114 psi, 392 - 785 kPa) as shown.

SST 09350-32014 (09351-32190)

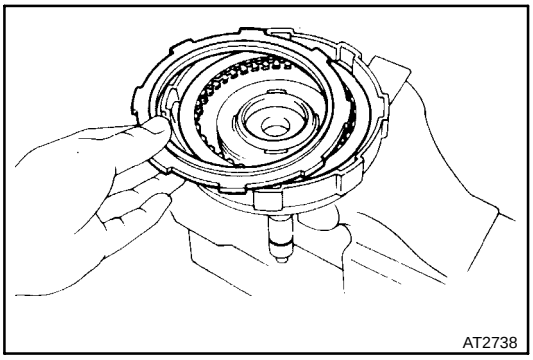
Piston stroke: 1.41 - 1.82 mm (0.0555 - 0.0717 in.)

If the piston stroke is greater than the maximum, inspect each component.

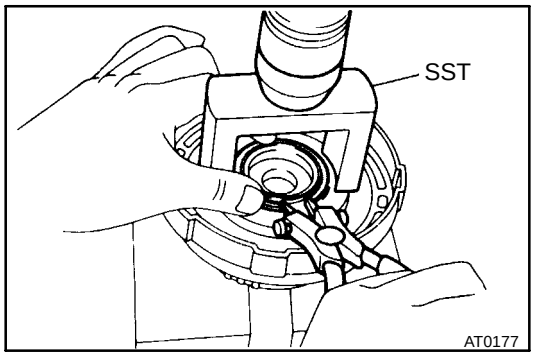




2. REMOVE SNAP RING FROM CLUTCH DRUM



3. REMOVE FLANGE, DISCS AND PLATES

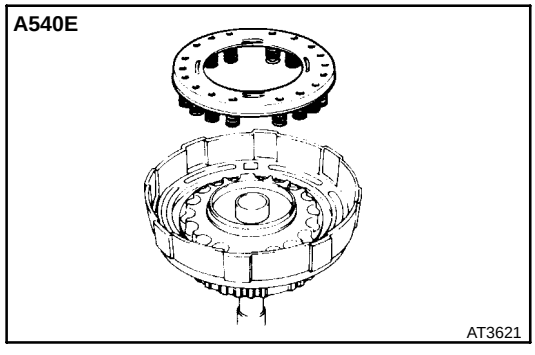


4. REMOVE RETURN SPRING

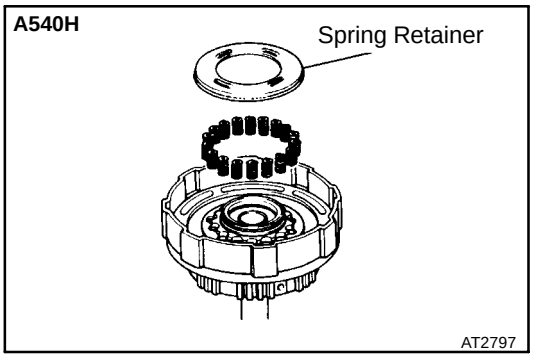
(a) Place SST on the spring retainer and compress the springs with a shop press.

SST 09350-32014 (09351-32070)

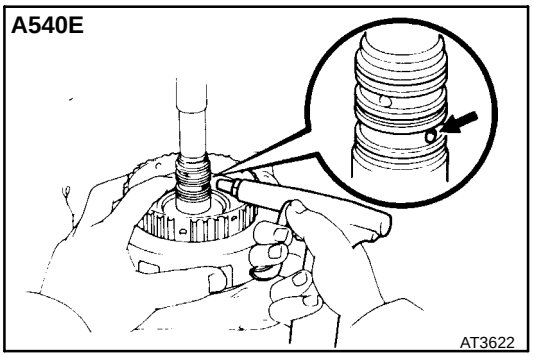
(b) Remove the snap ring using snap ring pliers.



(c) (A540E)
Remove the return spring.



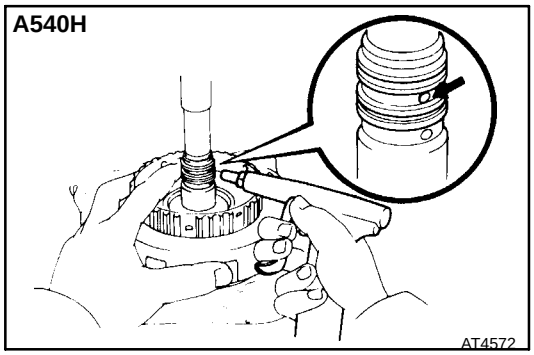
(A540H)
Remove the spring retainer and eighteen return springs.

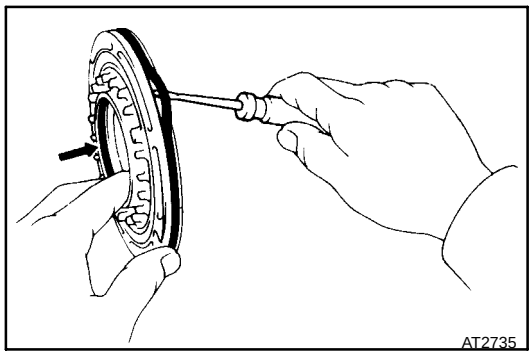


5. REMOVE CLUTCH PISTON

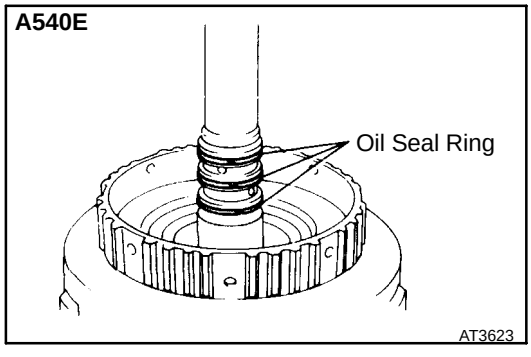
(a) Apply compressed air into the oil passage to remove the piston.

If the piston does not come out, use needle-nose pliers to remove it.



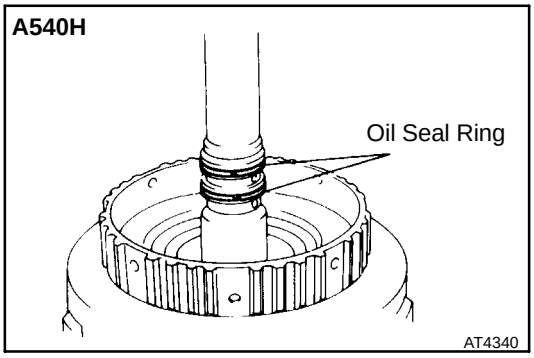


(b) Remove the two O-rings from the piston.

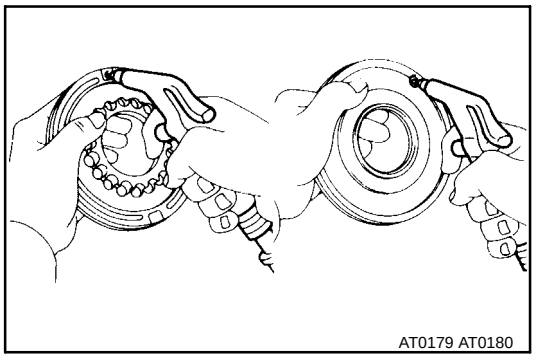


6. IF NECESSARY, REMOVE OIL SEAL RINGS

(A540E)
Remove the three oil seal rings from the shaft.



(A540H)
Remove the two oil seal rings from the shaft.

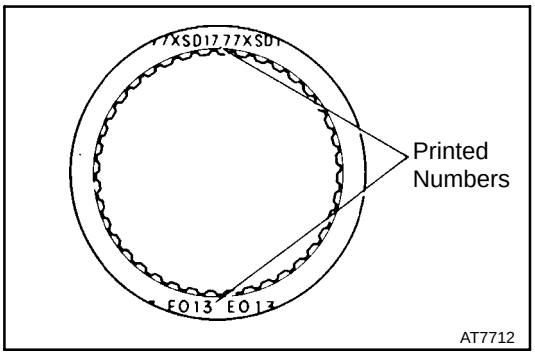


INSPECTION OF FORWARD CLUTCH

1. INSPECT CLUTCH PISTON

(a) Check that the check ball is free by shaking the piston.

(b) Check that the valve does not leak by applying low-pressure compressed air.

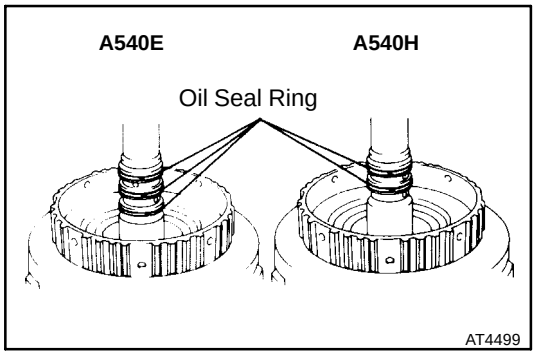


2. INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates and flange are worn or burnt. If necessary, replace them.
HINT:

® If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.

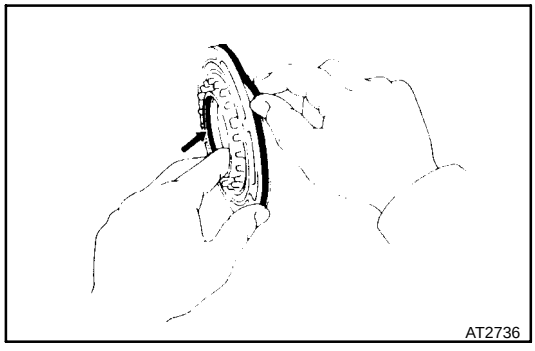
® Before assembling new discs, soak them in ATF for at least fifteen minutes.



ASSEMBLY OF FORWARD CLUTCH

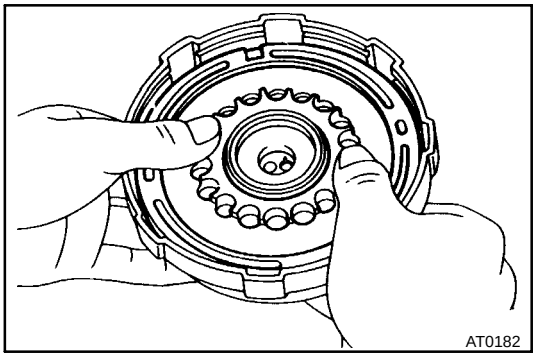
1. INSTALL OIL SEAL RINGS

Install the three oil seal rings (A540E) or two oil seal rings (A540H) to the shaft.
NOTICE: Do not spread the ring ends more than necessary.
HINT: After installing the oil seal rings, check that they move smoothly.



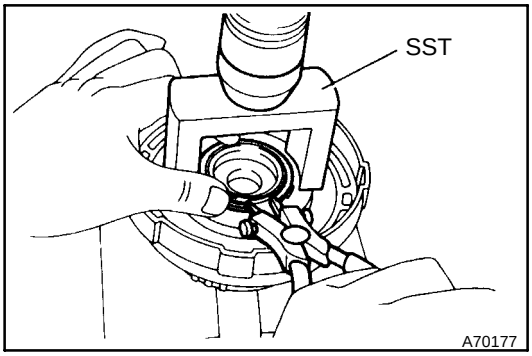
2. INSTALL CLUTCH PISTON TO CLUTCH DRUM

(a) Install the two new O-rings to the piston.



(b) Coat the O-rings with ATF.

(c) Press the piston into the drum with the cup side up, being careful not to damage the O-rings.



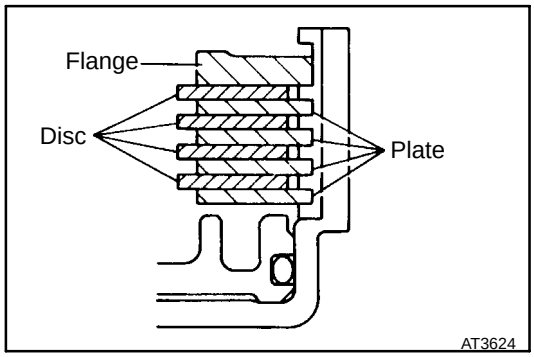
3. INSTALL PISTON RETURN SPRINGS

(a) Place the return spring and snap ring onto the piston.

(b) Place SST on the spring retainer, and compress the springs with a shop press.

SST 09350-32014 (09351-32070)

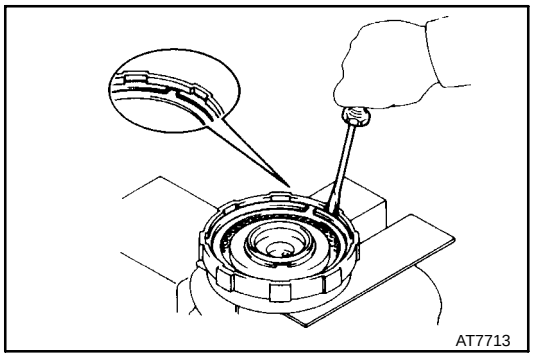
(c) Install the snap ring with snap ring pliers. Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



4. INSTALL PLATES, DISCS AND FLANGE

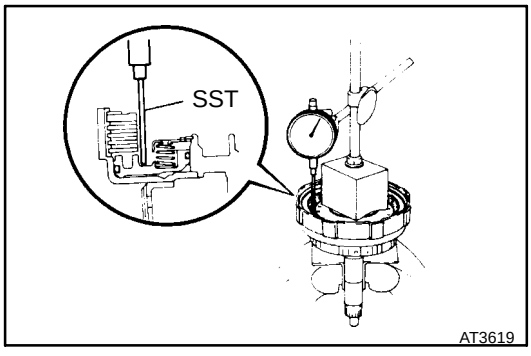
(a) Install the plates and discs.
Install in order: P = Plate D = Disc
P-D-P-D-P-D-P-D

(b) Install the flange with the flat end facing downward.



5. INSTALL SNAP RING

Check that the end gap of snap ring is not aligned with one of the cutouts.



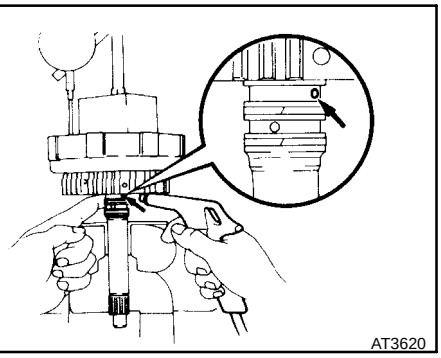
6. RECHECK PISTON STROKE OF FORWARD CLUTCH

Using a dial indicator (long type pick or SST), measure the forward clutch piston stroke applying and releasing the compressed air (4 - 8 kg/cm^2, 57 - 114 psi, 392 - 785 kPa) as shown next page.

SST 09350-32014 (09351-32190)

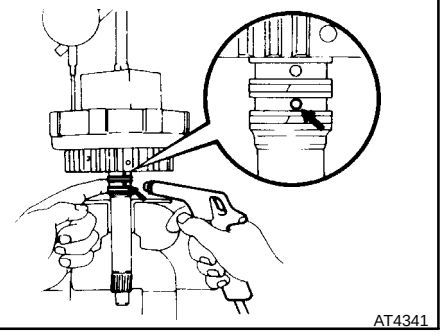
Piston stroke: 1.41 - 1.82 mm (0.0555 - 0.0717 in.)

A540E



AT3620

A540H



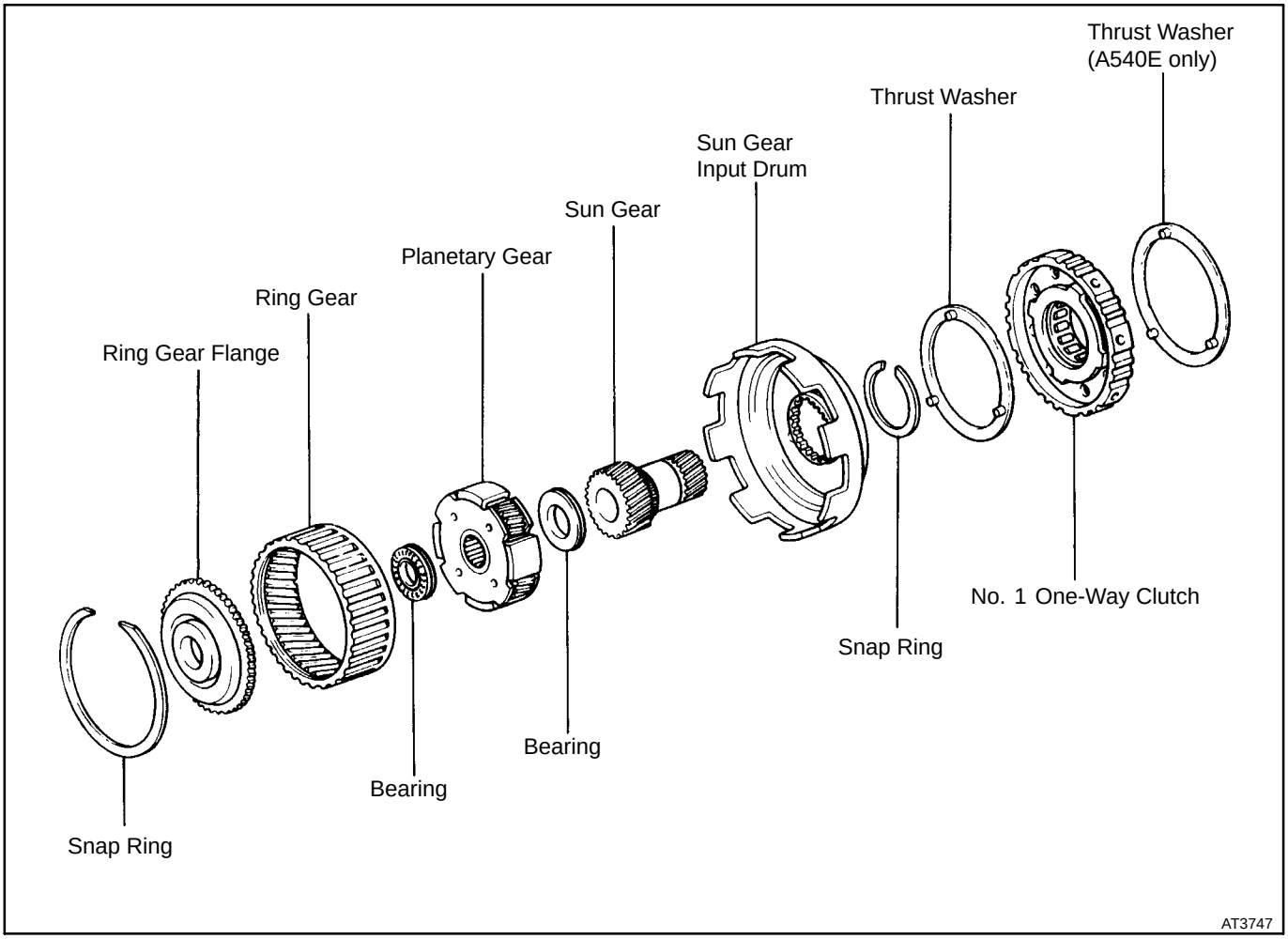
AT4341

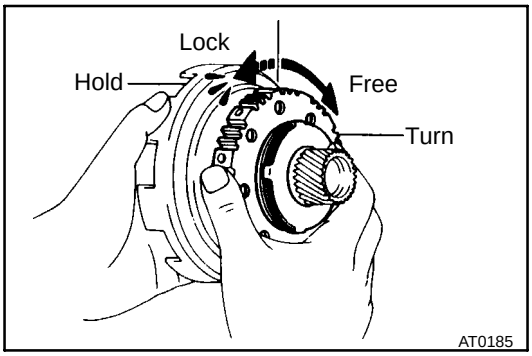
If the piston stroke is nonstandard, select another flange.
HINT: There are two different thicknesses for the flange.

Flange thickness: 3.00 mm (0.1181 in.)
3.37 mm (0.1327 in.)

Front Planetary Gear

COMPONENTS

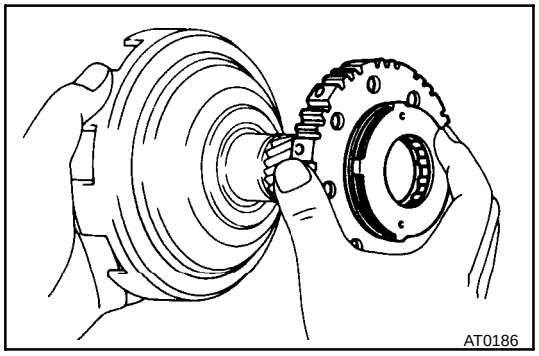




DISASSEMBLY OF NO. 1 ONE-WAY CLUTCH AND SUN GEAR

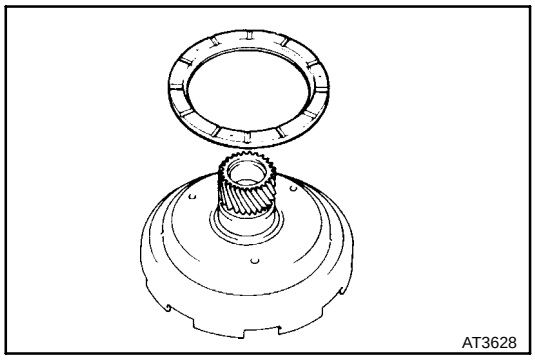
1. CHECK OPERATION OF NO. 1 ONE-WAY CLUTCH

Hold the sun gear and turn the hub. The hub should turn freely clockwise and should lock counterclockwise.

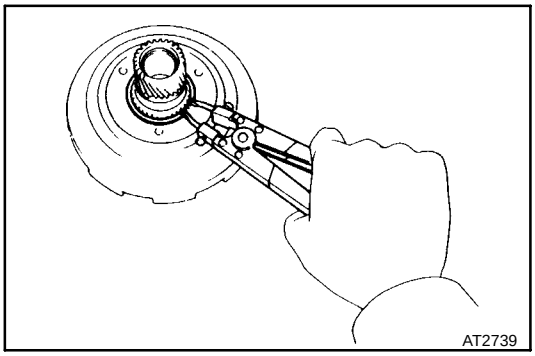


2. REMOVE NO. 1 ONE-WAY CLUTCH FROM SUN GEAR

While turning the hub clockwise, remove the No. 1 one-way clutch from the sun gear.



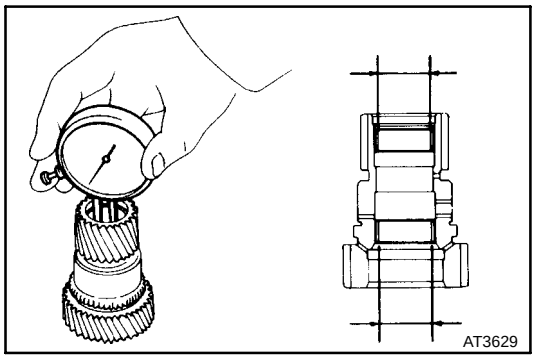
3. REMOVE THRUST WASHER FROM SUN GEAR INPUT DRUM



4. REMOVE SUN GEAR FROM DRUM

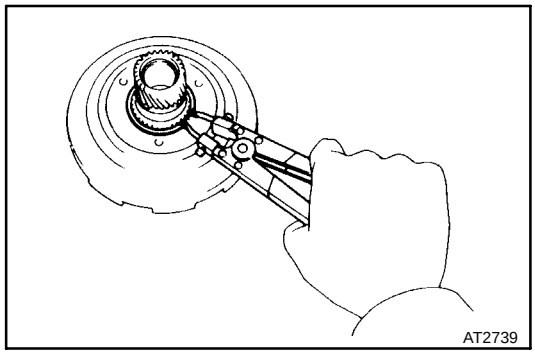
(a) Using snap ring pliers, remove the snap ring from the drum.

(b) Remove the sun gear from the drum.



5. CHECK SUN GEAR BUSHINGS

Using a dial indicator, measure the inside diameter of the sun gear bushings.
Maximum inside diameter: 22.59 mm (0.8894 in.)
If the inside diameter is greater than the maximum, replace the sun gear.

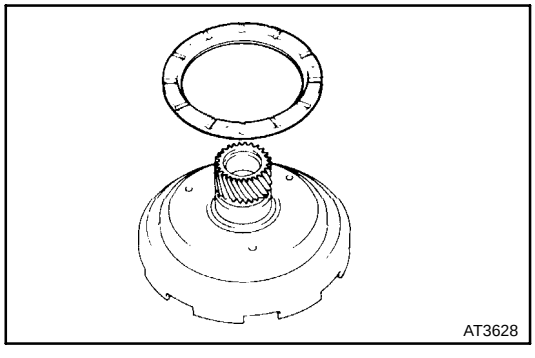


ASSEMBLY OF NO. 1 ONE-WAY CLUTCH AND SUN GEAR

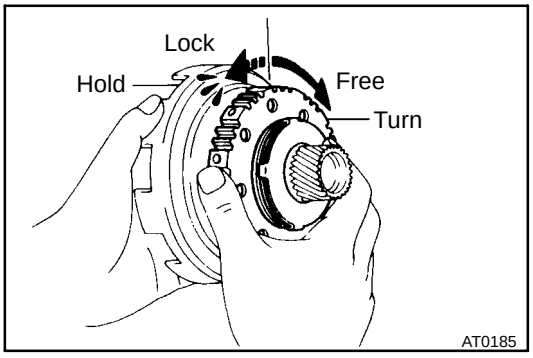
1. INSTALL SUN GEAR TO DRUM

(a) Install the sun gear to the drum.

(b) Using snap ring pliers, install the snap ring to drum.



2. INSTALL THRUST WASHER TO SUN GEAR INPUT DRUM

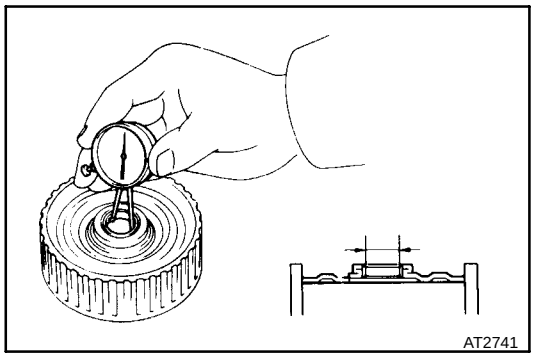


3. INSTALL NO. 1 ONE-WAY CLUTCH ON SUN GEAR

While turning the hub clockwise, slide the No. 1 one-way clutch onto the sun gear.

4. RECHECK OPERATION OF NO. 1 ONE-WAY CLUTCH

INSPECTION OF PLANETARY RING GEAR

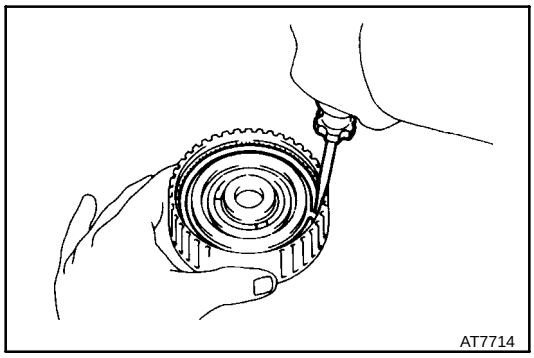


1. INSPECT RING GEAR FLANGE BUSHING

Using a dial indicator, measure the inside diameter of the flange bushing.

Maximum inside diameter: 30.08 mm (1.1842 in.)

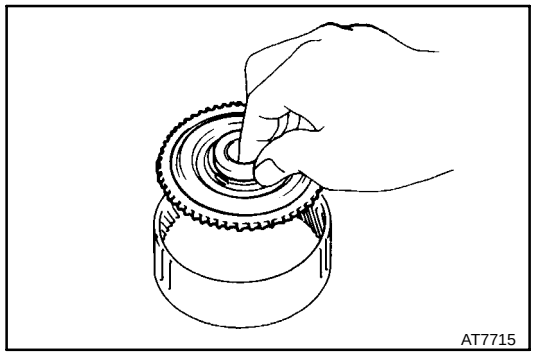
If the inside diameter is greater than the maximum, replace the flange.



2. REMOVE RING GEAR FLANGE

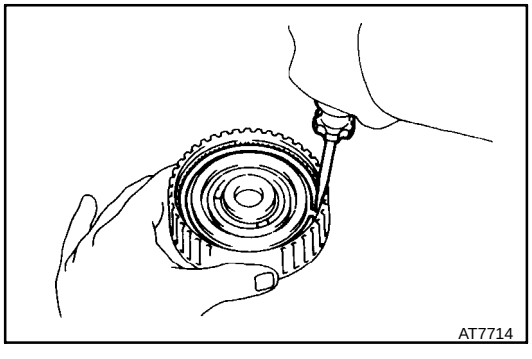
(a) Using a screwdriver, remove the snap ring.

(b) Remove the flange from the ring gear.

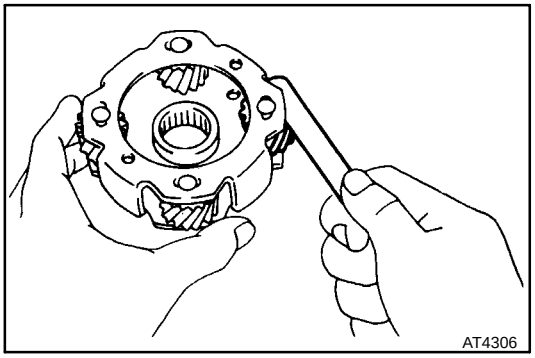


3. INSTALL RING GEAR FLANGE

(a) Position the flange into the ring gear.



(b) Using a screwdriver, install the snap ring.



INSPECTION OF FRONT PLANETARY GEAR

MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

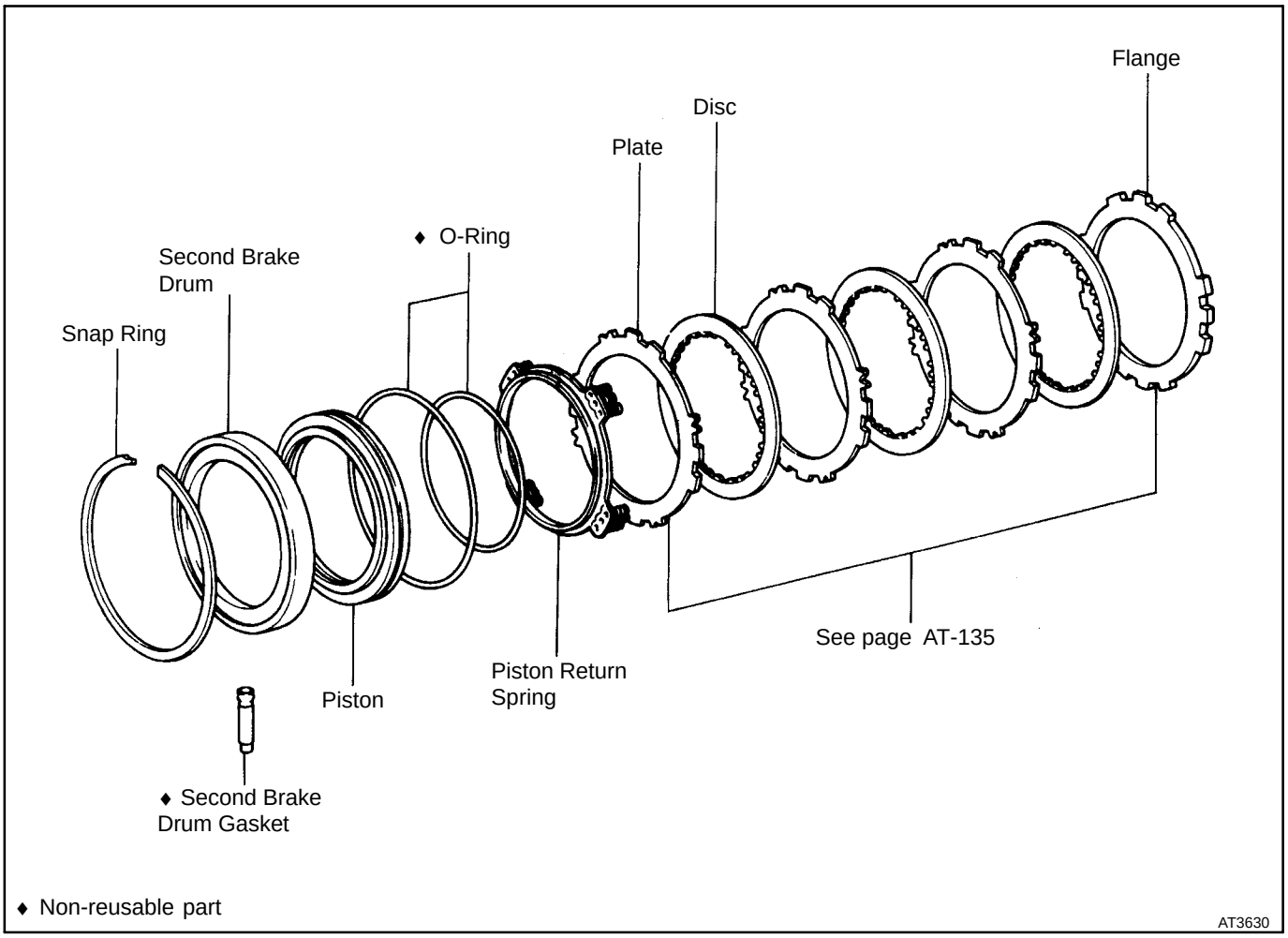
Standard clearance: **0.16 - 0.56 mm (0.0063 - 0.0220 in.)**

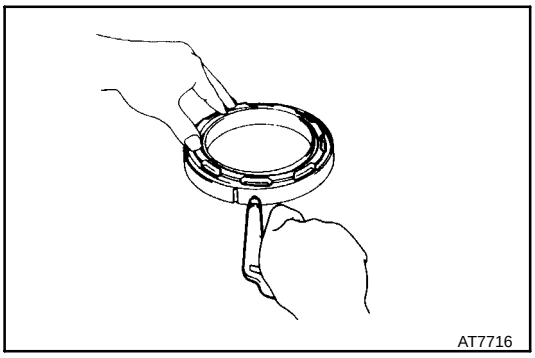
Maximum clearance: **0.61 mm (0.0240 in.)**

If the clearance is greater than the maximum, replace the planetary gear assembly.

Second Brake

COMPONENTS

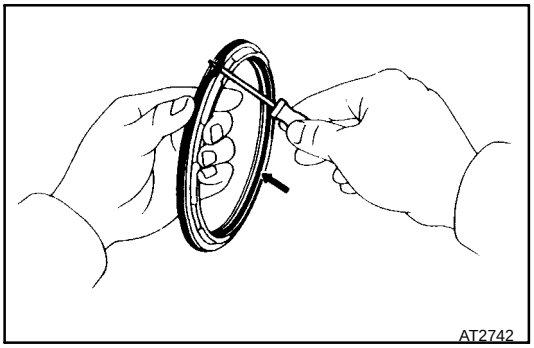




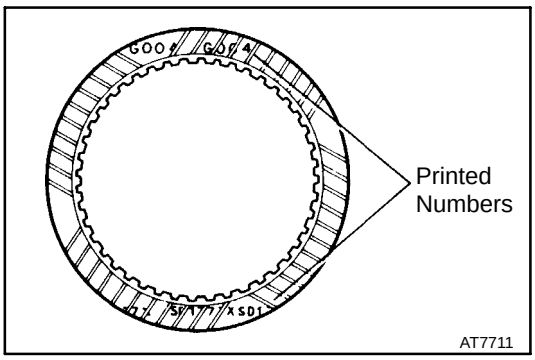
DISASSEMBLY OF SECOND BRAKE PISTON

REMOVE SECOND BRAKE PISTON

(a) Apply compressed air to the oil hole to remove the piston.



(b) Remove the two o-rings from the piston.

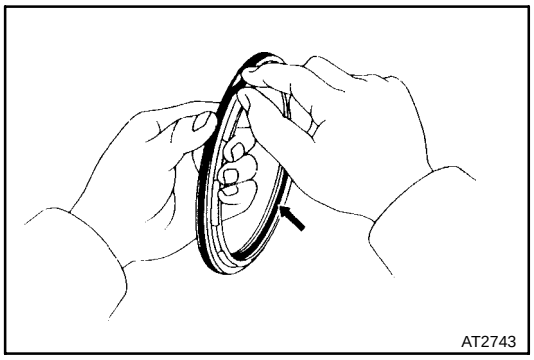


INSPECTION OF SECOND BRAKE COMPONENT

INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates and flange are worn or burnt. If necessary, replace them.
HINT:

- ® If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- ® Before assembling new discs, soak them in ATF for at least fifteen minutes.

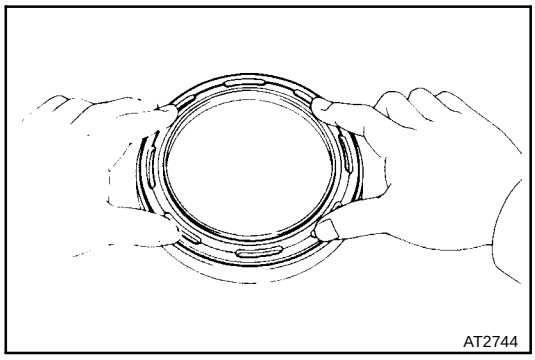


ASSEMBLY OF SECOND BRAKE PISTON

INSTALL PISTON

(a) Coat a new O-ring with ATF.

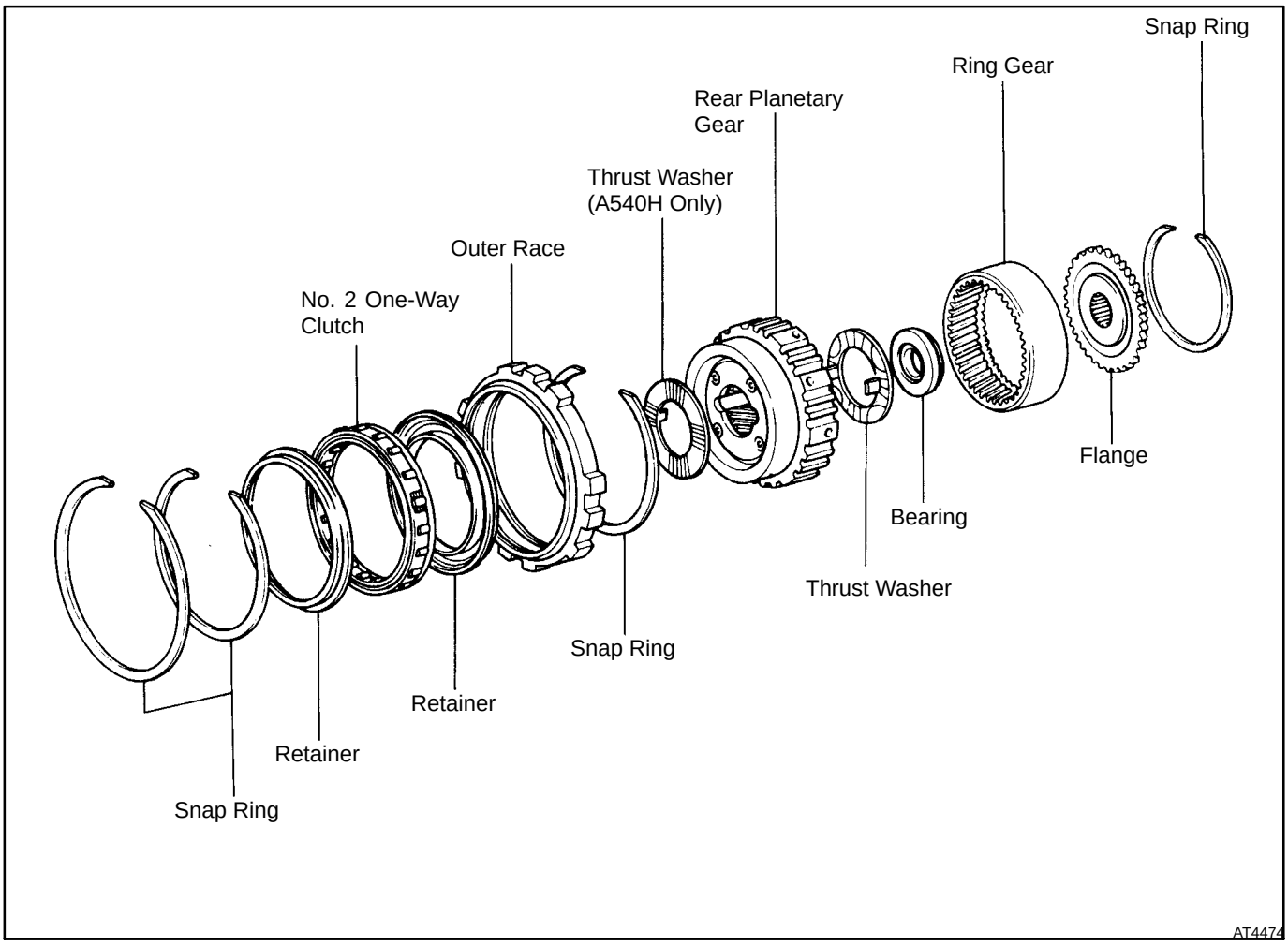
(b) Install the two O-rings on the piston.

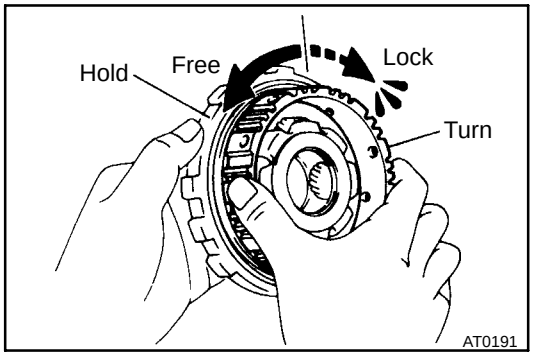


(c) Press the piston into the drum, being careful not to damage the O-rings.

Rear Planetary Gear

COMPONENTS



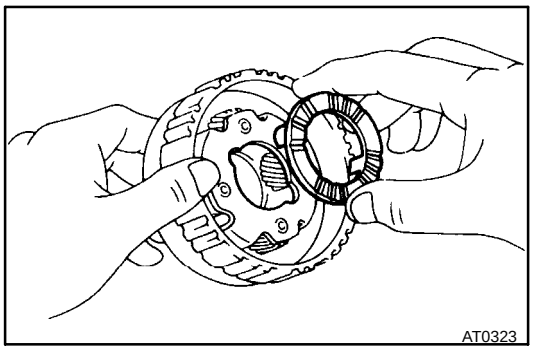


DISASSEMBLY OF NO. 2 ONE-WAY CLUTCH

1. CHECK OPERATION OF NO. 2 ONE-WAY CLUTCH

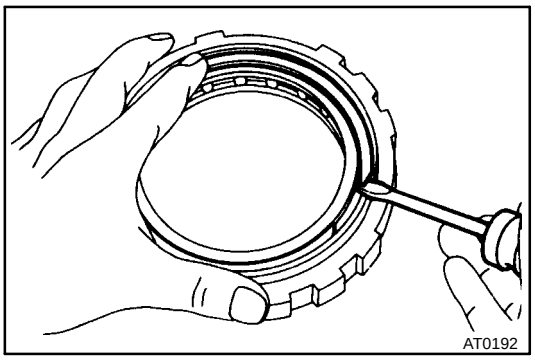
Hold the outer race and turn the rear planetary gear. The rear planetary gear should turn freely counter-clockwise and should lock clockwise.

2. SEPARATE NO. 2 ONE-WAY CLUTCH AND REAR PLANETARY GEAR



3. REMOVE THRUST WASHERS

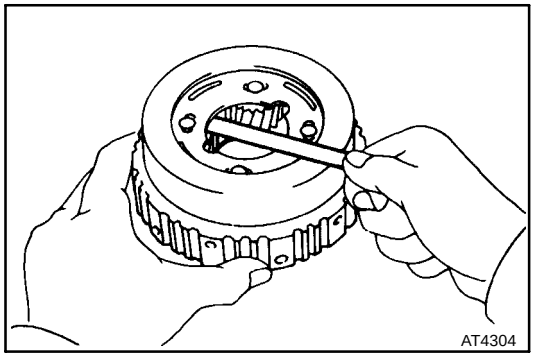
(A540E)
Remove the thrust washer from the rear side of planetary gear.
(A540H)
Remove the two thrust washers from both sides of planetary gear.



4. REMOVE NO. 2 ONE-WAY CLUTCH FROM OUTER RACE

(a) Remove the two snap rings and retainers from both sides.

(b) Remove the No. 2 one-way clutch from the outer race.



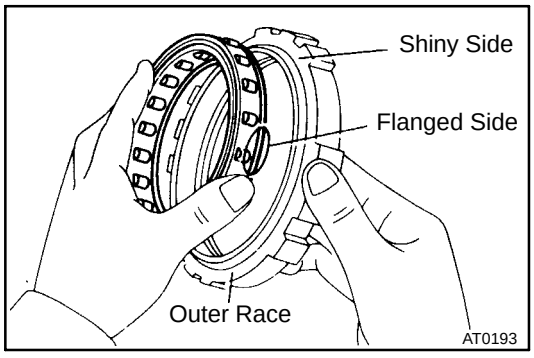
INSPECTION OF REAR PLANETARY GEAR

MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

Standard clearance: 0.16 - 0.56 mm (0.0063 - 0.0220 in)
Maximum clearance: 0.61 mm (0.0240 in.)

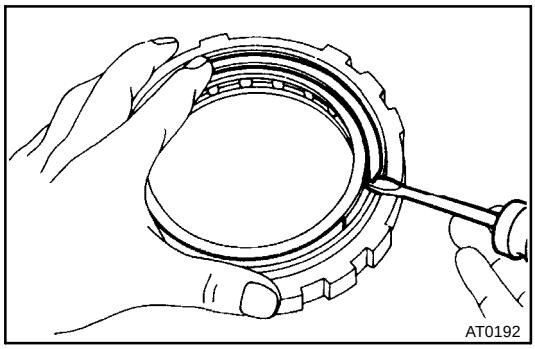
If the clearance is greater than the maximum, replace the planetary gear assembly.



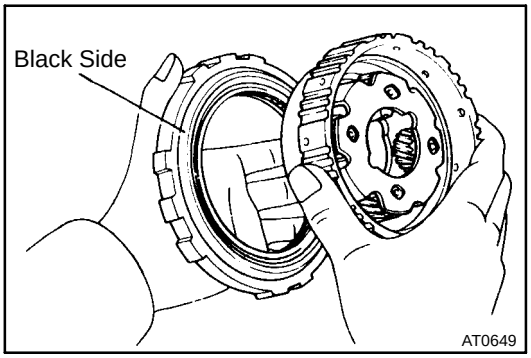
ASSEMBLY OF NO. 2 ONE-WAY CLUTCH

1. INSTALL ONE-WAY CLUTCH

(a) Install the No. 2 one-way clutch into the outer race, facing the flanged side of the No. 2 one-way clutch toward the shiny side of the outer race.

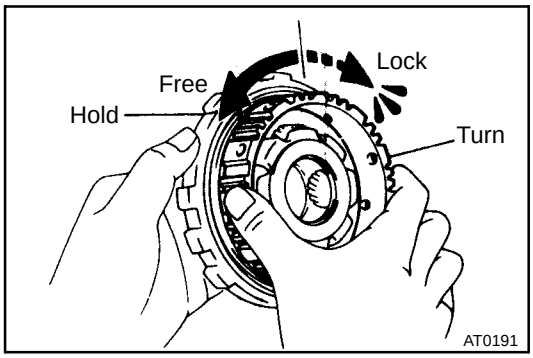


(b) Install the two retainers and snap rings to both sides.

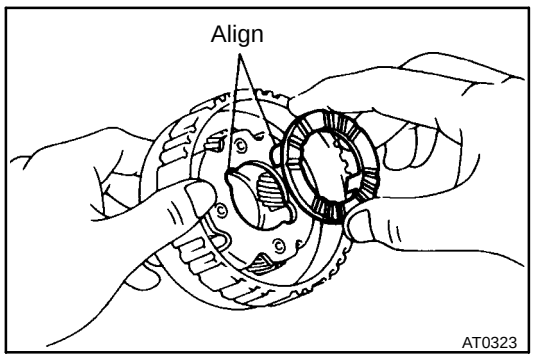


2. INSTALL PLANETARY GEAR INTO NO. 2 ONE-WAY CLUTCH

Install the planetary gear into the No. 2 one-way clutch, facing the inner race of the rear planetary gear toward the black side of the No. 2 one-way clutch outer race.



3. CHECK OPERATION OF NO. 2 ONE-WAY CLUTCH



4. INSTALL THRUST WASHERS

(A540E)

(a) Coat the thrust washer with petroleum jelly.

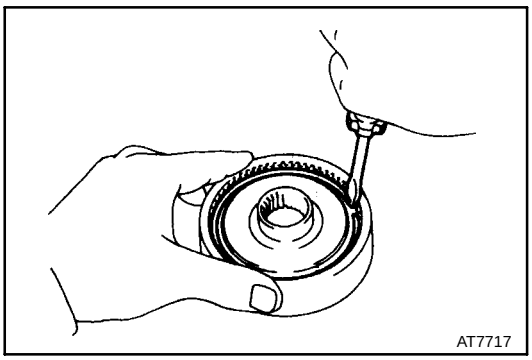
(b) Align the tab of the washer with the hollows of the carrier.

(A540H)

(a) Coat the two thrust washers with petroleum jelly.

(b) Align the tab of the washer with the hollows of the carrier.

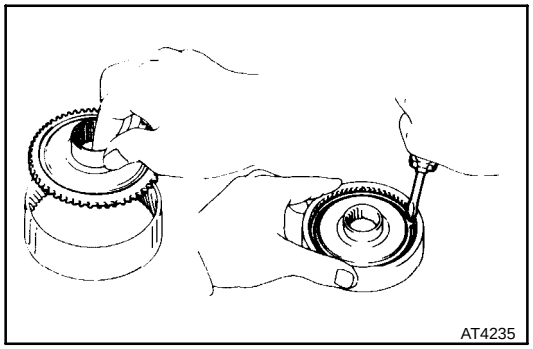
REPLACEMENT OF RING GEAR FLANGE



1. REMOVE RING GEAR FLANGE

(a) Using a screwdriver, remove the snap ring.

(b) Remove the flange from the ring gear.



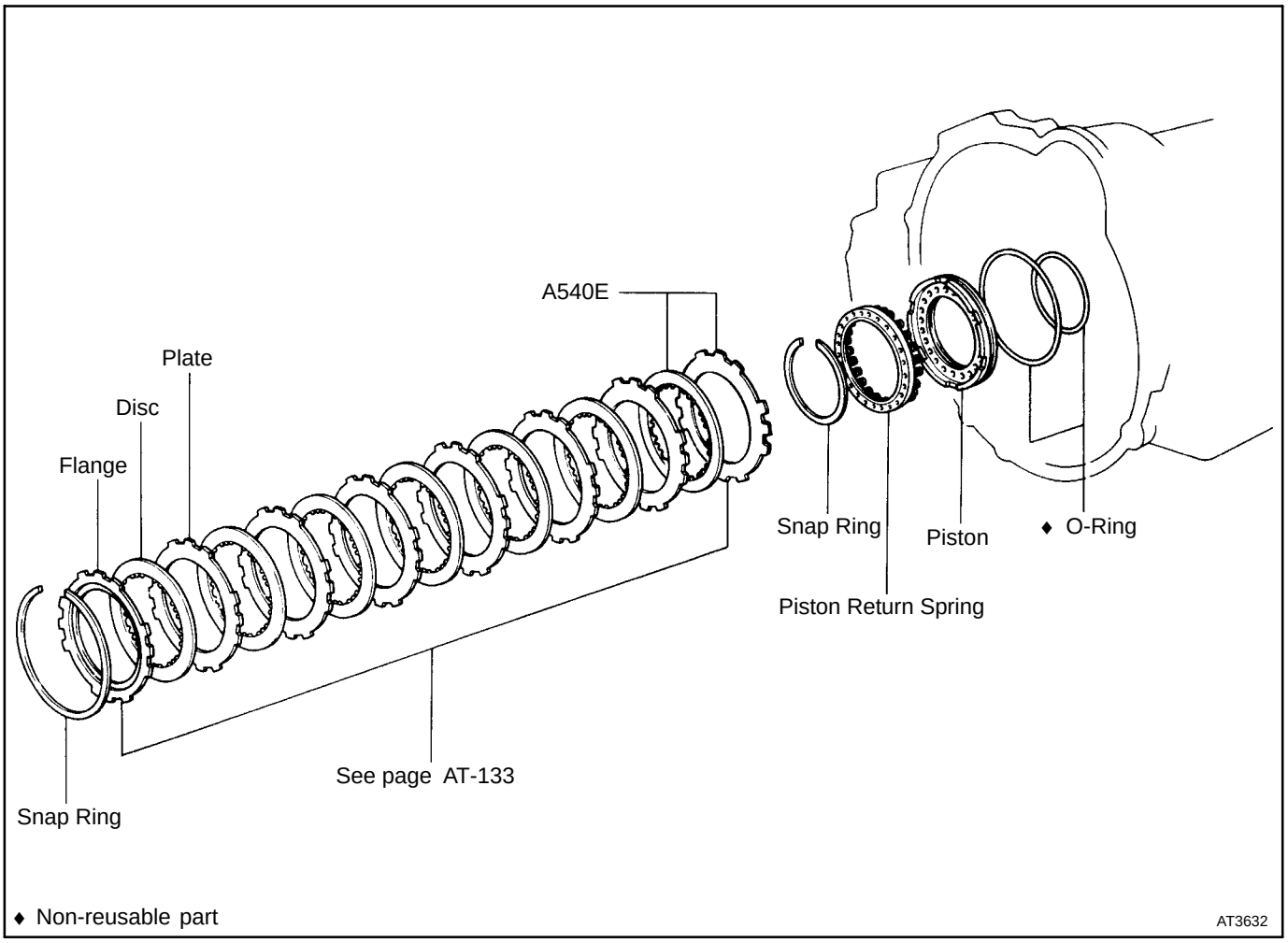
2. INSTALL RING GEAR FLANGE

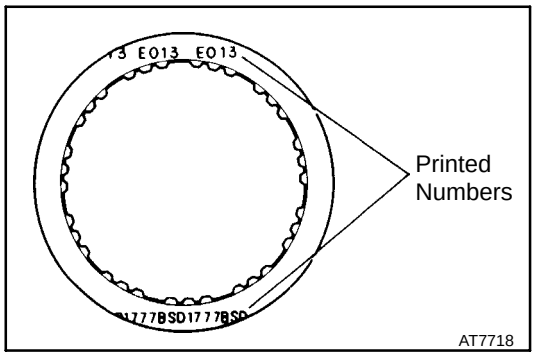
(a) Position the flange into the ring gear.

(b) Using a screwdriver, install the snap ring.

First and Reverse Brake

COMPONENTS





INSPECTION OF FIRST AND REVERSE BRAKE COMPONENTS

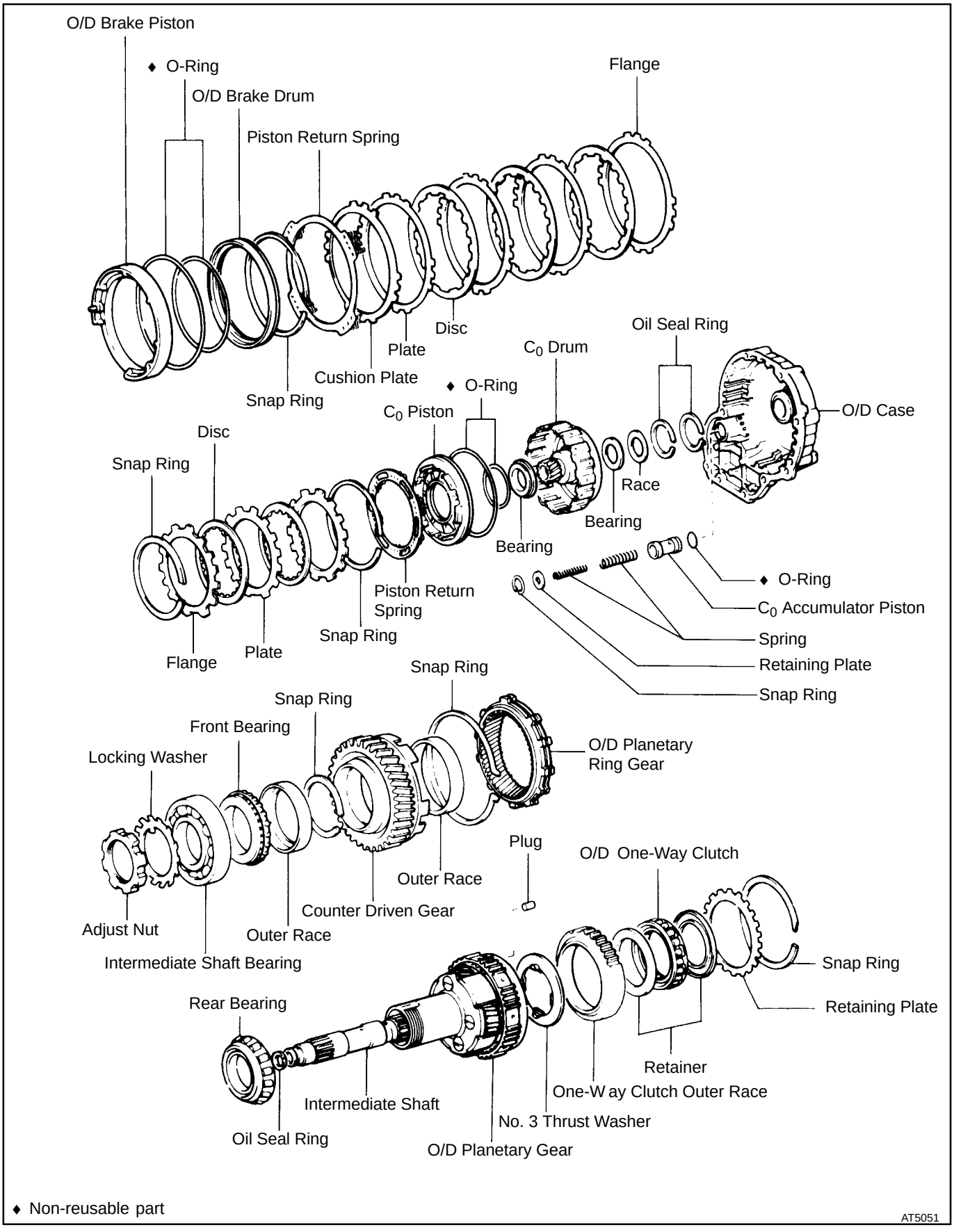
INSPECT DISCS, PLATES AND FLANGES

Check if the sliding surfaces of the discs, plates and flanges are worn or burnt. If necessary, replace them.
HINT:

- ® If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- ® Before assembling new discs, soak them in ATF for at least fifteen minutes.

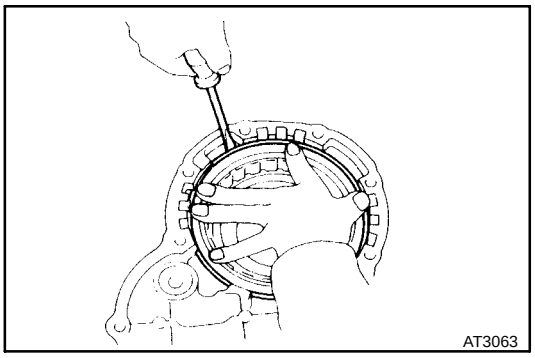
Overdrive Unit

COMPONENTS



♦ Non-reusable part

AT5051

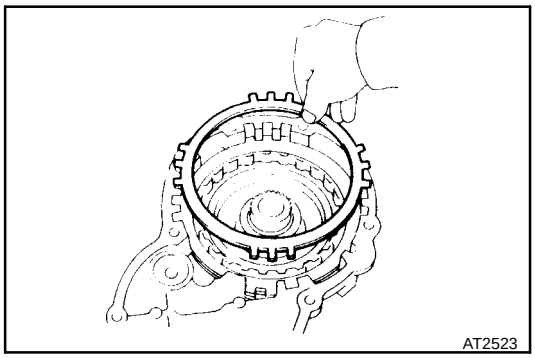


DISASSEMBLY OF OVERDRIVE BRAKE

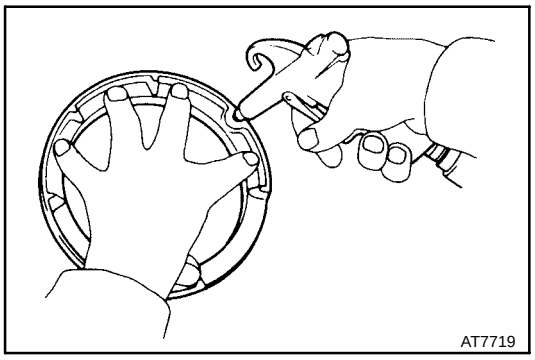
1. REMOVE PISTON RETURN SPRING

(a) While pushing the return spring, remove the snap ring with a screwdriver.

(b) Remove the piston return spring.

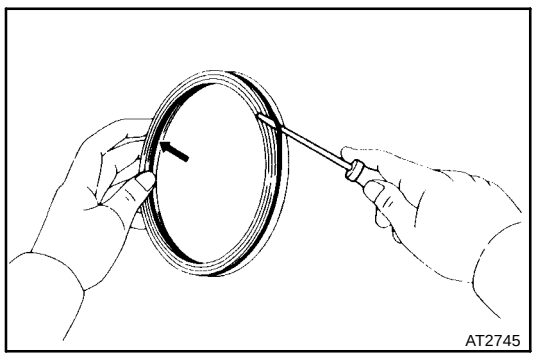


2. REMOVE PLATES, DISCS AND FLANGE



3. REMOVE PISTON FROM DRUM

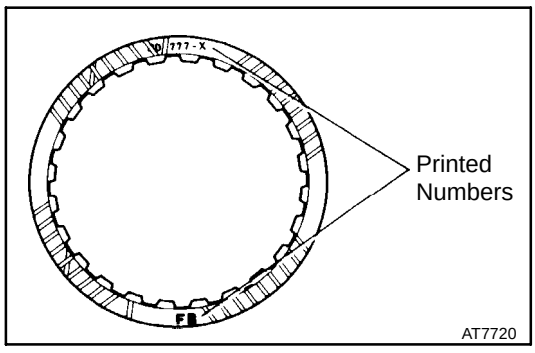
Apply compressed air to oil hole to remove the piston.
HINT: Blow with the gun slightly away from the oil hole, and be careful that the piston dose not tilt.



4. REMOVE O-RINGS

Remove the inner and outer O-rings from the piston.

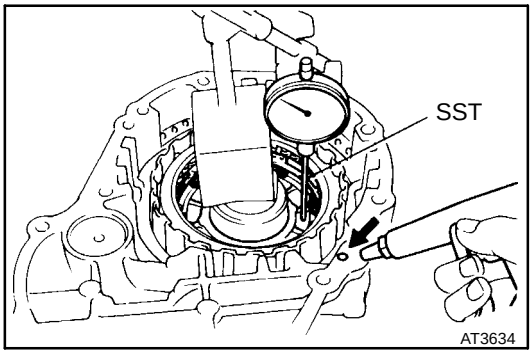
INSPECTION OF OVERDRIVE BRAKE



INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates and flange are worn or burnt. If necessary, replace them.
HINT:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.



DISASSEMBLY OF OVERDRIVE DIRECT CLUTCH

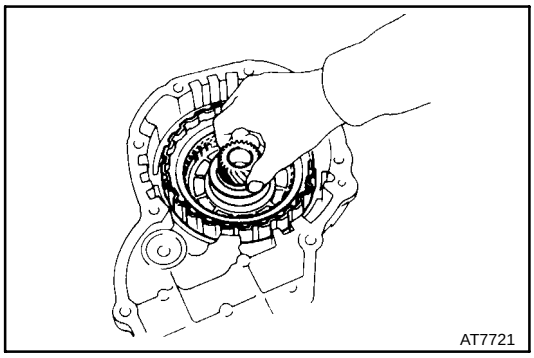
1. CHECK PISTON STROKE OF DIRECT CLUTCH

Using a dial indicator, measure the piston stroke while applying and releasing the compressed air (4 - 8 kg/cm^2, 57 - 114 psi or 392 - 785 kPa) as shown.

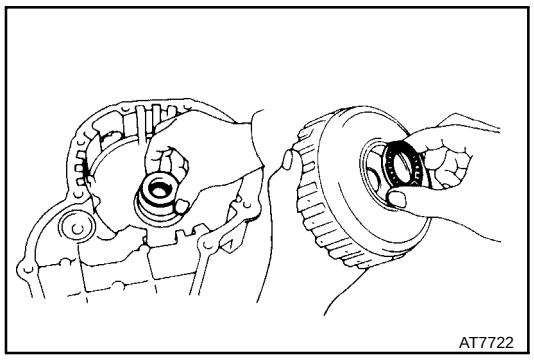
Piston stroke: 1.75 - 2.49 mm (0.0689 - 0.0980 in.)

SST 09350-32014 (09351-32190)

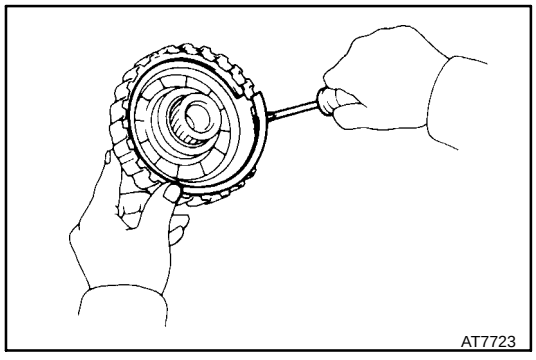
If the piston stroke is greater than the maximum, inspect each component.



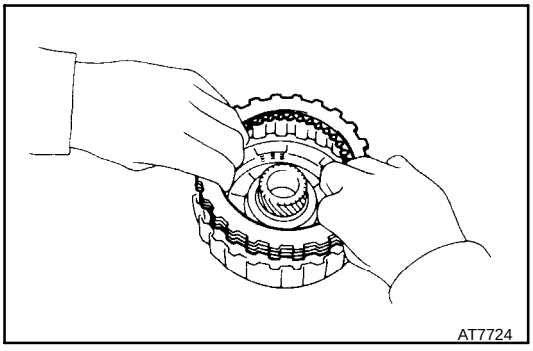
2. REMOVE OVERDRIVE DIRECT CLUTCH FROM CASE



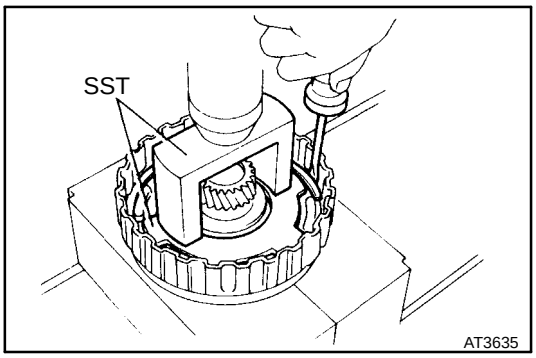
3. REMOVE BEARING AND RACE FROM CLUTCH DRUM AND CASE



4. REMOVE SNAP RING WITH SCREWDRIVER



5. REMOVE FLANGES, DISCS AND PLATES

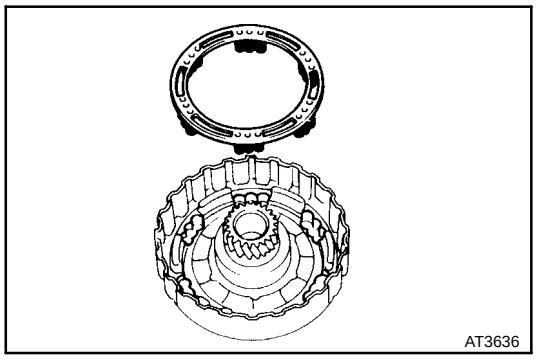


6. REMOVE PISTON RETURN SPRING

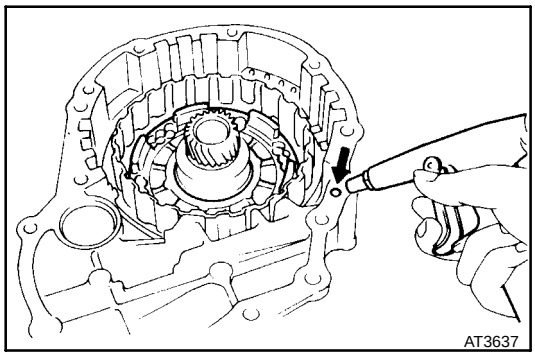
(a) Place SST on the spring retainer and compress the spring with a shop press.

SST 09350-32014 (09351-32070, 09351-32200)

(b) Remove the snap ring.



(c) Remove the piston return spring.



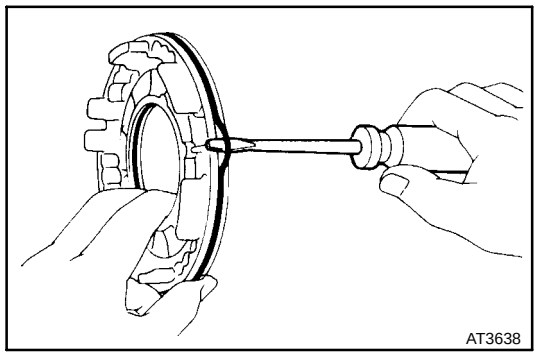
7. REMOVE PISTON FROM CLUTCH DRUM

(a) Install the clutch drum on the case.

(b) Apply compressed air to the pressure apply hole of the case.

(c) Remove the piston from the clutch drum.
If the piston does not come out completely, use needle-nose pliers to remove it.

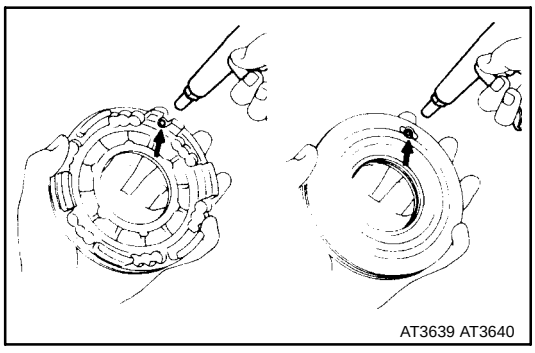
(d) Remove the clutch drum from the case.



8. REMOVE O-RINGS

Remove the two O-rings from the piston.

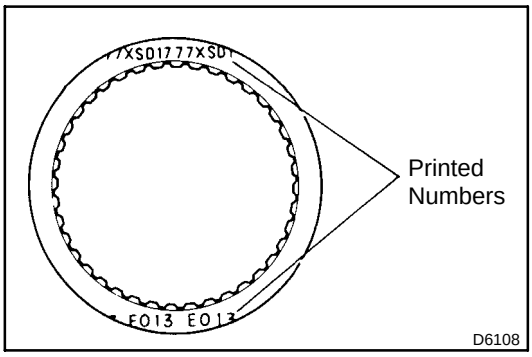
INSPECTION OF OVERDRIVE DIRECT CLUTCH



1. INSPECT OVERDRIVE DIRECT CLUTCH

(a) Check that the check ball is free by shaking the piston.

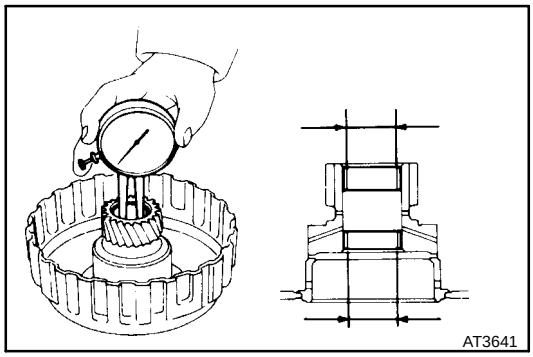
(b) Check that the valve does not leak by applying low-pressure compressed air.



2. INSPECT DISCS, PLATES AND FLANGES

Check if the sliding surfaces of the discs, plates and flanges are worn or burnt. If necessary, replace them.
HINT:

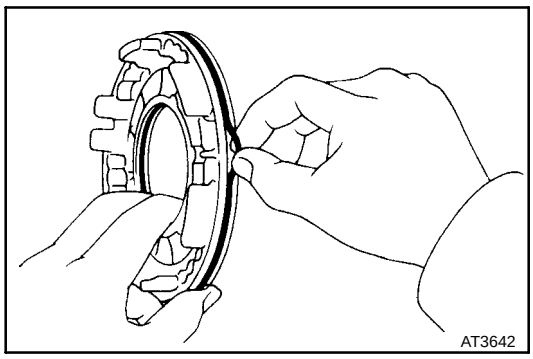
- ® If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- ® Before assembling new discs, soak them in ATF for at least fifteen minutes.



3. CHECK DIRECT CLUTCH BUSHING

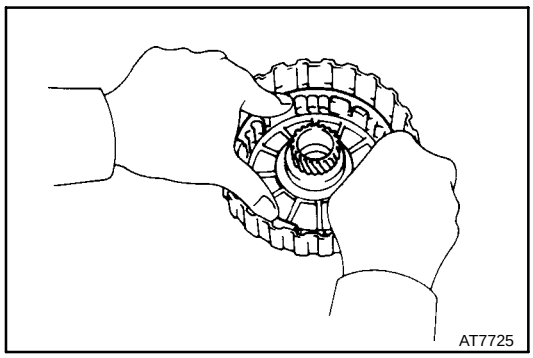
Using a dial indicator, measure the inside diameter of the two direct clutch bushings.
Maximum inside diameter: 22.13 mm (0.8713 in.)
If the inside diameter is greater than the maximum, replace the direct clutch drum.

ASSEMBLY OF OVERDRIVE DIRECT CLUTCH

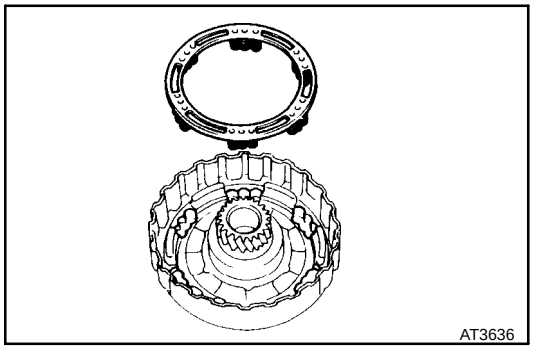


1. INSTALL CLUTCH PISTON

(a) Install new O-rings to the piston. Coat the O-rings with ATF.

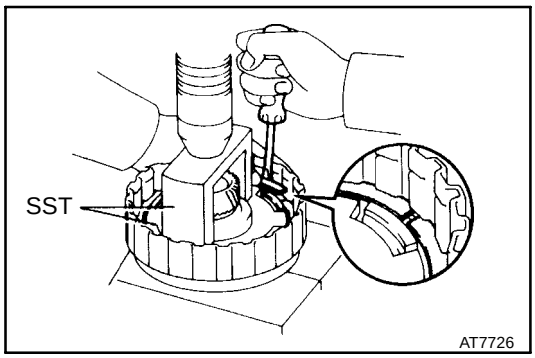


(b) Press the piston into the drum with the cup side up, being careful not to damage the O-ring.



2. INSTALL PISTON RETURN SPRING

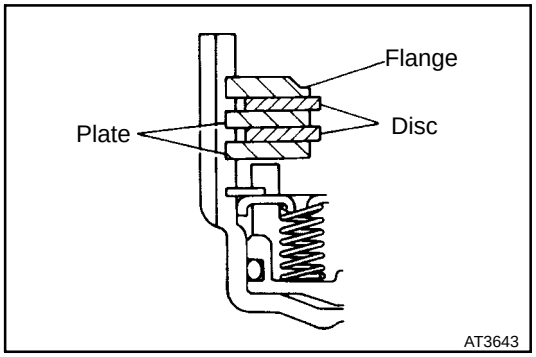
(a) Install the return spring and set snap ring in place.



(b) Place SST on the spring retainer, and compress the spring with a shop press.

SST 09350-32014 (09351-32070, 09351-32200)

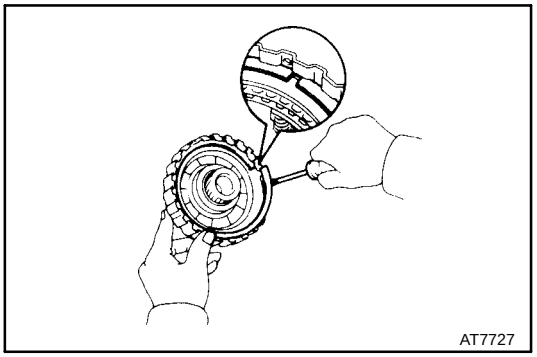
(c) Install the snap ring with a screwdriver. Be sure end gap of snap ring is aligned with the groove of the clutch drum.



3. INSTALL PLATES, DISCS AND FLANGE

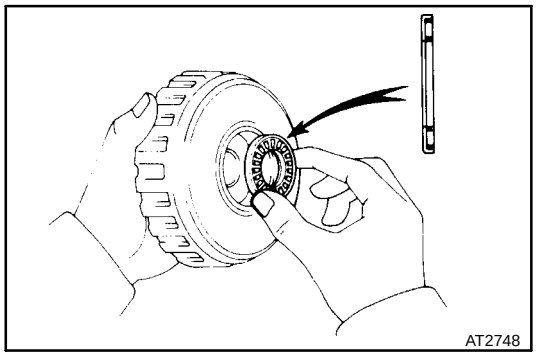
Install in order: P = Plate D = Disc

P-D-P-D-Flange



4. INSTALL SNAP RING

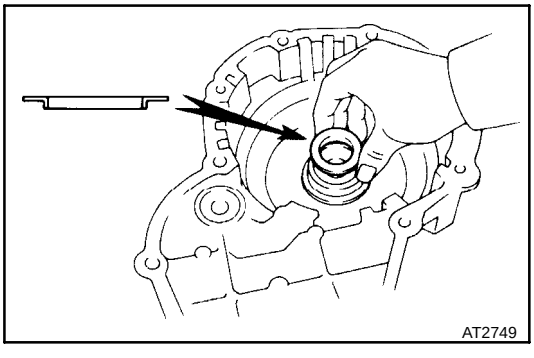
Be sure end gap of the snap ring is not aligned with the groove of the clutch drum.



5. INSTALL BEARING AND RACE

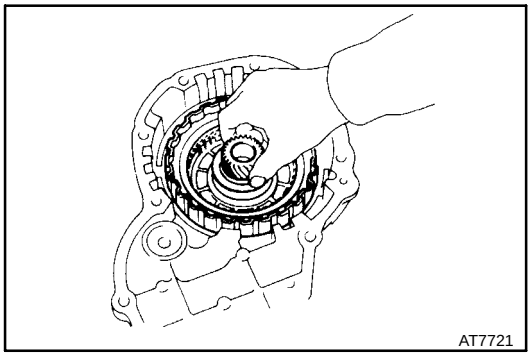
(a) Coat the bearing with petroleum jelly and install it facing the race side downward to the clutch drum.

Bearing: outer diameter 46.3 mm (1.823 in.)
Inner diameter 26.2 mm (1.031 in.)

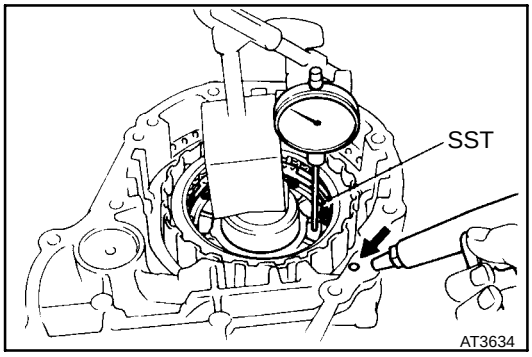


(b) Coat the race with petroleum jelly and install it to the case.

Race: Outer diameter 43.0 mm (1.693 in.)
Inner diameter 24.5 mm (0.965 in.)



6. INSTALL DIRECT CLUTCH ON CASE



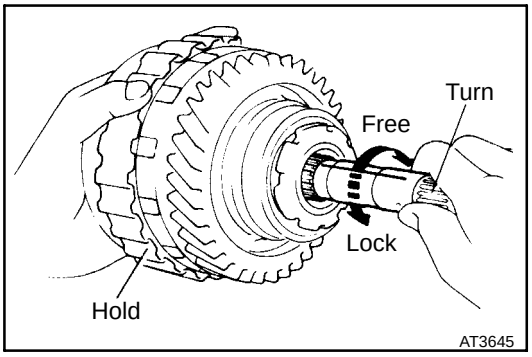
7. RECHECK PISTON STROKE OF DIRECT CLUTCH

Using a dial indicator, measure the piston stroke while applying and releasing the compressed air (4 - 8 kg/cm^2, 57 - 114 psi or 392 - 785 kPa) as shown.

Piston stroke: 1.75 - 2.49 mm (0.0689 - 0.0980 in.)

SST 09350-32014 (09351-32190)

DISASSEMBLY OF COUNTER DRIVE GEAR

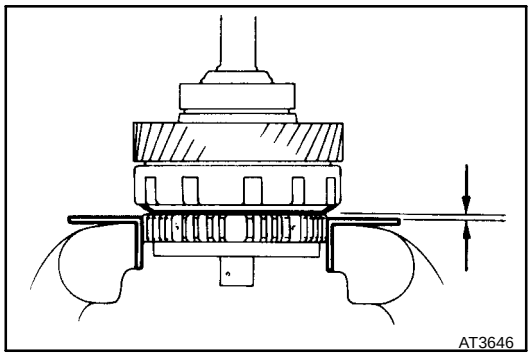


1. CHECK OPERATION OF ONE-WAY CLUTCH

(a) Install the overdrive direct clutch into the one-way clutch.

(b) Hold the overdrive direct clutch and turn the intermediate shaft. The shaft should turn freely clockwise and should lock counterclockwise.

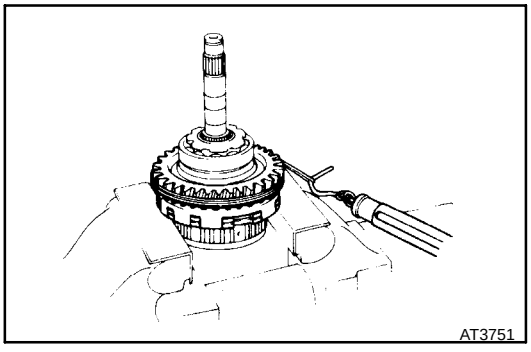
(c) Remove the overdrive direct clutch.



2. CHECK COUNTER DRIVE GEAR PRELOAD

(a) Hold the overdrive planetary gear in a vise with soft jaws.

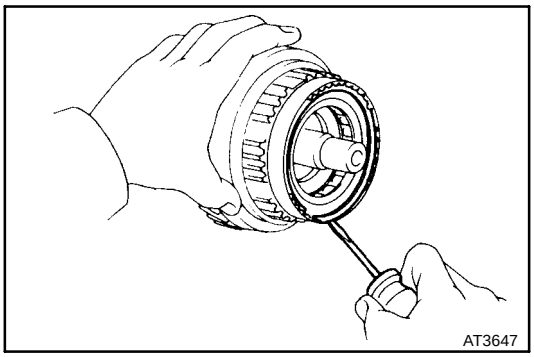
HINT: Do not let the counter drive gear touch the vise.



(b) Using a tension gauge, measure the preload.

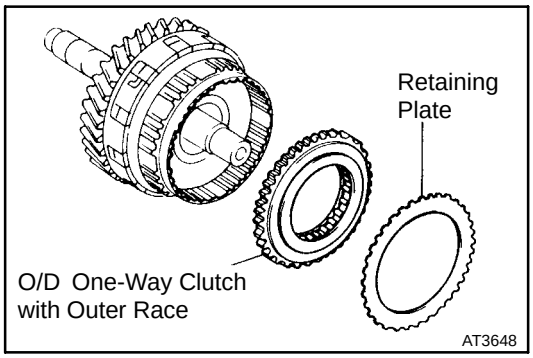
Preload (at starting): 940 - 1,560 g (2.1 - 3.4 lb, 9.2 - 15.3 N)

HINT: Turn the counter drive gear right and left several times before measuring the preload.



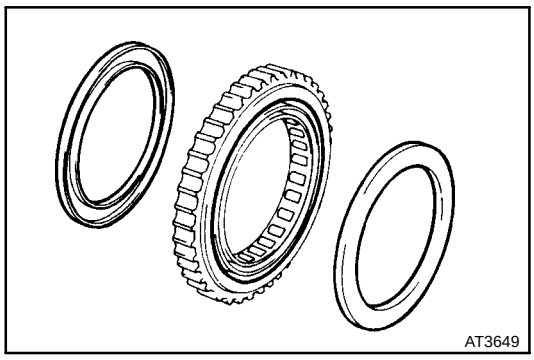
3. REMOVE O/D ONE-WAY CLUTCH AND OUTER RACE

(a) Remove the snap ring.

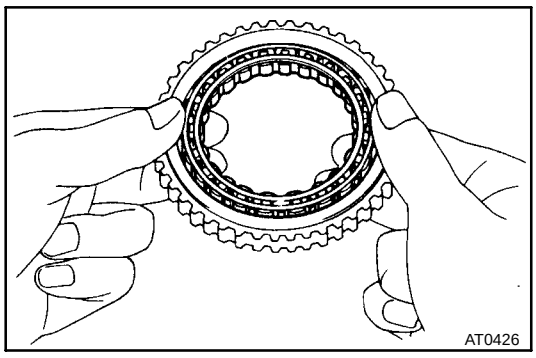


(b) Remove the retaining plate.

(c) Remove the O/D one-way clutch with outer race.

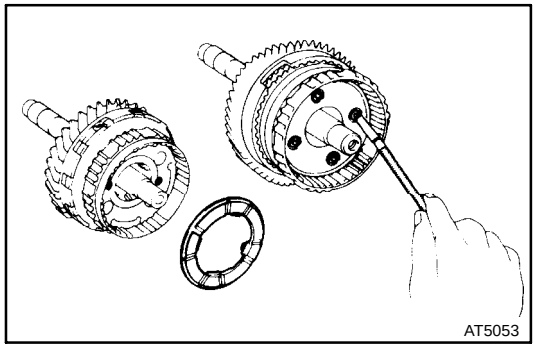


(d) Remove the two retainers from both sides of the O/D one-way clutch.



(e) Remove the O/D one-way clutch from the outer race.

HINT: Note the direction of the one-way clutch.

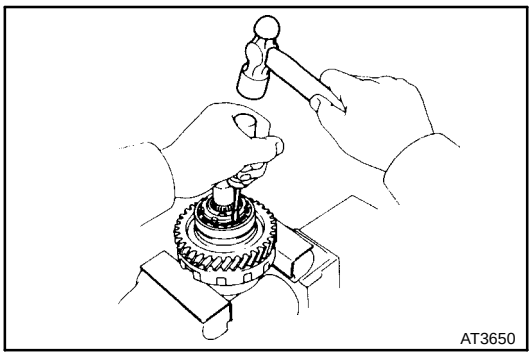


4. REMOVE NO. 3 PLANETARY THRUST WASHER

5. REMOVE PLUGS FROM PLANETARY GEAR

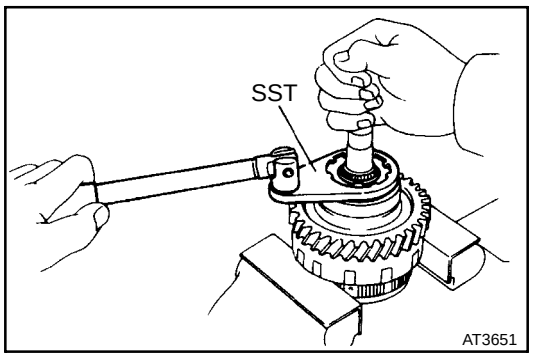
Remove the four plugs with a magnetic finger.

HINT: Be careful not to lose them.



6. REMOVE ADJUSTING NUT AND LOCKING WASHER

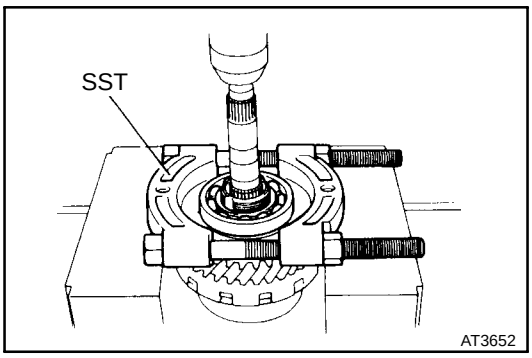
(a) Pry off the locking washer.



(b) Using SST, loosen the adjusting nut.

SST 09350-32014 (09351-32080)

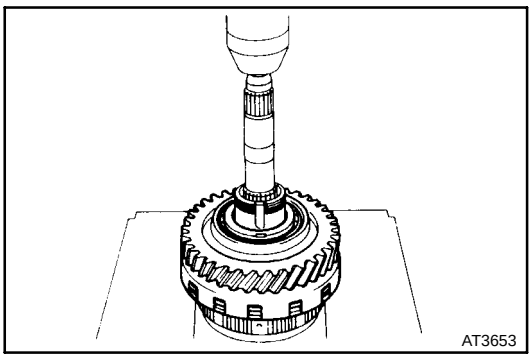
(c) Remove the adjusting nut and locking washer.



7. REMOVE INTERMEDIATE SHAFT BEARING

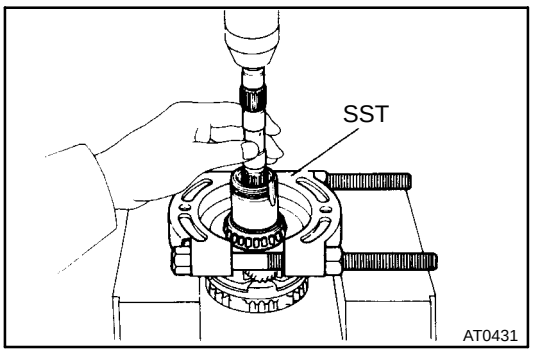
Using SST, press out the bearing from the shaft.

SST 09950-00020



8. REMOVE COUNTER DRIVE GEAR AND FRONT BEARING

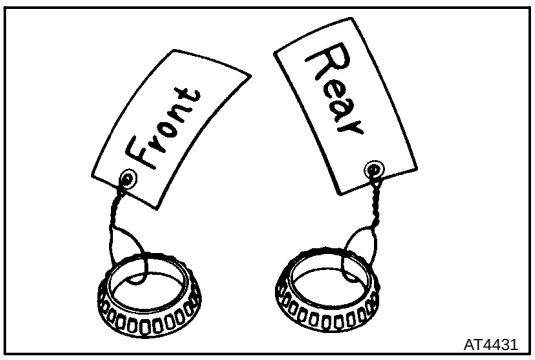
Press out the gear and bearing together.



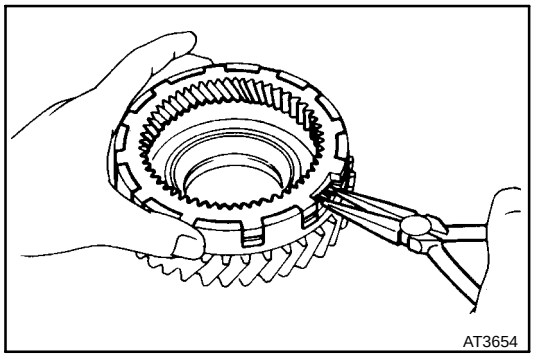
9. REMOVE REAR BEARING

(a) Using SST, press out the bearing.

SST 09950-00020



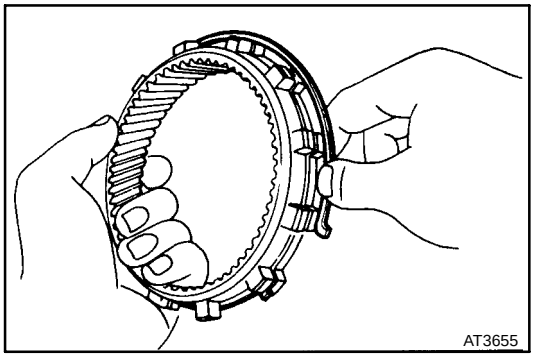
(b) Tag the bearings to show the location for reassembly.



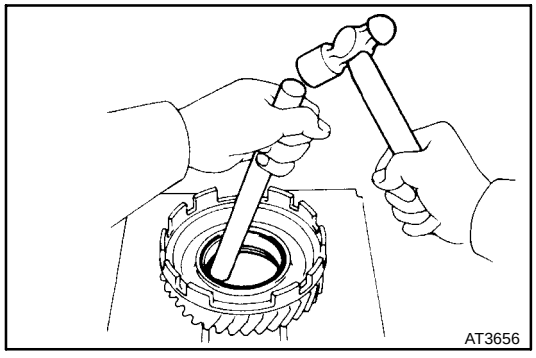
10. REMOVE OVERDRIVE PLANETARY RING GEAR FROM COUNTER DRIVE GEAR

(a) While pulling up the ring gear, compress the snap ring with needle-nose pliers and remove it from the groove.

(b) Remove the ring gear from the counter drive gear.

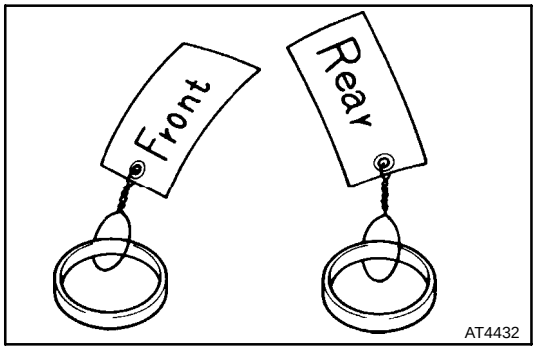


(c) Remove the snap ring from the ring gear.

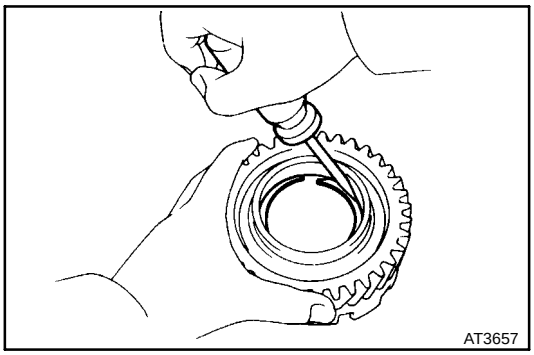


11. REMOVE OUTER RACES FROM COUNTER DRIVE GEAR

(a) Drive out the two races with a brass bar and hammer.

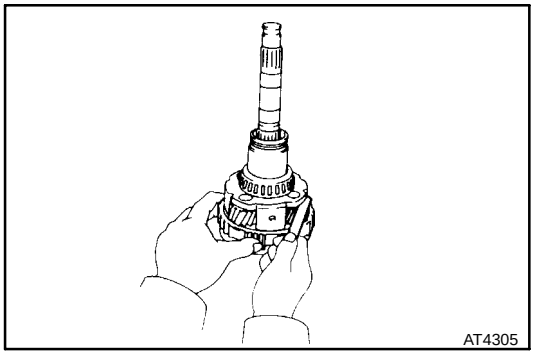


(b) Tag the races to show the location for reassembly.



12. REMOVE SNAP RING FROM COUNTER DRIVE GEAR

Using a screwdriver, remove the snap ring.



INSPECTION OF OVERDRIVE PLANETARY GEAR

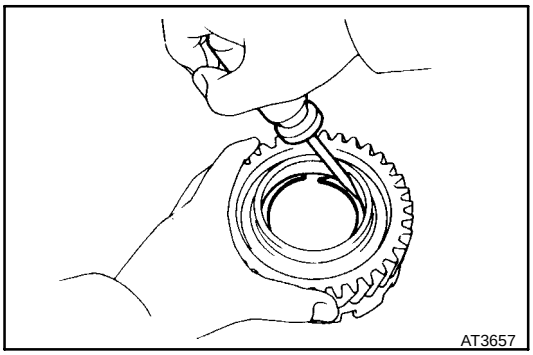
MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

Standard clearance: 0.16 - 0.56 mm (0.0063 - 0.0220 in.)

Maximum clearance: 0.61 mm (0.0240 in.)

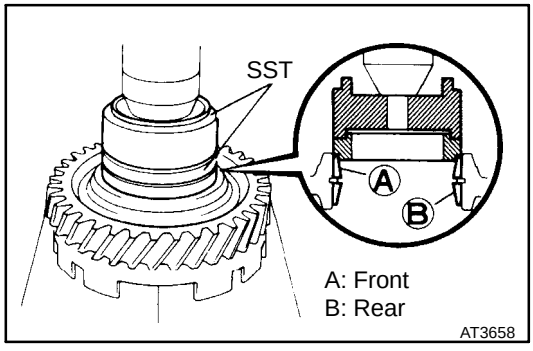
If the clearance is greater than the maximum, replace the planetary gear assembly.



ASSEMBLY OF COUNTER DRIVE GEAR

1. INSTALL SNAP RING INTO COUNTER GEAR

Install the snap ring with a screwdriver.

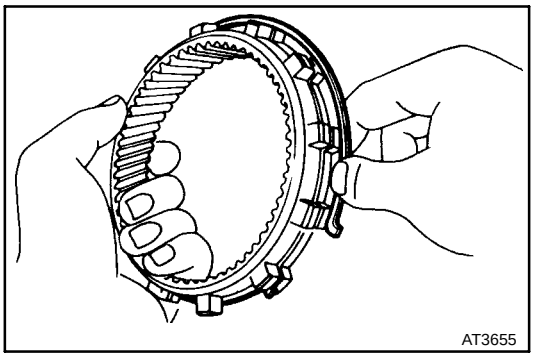


2. INSTALL OUTER RACES INTO COUNTER DRIVE GEAR

Using SST, press in the two outer races to both sides of the gear.

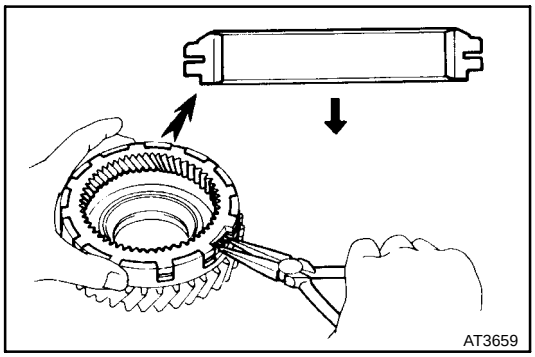
SST 09350-32014 (09351-32120, 09351-32150)

HINT: Press in the two outer races until they touch the snap ring. Tap the races in straight, so that they do not tilt.

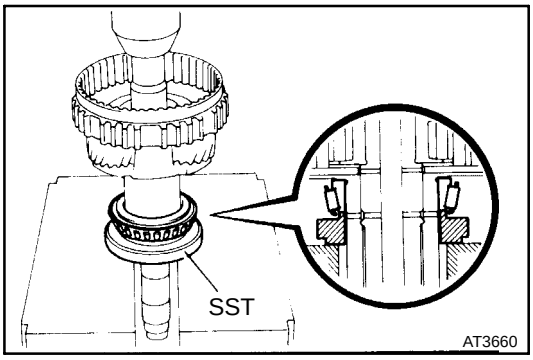


3. INSTALL OVERDRIVE PLANETARY RING GEAR INTO COUNTER DRIVE GEAR

(a) Install the snap ring to the ring gear.

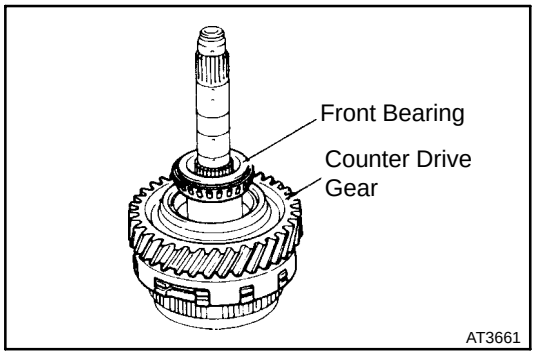


(b) While pushing down the ring gear, squeeze the snap ring end with needle-nose pliers, and install it into the groove.



4. INSTALL REAR BEARING

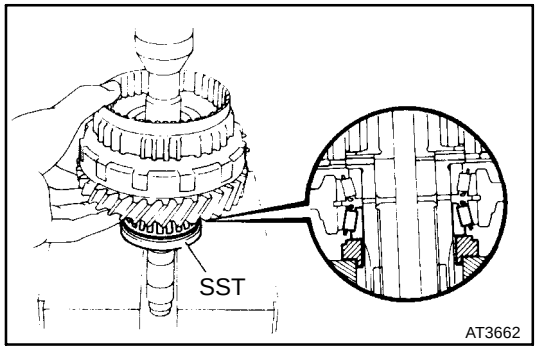
Using SST, press in the bearing onto the shaft.
SST 09350-32014 (09351-32120)
HINT: Press in the bearing until the side surface of the inner race touches the planetary carrier.



5. INSTALL COUNTER DRIVE GEAR AND FRONT BEARING

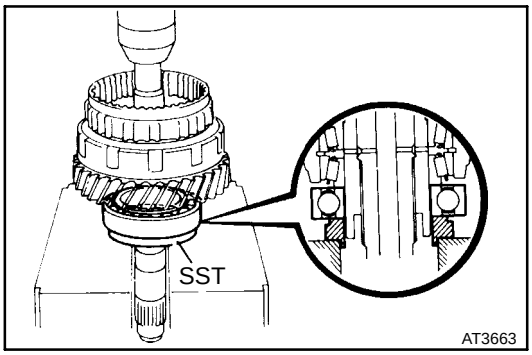
(a) Install the gear onto the shaft, and mesh the ring gear with the planetary pinions.

(b) Place the front bearing onto the shaft.



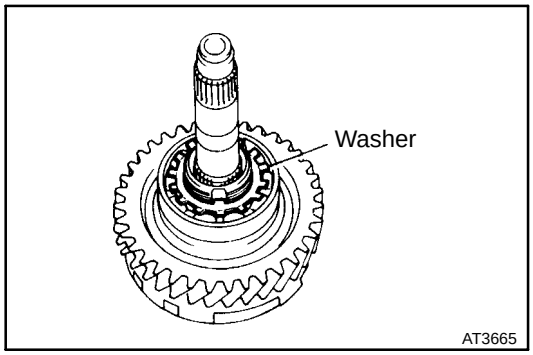
(c) Using SST, press in the bearing until slightly play between the bearings.

SST 09350-32014 (09351-32120)
HINT: Hold the ring gear to prevent it from falling.

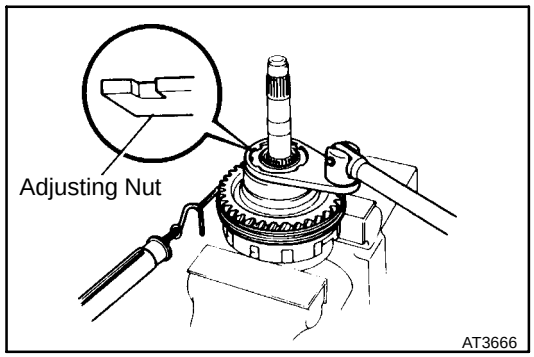


6. INSTALL INTERMEDIATE SHAFT BEARING

Using SST, press in the bearing until it slightly touches the front bearing of the counter drive gear.
SST 09350-32014 (09351-32120)
HINT: The counter drive gear can be turned lightly.



7. PLACE NEW LOCKING WASHER

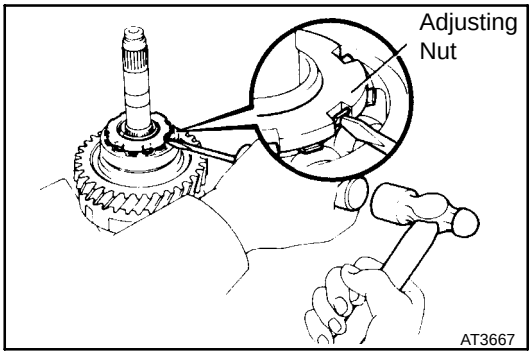


8. INSTALL ADJUSTING NUT AND ADJUST PRELOAD OF COUNTER DRIVE GEAR

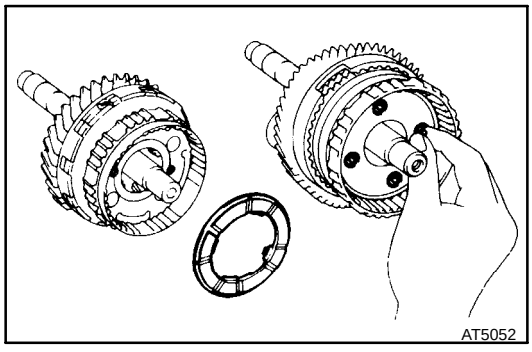
(a) Hold the overdrive planetary gear in a vise with soft jaws.

(b) Using SST, tighten the adjusting nut until the following gear starting load is reached on the tension gauge.

SST 09350-32014 (09351-32080)
Preload (at starting): 940-1,560 g (2.1-3.4 lb, 9.2-15.3 N)
HINT: Turn the counter drive gear right and left several times before measuring the preload.



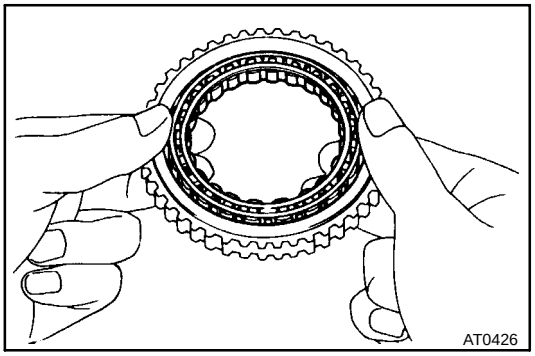
(c) Lock the adjusting nut with one tab on locking washer. Bend the locking washer tab until it is even with the adjusting nut groove.



9. INSTALL NO. 3 OVERDRIVE PLANETARY THRUST WASHER

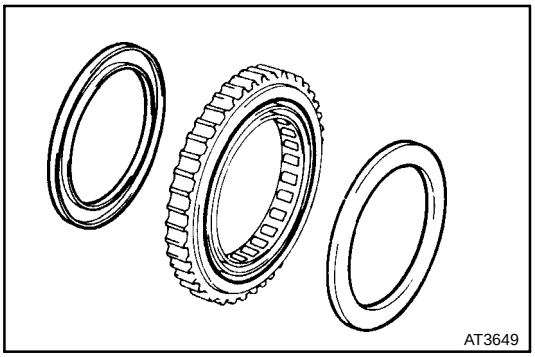
10. INSTALL PINION SHAFT PLUGS

Install the four plugs into the pinion shaft.

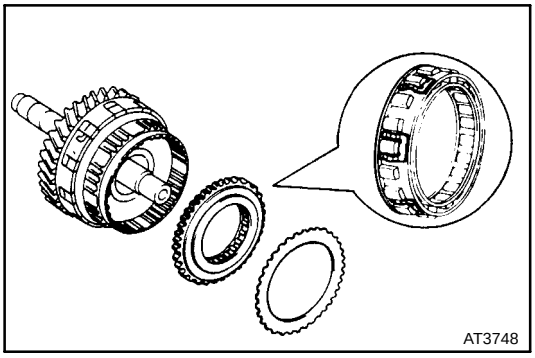


11. INSTALL OVERDRIVE ONE-WAY CLUTCH AND RETAINING PLATE

(a) Install the one-way clutch into the outer race.



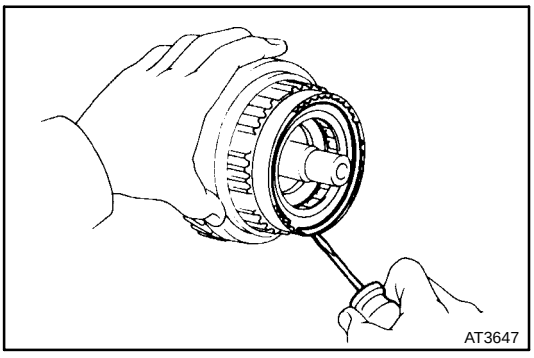
(b) Install the two retainer on both sides of the one-way clutch.



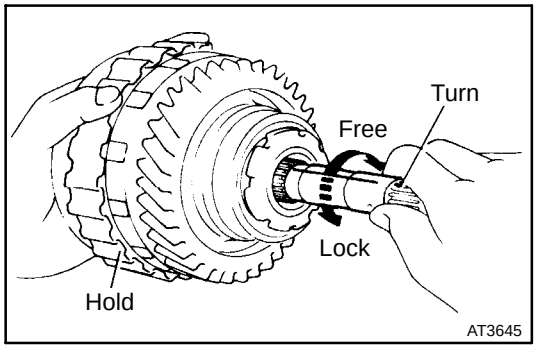
(c) Install the one-way clutch into the overdrive planetary gear.

HINT: Be sure that the one-way clutch is installed in the correct direction.

(d) Install the retaining plate.



(e) Install the snap ring.

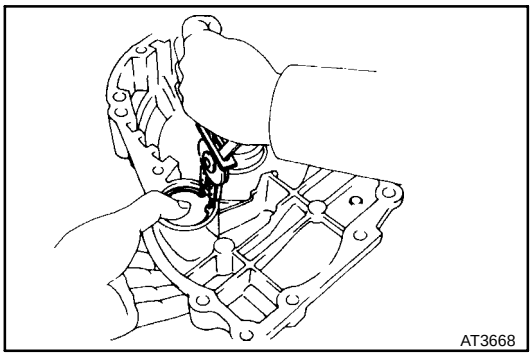


12. CHECK OPERATION OF O/D ONE-WAY CLUTCH

(a) Install the overdrive direct clutch into the one-way clutch.

(b) Hold the overdrive direct clutch and turn the intermediate shaft. The shaft should turn freely clockwise and should lock counterclockwise.

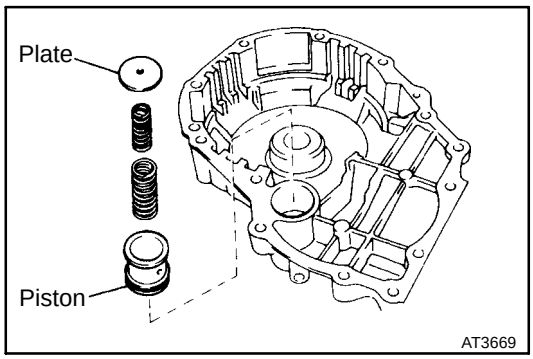
(c) Remove the overdrive direct clutch.



DISASSEMBLY OF OVERDRIVE CASE

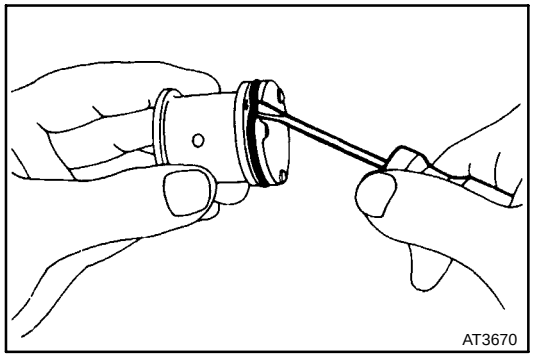
1. REMOVE C_0 ACCUMULATOR PISTON FROM OVERDRIVE CASE

(a) Using snap ring pliers, remove the snap ring.



(b) Remove the retaining plate and two springs.

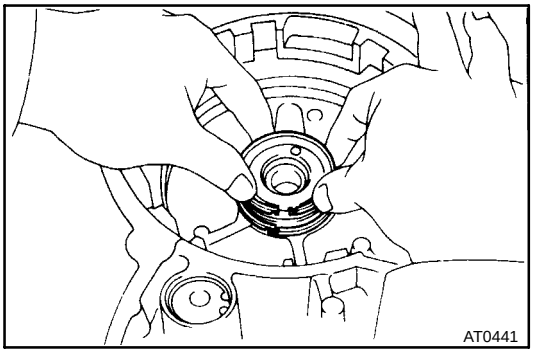
(c) Remove the accumulator piston.



(d) Remove the O-ring from the piston.

2. REMOVE OIL SEAL RINGS

Spread the two rings apart and remove them.

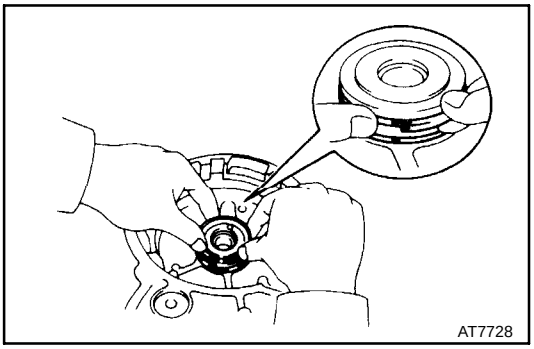


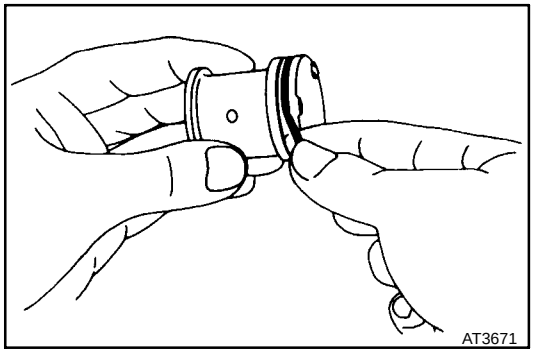
ASSEMBLY OF OVERDRIVE CASE

1. INSTALL OIL SEAL RINGS ON OVERDRIVE CASE

Spread the two rings apart and install them into the groove.

HINT: After installing the oil seal rings, check that they move smoothly.

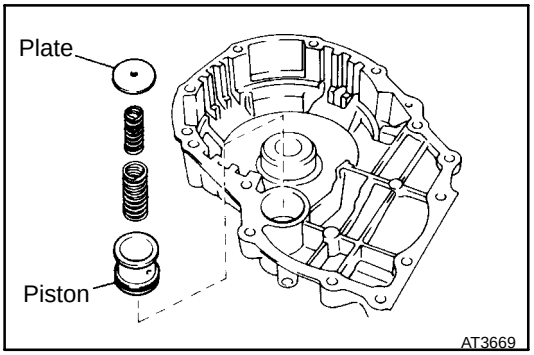




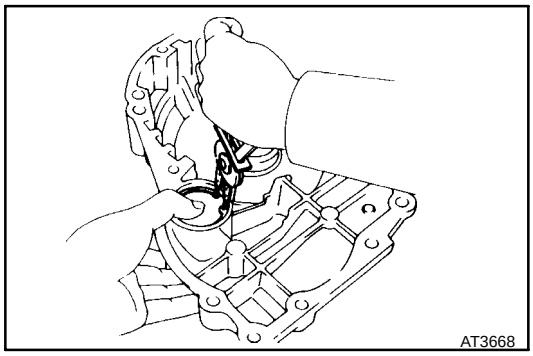
2. INSTALL C_0 ACCUMULATOR PISTON TO OVERDRIVE CASE

(a) Install a new O-ring to the accumulator piston.

(b) Coat the O-ring with ATF.



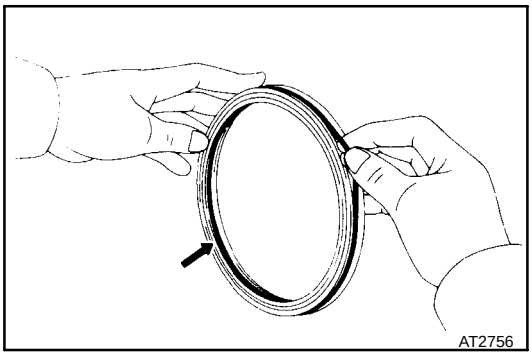
(c) Install the accumulator piston, two springs and retaining plate.



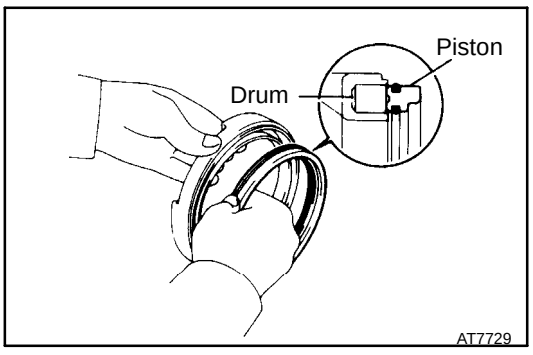
(d) Using snap ring pliers, install the snap ring.

ASSEMBLY OF OVERDRIVE BRAKE

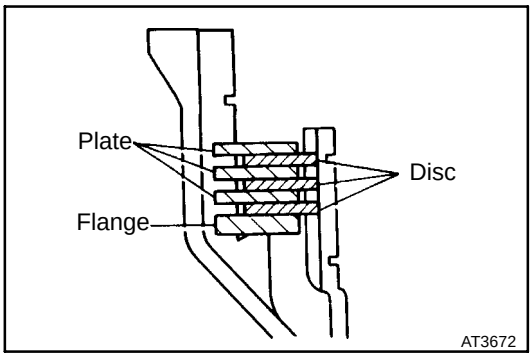
1. INSTALL PISTON INTO DRUM



(a) Install the new O-rings to the piston. Coat the O-rings with ATF.

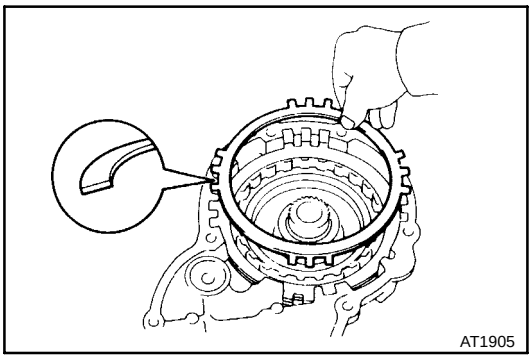


(b) Press the piston into the drum, being careful not to damage the O-rings.

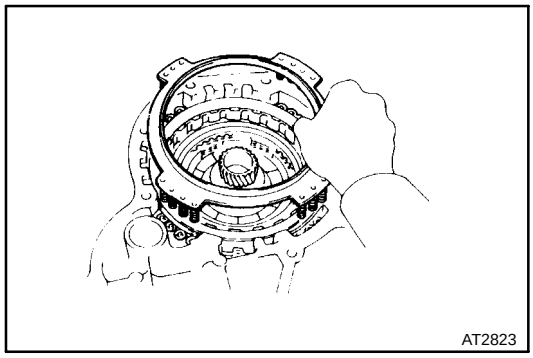


2. INSTALL FLANGE, DISCS AND PLATES

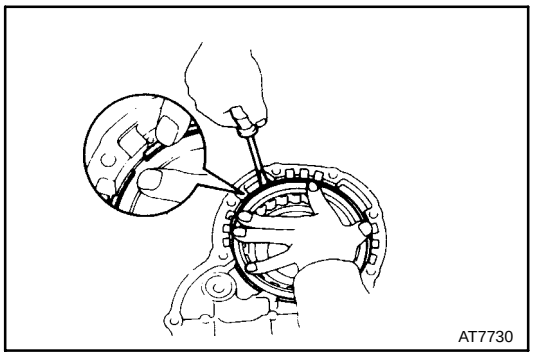
(a) Install the flange, discs and plates.
Install in order: P = Plate D = Disc
Flange-D-P-D-P-D-P



(b) Install the cushion plate with the rounded end facing upward.

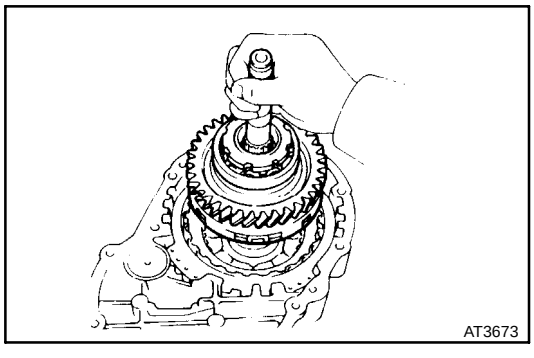


3. POSITION PISTON RETURN SPRING



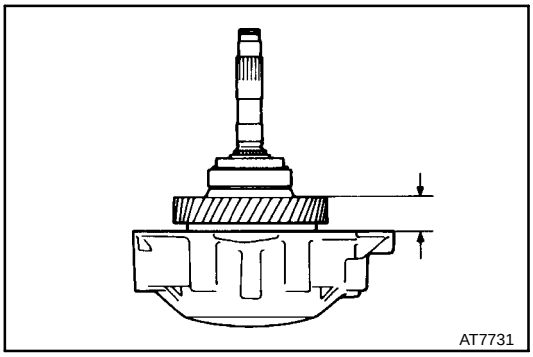
4. INSTALL SNAP RING INTO CASE

Be sure the end gap of the snap ring is not aligned with one of cutouts.



5. INSTALL OVERDRIVE PLANETARY GEAR ONTO OVERDRIVE DIRECT CLUTCH

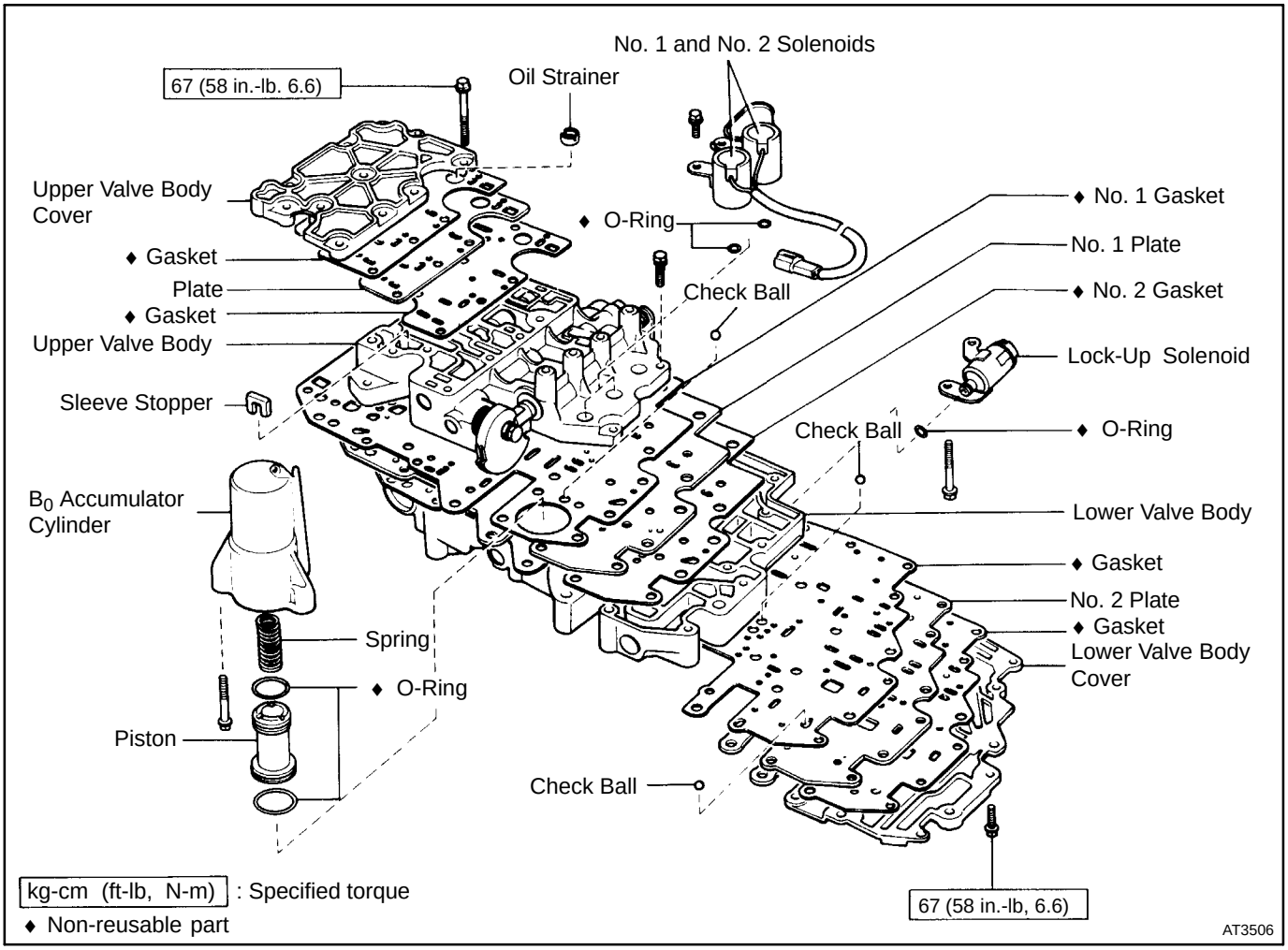
While turning the overdrive planetary gear clockwise, install it onto the overdrive direct clutch.

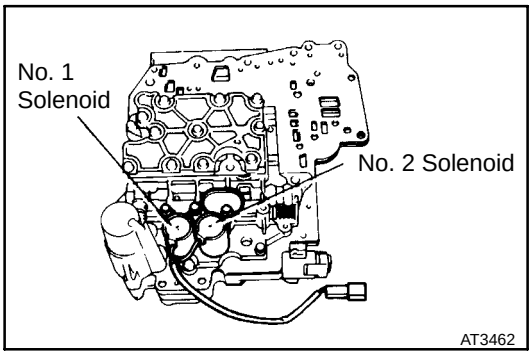


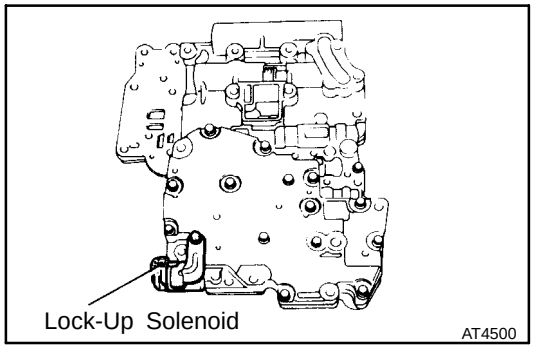
HINT: If the overdrive planetary gear is properly installed onto the direct clutch, the counter drive gear height from the overdrive case will be about 24 mm (0.94 in.).

Valve Body

COMPONENTS







(Disassembly of Valve Body)

NOTICE: When disassembling the valve body, be careful not to damage or deform the plate which overhangs the valve body.

1. REMOVE SOLENOIDS

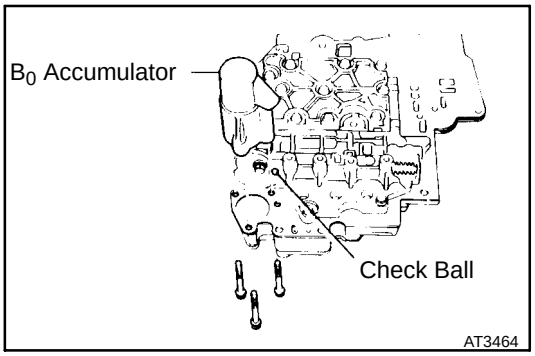
(a) Remove No. 1 and No. 2 solenoids.

NOTICE: When removing the solenoid, do not use a screwdriver, etc. to pry up the solenoid.

(b) Remove the O-ring from each solenoid.

(c) Remove the lock-up solenoid.

(d) Remove the O-ring from the solenoid.

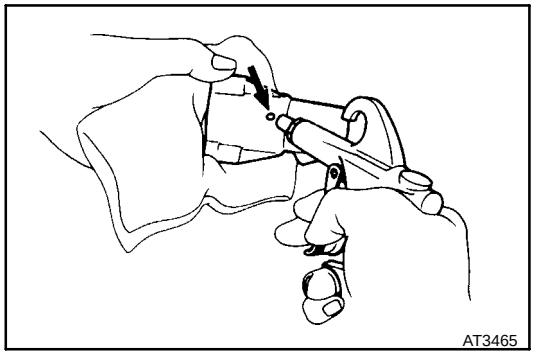


2. REMOVE B_0 ACCUMULATOR ASSEMBLY

(a) Remove the three bolts.

(b) Remove the B_0 accumulator assembly.

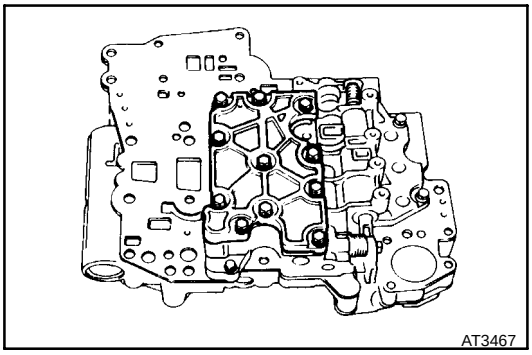
(c) Remove the check ball on No. 1 plate.



3. DISASSEMBLE B_0 ACCUMULATOR ASSEMBLY

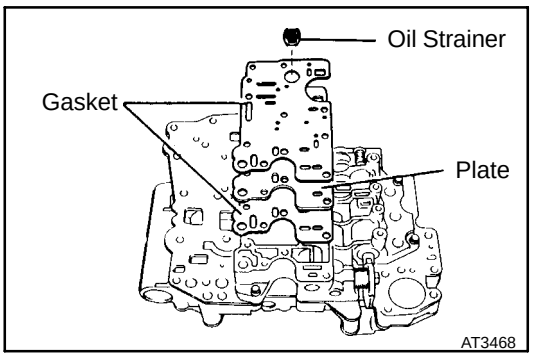
(a) Applying compressed air to the cylinder hole, remove the piston and spring.

(b) Remove the two O-ring from the piston.



4. REMOVE UPPER VALVE BODY COVER

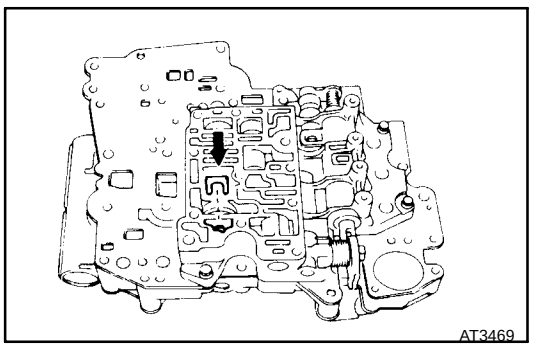
Remove the eleven bolts and upper valve body cover.



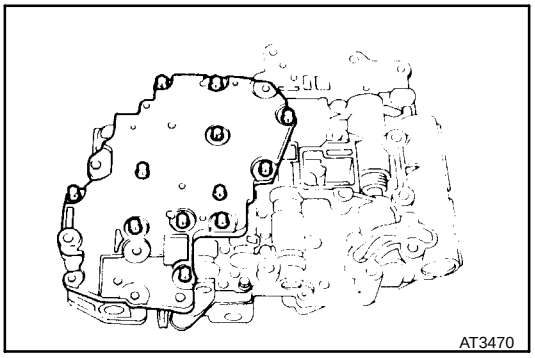
5. REMOVE OIL STRAINER, UPPER VALVE BODY COVER GASKETS AND PLATE

(a) Remove the oil strainer on the gasket.

(b) Remove the two gaskets and plate from the upper valve body.

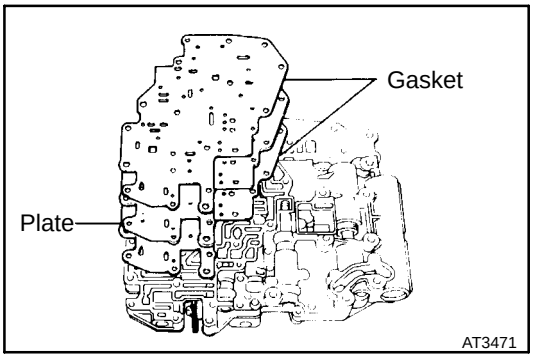


6. REMOVE LOCK-UP RELAY VALVE SLEEVE STOPPER

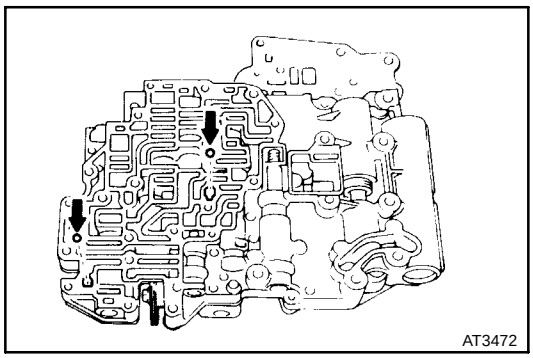


7. REMOVE LOWER VALVE BODY COVER

Remove the twelve bolts and lower valve body cover.

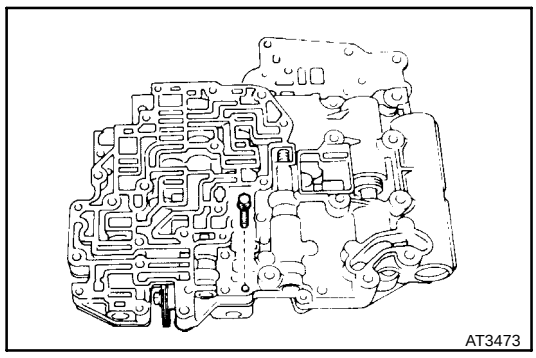


8. REMOVE LOWER VALVE BODY COVER GASKETS AND NO. 2 PLATE

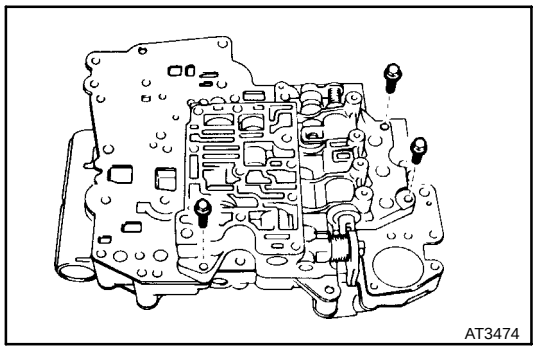


9. REMOVE CHECK BALLS

Remove the two check balls from the lower valve body.

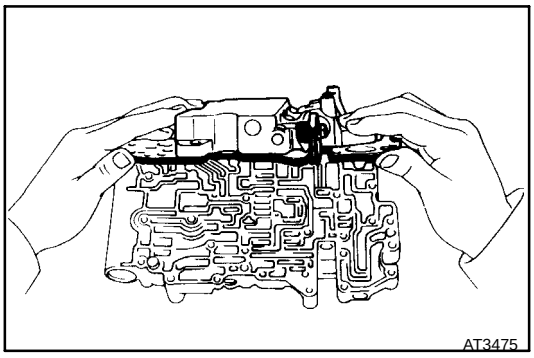


10. REMOVE BOLT FROM LOWER VALVE BODY



11. REMOVE BOLTS FORM UPPER VALVE BODY

Remove the three bolts.

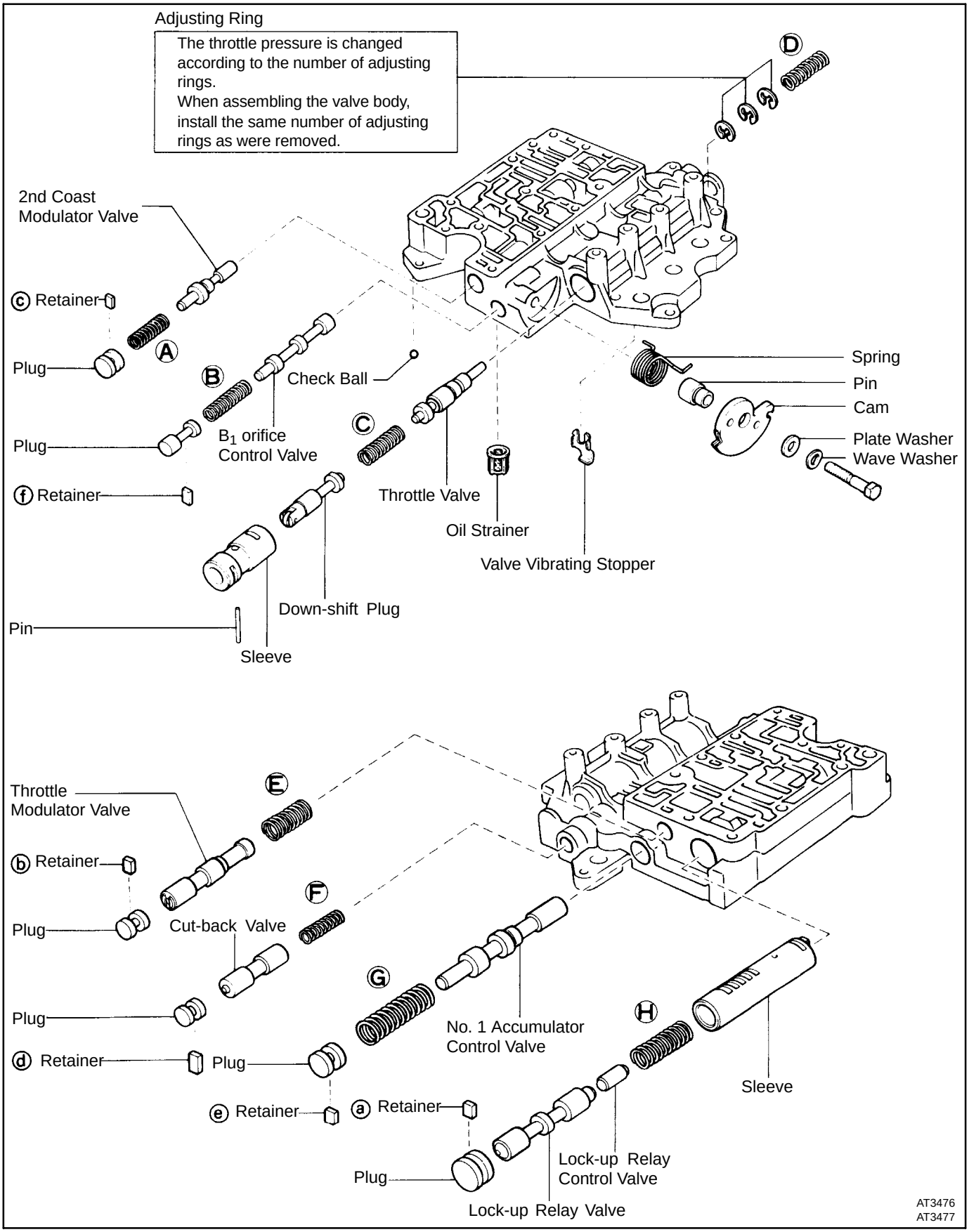


12. LIFT OFF UPPER VALVE BODY AND NO. 1 PLATE AS A SINGLE UNIT

Hold No. 1 plate to the upper valve body and lift off the upper valve body.
HINT: Be careful that the check balls and oil strainer do not fall out.

(Upper Valve Body)

COMPONENTS

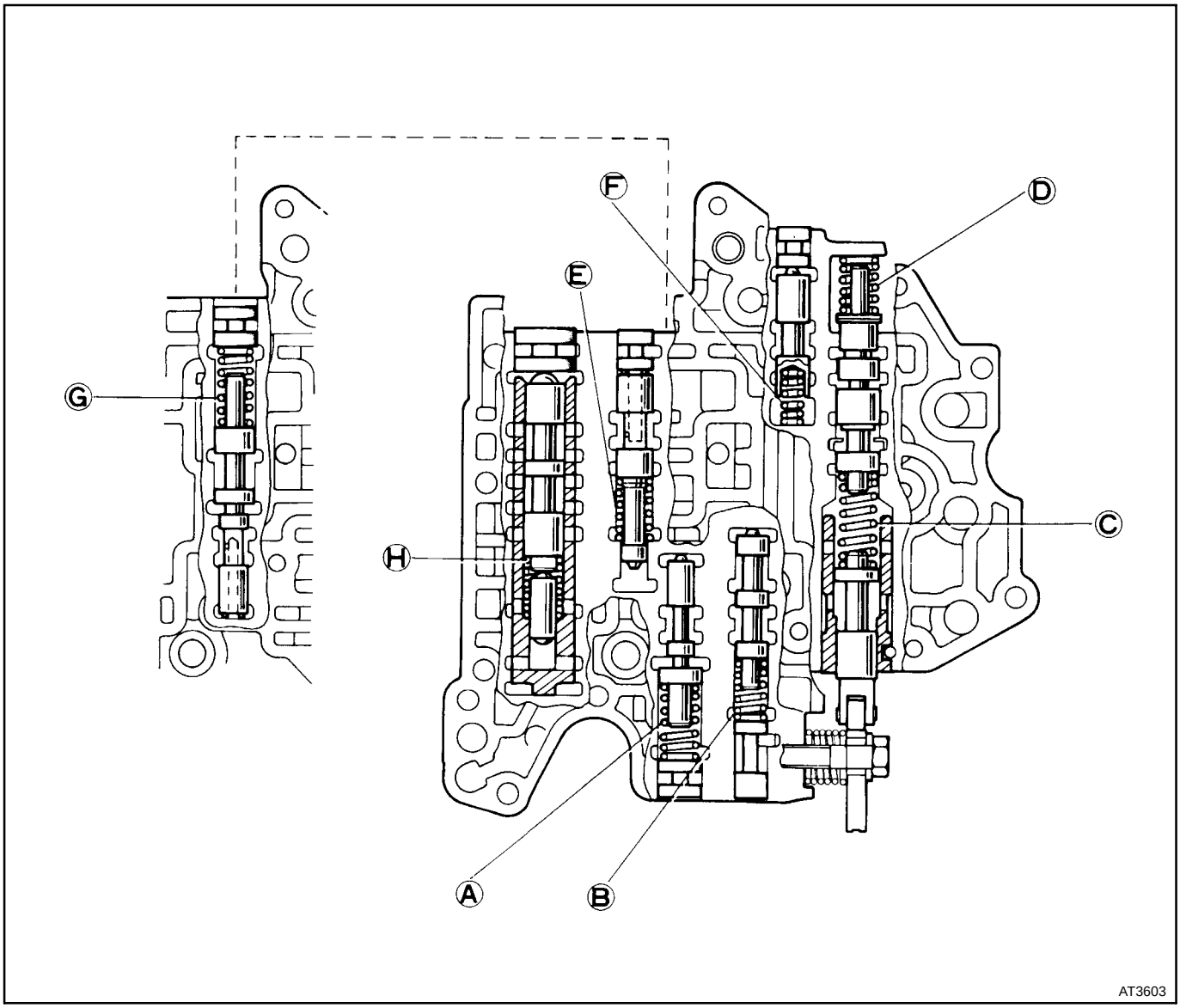


SPECIFICATIONS OF VALVE BODY SPRINGS

Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coils	Color
Ⓐ	Second coast modulator valve	27.5 (1.083)	8.9 (0.350)	14.6	Brown
Ⓑ	B_1 orifice control valve	24.8 (0.976)	8.0 (0.315)	12.0	White
Ⓒ	Down-shift plug	29.8 (1.173)	8.7 (0.343)	13.5	Yellow
Ⓓ	Throttle valve	30.7 (1.209)	9.2 (0.362)	9.5	Purple
Ⓔ	Throttle modulator valve	21.7 (0.854)	9.5 (0.374)	9.5	Orange
Ⓕ	Cut-back valve	21.8 (0.858)	6.0 (0.236)	13.5	Red
Ⓖ	No. 1 accumulator control valve	28.1 (1.106)	10.6 (0.417)	13.0	Yellow
Ⓗ	Lock-up relay valve	26.6 (1.047)	10.2 (0.402)	11.5	Green

HINT: During reassembly please refer to the spring specifications above to help discriminate the different springs.

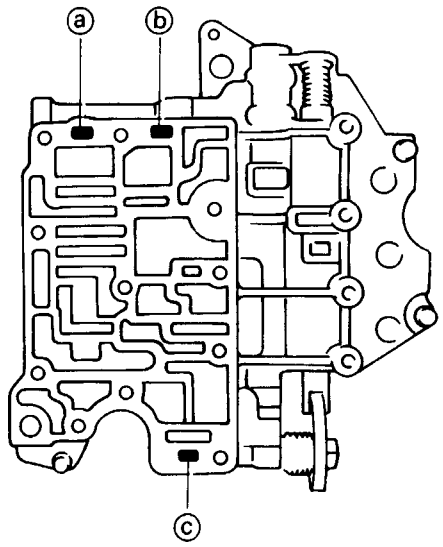
SECTIONAL VIEW OF VALVE BODY



LOCATION OF RETAINERS, PIN, STOPPER, CHECK BALL AND STRAINER

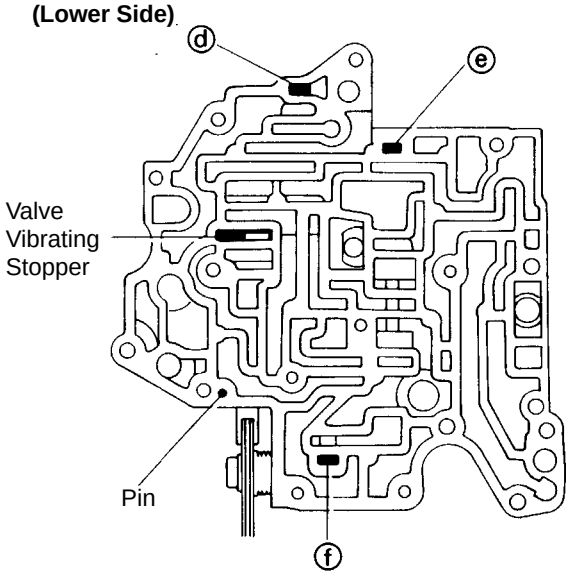
1. RETAINER, STOPPER AND PIN

(Upper Side)



AT3479

(Lower Side)

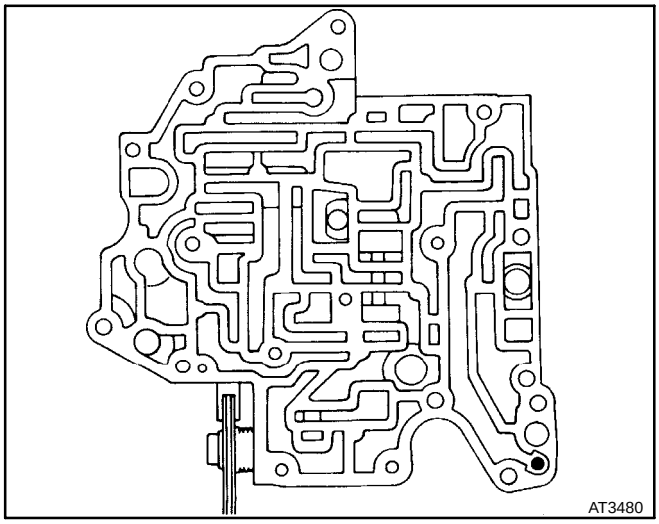


AT3478

mm (in.)

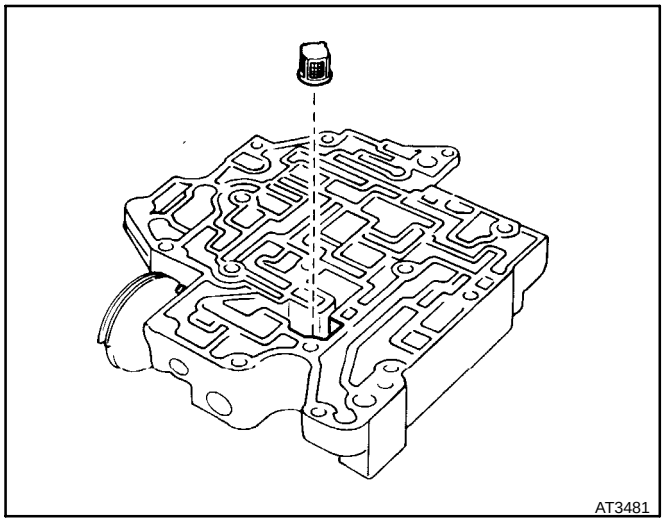
Retainer		Height	Width	Thickness
ⓐ	Lock-up relay valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓑ	Throttle modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓒ	Second coast modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓓ	Cut-back valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓔ	No. 1 accumulator control valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓕ	B_1 orifice control valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)

2. CHECK BALL



AT3480

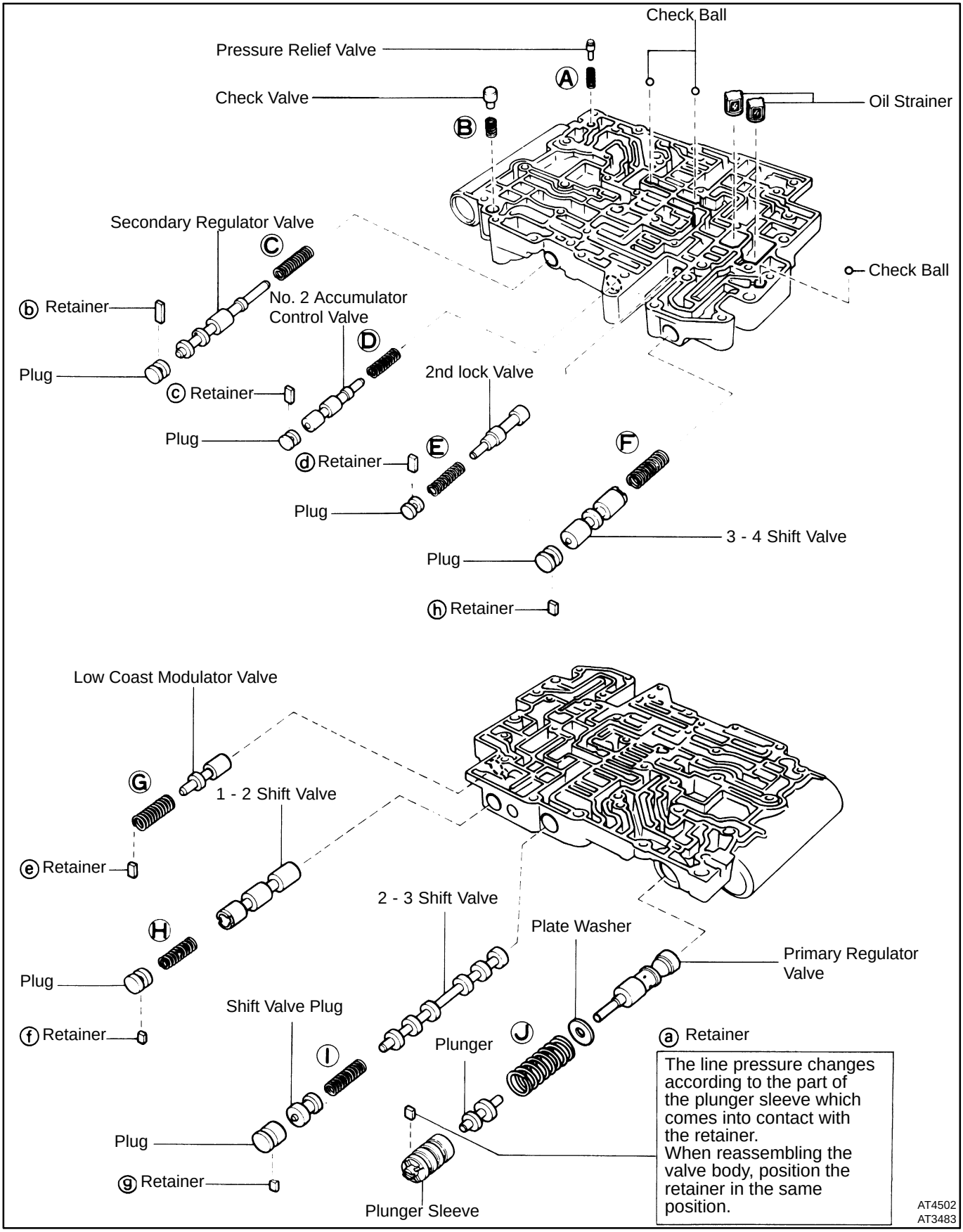
3. STRAINER



AT3481

(Lower Valve Body)

COMPONENTS

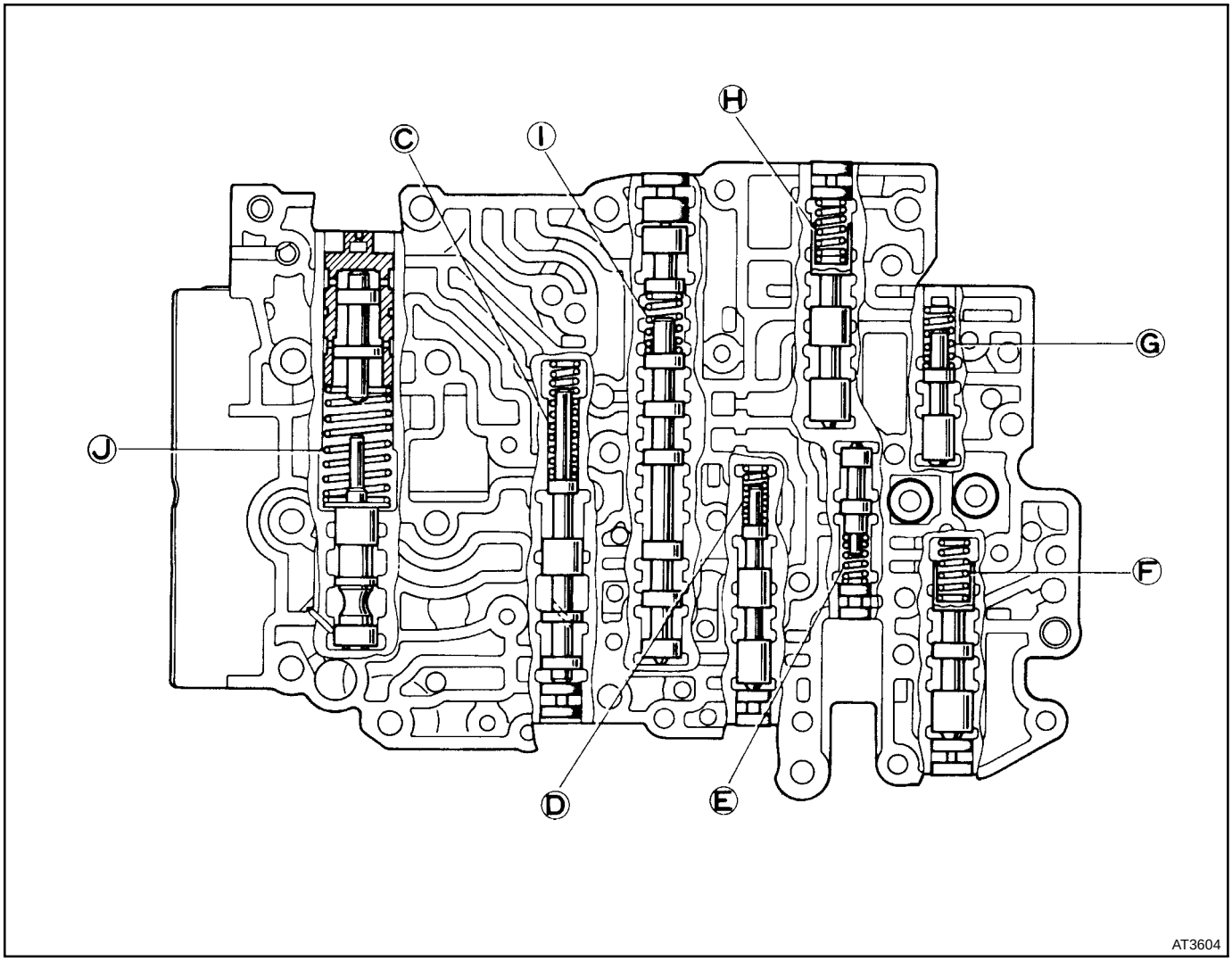


SPECIFICATIONS OF VALVE BODY SPRINGS

Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coils	Color
Ⓐ	Pressure relief valve	11.2 (0.441)	6.4 (0.252)	7.5	None
Ⓑ	Check valve	19.9 (0.783)	11.0 (0.433)	8.5	None
Ⓒ	Secondary regulator valve	38.5 (1.516)	8.4 (0.331)	17.0	Purple
Ⓓ	No. 2 accumulator control valve	23.0 (0.906)	6.3 (0.248)	12.0	Gray
Ⓔ	Second lock valve	20.7 (0.815)	6.1 (0.240)	12.0	Orange
Ⓕ	3 - 4 shift valve	29.2 (1.150)	8.9 (0.350)	12.0	Light Green
Ⓖ	Low coast modulator valve	20.2 (0.795)	7.9 (0.311)	11.9	Purple
Ⓗ	1 - 2 shift valve	29.2 (1.150)	8.9 (0.350)	12.0	Light Green
Ⓘ	2 - 3 shift valve	28.0 (1.102)	9.4 (0.370)	10.3	None
Ⓙ	Primary regulator valve	64.2 (2.528)	18.6 (0.732)	12.5	None

HINT: During reassembly please refer to the spring specifications above to help discriminate the different springs.

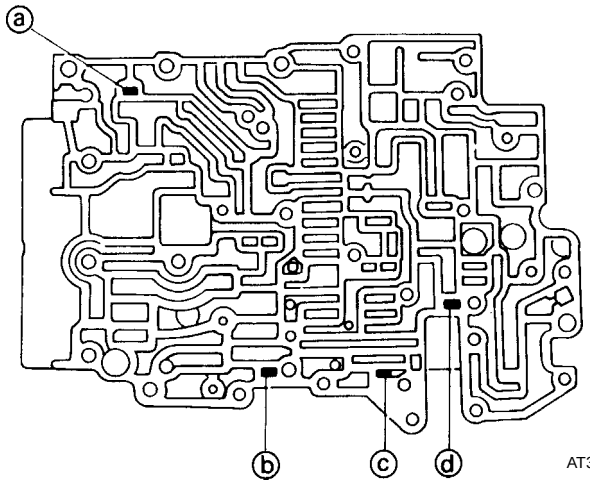
SECTIONAL VIEW OF VALVE BODY



LOCATION OF RETAINERS, CHECK BALLS AND STRAINERS

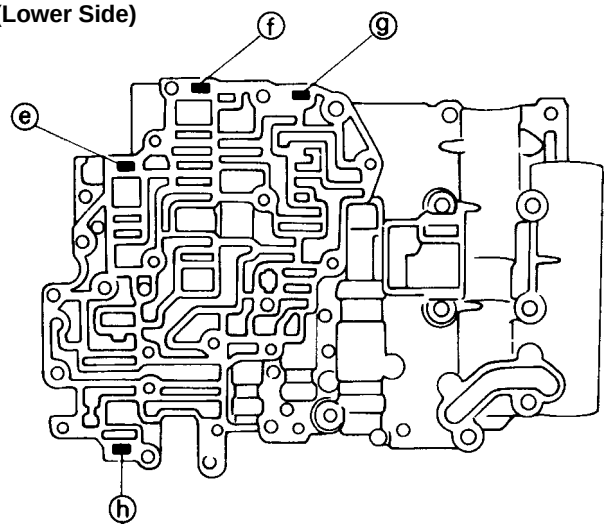
1. RETAINER

(Upper Side)



AT3484

(Lower Side)

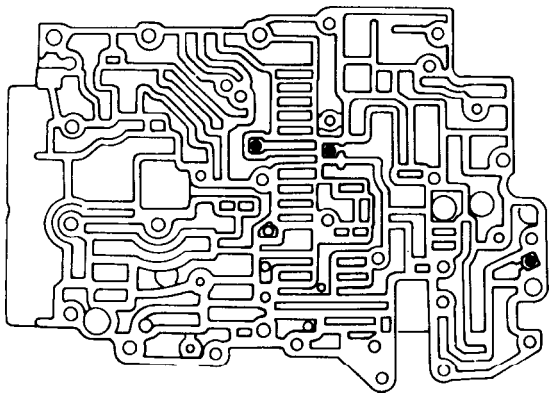


AT3485

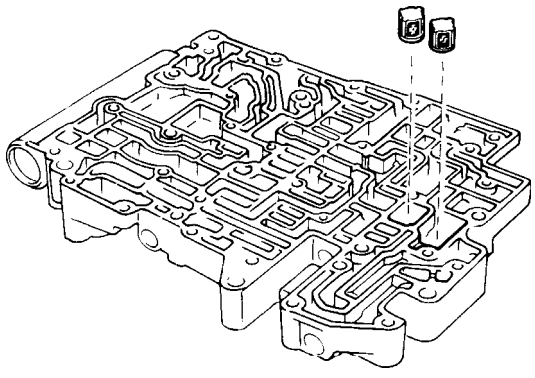
mm (in.)

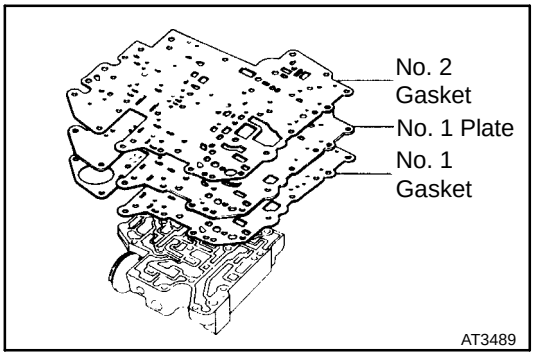
Retainer		Height	Width	Thickness
ⓐ	Primary regulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓑ	Secondary regulator valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)
ⓒ	No. 2 accumulator control valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓓ	Second lock valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓔ	Low coast modulator valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓕ	1 - 2 shift valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓖ	2 - 3 shift valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓗ	3 - 4 shift valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)

2. CHECK BALL


AT4501

3. STRAINER


AT3487

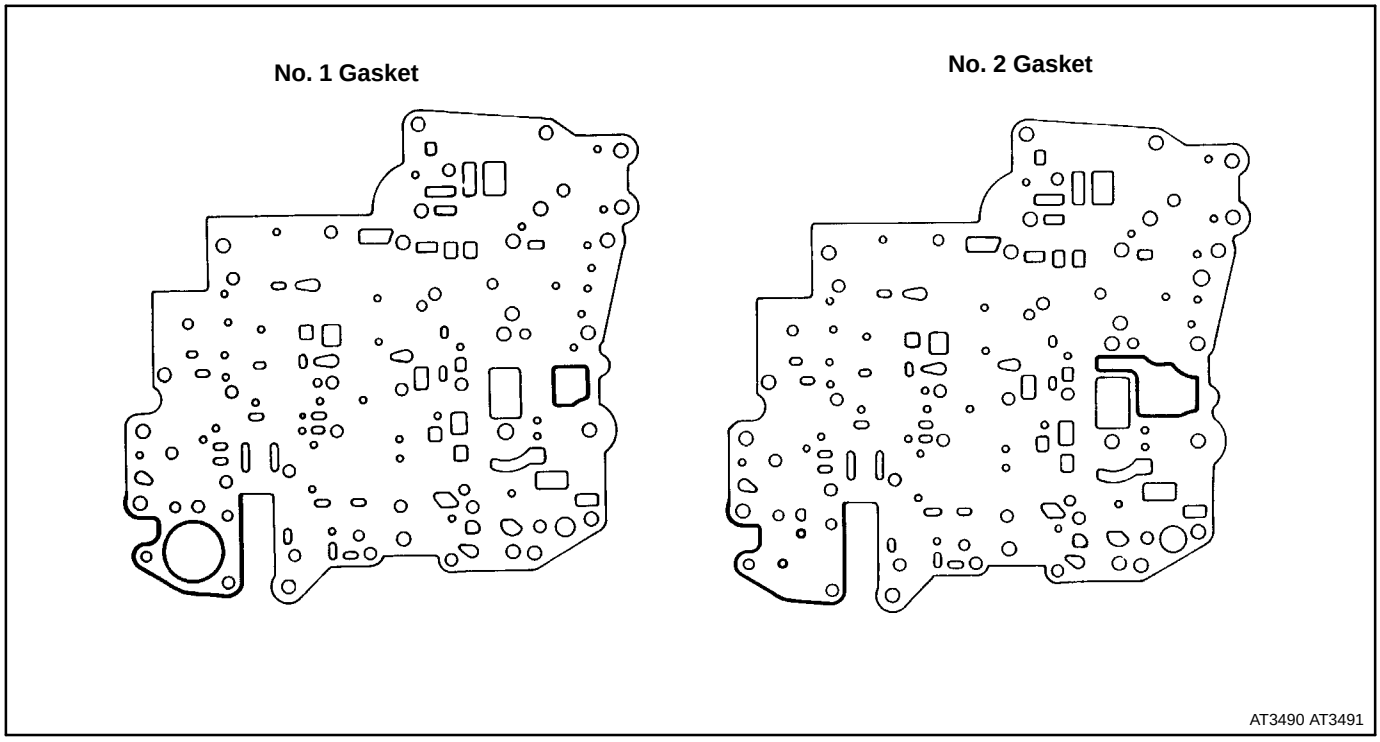


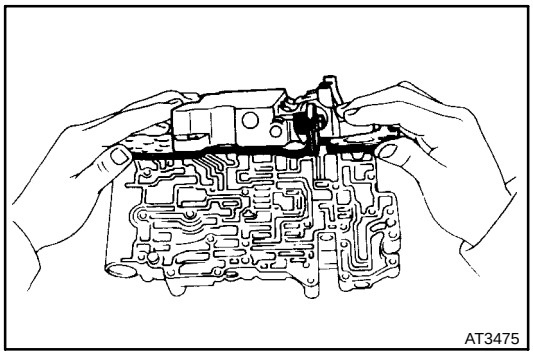
(Assembly of Valve Body)

(See page AT-85)

1. POSITION NO. 1 PLATE AND NEW GASKETS ON UPPER VALVE BODY

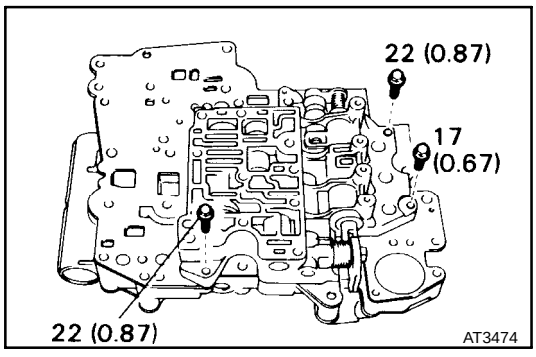
Position new No. 1 gasket, No. 1 plate and then new No. 2 gasket on the upper valve body.
HINT: Since No. 1 gasket and No. 2 gasket are similar, use the illustration below to discriminate between them.





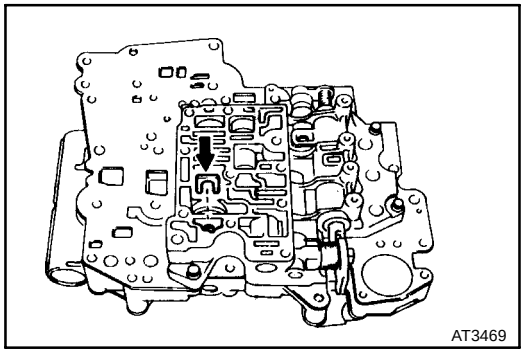
2. PLACE UPPER VALVE BODY WITH NO. 1 PLATE AND GASKETS ON LOWER VALVE BODY

Hold the upper valve body, No. 1 plate and gaskets securely so they do not separate.
Align each bolt hole in the valve bodies with the gaskets and plate.

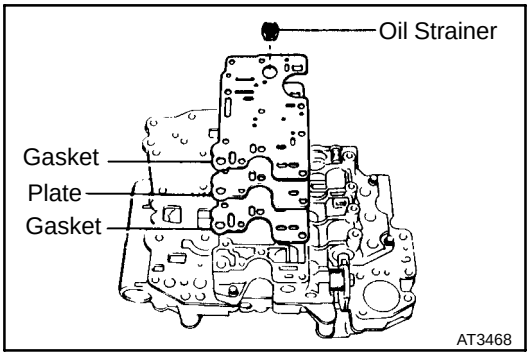


3. INSTALL AND FINGER TIGHTEN BOLTS IN UPPER VALVE BODY TO SECURE LOWER VALVE BODY

Install and finger tighten the three bolts.
HINT: Each bolt length (mm, in.) is indicated in the figure.



4. INSTALL LOCK-UP RELAY VALVE SLEEVE STOPPER

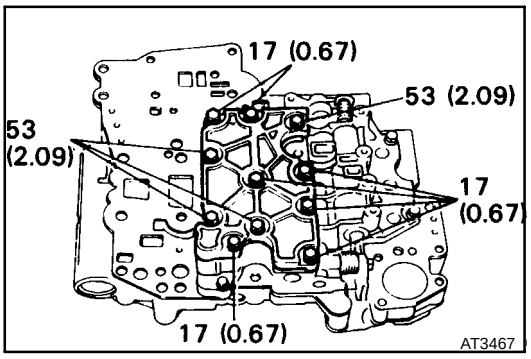


5. INSTALL UPPER VALVE BODY COVER GASKETS, PLATE AND THROTTLE MODULATOR OIL STRAINER

(a) Position a new gasket and plate and then another new gasket

HINT: Both gaskets are same one.

(b) Install the oil strainer onto the gasket.

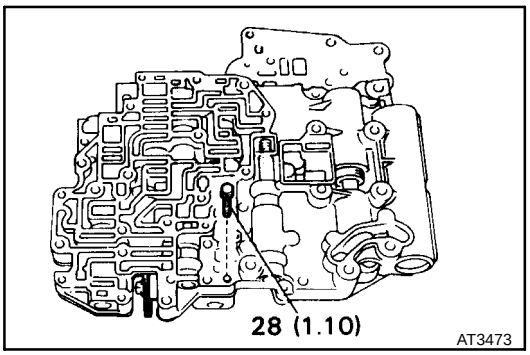


6. INSTALL UPPER VALVE BODY COVER

(a) Position the upper valve body cover.

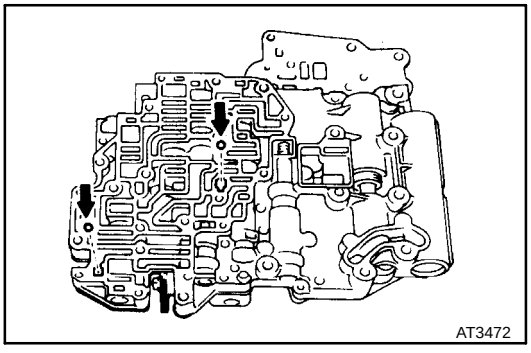
(b) Install and finger tighten the eleven bolts.

HINT: Each bolt length (mm, in.) is indicated in the figure.



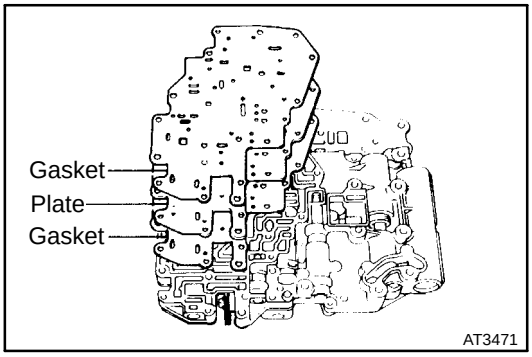
7. INSTALL AND FINGER TIGHTEN BOLT IN LOWER VALVE BODY

HINT: Bolt length (mm, in.) is indicated in the figure.



8. INSTALL CHECK BALLS

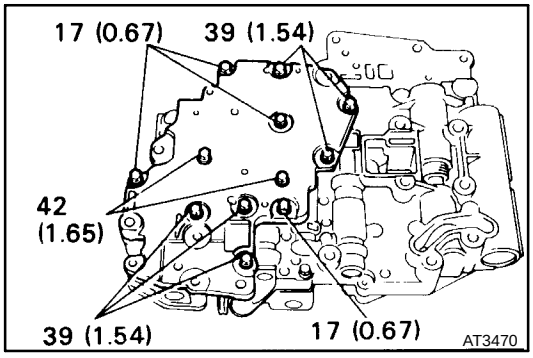
Install the two check balls into the lower valve body.



9. INSTALL LOWER VALVE BODY COVER GASKETS AND NO. 2 PLATE

Position a new gasket and plate and then another new gasket.

HINT: Both gaskets are same one.

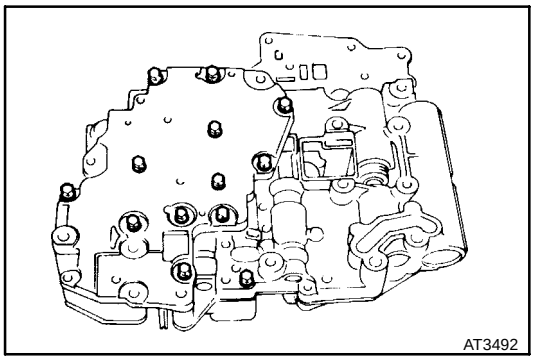


10. INSTALL LOWER VALVE BODY COVER

(a) Position the lower valve body cover.

(b) Install and finger tighten the twelve bolts.

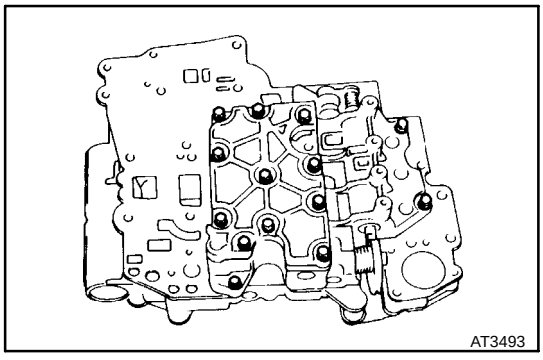
HINT: Each bolt length (mm, in.) is indicated in the figure.



11. TIGHTEN BOLTS OF UPPER AND LOWER VALVE BODIES

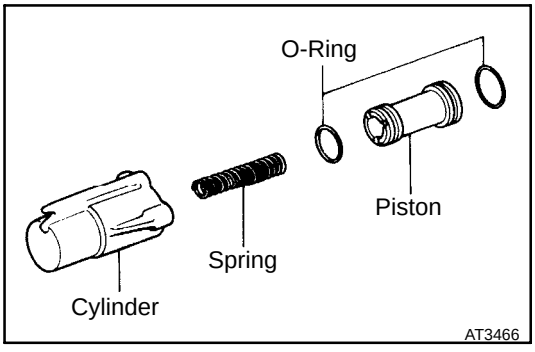
(a) Tighten the thirteen bolts in the lower valve body.

Torque: 67 kg-cm (58 in.-lb, 6.6 N-m)



(b) Tighten the fourteen bolts in the upper valve body.

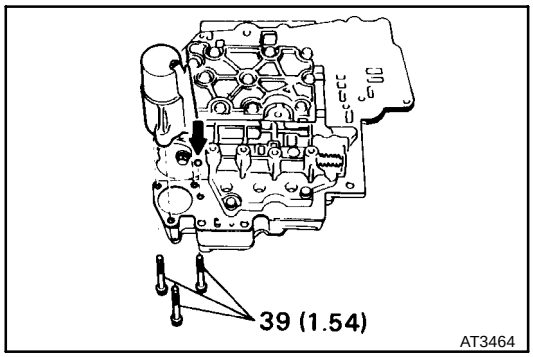
Torque: 67 kg-cm (58 in.-lb, 6.6 N-m)



12. INSTALL B_0 ACCUMULATOR ASSEMBLY

(a) Coat new O-rings with ATF and install them to the piston.

(b) Insert the spring and piston into the cylinder.

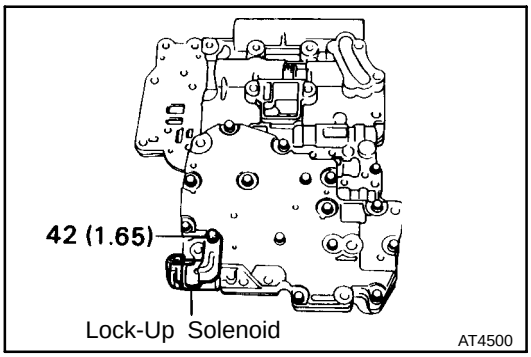


(c) Plate the check ball on No. 1 gasket.

(d) Install the B_0 accumulator assembly.

(e) Install and torque the three bolts.

HINT: Each bolt length (mm, in.) is indicated in the figure.
Torque: 67 kg-cm (58 in.-lb, 6.6 N-m)



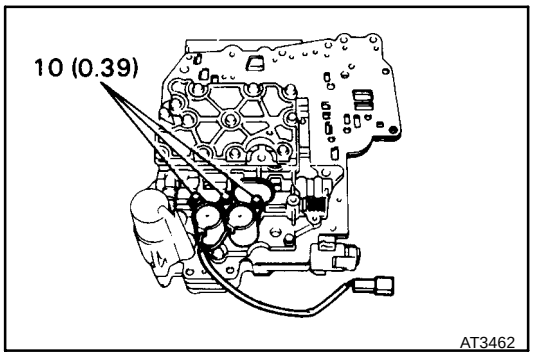
13. INSTALL SOLENOIDS

(a) Coat new O-rings with ATF and install them to the solenoids.

(b) Install the lock-up solenoid.

(c) Install and torque the bolt.

HINT: Bolt length (mm, in.) is indicated in the figure.
Torque: 67 kg-cm (58 in.-lb, 6.6 N-m)



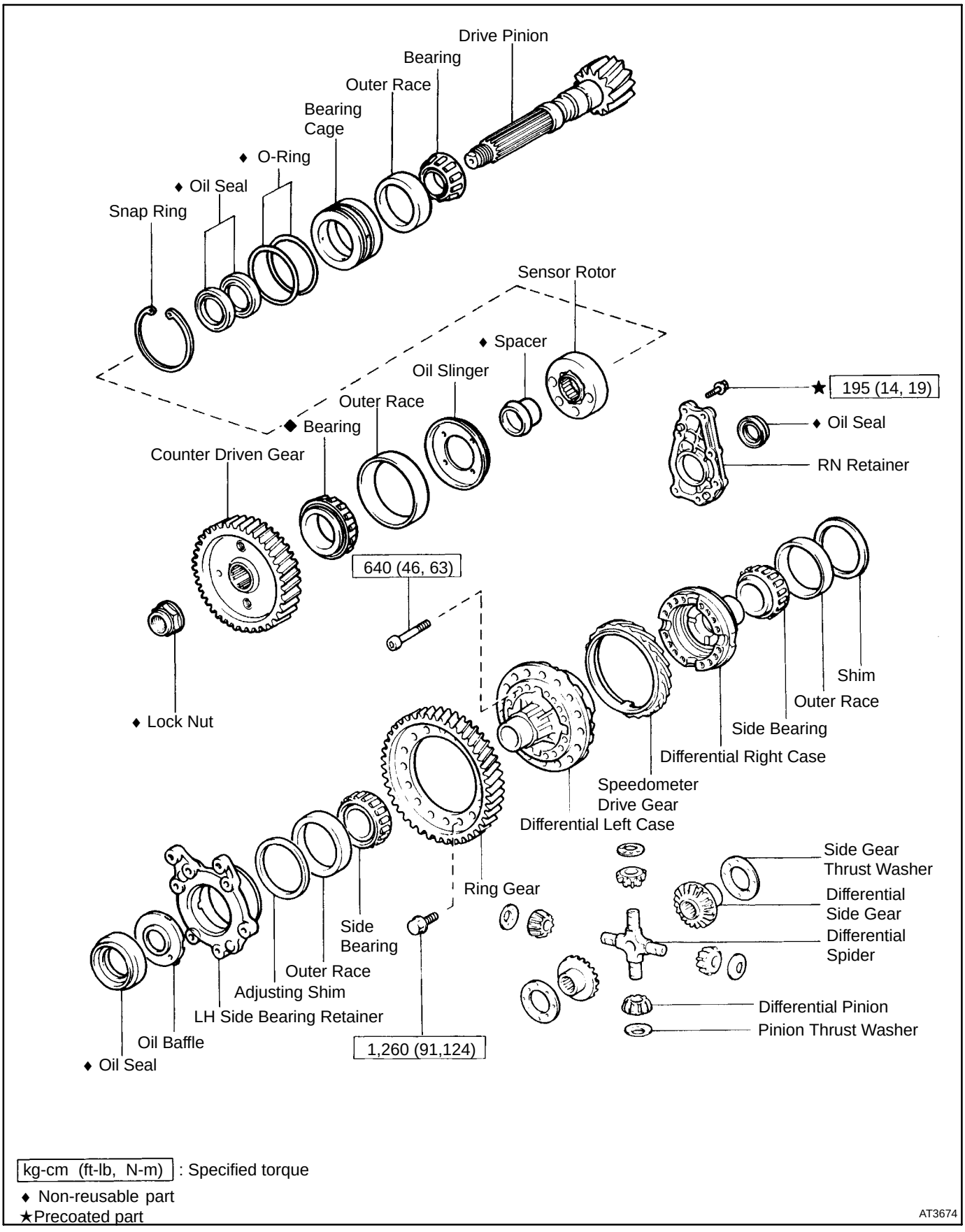
(d) Install No. 1 and No. 2 solenoids.

(e) Install and torque the three bolts.

HINT: Each bolt length (mm, in.) is indicated in the figure.
Torque: 67 kg-cm (58 in.-lb, 6.6 N-m)

Differential Assembly (A540E)

COMPONENTS

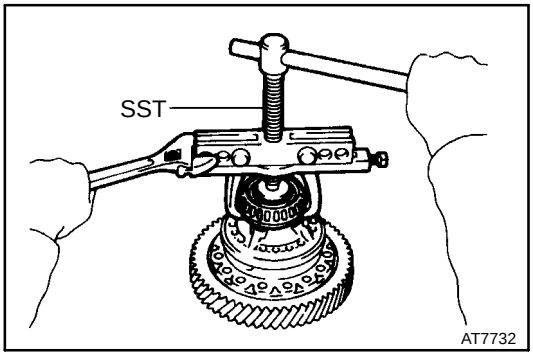


kg-cm (ft-lb, N-m) : Specified torque

♦ Non-reusable part

★Precoated part

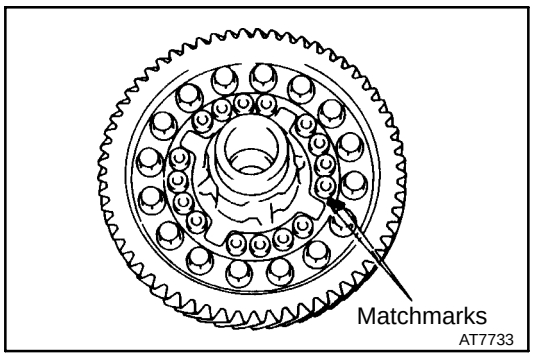
AT3674



DISASSEMBLY OF DIFFERENTIAL CASE

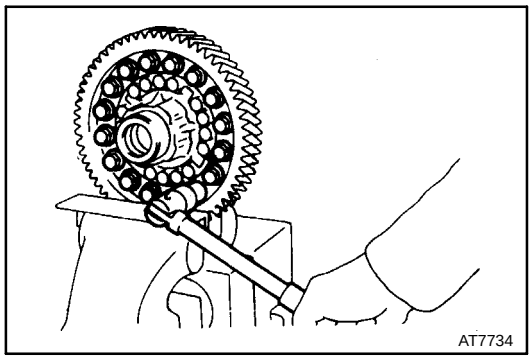
1. REMOVE SIDE BEARING

Using SST, remove the two side bearings.
SST 09950-20017

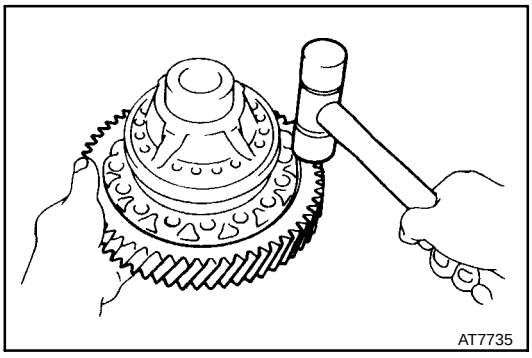


2. REMOVE RING GEAR

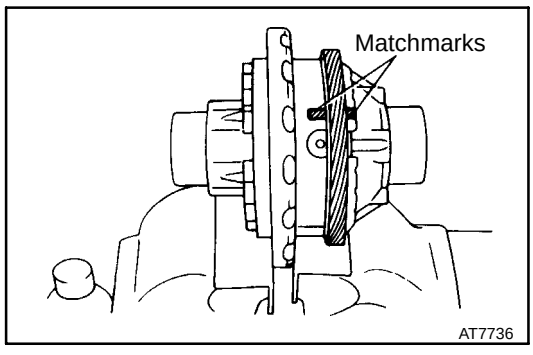
(a) Place the matchmarks on both the differential case and ring gear.



(b) Remove the sixteen bolts.

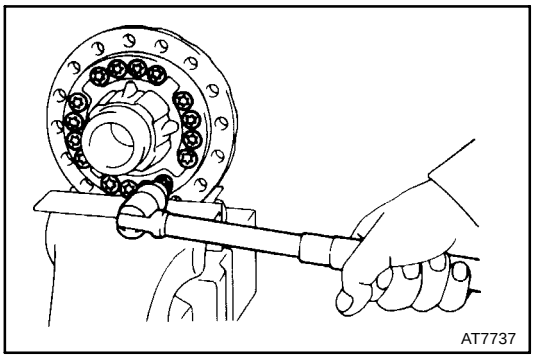


(c) Using a plastic hammer, tap out the ring gear.

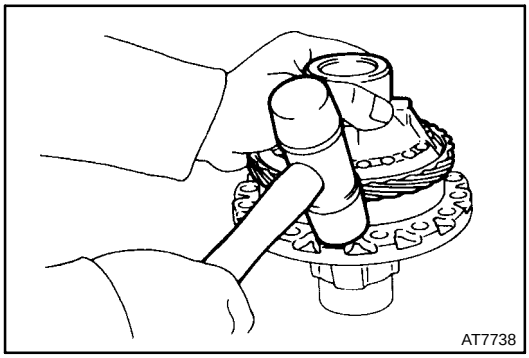


3. DISASSEMBLE OF DIFFERENTIAL CASE

(a) Place the matchmarks on the differential right and left case.

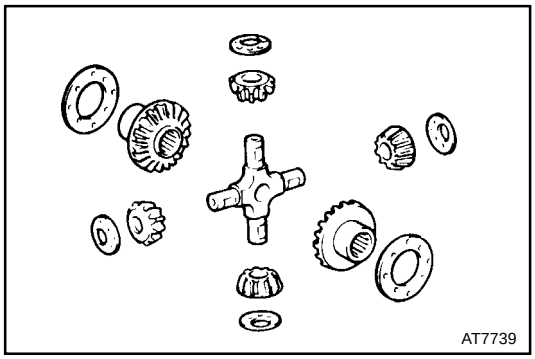


(b) Using a torx wrench, remove the sixteen torx screws.



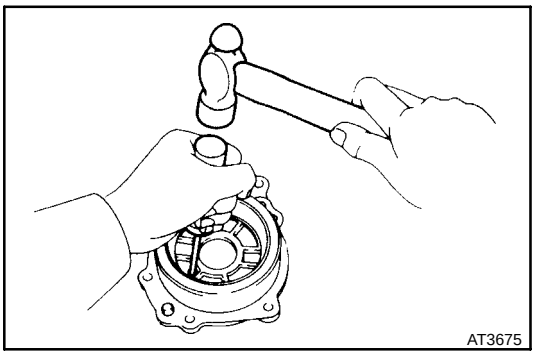
(c) Using a plastic hammer, tap out the differential left case.

(d) Remove the speedometer drive gear from the differential right case.



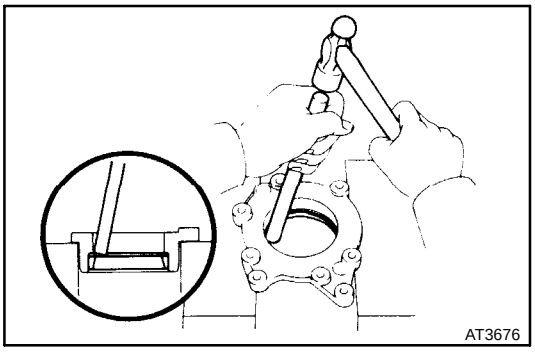
(e) Remove the two differential side gears, two side thrust washers, differential spider, four differential pinions and four pinion washers from the differential left case.

4. DISASSEMBLE LH BEARING RETAINER

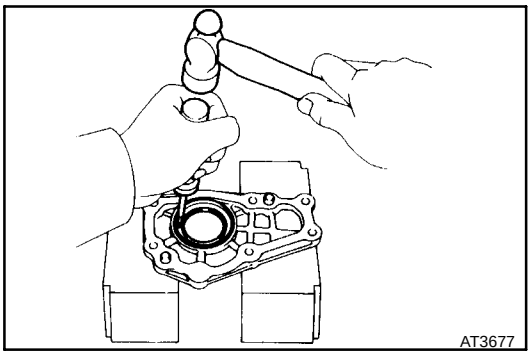


(a) Using a hammer and screwdriver, remove the oil seal.

(b) Remove the oil baffle from the LH bearing retainer.

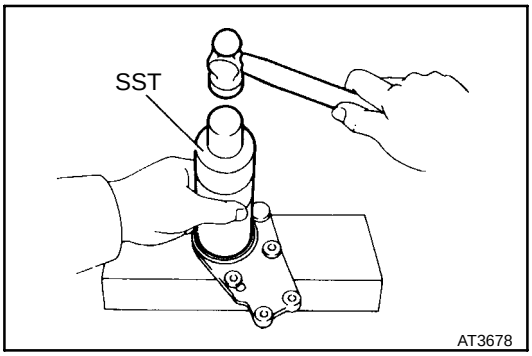


(c) Using a hammer and brass bar, drive out the outer race and adjusting shim from LH bearing retainer.



5. REMOVE RH OIL SEAL FROM RH RETAINER

Using a hammer and screwdriver, drive out the oil seal.



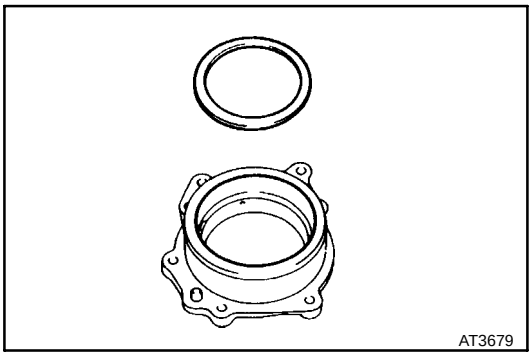
ASSEMBLY OF DIFFERENTIAL CASE

1. INSTALL RH OIL SEAL TO RH RETAINER

(a) Using SST, drive in a new oil seal until its surface is flush with the surface of RH retainer.

SST 09316-60010 (09316-00010)

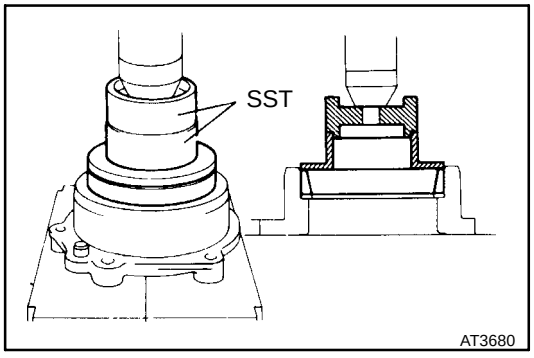
(b) Coat the oil seal lip with MP grease.



2. INSTALL ADJUSTING SHIM AND BEARING OUTER RACE TO LH BEARING RETAINER

(a) Place the adjusting shim into the LH bearing retainer.

HINT: Use either the shim which was removed or one 2.40 mm (0.0945 in.).

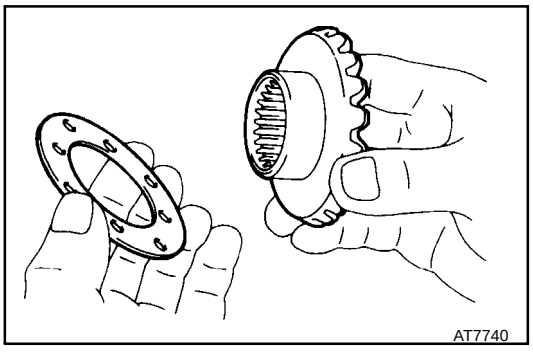


(b) Using SST, press the outer race into the LH retainer.

SST 09316-2001 1, 09350-32014 (09351-32150)

HINT: Install the oil baffle and oil seal after adjusting the differential side bearing preload.

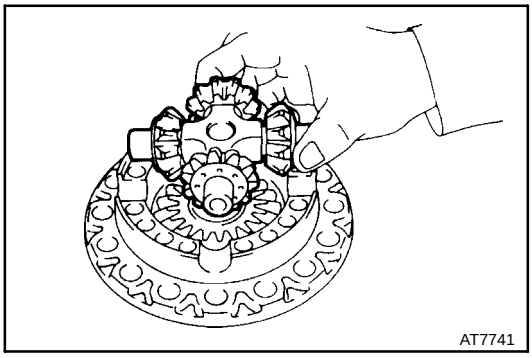
(See page AT-126)



3. ASSEMBLE DIFFERENTIAL CASE

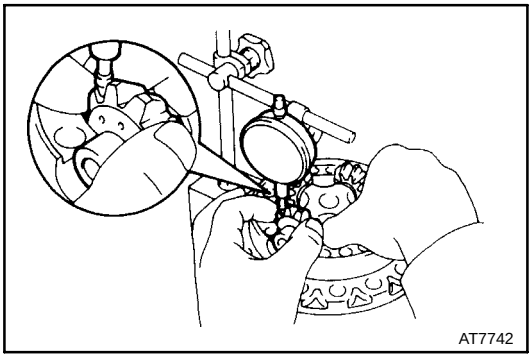
HINT: Coat all of the sliding and rotating surface with ATF before assembly.

(a) Install the thrust washer to the side gear.



(b) Install the four pinions and thrust washers to the spider.

(c) Install the side gear and spider with four pinions to the differential left case.



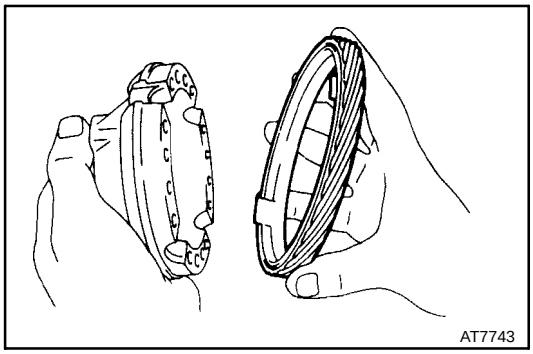
(d) Using a dial indicator, measure the backlash of one pinion gear while holding the side gear.

Standard backlash: 0.05 - 0.20 mm (0.0020 - 0.0079 in.)

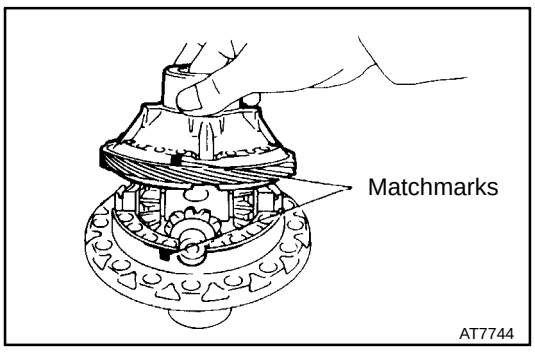
(e) Install the side gear and spider with four pinions to the right side of the differential case.
And check the pinion gear backlash.

(f) Referring to the table below, select the side gear thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

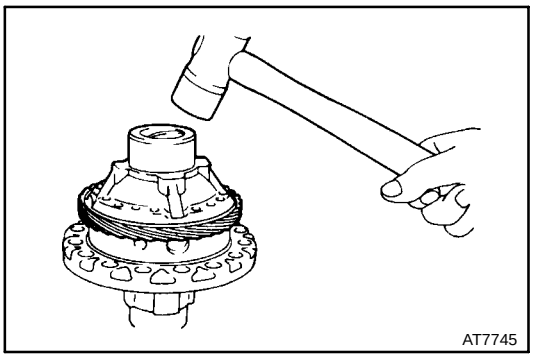
Thickness mm (in.)	
0.80 (0.0315)	1.20 (0.0472)
0.90 (0.0354)	1.30 (0.0512)
1.00 (0.0394)	1.40 (0.0551)
1.10 (0.0433)	



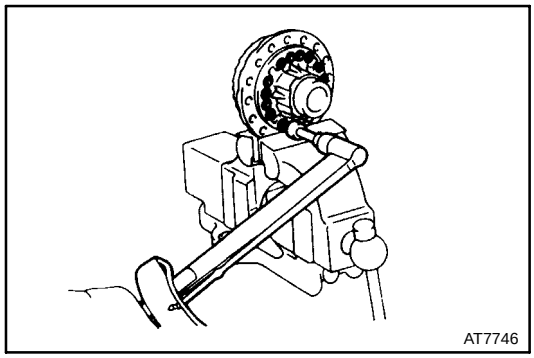
(g) Install the speedometer driven gear.



(h) Align the matchmarks on the differential cases.

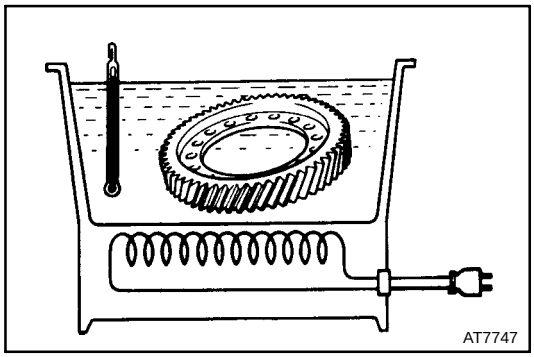


(i) Using a plastic hammer, carefully tap the differential right case.



(j) Using a torx wrench, install and torque the sixteen torx screws.

Torque: 640 kg-cm (46 ft-lb, 63 N-m)



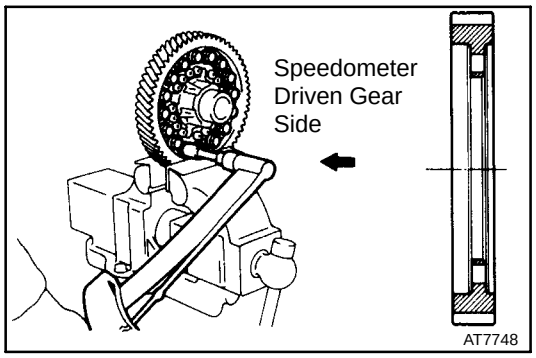
4. INSTALL RING GEAR

(a) Clean the contact surface of the differential case.

(b) Heat the ring gear to about 212˚F (100˚C) in an oil bath.

NOTICE: Do not heat the ring gear above 230˚F (110˚C).

(c) Clean the contact surface of the ring gear with cleaning solvent.

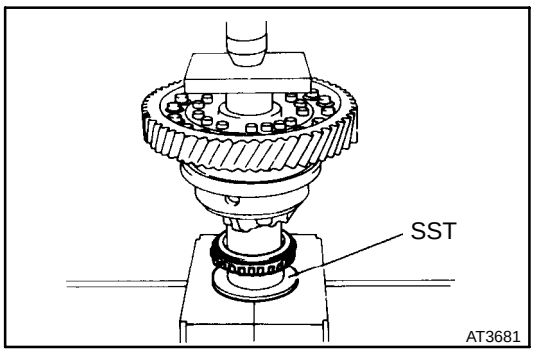


(d) Quickly install the ring gear on the differential case. Install the sixteen bolts.

HINT: Align the matchmarks on the differential left case and contact the ring gear.

(e) Tighten the set bolts uniformly and a little at a time. Torque the bolts.

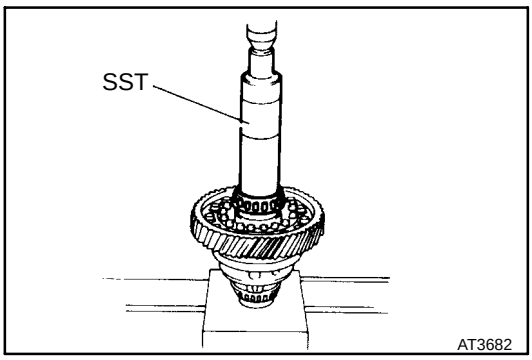
Torque: 1,260 kg-cm (91 ft-lb, 124 N-m)



5. INSTALL SIDE BEARINGS

(a) Using SST and a press, install the RH side bearing to the differential case.

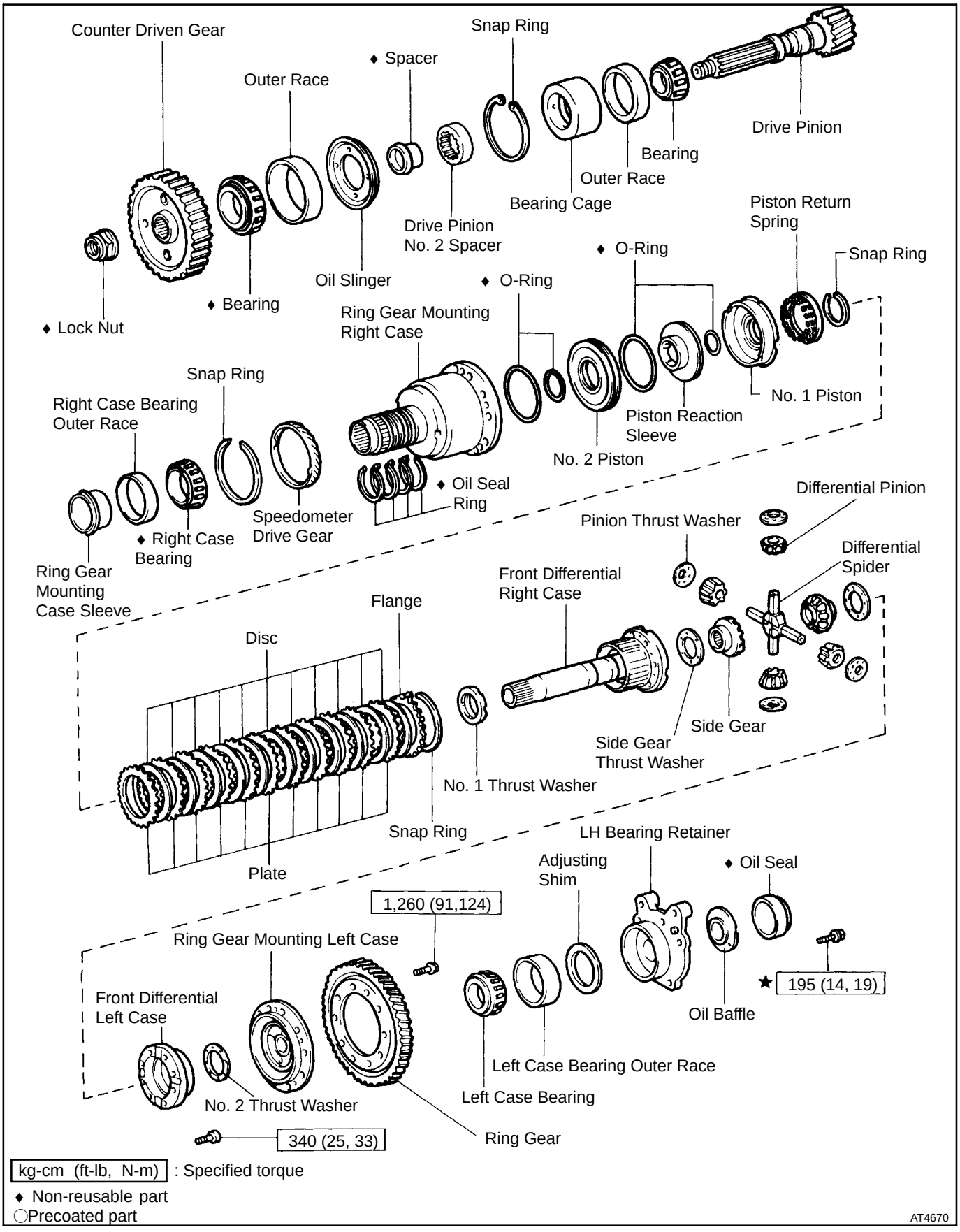
SST 09361-2001 1



(b) Using SST and a press, install the LH side bearing.
SST 09316-60010 (09316-00010)

Differential Assembly (A540H)

COMPONENTS

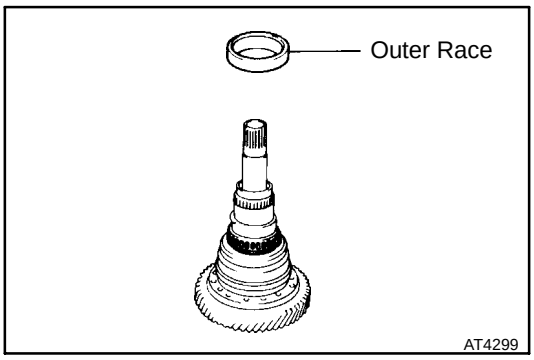


kg-cm (ft-lb, N-m) : Specified torque

♦ Non-reusable part

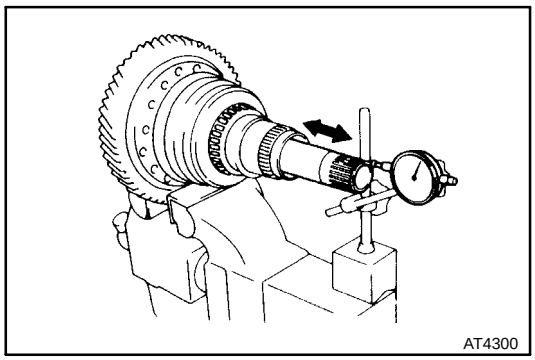
○Precoated part

AT4670



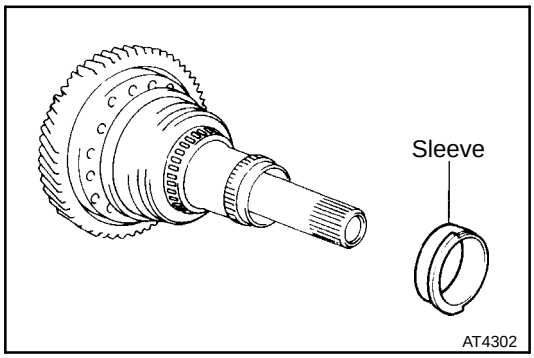
DISASSEMBLY OF DIFFERENTIAL ASSEMBLY

1. REMOVE RIGHT SIDE BEARING OUTER RACE

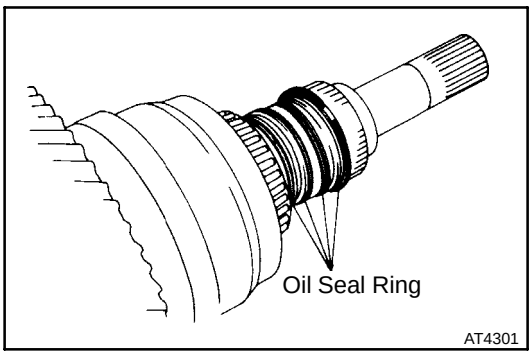


2. CHECK DIFFERENTIAL END PLAY

Using a dial indicator, measure the differential end play.
End play: 0.18 - 0.82 mm (0.0071 - 0.0323 in.)

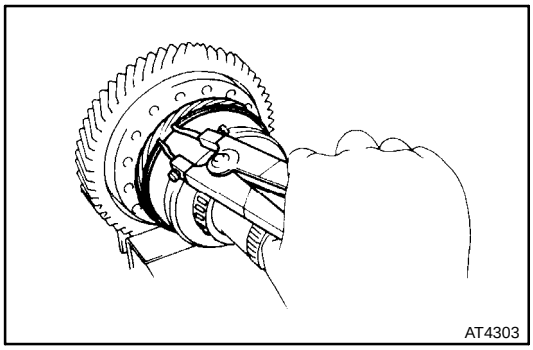


3. REMOVE RING GEAR MOUNTING CASE SLEEVE



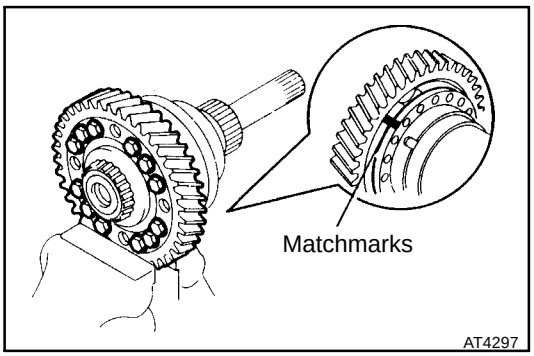
4. REMOVE OIL SEAL RINGS

Remove four oil seal rings from the ring gear mounting right case.



5. REMOVE SPEEDOMETER DRIVE GEAR

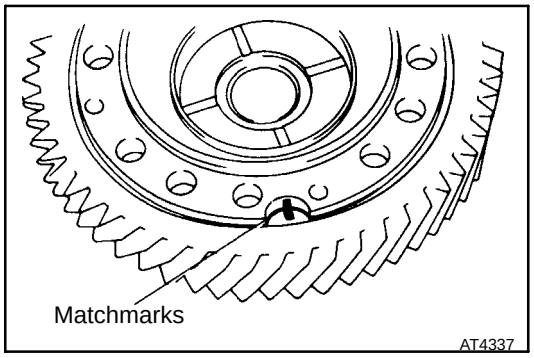
Using snap ring pliers, remove the snap ring and the speedometer drive gear.



6. REMOVE RING GEAR MOUNTING LEFT CASE

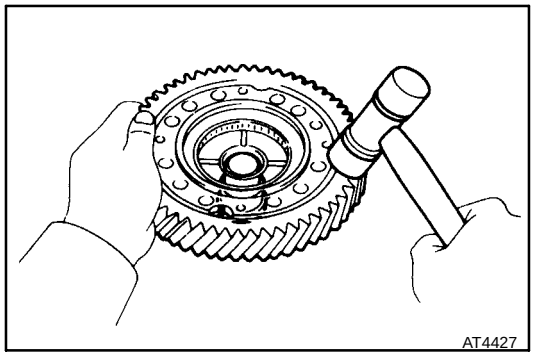
(a) Place matchmarks on the ring gear mounting left case and right case.

(b) Remove the twelve bolts and left case.



7. REMOVE RING GEAR

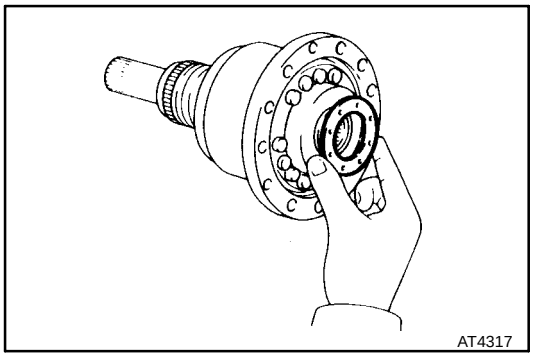
(a) Place matchmarks on the ring gear and left case.



(b) Place the left case on SST.

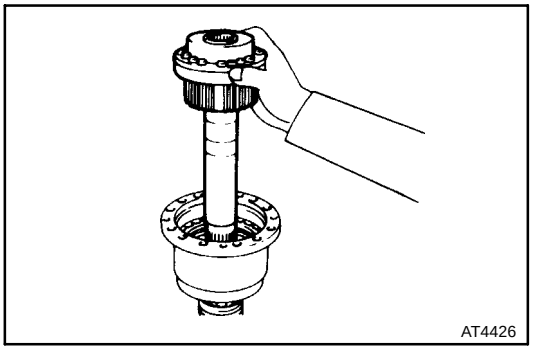
SST 09350-32014 (09351-32090)

(c) Using a plastic hammer, remove the ring gear from the left case.

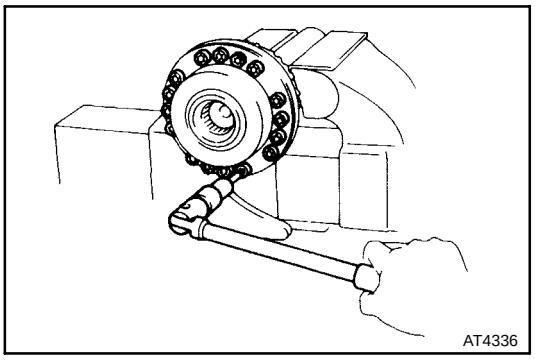


8. REMOVE FRONT DIFFERENTIAL CASE

(a) Remove the No. 2 thrust washer.



(b) Remove the front differential case from the ring gear mounting right case.

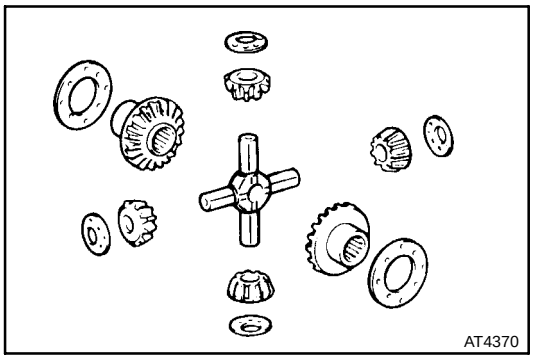


9. REMOVE FRONT DIFFERENTIAL LEFT CASE

(a) Using a torx wrench, remove the sixteen screws from the left case.

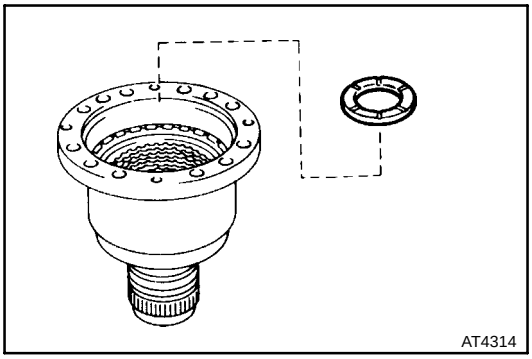
(b) Separate the left case and right case.

NOTICE: Do not scratch the contact surface of the needle bearing.

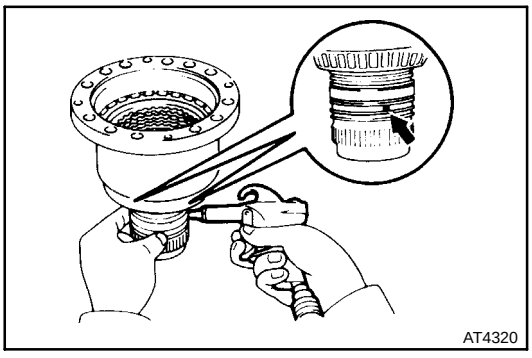


10. REMOVE DIFFERENTIAL PINIONS AND SIDE GEARS

Remove the two differential side gears, two side thrust washers, differential spider, four differential pinions and four pinion washers from the front differential cases.



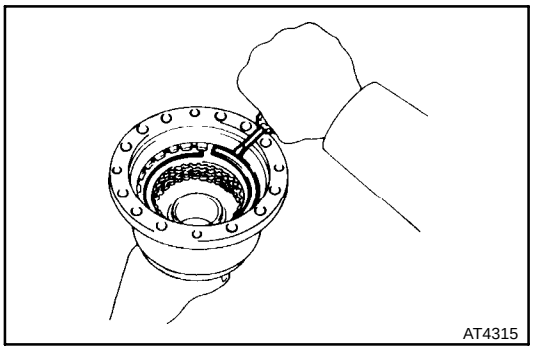
11. REMOVE NO. 1 THRUST WASHER



12. CHECK OPERATION OF CLUTCH PISTONS

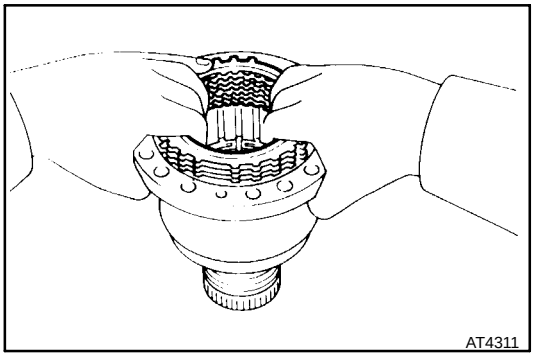
(a) Plug one hole of the right case with your hand.

(b) Apply compressed air into the other hole and confirm that the pistons move.

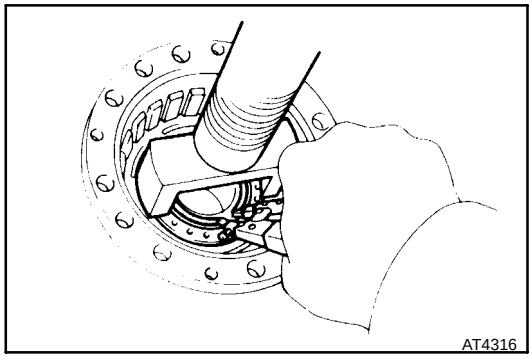


13. REMOVE HYDRAULIC MULTIPLATE CLUTCH DISCS AND PLATES

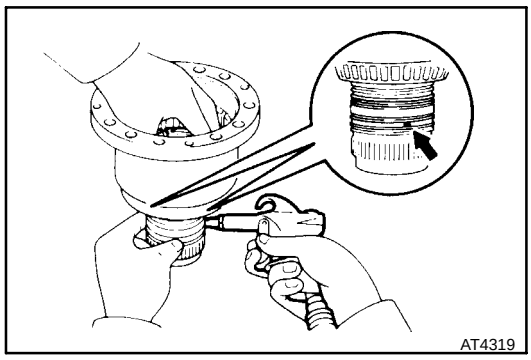
(a) Using a screwdriver, remove the snap ring.


AT4311

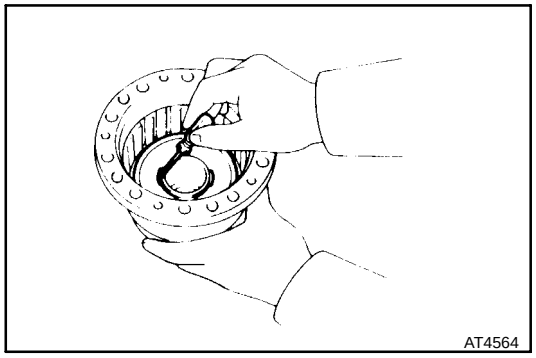
(b) Remove the flange, eleven discs and eleven plates.


AT4316

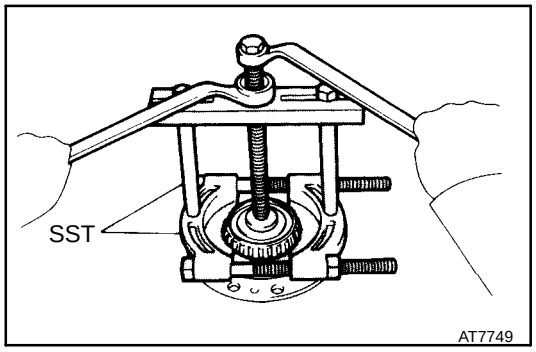
(c) Place SST, and compress the return spring.
SST 09350-32014 (09351-32070)
(d) Using snap ring pliers, remove the snap ring.


AT4319

(e) Apply compressed air to the right case hole to remove the No. 1 piston.
(f) Remove the O-ring from the No. 1 piston.


AT4564

(g) Using a small screwdriver, remove the reaction sleeve and No. 2 piston.
(h) Remove the three O-rings from the reaction sleeve and No. 2 piston.

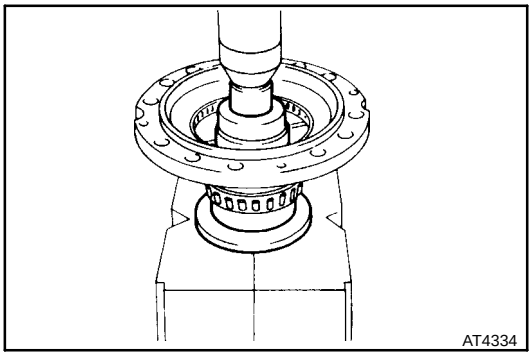


AT7749

REPLACEMENT OF RING GEAR MOUNTING CASE BEARINGS

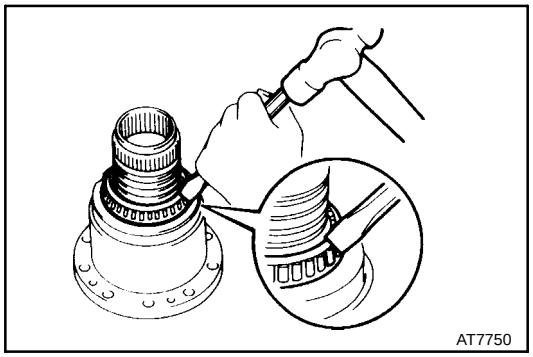
1. REMOVE RING GEAR MOUNTING LEFT CASE BEARING

Using SST, remove the bearing.
SST 09950-00020, 09950-00030



2. INSTALL RING GEAR MOUNTING LEFT CASE BEARING

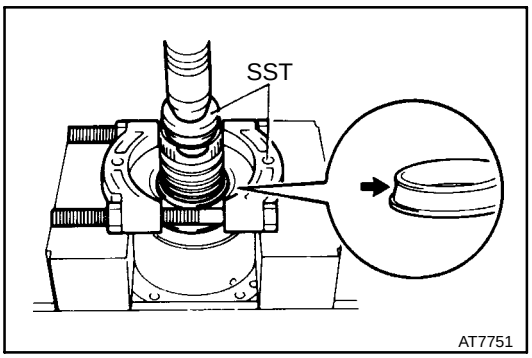
Using a press and SST, press in the bearing.
SST 09316-2001 1, 09350-32014 (09351-32090)



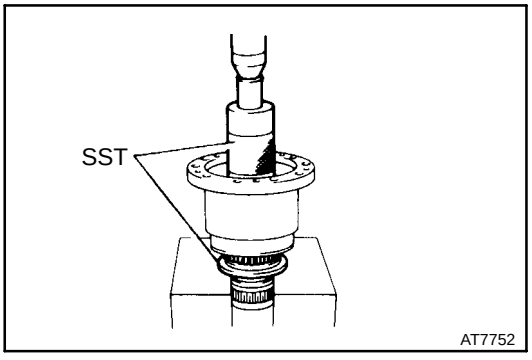
3. REMOVE RING GEAR MOUNTING RIGHT CASE BEARING

(a) Using a chisel and hammer, cut out the bearing cage.

NOTICE: Do not damage the right case.

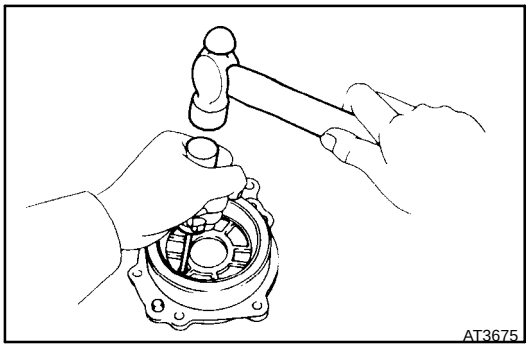


(b) Using a press and SST, press out the bearing inner race.
SST 09350-32014 (09351-32090), 09950-00020



4. INSTALL RING GEAR MOUNTING RIGHT CASE BEARING

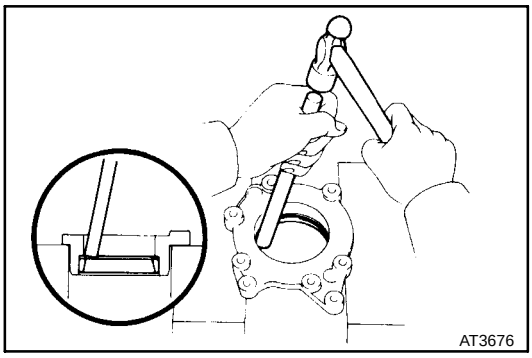
Using a press and SST, press in the new bearing.
SST 09316-60010 (09316-00010), 09502-12010



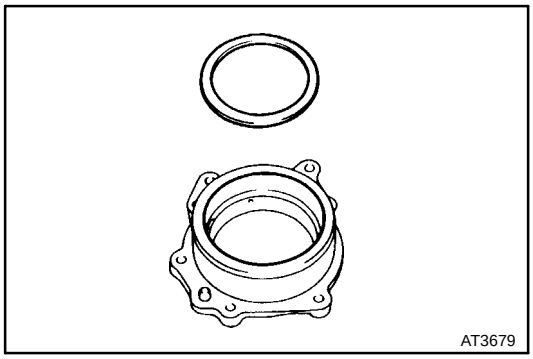
5. REMOVE RING GEAR MOUNTING LEFT CASE BEARING OUTER RACE FROM LH BEARING RETAINER

(a) Using a hammer and screwdriver, remove the oil seal.

(b) Remove the oil baffle from the LH bearing retainer.



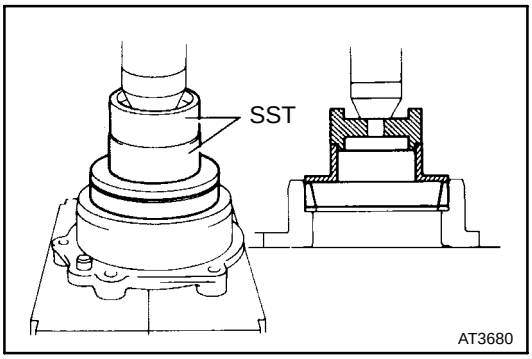
(c) Using a hammer and brass bar, drive out the outer race and adjusting shim from LH bearing retainer.



6. INSTALL ADJUSTING SHIM AND BEARING OUTER RACE TO LH BEARING RETAINER

(a) Place the adjusting shim into the LH bearing retainer.

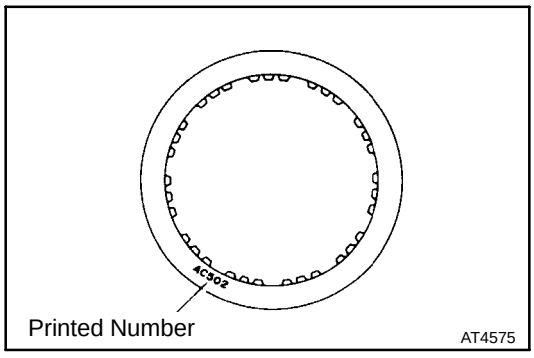
HINT: Use either the shim which was removed or one 2.40 mm (0.0945 in.).



(b) Using SST, press the outer race into the LH retainer.

SST 09316-2001 1, 09350-32014 (09351-32150)

HINT: Install the oil baffle and oil seal after adjusting the differential side bearing preload.
(See page AT-126)



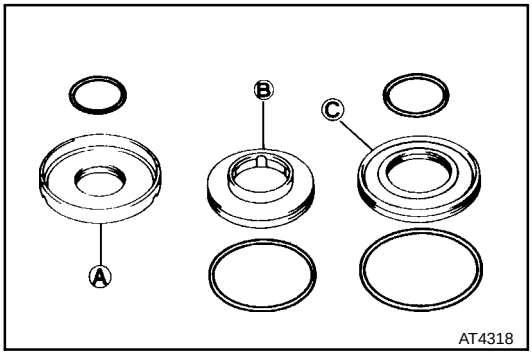
INSPECTION OF HYDRAULIC MULTIPLATE CLUTCH

INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of discs, plates and flange are worn or burnt. If necessary, replace them.

HINT:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed number is defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.

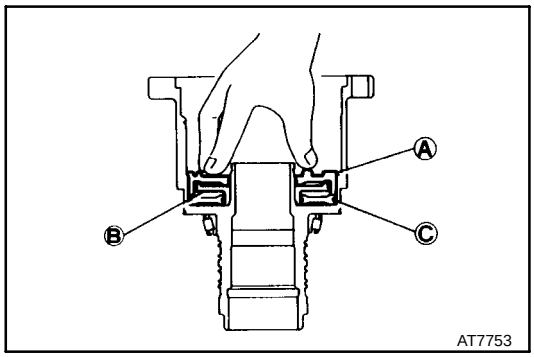


ASSEMBLY OF DIFFERENTIAL ASSEMBLY

1. INSTALL PISTONS AND SLEEVE

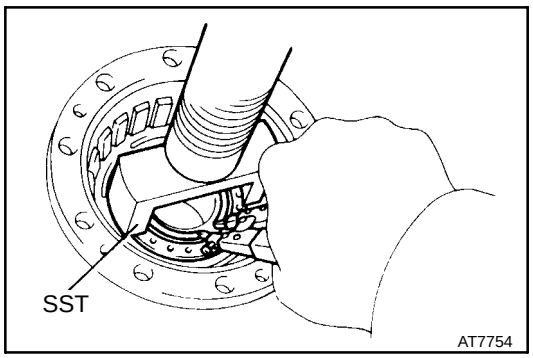
(a) Coat the four O-rings with ATF.

(b) Install the four O-rings to the reaction sleeve and pistons.



(c) Install the No. 1 (A), No. 2 (B) pistons and reaction sleeve (C) to the ring gear mounting right case.

2. INSTALL PISTON RETURN SPRING



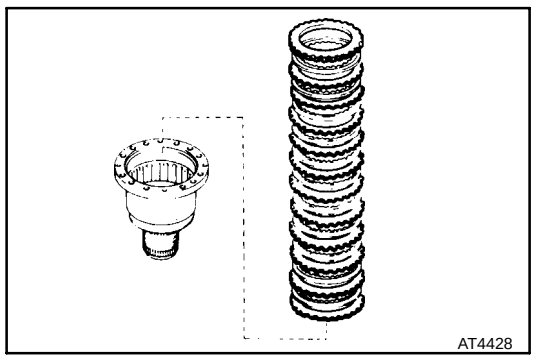
(a) Place the spring on the piston.

(b) Place SST on the spring retainer, and compress the spring with a press.

SST 09350-32014 (09351-32070)

(c) Using snap ring pliers, install the snap ring.

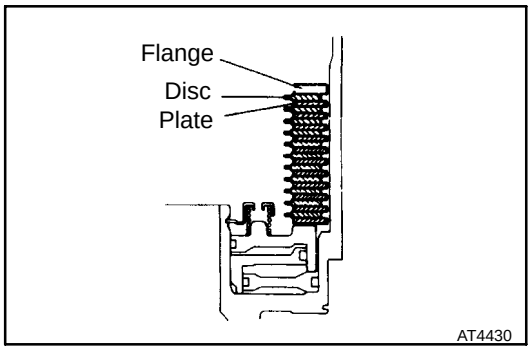
3. INSTALL PLATE, DISCS AND FLANGE



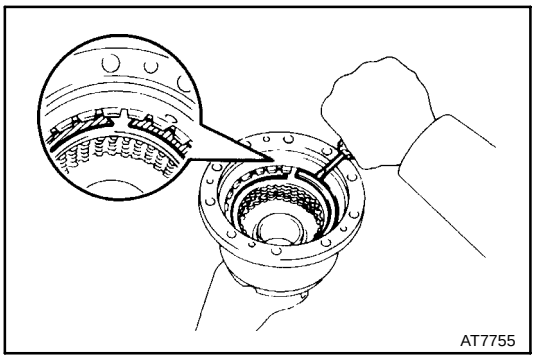
(a) Install the plate and discs.
Install in order: P = Plate D = Disc

P-D-P-D-P-D-P-D-P-D-P-D-P-D-P-D-P-D-P-D-P-D-P-D-P

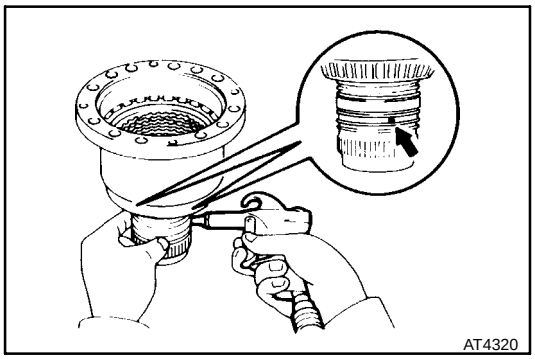
HINT: Before assembling new discs, soak them in ATF for at least fifteen minutes.



(b) Install the flange with the flat end facing downward.



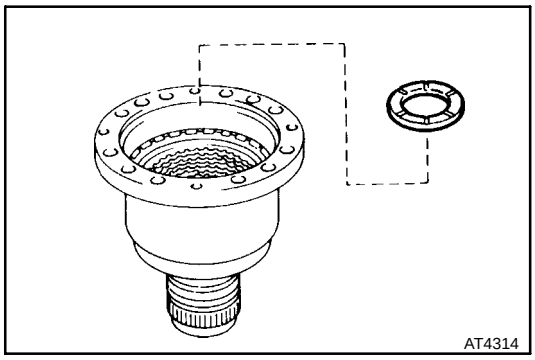
(c) Using a screwdriver, install the snap ring.



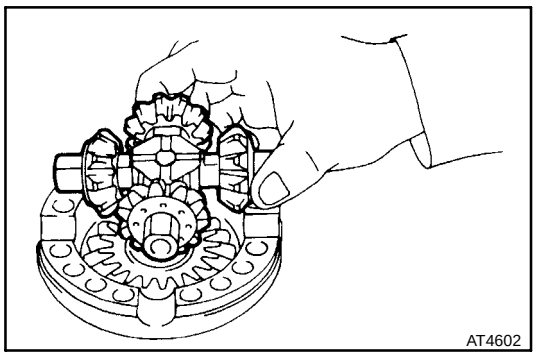
4. CHECK OPERATION OF CLUTCH PISTONS

(a) Plug one hole with your hand.

(b) Apply compressed air into the other hole and make sure that the pistons move.



5. INSTALL NO. 1 THRUST WASHER



6. CHECK AND ADJUST FRONT DIFFERENTIAL SIDE GEAR BACKLASH

(Front Differential Left Case)

(a) Install the following parts:
- Side gear thrust washer
- Side gear
- Four differential pinion gears
- Four pinion gear thrust washers
- Differential spider

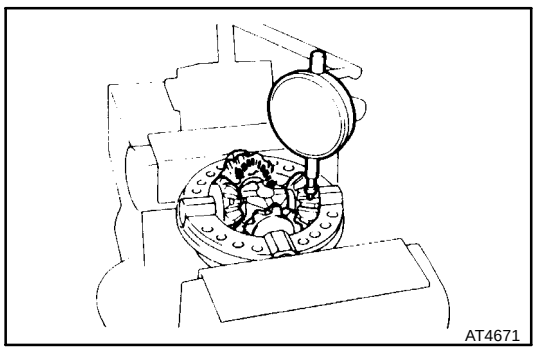
(b) Using a dial indicator, measure the backlash of one pinion gear while holding the side gear toward the case.

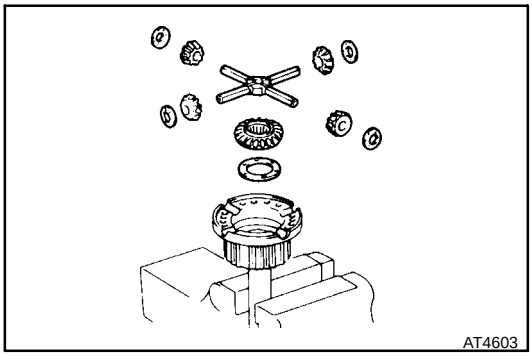
Backlash: 0.05 - 0.20 mm (0.0020 - 0.0079 in.)

If not within specification select the side gear thrust washer.

NOTICE: Do not tighten the vise too tight.

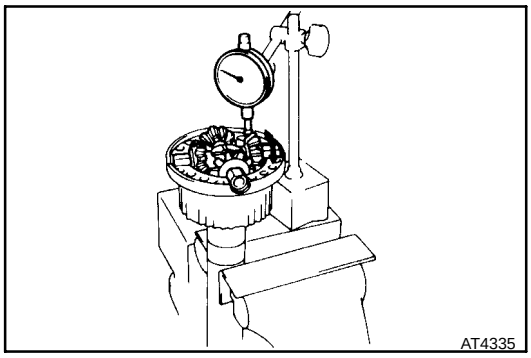
(c) Remove four pinion gears, four thrust washers and spider.





(Front Differential Right Case)

(a) Install the following parts:
- Side gear thrust washer
- Side gear
- Four differential pinion gears
- Four pinion gear thrust washers
- Differential spider

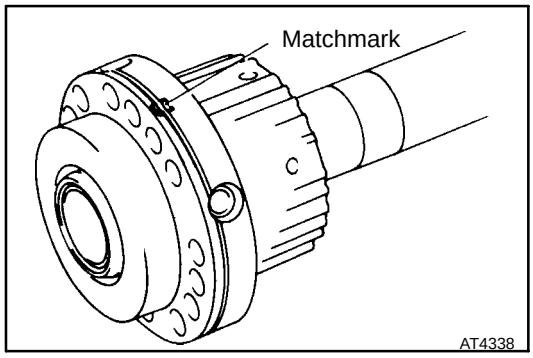


(b) Using a dial indicator, measure the backlash of one pinion gear while holding the side gear toward the case.

Backlash: 0.05 - 0.20 mrn (0.0020 - 0.0079 in.)

Referring to the table below, select the side gear thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

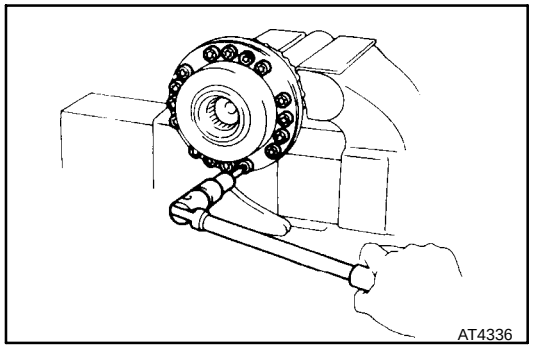
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	1.00 (0.0394)	E	1.20 (0.0472)
B	1.05 (0.0413)	F	1.25 (0.0492)
C	1.10 (0.0433)	G	1.30 (0.0512)
D	1.15 (0.0453)		



7. INSTALL FRONT DIFFERENTIAL LEFT CASE

(a) Install the left case to the right case.

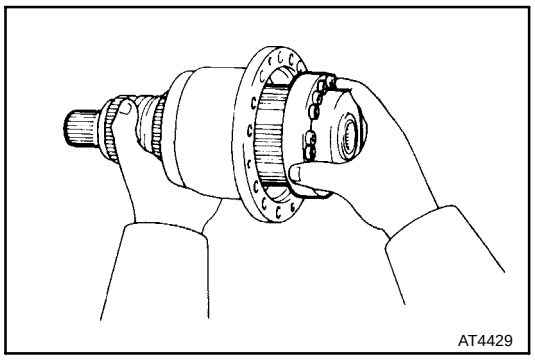
HINT: Align the matchmarks on the left case and right case.



(b) Using a torx wrench, torque the sixteen torx screws.

Torque: 340 kg-cm (25 ft-lb, 33 N-m)

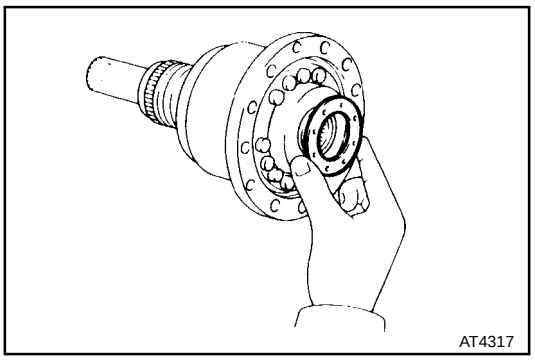
NOTICE: Do not scratch the contact surface of the needle bearing.



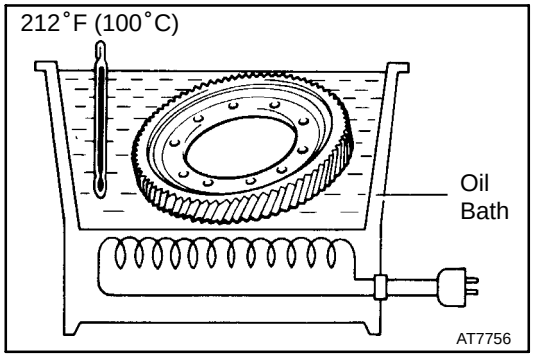
8. INSTALL FRONT DIFFERENTIAL CASE

(a) Install the front differential case to the ring gear mounting right case.

HINT: Align the flukes of the discs in the hydraulic multi-plate clutch.



(b) Install the No. 2 thrust washer.



9. INSTALL RING GEAR

(a) Clean the contact surface of the ring gear mounting left case.

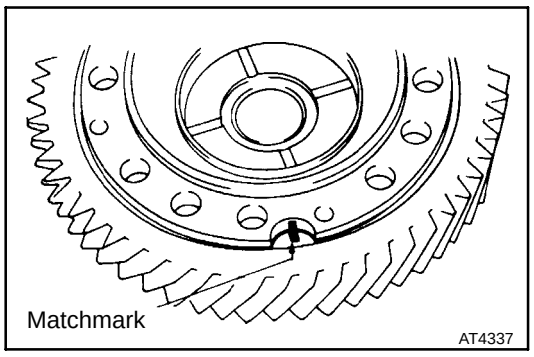
(b) Heat the ring gear to about 212˚F (100˚C) in an oil bath.

NOTICE: Do not heat the ring gear above 230˚F (110˚C).

(c) Clean the contact surface of the ring gear with cleaning solvent.

(d) Quickly install the ring gear on the ring gear mounting left case.

HINT: Align the matchmarks on the ring gear mounting left case and the ring gear.

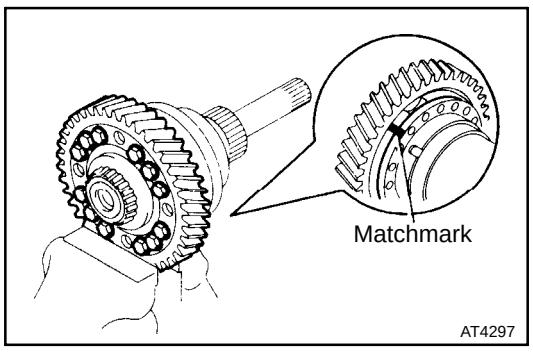


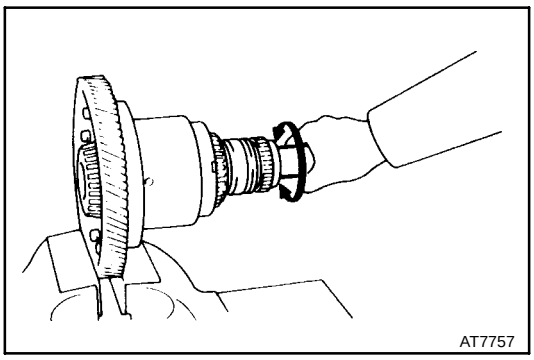
(e) Install the ring gear and ring gear mounting left case on the ring gear mounting right case. Install the twelve bolts.

HINT: Align the matchmarks on the ring gear mounting left case and contact the right case.

(f) Tighten the set bolts uniformly and a little at a time. Torque the bolts.

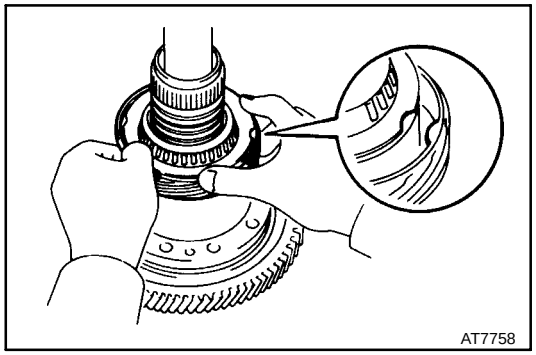
Torque: 1,260 kg-cm (91 ft-lb, 124 N-m)





10. CHECK OPERATION OF FRONT DIFFERENTIAL

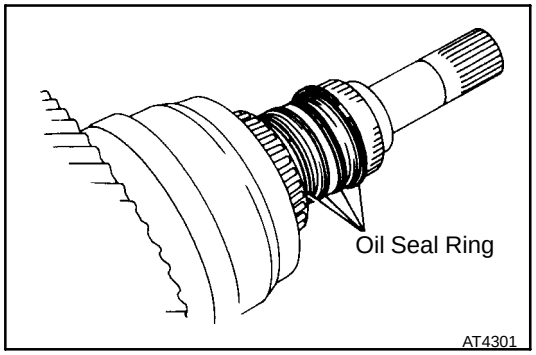
Check that the front differential turns smoothly.



11. INSTALL SPEEDOMETER DRIVE GEAR

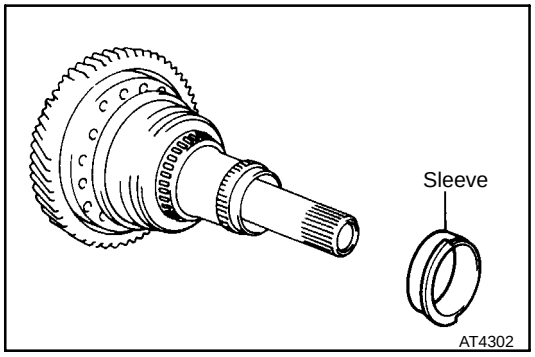
(a) Place the speedometer drive gear on the ring gear mounting case.

(b) Install the snap ring.

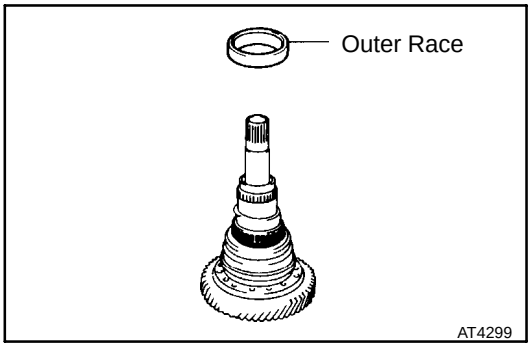


12. INSTALL OIL SEAL RINGS

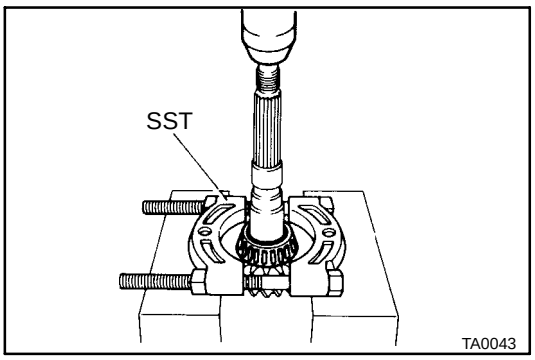
Install the four oil seal rings to the ring gear mounting right case.



13. INSTALL RING GEAR MOUNTING CASE SLEEVE



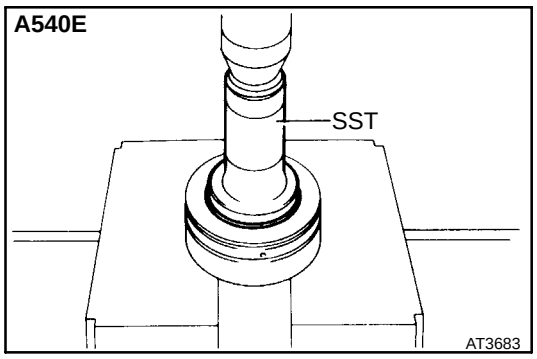
14. INSTALL RIGHT SIDE BEARING OUTER RACE



DISASSEMBLY OF DRIVE PINION

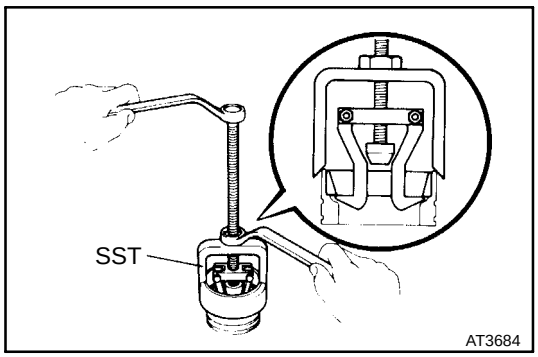
1. REMOVE DRIVE PINION SHAFT BEARING

Using SST and a press, remove the bearing.
SST 09950-00020



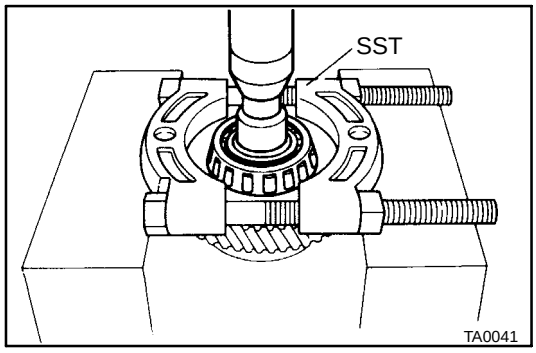
2. (A540E)
REMOVE OIL SEALS FROM CAGE

Using SST, press out the two oil seals.
SST 09325-12010



3. REMOVE PINION SHAFT BEARING OUTER RACE FROM CAGE

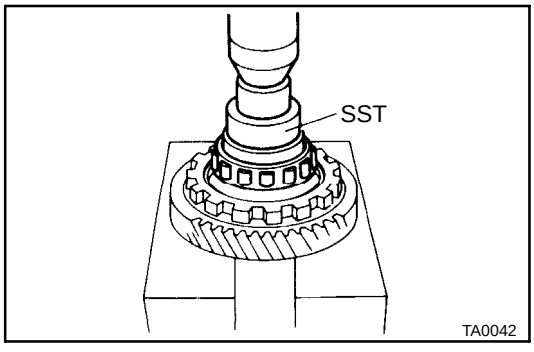
Using SST, remove the outer race.
SST 09612-65014



4. REMOVE COUNTER DRIVEN GEAR BEARING

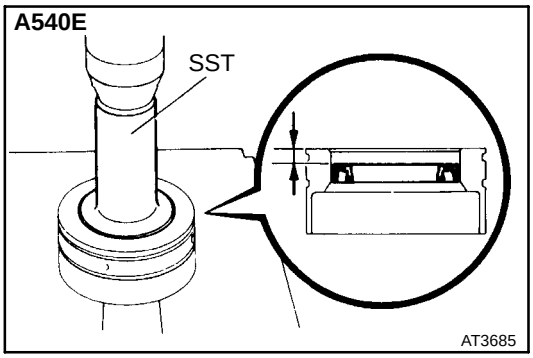
Using SST and a press, remove the bearing.
SST 09950-00020

ASSEMBLY OF DRIVE PINION SHAFT COMPONENTS



1. INSTALL COUNTER DRIVEN GEAR BEARING

Using SST, press in a new bearing.
SST 09350-32014 (09351-32090)

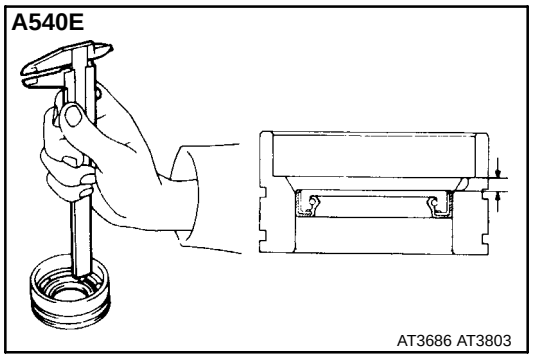


2. (A540E)
INSTALL OIL SEALS TO CAGE

(a) Using SST, press in a new oil seal with the lip facing downward.

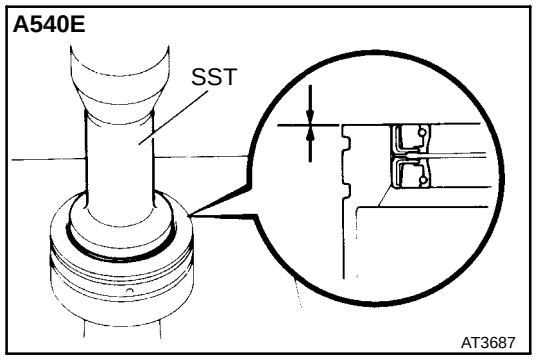
SST 09325-12010

Oil seal press in depth (from flat end):
8 mm (0.31 in.)



(b) Check the oil seal press in depth.

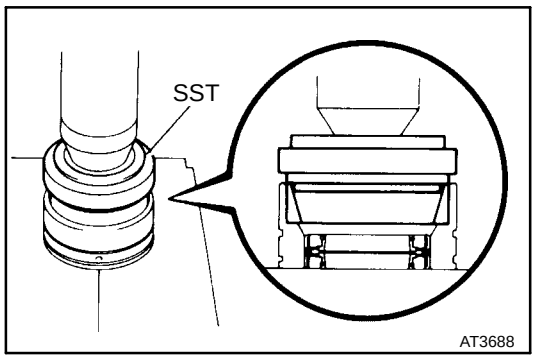
Oil seal press in depth: 4.3 mm (0.169 in.)



(c) With the oil seal lip facing upward, use SST to press in a new oil seal until its end is flush with the surface of the cage.

SST 09325-12010

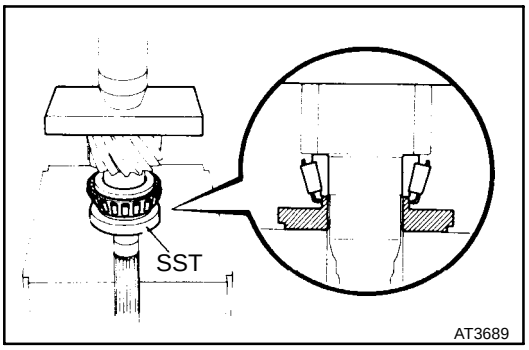
(d) Coat the oil seal lips with MP grease.



3. INSTALL SHAFT BEARING OUTER RACE TO CAGE

Using SST, press the outer race into the cage.

SST 09350-32014 (09351-32111)



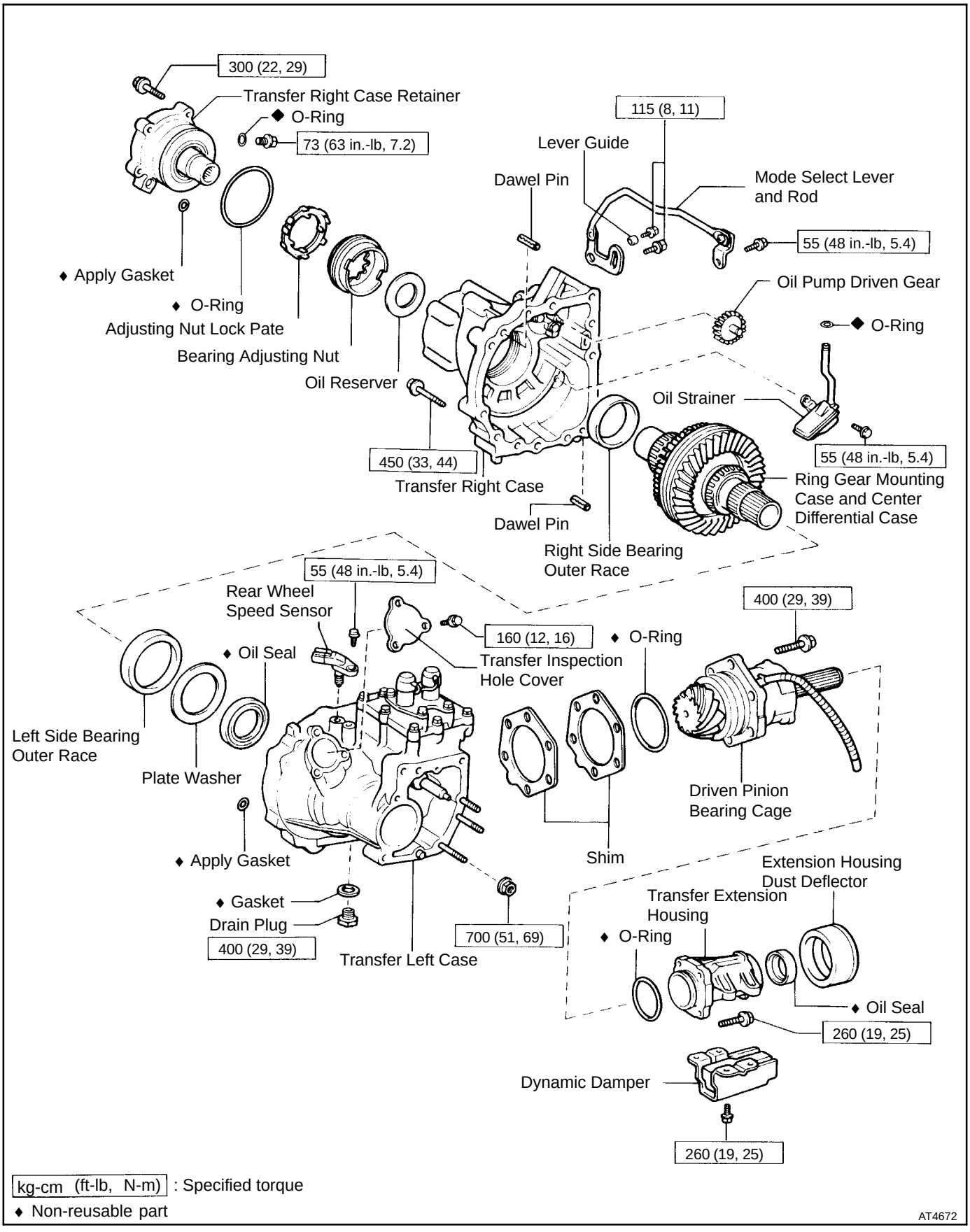
4. INSTALL DRIVE PINION SHAFT BEARING

Using SST, press in the bearing.

SST 09350-32014 (09351-32100)

Transfer (A540H)

COMPONENT PARTS



kg-cm (ft-lb, N-m) : Specified torque

♦ Non-reusable part

AT4672

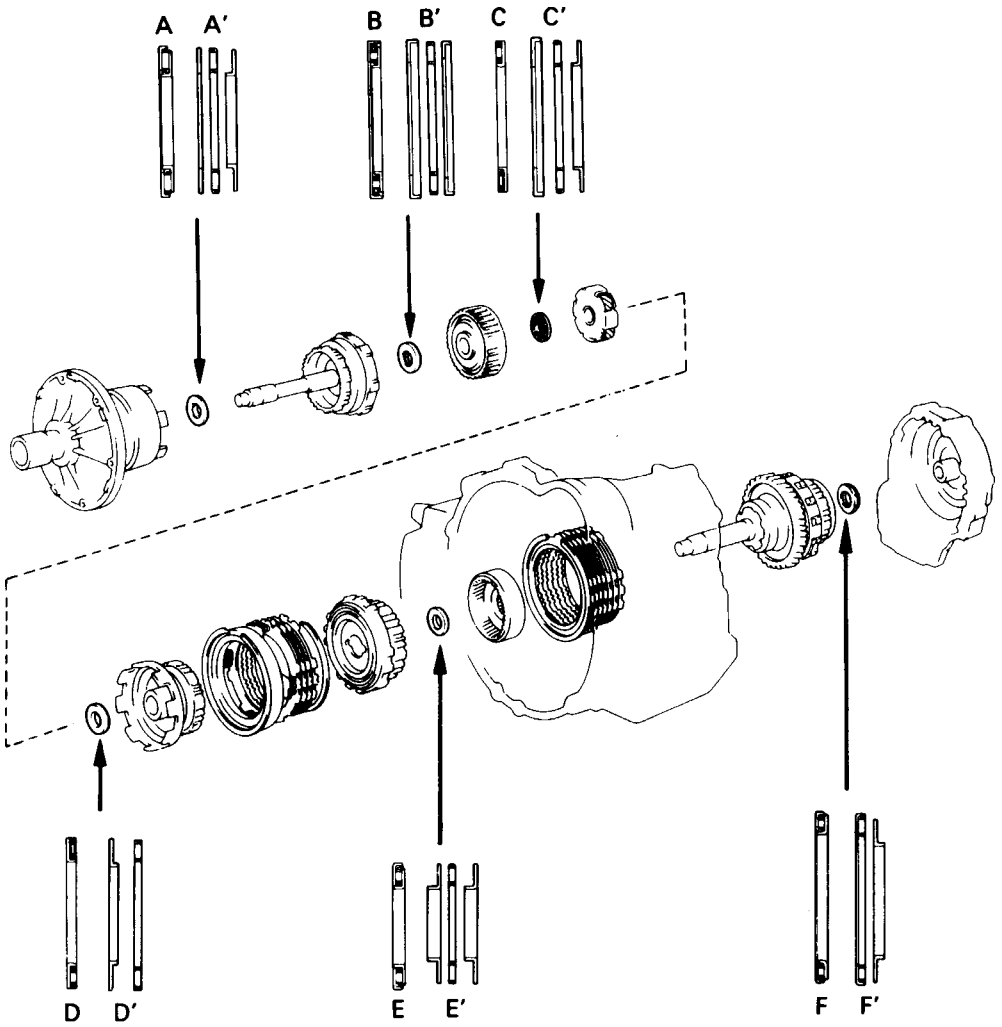
INSTALLATION OF COMPONENT PARTS

Disassembly, inspection and assembly of each component group have been indicated in the preceding chapter. Before assembly, make sure, again, that all component groups are assembled correctly.
If something wrong is found in a certain component group during assembly, inspect and repair this group immediately.
Recommended ATF: DEXRON® II (A540E)
Type T (08886 - 00405) or equivalent (A540H)

GENERAL INSTALLATION NOTES:

1. **The automatic transaxle is composed of highly precision-finished parts, necessitating careful inspection before assembly because even a small nick could cause fluid leakage or affect performance.**
2. **Before assembling new clutch discs, soak them in automatic transaxle fluid for at least fifteen minutes.**
3. **Apply automatic transaxle fluid on the sliding or rotating surfaces of parts before assembly.**
4. **Use petroleum jelly to keep small parts in their places.**
5. **Do not use adhesive cements on gaskets and similar parts.**
6. **When assembling the transaxle, be sure to use new gaskets and O-rings.**
7. **Dry all parts with compressed air - never use shop rags.**

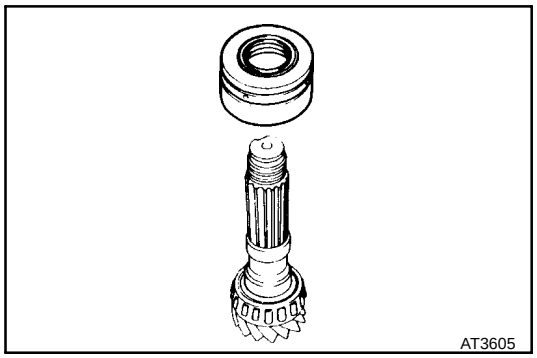
8. Be sure to install the thrust bearings and races in the correct direction and position.



AT5039

mm (in.)

A540E		A	B	C	D	E	F
Bearing (with race)	Outer Diameter	See page AT-354	47.6 (1.874)	45.5 (1.791)	←	38.7 (1.524)	54.0 (2.126)
	Inner Diameter	27.7 (1.091)	31.4 (1.236)	30.1 (1.185)	←	22.6 (0.890)	39.4 (1.551)
A540H		A'	B'	C'	D'	E'	F'
Front Bearing Race	Outer Diameter	43.0 (1.693)	37.9 (1.492)	←	45.0 (1.772)	37.3 (1.469)	—
	Inner Diameter	30.5 (1.201)	22.0 (0.866)	←	28.0 (1.102)	24.1 (0.949)	—
Thrust Bearing	Outer Diameter	42.0 (1.654)	36.1 (1.421)	←	45.0 (1.772)	37.6 (1.480)	46.3 (1.823)
	Inner Diameter	28.9 (1.138)	22.2 (0.874)	←	30.0 (1.181)	24.0 (0.974)	26.2 (1.031)
Rear Bearing Race	Outer Diameter	42.0 (1.654)	35.7 (1.406)	35.0 (1.378)	—	37.6 (1.480)	43.0 (1.693)
	Inner Diameter	27.1 (1.067)	23.0 (0.906)	19.0 (0.748)	—	22.2 (0.874)	24.5 (0.965)

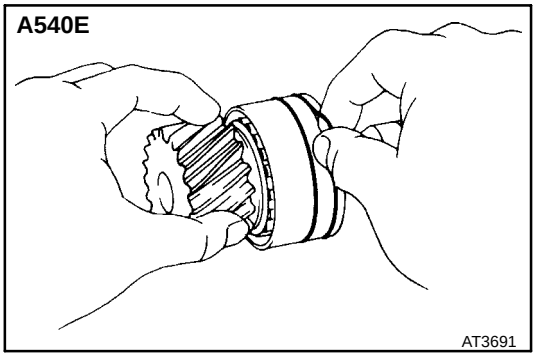


INSTALLATION OF DIFFERENTIAL AND DRIVE PINION

1. INSTALL DRIVE PINION INTO TRANSAXLE CASE

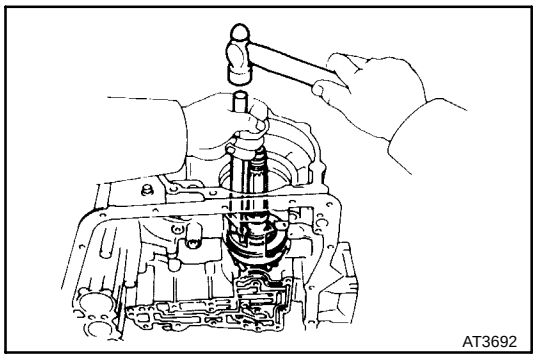
(a) Place the bearing cage onto the drive pinion shaft.

NOTICE: Be careful not to damage the oil seals with the pinion shaft. (A540E)

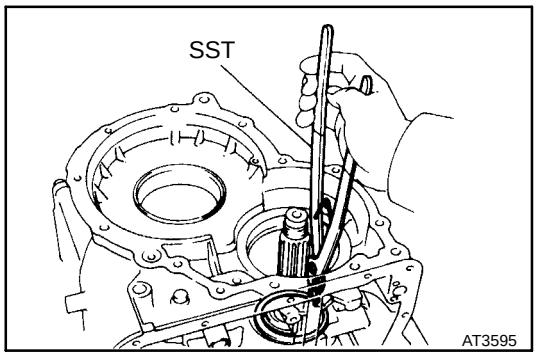


(b) Install the two new O-rings to the bearing cage. (A540E)

(c) Coat the O-rings with ATF. (A540E)

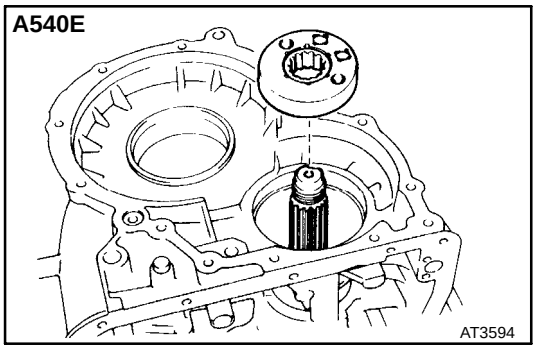


(d) Using a hammer and brass bar, slightly tap the bearing cage into the transaxle case until the snap ring groove in the bore can be seen.

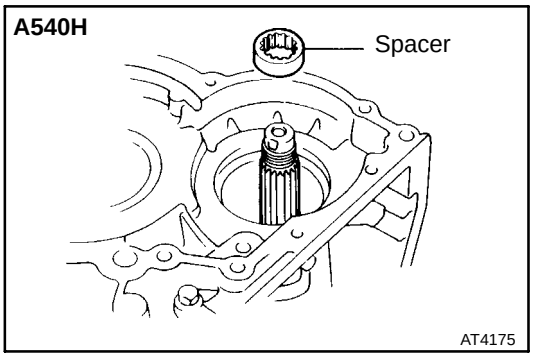


(e) Using SST, install snap ring into the bore.

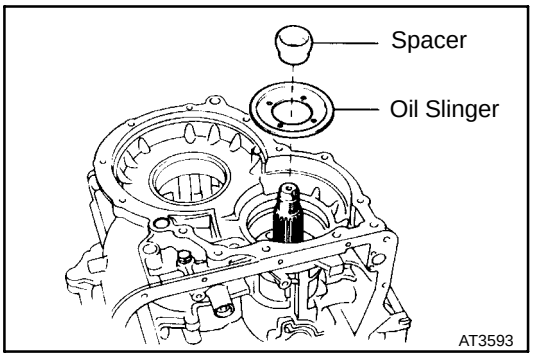
SST 09350-32014 (09351-32050)



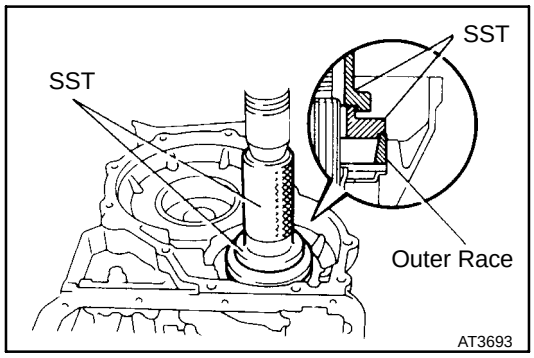
2. (A540E) PLACE SENSOR ROTOR ONTO DRIVE PINION SHAFT



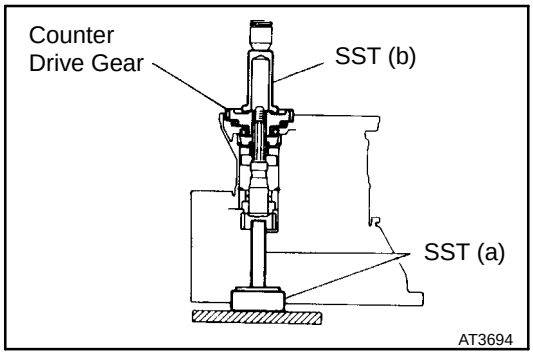
3. (A540H)
INSTALL DRIVE PINION BEARING NO. 2 SPACER



4. PLACE OIL SLINGER AND NEW SPACER
HINT: Install the spacer with the small end downward.



5. INSTALL OUTER RACE TO TRANSAXLE CASE
Using SST, press in the outer race.
SST 09350-32014 (09351-32100, 09351-32140)



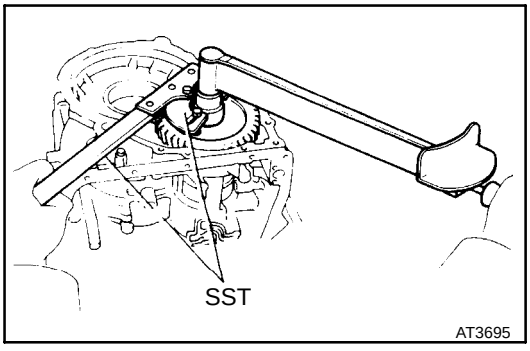
6. INSTALL COUNTER DRIVEN GEAR

(a) Place SST into the transaxle hole to hold the drive pinion shaft.

SST (a) 09350-32014 (09351-32130, 09351-32150)

(b) Using SST, press in the counter driven gear until slightly thickness between the counter driven gear bearing and outer race.

SST (b) 09350-32014 (09351-32140)

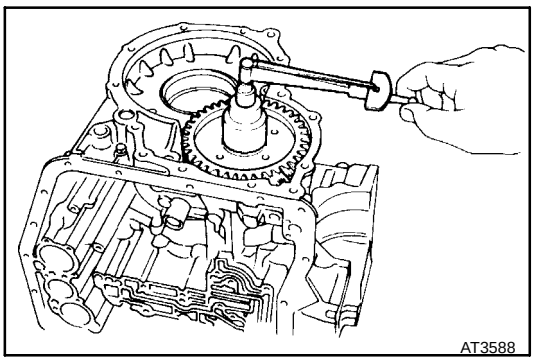


7. INSTALL NEW LOCK NUT AND ADJUST DRIVE PINION PRELOAD

(a) Install the new lock nut.

(b) Using SST to hold the gear, tighten the nut.

Torque: 2,100 kg-cm (152 ft-lb, 206 N-m)
SST 09330-00021, 09350-32014 (09351-32032)



(c) Turn the gear counterclockwise and clockwise several times.

(d) Using a torque meter, measure the preload of the drive pinion.

Drive pinion preload (at starting):

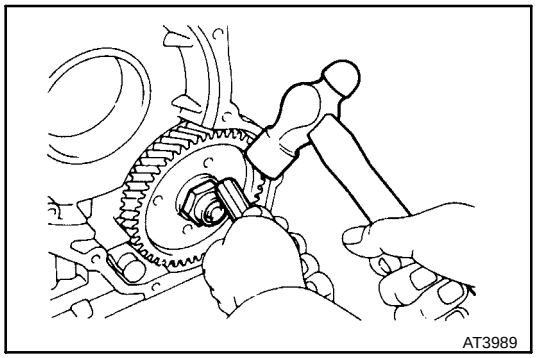
New bearing

10 - 16 kg-cm
(8.7 - 13.9 in.-lb, 1.0 - 1.6 N-m)

Reused bearing

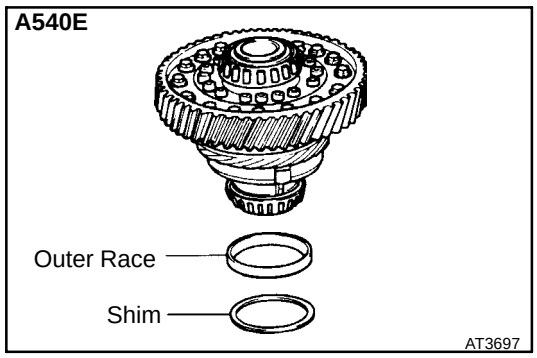
5 - 8 kg-cm
(4.3 - 6.9 in.-lb, 0.5 - 0.8 N-m)
If the preload is greater than specified, replace the bearing spacer.
If the preload is less than specified, retighten the nut 130 kg-cm (9 ft-lb, 13 N-m) at a time until the specified preload is reached.

If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure.
Do not back off the nut to reduce the preload.
Maximum torque: 3,600 kg-cm (260 ft-lb, 353 N-m)

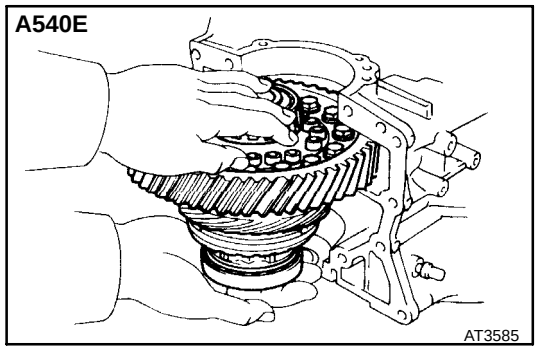


(e) If the preload is adjusted within specification, make a note of it.

(f) Stake the lock nut.

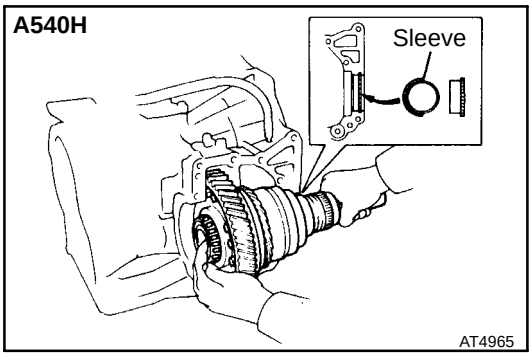


8. (A540E)
PLACE OUTER RACE AND SHIM ONTO RH SIDE BEARING

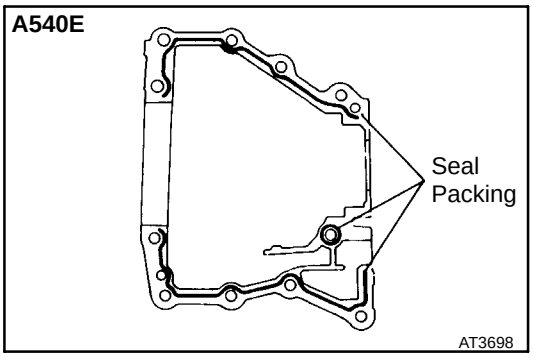


9. PLACE DIFFERENTIAL CASE INTO TRANSAXLE CASE

(A540E)
Be sure to install the shim and outer race into place.



(A540H)
Be sure to install the ring gear mount case sleeve and outer race into place.



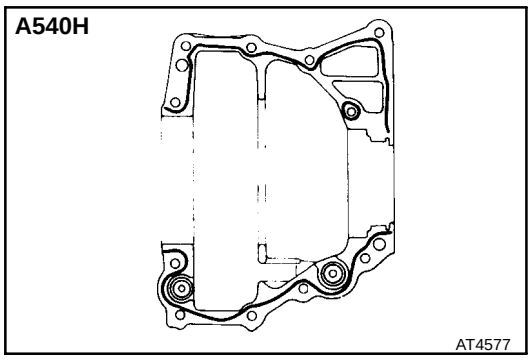
10. INSTALL CARRIER COVER

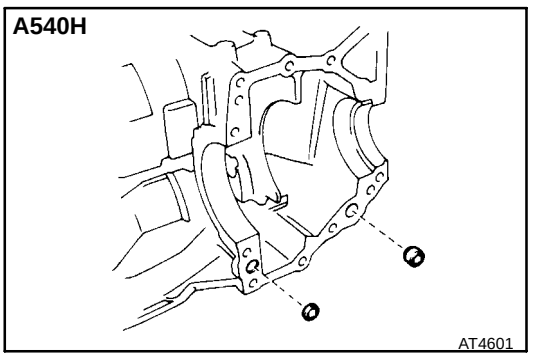
(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the carrier cover and transaxle case.

(b) Apply seal packing to the carrier cover as shown.

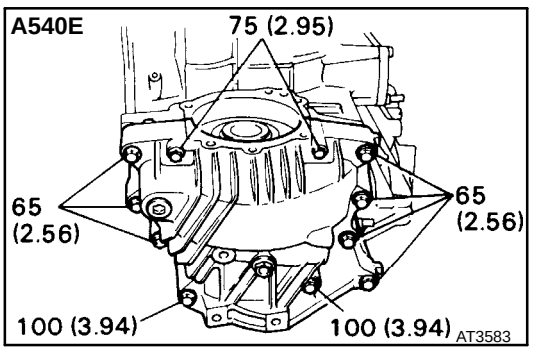
Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT: Install the carrier cover within ten minutes after applying seal packing.





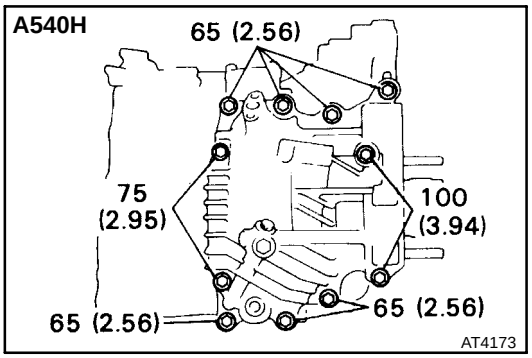
(c) Install the two apply gaskets.

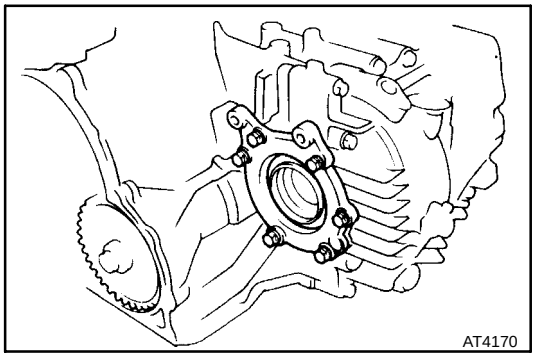


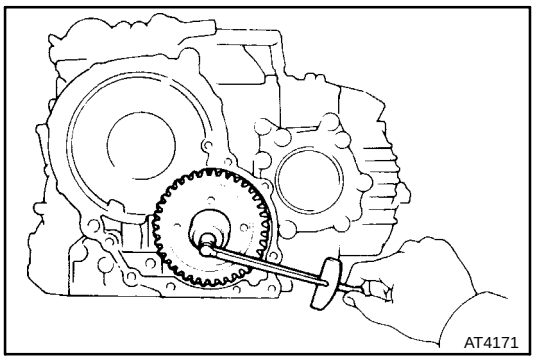
(d) Install and torque the eleven bolts.

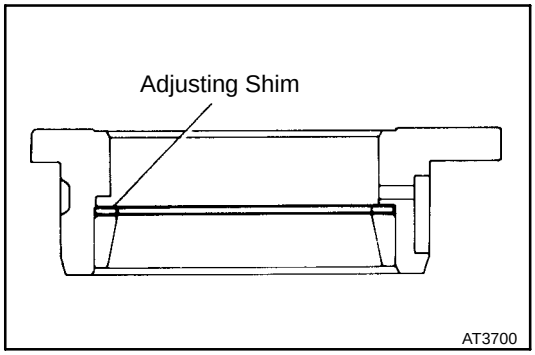
Torque: 400 kg-cm (29 ft-lb, 39 N-m)

HINT: Each bolt length (mm, in.) is indicated in the figure.









11. ADJUST SIDE SEARING PRELOAD

(a) Remove any packing material on the contacting surfaces of the LH bearing retainer and transaxle case.

HINT: Do not apply seal packing yet.

(b) Install the LH bearing retainer and torque the six bolts.

Torque: 195 kg-cm (14 ft-lb, 19 N-m)

(c) Snap down the bearings by turning the differential case several times.

(d) Using a torque meter, measure the differential total preload.

Total preload (at starting)
Add drive pinion preload

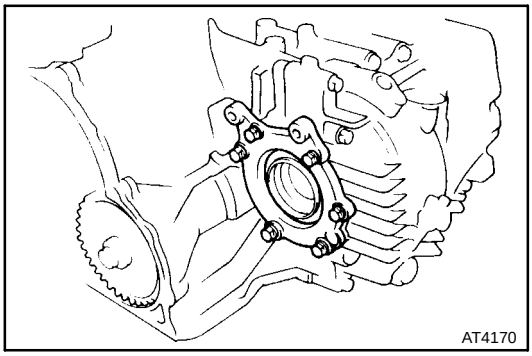
kg-cm (in.-lb, N-m)

	New Bearing	Reused Bearing
A540E	2.8 - 4.4 (2.4 - 3.8, 0.3 - 0.4)	1.4 - 2.2 (1.2 - 1.9, 0.1 - 0.2)
A540H	2.3 - 3.7 (2.0 - 3.2, 0.2 - 0.4)	1.2 - 1.9 (1.0 - 1.6, 0.1 - 0.2)

If the preload is not within specification, replace the adjusting shim in the LH bearing retainer with another thickness one.

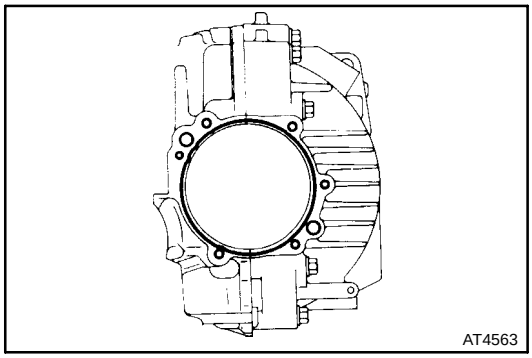
mm (in.)

Mark	Thickness	Mark	Thickness
0	2.00 (0.0787)	9	2.45 (0.0965)
1	2.05 (0.0807)	A	2.50 (0.0984)
2	2.10 (0.0827)	B	2.55 (0.1004)
3	2.15 (0.0846)	C	2.60 (0.1024)
4	2.20 (0.0866)	D	2.65 (0.1043)
5	2.25 (0.0886)	E	2.70 (0.1063)
6	2.30 (0.0906)	F	2.75 (0.1083)
7	2.35 (0.0925)	G	2.80 (0.1102)
8	2.40 (0.0945)	H	2.85 (0.1122)



12. INSTALL LH BEARING RETAINER

(a) Remove the six bolts and LH bearing retainer.

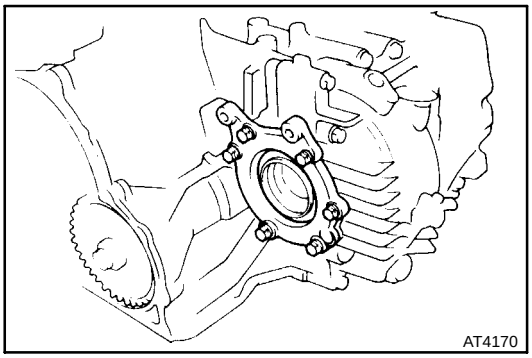


(b) Remove any packing material on the contacting surfaces of LH bearing retainer, transaxle case and carrier cover.

(c) Apply the seal packing to the transaxle case and carrier cover as shown.

Seal packing: Part No. 08826 - 00090, THREE BOND 1281 or equivalent

HINT: Install the LH bearing retainer with ten minutes after applying seal packing.



(d) Install the LH bearing retainer.

(e) Coat the threads of bolts with sealer.

Sealer: Part No. 08833 - 00070, THREE BOND 1324 or equivalent

(f) Tighten the bolts.

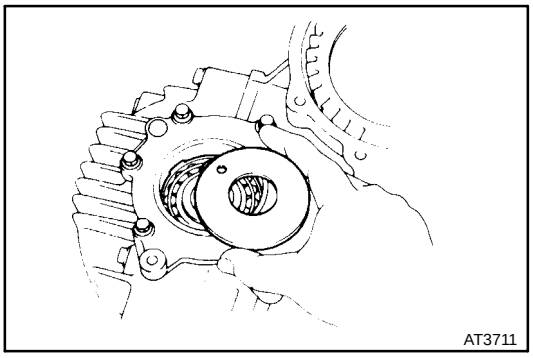
Torque: 195 kg-cm (14 ft-lb, 19 N-m)

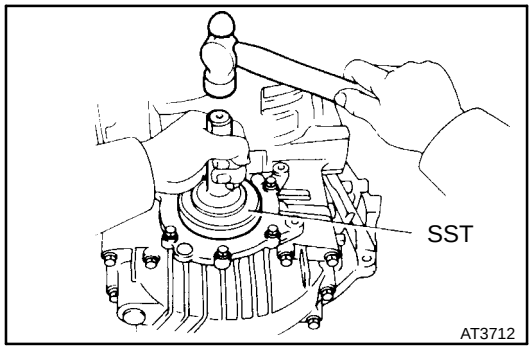
(g) Snap down the bearings.

(h) Recheck the differential total preload.

13. INSTALL NEW OIL SEAL

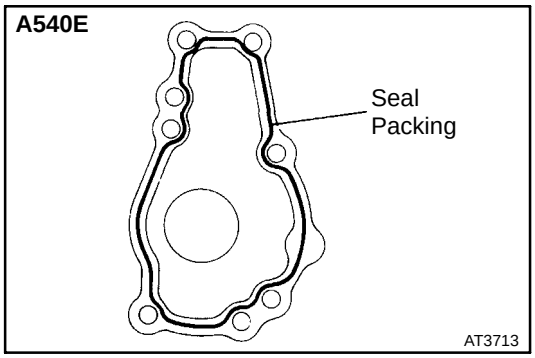
(a) Place the oil baffle onto the LH bearing retainer.





(b) Using SST, driven in a new oil seal until its end is flush with the surface of the LH bearing retainer.

SST 09223-15010



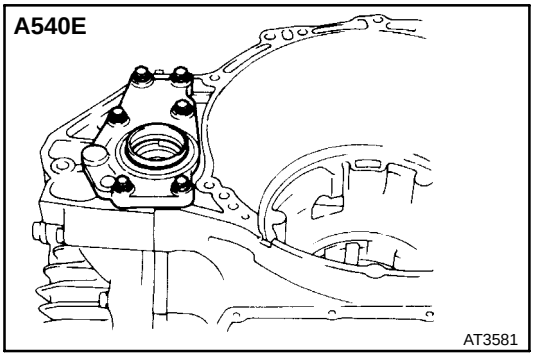
14. (A540E)
INSTALL RH RETAINER

(a) Remove any packing material on the contacting surfaces of RH retainer and transaxle case.

(b) Apply the seal packing to the RH retainer as shown.

Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT: Install the RH retainer within ten minutes after applying seal packing.

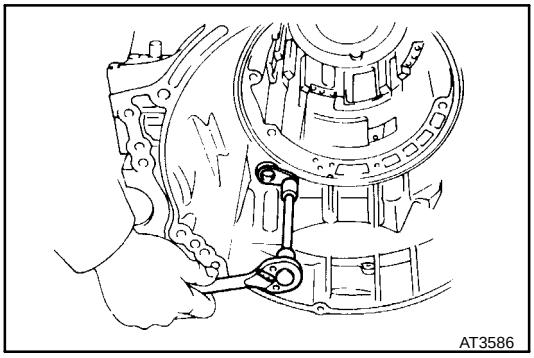


(c) Coat the threads of bolts with sealer.

Sealer: Part No. 08833 - 00070, THREE BOND 1324 or equivalent

(d) Tighten the bolts.

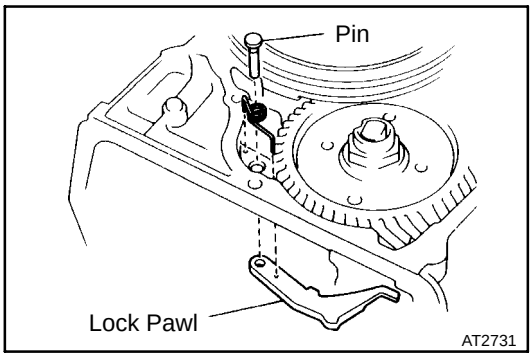
Torque: 195 kg-cm (14 ft-lb, 19 N-m)



15. INSTALL DRIVE PINION CAP

(a) Install a new O-ring to the cap.

(b) Install the drive pinion cap to the transaxle case.

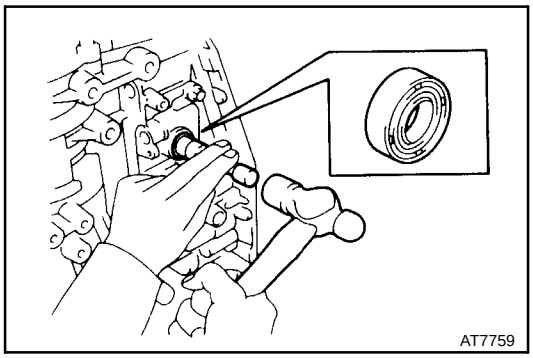


INSTALLATION OF 4-SPEED GEAR UNIT

1. INSTALL PARKING LOCK PAWL

(a) Place the parking lock pawl onto the case. Hook the spring ends to the case and pawl.

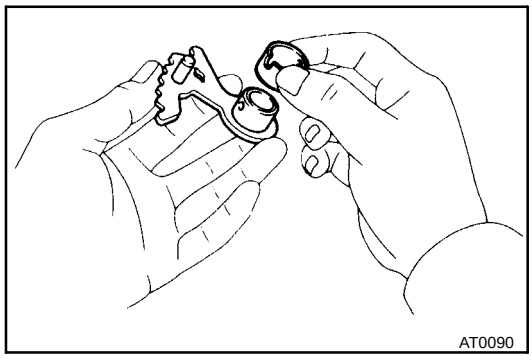
(b) Install the pin into the hole of the case through the spring and pawl.



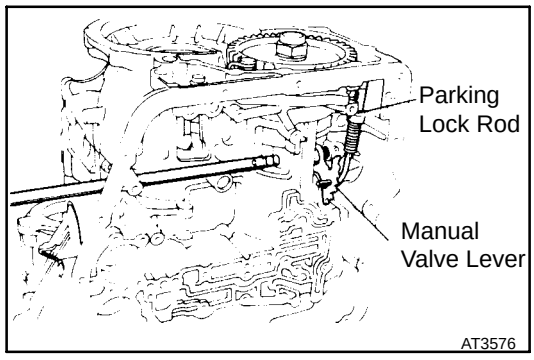
2. INSTALL MANUAL VALVE SHAFT

(a) Coat the oil seal lip with the MP grease.

(b) Install the manual valve shaft oil seal to the case.

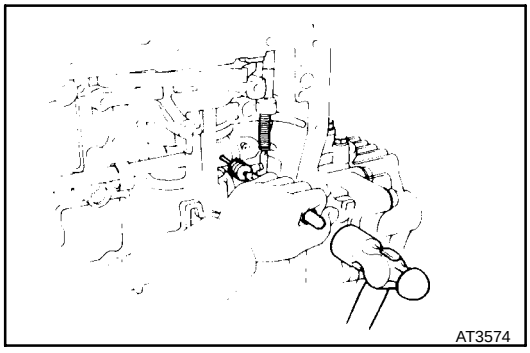


(c) Assemble a new collar to the manual valve lever.

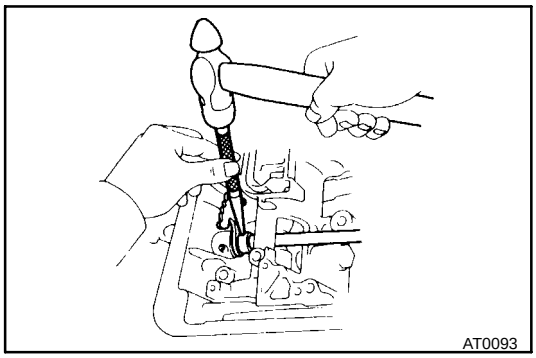


(d) Install the manual valve shaft to the transmission case through the manual valve lever.

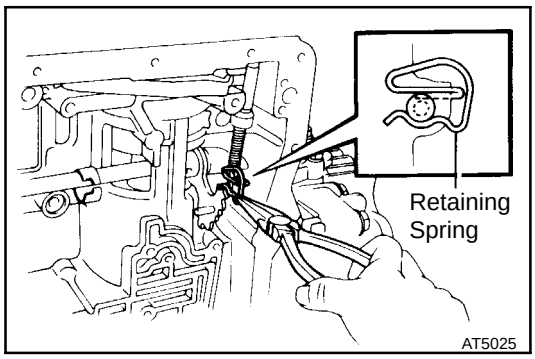
(e) Install the parking lock rod.



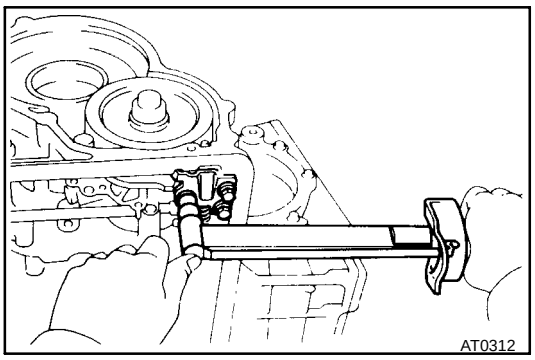
(f) Using a pin punch, drive in the roll pin until its surface is flush with the manual valve lever surface.



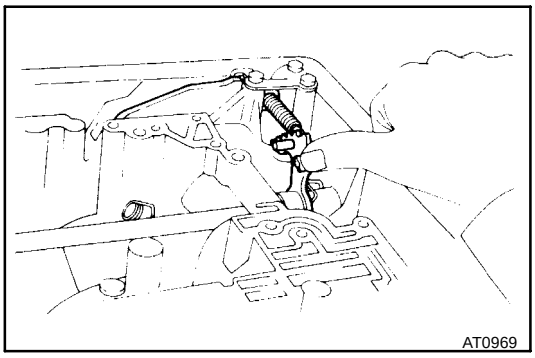
(g) Match the collar hole to the lever calking hollow and calk the collar to the lever.



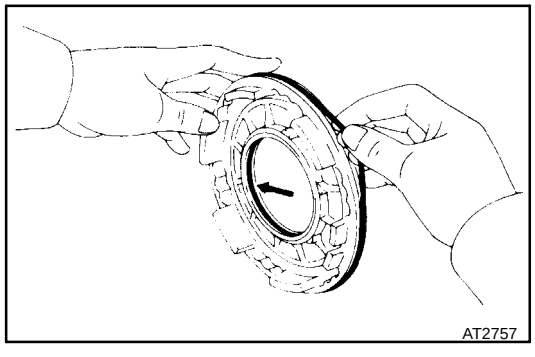
(h) Install the retaining spring.



3. INSTALL PARKING LOCK PAWL BRACKET
Torque: 75 kg-cm (65 in.-lb, 7.4 N-m)



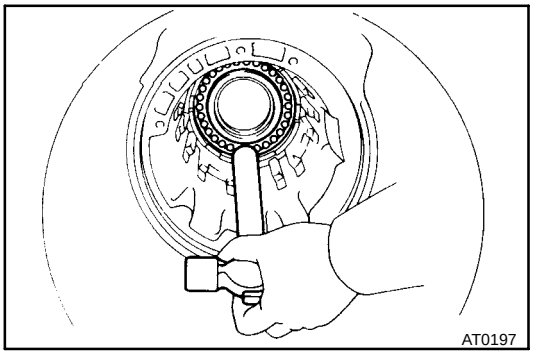
4. CHECK OPERATION OF PARKING LOCK PAWL
Make sure the counter driven gear is locked when the manual valve lever is in the P range.



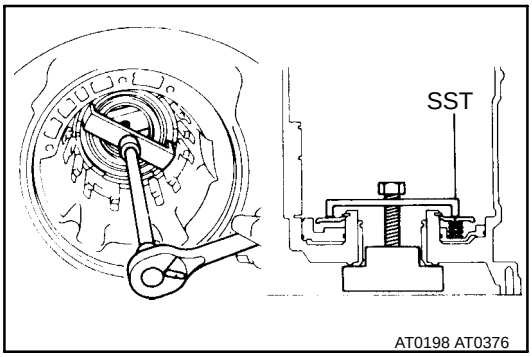
5. INSTALL FIRST AND REVERSE BRAKE PISTON TO TRANSMISSION CASE

(a) Coat the new O-rings with ATF.

(b) Install the two O-rings on the piston.



(c) Push the piston into the bore of the case, facing the spring seat upward.

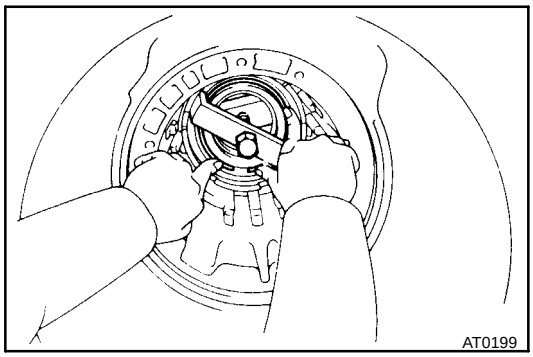


6. INSTALL PISTON RETURN SPRING

(a) Place the return spring and snap ring on the piston.

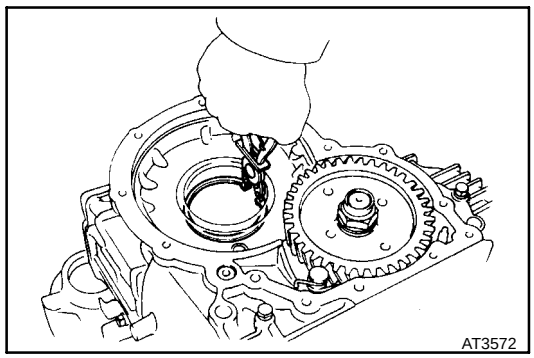
(b) Place SST, and compress the return spring evenly by tightening the bolt gradually.

SST 09350-32014 (09351-32040)

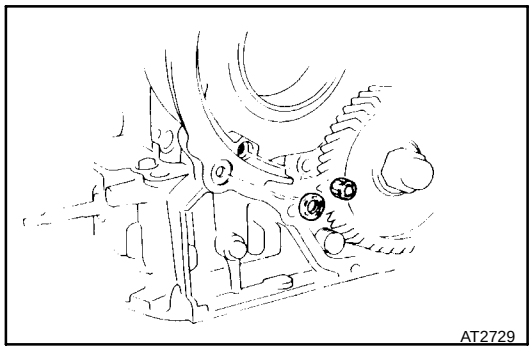


(c) Install snap ring. Visually check to make sure it is fully seated and centered by the three lugs on the spring retainer.
Be sure the end gap of snap ring is not aligned with the spring retainer claw.

(d) Remove SST.

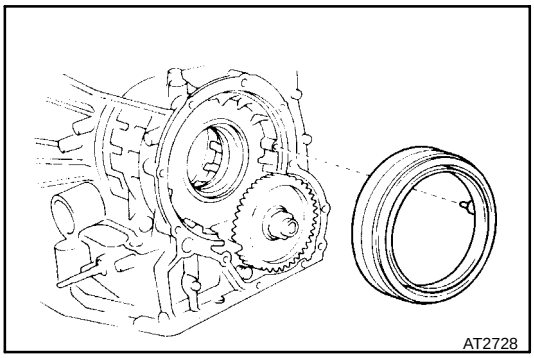


7. INSTALL SNAP RING TO TRANSAXLE CASE



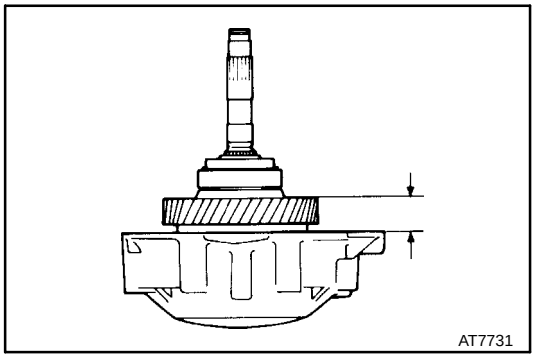
8. INSTALL OVERDRIVE UNIT

(a) Install the overdrive brake apply gasket and overdrive clutch apply gasket.

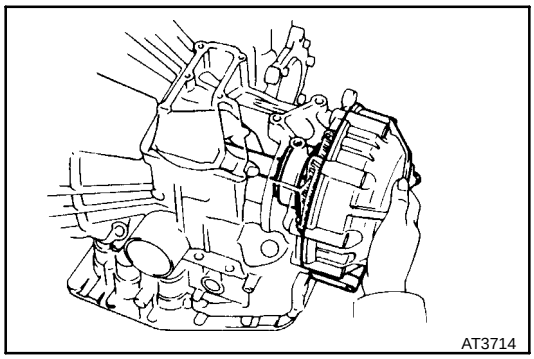


(b) Install the overdrive brake drum to the case.

(c) Install the new case gasket to the case.

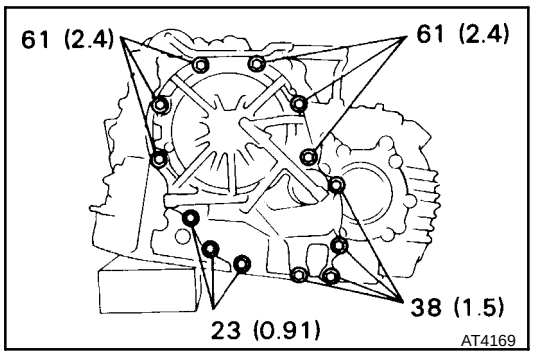


(d) Make sure that the length from the top surface of the case to the counter driven gear top surface should be about 24 mm (0.94 in.)



(e) Place the new gasket onto the transaxle case.

(f) Install the overdrive assembly with overdrive case to the transaxle case.



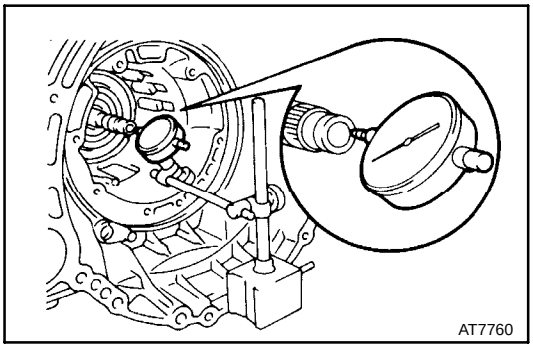
(g) Coat the threads of 23 mm (0.91 in.) bolts with sealer.

Sealer: Part No. 08833 - 00070, THREE BOND 1324 or equivalent.

(h) Install and tighten the thirteen bolts.

Torque: 250 kg-cm (18 ft-lb, 25 N-m)

HINT: Each bolt length (mm, in.) is indicated in the figure.



9. CHECK INTERMEDIATE SHAFT END PLAY

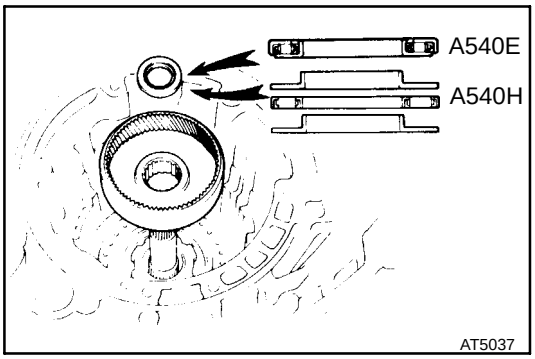
(a) Make sure that the intermediate shaft has thrust play in axial direction.

Thrust play: 0.47 - 1.50 mm (0.0185 - 0.0591 in.)

If the thrust play is not within specification, check the installation of intermediate shaft.

(See page AT-83)

(b) Make sure that the intermediate shaft turns smoothly.



10. INSTALL REAR PLANETARY GEAR

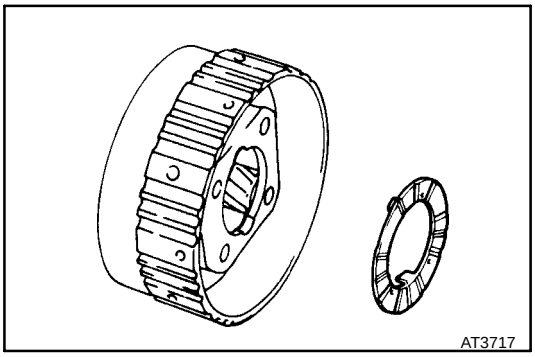
(a) Install the rear planetary ring gear.

(b) (A540E)
Place the bearing onto the ring gear.

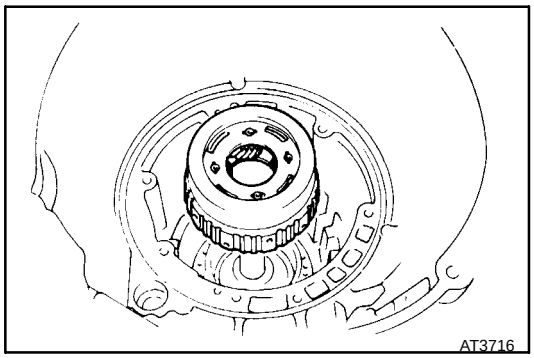
(c) (A540H)
Coat the races and bearing with petroleum jelly and install them onto the ring gear.

Bearing and race: mm (in.)

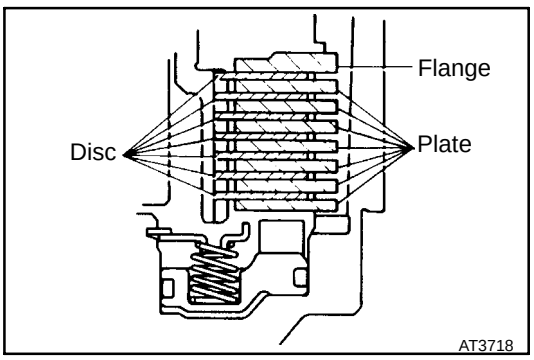
		Outer Diameter	Inner Diameter
A540E	Bearing	38.7 (1.524)	22.6 (0.890)
A540H	Front Race	37.3 (1.469)	24.1 (0.949)
	Bearing	37.6 (1.480)	24.0 (0.945)
	Rear Race	37.6 (1.480)	22.2 (0.874)



(d) Coat the thrust washer with petroleum jelly and place it onto the rear planetary gear.



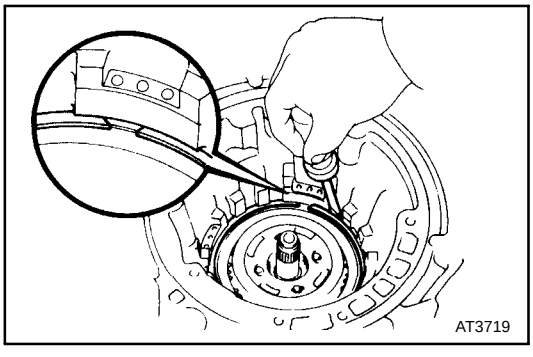
(e) Install the rear planetary gear.



11. INSTALL DISCS, PLATES AND FLANGE OF FIRST AND REVERSE BRAKE

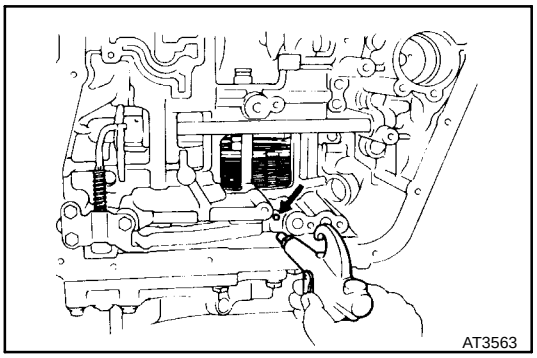
(a) Install the seven plates and seven discs.
Install in order: P = Plate D = Disc
A540E: P-D-P-D-P-D-P-D-P-D-P-D-P
A540H: P-D-P-D-P-D-P-D-P-D-P

(b) Install the flange, facing the flat end downward.



(c) Install the snap ring.

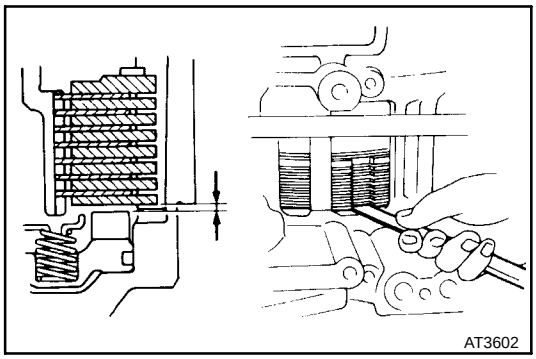
HINT: Be sure that the end gap of the snap ring is not aligned with one of cutouts.



12. CHECK FIRST AND REVERSE BRAKE

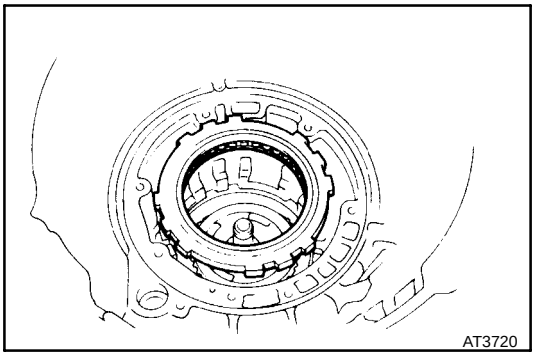
(a) Check the operation of the first and reverse brake piston.

Apply compressed air into the case passage and confirm that the piston moves.



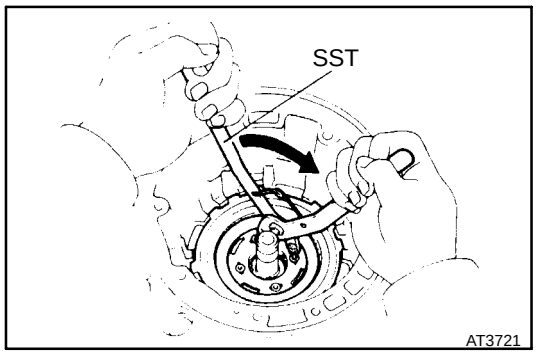
(b) Using a filler gauge, check the pack clearance of the first and reverse brake.

Clearance: A540E
0.85 - 2.05 mm (0.033 - 0.081 in.)
A540H
1.04 - 2.16 mm (0.041 - 0.085 in.)



13. INSTALL NO. 2 ONE-WAY CLUTCH INTO CASE

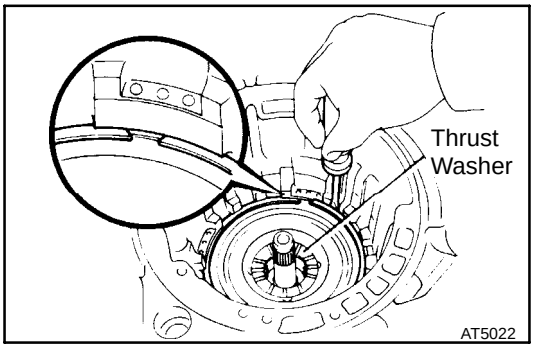
(a) Place the No. 2 one-way clutch with the shiny side of flange upward.



(b) Install the one-way clutch while turning the planetary gear clockwise with SST.

SST 09350-32014 (09351-32050)

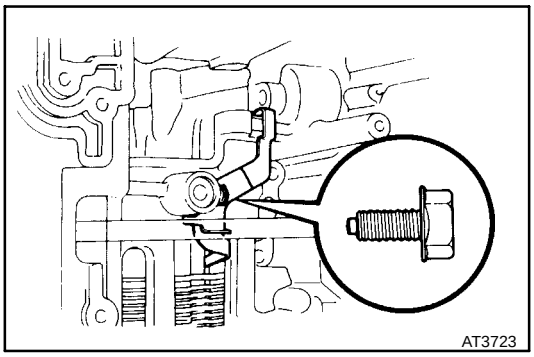
If can not turn the planetary gear clockwise, check the installation of the one-way clutch.



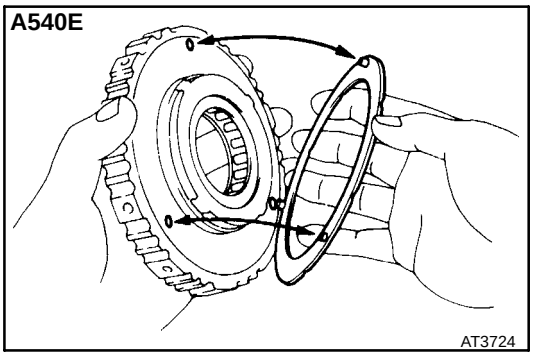
(c) Install the snap ring.

HINT: Be sure that the end gap of the snap ring is not aligned with one of cutouts.

(d) (A540H only)
Coat the thrust washer with petroleum jelly and install it onto the rear planetary gear.

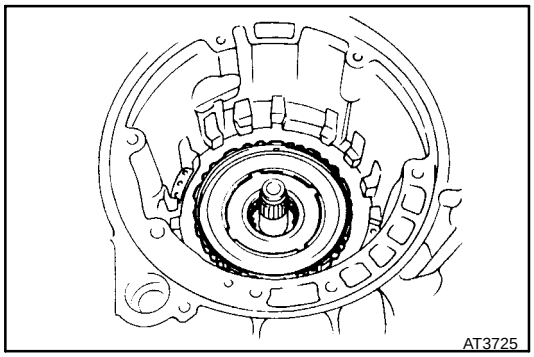


14. INSTALL SECOND COAST BRAKE BAND GUIDE

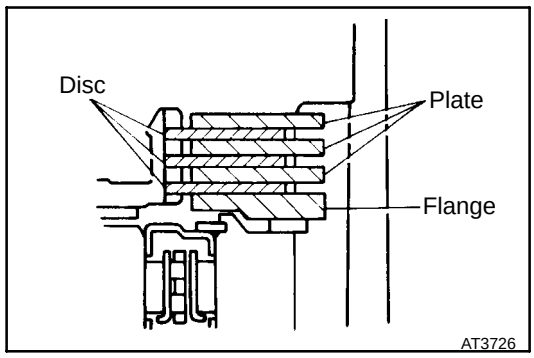


15. PLACE NO. 1 ONE-WAY CLUTCH

(a) Coat the thrust washer with petroleum jelly and install it on the No. 1 one-way clutch. (A540E)



(b) Place the No. 1 one-way clutch onto the rear planetary gear.

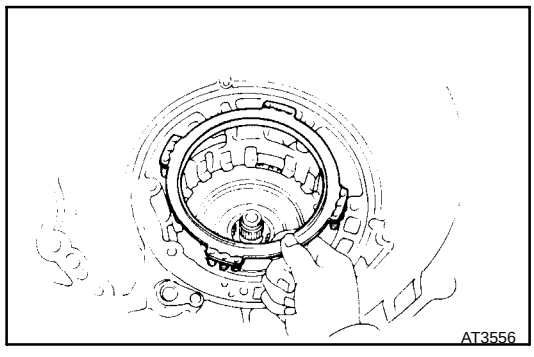


16. INSTALL SECOND BRAKE

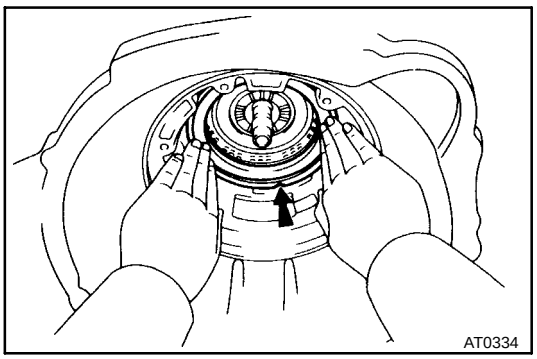
(a) Install the flange, facing the flat end upward.

(b) Install the three discs and plates.

Install in order: P = Plate D = Disc
D-P-D-P-D-P

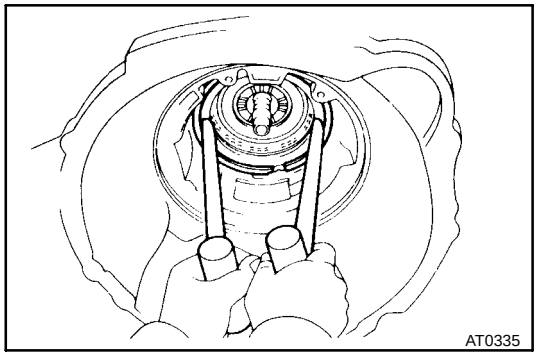


(c) Place the piston return spring into the case.



(d) Place the second brake drum into the case.

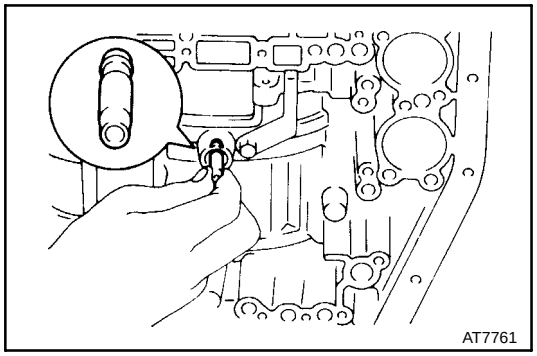
HINT: Align the groove of the drum with the bolt.



(e) Place the snap ring into the case so that end gap is installed into the groove.

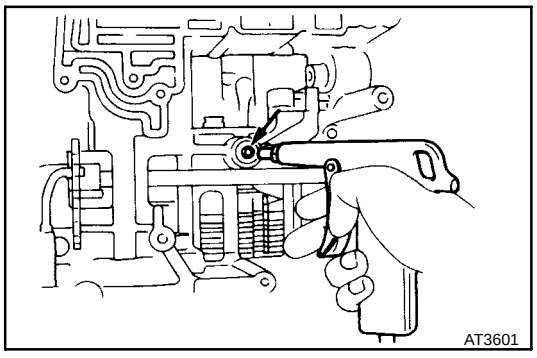
(f) While compressing the piston return springs over the drum with hammer handles, install the snap ring into the groove.

(g) Be sure that the end gap of the snap ring is not aligned with one of cutouts.



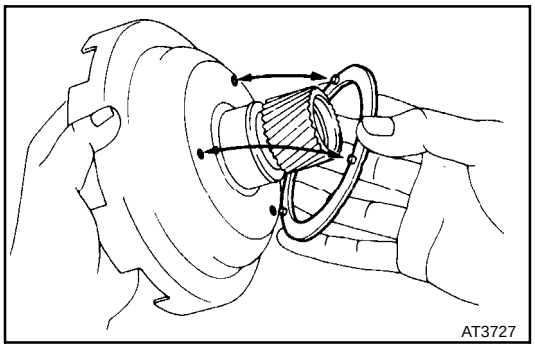
17. INSTALL NEW SECOND BRAKE GASKET

Install a new gasket until it makes contact with the second brake drum.



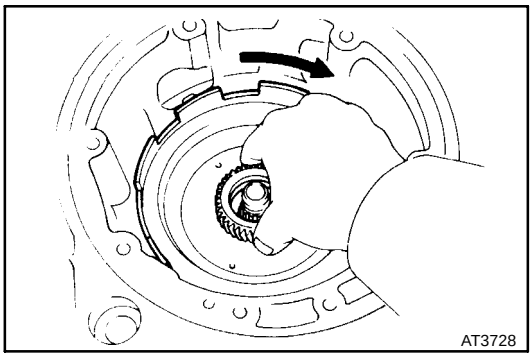
18. CHECK OPERATION OF SECOND BRAKE

Apply compressed air into the second brake gasket and confirm that the piston moves.

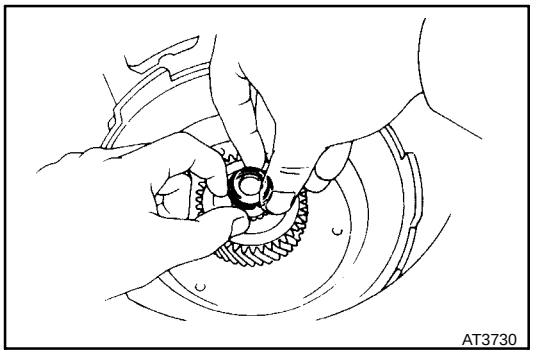


19. INSTALL SUN GEAR AND SUN GEAR INPUT DRUM

(a) Coat the thrust washer with petroleum jelly and install it on the sun gear input drum.

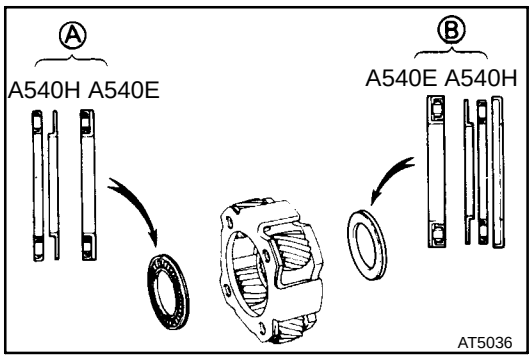


(b) While turning the sun gear clockwise, install it into the No. 1 one-way clutch.



20. INSTALL OIL SEAL RING TO INTERMEDIATE SHAFT

HINT: After installing the oil seal ring, check that it moves smoothly.



21. INSTALL FRONT PLANETARY GEAR

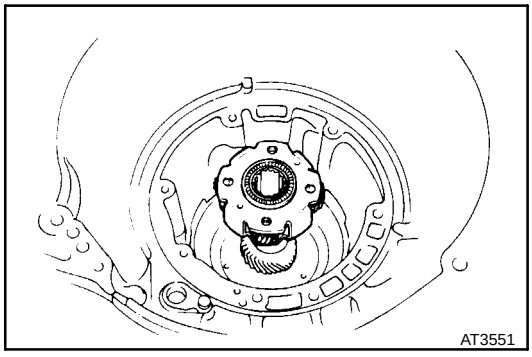
(a) Coat the races and bearings with petroleum jelly, and install them onto the both sides of planetary gear.

Bearing and race: Ⓐ mm (in.)

		Outer Diameter	Inner Diameter
A540E	Bearing	45.5 (1.791)	30.1 (1.185)
A540H	Bearing	45.0 (1.772)	30.0 (1.181)
	Race	45.0 (1.772)	28.0 (1.102)

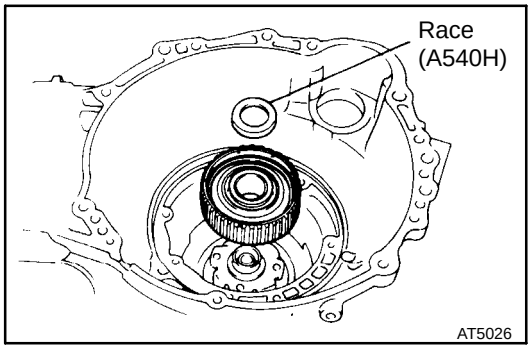
Bearing and race: Ⓑ mm (in.)

		Outer Diameter	Inner Diameter
A540E	Bearing	45.5 (1.791)	30.1 (1.185)
A540H	Front Race	37.9 (1.492)	22.0 (0.866)
	Bearing	36.1 (1.421)	22.2 (0.874)
	Rear Race	35.0 (1.378)	19.0 (0.748)



HINT: The bearings are the same on the Ⓐ and Ⓑ side (A540E).

(b) Install the planetary gear onto the sun gear.

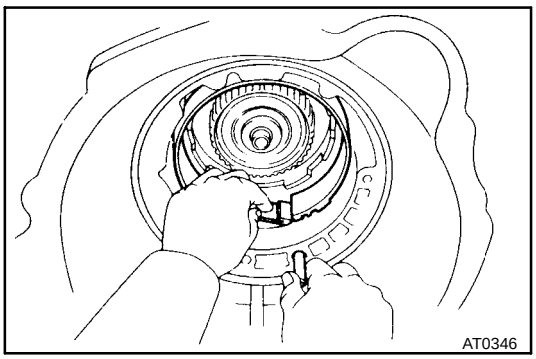


22. INSTALL FRONT PLANETARY RING GEAR

(A540H)

Coat the race with petroleum jelly and install it onto the tip of ring gear.

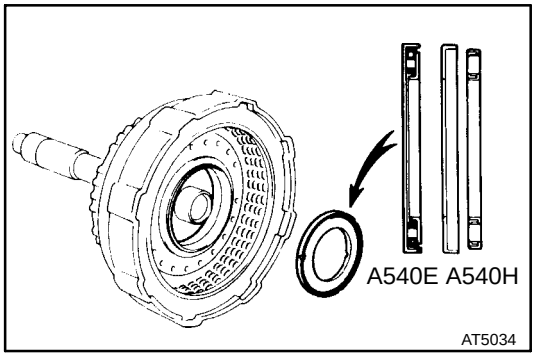
Race: Outer diameter 35.7 mm (1.406 in.)
Inner diameter 23.0 mm (0.906 in.)



23. INSTALL SECOND COAST BRAKE BAND

(a) Place the band into the case.

(b) Install the pin through the oil pump mounting bolt hole.



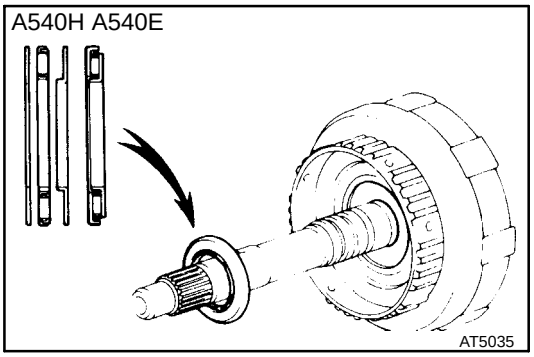
24. INSTALL FORWARD CLUTCH AND DIRECT CLUTCH

(a) Coat the race and bearing with petroleum jelly and install it onto rear side of the forward clutch.

Bearing and race

mm (in.)

		Outer Diameter	Inner Diameter
A540E	Bearing	47.6 (1.874)	31.4 (1.236)
A540H	Bearing	36.1 (1.421)	22.2 (0.874)
	Race	37.9 (1.492)	22.0 (0.866)



(b) Coat the race and bearing with petroleum jelly and install it onto front side of the forward clutch.

HINT: There are two different-thick races (A540H) and bearings (A540E) for adjustment of the input shaft thrust play.

Bearing: A540E

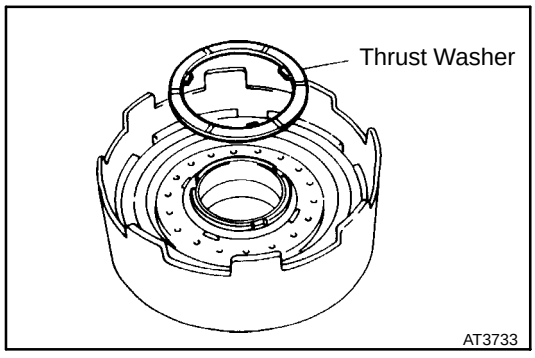
mm (in.)

	Thickness	Outer Diameter	Inner Diameter
Bearing	3.60 (0.1417)	45.9 (1.807)	27.7 (1.091)
	4.19 (0.1650)	47.1 (1.854)	27.7 (1.091)

Bearing and race: A540H

mm (in.)

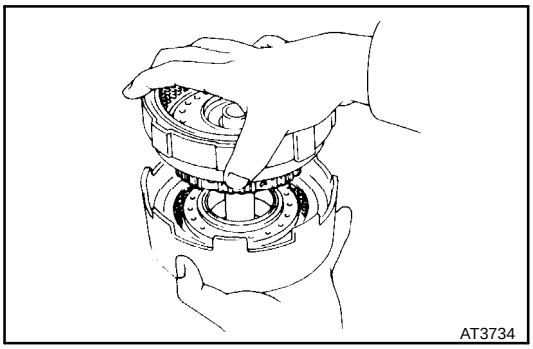
	Thickness	Outer Diameter	Inner Diameter
Front Race	0.8 (0.0315)	43.0 (1.693)	30.5 (1.201)
	1.4 (0.0551)		
Bearing	—	42.0 (1.654)	28.9 (1.138)
Rear Race	—	42.0 (1.654)	27.1 (1.067)

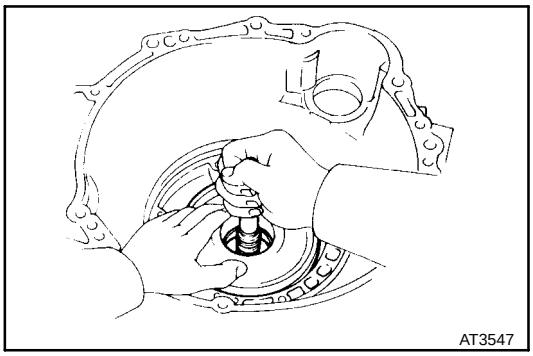


(c) Coat the thrust washer with petroleum jelly and install it with the oil groove facing upward onto the direct clutch drum.

(d) Mesh the hub of the forward clutch with flukes of the direct clutch discs.

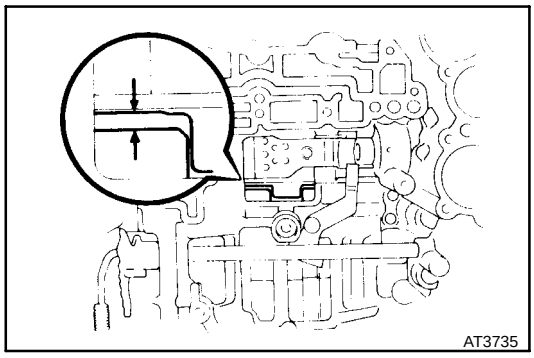
HINT: Be careful that the bearing and thrust washer do not get out of place.





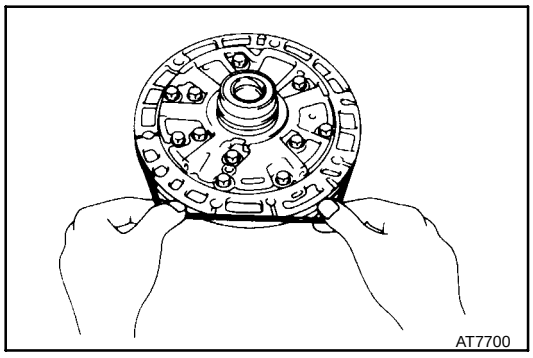
(e) Install the direct clutch and forward clutch into the case.

HINT: Hold the direct clutch toward the forward clutch to prevent the thrust washer from getting out of place.



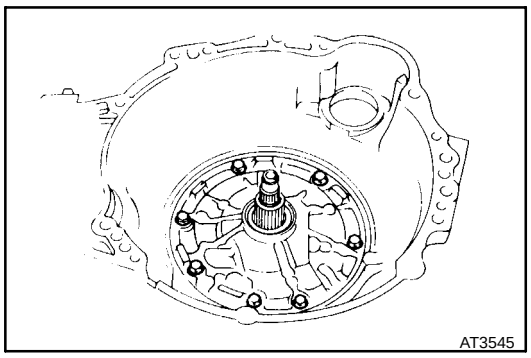
(f) Check the distance between the direct clutch drum and the sun gear input drum.

Distance: Approx. 3 mm (0.12 in.)



25. INSTALL OIL PUMP INTO CASE

(a) Coat a new O-ring with ATF and install it to the oil pump.

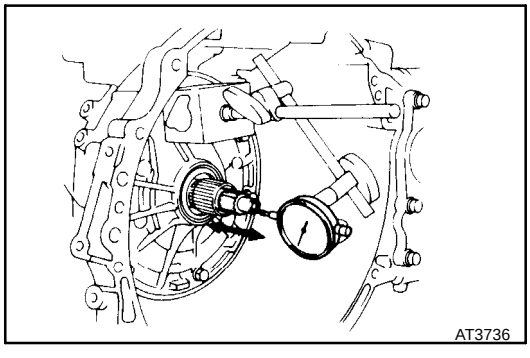


(b) Place the oil pump through the input shaft, and align the bolt holes of the pump body with the transmission case.

NOTICE: Do not push on the oil pump strongly or the oil seal ring will stick to the direct clutch drum.

(c) Install and tighten the seven bolts.

Torque: 225 kg-cm (16 ft-lb, 22 N-m)



26. MEASURE THRUST PLAY OF INPUT SHAFT

Measure the thrust play with a dial gauge.

Thrust play: 0.13 - 0.90 mm (0.0051 - 0.0354 in.)

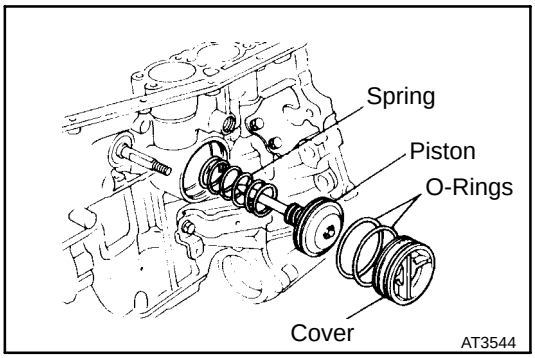
HINT: There are two different-thick bearings (A540E) or races (A540H) for the end of stator shaft. If the thrust play is in excess of standard, select one of them.

(A540E)

Bearing thickness: 3.60 mm (0.1417 in.)
4.19 mm (0.1650 in.)

(A 540H)

Race thickness: 0.8 mm (0.031 in.)
1.4 mm (0.055 in.)



27. CHECK INPUT SHAFT ROTATION

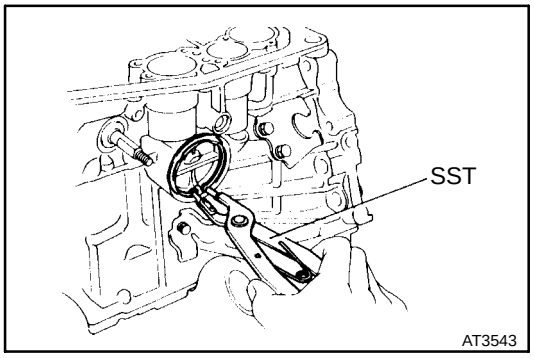
Make sure that the input shaft rotates smoothly.

28. INSTALL SECOND COAST BRAKE PISTON

(a) Coat the new O-rings with ATF and install it to the cover.

(b) Install the outer spring with the piston.

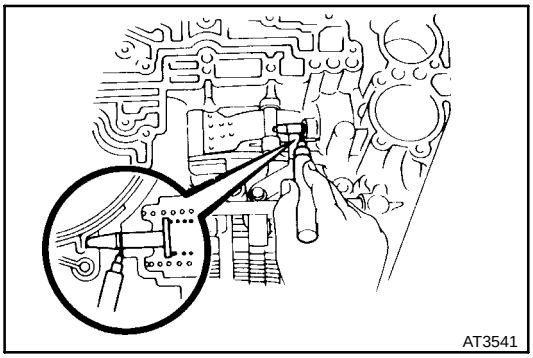
(c) Place the cover into the bore.



(d) Using SST, install the snap ring while pressing the cover.

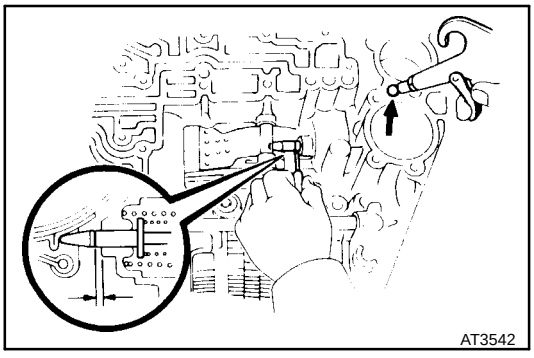
SST 09350-32014 (09351-32050)

(e) Check that the front end of the piston rod contacts the center of the second brake band depression.



29. CHECK SECOND COAST BRAKE PISTON STROKE

(a) Apply a small amount of paint to the piston rod at the point it meets the case shown in the illustration.



(b) Using SST, measure the piston stroke applying and releasing the compressed air (4 - 8 kg/cm^2, 57 - 114 psi or 392 - 785 kPa) as shown.

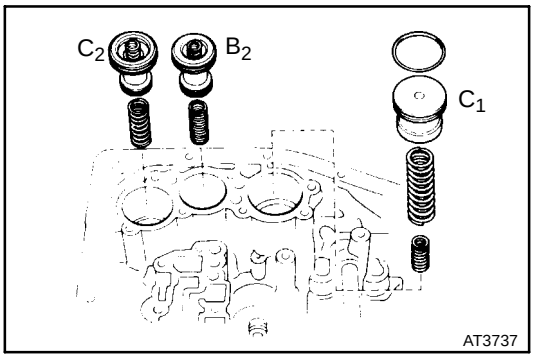
SST 09240-00020

Piston stroke: 2.0 - 3.5 mm (0.079 - 0.138 in.)

If the stroke is more than specified, replace the piston rod with a longer one.

Piston rod length: 95.2 mm (3.748 in.)
96.3 mm (3.791 in.)

It is still more than standard value, replace the brake band with a new one.



30. INSTALL ACCUMULATOR PISTONS AND SPRINGS

(a) Install the new O-rings to the pistons.

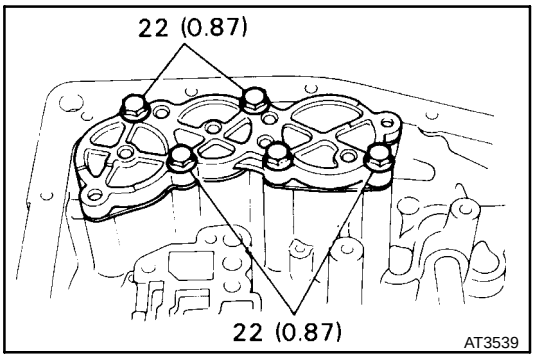
(b) Install the springs and pistons into the bores.

Spring		Free length mm (in.)	Outer diameter mm (in.)	Color
C_2		51.0 (2.008)	18.0 (0.709)	Red
B_2		58.5 (2.303)	15.2 (0.598)	Orange
C_1	Outer	71.2 (2.803)	24.4 (0.961)	Blue
	Inner	43.4 (1.709)	17.8 (0.701)	Light green

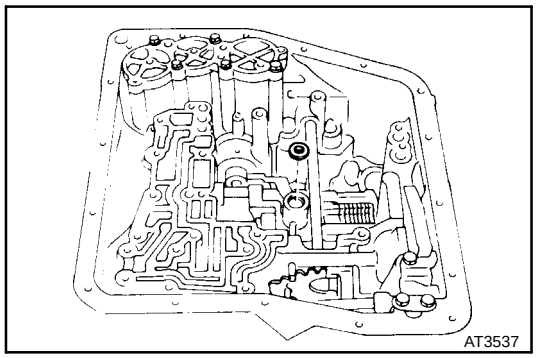
(c) Place the cover with a new gasket and gradually tighten the bolts a little a time in sequence.

HINT: Each bolt length (mm, in.) is indicated in the figure.

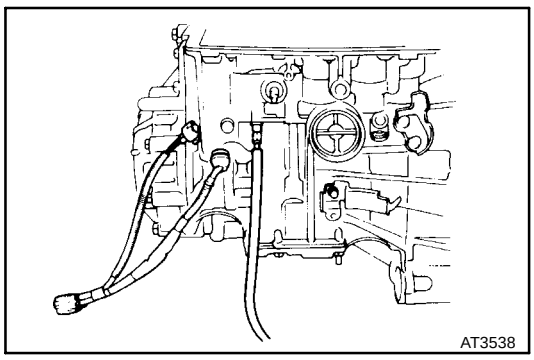
Torque: 100 kg-cm (7 ft-lb, 10 N-m)



31. PLACE NEW SECOND BRAKE APPLY GASKET



32. INSTALL THROTTLE CABLE AND SOLENOID WIRE

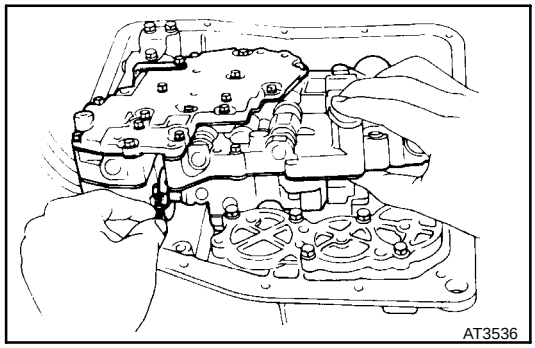


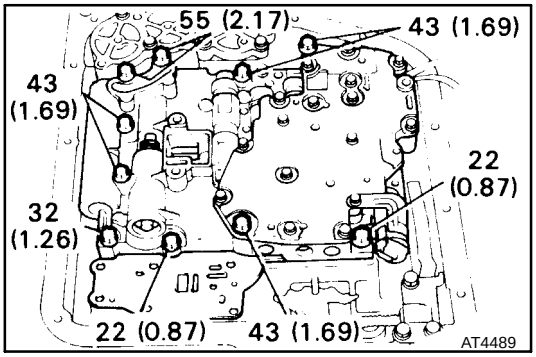
33. INSTALL VALVE BODY TO TRANSAXLE CASE

(a) While holding the cam down with your hand, slip the cable end into the slot.

(b) Lower the valve body into place.

NOTICE: Do not entangle the solenoid wire.



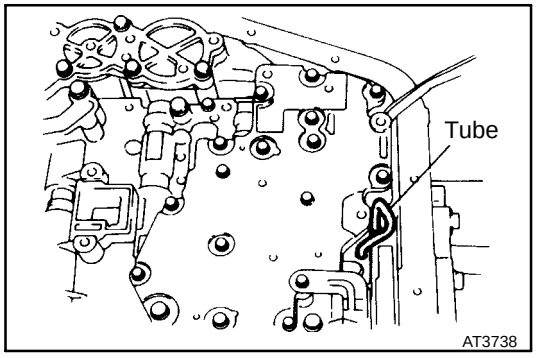


(c) Install and tighten the ten bolts.

HINT:

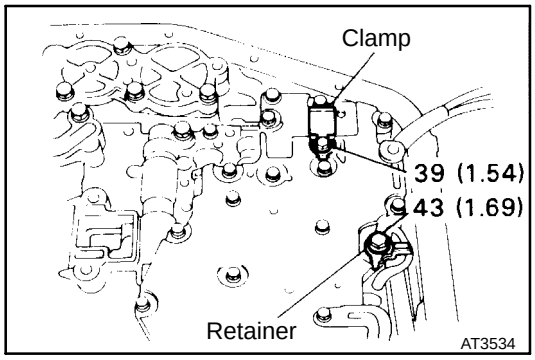
Each bolt length (mm, in.) is indicated in the figure. Hand tighten the ten bolts first, then torque with a torque wrench.

Torque: 110 kg-cm (8 ft-lb, 11 N-m)



34. INSTALL B_3 APPLY TUBE

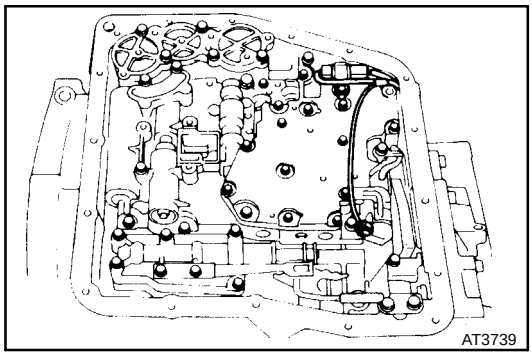
NOTICE: Be careful not to bend or damage the tube.



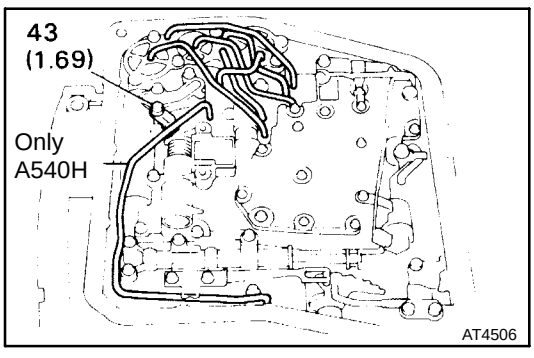
35. INSTALL CONNECTOR CLAMP AND TUBE RETAINER

HINT: Each bolt length (mm, in.) is indicated in the figure.

Torque: 110 kg-cm (8 ft-lb, 11 N-m)



36. CONNECT SOLENOID CONNECTORS



37. INSTALL OIL TUBES

(A540E)

Using a plastic hammer, install the tubes into the positions indicated in the figure.

(A540H)

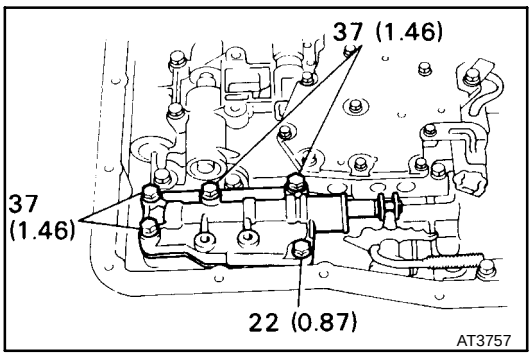
(a) Using a plastic hammer, install the tubes into the positions indicated in the figure.

(b) Install the bolt.

Torque: 55 kg-cm (48 in.-lb, 5.4 N-m)

HINT: Each bolt length (mm, in.) is indicated in the figure.

NOTICE: Be careful not no bend or damage the tubes.



38. INSTALL MANUAL VALVE BODY AND DETENT SPRING

HINT: Each bolt length (mm, in.) is indicated in the figure.

(a) Align the manual valve with the pin on the manual shaft lever.

(b) Lower the manual valve body into place.

(c) Hand tighten the five bolts first. Then, tighten them with a torque wrench.

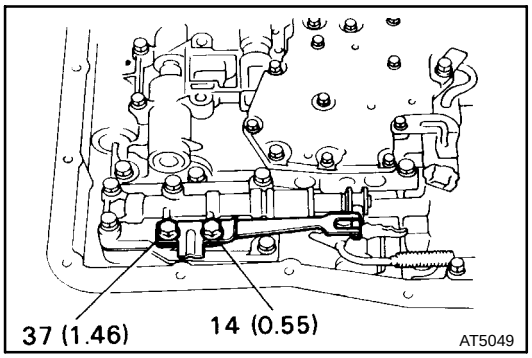
Torque: 110 kg-cm (8 ft-lb, 11 N-m)

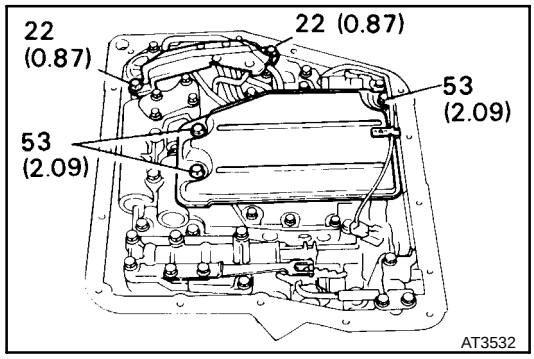
(d) Place the detent springs on the manual valve body and hand tighten the two bolts first.
Then, tighten them with a torque wrench.

Torque: 110 kg-cm (8 ft-lb, 11 N-m)

HINT: Each bolt length (mm, in.) is indicated in the figure.

(e) Check that the manual valve lever is touching the center of the detent spring tip roller.



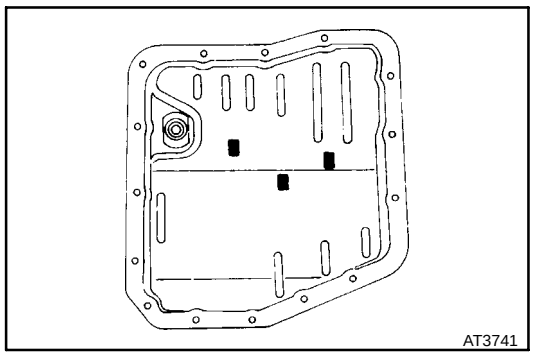


39. INSTALL TUBE BRACKET AND OIL STRAINER

Each bolt length (mm, in.) is indicated in the figure.

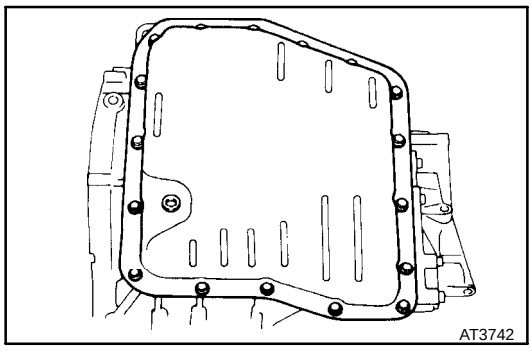
Torque:

Tube bracket	**100 kg-cm (7 ft-lb, 10 N-m)**
Oil strainer	**110 kg-cm (8 ft-lb, 11 N-m)**



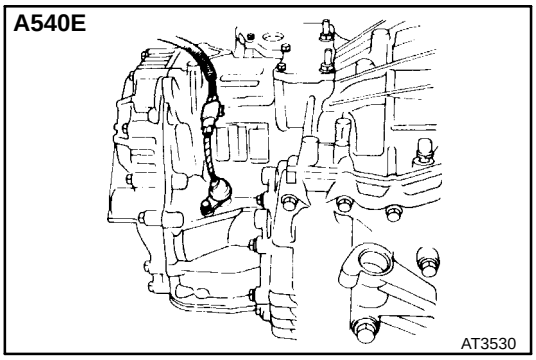
40. INSTALL MAGNETS IN PLACE AS SHOWN

NOTICE: Make sure that the magnets do not interfere with the oil tubes.



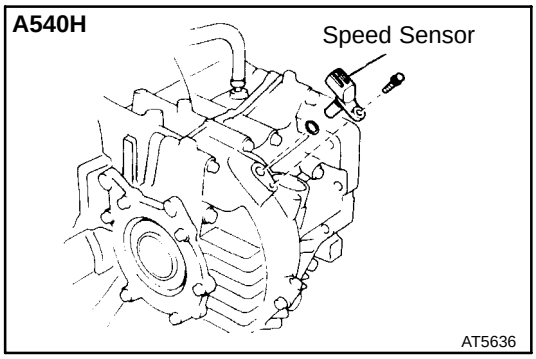
41. INSTALL OIL PAN WITH NEW GASKET

Torque: 50 kg-cm (43 in.-lb, 4.9 N-m)



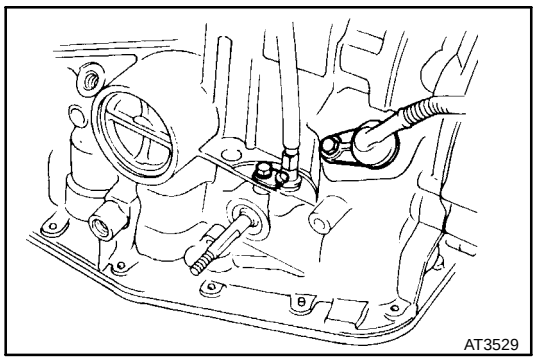
42. (A540E)
INSTALL SPEED SENSOR

(a) Install a new O-ring to the speed sensor.
(b) Install the speed sensor to the transaxle case.
(c) Tighten the bolt.
(d) Connect the sensor connector.



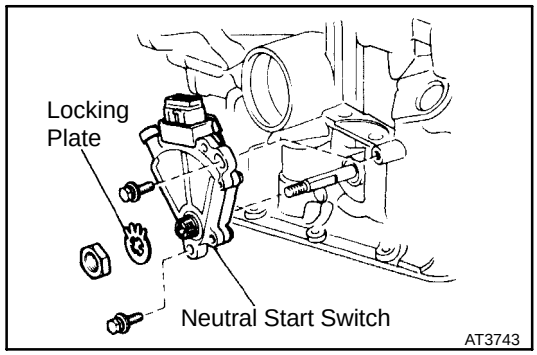
43. (A540H)
INSTALL VEHICLE SPEED SENSOR

(a) Install a new O-ring to the vehicle speed sensor.
(b) Install the vehicle speed sensor to the transaxle case.
(c) Install and tighten the bolt.



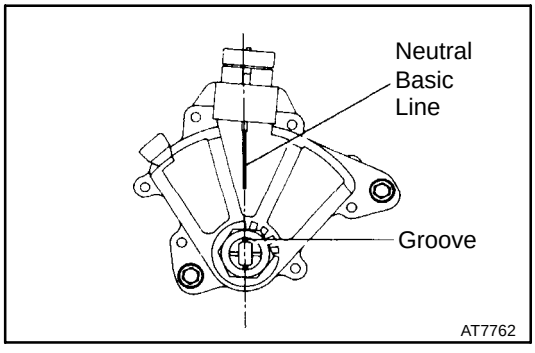
44. INSTALL THROTTLE CABLE RETAINING PLATE

45. INSTALL SOLENOID WIRE

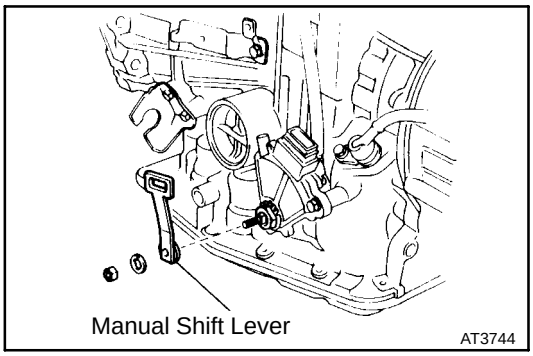


46. INSTALL NEUTRAL START SWITCH

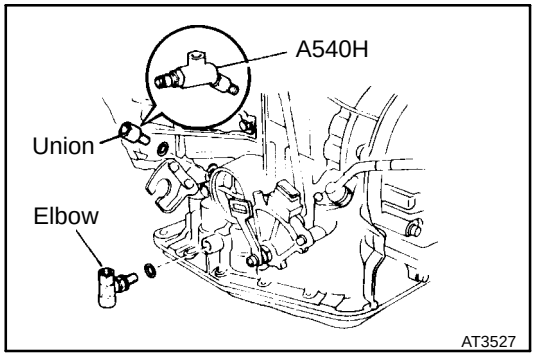
(a) Install the neutral start switch to the manual valve shaft.
(b) Place the new locking plate and tighten the nut.
(c) Stake the nut with locking plate.
(d) Install the two bolts.



(e) Adjust the neutral start switch.
HINT: Align the groove and neutral basic line.
(f) Tighten the two bolts.



47. INSTALL MANUAL SHIFT LEVER

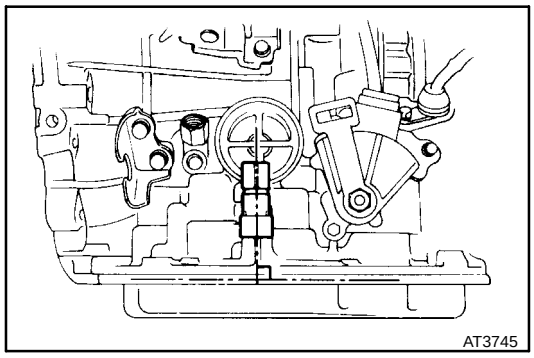


48. INSTALL UNION AND ELBOW

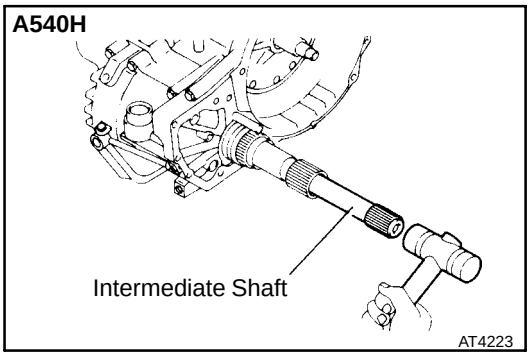
(a) Install the new O-rings to the union and elbow.

(b) Install the union and elbow to the transaxle case.

Torque: 275 kg-cm (20 ft-lb, 27 N-m)



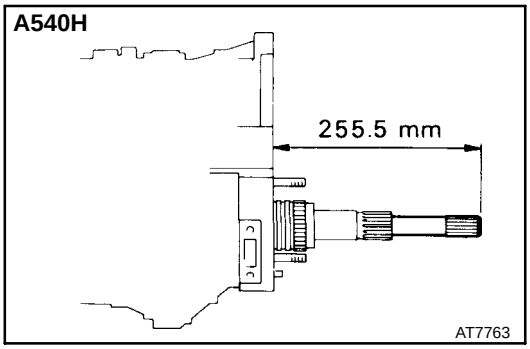
HINT: Install the elbow at right angles to the bottom of the transaxle case.



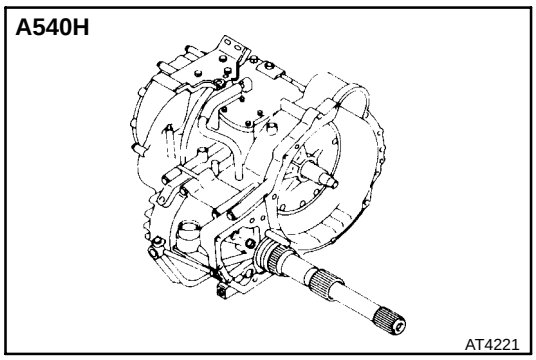
49. (A540H)
INSTALL DIFFERENTIAL SIDE GEAR INTERMEDIATE SHAFT

(a) Install a new snap ring to the shaft groove.

(b) Using a plastic hammer, install the shaft.

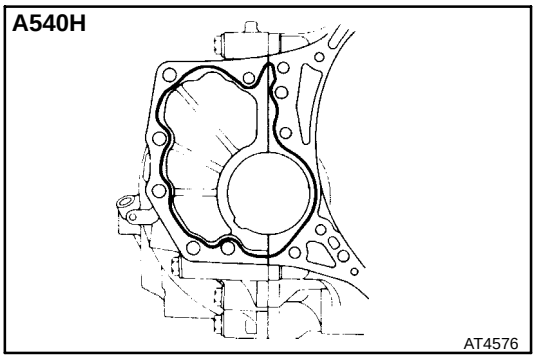


HINT: Keeping the intermediate shaft on the pinion shaft of differential, measure the point in the illustration.
Protrusion length (Reference): 255.5 mm (10.059 in.)



50. (A540H)
INSTALL APPLY GASKET

Install a new apply gasket to the differential carrier cover.



51. (A540H)
INSTALL TRANSFER ASSEMBLY

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transfer and transaxle.

(b) Apply seal packing to the transaxle as shown in the illustration.

Seal packing: Part No. 08826 - 00090, THREE BOND 1281, or equivalent

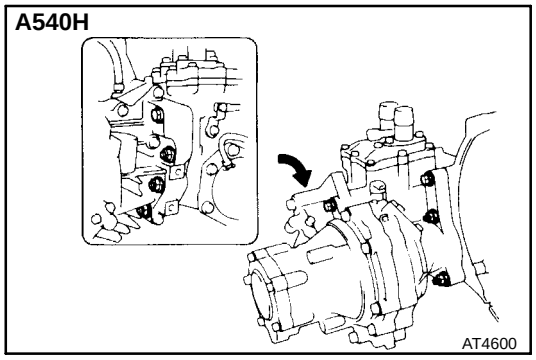
HINT: Install the transfer assembly as soon as the seal packing is applied.

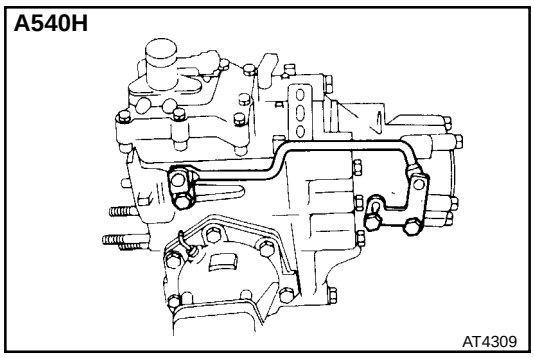
(c) Coat the threads of bolts with sealer.

Sealer: Part No. 08833 - 00070, THREE BOND 1324 or equivalent.

(d) Install and torque the five nuts and three bolts.

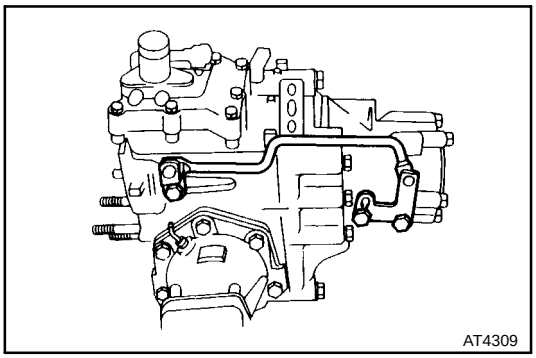
Torque: 700 kg-cm (51 ft-lb, 69 N-m)





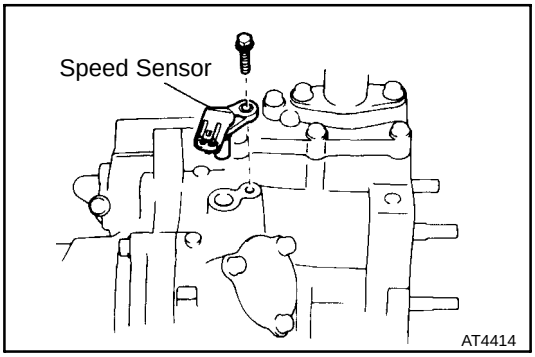
52. (A540H)
INSPECT MODE SELECT LEVER POSITION

After finishing inspection or repair the transaxte, be sure the select lever position to FREE mode and attach the lock bolt.


AT4309

DISASSEMBLY OF COMPONENT PARTS

1. REMOVE TRANSFER MODE SELECT LEVER AND ROD

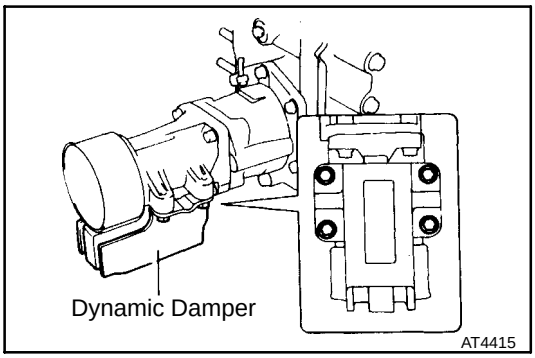


AT4414

2. REMOVE REAR WHEEL SPEED SENSOR

(a) Remove the bolt and pull out the speed sensor.

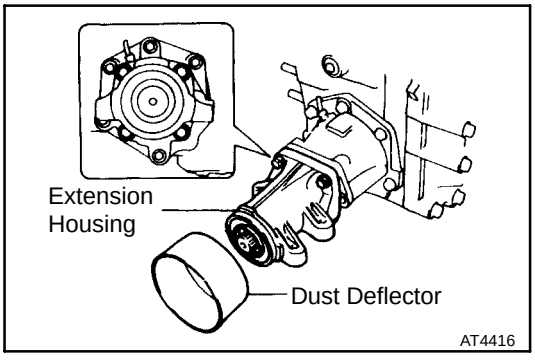
(b) Remove the O-ring from speed sensor.



AT4415

3. REMOVE DYNAMIC DAMPER

Remove the four bolts and dynamic damper.



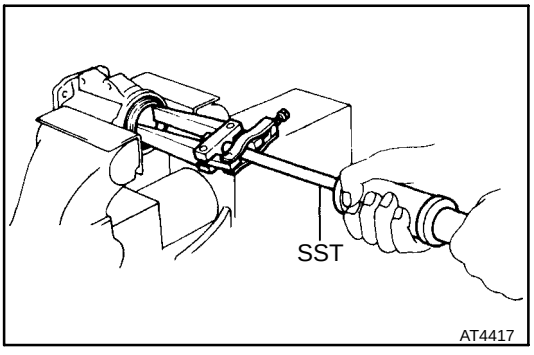
AT4416

4. REMOVE EXTENSION HOUSING

(a) Remove the dust deflector from the extension housing.

(b) Remove the four bolts and extension housing.

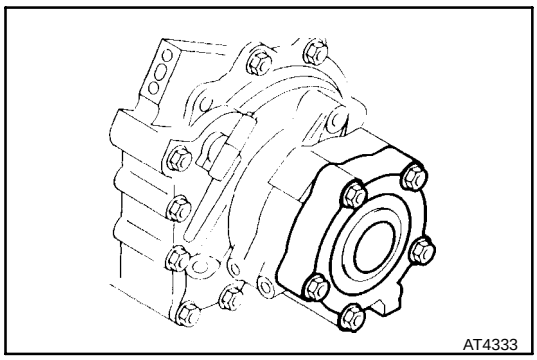
(c) Remove the O-ring from the extension housing.



AT4417

(d) Using SST, remove the oil seal.

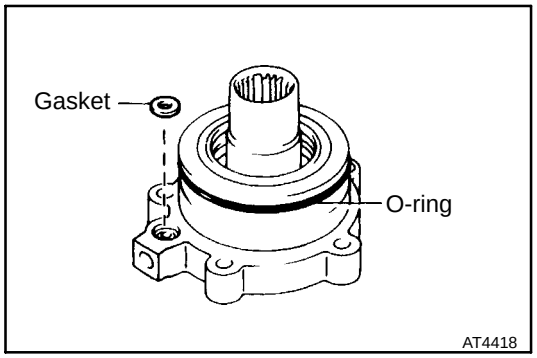
SST 09308-00010


AT4333

5. REMOVE TRANSFER RIGHT CASE RETAINER

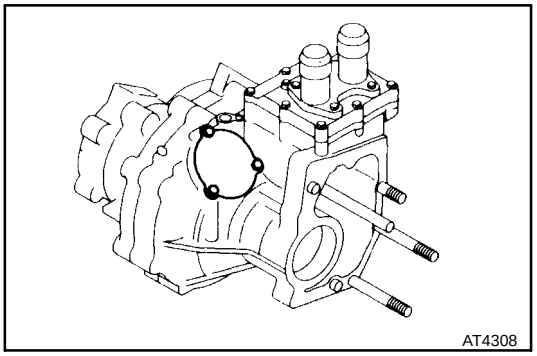
(a) Remove the five bolts.

(b) Using a plastic hammer, remove the right case retainer.



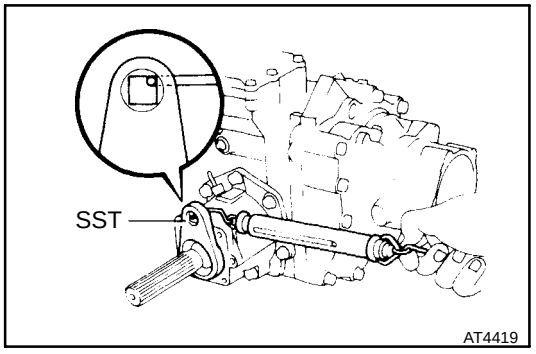
AT4418

(c) Remove the O-ring and apply gasket from the right case retainer.


AT4308

6. REMOVE TRANSFER INSPECTION HOLE COVER

Remove the three bolts and inspection hole cover.



AT4419

7. CHECK PRELOAD

(a) Using SST and a spring tension gauge, measure the driven pinion preload of the backlash between the driven pinion and ring gear.

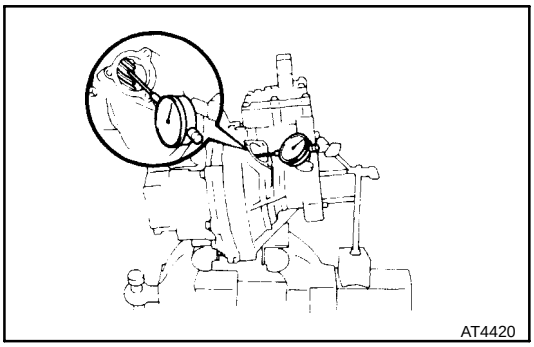
SST 09326-2001 1

Driven pinion preload (at starting):
0.9 - 1.4 kg (2.0 - 3.1 lb, 8.8 - 13.7 N)

(b) Using SST and a spring tension gauge, measure the total preload.

SST 09326-2001 1

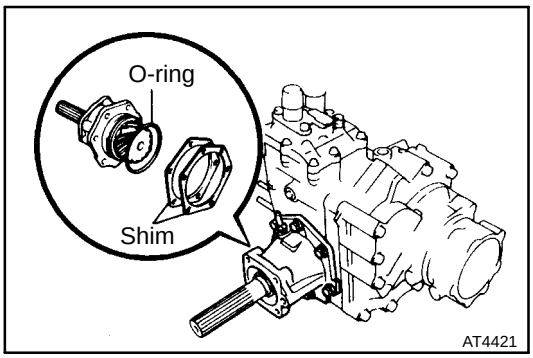
Total preload (at starting):
Add driven pinion preload
0.5 - 0.9 kg (1.1 - 2.0 lb, 4.9 - 8.8 N)


AT4420

8. CHECK RING GEAR BACKLASH

Using a dial indicator, measure the ring gear backlash.
Backlash: 0.13 - 0.18 mm (0.0051 - 0.0071 in.)

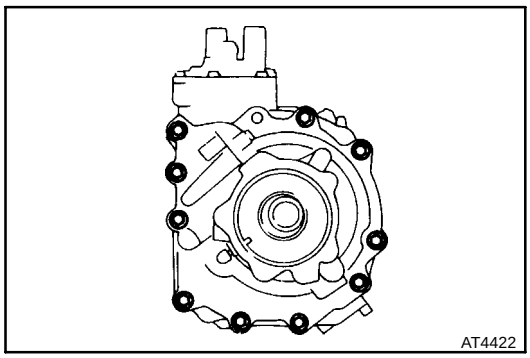
CHECK TOOTH CONTACT
(See page TF-34)



9. REMOVE DRIVEN PINION BEARING CAGE

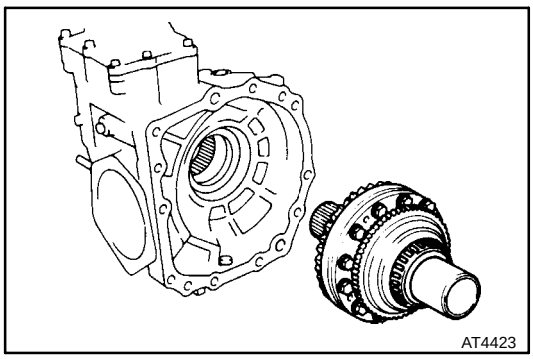
(a) Remove the six bolts and bearing cage.

(b) Remove the O-ring and the shims from the bearing cage.

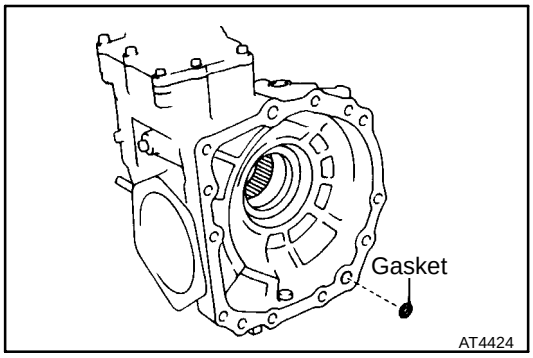


10. REMOVE TRANSFER RIGHT CASE

Remove the ten bolts and right case.

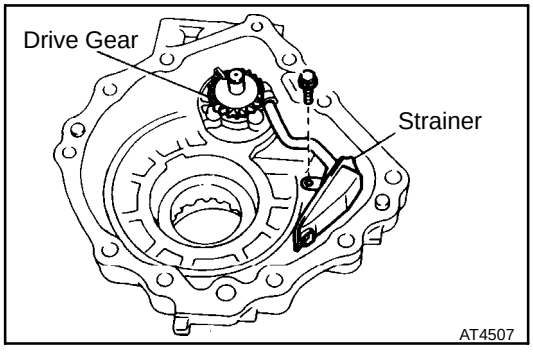


11. REMOVE CENTER DIFFERENTIAL ASSEMBLY



12. REMOVE APPLY GASKET

Remove the apply gasket from the left case.

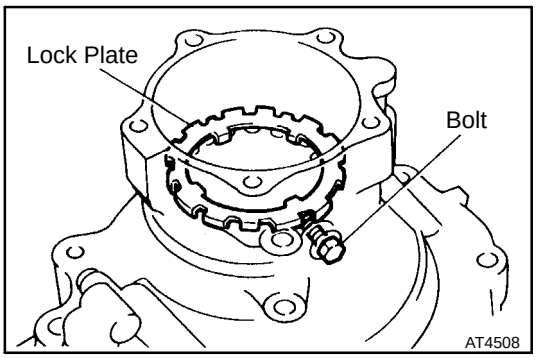


13. REMOVE OIL PUMP DRIVEN GEAR AND OIL PUMP STRAINER

(a) Remove oil pump driven gear.

(b) Remove the bolt and oil pump strainer.

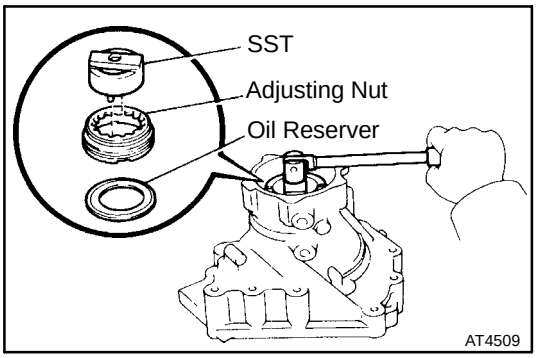
(c) Remove the O-ring from the oil pump strainer.



14. REMOVE ADJUSTING NUT LOCK PLATE

(a) Remove the bolt and nut lock plate from the right case.

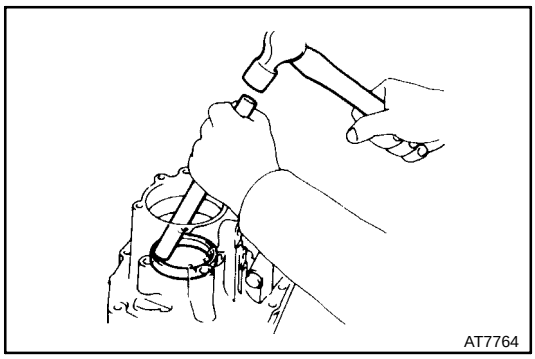
(b) Remove the O-ring from the bolt.



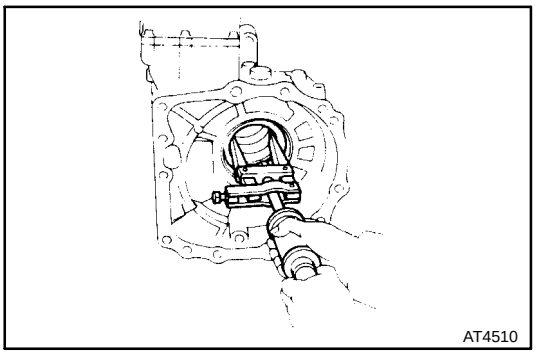
15. REMOVE DIFFERENTIAL RIGHT SIDE BEARING OUTER RACE

(a) Using SST, remove the adjusting nut and oil reserver from the right case.

SST 09318-12010



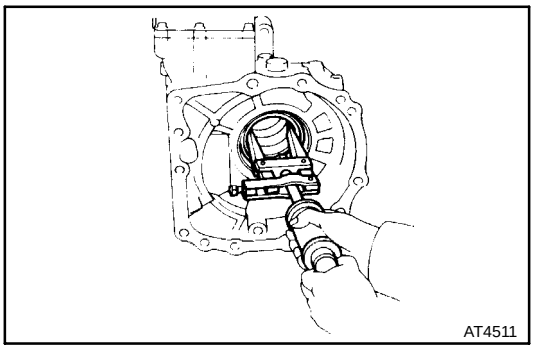
(b) Using a brass bar, remove the outer race.



16. REMOVE DIFFERENTIAL LEFT SIDE BEARING OUTER RACE

Using SST, remove the outer race and plate washer.

SST 09308-00010



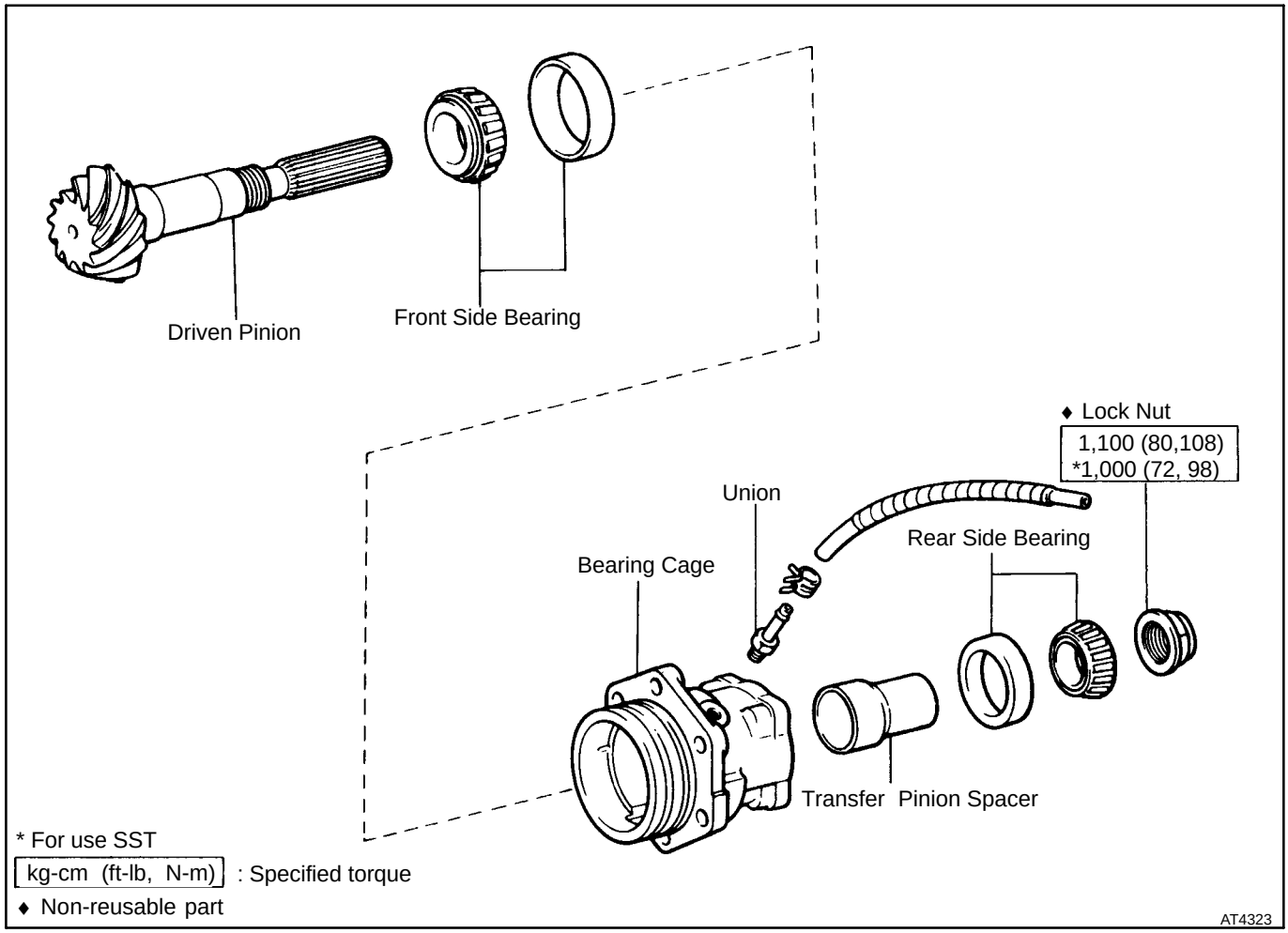
17. REMOVE LEFT CASE OIL SEAL

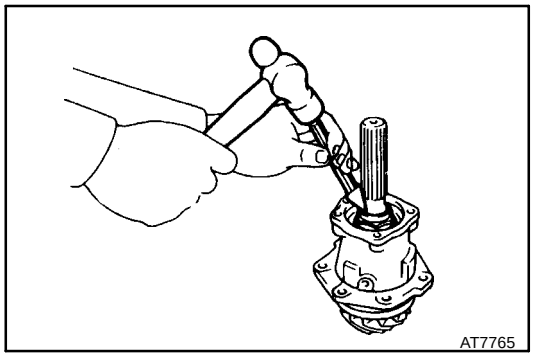
Using SST, remove the oil seal.

SST 09308-00010

Driven Pinion Bearing Cage

COMPONENTS

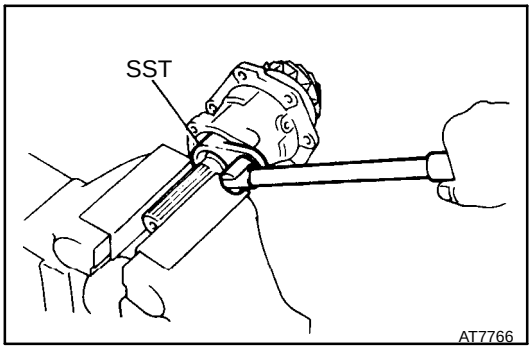




DISASSEMBLY OF DRIVEN PINION BEARING CAGE

1. REMOVE LOCK NUT

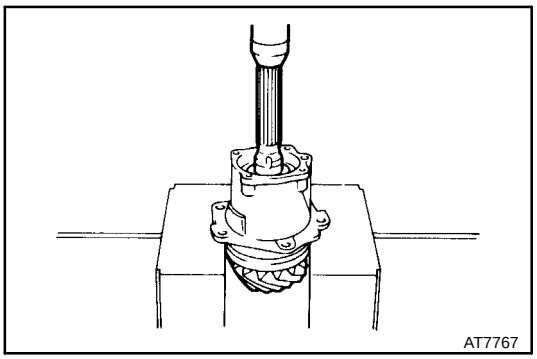
(a) Using a chisel and hammer, unstake the lock nut.



(b) Using SST, remove the lock nut.

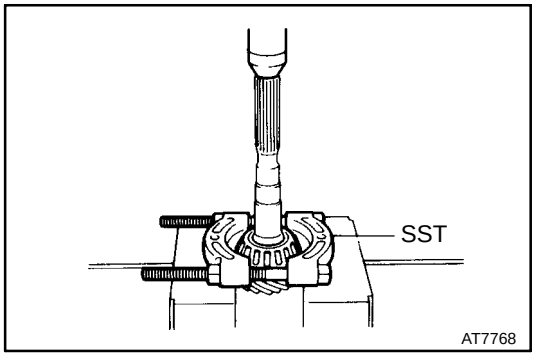
SST 09326-2001 1

NOTICE: Using soft jaws, hold the driven pinion in a vise.


AT7767

2. REMOVE DRIVEN PINION

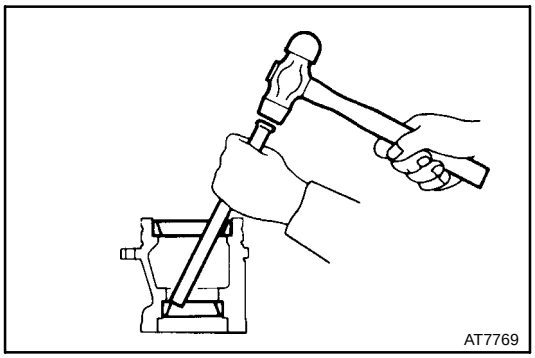
Using a press, remove the driven pinion, rear side bearing and spacer.



AT7768

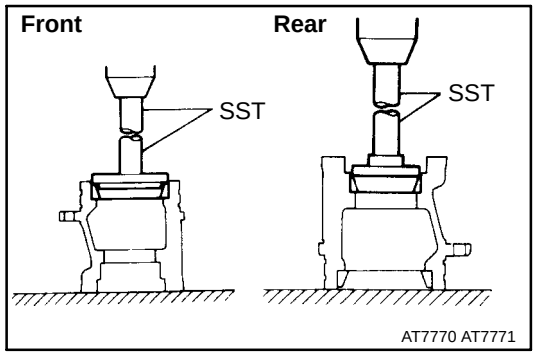
3. REMOVE FRONT SIDE BEARING

Using a press and SST, remove the front side bearing.
SST 09950-00020


AT7769

4. REMOVE BEARING OUTER RACES

Using a brass bar and hammer, remove the two bearing outer races.



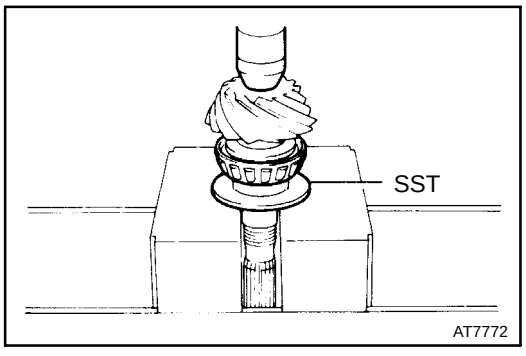
AT7770 AT7771

ASSEMBLY OF DRIVEN PINION BEARING CAGE

1. INSTALL BEARING OUTER RACES

Using a press and SST, install the two bearing outer races to the bearing cage.
SST

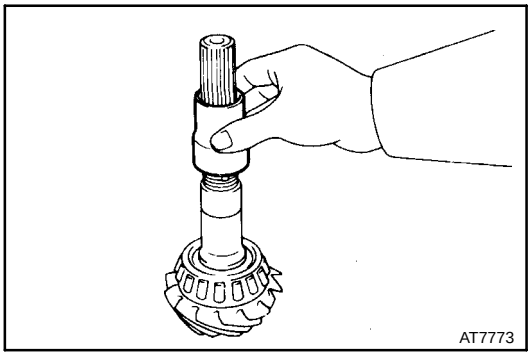
Front side:
09608-35014 (09608-06020, 09608-06120)
Rear side:
09608-30022 (09608-05010, 09608-00050)



AT7772

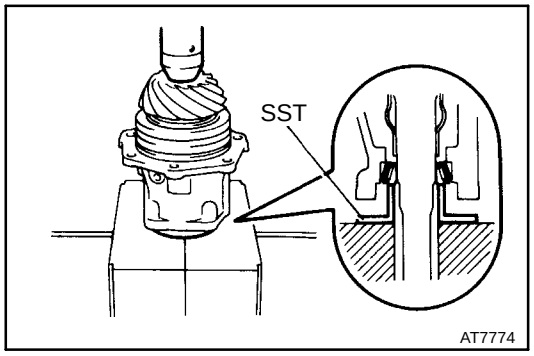
2. INSTALL DRIVEN PINION FRONT SIDE BEARING

Using a press and SST, install the front side bearing.
SST 09506-35010



3. INSTALL SPACER

Install a new spacer to the driven pinion.

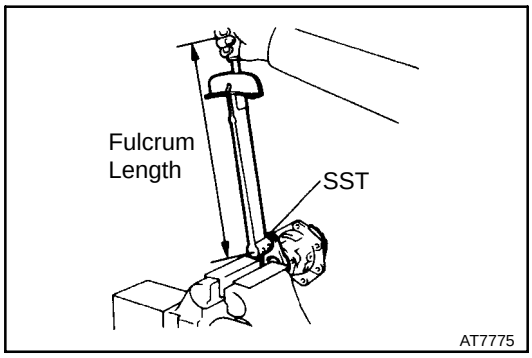


4. INSTALL DRIVEN PINION REAR SIDE BEARING

(a) Install the bearing cage to the driven pinion.

(b) Using a press and SST, install the rear side bearing to the driven pinion.

SST 09506-35010



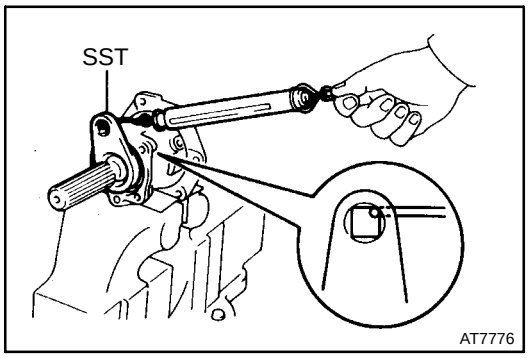
5. ADJUST DRIVEN PINION PRELOAD

(a) Using SST, torque a new nut.

SST 09326-2001 1

Torque: 1,000 kg-cm (72 ft-lb, 98 N-m)

HINT: Use a torque wrench with a fulcrum length of 42.5 cm (16.732 in.).



(b) Using a spring tension gauge and SST, measure the preload.

SST 09326-2001 1

HINT: Turn the driven pinion right and left two or three times to allow the bearings to settle.

Preload (at starting):

New bearing

1.8 - 2.9 kg (4.0 - 6.4 lb, 18 - 28 N)

Reused bearing

0.9 - 1.4 kg (2.0 - 3.1 lb, 9 - 14 N)

® **If preload is greater than specification, replace the bearing spacer.**

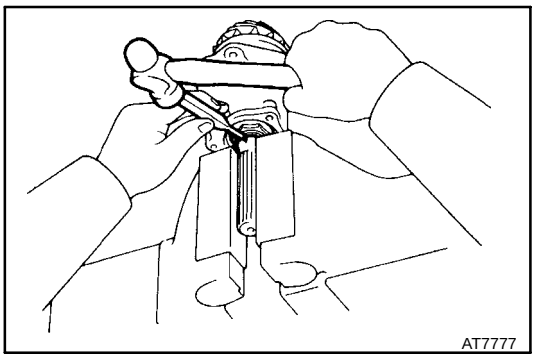
® **If preload is less than specification, retighten the nut 5° - 10°at a time until the specified preload is rechecked.**

If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure.

Do not back off the pinion nut to reduce the preload.

Maximum torque: 2,400 kg-cm (174 ft-lb, 235 N-m)

NOTICE: Using the soft jaws, hold the bearing cage in a vise.

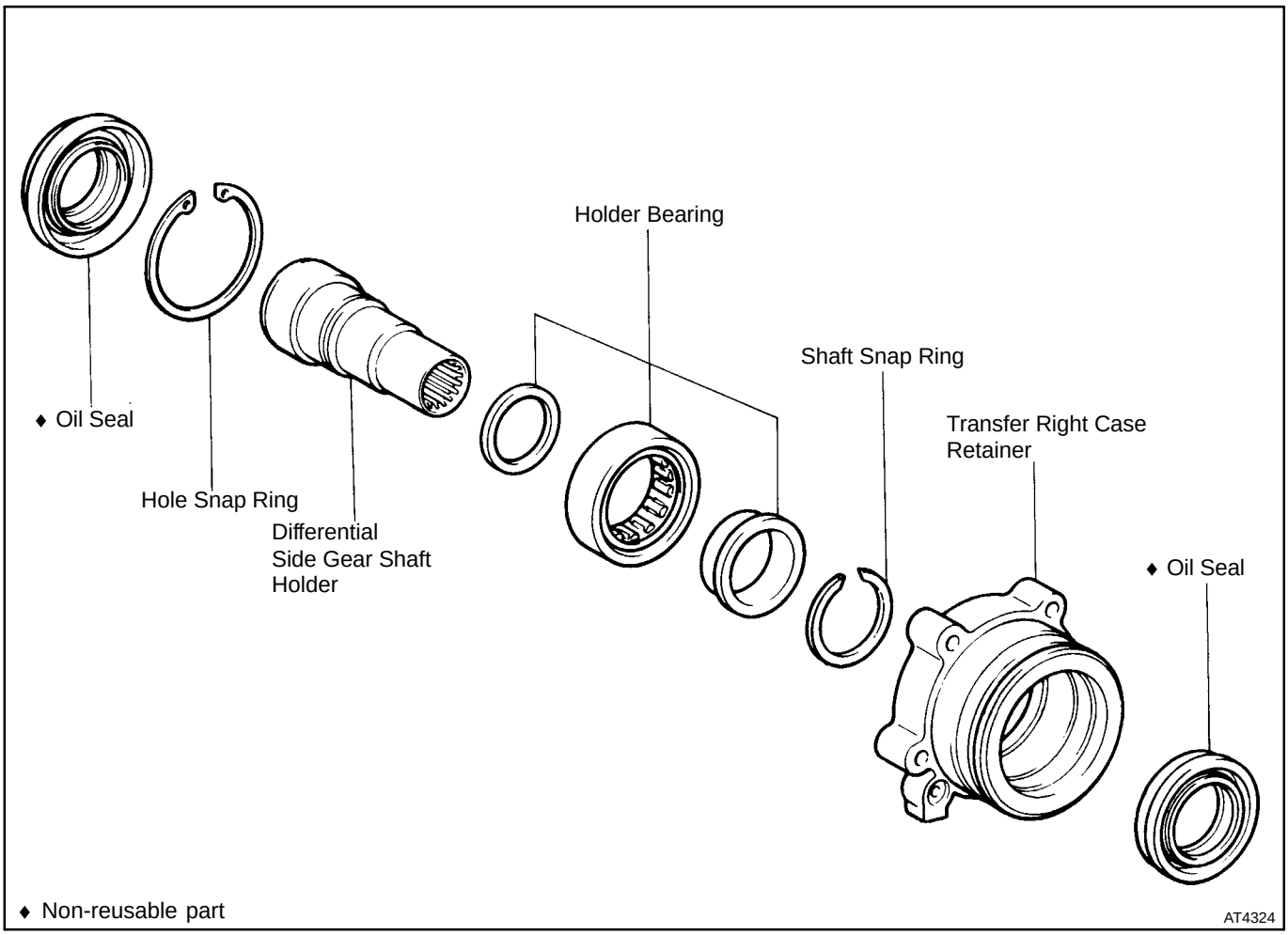


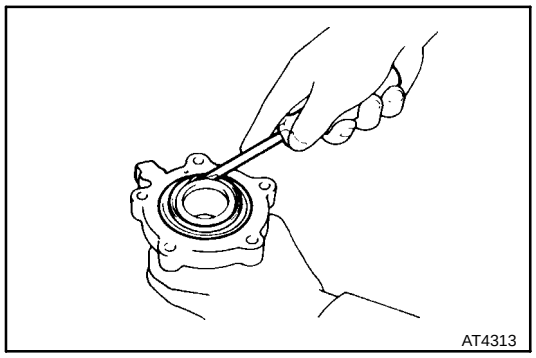
6. STAKE LOCK NUT

Using a pin punch and hammer, stake the nut.

Transfer Right Case Retainer

COMPONENTS

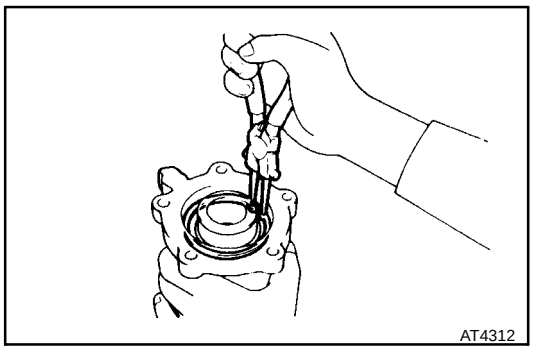




DISASSEMBLY OF TRANSFER RIGHT CASE RETAINER

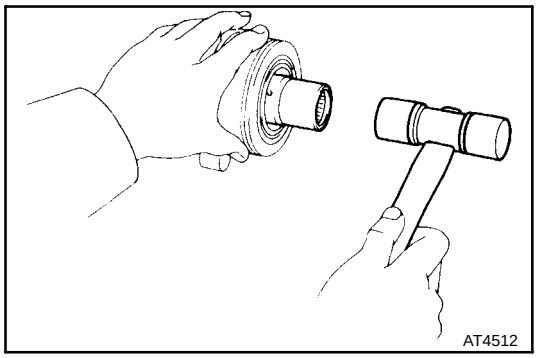
1. REMOVE OIL SEAL

Using a screwdriver, remove the oil seal.

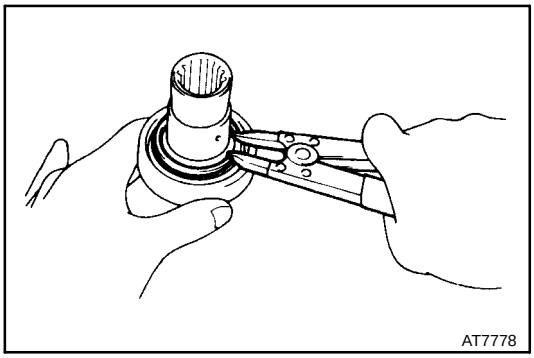


2. REMOVE SIDE GEAR SHAFT HOLDER

(a) Using snap ring pliers, remove the snap ring.

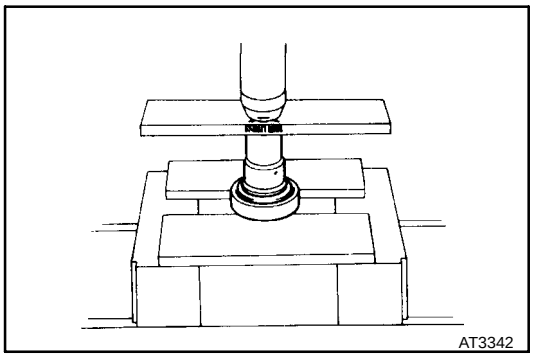


(b) Using a plastic hammer, remove the side gear shaft holder.

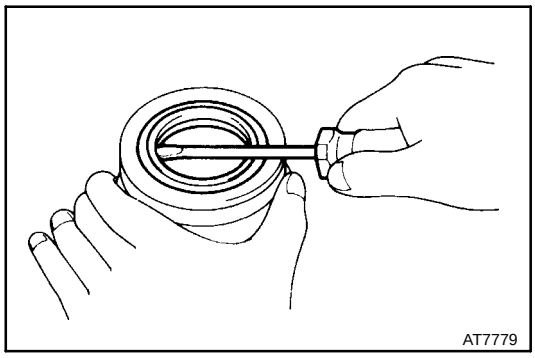


3. REMOVE HOLDER BEARING

(a) Using snap ring pliers, remove the snap ring.



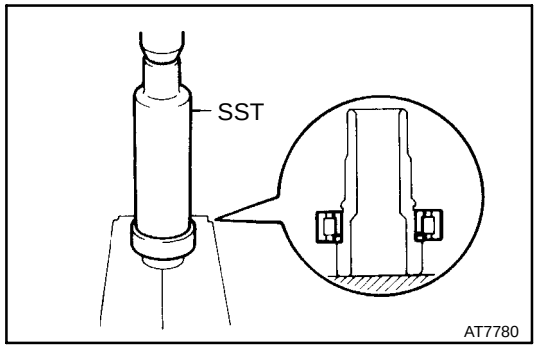
(b) Using a press, press out the bearing.



4. REMOVE OIL SEAL

Using a screwdriver, remove the oil seal.

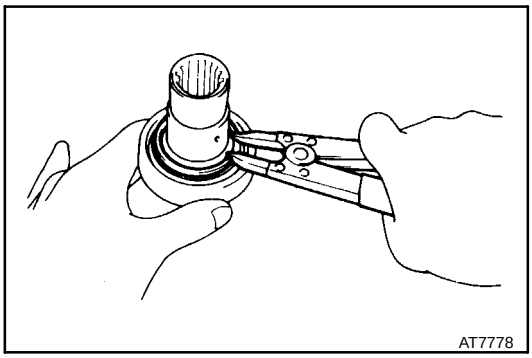
ASSEMBLY OF TRANSFER RIGHT CASE RETAINER



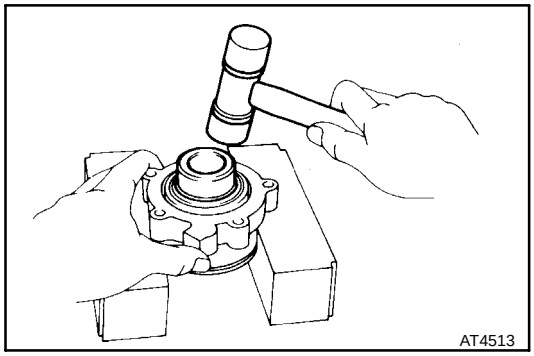
1. INSTALL HOLDER BEARING

(a) Using SST and a press, press in the holder bearing.

SST 09226-10010

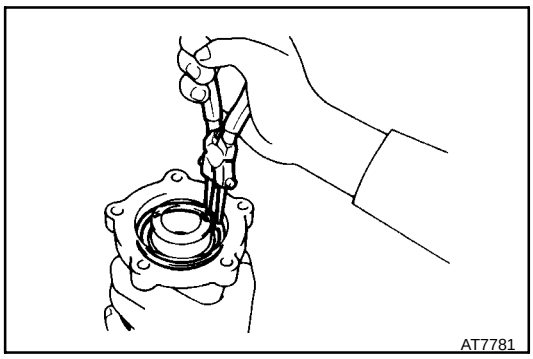


(b) Using snap ring pliers, install the snap ring.

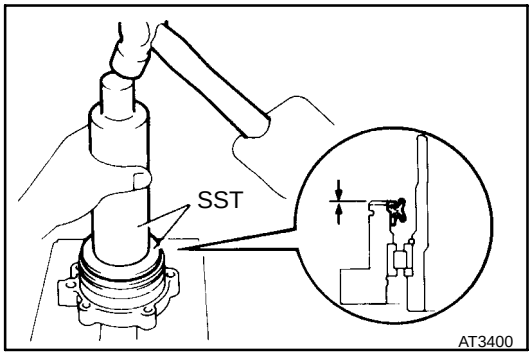


2. INSTALL SIDE GEAR SHAFT HOLDER

(a) Install the side gear shaft holder.



(b) Using snap ring pliers, install the snap ring.



3. INSTALL OIL SEAL

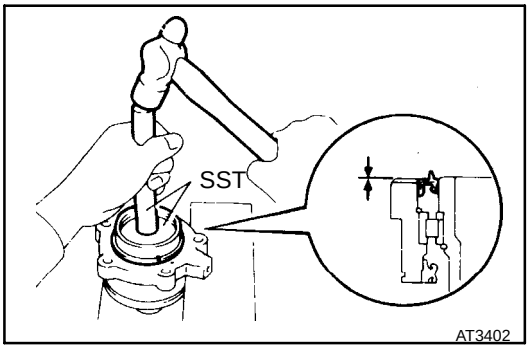
(Left side oil seal)

(a) Coat a new oil seal lip with MP grease.

(b) Using a hammer and SST, drive in the oil seal.

SST 09316-60010 (09316-00010, 09316-00040)

Oil seal depth: 0 mm (0 in.)



(Right side oil seal)

(a) Coat a new oil seal lip with MP grease.

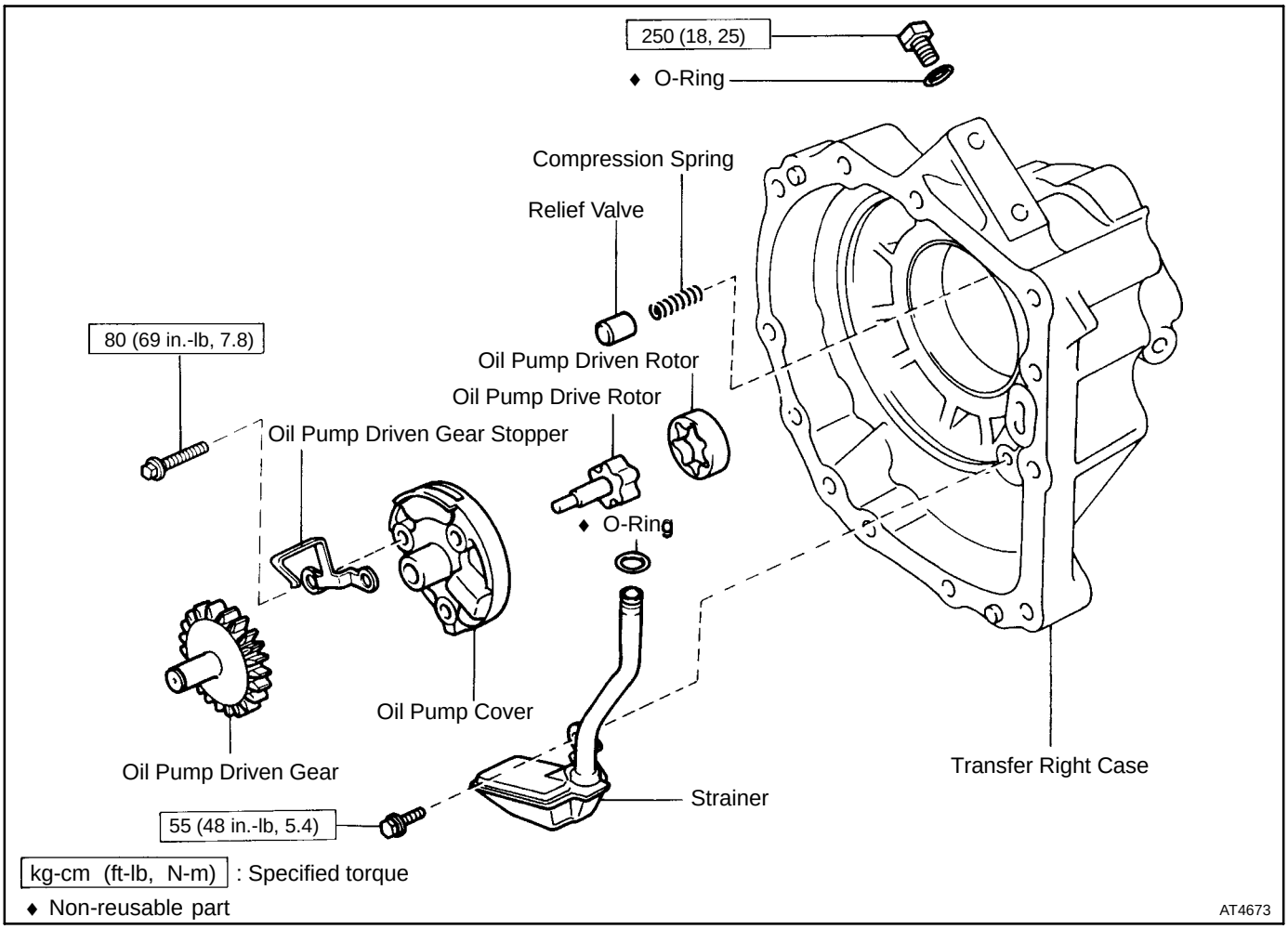
(b) Using a hammer and SST, drive in the oil seal.

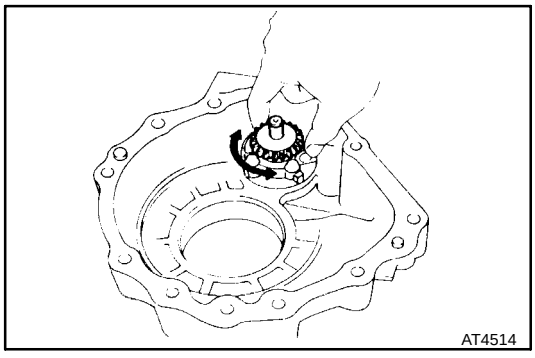
SST 09608-32010, 09608-35014 (09608-06020)

Oil seal depth: 0 mm (0 in.)

Transfer Right Case

COMPONENTS

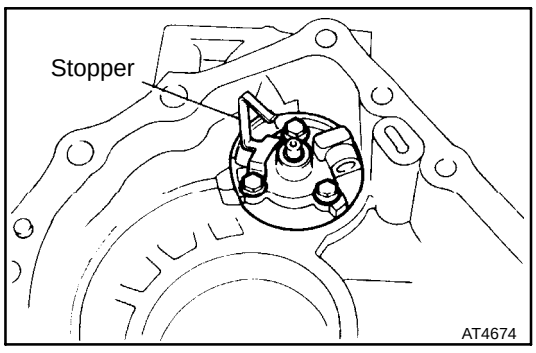




DISASSEMBLY OF TRANSFER RIGHT CASE

1. INSPECT OIL PUMP OPERATION

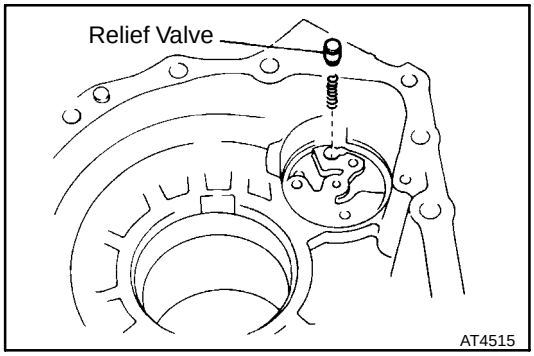
Check that the oil pump turns smoothly with oil pump driven gear.



2. REMOVE OIL PUMP DRIVEN GEAR STOPPER, OIL PUMP COVER, DRIVE ROTOR AND DRIVEN ROTOR

(a) Remove the three bolts and oil pump driven gear stopper.

(b) Pull out the oil pump cover, drive rotor and driven rotor.



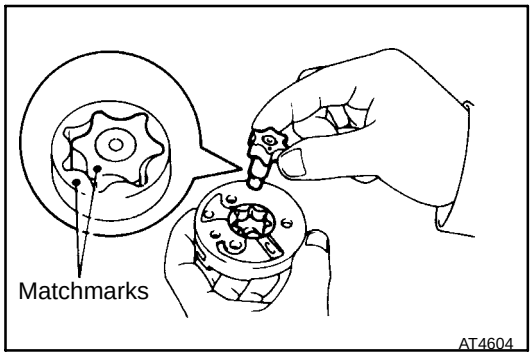
3. REMOVE RELIEF VALVE

Remove the relief valve and spring.

ASSEMBLY OF TRANSFER RIGHT CASE

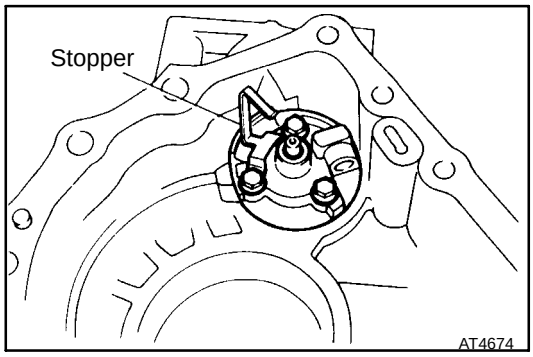
1. INSTALL RELIEF VALVE

Install the relief valve and spring.



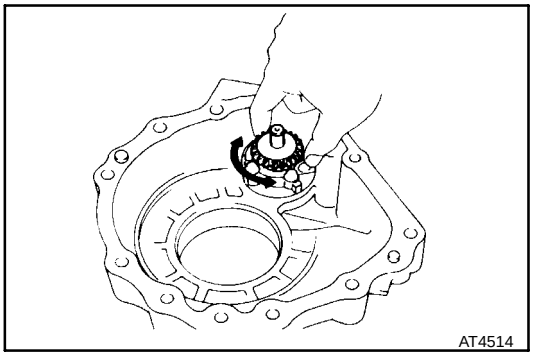
2. INSTALL OIL PUMP DRIVE ROTOR AND DRIVEN ROTOR

Align the matchmarks on the drive rotor and the driven rotor.



3. INSTALL OIL PUMP COVER AND DRIVEN GEAR STOPPER

Torque the three bolts evenly.
Torque: 80 kg-cm (69 in.-lb, 7.8 N-m)

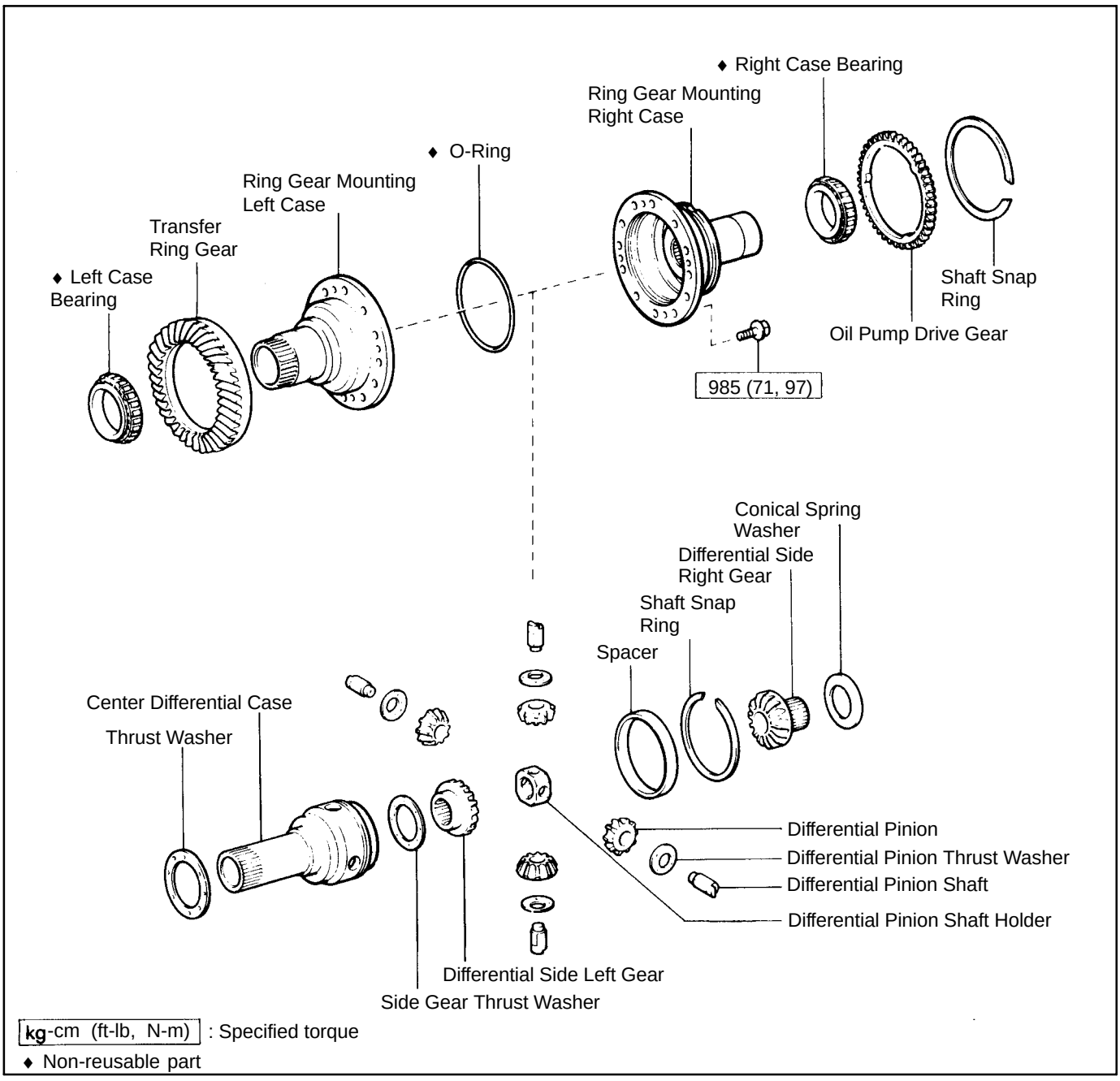


4. CHECK OPERATION OF OIL PUMP

Insert the oil pump driven gear to the drive rotor, check that the drive rotor turns smoothly.

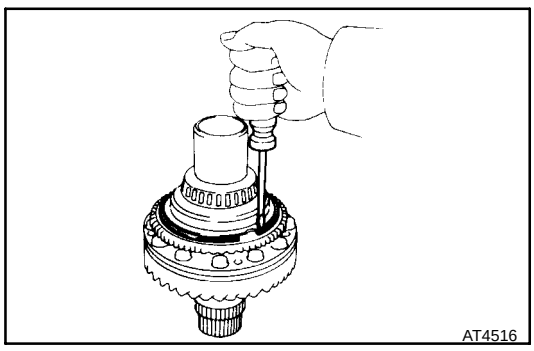
Ring Gear Mounting Case and Center Differential Case

COMPONENTS



kg-cm (ft-lb, N-m) : Specified torque

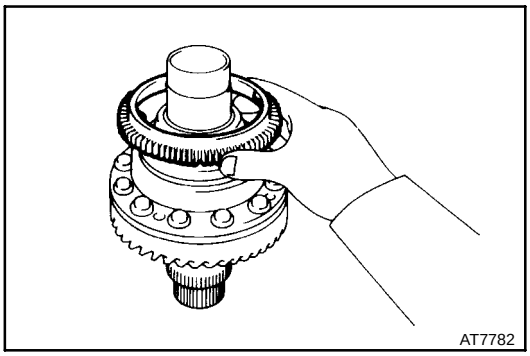
♦ Non-reusable part



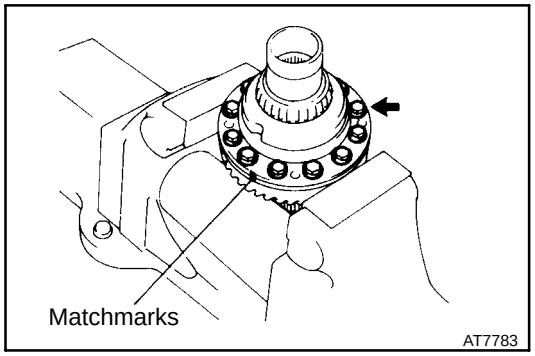
DISASSEMBLY OF RING GEAR MOUNTING CASE AND CENTER DIFFERENTIAL CASE

1. REMOVE OIL PUMP DRIVE GEAR

(a) Using a screwdriver, remove the shaft snap ring.



(b) Remove oil pump drive gear.

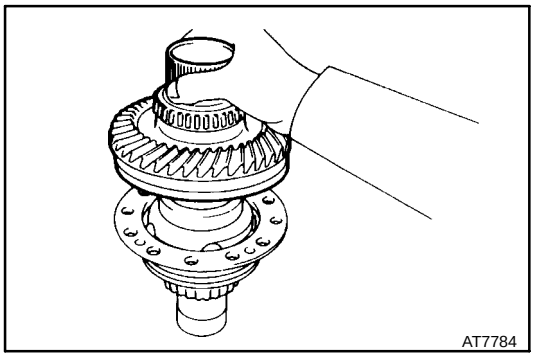


2. REMOVE RING GEAR MOUNTING LEFT CASE

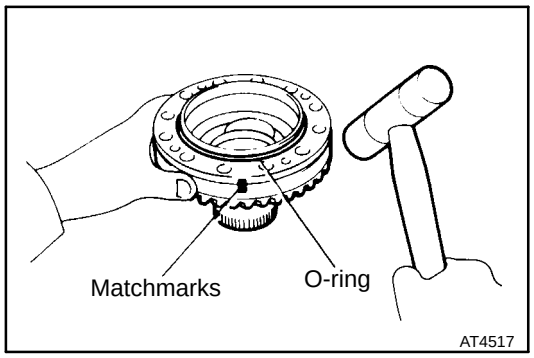
(a) Place matchmarks on the differential left case and the differential right case.

(b) Remove the twelve bolts.

NOTICE: Using the soft jaws, hold the left case in a vise.



(c) Remove the differential left case upward.

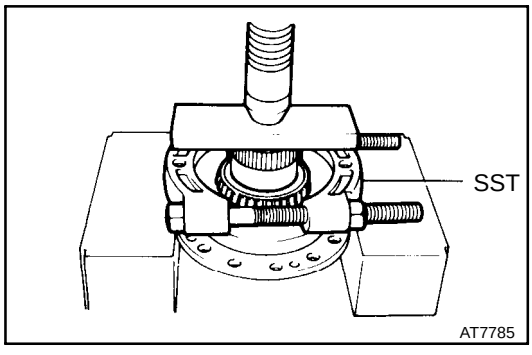


3. REMOVE RING GEAR

(a) Place matchmarks on the differential left case and ring gear.

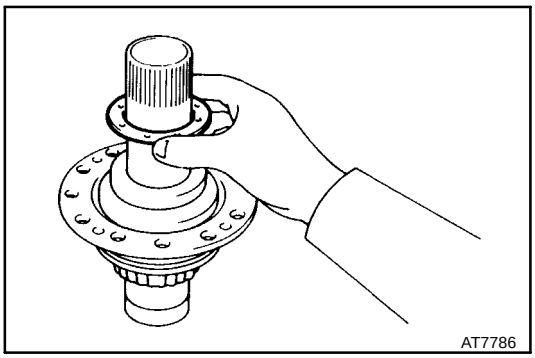
(b) Using a plastic hammer, tap out the ring gear.

(c) Remove the O-ring from the left case.

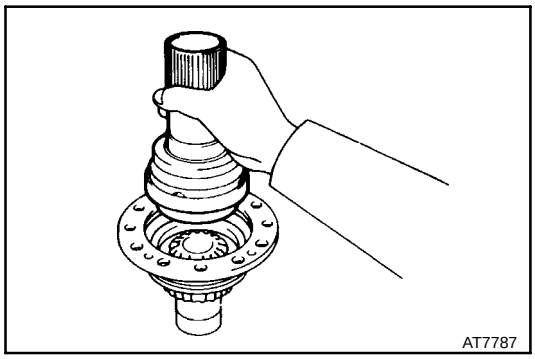


4. REMOVE LEFT CASE BEARING

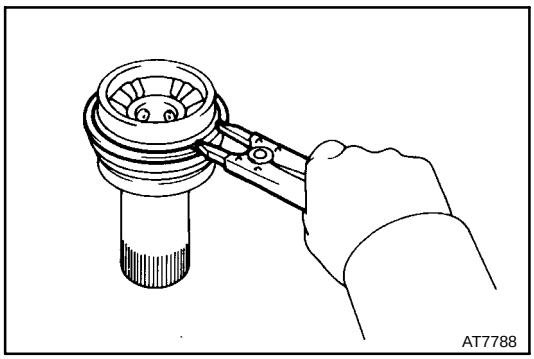
Using SST and a press, press out the bearing.
SST 09950-00020



5. REMOVE THRUST WASHER

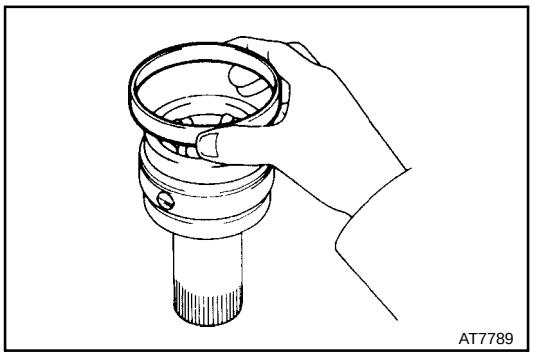


6. REMOVE CENTER DIFFERENTIAL CASE ASSEMBLY

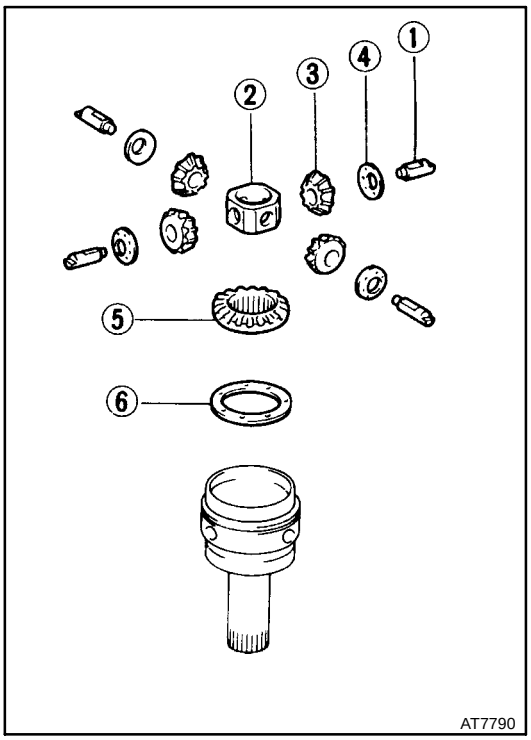


7. DISASSEMBLE CENTER DIFFERENTIAL CASE

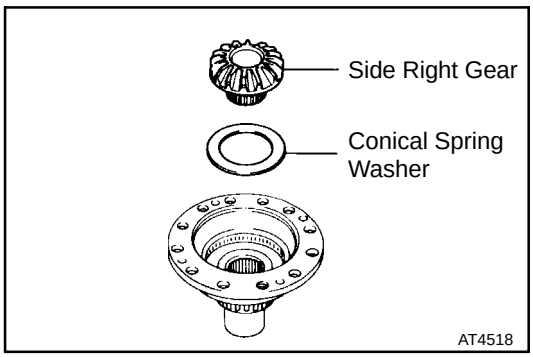
(a) Using snap ring pliers, remove the shaft snap ring.



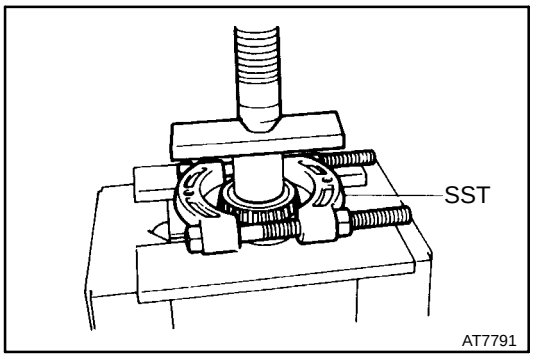
(b) Remove the spacer.



(c) Remove the following parts from the center differential case:
① Four pinion shafts
② Pinion shaft holder
③ Four differential pinions
④ Four pinion thrust washers
⑤ Differential side left gear
⑥ Side gear thrust washer



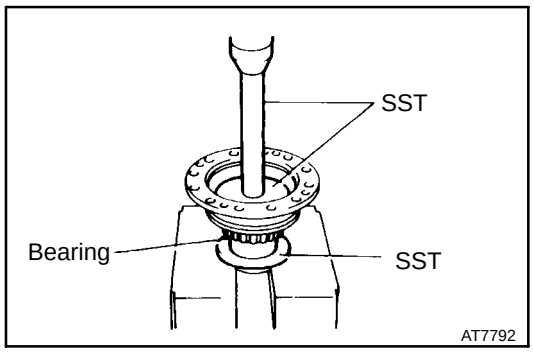
8. REMOVE DIFFERENTIAL SIDE RIGHT GEAR AND CONICAL SPRING WASHER



9. REMOVE RIGHT CASE BEARING

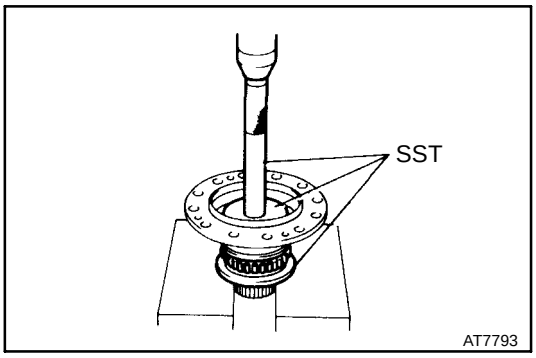
Using SST and a press, press out the bearing.
SST 09950-00020

ASSEMBLY OF RING GEAR MOUNTING CASE AND CENTER DIFFERENTIAL CASE



1. INSTALL RIGHT CASE BEARING

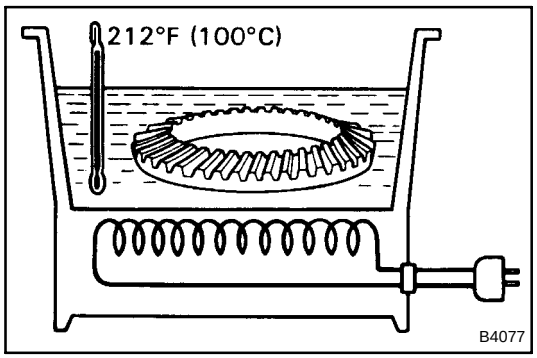
Using SST and a press, press in the bearing.
SST 09316-2001 1, 09608-35014
(09608-06020, 09608-06120)



2. INSTALL LEFT CASE BEARING

Using SST and a press, press in the left case.

SST 09316-12010, 09608-35014
(09608-06020, 09608-06120)



3. INSTALL RING GEAR

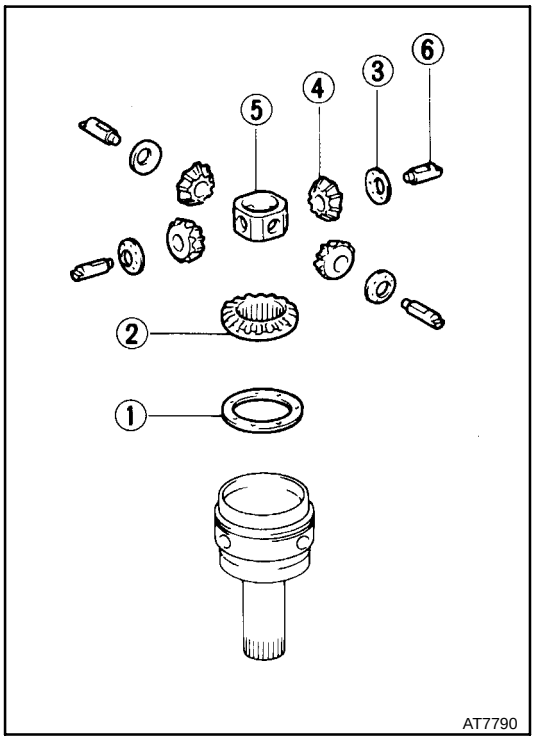
(a) Clean the contact surface of the ring gear mounting left case.

(b) Heat the ring gear to about 212˚F (100˚C) in an oil bath.

NOTICE: Do not heat the ring gear above 230˚F (110˚C).

(c) Clean the contact surface of the ring gear with cleaning solvent.

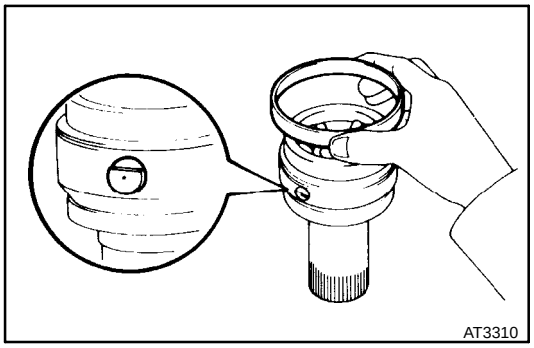
(d) Align the matchmarks and quickly install the ring gear on the ring gear mounting left case.



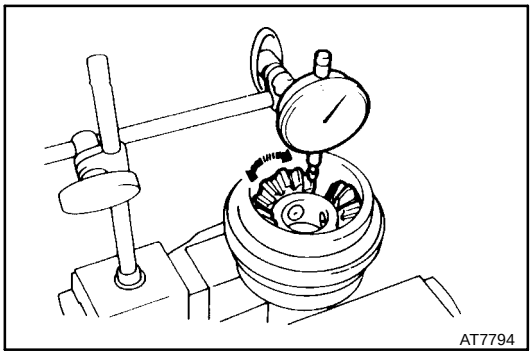
4. CHECK AND ADJUST CENTER DIFFERENTIAL SIDE GEAR BACKLASH

(a) Install the following parts to the center differential case:

① Side gear thrust washer
② Differential side left gear
③ Four pinion thrust washers
④ Four differential pinions
⑤ Pinion shaft holder
⑥ Four pinion shafts



(b) Install the spacer to the case as shown.

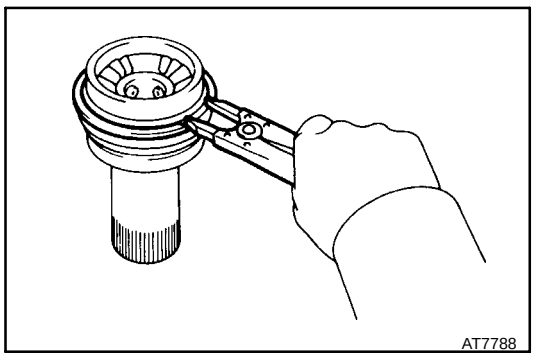


(c) Using a dial indicator, measure the backlash of one pinion gear while holding the side gear toward the case.

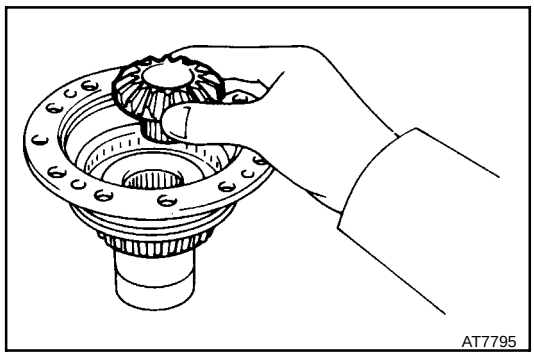
Standard backlash: 0.05 - 0.20 mm (0.002 - 0.0079 in.)

HINT: Do not place in a vise the surface of the center differential case which comes in contact with the bushing. Referring to the table below, select the thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	1.00 (0.0394)	F	1.25 (0.0492)
B	1.05 (0.0413)	G	1.30 (0.0512)
C	1.10 (0.0433)	H	1.35 (0.0531)
D	1.15 (0.0453)	J	1.40 (0.0551)
E	1.20 (0.0472)		



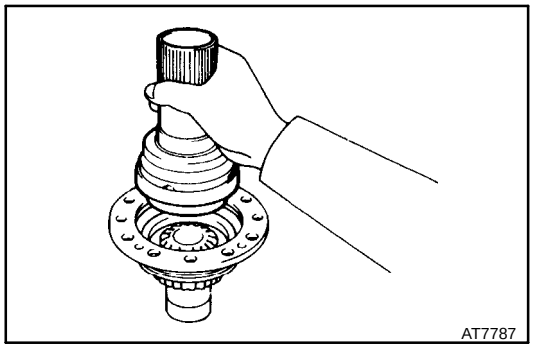
(d) Using snap ring pliers, install the shaft snap ring.



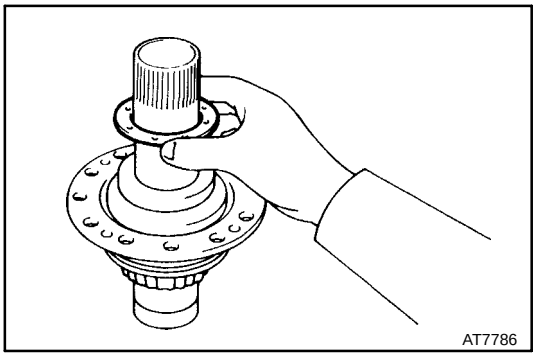
5. CHECK AND ADJUST CENTER DIFFERENTIAL SIDE GEAR THRUST CLEARANCE

(a) Install the differential side right gear.

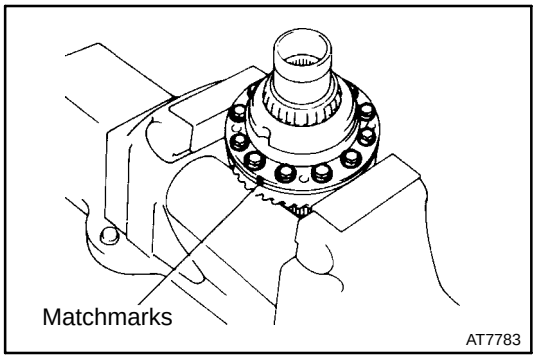
HINT: Do not install the conical spring washer.



(b) Install the center differential case.



(c) Install the thrust washer.



(d) Align the matchmarks on the ring gear mounting left and right case.

(e) Install and torque the twelve bolts.

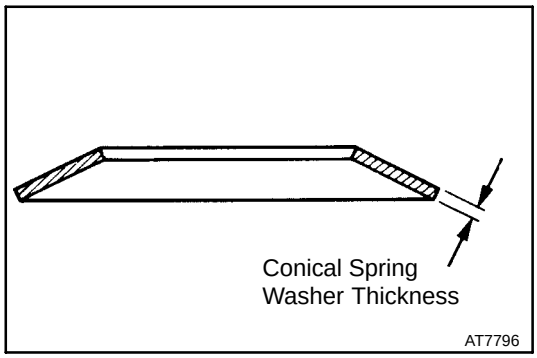
Torque: 985 kg-cm (71 ft-lb, 97 N-m)

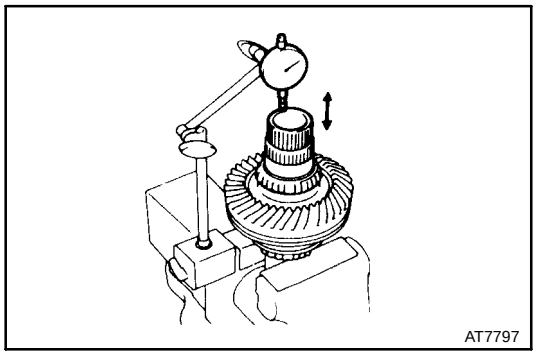
HINT: Do not install the O-ring.

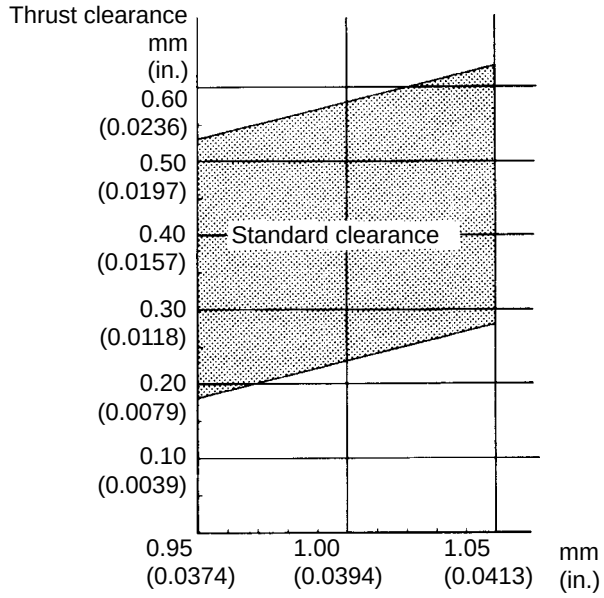
(f) Using a caliper, measure the conical spring washer thickness.

(g) Using a dial indicator, measure the thrust clearance of center differential case while holding the ring gear mounting case.

Standard clearance:



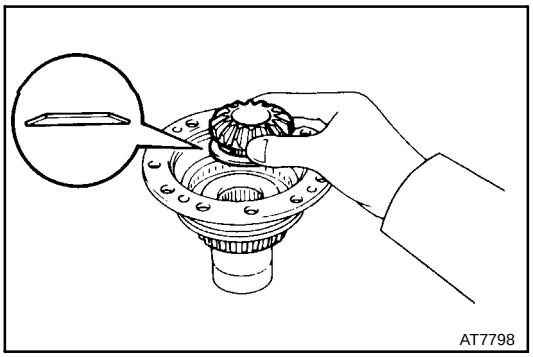




(h) Referring to the table below, select the thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

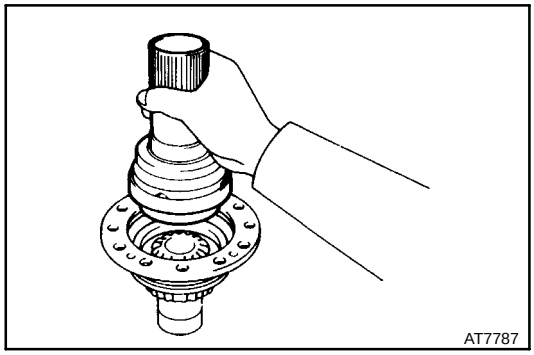
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	1.00 (0.0394)	G	1.30 (0.0512)
B	1.05 (0.0413)	H	1.35 (0.0531)
C	1.10 (0.0433)	J	1.40 (0.0551)
D	1.15 (0.0453)	K	1.45 (0.0571)
E	1.20 (0.0472)	L	1.50 (0.0591)
F	1.25 (0.0492)		

(i) Remove ring gear mounting right case.

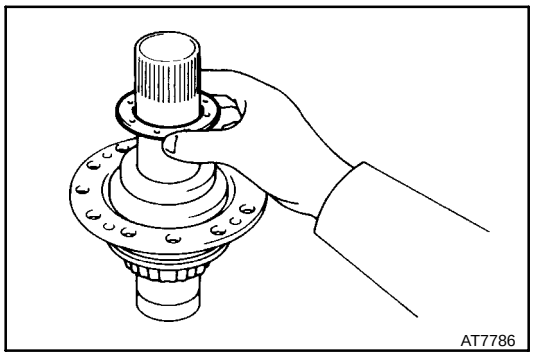


6. INSTALL DIFFERENTIAL SIDE GEAR AND CONICAL SPRING WASHER

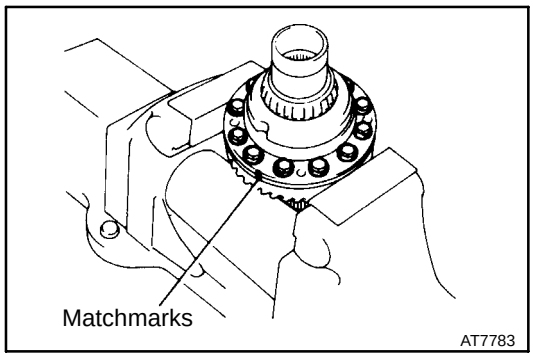
HINT: Be careful not to make a mistake in the direction of the conical spring washer.



7. INSTALL CENTER DIFFERENTIAL CASE



8. INSTALL THRUST WASHER (Previously selected)



9. INSTALL RING GEAR MOUNTING LEFT CASE

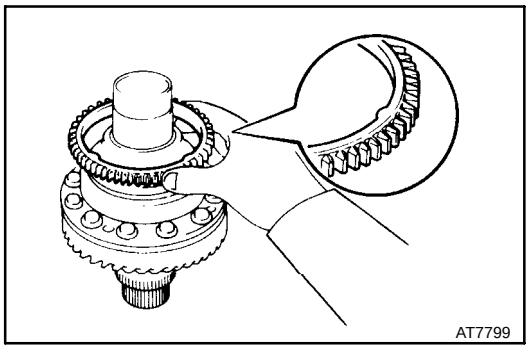
(a) Coat the new O-ring with ATF, and install it onto the left case.

(b) Align the matchmarks on the right and left case.

(c) Install and torque the twelve bolts.

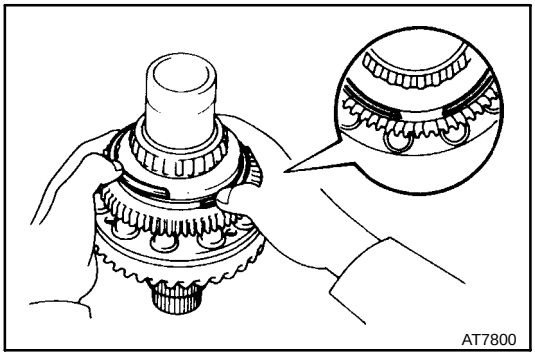
Torque: 985 kg-cm (71 ft-lb, 97 N-m)

NOTICE: Using the soft jaws, hold the left case in a vise.



10. INSTALL OIL PUMP DRIVE GEAR

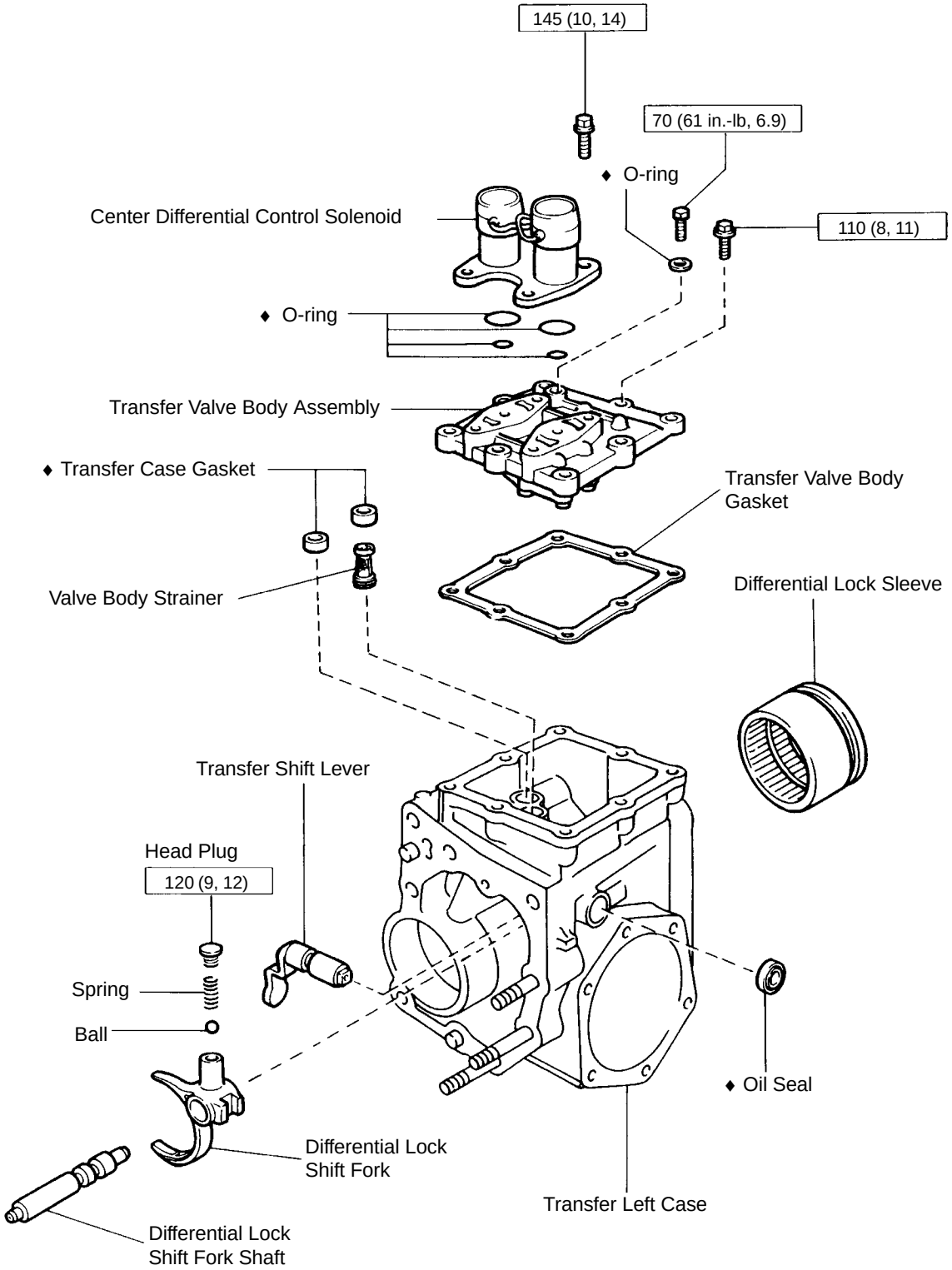
(a) Install the oil pump drive gear.



(b) Install the shaft snap ring.

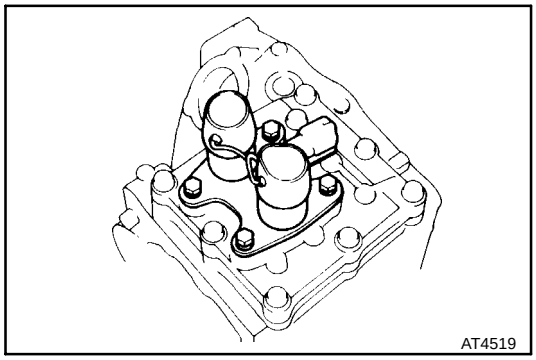
Transfer Left Case

COMPONENTS



kg-cm (ft-lb, N-m) : Specified torque
♦ Non-reusable part
★ Precoated part

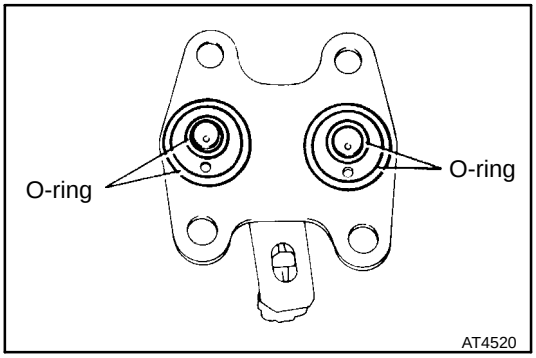
AT4605


AT4519

DISASSEMBLY OF TRANSFER LEFT CASE

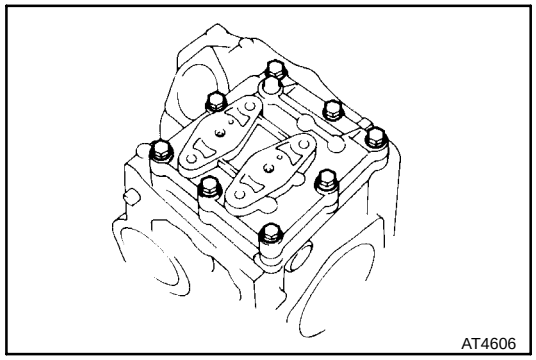
1. REMOVE CENTER DIFFERENTIAL CONTROL SOLENOIDS

(a) Remove the four bolts and solenoid.



AT4520

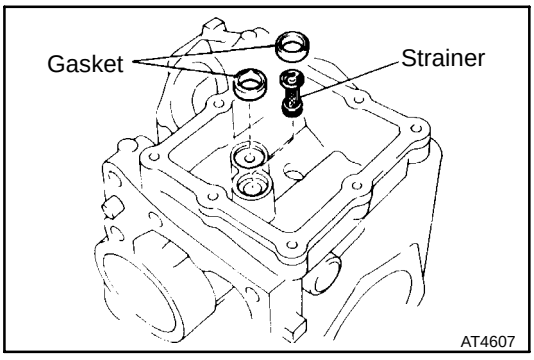
(b) Remove the four O-rings from the solenoids.


AT4606

2. REMOVE TRANSFER VALVE BODY ASSEMBLY

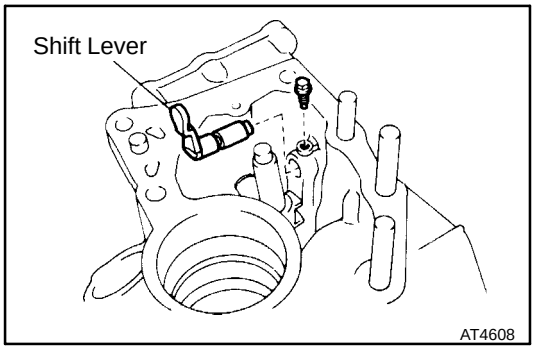
(a) Remove the eight bolts and transfer valve body assembly.

(b) Remove the transfer valve body gasket.



AT4607

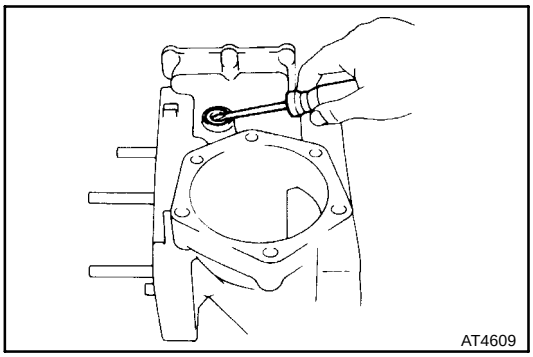
(c) Remove transfer case gaskets and valve body strainer.



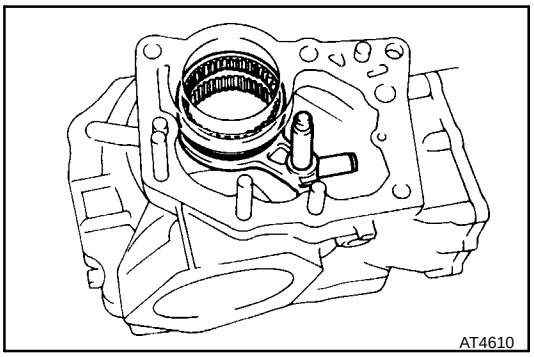
AT4608

3. REMOVE TRANSFER SHIFT LEVER

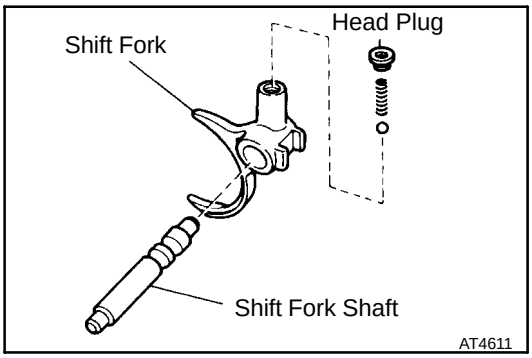
(a) Remove the lock bolt and transfer shift lever.



(b) Using a screwdriver, remove the oil seal.



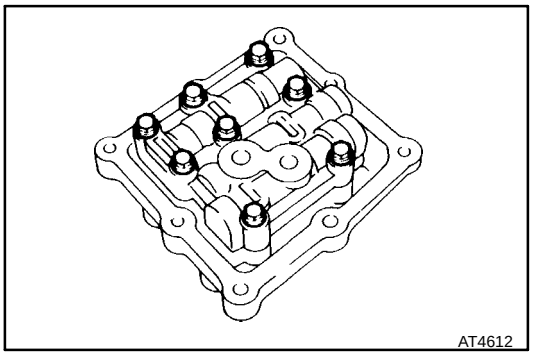
4. REMOVE SHIFT FORK SHAFT, SHIFT FORK AND SLEEVE



5. REMOVE SHIFT FORK SHAFT FROM SHIFT FORK

(a) Remove the head plug, spring and ball.

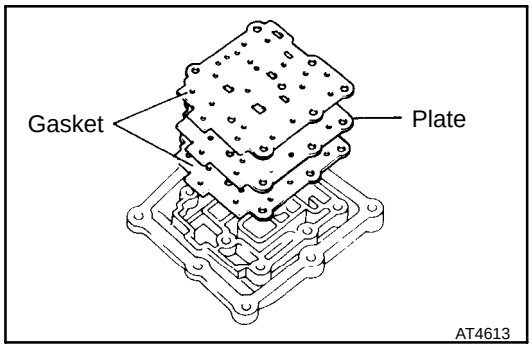
(b) Pull out the shift fork shaft from shift fork.



DISASSEMBLY OF TRANSFER VALVE BODY

REMOVE TRANSFER LOWER VALVE BODY

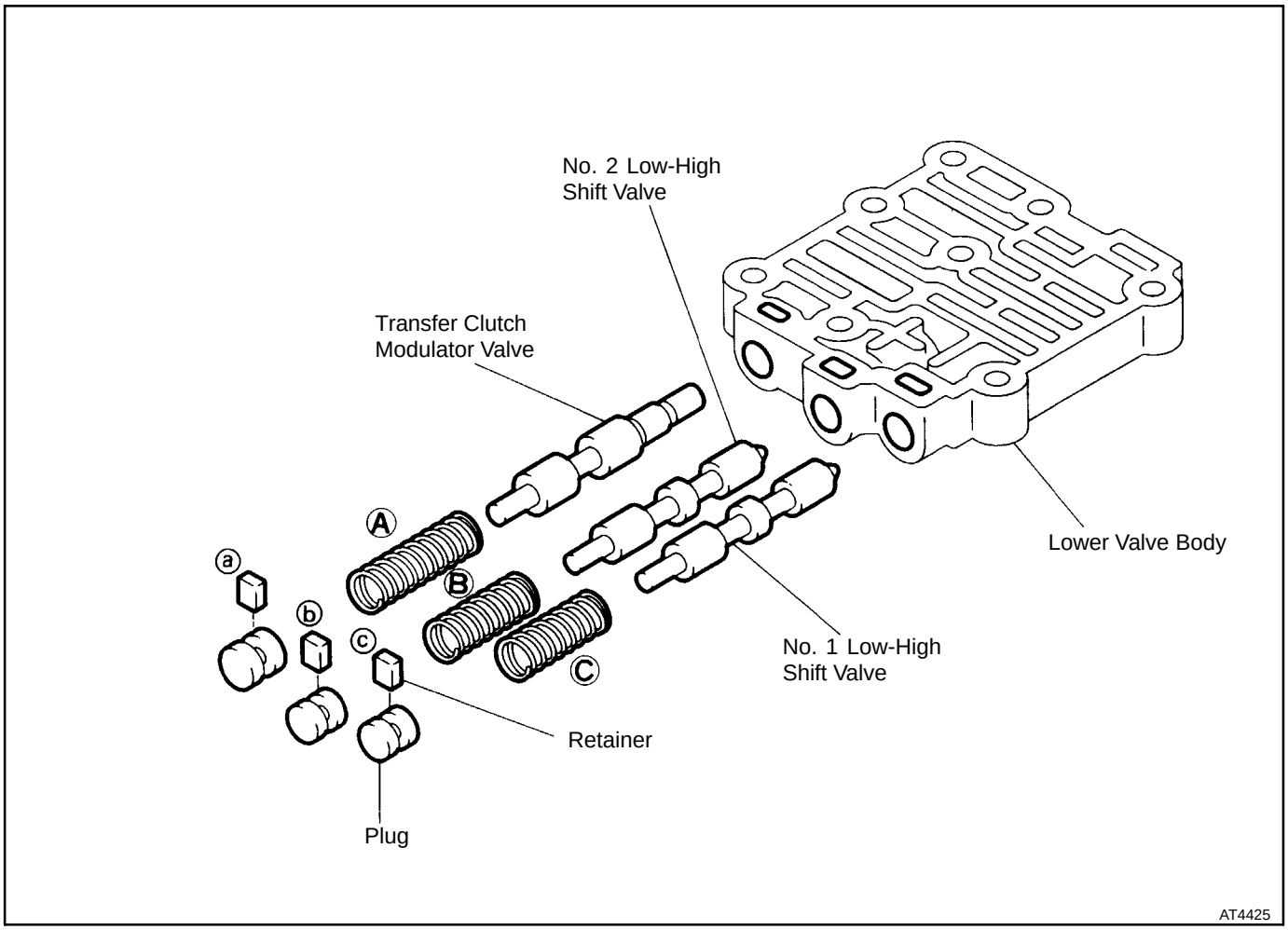
(a) Remove the eight bolts and transfer lower valve body.



(b) Remove the two gaskets and plate from the transfer upper valve body.

Transfer Lower Valve Body

COMPONENTS

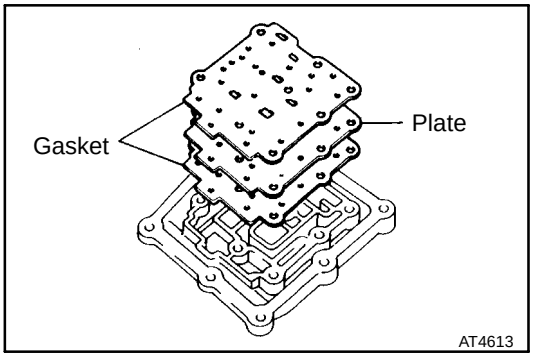


SPECIFICATIONS OF TRANSFER LOWER VALVE BODY SPRINGS AND RETAINERS

Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of Coils	Color
Ⓐ	Transfer clutch modulator valve	32.3 (1.272)	7.6 (0.299)	16	None
Ⓑ	No. 2 Low-high shift valve	28.9 (1.138)	7.0 (0.276)	14	None
Ⓒ	No. 1 Low-high shift valve				

HINT: During reassembly please refer to the spring specifications above to help discriminate between the different springs.

Retainer		Height mm (in.)	Width mm (in.)	Thickness mm (in.)
ⓐ	Transfer clutch modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓑ	No. 2 Low-high shift valve			
ⓒ	No. 1 Low-high shift valve			

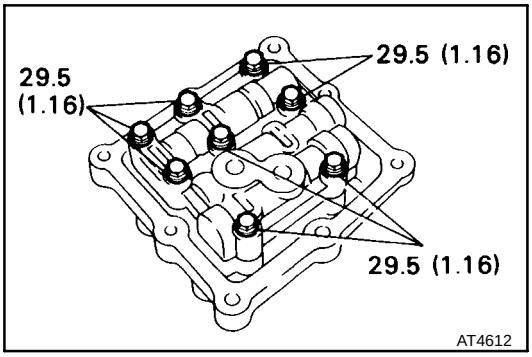


ASSEMBLY OF TRANSFER VALVE BODY

1. INSTALL PLATE AND NEW GASKETS ON TRANSFER LOWER VALVE BODY

Install a new gasket and plate and then the other new gasket.

HINT: Both gaskets are the same.



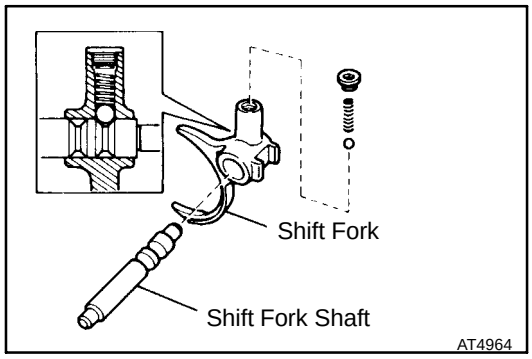
2. INSTALL TRANSFER LOWER VALVE BODY

Each bolt length (mm, in.) is indicated in the figure.

(a) Lower the transfer lower valve body into place.

(b) Hand tighten the eight bolts first. Then, tighten them with a torque wrench.

Torque: 67 kg-cm (58 in.-lb, 6.6 N-m)



ASSEMBLY OF TRANSFER LEFT CASE

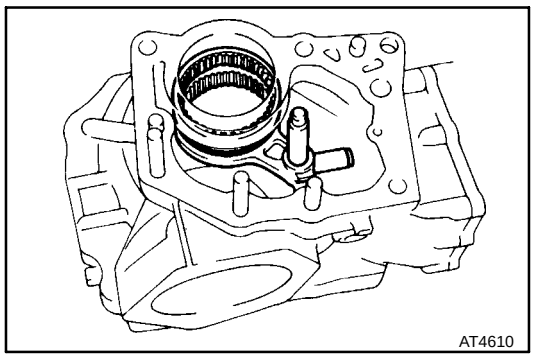
1. INSTALL SHIFT FORK SHAFT TO SHIFT FORK

(a) Insert the shift fork shaft into the shift fork.

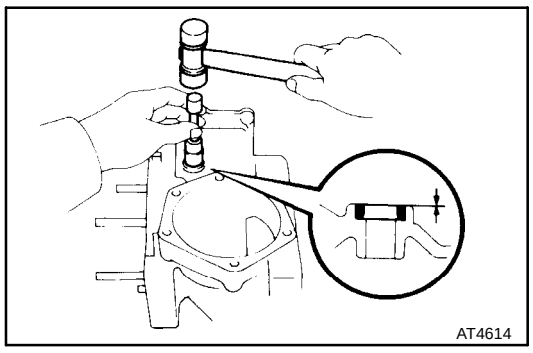
(b) Install the ball, spring and head plug.

(c) Tighten the plug.

Torque: 250 kg-cm (18 ft-lb, 25 N-m)



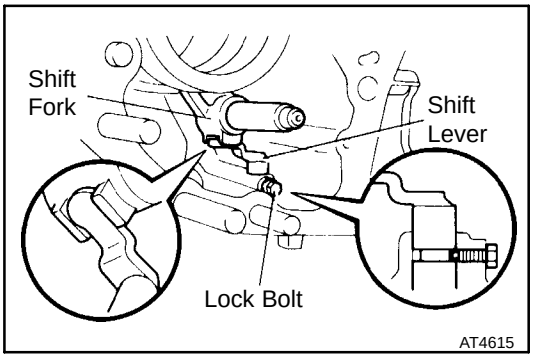
2. INSTALL SHIFT FORK SHAFT, SHIFT FORK AND SLEEVE



3. INSTALL TRANSFER SHIFT LEVER

(a) Coat the lip of new oil seal with MP grease.

(b) Using a 17 mm (0.67 in.) socket wrench and hammer, drive in the oil seal as shown.

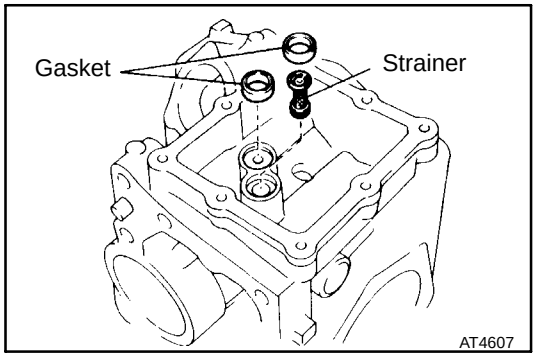


(c) Install transfer shift lever.

HINT: Engage shift fork and transfer shift lever.

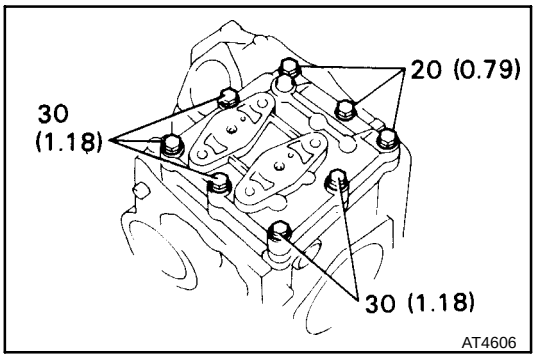
(d) Install and tighten the lock bolts.

Torque: 40 kg-cm (35 in.-lb, 3.9 N-m)



4. INSTALL TRANSFER VALVE BODY ASSEMBLY

(a) Install the new transfer case gaskets and valve body strainer.

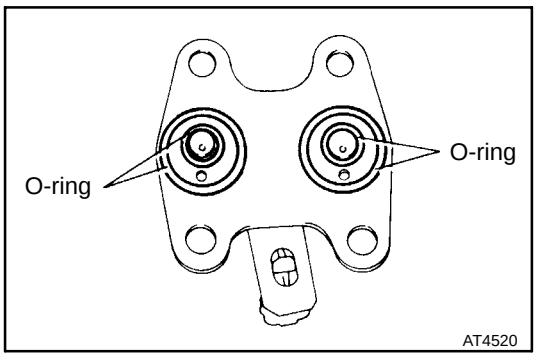


(b) Install the new transfer valve body gasket.

(c) Install the transfer valve body assembly.

(d) Tighten the bolts.

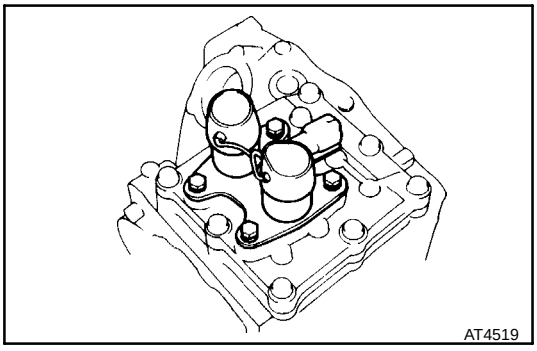
Torque: 110 kg-cm (8 ft-lb, 11 N-m)



5. INSTALL CENTER DIFFERENTIAL CONTROL SOLENOIDS

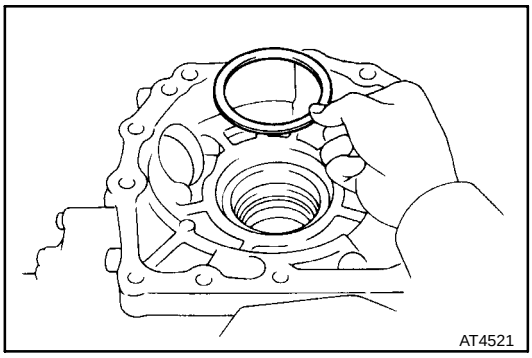
(a) Install the four new O-rings to the solenoids.

(b) Coat the O-rings with ATF.



(c) Install the solenoids.

Torque: 145 kg-cm (10 ft-lb, 14 N-m)

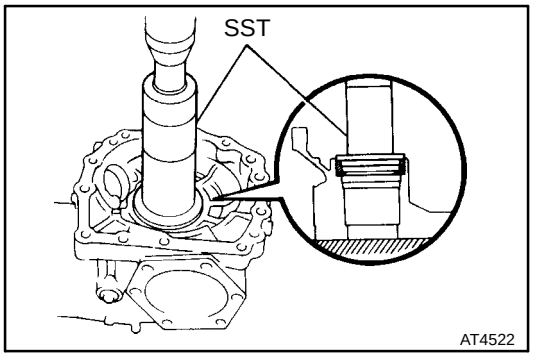


ASSEMBLY OF COMPONENT PARTS

1. INSTALL CASE SIDE

(a) Install the plate washer.

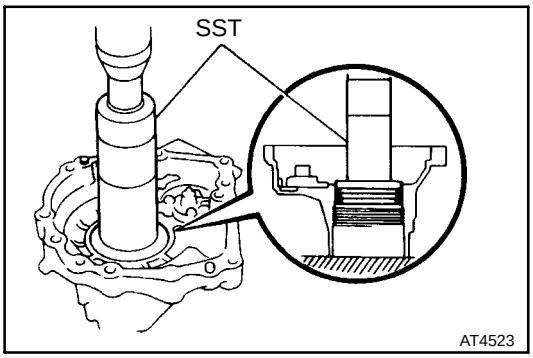
HINT: First install a washer of the same thickness as before.



(b) Using SST and a press, press in the outer race.

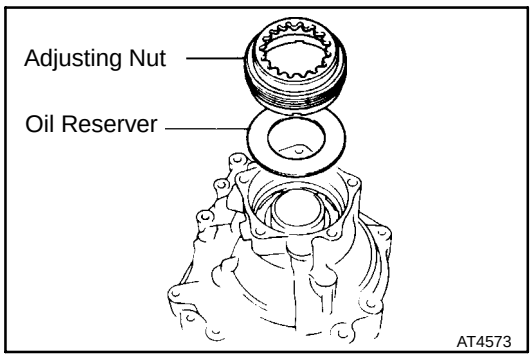
SST 09316-60010 (09316-00010, 09316-00060)

2. INSTALL RIGHT CASE SIDE



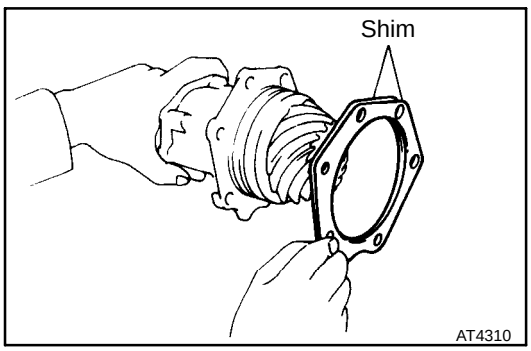
(a) Using SST and a press, press in outer race as shown.

SST 09316-60010 (09316-00010, 09316-00060)



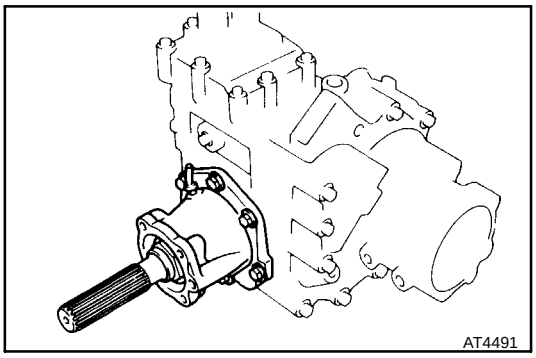
(b) Install the bearing adjusting nut and oil reserver, until it touches the outer race.

3. ADJUST RING GEAR BACKLASH



(a) Install the two shims to the driven pinion bearing cage assembly.

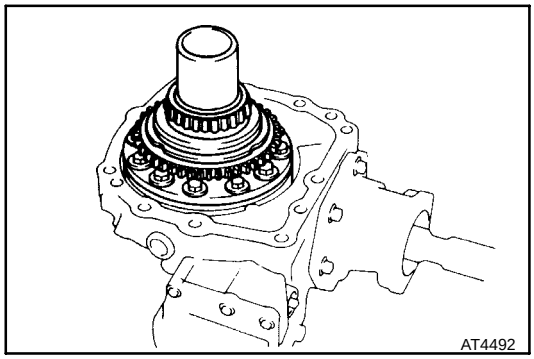
HINT: First install shims of the same thickness as before.


AT4491

(b) Install the driven pinion bearing cage.

Torque: 400 kg-cm (29 ft-lb, 39 N-m)

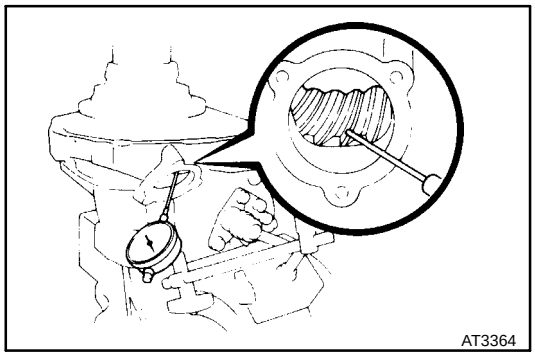
HINT: Do not install the O-ring.


AT4492

(c) Install the ring gear mounting case and center differential case.

(d) Using a dial indicator, measure the ring gear backlash.

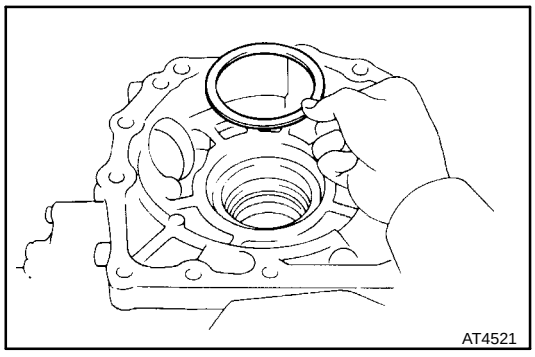
Backlash: 0.13 - 0.18 mm (0.0051 - 0.0071 in.)

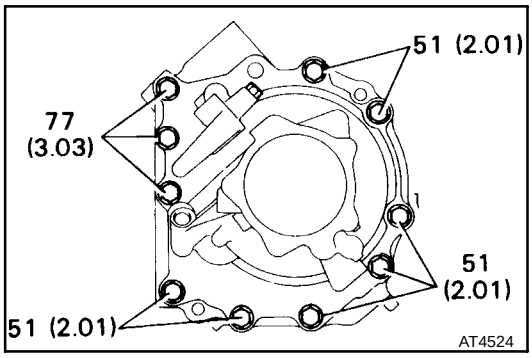

AT3364

(e) Referring to the table below, select the plate washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

Plate washer thickness mm (in.)

Mark	Thickness	Mark	Thickness
71	2.13 (0.0839)	83	2.49 (0.0980)
72	2.16 (0.0850)	84	2.52 (0.0992)
73	2.19 (0.0862)	85	2.55 (0.1004)
74	2.22 (0.0874)	86	2.58 (0.1016)
75	2.25 (0.0886)	87	2.61 (0.1028)
76	2.28 (0.0898)	88	2.64 (0.1039)
77	2.31 (0.0909)	89	2.67 (0.1051)
78	2.34 (0.0921)	90	2.70 (0.1063)
79	2.37 (0.0933)	91	2.73 (0.1075)
80	2.40 (0.0945)	92	2.76 (0.1087)
81	2.43 (0.0957)	93	2.79 (0.1098)
82	2.46 (0.0969)	94	2.82 (0.1110)


AT4521



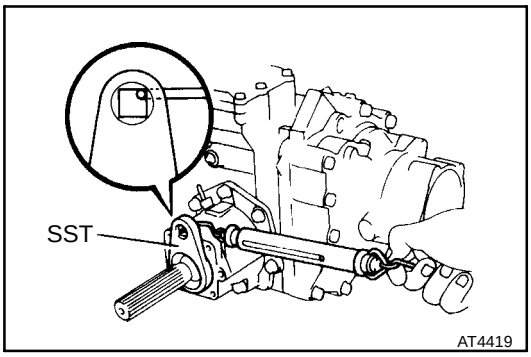
4. ADJUST TOTAL PRELOAD

(a) Install the transfer right case.

(b) Install and torque the ten bolts.

Torque: 450 kg-cm (33 ft-lb, 44 N-m)

HINT: Do not apply seal packing and do not install gasket. Each bolt length (mm, in.) is indicated in the figure.



(c) Using SST and a spring tension gauge, measure the total preload.

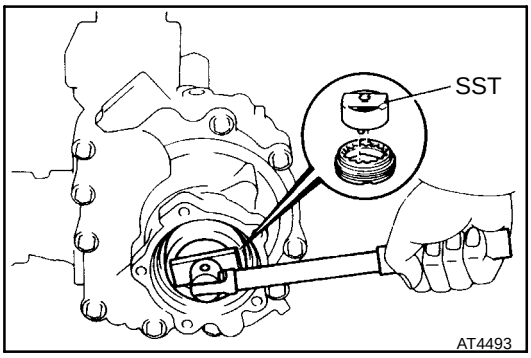
SST 09326-2001 1

Preload (at starting):

Add driven pinion preload

0.5 - 0.9 kg (1.1 - 2.0 lb, 4.9 - 8.8 N)

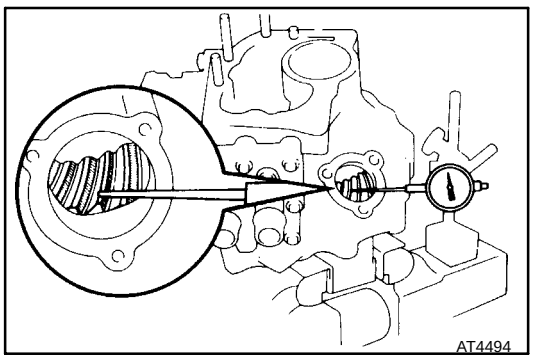
HINT: Turn the drive pinion counterclockwise and clockwise several times.



(d) Adjust the total preload by tightening the adjusting nut with SST.

SST 09318-12010

HINT: Measure the preload while tightening the bearing adjusting nut a little at a time.

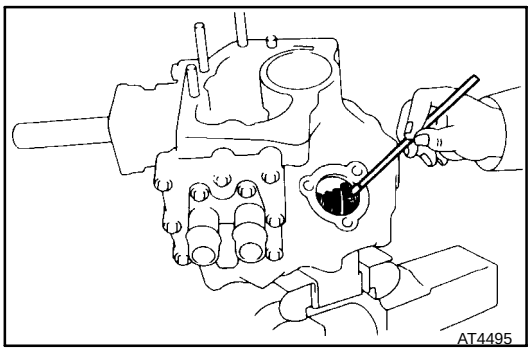


5. CHECK RING GEAR BACKLASH

(a) Using a dial indicator, measure the ring gear backlash.

Backlash: 0.13 - 0.18 mm (0.0051 - 0.0071 in.)

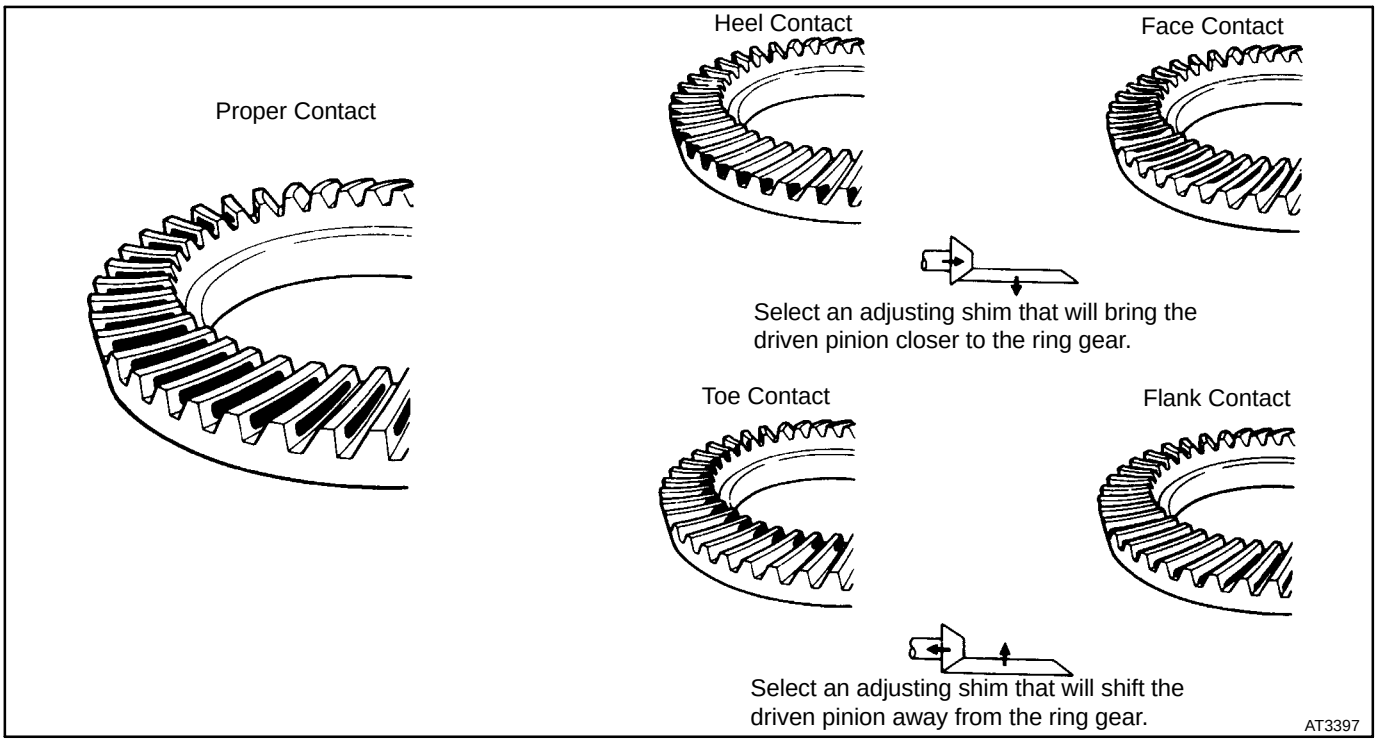
(b) When the backlash is outside the standard value, select a different plate washer to the one selected in step 3. Again adjust the backlash and total preload.

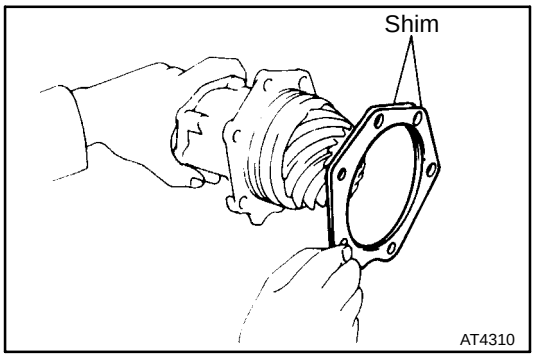


6. CHECK TOOTH CONTACT

(a) Coat 3 or 4 teeth at four different positions on the ring gear with red lead.

(b) Rotate the ring gear, inspect the teeth pattern.

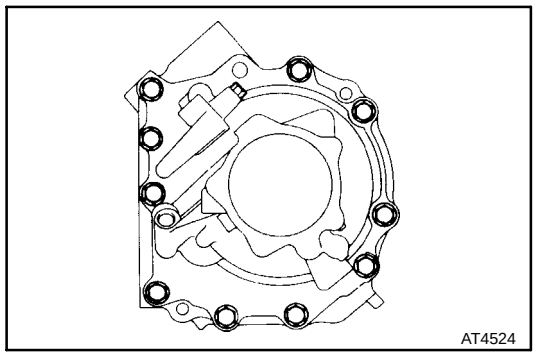




(c) If the teeth are not connecting properly, again the proper shim and plate washer.

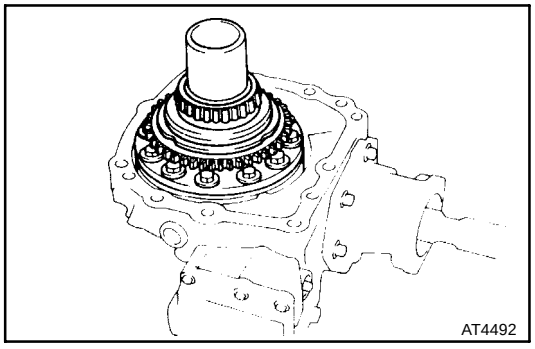
Shim thickness mm (in.)

Mark	Thickness	Mark	Thickness
A	0.30 (0.0118)	F	0.45 (0.0177)
B	0.33 (0.0130)	G	0.48 (0.0189)
C	0.36 (0.0142)	H	0.51 (0.0201)
D	0.39 (0.0154)	J	0.54 (0.0213)
E	0.42 (0.0165)	K	0.57 (0.0224)

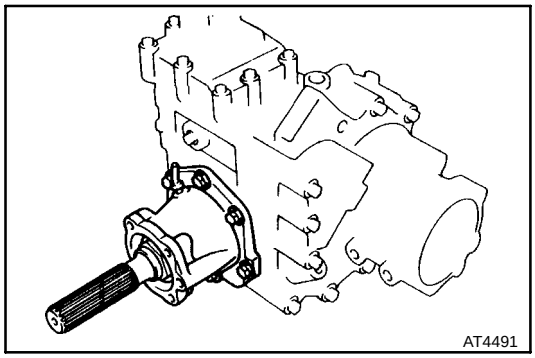


7. REMOVE TRANSFER RIGHT CASE

Remove the ten bolts and transfer right case.

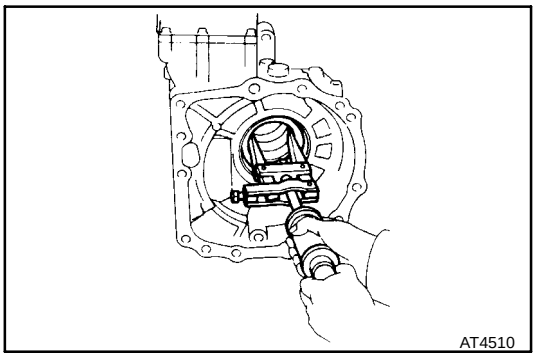


8. REMOVE RING GEAR MOUNTING CASE AND CENTER DIFFERENTIAL CASE


AT4491

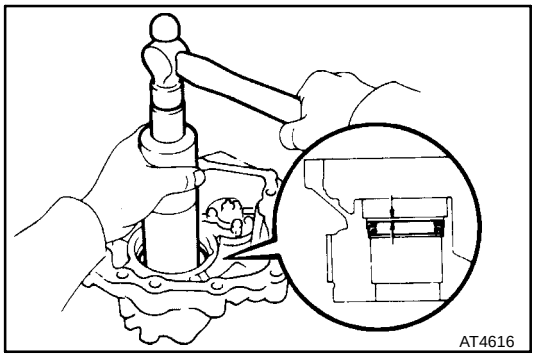
9. REMOVE DRIVEN PINION BEARING CAGE ASSEMBLY

Remove the six bolts and driven pinion bearing cage assembly.


AT4510

10. REMOVE DIFFERENTIAL LEFT SIDE BEARING OUTER RACE AND PLATE WASHER

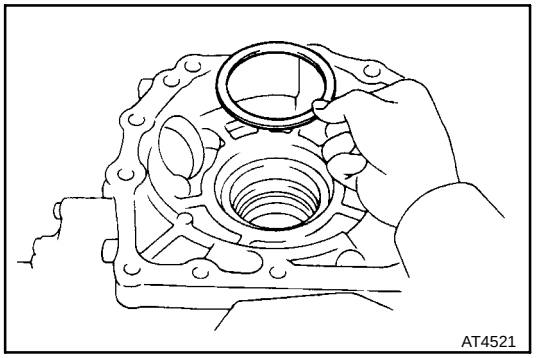
Using SST, remove the outer race and plate washer.
SST 09308-00010


AT4616

11. INSTALL OIL SEAL

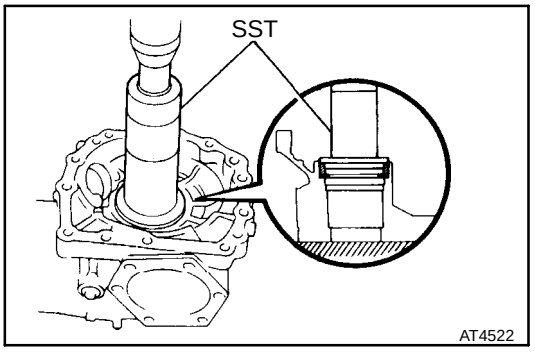
(a) Using SST, install a new oil seal as shown.
SST 09316-60010 (09316-00010, 09316-00030)
Oil seal depth: 3 mm (0.12 in.)

(b) Coat the lip of oil seal with MP grease.


AT4521

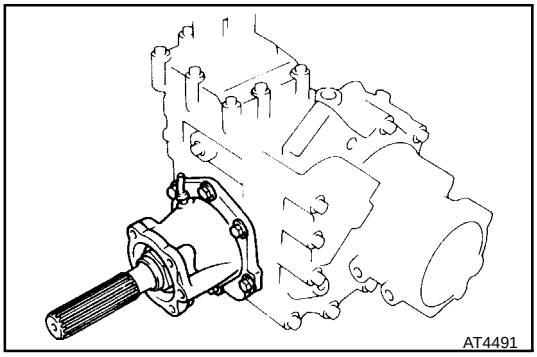
12. INSTALL LEFT CASE BEARING OUTER RACE

(a) Install the plate washer. (previously selected)



AT4522

(b) Using SST and a press, press in the outer race.
SST 09316-60010 (09316-00010, 09316-00060)



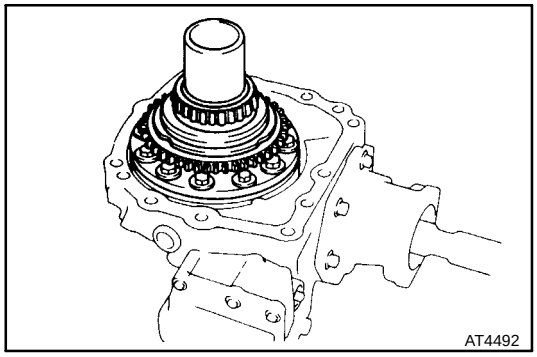
13. INSTALL DRIVEN PINION BEARING CAGE ASSEMBLY

(a) Coat the O-ring with gear oil, and install it to the bearing cage assembly.

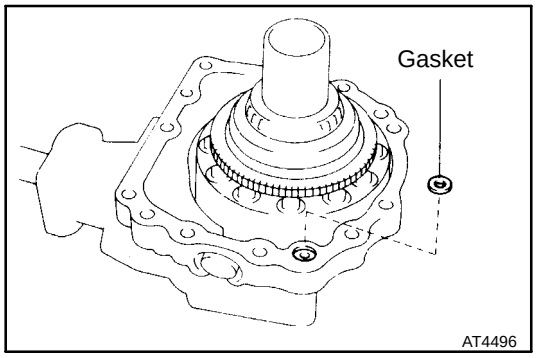
(b) Install the bearing cage with adjust shim (Previously selected) to the transfer left case.

(c) Install and torque the six bolts.

Torque: 400 kg-cm (29 ft-lb, 39 N-m)

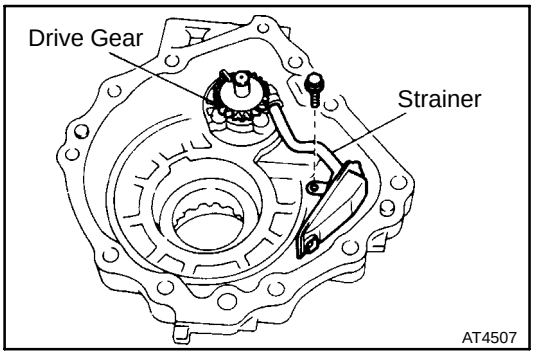


14. INSTALL RING GEAR MOUNTING CASE AND CENTER DIFFERENTIAL CASE



15. INSTALL TRANSFER RIGHT CASE

(a) Install a new apply gasket to the left case.



(b) Coat the O-ring with gear oil.

(c) Install the O-ring to the oil pump strainer.

(d) Install the oil pump strainer to the transfer right case.

(e) Install and torque the bolt.

Torque: 55 kg-cm (48 in.-lb, 5.4 N-m)

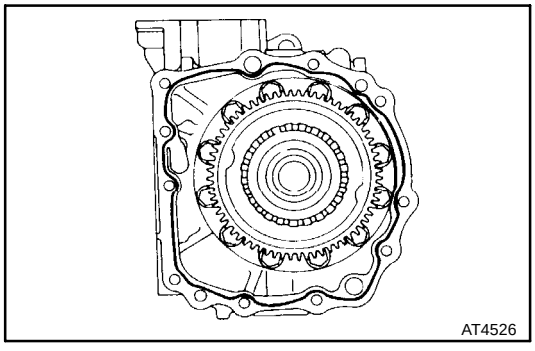
(f) Install the oil pump driven gear.

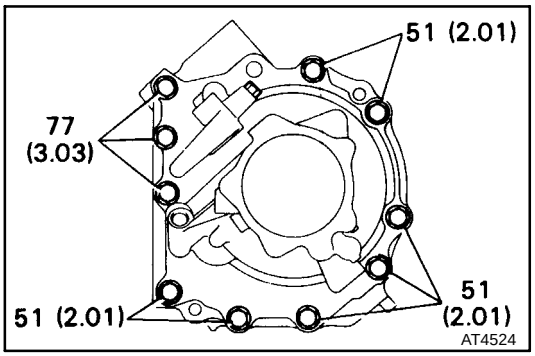
(g) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transfer left case or right case.

(h) Apply seal packing to the left case as shown in the figure.

Seal packing: Part No. 08826 - 00090 THREE BOND 1281 or equivalent

HINT: Install the right case as soon as the seal packing is applied.





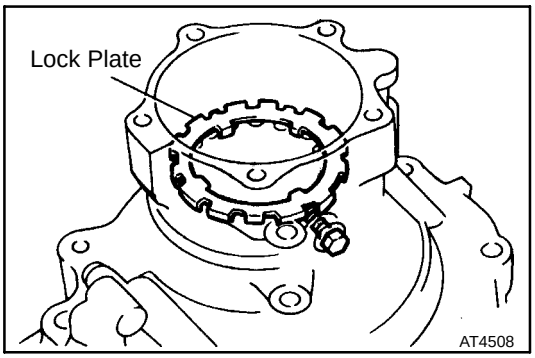
(i) Install the right case to the left case.

(j) Install and torque the ten bolts.

Torque: 450 kg-cm (33 ft-lb, 44 N-m)

HINT: Each bolt length (mm, in.) is indicated in the figure.

16. CHECK TOTAL PRELOAD
(See page AT-126)

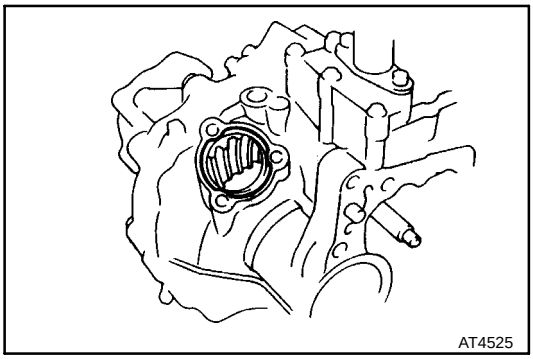


17. INSTALL ADJUSTING NUT LOCK PLATE

(a) Install the lock plate so that the projection from the lock plate fits properly into the groove of the adjusting nut.

HINT: When the lock plate cannot be installed, tighten the adjusting nut the smallest amount possible.

(b) Coat a new O-ring with gear oil and install it to the lock bolt.



(c) Install and torque the lock bolt.

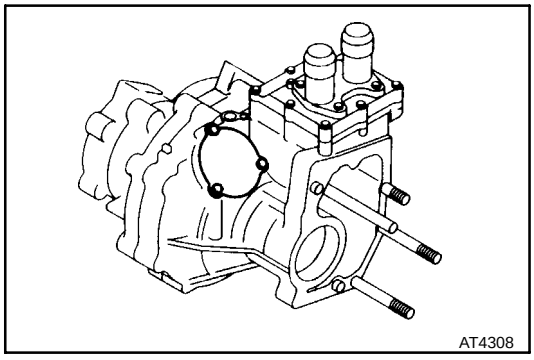
Torque: 73 kg-cm (63 in.-lb, 7 N-m)

18. INSTALL TRANSFER INSPECTION HOLE COVER

(a) Apply seal packing to the left case as shown in the figure.

Seal packing: Part No. 08826-00090 THREE BOND 1281 or equivalent

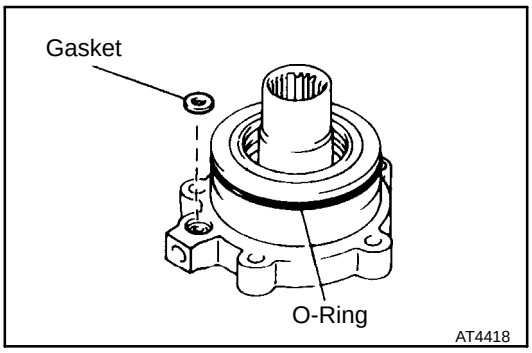
HINT: Install the cover as soon as the seal packing is applied.



(b) Install the hole cover to the transfer left case.

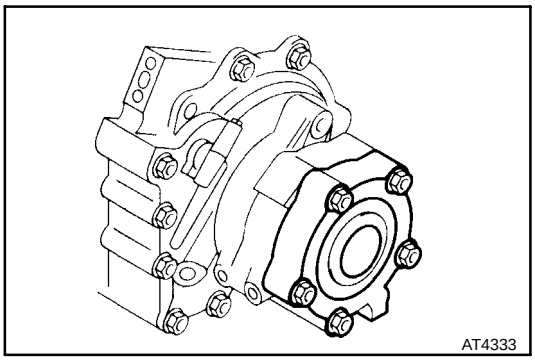
(c) Install and torque the three bolts.

Torque: 160 kg-cm (12 ft-lb. 16 N-m)



19. INSTALL TRANSFER RIGHT CASE RETAINER

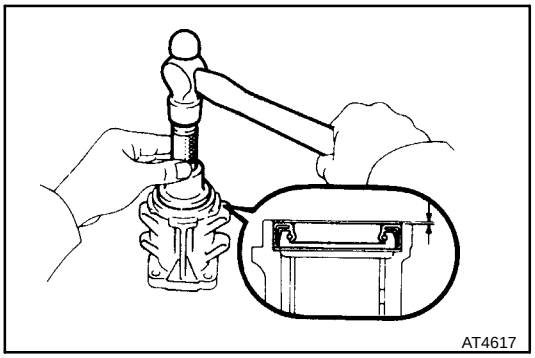
(a) Coat a new O-ring with gear oil, and install it and new apply gasket.



(b) Install the right case retainer to the transfer right case.

(c) Install and torque the five bolts.

Torque: 300 kg-cm (22 ft-lb, 29 N-m)

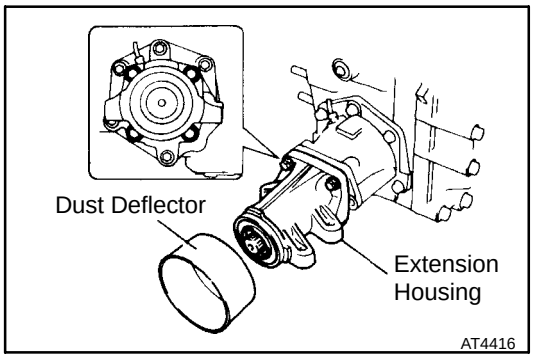


20. INSTALL EXTENSION HOUSING

(a) Using SST and a hammer, drive in a new oil seal as shown.

SST 09325-20010

(b) Coat the lip of the oil seal with MP grease.



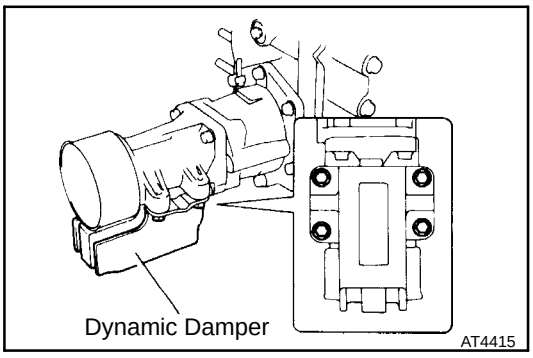
(c) Coat a new O-ring with gear oil and install it to the extension housing.

(d) Install the extension housing to the driven pinion bearing cage.

(e) Install and torque the four bolts.

Torque: 260 kg-cm (19 ft-lb, 25 N-m)

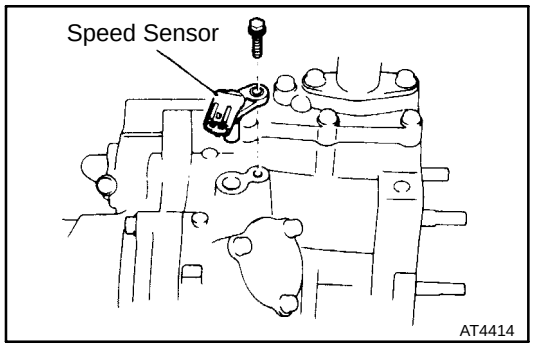
(f) Using a plastic hammer, install the dust deflector.



21. INSTALL DYNAMIC DAMPER

Install and torque the four bolts.

Torque: 260 kg-cm (19 ft-lb, 25 N-m)



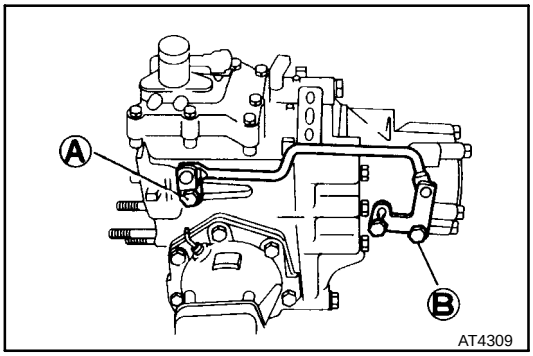
22. INSTALL REAR WHEEL SPEED SENSOR

(a) Install a new O-ring to the speed sensor.

(b) Install the speed sensor to the transfer left case.

(c) Install and torque a bolt.

Torque: 55 kg-cm (48 in.-lb, 5.4 N-m)

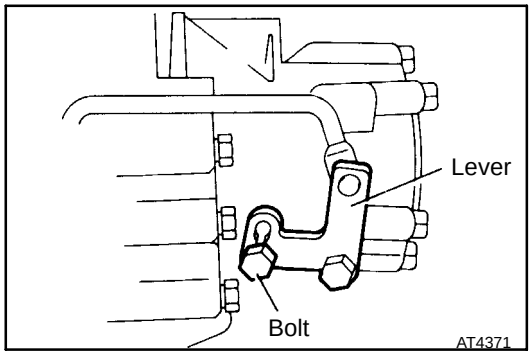


23. INSTALL TRANSFER MODE SELECT LEVER AND ROD

(a) Install the lever, rod and lever guide.

(b) Install and torque the two bolts.

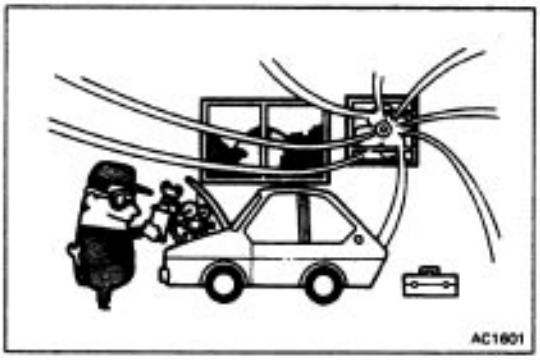
Torque: A 55 kg-cm (48 in.-lb, 5.4 N-m)
B 115 kg-cm (8 ft-lb, 11 N-m)



(c) Install the bolt while setting the lever as shown.

Torque: 115 kg-cm (8 ft-lb, 11 N-m)

AIR CONDITIONING SYSTEM



GENERAL INFORMATION

1. WHEN HANDLING REFRIGERANT (R–12), FOLLOWING PRECAUTIONS MUST BE OBSERVED.

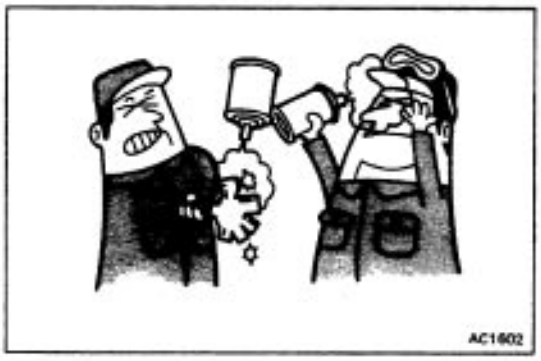
(a) Do not handle refrigerant in an enclosed area or near an open flame.

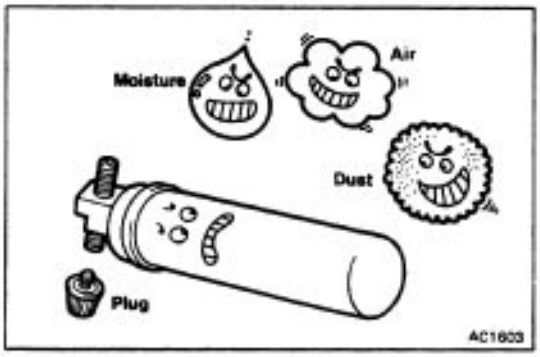
(b) Always wear eye protection.

(e) Be careful that liquid refrigerant does not get in your eyes or on your skin.

If liquid refrigerant gets in your eyes on your skin;

- Do not rub.
- Wash the area with a lot of cool water
- Apply clean petroleum jelly to the skin.
- Go immediately to a physician or hospital for professional treatment.
- Do not attempt to treat yourself.



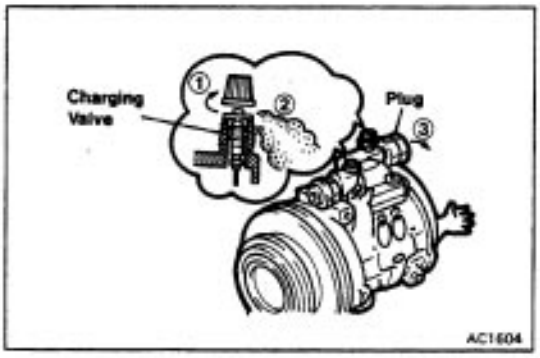


2. WHEN REPLACEiNG PARTS ON REFRIGERANT LINE;

(a) Discharge refrigerant slowly before replacement.

(b) Insert a plug immediately in disconnected parts to prevent entry of moisture and dust.

(c) Do not leave a new condenser or receiver, etc., lying around with the plug removed.



(d) Discharge refrigerant from the charging valve before installing the new compressor.

If the refrigerant is not discharged first, compressor oil will spray out with the refrigerant gas when the plug is r moved.

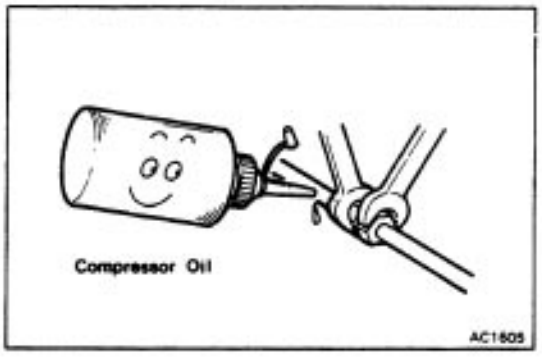
(e) Do not use a burner for bending or lengthening operations on tubes.

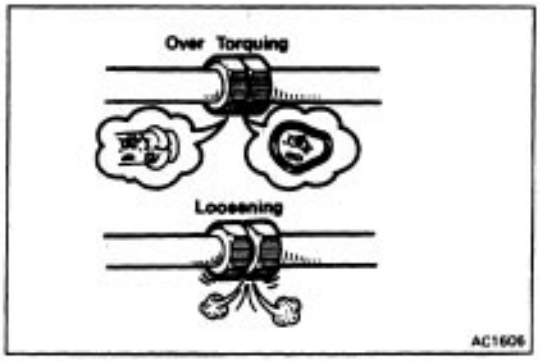
If tubes are heated with a burner, a layer of oxidation forms inside the tube, causing the same kind of trouble as an ac–cumulation of dust.

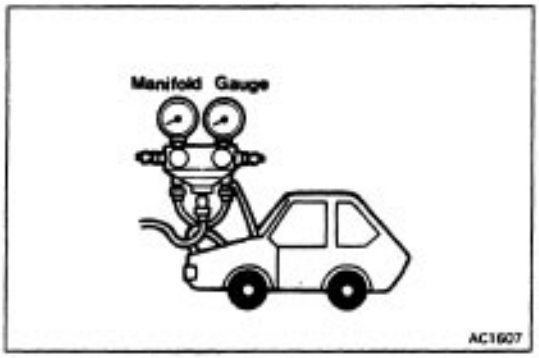
3. WHEN TIGHTENING CONNECTING PARTS;

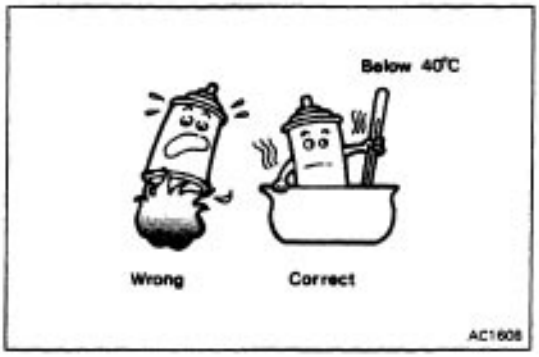
(a) Apply a few drops of compressor oil to O–ring fittings for easy tightening and to prevent leaking of refrigerant gas.

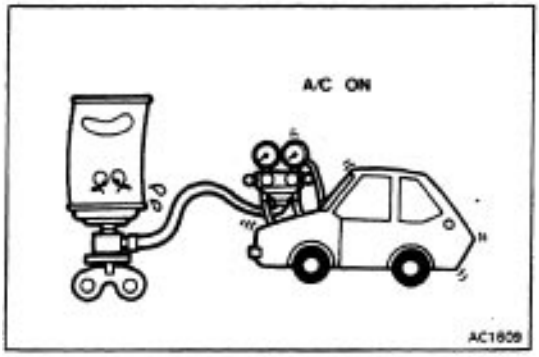
(b) Tighten the nut using two wrenches to avoid twisting the tube.

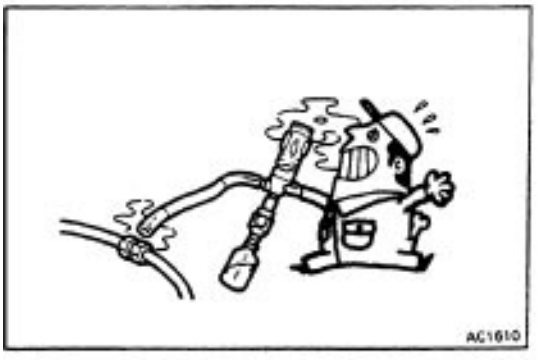












(e) Tighten the O–ring fittings or the bolted type fittings to the specified torque.

4. WHEN CONNECTING MANIFOLD GAUGE;

(a) Be sure to connect the charging hose end with a pin to the compressor charging valve.

(b) The letter ”D” engraved near the compressor service valve indicates the high pressure side, and ”S” indicates the low pressure side. Pay careful attention when connecting the hose.

(c) Tighten hose by hand.

(d) To prevent loosening of connected hose, do not apply drops of compressor oil to the seat of connection.

HINT: After connecting the manifold gauge and the refrig–erant container (service can), discharge any air in the hoses.

5. WHEN EVACUATING;

Approx. 15 minutes after removal, check the system for leaks, then take at least another 15 minutes to make sure the air is fully removed.

6. WHEN HANDLING REFRIGERANT CONTAINER (SERVICE CAN);

(a) Must never be heated.

(b) Must be kept below 4Ω˚C (1 04˚F).

(c) If warming service can with hot water, be careful that the valve on top of the service can is never immersed in the water, as the water may permeate into the refrigerant cycle.

(d) Empty service cans must never be re–used.

7. WHEN A/C IS ON AND REFRIGERANT GAS IS BEING REPLENISHED;

(a) If there is not enough refrigerant gas in the refrigerant cycle, oil lubrication becomes insufficient and compressor burnout may occur, so take care to avoid this.

(b) If the valve on the high pressure side is opened, refrigerant flows in reverse and causes the service can to rupture, so only open and close the vlave on the low pressure side.

(c) If the service can is inverted and refrigerant is inserted in a liquid state, the liquid is compressed and the compressor brakes down, so the refrigerant must be inserted in a g¿¿seous state.

(d) Be careful not to insert too much refrigerant gas, as this causes trouble such as inadequate cooling, poor fuel economy, engine overheat, etc.

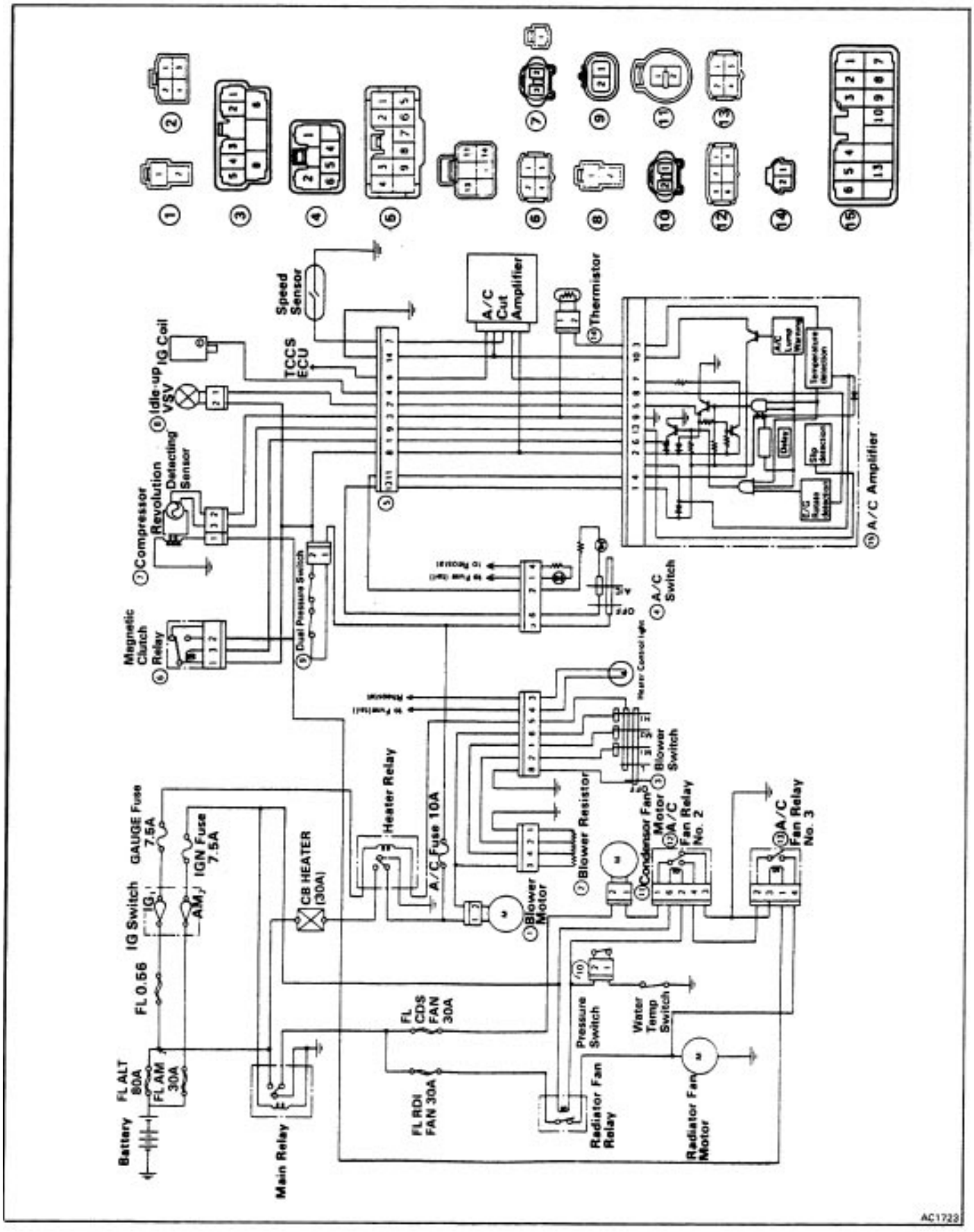
8. WHEN USING GAS–CYLINDER TYPE LEAK DETECTION INSTRUMENT;

(a) As a naked flame is used, first make sure that there are no flammable substances nearby before using it.

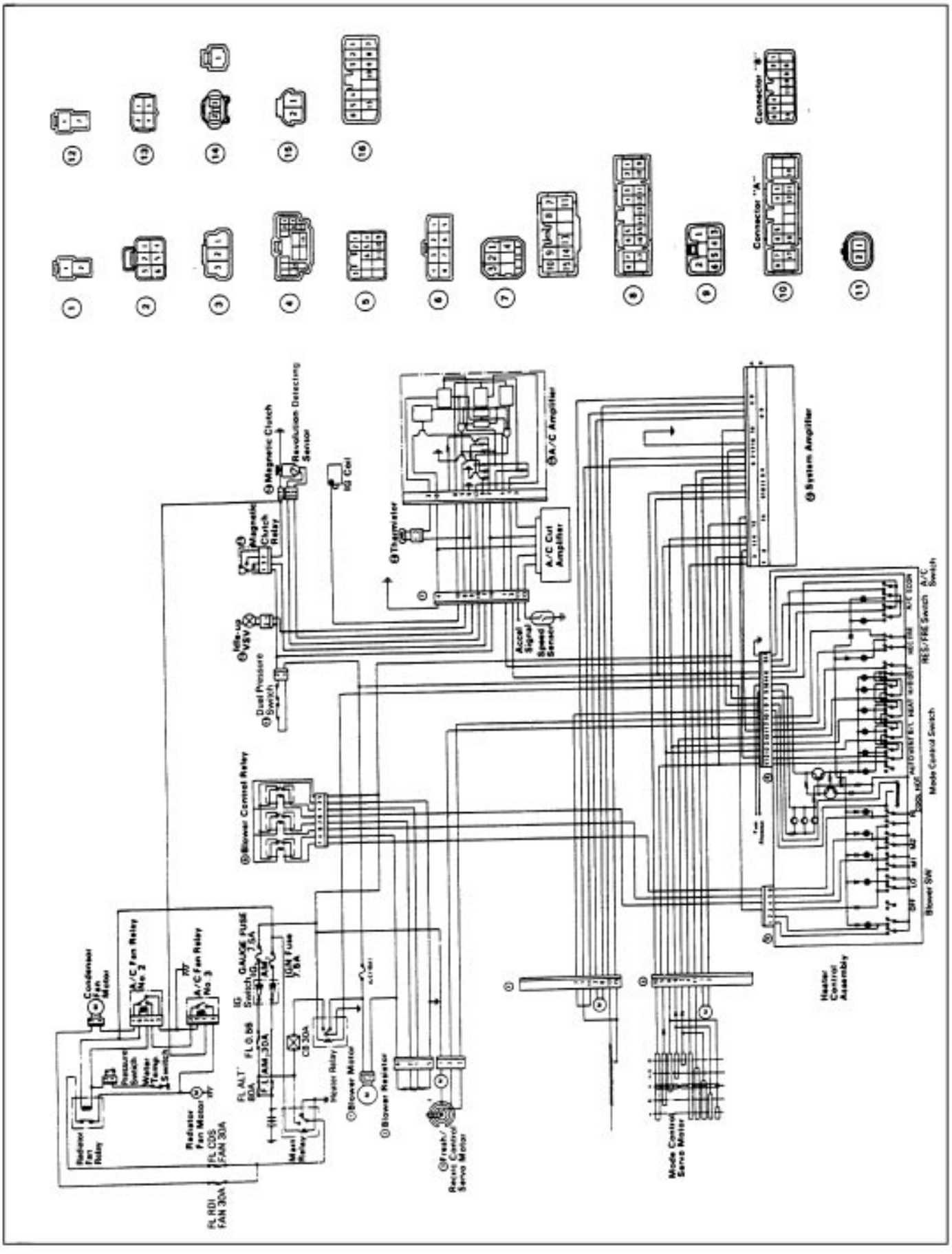
(b) Be careful, as poisonous gas is produced when refrigerant gas comes in contact with heat parts.

AIR CONDITIONING SYSTEM CIRCUIT

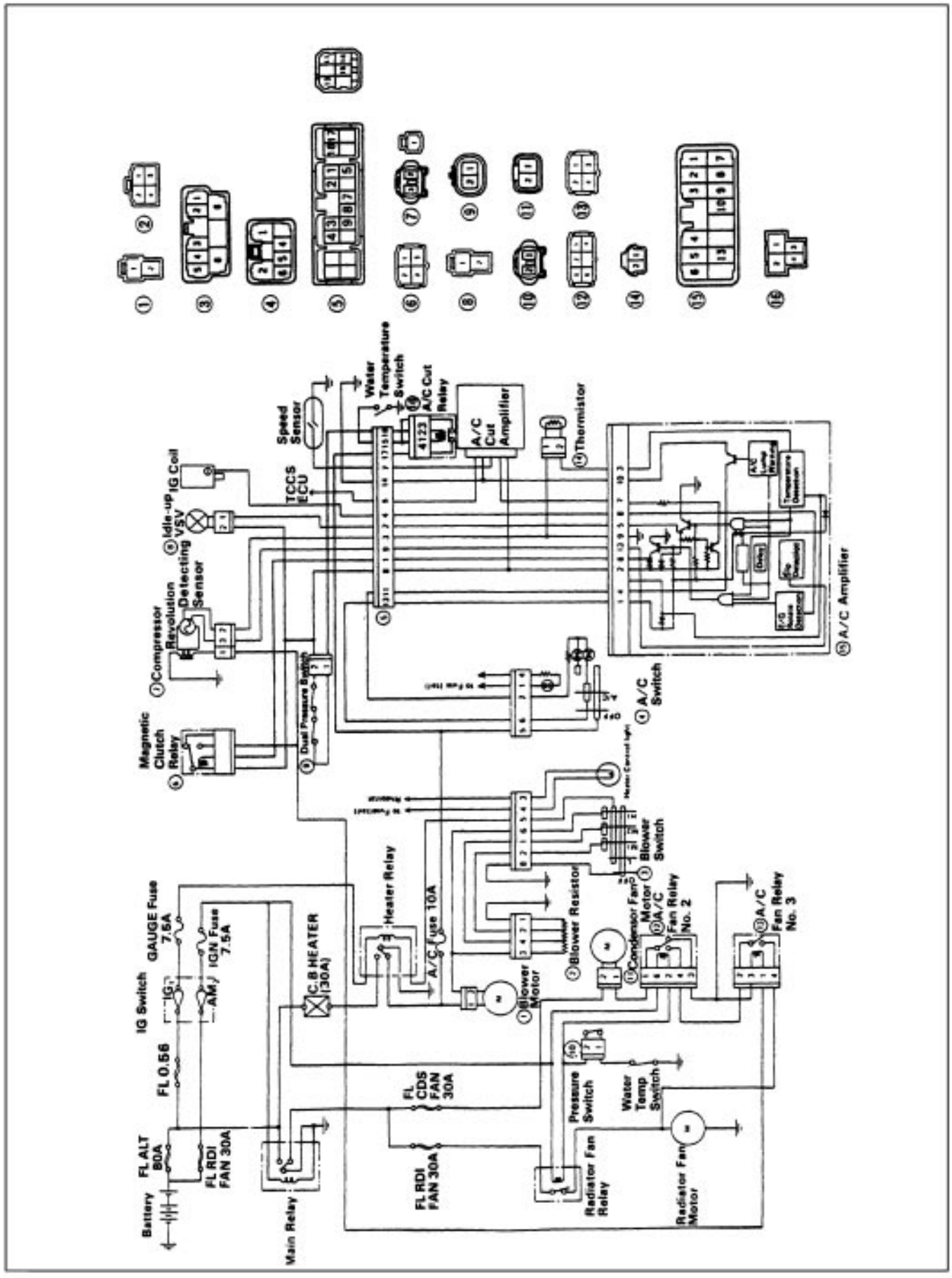
(Lever Type on 3S–FE Engine FWD Model)



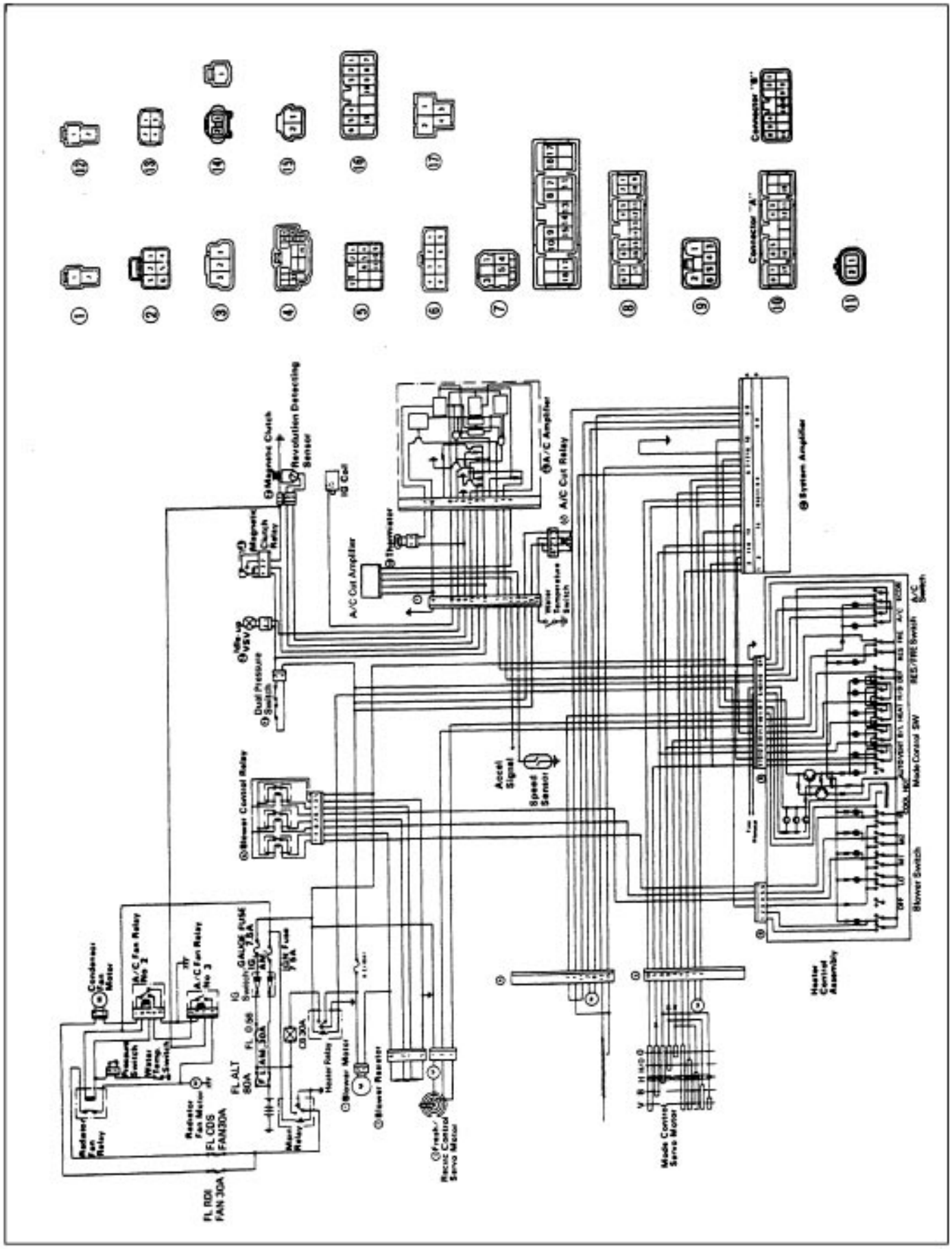
(Push Type on 3S–FE Engine FWD Model)



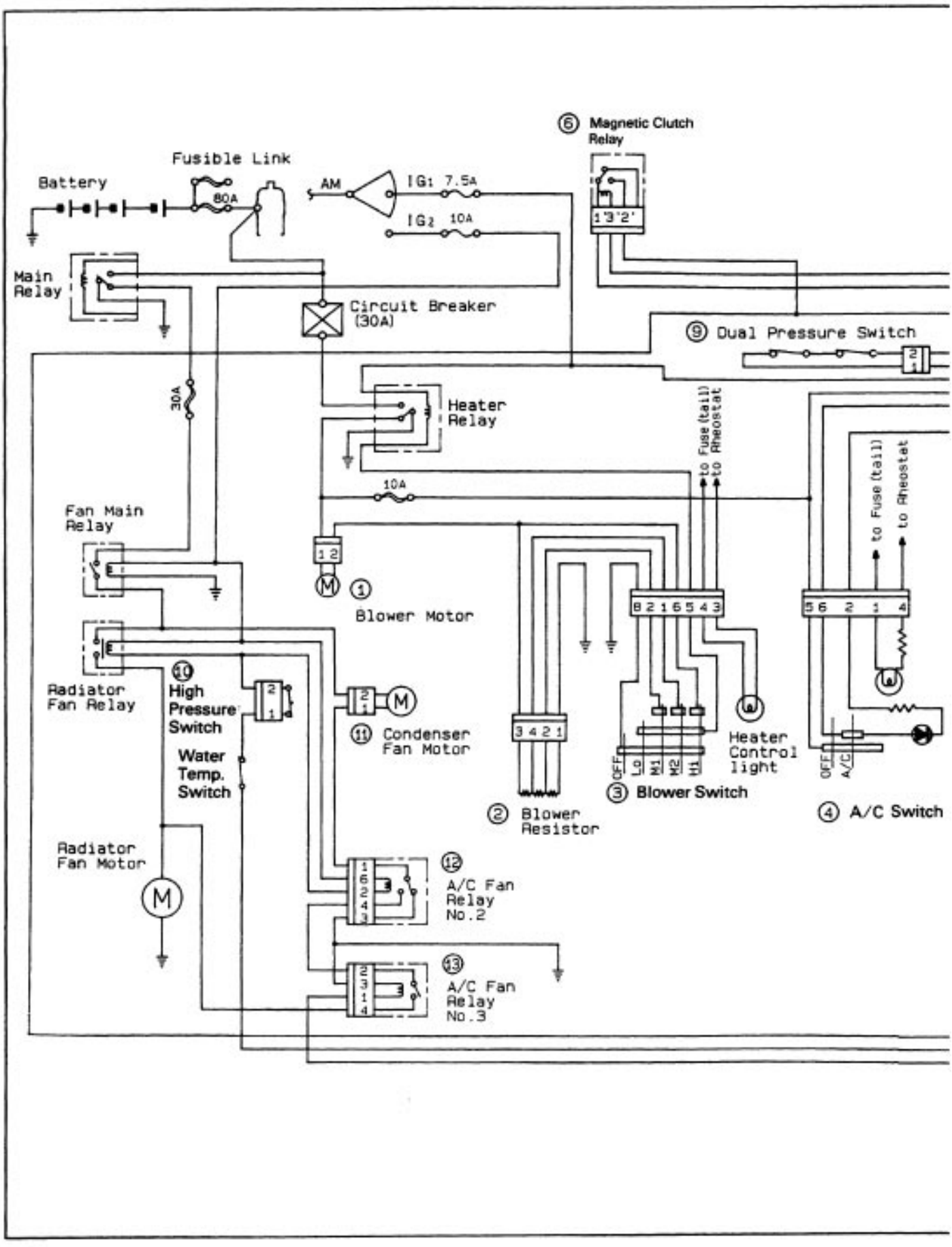
(Lever Type on 3S–FE Engine All–Trac/4WD Model)

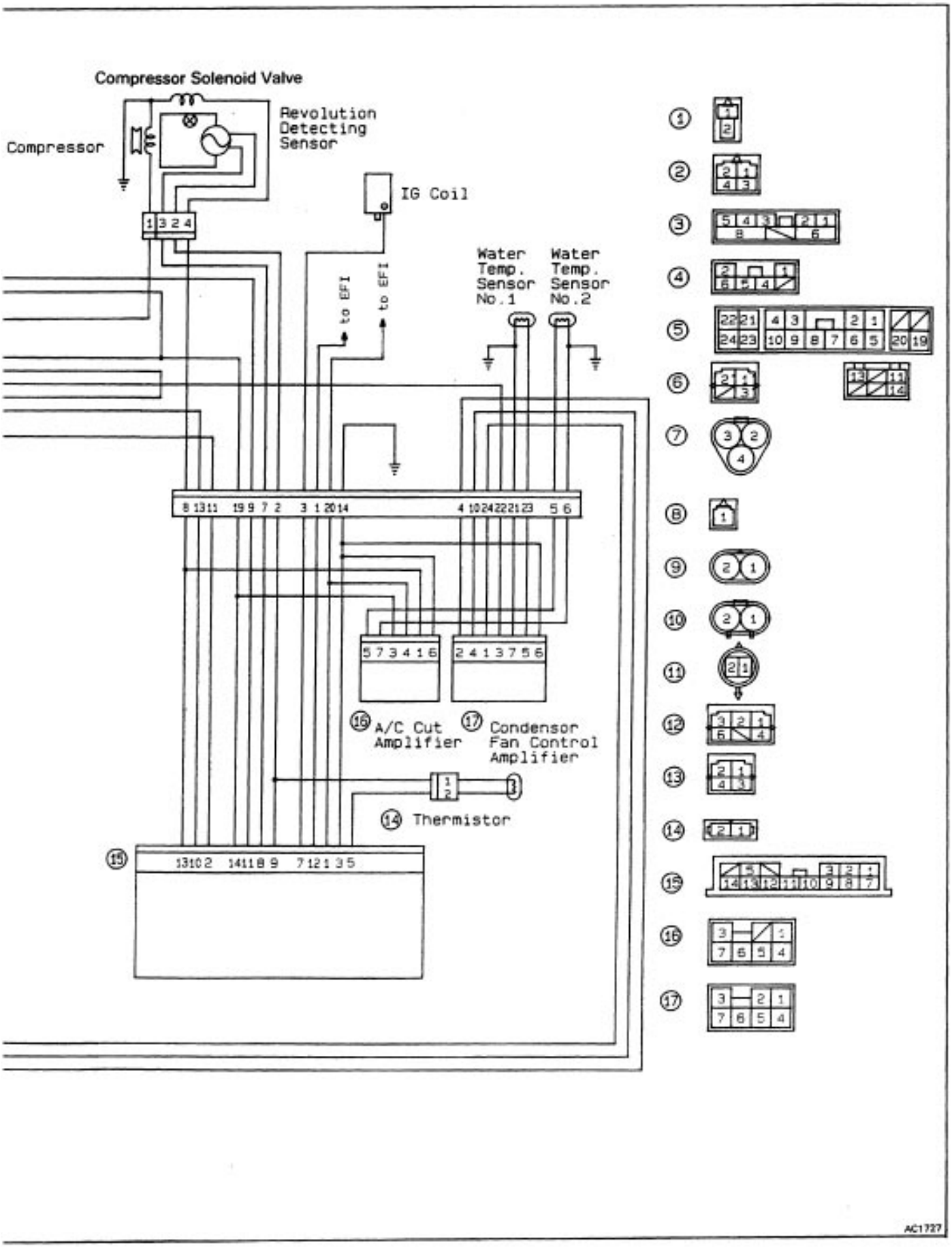


(Push Type on 3S–FE Engine All–Trac/4WD Model)

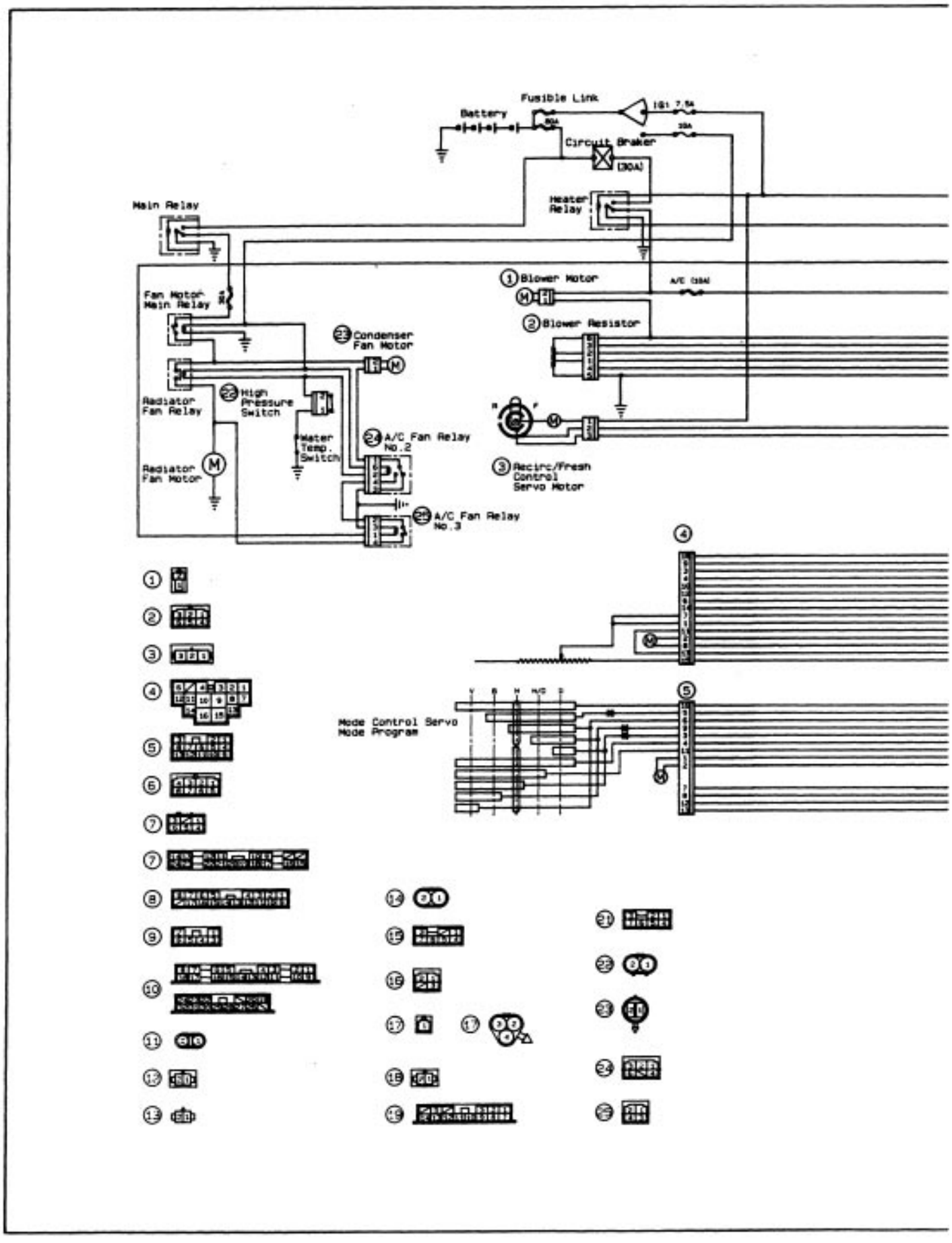


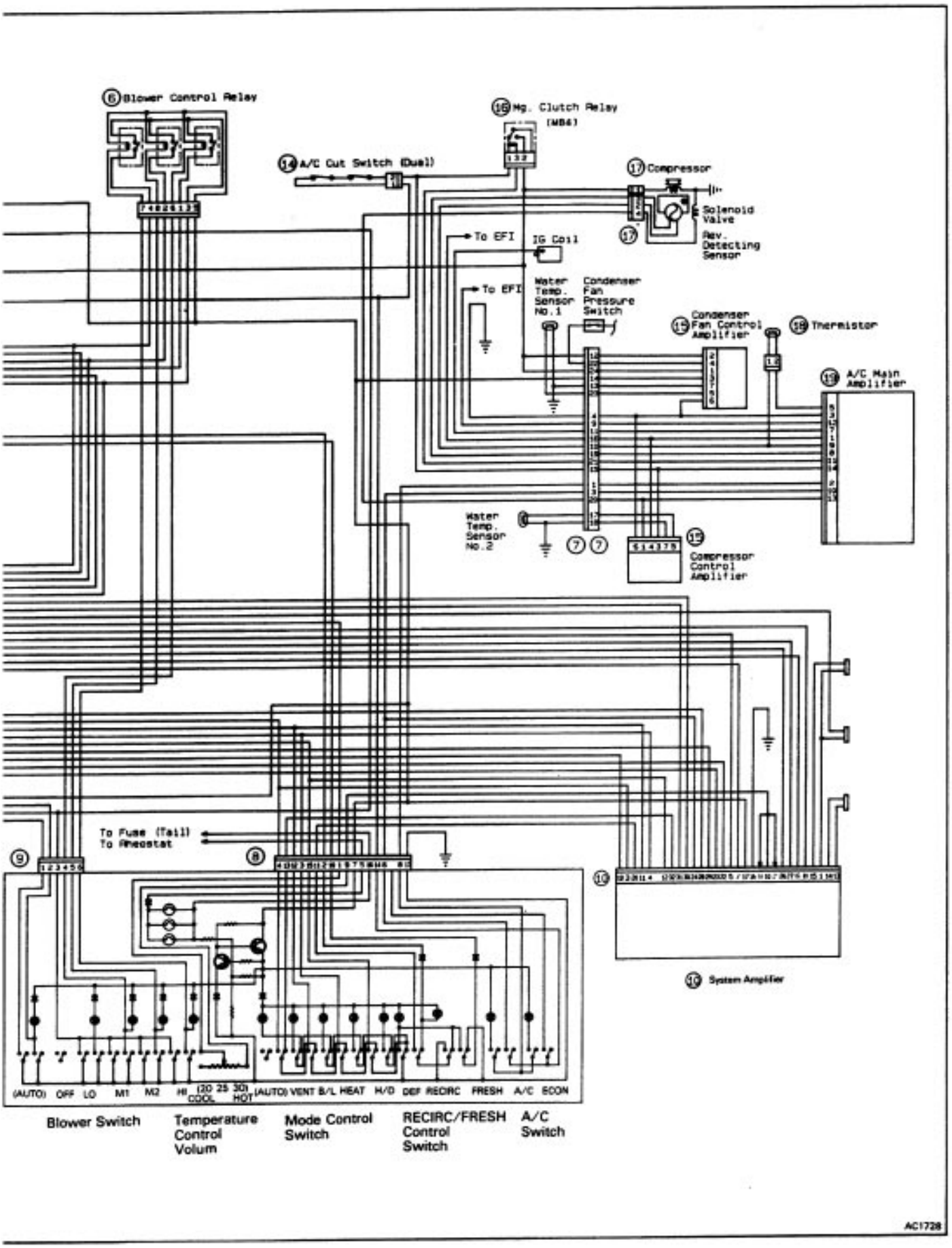
(Lever Type on 2VZ–FE Engine Model)




Compressor Solenoid Valve
Compressor
Revolution Detecting Sensor
IG Coil
1 3 2 4
to EFI
to EFI
Water Temp. Sensor No.1
Water Temp. Sensor No.2
8 13 11 19 9 7 2 3 1 20 14 4 10 24 22 21 23 5 6
5 7 3 4 1 6
2 4 1 3 7 5 6
⑯ A/C Cut Amplifier
⑰ Condenser Fan Control Amplifier
⑭ Thermistor
⑮ 13 10 2 14 11 18 9 7 12 1 3 5
AC1727

(Push Type on 2VZ–FE Engine Model)

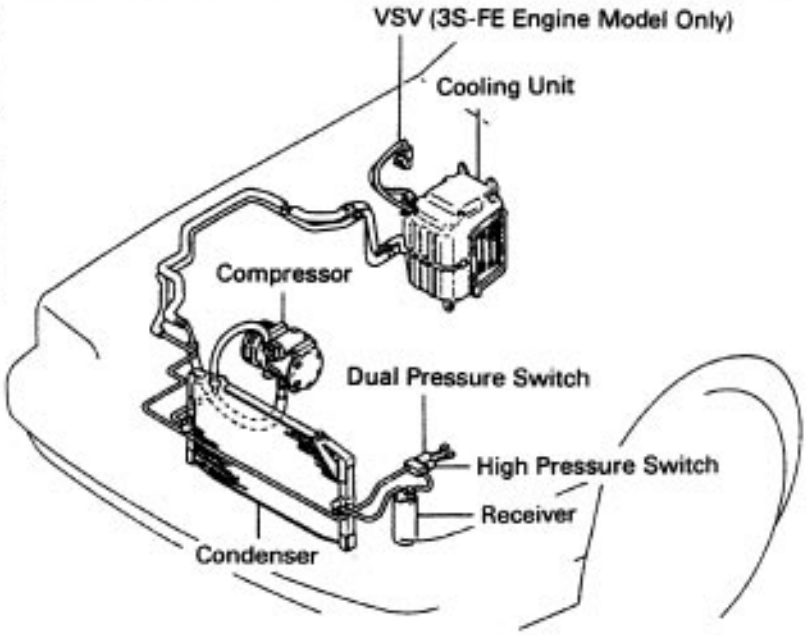


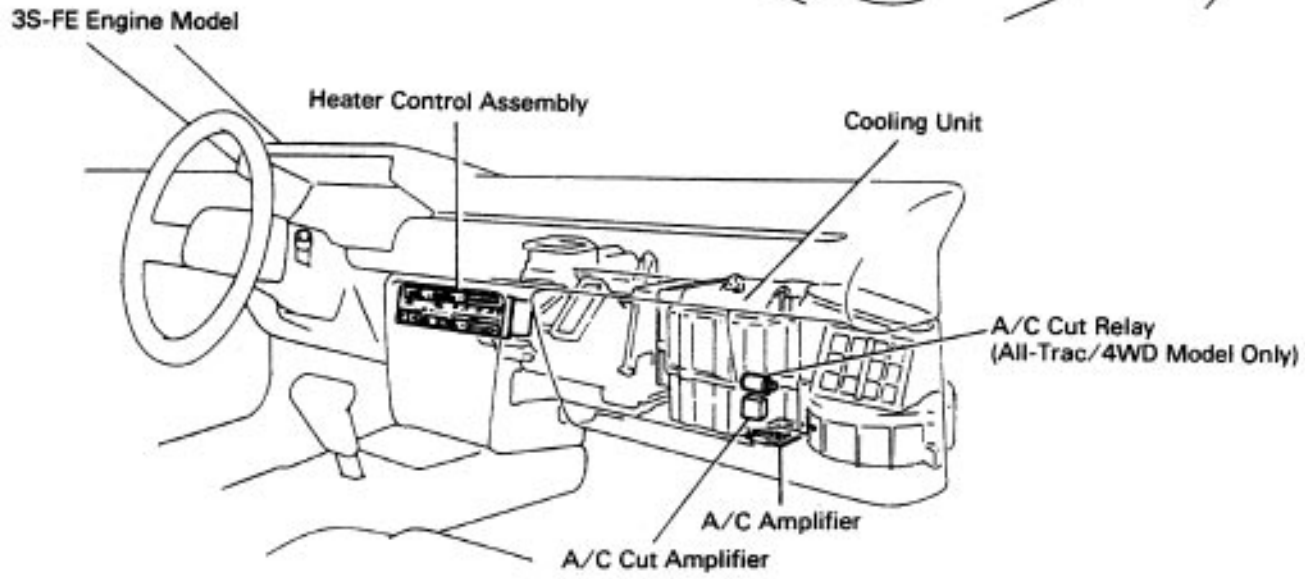

6 Blower Control Relay
16 Mg. Clutch Relay (MB4)
14 A/C Cut Switch (Dual)
17 Compressor
Solenoid Valve
17 Rev. Detecting Sensor
To EFI
IG Coil
To EFI
Water Temp. Sensor No.1
Condenser Fan Pressure Switch
15 Condenser Fan Control Amplifier
18 Thermistor
19 A/C Main Amplifier
Water Temp. Sensor No.2
7 7
15 Compressor Control Amplifier
To Fuse (Tail)
To Rheostat
9
8
10
10 System Amplifier
(AUTO) OFF LO M1 M2 HI (20 25 30) COOL HOT
(AUTO) VENT B/L HEAT H/D DEF RECIRC FRESH A/C ECON
Blower Switch
Temperature Control Volum
Mode Control Switch
RECIRC/FRESH Control Switch
A/C Switch
AC1728

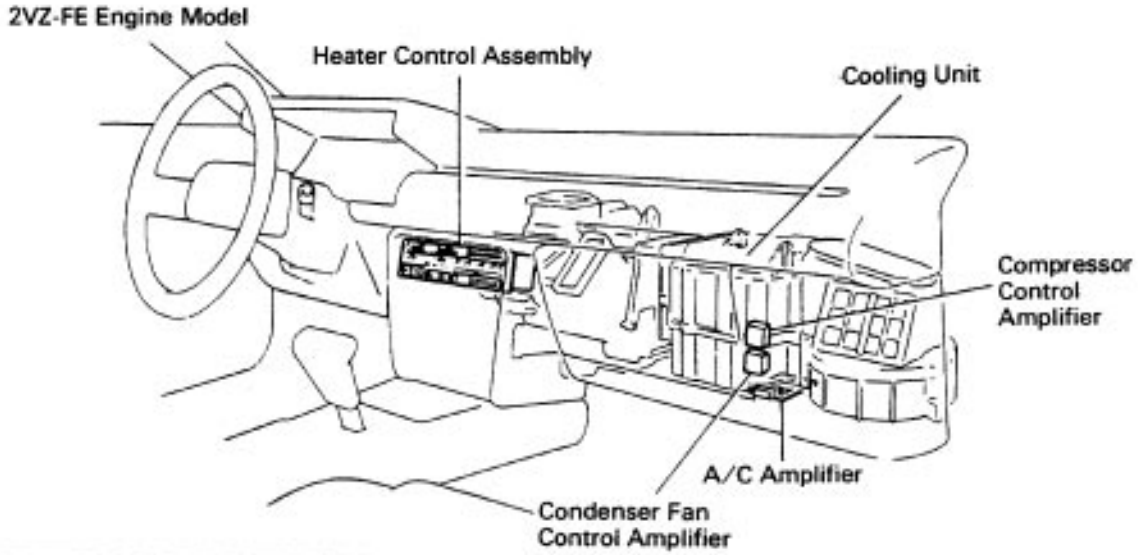
SYSTEM COMPONENTS

Specified Torque: kg-cm (ft-lb, N-m)

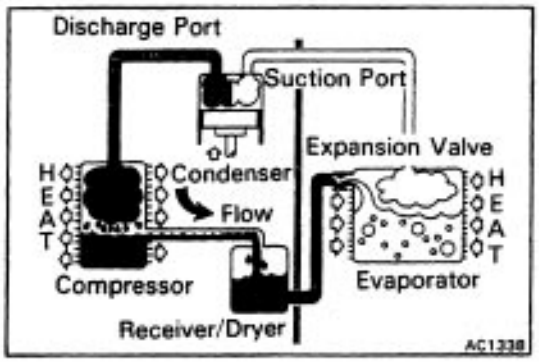
Fitting size		Torque
0.31 in. Tube		140 (10, 14)
0.50 in. Tube		230 (16, 22)
0.62 in. Tube		330 (24, 32)
Bolted Type	(For Compressor)	250 (18, 25)
	(For Condenser)	130 (9, 13)
	(For Receiver)	55 (48 in.-lb 5.4 N-m)







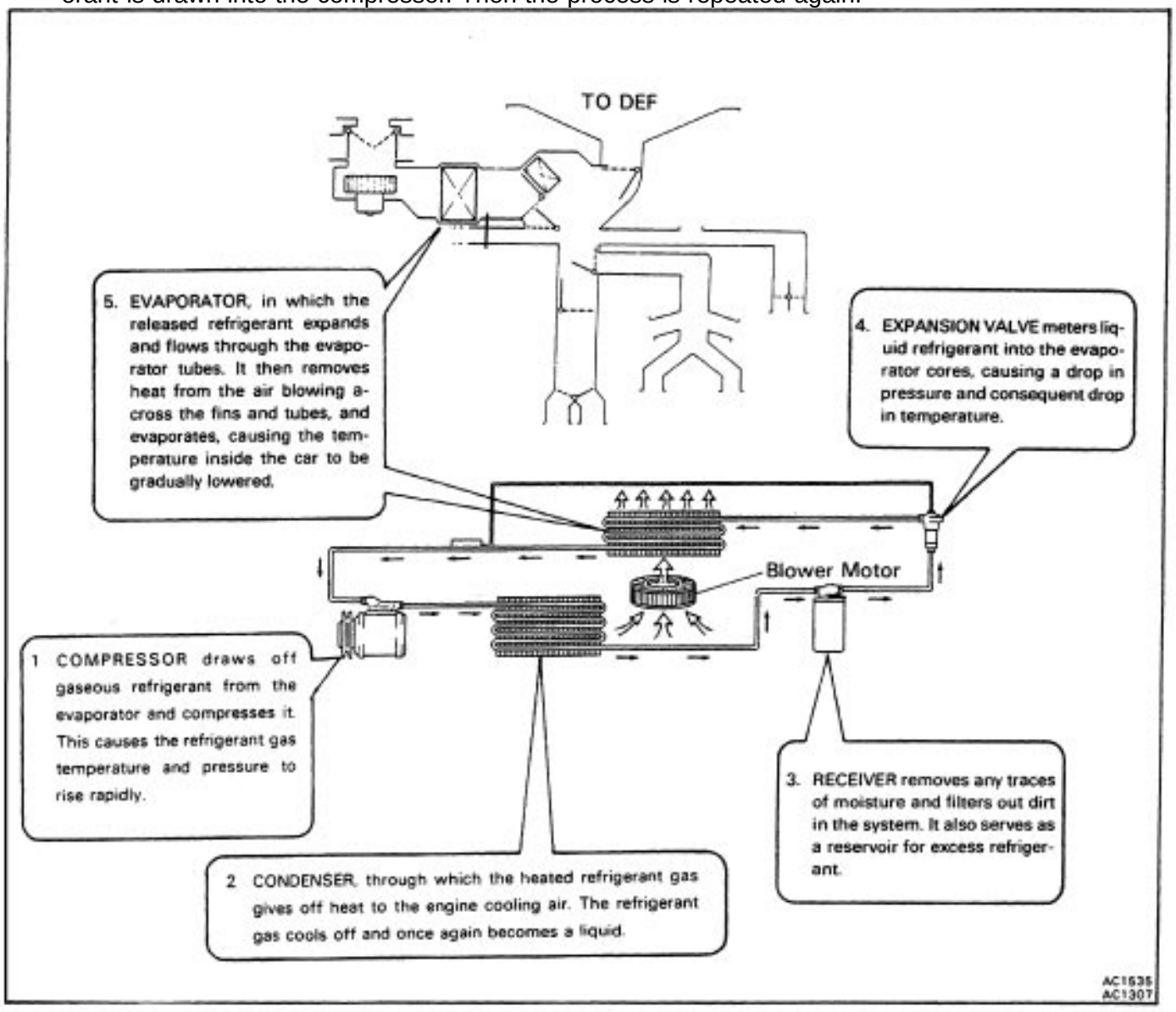
AC1718



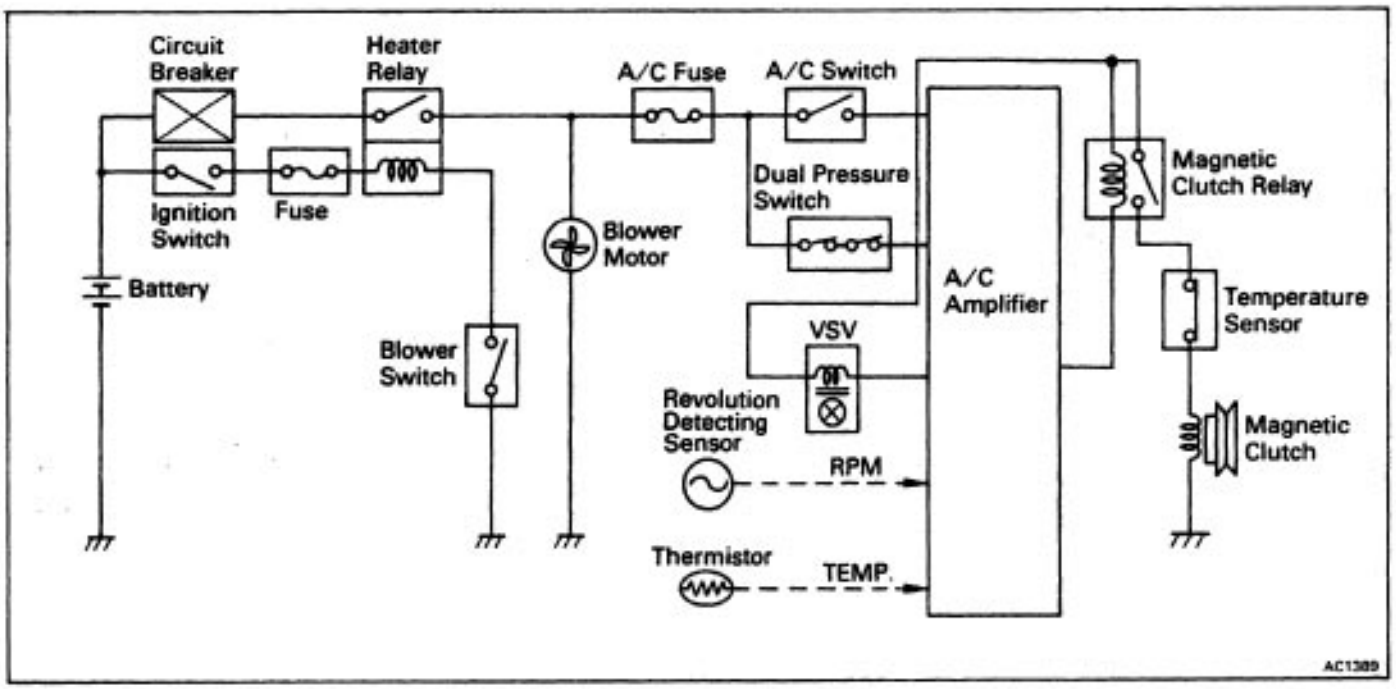
GENERAL DESCRIPTION

REFRIGERATION CYCLE

1. The compressor discharges high temperature and high pressure refrigerant containing the heat absorbed from the evaporator plus the heat created by the compressor in a discharge stroke.
2. This gaseous refrigerant flows into the condenser. In the condenser, the gaseous refrigerant condenses into liquid refrigerant.
3. This liquid refrigerant flows into the receiver which stores and filters the liquid refrigerant till the evaporator requires the ref–rigerant.
4. The liquid refrigerant is charged by the expansion valve into a low temperature, low pressure liquid and geseous mixture.
5. This cold and foggy refrigerant flows to the evaporator. Vaporizing the liquid in the evaporator, the heat from the warm air stream passing through the evaporator core is transfered to the refrigerant.
   All the liquid is changed into geseous refrigerant in the evaporator and only heat–laden geseous refrigerant is drawn into the compressor. Then the process is repeated again.



1. PRINCIPLE OF A/C ELECTRICAL CIRCUIT



2. HOW IS MAGNETIC CLUTCH ENERGIZED?

The general process until the magnetic clutch is energized is shown below.

1. Ignition Switch ”ON”
2. Blower Switch ”’ON” → Heater Relay “ON” (Blower Motor ”RUN”)
3. A/C Switch ”ON” → A/C Amplifier ”’ON” (A/C Amp. Main Power Supply)
4. Dual Pressure Switch ”’ON”:
   Refrigerant Condition (2.1 kg/cm2 (30 psi, 206 kPa) less than 27 kg/cm^2 (384 psi, 2,648 kPa))
5. Thermistor supplies temperature signal of evaporator to A/C amplifier.
6. VSV ”ON” → E/G Idle–Up
7. Magnetic Clutch Relay ”’ON”
8. Temperature Sensor ”ON”:
   Temperature of Temperature Sensor is less than 180˚C (356˚F).
9. Magnetic Clutch ”ON”
10. Revolution Detecting Sensor supplies RPM signal of compressor to A/C amplifier.

If compressor is not locked, magnetic clutch is continuously energized.

SPECIAL TOOLS AND EQUIPMENT

Tool	SST No.	Use
Air conditioner service tool set	07110–58011	To evacuate and charge system
Ohmmeter		To perform electrical diagnosis
Voltage meter		To perform electrical diagnosis
Ammeter	07112–76060	To perform electrical diagnosis
Magnetic clutch stopper	07112–66040	To remove and install pressure plate
Magnetic clutch remover	07114–84020	To remove pressure plate
Snap ring pliers (External type)		To remove and install rotor and stator

SSM (SPECIAL SERVICE MATERIALS)

Part Name	Part No.	Use etc.
DENSOOIL 6, SUNISO No. 5GS or equivalent	07117–68040	Compressor

SPECIAL TOOLS AND EQUIPMENT

Tool	SST No.	Use
Air conditioner service tool set	07110–58011	To evacuate and charge system
Ohmmeter		To perform electrical diagnosis
Voltage meter		To perform electrical diagnosis
Ammeter	07112–76060	To perform electrical diagnosis
Magnetic clutch stopper	07112–66040	To remove and install pressure plate
Magnetic clutch remover	07114–84020	To remove pressure plate
Snap ring pliers (External type)		To remove and install rotor and stator

SSM (SPECIAL SERVICE MATERIALS)

Part Name	Part No.	Use etc.
DENSOOIL 6, SUNISO No. 5GS or equivalent	07117–68040	Compressor

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
No cooling	Blower does not, operate	Replace fuse and check for short	
	(a) GAUGE fuse blown	Replace FL and check for short	AC–4 to 11
	(b) FL blown	Check circuit breaker	AC–4 to 11
	(c) Circuit breaker faulty	Check relay .	AC–4 to 11
	(d) HEATER relay faulty	Replace fuse and check for short	BE–73
	(e) HEATER fuse blown	Check blower motor	AC–4 to 11
	(f) Blower motor faulty	Check blower resistor	
	(g) Blower resistor faulty	Check blower switch	
	(h) Blower switch faulty	Repair as necessary	BE–73
	(i) Wiring or ground faulty		BE–72, 74
	Magnetic clutch does not engage		AC–4 to 11
	(a) FL (30A CDS) blown		
	(b) Magnetic clutch relay faulty	Replace FL and check for short	AC–4 to 11
	(c) Magnetic clutch faulty	Check relay	AC–37
	(d) A/C fuse faulty	Check magnetic clutch	AC–23
	(e) A/C switch faulty	Replace fuse and check for short	AC–4 to 11
	(f) Thermistor faulty	Check switch	AC–44
	(g) A/C amplifier faulty	Check thermistor	AC–43
	(h) Revolution detecting sensor faulty	Check amplifier	AC–45 to 47
	(i) Pressure switch faulty	Check sensor	AC–24
	(j) Wiring or ground faulty	Check switch	AC–36
	(k) Refrigerant empty	Repair as necessary	AC–4 to 11
	Compressor does not rotate properly	Check refrigerant pressure	AC–18, 22
	(a) Drive belt loose or broken		
	(b) Compressor faulty		
	Expansion valve faulty		
	Leak i n system	Ajust or replace drive belt	AC–21
		Check compressor	AC–23
		Check expansion valve	AC–39
		Test system for leaks	AC–42
Coo! air comes out intermittently	Magnetic clutch slipping	Check magnetic clutch	AC–23
	Expansion valve faulty	Check expansion valve	AC–39
	Excessive moisture in the system	Evacuate and charge system	
	Revolution detecting sensor faulty	Check sensor	
	A/C amplifier faulty	Check amplifier	AC–24
	Wiring connection faulty	Repair as necessary	AC–45 to 47
			AC–4 to 11
Cool air comes out only at high speed	Condenser clogged	Check condenser	AC–33
	Drive belt slipping	Check or replace drive belt	AC–21
	Compressor faulty	Check compressor	AC–23
	Insufficient or too much refrigerant	Check refrigerant volume	AC–22
	Air i n system	Evacuate and charge system	

* FL: Fusible Link

Problem	Possible cause	Remedy	Page
Insufficient cooling	Condenser clogged	Check condenser .	AC–33
	Drive belt slipping	Check or replace drive belt	AC–21
	Magnetic clutch faulty	Check magnetic clutch	AC–23
	Compressor faulty	Check compressor	AC–23
	Expansion valve faulty	Check expansion valve	AC–39
	Thermistor faulty	Check thermistor	AC–43
	A/C amplifier faulty	Check amplifier	AC–45 to 47
	Insufficient or too much refrigerant	Check refrigerant volume	AC–22
	Air or excessive compressor oil in system	Evacuate and charge system	
	Receiver clogged	Check receiver	AC–32
	Water valve cable set faulty	Reset water valve cable	BE–79
Insufficient velocity of cool air	Evaporator clogged or frosted	Clean evaporator fins or filters	AC–41
	Air leakage from cooling unit or air duct	Repair as necessary	AC–39 to 42
	Air inlet blocked		
	Blower motor faulty	Repair as necessary	AC–39 to 42
	A/C amplifier faulty	Replace blower motor	
		Check amplifier	AC–45 to 47
A/C switch indicator flashing	Drive belt slipping	Check or replace drive belt	AC–21
	Revolution detecting sensor faulty (w/Power steering)	Check sensor	AC–24
	A/C amplifier faulty	Check amplifier	AC–45 to 47

Discharging of Refrigeration System Evacuating and Charging of Refrigeration System

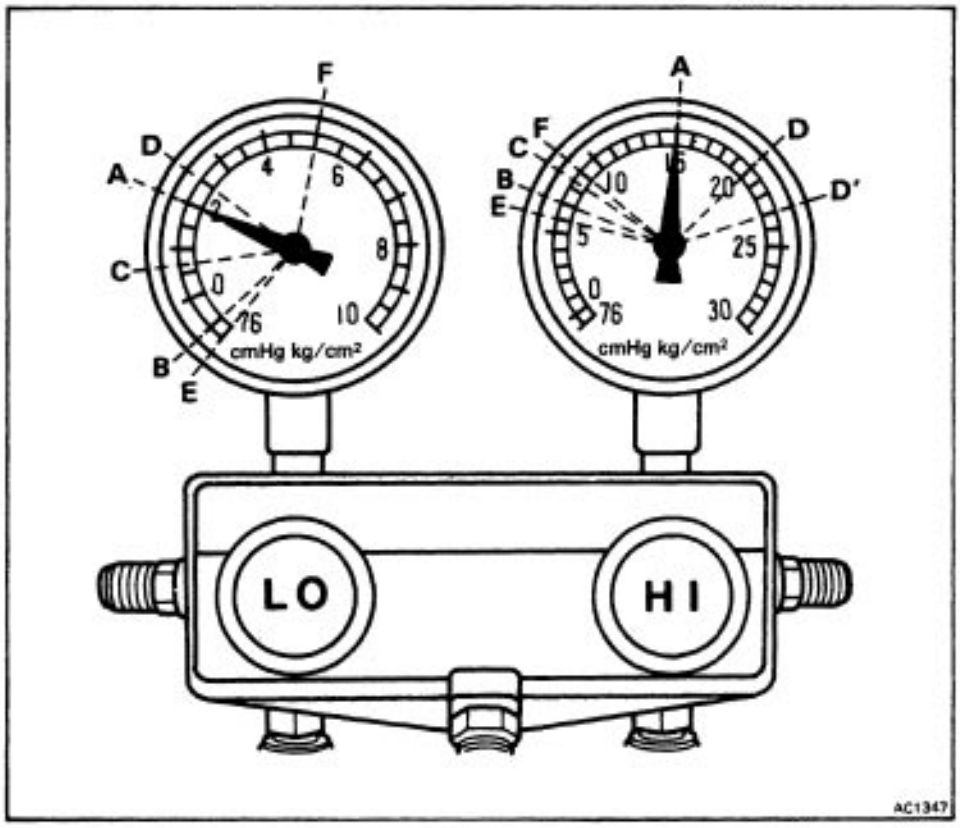
(See Air Conditioning Fundamentals and Repairs Pub. No. 36950E)

Checking of Refrigeration System with Manifold Gauge

This is a method in which the trouble is located by using a manifold gauge. Read the manifold gauge pressure when the following conditions are established:

(a) Temperature at the air inlet is 30 – 35˚C (86 – 95˚F)
(b) Engine running at 1,500 rpm
(e) Blower fan speed switch set at high speed
(d) Temperature control lever set at cool side

HINT: It should be noted that the gauge indications may vary slightly due to ambient temperature condi–tions.



NORMALLY FUNCTIONING REFRIGERATION SYSTEM
Gauge reading:
Low pressure side
1.5 – 2.0 kg/cm^2
(21 – 28 psi, 147 – 196 kPa)
High pressure side
14.5 – 15.0 kg /cm^2
(206 – 213 psi, 1,422–1,471 kPa
Each pointer of manifold gauge point to position A

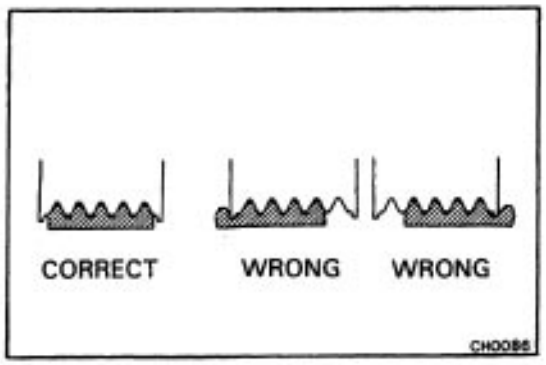
No	Trouble	Condition	Position of Pointers
1	Moisture present in refrigeration system	Periodically cools and then fails to cool	Between A and B
2	Insufficient refrigerant	Insufficient cooling	C
3	Poor circulation of refrigerant	Insufficient cooling	C
4	Refrigerant overcharge or insufficient cooling of condenser	Does not cool sufficiently	D
5	Expansion valve improperly mounted, heat sensing tube defective (opens too wide)	Insufficient cooling	D
6	Air present in refrigeration system	Does not cool sufficiently	Low is D High is O
7	Refrigerant does not circulate	Does not coo! (cools from time to time in some cases)	E
8	Insufficient compression	Does not cool	F

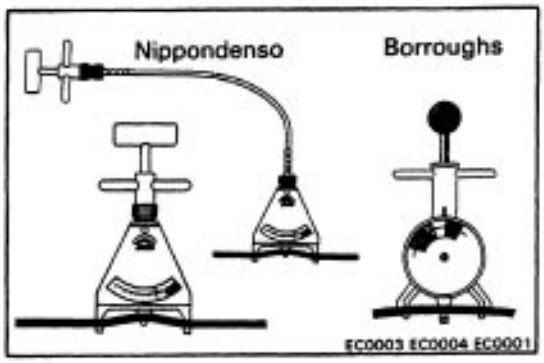
No.	Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
1	During operation, pressure at low pressure side sometimes becomes a vacuum and sometimes normal	Moisture entered in refrigeration system freeze at expansion valve orifice and temporarily stops cycle, but normal state is restored after a time when the ice melts	Drier in oversaturated state Moisture in refrigeration system freezes at expansion valve orifice and blocks circulation of refrigerant	(1)Replace receiver and drier (2)Remove moisture in cycle through repeated vacuum purging (3)Charge refrigerant to proper amount
2	Pressure low at both low and high pressure sides Bubbles seen in sight glass Insufficient cooling performance	Gas leakage at some place i n refrigeration system	Insufficient refrigerant in system Refrigerant leaking	(1)Check with leak tester and repair (2)Charge refrigerant to proper amount
3	Pressure low at both low and high pressure sides Frost on tubes from receiver to unit	Refrigerant flow obstructed by dirt in receiver	Receiver clogged	Replace receiver
4	Pressure too high at both tow and high pressure sides	Unable to develop –sufficient performance due to excessive refrigerant in system Condenser cooling insufficient	Excess refrigerant in cycle – refrigerant overcharged Condenser cooling insufficient – condenser fins clogged or fan motor faulty	(1)Clean condenser (2)Check fan motor operation (3)If (1) and (2) are normal, check refrigerant amount HINT: Vent out refrigerant through gauge manifold low pressure side by gradually opening valve.
5	Pressure too high at both low and high pressure sides Frost or large amount of dew on piping at low pressure side	Trouble in expansion valve or heat sensing tube not installed correctly Refrigerant flow out	Excess refrigerant in low pressure piping Expansion valve opened too wide	(1)Check heat sensing tube installed condition (2)If (1) is normal, test expansion valve in unit (3) Replace if defective
6	Pressure too high at both low and high pressure sides	Air entered refrigeration system	Air present in refrigeration system Insufficient vacuum purging	(1)Replace receiver and drier (2)Check compressor oil to see if dirty or insufficient (3)Vacuum purge and charge new refrigerant

***NOTE at No.6**

These gauge indications are shown when the refrigeration system has been opened and the refrigerant charged without vacuum purging.

No.	Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
7	Vacuum indicated at low pressure side, very low pressure indicated at high pressure side Frost or dew seen on piping before and after receiver and drier or expansion valve	Refrigerant flow obstructed by moisture or dirt in refrigerant freezing or adhering to expansion valve orifice Refrigerant flow obstructed by gas leakage from expansion valve heat sensing tube	Expansion valve orifice clogged Refrigerant does not flow	Allow to stand for some time and then restart operation to determine if trouble is caused by moisture or dirt. If caused by moisture refer to procedures¿Step 2 on ,page AC–19. If caused by dirt, remove expansion valve and clean off dirt by blowing with air. If unable to remove dirt, replace valve. Vacuum purge and charge new refrigerant to proper amount. For gas leakage from heat sensing tube, replace expansion valve.
8	Pressure too high at low pressure side Pressure too low at high pressure side	Internal leak in compressor	Compression defective ↓ Valve leaking or broken sliding parts (Piston, cylinder, gasket, etc. broken	Repair or replace compressor





ON–VEHICLE INSPECTION

1. CHECK CONDENSER FINS FOR BLOCKAGE OR DAMAGE

If the fins are clogged, clean them with pressurized water.

NOTICE: Be careful not to damage the fins.

2. MAKE SURE THAT DRIVE BELT IS INSTALLED CORRECTLY

Check that the drive belt tits properly in the ribbed grooves.

3. CHECK DRIVE BELT TENSION

Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

Nippondenso BTG–20 (95506–00020) or
Borroughs No. BT–33–73F

Drive belt tension

Engine	New Belt	Used Belt
3S–FE	175 ± 5 lbs	130 ± 10 lbs
2¿¿–FE	175 ± 5 lbs	115 ± 20 lbs

HINT:

- ”New belt” refer to a belt which has been used less than
  5 minutes on a running engine.
- ”Used belt” refer to a belt which has been used on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly i n the ribbed grooves.

4. START ENGINE

5. TURN ON A/C SWITCH

Check that the A/C operates at each position of the blower switch.

6. CHECK MAGNETIC CLUTCH OPERATION

If magnetic clutch does not engage, check the A/C fuse.

7. CHECK THAT IDLE INCREASES

When the magnetic clutch engages, engine revolution should increase.

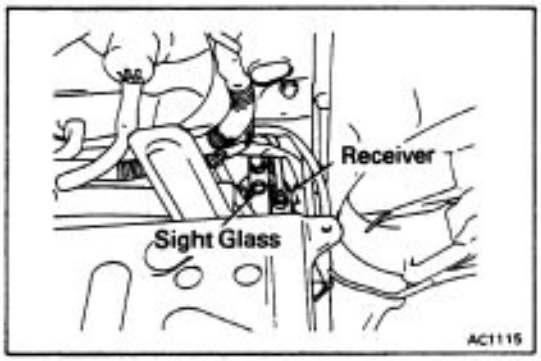
Standard idle–up rpm:

Engine	Standard idle–up rpm:
3S–FE	950 ± 50 rpm
2VZ–FE	800 ± 20 rpm

8. **CHECK CONDENSER FAN MOTOR ROTATES**
9. **CHECK AMOUNT OF REFRIGERANT**
   If you can see bubbles in the sight glass, additional refrigerant is needed.
   (See page **AC–22**)
10. **IF NO COOLING OR IT IS INSUFFICIENT, INSPECT FOR LEAKAGE**
    Using a gas leak tester, inspect each component of the refrigeration system.

REFRIGERATION SYSTEM

Checking of Refrigerant Volume



1. **RUN ENGINE AT APPROX. 1,500 RPM**
2. **OPERATE AIR CONDITIONER AT MAXIMUM COOLING FOR A FEW MINUTES**
3. **CHECK AMOUNT OF REFRIGERANT**
   Observe the sight glass on the receiver.

Item	Symptom	Amount of refrigerant	Remedy.
1	Bubbles present in sight glass	Insufficient	Check for leak with gas leak tester
2	No bubbles present in sight glass	Empty, proper or too much	Refer to items 3 and 4
3	No temperature difference between compressor inlet and outlet	Empty or nearly empty	Evacuate and charge system. Then check for leak with gas leak detector
4	Temperature between compressor inlet and outlet is noticeably different	Proper or too much	Refer to items 5 and 6
5	Immediately after the air conditioner is turned off, refrigerant in sight glass stays clear	Too much	Discharge the excess refrigerant to specified amount
6	When the air conditioner is turned off, refrigerant foams and then stays clear	Empty, proper or too much	Refer to items 3 and 4

8. **CHECK CONDENSER FAN MOTOR ROTATES**
9. **CHECK AMOUNT OF REFRIGERANT**
   If you can see bubbles in the sight glass, additional refrigerant is needed.
   (See page **AC–22**)
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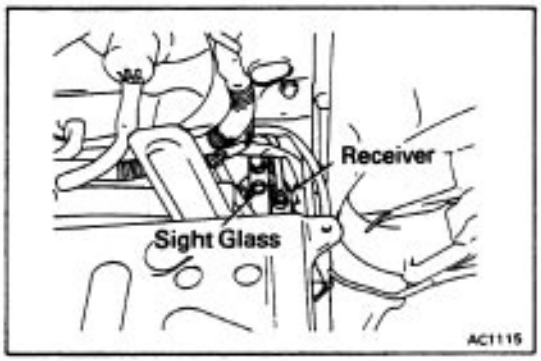
REFRIGERATION SYSTEM

Checking of Refrigerant Volume



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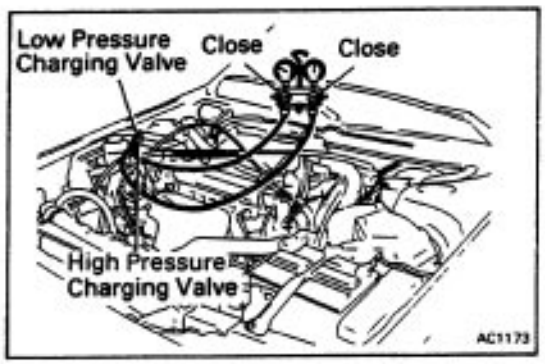


Installation of Manifold Gauge Set

1. **CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET**
2. **INSTALL CHARGING HOSES OF GAUGE SET TO CHARGING VALVES**

Connect the low pressure hose to the low pressure charging valve and the high ..pressure hose to the high pressure charging valve. Tighten the hose nuts by hand.

HINT Do not apply compressor oil to the seat of the connection.

COMPRESSOR

ON–VEHICLE INSPECTION

1. **INSTALL MANIFOLD GAUGE SET**
   (See page AC–23**)**
2. **RUN ENGINE AT APPROX. 1,500 RPM**
3. **CHECK COMPRESSOR FOR FOLLOWING:**
   (1) High pressure gauge reading is not lower and low pressure gauge reading is not higher than normal.
   (b) Metallic sound
   (e) Leakage from shaft seal

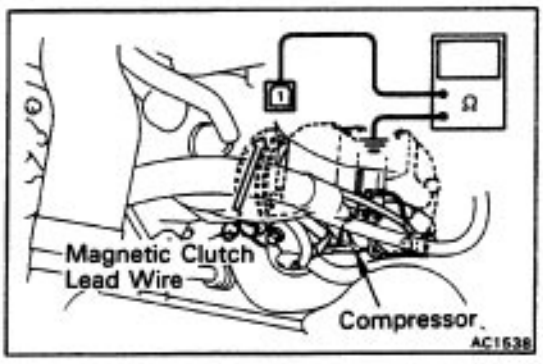
   If defects are found, repair the compressor.
4. **CHECK MAGNETIC CLUTCH**
   (a) Inspect the pressure plate, and the rotor for signs of oil.
   (b) Check the clutch bearings for noise and grease leakage.
   (e) Using an ohmmeter, measure the resistance of the stator coil between the clutch lead wire and ground.

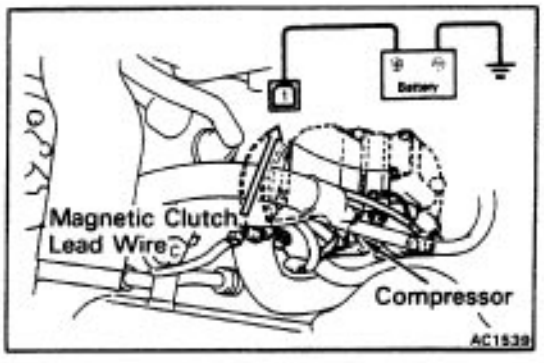
   Standard resistance: 3.4 – 3.8 Ω at 20˚C (68˚F)

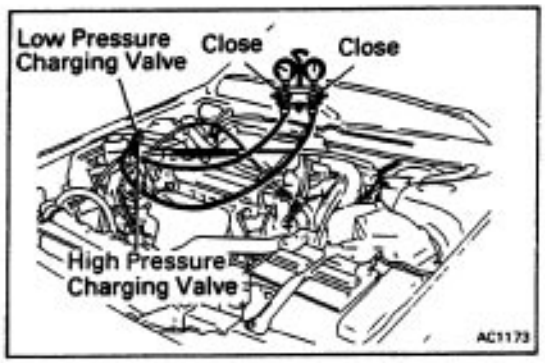
   If resistance value is not as specified, replace the coil.
   (d) Connect the positive (+) lead from the battery to terminal 1, check that the magnetic clutch is energized.

   If magnetic clutch is not energized, replace the coil.

   NOTICE: Do not short positive (+) lead wire on the vehicle by applying battery voltage.







Installation of Manifold Gauge Set

1. **CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET**
2. **INSTALL CHARGING HOSES OF GAUGE SET TO CHARGING VALVES**

Connect the low pressure hose to the low pressure charging valve and the high ..pressure hose to the high pressure charging valve. Tighten the hose nuts by hand.

HINT Do not apply compressor oil to the seat of the connection.

COMPRESSOR

ON–VEHICLE INSPECTION

1. **INSTALL MANIFOLD GAUGE SET**
   (See page AC–23**)**
2. **RUN ENGINE AT APPROX. 1,500 RPM**
3. **CHECK COMPRESSOR FOR FOLLOWING:**
   (1) High pressure gauge reading is not lower and low pressure gauge reading is not higher than normal.
   (b) Metallic sound
   (e) Leakage from shaft seal

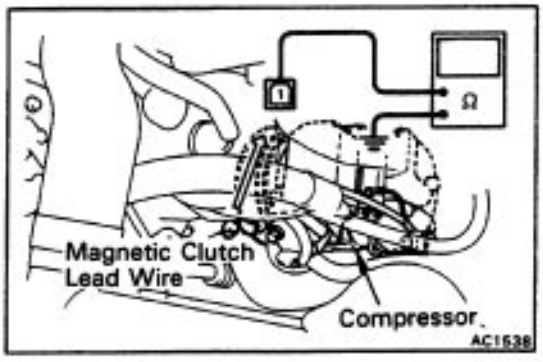
   If defects are found, repair the compressor.
4. **CHECK MAGNETIC CLUTCH**
   (a) Inspect the pressure plate, and the rotor for signs of oil.
   (b) Check the clutch bearings for noise and grease leakage.
   (e) Using an ohmmeter, measure the resistance of the stator coil between the clutch lead wire and ground.

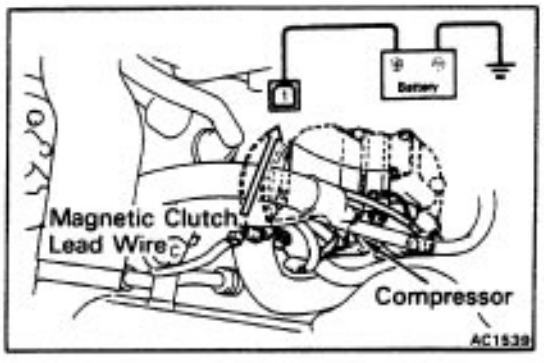
   Standard resistance: 3.4 – 3.8 Ω at 20˚C (68˚F)

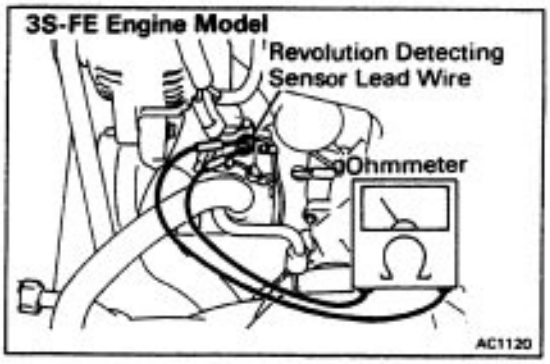
   If resistance value is not as specified, replace the coil.
   (d) Connect the positive (+) lead from the battery to terminal 1, check that the magnetic clutch is energized.

   If magnetic clutch is not energized, replace the coil.

   NOTICE: Do not short positive (+) lead wire on the vehicle by applying battery voltage.





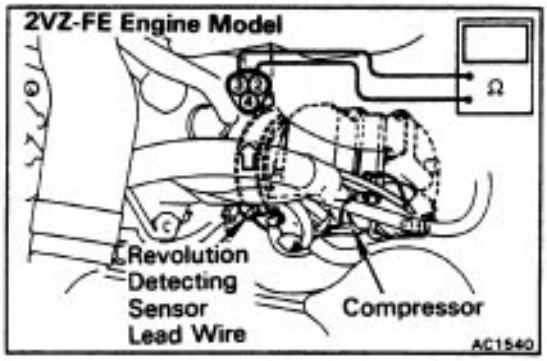


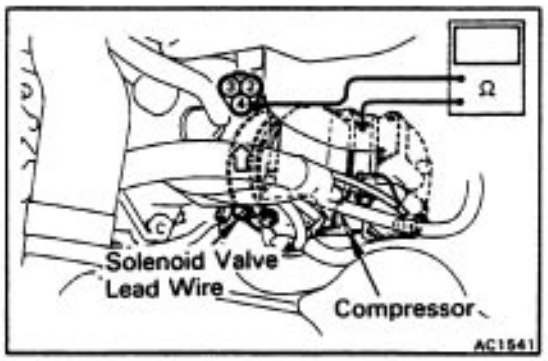
5. CHECK REVOLUTION DETECTING SENSOR

Using an ohmmeter, measure the resistance between two terminals of the sensor.

Specified resitance: 100 – 130 Ω at 20˚C (68˚F)

If resistance value is not as specified, replace the revolution detecting sensor.





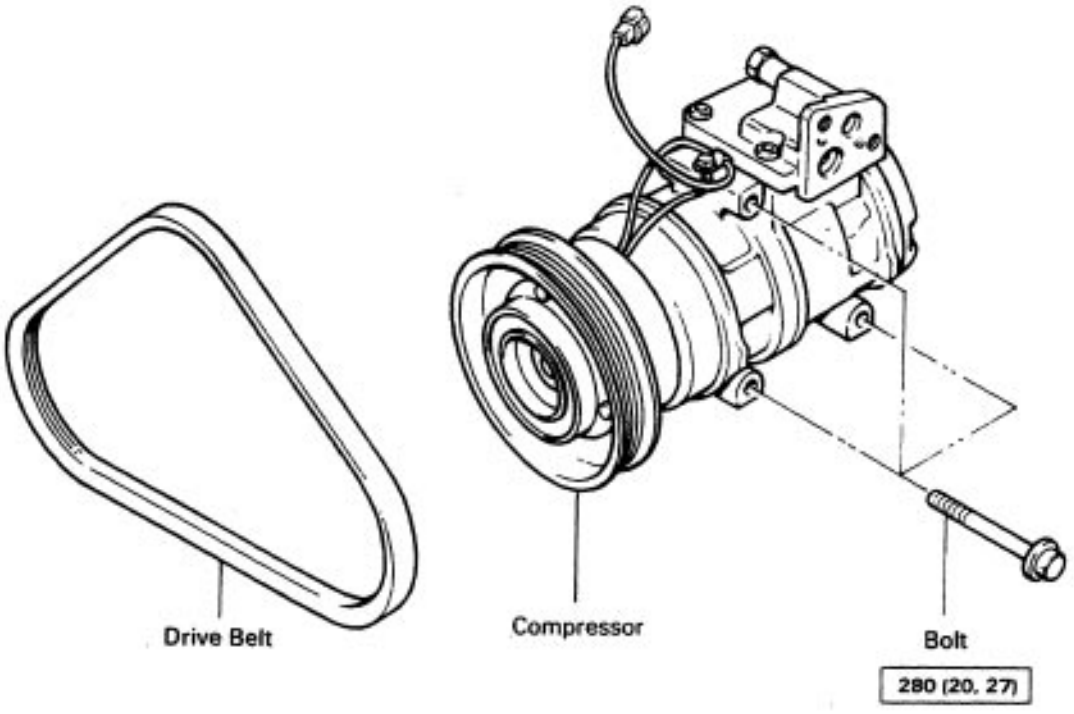
6. CHECK SOLENOID VALVE

Using an ohmmeter, check the continuity.

If continuity is not as specified, replace the valve.

REMOVAL OF COMPRESSOR

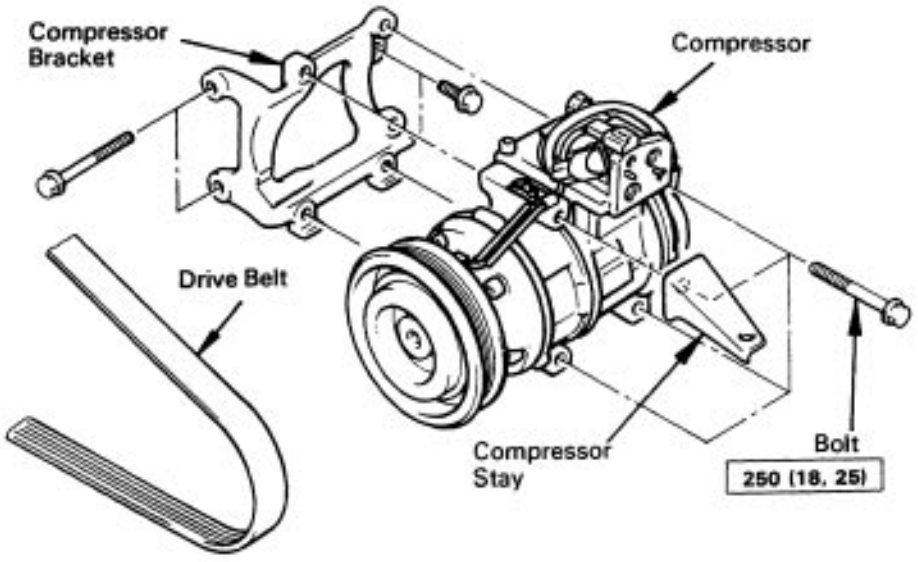
3S–FE Engine Model



kg-cm (ft-lb, N·m) : Specified torque

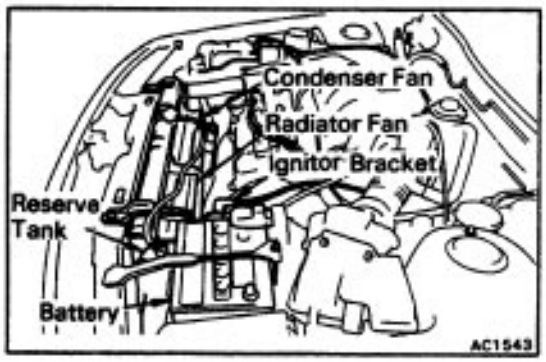
AC1826

2VZ-FE Engine Model

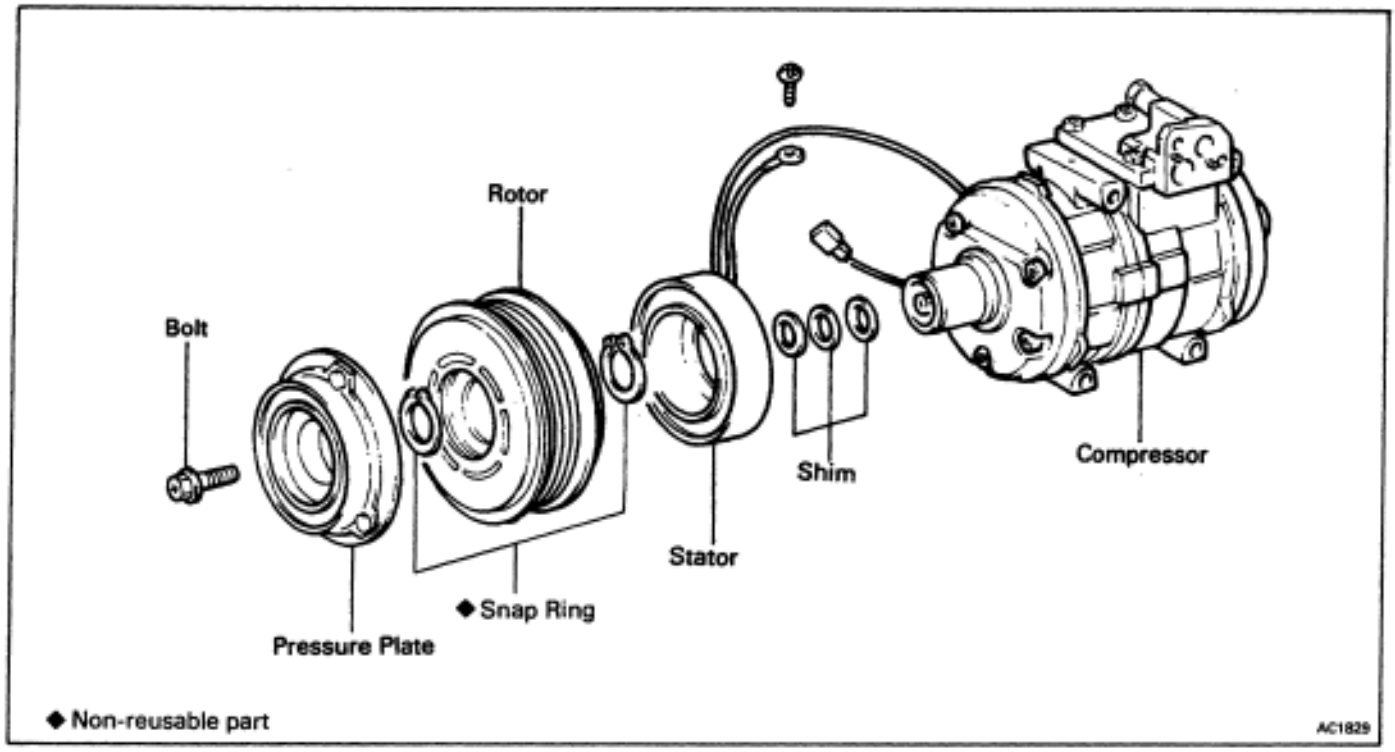


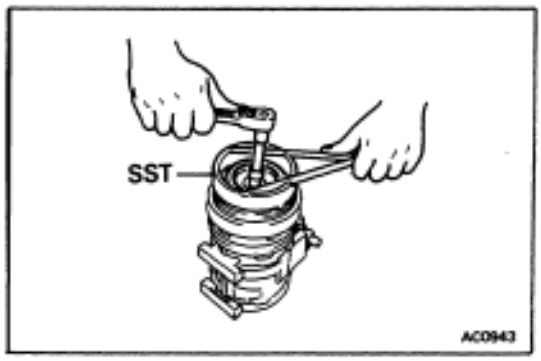
kg-cm (ft-lb, N·m) : Specified torque

AC1825



1. **RUN– ENGINE AT IDLE SPEED WITH AIR CONDITIONING ON FOR 10 MINUTES**
2. **STOP ENGINE**
3. **DISCONNECT NEGATIVE CABLE FROM BATTERY**
4. **REMOVE BATTERY**
5. **(2VZ–FE ENGINE)**
   REMOVE IGNITOR BRACKET, RADIATOR FAN AND CONDENSER FAN
6. **DISCONNECT CONNECTOR FOR MAGNETIC CLUTCH, TEMPERATURE SWITCH AND REVOLUTION DETECTING SENSOR**
7. **DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM**
8. **DISCONNECT TWO HOSES FROM COMPRESSOR SERVICE VALVES**
   Cap the open fitting immediately to keep moisture out of the system.
9. **REMOVE COMPRESSOR**
   (a) Loosen the drive belt.
   (b) Remove the compressor mounting bolts and the compressor.

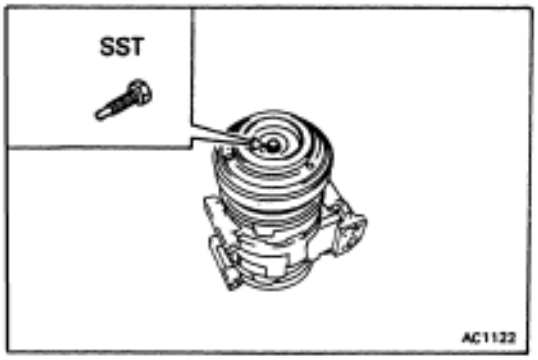




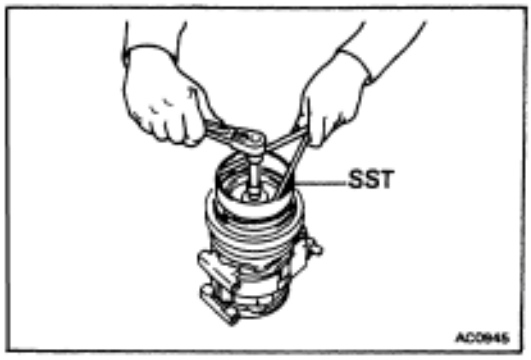
DISASSEMBLY OF MAGNETIC CLUTCH

1. REMOVE PRESSURE PLATE

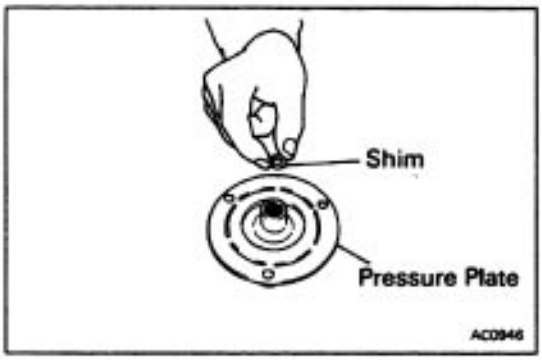
(a) Using SST and a socket, remove the shaft bolt.
SST 07112–76060



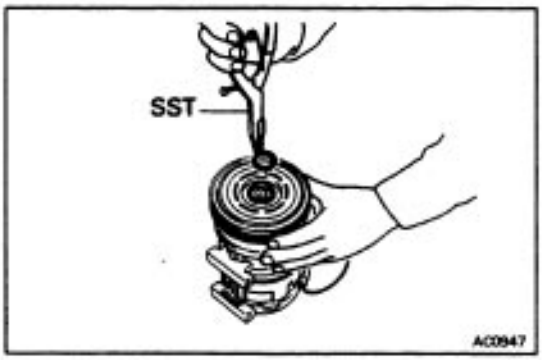
(b) Install SST to the pressure plate.
SST 07112–66040



(c) Using SST and the socket, remove the pressure plate.
SST 07112–76060

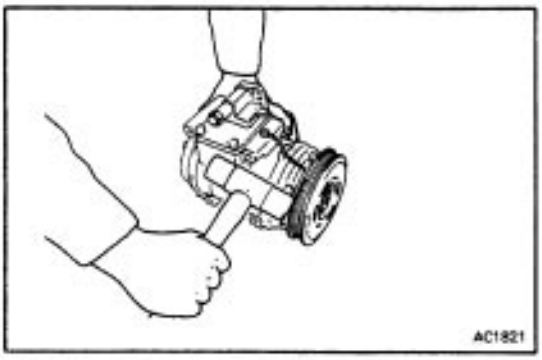


(d) Remove the shims from the pressure plate.

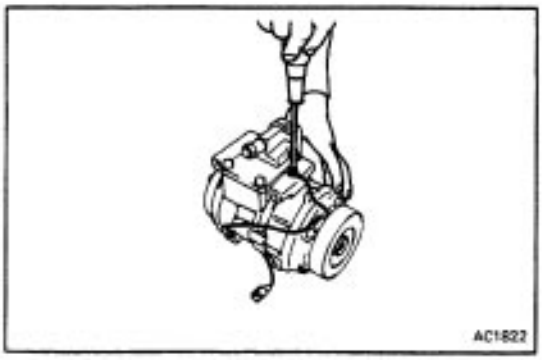


2. REMOVE ROTOR

(a) Using SST, remove the snap ring.
SST 07114–84020

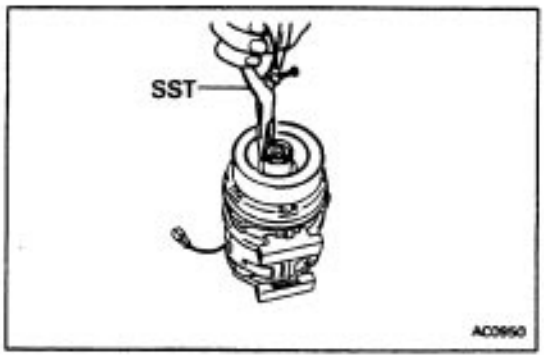


(b) Using a plastic hammer, tap the rotor off the shaft.
NOTICE: Be careful not to damage the pulley when tapping on the rotor.

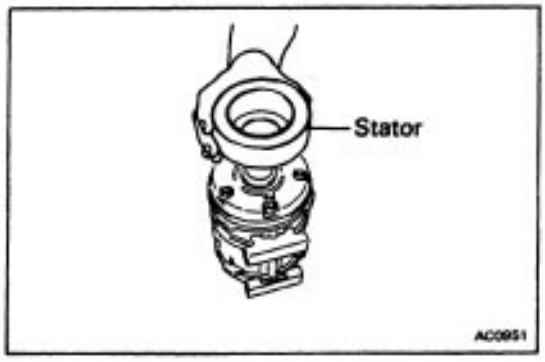


3. REMOVE STATOR

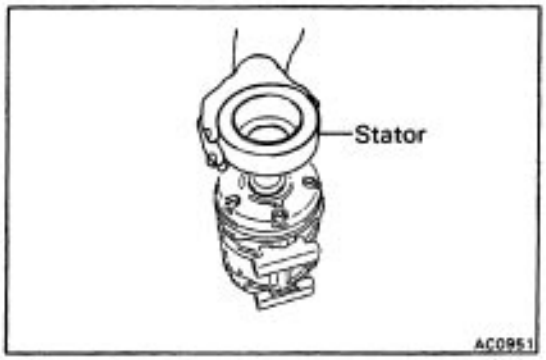
(a) Disconnect the stator lead wire from the compressor housing.



(b) Using SST, remove the snap ring.
SST 07114–84020



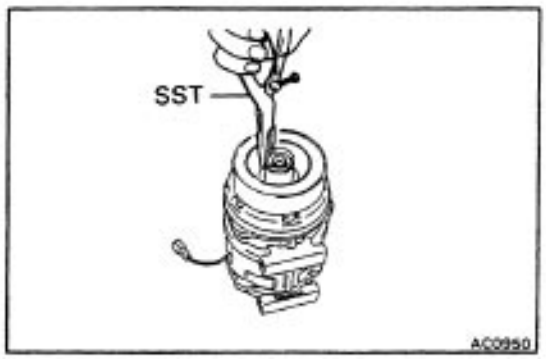
(c) Remove the stator.



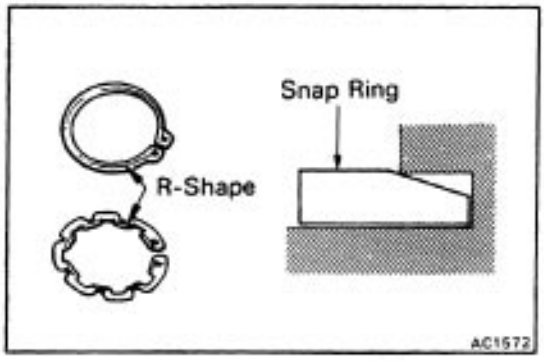
ASSEMBLY OF MAGNETIC CLUTCH

1. INSTALL STATOR

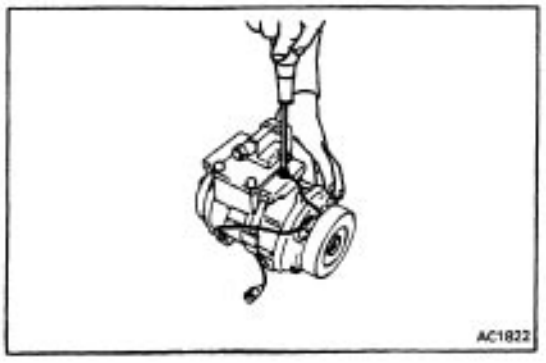
(a) Install the stator on the compressor.



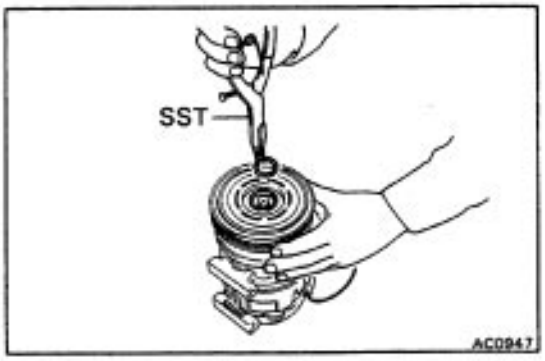
(b) Using SST, install the new snap ring.
SST 07114–84020



NOTICE: The snap ring should be installed so that its R–shape looks up.



(c) Using SST and torque wrench, fasten the magnetic clutch lead wire to the cylinder block.
Torque: 35 kg–cm (3o in.–ib, 3.4 N–m)
SST 07110–61050

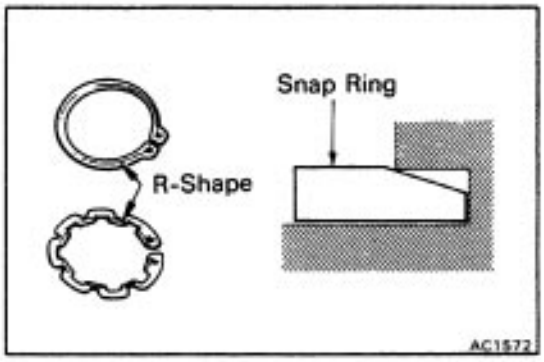


2. INSTALL ROTOR

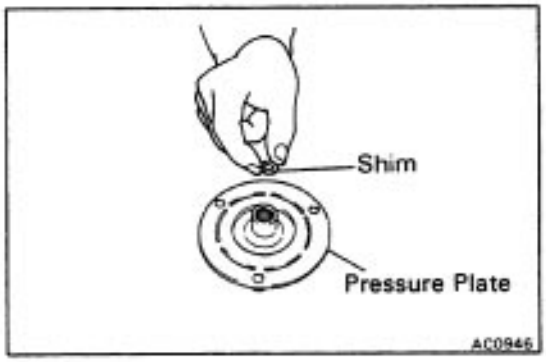
(a) Install the rotor on the compressor shaft.

(b) Using SST, install the new snap ring.

SST 07114–84020

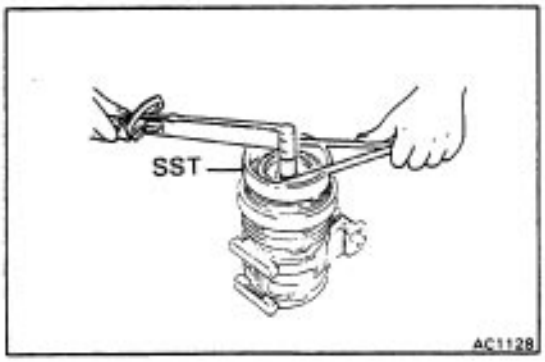


NOTICE: The snap ring should be installed so that its R–shape looks up.



3. INSTALL PRESSURE PLATE

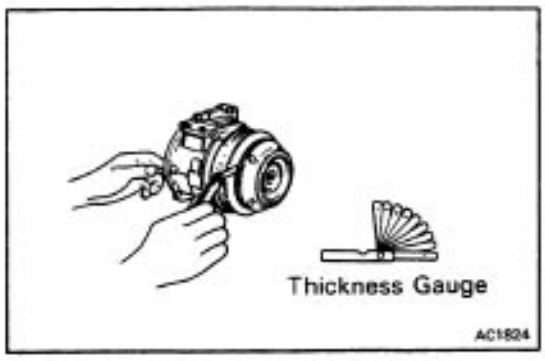
(a) Put the shims to the pressure plate.



(b) Using SST and torque wrench, instal! the shaft bolt.

SST 07112–76064

Torque: 135 kg–cm (9.7 ft–lb, 13 N–m)



4. CHECK CLEARANCE OF MAGNETIC CLUTCH

Check the clearance between the pressure plate and rotor using thickness gauge.

Standard clearance: 0.5 ± 0.15 mm

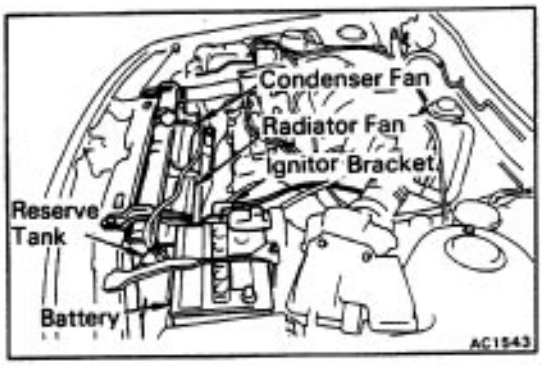
(0.020 ± 0.0059 in.)

If the clearance is not within tolerance, charge the number of shims to obtain the standard clearance.

INSTALLATION OF COMPRESSOR

(See page AC–25)

1. **INSTALL COMPRESSOR WITH FOUR MOUNTING BOLTS**
   Torque:
   3S–FE engine 280 kg–cm (20 ft–lb, 27 N–m)
   2VZ–FE engine 250 kg–cm (18 ft–lb, 25 N–m)
2. **INSTALL DRIVE BELT(See steps 2 and 3 on page AC–21)**
3. **CONNECT TWO HOSES TO COMPRESSOR SERVICE VALVES**
   Torque:
   Discharge line 250 kg–cm (18 ft–lb, 25 N–m)
   Suction line 250 kg–cm (18 ft–lb, 25 N–m)
4. **CONNECT CLUTCH LEAD WIRE TO WIRING HARNESS**
5. **(2VZ–FE ENGINE MODEL)**
   PLACE CONDENSER FAN, RADIATOR FAN AND IGNITOR BRAKET
6. **INSTALL BATTERY AND CONNECT NEGATIVE CABLE TO BATTERY**
7. **EVACUATE AIR FROM AIR CONDITIONING SYSTEM**
8. **CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE**
   Specified amount: 600 – 750 g (1.3 – 1.7 lb)



RECEIVER

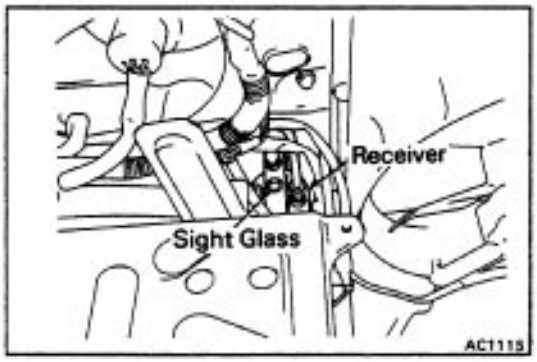
(See page AC–12)

ON–VEHICLE INSPECTION

CHECK SIGHT GLASS, FUSIBLE PLUG AND FITTINGS FOR LEAKAGE

Use a gas leak tester. Repair as necessary.

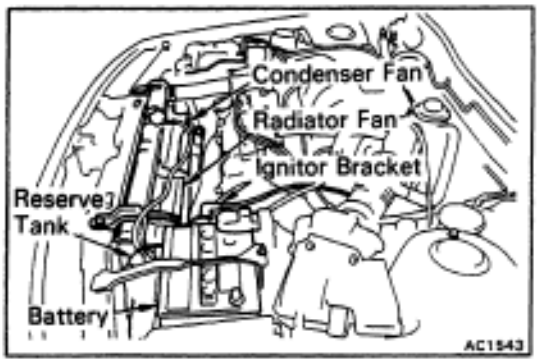
REMOVAL OF RECEIVER

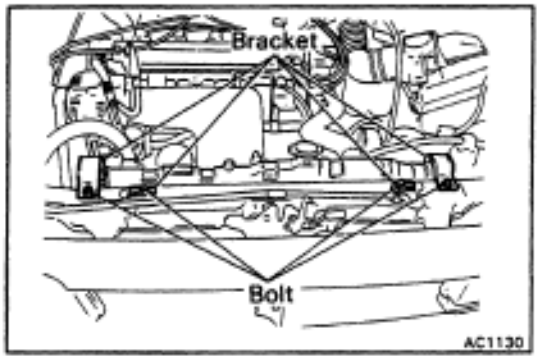


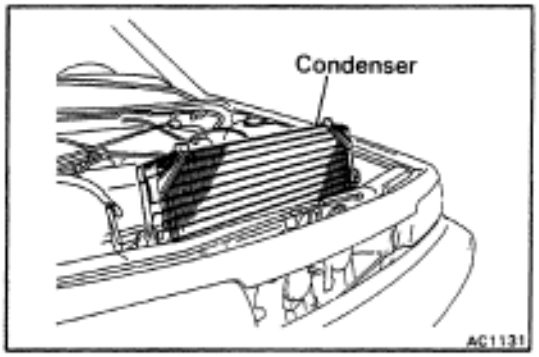
1. **DISCHARGE REFRIGERATION SYSTEM**
2. **REMOVE BATTERY, RESERVE TANK AND IGNITOR BRACKET**
3. **DISCONNECT TWO LIQUID TUBES FROM RECEIVER**
   HINT: Cap the open fittings immediately to keep moisture out of the system.
4. **REMOVE RECEIVER FROM RECEIVER HOLDER**

INSTALLATION OF RECEIVER

1. **INSTALL RECEIVER IN RECEIVER HOLDER**
   HINT: Do not remove the blind plugs until ready for connection.
2. **CONNECT TWO LIQUID TUBES TO RECEIVER**
   Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)
3. **REINSTALL IGNITOR BRACKET, RESERVE TANK AND BATTERY**
4. **IF RECEIVER WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR**
   Add 20 cc (0.7 fl.oz.)
   Compressor oil: DENSOOIL 6,
   SUNISO NO. 5GS or equivalent
5. **EVACUATE AIR FROM AIR CONDITIONING SYSTEM**
6. **CHARGE AND CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE**
   Specified amount: 600 – 750 g (1.3 – 1.7 lb)







CONDENSER

(See page AC–12)

ON–VEHICLE INSPECTION

1. **CHECK CONDENSER FINES FOR BLOCKAGE OR DAMAGE**
   If the fins are clogged, wash them with water and dry with compressed air.
   NOTICE: Be careful not to damage the fins.
   If the fins are bent, straighten them with a screwdriver or pliers.
2. **CHECK CONDENSER FITTINGS FOR LEAKAGE**
   Repair as necessary.

REMOVAL OF CONDENSER

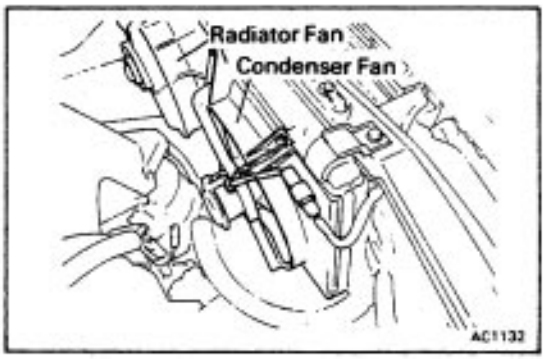
1. **DISCHARGE REFRIGERATION SYSTEM**
2. **REMOVE BATTERY, IGNITOR BRACKET RADIATOR FAN, CONDENSER FAN**
3. **DISCONNECT LIQUID TUBE AND DISCHARGE HOSE FROM CONDENSER FITTINGS**
   HINT: Cap the open fittings immediately to keep moisture out of the system.
4. **REMOVE CONDENSER**
   Remove four brackets and four bolts.

INSTALLATION OF CONDENSER

(See page AC–12)

1. **INSTALL CONDENSER**
   Install the brackets and bolts, making sure the rubber cushions fit on the mounting flanges correctly.
2. **CONNECT LIQUID TUBE, DISCHARGE HOSE TO CONDENSER**
   Torque:
   Liquid tube 130 kg–cm (9 ft–lb, 13 N–m)
   Discharge hose 130 kg–cm (9 ft–lb, 13 N–m)
3. **REINSTALL CONDENSER FAN, RADIATOR FAN IGNITOR BRACKET AND BA¿¿ERY**
4. **IF CONDENSER WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR**
   Add 40 – 50 cc (1.4 – 1.7 fl.oz.)
   Compressor oil: DENSOOIL 6,
   SUNISO NO. 5GS or equivalent
5. **EVACUATE AIR FROM AIR CONDITIONING SYSTEM**
6. **CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE**
   Specified amount: 600 – 750 g (1.3 – 1.7 lb)

CONDENSER FAN MOTOR



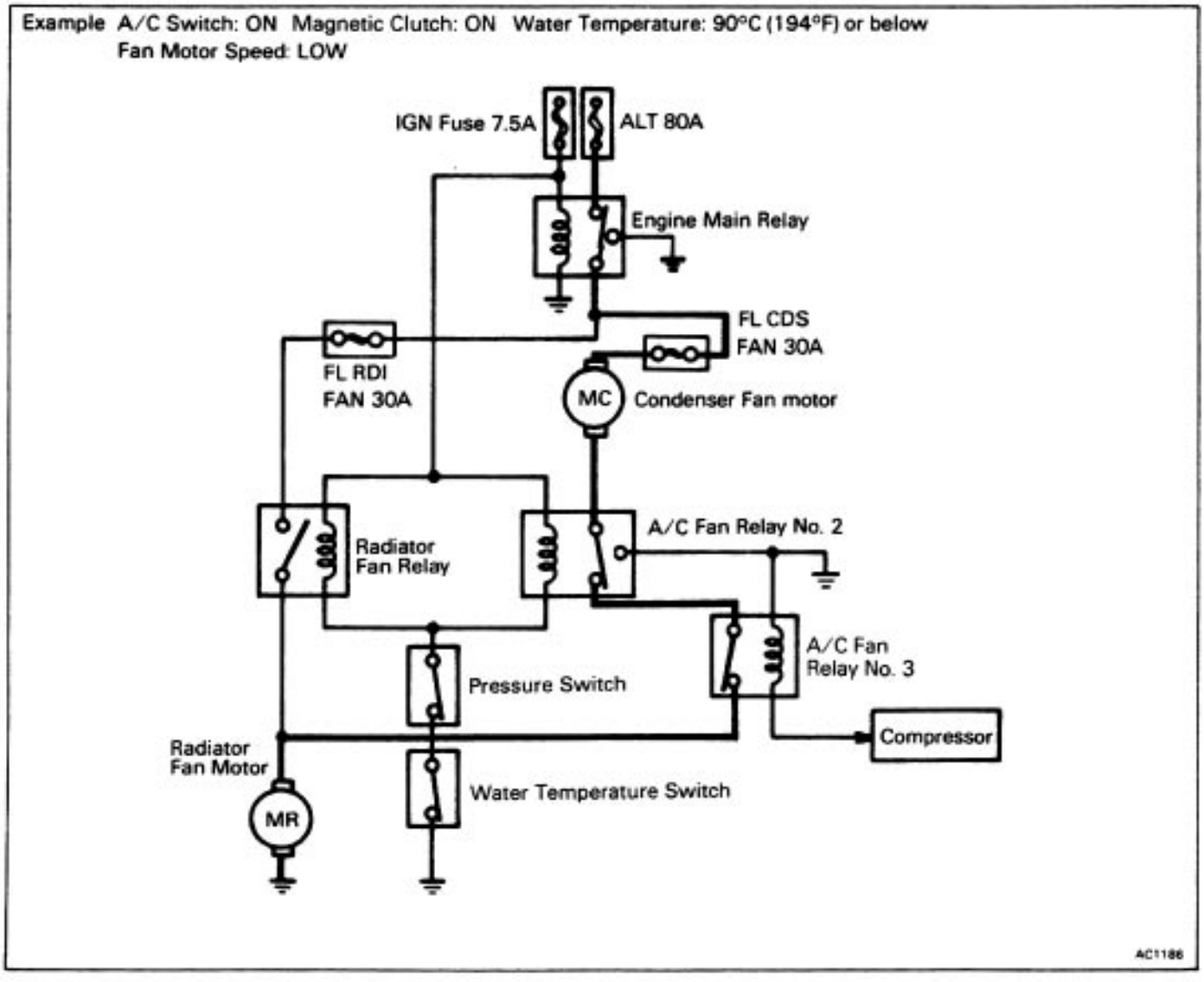
INSPECTION ON FAN MOTORS

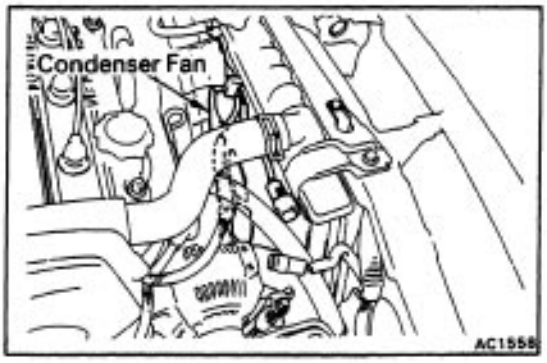
1. CHECK OPERATION OF FAN MOTOR

HINT: The fan motor operates at two speeds depending on the water temperature and the A/C switch.

3S–FE Engine Model

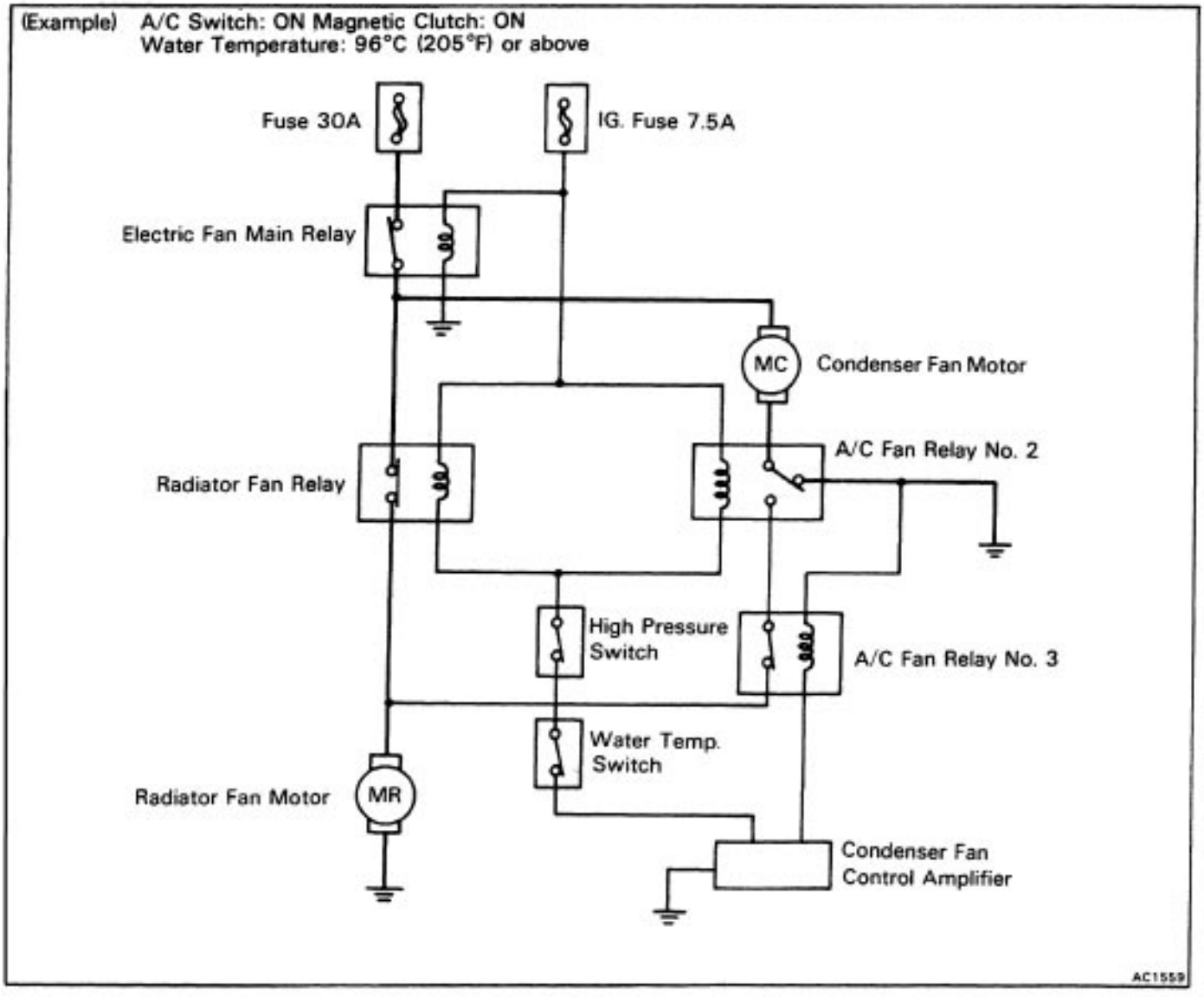
A/C Switch	Magnetic Clutch	Water Temperature	Fan Motor Speed
OFF or ON	OFF	90˚C (194˚F) or below	Off
		90˚C (194˚F) or above	High
		90˚C (194˚F) or below	Low
ON	ON	90˚C (194˚F) or above or the refrigerant pressure is approx. 15.5 kg/cm^2 (220 psi, 1,520 kPa) or greater	High

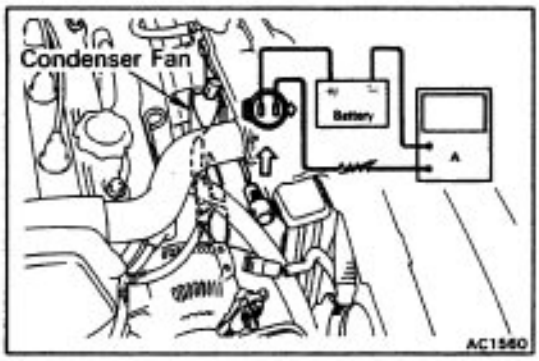


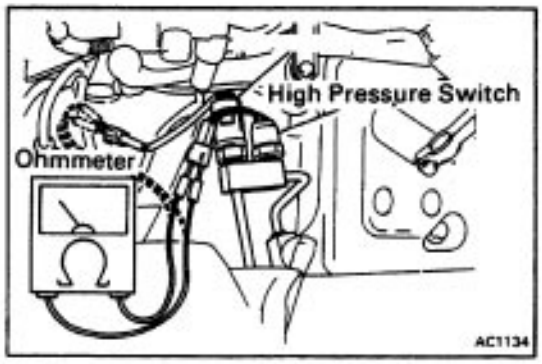


(2VZ–FE Engine Model)

A/C Switch	Magnetic Clutch	Water Temperature	Fan Motor Speed
OFF or ON	OFF	91 ˚C (196˚F) or below	Off
		91 ˚C (196˚F) – 96˚C (205˚F)	Low
		96˚C (205˚F) or above	High
ON	ON	91 ˚C (196˚F) or below	Low
		96˚C (205˚F) or above or the refrigerant pressure is approx. 15.5 kg/cm2 (220psi, 1,520 kPa) or greater	High







2. INSPECT FAN MOTOR

(a) Disconnect 2–P connector of the fan motor.

(b) Using wire harness, apply battery voltage to the connector.

(c) Confirm smooth rotation of the motor within the specified current flow.

Standard current: 6.6 ±0.8 A

If defective, replace the motor.

3. CHECK HIGH PRESSURE SWITCH

(a) Install manifold gauge set.
(See page AC–23)

(b) Check continuity between the two terminals of the pressure switch when refrigerant pressure is less than approx. 12.5 kg/cm2 (178 psi, 1,226 kPa).

(e) Check that there is no continuity between two terminals of the pressure switch when refrigerant pressure is more than approx. 15.5 kg/Cm2 (220 psi, 1,520 kPa).

If continuity is not as specified, replace the switch.

4. CHECK WATER TEMPERATURE SWITCH
(See page AC–49)

PRESSURE SWITCH

(See page AC–12)

ON–VEHICLE INSPECTION

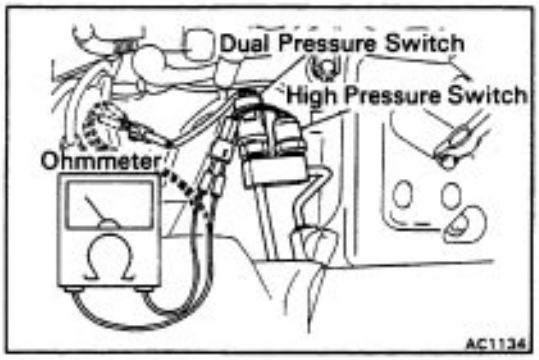
1. DISCONNECT CONNECTOR OF PRESSURE SWITCH

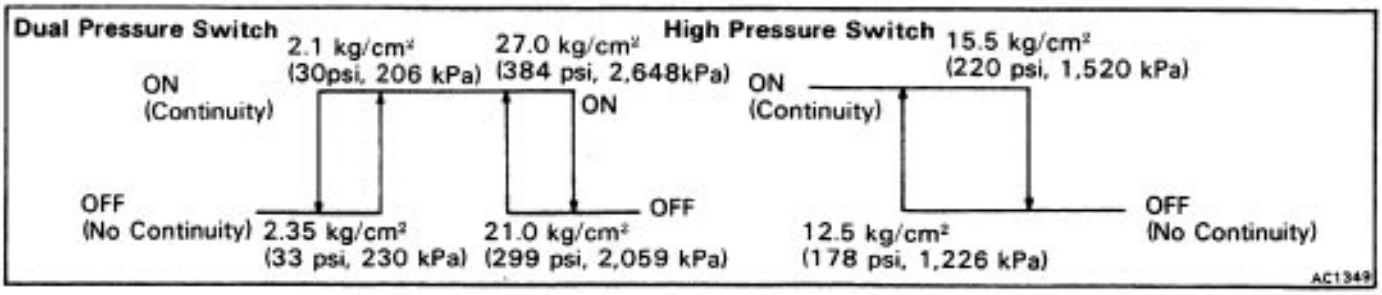
2. INSPECT PRESSURE SWITCH

(a) Install the manifold gauge set.

(b) Observe the gauge reading.

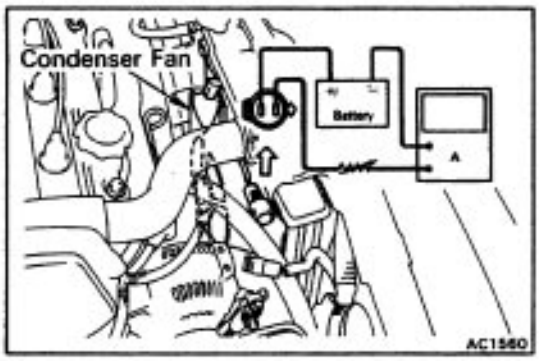
(c) Check continuity between the two terminals of the pressure swtich shown in the below.

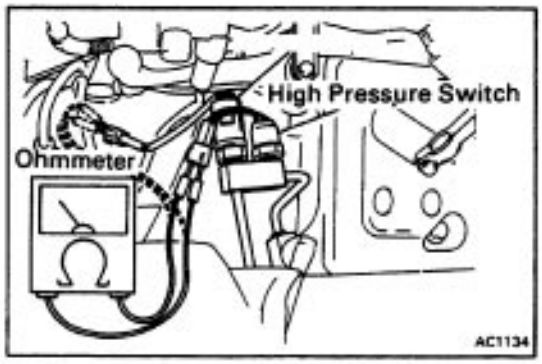




If defective, replace the pressure switch.

3. CONNECT CONNECTOR OF PRESSURE SWITCH





2. INSPECT FAN MOTOR

(a) Disconnect 2–P connector of the fan motor.

(b) Using wire harness, apply battery voltage to the connector.

(c) Confirm smooth rotation of the motor within the specified current flow.

Standard current: 6.6 ±0.8 A

If defective, replace the motor.

3. CHECK HIGH PRESSURE SWITCH

(a) Install manifold gauge set.
(See page AC–23)

(b) Check continuity between the two terminals of the pressure switch when refrigerant pressure is less than approx. 12.5 kg/cm2 (178 psi, 1,226 kPa).

(e) Check that there is no continuity between two terminals of the pressure switch when refrigerant pressure is more than approx. 15.5 kg/Cm2 (220 psi, 1,520 kPa).

If continuity is not as specified, replace the switch.

4. CHECK WATER TEMPERATURE SWITCH
(See page AC–49)

PRESSURE SWITCH

(See page AC–12)

ON–VEHICLE INSPECTION

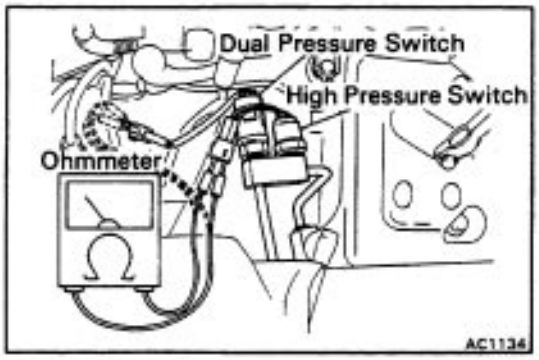
1. DISCONNECT CONNECTOR OF PRESSURE SWITCH

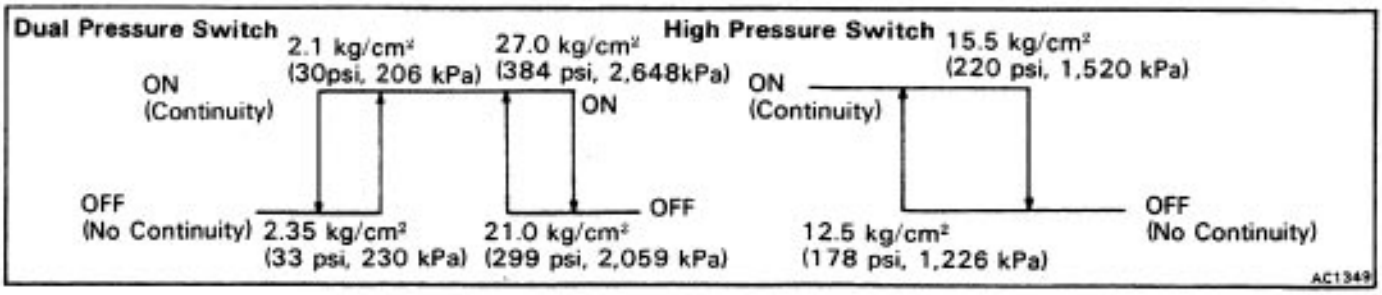
2. INSPECT PRESSURE SWITCH

(a) Install the manifold gauge set.

(b) Observe the gauge reading.

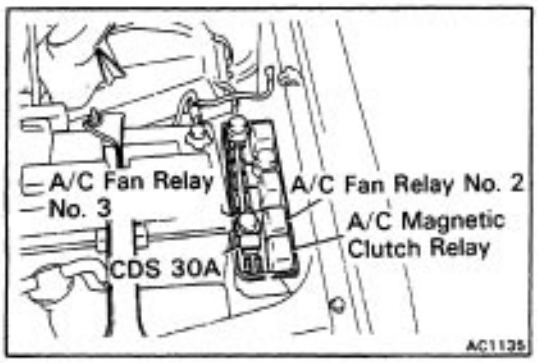
(c) Check continuity between the two terminals of the pressure swtich shown in the below.





If defective, replace the pressure switch.

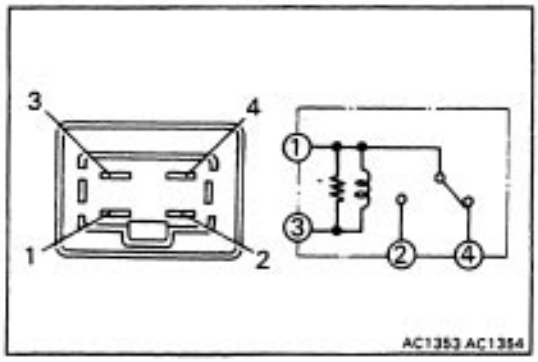
3. CONNECT CONNECTOR OF PRESSURE SWITCH



RELAYS

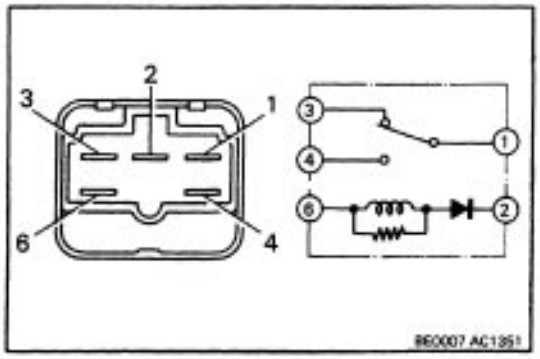
INSPECTION OF A/C RELAY

1. **REMOVE COVER OF RELAY BOX**
2. **REMOVE RELAY**
3. **INSPECT RELAY CONTINUITY (Magnetic Clutch Relay)**



Terminal / Condition	1	2	3	4
Constant	○	○	○	○
Apply battery voltage to terminal 1 and 3	○	○		

If continuity is not as specified, replace the relay.

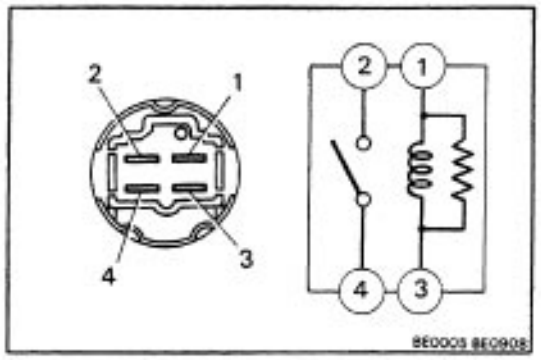


(A/C Fan Relay No. 2)

Terminal / Condition	1	2	3	4	6
Constant	○	○	○	○	○
Apply battery voltage to terminal 2 (–j and 6 (+)	○			○	

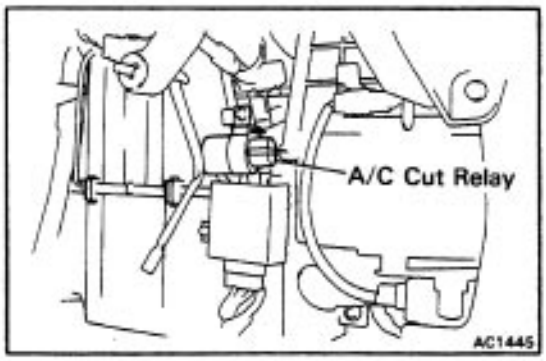
If continuity is not as specified, replace the relay.

(A/C Fan Relay No. 3)



Terminal / Condition	1	2	3	4
Constant	○	○	○	
Apply battery –voltage to terminal 1 and 3		○		○

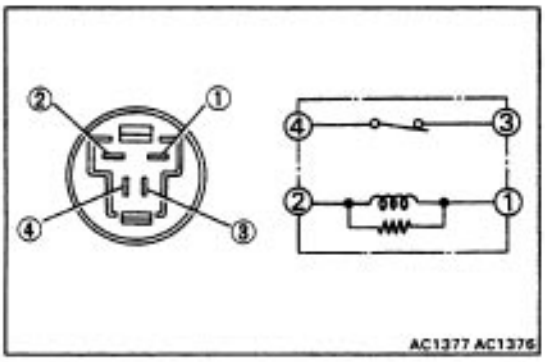
If continuity is not as specified, replace the relay.



All–Trac/4WD Model
(A/C Cut Relay)

Terminals / Condition	1	2	3	4
Constant	○—⏦—○		○	○
Apply battery voltage to terminal 1 and 2			No continuity	

If continuity is not as specified, replace the relay.

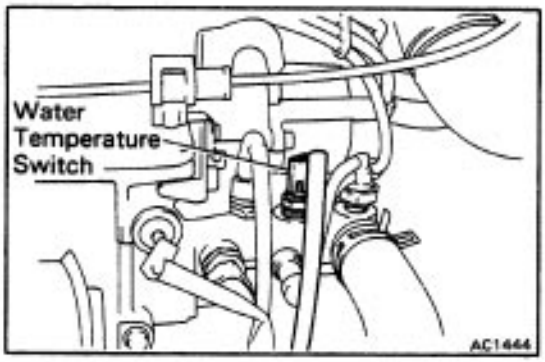


WATER TEMPERATURE SWITCH

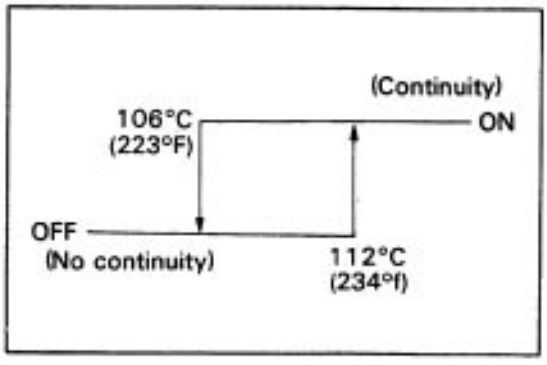
All–Trae/4WD Model

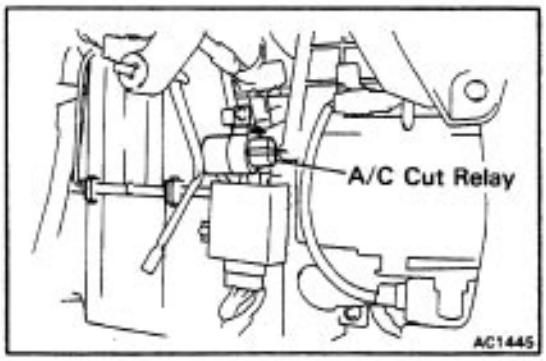
INSPECT SWITCH CONTINUITY

Inspect the switch continuity.



If detective, replace the water temperature switch.

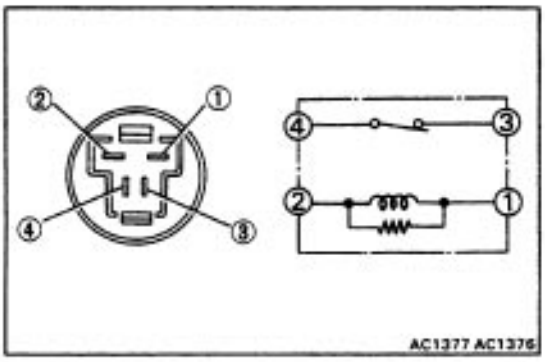




All–Trac/4WD Model
(A/C Cut Relay)

Terminals / Condition	1	2	3	4
Constant	○—⏦—○		○	○
Apply battery voltage to terminal 1 and 2			No continuity	

If continuity is not as specified, replace the relay.

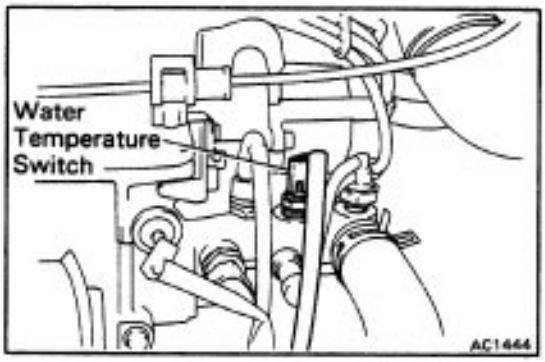


WATER TEMPERATURE SWITCH

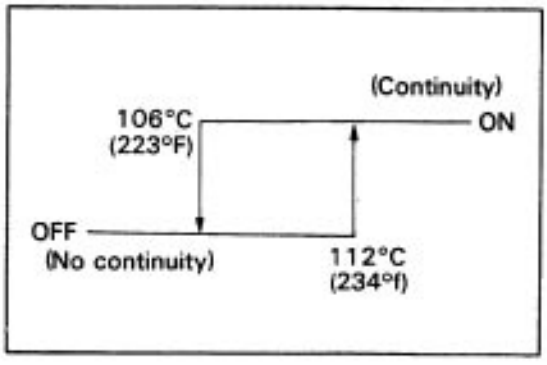
All–Trae/4WD Model

INSPECT SWITCH CONTINUITY

Inspect the switch continuity.



If detective, replace the water temperature switch.

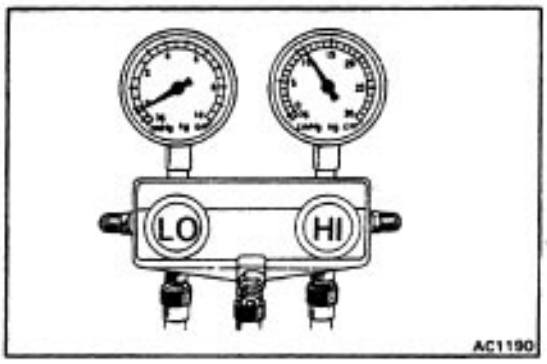


COOLING UNIT

(See page AC–12)

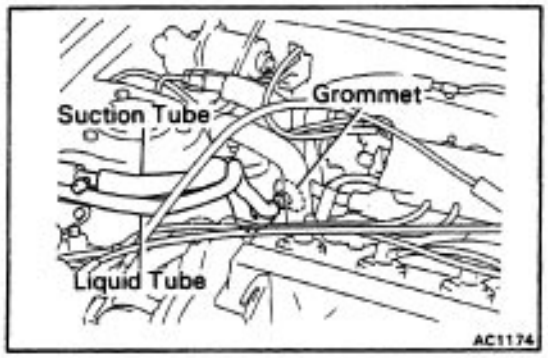
ON–VEHICLE INSPECTION OF EXPANSION VALVE

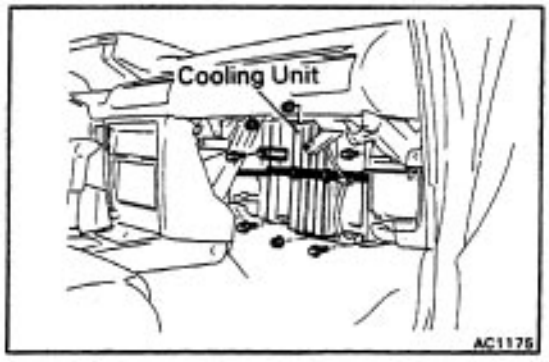
1. **CHECK QUANTITY OF REFRIGERANT GAS DURING REFRIGERATION CYCLE**
2. **INSTALL MANIFOLD GAUGE SET**
   (See page AC–23)
3. **RUN ENGINE**
   Run the engine at 2.000 rpm at least 5 minutes.
4. **CHECK EXPANSION VALVE**
   If the expansion valve is clogged,the low pressure reading will drop to 0 kg/cm2 (0 psi, 0 kPa), otherwise it is OK.



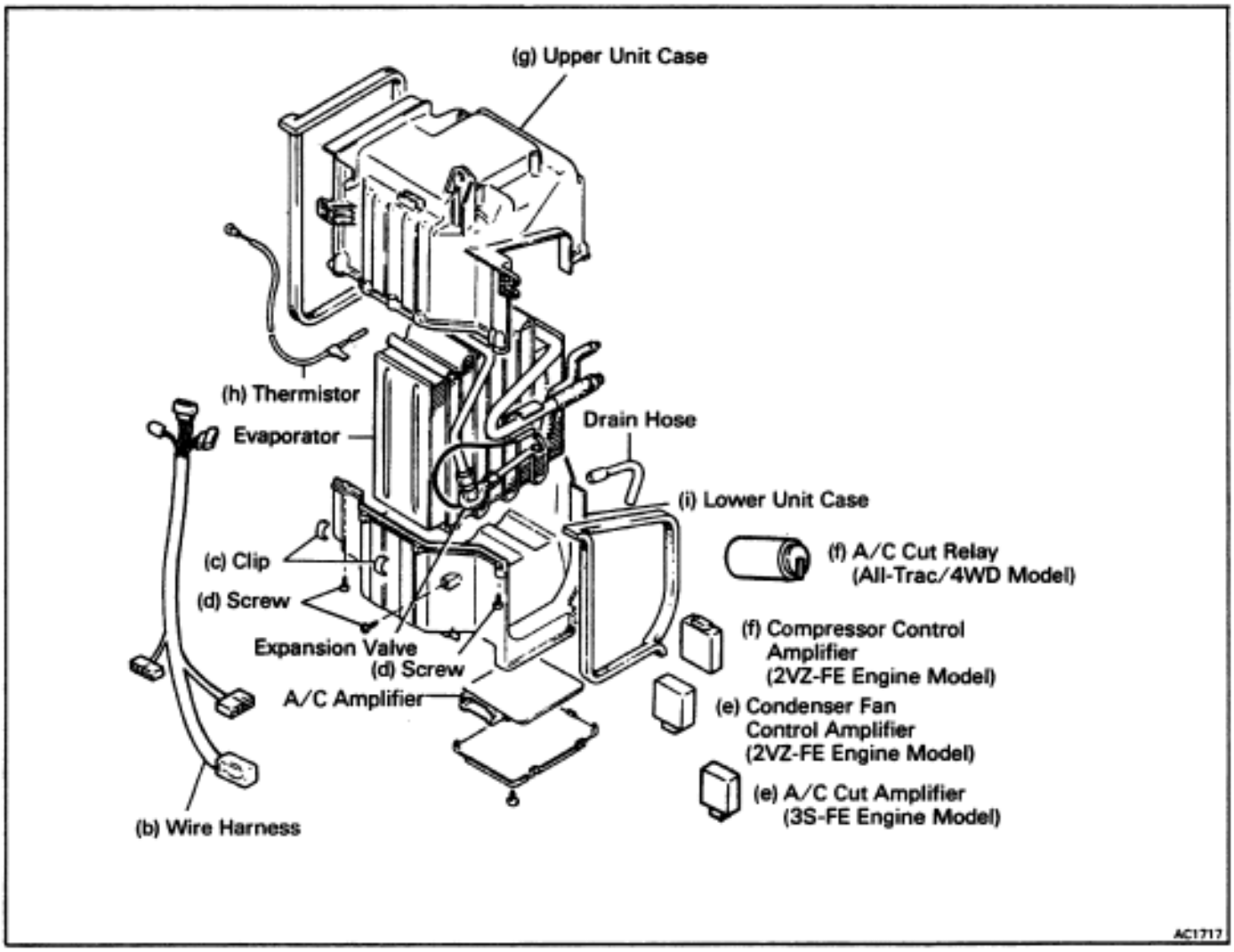
REMOVAL OF COOLING UNIT

1. **DISCONNECT NEGATIVE CABLE FROM BATTERY**
2. **DISCHARGE REFRIGERATION SYSTEM**
3. **DISCONNECT SUCTION TUBE FROM COOLING UNIT OUTLET FITTING**
4. **DISCONNECT LIQUID TUBE FROM COOLING UNIT INLET FITTING**
   HINT: Cap the open fittings immediately to keep moisture out of the system.
5. **REMOVE GROMMETS FROM INLET AND OUTLET FITTINGS**
6. **REMOVE GLOVE BOX**
7. **DISCONNECT CONNECTORS**
8. **REMOVE COOLING UNIT**
   Remove three nuts and four bolts.





DISASSEMBLY OF COOLING UNIT

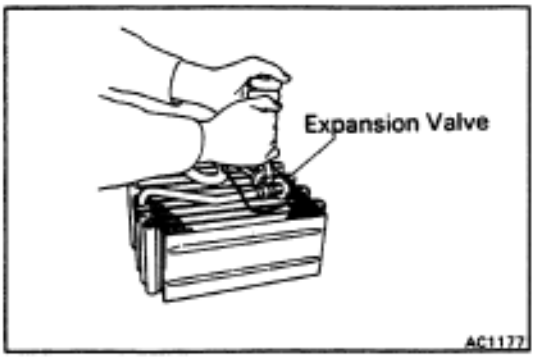


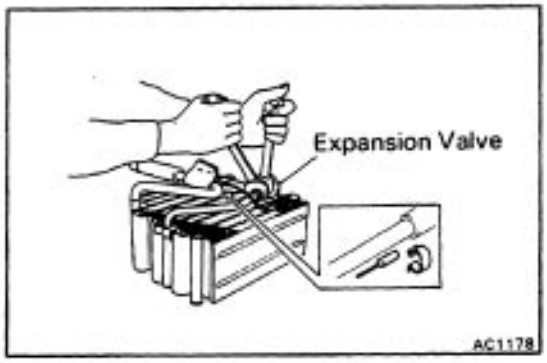
1. REMOVEL LOWER AND UPPER UNIT CASES

(a) Discoonnect connectors
(b) Remove wire harness.
(c) Remove four clips.
(d) Remove five screws.
(e) Remove condenser fan control amplifier (2vZ–FE E/G) or A/C cut amplifier (3S–FE E/G).
(f) Remove compressor control amplifier (2VZ–FE E/G) or
A/C cut relay (All–Trac/4WD model).
(g) Remove upper unit case.
(h) Remove thermistor with thermistor holder.
(i) Remove lower unit case.

2. REMOVE EXPANSION VALVE

(a) Disconnect the liquid tube from the inlet fitting of the expansion valve.
(b) Remove the packing and heat sensing tube from suction tube of evaporator.





(c) Remove the expansion valve.

Evaporator

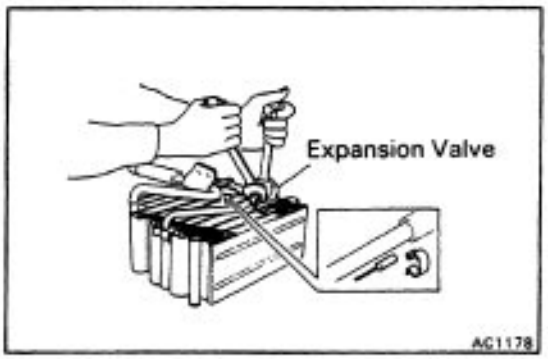
INSPECTION OF EVAPORATOR

1. **CHECK EVAPORATOR FINS FOR BLOCKAGE**
   If the fins are clogged, clean them with compressed air.
   NOTICE: Never use water to clean the evaporator.
2. **CHECK FITTINGS FOR CRACKS OR SCRATCHES**
   Repair as necessary.

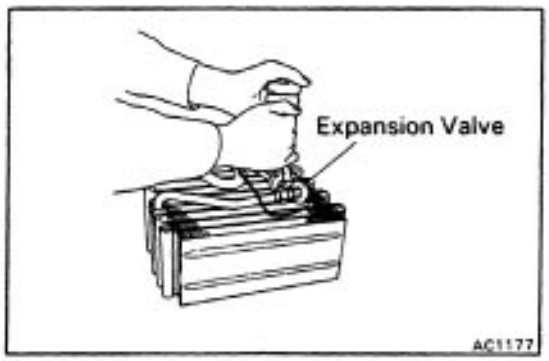
ASSEMBLY OF COOLING UNIT

INSTALL COMPONENTS ON EVAPORATOR

(a) Connect the expansion valve to the inlet fitting of the evaporator. Torque the nut.
Torque: 230 kg–cm (16 ft–lb, 22 N–m)
HINT: Be sure that the 0–ring are positioned on the tube fitting.

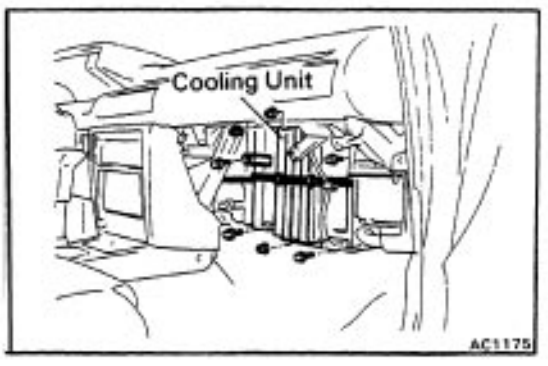


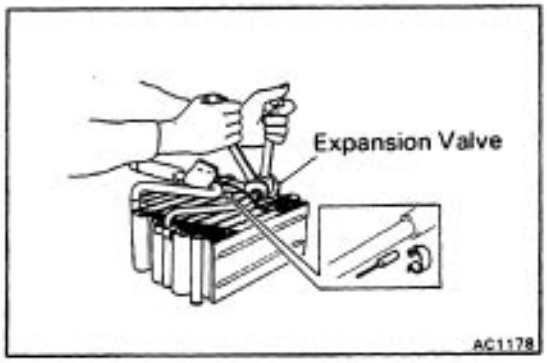
(b) Install the holder to the suction tube with heat sensitizing tube.
(c) Connect the liquid tube to the inlet fitting of the expansion valve. Torque the nut.
Torque: 140 kg–cm (10 ft–lb, 14 N–m)
(d) Install lower unit case to the evaporator.
(e) Install thermistor to the evaporator.
(f) Install upper unit case.
(g) Install four screws.
(h) Install four clips.
(i) Install wire harness.
(j) Install condenser fan control amplifier.
(k) Install compressor control amplifier.
(l) Connect connectors.



INSTALLATION OF COOLING UNIT

1. **INSTALL COOLING UNIT**
   Install the cooling unit with three nuts and four bolts.
2. **CONNECT CONNECTORS**
3. **INSTALL GLOVE BOX REINFORCEMENT**





(c) Remove the expansion valve.

Evaporator

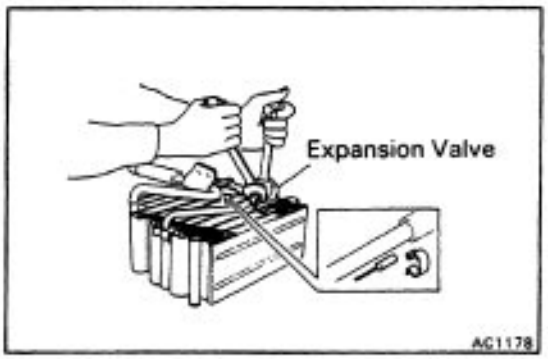
INSPECTION OF EVAPORATOR

1. **CHECK EVAPORATOR FINS FOR BLOCKAGE**
   If the fins are clogged, clean them with compressed air.
   NOTICE: Never use water to clean the evaporator.
2. **CHECK FITTINGS FOR CRACKS OR SCRATCHES**
   Repair as necessary.

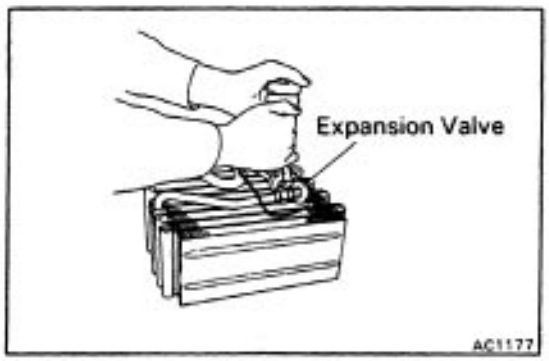
ASSEMBLY OF COOLING UNIT

INSTALL COMPONENTS ON EVAPORATOR

(a) Connect the expansion valve to the inlet fitting of the evaporator. Torque the nut.
Torque: 230 kg–cm (16 ft–lb, 22 N–m)
HINT: Be sure that the 0–ring are positioned on the tube fitting.

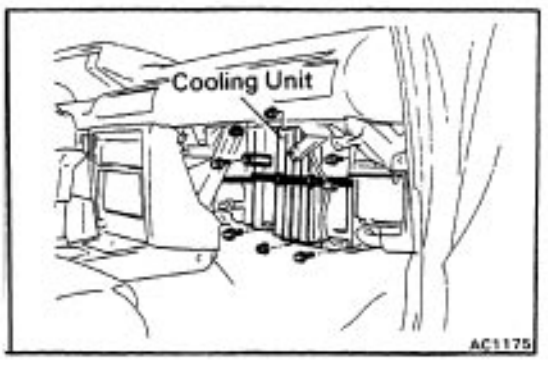


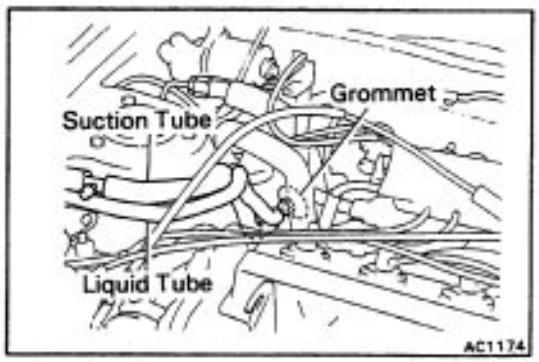
(b) Install the holder to the suction tube with heat sensitizing tube.
(c) Connect the liquid tube to the inlet fitting of the expansion valve. Torque the nut.
Torque: 140 kg–cm (10 ft–lb, 14 N–m)
(d) Install lower unit case to the evaporator.
(e) Install thermistor to the evaporator.
(f) Install upper unit case.
(g) Install four screws.
(h) Install four clips.
(i) Install wire harness.
(j) Install condenser fan control amplifier.
(k) Install compressor control amplifier.
(l) Connect connectors.



INSTALLATION OF COOLING UNIT

1. **INSTALL COOLING UNIT**
   Install the cooling unit with three nuts and four bolts.
2. **CONNECT CONNECTORS**
3. **INSTALL GLOVE BOX REINFORCEMENT**





4. **INSTALL GROMMETS ON INLET AND OUTLET FITTINGS**
5. **CONNECT LIQUID TUBE TO COOLING UNIT INLET FITTING**
   Torque the nut.
   Torque: 140 kg–cm (10 ft–lb, 14 N–m)
6. **CONNECT SUCTION TUBE TO COOLING UNIT OUTLET FITTING**
   Torque the nut.
   Torque: 330 kg–cm (24 ft–ib, 32 N–m)
7. **IF EVAPORATOR WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR**
   Add 40 – 50 cc (1.4 – 1.7 fl.oz.)
   Compressor oil: DENSOOIL 6,
   SUNISO NO. 5GS or equivalent
8. **CONNECT NEGATIVE CABLE TO BATTERY**
9. **EVACUATE AIR FROM AIR CONDITIONING SYSTEM**
10. **CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE**
    Specified amount: 600 – 700 g (1.3 – 1.7 lb)

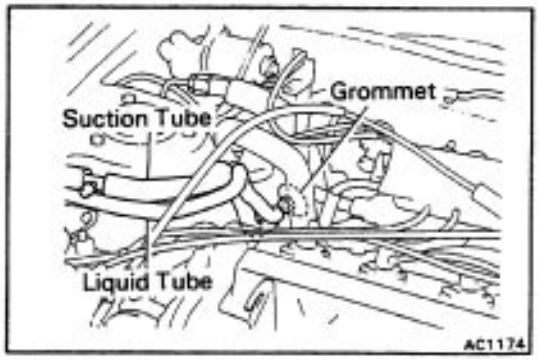
REFRIGERANT LINES

(See page AC–12)

1. **INSPECT HOSES AND TUBES FOR LEAKAGE**
   Use a gas leak detector. Replace, if necessary.
2. **CHECK THAT HOSE AND TUBE CLAMPS ARE NOT LOOSE**
   Tighten or replace as necessary.

REPLACEMENT OF REFRIGERANT LINES

1. **DISCHARGE REFRIGERATION SYSTEM**
2. **REPLACE FAULTY TUBE OR HOSE**
   HINT: Cap the open fitting immediately to keep moisture out of the system.
3. **TIGHTENING TORQUE FOR O–RING AND BOLTED TYPE FITTINGS**
   (See page AC–12)
4. **EVACUATE AIR FROM AIR CONDITIONING SYSTEM**
5. **CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE**
   Specified amount: 600 – 750 g (1.3 – 1.7 lb)



4. **INSTALL GROMMETS ON INLET AND OUTLET FITTINGS**
5. **CONNECT LIQUID TUBE TO COOLING UNIT INLET FITTING**
   Torque the nut.
   Torque: 140 kg–cm (10 ft–lb, 14 N–m)
6. **CONNECT SUCTION TUBE TO COOLING UNIT OUTLET FITTING**
   Torque the nut.
   Torque: 330 kg–cm (24 ft–lb, 32 N–m)
7. **IF EVAPORATOR WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR**
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    Specified amount: 600 – 700 g (1.3 – 1.7 lb)

REFRIGERANT LINES

(See page AC–12)

1. **INSPECT HOSES AND TUBES FOR LEAKAGE**
   Use a gas leak detector. Replace, if necessary.
2. **CHECK THAT HOSE AND TUBE CLAMPS ARE NOT LOOSE**
   Tighten or replace as necessary.

REPLACEMENT OF REFRIGERANT LINES

1. **DISCHARGE REFRIGERATION SYSTEM**
2. **REPLACE FAULTY TUBE OR HOSE**
   HINT: Cap the open fitting immediately to keep moisture out of the system.
3. **TIGHTENING TORQUE FOR O–RING AND BOLTED TYPE FITTINGS**
   (See page AC–12)
4. **EVACUATE AIR FROM AIR CONDITIONING SYSTEM**
5. **CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE**
   Specified amount: 600 – 750 g (1.3 – 1.7 lb)

THERMISTOR

(See page AC–40)

REMOVAL AND INSPECTION OF THERMISTOR

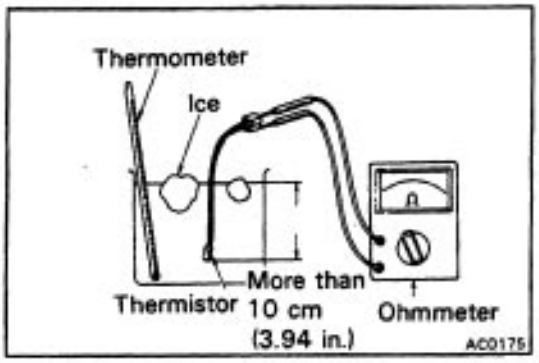
1. **DISCONNECT NEGATIVE CABLE FROM BATTERY**
2. **REMOVE GLOVE BOX AND UNDER COVER**
3. **CHECK THERMISTOR INSTALLED OPERATION**

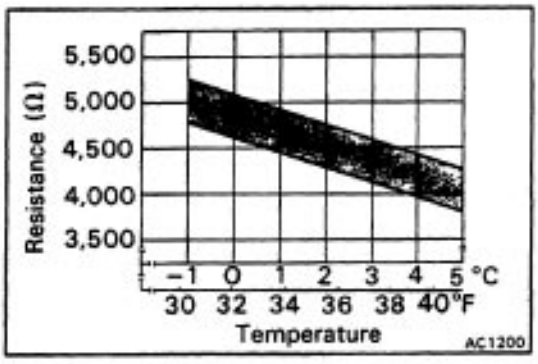
   Using an ohmmeter, measure the resistance at the connector.

   Resistance: 1,500 Ω at 25˚C (77˚F)

   If resistance value is not as speci¿¿ed, replace the thermistor.
4. **REMOVE THERMISTOR**
   (a) Disconnect the connector.
   (b) Remove the screw and thermistor from the cooling unit.
5. **CHECK THERMISTOR OPERATION**
   (a) Place the thermistor in cold water. While varying the temperature of the water, measure the resistance at the connector and at the same time, measure the temperature of the water with a thermometer.
   (b) Compare the two readings on the chart.

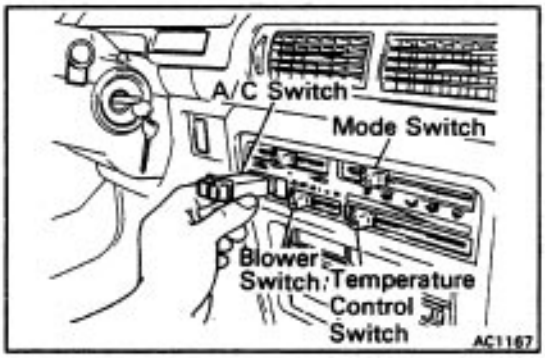
   If the intersection is not between the two lines, replace the thermistor.





INSTALLATION OF THERMISTOR

1. **INSTALL THERMISTOR**
   (a) Install the thermistor with the screw.
   (b) Connect the connector.
2. **INSTALL GLOVE BOX AND UNDER COVER**
3. **CONNECT NEGATIVE CABLE TO BATTERY**



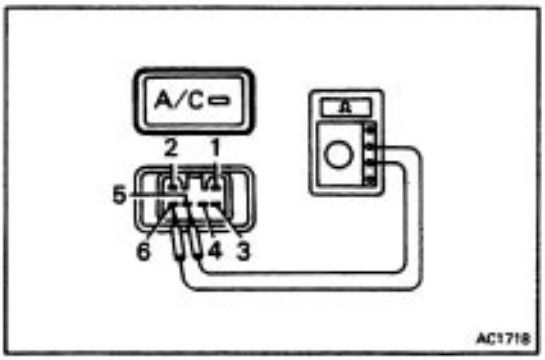
AC SWITCH (Lever Type)

(See page AC–12)

ON–VEHICLE INSPECTION

1. **DISCONNECT NEGATIVE CABLE FROM BATTERY**
2. **REMOVE A/C SWITCH**
3. **CHECK A/C SWITCH FOR CONTINUITY**

Using an ohmmeter, check continuity between the terminals for each switch position as shown in the table.



Terminal / Switch position	2	3	5	6	Illumination 1	Illumination 4
OFF						
A/C	○	○	○	○	○	○

HINT: When checking for continuity in circuits which contain an LED, please observe the following instructions.

(a) Use a tester with a power source of 3V or greater to overcome the circuit resistance.

(b) If a suitable tester is not available, apply battery voltage and check that the LED lights up.

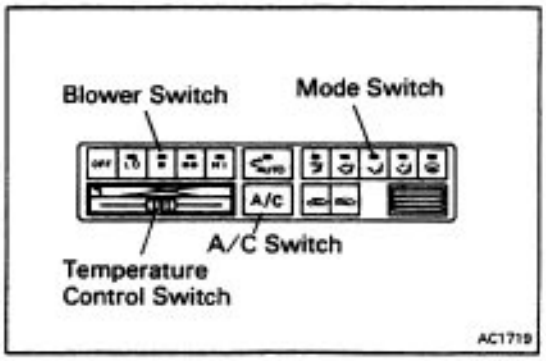
If there is no continuity as specified, replace the A/C switch.

4. **INSTALL A/C SWITCH**
5. **CONNECT NEGATIVE CABLE TO BATTERY**

A/C SWITCH (Push Type)

1. **DISCONNECT NEGATIVE CABLE FROM BATTERY**
2. **REMOVE HEATER CONTROL ASSEMBLY**
3. **DISCONNECT HEATER CONTROL CONNECTOR**
4. **CHECK A/C SWITCH CONTINUITY**

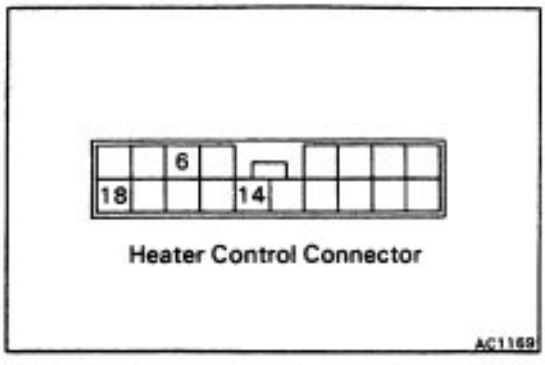
Using an ohmmeter, check continuity between the terminals for each switch position as shown in the table.

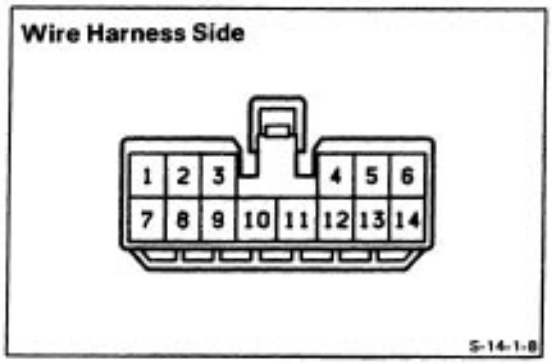


Terminal / Switch position	6	14
OFF		
A/C	○	○

If there in no continuity as specified, replace the A/C switch.

5. **CONNECT HEATER CONTROL CONNECTOR**
6. **INSTALL HEATER CONTROL ASSEMBLY**
7. **CONNECT NEGATIVE CABLE TO BATTERY**





AMPLIFIERS

Inspection of Amplifier

(See page AC–12)

Air Conditioner Amplifier

INSPECT AMPLIFIER CIRCUIT

Disconnect the amplifier and inspect the connector on the wire harness side as shown in the chart below.

Test conditions:

(1) Ignition: ON

(2) Temperature control lever: MAX. COOL

(3) Blower switch: Hl

3S–FE Engine Model

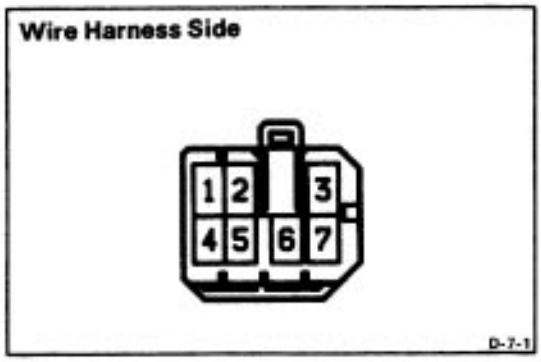
Check for	Tester connection	Condition	Specified value
Continuity	10 — Ground	Constant	Continuity
Voltage	4 — 10	Turn A/C switch on.	Battery voltage
		Turn A/C switch off.	No voltage
	1 — 10	Turn A/C switch on.	Battery voltage
		Turn A/C switch off.	No voltage
Voltage	2 — 10	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	6 — 10	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voitage
	8 — 10	Start engine.	4pprox. 10 to 14 V
		Stop engine.	No voltage
	5 — 10	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
Resistance	3 — 9	Constant	ApProx. 1.7 kΩ at 25˚C (77˚F)
	9 — 13	Constant	ApproX. 250 Ω

If circuit is as specified, replace the amplifier.

2VZ–FE Engine Model

Check for	Tester connection	Condition	Specified value
Continuity	3 — Ground	Constant	Continuity
Voltage	14 — Ground	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	11 — Ground	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	2 — Ground	Turn A/C switch on.	Battery voltage
		Turn A/C switch off.	No voltage
	10 — Ground	Turn A/C switch on.	Battery voltage
		Turn A/C switch off.	No voltage
	7 — Ground	Start engine.	Approx. 10 to 14 V
		Stop engine.	No voltage
Resistance	5 — 9	Constant	Approx. 1.5 kΩ at 27˚C (77˚F)
	8 — 9	Constant	Approx. 250Ω

If the circuit is as specified, replace the amplifier.



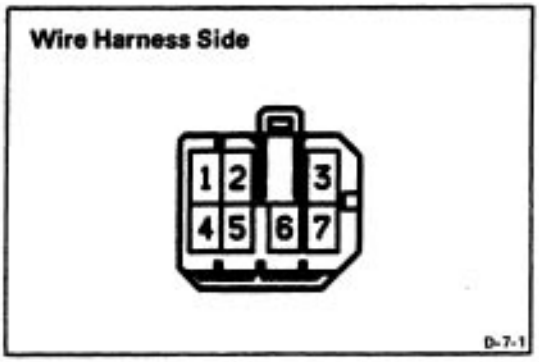
Condenser Fan Control Amplifier

INSPECT AMPLIFIER CIRCUIT

Disconnect the amplifier and inspect the connector on the wire harness side as shown in the chart below.

Check for	Tester connection	Condition	Specified value
Continuity	1 – Ground	Constant	Continuity
	2 – Ground	Constant	Continuity
	5 – Ground	Constant	Continuity
	6 – Ground	Constant	Continuity
Voltage	3 – 6	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	4 – 6	Turn ignition switch on–.	Battery voltage
		Turn ignition switch off.	No voltage

If circuit is as specified, replace the amplifier.



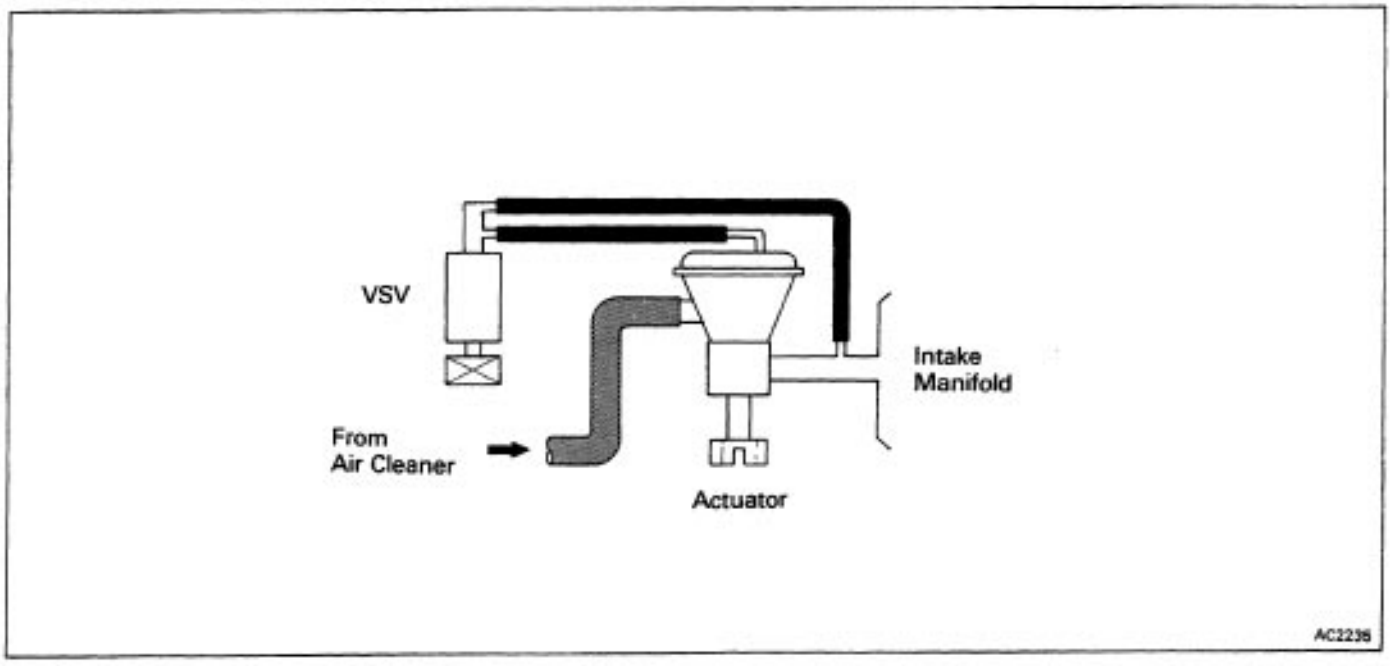
Compressor Control Amplifier

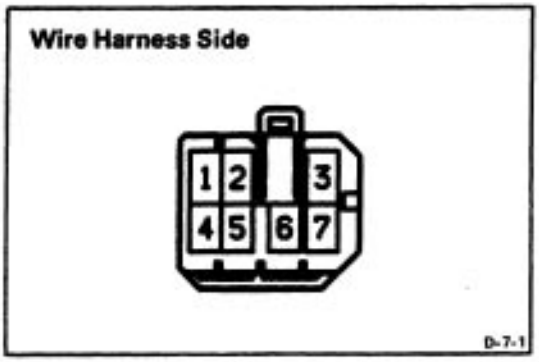
INSPECT AMPLIFIER CIRCUIT

Disconnect the amplifier and inspect the connector on the wire harness side as shown in the chart below.

Check for	Tester connection	Condition	Specified value
Continuity	6 – Ground	Constant	Continuity
Voltage	3 – Ground	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
Resistance	5–7	Constant	Approx. 4.4 kΩ 25˚C(77˚F)

VACUUM HOSE CIRCUIT (3S–FE Engine)





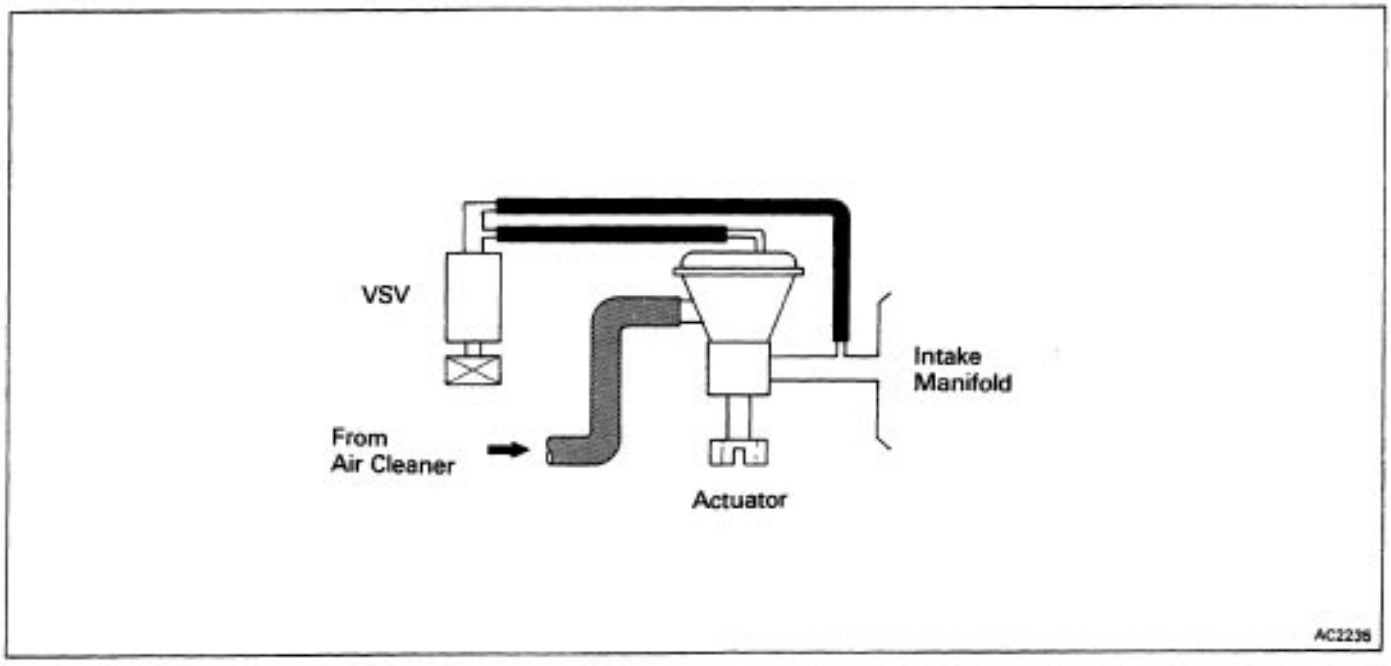
Compressor Control Amplifier

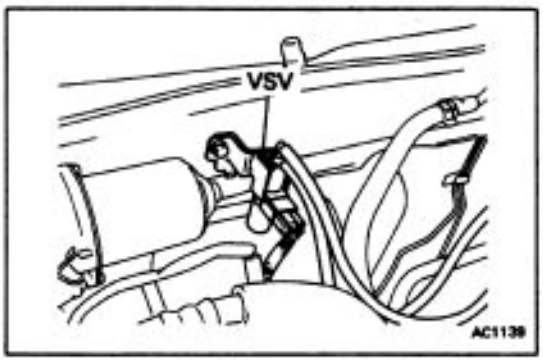
INSPECT AMPLIFIER CIRCUIT

Disconnect the amplifier and inspect the connector on the wire harness side as shown in the chart below.

Check for	Tester connection	Condition	Specified value
Continuity	6 – Ground	Constant	Continuity
Voltage	3 – Ground	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
Resistance	5–7	Constant	Approx. 4.4 kΩ 25˚C (77˚F)

VACUUM HOSE CIRCUIT (3S–FE Engine)



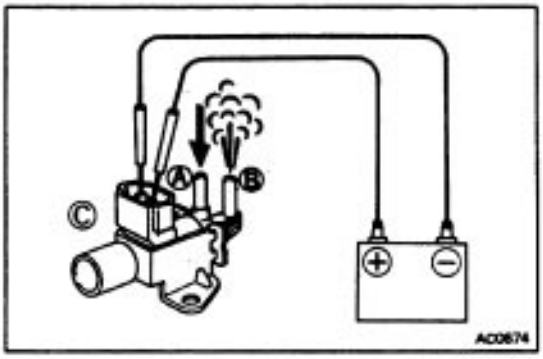


VACUUM SWITCHING VALVE (VSV)

(See pages AC–4 to AC–7)

INSPECTION OF VSV

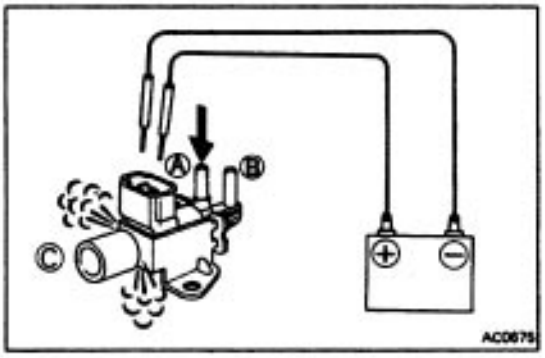
1. REMOVE VSV



2. CHECK VACUUM CIRCUIT CONTINUITY IN VSV 8* BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as shown.

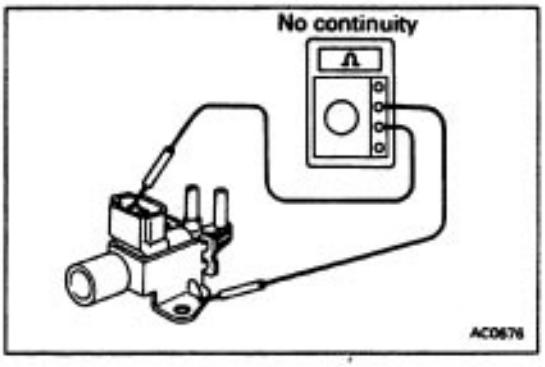
(b) Blow into pipe ”A”, and check that air comes out of pipe ”B” but does not come out of filter ”C”.



(c) Disconnect the battery.

(d) Blow into pipe ”A” and check that air comes out of filter ”C” but does not come out of pipe ”B”.

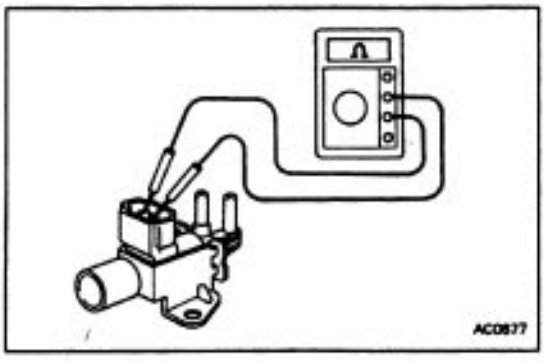
If a problem is found, replace the VSV.



3. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between each terminal and the VSV body.

If a short circuit is found, repair or replace the VSV.



4. CHECK FOR OPEN CIRCUIT

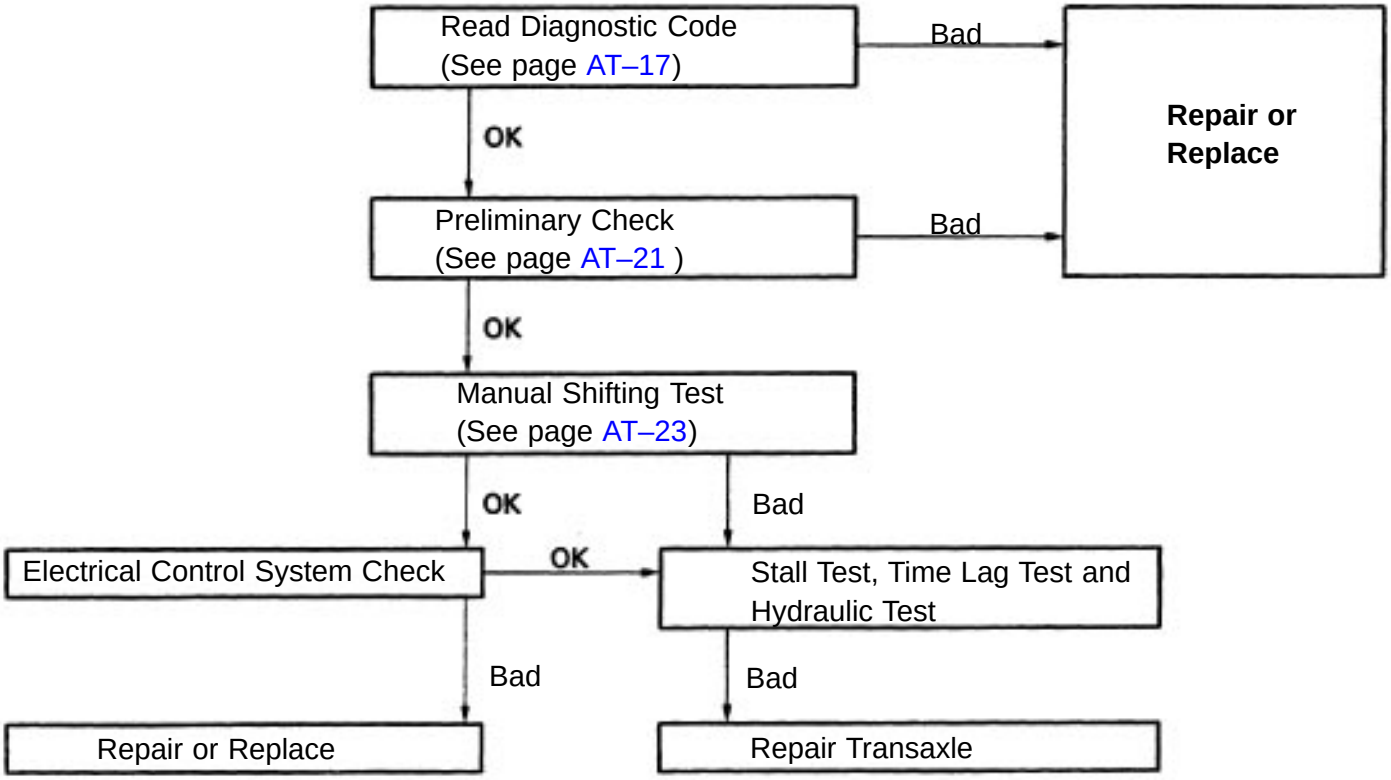
Using an ohmmeter, measure the resistance between the two terminals of the VSV.

Specified resistance: 37 – 44 at 20˚C (68˚F)

If resistance value is not as specified, replace the VSV.

TROUBLESHOOTING
Basic Troubleshooting

Before troubleshooting an ECT, first determine whether the problem is electrical or mechanical. To do this, just refer to the basic troubleshooting flow–chart provided below.
If the cause is already known, using the basic troubleshooting chart below along with the general troubleshooting chart on the following pages should speed the procedure.



AUTOMATIC TRANSAXLE

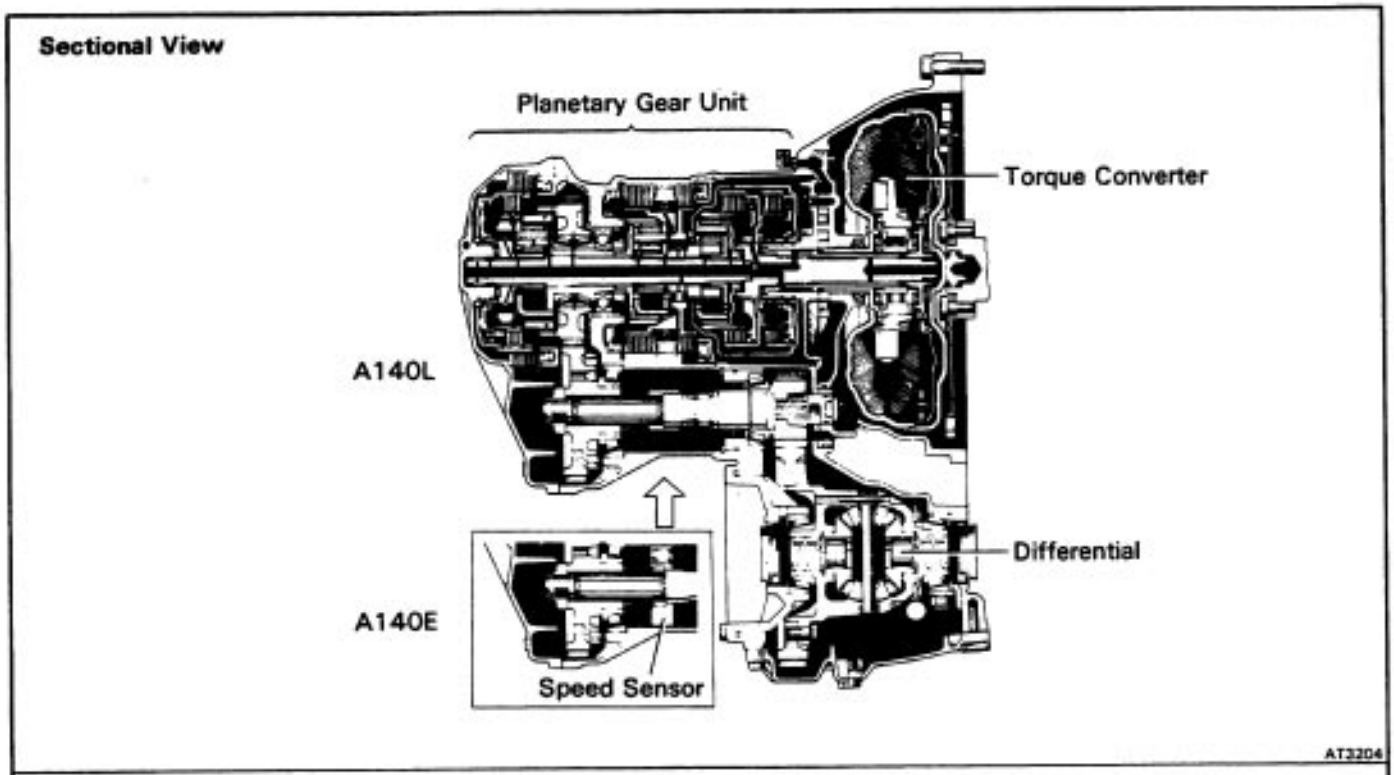
MEMO

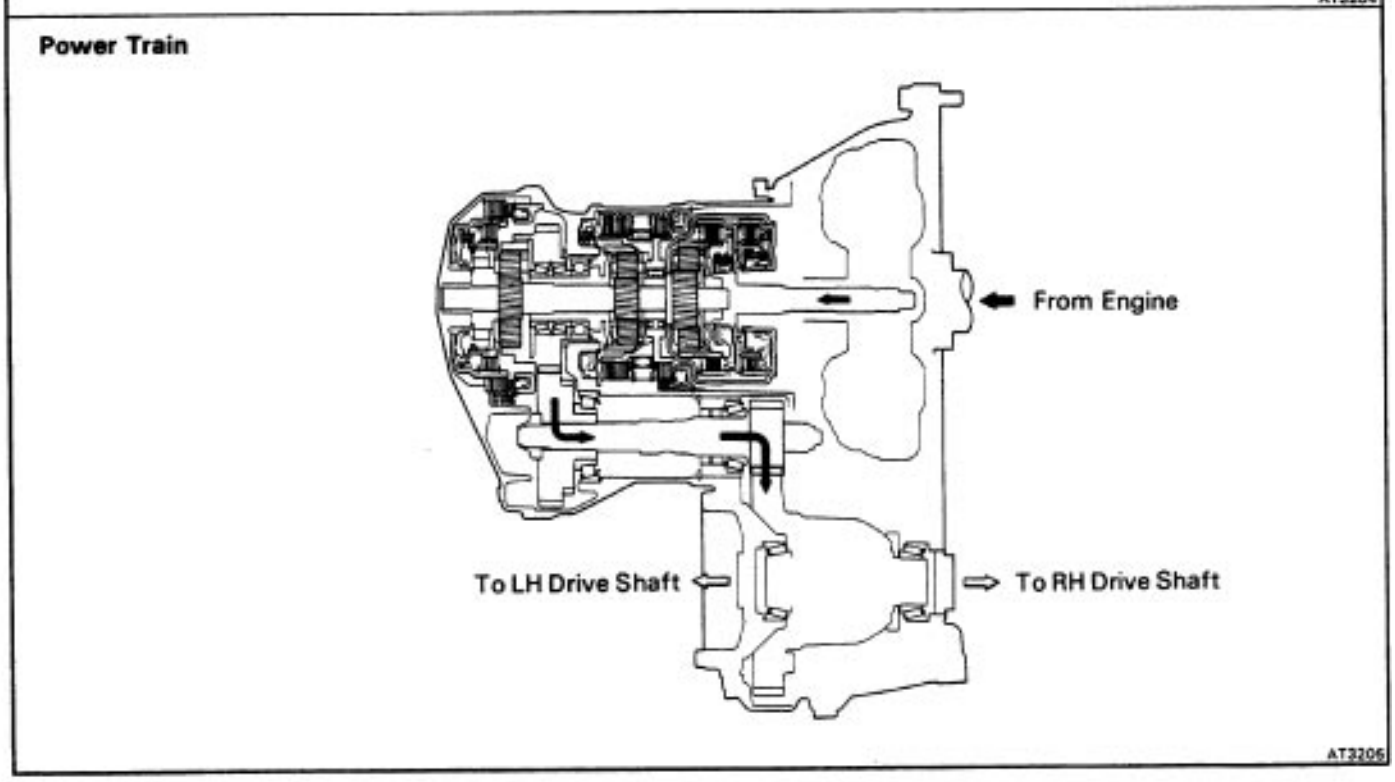
A140L AND A140E AUTOMATIC TRANSAXLE

DESCRIPTION

The A140L and. A140E automatic transaxle described in this AT section is a lock–up four–speed automatic transaxle developed exclusively for use– with a transversely–mounted engine.

The A140E is called an ECT (Electronic Controlled Transaxle). Based on the A140L, the hydraulic control system has been changed, and the shift and lock–up timing are controlled by micro computer.





The construction and operation of the A140L, will first be explained. Then the difference between the A140E

and the A140L, and the features of the ECT, will also be explained.

A140L Automatic Transaxle

CONSTRUCTION AND OPERATION

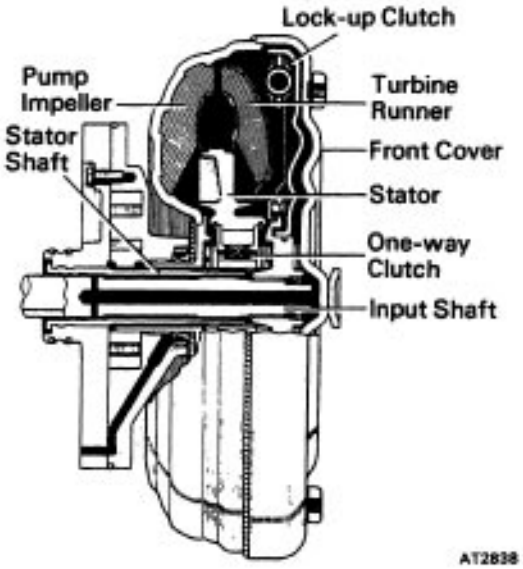
The A140L automatic transaxle can be roughly divided into the automatic transmission section and the differential section. The automatic transmission section is composed of the torque converter, planetary gear unit and the hydraulic control system.

1. Torque Converter

CONSTRUCTION

The torque converter is composed of the pump impeller which is rotated by the engine, the turbine runner and lock–up clutch which are fixed to the transmission input shaft, and the stator which is attached to the stator shaft via the one–way clutch.

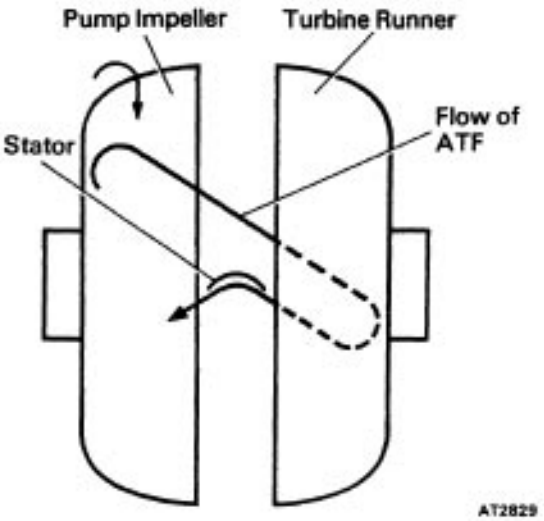
The torque converter is filled with ATF.



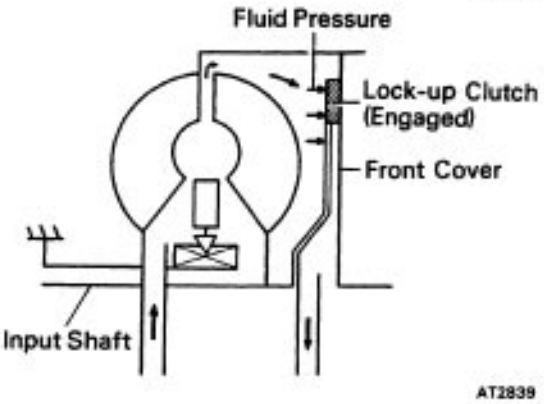
OPERATION

The pump impeller is rotated by the engine, which causes a flow in the ATF inside the torque converter. The flow of ATF caused by the pump impeller strikes the turbine runner, providing a force to rotate the turbine runner, and transmits torque to the input shaft. The flow of ATF which has hit the turbine runner rebounds and tries to flow in the direction opposite to the direction of rotation of the pump impeller, but the stator returns the flow the original direction of rotation. So the ATF
becomes a force which supports the pump impeller and increases torque.

HINT: Although the stator is immobilized by the one-way clutch, should the one–way clutch become defective the stator will be rotated by the flow of ATF, the flow of
ATF will not be reversed, torque will not be increased and the problem of inadequate acceleration will occur.



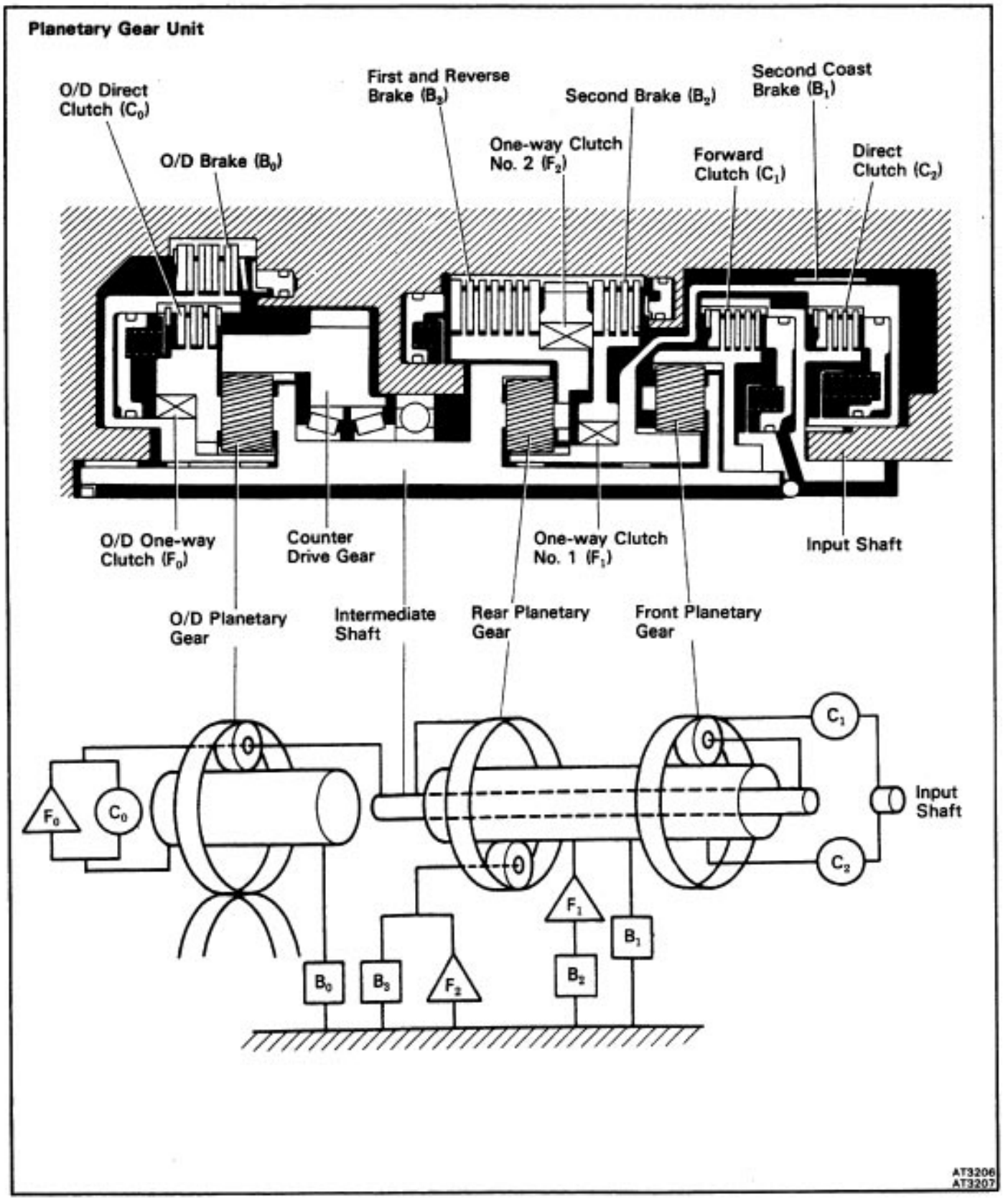
The lock–up clutch is pushed against the front cover by fluid pressure so that the engine revolutions are directly transmitted to the input shaft without the medium of the
ATF.



2. Planetary Gear Unit

CONSTRUCTION

The planetary gear unit is composed of three sets of planetary gears, three clutches which transmit power to the planetary gears, and four brakes and three one–way clutches which immobilize the planetary carrier and planetary sun gear.



OPERATION

Power from the engine transmitted to the input shaft via the torque converter is then transmitted to the planetary gears by the operation of the clutch.

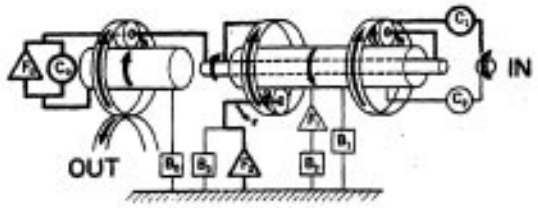
By operation of the brake and one–way clutch, either the planetary carrier or the planetary sun gear are immobilized, altering the speed of revolution of the. planetary gear unit.

Shift change is carried out by altering the combination of clutch and brake operation.

Each clutch and brake operates by hydraulic pressure; gear position is decided according to the throttle opening angle and vehicle speed, and shift change automatically occurs.

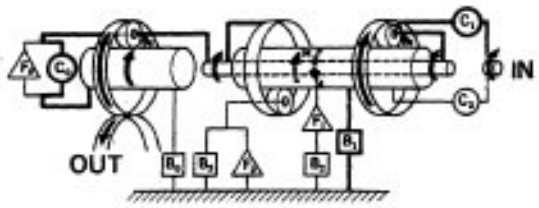
The conditions of operation for each gear position are shown on the following illustrations:

D or 2 Range 1st Gear



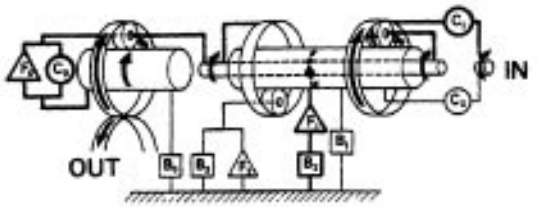
AT1097

2 Range 2nd Gear



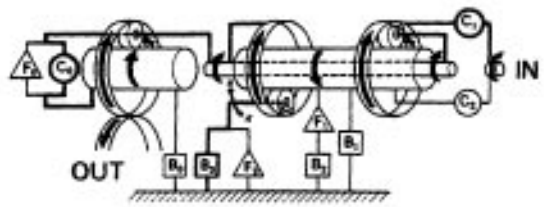
AT1102

D Range 2nd Gear



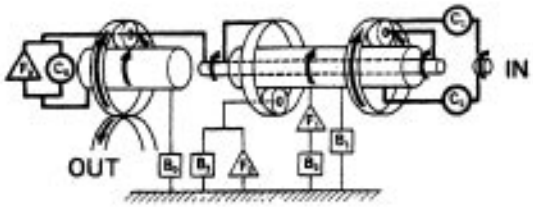
AT1098

L Range 1st Gear



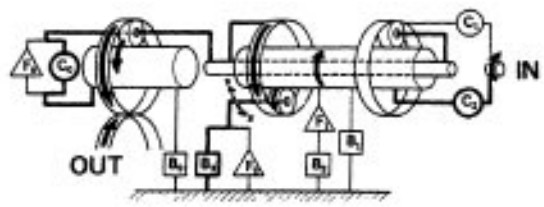
AT1103

D Range 3rd Gear



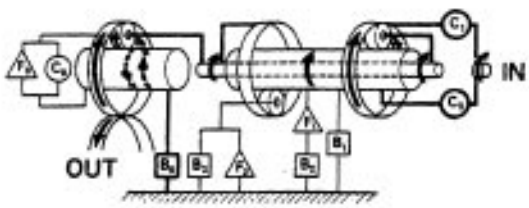
AT1099

R Range Reverse Gear



AT1101

D Range O/D Gear



AT1100

3. Hydraulic Control System

CONSTRUCTION

The hydraulic control is composed of an oil pump, rotated by the engine, which supplies hydraulic pressure; a valve body which controls the hydraulic pressure and the opening and closing of the fluid passaged; and a governor valve which supplies hydraulic pressure in accordance with vehicle speed.

OPERATION

Hydraulic pressure supplied by the oil pump is controlled– by the regulator valve; the resulting oil pressure controlled by the regulator valve is called the line pressure.

Line pressure produces the hydraulic pressure for throttle pressure and governor pressure. Also, line pressure produces hydraulic pressure for the operation of each brake and clutch in the planetary gear unit.

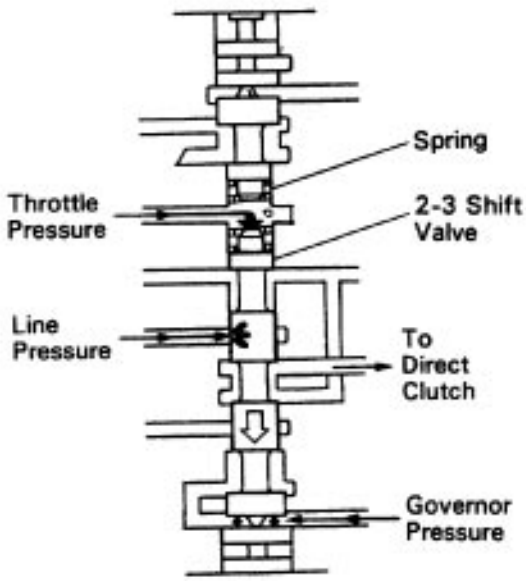
The throttle valve acts to produce hydraulic pressure, called the throttle pressure, which responds to accelerator pedal modulation. Throttle pressure increases as the accelerator pedal is depressed.

The governor valve produces hydraulic pressure, called the governor pressure, in response to vehicle speed. Governor pressure increases as vehicle speed increases.

In accordance with the difference between throttle pressure and governor pressure, each shift valve shifts, the fluid passages to the clutches are brakes in the planetary gear unit are opened and the clutches and brakes operate, and shift change occurs.

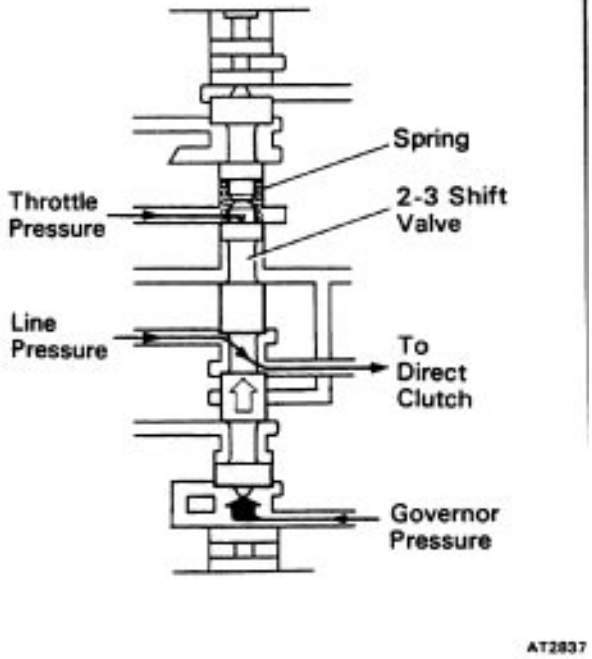
The operation of the hydraulic control system, using the 2–3 shift valve as an example, is shown below;

[Low Speed] Gear Position: 2nd



Governor pressure is low.
2-3 shift valve is forced downward by throttle pressure and spring tension.
The line pressure fluid passage is closed.

[High Speed] Gear Position: 3rd



When vehicle speed increases the governor pressure increases and overcomes throttle pressure and spring tension; 2-3 shift valve is forced upward. The line pressure fluid passage opens, the direct clutch is operated and the gear is shifted up to third.

A140E Automatic Transaxle (ECT)

WHAT IS THE ECT?

ECT means Electronic Controlled Transaxle. The hydraulic control system of the previous automatic transaxle has been changed, the throttle and governor pressure have been replaced by electronic signals and a micro computer has been used to give precise control of shift timing and lock–up timing.

FEATURES OF THE ECT

(a) The shift pattern can be chosen.

In the ECT ECU micro computer used in the A140E, two types of shift pattern, Power and Normal, are recorded in the memory. By operating the pattern select switch, the driver can select the preferred shift pattern.

(b) Reduced fuel consumption and reduced shock during shifting is made possible.

Precise control of the shift timing by the ECT ECU, operation of the lock–up clutch from low speeds, and decreased fuel consumption are made possible. Also, shock during Shifting is reduced.

(e) Self–Diagnostic System

When a malfunction occurs in the electronic control system, the driver is informed of this fact. Also, there is a Self–Diagnostic System which displays the location of the malfunction when the service connector is shorted.

(d) Fail–Safe System

A fail–Safe System is included so that, even if a malfunction occurs in the electronic control system, the vehicle will be able to operate.

CONSTRUCTION AND OPERATION

When the A140E (ECT) is compared with the A140L, the automatic transaxle body has the same construction and operation, with the exception of the hydraulic control system, as the A140L.
The electronic control system, which controls the shift timing and lock–up timing, has been added.

1. Hydraulic Control System (Comparison with the A140L)

VALVE BODY – Additions or changes to solenoid valve

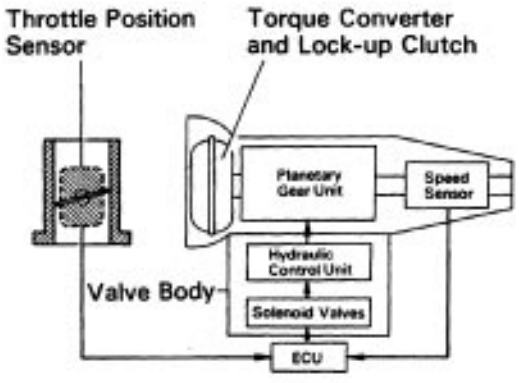
In the A140E there are three solenoid valves, the No. 1, the No. 2 and the lock–up solenoid valves. Shifting occurs according to whether the No. 1 and No. 2 solenoid valves are ON or OFF, and the lock–up solenoid valve controls the lock–up clutch.

GOVERNOR VALVE – Removed

With the A140E, the governor valve has been replaced with a speed sensor, so that instead of the governor pressure, a speed sensor signal is sent to the ECT ECU.

SHIFT CONTROL IN ECT

1. The vehicle speed is sensed by the vehicle speed sensor, which sends this data to the ECU in the form of electrical signals.
2. The angle to which the throttle is open is sensed by the throttle position sensor, which sends this data to the ECU in the form of electrical signals.
3. The ECT computer determines the shift point on the basis of these two signals and operates the solenoid valves in the hydraulic control unit, thus shifting the transmission.



AT1079

2. Electronic Control System

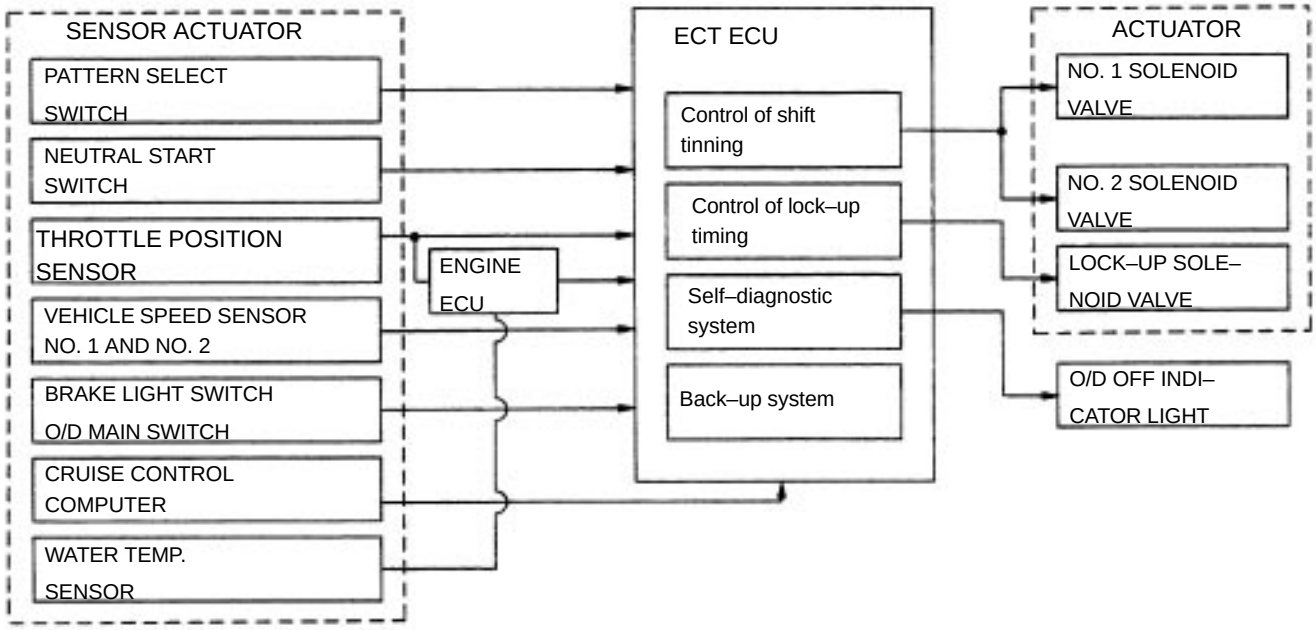
COMPONENTS

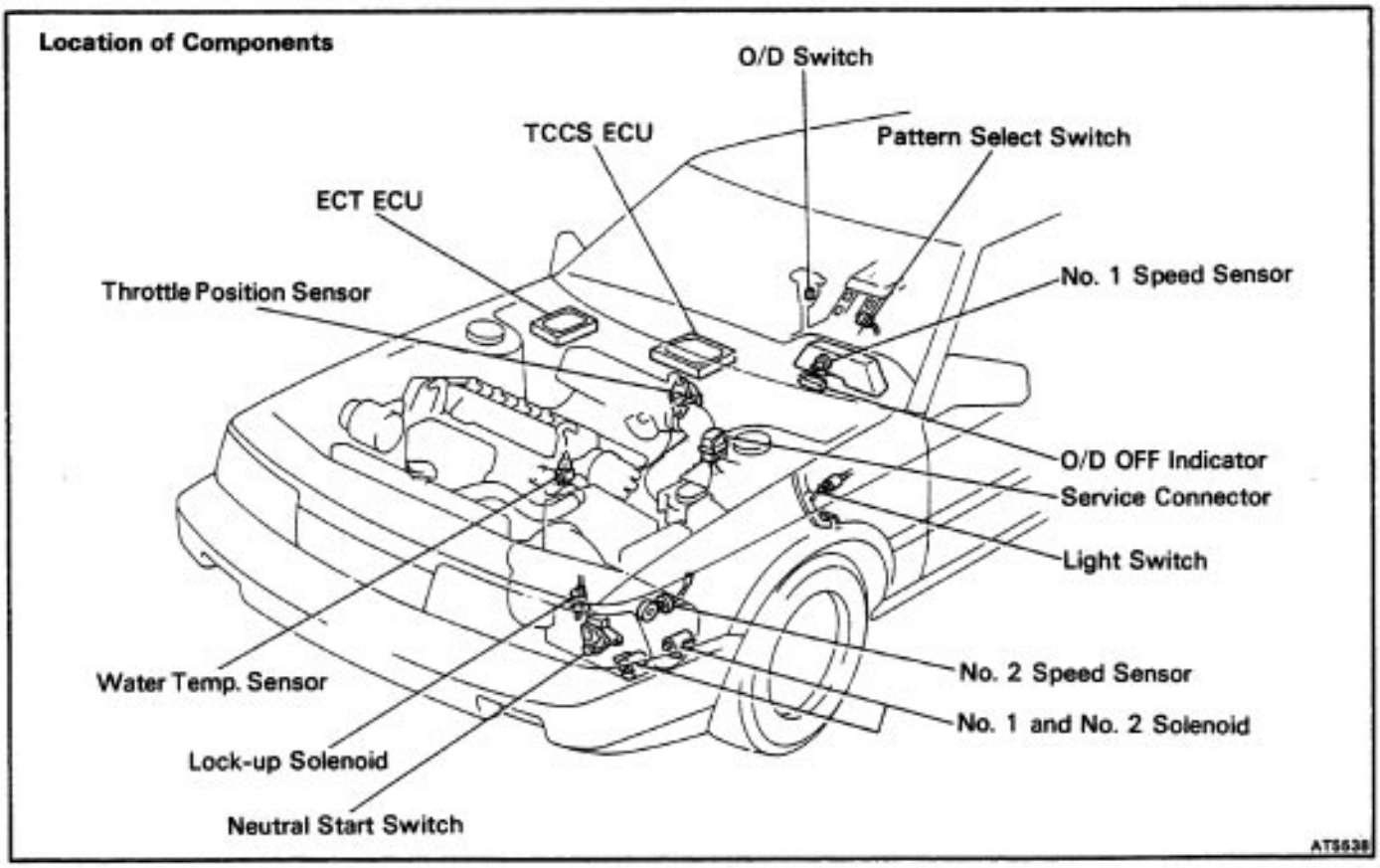
The electronic control system for controlling the shift timing and the operation of the lock–up clutch is composed of the following three parts:

(a) Sensors: These sense the vehicle speed and throttle position and send this data to the ECT ECU in the form of electronic signals.

(b) ECT ECU: This determines the shift and lock–up timing based upon the signals from the. sensors.

(e) Actuators: Solenoid valves divert hydraulic pressure from one circuit of the hydraulic control unit to another, thus controlling shifting and lock–up timing.





General Troubleshooting

Problem	Possible cause	Remedy	Page	
			A140L	A140E
Fluid discolored or smells burnt	Fluid contaminated	Replace fluid	AT–21	←
	Torque converter faulty	Replace torque converter	AT–156	←
	Transaxle faulty	Disassemble and inspect transaxle	AT–56	←
Vehicle does not move in any forward range or reverse	Shift cable out of adjustment	Adjust shift cable	AT–22	AT–121
	Valve body or primary regulator faulty	Inspect valve body	AT–133	
	Parking lock pawl faulty	Inspect parking lock pawl	AT–72	←
	Torque converter faulty	Replace torque converter	AT–156	←
	Converter drive plate broken	Replace drive plate		
	Oil pump intake screen blocked	Clean screen		
	Transaxle faulty	Disassemble and inspect transaxle	AT–56	←
Shift lever position incorrect	Shift cable out of adjustment	Adjust shift cable	AT–22	AT–121
	Manual valve and lever faulty	Inspect valve body	AT–133	
	Transaxle faulty	Disassemble and inspect transaxle	AT–56	
Harsh engagement into any drive range	Throttle cable out of adjustment	Adjust throttle cable	AT–22	AT–121
	Valve body or primary regulator faulty	Inspect valve body	AT–133	
	Accumulator pistons faulty	Inspect accumulator pistons	AT–177	←
	Transaxle faulty	Disassemble and inspect transaxle	AT–56	←
Delayed 1–2, 2–3 or 3–O/D up–shift, or down–shifts from O/D–3 or 3–2 and shifts back to O/D or 3	Electronic control faulty	Inspect electronic control	AT–36	AT–24
	Valve body faulty	Inspect valve body	AT–133	AT–121
	Solenoid valve faulty	Inspect solenoid valve		AT–33
Slips on 1–2, 2–3 or 3–O/D up–shift, or slips or shudders on acceleration	Shift cable out of adjustment	Adjust shift cable	AT–22	AT–121
	Throttle cable out of adjustment	Adjust throttle cable	AT–22	AT–33
	Valve body faulty	Inspect valve body	AT–133	
	Solenoid valve faulty	Inspect solenoid valve	AT–56	
	Transaxle faulty	Disassemble and inspect transaxle		
Drag, binding or tieup on 1–2, 2–3 or 3–4/D up–shift	Shift cable out of adjustment	Adjust shift cable	AT–22	AT–121
	Valve body faulty	Inspect valve body	AT–133	
	Transaxle faulty	Disassemble and inspect transaxle	AT–56	

General Troubleshooting (Cont'd)

Problem	Possible cause	Remedy	Page	
			A140L	A140E
No lock–up in 2nd, 3rd or O/D	Electronic control faulty Valve body faulty Solenoid valve faulty Transaxle faulty	Inspect electronic control Inspect valve body Inspect solenoid valve Disassemble and inspect transaxle	AT–36 AT–133 AT–56	AT–24 AT–121 AT–33
Harsh down–shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transaxle faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator pistons Inspect valve body Disassemble and inspect transaxle	AT–22 AT–22 AT–177 AT–133 AT–56	← ← AT–121
No down–shift when coasting	Valve body faulty Solenoid valve faulty Electronic control faulty	Inspect valve body Inspect solenoid valve Inspect electronic control	AT–133 AT–36	AT–121 AT–33 AT–24
Down–shift occurs too quickly or too late while coasting	Throttle cable faulty Valve body faulty Transaxle faulty Solenoid valve faulty Electronic control faulty	Inspect throttle cable Inspect valve body Disassemble and inspect transaxle Inspect solenoid valve Inspect electronic control	AT–22 AT–133 AT–56 AT–36	AT–121 AT–33 AT–24
No O/D–3, 3–2 or 2–1 kick–down	Solenoid valve faulty Electronic control faulty Valve body faulty	Inspect solenoid valve Inspect electronic control Inspect valve body	AT–36 AT–133	AT–33 AT–24 AT–121
No engine braking in 2 or L range	Solenoid valve faulty Electronic control faulty Valve body faulty Transaxle faulty	Inspect solenoid valve Inspect electronic control Inspect valve body Disassemble and inspect transaxle	AT–36 AT–133 AT–56	AT–33 AT–24 AT–121
Vehicle does not hold in P	Shift cable out of adjustment Parking lock pawl cam and spring faulty	Adjust shift cable Inspect cam and spring	AT–22 AT–72	← ←

Operating Mechanism for Each Gear (A140L A140E)

1. CLUTCH BRAKE AND ONE–WAY CLUTCH

A140L

○ . . . . . Operating

Shift lever position	Gear position	C_0	C_1	C_2	B_0	B_1	B_2	B_3	F_0	F_1	F_2
P	Parking	○									
R	Reverse	○		○				○			
N	Neutral	○									
D	1 st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1 st	○	○						○		○
	2nd	○	○			○	○		○	○	
L	1 st	○	○					○	○		○
	2nd	○	○			○	○		○	○	

‘Down–shift only – no up–shift

A140E

○ . . . . . Operating

Shift lever position	Gear Position	C_0	C_1	C_2	B_0	B_1	B_2	B_3	F_0	F_1	F_2
P	Parking	○									
R	Reverse	○		○				○			
N	Neutral	○									
D	1 st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1 st	○	○						○		○
	2nd	○	○			○	○		○	○	
	3rd	○	○	○			○		○		
L	1st	○	○					○	○		○
	2nd	○	○			○	○		○	○	

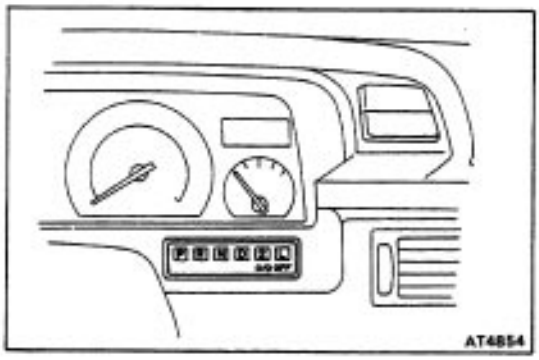
’Down–shift only – no up–shift

2. SOLENOID SYSTEM (A140E)

Possible gear positions in accordance with solenoid operating conditions.
A140E

Range	NORMAL			NO. 1 SOLENOID MALFUNCTIONING			NO. 2 SOLENOID MALFUNCTIONING			BOTH SOLENOID MALFUNCTIONING		
	Solenoid valve		Gear Position	Solenoid valve		Gear Position	Solenoid valve		Gear Position	Solenoid valve		Gear Position
	No. 1	No. 2		No. 1	No. 2		No. 1	No. 2		No. 1	No. 2	
D range	ON	OFF	1st	x	ON (OFF)	3rd (O/D)	ON	x	1st	x	x	O/D
	ON	ON	2nd	x	ON	3rd	OFF (ON)	x	O/D (1st)	x	x	O/D
	OFF	ON	3rd	x	ON	3rd	OFF	x	O/D	x	x	O/D
	OFF	OFF	O/D	x	OFF	O/D	OFF	x	O/D	x	x	O/D
2 range	ON	OFF	1st	x	ON (OFF)	3rd (O/D)	ON	x	1st	x	x	3rd
	ON	ON	2nd	x	ON	3rd	OFF (ON)	x	3rd (1st)	x	x	3rd
	OFF	ON	3rd	x	ON	3rd	OFF	x	3rd	x	x	3rd
L. range	ON	OFF	1st	x	OFF	1st	ON	x	1st	x	x	1st
	ON	ON	2nd	x	ON	2nd	ON	x	1st	x	x	1st

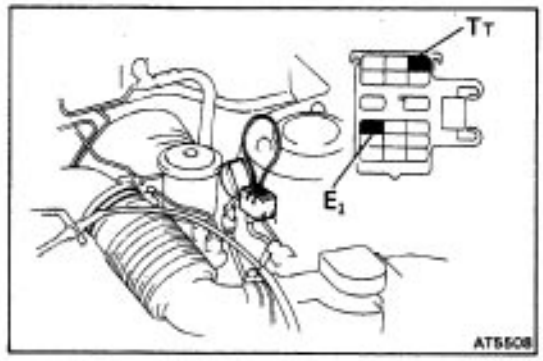
( ) : No fail safe function x: Malfunctions

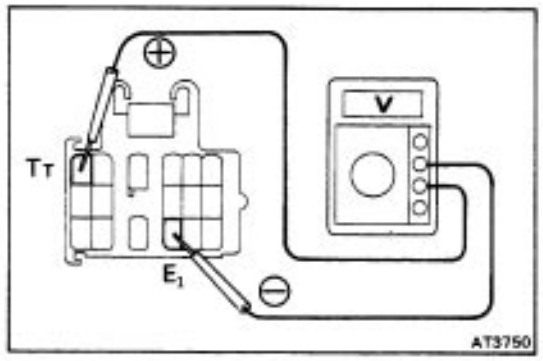


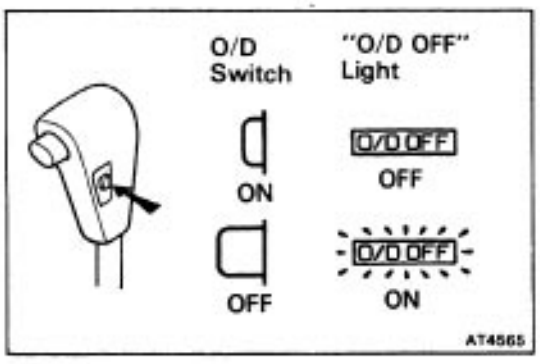
Diagnosis System (A140E)

DESCRIPTION

1. A self–diagnosis function is built into the electrical control system.
   Warning is indicated by the overdrive OFF indicator.
   HINT: Warning and diagnostic codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF indicator is lit continuously and will not blink.
   (a) If a malfunction occurs within the speed sensors (No. 1 or 2) or solenoids (No. 1 or 2), the overdrive OFF light will blink to. warn the driver. .
   However, there will be no warning of a malfunction with lock–up solenoid.
   (b) The diagnostic code can be read by the number of blinks of the overdrive OFF indicator when terminals
   Tt and E1 are short–circuited. (See page AT–17)
   tc) The throttle position sensor or brake signal are not indicated, but inspection can be made by checking the voltage at terminal Tt of the check connector (diagnosis).
   (d) The signals to each gear can be checked by measuring the voltage at terminal Tt of the check connector while driving.
2. The diagnostic (malfunction) code is retained in memory by the CPU and due to back–up voltage, is not canceled out when the engine is turned off. Consequently, after repair, it is necessary to turn the ignition switch off and remove the fuse EFI (15A) or disconnect the ECT computer connector to cancel out the diagnostic (malfunction)
   code. (See page AT–18)
   HINT:
   - Low battery voltage will cause faulty operation of the diagnosis system. Therefore, always check the battery first.
   - Use a voltmeter and ohmmeter that have an impedance of at least 10 k 11 IV.



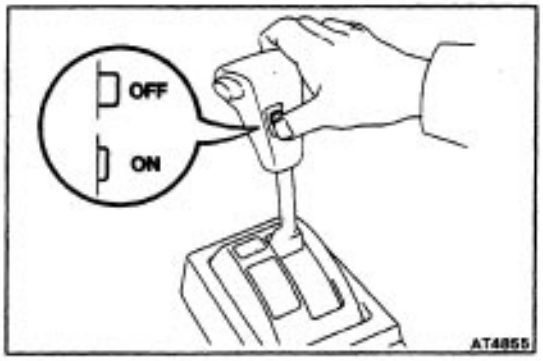




CHECK O/D OFF INDICATOR LIGHT

1. Turn the ignition switch ON.
2. The O/D OFF light will come on when the O/D switch is placed at OFF.
3. When the O/D switch is set to ON, the O/D OFF light should go out.
   If the O/D OFF light flashes when the O/D switch is set to ON, the electronic control system is faulty.

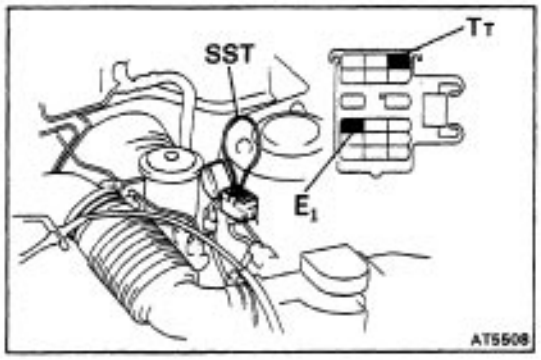
READ DIAGNOSTIC CODE



1. TURN IGNITION SWITCH AND O/D SWITCH TO ON

Do not start the engine.

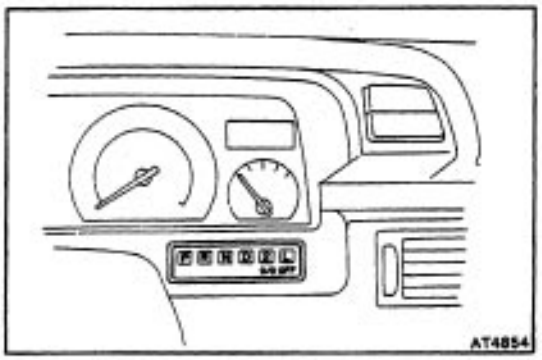
HINT: Warning and diagnostic codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light will light continuously and will not blink.



2. SHORT ECT TERMINAL CIRCUIT OF CHECK CONNECTOR

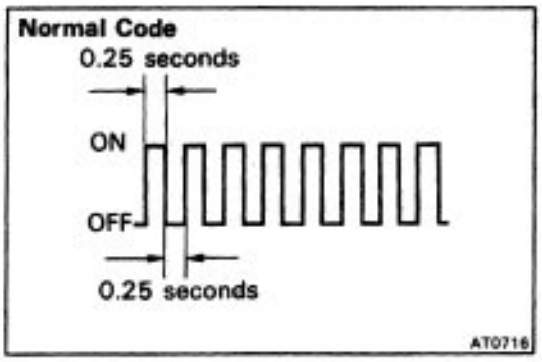
Using a SST, short terminals Tt and E1 of the check connector.

SST 09843–18020



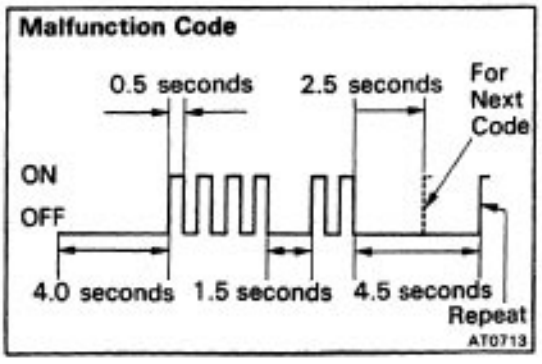
3. READ DIAGNOSTIC CODE

Read the diagnostic code as indicated by the number of times the O/D OFF indicator flashes.



(Diagnostic Code Indication)

- If the system is operating normally, the light will blink once every 0.25 seconds.



- In the event of a malfunction, the fight will blink once every 0.5 seconds. The number of blinks will equal the first number and, after 1.5 seconds pause, the second number of the two digit diagnostic code. If there are two or more codes, there will be a 2.5 seconds pause between each.

HINT: In the event of several trouble codes occurring simultaneously, indication will begin from the smaller value and continue to the larger.

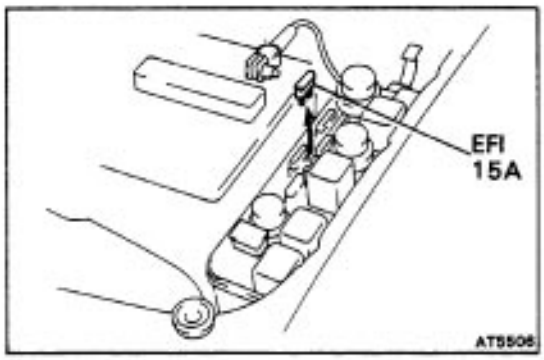
4. REMOVE SST

SST 09843–18020

DIAGNOSTIC CODES

Code No.	Light Pattern	Diagnosis System
–		Normal
42		Defective No. 1 speed sensor (in combination meter) – severed wire harness or short circuit
61		Defective No. 2 speed sensor (in ATM) – severed wire harness or short circuit
62		Severed No. 1 solenoid or short circuit – severed wire harness or short circuit
63		Severed No. 2 solenoid or short circuit – severed wire harness or short circuit
64		Severed lock–up solenoid or short circuit – severed wire harness or short circuit

HINT: If codes 62, 63 or 64 appear, there is an electrical malfunction in the solenoid.
Causes due to –mechanical failure, such as a stuck valve, will not appear.



CANCEL OUT DIAGNOSTIC CODE

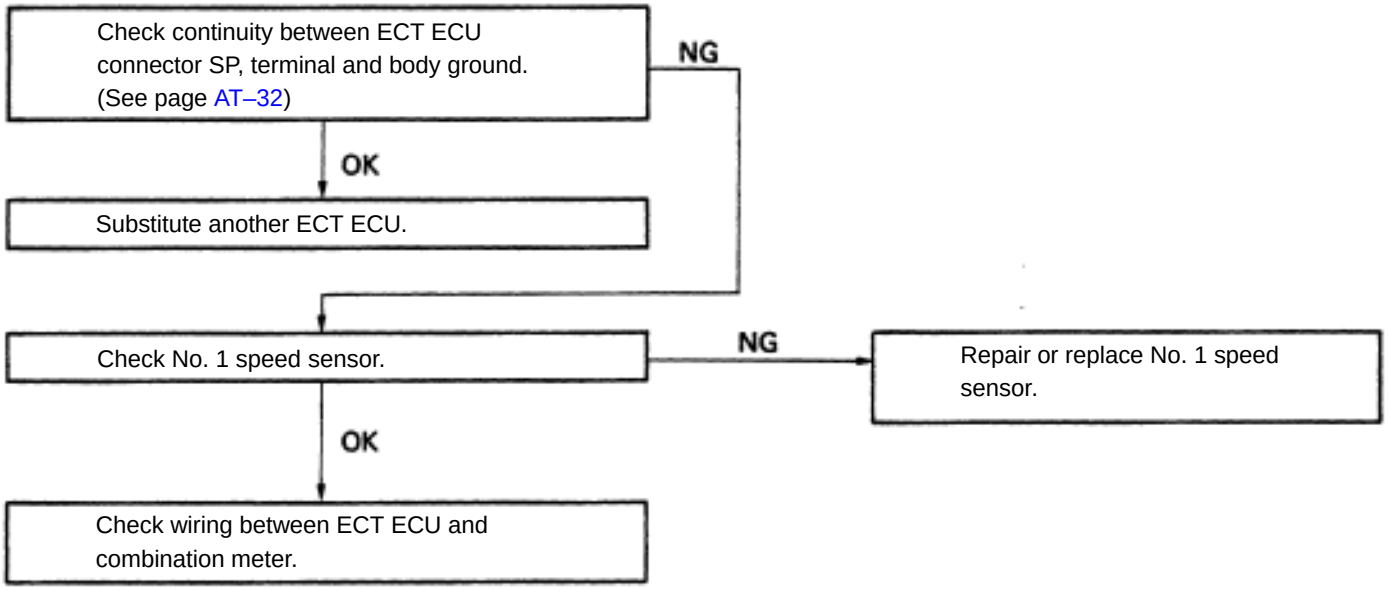
1. After repair of the trouble area, the diagnostic code retained in memory by the ECT ECU must be canceled by removing the fuse EFI (15A) for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.
   HINT:
   - Cancellation can be also done by removing the battery negative (–) terminal, but in this case other memory systems (TCCS diagnosis memory, etc.) will be also canceled out.
   - The diagnostic code can be also canceled out by disconnecting the ECT ECU connector.
   - If the diagnostic code is not canceled out, it will be retained by the ECT ECU and appear along with a new code in event of future trouble.
2. After cancellation, perform a road test to confirm that a ”normal code” is now read on the O/D OFF indicator.

TROUBLESHOOTING FLOW–CHART

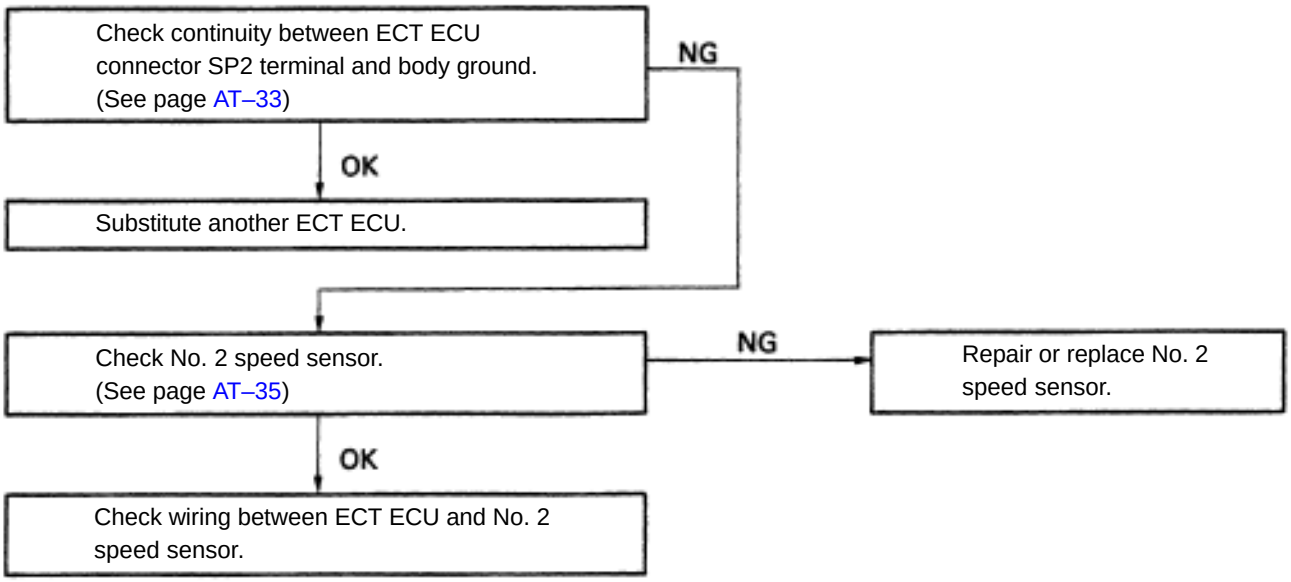
HINT:

- If diagnostic code Nos. 42, 61, 62 or 63 are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver. However, an impact or shock may cause the blinking to stop; but the code will still be retained in the ECT ECU memory until canceled out.
- There is no warning for diagnostic code No. 64.
- In the event of a simultaneous malfunction of both No. 1 and No. 2 speed sensors, no diagnostic code will appear and the fail–safe system will not function. However, when driving in the D range, the transaxle will not up–shift from first gear, regardless of the vehicle speed.

1. Diagnostic code 42 (No. 1 speed sensor circuitry)

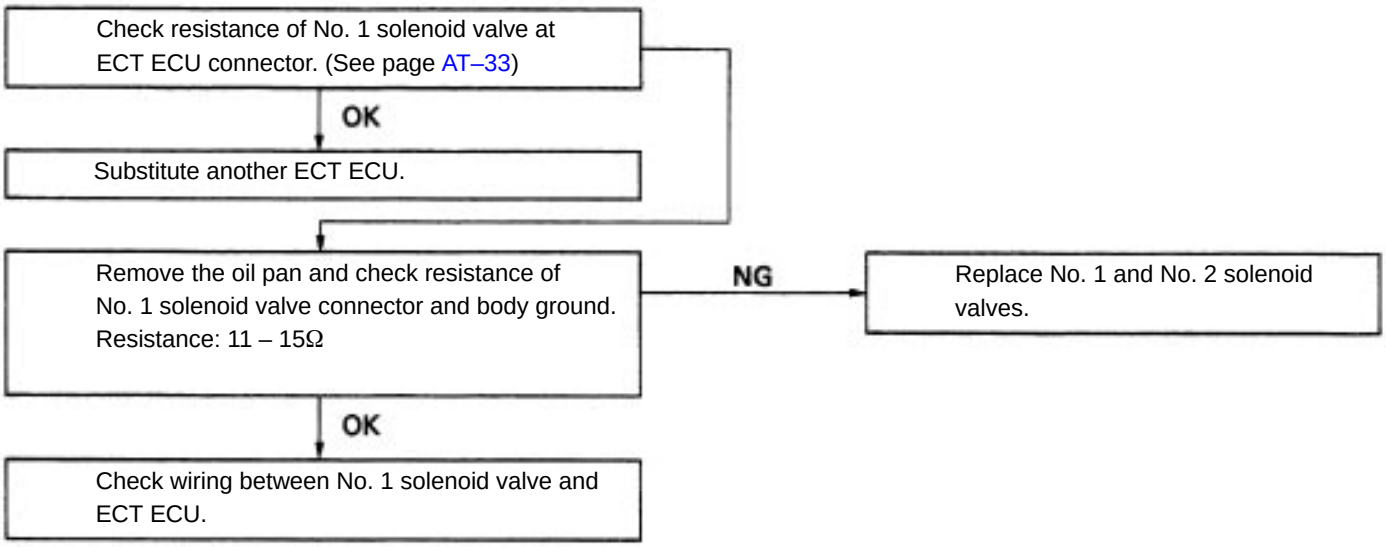


2. Diagnostic code 61 (No. 2 speed sensor circuitry



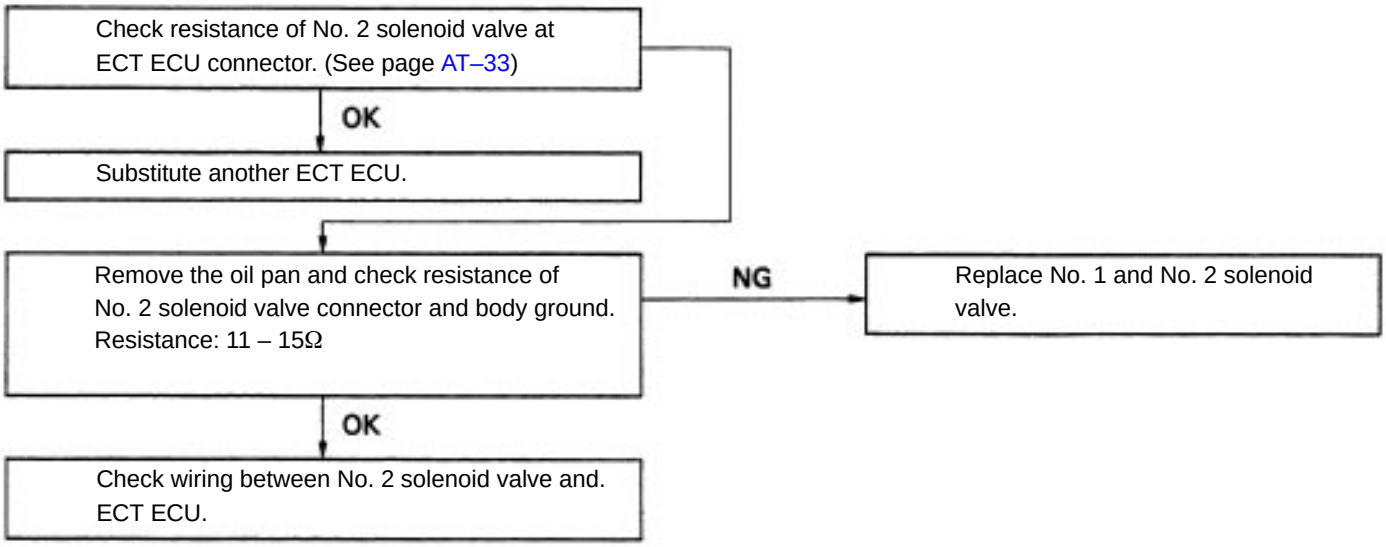
3. Diagnostic code 62 (No. 1 solenoid valve circuitry)

Check resistance of No. 1 solenoid valve at NG



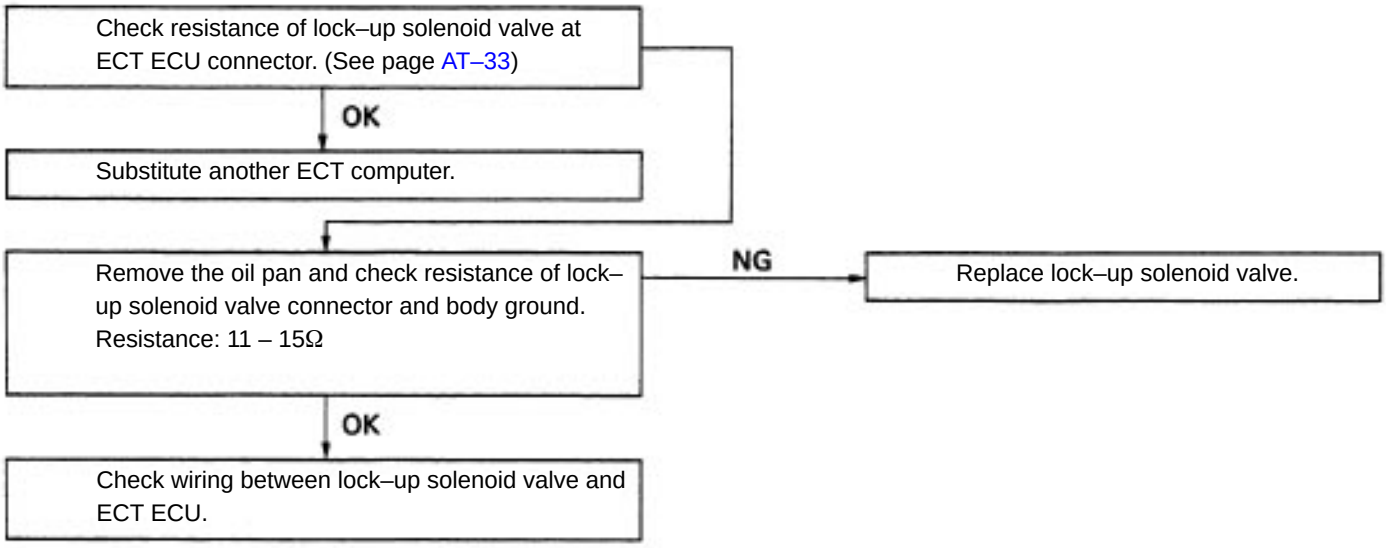
4. Diagnostic code 63 (No. 2 solenoid valve circuitry)

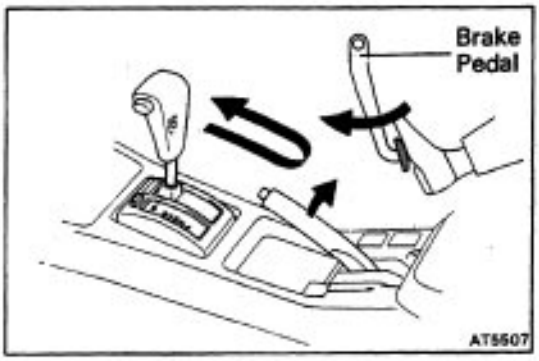
Check resistance of No. 2 solenoid valve at NG

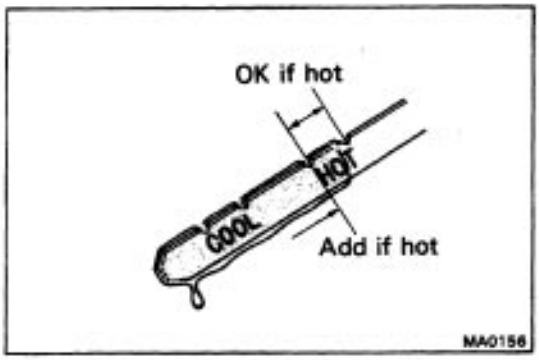


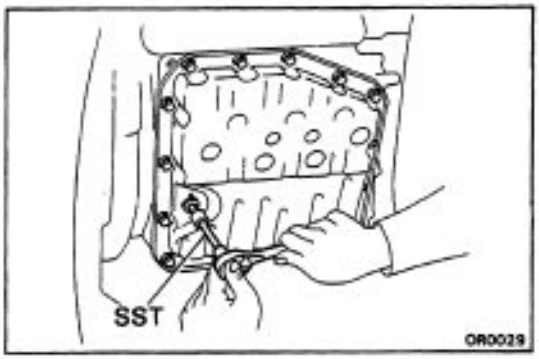
5. Diagnostic code 64 (Lock–up solenoid valve circuitry)

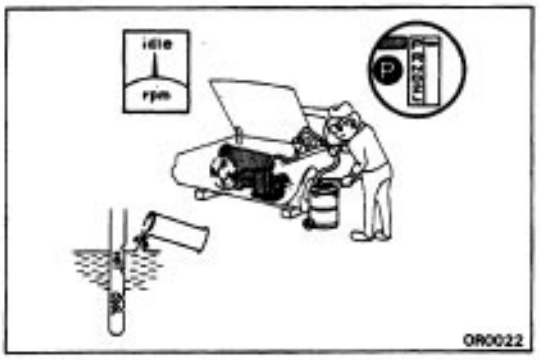
Check resistance of lock–up solenoid valve at NG

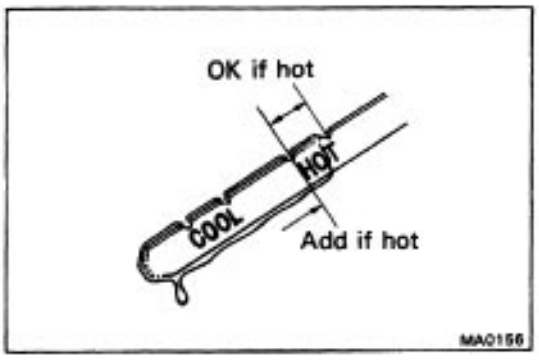












Preliminary Check

11. CHECK FLUID LEVEL

HINT: The vehicle must have been driven so that the engine and transmission are at normal operating temperature. (fluid temperature: 158 – 176˚F or 70 –80˚C)

(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P position.

HINT: Depress the brake pedal.

(a) Pull out the transaxle dipstick and wipe it clean.

(b) Push it back fully into the tube.

(c) Pull it out and check that the fluid level is in the HOT range. If the level is at the low side of the hot range, add fluid.

Fluid type: ATF DEXRON® II

NOTICE: Do not overfill.

2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it

3. REPLACE ATF

NOTICE: Do not overfill.

(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.

(c) With the engine OFF, and new fluid through the dip stick tube.

SST 09043–38100

Fluid: ATF DEXRON® II

Capacity:

Dry fill:

A140E 5.3 liters (5.6 US qts, 4.7 Imp. qts)

A140L 5.7 liters (6.0 U S qts, 5.0 Imp. qts)

Drain and refill (Reference):

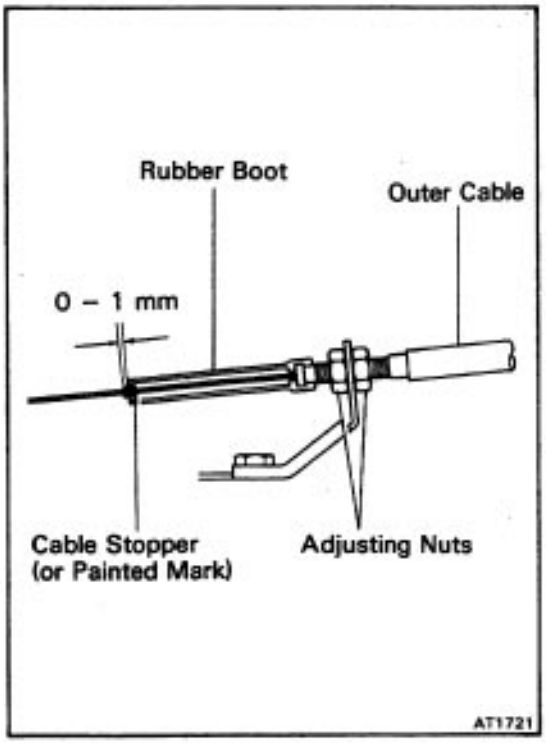
140E, A140L 2.5 liters (2.6 US qts, 2.2 Imp. qts)

(d) Start the engine and shift the selector into all positions from P through L and then shift into P.

(e) With the engine idling, check the fluid level. Add fluid up to the ”COOL” level on the dipstick.

(f) Check the fluid level with the normal fluid temperature (158 – 176˚F or 70 – 80˚C) and add as necessary.

NOTICE: Do not overfill.



4. INSPECT AND ADJUST THROTTLE CABLE

(a) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

HINT: If the valve does not open fully, adjust the accelerator link.

(b) Fully depress the accelerator pedal.

(c) Loosen the adjustment nuts.

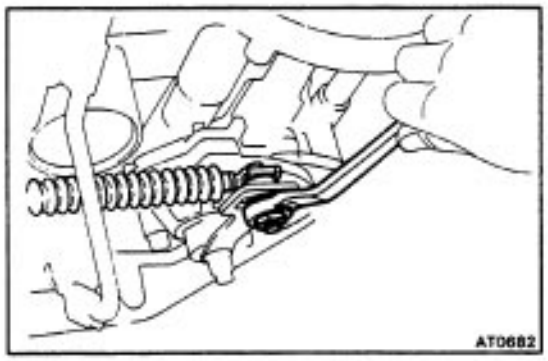
(d) Adjust the outer cable so that the distance between the end of the boot and stopper on the cable is the standard.

Standard boot and cable stopper distance:

0– 1 mm 10–0.04 in.)

(e) Tighten the adjusting nuts.

(f) Recheck the adjustments.



5. INSPECT AND ADJUST SHIFT CABLE

When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

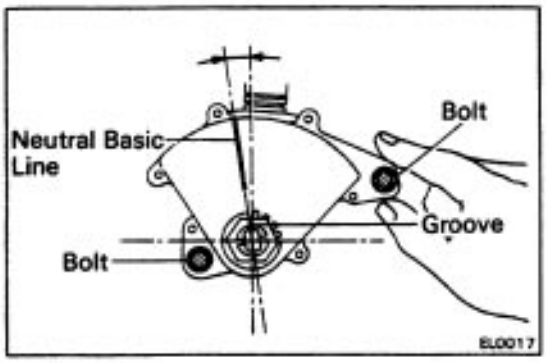
(a) Loosen the swivel nut on manual shift lever.

(b) Push the manual lever fully toward the right side of the vehicle.

(c) Return the lever two notches to NEUTRAL position.

(d) Set the shift lever to N.

(e) While holding the lever lightly toward the R range side, tighten the swivel nut.



6. ADJUST NEUTRAL START SWITCH

If the engine will start with the shift selector in any range other than N or P range, adjustment is required.

(a) Loosen the neutral start switch bolts and set the shift selector to the N range.

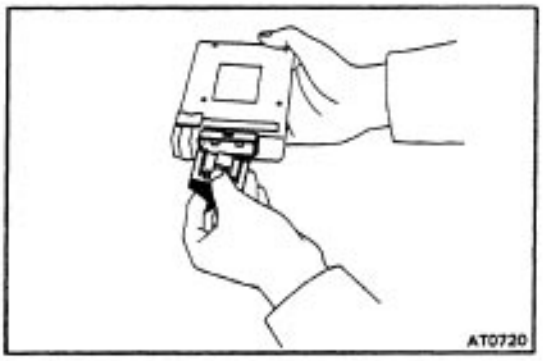
(b) Align the groove and neutral basic line.

(c) Hold in position and tighten the bolts.

Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)

7. INSPECT IDLE SPEED (N RANGE)

Idle speed: 700 rpm



Manual Shifting Test (A140E)

HINT: With this test, it can be determined whether the trouble lies within the electrical circuit or is a mechanical problem in the transaxle.

1. DISCONNECT ECT ECU CONNECTOR

(a) Remove the glove box.

(b) With the engine OFF, disconnect the ECT connector.

2. INSPECT MANUAL DRIVING OPERATION

Check that the shift and gear positions correspond with the table below.

Shift position	V range	2 range	L range	R range	P ' range
Gear position	O/D	3rd	1st	Reverse	Pawl Lock

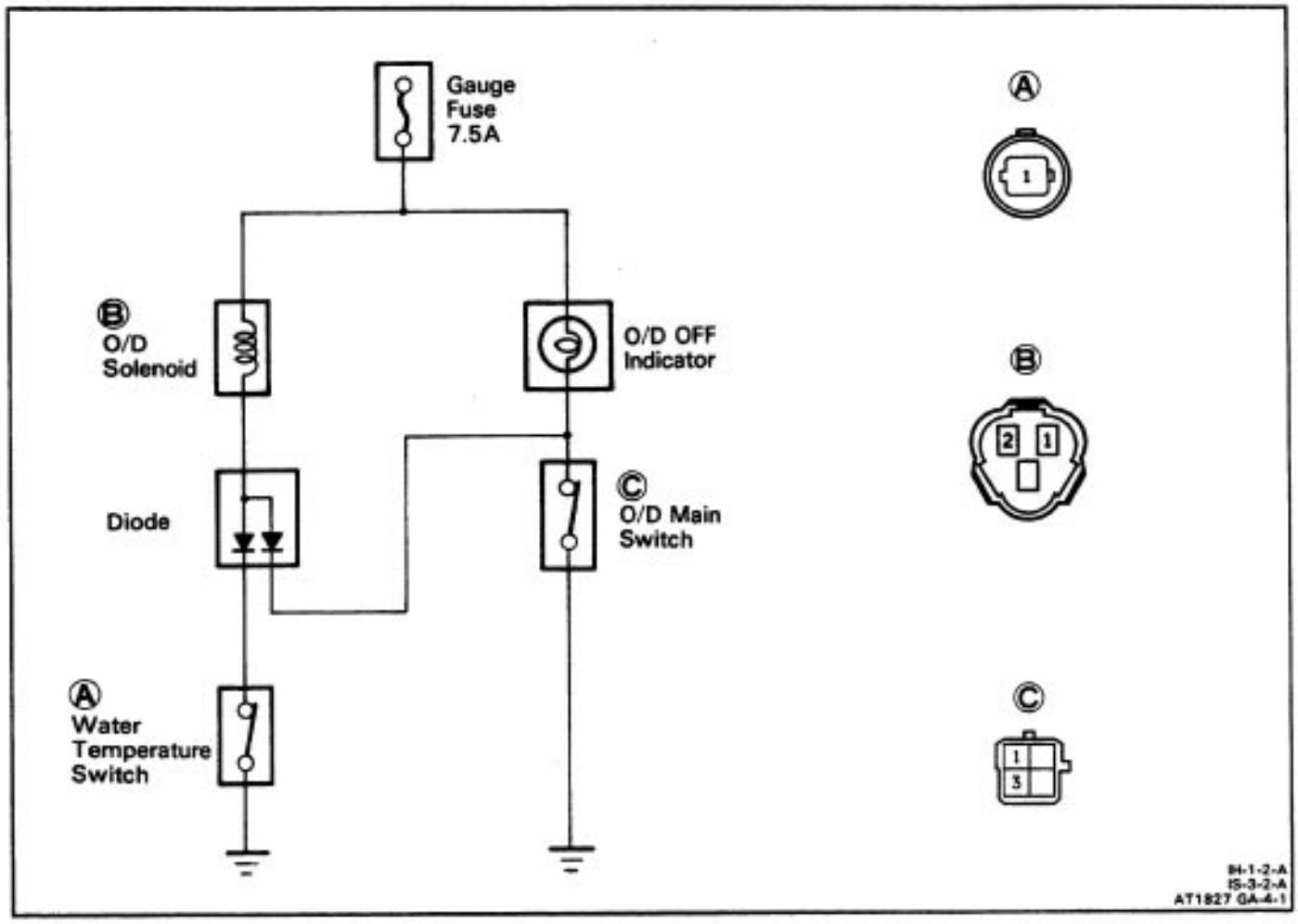
HINT: If the L, 2 and D range gear positions are difficult to distinguish, perform the following road test.

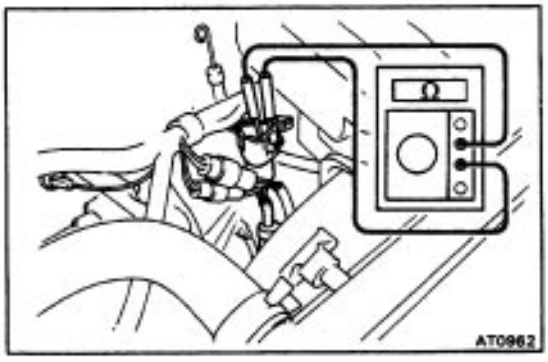
- White driving, shift through the L, 2 and D ranges. Check that the gear change corresponds to the shift position.

3. CONNECT ECT ECU CONNECTOR

Electronic Control System (A140L)

ELECTRONIC CONTROL CIRCUIT





INSPECTION OF ELECTRONIC CONTROL COMPONENTS

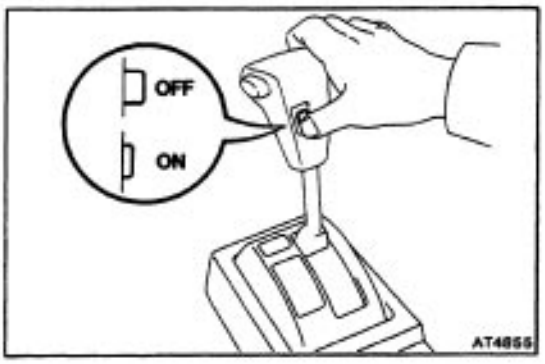
1. INSPECT O/D SOLENOID

(a) Disconnect the solenoid connector.

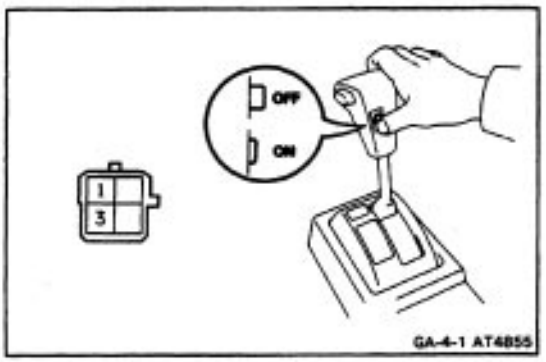
(b) Apply voltage between terminals 1 and 2.
At this time, confirm that a solenoid operation sound in heard.

(e) Using an ohmmeter, measure the solenoid coil resistance between terminals 1 and 2.
Resistance: 13 × 2

(d) Connect the solenoid connector.



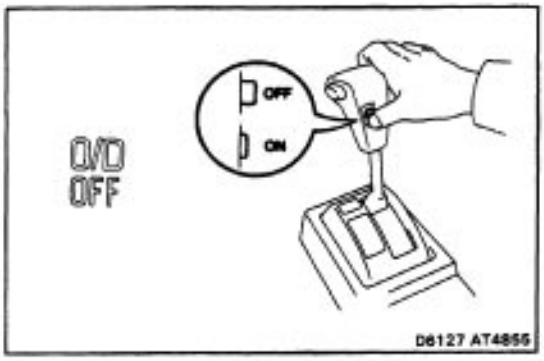
(e) Turn on the ignition switch and disconnect the water temperature switch wire.
(f) Confirm that operation sounds of the solenoid can be heard if the O/D main switch is repeatedly turn on and off.
(g) Turn off the ignition switch and connect the water temperature switch wire.



2. INSPECT O/D MAIN SWITCH

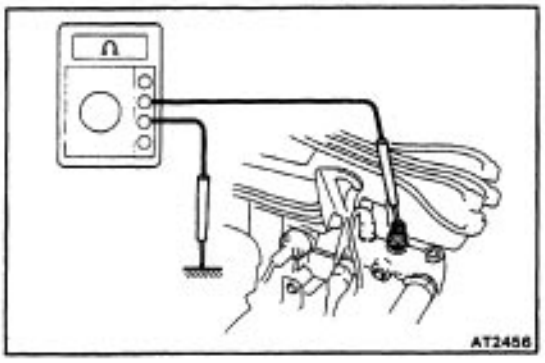
(a) Remove the console box.
(b) Using an ohmmeter, measure the resistance between terminals 1 and 3.

- Switch ON – Resistance: ∞
- Switch OFF– Resistance: 0



3. INSPECT O/D OFF INDICATOR

(a) Turn on the ignition switch.
(b) Turn off the O/D main switch.
(c) Check that the O/D OFF indicator lights.



4. INSPECT WATER TEMPERATURE SWITCH

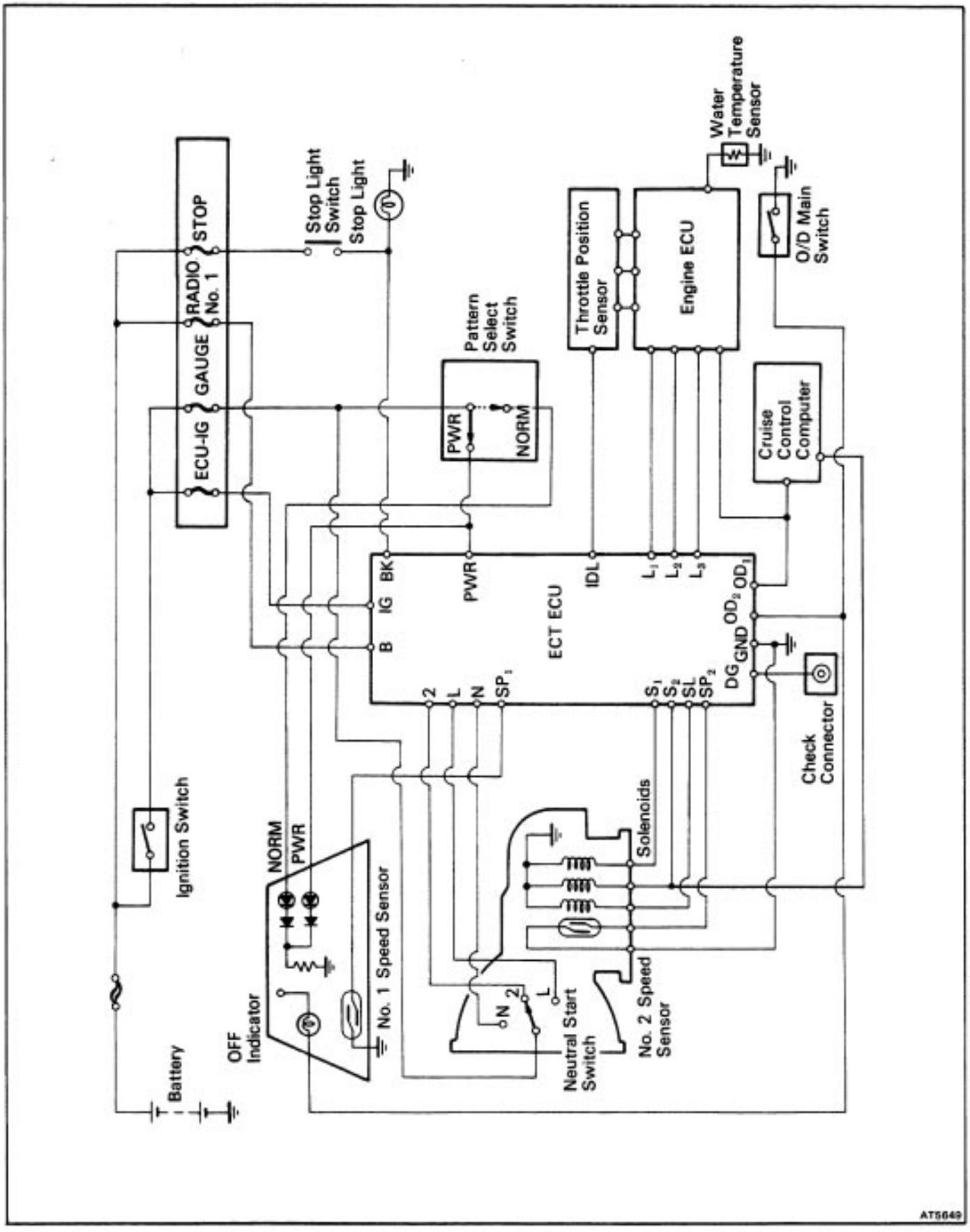
(a) Disconnect the switch connector.
(b) Using an ohmmeter, measure the resistance between terminal 1 and body ground.

Coolant temperature:
Below 109˚F (43˚C) 0
Above 131˚F (55˚C) ∞

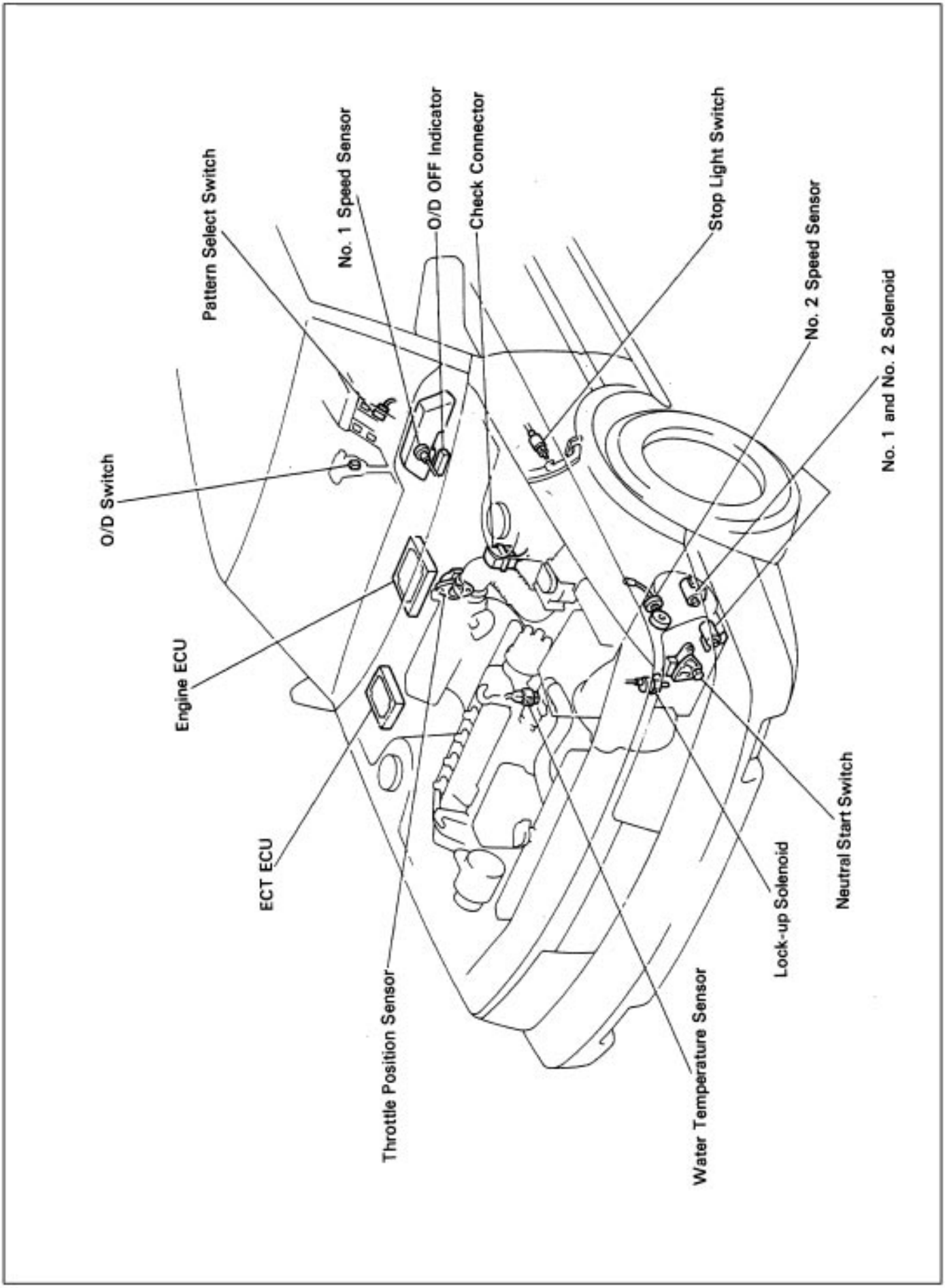
(c) Connect the switch connector.

Electronic Control System (A140E)

ELECTRONIC CONTROL CIRCUIT

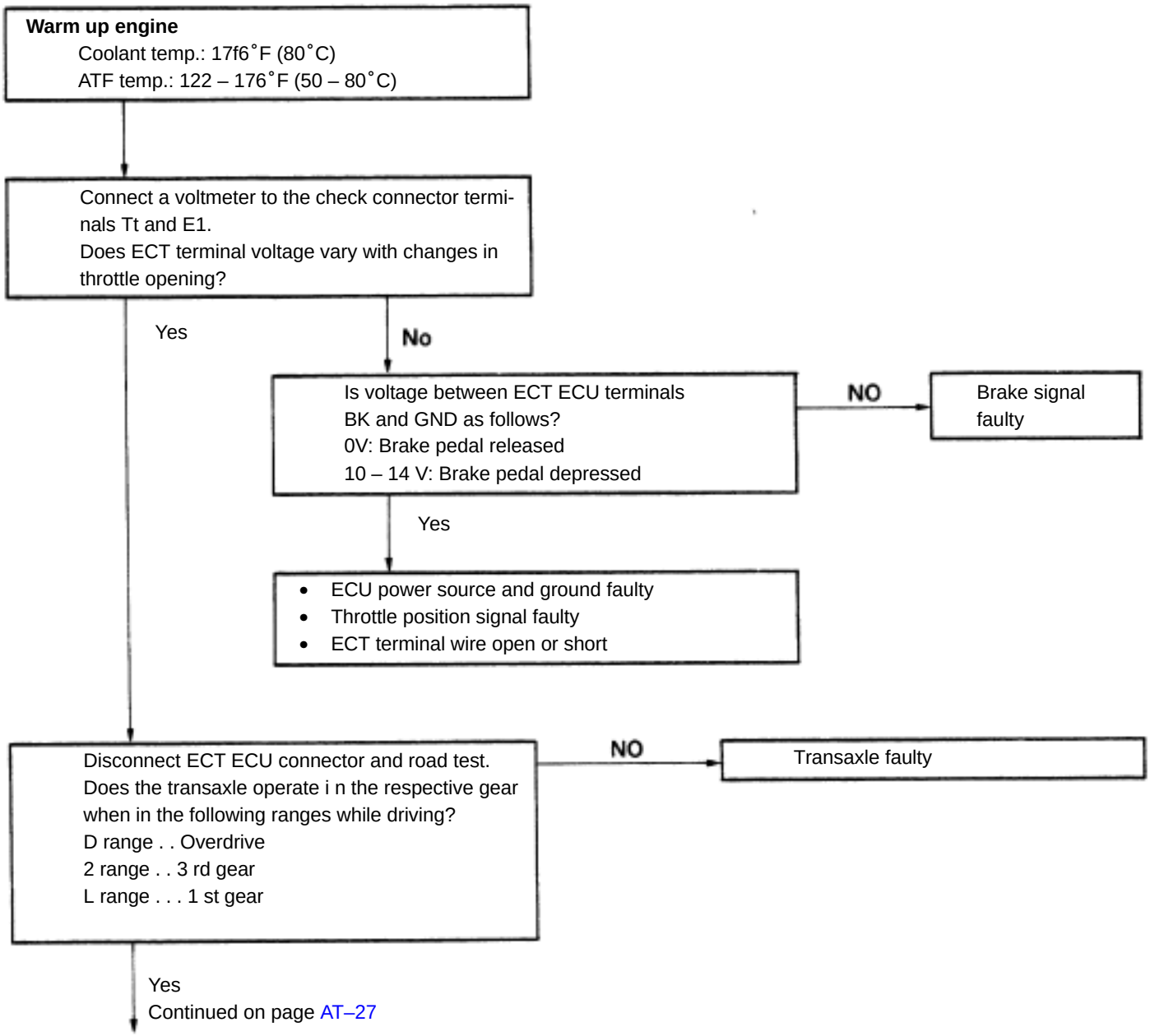


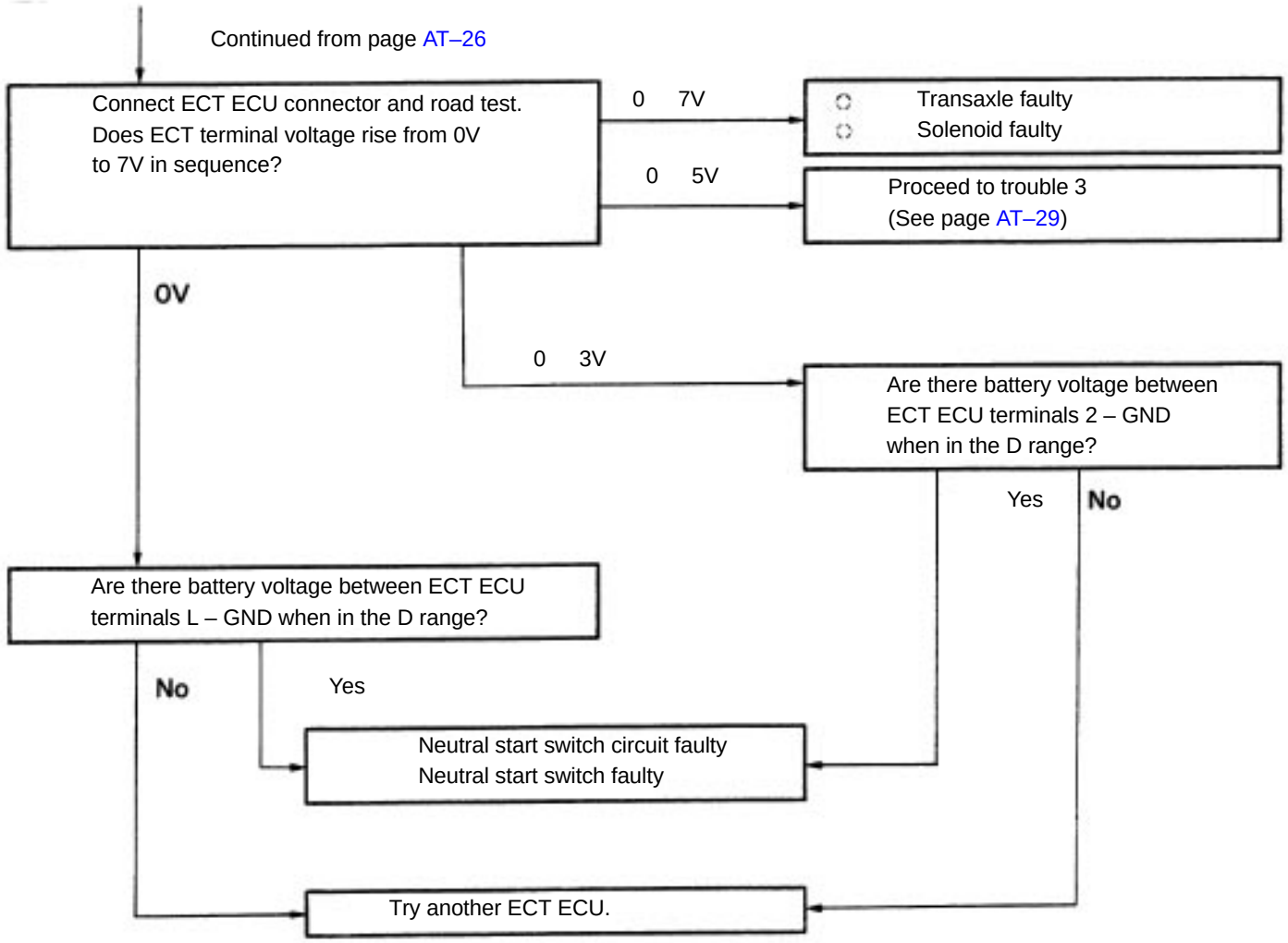
ELECTRONIC CONTROL COMPONENTS



TROUBLESHOOTING FLOW–CHART

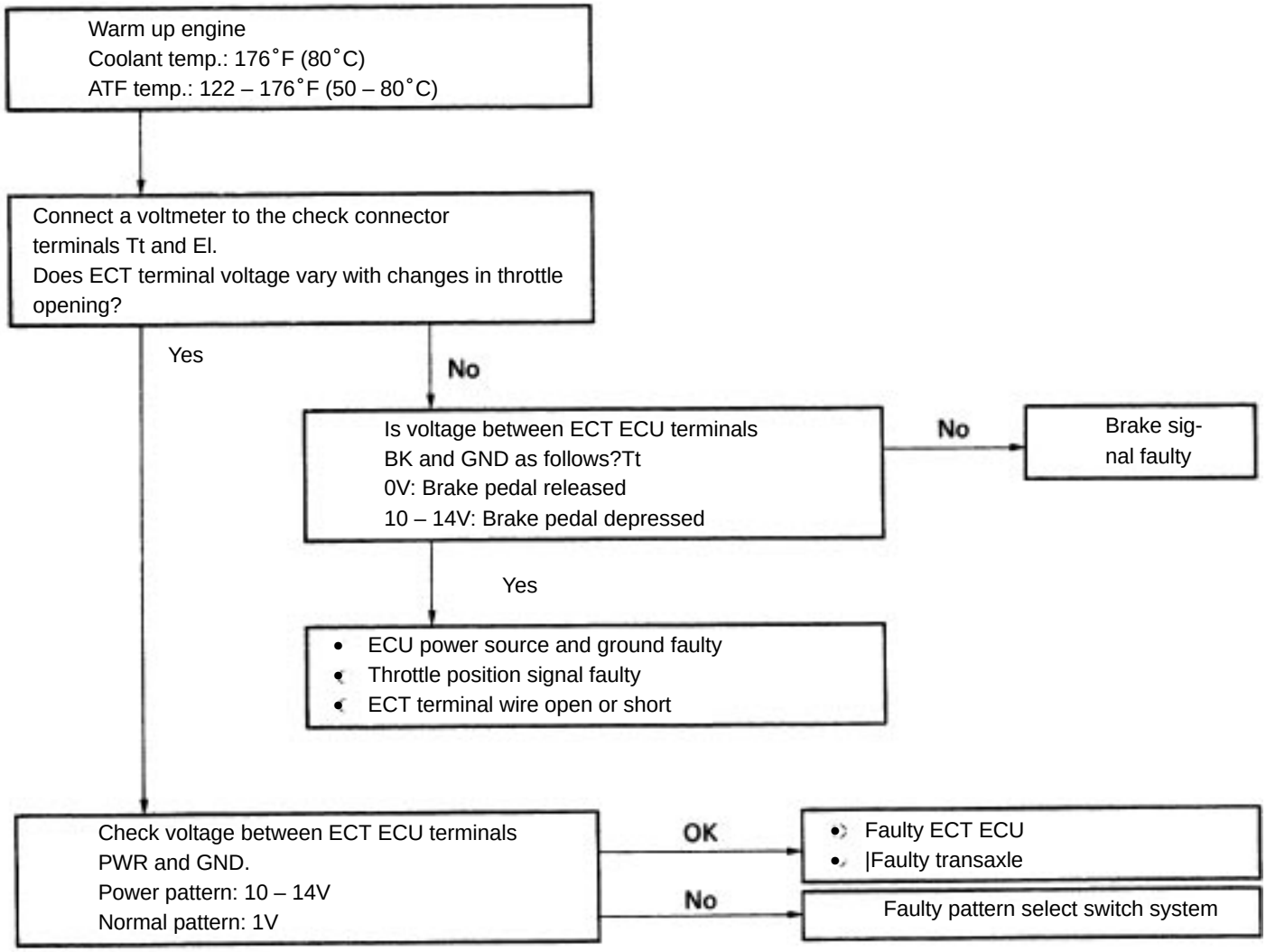
Trouble No.1 No Shifting



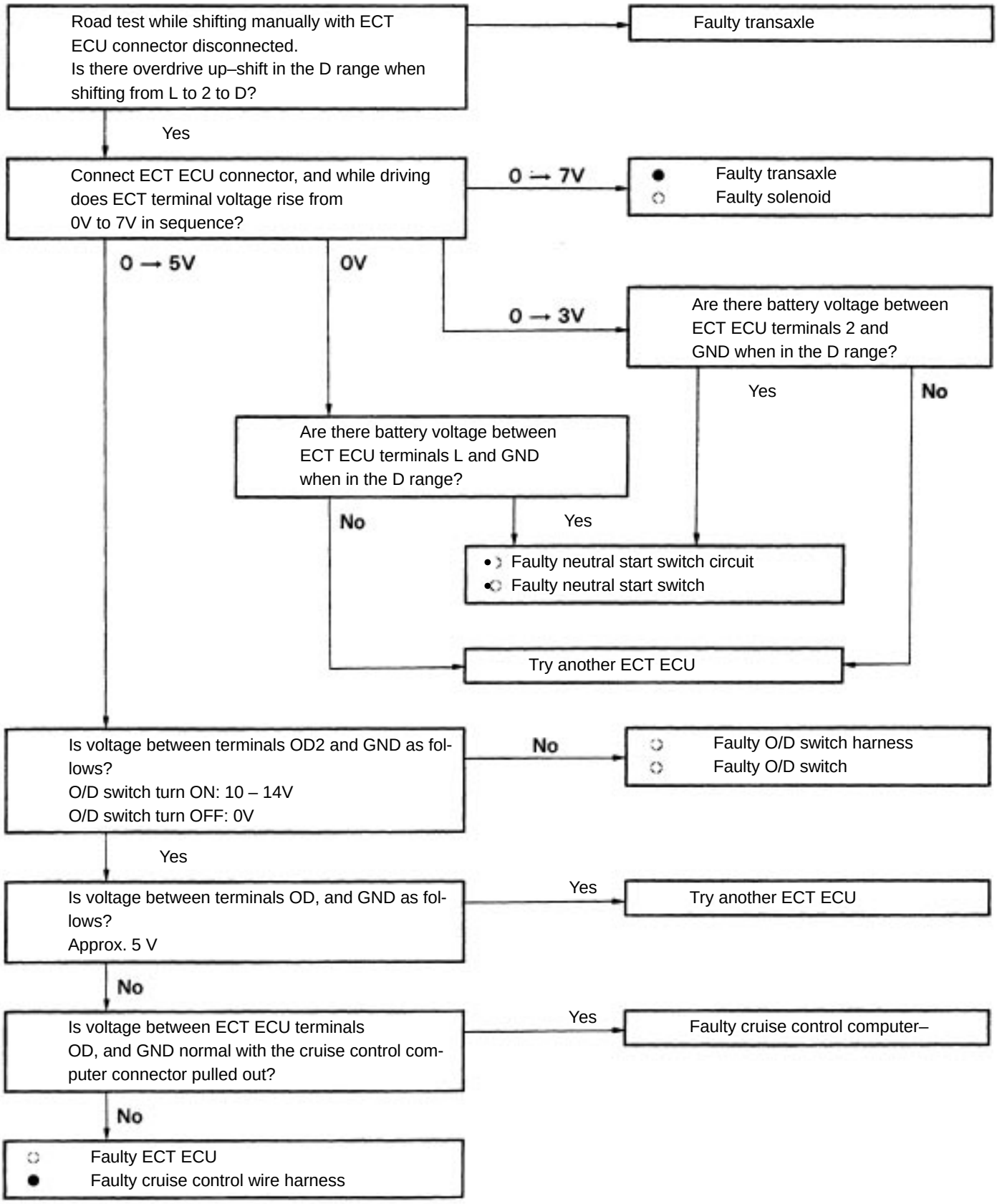

Continued from page AT–26
Connect ECT ECU connector and road test.
Does ECT terminal voltage rise from 0V
to 7V in sequence?
0 7V
Transaxle faulty
Solenoid faulty
0 5V
Proceed to trouble 3
(See page AT–29)
0V
0 3V
Are there battery voltage between
ECT ECU terminals 2 – GND
when in the D range?
Yes
No
Are there battery voltage between ECT ECU
terminals L – GND when in the D range?
No
Yes
Neutral start switch circuit faulty
Neutral start switch faulty
Try another ECT ECU.

Trouble No. 2

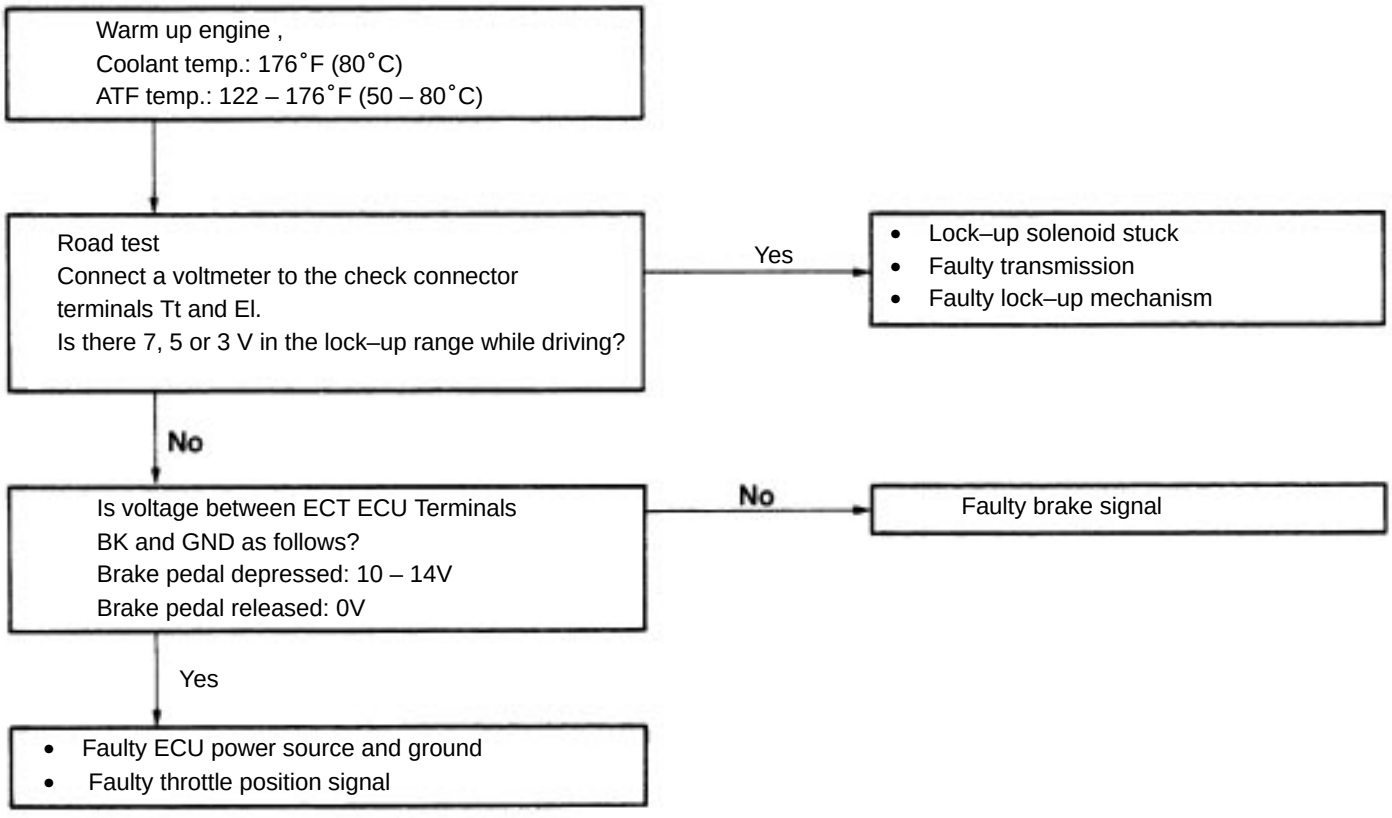
Shift point too high or too low



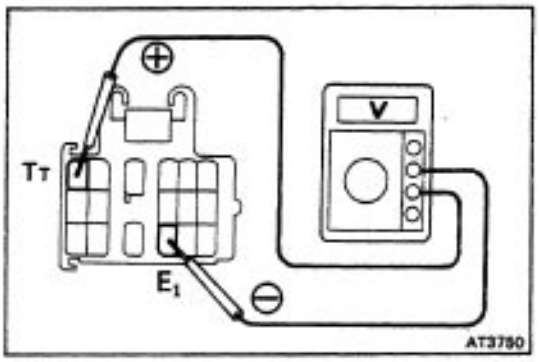
Trouble No. 3 No up–shift to overdrive (After warm–up)



Trouble No. 4 **No lock–up (After warm–up)**



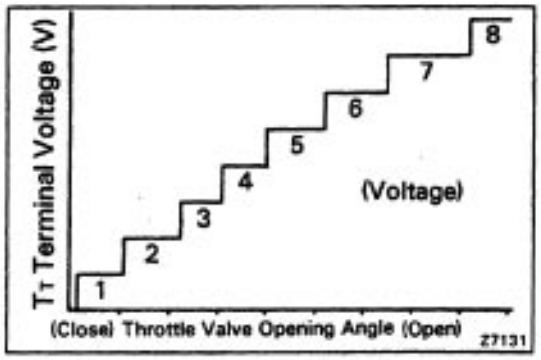
INSPECTION OF Tt TERMINAL VOLTAGE



1. INSPECT THROTTLE POSITION SENSOR SIGNAL

(a) Turn the ignition switch to ON. Do not start the engine.

(b) Connect a voltmeter to terminals Tt and E1.



(c) While slowly depressing the accelerator pedal, check that ECT terminal voltage rises in sequence. if the voltage does not change in proportion to the throttle opening angle, there is a malfunction in the throttle position sensor or circuit.

2. INSPECT BRAKE SIGNAL

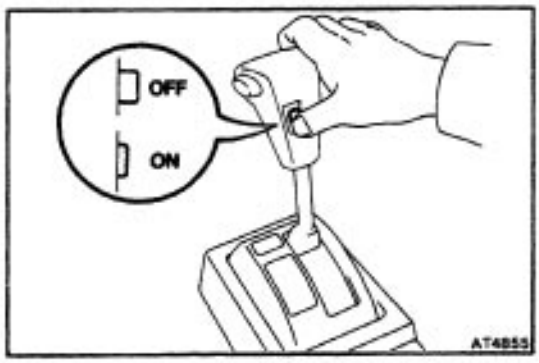
(a) Depress the accelerator pedal until the ECT terminal indicates 8V.

(b) Depress the brake pedal and check the voltage reading from the ECT terminal.

(c) Brake pedal depressed 0V

Brake pedal released 8V

If not as indicated, there is a malfunction in either the stop light switch or circuit.



3. INSPECT EACH UP–SHIFT POSITION

(a) Warm up the engine.

Coolant temperature: 176˚F (80˚C)

(b) Turn the O/D switch to ”ON”.

(c) Place the pattern select switch in ”Normal” and the shift lever into the D range.

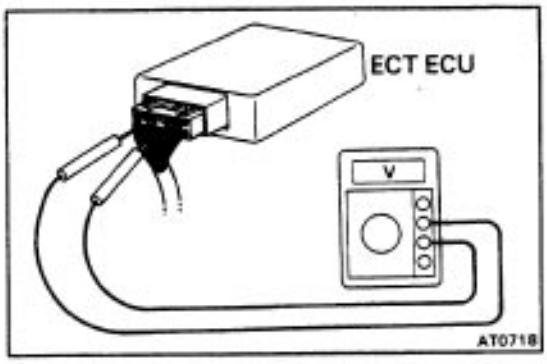
(d) During a road test (above 10 km/h or 6 mph) check that voltage at the ECT terminal is as indicated below for each up–shift position.

If the voltage rises from 0V to 7V in the sequence shown, the control system is okay.

The chart on the left shows the voltmeter reading and corresponding gears. .

ECT Terminal (V)	Gear Position
0	1st
2	2nd
3	2nd Lock-up
4	3rd
5	3rd Lock-up
6	O/D
7	O/D Lock-up

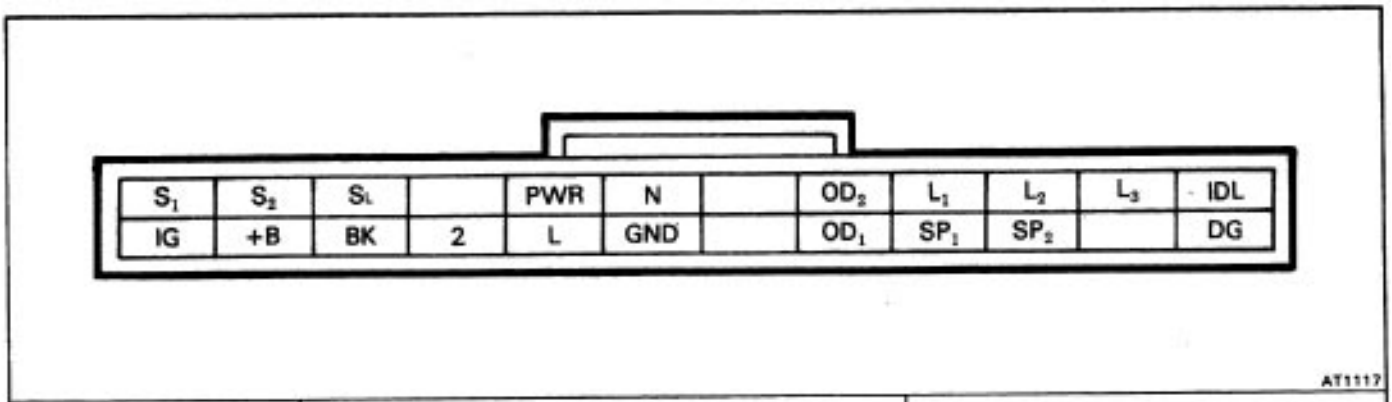
HINT: Determine the gear position by a light shock or change in engine rpm when shifting. The lock–up clutch will turn ON only infrequently during normal 2nd and 3rd gear operation. To trigger this action, press the accelerator pedal to 50% or more of its stroke. At less than 50%, the voltage may change in the sequence 2V – 4V – 6V – 7V.



INSPECTION ELECTRONIC CONTROL COMPONENTS

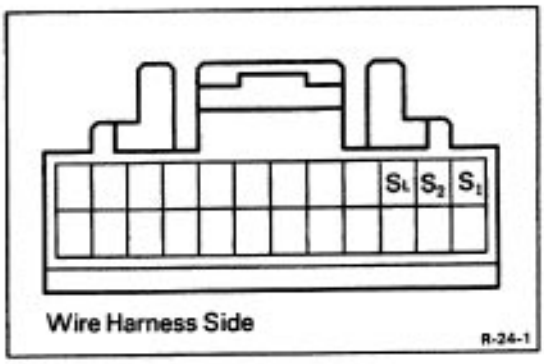
1. INSPECT VOLTAGE OF ECT ECU CONNECTOR

(a) Remove the glove box and instrument panel.
(b) Turn on the ignition switch.
(e) Measure the voltage at each terminal.



Terminal	Measuring condition	Voltage (V)
L_1 – GND	Throttle valve fully closed	5
	Throttle valve fully closed to fully open	5 to 0
	Throttle valve fully open	0
L_2 – GND	Throttle valve fully closed	5
	Throttle valve fully closed to fully open	5 to 0 to 5
	Throttle valve fully open	5
L_3 – GND	Throttle valve fully closed	5
	Throttle valve fully closed to fully open	5 to 0 to 5 to 0 to 5
	Throttle valve fully open	5
IDL – GND	Throttle valve fully closed	0
	Throttle valve opening above 1 .5°	10 – 14
SP_1 – GND	Standing still (Cruise control OFF)	5 or 0
	Vehicle moving (Cruise control OFF)	2.5
BK – GND	When brake pedal is depressed	10 – 14
	When brake pedal is not depressed	0
2 – GND	2 range	10 – 16
	Except 2 range	0 – 2
L – GND	L range	10 – 16
	Except L range	0 – 2
N – GND	N range	10 – 16
	Except N range	0 – 2

Terminal	Measuring condition	Voltage (V)
S_1 – GND	–	10 – 14
S_2, SL – GND	–	0
OD_1 – GND	Coolant temp. below 122˚F (50˚C)	0
	Coolant temp. above 122˚F (50˚C)	5
OD_2 – GND	O/D main switch turned ON	10 – 14
	O/D main switch turned OFF	0
IG – GND	Ignition switch ON	10 – 14
SP_2 – GND	Standing still	5 or 0
	Vehicle moving	4
PWR – GND	PWR pattern	10 – 14
	NORM pattern	0 – 2
+B – GND	–	10 – 14



2. INSPECT SOLENOID

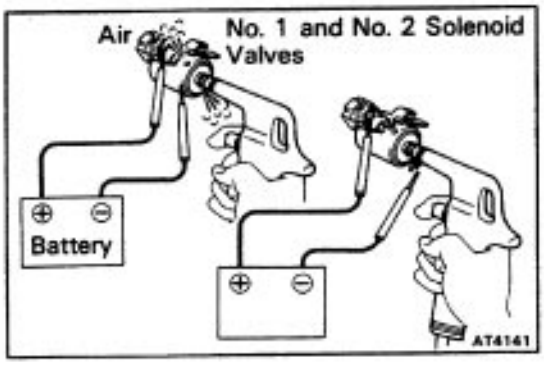
(a) Disconnect the connector from the ECT computer.

(b) Measure the resistance between S1, S2, SL and ground.

Resistance: 11 – 15Ω

(c) Apply battery voltage to the solenoid. Check that an operation noise can be heard from the solenoid.

HINT: If there is foreign matter in the solenoid valve, there will be no fluid control even with solenoid operation.

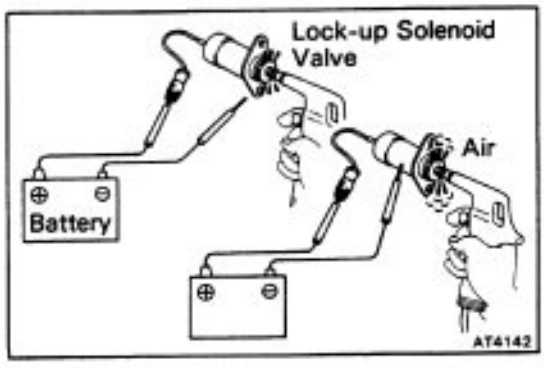


3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

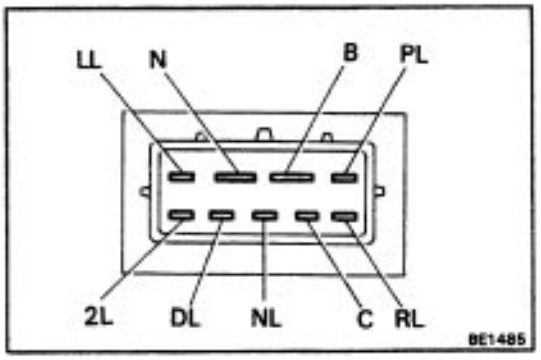
(a) Check No. 1 and No. 2 solenoid valves.

- Applying 5 kg/cm2 (71 psi, 490 kPa) or compressed air, check that the solenoid valves do not leak the air.
- When supply battery voltage to the solenoids, check that the solenoid valves open.



(b) Check the lock–up solenoid valve.

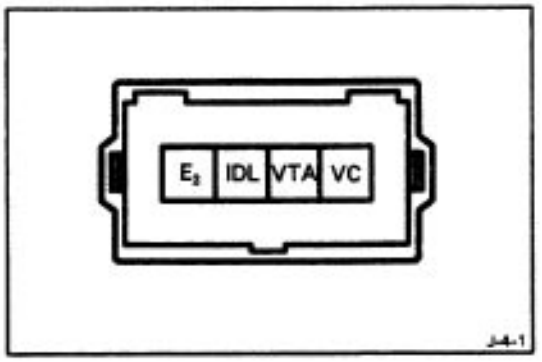
- Applying 5 kglcm2 (71 psi, 490 kPa) of compressed air, check that the solenoid valve opens.
- When supply battery voltage to the solenoid, check that the solenoid valve does not leak the air.



4. INSPECT NEUTRAL START SWITCH

Inspect that there is continuity between terminal LL–C, 2L–C and NL–C.

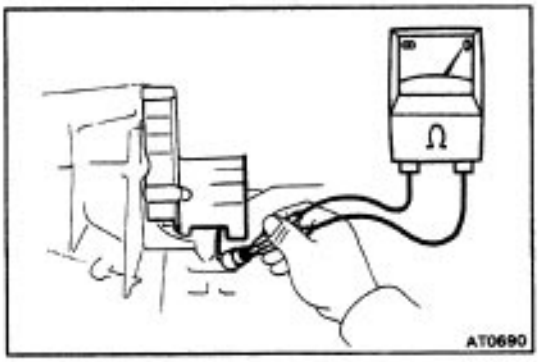
Shift Position \ Terminal	LL	2L	NL	C
N range			○	○
2 range		○		○
L range	○			○



5. INSPECT THROTTLE POSITION SENSOR

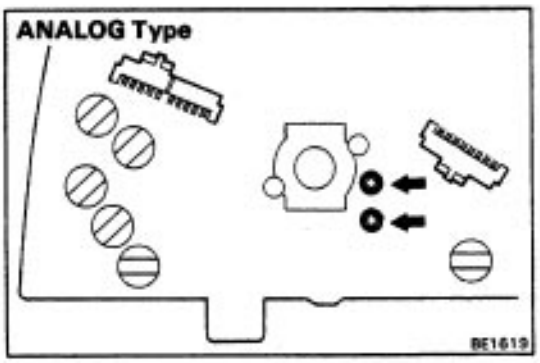
Using an ohmmeter, check the resistance between each terminal.

Terminal	Throttle valve condition	resistance (W)
IDL – E_2	Fully closed	0 – 0.1
	Open	Infinity
V_C – E_2	–	3 – 7
V_{TA} – E_2	Fully closed	0.2 – 0.8
	Fully open	3.3 – 10



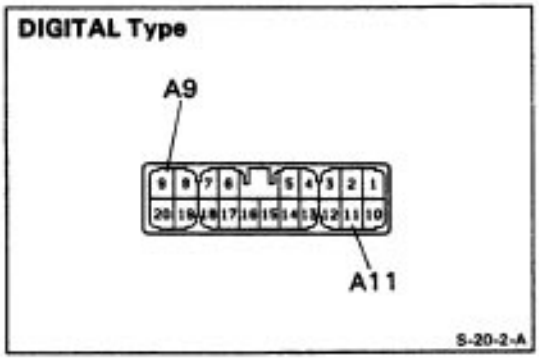
6. INSPECT NO. 2 SPEED SENSOR IN ATM

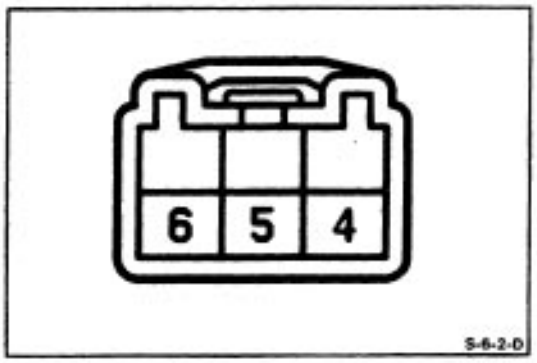
(a) Jack up a front wheel on one side.
(b) Connect an ohmmeter between the terminals.
(c) Spin the wheel and check that the meter needle deflects from 0 to ∞ Ω.

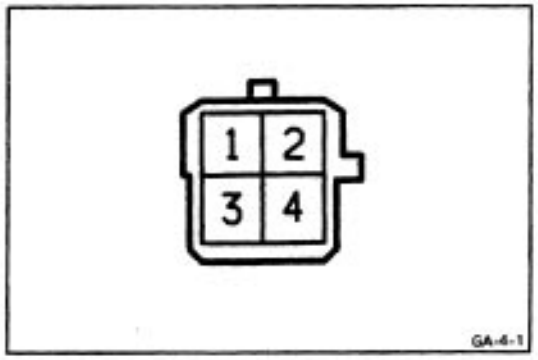


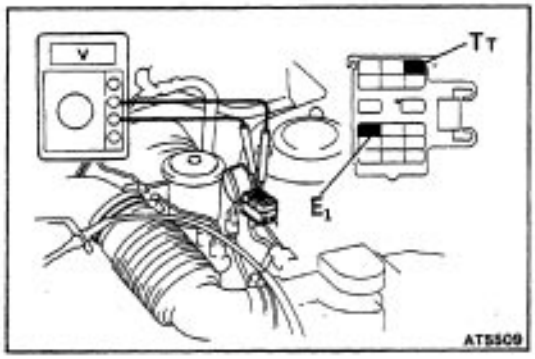
7. INSPECT NO. 1 SPEED SENSOR IN COMBINATION METER

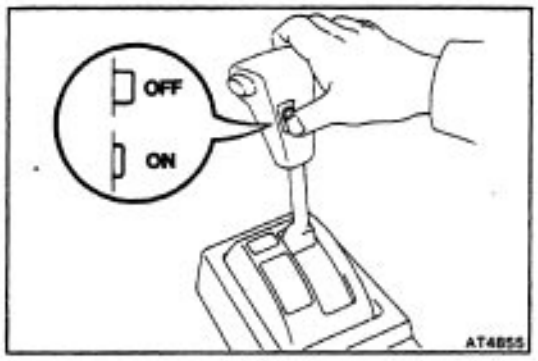
(a) Remove the combination meter.
(b) Connect an ohmmeter between the terminals.
(c) Revolve the meter shaft and check that the meter needle repeatedly deflects from 0 to ∞ .











8. INSPECT PATTERN SELECTION SWITCH

Inspect that there is continuity between 5 and each terminal. .

HINT: As there are diodes inside, be careful of the tester probe polarity.

Terminal / Pattern	6	5	4
NORM	○——	——○	
PWR	○——		——○

9. INSPECT O/D SWITCH

Inspect that there is continuity between terminals 1 and 3.

Terminal / S/W position	1	3
ON		
OFF	○——	——○

10. INSPECT LOCK–UP MECHANISM

(a) Warm up the coolant and ATF.

(b) Connect a voltmeter to the check connector terminals Tt and E1.

(e) Turn the O/D switch ON.

(d) Select the normal pattern.

(e) Drive .at around 50 km/h (31 mph) to where 7, 5 or 3 volts appears on the voltmeter (this is the lock–up range) .

(f) Depress the accelerator pedal and read the tachometer. If there is a big jump in engine rpm there is not lock–up.

11. INSPECT BRAKE SIGNAL

Check that the brake light comes on when the brake pedal is depressed.

Mechanical System Tests

STALL TEST

The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R ranges.

CAUTION:

- **Perform the test at normal operation fluid temperature (122 – 176˚F or 50 – 80˚C).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area, which provides good traction.**
- **The stall test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE STALL SPEED

(a) Chock the front and rear wheels.
(b) Connect a tachometer to the engine.
(c) Fully apply the parking brake.
(d) Step down strongly on the brake pedal with your left foot.
(e) Start the engine.
(f) Shift into the D range. Step all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.
Stall speed: 2,200 ±150 rpm
(g) Perform the same test in R range.

EVALUATION

(a) If the stall speed is the same for both ranges without the rear wheels rotating but lower than specified value:

- Engine output may be insufficient
- Stator one–way clutch is not operating properly

(b) If the stall speed in D range is higher than specified:

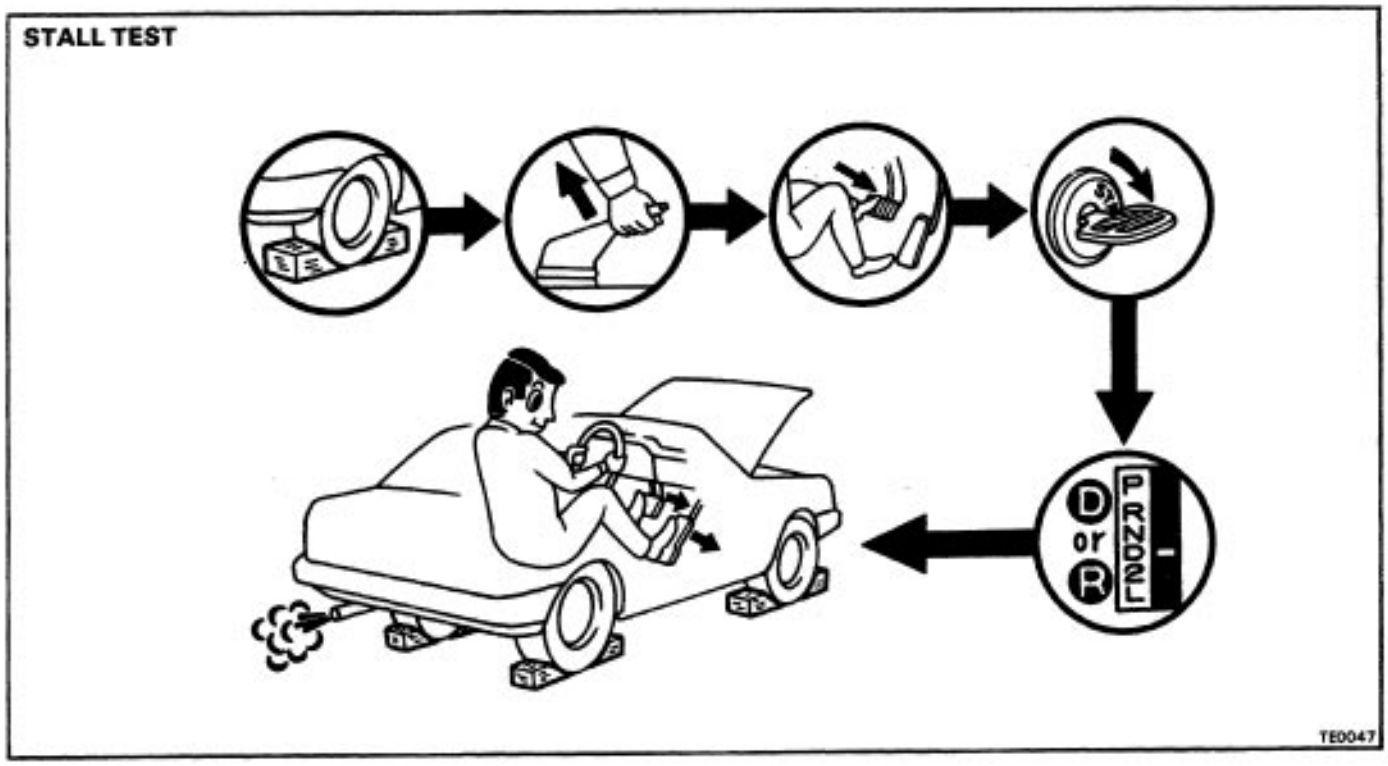
- Line pressure too low
- Forward clutch slipping
- No. 2 one–way clutch not operating properly
- O/D one–way clutch not operating properly

(c) If the stall speed in R range is higher than specified:

- Line pressure too low
- Direct clutch slipping
- First and reverse brake slipping
- O/D one–way clutch not operating properly

(d) If the stall speed in both R and D ranges are higher than specified:

- Line pressure too low
- Improper fluid level
- O/D one–way clutch not operating properly



TIME LAG TEST

When the shift lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, forward clutch, direct clutch and first and reverse brake.

NOTICE:

- **Perform the test at normal operating fluid temperature (122 –176˚F or 50 – 80˚C).**
- **Be sure to allow one minute interval between tests.**
- **Make three measurements and take the average value.**

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Start the engine and check the idle speed.

Idle speed (N range) : 700 rpm

(c) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds

(d) In the same manner, measure the time lag for N – R.

Time lag: Less than 1.5 seconds

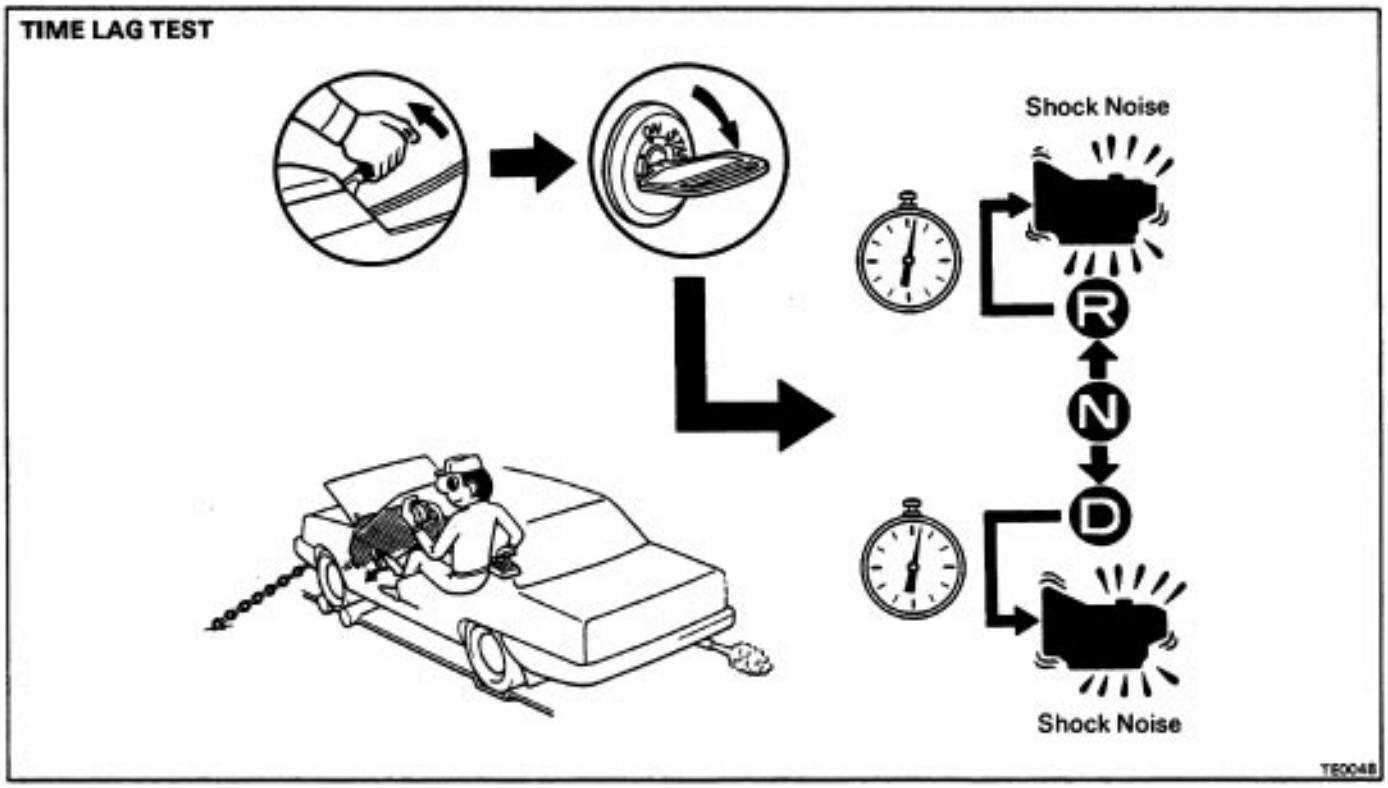
EVALUATION

(a) If N – D time lag is longer than specified:

- Line pressure too low
- Forward clutch worn
- O/D one–way clutch not operating properly

(b) If N – R time lag is longer than specified:

- Line pressure too low
- Direct clutch worn
- First and reverse brake worn
- O/D one–way clutch not operating properly



HYDRAULIC TEST

PREPARATION

(a) Warm up the transaxle fluid.
(b) Remove the transaxle case test plug and connect the hydraulic pressure gauge.
SST 09992–00094 (Oil pressure gauge)

NOTICE:

- **Perform the test at normal operating fluid temperature (122 –176˚F or 50 – 80˚C).**
- **The line pressure test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE LINE PRESSURE

(a) Fully apply the parking brake and chock the four wheels.
(b) Start the engine and check idling rpm.
(e) Step down strongly on the brake pedal with your left foot and shift into D range.
(d) Measure the line pressure when the engine is idling.
(e) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
(f) In the same manner, perform the test in R range.

Line pressure kg/cm (psi, kPa)			
D range		R range	
Idling	Stall	Idling	Stall
3.7 – 4.3 (53 – 61, 363 – 422)	9.2 – 10.7 (131 – 152, 902 – 1,049)	5.4 – 7.2 (77 – 102, 530 – 706)	14.4 – 16.8 (205 – 239, 1,412 – 1,648)

If the measured pressure are not up to specified values, recheck the throttle cable adjustment and perform a retest.

EVALUATION

(a) If the measured values at all ranges are higher than specified:

- Throttle cable out of adjustment
- 4 Throttle valve defective
  Regulator valve defective

(b) If the measured values at all ranges are lower than specified:

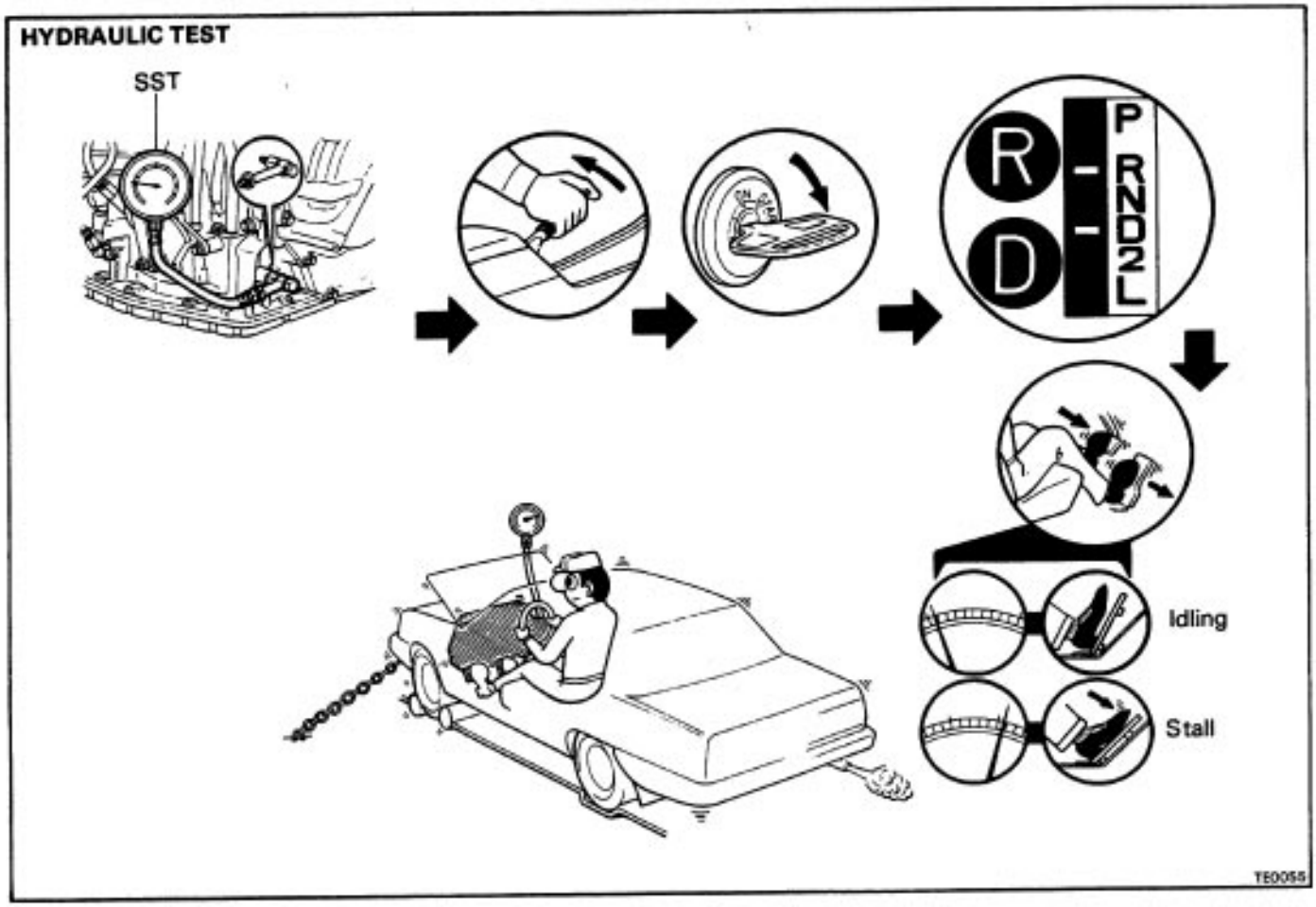
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective

(c) If pressure is low in the D range only:

- D range circuit fluid leakage
- Forward clutch defective

(d) If pressure is low in the R range only:

- R range circuit fluid leakage
- Direct clutch defective
- First and reverse brake defective



MEASURE GOVERNOR PRESSURE (A1401)

(a) Check the parking brake to see that it is not applied.

(b) Start the engine.

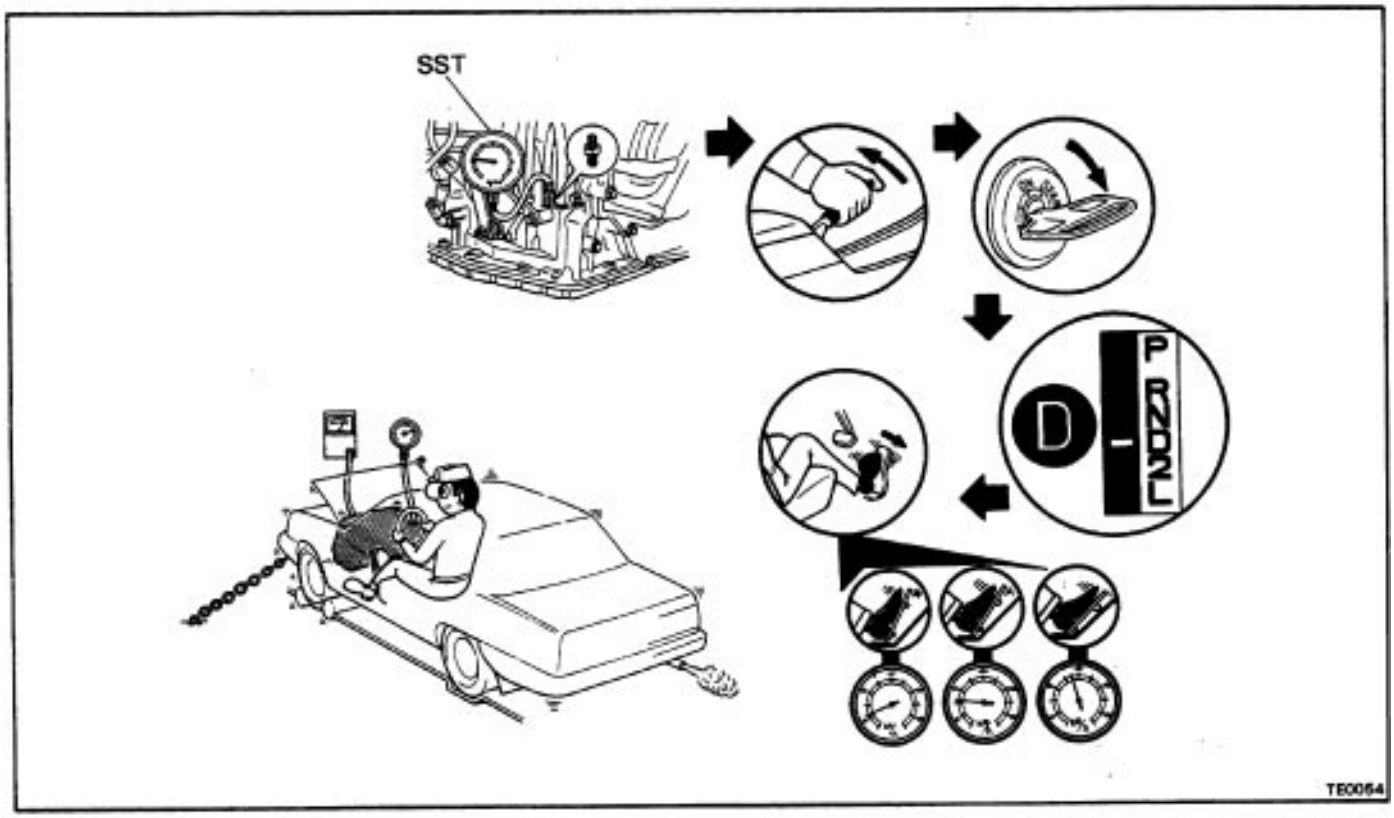
(c) Shift into D range and measure the governor pressures at the speeds specified in the table.

EVALUATION

If governor pressure is defective:

- Line pressure defective
- Fluid leakage in governor pressure circuit
- Governor valve operation defective .

Drive pinion shaft	Vehicle speed (Reference only)	Governor pressure
1,000 rpm	30 km/h (19 mph)	0.6 – 1.4 kg/cm² (9 – 20 psi, 59 – 137 kPa)
1,800 rpm	55 km/h (34 mph)	1.5 – 2.3 kg/cm² (21 – 33 psi, 147 – 226 kPa)
3,500 rpm	106 km/h (66 mph)	4.2 – 5.0 kg/cm² (60 – 71 psi, 412 – 490 kPa)



ROAD TEST (A140E)

NOTICE: Perform the test at normal operating fluid temperature (122 – 176˚F or 50 – 84˚C). .

1. D RANGE TEST IN NORM AND PWR PATTERN RANGES

Shift into the D range and hold the accelerator pedal constant at the full throttle valve opening position.

Check the following:

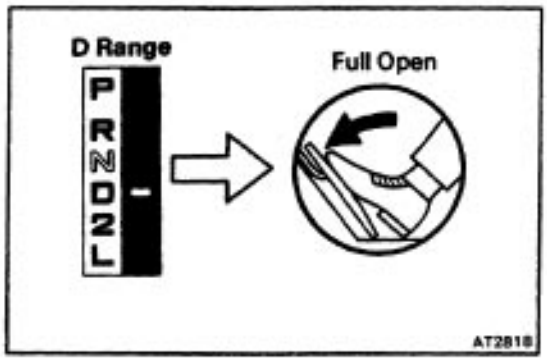
(a) 1–2, 2–3 and 3–O/D up–shifts should take place, and shift points should conform to those shown in the automatic shift schedule. (See page AT–49)

Conduct a test under both Normal and Power patterns.

HINT:

There is no O/D up–shift when coolant temperature is below 122˚F (50˚C).

There is no lock–up when the vehicle speed is 10 km/h (6 mph) less than the set cruise control speed.



EVALUATION

(1) If there is no 1 – 2 up–shift:

- No. 2 solenoid is stuck
- 1–2 shift valve is stuck

(2) If there is no 2 – 3 up–shift:

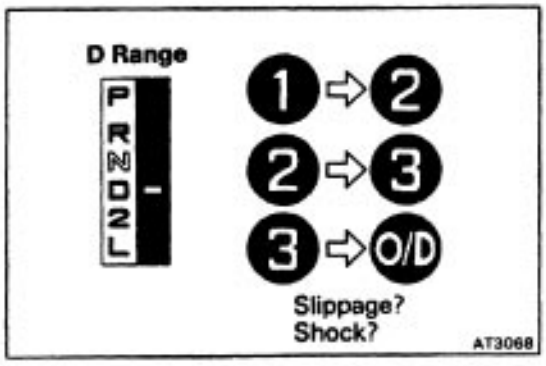
- No. 1 solenoid is stuck
- 2–3 shift valve is stuck

(3) If there is no 3 – O/D up–shift:

- 3–O/D shift valve is stuck

(4) If the shift point is defective:

- Throttle valve, 1–2 shift valve, 2–3 .shift valve, 3–
- O/D shift valve etc., are defective



(5) If the lock–up is defective:

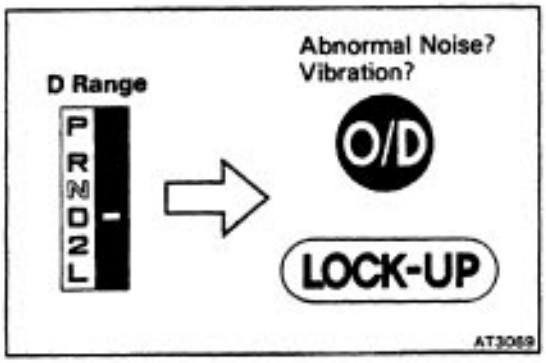
- Lock–up solenoid is stuck
- Lock–up relay valve is stuck

(b) In the same manner, check the shock and slip at the 1 –2, 2 – 3 and 3 – O/D up–shifts.

EVALUATION

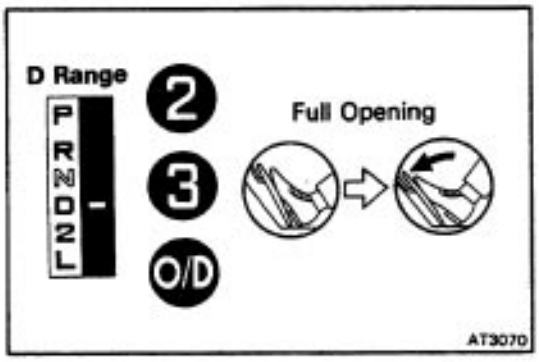
If the shock is excessive:

- Line pressure is too high
- Accumulator is defective
- Check ball is defective



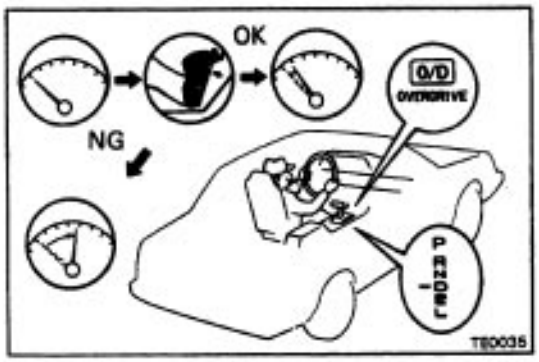
(c) Run at the D range lock–up or O/D gear and check for abnormal noise and vibration.

HINT: The check for the cause of abnormal noise and vibration must be make with extreme care as it could also be due to loss of balance in the drive shaft, tire, torque converter, etc.



(d) While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 –1, 3 –2 and O/D –3 kickdowns conform to those indicated on the automatic shift schedule. (See page **AT–49**)

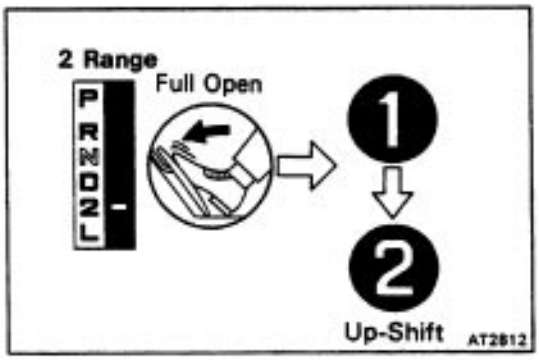
(e) Check for abnormal shock and slip at kick–down.



(f) Check for the lock–up mechanism:

(1) Drive in D range – O/D gear, at a steady speed (lock–up ON) of about 75 km/h (47 mph).

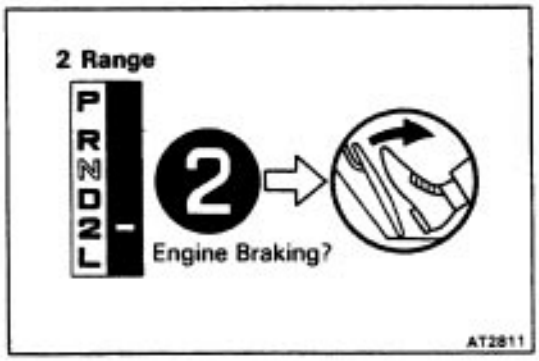
(2) Lightly depress the. accelerator pedal and check that the engine rpm does not change abruptly. If there is a big jump in engine rpm, there is no lock–up.



2. 2 RANGE TEST

Shift into the 2 range and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check on the following points.

(a) Check to see that the 1 –2 up–shift takes place and that the shift point conforms to it shown on the automatic shift schedule. (See page AT–49)

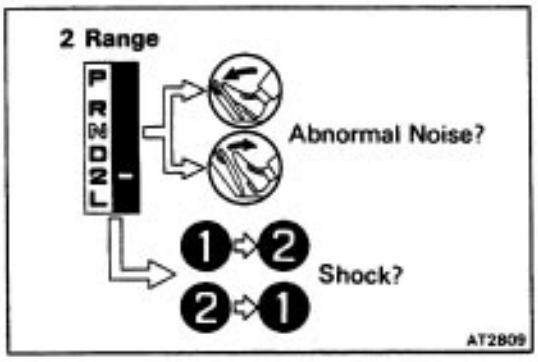


(b) White running in the 2 range and 2nd gear, release the accelerator pedal and check the engine braking effect.

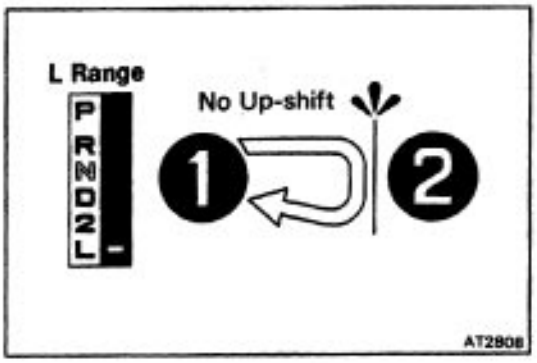
EVALUATION

If there is no engine braking effect:

- Second coast brake is defective

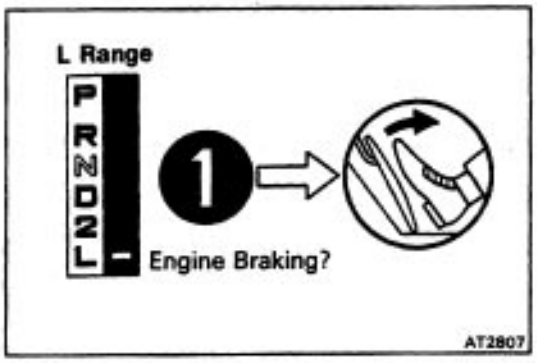


(e) Check for abnormal noise at acceleration and deceleration, and for shock at up–shift and downshift.



3. L RANGE TEST

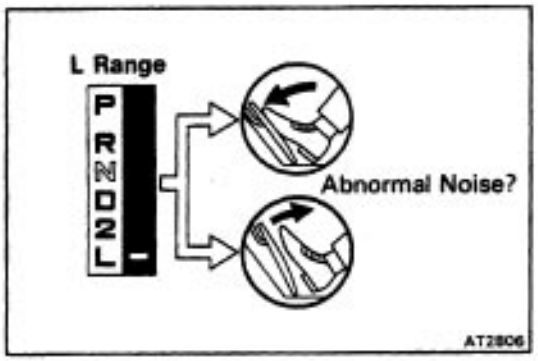
(a) White running in the L range, check to see that there is no up–shift to 2nd gear.



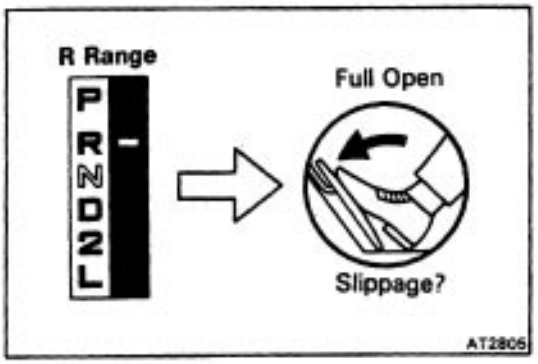
(b) White running in the L range, release the accelerator pedal and check the engine braking effect.

EVALUATION

If there is no engine braking effect:
First and reverse brake is defective

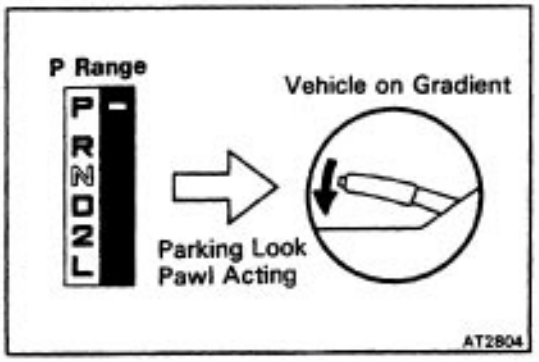


(c) Check for abnormal noise during acceleration and deceleration.



4. R RANGE TEST

Shift into the R range and, while starting at full throttle, check for slipping.



5. P RANGE TEST

Stop the vehicle on a gradient (more than 5°) and after shifting into the P range, release the parking brake.
Then check to see that the parking lock pawl holds the vehicle in place.

ROAD TEST (A140L)

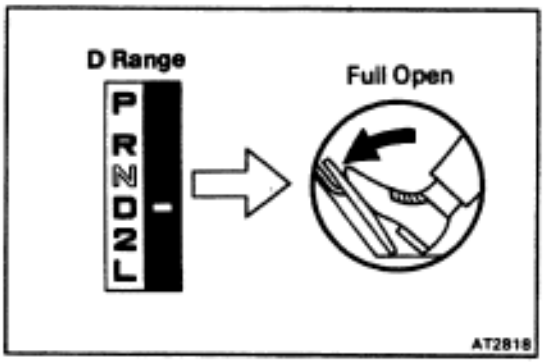
NOTICE: Perform the test at norrnal operating fluid temperature (122 – 176˚F or 50 – 80˚C).

1. D RANGE TEST

Shift into the D range and hold the accelerator pedal constant at the full throttle valve opening position.

Check the following:

(a) 1–2, 2–3 and 3–0ID up–shifts should take place, and shift points should conform to those shown in the automatic shift schedule. (See page AT–49)



EVALUATION

(1) If there is no 1 –2 up–shift:

- Governor valve is defective
- 1–2 shift valve is stuck

(2) if there is no 2 –3 up–shift:

- 2–3 shift valve is stuck .

(3) If there is no 3 – O/D up–shift:

- 3–O/D shift valve is stuck
- O/D solenoid is defective

(4) If the shift point is defective:

- Throttle cable is out–of–adjustment
- Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–O/D shift valve etc., are defective

(b) In the same manner, check the shock and slip at the 1– 2, 2 – 3 and 3 – O/D up–shifts.

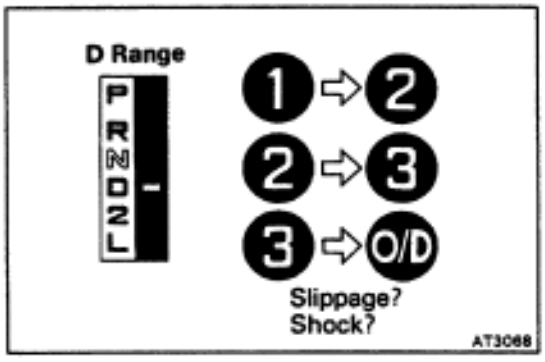
EVALUATION

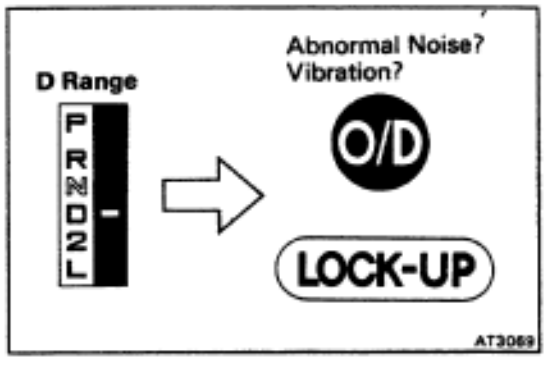
If the shock is excessive:

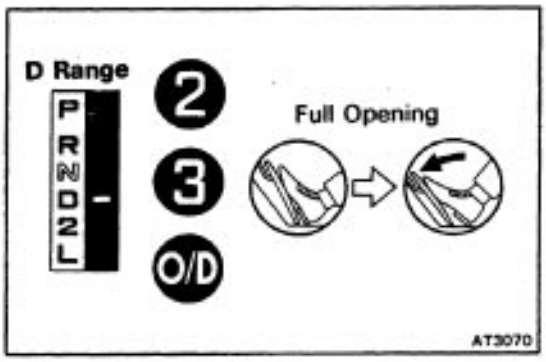
- Line pressure is too high
  Accumulator is defective
- Check ball is defective

(c) Run at the D range lock–up or O/D gear and check for abnormal noise and vibration.

HINT: The check for the cause of abnormal noise and vibration must be make with extreme care as it could also be due to loss of balance in the drive shaft, tire, torque converter, etc.

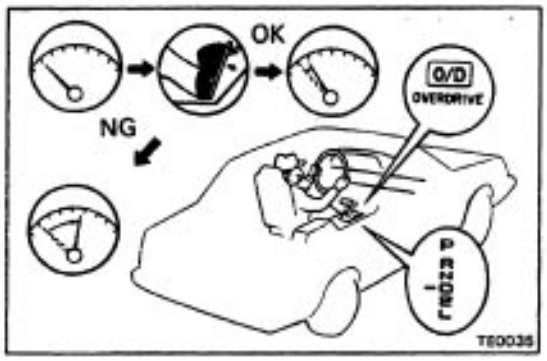






(d) While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 –1, 3 –2 and O/D – 3 kickdowns conform to those indicated on the automatic shift schedule. (See page AT–49)

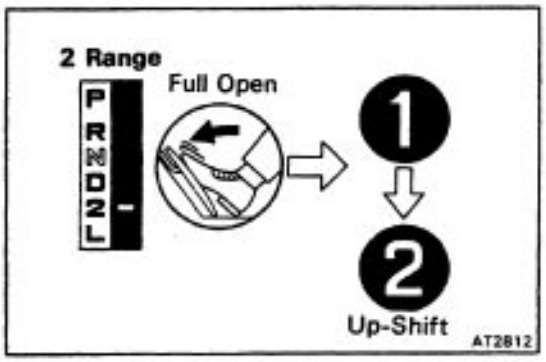
(e) Check for abnormal shock and slip at kick–down.



(f) Check for the lock–up mechanism.

(1) Drive in D range, O/D gear, at a steady speed (lock–up ON) of about 70 km/h (43 mph).

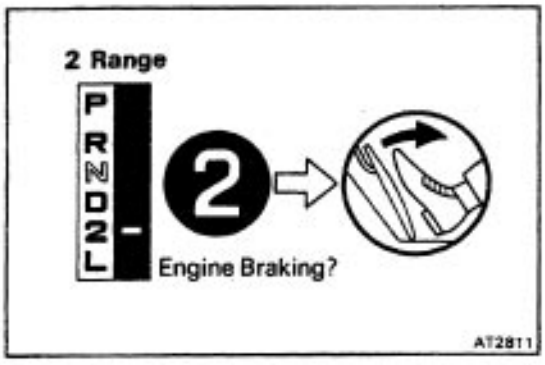
(2) Lightly depress the accelerator pedal and check that the engine rpm does. not change abruptly. If there is a big jump in engine rpm, there is no lock–up.



2. 2 RANGE TEST

Shift into the .2 range and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, check on the following points.

(a) Check to see that the 1 – 2 up–shift takes place and that the shift point conforms to it shown on the automatic shift schedule. (See page AT–49)

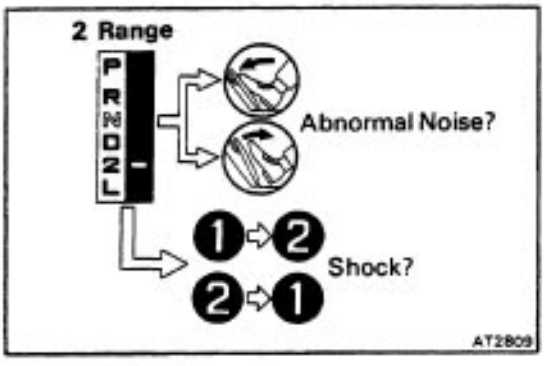


(b) While running in the 2 range and 2nd gear, release the accelerator pedal and check the engine braking effe**ct.**

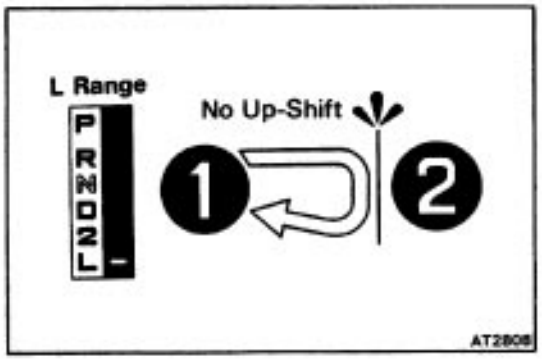
EVALUATION

If there is no engine braking effect:

Second coast brake is defective

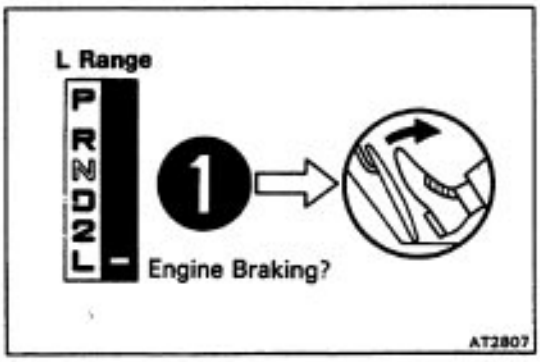


(c) Check for abnormal noise at acceleration and deceleration, and for shock at up–shift and down-shift.



3. L RANGE TEST

(a) While running in the L range, check to see that there is no up–shift to 2nd gear.

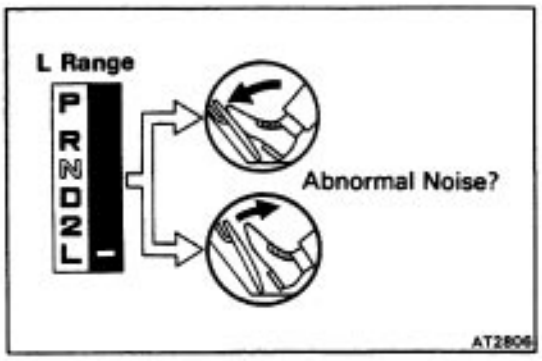


(b) While running in the L range, release the accelerator pedal and check the engine braking effect.

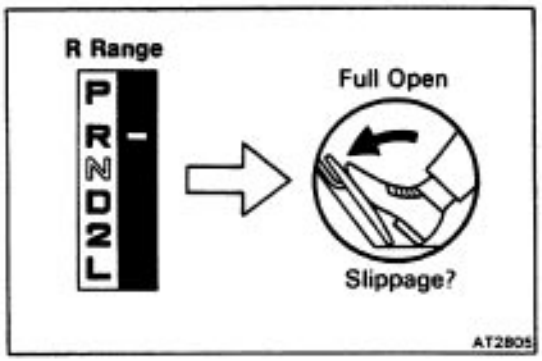
EVALUATION

If there is no engine braking effect:

- First and reverse brake is defective

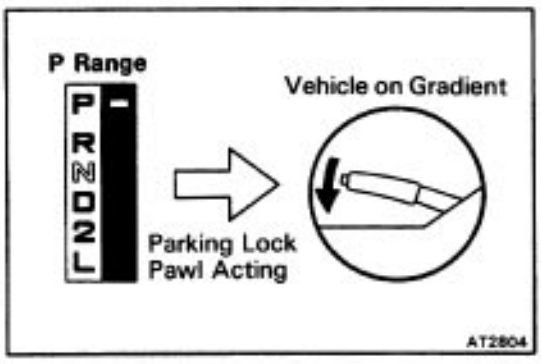


(c) Check for abnormal noise during acceleration and deceleration.



4. R RANGE TEST

Shift into the R range and, while starting at full throttle, check for slipping.



5. P RANGE TEST

Stop the vehicle on a gradient (more than 5˚) and after shifting into the P range, release the parking brake.

Then check to see that the parking lock pawl holds the vehicle in place.

Automatic Shift Schedule (A140E)

		Throttle valve fully open [ ] Fully closed km/h (mph)							
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	51 - 56 (32 - 35)	97 - 107 (60 - 66)	145 - 155 (90 - 96)	31 - 36 (19 - 22)	22 - 26 (14 - 16)	135 - 145 (84 - 90)	90 - 100 (56 - 62)	41 - 46 (25 - 29)
	PWR	60 - 65 (37 - 40)	112 - 122 (70 - 76)	148 - 158 (92 - 98)	34 - 39 (21 - 24)	22 - 26 (14 - 16)	138 - 148 (86 - 92)	105 - 115 (65 - 71)	41 - 46 (25 - 29)
2 range	NORM PWR	51 - 56 (32 - 35)	–	–	–	–	–	–	41 - 46 (25 - 29)
L range	NORM PWR	–	–	–	–	–	–	–	46 - 51 (29 - 32)

		Throttle valve opening 5% km/h (mph)			
		Lock–up ON		Lock–up OFF	
		3rd	O/D	3rd	O/D
D range	NORM	*61 - 66 (38 - 41)	67 - 72 (42 - 45)	*46 - 51 (29 - 32)	64 - 69 (40 - 43)
	PWR	*64 - 69 (40 - 43)	73 - 78 (45 - 48)	*58 - 63 (36 - 39)	70 - 75 (43 - 47)

***O/D main switch OFF**

HINT:

(1) In the 2 and L ranges, ail stages lock–up is OFF.

(2) In the following cases, the lock–up will be released regardless of the lock–up pattern.

- When the throttle is completely closed.
- When the brake light switch is ON.

(A140L)

km/h (mph)

Differential gear ratio	D range (Throttle valve fully open)								L range
	1 → 2	2 → 3	3 → O/D	Lock-up ON	Lock-up OFF	O/D → 3	3 → 2	2 → 1	2 → 1
3.736	51 - 67 (32 - 42)	99 - 114 (62 - 71)	–*1	–*2	–*3	–*4	94 - 113 (58 - 70)	39 - 49 (24 - 30)	38 - 50 (24 - 31)

*1 3 – O/D up–shift point with closed throttle valve is at 32 – 45 km/h (20 – 28 mph).

*2 Lock–up ”ON”’ point with closed throttle valve is at 64 – 73 km/h (40 – 45 mph).

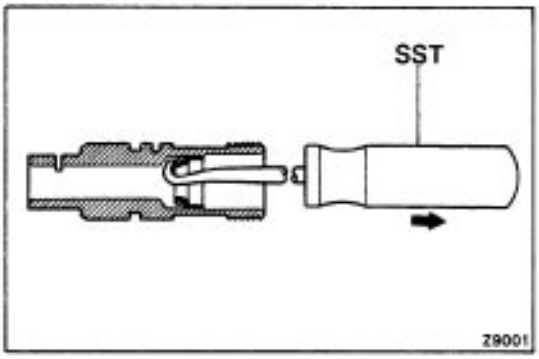
*3 Lock–up ”OFF” point with closed throttle valve is at 60 – 68 km/h (37 – 42 mph).

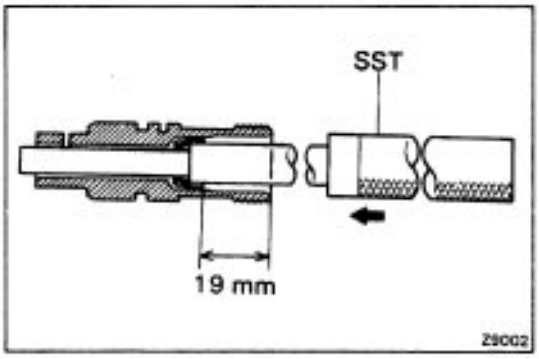
*4 O/D –3 down–shift is possible up to maximum speed.

ON–VEHICLE REPAIR

HINT: The components mentioned below can be replaced on the vehicle as they are without any necessity removal of the transmission. For the respective operating procedures refer to the following pages:

Components	Removal		Installation	
	See page	Remarks	See page	Remarks
Valve Body	AT–61 to AT–63	Using SST, remove the drain plug and drain the fluid before removing oil pan.	AT–1 7 7 to AT–180	After installing oil pan, fill transmission with ATF. (See page AT–21)
Throttle Cable	AT–51		AT–51 and AT–52	
Speed Sensor (A140E)	AT–52		AT–53	
Governor Valve (A140L)	AT–61	Before removing governor bracket, remove transaxle protector and– LH drive shaft.	AT–1 80 and AT–181	After installing governor bracket, install transaxle protector an d LH drive shaft.
Speedometer Driven Gear	AT–50		AT–50	





Speedometer Driven Gear

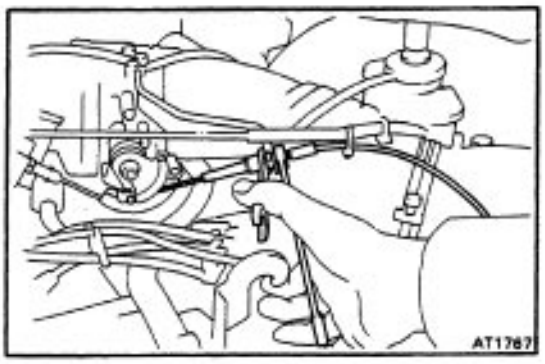
REPLACEMENT OF SPEEDOMETER DRIVEN GEAR OIL SEAL

1. REMOVE SPEEDOMETER DRIVEN GEAR OIL SEAL

Using SST, pull out the oil seal.
SST 09921–00010

2. INSTALL SPEEDOMETER DRIVEN GEAR OIL SEAL

SST 09201–60011
Drive in depth: 19 mm (0.75 in.)

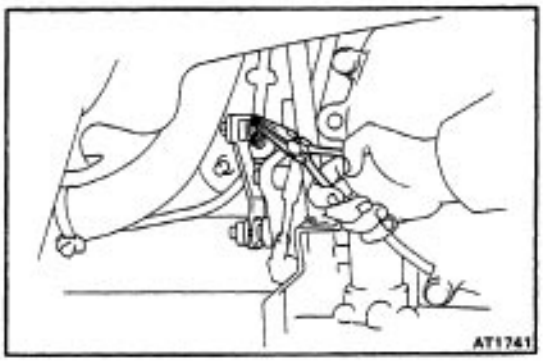


Throttle Cable

REMOVAL OF THROTTLE CABLE

1. DISCONNECT THROTTLE CABLE

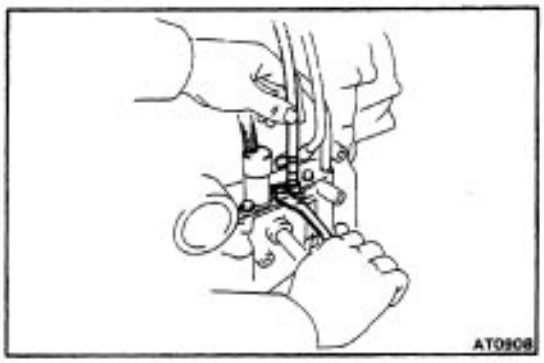
(a) Disconnect the cable housing from the bracket.
(b) Disconnect the cable from the throttle linkage.



2. REMOVE NEUTRAL START SWITCH

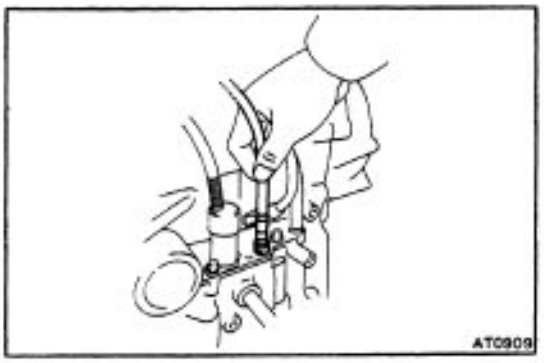
(a) Remove the clips and, disconnect the transmission control cable from manual shift lever.
(b) Remove the manual shift lever.
(c) Remove the neutral start switch.

3. REMOVE VALVE BODY (See page AT–61, AT–62)



4. PULL THROTTLE CABLE OUT OF TRANSMISSION CASE

(a) Remove the bolt and retaining plate.
(b) Pull the cable out of the transmission case.

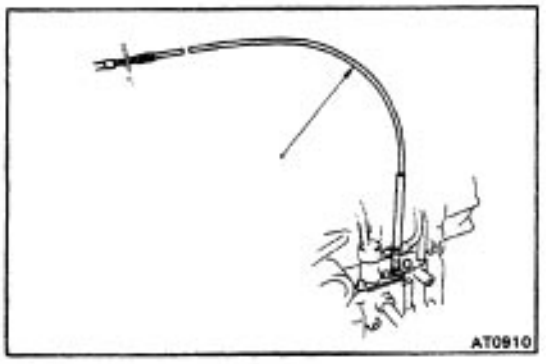


INSTALLATION OF THROTTLE CABLE

1. INSTALL CABLE IN TRANSMISSION CASE

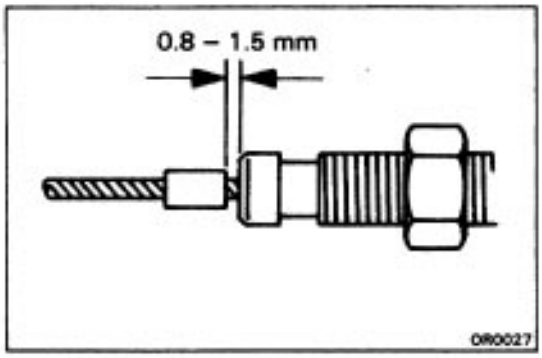
(a) Be sure to push it in all the way.
(b) Install the retaining plate and one bolt.

2. INSTALL VALVE BODY (See page AT–177, AT–178)

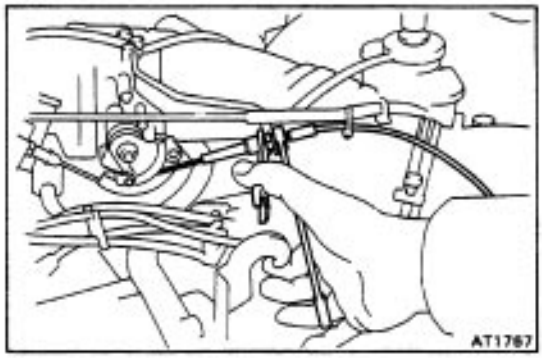


3. IF THROTTLE CABLE IS NEW, STAKE STOPPER ON INNER CABLE

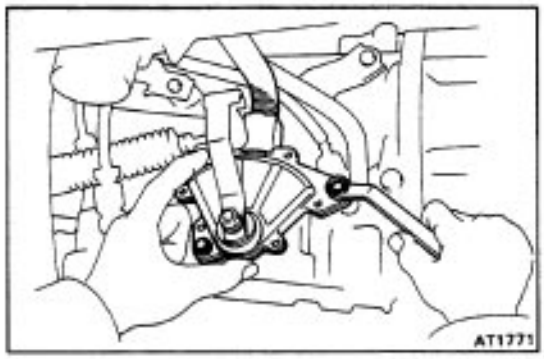
(a) Bend the cable so there is a radius of about 200 mm (7.87 in.).



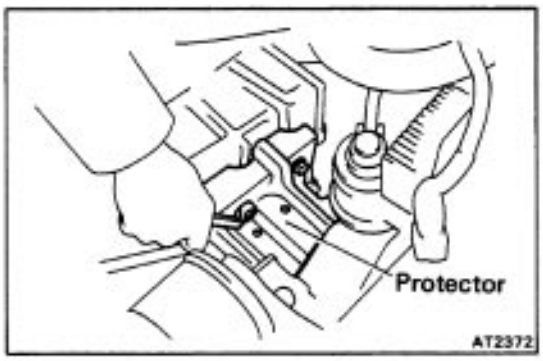
(b) Pull the inner cable lightly until a slight resistance is felt, and hold it.
(c) Stake the stopper 0.8 – 1.5 mm (0.031 – 0.059 in.) from the surface of outer cable as shown.



4. CONNECT THROTTLE CABLE
(a)Connect the cable to the throttle linkage.
(b) Connect the cable housing to the bracket.
5. ADJUST THROTTLE CABLE (See page AT–22)



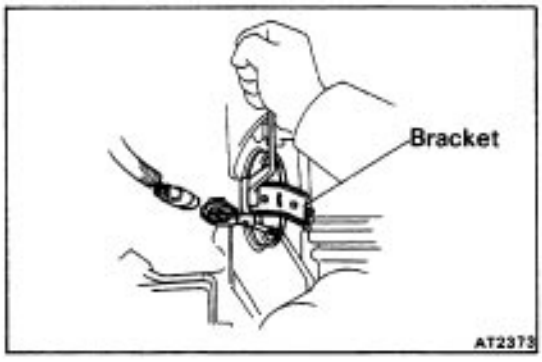
6. INSTALL NEUTRAL START SWITCH
(a) Install the neutral start switch.
(b) Install the manual shift lever.
(c) Adjust the neutral start switch.
(See page AT–22)
(d) Connect the transmission control cable.



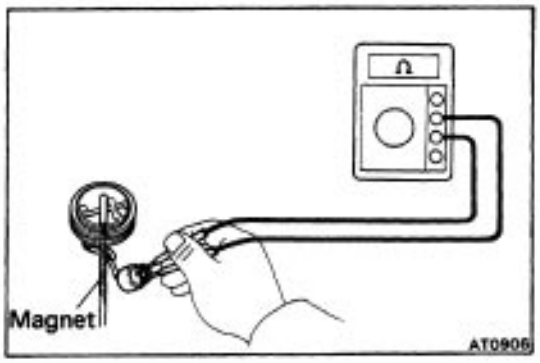
No. 2 Speed Sensor (A140E)

REMOVAL OF SPEED SENSOR

1. REMOVE TRANSAXLE CASE PROTECTOR



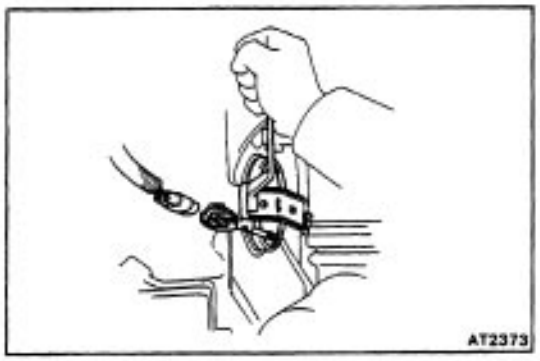
2. DISCONNECT SPEED SENSOR CONNECTOR
3. REMOVE BRACKET
4. REMOVE SPEED SENSOR AND O–RING



INSPECTION OF SPEED SENSOR

INSPECT SPEED SENSOR

Connect an ohmmeter to the speed sensor and check that the meter deflects when the sensor is repeatedly brought close to a magnet and removed from it.



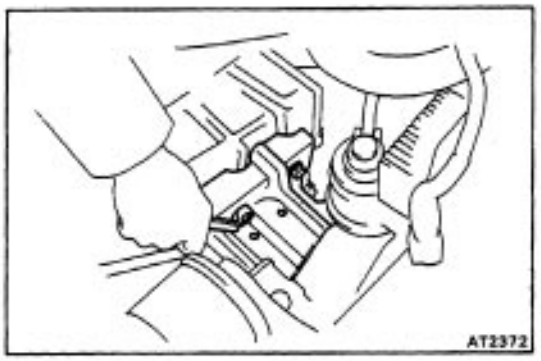
INSTALLATION OF SPEED SENSOR

7. INSTALL SPEED SENSOR AND O–RING

2. INSTALL BRACKET

Torque: 130 kg–cm (9 ft–lb. 13 N–m)

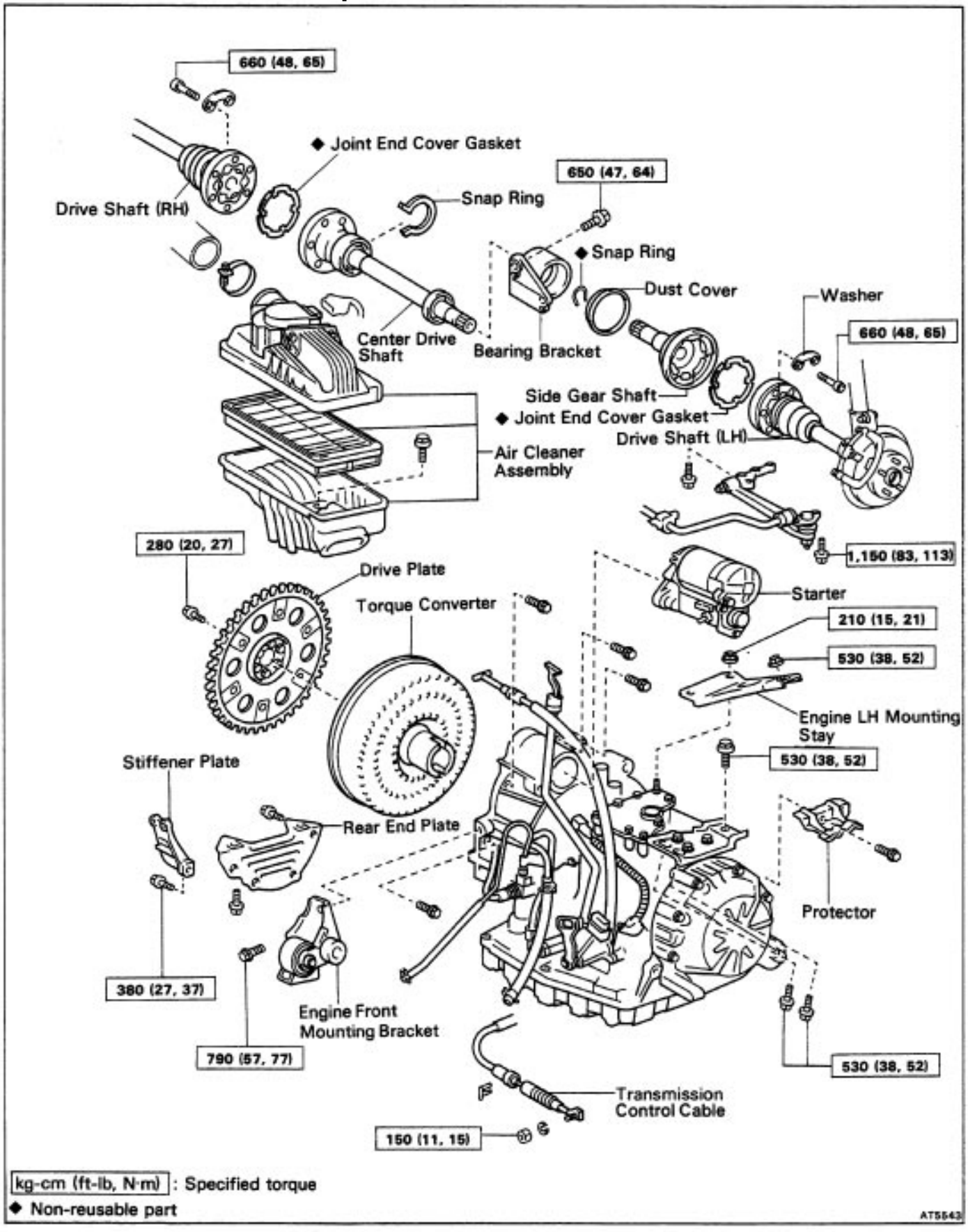
3. CONNECT SPEED SENSOR CONNECTOR



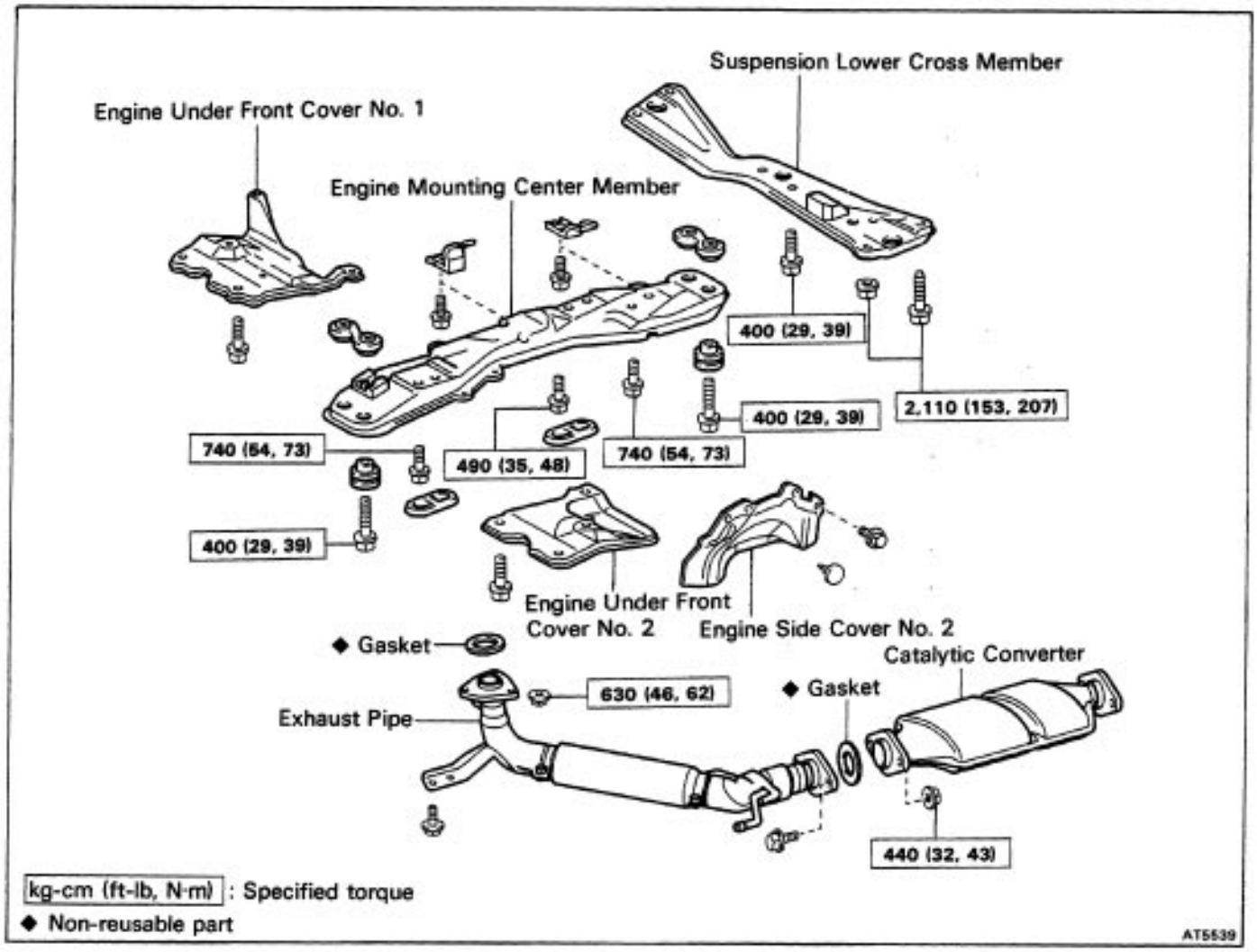
4. INSTALL TRANSAXLE CASE PROTECTOR

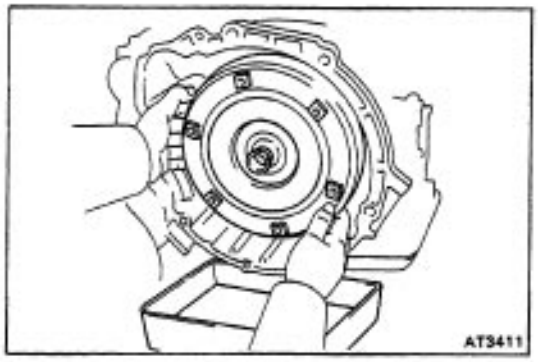
REMOVAL AND INSTALLATION OF TRANSAXLE

Remove and install the parts as shown.



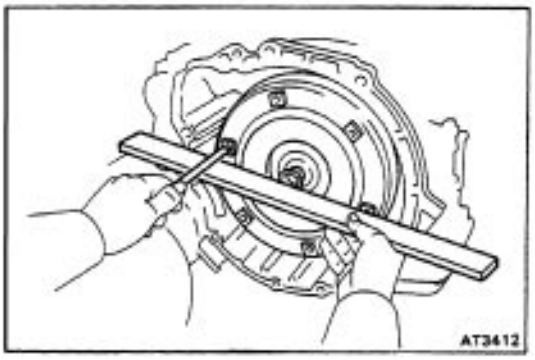
REMOVAL AND INSTALLATION OF TRANSAXLE (Cont'd)





(MAIN POINT OF INSTALLATION)

1. INSTALL TORQUE CONVERTER IN TRANSAXLE



2. CHECK TORQUE CONVERTER INSTALLATION

Using calipers and a straight edge, measure from the installed surface to the front surface of the transaxle housing.

Correct distance: 13 mm (0.51 in.)

COMPONENT PARTS
General Notes

The instructions here are organized so that you work on only one component group at a time.
This will help avoid confusion from similar–looking parts of different subassemblies being on your work bench at the same time.
The component groups are inspected and repaired from the converter housing side.
As much as possible, complete the inspection, repair and assembly before proceeding to the next component group. If a component group can not be assembled because parts are being ordered, be sure tc keep all parts of that group in a separate container while proceeding with disassembly, inspection, repair and assembly of other component groups.
Recommended fluid for the automatic transaxle is ATF type DEXRON® ll.
GENERAL CLEANING NOTES:

1. All disassembled parts should be washed clean with any fluid passages and holes blown trough wit compressed air.
2. When using compressed air to dry parts, always aim away from yourself to prevent accidentally spraying, automatic transmission fluid or kerosene in your face.
3. The recommended automatic transaxle fluid or kerosene should be used for cleaning.

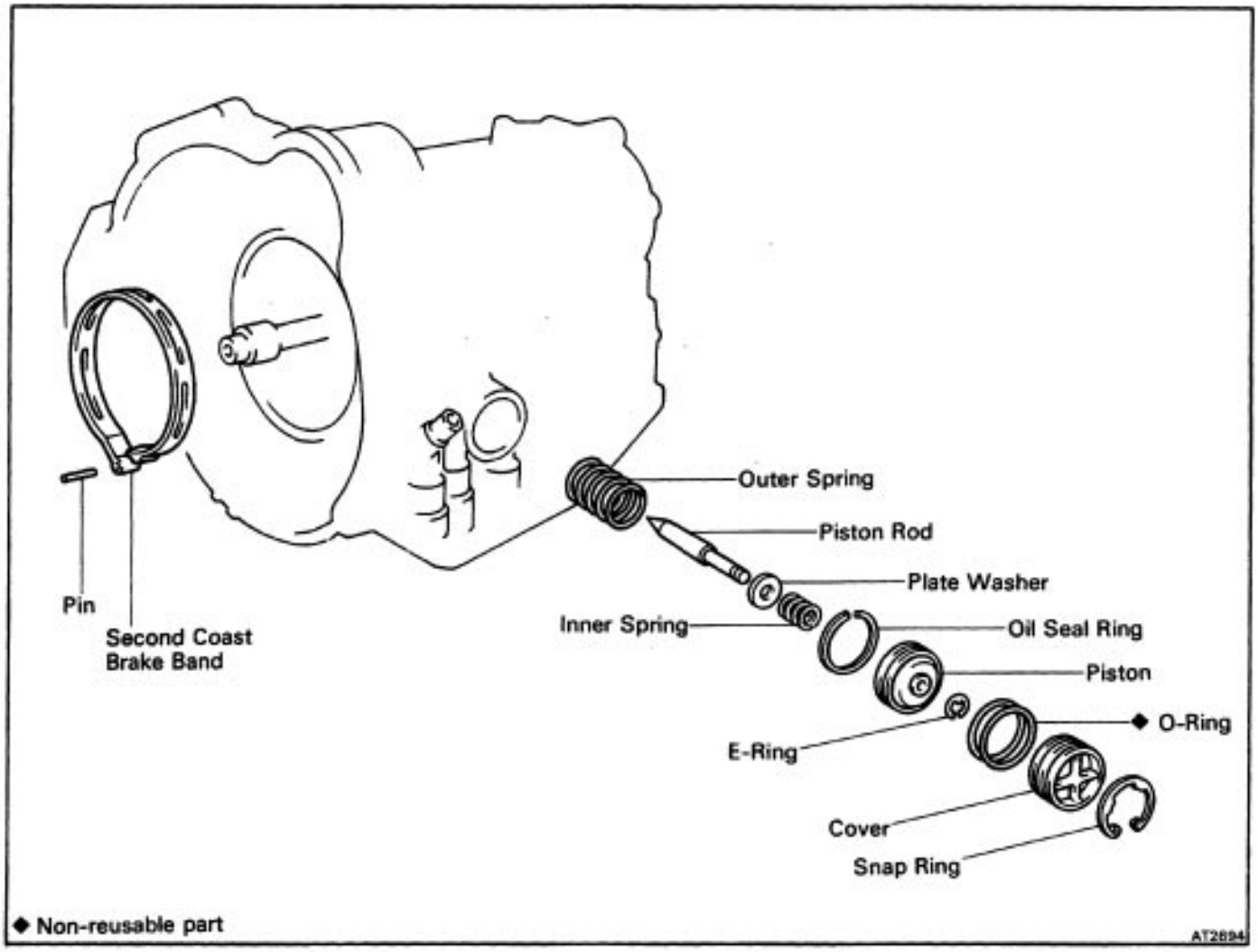
PARTS ARRANGEMENT:

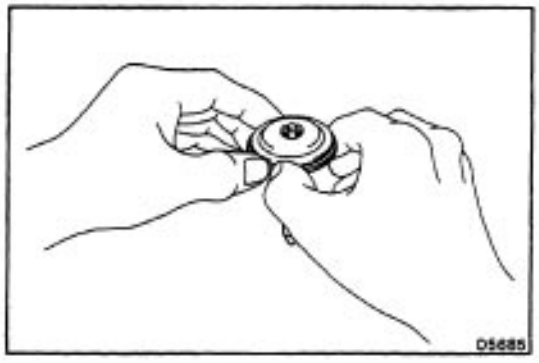
1. After cleaning, the parts should be arranged in proper order to allow efficient inspection, repairs, an(reassembly.
2. When disassembling a valve body, be sure to keep each valve together with the corresponding spring
3. New brakes and clutches that are to be used for replacement must be soaked in transaxle fluid for a least fifteen minutes before assembly.

GENERAL ASSEMBLY:

1. All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with transmission fluid prior to reassembly.
2. All gaskets and rubber O–rings should be replaced.
3. Make sure that the ends of a snap ring are not aligned with one of the cutouts and are installed in the groove correctly.
4. If a worn bushing is to be replaced, the subassembly containing that bushing must be replaced.
5. Check thrust bearings and races for wear or damage. Replace if necessary.
6. Use petroleum jelly to keep parts in place.

Second Coast Brake

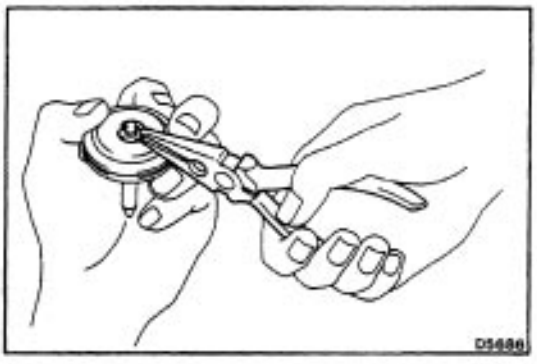




DISASSEMBLY OF SECOND COAST BRAKE PISTON

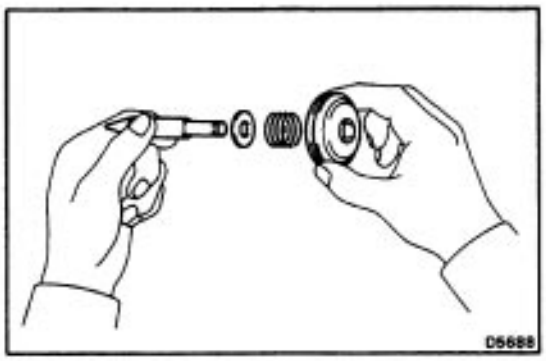
1. REMOVE OIL SEAL RING

Remove the oil seal ring from the piston.

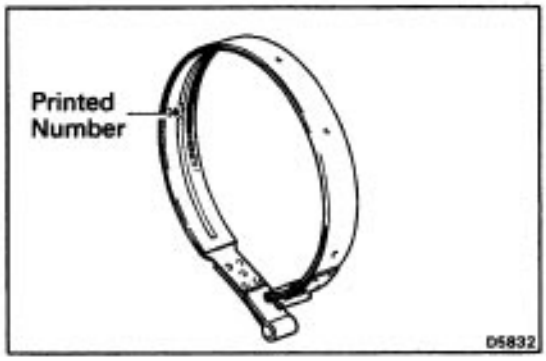


Z. REMOVE PISTON ROD

(a) Remove the E–ring white pushing the piston with needle–nose pliers.



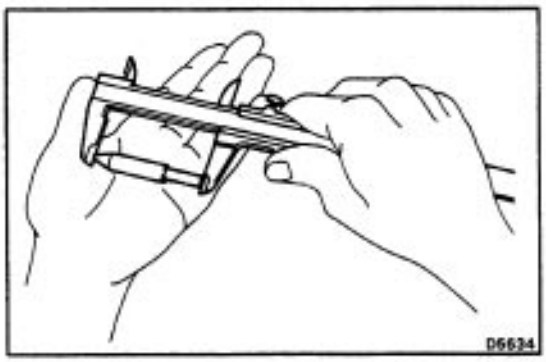
(b) Remove the spring, washer and piston rod.



INSPECTION OF SECOND COAST BRAKE COMPONENT

INSPECT BRAKE BAND

If the lining of the brake band is exfoliated or discolored, or even part of the printed numbers are defaced, replace the brake band.



ASSEMBLY OF SECOND COAST BRAKE PISTON

1. SELECT PISTON ROD

If the band is OK with piston stroke not within the standard value, select the piston rod.

Piston stroke: 1.5 – 3.0 mm (0.059 – 0.118 in.)

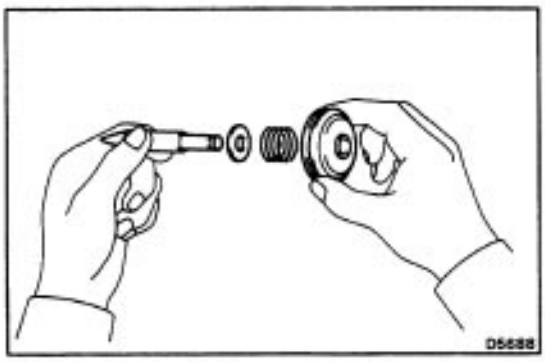
There are two lengths of piston rod.

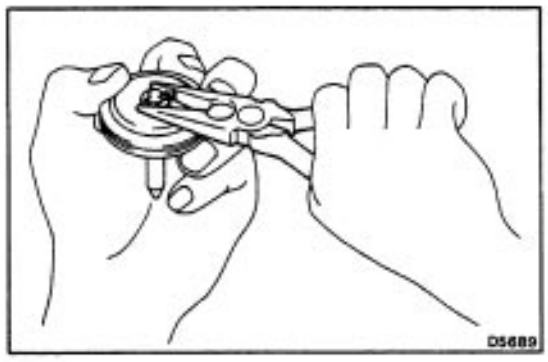
Piston rod length: 72.9 mm (2.870 in.)

71.4 mm (2.811 in.)

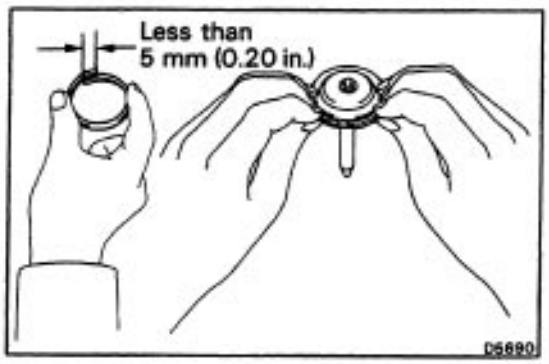
2. INSTALL PISTON ROD

(a) Install the washer and spring to the piston rod.





(b) Install an E–ring while pushing the piston.



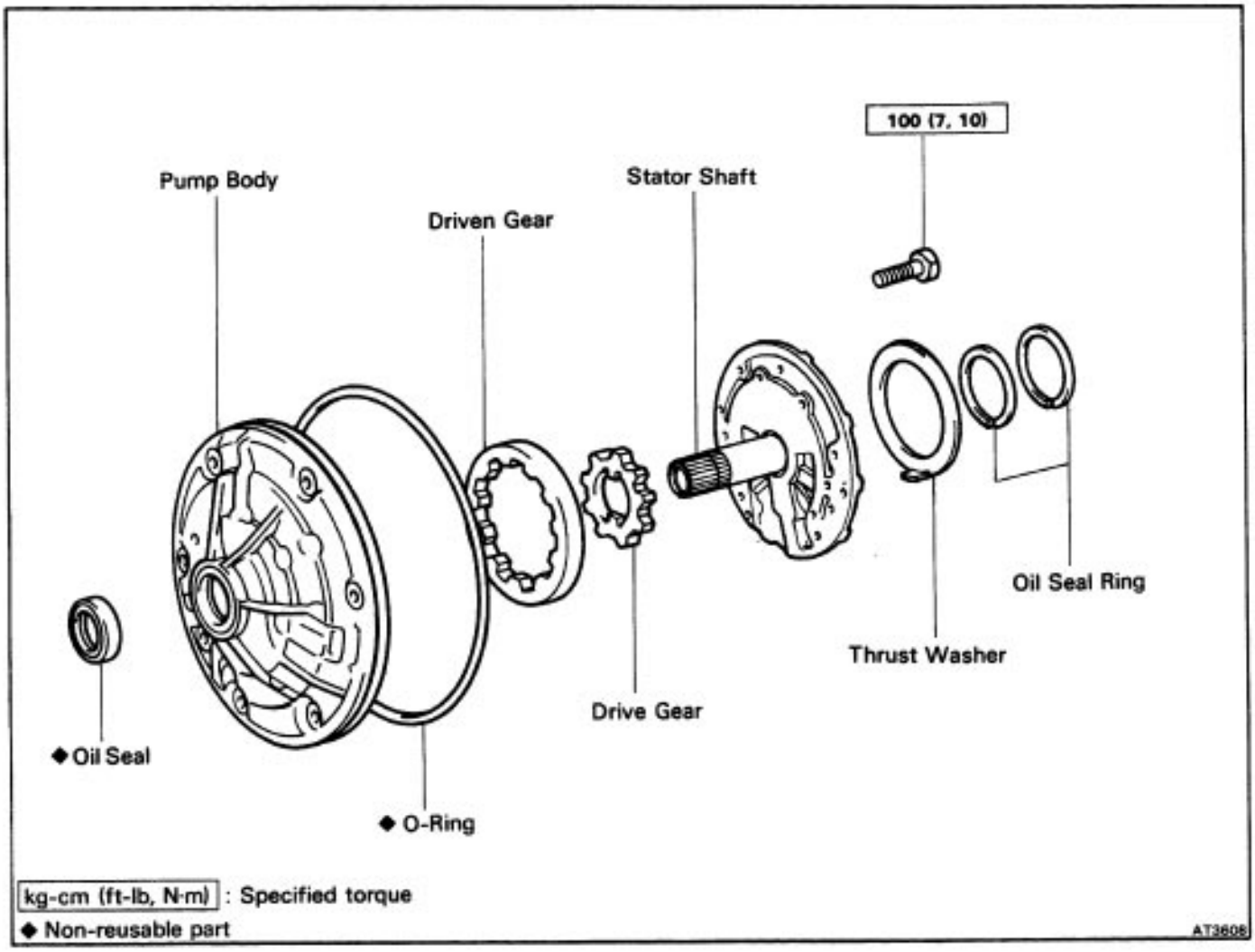
3. INSTALL OIL SEAL RING

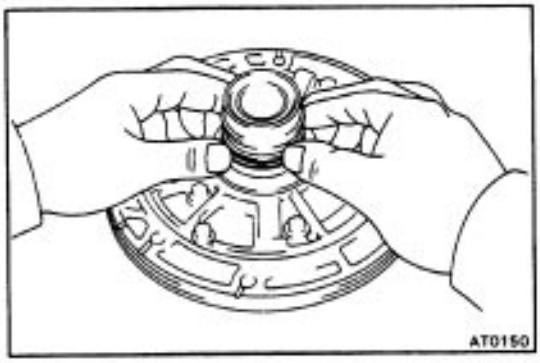
(a) Apply ATF to the oil seal ring.

(b) Install the oil seal ring to the piston.

NOTICE: Do not spread the ring ends more than necessary.

Oil Pump

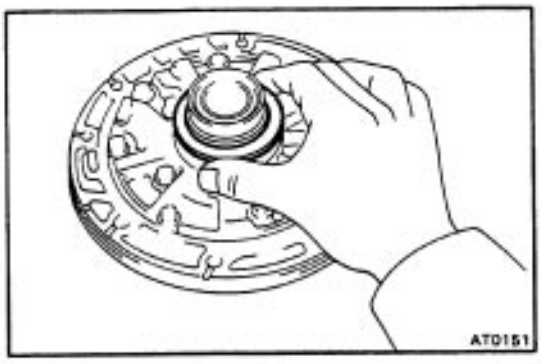




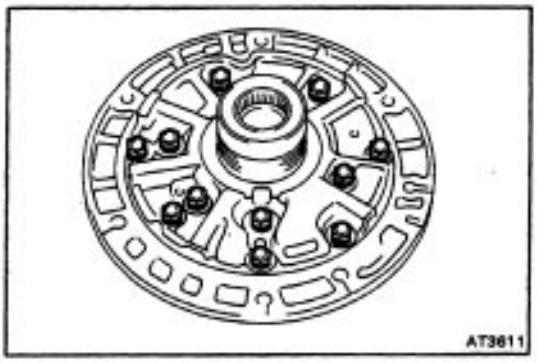
DISASSEMBLY OF OIL PUMP

1. REMOVE OIL SEAL RINGS

Remove the two oil seal rings from the stator shaft back, side.

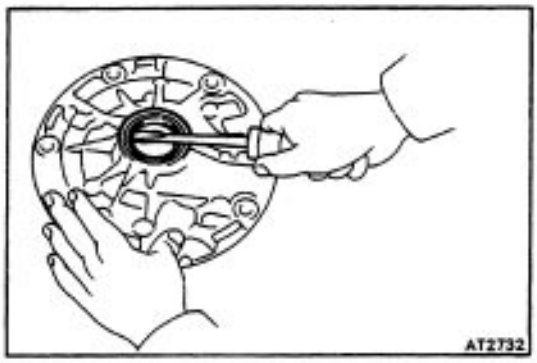


2. REMOVE THRUST WASHER FROM STATOR SHAFT BACK SIDE



3. REMOVE STATOR SHAFT

Remove the eleven bolts and stator shaft.
Keep the gears in assembly order.



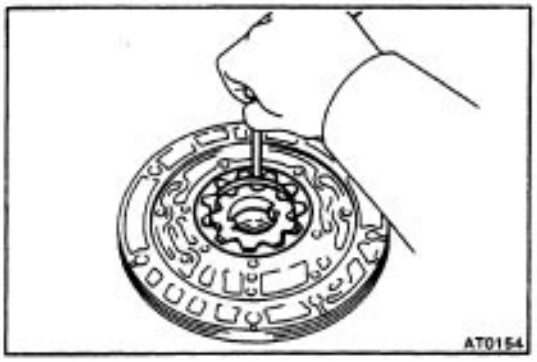
4. REMOVE FRONT OIL SEAL

Pry off the oil seal with a screwdriver.

INSPECTION OF OIL PUMP

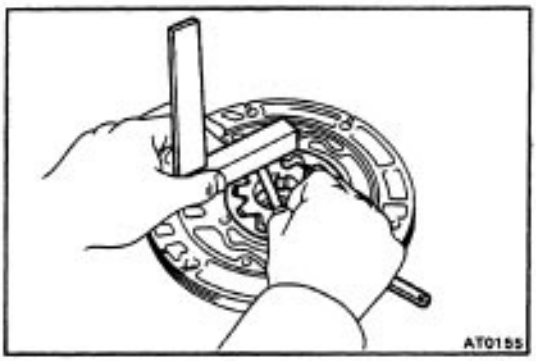
1. CHECK BODY CLEARANCE OF DRIVEN GEAR

Push the driven gear to one side of the body.
Using a feeler gauge, measure the clearance.
Standard body clearance: 0.07 – 0.15 mm (0.0028 – 0.0059 in.)
Maximum body clearance: 0.3 mm (0.012 in.)
If the body clearance is greater than the maximum, r place the oil pump body subassembly.



2. CHECK TIP CLEARANCE OF DRIVEN GEAR

Measure between the driven gear teeth and the crescent shaped part of the pump body.
Standard tip clearance: 0.11 – 0.14 mm (0.0043 – 0.0055 in.)
Maximum tip clearance: 0.3 mm (0.012 in.)
If the tip clearance is greater than the maximum, replace the oil pump body subassembly.



3. CHECK SIDE CLEARANCE OF BOTH GEARS

Using a steel straightedge and a feeler gauge, measure the side clearance of both gears.
Standard side clearance: 0.02 – 0.05 mm (0.0008 – 0.0020 in.)
Maximum side clearance: 0.1 mm (0.004 in.)

There are three different thicknesses for drive and driven gears.

Drive and driven gear thickness

Mark	Thickness
A	9.440 – 9.455 mm (0.3717 – 0.3723 in.)
g	9.456 – 9.474 mm (0.3723 – 0.3730 in.)
C	9.474 – 9.490 mm (0.3730 – 0.3736 in.)

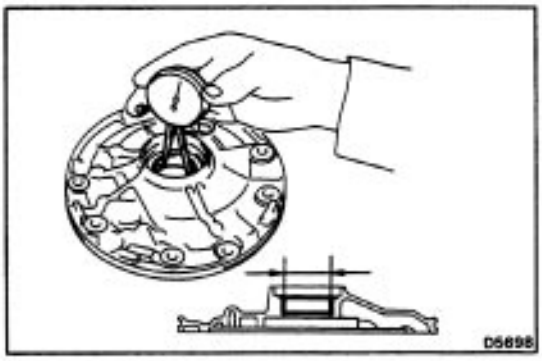
If the thickest gear can not make the side clearance within standard specification, replace the oil pump body **subassembly.**

4. CHECK OIL PUMP BODY BUSHING

Using a dial indicator, measure the inside diameter of the oil pump body bushing.

Maximum inside diameter: 38.18 mm (1.5031 in.)

If the inside diameter is greater than the maximum, replace the oil pump body subassembly.



5. CHECK STATOR SHAFT BUSHINGS

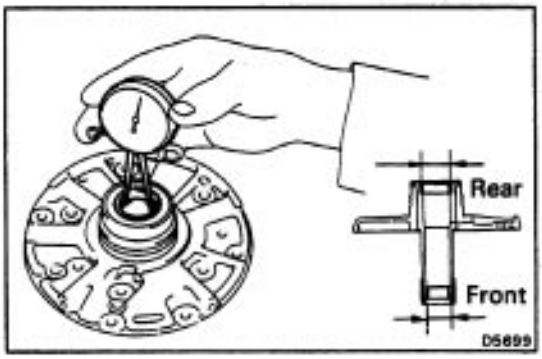
Using a dial indicator, measure the inside diameter of the stator shaft bushings.

Maximum inside diameter:

Front side 21.57 mm (0.8492 in.)

Rear side 27.07 mm (1.0657 in.)

If the inside diameter is greater than the maximum, replace the stator shaft.

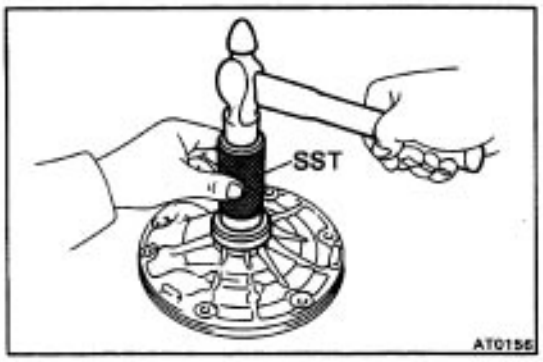


ASSEMBLY OF OIL PUMP

1. INSTALL FRONT OIL SEAL

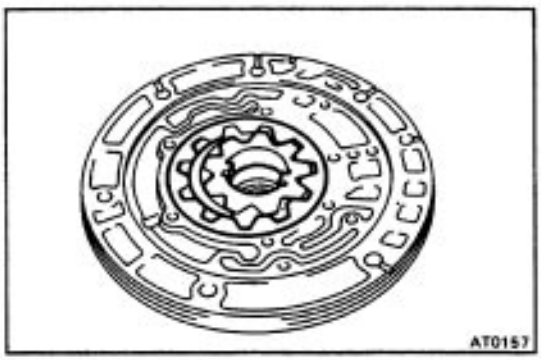
Using SST and a hammer, install a new oil seal. The seal end should be flush with the outer edge of the pump body.

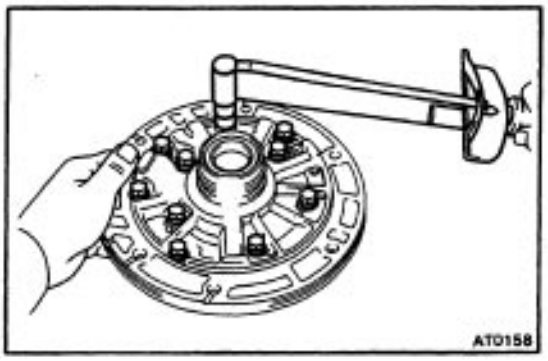
SST 09350–32014 (09351–32140)



2. INSTALL DRIVEN GEAR AND DRIVE GEAR

Make sure the top of the gears are facing upward.



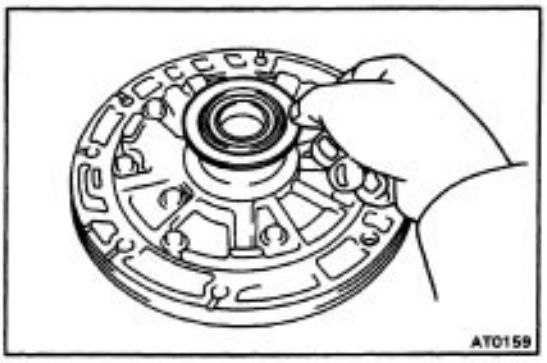


3. INSTALL STATOR SHAFT ONTO PUMP BODY

Align the stator shaft with each bolt hole.

4. TIGHTEN ELEVEN BOLTS

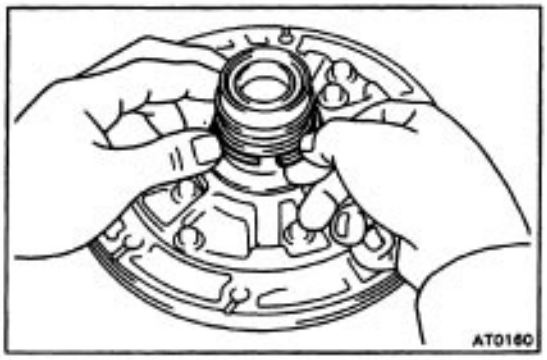
Torque: 100 kg–cm (7 ft–lb, 10 N–m)



5. INSTALL THRUST WASHER

(a) Coat the thrust washer with petroleum jelly.

(b) Align the tab of the washer with the hollow of the pump body.

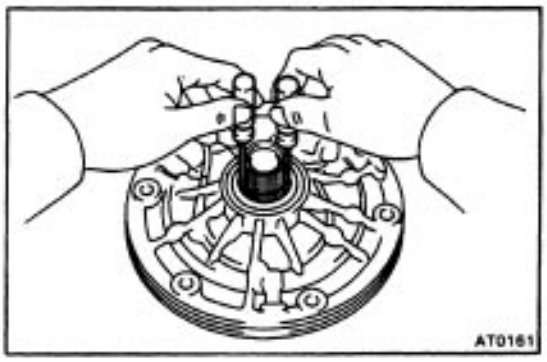


6. INSTALL TWO OIL SEAL RINGS ON OIL PUMP

Spread the rings apart and install them into the groove.

NOTICE: Do not spread the ring ends too much.

HINT: After installing the oil seal rings, check that they move smoothly.



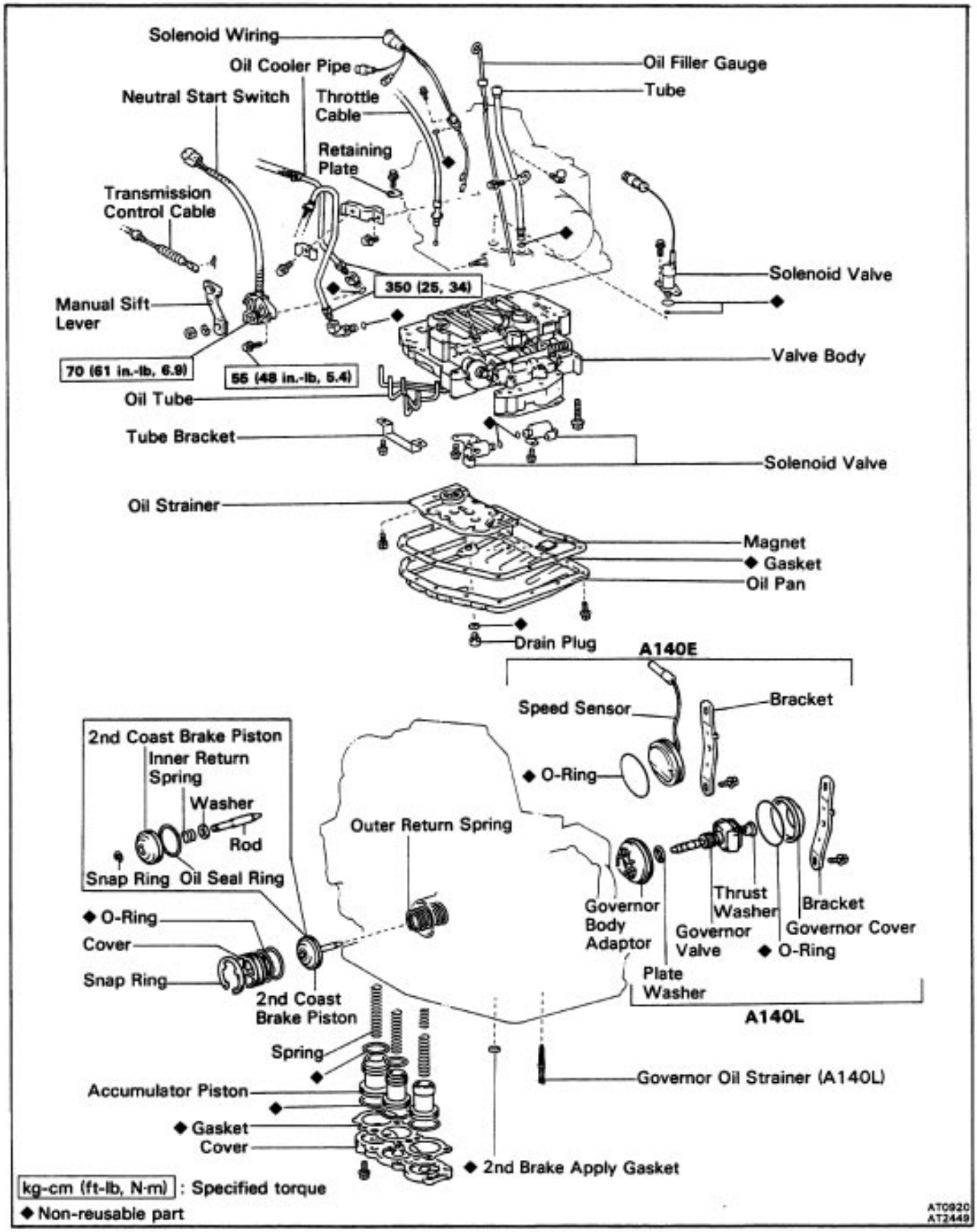
7. CHECK PUMP DRIVE GEAR ROTATION

Turn the drive gear with screwdrivers and make sure that it rotates smoothly.

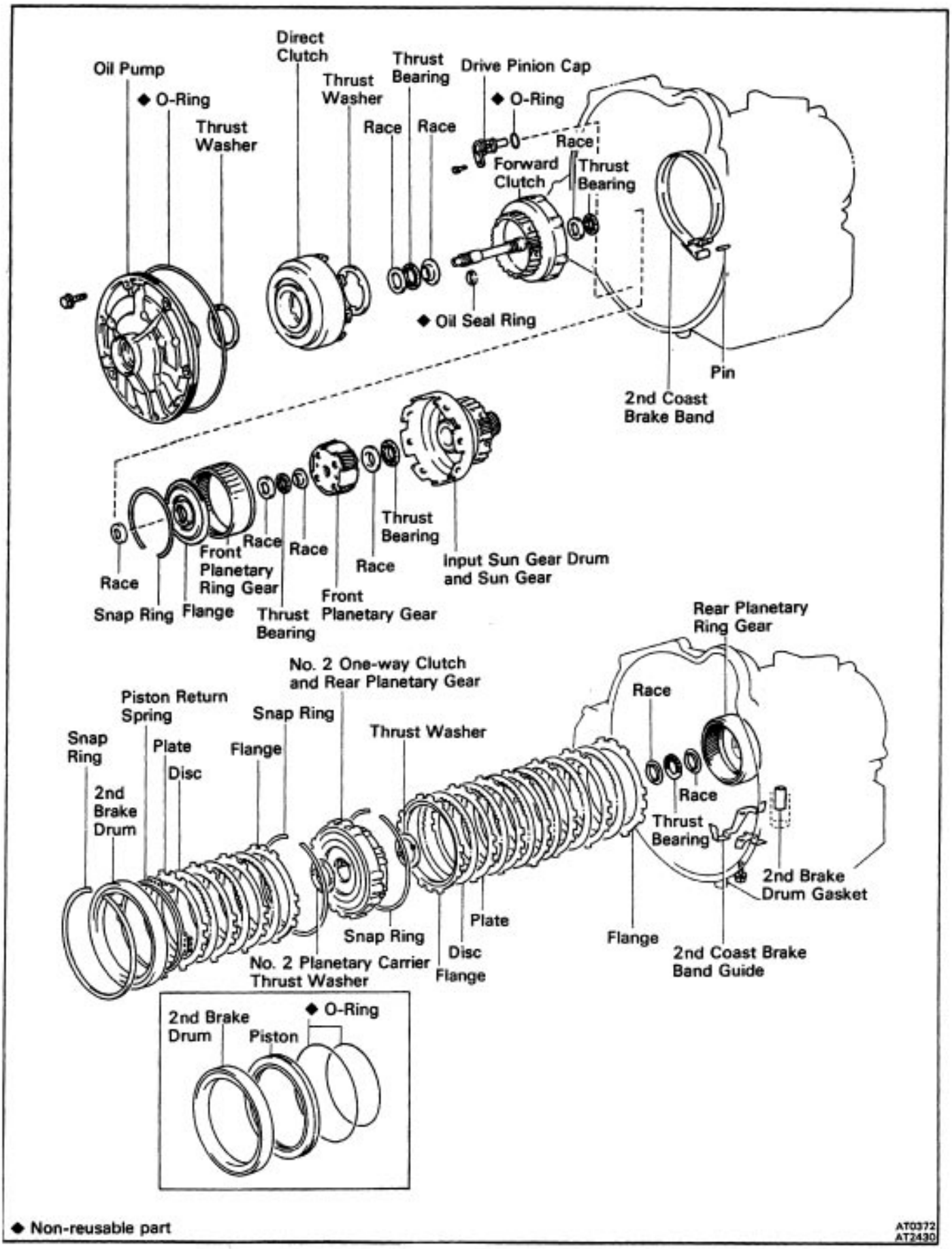
NOTICE: Be careful not to damage the oil seal lip.

REMOVAL OF COMPONENT PARTS

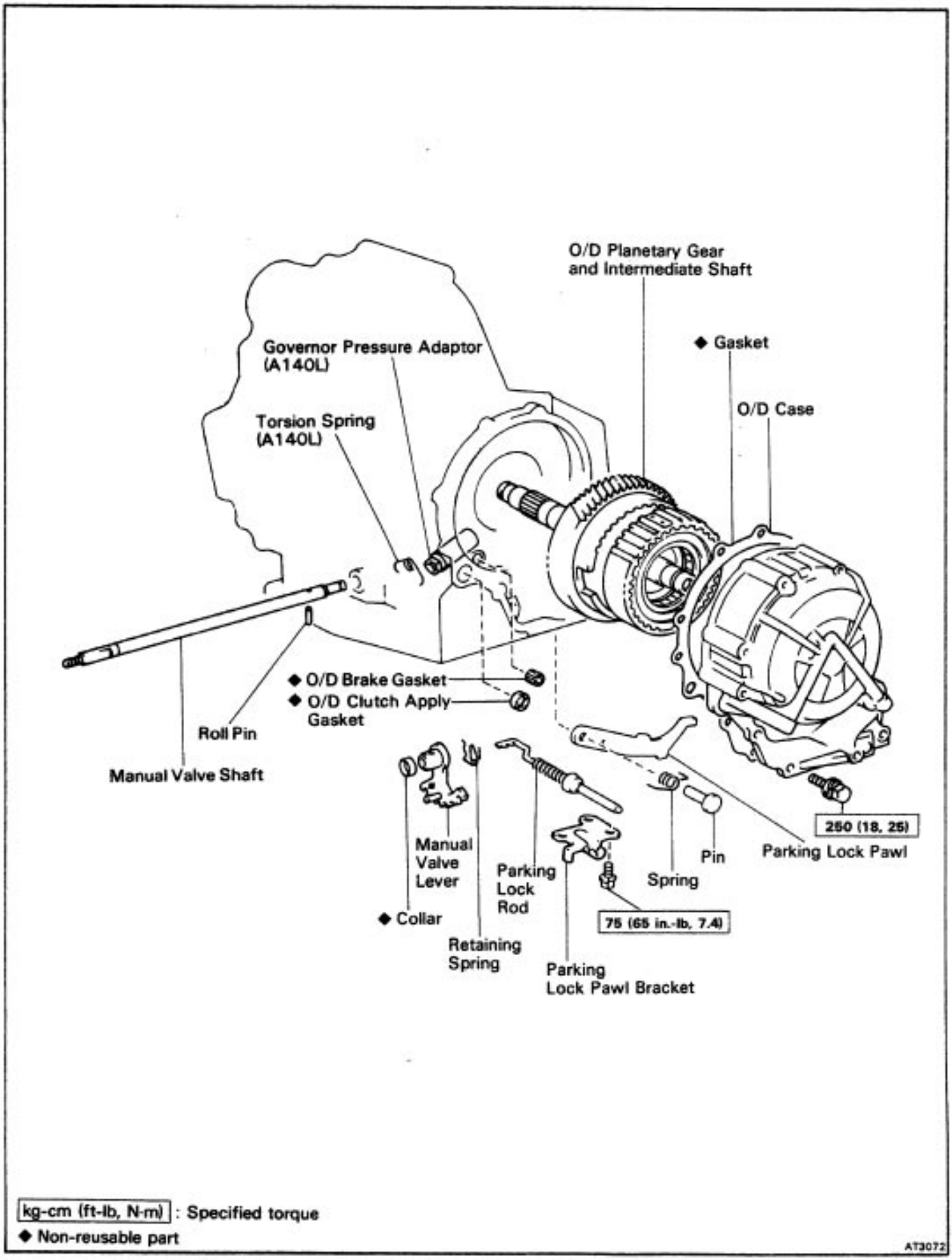
COMPONENTS



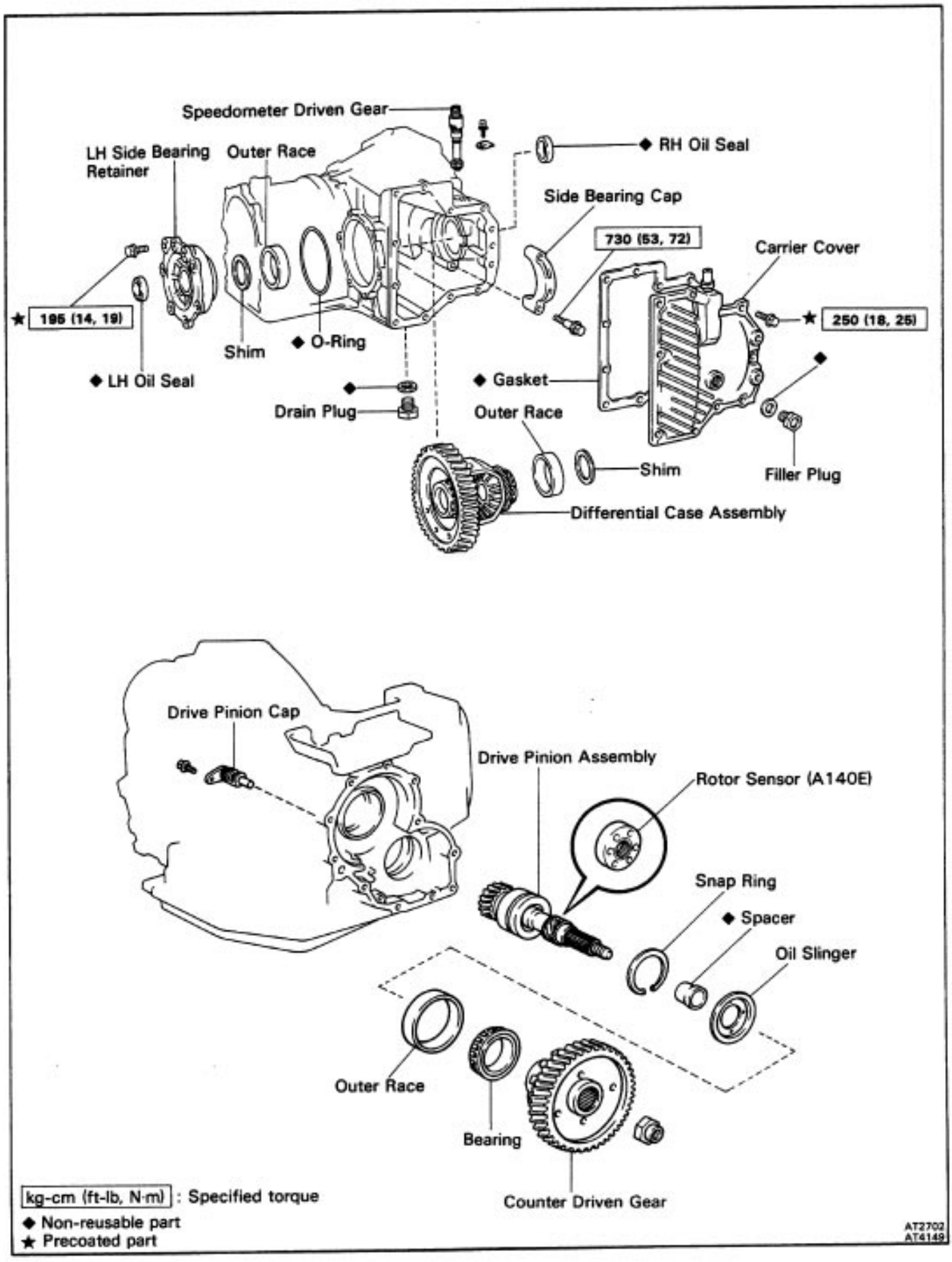
COMPONENTS (Cont'd)

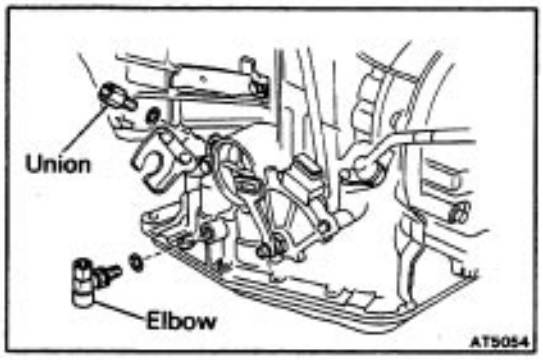


COMPONENTS (Cont'd)



COMPONENTS (Cont'd)



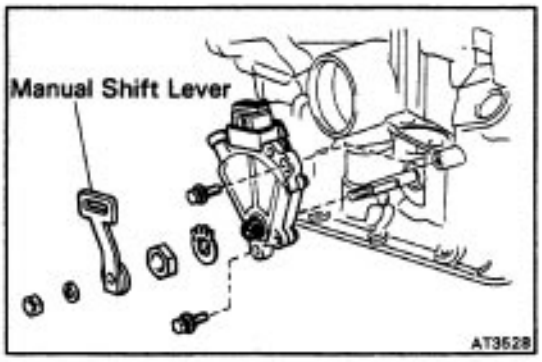


SEPARATE BASIC SUBASSEMBLY

1. REMOVE UNION AND ELBOW

(a) Using the open end wrench, remove the union and elbow.

(b) Remove the O–rings from the union and elbow.

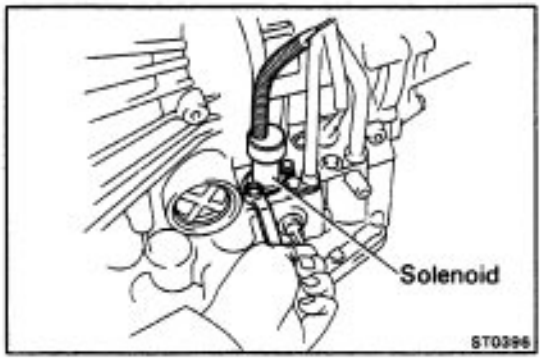


2. REMOVE NEUTRAL START SWITCH

(a) Remove the manual shift lever.

(b) Pry off the lock washer and remove the manual valve shaft nut.

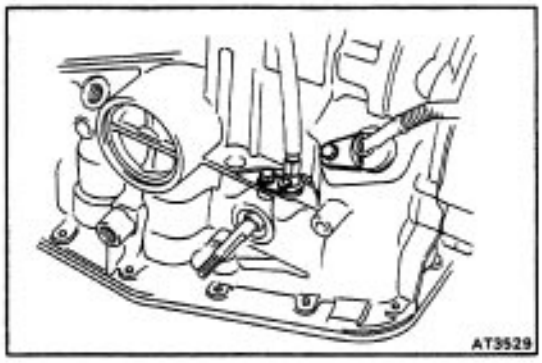
(c) Remove the two bolts and pull out the neutral start switch.



3. REMOVE SOLENOID

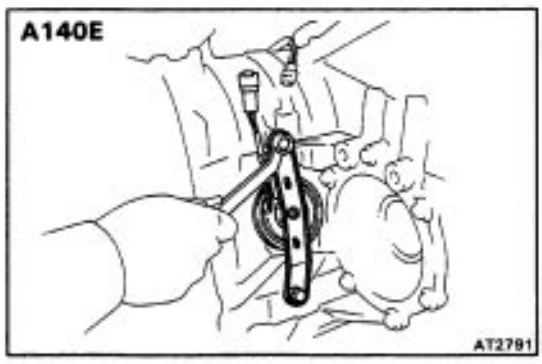
(a) Disconnect connector.

(b) Remove the two bolts and solenoid.



4. REMOVE THROTTLE CABLE RETAINING PLATE

5. REMOVE SOLENOID WIRE RETAINING BOLT

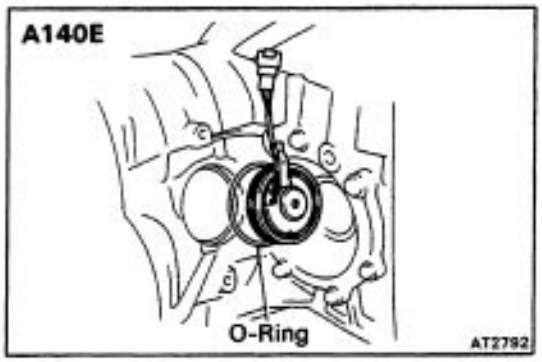


6. (A140E)

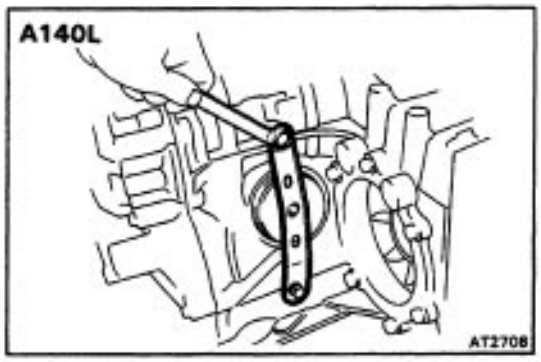
REMOVE NO. 2 SPEED SENSOR

(a) Disconnect the speed sensor connector.

(b) Remove the two bolts and cover bracket.



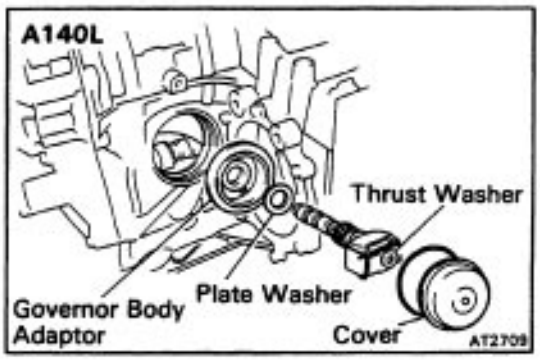
(c) Remove the speed sensor.



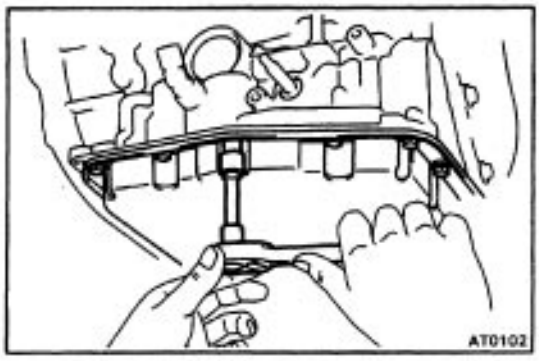
7. (A 140 L)

REMOVE GOVERNOR BODY

(a) Remove the two bolts and cover bracket.



(b) Remove the governor cover.
(c) Remove the governor body and thrust washer.
(d) Remove the plate washer and governor body adaptor.

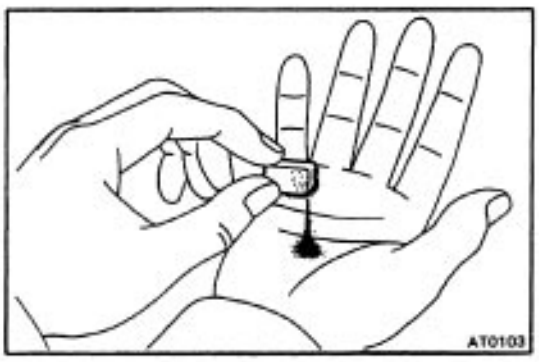


8. REMOVE OIL PAN AND GASKET

(a) Remove the fifteen bolts.
(b) Remove the oil pan by lifting transmission case.

NOTICE: Do not turn the transmission over as this will contaminate the valve body with the foreign materials in the bottom of the oil pan.

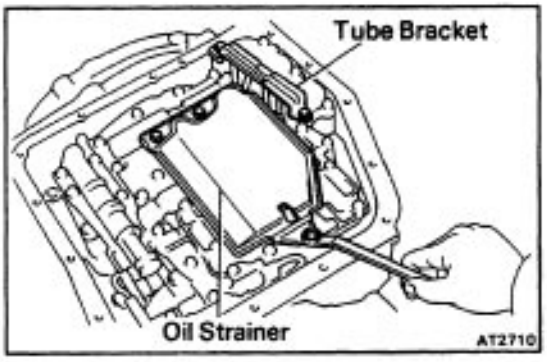
(c) Place the transmission on wooden blocks to prevent damage to the tube bracket.



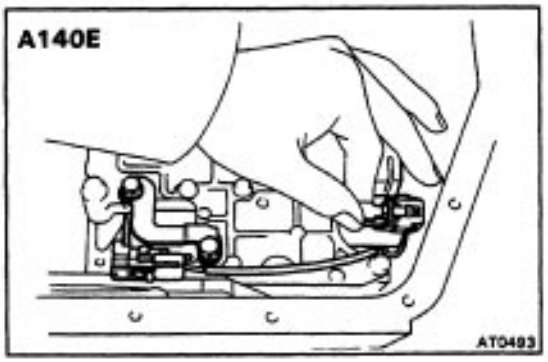
9. EXAMINE PARTICLES IN PAN

Remove the magnets and use them to collect any steel chips. Look carefully at the chips and particles in the oil pan and on the magnets to anticipate what type of wear you will find in the transmission:

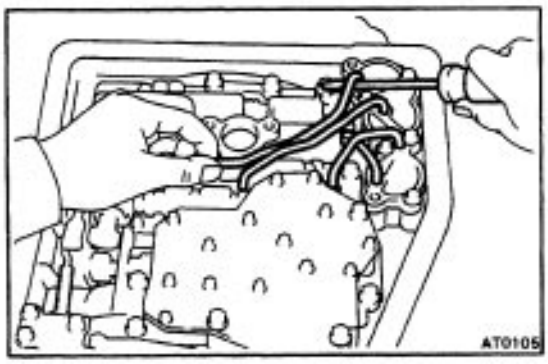
Steel (magnetic) ...bearing, gear and plate wear
Brass (non–magnetic) ...bushing wear



14. REMOVE TUBE BRACKET AND OIL STRAINER

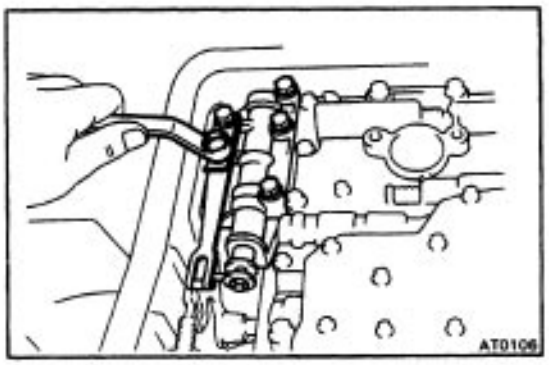


11. (A140E)
DISCONNECT SOLENOID CONNECTORS

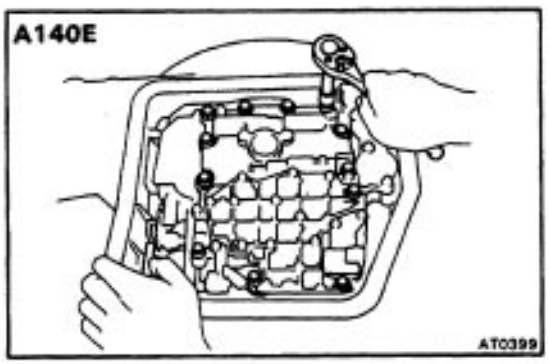


12. REMOVE OIL TUBES

Pry up both tube ends with a large screwdriver and remove the four tubes.



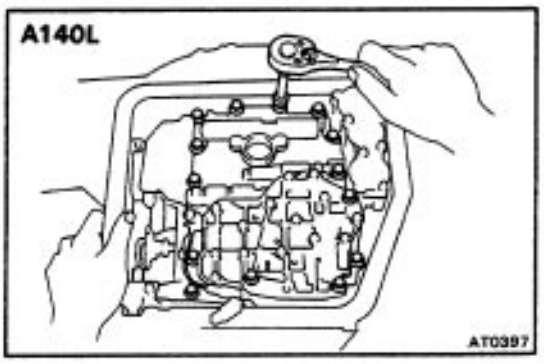
13. REMOVE MANUAL DETENT SPRING
14. REMOVE MANUAL VALVE AND MANUAL VALVE BODY



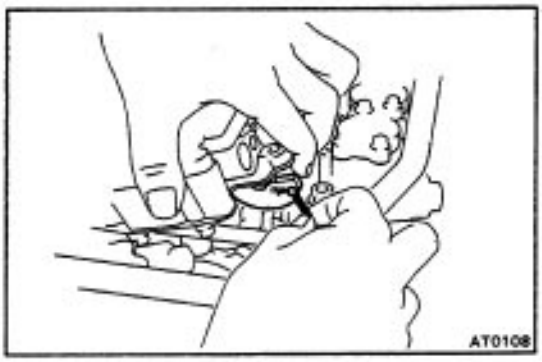
15. REMOVE VALVE BODY

(a) (A140E)

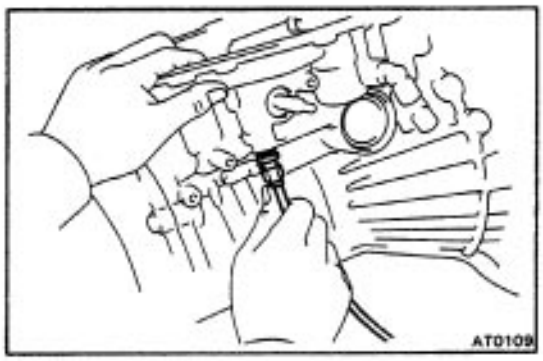
Remove the twelve bolts.



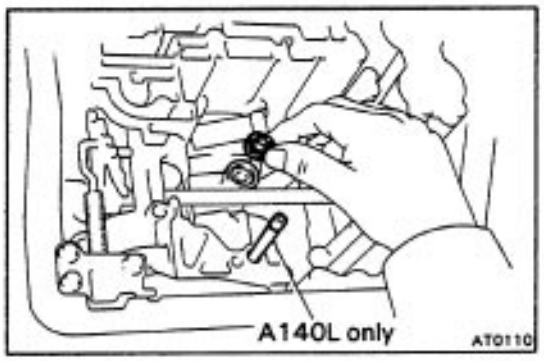
(b) (A140L)
Remove the fourteen bolts.



(e) Disconnect the throttle cable from the cam and remove the valve body.

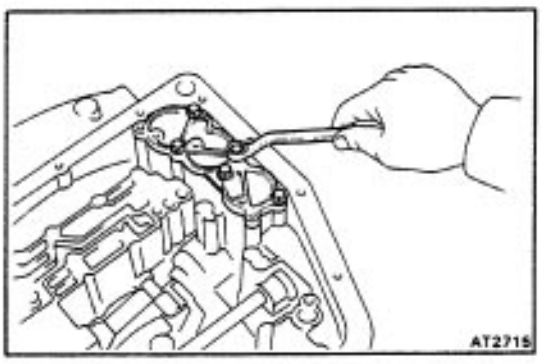


16. REMOVE THROTTLE CABLE AND SOLENOID WIRING FROM CASE



17. REMOVE SECOND BRAKE APPLY GASKET AND GOVERNOR OIL STRAINER

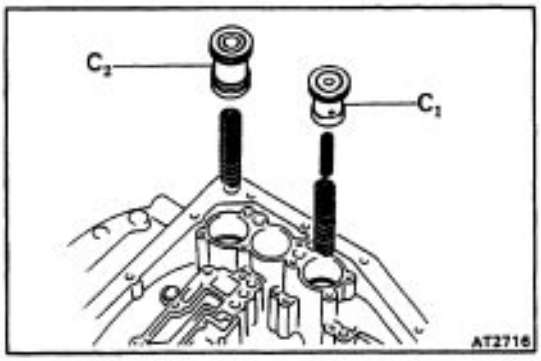
HINT: Governor oil strainer...A140L only



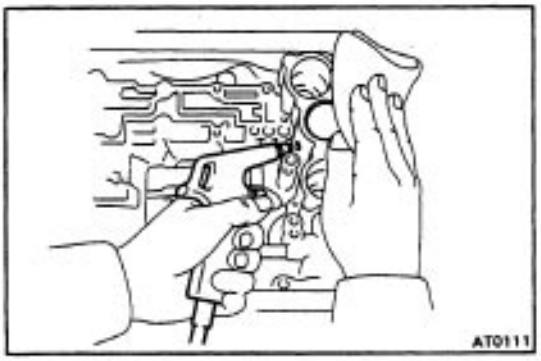
18. REMOVE ACCUMULATOR PISTON AND SPRINGS

(a) Loosen the five bolts one turn at a time until the spring tension is released.

(b) Remove the cover and gasket.



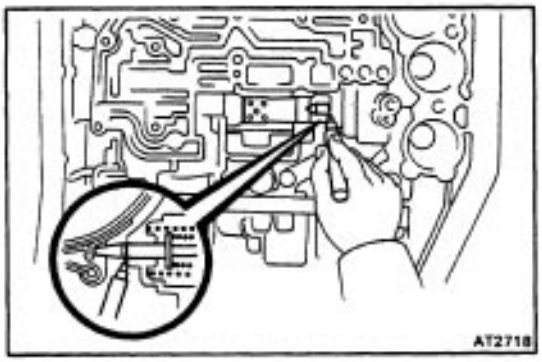
(c) Remove the piston and spring for C1 and C2.
(d) Remove the O–rings.



(e) Pop out piston B2 into a rag, using low–pressure compressed air 0 kg/cm2, 14 psi or 98 kPa1. Force air into the hole shown and remove the piston and spring.
(f) Remove the two O–rings from the B2 piston.

19. MEASURE PISTON STROKE OF SECOND COAST BRAKE

(a) Apply a small amount of paint to the piston rod at the point it meets the case as shown in the illustration.

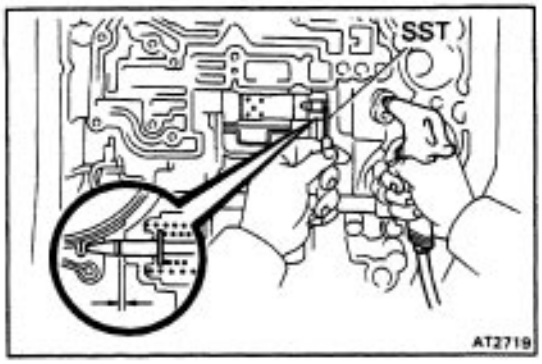


(b) Using SST, measure the piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi or 392 – 785 kPa) as shown.

SST 09240–00020

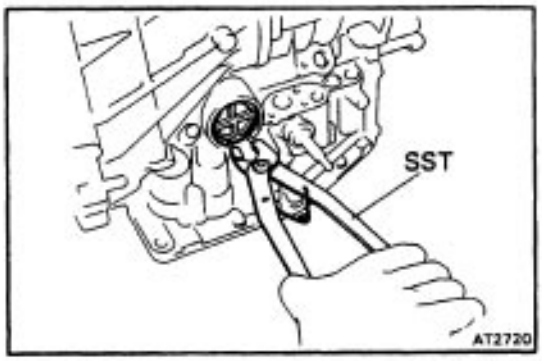
Piston stroke: 1.5 – 3.0 mm (0.059 – 0.118 in.)

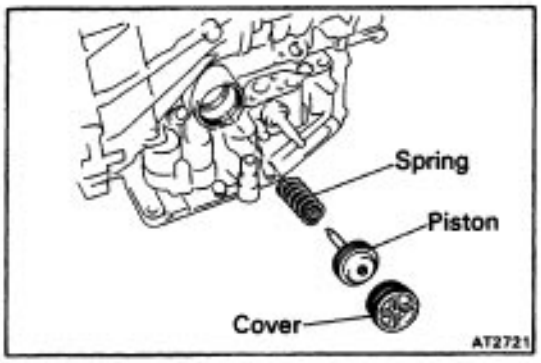
If the piston stroke exceeds the limit, replace the piston rod or brake band.



20. REMOVE SECOND COAST BRAKE PISTON

(a) Using SST, remove the snap ring.
SST 09350–32014 (09351–32050)



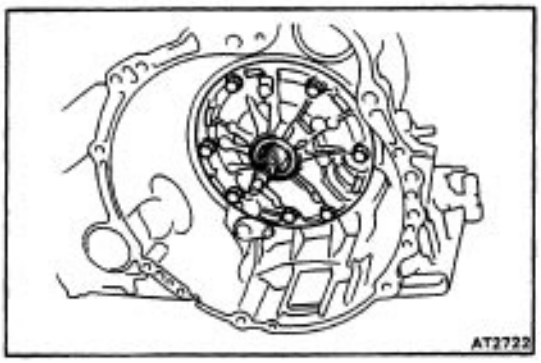


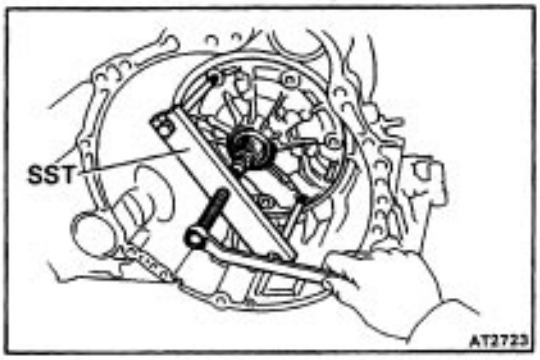
(b) Remove the cover.
(c) Remove the piston and outer return spring.
(d) Remove the O–ring from the cover.

21. REMOVE OIL PUMP AND DIRECT CLUTCH

NOTICE: Before removing the oil pump, remove the second coast brake piston.

(a) Remove the seven bolts. .



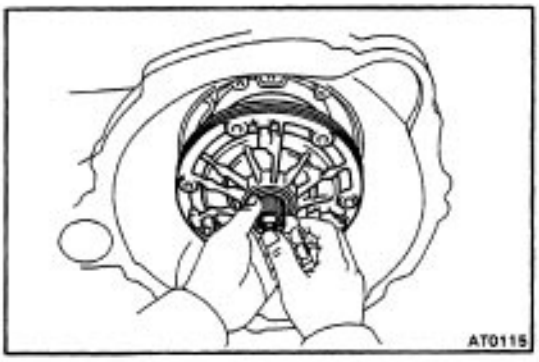


(b) Using SST, pull out the oil pump from the transmission case.
SST 09350–32014 (09351–32061)

22. REMOVE OIL PUMP AND DIRECT CLUTCH

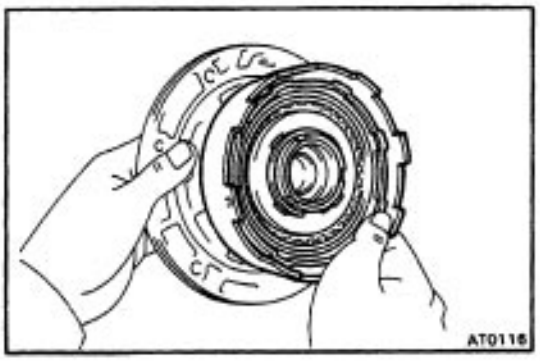
While holding the input shaft, grasp the pump stator shaft and pull the oil pump and direct clutch together out the transmission case.

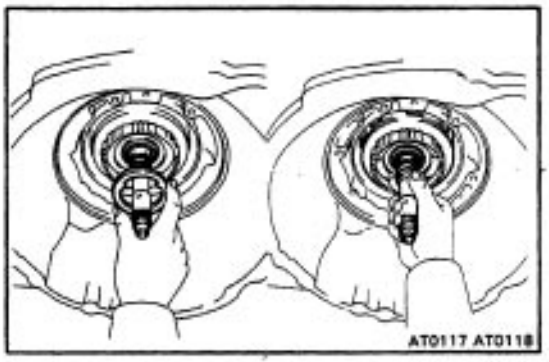
NOTICE: Push the 2nd coast brake band into the case, being careful not to catch it on the direct clutch
drum.



23. REMOVE DIRECT CLUTCH FROM OIL PUMP

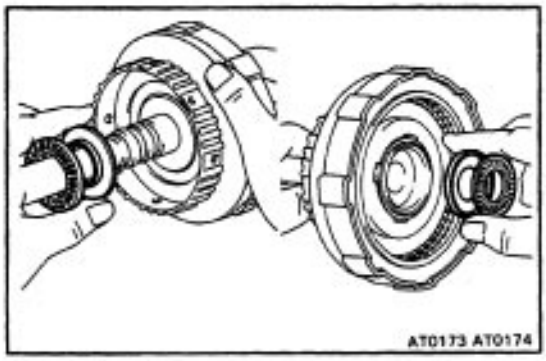
24. BE CAREFUL WHEN REMOVING RACE BEHIND OIL PUMP



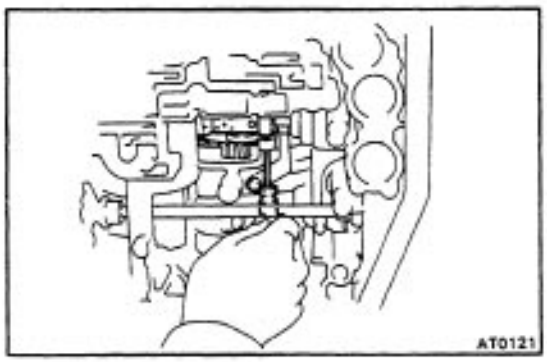


25. REMOVE CLUTCH DRUM THRUST WASHER

26. REMOVE FORWARD CLUTCH



27. REMOVE BEARINGS AND RACES FROM FORWARD CLUTCH

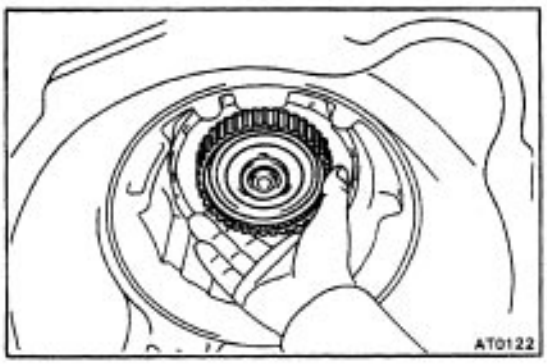


28. REMOVE SECOND COAST BRAKE BAND

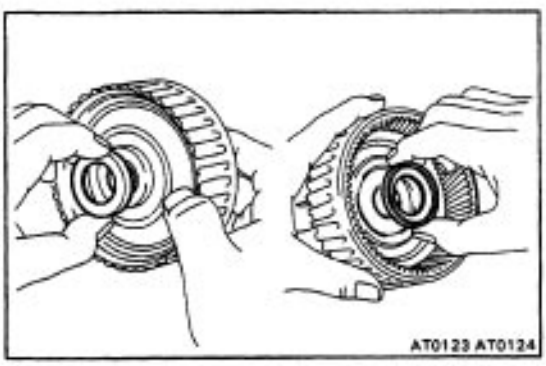
(a) Push the pin with a small screwdriver and remove it from the bolt hole of the oil pump mounting.

(b) Remove the brake band.

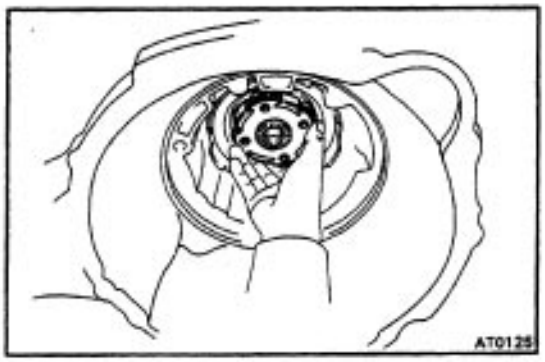
HINT: The method of inspection, refer to page AT–80.



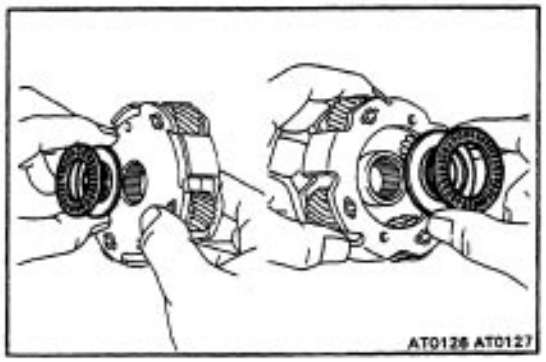
29. REMOVE FRONT PLANETARY RING GEAR



30. REMOVE BEARING RACES FROM FRONT PLANETARY RING GEAR

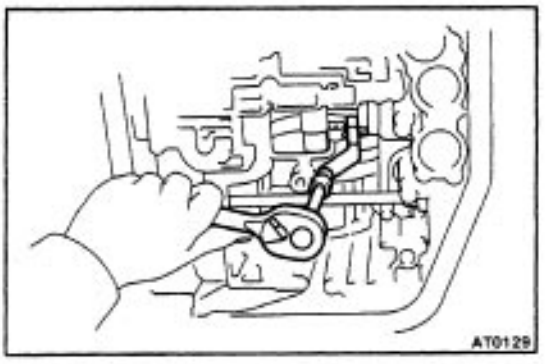


31. REMOVE PLANETARY GEAR

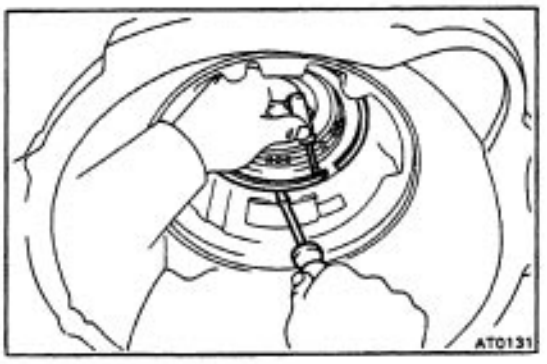


32. REMOVE RACES AND BEARINGS FROM PLANETARY GEAR

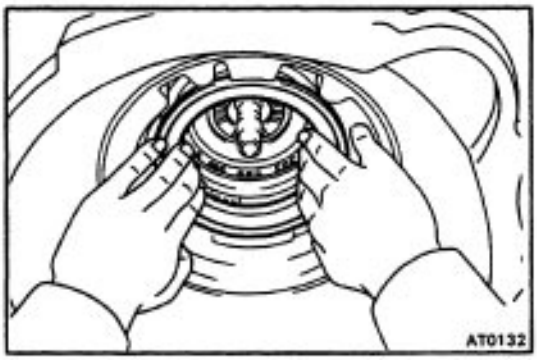
33. REMOVE SUN GEAR, SUN GEAR INPUT DRUM, SECOND BRAKE HUB AND NO. 1 ONE–WAY CLUTCH



34. STAND TRANSMISSION CASE UP AND REMOVE SECOND COAST BRAKE BAND GUIDE

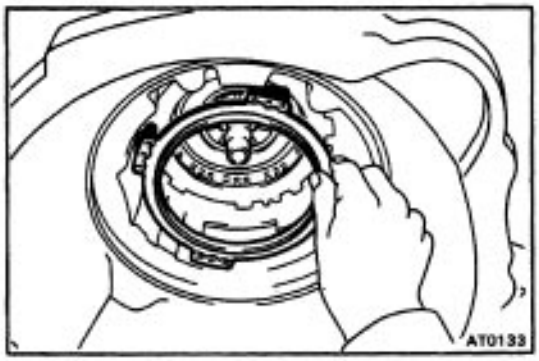


35. REMOVE SNAP RING HOLDING SECOND BRAKE DRUM TO CASE

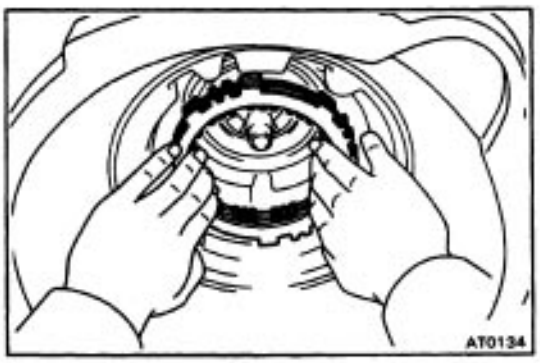


36. REMOVE SECOND BRAKE DRUM

If the brake drum is difficult to remove, lightly tap it with a wooden block.

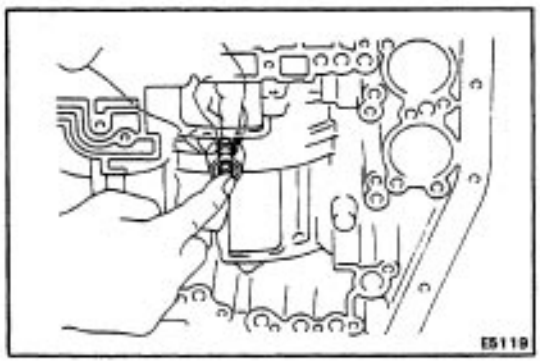


37. REMOVE SECOND BRAKE PISTON RETURN SPRING

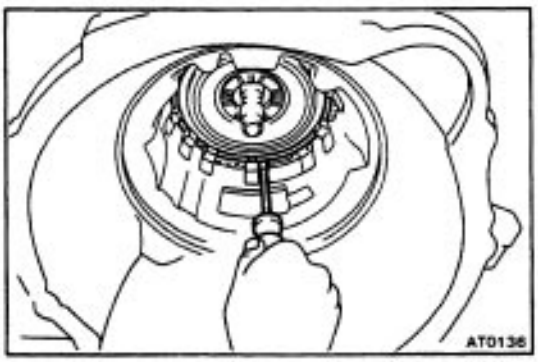


38. REMOVE PLATES, DISCS AND FLANGE

HINT: For the method of inspection, refer to AT–100.

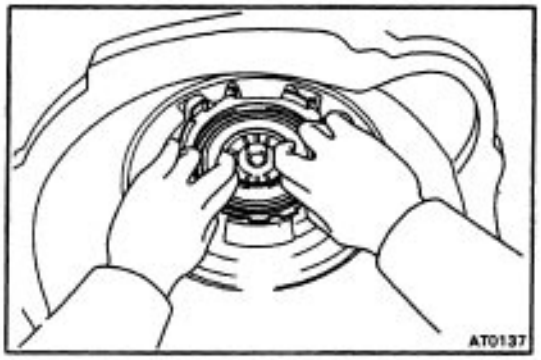


39. REMOVE SECOND BRAKE DRUM GASKET

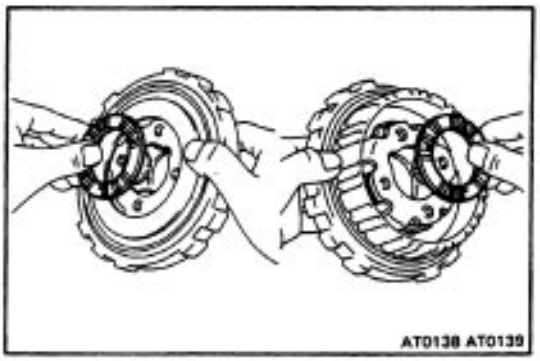


40. REMOVE SNAP RING HOLDING NO. 2 ONE–WAN CLUTCH OUTER RACE TO CASE

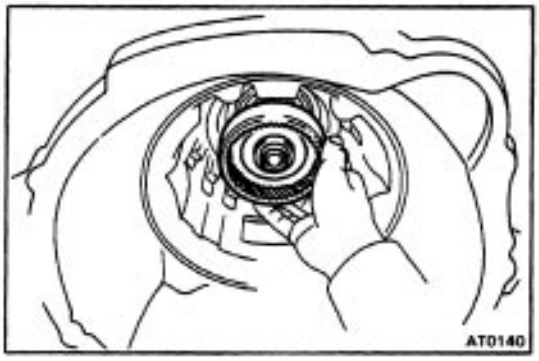
41. REMOVE NO. 2 ONE–WAY CLUTCH AND REAR PLANETARY GEAR



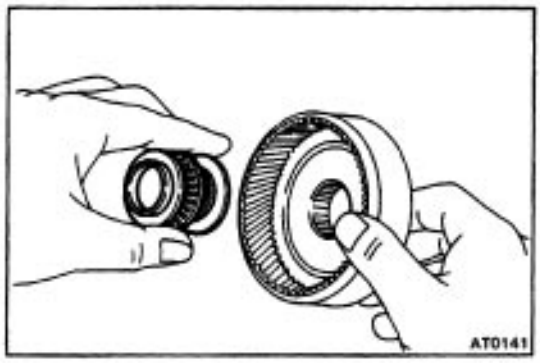
42. BE CAREFUL WHEN REMOVING THRUST WASHERS FROM BOTH SIDES OF PLANETARY CARRIER



43. REMOVE REAR PLANETARY RING GEAR



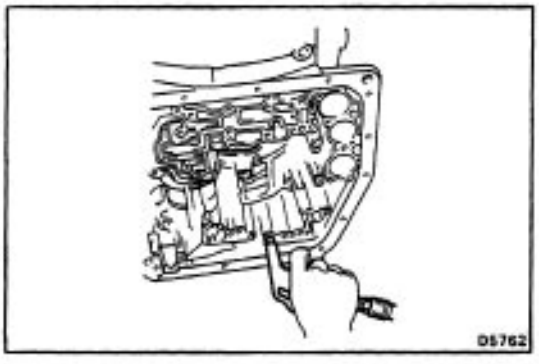
44. REMOVE BEARINGS AND RACES

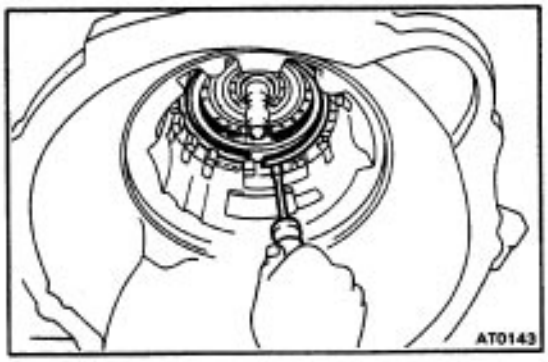


45. CHECK OPERATION OF FIRST AND REVERSE BRAKE PISTON

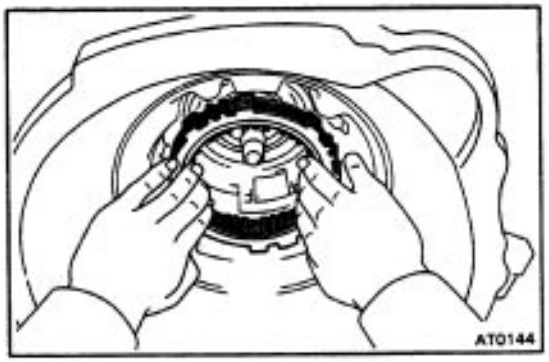
Apply compressed air into the case passage and confirm that the piston moves.

If the piston does not move, disassemble and inspect.





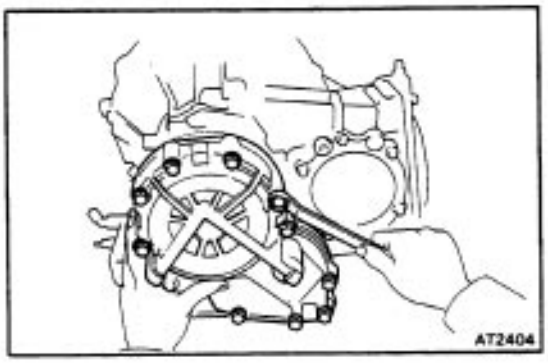
46. REMOVE SNAP RING HOLDING FLANGE TO CASE



47. REMOVE FLANGES. PLATES AND DISCS

48. TURN TRANSMISSION CASE AROUND

49. REMOVE ELEVEN BOLTS HOLDING OVERDRIVE UNIT TO TRANSMISSION CASE

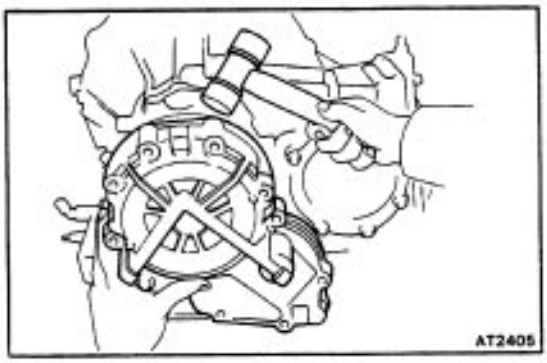


50. REMOVE OVERDRIVE UNIT WITH ALL PARTS

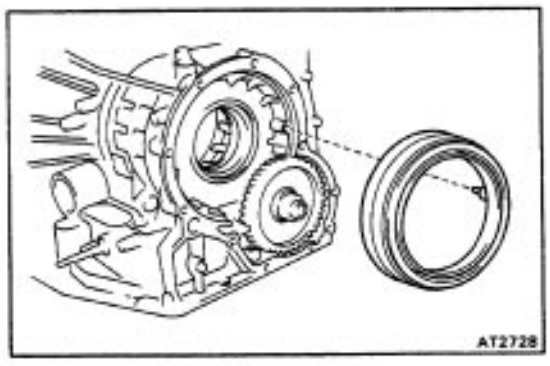
(a) Tap on the overdrive case circumference with¿plastic hammer to remove the unit from the transmis. sion case.

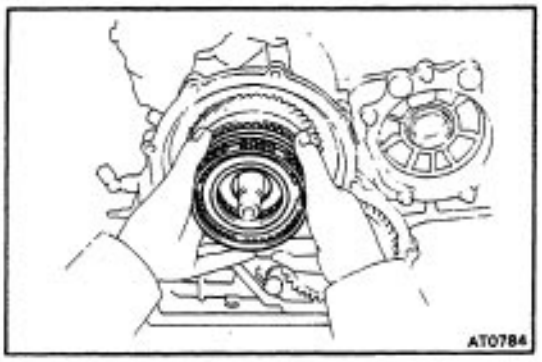
(b) Remove the overdrive planetary gear and counter gear if they remained in the transmission.

HINT: The overdrive unit is heavy, so be careful not tc drop it.

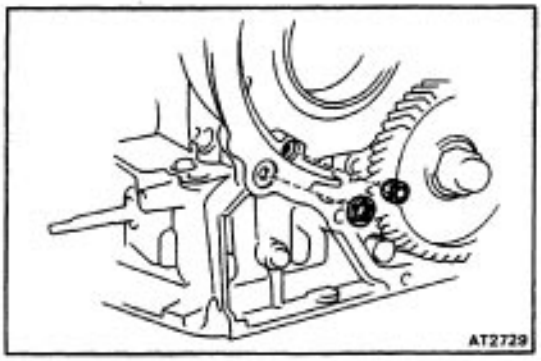


(c) Remove the overdrive brake drum from the transmission case.

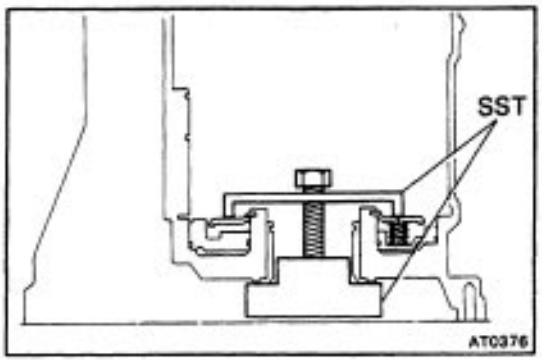




(d) Remove the overdrive planetary gear and counter gear if they remain in the transmission.

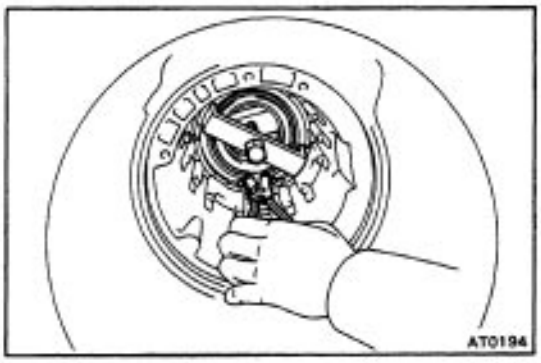


51. REMOVE– OVERDRIVE CLUTCH APPLY GASKET AND OVERDRIVE BRAKE APPLY GASKET

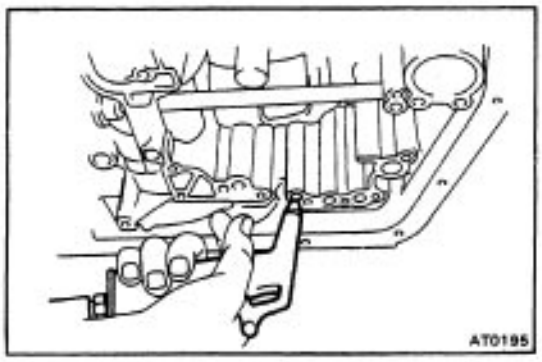


52. REMOVE PISTON RETURN SPRING

(a) Place SST, and compress the return springs evenly by tightening the bolt gradually.
SST 09350–32014 (09351–32040)



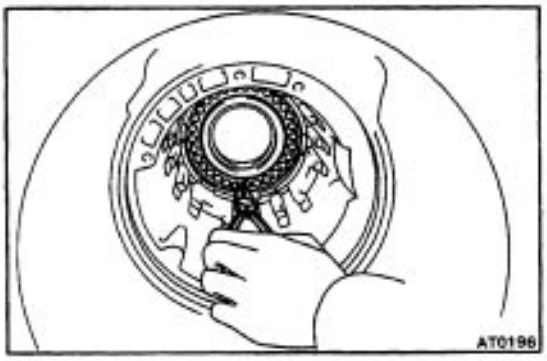
(b) Using snap ring pliers, remove the snap ring.
(c) Remove SST.
(d) Remove the return spring from the case.



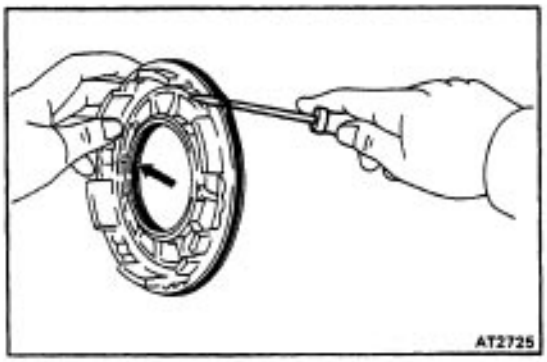
53. REMOVE FIRST AND REVERSE BRAKE PISTON

(a) Apply compressed air into the passage of the case to remove the piston.

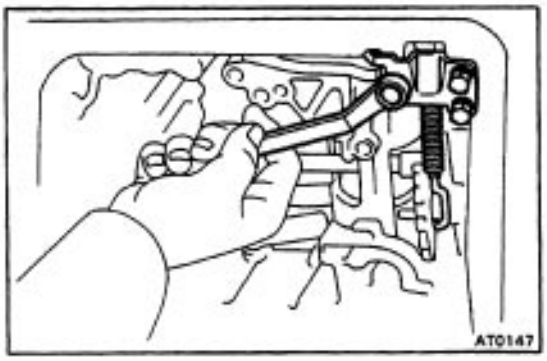
HINT: Hold the piston so it is not slanted and blow with the gun ’slightly away from the oil hole.



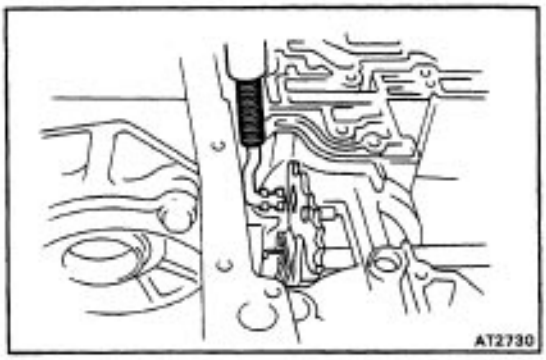
(b) If the piston does not pop out with compressed air, use needle–nose pliers to remove it.



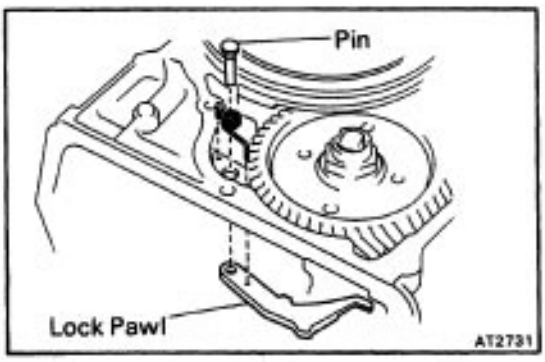
(c) Remove the two O–rings from the piston.



54. REMOVE PARKING LOCK PAWL BRACKET



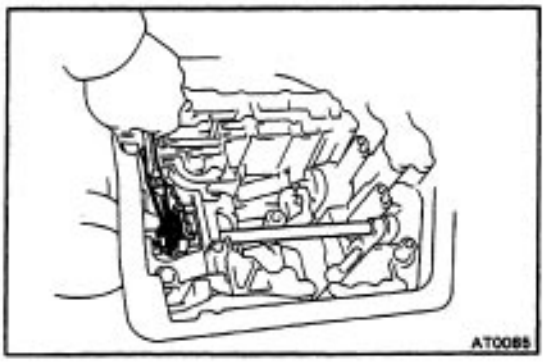
55. REMOVE PARKING LOCK ROD

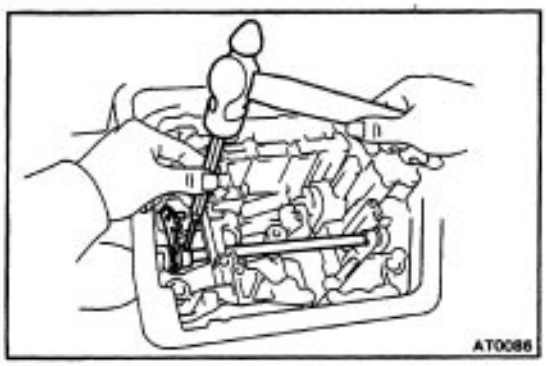


56. REMOVE PIN, SPRING AND PARKING LOCK PAWL

57. REMOVE MANUAL VALVE SHAFT

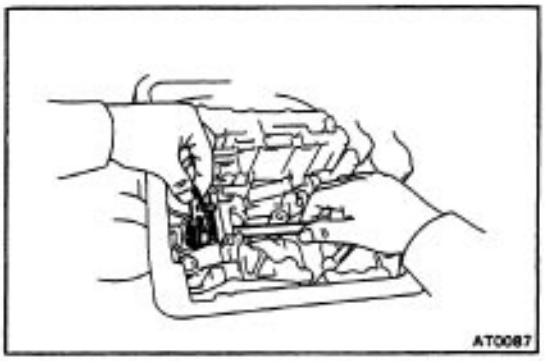
(a) Remove the retaining spring.





(b) Using a hammer and chisel, pry and turn the collar.

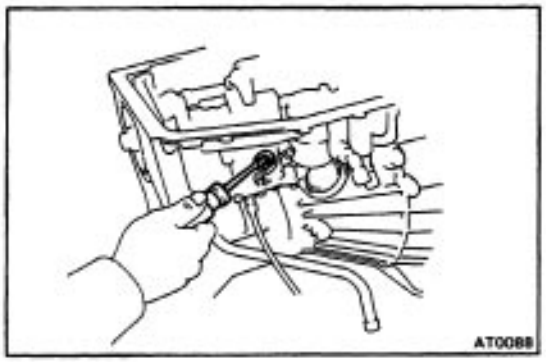
(c) Using a hammer and punch, drive out the pin.



(d) Slide out the shaft and remove the manual valve lever from the case.

58. REMOVE MANUAL SHAFT OIL SEAL

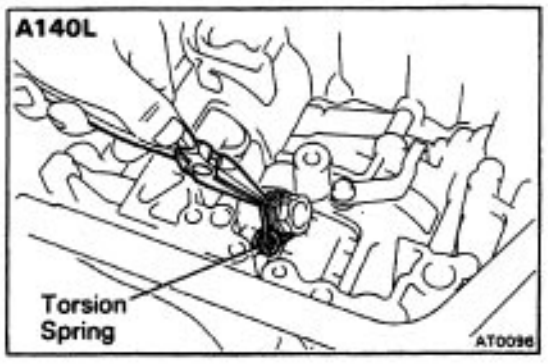
Remove the oil seal with a screwdriver.

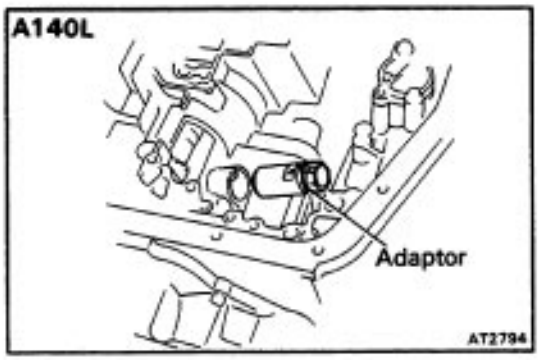


59. (A140L)

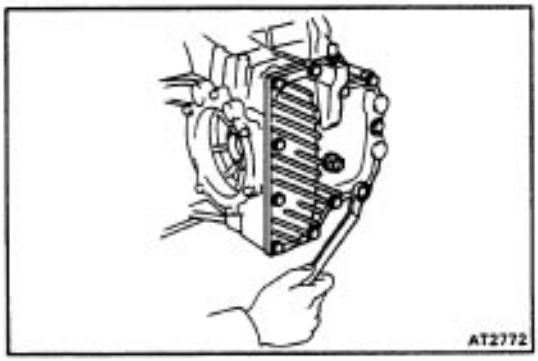
REMOVE GOVERNOR PRESSURE ADAPTOR

(a) Remove the torsion spring with long nose pliers.



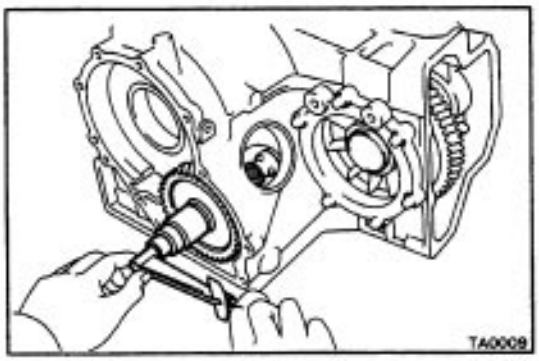


(b) Remove the governor pressure adaptor from the case.



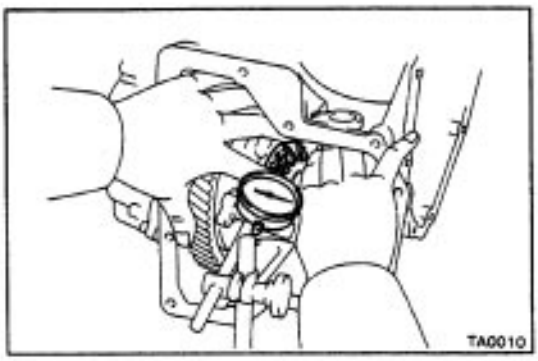
DISASSEMBLY OF DIFFERENTIAL

1. REMOVE CARRIER COVER



2. MEASURE TOTAL PRELOAD

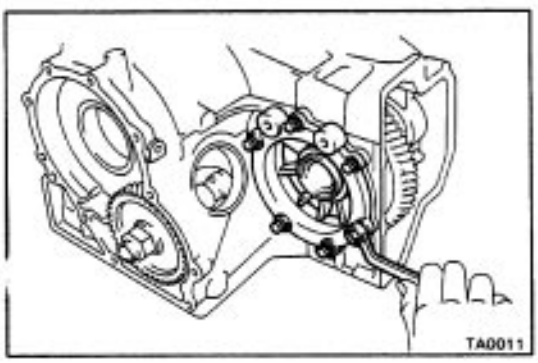
Using a torque meter, measure the total preload, and note the measurement value.



3. MEASURE BACKLASH OF SIDE GEAR

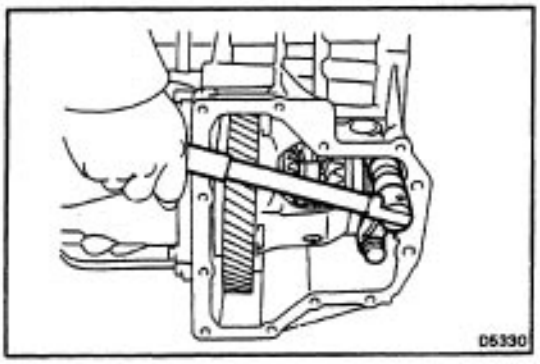
Measure each side gear backlash while holding one pinion toward the case.

Standard backlash:
0.05 – 0.20 mm (0.0020 – 0.0079 in.)



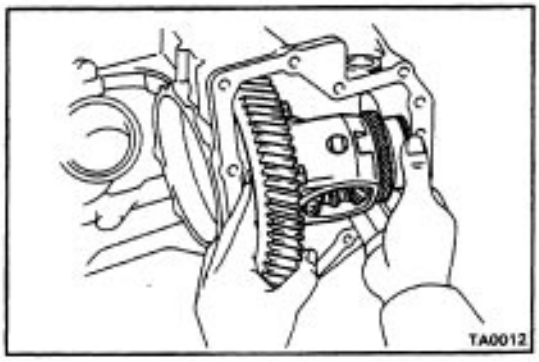
4. REMOVE LH BEARING RETAINER

(a) Remove the six bolts.
(b) Tap the retainer with a plastic hammer to remove it
(c) Remove the O–ring from the retainer.



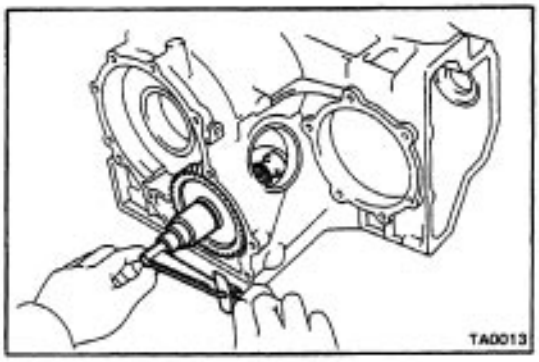
5. REMOVE RH SIDE BEARING CAP

Remove the two bolts and the side bearing cap.



6. REMOVE DIFFERENTIAL CASE, OUTER RACE AND ADJUSTING SHIM

Remove the differential case, the outer race and the adjusting shim from the case.



7. MEASURE DRIVE PINION PRELOAD

Using a torque meter, measure the drive pinion preload.

Preload (at starting):

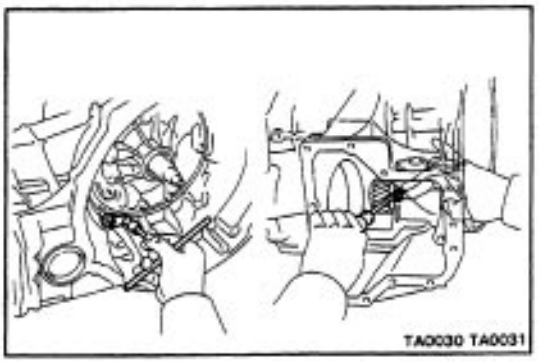
Reused bearing 5 – 8 kg–cm

(4.3 – 6.9 in.–lb, 0.5 – 0.8 N–m)

The total preload measured in step 2 minus the drive pinion preload equals 1.5 – 2.0 kg–cm 0.3 – 1.7 in.–lb, 0.1 –0.2N–m).

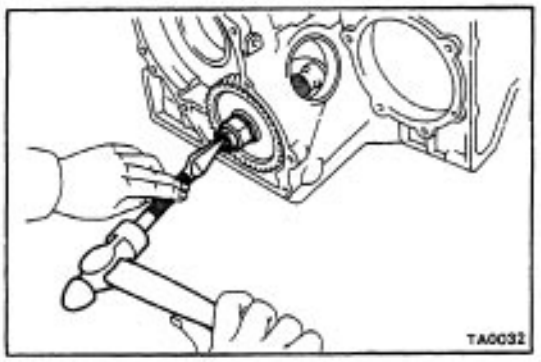
If the result is not within this specification, the side bearing preload is bad.

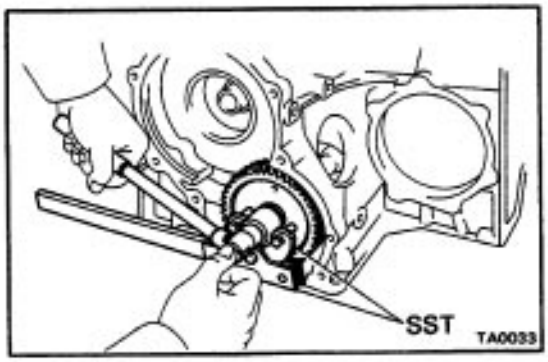
8. REMOVE DRIVE PINION CAP



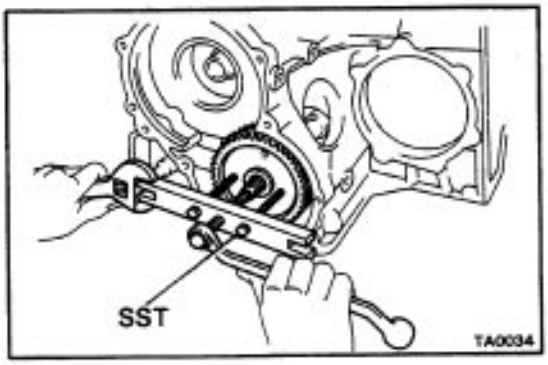
9. REMOVE COUNTER DRIVEN GEAR

(a) Using a chisel, loosen the staked part of the nut.

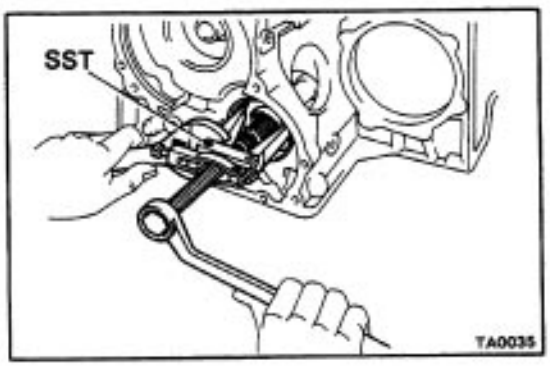




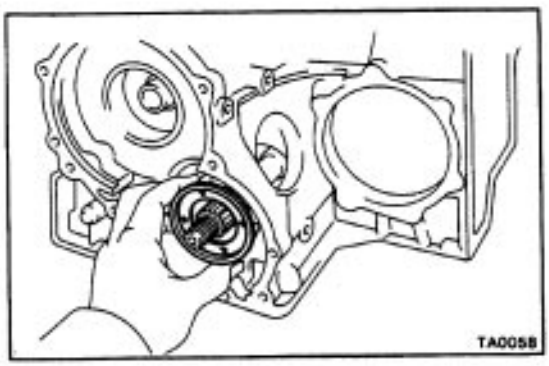
(b) Install SST onto the gear.
SST 09350–32014 (09351–32031)
(c) Using SST to hold the gear, remove the nut.
SST 09330–00021



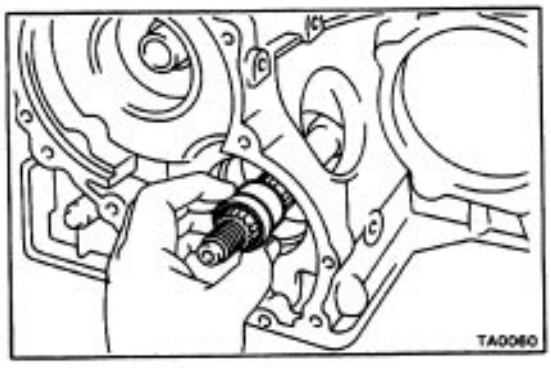
(d) Using SST, remove the gear and bearing.
SST 09350–32014 (09351–32061)



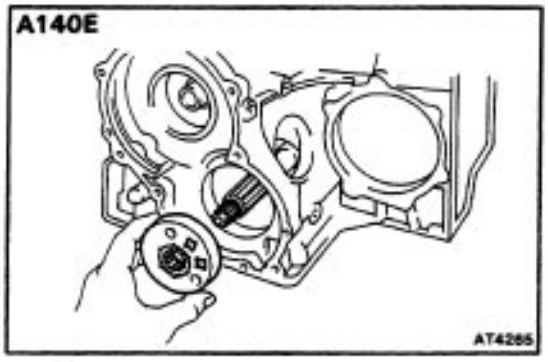
10. REMOVE OUTER RACE FROM CASE
Using SST, remove the outer race.
SST 09350–32014 (09308–10010)



11. REMOVE OIL SLINGER



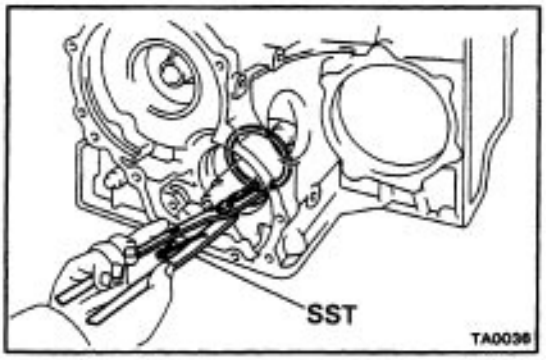
12. REMOVE SPACER

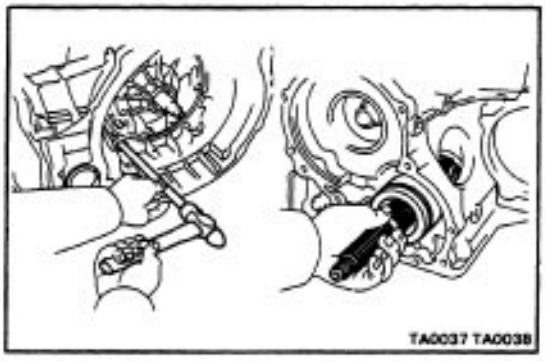


13. (A140E)
REMOVE ROTOR SENSOR

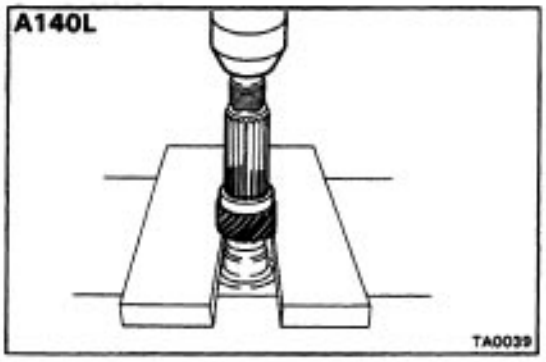
14. REMOVE DRIVE PINION

(a) Using SST, remove the snap ring.'
SST 09350–32014 (09351–32050)

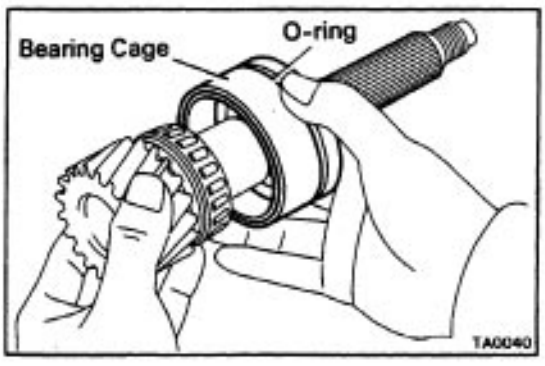




(b) Insert a brass bar into case hole to tap out the drive pinion.
(c) Tap the drive pinion and remove the bearing cage from the bore.

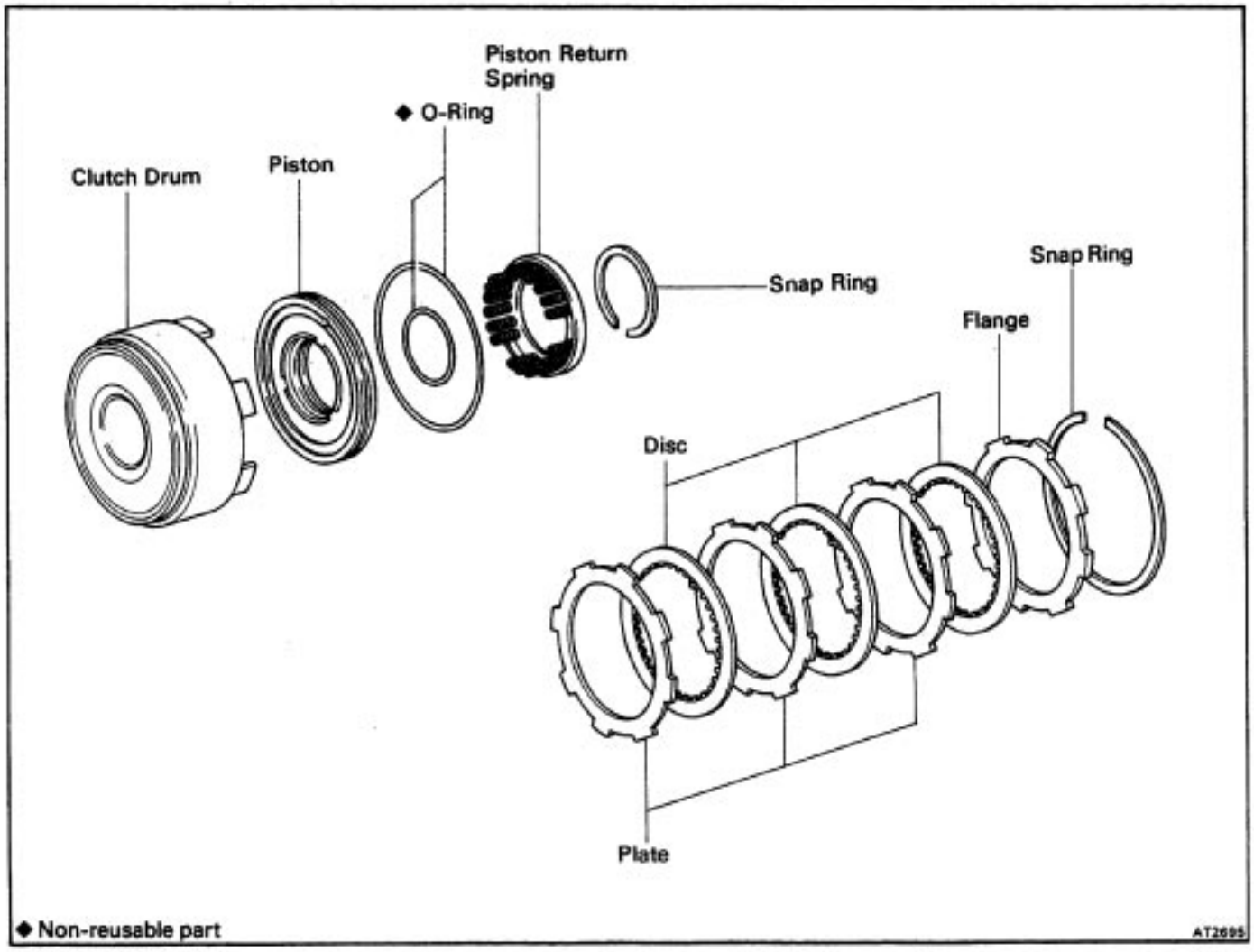


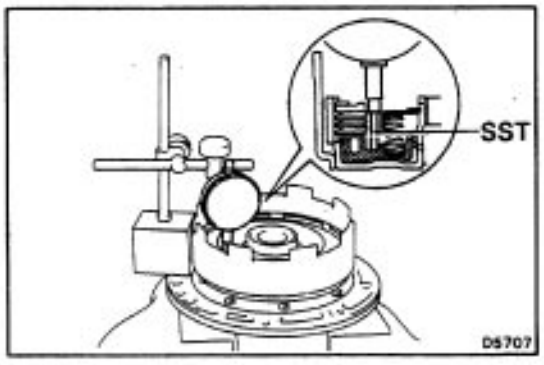
15. (A140L)
REMOVE GOVERNOR BODY DRIVE GEAR
Using a press, press out the governor body drive gear.

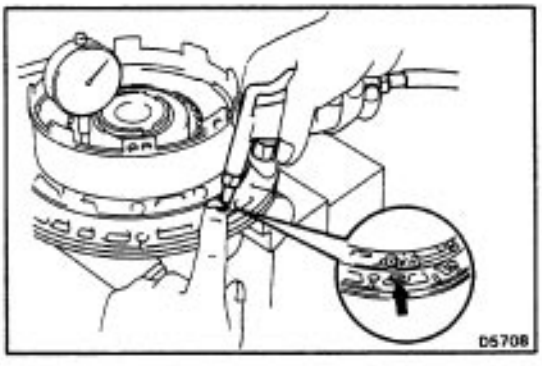


16. REMOVE BEARING CAGE FROM DRIVE PINION
17. REMOVE O–RING FROM BEARING CAGE

Direct Clutch





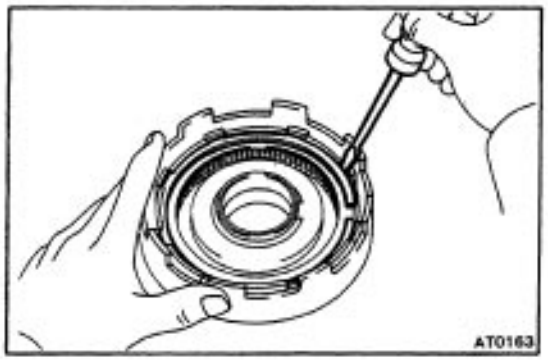


DISASSEMBLY OF DIRECT CLUTCH

1. CHECK PISTON STROKE OF DIRECT CLUTCH

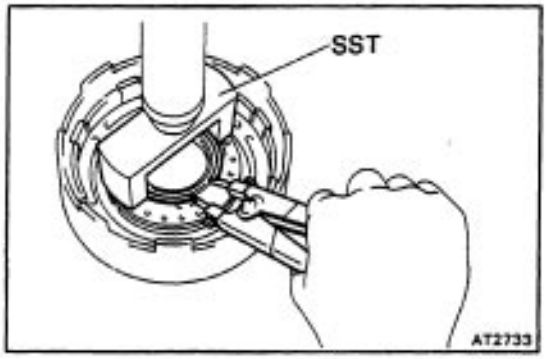
(a) Install the direct clutch on the oil pump.

(b) Using a dial indicator (long type pick or SST), measure the direct clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi, 392 – 785 kPa) as shown.
SST 09350–32014 (09351–32190)
Piston stroke: 1.11 – 1.44 mm (0.0437 – 0.0567 in.)
If the piston stroke is greater than the maximum inspect the each component.



2. REMOVE SNAP RING FROM CLUTCH DRUM

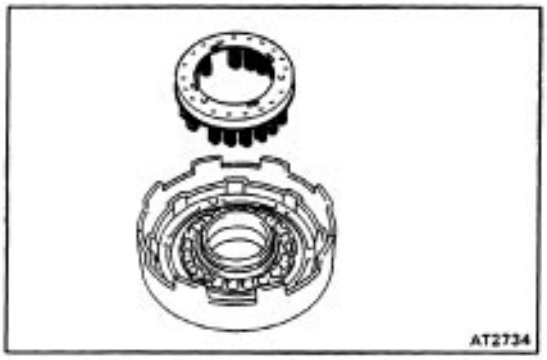
3. REMOVE FLANGE. DISCS AND PLATES



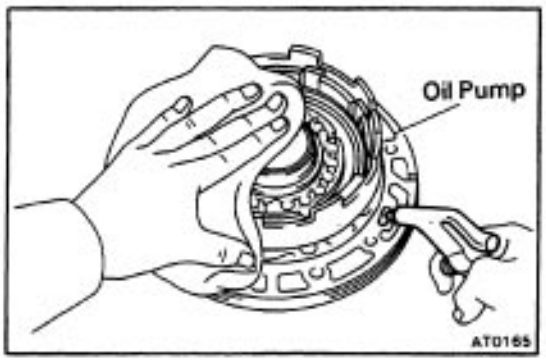
4. REMOVE PISTON RETURN SPRING

(a) Place SST on the spring retainer and compress the springs with a shop press.
SST 09350–32014 (09351–32070)

(b) Remove the snap ring with the snap ring pliers.



(c) Remove the piston return spring.

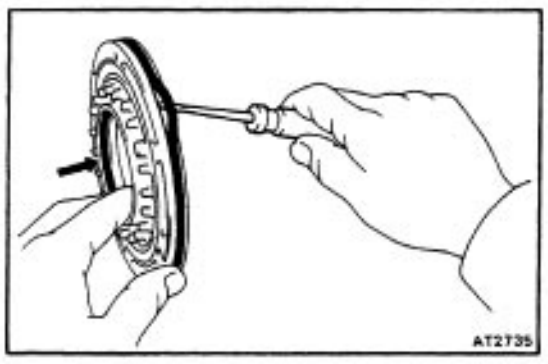


5. REMOVE CLUTCH PISTON

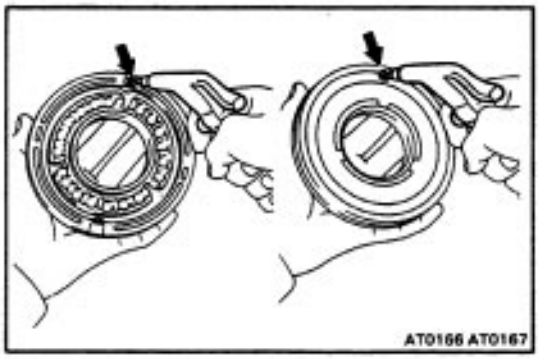
(a) Install the direct clutch onto the oil pump.

(b) Apply compressed air to the oil pump to remove the piston. (if the piston does not come out completely, use needle–nose pliers to remove it.)

(c) Remove the direct clutch from the oil pump.



(d) Remove the two O–rings from the piston.

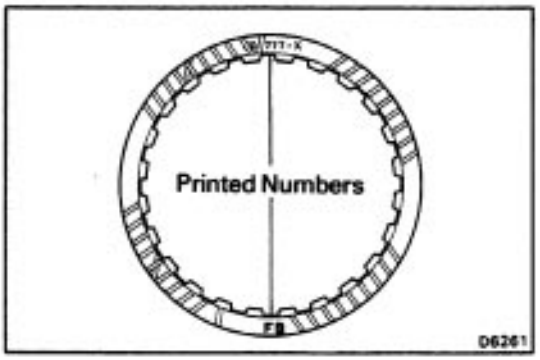


INSPECTION OF DIRECT CLUTCH

1. INSPECT CLUTCH PISTON

(a) Check that the check ball is free by shaking the piston.

(b) Check that the valve does not leak by applying low pressure compressed air.

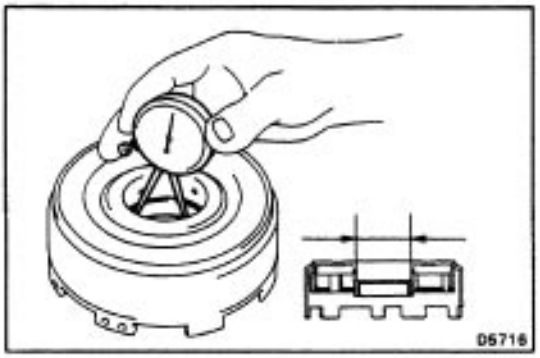


2. INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates and flange are worn or burnt. If necessary, replace them.

HINT:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least two hours.

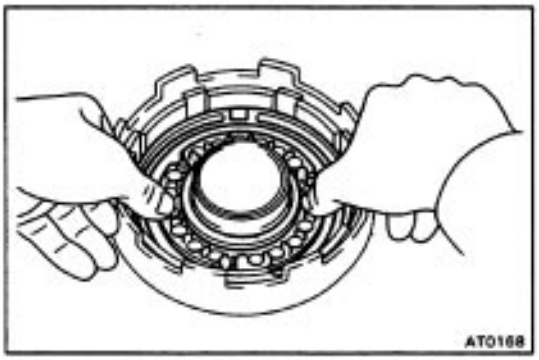


3. CHECK DIRECT CLUTCH BUSHING

Using a dial indicator, measure the inside diameter of the direct clutch bushing.

Maximum inside diameter: 47.07 mm (1.8531 in.)

If the inside diameter is greater than the maximum, replace the direct clutch.

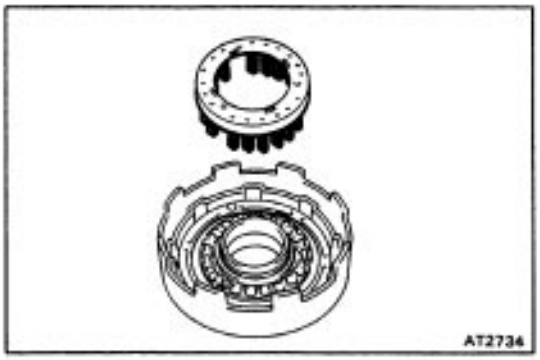


ASSEMBLY OF DIRECT CLUTCH

1. INSTALL CLUTCH PISTON IN DIRECT CLUTCH DRUM

(a) Install new O–rings to the piston. Coat the O–ring¿¿c with ATF.

(b) Being careful not to damage the O–rings, press the piston into the drum with the cup side up.

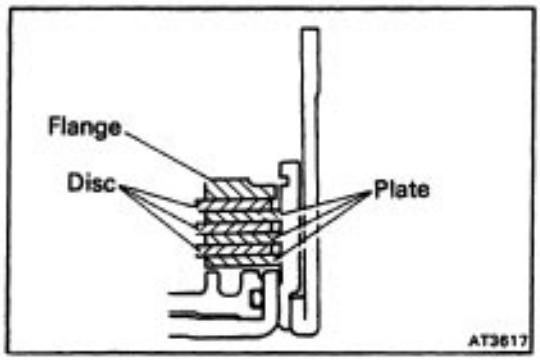


2. INSTALL PISTON RETURN SPRING

(a) Place the return spring and snap ring onto the piston

(b) Place SST on the spring retainer, and compress the return spring with a shop press.
SST 09350–32014 (09351–32070)

(c) Install the snap ring with the snap ring pliers. Be surf the end gap of snap ring is not aligned with the spring retainer claw.



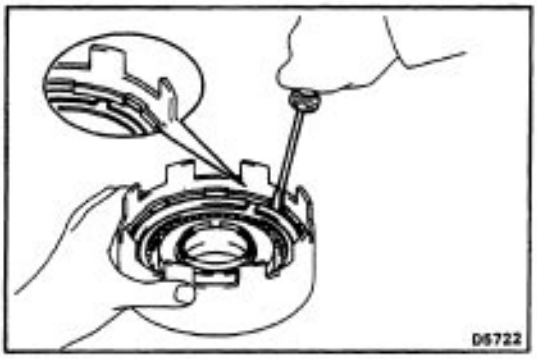
3. INSTALL PLATES, DISCS AND FLANGE

(a) Install plates and discs.

Install in order: P=Plate D=Disc

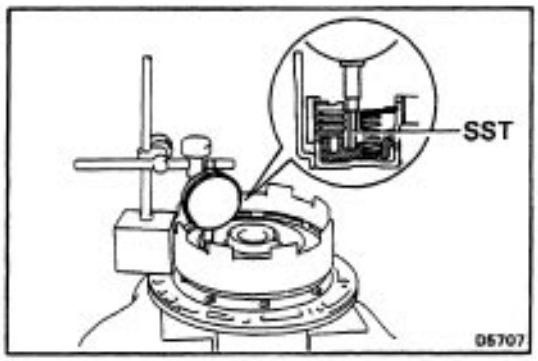
P–D–P–D–P–D

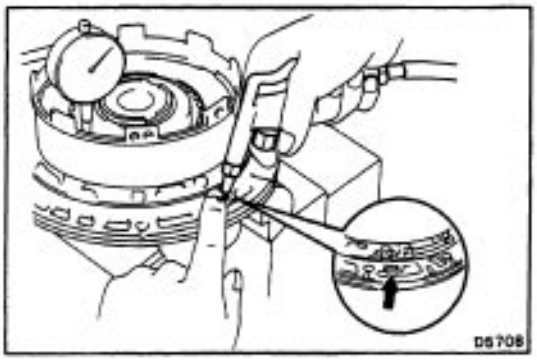
(b) Install the flange with the flat end facing downward.



4. INSTALL SNAP RING

Check that the end gap of the snap ring is not aligned with one of the cutouts.





5. RECHECK PISTON STROKE OF DIRECT CLUTCH

(a) Install the direct clutch on the oil pump.

(b) Using a dial indicator (long type pick or SST), measure the direct clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi, 392 – 785 kPa) as shown.

SST 09350–32014 (09351–32190)

Piston stroke: 1.11 – 1.44 mm 10.0437 – 0.0567 in.)

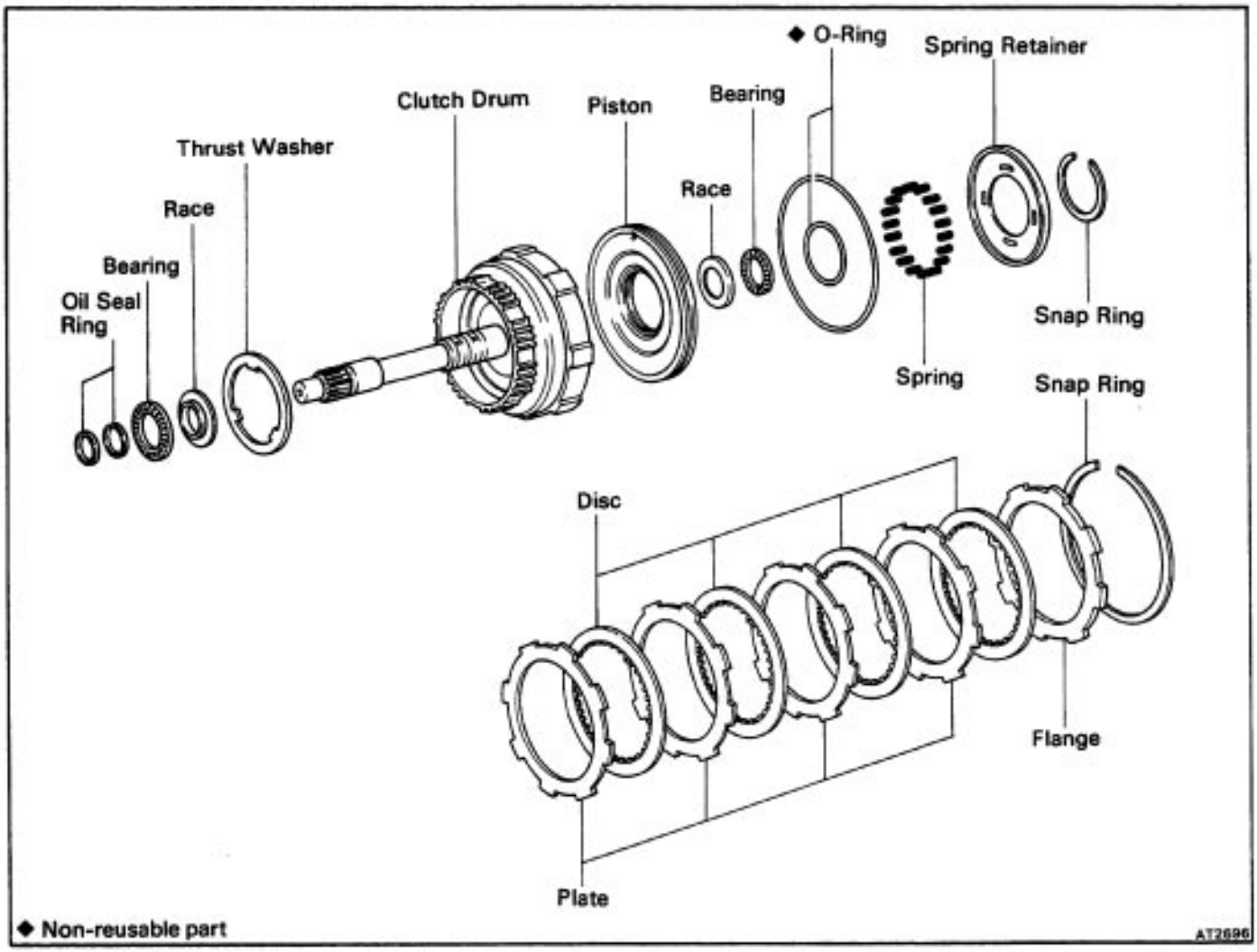
If the piston stroke nonstandard, select another flange.

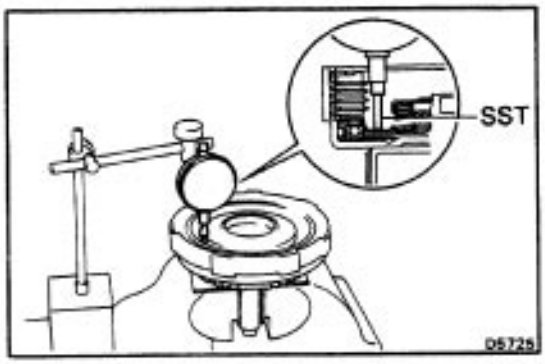
HINT: There are two different flange thickness.

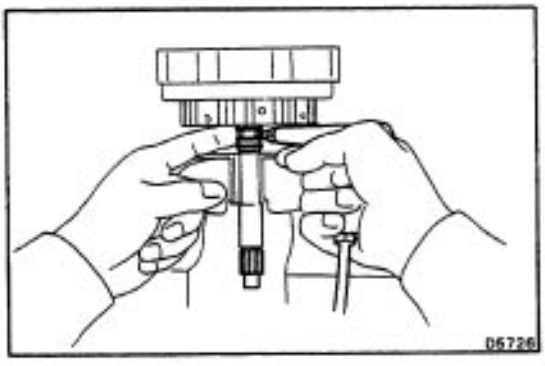
Flange thickness: 2.60 mm (0.1024 in.)

3.00 mm (0.1181 in.)

Forward Clutch







DISASSEMBLY OF FORWARD CLUTCH

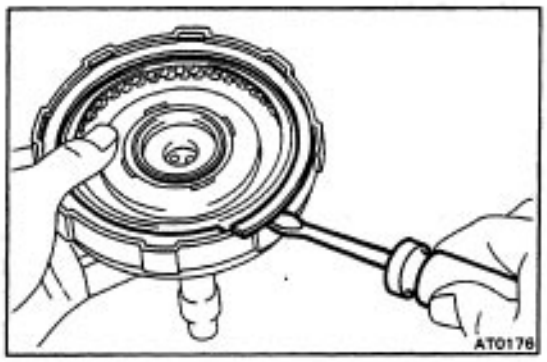
1. CHECK PISTON STROKE OF FORWARD CLUTCH

Using a dial indicator (long type pick or SST), measure the forward clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi, 392 – 785 kPa) as shown.

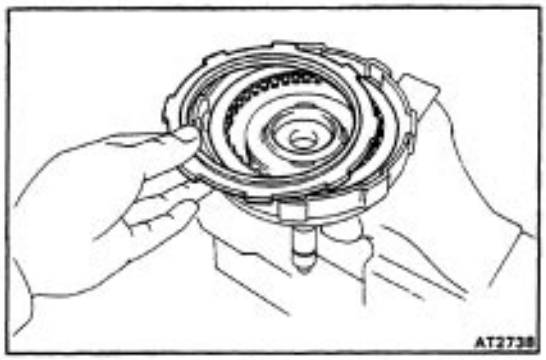
SST 09350–32014 (09351–32190)

Piston stroke: 1.41 – 1.82 mm (0.0555 – 0.0717 in.)

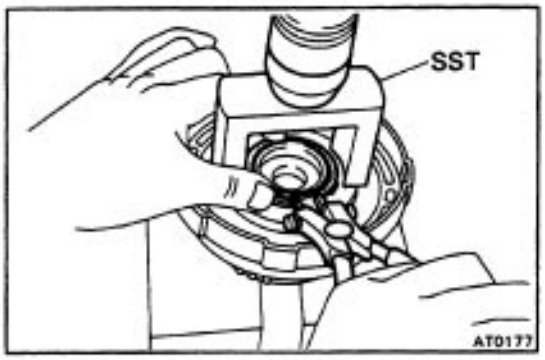
If the piston stroke is greater than the maximum inspect the each component.



2. REMOVE SNAP RING FROM CLUTCH DRUM



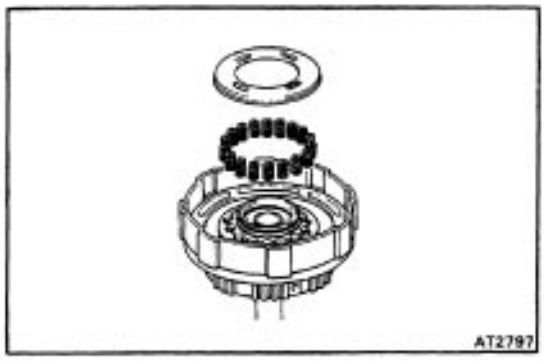
3. REMOVE FLANGE, DISCS AND PLATES



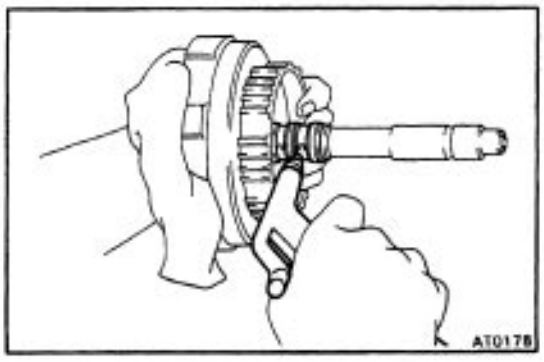
4. REMOVE RETURN SPRINGS

(a) Place SST on the spring retainer and compress the springs with a shop press.
SST 09350–32014 (09351–32070)

(b) Remove the snap ring with the snap ring pliers.

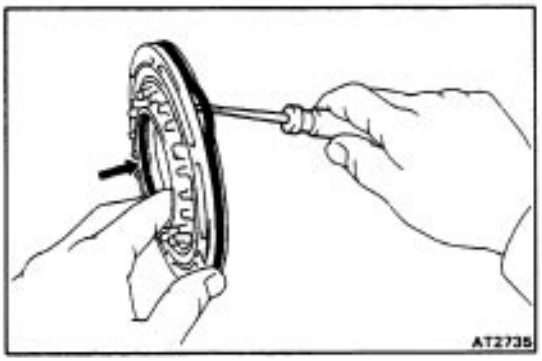


(c) Remove the spring retainer and eighteen return springs.

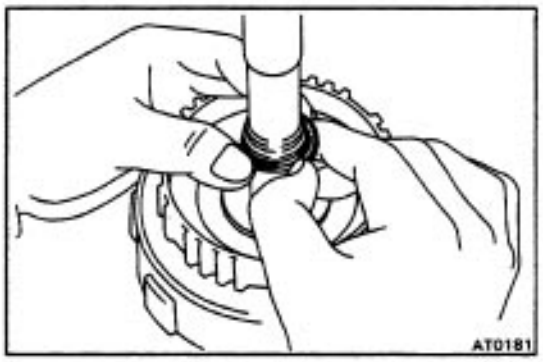


5. REMOVE CLUTCH PISTON

(a) Apply compressed air into the oil passage to remove the piston.
if the piston does not come out, use needle–nose pliers to remove it.

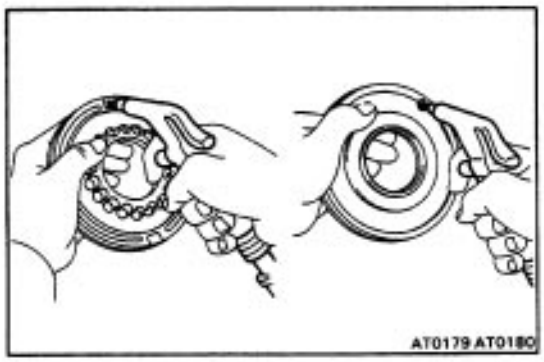


(b) Remove the two O–rings from the piston.



6. IF NECESSARY, REMOVE OIL SEAL RINGS

Remove the two oil seal rings from the shaft.

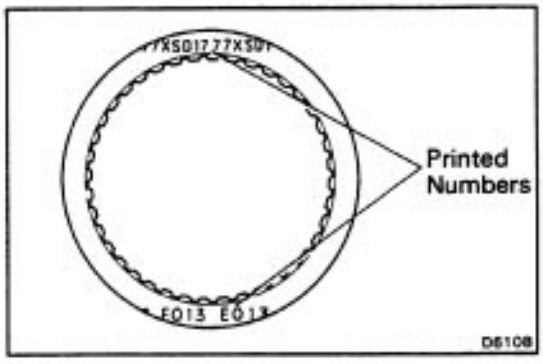


INSPECTION OF FORWARD CLUTCH

1. INSPECT CLUTCH PISTON

(a) Check that the check ball is free by shaking the piston.

(b) Check that the valve does not leak by applying low pressure compressed air.

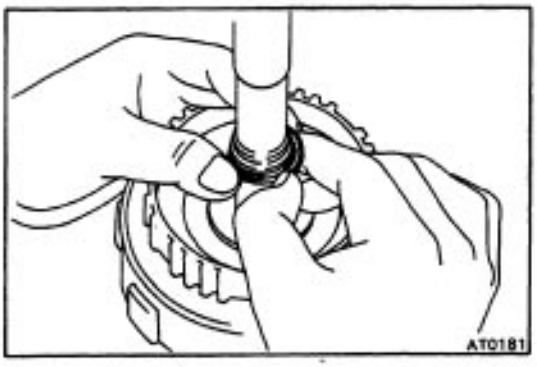


2. INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates are flange are worn or burnt. If necessary, replace them.

HINT:

- If the lining of the disc is exfoliated or discolored, o even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least two hours.



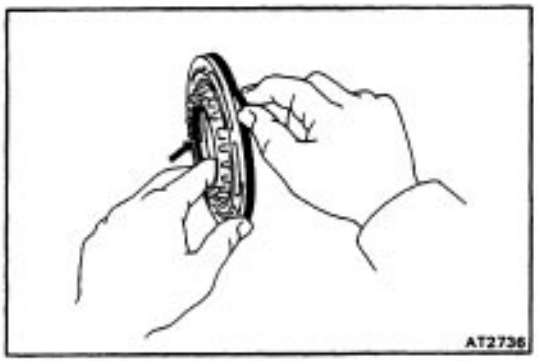
ASSEMBLY OF FORWARD CLUTCH

1. INSTALL OIL SEAL RINGS

Install! the two oil seal rings to the shaft.

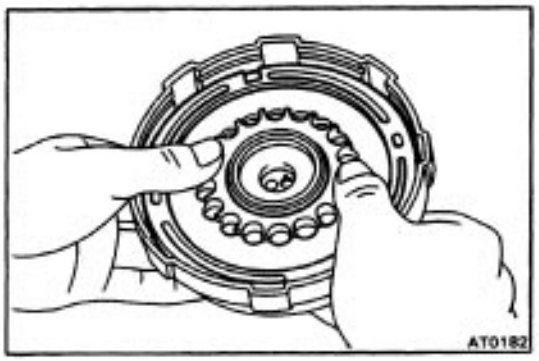
NOTICE: Do not spread the ring ends more than necessary.

HINT: After installing the oil seal rings, check that they move smoothly.



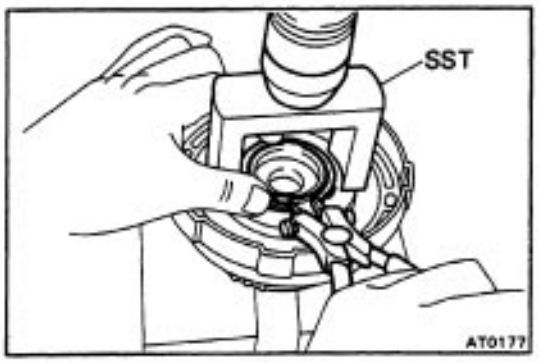
2. INSTALL CLUTCH PISTON TO CLUTCH DRUM

(a) Install the two new O–rings to the piston.



(b) Coat the O–rings with ATF.

(c) Press the piston into the drum with the cup side up, being careful not to damage the O–rings.

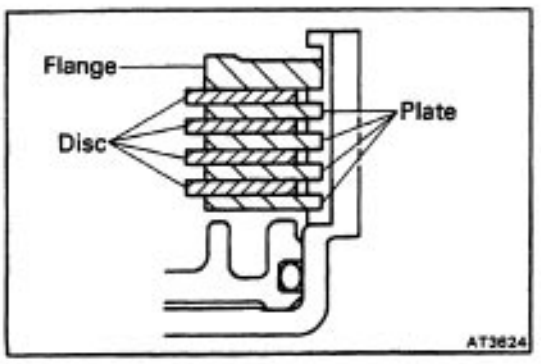


3. INSTALL PISTON RETURN SPRINGS

(a) Place the eighteen springs, spring retainer and snap ring onto the piston.

(b) Place SST on the spring retainer, and compress the springs with a shop press.
SST 09350–32014 (09351–32070)

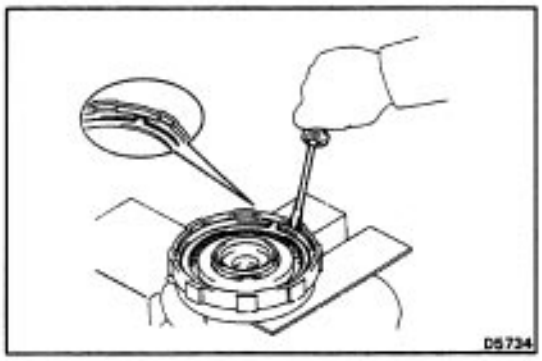
(c) Install the snap ring with snap ring pliers.
Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



4. INSTALL PLATES, DISCS AND FLANGE

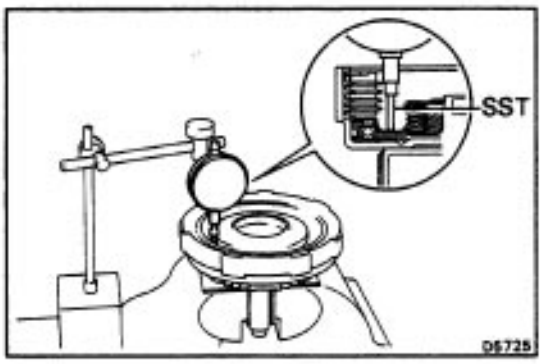
(a) Install the plates and discs.
Install in order: P=Plate D= Disc
P–D–P–D–P–D–P–D

(b) Install the flange with the flat end facing downward.



5. INSTALL SNAP RING

Check that the end gap of snap ring is not aligned with one of the cutouts.



6. RECHECK PISTON STROKE OF FORWARD CLUTCH

Using a dial indicator (long type pick or SST), measure the forward clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi, 392 – 785 kPa) as shown.

SST 09350–32014 (09351–32190)

Piston stroke: 1.41 – 1.82 mm (0.0555 – 0.0717 in.)

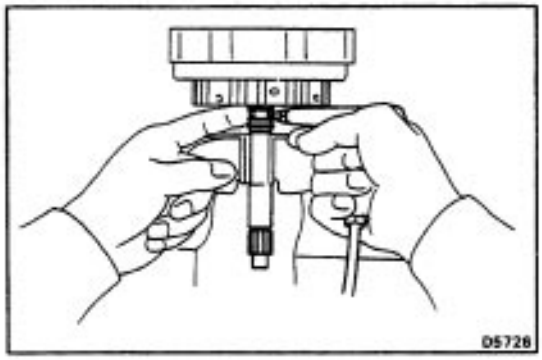
If the piston stroke is less than the limit, parts may be misassembled and reinstall them.

If the piston stroke nonstandard, select another flange.

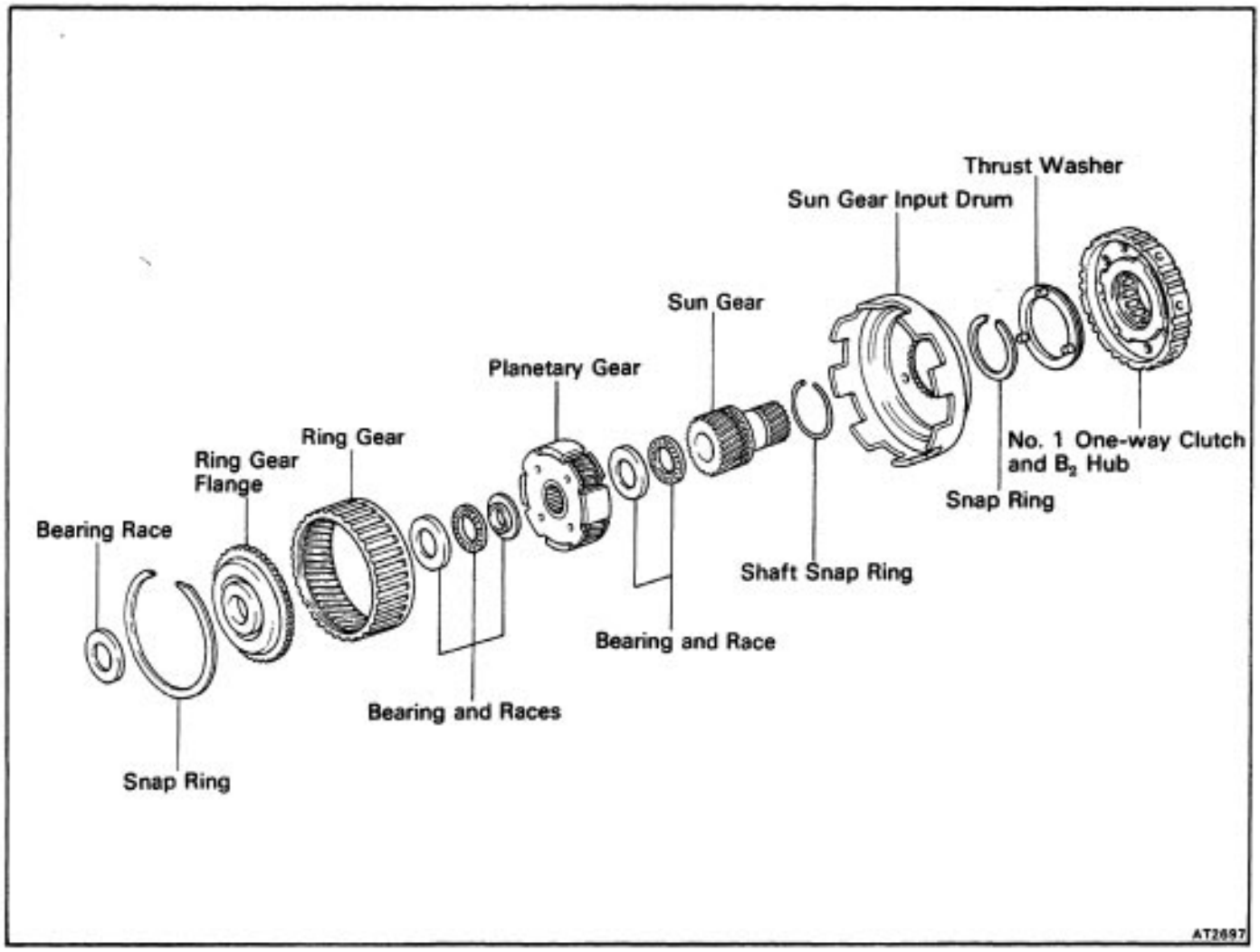
HINT: There are two different flange thickness.

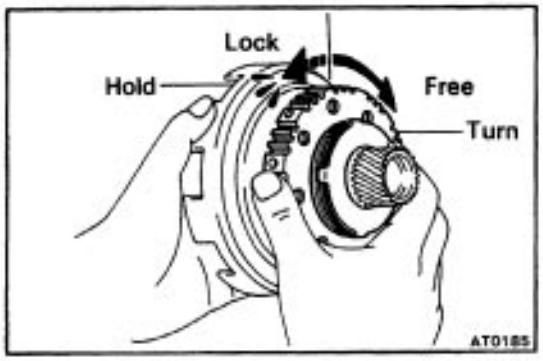
Flange thickness: 3.00 mm (0.1181 in.)

3.37 mm 10.1327 in.)



Front Planetary Gear

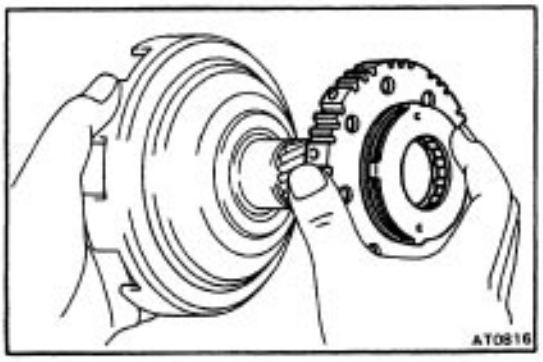




DISASSEMBLY OF ONE–WAY CLUTCH AND SUN GEAR

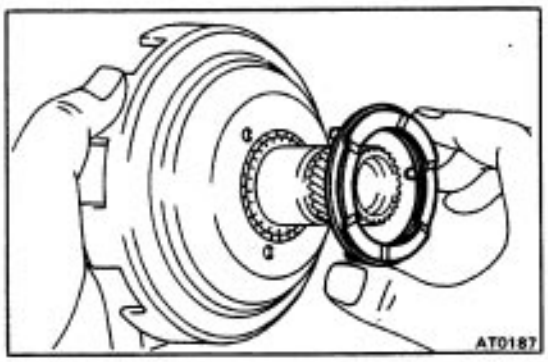
7. CHECK OPERATION OF ONE–WAY CLUTCH

Hold the sun gear and turn the hub. The hub should turn freely clockwise and should lock counterclockwise.

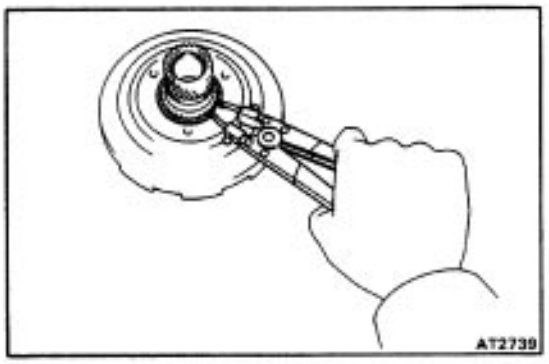


2. REMOVE SECOND BRAKE HUB AND ONE–WAY CLUTCH FRONT SUN GEAR .

While turning the hub clockwise, remove the one–way clutch from the sun gear.



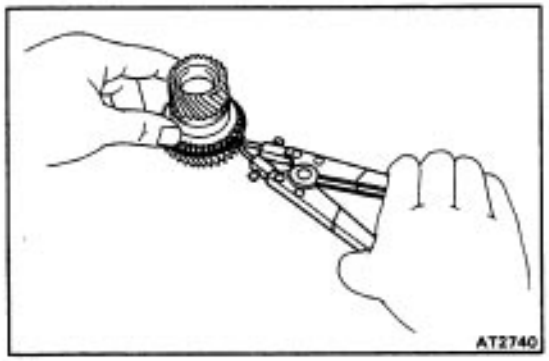
3. REMOVE THRUST WASHER FROM SUN GEAR INPUT DRUM



4. REMOVE SUN GEAR FROM DRUM

(a) Using the snap ring pliers, remove the snap ring from the drum.

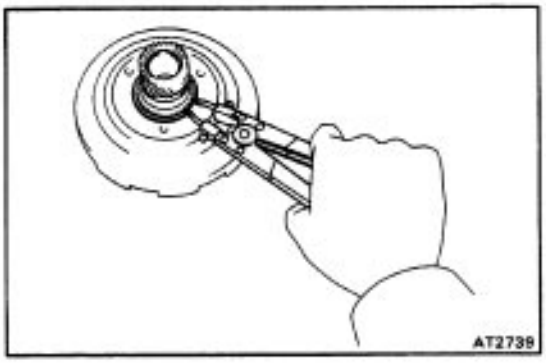
(b) Remove the sun gear from the drum.



5. REMOVE SHAFT SNAP RING

Using the snap ring pliers, remove the shaft snap ring from the sun gear.

ASSEMBLY OF ONE–WAY CLUTCH AND SUN GEAR

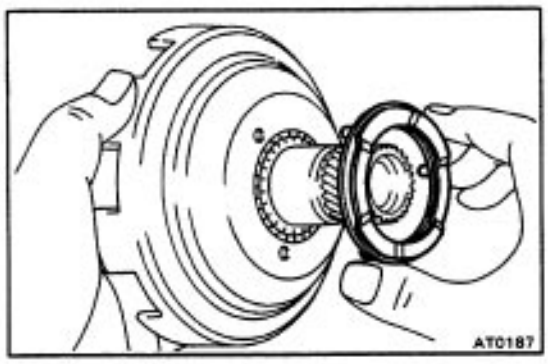


1. INSTALL SHAFT SNAP RING TO SUN GEAR

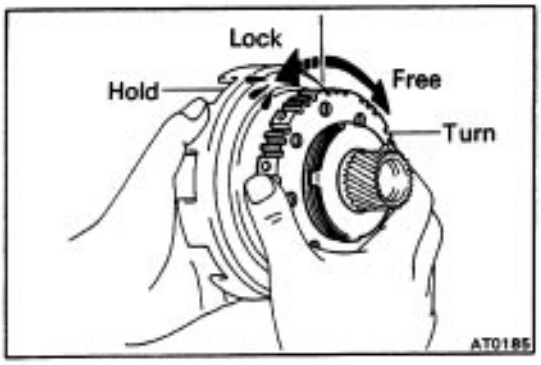
2. INSTALL SUN GEAR TO DRUM

(a) Install the sun gear to the drum.

(b) Using the snap ring plies, install the snap ring to the drum.



3. INSTALL THRUST WASHER TO SUN GEAR INPUT DRUM

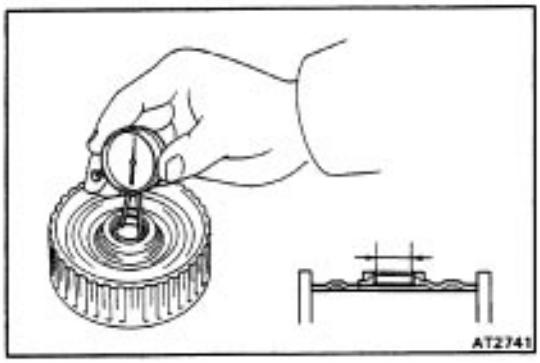


4. INSTALL ONE–WAY CLUTCH AND SECOND BRAKE HUB ON SUN GEAR

While turning the hub clockwise, slide the one–way clutch onto the sun gear.

5. RECHECK OPERATION OF ONE–WAY CLUTCH

INSPECTION OF PLANETARY RING GEAR

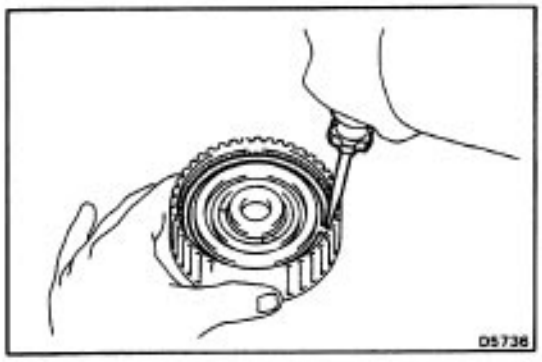


1. INSPECT RING GEAR FLANGE BUSHING

Using a dial indicator, measure the inside diameter of the flange bushing.

Standard inside diameter: 19.025 – 19.050 mm (0.7490 – 0.7500 in.)

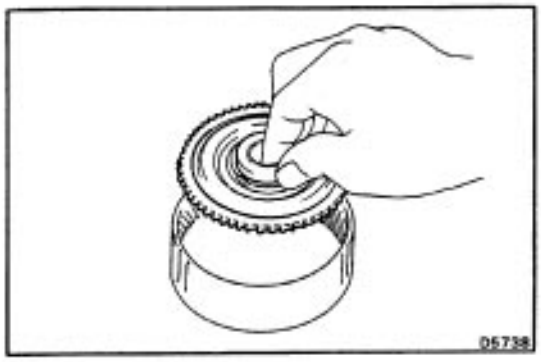
If the inside diameter is greater than the maximum, replace the flange.



2. REMOVE RING GEAR FLANGE

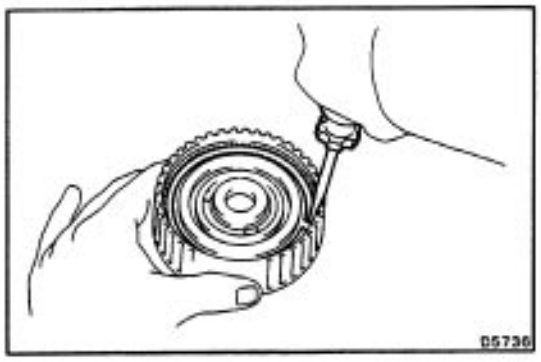
(a) Using a screwdriver, remove the snap ring.

(b) Remove the flange from the ring gear.

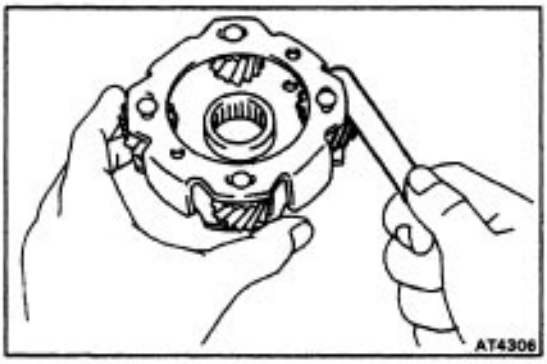


3. INSTALL RING GEAR FLANGE

(a) Position the flange into the ring gear.



(b) Using a screwdriver, install the snap ring.



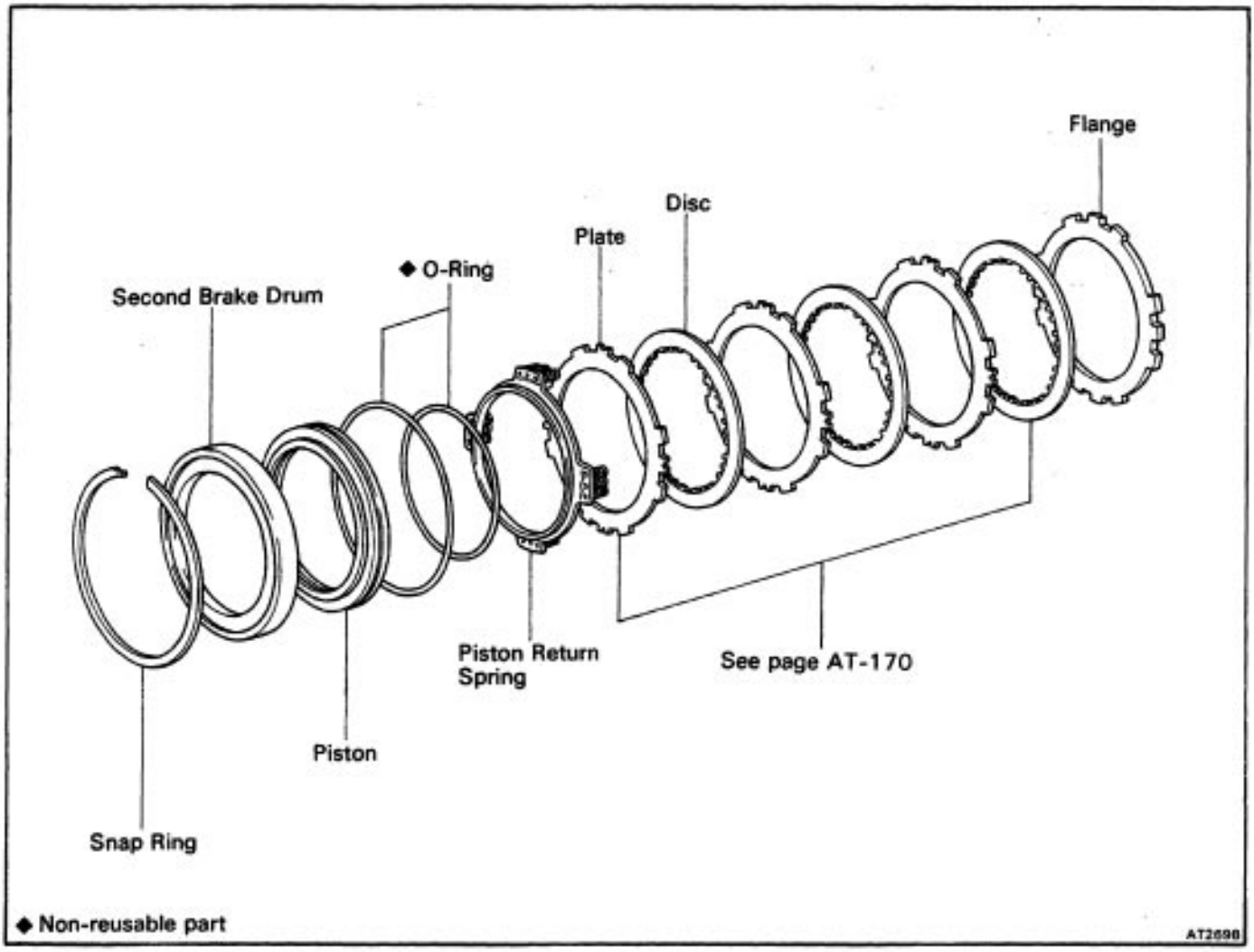
INSPECTION OF FRONT PLANETARY GEAR

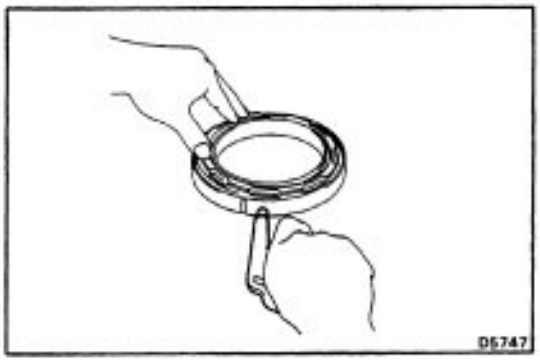
MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

Standard clearance: 0.20 – 0.50 mm (0.0079 – 0.0197 in.)

Second Brake

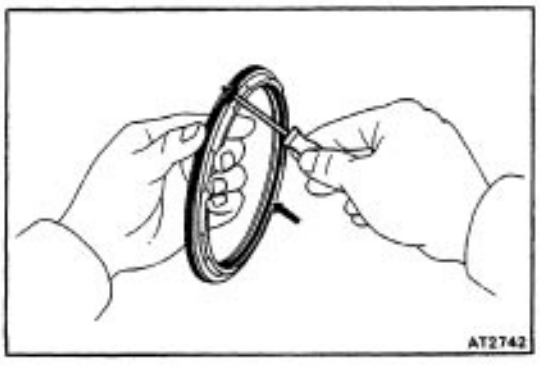




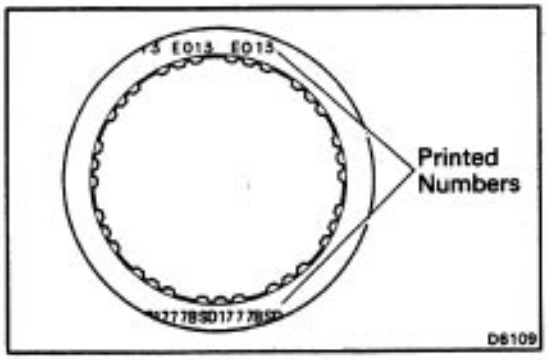
DISASSEMBLY OF SECOND BRAKE PISTON

REMOVE SECOND BRAKE PISTON

(a) Apply compressed air to the oil hole to remove the piston.



(b) Remove the two O–rings from the piston.



INSPECTION OF SECOND BRAKE COMPONENT

INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surface of the discs, plates and flange are worn or burnt. If necessary, replace them.

HINT:

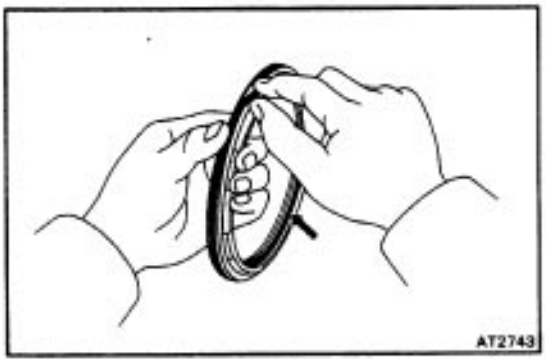
- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least two hours.

ASSEMBLY OF SECOND BRAKE PISTON

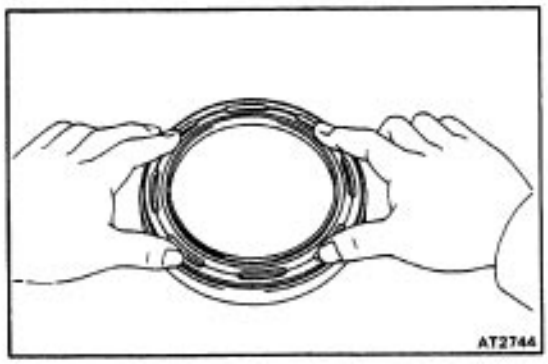
INSTALL PISTON

(a) Coat a new O–ring with ATF.

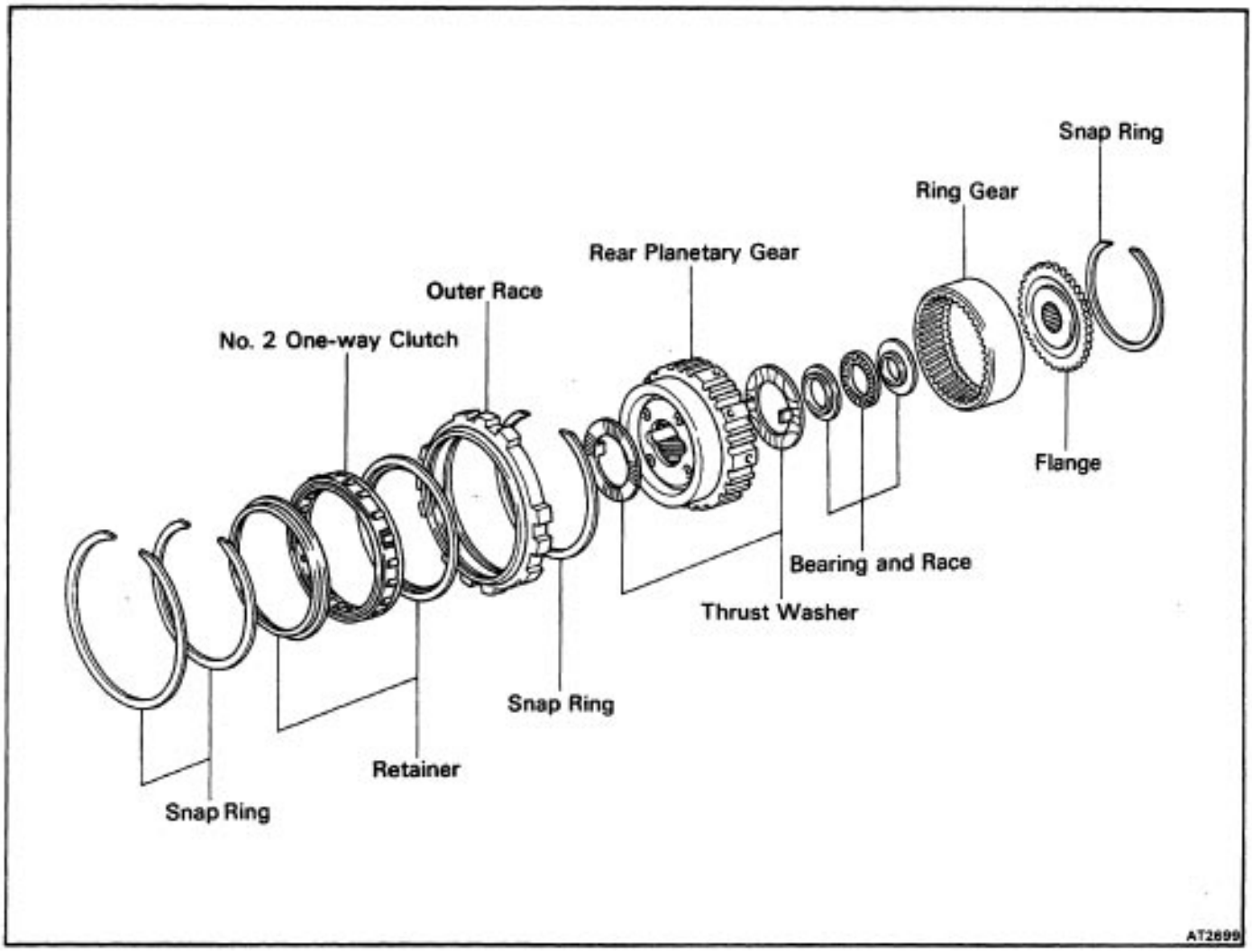
(b) Install the two O–rings on the piston.

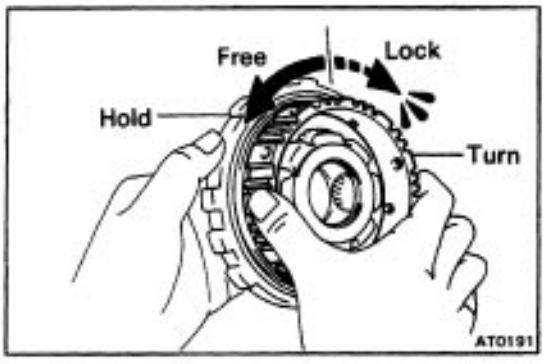


(c) Press the piston into the drum, being careful not to damage the O–rings.



Rear Planetary Gear

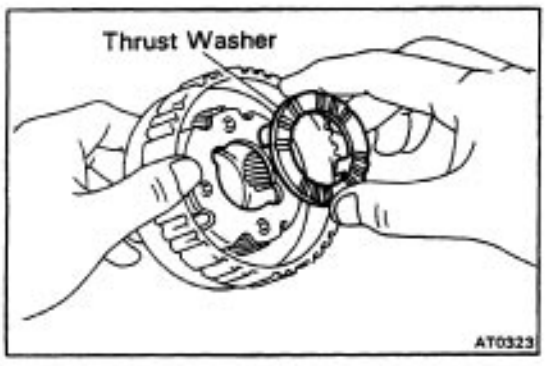




DISASSEMBLY OF ONE–WAY CLUTCH

1. CHECK OPERATION OF ONE–WAY CLUTCH

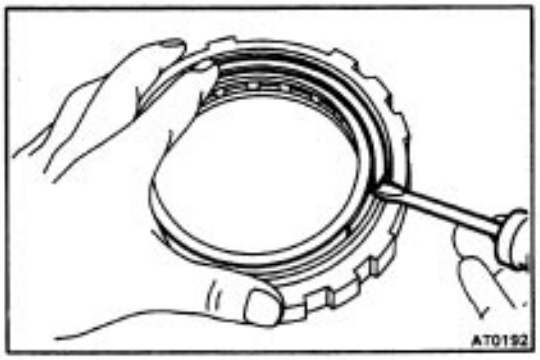
Hold the outer race and turn the hub. The hub should turn freely counterclockwise and should lock clockwise.



2. SEPARATE ONE–WAY CLUTCH AND PLANETARY GEAR

3. REMOVE THRUST WASHERS

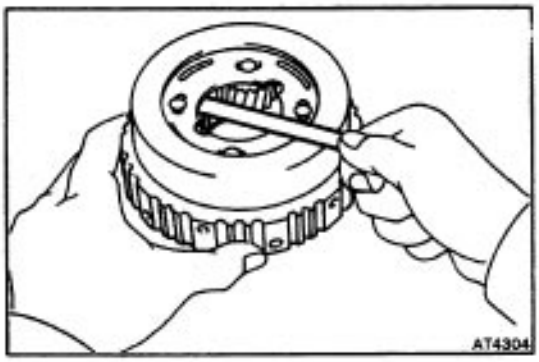
Remove the two thrust washers from the both sides of planetary gear.



4. REMOVE ONE–WAY CLUTCH FROM OUTER RACE

(a) Remove the two snap rings and retainers from the both sides.

(b) Remove the one–way clutch from the outer race.

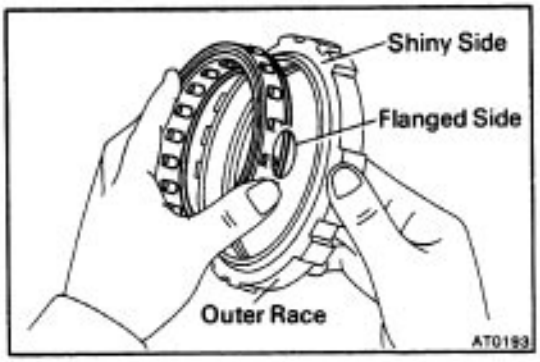


INSPECTION OF REAR PLANETARY GEAR

MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

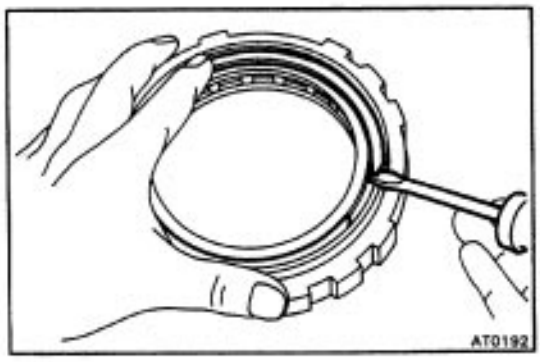
Standard clearance: 0.20 – 0.50 mm (0.0079 – 0.0197 in.)



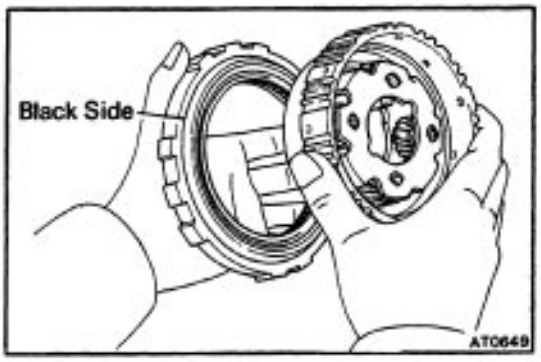
ASSEMBLY OF ONE–WAY CLUTCH

1. INSTALL ONE–WAY CLUTCH

(a) Install the one–way clutch into the outer race, facing the flanged side of the one–way clutch toward the shiny side of the outer race.

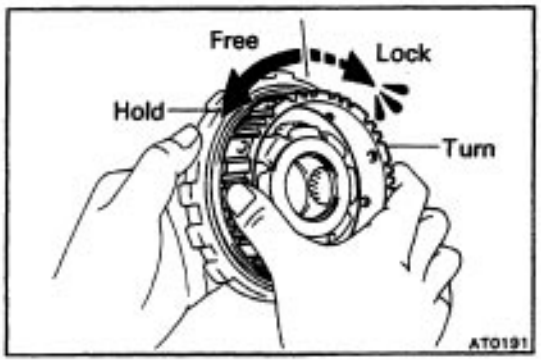


(b) Install the two retainers and snap rings to the bott sides.

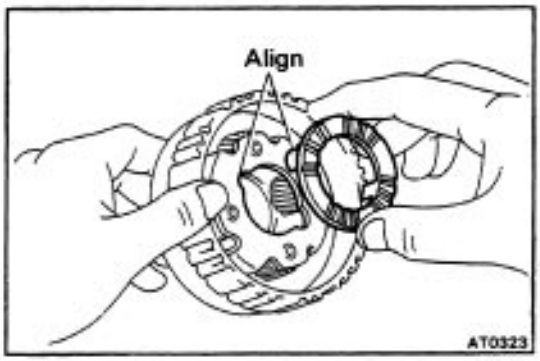


2. INSTALL PLANETARY GEAR INTO ONE–WAY CLUTCH

Install the planetary gear into the one–way clutch, facing the inner race of the planetary gear toward the black side of the one–way clutch outer race.



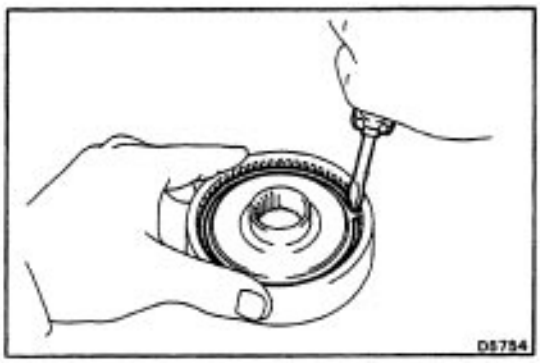
3. CHECK OPERATION OF ONE–WAY CLUTCH



4. INSTALL THRUST WASHERS

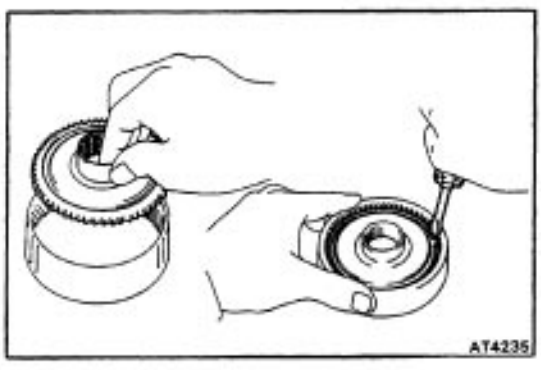
(a) Coat the two thrust washers with petroleum jelly.
(b) Align the tab of the washers with the hollow of the carrier.

REPLACEMENT OF RING GEAR FLANGE



1. REMOVE RING GEAR FLANGE

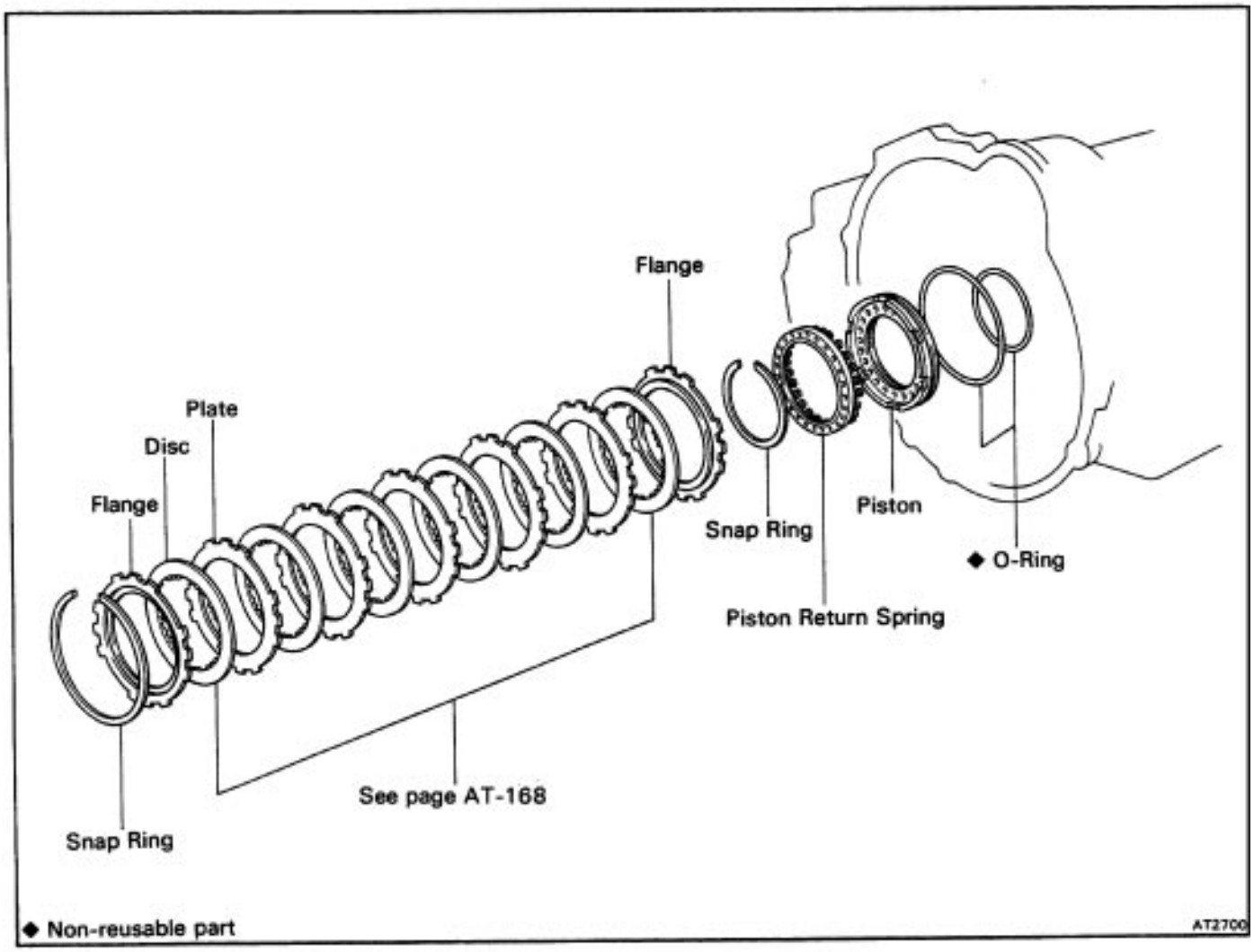
(a) Using a screwdriver, remove the snap ring.
(b) Remove the flange from the ring gear.

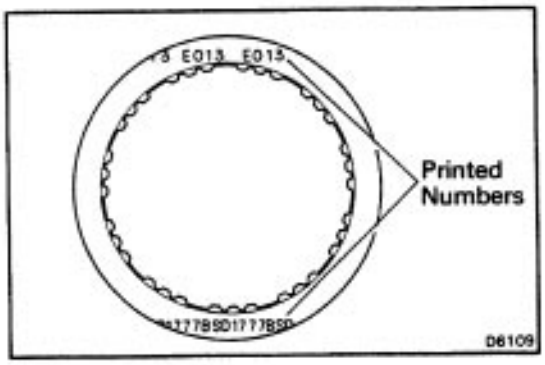


2. INSTALL RING GEAR FLANGE

(a) Position the flange into the ring gear.
(b) Using a screwdriver, install the snap ring.

First and Reverse Brake





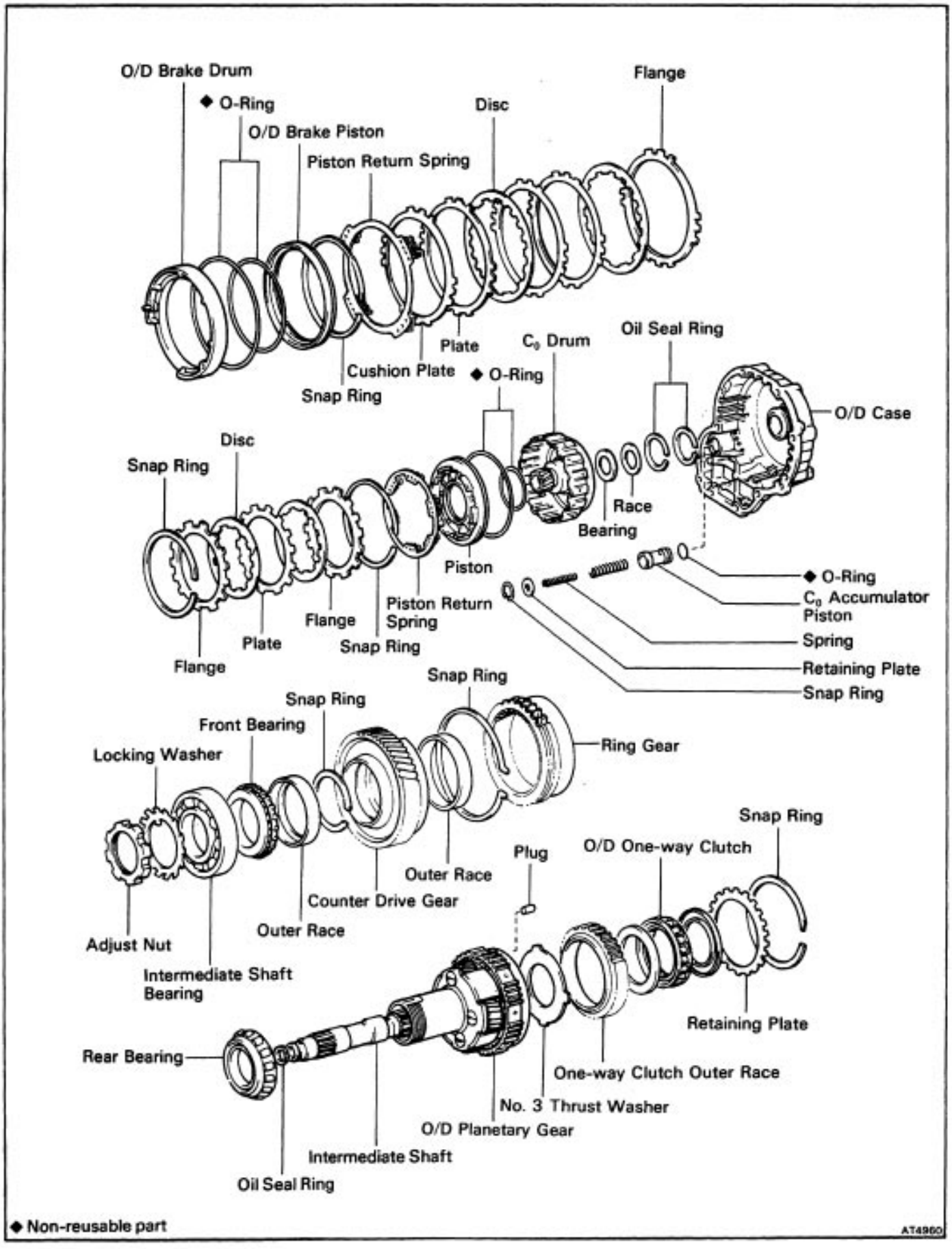
INSPECTION OF FIRST AND REVERSE BRAKE COMPONENT

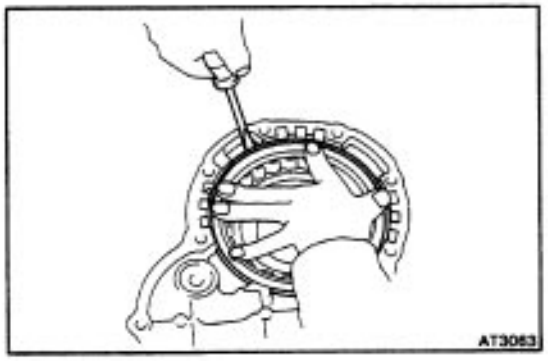
INSPECT DISCS, PLATES AND FLANGES

Check if the sliding surfaces of the discs, plates an flanges are worn or burnt. If necessary, replace them.
HINT:

- If the lining of the disc is exfoliated or discolored, c even a part of the printed numbers are defaced, replace all discs.
- Before assembly new discs, soak them in ATF for at least fifteen minutes.

Overdrive Unit



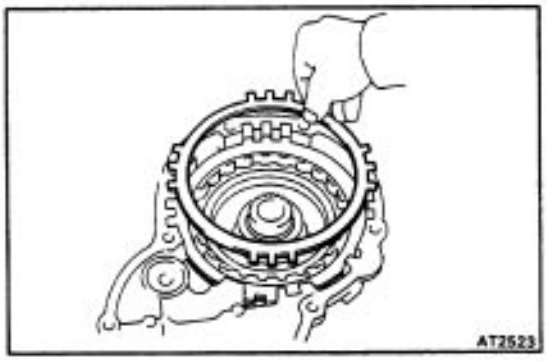


DISASSEMBLY OF OVERDRIVE BRAKE

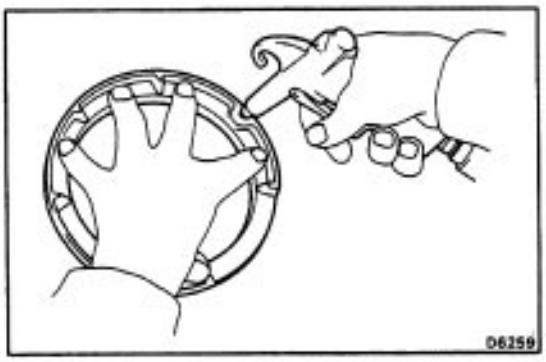
1. REMOVE PISTON RETURN SPRING

(a) While pushing the return spring, remove the snap ring with a screwdriver.

(b) Remove the piston return spring.



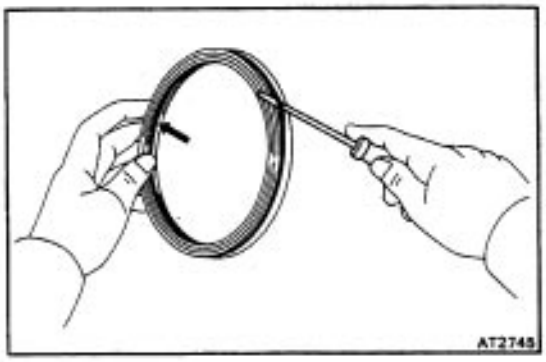
2. REMOVE CUSHION PLATE, PLATES, DISCS AND FLANGE



3. REMOVE PISTON FROM DRUM

Apply compressed air to oil hole to remove the piston.

HINT: Blow with the gun slightly away from the oil hole, and be careful that the piston does not tilt.



4. REMOVE O–RINGS

Remove the inner and outer O–rings from the piston.

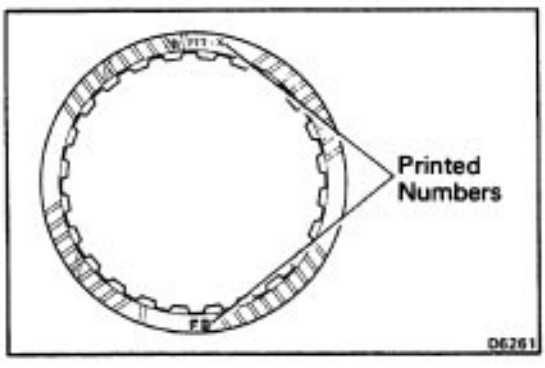
INSPECTION OF OVERDRIVE BRAKE

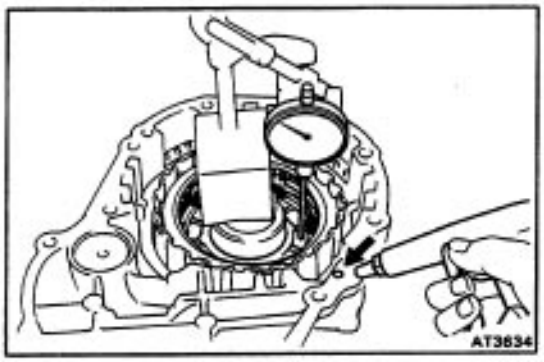
INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates an, flange are worn or burnt. If necessary, replace them.

HINT:

- If the fining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.





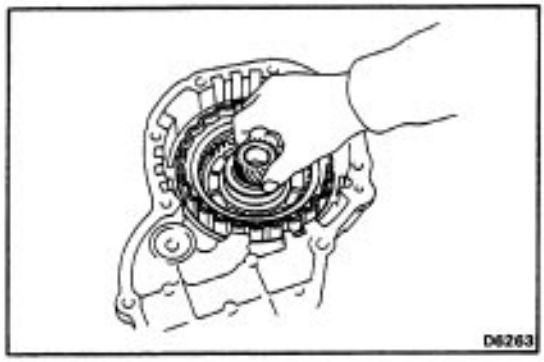
DISASSEMBLY OF OVERDRIVE DIRECT CLUTCH

1. CHECK PISTON STROKE OF DIRECT CLUTCH

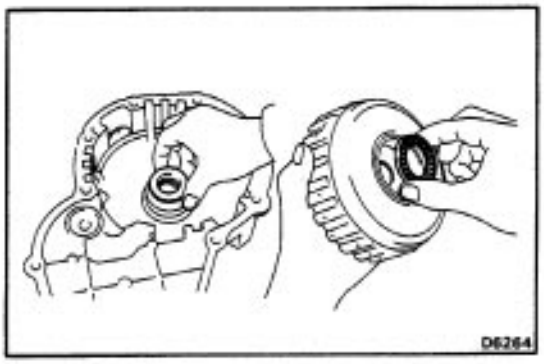
Using a dial indicator, measure the piston stroke while applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi or 392 – 785 kPa) as shown.

Piston stroke: 1.21 – 1.81 mm
(0.0476 – 0.0752 in.)

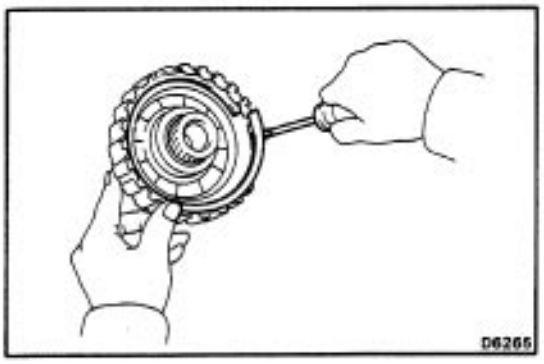
If the piston stroke is greater than the maximum, inspect the each component.



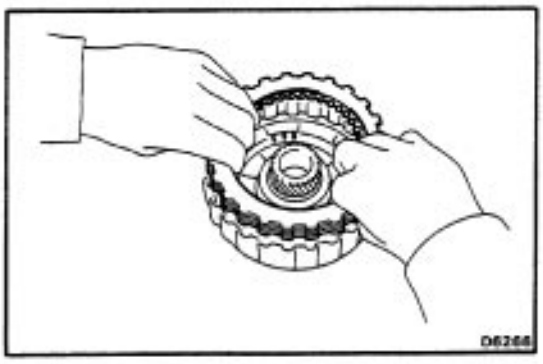
2. REMOVE OVERDRIVE DIRECT CLUTCH FROM CASE



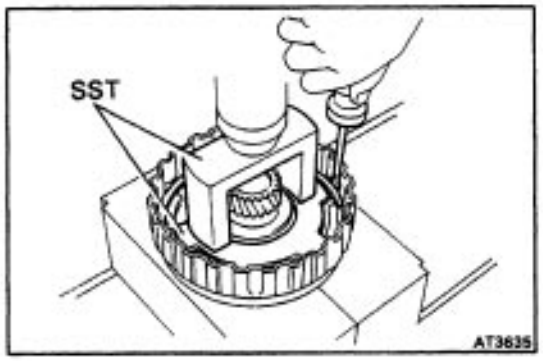
3. REMOVE BEARING AND RACE FROM CLUTCH DRUM AND CASE



4. REMOVE SNAP RING WITH SCREWDRIVER



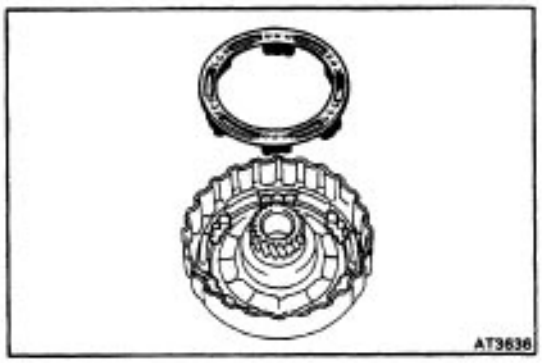
5. REMOVE FLANGES, DISCS AND PLATES



6. REMOVE PISTON RETURN SPRING

(a) Place SST on the spring retainer and compress the spring with a shop press.
SST 09350–32014 (09351–32070, 09351–32200)

(b) Remove the snap ring.



(c) Remove the piston return spring.

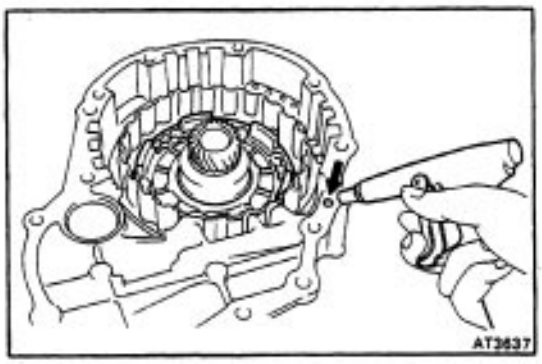
7. REMOVE PISTON FROM CLUTCH DRUM

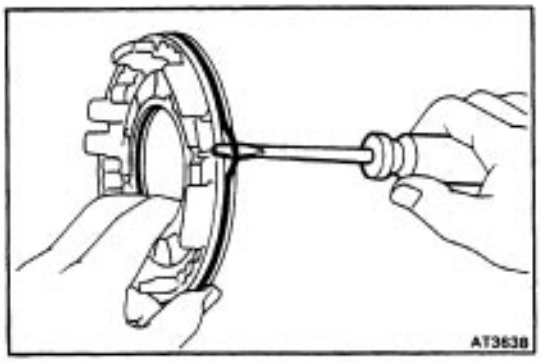
(a) Install the clutch drum of the case.

(b) Apply compressed air to the pressure apply hole of the case.

(c) Remove the piston from the clutch drum.
If the piston does not come out completely, use needle–nose pliers to remove it.

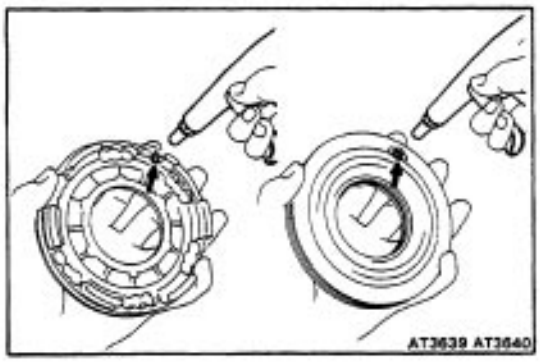
(d) Remove the clutch drum from the case.





8. REMOVE O–RINGS

Remove the two 4–rings from the piston.

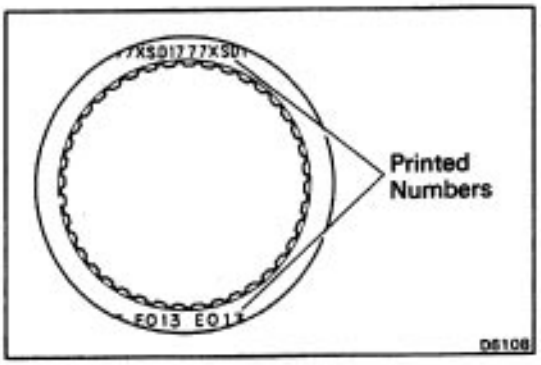


INSPECTION OF OVERDRIVE DIRECT CLUTCH

1. INSPECT OVERDRIVE DIRECT CLUTCH

(a) Check that the check ball is free by shaking the piston.

(b) Check that the valve does not leak by applying low pressure compressed air.

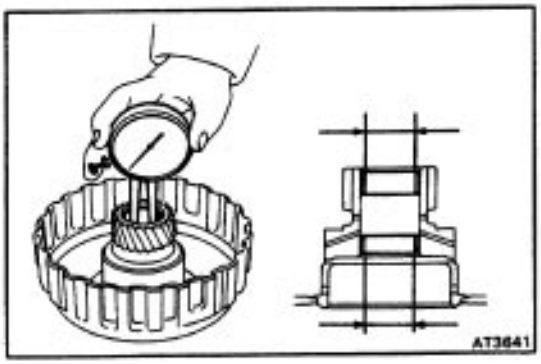


2. INSPECT DISCS, PLATES AND FLANGES

Check that the sliding surfaces of discs, plates and flanges are worn or burnt. If necessary, replace them.

HINT:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.



3. CHECK DIRECT CLUTCH BUSHING

Using a dial indicator, measure the inside diameter of the two direct clutch bushings.

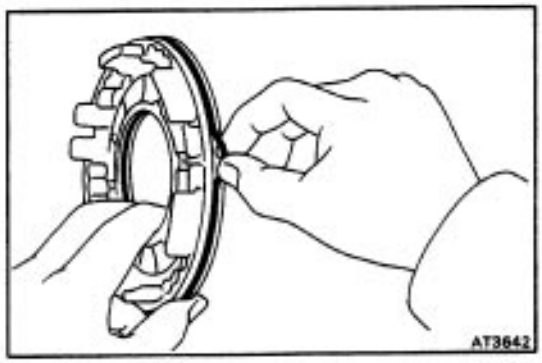
Maximum inside diameter: 22.09 mm (0.8697 in.)

If the inside diameter is greater than the maximum, replace the direct clutch drum.

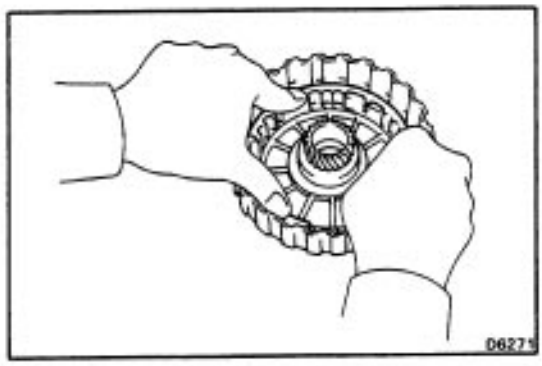
ASSEMBLY OF OVERDRIVE DIRECT CLUTCH

1. INSTALL CLUTCH PISTON

(a) Install new O–rings to the piston. Coat the O–rings with ATF.

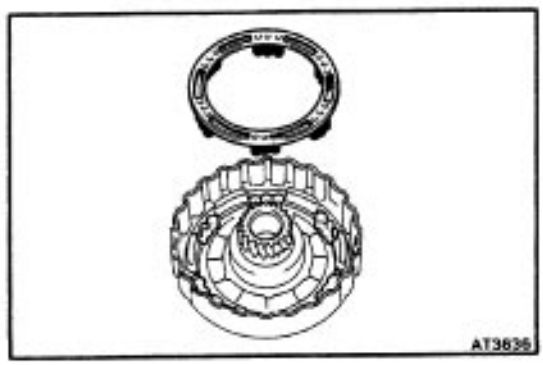


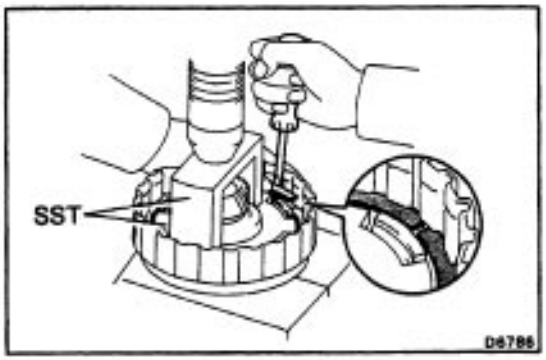
(b) Press the piston into the drum with the cup side up, being careful not to damage the O–ring.



2. INSTALL PISTON RETURN SPRING

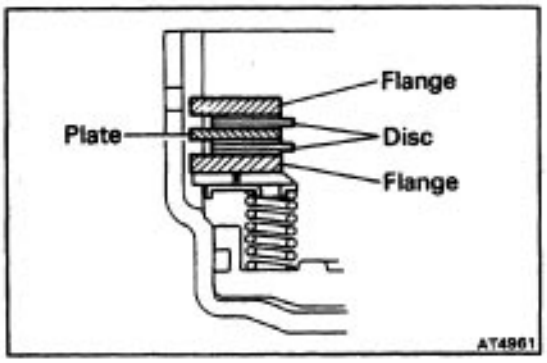
(a) Install the return spring and set snap ring in place.





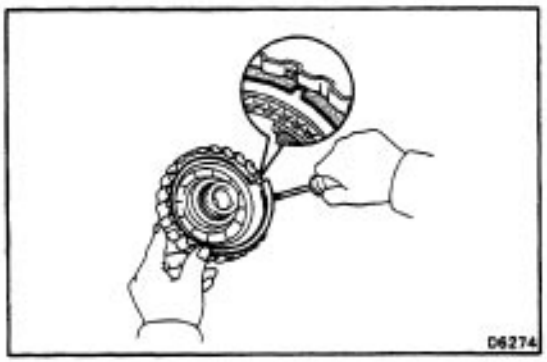
(b) Place SST on the spring retainer, and compress the spring with a shop press.
SST 09350–32014 (09351–32070, 09351–32200)

(c) Install the snap ring with a screwdriver. Be sure end gap of snap ring is aligned with the groove of the clutch drum.



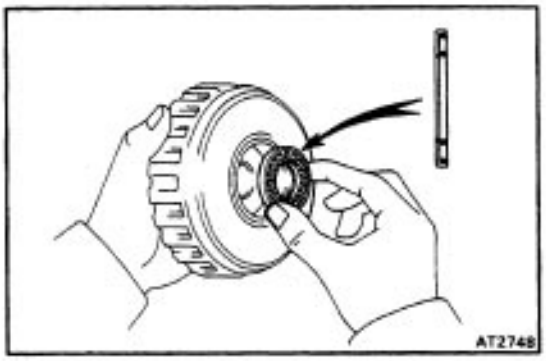
3. INSTALL PLATES. DISCS AND FLANGE

Install in order: P=Plate D=Disc
Flange – D – P – D – Flange



4. INSTALL SNAP RING

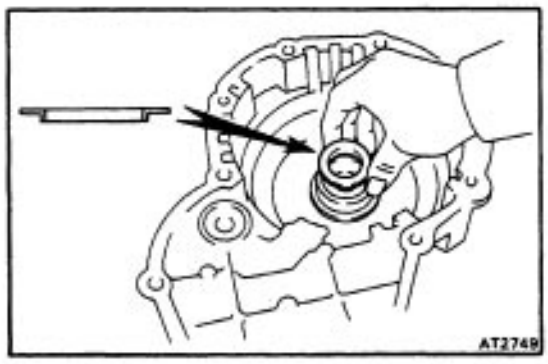
Be sure end gap of the snap ring is not aligned with the groove of the clutch drum.



5. INSTALL BEARING AND RACE

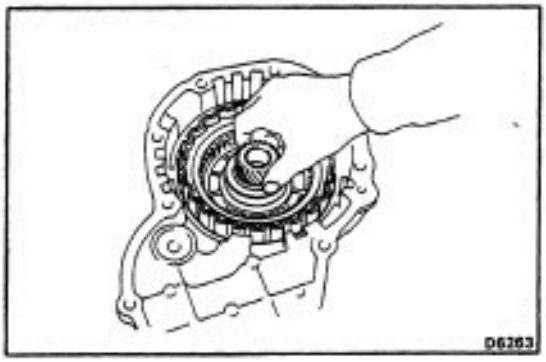
(a) Coat the bearing with petroleum jelly and install it facing the race side downward to the clutch drum.

Bearing: Outer diameter 46.3 mm (1 .823 in.)
Inner diameter 26.2 mm (1.031 in.)

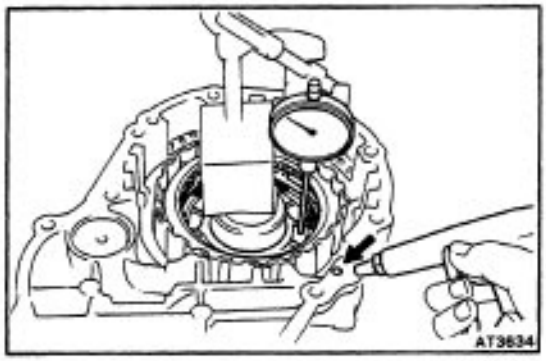


(b) Coat the race with petroleum jelly and install it to the case.

Race: Outer diameter 43.0 mm (11 .693 in.)
Inner diameter 24.6 mm (0.965 in.)



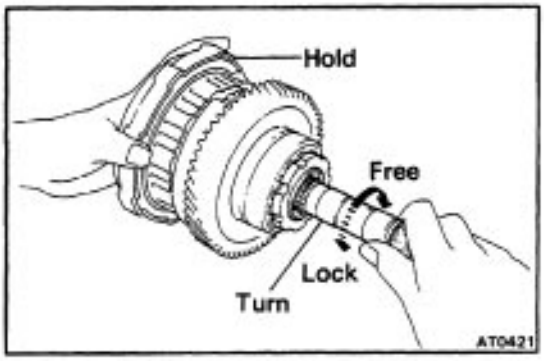
6. INSTALL DIRECT CLUTCH ON CASE



7. RECHECK PISTON STROKE OF' DIRECT CLUTCH

Using a dial indicator, measure the piston stroke while applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi or 392 – 785 kPa) as shown.

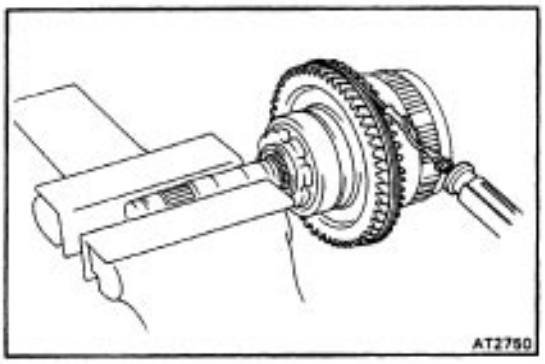
Piston stroke: 1.21 – 1.91 mm
(0.0476 – 0.0752 in.)



DISASSEMBLY OF COUNTER DRIVE GEAR

1. CHECK OPERATION OF ONE–WAY CLUTCH

(a) While turning the overdrive gear clockwise, install the overdrive direct clutch into the one–way clutch.
(b) Hold the overdrive direct clutch and turn the intermediate shaft. The shaft should turn freely clockwise and should lock counterclockwise.
(c) Remove the overdrive direct clutch.

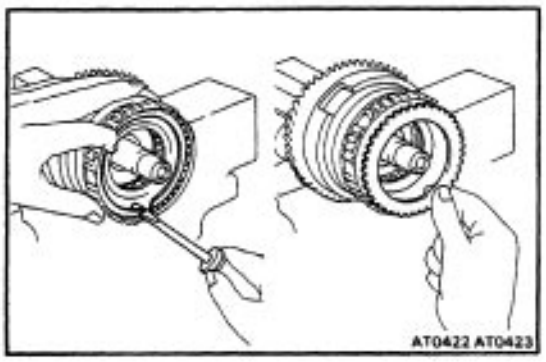


2. CHECK COUNTER DRIVE GEAR PRELOAD

(a) Hold the intermediate shaft in a vise with soft jaws.
(b) Using a tension gauge, measure the preload.

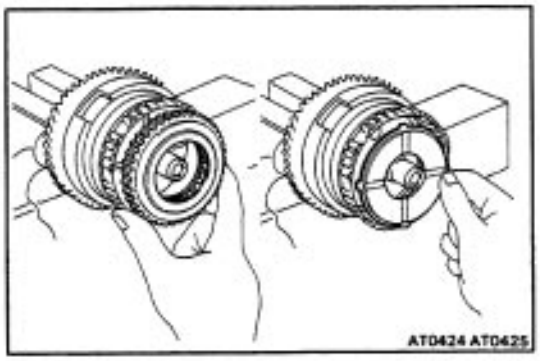
Preload (at starting) : 920 – 1,530 g
(2.0 – 3.4 lb, 9 – 15 N)

HINT: Turn the counter drive gear right and left several times before measuring the preload.



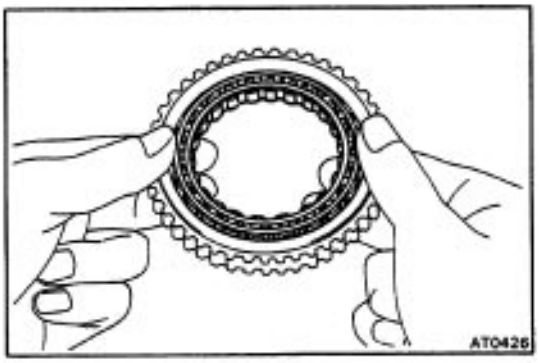
3. REMOVE RETAINING PLATE

(a) Remove the snap ring with a screwdriver.
(b) Remove the retaining plate.



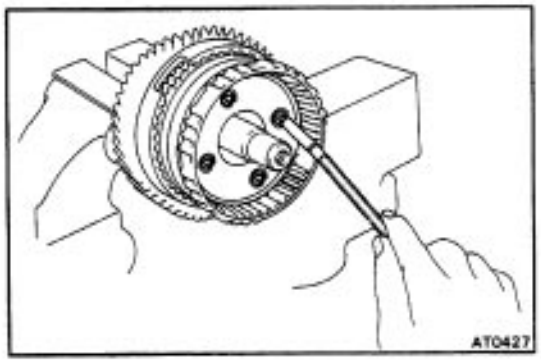
4. REMOVE ONE–WAY CLUTCH AND OUTER RACE

5. REMOVE NO. 3 OVERDRIVE PLANETARY THRUST WASHER



6. REMOVE ONE–WAY CLUTCH FROM OUTER RACE

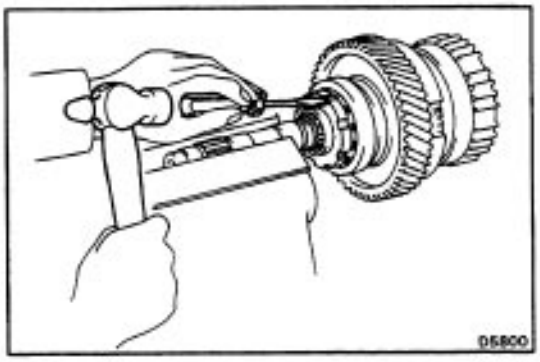
Note the direction of the one–way clutch.



7. REMOVE PLUGS FROM PLANETARY GEAR

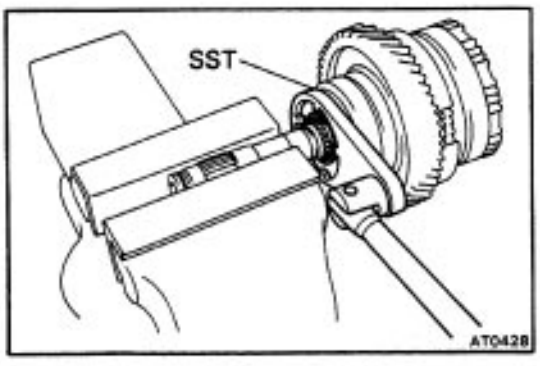
Remove the four plugs with a magnetic finger.

HINT: Be careful not to lose them.



8. REMOVE ADJUSTING NUT AND WASHER

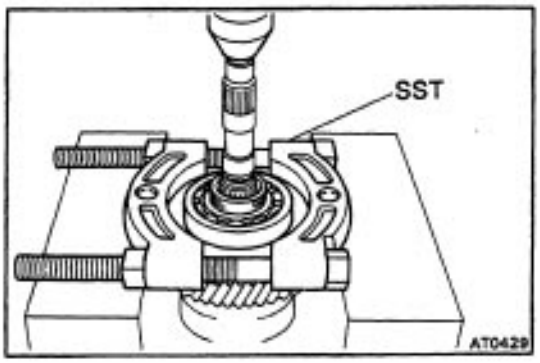
(a) Pry off the locking washer with chisel.



(b) Using SST, loosen the adjusting nut.

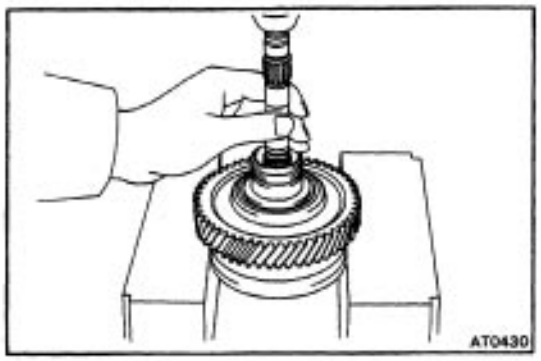
SST 09350–32014 (09351–32080)

(c) Remove the adjusting nut and washer.



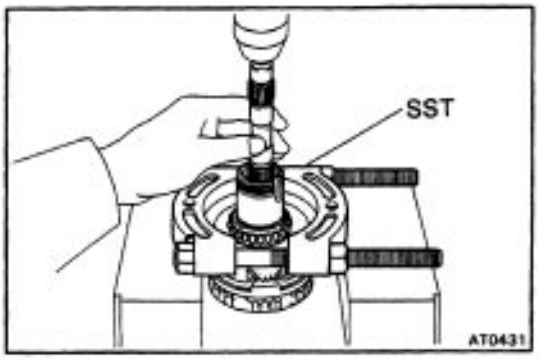
9. REMOVE INTERMEDIATE SHAFT BEARING

Using SST, press out the bearing from the shaft.
SST 09950–00020



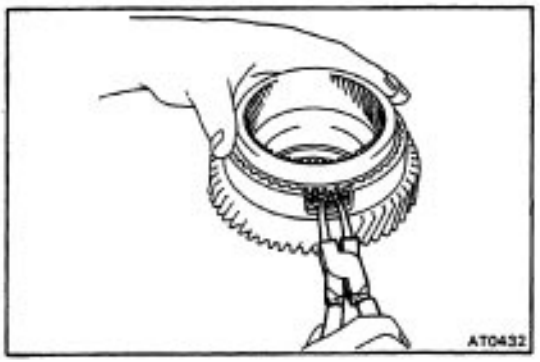
10. REMOVE COUNTER DRIVE GEAR AND FRONT BEARING

Press out the gear and bearing together.



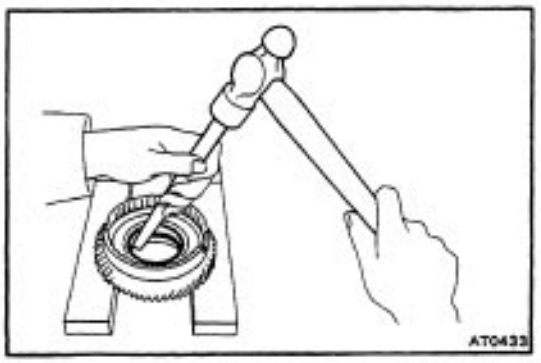
11. REMOVE REAR BEARING

Using SST, press out the bearing.
SST 09950–00020



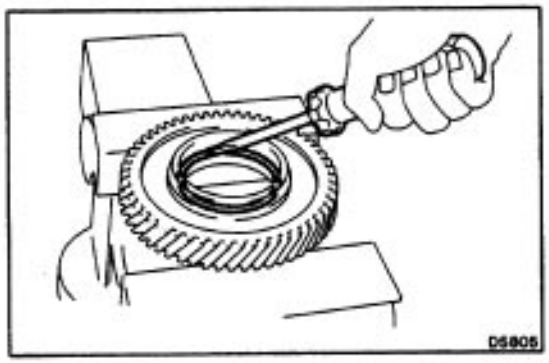
12. REMOVE OVERDRIVE PLANETARY RING GEAR FROM COUNTER DRIVE GEAR

(a) While pulling up the ring gear, compress the snap ring with needle–nose pliers and remove it from the groove.
(b) Remove the ring gear from the counter drive gear.



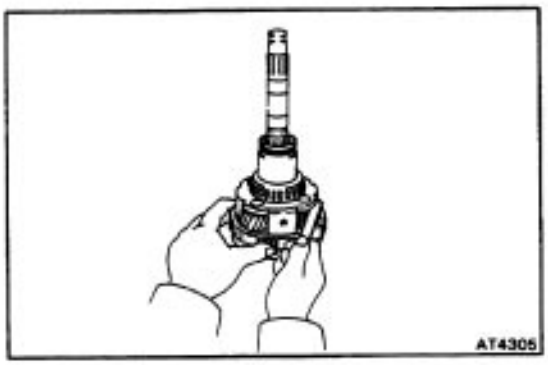
13. REMOVE OUTER RACES FROM COUNTER DRIVE GEAR

Drive out the two races with a brass bar and hammer.



14. REMOVE SNAP RING FROM COUNTER DRIVE GEAR

Using a screwdriver, remove the snap ring.

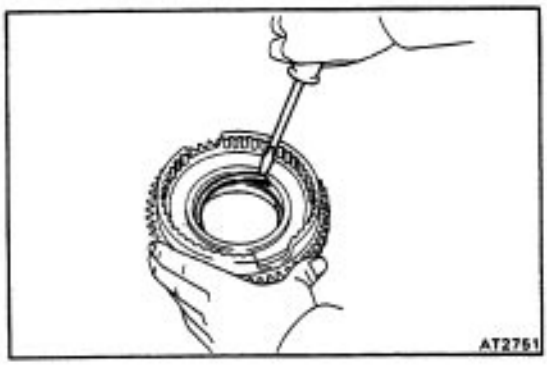


INSPECTION OF OVERDRIVE PLANETARY GEAR

MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

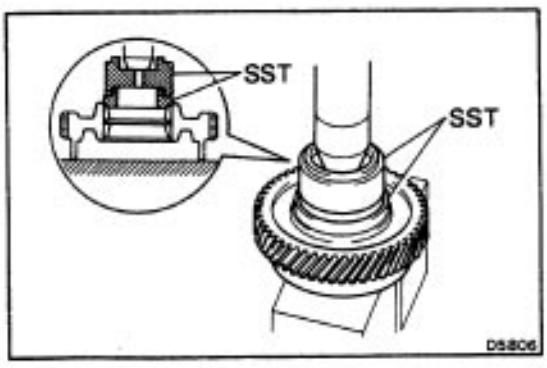
Standard clearance: 0.20 – 0.50 mm (0.0079 – 0.0197 in.)



ASSEMBLY OF COUNTER DRIVE GEAR

1. INSTALL SNAP RING INTO COUNTER GEAR

Install the snap ring with a screwdriver.

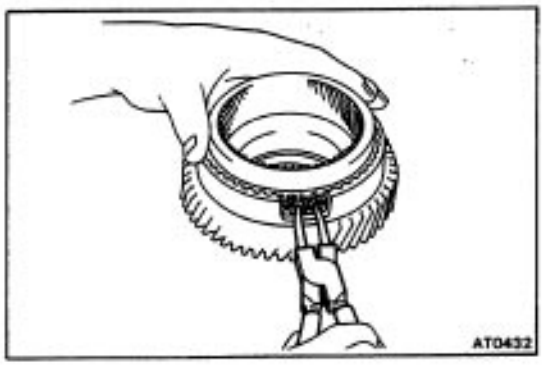


2. INSTALL OUTER RACES INTO COUNTER DRIVE GEAR

Using SST, press in the two outer races to the gear both side.

SST 09350–32014 (09351–32120, 09351–32150)

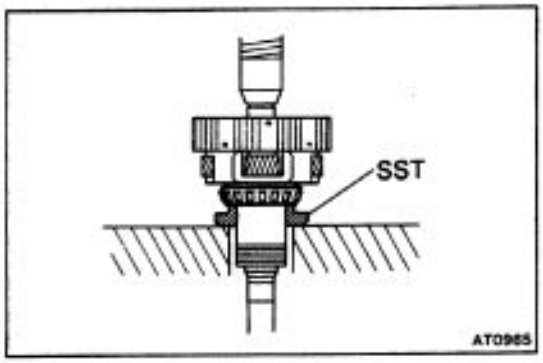
HINT: Press in the two outer races until they touch the snap ring. Tap the races in straight, so that they do not tilt



3. INSTALL OVERDRIVE PLANETARY RING GEAR INTO COUNTER DRIVE GEAR

While pushing down the ring gear, squeeze the snap ring end with a needle–nose pliers, and install it into the groove.

HINT: When the snap ring is fully seated, the end will be free.

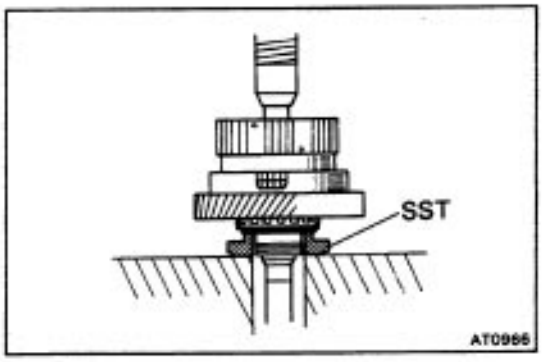


4. INSTALL REAR BEARING

Using SST, press in the bearing onto the shaft.

SST 09350–32014 (09351–32120)

HINT: Press in the bearing until the side surface of the inner race touches the shaft.

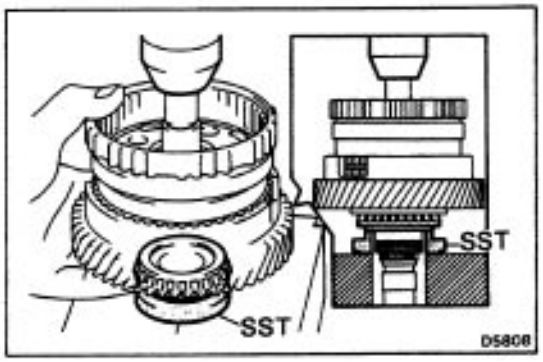


5. INSTALL COUNTER DRIVE GEAR AND FRONT BEARING

(a) Install the gear onto the shaft, and mesh the ring gear with the planetary pinions.

(b) Place the front bearing onto the shaft.

HINT: Hold the ring gear to prevent it from failing.



(c) Using SST, press in the bearing until slightly play between the bearings.

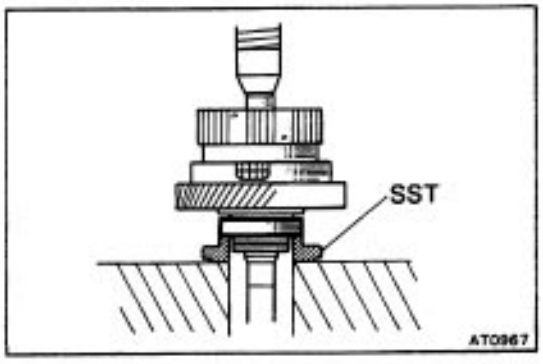
SST 09350–32014 (09351–32120)

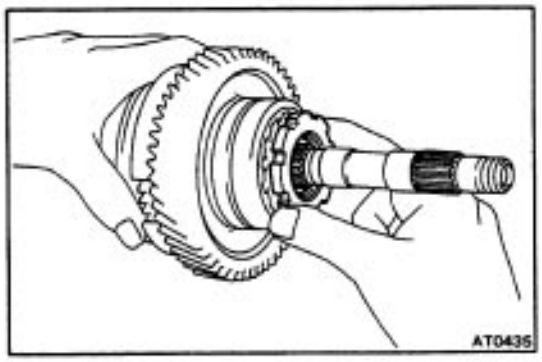
6. INSTALL INTERMEDIATE SHAFT BEARING

Using SST, press in the bearing until it slightly touches the front bearing of the counter drive gear.

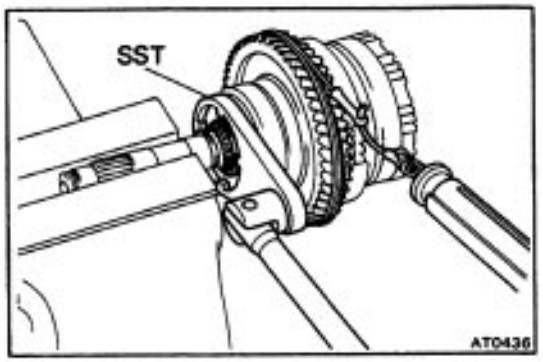
SST 09350–32014 (09351–32120)

HINT: The counter drive gear can be turned lightly.





7. PLACE NEW LOCKING WASHER AND ADJUSTING NUT ONTO INTERMEDIATE SHAFT



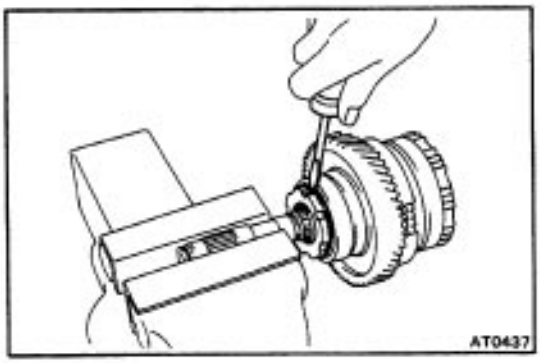
8. ADJUST PRELOAD OF COUNTER DRIVE GEAR

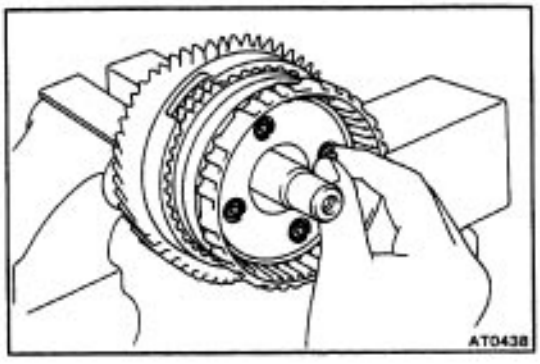
(a) Place SST onto the adjusting nut and hold the shaft in a vise with soft jaws.
SST 09350–32014 (09351–32080)

(b) Tighten the adjusting nut until the following gear starting load occurs with a tension gauge.
(Preload at starting): 920 – 1,530 g (2.0–3.41b,9–15N)

HINT: Turn the counter drive gear right and left several times before measuring the preload.

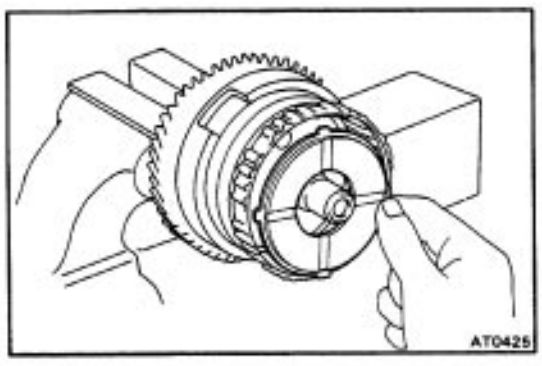
(c) Lock the adjusting nut with one tab on locking washer. Bend the locking washer tab until it is even with the adjusting nut groove.





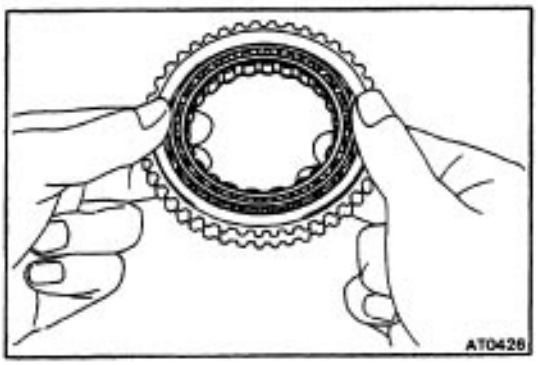
9. INSTALL PINION SHAFT PLUGS

Install the four plugs into the pinion shaft.



10. INSTALL NO. 3 OVERDRIVE PLANETARY THRUST WASHER

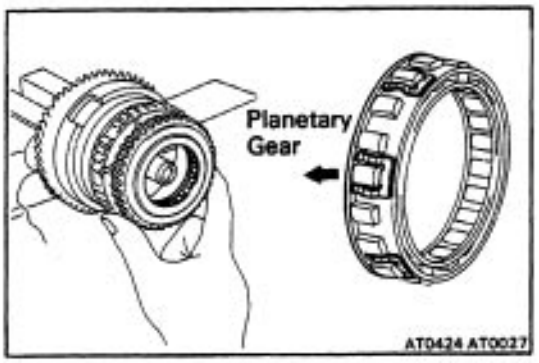
Install the thrust washer, facing the groove toward the overdrive case.



11. ASSEMBLE OVERDRIVE ONE–WAY CLUTCH

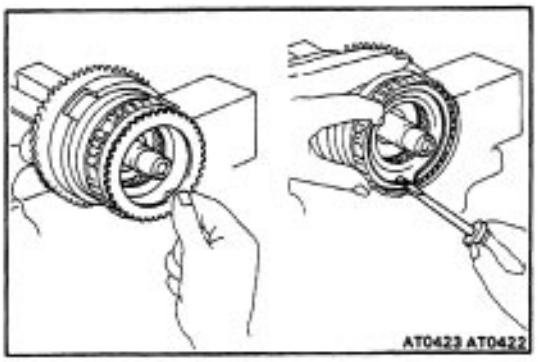
(a) Install the one–way clutch into the outer race.

(b)Install a retainer on both sides of the one–way clutch.



12. INSTALL OVERDRIVE ONE–WAY CLUTCH INTO HUB

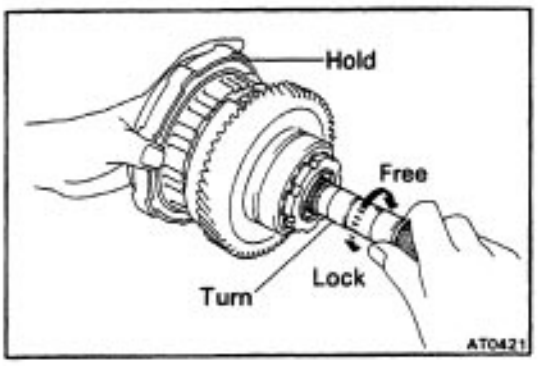
Be sure that the one–way clutch is installed in the correct direction.



13. INSTALL RETAINING PLATE

(a) Place the retaining plate into the hub.

(b) Install the snap ring with a screwdriver.

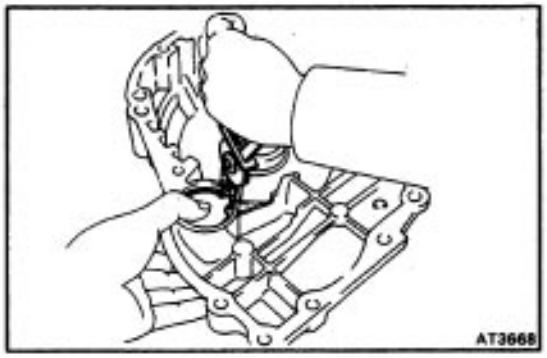


14. CHECK OPERATION OF ONE–WAY CLUTCH

(a) While turning the overdrive gear clockwise, install the overdrive direct clutch into the one–way clutch.

(b) Hold the overdrive direct clutch and turn the intermediate shaft. The shaft should turn freely clockwise and should lock counterclockwise.

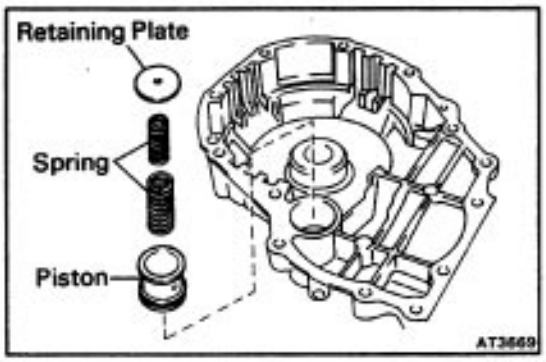
(e) Remove the overdrive direct clutch.



DISASSEMBLY OF OVERDRIVE CASE

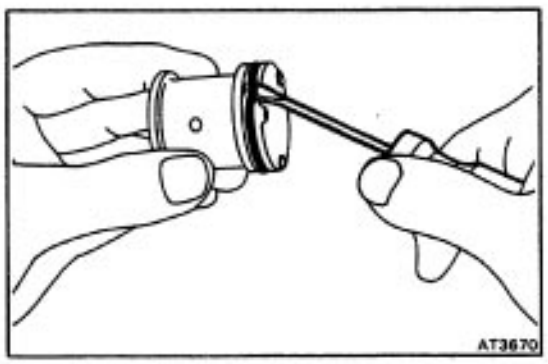
1. REMOVE Co ACCUMULATOR PISTON FROM OVERDRIVE CASE

(a) Using snap ring pliers, remove the snap ring.

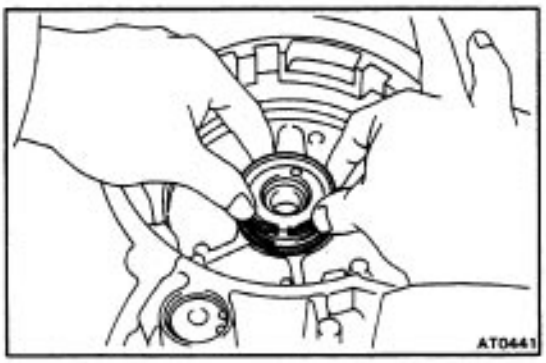


(b) Remove the retaining plate and two springs.

(e) Remove the accumulator piston.



(d) Remove the O–ring from the piston.



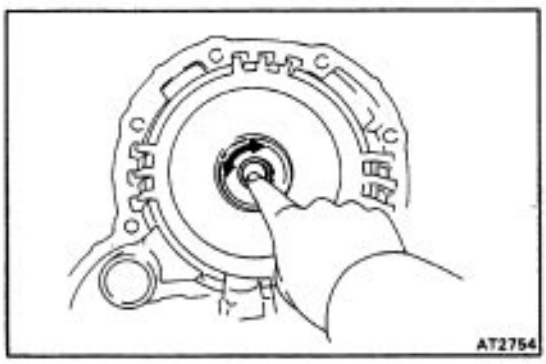
2. REMOVE OIL SEAL RINGS

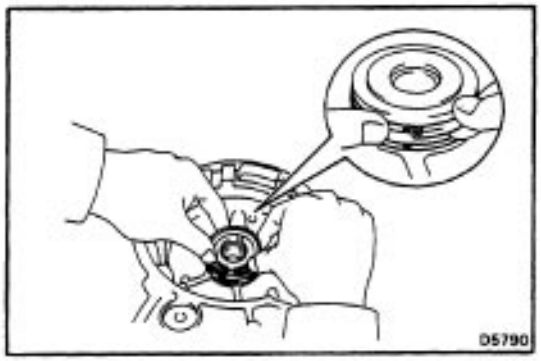
Spread the two rings apart and remove them.

INSPECTION OF OVERDRIVE CASE

INSPECT OVERDRIVE CASE BEARING

Check that the bearing turn smoothly with finger.



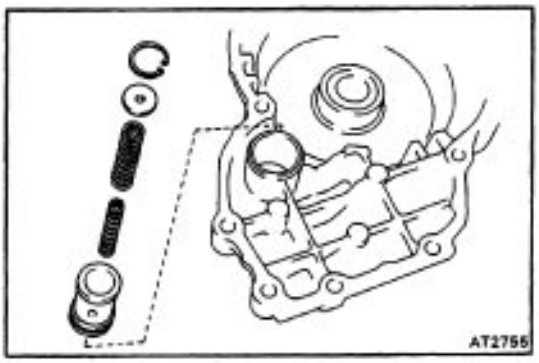


ASSEMBLY OF OVERDRIVE CASE

1. INSTALL OIL SEAL RINGS ON OVERDRIVE CASE

Spread the two rings apart and install them into the groove.

HINT: After installing the oil seal rings, check that they move smoothly.

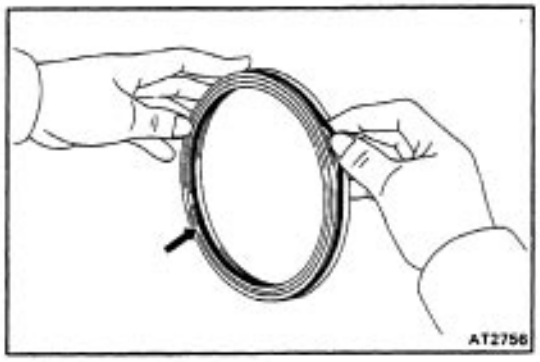


2. INSTALL Co ACCUMULATOR PISTON OF OVERDRIVE CLUTCH

(a) Install a new O–ring to the accumulator piston.
Coat the O–ring with ATF.

(b) Install the accumulator piston, two springs and plate.

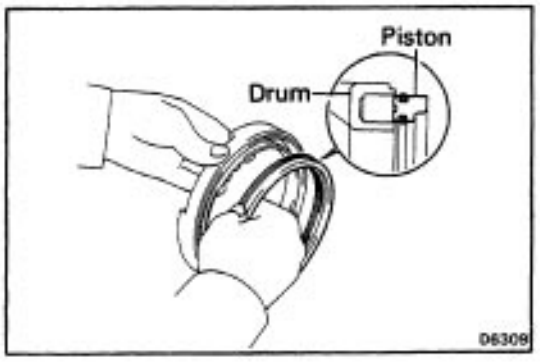
(c) Install the snap ring with snap ring pliers.



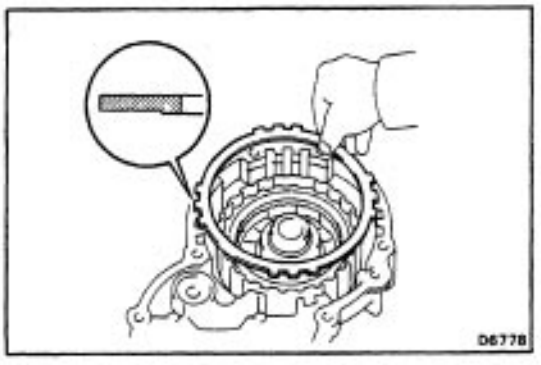
ASSEMBLY OF OVERDRIVE BRAKE

1. INSTALL PISTON INTO DRUM

(a) Install the new O–rings to the piston.
Coat the O–rings with ATF.

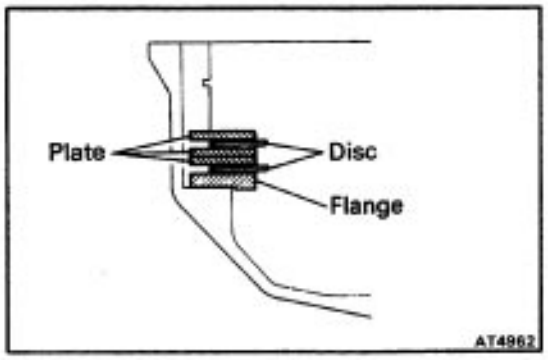


(b) Press the piston into the drum, being careful not to damage the O–rings.

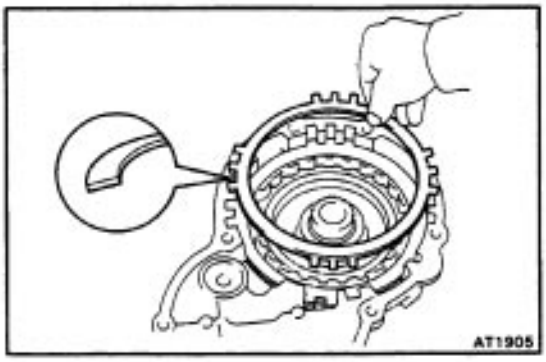


2. INSTALL FLANGE, DISCS AND PLATES

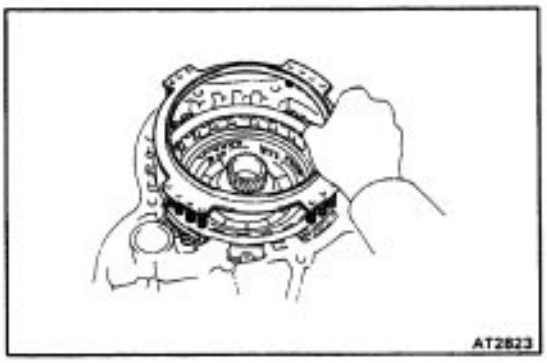
(a) Install the flange, facing the flat end upward.



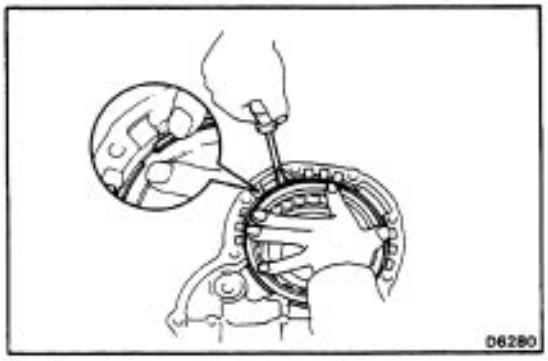
(b) Install the discs and plates.
Install in order: P=Plate D=Disc
Flange –D–P–P–D–P



(c) Install the cushion plate facing the rounded end upward.

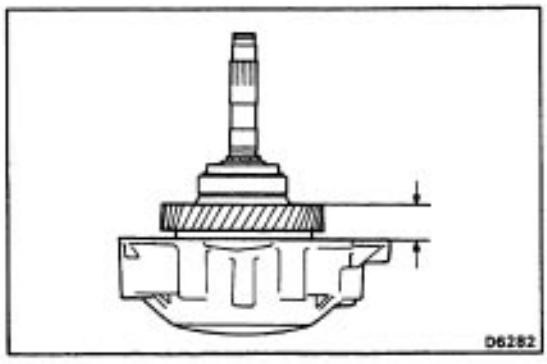


3. INSTALL PISTON RETURN SPRING



4. INSTALL SNAP RING INTO CASE

Be sure the end gap of the snap ring is not aligned with one of cutouts.

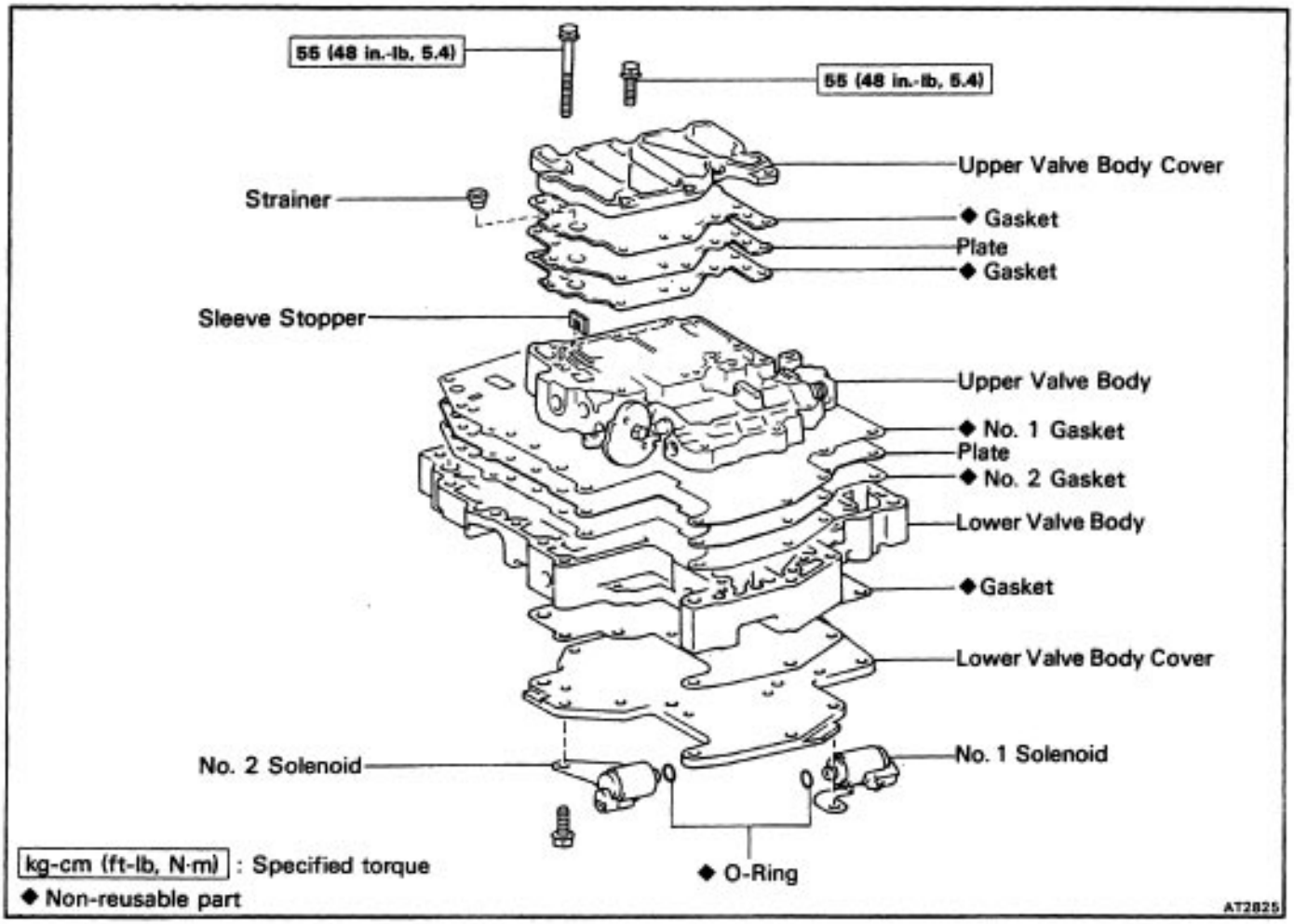


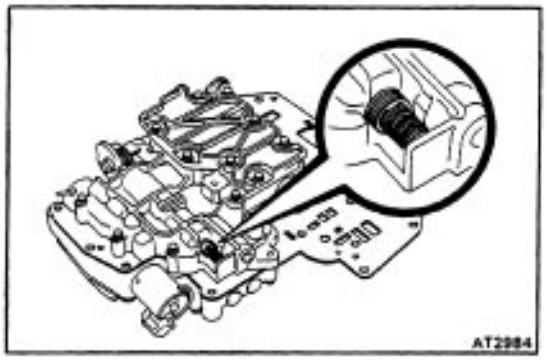
5. INSTALL OVERDRIVE GEAR ASSEMBLY ONTO CASE

While turning the overdrive gear clockwise, install the overdrive gear assembly to the case.
If the overdrive gear assembly is properly installed to the overdrive case, the clearance between them will be about 24 mm (0.94 in.).

Valve Body (A140E)

COMPONENTS

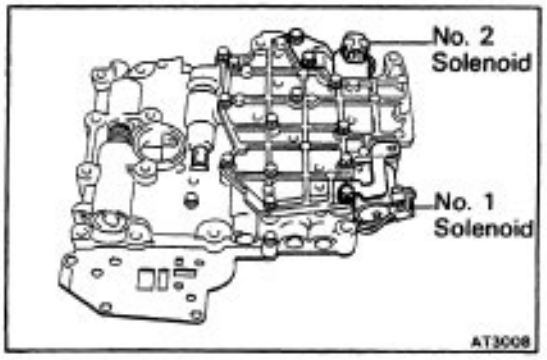




(Disassembly of Valve Body)

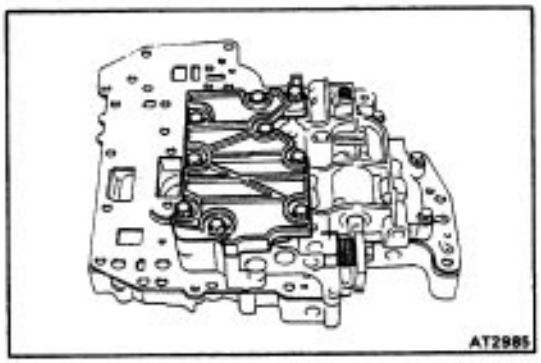
1. NOTE THE NUMBERS OF ADJUSTING RINGS

HINT: Count the number of adjusting rings before disassembly of the valve body because the throttle pressure is changed according to the number. (Some of the valve bodies do not have any adjusting rings.)



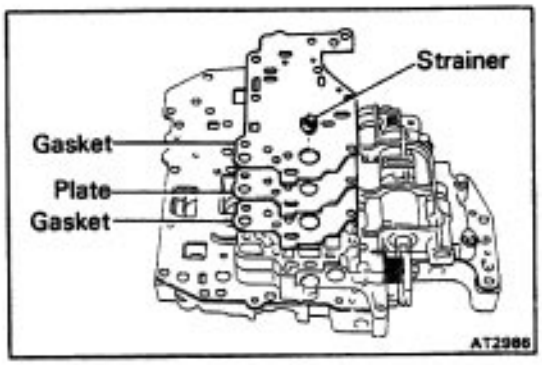
2. REMOVE SOLENOIDS

(a) Remove the No. 1 and No. 2 solenoids.
(b) Remove the 4–rings from the solenoids.



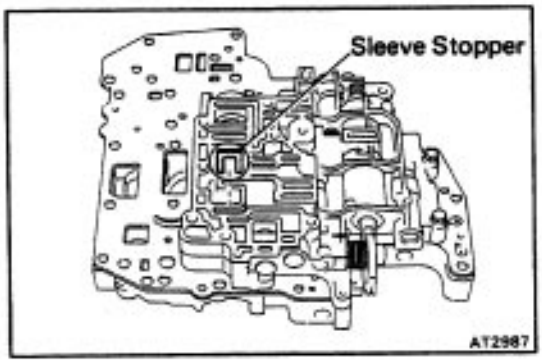
3. REMOVE UPPER VALVE BODY COVER

Remove the nine bolts and upper valve body cover.

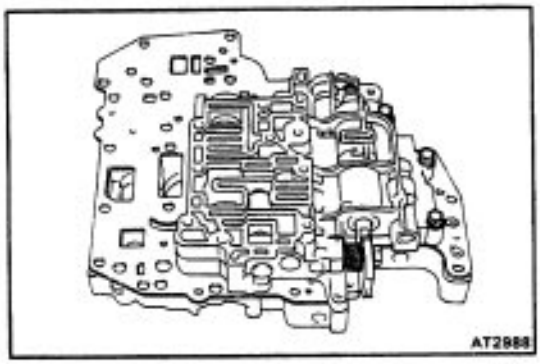


4. REMOVE STRAINER GASKETS, PLATE AND SLEEVE STOPPER FROM UPPER VALVE BODY

(a) Remove the strainer, two gaskets and plate.

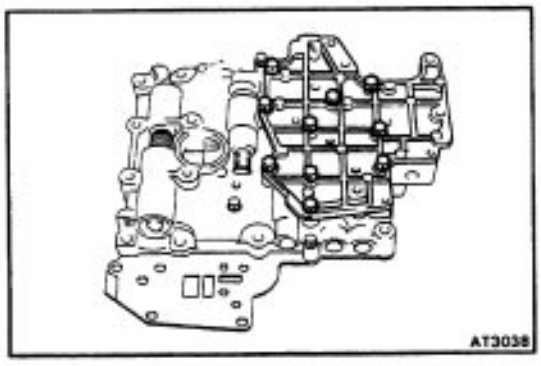


(b) Remove the sleeve stopper.



5. REMOVE BOLTS FROM UPPER VALVE BODY

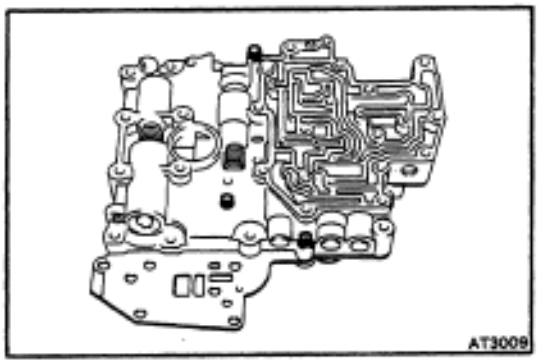
Remove the three bolts from the upper valve body.



6. REMOVE LOWER VALVE BODY COVER

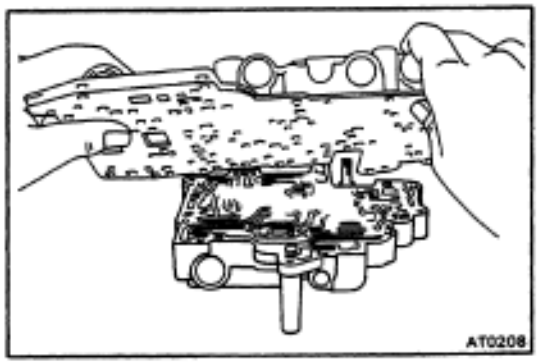
(a) Remove the ten bolts.

(b) Remove the lower valve body cover and gasket.



7. REMOVE BOLTS FROM LOWER VALVE BODY

Remove the three bolts from lower valve body.



8. LIFT OFF LOWER VALVE BODY AND PLATE AS SINGLE UNIT

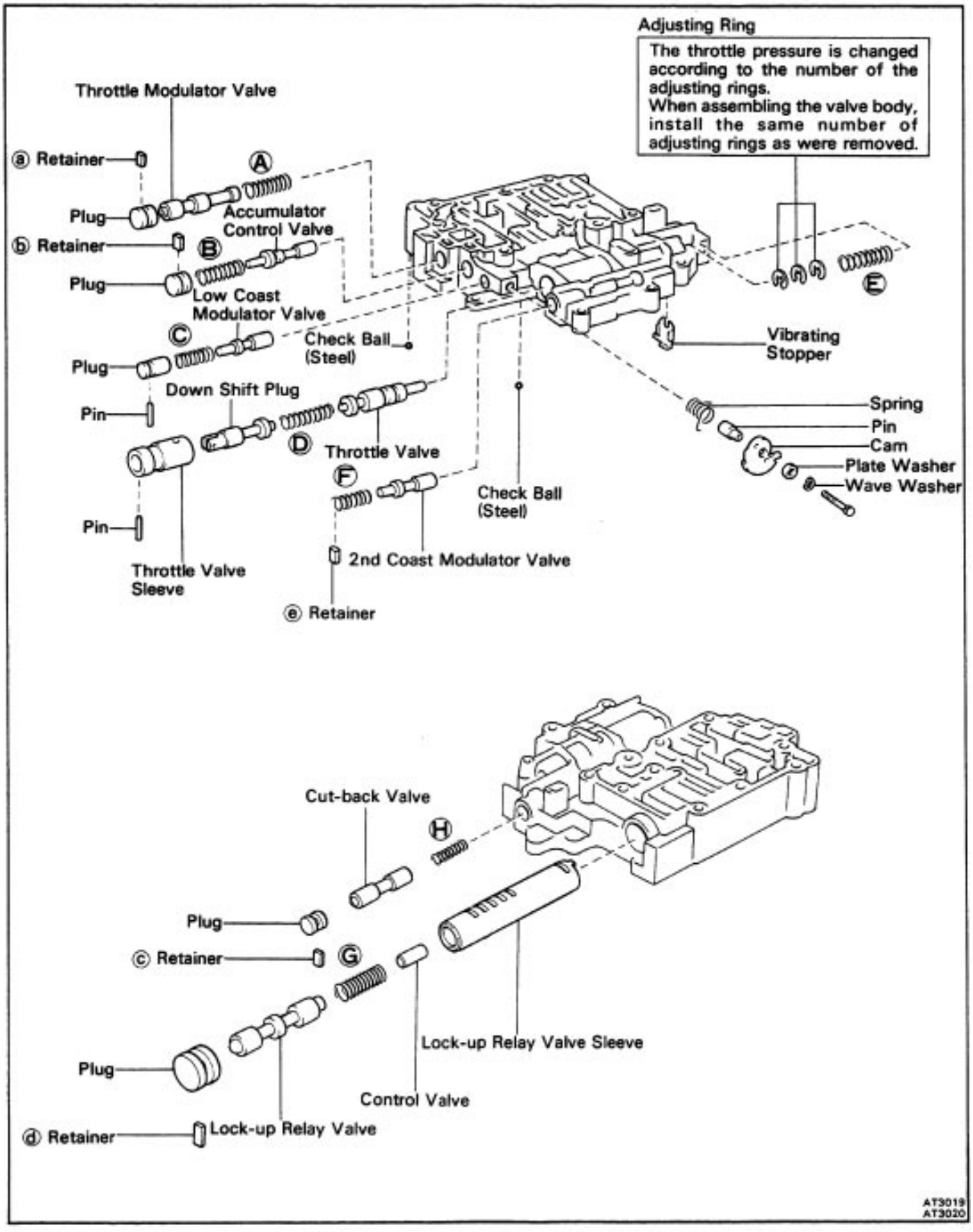
Hold the plate to the lower valve body and lift off the lower valve body.

HINT: Be careful that the check balls do not fail out.

9. REMOVE PLATE AND GASKETS

(Upper Valve Body)

COMPONENTS

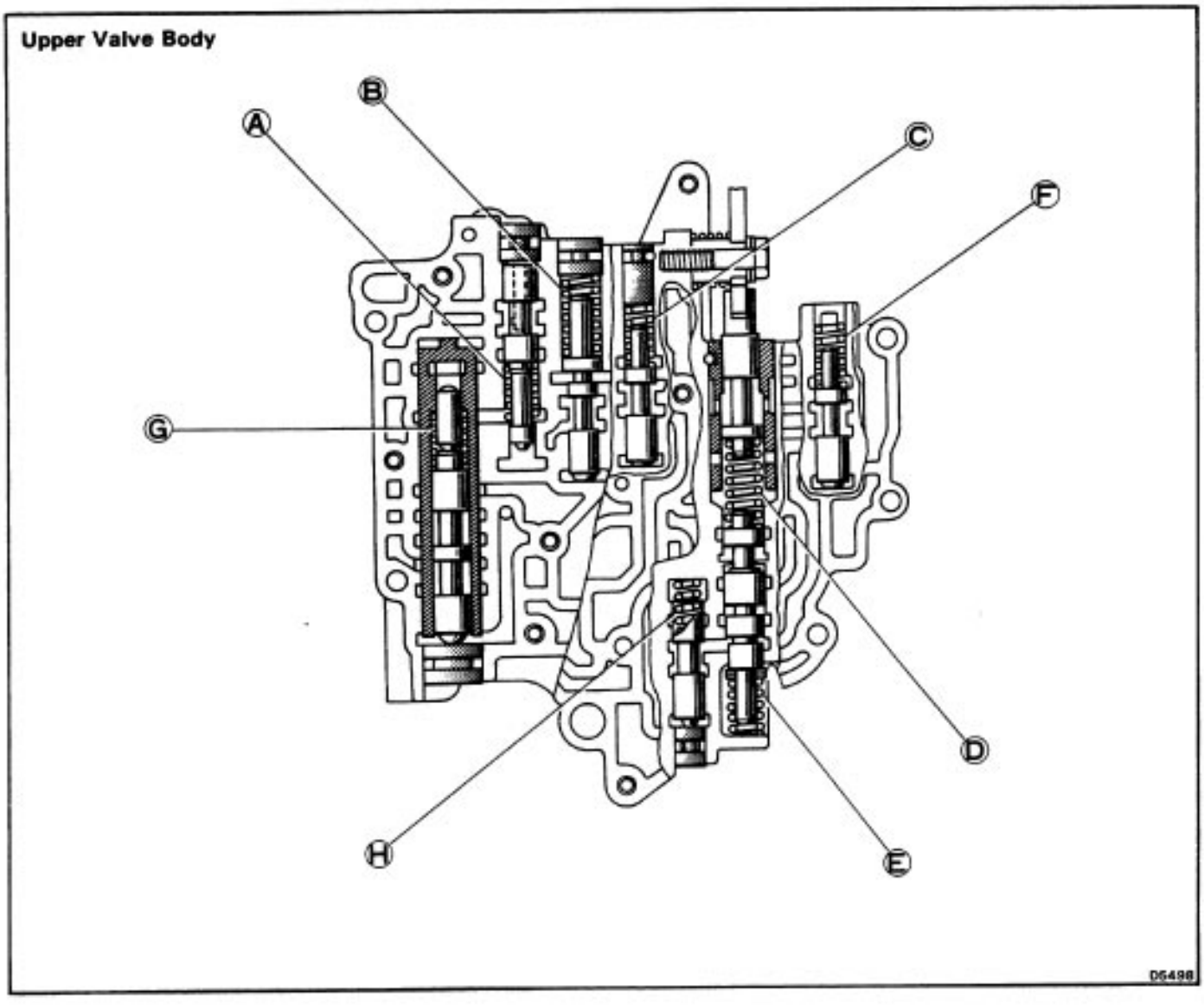


SPECIFICATIONS OF VALVE BODY SPRINGS

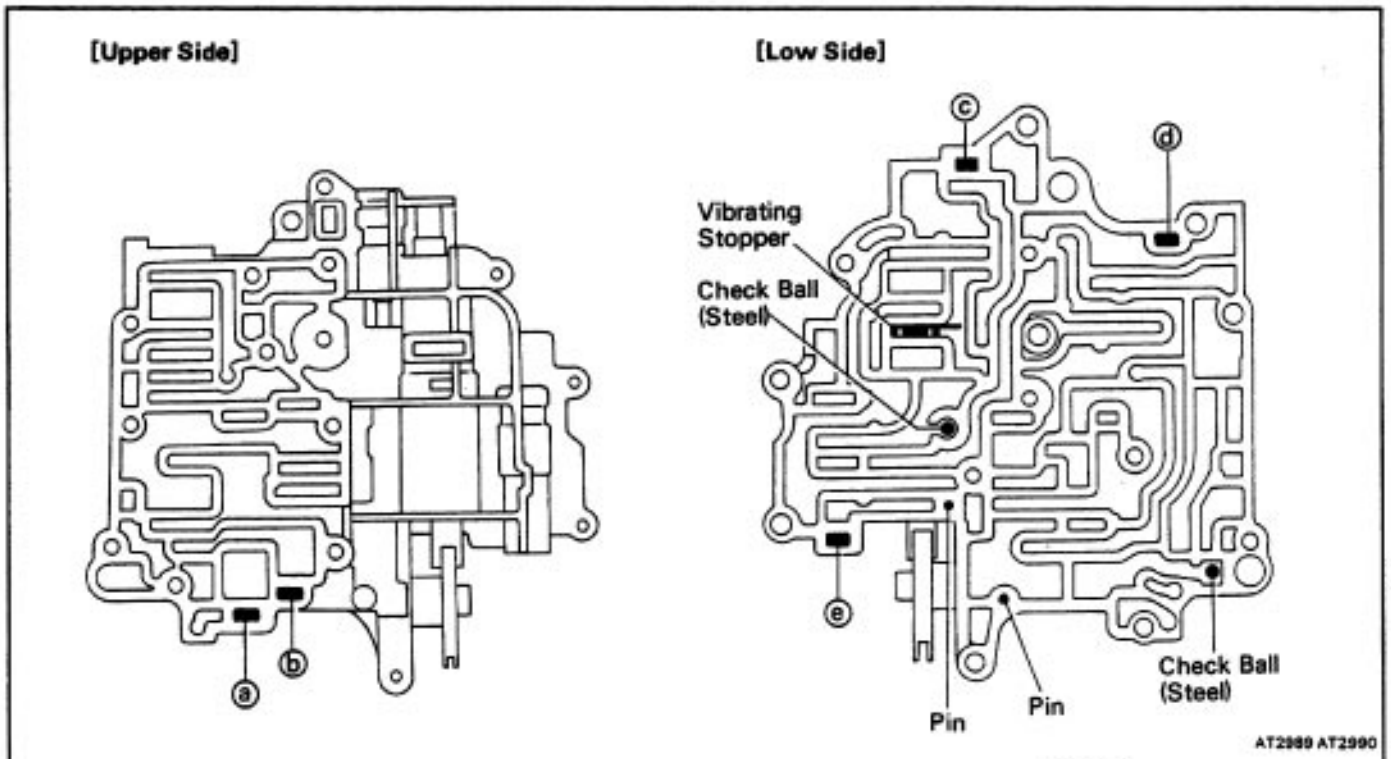
	Spring	Free Length mm (in.)	Coil Outer Diameter mm (in.)	Number of Coils	Color
Ⓐ	Throttle Modulator Valve Spring	21.70 (0.8543)	9.50 (0.3740)	9.5	None
Ⓑ	Accumulator Control Valve Spring	28.06 (1.1047)	10.60 (0.4173)	13.0	Yellow
Ⓒ	Low Coast Modulator Valve Spring	21.60 (0.8504)	7.90 (0.3110)	11.5	None
Ⓓ	Down Shift Plug Spring	29.76 (1.1717)	8.73 (0.3437)	13.5	Yellow
Ⓔ	Throttle Valve Spring	30.70 (1.2087)	9.20 (0.3622)	9.5	None
Ⓕ	2nd Coast Modulator Valve Spring	20.93 (0.8240)	8.50 (0.3346)	10.0	Light Green
Ⓖ	Lock–up Relay Valve Spring	26.56 (1.0457)	10.20 (0.4016)	11.5	Green
Ⓗ	Cut–back Valve Spring	21.80 (0.8583)	6.00 (0.2362)	13.5	None

HINT: During re–assembly please refer to the spring specifications above to help discriminate between the different springs.

SECTIONAL VIEW OF VALVE BODY



LOCATION OF RETAINERS PINS VIBRATING STOPPER AND CHECK BALLS

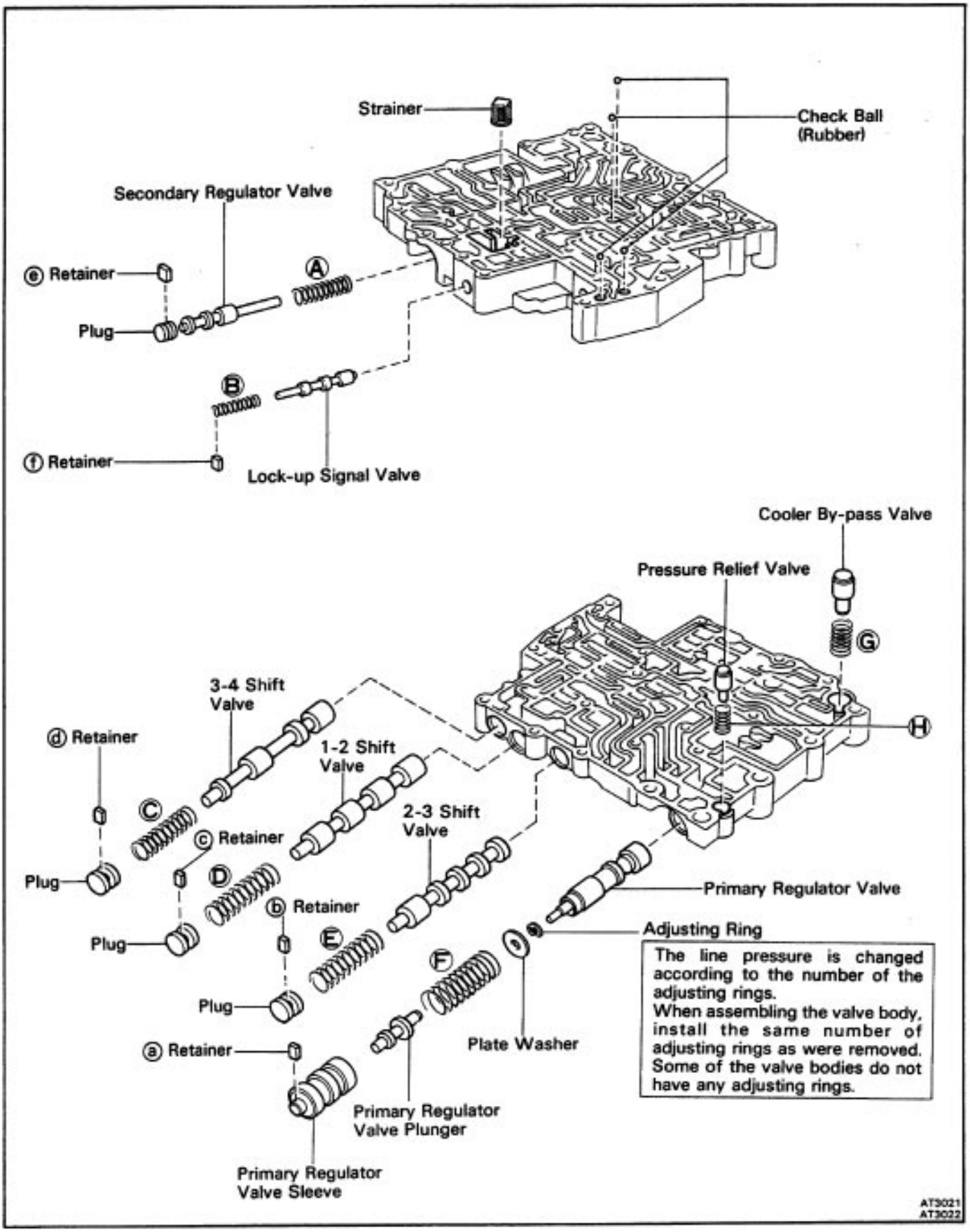


mm (in.)

Retainer		Height	Width	Thickness
ⓐ	Throttle modulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓑ	Accumulator control valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓒ	Cut-back valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓓ	Lock-up relay valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)
ⓔ	2nd coast modulator valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)

(Lower. Valve Body)

COMPONENTS

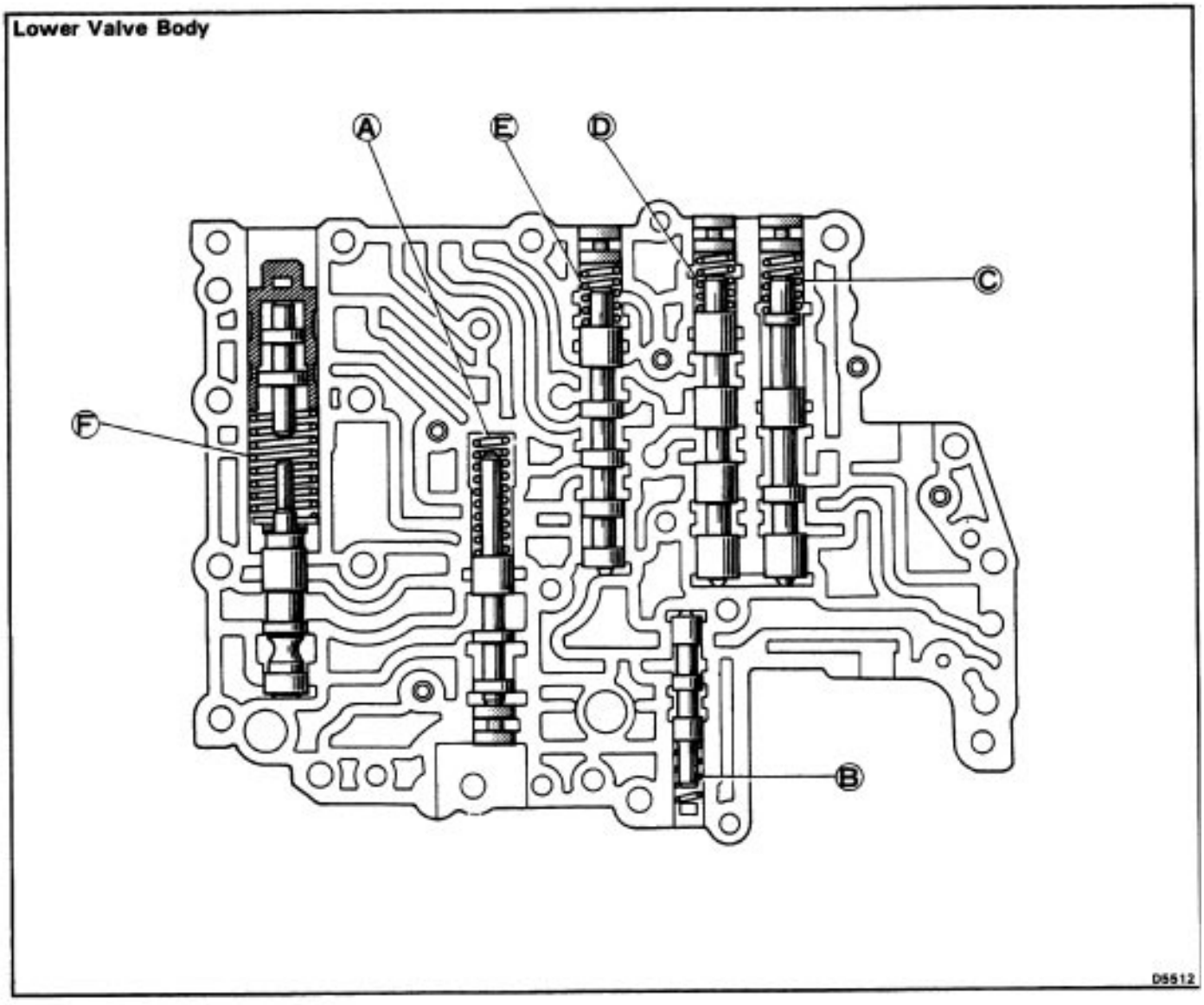


SPECIFICATIONS OF VALVE BODY SPRINGS

	Spring	Free Length mm (in.)	Coil Outer Diameter mm (in.)	Number of Coils	Color
Ⓐ	Secondary Regulator Valve Spring	43.60 (1.7165)	10.90 (0.4291)	11.5	None
Ⓑ	Lock–up Signal Valve Spring	30.00 (1.1811)	8.20 (0.3228)	11.5	None
Ⓒ	3–4 Shift Valve Spring	29.27 (1.1524)	9.70 (0.3819)	10.5	None
Ⓓ	1–2 Shift Valve Spring	29.27 (1.1524)	9.70 (0.3819)	10.5	None
Ⓔ	2–3 Shift Valve Spring	29.27 (1.1524)	9.70 (0.3819)	10.5	None
Ⓕ	Primary Regulator Valve Spring	66.65 (2.6240)	18.60 (0.7323)	12.5	None
Ⓖ	Cooler By–pass Valve Spring	19.90 (0.7835)	11.00 (0.4331)	8.5	None
Ⓗ	Pressure Relief Valve Spring	11.20 (0.4409)	6.40 (0.2520)	7.5	None

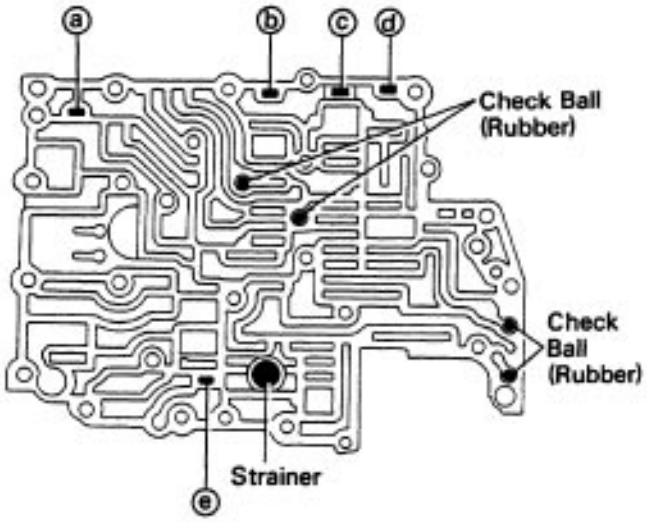
HINT: During re–assembly please refer to the spring specifications above to help discriminate between the different springs.

SECTIONAL VIEW OF VALVE BODY

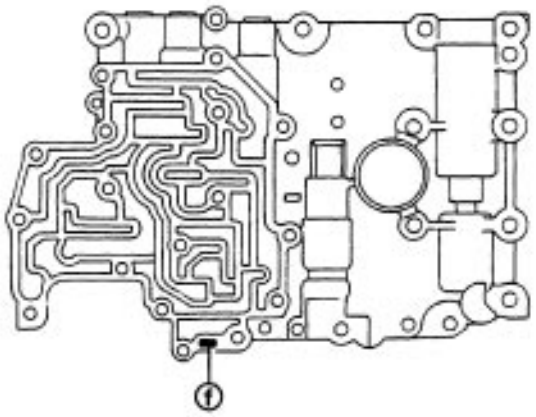


LOCATION OF RETAINER STRAINER AND CHECK BALLS

[Upper Side]



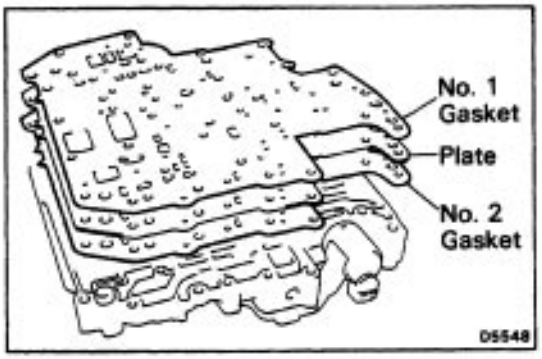
[Lower Side]



AT2991 AT2992

mm (in.)

Retainer		Height	Width	Thickness
ⓐ	Primary regulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓑ	2-3 shift valve	8.0 (0.315)	6.0 (0.236)	3.2 (0.126)
ⓒ	1-2 shift valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓓ	3-4 shift valve	8.0 (0.315)	6.0 (0.236)	3.2 (0.126)
ⓔ	Secondary regulator valve	13.0 (0.512)	6.0 (0.236)	3.2 (0.126)
ⓕ	Lock-up signal valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)



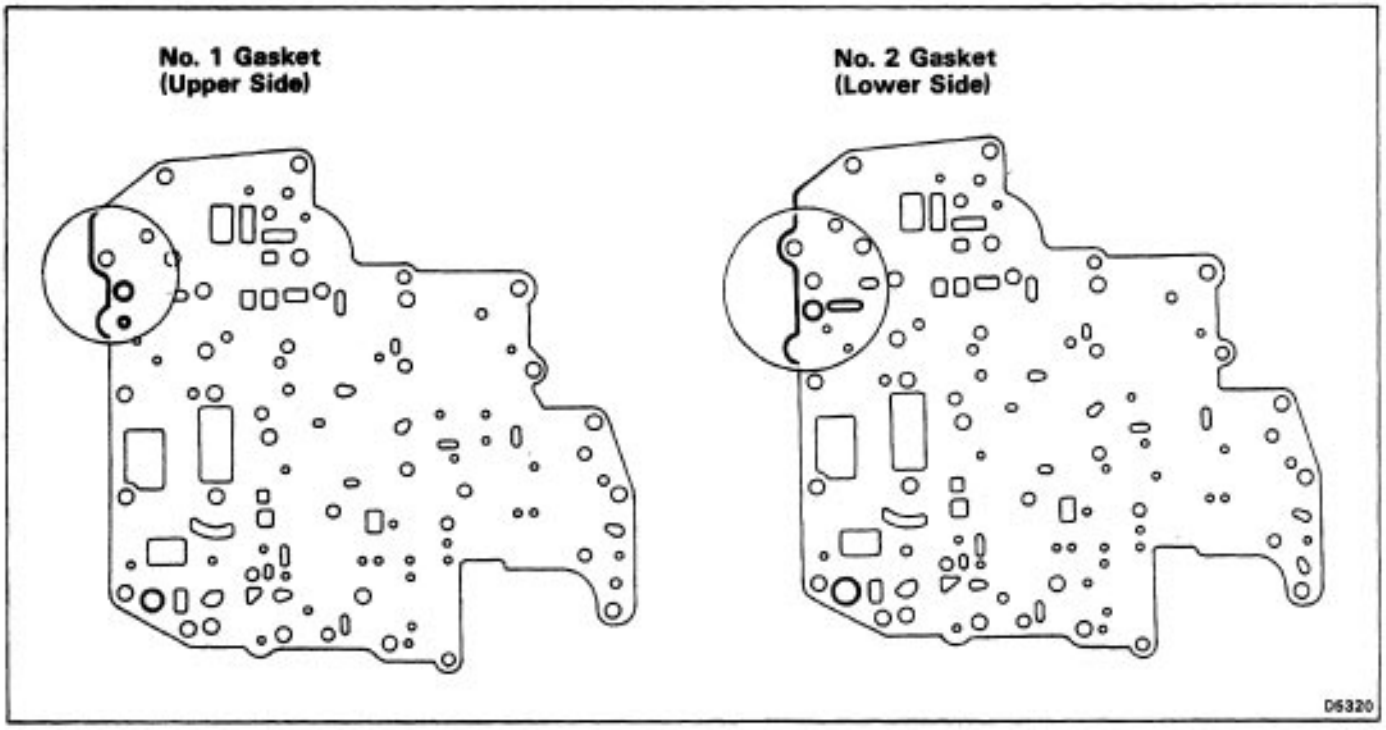
(Assembly of Valve Body)

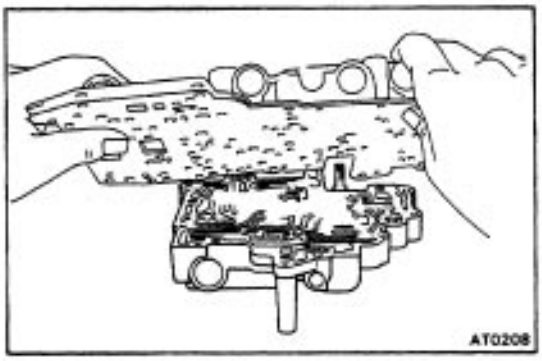
(See page AT–121)

1. POSITION PLATE AND NEW GASKETS ON LOWER VALVE BODY

Position the new No. 2 gasket, the plate and then the new No. 1 gasket on the lower valve body.

HINT: Since No. 1 gasket and No. 2 gasket are similar use the illustration below to discriminate between them.

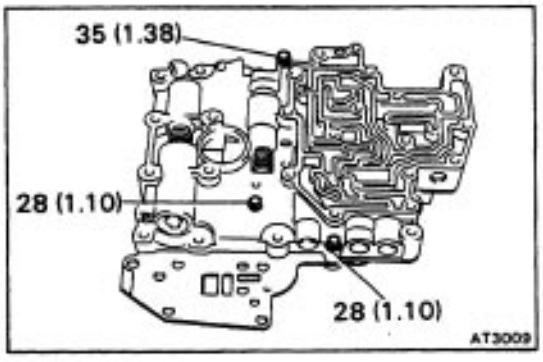




2. PLACE LOWER VALVE BODY WITH PLATE AND GASKETS ON UPPER VALVE BODY

HINT: Hold the lower valve body, gaskets and plate securely so they do not separate.

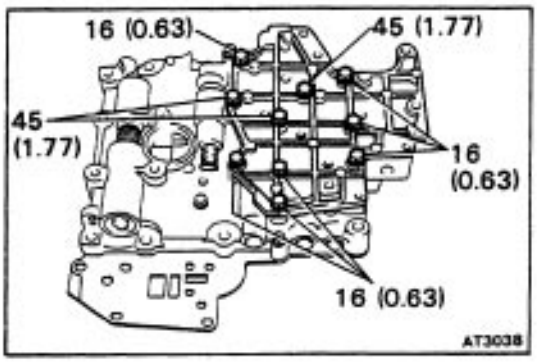
Align each bolt hole in the valve bodies with the gaskets and plate.



3. INSTALL AND FINGER TIGHTEN BOLTS IN LOWER VALVE BODY TO SECURE UPPER VALVE BODY

Install and finger tighten the three bolts.

HINT: Each bolt length (mm (in.)) is indicated in the figure.

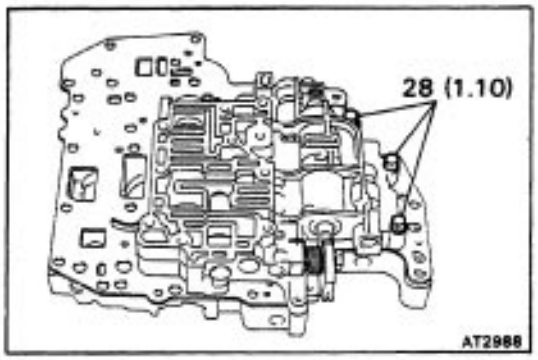


4. INSTALL LOWER VALVE BODY COVER

(a) Install the lower valve body cover over the new gasket.

(b) Install and finger tighten the ten bolts.

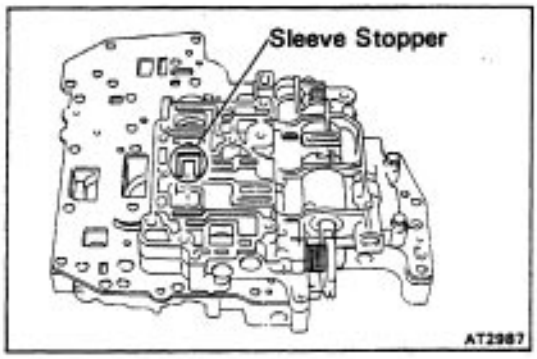
HINT: Each bolt length (mm (in.)) is indicated in the figure.



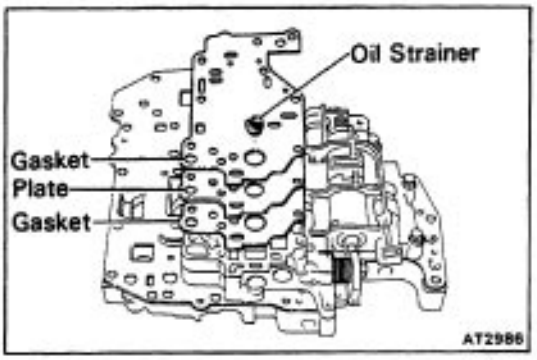
5. INSTALL AND FINGER TIGHTEN BOLTS IN UPPER VALVE BODY

Install and finger tighten the three bolts.

HINT: Each bolt length (mm (in.)) is indicated in the figure.



6. INSTALL SLEEVE STOPPER

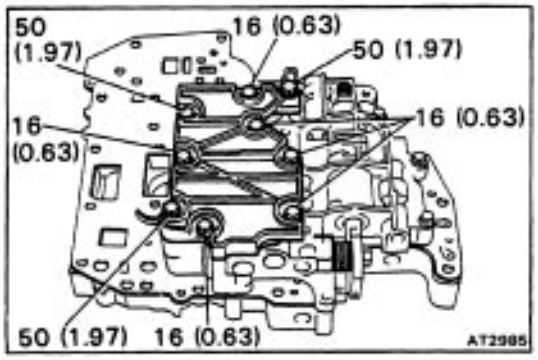


7. INSTALL UPPER VALVE BODY COVER GASKETS, PLATE AND THROTTLE MODULATOR OIL STRAINER

(a) Position a new gasket and plate and then another new gasket.

HINT: Both gaskets are same one.

(b) Install the oil strainer onto the gasket.

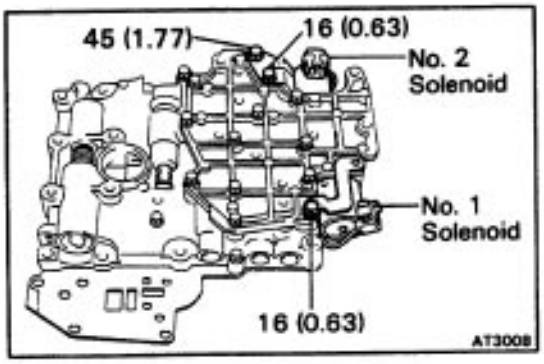


8. INSTALL UPPER VALVE BODY COVER

(a) Position the upper valve body cover.

(b) Install and finger tighten the nine bolts.

HINT: Each bolt length (mm (in.)) is indicated in the figure.



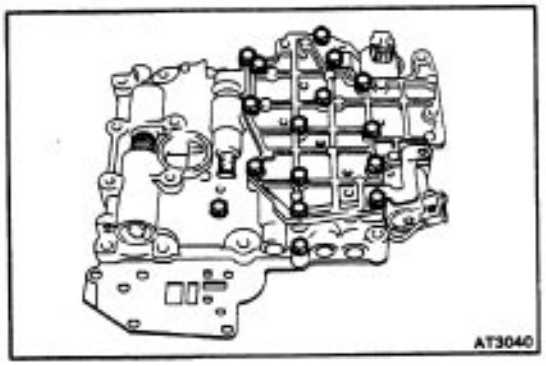
9. INSTALL SOLENOIDS

(a) Install the new O–rings on the solenoids.

W Install the No. 1 and No. 2 solenoids.

(e) Install and finger tighten the three bolts.

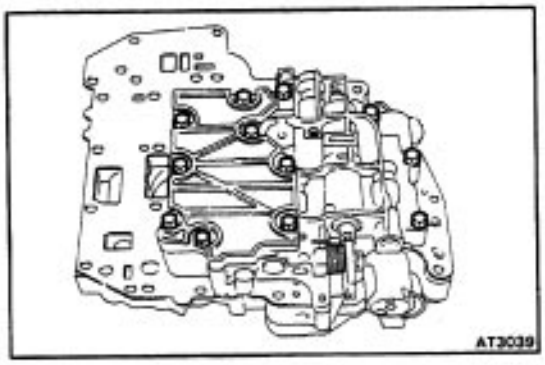
HINT: Each bolt length (mm (in.)) is indicated in the figure.



10. TIGHTEN BOLTS OF UPPER AND LOWER VALVE BODIES

(a) Tighten the sixteen bolts in the lower valve body.

Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)

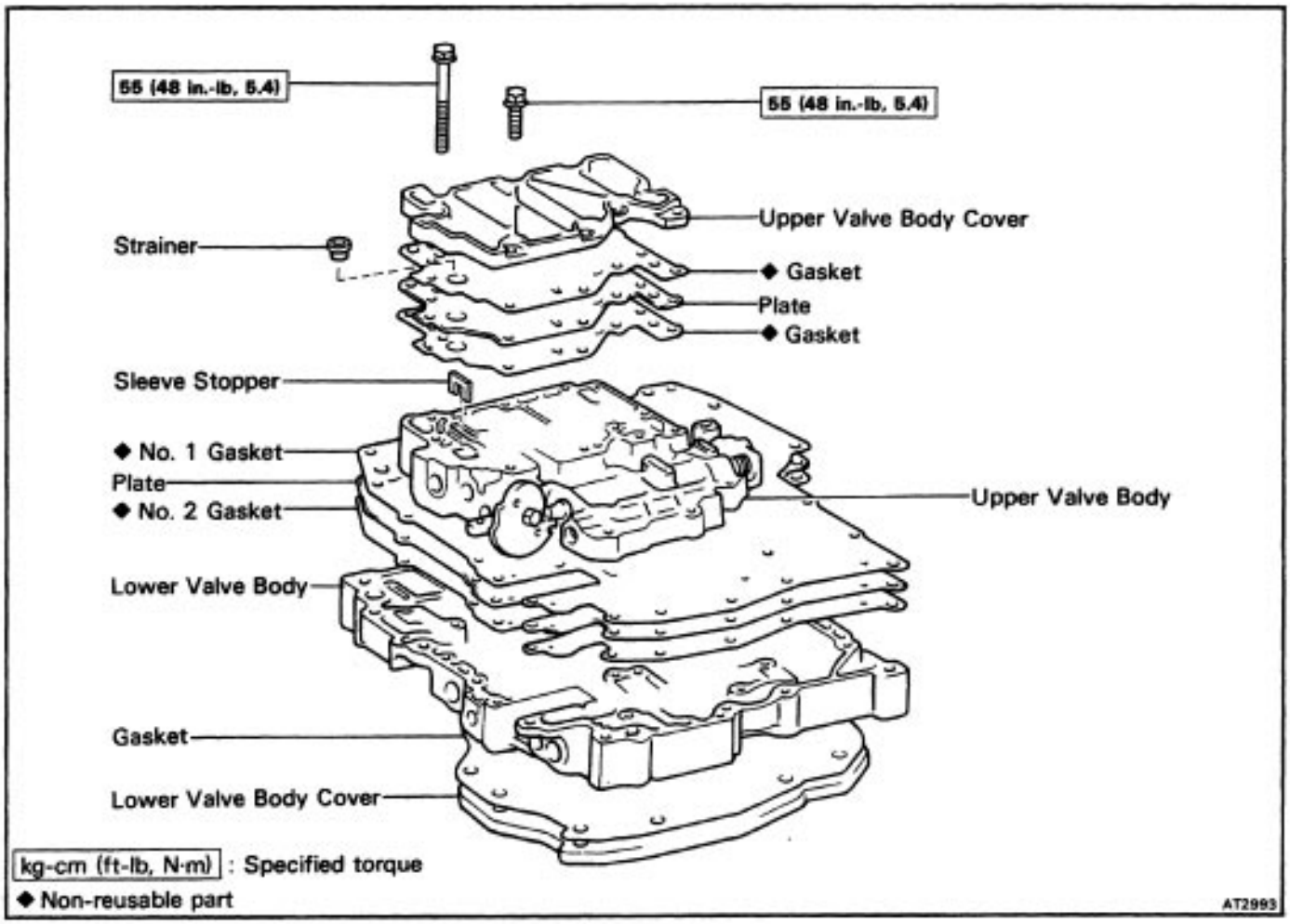


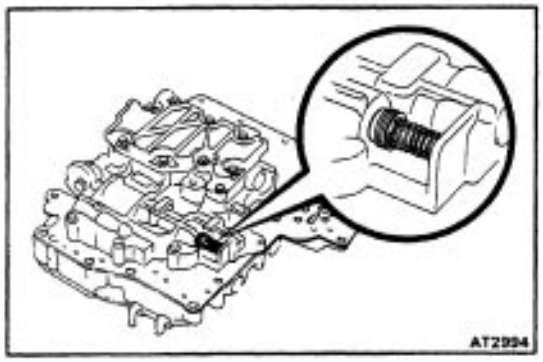
(b) Tighten the twelve bolts in the upper valve body.

Torque: 55 k9–cm (48 in.–lb, 5.4 N–m))

Valve Body (A140L)

COMPONENTS

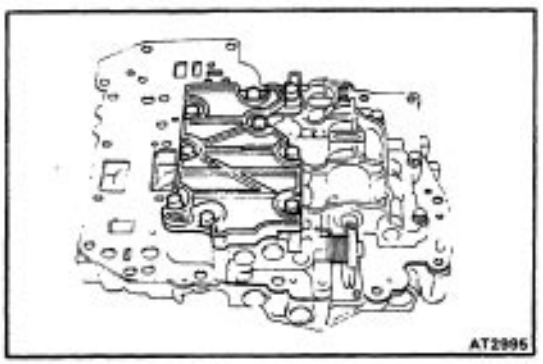




(Disassembly of Valve Body)

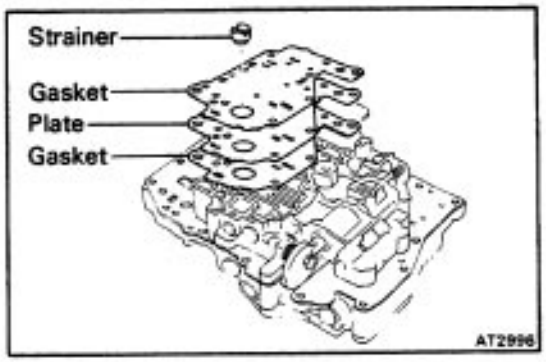
1. NOTE THE NUMBER OF ADJUSTING RINGS

HINT: Count the number of adjusting rings before disassembly of the valve body because the throttle pressure
is changed according to the number. (Some of the valve bodies do not have any adjusting rings.)



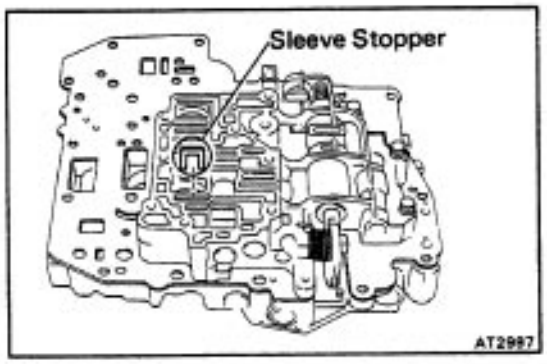
2. REMOVE UPPER VALVE BODY COVER

Remove the nine bolts and upper valve body cover.



3. REMOVE STRAINER, GASKETS, PLATE AND SLEEVE STOPPER FROM UPPER VALVE BODY

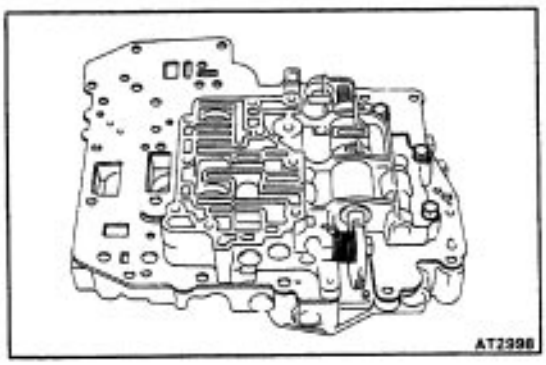
(a) Remove the strainer, two gaskets and plate.



(b) Remove the sleeve stopper.

4. REMOVE BOLTS FROM UPPER VALVE BODY

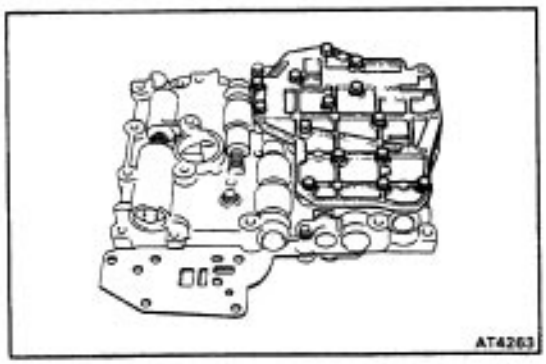
Remove the three bolts from upper valve body.



5. REMOVE LOWER VALVE BODY COVER

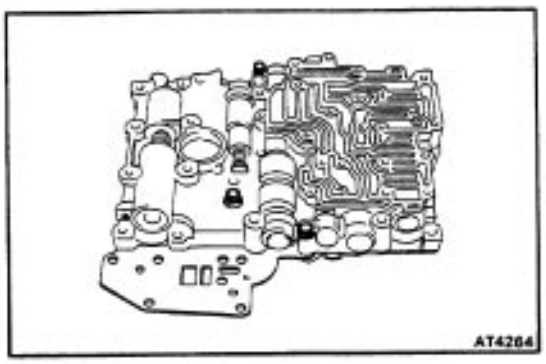
(a) Remove the fourteen bolts.

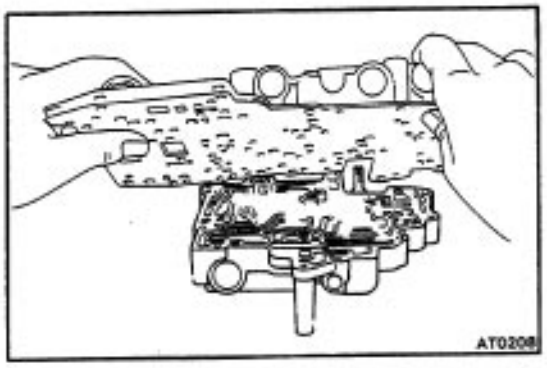
(b) Remove the lower valve body cover and gasket.



6. REMOVE BOLTS FROM LOWER VALVE BODY

Remove the three bolts from lower valve body.

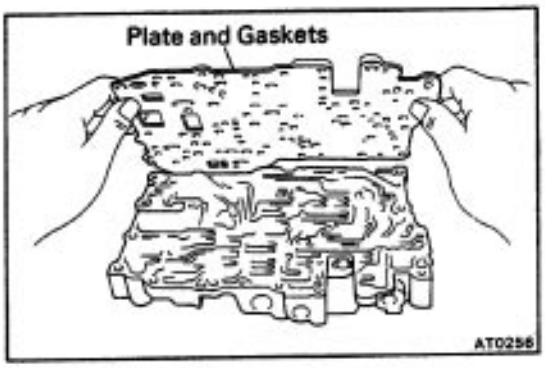




7. LIFT OFF LOWER VALVE BODY AND PLATE AS SINGLE UNIT

Hold the plate to the lower valve body and lift off the tower valve body.

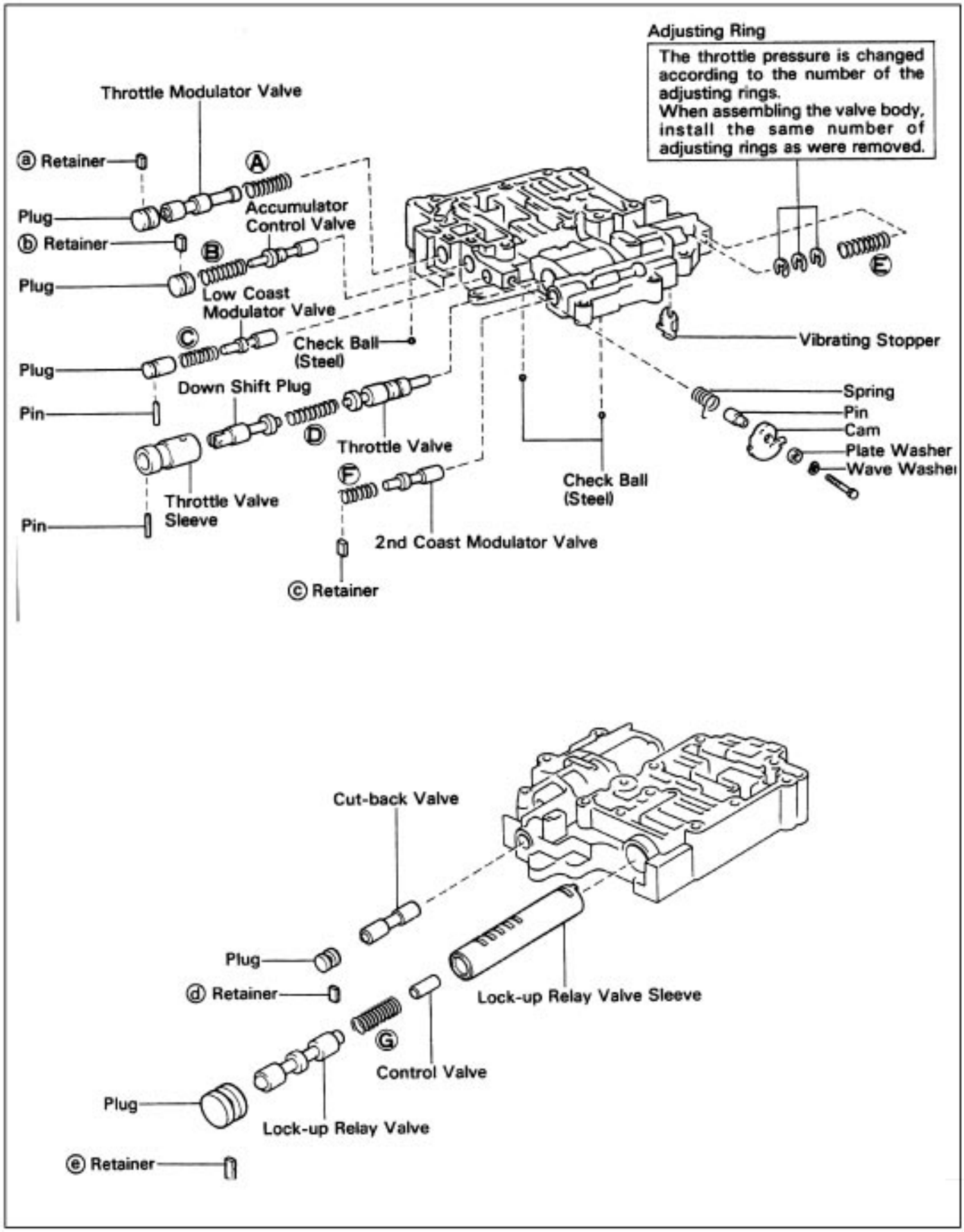
HINT: Be careful that the check balls do not fall out.



8. REMOVE PLATE AND GASKETS

(Upper Valve Body)

COMPONENTS

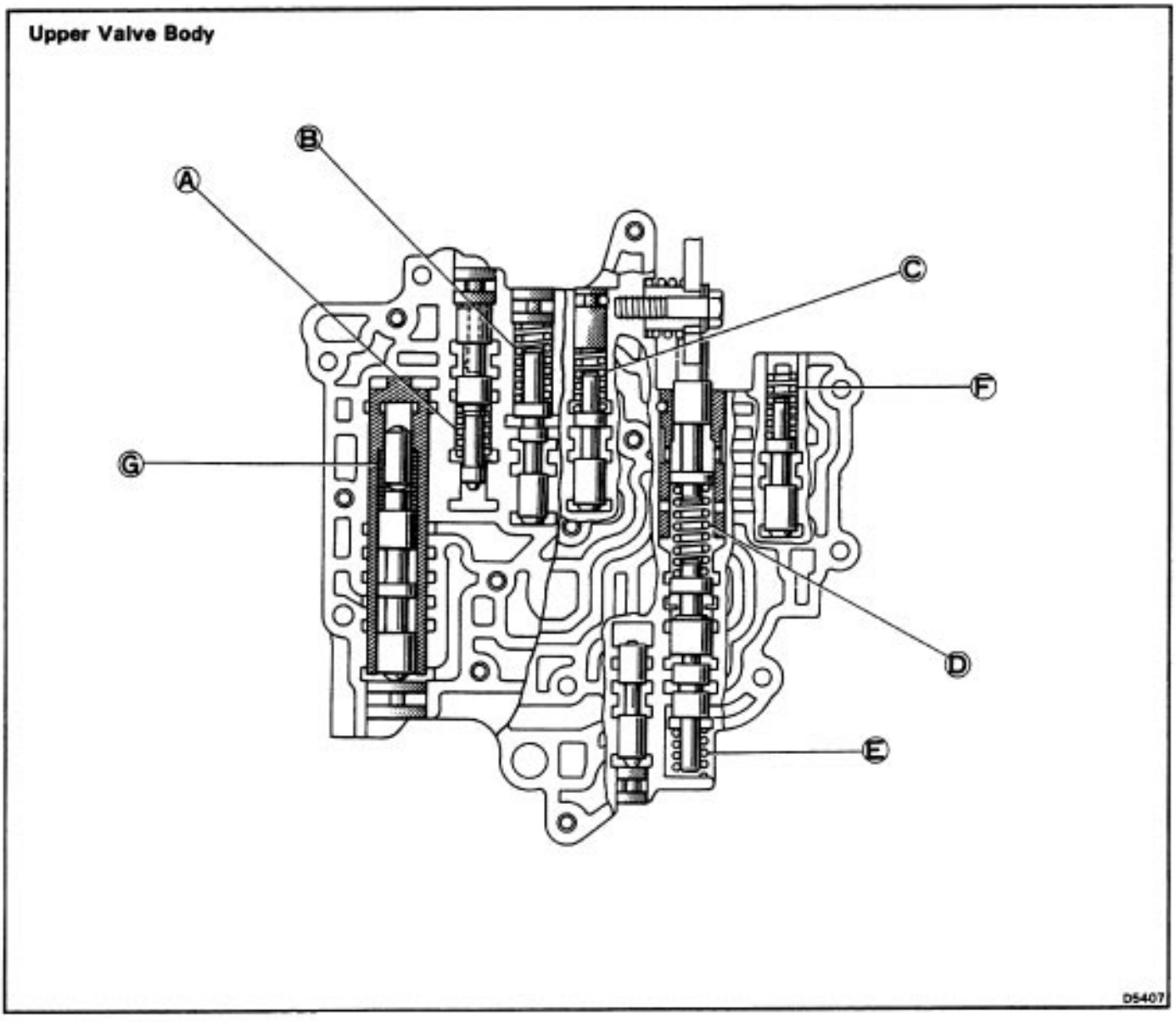


SPECIFICATIONS OF VALVE BODY SPRINGS

Spring		Free Length mm (in.)	Coil Outer Diameter mm (in.)	Number of Coils	Color
Ⓐ	Throttle Modulator Valve Spring	21.70 (0.8543)	9.50 (0.3740)	9.5	None
Ⓑ	Accumulator Control Valve Spring	28.06 (1.1047)	10.60 (0.4173)	13.0	Yellow
Ⓒ	Low Coast Modulator Valve Spring	23.40 (0.9213)	7.90 (0.3110)	11.5	Red
Ⓓ	Down Shift Plug Spring	29.76 (1.1717)	8.73 (0.3437)	13.5	Yellow
Ⓔ	Throttle Valve Spring	30.70 (1.2087)	9.20 (0.3622)	9.5	None
Ⓕ	2nd Coast Modulator Valve Spring	20.93 (0.8240)	8.50 (0.3346)	10.0	Light Green
Ⓖ	Lock–up Relay Valve Spring	26.56 (1.0457)	10.20 (0.4016)	11.5	Green

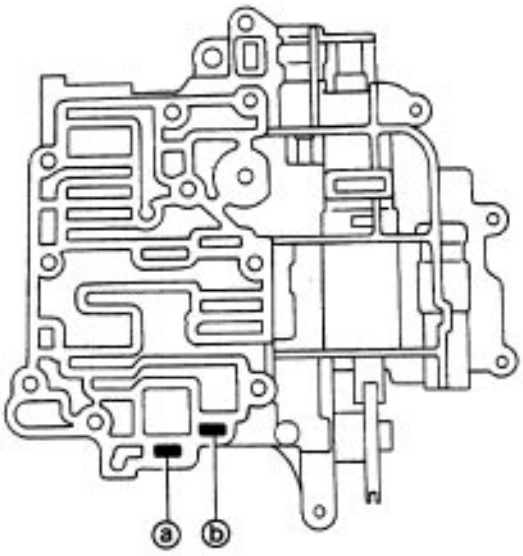
HINT: During re–assembly please refer to the spring specifications above to help discriminate between the different springs.

SECTIONAL VIEW OF VALVE BODY

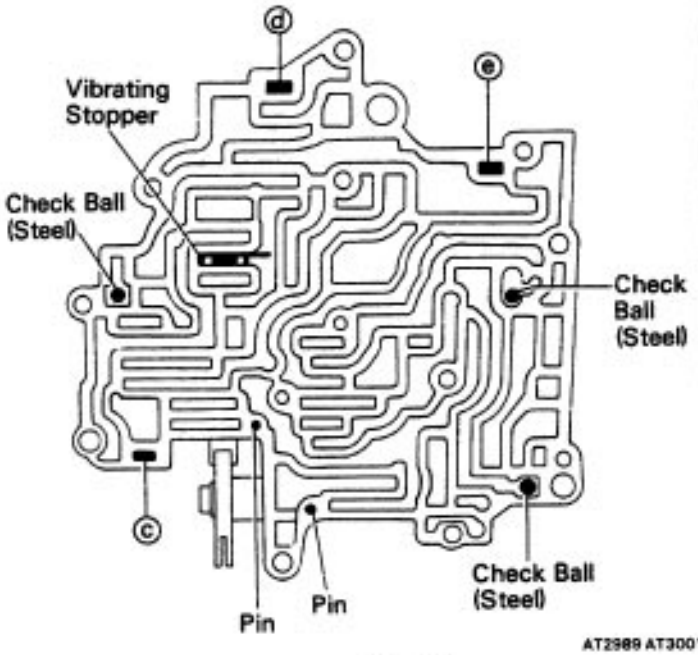


LOCATION OF RETAINERS, PINS, VIBRATING STOPPER AND CHECK BALLS

[Upper Side]



[Lower Side]



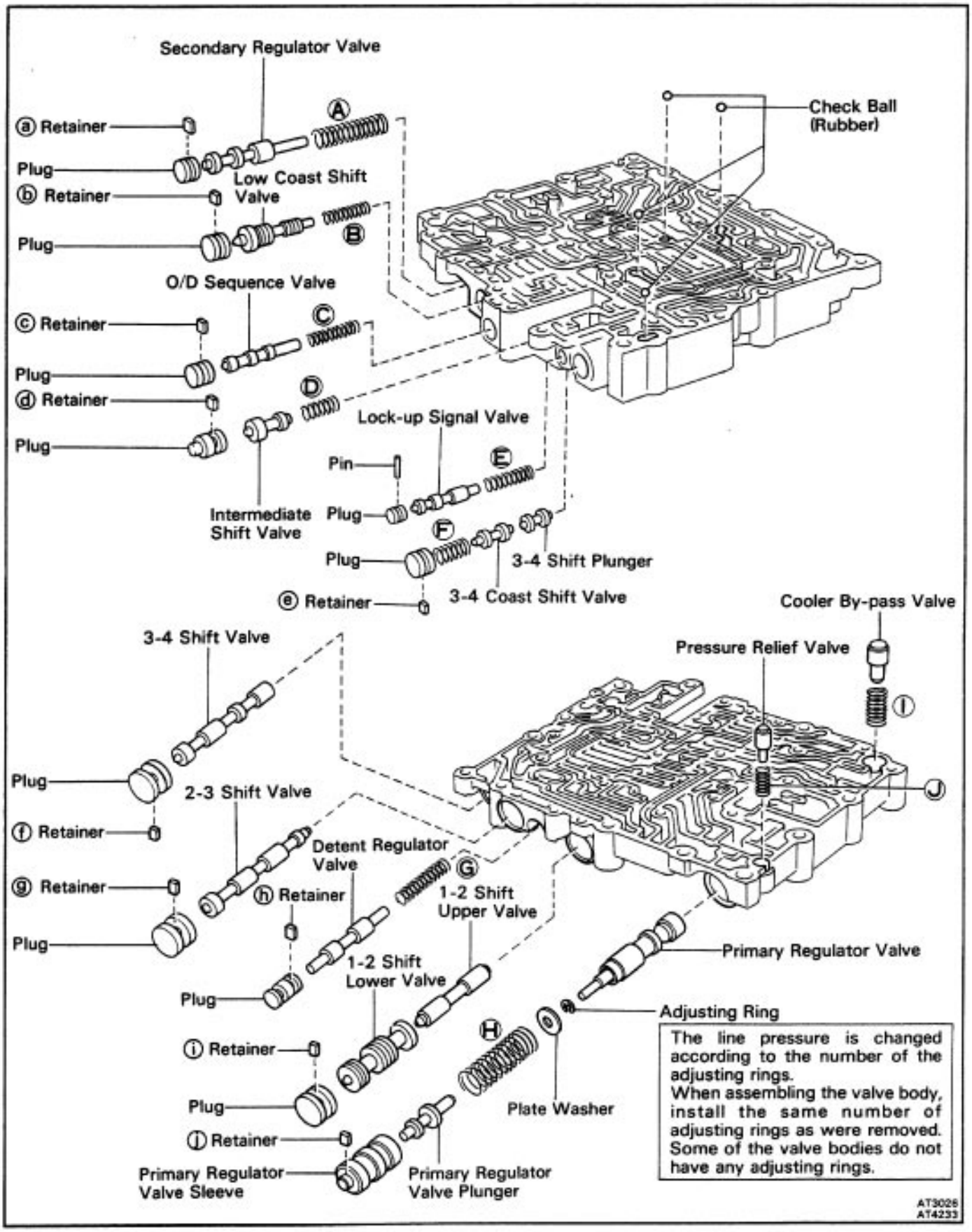
AT2989 AT3001

mm (in.)

Retainer		Height	Width	Thickness
ⓐ	Throttle modulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓑ	Accumulator control valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓒ	2nd coast modulator valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)
ⓓ	Cut-back valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓔ	Lock-up relay valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)

(Lower Valve Body)

COMPONENTS

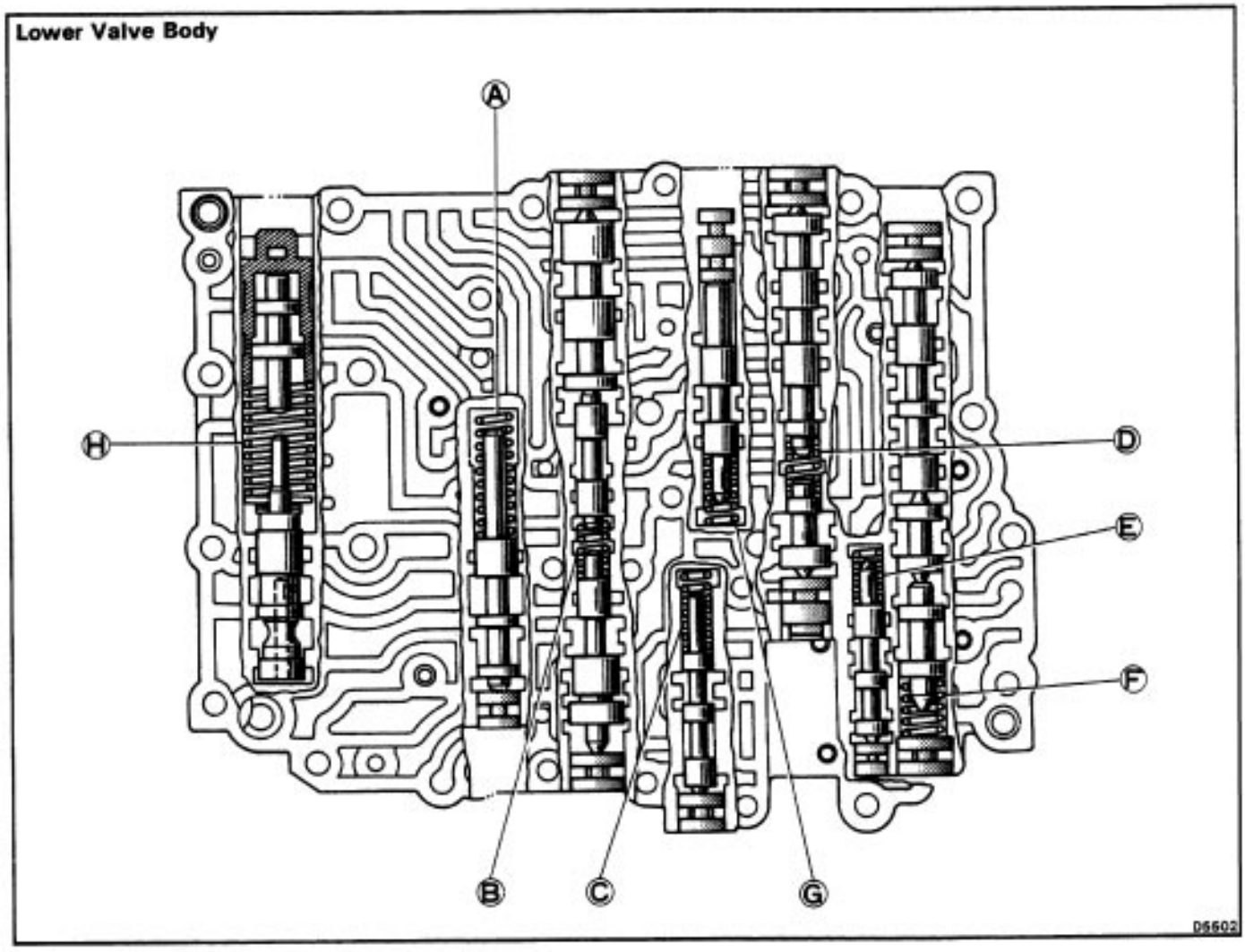


SPECIFICATIONS OF VALVE BODY SPRINGS

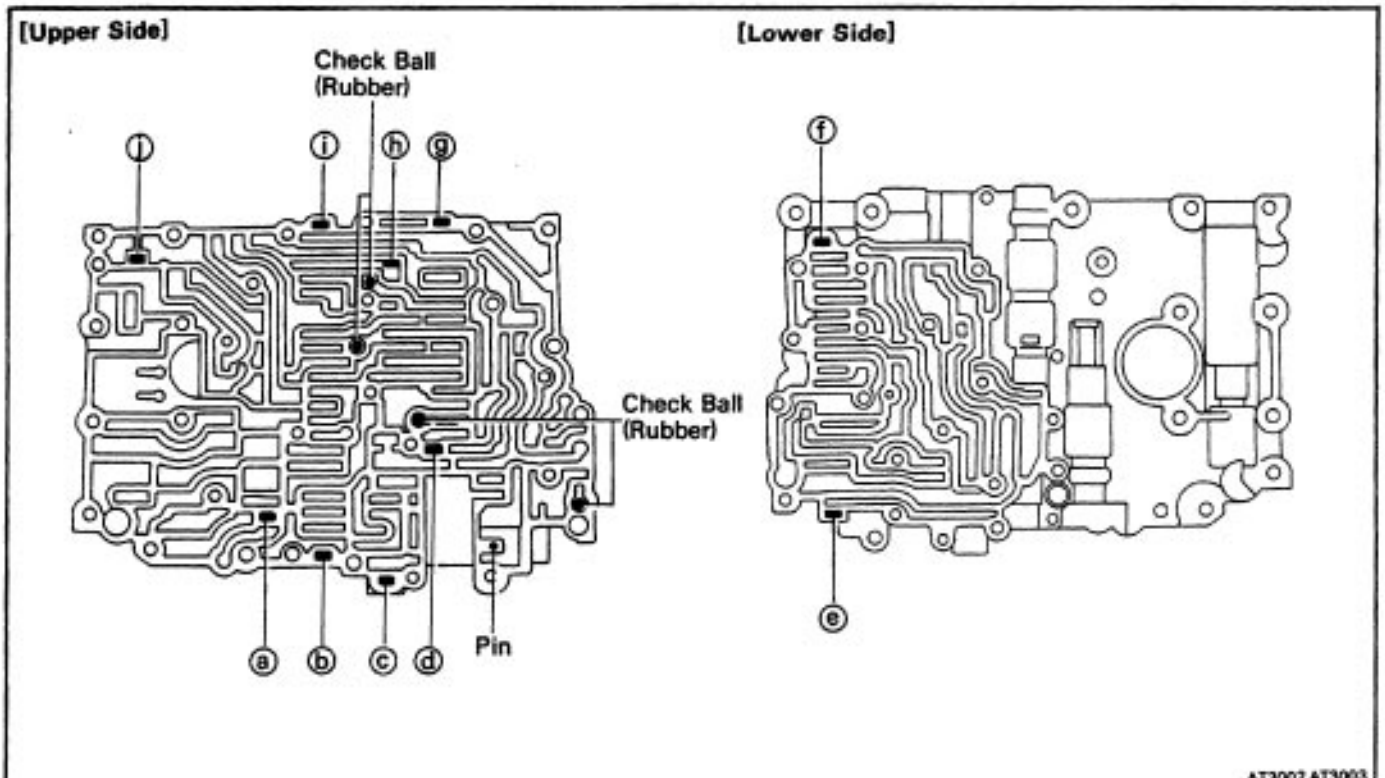
Spring		Free Length mm (in.)	Coil Outer Diameter mm (in.)	Number of Coils	Color
Ⓐ	Secondary Regulator Valve Spring	43.60 (1.7165)	10.90 (0.4291)	11.5	None
Ⓑ	1–2 Shift Valve Spring	27.17 (1.0697)	6.39 (0.2516)	15.5	Yellow
Ⓒ	O/D Sequence Valve Spring	30.90 (1.2165)	7.00 (0.2756)	18.5	None
Ⓓ	2–3 Shift Valve Spring	27.74 (1.0921)	8.30 (0.3268)	11.0	None
Ⓔ	Lock–up Signal Valve Spring	38.65 (1.5217)	8.15 (0.3209)	15.25	Pink
Ⓕ	3–4 Coast Shift Valve Spring	21.10 (0.8307)	10.90 (0.4291)	8.5	White
Ⓖ	Detent Regulator Valve Spring	30.64 (1.2063)	7.90 (0.3110)	12.5	Blue
Ⓗ	Primary Regulator Valve Spring	66.65 (2.6240)	18.60 (0.7323)	12.5	None
Ⓘ	Cooler By–pass Valve Spring	19.90 (0.7835)	11.00 (0.4331)	8.5	None
Ⓙ	Pressure Relief Valve Spring	11.20 (0.4409)	6.40 (0.2520)	7.5	None

HINT: During re–assembly please refer to the spring specifications above to help discriminate between the different springs.

SECTIONAL VIEW OF VALVE BODY



LOCATION OF RETAINER PIN AND CHECK BALLS

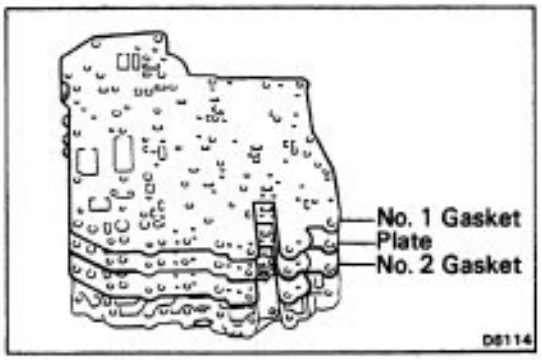


mm (in.)

Retainer		Height	Width	Thickness
ⓐ	Secondary regulator valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓑ	Low coast shift valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓒ	O/D sequence valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓓ	Intermediate shift valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓔ	3-4 coast shift valve	6.0 (0.236)	8.0 (0.315)	3.2 (0.126)
ⓕ	3-4 shift valve	6.0 (0.236)	8.0 (0.315)	3.2 (0.126)
ⓖ	2-3 shift valve	6.0 (0.236)	8.0 (0.315)	3.2 (0.126)
ⓗ	Detent regulator valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓘ	1-2 shift lower valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓙ	Primary regulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)

(Assembly of Valve Body)

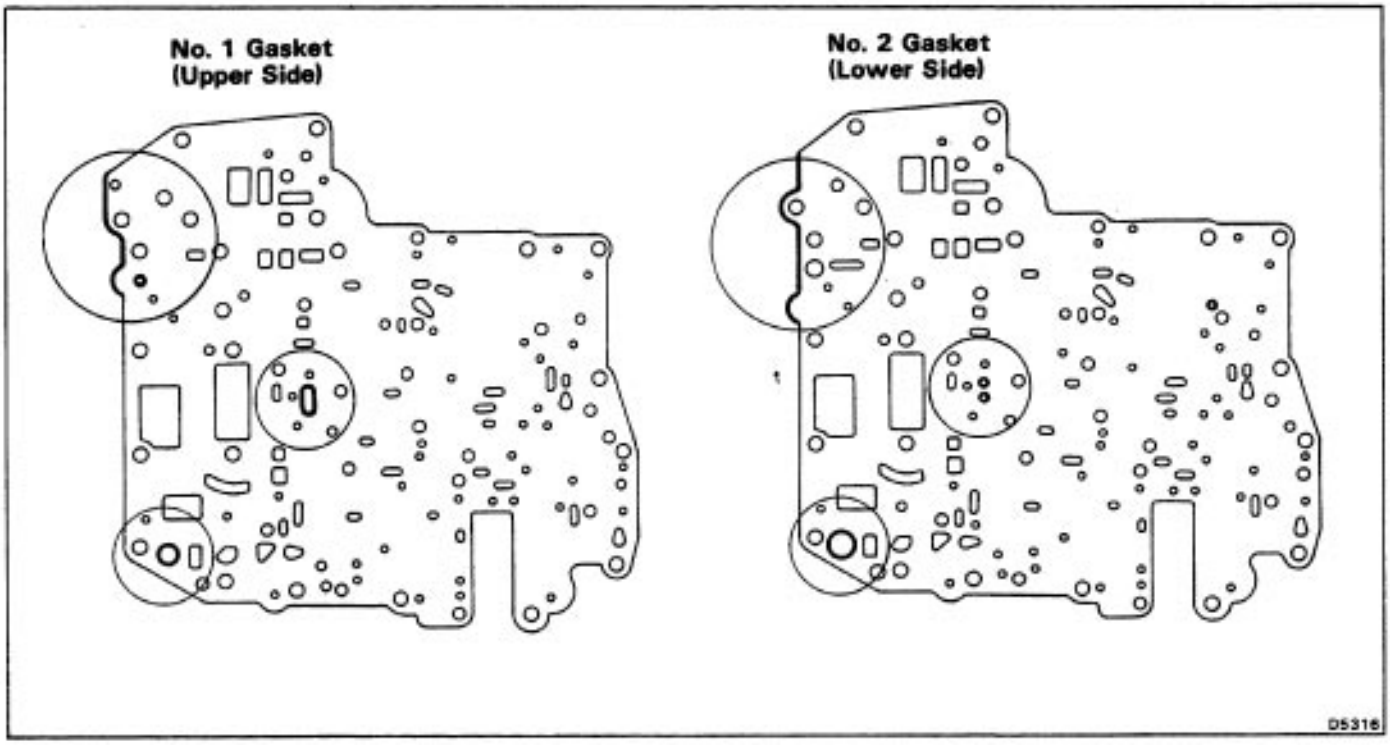
(See page AT–133)

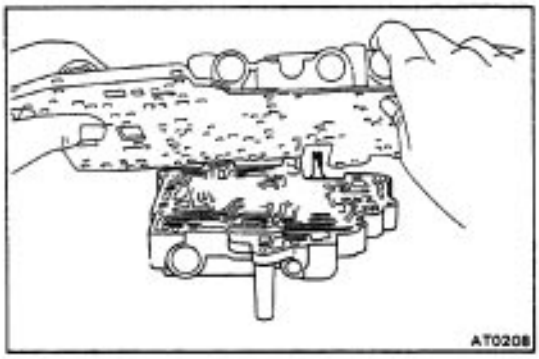


1. POSITION PLATE AND NEW GASKETS ON LOWER VALVE BODY

Position the new No. 2 gasket, the plate and then the new No. 1 gasket on the lower valve body.

HINT: Since No. 1 gasket and No. 2 gasket are similar use the illustration below to discriminate between them.

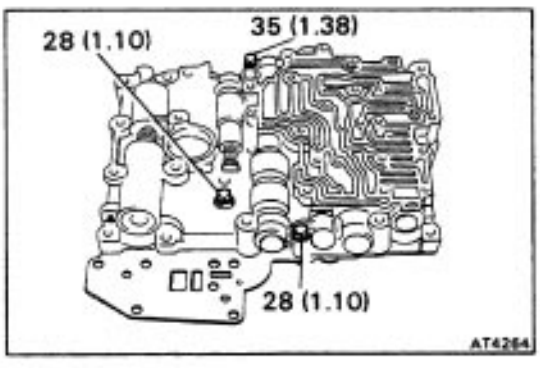




2. PLACE LOWER VALVE BODY WITH PLATE AND GASKETS ON UPPER VALVE BODY

HINT: Hold the tower valve body, gaskets and plate securely so they do not separate.

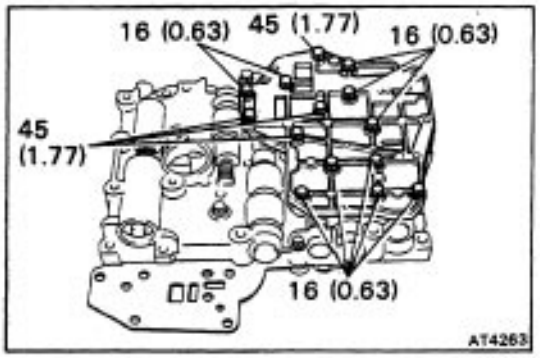
Align each bolt hole in the valve bodies with the gaskets and plate.



3. INSTALL AND FINGER TIGHTEN BOLTS IN LOWER VALVE BODY

Install and finger tighten the three bolts.

HINT: Each bolt length (mm (in.)) is indicated in the figure.

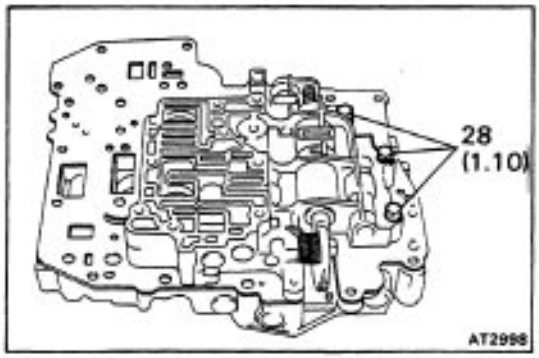


4. INSTALL LOWER VALVE BODY COVER

(a) Install the lower valve body cover over the new gasket.

(b) Install and finger tighten the fourteen bolts.

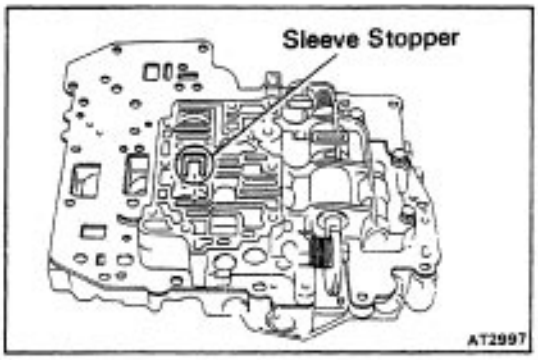
HINT: Each bolt length (mm (in.)) is indicated in the figure.



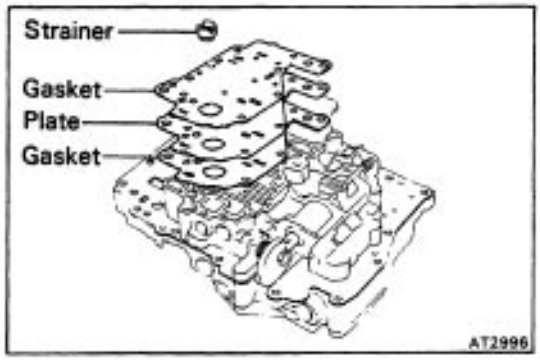
5. INSTALL AND FINGER TIGHTEN BOLTS IN UPPER VALVE BODY

Install and finger tighten the three bolts.

HINT: Each bolt length (mm (in.)) is indicated in the figure.



6. INSTALL SLEEVE STOPPER

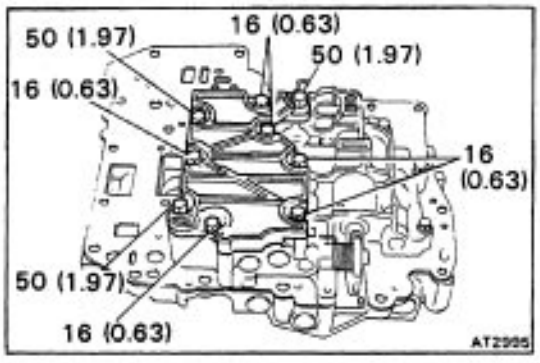


7. INSTALL UPPER VALVE BODY COVER GASKETS, PLATE AND THROTTLE MODULATOR OIL STRAINER

(a) Position a new gasket and plate and then another new gasket.

HINT: Both gaskets are same one.

(b) install the oil strainer onto the gasket.

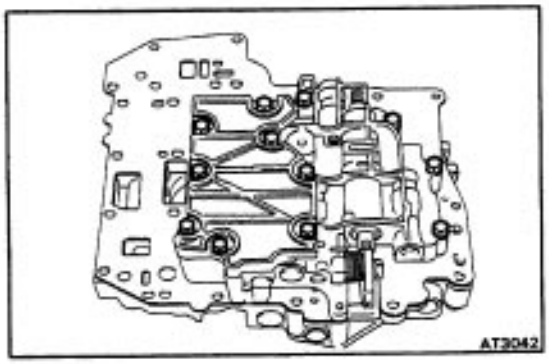


8. INSTALL UPPER VALVE BODY COVER

(a) Position the upper valve body cover.

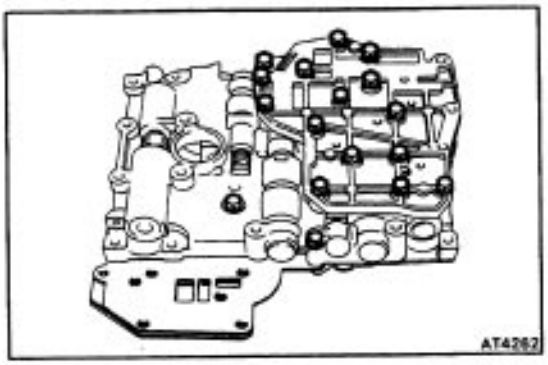
(b) Install and finger tighten the nine bolts.

HINT: Each bolt length (mm (in.)) is indicated in the figure.



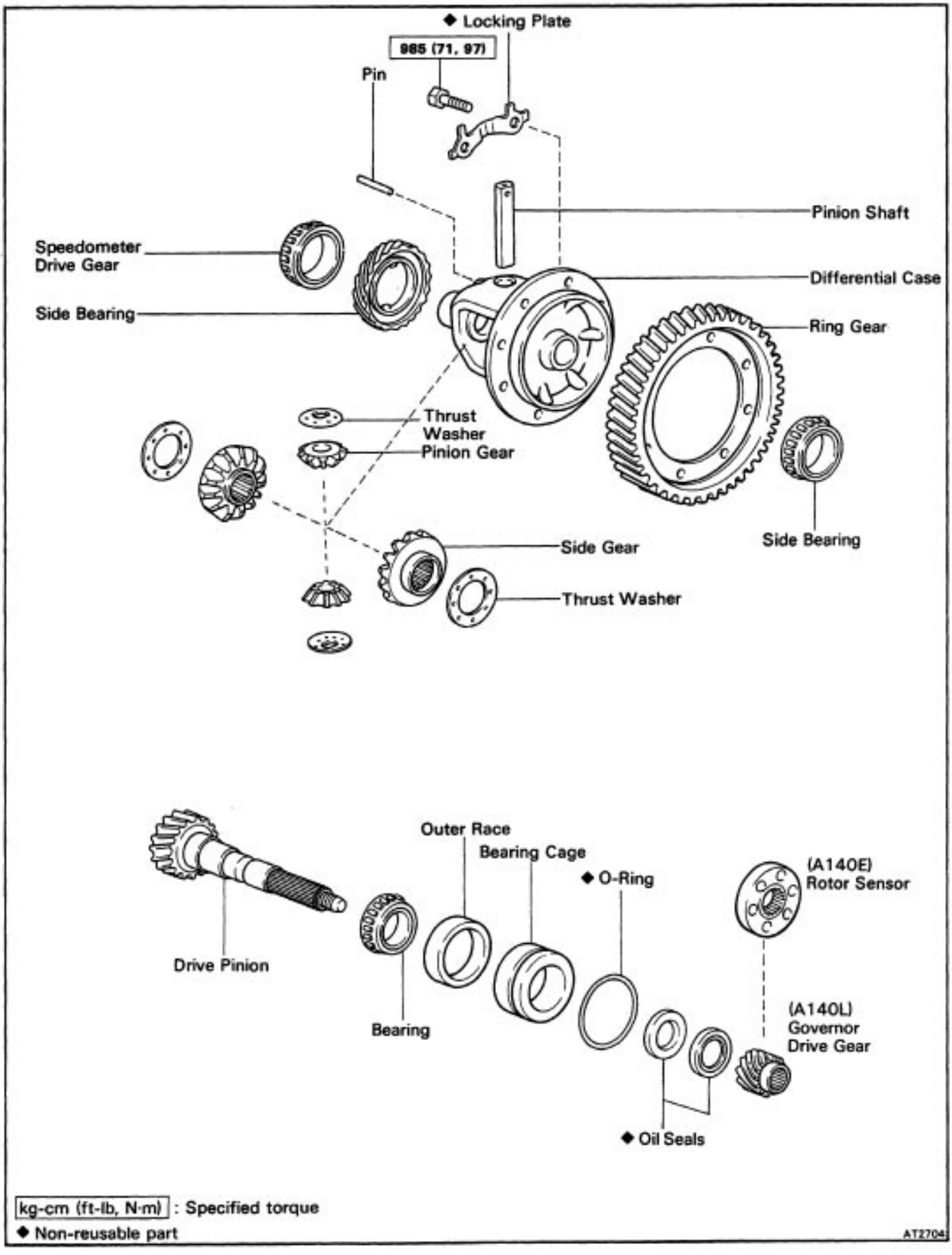
9. TIGHTEN BOLTS OF UPPER AND LOWER VALVE BODIES

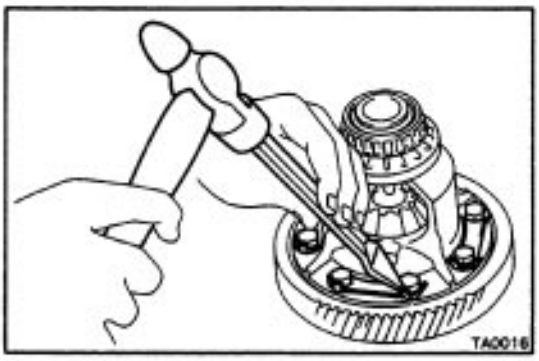
(a) Tighten the twelve bolts in the upper valve body.
Torque: 55 kg–cm (48 in.–lb, 54 N–m)



(b) Tighten the seventeen bolts in the lower valve body.
Torque: 55 kg–cm (48 in.–lb, 54 N–m)

Differential and Drive Pinion

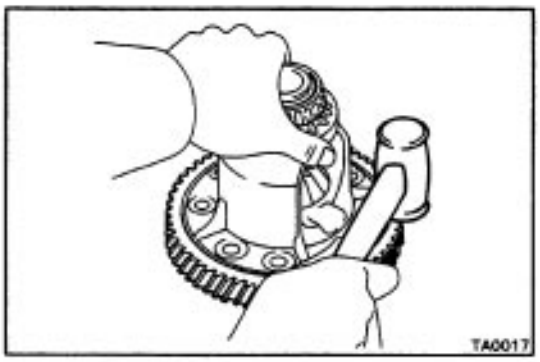




DISASSEMBLY OF DIFFERENTIAL CASE

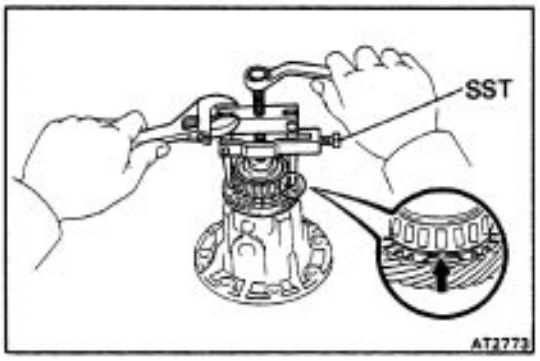
1. REMOVE RING GEAR

(a) Loosen the staked part of the lock plate.



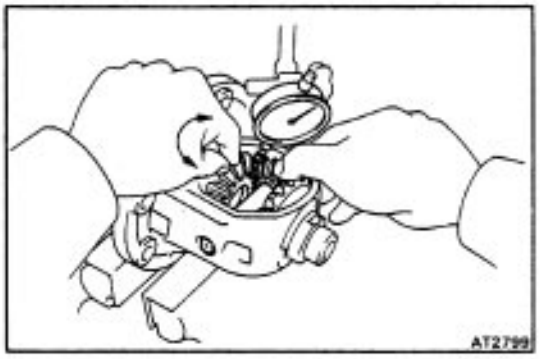
(b) Remove the eight bolts and locking plates.

(c) Using a copper hammer, tap on the ring gear to remove it from the case.



2. REMOVE SIDE BEARINGS

Fasten SST under the bearing above the cutouts on the speedometer drive gear. Remove the bearing from the case.
SST 09502–10012

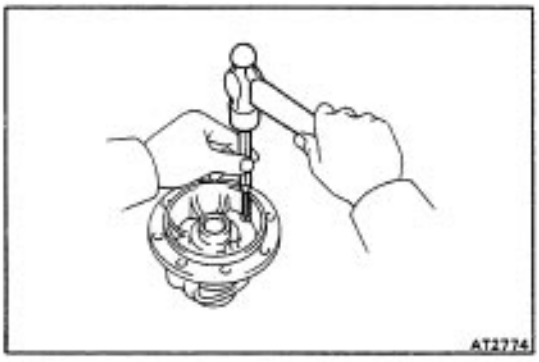


3. CHECK SIDE GEAR BACKLASH

Using a dial gauge, measure the backlash of each side gear while holding one pinion toward the case.

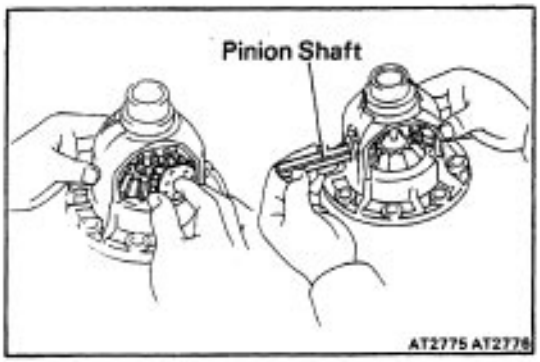
Standard backlash:

0.05 – 0.20 mm (0.0020 – 0.0079 in.)

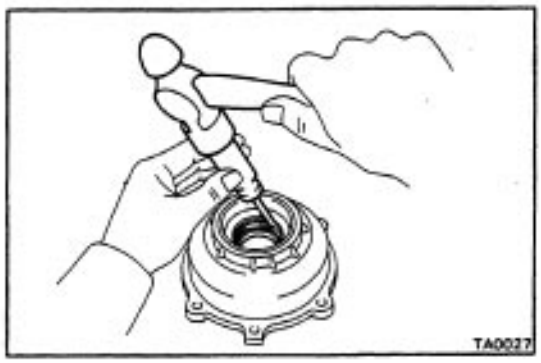


4. DISASSEMBLE DIFFERENTIAL CASE

(a) Drive out the pinion shaft lock pin from the side on which the ring gear is installed.

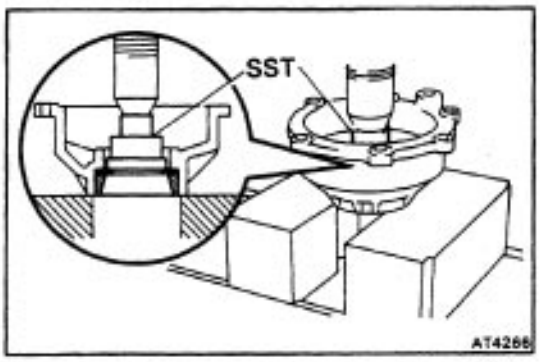


(b) Remove the pinion shaft from the case.
(c) Remove the two pinions and two side gears with the four thrust washers.



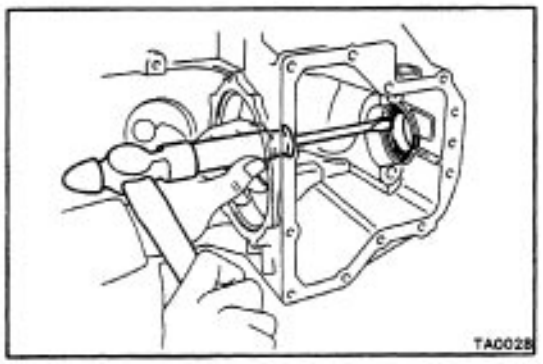
5. REMOVE LH OIL SEAL

Using a hammer and screwdriver, remove the oil seal.



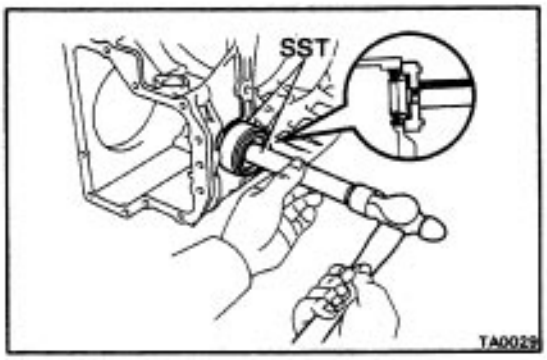
6. REMOVE BEARING OUTER RACE FROM LH SIDE BEARING RETAINER

Using SST, press out the outer race and shim.
SST 09350–32014 (09351–32090)



7. REMOVE RH OIL SEAL

Using a hammer and screwdriver, remove the oil seal.

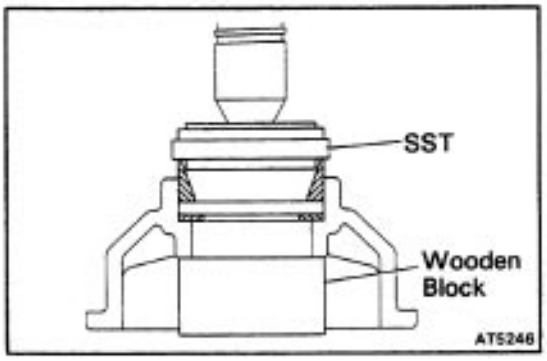


ASSEMBLY OF DIFFERENTIAL CASE

1. INSTALL RH OIL SEAL

(a) Using SST, drive in a new oil seal until its surface is flush with the surface of the case.
SST 09350–32014 (09351–32130, 09351–32150)

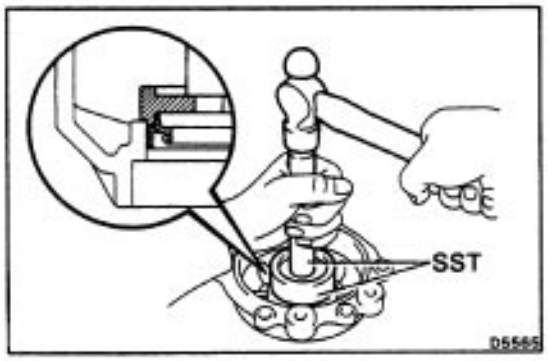
(b) Coat the oil seal lip with MP grease.



2. INSTALL BEARING OUTER RACE TO LH SIDE BEARING RETAINER

(a) Place the shim onto the retainer.

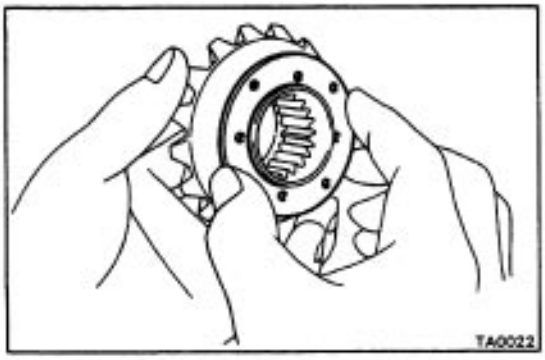
(b) Using SST, press a new outer race into the retainer.
SST 09350–32014 (09351–32111, 09351–32130)
HINT: Use the shim 2.60 mm (0.1024 in.) thick.



3. INSTALL LH OIL SEAL

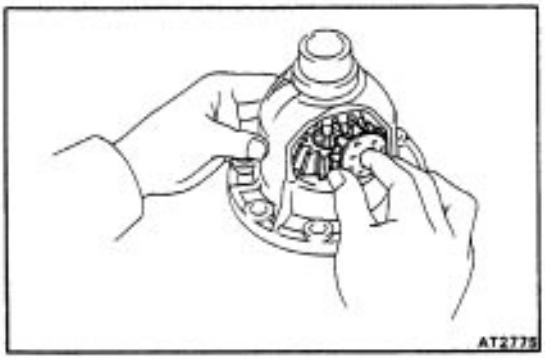
(a) Using SST, drive in a new oil seal.
SST 09350–32014 (09351–32130, 09351–32150)
Oil seal drive in depth: 2.7 mm (0.106 in.)

(b) Coat the oil seal lip with MP grease.

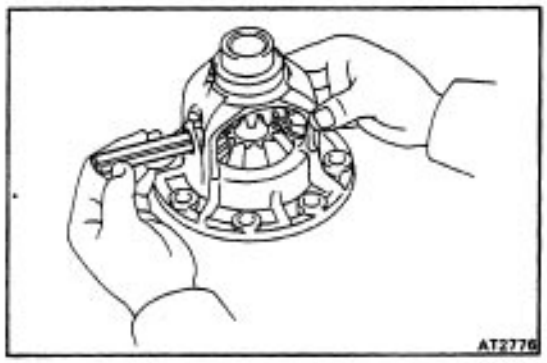


4. ASSEMBLE DIFFERENTIAL CASE

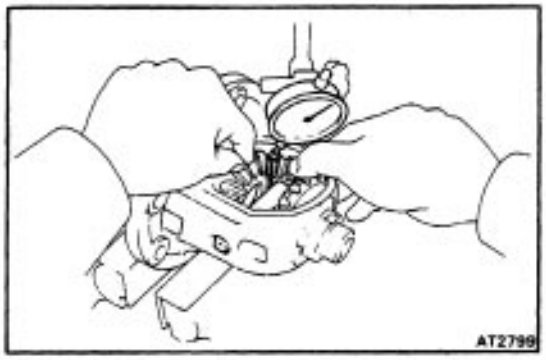
(a) Install the removed thrust washers to the side gears.



(b) Install the side gears with thrust washers, pinion thrust washers and pinion gears.



(c) Install the pinion shaft.



(d) Check the side gear backlash.

Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

Referring to the table below, select thrust washers which will ensure that the backlash is within specification. Try to select washers of the same size for both sides.

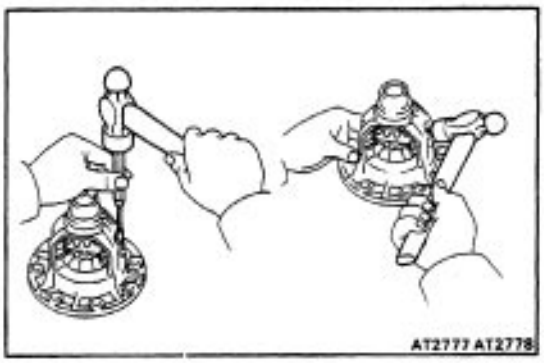
Thrust washer thickness mm (in.)

0.95 (0.0374)	1.10 (0.0433)
1.00 (0.0394)	1.15 (0.0453)
1.05 (0.0413)	1.20 (0.0472)

If the backlash is not within specification, install a thrust washer of a different thickness.

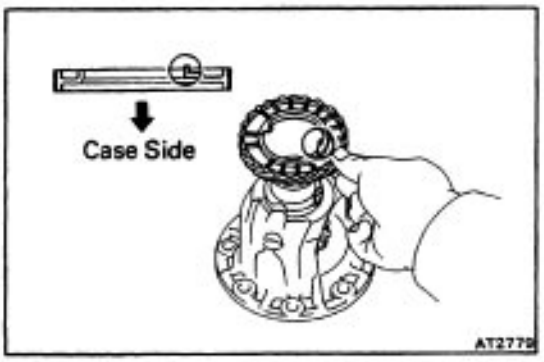
Using a hammer and punch, drive the lock pin through the case and hole in the pinion shaft.

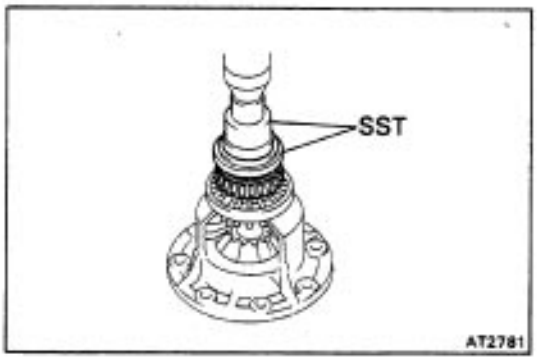
(f) Stake the differential case.



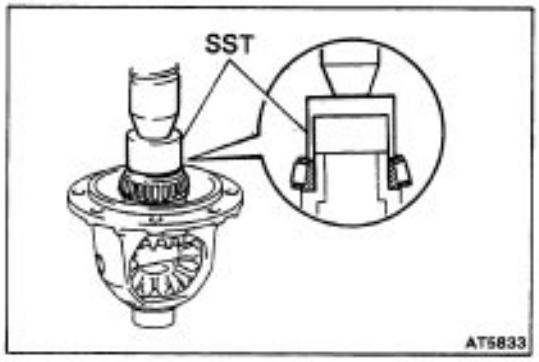
5. INSTALL SIDE BEARINGS

(a) Install the speedometer drive gear onto the differential case.

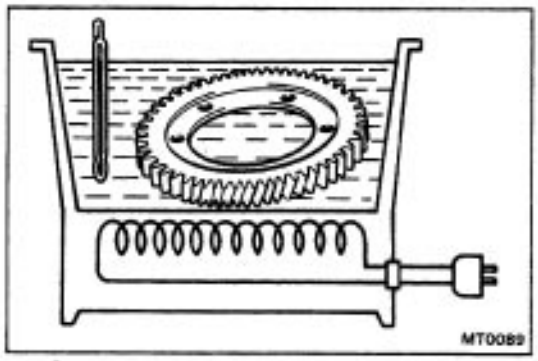




(b) Using SST and a press, press in the RH side bearing onto the differential case.
SST 09350–32014 (09351–32090, 09351–32120)

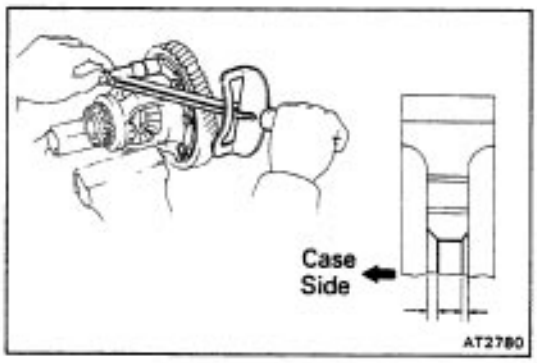


(c) Using SST and a press, press in the LH side bearing onto the differential case.
SST 09710–28020 (09710–08040)

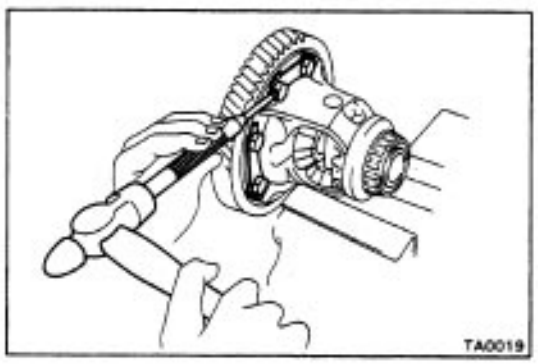


6. INSTALL RING GEAR

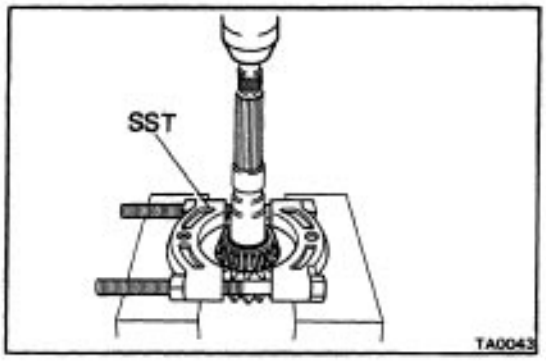
(a) Clean the contact surface of the differential case.
(b) Heat the ring gear to about 212˚F (100˚C) in an oil bath.
NOTICE: Do not heat the ring gear above 230˚F (110˚C).
(c) Clean the contact surface of the ring gear with cleaning solvent.



(d) Quickly install the ring gear on the differential case.
(e) install new locking plates and set bolts. Tighten the set bolts uniformly and a little at a time. Torque the bolts.
Torque: 985 kg–cm (71 ft–lb, 97 N–m)



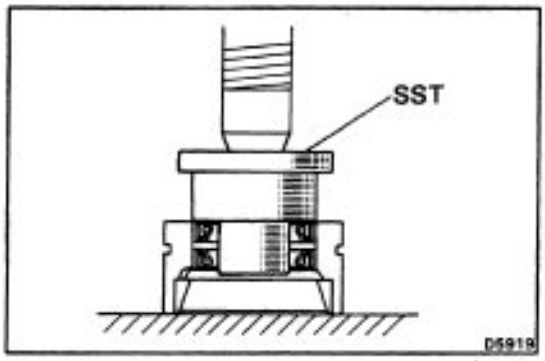
(f) Using a hammer and drift punch, stake the locking plates.
HINT: Stake one claw flush with the flat surface of the nut. For the claw contacting the protruding portion of the nut, stake only the half on the tightening side.



DISASSEMBLY OF DRIVE PINION ASSEMBLY

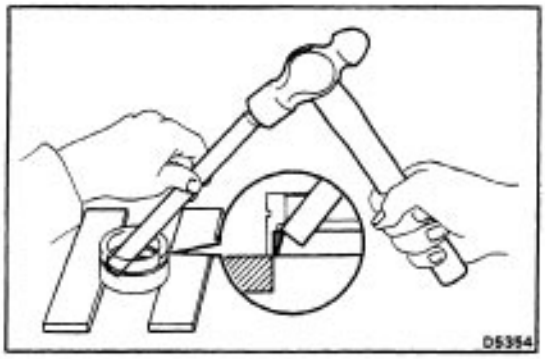
1. REMOVE DRIVE PINION SHAFT BEARING

Using SST, press out the bearing.
SST 09950–00020



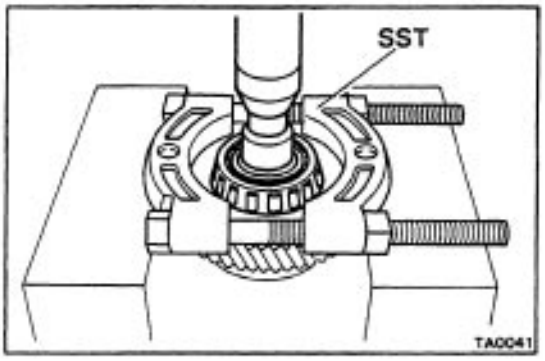
2. REMOVE OIL SEALS FROM CAGE

Using SST, press out the two oil seals together.
SST 09350–32014 (09351–32090)



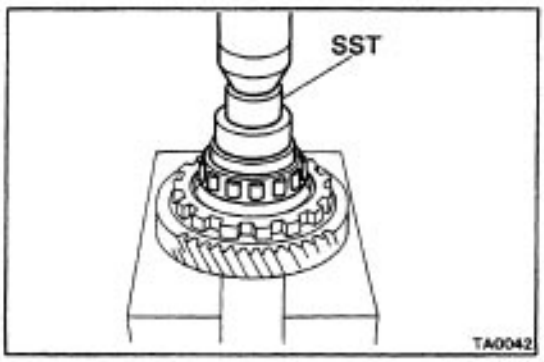
3. REMOVE SHAFT BEARING OUTER RACE FROM CAGE

Using a hammer and, brass bar, drive out the outer race from the cage.



4. REMOVE COUNTER DRIVEN GEAR BEARING

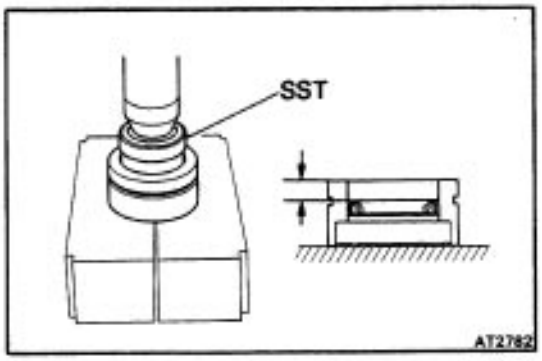
Using SST, press out the bearing.
SST 09950–00020



ASSEMBLY OF DRIVE PINION SHAFT COMPONENTS

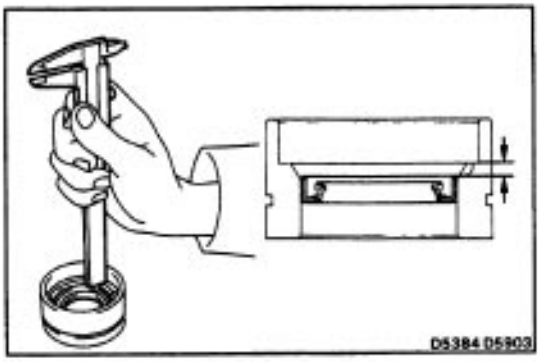
1. INSTALL COUNTER DRIVEN GEAR BEARING

Using SST, press in a new bearing.
SST 09350–32014 (09351–32090)

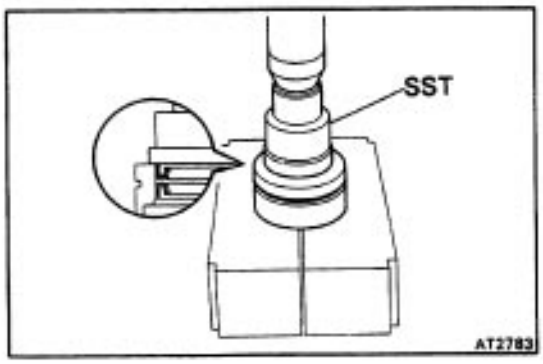


2. INSTALL OIL SEALS TO CAGE

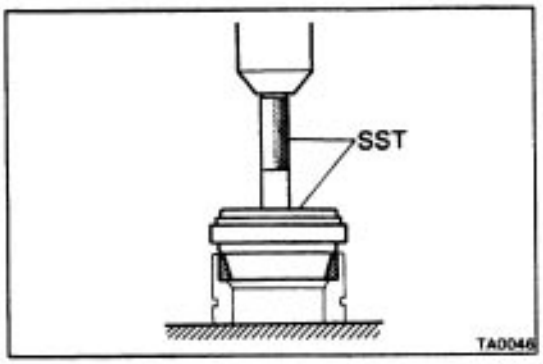
(a) Using SST, press in a new oil seal with the lip facing downward.
SST 09350–32014 (09351–32090)
Oil seal press in depth (from flat end): 9.5 mm (0.374 in.)



(b) Measure the oil seal press in depth.
Oil seal press in depth: 4 mm (0.16 in.)

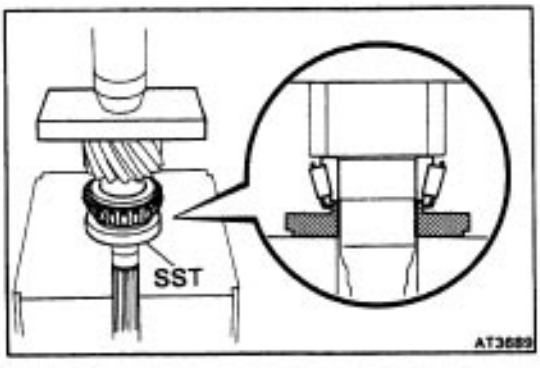


(c) With the oil seal lip facing upward, use SST to press in a new oil seal until its end is flush with the surface of the cage.
SST 09350–32014 (09351–32090)
(d) Coat the oil seal lip with MP grease.



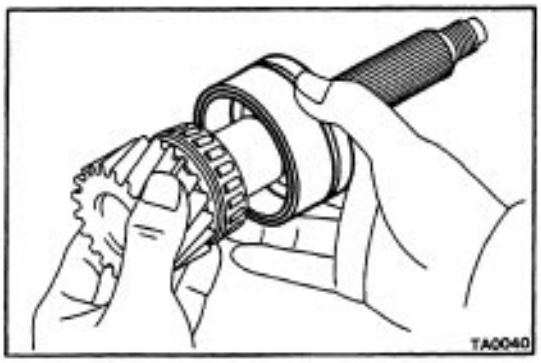
3. INSTALL SHAFT BEARING OUTER RACE TO CAGE

Using SST, press a new outer race into the cage.
SST 09350–32014 (09351–32111, 09351–32130)



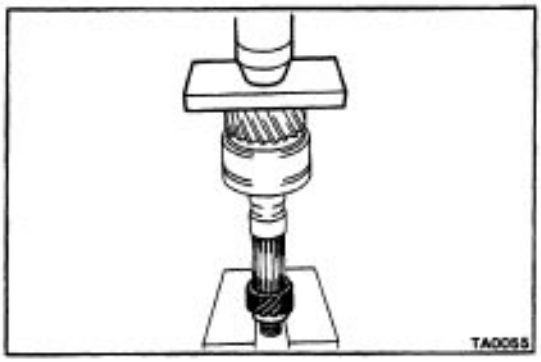
4. INSTALL DRIVE PINION SHAFT BEARING

Using SST, press in the bearing.
SST 09350–32014 (09351–32100)



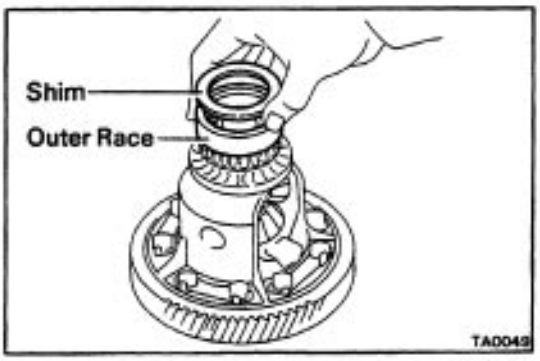
5. PLACE BEARING CAGE ONTO DRIVE PINION SHAFT

Be careful not to damage the oil seal with the splines.



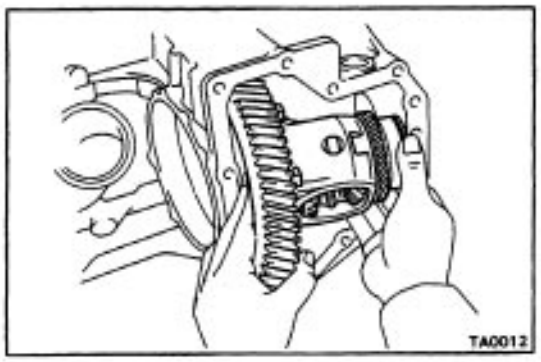
6. INSTALL ROTOR SENSOR (A140E) OR GOVERNOR DRIVE GEAR (A140L)

ADJUSTMENT OF DIFFERENTIAL SIDE BEARING PRELOAD



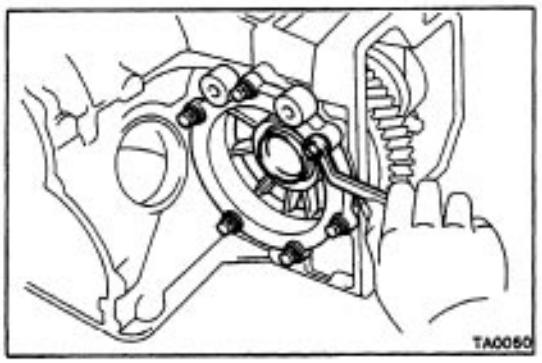
1. PLACE OUTER RACE AND ADJUSTING SHIM ONTO RH SIDE BEARING

Use the adjusting shim which was removed or one 2.40 mm (0.0945 in.) thick.



2. PLACE DIFFERENTIAL CASE INTO TRANSAXLE CASE

Be sure to install the adjusting shim.

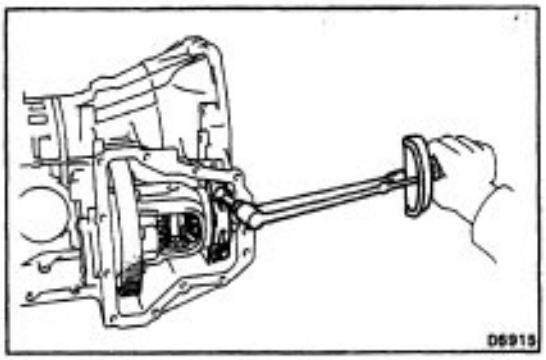


3. INSTALL LH BEARING RETAINER

(a) Do not install the O–ring yet.

(b) Do not coat the bolt threads with sealant yet.

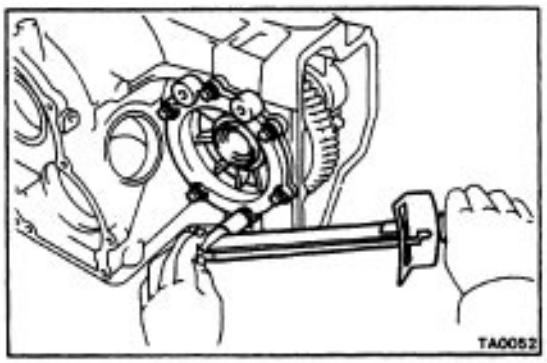
(e) Temporarily tighten the bolts evenly and gradually while turning the ring gear.



4. INSTALL RH SIDE BEARING CAP

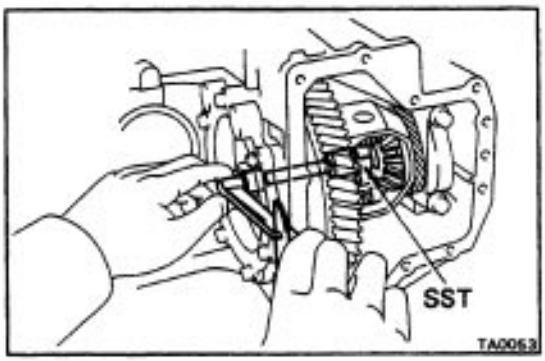
Tighten the bolts evenly. and gradually while turning the ring gear.

Torque: 730 kg–cm l53 ft–lb, 72 N–m)



5. TIGHTEN LH BEARING RETAINER

Torque: 195 kg–cm (14 ft–ft. 19 N–m)



6. ADJUST SIDE BEARING PRELOAD

Using SST and a torque meter, measure the preload of the ring gear.

SST 09564–32011

Preload (at starting):

New bearing 10 – 16 kg–cm

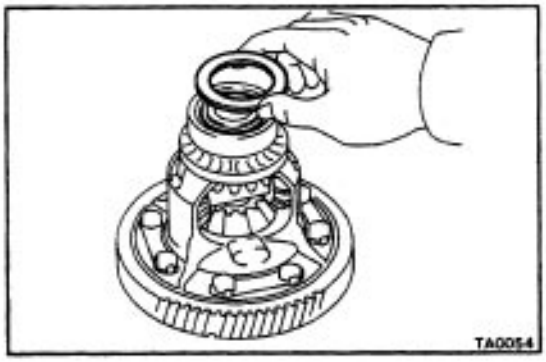
(8.7 – 13.9 in.–lb, 1.0 – 1.6 N–m)

Reused bearing 5 – 8 kg–cm

(4.3 – 6.9 in.–lb, 0.5 – 0.8 N–m)

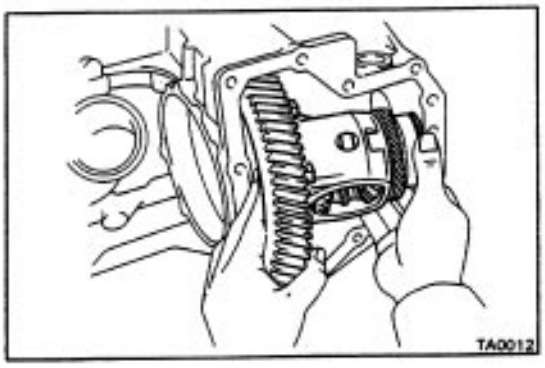
If the preload is not within specification, remove the differential case assembly.

B



Thickness mm (in.)	Thickness mm (in.)
1.90 (0.0748)	2.40 (0.0945)
1.95 (0.0768)	2.45 (0.0965)
2.00 (0.0787)	2.50 (0.0984)
2.05 (0.0807)	2.55 (0.1004)
2.10 (0.0827)	2.60 (0.1024)
2.15 (0.0846)	2.65 (0.1043)
2.20 (0.0866)	2.70 (0.1063)
2.25 (0.0886)	2.75 (0.1083)
2.30 (0.0906)	2.80 (0.1103)

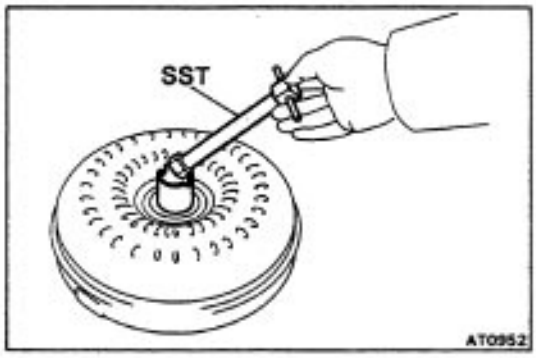
HINT: The preload will change about 3 – 4 kg–cm (2.6 – 3.5 in.–lb, 0.3 – 0.4 N–m) with each shim thickness.



7. REMOVE DIFFERENTIAL CASE AND COMPONENT PARTS

If the preload is adjusted within specification, remove the bearing retainer, differential case, RH side bearing and shim.

Be careful not to lose the adjusted shim.

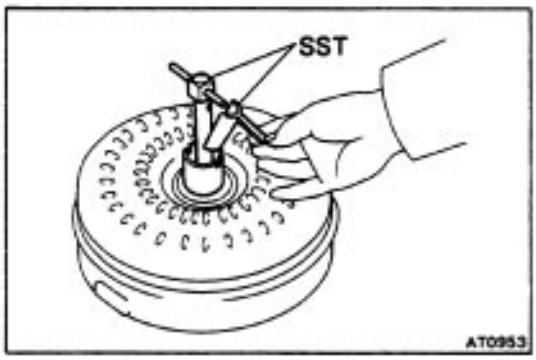


Torque Converter

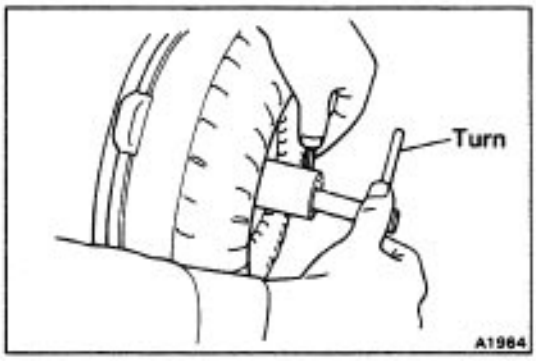
INSPECTION OF TORQUE CONVERTER

1. INSERT SST IN END OF TORQUE CONVERTER

(a) Insert a turning tool into the inner race of the one–way clutch.
SST 09350–32014 f09351–320101



(b) Insert the stopper so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–32014 (09351–32020)



2. TEST ONE–WAY CLUTCH

With the torque converter standing on its side, the clutch should lock when turned counterclockwise, and rotate freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch.
Replace the converter if the clutch still fails the test.

CLEAN TORQUE CONVERTER

If the transmission is contaminated, the torque converter and transmission cooler should be thoroughly flushed with ATF.

INSTALLATION OF COMPONENT PARTS

Disassembly, inspection and assembly of each component group have been indicated in the preceding chapter. Before assembly, make sure, again, that all component groups are assembled correctly.

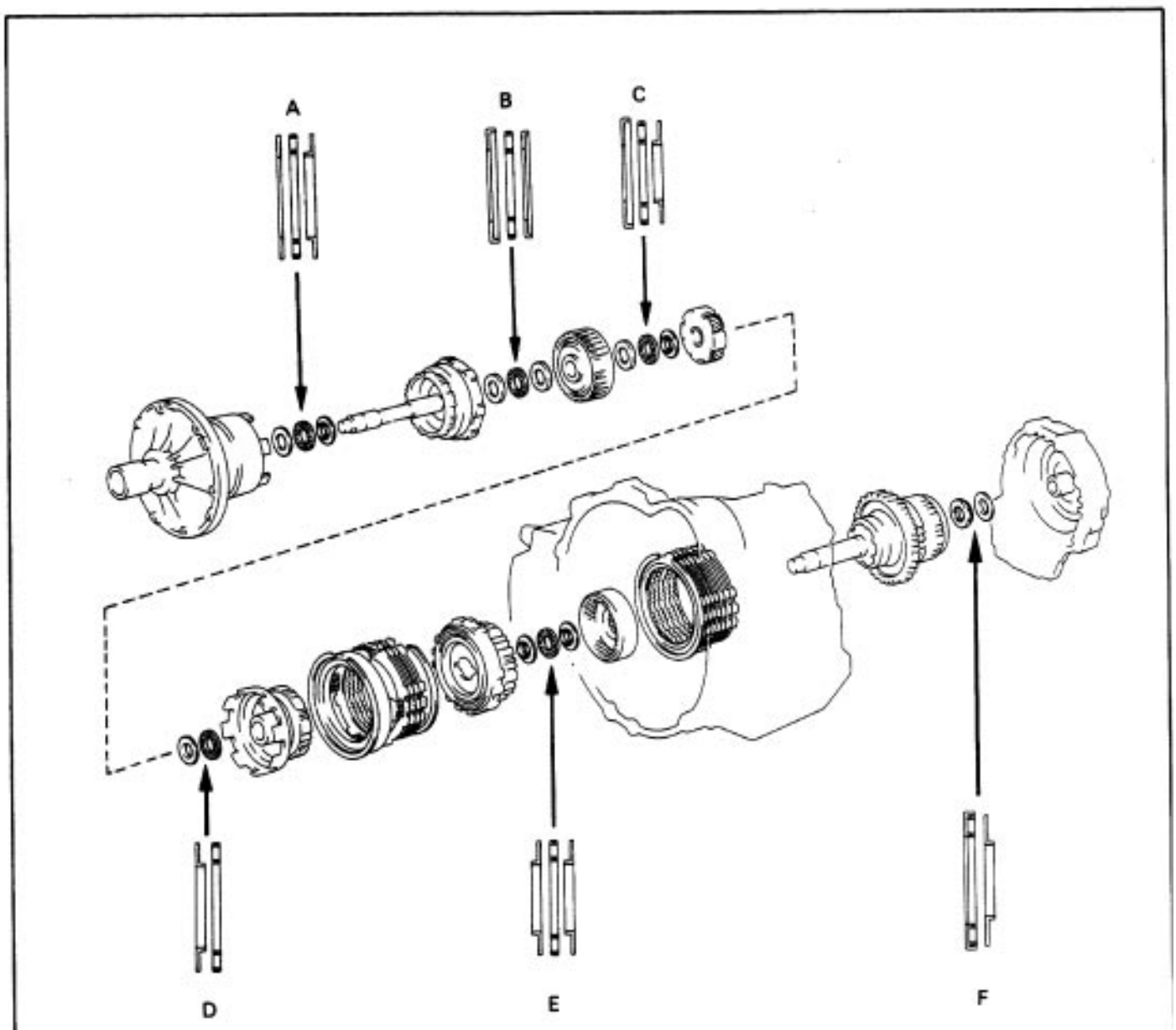
If something wrong is found in a certain component group during assembly, inspect and repair this group immediately.

Recommended ATF: DEXRON® II

GENERAL INSTALLATION NOTES:

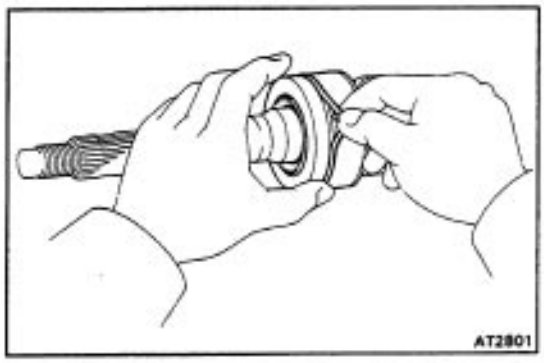
1. The automatic transaxle is composed of highly precision–finished parts, necessitating careful inspection before assembly because even a small nick could cause fluid leakage or affect performance.
2. Before assembling new clutch discs, soak them in automatic transaxle fluid for at least two hours.
3. Apply automatic transaxle fluid on the sliding or rotating surfaces of parts before assembly.
4. Use petroleum jelly to keep small parts in their places.
5. Do not use adhesive cements on gaskets and similar parts.
6. When assembling the transaxle, be sure to use new gaskets and O–rings.
7. Dry all parts with compressed air–never use shop rags.

8. Be sure to install the thrust bearings and races in the correct direction and position.



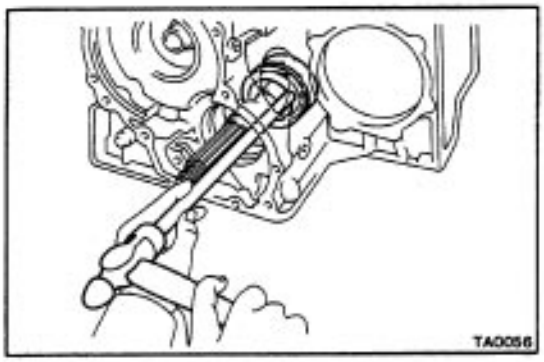
mm (in.)

		A	B	C	D	E	F
Front Bearing Race	Outer Diameter	43.0 (1.693)	37.9 (1.492)	←	45.0 (1.772)	37.3 (1.469)	–
	Inner Diameter	30.5 (1.201)	22.0 (0.866)	←	28.0 (1.102)	24.1 (0.949)	–
Thrust Bearing	Outer Diameter	42.0 (1.654)	36.1 (1.421)	←	45.0 (1.772)	37.6 (1.480)	46.3 (1.823)
	Inner Diameter	28.9 (1.138)	22.2 (0.874)	←	30.0 (1.181)	24.0 (0.945)	26.2 (1.031)
Rear Bearing Race	Outer Diameter	42.0 (1.654)	35.7 (1.406)	35.0 (1.378)	–	37.6 (1.480)	43.0 (1.693)
	Inner Diameter	27.1 (1.067)	23.0 (0.906)	19.0 (0.748)	–	22.2 (0.874)	24.5 (0.965)



INSTALL AND ADJUSTMENT OF DRIVE PINION ASSEMBLY

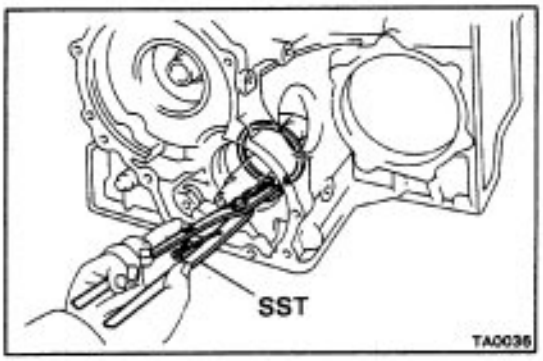
1. INSTALL NEW O–RING ONTO BEARING CAGE



2. INSTALL DRIVE PINION SHAFT INTO CASE

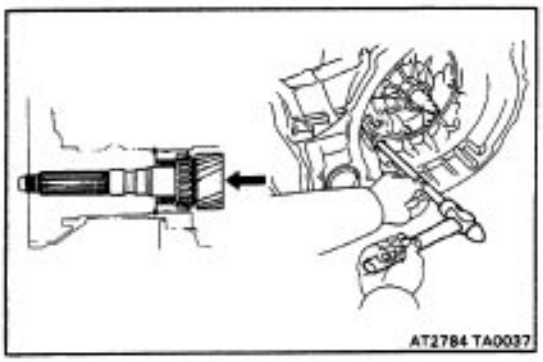
Slightly tap the cage into the case until the groove with the bore can be seen.

HINT: Drive in the bearing cage until the surface of the bearing cage passes through the groove with the bore.

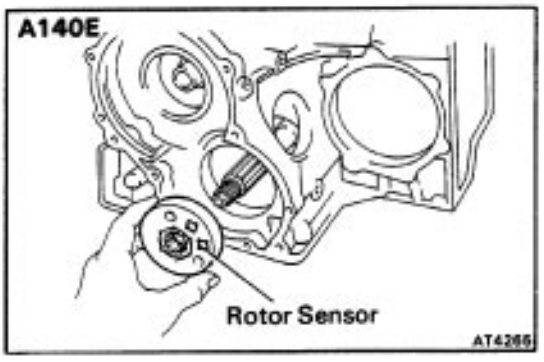


3. INSTALL SNAP RING INTO CASE

(a) Using SST, install the snap ring into the groove.
SST 09350–32014 (09351–32050)



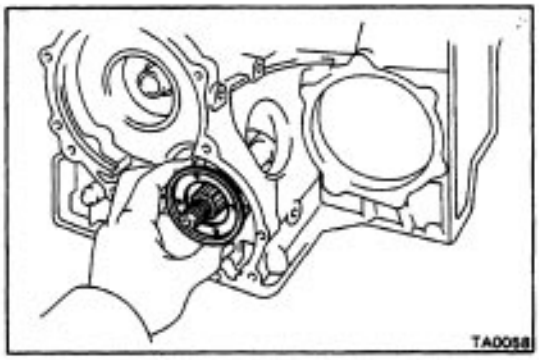
(b) Slightly tap the drive pinion to fit the snap ring into the groove.



4. (A140E)

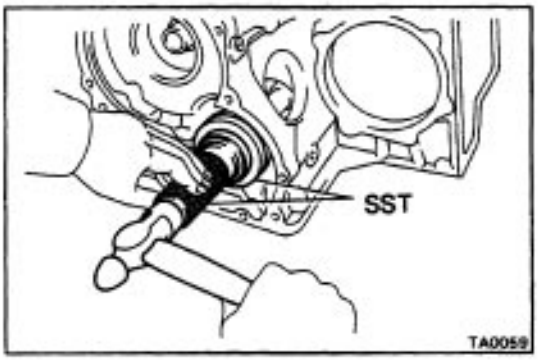
INSTALL ROTOR SENSOR

Install the rotor sensor, facing the magnet outward.



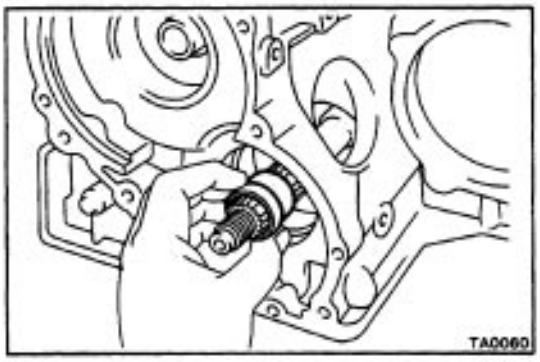
5. INSTALL OIL SLINGER

Install the oil slinger, facing the lip outward.



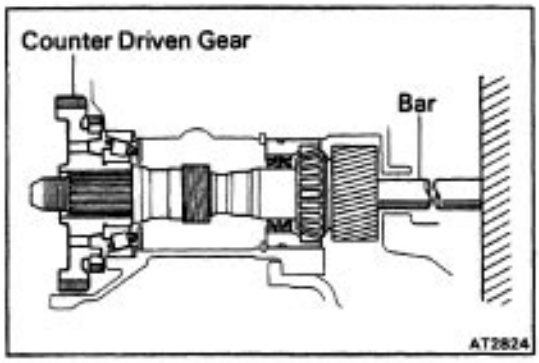
6. INSTALL OUTER RACE

Using SST, drive the outer race into the case.
SST 09350–32014 (09351–32100, 09351–32140)



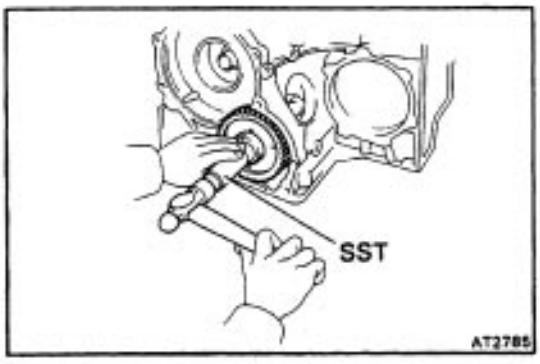
7. INSTALL NEW SPACER

Always use new spacer.
Install the spacer with the small end first.



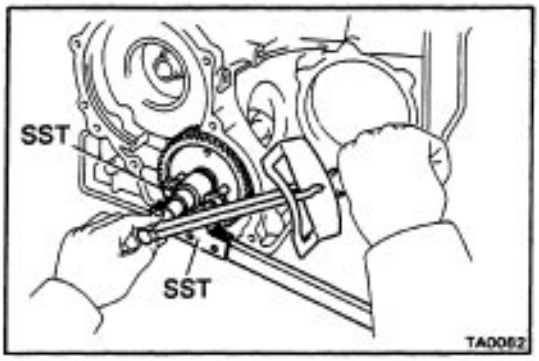
8. INSTALL COUNTER DRIVEN GEAR ONTO SHAFT

(a) Place a bar at the drive pinion side ’and position the outer end of the bar against a vise or such.



(b) Using SST, driven in gear onto the shaft until the nut can be installed on the threads of the shaft.
NOTICE: Be careful not to cause an impact to the transmission case.
SST 09350–32014 (09351–32140)

9. ADJUST DRIVE PINION PRELOAD

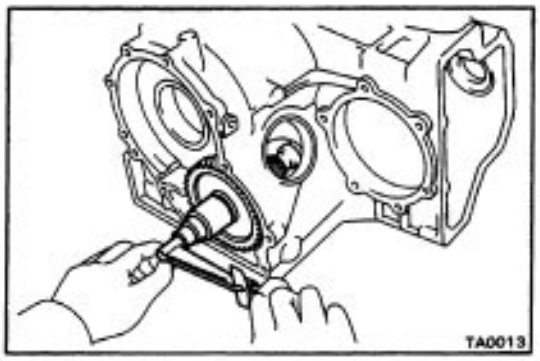


(a) Coat the threads and surface of the nut with MP grease.

(b) Using SST to hold the gear, tighten the nut.

Torque: 1,750 kg–cm (127 ft–lb, 172 N–m)

SST 09330–00021, 09350–32014 (09351–32031)



(e) Turn the gear counterclockwise and clockwise several times.

(d) Using a torque meter, measure the preload of the drive pinion.

Preload (at starting) :

New bearing 10 – 16 kg–cm
(8.7 – 13.9 in.–lb, 1.0 – 1.6 N–m)

Reused bearing 5 – 8 kg–cm
(4.3 – 6.9 in.–lb, 0.5 – 0.8 N–m)

- If the preload is greater than specified, replace the bearing spacer.
- If the preload is less than specified, retighten the nut 130 kg–cm (9 ft–lb, 13 N–m) at a time until the specified preload is reached.

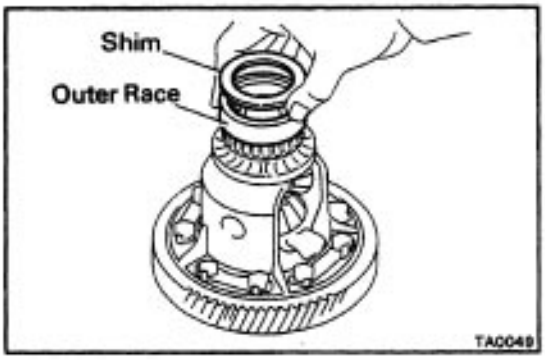
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure.

Do not back off the nut to reduce the preload.

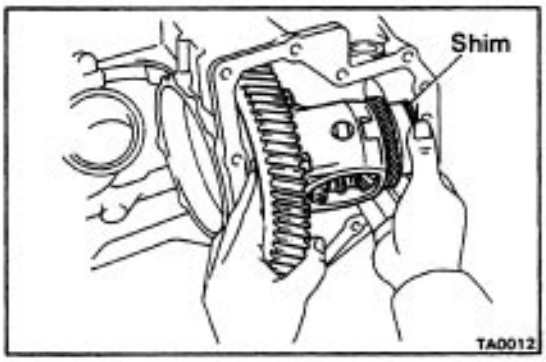
Maximum torque: 2,950 kg–cm (213 ft–lb, 289 N–m)

(e) If the preload is adjusted within specification, make a note of it.

INSTALLATION OF DIFFERENTIAL

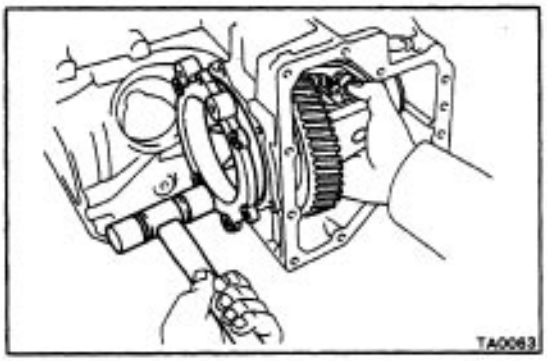


1. PLACE OUTER RACE AND SELECTED ADJUSTING SHIM ONTO RH SIDE BEARING



2. PLACE DIFFERENTIAL CASE INTO CASE

Be sure to install the adjusting shim into place.

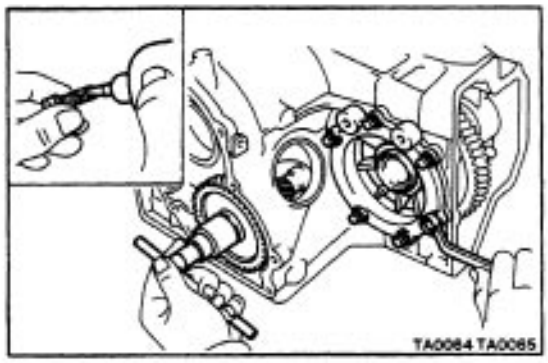


3. INSTALL LH BEARING RETAINER

(a) Install a new O–ring.

(b) Position the retainer by tapping it while holding the differential case center with the retainer.

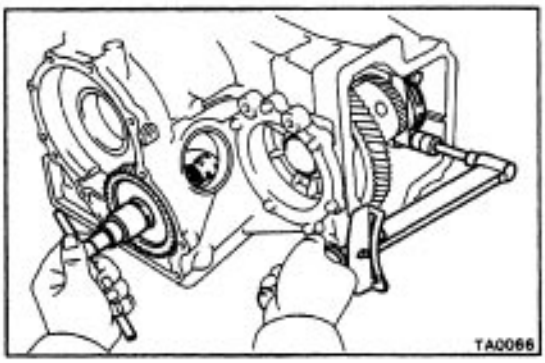
(c) Clean the threads of the bolts and case with white gasoline.



(d) Coat the threads of the bolts with sealer.

Sealer: Part No. 08833–00070, THREE BOND 1324 or equivalent

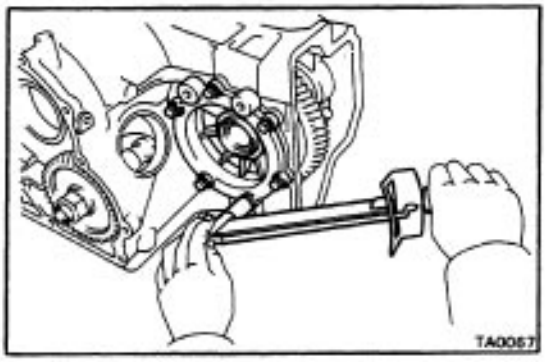
(e) Temporarily tighten the bolts evenly and gradually while turning the ring gear.



4. INSTALL RN SIDE BEARING CAP

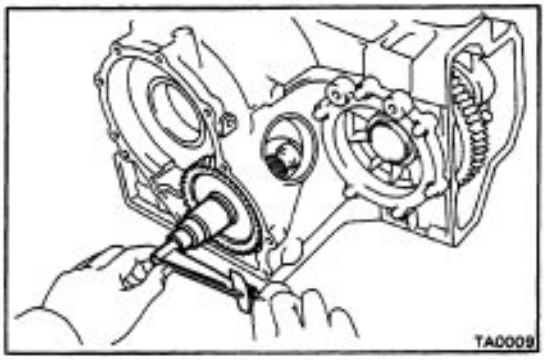
Tighten the bolts evenly and gradually while turning the ring gear.

Torque: 730 kg–cm (53 ft–lb, 72 N–m)



5. TIGHTEN LH BEARING RETAINER

Torque: 195 kg–cm (14 ft–lb, 19 N–m)



6. MEASURE TOTAL PRELOAD

Using a torque meter, measure. the total preload of the drive pinion shaft.

Total preload (at starting) :

Add drive pinion preload (See page AT–164)

New bearing 2.9 – 4.0 kg–cm

(2.5 – 3.5 in.–lb, 0.3 – 0.4 N–m)

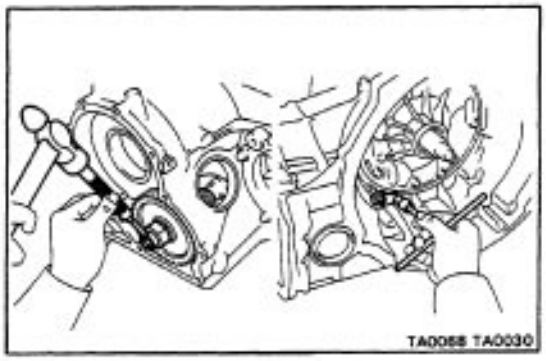
Reused bearing 1.5 – 2.0 kg–cm

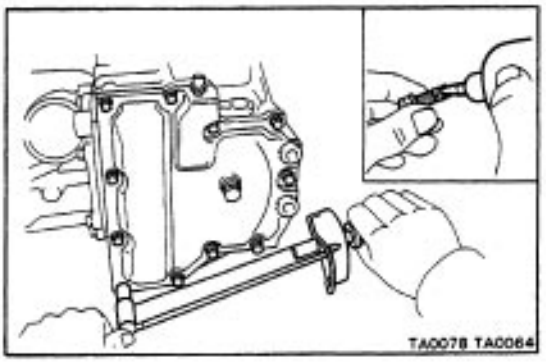
(1.3 – 1.7 in.–lb, 0.1 – 0.2 N–m)

If the preload is not within specification, redisassemble and readjust.

7. STAKE COUNTER DRIVEN GEAR NUT

8. INSTALL DRIVE PINION CAP





9. INSTALL CARRIER COVER

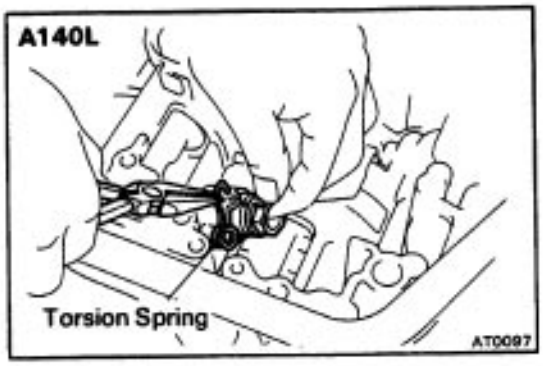
(a) Clean the threads of the bolts and case with white gasoline.

(b) Coat the threads of the bolts with sealer.

Sealer: Part No. 08833–00070, THREE BOND 1324 or equivalent

(c) Install the carrier cover over the gasket.

Torque: 250 kg–cm (18 ft–lb, 25 N–m)



INSTALLATION OF 4–SPEED GEAR UNIT

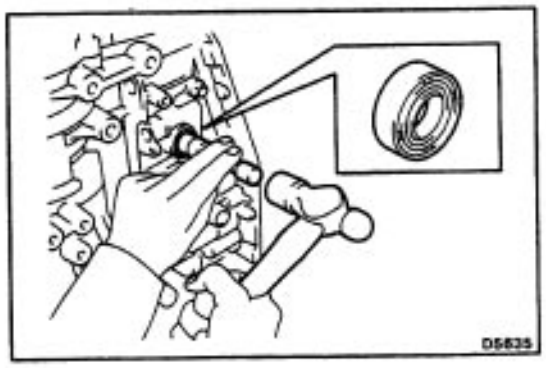
1. (A140L)

INSTALL GOVERNOR PRESSURE ADAPTOR

(a) Install the governor pressure adaptor into the case.

(b) Align the hole of adaptor with the hole of the case and install the torsion spring.

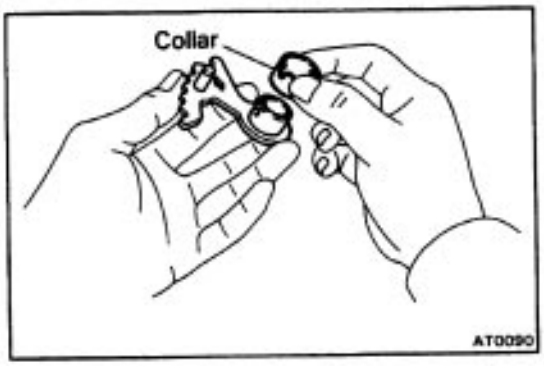
(e) Check that the adaptor dose not slide or the spring fall out when puller by hand.



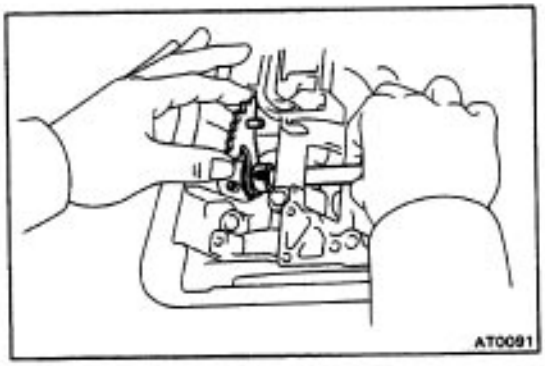
2. INSTALL MANUAL VALVE SHAFT

(a) Coat the oil seal lip with MP grease.

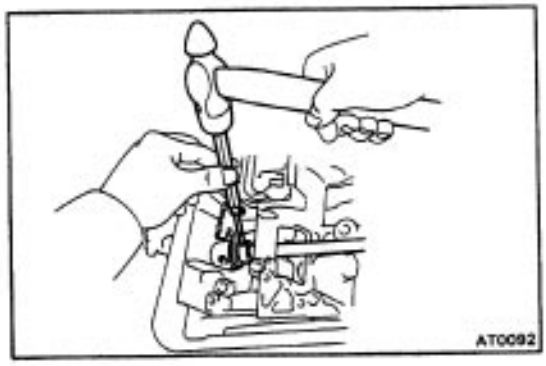
(b) Install the manual valve shaft oil seal to the case.



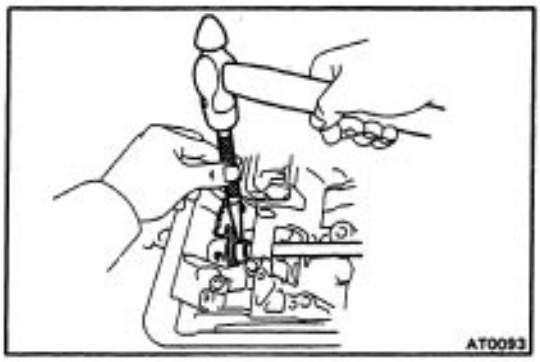
(c) Assemble a new collar to the manual valve lever.



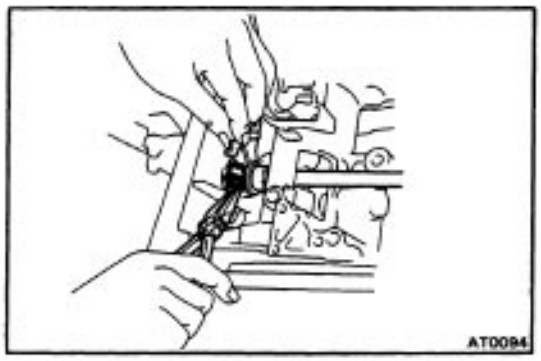
Install the manual valve lever shaft to the transmission case through the manual valve lever.



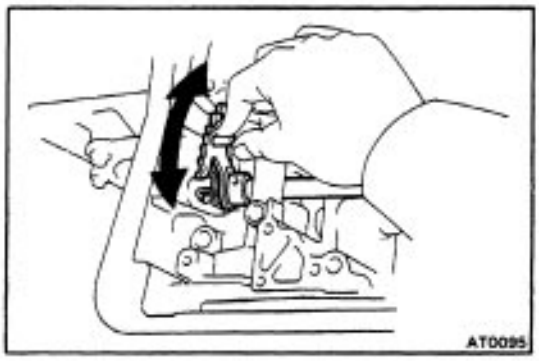
(e) Using a pin punch, drive in the roll pin until its surface is flush with the manual valve lever surface.



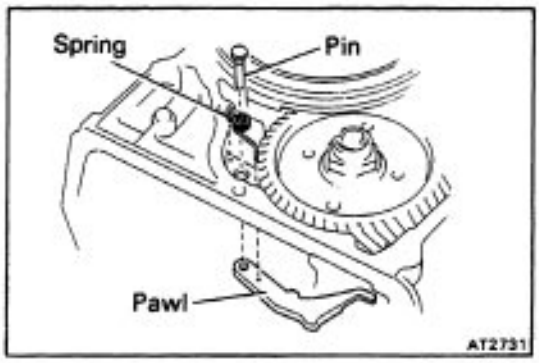
(f) Match the collar hole to the lever calking hollow and calk the collar to the lever.



(g) Install the retaining spring.



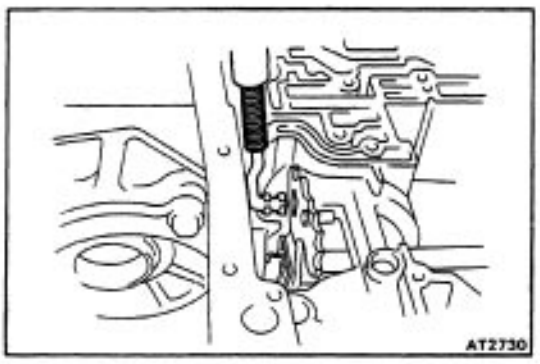
(h) Make sure that the lever moves smoothly.



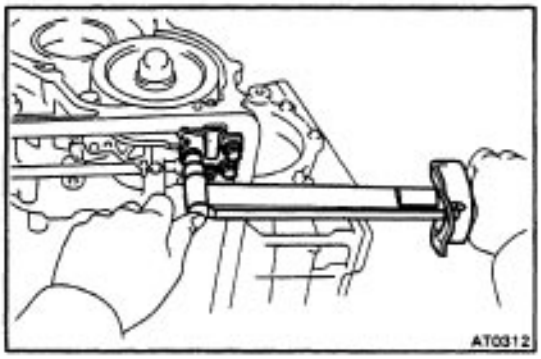
3. INSTALL PARKING LOCK PAWL

(a) Place the parking lock pawl onto the case. Hook the spring ends to the case and pawl.

(b) Install the pin into the hole of the case through the spring and pawl.

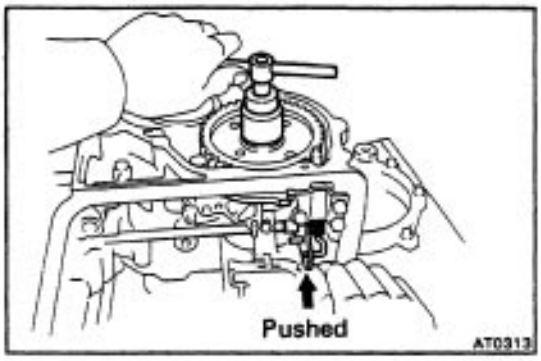


4. INSTALL PARKING LOCK ROD



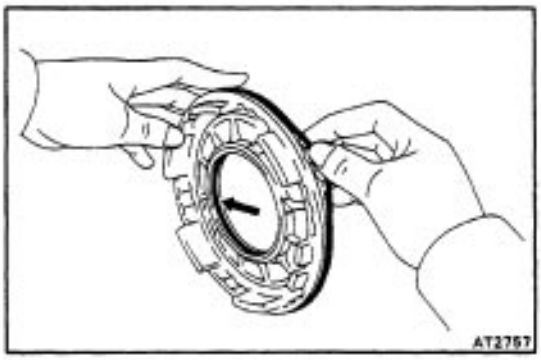
5. INSTALL PARKING LOCK PAWL BRACKET

Torque: 75 kg–cm (65 in.–lb, 7.4 N–m)



6. CHECK OPERATION OF PARKING LOCK PAWL

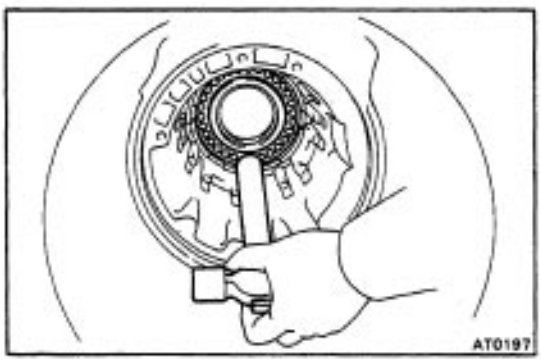
Make sure the counter driven gear is locked when the manual valve lever is in the P range.



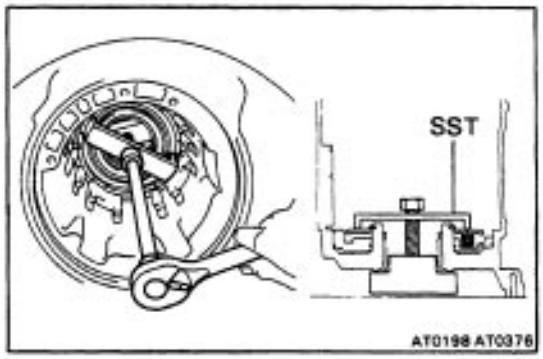
7. INSTALL FIRST AND REVERSE BRAKE PISTON TO TRANSMISSION CASE

(a) Coat the new O–rings with ATF.

(b) Install the two O–rings on the piston.



(e) Push the piston into the bore of the case, facing the spring seat upward.

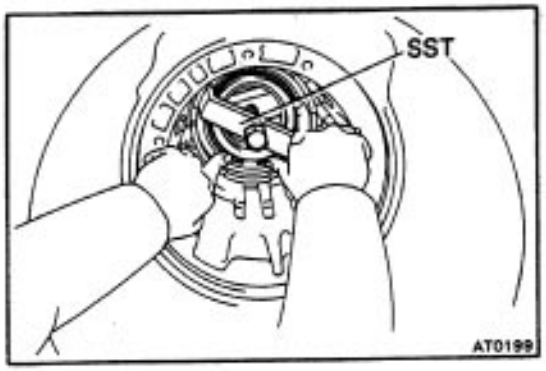


8. INSTALL PISTON RETURN SPRING

(a) Place the return spring and snap ring on the piston.

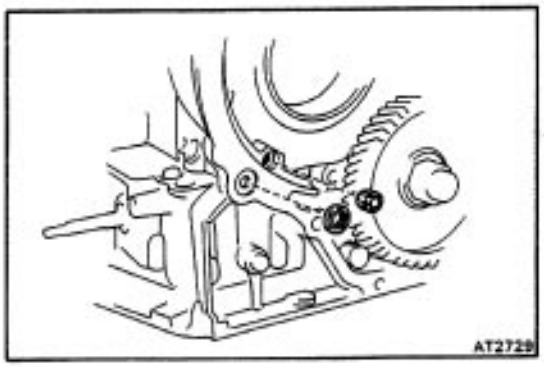
(b) Place SST, and compress the return spring evenly by tightening the bolt gradually.

SST 09s50–32014 (09351–32040)

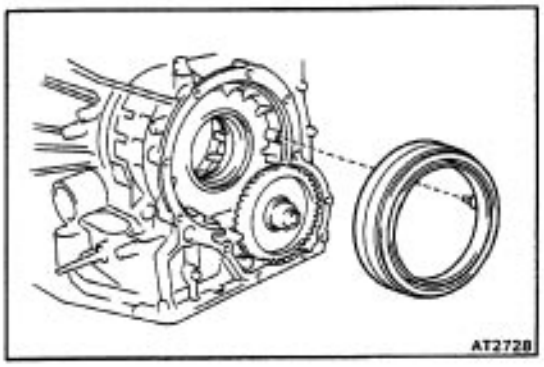


(c) Install snap ring. Visually check to make sure it is fully seated and centered by the three lugs on the spring retainer.
Be sure the end gap of snap ring is not aligned with the spring retainer claw.
(d) Remove SST.

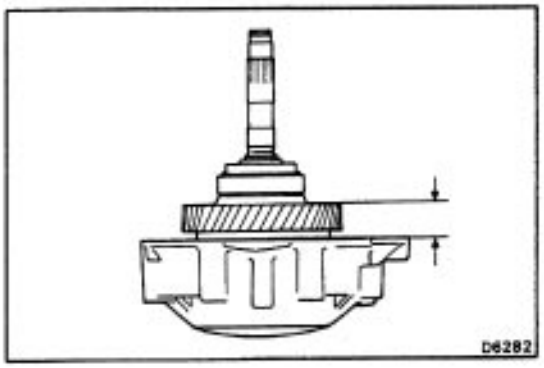
9. INSTALL OVERDRIVE UNIT



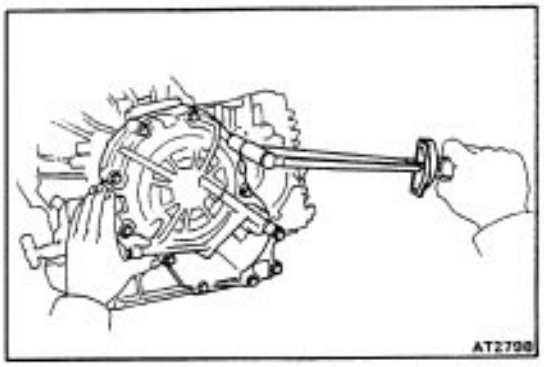
(a) Install the overdrive brake apply gasket and overdrive clutch apply gasket.



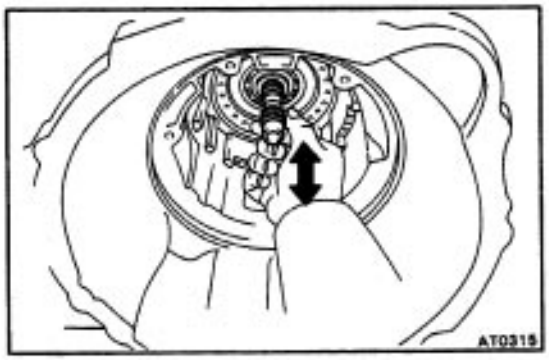
(b) Install the overdrive brake drum to the case.
(c) Install the new case gasket to the case.



(d) Make sure that the length from the top surface of the case to the counter driven gear top surface should be about 24 mm (0.94 in.).



(e) Install the overdrive unit with overdrive case to the transaxle case.
(f) Install and tighten the bolts.
Torque: 250 kg–cm (18 ft–lb, 25 N–m)



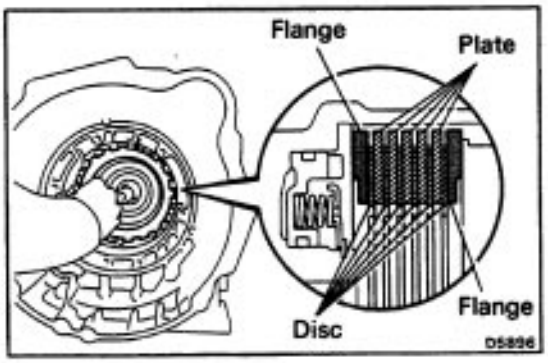
10. CHECK INTERMEDIATE SHAFT END PLAY

(a) Make sure that the intermediate shaft has thrust play.

Thrust play: 0.49 – 1.51 mm (0.0193 – 0.0594 in.)

If the thrust play is not within specification, check the installation of intermediate shaft.

(b) Make sure that the intermediate shaft turns smoothly.



11. INSTALL FIRST AND REVERSE BRAKE IN CASE

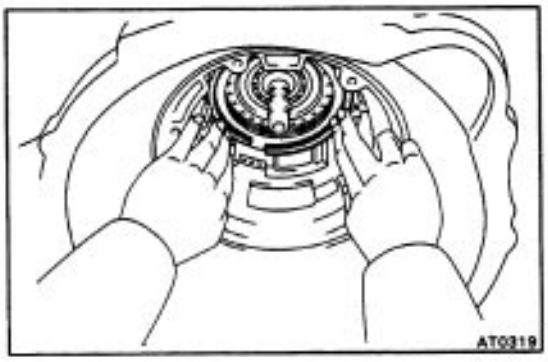
(a) Install the inner flange facing the flat end toward the oil pump side.

(b) Install the discs and plates.

Install in order: P=Plate D=Disc

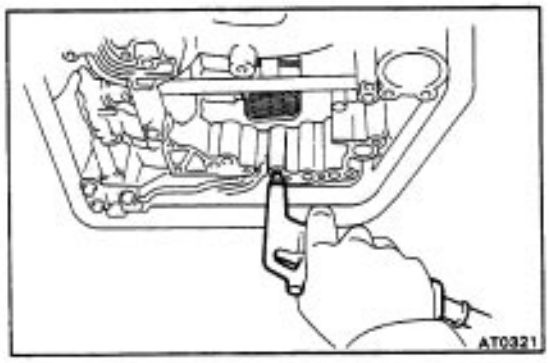
D–P–D–P–D–P–D–P–D–P–C

(c) Install the outer flange, facing the flat end toward the piston side.



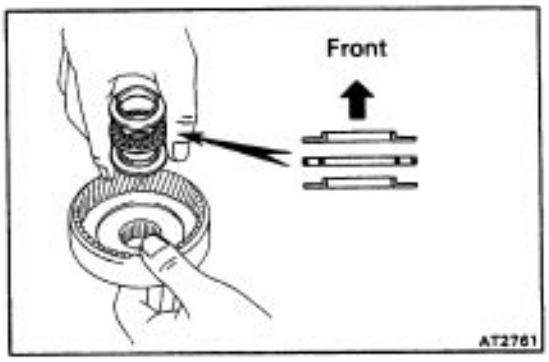
12. INSTALL SNAP RING

Be sure the end gap of the snap ring is not aligned with one of the cutouts.



13. CHECK OPERATION OF FIRST AND REVERSE BRAKE

Apply compressed air into the oil passage with the case and be sure that the piston moves.

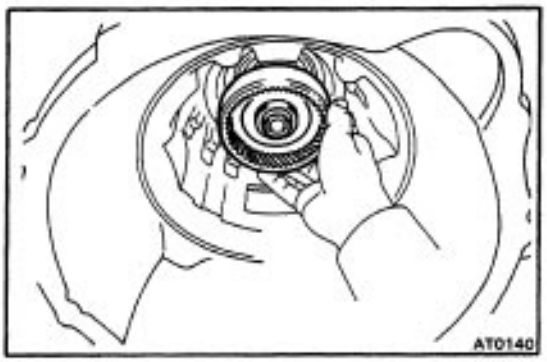


14. INSTALL RING GEAR INTO CASE

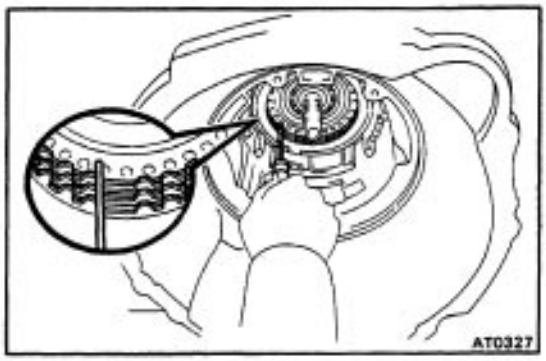
(a) Coat the races and bearing with petroleum jelly an install them onto the ring gear.

Bearing and races: mm(in)

	Outer Diameter	Inner Diameter
Front Race	37.3 (1.469)	24.1 (0.949)
Bearing	37.6 (1.480)	24.0 (0.945)
Rear Race	37.6 (1.480)	22.2 (0.874)

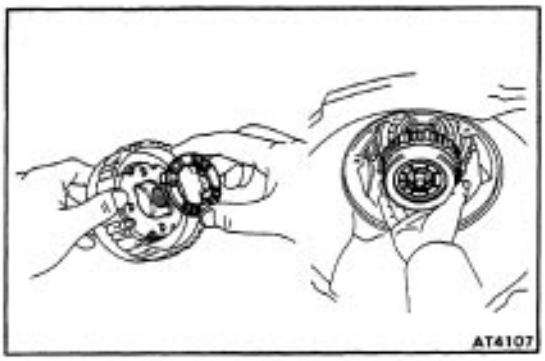


(b) Install the ring gear into the case.



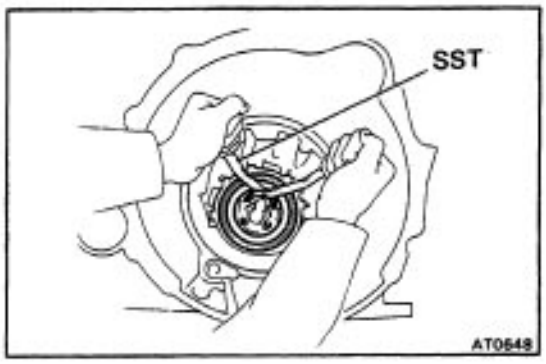
15. INSTALL REAR PLANETARY GEAR INTO CASE

(a) Align the flukes of the discs in the first and reverse brake.



(b) Coat the thrust washer with petroleum jelly. Align the tab of the washer with the hollow of the carrier.

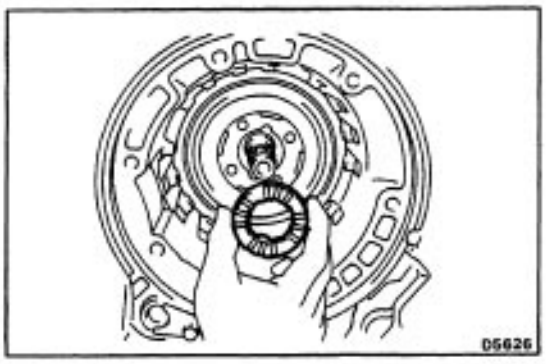
(c) Align the spline of the planetary carrier with either of the flukes of the discs, and install the planetary gear into the first and reverse brake discs.



16. INSTALL NO. 2 ONE–WAY CLUTCH INTO CASE WITH SHINY SIDE UPWARD

(a) Place the one–way clutch with the shiny side upward.

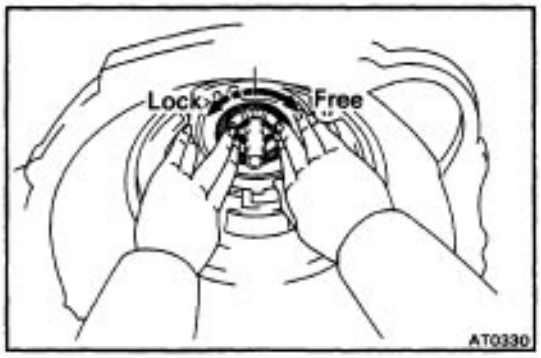
(b) Install the one–way clutch onto the inner race while turning the planetary gear clockwise with SST.
SST 09350–32014 (09351–32050)



(e) Coat the thrust washer with petroleum jelly and install it onto the planetary gear.

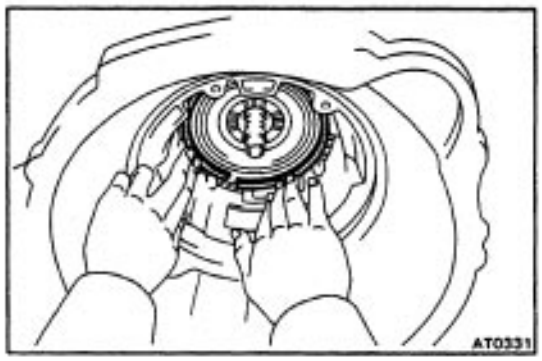
17. CHECK OPERATION OF NO. 2 ONE–WAY CLUTCH

Turn the planetary carrier. The carrier should turn freely clockwise and lock counterclockwise.



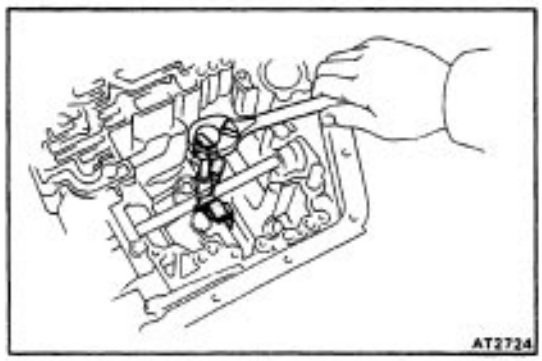
18. INSTALL SNAP RING

Be sure the end gap of the snap ring is not aligned with one of cutouts.



19. INSTALL SECOND COAST BRAKE BAND GUIDE

Install the two band guides so that its tip touches the case.



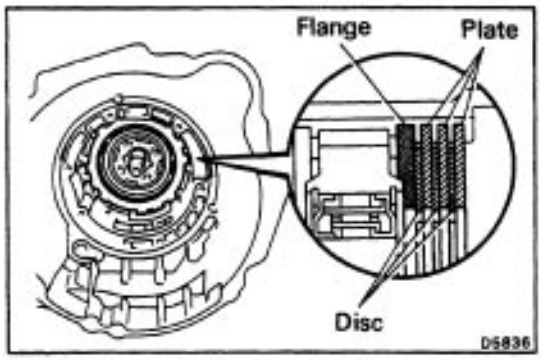
20. INSTALL SECOND BRAKE INTO CASE

(a) Install the flange, facing the flat end toward the oil pump side.

(b) Install the discs and plates.

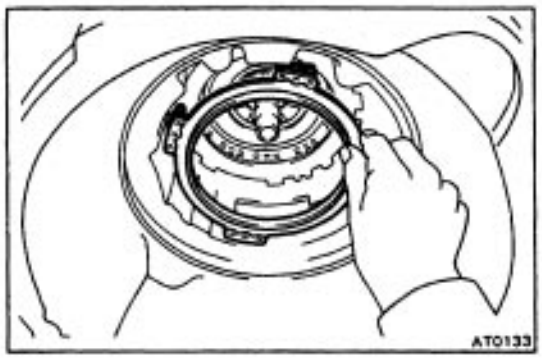
Install in order: P=Plate D=Disc

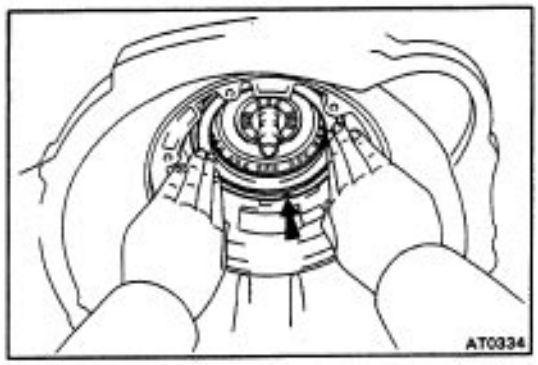
Flange– D–P–D–P–D–P



21. INSTALL PISTON RETURN SPRING

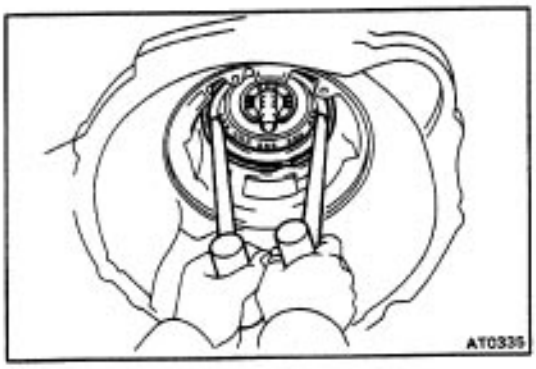
Each spring end is installed onto the protrusion with the case.





22. INSTALL SECOND BRAKE DRUM INTO CASE

Align the groove of the drum with the bolt and place it into the case.

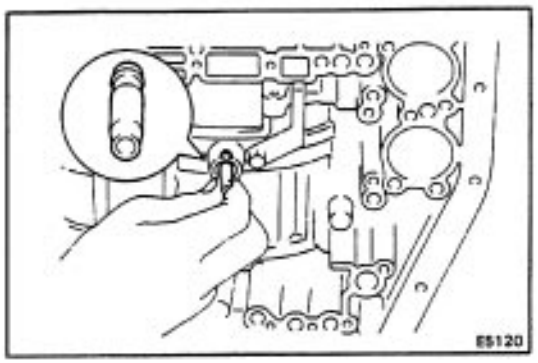


23. INSTALL SNAP RING

(a) Place the snap ring into the case so that the end gap is installed into the groove.

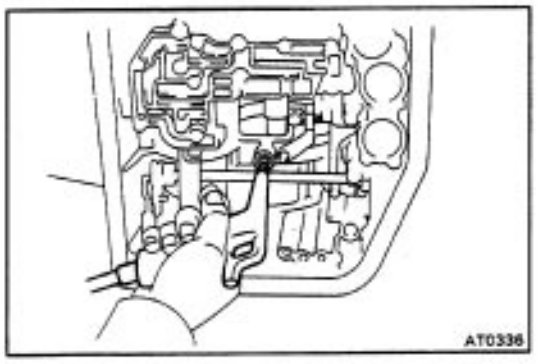
(b) While compressing the piston return springs over the drum with hammer handles, install the snap ring into the groove.

(c) Be sure the end gap of the snap ring is not aligned with one of the cutouts.



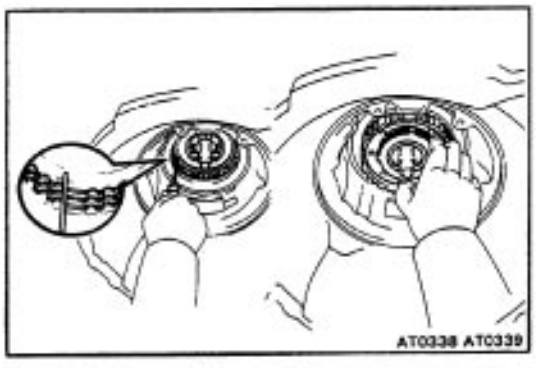
24. INSTALL SECOND BRAKE DRUM GASKET

Install a new gasket until it makes contact with the second brake drum.



25. CHECK OPERATION OF SECOND BRAKE

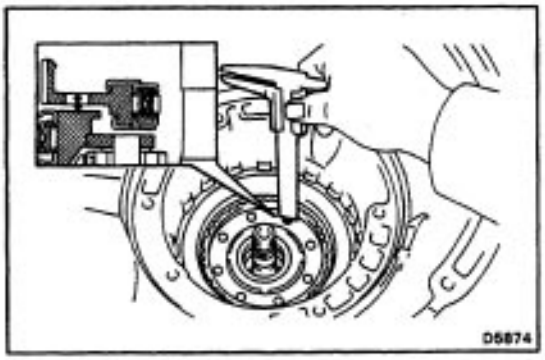
Blow compressed air into the oil passage with the case, and be sure that the piston moves.



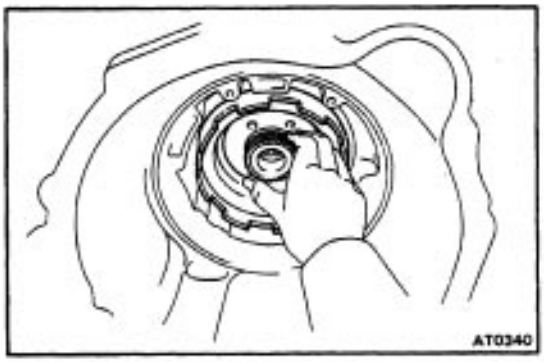
26. INSTALL NO–1 ONE–WAY CLUTCH AND SECOND BRAKE HUB

(a) Align the flukes of the discs in the 2nd brake.

(b) Align the spline of the hub with the flukes of the discs and install the hub to the 2nd brake discs.

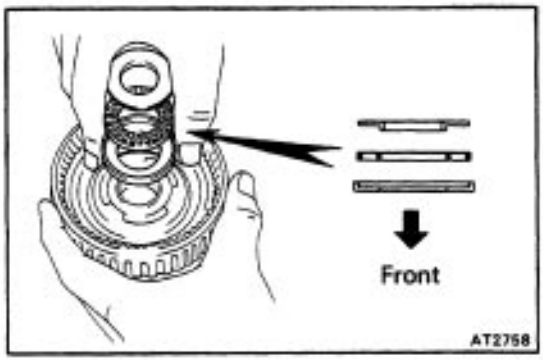


(c) Check the distance between the surfaces of the 2nd brake hub and rear planetary gear.
Distance: Approx. 5 mm (0.20 in.)



27. INSTALL SUN GEAR AND SUN GEAR INPUT DRUM

While turning the sun gear clockwise, install it into the one–way clutch.

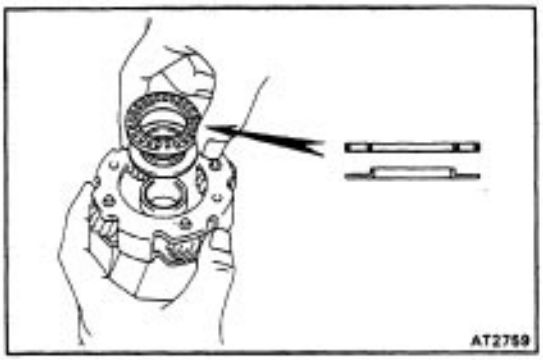


28. INSTALL FRONT PLANETARY GEAR ONTO RING GEAR

(a) Coat the races and bearing with petroleum jelly, and install them onto the ring gear.

Bearing and race: mm (in.)

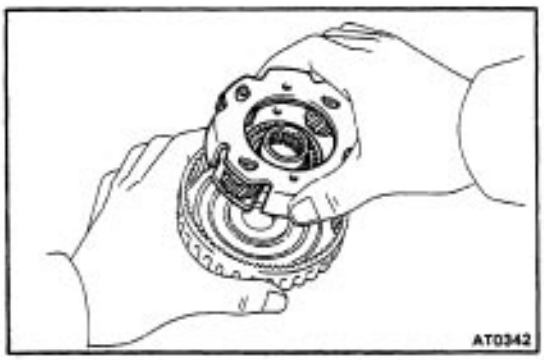
	Outer Diameter	Inner Diameter
Front Race	37.9 (1.492)	22.0 (0.866)
Bearing	36.1 (1.421)	22.2 (0.874)
Rear Race	35.0 (1.378)	19.0 (0.748)



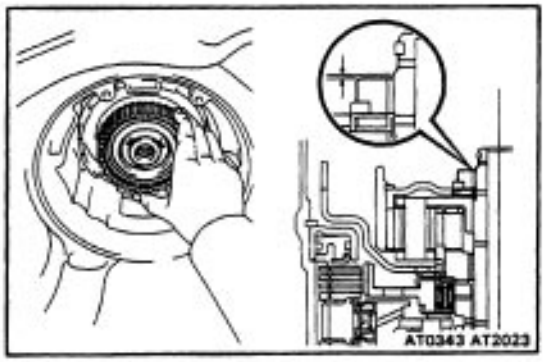
(b) Coat the race and bearing with petroleum jelly, and install them onto the planetary gear.

Bearing and race: mm (in.)

	Outer Diameter	Inner Diameter
Bearing	45.0 (1.772)	30.0 (1.181)
Race	45.0 (1.772)	28.0 (1.102)

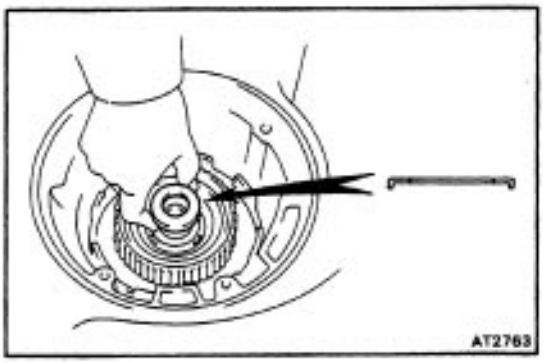


(c) Install the planetary gear onto the ring gear.



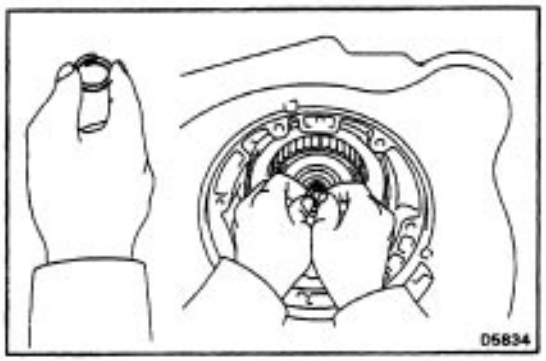
29. INSTALL FRONT PLANETARY GEAR ASSEMBLY ONTO SUN GEAR

(a) If the planetary gear and other parts are installed correctly into the case, the end of the bushing with the ring gear flange will be flush with a shoulder of the intermediate shaft or under.

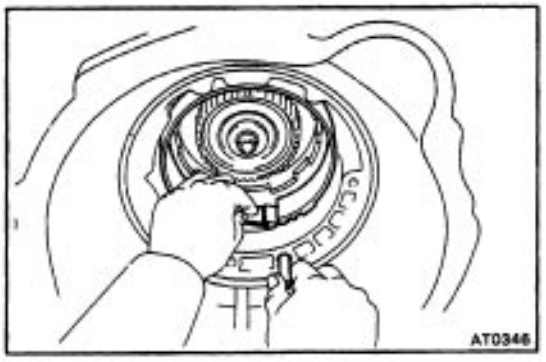


(b) Coat the race with petroleum jelly and install it onto the tip of ring gear flange.

Race: Outer diameter 35.7 mm (1.406 in.)
Inner diameter 23.0 mm (0.906 in.)



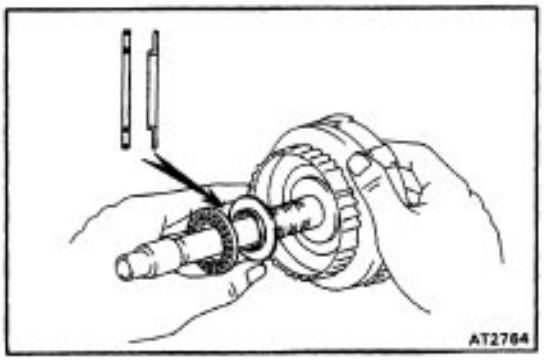
30. INSTALL INTERMEDIATE SHAFT OIL SEAL RING



31. INSTALL SECOND COAST BRAKE BAND

(a) Place the band into the case.

(b) Install the pin. through the oil pump mounting bolt hole.

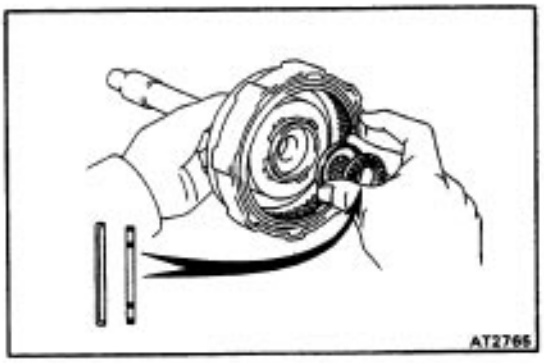


32. INSTALL FORWARD CLUTCH AND DIRECT CLUTCH

(a) Coat the races and bearing with petroleum jelly, and install them onto both sides of the clutch drum.

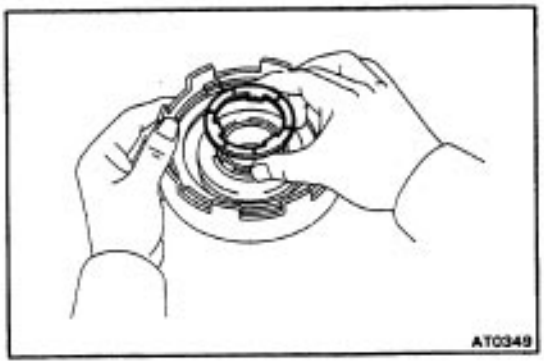
Bearing and race: mm (in.)

	Outer Diameter	Inner Diameter
Bearing	42.0 (1.654)	28.9 (1.138)
Race	42.0 (1.654)	27.1 (1.067)

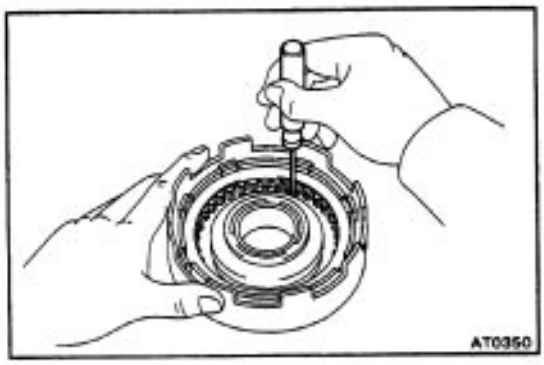


Bearing and race: mm (in.)

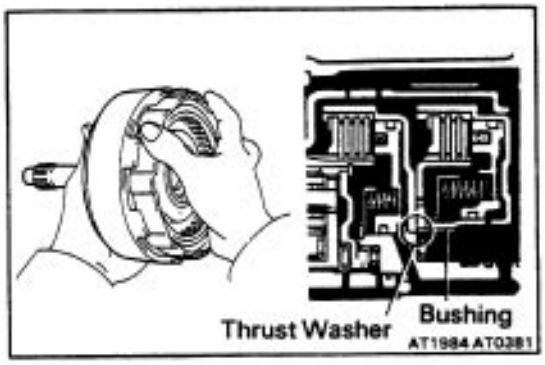
	Outer Diameter	Inner Diameter
Bearing	36.1 (1.421)	22.2 (0.874)
Race	37.9 (1.492)	22.0 (0.866)



(b) Coat the clutch drum thrust washer with petroleum jelly and install it with the oil groove facing upward onto the direct clutch drum.

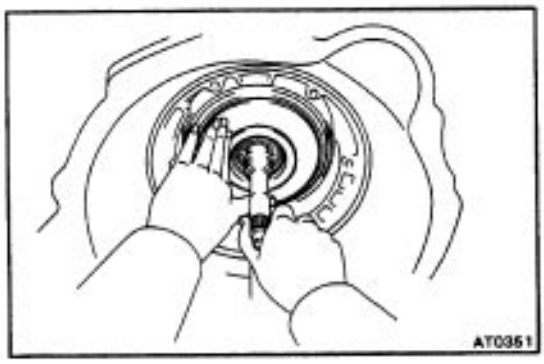


(c) Align the flukes of discs in the direct clutch.



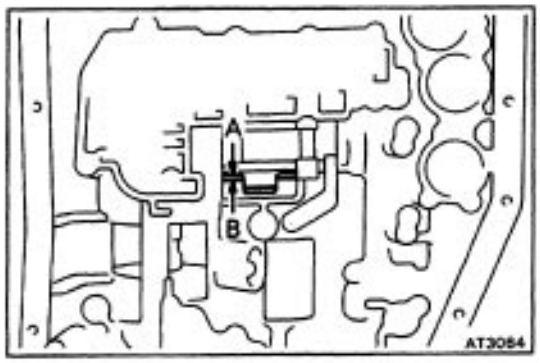
(d) Mesh the hub with the flukes of the direct clutch while turning the clutch drum or forward clutch.

(e) If the flukes of the discs are meshed with the hut correctly, the end of the bushing with the direct clutch drum will be flush with the surface of the for ward clutch.

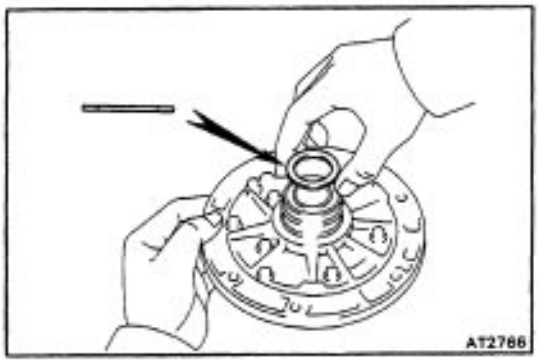


(f) Place the direct clutch and forward clutch into the case.

(g) Rotate the forward clutch to mesh the front planetar ring gear and discs.

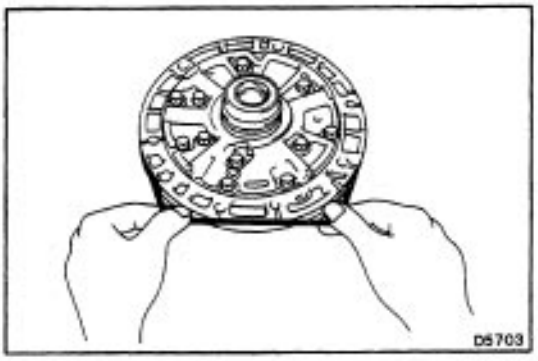


(h) Check the distance between the A and6 as shown in the illustration.
Distance: Approx. 3 mm (0.118 in.)

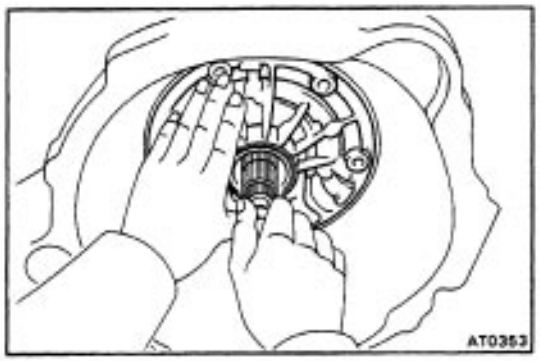


33. INSTALL OIL PUMP INTO CASE

(a) Coat the race with petroleum jelly and install it onto stator shaft.



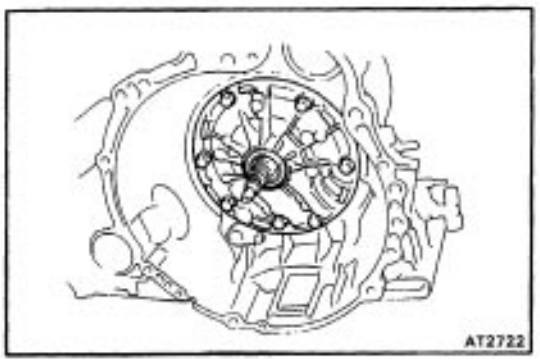
(b) Coat a new O–ring with ATF and install it to oil pump.



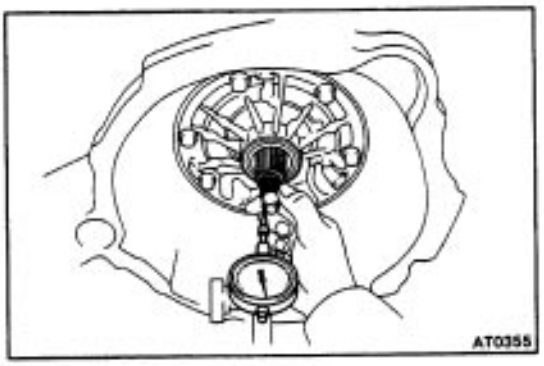
(c) Place the oil pump through the input shaft, and align the bolt holes of the pump body with the transmission case.

(d) Hold the input shaft, and lightly press the oil pump body to slide the oil seal rings on the stator shaft through the direct clutch drum.

NOTICE: Do not push on the oil pump strongly or the oil seal ring will stick to the direct clutch drum.



(e) Install and tighten the seven bolts.
Torque: 225 kg–cm (16 ft–lb, 22 N–m)



34. MEASURE THRUST PLAY OF INPUT SHAFT

Measure the thrust play with a dial gauge.

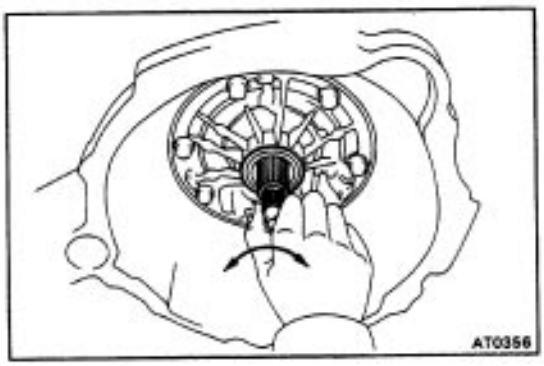
Thrust play: 0.3 – 0.9 mm (0.012 – 0.035 in.)

HINT: There are two thickness of races for the end of stator shaft.

If the thrust play is in excess of standard, select one of them.

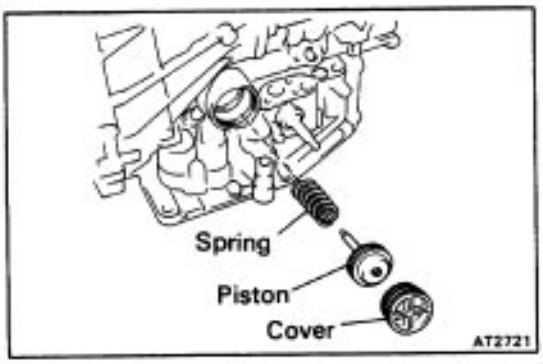
Race thicknesses: 0.8 mm (0.031 in.)

1.4 mm (0.055 in.)



35. CHECK INPUT SHAFT ROTATION

Make sure that the input shaft rotates smoothly.

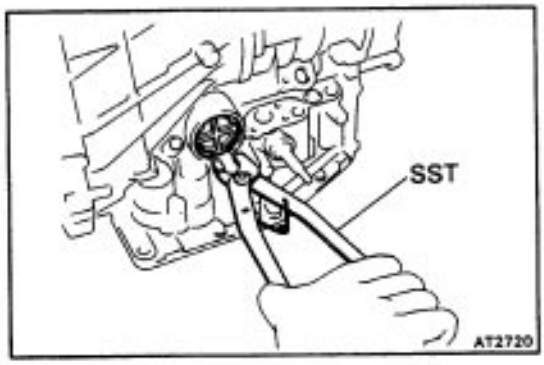


36. INSTALL SECOND COAST BRAKE PISTON

(a) Coat the new O–rings. with ATF and install them on the cover.

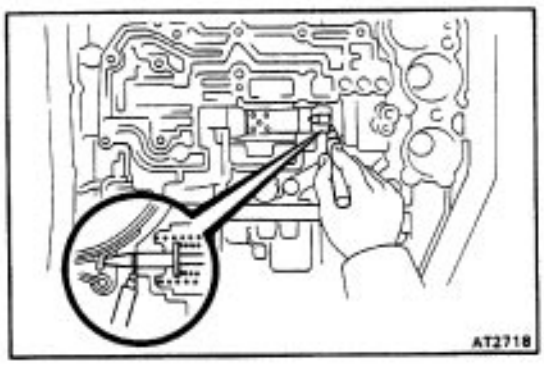
(b) Install the outer spring with the piston.

(c) Place the cover into the bore.



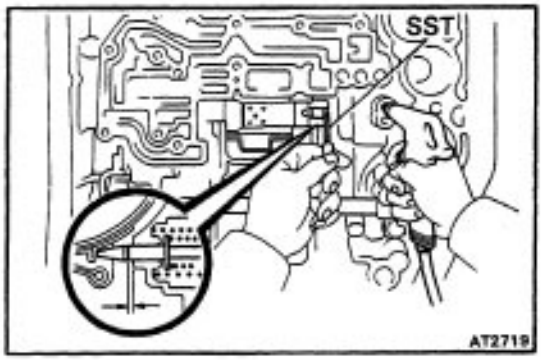
(d) Using SST, install the snap ring while pressing the cover.
SST 09350–32014 109351–32050

(e) Check that the front end of the piston rod contact: the center of the second brake band depression.



37. CHECK SECOND COAST BRAKE PISTON STROKE

(a) Apply a small amount of paint to the piston rod at the point it meets the case as shown in the illustration.

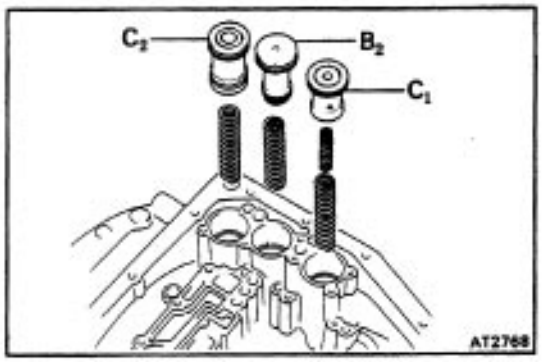


(b) Using SST, measure the piston stroke applying and releasing the compressed air (4 – 8 kg/ cm2, 5 7 – 114 psi or 392 – 785 kPa) as shown.
SST 09240–00020

Piston stroke: 1.5 – 3.0 mm (0.059 – 0.118 in).

If the stroke is more than standard value, replace the piston rod with a longer one.

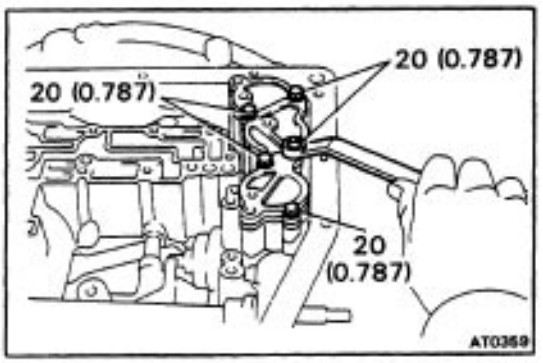
Piston rod length: 72.9 mm (2.870 in)
71.4 mm (2.811 in)



38. INSTALL ACCUMULATOR PISTONS AND SPRINGS

(a) Install the springs and pistons into the bore.

Spring		Free length mm (in)	Color
C_1	Inner	48.00 (1.8898)	None
	Outer	81.09 (3.1925)	Yellow Green
C_2		72.18 (2.8417)	Yellow
B_2		66.68 (2.6252)	Orange

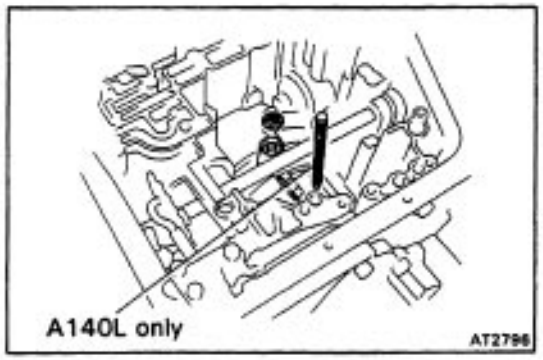


(b) Place the cover with the gasket and tighten the bolts gradually in sequence.

HINT: Each bolt length (mm (in.)) is indicated in the figure.

39. INSTALL NEW SECOND BRAKE APPLY GASKET

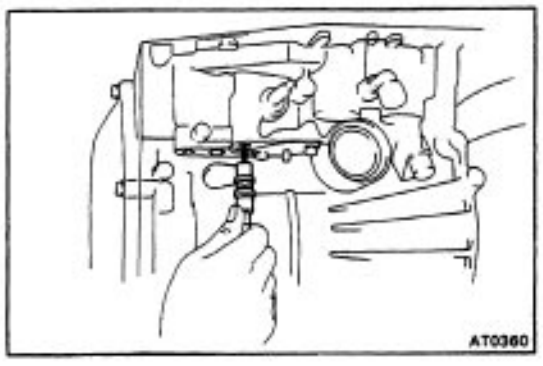
40. (A 1401.)
INSTALL NEW GOVERNOR OIL STRAINER

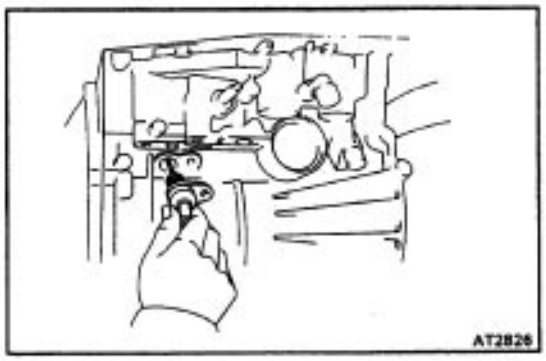


41. INSTALL THROTTLE CABLE IN CASE

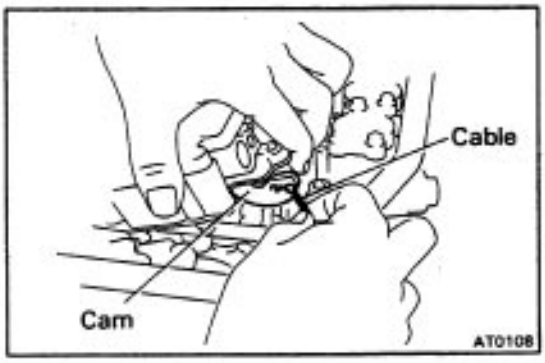
Push the cable through the case, being careful not to damage the O–ring. Check for full seating.

NOTICE: In subsequent work, to avoid breaking the cable fitting do not roll the case over the cable.

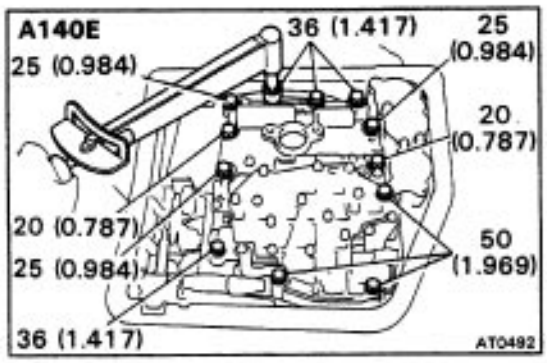




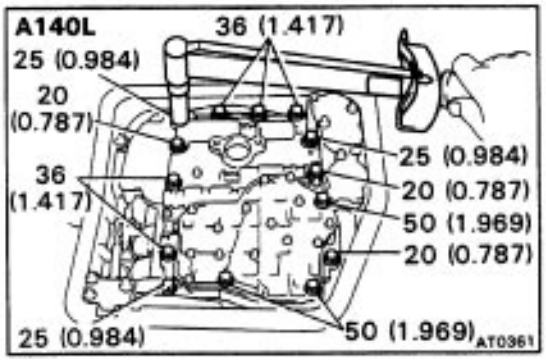
42. (A140E)
INSTALL SOLENOID WIRING
(A 140 L)
INSTALL KICK–DOWN SWITCH WIRING
Push the solenoid wiring through the case, being careful not to damage the O–ring. Check for full seating.

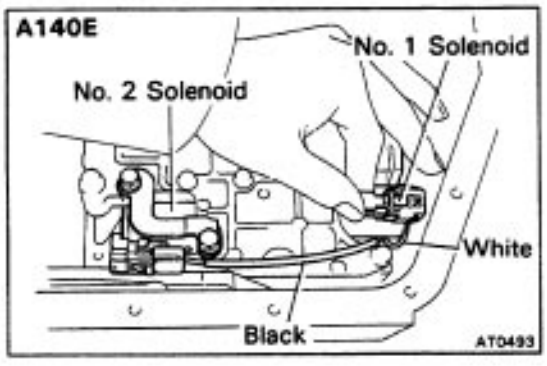


43. PLACE VALVE BODY ON TRANSMISSION
(a) While holding the cam down with your hand, slip the cable end into the slot.
(b) Lower the valve body into place.
NOTICE: Do not entangle the kick–down switch wire or solenoid wire.

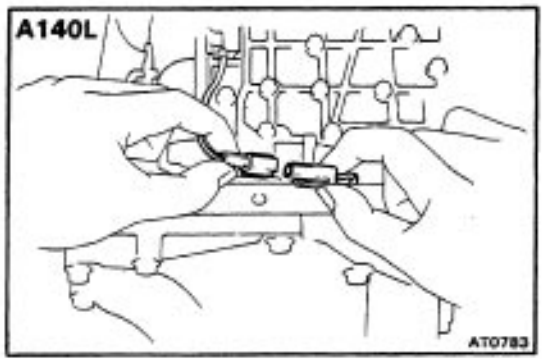


44. INSTALL BOLTS IN VALVE BODY
HINT: Each bolt length (mm (in.)) is indicated in the figure.
Hand tighten the twelve bolts A140E) of fourteen bolts (A140L) first, then torque with a torque wrench.
Torque: 100 kg–cm (7 ft–lb, 10 N–m)





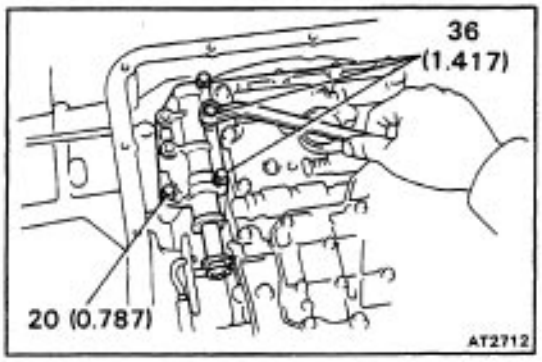
5. (A140E)
CONNECT SOLENOID WIRING
(a) Connect the No. 1 solenoid connector. (white and shorter wire)
(b) Connect the No. 2 solenoid connector. (black and longer wire)



46. (A140L)

CONNECT KICK–DOWN SWITCH WIRING

Connect the kick–down switch connector and clamp it onto the bracket.



47. INSTALL MANUAL VALVE BODY AND DETENT SPRING

HINT: Each bolt length (mm (in.)) is indicated in the figure.

(a) Align the manual valve with the pin on the manual shaft lever.

(b) Lower the manual valve body into place.

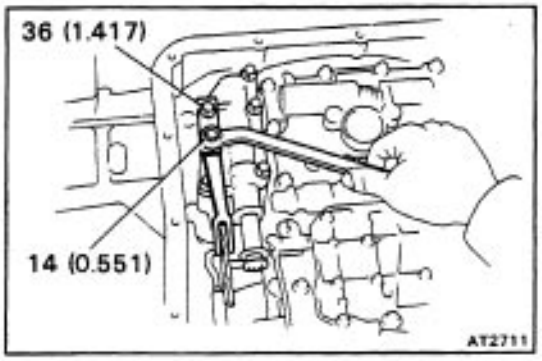
(c) Hand tighten the four bolts first. Then, tighten them with a torque wrench.

Torque: 100 kg–cm (7 ft–lb, 10 N–m)

(d) Place the detent spring on the manual valve body and hand tighten the two bolts first.
Then, tighten them with a torque wrench.

Torque: 100 kg–cm (7 ft–lb, 10 N–m)

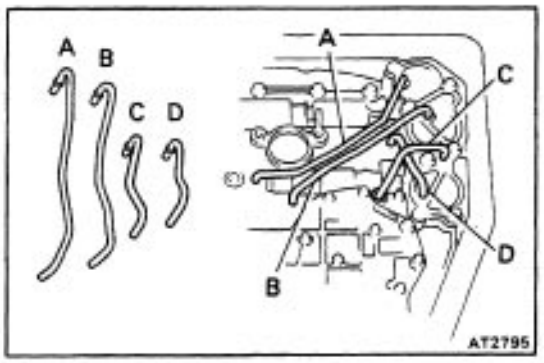
(e) Check that the manual valve lever is touching the center of the detent spring tip roller.



48. INSTALL OIL TUBES

Using a plastic hammer, install the tubes into the positions indicated in the figure.

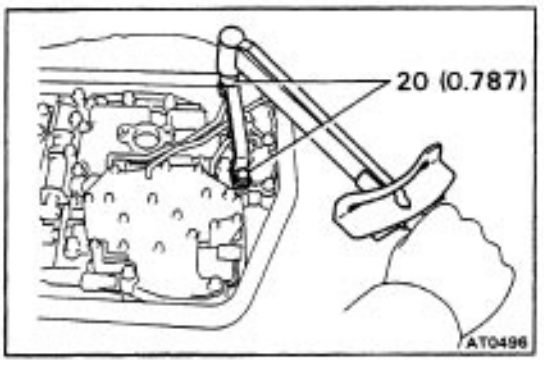
NOTICE: Be careful not to bend or damage the tubes.

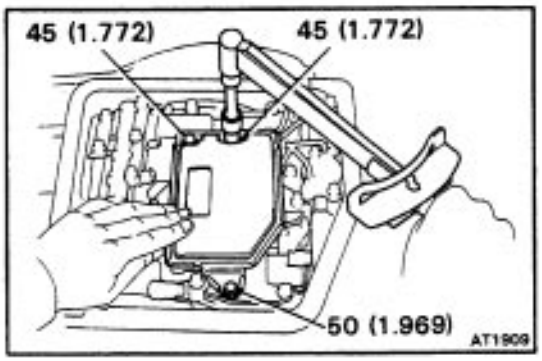


49. INSTALL TUBE BRACKET

Each bolt length (mm (in) is indicated in the figure.

Torque: 100 kg–cm (7 ft–lb, 10 N–m)

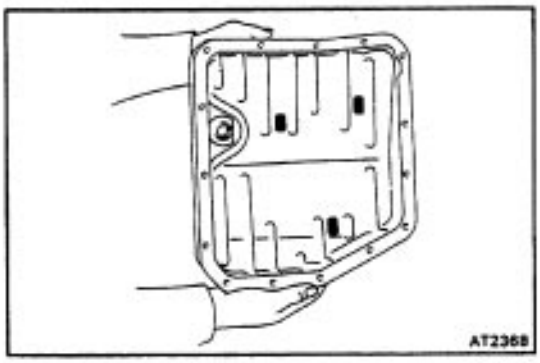




50. INSTALL OIL STRAINER

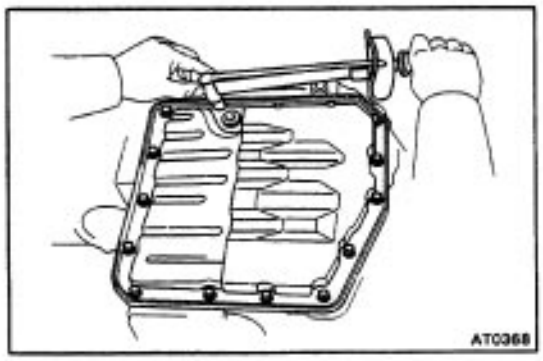
Each bolt length (mm (in.)) is indicated in the figure.

Torque: 100 kg–cm (7 ft–lb, 10 N–m)



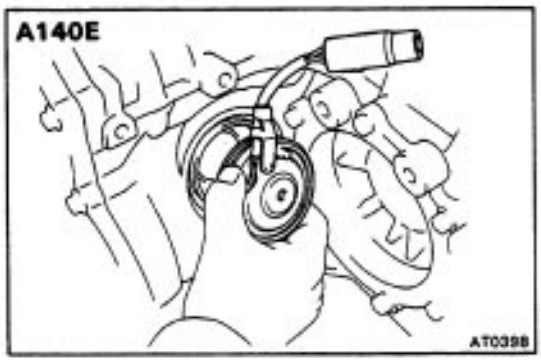
51. INSTALL MAGNETS IN PLACE AS SHOWN

NOTICE: Make sure that the magnets do not interfere with the oil tubes.



52. INSTALL OIL PAN WITH NEW GASKET

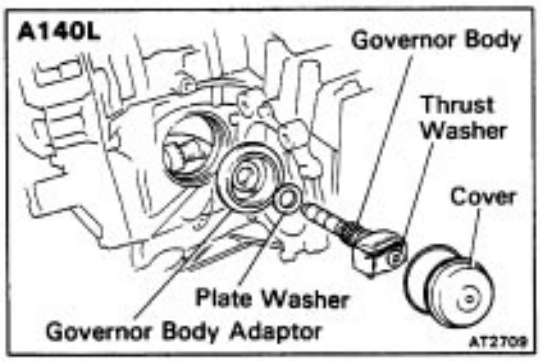
Torque: 50 kg–cm (43 in.–lb, 4.9 N–m)



53. (A140E)

INSTALL NO. 2 SPEED SENSOR

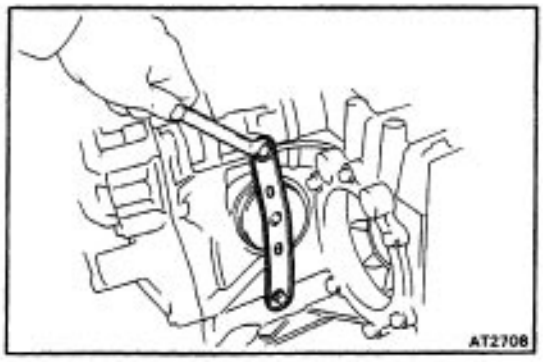
(a) Install the speed sensor with a new O–ring.
(b) Install the cover bracket with the two bolts.



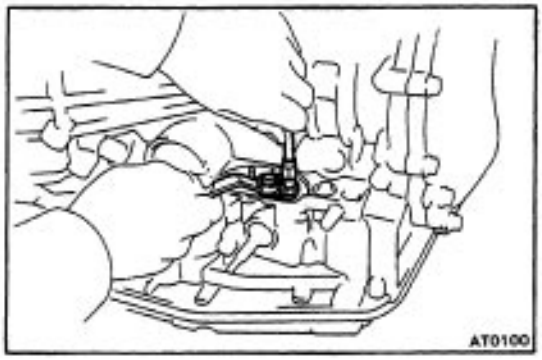
54. (140L)

INSTALL GOVERNOR BODY

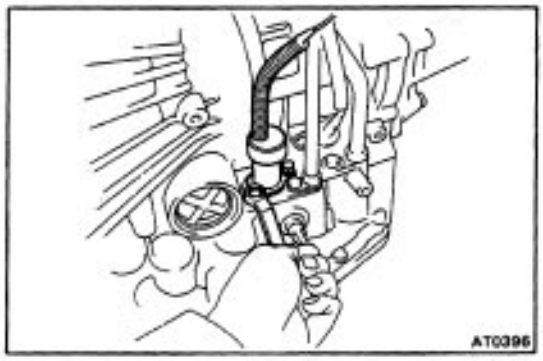
(a) Install the governor body adaptor.
(b) Install the governor body with the plate washer.
(c) Install the thrust washer onto the governor body.
(d) Install the new O–ring to the cover.
(e) Install the cover to the case.



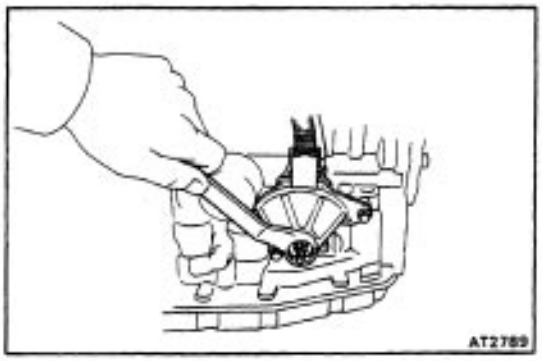
55. INSTALL COVER BRACKET



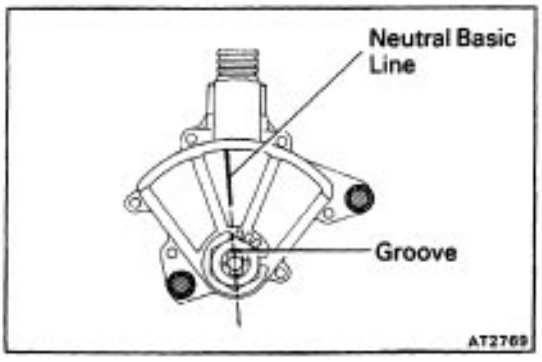
56. (A140E)
INSTALL SOLENOID WIRING RETAINING PLATE
57. INSTALL THROTTLE CABLE RETAINING PLATE
58. INSTALL FILLER TUBE AND DIPSTICK



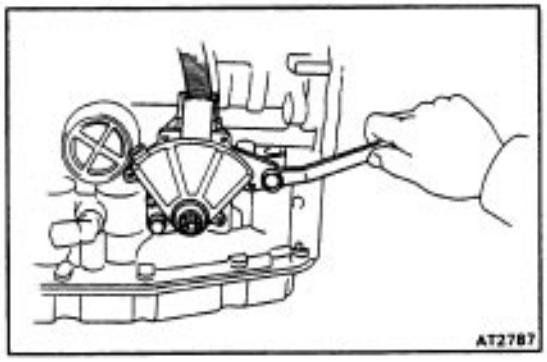
59. INSTALL SOLENOID
(a) Coat the O–rings with ATF and push the tip of solenoid into the hole.
(b) Tighten the two bolts evenly and gradually.



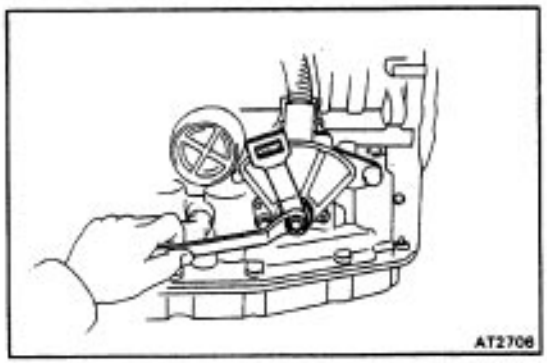
60. INSTALL NEUTRAL START SWITCH
(a) Install the neutral start switch to the manual valve shaft.
(b) Install the seal gasket and locking plate.
(c) Tighten the nut and stake it with the locking plate.
Torque: 70 kg–cm (61 in.–lb. 6.9 N–m)



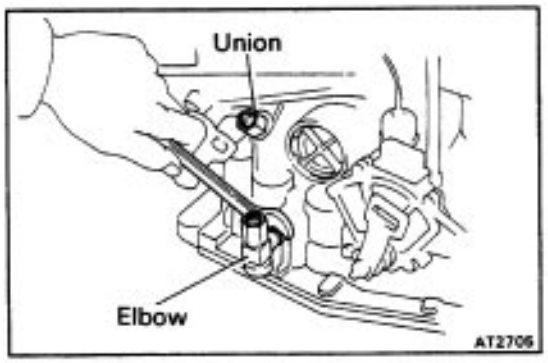
61. ADJUST NEUTRAL START SWITCH
(a) Align the groove and return neutral basic line.



(b) Lock the switch with two bolts.
Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)



62. INSTALL MANUAL SHIFT LEVER



63. INSTALL UNION AND ELBOW

(a) Coat a new O–rings with ATF.
(b) Install the O–rings to the union and elbow.
(e) Install the union and elbow to the transaxle case.
Torque: 275 kg–cm (20 ft–lb, 27 N–m)

A540E AND A540H AUTOMATIC TRANSAXLE

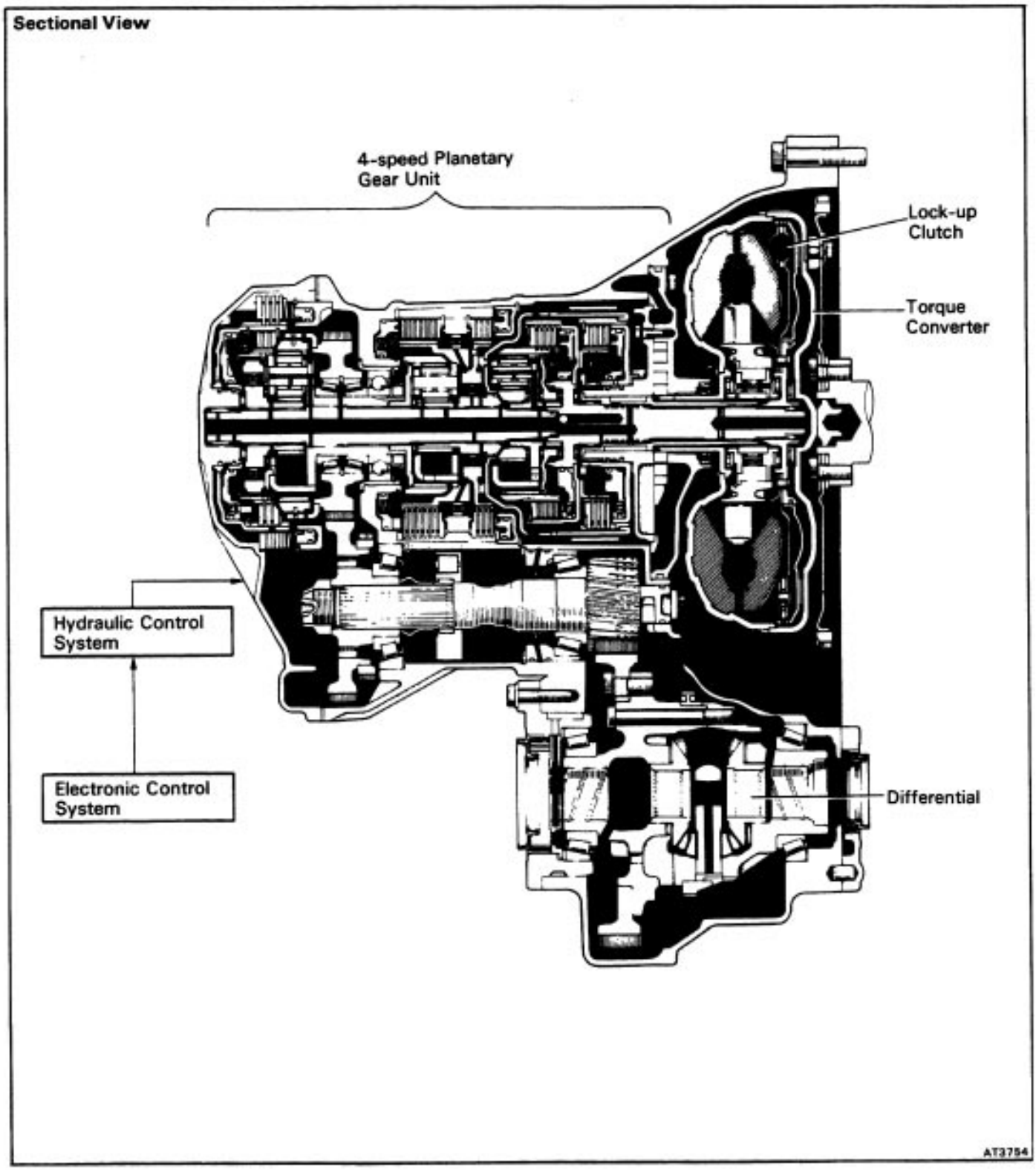
DESCRIPTION

GENERAL

(A540E)

The A540E is a 4–speed, Electronic Controlled Transaxle (hereafter called ECT) developed exclusively for use with a transversely–mounted engine. A lock–up is built into the torque converter.

The A540E transaxle is mainly composed of the torque converter, the 4–speed planetary gear unit, the differential, the hydraulic control system and the electronic control system.

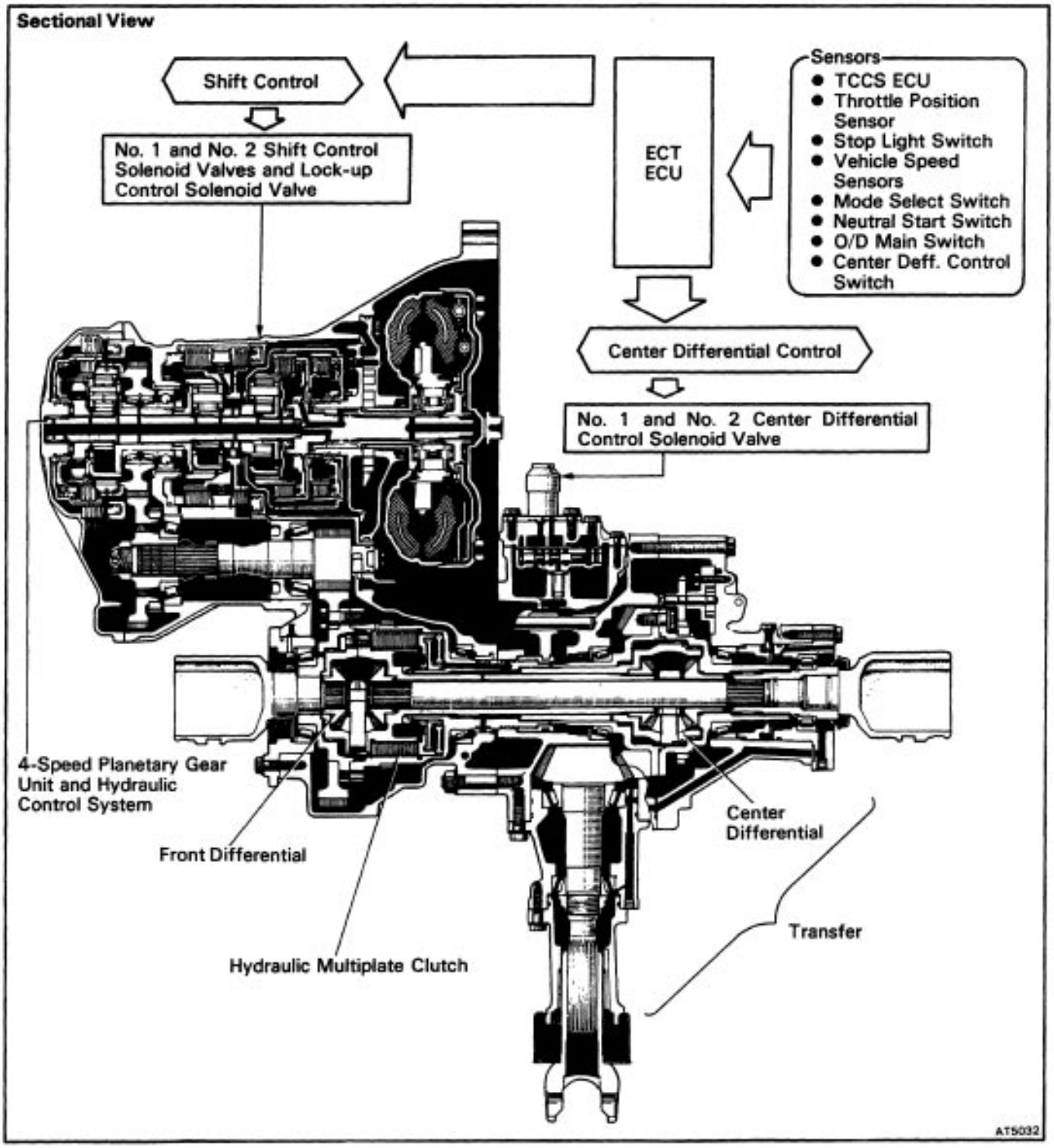


(A540H)

The A540H automatic transaxle design is based on the A540E automatic transaxle and equipped with a center differential and transfer.

This transaxle has the same hydraulic multiplate clutch in the center differential limiting control mechanism as the A241 H automatic transaxle on the Corolla All–TRAC/4WD Station Wagon. The fluid pressure acting on the hydraulic multiplate clutch of the A540H is controlled by the ECT ECU (Electronic Control Unit according to the vehicle driving conditions. As a result, torque is distributed to the front and rear wheels appropriately at all times to maximize the overall performance of the 4WD vehicle.

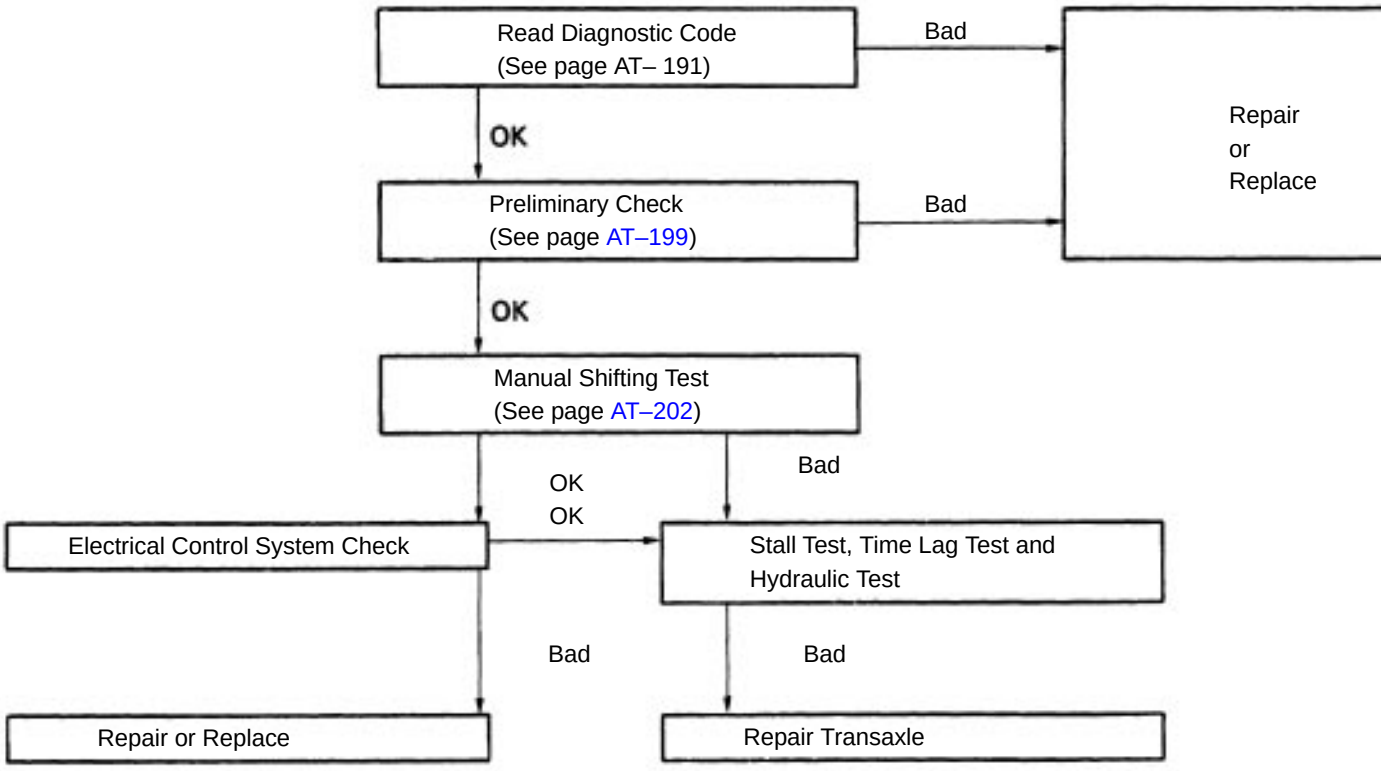
NOTICE: Special handling methods are necessary for full–time 4WD vehicles during inspection and maintenance. Instructions concerning these handling methods are given on page IN–8.



TROUBLESHOOTING (A540E, A540H)

Basic Troubleshooting

Before troubleshooting an ECT, first determine whether the problem is electrical or mechanical.
To do this, just refer to the basic troubleshooting flow–chart provided below.
If the cause is already known, using the basic troubleshooting chart below along with the general troubleshooting chart on the following pages should speed the procedure.



General Troubleshooting

Problem	Possible cause	Remedy	Page	
			A540E	A540 H
Fluid discolored or smells burnt	Fluid contaminated	Replace fluid	AT–200	←
	Torque converter faulty	Replace torque converter	AT–381	←
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	←
Vehicle does not move in any forward range or reverse	Shift cable out of adjustment	Adjust shift cable	AT–201	←
	Valve body or primary regulator faulty	Inspect valve body	AT–308	←
	Parking lock pawl faulty	Inspect parking lock pawl	AT–392	←
	Torque converter faulty	Replace torque converter	AT–381	←
	Converter drive plate broken	Replace drive plate		
	Oil pump intake screen blocked	Clean screen		
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	←
Shift lever position incorrect	Shift cable out of adjustment	Adjust shift cable	AT–201	1–
	Manual valve and lever faulty	Inspect valve body	AT–308	
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	
Harsh engagement into any drive range	Throttle cable out of adjustment	Adjust throttle cable	AT–201	←
	Valve body or primary regulator faulty	Inspect valve body	AT–308	←
	Accumulator pistons faulty	Inspect accumulator pistons	AT–403	←
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	←
Delayed 1–2, 2–3 or 3–O/D up–shift, or down–shifts from O/D–3 or 3–2 and shifts back to O/D or 3	Electronic control faulty	Inspect electronic control	AT–203	AT–219
	Valve body faulty	Inspect valve body	AT–308	
	Solenoid valve faulty	Inspect solenoid valve	AT–218	
Slips on 1–2, 2–3 or 3–O/D up–shift, or slips or shudders on acceleration	Shift cable out of adjustment	Adjust shift cable	AT–201	AT–219
	Throttle cable out of adjustment	Adjust throttle cable	AT–201	
	Valve body faulty	Inspect valve body	AT–308	
	Solenoid valve faulty	Inspect solenoid valve	AT–218	
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	
Drag, binding or tieup on 1–2, 2–3 or 3–O/D up–shift	Shift cable out of adjustment	Adjust shift cable	AT–201	←
	Valve body faulty	Inspect valve body	AT–308	←
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	←

General Troubleshooting (Cont'd)

Problem	Possible cause	Remedy	Page	
			A540E	A540H
No lock–up in 2nd, 3rd or O/D	Electronic control faulty	Inspect electronic control	AT–203	←
	Valve body faulty	Inspect valve body	AT–308	←
	Solenoid valve faulty	Inspect solenoid valve	AT–218	AT–219
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	←
Harsh down–shift	Throttle cable out of adjustment	Adjust throttle cable	AT–201	←
	Throttle cable and cam faulty	Inspect throttle cable and cam	AT–201	←
	Accumulator pistons faulty	Inspect accumulator pistons		
	Valve body faulty	Inspect valve body	AT–403	←
	Transaxle faulty	Disassemble and inspect transaxle	AT–308	←
			AT–236	←
No down–shift when coasting	Valve body faulty	Inspect valve body	AT–308	←
	Solenoid valve faulty	Inspect solenoid valve	AT–218	AT–219
	Electronic control faulty	Inspect electronic control	AT–203	←
Down–shift occurs too quickly or too late while coasting	Throttle cable faulty	Inspect throttle cable	AT–201	←
	Valve body faulty	Inspect valve body	AT–308	←
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	←
	Solenoid valve faulty	Inspect solenoid valve	AT–218	AT–219
	Electronic control faulty	Inspect electronic control	AT–203	←
No O/D–3, 3–2 or 2–1 kick–down	Solenoid valve faulty	Inspect solenoid valve	AT–218	AT–219
	Electronic control faulty	Inspect electronic control	AT–203	←
	Valve body faulty	Inspect valve body	AT–308	←
No engine braking in 2 or L range	Solenoid valve faulty	Inspect solenoid valve	AT–218	AT–219
	Electronic control faulty	Inspect electronic control	AT–203	←
	Valve body faulty	Inspect valve body	AT–308	←
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	←
Vehicle does not hold in P range	Shift cable out of adjustment	Adjust shift cable	AT–201	←
	Parking lock pawl and spring faulty	Inspect cam and spring	AT–392	←
No center differential Control	Electronic control faulty	Inspect electronic control	–	AT–203
	Valve body faulty	Inspect valve body	–	AT–368
	Transfer faulty	disassemble and inspect transfer	–	AT–343
	Hydraulic multiplate clutch faulty	Disassemble and inspect center differential clutch	–	AT–335

Operating Mechanism for Each Gear (A540E A540H)

1. CLUTCH BRAKE AND ONE–WAY CLUTCH

A540E, A540H

○ ..... Operating

Shift lever position	Gear position	C_0	C_1	C_2	B_0	B_1	B_2	B_3	F_0	F_1	F_2
P	Parking	○									
R	Reverse	○		○				○			
N	Neutral	○									
D	1st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1st	○	○						○		○
	2nd	○	○			○	○		○	○	
	3 rd	○	○	○			○		○		
L	1st	○	○					○	○		○
	2nd	○	○			○	○		○	○	

Down–shift only – no up–shift

2. SOLENOID SYSTEM

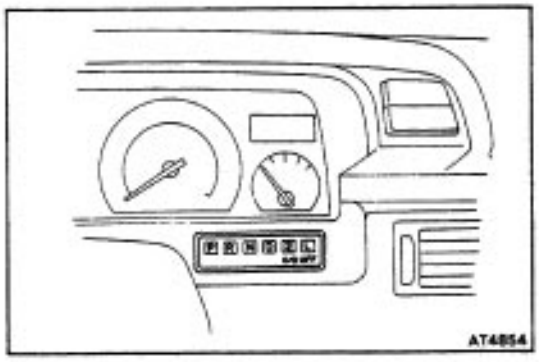
Possible gear positions in accordance with solenoid operating conditions.

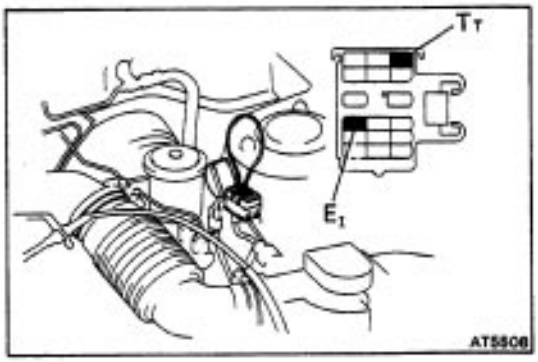
A540E, A540H

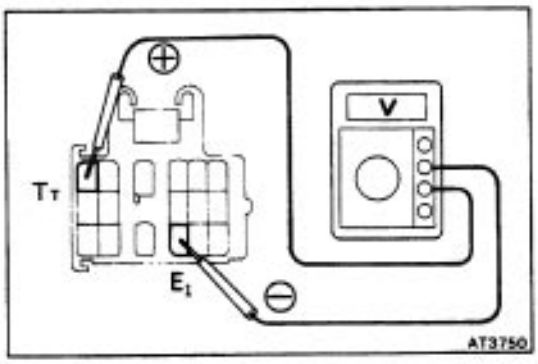
Range	NORMAL			NO. I SOLENOID MALFUNCTIONING			NO. 2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position
	No. 1	No. 2		No. 1	No. 2		No. 1	No. 2		No. 1	No. 2	
D range	ON	OFF	1st	X	ON (OFF)	3rd (O/D)	ON	X	1st	X	X	O/D
	ON	ON	2nd	X	ON	3rd	OFF (ON)	X	O/D (1st)	X	X	O/D
	OFF	ON	3rd	X	ON	3rd	OFF	X	O/D	X	X	O/D
	OFF	OFF	O/D	X	OFF	O/D	OFF	X	O/D	X	X	O/D
2 range	ON	OFF	1st	X	ON (OFF)	3rd (O/D)	ON	X	1st	X	X	O/D
	ON	ON	2nd	X	ON	3rd	OFF (ON)	X	O/D (1st)	X	X	O/D
	OFF	ON	3rd	X	ON	3rd	OFF	X	O/D	X	X	O/D
L range	ON	OFF	1st	X	OFF	1st	ON	X	1st	X	X	1st
	ON	ON	2nd	X	ON	2nd	ON	X	1st	X	X	1st

( ) 1: No fail–safe function X: Malfunctions

HINT: (A540H) When any one of the speed sensors (front or rear) or center differential control solenoid valves (No. 1 or No. 2) malfunction, the ECT ECU stops center differential control and maintains the center differential in a free condition.



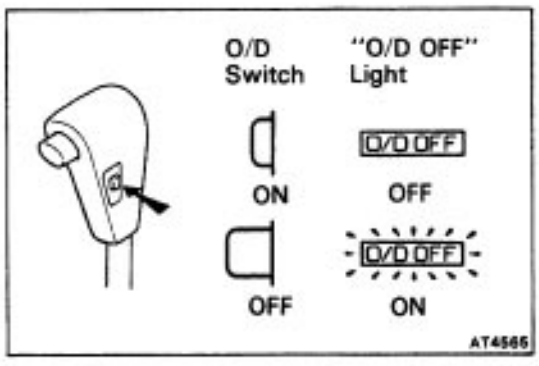




Diagnosis System

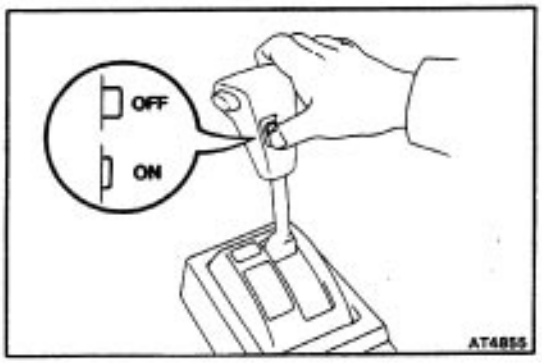
DESCRIPTION

1. A self–diagnosis function is. built into the electrical control system. Warning is indicated by the overdrive OFF indicator.
   HINT: Warning and diagnostic codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF indicator is lit continuously and will not blink.
   (a) If a malfunction occurs within the speed sensors or solenoids, the overdrive OFF light will blink to warn the driver. However, there will be no warning of a malfunction with lock–up solenoid.
   W The diagnostic code can be read by the number of blinks of the overdrive OFF indicator when terminals Tt and E1 are short–circuited. (See page AT– 191)
   (c) The throttle position sensor or brake signal are not indicated, but inspection can be made by checking the voltage at terminal Tt of the check connector.
   (d) The signals to each gear can be checked by measuring the voltage at terminal Tt of the check connector while driving.
2. The diagnostic (malfunction) code is retained in memory by the ECU and due to back–up voltage, is not canceled out when the engine is turned off. Consequently, after repair, it is necessary to turn the ignition switch off and remove the fuse EFI (15A) (A540E) or DOME (20A)
   (A540H) or disconnect the Engine and ECT ECU (A540E) or ECT ECU (A540H) connector to cancel out the diagnostic (malfunction) code. (See page AT–192)
   HINT:
   - Low battery voltage will cause faulty operation of the diagnosis system. Therefore, always check the battery first.
   - Use a voltmeter and ohmmeter that have an impedance of at least 10 k /V.



CHECK O/D OFF INDICATOR LIGHT

1. Turn the ignition switch ON.
2. The O/D OFF light will come on when the O/D switch placed at OFF.
3. When the O/D switch is set to ON, the O/D OFF light should go out.
   If the O/D OFF light flashes when the O/D switch is set to ON, the electronic control system is faulty.

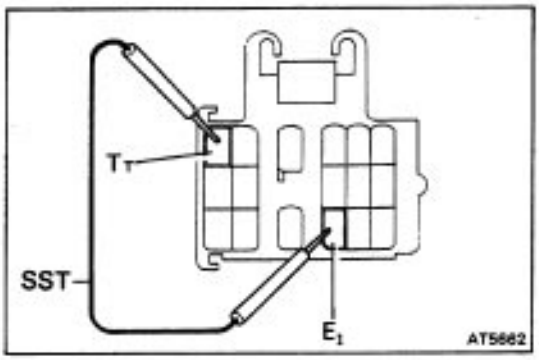


READ DIAGNOSTIC CODE

1. TURN IGNITION SWITCH AND O/D SWITCH TO ON

Do not start the engine.

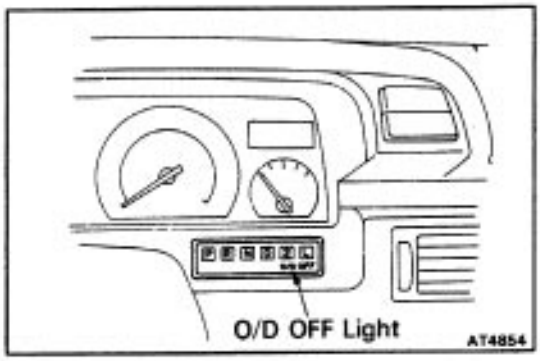
HINT: Warning and diagnostic codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light will light continuously and will not blink.



2. SHORT Tt TERMINAL CIRCUIT OF CHECK CONNECTOR

Using SST, short terminals Tt and E1 of the check connector.

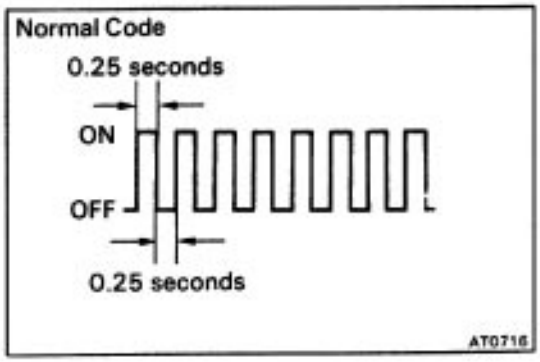
SST 09843–18020



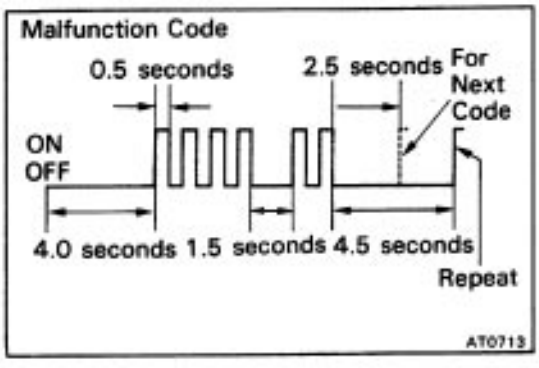
3. READ DIAGNOSTIC CODE

Read the diagnostic code as indicated by the number of times the O/D OFF light flashes.

(Diagnostic Code Indication)



- If the system is operating normally, the light will blink once every 0.25 seconds.



- In the event of a malfunction, the light will blink once every 0.5 seconds. The number of blinks will equal the first number and, after 1.5 seconds pause, the second number of the two digit diagnostic code. If there are two or more codes, there will be a 2.5 seconds pause between each.

HINT: In the event of several trouble codes occurring simultaneously, indication will begin from the smaller value and continue to the larger.

4. REMOVE SST

SST 09843–18020

DIAGNOSTIC CODES.

(A540E)

Code No.	Light Pattern	Diagnosis System
–		Normal
42		Defective No. 1 speed sensor (in combination meter) – severed wire harness or short circuit
61		Defective No. 2 speed sensor (in ATM) – severed wire harness or short circuit
62		Severed No. 1 solenoid or short circuit – severed wire harness or short circuit
63		Severed No. 2 solenoid or short circuit – severed wire harness or short circuit
64		Severed lock–up solenoid or short circuit – severed wire harness or short circuit

AT2020

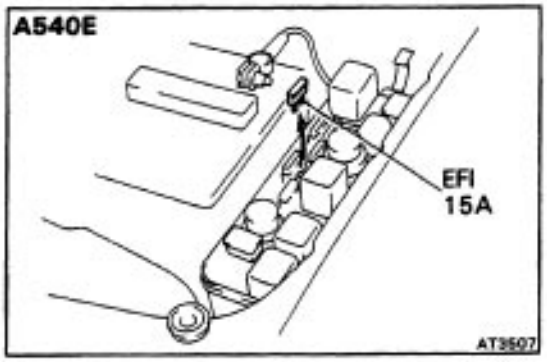
HINT: If codes 62, 63 or 64 appear, there is an electrical malfunction in the solenoid. Causes due to mechanical failure, such as a stuck valve, will not appear.

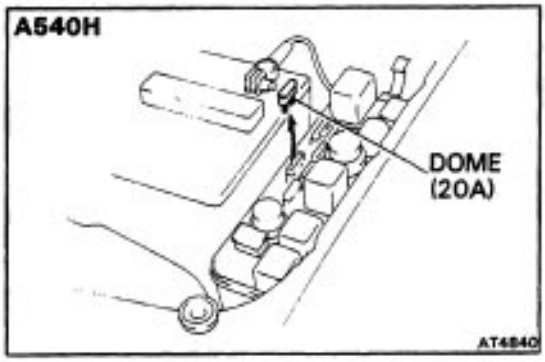
(A540H)

Code No.	Light Pattern	Diagnosis System
–		Normal
44		Defective rear wheel speed sensor (in transfer left case) – severed wire harness or short circuit
61		Defective vehicle speed sensor (in differential carrier cover) severed wire harness or short circuit
62		Severed No. t solenoid or short circuit – severed wire harness or short circuit
63		Severed No. 2 solenoid or short circuit – severed wire harness or short circuit
64		Severed lock–up solenoid or short circuit – severed wire harness or short circuit
73		Severed No. 1 center differential control solenoid valve or short circuit – severed wire harness or short circuit.
74		Severed No. 2 center differential control solenoid valve or short circuit – severed wire harness or short circuit.

AT4B'

HINT: If codes 62, 63, 64, 73 or 74 appear, there is an electrical malfunction in the solenoid. Causes due t mechanical failure, such as a stuck valve, will not appear.
If codes 44 and 61 appear, check the both (vehicle and rear wheel) speed sensors.





CANCEL OUT DIAGNOSTIC CODE

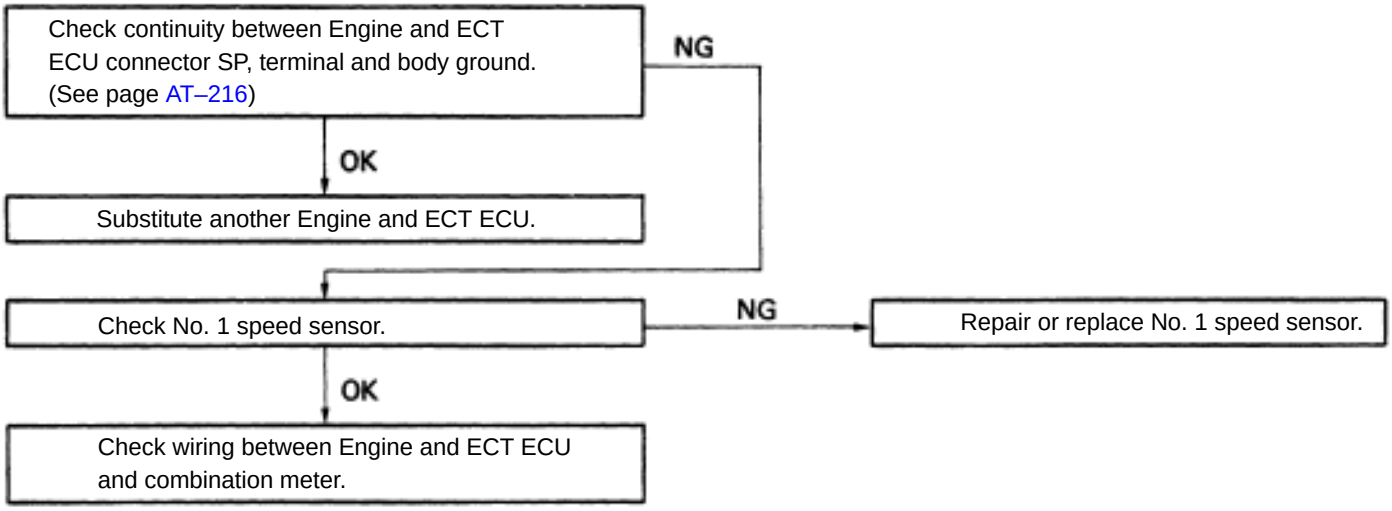
1. After repair of the trouble area, the diagnostic code retained in memory by the Engine and ECT ECU (A540E) or ECT ECU (A540H) must be canceled by removing the fuse EFI (15A) (A540E) or DOME (20A) (A540H) for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out with the ignition switch OFF.
   - HINT:Cancellation can be also done by removing the battery negative (–) terminal, but in this case other memory systems (engine control system diagnosis memory, clock. ETR, etc.) will also be canceled out
   - The diagnostic code can be also canceled out by disconnecting the Engine and ECT ECU (A540E) or ECT ECU (A540H) connector.
   - If the diagnostic code is not canceled out, it will be retained by the Engine and ECT ECU (A540E) or ECT ECU (A540H) and appear along with a new code in event of future trouble.
2. After cancellation, perform a road test to confirm that a ”normal code” is now read on the O/D OFF indicator.

TROUBLESHOOTING FLOW–CHART (A540E)

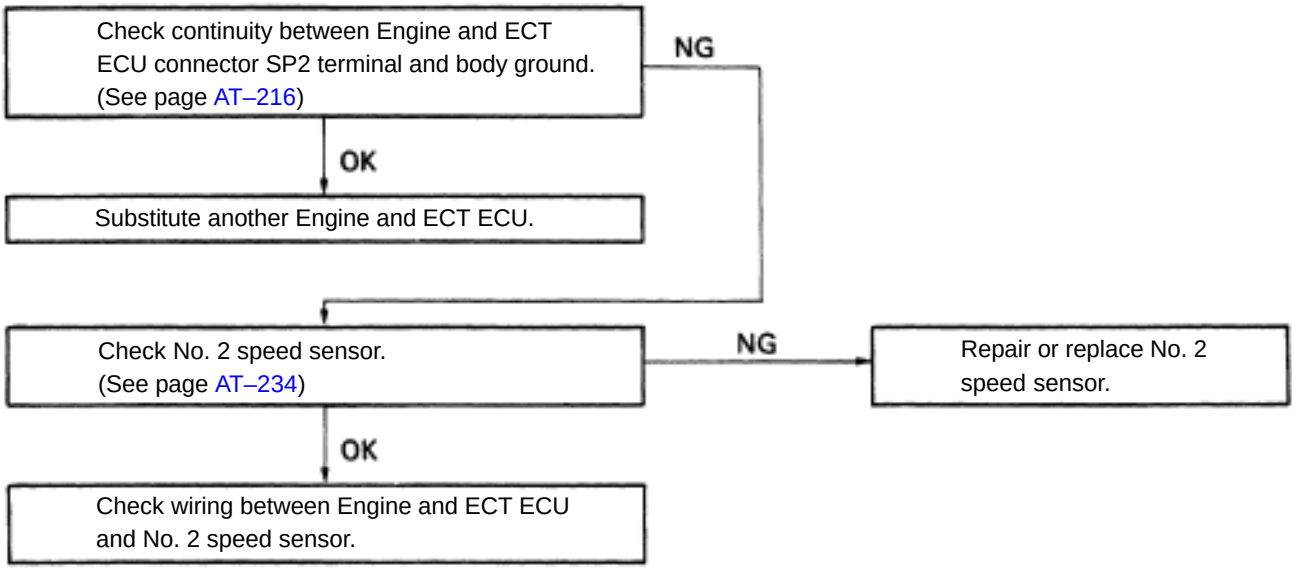
HINT:

- If diagnostic code Nos. 42, 61, 62 or 63 are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver. However, an impact or shock may cause the blinking to stop; but the code will still be retained in the Engine and ECT ECU memory until canceled out.
- There is no warning for diagnostic code No. 64.
- In the event of a simultaneous malfunction of both No. 1 and No. 2 speed sensors, no diagnostic code will appear and the fail–safe system will not function. However, when driving in the D range, the transaxle will not up–shift from first gear, regardless of the vehicle speed.

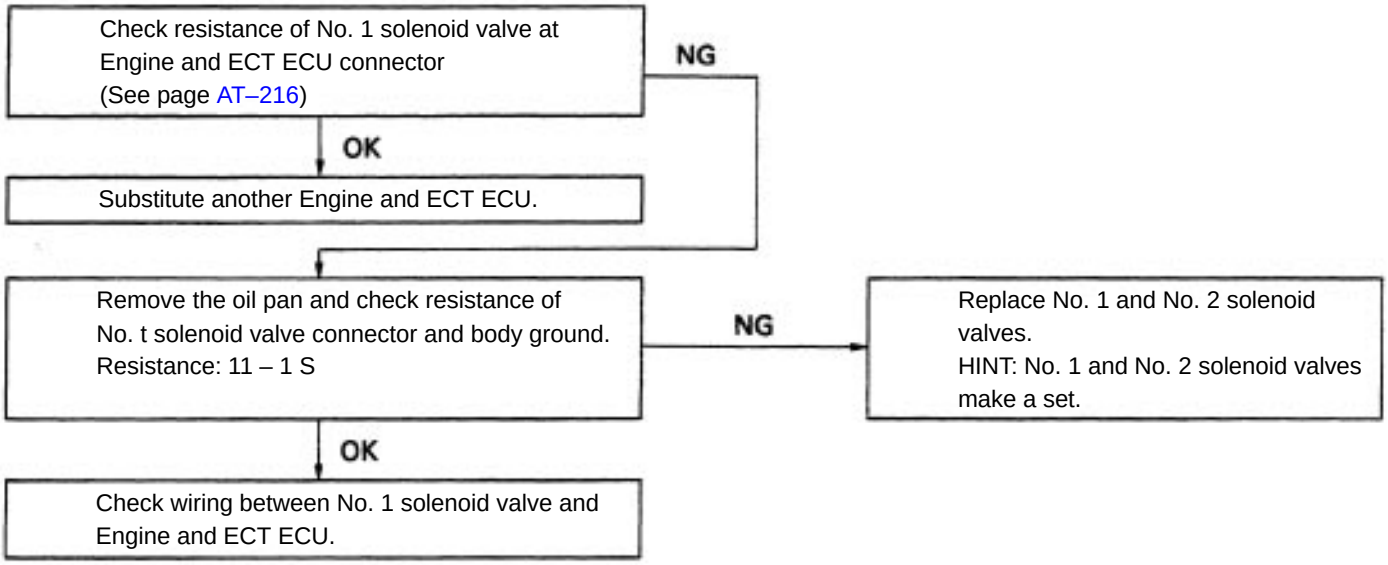
1. Diagnostic code 42 (No. 1 speed sensor circuitry)



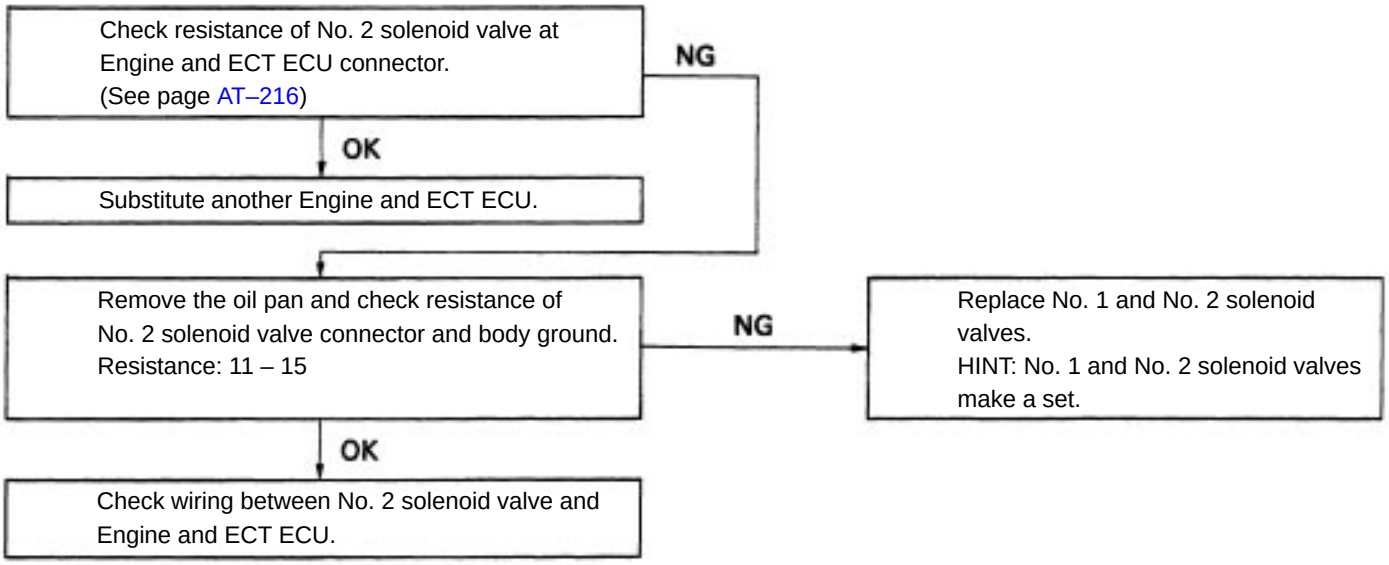
2. Diagnostic code 61 (No. 2 speed sensor circuitry)



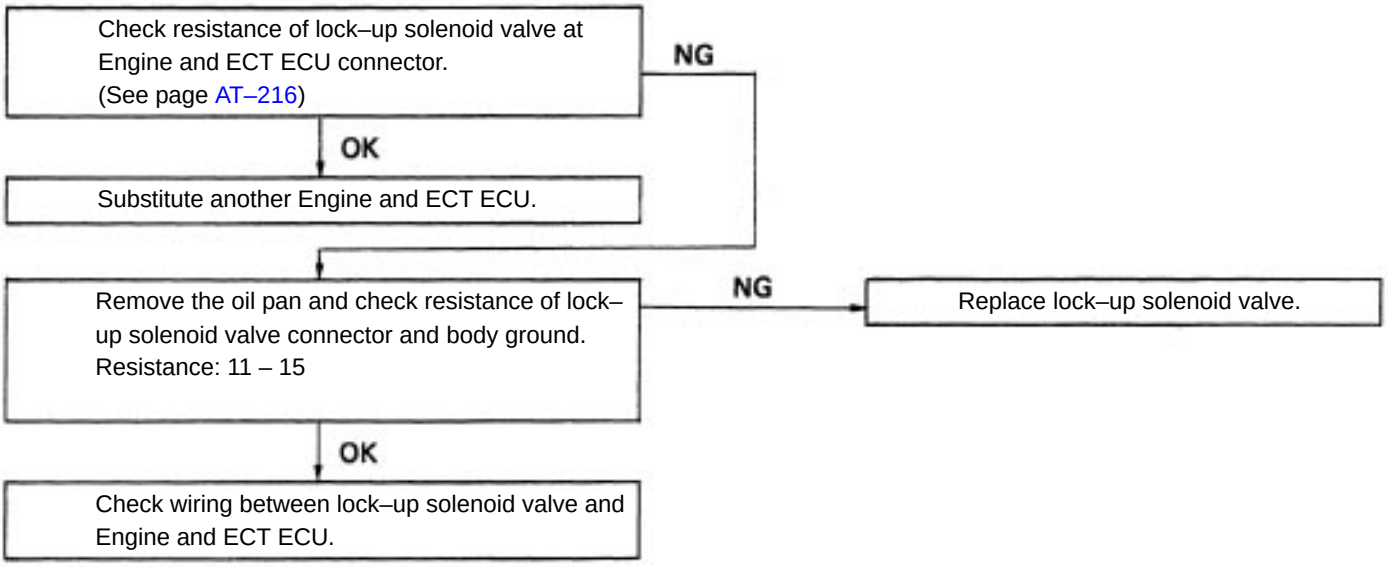
3. Diagnostic code 62 (No. 1 solenoid valve circuitry)



4. Diagnostic code 63 (No. 2 solenoid valve circuitry)



5. Diagnostic code 64 (Lock–up solenoid valve circuitry)

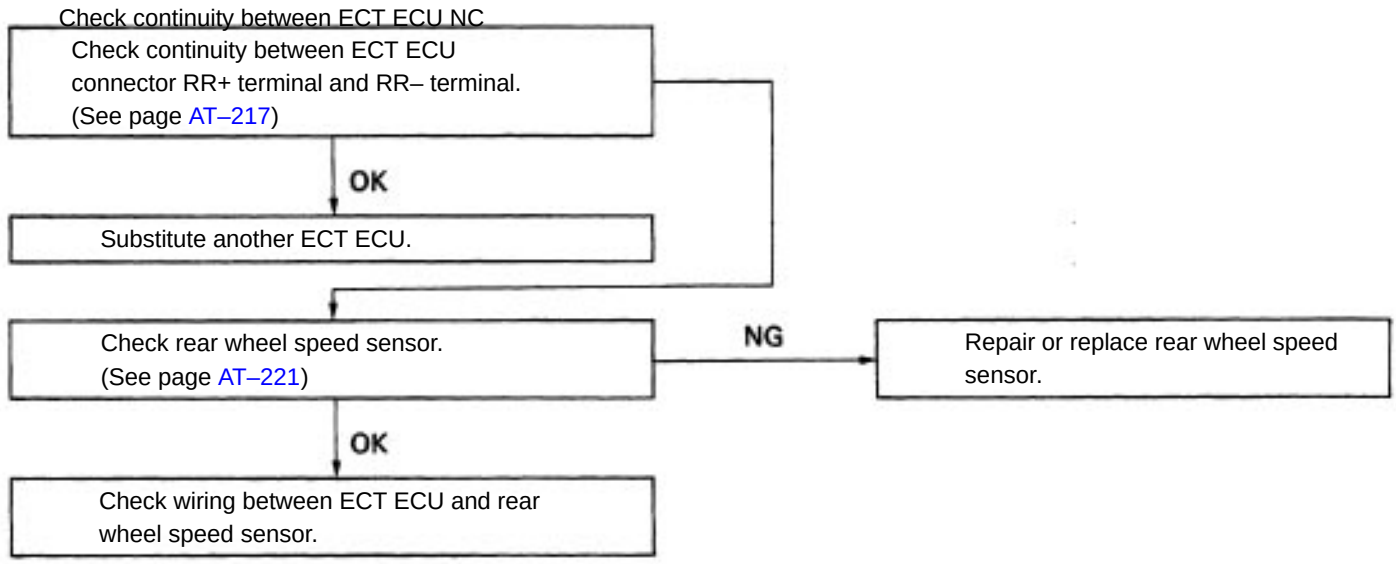


TROUBLESHOOTING FLOW–CHART (A540H)

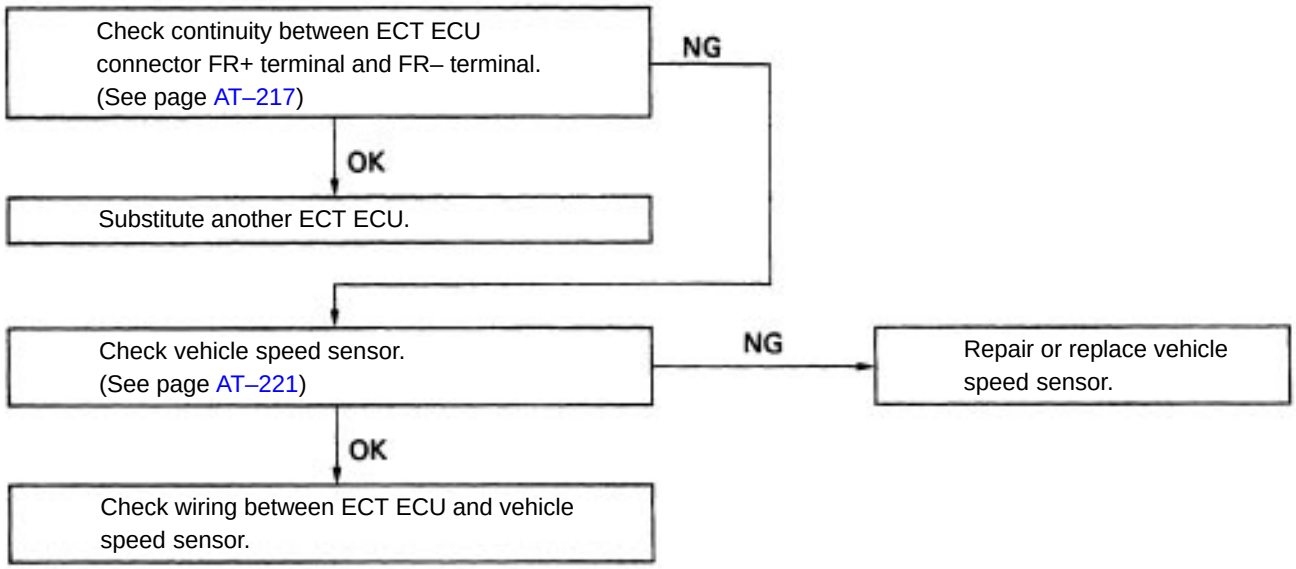
HINT:

- If diagnostic code Nos. 44, 61, 62, 63, 73 or 74 are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver.
  However, an impact or shock may cause the blinking to stop; but the code will still be retained in the ECT ECU memory until canceled out.
- There is no warning for diagnostic code No. 64.
- In the event of a simultaneous malfunction of both vehicle and rear speed sensors, no diagnostic code will appear and the fail–safe system will not function. However, when driving in the D range, the transaxle will not up–shift from first gear, regardless of the vehicle speed.

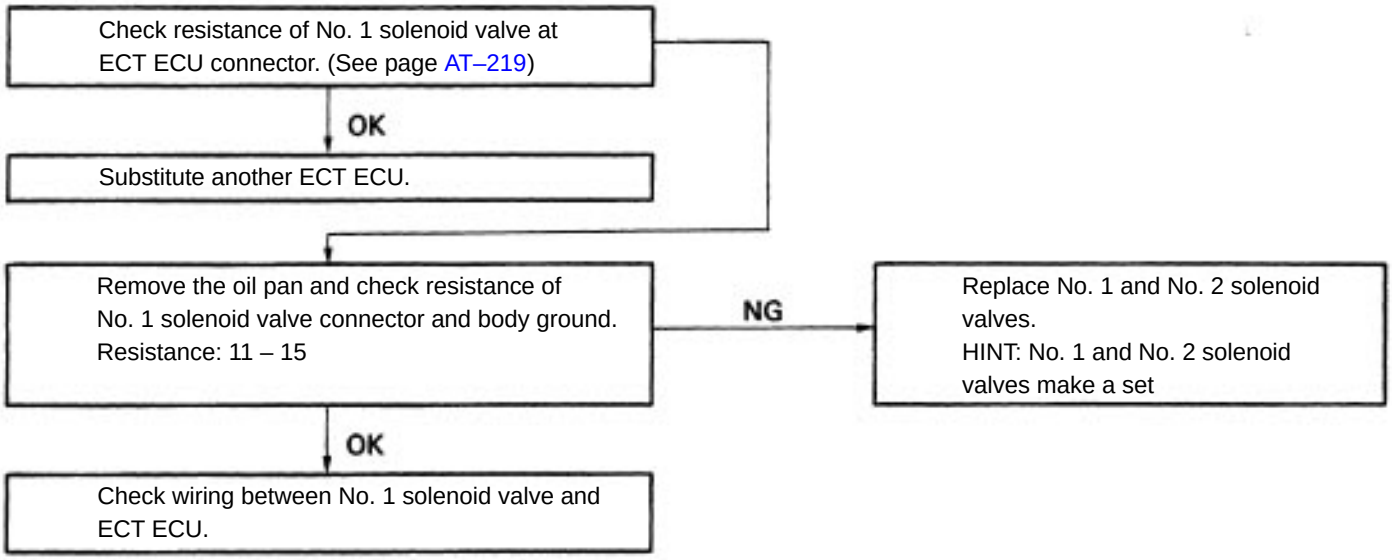
1. Diagnostic code 44 (Rear speed sensor circuitry)



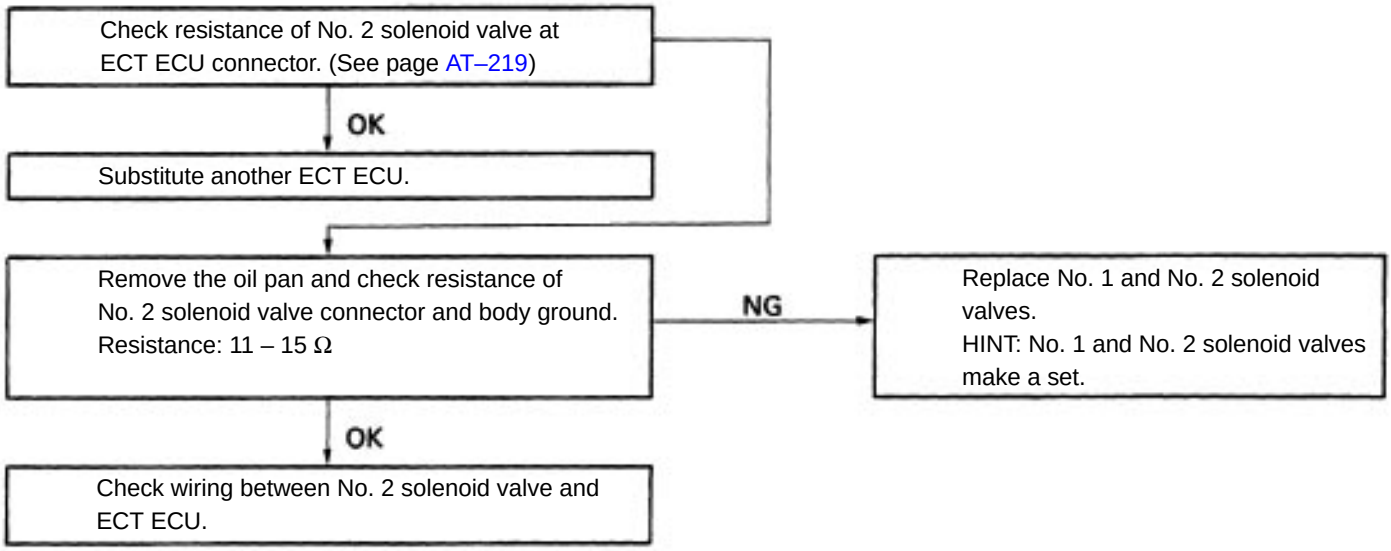
2. Diagnostic code 61 (Vehicle speed sensor circuitry)



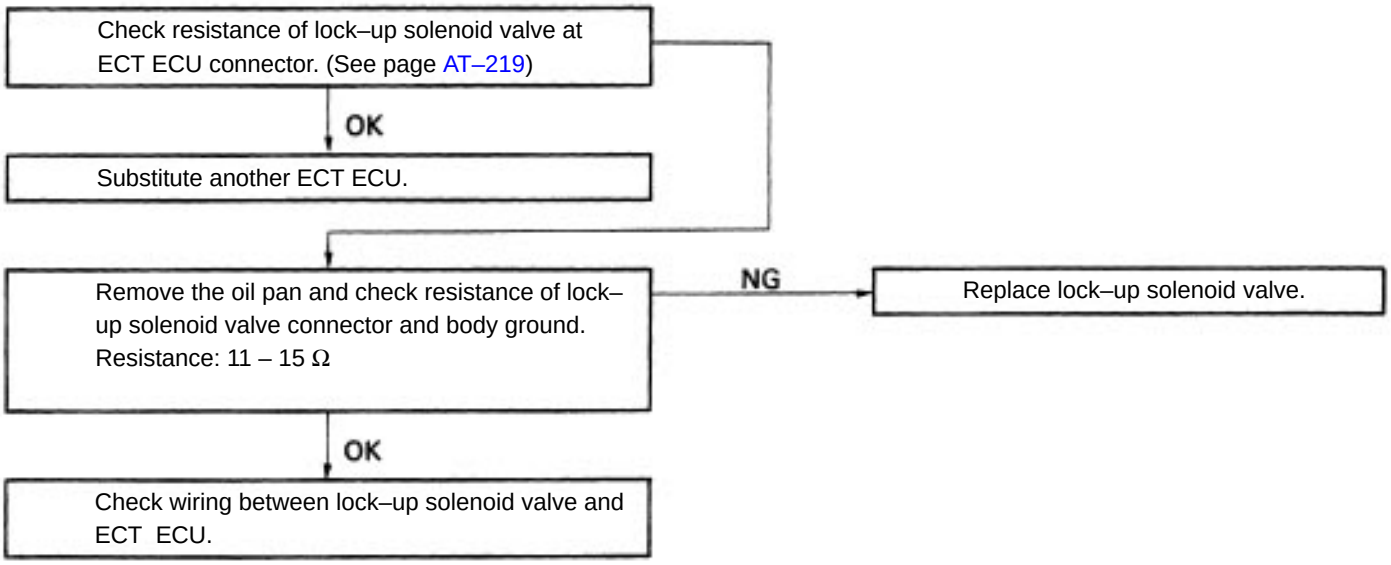
3. Diagnostic code 62 (No. 1 solenoid valve circuitry)



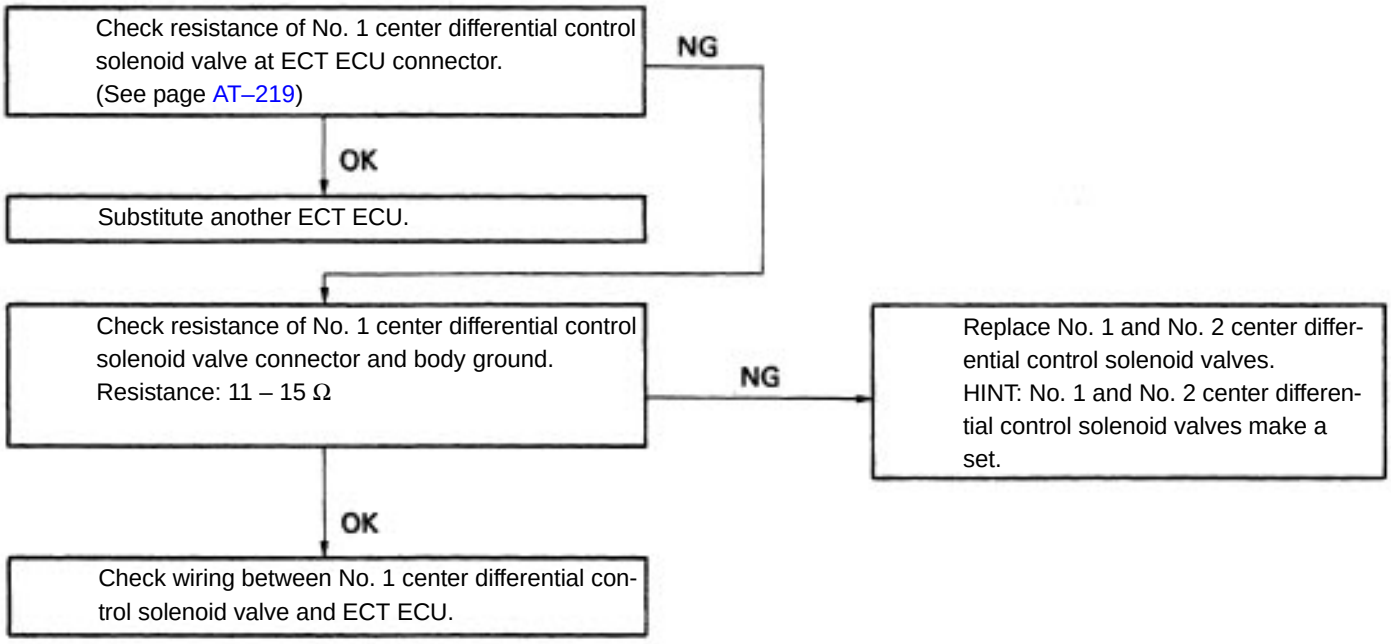
4. Diagnostic code 63 (No. 2 solenoid valve circuitry)



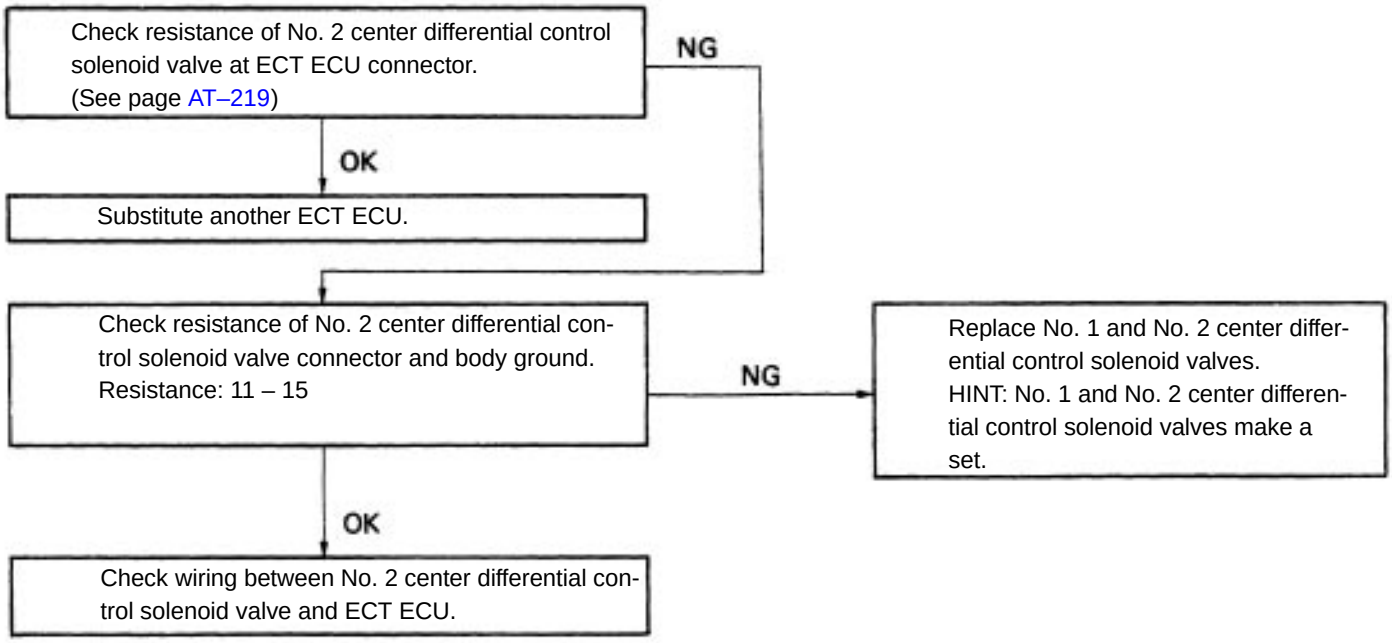
5. Diagnostic code 64 (Lock–up solenoid valve circuitry)

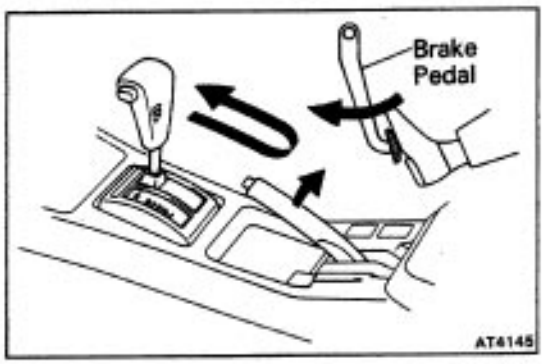


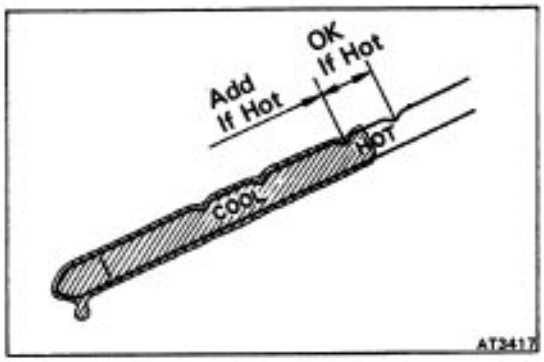
6. Diagnostic code 73 (No. 1 center differential control solenoid valve circuitly)

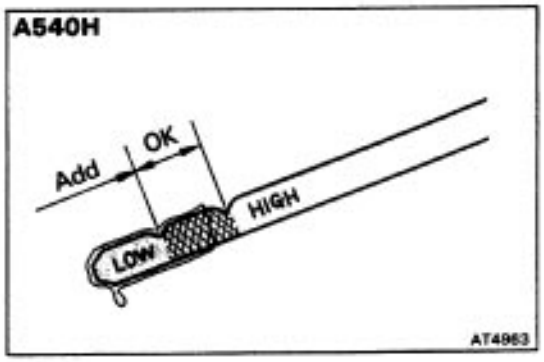


7. Diagnostic code 74 (No. 2 center differential control solenoid valve circuitly)









Preliminary Check

1. CHECK TRANSAXLE FLUID LEVEL

HINT:

The vehicle must have been driven so that the engine and transaxle are at normal operating temperature.

(Fluid temperature: 158 – 176˚F or 70 – 80˚C)

(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P position.

HINT: Depress the brake pedal.

(e) Pull out the transaxle dipstick and wipe it clean.

(d) Push it back fully into the tube.

(e) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side, add fluid.

Fluid type: A540E ATF DEXRON© II

A540H ATF Type T (08886–00405) or equivalent

NOTICE: Do not overfill.

2. (A540H)

CHECK TRANSFER OIL LEVEL

(a) Park the vehicle on a level surface, set the parking brake.

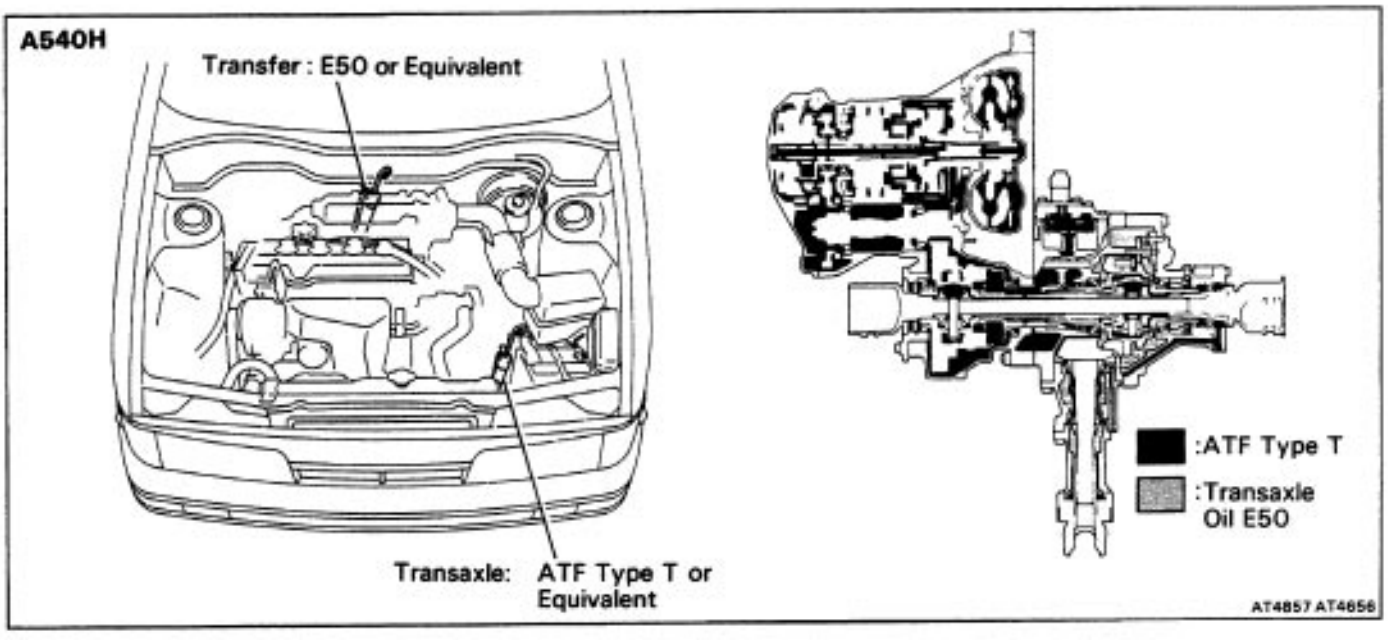
(b) Pull out the transfer dipstick and wipe it clean.

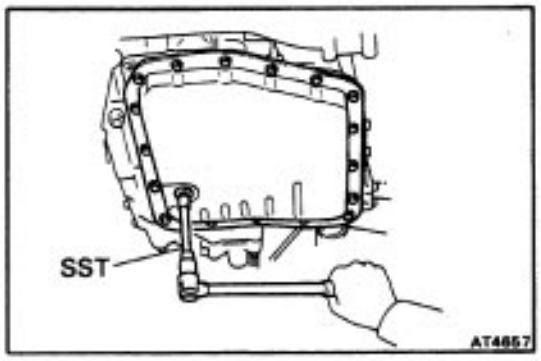
(e) Push it back fully into the tube.

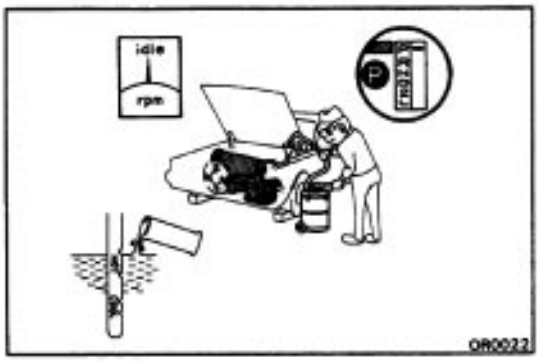
(d) Pull it out and check the oil level as shown in the illustration.

Oil type: Transaxle oil E50 (08885–80206), AP GL5, SAE 75W – 90 or equivalent

NOTICE: Do not overfill.







3. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it.

4. REPLACE TRANSAXLE FLUID

NOTICE: Do not overfill.

(a) Remove the drain plug and drain the fluid.

(b) Install the drain plug.

(c) Add new fluid through the filler tube.

SST 09043–38100

(A540E)

Fluid type: ATF DEXRON© II

Capacity:

Dry fill: 5.9 liters (6.2 US qts, 5.2 Imp. qts)

Drain and refill:

2.5 liters (2.6 US qts, 2.2 Imp. qts)

(A540H)

Fluid type: ATF Type T (08886–00405) or equivalent

Capacity:

Dry fill: 7.0 liter (7.4 US qts, 6.2 Imp. qts)

Drain and refill:

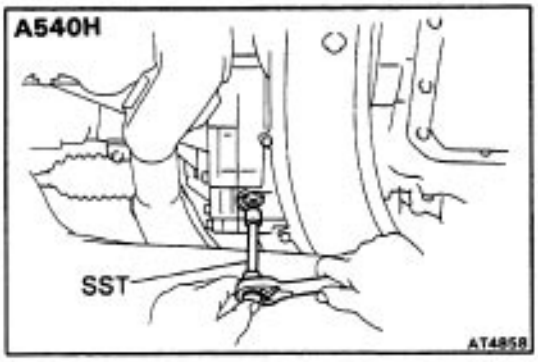
3.3 liter (3.5 US qts, 2.9 Imp. qts)

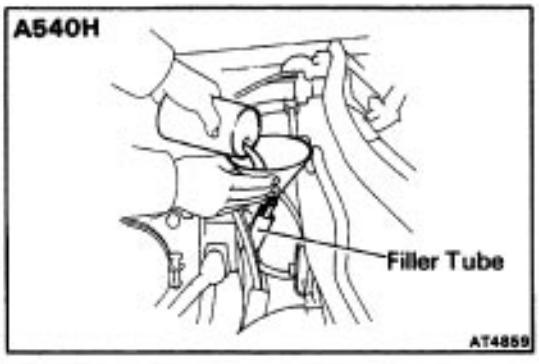
(d) Start the engine and shift the selector into all positions from P through L and then shift into P.

(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.

(f) Check the fluid level with the normal fluid temperature (158 – 176° F or 70 – 80°C) –and add as necessary.

NOTICE: Do not overfill.





5. (A540H)

REPLACE TRANSFER OIL

(a) Remove the drain plug and drain the oil.

(b) Install the drain plug.

(e) Add new oil through the filler tube.

SST 09043–38100

Oil type: Transaxle oil E50 (08885–80206) or equivalent

Recommended oil:

Oil grade API GL–5

Viscosity SAE 75W – 90 or 80W – 90

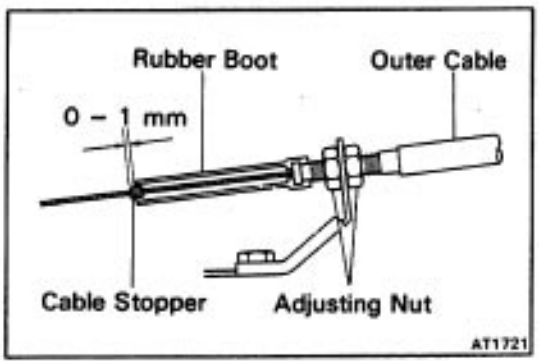
Above –18˚C (0˚F) SAE 90W

below –18˚C (0˚F) SAE 80W

NOTICE: 0.7 liter (0.74 US qts, 0.62 Imp. qts)

(d) Check the oil level and add as necessary.

NOTICE: Do not overfill.



S. INSPECT AND ADJUST THROTTLE CABLE

(a) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

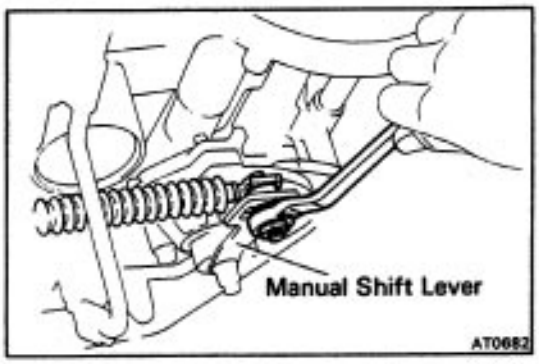
HINT: If the valve does not open fully, adjust the accelerator cable.

(b) Fully depress the accelerator pedal.

(c) Measure the distance between the end of the boot and stopper on the cable.

Standard distance: 0 – 1 mm (0 – 0.04 in.)

If the distance is not standard, adjust the cable by the adjusting nuts.



7. INSPECT AND ADJUST SHIFT CABLE

When shifting the shift lever from the –N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

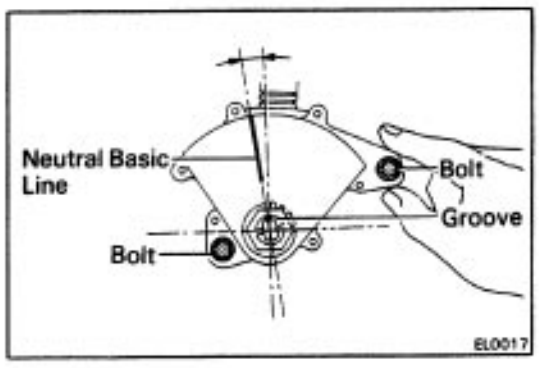
(a) Loosen the swivel nut on manual shift lever.

(b) Push the manual lever fully toward the right side of the vehicle.

(c) Return the lever two notches to NEUTRAL position.

(d) Set the shift lever to N.

(e) While holding the lever lightly toward the R range side, tighten the swivel nut.



8. ADJUST NEUTRAL START SWITCH

If the engine will start with the shift selector in any range other than N or P range, adjustment is required.

(a) Loosen the neutral start switch bolts and set the shift selector to the N range.

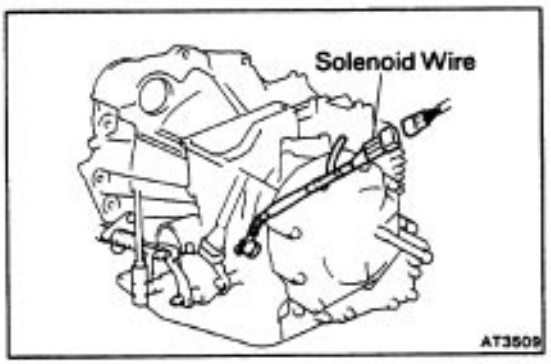
(b) Align the groove and neutral basic line.

(c) Hold in position and tighten the bolts.

Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)

9. INSPECT IDLE SPEED IN RANGE)

Idle speed: 700 rpm



Manual Shifting Test

HINT: With this test, it can be determined whether the trouble lies within the electrical circuit or is a mechanical problem in the transaxle.

1. DISCONNECT SOLENOID WIRE

2. INSPECT MANUAL DRIVING OPERATION

Check that the shift and gear positions correspond with the table below.

Shift position	D range	2 range	range	R range	P range
Gear position	O/D	O/D	1 st	Reverse	Pawl Lock

HINT: If the L, 2 and D range gear positions are difficult to distinguish, perform the following road test.

- While driving, shift through the L, 2 and D ranges, Check that the gear change corresponds to the shift position.

If any abnormality is found in the above test, the problem lies in transaxle itself.

3. CONNECT SOLENOID WIRE

Mechanical System Tests

STALL TEST

The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R ranges.

CAUTION:

- Perform the test at normal operation fluid temperature (122 – 176˚F or 50 – 80˚C).
- Do not continuously run this test longer than 5 seconds.
- To ensure safety, conduct this test in a wide, clear, level area, which provides good traction.
- The stall test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.

MEASURE STALL SPEED

(a) Chock the front and rear wheels.
(b) Connect a tachometer to the engine.
(c) Fully apply the parking brake.
(d) Step down strongly on the brake pedal with your left foot.
(e) Start the engine.
(f) Shift into the D range. Step all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

Stall speed: A540E (2VZ–FE) 2,450 ±150 rpm
A540H (3S–FE) 2,320 ±150 rpm

(g) Perform the same test in R range.

EVALUATION

(a) If the stall speed is the same for both ranges without the rear wheels rotating but lower than specified value:

- Engine output may be insufficient
- Startor one–way clutch is not operating properly

(b) If the stall speed in D range is higher than specified:

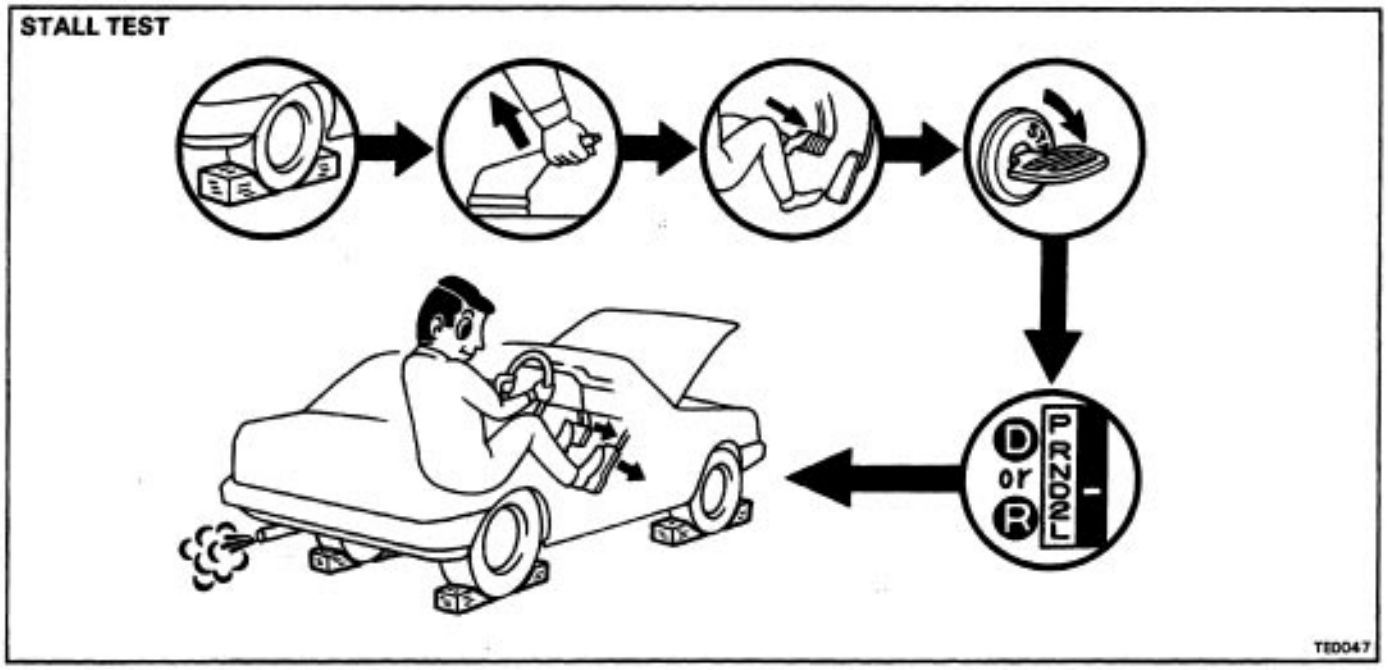
- Line pressure too low
- Forward clutch slipping
- No. 2 one–way clutch not operating properly
- O/D one–way clutch not operating properly

(e) If the stall speed in R range is higher than specified:

- Line pressure too low
- Direct clutch slipping
- First and reverse brake slipping
- O/D one–way clutch not operating properly

(d) If the stall speed in both R and D ranges are higher than specified:

- Line pressure too low
- Improper fluid level
- O/D one–way clutch not operating properly



TIME LAG TEST

If the shift lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, forward clutch, direct clutch and first and reverse brake.

NOTICE: .

- **Perform the test at normal operating fluid temperature (122 – 176˚F or 50 – 80˚C).**
- **Be sure to allow one minute interval between tests.**
- **Make three measurements and take the average value.**

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Start the engine and check the idle speed.

Idle speed (N range): 700 rpm (A540E and A540H)

(c) Shift the shift lever from N to D position. Using a stopwatch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds.

(d) In the same manner, measure the time lag for N – R.

Time lag: Less than 1.5 seconds.

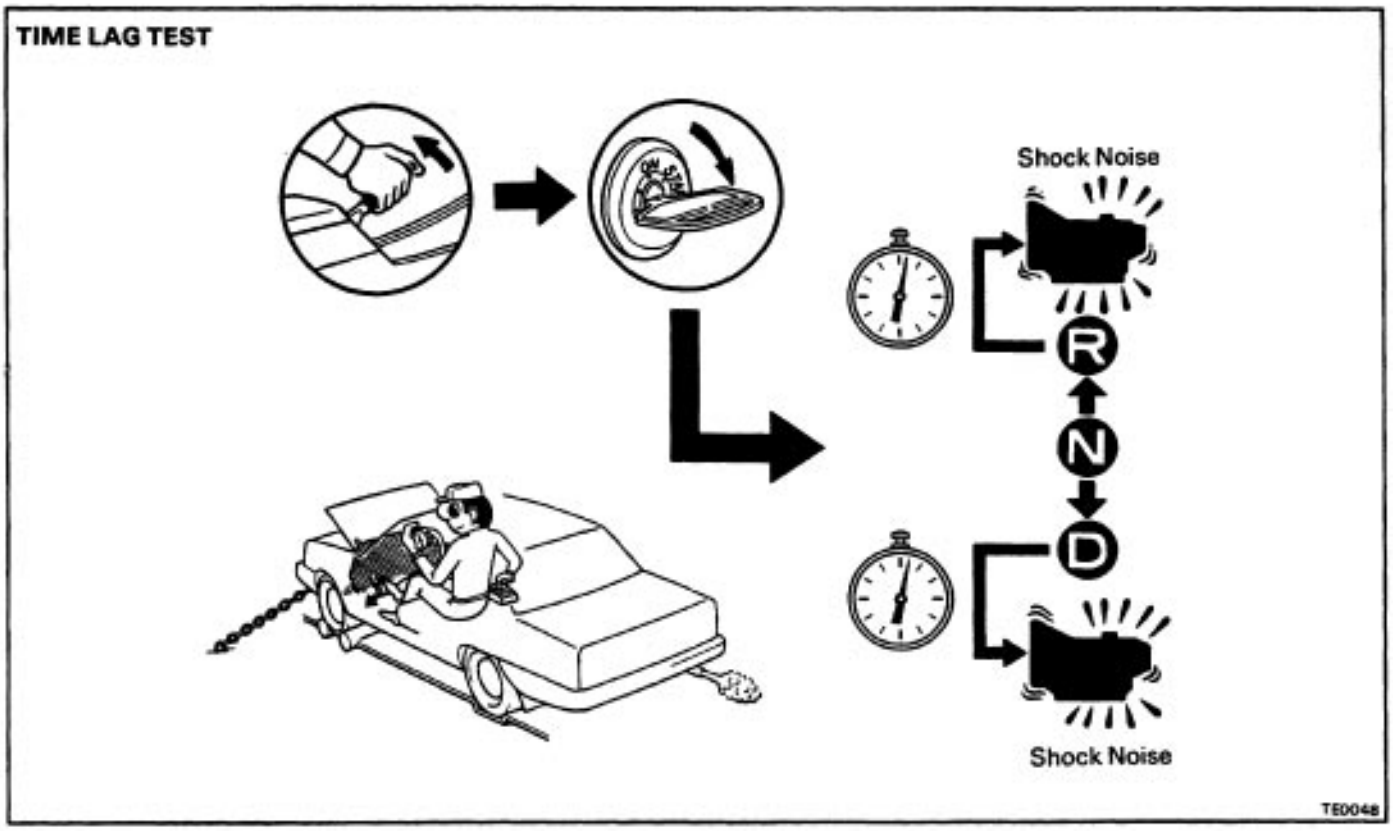
EVALUATION

(a) If N – D time lag is longer than specified:

- Line pressure too low
- Forward clutch worn
- O/D one–way clutch not operating properly

(b) If N – R time lag is longer than specified:

- Line pressure too low
- Direct clutch worn
- First and reverse brake worn
- O/D one–way clutch not operating properly



HYDRAULIC TEST

PREPARATION

(a) Warm up the transaxle fluid.

(b) Remove the transaxle case test plug and connect the hydraulic pressure gauge.
SST 09992–00094 (Oil pressure gauge)

NOTICE:

- **Perform the test at normal operating fluid temperature (122 – 176˚F or 50 – 80˚C)**
- **The line pressure test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE LINE PRESSURE

(a) Fully apply the parking brake and chock the four wheels.

(b) Start the engine and check idling rpm.

(c) Step down strongly on the brake pedal with your left foot and shift into D range.

(d) Measure the line pressure when the engine is idling.

(e) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

(f) In the same manner, perform the test in R range.

(A540E)

Line pressure			kg/cm2 (psi, kPa)
D range		R range	
Idling	Stall	Idling	Stall
3.6 – 4.2 (53 – 60, 363 – 412)	7.5 – 8.7 (107 – 124, 735 – 853)	5.7 – 6.6 (81 – 94, 559 – 647)	11.8 – 13.8 (168 – 196, 1,157 – 1,353)

(A540H)

Line pressure				kg/cm2 (psi, kPa)
D			R range	Stall
Idling	D range	Stall	Idling	
3.6 – 4.2 (53 – 60, 369 – 412)	7.5 – 8.7 (107 – 124, 736 – 853)		6.6 – 7.7 (94 – 102, 647 – 706)	13.5 – 15.8 (192 – 225, 1,324 – 1,549)

If the measured pressure are not up to specified values, recheck the throttle cable adjustment and perform a retest.

EVALUATION

(a) If the measured values at all ranges are higher than specified:

- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective

(b) If the measured values at all ranges are lower than specified:

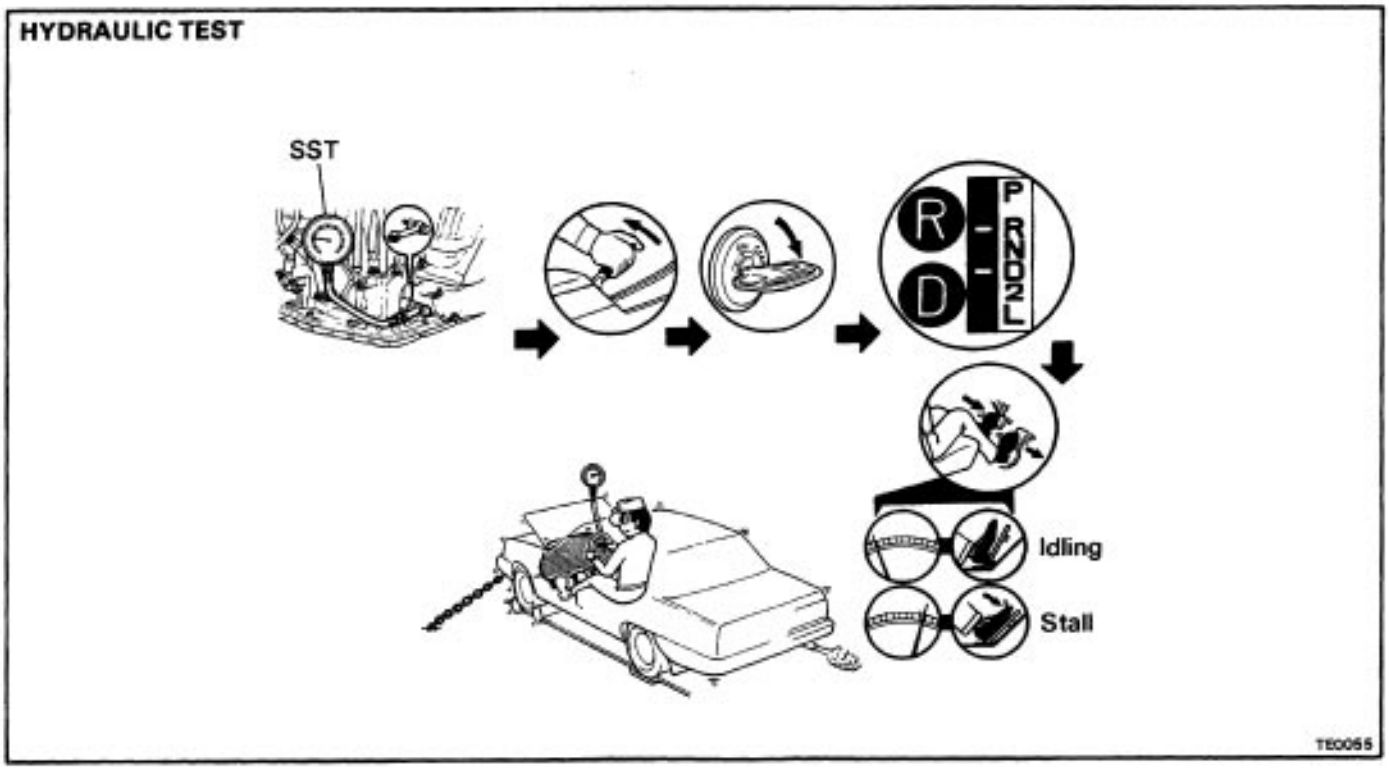
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective

(e) If pressure is low in the D range only:

- D range circuit fluid leakage
- Forward clutch defective

(d) If pressure is low in the R range only:

- R range circuit fluid leakage
- Direct clutch defective
- First and reverse brake defective

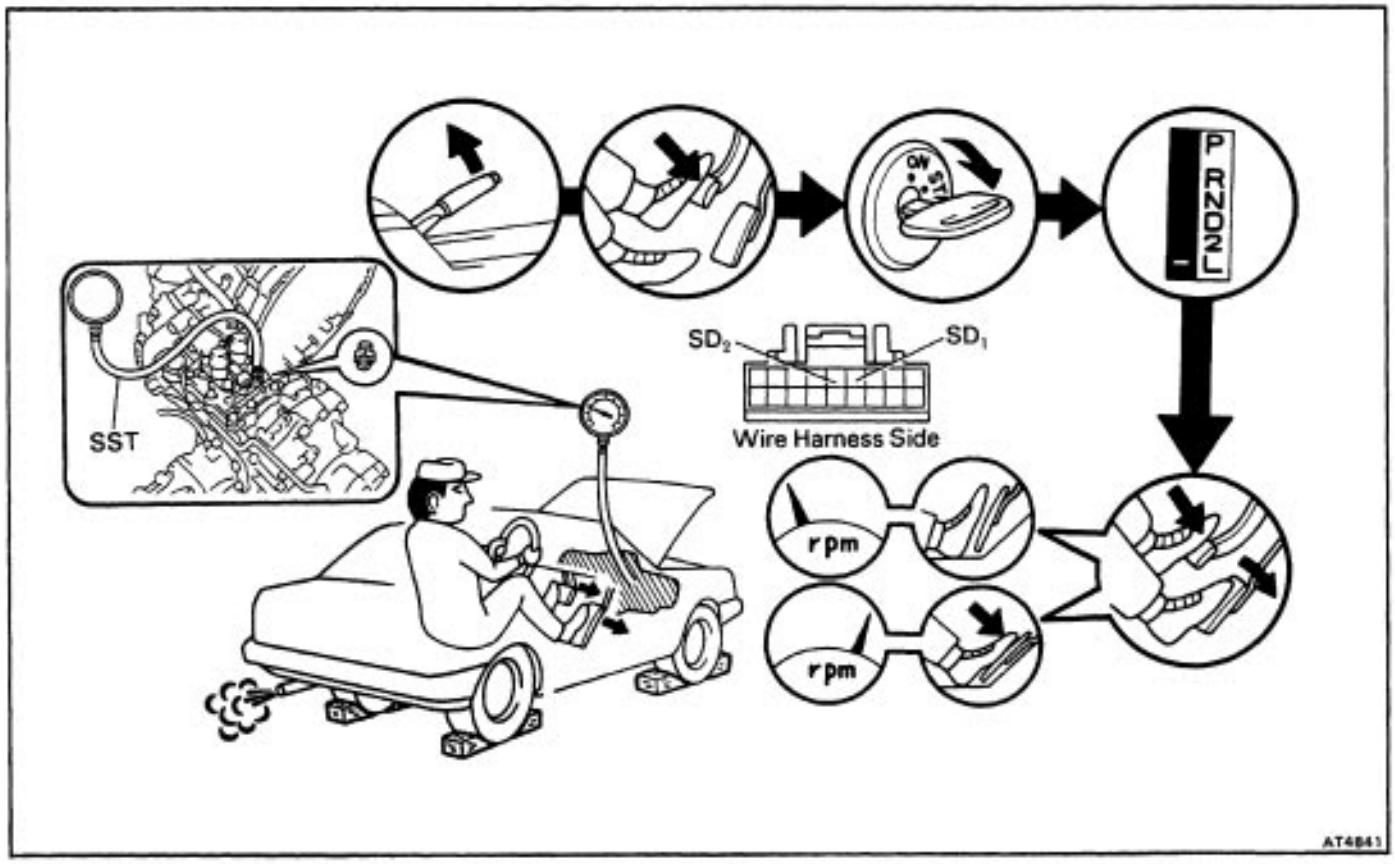


MEASURE CENTER DIFFERENTIAL CONTROL PRESSURE (A540H Only)

(a) Warm up the transaxle fluid (122 – 176˚F or 50 – 80˚C)
(b) Measure the line pressure. (See page AT–224)
(e) Remove the transfer case test plug and mount the oil pressure gauge (SST).
SST 09992–00094
(d) Check the parking brake to see that it is fully applied chock the four wheels.
(e) Disconnect the connector from ECT ECU.
(f) Start the engine.
(g) Apply battery voltage to terminal SD1, or SD2 of the wire harness side connector and turn the No. .1 and No. 2 center differential control solenoid valves to either ON or OFF.
(h) Shift into the L range, step down strongly on the brake pedal with your left foot and while manipulating the accelerator pedal with the right foot, measure the pressure at the engine speeds specified in the table.
kg/cm2 (psi, kPa)

Range		L range			
Condition of Solenoid Valves	No. 1 Solenoid Valve	ON	OFF	ON	OFF
	No. 2 Solenoid Valve	ON	ON	OFF	OFF
Engine RPM	Idling	3.6–4.2 (51–60, 353–412)	1.7–2.4 (24–34, 167–235)	0.7–1.4 (10–20, 69–137)	Under 0.1 (1 , 10)
	Stall	7.4–8.8 (107–125, 726–863)	4.3–5.2 (61–74, 422–510)	2.5–3.2 (36–46, 245–314)	Under 0.1 (1 , 10)

HINT: After inspecting the center differential control pressure, erase the diagnosis codes (No. 73 and 74) from the memory.



ROAD TEST (A540E and A540H)

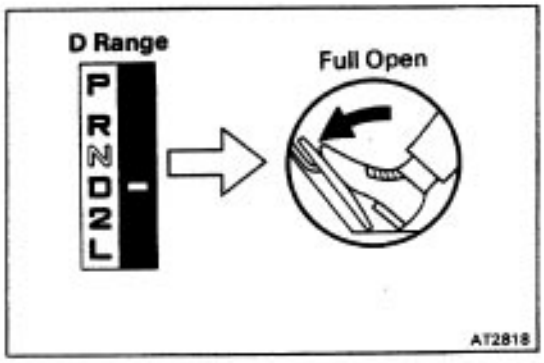
NOTICE: Perform the test at normal operating fluid temperature (122 – 176˚F or 50 – 80˚C).

1. D RANGE TEST IN NORM AND PWR PATTERN RANGES

Shift into the D range and hold the accelerator pedal constant at the full throttle valve opening position.

Check the following:

(a) 1–2, 2–3 and 3–O/D up–shifts should take place, and shift points should conform to those shown in the automatic shift schedule. (See page AT–230)



Conduct a test under both Normal and Power. patterns.

HINT:

- There is no O/D up–shift and lock–up when the coolant temp. is below 140˚F (60˚C) (A540E) or 122˚I= (50˚C) (A540H).
- When the coolant temp. is below 140˚F (600C) or 122˚F (50˚C) (A540H), the shift point is lower than specified in the automatic shift schedule.

EVALUATION

(1) If there is no 1 – 2 up–shift:

- No. 2 solenoid is stuck
- 1–2 shift valve is stuck

(2) If there is no 2 – 3 up–shift:

- No. 1 solenoid is stuck
- 2–3 shift valve is stuck

(3) If there is no 3 – O/D up–shift:

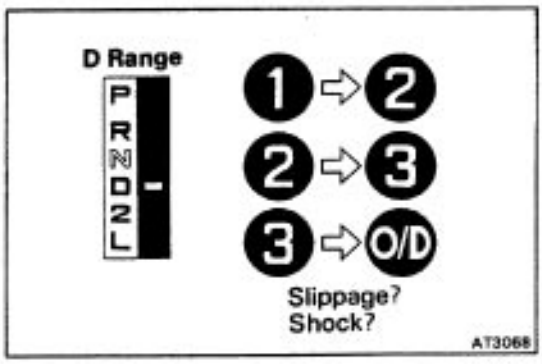
- 3–4 shift valve is stuck

(4) If the shift point is defective:

- Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–4 shift valve etc., are defective

(5) If the lock–up is defective:

- Lock–up solenoid is stuck .
- Lock–up relay valve is stuck

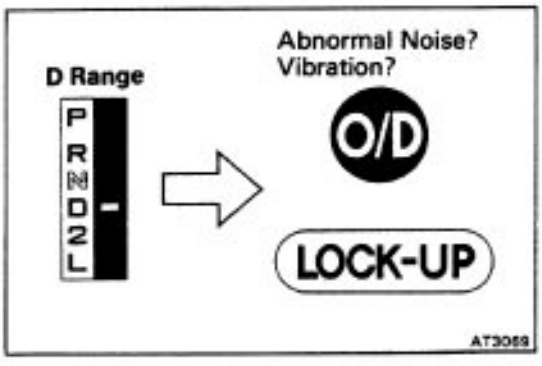


(b) In the same manner, check the shock and slip at the 1 –2, 2 – 3 and 3 – O/D up–shifts.

EVALUATION

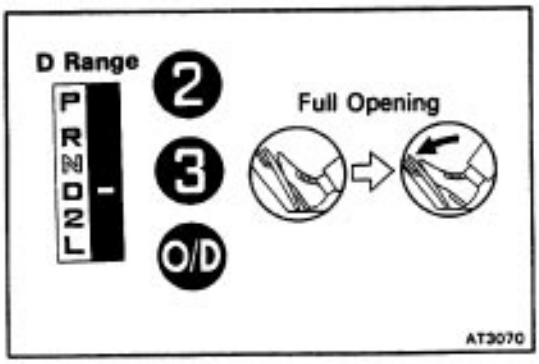
If the shock is excessive:

- Line pressure is too high
- Accumulator is defective
- Check ball is defective



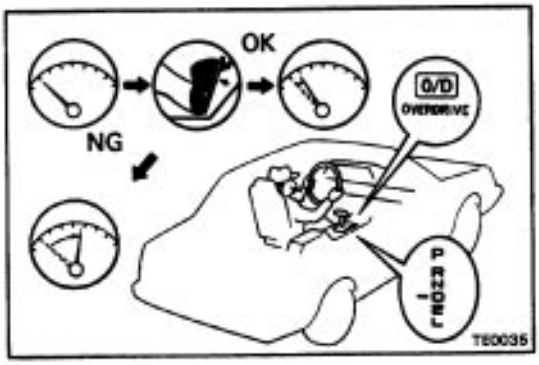
(c) Run at the D range lock–up or 0/C) gear and check for abnormal noise and vibration.

HINT: The check for the cause of abnormal noise and vibration must be make with extreme care as it could also be due to loss of balance in the drive shaft, tire, torque converter, etc.



(d) While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 – 1, 3 – 2 and O/D – 3 kickdowns conform to those indicated on the automatic shift schedule. (See page AT–230)

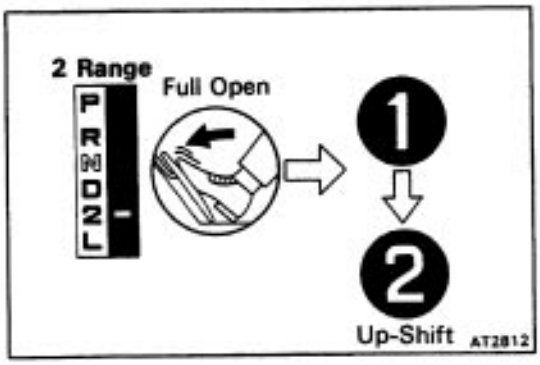
(e) Check for abnormal shock and slip at kick–down.



(f) Check for the lock–up mechanism.

(1) Drive in D range, O/D gear, at a steady speed (lock–up ON) of about 75 km/h (47 mph).

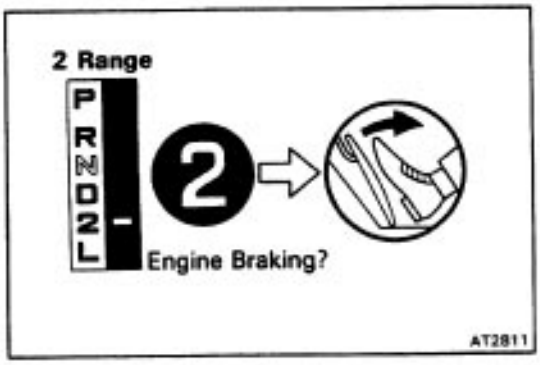
(2) Lightly depress the accelerator pedal and check that the engine rpm does not change abruptly. If there is a big jump in engine rpm, there is no lock–up.



2. 2 RANGE TEST

Shift into the 2 range and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check or the following points.

(a) Check to see that the 1 – 2 up–shift takes place and that the shift point conforms to it shown on the automatic shift schedule. (See page AT–230)

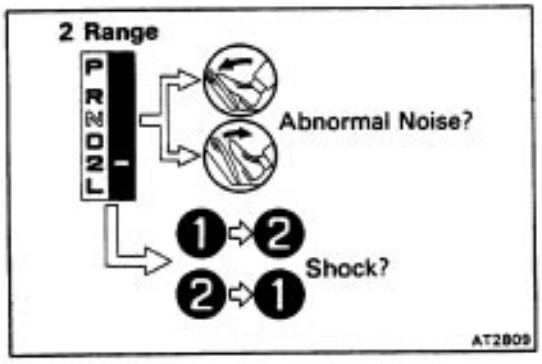


(b) While running in the 2 range and 2nd gear, release the accelerator pedal and check the engine braking effect.

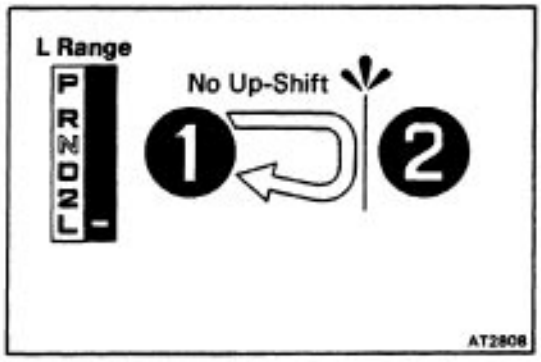
EVALUATION

If there is no engine braking effect:

- Second coast brake is defective

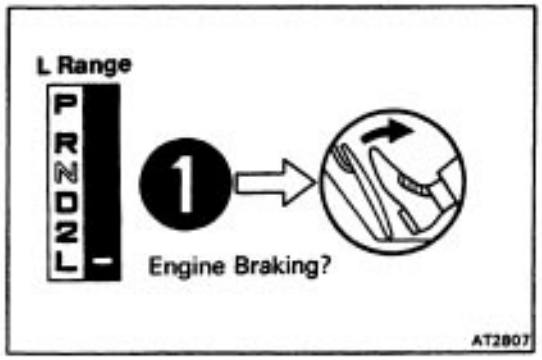


(c) Check for abnormal noise at acceleration an4 deceleration, and for shock at up–shift and down shift.



3. L RANGE. TEST

(a) While running in the L range, check to see that there is no up–shift to 2nd gear.

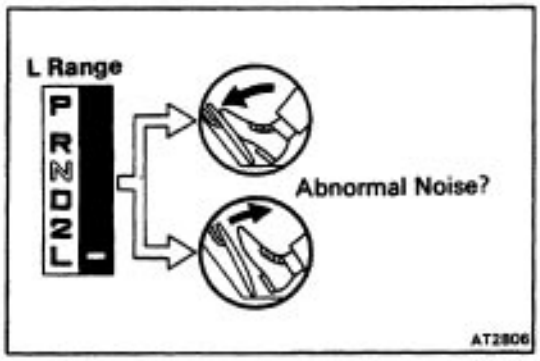


(b) While running in the L range, release the accelerator pedal and check the engine braking effect.

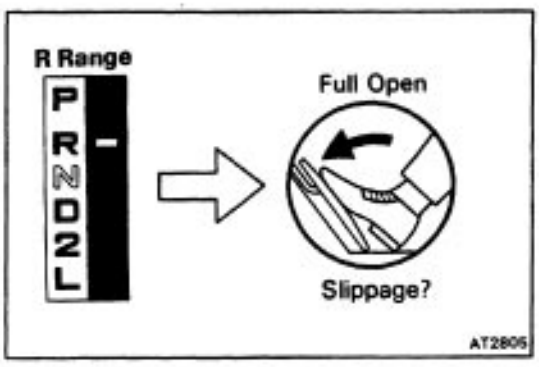
EVALUATION

If there is no engine braking effect:

- First and reverse brake is defective

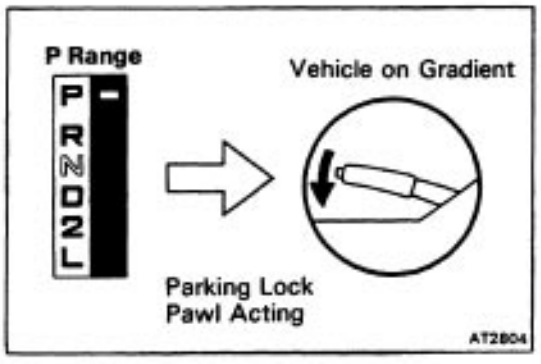


(c) Check for abnormal noise during acceleration and deceleration.



4. R RANGE TEST

Shift into the R range and, while starting at full throttle, check for slipping.



5. P RANGE TEST

Stop the vehicle on a gradient (more than 51 and after shifting into the P range, release the parking brake. Then check to see that the parking lock pawl holds the vehicle in place.

Automatic Shift Schedule (A540E)

		Throttle valve fully open [fully closed] km/h (mph)							
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	55 – 60 (34 – 37)	100 – 109 (62 – 68)	154 – 164 (96 – 102)	[35 – 39 (22 – 24)]	[19 – 24 (12 – 15)]	148 – 157 (92 – 98)	88 – 97 (55 – 60)	48 – 53 (30 – 33)
	PWR	61 – 66 (38 – 41)	116 – 125 (72 – 78)	181 – 191 (112 – 119)	[35 – 39 (22 – 24)]	[19 – 24 (12 – 15)]	172 – 182 (107 – 113)	107 – 115 (66 – 71)	48 – 53 (30 – 33)
2 range	NORM PWR	61 – 66 (38 – 41)	–	–	–	–	–	–	48 – 53 (30 – 33)
L range	NORM PWR	–	–	–	–	–	–	–	51 – 56 (32 – 35)

		Throttle valve opening 5% km/h (mph)					
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	–	77 – 82 (48 – 51)	64 – 69 (40 – 43)	–	68 – 73 (42 – 45)	61 – 66 (38 – 41)
	PWR	–	77 – 82 (48 – 51)	64 – 69 (40 – 43)	–	68 – 73 (42 – 45)	61 – 66 (38 – 41)

*: O/D switch OFF

(A540H)

		Throttle valve fully open [fully closed] km/h (mph)							
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	41 – 45 (25 – 28)	79 – 85 (49 – 53)	117 – 123 (73 – 76)	[25 – 29 (16 – 18)]	[15 – 19 (9 – 12)]	109 – 116 (68 – 72)	75 – 79 (47 – 49)	35 – 39 (22 – 24)
	PWR	48 – 52 (30 – 32)	90 – 97 (56 – 60)	126 – 133 (78 – 83)	[27 – 31 (17 – 19)]	[15 – 19 (9 – 12)]	112 – 118 (70 – 73)	85 – 91 (53 – 57)	41 – 44 (25 – 27)
2 range	NORM PWR	41 – 45 (25 – 28)	–	–	–	–	–	–	35 – 39 (22 – 24)
L range	NORM PWR	–	–	–	–	–	–	–	37 – 41 (23 – 25)

		Throttle valve opening 5% km/h (mph)					
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	–	49 – 53 (30 – 33)	57 – 61 (35 – 38)	–	37 – 41 (23 – 25)	47 – 51 (29 – 32)
	PWR	–	59 – 63 (37 – 39)	66 – 70 (41 – 43)	–	47 – 51 (29 – 32)	57 – 61 (35 – 38)

*: O/D switch OFF

HINT:

(1) Lock–up will not occur in 2nd gear unless the throttle valve opening is greater than 50%.

(2) There is no lock–up in the 2 and L ranges.

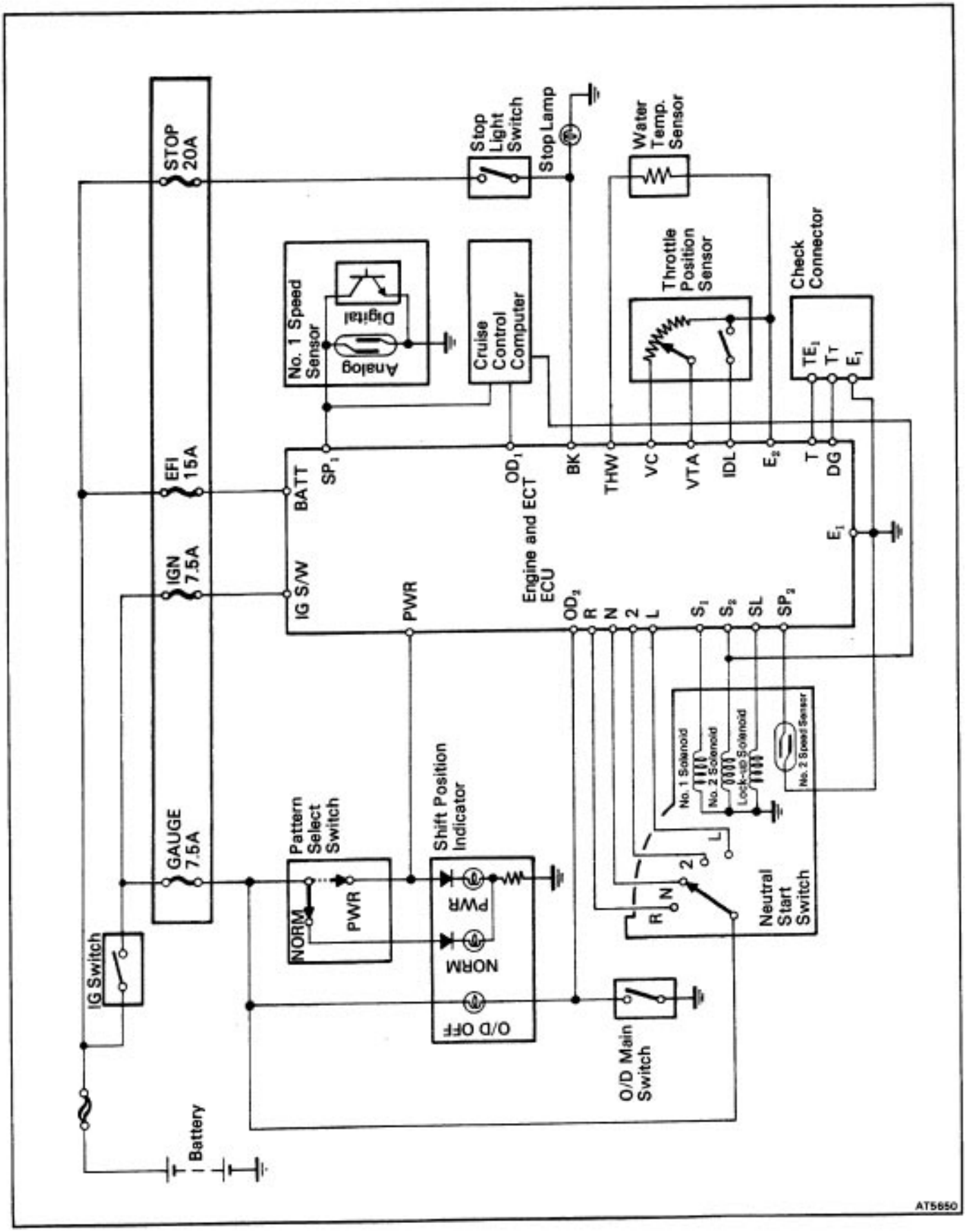
(3) In the following cases, the lock–up will be released regardless of the lock–up pattern.

- When the throttle is completely closed.
- When the brake light switch is ON.

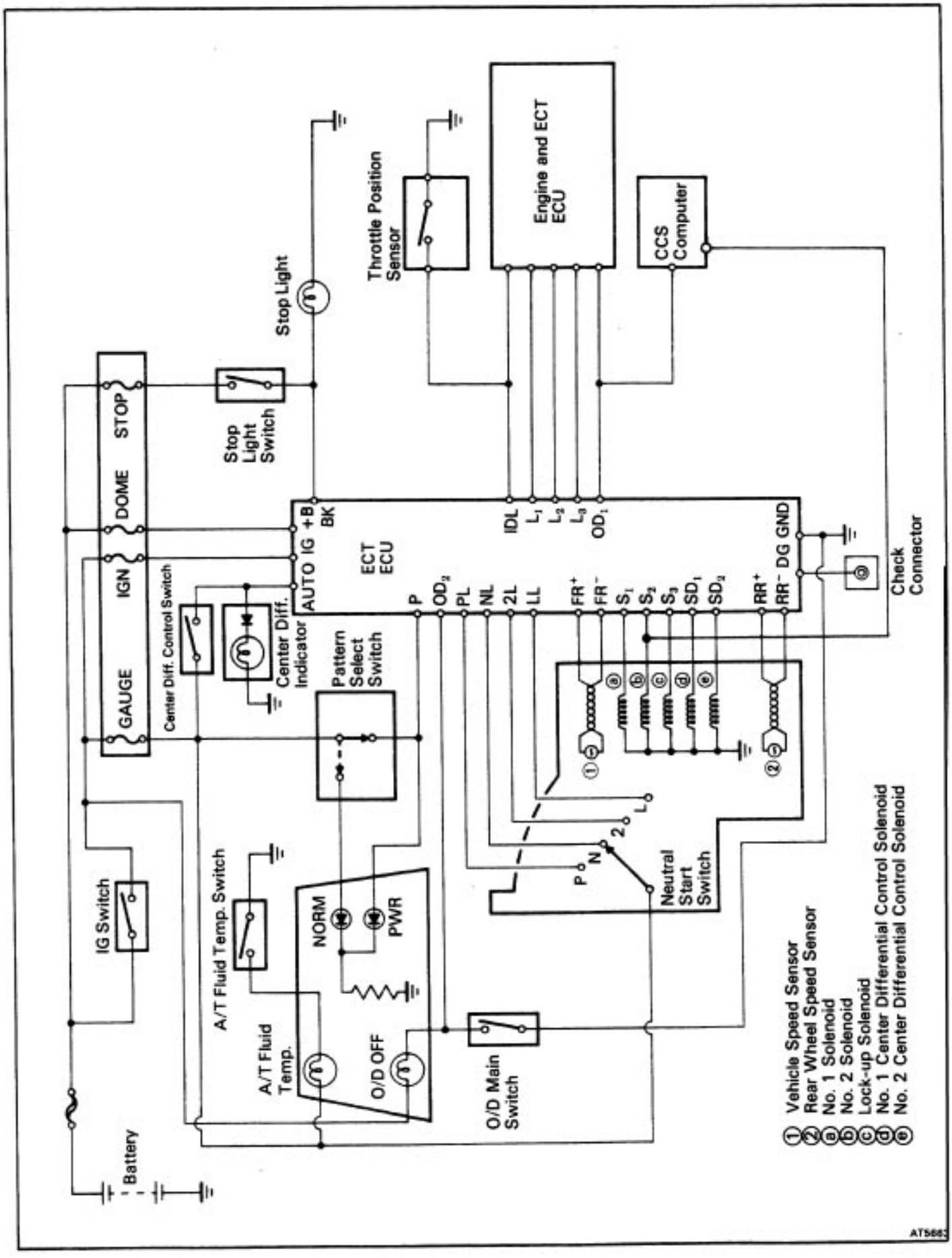
(4) When the coolant. temp. is below 140˚F (60˚C) (A540E) or 122˚F (50˚C) (A540H), the shift point is lower than specified vehicle speed.

Electronic Control System

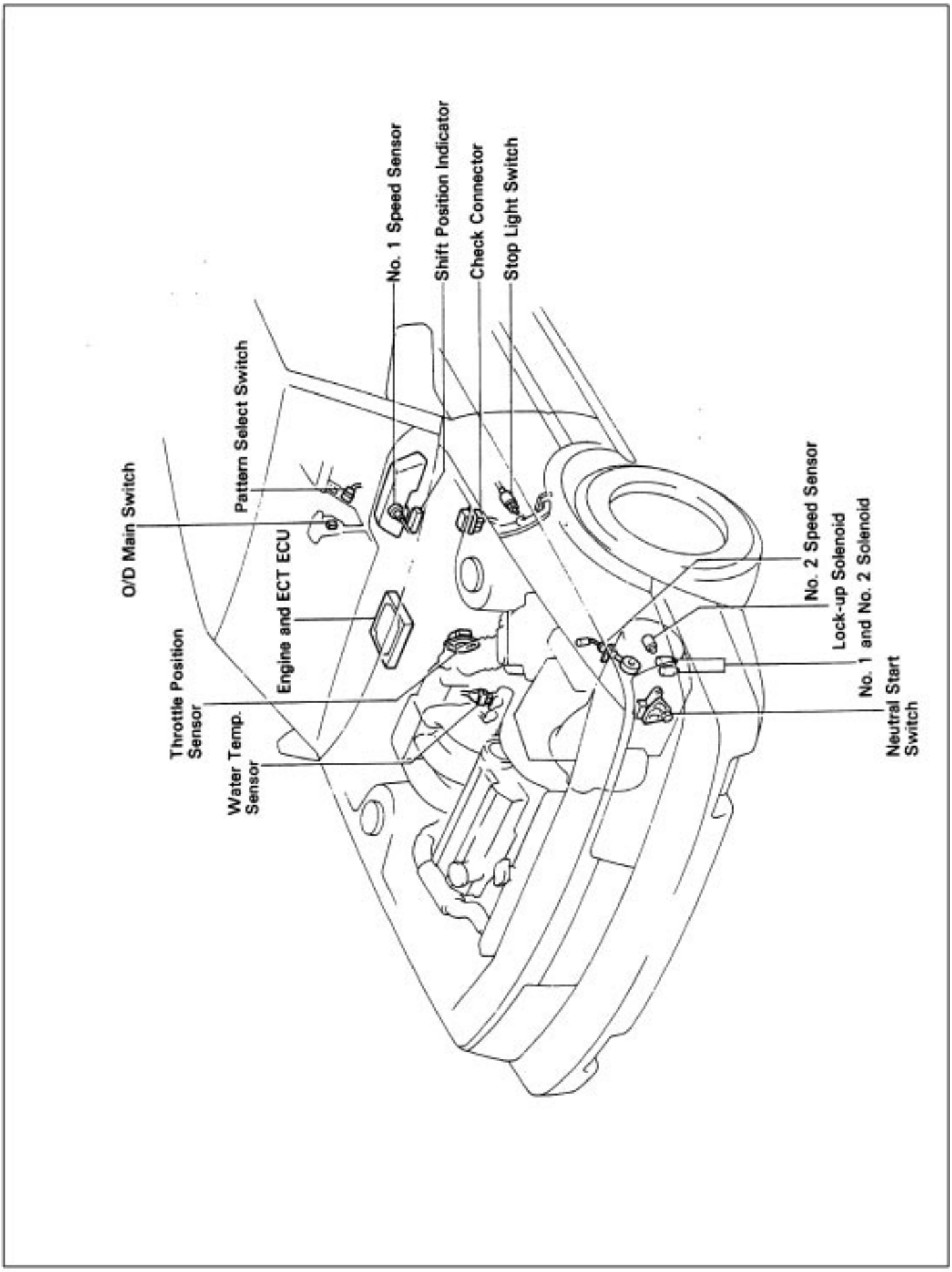
ELECTRONIC CONTROL CIRCUIT (A540E)



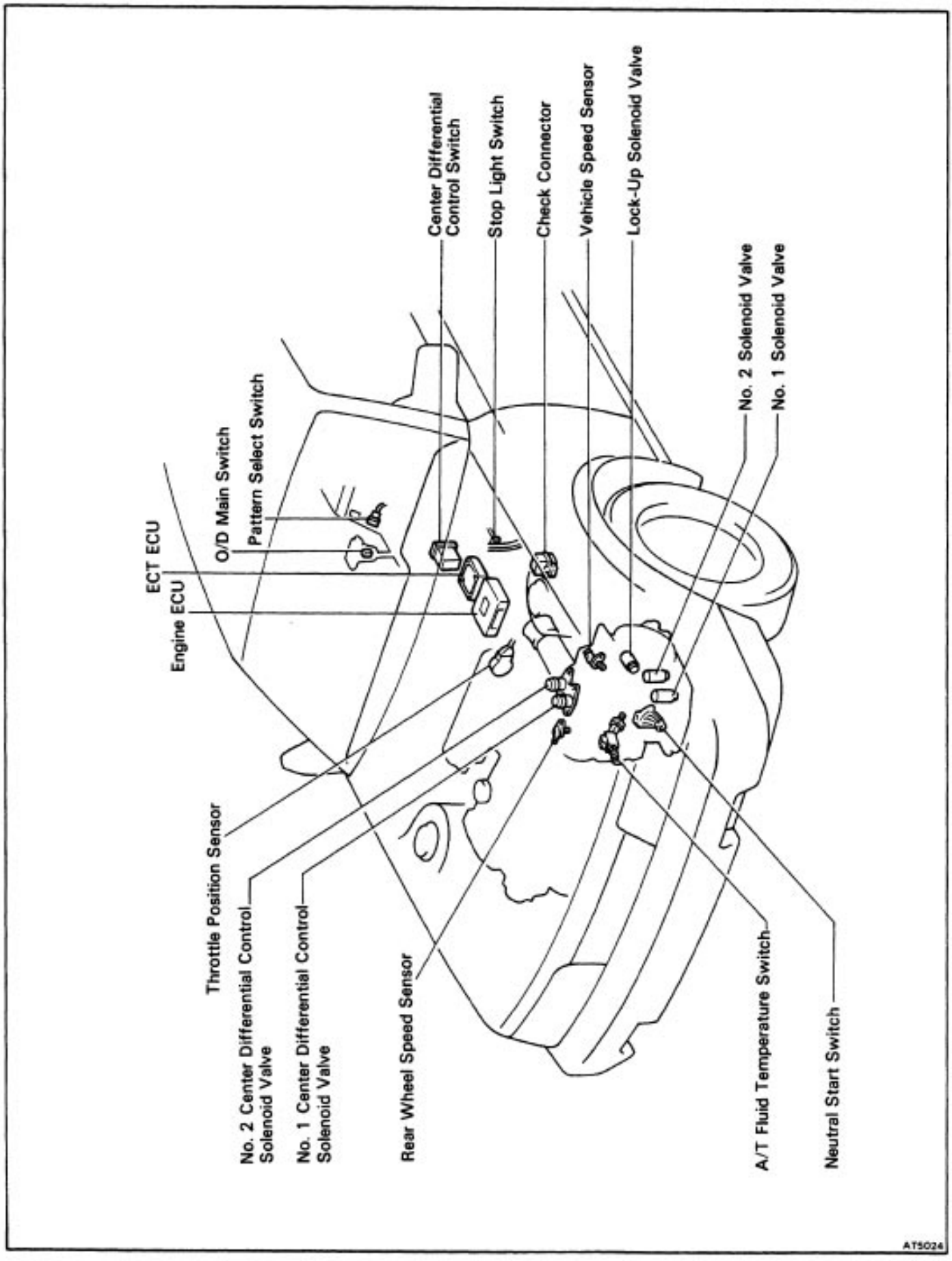
ELECTRONIC CONTROL CIRCUIT (A540H)



ELECTRONIC CONTROL COMPONENTS (A540E)

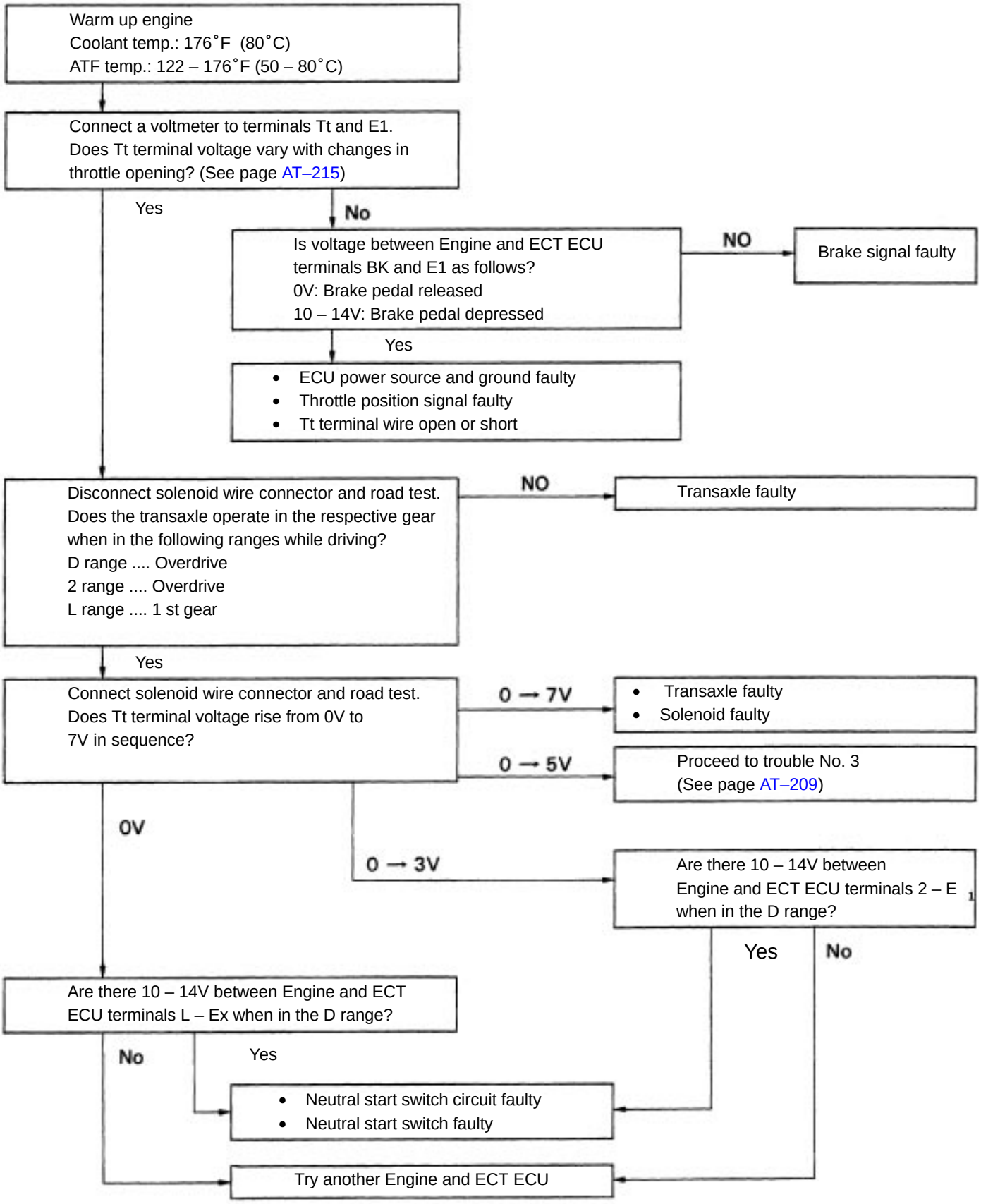


ELECTRONIC CONTROL COMPONENTS (A540H)

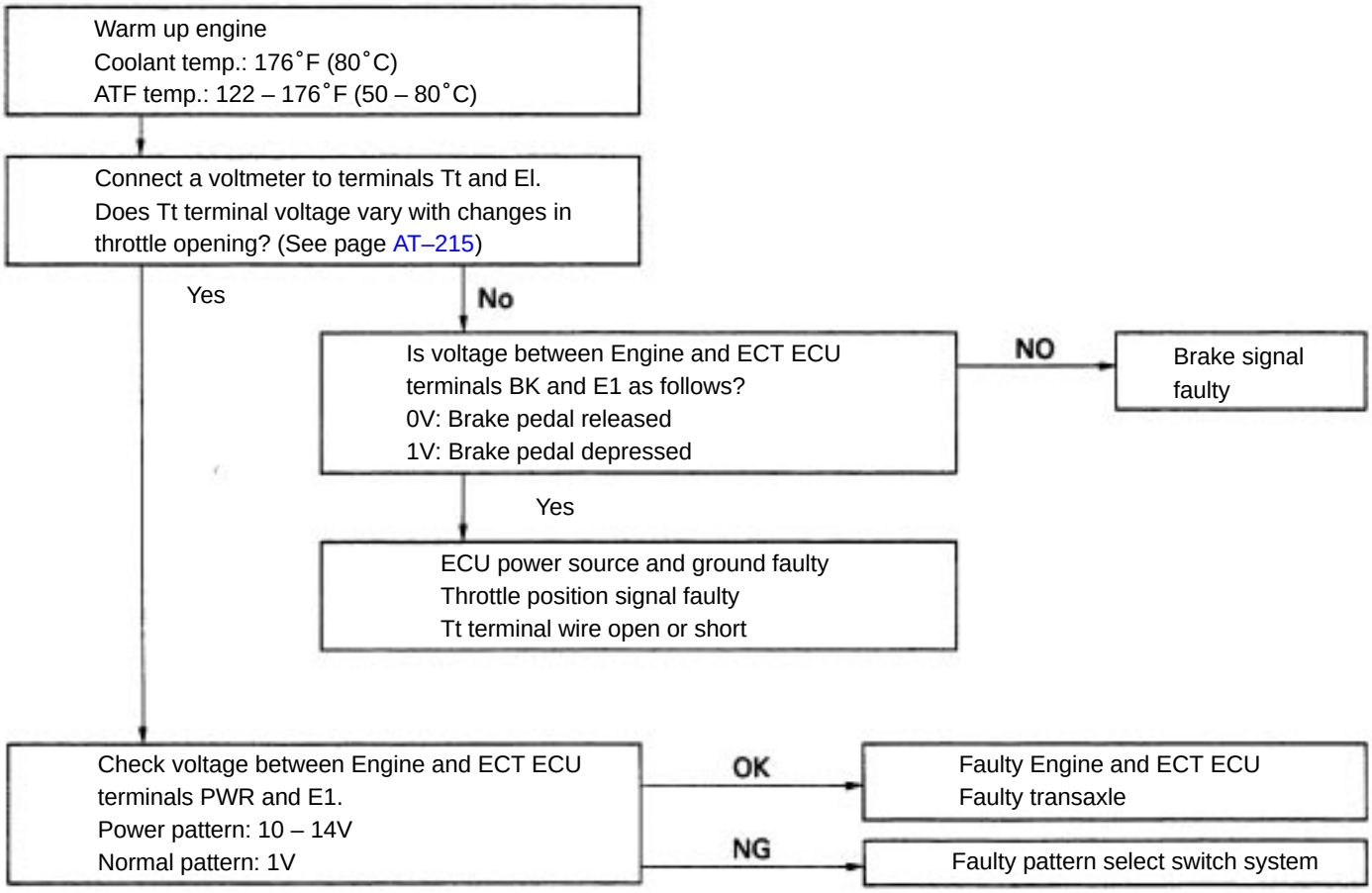


TROUBLESHOOTING FLOW–CHART (A540E)

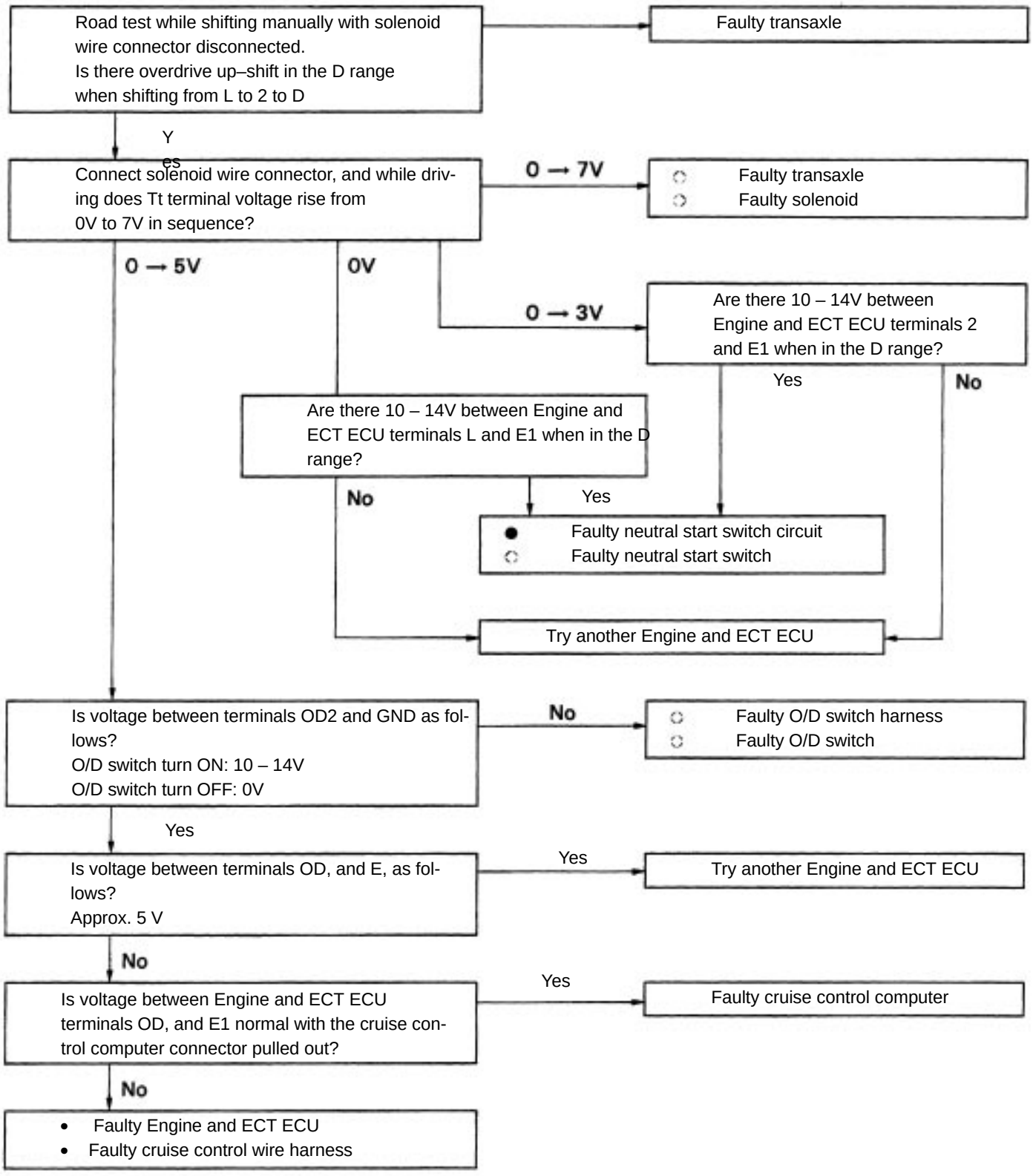
Trouble No. 1 No Shifting



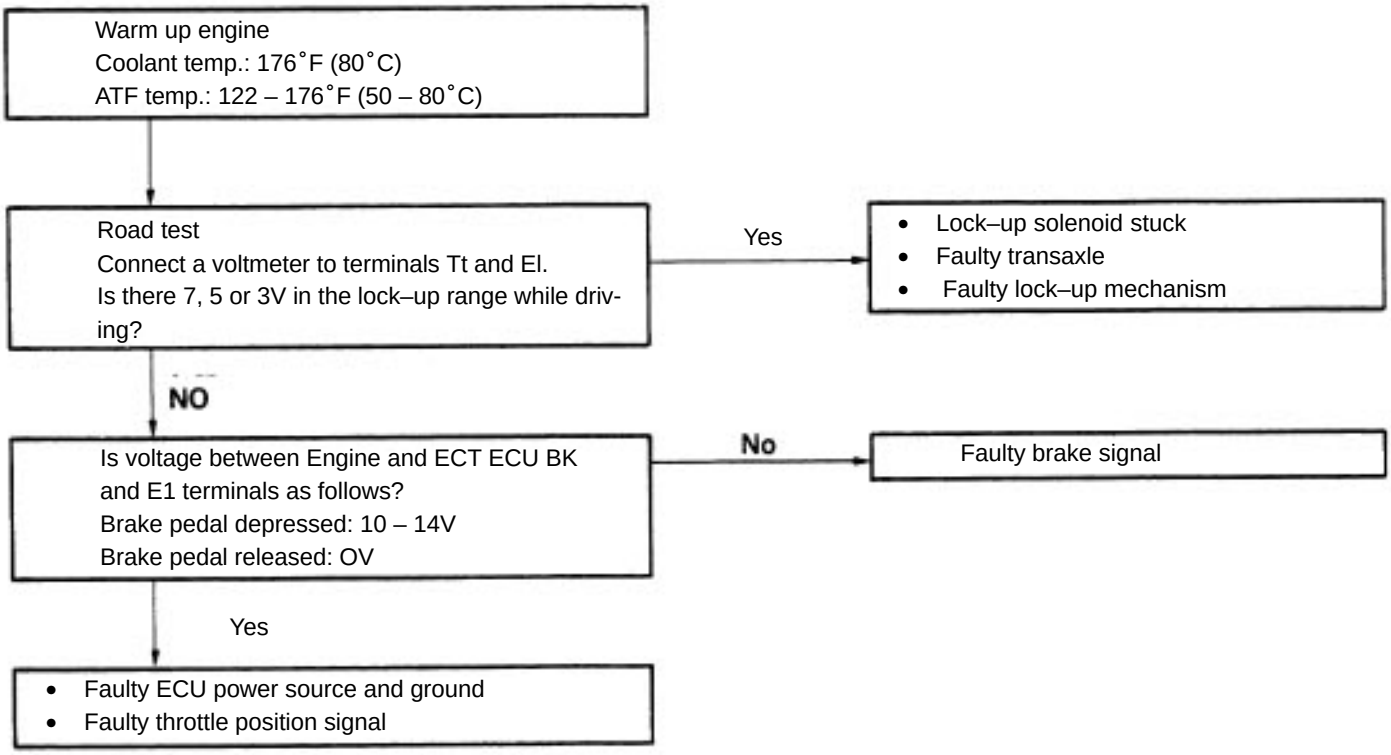
Trouble No. 2 Shift point too high or too Low



Trouble No. 3 No up–shift to overdrive (After warm–up)

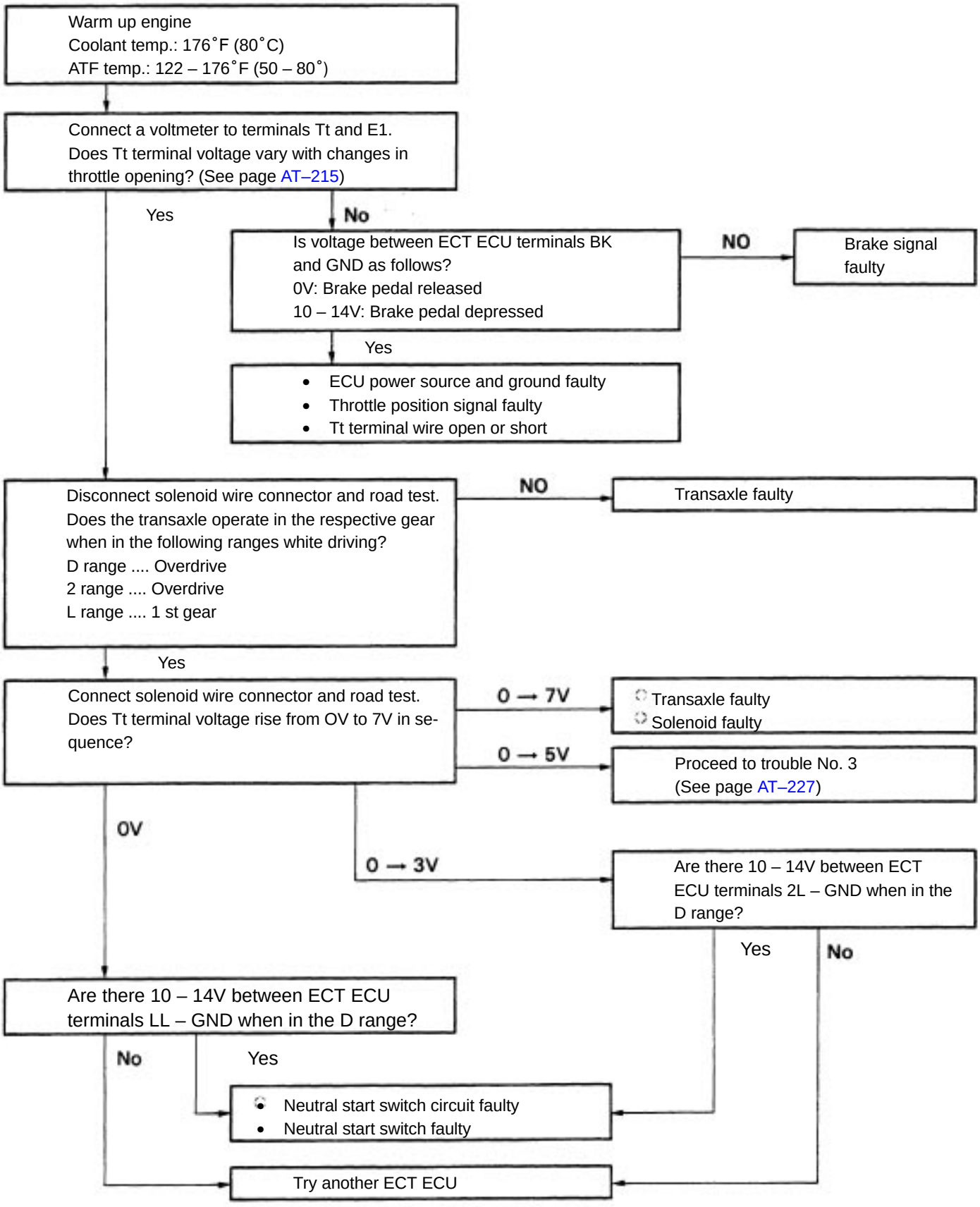


Trouble No. 4 **No lock–up (After warm–up)**

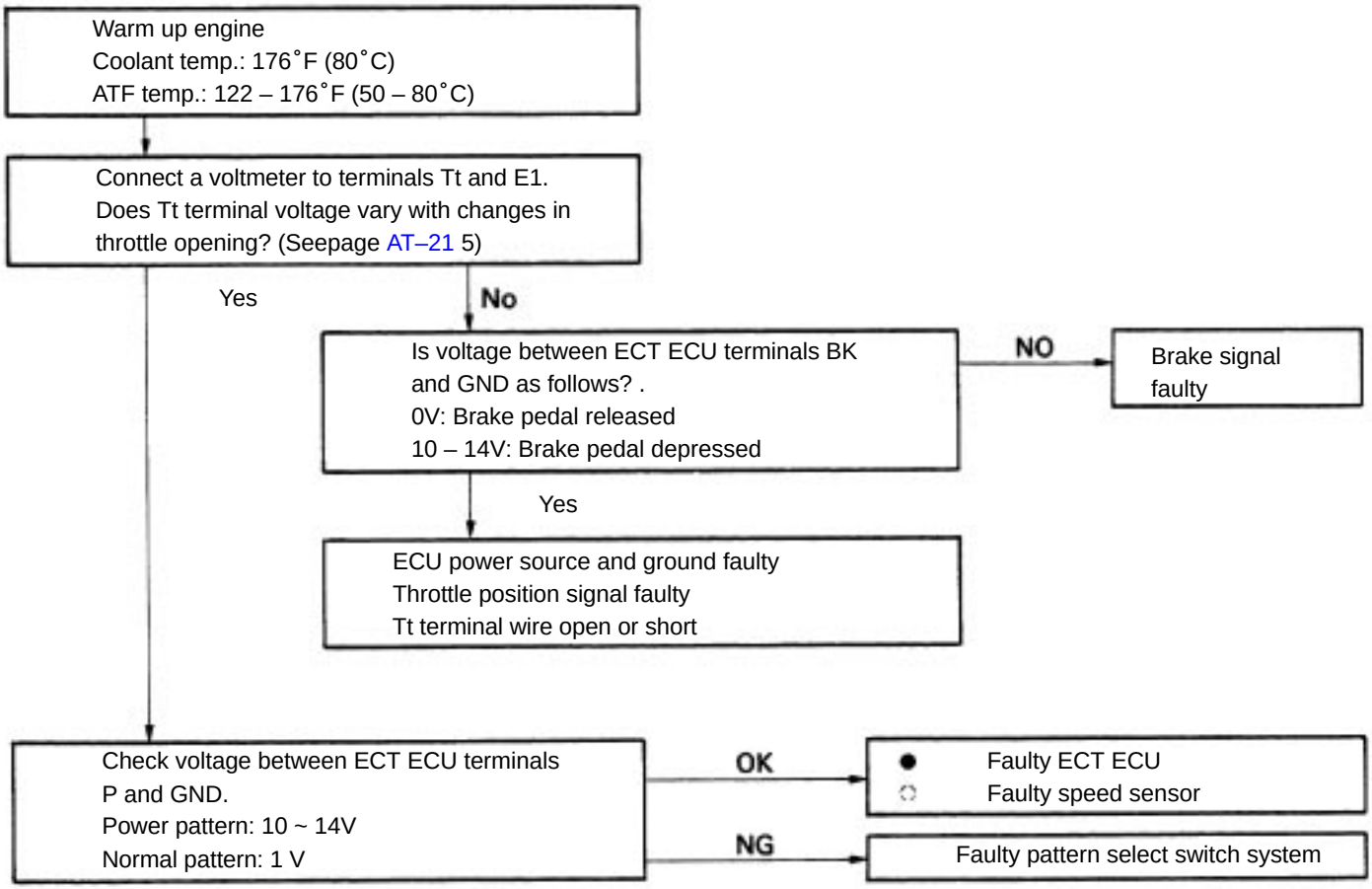


TROUBLESHOOTING FLOW–CHART (A540H)

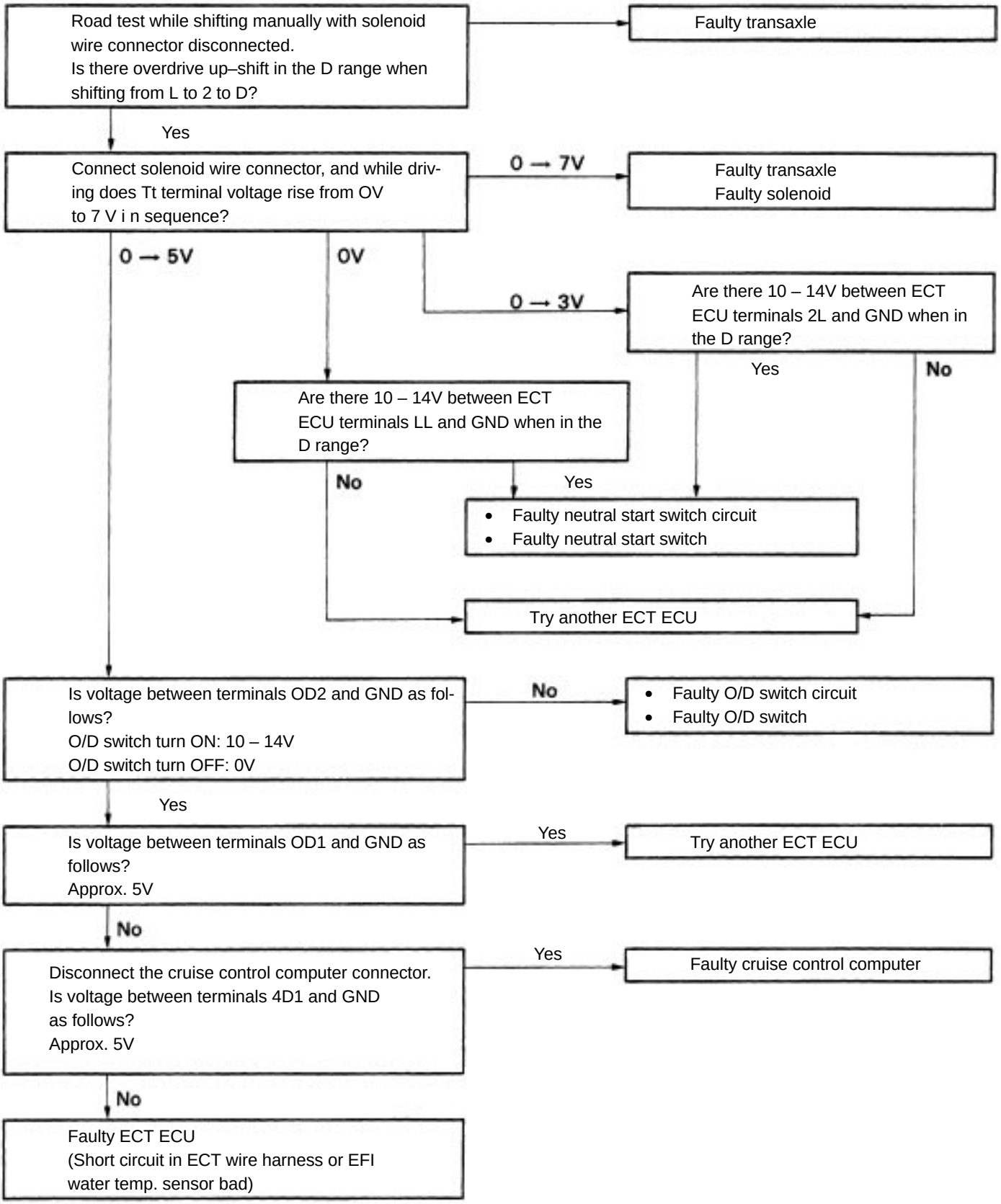
Trouble No. 1 No Shifting



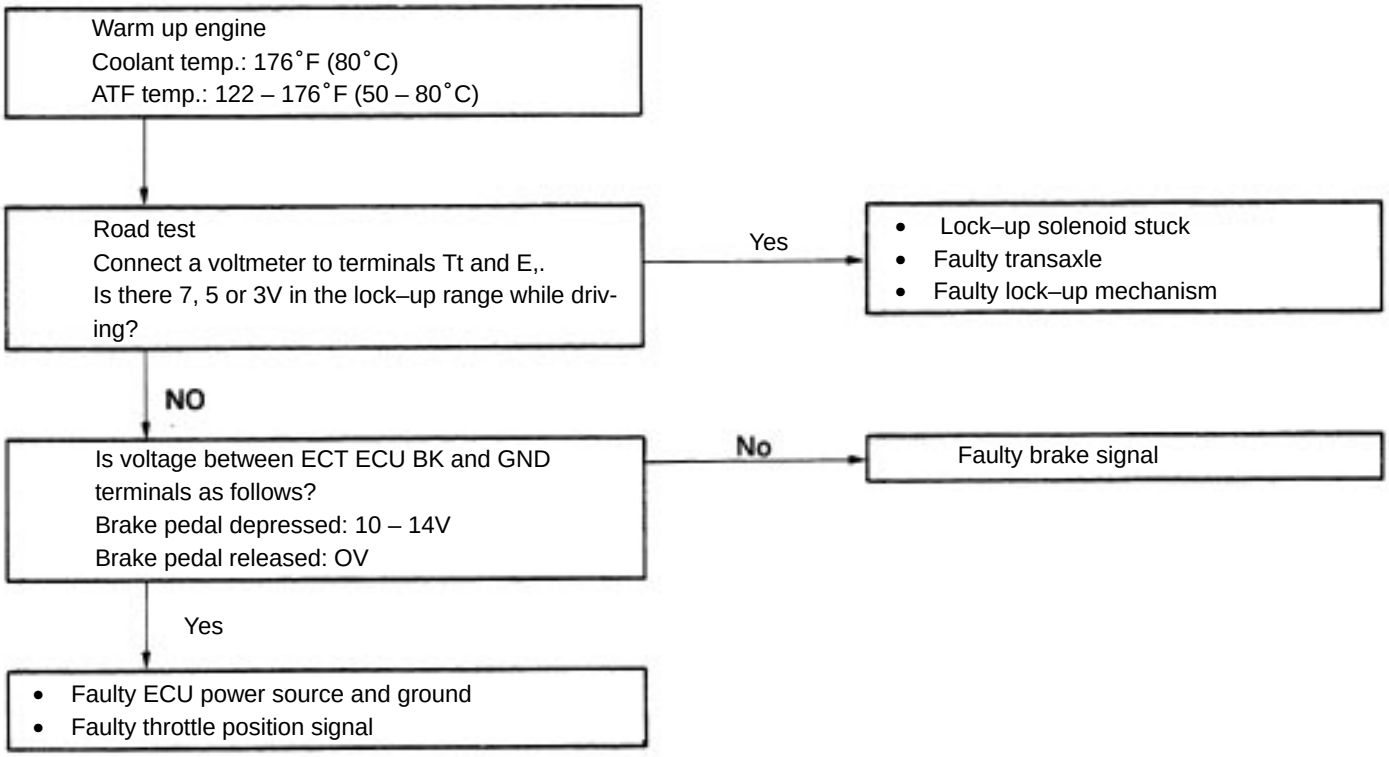
Trouble No. 2 Shift point too high or too low

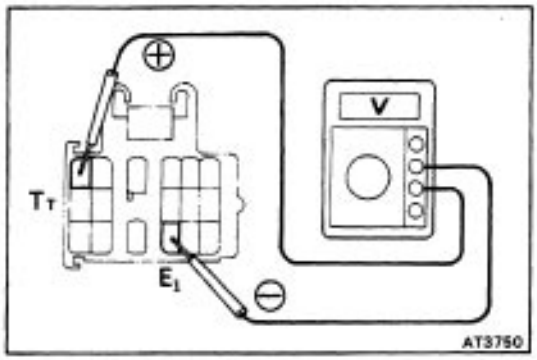


Trouble No. 3 No up–shift to overdrive (After warm–up)



Trouble No. 4 No lock–up (After warm–up)



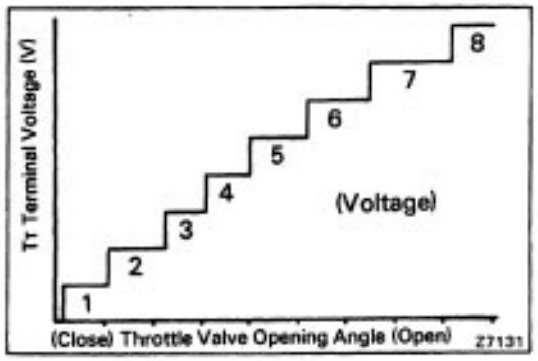


INSPECTION OF ECT OR Tt TERMINAL VOLTAGE

1. INSPECT THROTTLE POSITION SENSOR SIGNAL

(a) Turn the ignition switch to ON. Do not start the engine.

(b) Connect a voltmeter to terminals Tt and E1.



(c)while slowly depressing the accelerator pedal, check that Tt terminal voltage rises in sequence.

If the voltage does not change in proportion to the throttle opening angle, there is a malfunction in the throttle position sensor or circuit.

2. INSPECT BRAKE SIGNAL

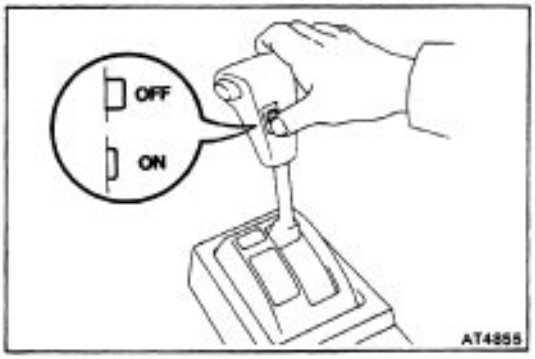
(a) Depress the accelerator pedal until the Tt terminal indicates 8V.

(b) Depress the brake pedal and check the voltage reading from the Tt terminal.

Brake pedal depressed 0V

Brake pedal released 8V

If not as indicated, there is a malfunction in either the stop light switch or circuit.



3. INSPECT EACH UP–SHIFT POSITION

(a) Warm up the engine.

Coolant temperature: 176˚F (80˚)

(b) Turn the O/D switch to ”ON”.

(c) Place the pattern select switch in ”Normal” and the shift lever into the D range.

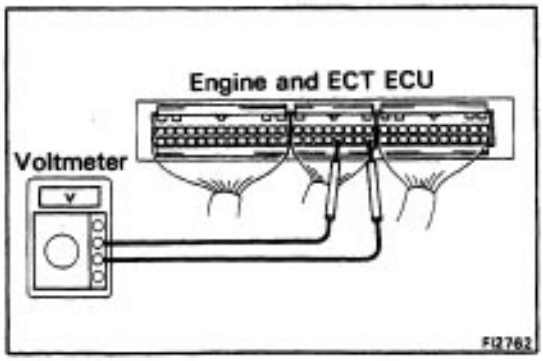
(d) During a road test (above 10 km/h or 6 mph) check that voltage at the Tt terminal is as indicated below for each up–shift position.

If the voltage rises from 0V to 7V in the sequence shown, the control system is okay.

The chart on the left shows the voltmeter reading and corresponding gears.

ECT terminal (V)	Gear position
0	1st
2	2nd
3	2nd Lock-up
4	3rd
5	3rd Lock-up
6	O/D
7	O/D Lock-up

HINT: Determine the gear position by a fight shock or change in engine rpm when shifting. The lock–up clutch will turn ON only infrequently during normal 2nd and 3rd gear operation. To trigger this action, press the accelerator pedal to 50% or more of its stroke. At less than 50%, the voltage may change in the sequence 2v – 4V – 6V – 7V.



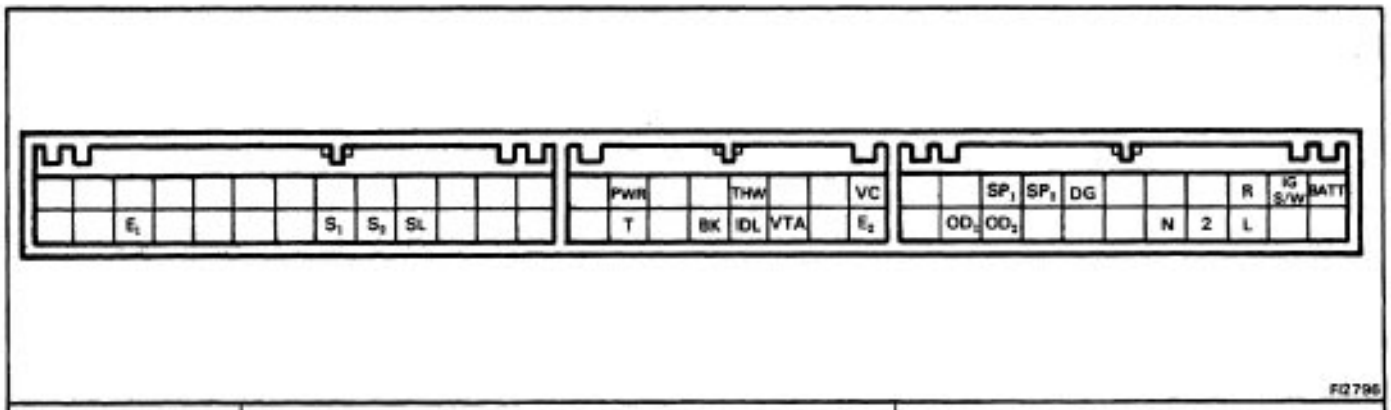
INSPECTION OF ELECTRONIC CONTROL COMPONENTS

1. (A540E)

INSPECT VOLTAGE OF TCCS ECU CONNECTOR

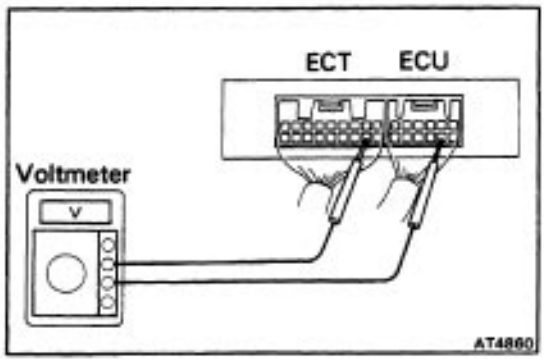
(a) Turn on the ignition switch.

(b) Measure the voltage at each terminal.



Terminal	Measuring condition		Voltage (V)
$S_1 - E_1$	D, 2 or L range		10 – 14
	P, R or N range		0
S_2, $S_L - E_1$	———		0
PWR – E_1	PWR pattern		10 – 14
	NORM pattern		0 – 2
BK – E_1	Brake pedal is depressed		10 – 14
	Brake pedal is released		0
THW – E_2	Coolant temp. 176˚F (84˚C)		0.1 – 1.0
IDL – E_2	Throttle valve fully closed		0
	Throttle valve open		4 – 6
VTA – E_2	Throttle valve fully closed		0.1 – 1.0
	Throttle valve fully open		3 – 5
VC – E_2	———		4 – 6
$OD_1 - E_1$	———		5
$OD_2 - E_1$	O/D main switch turned ON		10 – 14
	O/D main switch turned OFF		0
$SP_1 - E_1$	Cruise control main switch OFF	Standing still	0 or 5
		Vehicle moving	2 – 3
$SP_2 - E_1$	Standing still		0 or 5
	Vehicle moving		2 – 3

Terminal	Measuring condition	Voltage IV1
R – E_1	R range	10 – 14
	Except R range	0 – 2
N – E_1	N range	10 – 14
	Except N range	0 – 2
2 – E_1	2 range	10 – 14
	Except 2 range	0 – 2
L – E_1	L range	10 – 14
	Except L range	0 – 2
IG S/W – E_1	———	10 – 14
BATT – E_1	———	10 – 14

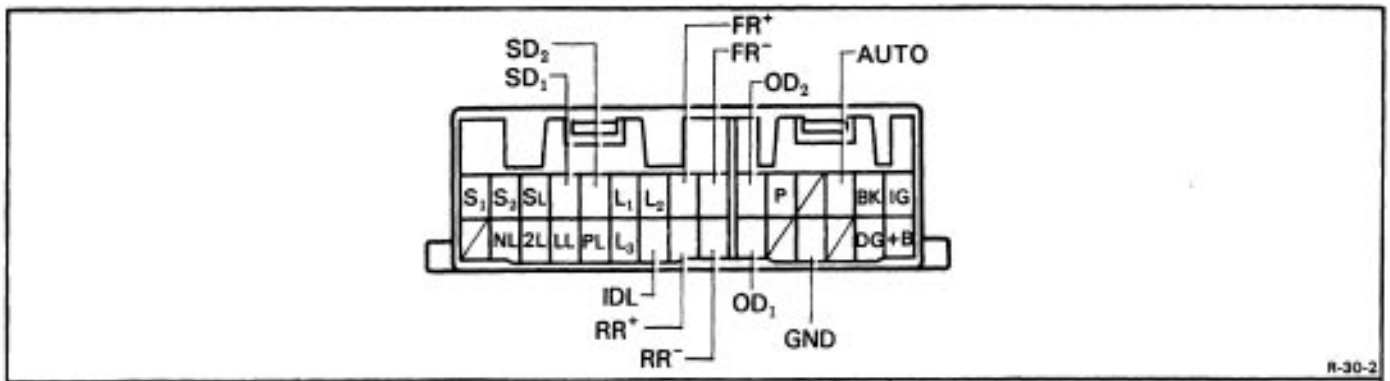


2. (A540H)

INSPECT VOLTAGE OF ECT ECU CONNECTOR

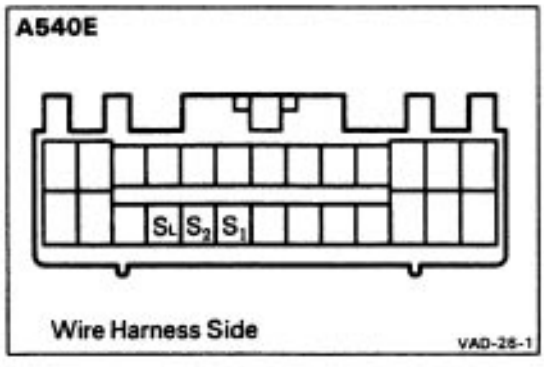
(a) Turn on the ignition switch.

(b) Measure the voltage at each terminal.



Terminal	Measuring condition	Voltage (V)
IG – GND	———	10 – 14
+B – GND	———	10 – 14
IDL – GND	Throttle valve fully closed	0
	Throttle valve open	10 – 14
L_3 – GND	Throttle valve fully closed to fully open	5 to 0 to 5 to 0 to 5
L_2 – GND	Throttle valve fully closed to fully open	5 to 0 to 5

Terminal	Measuring condition	Voltage (V)
L_1 – GND	Throttle valve fully closed to fully open	5 to 0
OD_2 – GND	O/D main switch turned ON	10 – 14
	O/D main switch turned OFF	0
OD_1 – GND	Coolant temp. below 122˚F950˚0	0
	Coolant temp. above 122˚F (50˚C0	5
AUTO – GND	Center differential control switch AUTO position	10 – 14
	Center differential control switch turned OFF	0
PL – GND	P range	10 – 14
	Except P range	0
LL – GND	L range	10 – 14
	Except L range	0
2L – GND	2 range	10 – 14
	Except 2 range	0
NL – GND	N range	10 – 14
	Except N range	0
P – GND	PWR pattern	10 – 14
	NORM pattern	0
BK – GND	Brake pedal is depressed	10 – 14
	Brake pedal is released	0
SD_2,SL,S_2 – GND	———	0
S_1 – GND	———	10 – 14
FR^-,FR^+ RR^-,RR^+ – GND	———	0.5 – 1
SD_1 – GND	Center differential control switch AUTO position	10 – 14
	Center differential control switch turned OFF	0



3. (A540E)

INSPECT SOLENOID VALVES

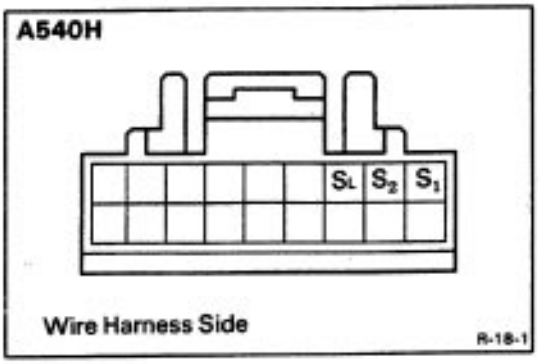
(a) Disconnect the connector from Engine and ECT ECU

(b) Measure the resistance between S1, S2, SL and body ground.

Resistance: 11 – 15Ω

(e) Apply battery voltage to each terminal.

Check that an operation noise can be heard from the solenoid.



4. (A540H)

INSPECT SOLENOID VALVES

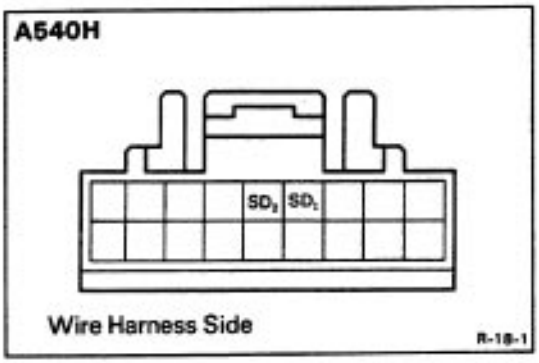
(a) Disconnect the connector from ECT ECU.

(b) Measure the resistance between S1, S2, SL and body ground.

Resistance: 11 – 15Ω

(c) Apply battery voltage to each terminal.

Check that an operation noise can be heard from the solenoid.



5. (A540H)

INSPECT CENTER DIFFERENTIAL CONTROL SOLENOID VALVES

(a) Disconnect the connector from ECT ECU.

(b) Measure the resistance between SD1, SD2 and body ground.

Resistance: 11 – 15Ω

(c) Apply battery voltage to each terminal.

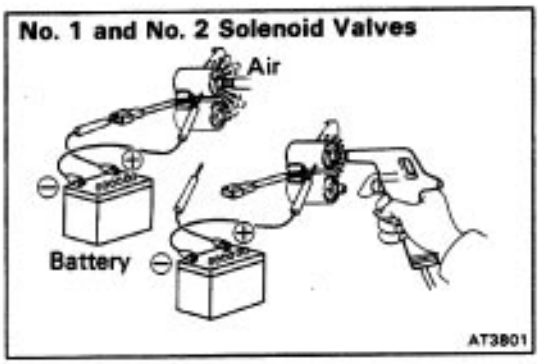
Check that an operation noise can be heard from– the solenoid.

6. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

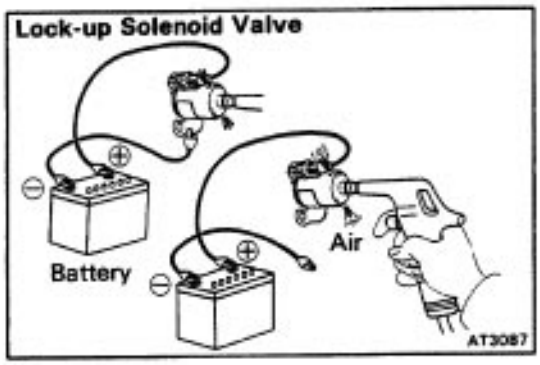
(a) Check No. 1 and No. 2 solenoid valves. (A540E, A540H)

- Applying 5 kg/cm2 (71 psi, 490 kPa) of compressed air, check that the solenoid valves open do not leak the air.
- When supply battery voltage to the solenoids, check that the solenoid valves open.



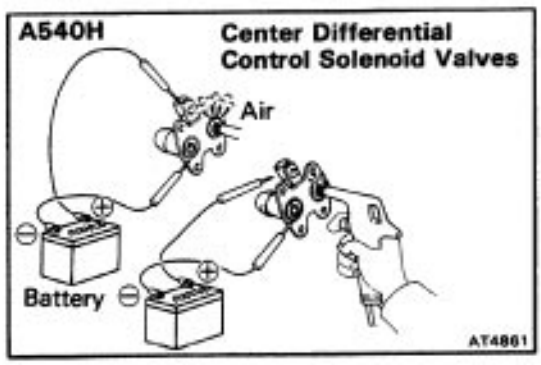
(b) Check the lock–up solenoid valve. (A540E, A540H)

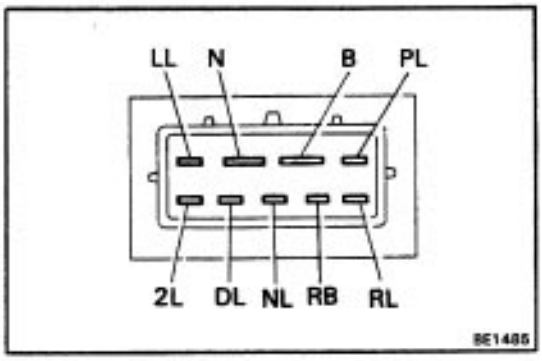
- Applying 5 kglcm2 (71 psi, 490 kPa) of compressed air, check that the solenoid valve opens.
- When supply battery voltage to the solenoid, check that the solenoid valve does not leak the air.



(c) Check No. 1 and No. 2 center differential control solenoid valves. (A540H)

- Applying 5 kg/cm2 (71 psi, 490 kPa) of compressed air, check that the solenoid valves open do not leak the air.
- When supply battery voltage to the solenoids, check that the solenoid valves open.





7. (A540E, A540H)

INSPECT NEUTRAL START SWITCH

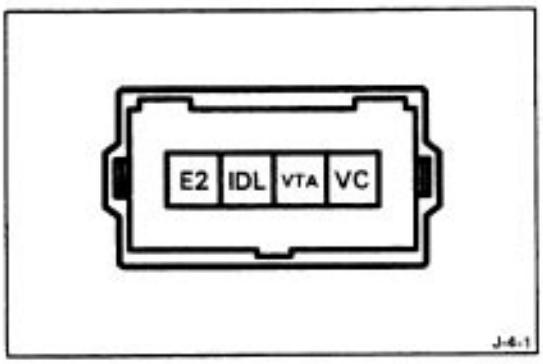
Using an ohmmeter, check the continuity of the terminals for each switch position shown in the table below. (A540H)

Range \ Terminal	B	N	RB	PL	RL	NL	DL	2L	LL
P	O	O	O	O					
R			O		O				
N	O	O	O			O			
D			O				O		
2			O					O	
L			O						O

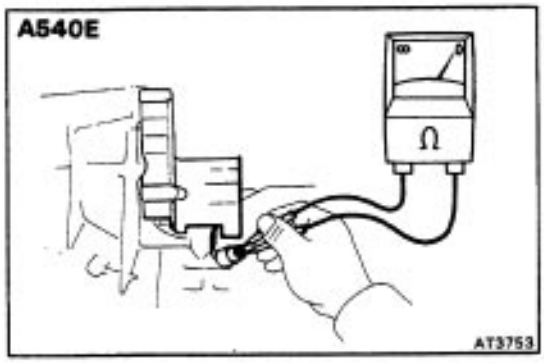
8. (A540E, A540H)

INSPECT THROTTLE POSITION SENSOR

Using an ohmmeter, check the resistance between each terminal.



Terminal	Throttle valve condition	Resistance (kΩ)
IDL – E_2	Fully closed	0 – 0.1
	Open	Infinity
V_C – E_2	—	3 – 7
V_{TA} – E_2	Fully closed	0.2 – 0.8
	Fully open	3.3 – 10



(A540E)

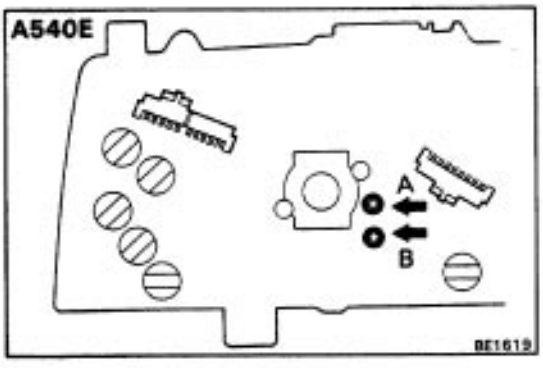
INSPECT NO. 2 SPEED SENSOR

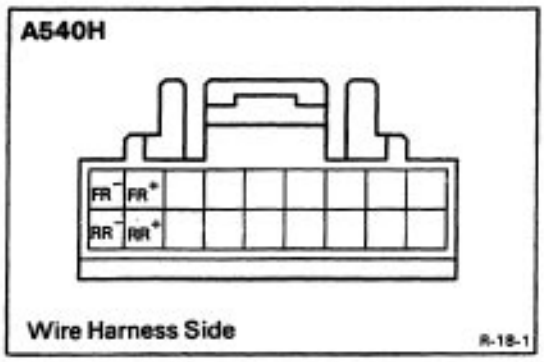
(a) Jack up a front wheel on one side.
(b) Connect an ohmmeter between the terminals.
(c) Spin the wheel and check that the meter needle deflects from 4 to ∞ Ω

10. (A540E)

INSPECT NO. 1 SPEED SENSOR IN COMBINATION METER

(a) Remove the combination meter.
(b) Connect an ohmmeter between terminals A and B.
(c) Revolve the meter shaft and check that the mete needle repeatedly deflects from 0 Ω to ∞ Ω





11. (A540H) . . . .

INSPECT VEHICLE SPEED SENSOR AND REAR WHEEL SPEED SENSOR

(a) Disconnect the connector from ECT ECU.

(b) Measure the resistance between FR– and FR* (vehicle speed sensor, and between RR– and RR* (rear wheel speed sensor). .

Resistance: 620 × 60Ω

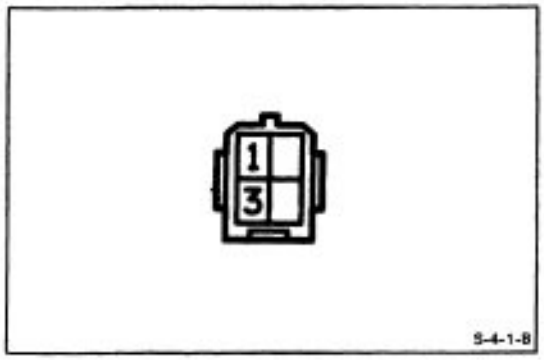
12. (A540E, A540H)

INSPECT PATTERN SELECTION SWITCH

Inspect that there is continuity between 5 and each terminal.

HINT: As there are diodes inside, be careful of the tester probe polarity.

Terminal / Pattern	6	5	4
NORM	○	○	
PWR	○		○

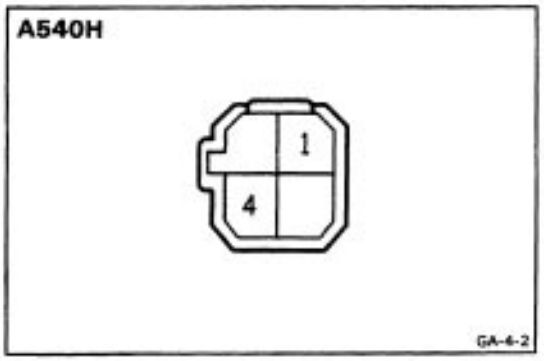


13. (A540E, A540H)

INSPECT O/D MAIN SWITCH

Inspect that there is continuity between terminals 1 and 3.

Terminal / S/W position	1	3
ON		
OFF	○	○



14. (A540H)

INSPECT CENTER DIFFERENTIAL CONTROL SWITCH

(a) Disconnect the connector from center differential control switch.

(b) Inspect that there is continuity between terminals 1 and 4.

Terminal / S/W position .	1	4
AUTO	○	○
OFF		

ON–VEHICLE REPAIR

HINT: The components mentioned below can be replaced on the vehicle without any necessity for removal of the transaxle. For the respective operating procedures refer to the following pages:

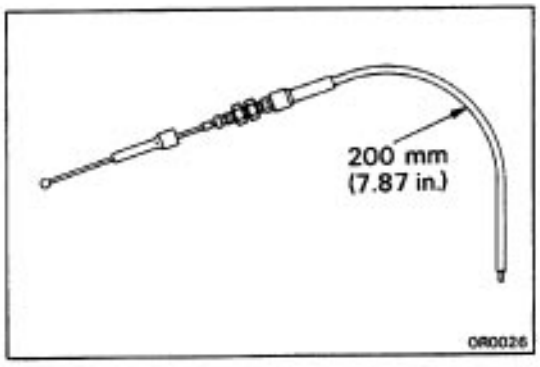
Components	Removal	Installation	Remarks
Valve body	AT–242 to AT–244	AT-403 to AT-405	
Throttle cable	AT–231	AT–231	
Speedometer driven gear oil seal	AT–232	AT–232	
Side gear shaft oil seal	AT–232	AT–232 and AT–233	
Extension housing oil seal	AT–233	AT–233	Only A540H

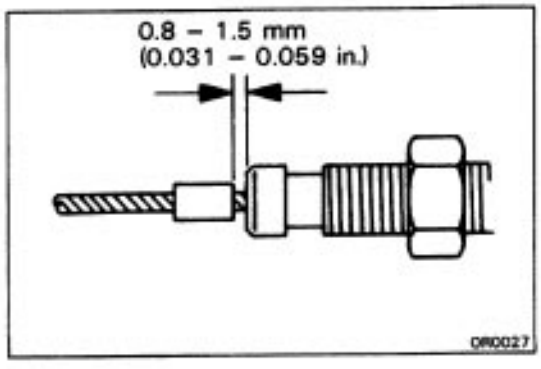
Throttle Cable

REMOVAL OF THROTTLE CABLE

1. DISCONNECT THROTTLE CABLE FROM ENGINE
2. REMOVE NEUTRAL START SWITCH
3. REMOVE VALVE BODY
4. REMOVE THROTTLE CABLE

INSTALLATION OF THROTTLE CABLE





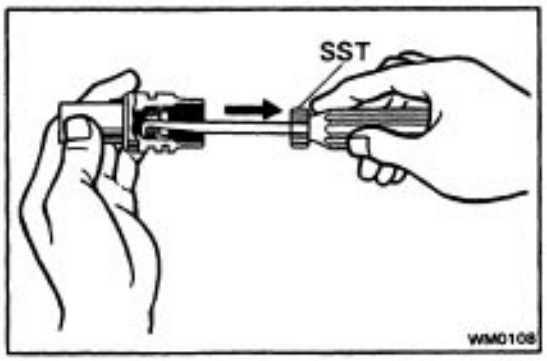
1. INSTALL CABLE INTO TRANSMISSION CASE
2. INSTALL VALVE BODY
3. IF THROTTLE CABLE IS NEW, STAKE STOPPER OR PAINT MARK ON INNER CABLE

   HINT: New cable do not have a cable stopper staked.

   (a) Bend the cable so there is a radius of about 200 mm(7.87 in.).

   (b) Pull the inner cable lightly until a slight resistance is felt, and hold it.

   (e) Stake the stopper, 0.8 – 1.5 mm (0.031 – 0.059 in.) from the end of outer cable.
4. CONNECT THROTTLE CABLE TO ENGINE
5. ADJUST THROTTLE CABLE (See page AT–201)
6. INSTALL AND ADJUST NEUTRAL START SWITCH
7. TEST DRIVE VEHICLE

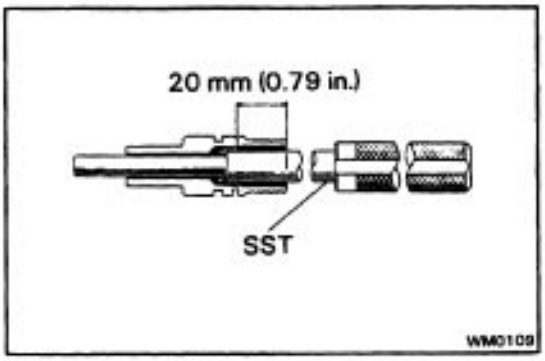


Speedometer Driven Gear Oil Seal

REPLACEMENT OF SPEEDOMETER DRIVEN GEAR OIL SEAL

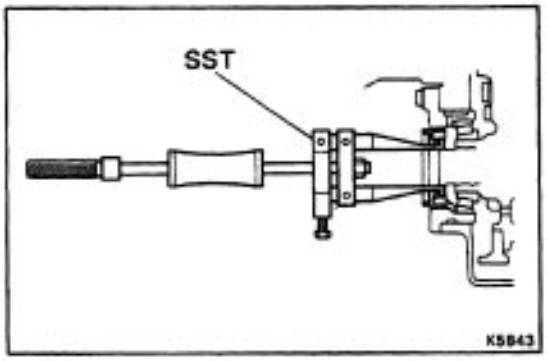
1. REMOVE SPEEDOMETER DRIVEN GEAR OIL SEAL

Using SST, pull out the oil seal.
SST 09921–00010



2. INSTALL SPEEDOMETER DRIVEN GEAR OIL SEAL

Using SST, drive in the oil seal.
SST 09201–60011
Drive in depth: 20 mm (0.79 in.)



Side Gear Shaft Oil Seal

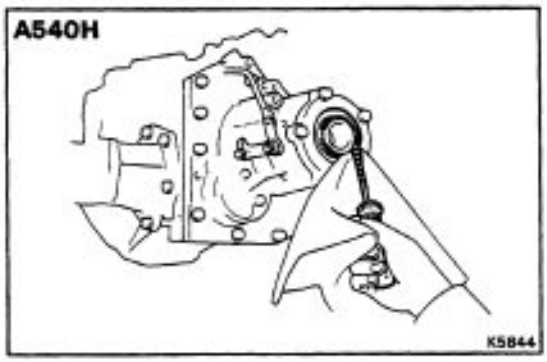
REPLACEMENT OF SIDE GEAR SHAFT OIL SEAL

1. REMOVE BOTH DRIVE SHAFTS

(See page FA–30 or FA–43)

2. REMOVE LEFT SIDE GEAR SHAFT OIL SEAL

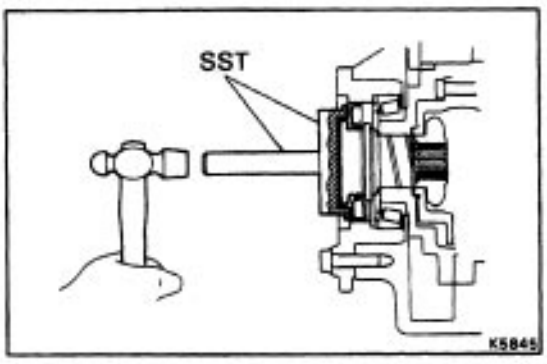
Using SST, pull out the oil seal.
SST 09308–00010



3. (A540H)

REMOVE RIGHT SIDE GEAR SHAFT OIL SEAL

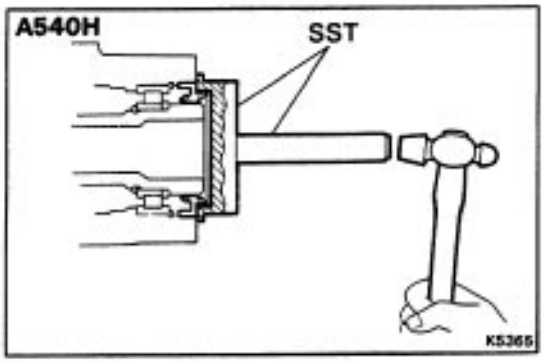
Using a screwdriver, remove the oil seal.



4. INSTALL LEFT SIDE GEAR SHAFT OIL SEAL

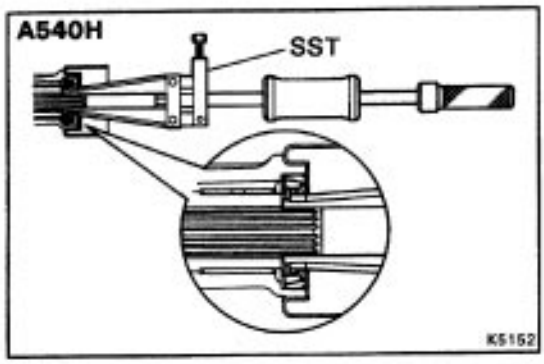
(1) Using SST, drive in a new oil seal.
SST 09608–30022 (09608–05010, 09608–32010)
Oil seal depth: 0 0.5 mm (0 0.02 in.)

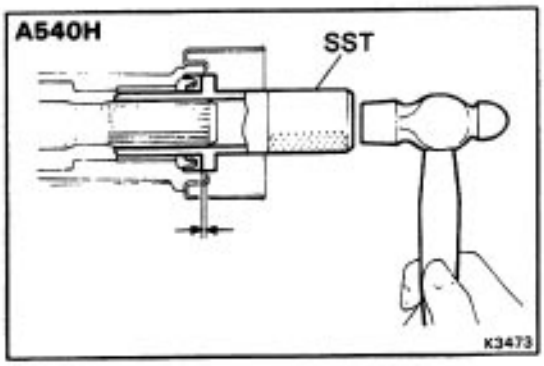
(2) Coat the lip of oil seal with MP grease.



5. (A540H)
INSTALL RIGHT SIDE GEAR SHAFT OIL SEAL
(1) Coat the lip of oil seal with MP grease.
(2) Using SST, drive in a new oil seal.
SST 09608–30022 (09608–05010, 09608–32010)
Oil seal depth: 0 0.3 mm (0.012 in.)

6. INSTALL BOTH DRIVE SHAFTS
(See page FA–39 **or** FA–50**) .**
7. CHECK TRANSAXLE FLUID LEVEL (See page AT–199**)**





Extension Housing Oil Seal (A540H)

REPLACEMENT OF EXTENSION HOUSING OIL SEAL

1. DRAIN TRANSFER OIL
2. REMOVE PROPELLER SHAFT (See page PR–4**)**
3. REMOVE EXTENSION HOUSING OIL SEAL
Using SST, remove the oil seal.
SST 09308–00010
4. INSTALL EXTENSION HOUSING OIL SEAL
(a) Coat the lip of oil seal with MP grease.
(b) Using SST, drive in a new oil seal.
SST 09325–20010
5. INSTALL PROPELLER SHAFT (See page PR–10**)**
6. FILL TRANSFER OIL (See page AT–200**)**

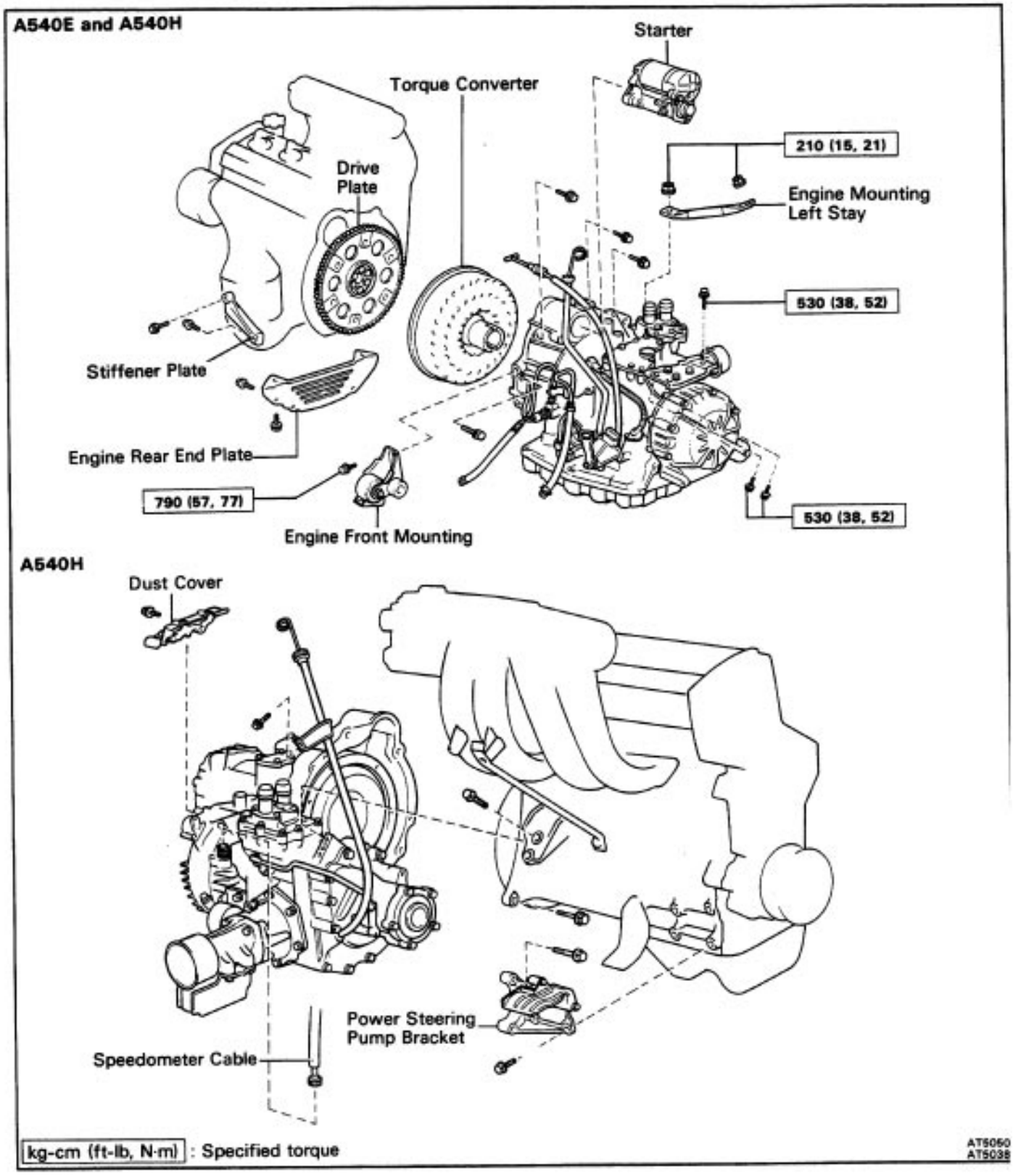
REMOVAL AND INSTALLATION OF TRANSAXLE (A540E and A540H)

REMOVAL AND INSTALLATION OF ENGINE

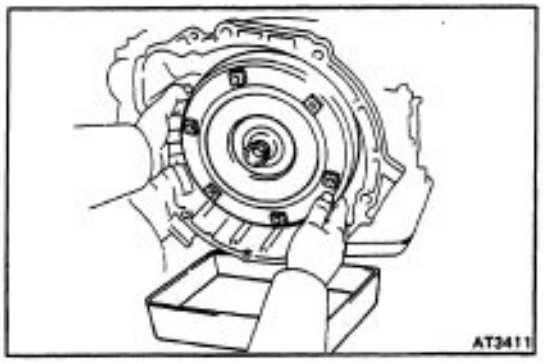
(3S–FE: See pages EM–106 and EM–t30, 2VZ–FE: EM–138 and EM–165)

REMOVAL AND INSTALLATION OF TRANSAXLE

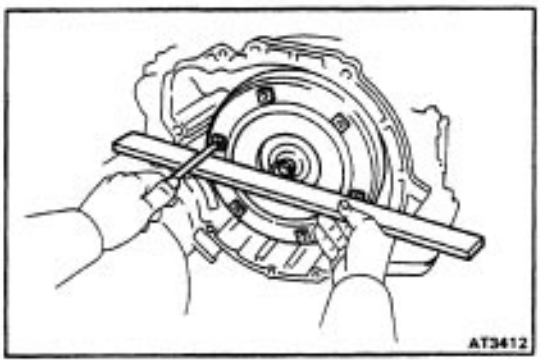
(Remove and install transaxle as shown)



(MAIN POINT OF INSTALLATION)



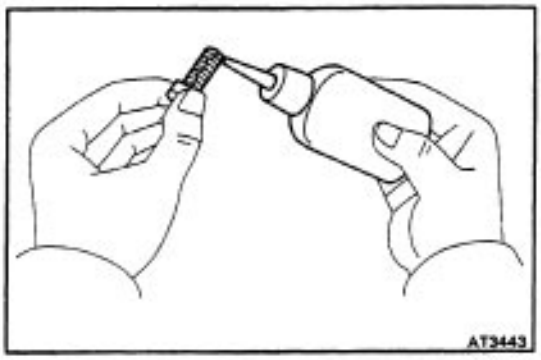
1. INSTALL TORQUE CONVERTER IN TRANSAXLE



2. CHECK TORQUE CONVERTER INSTALLATION

Using a scale and a straight edge, measure from the installed surface to the front surface of the transaxle housing.

Correct distance: 23.0 mm I0.906 in.) or more



3. INSTALL TORQUE CONVERTER MOUNTING BOLTS

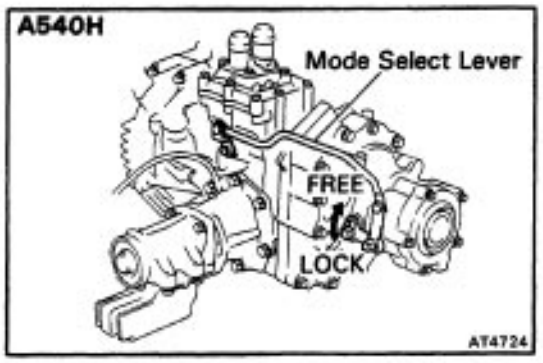
(a) Clean the threads of the bolts with the gasoline.

(b) Coat the threads of the bolts with sealer.

Sealer: Part No. 08833–00070, THREE BOND 1324 or equivalent.

(c) Tighten the bolts evenly.

Torque: 280 kg–cm (20 ft–lb, 27 N–m)



4. (A540H, Transfer)

INSPECT MODE SELECT LEVER POSITION

After finishing inspection or repair the transaxle, be sure the mode select lever position to FREE mode and attach the lock bolt.

COMPONENT PARTS
General Notes

The instructions here are organized so that you work on only one component group at a time. This will help avoid confusion from similar–looking parts of different subassemblies being on your workbench at the same time.

The component groups are inspected and repaired from the converter housing side.

As much as possible, complete the inspection, repair and assembly before proceeding to the next component group. If a component group can not be assembled because parts are being ordered, be sure to

keep all parts of that group in a separate container while proceeding with disassembly, inspection, repair and assembly of other component groups.

Recommended fluid for the automatic transaxle: A540E ATF DEXRON©II

A540H ATF Type T or equivalent

Recommended oil for the transfer: Transaxle oil E50, API GL5, SAE 75W–90 or equivalent

GENERAL CLEANING NOTES:

1. All disassembled parts should be washed clean, with any fluid passages and holes blown through with compressed air.
2. When using compressed air to dry parts, always aim away from yourself to prevent accidentally spraying automatic transaxle fluid or kerosene in your face.
3. The recommended automatic transaxle fluid or kerosene should be used for cleaning.

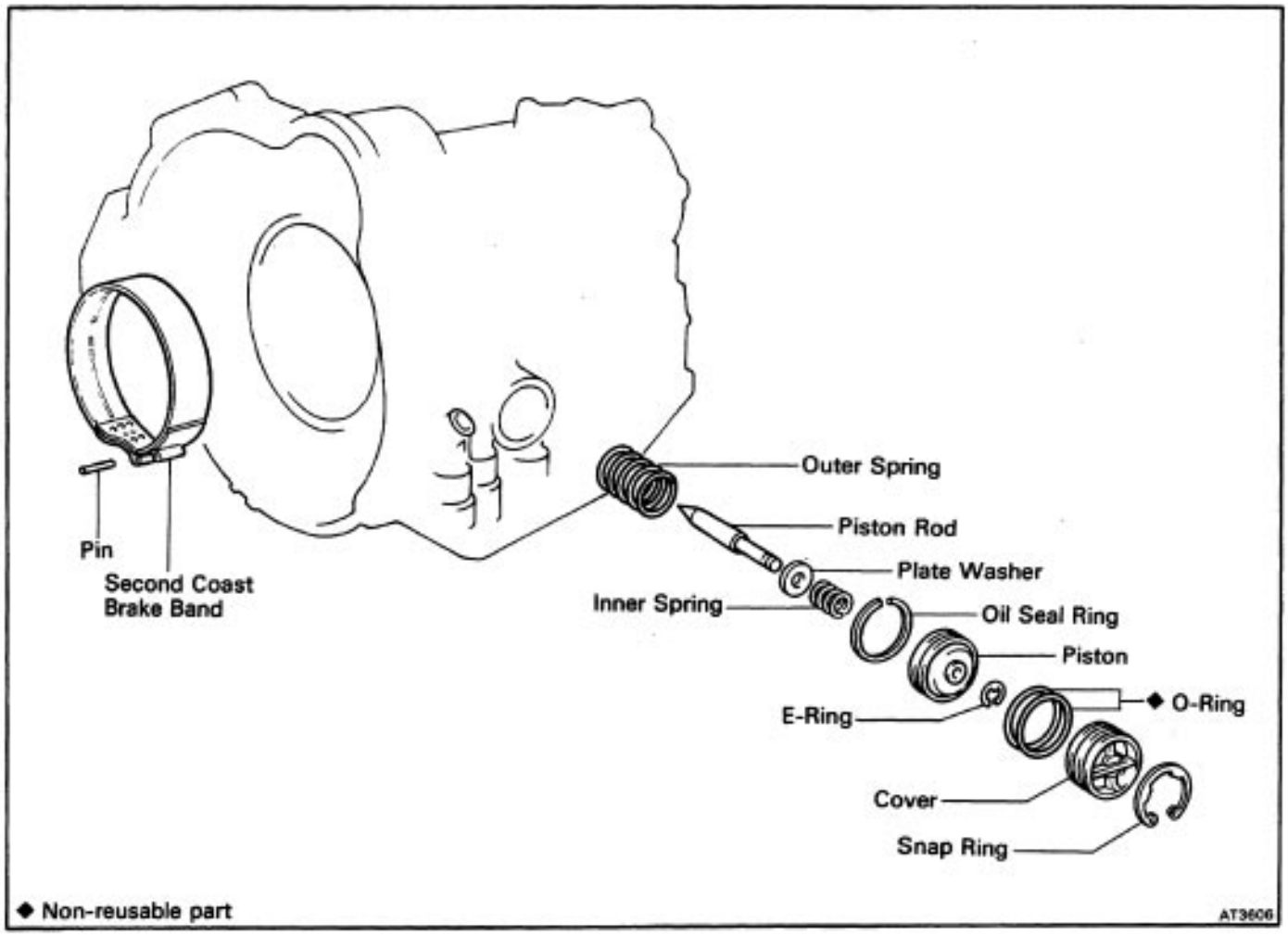
PARTS ARRANGEMENT:

1. After cleaning, the parts should be arranged in proper order to allow efficient inspection, repairs, and reassembly.
2. When disassembling a valve body, be sure to keep each valve together with the corresponding spring.
3. New brakes and clutches that are to be used for replacement must be soaked in transaxle fluid for at least fifteen minutes before assembly.

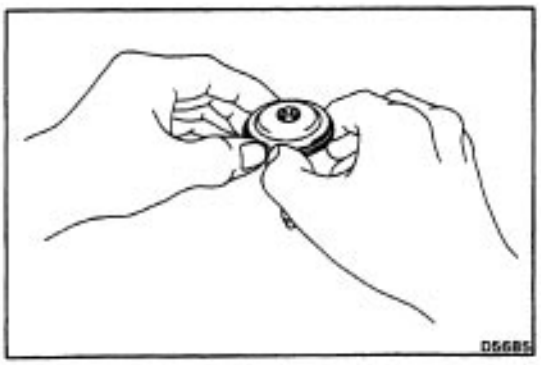
GENERAL ASSEMBLY:

1. All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with transmission fluid prior to reassembly.
2. All gaskets and rubber O–rings should be replaced.
3. Make sure that the ends of a snap ring are not aligned with one of the cutouts and are installed in the groove correctly.
4. If a worn bushing is to be replaced, the subassembly containing that bushing must be replaced.
5. Check thrust bearings and races for wear or damage. Replace if necessary.
6. Use petroleum jelly to keep parts in place.

COMPONENT PARTS
Second Coast Brake

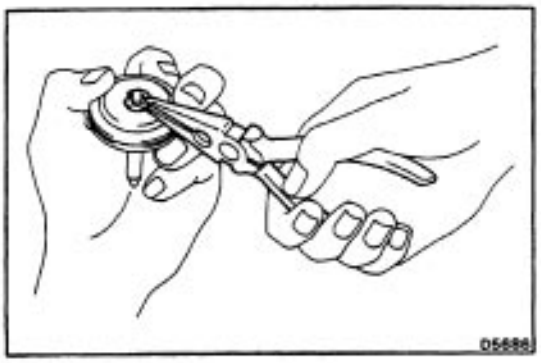


DISASSEMBLY OF SECOND COAST BRAKE PISTON



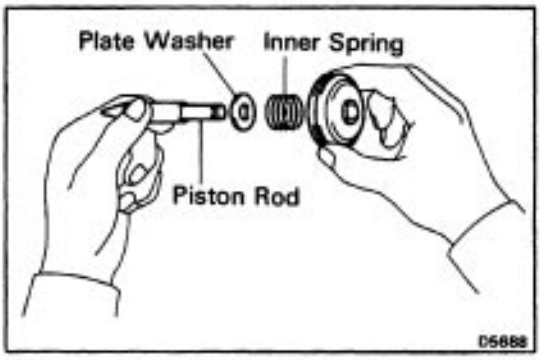
1. REMOVE OIL SEAL RING

Remove the oil seal ring from the piston.

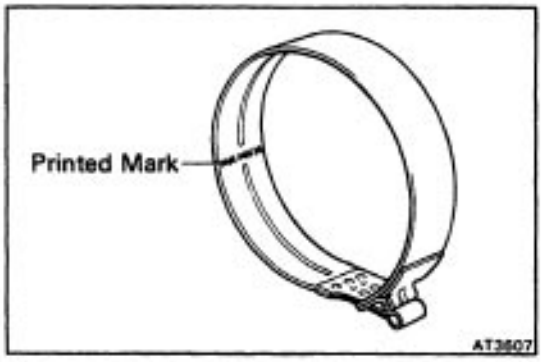


2. REMOVE PISTON ROD

(a) Remove the E–ring while pushing the piston with needle–nose pliers.



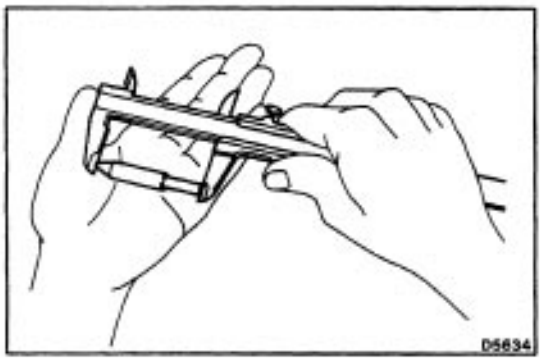
(b) Remove the inner spring, plate washer and piston rod.



INSPECTION OF SECOND COAST BRAKE COMPONENT

If the lining of the brake band is exfoliated or discolored,

or even part of the printed marks is defaced, replace the brake band.



ASSEMBLY OF SECOND COAST BRAKE PISTON

1. SELECT PISTON ROD

If the band is OK but piston stroke not within the standard value, select the piston rod.

Piston stroke: 2.0 – 3.5 mm (0.079 – 0.138 in.)

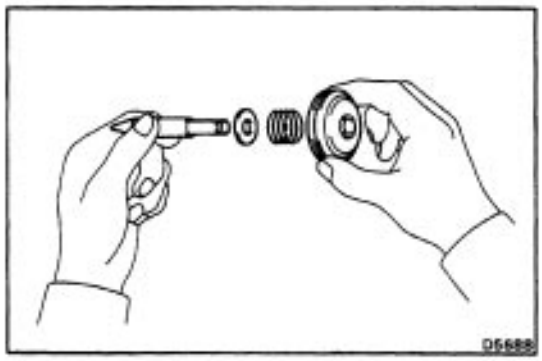
There are two lengths of piston rod.

Piston rod length: 95.2 mm l3.748 in.)

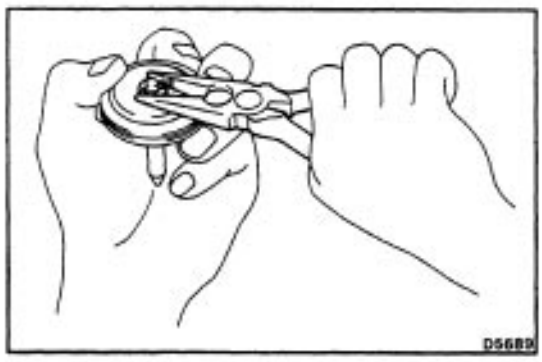
96.3 mm (3.791 in.)

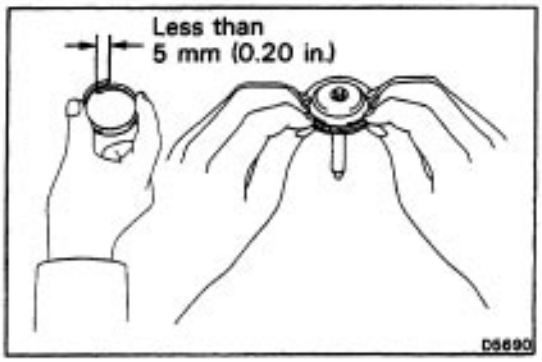
2. INSTALL PISTON ROD

(a) Install the plate washer and inner spring to the piston rod.



(b) Install the E–ring while pushing the piston.





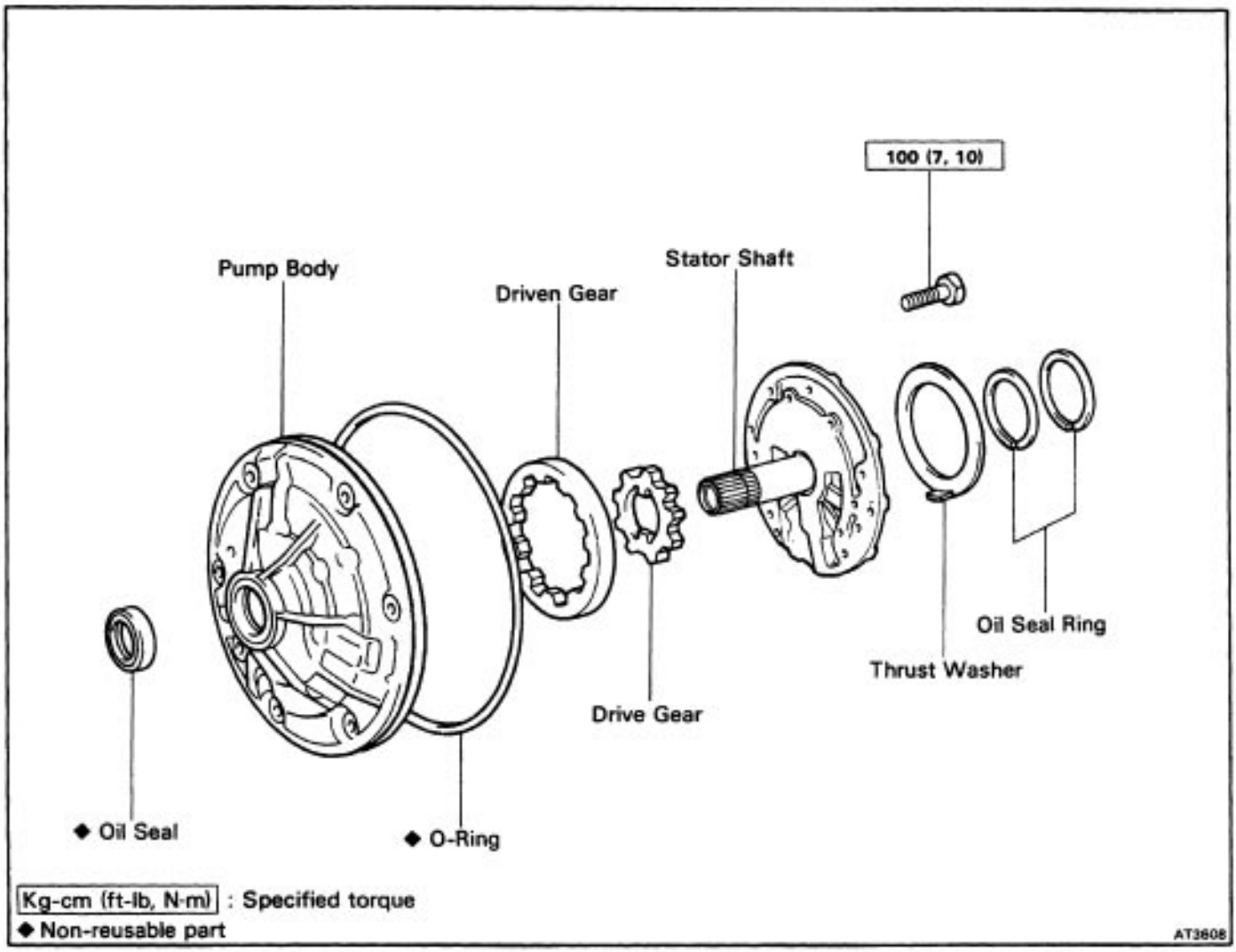
3. INSTALL OIL SEAL RING

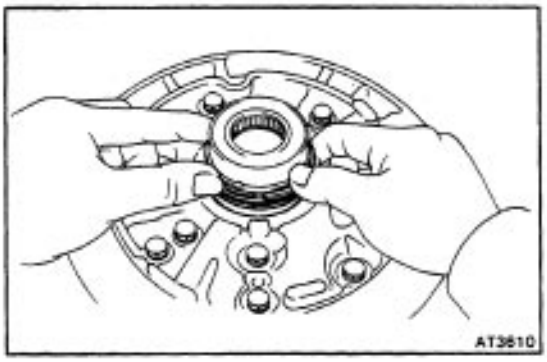
(a) Apply ATF to the oil seal ring.

(b) Install the oil seal ring to the piston.

NOTICE: Do not spread the ring ends more than necessary.

Oil Pump

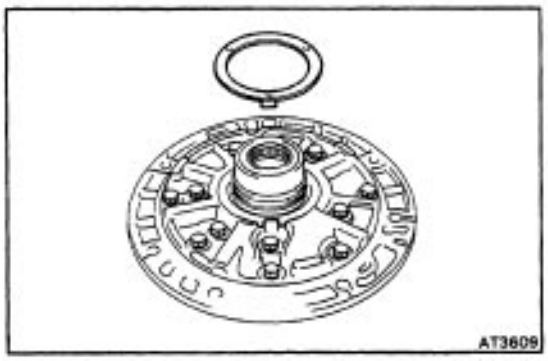




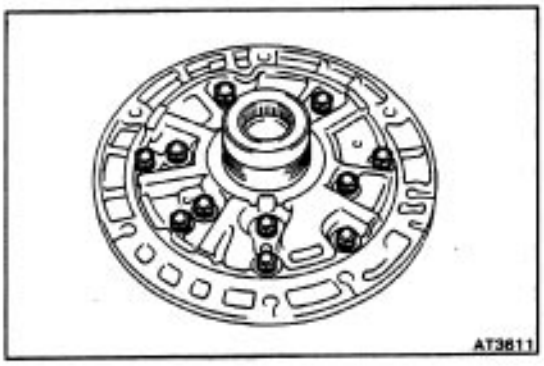
DISASSEMBLY OF OIL PUMP

1. REMOVE OIL SEAL RINGS

Remove the two oil seal rings from the stator shaft back side.



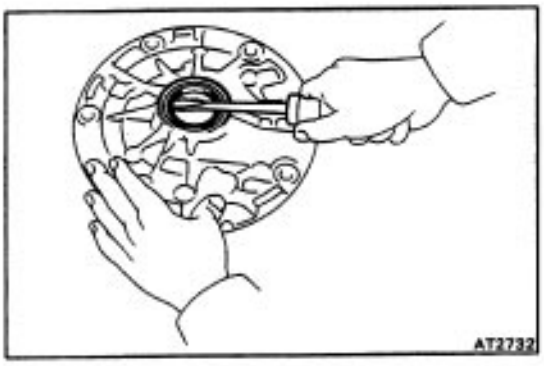
2. REMOVE THRUST WASHER FROM STATOR SHAFT BACK SIDE



3. REMOVE STATOR SHAFT

Remove the eleven bolts and stator shaft.

HINT: Keep the gears in assembly order.



4. REMOVE FRONT OIL SEAL

Pry off the oil seal with a screwdriver.

INSPECTION OF OIL PUMP

1. CHECK BODY CLEARANCE OF DRIVEN GEAR

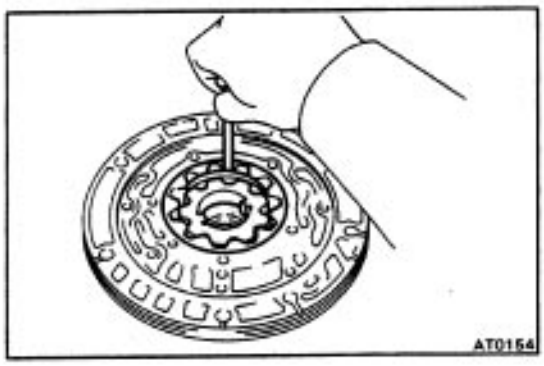
Push the driven gear to one side of the body.

Using a feeler gauge, measure the clearance.

Standard body clearance: 0.07 – 0.15 mm (0.0028 – 0.0059 in.)

Maximum body clearance: 0.3 mm (0.012 in.)

If the body clearance is greater than the maximum, replace the oil pump body subassembly.



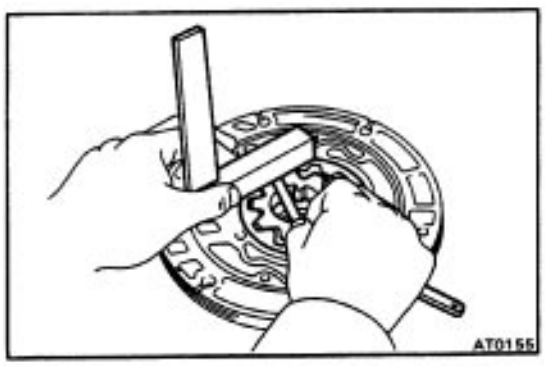
2. CHECK TIP CLEARANCE OF DRIVEN GEAR

Measure between the driven gear teeth and the crescent shaped part of the pump body.

Standard tip clearance: 0.11 – 0.14 mm (0.0043 – 0.0055 in.)

Maximum tip clearance: 0.3 mm (0.012 in.)

If the tip clearance is greater than the maximum, replace the oil pump body subassembly.



3. CHECK SIDE CLEARANCE OF BOTH GEARS

Using a steel straightedge and a feeler gauge, measure the side clearance of both gears.

Standard side clearance: 0.002 – 0.005 mm (0.0008 – 0.0020 in.)

Maximum side clearance: 0.1 mm (0.004 in.)

There are three different thicknesses for drive and driven gears.
Drive and driven gear thickness

Mark Thickness

A 9.440 – 9.456 mm (0.3717 – 0.3723 in.)

B 9.456 – 9.474 mm (0.3723 – 0.3730 in.)

C 9.474 – 9.490 mm (0.3730 – 0.3736 in.)

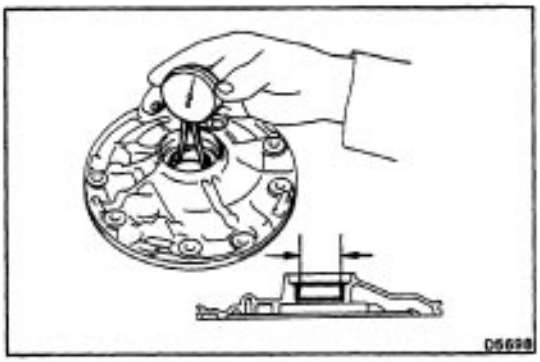
If the thickest gear can not make the side clearance within standard specification, replace the oil pump body subassembly.

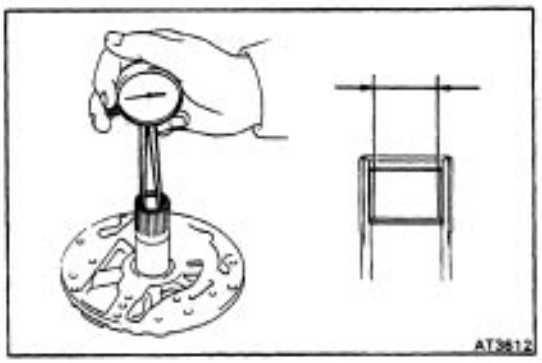
4. CHECK OIL PUMP BODY BUSHING

Using a dial indicator, measure the inside diameter of the oil pump body bushing.

Maximum inside diameter: 38.18 mm (1.5031 in.)

If the inside diameter is greater than the maximum, replace the oil pump body subassembly.





5. CHECK STATOR SHAFT BUSHING

Using a dial indicator, measure the inside diameter stator shaft bushing.

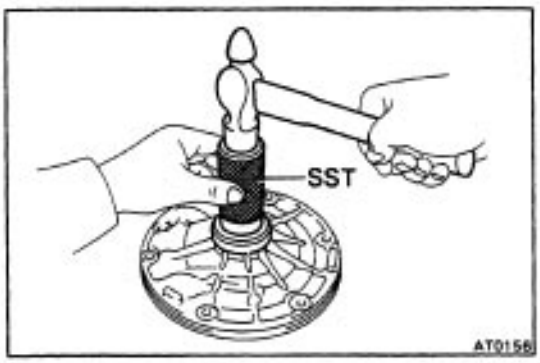
Maximum inside diameter: 21.57 mm (0.8492 in.)

If the inside diameter is greater than the maximum, replace the stator shaft.

ASSEMBLY OF OIL PUMP

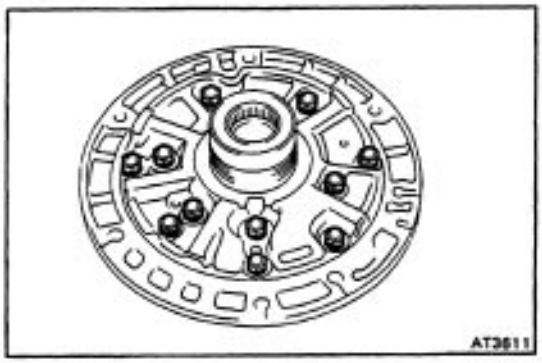
1. INSTALL FRONT OIL SEAL

Using SST and a hammer, install a new oil seal. The sea end should be flush with the outer edge of the pump body
SST 09350–32014 (09351–32140)



Z. INSTALL DRIVEN GEAR AND DRIVE GEAR

Make sure the top of the gears are facing upward.

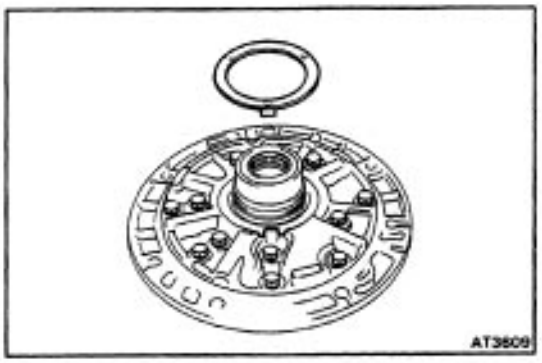


3. INSTALL STATOR SHAFT TO PUMP BODY

(a) Align the stator shaft with each bolt hole.

(b) Torque the eleven bolts.

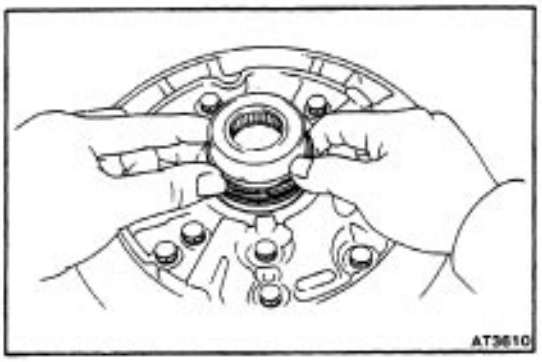
Torque: 100 kg–cm (7 ft–lb, 10 N–m)



4. INSTALL THRUST WASHER

(a) Coat the thrust washer with petroleum jelly.

(b) Align the tab of the washer with the hollow of the pump body.

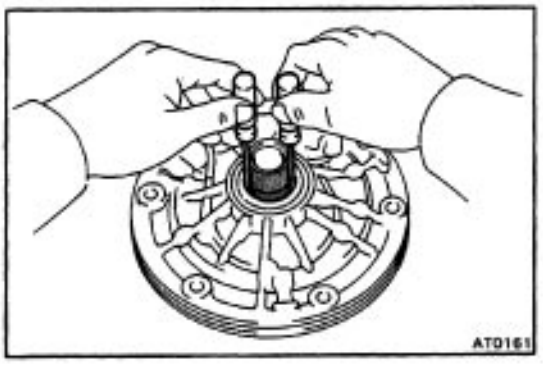


5. INSTALL OIL SEAL RINGS

Install the two oil seal rings to the stator shaft back side.

NOTICE: Do not spread the ring ends more than necessary.

HINT: After installing the oil seal rings, check that they move smoothly.

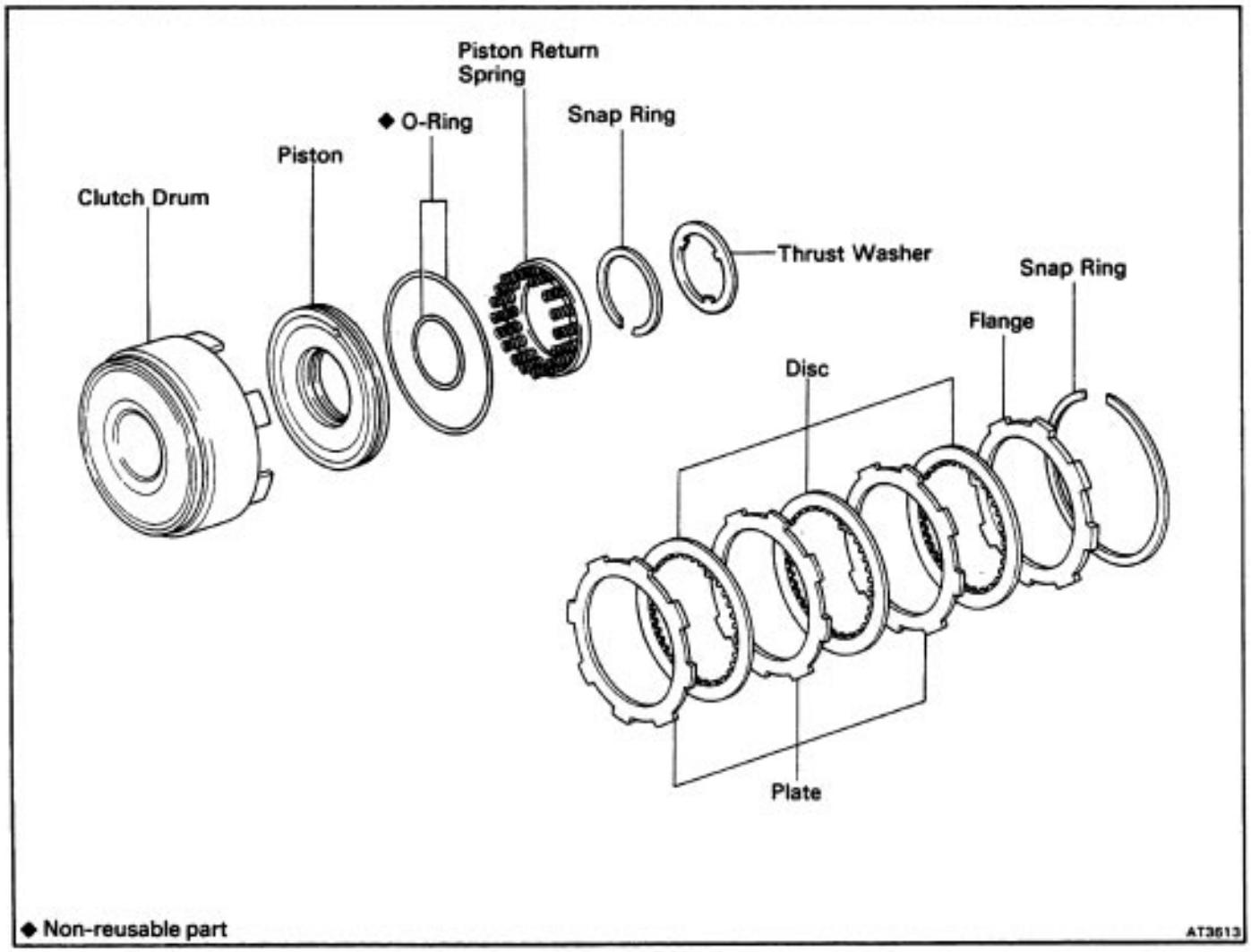


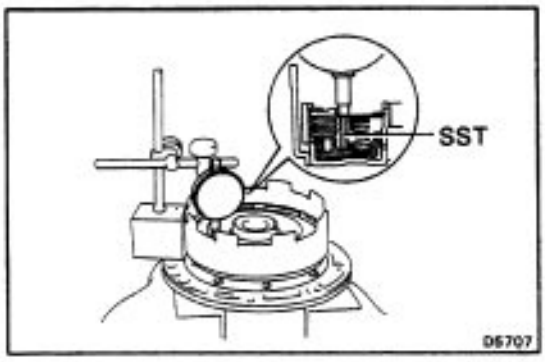
6. CHECK PUMP DRIVE GEAR ROTATION

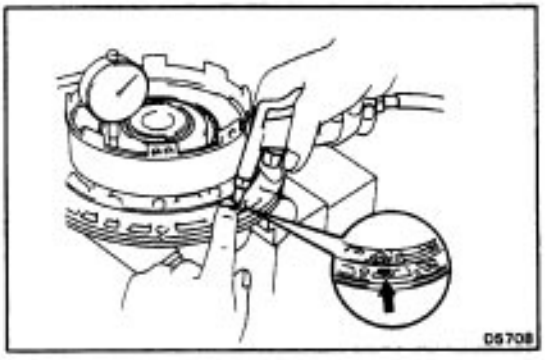
Turn the drive gear with two screwdrivers and make sure it rotates smoothly.

NOTICE: Be careful not to damage the oil seal lip.

Direct Clutch







DISASSEMBLY OF DIRECT CLUTCH

1. CHECK PISTON STROKE OF DIRECT CLUTCH

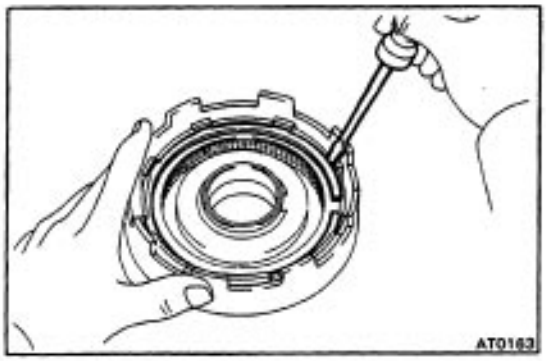
(a) Install the direct clutch on the oil pump.

(b) Using a dial indicator (long type pick or SST), measure the direct clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi, 392 – 785 kPa) as shown.

SST 09350–32014 (09351–32190)

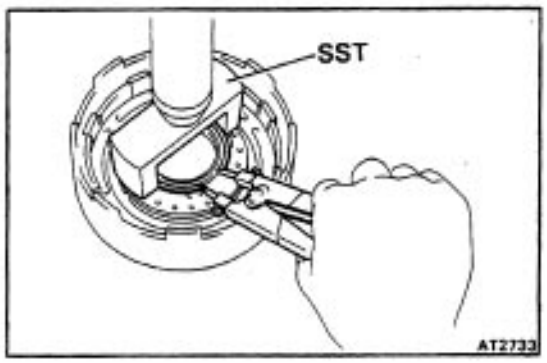
Piston stroke: A540E 0.91 – 1.35 mm
(0.0358 – 0.0531 in.)
A540H 1.11 – 1.47 mm
(0.0437 – 0.0579 in.)

If the piston stroke is greater than the maximum, inspect each component.



2. REMOVE SNAP RING FROM CLUTCH DRUM

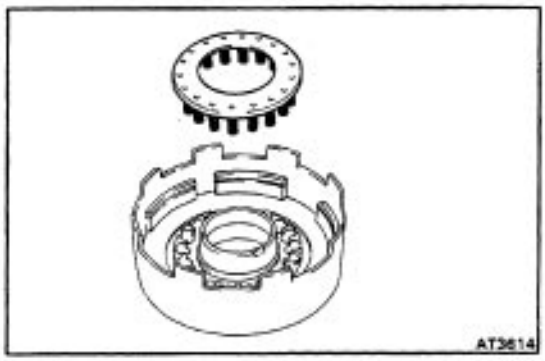
3. REMOVE FLANGE, DISCS AND PLATES



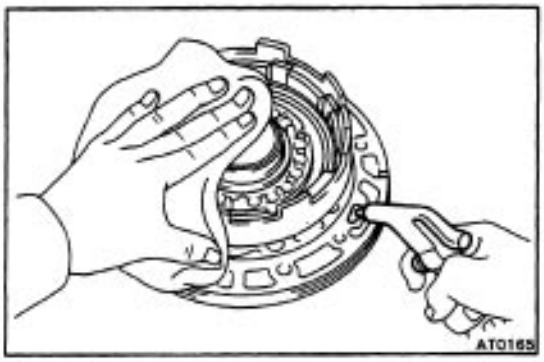
4. REMOVE PISTON RETURN SPRING

(a) Place SST on the spring retainer and compress the springs with a shop press.
SST 09350–32014 (09351–32070)

(b) Remove the snap ring with snap ring pliers.



(e) Remove the piston return spring.

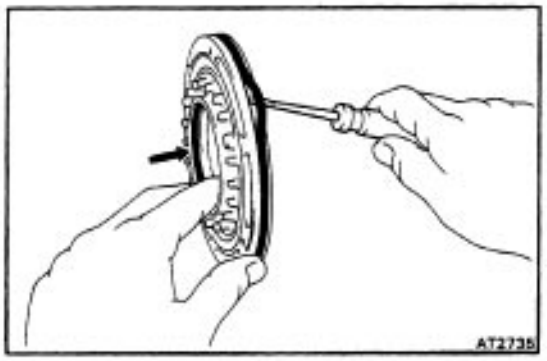


5.REMOVE CLUTCH PISTON

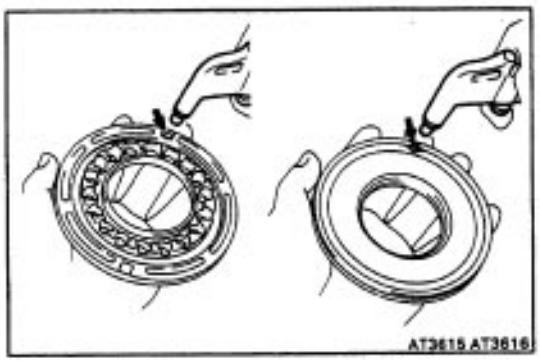
(a) Install the direct clutch onto the oil pump.

(b) Apply compressed air to the oil pump to remove the piston. (If the piston does not come out completely, use needle–nose pliers to remove it.)

(c) Remove the direct clutch from the oil pump.



(d) Remove the two O–rings from the piston.

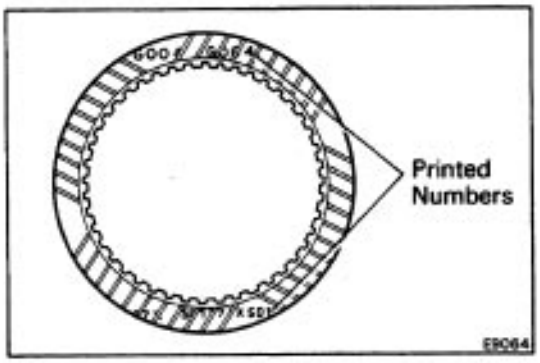


INSPECTION OF DIRECT CLUTCH

1. INSPECT CLUTCH PISTON

(a) Check that the check ball is free by shaking the piston.

(b) Check that the valve does not leak by applying low pressure compressed air.

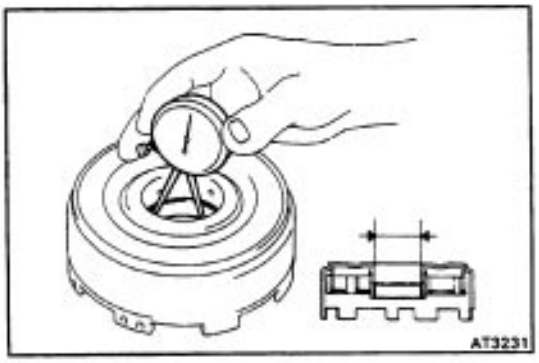


2. INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates and flange are worn or burnt If necessary, replace them.

HINT:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.

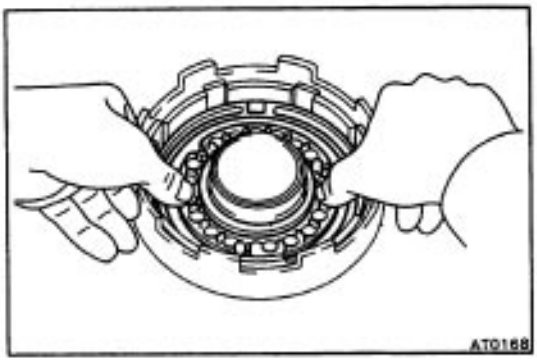


3. CHECK DIRECT CLUTCH BUSHING

Using a dial indicator, measure the inside diameter of the direct clutch bushing.

Maximum inside diameter: 48.27 mm (1.9004 in.)

If the inside diameter is greater than the maximum, replace the direct clutch.

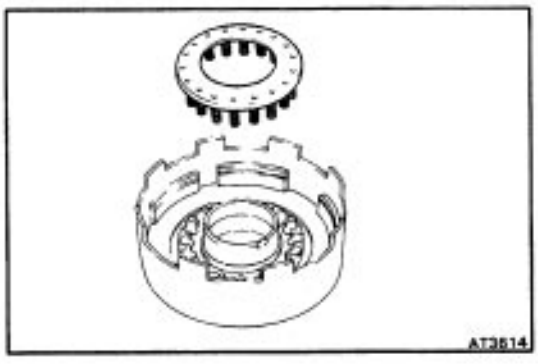


ASSEMBLY OF DIRECT CLUTCH

1. INSTALL CLUTCH PISTON IN DIRECT CLUTCH DRUM

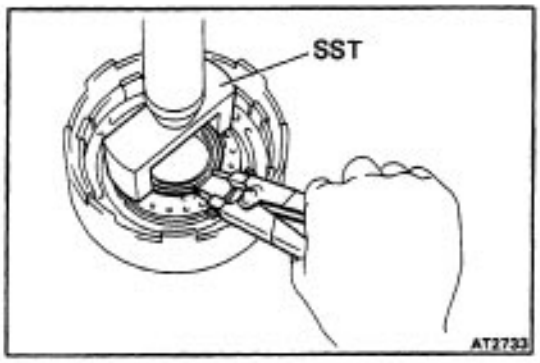
(a) Install new O–rings to the piston. Coat the O–ring: with ATF.

(b) Being careful not to damage the O–rings, press the piston into the drum with the cup side up.



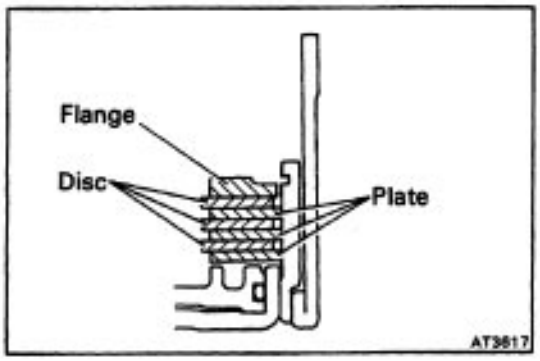
2. INSTALL PISTON RETURN SPRING

(a) Place the return spring and snap ring onto the piston



(b) Place SST on the spring retainer, and compress the return spring with a shop press.
SST 09350–32014 (09351–32070)

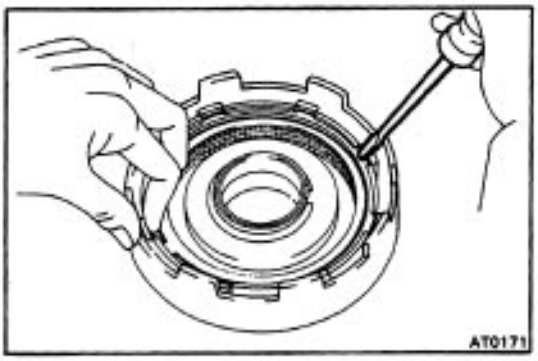
(c) Install the snap ring using snap ring pliers. Be sure the end gap of snap ring is not aligned with the spring retainer claw.



3. INSTALL PLATES, DISCS AND FLANGE

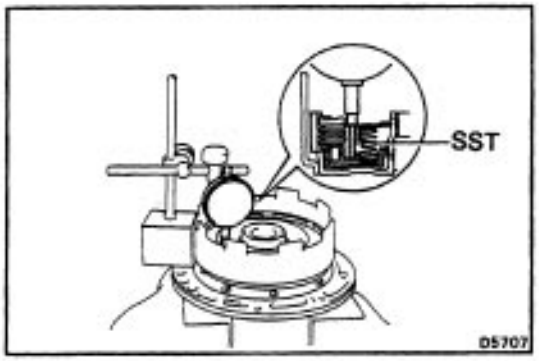
(a) Install plates and discs.
Install in order: P=Plate D=Disc
P–D–P–D–P–D

(b) Install the flange with the flat end facing downward.



4. INSTALL SNAP RING

Check that the end gap of the snap ring is not aligned with one of the cutouts.



5. RECHECK PISTON STROKE OF DIRECT CLUTCH

(a) Install the direct clutch on the oil pump.

(b) Using a dial indicator (long type pick or SST), measure the direct clutch piston stroke applying and releasing the compressed air (4 – 8 kg/Cm2, 57 – 114 psi, 392 – 785 kPa) as shown.

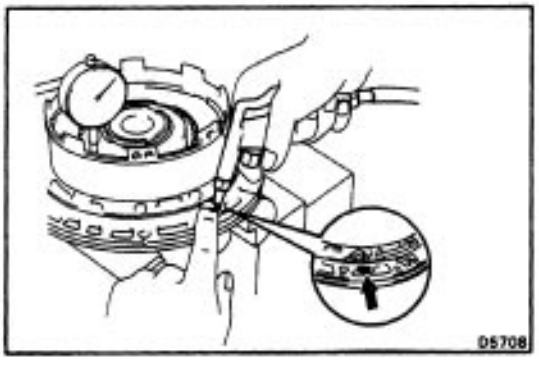
SST 09350–32014 (09351–32190)

Piston stroke: A540E 0.91 – 1.35 mm
(0.0358 – 0.0531 in.)
A540H 1.11 – 1.47 mm
(0.0437 – 0.0579 in.)

If the piston stroke is nonstandard, select another flange.

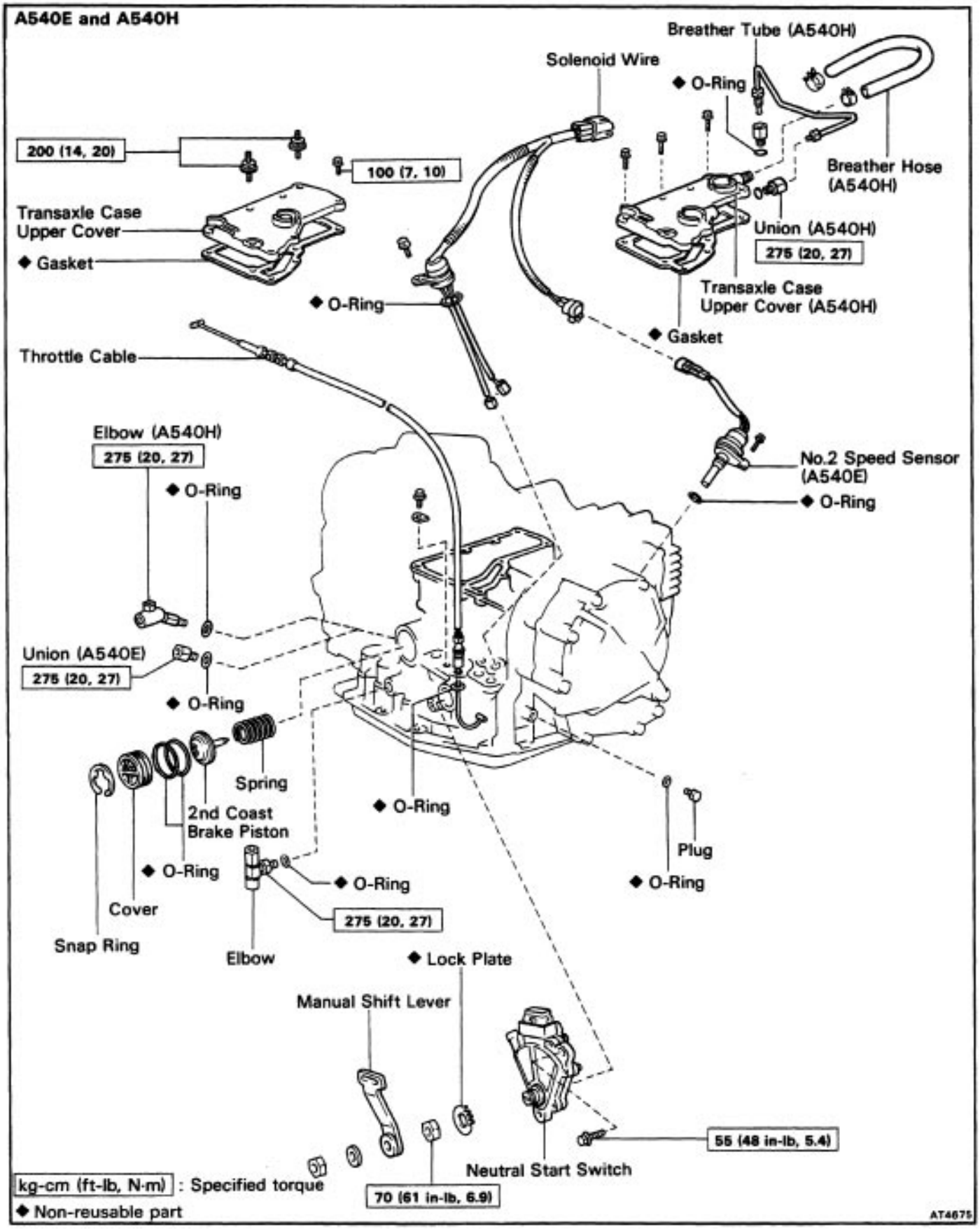
HINT: There are two different thicknesses for the flange.

Flange thickness: 2.70 mm (0.1063 in.)
3.00 mm (0.1181 in.)

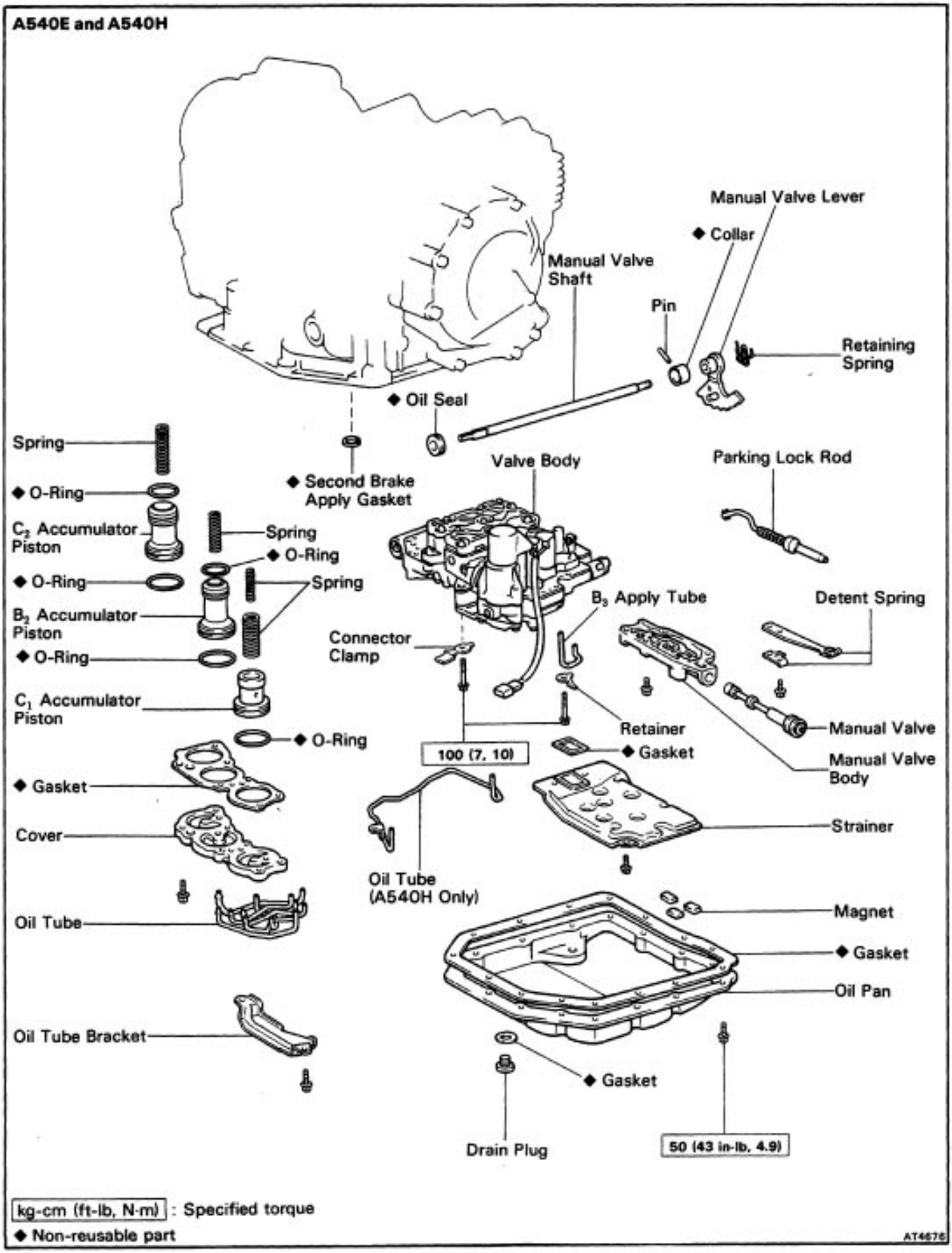


REMOVAL OF COMPONENT PARTS (A540E and A540H)

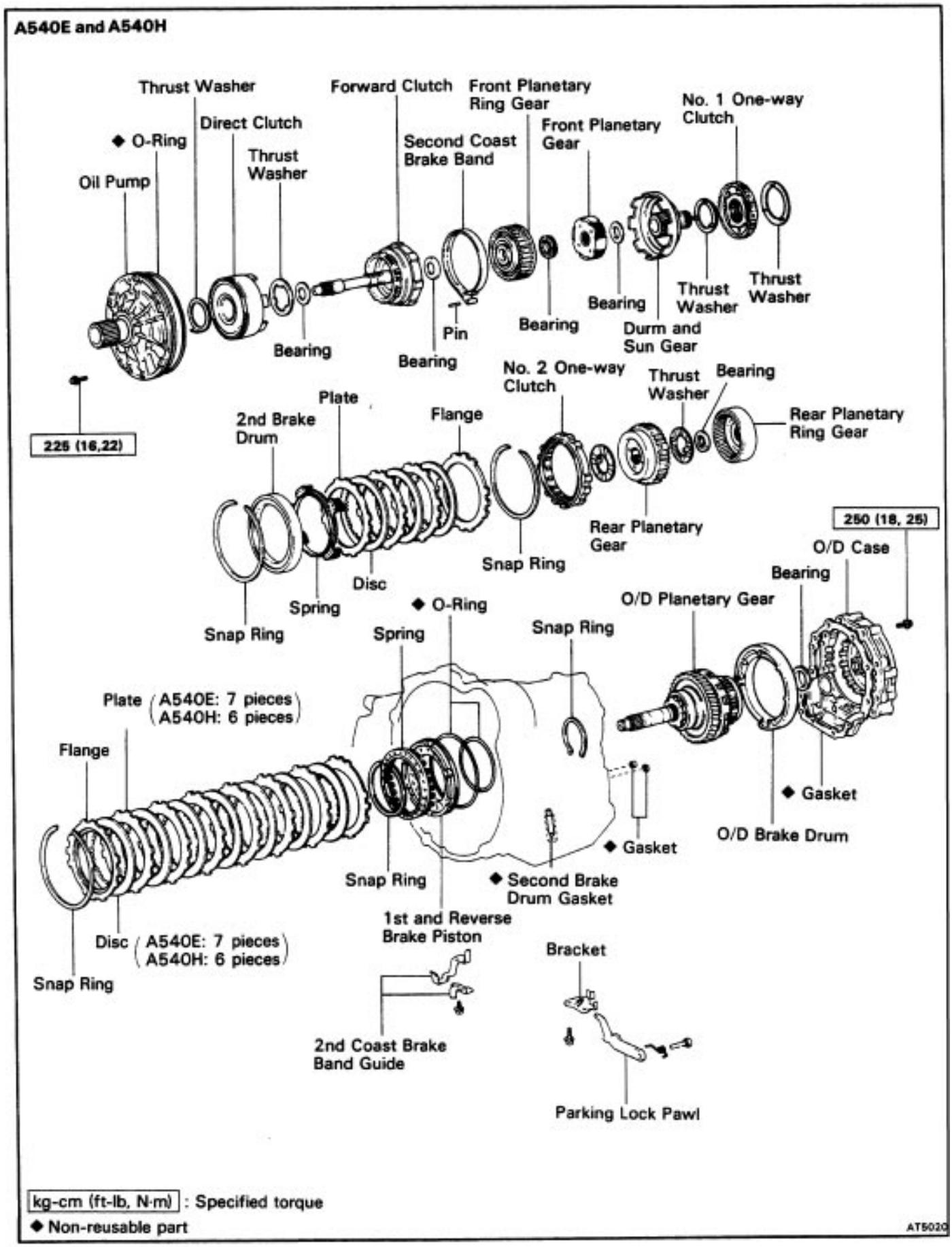
COMPONENTS



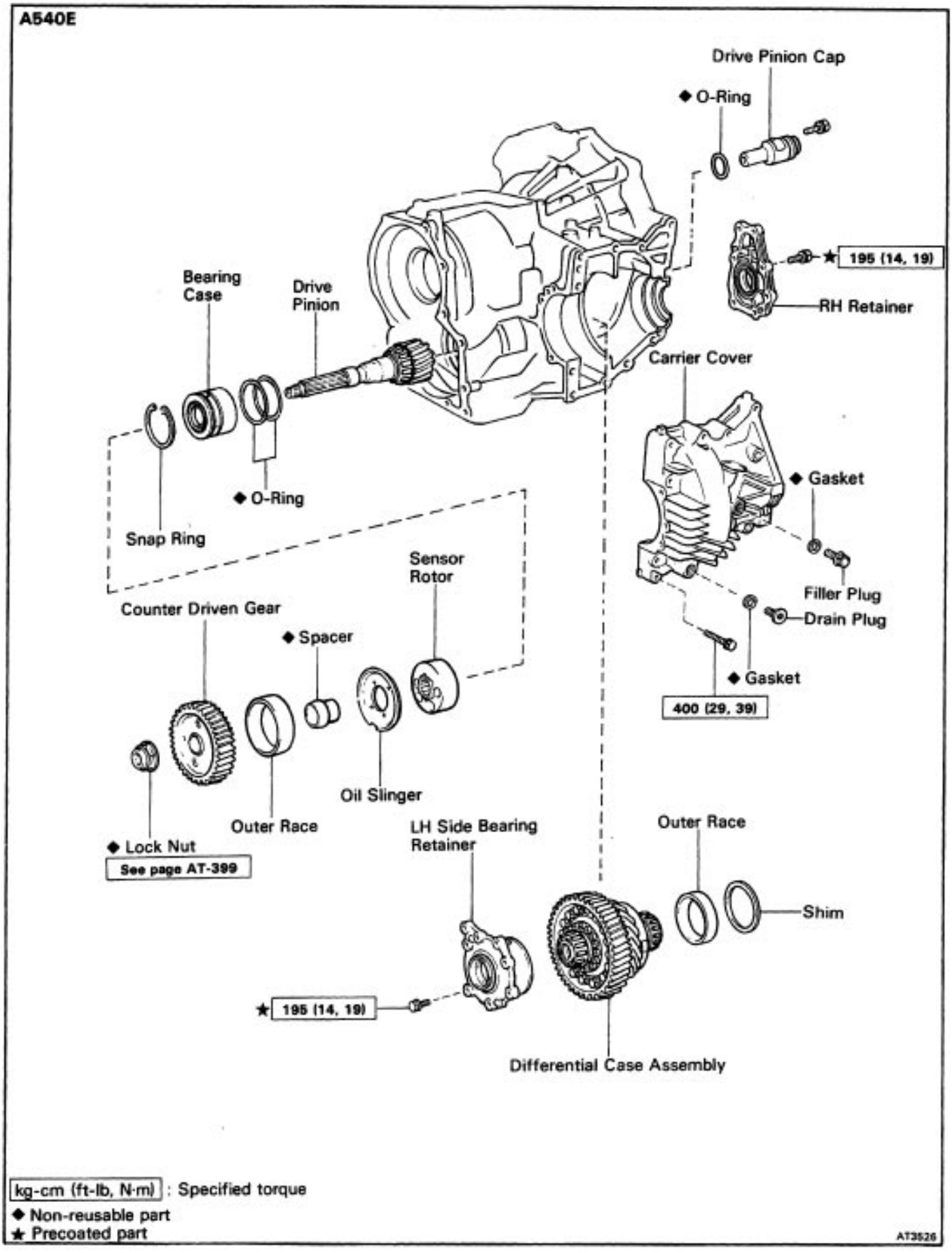
COMPONENTS (Cont'd)



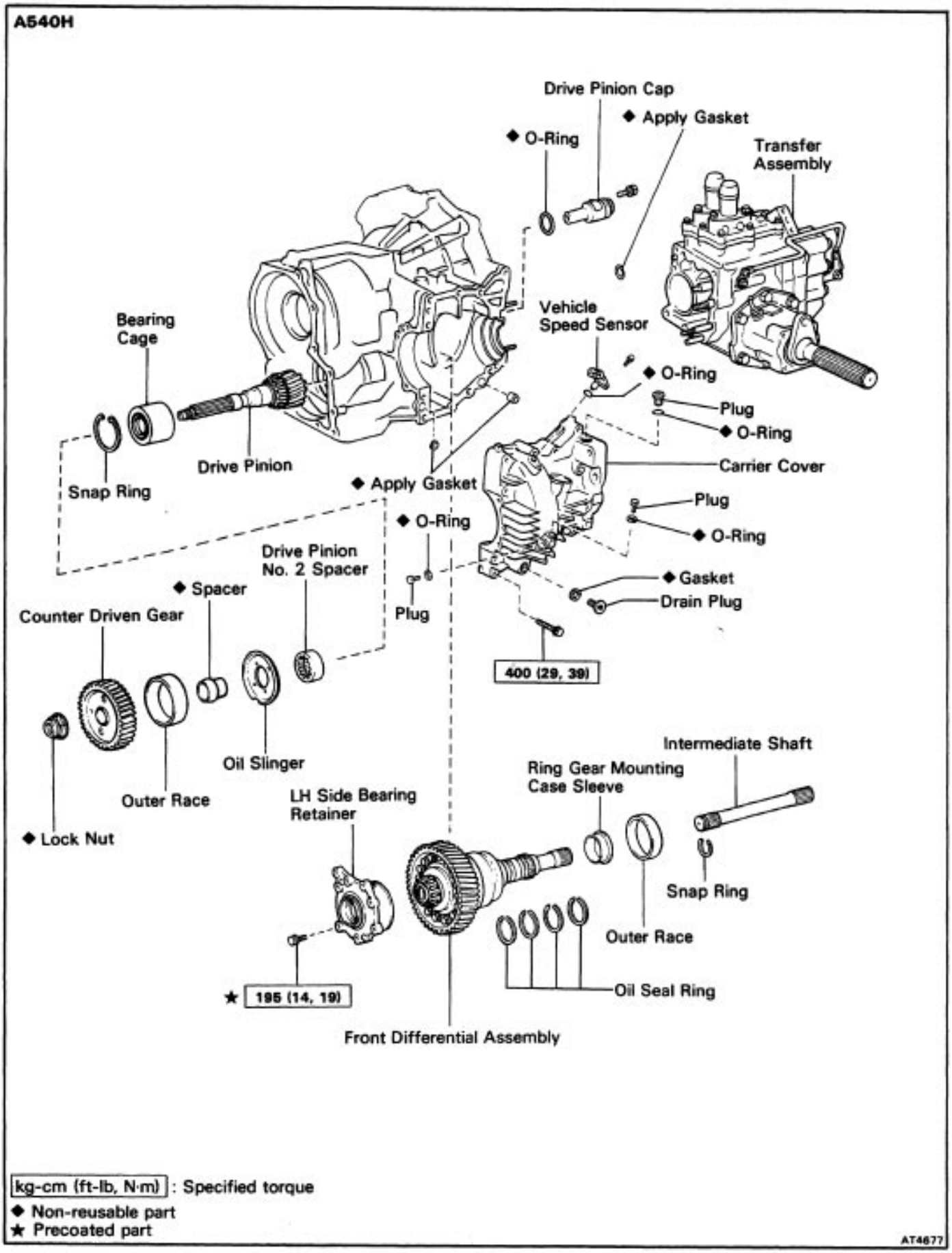
COMPONENTS (Cont'd)

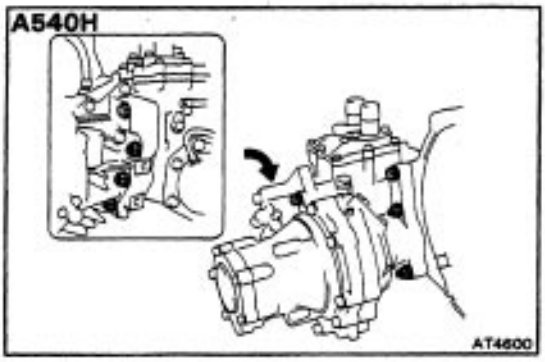


COMPONENTS (Cont'd)



COMPONENTS (Cont'd)





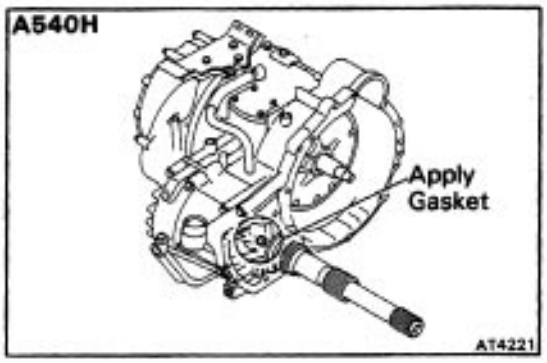
SEPARATE BASIC SUBASSEMBLY

1. (A540H)

REMOVE TRANSFER ASSEMBLY

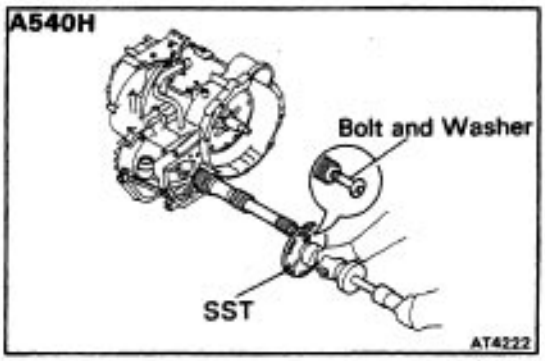
(a) Remove the five nuts and three bolts.

(b) Using a plastic hammer, remove the transfer assembly form the transaxle.



2. (A540H)

REMOVE APPLY GASKET

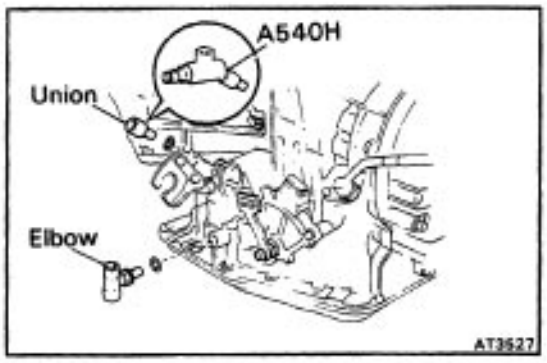


3. (A540H)

REMOVE DIFFERENTIAL SIDE GEAR INTERMEDIATE SHAFT

(a) Screw in suitable bolt with washer into the side gear intermediate shaft.

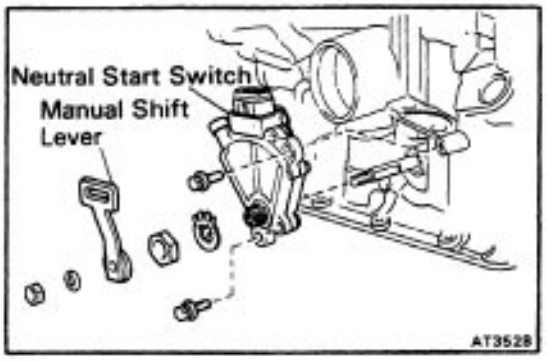
(b) Using SST, remove the side gear intermediate shaft.
SST 09520–32012



4. REMOVE UNION AND ELBOW

(a) Using an open end wrench, remove the union and elbow.

(b) Remove the O–rings from the union and elbow.

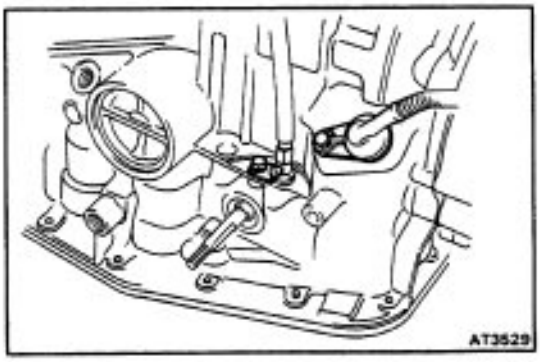


5. REMOVE NEUTRAL START SWITCH

(a) Remove the manual shift lever.

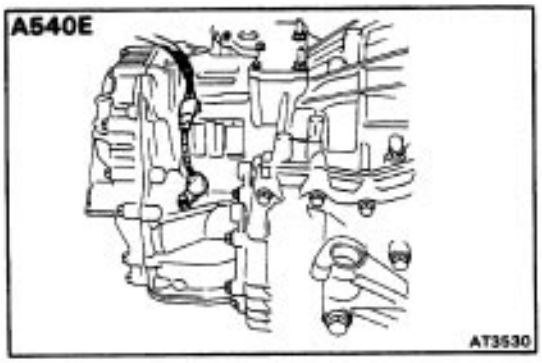
(b) Pry off the lock washer and remove the manual valve shaft nut.

(c) Remove the two bolts and pull out the neutral start switch.



6. REMOVE THROTTLE CABLE RETAINING BOLT AND PLATE

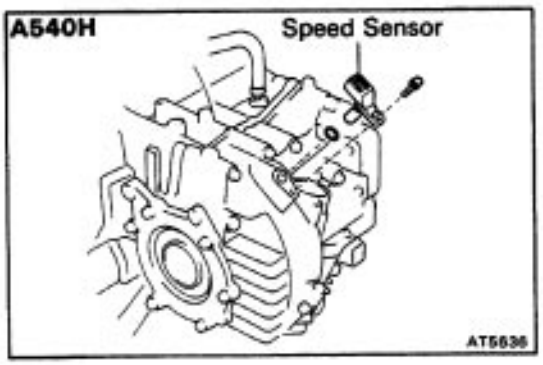
7. . REMOVE SOLENOID WIRE RETAINING BOLT



8. (A540E)

REMOVE NO. 2 SPEED SENSOR

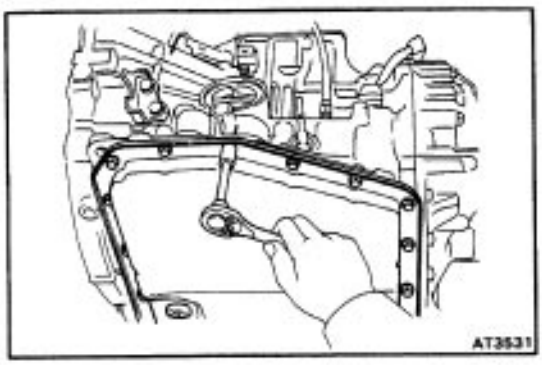
(a) Disconnect the connector.
(b) Remove the bolt and pull out the speed sensor.
(c) Remove the O–ring from speed sensor.



9. (A540H)

REMOVE VEHICLE SPEED SENSOR

(a) Remove the bolt and pull out the speed sensor.
(b) Remove the O–ring from speed sensor.

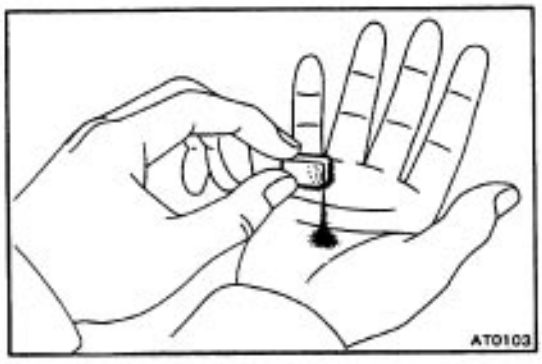


10. REMOVE OIL PAN AND GASKET

(a) Remove the seventeen bolts.
(b) Remove the oil pan by lifting transaxle case.

NOTICE: Do not turn the transaxle over as this will contaminate the valve body with the foreign material; in the bottom of the oil pan.

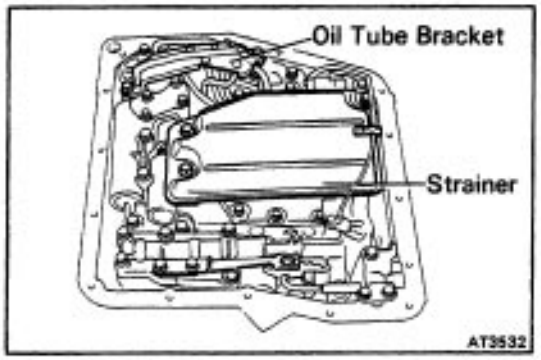
(c) Place the transaxle on wooden blocks to prevent damage to the oil tube bracket.



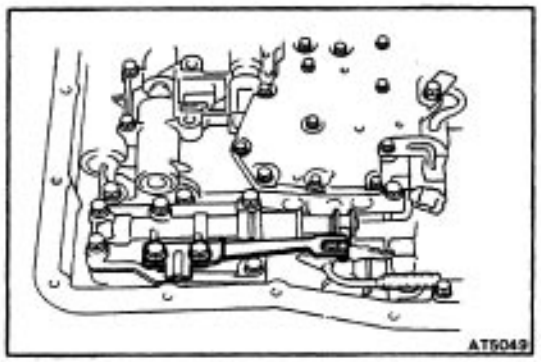
11. EXAMINE PARTICLES IN PAN

Remove the magnet and use it to collect any steel chips
Look carefully at the chips and particles in the oil pan an(
on the magnet to anticipate what type of wear you will find in the transaxle.

Steel (magnetic) ... bearing, gear and plate wear
Brass (non–magnetic) ... bushing wear

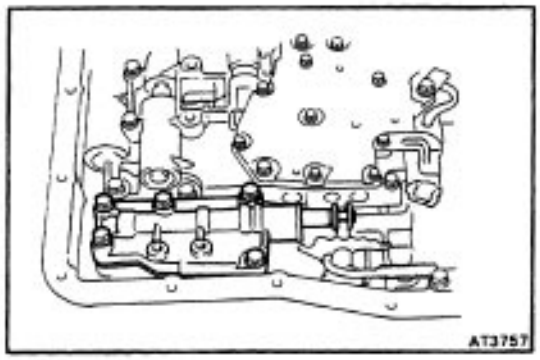


12. REMOVE OIL TUBE BRACKET AND STRAINER



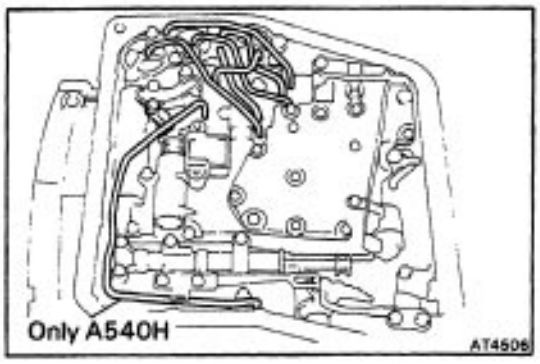
13. REMOVE MANUAL VALVE BODY

(a) Remove the two bolts and detent spring.



(b) Remove the five bolts and manual valve body with the manual valve.

(c) Remove the manual valve from the manual valve body.



14. REMOVE OIL TUBES

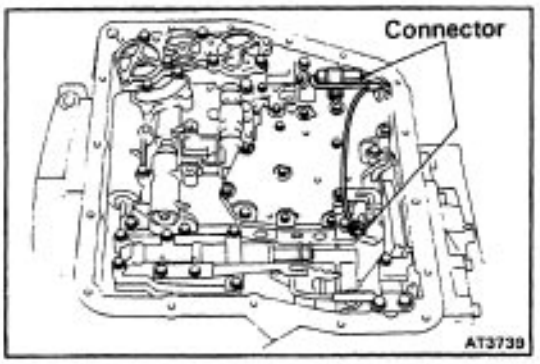
(A540E)

Pry up both tube ends with a large screwdriver and remove the six tubes.

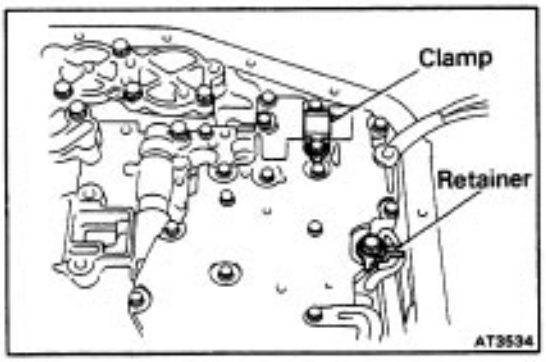
(A540H)

(a) Remove the bolt.

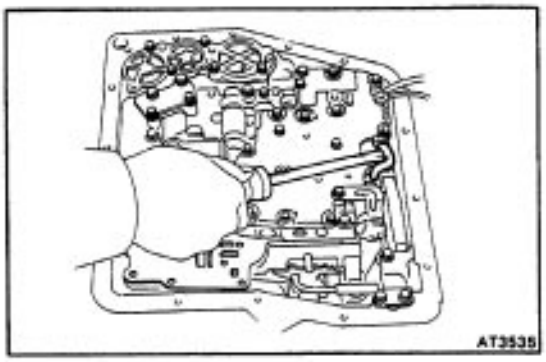
(b) Pry up both tube ends with a large screwdriver and remove the seven tubes.



15. DISCONNECT SOLENOID CONNECTORS

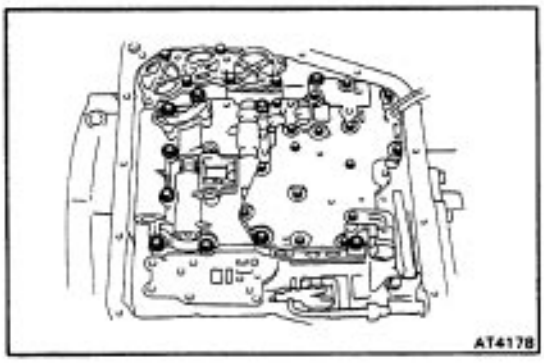


16. REMOVE CONNECTOR CLAMP AND TUBE RETAINER



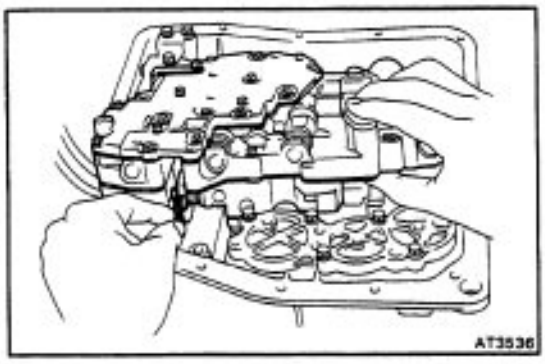
17. REMOVE B3 APPLY TUBE

Pry up the tube with a screwdriver and remove the tube.

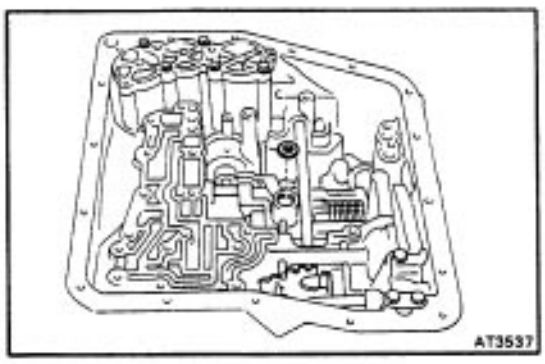


18. REMOVE VALVE BODY

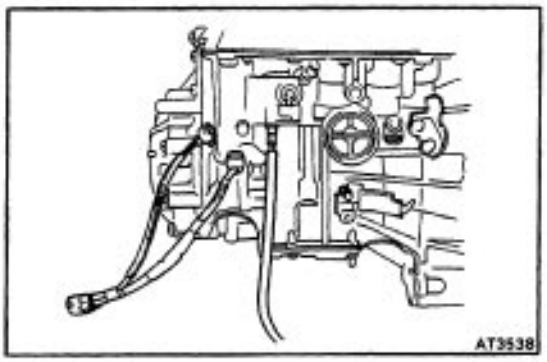
(a) Remove the ten bolts.



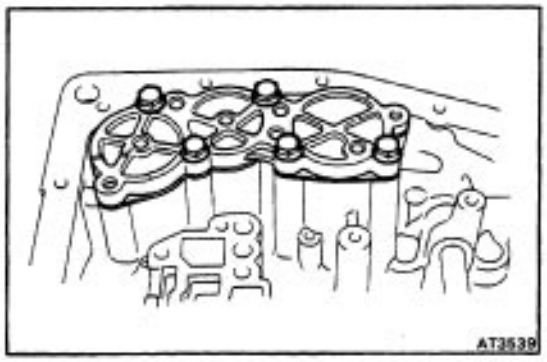
(b) Disconnect the throttle cable from the cam and remove the valve body.



19. REMOVE SECOND BRAKE APPLY GASKET

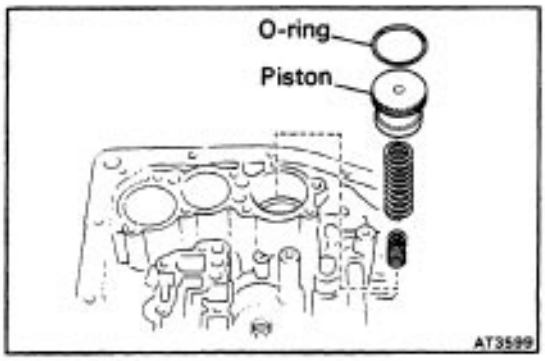


20. REMOVE THROTTLE CABLE AND SOLENOID WIRE

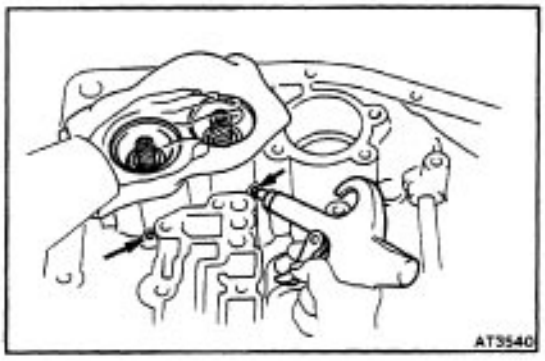


21. REMOVE ACCUMULATOR PISTONS AND SPRINGS

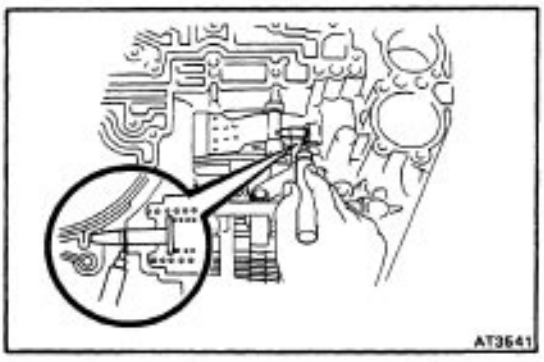
(a) Loosen the five bolts one turn at a time until the spring tension is released.
(b) Remove the cover and gasket.



(c) Remove the C1 accumulator piston.
(d) Remove the O–ring.

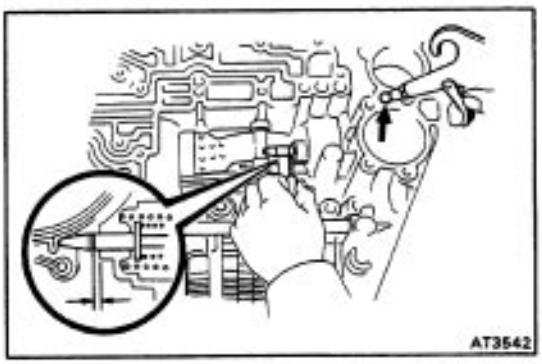


(e) Pop out pistons for C2 and B2 into a rag, using low pressure compressed air (1 kg/cm2, 14 psi or 98 kPa). Force air into the holes shown and remove the pistons and springs.
(f) Remove the 4–rings from the pistons.



22. MEASURE PISTON STROKE OF SECOND COAST BRAKE

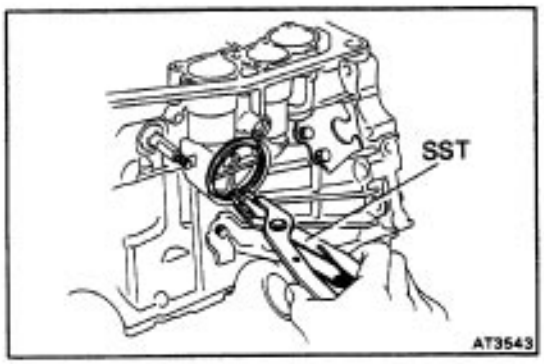
(a) Apply a small amount of paint to the piston rod at the point it meets the case as shown in the illustration.



(b) Using SST, measure the piston stroke applying and releasing the compressed air (4 – 8 kg/cm2 57 – 114 psi or 392 – 785 kPa) as shown.
SST 09240–00020

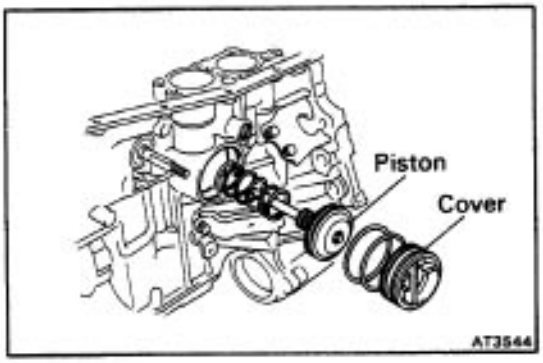
Piston stroke: 2.0 – 3.5 mm (0.079 – 0.138 in.)

if the piston stroke exceeds the limit, inspect the second coast brake band (See page AT–264).

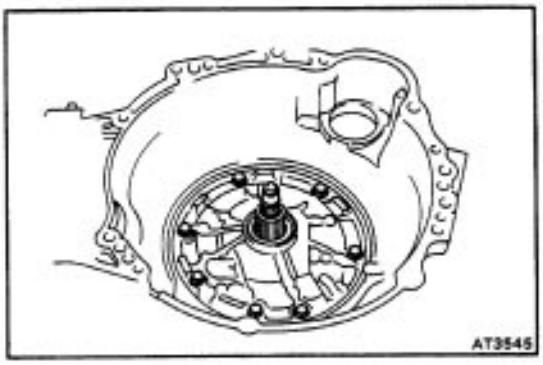


23. REMOVE SECOND COAST BRAKE PISTON

(a) Using SST, remove the snap ring.
SST 09350–32014 (09351–32050)



(b) Remove the cover.
(c) Remove the piston and outer return spring.
(d) Remove the two O–rings from the cover.

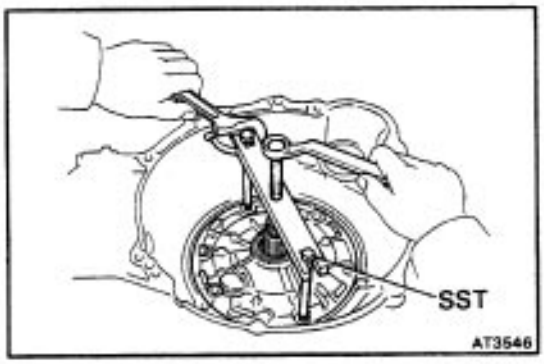


24. STAND TRANSAXLE ENGINE SIDE UPWARD

25. REMOVE OIL PUMP

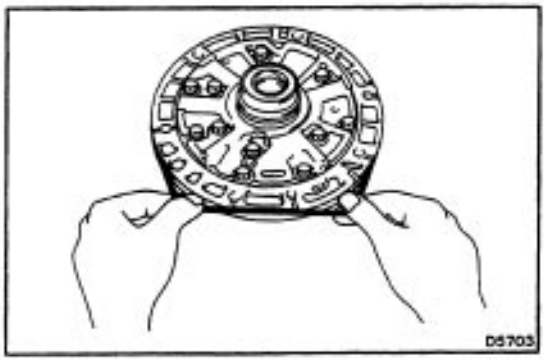
NOTICE: Before removing the oil pump, remove the second coast brake piston.

(a) Remove the seven bolts.

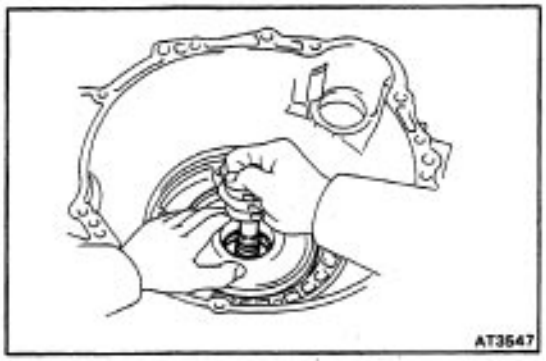


(b) Using SST, pull out the oil pump from the transaxle case.
SST 09350–32014 (09351–32061

26. REMOVE O–RING FROM OIL PUMP

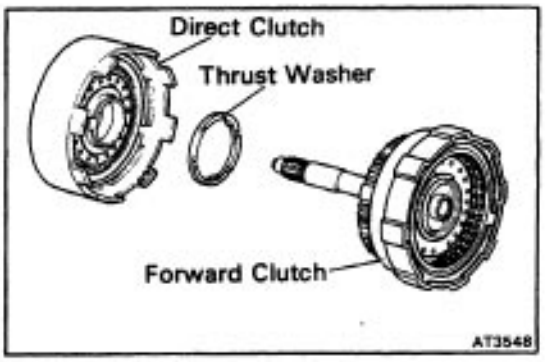


27. REMOVE DIRECT CLUTCH AND FORWARD CLUTCH

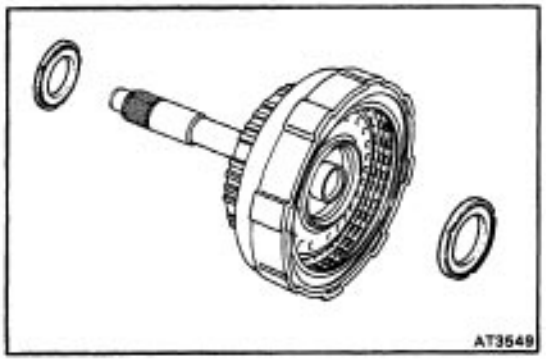


28. SEPARATE DIRECT CLUTCH AND FORWARD CLUTCH

(a) Separate the direct clutch and forward clutch.
(b) Remove the thrust washer from direct clutch.



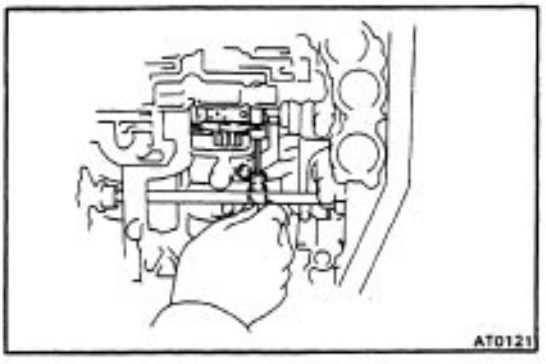
29. REMOVE BEARINGS FROM FORWARD CLUTCH

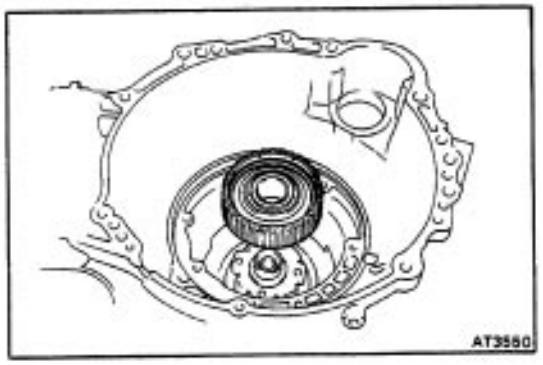


30. REMOVE SECOND COAST BRAKE BAND

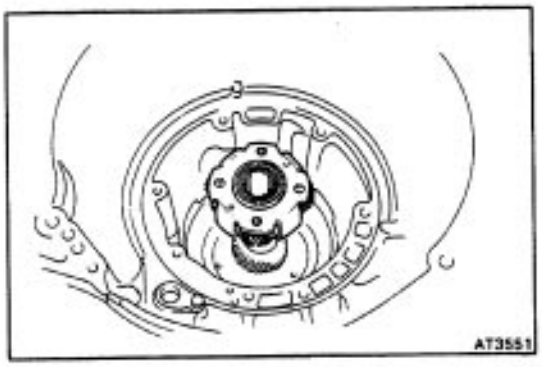
(a) Push the pin with a small screwdriver and remove it from the bolt hole of the oil pump mounting.
(b) Remove the brake band.

HINT: For the method of inspection, refer to page AT–264.



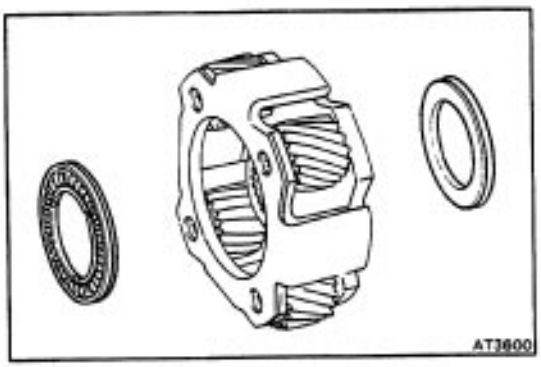


31. REMOVE FRONT PLANETARY RING GEAR

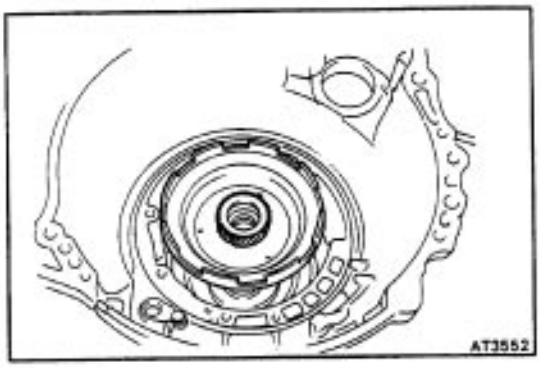


32. REMOVE FRONT PLANETARY GEAR

(a) Remove the front planetary gear.

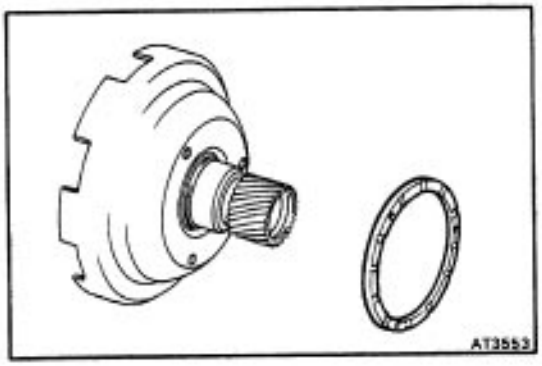


(b) Remove the two bearings from the planetary gear.

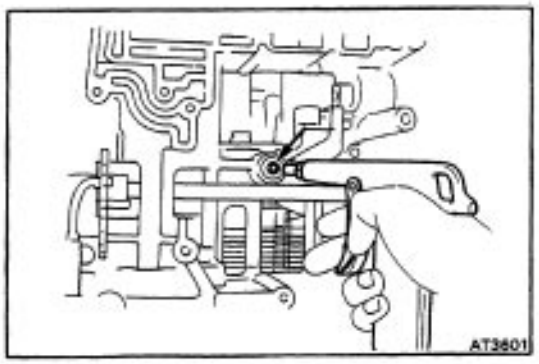


33. REMOVE SUN GEAR AND SUN GEAR INPUT DRUM

(a) Remove the sun gear and sun gear input drum.



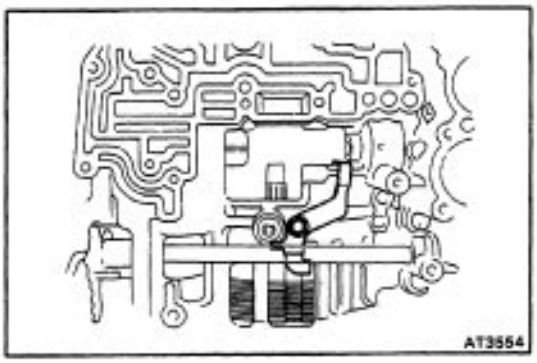
(b) Remove the thrust washer from sun gear input drum



34. CHECK OPERATION OF SECOND BRAKE PISTON

Apply compressed air into the case passage and confirm that the piston moves.

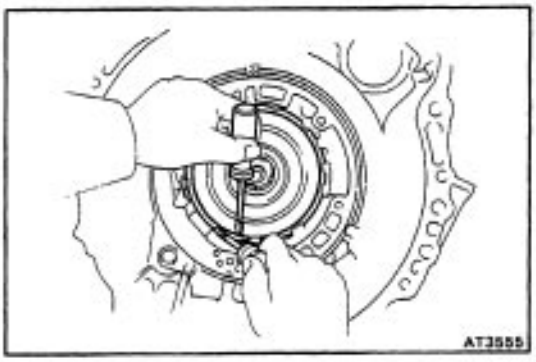
If the piston does not move, disassemble and inspect.



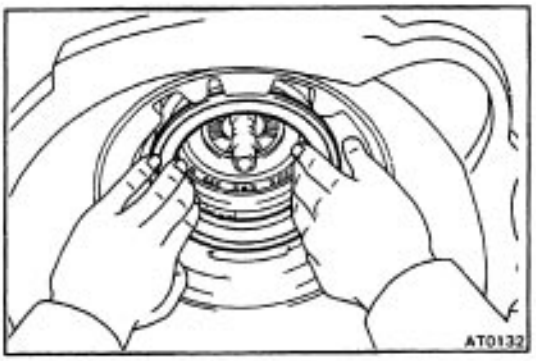
35. REMOVE SECOND COAST BRAKE BAND GUIDE

36. REMOVE SECOND BRAKE DRUM

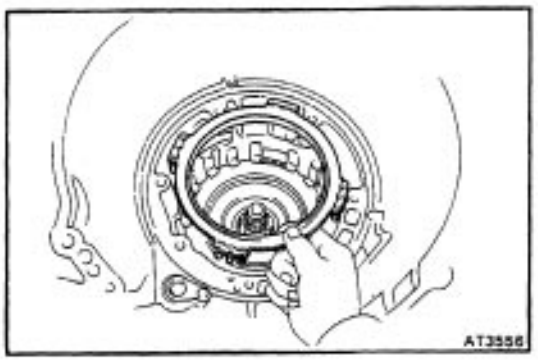
(a) Remove the snap ring.

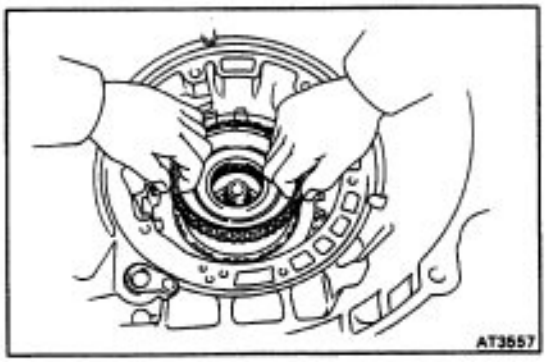


(b) Remove the second brake drum.

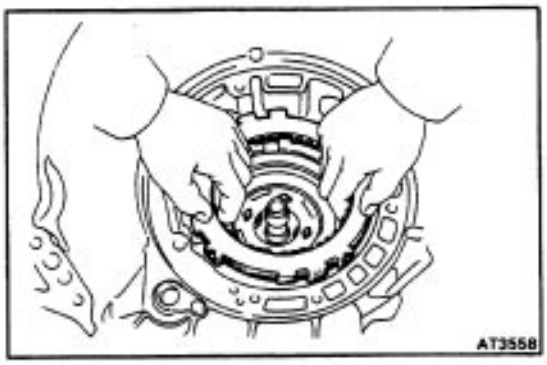


37. REMOVE SECOND BRAKE PISTON RETURN SPRING.



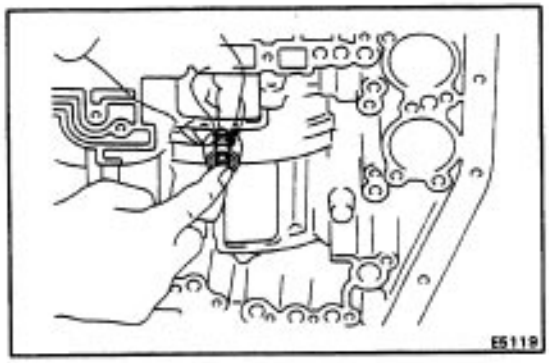


38. REMOVE NO. 1 ONE–WAY CLUTCH



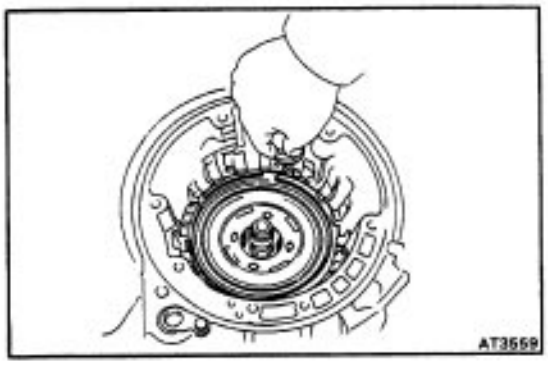
39. REMOVE PLATES, DISCS AND FLANGE

HINT: For the method of inspection, refer to page AT–285.



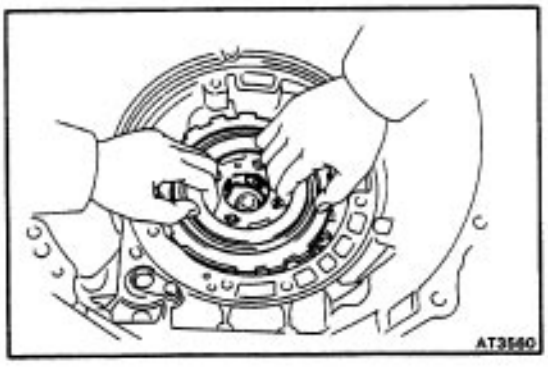
40. REMOVE SECOND BRAKE DRUM GASKET

Remove the gasket.

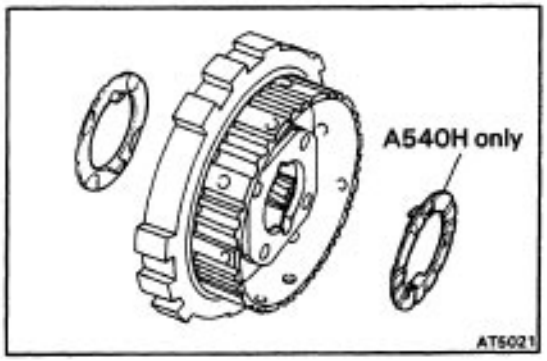


41. REMOVE NO.2 ONE–WAY CLUTCH AND REAR PLANETARY GEAR

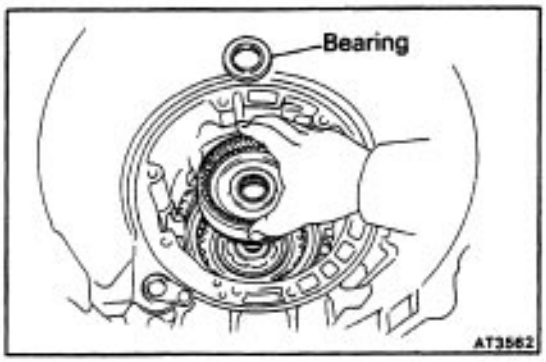
(a) Remove the snap ring.



(b) Remove the No. 2 one–way clutch and rear planetary gear.



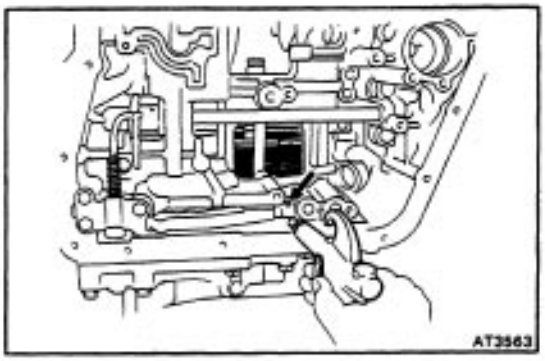
(c) Remove the thrust washer from the rear planetary gear.



42. REMOVE REAR PLANETARY RING GEAR

(a) Remove the rear planetary ring gear.

(b) Remove the bearing from the ring gear.

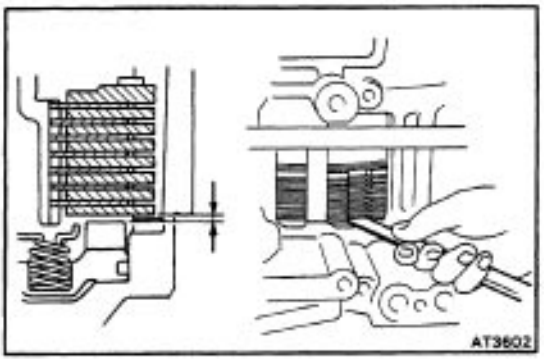


43. CHECK FIRST AND REVERSE BRAKE

(a) Check the operation of the first and reverse brake piston

Apply compressed air into the case passage and confirm that the piston moves.

If the piston does not move, disassemble and inspect.



(b) Using a filter gauge, check the pack clearance of the first and reverse brake.

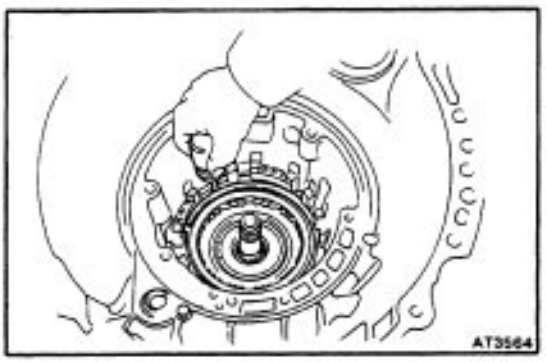
Clearance: A540E

0.85 – 2.05 mm (0.033 – 0.081 in.)

A540H

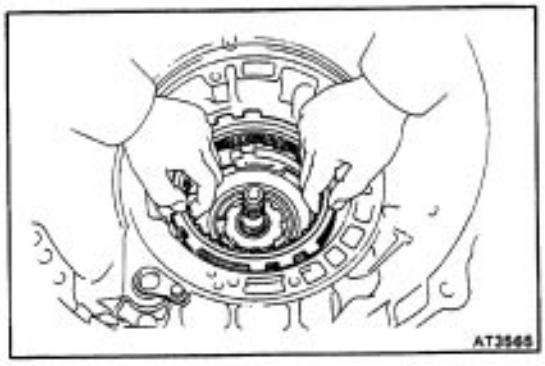
1.04 – 2.16 mm (0.041 – 0.085 in.)

If the pack clearance is not within specification, disassemble and inspect.

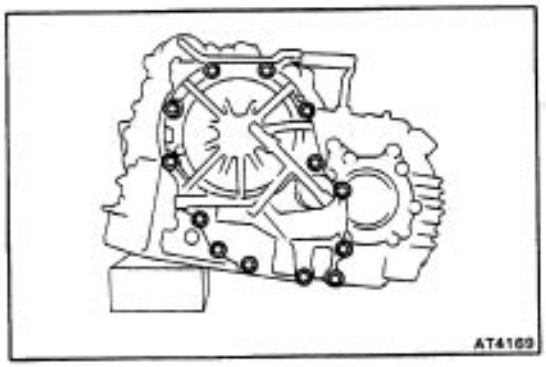


44. REMOVE FLANGE, DISCS AND PLATES OF FIRST AND REVERSE BRAKE

(a) Remove the snap ring.



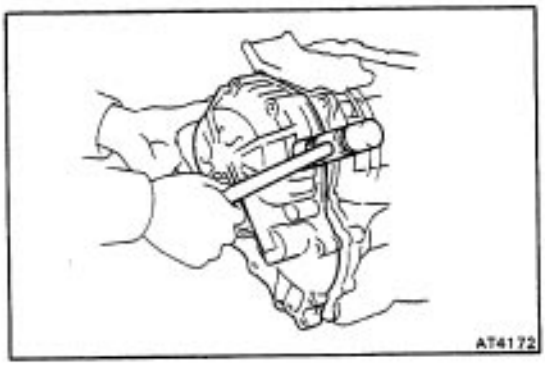
(b) Remove the flange, seven discs and seven plates.
HINT: For the method of inspection, refer to AT–289.



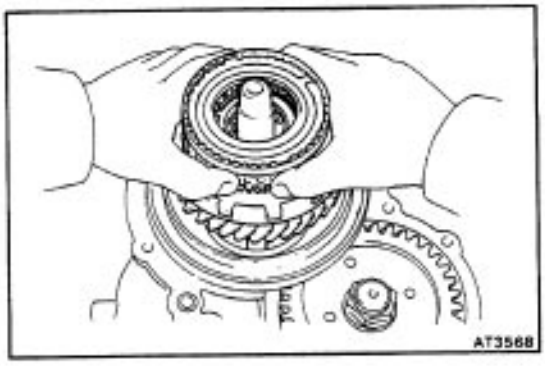
45. TURN TRANSAXLE CASE AROUND

46. REMOVE OVERDRIVE UNIT

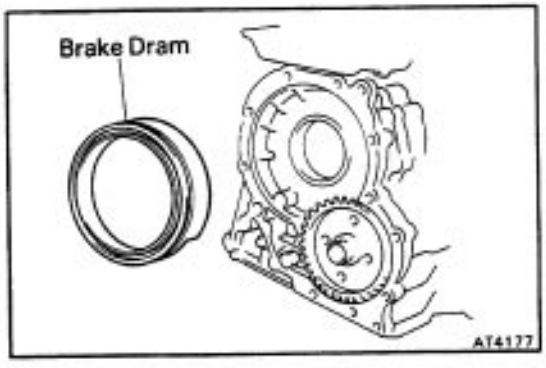
(a) Remove the thirteen bolts.



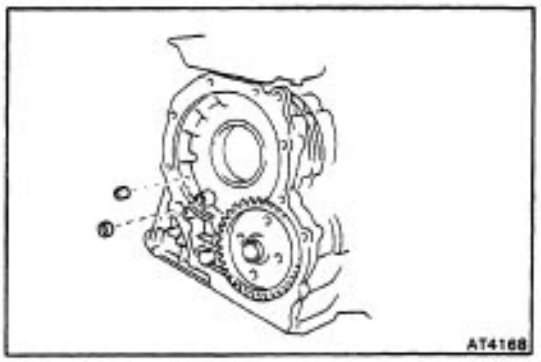
(b) Tap on the circumference of the overdrive case with a plastic hammer to remove the overdrive case and gasket.



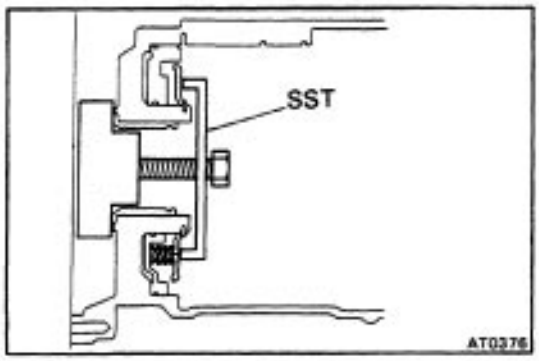
(c) Remove the overdrive planetary gear from transaxle case.



(d) Remove the overdrive brake drum from the transaxle case.



(e) Remove the overdrive clutch apply gasket and overdrive brake apply gasket.

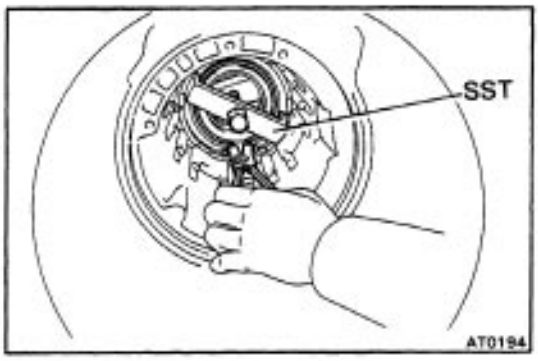


47. REMOVE FIRST AND REVERSE BRAKE PISTON

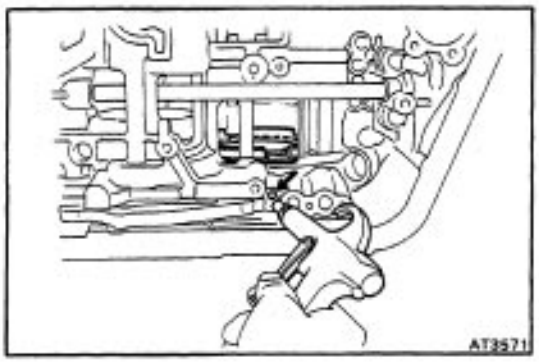
(a) Remove the piston return spring.

Place SST, and compress the return spring evenly by tightening the bolt gradually.

SST 09350–32014 (09351–32040)

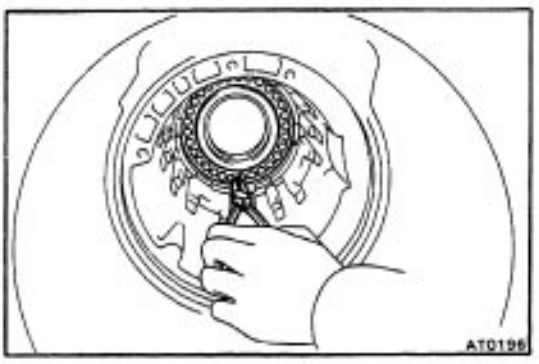


- Using snap ring pliers, remove the snap ring.
- Remove SST.
- Remove the return spring from the case.

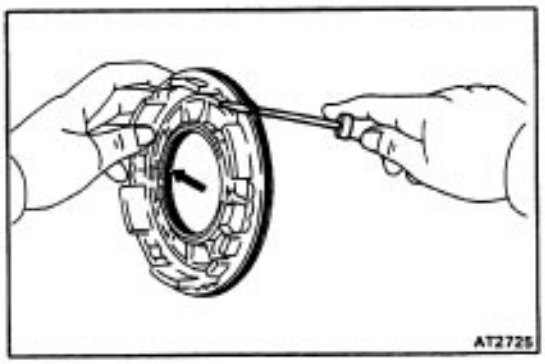


(b) Apply compressed air into the passage of the case to remove the piston**.**

HINT: Hold the piston so it is not slanted and blow with the gun slightly away from the oil hole.

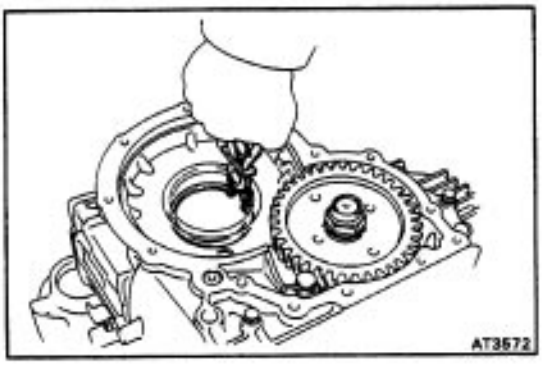


(c) If the piston does not pop out with compressed air, use needle–nose pliers to remove it.

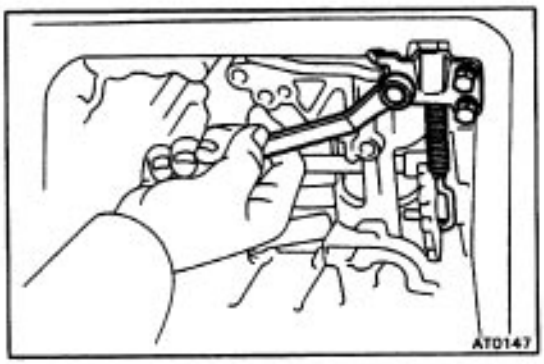


(d) Remove the two O–rings from the piston.

48. REMOVE SNAP RING FROM TRANSAXLE CASE

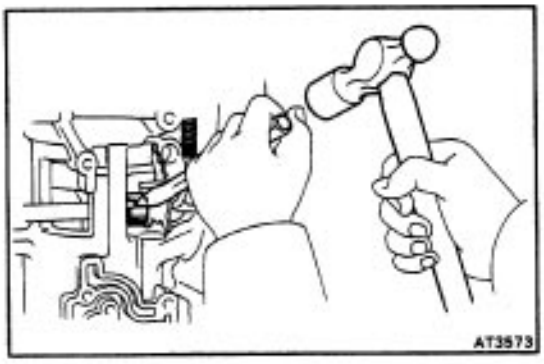


49. REMOVE PARKING LOCK PAWL BRACKET

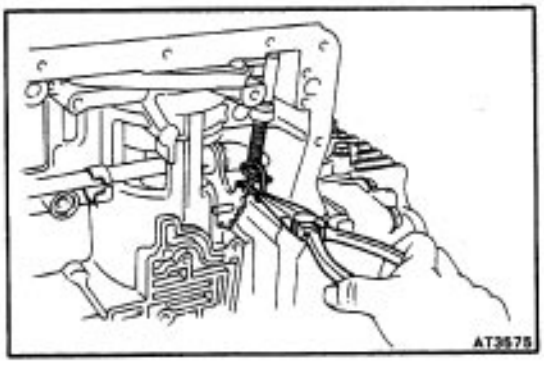


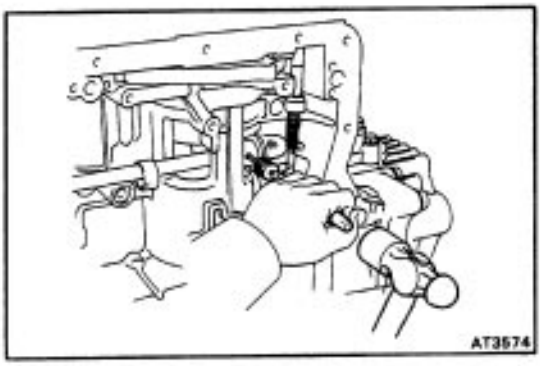
50. REMOVE MANUAL VALVE SHAFT

(a) Using a cold chisel and hammer, cut the collar.

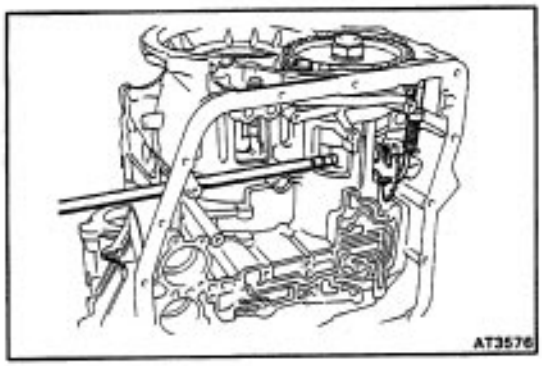


(b) Remove the retaining spring.

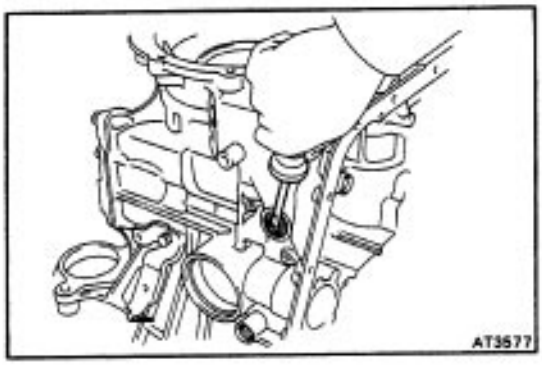




(c) Using a hammer and punch, drive out the pin.

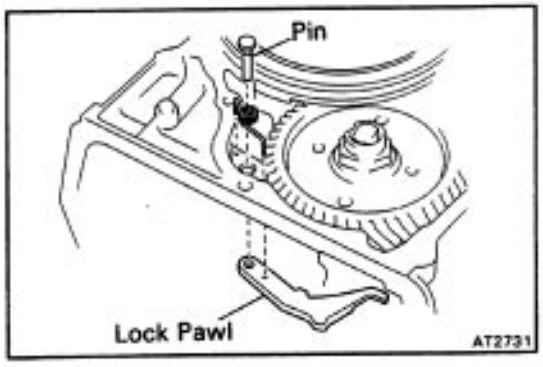


(d) Slide out the shaft from the transaxle case and remove the manual valve lever and parking lock rod.

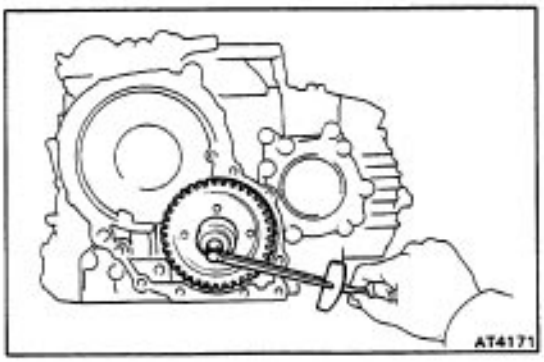


51. REMOVE MANUAL VALVE SHAFT OIL SEAL

Using a screwdriver, remove the oil seal.



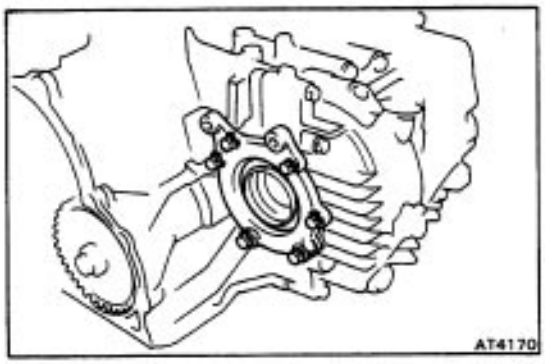
52. REMOVE PIN, SPRING AND PARKING LOCK PAWL



REMOVAL OF DIFFERENTIAL COMPONENT PARTS

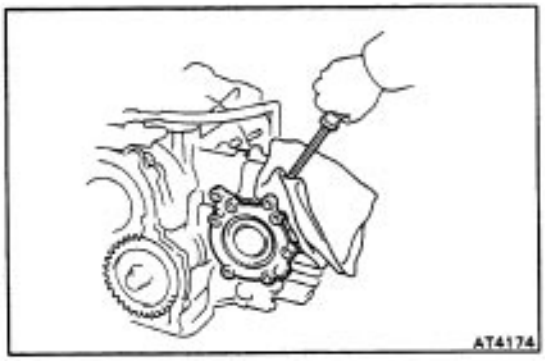
1. MEASURE DIFFERENTIAL TOTAL PRELOAD

Using a torque meter measure the total preload, and make a note of it.



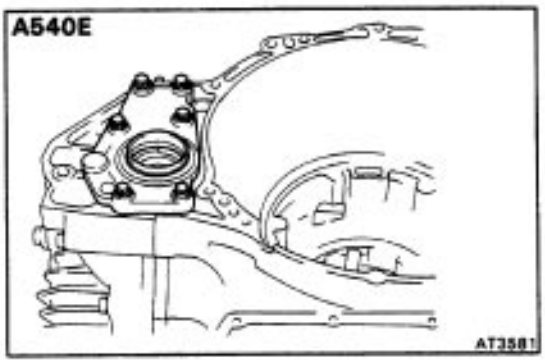
2. REMOVE LH BEARING RETAINER

(a) Remove the six bolts.



(b) Using a large screwdriver, remove the LH bearing retainer.

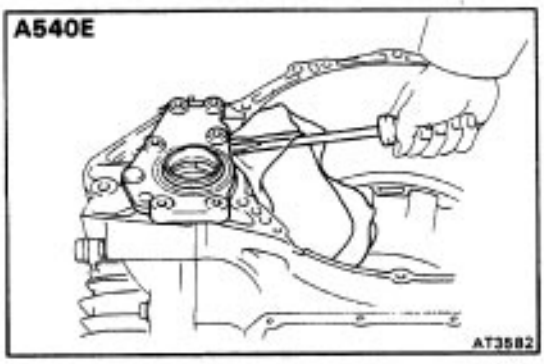
NOTICE: Wrap the screwdriver in a rag, etc. to avoid damage to the case and retainer.



3. (A540E)

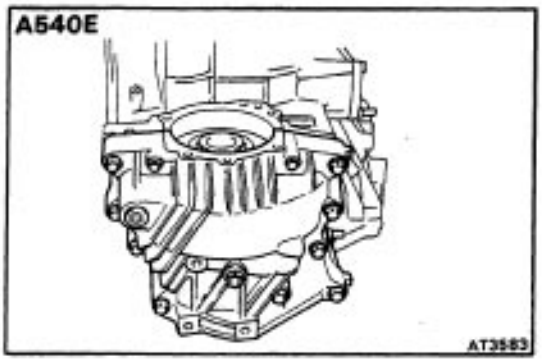
REMOVE RH RETAINER

(a) Remove the six bolts.



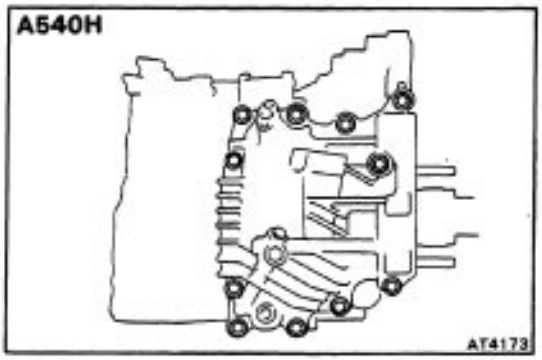
(b) Using a large screwdriver, remove the RH retainer.

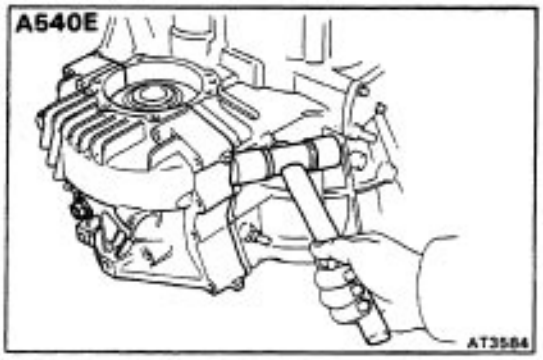
NOTICE: Wrap the screwdriver in a rag, etc. to avoid damage to the case and retainer.



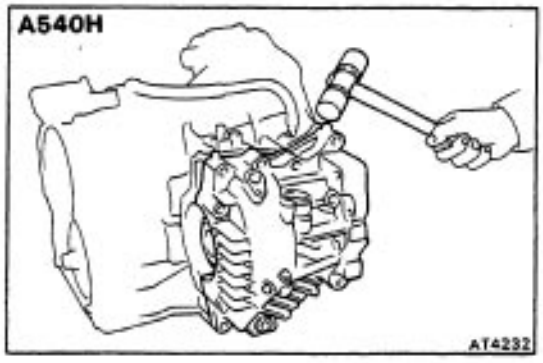
4. REMOVE CARRIER COVER

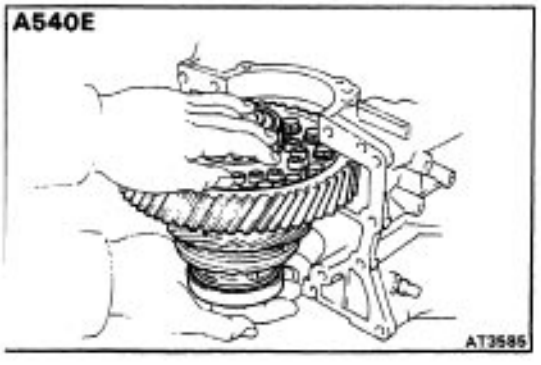
(a) Remove the eleven bolts.





(b) Tap the carrier cover with a plastic hammer to remove it.

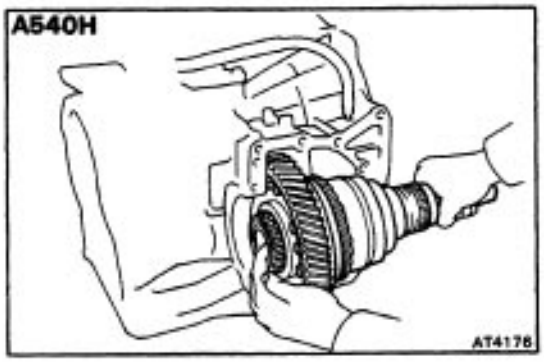




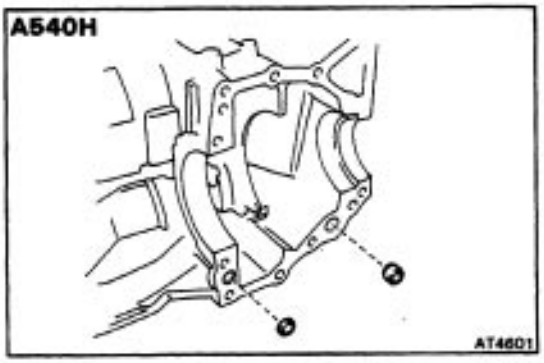
5. REMOVE DIFFERENTIAL CASE

(a) (A540E)

Remove the differential case, outer race and shim from the transaxle case.



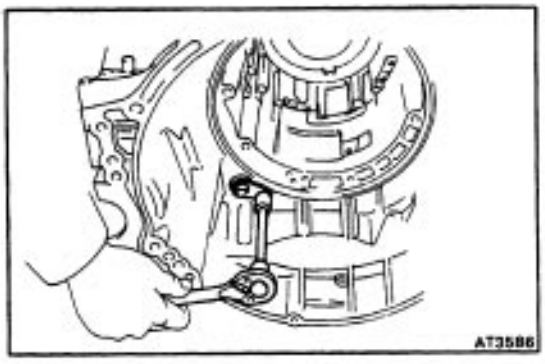
(a) (540H)
Remove the differential assembly.



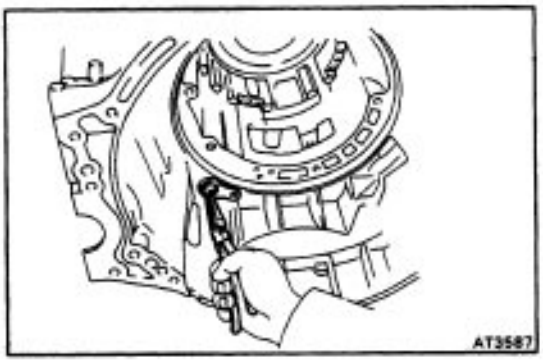
(b) Remove the two apply gaskets.

6. REMOVE DRIVE PINION CAP

(a) Remove the bolt.



(b) Using pliers, pull out the drive pinion cap.
(c) Remove the O–rings from the cap.



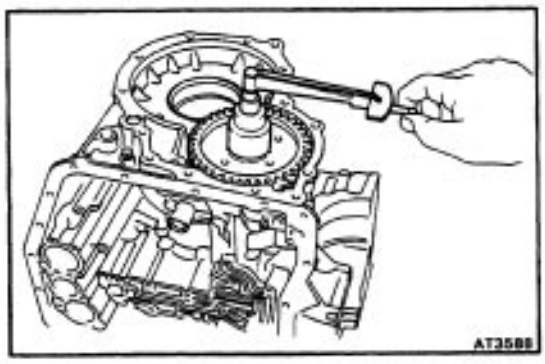
7. MEASURE DRIVE PINION PRELOAD

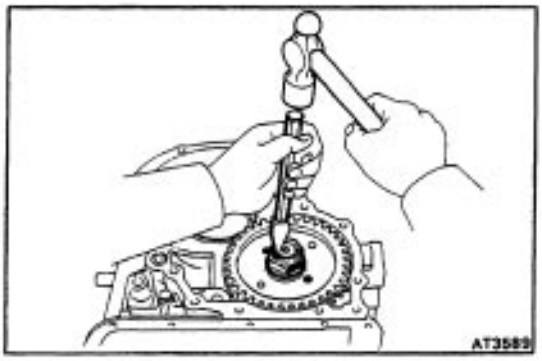
Using a torque meter, measure the drive pinion preload.

Preload (at starting) : Reused bearing

5 – 8 kg–cm (4.3 – 6.9 in.–lb, 0.5 – 0.8 N–m)

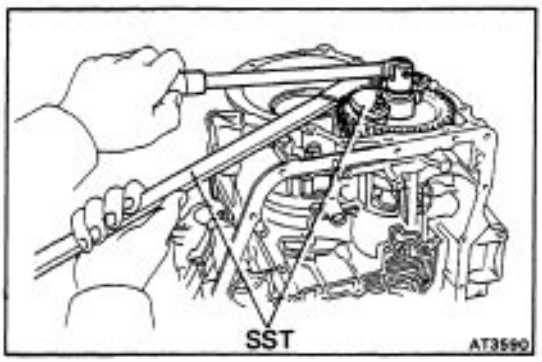
The total preload measured in step 1 minus the drivE pinion preload equals 1.3 – 2.0 kg–cm (1.1 – 1.7 in.–lb 0.1 – 0.2 N–m). If the result is not within this specification the side bearing preload is bad.



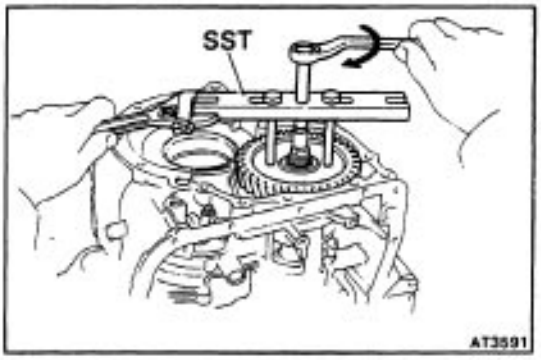


8. REMOVE COUNTER DRIVEN GEAR

(a) Using a chisel, loosen the staked part of the nut.

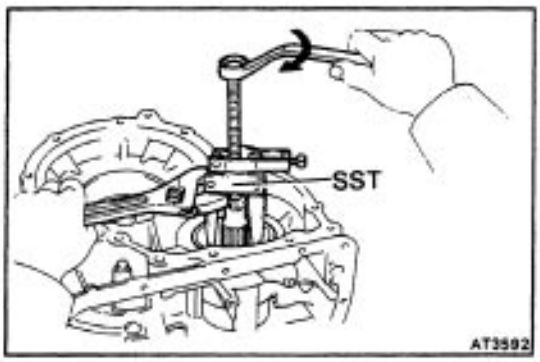


(b) Using SST to hold the gear, remove the nut.
SST 09330–00021, 09350–32014 (09351–32032)

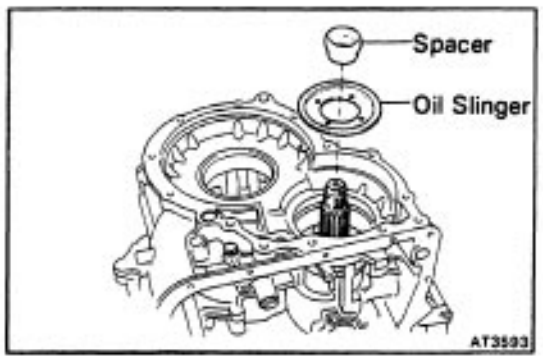


(e) Using SST, remove the gear and bearing.
SST 09350–32014 (09351–32061)

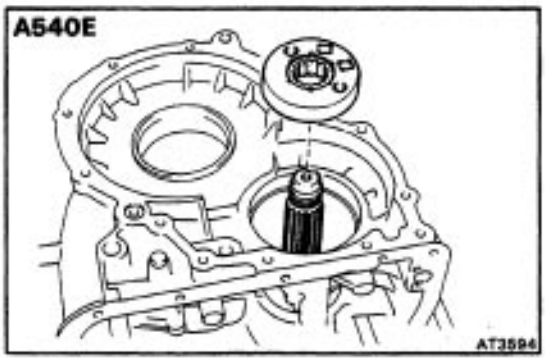
9. REMOVE OUTER RACE, SPACER AND OIL SLINGER



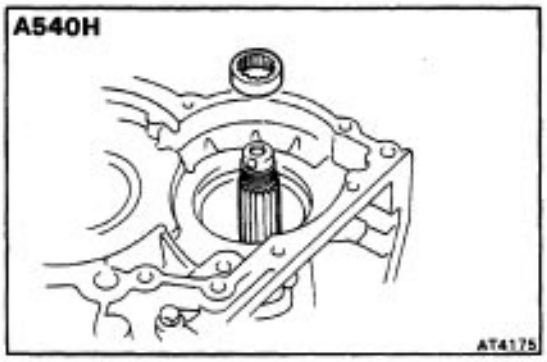
(a) Using SST, remove the outer race.
SST 09350–32014 (09308–10010)



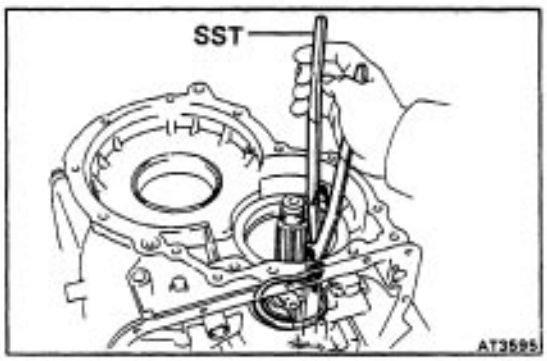
(b) Remove the spacer and oil slinger**.**



10. (A540E)
REMOVE SENSOR ROTOR

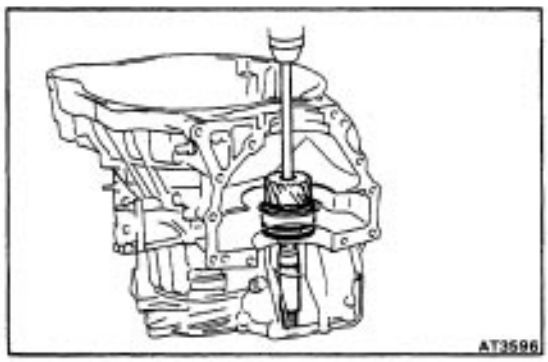


11. (A540H)
REMOVE DRIVE PINION BEARING NO. 2 SPACER



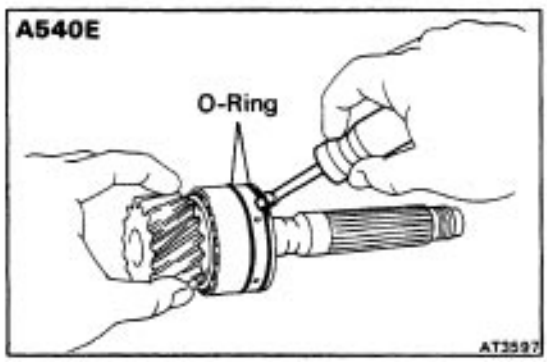
12. REMOVE DRIVE PINION

(a) Using SST, remove the snap ring.
SST 09350–32014 (09351–32050)

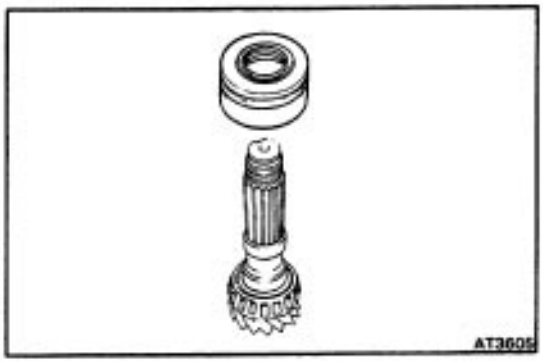


(b) Insert the bar into the case hole to drive out the drive pinion.

(c) Using a press, drive out the drive pinion from transaxle case.

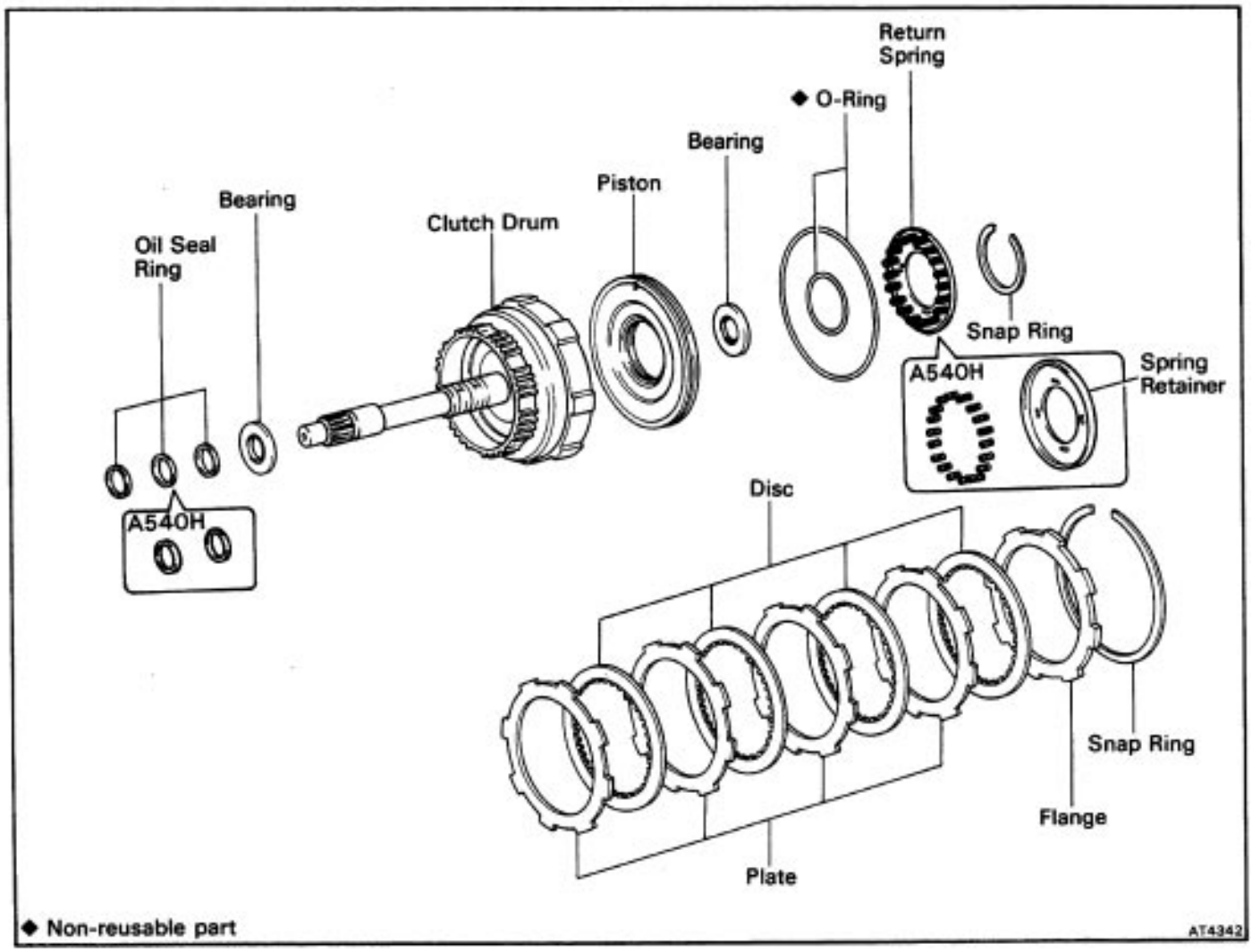


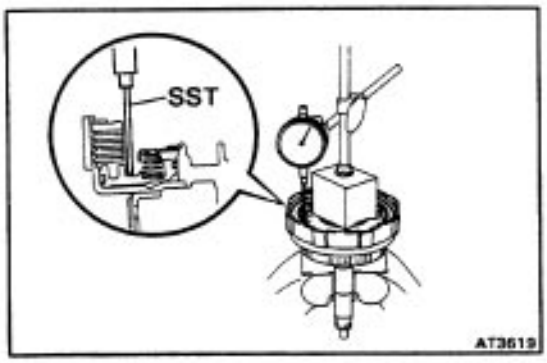
(d) (A540E)
Remove the two O–rings from the bearing cage.

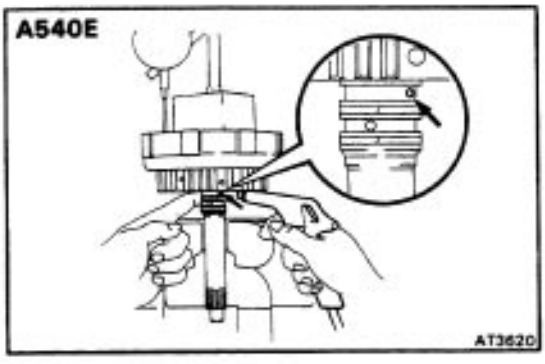


(e) Remove the bearing cage from drive pinion.

Forward Clutch







DISASSEMBLY OF FORWARD CLUTCH

1. CHECK PISTON STROKE OF FORWARD CLUTCH

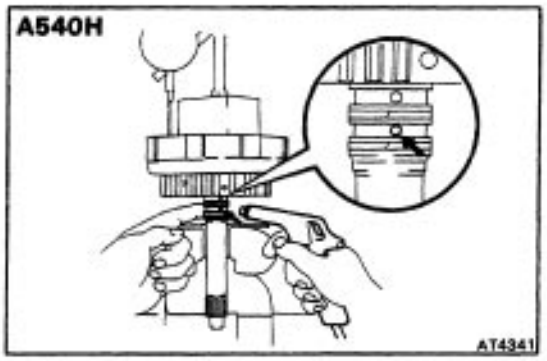
Using a dial indicator (long type pick or SST), measure the forward clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi, 392 – 78E kPa) as shown.

SST 09350–32014 (09351–32190)

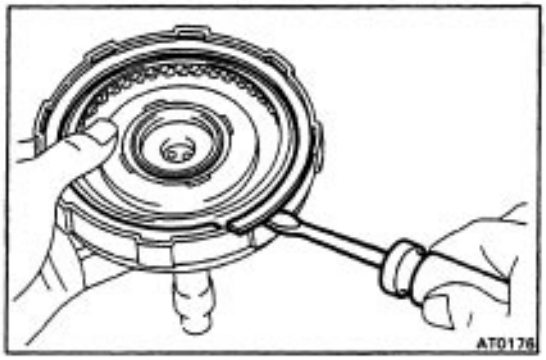
Piston stroke: 1.41 – 1.82 mm

(0.0555 – 0.0717 in.)

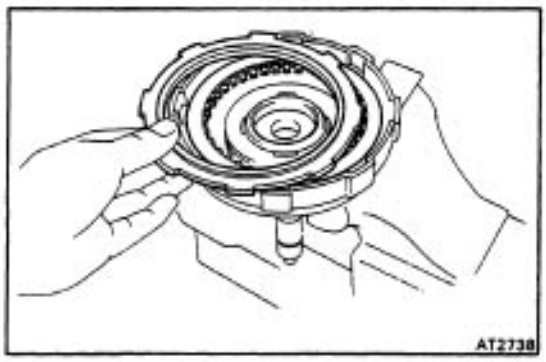
If the piston stroke is greater than the maximum, inspect each component.



2. REMOVE SNAP RING FROM CLUTCH DRUM



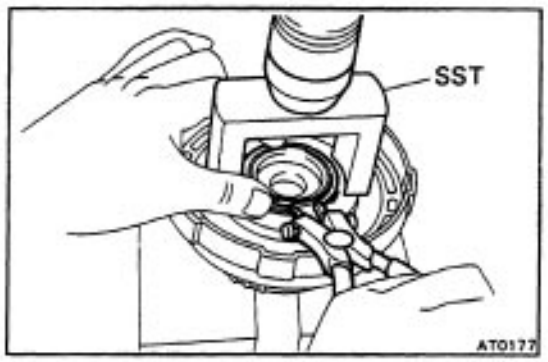
3. REMOVE FLANGE, DISCS AND PLATES



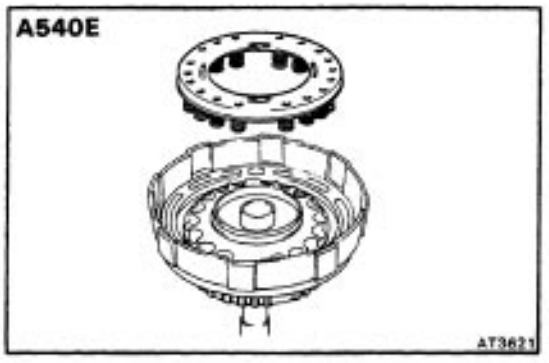
4. REMOVE RETURN SPRING

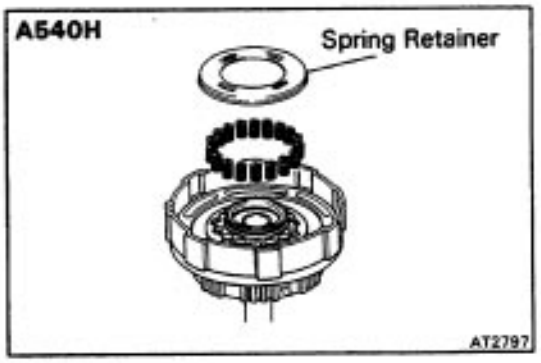
(a) Place SST on the spring retainer and compress the springs with a shop press.
SST 09350–32014 (09351–32070)

(b) Remove the snap ring using snap ring pliers.

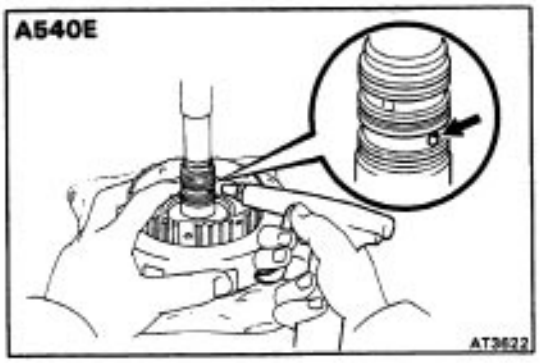


(c) (A540E)
Remove the return spring.



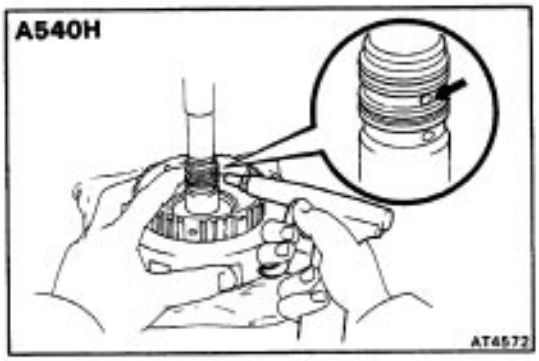


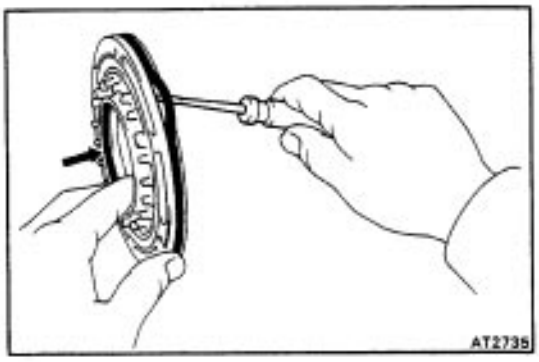
(A540H)
Remove the spring retainer and eighteen return springs.



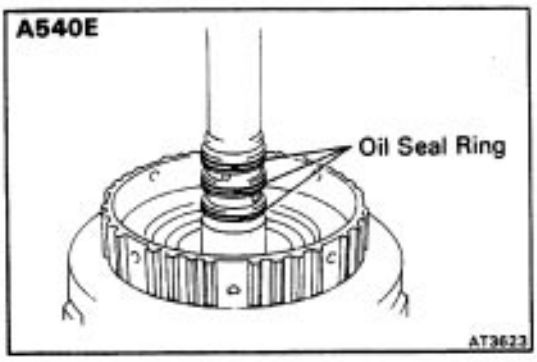
5. REMOVE CLUTCH PISTON

(a) Apply compressed air into the oil passage to remove the piston.
If the piston does not come out, use needle–nose pliers to remove it.



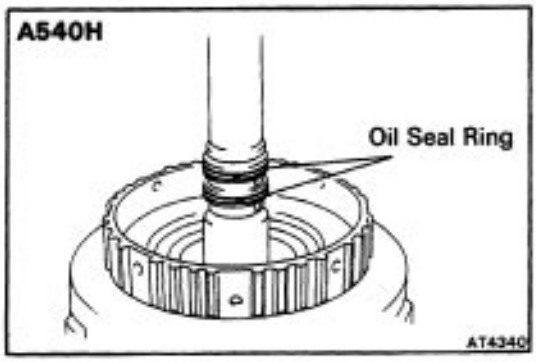


(b) Remove the two 4–rings from the piston.

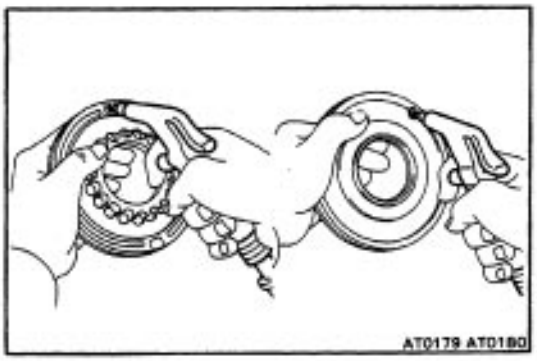


S. IF NECESSARY, REMOVE OIL SEAL RINGS (A540E)

Remove the three oil seal rings from the shaft.



(A540H)
Remove the two oil seal rings from the shaft.

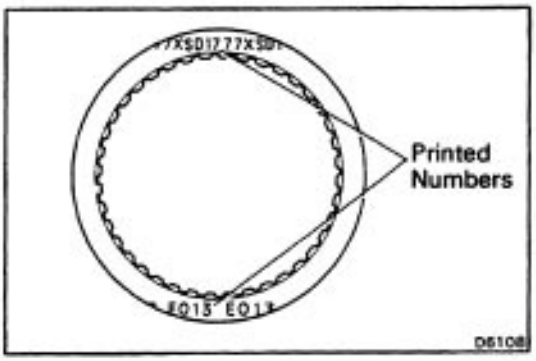


INSPECTION OF FORWARD CLUTCH

1. INSPECT CLUTCH PISTON

(a) Check that the check ball is free by shaking the piston.

(b) Check that the valve does not leak by applying low pressure compressed air.



2. INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates and flange are worn or burnt. If necessary, replace them.

HINT:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.

ASSEMBLY OF FORWARD CLUTCH

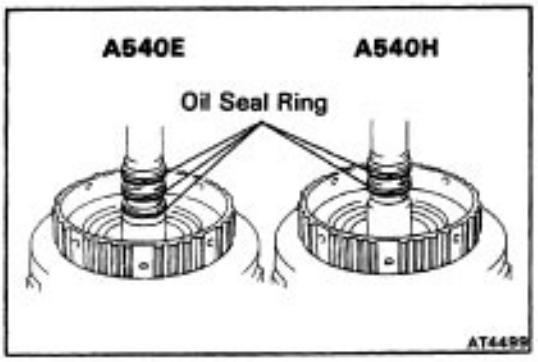
1. (A540E, A540H)

INSTALL OIL SEAL RINGS

Install the three oil seal rings (A540E) or two oil seal rings (A540H) to the shaft.

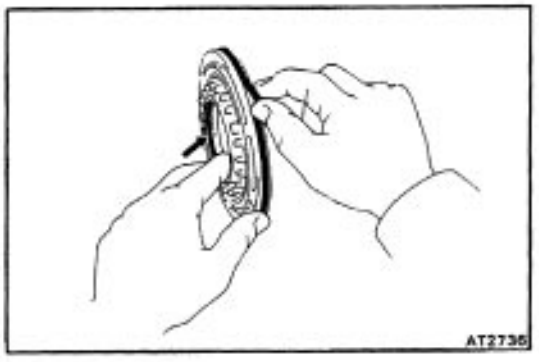
NOTICE: Do not spread the ring ends more than necessary.

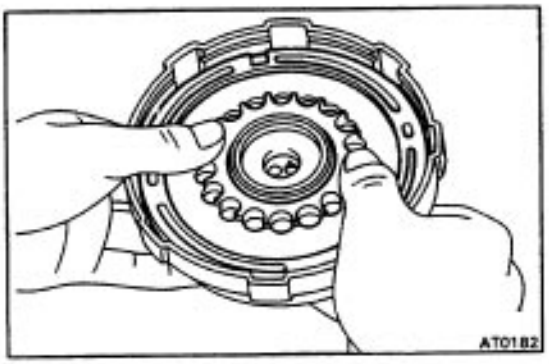
HINT: After installing the oil seal rings, check that they move smoothly.



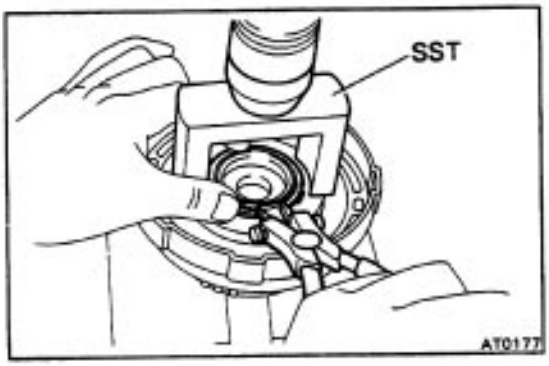
2. INSTALL CLUTCH PISTON TO CLUTCH DRUM

(a) Install the two new O–rings, to the piston.



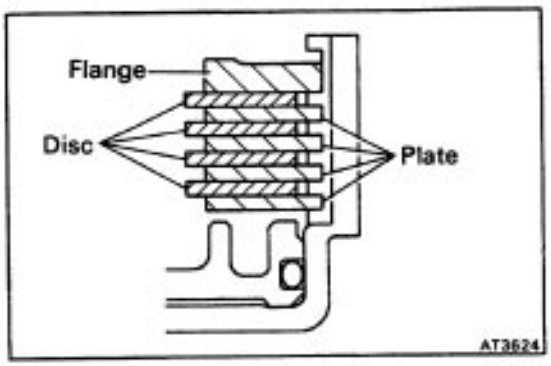


(b) Coat the O–rings with ATF.
(c) Press the piston into the drum with the cup side up, being careful not to damage the O–rings.



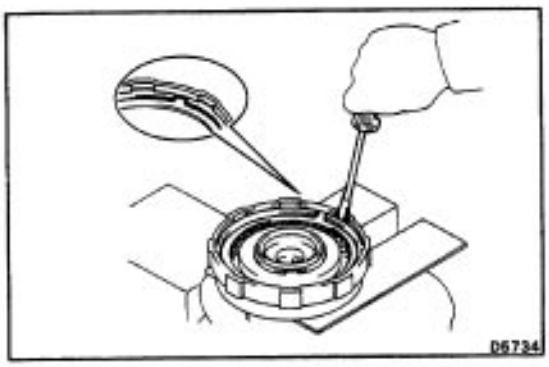
3. INSTALL PISTON RETURN SPRINGS

(a) Place the return spring and snap ring onto the piston.
(b) Place SST on the spring retainer, and compress the springs with a shop press.
SST 09350–32014 (09351–32070)
(e) Install the snap ring with snap ring pliers.
Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



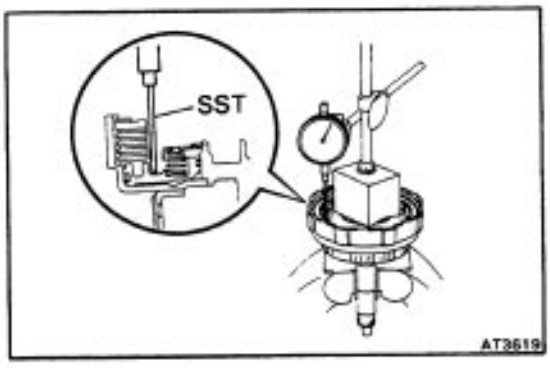
4. INSTALL PLATES, DISCS AND FLANGE

(a) Install the plates and discs.
Install in order: P=Plate D=Disc
P–D–P–D–P–D–P–D
(b) Install the flange with the flat end facing downward.



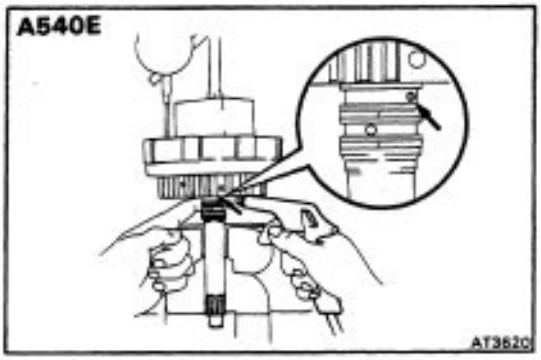
5. INSTALL SNAP RING

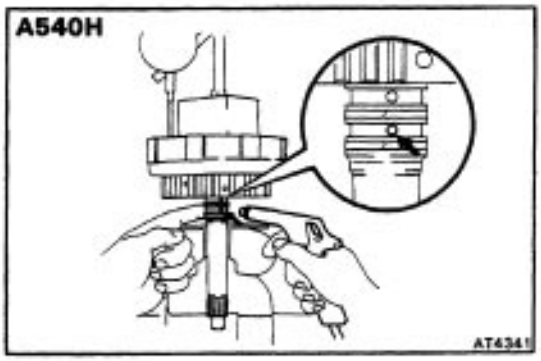
Check that the end gap of snap ring is not aligned with one of the cutouts.



6. RECHECK PISTON STROKE OF FORWARD CLUTCH

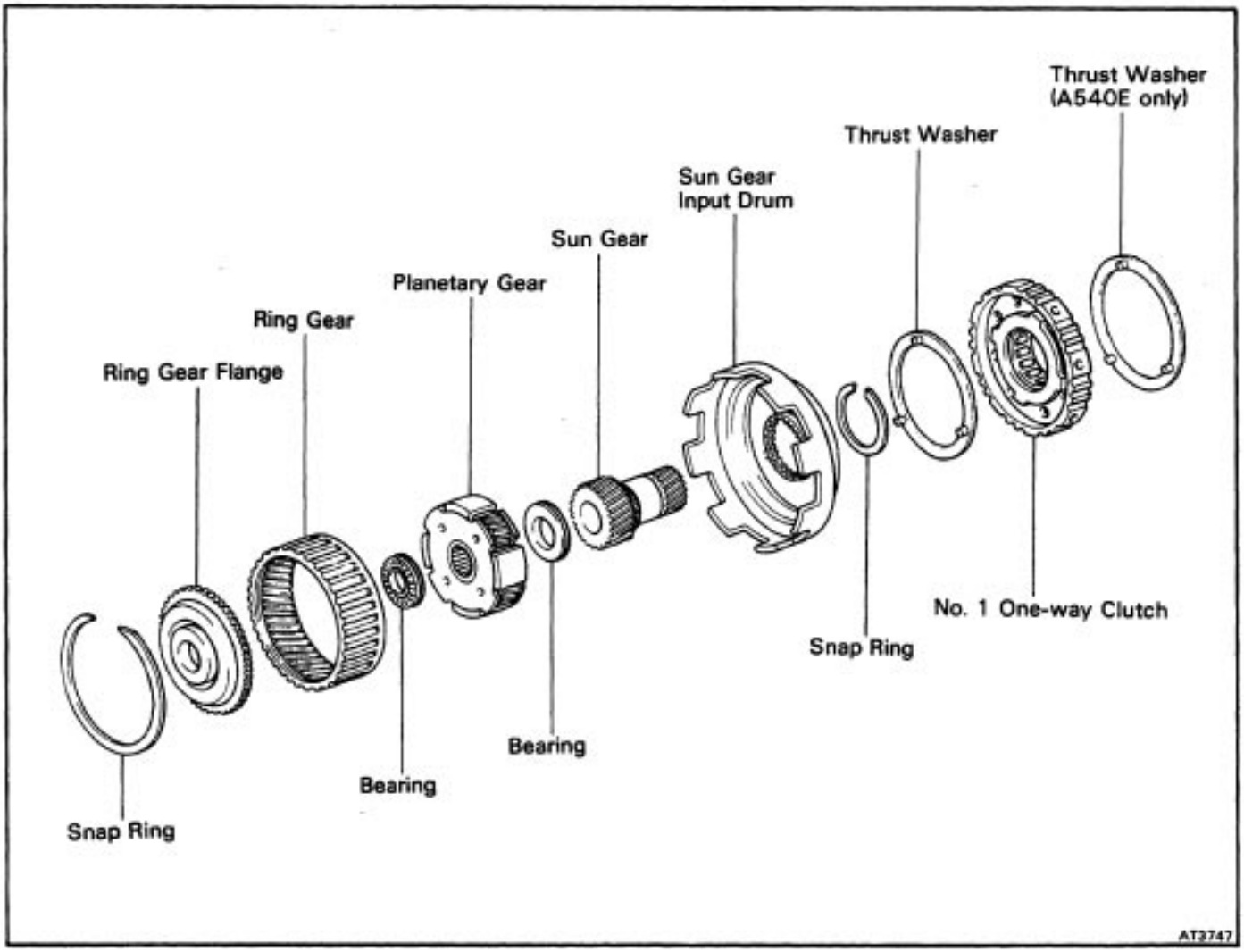
Using a dial indicator (long type pick or SST), measure the forward clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi, 392 – 785 kPa) as shown next page.
SST 09350–32014 (09351–32190)
Piston stroke: 1.41 – 1.82 mm
(0.0555 – 0.0717 in.)

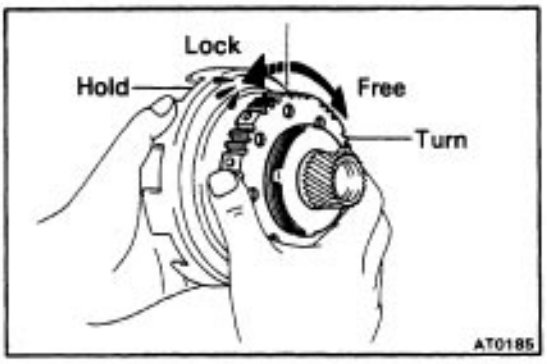




If the piston stroke is nonstandard, select another flange.
HINT: There are two different thicknesses for the flange.
Flange thickness: 3.00 mm (0.1181 in.)
3.37 mm (0.1327 in.)

Front Planetary Gear

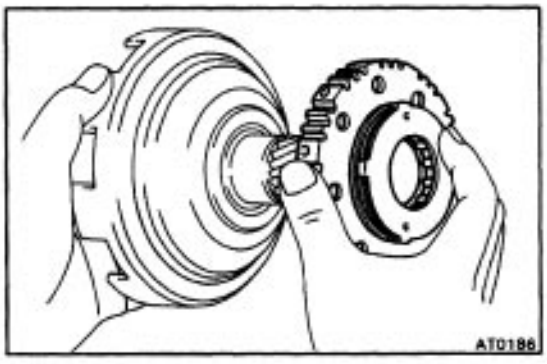




DISASSEMBLY OF NO. 1 ONE–WAY CLUTCH AND SUN GEAR

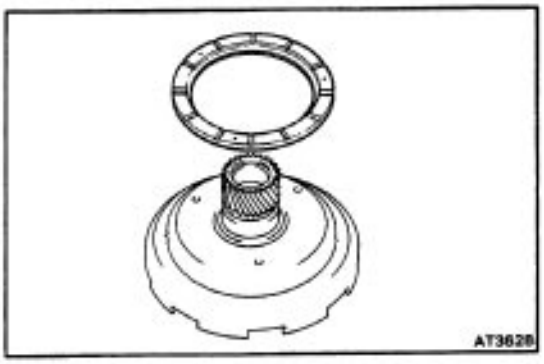
1. CHECK OPERATION OF NO. 1 ONE–WAY CLUTCH

Hold the sun gear and turn the hub. The hub should turn freely clockwise and should lock counterclockwise.

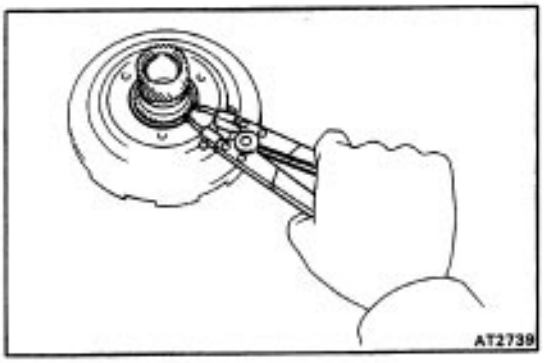


2. REMOVE NO. 1 ONE–WAY CLUTCH FROM SUN GEAR .

While turning the hub clockwise, remove the No. 1 one–way clutch from the sun gear.



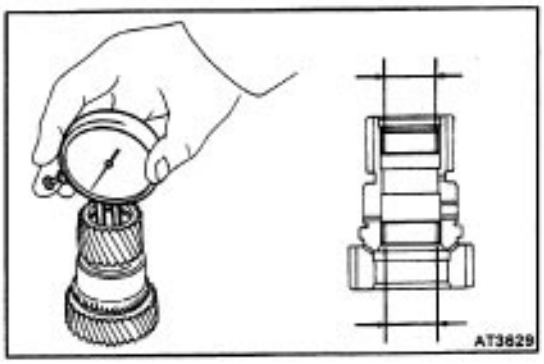
3. REMOVE THRUST WASHER FROM SUN GEAR INPUT DRUM



4. REMOVE SUN GEAR FROM DRUM

(a) Using snap ring pliers, remove the snap ring from the drum.

(b) Remove the sun gear from the drum.



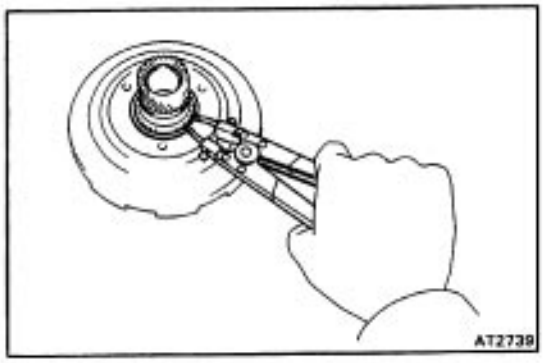
5. CHECK SUN GEAR BUSHINGS

Using a dial indicator, measure the inside diameter of the sun gear bushings.

Maximum inside diameter: 22.59 mm(0.8894 in.)

If the inside diameter is greater than the maximum, replace the sun gear.

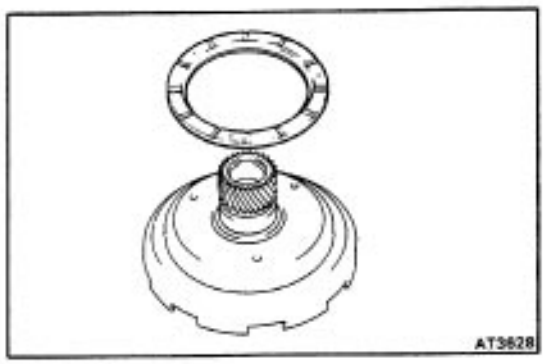
ASSEMBLY OF NO. 1 ONE–WAY CLUTCH AND SUN GEAR



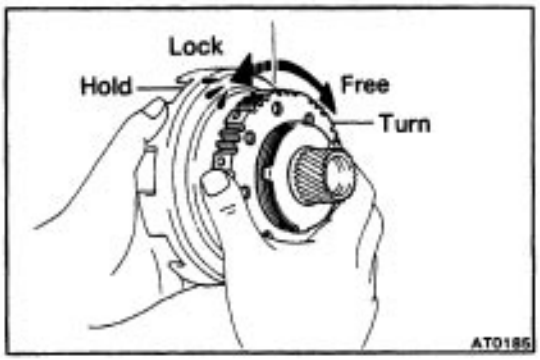
1. INSTALL SUN GEAR TO DRUM

(a) Install the sun gear to the drum.

(b) Using snap ring pliers, install the snap ring to drum.



2. INSTALL THRUST WASHER TO SUN GEAR INPUT DRUM

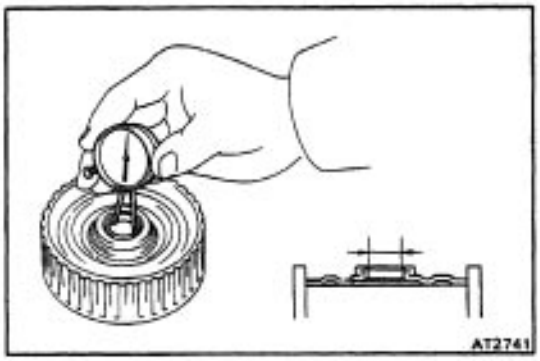


3. INSTALL NO. 1 ONE–WAY CLUTCH ON SUN GEAR

While turning the hub clockwise, slide the No. 1 one–way clutch onto the sun gear.

4. RECHECK OPERATION OF NO. 1 ONE–WAY CLUTCH

INSPECTION OF PLANETARY RING GEAR

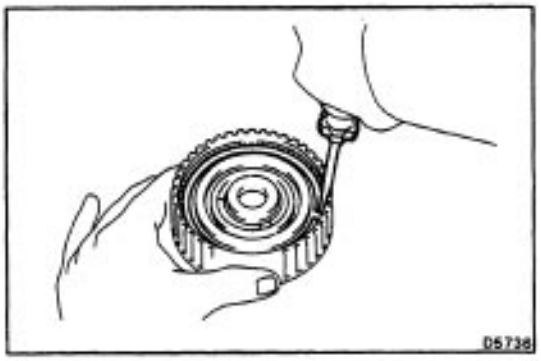


1. INSPECT RING GEAR FLANGE BUSHING

Using a dial indicator, measure the inside diameter of the flange bushing.

Maximum inside diameter: 30.08 mm (1.1842 in.)

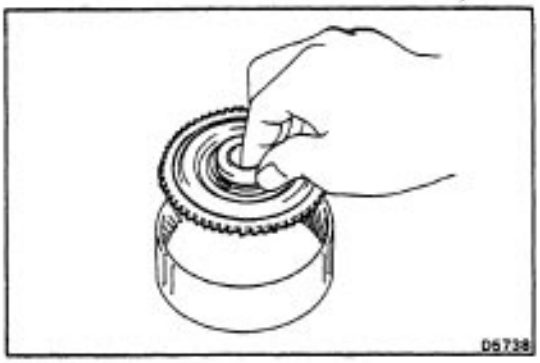
If the inside diameter is greater than the maximum, replace the flange.



2. REMOVE RING GEAR FLANGE

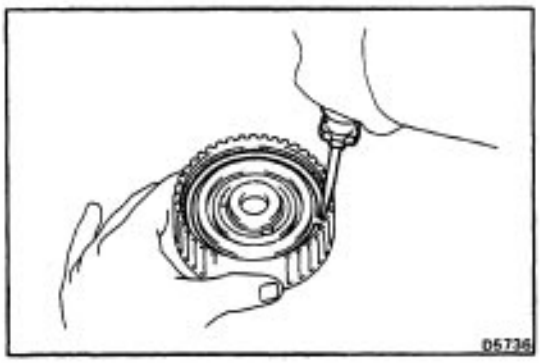
(a) Using a screwdriver, remove the snap ring.

(b) Remove the flange from the ring gear.

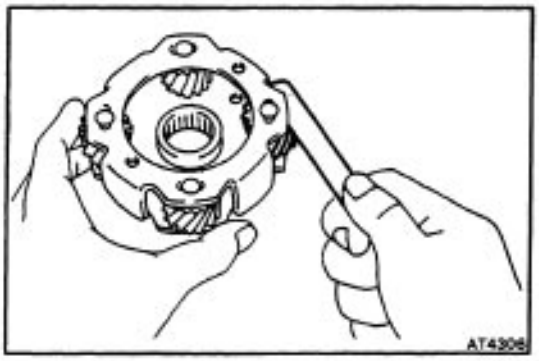


3. INSTALL RING GEAR FLANGE

(a) Position the flange into the ring gear.



(b) Using a screwdriver, install the snap ring.



INSPECTION OF FRONT PLANETARY GEAR

MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

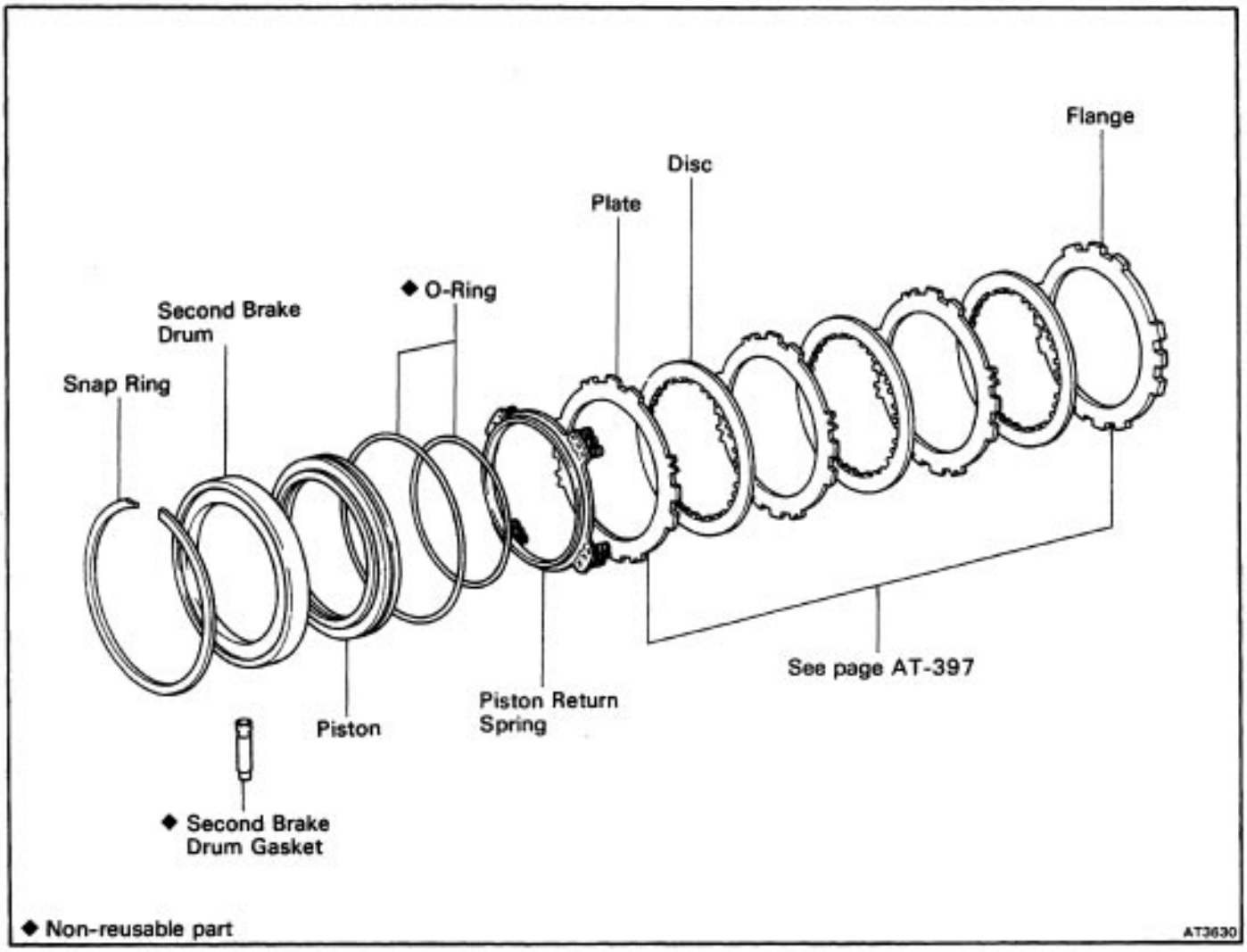
Using a feeler gauge, measure the planetary pinion gear thrust clearance.

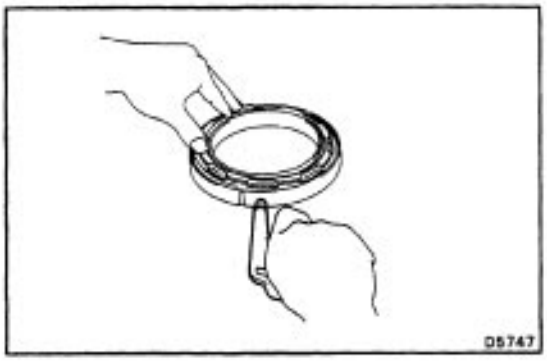
Standard clearance: 0.16 – 0.56 mm
(0.0063 – 0.0220 in.)

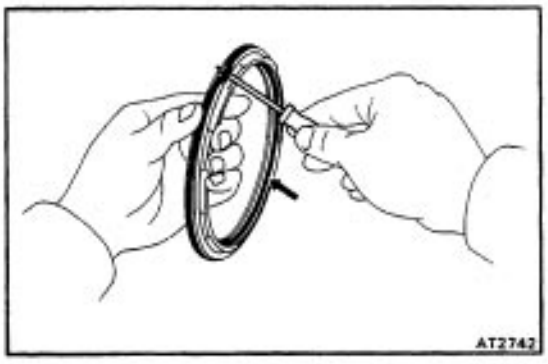
Maximum clearance: 0.61 mm
(0.0240 in.)

If the clearance is greater than the maximum, replace the planetary gear assembly.

Second Brake





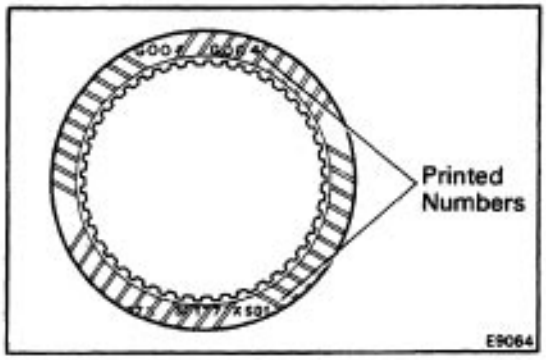


DISASSEMBLY OF SECOND BRAKE PISTON

REMOVE SECOND BRAKE PISTON

(a) Apply compressed air to the oil hole to remove the piston.

(b) Remove the two O–rings from the piston.



INSPECTION OF SECOND BRAKE COMPONENT

INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates and flange are worn or burnt. If necessary, replace them.

HINT:

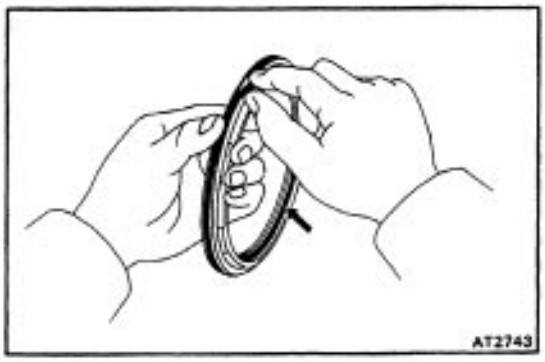
- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.

ASSEMBLY OF SECOND BRAKE PISTON

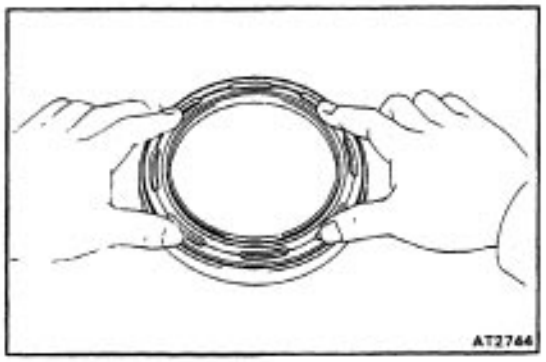
INSTALL PISTON

(a) Coat a new O–ring with ATF.

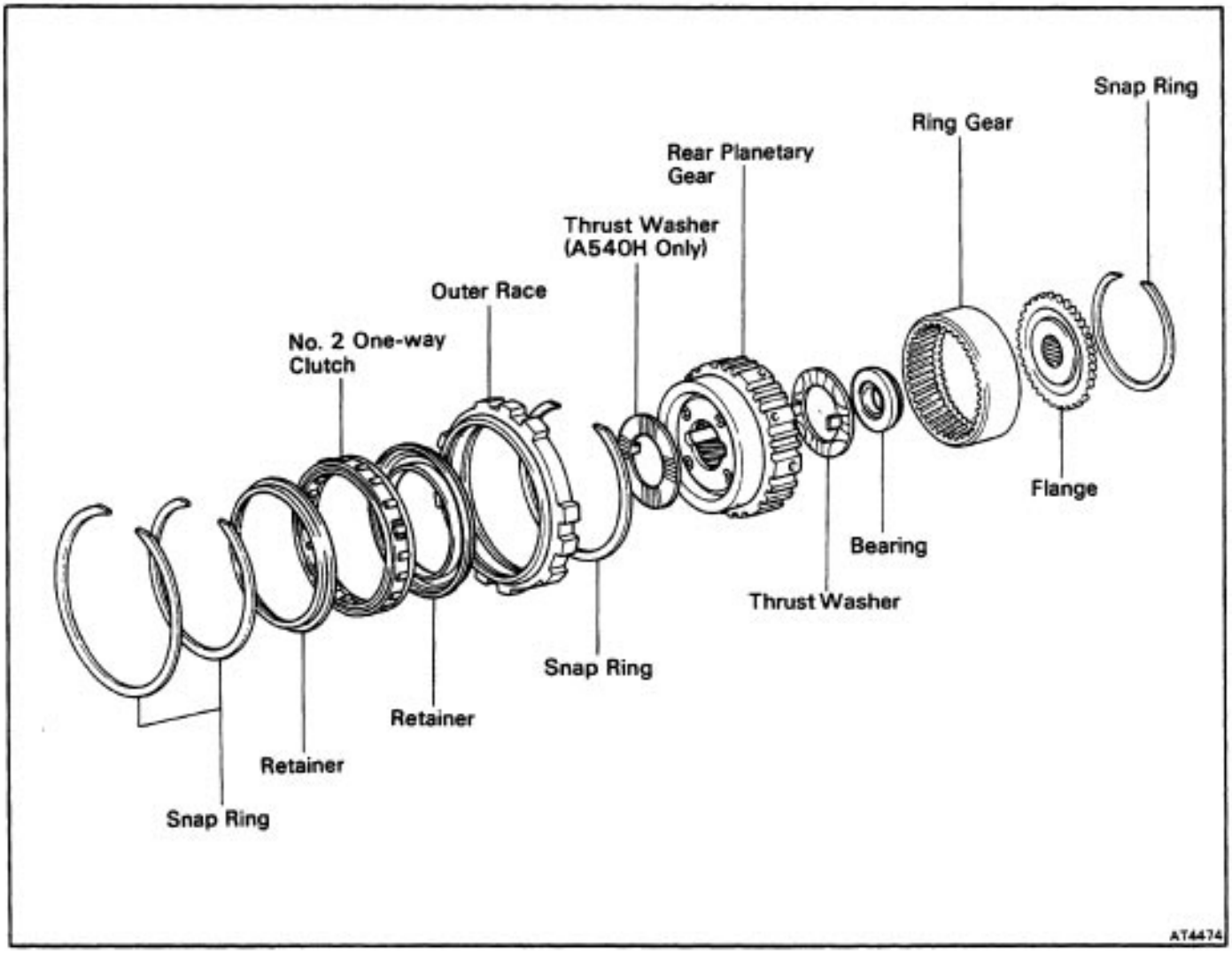
(b) Install the two O–rings on the piston.

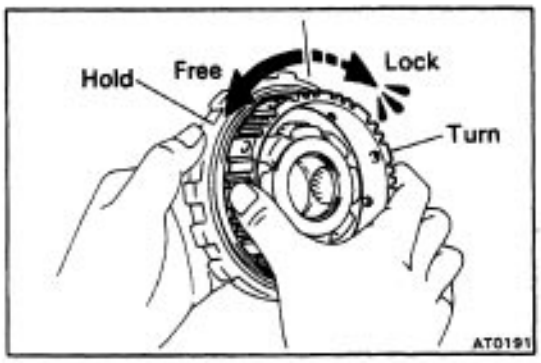


(c) Press the piston into the drum, being careful not to damage the O–rings.



Rear Planetary Gear



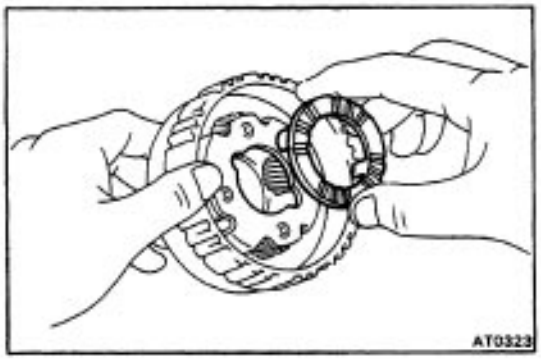


DISASSEMBLY OF NO. 2 ONE–WAY CLUTCH

1. CHECK OPERATION OF NO. 2 ONE–WAY CLUTCH

Hold the outer race and turn the rear planetary gear. The rear planetary gear should turn freely counter-clockwise and should lock clockwise.

2. SEPARATE NO. 2 ONE–WAY CLUTCH AND REAR PLANETARY GEAR



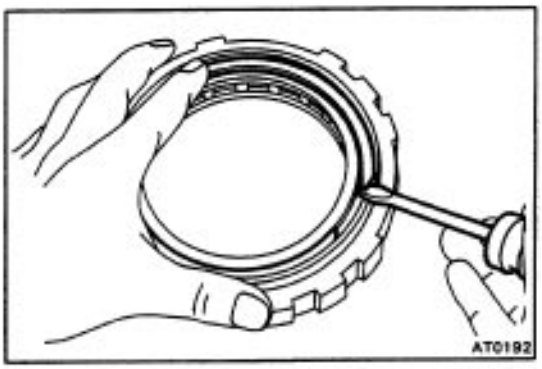
3. REMOVE THRUST WASHERS

(A540E)

Remove the thrust washer from the rear side of planetary gear.

(A540H)

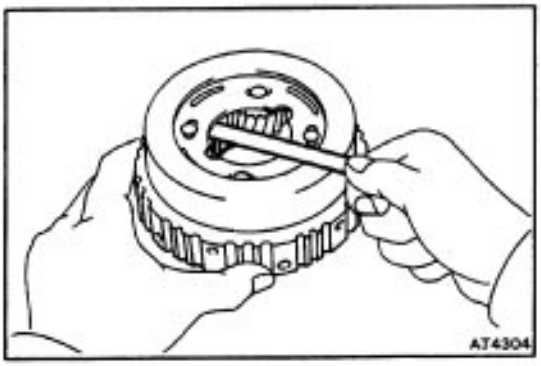
Remove the two thrust washers from both sides of planetary gear.



4. REMOVE NO. 2 ONE–WAY CLUTCH FROM OUTER RACE .

(a) Remove the two snap rings and retainers from both sides.

(b) Remove the No. 2 one–way clutch from the outer race.



INSPECTION OF REAR PLANETARY GEAR

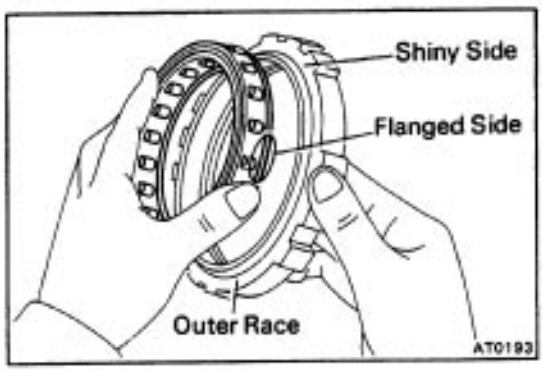
MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

Standard clearance: 0.16 – 0.56 mm (0.0063 – 0.0220 in)

Maximum clearance: 0.61 mm (0.0240 in.)

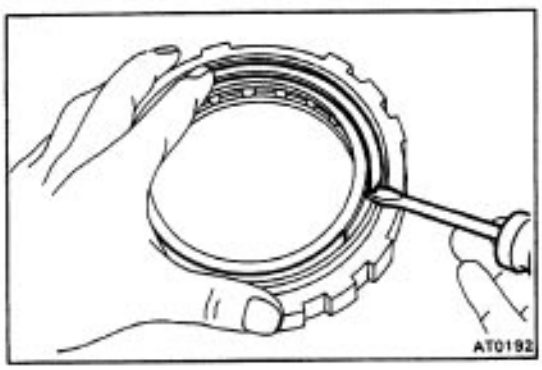
If the clearance is greater than the maximum, replace the planetary gear assembly.



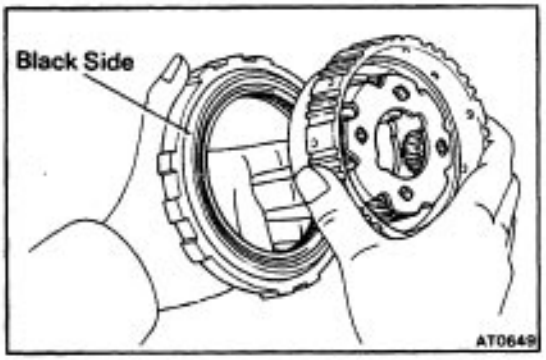
ASSEMBLY OF NO. 2 ONE–WAY CLUTCH

1. INSTALL ONE–WAY CLUTCH

(a) Install the No. 2 one–way clutch into the outer race, facing the flanged side of the No. 2 one–way clutch toward the shiny side of the outer race.

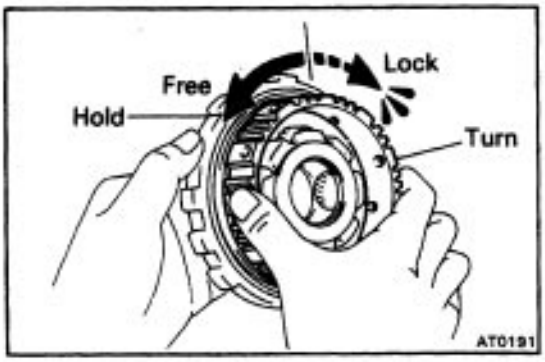


(b) Install the two retainers and snap rings to both sides.

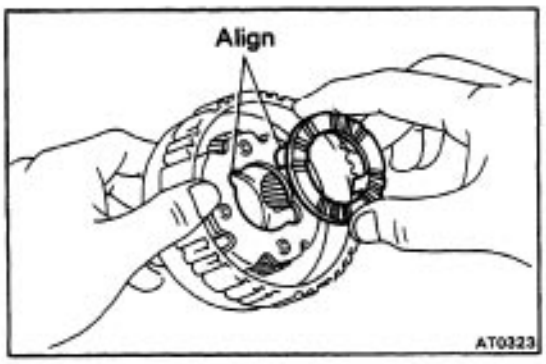


2. INSTALL PLANETARY GEAR INTO NO. 2 ONE–WAY CLUTCH

Install the planetary gear into the No. 2 one–way clutch, facing the inner race of the rear planetary gear toward the black side of the No. 2 one–way clutch outer race.



3. CHECK OPERATION OF NO. 2 ONE–WAY CLUTCH



4. INSTALL THRUST WASHERS

(A540E)

(a) Coat the thrust washer with petroleum jelly.

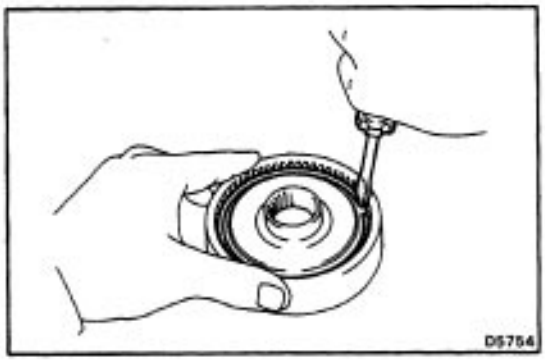
(b) Align the tab of the washer with the hollows of the carrier.

(A540H)

(a) Coat the two thrust washers with petroleum jelly.

(b) Align the tab of the washer with the hollows of the carrier.

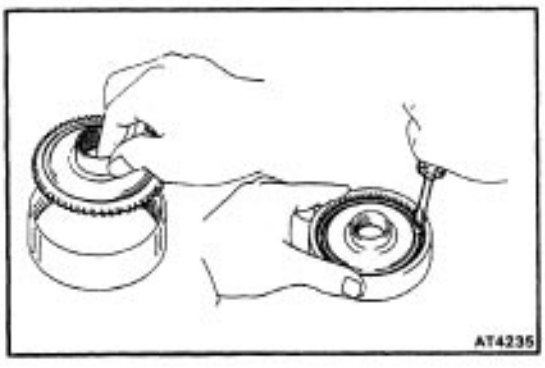
REPLACEMENT OF RING GEAR FLANGE



1. REMOVE RING GEAR FLANGE

(a) Using a screwdriver, remove the snap ring.

(b) Remove the flange from the ring gear.

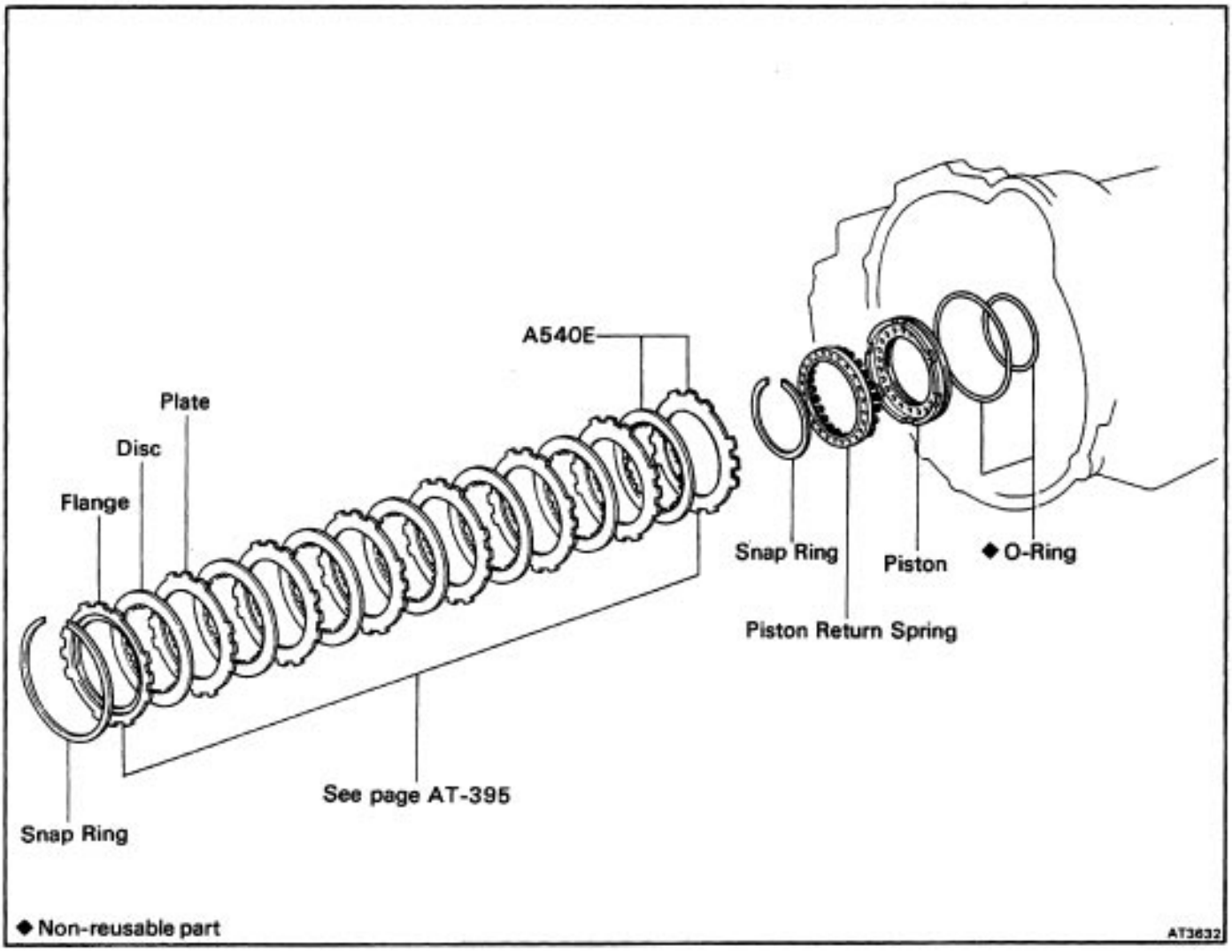


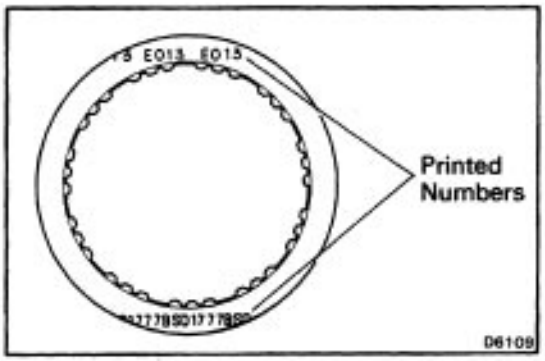
2. INSTALL RING GEAR FLANGE

(a) Position the flange into the ring gear.

(b) Using a screwdriver, install the snap ring.

First and Reverse Brake





INSPECTION OF FIRST AND REVERSE BRAKE COMPONENTS

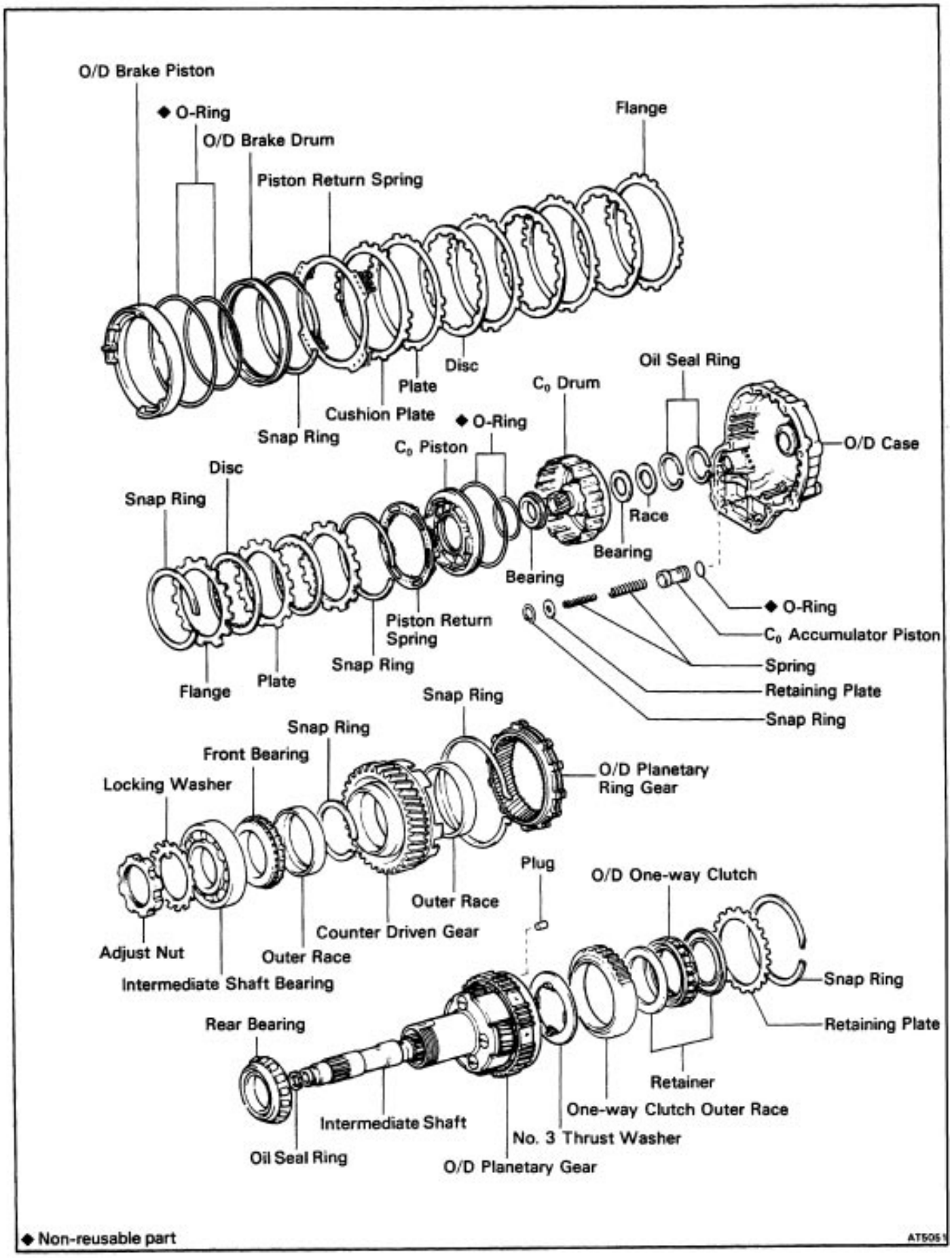
INSPECT DISCS, PLATES AND FLANGES

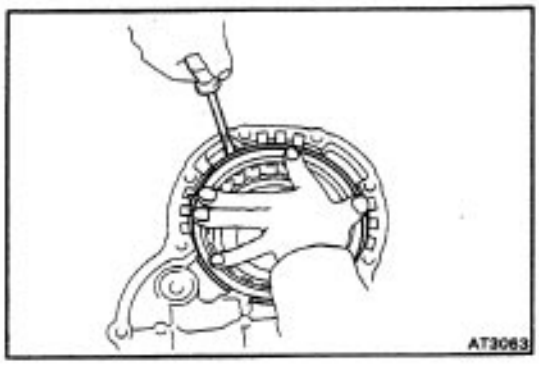
Check if the sliding surfaces of the discs, plates and flanges are worn or burnt If necessary, replace them.

HINT:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.

Overdrive Unit



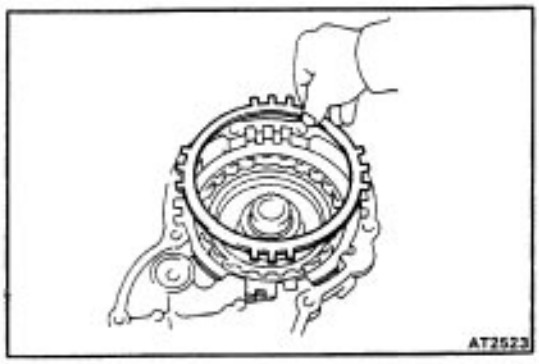


DISASSEMBLY OF OVERDRIVE BRAKE

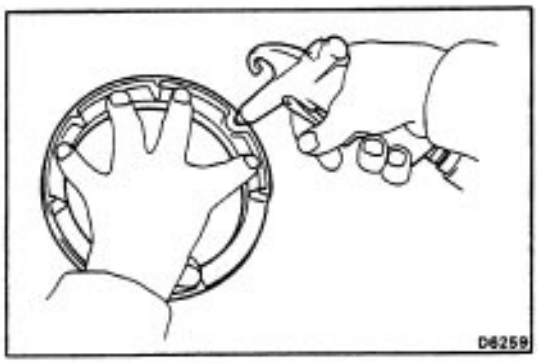
1. REMOVE PISTON RETURN SPRING

(a) While pushing the return spring, remove the snap ring with a screwdriver.

(b) Remove the piston return spring.



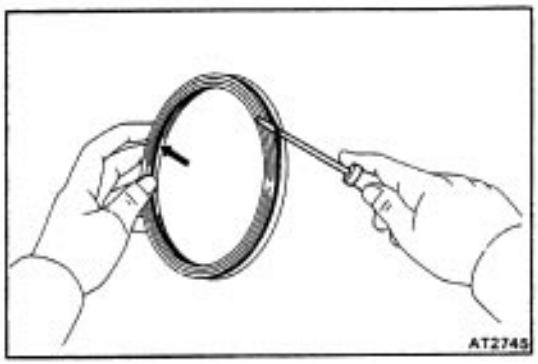
2. REMOVE PLATES, DISCS AND, FLANGE



3. REMOVE PISTON FROM DRUM

Apply compressed air to oil hole to remove the piston.

HINT: Blow with the gun slightly away from the oil hole, and be careful that the piston dose not tilt.



4. REMOVE 4–RINGS

Remove the inner and outer O–rings from the piston.

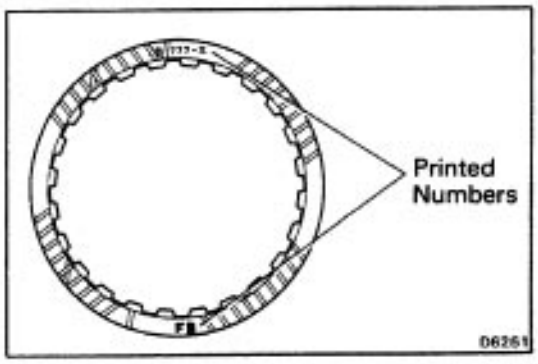
INSPECTION OF OVERDRIVE BRAKE

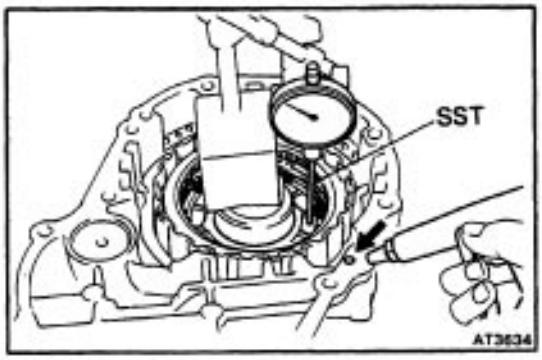
INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates and flange are worn or burnt. If necessary, replace them.

HINT:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.





DISASSEMBLY OF OVERDRIVE DIRECT CLUTCH

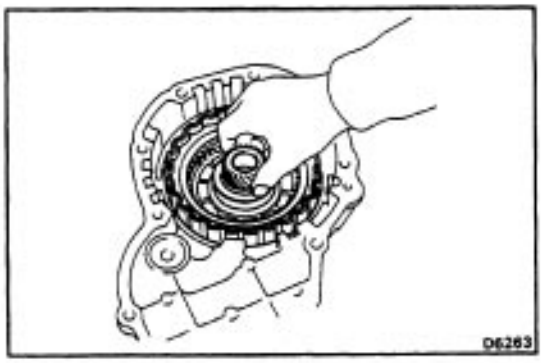
1. CHECK PISTON STROKE OF DIRECT CLUTCH

Using a dial indicator, measure the piston stroke while applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi or 392 – 785 kPa) as shown.

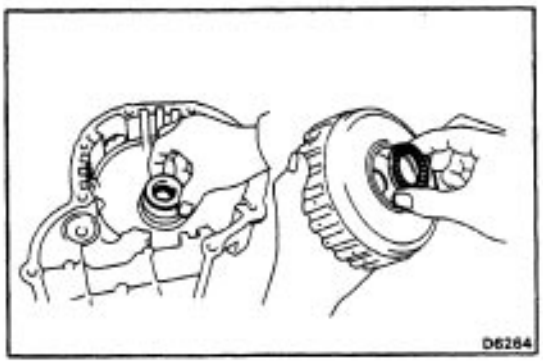
Piston stroke: 1.75 – 2.49 mm
(0.0688 – 0.0980 in.)

SST 09350–32014 (09351–32190)

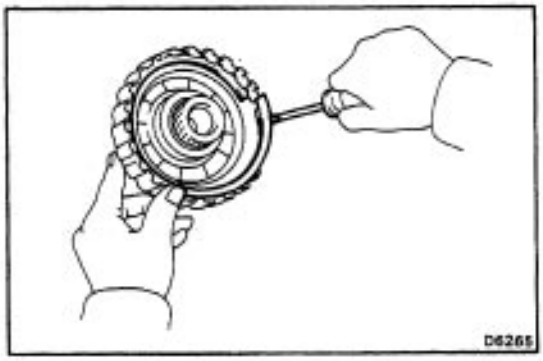
If the piston stroke is greater than the maximum, inspect each component.



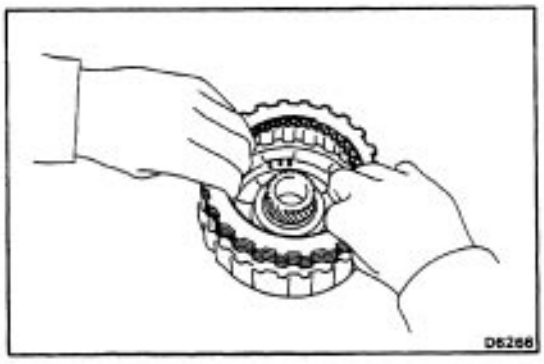
2. REMOVE OVERDRIVE DIRECT CLUTCH PROM CASE



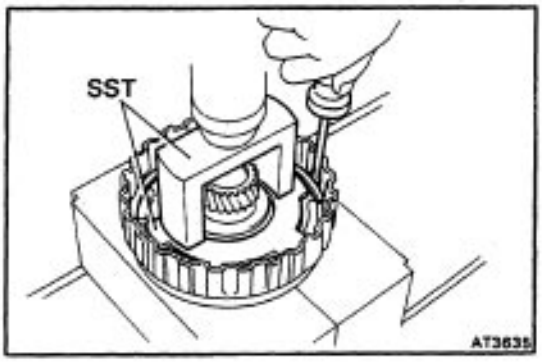
3. REMOVE BEARING AND RACE FROM CLUTCH DRUM AND CASE



4. REMOVE SNAP RING WITH SCREWDRIVER



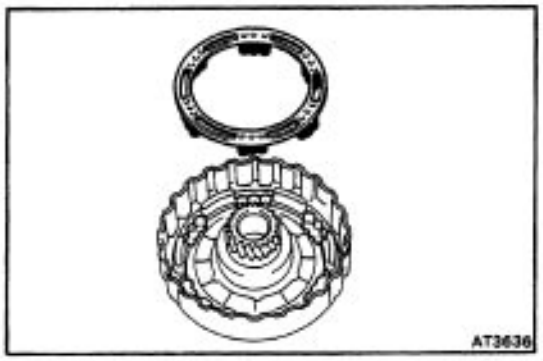
5. REMOVE FLANGES, DISCS AND PLATES



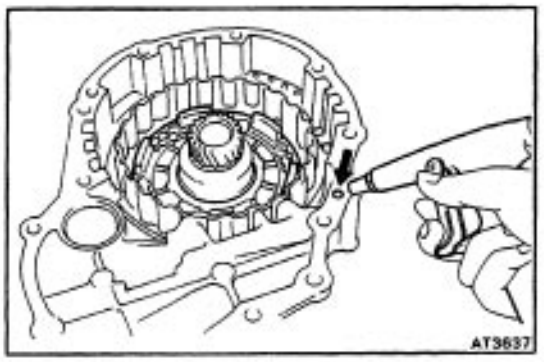
6. REMOVE PISTON RETURN SPRING

(a) Place SST on the spring retainer and compress the spring with a shop press.
SST 09350–32014 (09351–32070, 09351–32200)

(b) Remove the snap ring.



(c) Remove the piston return spring.



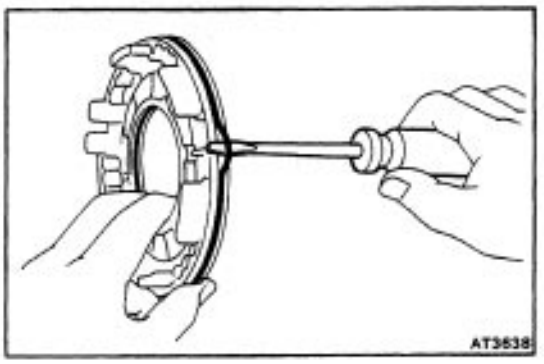
7. REMOVE PISTON FROM CLUTCH DRUM

(a) Install the clutch drum on the case.

(b) Apply compressed air to the pressure apply hole of the case.

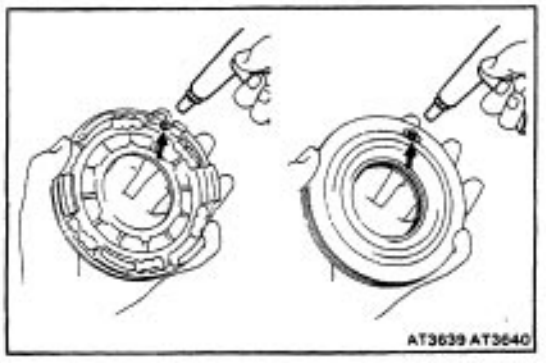
(c) Remove the piston from the clutch drum.
If the piston does not come out completely, use needle–nose pliers to remove it.

(d) Remove the clutch drum from the case.



8. REMOVE O–RINGS

Remove the two O–rings from the piston.

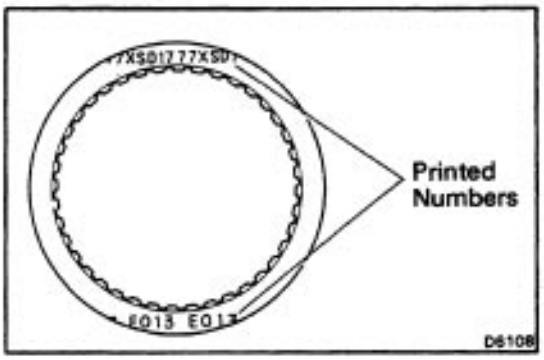


INSPECTION OF OVERDRIVE DIRECT CLUTCH

1. INSPECT OVERDRIVE DIRECT CLUTCH

(a) Check that the check ball is free by shaking the piston.

(b) Check that the valve does not leak by applying low–pressure compressed air.

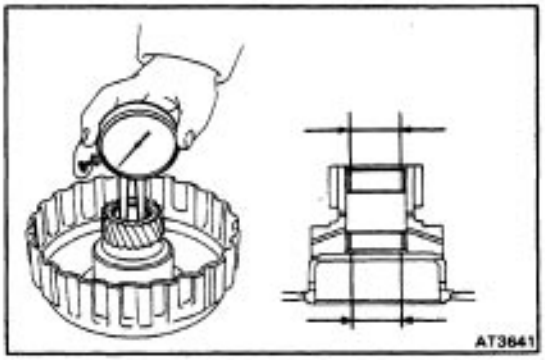


2. INSPECT DISCS, PLATES AND FLANGES

Check if the sliding surfaces of the discs, plates and flanges are worn or burnt. If necessary, replace them.

HINT:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.



3. CHECK DIRECT CLUTCH BUSHING

Using a dial indicator, measure the inside diameter of the two direct clutch bushings.

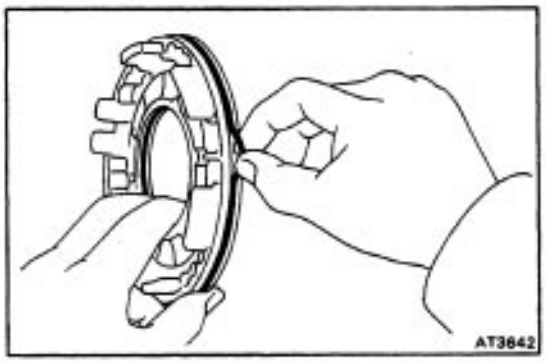
Maximum inside diameter: 22.13 mm (0.8713 in.)

If the inside diameter is greater than the maximum, replace the direct clutch drum.

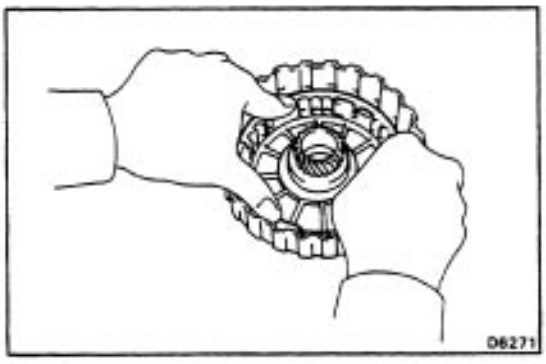
ASSEMBLY OF OVERDRIVE DIRECT CLUTCH

1. INSTALL CLUTCH PISTON

(a) Install new O–rings to the piston. Coat the O–rings with ATF.

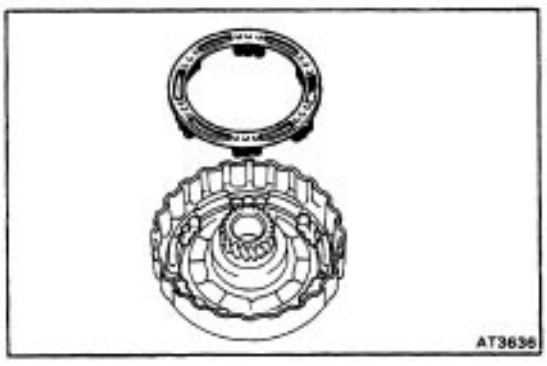


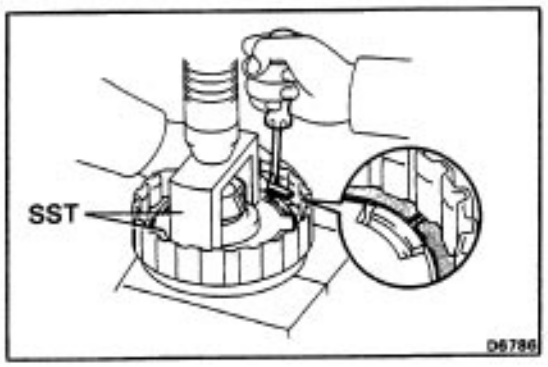
(b) Press the piston into the drum with the cup side up, being careful not to damage the O–ring.



2. INSTALL PISTON RETURN SPRING

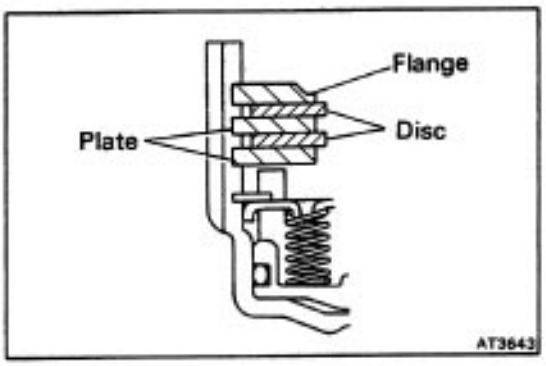
(a) Install the return spring and set snap ring in place.





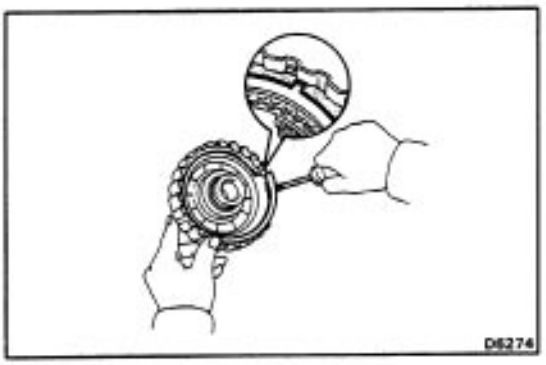
(b) Place SST on the spring retainer, and compress the spring with a shop press.
SST 09350–32014 (09351–32070, 09351–32200)

(c) Install the snap ring with a screwdriver. Be sure end gap of snap ring is aligned with the groove of the clutch drum.



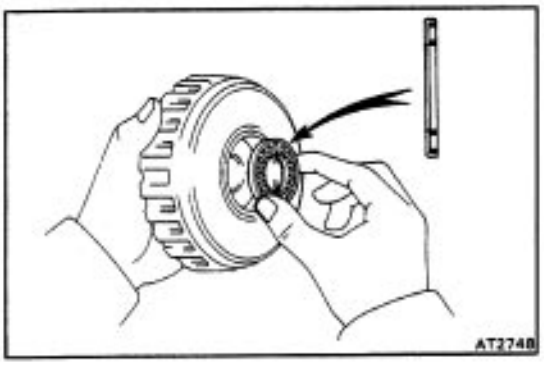
3. INSTALL PLATES, DISCS AND FLANGE

Install in order: P=Plate D=Disc
P–D–P–D–Flange



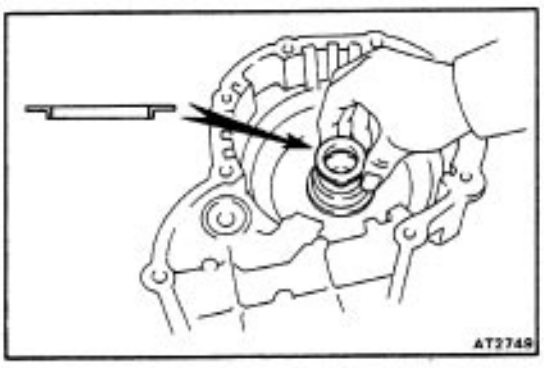
4. INSTALL SNAP RING

Be sure end gap of the snap ring is not aligned with the groove of the clutch drum.

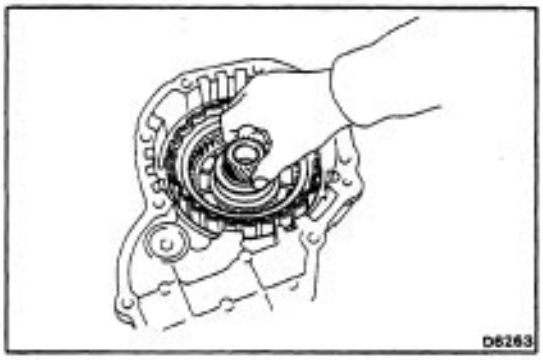


5. INSTALL BEARING AND RACE

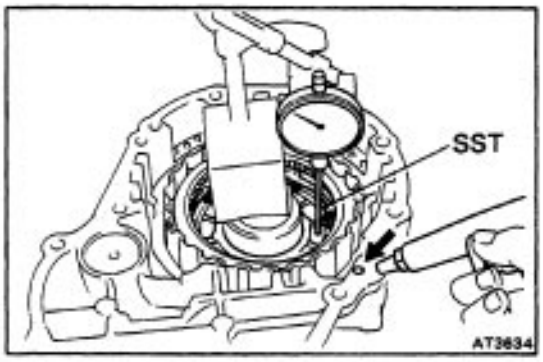
(a) Coat the bearing with petroleum jelly and install it facing the race side downward to the clutch drum.
Bearing: outer diameter 46.3mm (1.823 in.)
Inner diameter 26.2mm (1.031 in.)



(b) Coat the race with petroleum jelly and install it to the case.
Race: Outer diameter 43.0mm (1.693 in.)
Inner diameter 24.5mm (0.965 in.)



6. INSTALL DIRECT CLUTCH ON CASE

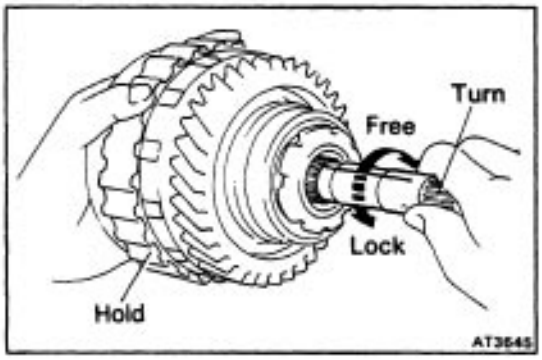


7. RECHECK PISTON STROKE OF DIRECT CLUTCH

Using a dial indicator, measure the piston stroke while applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi or 392 – 785 kPa) as shown.

Piston stroke: 1.75 – 2.49mm
(0.0689 – 0.0980 in.)

SST 09350–32014 (09351–32190)



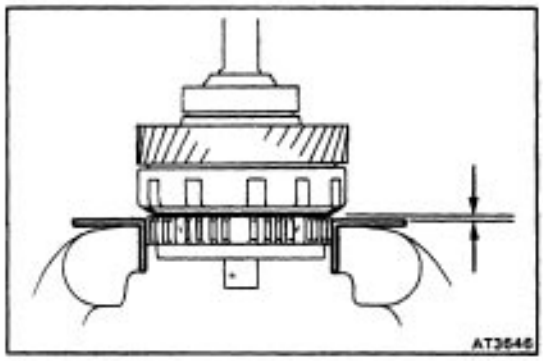
DISASSEMBLY OF COUNTER DRIVE GEAR

1. CHECK OPERATION OF ONE–WAY CLUTCH

(a) Install the overdrive direct clutch into the one–way clutch.

(b) Hold the overdrive direct clutch and turn the intermediate shaft. The shaft should turn freely clockwise and should lock counterclockwise.

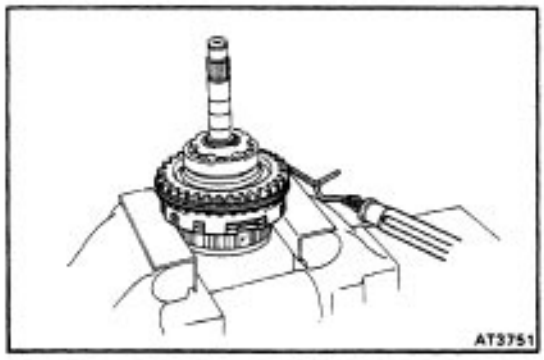
(e) Remove the overdrive direct clutch.



2. CHECK COUNTER DRIVE GEAR PRELOAD

(a) Hold the overdrive planetary gear in a vise with soft jaws.

HINT: Do not let the counter drive gear touch the vise.



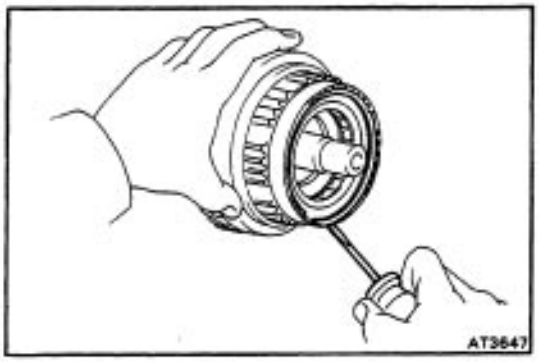
(b) Using a tension gauge, measure the preload.

Preload (at starting) : 940 – 1,560 g
(2.1 – 3.4 lb, 9.2 – 15.3 N)

HINT: Turn the counter drive gear right and left several times before measuring the preload.

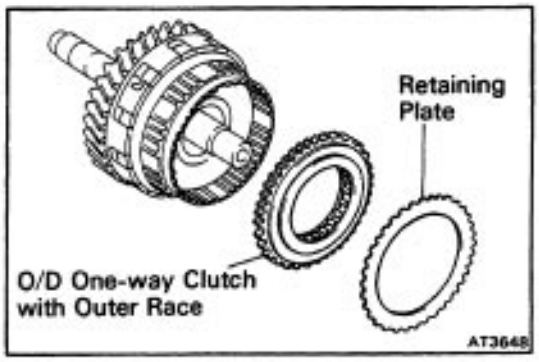
3. REMOVE O/D ONE–WAY CLUTCH AND OUTER RACE

(a) Remove the snap ring.

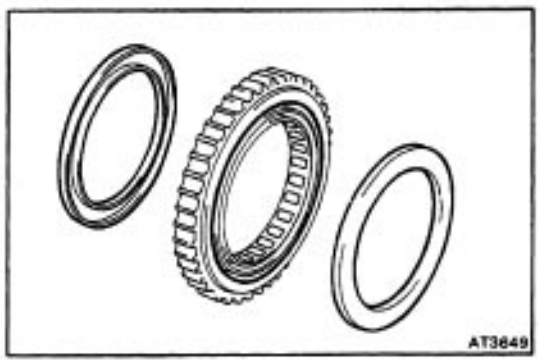


(b) Remove the retaining plate.

(c) Remove the O/D one–way clutch with outer race.

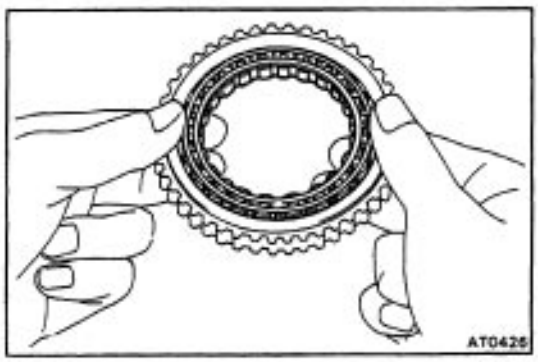


(d) Remove the two retainers from both sides of the O/D one–way clutch.



(e) Remove the O/D one–way clutch from the outer race.

HINT: Note the direction of the one–way clutch.

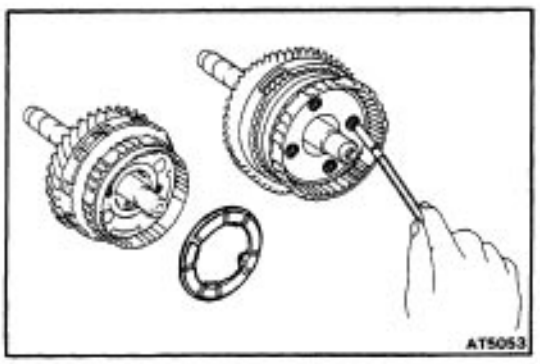


4. REMOVE NO. 3 PLANETARY THRUST WASHER

5. REMOVE PLUGS FROM PLANETARY GEAR

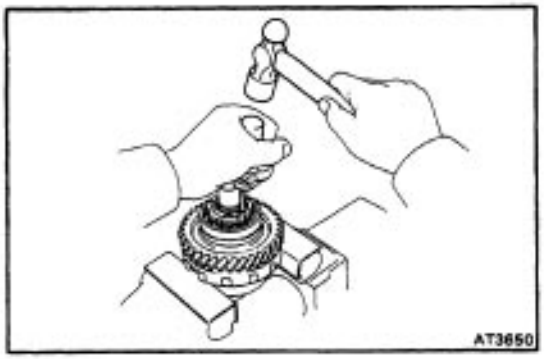
Remove the four plugs with a magnetic finger.

HINT: Be careful not to lose them.



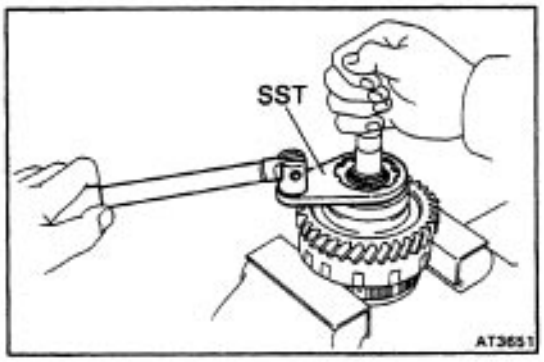
6. REMOVE ADJUSTING NUT AND LOCKING WASHER

(a) Pry off the locking washer.



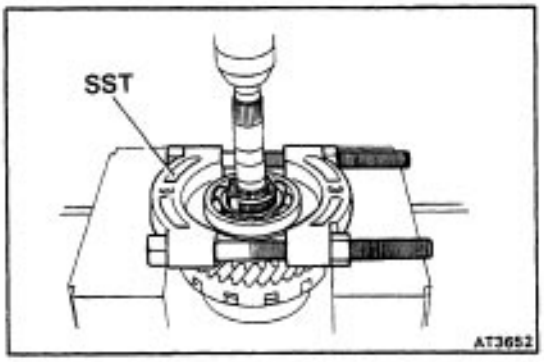
(b) Using SST, loosen the adjusting nut.
SST 09350–32014 (09351–32080)

(c) Remove the adjusting nut and locking washer.



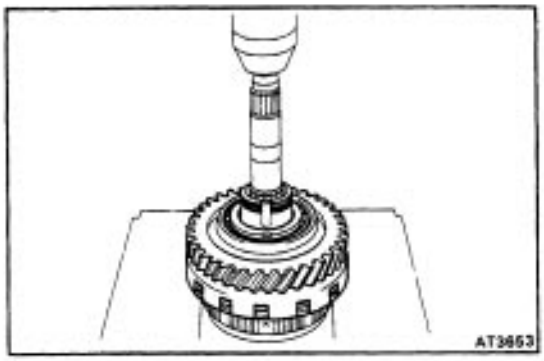
7. REMOVE INTERMEDIATE SHAFT REARING

Using SST, press out the bearing from the shaft.
SST 09950–00020



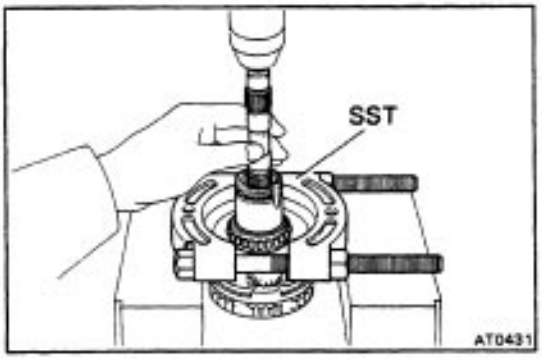
8. REMOVE COUNTER DRIVE GEAR AND FRONT BEARING

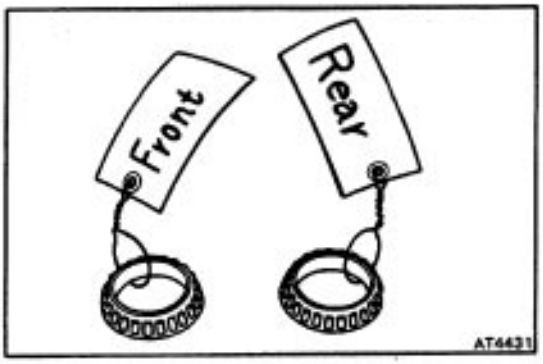
Press out the gear and bearing together.



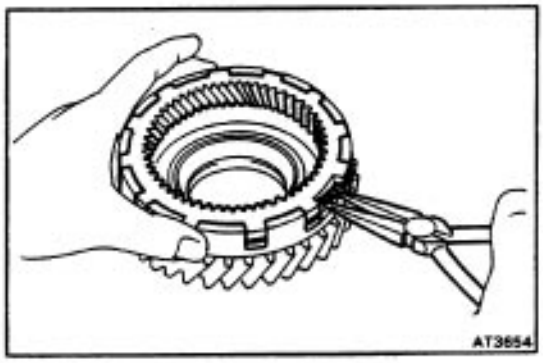
9. REMOVE REAR BEARING

(a) Using SST, press out the bearing.
SST 09950–00020





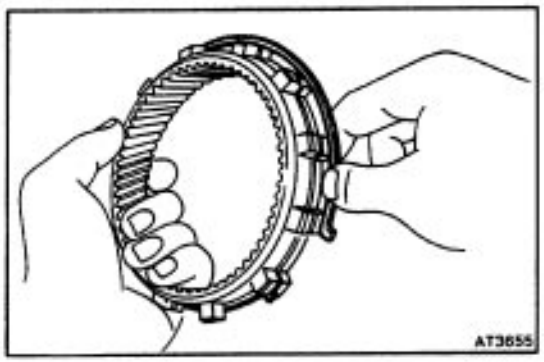
(b) Tag the bearings to show the location for reassembly.



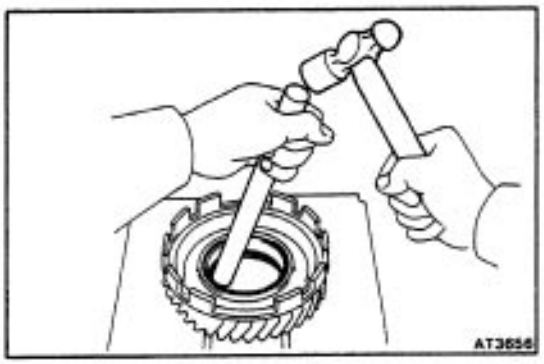
10. REMOVE OVERDRIVE PLANETARY RING GEAR FROM COUNTER DRIVE GEAR

(a) While pulling up the ring gear, compress the snap ring with needle–nose pliers and remove it from the groove.

(b) Remove the ring gear from the counter drive gear.

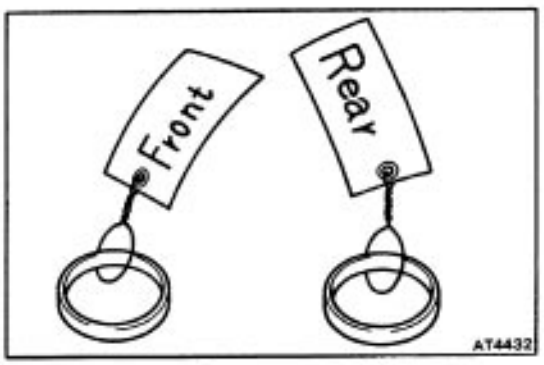


(c) Remove the snap ring from the ring gear.

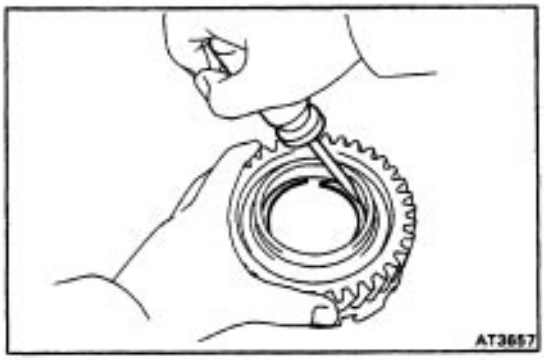


11. REMOVE OUTER RACES FROM COUNTER DRIVE GEAR

(a) Drive out the two races with a brass bar and hammer.

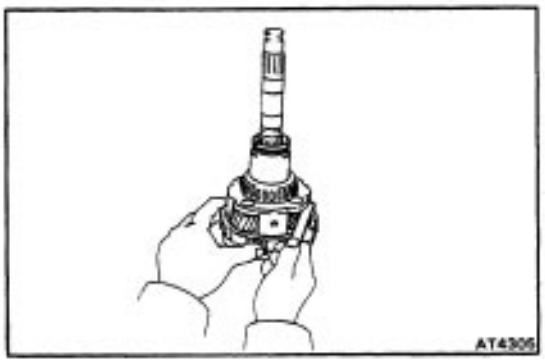


(b) Tag the races to show the location for reassembly.



12. REMOVE SNAP RING FROM COUNTER DRIVE GEAR

Using a screwdriver, remove the snap ring.



INSPECTION OF OVERDRIVE PLANETARY GEAR

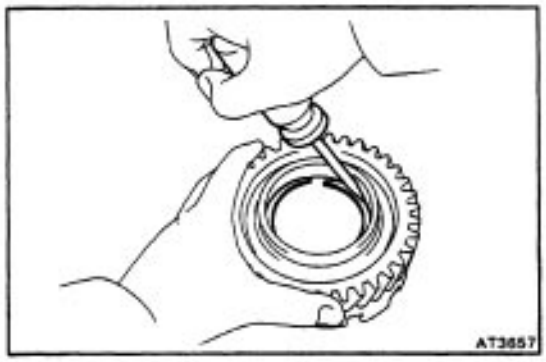
MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

Standard clearance: 0.16 – 0.56 mm
(0.0063 – 0.0220 in.)

Maximum clearance: 0.61 mm
(0.0240 in.)

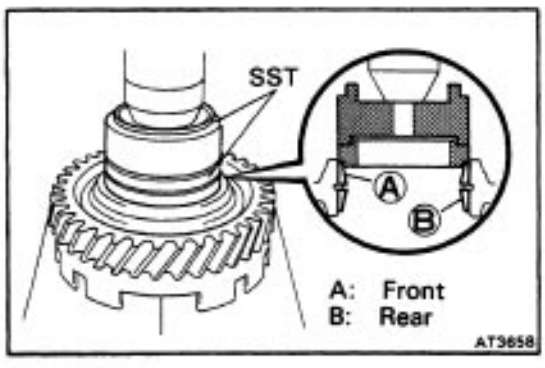
If the clearance is greater than the maximum, replace the planetary gear assembly.



ASSEMBLY OF COUNTER DRIVE GEAR

1. INSTALL SNAP RING INTO COUNTER GEAR

Install the snap ring with a screwdriver.

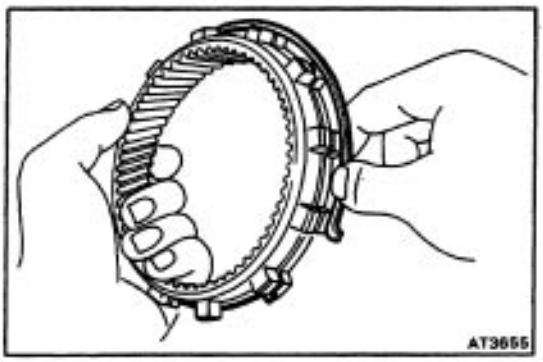


2. INSTALL OUTER RACES INTO COUNTER DRIVE GEAR

Using SST, press in the two outer races to both sides o1 the gear.

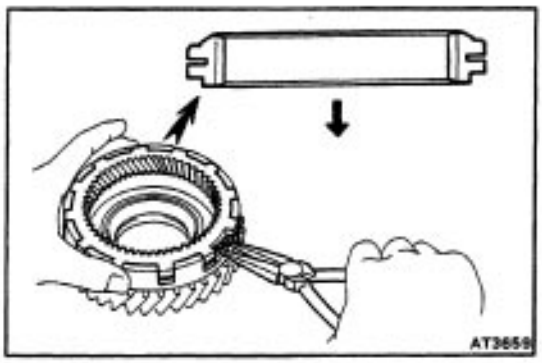
SST 09350–32014 (09351–32120, 09351–32150)

HINT: Press in the two outer races until they touch the snap ring. Tap the races in straight, so that they do not tilt

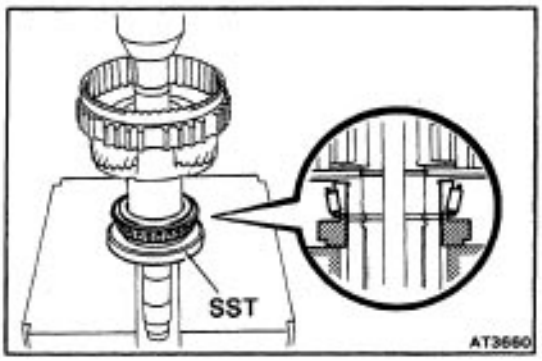


3: INSTALL OVERDRIVE PLANETARY RING GEAR INTO COUNTER DRIVE GEAR

(a) Install the snap ring to the ring gear.

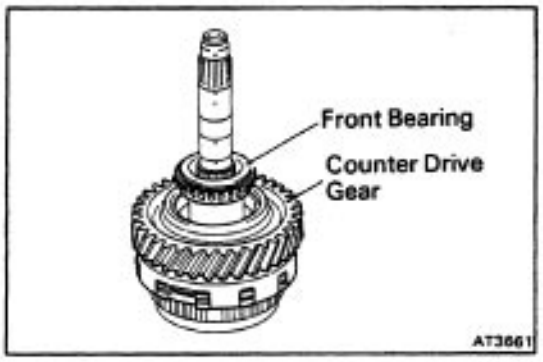


(b) While pushing down the ring gear, squeeze the snap ring end with needle–nose pliers, and install it into the groove.



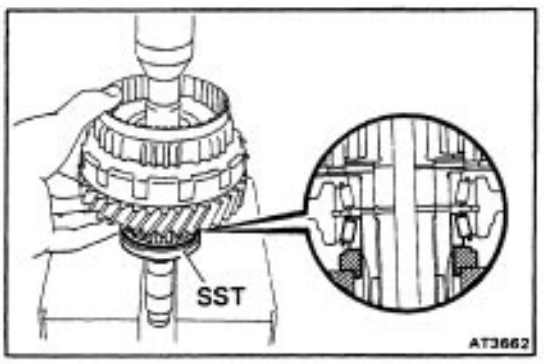
4. INSTALL REAR BEARING

Using SST, press in the bearing onto the shaft.
SST 09350–32014 (09351–32120)
HINT: Press in the bearing until the side surface of the inner race touches the planetary carrier.

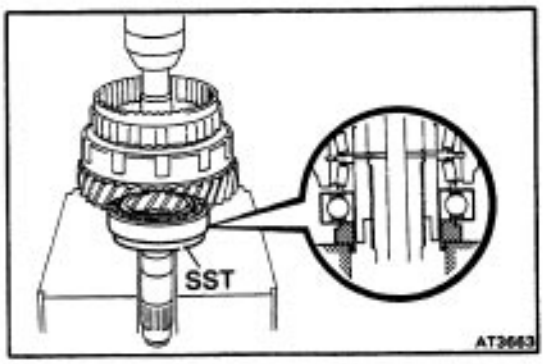


5. INSTALL COUNTER DRIVE GEAR AND FRONT BEARING

(a) Install the gear onto the shaft, and mesh the ring gear with the planetary pinions.
(b) Place the front bearing onto the shaft.



(c) Using SST, press in the bearing until slightly play between the bearings.
SST 09350–32014 (09351–32120)
HINT: Hold the ring gear to prevent it from falling.

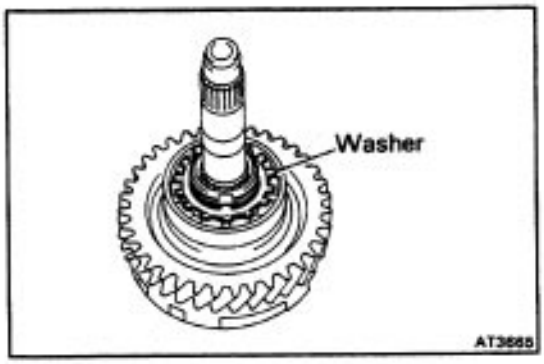


6. INSTALL INTERMEDIATE SHAFT BEARING

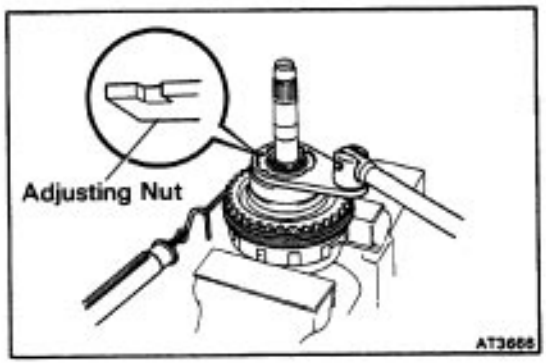
Using SST, press in the bearing until it slightly touches the front bearing of the counter drive gear.

SST 09350–32014 109351–32120i

HINT: The counter drive gear can be turned tightly.



7. PLACE NEW LOCKING WASHER



8. INSTALL ADJUSTING NUT AND ADJUST PRELOAD OF COUNTER DRIVE GEAR

(a) Hold the overdrive planetary gear in a vise with soft jaws.

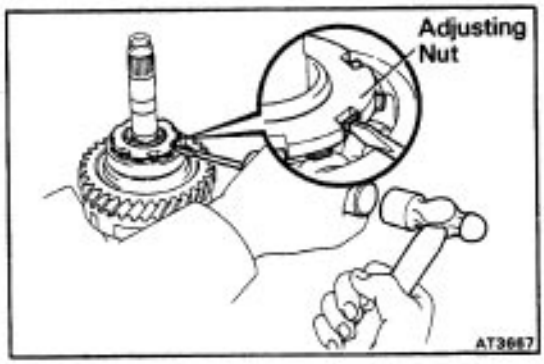
(b) Using SST, tighten the adjusting nut until the following gear starting load is reached on the tension gauge.

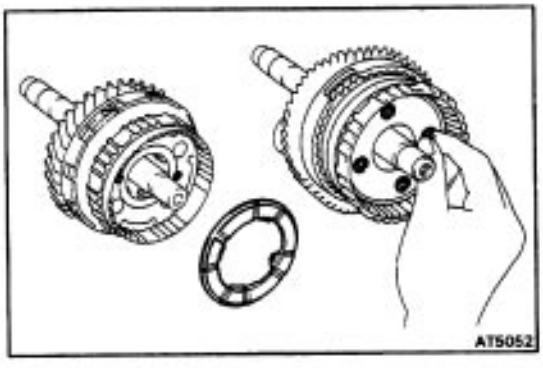
SST 09350–32014 I09351–32080

Preload (at starting) : 940 – 1,560 g (2.1 – 3.4 lb, 9.2 – 15.3 N)

HINT: Turn the counter drive gear right and left several times before measuring the preload.

(c)Lock the adjusting nut with one tab on locking washer. Bend the locking washer tab until it is ever with the adjusting nut groove.

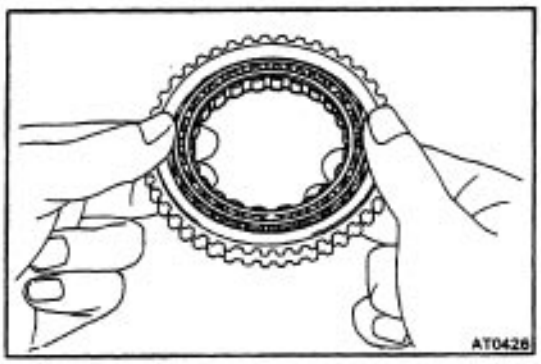




9. INSTALL NO. 3 OVERDRIVE PLANETARY THRUST WASHER

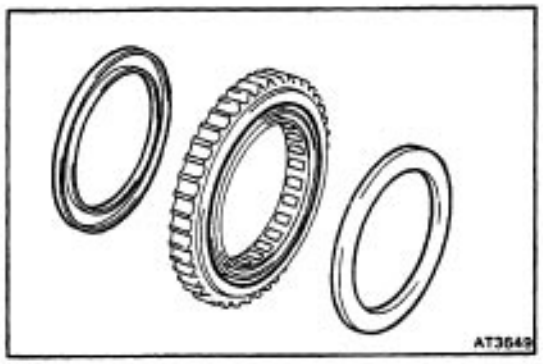
10. INSTALL PINION SHAFT PLUGS

Install the four plugs into the pinion shaft.

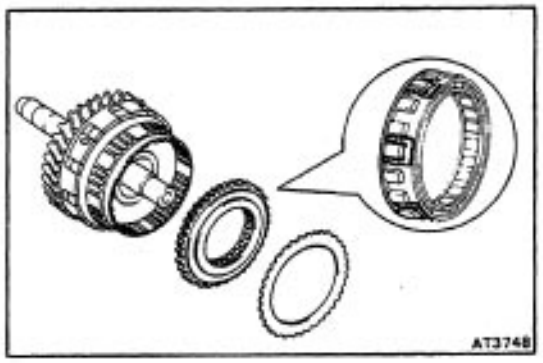


11. INSTALL OVERDRIVE ONE–WAY CLUTCH AND RETAINING PLATE

(a) Install the one–way clutch into the outer race.



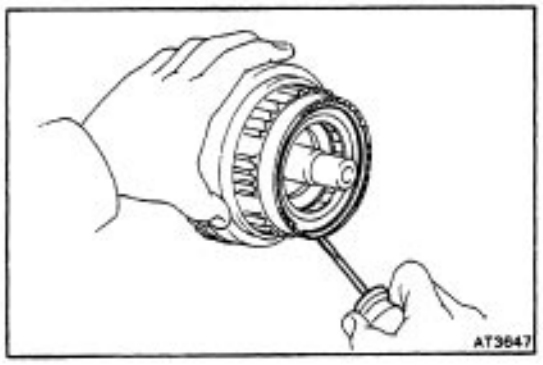
(b) Install the two retainer on both sides of the one–way clutch.



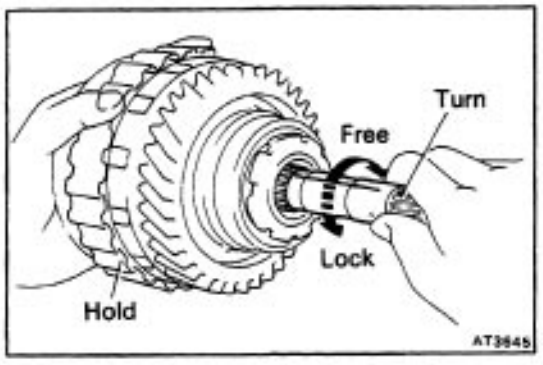
(c) Install the one–way clutch into the overdrive planetary gear.

HINT: Be sure that the one–way clutch is installed in the correct direction.

(d) Install the retaining plate.



(e) Install the snap ring.

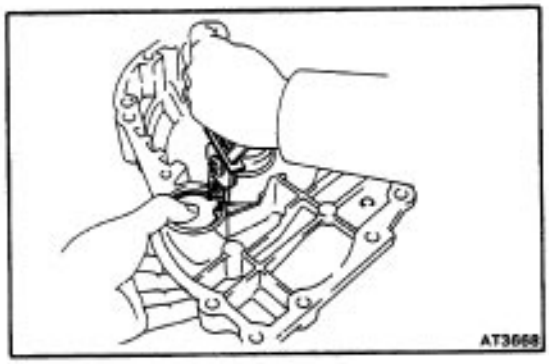


12. CHECK OPERATION OF O/D ONE–WAY CLUTCH

(a) Install the overdrive direct clutch into the one–way clutch.

(b) Hold the overdrive direct clutch and turn the intermediate shaft. The shaft should turn freely clockwise and should lock counterclockwise.

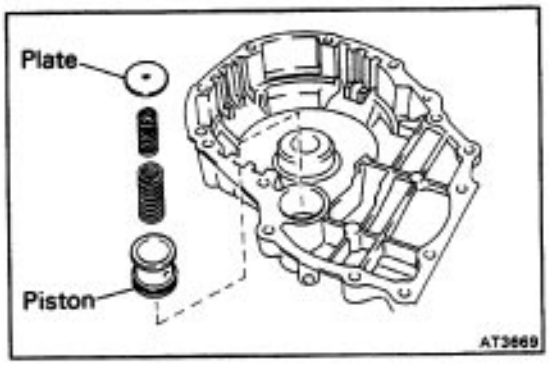
(c) Remove the overdrive direct clutch.



DISASSEMBLY OF OVERDRIVE CASE

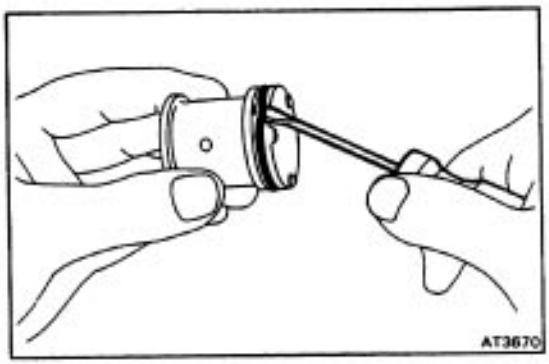
1. REMOVE C0 ACCUMULATOR PISTON FROM OVERDRIVE CASE

(a) Using snap ring pliers, remove the snap ring.



(b) Remove the retaining plate and two springs.

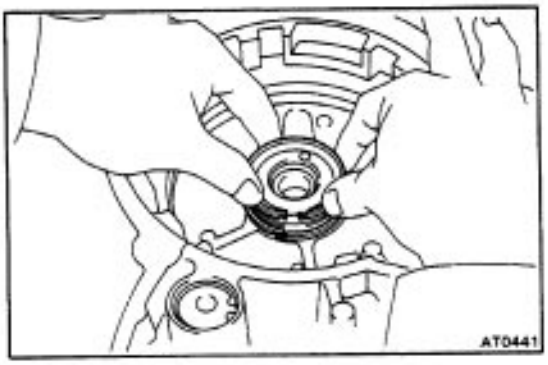
(c) Remove the accumulator piston.



(d) Remove the O–ring from the piston.

2. REMOVE OIL SEAL RINGS

Spread the two rings apart and remove them.

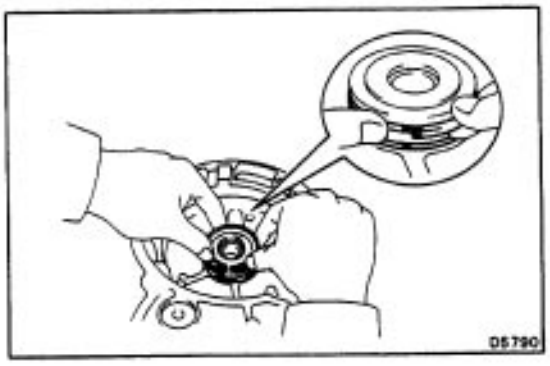


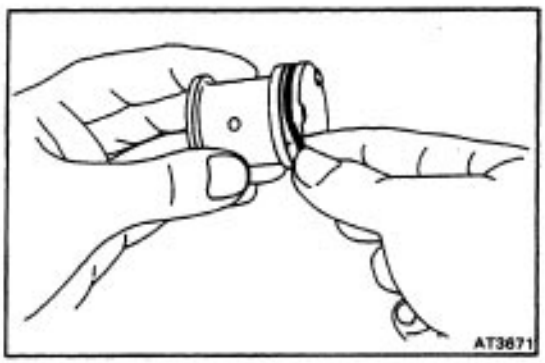
ASSEMBLY OF OVERDRIVE CASE

1. INSTALL OIL SEAL RINGS ON OVERDRIVE CASE

Spread the two rings apart and install them into the groove.

HINT: After installing the oil seal rings, check that the move smoothly.

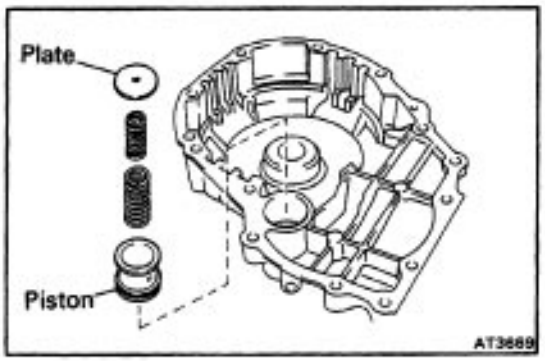




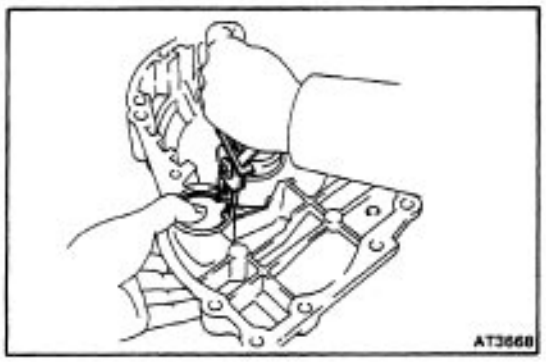
2. INSTALL Co ACCUMULATOR PISTON TO OVERDRIVE CASE

(a) Install a new O–ring to the accumulator piston.

(b) Coat the O–ring with ATF.



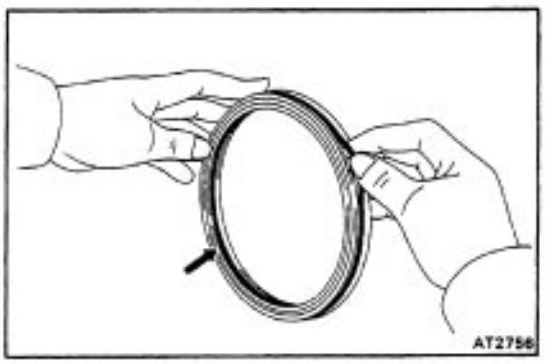
(c) Install the accumulator piston, two springs and retaining plate.



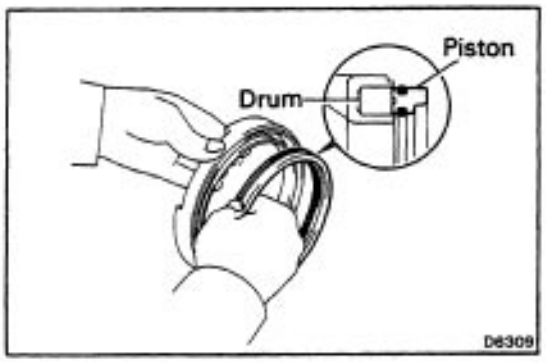
(d) Using snap ring pliers, install the snap ring.

ASSEMBLY OF OVERDRIVE BRAKE

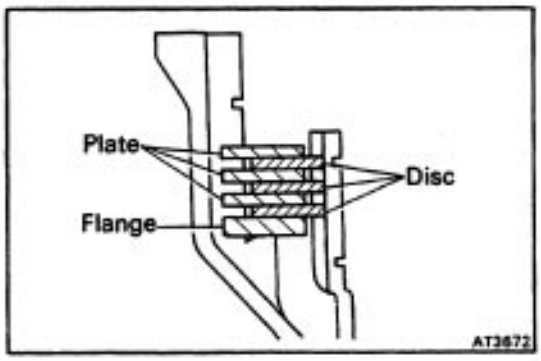
1. INSTALL PISTON INTO DRUM



(a) Install the new O–rings to the piston.
Coat the O–rings with ATF.



(b) Press the piston into the drum, being careful not to damage the O–rings.

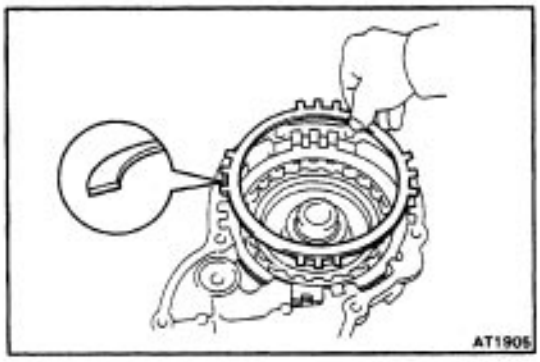


2. INSTALL FLANGE, DISCS AND PLATES

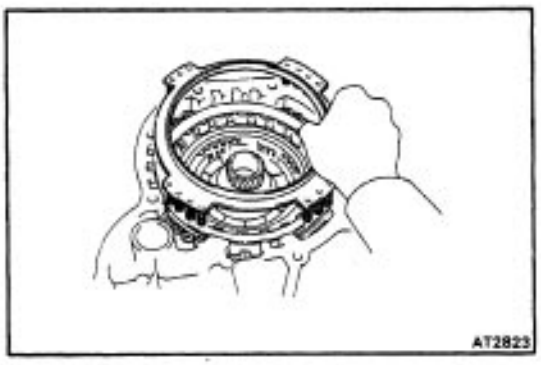
(a) Install the flange, discs and plates.

Install in order: P=Plate D=Disc

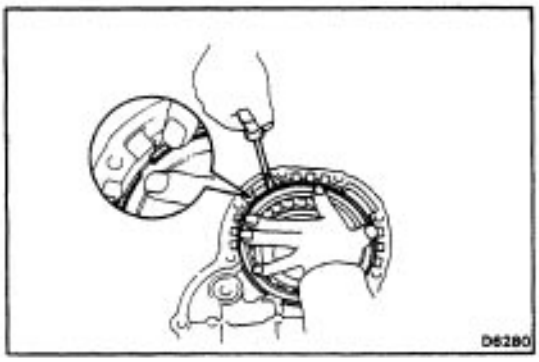
Flange– D=P–D–P–D–P



(b) Install the cushion plate with the rounded end facing upward.

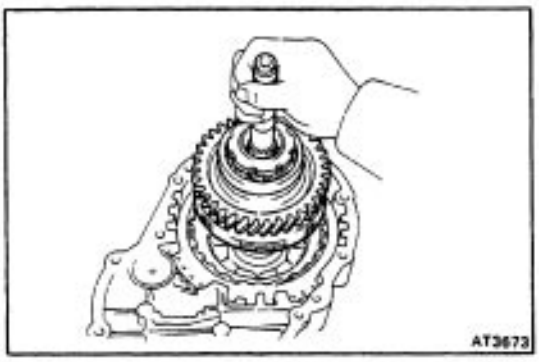


3. POSITION PISTON RETURN SPRING



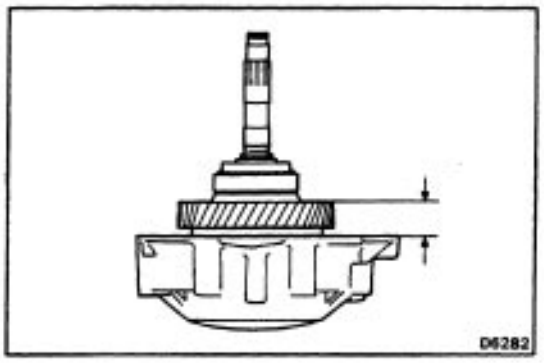
4. INSTALL SNAP RING INTO CASE

Be sure the end gap of the snap ring is not aligned with one of cutouts.



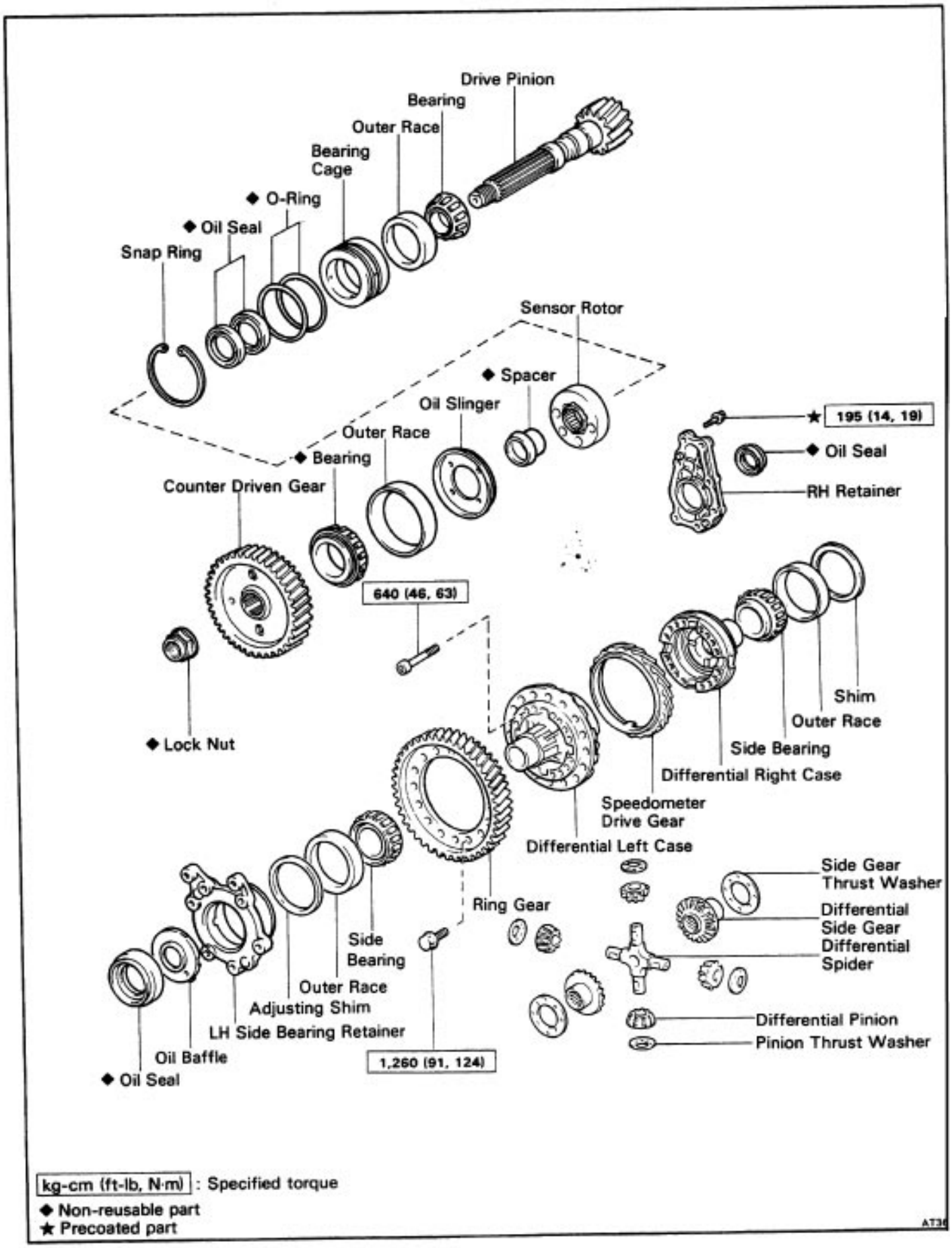
5. INSTALL OVERDRIVE PLANETARY GEAR ONTO OVERDRIVE DIRECT CLUTCH

While turning the overdrive planetary gear clockwise install it onto the overdrive direct clutch.

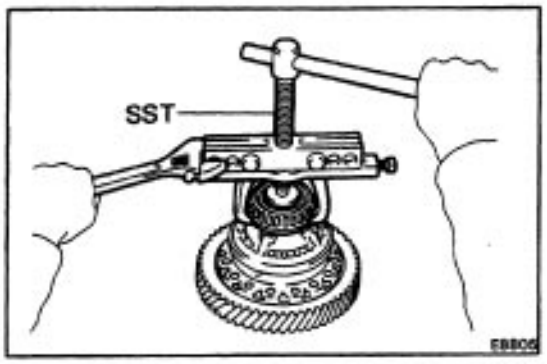


HINT: If the overdrive planetary gear is properly installed onto the direct clutch, the counter drive gear height from the overdrive case will be about 24mm (0.94 in.).

Differential Assembly (A540E)

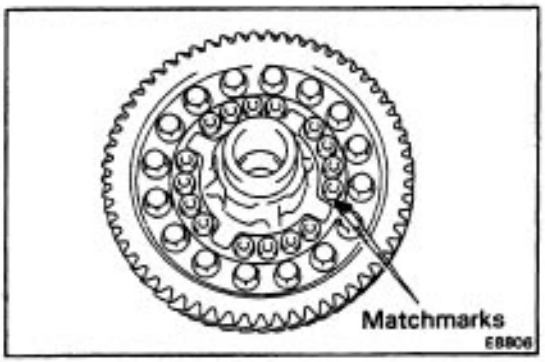


DISASSEMBLY OF DIFFERENTIAL CASE



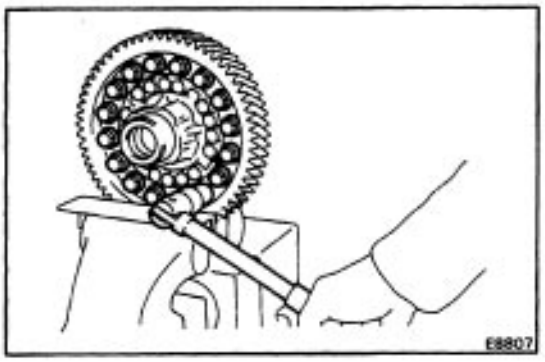
1. REMOVE SIDE BEARING

Using SST, remove the two side bearings.
SST 09950–20017

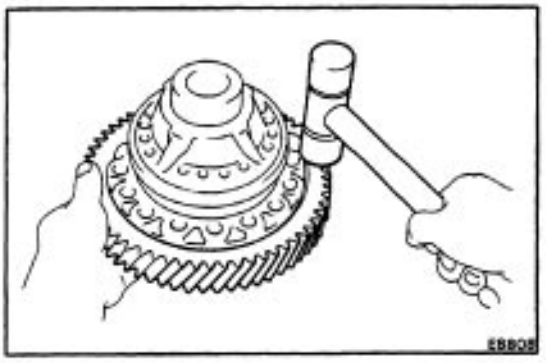


2. REMOVE RING GEAR

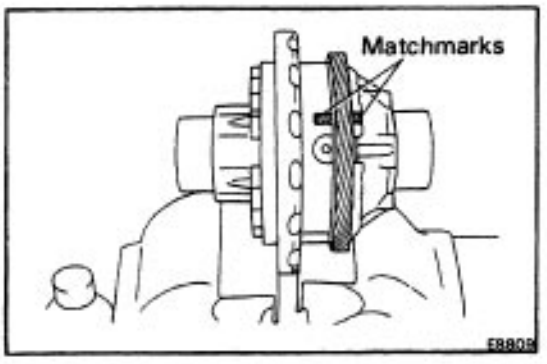
(a) Place the matchmarks on both the differential case and ring gear.



(b) Remove the sixteen bolts.

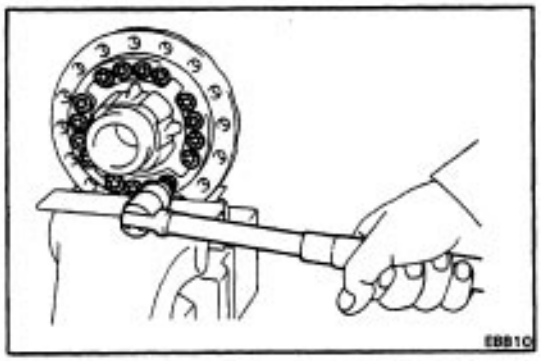


(c) Using a plastic hammer, tap out the ring gear.

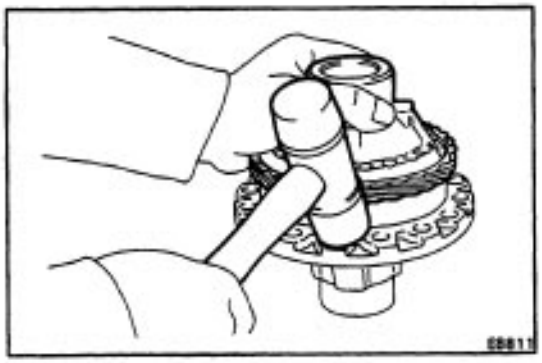


3. DISASSEMBLE OF DIFFERENTIAL CASE

(a) Place the matchmarks on the differential right and left case.

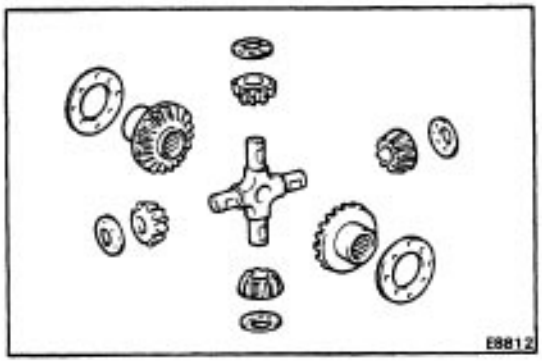


(b) Using a torx wrench, remove the sixteen torx screws.



(c) Using a plastic hammer, tap out the differential left case.

(d) Remove the speedometer drive gear from the differential right case.

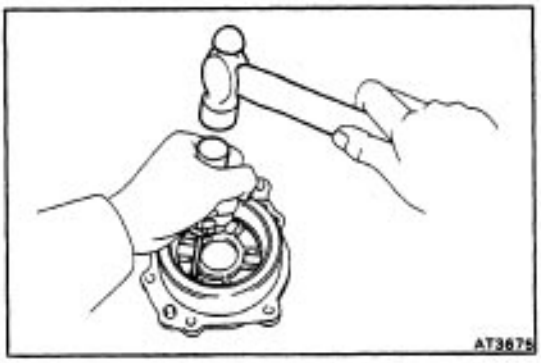


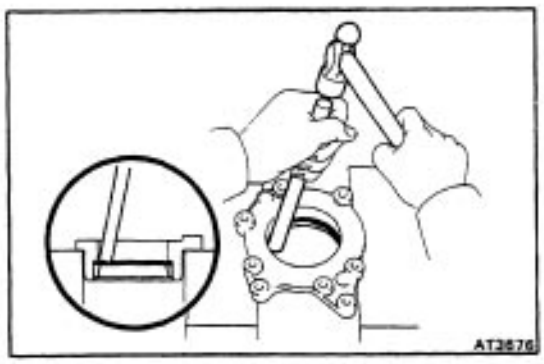
(e) Remove the two differential side gears, two side thrust washers, differential spider, four differential pinions and four pinion washers from the differential left case.

4. DISASSEMBLE LH BEARING RETAINER

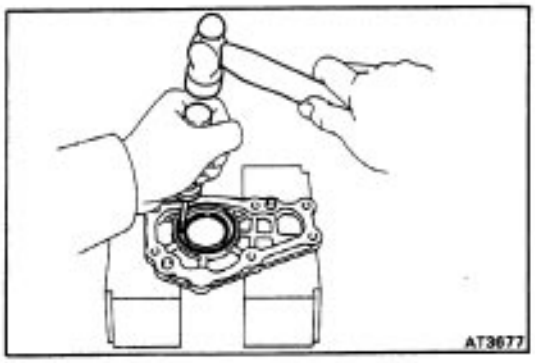
(a) Using a hammer and screwdriver, remove the oil seal.

(b) Remove the oil baffle from the LH bearing retainer.



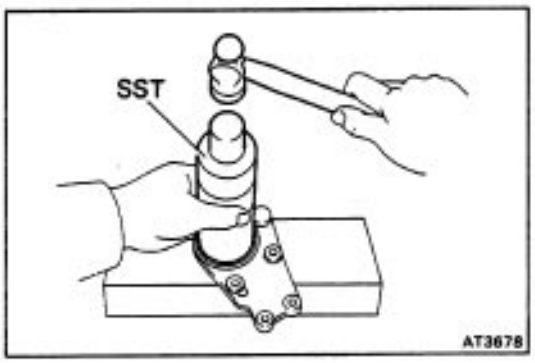


(e) Using a hammer and brass bar, drive out the outer race and adjusting shim from LH bearing retainer.



5. REMOVE RH OIL SEAL FROM RH RETAINER

Using a hammer and screwdriver, drive out the oil seal.

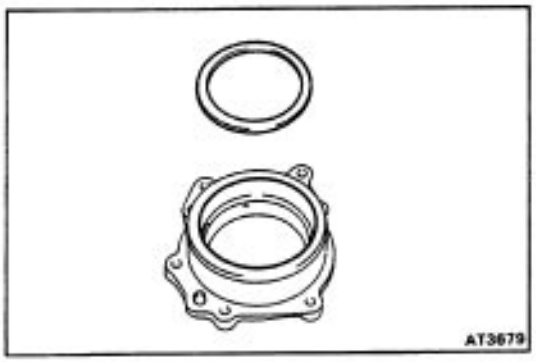


ASSEMBLY OF DIFFERENTIAL CASE

1. INSTALL RH OIL SEAL TO RH RETAINER

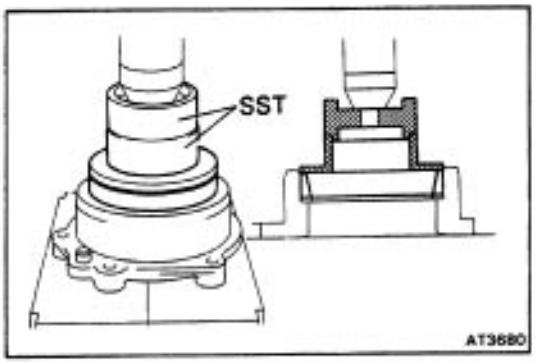
(a) Using SST, drive in a new oil seal until its surface is flush with the surface of RH retainer.
SST 09316–60010 (09316–00010)

(b) Coat the oil seal lip with MP grease.



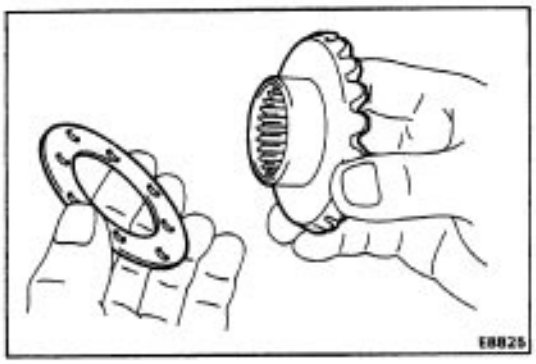
2. INSTALL ADJUSTING SHIM AND BEARING OUTER RACE TO LH BEARING RETAINER

(a) Place the adjusting shim into the LH bearing retainer.
HINT: Use either the shim which was removed or one 2.40 mm (0.0945 in.).



(b) Using SST, press the outer race into the LH retainer.
SST 09316–20011, 09350–32014 109351–32150y

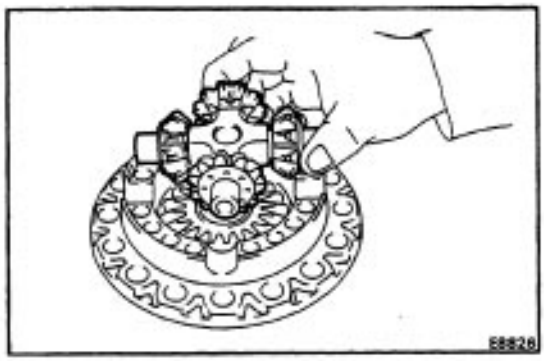
HINT: Install the oil baffle and oil seal after adjusting the differential side bearing preload.
(See page AT–388)



3. ASSEMBLE DIFFERENTIAL CASE

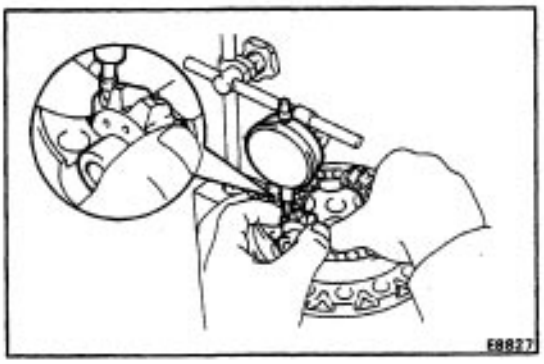
HINT: Coat all of the sliding and rotating surface with ATF before assembly.

(a) Install the thrust washer to the side gear.



(b) Install the four pinions –and thrust washers to the spider.

(c) Install the side gear and spider with four pinions to the differential left case.



(d) Using a dial indicator, measure the backlash of one pinion gear while holding the side gear.

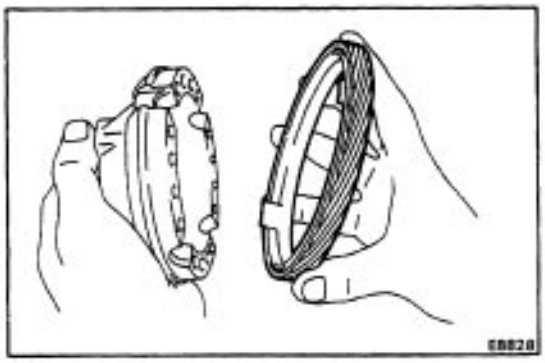
Standard backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

(e) Install the side gear and spider with four pinions to the right side of the differential case. And check the pinion gear backlash.

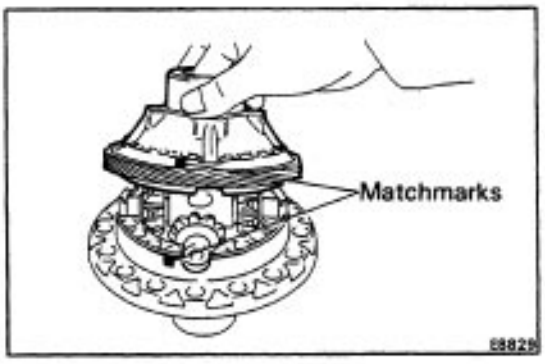
(f) Referring to the table below, select the side gear thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

mm (in.)

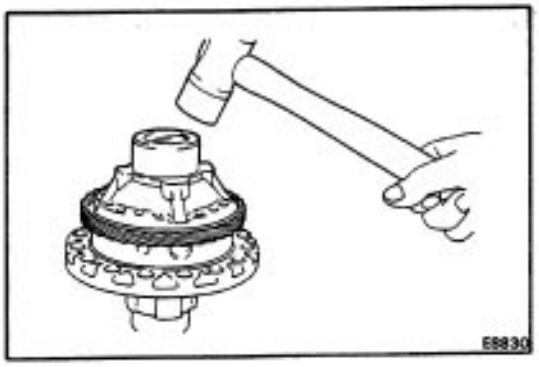
Thickness	
0.80 (0.0315)	1.20 (0.0472)
0.90 (0.0354)	1.30 (0.0512)
1.00 (0.0394)	1.40 (0.0551)
1.10 (0.0433)	



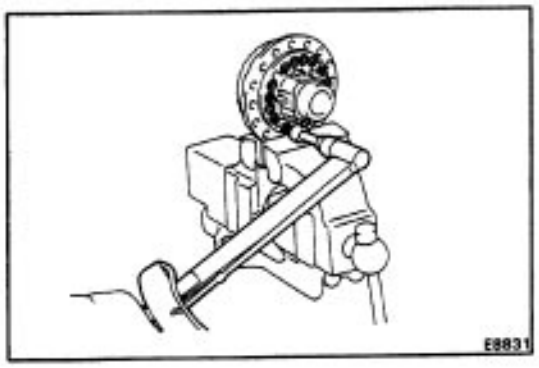
(g) Install the speedometer driven gear.



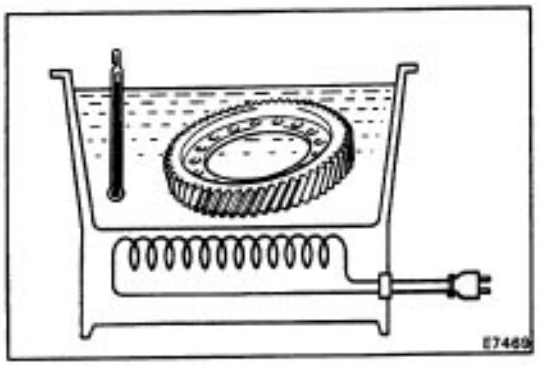
(h) Align the matchmarks on the differential cases.



(i) Using plastic hammer, carefully tap the differential right case.

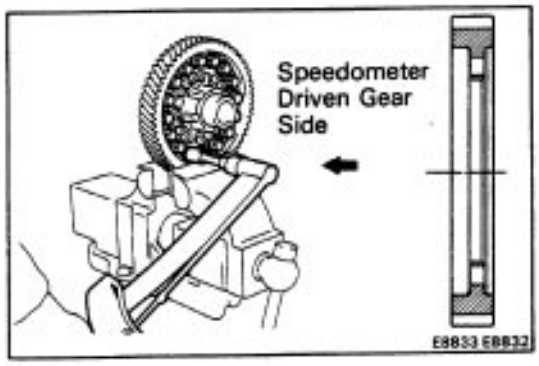


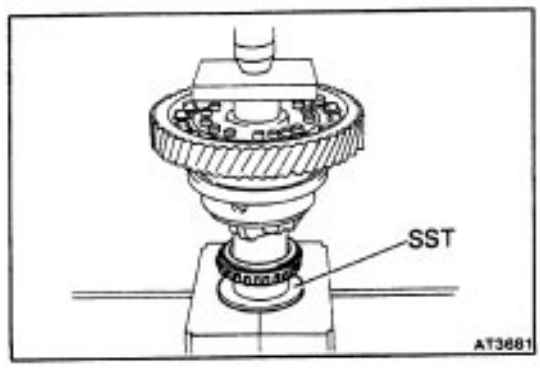
Q) Using a torx wrench, install and torque the sixteen torx screws.
Torque: 640 kg–cm (46 ft–lb, 63 N–m)



4. INSTALL RING GEAR

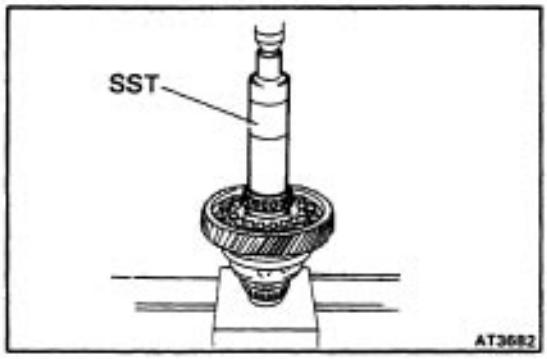
(a) Clean the contact surface of the differential case.
(b) Heat the ring gear to about 212˚F (100˚C) in an oil bath.
NOTICE: Do not heat the ring gear above 230˚F (110˚C).
(c) Clean the contact surface of the ring gear with cleaning solvent.
(d) Quickly install the ring gear on the differential case. Install the sixteen bolts.
HINT: Align the matchmarks on the differential left case and contact the ring gear.
(e) Tighten the set bolts uniformly and a little at a time. Torque the bolts.
Torque: 1,260 kg–cm (91 ft–lb, 124 N–m)





5. INSTALL SIDE BEARINGS

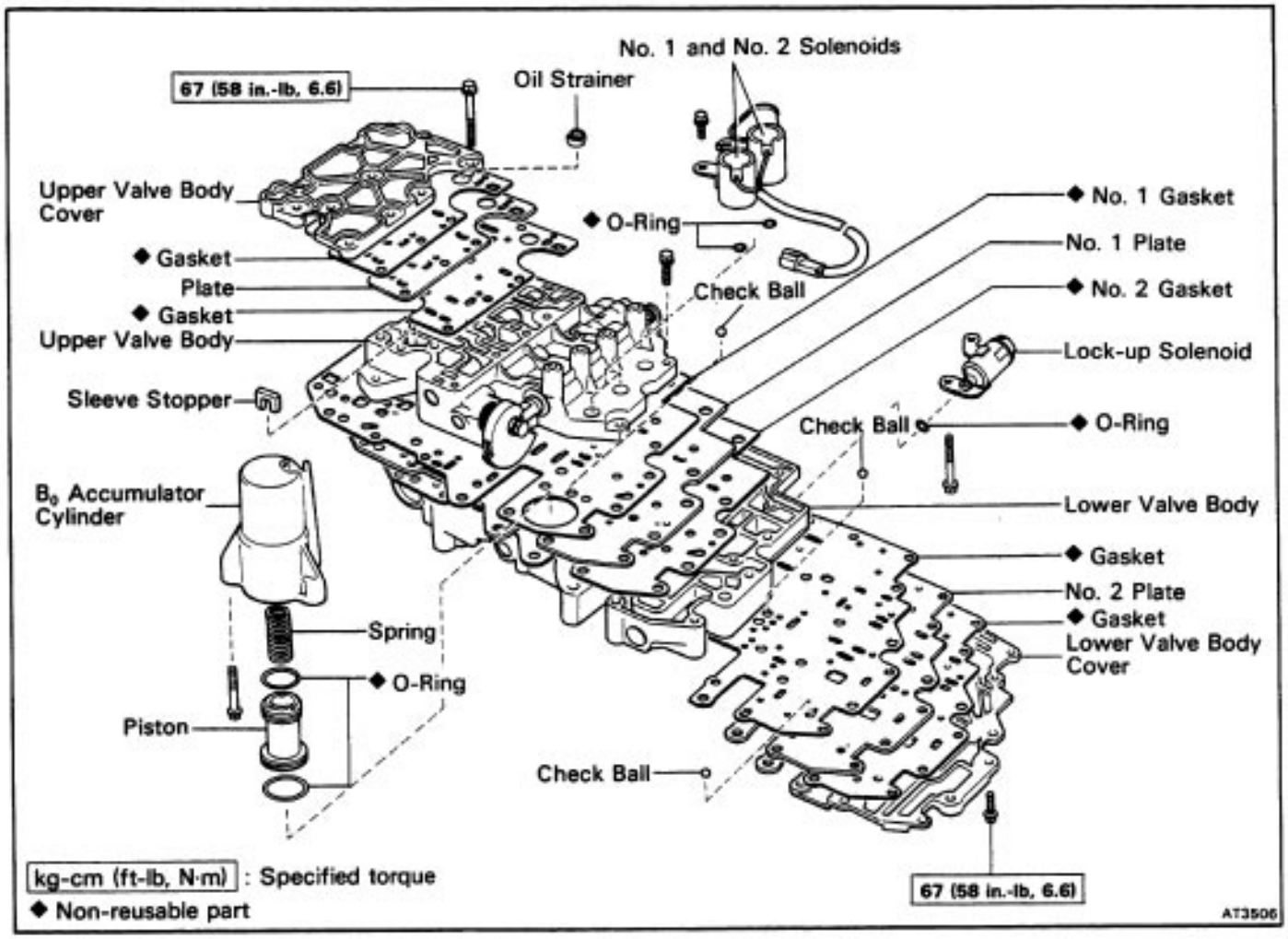
(a) Using SST and a press, install the RH side bearing to the differential case.
SST 09361–20011

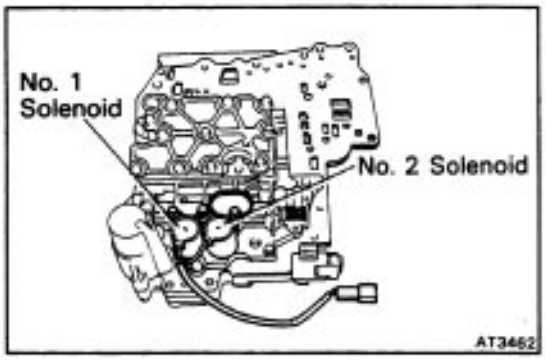


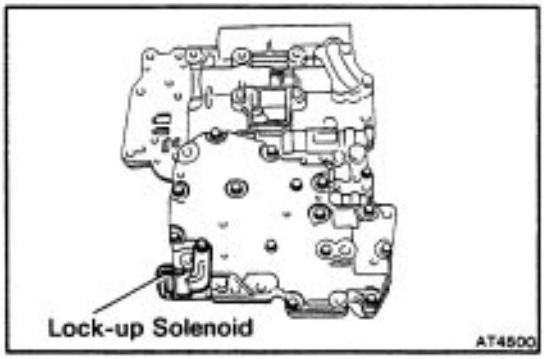
(b) Using SST and a press, install the LH side bearing.
SST 09316–60010 (09316–00010)

Valve Body (A540E and A540H)

COMPONENTS







(Disassembly of Valve Body)

NOTICE: When disassembling the valve body, be careful not to damage or deform the plate which over. hangs the valve body.

1. REMOVE SOLENOIDS

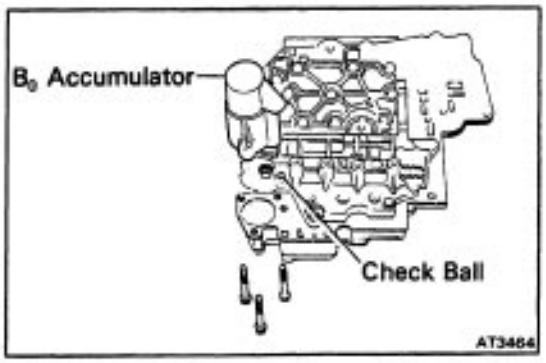
(a) Remove No. 1 and No. 2 solenoids.

NOTICE: When removing the solenoid, do not use g screwdriver, etc. to pry up. the solenoid.

(b1 Remove the O–ring from each solenoid.

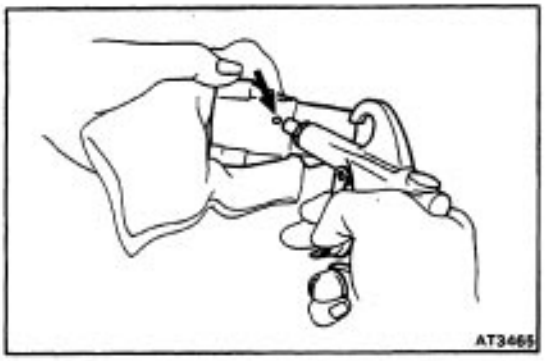
(e1 Remove the lock–up solenoid.

(d) Remove the O–ring from the solenoid.



2. REMOVE So ACCUMULATOR ASSEMBLY

(a) Remove the three bolts.
(b) Remove the B0 accumulator assembly.
(c) Remove the check ball on No. 1 plate.

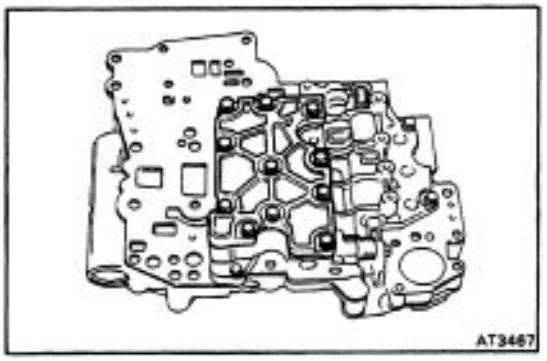


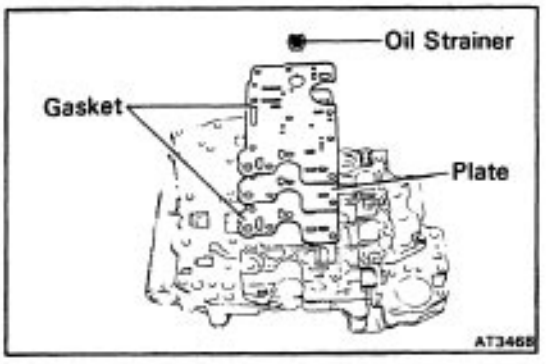
3. DISASSEMBLE So ACCUMULATOR ASSEMBLY

(a) Applying compressed air to the cylinder hole, remove the piston and spring.
(b) Remove the two O–ring from the piston.

4. REMOVE UPPER VALVE BODY COVER

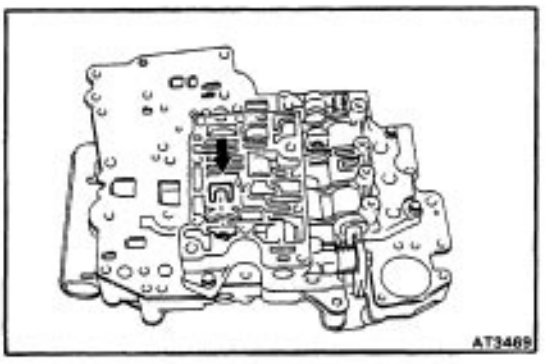
Remove the eleven bolts and upper valve body cover.



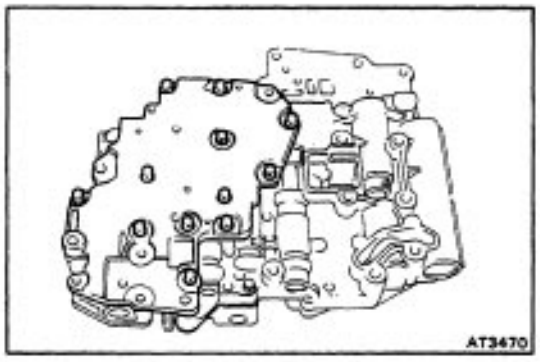


5. REMOVE OIL STRAINER, UPPER VALVE BODY COVER GASKETS AND PLATE

(a) Remove the oil strainer on the gasket.
(b) Remove the two gaskets and plate from the upper valve body.

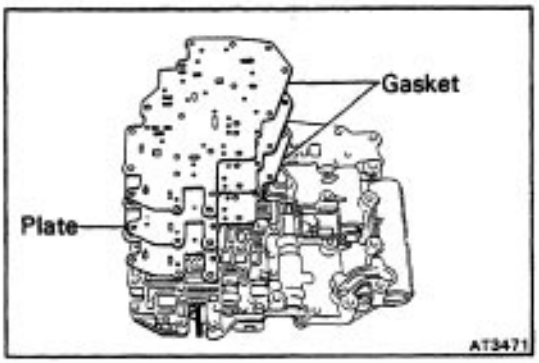


6. REMOVE LOCK–UP RELAY VALVE SLEEVE STOPPER

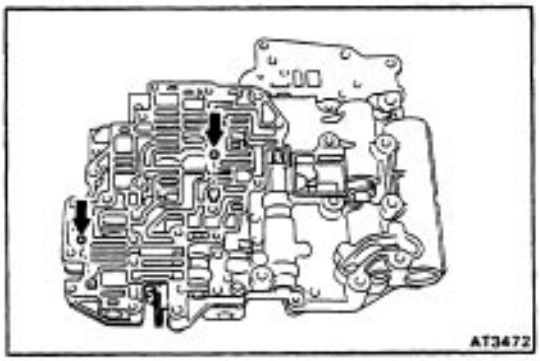


7.. REMOVE LOWER VALVE BODY COVER

Remove the twelve bolts and lower valve body cover.

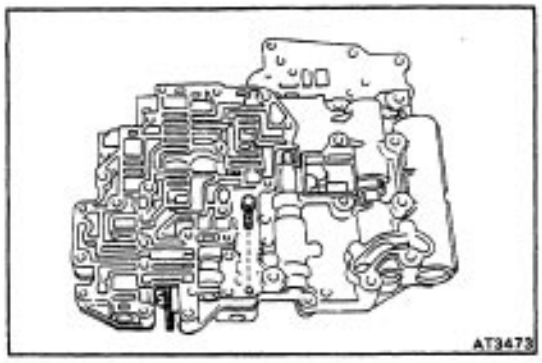


8. REMOVE LOWER VALVE BODY COVER GASKETS AND NO. 2 PLATE

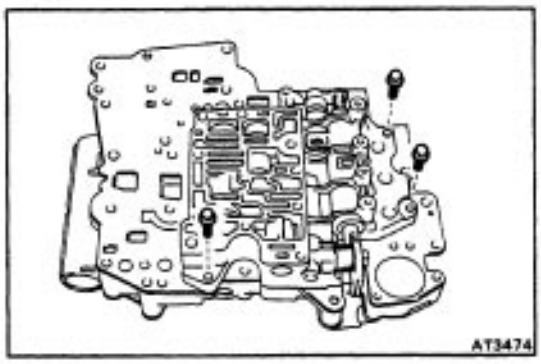


9. REMOVE CHECK BALLS

Remove the two check balls from the lower valve body.

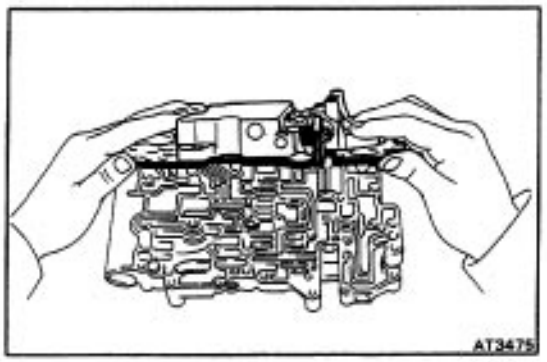


10. REMOVE BOLT FROM LOWER VALVE BODY



11. REMOVE BOLTS FORM UPPER VALVE BODY

Remove the three bolts.



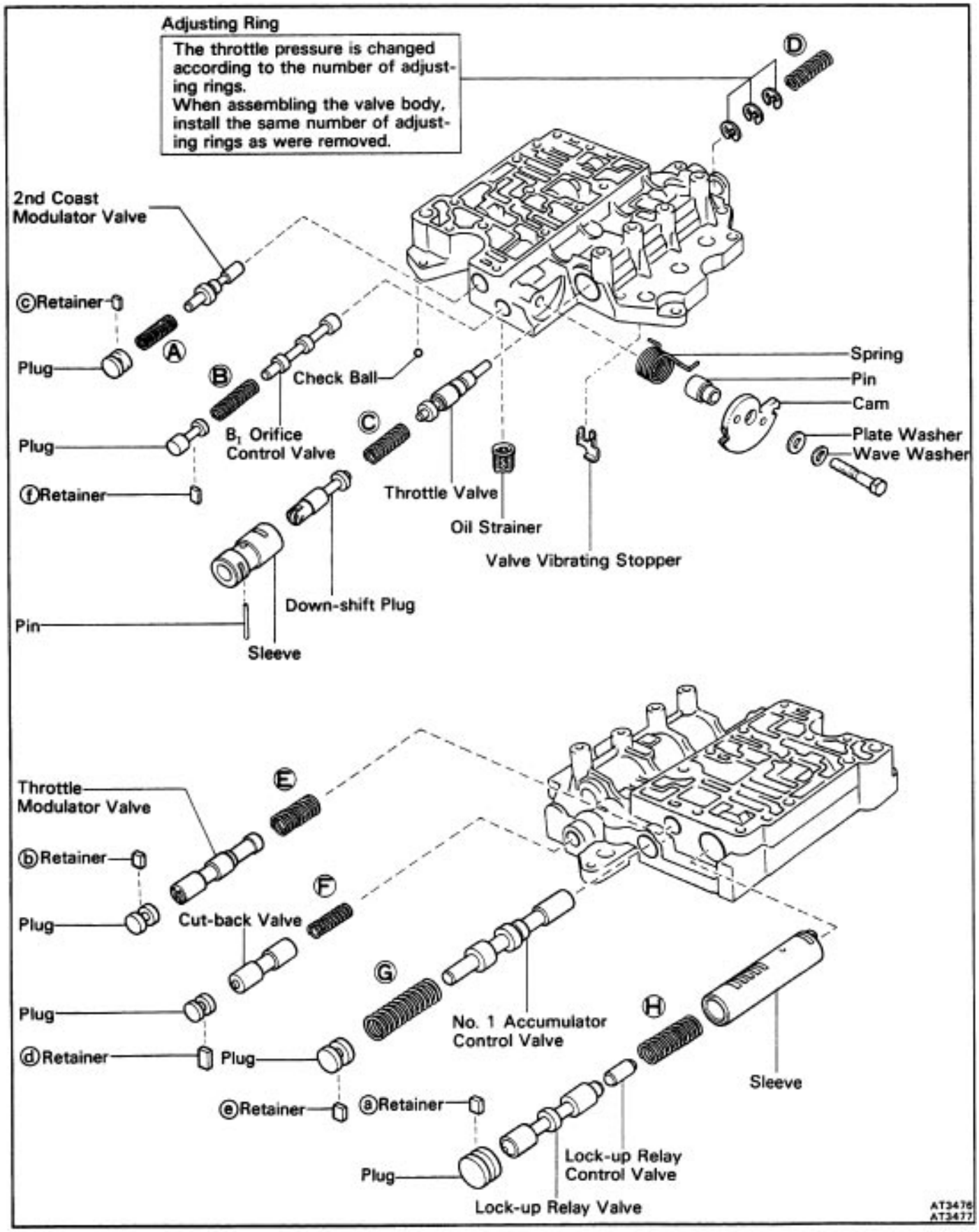
12. LIFT OFF UPPER VALVE BODY AND NO. 1 PLATE AS A SINGLE UNIT

Hold No. 1 plate to the upper valve body and lift off the upper valve body.

HINT: Be careful that the check balls and oil strainer do not fall out.

(Upper Valve Body)

COMPONENTS

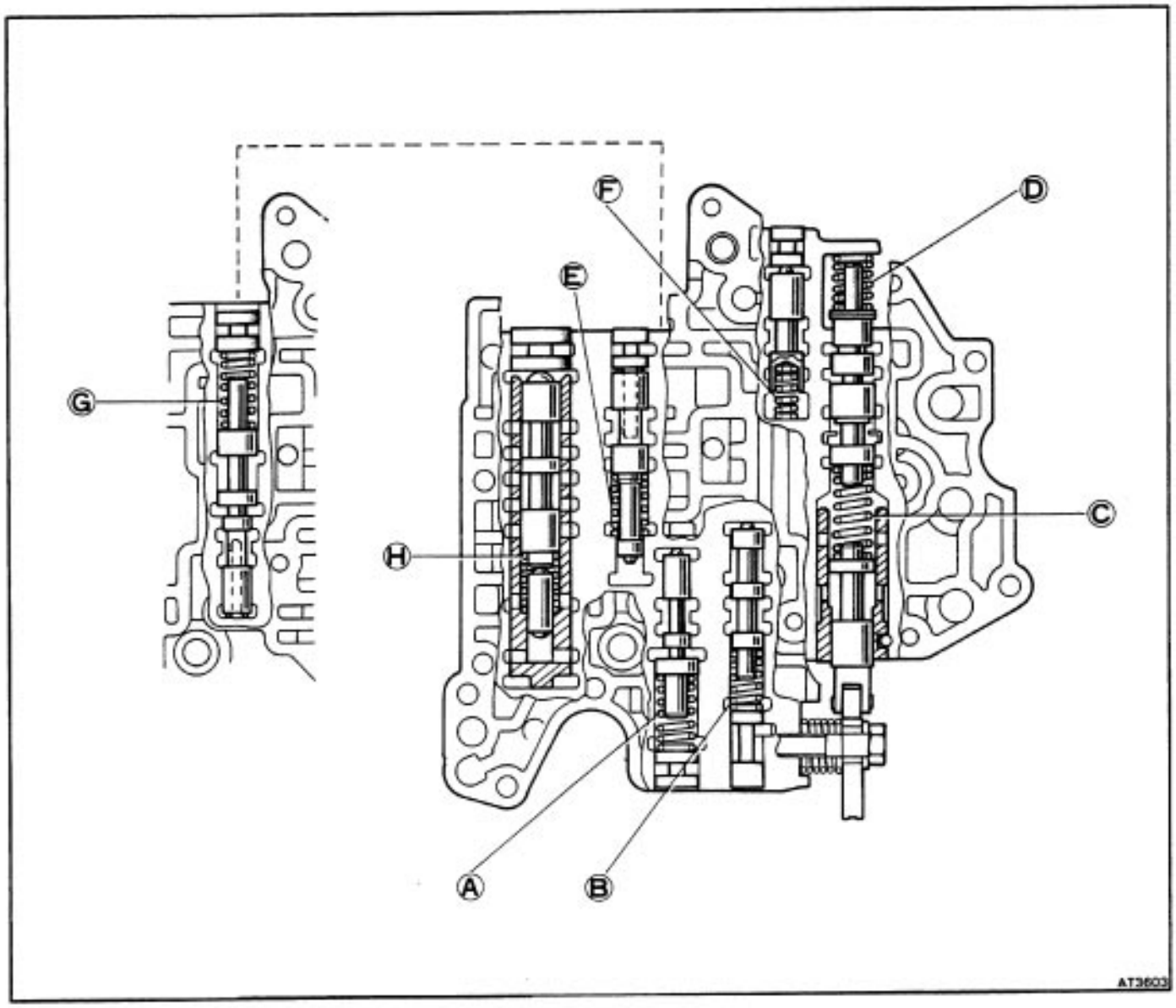


SPECIFICATIONS OF VALVE BODY SPRINGS

Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coils	Color
Ⓐ	Second coast modulator valve	27.5 (1.083)	8.9 (0.350)	14.6	Brown
Ⓑ	B1 orifice control valve	24.8 (0.976)	8.0 (0.315)	12.0	White
Ⓒ	Down–shift plug	29.8 (1.173)	8.7 (0.343)	13.5	Yellow
Ⓓ	Throttle valve	30.7 (1.209)	9.2 (0.362)	9.5	Purple
Ⓔ	Throttle modulator valve	21.7 (0.854)	9.5 (0.374)	9.5	Orange
Ⓕ	Cut–back valve	21.8 (0.858)	6.0 (0.236)	13.5	Red
Ⓖ	No. 1 accumulator control valve	28.1 (1.106)	10.6 (0.417)	13.0	Yellow
Ⓗ	Lock–up relay valve	26.6 (1.047)	10.2 (0.402)	11.5	Green

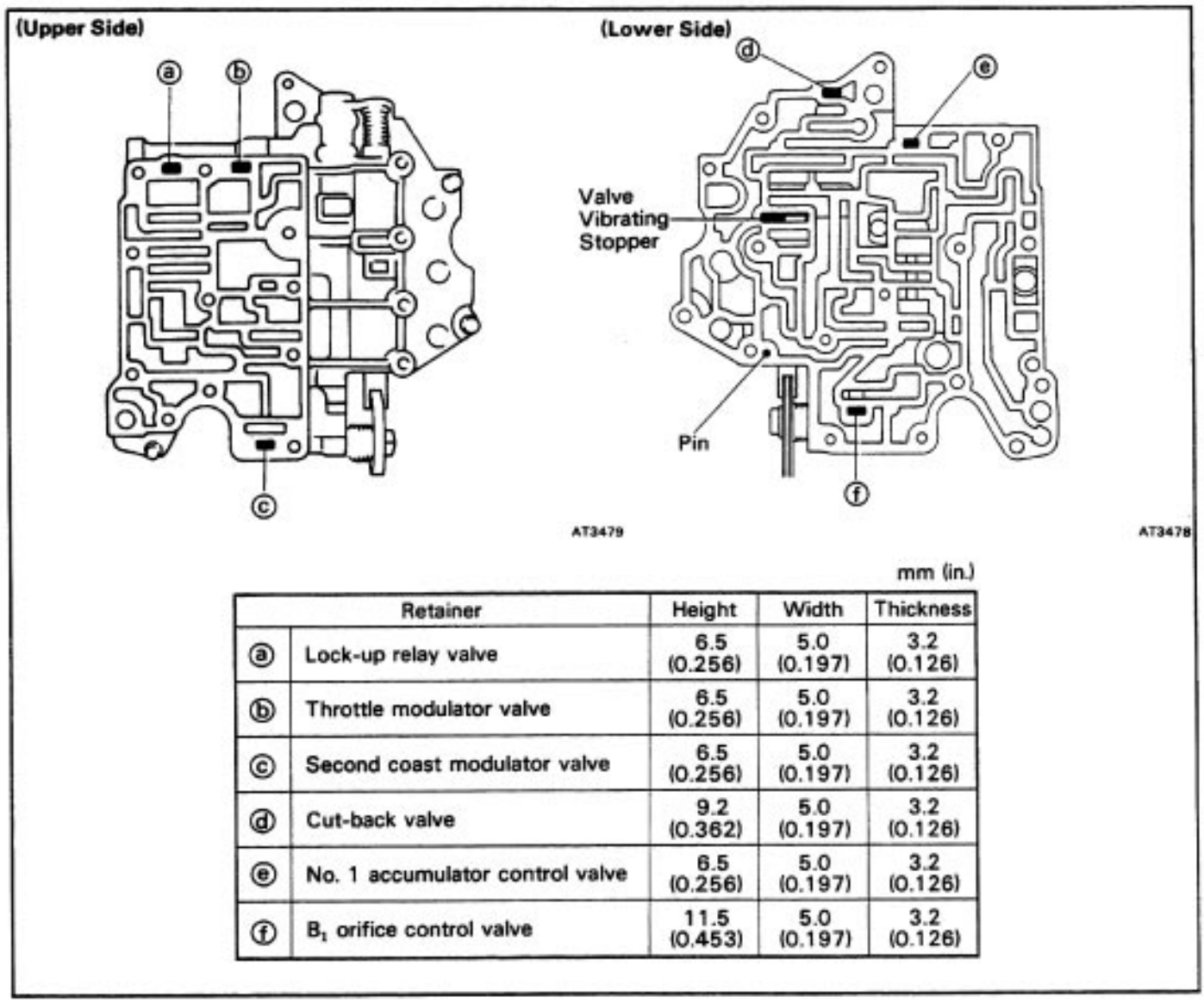
HINT: During reassembly please refer to the spring specifications above to help discriminate the different springs.

SECTIONAL VIEW OF VALVE BODY



LOCATION OF RETAINERS PIN STOPPER CHECK BALL AND STRAINER

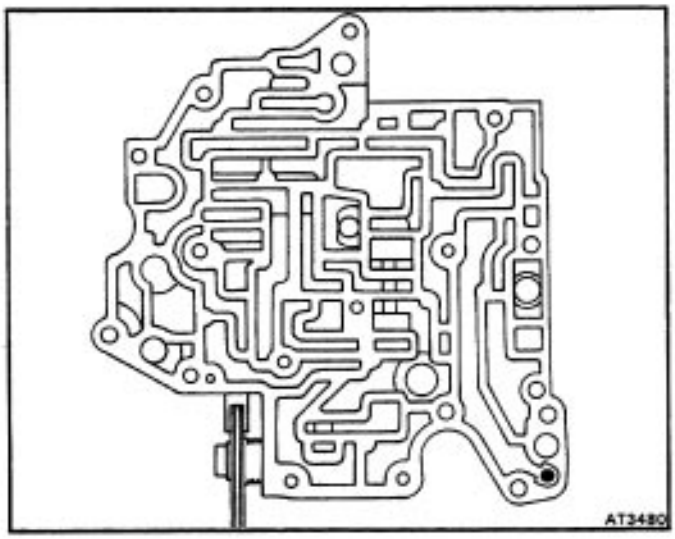
7. RETAINER, STOPPER AND PIN



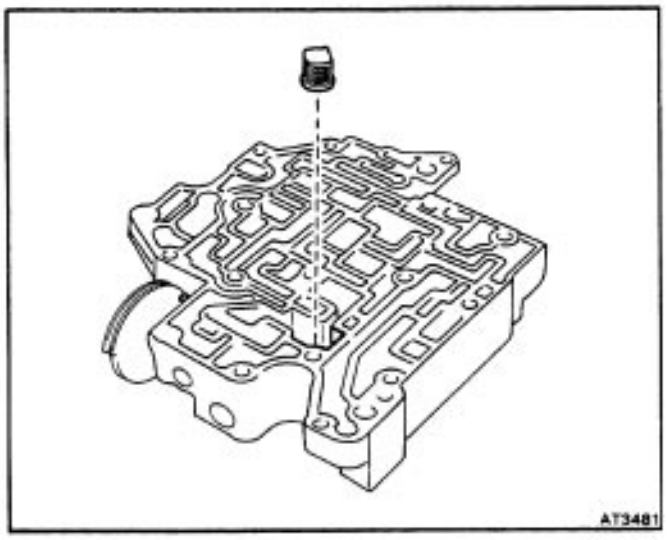
mm (in.)

Retainer		Height	Width	Thickness
ⓐ	Lock-up relay valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓑ	Throttle modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓒ	Second coast modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓓ	Cut-back valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓔ	No. 1 accumulator control valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓕ	B_1 orifice control valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)

2. CHECKBALL

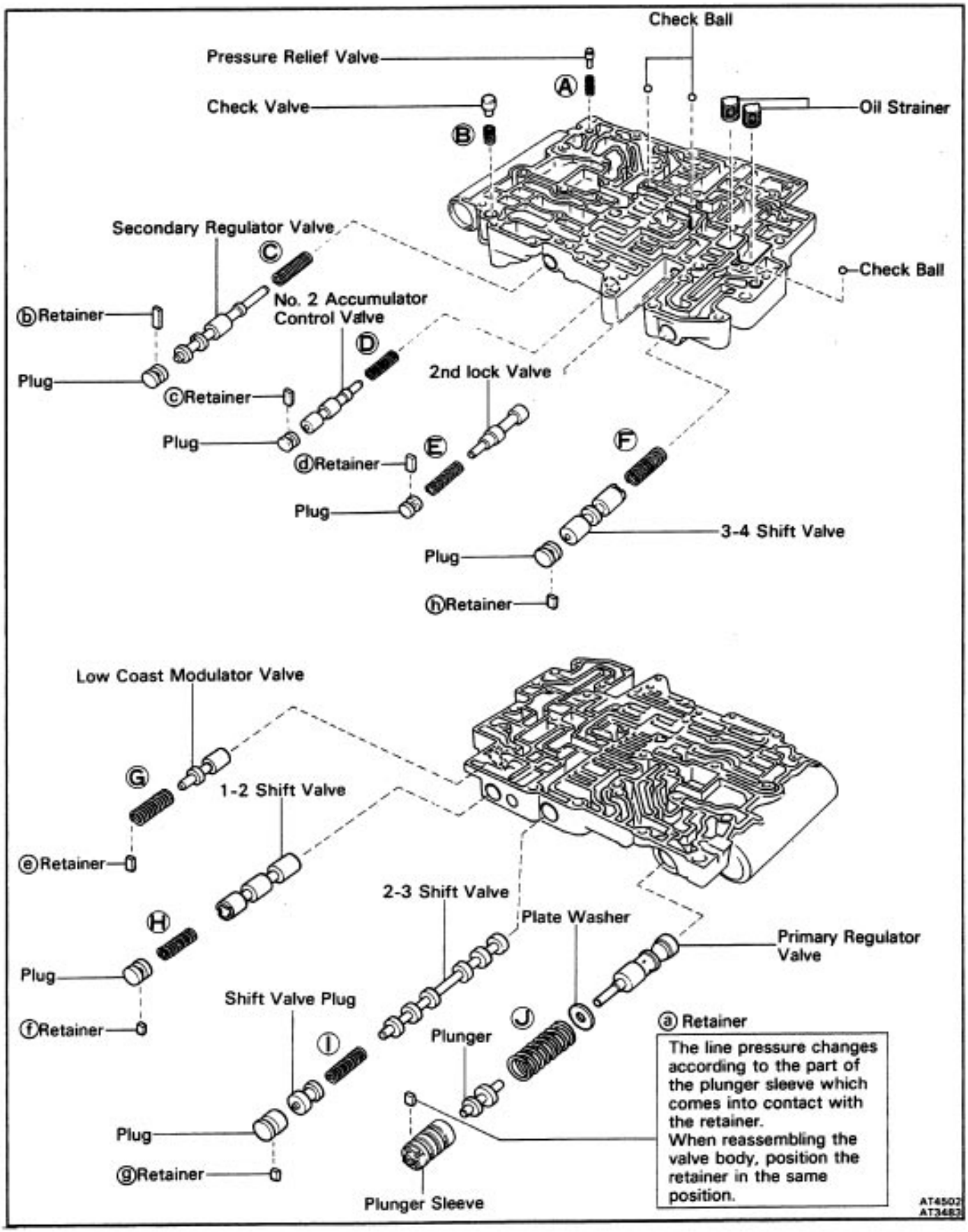


3. STRAINER



(Lower Valve Body)

COMPONENTS

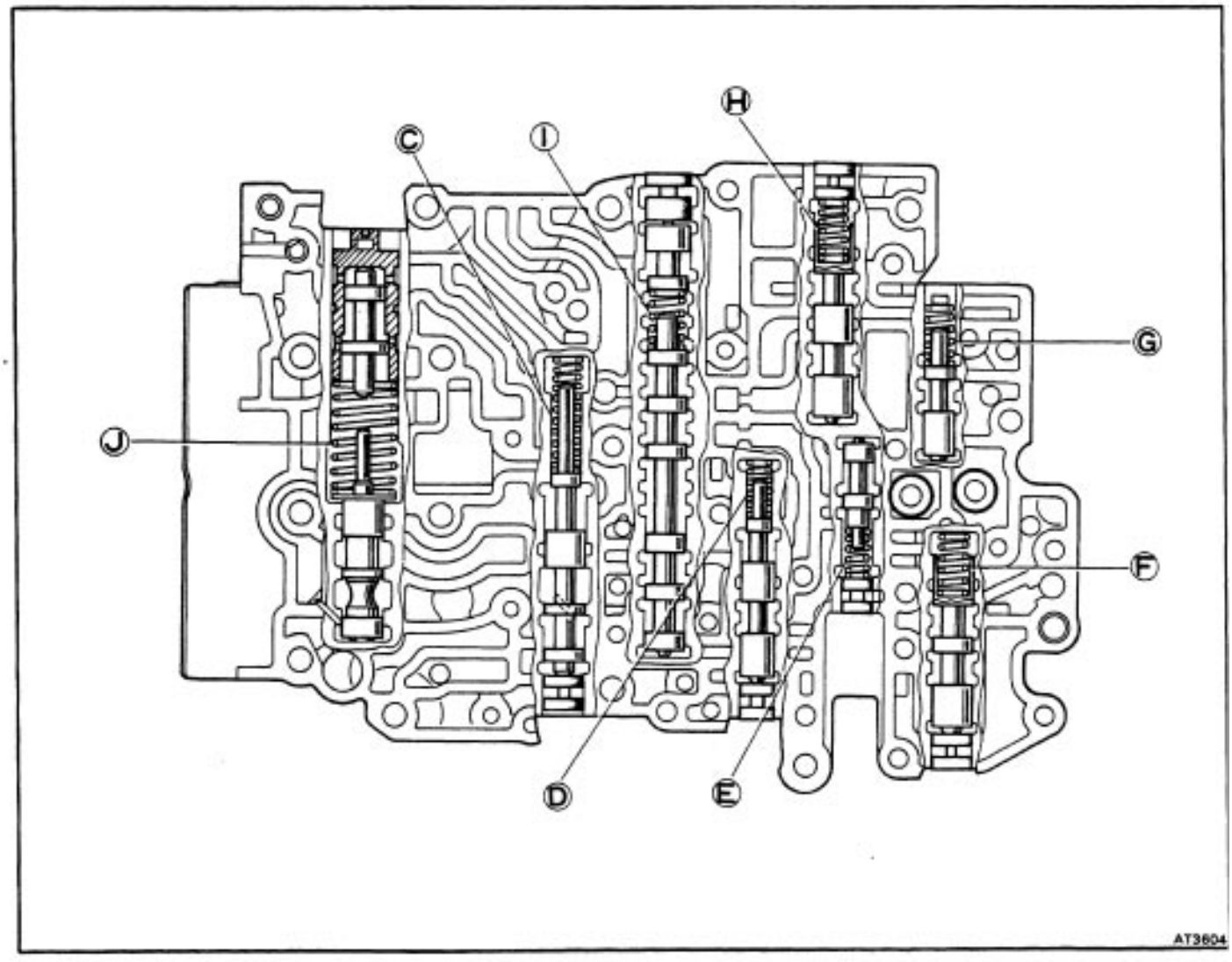


SPECIFICATIONS OF VALVE BODY SPRINGS

Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coils	Color
Ⓐ	Pressure relief valve	11.2 (0.441)	6.4 (0.252)	7.5	None
Ⓑ	Check valve	19.9 (0.783)	11.0 (0.433)	8.5	None
Ⓒ	Secondary regulator valve	38.5 (1.516)	8.4 (0.331)	17.0	Purple
Ⓓ	No. 2 accumulator control valve	23.0 (0.906)	6.3 (0.248)	12.0	Gray
Ⓔ	Second lock valve	20.7 (0.815)	6.1 (0.240)	12.0	Orange
Ⓕ	3–4 shift valve	29.2 (1.150)	8.9 (0.350)	12.0	Light Green
Ⓖ	Low coast modulator valve	20.2 (0.795)	7.9 (0.311)	11.9	Purple
Ⓗ	1–2 shift valve	29.2 (1.150)	8.9 (0.350)	12.0	Light Green
Ⓘ	2–3 shift valve	28.0 (1.102)	9.4 (0.370)	10.3	None
Ⓙ	Primary regulator valve	64.2 (2.528)	18.6 (0.732)	12.5	None

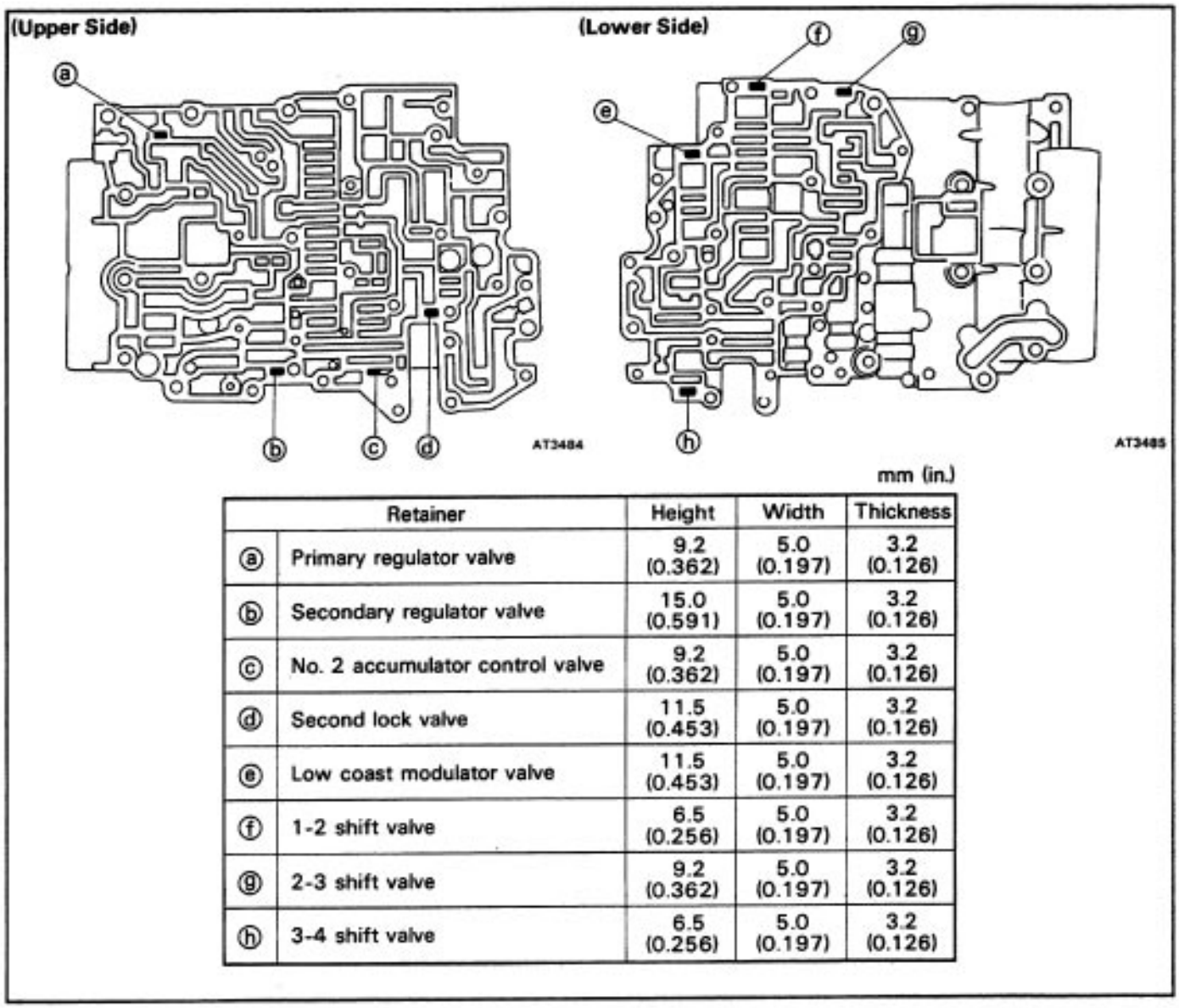
HINT: During reassembly please refer to the spring specifications above to help discriminate the different springs.

SECTIONAL VIEW OF VALVE BODY



LOCATION OF RETAINERS CHECK BALLS AND STRAINERS

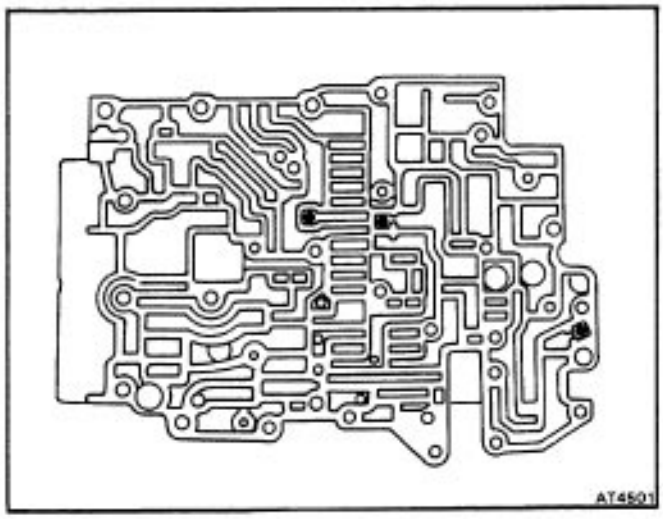
1. RETAINER



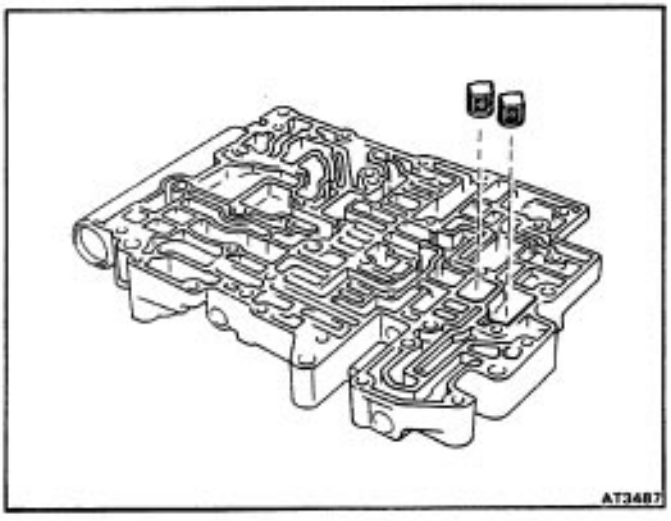
mm (in.)

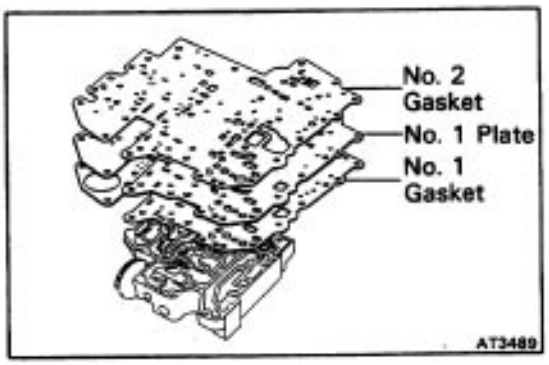
Retainer		Height	Width	Thickness
ⓐ	Primary regulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓑ	Secondary regulator valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)
ⓒ	No. 2 accumulator control valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓓ	Second lock valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓔ	Low coast modulator valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓕ	1-2 shift valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓖ	2-3 shift valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓗ	3-4 shift valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)

2. CHECK BALL



3. STRAINER





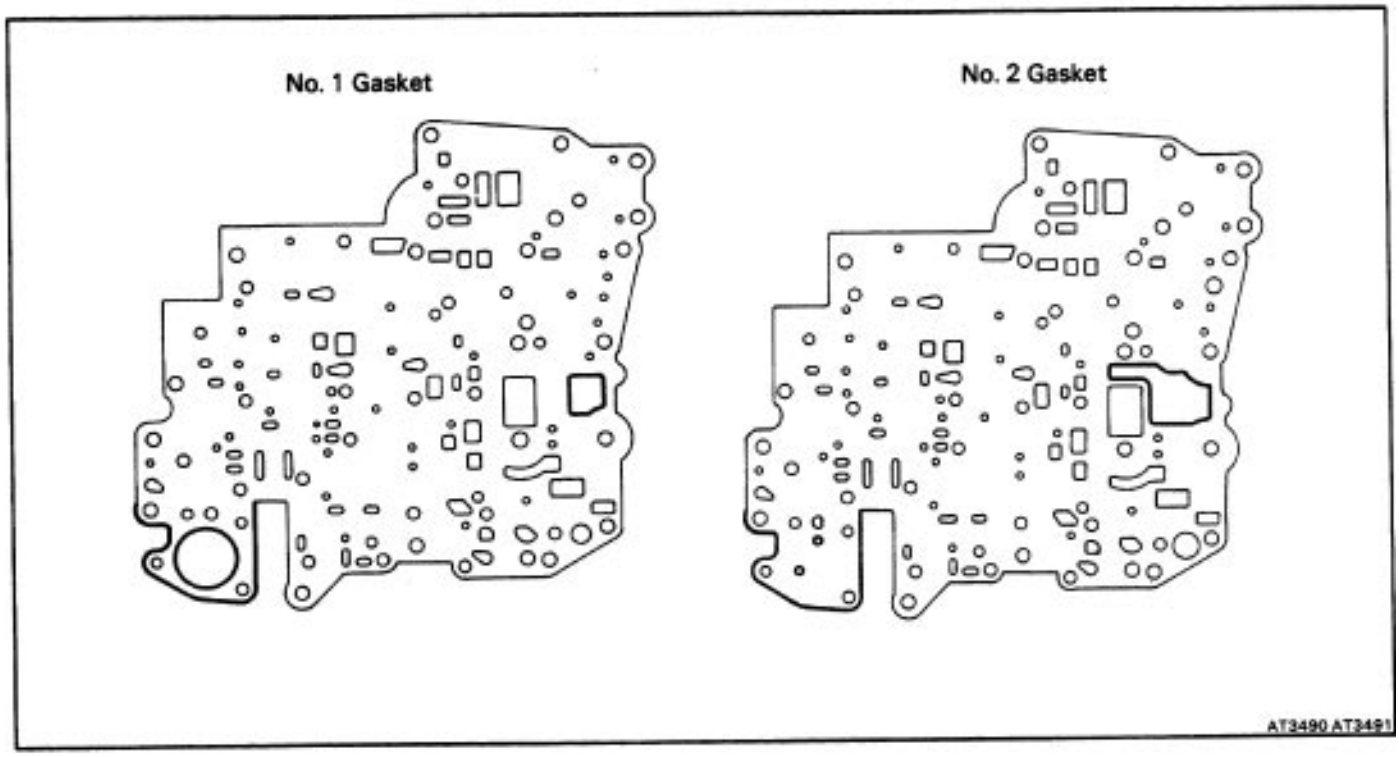
(Assembly of Valve Body)

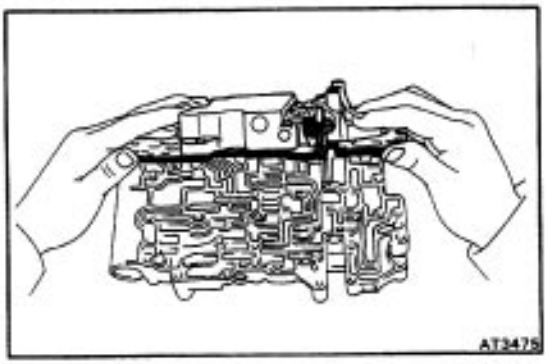
(See page AT–308)

1. POSITION NO. 1 PLATE AND NEW GASKETS ON UPPER VALVE BODY

Position new No. 1 gasket, No. 1 plate and then new No. 2 gasket on the upper valve body.

HINT: Since No. 1 gasket and No. 2 gasket are similar, use the illustration below to discriminate between them.

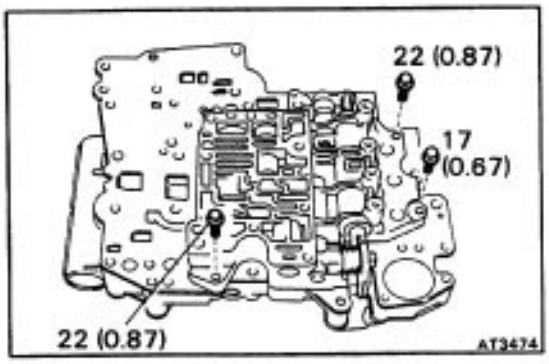




2. PLACE UPPER VALVE BODY WITH NO. 1 PLATE AND GASKETS ON LOWER VALVE BODY

Hold the upper valve body, No. 1 plate and gasket; securely so they do not separate.

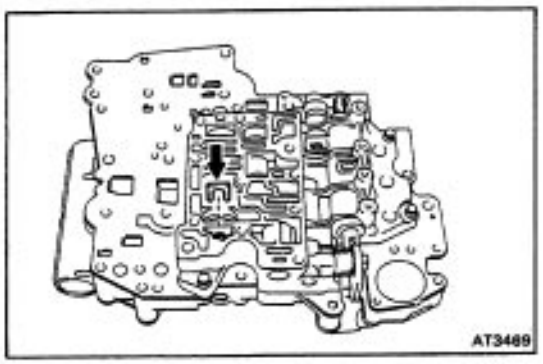
Align each bolt hole in the valve bodies with the gasket; and plate.



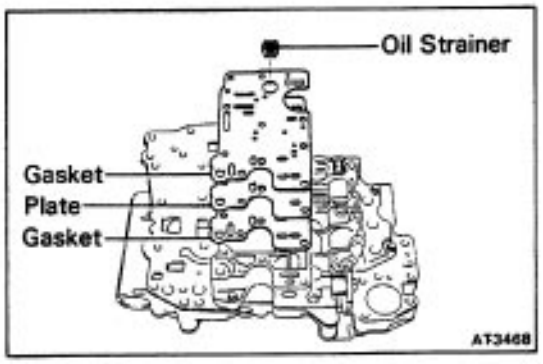
3. INSTALL AND FINGER TIGHTEN BOLTS IN UPPER VALVE BODY TO SECURE LOWER VALVE BODY

Install and finger tighten the three bolts.

HINT: Each bolt length (mm (in.)) is indicated in the figure.



4. INSTALL LOCK–UP RELAY VALVE SLEEVE STOPPER

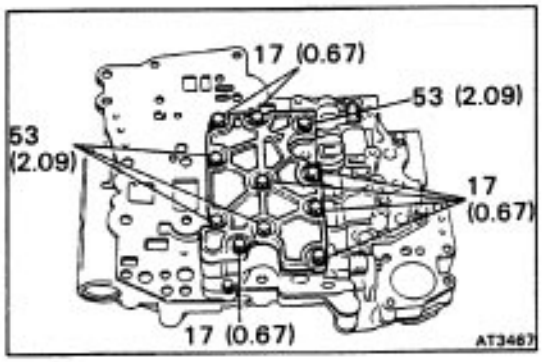


5. INSTALL UPPER VALVE BODY COVER GASKETS, PLATE AND THROTTLE MODULATOR OIL STRAINER

(a) Position a new gasket and plate and then another new gasket.

HINT: Both gaskets are same one.

(b) Install the oil strainer onto the gasket.

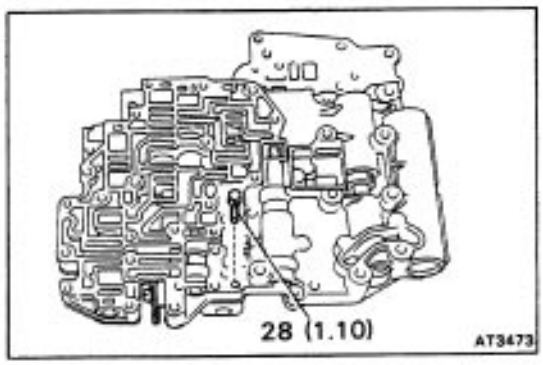


6. INSTALL UPPER VALVE BODY COVER

(a) Position the upper valve body cover.

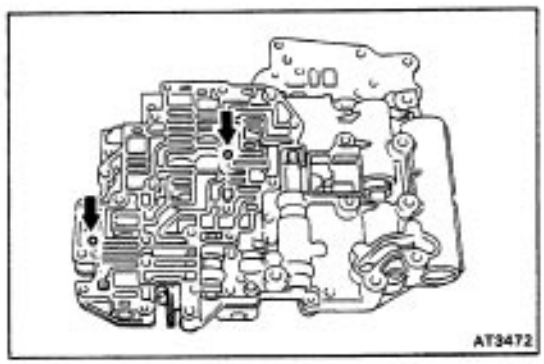
(b)) Install and finger tighten the eleven bolts.

HINT: Each bolt length (mm (in.)) is indicated in the figure.



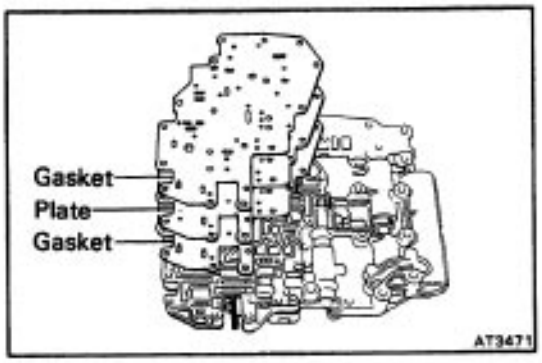
7. INSTALL AND FINGER TIGHTEN BOLT IN LOWER VALVE BODY

HINT: Bolt length (mm (in)) is indicated in the figure.



8. INSTALL CHECK BALLS

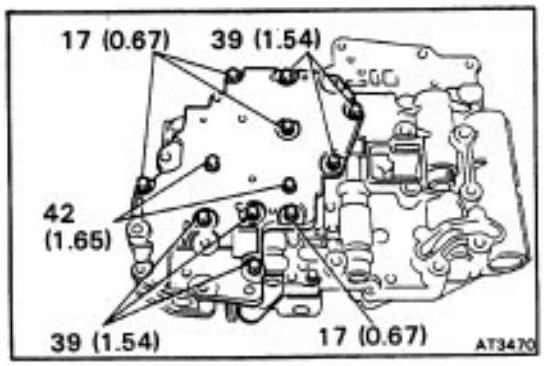
Install the two check balls into the lower valve body.



9. INSTALL LOWER VALVE BODY COVER GASKETS AND NO. 2 PLATE

Position a new gasket and plate and then another new gasket.

HINT: Both gaskets are same one.

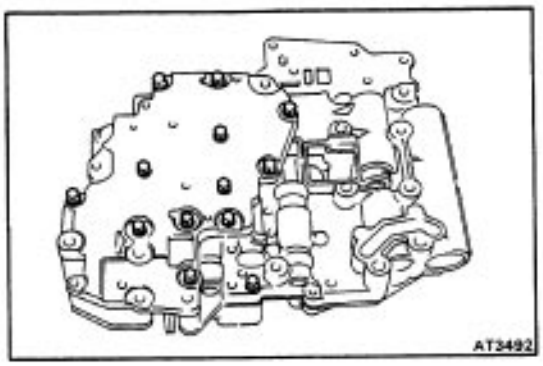


14. INSTALL LOWER VALVE BODY COVER

(a) Position the lower valve body cover.

(b) Install and finger tighten the twelve bolts.

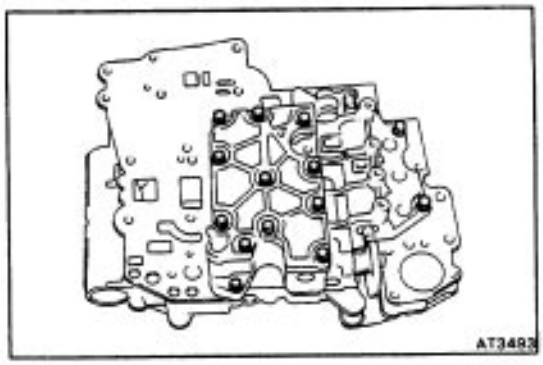
HINT: Each bolt length (mm (in.)) is indicated in the figure.



11. TIGHTEN BOLTS OF UPPER AND LOWER VALVE BODIES

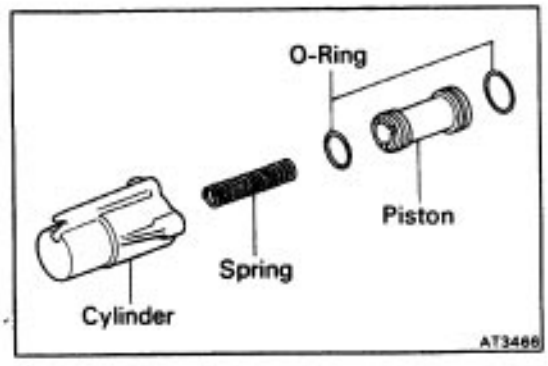
(a) Tighten the thirteen bolts in the lower valve body.

Torque: 67 kg–cm (58 in.–lb, 6.6 N–m)



(b) Tighten the fourteen bolts in the upper valve body.

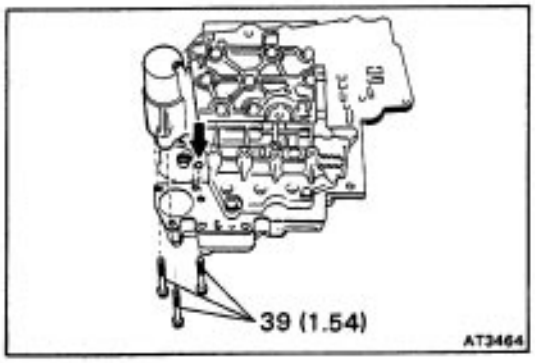
Torque: 67 kg–cm (58 in.–lb, 6.6 N–m)



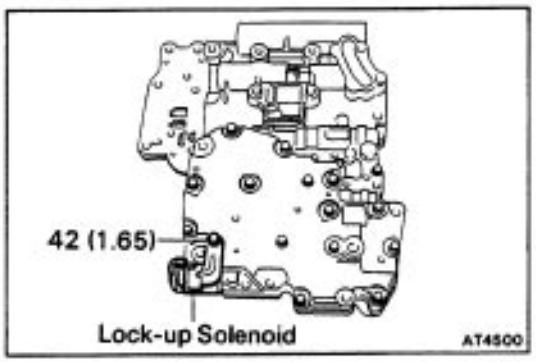
12. INSTALL B0 ACCUMULATOR ASSEMBLY

(a) Coat new O–rings with ATF and install them to the piston.

(b) Insert the spring and piston into the cylinder.

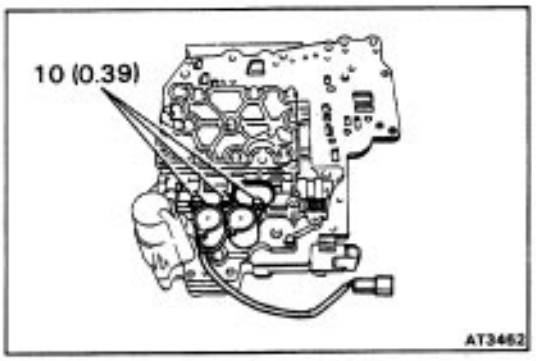


(c) Plate the check ball on No. 1 gasket.
(d) Install the B0 accumulator assembly.
(e) Install and torque the three bolts.
HINT: Each bolt length (mm 60) is indicated in the figure.
Torque: 67 kg–cm (58 in.–lb, 6.6 N–m)



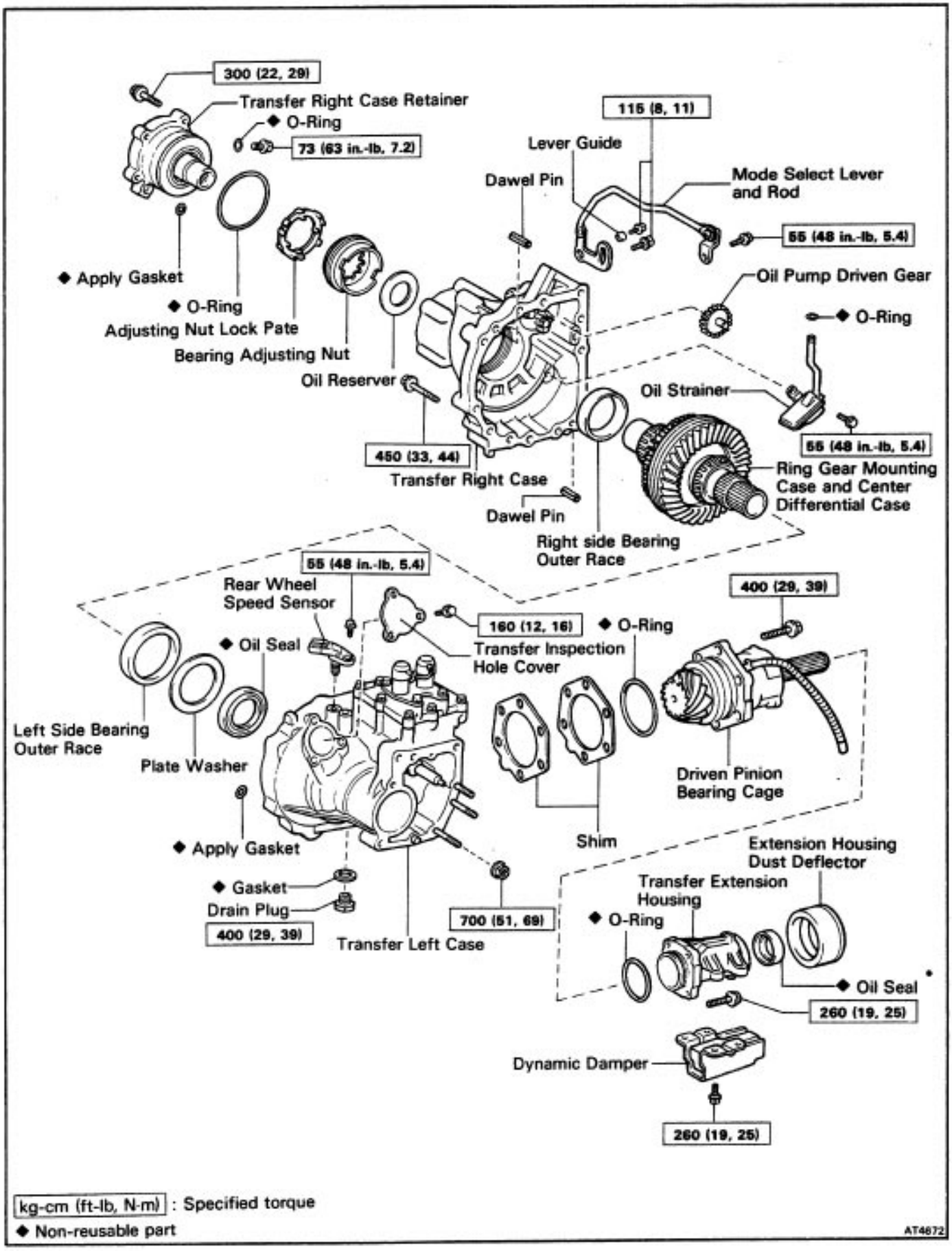
13. INSTALL SOLENOIDS

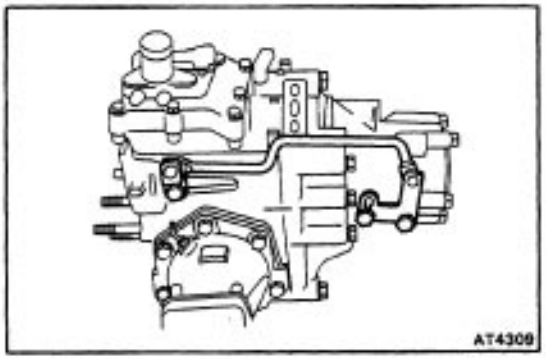
(a) Coat new O–rings with ATF and install them to the solenoids.
(b) Install the lock–up. solenoid.
(e) Install and torque the bolt:
HINT: Bolt length (mm (in.)) is indicated in the figure.
Torque: 67 kg–cm (58 in.–lb, 6.6 N–m)



(d) Install No. 1 and No. 2 solenoids.
(e) Install and torque the three bolts.
HINT: Each bolt length (mm (in.)) is indicated in the figure.
Torque: 67 kg–cm (58 in.–lb. 6.6 N–m)

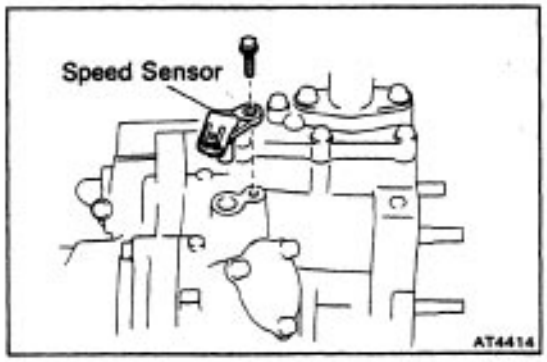
Transfer (A540H)





REMOVAL OF COMPONENT PARTS

7. REMOVE TRANSFER MODE SELECT LEVER AND ROD

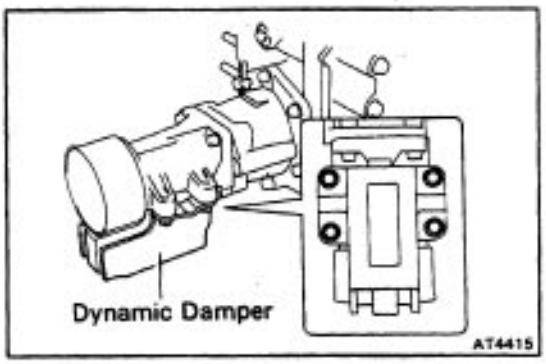


2: REMOVE REAR WHEEL SPEED SENSOR

(a) Remove the bolt and pull out the speed sensor.
(b) Remove the O–ring from speed sensor.

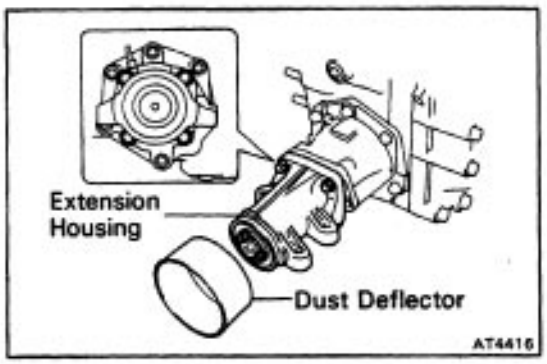
3. REMOVE DYNAMIC DAMPER

Remove the four bolts and dynamic damper.

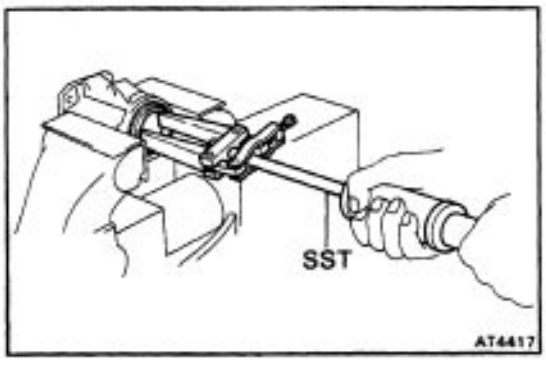


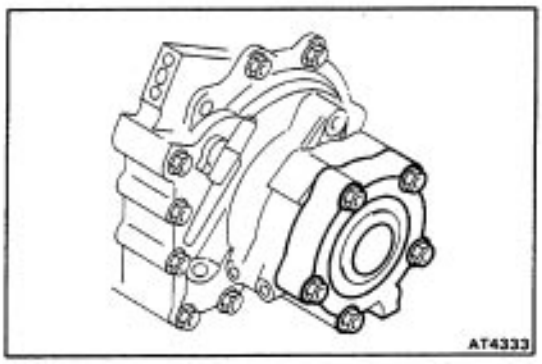
4. REMOVE EXTENSION HOUSING

(a) Remove the dust deflector from the extension housing.
(b) Remove the four bolts and extension housing.
(c) Remove the O–ring from the extension housing.



(d) Using SST, remove the oil seal.
SST 09308–00010

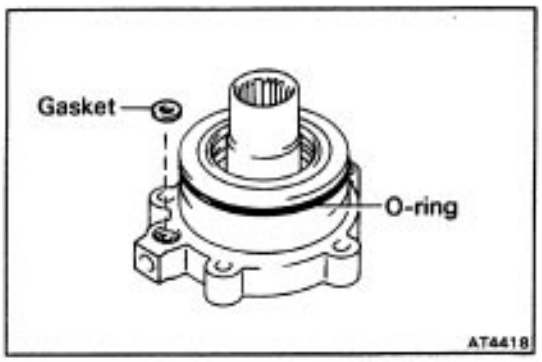




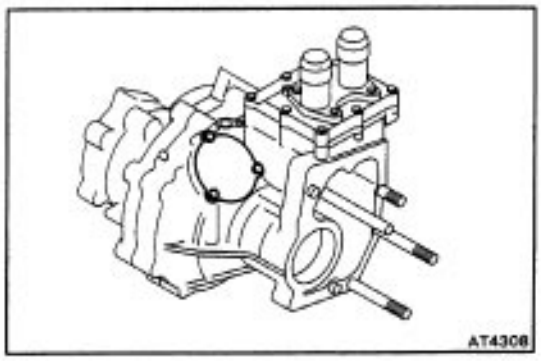
5. REMOVE TRANSFER RIGHT CASE RETAINER

(a) Remove the five bolts.

(b) Using a plastic hammer, remove the right case retainer.

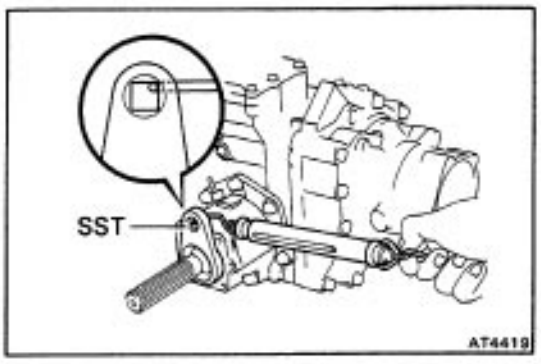


(e) Remove the O–ring and apply gasket from the right case retainer.



6. REMOVE TRANSFER INSPECTION HOLE COVER

Remove the three bolts and inspection hole cover.



7. CHECK PRELOAD

(a) Using SST and a spring tension gauge, measure the driven pinion preload of the backlash between the driven pinion and ring gear.

SST 09326–20011

Driven pinion preload (at starting) :

0.9– 1.4 kg (2.0–3.1 lb,8.8– 13.7 N)

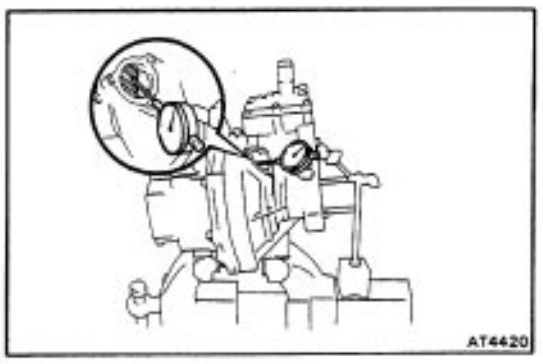
(b) Using SST and a spring tension gauge, measure the total preload.

SST 09326–20011

Total pre load (at starting):

Add driven pinion preload

0.5–0.9kg(1.1 –2.0 lb,4.9–8.8N)



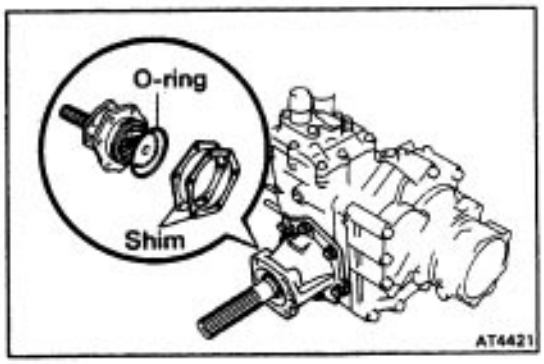
8. CHECK RING GEAR BACKLASH

Using a dial indicator, measure the –ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

CHECK TOOTH CONTACT

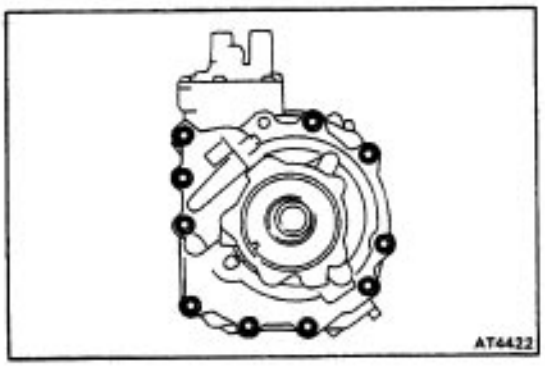
(See page AT–374**)**



9. REMOVE DRIVEN PINION BEARING CAGE

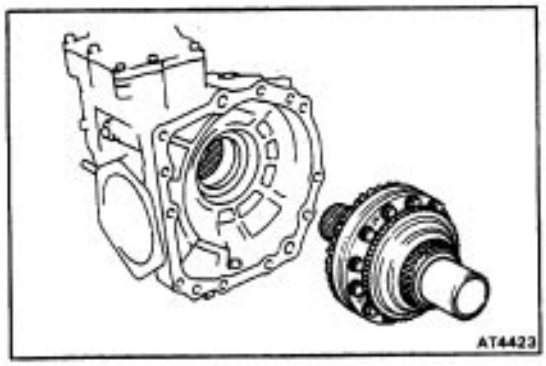
(a) the six bolts and bearing cage.

(b) Remove the O–ring and the shims from the bearing cage.

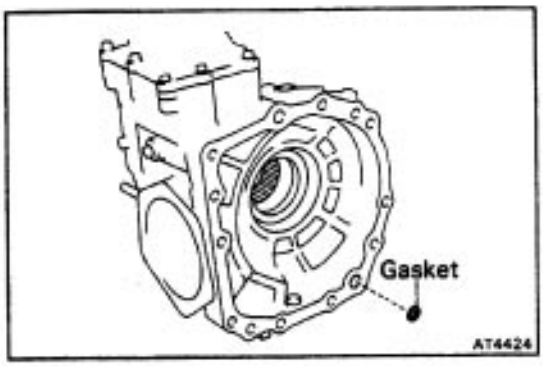


10. REMOVE TRANSFER RIGHT CASE

Remove the ten bolts and right case.

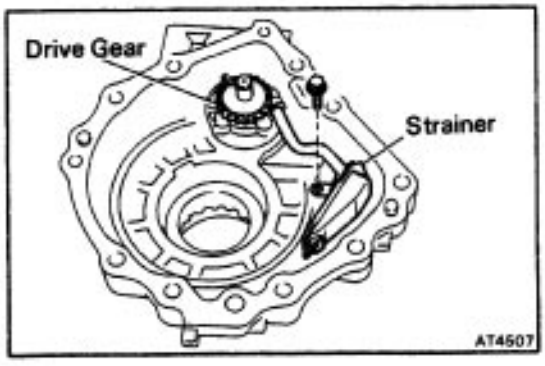


11. REMOVE CENTER DIFFERENTIAL ASSEMBLY



12. REMOVE APPLY GASKET

Remove the apply gasket from the left case.

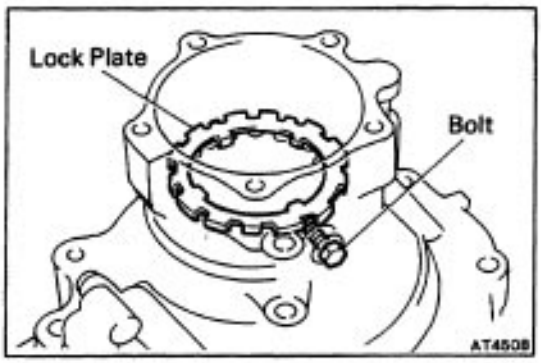


13. REMOVE OIL PUMP DRIVEN GEAR AND OIL PUMP STRAINER

(a) Remove oil pump driven gear.

(b) Remove the bolt and oil pump strainer.

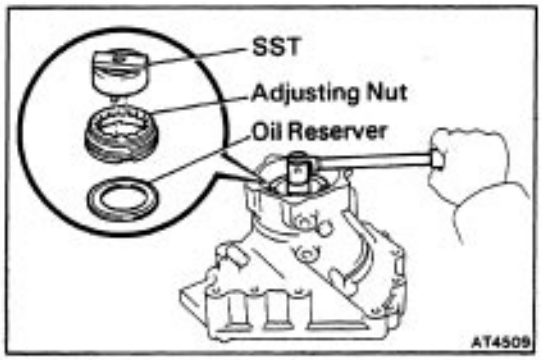
(c) Remove the O–ring from the oil pump strainer.



14. REMOVE ADJUSTING NUT LOCK PLATE

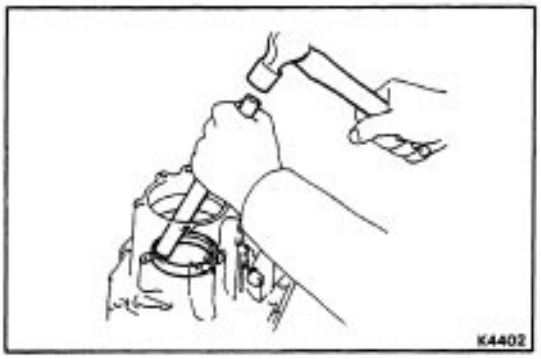
(a) Remove the bolt and nut lock plate from the right case.

(b) Remove the O–ring from the bolt.

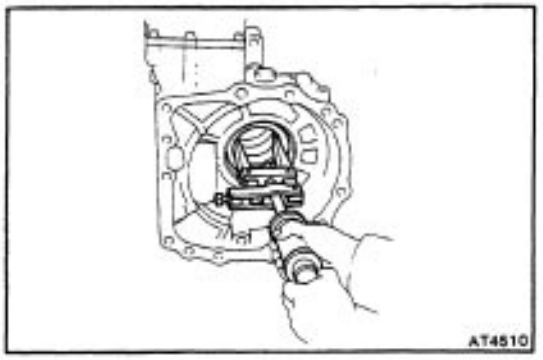


15. REMOVE DIFFERENTIAL RIGHT SIDE BEARING OUTER RACE

(a) Using SST, remove the adjusting nut and oil reservoir from the right case.
SST 09318–12010

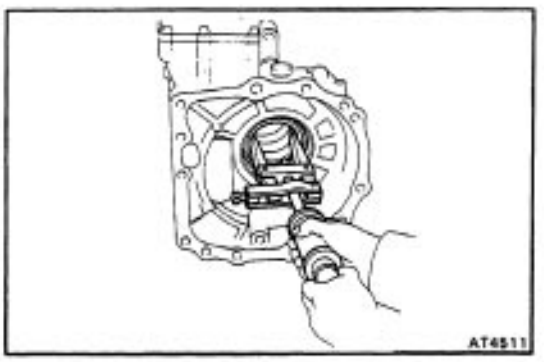


(b) Using a brass bar, remove the outer race.



16. REMOVE DIFFERENTIAL LEFT SIDE BEARING OUTER RACE

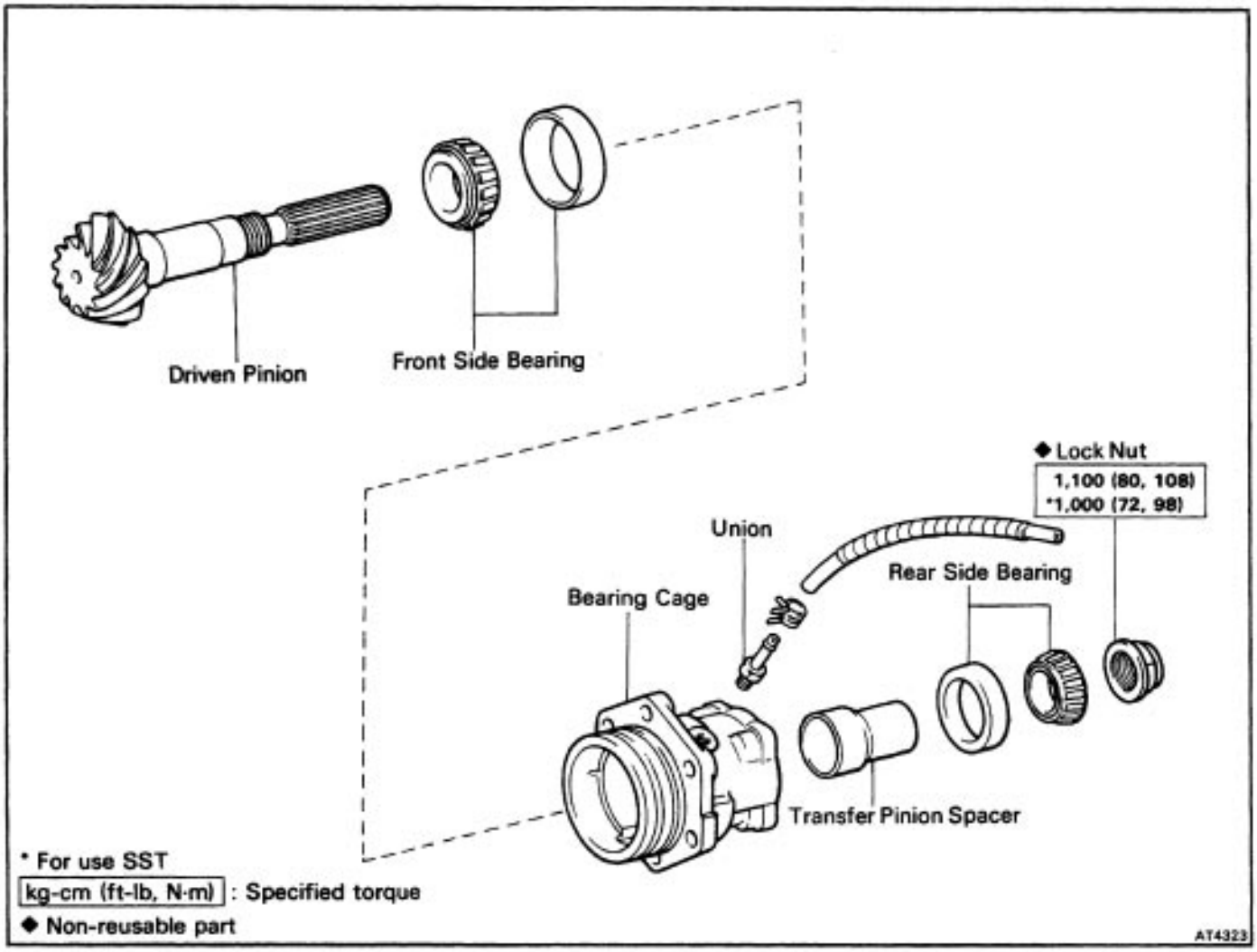
Using SST, remove the outer race and plate washer.
SST 09308–00010

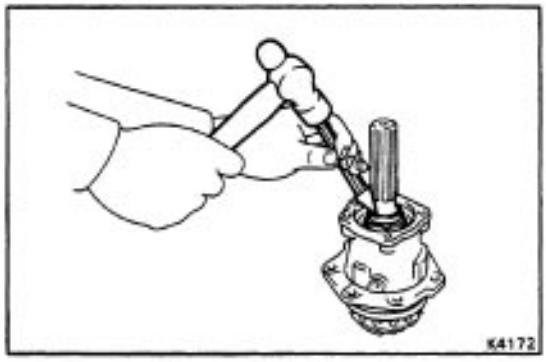


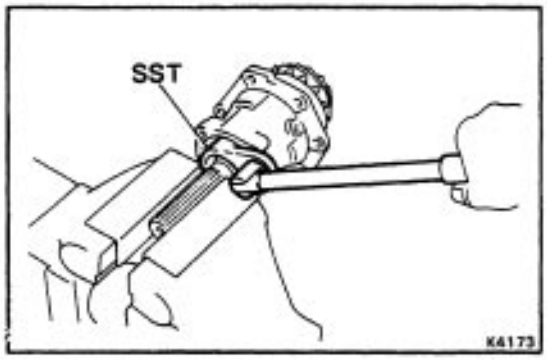
17. REMOVE LEFT CASE OIL SEAL

Using SST, remove the oil seal.
SST 09308–00010

(Driven Pinion Bearing Cage)







DISASSEMBLY OF DRIVEN PINION BEARING CAGE

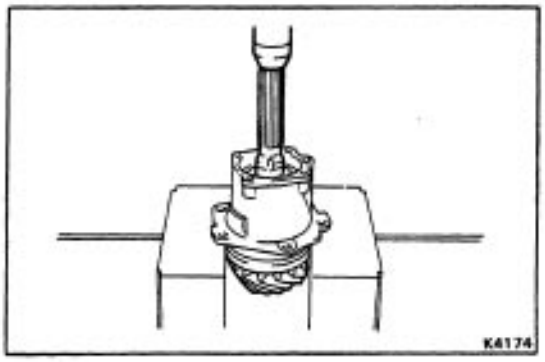
1. REMOVE LOCK NUT

(a) Using a chisel and hammer, unstake the lock nut.

(b) Using SST, remove the lock nut.

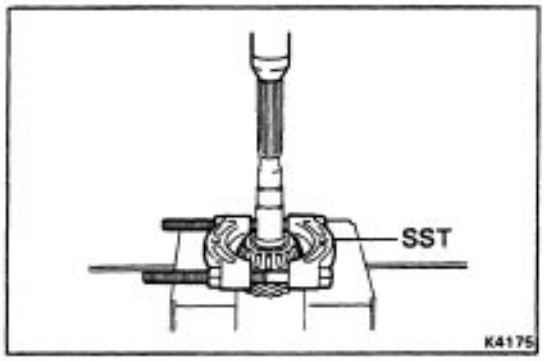
SST 09326–20011

NOTICE: Using soft jaws, hold the driven pinion in a vise.



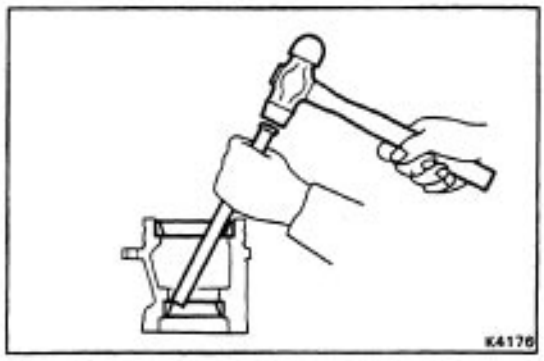
2. REMOVE DRIVEN PINION

Using a press, remove the driven pinion, rear side bearing and spacer.



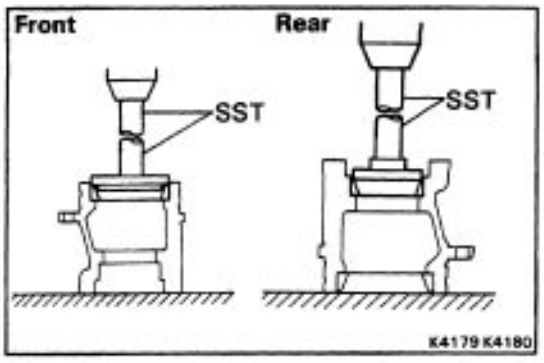
3. REMOVE FRONT SIDE BEARING

Using a press and SST, remove the front side bearing.
SST 09950–00020



4. REMOVE BEARING OUTER RACES

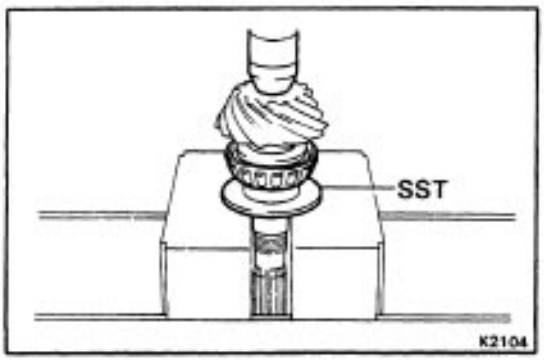
Using a brass bar and hammer, remove the two bearing outer races.



ASSEMBLY OF DRIVEN PINION BEARING CAGE

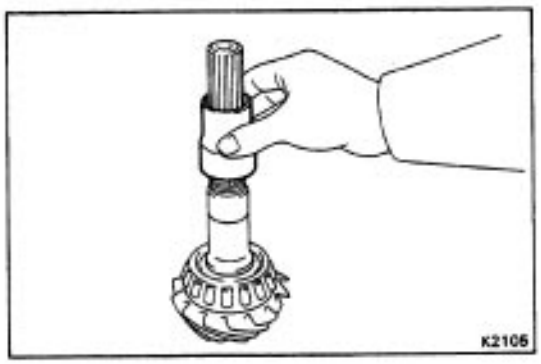
1. INSTALL BEARING OUTER RACES

Using a press and SST, install the two bearing outer races to the bearing cage.
SST
Front side:
09608–35014 (09608–06020, 09608–06120)
Rear side:
09608–30022 (09608–05010. 09608–00050)



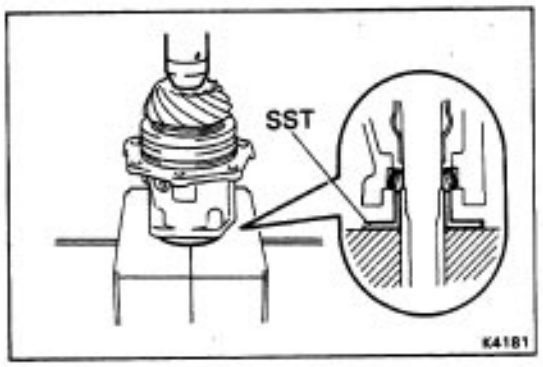
2. INSTALL DRIVEN PINION FRONT SIDE BEARING

Using a press and SST, install the front side bearing.
SST 09506–35010



3. INSTALL SPACER

Install a new spacer to the driven pinion.

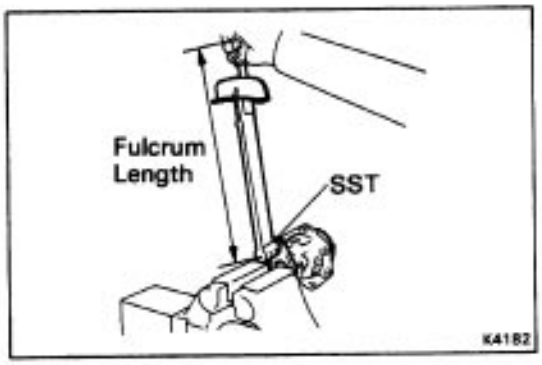


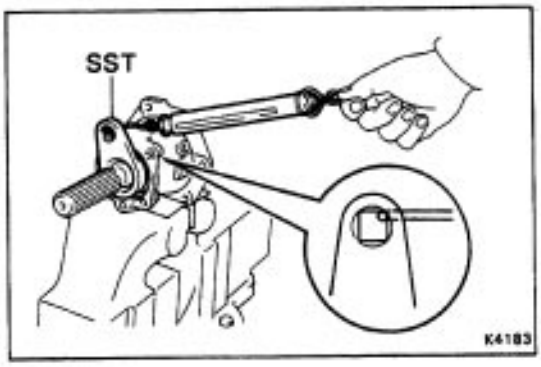
4. INSTALL DRIVEN PINION REAR SIDE BEARING

(a) Install the bearing cage to the driven pinion.

(b) Using a press and SST, install the rear side bearing to the driven pinion.

SST 09506–35010





5. ADJUST DRIVEN PINION PRELOAD

(a) Using SST, torque a new nut.

SST 09326–20011

Torque: 1,000 kg–cm (72 ft–lb, 98 N–m)

HINT: Use a torque wrench with a fulcrum length of 42.5 cm (16.732 in.).

(b) Using a spring tension gauge and SST, measure the preload.

SST 09326–20011

HINT: Turn the driven pinion right and left two or three times to allow the bearings to settle.

Preload (at starting) :

New bearing

1.8–2.9kg (4.0–6.41b, 18–28N)

Reused bearing

0.9– 1.4 kg (2.0–3.1 lb,9– 14 N)

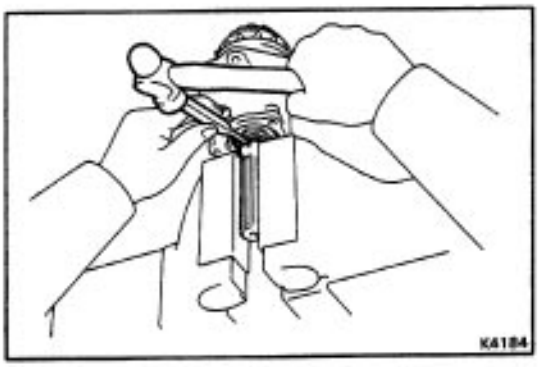
- If preload is greater than specification, replace the bearing spacer.
- If preload is less than specification, retighten the nut 5 – 10˚ at a time until the specified preload is rechecked

  If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure.

  Do not back off the pinion nut to reduce the preload.

  Maximum torque: 2,400 kg–cm (174 ft–lb, 235 N–m)

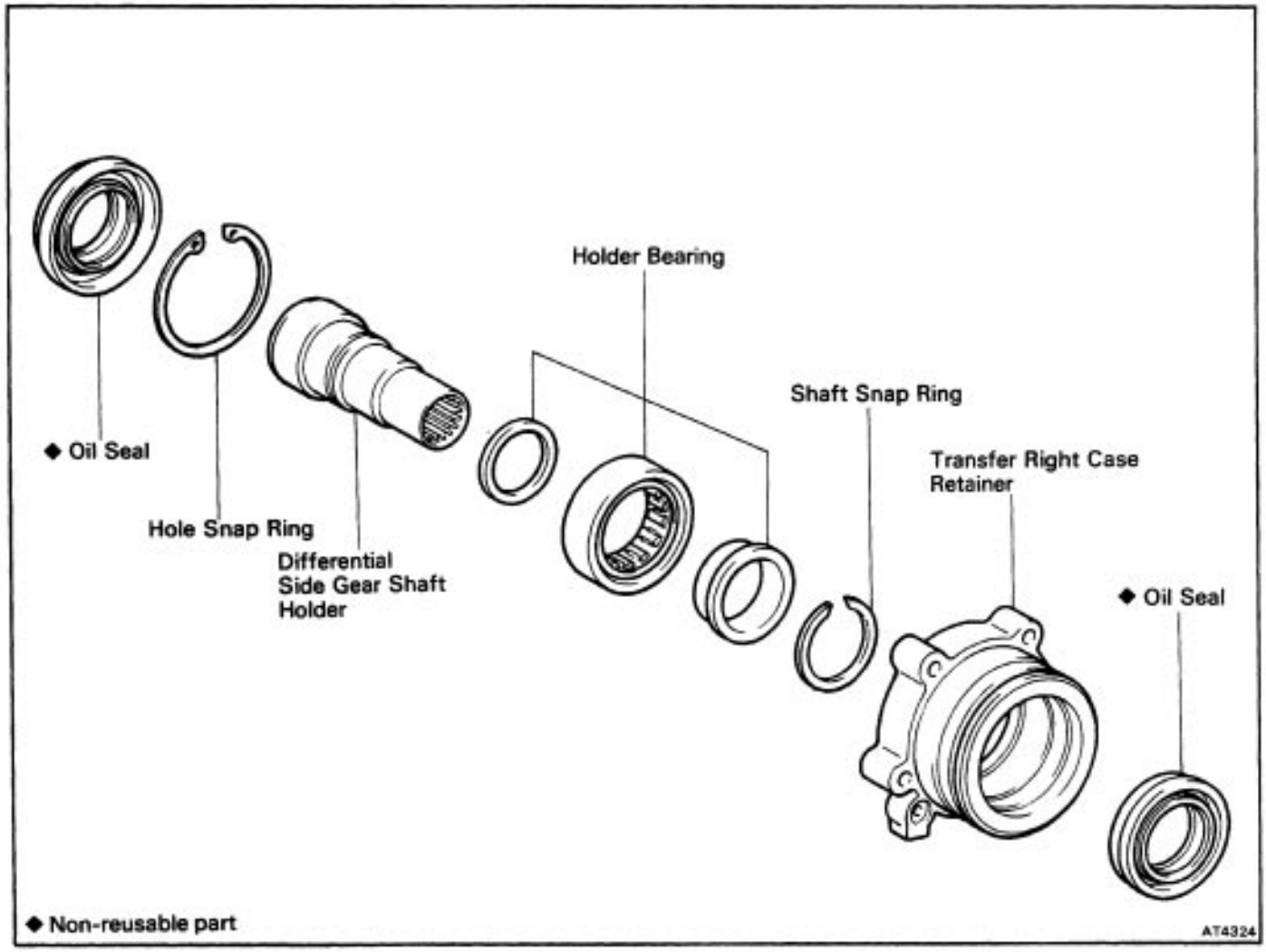
NOTICE: Using the soft jaws, hold the bearing cage in a vise.

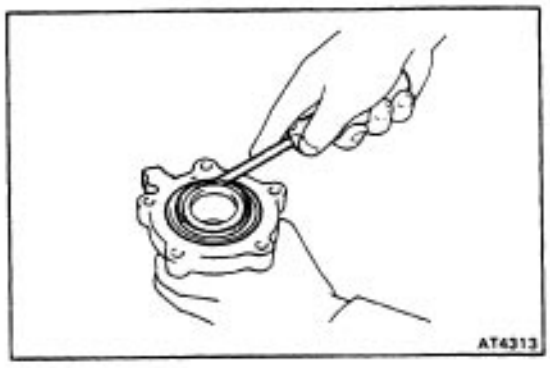


6. STAKE LOCK NUT

Using a punch and hammer, stake the nut.

(Transfer Right Case Retainer)

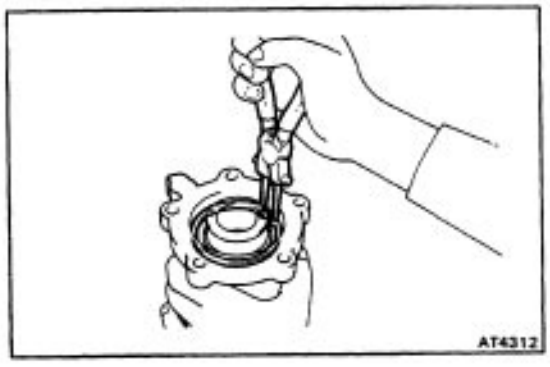




DISASSEMBLY OF TRANSFER RIGHT CASE RETAINER

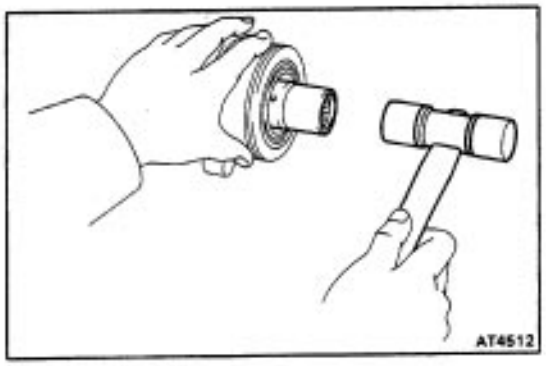
1. REMOVE OIL SEAL

Using a screwdriver, remove the oil seal.

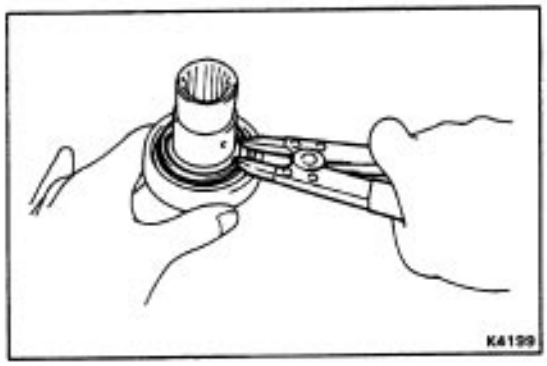


2. REMOVE SIDE GEAR SHAFT HOLDER

(a) Using a snap ring pliers, remove the snap ring.

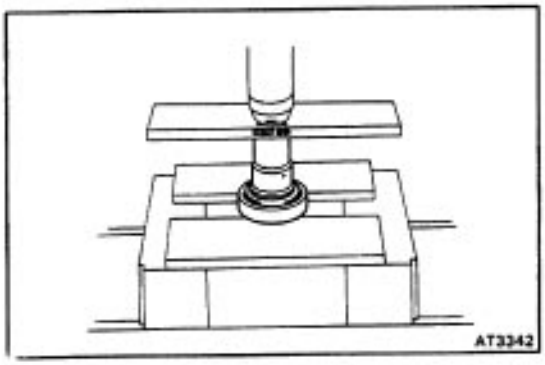


(b) Using a plastic hammer, remove the side gear shaft holder.

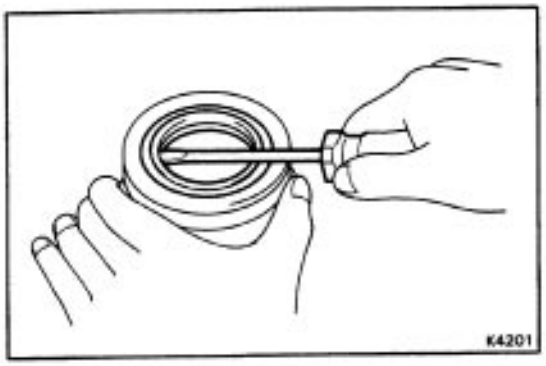


3. REMOVE HOLDER BEARING

(a) Using snap ring pliers, remove the snap ring.



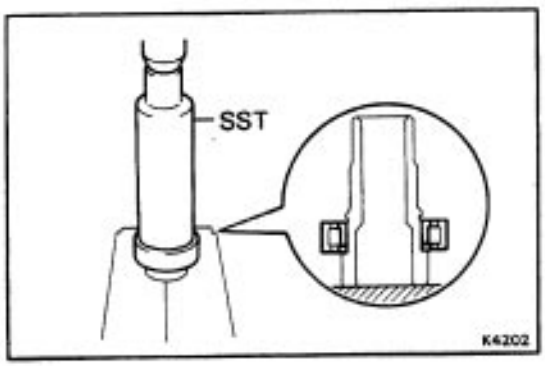
(b) Using a press, press out the bearing.



4. REMOVE OIL SEAL

Using a screwdriver, remove the oil seal.

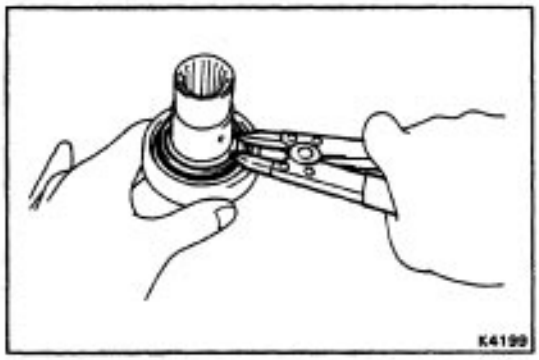
ASSEMBLY OF TRANSFER RIGHT CASE RETAINER



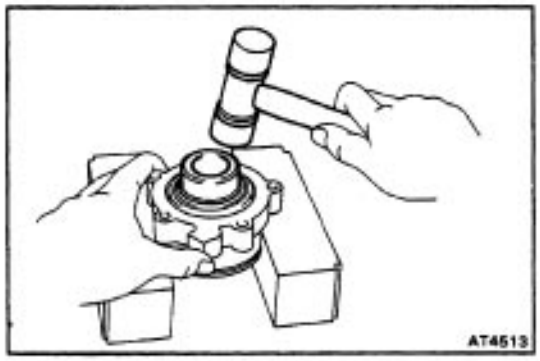
1. INSTALL HOLDER BEARING

(a) Using SST and a press, press in the holder bearing.

SST 09226–10010

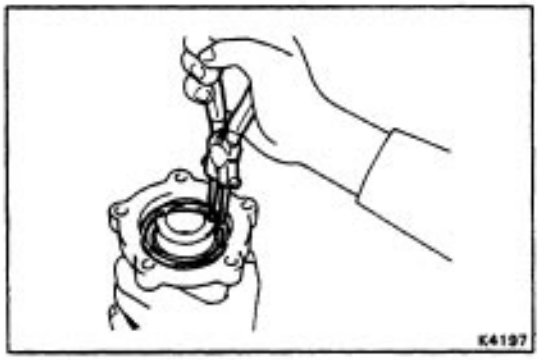


(b) Using snap ring pliers, instal! the snap ring.

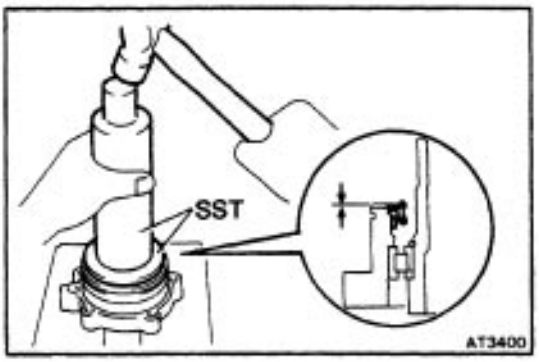


2. INSTALL SIDE GEAR SHAFT HOLDER

(a) Install the side gear shaft holder.



(b) Using snap ring pliers, install the snap ring.



3. INSTALL OIL SEAL

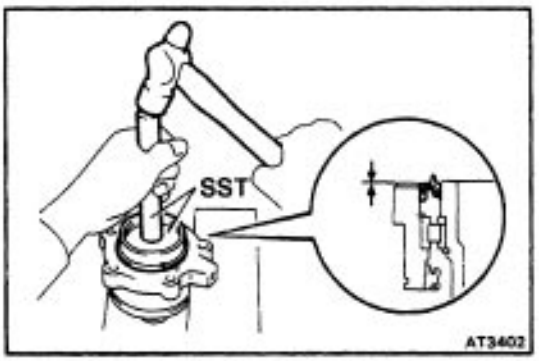
(Left side oil seal)

(a) Coat a new oil seal lip with MP grease.

(b) Using a hammer and SST, drive in the oil seal.

SST 09316–60010 (09316–00010, 09316–00040)

Oil seal depth: 0 mm (0 in.)



(Right side oil seal)

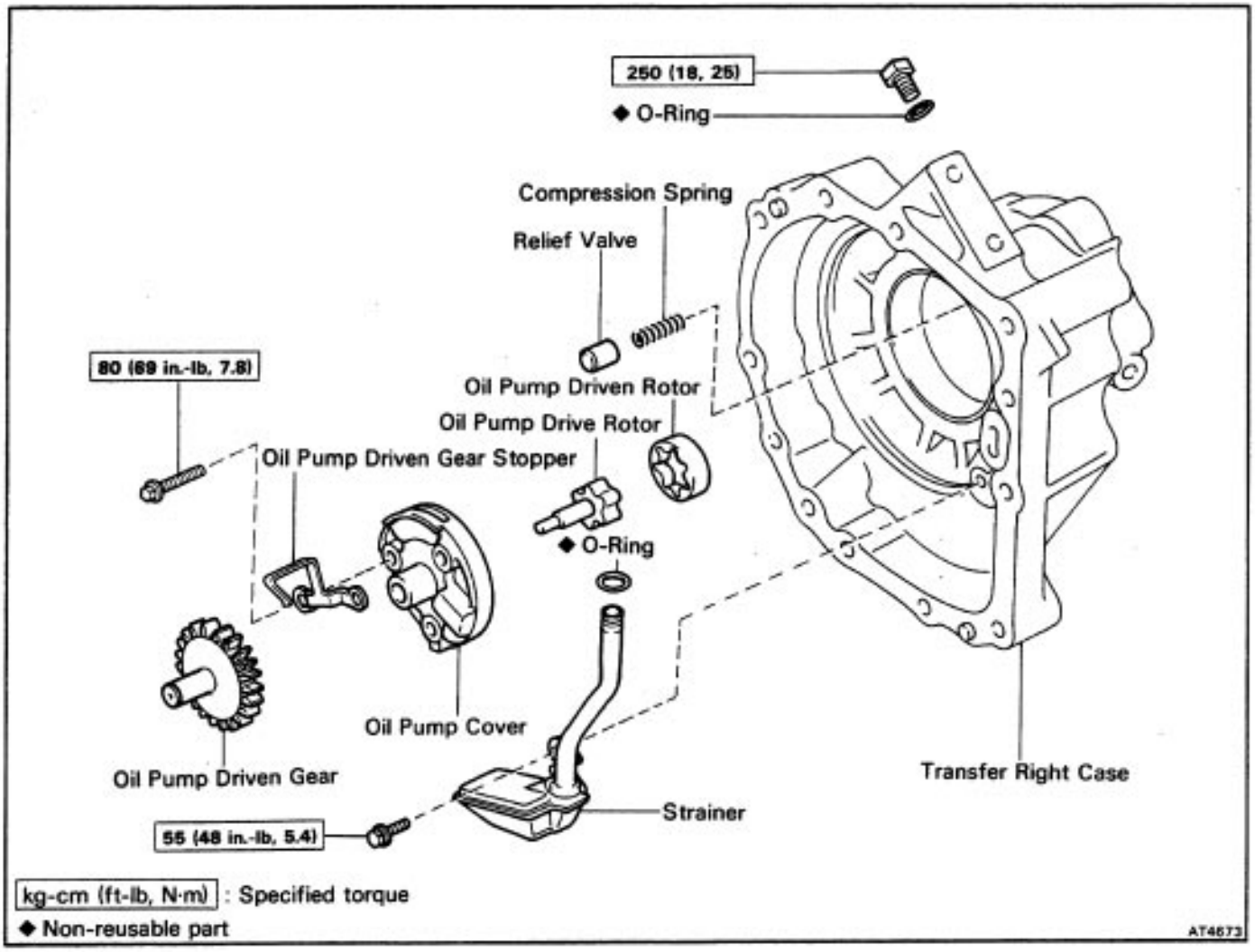
(a) Coat a new oil seal lip with MP grease.

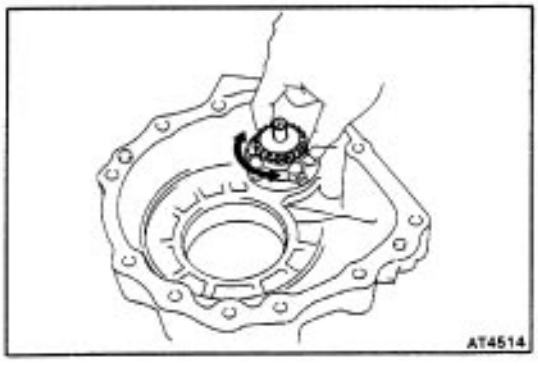
(b) Using a hammer and SST, drive in the oil seal.

SST 09608–32010, 09608–35014 (09608–06020)

Oil seal depth: 0 mm (0 in.)

(Transfer Right Case)

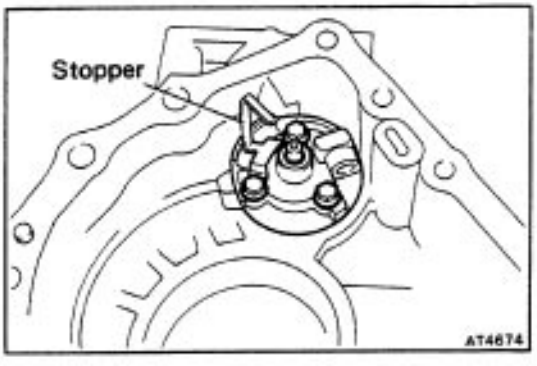




DISASSEMBLY OF TRANSFER RIGHT CASE

1. INSPECT OIL PUMP OPERATION

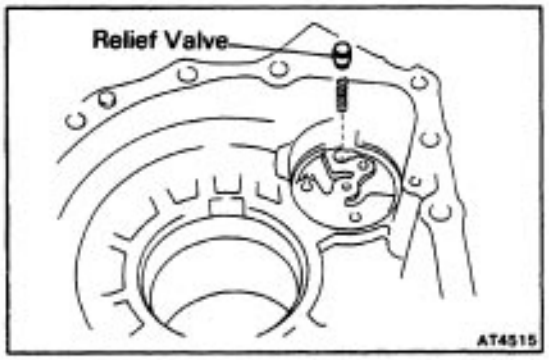
Check that the oil pump turns smoothly with oil pump driven gear.



2. REMOVE OIL PUMP DRIVEN GEAR STOPPER, OIL PUMP COVER, DRIVE ROTOR AND DRIVEN ROTOR

(a) Remove the three bolts and oil pump driven gear stopper.

(b) Pull out the oil pump cover, drive rotor and driven rotor.



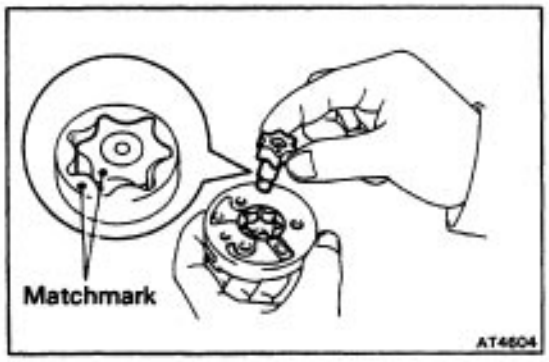
3. REMOVE RELIEF VALVE

Remove the relief valve and spring.

ASSEMBLY OF TRANSFER RIGHT CASE

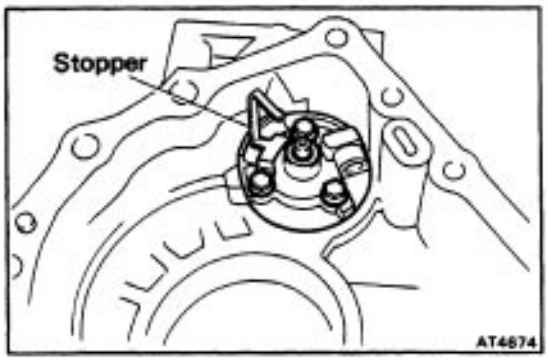
1. INSTALL RELIEF VALVE

Install the relief valve and spring.



2. INSTALL OIL PUMP DRIVE ROTOR AND DRIVEN ROTOR

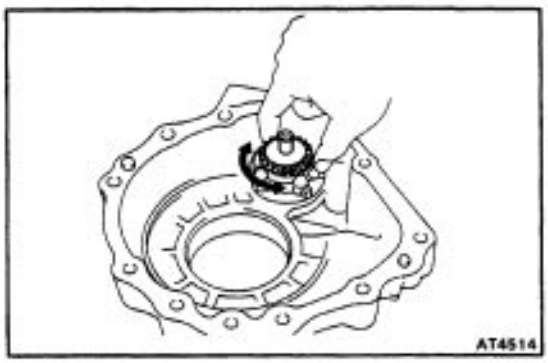
Align the matchmarks on the drive rotor and the driven rotor.



3. INSTALL OIL PUMP COVER AND DRIVEN GEAR STOPPER

Torque the three bolts evenly.

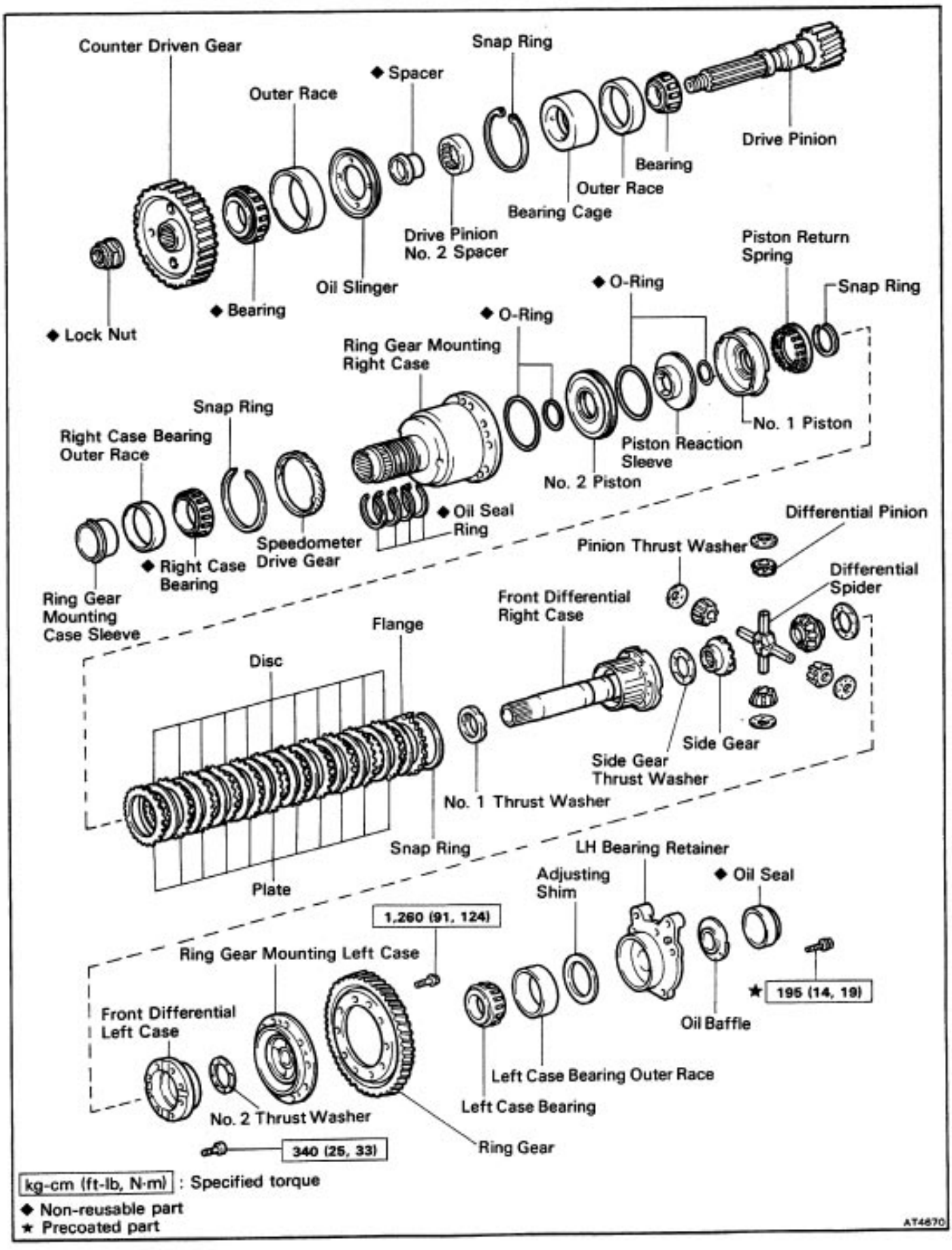
Torque: 80 kg–cm (69 in.–lb, 7.8 N–m)

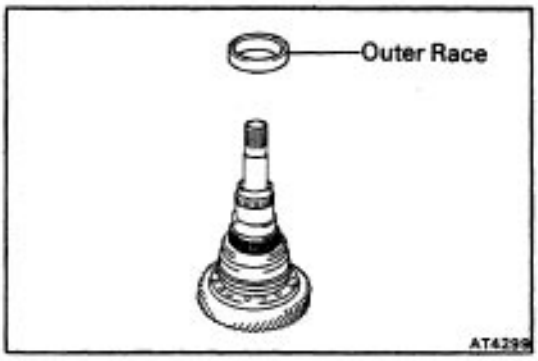


4. CHECK OPERATION OF OIL PUMP

Insert the oil pump driven gear to the drive rotor, check that the drive rotor turns smoothly.

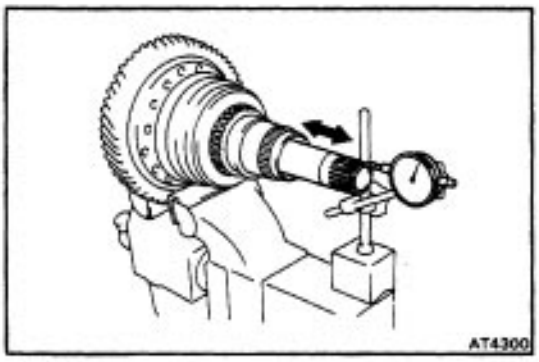
Differential Assembly (A540H)





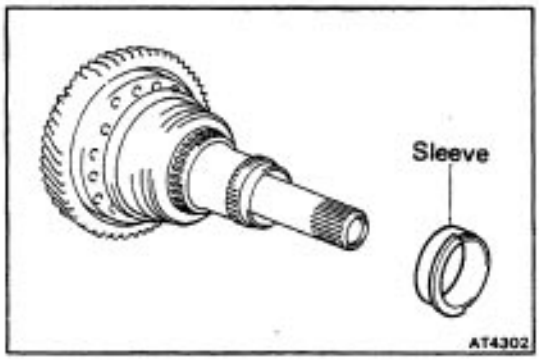
DISASSEMBLY OF DIFFERENTIAL ASSEMBLY

1. REMOVE RIGHT SIDE BEARING OUTER RACE

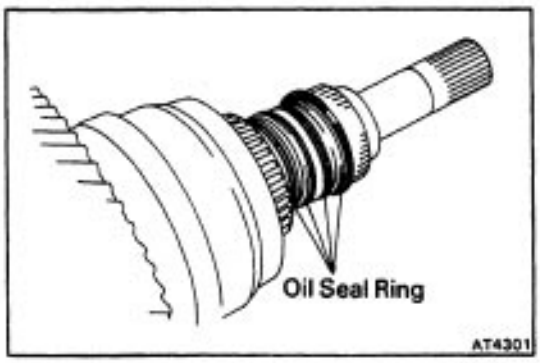


2. CHECK DIFFERENTIAL END PLAY

Using a dial indicator, measure the differential end play.
End play: 0.18 – 0.82 mm (0.o071 – 0.0323 in.)

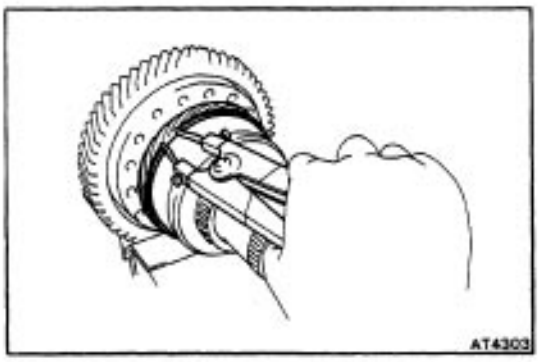


3. REMOVE RING GEAR MOUNTING CASE SLEEVE



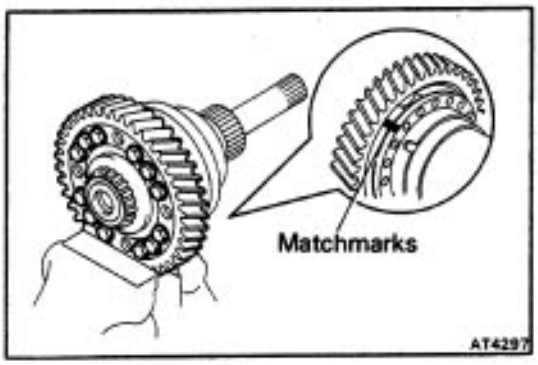
4. REMOVE OIL SEAL RINGS

Remove four oil sea! rings from the ring gear mounting right case.



5. REMOVE SPEEDOMETER DRIVE GEAR

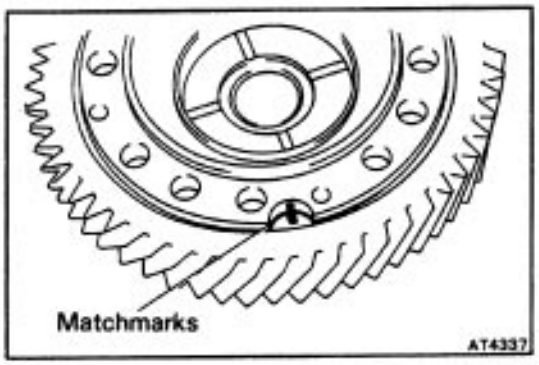
Using snap ring pliers, remove the snap ring and the speedometer drive gear.



6. REMOVE RING GEAR MOUNTING LEFT CASE

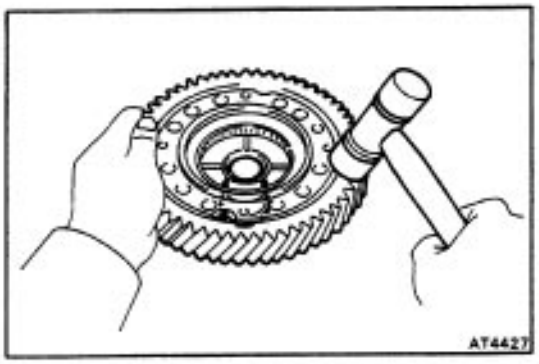
(a) Place matchmarks on the ring gear mounting left case and right case.

(b) Remove the twelve bolts and left case.



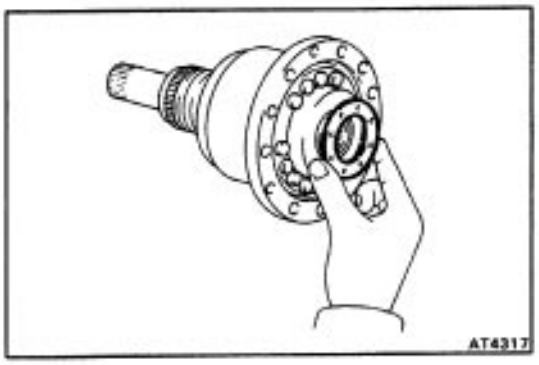
7. REMOVE RING GEAR

(a) Place matchmarks on the ring gear and left case.



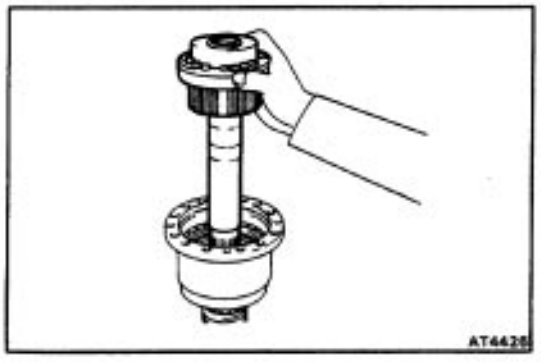
(b) Place the left case on SST.
SST 09350–32014 (09351–32090)

(c) Using a plastic hammer, remove the ring gear from the left case.

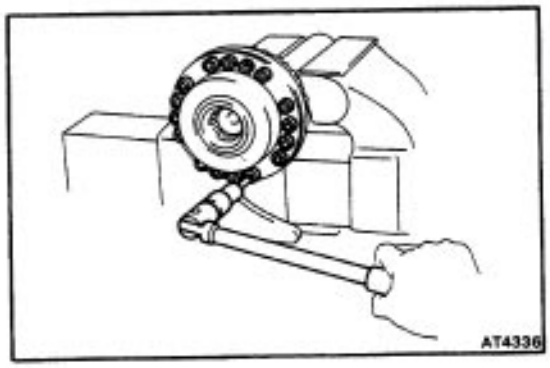


8. REMOVE FRONT DIFFERENTIAL CASE

(a) Remove the No. 2 thrust washer.



(b) Remove the front differential case from the ring gear mounting right case.

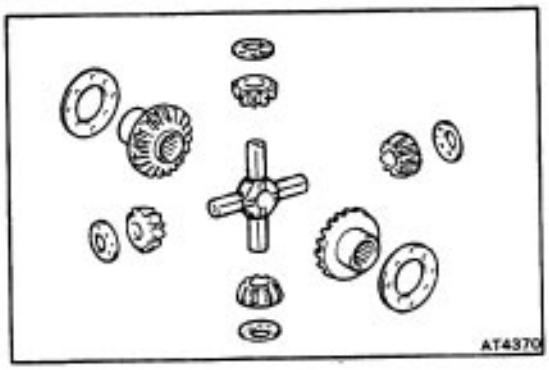


9. REMOVE FRONT DIFFERENTIAL LEFT CASE

(a) Using a torx wrench, remove the sixteen screws from the left case.

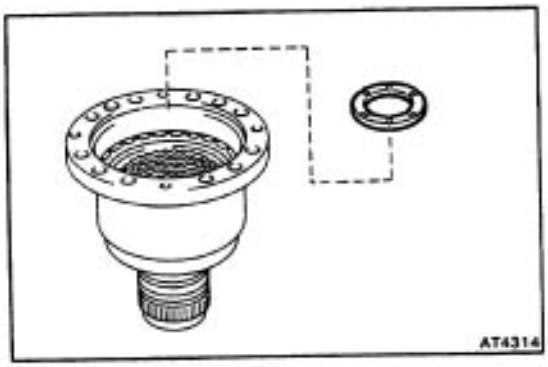
(b) Separate the left case and right case..

NOTICE: Do not scratch the contact surface of the needle bearing.

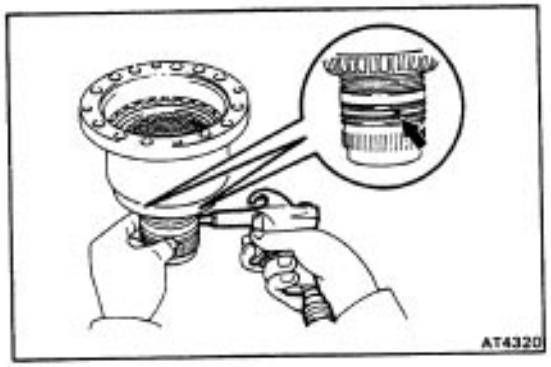


10. REMOVE DIFFERENTIAL PINIONS AND SIDE GEARS

Remove the two differential side gears, two side thrust washers, differential spider, four differential pinions and four pinion washers from the front differential cases.



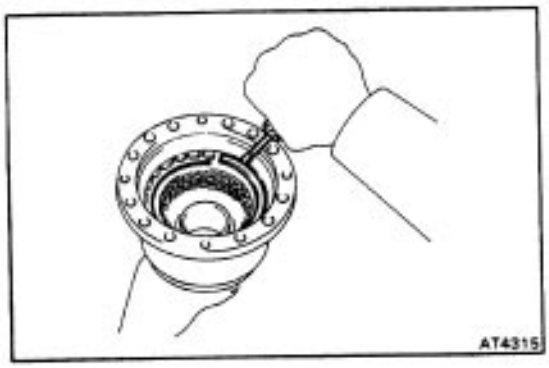
11. REMOVE NO. 1 THRUST WASHER



12. CHECK OPERATION OF CLUTCH PISTONS

(a) Plug one hole of the right case with your hand.

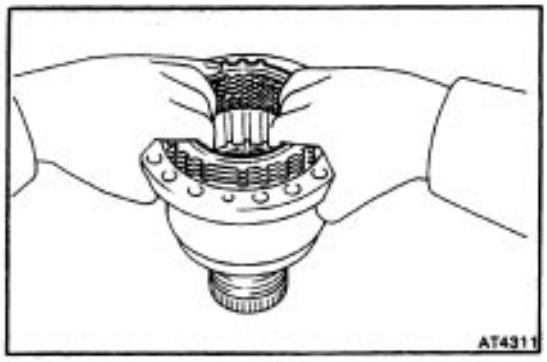
(b) Apply compressed air into the other hole and confirm that the pistons move.

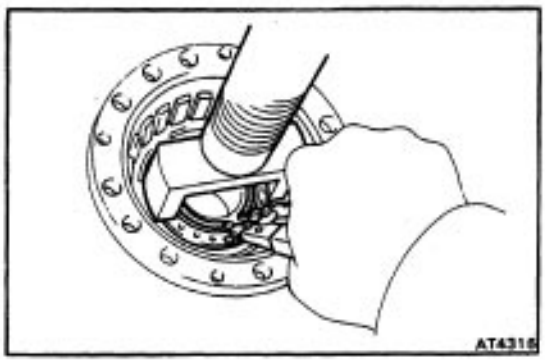


13. REMOVE HYDRAULIC MULTIPLATE CLUTCH DISCS AND PLATES

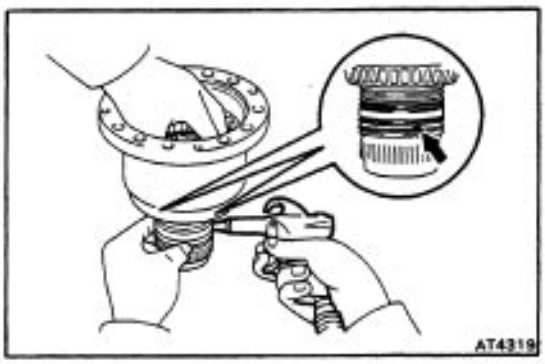
(a) Using a screwdriver, remove the snap ring.

(b) Remove the flange, eleven discs and eleven plates.

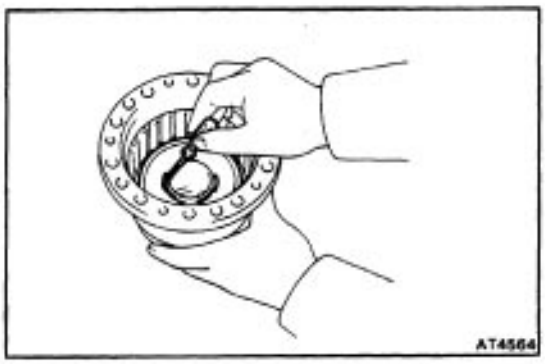




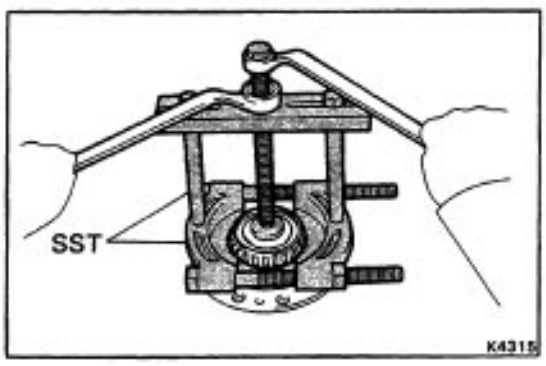
(c) Place SST, and compress the return spring.
SST 09350–32014¿09351–320701
(d) Using snap ring pliers, remove the snap ring.



(e) Apply compressed air to the right case hole to remove the No. 1 piston.
(f) Remove the O–ring from the No. 1 piston.



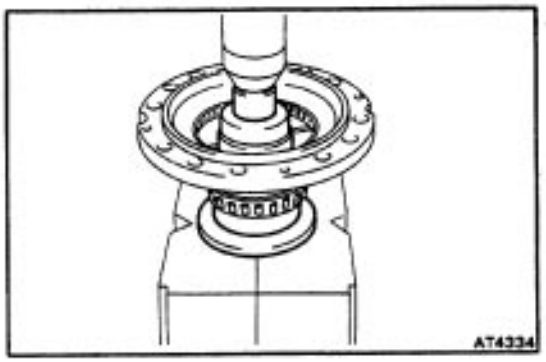
(g) Using a small screwdriver, remove the reaction sleeve and No. 2 piston.
(h) Remove the three O–rings from the reaction sleeve and No. 2 piston.



REPLACEMENT OF RING GEAR MOUNTING CASE BEARINGS

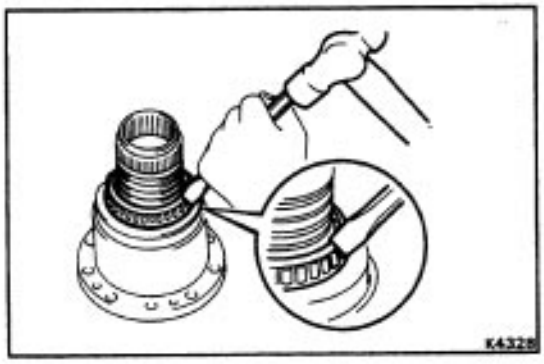
1. REMOVE RING GEAR MOUNTING LEFT CASE BEARING

Using SST, remove the bearing.
SST 09950–00020, 09950–00030



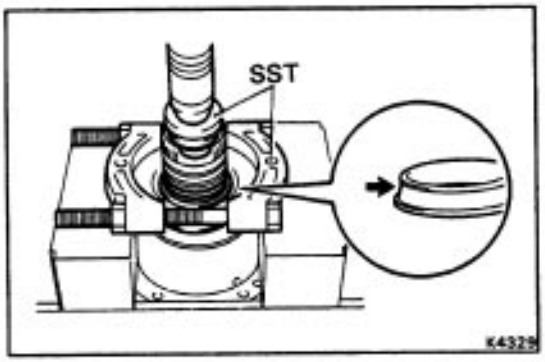
2. INSTALL RING GEAR MOUNTING LEFT CASE BEARING

Using a press and SST, press in the bearing.
SST 09316–20011, 09350–32014 (09351–32090)

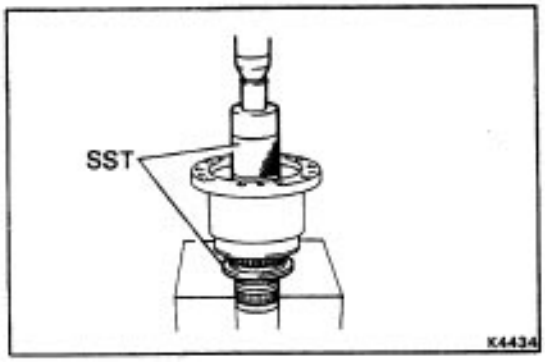


3. REMOVE RING GEAR MOUNTING RIGHT CASE BEARING

(a) Using a chisel and hammer, cut out the bearing cage.
NOTICE: Do not damage the right case.

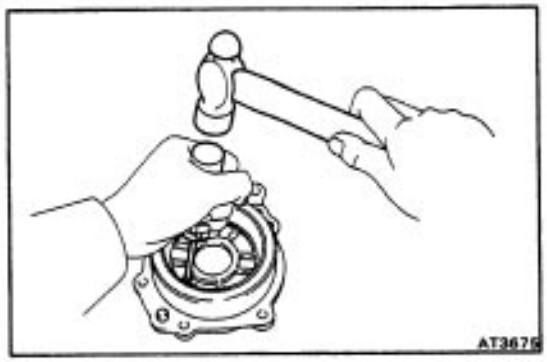


(b) Using a press and SST, press out the bearing inner race.
SST 09350–32014 (09351–32090), 09950–00020



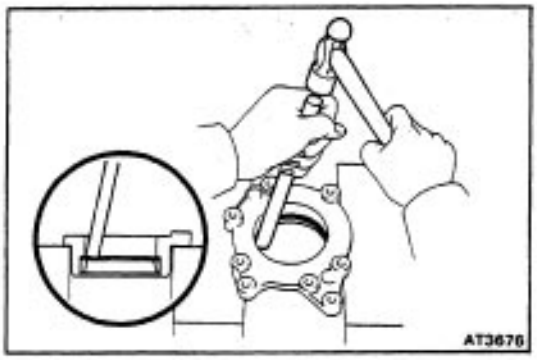
4. INSTALL RING GEAR MOUNTING RIGHT CASE BEARING

Using a press and SST, press in the new bearing.
SST 09316–60010 (09316–00010), 09502–12010



5. REMOVE RING GEAR MOUNTING LEFT CASE BEARING OUTER RACE FROM LH BEARING RETAINER

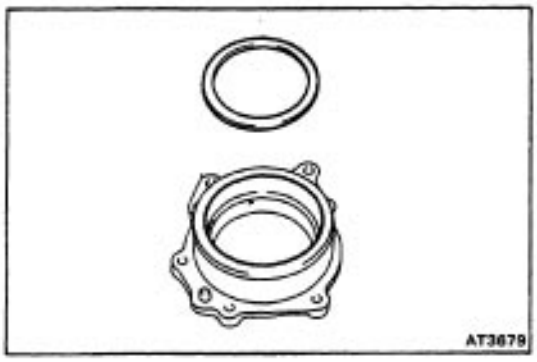
(a) Using a hammer and screwdriver, remove the oil seal.
(b) Remove the oil baffle from the LH bearing retainer.



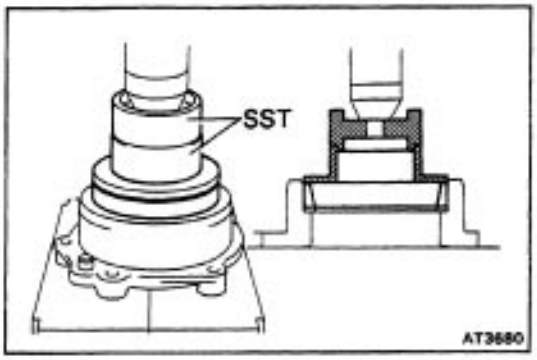
(c) Using a hammer and brass bar, drive out the outer race and adjusting shim from LH bearing retainer.

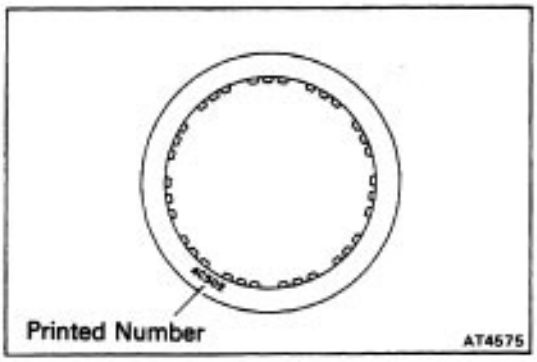
6. INSTALL ADJUSTING SHIM AND BEARING OUTER RACE TO LH BEARING RETAINER

(a) Place the adjusting shim into the LH bearing retainer.
HINT: Use either the shim which was removed or one 2.40 mm (4.0945 in.).



(b) Using SST, press the outer race into the LH retainer.
SST 09316–20011, 09350–32014 (09351–32150)
HINT: Install the oil baffle and oil seal after adjusting the differential side bearing preload.
(See page AT–388)



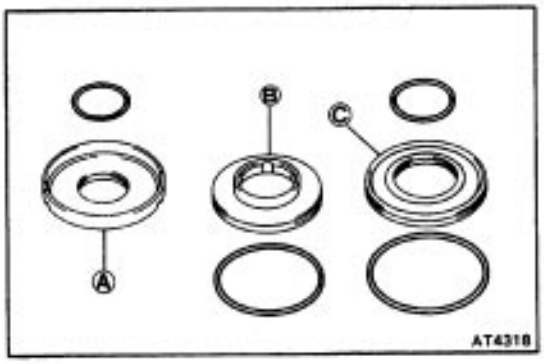


INSPECTION OF HYDRAULIC MULTIPLATE CLUTCH

INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of discs, plates and flange are worn or burnt. If necessary, replace them.
HINT:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed number is defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.

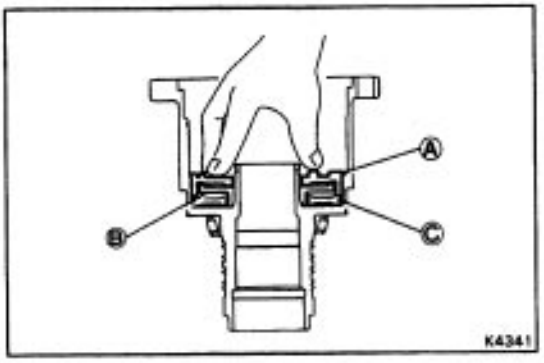


ASSEMBLY OF DIFFERENTIAL ASSEMBLY

1. INSTALL PISTONS AND SLEEVE

(a) Coat the four O–rings with ATF.

(b) Install the four O–rings to the reaction sleeve and pistons.



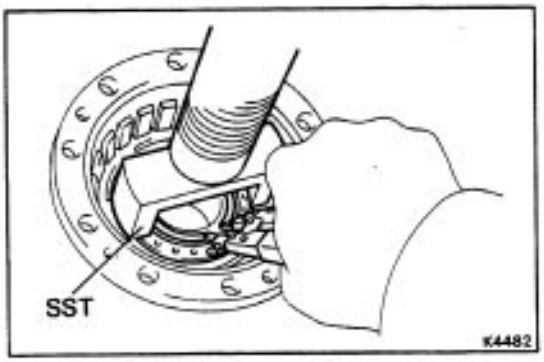
(c) Install the No. 1 ((A)), No. 2 ((B)) pistons and reaction sleeve ((C)) to the ring gear mounting right case.

2. INSTALL PISTON RETURN SPRING

(a) Place the spring on the piston.

(b) Place SST on the spring retainer, and compress the spring with a press.
SST 09350–32014 (09351–32070)

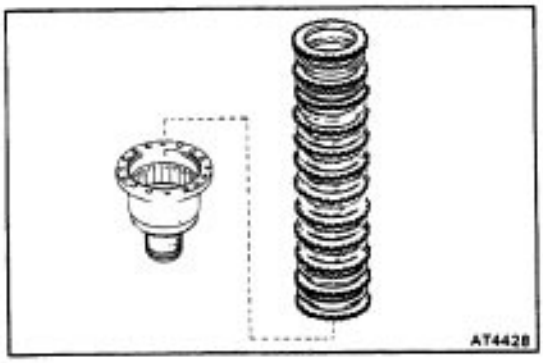
(c) Using snap ring pliers, install the snap ring.



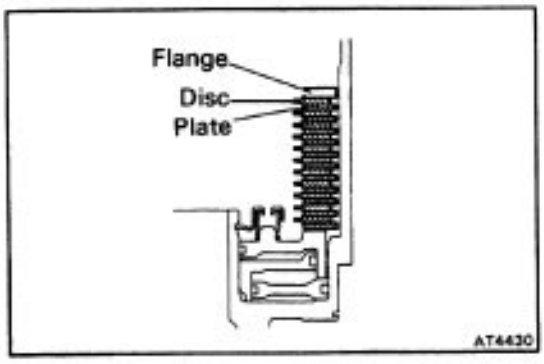
3. INSTALL PLATE, DISCS AND FLANGE

(a) Install the plate and discs.
Install in order: P = Plate D = Disc
P–D–P–D–P–D–P–D–P–D–P–D–P–D–P–D–P–D–P–D–P–D–P–D–P–D–P–D

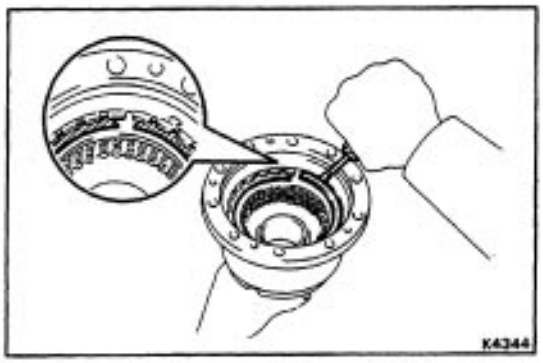
HINT: Before assembling new discs, soak them in ATF for at least fifteen minutes.



(b) Install the flange with the flat end facing downward



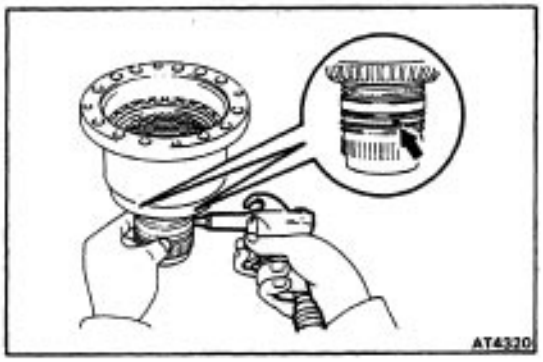
(e) Using a screwdriver, install the snap ring.



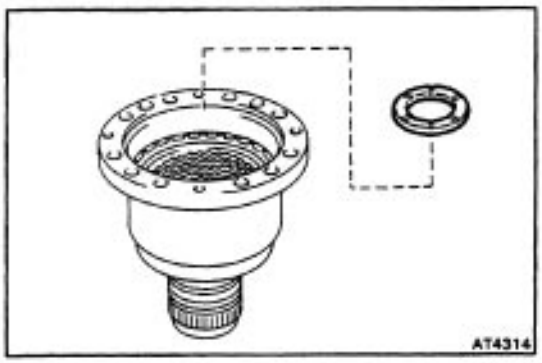
4. CHECK OPERATION OF CLUTCH PISTONS

(a) Plug one hole with your hand.

(b) Apply compressed air into the other hole and make sure that the pistons move.



5. INSTALL NO. 1 THRUST WASHER



6. CHECK AND ADJUST FRONT DIFFERENTIAL SIDE GEAR BACKLASH

(Front Differential Left Case)

(a) Install the following parts:

- Side gear thrust washer
- Side gear
- Four differential pinion gears
- Four pinion gear thrust washers
- Differential spider

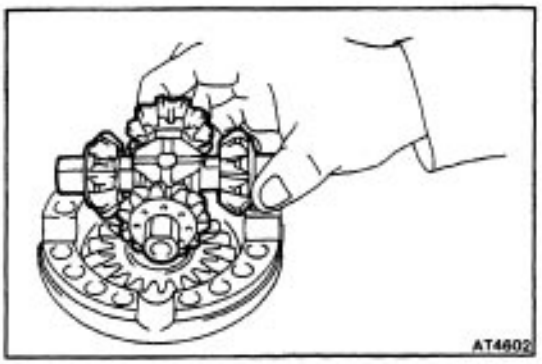
(a)Using a dial indicator, measure the backlash of one pinion gear while holding the side gear toward the case.

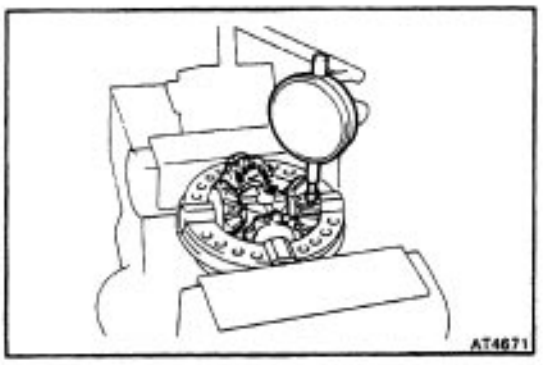
Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

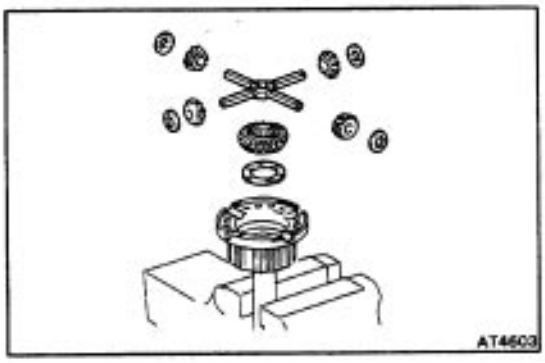
If not within specification select the side gear thrust washer.

NOTICE: Do not tighten the vise too tight.

(c) Remove four pinion gears, four thrust washers and spider.



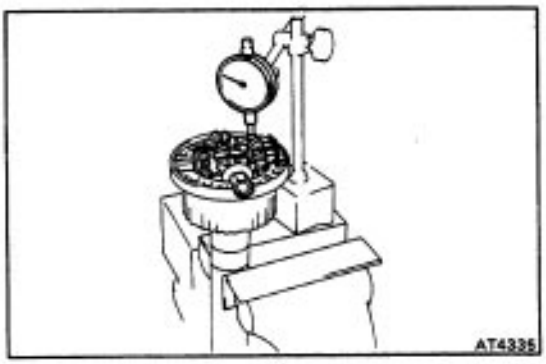




(Front Differential Right Case)

(a) Install the following parts:

- Side gear thrust washer
- Side gear
- Four differential pinion gears
- Four pinion gear thrust washer
- Differential spider

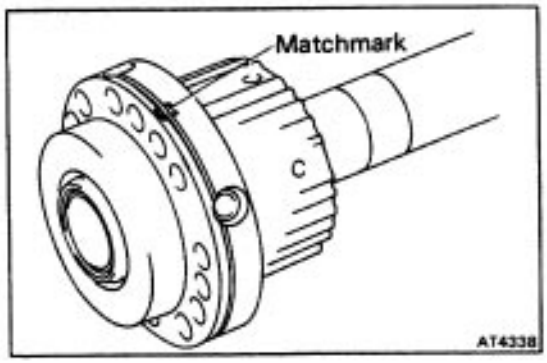


(b) Using a dial indicator, measure the backlash of one pinion gear while holding the side gear toward the case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

Referring to the table below, select the side gear thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

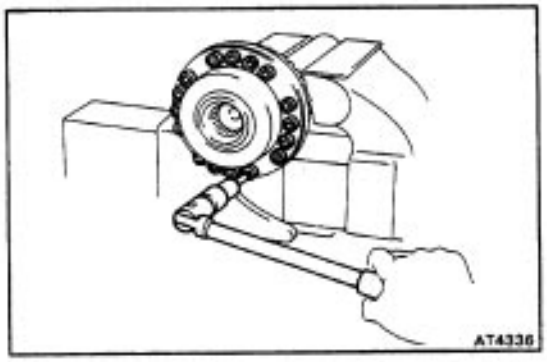
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	1.00 (0.0394)	E	1.20 (0.0472)
B	1.05 (0.0413)	F	1.25 (0.0492)
C	1.10 (0.0433)	G	1.30 (0.0512)
D	1.15 (0.0453)		



7. INSTALL FRONT DIFFERENTIAL LEFT CASE

(a) Install the left case to the right case.

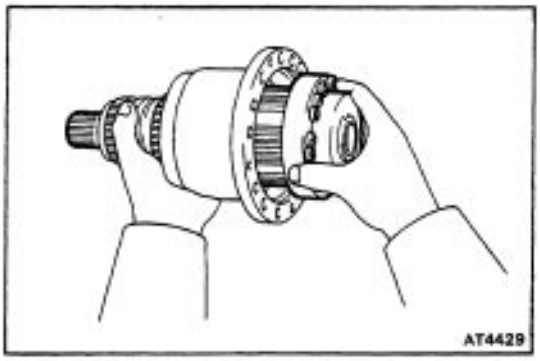
HINT: Align the matchmarks on the left case and right case.



(b) Using a torx wrench, torque the sixteen torx screw:

Torque: 340 kg–cm (25 ft–lb, 33 N–m)

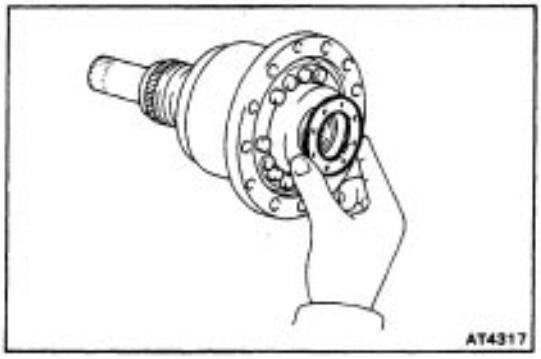
NOTICE: Do not scratch the contact surface of the needle bearing.



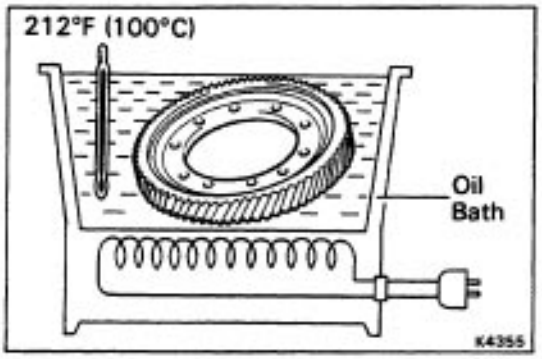
8. INSTALL FRONT DIFFERENTIAL CASE

(a) Install the front differential case to the ring gear mounting right case.

HINT: Align the flukes of the discs in the hydraulic mut-tiplate clutch.



(b) Install the No. 2 thrust washer.



9. INSTALL RING GEAR

(a) Clean the contact surface of the ring gear mounting left case.

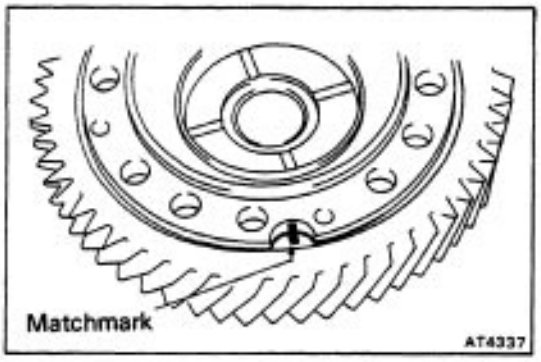
(b) Heat the ring gear to about 212* F (1000C) in an oil bath.

NOTICE: Do not heat the ring gear above 230˚F (11 0˚C).

(c) Clean the contact surface of the ring gear with cleaning solvent.

(d) Quickly install the ring gear on the ring gear mounting left case.

HINT: Align the matchmarks on the ring gear mounting left case and the ring gear.

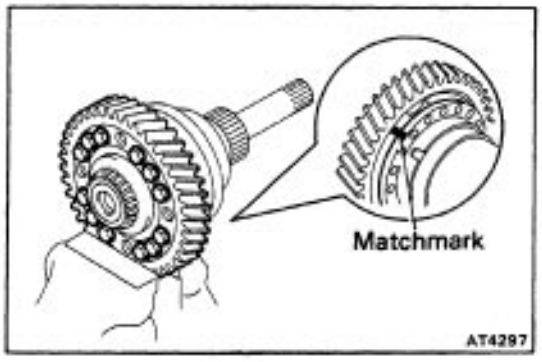


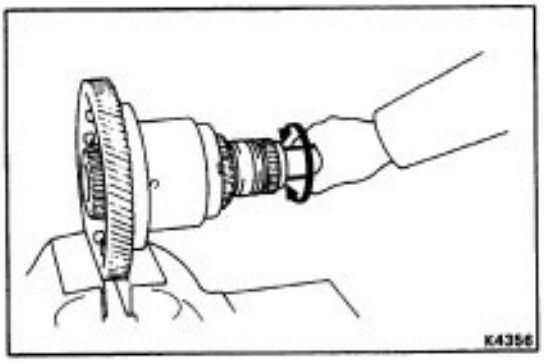
(e) Install the ring gear and ring gear mounting left case on the ring gear mounting right case. Install the twelve bolts.

HINT: Align the matchmarks on the ring gear mounting left case and contact the right case.

(f) Tighten the set bolts uniformly and a little at a time. Torque the bolts.

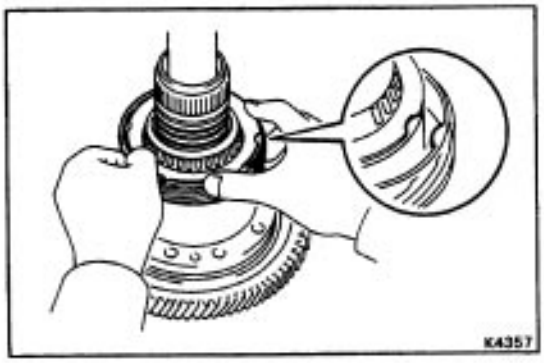
Torque: 1,260 kg–cm I91 ft–lb, 124 N–m)





10. CHECK OPERATION OF FRONT DIFFERENTIAL

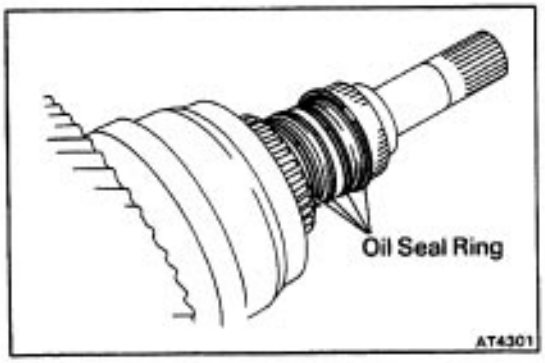
Check that the front differential turns smoothly.



11. INSTALL SPEEDOMETER DRIVE GEAR

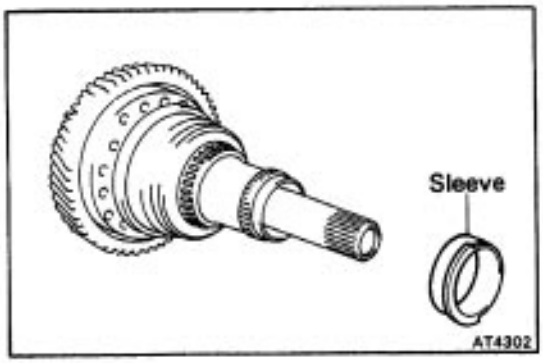
(a) Place the speedometer drive gear on the ring gear mounting case.

(b) Install the snap ring.

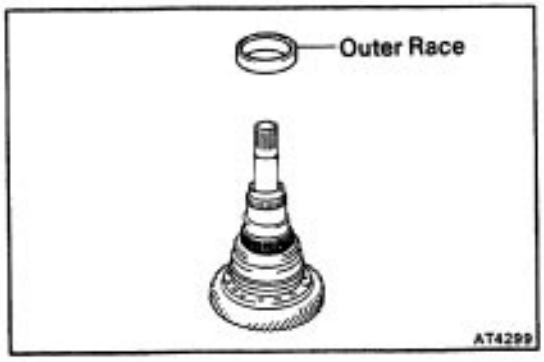


12. INSTALL OIL SEAL RINGS

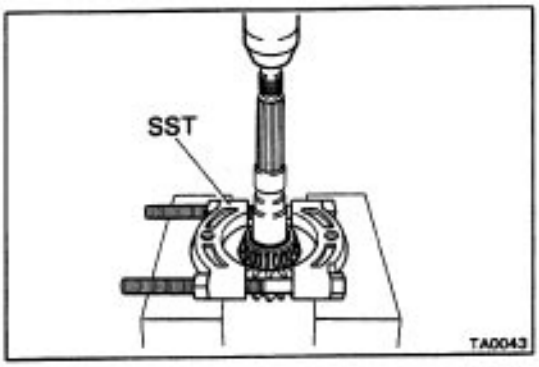
Install the four oil seal rings to the ring gear mounting right case.



13. INSTALL RING GEAR MOUNTING CASE SLEEVE



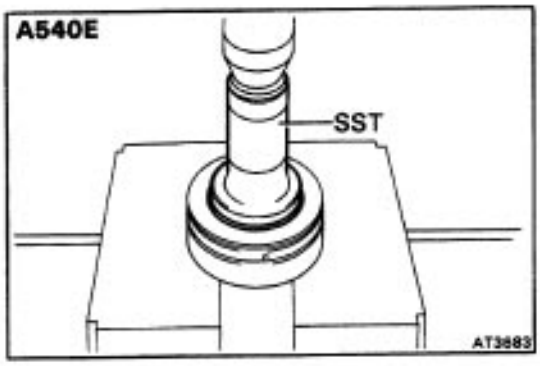
14. INSTALL RIGHT SIDE BEARING OUTER RACE



DISASSEMBLY OF DRIVE PINION

1. REMOVE DRIVE PINION SHAFT BEARING

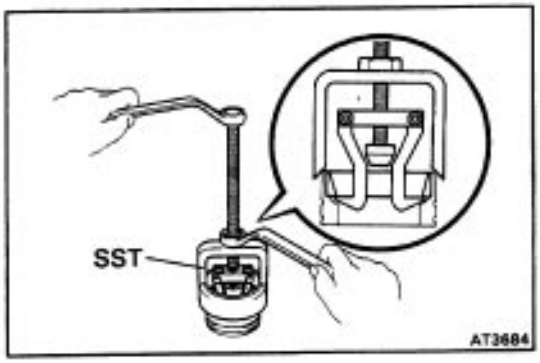
Using SST and a press, remove the bearing.
SST 09950–00020



2. (A540E)

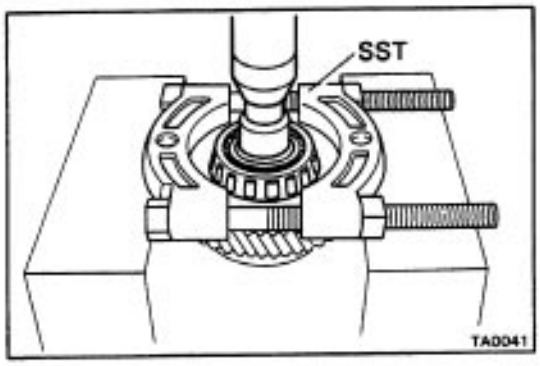
REMOVE OIL SEALS FROM CAGE

Using SST, press out the two oil seals.
SST 09325–12010



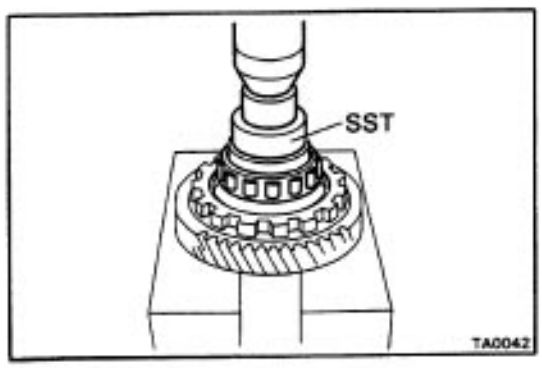
3. REMOVE PINION SHAFT BEARING OUTER RACE FROM CAGE

Using SST, remove the outer race.
SST 09612–65014



4. REMOVE COUNTER DRIVEN GEAR BEARING

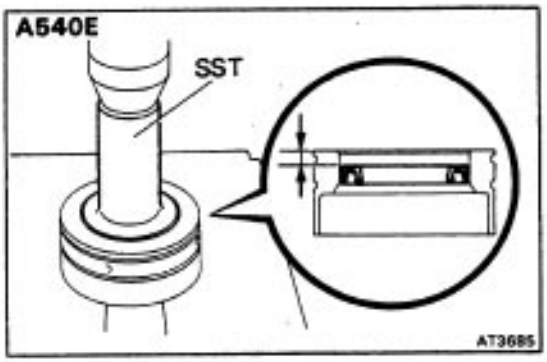
Using SST and a press, remove the bearing.
SST 09950–00020



ASSEMBLY OF DRIVE PINION SHAFT COMPONENTS

1. INSTALL COUNTER DRIVEN GEAR BEARING

Using SST, press in a new bearing.
SST 09350–32014 (09351–32090)

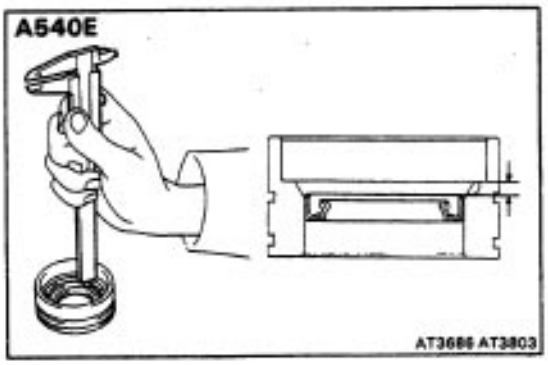


2. (A540E)

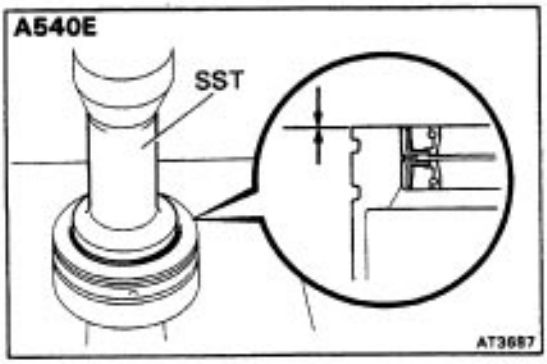
INSTALL OIL SEALS TO CAGE

(a) Using SST, press in a new oil seal with the lip facing downward.
SST 09325–12010

Oil seal press in depth (from flat end):
8 mm (0.31 in.)

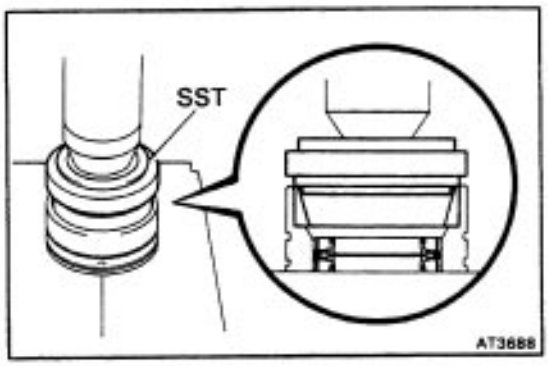


(b) Check the oil seal press in depth.
Oil seat press in depth: 4.3 mm (0–169 in.)



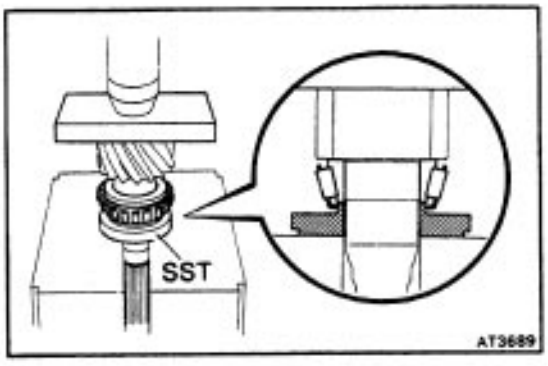
(c) With the oil seal lip facing upward, use SST to press in a new oil seal until its end is flush with the surface of the cage.
SST 09325–12010

(d) Coat the oil seal lips with MP grease.



3. INSTALL SHAFT BEARING OUTER RACE TO CAGE

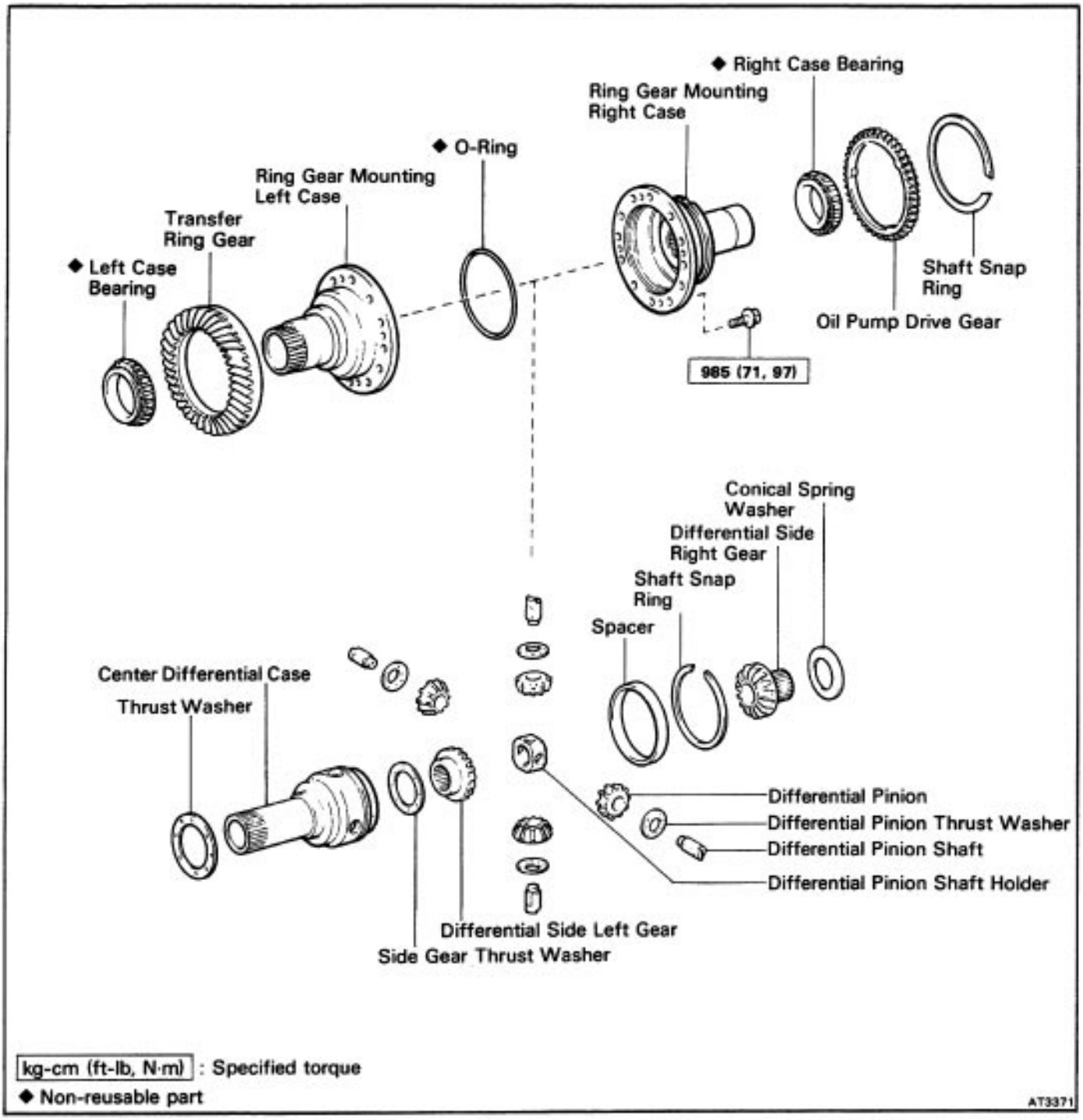
Using SST, press the outer race into the cage.
SST 09350–32014 (09351–32111)

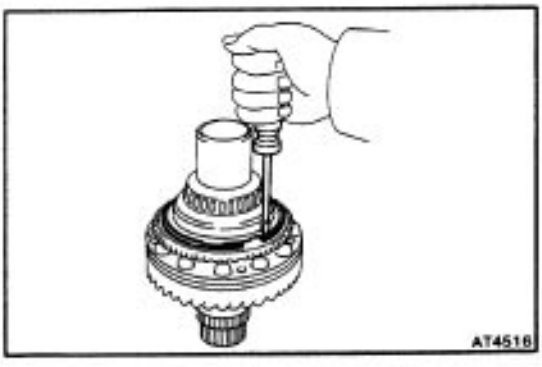


4. INSTALL DRIVE PINION SHAFT BEARING

Using SST, press in the bearing.
SST 09350–32014 (09351–32100)

(Ring Gear Mounting Case and Center Differential Case)

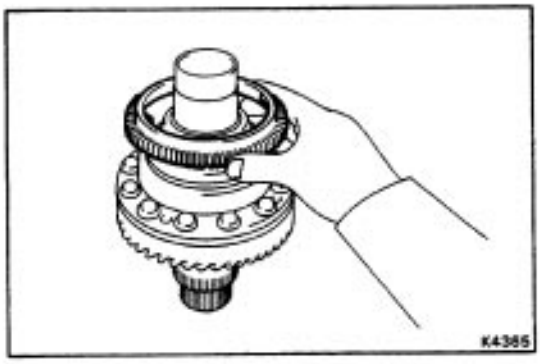




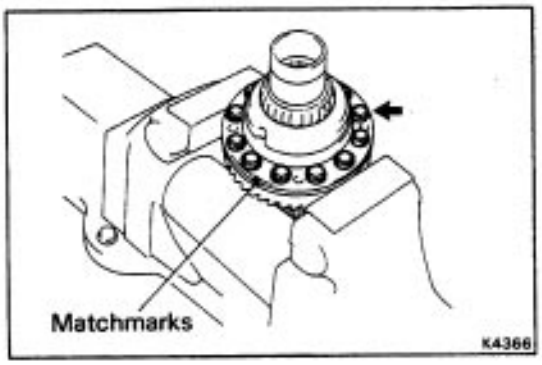
DISASSEMBLY OF RING GEAR MOUNTING CASE AND CENTER DIFFERENTIAL CASE

1. REMOVE OIL PUMP DRIVE GEAR

(a) Using a screwdriver, remove the shaft snap ring.



(b) Remove oil pump drive gear.

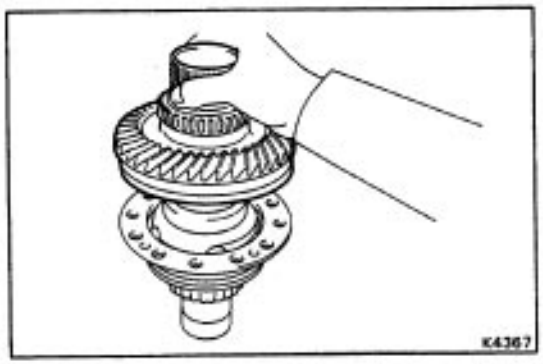


2. REMOVE RING GEAR MOUNTING LEFT CASE

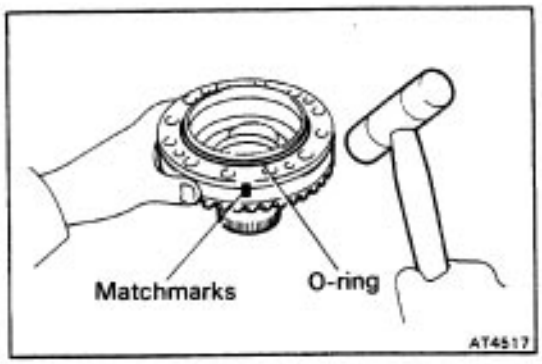
(a) Place matchmarks on the differential left case and the differential right case.

(b) Remove the twelve bolts.

NOTICE: Using the soft jaws, hold the left case in a vise.



(c) Remove the differential left case upward.

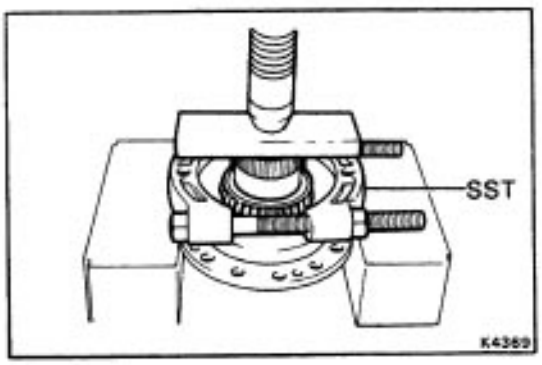


3. REMOVE RING GEAR

(a) Place matchmarks on the differential left case an(ring gear.

(b) Using a plastic hammer, tap out the ring gear.

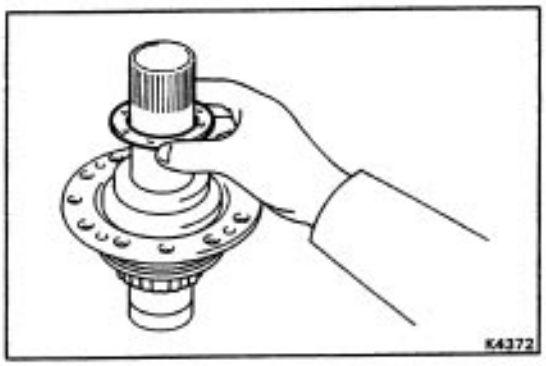
(c) Remove the O–ring from the left case.



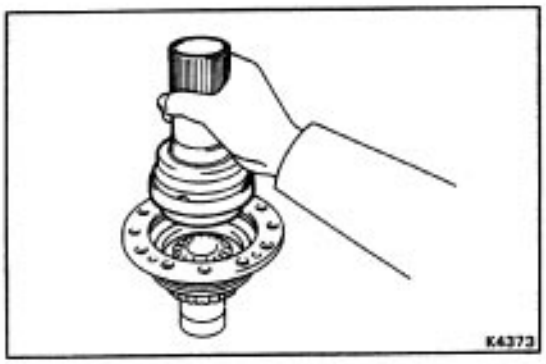
4. REMOVE LEFT CASE BEARING

Using SST and a press, press out the bearing.

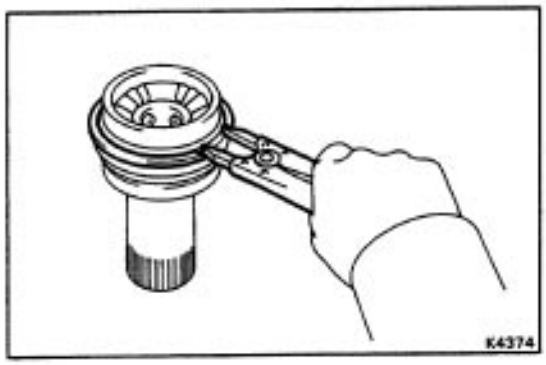
SST 09950–00020



5. REMOVE THRUST WASHER

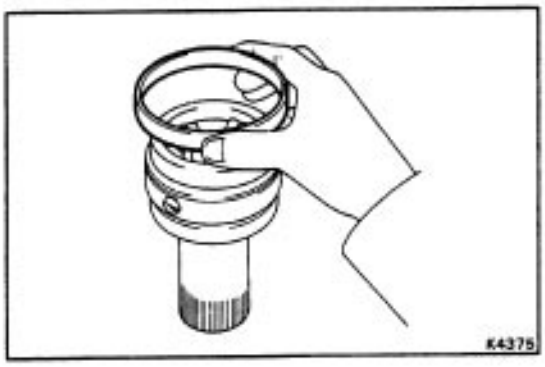


6. REMOVE CENTER DIFFERENTIAL CASE ASSEMBLY

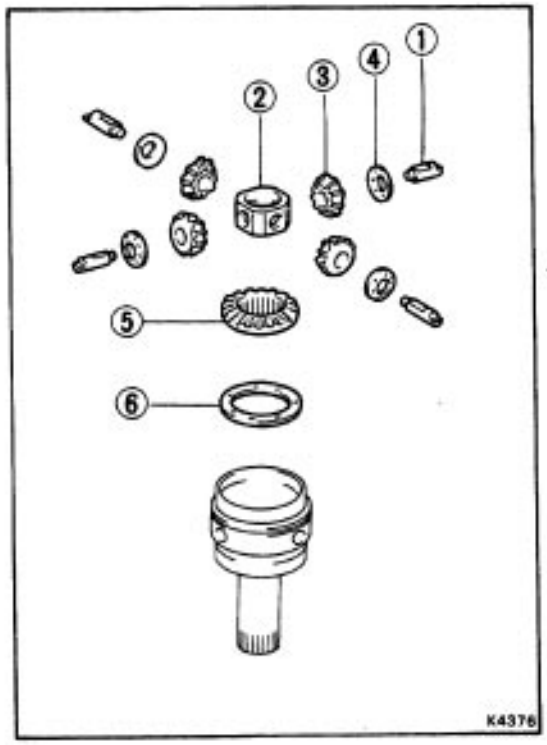


7. DISASSEMBLE CENTER DIFFERENTIAL CASE

(a) Using snap ring pliers, remove the shaft snap ring.

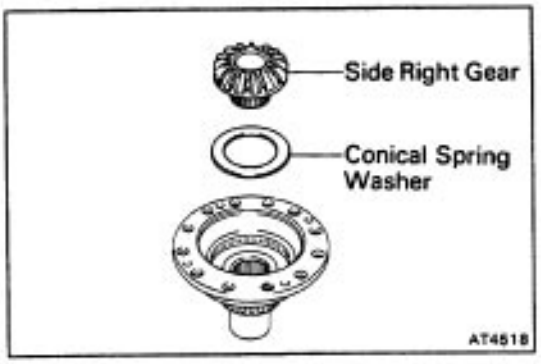


(b) Remove the spacer.

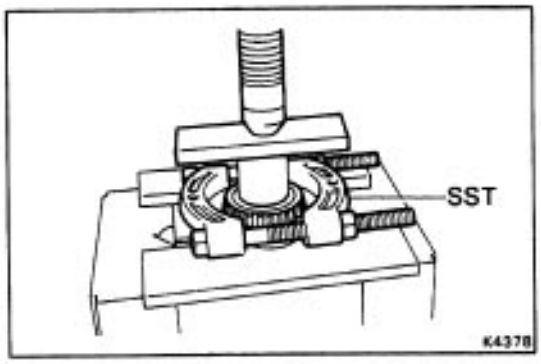


(e) Remove the following parts from the center differential case:

- Four pinion shafts
- Pinion shaft holder
- Four differential pinions
- Four pinion thrust washers
- Differential side left gear
- Side gear thrust washer

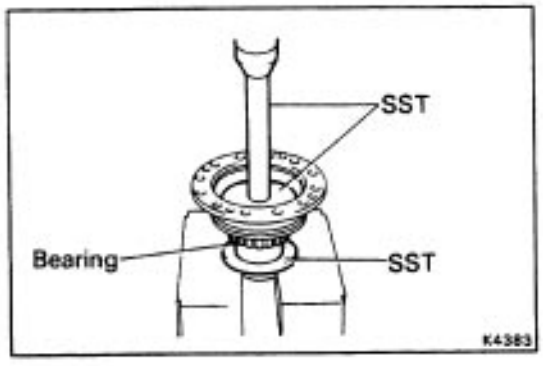


8. REMOVE DIFFERENTIAL SIDE RIGHT GEAR AND CONICAL SPRING WASHER



9. REMOVE RIGHT CASE BEARING

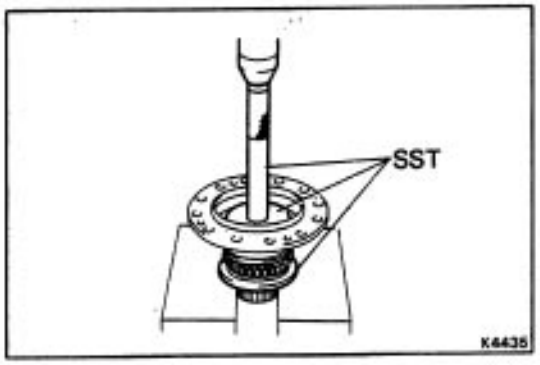
Using SST and a press, press out the bearing.
SST 09950–00020



ASSEMBLY OF RING GEAR MOUNTING CASE AND CENTER DIFFERENTIAL CASE

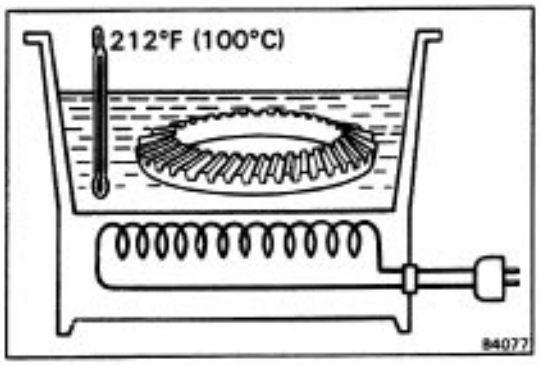
1. INSTALL RIGHT CASE BEARING

Using SST and a press, press in the bearing.
SST 09316–20011, 09608–35014
(09608–06020, 09608–06120)



2. INSTALL LEFT CASE¿ BEARING

Using SST and a press, press in the left case.
SST 09316–12010, 09608–35014
(09608–06020, 09608–06120)

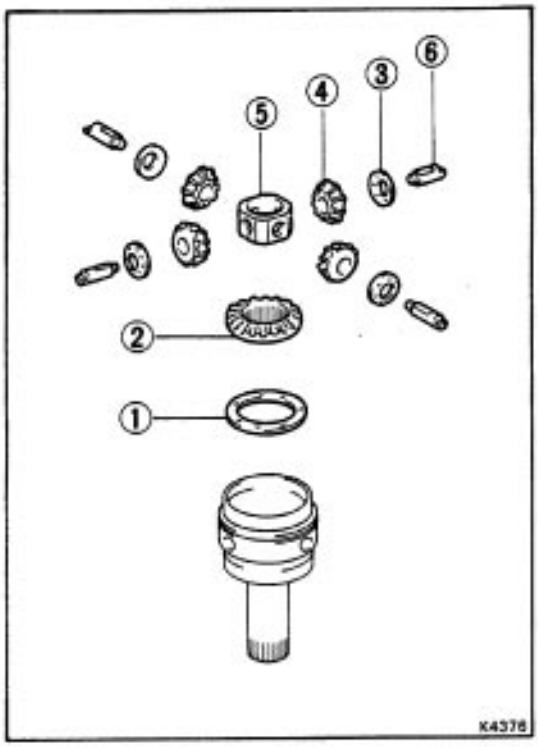


3. INSTALL RING GEAR

(a) Clean the contact surface of the ring gear mounting left case.
(b) Heat the ring gear to about 212˚F (100˚C) in an oil bath.

NOTICE: Do not heat the ring gear above 230˚F (110˚C).

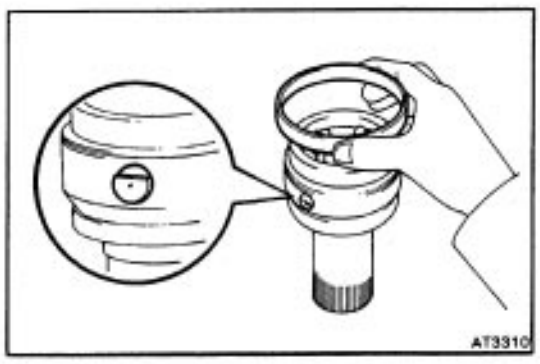
(e) Clean the contact surface of the ring gear with cleaning solvent.
(d) Align the matchmarks and quickly install the ring gear on the ring gear mounting left case.



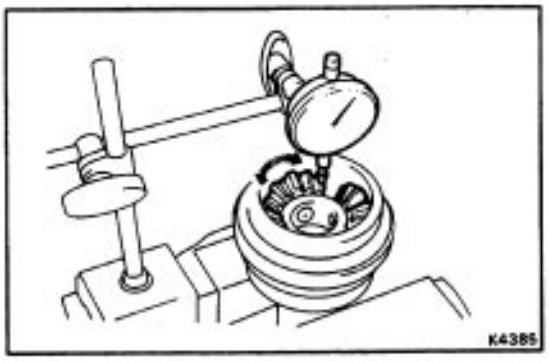
4. CHECK AND ADJUST CENTER DIFFERENTIAL SIDE GEAR BACKLASH

(a) Install the following parts to the center differential case:

- Side gear thrust washer|
- Differential side left gear
- Four pinion thrust washers
- Four differential pinions
- Pinion shaft holder
- Four pinion shafts



(b) Install the spacer to the case as shown.



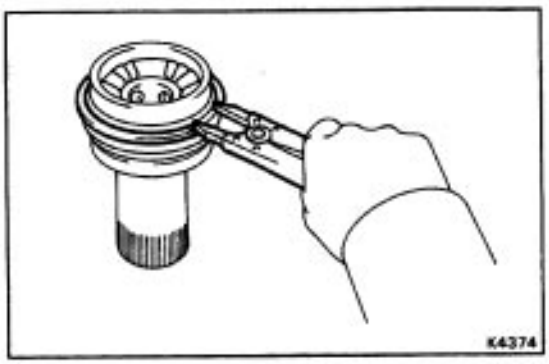
(c) Using a dial indicator, measure the backlash of one pinion gear while holding the side gear toward the case.

Standard backlash: 0.05 – 0.20 mm (0.002 – 0.0079 in.)

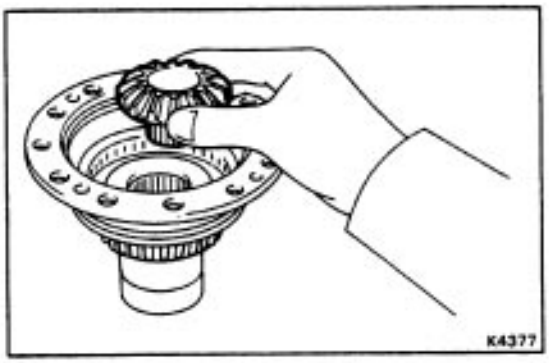
HINT: Do not place in a vise the surface of the center differential case which comes in contact with the bushing.

Referring to the table below, select the thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	1.00 (0.0394)	F	1.25 (0.0492)
B	1.05 (0.0413)	G	1.30 (0.0512)
C	1.10 (0.0433)	H	1.35 (0.0531)
D	1.15 (0.0453)	J	1.40 (0.0551)
E	1.20 (0.0472)		



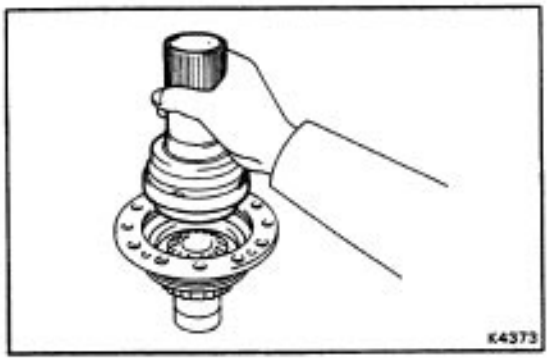
(d) Using snap ring pliers, install the shaft snap ring.



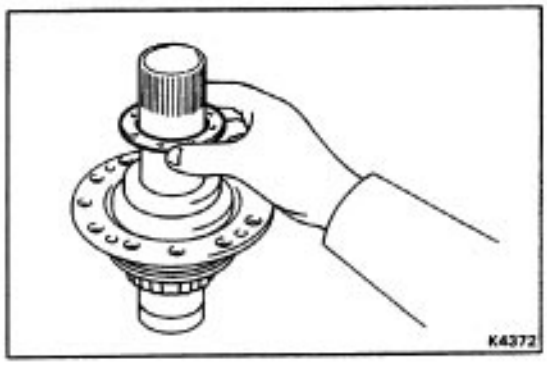
5. CHECK AND ADJUST CENTER DIFFERENTIAL SIDE GEAR THRUST CLEARANCE

(a) Install the differential side right gear.

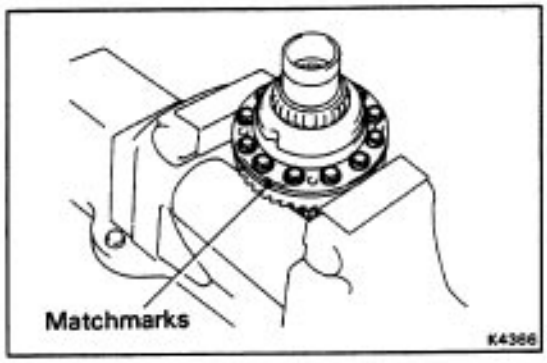
HINT: Do not install the conical spring washer.



(b) Install the center differential case.



(c) Install the thrust washer.



(d) Align the matchmarks on the ring gear mounting left and right case.

(e) Install and torque the twelve bolts.

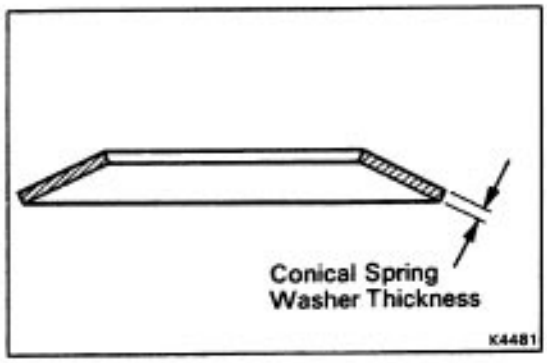
Torque: 985 kg–cm (71 ft–lb, 97 N–m)

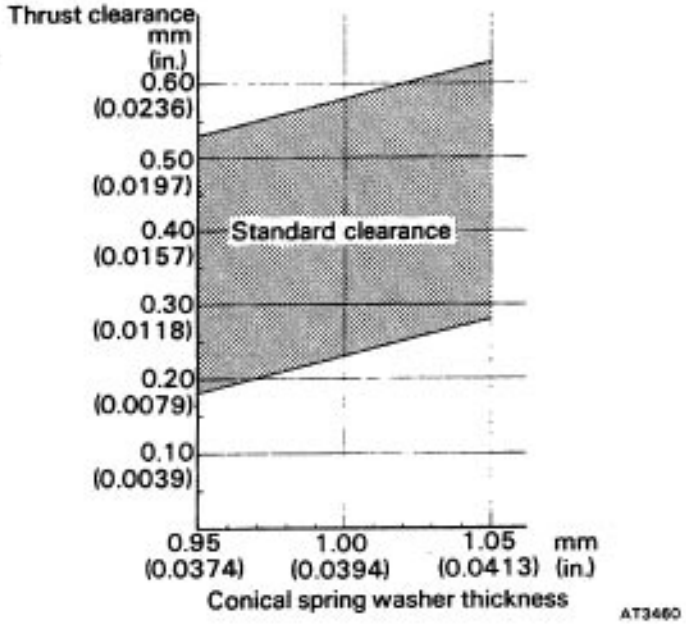
HINT: Do not install the O–ring.

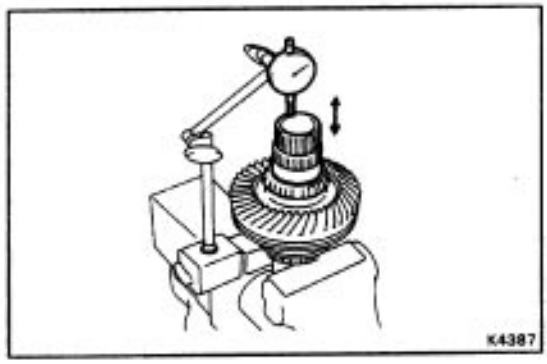
(f) Using a caliper, measure the conical spring washer thickness.

Using a dial indicator, measure the thrust clearance of center differential case while holding the ring gear mounting case.

Standard clearance:



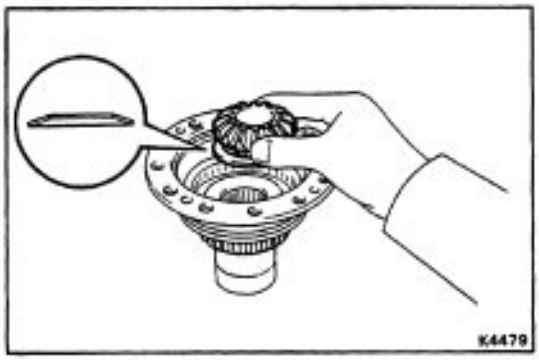




(h) Referring to the table below, select the thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

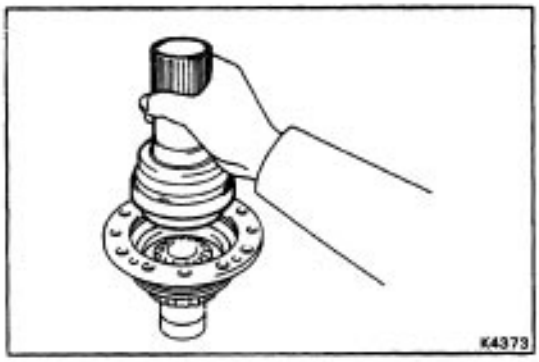
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	1.00 (0.0394)	G	1.30 (0.0512)
B	1.05 (0.0413)	H	1.35 (0.0531)
C	1.10 (0.0433)	J	1.40 (0.0551)
D	1.15 (0.0453)	K	1.45 (0.0571)
E	1.20 (0.0472)	L	1.50 (0.0591)
F	1.25 (0.0492)		

(i) Remove ring gear mounting right case.

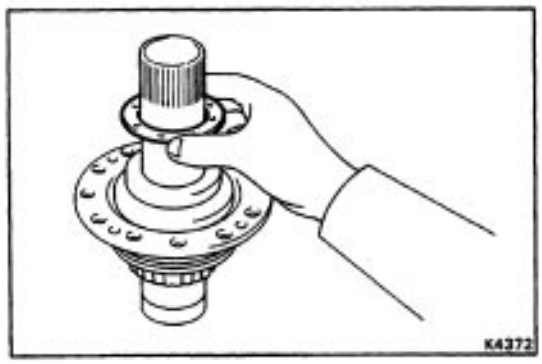


6. INSTALL DIFFERENTIAL SIDE GEAR AND CONICAL SPRING WASHER

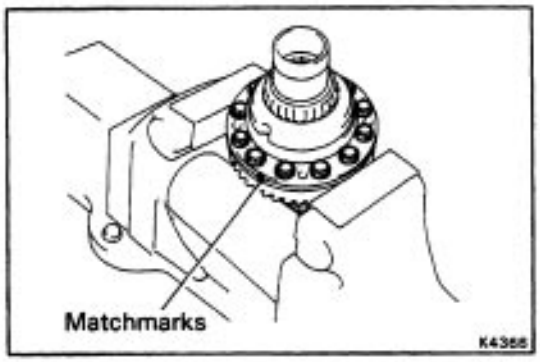
HINT: Be careful not to make a mistake in the direction of the conical spring washer.



7. INSTALL CENTER DIFFERENTIAL CASE



8. INSTALL THRUST WASHER (Previously selected)



9. INSTALL RING GEAR MOUNTING LEFT CASE

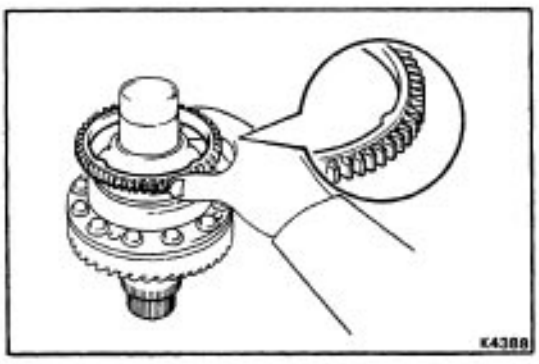
(a) Coat the new O–ring with ATF, and install it onto the left case.

(b) Align the matchmarks on the right and left case.

(c) Install and torque the twelve bolts.

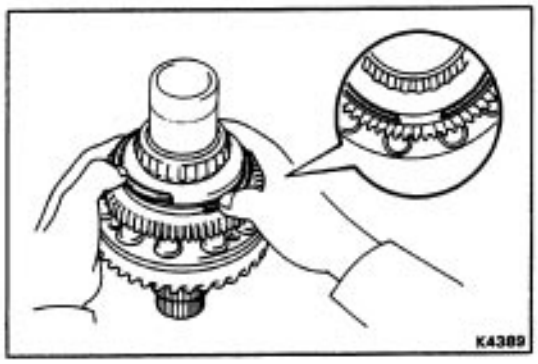
Torque: 985 kg–cm (71 ft–lb, 97 N–m)

NOTICE: Using the soft jaws, hold the left case in a vise.

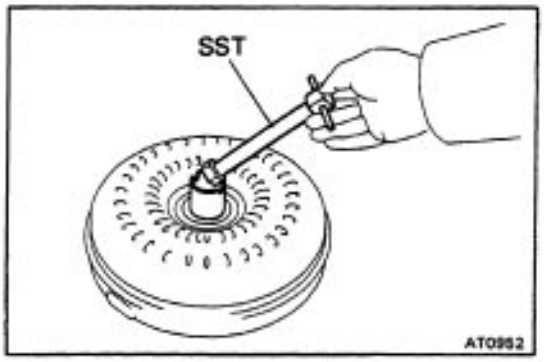


10. INSTALL OIL PUMP DRIVE GEAR

(a) Install the oil pump drive gear.



(b) Install the shaft snap ring.

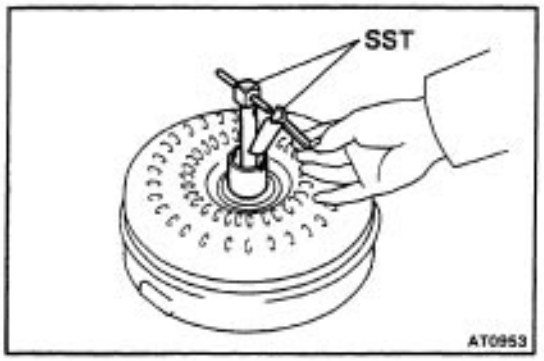


Torque Converter

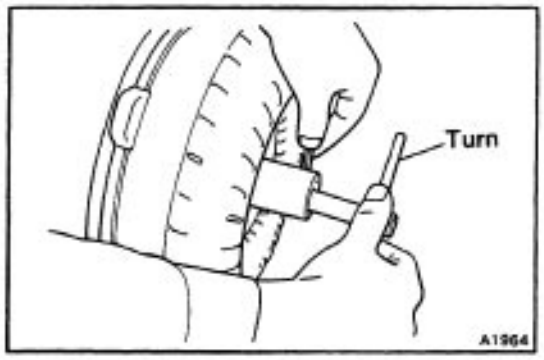
INSPECTION OF TORQUE CONVERTER

1. INSERT SST IN END OF TORQUE CONVERTER

(a) Insert a turning tool into the inner race of the one–way clutch.
SST 09350–32014 (09351–32010)



(b) Insert the stopper so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–32014 (09351–32020)



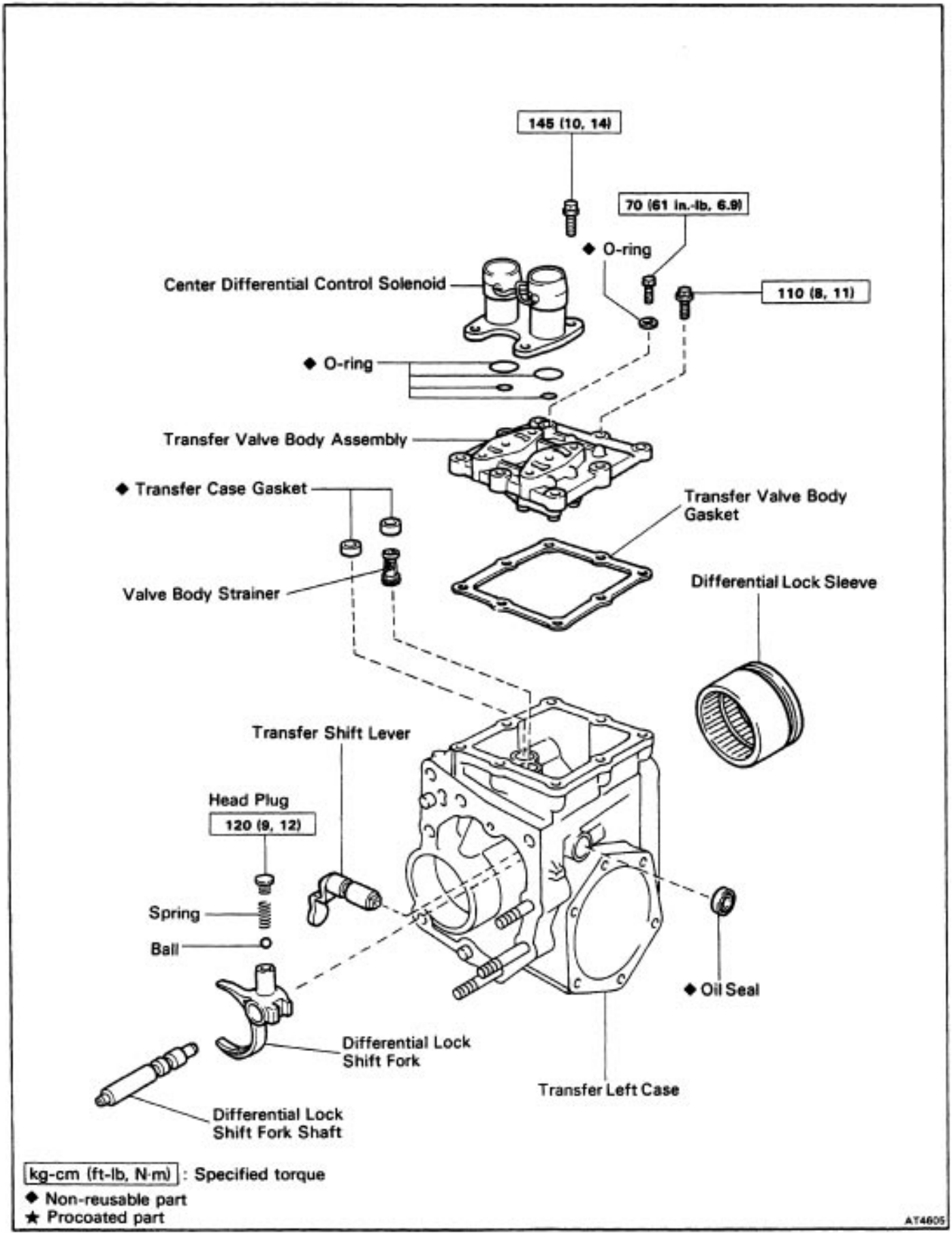
2. TEST ONE–WAY CLUTCH

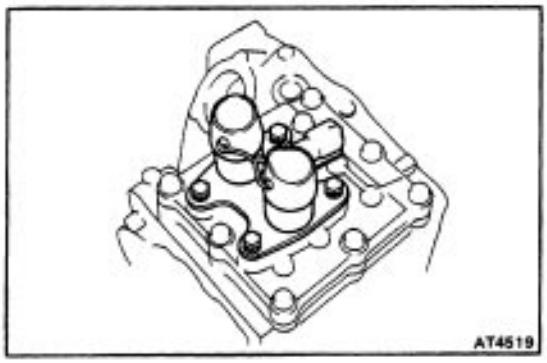
With the torque converter made stand, the clutch should lock when turned counterclockwise, and rotate freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch.
Replace the converter if the clutch still fails the test.

CLEAN TORQUE CONVERTER

if the transmission is contaminated, the torque converter and transmission cooler should be thoroughly flushed with ATF.

(Transfer Left Case)

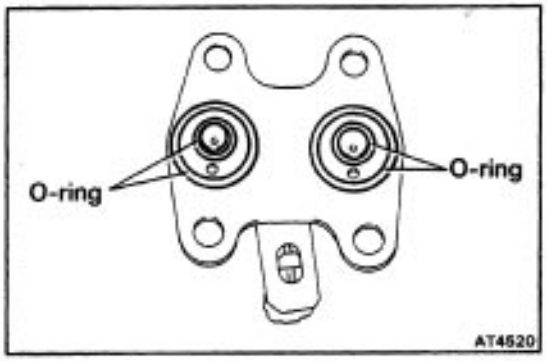




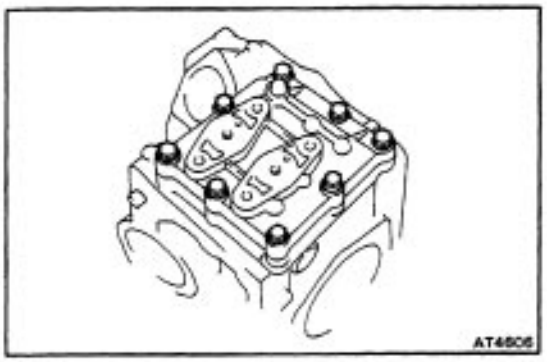
DISASSEMBLY OF TRANSFER LEFT CASE

1. REMOVE CENTER DIFFERENTIAL CONTROL SOLENOIDS

(a) Remove the four bolts and solenoids.



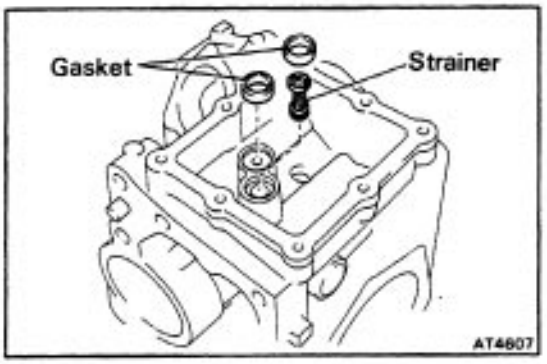
(b) Remove the four O–rings from the solenoids.



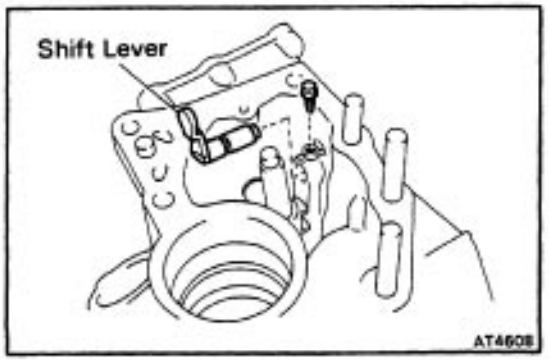
2. REMOVE TRANSFER VALVE BODY ASSEMBLY

(a) Remove the eight bolts and transfer valve body assembly.

(b) Remove the transfer valve body gasket.

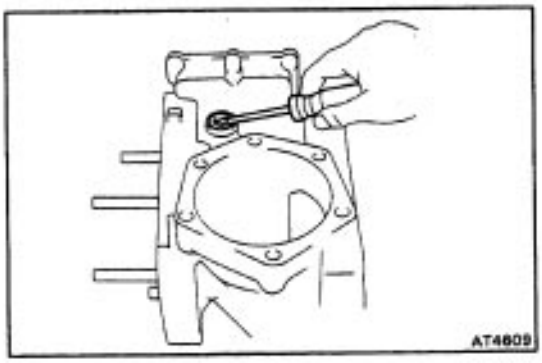


(c) Remove transfer case gaskets and valve body strainer.

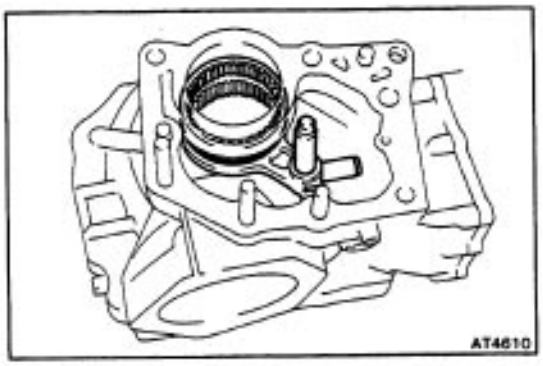


3. REMOVE TRANSFER SHIFT LEVER

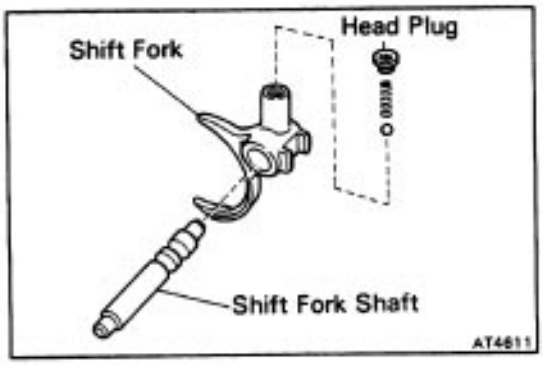
(a) Remove the lock bolt and transfer shift lever.



(b) Using a screwdriver, remove the oil seal.



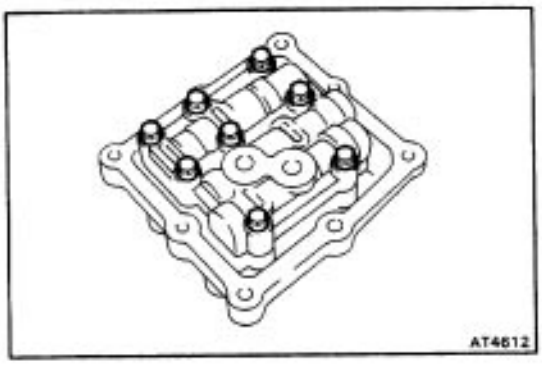
4. REMOVE SHIFT FORK SHAFT, SHIFT FORK AND SLEEVE



5. REMOVE SHIFT FORK SHAFT FROM SHIFT FORK

(a) Remove the head plug, spring and bail.

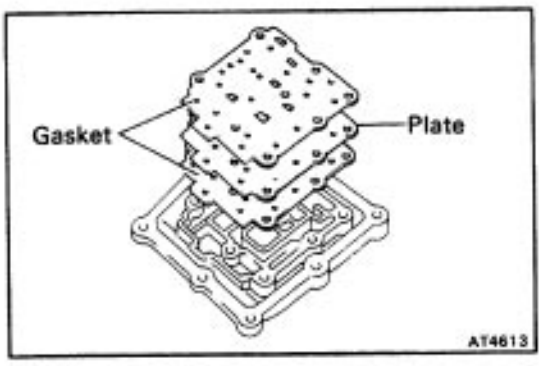
(b) Pull out the shift fork shaft from shift fork.



DISASSEMBLY OF TRANSFER VALVE BODY

REMOVE TRANSFER LOWER VALVE BODY

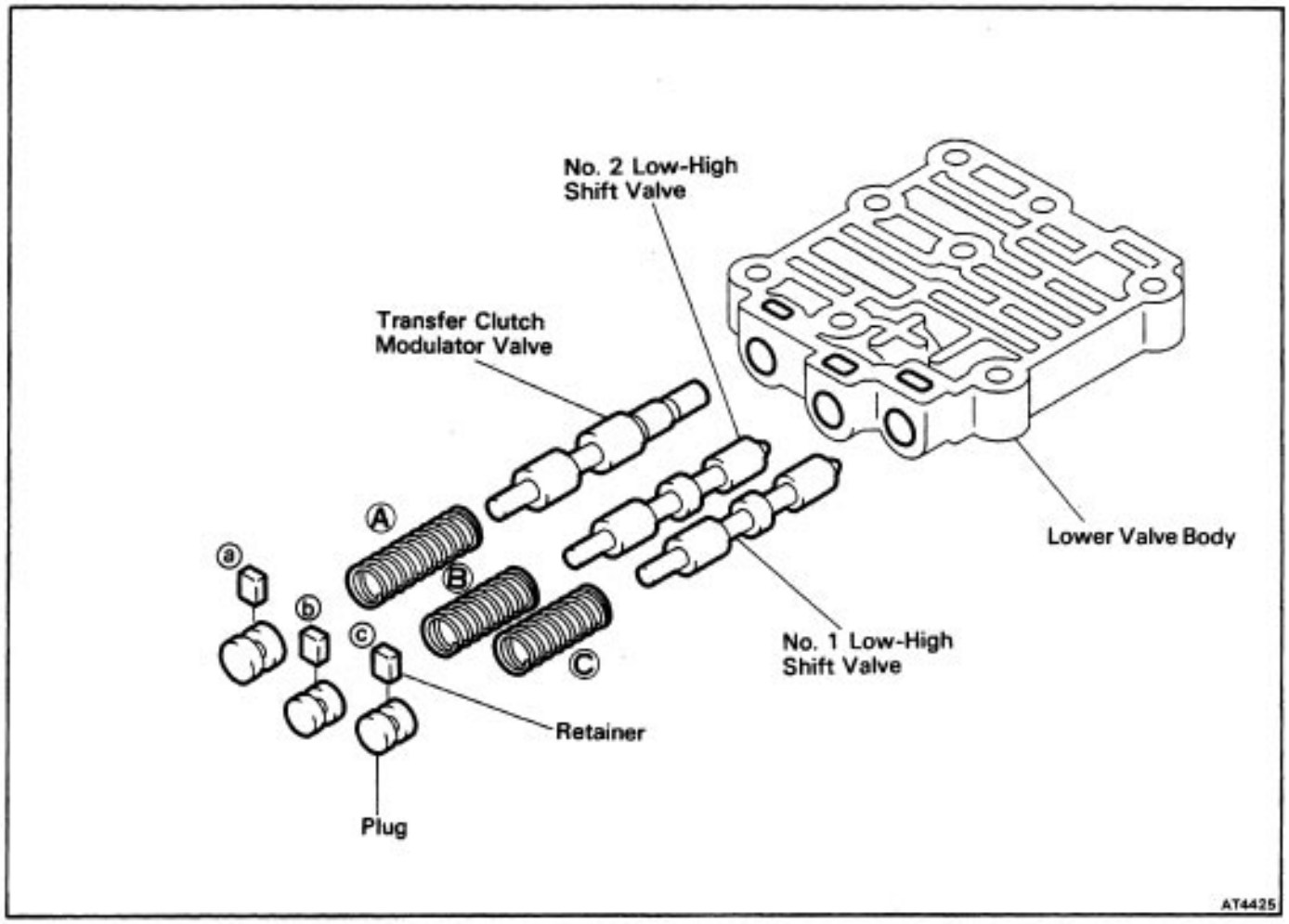
(a) Remove the eight bolts and transfer lower valve(body.



(b) Remove the two gaskets and plate from the transfer upper valve body.

(Transfer Lower Valve Body)

COMPONENTS

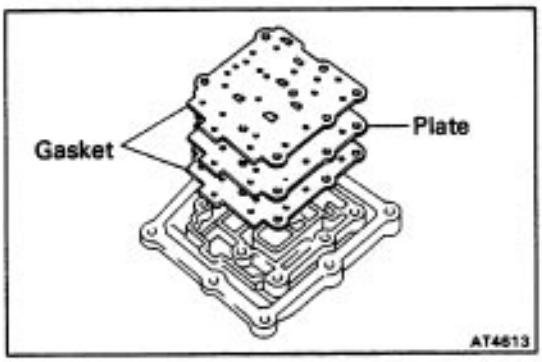


SPECIFICATIONS OF TRANSFER LOWER VALVE BODY SPRINGS AND RETAINERS

Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of Coils	Color
Ⓐ	Transfer clutch modulator valve	32.3 (1.272)	7.6 (0.299)	16	None
Ⓑ	No. 2 Low–high shift valve	28.9 (1.138)	7.0 (0.276)	14	None
Ⓒ	No. 1 Low–high shift valve				

HINT: During reassembly please refer to the spring specifications above to help discriminate between the different springs.

Retainer		Height mm (in.)	Width mm (in.)	Thickness mm (in.)
ⓐ	Transfer clutch modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓑ	No. 2 Low–high shift valve			
ⓒ	No. 1 Low–high shift valve			

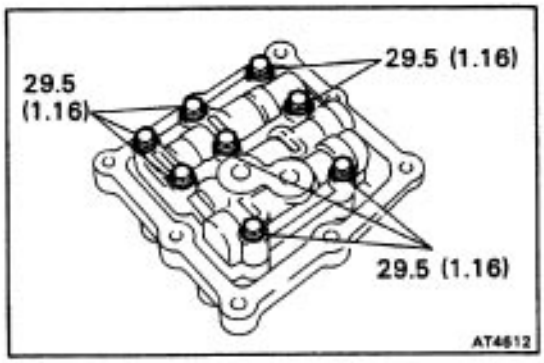


ASSEMBLY OF TRANSFER VALVE BODY

1. INSTALL PLATE AND NEW GASKETS ON TRANSFER LOWER VALVE BODY

Install a new gasket and plate and then the other new gasket.

HINT: Both gaskets are the same.



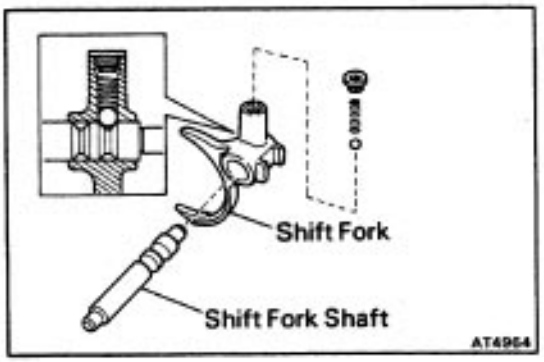
2. INSTALL TRANSFER LOWER VALVE BODY

Each bolt length (mm (in.)) is indicated in the figure.

(a) Lower the transfer tower valve body into place.

(b1 Hand tighten the eight bolts first. Then, tighten them with a torque wrench.

Torque: 67 kg–cm (58 in.–lb, 6.6 N–m)



ASSEMBLY OF TRANSFER LEFT CASE

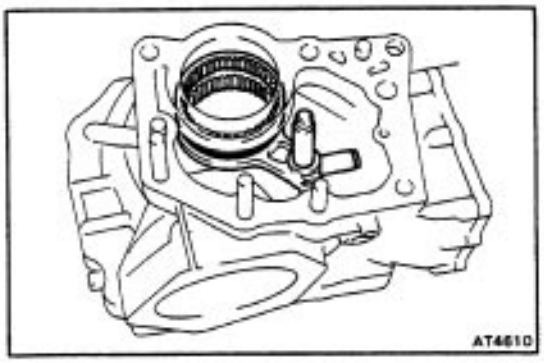
1. INSTALL SHIFT FORK SHAFT TO SHIFT FORK

(a) Insert the shift fork shaft into the shift fork.

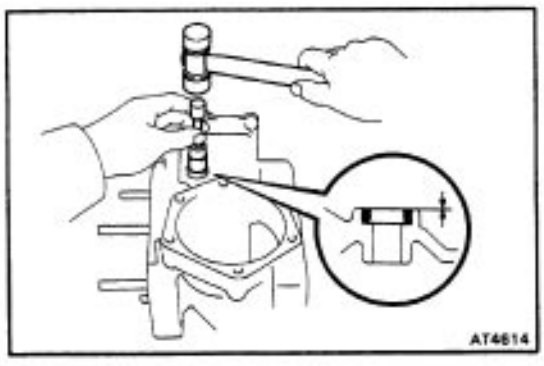
(b) Install the ball, spring and head plug.

(c) Tighten the plug.

Torque: 250 kg–cm (18 ft–lb, 25 N–m)



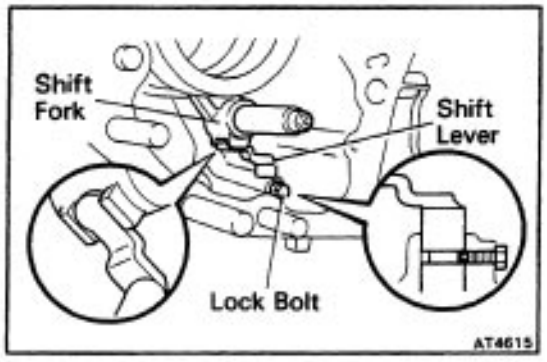
2. INSTALL SHIFT FORK SHAFT, SHIFT FORK AND SLEEVE



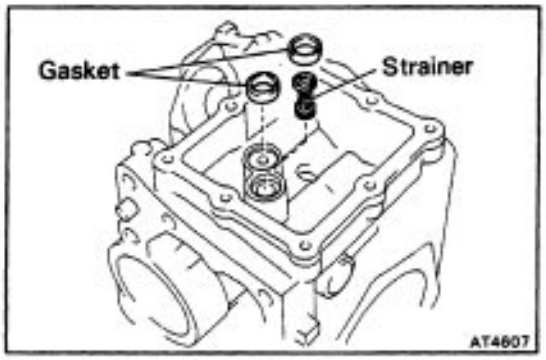
3. INSTALL TRANSFER SHIFT LEVER

(a) Coat the lip of new oil seal with MP grease.

(b) Using a 17 mm (0.67 in.) socket wrench and hammer, drive in the oil seal as shown.

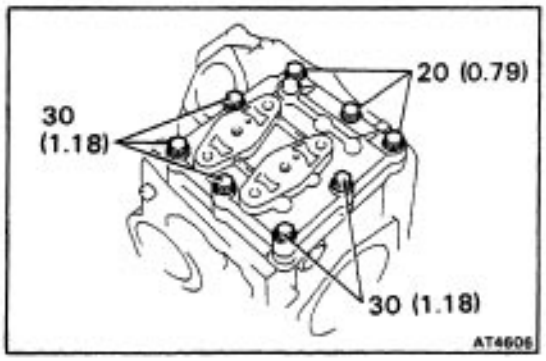


(c)Install transfer shift lever.
HINT: Engage shift fork and transfer shift lever.
(d) Install and tighten the lock bolts.
Torque: 40 kg–cm (35 in.–lb, 3.9 N–m)

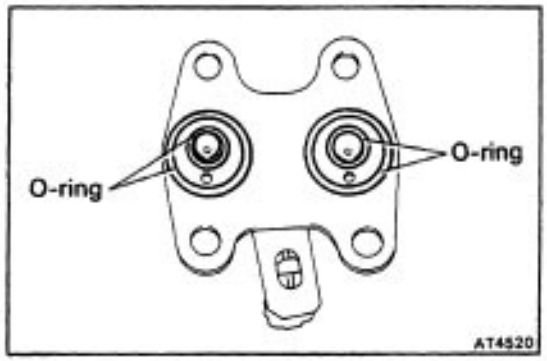


4. INSTALL TRANSFER VALVE BODY ASSEMBLY

(a) Install the new transfer case gaskets and valve body strainer.

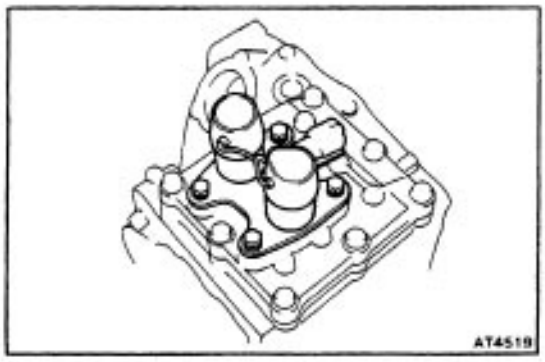


(b) Install the new transfer valve body gasket.
(e) Install the transfer valve body assembly.
(d) Tighten the bolts.
Torque: 110 kg–cm (8 ft–lb, 11 N–m)



5. INSTALL CENTER DIFFERENTIAL CONTROL SOLENOIDS

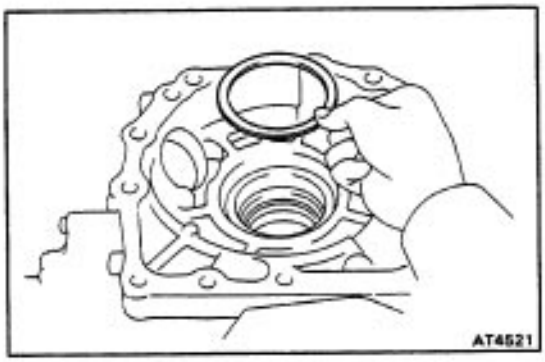
(a) Install the four new O–rings to the solenoids.
(b) Coat the O–rings with ATF.



(c) Install the solenoids.

.

Torque: 145 kg–cm (10 ft–lb, 14 N–m)

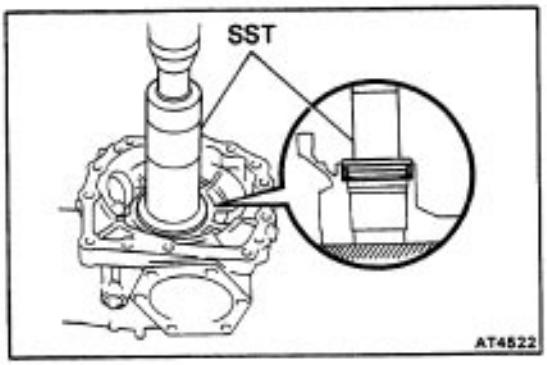


ASSEMBLY OF COMPONENT PARTS

1. INSTALL CASE SIDE

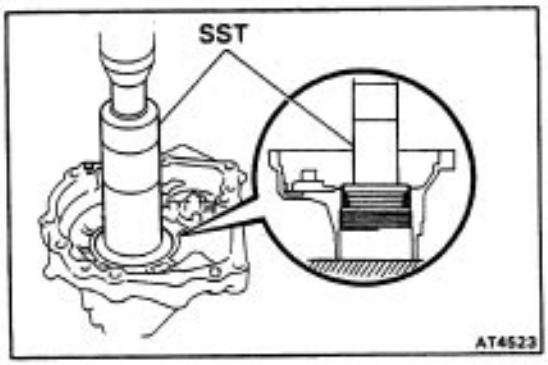
(a) Install the plate washer.

HINT: First install a washer of the same thickness as before.

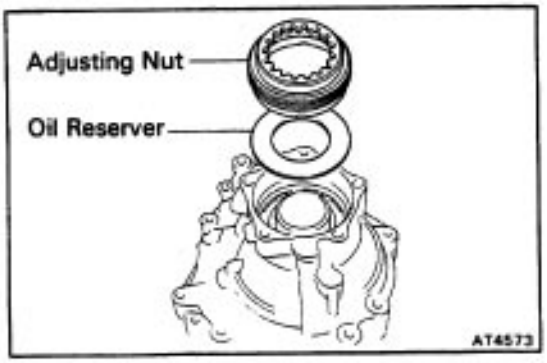


(b) Using SST and a press, press in the outer race.
SST 09316–60010 (09316–00010, 09316–00060)

2. INSTALL RIGHT CASE SIDE

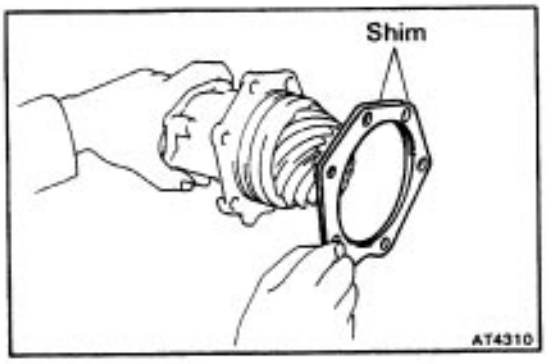


(a) Using SST and a press, press in outer race as shown
SST 09316–60010 (09316–00010, 09316–00060)



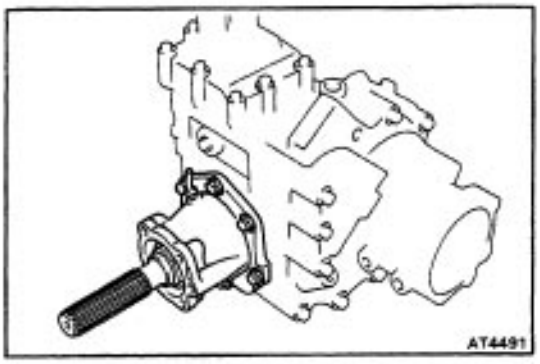
(b) Install the bearing adjusting nut and oil reservoir, until it touches the outer race.

3. ADJUST RING GEAR BACKLASH



(a) Install the two shims to the driven pinion bearing cage assembly.

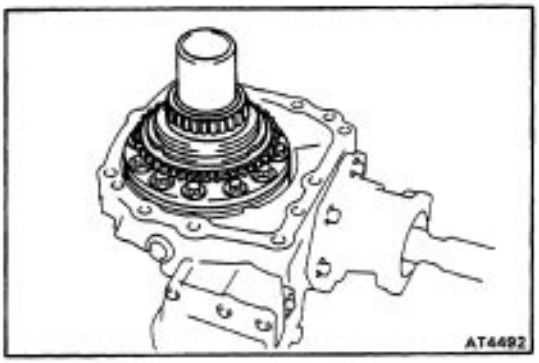
HINT: First install shims of the same thickness as before



(b) Install the driven pinion bearing cage.

Torque: 400 kg–cm (29 ft–lb, 39 N–m)

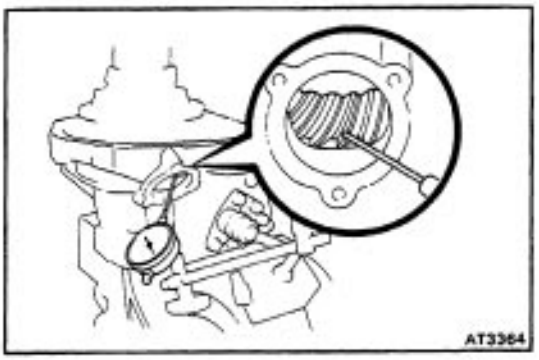
HINT: Do not install the O–ring.



(c) Install the ring gear mounting case and center differential case.

(d) Using a dial indicator, measure the ring gear backlash.

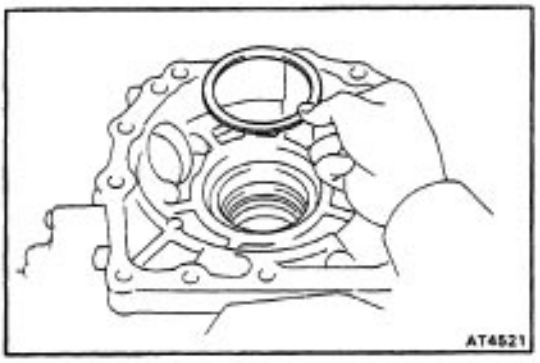
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

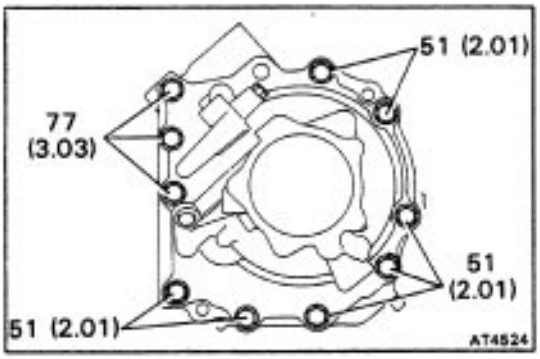


(e) Referring to the table below, select the plate washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

Plate washer thickness mm (in)

Mark	Thickness	Mark	Thickness
71	2.13 (0.0839)	83	2.49 (0.0980)
72	2.16 (0.0850)	84	2.52 (0.0992)
73	2.19 (0.0862)	85	2.55 (0.1004)
74	2.22 (0.0874)	86	2.58 (0.1016)
75	2.25 (0.0886)	87	2.61 (0.1028)
76	2.28 (0.0898)	88	2.64 (0.1039)
77	2.31 (0.0909)	89	2.67 (0.1051)
78	2.34 (0.0921)	90	2.70 (0.1063)
79	2.37 (0.0933)	91	2.73 (0.1075)
80	2.40 (0.0945)	92	2.76 (0.1087)
81	2.43 (0.0957)	93	2.79 (0.1098)
82	2.46 (0.0969)	94	2.82 (0.1110)





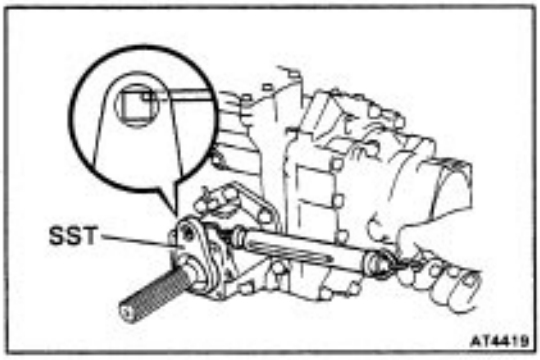
4. ADJUST TOTAL PRELOAD

(a) Install the transfer right case.

(b) Install and torque the ten bolts.

Torque: 450 kg–cm (33 ft–lb, 44 N–m)

HINT: Do not apply seal packing and do not install gasket. Each bolt length (mm (in.) is indicated in the figure.



(c) Using SST and a spring tension gauge, measure the total preload.

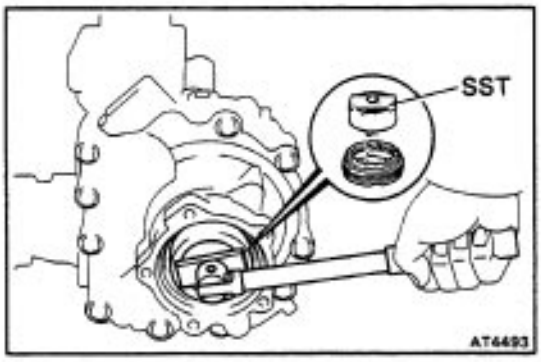
SST 09326–20011

Preload (at starting):

Add driven pinion preload

0.5–0.9kg (1.1 –2.0lb,4.9–8.8N)

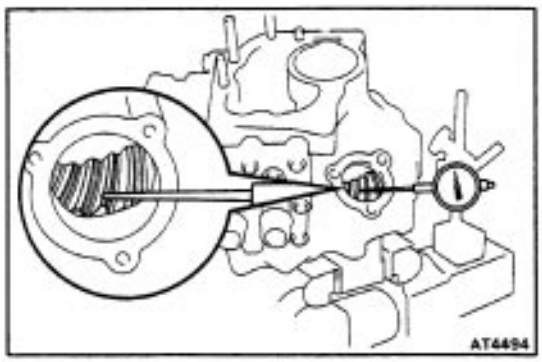
HINT: Turn the drive pinion counterclockwise and clockwise several times.



(d) Adjust the total preload by tightening the adjusting nut with SST.

SST 09318–12010

HINT: Measure the preload while tightening the bearing adjusting nut a little at a time.

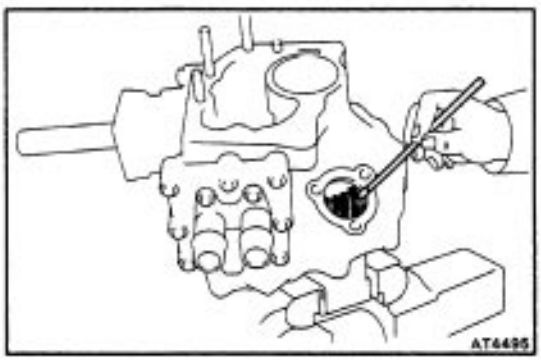


5. CHECK RING GEAR BACKLASH

(a) Using a dial indicator, measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

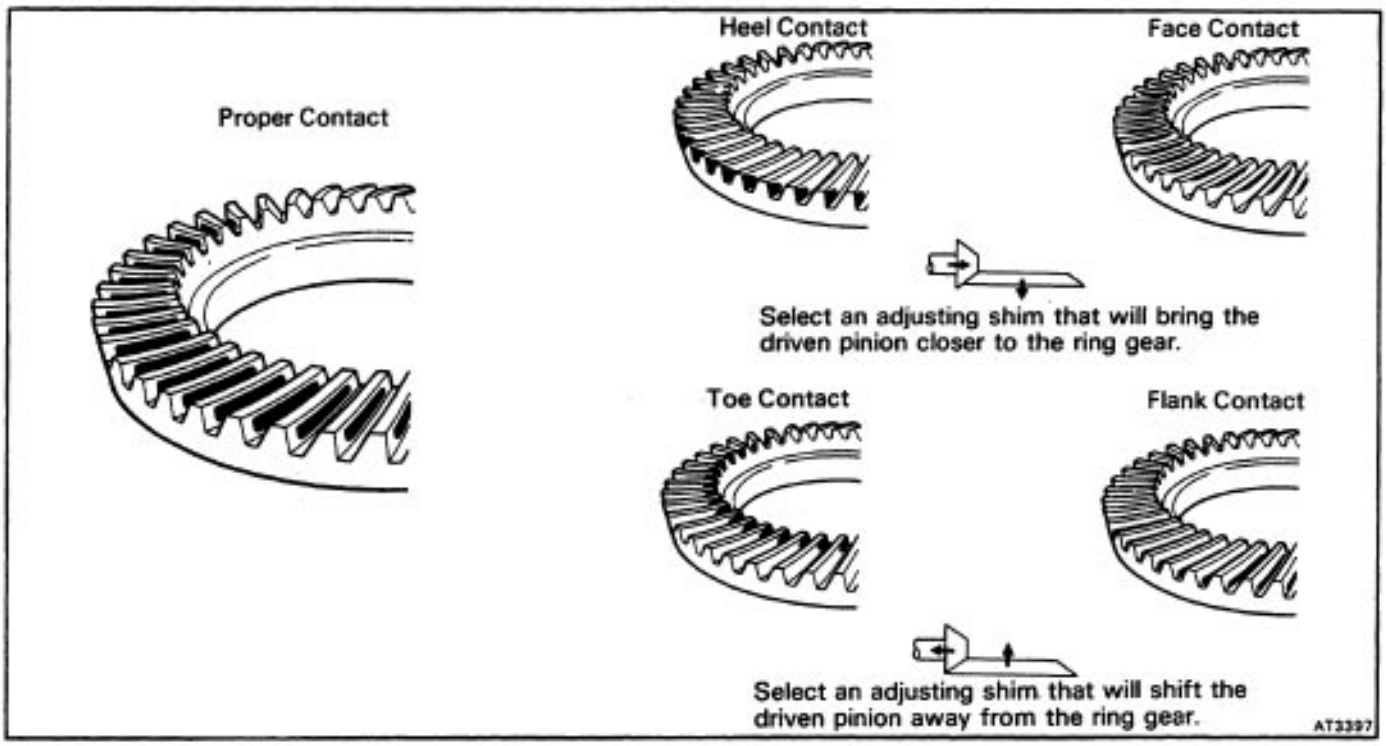
(b) When the backlash is outside the standard value, select a different plate washer to the one selected in step 3. Again adjust the backlash and total preload.

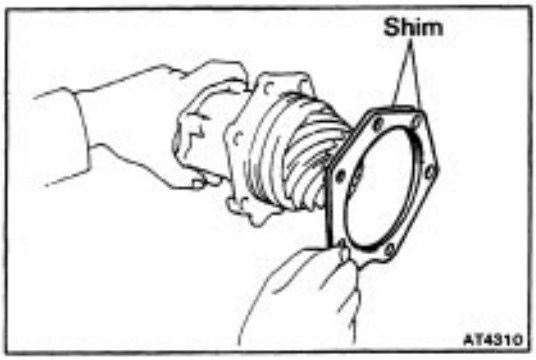


6. CHECK TOOTH CONTACT

(a) Coat 3 or 4 teeth at four different positions on the ring gear with red lead.

(b) Rotate the ring gear, inspect the teeth pattern.

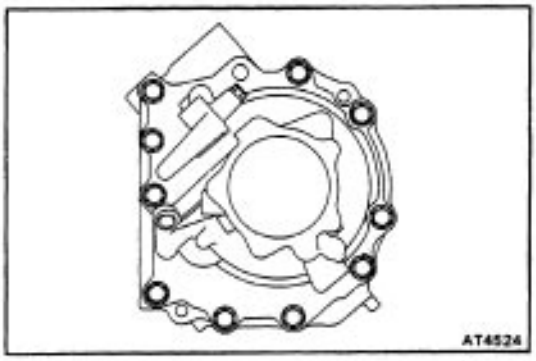




(e) If the teeth are not connecting properly, again the proper shim and plate washer.

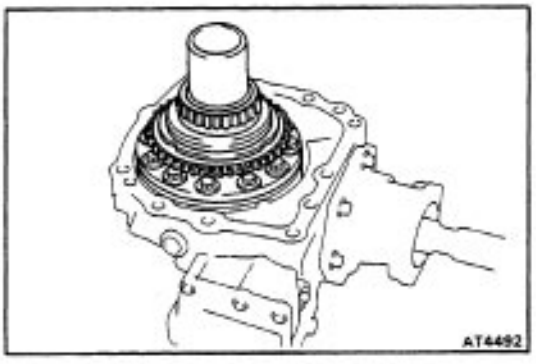
Shim thickness mm (in.)

Mark	Thickness	Mark	Thickness
A	0.30 (0.0118)	F	0.45 (0.0177)
B	0.33 (0.0130)	G	0.48 (0.0189)
C	0.36 (0.0142)	H	0.51 (0.0201)
D	0.39 (0.0154)	J	0.54 (0.0213)
E	0.42 (0.0165)	K	0.57 (0.0224)

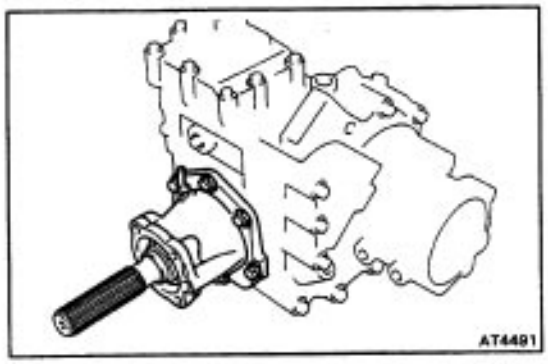


7. REMOVE TRANSFER RIGHT CASE

Remove the ten bolts and transfer right case.

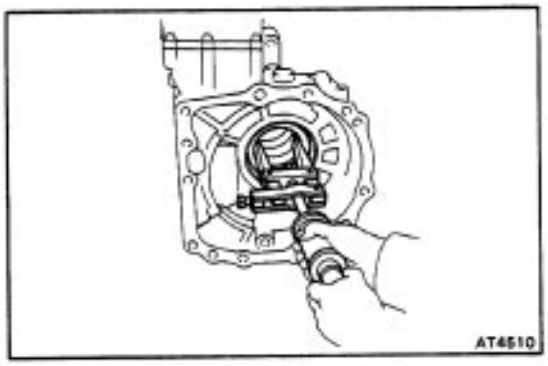


8. REMOVE RING GEAR MOUNTING CASE AND CENTER DIFFERENTIAL CASE



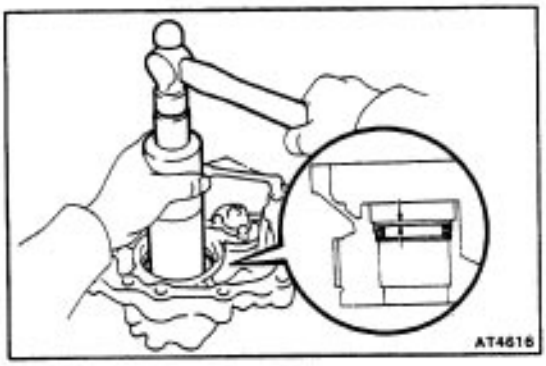
9. REMOVE DRIVEN PINION BEARING CAGE ASSEMBLY

Remove the six bolts and driven pinion bearing cage assembly.



10. REMOVE DIFFERENTIAL LEFT SIDE BEARING OUTER RACE AND PLATE WASHER

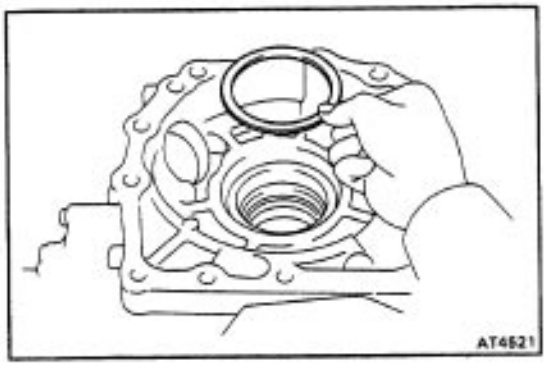
Using SST, remove the outer race and plate washer.
SST 09308–00010



11. INSTALL OIL SEAL

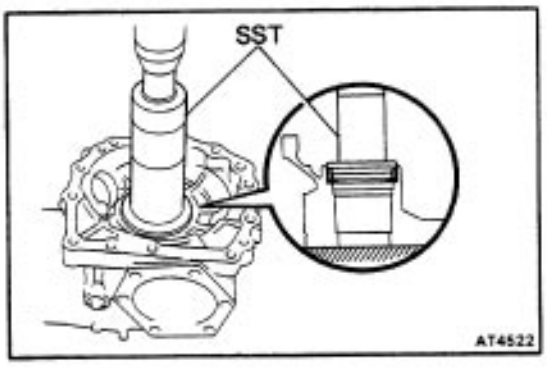
(a) Using SST, install a new oil seal as shown.
SST 09316–60010 (09316–00010, 09316–00030)
Oil seal depth: 3 mm (0.12 in.)

(b) Coat the lip of oil seal with MP grease.

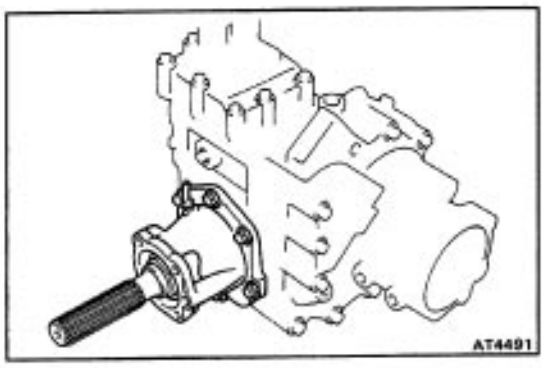


12. INSTALL LEFT CASE BEARING OUTER RACE

(a) Install the plate washer. (previously selected)



(b) Using SST and a press, press in the outer race.
SST 09316–60010 (09316–00010, 09316–00060)



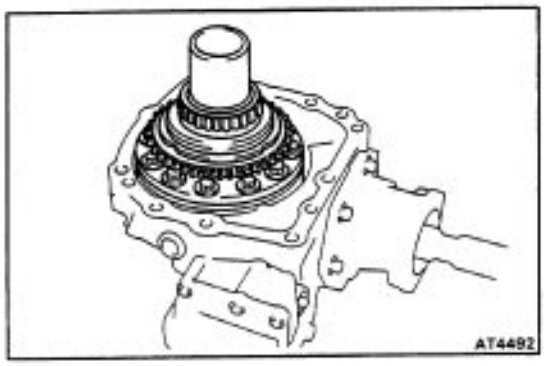
13. INSTALL DRIVEN PINION BEARING CAGE ASSEMBLY

(a) Coat the O–ring with gear oil, and install it to the bearing cage assembly.

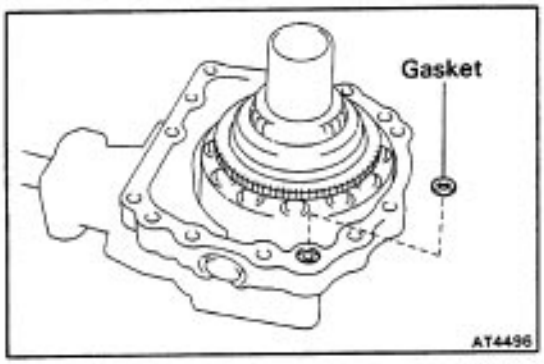
W Install the bearing cage with adjust shim (Previously selected) to the transfer left case.

W Install and torque the six bolts.

Torque: 400 kg–cm (29 ft–lb, 39 N–m)

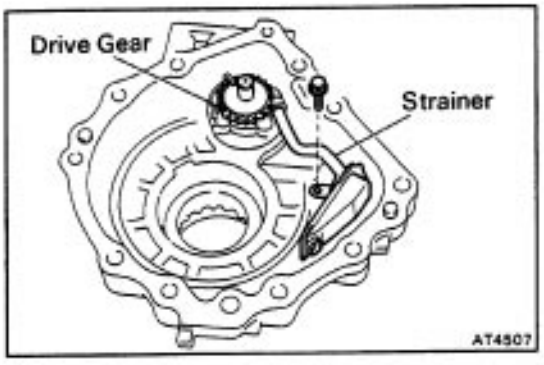


14. INSTALL RING GEAR MOUNTING CASE AND CENTER DIFFERENTIAL CASE



15. INSTALL TRANSFER RIGHT CASE

(a) Install a new apply gasket to the left case.



(b) Coat the O–ring with gear oil.

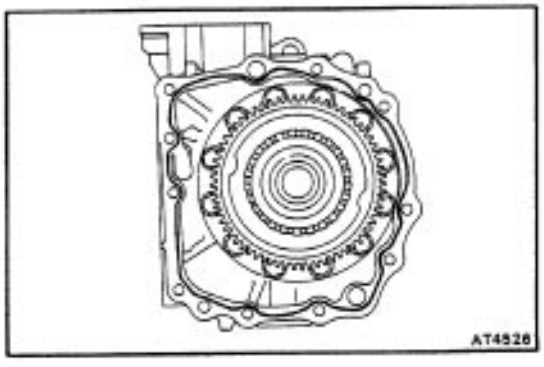
(c) Install the O–ring to the oil pump strainer.

(d) Install the oil pump strainer to the transfer right case.

(e) Install and torque the bolt.

Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)

(f) Install the oil pump driven gear.

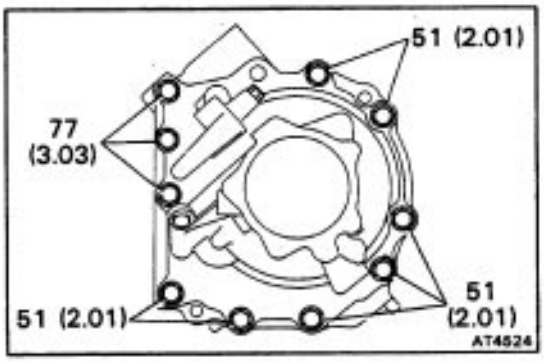


(g) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transfer left case or right case.

(h) Apply–seal packing to the left case as shown in the figure.

Seal packing: Part No. 08826–00090 THREE BOND 1281 or equivalent

HINT: Install the right case as soon as the seal packing is applied.



Install the right case to the left case.

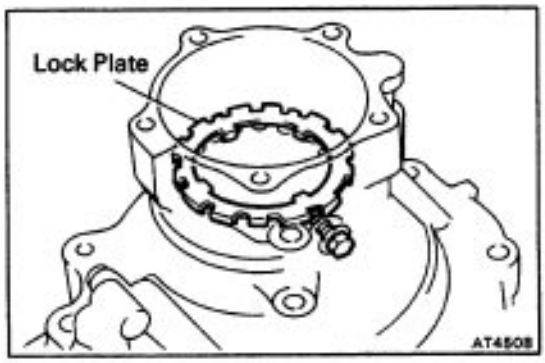
Q) Install and torque the ten bolts.

Torque: 450 kg–cm (33 ft–b. 44 N–m)

HINT: Each bolt length (mm (in.)) is indicated in the figure.

16. CHECK TOTAL PRELOAD

(See page AT–388**)**

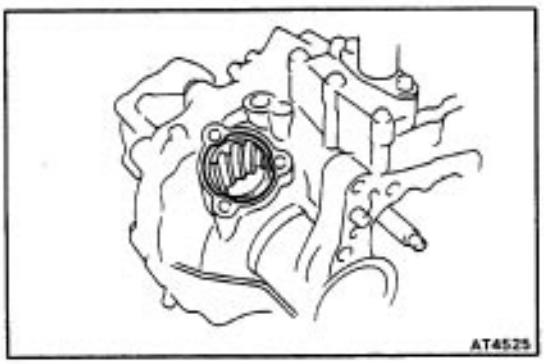


17. INSTALL ADJUSTING NUT LOCK PLATE

(a) Install the lock plate so that the projection from the lock plate fits properly into the groove of the adjusting nut.

HINT: When the lock plate cannot be installed, tighten the adjusting nut the smallest amount possible.

(b) Coat a new O–ring with gear oil and install it to the lock bolt.



(c) Install and torque the lock bolt.

Torque: 73 kg–cm (63 in.–lb, 7 N–m)

18. INSTALL TRANSFER INSPECTION HOLE COVER

(a) Apply seal packing to the left case as shown in the figure.

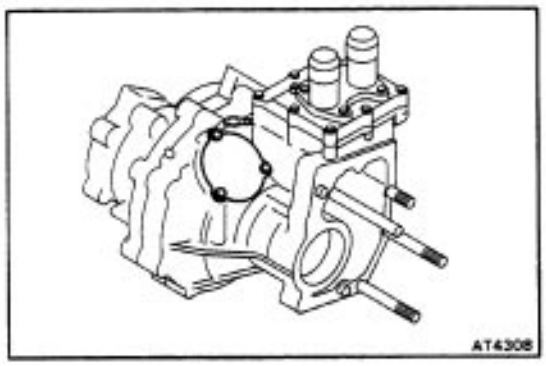
Seal packing: Part No. 08826–00090 THREE BOND 1281 or equivalent

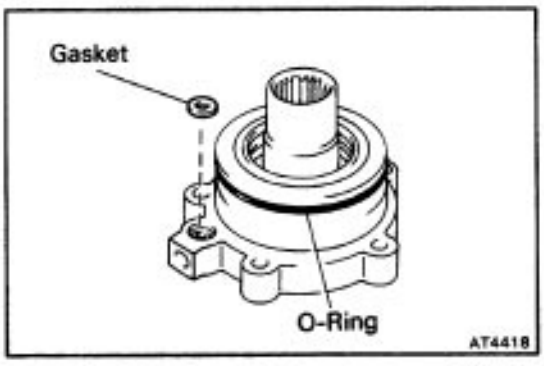
HINT: Install the cover as soon as the seal packing is applied.

(b) Install the hole cover to the transfer left case.

(c) Install and torque the three bolts.

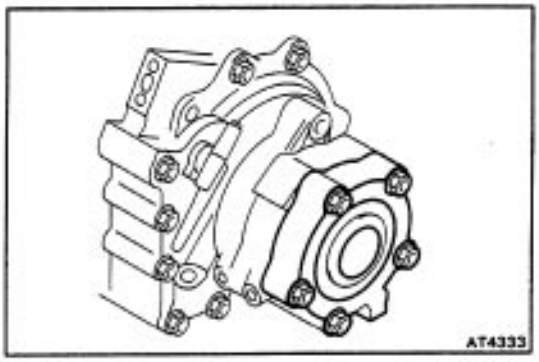
Torque: 160 kg–cm (12 ft–lb, 16 N–m)



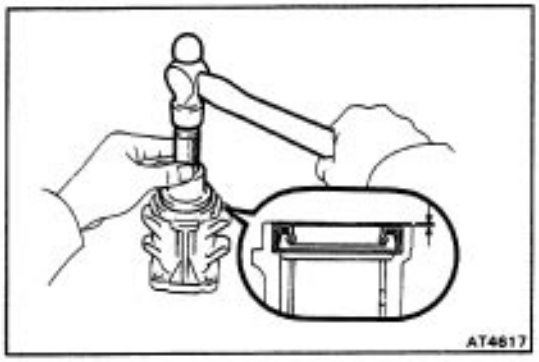


19. INSTALL TRANSFER RIGHT CASE RETAINER

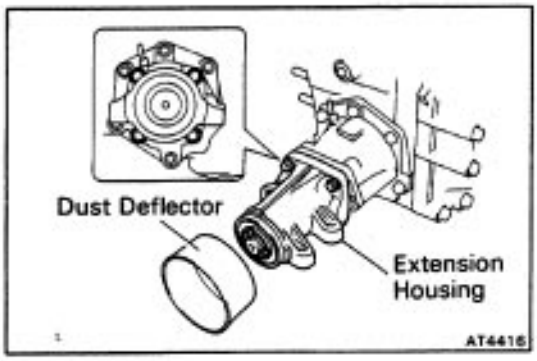
(a) Coat a new O–ring with gear oil, and install it and new apply gasket.



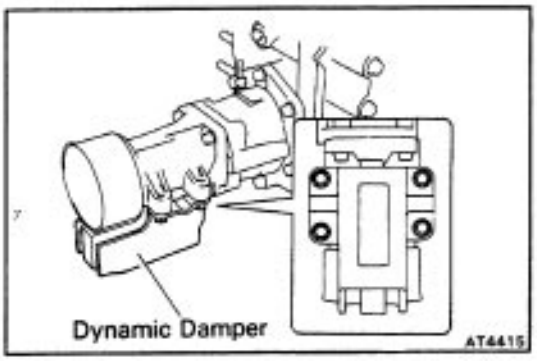
(b) Install the right case retainer to the transfer right case.
(c) Install and torque the five bolts.
Torque: 300 kg–cm (22 ft–lb, 29 N–m)



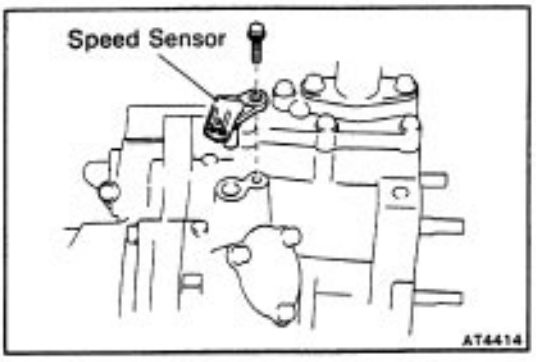
20. INSTALL EXTENSION HOUSING
(a) Using SST and a hammer, drive in a new oil seal as shown.
SST 09325–20010
(b) Coat the lip of the oil seal with MP grease.



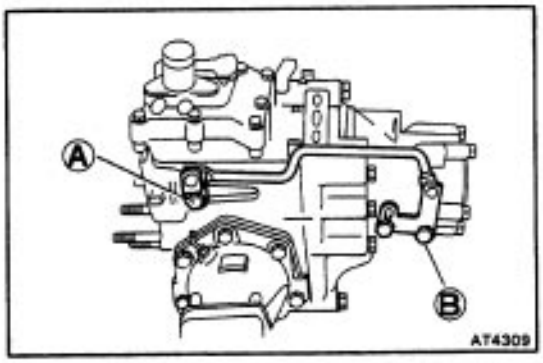
(c) Coat a new O–ring with gear oil and install it to the extension housing.
(d) Install the extension housing to the driven pinion bearing cage.
(e) Install and torque the four bolts.
Torque: 260 kg–cm (19 ft–lb, 25 N–m)
(f) Using a plastic hammer, install the dust deflector.



21. INSTALL DYNAMIC DAMPER
Install and torque the four bolts.
Torque: 260 kg–cm (19 ft–lb, 25 N–m)



22. INSTALL REAR WHEEL SPEED SENSOR
(a) Install a new O–ring to the speed sensor.
(b) Install the speed sensor to the transfer left case.
(c) Install and torque a bolt.
Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)

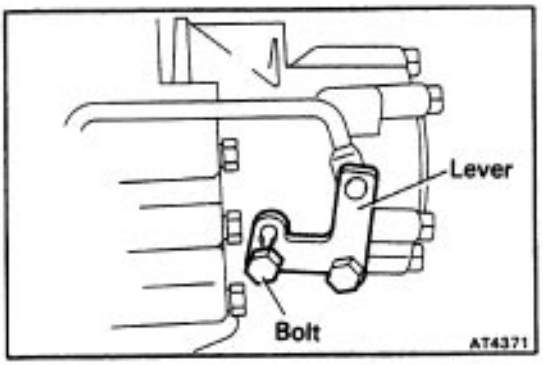


23. INSTALL TRANSFER MODE SELECT LEVER AND ROD

(a) Install the lever, rod and lever guide.

1bI Install and torque the two bolts.

Torque: (A) 55 kg–cm (48 in.–lb, 5.4 N–m)
115 kg–cm (8 ft–lb, 11 N–m)

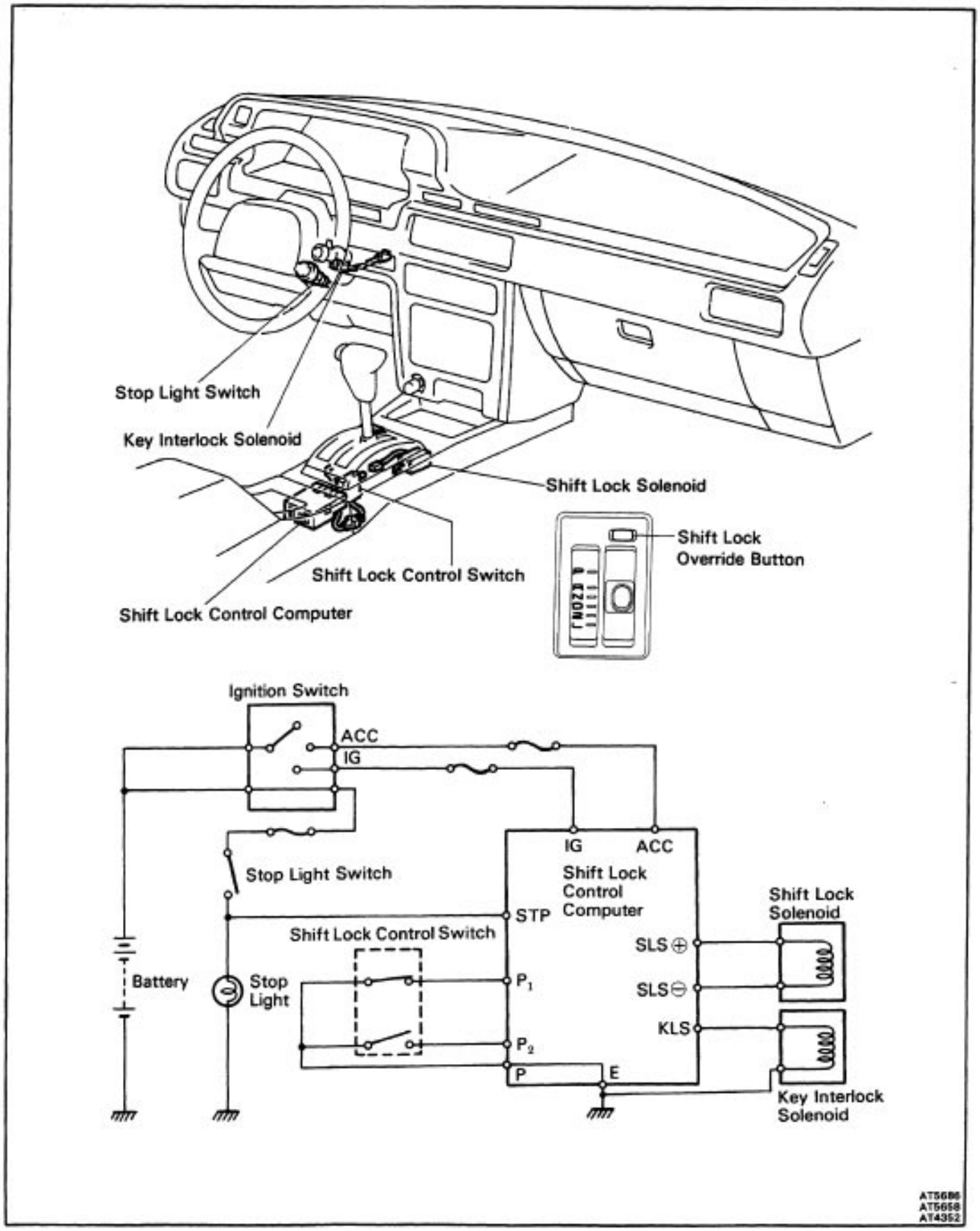


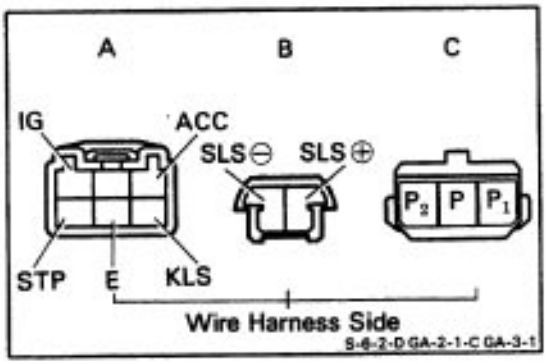
(c) Install the bolt while setting the lever as shown.

Torque: 115 kg–cm (8 ft–lb, 11 N–m)

SHIFT LOCK SYSTEM

COMPONENT AND CIRCUIT





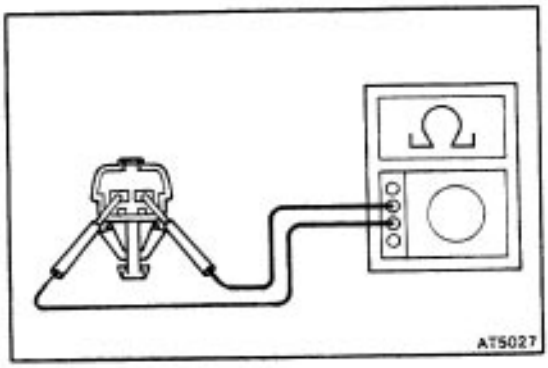
INSPECTION OF ELECTRIC CONTROL COMPONENTS

1. INSPECT SHIFT LOCK CONTROL COMPUTER

Using a voltmeter, measure the voltage at each terminals.

HINT: Do not disconnect the computer connector.

Connector	Terminal	Measuring condition	Voltage (V)
A	ACC – E	Ignition switch ACC position	10 – 14
	IG – E	Ignition switch ON position	10 – 14
	STP – E	Depress brake pedal	10 – 14
	KLS – E	① Ignition switch ACC position and P range	0
		② Ignition switch ACC position and except P range	10 – 14
		③ (Approx.–after one second)	6 – 9
B	SLS + – SLS -	① Ignition switch ON position and P range	0
		② Depress brake pedal	8.5 – 13.5
		③ (Approx.–after 20 seconds)	5.5 – 9.5
		④ Except P range	0
C	P_1 – P	① Ignition switch 4N, P range and depress brake pedal	0
		② Shift except P range under conditions above	9 – 13.5
	P_2 – P	① Ignition switch ACC position and P range	9 – 13.5
		② Shift except P range under condition above	0

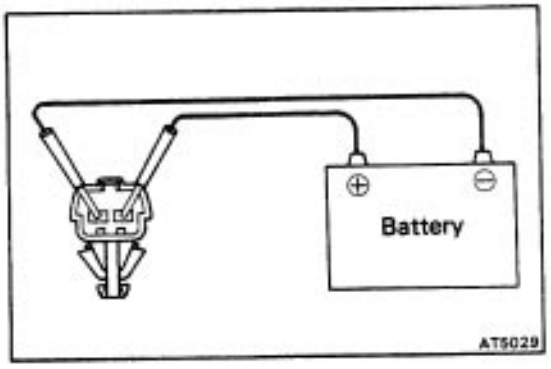


2. INSPECT SHIFT LOCK SOLENOID

(a) Disconnect the solenoid connector.

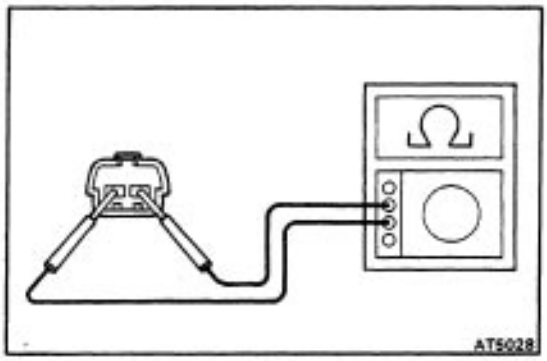
(b) Using an ohmmeter, measure the resistance between terminals.

Standard resistance: 21 – 27 Ω



(c) Apply the battery voltage between terminals. Check that an operation noise can be heard from the solenoid.

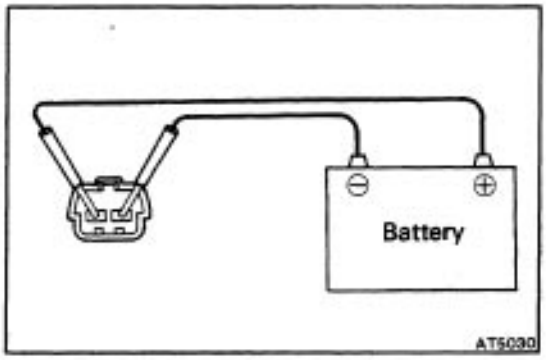
3. INSPECT KEY INTERLOCK SOLENOID



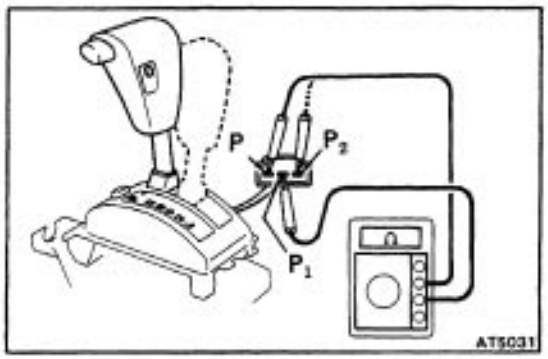
(a) Disconnect the solenoid connector.

(b) Using an ohmmeter, measure the resistance between terminals.

Standard resistance: 12.5 – 16.5Ω



(e) Apply the battery voltage between terminals. Check that an operation noise can be heard from the solenoid.



4. INSPECT SHIFT LOCK CONTROL SWITCH

Inspect that there is continuity between each terminals.

O—O : Continuity

Shift Position \ Terminal	P	P_1	P_2
P range (Release button is not pushed)	O—O	O—O	
R,N,D,2,L range	O—O		O—O

INSTALLATION OF COMPONENT PARTS

Disassembly, inspection and assembly of each component group have been indicated in the preceding chapter. Before assembly, make sure, again, that all component groups are assembled correctly.

If something wrong is found in a certain component group during assembly, inspect and repair this group immediately.

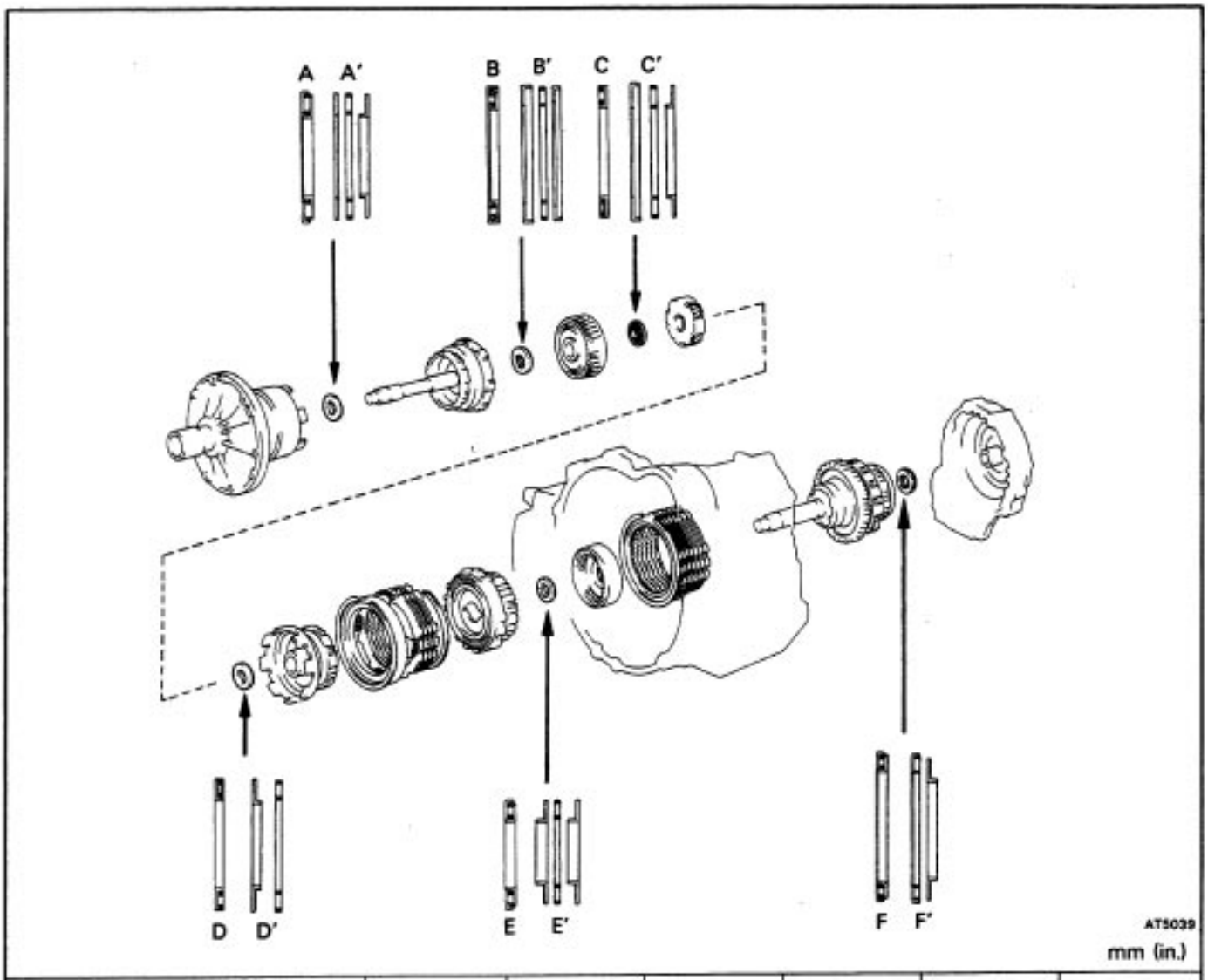
Recommended ATF: DEXRON© II (A540E)

Type T (08886–00405) or equivalent (A540H)

GENERAL INSTALLATION NOTES:

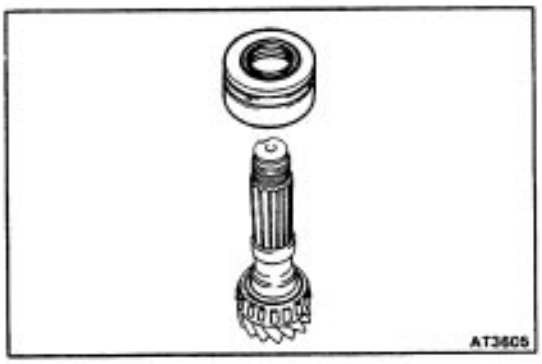
1. The automatic transaxle is composed of highly precision–finished parts, necessitating careful inspection before assembly because even a small nick could cause fluid leakage or affect performance.
2. Before assembling new clutch discs, soak them in automatic transaxle fluid for at least two hours.
3. Apply automatic transaxle fluid on the sliding or rotating surfaces of parts before assembly.
4. Use petroleum jelly to keep small parts in their places.
5. Do not use adhesive cements on gaskets and similar parts.
6. When assembling the transaxle, be sure to use new gaskets and O–rings.
7. Dry all parts with compressed air–never use shop rags.

8. Be sure to install. the thrust bearings and races in the correct direction and position.



mm (in.)

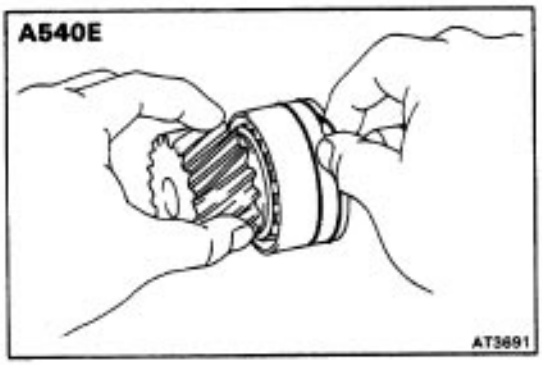
A540E		A	B	C	D	E	F
Bearing (with race)	Outer Diameter	See page AT-354	47.6 (1.874)	45.5 (1.791)	←	38.7 (1.524)	54.0 (2.126)
	Inner Diameter	27.7 (1.091)	31.4 (1.236)	30.1 (1.185)	←	22.6 (0.890)	39.4 (1.551)
A540H		A'	B'	C'	D'	E'	F'
Front Bearing Race	Outer Diameter	43.0 (1.693)	37.9 (1.492)	←	45.0 (1.772)	37.3 (1.469)	–
	Inner Diameter	30.5 (1.201)	22.0 (0.866)	←	28.0 (1.102)	24.1 (0.949)	–
Thrust Bearing	Outer Diameter	42.0 (1.654)	36.1 (1.421)	←	45.0 (1.772)	37.6 (1.480)	46.3 (1.823)
	Inner Diameter	28.9 (1.138)	22.2 (0.874)	←	30.0 (1.181)	24.0 (0.974)	26.2 (1.031)
Rear Bearing Race	Outer Diameter	42.0 (1.654)	35.7 (1.406)	35.0 (1.378)	–	37.6 (1.480)	43.0 (1.693)
	Inner Diameter	27.1 (1.067)	23.0 (0.906)	19.0 (0.748)	–	22.2 (0.874)	24.5 (0.965)



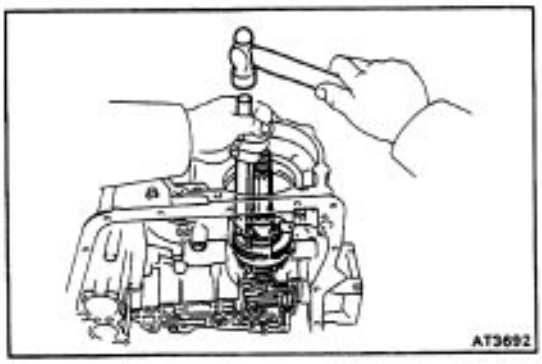
INSTALLATION OF DIFFERENTIAL AND DRIVE. PINION

1. INSTALL DRIVE PINION INTO TRANSAXLE CASE

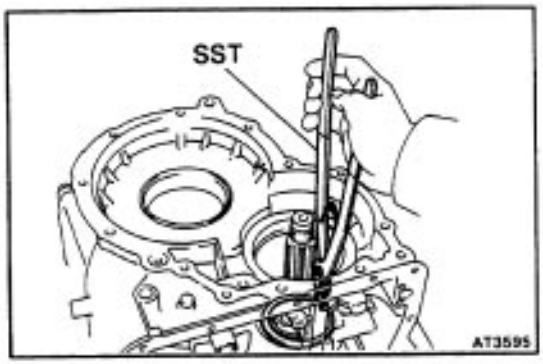
(a) Place the bearing cage onto the drive pinion shaft.
NOTICE: Be careful not to damage the oil seals with the pinion shaft. (A540E)



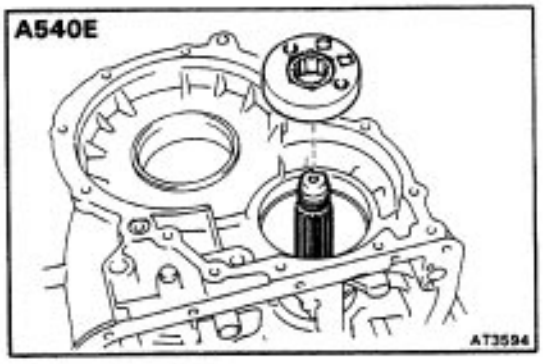
(b) Install the two new O–rings to the bearing cage. (A540E)
(c) Coat the O–rings with ATF. (A540E)



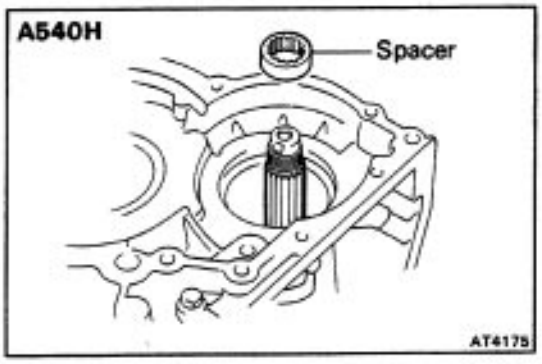
(d) Using a hammer and brass bar, slightly tap the bearing cage into the transaxle case until the snap ring groove in the bore can be seen.



(e) Using SST, install snap ring into the bore.
SST 09350–32014 (09351–32050‘



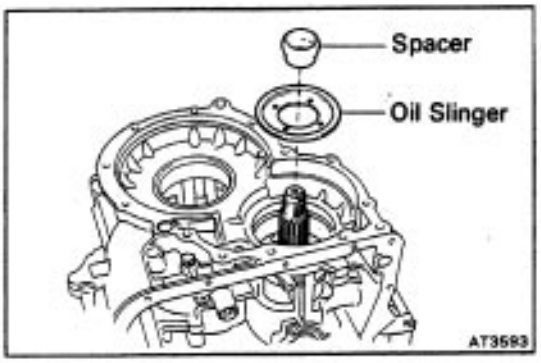
2. (A540E)
PLACE SENSOR ROTOR ONTO DRIVE PINION SHAFT



3.(A540H)
INSTALL DRIVE PINION BEARING NO. 2 SPACER

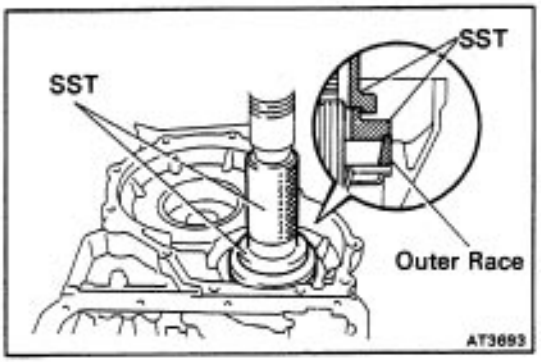
4. PLACE OIL SLINGER AND NEW SPACER

HINT: Install the spacer with the small end downward.



5. INSTALL OUTER RACE TO TRANSAXLE CASE

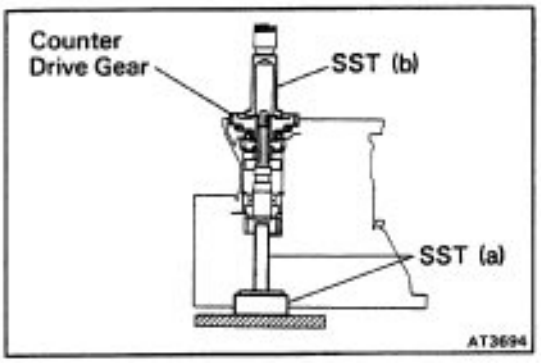
Using SST, press in the outer race.
SST 09350–32014 (09351–32100, 09351–32140)



6. INSTALL COUNTER DRIVEN GEAR

(a) Place SST into the transaxle hole to hold the drive pinion shaft.
SST (a) 09350–32014 (09351–32130, 09351–32150)

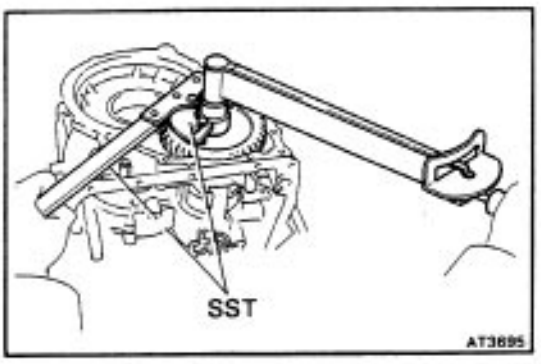
(b) Using SST, press in the counter driven gear until slightly thickness between the counter driven gear bearing and outer race.
SST (b) 09350–32014 (09351–32140)

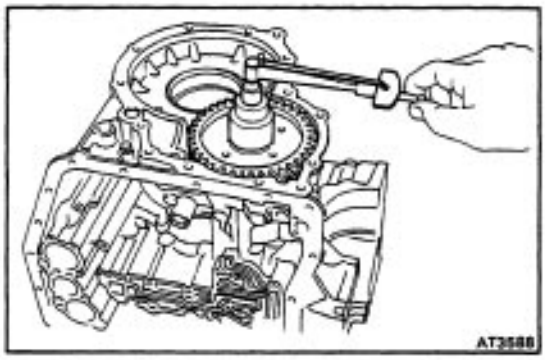


7. INSTALL NEW LOCK NUT AND ADJUST DRIVE PINION PRELOAD

(a) Install the new lock nut.

(b) Using SST to hold the gear, tighten the nut.
Torque: 2,100 kg–cm (152 ft–lb, 206 N–m)
SST 09330–00021, 09350–32014 (09351–32032)





Turn the gear counterclockwise and clockwise several times.

(d) Using a torque meter, measure the preload of the drive pinion.

Drive pinion preload (at starting):

New bearing

10 – 16 kg–cm

(8.7 – 13.9 in.–lb, 1.0 – 1.6 N–m)

Reused bearing

5 – 8 kg–cm

(4.3 – 6.9 in.–lb, 0.5 – 0.8 N–m)

- If the preload is greater than specified, replace the bearing spacer.
- If the preload is less than specified, retighten the nut 130 kg–cm (9 ft–lb, 13 N–m) at a time until the specified preload is reached.

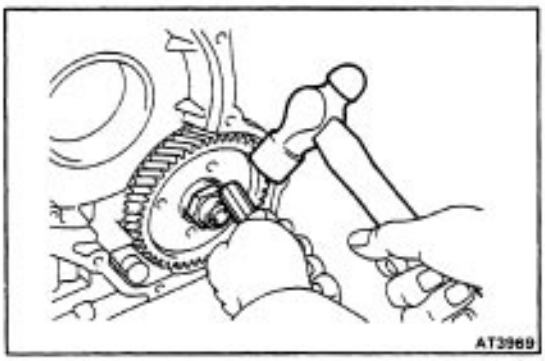
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure.

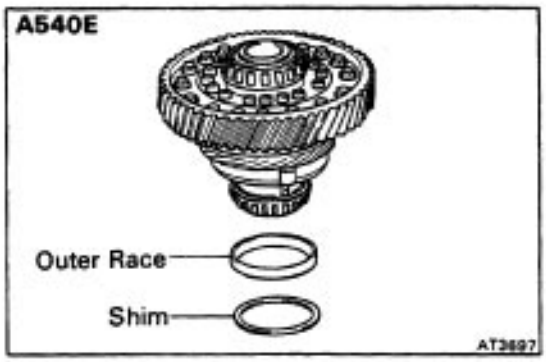
Do not back off the nut to reduce the preload.

Maximum torque: 3,640 kg–cm (260ft–lb, 353 N–m)

(e) If the preload is adjusted within specification, make a note of it.

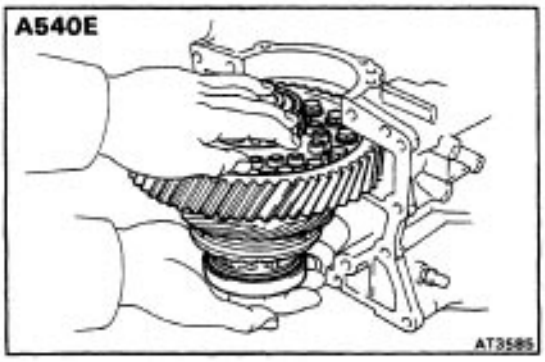
M Stake the lock nut.





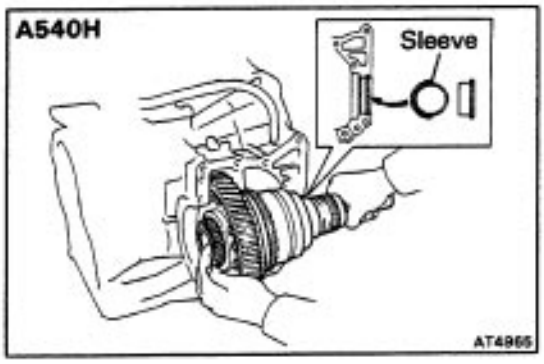
8. (AS40E)

PLACE OUTER RACE AND SHIM ONTO RH SIDE BEARING

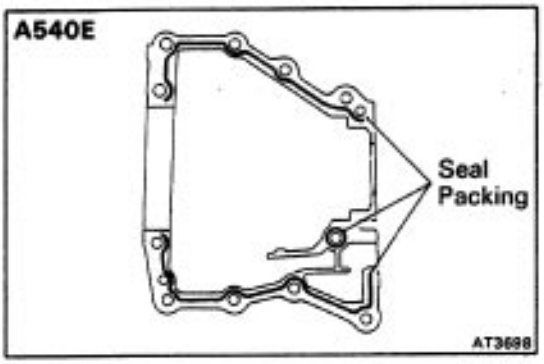


9. PLACE DIFFERENTIAL CASE INTO TRANSAXLE CASE

(A540E) Be sure to install the shim and outer rece into place.



(A540H)
Be sure to install the ring gear mount case sleeve and outer race into place.



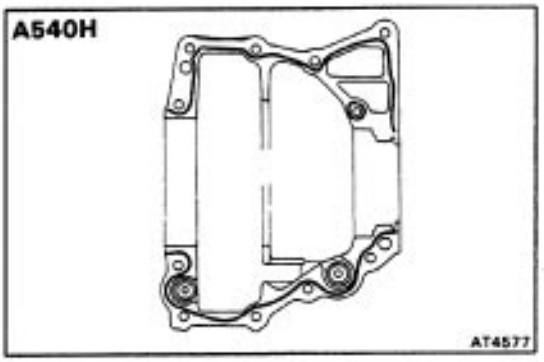
10. INSTALL CARRIER COVER

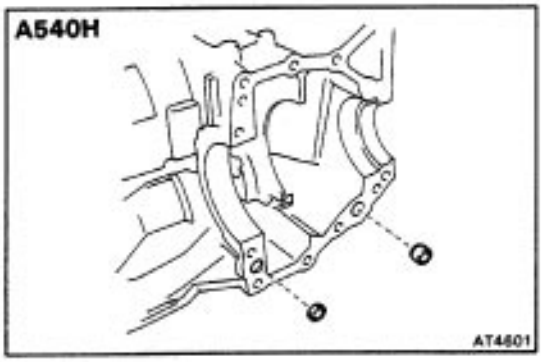
(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the carrier cover and transaxle case.

(b) Apply seat packing to the carrier cover as shown.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT: Install the carrier cover within ten minutes after applying seal packing.



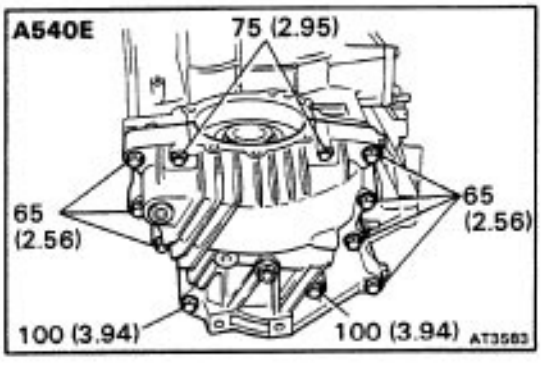


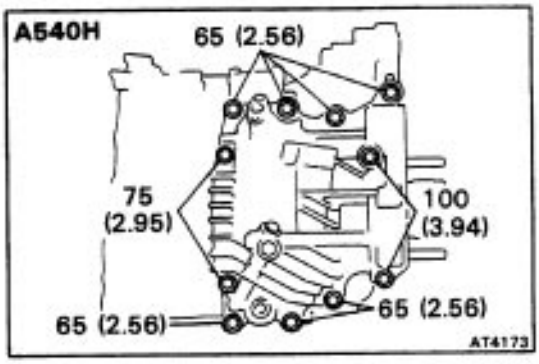
(e) Install the two apply gaskets.

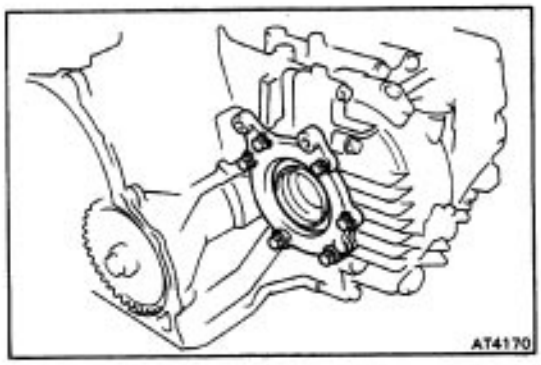
(d) Install and torque the eleven bolts.

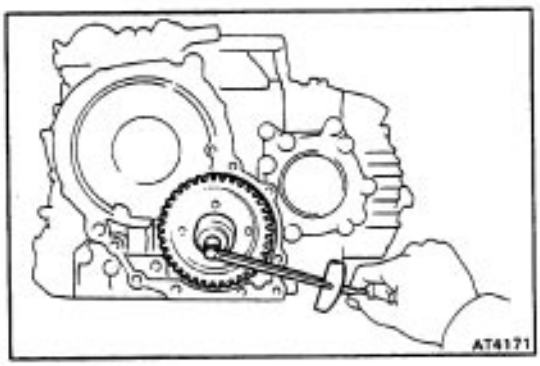
Torque: 400 kg–cm (29 ft–lb, 39 N–m)

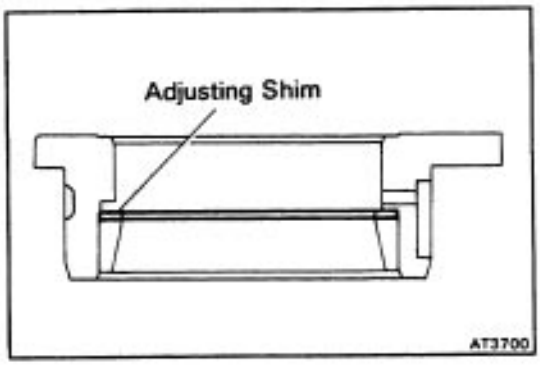
HINT: Each bolt length (mm (in)) is indicated in the figure.











11. ADJUST SIDE BEARING PRELOAD

1ay Remove any packing material on the contacting surfaces of the LH bearing retainer and transaxle case.

HINT: Do not apply seal packing yet.

W Install the LH bearing retainer and torque the six bolts.

Torque: 195 kg–cm (14 ft–lb, 19 N–m)

Snap down the bearings by turning the differential case several times.

(d) Using a torque meter, measure the differential total preload.

Total preload (at starting):

Add drive pinion preload

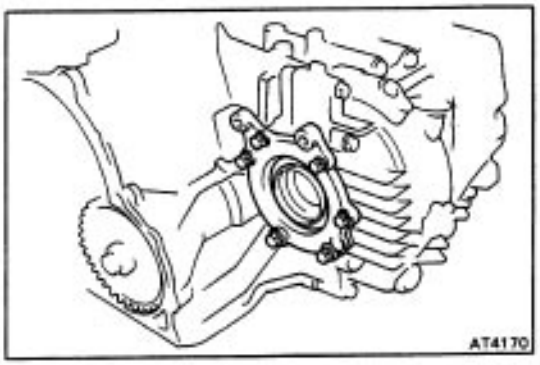
kg–cm (in–lb, N–m)

	New Bearing	Reused Bearing
A540E	2.8 – 4.4 (2.4 – 3.8, 0.3 – 0.4)	1.4 – 2.2 (1.2 – 1.9, 0.1 – 0.2)
A540H	2.3 – 3.7 (2.0 – 3.2, 0.2 – 0.4)	1.2 – 1.9 (1.0 – 1.6, 0.1 – 0.2)

If the preload is not within specification, replace tho adjusting shim in the LH bearing retainer with another thickness one.

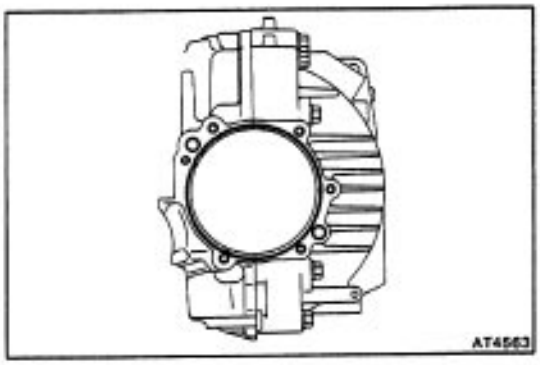
mm (in)

Mark	Thickness	Mark	Thickness
0	2.00 (0.0787)	9	2.45 (0.0965)
1	2.05 (0.0807)	A	2.50 (0.0984)
2	2.10 (0.0827)	B	2.55 (0.1004)
3	2.15 (0.0846)	C	2.60 (0.1024)
4	2.20 (0.0866)	D	2.65 (0.1043)
5	2.25 (0.0886)	E	2.70 (0.1063)
6	2.30 (0.0906)	F	2.75 (0.1083)
7	2.35 (0.0925)	G	2.80 (0.1102)
8	2.40 (0.0945)	H	2.85 (0.1122)



12. INSTALL LH BEARING RETAINER

(a) Remove the six bolts and LH bearing retainer.

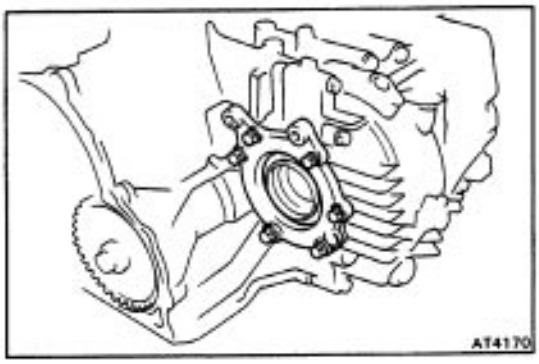


(b) Remove any packing material on the contacting surfaces of LH bearing retainer, transaxle case and carrier cover.

(c) Apply the seal packing to the transaxle case and carrier cover as shown.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT: Install the LH bearing retainer with ten minutes after applying seal packing.



(d) Install the LH bearing retainer.

(e) Coat the threads of bolts with sealer.

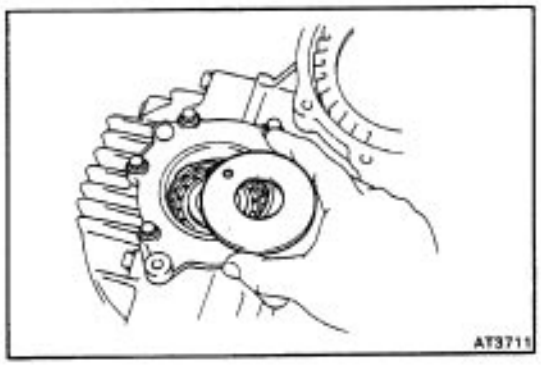
Sealer: Part No. 08833–00070, THREE BOND 1324 or equivalent

(f) Tighten the bolts.

Torque: 195 kg–cm (14 ft–lb, 19 N–m)

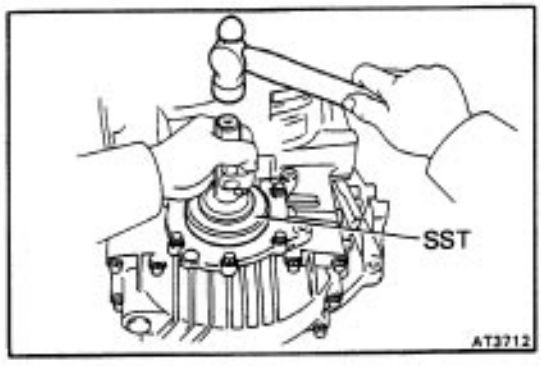
(g) Snap down the bearings.

(h) Recheck the differential total preload.



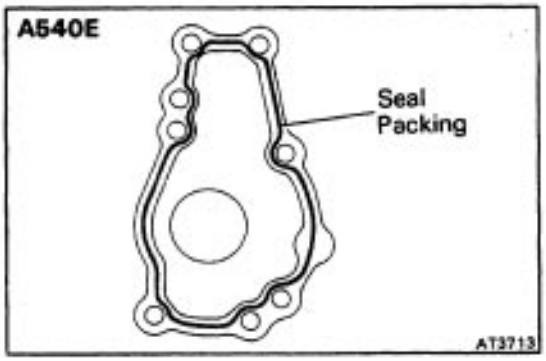
13. INSTALL NEW OIL SEAL

(a) Place the oil baffle onto the LH bearing retainer.



(b) Using SST, driven in a new oil seal until its end is flush with the surface of the LH bearing retainer.

SST 09223–15010



14. (A540E)

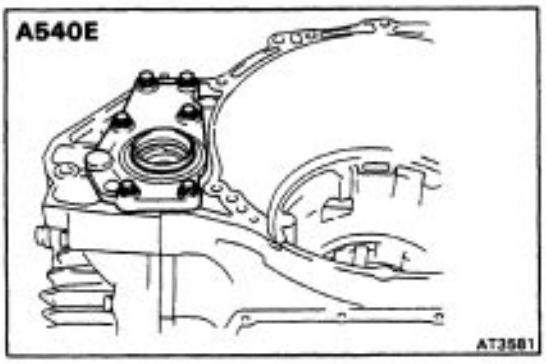
INSTALL RH RETAINER

(a) Remove any packing material on the contacting surfaces of RH retainer and transaxle case.

(b) Apply the seal packing to the RH retainer as shown.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT: Install the RH retainer within ten minutes after applying seal packing.

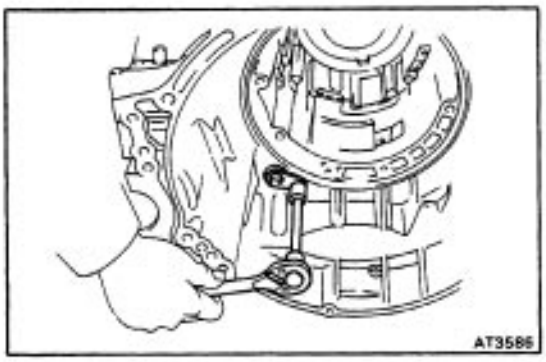


(e) Coat the threads of bolts with sealer.

Sealer: Part No. 08833–00070, THREE BOND 1324 or equivalent

(d) Tighten the bolts.

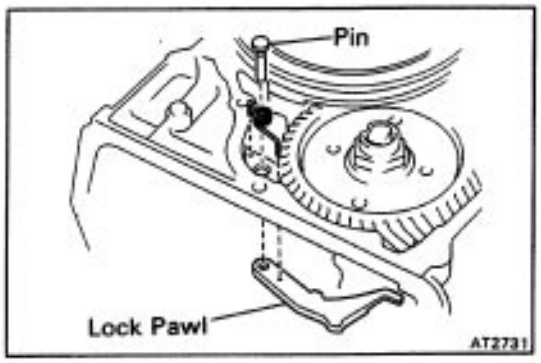
Torque: 196 kg–cm 114 ft–lb, 19 N–m)



15. INSTALL DRIVE PINION CAP

(a) Install a new O–ring to the cap.

(b) Install the drive pinion cap to the transaxle case.

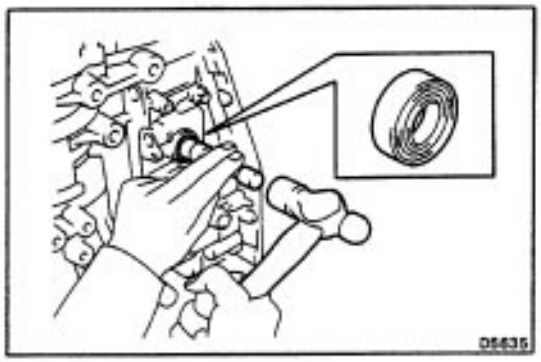


INSTALLATION OF 4–SPEED GEAR UNIT

1. INSTALL PARKING LOCK PAWL

(a) Place the parking lock pawl onto the case.
Hook the spring ends to the case and pawl.

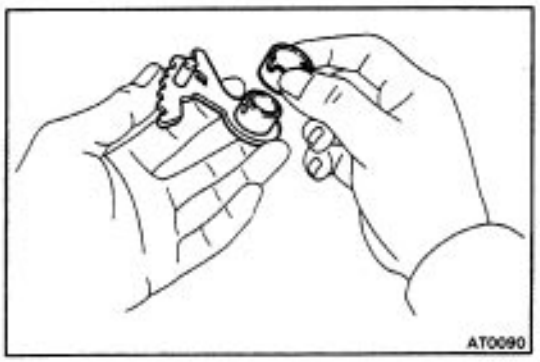
(b) Install the pin into the hole of the case through the spring and pawl.



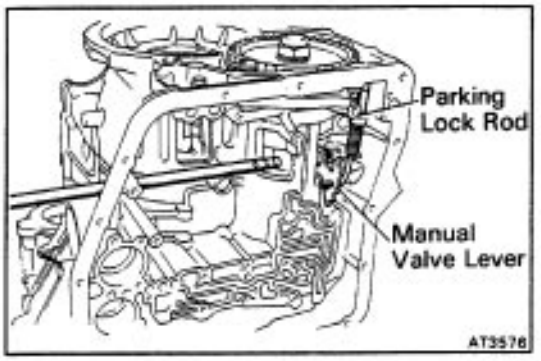
2. INSTALL MANUAL VALVE SHAFT

(a) Coat the oil seal lip with the MP grease.

(b) Install the manual valve shaft oil seal to the case.

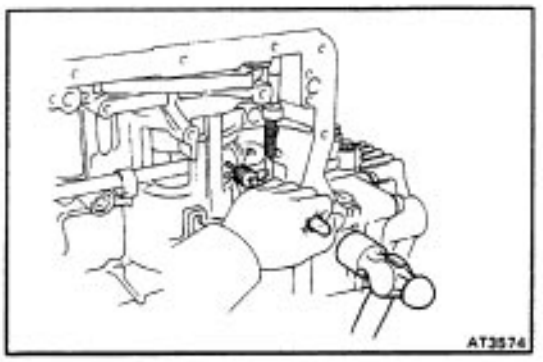


(c) Assemble a new collar to the manual valve lever.

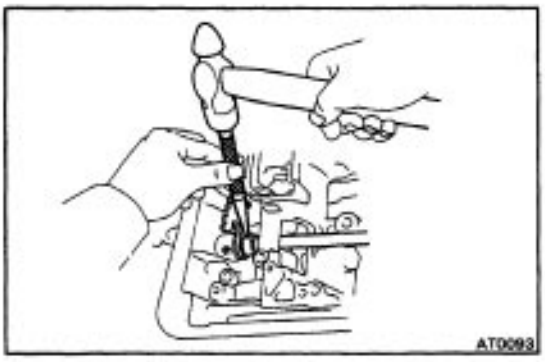


(d) Install the manual valve shaft to the transmission case through the manual valve lever.

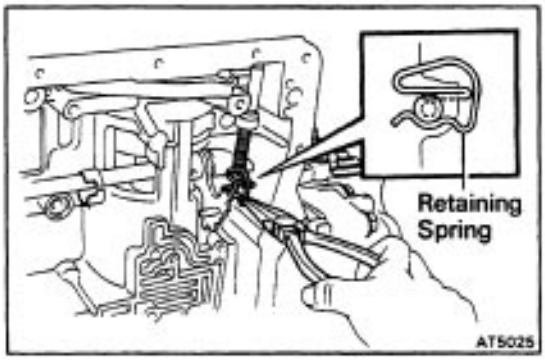
(e) Install the parking lock rod.



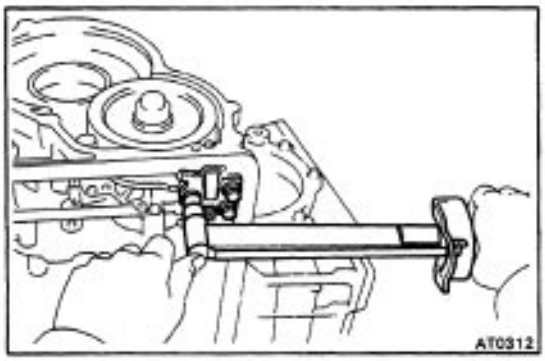
(f) Using a pin punch, drive in the roll pin until its surface is flush with the manual valve lever surface.



(g) Match the collar hole to the lever calking hollow and calk the collar to the lever.

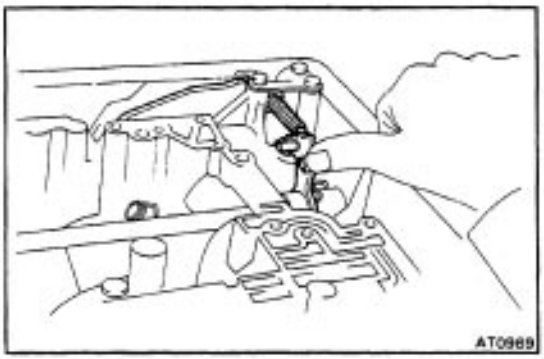


(h) Install the retaining spring.



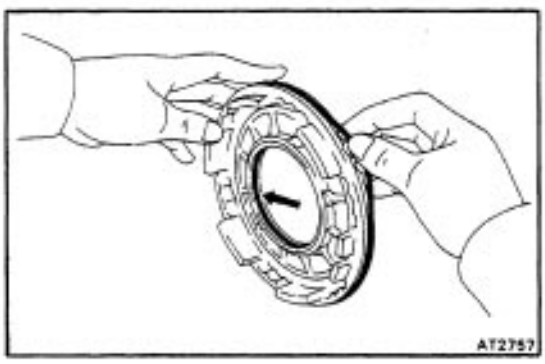
3. INSTALL PARKING LOCK PAWL BRACKET

Torque: 75 kg–cm (65 in.–lb, 7.4 N–m)



4. CHECK OPERATION OF PARKING LOCK PAWL

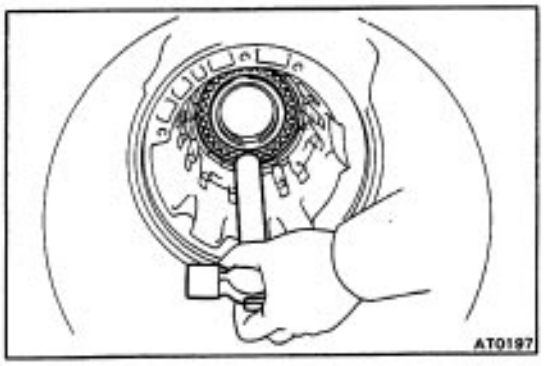
Make sure the counter driven gear is locked when the manual valve fever is in the P range.



5. INSTALL FIRST AND REVERSE BRAKE PISTON TO TRANSMISSION CASE

(a) Coat the new 4–rings with ATF.

(b) Install the two O–rings on the piston.

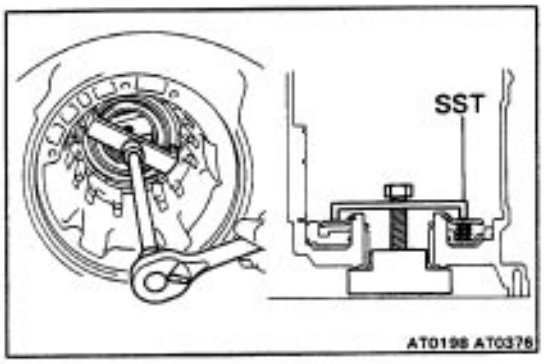


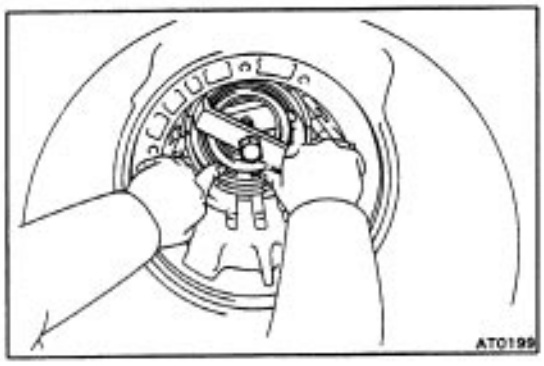
(c) Push the piston into the bore of the case, facing the spring seat upward.

6. INSTALL PISTON RETURN SPRING

(a) Place the return spring and snap ring on the piston.

(b) Place SST, and compress the return spring evenly by tightening the bolt gradually.
SST 09350–32014 (09351–32040)

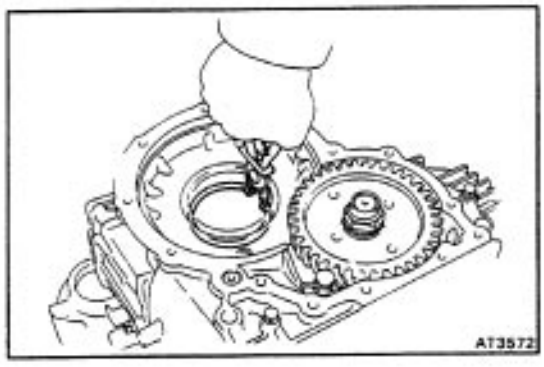




(c) Install snap ring. Visually check– to make sure it is fully seated and centered by the three lugs on the spring retainer.
Be sure, the end gap of snap ring is not aligned with the spring retainer claw.

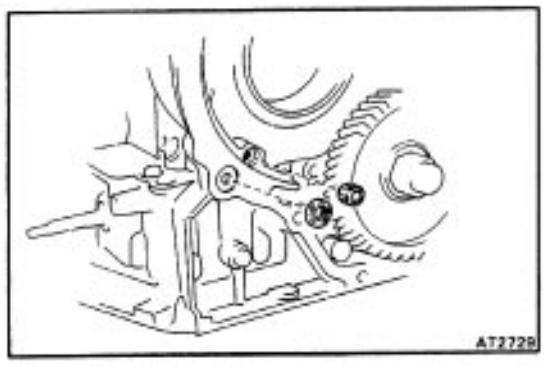
(d) Remove SST.

7. INSTALL SNAP RING TO TRANSAXLE CASE

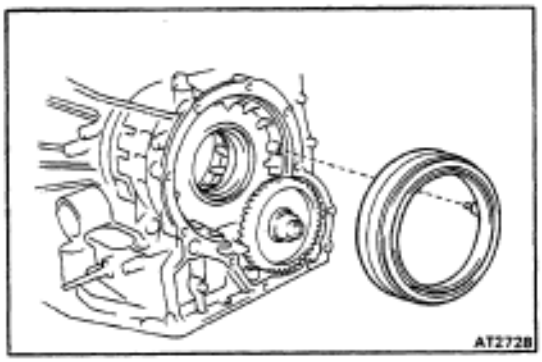


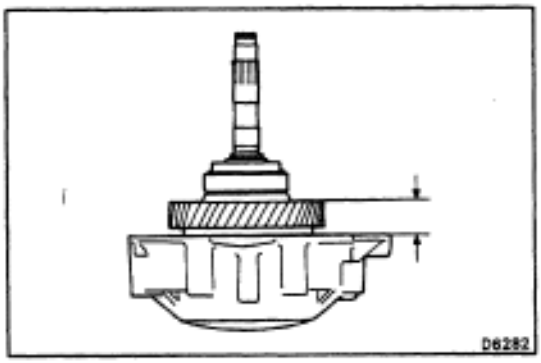
8. INSTALL OVERDRIVE UNIT

(a) Install the overdrive brake apply gasket and overdrive clutch apply gasket.

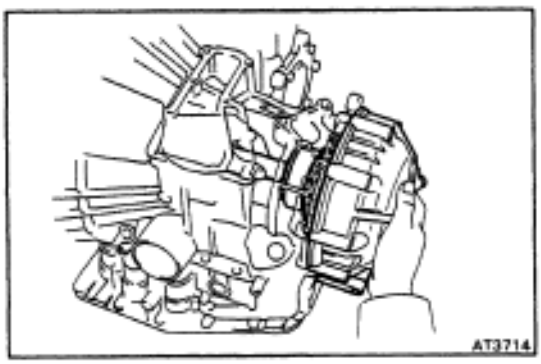


(b) Install the overdrive brake drum to the case.
(c) Install the new case gasket to the case.

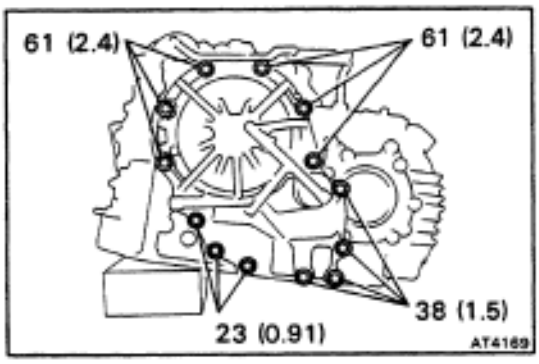




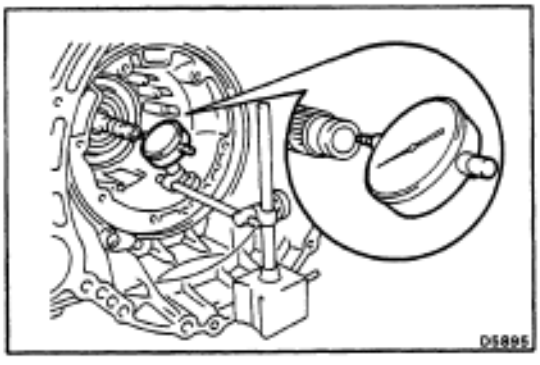
(d) Make sure that the length from the top surface of the case to the counter driven gear top surface should be about 24 mm (0.94 in.)



(e) Place the new gasket onto the transaxle case.
M Install the overdrive assembly with overdrive case to the transaxle case.

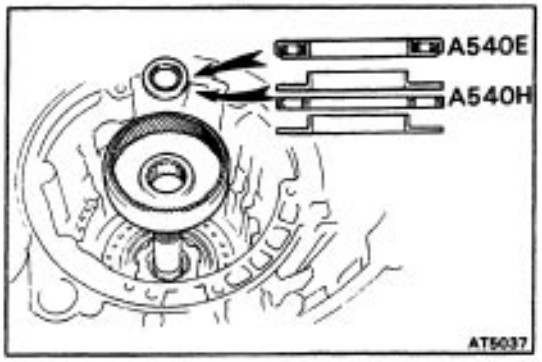


(g) Coat the threads of 23 mm (0.91 in.) bolts with sealer.
Sealer: Part No. 08833–00070, THREE BOND 1324 or equivalent.
(h) Install and tighten the thirteen bolts.
Torque: 250 kg–cm (18 ft–lb, 25 N–m)
HINT: Each bolt length (mm (in.)) is indicated in the figure.



9. CHECK INTERMEDIATE SHAFT END PLAY

(a) Make sure that the intermediate shaft has thrust plate) in axial direction.
Thrust play: 0.47 – 1.50 mm (0.0185 – 0.0591 in.)
If the thrust play is not within specification, check the installation of intermediate shaft.
(See page AT–306)
(b) Make sure that the intermediate shaft turns smoothly.



10. INSTALL REAR PLANETARY GEAR

(a) Install the rear planetary ring gear.

(b) (A540E)

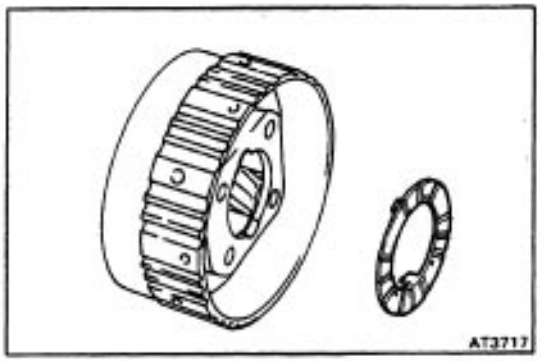
Place the bearing onto the ring gear.

(e) (A540H)

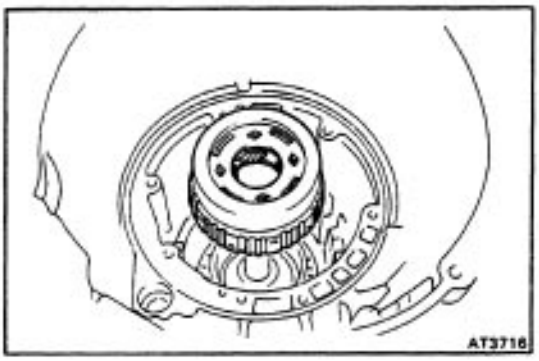
Coat the races and bearing with petroleum jelly and install them onto the ring gear.

Bearing and race: mm (in.) mm (in.)

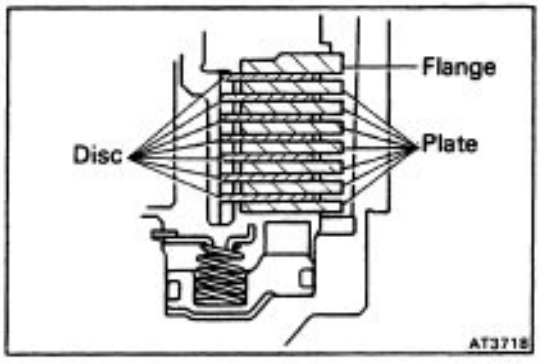
		Outer Diameter	Inner Diameter
A540E	Bearing	38.7 (1.524)	22.6 (0.890)
A540H	Front Race	37.3 (1.469)	24.1 (0.949)
	Bearing	37.6 (1.480)	24.0 (0.945)
	Rear Race	37.6 (1.480)	22.2 (0.874)



(d) Coat the thrust washer with petroleum jelly and place it onto the rear planetary gear.



(3) Install the rear planetary gear.



11. INSTALL DISCS, PLATES AND FLANGE OF FIRST AND REVERSE BRAKE

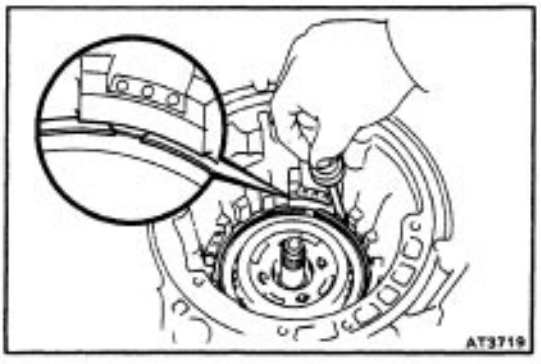
(a) Install the seven plates and seven discs.

Install in order: P = Plate D = Disc

A540E: P–D–P–D–P–D–P–D–P–D–P–D–P–D

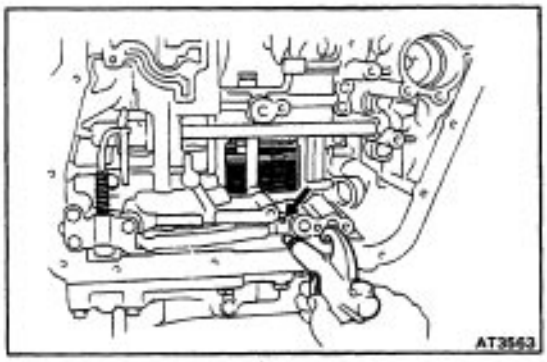
A540H: P–D–P–D–P–D–P–D–P–D–P–D

(b) Install the flange, facing the flat end downward.



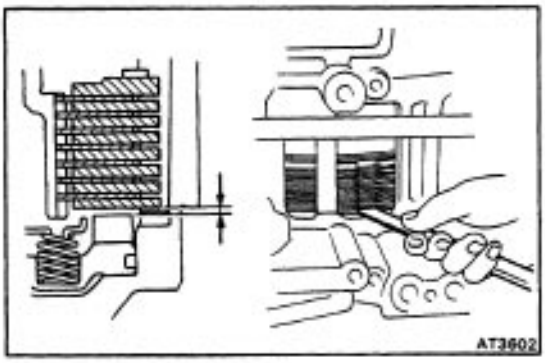
(c) Install the snap ring.

HINT: Be sure that the end gap of the snap ring is not aligned with one of cutouts.

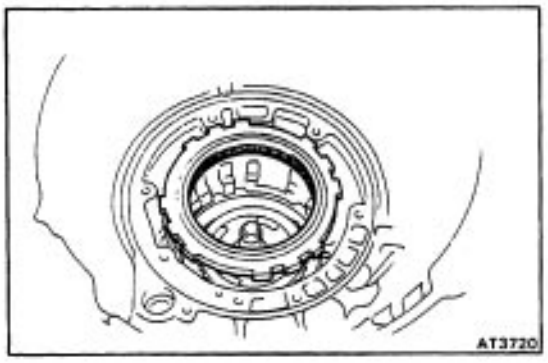


12. CHECK FIRST AND REVERSE BRAKE

(a) Check the operation of the first and reverse brake piston. – Apply compressed air into the case passage and confirm that the piston moves.

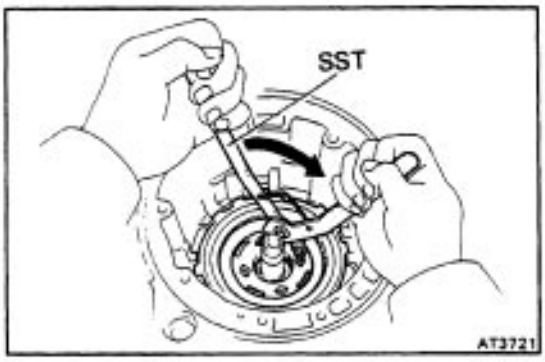


(b) Using a filler gauge, check the pack clearance of the first and reverse brake.
Clearance: A540E
0.85 – 2.05 mm (0.033 – 0.081 in.)
A540H
1.04 – 2.16 mm (0.041 – 0.085 in.)

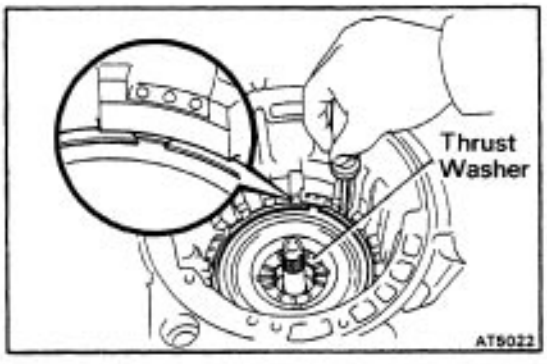


13. INSTALL NO. 2 ONE–WAY CLUTCH INTO CASE

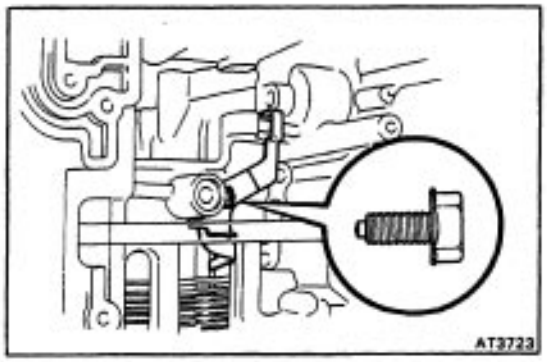
(a) Place the No. 2 one–way clutch with the shiny side of flange upward.



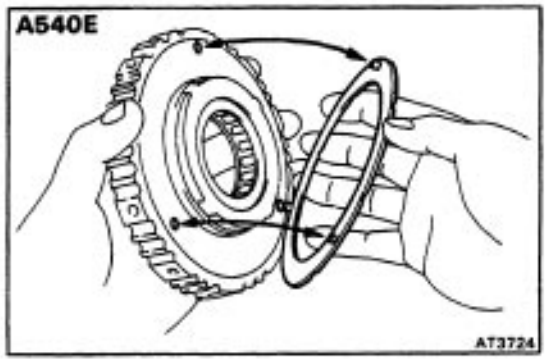
(b) Install the one–way clutch while turning the planetary gear clockwise with SST.
SST 09350–32014 (09351–32050)
If can not turn the planetary gear clockwise, check the installation of the one–way clutch.



(c) Install the snap ring.
HINT: Be sure that the end gap of the snap ring is not aligned with one of cutouts.
(d) (A540H only)
Coat the thrust washer with petroleum jelly and install it onto the rear planetary gear.

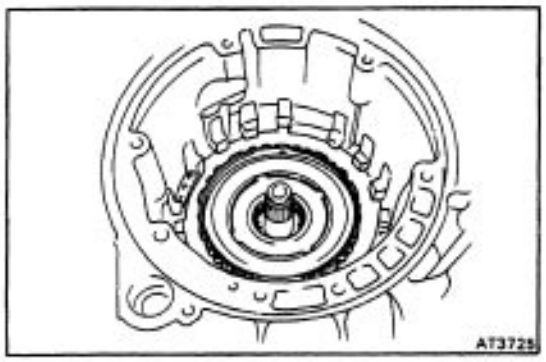


14. INSTALL SECOND COAST BRAKE BAND GUIDE

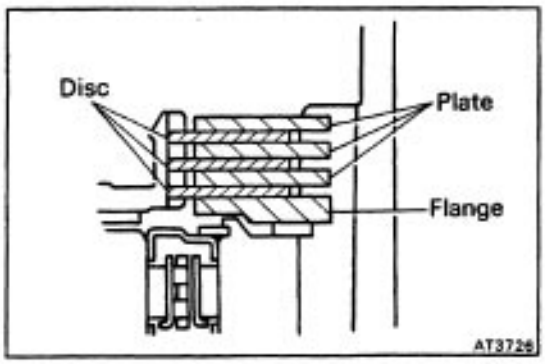


15. PLACE NO. 1 ONE–WAY CLUTCH

(a) Coat the thrust washer with petroleum jelly and install it on the No. 1 one–way clutch. (A540E)



(b) Place the No. 1 one–way clutch onto the rear planetary gear.



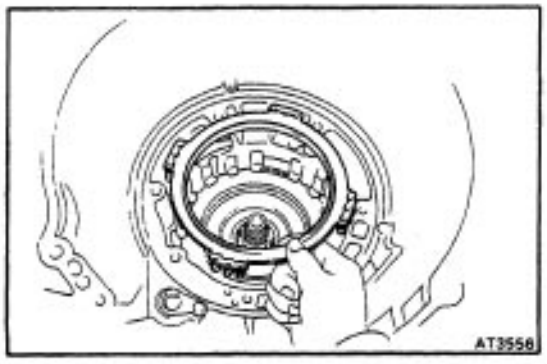
16. INSTALL SECOND BRAKE

(a) Install the flange, facing the flat end upward.

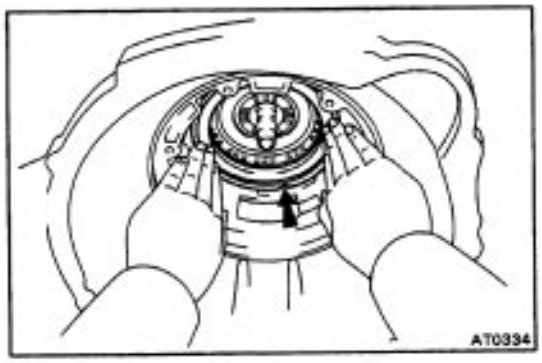
(b) Install the three discs and plates.

Install in order: P = Plate D = Disc

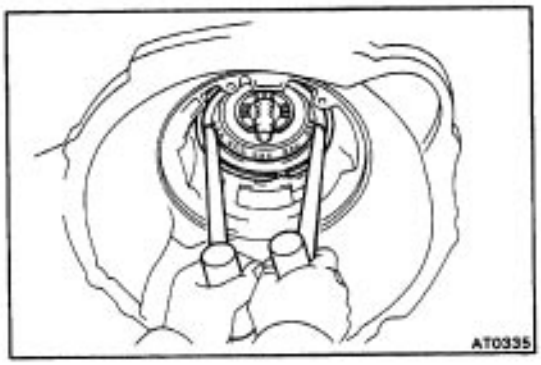
D–P–D–P–D–P



(c) Place the piston return spring into the case.

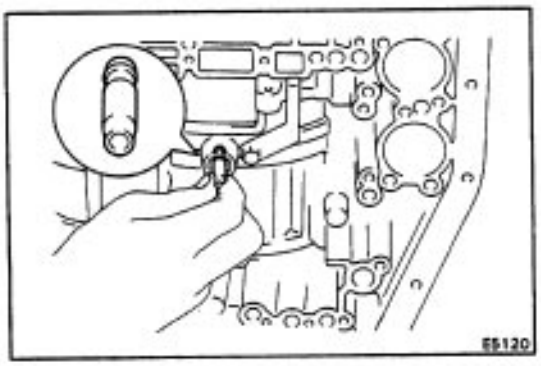


(d) Place the second brake drum into the case.
HINT: Align the groove of the drum with the bolt.



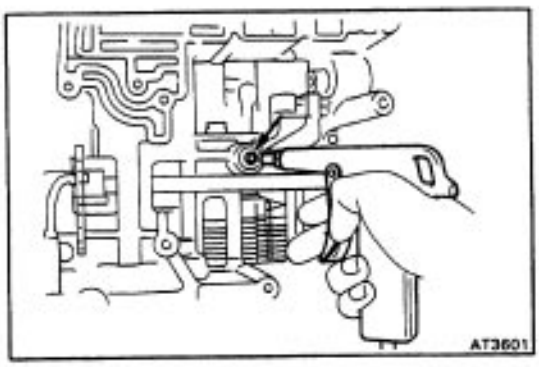
(e) Place the snap ring into the case so that end gap is installed into the groove.
(f) While compressing the piston return springs over the drum with hammer handles, install the snap ring into the groove.

(g) Be sure that the end gap of the snap ring is not aligned with one of cutouts.



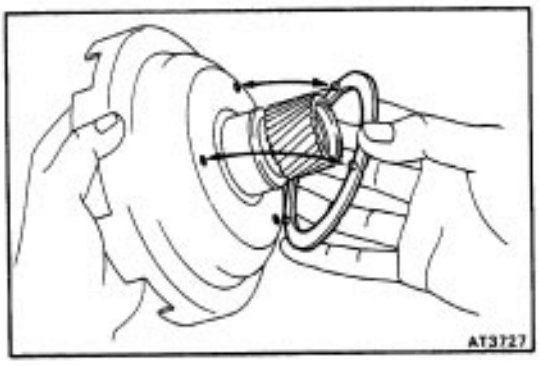
17. INSTALL NEW SECOND BRAKE GASKET

Install a new gasket until it makes contact with the second brake drum.



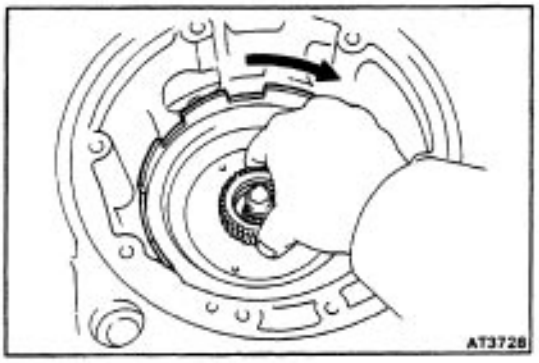
18. CHECK OPERATION OF SECOND BRAKE

Apply compressed air into the second brake gasket and confirm that the piston moves.

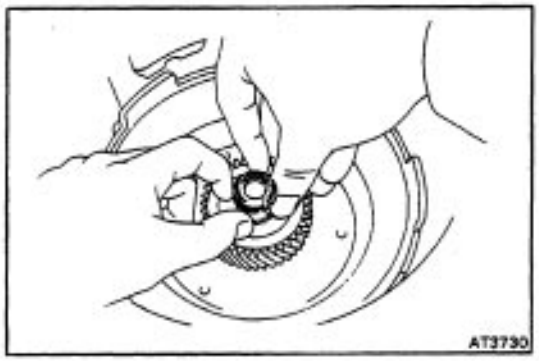


19. INSTALL SUN GEAR AND SUN GEAR INPUT DRUM

(a) Coat the thrust washer with petroleum jelly an install it on the sun gear input drum.

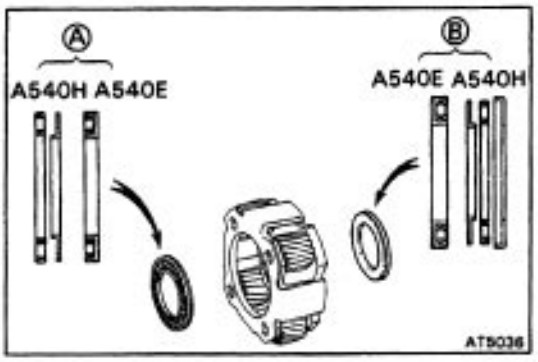


(b) While turning the sun gear clockwise, install it into the No. 1 one–way clutch.



20. INSTALL OIL SEAL RING TO INTERMEDIATE SHAFT

HINT: After installing the oil seal ring, check that it moves smoothly.



21. INSTALL FRONT PLANETARY GEAR

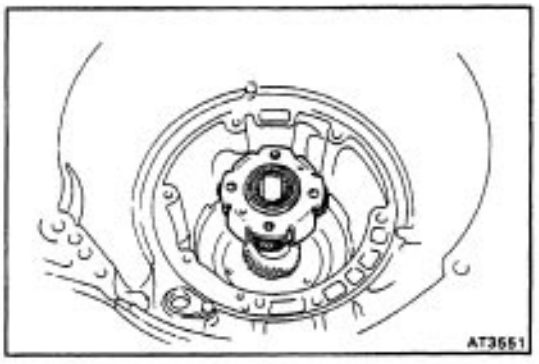
(a) Coat the races and bearings with petroleum jelly, and install them onto the both sides of planetary gear.

Bearing and race: Ⓐ mm (in.)

		Outer Diameter	Inner Diameter
A540E	Bearing	45.5 (1.791)	30.1 (1.185)
A540H	Bearing	45.0 (1.772)	30.0 (1.181)
	Race	45.0 (1.772)	28.0 (1.102)

Bearing and race: Ⓑ mm (in.)

		Outer Diameter	Inner Diameter
A540E	Beating	45.5 (1.791)	30.1 (1.185)
A540H	Front Race	37.9 (1.492)	22.0 (0.866)
	Bearing	36.1 (1.421)	22.2 (0.874)
	Rear Race	35.0 (1.378)	19.0 (0.748)



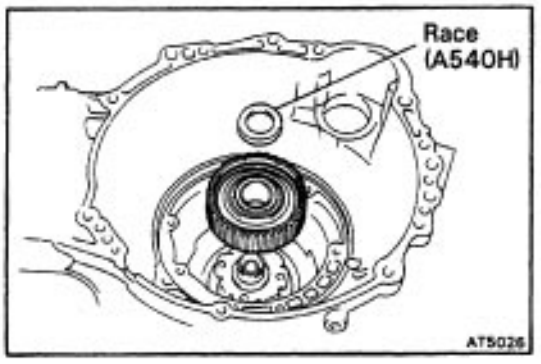
HINT: The bearings are the same on the (A) and (B) side (A540E).

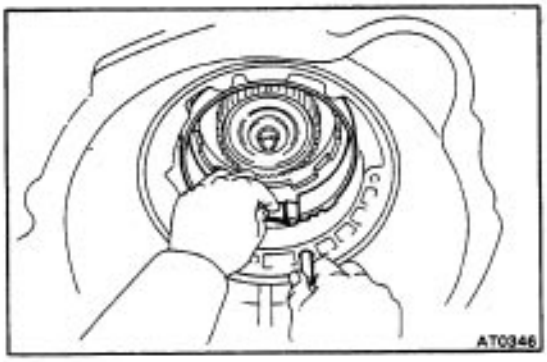
(b) Install the planetary gear onto the sun gear.

22. INSTALL FRONT PLANETARY RING GEAR (A540H)

Coat the race with petroleum jelly and install it onto the tip of ring gear.

Race: Outer diameter 35.7 mm (1.406 in.)
Inner diameter 23.0 mm (0.906 in.)

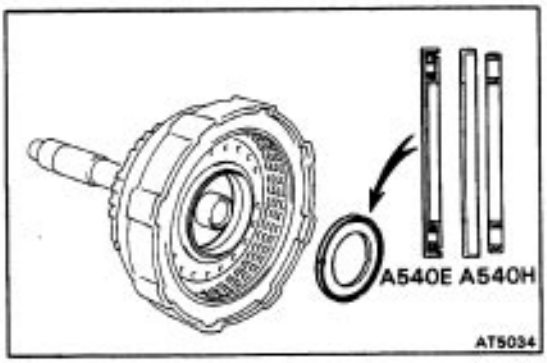




23. INSTALL SECOND COAST BRAKE BAND

(a) Place the band into the case.

(b) Install the pin through the oil pump mounting bolt hole.

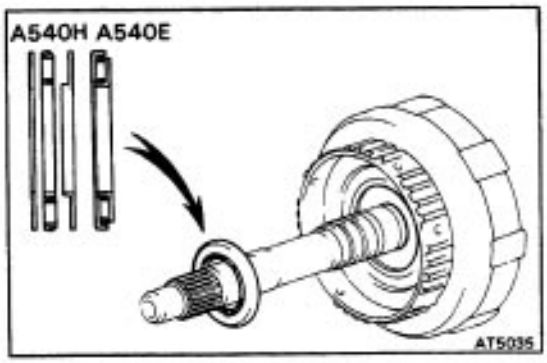


24. INSTALL FORWARD CLUTCH AND DIRECT CLUTCH

(a) Coat the race and bearing with petroleum jelly and install it onto rear side of the forward clutch.

Bearing and race mm (in.)

		Outer Diameter	Inner Diameter
A540E	Bearing	47.6 (1.874)	31.4 (1.236)
A540H	Bearing	36.1 (1.421)	22.2 (0.874)
	Race	37.9 (1.492)	22.0 (0.866)



(b) Coat the race and bearing with petroleum jelly and install it onto front side of the forward clutch.

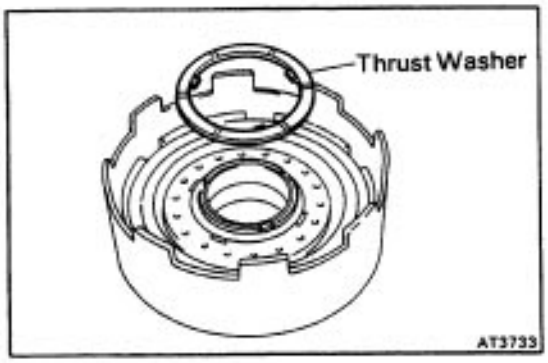
HINT: There are two different–thick races (A540H) and bearings (A540E) for adjustment of the input shaft thrust play.

Bearing: A540E mm (in.)

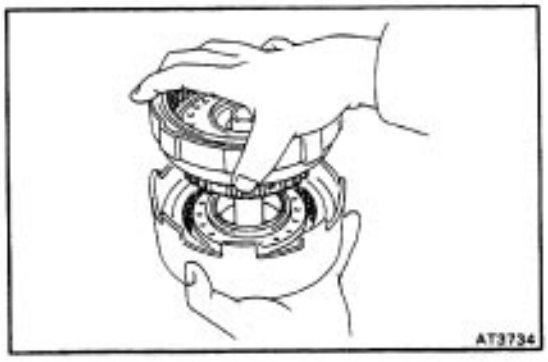
	Thickness	Outer Diameter	Inner Diameter
Bearing	3.60 (0.1417)	45.9 (1.807)	27.7 (1.091)
	4.19 (0.1650)	47.1 (1.854)	27.7 (1.091)

Bearing and race: A540H mm (in.)

	Thickness	Outer Diameter	Inner Diameter
Front Race	0.8 (0.0315)	43.0 (1.693)	30.5 (1.201)
	1.4 (0.0551)		
Bearing	—	42.0 (1.654)	28.9 (1.138)
Rear Race	—	42.0 (1.654)	27.1 (1.067)

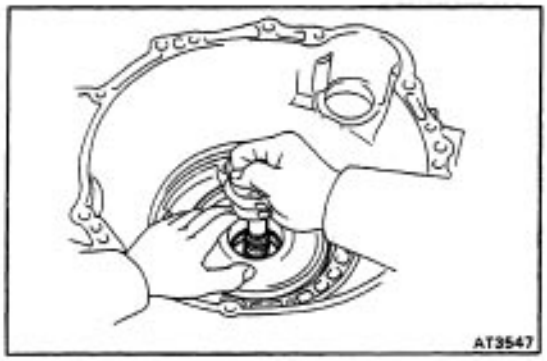


(c) Coat the thrust washer with petroleum jelly an(install it with the oil groove facing upward onto the direct clutch drum.



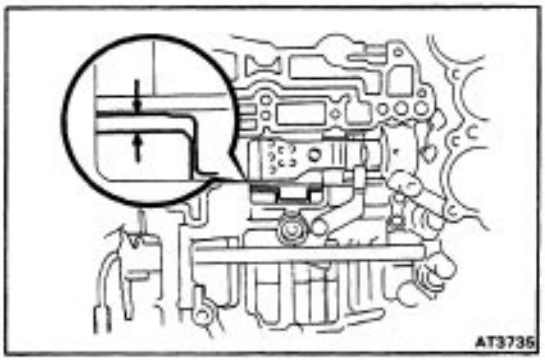
(d) Mesh the hub of the forward clutch with flukes of the direct clutch discs.

HINT: Be careful that the bearing and thrust washer do not get out of place.



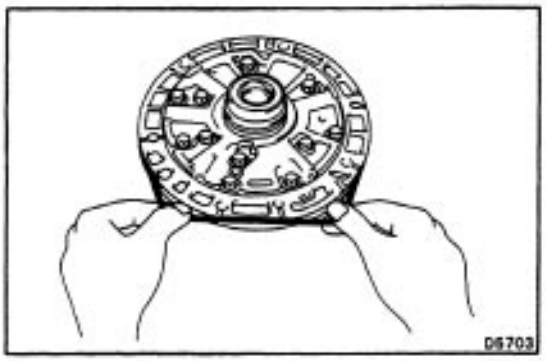
(e) Install the direct clutch and forward clutch into the case.

HINT: Hold the direct clutch toward the forward clutch to prevent the thrust washer from getting out of place.



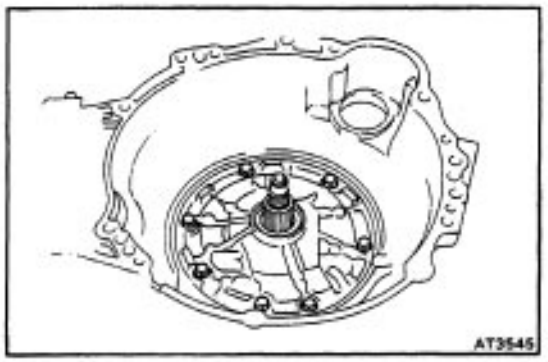
(f) Check the distance between the direct clutch drum and the sun gear input drum.

Distance: Approx. 3mm (0.12 in.)



25. INSTALL OIL PUMP INTO CASE

(a) Coat a new O–ring with ATF and install it to the oil purnp.

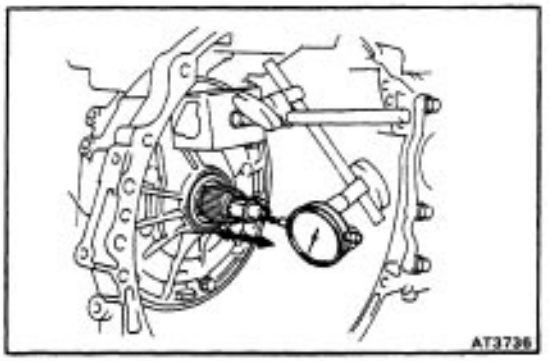


(b) Place the oil pump through the input shaft, and align the bolt holes of the pump body with the transmission case.

NOTICE: Do not push on the oil pump strongly or the oil seal ring will stick to the direct clutch drum.

(c) Install and tighten the seven bolts.

Torque:. 225 kg–cm (16 ft–lb, 22 N–m)



26. MEASURE THRUST PLAY OF INPUT SHAFT

Measure the thrust play with a dial gauge.

Thrust play: 0.13 – 0.90 mm (0.0051 – 0.0354 in.)

HINT: There are two different–thick bearings (A540E) or races (A540H) for the end of stator shaft. If the thrust play is in excess of standard, select one of them.

(A540E)

Bearing thickness: 3.60 mm (0.1417 in.)

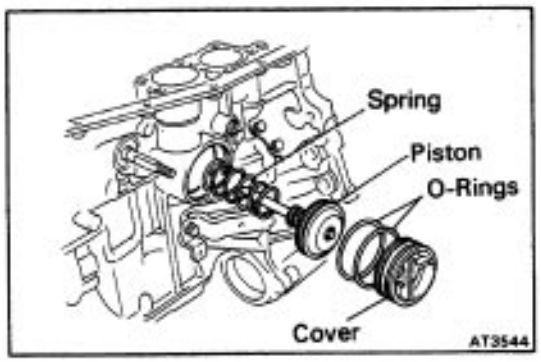
4.19 mm (0.1650 in.)

(A540H)

Race thickness: 0.8 mm (0.031 in.)

0.8 mm (0.031 in.)

1.4 mm (0.055 in.)



27. CHECK INPUT SHAFT ROTATION

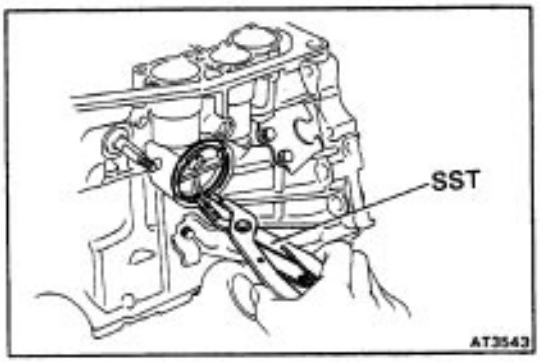
Make sure that the input shaft rotates smoothly.

28. INSTALL SECOND COAST BRAKE PISTON

(a) Coat the new O–rings with ATF and install it to the cover.

(b) Install the outer spring with the piston.

(c) Place the cover into the bore.

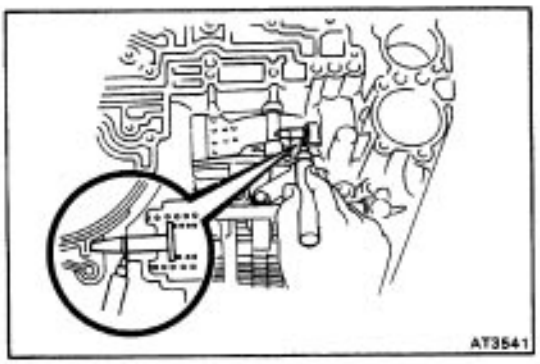


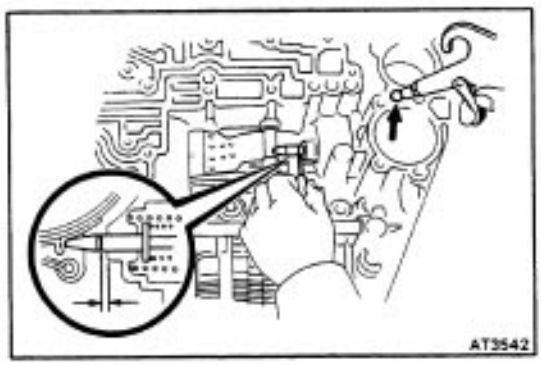
(d) Using SST, install the snap ring while pressing the cover.
SST 09350–32014 (09351–32050)

(e) Check that the front end of the piston rod contacts the center of the second brake band depression.

29. CHECK SECOND COAST BRAKE PISTON STROKE

(a) Apply a small amount of paint to the piston rod at the point it meets the case shown in the illustration.





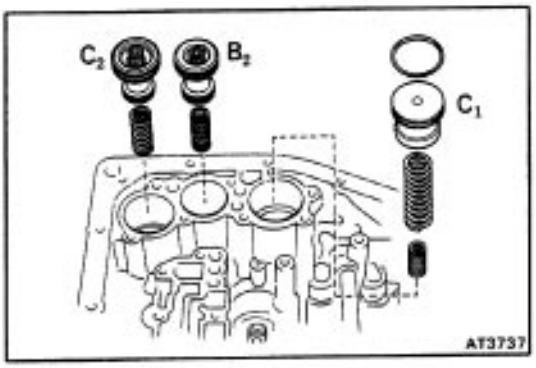
(b) Using SST, measure the piston stroke applying an(releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi or 392 – 785 kPa) as shown.
SST 09240–00020

Piston stroke: 2.0 – 3.5 mm (o.079 – 0.138 in.)

If the stroke is more than specified, replace the piston rod with a longer one.

Piston rod length: 95.2 mm (3.748 in.)
96.3 mm (3.791 in.)

It is still more than standard value, replace the brake ban(with a new one.

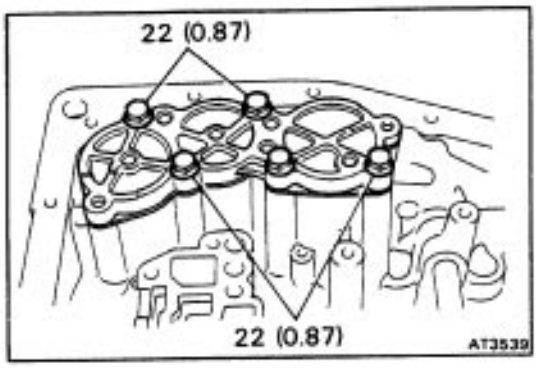


34. INSTALL ACCUMULATOR PISTONS AND SPRINGS

(a) Install the new O–rings to the pistons.

(b) Install the springs and pistons into the bores.

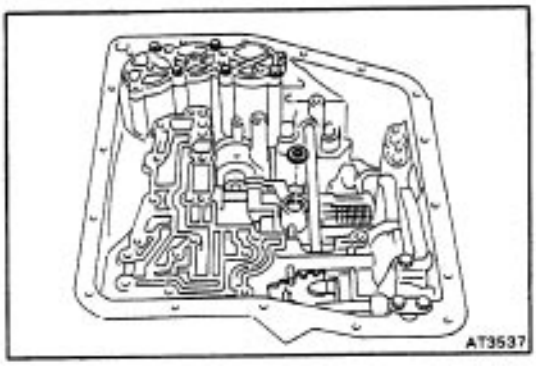
Spring		Free length mm (in.)	Outer diameter mm (in.)	Color
C_2		51.0 (2.008)	18.0 (0.709)	Red
B_2		58.5 (2.303)	15.2 (0.598)	Orange
C_1	Outer	71.2 (2.803)	24.4 (0.961)	Blue
	Inner	43.4 (1.709)	17.8 (0.701)	Light green



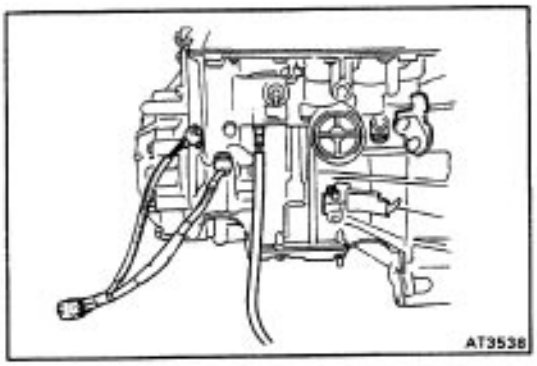
(c) Place the cover with a new gasket and gradually tighten the bolts a little a time in sequence.

HINT: Each bolt length (mm (in.)) is indicated in the figure.

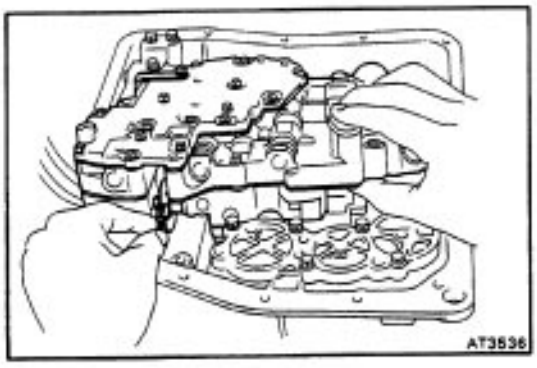
Torque: 100 kg–cm (7 ft–lb, 10 N–m)



31. PLACE NEW SECOND BRAKE APPLY GASKET



32. INSTALL THROTTLE CABLE AND SOLENOID WIRE

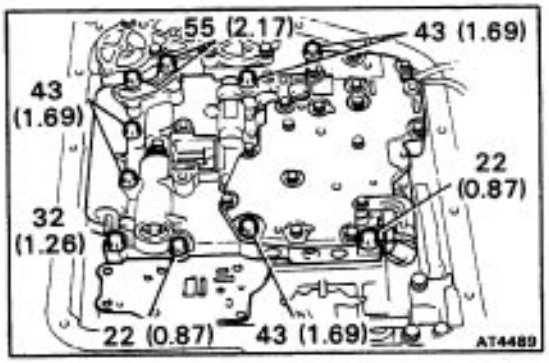


33. INSTALL VALVE BODY TO TRANSAXLE CASE

(a) While holding the cam down with your hand, slip the cable end into the slot.

(b) Lower the valve body into place.

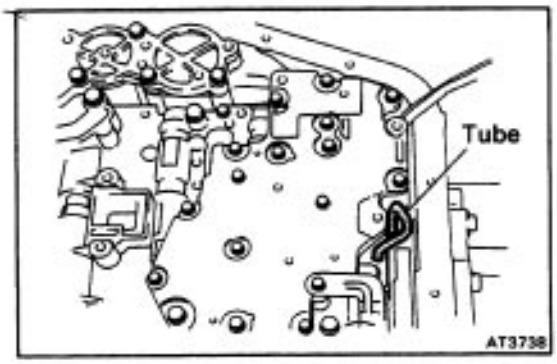
NOTICE: Do not entangle the solenoid wire.



(c)Install and tighten the ten bolts.
HINT:

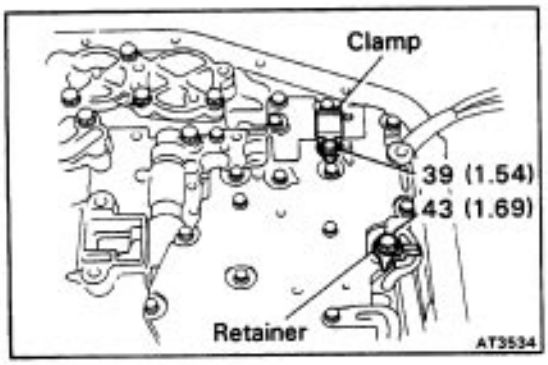
- Each bolt length (mm (in.)) is indicated in the figure.
- Hand tighten the ten bolts first, then torque with a torque wrench.

Torque: 110 kg–cm (8 ft–lb, 11 N–m)



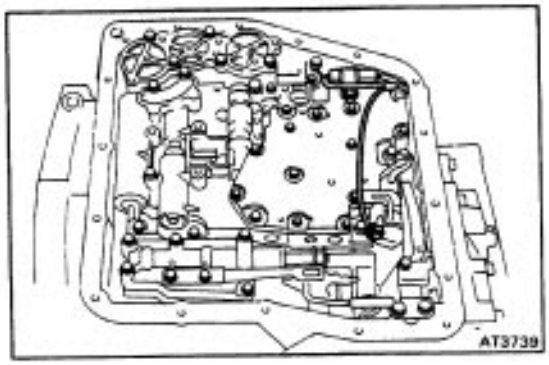
34. INSTALL B3 APPLY TUBE

NOTICE: Be careful not to bend or damage the tube.

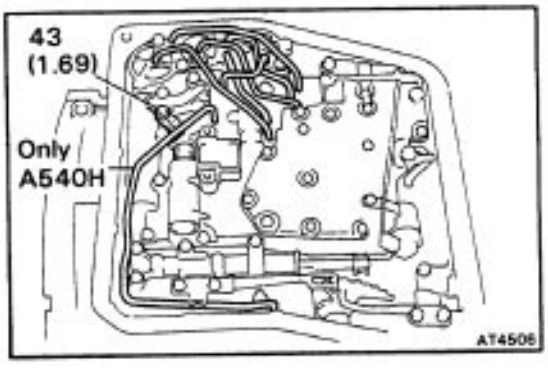


35. INSTALL CONNECTOR CLAMP AND TUBE RETAINER

HINT: Each bolt length (mm (in)) is indicated in the figure.
Torque: 110 kg–cm (8 ft–lb, 11 N–m)



36. CONNECT SOLENOID CONNECTORS



37. INSTALL OIL TUBES

(A540E)

Using a plastic hammer, install the tubes into the position: indicated in the figure.

(A540H)

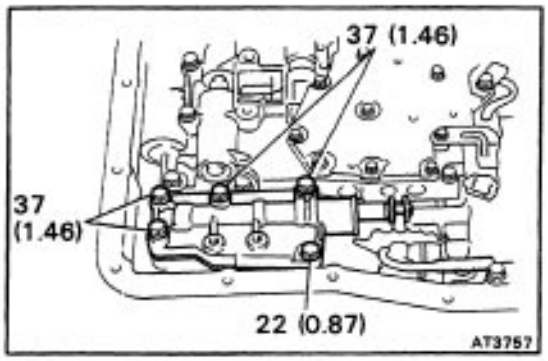
(a) Using a plastic hammer, install the tubes into the positions indicated in the figure.

(b) Install the bolt.

Torque: 55 kg–cm (48 in–lb, 5.4 N–m)

HINT: Each bolt length (mm (in.)) is indicated in the figure.

NOTICE: Be careful not no bend or damage the tubes



38. INSTALL MANUAL VALVE BODY AND DETENT SPRING

HINT: Each bolt length (mm (in.)) is indicated in the figure.

(a) Align the manual valve with the pin on the manual shaft lever.

(b) Lower the manual valve body into place.

(e¿ Hand tighten the five bolts first. Then, tighten them with a torque wrench.

Torque: 110 kg–cm (8 ft–lb, 11 N–m)

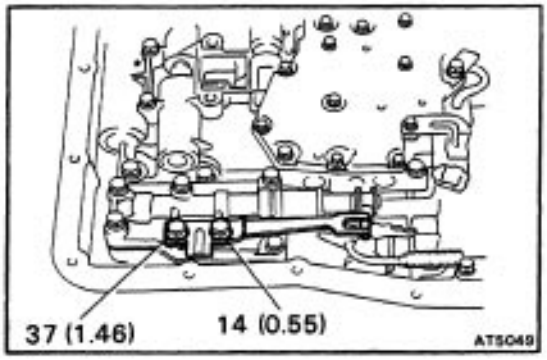
(d) Place the detent springs on the manual valve body and hand tighten the two bolts first.

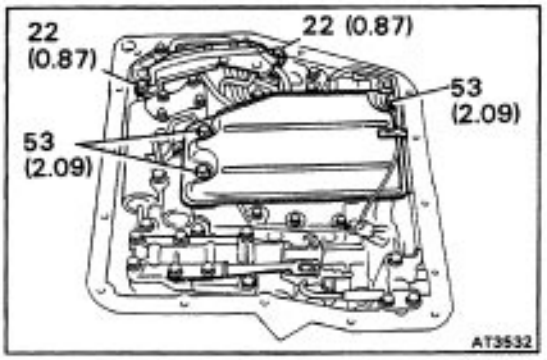
Then, tighten them with a torque–wrench.

Torque: 110 kg–cm (8 ft–lb, 11 N–m)

HINT: Each bolt length (mm (in.)) is indicated in the figure.

(e) Check that the manual valve lever is touching the center of the detent spring tip roller.





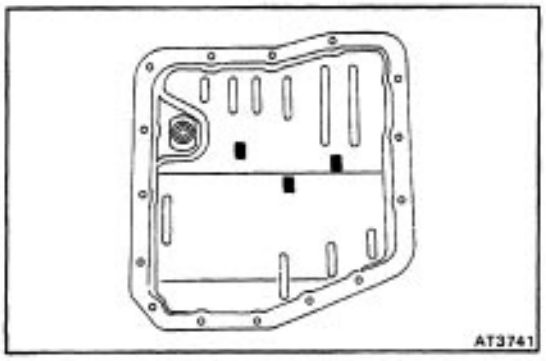
39. INSTALL TUBE BRACKET AND OIL STRAINER

Each bolt length (mm (in.)) is indicated in the figure.

Torque:

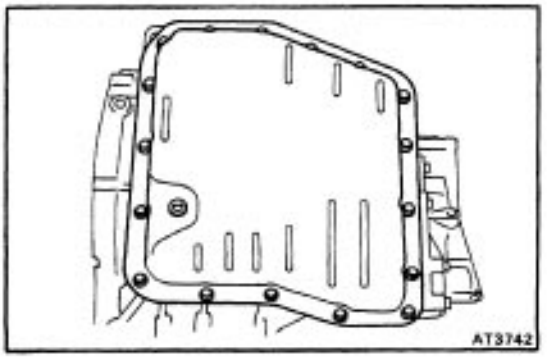
Tube bracket 100 kg–cm (7 ft–lb, 10 N–m)

Oil strainer 110 kg–cm (8 ft–lb, 11 N–m))



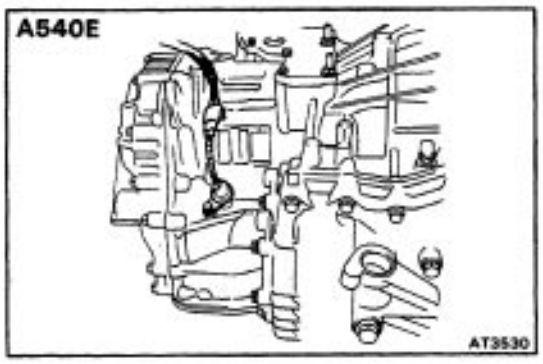
40. INSTALL MAGNETS IN PLACE AS SHOWN

NOTICE: Make sure that the magnets do not interfere with the oil tubes.



41. INSTALL OIL PAN WITH NEW GASKET

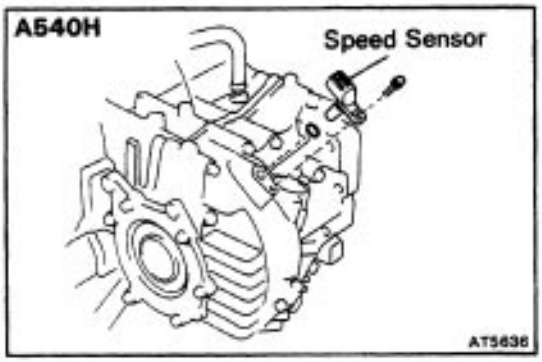
Torque: 50 kg–cm (43 in–lb, 4.9 N–m)



42. (A540E)

INSTALL SPEED SENSOR

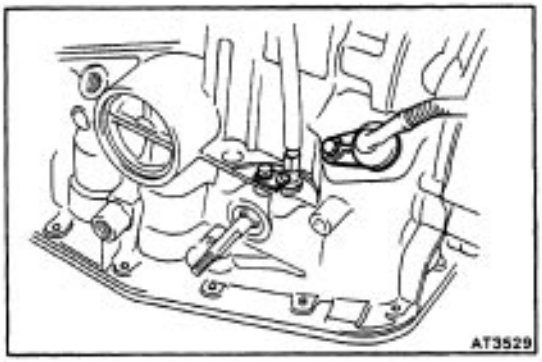
(a) Install a new O–ring to the speed sensor.
(b) Install the speed sensor to the transaxle case.
(c) Tighten the bolt.
(d) Connect the sensor connector.



43. (A540H)

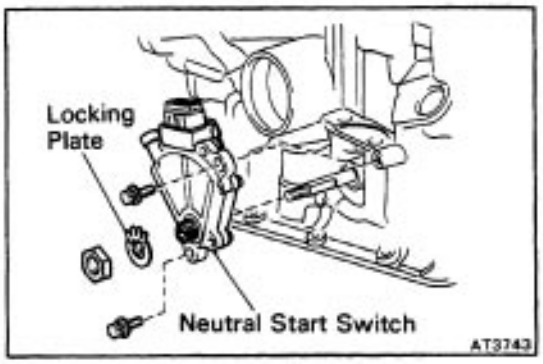
INSTALL VEHICLE SPEED SENSOR

(a) Install a new O–ring to the vehicle speed sensor.
(b) Install the vehicle speed sensor to the transaxle case.
(e) Install and tighten the bolt.



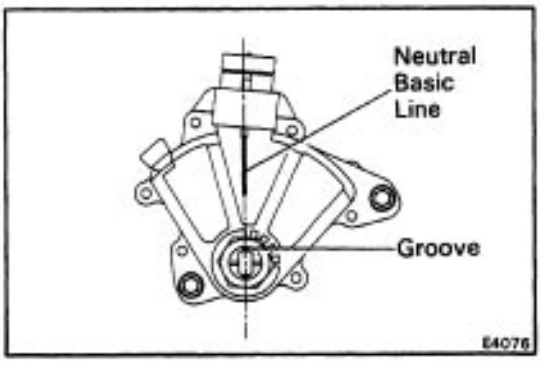
44. INSTALL THROTTLE CABLE RETAINING PLATE

45. INSTALL SOLENOID WIRE .

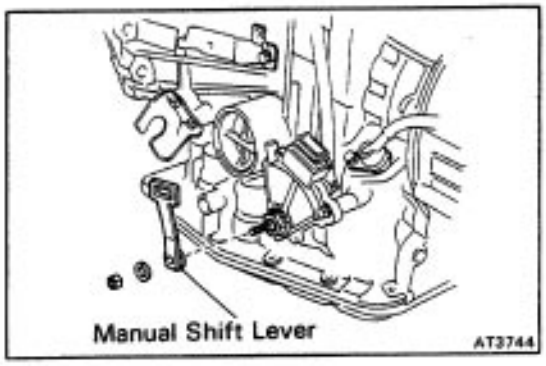


46. INSTALL NEUTRAL START SWITCH

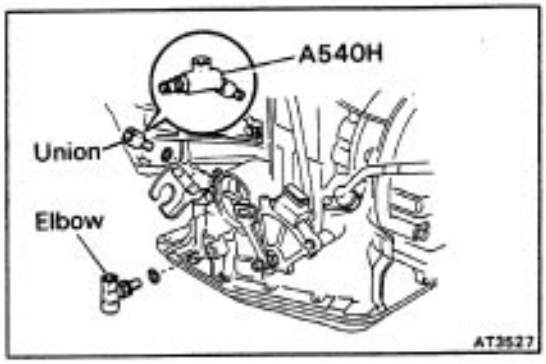
(a) Install the neutral start switch to the manual valve shaft.
(b) Place the new locking plate and tighten the nut.
(c) Stake the nut with locking plate.
(d) Install the two bolts.



(e) Adjust the neutral start switch.
HINT: Align the groove and neutral basic line.
(f) Tighten the two bolts.

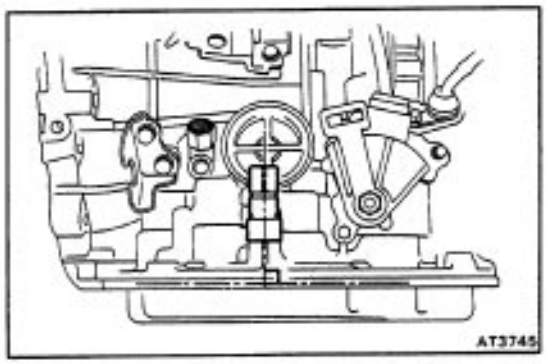


47. INSTALL MANUAL SHIT LEVER

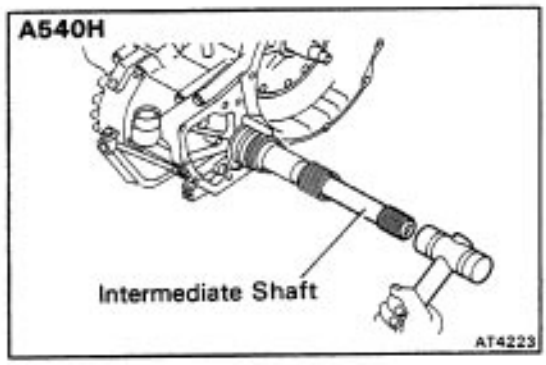


48. INSTALL UNION AND ELBOW

(a) Install the new O–rings to the union and elbow.
(b) Install the union and elbow to the transaxle case.
Torque: 275 kg–cm (20 ft–lb, 27 N–m)

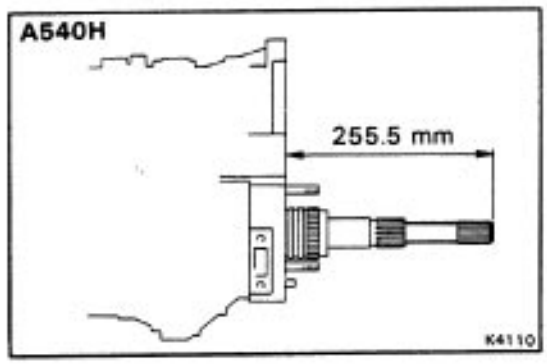


HINT: Install the elbow at right angles to the bottom of the transaxle case.

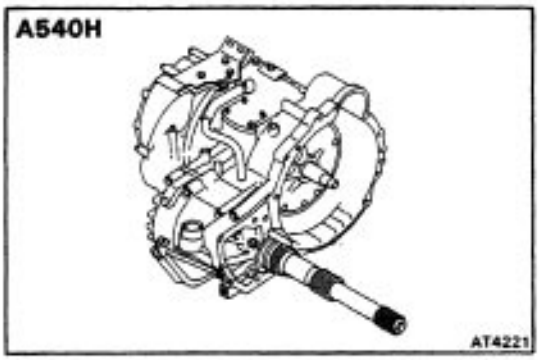


49. (A540H)
INSTALL DIFFERENTIAL SIDE GEAR INTERMEDIATE SHAFT

(a) Install a new snap ring to the shaft groove.
(b) Using a plastic hammer, install the shaft.



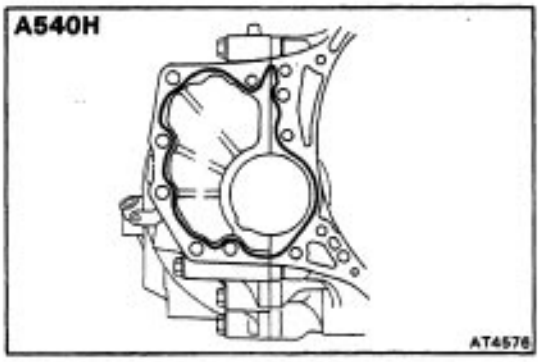
HINT: Keeping the intermediate shaft on the pinion shaft of differential, measure the point in the illustration.
Protrusion length (Reference): 255.5 mm 110.059 in.)



50. (A540 H)

INSTALL APPLY GASKET

Install a new apply gasket to the differential carrier cover.



51. (A540H)

INSTALL TRANSFER ASSEMBLY

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transfer and transaxle.

(b) Apply seal packing to the transaxle as shown in the illustration.

S**eal packing: Part No. 08883–00090, Adhesive 1131, THREE BOND 1131, Loctite 518, or equivalent**

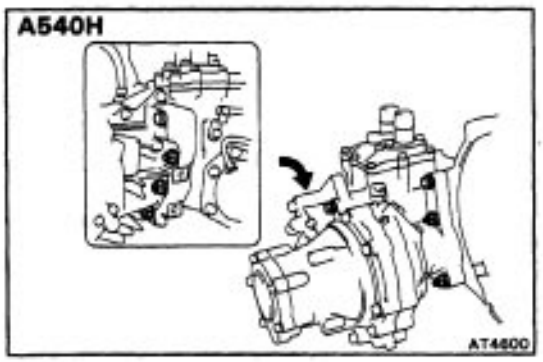
HINT: Install the transfer assembly as soon as the seal packing is applied.

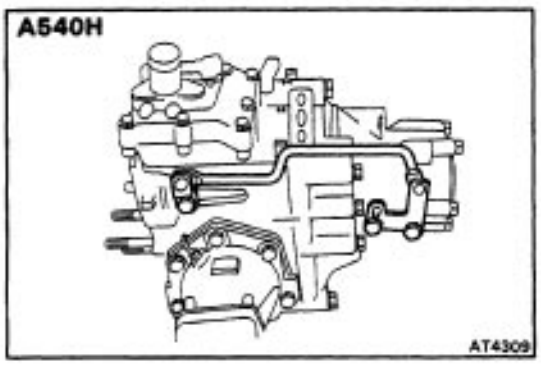
(e) Coat the threads of bolts with sealer.

Sealer: Part No. 08833–00070, THREE BOND 1324 or equivalent.

(d) Install and torque the five nuts and three bolts.

Torque: 700 kg–cm (51 ft–lb, 69 N–m)





52. (A540H)

INSPECT MODE SELECT LEVER POSITION

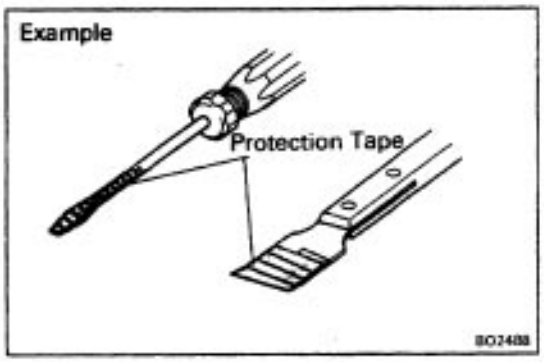
After finishing inspection or repair the transaxle, be sure the select lever position to FREE mode and attach the lock bolt.

BODY

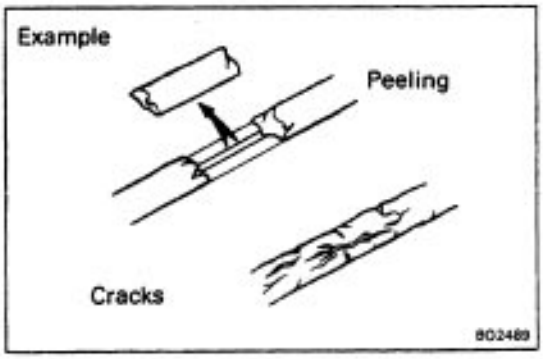
GENERAL INFORMATION

If there is a possiblity that the body and/or parts may be damaged, first remove the danger before performing repair operations.
Example:

1. Apply protection tape to the body adjacent to the body part when removing and installing.

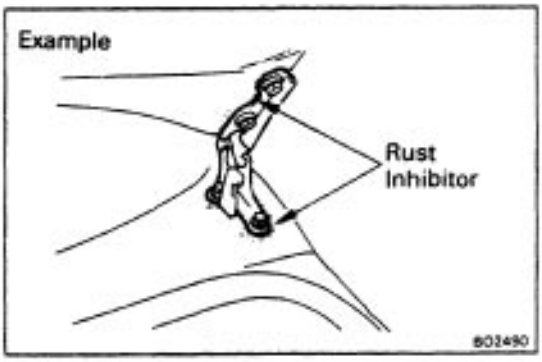


2. When prying off the body parts with a screwdriver or scraper, etc., be sure to apply protection tape to the tip or blade to prevent damage to the paint film or body part.

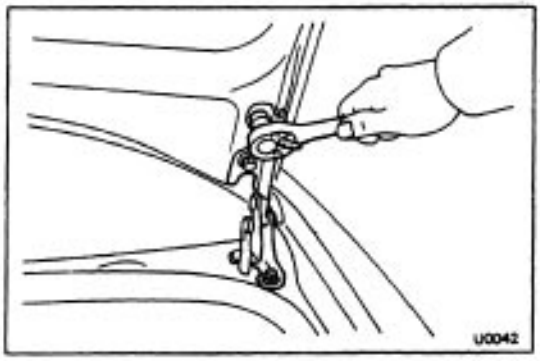


If anti–rust agents are damaged while repairing other parts, be sure to repair the anti–rust agent.
Example:

1. If body sealer, paint film or undercoat are damaged by peeling, cracks, etc., be sure to repair each with an antirust agent.



2. If a hinge or exterior body panel is loosened or removed, be sure to apply rust inhibitor after repairs.

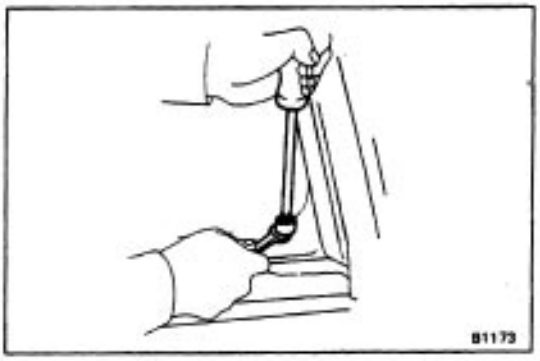


HOOD

ADJUSTMENT OF HOOD

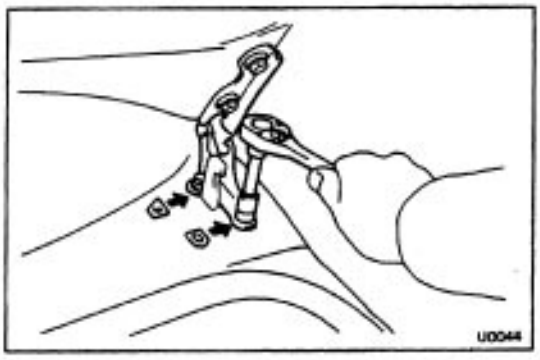
1. ADJUST HOOD IN FORWARD/REARWARD AND LEFT/RIGHT DIRECTIONS

Adjust the hood by loosening the hood side hinge bolts.



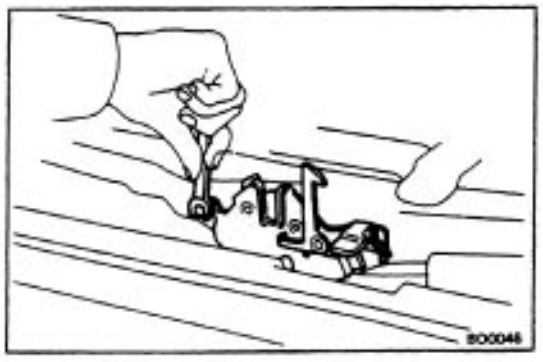
2. ADJUST FRONT EDGE OF HOOD IN VERTI¿¿L DIRECTION

Adjust the hood by turning the cushions.



3. ADJUST REAR EDGE OF HOOD IN VERTICAL DIRECTION

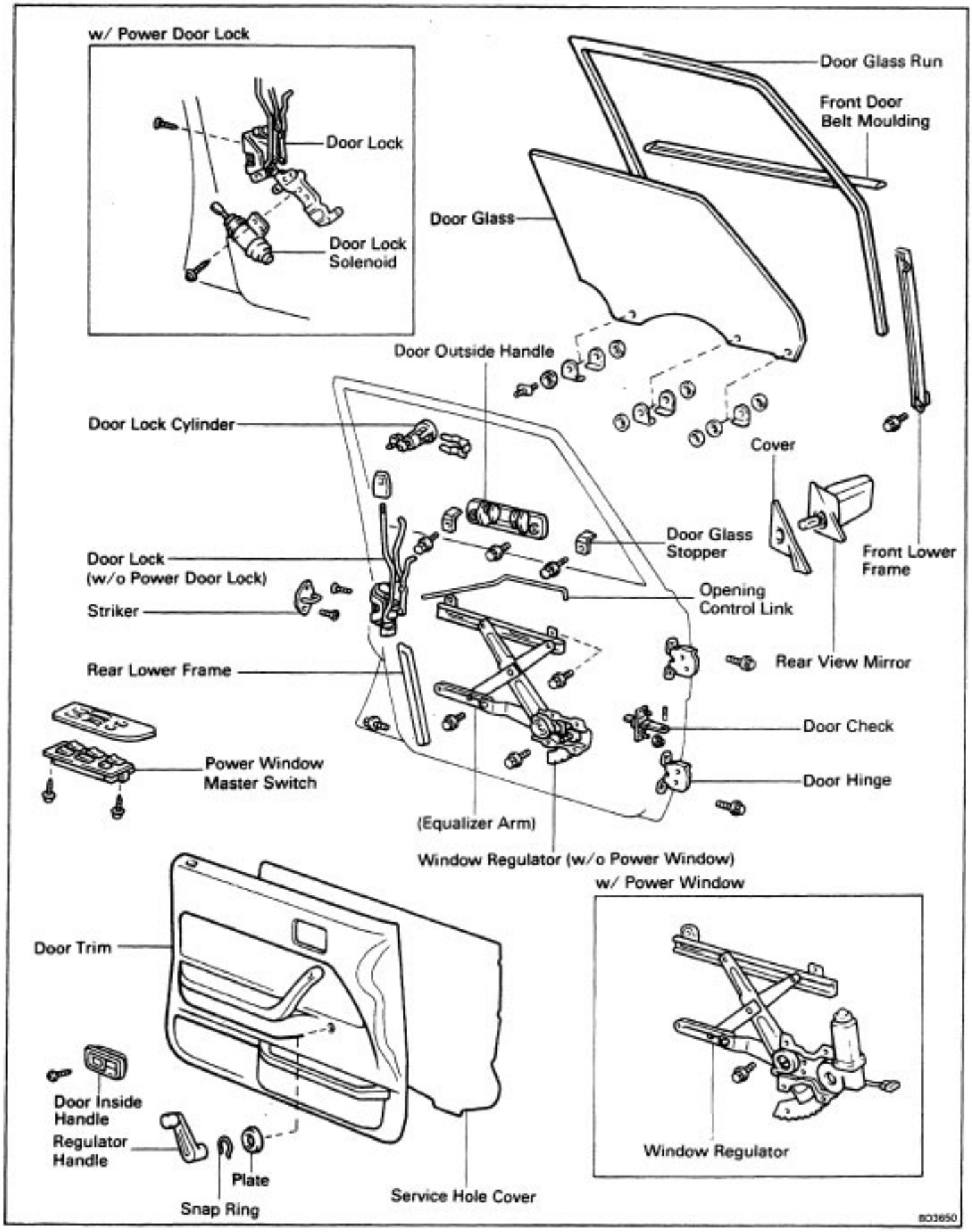
Adjust the hood by increasing or decreasing the number of the shims.



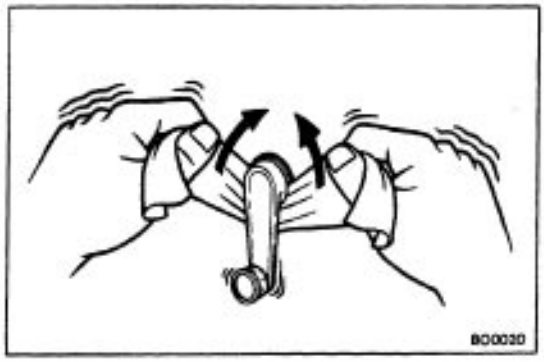
4. ADJUST HOOD LOCK

Adjust the lock by loosening the bolts.

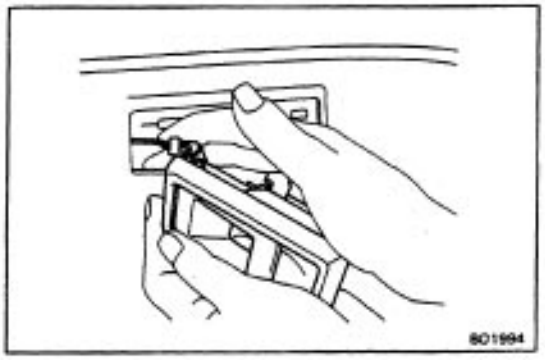
FRONT DOOR
COMPONENTS



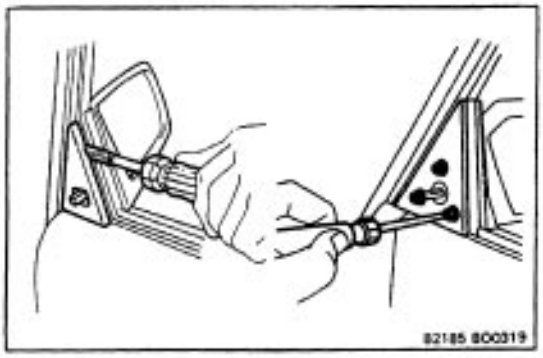
DISASSEMBLY OF FRONT DOOR



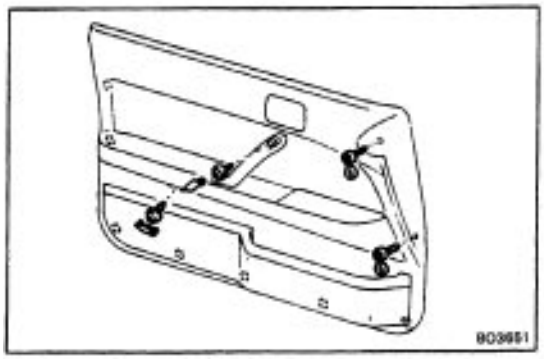
1. REMOVE REGULATOR HANDLE
(w/o POWER WINDOW)
Pull oft the snap ring with a cloth and remove the regulator handle and plate.



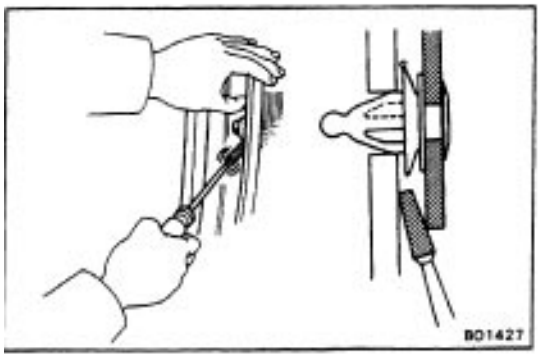
2. REMOVE DOOR INSIDE HANDLE
(a) Remove the screw, and slide the handle forward.
(b) Disconnect the handle from the control link and remove the handle.



3. REMOVE REAR VIEW MIRROR
(a) (Manual type)
Remove the setting screw and knob.
(b) Using a screwdriver, pry loose the retainer and remove the cover.
HINT: Tape the screwdriver tip before use.
(c) (Electrical type)
Disconnect the connector.
(d) Remove the three screws–and mirror.



4. REMOVE DOOR TRIM
(a) Remove the two screws from the armrest.
(b) Remove the two caps and two screws.



(c) Insert a screwdriver between the retainers and door trim to pry it loose.
HINT: Tape the screwdriver tip before use.
(d) (w/ Power Window and Power Door Lock)
Disconnect the connectors.

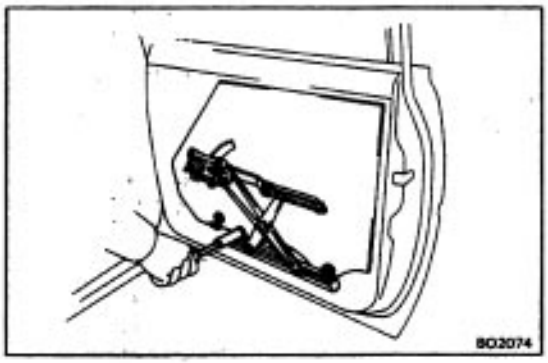
5. REMOVE SERVICE HOLE COVER

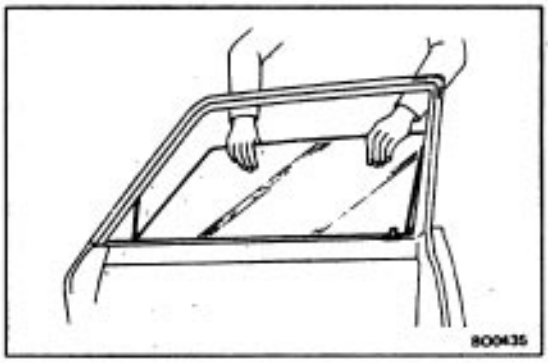
6. REMOVE OPENING CONTROL LINK FROM DOOR LOCK

7. REMOVE DOOR GLASS

(a) Wind the glass down into the door cavity.

(b) Remove the two glass channel mounting nuts.





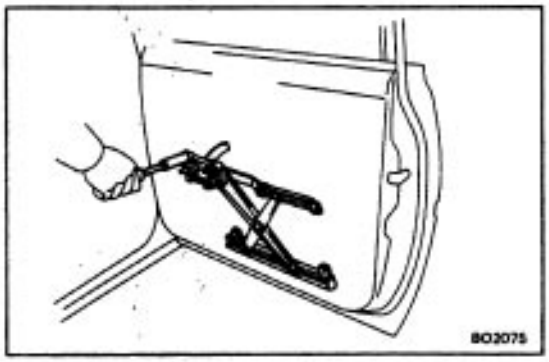
(c) Remove the door glass by pulling it upward.

8. REMOVE WINDOW REGULATOR

(a) (w/ Power Window)
Disconnect the connector.

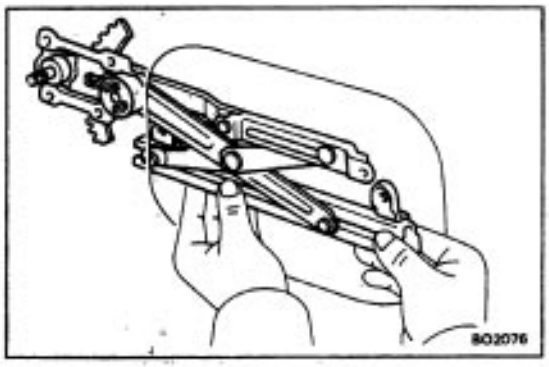
(b) Remove the regulator mounting bolts.

(e) Remove the equalizer arm bracket mounting bolts.



(d) Remove the regulator through the service hole.

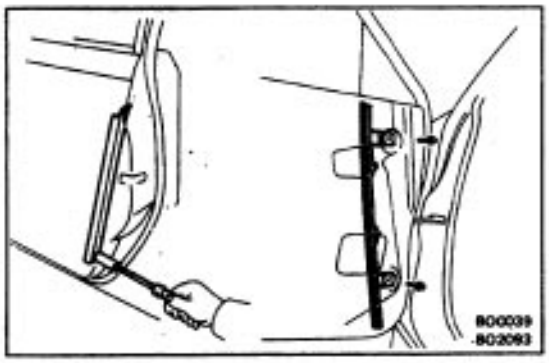
9. REMOVE DOOR GLASS RUN

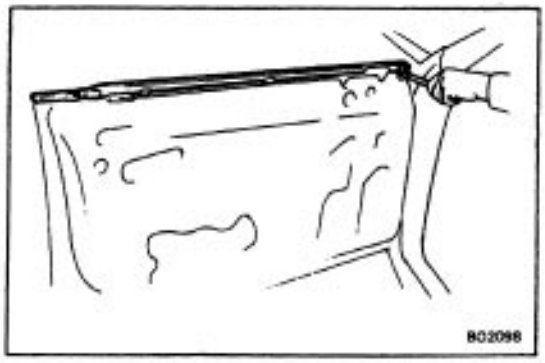


10. REMOVE REAR LOWER FRAME

11. REMOVE FRONT LOWER FRAME

Remove the two bolts from the panel.

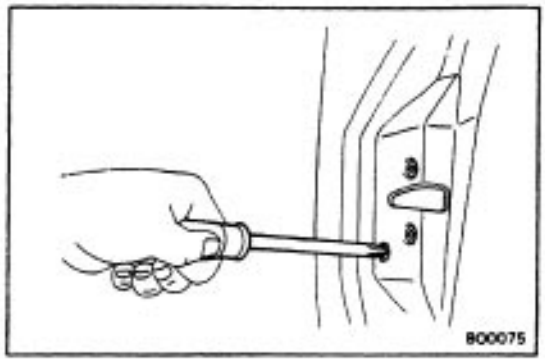




12. REMOVE FRONT DOOR BELT MOULDING

(a) Remove the screw.

(b) Pry loose the clips from the edge of the panel and remove the front door belt moulding.

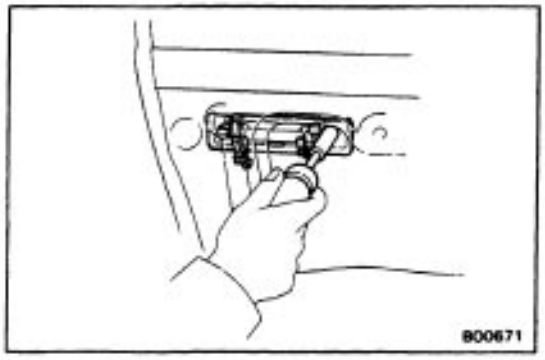


13. REMOVE DOOR LOCK

(a) Disconnect the links from the door outside handle and door lock cylinder.

(b) Remove the three screws and the door lock.

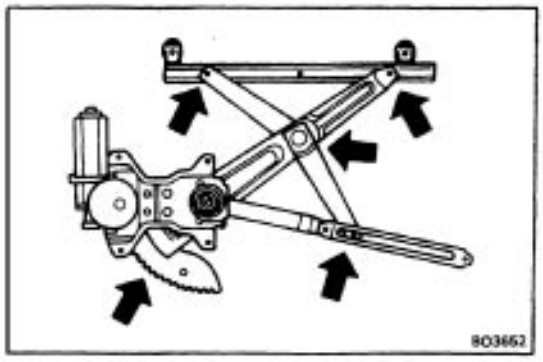
(c) (w/ Power Door Lock)
Remove the screw and door lock solenoid.



14. REMOVE DOOR OUTSIDE HANDLE AND DOOR LOCK CYLINDER

(a) Remove the two bolts and door outside handle.

(b) Remove the clip and door lock cylinder.



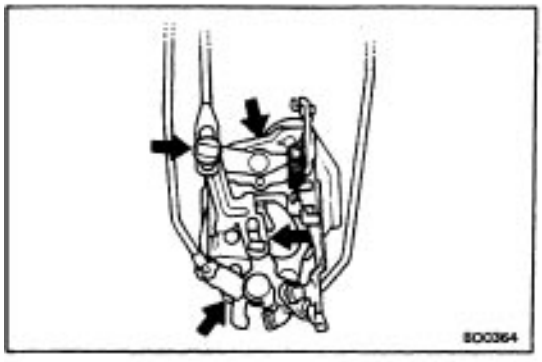
ASSEMBLY OF FRONT DOOR

(See page BO–3)

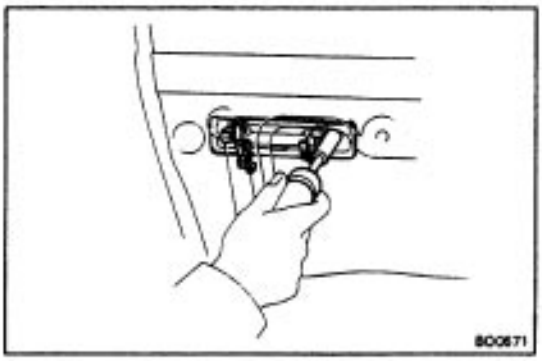
1. BEFORE INSTALLING PARTS, COAT THEM WITH MIP GREASE

(a) Coat the sliding surface and gears of the window regulator with MP grease.

NOTICE: Do not apply MP grease to the spring of the window regulator.



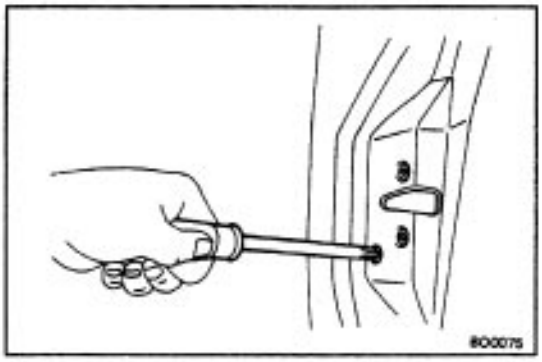
(b) Coat the sliding surface of the door lock with IMP grease.



2. INSTALL DOOR OUTSIDE HANDLE AND DOOR LOCK CYLINDER

(a) Install the door outside handle with the two bolts.

(b) Install the door lock cylinder with the clip.

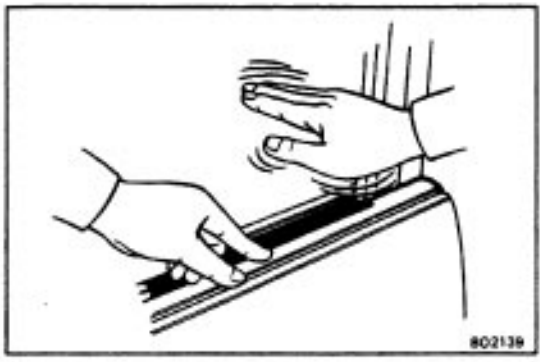


3. INSTALL DOOR LOCK

(a) (w/ Power Door Lock)
Install the door lock solenoid to the door lock with the screw.

(b) Install the door lock with the three screws.

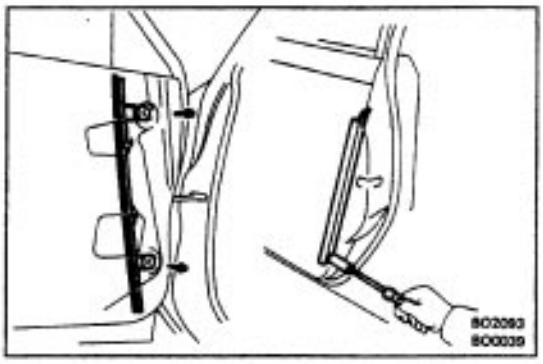
(e) Install the links to the door outside handle and door lock cylinder.



4. INSTALL FRONT DOOR BELT MOULDING

(a) Insert the claw of the clips into the upper panel hole and push the front door belt moulding onto the panel.

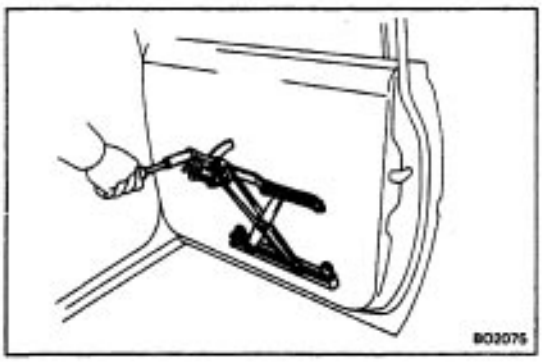
(b) Install the screw.



5. INSTALL FRONT LOWER FRAME

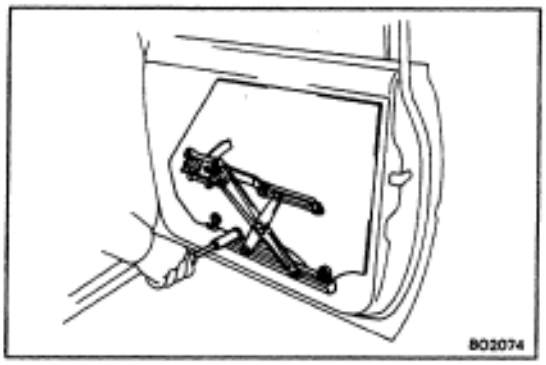
Install the front lower frame with the two bolts.

6. INSTALL REAR LOWER FRAME



7. INSTALL WINDOW REGULATOR

Place the regulator through the service hole and install the five mounting bolts.

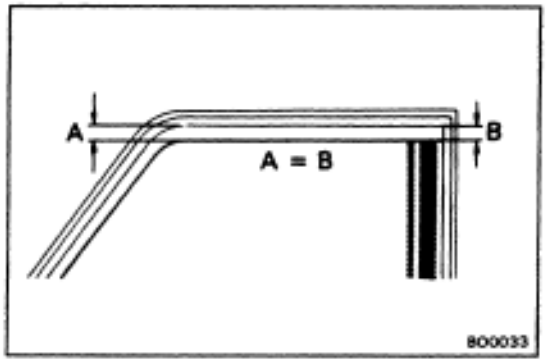


8. INSTALL DOOR GLASS

(a) Place the glass in the door cavity.

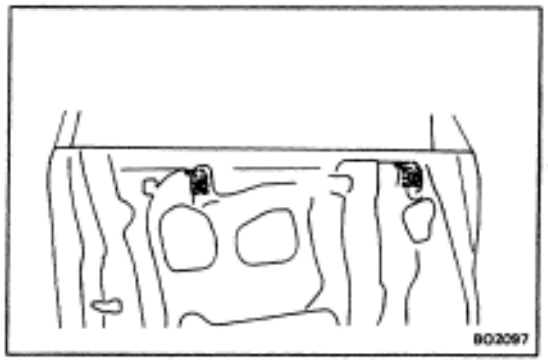
(b) Install the glass to the regulator with the two mounting nuts.

9. INSTALL DOOR GLASS RUN



10. ADJUST DOOR GLASS

(a) Adjust the equalizer arm up or down and tighten it where dimensions A and6, as shown, are equal.

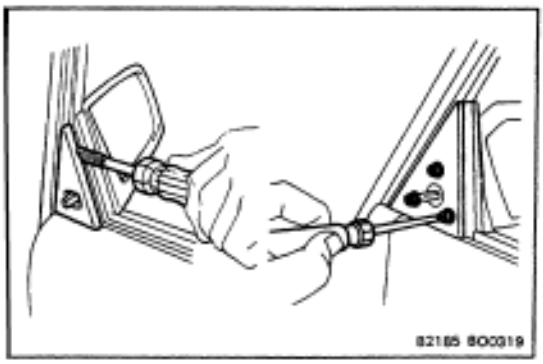


(b) With the door glass fully closed, .adjust the door glass stopper so it lightly makes contact with the glass plate.

11. INSTALL OPENING CONTROL LINK

12. INSTALL SERVICE HOLE COVER

13. INSTALL DOOR TRIM



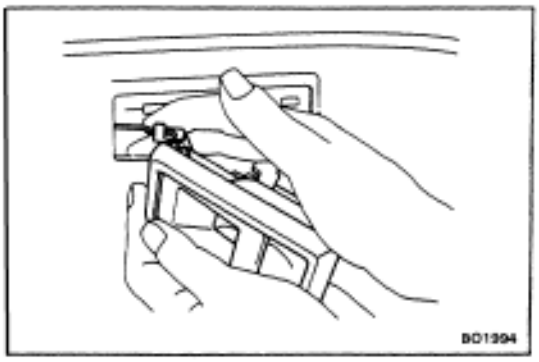
14. INSTALL REAR VIEW MIRROR

(a) Install the mirror with the three screws.

(b) (Electrical type)
Connect the connector.

(c) Install the cover.

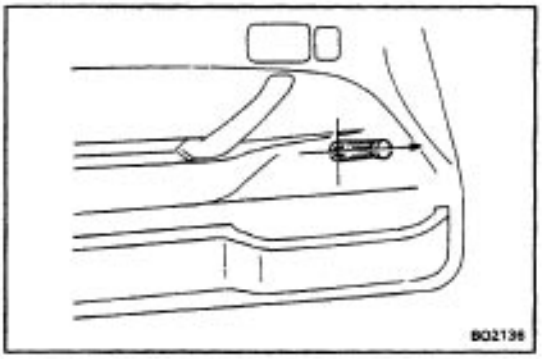
(d) (Manual type)
Install the knob with the setting screw.



15. INSTALL DOOR INSIDE HANDLE

(a) Connect the handle to the control link.

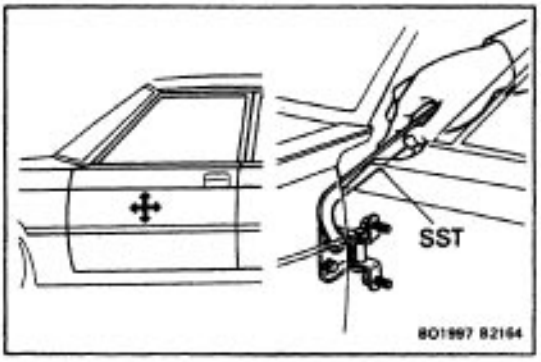
(b) Install the handle, slide it rearward, and install the screw.



16. INSTALL REGULATOR HANDLE

With door window fully closed, install the plate and regulator handle with a snap ring as shown.

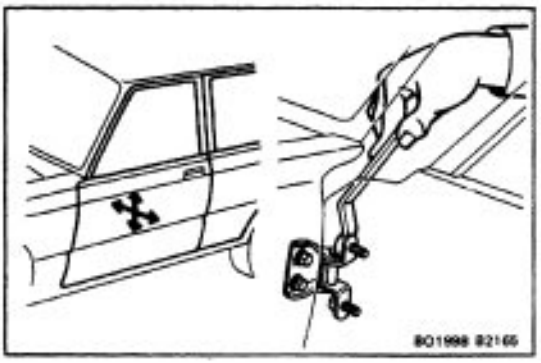
ADJUSTMENT OF FRONT DOOR



1. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

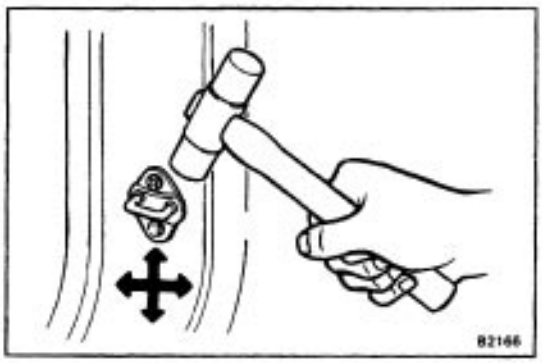
Using SST, adjust the door by loosening the body side hinge bolts.

SST 09812–00010



2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

Loosen the door side hinge bolts to adjust.



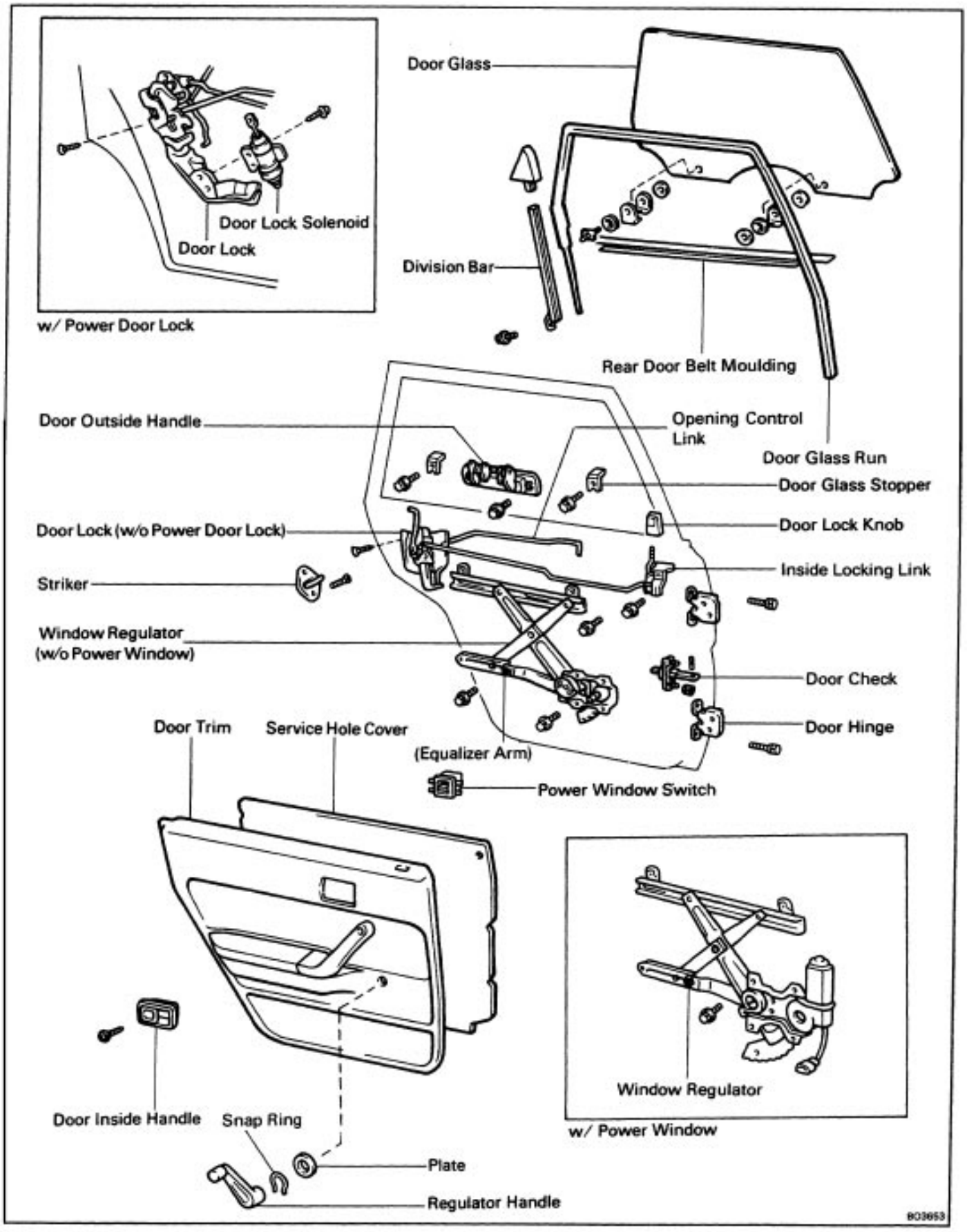
3. ADJUST DOOR LOCK STRIKER

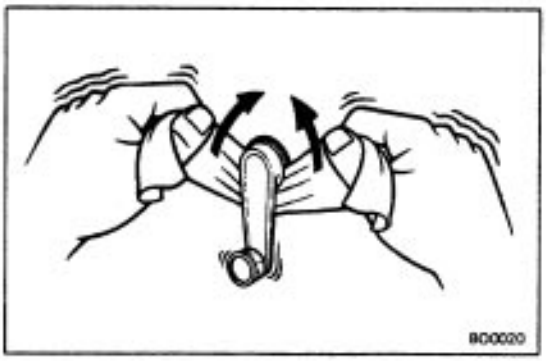
(a) Check that the door fit and door lock linkages are adjusted correctly.

(b) Adjust the striker position by slightly loosening the striker mounting screws, and hitting the striker with a hammer.

Tighten the striker mounting screws again.

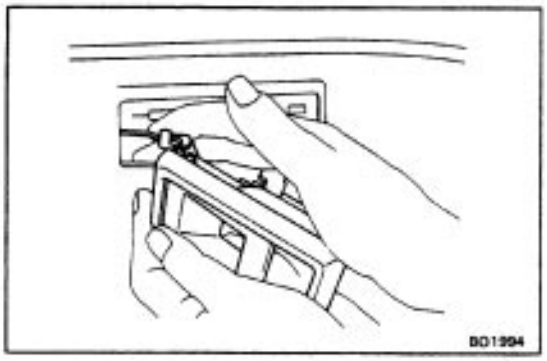
REAR DOOR
COMPONENTS



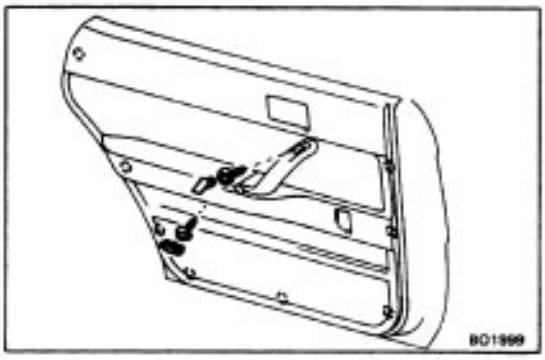


DISASSEMBLY OF REAR DOOR

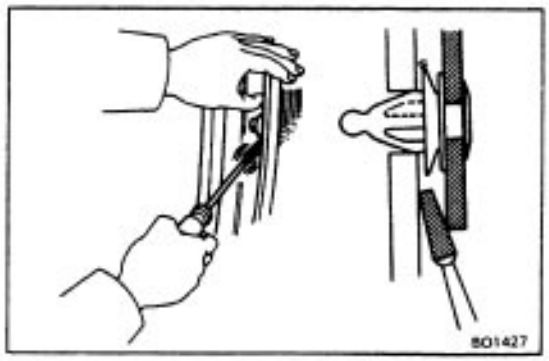
1. REMOVE REGULATOR HANDLE
(w/o POWER WINDOW)
Pull oft the snap ring with a cloth and remove the regulator handle and plate.



2. REMOVE DOOR INSIDE HANDLE
(a) Remove the screw, and slide the handle forward.
(b) Disconnect the control link and remove the handle.



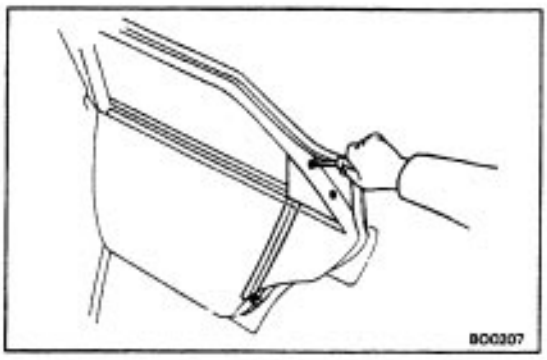
3. REMOVE DOOR TRIM WITH INNER WEATHERSTRIP
(a) Remove the two screws from the armrest.



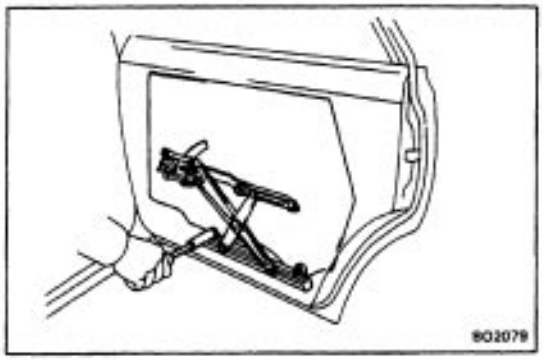
(b) Insert a screwdriver between the trim retainers and the door panel to pry it loose.
HINT: Tape the screwdriver tip before use.

4. REMOVE SERVICE HOLE COVER

5. REMOVE DOOR GLASS RUN



6. REMOVE DIVISION BAR
(a) Remove the two screws under the weatherstrip.
(b) Remove the bolt.
(c) Pull out the division bar.

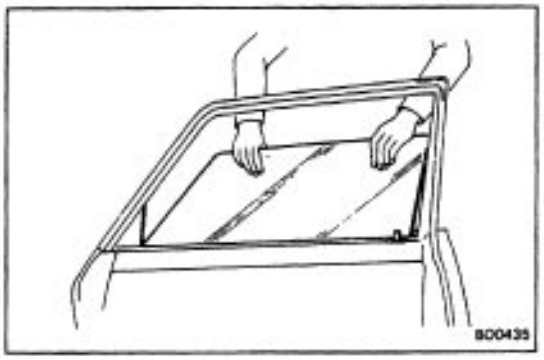


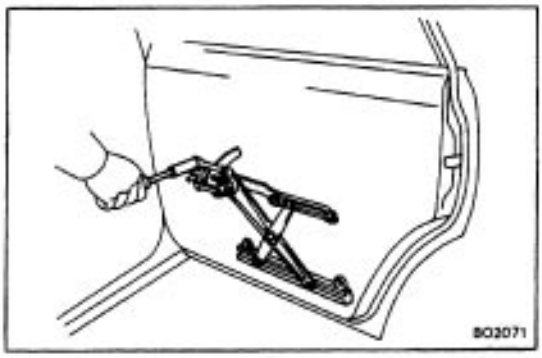
7. REMOVE DOOR GLASS

(a) Wind the glass down into the door cavity.

(b) Remove the two glass channel mounting nuts.

(c) Remove the door glass by pulling it upward.



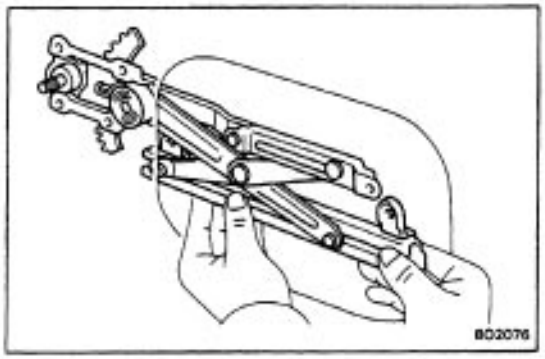


8. REMOVE WINDOW REGULATOR

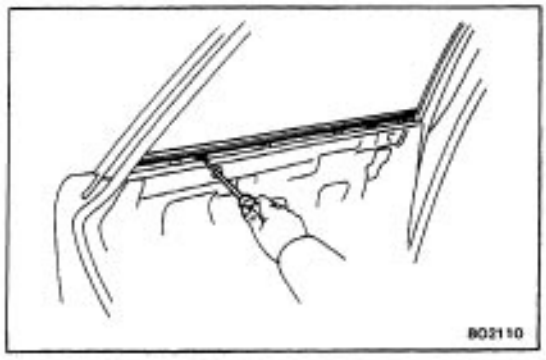
(a) (w/ Power Window)
Disconnect the connector.

(b) Remove the regulator –mounting bolts.

(c) Remove the equalizer arm bracket mounting bolts.

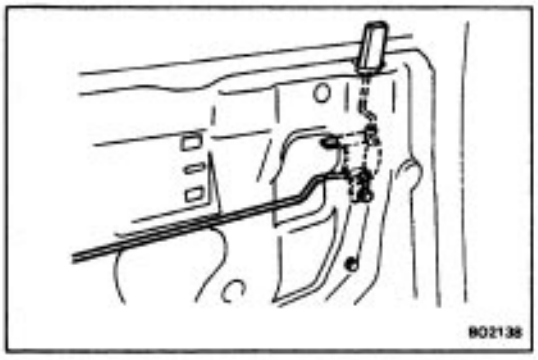


(d) Remove the regulator through the service hole.



9. REMOVE REAR DOOR BELT MOULDING

Pry out the rear door belt moulding with the clip as shown.

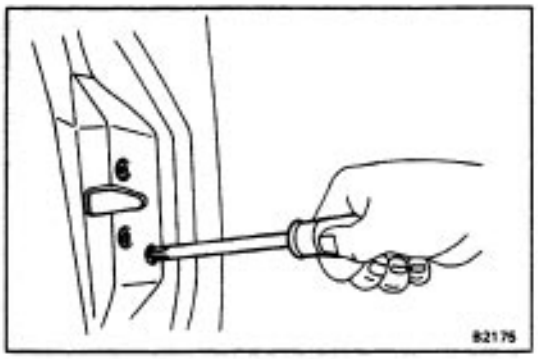


10. REMOVE INSIDE LOCKING LINK AND KNOB

Remove the bolt and disconnect the link from the door lock.

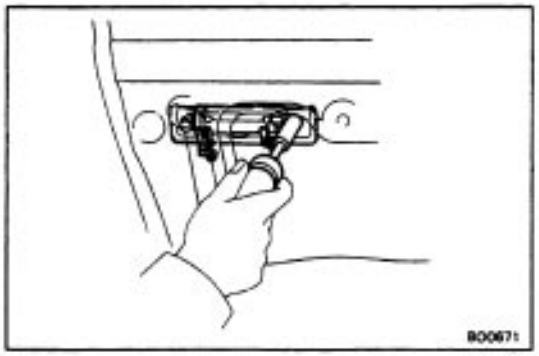
11. REMOVE OPENING CONTROL LINK

Disconnect the link from the door lock.



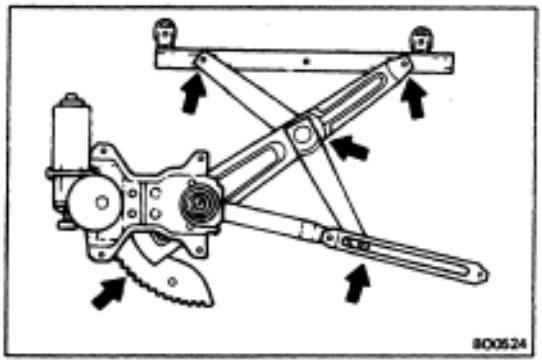
12. REMOVE DOOR LOCK

(a) Disconnect the link from the door outside handle.
(b) Remove the three screws and door lock.
(e) (w/ Power Door Lock)
Remove the screw and door lock solenoid.



13. REMOVE DOOR OUTSIDE HANDLE

Remove the two bolts and door outside handle.



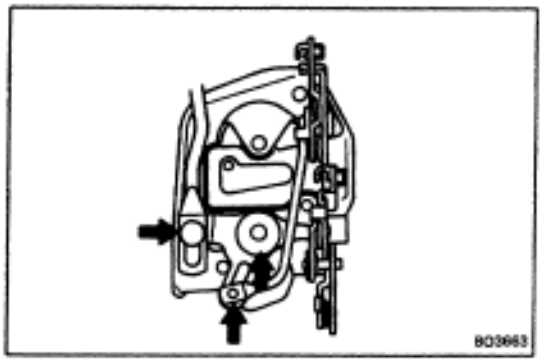
ASSEMBLY OF REAR DOOR

(See page SO–11)

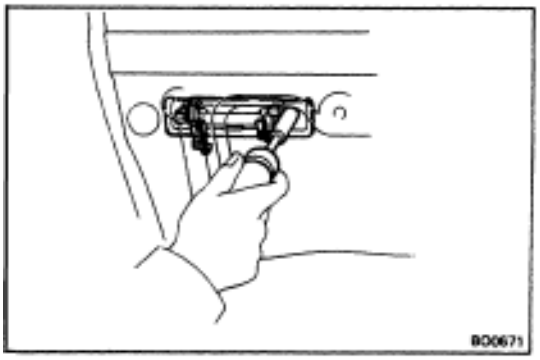
1. BEFORE INSTALLING PARTS, COAT THEM WITH MP GREASE

(a) Coat the sliding surface and gears of the window regulator with MP grease.

NOTICE: Do not apply MP grease to the spring of the window regulator.

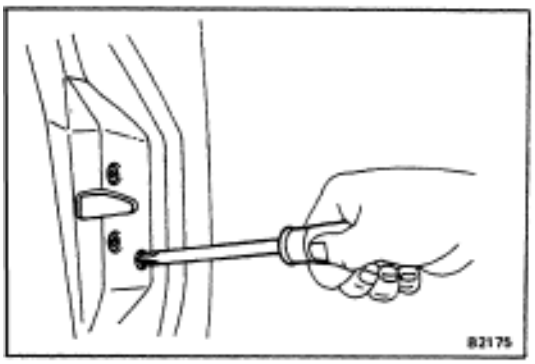


(b) Coat the sliding surface of the door lock with MP grease.



2. INSTALL DOOR OUTSIDE HANDLE

Install the door outside handle with two bolts.

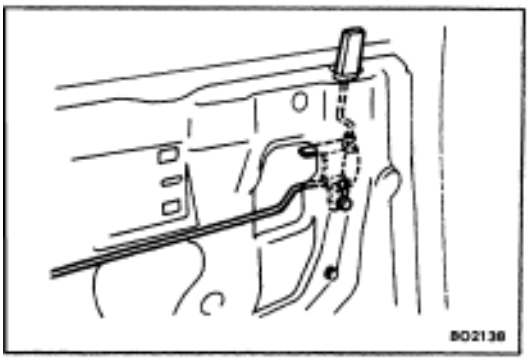


3. INSTALL DOOR LOCK

(a) (w/ Power Door Lock)
Install the door lock solenoid to the door lock with the screw.

(b) Install the door lock with three screws.

(c) Connect the link to the outside handle.



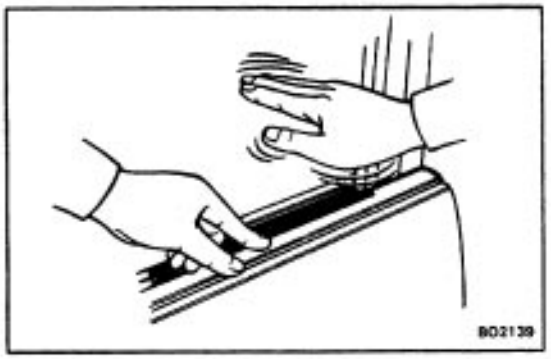
4. INSTALL OPENING CONTROL LINK

Connect the link to the door lock.

5. INSTALL INSIDE LOCKING LINK AND KNOB

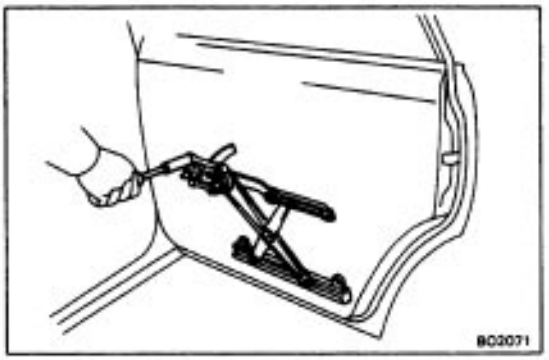
(a) Connect the link to the door lock.

(b) Install the link and knob with the bolt.



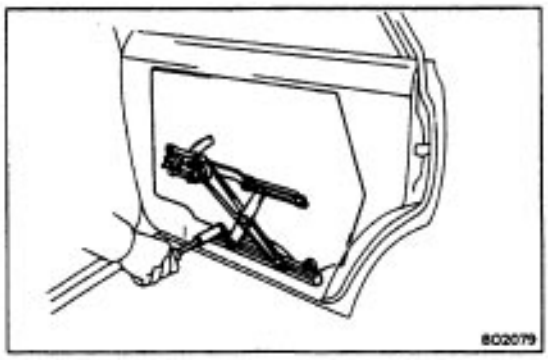
6. INSTALL REAR DOOR BELT MOULDING

Insert the claw of the clips into the upper panel hole and push the rear door belt moulding onto the panel.



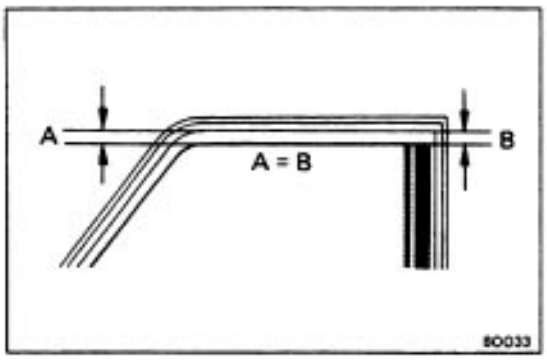
7. INSTALL WINDOW REGULATOR

(a) Place the regulator through the service hole.
(b) Install the five mounting bolts.
(c) (w/ Power Window)
Connect the connector.



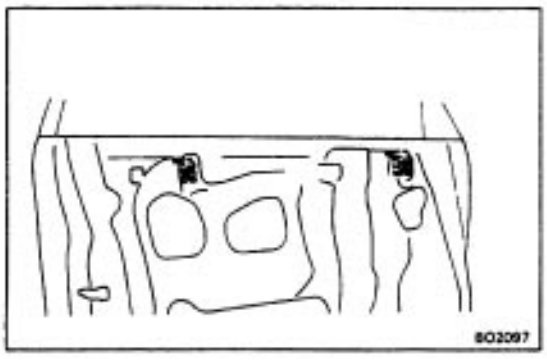
8. PLACE DOOR GLASS IN DOOR

(a) Insert the door glass in the door cavity.
(b) Install the regulator into the door glass rail.
(c) Install the two glass channel mounting nuts.

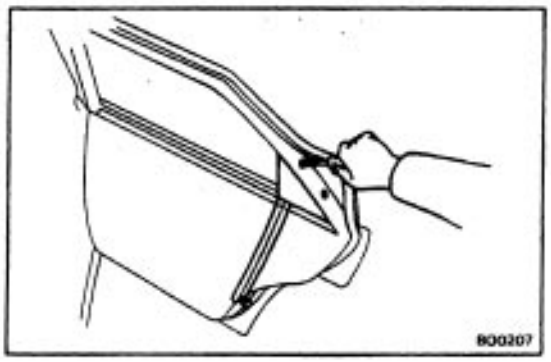


9. ADJUST DOOR GLASS

Adjust the equalizer arm up or down and tighten it where dimension A and6, as shown, are equal.



(b) With the door glass fully closed, adjust the door glass, stopper so it lightly makes contact with the glass plate.



10. INSTALL DIVISION BAR

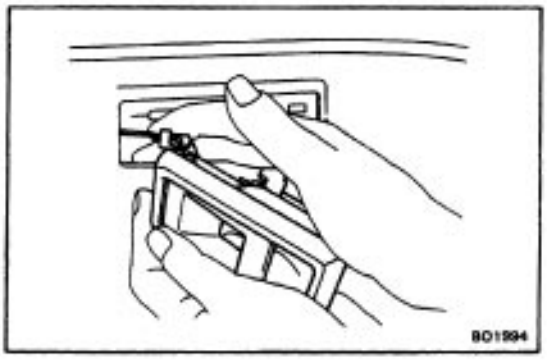
(a) Place the division bar in the door.

(b) Install the two screws and bolt.

11. INSTALL DOOR GLASS RUN

12. INSTALL SERVICE HOLE COVER

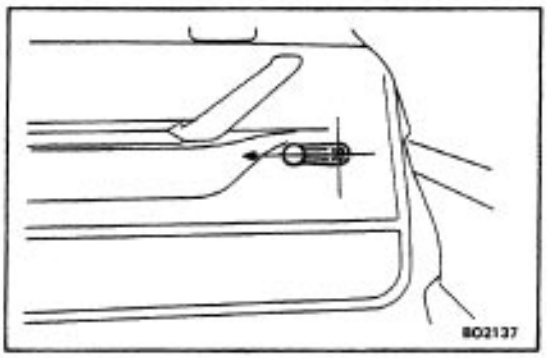
13. INSTALL DOOR TRIM WITH INNER WEATHERSTRIP



14. INSTALL DOOR INSIDE HANDLE

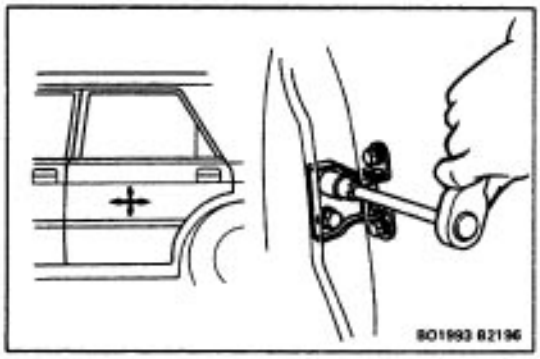
(a) Connect the handle to the control link.

(b) Install the handle, slide it rearward, and install the screw.



15. INSTALL REGULATOR HANDLE

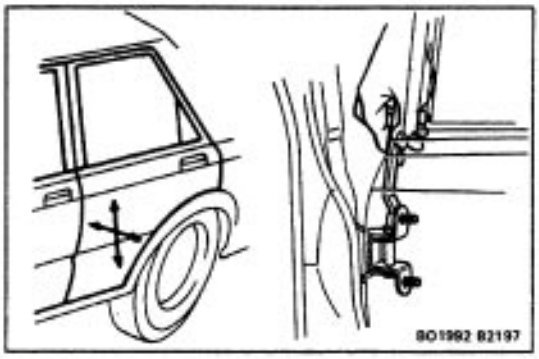
With the door window fully closed, install the plate and regulator handle with the snap ring as shown.



ADJUSTMENT OF REAR DOOR

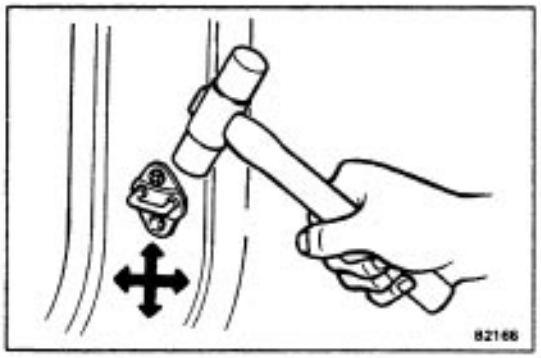
1. ADJUST DOOR IN FORWARD/ REARWARD AND VERTICAL DIRECTIONS

Using a wrench, loosen the body side hinge bolts.



2. ADJUST DOOR IN LEFT/RIGHTAND VERTICAL DIRECTIONS

Using a wrench, loosen the door side hinge bolts.

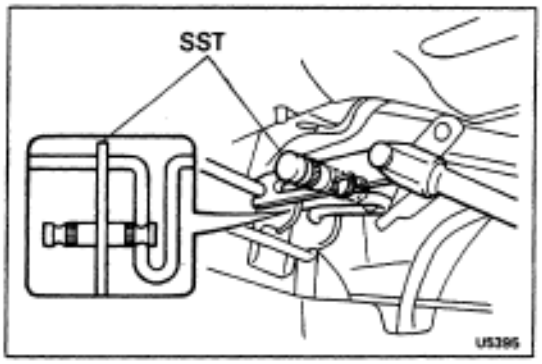


3. ADJUST DOOR LOCK STRIKER

(a) Check that the door fit and lock linkages are adjusted correctly.

(b) Adjust the striker position by slightly loosening the striker mounting screws, and hitting the striker with a hammer.

Tighten the striker mounting screws again.

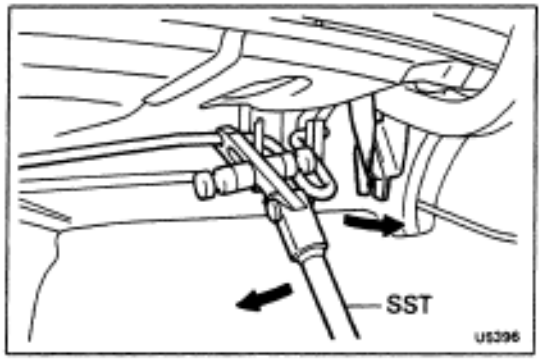


LUGGAGE COMPARTMENT LID

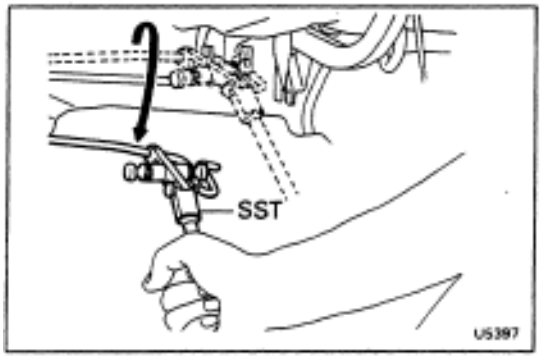
REMOVAL OF TORSION BAR

REMOVE TORSION BAR FROM LUGGAGE COMPARTMENT LID HINGE

(a) Install SST to the torsion bar on the hinge side.
SST 09804–24010



(b) Push down on SST, and pull the luggage compartment lid hinge from the torsion bar.

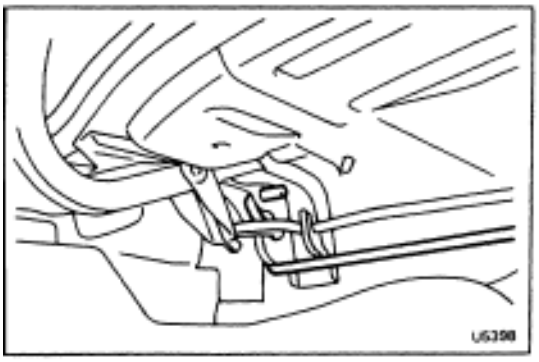


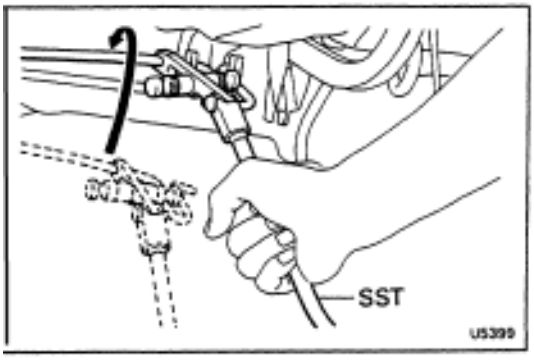
(c) Slowly lift SST, and remove the torsion bar from the torsion bar bracket with SST.
(d) Remove the torsion bar from the center bracket.
(e) Do the same for the other side.

INSTALLATION OF TORSION BAR

INSTALL TORSION BAR TO LUGGAGE COMPARTMENT LID HINGE

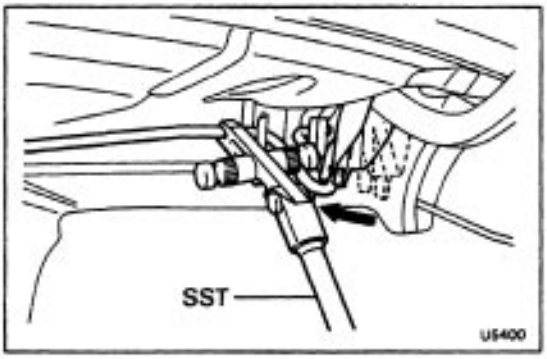
(a) Insert the torsion bar into the bracket as shown.
(b) Connect the torsion bar to the center bracket.



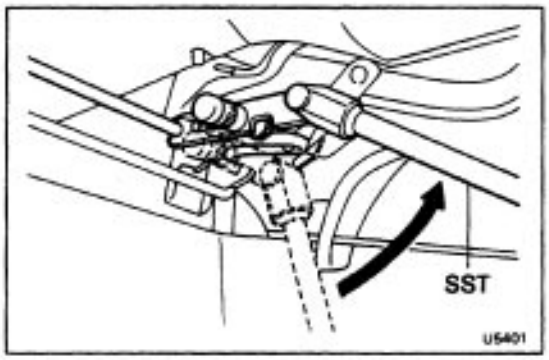


(c) Install SST to the torsion bar of the hinge side.
SST 09804–24010
(d) Slowly lift the torsion bar with SST and place on the torsion bar bracket.

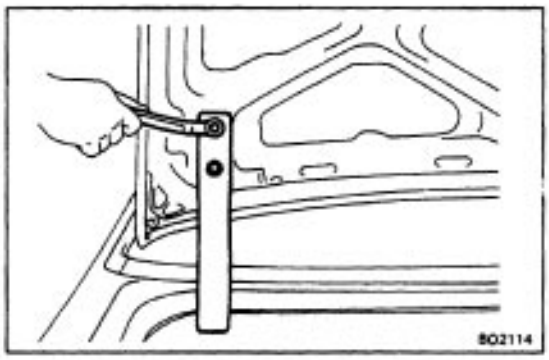
(e) Slowly pushdown SST, and install the torsion bar to the luggage compartment !id hinge.



(f) Slowly lift SST, and install the torsion bar.
Do the same for the other side.

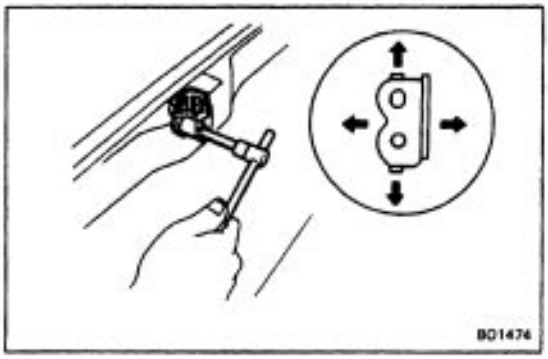


ADJUSTMENT OF LUGGAGE COMPARTMENT LID



(a) Forward/rearward and left/right adjustments loosen the bolts.
(b) For vertical adjustment of front end of lid, increase or decrease the number of washers.

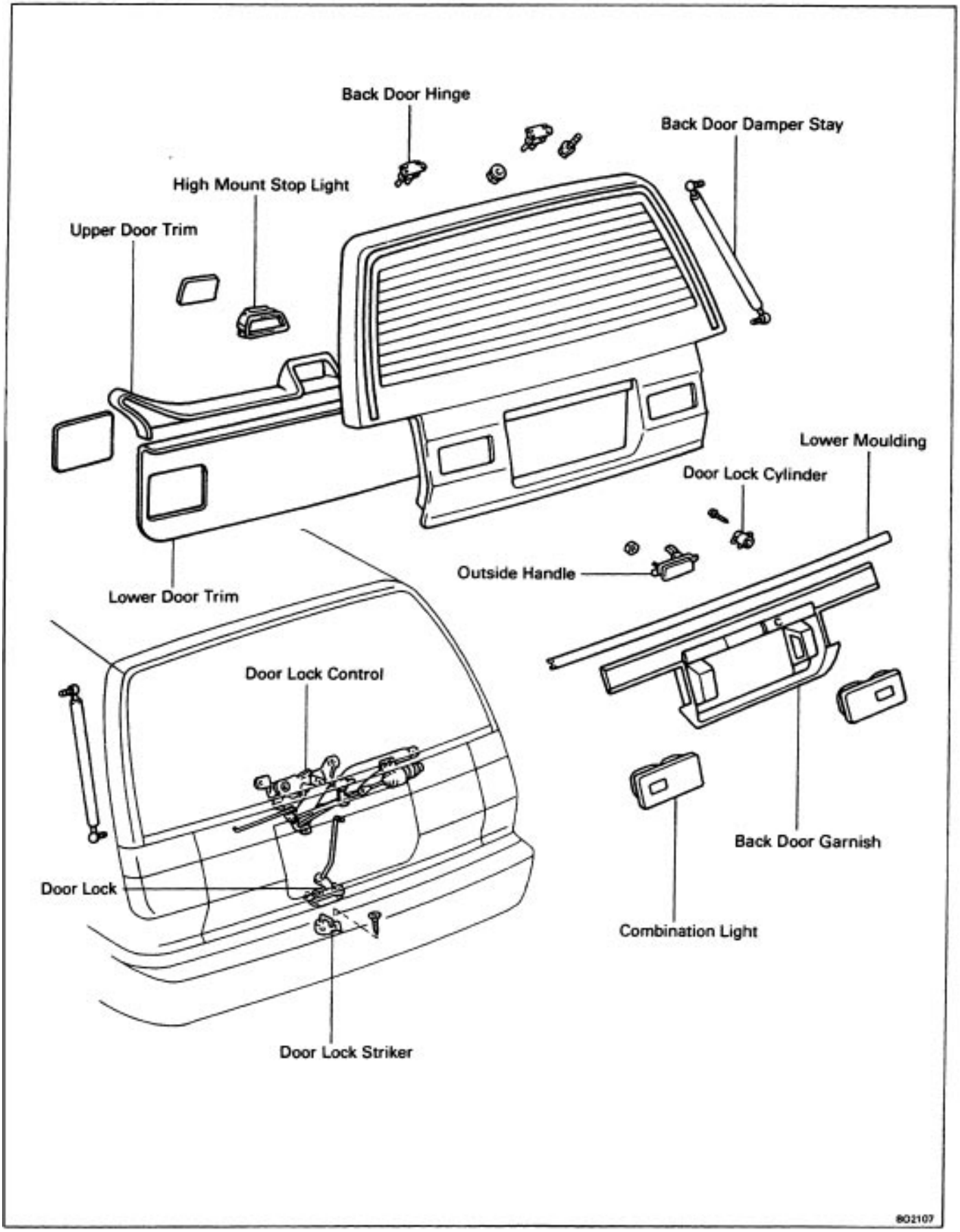
ADJUSTMENT OF LOCK STRIKER

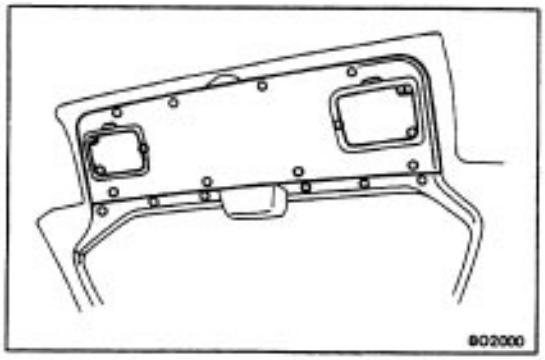


(a) Loosen the mounting bolts.
(b) Using a brass bar and hammer, tap the striker to adjust it.

BACK DOOR

COMPONENTS





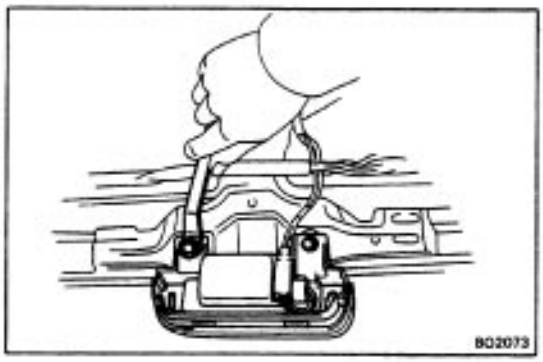
DISASSEMBLY OF BACK DOOR

1. REMOVE UPPER AND LOWER DOOR TRIMS

(a) Remove the six clips.

(b) Insert a screwdriver between the trim retainers and door panel to pry it loose.

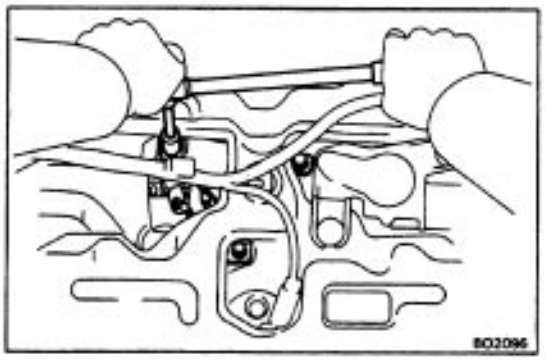
HINT: Tape the screwdriver tip before use.



2. REMOVE HIGH MOUNT STOP LIGHT

(a) Disconnect the connector from the high mount stop light.

(b) Remove the two bolts and high mount stop light.



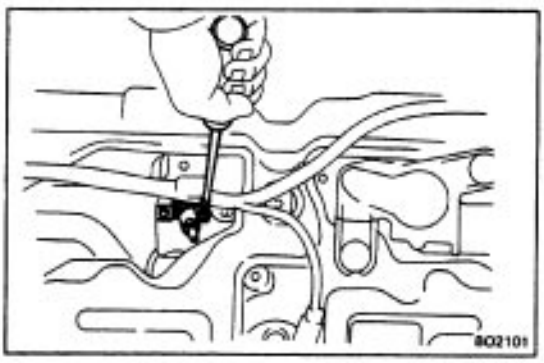
3. REMOVE DOOR LOCK CONTROL

(a) Remove the link protector.

(b) Disconnect the links from the door lock control and door lock cylinder.

(c) Disconnect the connector from the solenoid.

(d) Remove the four bolts and door lock control with the solenoid.

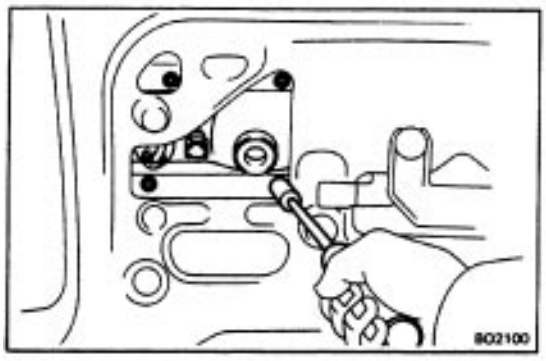


4. REMOVE DOOR LOCK CYLINDER

Remove the two screws and door lock cylinder.

5. REMOVE LOWER MOULDING

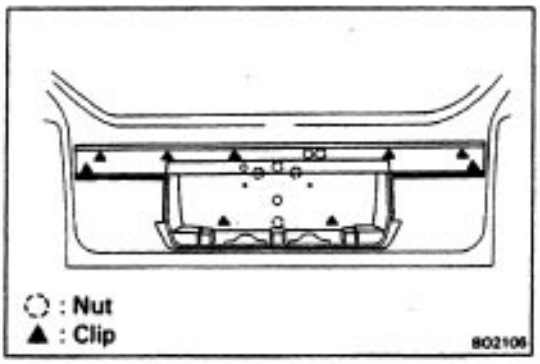
(See page 80–36)



6. REMOVE COMBINATION LIGHT

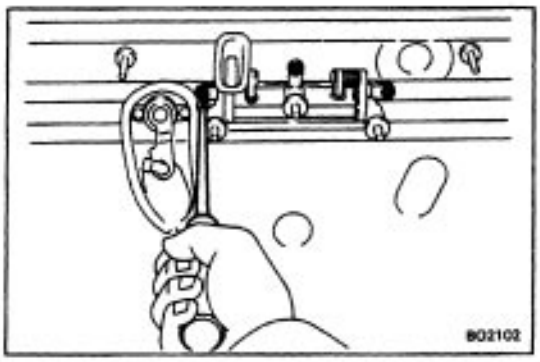
(a) Disconnect the connector from the combination light.

(b) Remove the eight nuts and combination light.



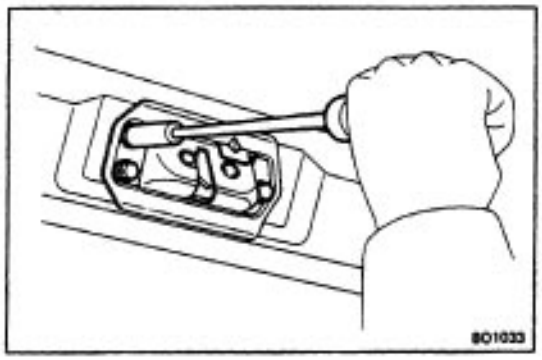
7. REMOVE BACK DOOR GARNISH

Remove the five nuts, nine clips and back door garnis**h.**



8. REMOVE OUTSIDE HANDLE

Remove the three screws and outside handle.



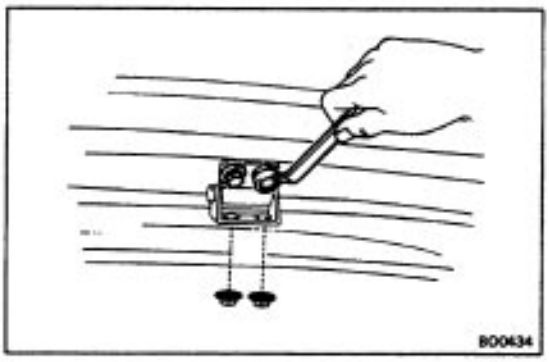
9. REMOVE DOOR LOCK

Remove the three bolts and door lock.

ASSEMBLY OF BACK DOOR

(See page 80–21)

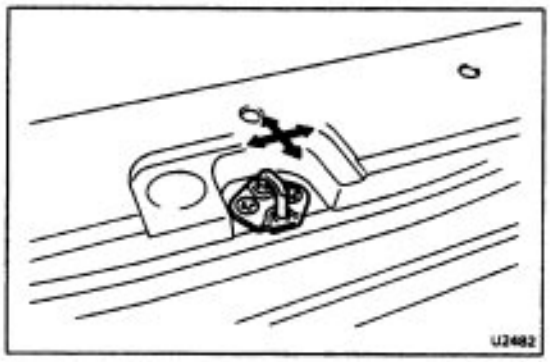
INSTALL BACK DOOR PARTS BY FOLLOWING DISASSEMBLY SEQUENCE IN REVERSE



ADJUSTMENT OF BACK DOOR

1. ADJUST DOOR IN FORWARD/REARWARD AND LEFT/RIGHT DIRECTIONS

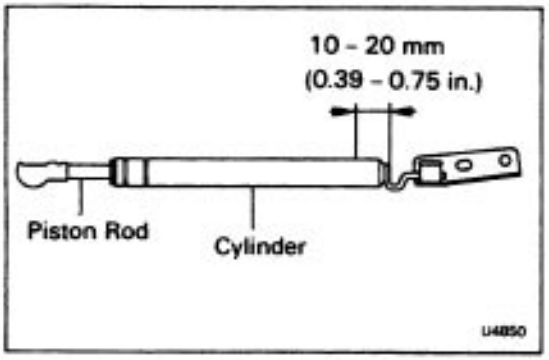
Adjust the door by loosening the hinge bolts.



2. ADJUST DOOR LOCK STRIKER

(a) Loosen the mounting bolts.

(b) Using a plastic hammer, tap the striker to adjust it.



Back Door Damper Stay

NOTICE: Handling the damper. .

(a) Do not disassemble the damper because the cylinder is filled with pressurized gas.

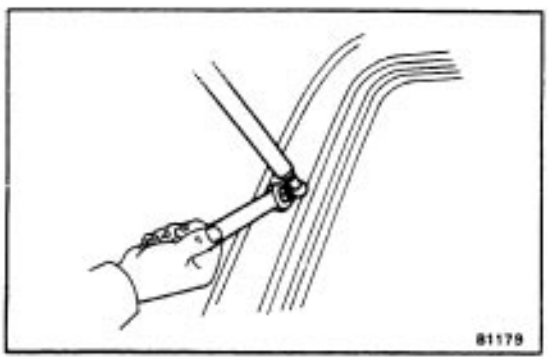
(b) If the damper is to be replaced, drill a 2.0 – 3.0ttm (0.079 – 0.118 in.) hole in the bottom of the removed damper cylinder to completely release the high–pressure gas before disposing of it.

(c) When drilling, chips may fly out, so work carefully.

(d) The gas is colorless, odorless and non poisonous.

(e) When working, handle the damper carefully. Never score or scratch the exposed part of the piston rod, and never allow paint or oil to get on it.

(f) Do not turn the piston rod and cylinder with the damper fully extended.



REMOVAL OF DAMPER STAY

1. REMOVE DAMPER STAY UPPER END FROM BACK DOOR

2. REMOVE DAMPER STAY LOWER END FROM BODY

INSTALLATION OF DAMPER STAY

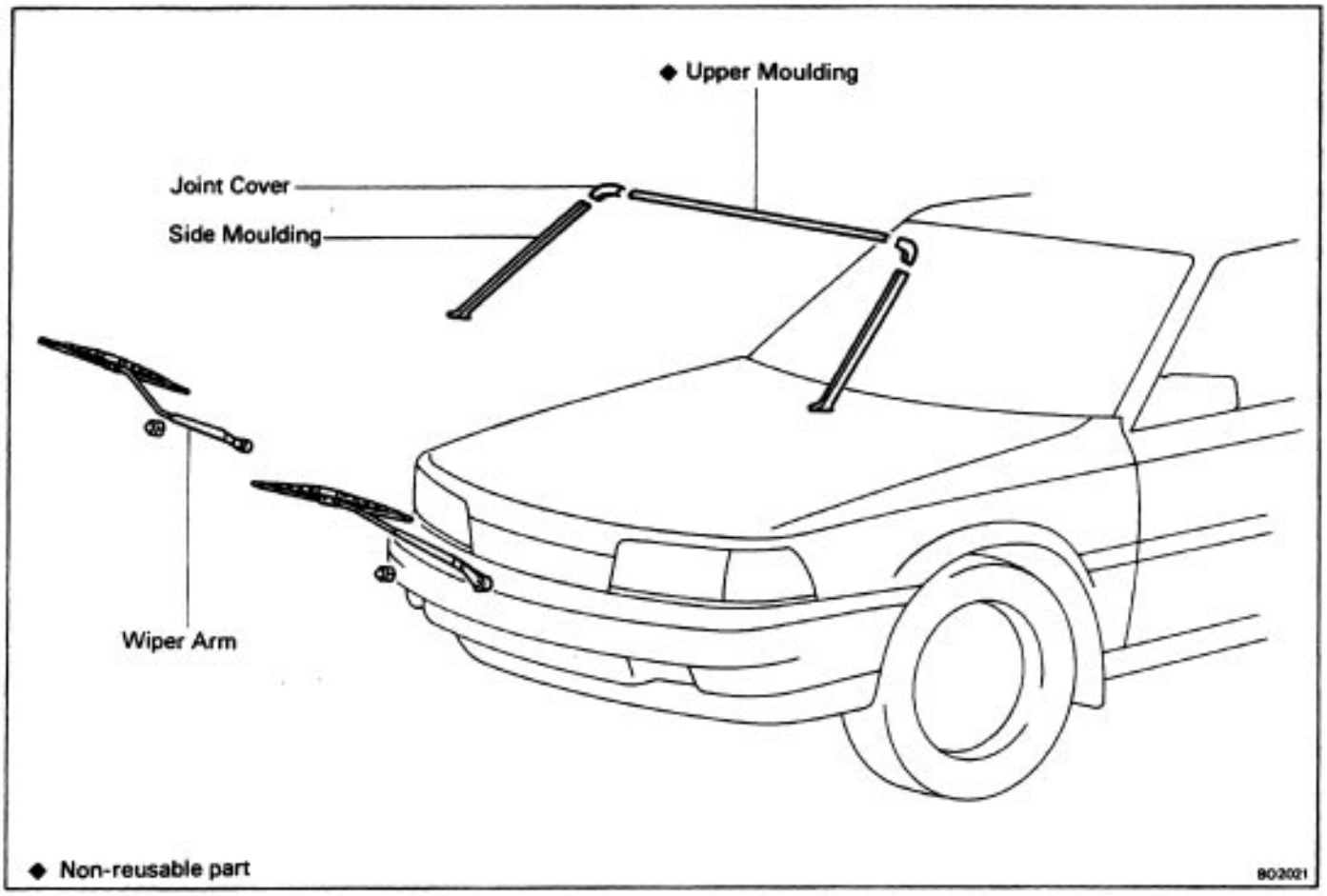
1. INSTALL DAMPER STAY UPPER END TO BACK DOOR

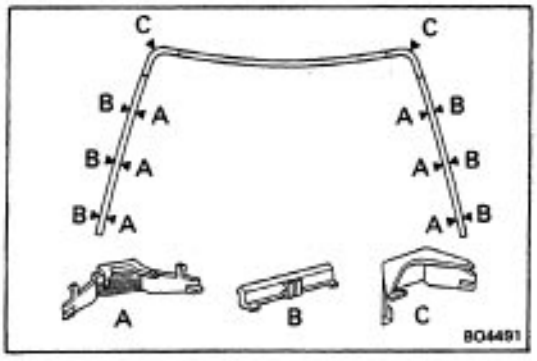
2. CONNECT DAMPER STAY LOWER END TO BODY

MOULDING

Windshield Outside Moulding

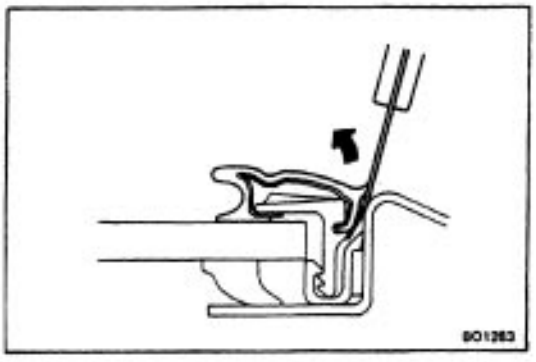
COMPONENTS





REMOVAL OF OUTSIDE MOULDING

Locations of clips and fasteners are as shown. Carefully apply adhesive tape to protect the body.



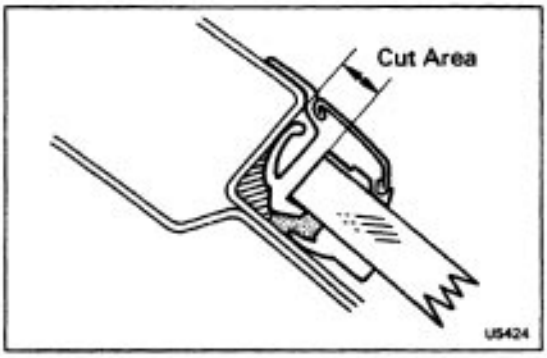
1. REMOVE SIDE MOULDING

(a) Insert the top of a scraper between the body and moulding. .

(b) Pry up the scraper to loosen the moulding from the claws of the clips and fasteners.

HINT: Apply tape to the scraper blade to prevent scratching the vehicle body.

(c) Remove the moulding.

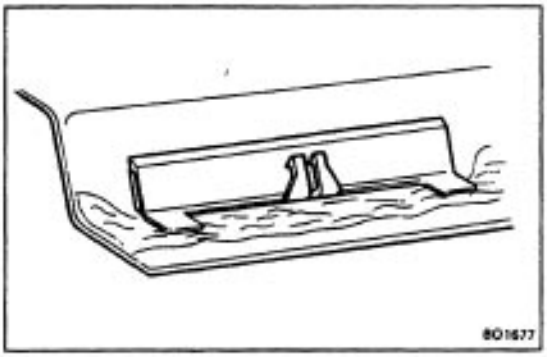


2. REMOVE UPPER MOULDING

Using a knife, cut off the upper moulding as shown.

HINT: Do not damage the body.

3. REMOVE WIPER ARM



REPLACEMENT OF FASTENER

REPLACE FASTENER

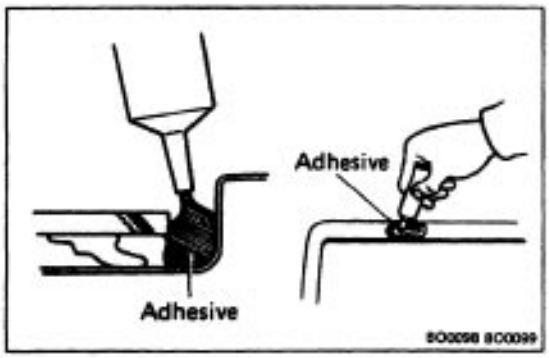
(a) Remove the damaged fastener.

(b) Cut off the old adhesive 6 round the fastener installation area.

HINT: Be careful not to damage the body.

(c) Clean the installation area.

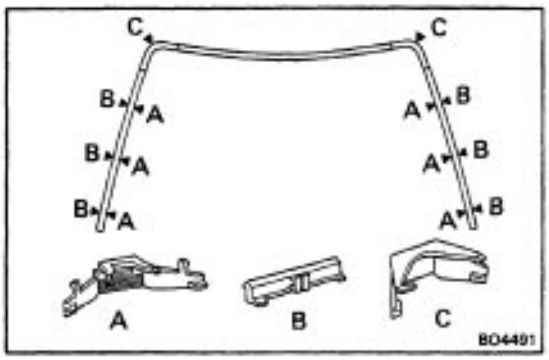
(d) Install a new fastener onto the body.



INSTALLATION OF OUTSIDE MOULDING

(See page BO–25)

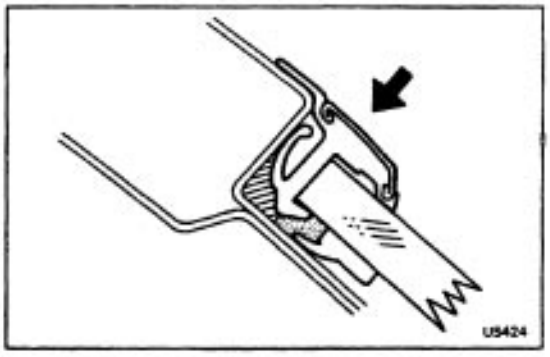
1. APPLY ADHESIVE AT A NEW CLIP AND UPPER MOULDING INSTALLATION AREA



2. INSTALL UPPER AND SIDE MOULDING

(a) Check the position of the clips on the moulding and the installation area.

(b) Place the moulding onto the body.

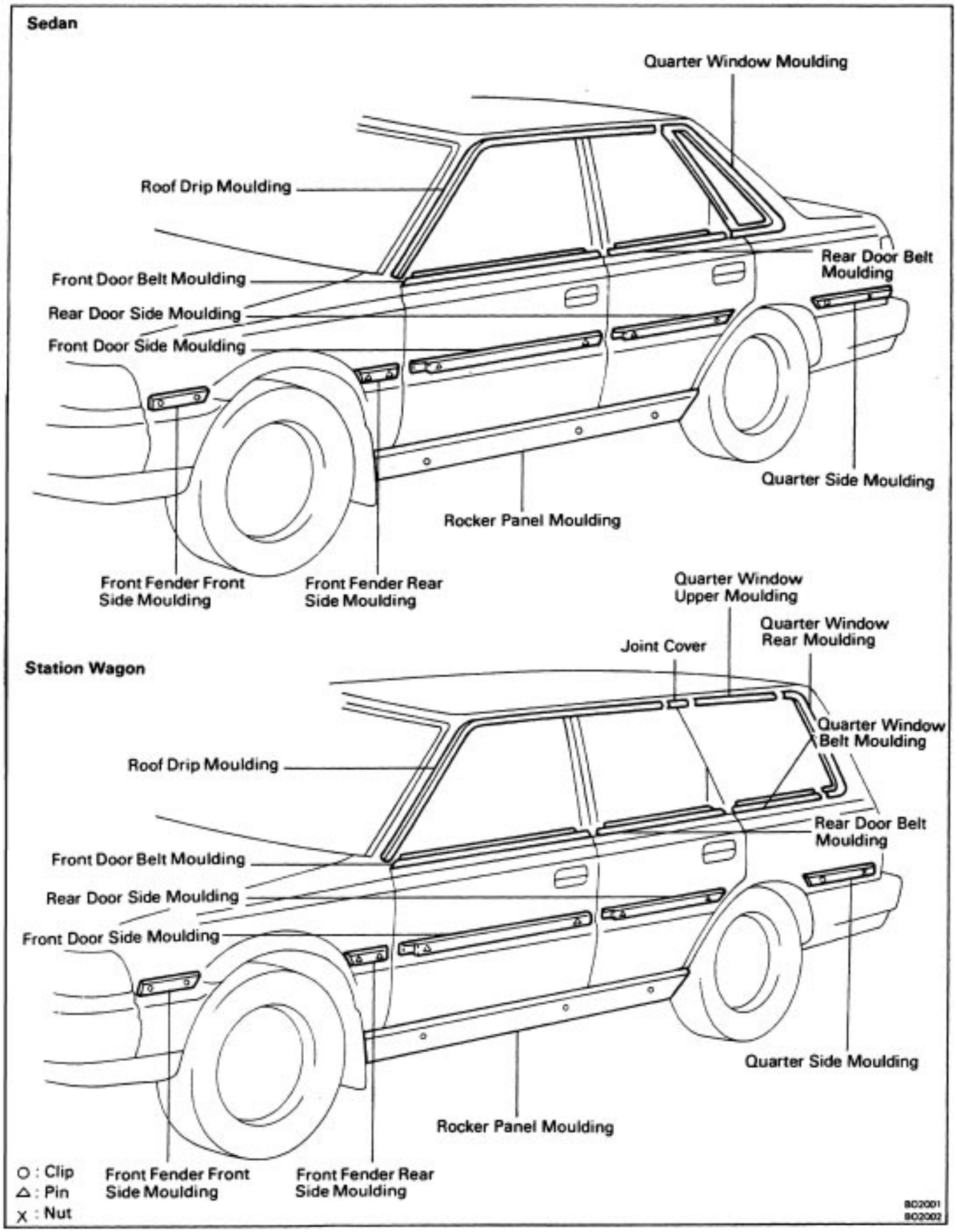


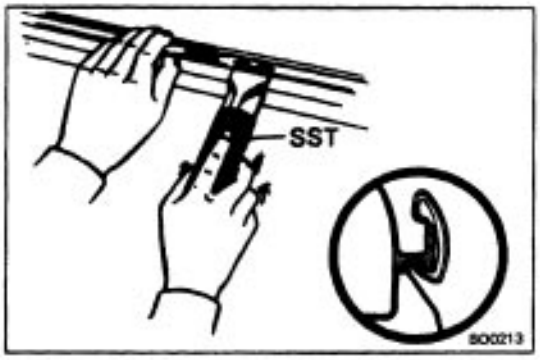
(c) Tap the moulding with your hand to fasten the clips at the glass edge. At the same time, install the fasteners by tapping them by hand.

3. INSTALL WIPER ARM

Side Moulding

COMPONENTS



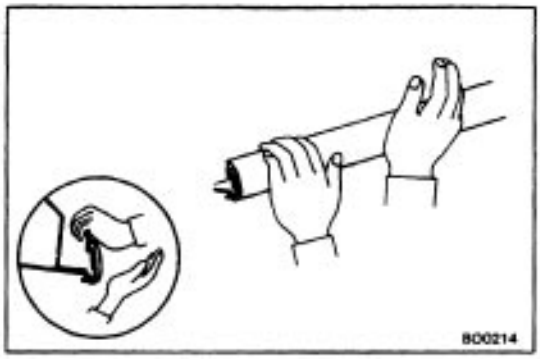


REMOVAL OF ROOF DRIP MOULDING

(See page BO–27)

REMOVE ROOF DRIP MOULDING

Using SST, pull oft the roof drip moulding from the front end.
SST 09806–30010

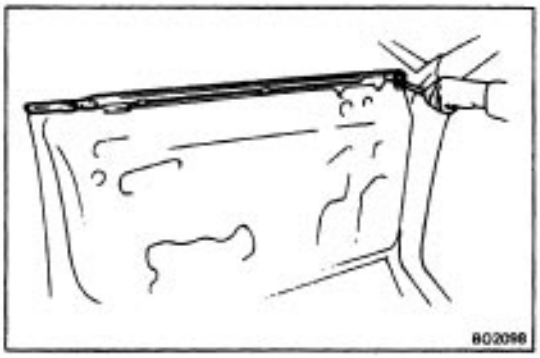


INSTALLATION OF ROOF DRIP MOULDING

(See page BO–27)

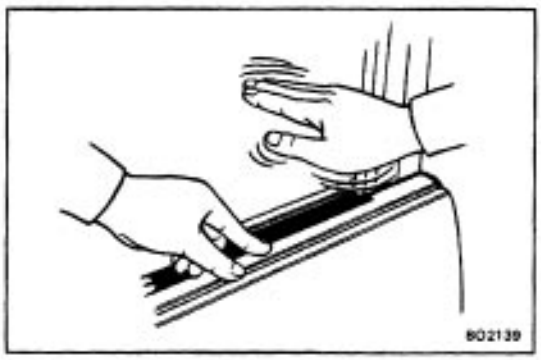
INSTALL ROOF DRIP MOULDING

Attach the upper edge of the moulding to the body flange.
Tap on the moulding by hand.



REMOVAL OF DOOR BELT MOULDING

1. **REMOVE DOOR GLASS**
   Front Door (See page BO–6)
   Rear Door (See page BO–1 3)
2. **REMOVE DOOR BELT MOULDING**
   (a) Remove the screw. (Front door)
   (b) Remove the two screws. (Rear door)
   (e) Pry loose the clips from the edge of the panel and remove the belt moulding.



INSTALLATION OF DOOR BELT MOULDING

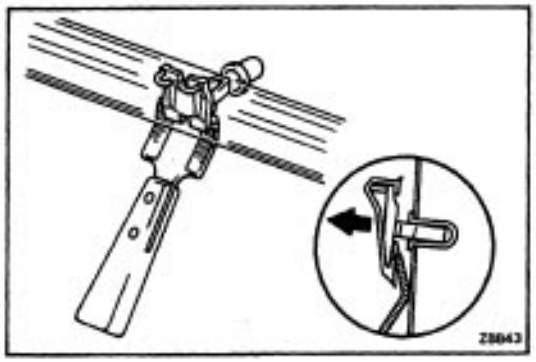
1. INSTALL DOOR BELT MOULDING
   (a) Tap the moulding onto the door by hand.
   (b) Install the screw. (Front door)
   (e) Install the two screws. (Rear door)
2. **INSTALL DOOR GLASS**
   Front Door (See page BO–9)
   Rear Door (See page BO–16)

REMOVAL OF QUARTER WINDOW MOULDING

Sedan (See page BO–44)
Station Wagon (See pages BO–46 and 47)

INSTALLATION OF QUARTER WINDOW MOULDING

Sedan (See page BO–45)
Station Wagon (See pages BO–47 and 48)



REMOVAL OF ROCKER PANEL MOULDING

(See page BO–27**)**

REMOVE ROCKER PANEL MOULDING

(a) Remove the two screws.

(b) Pry loose the clips with a scraper and remove the moulding.

HINT: Apply tape to the scraper blade to prevent scratching the vehicle body.

INSTALLATION OF ROCKER PANEL MOULDING

(See page BO–27**)**

INSTALL ROCKER PANEL MOULDING

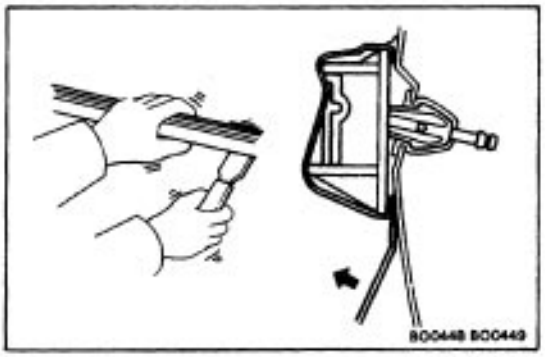
(a) Align the clip with the body hole and tap it in by hand.

(b) Install the two screws.

Side Body Moulding
TOOLS AND SUPPLIES

Part No.	Part name	Quantity
08850–00051	Adhesive (Super special) 20g (0–71 oz.)	1
	Cleaner (for cleaning body and removing body oil stains) Heat light	

Precautions for storing moulding material:
- Store in a cool place, avoiding direct sunlight, high temperatures and dust.
- The moulding is of polyvinyl chloride, so do not allow it to come in contact with thinner or other solvent, open flame, or boiling water.
- The storage time for the moulding, adhesive and Primer T is limited to about 9 months.



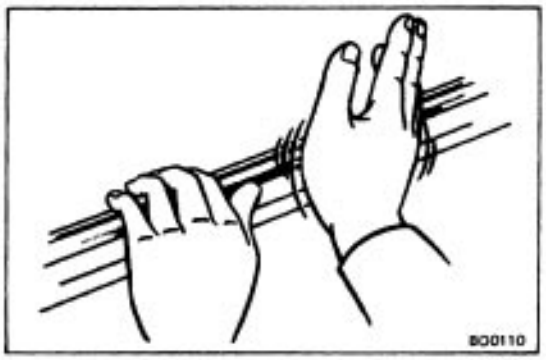
REMOVAL OF FRONT FENDER FRONT SIDE AND QUARTER SIDE MOULDING

REMOVE MOULDING

(a) Remove the nut from the moulding. (Front fender front side)

(b) Using a scraper, pry loose the clips and remove the moulding.

HINT: Apply tape to the scraper blade to prevent scratching the vehicle body.



INSTALLATION OF FRONT FENDER FRONT SIDE AND QUARTER SIDE MOULDING

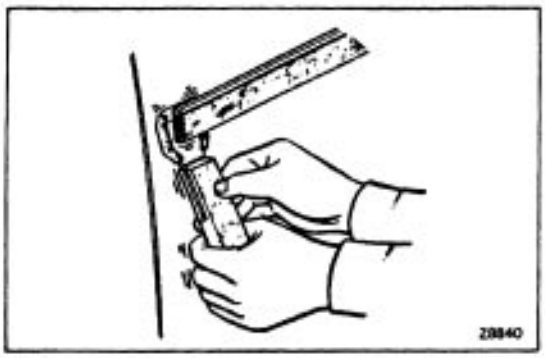
1. CLEAN MOULDING MOUNTING SURFACE

Wipe oft with a rag.

2. INSTALL MOULDING

(a) Install the clips to the moulding and push the moulding onto the panel by hand.

(b) Install the nut to the moulding. (Front fender front side)

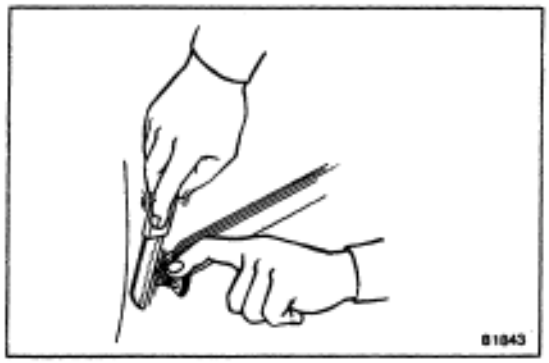


REMOVAL OF FRONT FENDER REAR SIDE AND DOOR SIDE MOULDING

1. REMOVE ENDS OF MOULDING

Using a scraper, pry the moulding loose about 30 mm (1.18 in.) from the ends.

HINT: Apply tape to the scraper blade to prevent scratching the vehicle body.



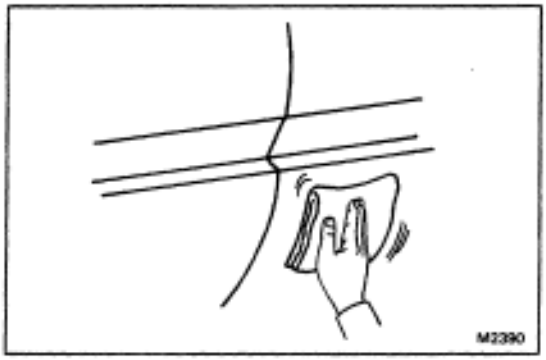
2. REMOVE MOULDING AND ADHESIVE

(a) Pull off the moulding by cutting the adhesive with a knife.

(b) Scrape. off adhesive from the body with a cutter or sandpaper.

NOTICE:

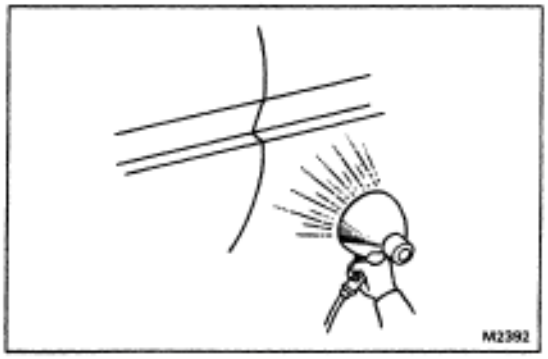
- 30 – 80 mm (1.18 – 3.15 in.) of the ends of the moulding are glued tightly with a strong adhesive.
- Do not reuse moulding.



INSTALLATION OF FRONT FENDER REAR SIDE AND DOOR SIDE MOULDING

1. CLEAN MOULDING MOUNTING SURFACE

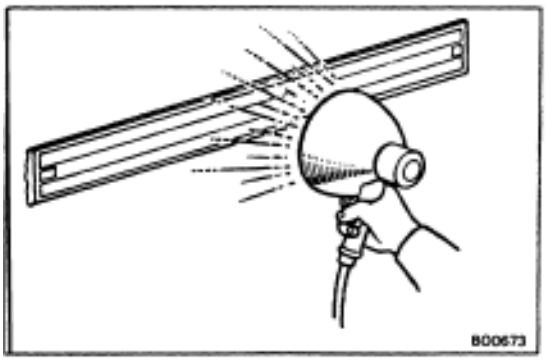
Wipe off stains with cleaner.



2. HEAT MOUNTING SURFACE

Using a heat tight, heat the mounting surface to 40 – 60 ˚C (104 – 140˚F).

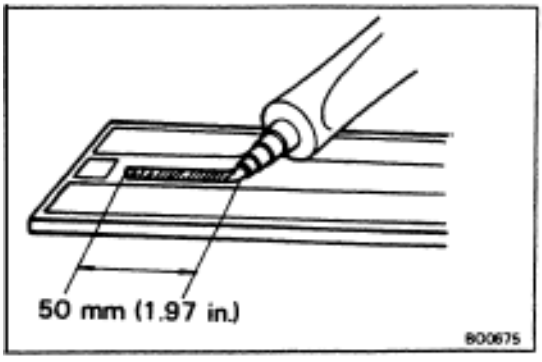
NOTICE: When the moulding is installed, the tem–perature of the mounting surface should be 20˚C (68˚F) of higher.



3. HEAT MOULDING

Using a heat light, heat the moulding to 30 60˚C (86 – 140˚F).

NOTICE: Do not heat moulding excessively. The tempera-ture should not be higher than 80˚C (176˚F).



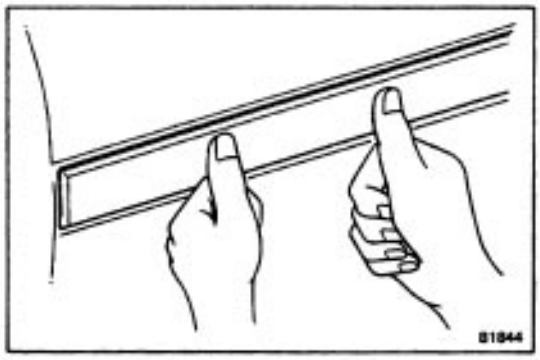
4. APPLY ADHESIVE TO MOULDING

Apply adhesive to both punched out ends of the double–stick tape.

NOTICE: Install the moulding within 7 minutes after applying the adhesive.

5. LIFT MOULDING RELEASE SHEET FROM FACE OF MOULDING

NOTICE: When the moulding release sheet is removed, be sure that no dirt or dust can get onto the uncovered area.



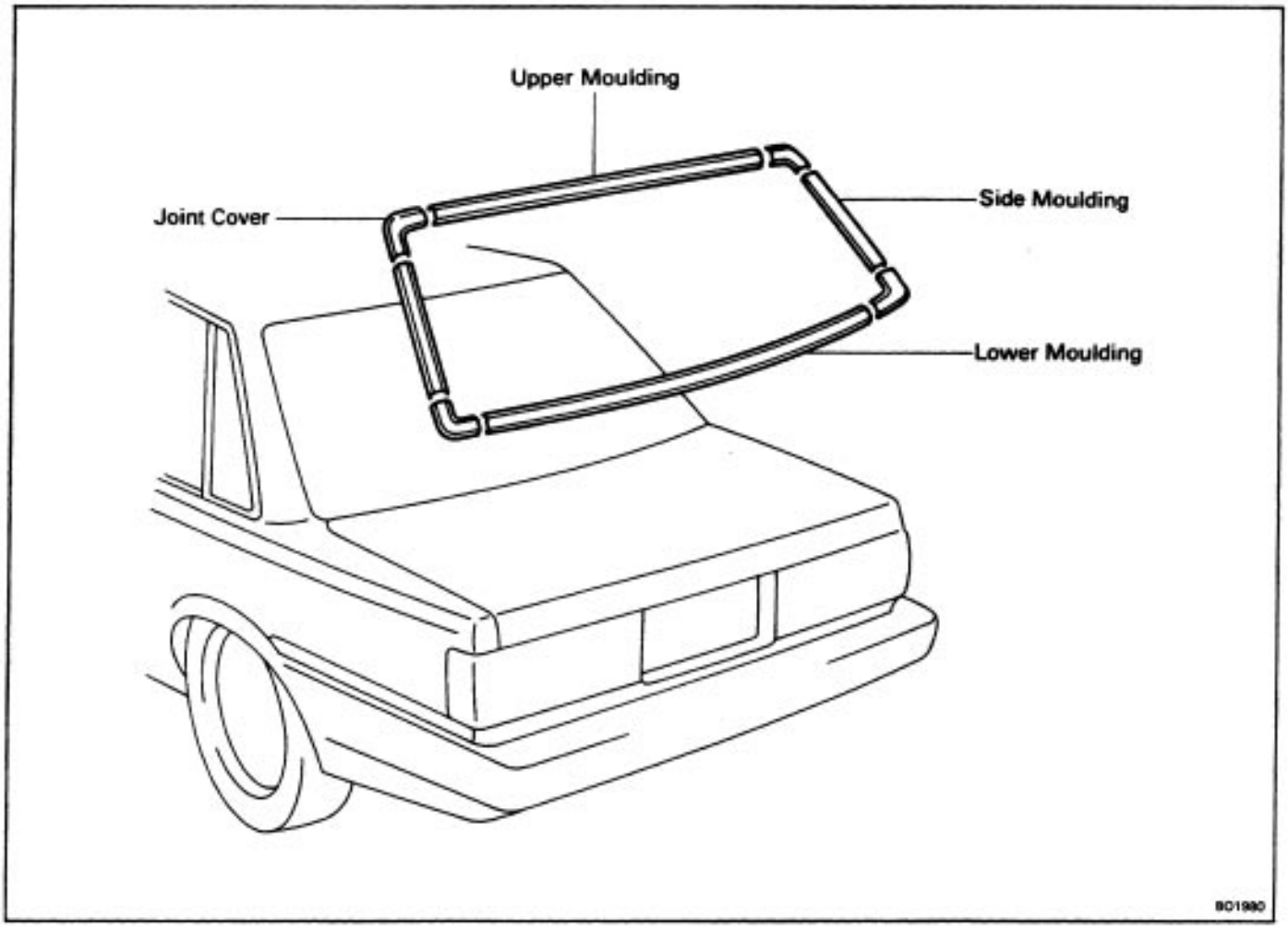
6. INSTALL MOULDING ALONG BODY PRESS LINE

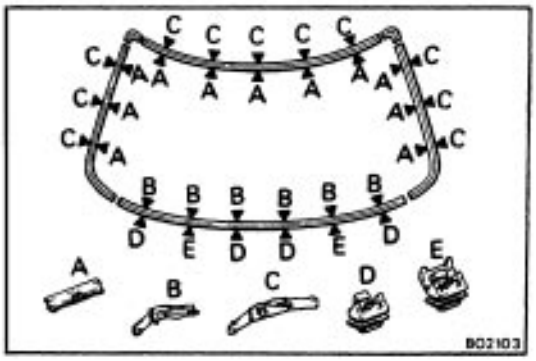
Push the moulding onto the panel by hand.

NOTICE:

- Be sure that the body and moulding are heated to the proper temperature.
- Do not depress the adhesive–coated parts excessively just hold them down with your thumb.
- Scrape off any overflowing adhesive with a plastic spatula and dean the surface with a dry rag.
- After installation, do not wash the vehicle for 24 hours.

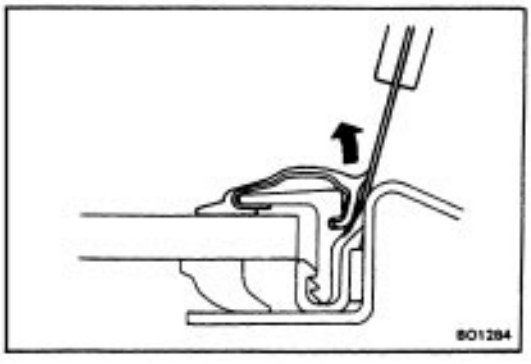
Rear Moulding
COMPONENTS





REMOVAL OF REAR MOULDING

There are three types of clips for moulding installation. Locations of these clips and fasteners are as shown. Carefully apply adhesive tape to protect the body.



REMOVE MOULDING

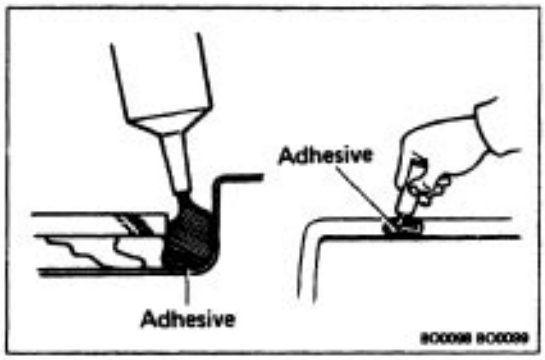
(a) Insert the top of a scraper between the body and moulding.

HINT: Apply tape to the scraper blade to prevent scratching the vehicle body.

(b) Pry up the scraper to loosen the moulding from the claws of the clips and fasteners.

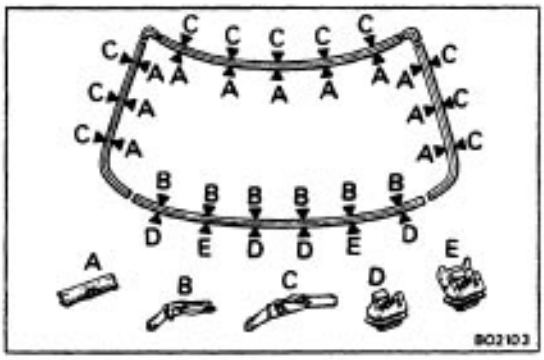
(c) Remove the moulding.

REPLACEMENT OF FASTENER
(See page BO–26)



INSTALLATION OF REAR MOULDING

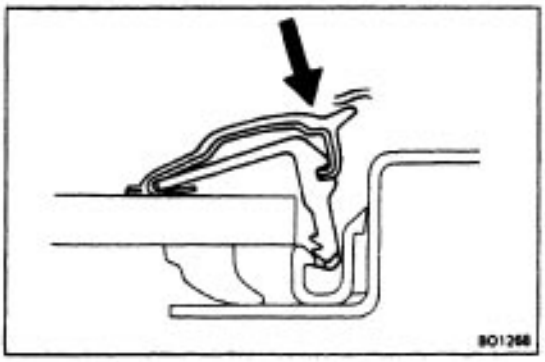
1. APPLY ADHESIVE AT A NEW CLIP INSTALLATION AREA



2. INSTALL MOULDING

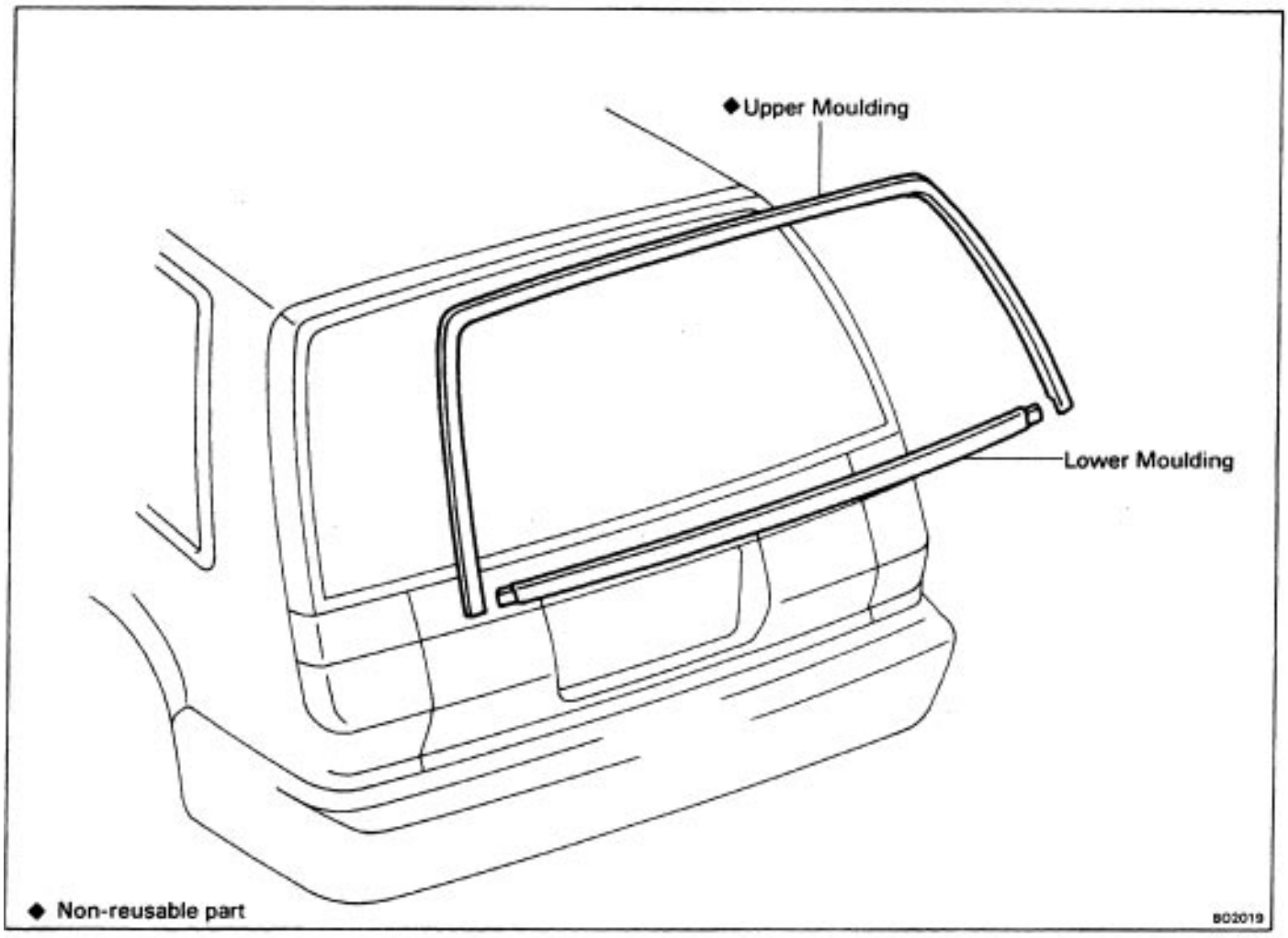
(a) Check the position of the clips on the moulding and the installation area.

(b) Place the moulding onto the body.



(c) Tap the moulding with your hand to fasten the clips at the glass edge. At the same time, install the fasteners by tapping them by hand.

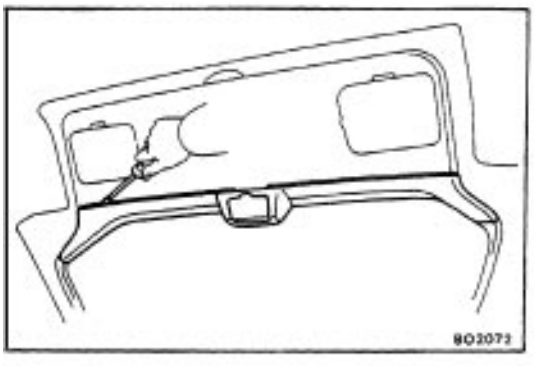
Back Door Moulding
COMPONENTS



REMOVAL OF BACK DOOR MOULDING

HINT: Carefully apply adhesive tape to protect the body.

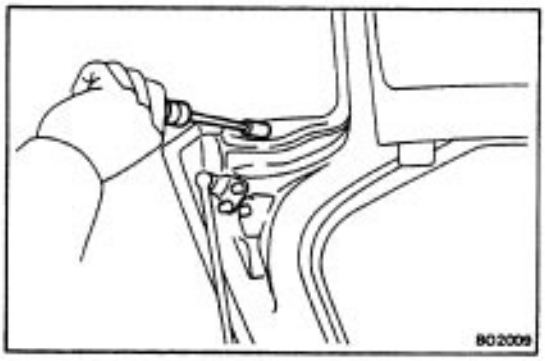
1. REMOVE WIPER ARM



2. REMOVE UPPER BACK DOOR TRIM

Using a screwdriver, remove the upper back door trim with the clips.

HINT: Tape the screwdrier tip before use.



3. REMOVE LOWER MOULDING AND CLIPS

(a) Remove the two nuts from the moulding.

(b) Insert the tip of a scraper between the body and moulding.

HINT: Apply tape to the scraper blade to prevent scratching the vehicle body.

(e) Pry up the scraper to loosen the moulding from the claws of the clips and fastener.

(d) Remove the moulding from the clips.

(e) Remove the six clips with the screws.

4. REMOVE UPPER MOULDING

HINT: Remove the upper moulding in the same manner as the windshield upper moulding. (See page **BO–26**)

REPLACEMENT OF FASTENER

(See page BO–26)

INSTALLATION OF BACK DOOR MOULDING

(See page BO–35**)**

1. INSTALL UPPER MOULDING

Install the upper moulding in the same manner as the windshield upper moulding . (See page **BO–26**)

2. INSTALL LOWER MOULDING

(a) Install the six clips with the screws.

(b) Place the moulding onto the body.

(e) Tap the moulding with your hand to fasten the clips at the glass edge. At the same time, install the fasteners by tapping them by hand.

(d) Install the two nuts.

3. INSTALL UPPER BACK DOOR TRIM

4. INSTALL WIPER ARM

WINDSHIELD

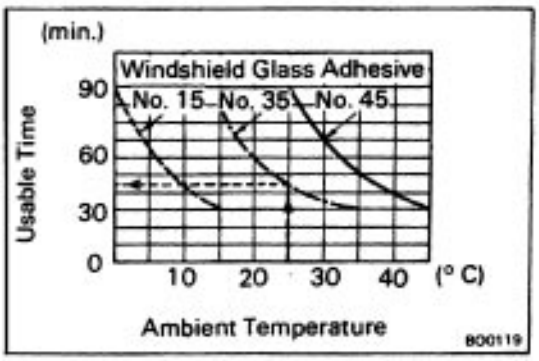
PREPARE ITEMS LISTED

Part name and No.	Contents of set	Quantity
Adhesive set 08850–00070 (0–15˚C or 32–59˚F) 08850–00080 (15–35˚C or 59–95˚F) 08850–00090 (35–45˚C or 95–113˚F)	Main agent 500g (17.64 oz.) Hardening agent 75g (2.65 oz.) Primer G (for glassy 20g (0.71 oz.) Primer M (for body) 20g (0.71 oz.) Sponge (for applying primer) Piano wire 0.6 mm dia. x 1 m (0.024 x 39.37 in.) Cartridge	1 1 1 1 2 1 1
Dam kit 04562–30040	Dam Double–stick tape (for sticking on dam)	
	Sealant gun (for applying adhesive) Glass of steel sheet (for mixing adhesive) Putty spatula (for mixing adhesive and correcting adhered parts) Cleaner (for cleaning adhering surface)	

Ambient temperature	Part No.	Part name
0 — 15°C (32 — 59°F)	08850–00070	Windshield glass adhesive set No. 15
15 — 35°C (59 — 95°F)	08850–00080	Windshield glass adhesive set No. 35
35 — 45°C (95 — 113°F)	08850–00090	Windshield glass adhesive set No. 45

1. CHOOSE SUITABLE ADHESIVE SET

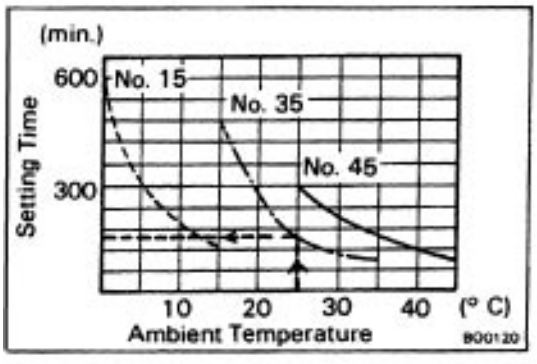
Use an adhesive set suitable for the ambient temperature.



2. CHECK ADHESIVE USABLE TIME

After mixing main and hardening agents, finish glass installation within the specified time as shown.

Example: For glass installation in an ambient temperature of 25˚C (77˚F), apply adhesive set No. 35 within 45 minutes.



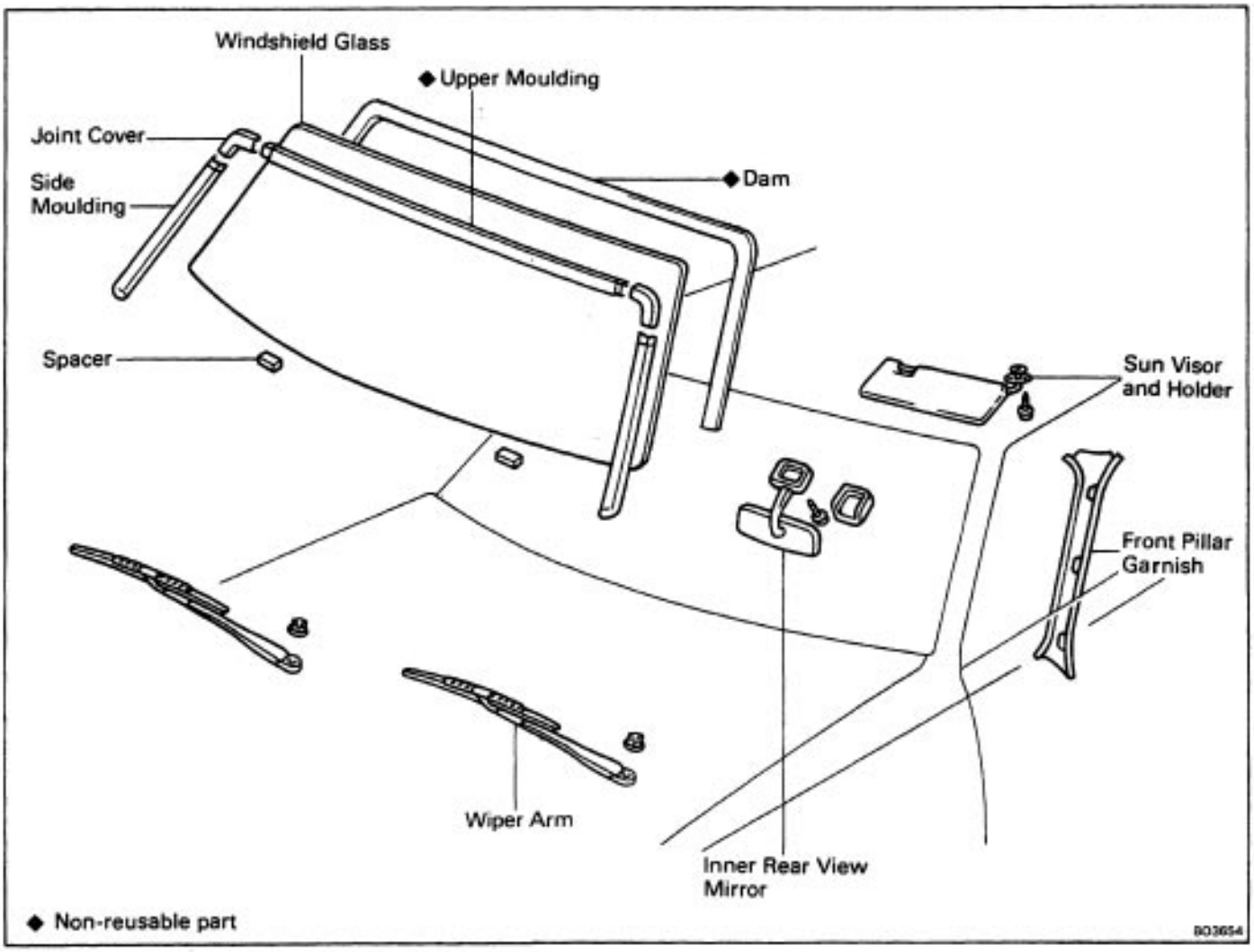
3. CHECK ADHESIVE HARDENING TIME

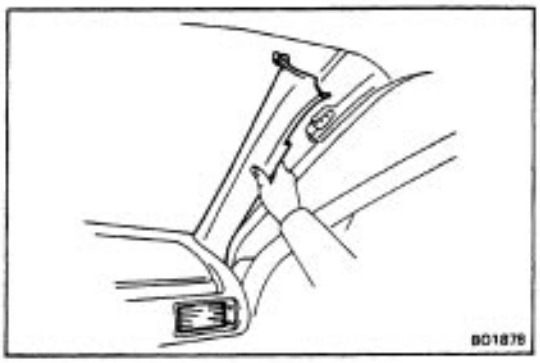
After main and hardening agents are mixed, leak tests should be made only after the hardening time has elapsed.

Example: The setting time for adhesive set No. 35 with an ambient temperature of 25˚C (77˚F) is 2.5 hours.

NOTICE: Do not drive the vehicle until at least double the hardening time has elapsed.

COMPONENTS





REMOVAL OF WINDSHIELD

1. REMOVE FRONT PILLAR GARNISH

(a) Pry out the clips by your hand.

(b) Pull the garnish upward to remove it.

2. REMOVE FOLLOWING PARTS:

(a) Inner rear view mirror

(b) Sun visors and holders

(e) Hood

(d) Wiper arms

3. REMOVE WINDSHIELD MOULDING

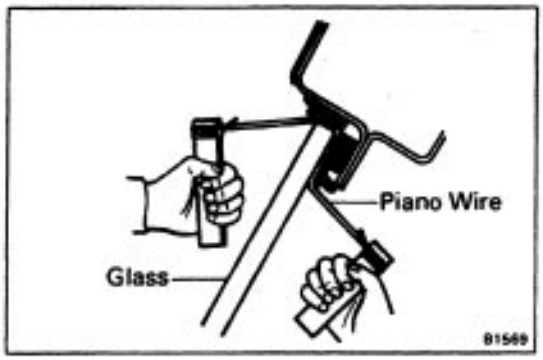
(See pages BO–25 and 26)

4. REMOVE CUPS

(See page BO–25)

Be careful not to damage the clips when removing them from around the glass.

HINT: It is not necessary to remove the fasteners but damaged fasteners should be replaced.

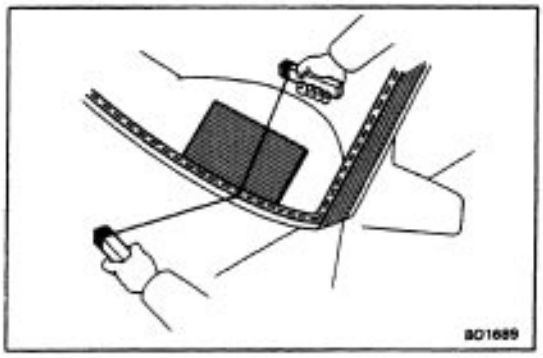


5. REMOVE WINDSHIELD GLASS

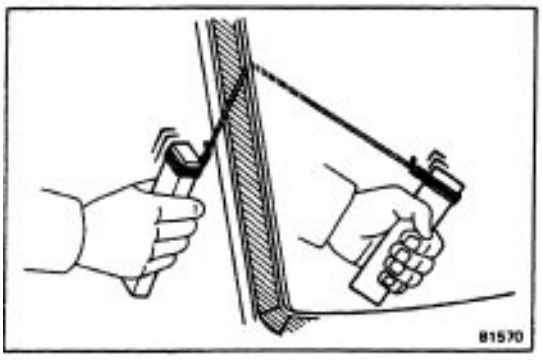
(a) Push piano wire through from the interior.

(b) Tie both wire ends to a wooden block or like o¿¿ect.

HINT: Apply adhesive tape to the outer surface to keep the surface from being scratched.



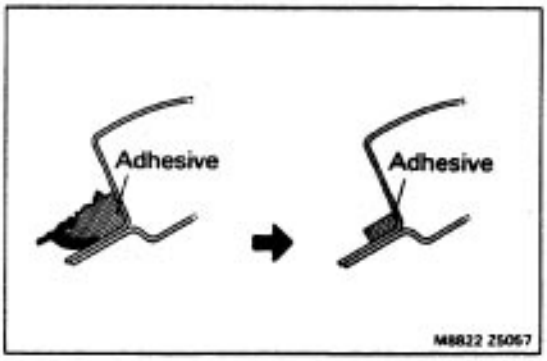
NOTICE: When separating, take care not to damage the paint and interior and exterior ornaments.
To prevent scratching the safety pad when removing the windshield, place a plastic sheet between the piano wire and safety pad.



(c) Cut the adhesive by pulling the piano wire around it.

(d) Remove the glass.

NOTICE: Leave as much of the adhesive on the body as possible when cutting off the glass.



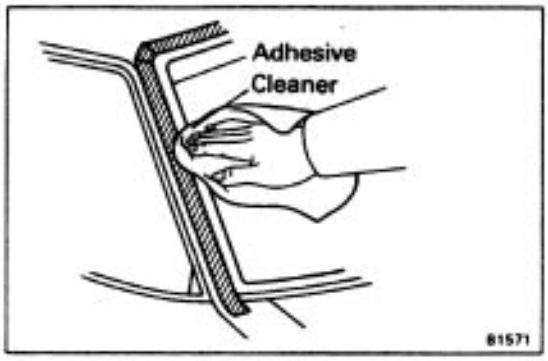
PREPARATION FOR INSTALLATION

1. CLEAN AND SHAPE CONTACT SURFACE OF BODY

(a) Remove any dam remaining on the body.

(b) Cut away any rough areas with a knife.

HINT: Even if all the adhesive has been removed, clean the body.

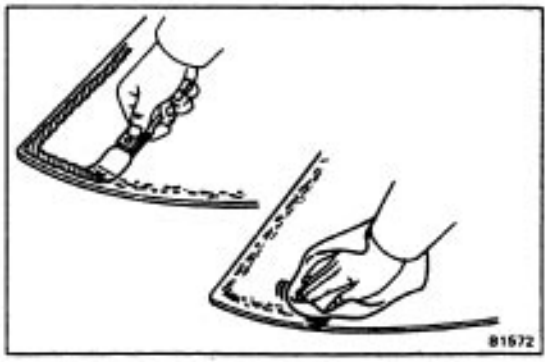


(c) Clean the cutting surface of the adhesive with a piece of cloth saturated in cleaner:

HINT: Even if all the adhesive has been removed, clean the body.

2. IF NECESSARY, REPLACE FASTENERS

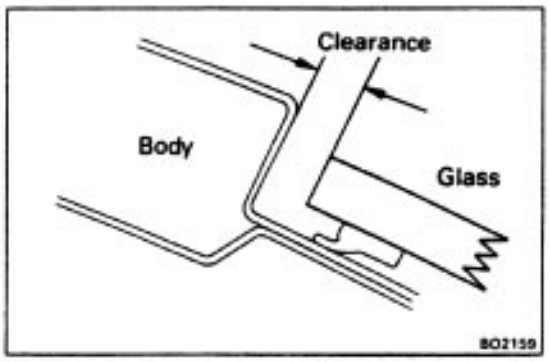
(See page BO–26)



3. CLEAN REMOVED GLASS BEFORE INSTALLATION

(a) Using a scraper, remove the adhesive sticking to the glass.

(b) Clean the glass with cleaner.



4. INSTALL SPACERS

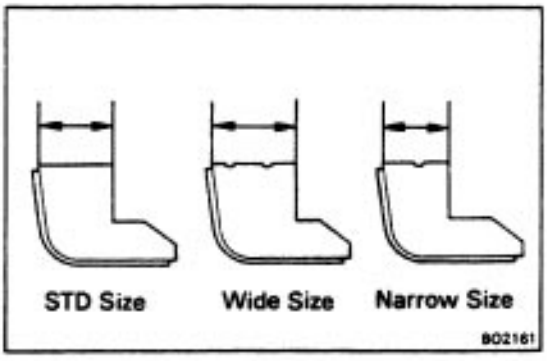
HINT: If replacing the spacer, select a spacer by the following method.

(a) Install the old type spacer or any type spacer.

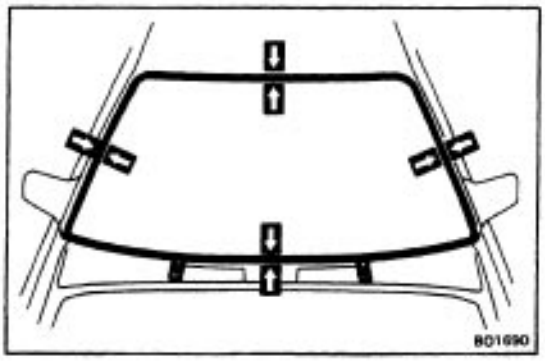
(b) Place the windshield glass to the body.
[See steps 5(a) to 5(e) on page BO–41]

(c) Measure the clearance between the top of the windshield glass and body as shown.
Standard clearance: 6.2 ± 2 mm (0.244 ± 0.08 in.)

If the clearance is not as specified, replace the spacer with one of the correct size.



Size	Clearance
STD	Standard clearance
Wide	Less than standard clearance
Narrow	More than standard clearance



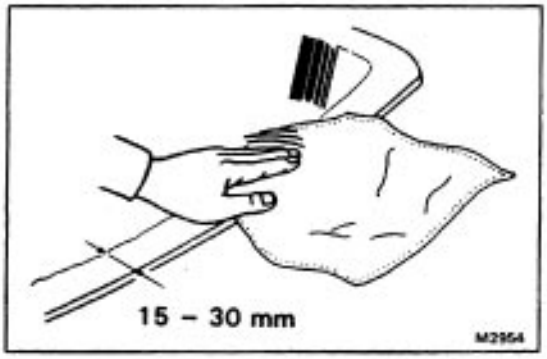
5. POSITION GLASS *

(a) Place glass in correct position onto the rubber spacers.

(b) Check that all contacting parts of the glass rim are perfectly even and do not make contact with the fasteners.

(c) Make reference marks between the glass and body.

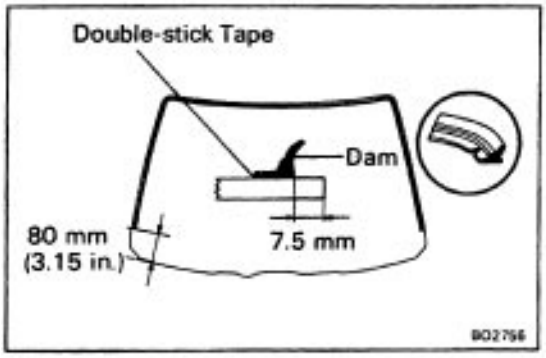
(d) Remove the glass.



6. CLEAN CONTACT SURFACE OF GLASS

Using cleaner, clean the contact surface 15 30 mm (0.59 1.18 in.) wide around the entire glass rim.

INSTALLATION OF WINDSHIELD



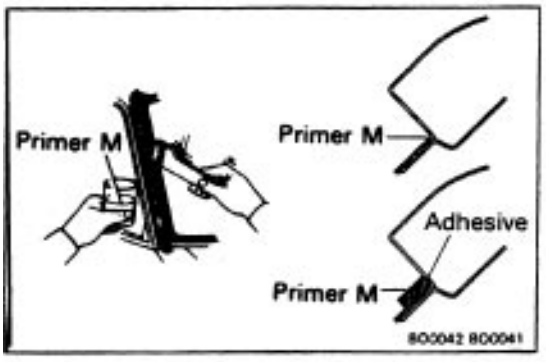
1. INSTALL DAM

(a) Apply double–stick tape at a point 7.5 mm (0.235 in.) from the glass rim as shown in the illustration.

(b) Place the dam on the double–stick tape.

HINT: Cut a V–wedge into the corner folds of the dam.

NOTICE: Do not touch the glass face a¿¿er cleaning it.

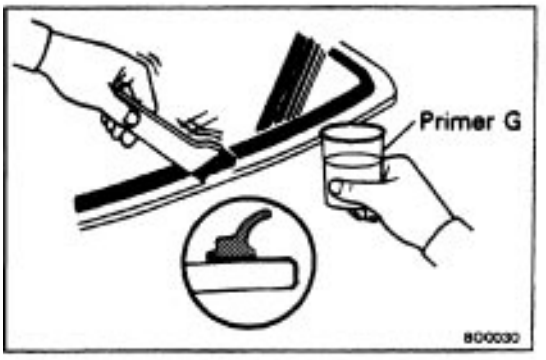


2. COAT CONTACT SURFACE OF BODY WITH PRIMER "M"

Using a brush, coat the contact surface on the body with Primer M.

NOTICE:

- **Let the Primer coating dry for 10 minutes or more. Make sure that the installation of the glass is finished within 2 hours.**
- **Use care not to leave any part of the contact surface uncoated or excessively coated, as Primer M and G**
  serve to boost the adhesive power of the adhesive to the glass or body.
- **Do not keep any of the opened Primer M and G for later use.**

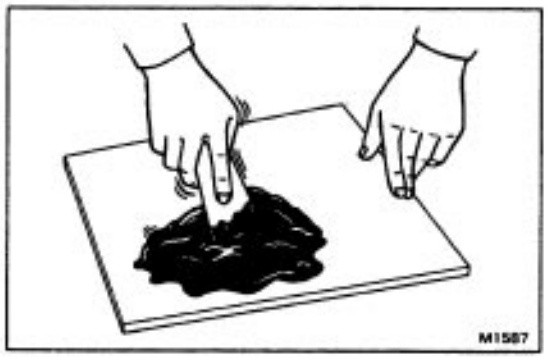


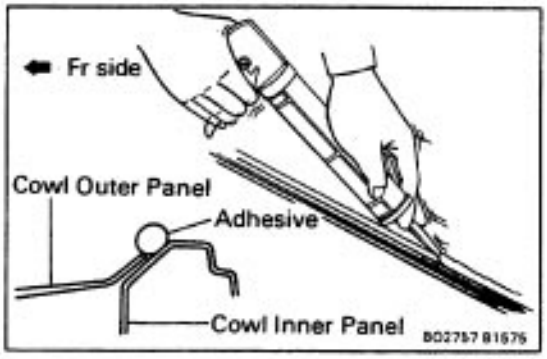
3. COAT CONTACT SURFACE OF GLASS WITH PRIMER "G"

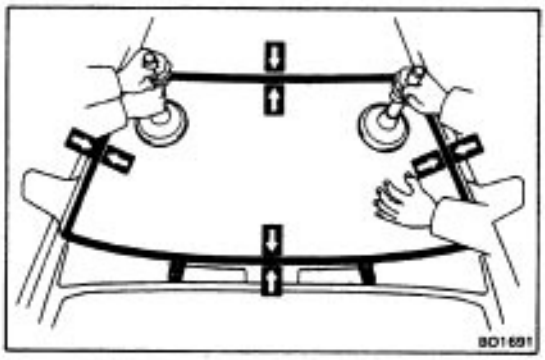
(a) Using a brush or sponge, coat the edge of the glass and the contact surface with Primer G.

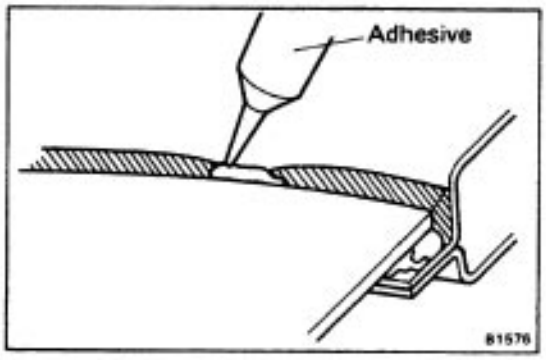
(b) Before the Primer dries, wipe any excess off with a clean cloth to avoid too thick a coat.

NOTICE: Be sure that installation of the glass is finished within 70 minutes.









4. MIX ADHESIVE COATING

NOTICE:

- Be sure that installation of the glass is finished within usable time. (See step 2 on page BO–37)
- The mixture should be made in 5 minutes or less.

(a) Thoroughly clean the glass plate and putty spatula with solvent.

(b) Thoroughly mix 500 g (17.64 oz.) of the main agent and 75 g (2.65 oz.) of the hardening agent on a glass plate or like object with a putty spatula.

5. APPLY ADHESIVE

(a) Cut off the tip of the cartridge nozzle to make a hole 5 mm, (0.20 in.) in diameter. Fill the cartridge with adhesive.

(b) Load the cartridge into the sealer gun.

(c) Coat the glass with adhesive on all contact surfaces along the ridge.

NOTICE: As to lower side of adhesive, apply it on the cowl inner panel.

Adhesive height:

If adhesive remains on body

3.5 – 5. 0 mm (0.138 – 0.197 in.)

If no adhesive remains on body

8 – 10 mm (0.31 – 0.39 in.)

6. INSTALL GLASS

(a) Position the glass so that the reference marks are lined up, and press in gently along the rim.

(b) Using a spatula, apply adhesive on the glass rim.

(c) Use a spatula to remove any excess or protruding adhesive.

(d) Fasten glass securely until the adhesive sets.

7. INSPECT FOR LEAKS AND REPAIR

(a) Perform a leak test after the hardening time has elapsed.

(b) Seal any leak with auto glass sealer.

Part No. 08833–00030 or equivalent

8. INSTALL WINDSHIELD OUTSIDE MOULDING

(See page BO–26)

9. INSTALL FOLLOWING PARTS:

(a) Wiper arms and inner rear view mirror

(b) Sun visors and holders

10. INSTALL FRONT PILLAR GARNISH

11. INSTALL AND ADJUST HOOD

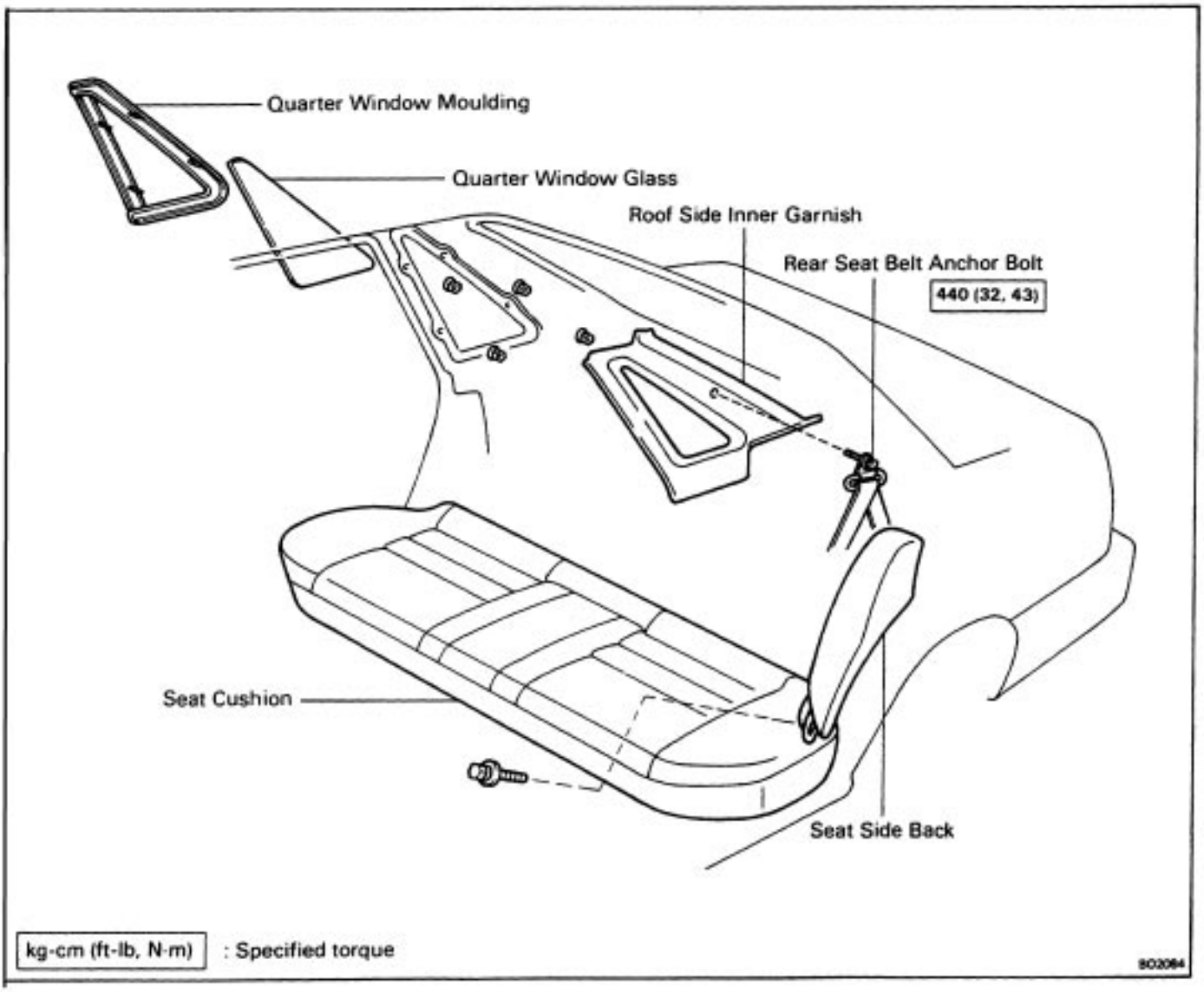
(See page BO–3)

NOTICE: Wait at least twice the setting time before driving the car.

QUARTER WINDOW GLASS
Sedan
PREPARE ITEMS LISTED

Part name and No.	Contents of set
Butyl tope set (08850–00065)	Butyl tape 9 mm dia. x 2,500 mm (0.35 x 98.43 in.) Primer 5 cc (0.17 fl.oz.) Sponge (for applying primer) Piano wire 1 mm dia. x 600 mm (0.04 x 23.62 in.) (for slicing off glass)
Materials required	Cleaner (for cleaning adhering surfaces

COMPONENTS



REMOVAL OF QUARTER WINDOW GLASS

1. REMOVE REAR SEAT CUSHION

(a) Pull the left and right levers forward and pull up the seat cushion.

2. REMOVE REAR SEAT BACK OR SEAT SIDE BACK

(a) Remove the lower left and right bolts and pull the seat back upward to separate it. (w/ Fixed seat type)

(b) Remove the lower side bolts and pull the seat side back upward to separate it. (w/ Separate seat type)

3. REMOVE ROOF DRIP MOULDING (See page BO–28)

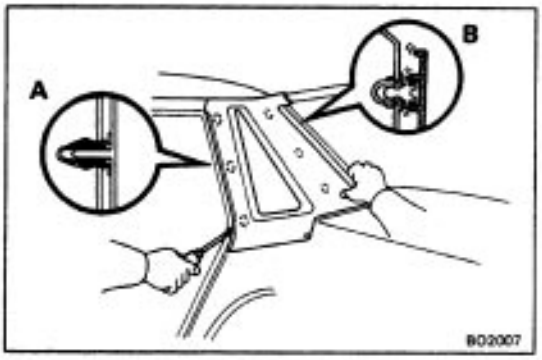
4. REMOVE REAR SEAT BELT ANCHOR BOLT

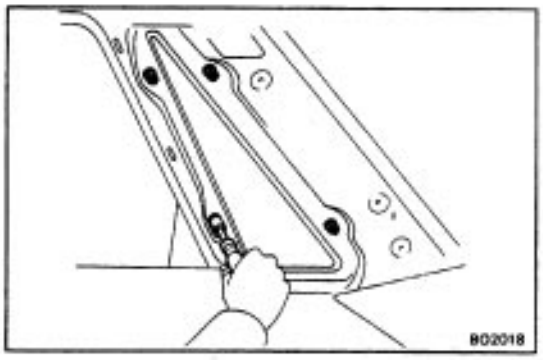
5. REMOVE ROOF SIDE INNER GARNISH

(a) Using a screwdriver, pry loose the three clips (A).

HINT: Tape the screwdriver tip before use.

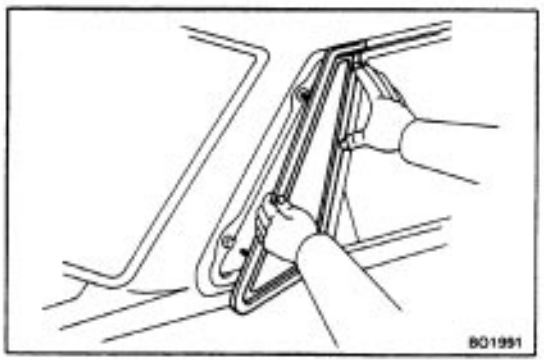
(b) Pull loose the three retainers (B) and remove the garnish.





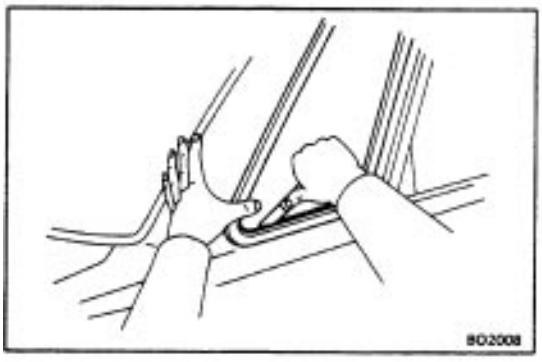
6. REMOVE QUARTER WINDOW MOULDING

(a) Remove the four mounting nuts.



(b) Pull the rear portion of the quarter window moulding outward by hand, and lift it from the body.

(c) While pushing the front side of the quarter window moulding, pull it off toward the outside.

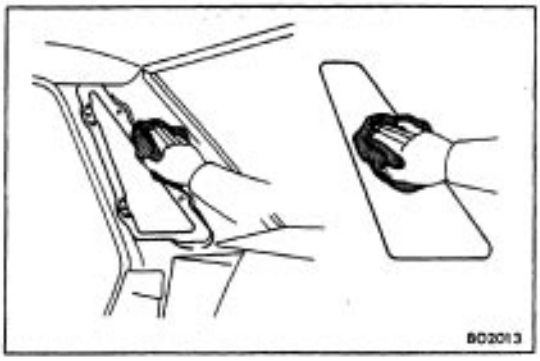


7. REMOVE QUARTER WINDOW GLASS

(a) Using a knife, cut loose the sealer.

HINT: Do not damage the body.

(b) Remove the glass.

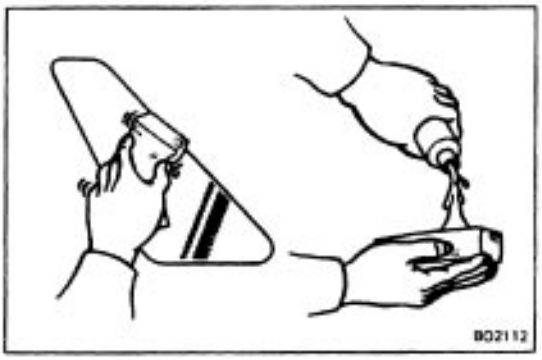


INSTALLATION OF QUARTER WINDOW GLASS

(See page BO–43)

1. CLEAN BODY OR GLASS

Wipe oft any adhesive left on the body and glass with cleaner.

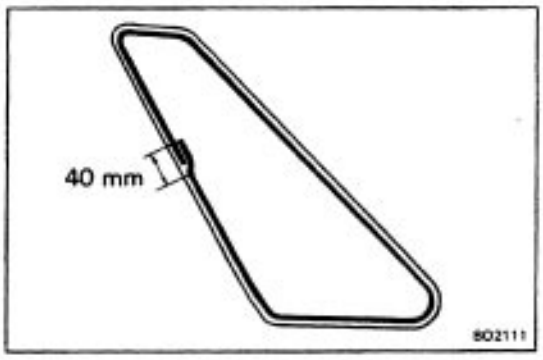


2. COAT CONTACT SURFACE OF GLASS WITH PRIMER

(a) Using a sponge, apply the primer around the entire ceramic application area.

HINT: Apply primer evenly and to the ceramic application area only.

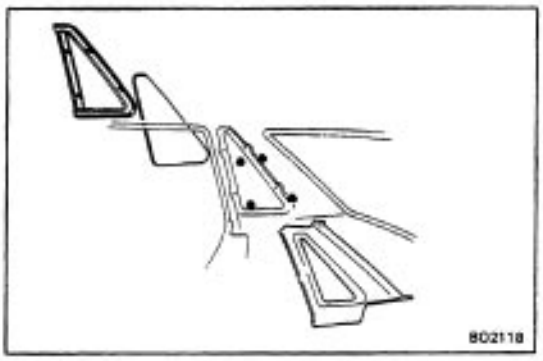
(b) Let the primer coating dry for 10 minutes.



3. APPLY SEAL TO GLASS

Install the seal to the glass.

HINT: Overlap the seal approx. 40 mm (1.57 in.) at the front area.



4. INSTALL QUARTER WINDOW GLASS WITH MOULDING

(a) Fit on the moulding.

(b) Install the glass using the moulding stud bolts as a guide.

(c) Install the four mounting nuts.

5. INSTALL FOLLOWING PARTS:

(a) Roof side inner garnish

(b) Rear seat belt anchor bolt

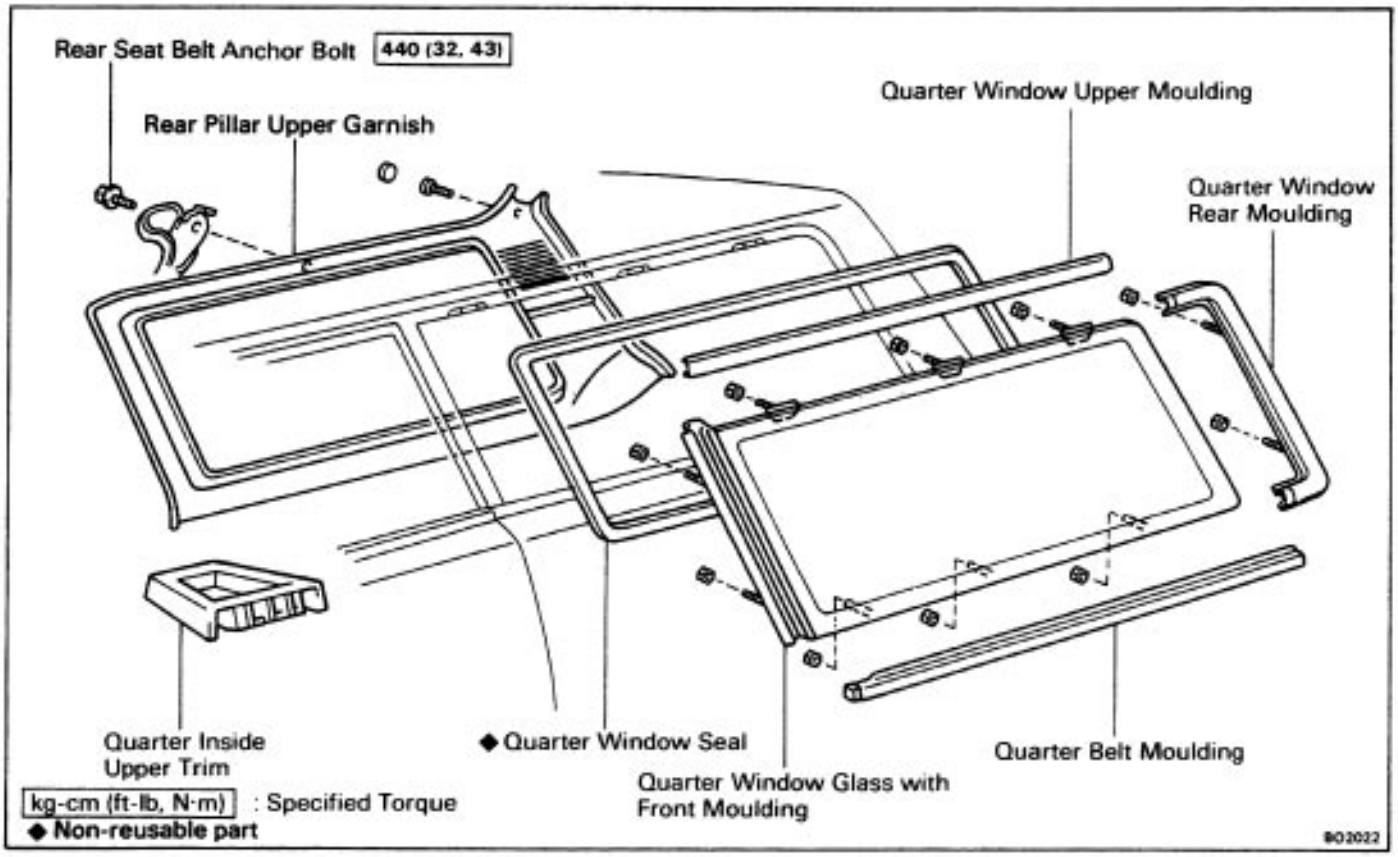
Torque: 440 kg–cm (32 ft–lb, 43 N¿rn)

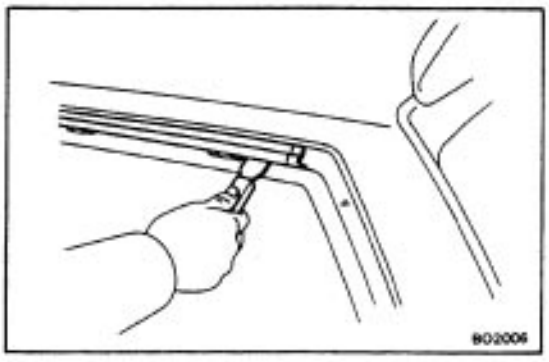
(c) Roof drip moulding

(d) (w/ Fixed Seat Type)
Rear seat

(e) (w/ Separate Seat Type)
Rear side seat back and seat cushion.

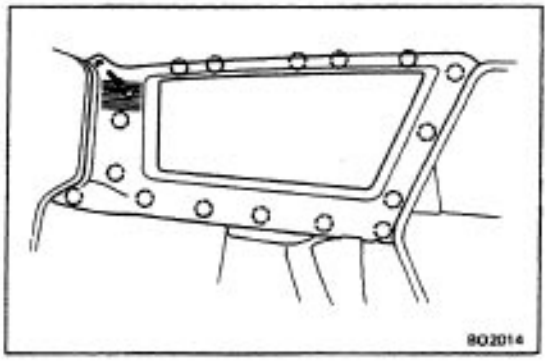
QUARTER WINDOW GLASS
Station Wagon
PREPARE ITEMS LISTED
(See page BO–43)
COMPONENTS





REMOVAL OF QUARTER WINDOW GLASS

1. **REMOVE REAR ROOF DRIP MOULDING**
   (See page BO–28)
2. **REMOVE QUARTER WINDOW UPPER MOULDING**
   Using a scraper, pry the upper moulding.
   HINT: Apply tape to the scraper blade to prevent scratching the vehicle body.
3. **REMOVE QUARTER BELT MOULDING**
   Pry oft the belt moulding by hand.
4. **REMOVE SEAT SIDE BACK**
   (See page BO–73)
   Remove the lower side bolts and pull the seat side back upward to separate it.
5. **REMOVE QUARTER INSIDE UPPER TRIM**
6. **REMOVE REAR SEAT BELT ANCHOR BOLT**

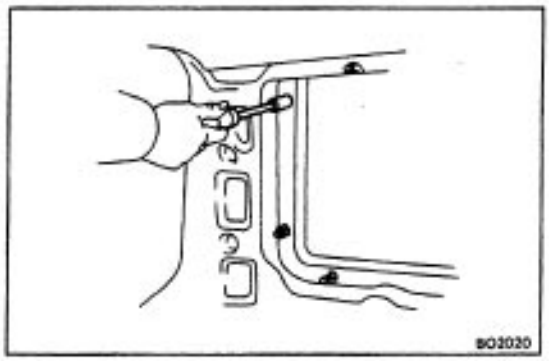


7. REMOVE REAR PILLAR UPPER GARNISH

(a) Remove the screw cap and screw.

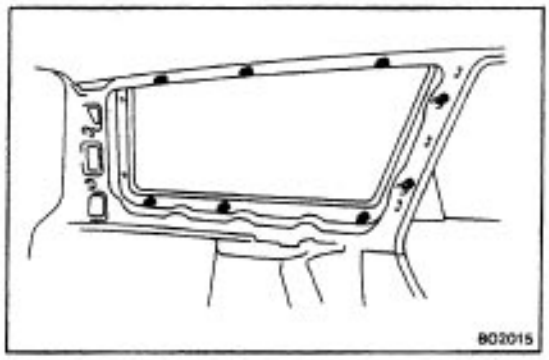
(b) Pry loose the sixteen clips with a screwdriver and remove the garnish.

HINT: Tape the screwdriver tip before use.



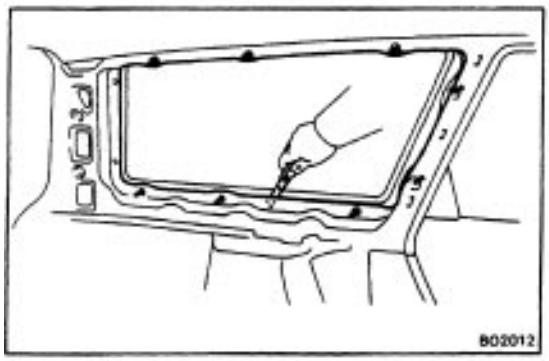
8. REMOVE QUARTER WINDOW REAR MOULDING

Remove the two nuts and rear moulding.



9. REMOVE QUARTER WINDOW GLASS WITH FRONT MOULDING

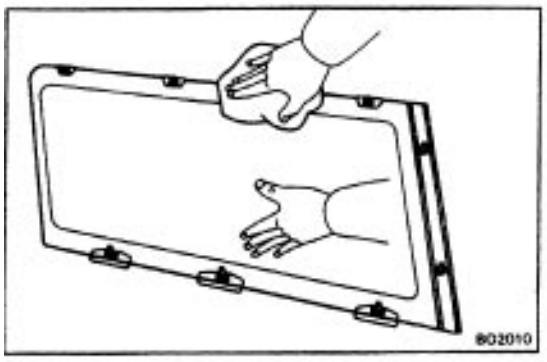
(a) Remove the eight window glass set nuts.



(b) Using a knife, cut loose the sealer.

HINT: Do not damage the body.

(c) Remove the glass with front moulding.

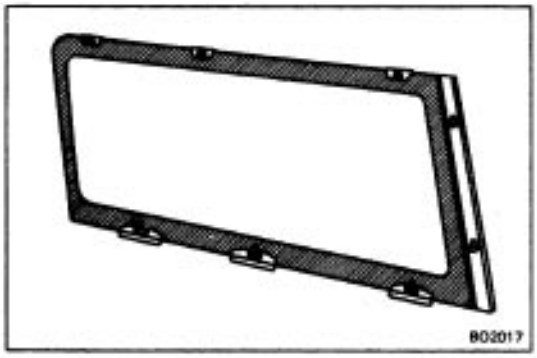


INSTALLATION OF QUARTER WINDOW GLASS

(See page BO–46)

1. CLEAN BODY OR GLASS

Wipe off any adhesive left on the body and glass with cleaner.

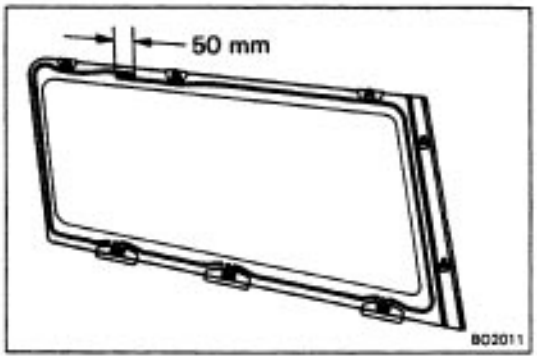


2. COAT CONTACT SURFACE OF GLASS WITH PRIMER

(a) Using a sponge, apply the primer around the entire ceramic application area.

HINT: Apply primer evenly and to– the ceramic application area only.

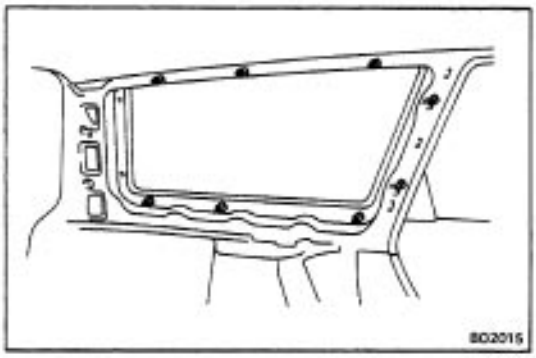
(b) Let the primer coating dry for 10 minutes.



3. APPLY SEAL TO GLASS

Install the seal to the glass.

HINT: Overlap the seal approx. 50 mm (1.97 in.) at the top of the glass.



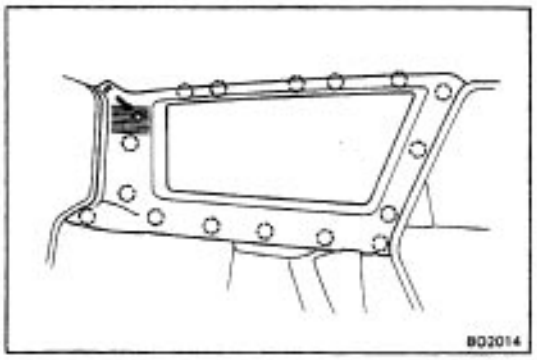
4. INSTALL QUARTER WINDOW GLASS WITH FRONT MOULDING

(a) Install the glass to the body.

(b) Install the eight window glass set nuts.

5. INSTALL QUARTER WINDOW REAR MOULDING

Install the rear moulding with two nuts.



6. INSTALL REAR PILLAR UPPER GARNISH

(a) Install the clips to the garnish and tap the garnish onto the body.

(b) Install the screw and screw cap.

7. INSTALL REAR SEAT BELT ANCHOR BOLT

Torque: 440 kg–cm (32 ft–lb, 43 N–m)

8. INSTALL QUARTER INSIDE UPPER TRIM

9. INSTALL SEAT SIDE BACK

10. INSTALL QUARTER BELT MOULDING

11. INSTALL QUARTER WINDOW UPPER MOULDING

12. INSTALL REAR ROOF DRIP MOULDING

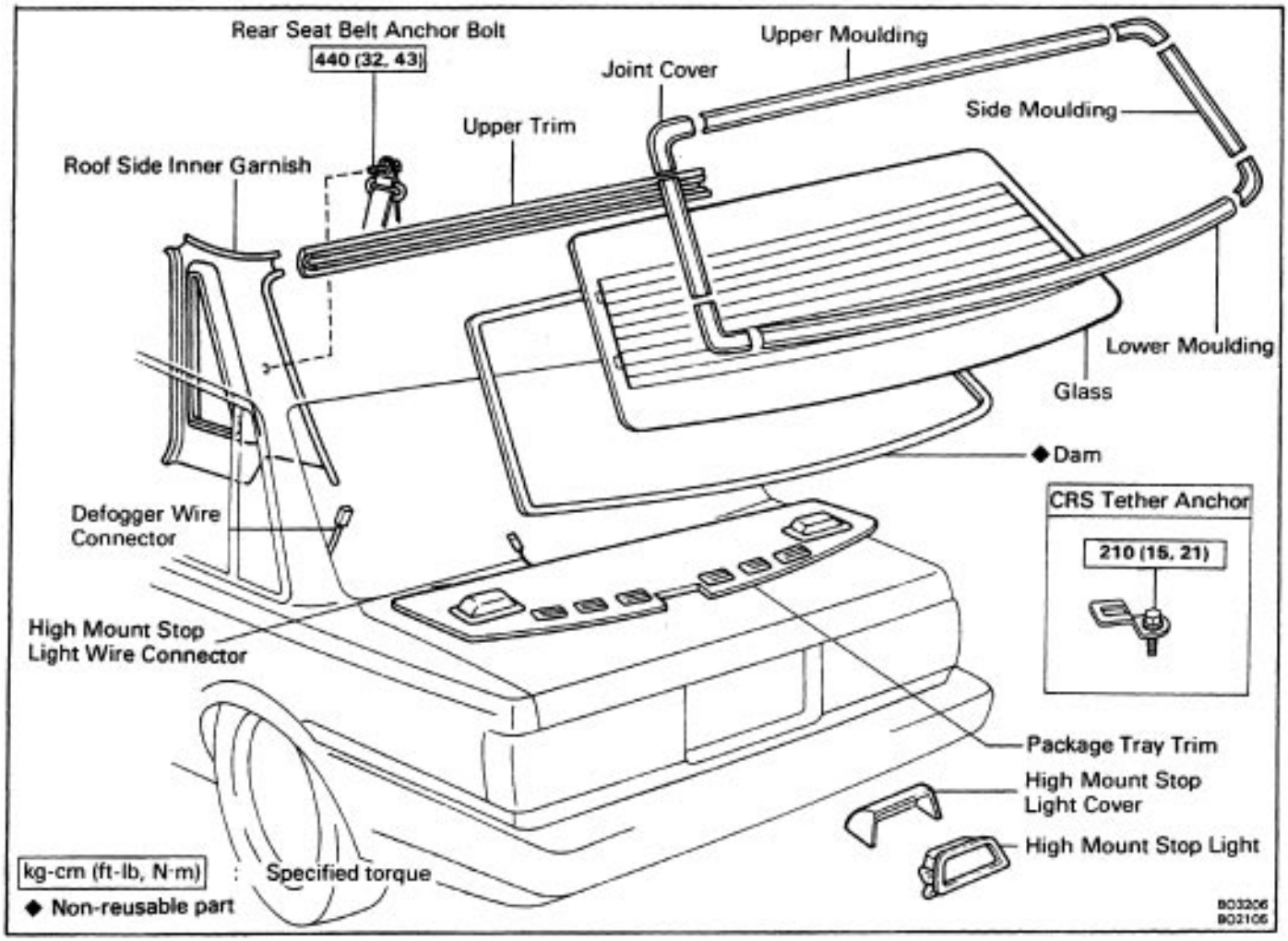
(See page BO–28)

REAR WINDOW GLASS

PREPARE ITEMS LISTED

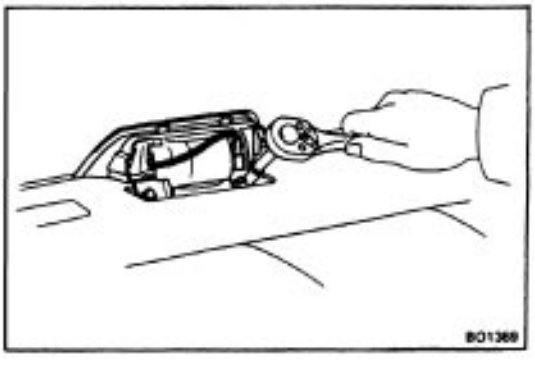
(See page BO–37)

COMPONENTS



REMOVAL OF REAR WINDOW GLASS

1. **DISCONNECT DEFOGGER WIRE CONNECTORS**
2. **REMOVE REAR SEAT BELT ANCHOR BOLT**
3. **REMOVE ROOF SIDE INNER GARNISH**
   (See page BO–44)
4. **REMOVE REAR MOULDING AND CLIPS**
   (See page BO–33)
5. **REMOVE HIGH MOUNT STOP LIGHT**
   (a) Remove the high mount stop light cover.
   (b) Disconnect the connector from the high mount stop light.
   (c) Remove the two bolts and high mount stop light.
6. **REMOVE CRS TETHER ANCHOR**
   Remove the bolt with CRS tether anchor.
7. **REMOVE PACKAGE TRAY TRIM**

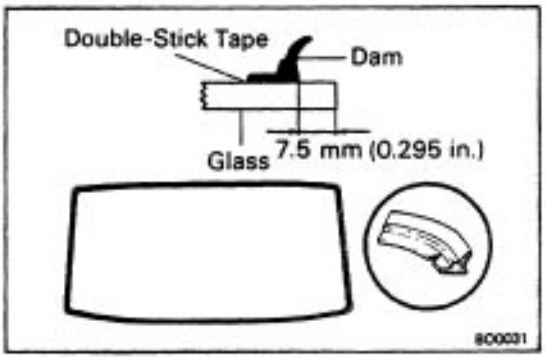


8. **REMOVE REAR WINDOW GLASS**
   HINT: Remove the rear window glass in the same manner as the windshield glass. (See page **BO–39**)

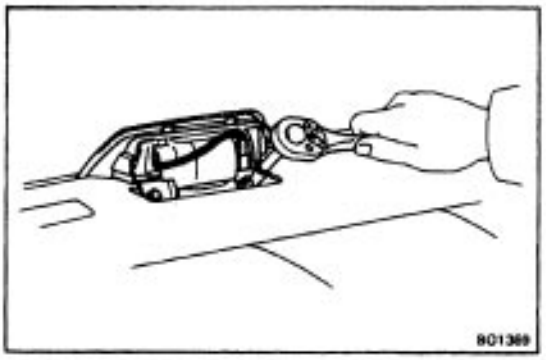
PREPARATION FOR INSTALLATION

(See pages BO–40 **and 41)**

INSTALLATION OF REAR WINDOW GLASS



1. **INSTALL DAM**
   (See page BO–41)
   HINT: Install the dam on the surroundings of glass.
2. **COAT CONTACT SURFACE OF BODY WITH PRIMER "M"**
   (See page BO–41)
3. **COAT CONTACT SURFACE OF GLASS WITH PRIMER "G"**
   (See page BO–41)
4. **MIX ADHESIVE COATING**
   (See page BO–41)
5. **APPLY ADHESIVE**
   (See page BO–41)
6. **INSTALL GLASS**
   (See page BO–42)
7. **INSPECT FOR LEAKS AND REPAIR**
   (See page BO–42)
8. **INSTALL REAR MOULDING AND CLIPS**
   (See page 80–34)
9. **INSTALL HIGH MOUNT STOP LIGHT**
   (a) Install the high mount stop light with the two bolts.
   (b) Connect the connector to the high mount stop light.
   (c) Install the high mount stop light cover.



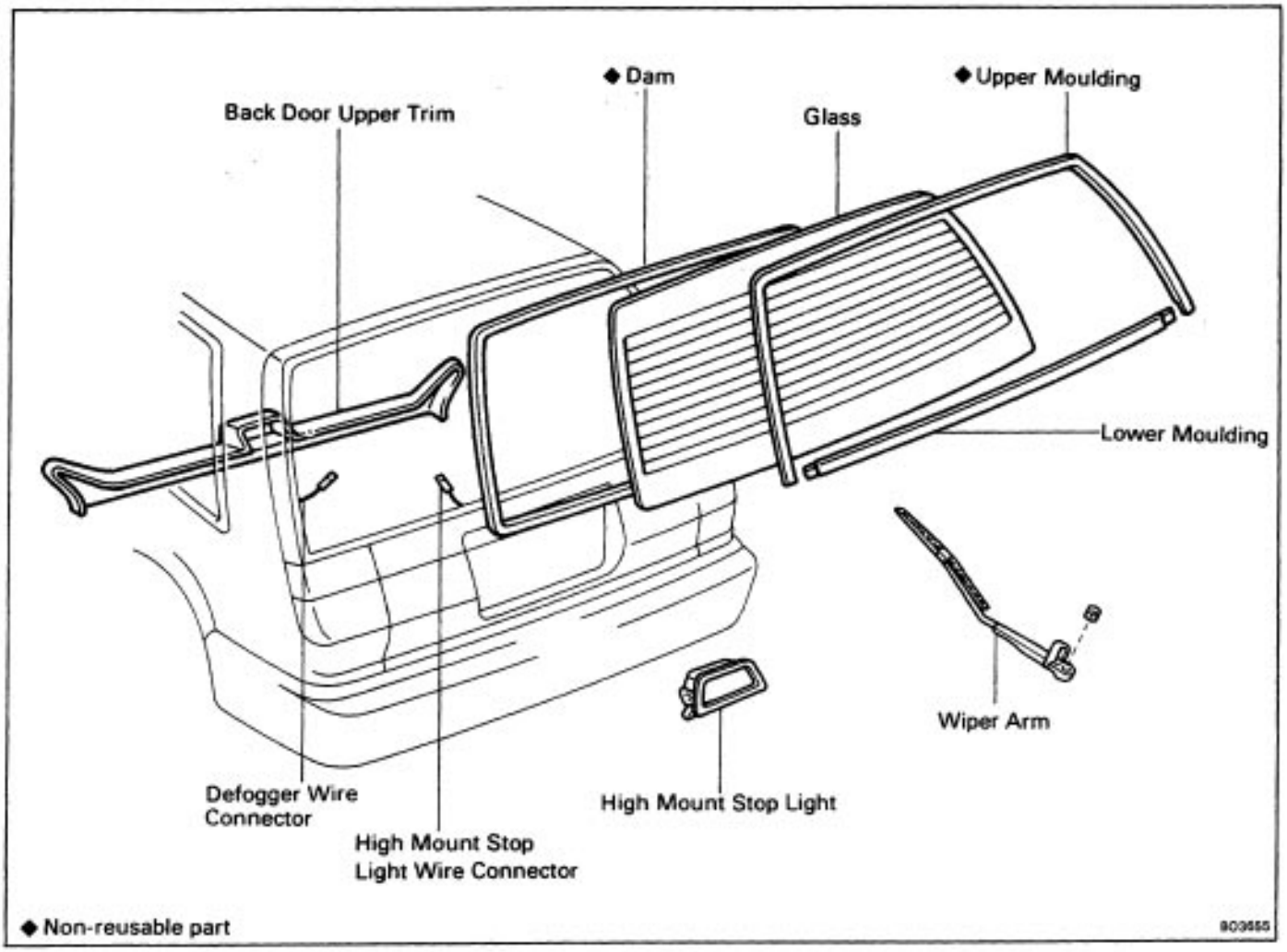
10. **INSTALL PACKAGE TRAY TRIM**
11. **INSTALL CRS TETHER ANCHOR**
    Install the CRS tether anchor with the bolt.
    Torque: 210 kg–cm (15 ft–lb, 21 N–m)
12. **INSTALL ROOF SIDE INNER GARNISH**
13. **INSTALL REAR SEAT BELT ANCHOR BOLT**
    Torque: 440 kg–cm (32 ft–lb, 43 N–m)
14. **CONNECT DEFOGGER WIRE CONNECTORS**

BACK DOOR GLASS

PREPARE ITEMS LISTED

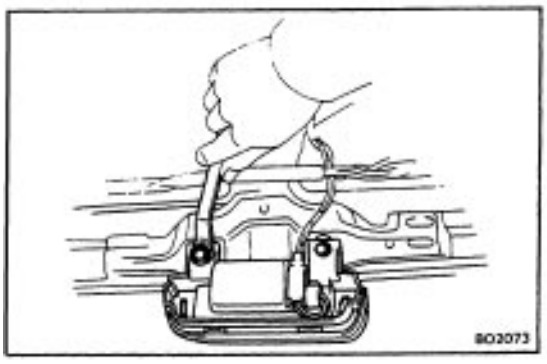
(See page BO–37)

COMPONENTS



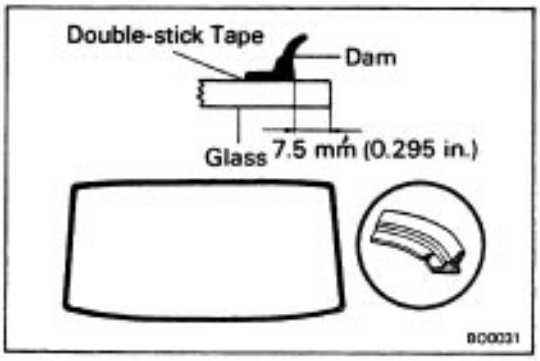
REMOVAL OF BACK DOOR GLASS

1. **REMOVE REAR WIPER ARM**
2. **DISCONNECT DEFOGGER WIRE CONNECTORS**
3. **REMOVE BACK DOOR UPPER TRIM**



4. **REMOVE HIGH MOUNT STOP LIGHT**
   (a) Disconnect the connector from the high mount stop light.
   (b) Remove the two bolts and high mount stop light.

5. **REMOVE LOWER MOULDING AND CLIPS**
(See page BO–36)
6. **REMOVE UPPER MOULDING**
HINT: Remove the upper moulding in the same manner as the windshield upper moulding. (See page **BO–26**)
7. **REMOVE BACK DOOR GLASS**
HINT: Remove the back door glass in the same manner as the windshield glass. (See page **BO–39**)

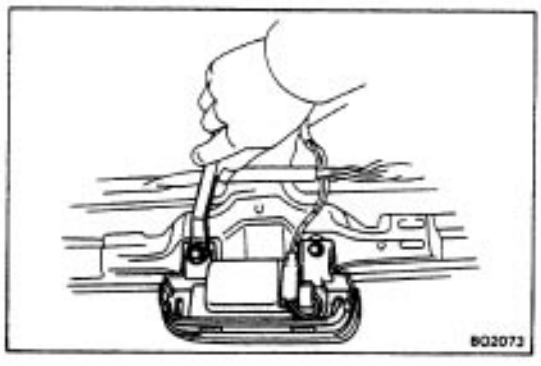


PREPARATION FOR INSTALLATION

(See pages BO–40 and 41)

INSTALLATION OF BACK DOOR GLASS

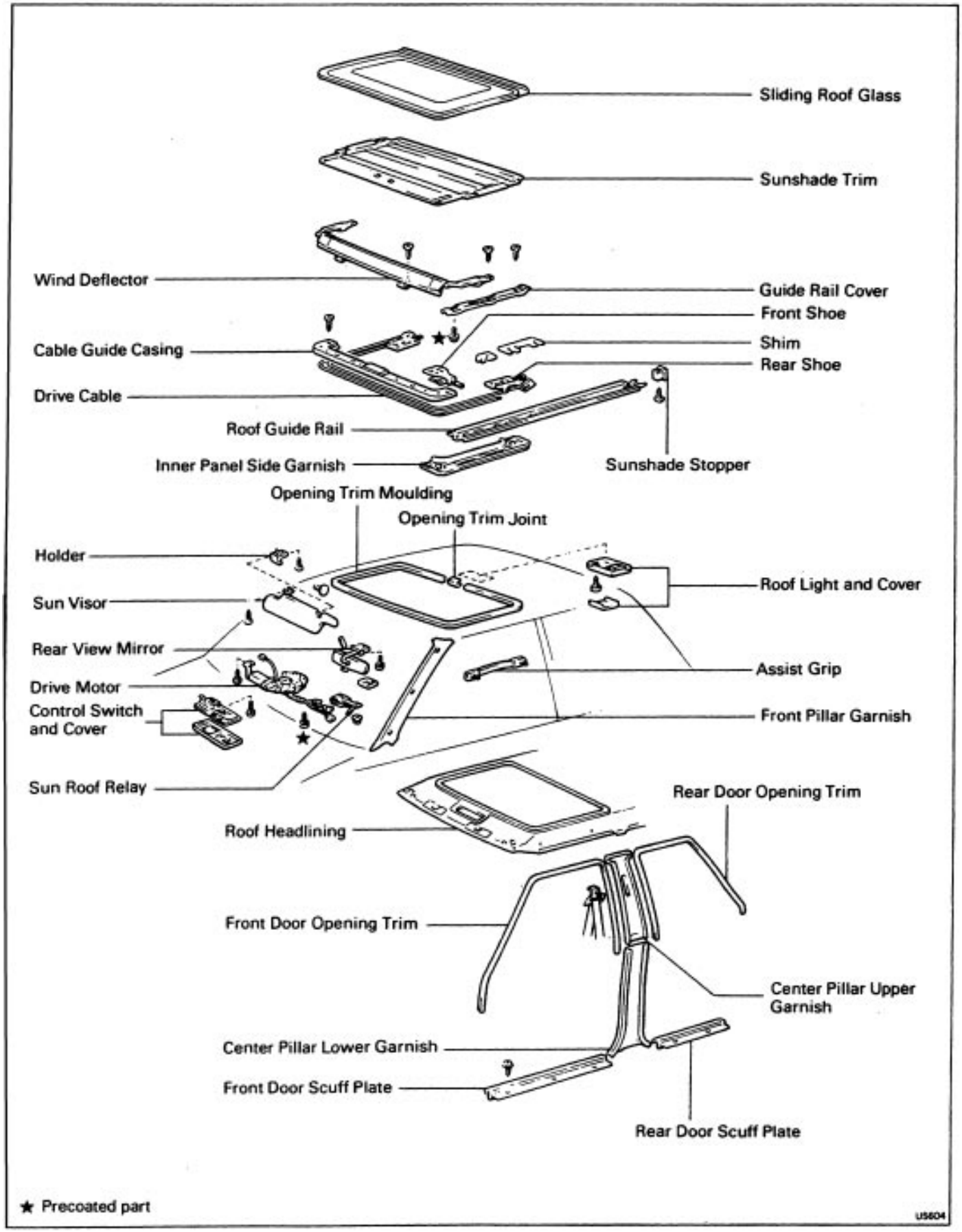
1. **INSTALL DAM**
(See page BO–41)
HINT: Install the dam on the surroundings of glass.
2. **COAT CONTACT SURFACE OF BODY WITH PRIMER "M"**
(See page BO–41)
3. **COAT CONTACT SURFACE OF GLASS WITH PRIMER "G"**
(See page BO–41)
4. **MIX ADHESIVE COATING**
(See page BO–41)
5. **APPLY .ADHESIVE**
(See page BO–41)
6. **INSTALL GLASS**
(See page BO–42)
7. **INSPECT FOR LEAKS AND REPAIR**
(See page BO–42)
8. **INSTALL UPPER MOULDING**
HINT: Install the upper moulding in the same manner as the windshield upper moulding. (See page **BO–26**)
9. **INSTALL LOWER MOULDING WITH CLIPS**
(See page BO–36)

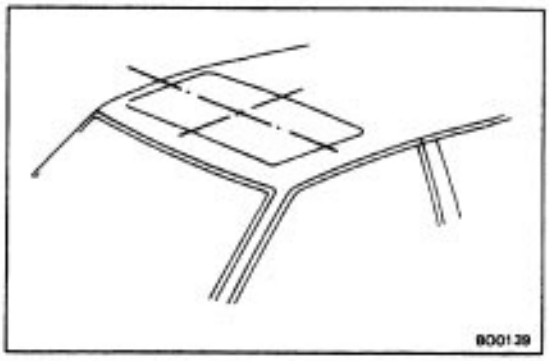


10. **INSTALL HIGH MOUNT STOP LIGHT**
Install the high mount stop light with the two bolts.
(b) Connect the connector to the high mount stop light.
11. **INSTALL BACK DOOR UPPER TRIM**
12. **CONNECT DEFOGGER WIRE CONNECTORS**
13. **INSTALL REAR WIPER ARM**

SUN ROOF

COMPONENT





ON–VEHICLE INSPECTION

INSPECT SLIDING ROOF GLASS ALIGNMENT

(a) Start the engine and check the operation time of the sun roof.

Operation time: Approx. 5 secs.

(b) Check for abnormal noise or binding during operation.

(e) With the sun roof fully closed, check for water leakage.

(d) Check for a difference in level between the sliding roof glass and roof panel.

Front side: 1.9 + 2.0 mm (0.075 +0.079 in.)
–1.0 –0.039

Rear side: 1.9 + 2.0 mm (0.075 +0.079 in.)
–1.0 –0.039

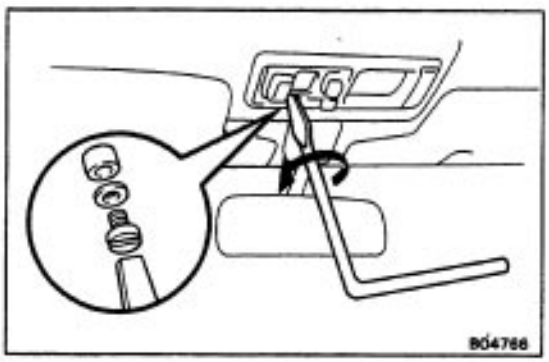
If the sliding roof does not operate:

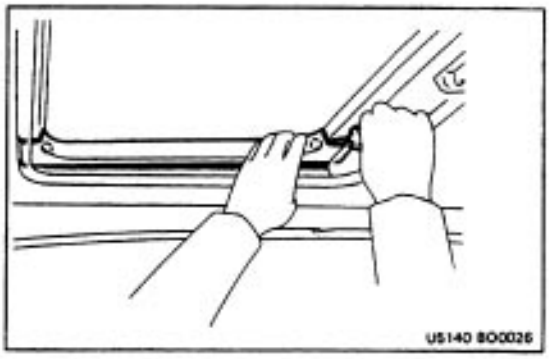
(a) Remove the control switch cover.

(b) Using a special crank–shaped screwdriver, remove the large screw inside.

NOTICE: Be careful not to lose the spring washer or shim.

(e) Manually operate the sun roof by inserting a special crank–shaped screwdriver into the hole and turning the drive shaft.



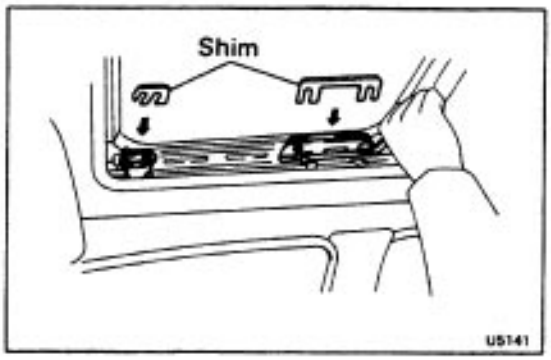


ADJUSTMENT OF SLIDING ROOF

1. REMOVE INNER PANEL SIDE GARNISH

Before making adjustments, remove the inner panel side garnish.

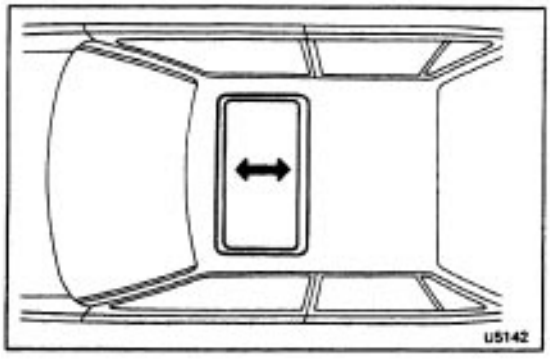
HINT: After adjustment, reinstall the inner panel side garnish.



2. TO ADJUST LEVEL DIFFERENCE

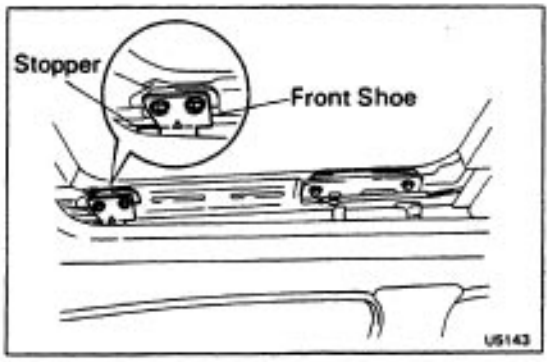
Adjust by increasing or decreasing the number of shims.

HINT: If the front of the sliding roof is high, even without a shoe shim, chek to see if the front shoes are in contact with the stoppers.

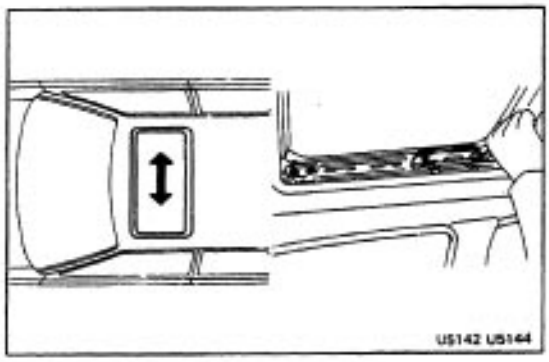


3. TO ADJUST FORWARD OR REARWARD

Adjust by loosening the sliding roof installation bolts, and move the sliding roof front shoe forward and rearward.

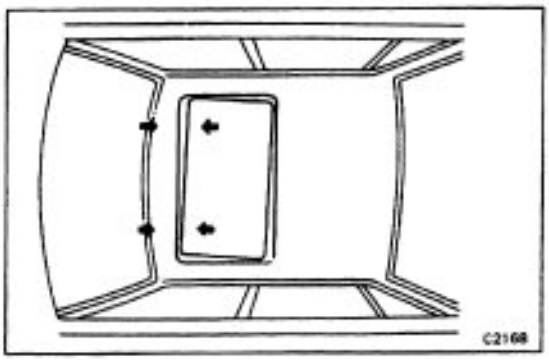


HINT: whe the sliding roof is fully closed, confirm that the front shoes are in contact with the stopper.



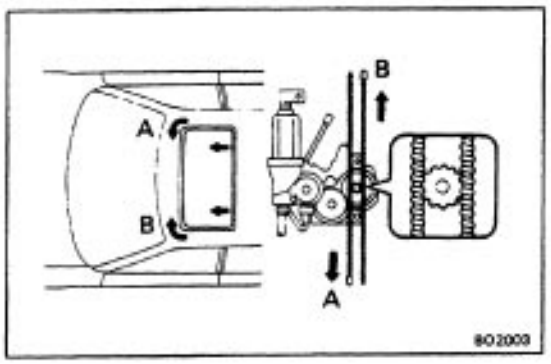
4. TO ADJUST RIGHT OR LEFT

Adjust by loosening the sliding roof rear shoe installation nuts, and move the sliding roof to the right and left.



5. TO ADJUST CLEARANCE

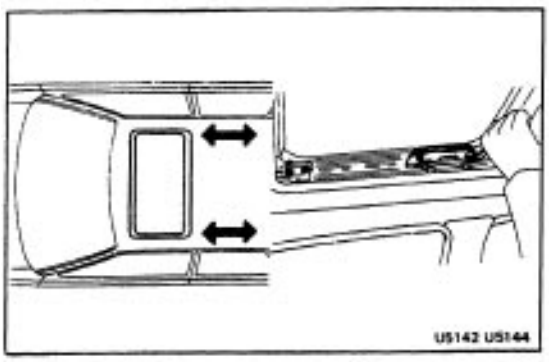
(Difference in left and right clearance)



If the difference is about 2 mm (0.08 =n.):

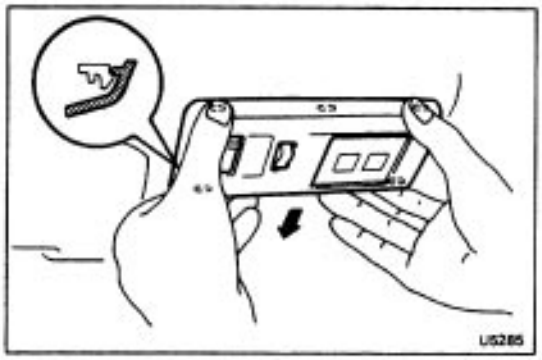
(a) Remove the drive motor and shift the cable one notch on the side with the larger clearance.

(b) Reinstall the motor.



If the difference is about 1 mm 10.04 in.):

Loosen the sliding roof rear shoe installation nuts and readjust the sliding roof to the proper position.



REMOVAL OF SUN ROOF

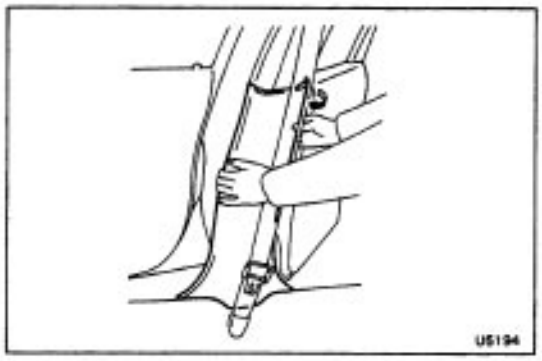
(See page BO–53)

1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL

2. REMOVE CONTROL SWITCH

3. REMOVE FOLLOWING PARTS:

- Front pillar garnishr Assist grip
- Rear view mirror
- Sun visor and holder
- Opening trim moulding

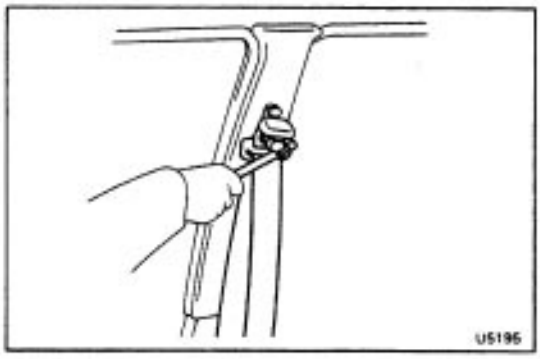


4. REMOVE CENTER PILLAR LOWER GARNISH

(a) Remove the front and rear door opening trims.

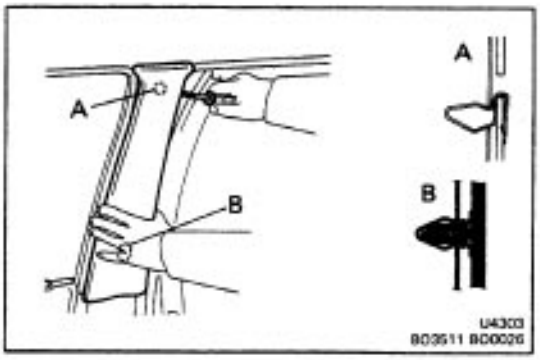
(b) Remove the front and rear scuff plates.

(e) Pry out the clips and remove the center pillar lower garnish.



5. REMOVE CENTER PILLAR UPPER GARNISH

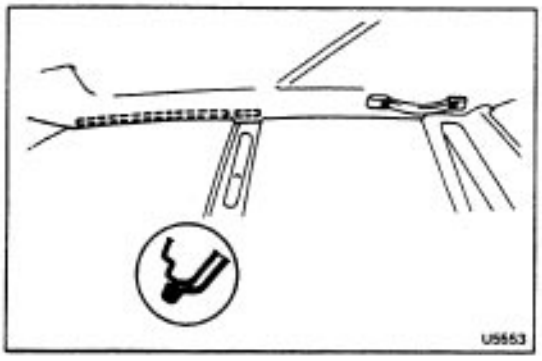
(a) (CANADA)
Remove the front shoulder belt anchor.



(b) Using a screwdriver, pry out the clips.

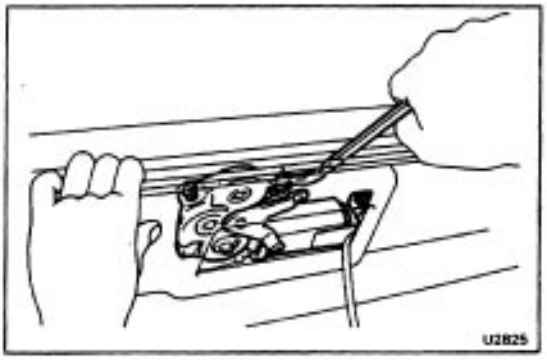
HINT: Tape the screwdriver tip before use.

(c) Remove the center pillar upper garnish.



6. REMOVE FRONT SIDE ROOF HEADLINING

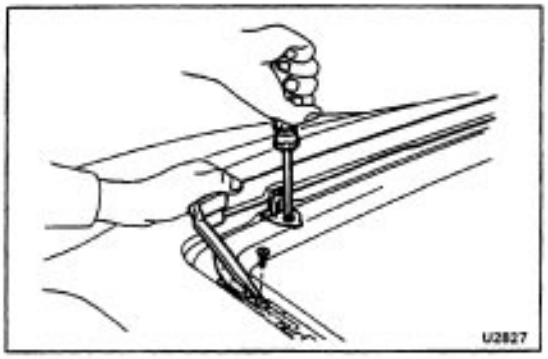
Tear off the roof headlining portion stuck with double–stick tape between front all center pillar.



7. REMOVE DRIVE MOTOR

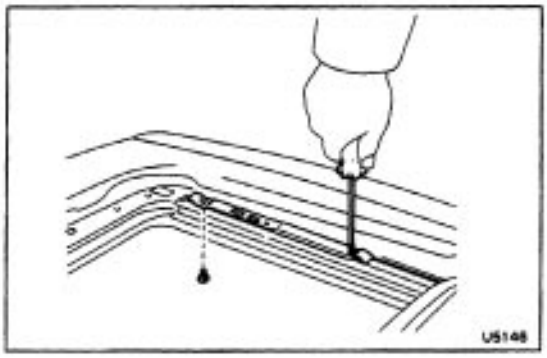
(a) Disconnect the drive motor connector.

(b) Remove the three bolts and drive motor.



8. REMOVE WIND DEFLECTOR

Remove the four screws and wind deflector.

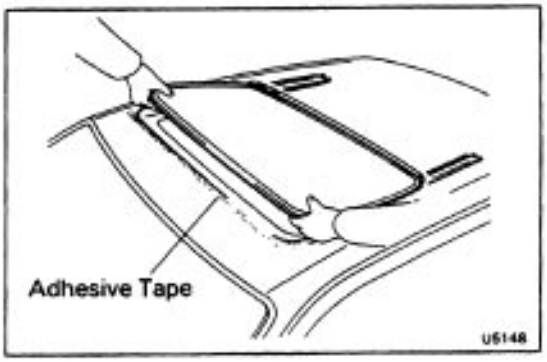


9. REMOVE GUIDE RAIL COVER

(a) Disconnect the front of roof headlining to make the clearance between the roof headlining and glass.

HINT: Do not damage the roof headlining.

(b) Remove the screw and guide rail cover.



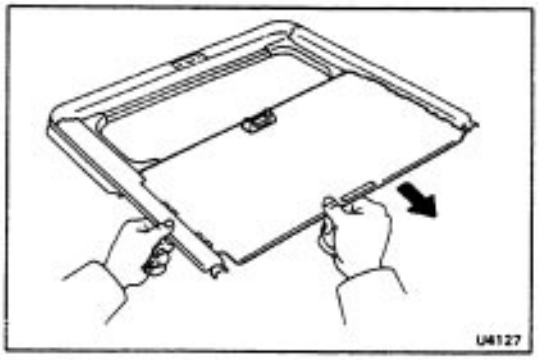
10. REMOVE SLIDING ROOF GLASS WITH GUIDE RAIL

(a) Apply adhesive tape to protect the body.

(b) Remove the four screws and sliding roof.

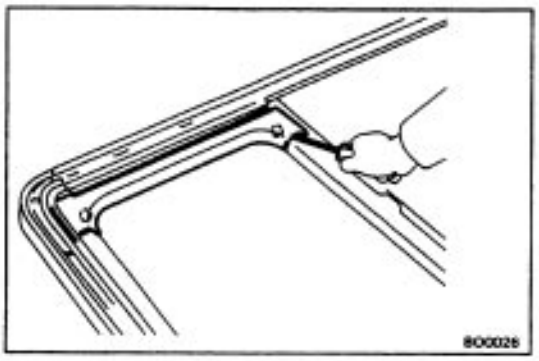
DISASSEMBLY OF SUN ROOF

(See page BO–53)



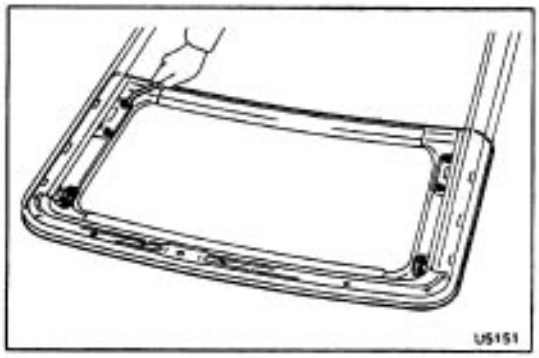
1. REMOVE SUNSHADE TRIM

(a) Remove the screw and sunshade stopper.
(b) Pull the sunshade trim rearward to remove.



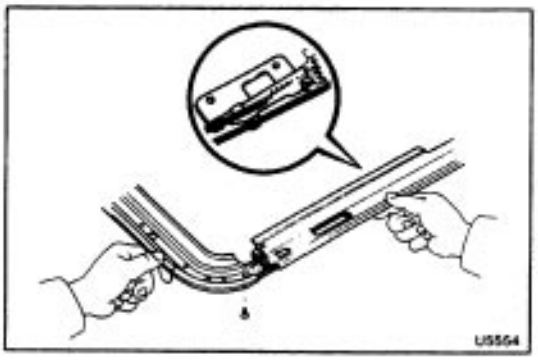
2. REMOVE INNER PANEL SIDE GARNISH

Using a screwdriver, remove the side garnish.
HINT: Tape the screwdriver tip before use.



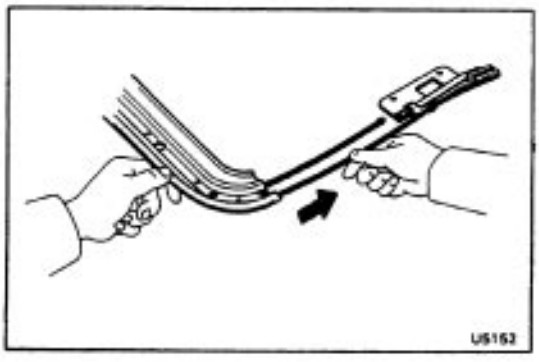
3. REMOVE SLIDING ROOF GLASS

Remove the eight nuts and sliding roof glass with the front and rear shims.
HINT: Note the number of shims in the front and rear shoes.



4. REMOVE CABLE GUIDE CASING FROM ROOF GUIDE RAIL

(a) Remove the screw and weatherstrip.
(b) Pull the cable guide casing forward to remove.



5. REMOVE DRIVE CABLE FROM CABLE GUIDE CASING

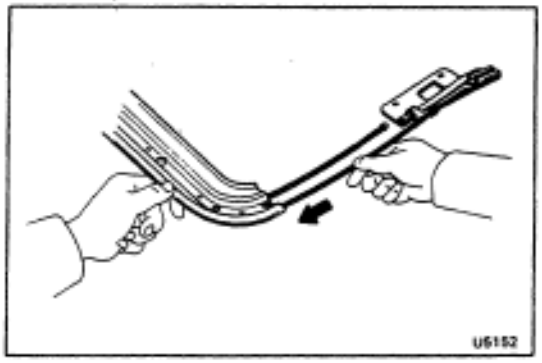
Pull the drive cable from the cable guide casing.

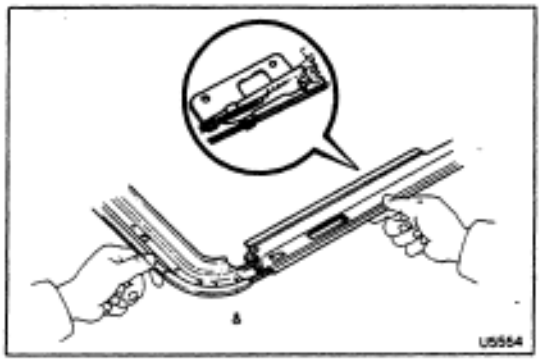
ASSEMBLY OF SUN ROOF

(See page BO–53)

1. APPLY NIP GREASE TO DRIVE CABLE

2. PLACE DRIVE CABLES INTO CABLE GUIDE CASING

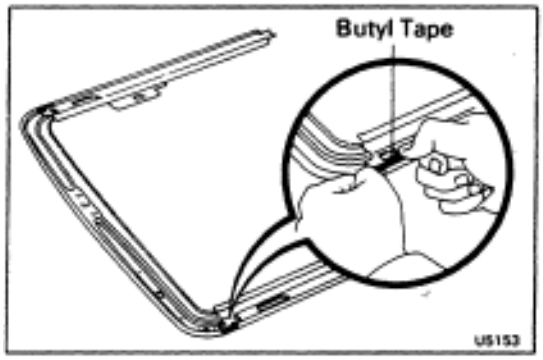




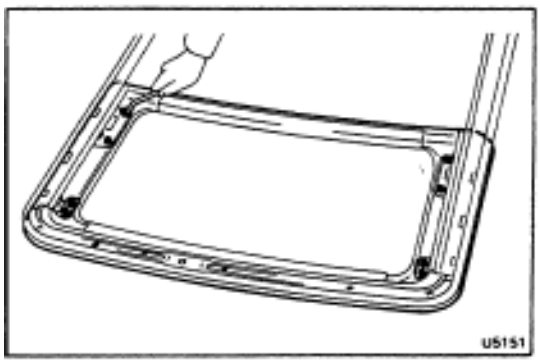
3. INSTALL CABLE GUIDE CASING TO ROOF GUIDE RAIL

(a) Insert the drive cable into the. rail, and afign it with the guide casing.

(b) Install the guide rail and guide casing with the screw.



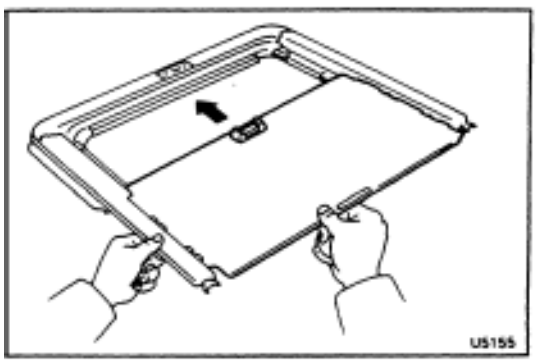
(e) Use butyl tape to cover the cut portion of the weather-strip at the connection between the guide casing and guide rail.



4. ASSEMBLE SLIDING ROOF GLASS

Install the sliding roof glass, shims and shoes with the eight nuts.

HINT: Install the same number of shims that were disassembled.



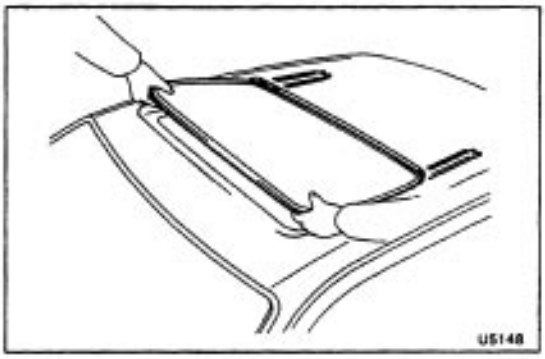
5. INSTALL SUNSHADE TRIM

(a) Run the sunshade trim through the guide rail.

HINT: Secure the headlining for adjustment after assembly.

(b) Install the sunshade stopper with the screw.

6. INSTALL INNER PANEL SIDE GARNISH



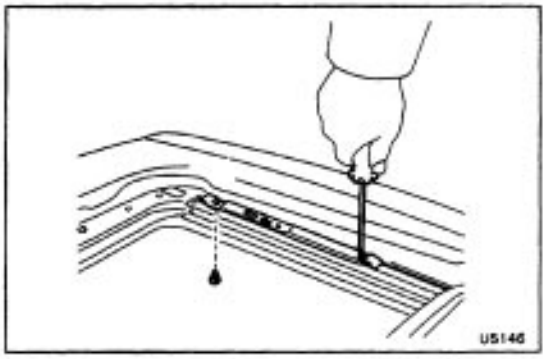
INSTALLATION OF SUN ROOF

(See page BO–53)

1. INSTALL SLIDING ROOF GLASS WITH GUIDE RAIL ONTO ROOF

(a) Place the sliding roof glass with the guide rail onto the roof.

(b) Tighten the guide rail with the four screws.



2. INSTALL GUIDE RAIL COVER

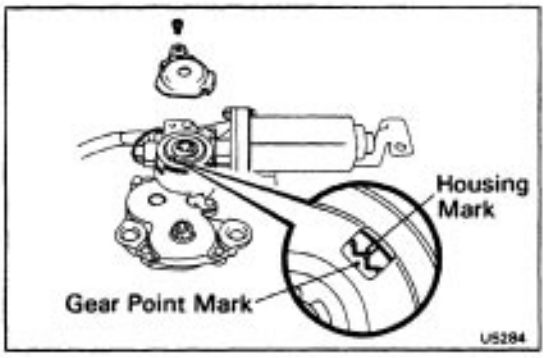
(a) Apply liquid sealer to 2 or 3 threads of the bolt end.

Sealant: Part No. 08833–00070, THREE BOND 1324, or equivalent

(b) Install the rail cover with the screw.

HINT: Do not damage the roof headlining.

3. INSTALL WIND DEFLECTOR

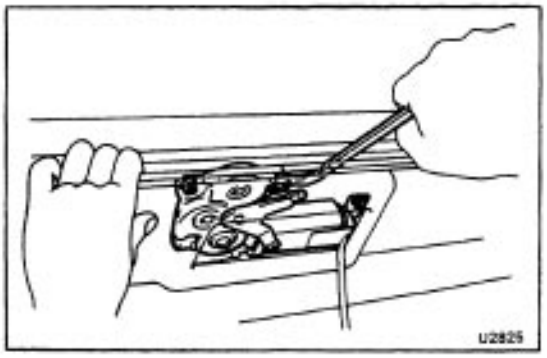


4. INSTALL SLIDING ROOF DRIVE MOTOR

(a) Remove the screw and cam plate cover.

(b) Align the housing and gear point mark.

(c) Install the cam plate cover and screw.



(d) Close the sliding roof panel by hand so the clearance between the left and right sides of the sliding roof panel and roof panel are equal.

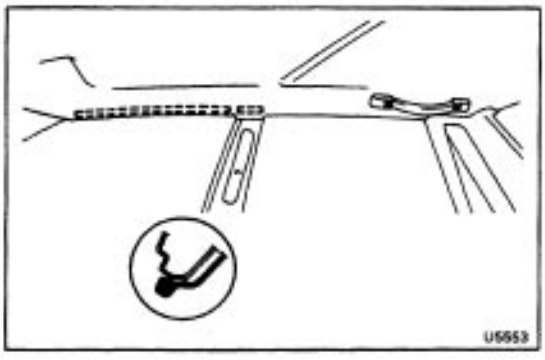
(e) Contact the front shoes with the stopper, install it.

(f) Apply liquid sealer to 2 or 3 threads of the bolt end.

Sealant: Part No. 08833–Q0070, THREE BOND 1324, or equivalent

(g) Install the drive motor with the three bolts.

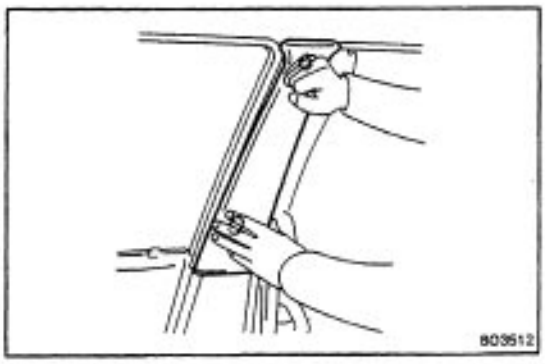
(h) Connect the drive motor connector.



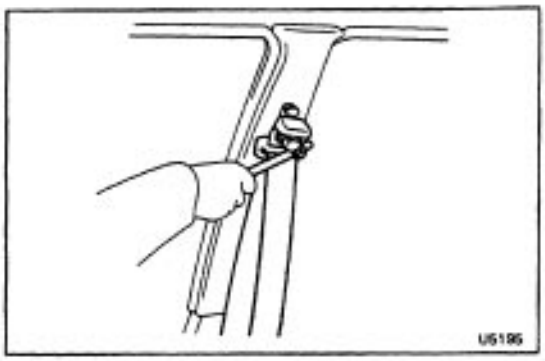
5. INSTALL FRONT SIDE ROOF HEADLINING

(a) Stick the double–stick tape between front and rear pillar as shown.

(b) Install the roof headlining to the roof panel.



6. **INSTALL CENTER PILLAR UPPER GARNISH**
   (a) Install the center pillar upper garnish¿¿ tapping.

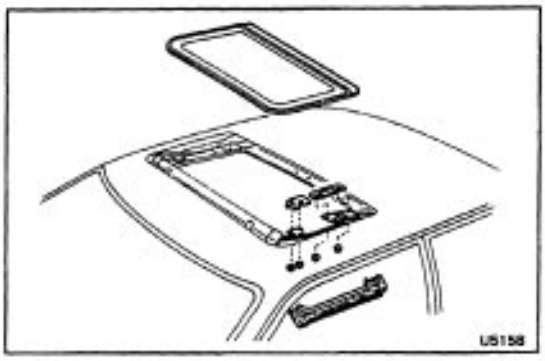


   (b) (CANADA)
   Install the shoulder belt anchor with the bolt.
   Torque: 440 kg–cm (32 ft–lb, 43 N–m)
7. **INSTALL CENTER PILLAR LOWER GARNISH**
8. **INSTALL SCUFF PLATE**
9. **INSTALL FOLLOWING PARTS:**
   - Front pillar garnish
   - Rear view mirror
   - Sun visor and holder
   - Assist grip
   - Opening trim moulding
10. **INSTALL CONTROL SWITCH**
11. **INSPECT AND ADJUST SLIDING ROOF**
    (See pages BO–54 and 55)
12. **CONNECT BATTERY CABLE TO NEGATIVE TERMINAL**

REMOVAL OF SLIDING ROOF GLASS

(See page BO–53)

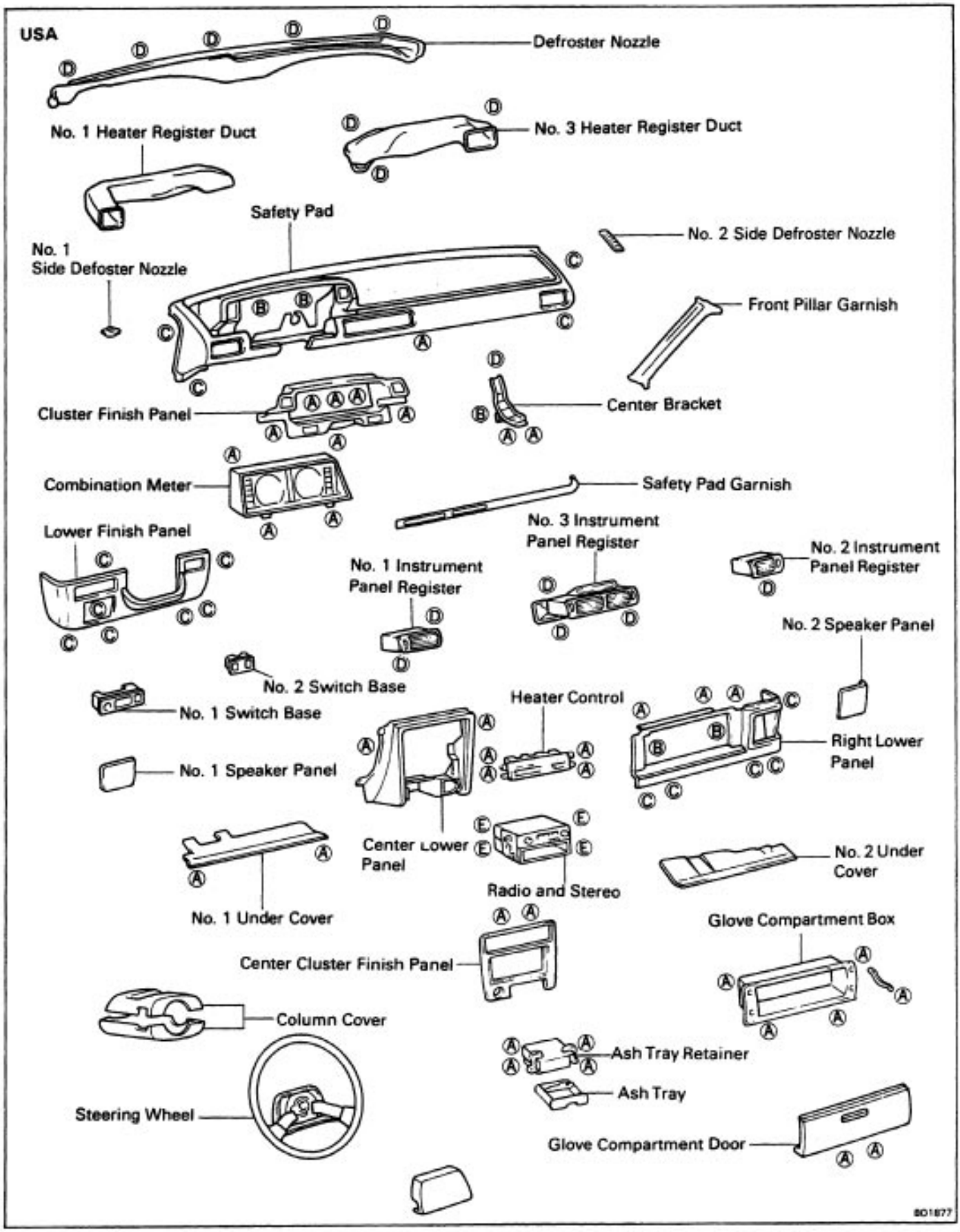
TO REMOVE ONLY SLIDING ROOF GLASS



(a) Slide the sunshade trim rearward.
(b) Remove the inner panel side garnish.
(e) Remove the front and rear shoe nuts.
(d) Remove the roof glass.

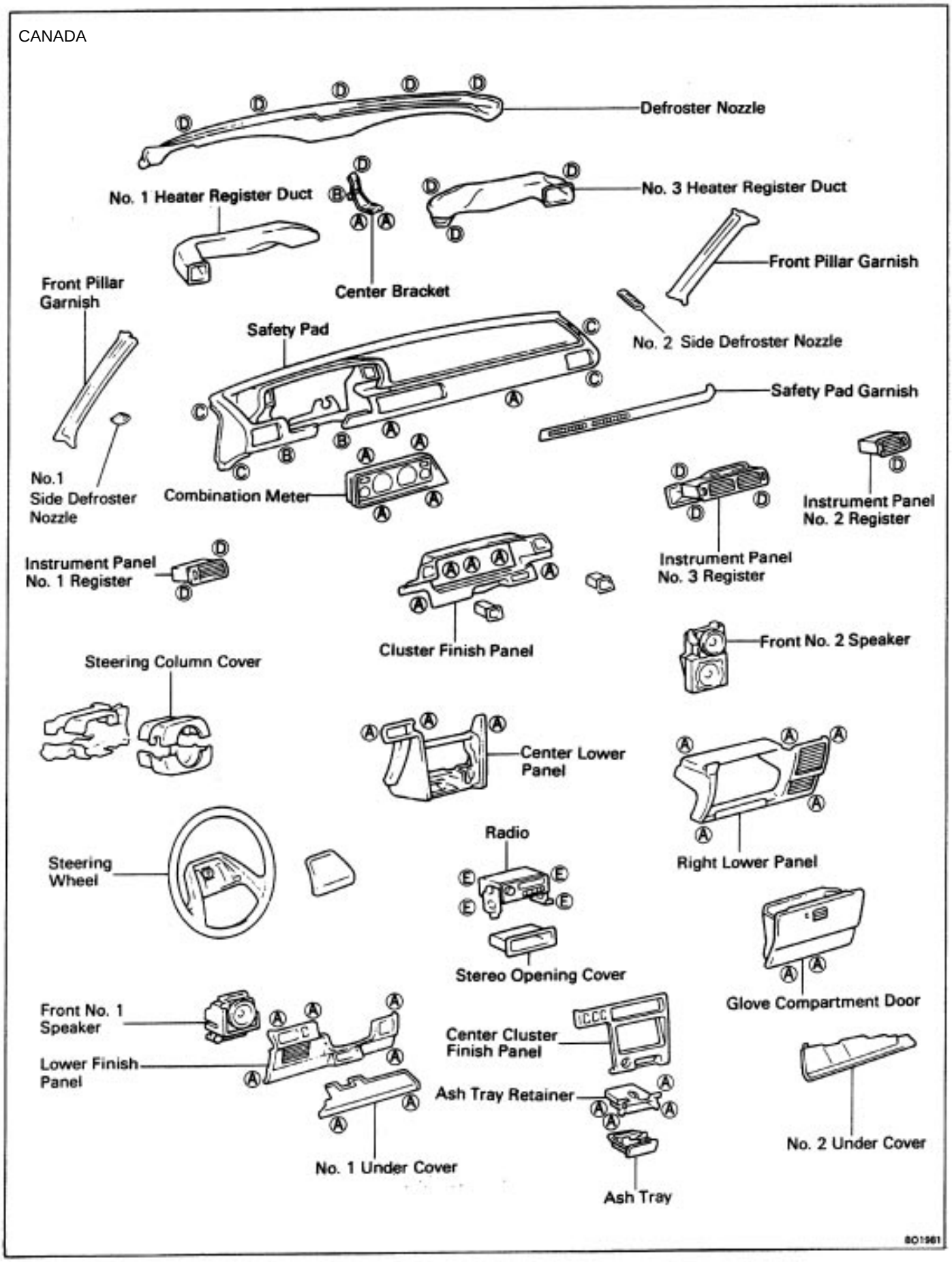
SAFETY PAD

COMPONENTS



COMPONENTS (Cont'd)

CANADA



HINT: Screw sizes in the previous illustration are indicated by following the code below for removal and installation of safety pad.

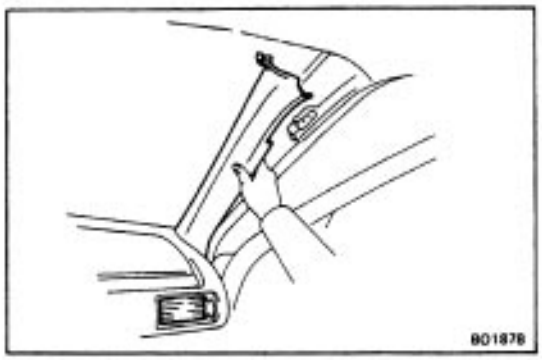
mm (in.)

Code	Shape	Size	Code	Shape	Size	Code	Shape	Size
A		ϕ = 5.2 (0.21) L = 16 (0.63)	B		ϕ = 6 (0.24)	C		ϕ = 6 (0.24) L = 20 (0.79)
D		ϕ = 5 (0.20) L = 14 (0.55)	E		ϕ = 5 (0.20) L = 18 (0.71)			

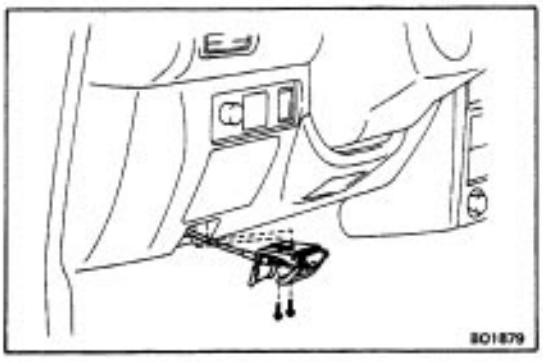
REMOVAL OF SAFETY PAD

(See pages BO–62, 63)

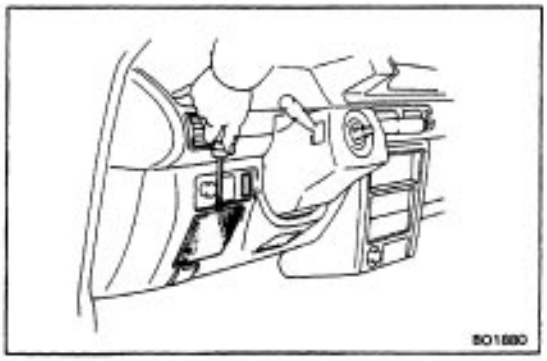
1. **DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL**
2. **REMOVE STEERING WHEEL**



3. **REMOVE FRONT PILLAR GARNISH**
   Pry out the clips and pull the front pillar garnish upward to remove it by the hand.
4. **REMOVE NO. 1 UNDER COVER**

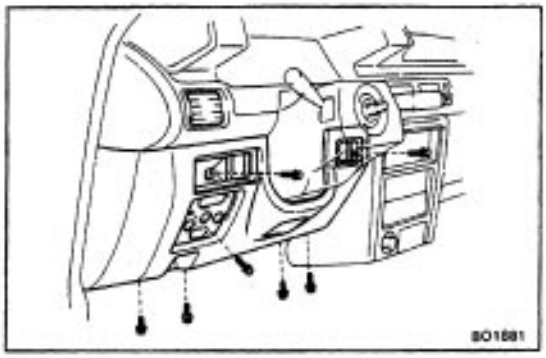


5. **REMOVE LOWER FINISH PANEL**
   (a) Remove the two screws and the engine. hood release lever.

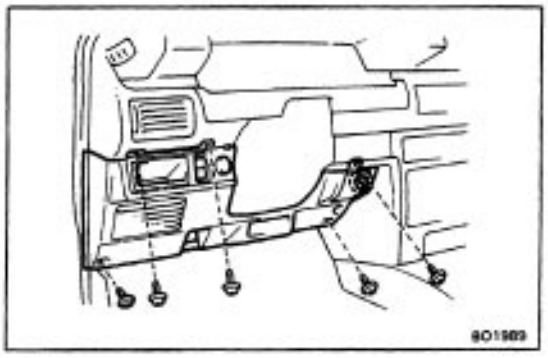


(b) (USA)
Using a screwdrier, pry out the switch bases and the No. 1 speaker panel.

HINT: Tape the screwdrier tip before use.

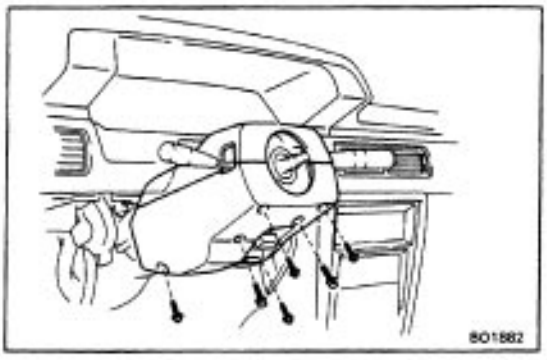


(c) (USA)
Remove the seven bolts and lower finish panel.



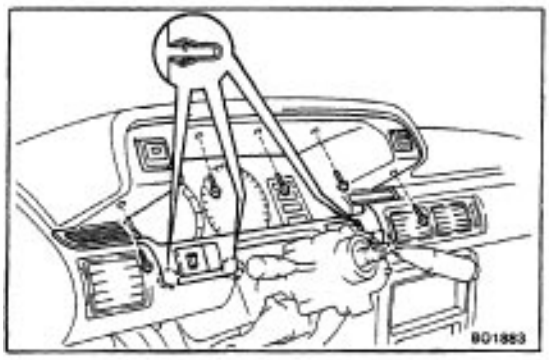
(d) (CANADA)
Remove the five screws and lower finish panel.

(e) Disconnect the connectors.



6. REMOVE STEERING COLUMN COVER

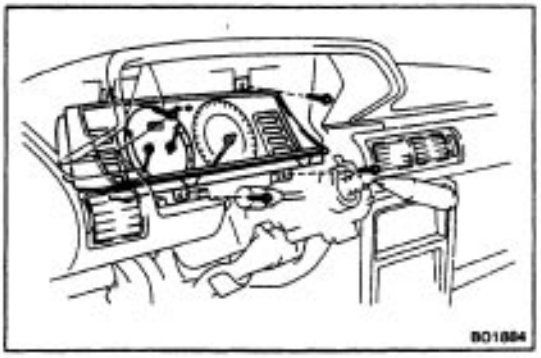
Remove the four screws, the two bolts, and the cover.



7. REMOVE CLUSTER FINISH PANEL

(a) Remove the five screws and the panel.

(b) Disconnect the connectors.

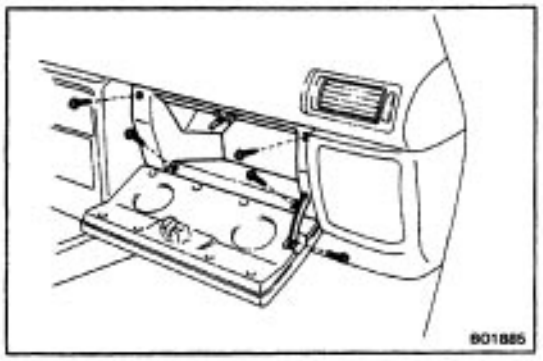


8. REMOVE COMBINATION METER

(a) Remove the four screws.

(b) Remove the speedometer cable, connectors and the meter.

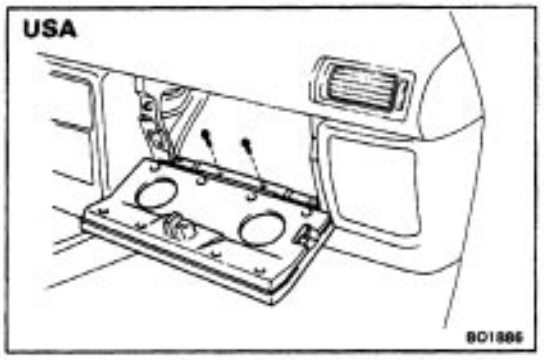
9. REMOVE NO.2 UNDER COVER



10. (USA)
REMOVE GLOVE COMPARTMENT BOX

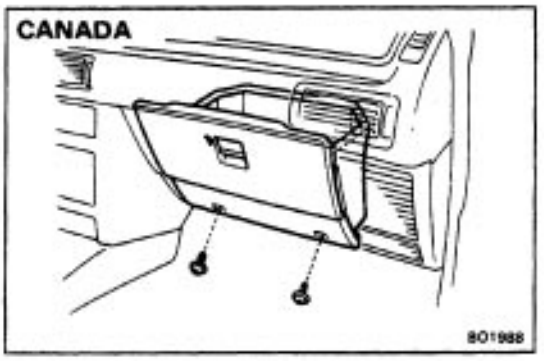
(a) Remove the screw and pull out the chech arm.

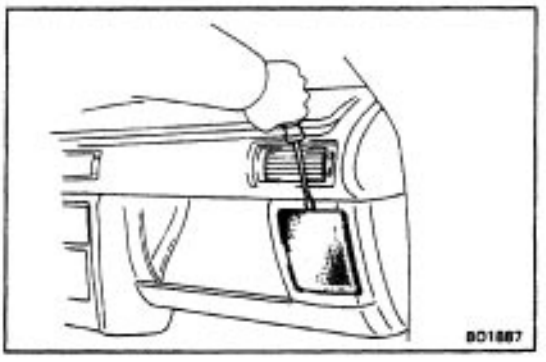
(b) Remove the four screws, the connector, and pull out the box.



11. REMOVE GLOVE COMPARTMENT DOOR

Remove the two screws and the door.



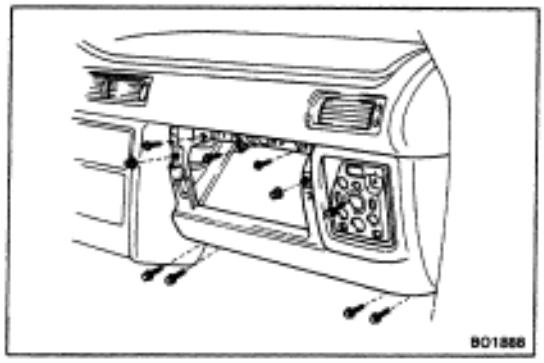


12. REMOVE RIGHT LOWER PANEL

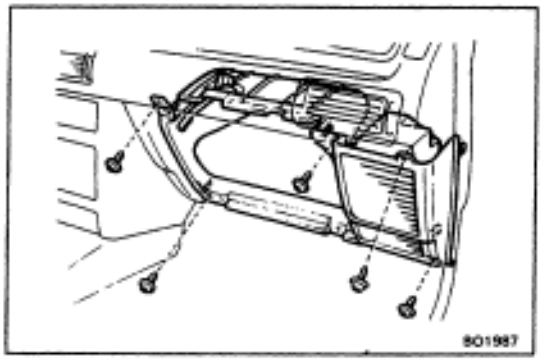
(a) (USA)

Using a screwdrier, pry out the No. 2 speaker panel.

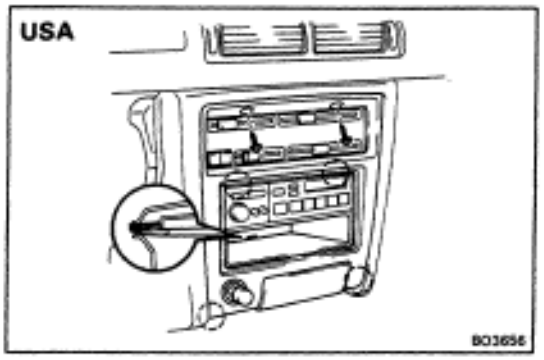
HINT: Tape the screwdriver tip before use.



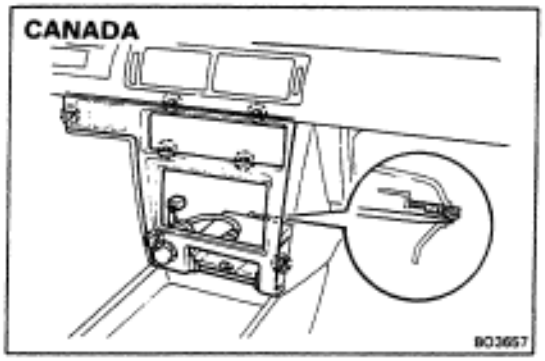
(b) (USA)
Remove the five bolts, the three screws and the twc nuts.

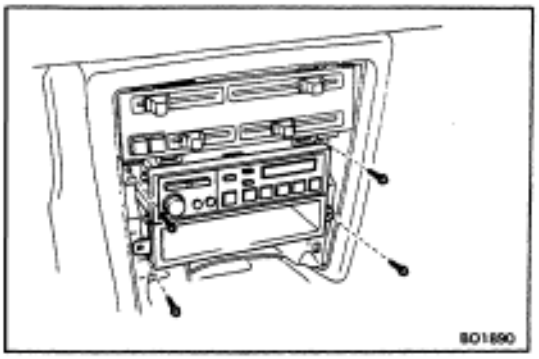


(e) (CANADA)
Remove the five screws.
(d) Remove the panel and disconnect the speaker connector.

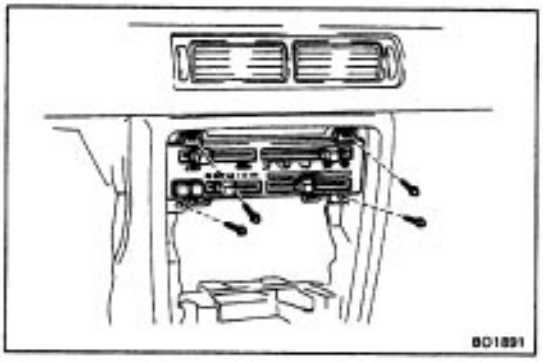


13. REMOVE CENTER CLUSTER FINISH PANEL
(a) (USA)
Remove the two screws.
(b) Remove the ash tray.
(c) Using a screwdriver, release the white plastic clip at the rear of the ash receptacle retainer.
HINT: Tape the screwdrier tip before use.
(d) Pull out the center cluster finish panel.



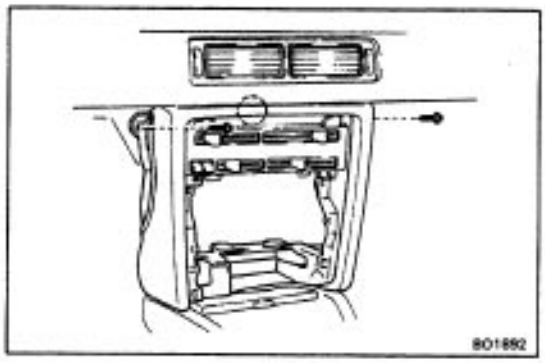


14. REMOVE RADIO AND STEREO
(a) Remove the four screws, radio and stereo.
(b) Disconnect the connectors and the antenna cable.



15. REMOVE NEATER CONTROL

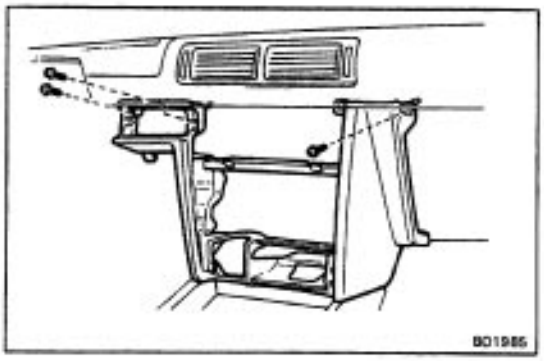
Remove the four screws and the heater control.



16. REMOVE CENTER LOWER PANEL

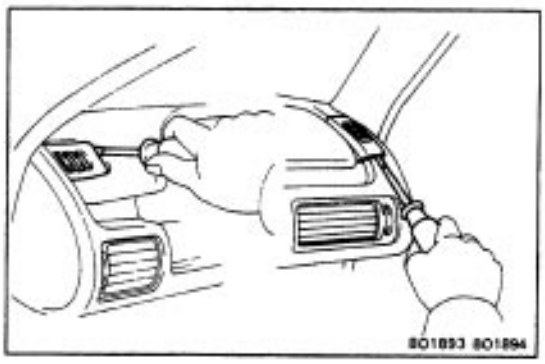
(a) (USA)

Remove the two screws and pull out the panel.



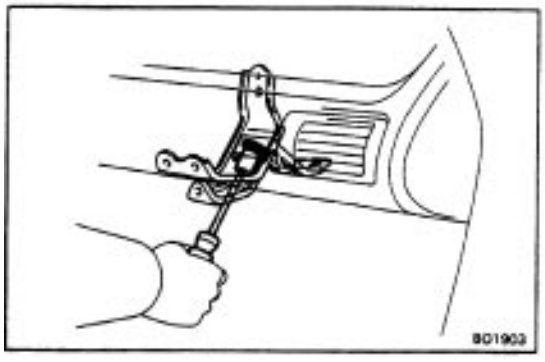
(b) (CANADA)

Remove the three screws and panel.

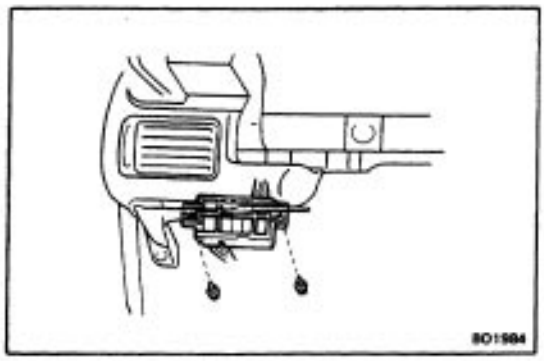


17. REMOVE SIDE DEFROSTER NOZZLE

HINT: Tape the screwdriver tip before use.



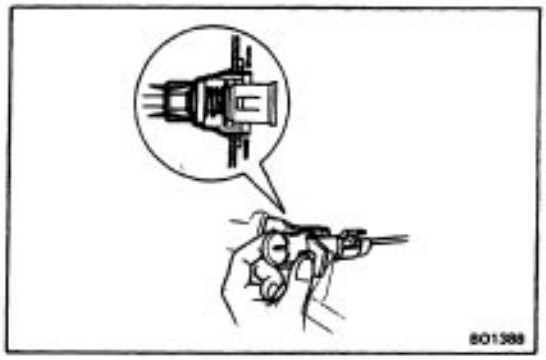
18. REMOVE NUT CONNECTING CENTER BRACKET AND SAFETY PAD



19. REMOVE JUNCTION BLOCK NO.3

(a) Remove the speaker.

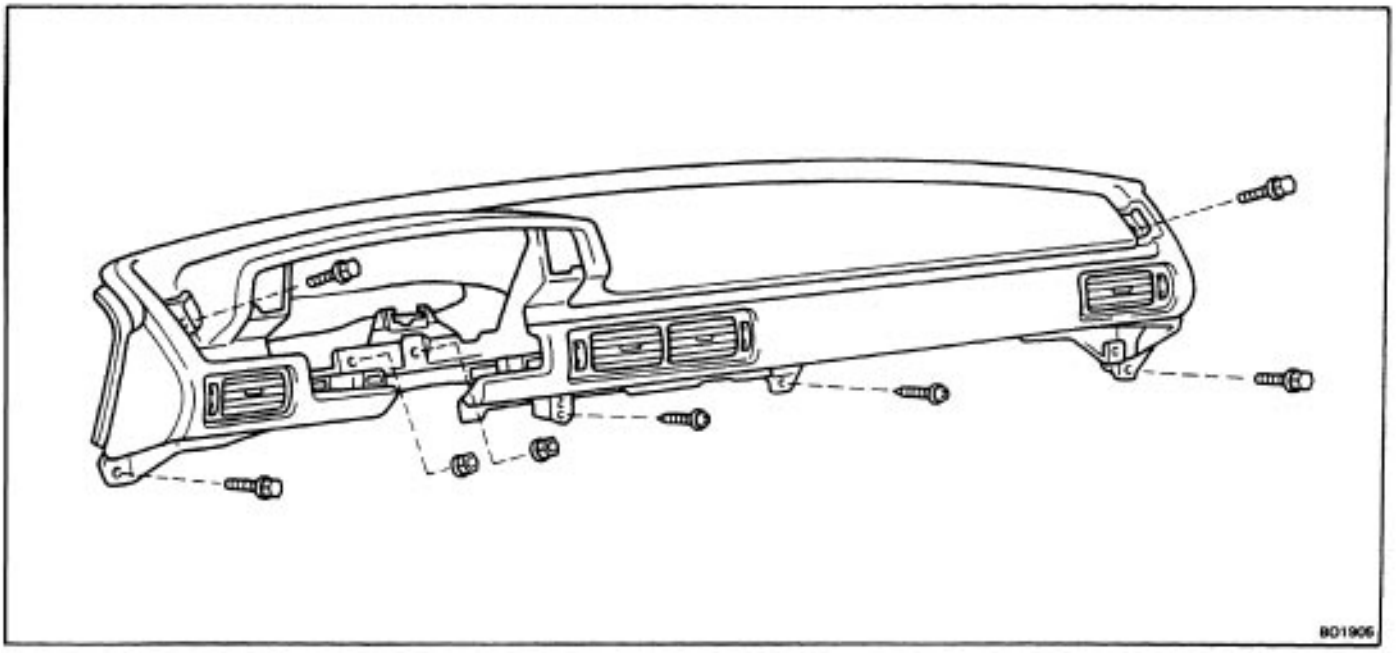
(b) Remove the two screws and junction block No.3.

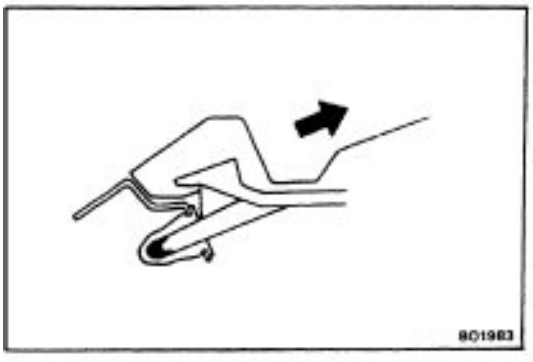


20. REMOVE SAFETY PAD

(a) Push on the pawls of speedometer cable, bracket and pull it from the safety pad.

(b) Remove the four bolts, two screws, two nuts and the safety pad.

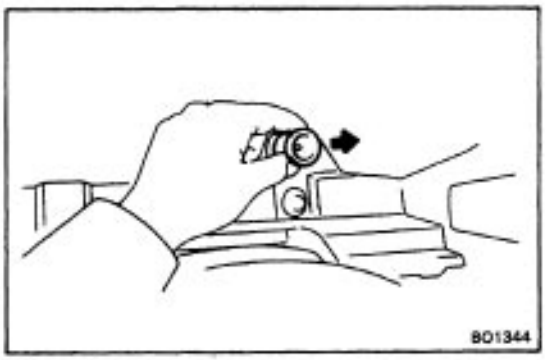


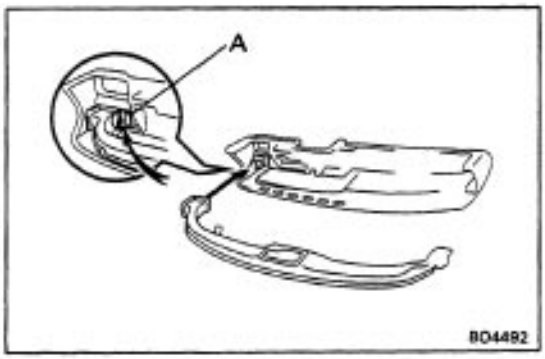


HINT: The safety pad has a boss on the reverse side for clamping onto the clip on the body side. Therefore, when removing, pull, upward at an angle.

(e) Remove the clips and disconnect the wire harness from the safety pad.

21. **REMOVE NO.1 HEATER REGISTER DUCT**
Pry out the clip and remove the duct.
22. **REMOVE NO.3 HEATER REGISTER DUCT**
Remove the three screws and duct.
23. **REMOVE DEFROSTER NOZZLE**
Remove the five screws and nozzle.
24. **REMOVE NO.1 INSTRUMENT PANEL REGISTER**
Remove the two screws and register.
25. **REMOVE NO.3 INSTRUMENT PANEL REGISTER**
Remove the three screws and register.
26. **REMOVE NO.2 INSTRUMENT PANEL REGISTER**
Remove the screws and register.
27. **REMOVE SAFETY PAD GARNISH**





INSTALLATION OF SAFETY PAD

(See pages BO–62**, 63)**

INSTALL SAFETY PAD PARTS FOLLOWING REMOVAL SEQUENCE IN REVERSE

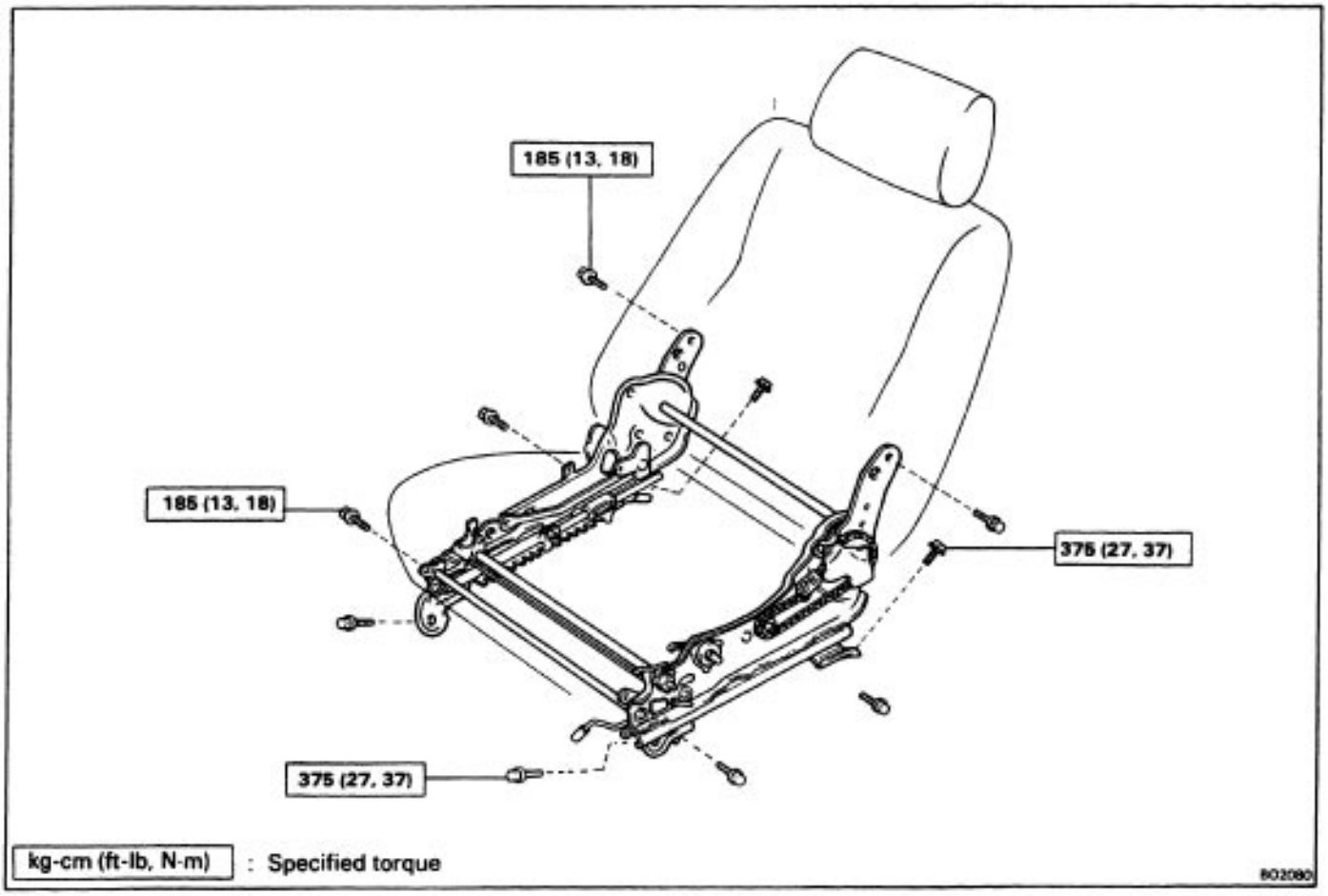
HINT:

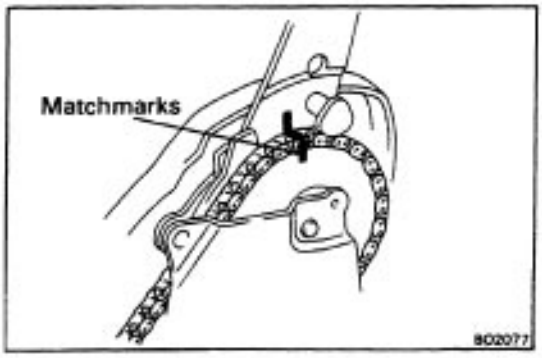
- When reinstall the speedometer cable, first pull on the cable guide casing.
- Insert the flange of def–nozzle between the rib (A) and the safety pad.

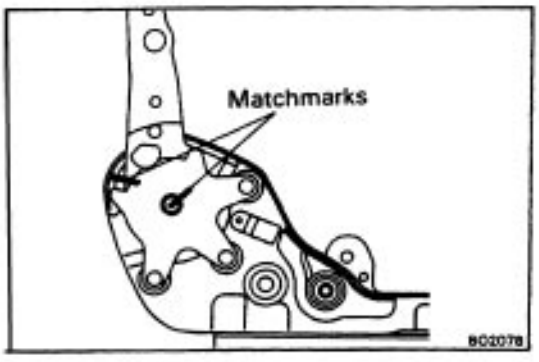
SEAT

Front Seat

COMPONENTS







ASSEMBLY OF FRONT SEAT

PRECAUTION: Pay attention items below when installing the front seat.

(a) To prevent warpage of the seat adjuster, carry out this operation on a level surface.

(b) Align the matchmark of the seat adjuster outer by turning the adjuster knob.

(c) Align the matchnnarks of the seat adjuster inner by turning the hinge pin.

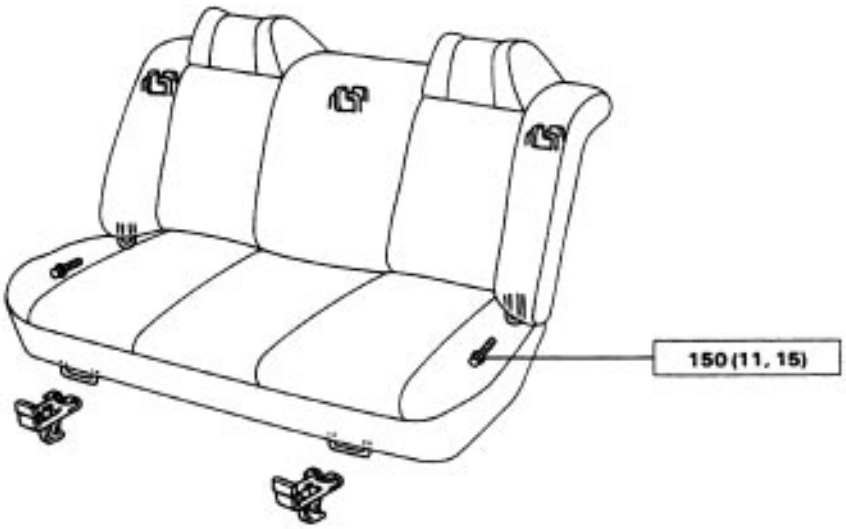
(d) After assemble the front seat, check that the seat adjuster operates normal by turning the adjuster knob.

If operation is not normal, reassemble the seat adjuster.

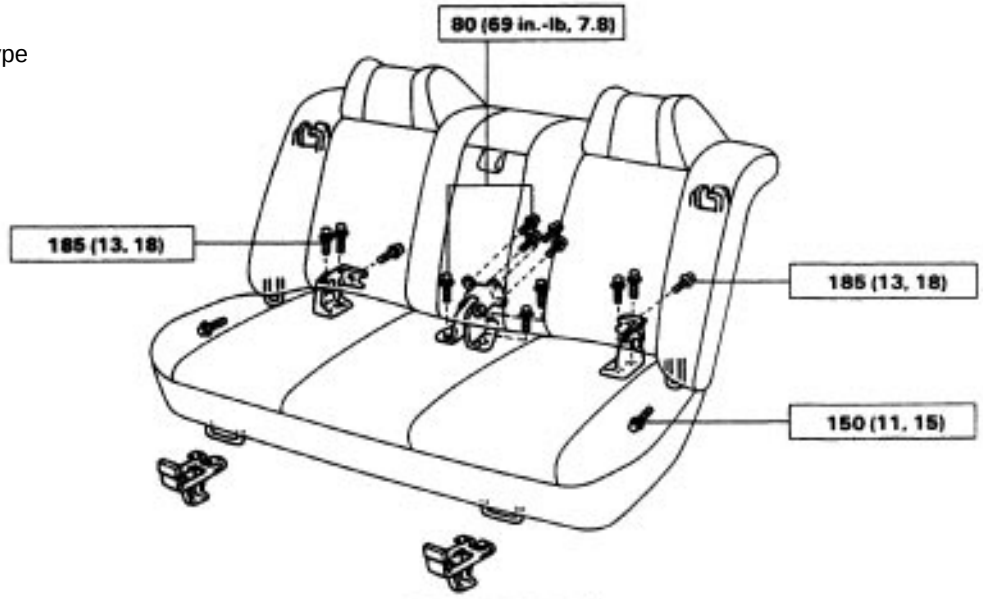
Rear Seat

COMPONENTS

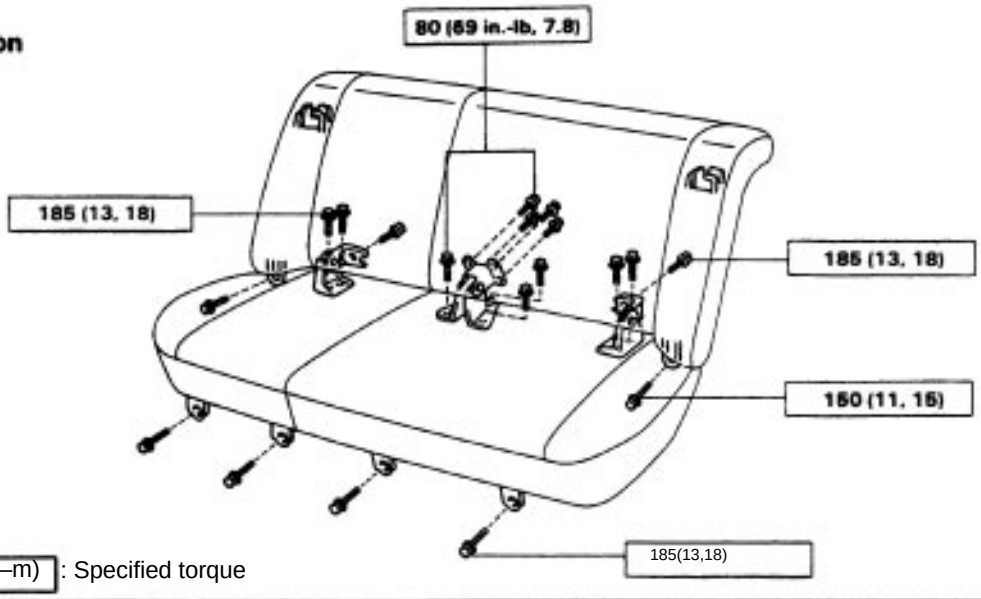
Sedan
Fixed type



Separate type



Station Wagon

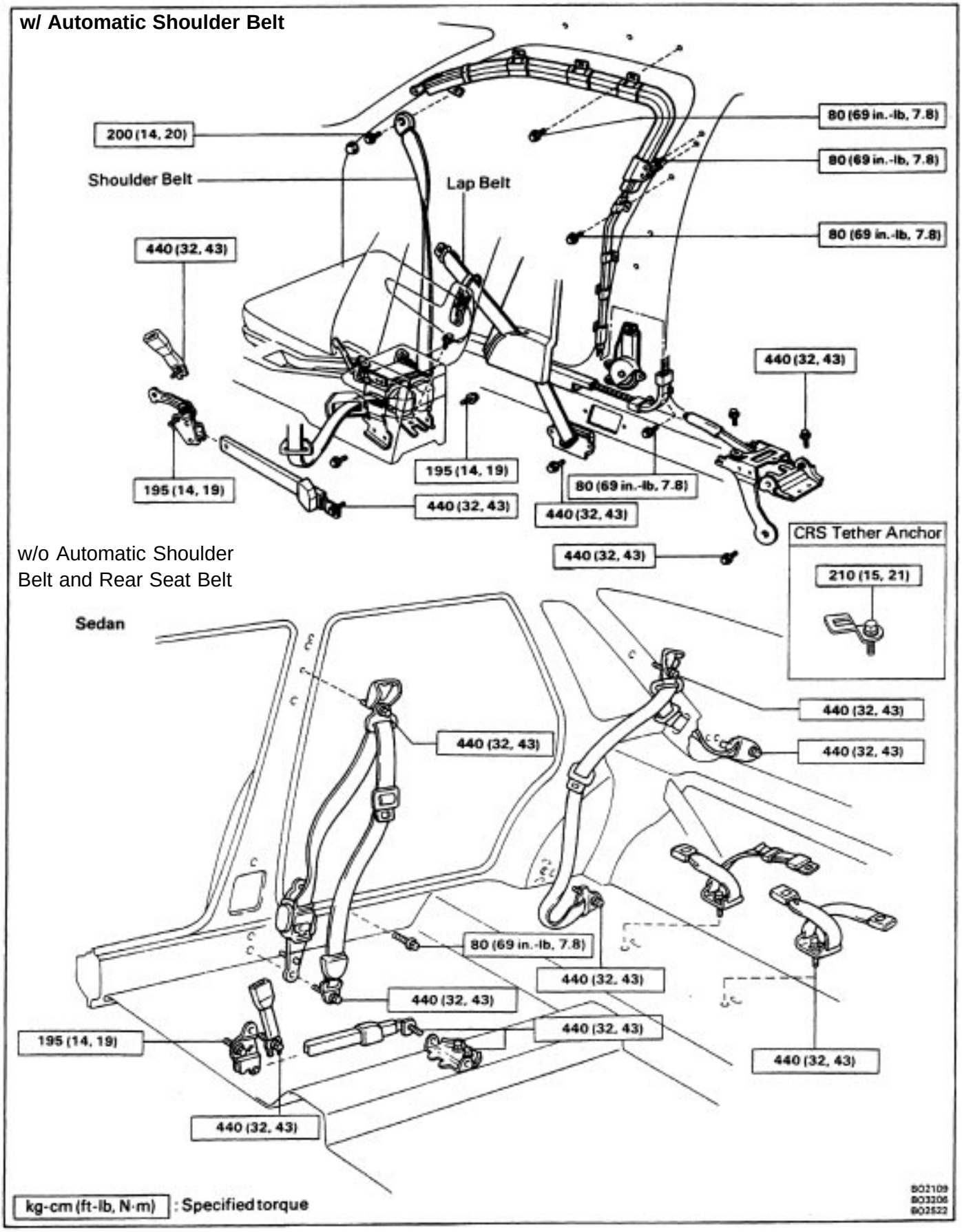


802016
802004
802005

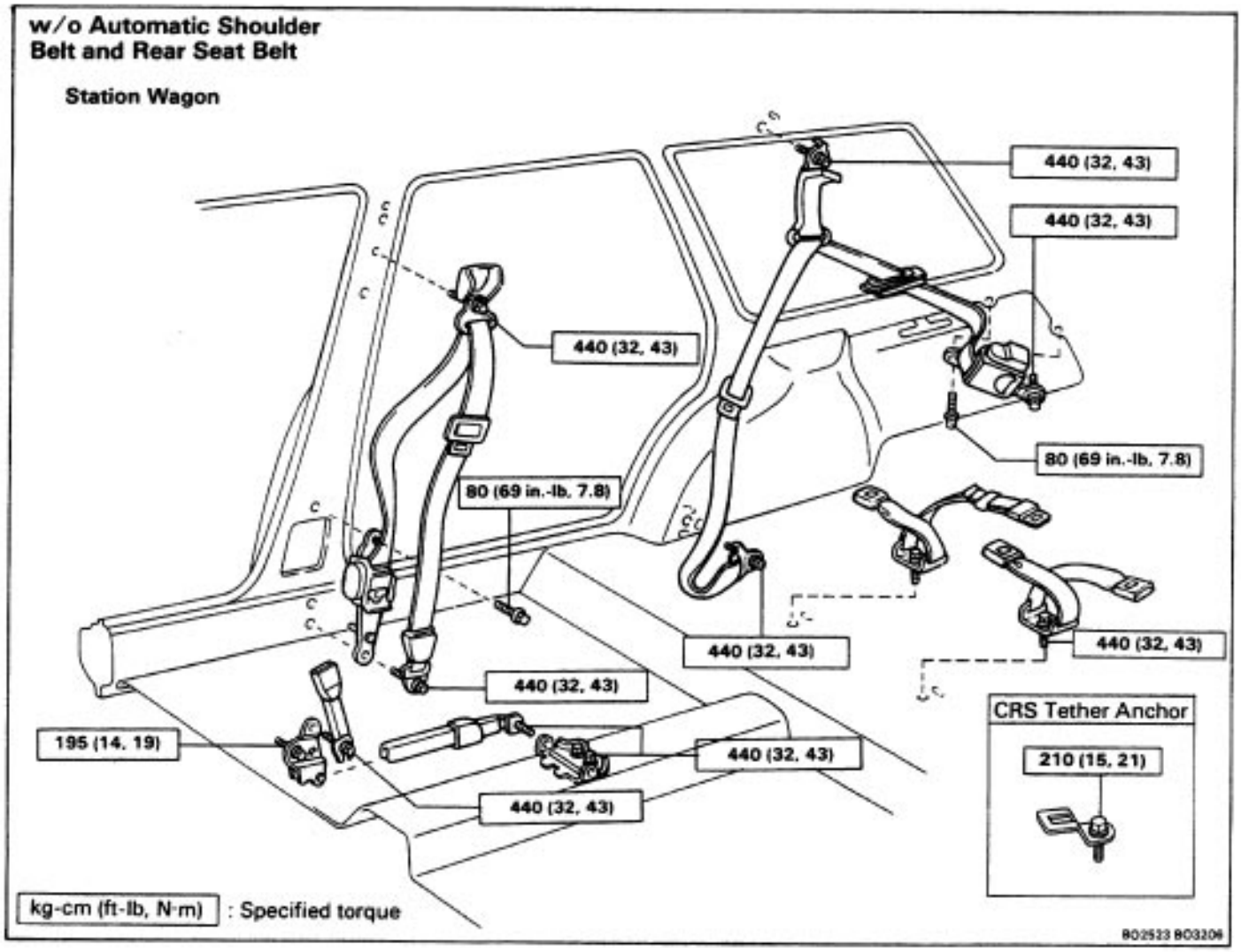
kg–cm (ft–lb, N–m) : Specified torque

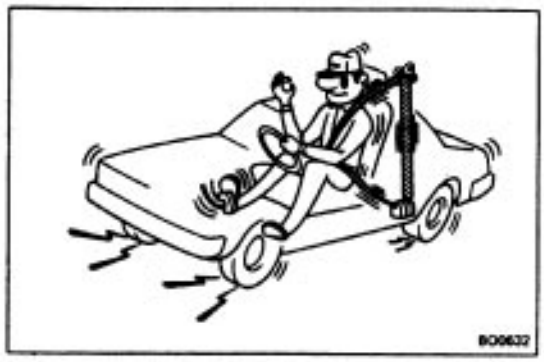
SEAT BELT

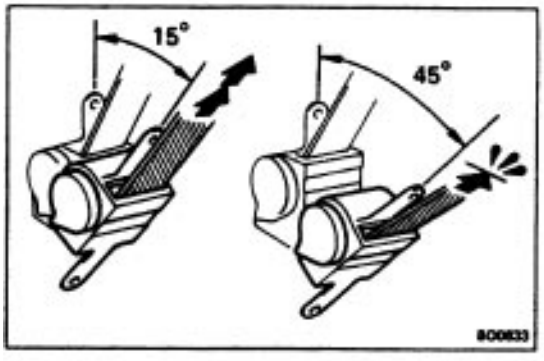
COMPONENTS



COMPONENTS (Cont'd)







FRONT AND REAR SEAT BELT
[Emergency Locking Retractor (ELR) Type]

1. RUNNING TEST (IN SAFE AREA)

(a) Fasten the front seat belt.

(b) Drive the car at 10 mph (16km/h) and make a very hard stop.

(e) Check that the belt is locked and cannot be extended at this time.

HINT: Conduct this test in a safe area. If the belt does not lock, remove the belt mechanism assembly and conduct the following static check. Also, whenever installing a new belt assembly, verify proper operation before installa–tion.

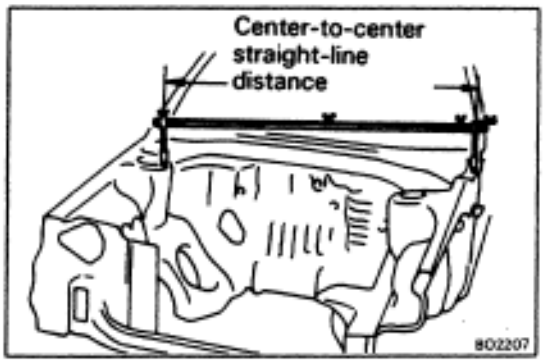
2. STATIC TEST

(a) Remove the locking retractor assembly.

(b) Tilt the retractor slowly.

(e) Verify that the belt can be pulled out at a tilt of 15 degrees or less, and cannot be pulled out at over 45 degrees of tilt.

If a problem is found, replace the assembly.



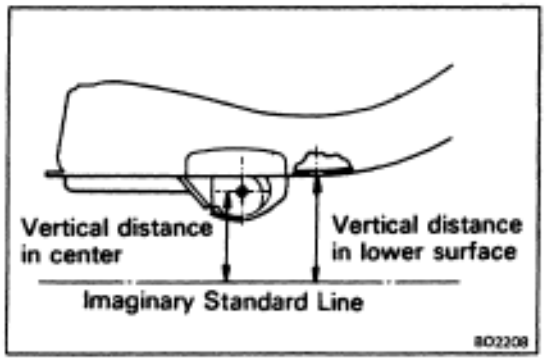
BODY DIMENSIONS

General Information

1. BASIC DIMENSIONS

(a) There are two types of dimensions in the diagram.

- Straight–line distance between the center of two measuring points.



- The height from an imaginary standard line.

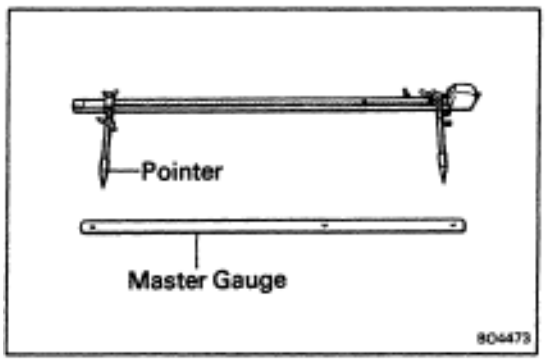
(b) In cases i n which only one dimension is given, left and right are symmetrical.

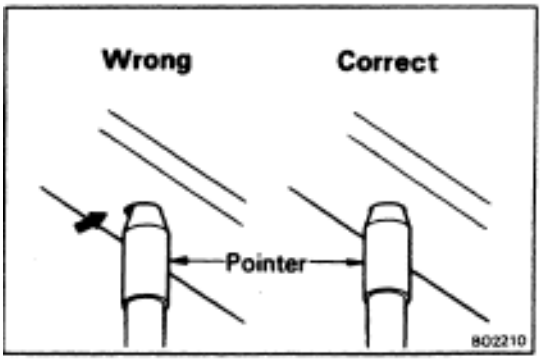
(c) The dimensions in the following drawing indicate actual distance. Therefore, please use the dimensions as a reference.

2. MEASURING

(a) Basically, all measurements are to be done with a tracking gauge. For portion where it is not possible to use a tracking gauge, a tape measure should be used.

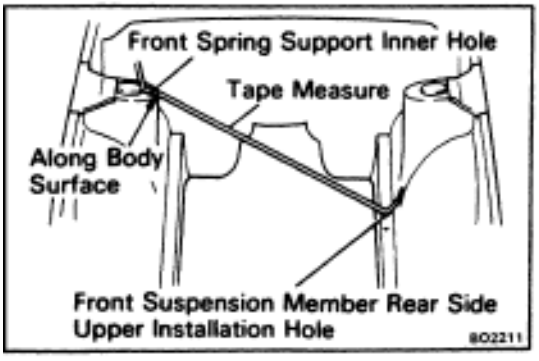
(b) Use only a tracking gauge that has no looseness in the body, measuring plate, or pointers.





HINT:

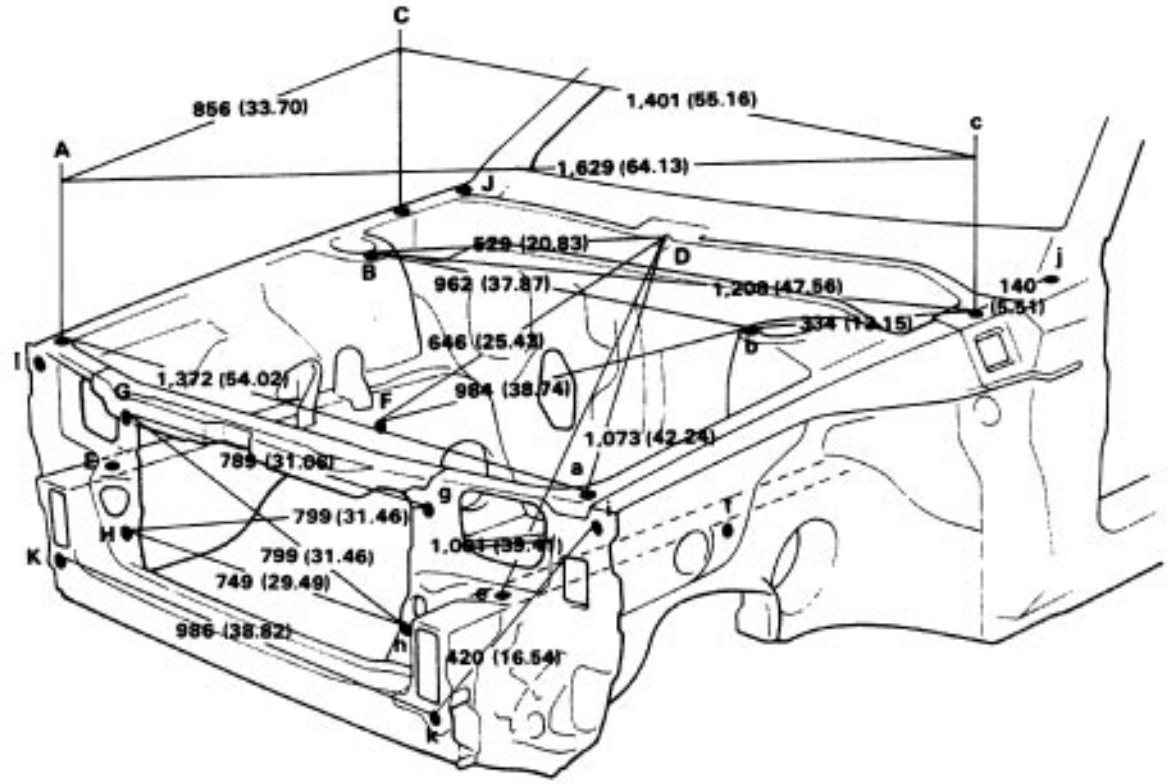
1. The height of the left and right pointers must be equal.
2. Always calibrate the tracking gauge before measuring or after adjusting the pointer height.
3. Take care not to drop the tracking gauge or otherwise shock it.
4. Confirm that the pointers are securely in the holes.



(e) When using a tape measure, avoid twists and bends in the tape.

(d) When tracking a diagonal measurement from the front spring support inner hole to the suspension member upper rear installation hole, measure along the front spring support panel surface.

BODY DIMENSIONS
ENGINE COMPARTMENT

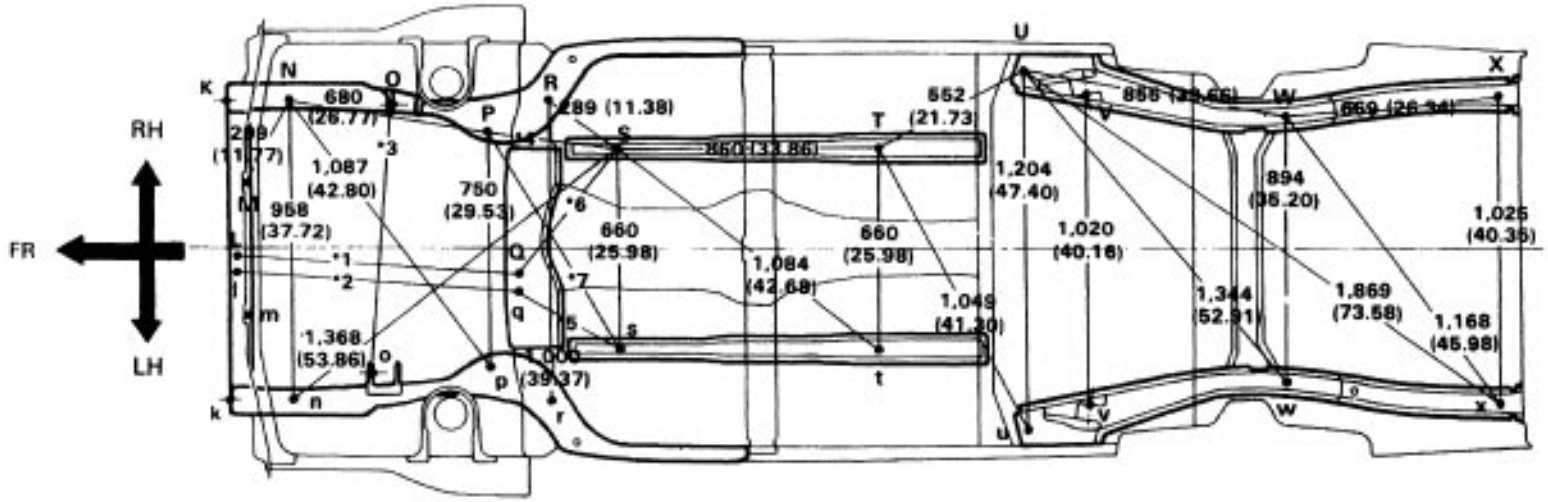


mm (in.)

Symbol	Name	Hole. diam.
A, a	Front fender installation nut	6 (0.24)
B, b	Front spring support inner hole	11 (0.43)
C, c	Front fender installation nut	6 (0.24)
D	Cowl top panel center mark	—
E, e	Front side member bumper installation hole	15 (0.59)
F, f	Front side member standard hole	15 (0.59)
G, g	Headlight installation hole	20 x 6.5 (0.79 x 0.26)
H, h	Tube clamp installation nut	6 (0.24)
I, i	Fender installation nut	6 (0.24)
J, j	Cowl top panel standard hole	10 (0.39)
K, k	Front crossmember bumper installation nut	12 (0.47)

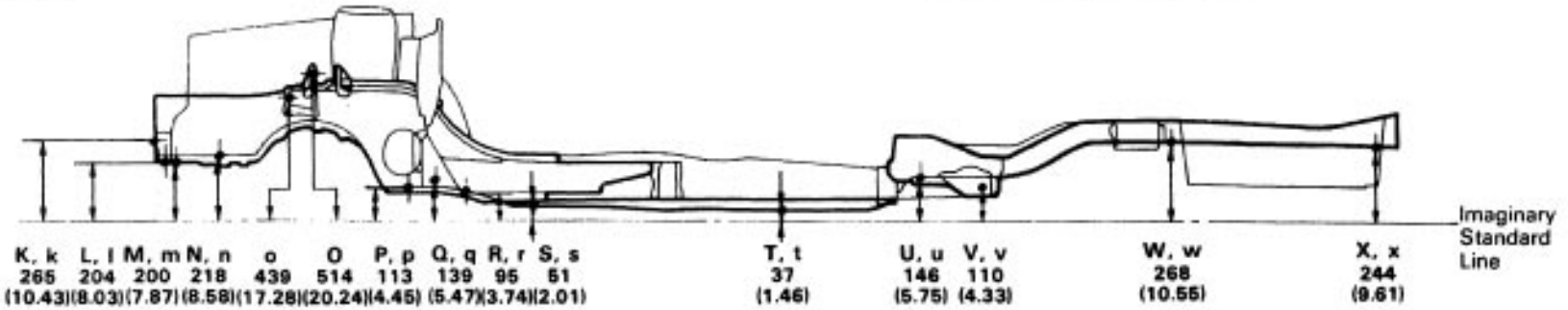
BO1973

UNDER BODY (FWD)



*1: L - Q 927 (36.50) *2: l - q 927 (36.50) *3: O - o 863 (33.98)
*4: P - S 433 (17.05) *5: q - s 404 (15.91) *6: Q - S 549 (21.61)
*7: 826 (32.52)

Wheel Base	2,600 (102.36)

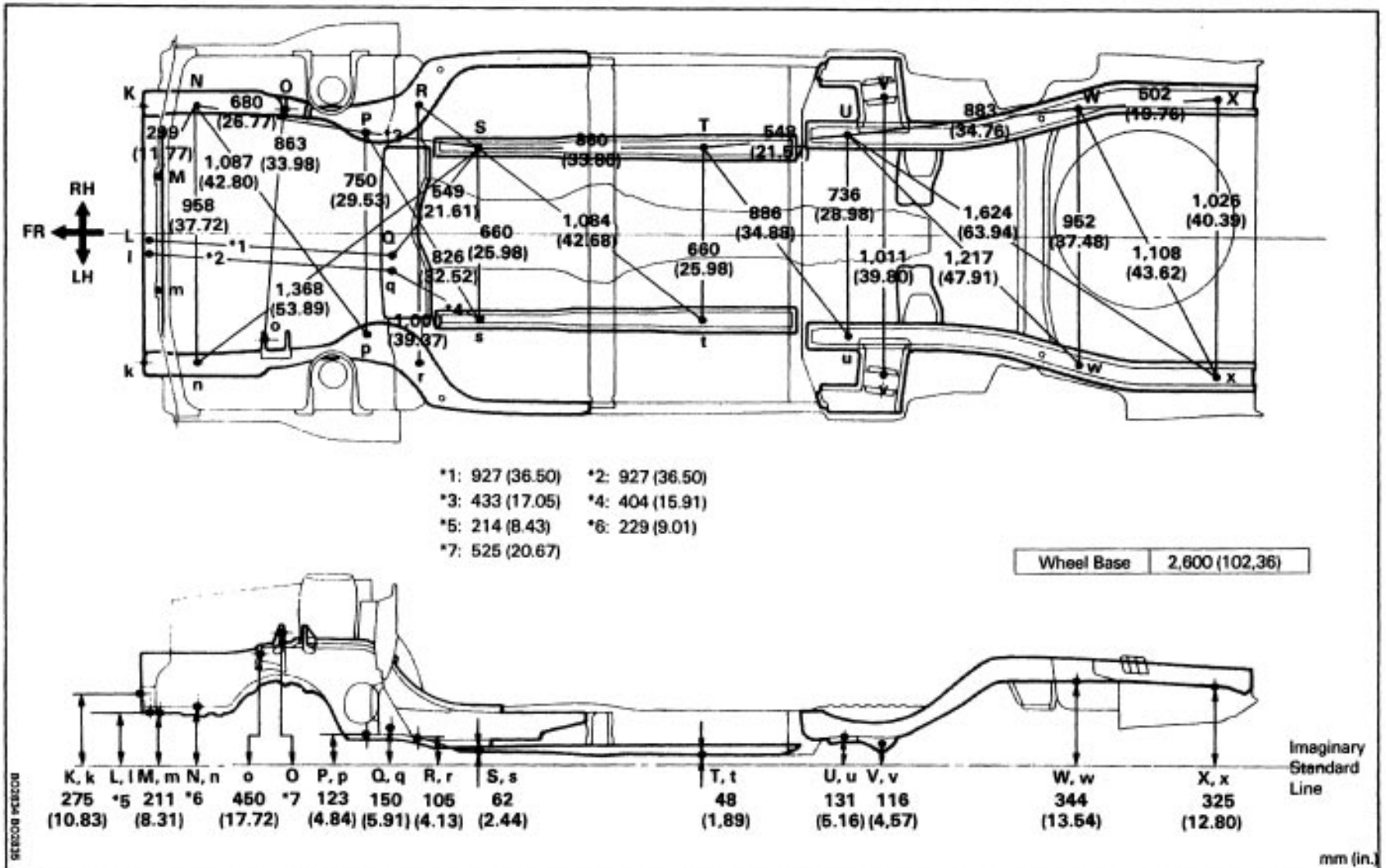


80194

Symbol	Nomenclature	Hole. dia
L, l	Engine mounting center member installation nut	10 (0.39)
M, m	Strut bar bracket front inner installation nut	10 (0.39)
N, n	Strut bar bracket rear front installation nut	10 (0.39)
O, o	Engine mounting bracket front hole	13 (0.51)
P, p	Lower arm installation nut	14 (0.55)
Q, q	Engine mounting center member installation nut	10 (0.39)
R, r	Front side member standard hole	15 (0.59)

S mbol	Nomenclature	Hole. dia mm (in.)
γ		
S, s	Front floor under reinforcement working hole	10 (0.39)
T, t	Front floor under reinforcement working hole	18 (0.71)
U, u	Rear floor side member standard hole	15 (0.59)
V, v	Strut bar inner installation hole	12 (0.47)
W, w	Rear floor side member standard hole	15 (0.59)
X, x	Rear floor side member transport hook installation hole	15 (0.59)

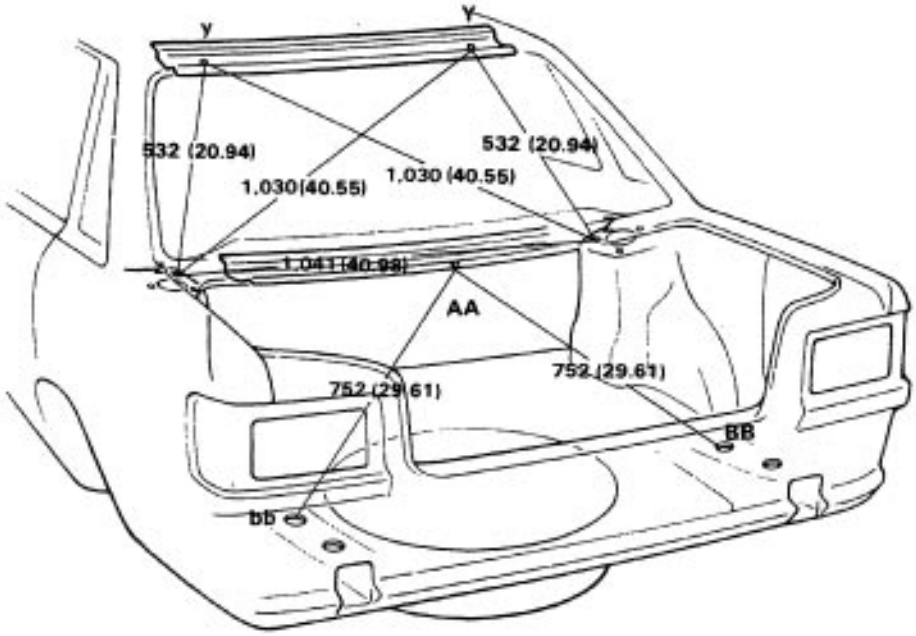
UNDER BODY (All–Trac/4WD)



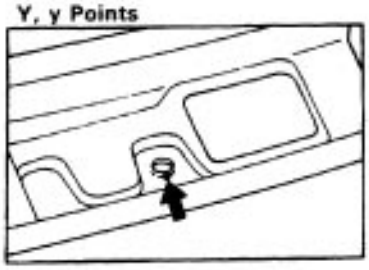
mm (in.)

Symbol	Nomenclature	Hole dia.	Symbol	Nomenclature	Hole dia.
L, l	Engine mounting member installation nut	10 (0.39)	S, s	Front floor under reinforcement working hole	10 (0.39)
M, m	Strut bar bracket front inner installation nut	10 (0.39)	T, t	Front floor under reinforcement working hole	18 (0.71)
N, n	Strut bar bracket rear front installation nut	10 (0.39)	U, u	Rear floor side member standard hole	18 (0.71)
O, o	Engine mounting bracket front hole	13 (0.51)	V, v	Strut bar inner installation hole	12 (0.47)
P, p	Lower arm installation nut	14 (0.55)	W, w	Rear floor side member standard hole	10 (0.39)
Q, q	Engine mounting member installation nut	10 (0.39)	X, x	Rear floor side member standard hole	18 (0.71)
R, r	Front side member standard hole	15 (0.59)	—	—	—

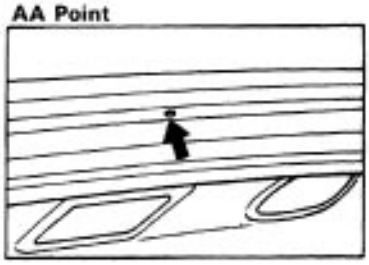
LUGGAGE COMPARTMENT (SEDAN)



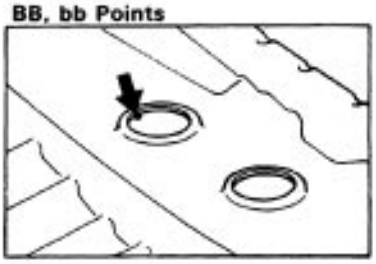
Y, y Points



AA Point



BB, bb Points



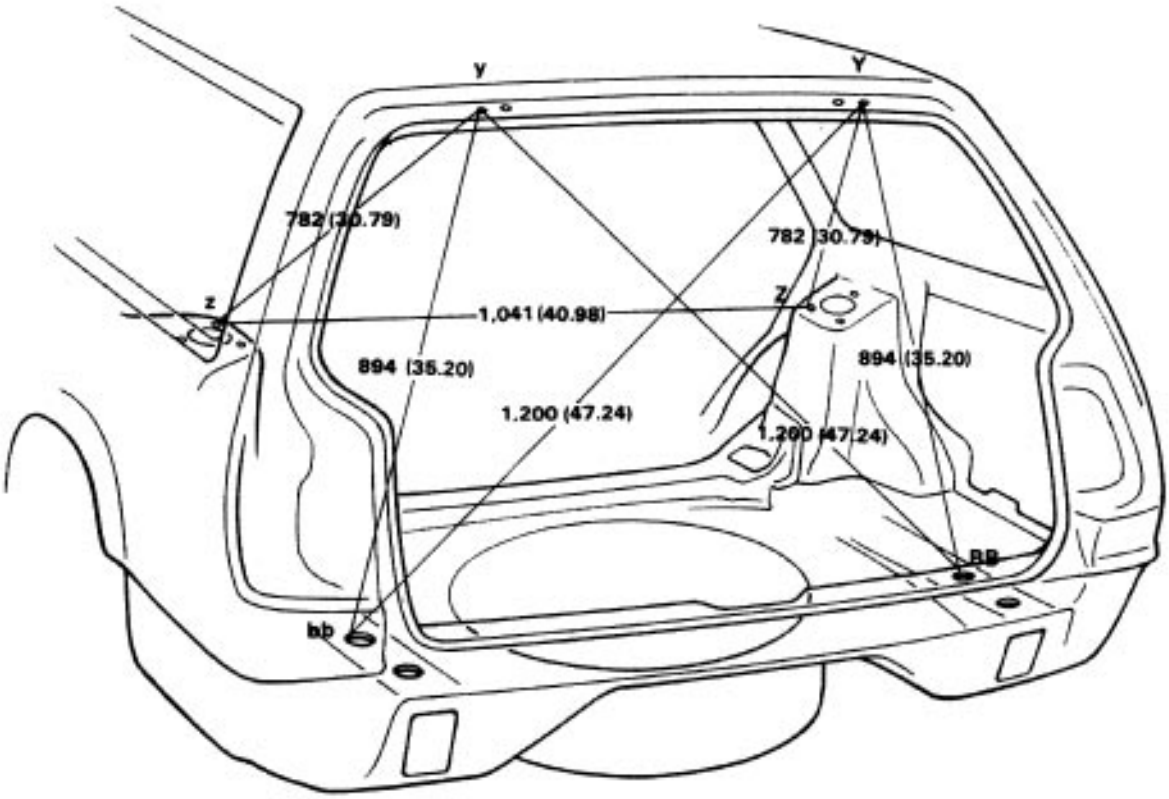
mm (in.)

Symbol	Nomenclature	Hole d¿a.
Y, y	Back window upper frame standard hole – rear	10 (0.39)
Z, z	Rear spring support front hole	9.5 (0.37)
AA	Upper back reinforcement center mark	3 (0.12)
BB, bb	Rear floor pan bumper front installation hole – front	45 (1.77)

801975

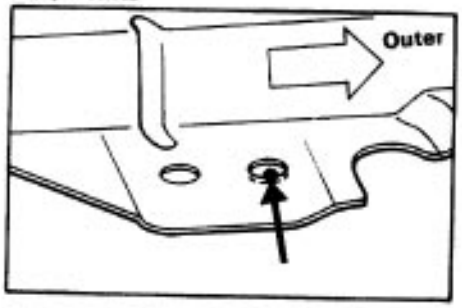
LUGGAGE COMPARTMENT (WAGON)

Wagon

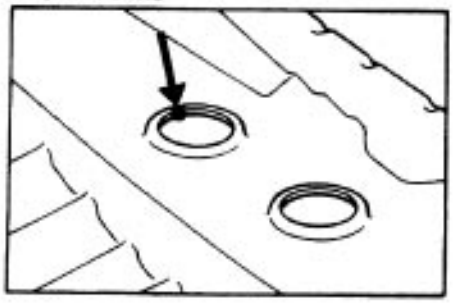


HINT: The luggage compartment measurement is performed between the two dot-marked points as shown in the figure below.

Y, y Points



BB, bb Points

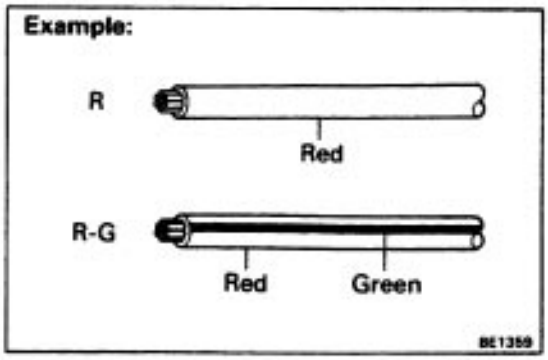


(mm (in))

Symbol	Nomenclature	Hole. dia
Y, y	Back door installation outer hole – rear	13 (0.51)
Z, z	Rear spring support front hole	9.5 (0.37)
BB, bb	Rear floor bumper installation front hole – front	45 (1.77)

BO1976

BODY ELECTRICAL SYSTEM



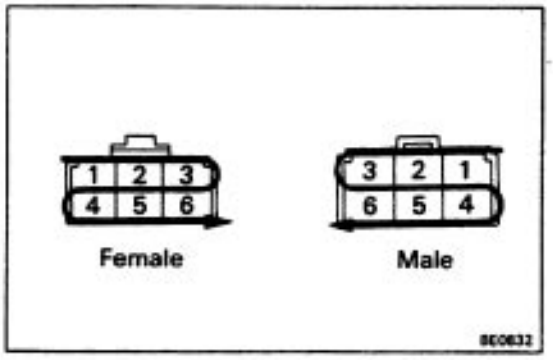
GENERAL INFORMATION

WIRING COLOR CODE

Wire colors are indicated by an alphabetical code.

B =Black	**L =Blue**	**R =Red**
BR=Brown	**LG=Light Green**	**V =Violet**
G =Green	**O =Orange**	**W=White**
GR=Gray	**P =Pink**	**Y =Yellow**

The first letter indicates the basic wire color and the second letter indicates the color of the stripe.



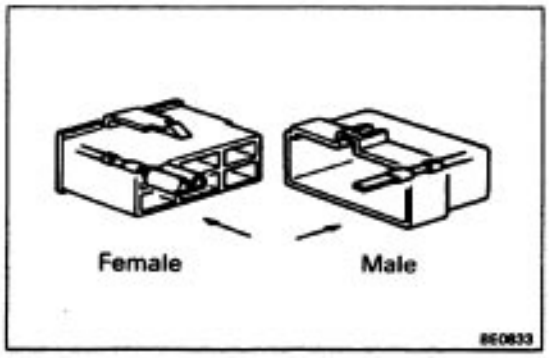
CONNECTOR

1. PIN NUMBER OF FEMALE CONNECTOR

Numbered in order from upper left to lower right.

2. PIN NUMBER OF MALE CONNECTOR

Numbered in order from upper right to lower left.



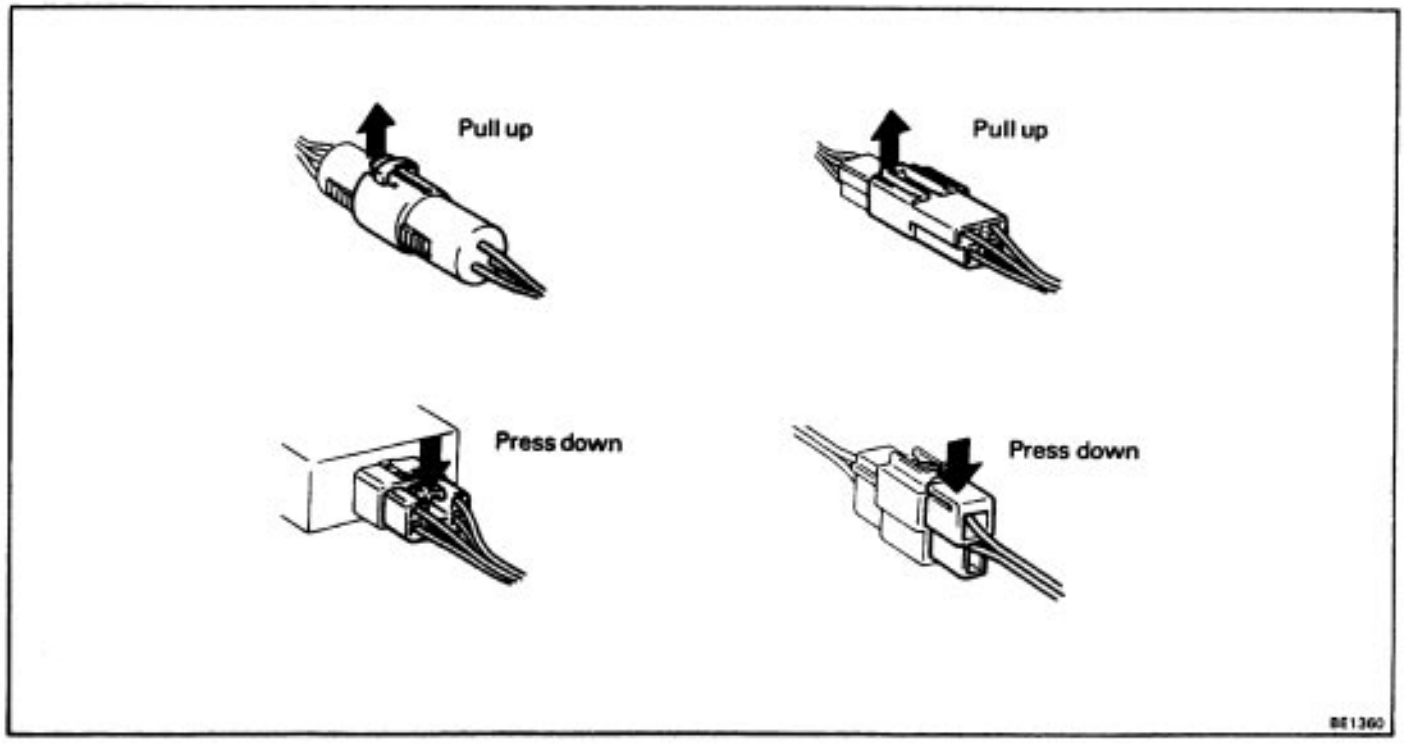
3. DISTINCTION OF MALE AND FEMALE CONNECTORS

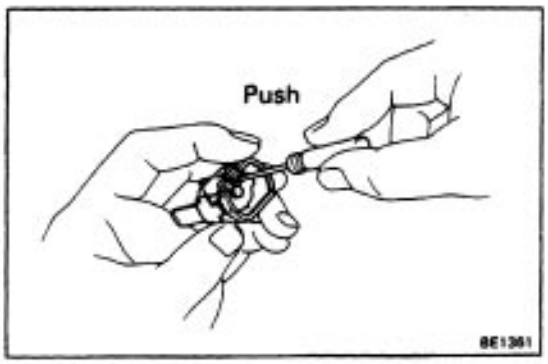
Male and female connectors are distinguished by shape of their internal pins.

(a) All connectors are shown from the open end, and the lock is on top.

(b) To pull apart the connectors, pull on the connector itself, not the wires.

HINT: Check the type of connector before disconnecting.





RESET CIRCUIT BREAKER

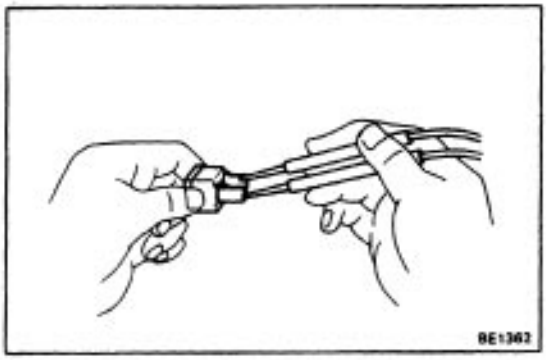
1. REMOVE CIRCUIT BREAKER

(a) Disconnect the negative (–) cable from the battery.

(b) Remove the circuit breaker.

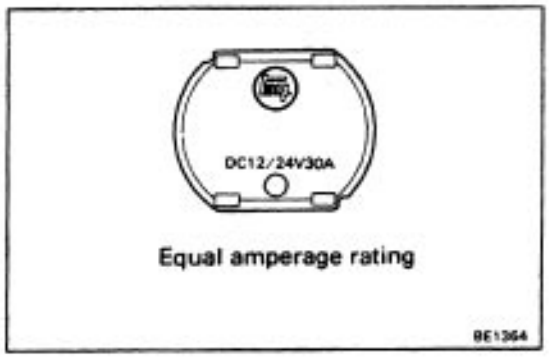
2. RESET CIRCUIT BREAKER

(a) Insert the needle into the reset hole and push it.

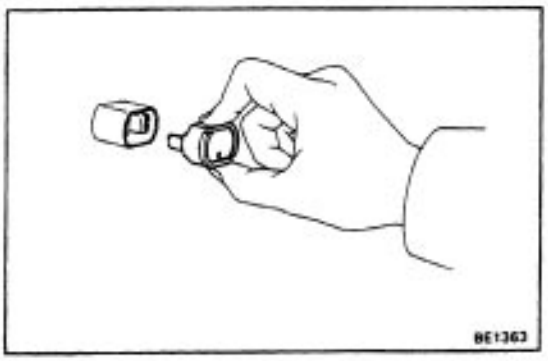


(b) Using an ohmmeter, check that there is continuity between both terminals of the circuit breaker.

If continuity is not as specified, replace the circuit breaker.



HINT: If replacing the circuit breaker, be sure to replace it with a breaker with an equal amperage, rating.

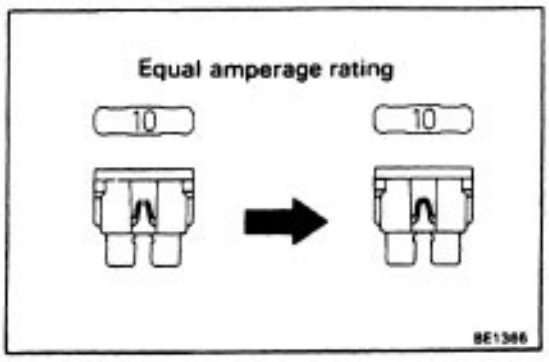


3. INSTALL CIRCUIT BREAKER

(a) Install the circuit breaker.

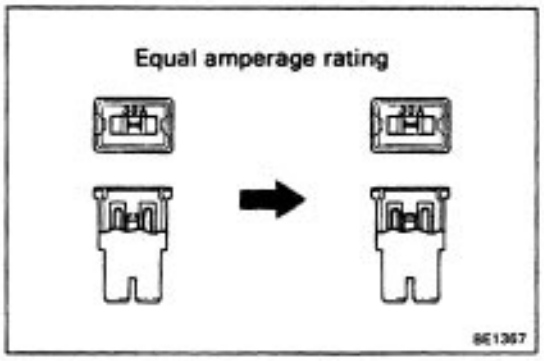
(b) Connect the negative (–) cable to the battery.

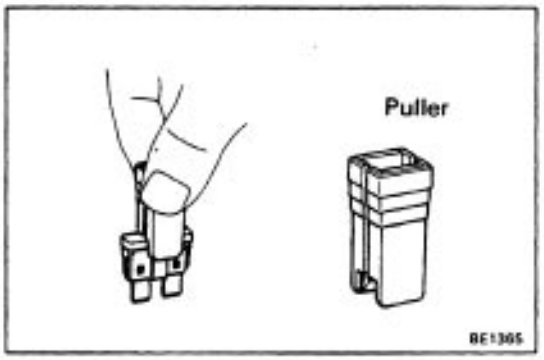
HINT: If a circuit breaker continues to cut out, a short circuit is indicated. Have the system checked by a qualified tec nician.



REPLACEMENT OF FUSE AND FUSIBLE LINK

HINT: If replacing the fuse or fusible link, be sure to replace it with a fuse or fusible link with an equal amperage rating.

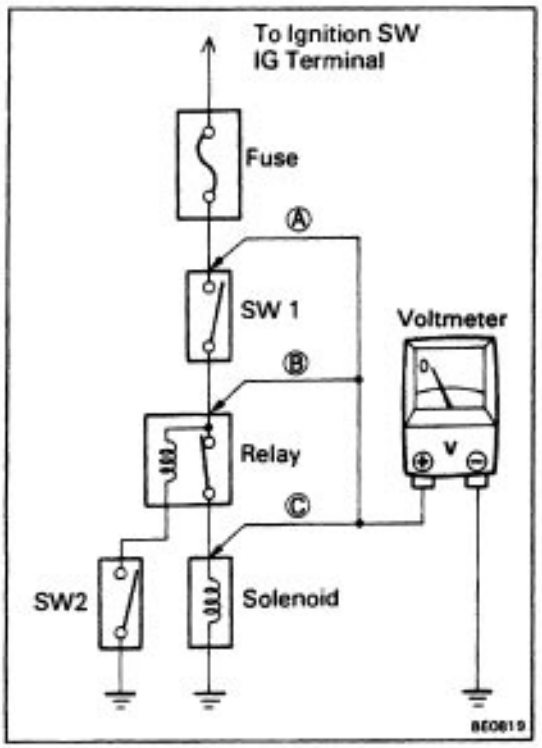




NOTICE:

1. **Turn off all electrical components and the ignition switch before replacing a fuse or fusible link. Do not exceed the fuse or fusible link amperage rating.**
2. **Always use a fuse puller for removing and inserting a fuse. Remove and insert straight in and out without twisting. Twisting could force open the terminals too much, resulting in a bad connection.**

If a fuse or fusible link continues to blow, a short circuit is indicated. The system must be checked by a qualified technician.



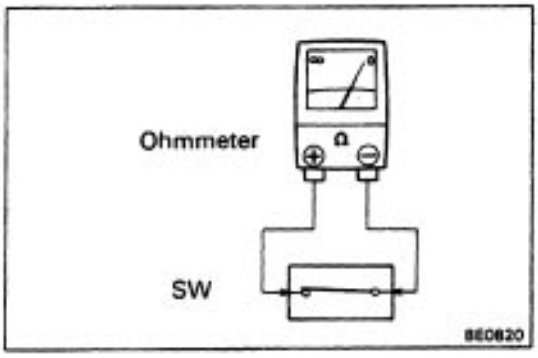
CHECK FOR VOLTAGE

(a) Establish conditions in which voltage is present at the check point.

Example:

(A) – Ignition SW on
(B) – Ignition SW and SW 1 on
(C) – Ignition SW, SW 1, and Relay on (SW 2 off)

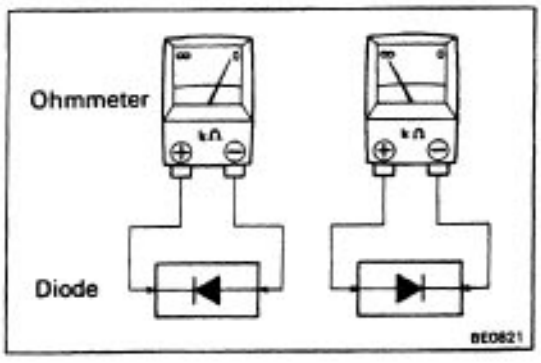
(b) Using a voltmeter, connect the negative (–) lead to a good ground point or negative (–) battery terminal and the positive (+) lead to the connector or component terminal. This check can be done with a test bulb instead of a voltmeter.



CHECK FOR CONTINUITY AND RESISTANCE

(a) Disconnect the battery terminal or wire so there is no voltage between the check points.

(b) Contact the two leads of an ohmmeter to each of the check points.

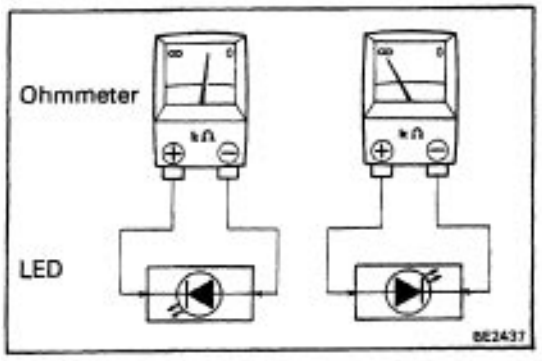


If the circuit has diodes, reverse the two leads and check again.

When contacting the negative (–) lead to the diode positive (+)
side and the positive (+) lead to the negative (–) side, there should be continuity.

When contacting the two leads in reverse, there should be no continuity.

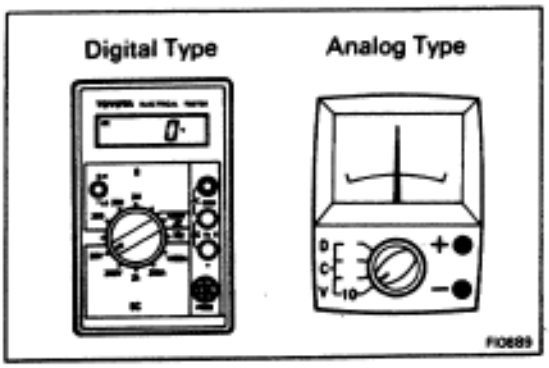
HINT: Specifications may vary depending on the type of tester, so refer to the tester's instruction manual before performing the inspection.



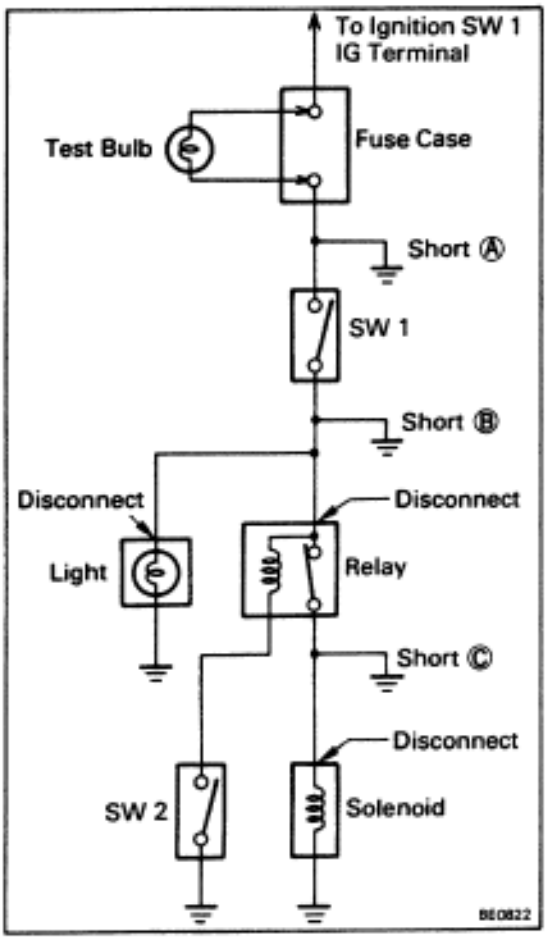
Check LED (Light Emitting Diode) in the same manner as that for diodes.

HINT:

- Use a tester with a power source of 3 V or greater to overcome the circuit resistance.
- If a suitable tester is not available, apply voltage and check that the LED lights up.



(c) Use a volt/ohmmeter with high impedance (10 kΩ/V minimum) for troubleshooting of the electrical circuit.



CHECK FOR SHORT CIRCUIT

(a) Remove the blown fuse and eliminate all toads from the fuse.

(b) Connect a test bulb in place of the fuse.

(e) Establish conditions in which the test bulb comes on.

Example:

(A) – Ignition SW on

(B) – Ignition SW and SW 1 on

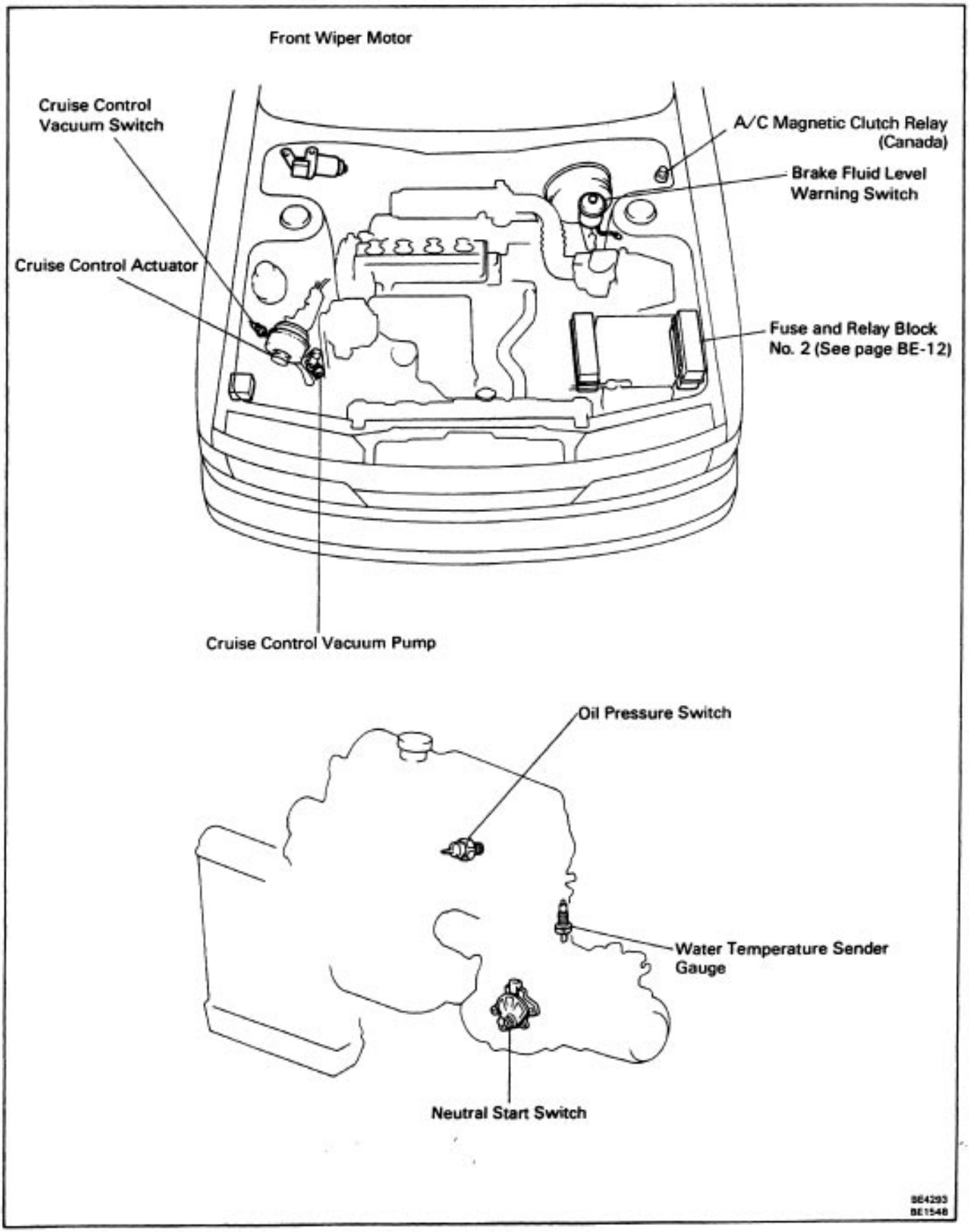
(C) – Ignition SW, SW 1 and Relay on (Connect the Relay) and SW 2 oft (or Disconnect SW 2)

(d) Disconnect and reconnect the connectors while watching the test bulb.

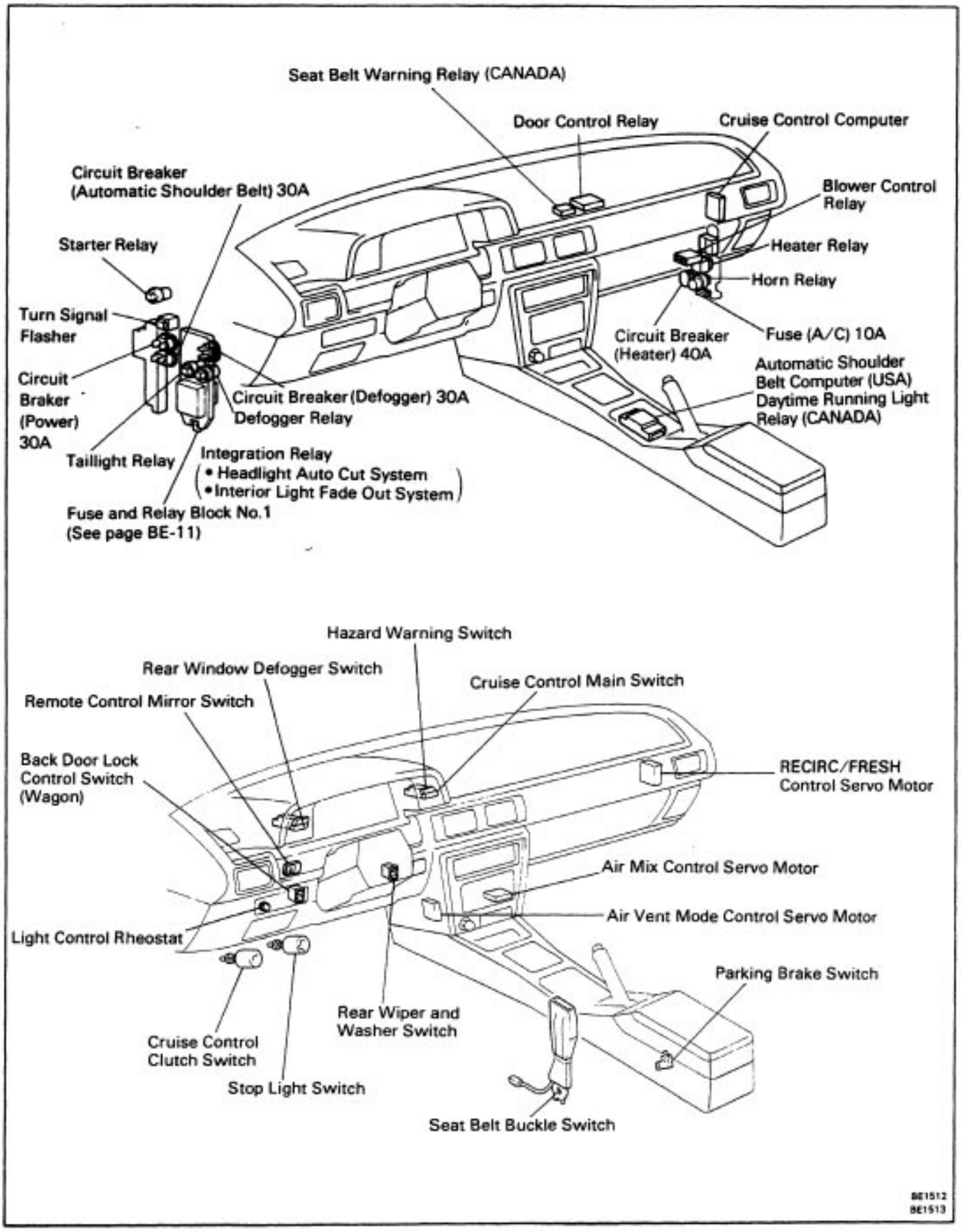
The short lies between the connector where the test bulb stays lit and the connector where the bulb goes out.

(e) Find the exact location of the short by lightly shaking the problem wire along the body.

LOCATION OF SWITCHES AND RELAYS

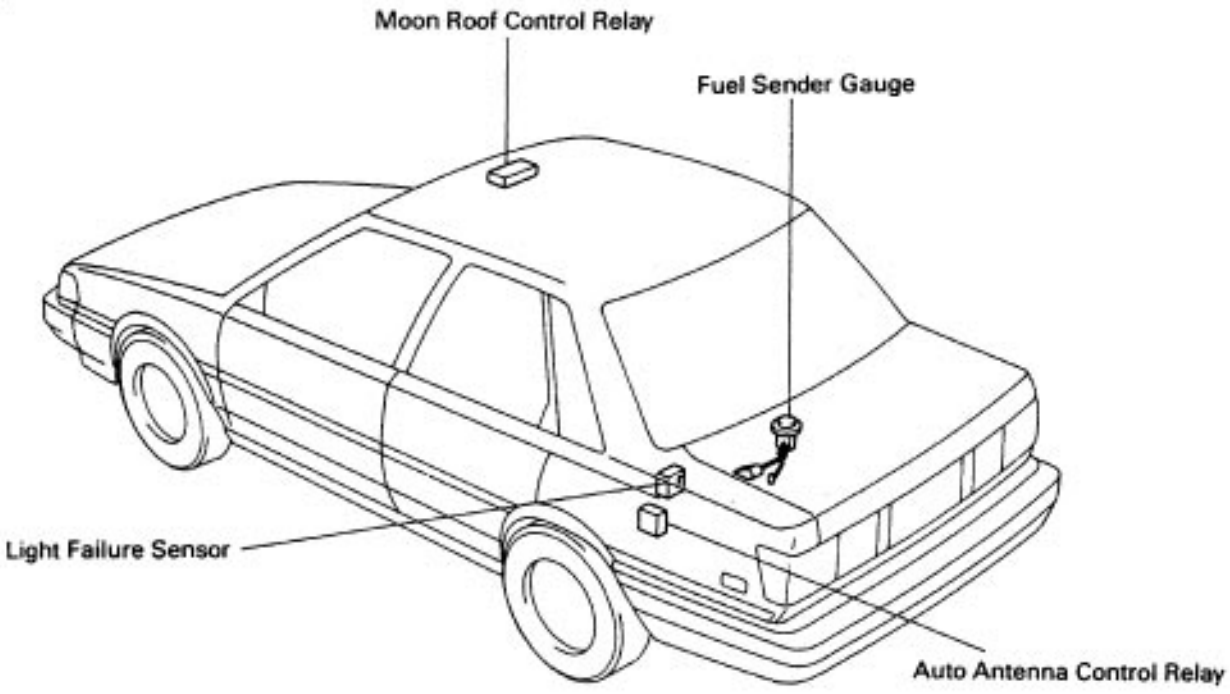


LOCATION OF SWITCHES AND RELAYS (Cont'd)

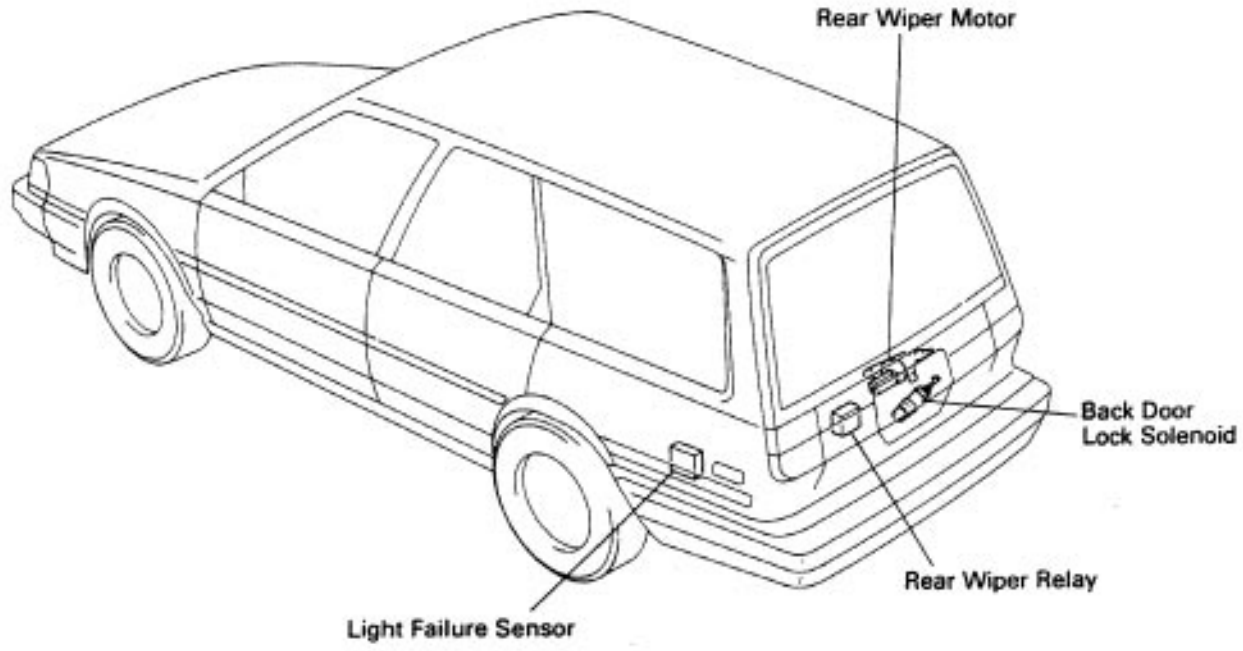


LOCATION OF SWITCHES AND RELAYS (Cont'd)

(Sedan)

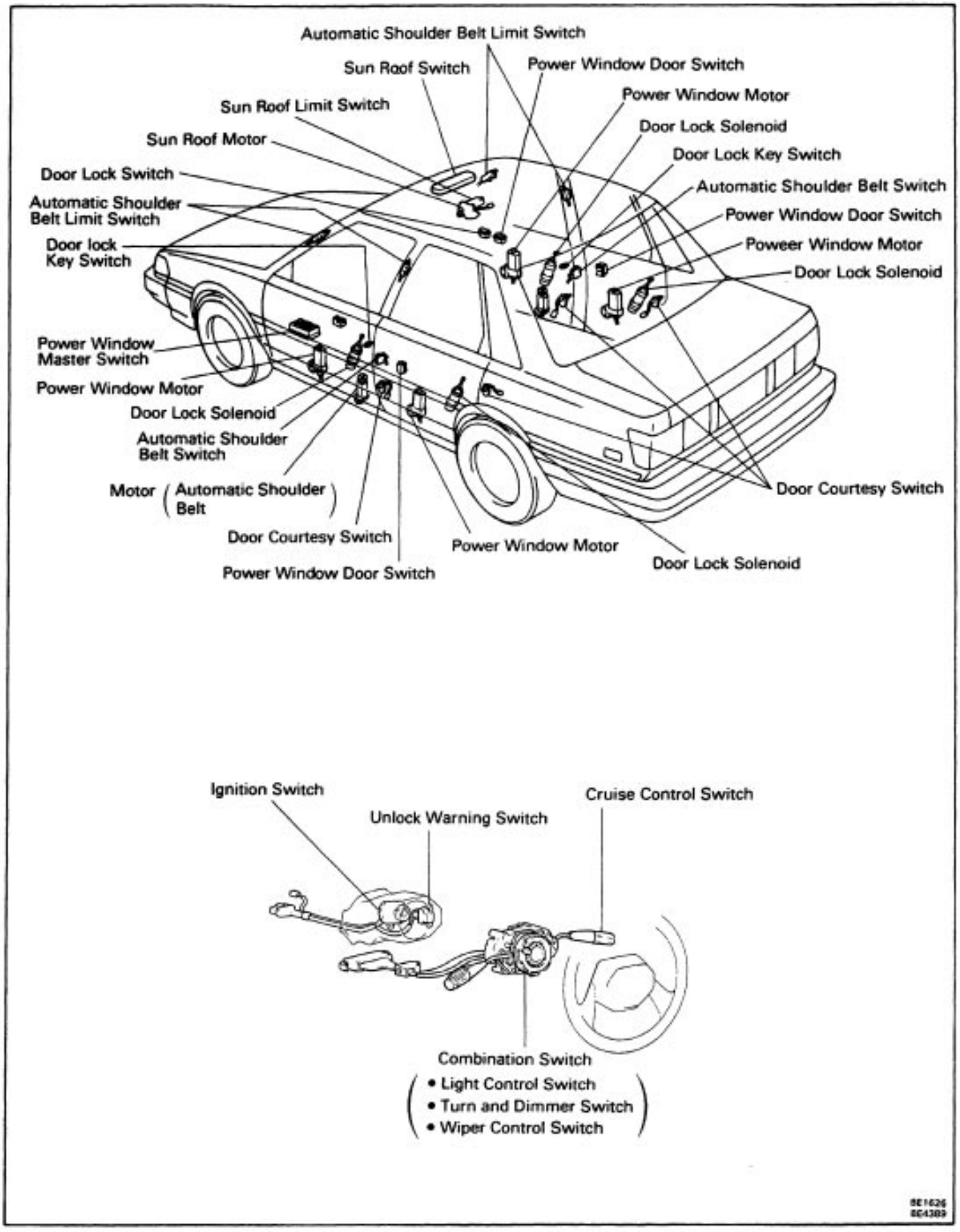


(Wagon)



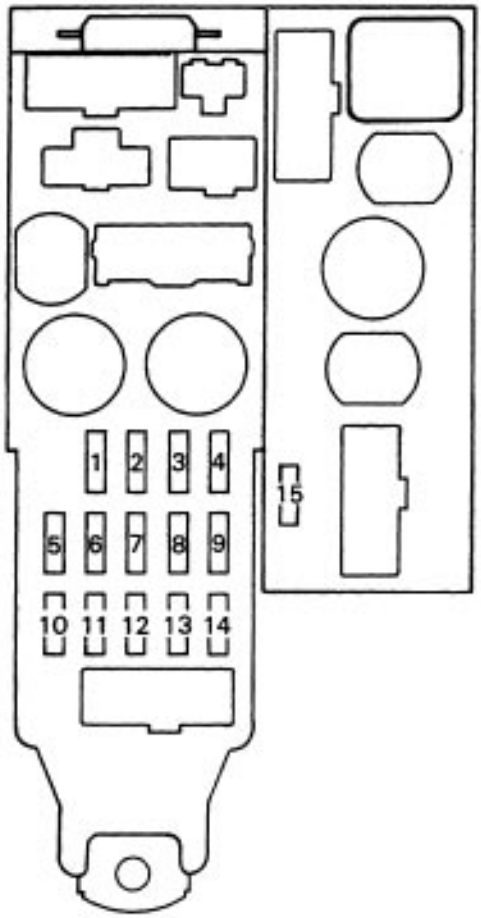
BE1516
BE1517

LOCATION OF SWITCHES AND RELAYS (Cont'd)



FUSE AND RELAY BLOCKS

FUSE AND RELAY BLOCK No–1 (LOCATION: Driver's Side Kick Panel)



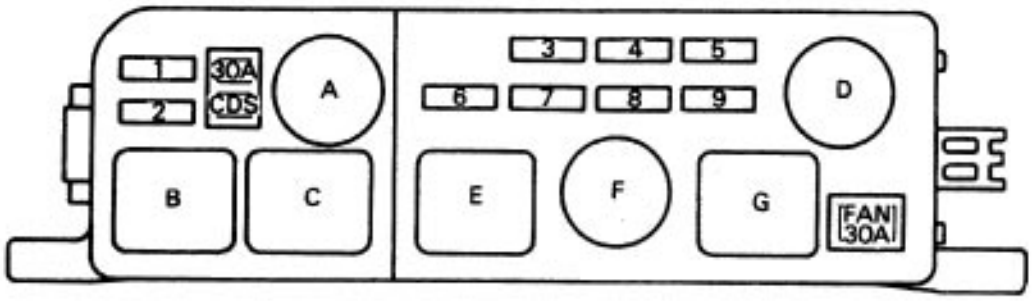
Fuses

1. GAUGE	7.5A
2. –	20A
3. STOP	15A
4. TAIL	15A
5. CIG	7.5A
6. RADIO	7.5A
7. TURN	10A
8. DEF–I/UP	10A
9. –	20A
10. ENGINE	15A
11. WIPER	7.5A
12. ECU–IG	1 0A
13. –	
14. IGN	
15. ECU–B	

BE0896

FUSE AND RELAY BLOCKS (Cont'd)

FUSE AND RELAY BLOCK No–2 (LOCATION: Engine Compartment)



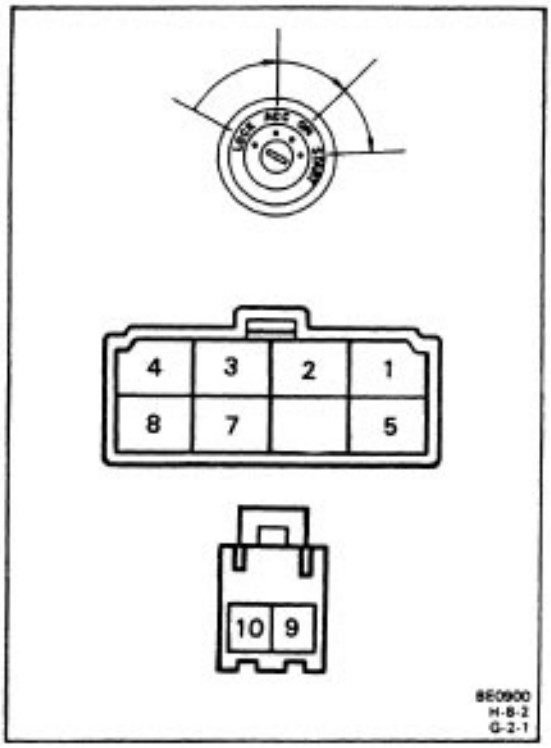
Fuses

1. HEAD–HI (RH) 15A (CANADA)
2. HEAD–HI (LH) 15A (CANADA)
3. DOME 20A
4. – –
5. HEAD (RH) 15A (USA)
   HEAD–LO (RH) 15A (CANADA)
6. CHARGE 7.5A
7. ER 15A
8. HAZ.HORN 15A
9. HEAD (LH) 15A (USA)
   HEAD–LO (H) 15A (CANADA)

Relays

A. A/C FAN No.3 Relay
B. A/C MAGNET CLUTCH Relay (USA)
   DIMMER Relay (CANADA)
C. A/C FAN No.2 Relay
D. FAN No. 1 Relay
E. HEADLIGHT Relay
F. EFI MAIN Relay
G. ENGINE MAIN Relay

BE1422



IGNITION SWITCH AND UNLOCK WARNING SWITCH

INSPECTION OF SWITCHES

INSPECT SWITCHES CONTINUITY

Inspect the switch continuity between terminals.

Ignition switch

Switch position \ Terminal	4	3	2	1	8	7	5
LOCK							
ACC	○—○						
ON	○—○—○				○—○		
START	○		○	○	○	○	○

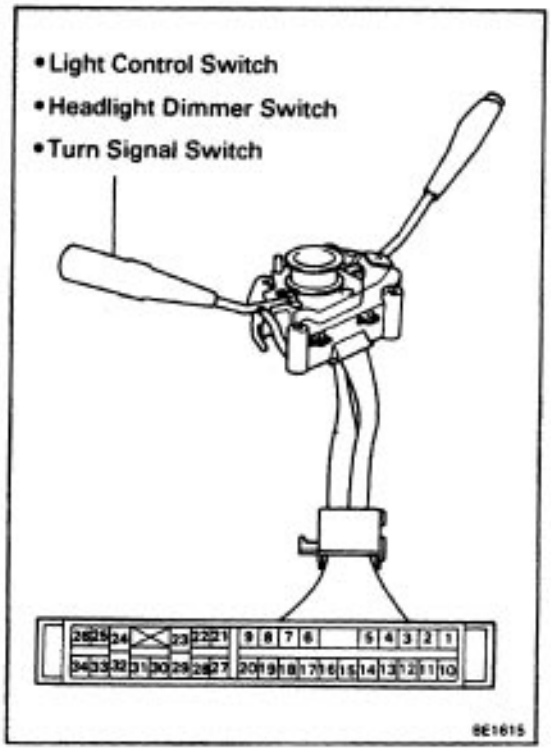
Unlock warning switch

Switch pin position \ Terminal	9	10
Released (Remove ignition key)		
Pushed in (Set ignition key)	○	○

If continuity is not as specified, replace the switch.

LIGHTING
Troubleshooting

Problem	Possible cause	Remedy	Page
Only one light comes ON	Light bulb burned out Socket, wire or ground faulty	Replace bulb Repair as necessary	
Headlights do not light	Fusible link blown Headlight control relay faulty Light control/dimmer switch faulty Daytime running light relay faulty (CANADA) Headlight dimmer relay faulty (CANADA) Wiring or ground faulty	Replace fusible link Check relay Check switch Check relay Check relay Repair as necessary	BE–3 BE–18 BE–15 BE–25 **BE–25**
High beam headlights or headlight flashers do not operate	Light control/dimmer switch faulty Daytime running light relay faulty (CANADA) Headlight dimmer relay faulty (CANADA) Wiring or ground faulty	Check switch Check relay Check relay Repair as necessary	BE–15 BE–25 BE–25
Tail, parking and license light do not light	TAIL fuse blown Fusible link blown Taillight control relay faulty Light control switch faulty Daytime running light relay faulty (CANADA) Wiring or ground faulty	Replace fuse and check for short Replace fusible fink Check relay Check switch Check relay Repair as necessary	BE–3 BE–3 BE–18 BE–15 BE–25
Stop lights do not light	STOP fuse blown Stop light swtich faulty Wiring or ground faulty	Replace fuse and check for short Adjust or replace switch Repair as necessary	BE–3 BE–89
Stop lights stay on	Stop light switch faulty	Adjust or replace switch	BE–89
Instrument lights do not light (taillights light)	Light control rheostat faulty Wiring or ground faulty	Check rheostat Repair as necessary	BE–23
Turn signal does not flash on one side	Turn signal switch faulty Wiring or ground faulty	Check switch Repair as necessary	BE–15
Turn signals do not operate	TURN fuse blown Turn signal flasher faulty Turn signal switch faulty Wiring or ground faulty	Replace fuse and check for short Check flasher Check switch Repair as necessary	BE–3 BE–19 BE–15
Hazard warning lights do not operate	HAZ–HORN fuse blown Turn signal flasher faulty Hazard warning switch faulty Wiring or ground faulty	Replace fuse and check short Check flasher Check switch Repair as necessary	BE–3 BE–19 BE–19



Light Control Switch, Headlight Dimmer Switch and Turn Signal Switch

INSPECTION OF SWITCHES

INSPECT SWITCHES CONTINUITY

Inspect the switch continuity between terminals.

Light control switch

Terminal / Switch position	22	31	33
OFF			
TAIL	○—○		
HEAD	○—○	○—○	

Headlight dimmer switch

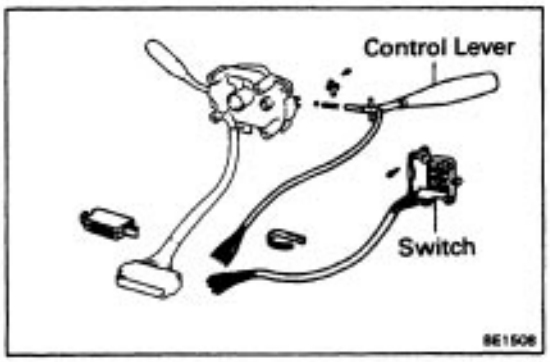
Terminal / Switch position	23	29	32	34
Flash		○—○	○—○	
Low Beam	○—○			
High Beam		○—○		

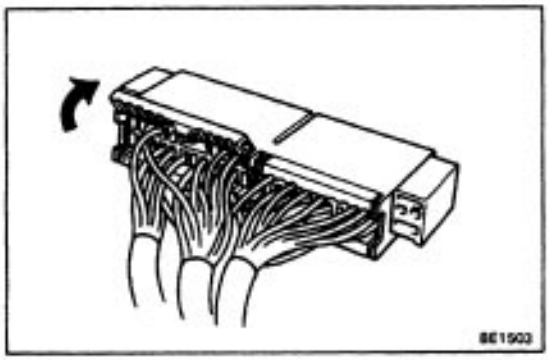
Turn signal switch

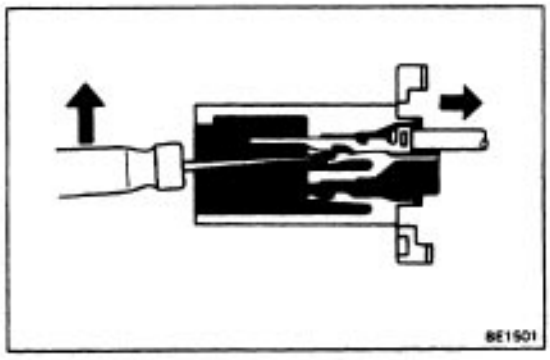
Terminal / Switch position	21	25	28
Left Turn	○—○		
Neutral			
Right Turn			○—○

If continuity is not as specified, replace the switch.

REPLACEMENT OF SWITCHES







1. REMOVE TERMINALS FROM CONNECTOR

(a) Release the four tabs and open the terminal cover.

(b) From the open end, insert a miniature screwdriver between the locking lug and the terminal.

(c) Pry down the locking lug with the screwdriver and pull the terminal out from the rear.

2. REMOVE CONTROL LEVER

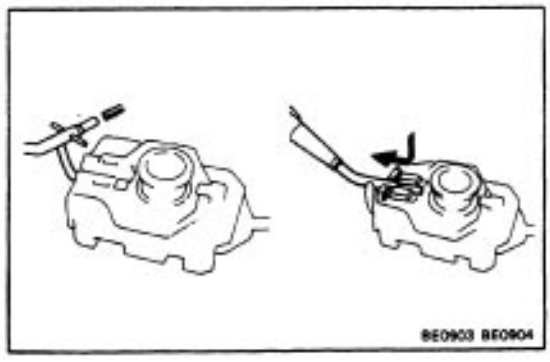
(a) Remove the bail set plate and the ball.

(b) Remove the control lever with the spring.

3. REMOVE SWITCHES

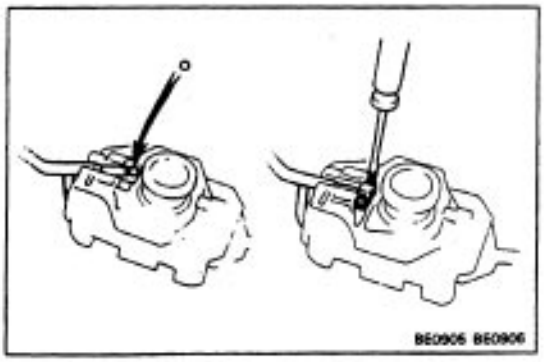
Remove the switches with the four screws.

4. INSTALL SWITCHES



5. INSTALL CONTROL LEVER

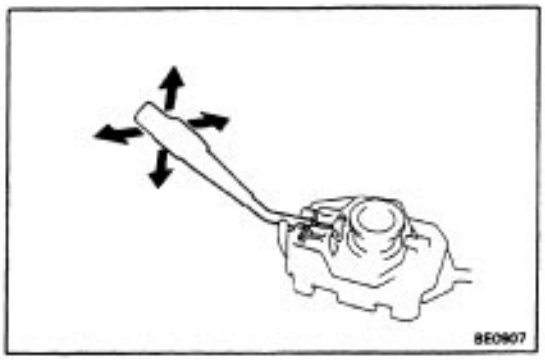
(a) Insert the spring into the control lever and install the control lever.



(b) Place the ball on the spring, position the control lever at HIGH and install the ball set plate with the two screws.

6. INSPECT SWITCH OPERATION

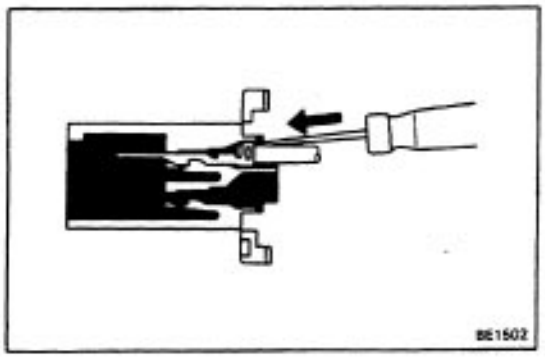
Insure that the switch operates smoothly.

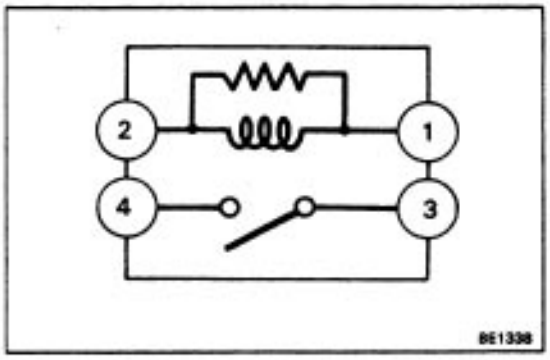


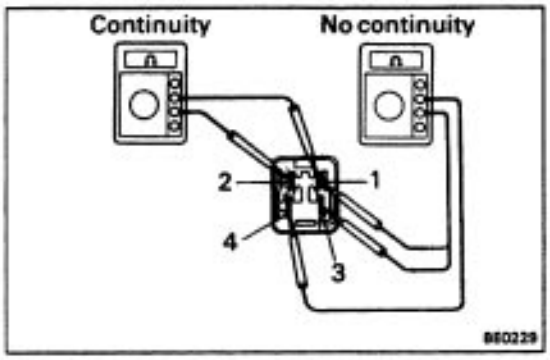
7. INSTALL TERMINALS TO CONNECTOR

(a) Push in the terminal until it is securely locked in the connector lug.

(b) Close the terminal cover.







Headlight Control Relay
INSPECTION OF RELAY

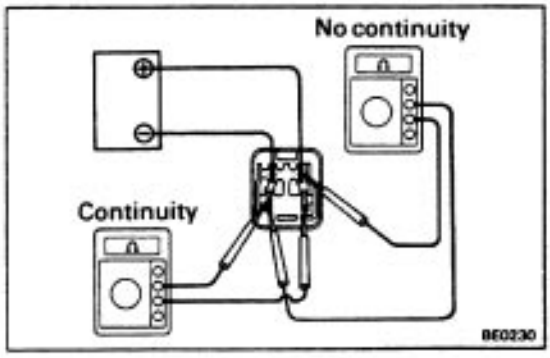
1. INSPECT RELAY CONTINUITY

(a) Check that there is continuity between terminals 1 and 2.

(b) Check that there is no continuity between terminals 3 and 4.

(e) Check that there is no continuity between terminals 1 and 4.

If continuity is not as specified, replace the relay.



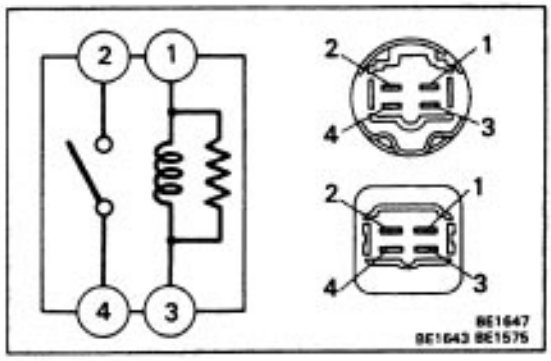
2. INSPECT RELAY OPERATION

(a) Apply battery voltage to terminals 1 and 2.

(b) Check that there is continuity between terminals 3 and 4.

(c) Check that there is no continuity between terminals 1 and 4.

If operation is not as specified, replace the relay.



Taillight Control Relay
INSPECTION OF RELAY

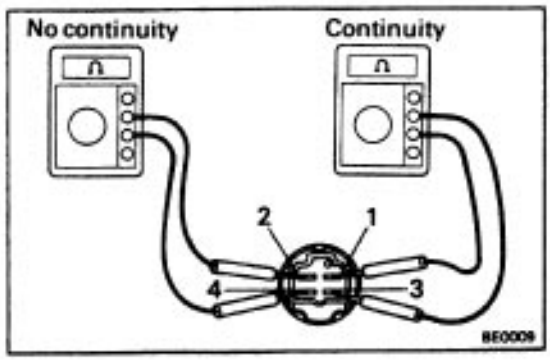
1. INSPECT RELAY CONTINUITY

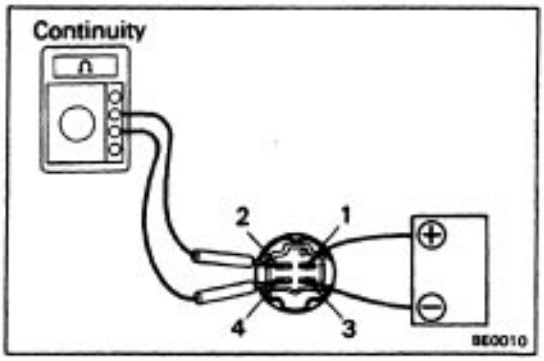
(a) Check that there is continuity between terminals 1 and 3.

(b) Check that there is no continuity between terminals 2 and 4.

(e) Check that there is no continuity between terminals 3 and 4.

If continuity is not as specified, replace the relay.

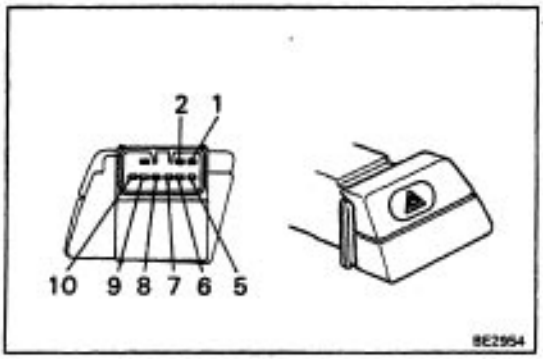




2. INSPECT RELAY OPERATION

(a) Apply battery voltage to terminals 1 and 3.
(b) Check that there is continuity between terminals 2 and 4.
(c) Check that there is no continuity between terminals 3 and 4.

If operation is not as specified, replace the relay.



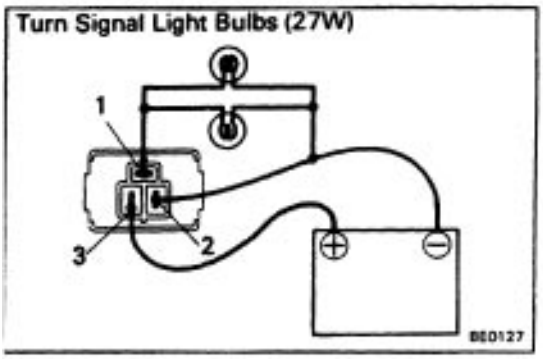
Hazard Warning Switch
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Terminal / Switch position	10	7	1
OFF (Free)	○—○		
ON (Lock)	○—○	○—○—○	○—○

If continuity is not as specified, replace the switch or bulb.



Turn Signal Flasher
INSPECTION OF FLASHER

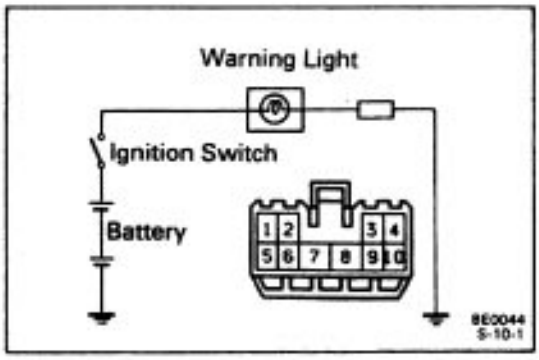
INSPECT FLASHER OPERATION

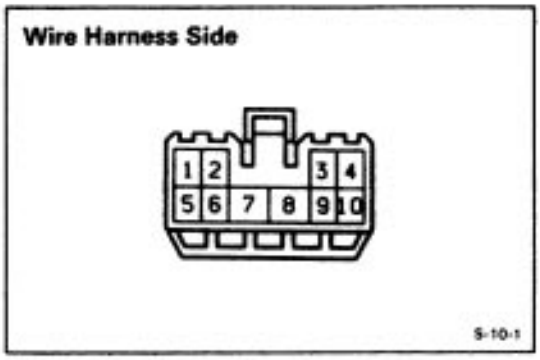
(a) Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 2.
(b) Connect the two turn signal light bulbs parallel to each other to terminals 1 and 2, check that the bulbs turn on and off.

HINT: The turn signal lights should flash 60 to 120 times per minute.

If one of the front or rear turn signal lights has an open cir–cuit, the number of flashes will be more than 140 per mi ute.

If operation is not as specified, replace the flashes.





Taillight Failure Sensor
INSPECTION OF SENSOR

1. INSPECT WARNING LIGHT OPERATION

(a) Disconnect the connector from the failure sensor and ground the terminal 3 on the wire harness side.

(b) Remove the CHARGE fuse and turn the ignition switch ON, check that the bulb lights.

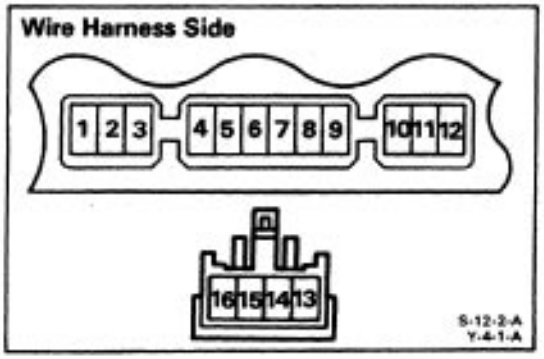
If bulb does not light, inspect the bulb.

2. INSPECT SENSOR CIRCUIT

Disconnect the failure sensor connector and inspect the connector on the wire harness side as shown in the chart.

Check for	Tester connection	Condition		Specified value
Continuity	1 — Ground	Always		Continuity
Voltage	2 — Ground	Turn ignition switch to OFF or ACC		No voltage
		Turn ignition switch ON		Battery voltage
	3 — Ground	Turn ignition switch to OFF or ACC		No voltage
		Turn ignition switch ON	Remove CHARGE fuse	Battery voltage
			Install CHARGE fuse	No vottage
Continuity	4 — Ground	Always		Continuity
Voltage	7 — Ground	Stop light switch OFF (Brake pedal released)		No voltage
		Stop light switch ON (Brake pedal depressed)		Battery voltage
Continuity	9 — Ground	Always		Continuity
Voltage	10 — Ground	Turn light control switch OFF		No voltage
		Turn light control switch TAIL or HEAD		Battery voltage

If circuit is as specified, replace the relay.



Integration Relay
INSPECTION OF RELAY

INSPECT RELAY CIRCUIT

Disconnect the relay connector and inspect the connector on the wire harness side as shown in the chart.

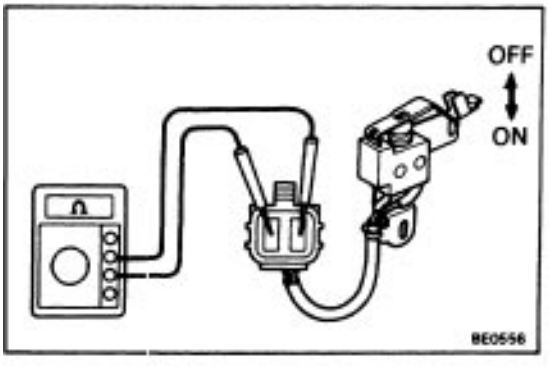
(w/o Fade Out System)

Check for	Tester connection	Condition	Specified value
Voltage	1 — Ground	Always	Battery voltage
	4 — Ground	Passenger's side and rear door courtesy switches OFF (Door closed)	Battery voltage
		Passenger's side or rear door courtesy switch ON (Door opened)	No voltage
Continuity	6 — Ground	Driver's side door courtesy switch OFF (Door closed)	No continuity
		Driver's side door courtesy switch ON (Door opened)	Continuity
Voltage	7 — Ground	Turn ignition switch to OFF or ACC	No voltage
		Turn ignition switch ON	Battery voltage
Continuity	13 — Ground	Turn light control switch to OFF or TAIL	No continuity
		Turn light control switch to HEAD	Continuity
Voltage	14 — Ground	Turn headlight dimmer switch to low beam or high beam	Battery voltage
		Turn headlight dimmer switch to Flash	No voltage
	15 — Ground	Always	Battery voltage
Continuity	16 — Ground	Turn light control switch OFF	No continuity
		Turn light control switch TAIL or HEAD	Continuity

(w/ Fade Out System)

Check for	Tester connection	Condition	Specified value
Voltage	1 — Ground	Always	Battery voltage
	2 — Ground	Always .	Battery voltage
Continuity	3 — Ground	Door room light retainer switch ON (Door outside handle pulled up on driver's side)	Continuity
		Door room light retainer switch OFF (Door outside handle released on driver's side)	No continuity
Voltage	4 — Ground	Passenger's side and rear door courtesy switches OFF (Door closed)	Battery voltage
		Passenger's side or rear door courtesy switch ON (Door opened)	No voltage
Continuity	6 — Ground	Driver's side door courtesy switch OFF (Door closed)	No continuity
		Driver's side door courtesy switch ON (Door opened)	Continuity
Voltage	7 — Ground	Turn ignition switch to OFF or ACC	No voltage
		Turn ignition switch ON	Battery voltage
Continuity	10 — Ground	Always	Continuity
	13 — Ground	Turn light control switch to OFF or TAIL	No continuity
		Turn light control switch to HEAD	Continuity
Voltage	14 — Ground	Turn headlight dimmer switch to low beam or high beam	Battery voltage
		Turn headlight dimmer switch to Flash	No voltage
	15 — Ground	Always	Battery voltage
Continuity	16 — Ground	Turn light control switch OFF	No continuity
		Turn light control switch TAIL or HEAD	Continuity

If circuit is as specified, replace the relay.



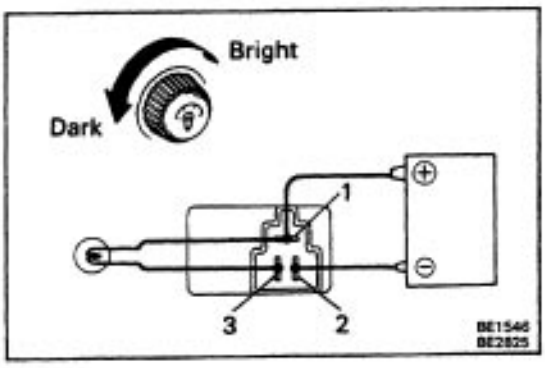
Room Light Retainer Switch
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

(a) Check that there is no continuity between terminals with the switch OFF (Door outside handle released).

(b) Check that there is continuity between terminals with the switch ON (Door outside handle pulled).

If continuity is not as specified, replace the switch.



Light Control Rheostat
INSPECTION OF RHEOSTAT

INSPECT RHEOSTAT OPERATION

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2.
(b) Connect the terminals 1 and 3 through a 3.4 W test bulb.
(c) Gradually turn the rheostat knob from the bright side to dark side, check that the test bulb brightness changes from bright to dark.

If operation is not as specified, replace the rheostat.

Daytime Running Light System (CANADA)

DESCRIPTION

Current is led from the battery to terminal 12 of the running light relay.
Operation examples of the switch are shown below.

1. IGNITION SWITCH ”ON” AND LIGHT CONTROL SWITCH ”OFF”

When the switches are set, current is led from the battery to terminal 1 of the running light relay. Also, because continuity is made between terminal 3 and the body ground, and 5 and the body ground of the running light relay, the taillight control relay and headlight control relay are turned on.
Then the taillights and headlights light up.
HINT: Because terminal 14 of the running light relay is not grounded at all times, the headlight dimmer relay is off, so that the headlights light up at the low beam.

2. LIGHT CONTROL SWITCH IN ”HEAD”

When the switch is set, continuity is made between terminal 4 and the body ground, and 2 and the body ground of the running light relay. Also, because the continuity is made between terminal 5 and the body ground, and 3 and the body ground of the running light relay at all times, the taillights and headlights light up.
HINT: When the headlight dimmer switch is set to ”HIGH”, continuity is made between terminal 13 of the running light relay and the body ground. Also, because continuity is made between terminal 14 of the running light relay and the body ground, the headlight dimmer relay is turned on. Then the headlights go on at the high beam.

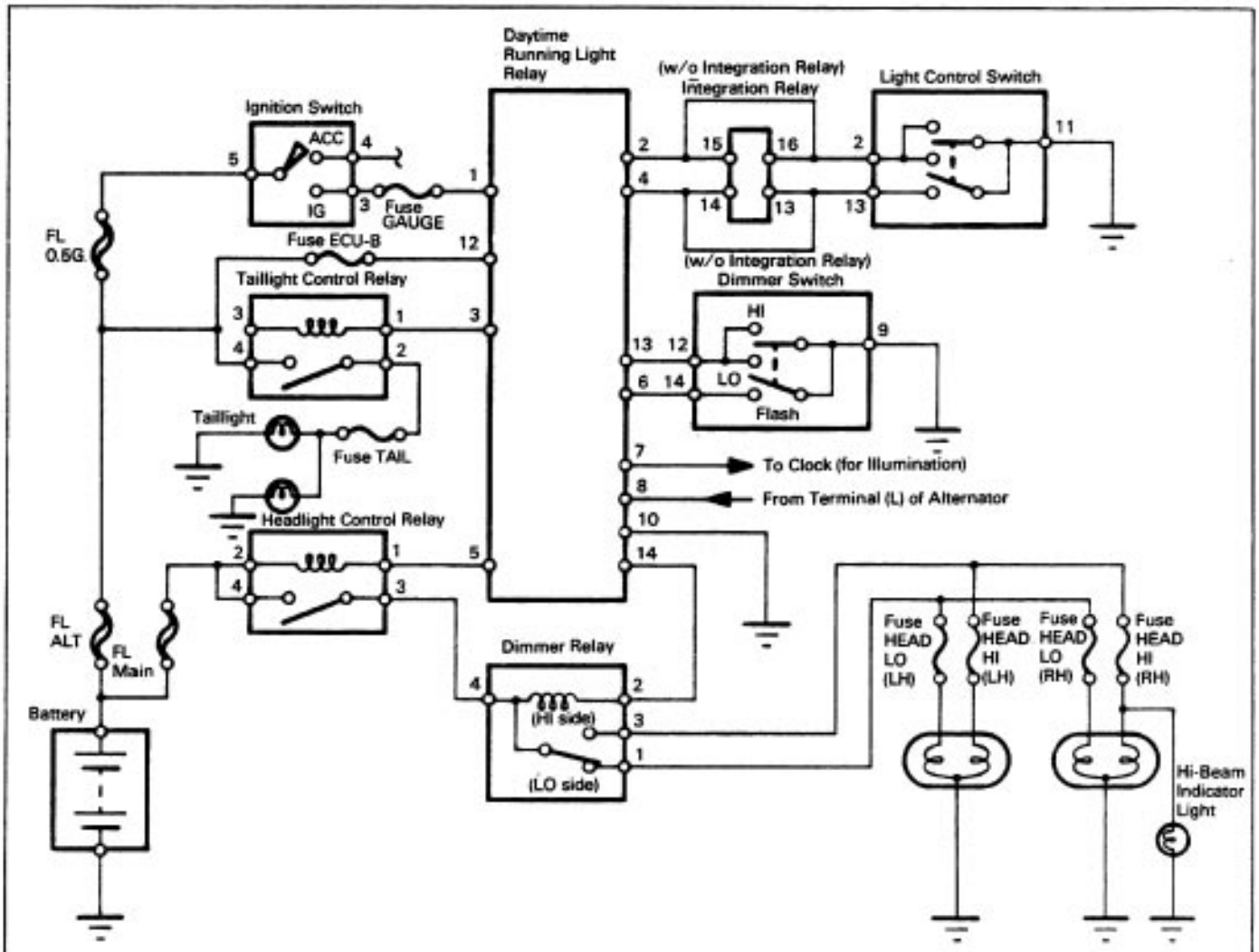
3. HEADLIGHT DIMMER SWITCH IN ”FLASH”

When the switch is set, continuity is made between terminal 6 and the body ground, and 13 and the body ground of the running light relay. Also, because the continuity is made between terminal 5 and the body ground, and 14 and the body ground of the running light relay, the headlights flash.

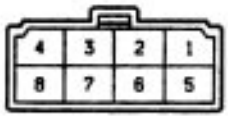
4. ENGINE STOPS (IGNITION SWITCH ”ON”)

When the engine is stopped, because the continuity between terminal 5 and terminal 10 of the running light relay remains, so the running lights also remain.
HINT: If ignition switch is turned to ”OFF”, running lights will go off because the continuity between terminal 5 and terminal 10 of the running light relay is cut off.

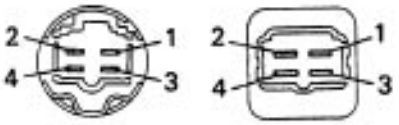
WIRING AND CONNECTOR DIAGRAMS



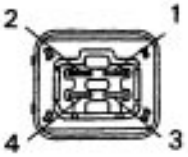
Ignition Switch



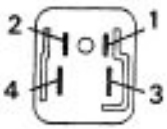
Taillight Control Relay



Dimmer Relay



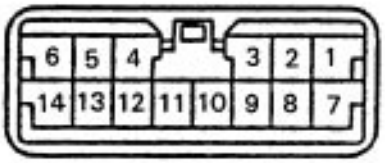
Headlight Control Relay



Integration Relay

- Dimmer Switch
- Light Control Switch
- Turn Signal Switch

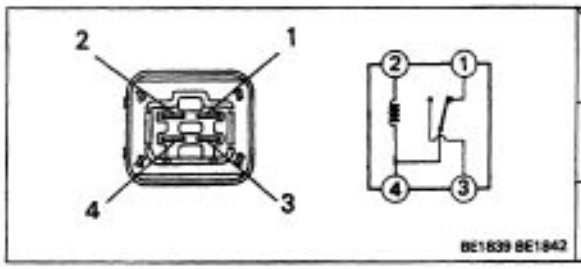
Daytime Running Light Relay



BE4072
N-8-2 BE1647 BE1575 BE1839 BE1838
Y-4-1-A BE1397 BE3972

INSPECTION OF RELAY

1. INSPECT DIMMER RELAY (Continuity)

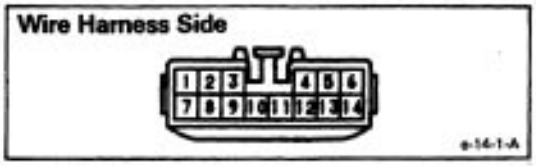


Terminal / Condition	1	2	3	4
Constant		○		○
		○		○
Apply battery voltage to terminals 2 and 4.			○	○

If continuity is not as specified, replace the relay.

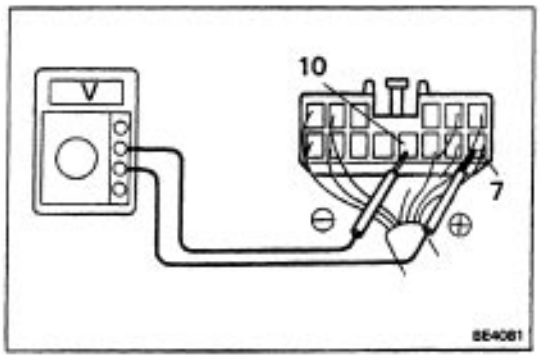
2. INSPECT DAYTIME RUNNING LIGHT RELAY (Relay Circuit)

Disconnect the connector from the relay and inspect the connector on the wire harness side as shown in the chart.



Check for	Tester connection	Condition		Specified value
Continuity	2 – Ground	Light control switch position	OFF	No continuity
			TAIL or HEAD	Continuity
	4 – Ground	Light control switch position	OFF or TAIL	No continuity
			HEAD	Continuity
	6 – Ground	Headlight dimmer switch position	Low beam or High beam	No continuity
			Flash	Continuity
	7 – Ground 10 – Ground	Constant		Continuity
	13 – Ground	Headlight dimmer switch position	Low beam	No continuity
			High beam or Flash	Continuity
Voltage	1 – Ground	Ignition switch position	LOCK or ACC	No voltage
			ON or START	Battery voltage
	3 – Ground 5 – Ground	Constant		Battery voltage
	8 – Ground	Engine	Stop	No voltage
			Running	Battery voltage
	12 – Ground	Constant		Battery voltage
	14 – Ground	Constant		No voltage
		Ground terminal 5		Battery voltage

If circuit is as specified, inspect relay operation.



(Relay Operation)

(a) Connect the positive (+) lead from the voltmeter to terminal 7 and negative (–) lead to terminal 10.

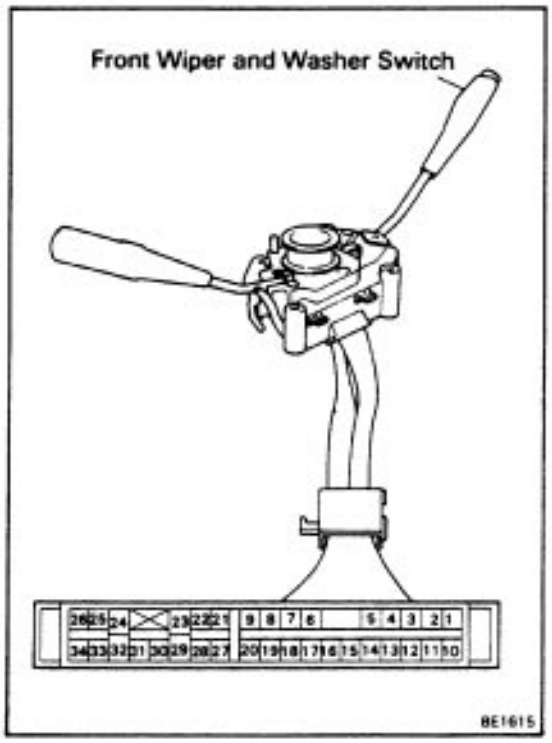
(b) Check that there is battery voltage with light control switch is turned on.

If operation is not as specified, replace the relay.

WIPERS AND WASHERS

Troubleshooting

Problem	Possible cause	Remedy	Page	
			Front	Rear
Wipers do not operate or return to off position	WIPER fuse blown Wiper motor faulty Wiper switch faulty Wiring or ground faulty	Replace fuse and check for short Check motor Check switch Repair as necessary	BE–3 BE–28 BE–26	BE–3 BE–29 BE–29
Wipers do not operate i n I NT position	Wiper relay faulty Wiper switch faulty Wiper motor faulty Wiring or ground faulty	Check relay Check switch Check motor Repair as necessary	BE–26 BE–28	BE–29 BE–29 BE–29
Washers do not operate	Washer hose or nozzle clogged Washer motor faulty Washer switch faulty Wiring faulty	Repair as necessary Replace motor Check switch Repair as necessary	BE–26	BE–29



Front Wiper and Washer Switch

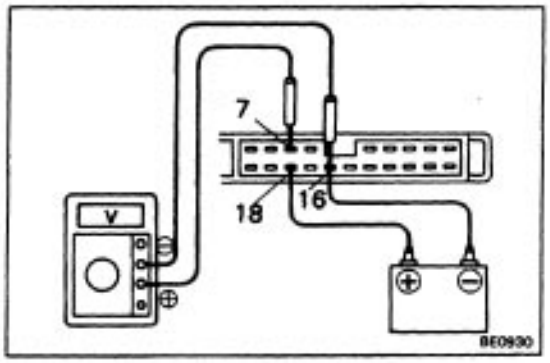
INSPECTION OF SWITCH

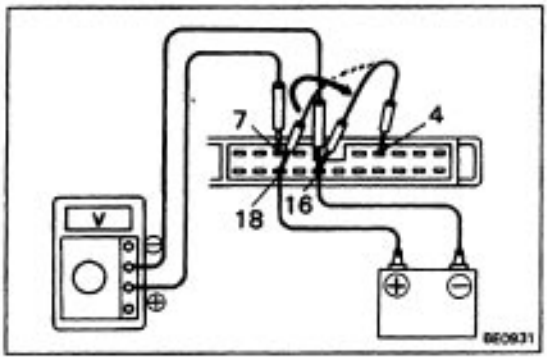
1. INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch	Terminal: Switch position	Terminal: MIST position	18	7	13	4	8	16
Wiper	OFF	OFF		○		○		
		ON	○	○				
	INT	OFF		○		○		
		ON	○	○				
	LO	OFF	○	○				
		ON	○	○				
	HI	OFF	○		○			
		ON	○	○	○			
Washer	OFF							
	ON						○	○

If continuity is not as specified, replace the switch.



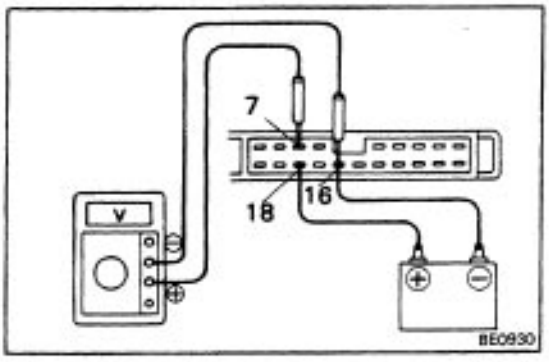


2. INSPECT INTERMITTENT OPERATION OF SWITCH

(a) Turn the wiper switch to INT position.
(b) Turn the INT switch to FAST position.(Variable type)
(c) Connect the positive (+) lead from the battery to terminal 18 and the negative (–) lead to terminal 16.
(d) Connect the positive (+) lead from the voltmeter to terminal 7 and the negative (–) lead to terminal 16, check that the meter needle indicates battery voltage.
(e) After connecting terminal 4 to terminal 18, connect it to terminal 16.
Then, check that the voltage rises from 0 volts to battery voltage with in the times as shown in the table.

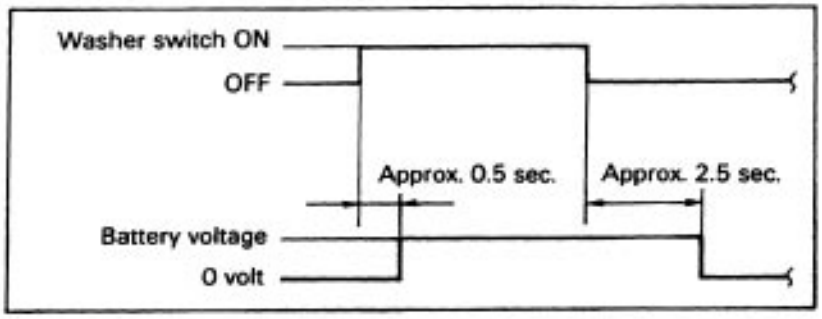
INT time control switch position	Voltage
FAST	Approx. 2 sec. — Battery voltage / 0 volt
SLOW	10.7 ± 5 sec. — Battery voltage / 0 volt
Non variable type	3.3 ± 1 sec. — Battery voltage / 0 volt

If operation is not as specified, replace the wiper and washer switch.

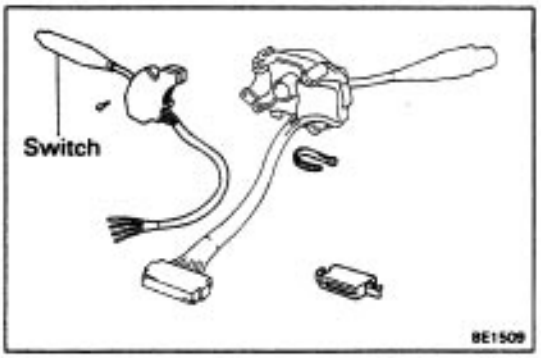


3. INSPECT WASHER SWITCH OPERATION (Washer linked type)

(a) Connect the positive (+) lead from the battery to terminal 18 and the negative (–) lead to terminal 16.
(b) Connect the positive (+) lead from the voltmeter to terminal 7 and the negative (–) lead to terminal 16.
(c) Push in the washer switch, check that the voltage changes as shown in the table.



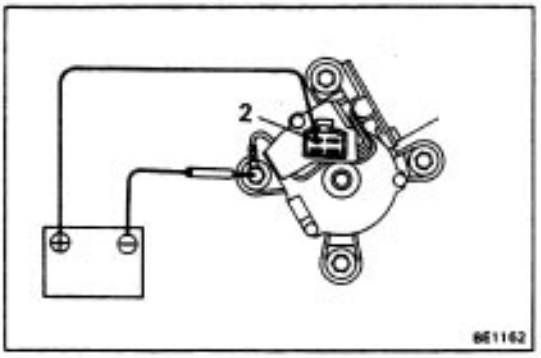
If operation is not as specified, replace the wiper and washer switch.



REPLACEMENT OF SWITCH

REPLACE SWITCH

(a) Disconnect terminals from the connector. (See page BE– 16)
(b) Remove the wiper and washer switch.
(e) Install the wiper and washer switch.
(d) Install terminals to the connector. (See page BE–1 7)

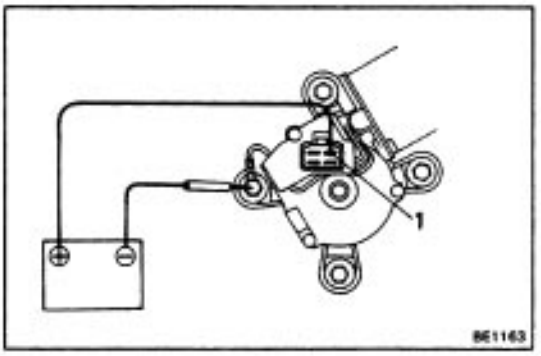


Front Wiper Motor

INSPECTION OF MOTOR

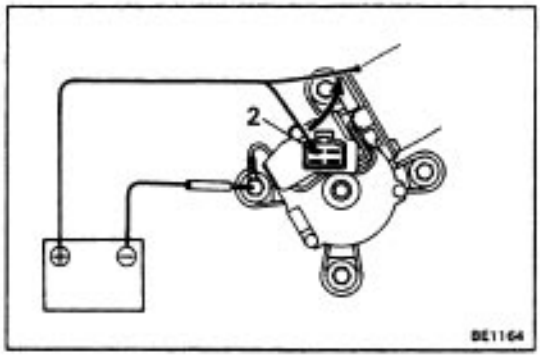
1. INSPECT MOTOR OPERATES AT LOW SPEED

(a) Disconnect the connector from the wiper motor.
(b) Connect the positive (+) lead from the battery to terminal 2. and the negative (–) lead to the motor body.
(e) Check that the motor operates at low speed.



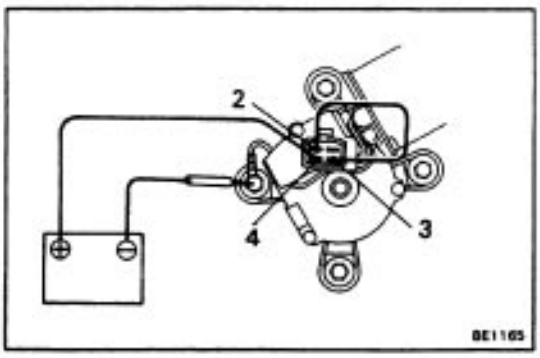
2. INSPECT MOTOR OPERATES AT HIGH SPEED

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to the motor body.
(b) Check that the motor operates at high speed.



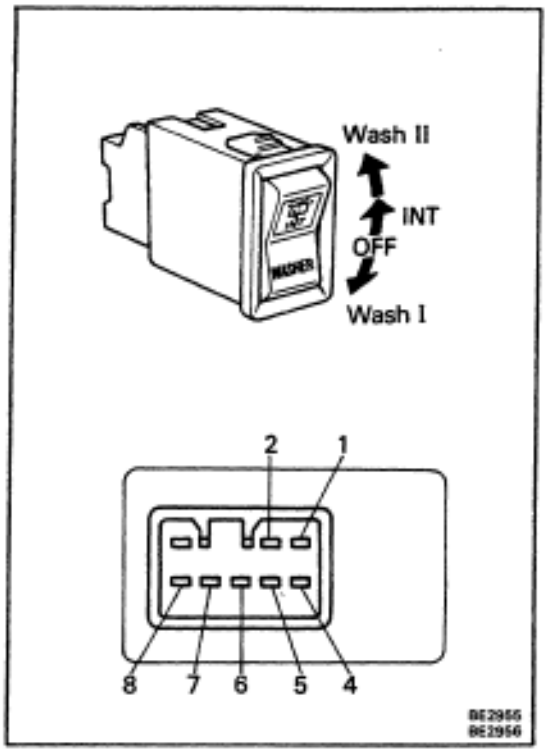
3. INSPECT MOTOR OPERATES, STOPPING AT STOP POSITION

(a) Operate the motor at low speed.
(b) Stop motor operation anywhere except at the off position by disconnecting terminal 2.



(c) Connect terminals 2 and 3.
(d) Connect the positive (+) lead from the battery to terminal 4.
(e) Check that the motor stops running at the off position after the motor operates again.

If operation is not as specified, replace the motor.



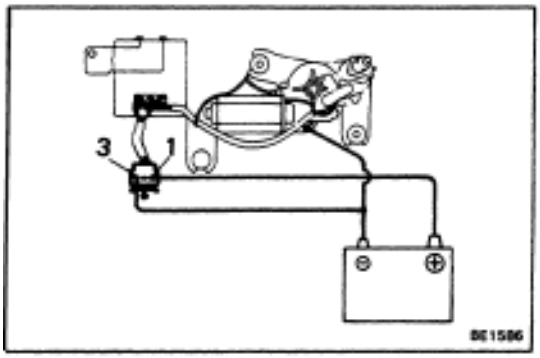
Rear Wiper and Washer Switch
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch position \ Terminal	2	7	8	5	6	1	4
Wash II		○—○	○—○	○—○		○—○	○—○
INT		○—○				○—○	○—○
OFF						○—○	○—○
Wash I	○	—○	—○	—○		○—○	○—○

If continuity is not as specified, replace the switch.

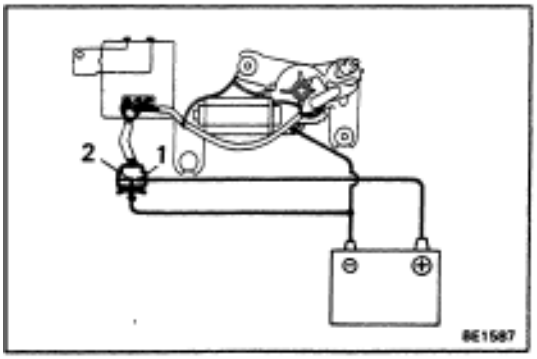


Rear Wiper Motor and Relay
INSPECTION OF MOTOR AND RELAY

1. INSPECT RELAY AND MOTOR OPERATES

(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) leads to both terminal 3 and motor body.

(b) Check that the motor operates.

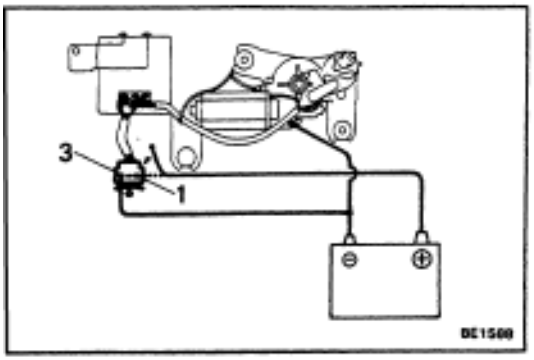


2. INSPECT INTERMITTENT OPERATION OF RELAY

(a) Connect the positive 1+y lead from the battery to terminal 1 and negative t–) leads to both terminal 2 and motor body.

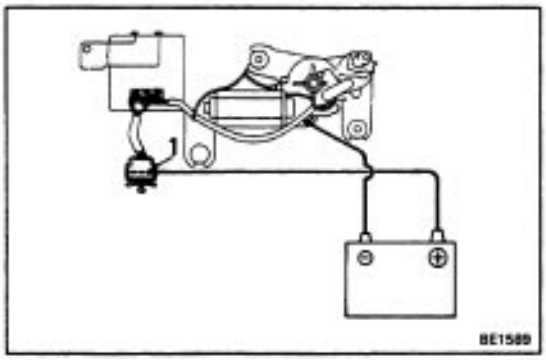
(b) Check that the motor operates intermittently for 9 15 seconds.

If operation is not as specified, replace the relay.



3. INSPECT MOTOR OPERATES, STOPPING AT STOP POSITION

(a) Start motor operation by connecting the positive (+j lead from the battery to terminal 1 and the negative (– lead to both terminal 3 and motor body.



(e) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to the motor body.
(d) Check that the motor stops running at the stop position after the motor operates again.

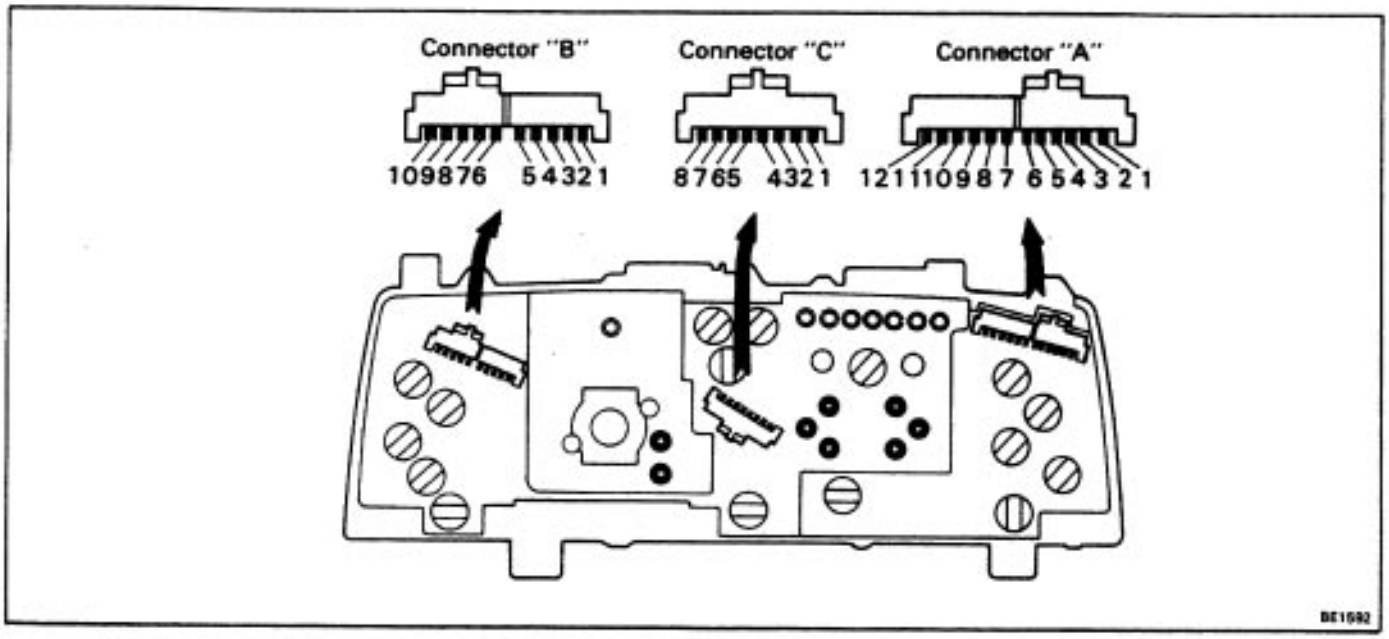
If operation is not as specified, replace the motor.

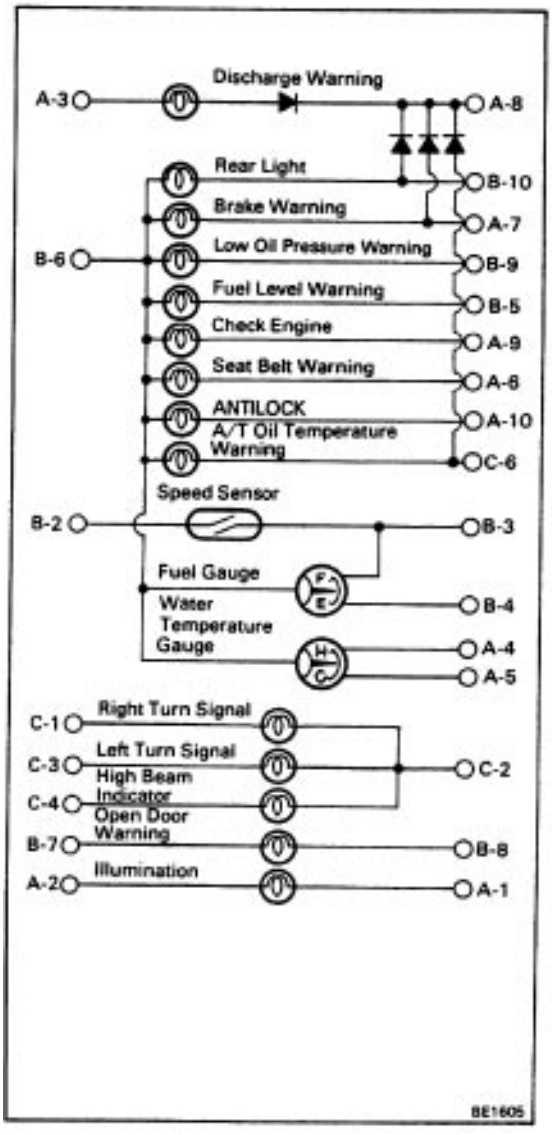
COMBINATION METER

Troubleshooting

Problem	Possible cause	Remedy	Page
Tachometer does not operate	”GAUGE” fuse blown Tachometer faulty Wiring faulty	Replace fuse and check for short Check tachometer Repair as necessary	BE–3 BE–36
Fuel gauge does not operate	”GAUGE” fuse blown Fuel gauge faulty Sender gauge faulty Wiring or ground faulty	Replace fuse .and check for short Check gauge Check sender gauge Repair as necessary	BE–3 BE–36 BE–37
Fuel level warning light does not light	”GAUGE” fuse blown Bulb burned out Fuel level warning switch faulty Wiring or ground faulty	Replace fuse and check for short Replace bulb Check switch Repair as necessary	BE–3 BE–37
Water temperature gauge does not operate	”GAUGE” fuse blown Water temperature gauge faulty Water temperature sender gauge faulty Wiring or ground faulty	Replace fuse and check for short Check gauge Check sender gauge Repair as necessary	BE–3 BE–38 BE–39
Low oil pressure warning light does not light	”GAUGE” fuse blown Buibburned out oil pressure warning switch faulty Wiring or ground faulty	Replace fuse and check for short Replace bulb Check switch Repair as necessary	BE–3 BE–39
Brake warning light does not light	”GAUGE” fuse blown Bulb burned out Brake fluid level warning switch faulty Parking brake switch faulty Wiring or ground faulty	Replace fuse and check for short Replace bulb Check switch Check switch Repair as necessary	BE–3 BE–40 BE–40
Open door warning light does not light	”GAUGE” fuse blown Bulb burned out Door courtesy switch faulty Wiring or ground faulty	Replace fuse and check for short Replace bulb Check switch –Repair as necessary	BE–3 BE–40
Seat belt warning does not operate (Canada)	”DOME” fuse blown Bulb burned out Door courtesy switch faulty Unlock warning switch faulty Buckle switch faulty Seat belt warning relay faulty Wiring or ground faulty	Replace fuse and check for short Replace bulb Check switch Check switch Check switch Check relay Repair a s necessary	BE–3 BE–40 BE–13 BE–41 BE–41

Combination Meter and Gauges (w/o Tachometer)

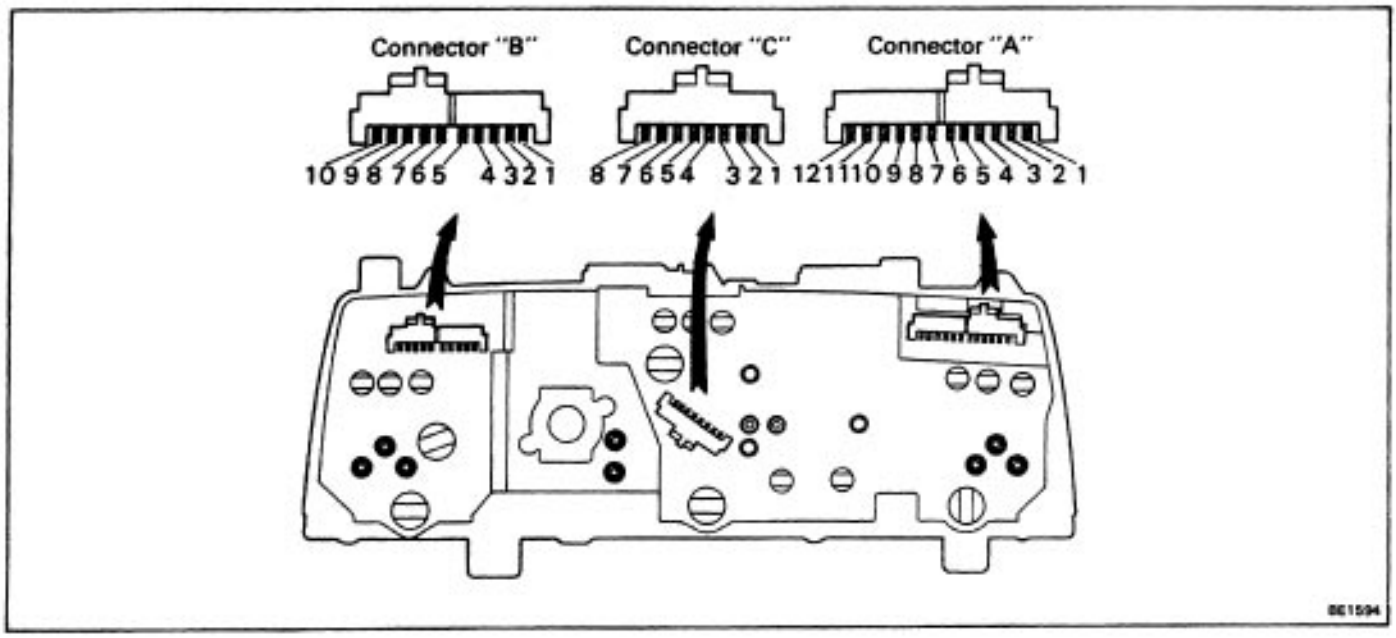




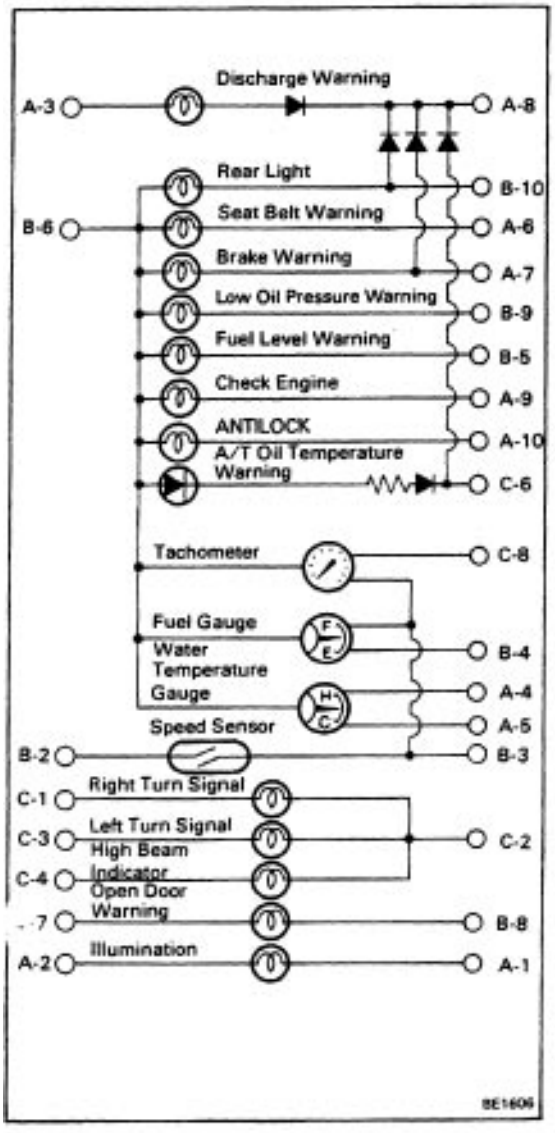
COMBINATION METER CIRCUIT

No.		Wiring Connector Side
A	1	Light Control Rheostat
	2	TAIL Fuse
	3	IGN Fuse
	4	Water Temperature Sender Gauge
	5	Ground
	6	Seat Beh Warning Relay
	7	Brake Fluid Level Warning Switch and Parking Brake Switch
	8	CHARGE Fuse
	9	TCCS ECU
	10	A.B.S. ECU
B	2	Cruise Control ECU and ECT ECU
	3	Ground
	4	Fuel Sender Gauge Terminal 3
	5	Fuel Sender Gauge Terminal 2
	6	GAUGE Fuse
	7	DOME Fuse
	8	Door Courtesy Switch
	9	Low Oil Pressure Switch
	10	Light Failure Sensor
C	1	Turn Signal Switch Terminal 28
	2	Ground
	3	Turn Signal Switch Terminal 25
	4	Turn Signal Switch Terminal 23 (USA) HEAD–HI (RH) Fuse (CANADA)
	6	A/T Oil Temperature Switch

Combination Meter and Gauges (w/ Tachometer)

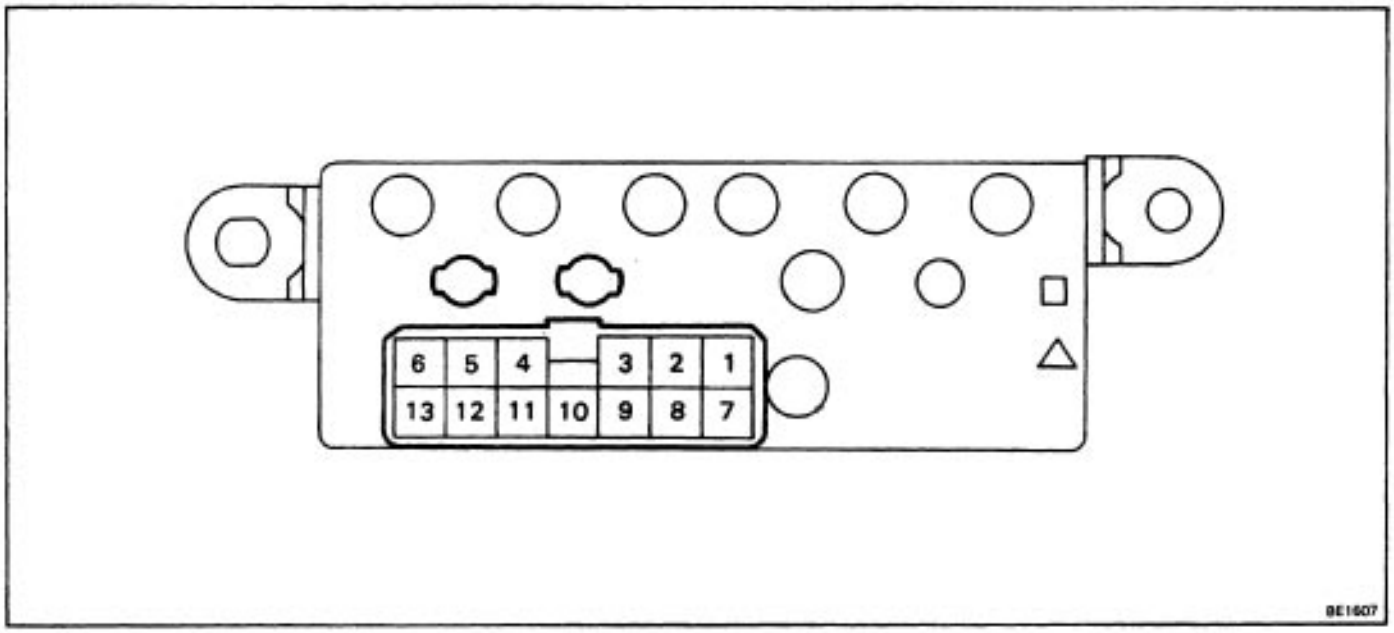


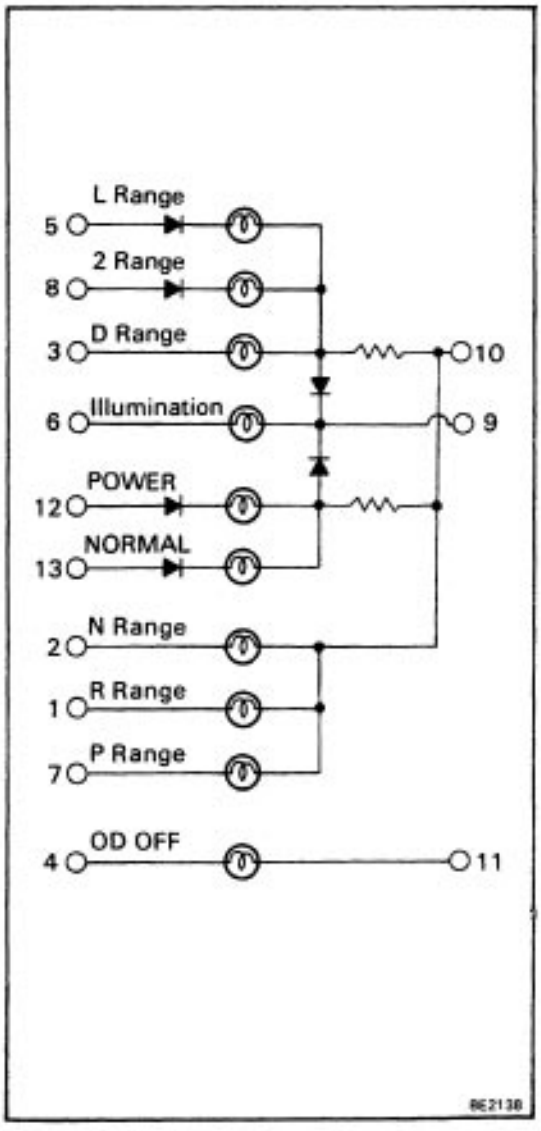
COMBINATION METER CIRCUIT



No.		Wiring Connector Side
A	1	Light Control Rheostat
	2	TAIL Fuse
	3	IGN Fuse
	4	Water Temperature Sender Gauge
	5	Ground
	6	Seat Belt Warning Relay
	7	Brake Fluid Level Warning Switch and Parking Brake Switch
	8	CHARGE Fuse
	9	TCCS ECU ,
	10	A. B. S. ECU
B	2	Cruise Control ECU and ECT ECU
	3	Ground
	4	Fuel Sender Gauge Terminal 3
	5	Fuel Sender Gauge Terminal 2
	6	. GAUGE Fuse
	7	DOME Fuse
	8	Door Courtesy Switch
	9	Low Oil Pressure Switch
	10	Light Failure Sensor
C	1	Turn Signal Switch Terminal 28
	2	Ground
	3	Turn Signal Switch Terminal 25
	4	Turn Signal Switch Terminal 23 (USA) HEAD–HI (RH) Fuse (CANADA)
	6	A/T Oil Temperature Switch
	8	Igniter

Shift Position Indicator (A/T)





SHIFT POSITION INDICATOR CIRCUIT

No.	Wiring Connector Side
1	Neutral Start Switch
2	Neutral Start Switch
3	Neutral Start Switch
4	GAUGE Fuse
5	Neutral Start Switch
6	TAIL Fuse
7	Neutral Start Switch
8	Neutral Strat Switch
9	Light Control Rheostat
10	Ground
11	OD Main Switch
12	Pattern Select Switch
13	Pattern Select Switch

Speedometer

INSPECTION OF SPEEDOMETER

INSPECT SPEEDOMETER OPERATION (ON–VEHICLE)

(a) Using a speedometer tester, inspect the speedometer for allowable indication error and check the operation of the odometer.

HINT: Tire wear and tire over or under inflation will increase the indication error.

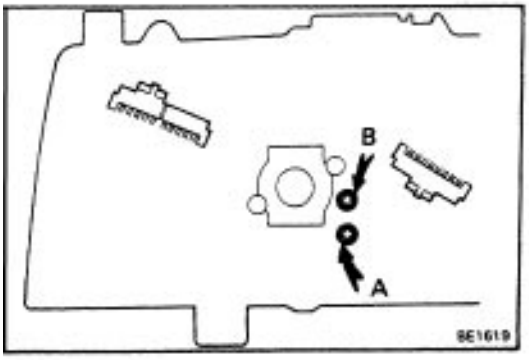
Standard indication (mph)	Allowable range (mph)
20	17 — 20
40	37 — 40.5
60	57 — 61
80	77 — 81.5
100	97 — 102
120	117 — 122.5

Standard indication (km/h)	Allowable range (km/h)
20	14 — 19
40	36 — 40
60	56 — 60.5
80	76 — 81
100	96 — 101
120	116 — 121.5
140	136 — 142
160	156 — 163

If error is excessive, replace the speedometer.

(b) Check the speedometer for pointer vibration and abnormal noise.

HINT: Pointer vibration can be caused by a loose speedometer cable.



Speed Sensor

INSPECTION OF SPEED SENSOR

INSPECT SPEED SENSOR

Check that there is continuity between terminals A and B four times per each revolution of the shaft.

If operation is not as specified, replace the speedometer.

Tachometer

INSPECTION OF TACHOMETER

INSPECT TACHOMETER OPERATION (ON–VEHICLE)

(a) Connect a tune–up test tachometer, and start the engine.

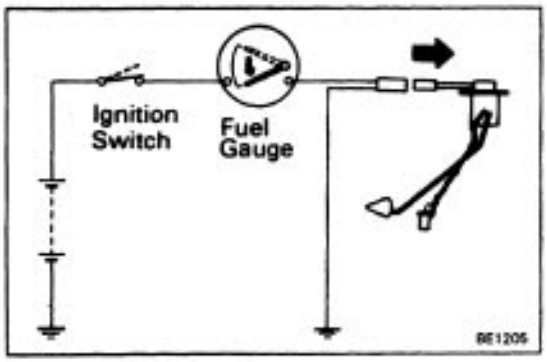
NOTICE:

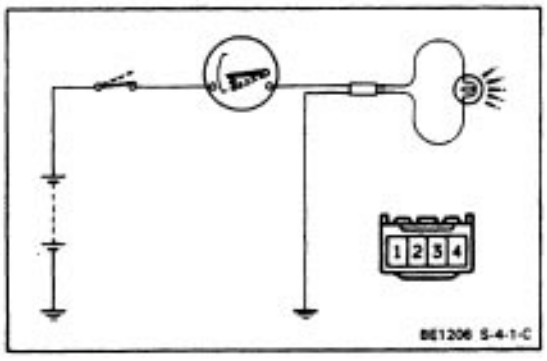
- Removing the connection of the tachometer will damage the transistors and diodes inside.
- When removing or installing the tachometer, be careful not to drop or subject it to heavy shocks.

(b) Compare the tester and tachometer indications.

DC 13.5 V 25˚C (77˚F)	
Standard indication (rpm)	Allowable range (rpm)
700	580 — 720
3,000	2,800 — 3,200
5,000	4,800 — 5,200
6,000	5,750 — 6,250
7,000	6,700 — 7,300

If error is excessive, replace the tachometer.





Fuel Gauge

INSPECTION OF GAUGE

1. INSPECT RECEIVER GAUGE OPERATION

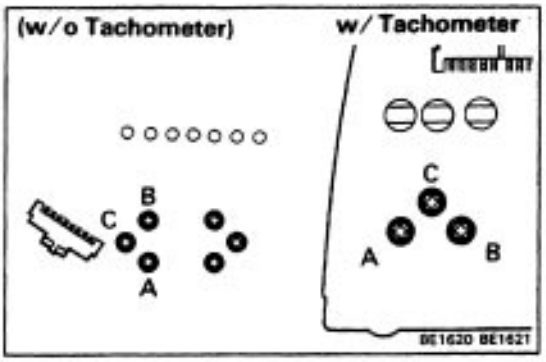
(a) Disconnect the connector from the sender gauge.

(b) Turn the ignition switch ON, check that the receiver gauge needle moves to EMPTY.

(e) Connect the terminals 3 and 4 on the wire harness side connector through a 3.4W test bulb, check that the bulb lights and receiver gauge needle moves towards the full side.

HINT: Because of the silicon oil in the gauge, it will take a short time for the needle to stabilize.

If operation is not as specified, test the receiver gauge.



2. MEASURE RECEIVER GAUGE RESISTANCE

Measure the resistance between terminals.

Between terminals	Resistance (Ω)
A — B	Approx. 64.3
A — C	Approx. 233.3
B — C	Approx. 169

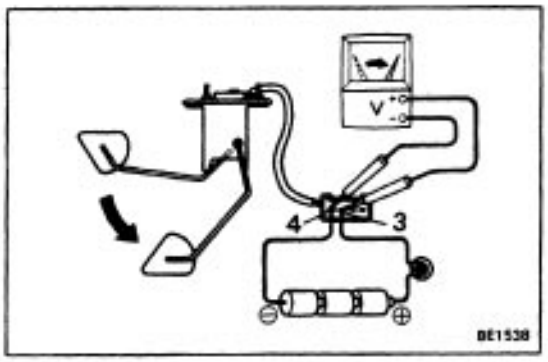
If resistance value is not as specified, replace the receiver gauge.

3. INSPECT SENDER GAUGE OPERATION

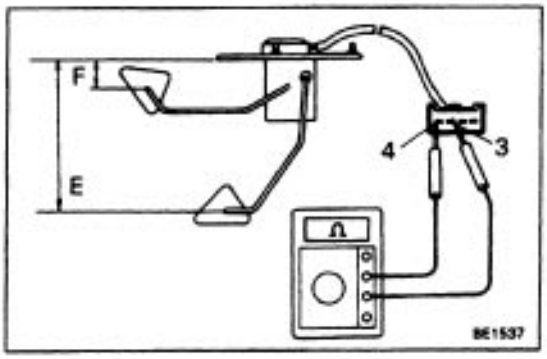
(a) Connect a series of three 1.5V dry cell batterys.

(b) Connect the positive (+) lead from the dry cell batterys to terminal 3 through a 3.4W test bulb and the negative (–) lead to terminal 4.

(c) Check that the voltage rises between terminals 3 and 4 as the float is moved from the top to bottom position.



(d) Measure the resistance between terminals 3 and 4 for each float position.



	Float position mm (in.)		Resistance (Ω)
	FWD	All–Trac/4WD	
F	Approx. 35 (1.38)	Approx. 97 (3.82)	Approx. 3
E	Approx. 141 (5.55)	Approx. 234 (9.21)	Approx. 110

If operation is not as specified, replace the sender gauge.

Fuel Level Warning

INSPECTION OF LEVEL WARNING

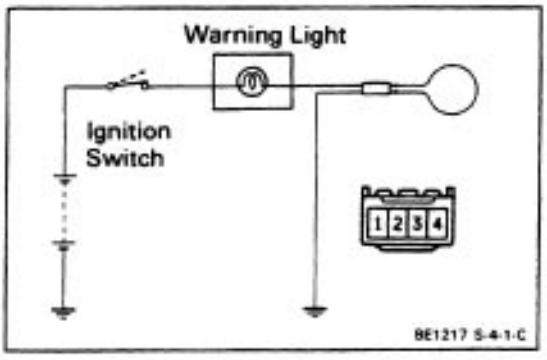
1. INSPECT WARNING LIGHT OPERATION

(a) Disconnect the connector from the sender gauge.

(b) Connect terminals 1 and 2 on the wire harness side-connector.

(e) Turn the ignition switch ON, check that the warning light lights.

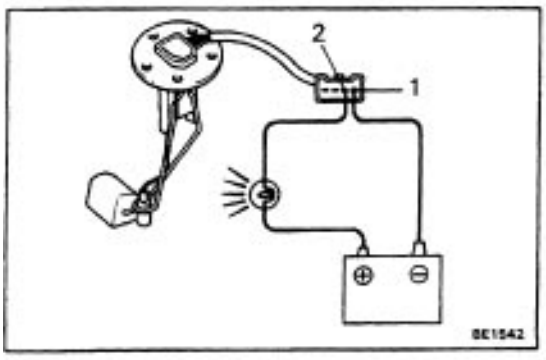
If the warning light does not light, test the bulb.

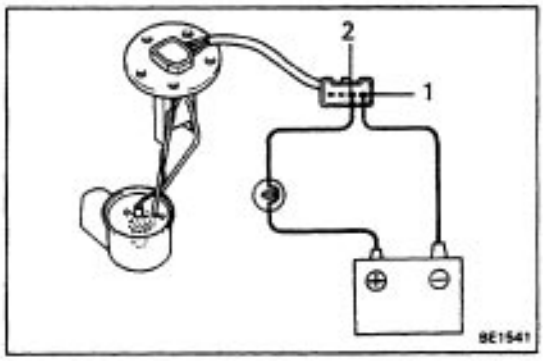


2. INSPECT WARNING SWITCH OPERATION

(a) Apply battery voltage to terminals 1 and 2 through a 3.4W test bulb, check that the bulb lights.

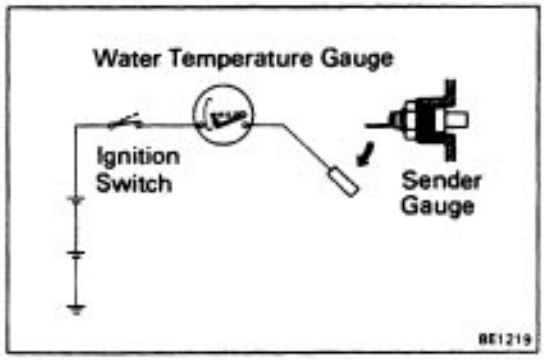
HINT: It will take a short time for the bulb to light.





(b) Submerge the switch in fuel, check that the bulb goes out.

If operation is not as specified, replace the sender gauge.

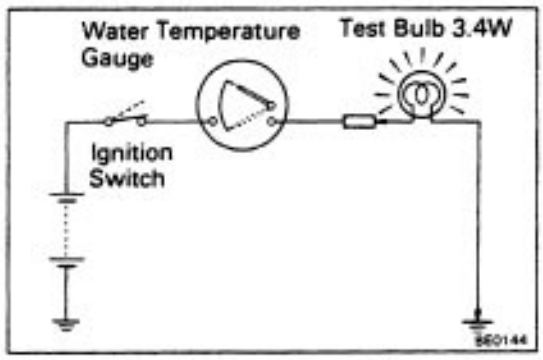


Water Temperature Gauge
INSPECTION OF GAUGE

1. INSPECT RECEIVER GAUGE OPERATION

(a) Disconnect the connector from the sender gauge.

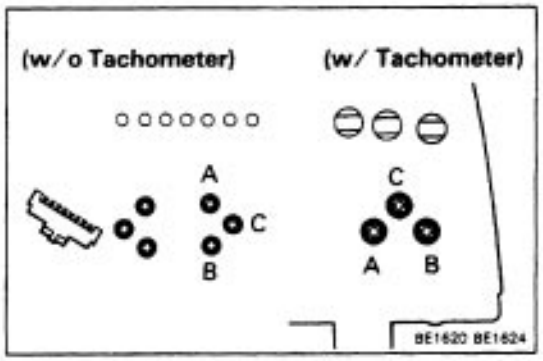
(b) Turn the ignition switch ON, check that the receiver gauge needle moves to COOL.



(c) Ground the terminal on the wire harness side connector through a 3.4W test bulb.

(d) Turn the ignition switch ON, check that the bulb lights and the receiver gauge needle moves to the hot side.

If operation is not as specified, measure the receiver gauge resistance.

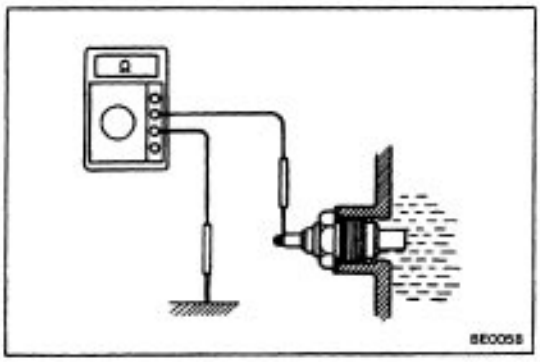


2. MEASURE RECEIVER GAUGE RESISTANCE

Measure the resistance between terminals.

Between terminals		Resistance (Ω)
Negative (–) lead from ohmmeter	Positive (+) lead from ohmmeter	
A	B	Approx. 54
A	C	Approx. 117.1
B	C	Approx. 201.1

If resistance value is not as specified, replace the receiver gauge.

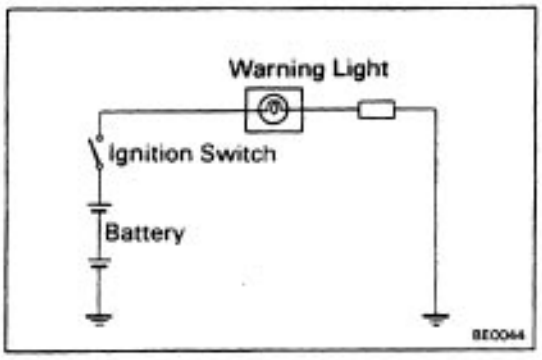


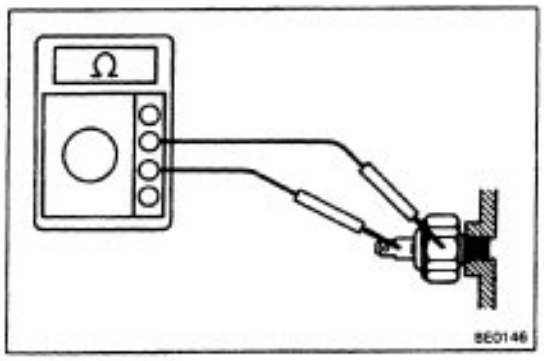
3. MEASURE SENDER GAUGE RESISTANCE

Measure the resistance between terminal and ground.

Water temperature oC (OF)	Resistance (Ω)	
	Yazaki	N i ppo nde nso
50 (122)	—	$226^{+33.6}_{-36.6}$
60 (140)	152.7	—
115 (239)	$26.4^{+2.2}_{-2.6}$	$26.4^{+1.71}_{-2.21}$

If resistance value is not as specified, replace the sender gauge.





Low Oil Pressure Warning

INSPECTION OF PRESSURE WARNING

1. INSPECT WARNING LIGHT OPERATION

(a) Disconnect the connector from the pressure switch and ground the connector on the wire harness side.

(b) Turn the ignition switch ON, check that t he warning light lights.

If the warning light does not light, test the bulb.

2. INSPECT PRESSURE SWITCH OPERATION

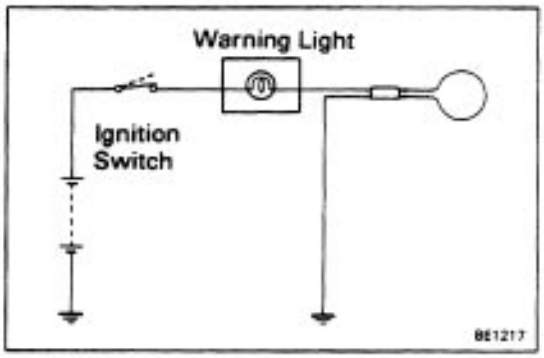
(a) Disconnect the connector from the switch.

(b) Check that there is continuity between terminal and ground with the engine stopped.

(c) Check that there is no continuity between terminal and ground with the engine running.

HINT: Oil pressure should be over 0.3 kg/cm2 (4.3 psi, 29 kPa).

If operation is not as specified, replace the switch.



Brake Warning

INSPECTION OF BRAKE WARNING

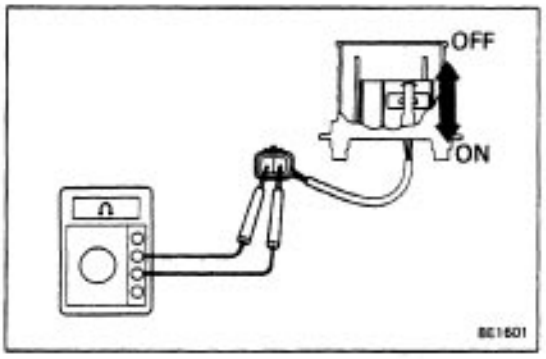
1. INSPECT WARNING LIGHT OPERATION

(a) Disconnect the connectors from the level warning switch and parking brake switch.

(b) Connect terminals on the wire harness side of the level warning switch connector.

(e) Remove the CHARGE fuse and turn the ignition switch
ON, check that the warning light lights.

If the warning light does not light, test the bulb.

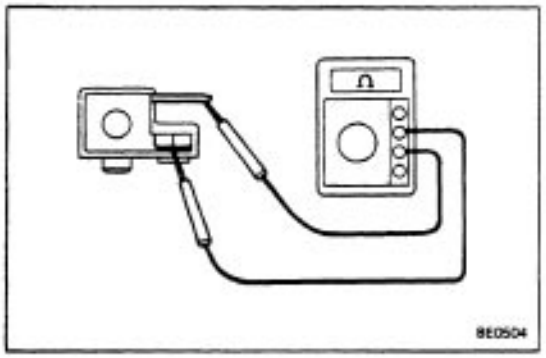


2. INSPECT LEVEL WARNING SWITCH OPERATION

(a) Check that there is no continuity between terminals with the switch OFF (float up).

(b) Check that there is continuity between terminals with the switch ON (float down).

If operation is not as specified, replace the switch.

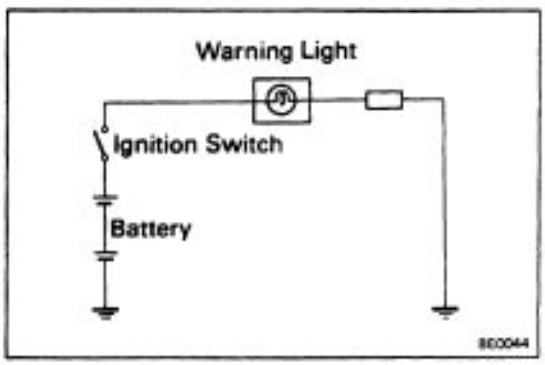


3. INSPECT PARKING BRAKE SWITCH OPERATION

(a) Check that there is continuity between terminal and switch set nut with the switch pin released.
(Parking brake lever pulled up)

(b) Check that there is no continuity between terminal and switch set nut with the switch pin pushed in.
(Parking brake lever released)

If operation is not as specified, replace the switch.



Open Door Warning

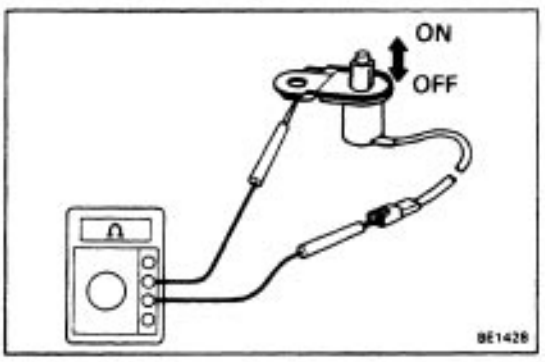
INSPECTION OF OPEN DOOR WARNING

1. INSPECT WARNING LIGHT OPERATION

(a) Disconnect the connector from the door courtesy switch and ground it.

(b) Turn the ignition switch ON, check that the warning light lights.

If the warning light does not light, test the bulb.

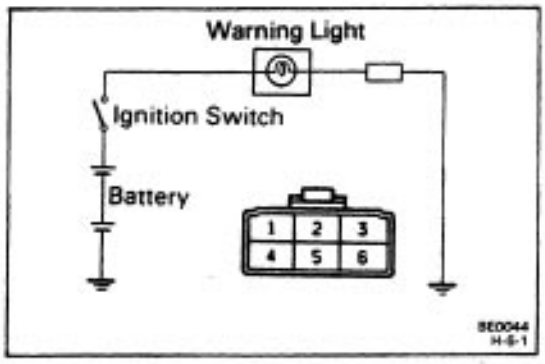


2. INSPECT COURTESY SWITCH OPERATION

(a) Check that there is continuity between terminal and switch body with the switch pin released.

(b) Check that there is no continuity between terminal and switch body when the switch pin is pushed in.

If operation is not as specified, replace the switch.



Seat Belt Warning

INSPECTION OF SEAT BELT WARNING

1. INSPECT WARNING LIGHT OPERATION

(a) Disconnect the connector from the seat belt warning relay and ground the terminal 5 on the wire harness side.

(b) Turn the ignition switch ON, check that the warning light lights.

If warning light does not light, test the bulb.

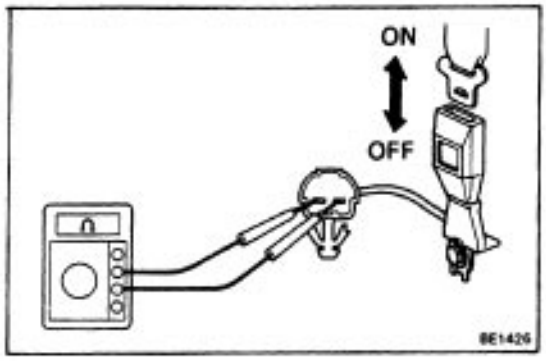
2. INSPECT BUCKLE SWITCH OPERATION

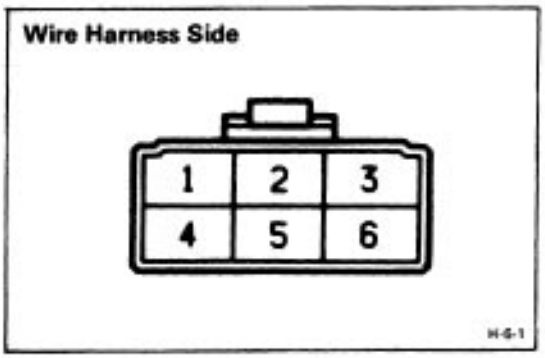
(a) Disconnect the connector from the switch.

(b) Check that there is no continuity between terminals on the switch side connector with the belt fastened.

(c) Check that there is continuity between terminals on the switch side connector with the belt unfastened.

If operation is not as specified, replace the seat belt inner.





3. INSPECT UNLOCK WARNING SWITCH OPERATION (See page BE–1 3)

If operation is not as specified, replace the switch.

4. INSPECT SEAT BELT WARNING RELAY CIRCUIT

Disconnect the relay connector and inspect the connector on the wire harness side as shown in the chart.

Check for	Tester connection	Condition	Specified value
Voltage	1 – Ground	Courtesy switch OFF (Door closed)	Battery voltage
		Courtesy switch ON (Door opened)	No voltage
	2 – Ground	Turn ignition switch to OFF or ACC	No voltage
		Turn ignition switch ON	Battery voltage
	3 – Ground	Unlock warning switch OFF (Ignition key removed)	No voltage
		Unlock warning switch ON (Ignition key set)	Battery voltage
Continuity	4 – Ground	Always	Continuity
Voltage	5 – Ground	Turn ignition switch to OFF or ACC	No voltage
		Turn ignition switch ON	Battery voltage
Continuity	6 – Ground	Buckle switch OFF (Seat belt fastened)	No continuity
		Buckle switch ON (Seat belt unfastened)	Continuity

If circuit is as specified, replace the relay.

REAR WINDOW DEFOGGER

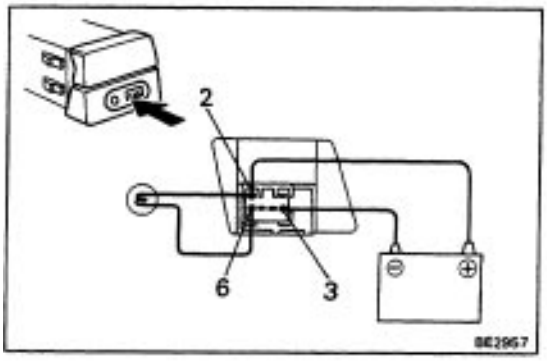
Troubleshooting

Problem	Possible cause	Remedy	Page
Rear window defogger does not work.	Circuit breaker OFF	Reset breaker and check for short	BE–3
	GAUGE fuse blown	Replace fuse and check for short	BE–3
	Defogger switch faulty	Check switch	BE–42
	Defogger relay faulty	Check relay	BE–42
	Defogger wire broken	Check wires	BE–43
	Wiring and ground faulty	Repair as necessary	

Rear Window Defogger Switch

INSPECTION OF SWITCH

INSPECT SWITCH OPERATION



(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 3.

(b) Connect terminals 2 and 6 through a 3.4 W test bulb.

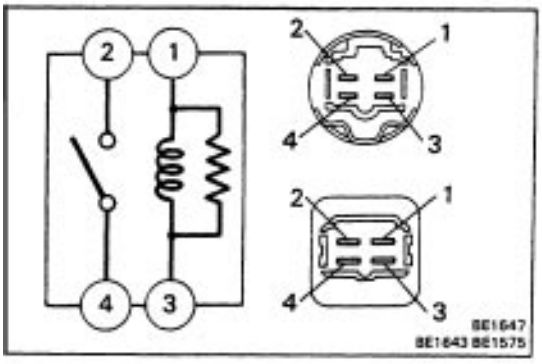
(e) Push the defogger switch. Check that the test bulb lights for 12 to 18 minutes, then the test bulb goes out.

If operation is not as specified, replace the switch.

Rear Window Defogger Relay

INSPECTION OF RELAY

1. INSPECT RELAY CONTINUITY

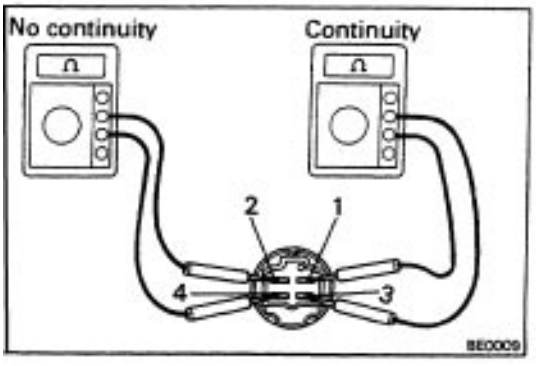


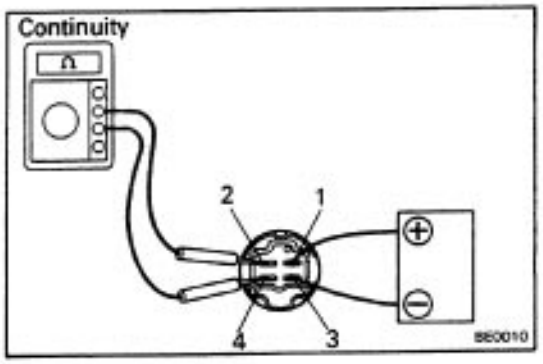
(a) Check that there is continuity between terminals 1 and 3.

(b) Check that there is no continuity between terminals 2 and 4.

(e) Check that there is no continuity between terminals 3 and 4.

If continuity is not as specified, replace the relay.





2. INSPECT RELAY OPERATION

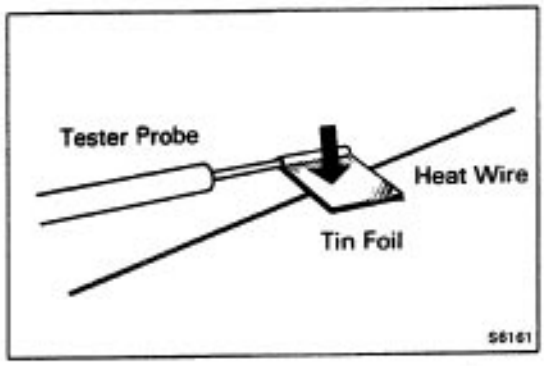
(a) Apply battery voltage to terminals 1 and 3.
(b) Check that there is continuity between terminals 2 and 4.
(c) Check that there is no continu,ity between terminals 3 and 4.

If operation is not as specified, replace the relay.

Rear Window Defogger Wires

CAUTION:

- When cleaning the glass, use a soft, dry cloth, and wipe the glass in the direction of the wire. Take care not to damage the wires.
- Do not use detergents or glass cleaners with abrasive ingredients.
- When measuring voltage, wind a piece of tin foil around the top of the negative probe and press the foil against the wire with your finger as shown.

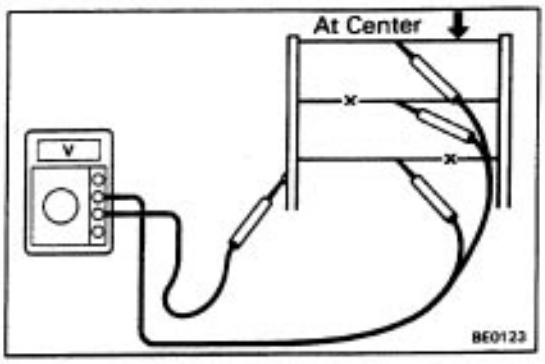


INSPECTION OF DEFOGGER WIRES

1. INSPECT FOR WIRE BREAKAGE

(a) Turn the ignition switch to ON.
(b) Turn the defogger switch to ON.

(c) Inspect the voltage at the center of each heat wire as shown.



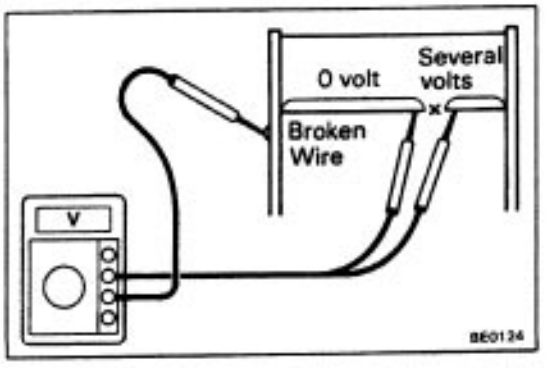
Voltage	Criteria
Apprrox. 5V	Okay (No break in wire)
Approx. 1 OV or OV	Broken wire

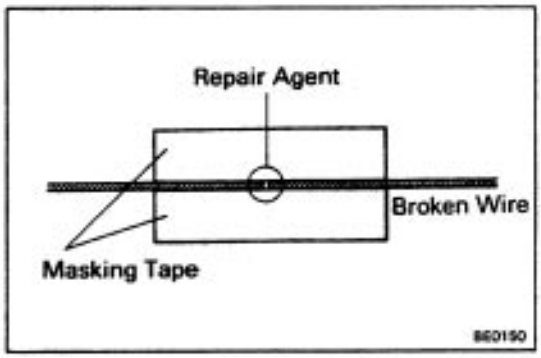
HINT: If there are 10V, the wire is broken between the center of the wire and positive (+) end. If there is no voltage, the wire is broken between the center of the wire and ground.

2. INSPECT FOR WIRE BREAKAGE POINT

(a) Place the voltmeter positive (+) lead against the defogger positive (+) terminal.
(b) Place the voltmeter negative (–) lead with the foil strip against the heat wire at the positive (+) terminal end and slide it toward the negative (–) terminal end.
(c) The point where the voltmeter deflects from zero to several volts is the place where the heat wire is broken.

HINT: If the heat wire is not broken, the voltmeter will ind cafe 0V at the positive (+) end of the heat wire but gradua ly increase to about 12V as the meter prove is moved to the other end.

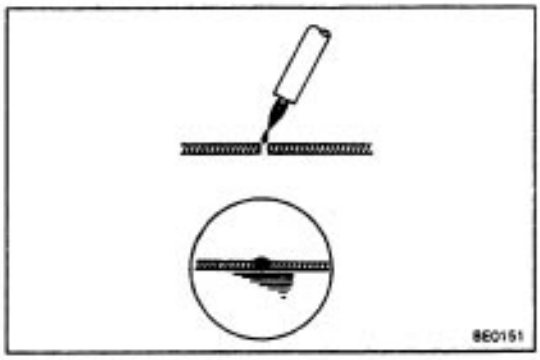




REPAIR OF DEFOGGER WIRES

1. CLEAN BROKEN WIRE TIPS WITH WHITE GASOLINE

2. PLACE MASKING TAPE ALONG BOTH SIDES OF WIRE TO BE REPAIRED



3. REPAIR DEFOGGER WIRES

(a) Thoroughly mix the repair agent (Dupont paste No. 4817).

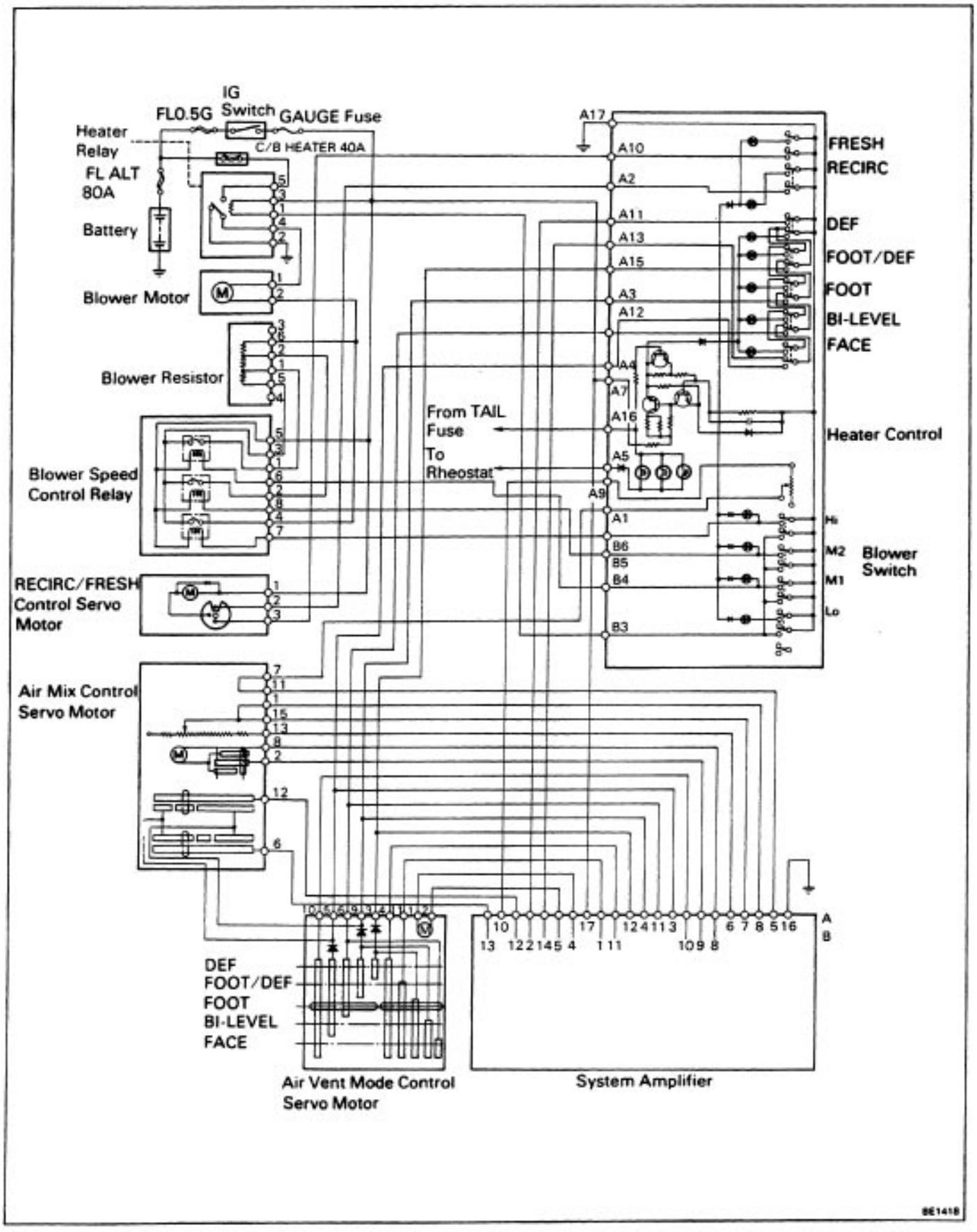
(b) Using a fine tip brush, apply a small amount to the wire.

(c) After a few minutes, remove the masking tape.

(d) Allow the repair to stand at least 24 hours.

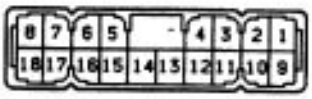
HEATER

Wiring Diagram (Push Type)

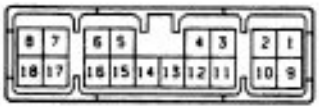


Connectors

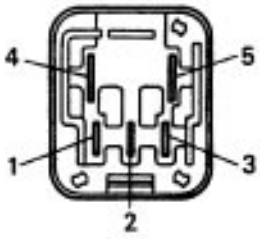
Heater Control Assembly
Connector ”A”



Amplifier
Connector ”A”

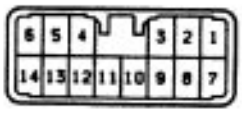


Heater Relay



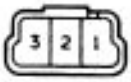
Connector ”6”

Connector”6”

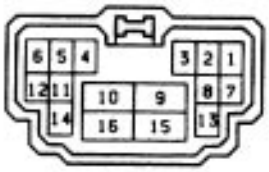


Blower Motor

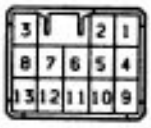
RECIRC/FRESH
Control Servo Motor



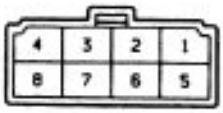
Air Mix Control Servo Motor



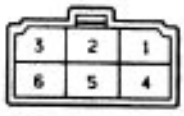
Air Vent Mode Control
Servo Motor



Blower Speed
Control Relay



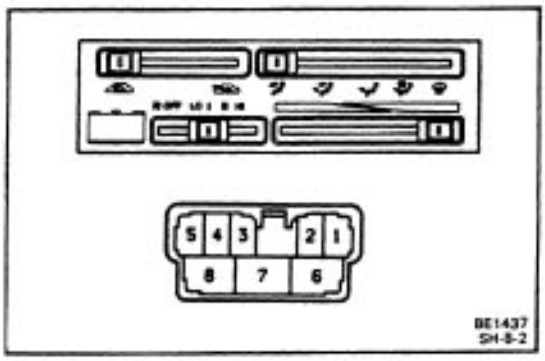
Blower Resistor



S-18-2-A, S-18-2, BE1013
S-6-2, S-14-2-B, H-2-2
GA-3-2, SH-16-2, S-13-2
H-8-2, H-6-2

Troubleshooting

Problem	Possible cause	Remedy	Page	
			Push	Lever
Bolwer does not work when fan switch is on	Heater circuit breaker OFF GAUGE fuse blown Heater relay faulty Blower speed control relay faulty Heater blower switch faulty Heater blower resistor faulty Heater blower motor faulty wiring or ground faulty	Reset breaker and check for short Replace fuse and check for short Check relay Check control relay Check switch Check resistor Check motor Repair as necessary	BE–3 BE–3 BE–48 BE–50 BE–49 BE–48	BE–3 BE–3 BE–48 BE–47 BE–48
Incorrect temperature output	Control cables broken or binding Servo motor faulty Heater hoses leaking or clogged Water valve faulty Air dampers broken Air ducts clogged Heater radiator leaking or clogged Heater control unit faulty	Check cables Check servo motor Replace hoses Replace water valve Repair air dampers Repair air ducts Repair heater radiator Repair control unit	BE–52	BE–54



Heater Blower Switch (Lever Type)

INSPECTION OF SWITCH

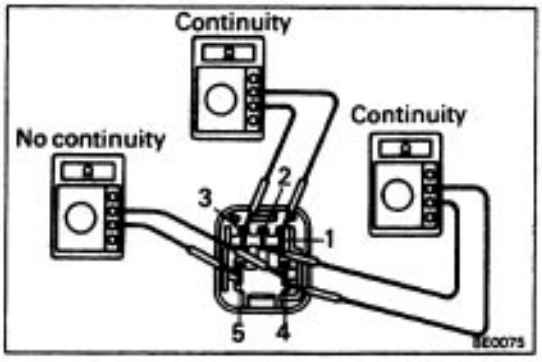
INSPECT SWITCH CONTINUITY

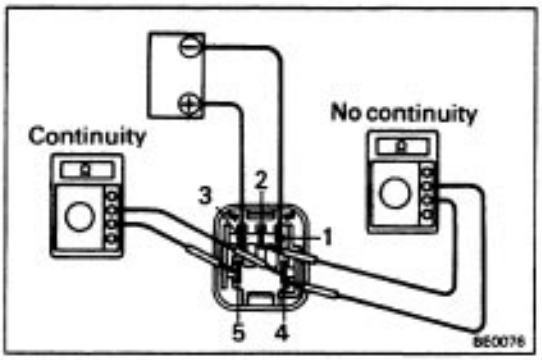
Inspect the heater blower switch continuity.

Terminal / Switch position	8	5	2	1	6	*3	*4
OFF						○	○
LO	○	○				○	○
I	○	○	○			○	○
II	○	○		○		○	○
HI	○	○			○	○	○

*For illumination light

If continuity is not as specified, replace the switch.





Heater Relay

INSPECTION OF RELAY

1. INSPECT RELAY CONTINUITY

(a) Check that there is continuity between terminals 1 and 3.

(b) Check that there is continuity between terminals 2 and 4.

(e) Check that there is no continuity between terminals 4 and 5.

If continuity is not as specified, replace the relay.

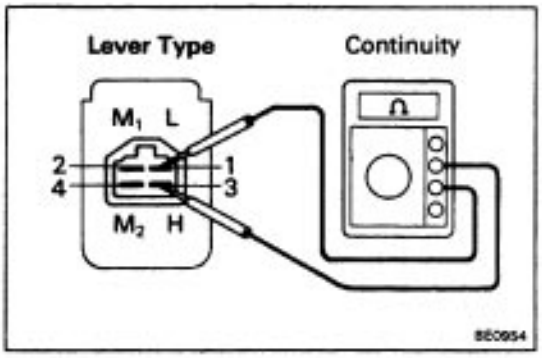
2. INSPECT RELAY OPERATION

(a) Apply battery voltage to terminals 1 and 3.

(b) Check that there is continuity between terminals 4 and 5.

(e) Check that there is no continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.



Heater Blower Resistor

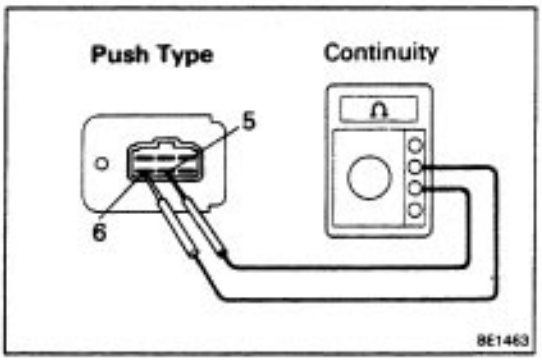
INSPECTION OF RESISTOR

INSPECT RESISTOR CONTINUITY

(Levertype)

Check that there is continuity between terminals 1 and 3.

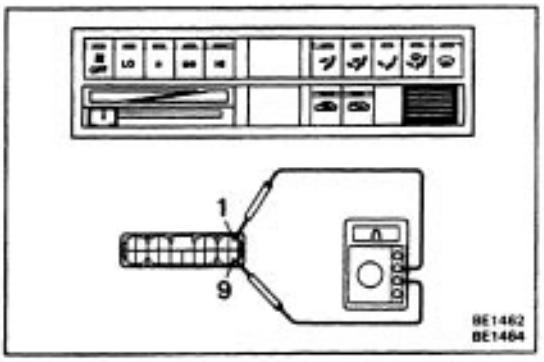
If there is no continuity, replace the resistor.



(Push type)

Check that there is continuity between terminals 5 and ^.

If there is no continuity, replace the resistor.



Heater Control Assembly (Push Type)

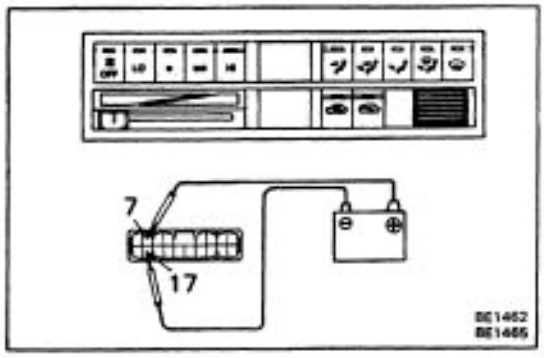
INSPECTION OF HEATER CONTROL ASSEMBLY

1. MEASURE TEMPERATURE CONTROL LEVER RESISTANCE

Measure the resistance between terminals A1 and A9 for each lever position.

Lever position	Resistance (kΩ)
Max Coo!	∞
Middle	1.5 ± 0.2
Max. Warm	0

If each resistance value is not as shown in the table above, replace the heater control assembly.



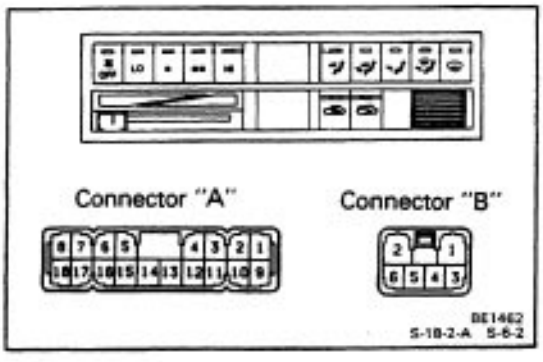
2. INSPECT INDICATOR LIGHT OPERATION

(a) Connect the positive (+) lead from the battery to terminal A7 and negative (–) lead to terminal Al 7.
(b) With the blower button pushed in, check that the indicator light is lit. (The indicator light will not go on when the blower button is in the OFF position.)
(c) With the RECIRC button pushed in, check that the indicator light is lit.
(d) Next, push the FRESH button in, check that the indicator light is lit and the RECIRC indicator light goes off.
(e) Press each of the mode buttons in and check that their indicator lights go on.

If operation is not as specified, replace the heater control.

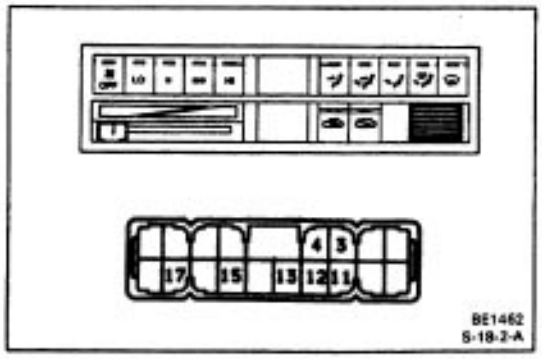
3. INSPECT BLOWER SWITCH CONTINUITY

Inspect the blower switch continuity between terminals.



Terminal / Switch position	A17	B3	B4	B5	B6
OFF					
LO	○—○				
I	○—○—○				
II	○—○——○				
HI	○—○———				○

If continuity is not as specified, replace the heater control.

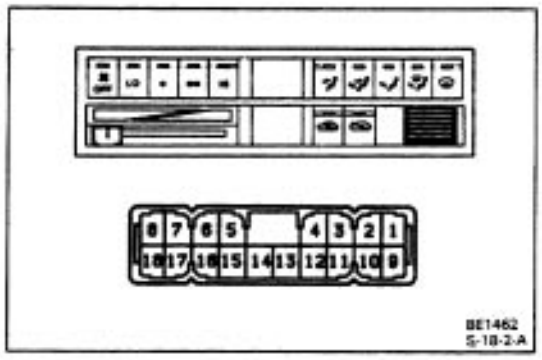


4. INSPECT AIR VENT MODE SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch position \ Terminal	At 7	A4	A12	A3	A15	A11
FACE	○	○				
BI–LEVEL	○		○			
FOOT	○			○		
FOOT/DEF	○				○	
DEF	○					○

If continuity is not as specified, replace the heater control.

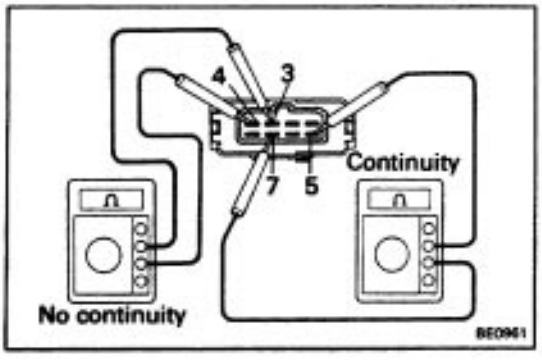


5. INSEPCT RECIRC/FRESH CONTROL SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch position \ Terminal	Al 7	A2	A10
RECiRC	○	○	
FRESH	○		○

If continuity is not as specified, replace the heater control.



Blower Speed Control Relay (Push Type)

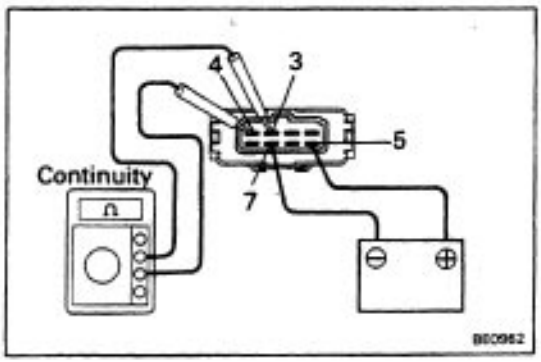
INSPECTION OF RELAY

1. INSPECT RELAY "A" CONTINUITY

(a) Check that there is continuity between terminals 5 and 7.

(b) Check that there is no continuity between terminals 3 and 4.

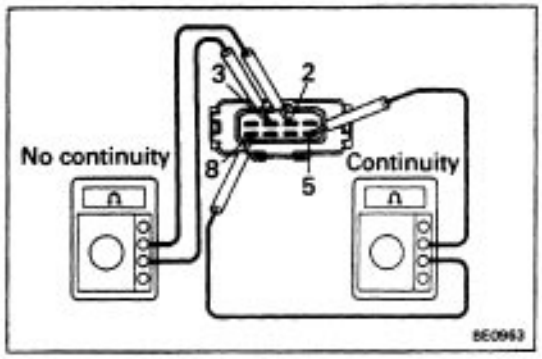
If continuity is not as specified, replace the relay.



2. INSPECT RELAY "A" OPERATION

(a) Apply battery voltage to terminals 5 and 7.
(b) Check that there is continuity between terminals 3 and 4.

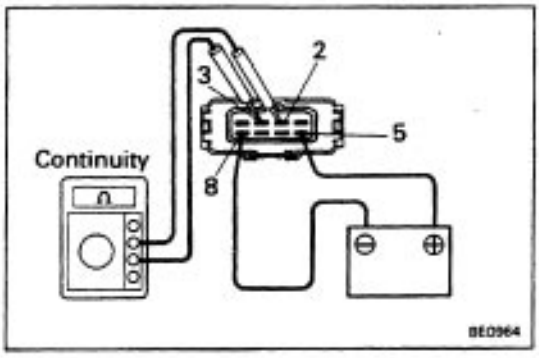
If operation is not as specified, replace the relay.



3. INSPECT RELAY "B" CoNTIN'U1TY

(a) Check that there is continuity between terminals 5 and 8.
(b) Check that there is no continuity between terminals 2 and 3.

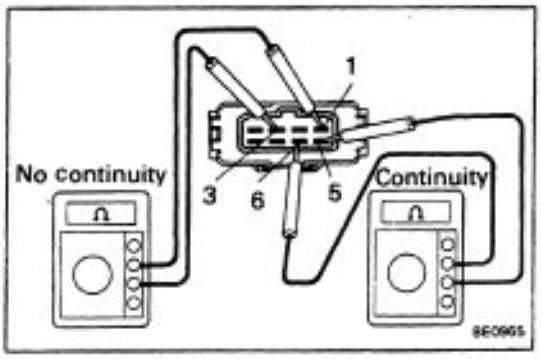
If continuity is not as specified, replace the relay.



4. INSPECT RELAY "B" OPERATION

(a) Apply battery voltage to terminals 5 and 8.
(b) Check that there is continuity between terminals 2 and 3.

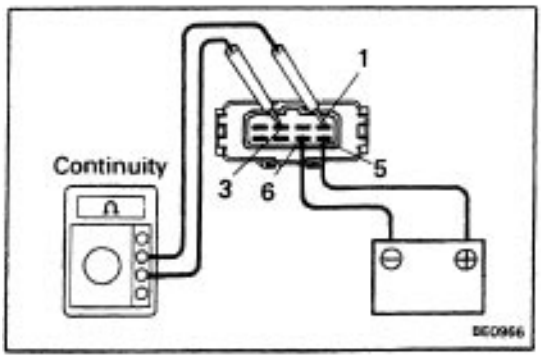
If operation is not as specified, replace the relay.



5. INSPECT RELAY "C" CONTINUITY

(a) Check that there is continuity between terminals 5 and 6.
(b) Check that there is no continuity between terminals 1 and 3.

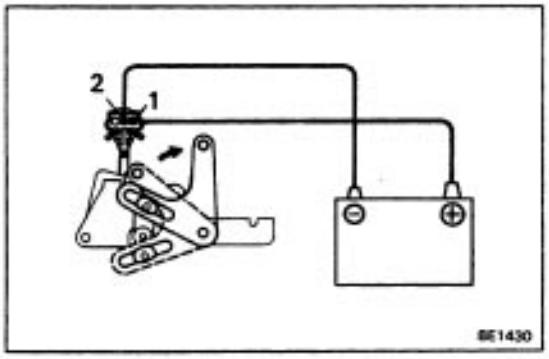
If continuity is not as specified, replace the relay.



6. INSPECT RELAY "C" OPERATION

(a) Apply battery voltage to terminals 5 and 6.
(b) Check that there is continuity between terminals 1 and 3.

If operation is not as specified, replace the relay.

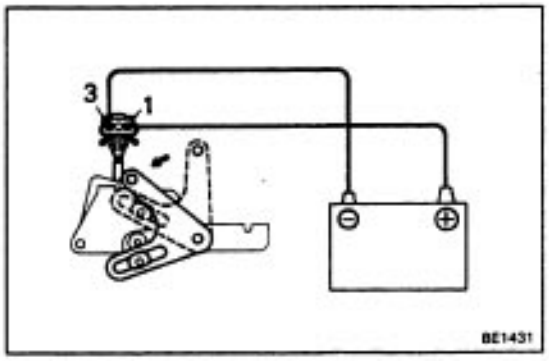


RECIRC/FRESH Control Servo Motor (Push type)

INSPECTION OF SERVO MOTOR

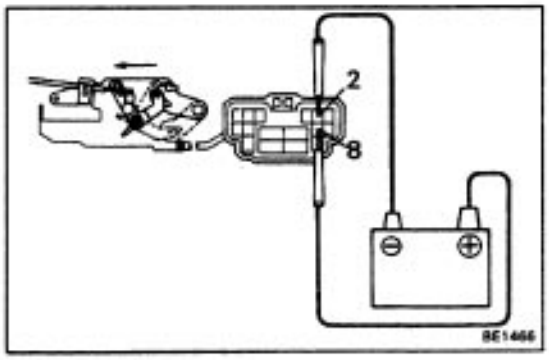
INSPECT SERVO MOTOR OPERATION

(a) With the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 2, check that the lever moves smoothly from FRESH to RECIRC.



(b) With the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 3, check that the lever moves smoothly from RECIRC to FRESH.

If operation is not as specified, replace the servo motor.

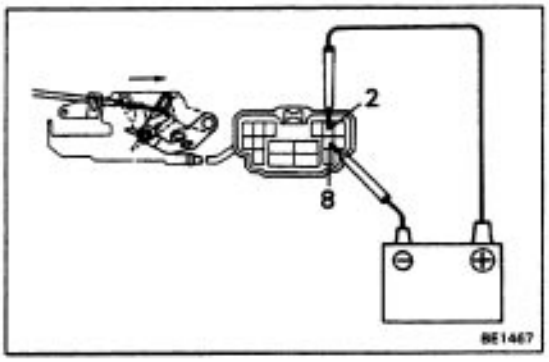


Air Mix Control Servo Motor (Push Type)

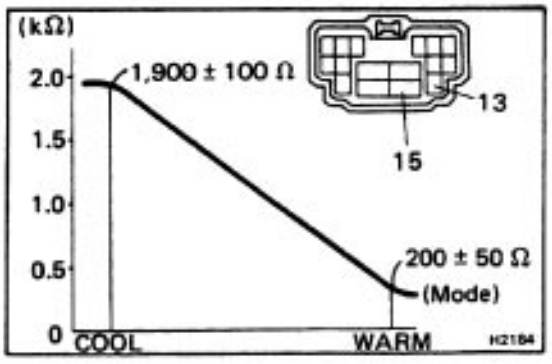
INSPECTION OF SERVO MOTOR

INSPECT SERVO MOTOR OPERATION

(a) With the positive (+) lead from the battery to terminal 8 and negative (–) lead to terminal 2, check that the lever moves smoothly from WARM to COOL.



(b) With the positive (+) lead from the battery to terminal 2 and negative (–) lead to terminal 8, check that the lever moves smoothly from COOL to WARM.

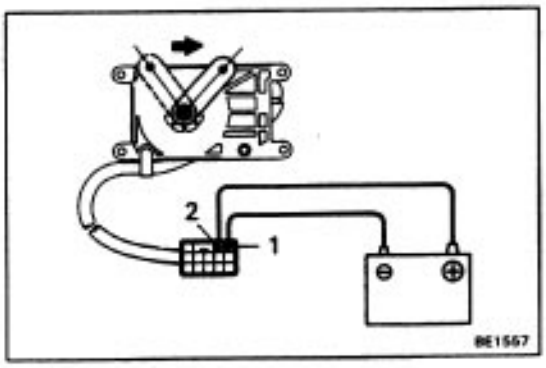


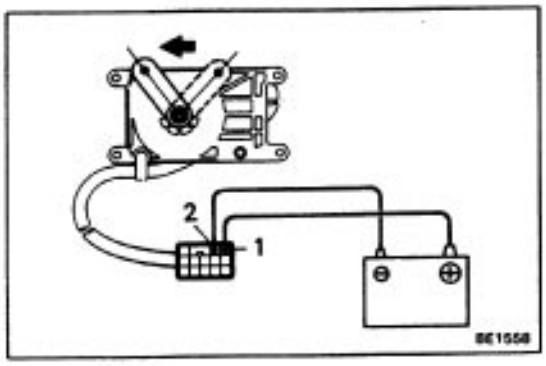
(c) While operating the servo motor from either points (a) or (b), measure the resistance values of terminals 13 and 15.

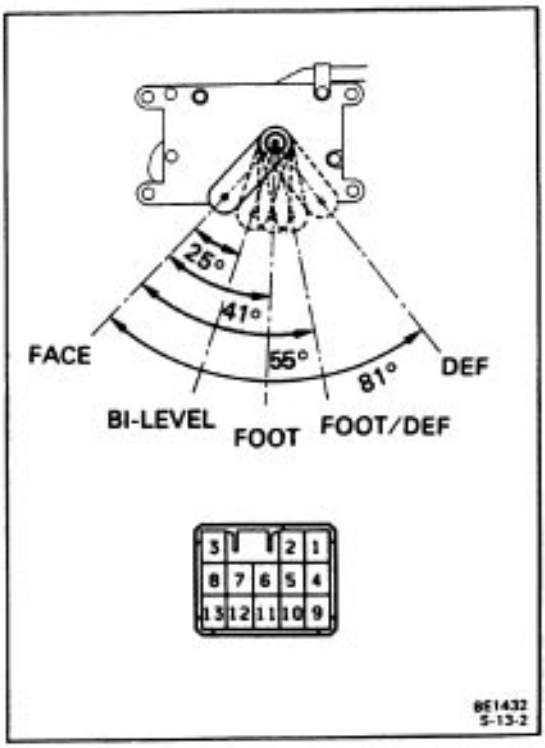
Position	Resistance (Ω)
COOL	1,900 ± 100
WARM	200 ± 50

The resistance values from COOL to WARM will successively decrease.

If operation is not as specified, replace the servo motor.







Air Vent Mode Control Servo Motor (Push Type)

INSPECTION OF SERVO MOTOR

INSPECT SERVO MOTOR OPERATION

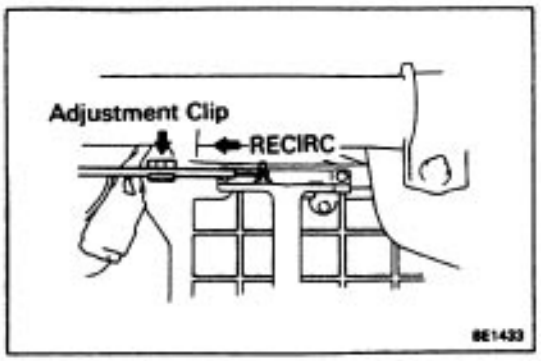
(a) Connect the positive (+) lead from the battery to terminal 2 and negative(–) lead to terminal 1, check that the lever moves smoothly from DEF to FACE.

(b) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 2, check that the lever moves smoothly from FACE to DEF.

(c) Check for continuity between terminal as shown below.

Terminal / Lever position	3	5	4	6	10	11	9
FACE	○		○	○		○	
BI–LEVEL	○	○	○		○	○	
FOOT	○	○	○	○	○		
Foot/DEF		○	○	○	○	○	○
DEF	○	○		○	○		○

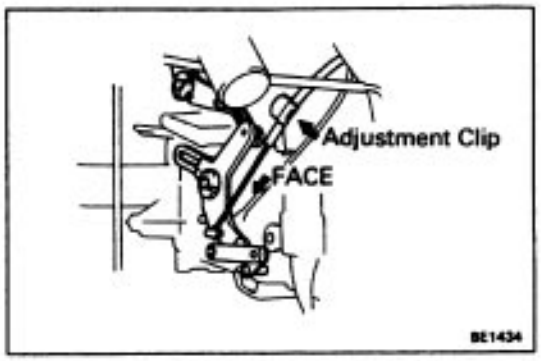
If operation is not as specified, replace the motor.



Heater Control
(Lever Type)
ADJUSTMENT OF HEAT CONTROL

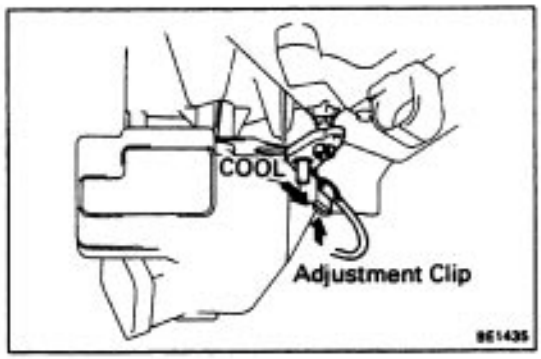
1. SET AIR INLET DAMPER

Set the air inlet damper and control lever to ”RECIRC”.



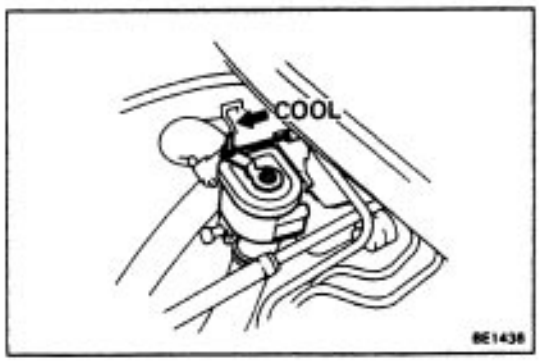
2. SET MODE SELECTOR DAMPER

Set the mode selector damper and control lever to ”’FACE”.



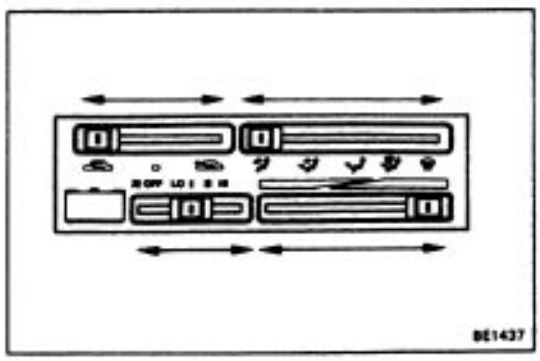
3. SET AIR MIX DAMPER

Set the air mix damper and control lever to ”COOL”.



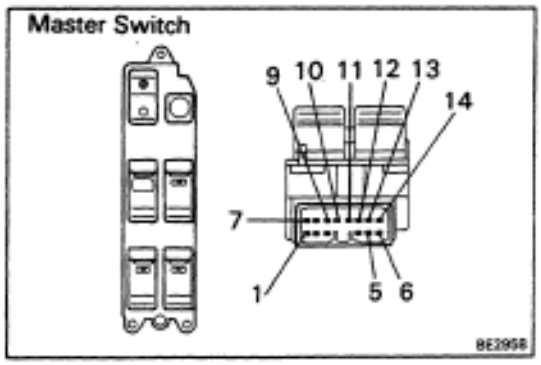
4. SET WATER VALVE

Set the water valve and control lever to ”COOL”.
HINT: Place the water valve lever on ”COOL” and while pushing the outer cable in the ”COOL” direction, clamp the outer cable to the water valve bracket.



5. TEST CONTROL CABLE OPERATION

Move the control levers right and left and check for stiffness or binding through the full range of the levers.



POWER WINDOW

Power Window Switch

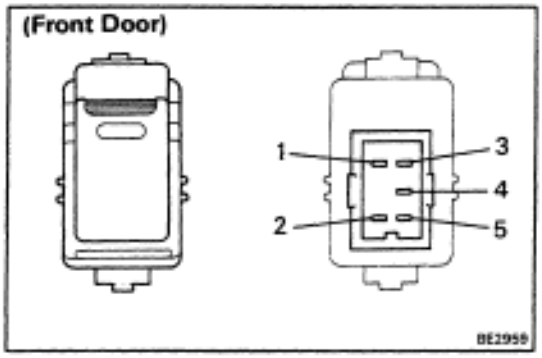
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

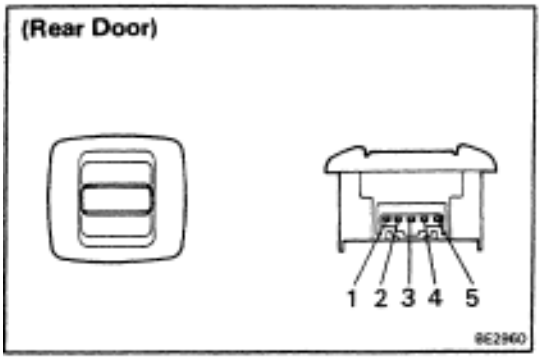
Illumination	Front–left		Ex. Front–left	
Terminal / Switch position	7	1	7	1
Window unlock	○—●—○		○—●—○	
Window lock	○—●—○			

Operation window		Front– Left				Front–Right				Rear–Left				Rear–Right			
Terminal / Switch position		7	13	6	1	7	5	12	1	7	9	10	1	7	14	11	1
	UP	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	OFF		○	○	○		○	○	○		○	○	○		○	○	○
	DOWN	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
S	UP	○	○	○	○	○	○			○	○			○	○		
S	OFF		○	○	○		○	○			○	○			○	○	
S	DOWN	○	○	○	○	○	○			○	○			○	○		



Door switch: Front door

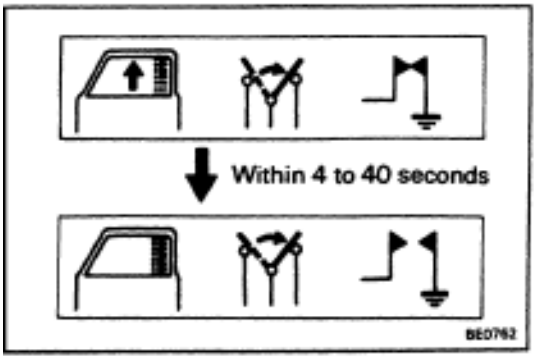
Terminal / Switch position	5	1	2	3	4
UP	○	○		○	○
OFF		○	○	○	○
DOWN	○	○	○		○



Door switch: Rear door

Terminal / Switch position	1	2	3	4	5
UP	○	○	○	○	
OFF	○	○		○	○
DOWN		○	○	○	○

If continuity is not as specified, replace the switch.

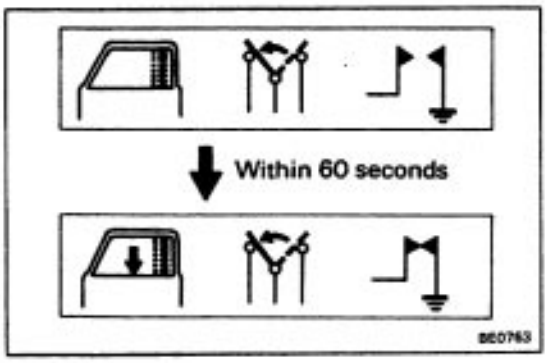


Power Window Motor

INSPECTION OF MOTOR

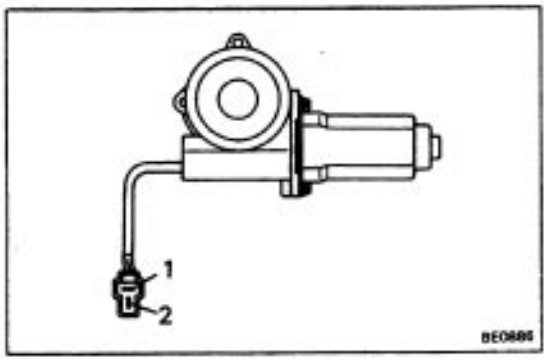
1. INSPECT CIRCUIT BREAKER OPERATION

(a) With the window in the full closed position, hold the power window switch in ”UP” position and check that there is a circuit breaker operation noise within 4 to 40 seconds.



(b) With the window in the full closed position, hold the switch in ”DOWN” and check that the window begins to descend within 60 seconds.

If operation is not as specified, replace the motor.



2. INSPECT MOTOR OPERATION

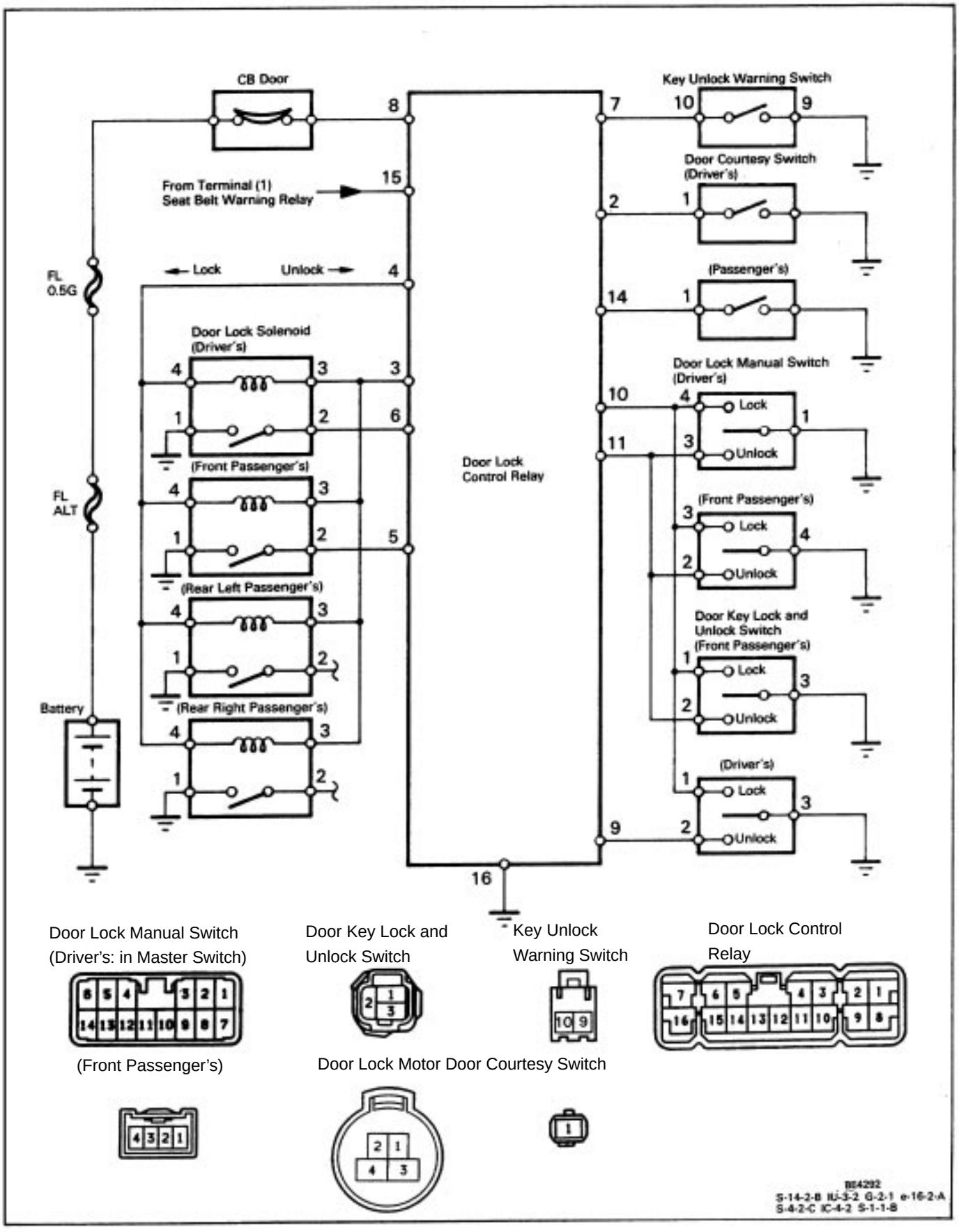
(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 2, check that the motor turns.

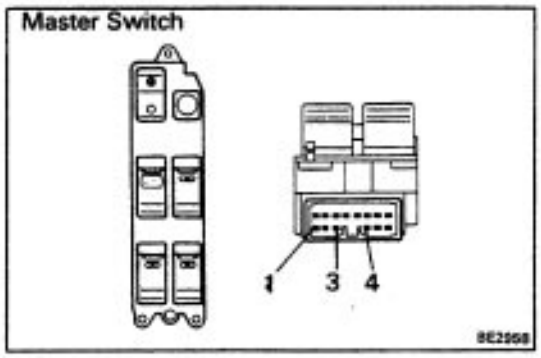
(b) Connect the positive (+) lead from the battery to terminal 2 and negative (–) lead to terminal 1, check that the motor turns the opposite way.

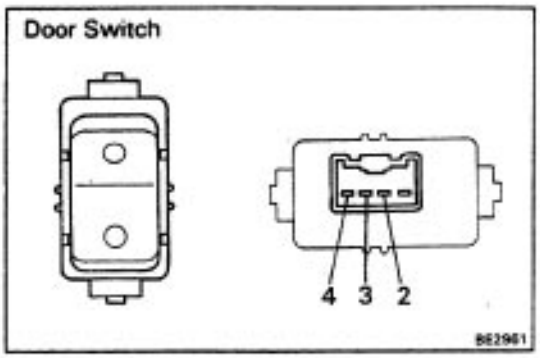
If operation is not as specified, replace the motor.

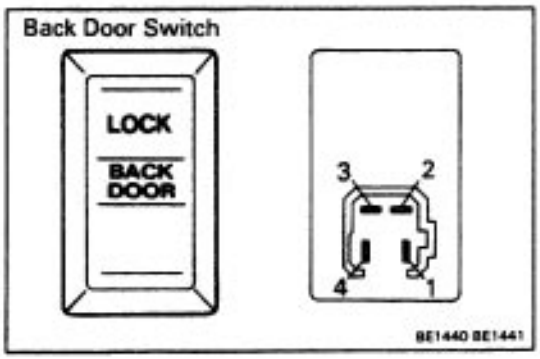
DOOR LOCK CONTROL SYSTEM

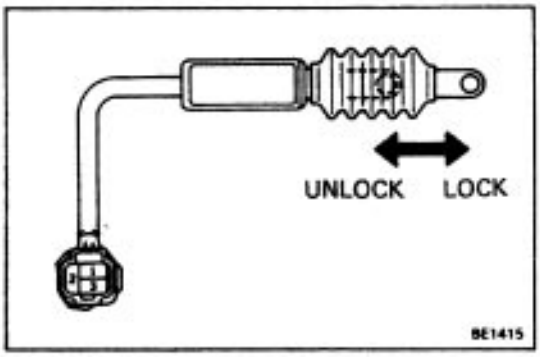
Wiring and Connector Diagrams











Door Lock Control Switch

INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Master Switch

Switch position \ Terminal	4	3	1
LOCK	○	—	○
UNLOCK		○	○

Door Switch

Switch position \ Terminal	2	4	3
LOCK		○	○
UNLOCK	○	○	

Back Door Switch

Switch position \ Terminal	1	2	3	4
LOCK	○	○	○	○
OFF	○	○	○	
UNLOCK	○		○	

If continuity is not as specified, replace the switch.

Door Lock Key Switch

INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch position \ Terminal	1	2	3
LOCK	○	—	○
UNLOCK		○	○

If continuity is not as specified, replace the switch.

Unlock Warning Switch

(See page BE–13)

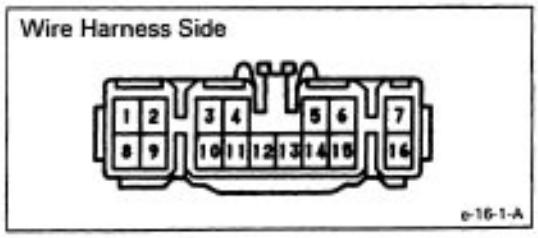
Door Courtesy Switch

(See page BE–40)

Door Lock Control Relay
INSPECTION OF RELAY

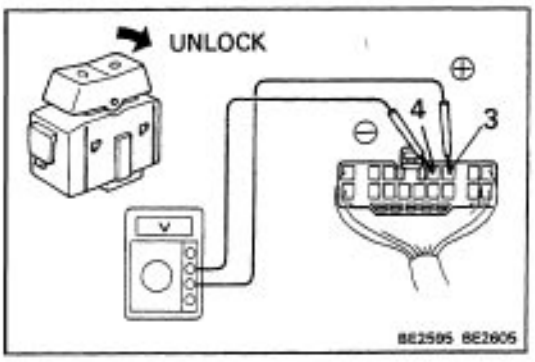
(Relay Circuit)

Disconnect the connector from the relay and inspect the connector on the wire harness side as shown in the chart.



Check for	Tester connection		Condition	Specified value
Continuity	2 — Ground	Driver's door courtesty switch position	OFF (Door closed)	No continuity
			ON (Door opened)	Continuity
	5 — Ground	Passenger's –door lock switch position	OFF (Door locked)	No continuity
			ON (Door unlocked)	Continuity
	6 — Ground	Driver's door lock switch position	OFF (Door locked)	No continuity
			ON (Door unlocked)	Continuity
	7 — Ground	Key unlock warning switch position	OFF (Ignition key removed)	No continuity
			ON (ignition key set)	Continuity
	9 — Ground	Door key lock and unlock switch position	OFF or lock (Door key free or turned to lock)	No continuity
			Unlock (Door key turned to unlock)	Continuity
	10 — Ground	Door lock manual switch position	OFF or Unlock	No continuity
			Lock	Continuity
	11 — Ground	Door lock manual switch position	OFF or Lock	No continuity
			Unlock	Continuity
	14 — Ground	Passenger's door courtesy switch position	OFF (Door closed)	No continuity
			ON (Door opened)	Continuity
	16 — Ground	Constant		Continuity
Voltage	1 — Ground	Ignition switch position	LOCK	No voltage
			ACC or ON	Battery voltage
	8 — Ground	Constant		Battery voltage

If circuit is as specified, inspect the door lock signal.



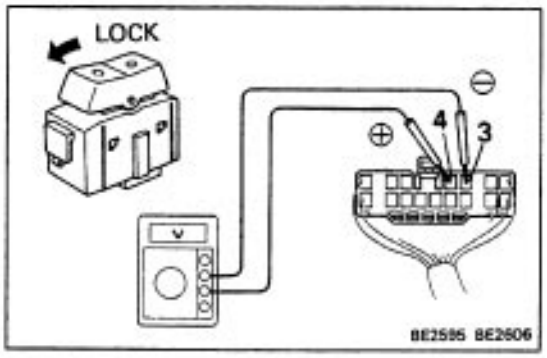
(Door Lock Signal)

HINT: When the relay circuit is as specified, inspect the door lock signal.

(a) Connect the connector to the relay.

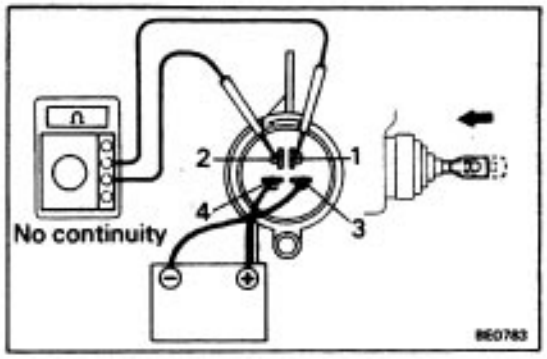
(b) Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (–) lead to the terminal 4.

(c) Set the door lock manual switch to UNLOCK, check
that the voltage rises from 0 volts to battery voltage for approximately 0.2 seconds.



(d) Reverse the polarity of the voltmeter leads.
(e) Set the door lock manual switch to LOCK, check that the voltage rises from 0 volts to battery voltage for approximately 0.2 seconds.

If operation is not as specified, replace the relay.



Door Lock Solenoid

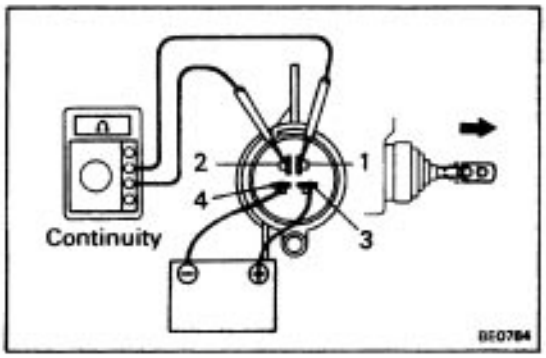
INSPECTION OF DOOR LOCK SOLENOID

1. INSPECT SOLENOID OPERATION

(Front and Rear door)

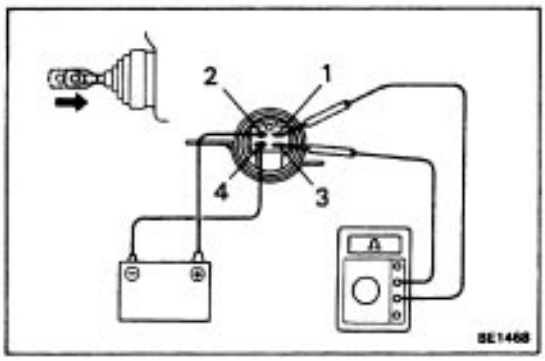
(a) Connect the positive (+) lead from the battery to terminal 4 and negative(–) lead to terminal 3, check that the solenoid operation in the lock (Pull) direction.
(b) Check that there is no continuity between terminals 1 and 2.
(c) Connect the positive (+) lead from the battery to terminal 3 and negative (–) lead to terminal 4, check that the solenoid operation in the unlock (Push) direction.
(d) Check that there is continuity between terminals 1 and 2.

If operation is not as specified, replace the solenoid.



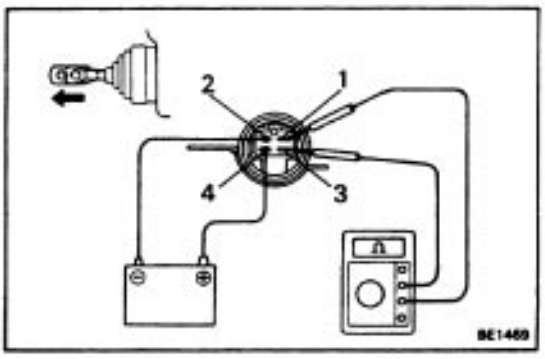
(Back door)

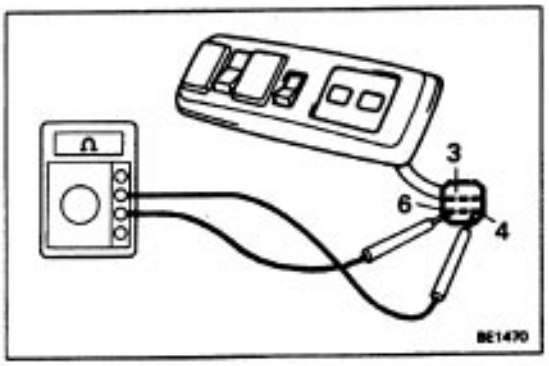
(a) Connect the positive (+) lead from the battery to terminal 2 and negative (–) lead to terminal 4, check that the solenoid operation in the lock (Pull) direction.
(b) Check that there is no continuity between terminals 1 and 3.



(c) Connect the positive (+) lead from the battery to terminal 4 and negative (–) lead to terminal 2, check that the solenoid operation in the unlock (Push) direction.
(d) Check that there is continuity between terminals 1 and 3.

If operation is not as specified, replace the solenoid.





MOON ROOF

Moon Roof Switch

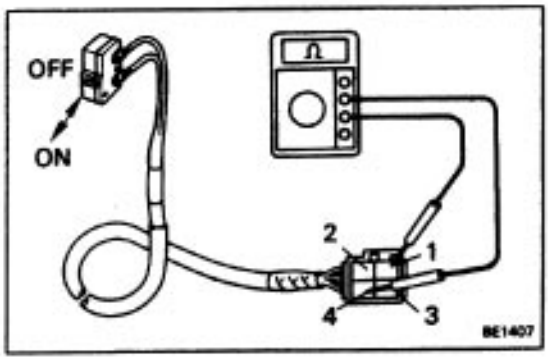
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Terminal / Switch position	3	4	6
OPEN	○	○	
CLOSE		○	○

If continuity is not as specified, replace the switch.



Limit Switch

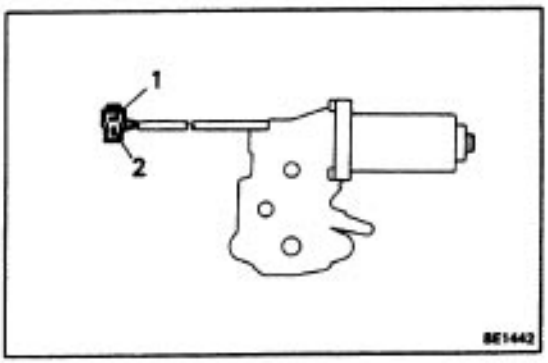
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

(a) Check that there is continuity between terminals 1 and 4 when the switch is ON.

(b) Check that there is no continuity between terminals 1 and 4 when the switch is OFF.

If continuity is not as specified, replace the switch.



Moon Roof Motor

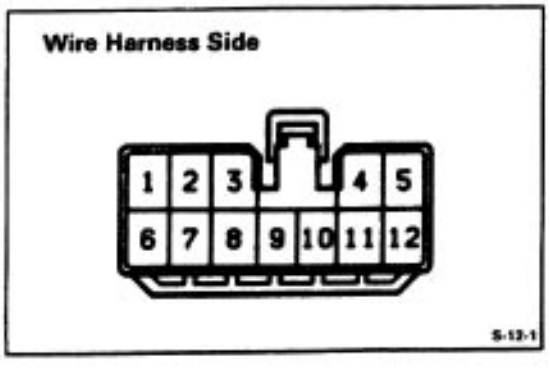
INSPECTION OF MOTOR

INSPECT MOTOR OPERATION

(a) Connect the positive (+) lead from the battery to term inall andnegative(–)lead toterminal2,check that the motor turns.

(b) Connect the positive (+) lead from the battery to terminal 2 and negative (–) lead to terminal 1, check that the motor turns the opposite way.

If operation is not as specified, replace the motor.



Moon Roof Control Relay

INSPECTION OF RELAY

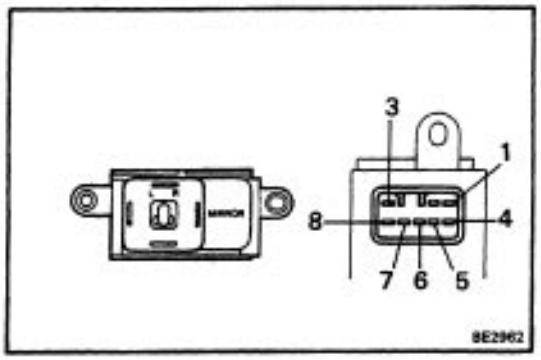
INSPECT RELAY VOLTAGE AND CONTINUITY

(a) Disconnect the relay connector and inspect the connector on the wire harness side as shown in the chart.

Check for	Tester connection	Condition	Specified value
Continuity	4 – Body ground	—	Continuity
Voltage	6 – Body ground	Turn ignition switch ON	Battery voltage
		Turn ignition switch OFF	No.voitage
Continuity	7 – Body ground	Push sun roof switch to CLOSE	Continuity
		Push sun roof switch to except CLOSE	No continuity
Continuity	8 – Body ground	Push sun roof switch to OPEN	Continuity
		Push sun roof switch to except OPEN	No continuity
Continuity	10 – Body ground	Push limit switch ON	Continuity
		Push limit switch OFF	No continuity
Continuity	12 – Body ground	—	Continuity

(b) Connect the positive lead from the battery to terminal 1 and–negative (–y lead to terminal 5, check that the motor turns to close. Then, reverse the polarity, check that the motor turns to open. 1f motor does not operate, remove and test the motor.

If circuit operation is correct, replace the relay.



REMOTE CONTROL MIRROR

Mirror Switch

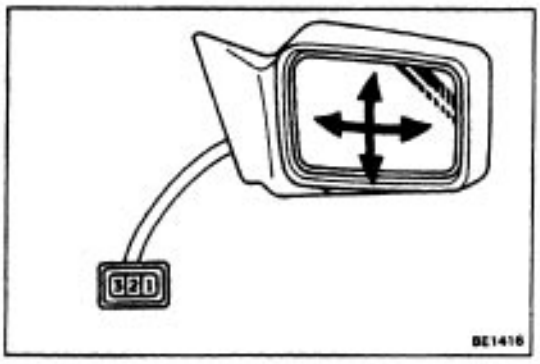
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Mirror	Left				Right				
Terminal / Switch position	8	6	4	3	7	3	4	5	1
UP	○		○				○		○
				○	○	○			
DOWN	○			○			○		○
			○		○		○		
LEFT		○	○				○	○	
				○	○	○			
RIGHT		○		○			○	○	
			○		○	○			

If continuity is not as specified, replace the switch.



Remote Control Mirror

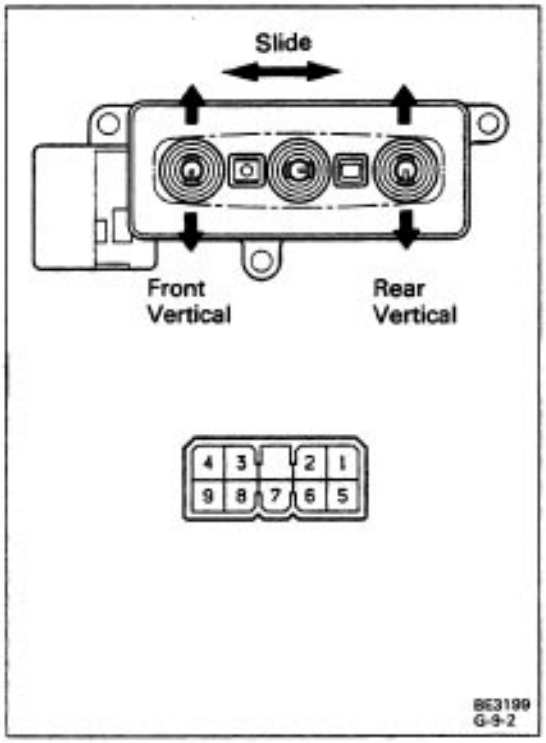
INSPECTION OF MIRROR

INSPECT MIRROR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 1 and negative lead to terminal 2, check that the mirror moves upward.
Then, reverse the polarity, check that the mirror operation is reversed.

(b) Connect the positive (+) lead from the battery to terminal 2 and negative(–) lead to terminal 3, check that the mirror moves to the right.
Then, reverse the polarity, check that the mirror operation is reversed.

If there is no mirror operation, replace the mirror.



POWER SEAT

Power Seat Switch

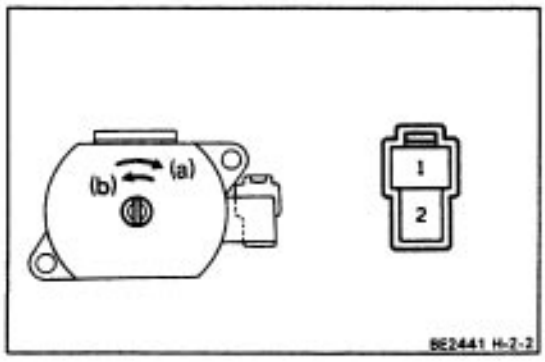
INSPECTION OF SWITCH

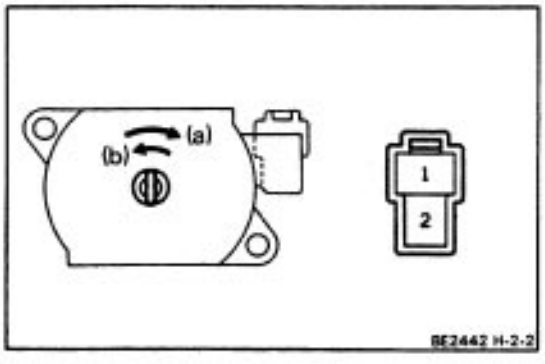
INSPECT SWITCH CONTINUITY

Inspect the switch continuity b¿¿ween terminals.

Switch position		Terminal 5	6	7	3	9	1	2	4
Slide Switch	FRONT	○			○	○		○	
	OFF	○				○		○	
	REAR	○			○	○		○	
Front Vertical Switch	UP	○	○		○				
	OFF	○	○	○					
	DOWN	○		○	○				
Rear Vertical Switch	UP	○			○		○		○
	OFF	○					○		○
	DOWN	○			○		○		○

If continuity is not as specified, replace the switch.





Power Seat Motor

INSPECTION OF MOTOR

INSPECT MOTOR OPERATION

(Slide Motor/Operation)

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, check that the motor turns clockwise (moves to rear side).

(b) Then, reverse the polarity, and check that the motor turns counterclockwise (moves to front side).

If operation is not as specified, replace the motor.

(Front and Rear Vertical Motor/Operation)

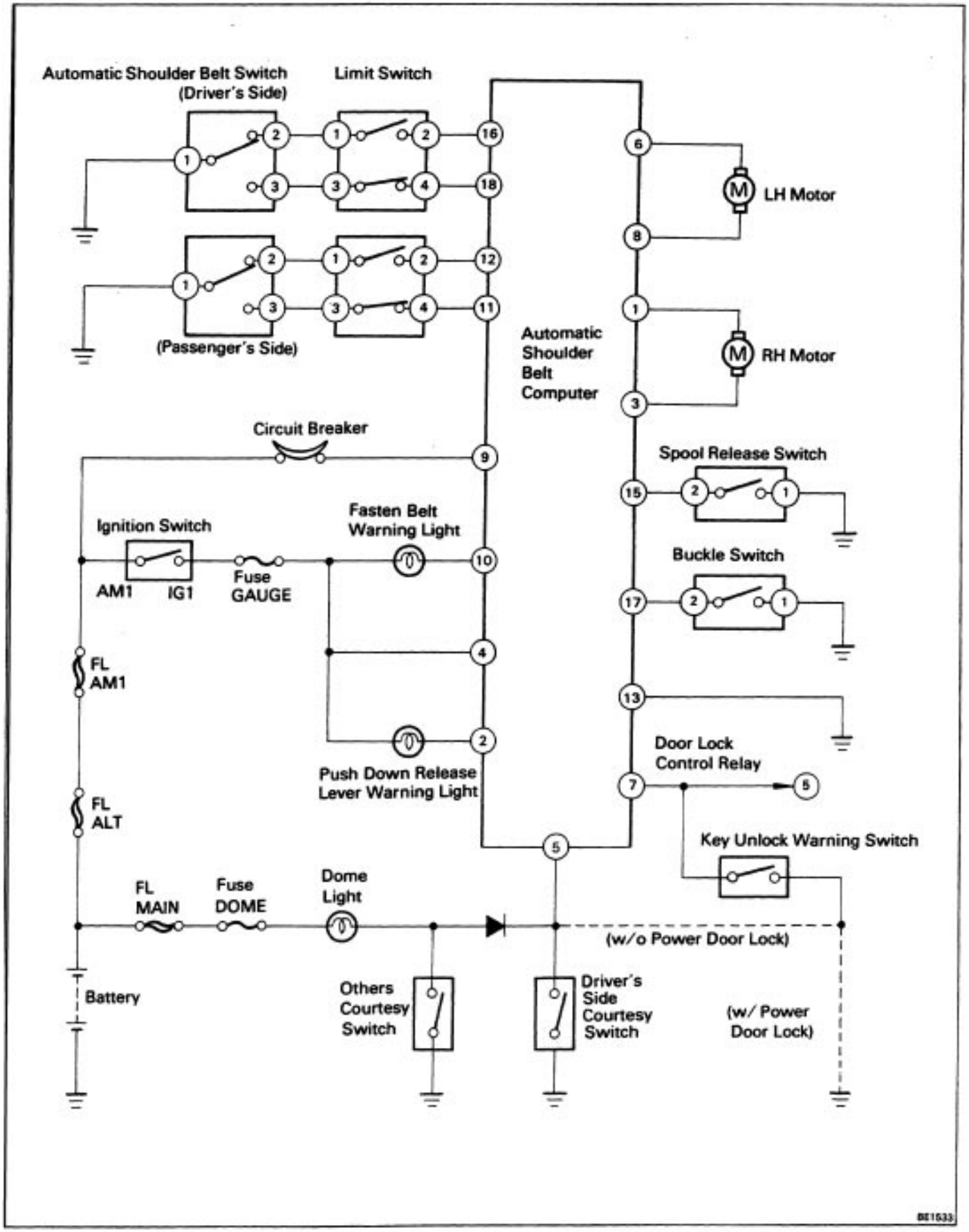
(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, check that the motor turns clockwise (seat rises).

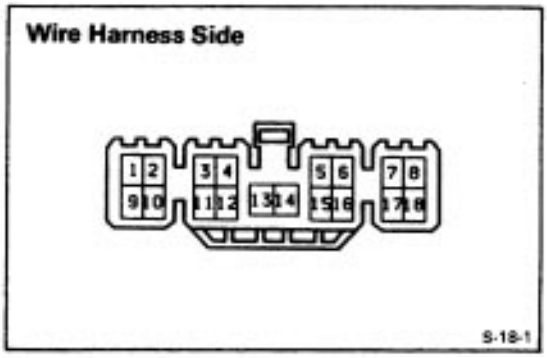
(b) Then, reverse the polarity, and check that the motor turns counterclockwise (seat drops).

If operation is not as specified, replace the motor.

AUTOMATIC SHOULDER BELT

Wiring Diagram





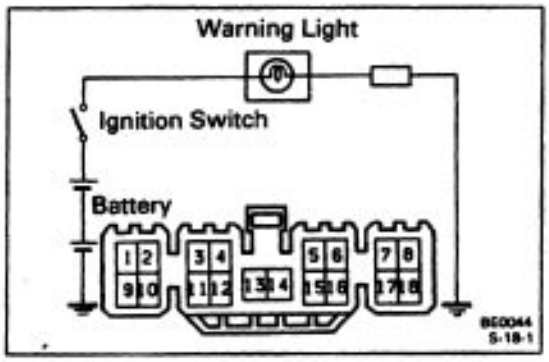
Computer
INSPECTION OF COMPUTER

INSPECT COMPUTER CIRCUIT

(a) Disconnect the computer connector and inspect the connector on the wire harness side as shown in the chart.

Check item	Check for	Tester connection	Condition	Specified value
Motor (RH)	Continuity	1–3	Always	Continuity
Push Down Release Lever Warning Light	Voltage	2 – Ground	Turn ignition switch ON.	Battery voltage
			Turn ignition switch OFF.	No voltage
Ignition Switch	Voltage	4 – Ground	Turn ignition switch ON.	Battery voltage
			Turn ignition switch OFF.	No voltage
w/ Power door lock Courtesy Switch (Driver's side)	Continuity	5 – Ground	Open door.	Continuity
			Close door.	No continuity
w/ Power door lock Unlock Warning Switch	Continuity	7 – Ground	Set ignition key.	Continuity
			Remove ignition key.	No continuity
w/o Power door lock Courtesy Switch (Driver's side) Unlock Warning Switch	Continuity	7 – Ground	Open driver's side door and set ignition key.	Continuity
			Close driver's side door and/or remove ignition key.	No continuity
Motor (Lh#)	Continuity	s–8	Always	Continuity
Circuit Breaker	Voltage	9 – Ground	Always	Battery voltage
Seat Belt Warning Light	Voftage	10 – Ground	Turn ignition switch ON.	Battery voltage
			Turn ignition switch OFF.	No vohage
Automatic Shoulder Belt Switch and Right Rear Limit Switch (Passenger's side)	Continuity	11 – Ground	Close RH front door and set shoulder anchor at ex. rear end position.	Continuity
			Open R H front door and set and/or shoulder anchor at rear end position.	No continuity
Automatic Shoulder Belt Switch and Right Front Limit Switch (Passenger's side)	Continuity	12 – Ground	Open RH front door and set shoulder anchor at ex. front end position.	Continuity
			Close RH front door and/or set shoulder anchor at front end position.	No continuity
Ground	Continuity	13 – Ground	Always	Continuity
Spool Release Switch	Continuity	15 – Ground	Pull up spool release lever.	Continuity
			Release spool release lever.	No continuity
Automatic Shoulder Belt Switch and Left Front Limit Switch (Driver's side)	Continuity	16 – Ground	Open LH front door and set shoulder anchor at ex. front end position.	Continuity
			Close LH front door and/or set shoulder anchor at front end position.	No continuity
Buckle Switch (Driver's side)	Continuity	17 – Ground	Unfasten lap belt.	Continuity
			Fasten lap belt.	No continuity
Automatic Shoulder Belt Switch and Left Rear Limit Switch (Driver's side)	Continuity	18 – Ground	Close LH front door and set shoulder anchor at ex. rear end position.	Continuity
			Open LH front door and set and/or shoulder anchor at rear end position.	No continuity

If circuit is as specified, replace the computer.

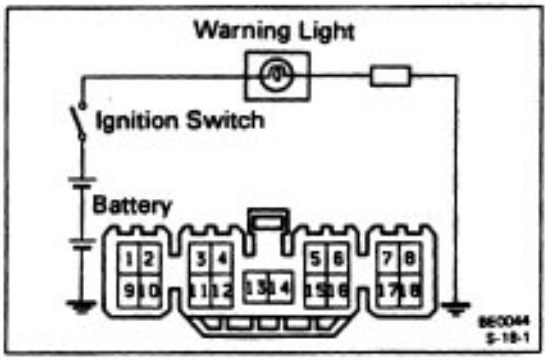


Seat Belt. Warning Light
INSPECTION OF WARNING LIGHT

INSPECT WARNING LIGHT OPERATION

(a) Disconnect the computer connector and ground the terminal 10 of the wire harness side connector.
(b) Turn the ignition switch ON, check that the bulb lights.

If operation is not as specified, check the bulb.

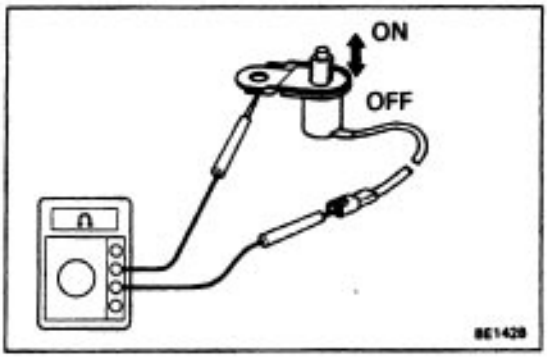


Release Lever Warning Light
INSPECTION OF WARNING LIGHT

INSPECT WARNING LIGHT OPERATION

(a) Disconnect the computer connector. Ground the terminal 2 of the wire harness side conne¿¿or.
(b) Turn the ignition switch ON, check that the bulb lights.

If operation is not as specif¿¿d, check the bulb.

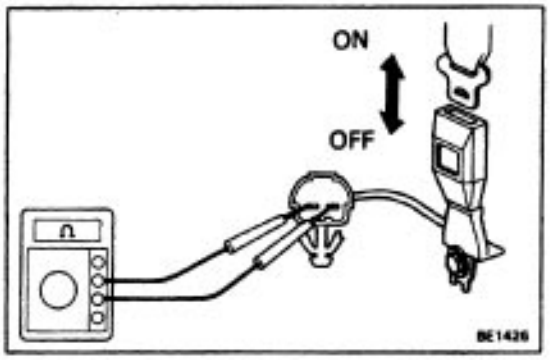


Door Courtesy Switch (Driver's side)
INSPECTION OF SWITCH

INSPECT SWITCH OPERATION

(a) Check that there is continuity between terminal and body ground with the switch ON (open door).
(b) Check that there is no continuity between terminal and body ground with the switch OFF (close door).

If operation is not as specified, replace the switch.

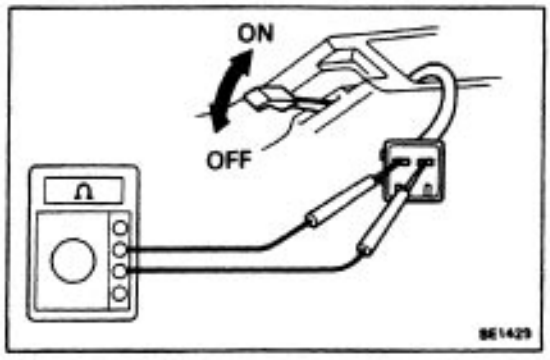


Buckle Switch
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

(a) Check that there is continuity between terminals with switch ON (unfasten lap belt).
(b) Check that there is no continuity between terminals with switch OFF (fasten lap belt).

If continuity is not as specified, replace the switch.

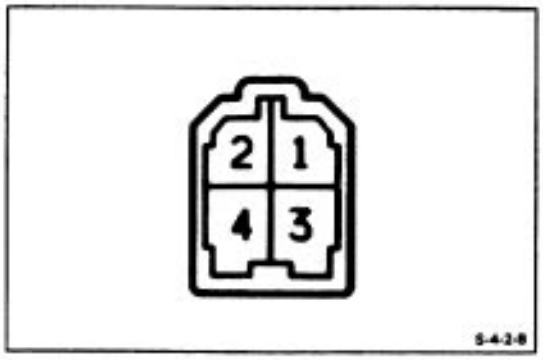


Spool Release Switch
INSPECTION OF SWITCH

INSPECTION SWITCH CONTINUITY

(a) Check that there is continuity between terminals with switch ON (pull up).
(b) Check that there is no continuity between terminals with switch OFF (push down).

It continuity is not as specified, replace the switch.



Limit Switch

INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

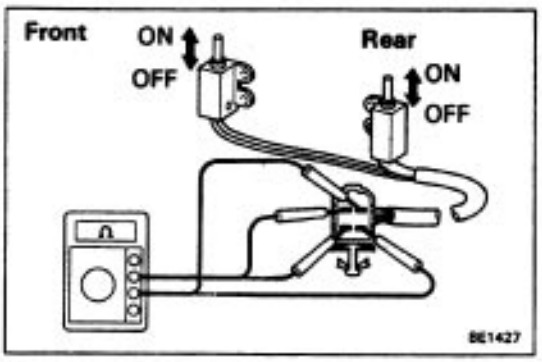
(a) Check that there is no continuity between terminals 1 and 2 with front switch OFF.
(Shoulder anchor at front end position)

(b) Check that there is no continuity between terminals 3 and 4 with rear switch OFF.
(Shoulder anchor at rear end position)

(e) Check that there is continuity between terminals 1 and 2 with front switch ON.
(Shoulder anchor at ex. front end position)

(d) Check that there is continuity between terminals 3 and 4 with rear switch ON.
(Shoulder anchor at ex rear end position)

If continuity is not as speci¿¿ed, replace the switch.



Unlock Warning Switch

(see page BE–13)

Automatic Shoulder Belt Switch

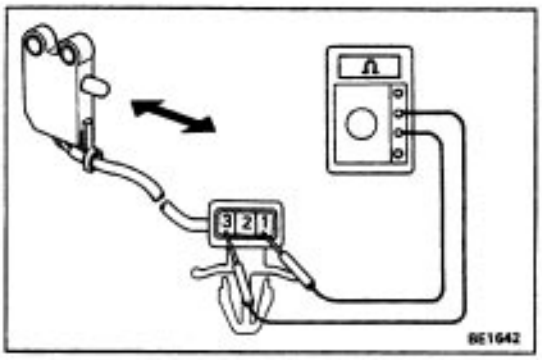
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

(a) Check that there is continuity between terminals 1 and 3 with switch pin pushed in (door close).

(b) Check that there is continuity between terminals 1 and 2 with switch pin free (door open).

If continuity is not as specified, replace the swich.



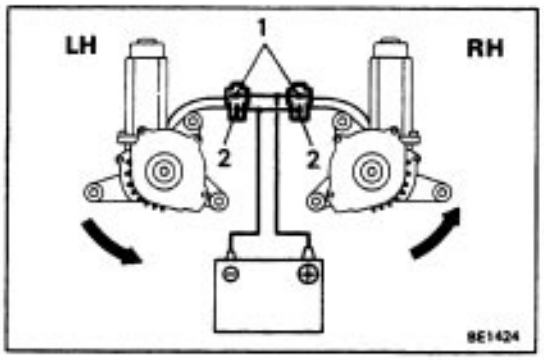
Motor

INSPECTION OF MOTOR

INSPECT MOTOR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 2.

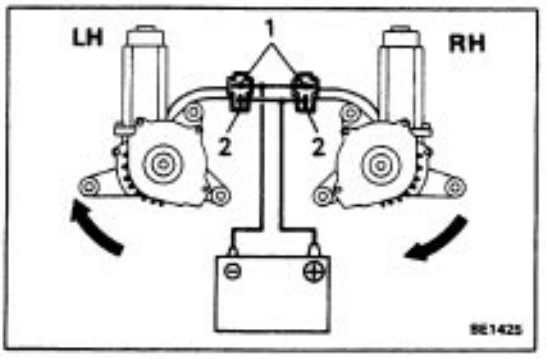
(b) Check that the motor turns as shown.

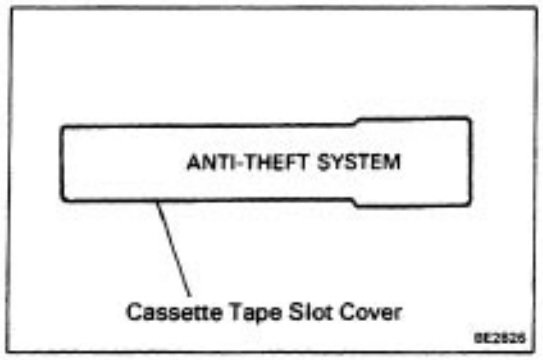


(c) Connect the positive (+) lead from the battery to terminal 2 and negative (–) lead to terminal 1.

(d) Check that the motor turns as shown.

If operation is not as specified, replace the motor.





AUDIO SYSTEM

System Description

Anti–Theft System (USA only)

The anti–theft system is only provided for audio systems equipped with an Acoustic Flavor function.

HINT: The words "'ANTI–THEFT SYSTEM" are displayed on the cassette tape slot cover.

For operation instructions for the anti–theft system, please consult the audio system section in the Owner's Manual (hereafter called O/M).

1. SETTING SYSTEM

The system is in operation once the customer has pushed the required buttons and entered the customerselected 3–digit ID number.

(Refer to the 0/M section, "Setting the anti–theft system"')

HINT:

- When the audio system is shipped the ID number has not been input, so the anti–theft system is not in operation.
- If the ID number has not been input, the audio system remains the same as a normal audio system.

2. ANTI–THEFT SYSTEM OPERATION

If the normal electrical power source (connector or battery terminal) is cut off, the audio system becomes inoperable, even if the power supply resumes.

3. CANCELLING SYSTEM

The ID number chosen by the customer is input to cancel the anti–theft system.

(Refer to the 0/M section, "if the system is activated")

HINT: To change or cancel the ID number, please refer to the 0/M section, "Cancelling the system".

Troubleshooting

HINT: For audio systems with anti–theft system, troubleshooting items marked (*) indicate that "Troubleshooting for ANTI–THEFT SYSTEM" should be carried out first.

No.	Problem		
1.	DEAD RADIO AND TAPE PLAYER	*(a)	No power to radio or tape player, or power but no sound.
		(b)	Tape player okay but no sound from AM and FM or either one.
		(c)	No sound from one speaker.
2.	FAINT RECEPTION		
3.	BAD SOUND QUALITY	(a)	Sound quality bad when radio played.
		(b)	Sound quality bad when tape player played.
4.	DEFECTIVE AUTO–SEARCH MECHANISM		

Troubleshooting for ANTI–THEFT SYSTEM

Turn ignition key from LOCK position to ACC position.

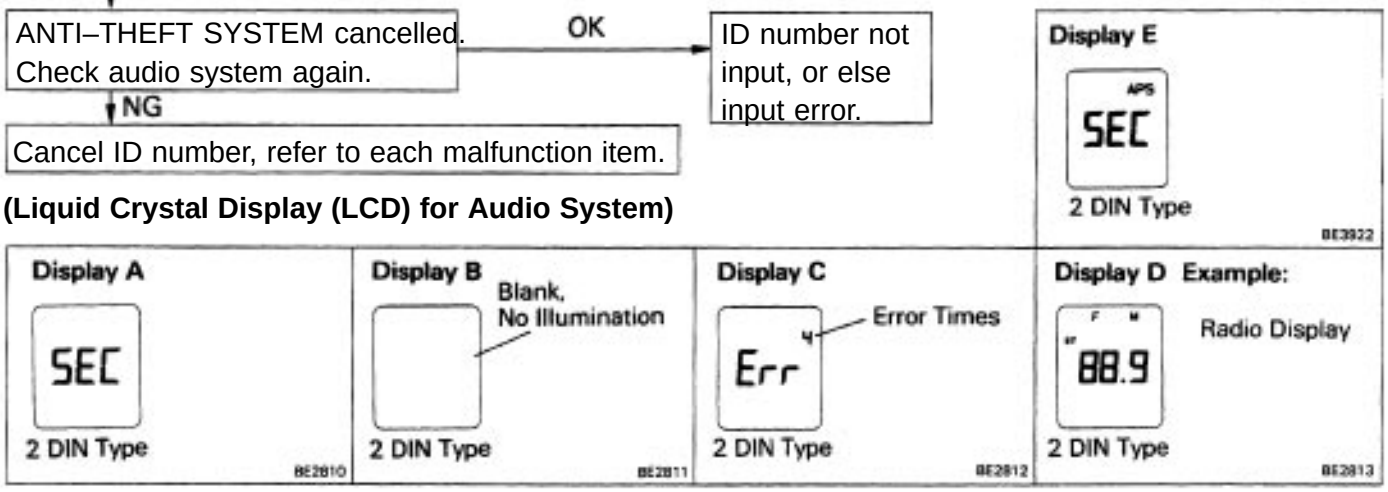
Display A showing?
- No → Radio switch turned 4N.
- Yes → ID nubmer is set.

Display B showing?
- No → ID number not input. (Display D)
- Yes → While holding the 1, 4 and6 buttons in. Push and hold the "PVIIR VOL" knob. Check display.
  - Display B → Refer to each malfunction item.
  - Display E → **ANTI–THEFT SYSTEM operating condition. (ID number input error 5 times) Take to designated radio service station.**

"SEC" display disappears after 1 second.
- Yes → Normal operation when radio switch turned ON?
  - Yes → Forgot to press switch.
  - No → Cancel ID number, refer to each malfunction item.
- No → **ANTI–THEFT SYSTEM operating condition. (ID number input error 4 times or less)**

Input ID number, check display.
- Display D → ANTI–THEFT SYSTEM cancelled. Check audio system again.
  - OK → ID number not input, or else input error.
  - NG → Cancel ID number, refer to each malfunction item.
- Display A or B → After 2 seconds Display C – A
  - No → **ANTI–THEFT SYSTEM not cancelled. ID number input 5 times or more?**
  - Yes → Take to designated radio service station.

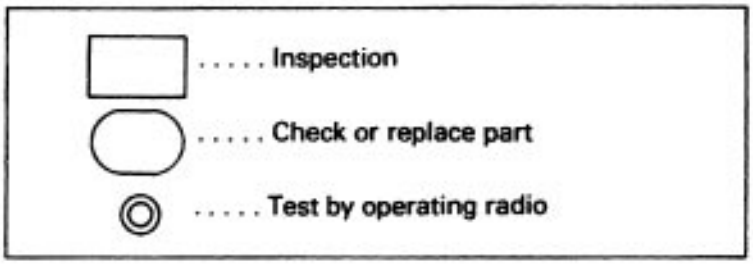
(Liquid Crystal Display (LCD) for Audio System)



HINT:

- Refer to 0/M for operation details of ANTI–THEFT SYSTEM.
- When the ID number has been cancelled, reset the same number after completing the operation, or inform the customer that it has been cancelled.

DESCRIPTION OF SYMBOLS

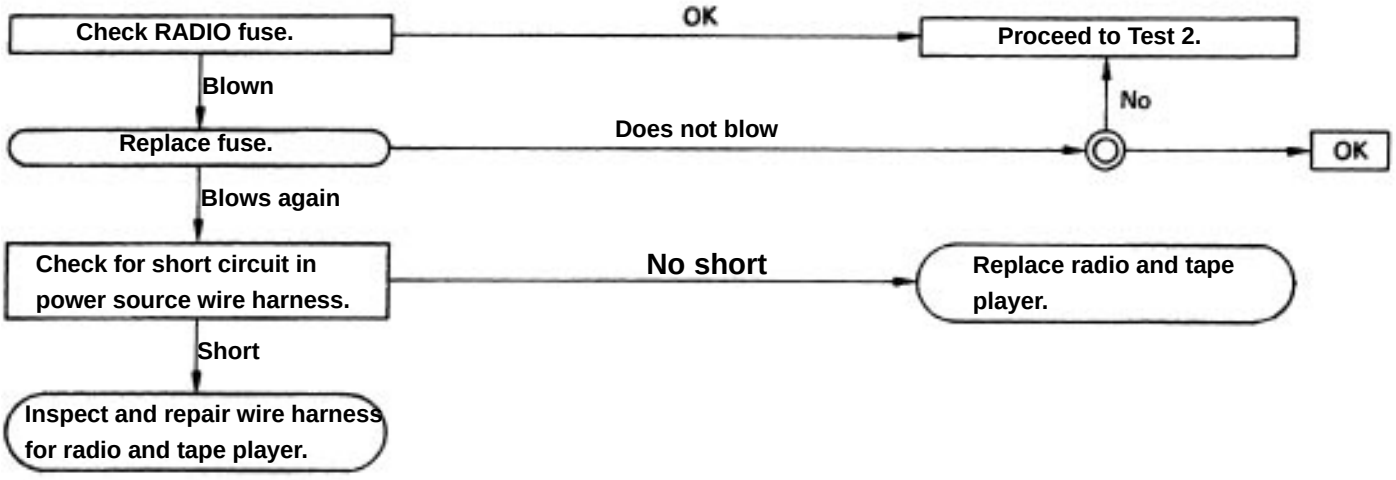


1. DEAD RADIO AND TAPE PLAYER

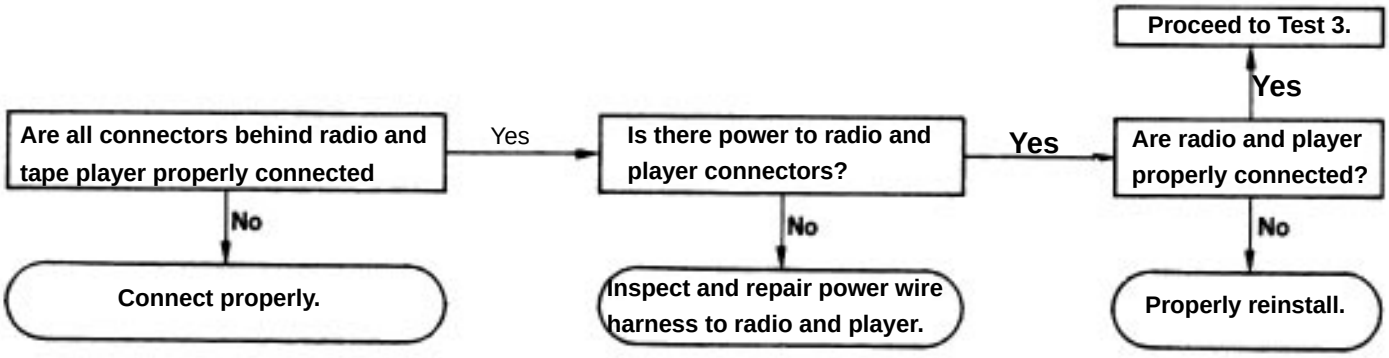
(a) No power to radio or tape player, or power but no sound.
Possible causes:

- Blown RADIO fuse
- Short circuit or broken wire in power source wire harness ,
- Loose connectors behind radio and tape player
- Loose speaker connector
- Defective speaker
- Broken wire in speaker wire harness
- Improperly installed radio or tape player
- Defective radio or tape player

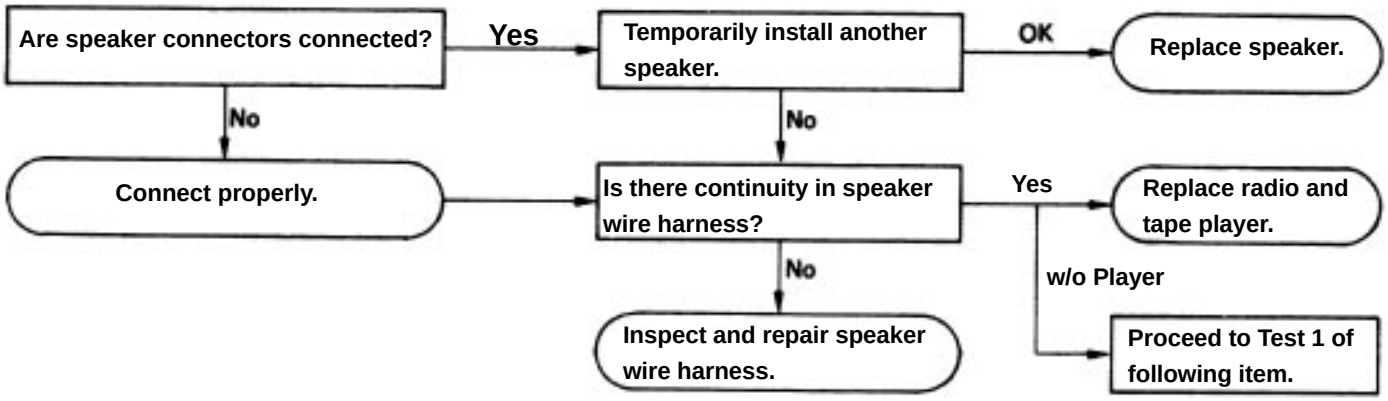
TEST 1



TEST 2



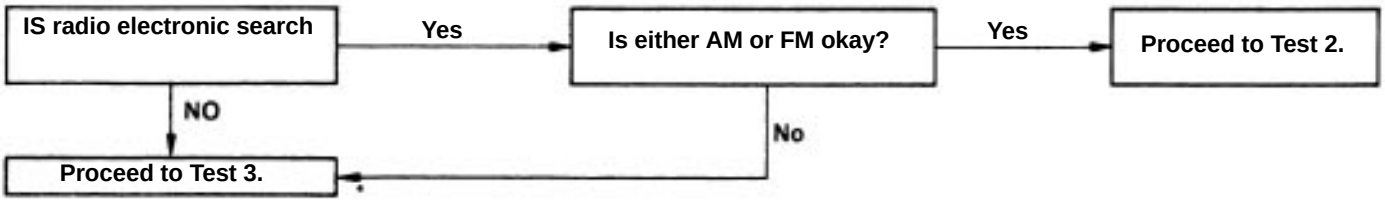
TEST 3



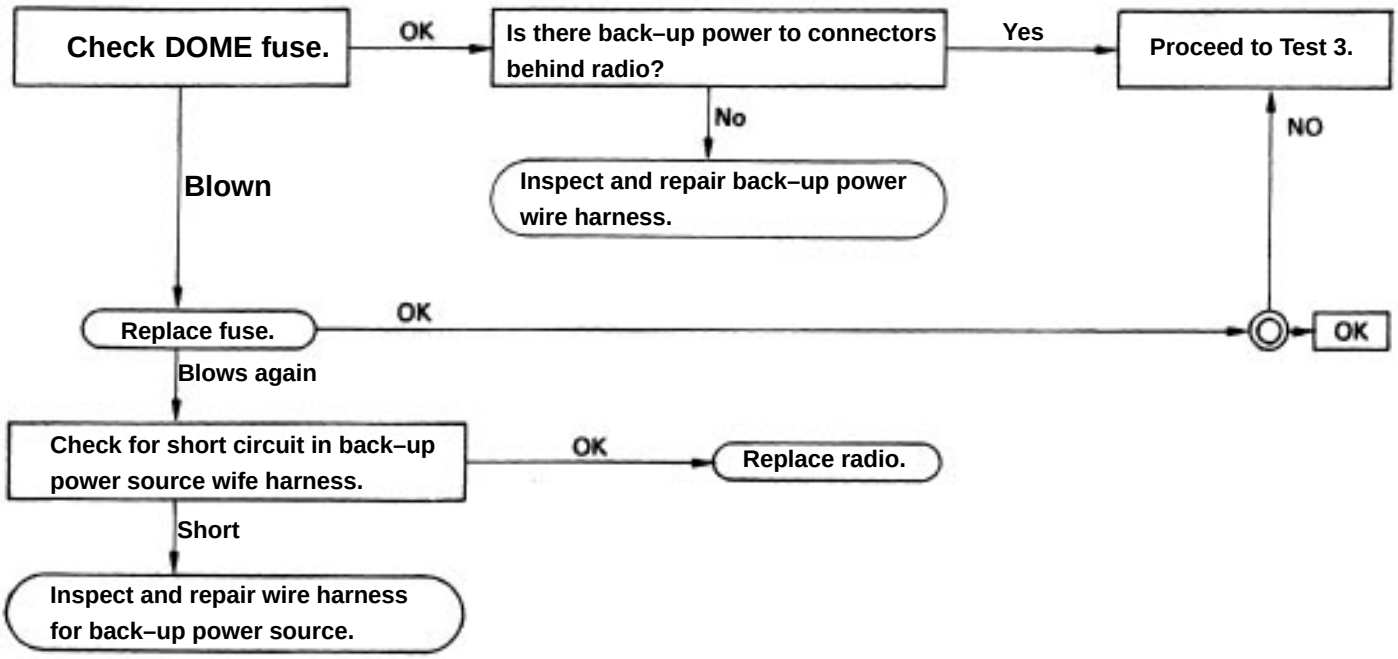
(b) Tape player okay but not sound from either the FM or AM band.
Possible causes:

- Antenna disconnected
- Antenna plug not properly connected
- Defective antenna
- Defective antenna cable
- Defective radio or tape player
- Blown DOME fuse
- Short circuit or broken wire in wire harness for backup power source

TEST 1

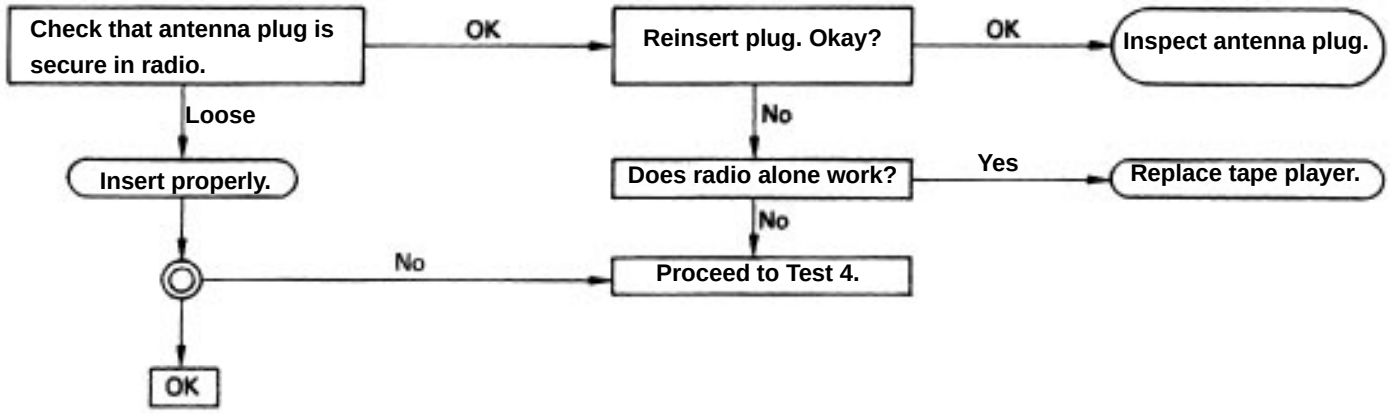


TEST 2

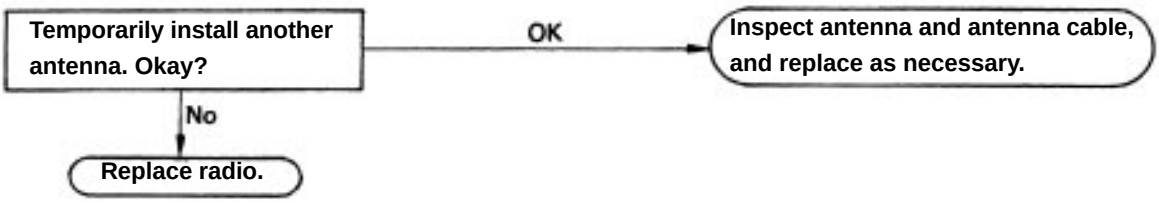


HINT: Back–up power refers to the storage voltage for preset tuning. This is applied even when the ignition switch is OFF.

TEST 3

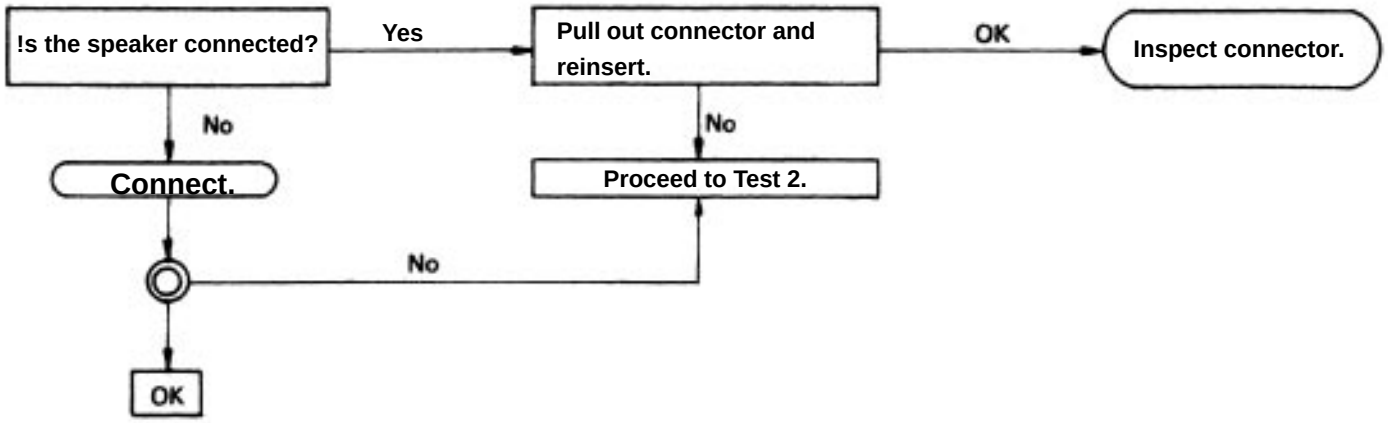


TEST 4

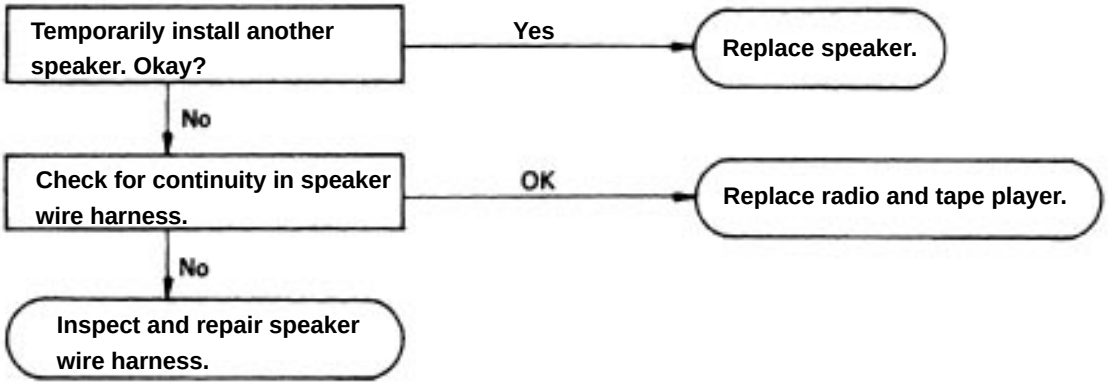


(c) No sound from one speaker.
Possible causes:
- Loose speaker connector
- Broken wire in speaker wire harness
- Defective speaker
- Defective radio and tape player

TEST 1



TEST 2

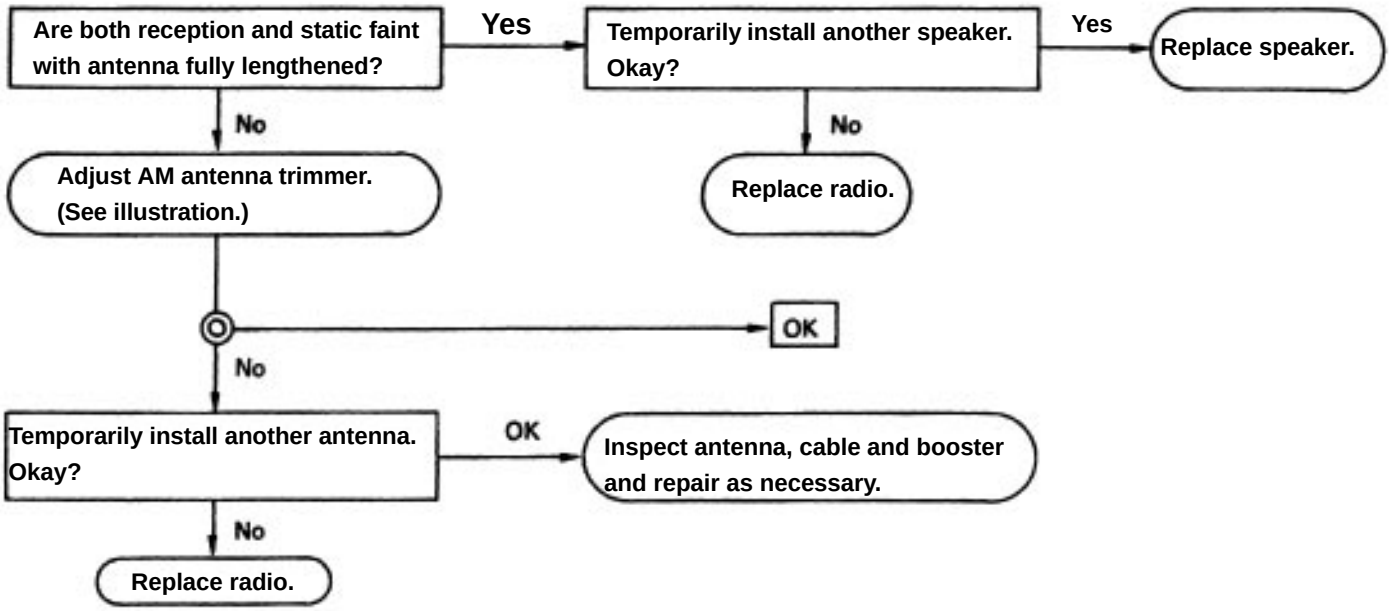


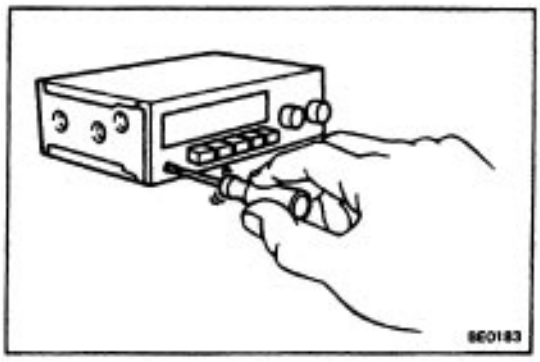
2. FAINT RECEPTION

Possible causes:

- Incorrectly adjusted antenna trimmer
- Defective antenna or antenna cable
- Defective speaker
- Defective radio

TEST





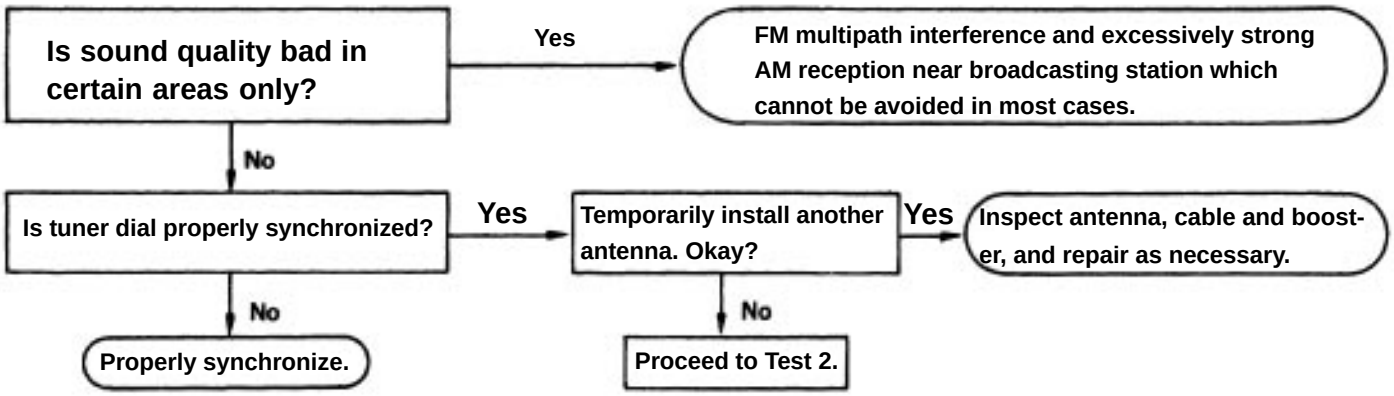
(Ex. Electronic Search Type)
HINT: Adjustment of the antenna trimmer.
(1) Fully lengthen the antenna.
(2) With the volume and tone at maximum, turn the dial to around 1,400 kHz where there is no reception.
(3) Adjust the trimmer to where static is loudest.

3. BAD SOUND QUALITY

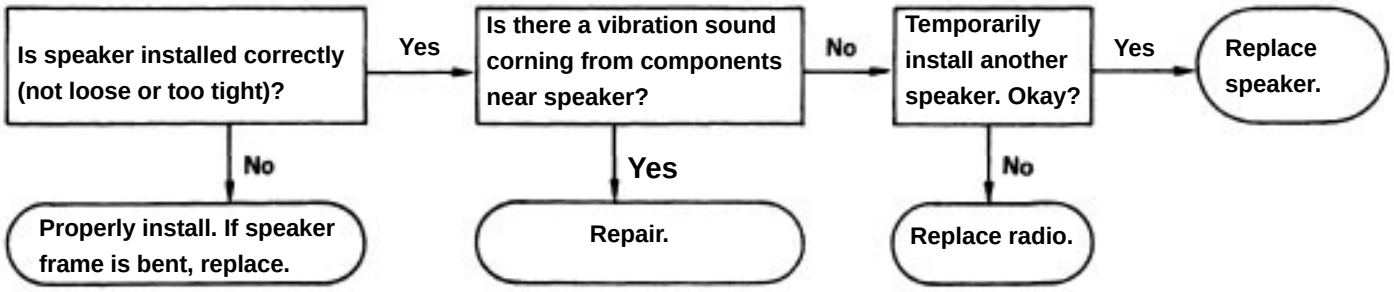
(a) Sound quality bad when radio played.
Possible causes:

- Multipath interference of excessive interception
- Tuner dial not synchronized with station
- Defective antenna or antenna cable
- Speaker improperly installed
- Vibration sound from components near speaker
- Defective speaker
- Defective radio

TEST 1



TEST 2

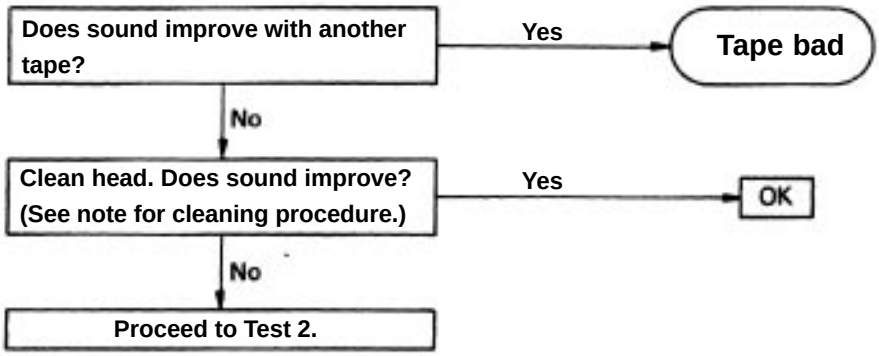


HINT: FM distortion tends to increase sharply if the tuner is not synchronized.

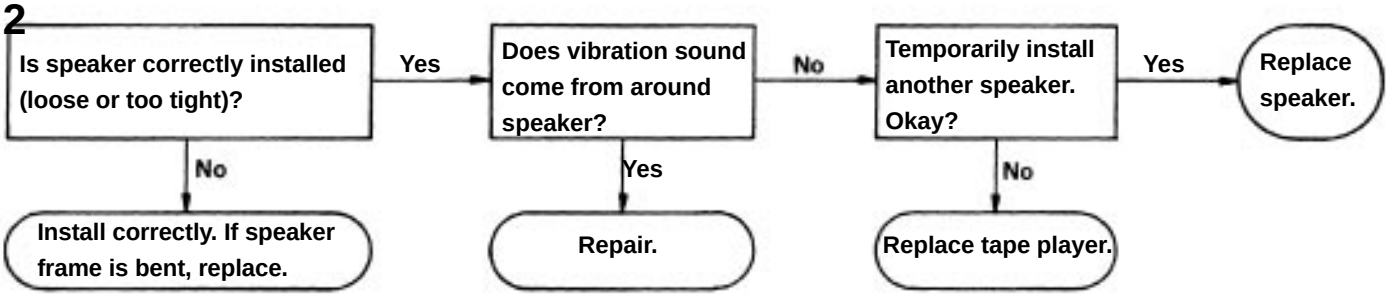
(b) Sound quality bad when tape player played.
Possible causes:

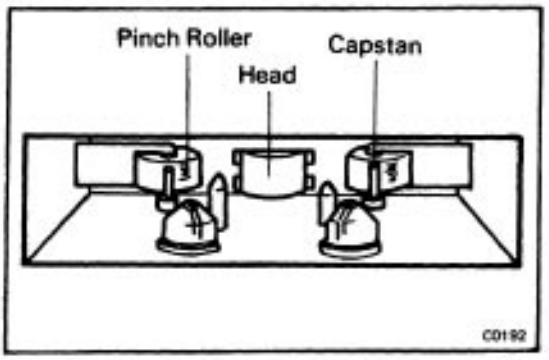
- Bad tape
- Dirty head
- Incorrectly installed speaker
- Vibration noise from around speaker
- Defective speaker
- Defective tape player

TEST 1



TEST 2





HINT: Head cleaning procedure.

(1) Raise the cassette door with your finger. Next, using a pencil or like object, push in the guide as shown.

(2) Using a cleaning pen or cotton applicator soaked in alcohol, clean the head surface, pinch rollers and capstans.

(3) Push in the ”eject” button.

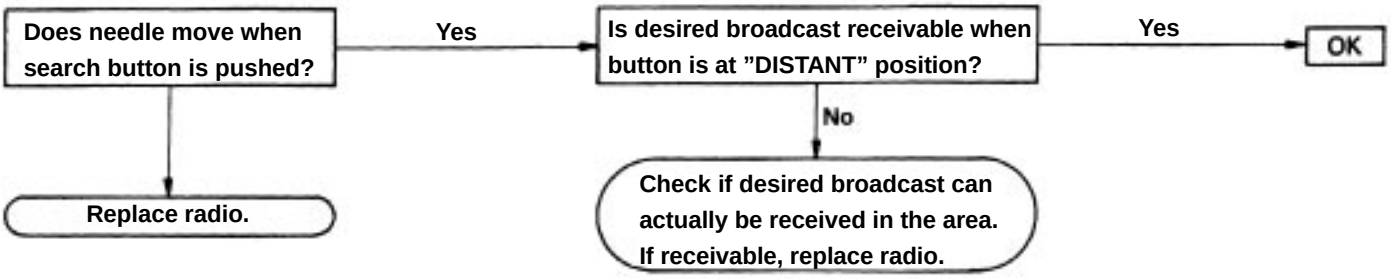
4. DEFECTIVE AUTO–SEARCH MECHANISM

Manual search possible but automatic search mechanism does not function or does not stop at all receivable stations.

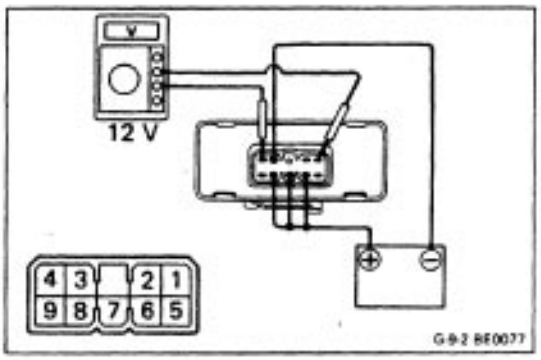
Possible causes:

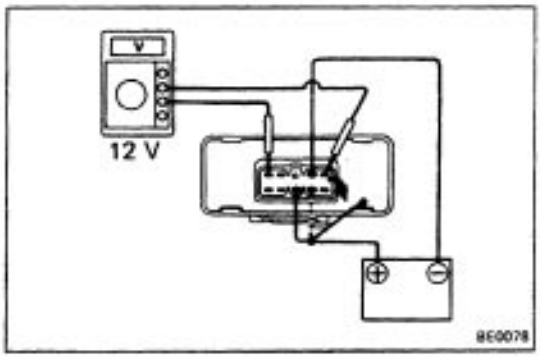
- Poor search sensitivity (SENS button)
- Defective radio

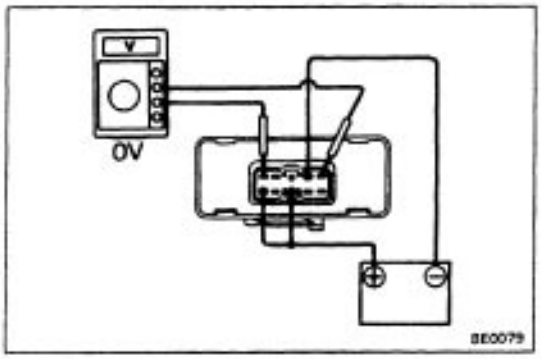
TEST



Antenna Motor Control Relay
INSPECTION OF ANTENNA MOTOR CONTROL RELAY







1. INSPECT RELAY OPERATION (ANTENNA UP)

(a) Connect the voltmeter positive (+) lead to terminal 1 and the negative (–) lead to terminal 4.

(b) Connect the positive (+) lead from the battery to terminals 6, 7 and 8. Connect the negative (–) lead to terminal 3.

(c) Check that there is battery voltage.

HINT: Measure the voltage within 7 seconds after connecting the positive (+) battery lead to terminals 8.

2. INSPECT RELAY OPERATION (ANTENNA DOWN)

(a) Connect the voltmeter positive (+) lead to terminal 4 and the negative (–) lead to terminal 1.

(b) Connect the positive (+) lead from the battery to terminals 6 and 7. Connect the negative (–) lead to terminal 2.

(e) Disconnect the positive (+) battery lead from terminal 6.

(d) Check that there is battery voltage.

HINT: Measure the voltage within 7 seconds after disconnecting the positive (+) battery lead from terminal 6.

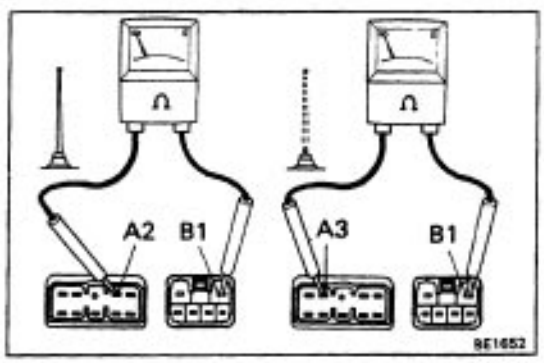
3. INSPECT RELAY OPERATION (ANTENNA STOP)

(a) Connect the voltmeter positive (+) lead to terminal 1 and the negative (–) lead to terminal 4.

(b) Connect the positive (+) lead from the –battery to terminals 7 and 9. Connect the negative (–) lead to terminal 2.

(c) Check that there is no battery voltage.

If operation is not as specified, replace the relay.



Antenna Motor
INSPECTION OF ANTENNA MOTOR

INSPECT LIMIT SWITCH OPERATION

(a) If the motor stops with the antenna up, check that there is no continuity between terminals A–2 and B–1.

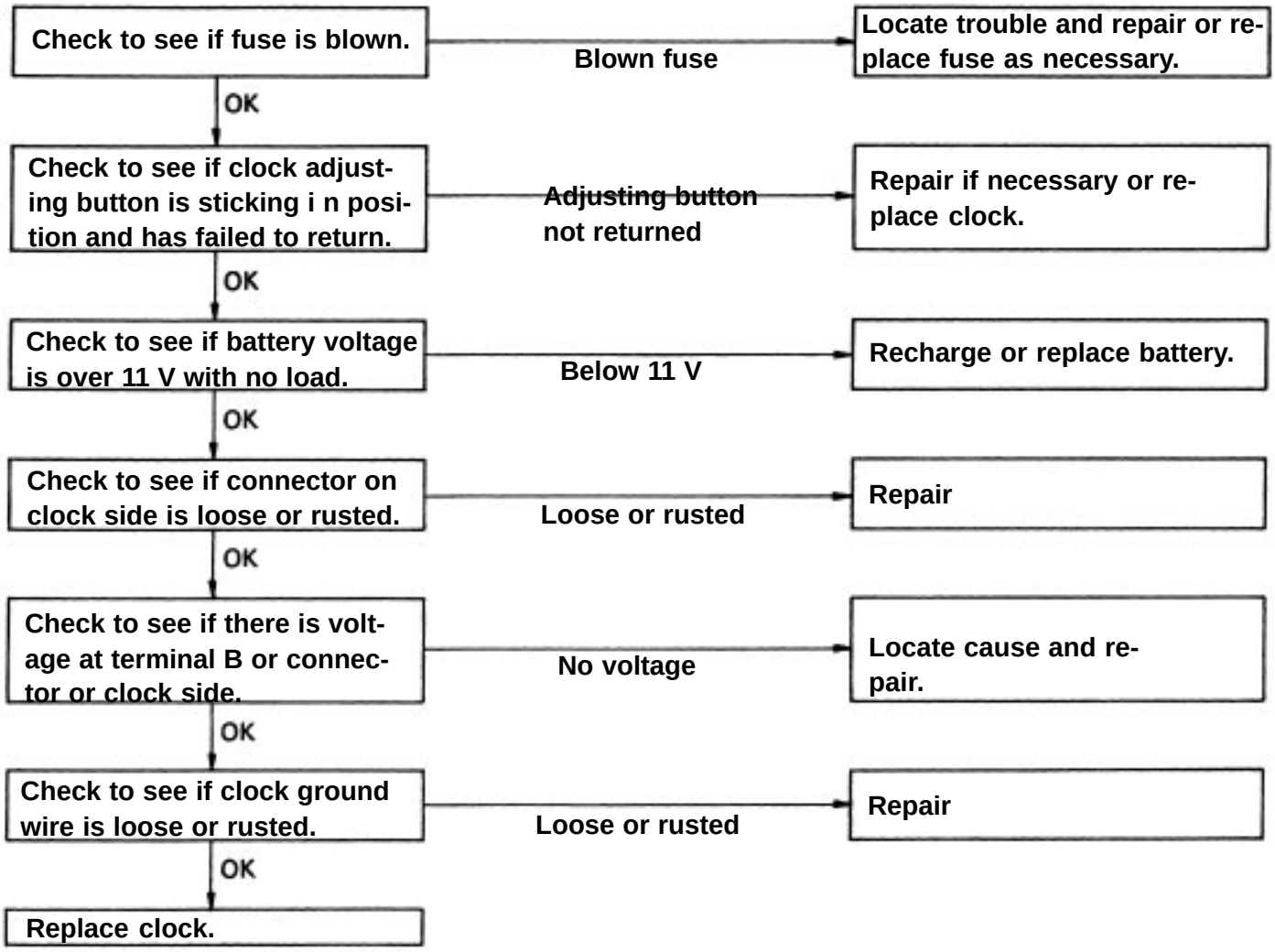
(b) If the motor stops with the antenna down, check that there is no continuity between terminals A–3 and B–1.

If continuity is not as specified, replace the motor.

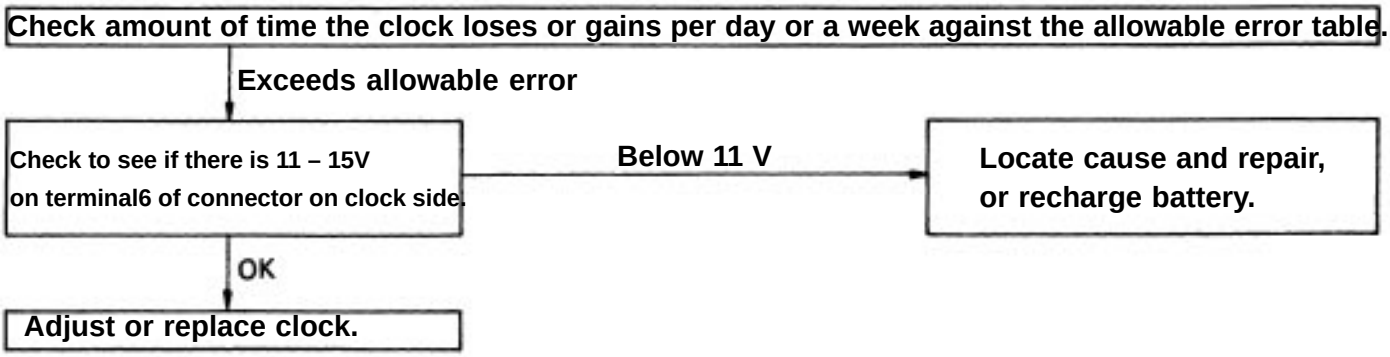
CLOCK

Troubleshooting

CLOCK WILL NOT OPERATE



CLOCK LOSES OR GAINS TIME



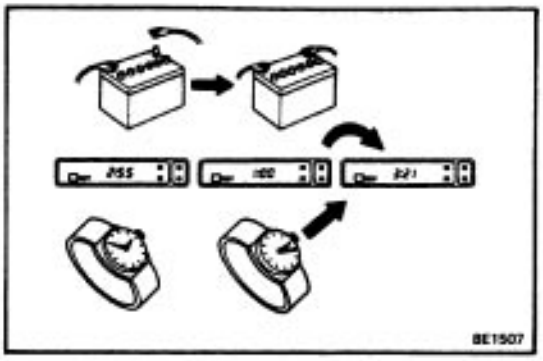
1. INSPECT ALLOWABLE ERROR OF CLOCK

Check the allowable error of the clock.

Allowable error (per day): ± 1.5 seconds

2. ADJUSTMENT OF CLOCK

Adjustment of the quartz clock requires a precise digital counter. Adjustment must be made in shop specified by-the manufacturer.



3. SETTING OF CLOCK

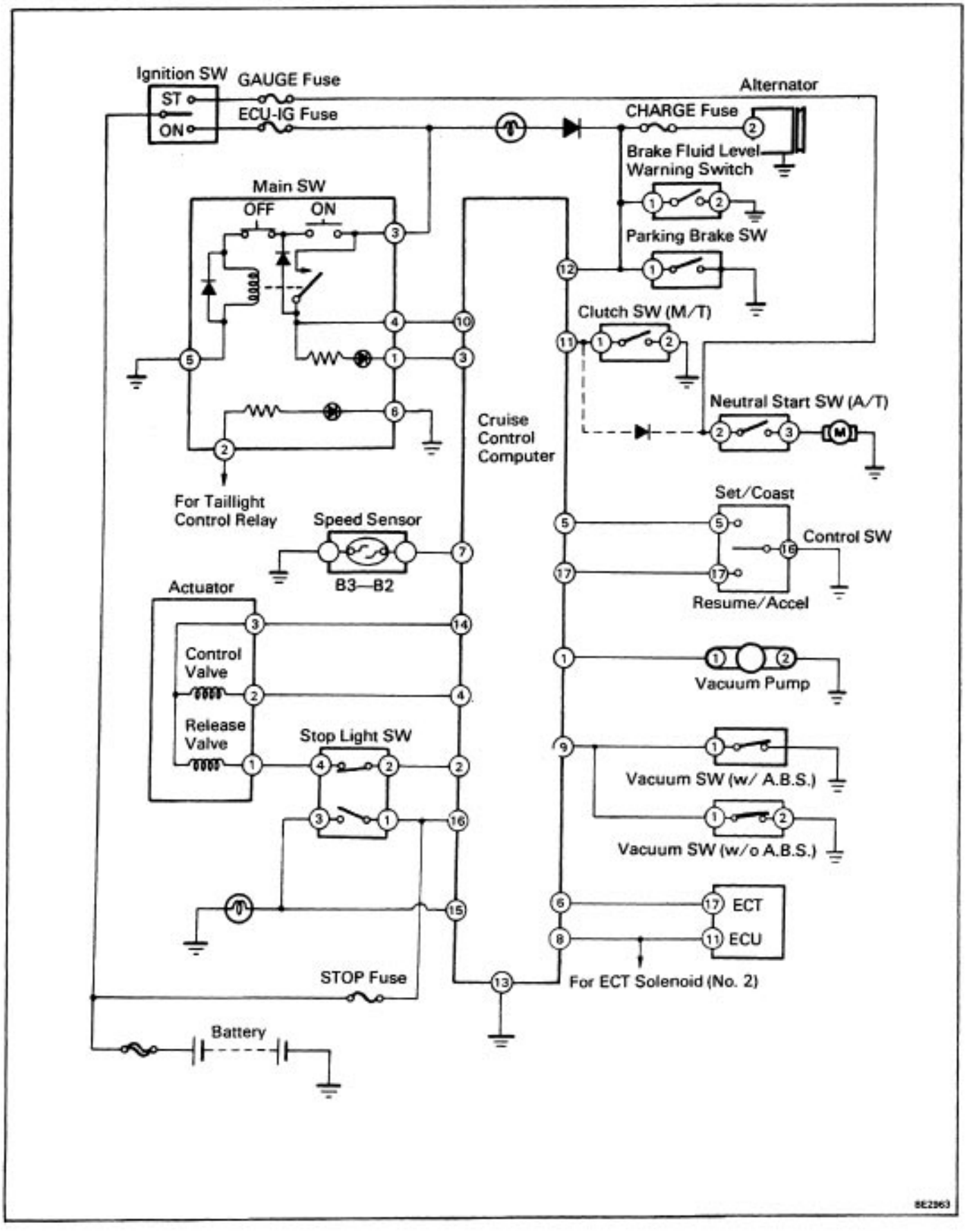
(a) Connect the battery terminal.

(b) Check the clock to see that it is running, and then set it to the correct time.

HINT: Whenever the battery terminal is disconnected, make sure to set the clock to the correct time after reco necting the battery.

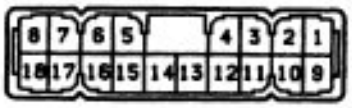
CRUISE CONTROL SYSTEM

Wiring Diagram



Connectors

Cruise Control Computer

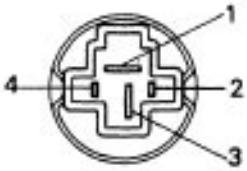


Main SW

Control SW

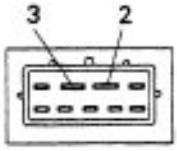
Actuator

Stop Light Switch

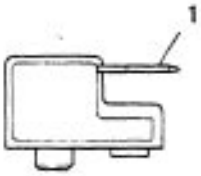


Clutch SW

Neutral Start Switch

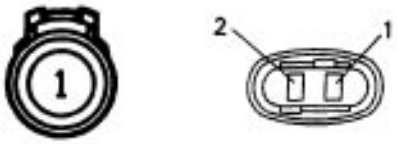


Parking Brake SW



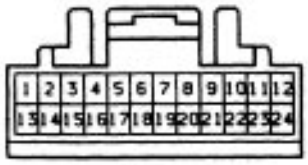
Speed Sensor

Vacuum Switch
(w/ A.B.S.) (w/o A.B.S.)



Vacuum Pump

ECT Computer
Wire Harness Side



Alternator
Wire Harness Side

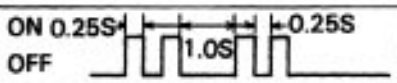
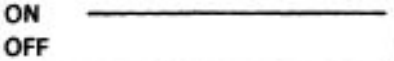
Brake Fluid Level
Warning Switch

S-18-2-A, S-8-2, BE1397
IS-3-2-A, BE0336, G-2-2
BE1486, BE1412, BE1641
IS-1-2-A, BE2047, IS-2-2-D, R-24-1
IA-3-1-C, IS-2-2-A

Diagnosis System
OUTPUT OF DIAGNOSTIC CODES

1. READ TYPE A CODE

(a) Turn the ignition switch on.
(b) Turn the set/coast switch on, and keep it on.
(e) Push the main switch on.
(d) Turn the set/coast switch oft.
(e) Meet the conditions listed below.
(f) Read the diagnostic code on the main switch indicator.

No.	Conditions	Indication code	Diagnosis
1	Set/coast switch on		Set/coast switch circuit is normal.
2	Resume/accel switch on		Resume/ accel switch circuit is normal.
3	Vacuum switch on		Vacuum switch circuit is normal.
4	Each cancel switch on (Stop light switch, Parking brake switch, Clutch switch, Neutral start switch)		Each cancel switch circuit is normal.
5	Drive 40 km/h (25 mph) or over		Speed sensor circuit is normal.
6	Drive 30 km/h 0 9 mph) or below		Speed sensor circuit is normal.

HINT:

- To save time performing the next test, do not turn off the ignition switch when steps (a) – (f) are completed.
- Checking of No. 4 code is done with the vehicle jacked up and the engine idling.
- If there is no indication code, perform diagnosis –and inspection. (See page Be–74)

2. READ TYPE 6 CODE

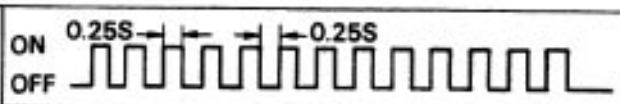
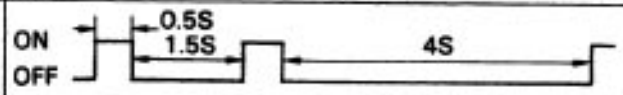
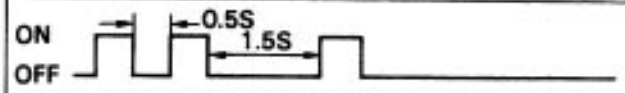
(a) If while driving with the cruise control on, the system is cancelled by a malfunction in either the actuator, speed sensor, or control switch circuit, the main switch indicator will blink 5 times.

(b) While driving at a speed of 16 km/h (10 mph) or less, press the SET/COAST switch three times in two seconds.

HINT: In order to retain the diagnostic code when a ma function has occurred, always inspect with the ignition and main switches on.

Should the power be cut, the diagnostic code will be erased from the computer memory.

(e) Read the diagnostic code on the main switch indicator.

Indication code		Diagnosis
		Normal.
11		Actuator circuit is abnormal.
21		Speed sensor signal circuit is abnormal.
23		*Vehicle speed decreases to 16 km/h (14 mph) or more below set speed.
31		Resume/accel switch circuit is abnormal.
33		Resume/accel switch and set/coast switch circuit is abnormal.

* If the set speed can be maintained when the speed control switch is again set at SET/COAST, there is no malfunction.

HINT:

- Indication codes appear in order from No. 11.
- Indication is stopped when vehicle speed is over 16 km/h (10 mph) or main switch is turned off.
- If there is no indication code, perform diagnosis and inspection. (See page BE–74)

Troubleshooting

Problem	Inspection item		No.
Cruise control does not operate.	(a) Inspect type A codes.	No.1 NO No.2 NO No.3 NO No.4 NO No.5 NO No.6 NO	B C J F to I E E
	(b) Inspect type6 codes.	11 21 23 31 33	D E D, E C B, C
	(e) All codes are normal.		A,D,E
Vehicle speed does not decrease when coast switch turned on.	Inspect No. 1 of type A code.	OK NO	D B
Vehicle speed fluctuates when set switch turned on.			
Vehicle speed does not accelerate when accel switch turned on.	Inspect No.2 of type A code.	OK NO	D C
Vehicle speed does not return to memorized speed when resume switch turned on.			
Setting speed deviates on high side.	—	—	D,E
Setting speed deviates on low side.			
Return and acceleration response is sluggish.	Inspect No.3 of type A code.	OK NO	D J
Setting speed does not cancel when brake pedal depressed.	Inspect No.4 of type A code.	OK NO	D F
Setting speed does not cancel when parking brake pulled up.	Inspect No.4 of type A code.	OK NO	D G
Setting speed does not cancel when clutch pedal depressed (M/T only).	Inspect No.4 of type A code.	OK NO	D H
Setting speed does not cancel when shifted to ”N” range (A/T only).	Inspect No.4 of type A code.	OK NO	D I
Speed can be set below about 40 km/h (25 mph).	Inspect No.5 of type A code. Inspect No.6 of type A code.	OK NO	D E
Cruise control will not disengage even about 40 km/h (25 mph).			
A short period after the O/D cut, (Approx. within 14 seconds) the O/D wilt resume.	—	—	K

A INSPECTION OF POWER SOURCE CIRCUIT

Turn ignition switch on.

Is ECU–IG fuse normal?

No → Replace fuse. Is operation normal?

No →
- Short circuit in wire harness between ECU–IG fuse and terminal 3 of main switch.
- Inspect main switch. (See page BE–89)

Yes → Fuse faulty

MAIN SWITCH

INSPECT GROUND CONNECTION
Is there continuity between terminal 5 and body ground?

No →
- Open circuit in wire harness between terminal 5 of main switch and body ground.
- Body ground faulty.

Yes

INSPECT POWER SOURCE
Is there battery voltage between terminal 3 and body ground?

No → Open circuit in wire harness between ECU–IG fuse and terminal 3 of main switch.

Yes

INSPECT SWITCH OPERATION
Is there battery voltage between terminal 4 and body ground with main switch turned on ?

No → Inspect main switch. (See page BE–89)

Yes

Is there battery voltage between terminal 4 and body ground with main switch turned off?

Yes → Inspect main switch. (See page BE–89)

No

INSPECT INDICATOR LIGHT OPERATION
Connect terminal i to body ground. Does indicator light light with main switch turned on?

No → Inspect main switch. (See page BE–89)

Yes

Does indicator light light with main switch turned off?

Yes → Inspect main switch. (See page BE–89)

No

CONTINUED ON PAGE BE–75

CONTINUED ON PAGE BE–74

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

INSPECT GROUND CONNECTION.
Is there continuity between terminal 13 and body ground?

No →
- Open circuit in wire harness betweeh terminal 13 and body ground.
- Body ground faulty.

Yes ↓

INSPECT POWER SOURCE
Is there battery voltage between terminal 10 and body ground with main switch turned on?

No → Open circuit in wire harness between terminal 10 of computer and terminal 4 of main switch.

Yes ↓

INSPECT INDICATOR LIGHT CIRCUIT
Connect terminal 3 to body ground.
Does indicator light light with main switch turned on?

No → Open circuit in wire harness between terminal 3 of computer and terminal 1 of main switch.

Yes ↓

Disconnect connector from control switch.
Is there continuity between terminal 3 and body ground?

Yes → Short circuit in wire harness between terminal 3 of computer and terminal 1 of main switch.

No ↓

Replace computer.

B INSPECTION OF SET/COAST SWITCH CIRCUIT

Turn ignition switch off.

CONTROL SW

INSPECT GROUND CONNECTION .
Disconnect connector from control switch.
Is there continuity between terminal 16 of wire harness side connector and body ground?

No →
- Open circuit in wire harness between terminal 16 and body ground.
- Body ground f aulty.

Yes

INSPECT SET/COAST SWITCH OPERATION
Is set/coast switch operation normal?
(See page **BE–89**)

No → Replace control switch.

Yes

Connect connector to control switch.

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

INSPECT SET/COAST SWITCH CIRCUIT
Is there continuity between terminal 5 and body ground with set/coast switch turned on?

No → Open or short circuit in wire harness between terminal 5 of computer and terminal 5 of control switch.

Yes

Replace computer.

C INSPECTION OF RESUME/ACCEL SWITCH CIRCUIT

Turn ignition switch off.

CONTROL SW

INSPECT GROUND CONNECTION
Disconnect connector from control switch.
Is there continuity between terminal 16 of wire harness side connector and body ground?

No →
- Open circuit in wire harness between terminal 16 and body ground.
- Body ground faulty.

Yes

INSPECT RESIIME/ACCEL SWITCH OPERATION
Is resume/accel switch operation normal?
(See page BE–89)

No → Replace control switch.

Yes

Connect connector to control switch.

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

INSPECT RESUME/ACCEL SWITCH CIRCUIT
Is there continuity between terminal 17 and body ground with resume/accel switch turned on?

No → Open or short circuit in wire harness between terminal 17 of computer and terminal 17 of control switch.

Yes

Replace computer.

D INSPECTION OF ACTUATOR CIRCUIT

Turn ignition switch off.

VACUUM HOSE

Are there cracks or other damage on the vacuum hose?
- Yes → Replace vacuum– hose.
- No ↓

ACTUATOR

INSPECT CABLE FREEPLAY
Is control Cable freeplay less than 10 mm (0.39 in)?
- No → Adjust control cable freeplay.
- Yes ↓

INSPECT ACTUATOR OPERATION
Disconnect connector from actuator.
Is actuator operation normal?
(See page BE–91)
- No → Replace actuator.
- Yes ↓

STOP LIGHT SW

INSPECT STOP LIGHT SWITCH CIRCUIT
Disconnect connector from stop light switch.
Is there continuity between terminal 4 of wire harness side connector and body ground?
- Yes → Short circuit in wire harness between terminal 1 of actuator and terminal 4 of stop light switch.
- No ↓

Connect the connector to actuator.
Is there continuity between terminal 4 of wire harness side connector and body ground?
- No → Open circuit in wire harness between terminal 1 of actuator and terminal 4 of stop light switch.
- Yes ↓

INSPECT STOP LIGHT SWITCH OPERATION
Is stop light switch operation normal?
(See page BE–89)
- No → Replace stop light switch.
- Yes ↓

Connect connector to stop light switch.

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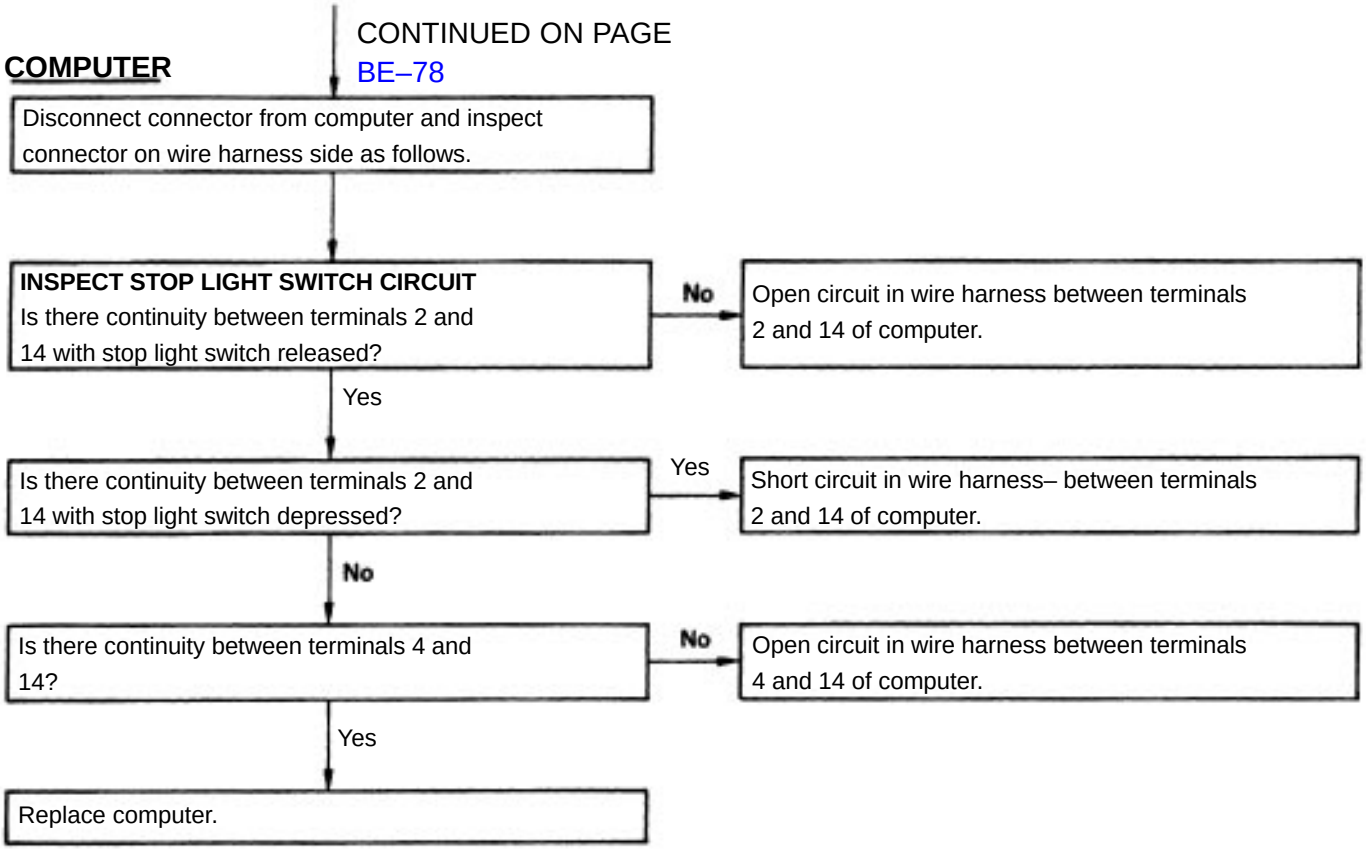
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BE–78
COMPUTER
Disconnect connector from computer and inspect connector on wire harness side as follows.
INSPECT STOP LIGHT SWITCH CIRCUIT
Is there continuity between terminals 2 and 14 with stop light switch released?
No
Open circuit in wire harness between terminals 2 and 14 of computer.
Yes
Is there continuity between terminals 2 and 14 with stop light switch depressed?
Yes
Short circuit in wire harness– between terminals 2 and 14 of computer.
No
Is there continuity between terminals 4 and 14?
No
Open circuit in wire harness between terminals 4 and 14 of computer.
Yes
Replace computer.

E INSPECTION OF SPEED SENSOR CIRCUIT

SPEEDOMETER CABLE

INSPECT SPEEDOMETER CABLE
Does the meter fluctuate when driving at a steady speed?

Yes → Meter cable faulty.

No ↓

Turn ignition switch off.

SPEED SENSOR

INSPECT GROUND CONNECTION
Disconnect connector from meter (speed sensor). Is there continuity between terminal B of wire harness side connector and body ground?

No → Open circuit in wire harness between terminal B and body ground.

Yes ↓

INSPECT SPEED SENSOR OPERATION
Is speed sensor operation normal?
(See page **BE–90**)

No → Speed sensor faulty.

Yes ↓

COMPUTER

INSPECT SPEED SENSOR CIRCUIT
Disconnect connector from computer.
Is there continuity between terminal A of wire harness side connector and terminal 7 of computer?

No → Open circuit in wire harness between terminal A of speed sensor and terminal 7 of computer.

Yes ↓

Replace computer.

F INSPECTION OF STOP LIGHT SWITCH CIRCUIT

Turn ignition switch off.

Is STOP fuse normal?
- No → Replace fuse. Is operation normal?
  - No → Short circuit in wire harness between terminal 16 of computer or terminal 1 of stop light switch and fuse.
  - Yes → Fuse faulty.
- Yes

STOP LIGHT SW

INSPECT GROUND CONNECTION
Disconnect connector from stop light switch.
Is there continuity between terminal 3 of wire harness side connector and body ground?
- No →
  - Open circuit in wire harness between terminal 3 and body ground.
  - Body ground faulty.
- Yes

INSPECT STOP LIGHT SWITCH OPERATION
Is stop light switch operation normal?
(See page BE–89)
- No → Replace stop light switch.
- Yes

Connect connector to stop light switch.

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

INSPECT STOP FUSE CIRCUIT
Is there battery voltage between terminal 16 and body ground with brake pedal released?
- No → Open circuit in wire harness between terminal 16 of computer and STOP fuse.
- Yes

INSPECT STOP LIGHT SWITCH CIRCUIT
Is there battery voltage between terminal 15 and body ground with brake pedal depressed?
- No → Open circuit in wire harness between terminal 15 of computer and terminal 3 of stop light switch.
- Yes

Replace computer.

G INSPECTION OF PARKING BRAKE SWITCH CIRCUIT

Turn ignition switch off.

ALTERNATOR

INSPECT ALTERNATOR OPERATION
is alternator operation normal? (See page CH–4)

No → Replace alternator.

Yes

BRAKE FLUID LEVEL WARNING SWITCH

INSPECT GROUND CONNECTION
Disconnect connector from brake level warning switch.
Is there continuity between terminal 2 of wire harness side connector and body gronud?

No →
- Open circuit in wire harness between terminal 2 and body ground.
- Body ground faulty.

Yes

INSPECT BRAKE WARNING SWITCH
Is brake fluid level warning switch operation nomal? (See page BE–38)

No → Replace brake warning switch.

Yes

Connect the connector to brake warning switch.

PARKING BRAKE SWITCH

INSPECT PARKING BRAKE SWITCH OPERATION
Disconnect connector from parking brake switch.
Is parking brake switch operation normal? (See page BE–90)

No → Replace parking brake switch.

Yes

Connect connector to parking brake switch.

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

Remove CHARGE fuse and ignition switch tuned on.

Is there no voltage between terminal 12 and body ground with parking brake pulled up?

No → Open circuit in wire harness between terminal 12 of computer and terminal of parking brake switch.

Yes

!s there battery voltage between terminal 12 and body ground with parking brake released?

No → Short circuit in wire harness between terminal 12 of computer and terminal 1 of parking brake switch, terminal 1 of brake fluid level warning switch or terminal 2 of alternator.

Yes

Replace computer.

H INSPECTION OF CLUTCH SWITCH CIRCUIT

Turn ignition switch off.

CLUTCH SW

INSPECT GROUND CONNECTION
Disconnect connector from clutch switch.
Is there continuity between terminal 2 of wire harness side connector and body ground?

No →
- Open circuit in wire harness between terminal 2 and body ground.
- Body ground faulty.

Yes

INSPECT CLUTCH SWITCH OPERATION
Is clutch switch operation normal?
(See page BE–90)

No → Replace clutch switch.

Yes

Connect connector to clutch switch.

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

INSPECT CLUTCH SWITCH CIRCUIT
Is there continuity between terminal 11 and body ground with clutch pedal depressed?

No → Open circuit in wire harness between terminal 11 of computer and terminal 1 of clutch switch.

Yes

Is there continuity between terminal 11 and body ground with clutch pedal released?

Yes → Short circuit in wire harness between terminal 11 of computer and terminal 1 of clutch switch.

No

Replace computer.

I INSPECTION OF NEUTRAL START SWITCH CIRCUIT

Turn ignition switch off.

NEUTRAL START SW

INSPECT GROUND CONNECTION
Disconnect connector from neutral start switch.
Is there continuity between terminal 3 of wire harness side connector and body ground?

No → Open circuit in wire harness between terminal 3 and body ground.

Yes

INSPECT NEUTRAL START SWITCH OPERATION
Is neutral start switch operation normal?
(See page BE–90)

No → Replace neutral switch.

Yes

Connect connector to neutral start switch.

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

INSPECT NEUTRAL START SWITCH CIRCUIT
Is there continuity between terminal 11 and body ground when shifted to ”N” and ”P” range?

No → Open circuit in wire harness between terminal 11 of computer and terminal 2 of neutral start switch.

Yes

Replace computer.

J INSPECTION OF VACUUM CIRCUIT

Turn ignition switch off.

VACUUM HOSE

Are there cracks or other damage on the vacuum hose?

Yes → Replace vacuum hose.

No

VACUUM SW

INSPECT VACUUM. SWITCH CIRCUIT
Disconnect connector from vacuum switch.
Is there continuity terminal 1 of vacuum switch and body ground?

No →
- Vacuum switch improper installed.
- Body ground faulty.

Yes

INSPECT VACUUM SWITCH OPERATION
Is vacuum switch normal?
(See page BE–92.)

No → Replace vacuum switch.

Yes

VACUUM PUMP

INSPECT GROUND CONNECTION
Disconnect connector from vacuum pump.
Is there continuity between terminal 2 of wire harness side connector and body ground?

No →
- Open circuit in wire harness between terminal 2 and body ground.
- Body ground faulty.

Yes

INSPECT VACUUM PUMP OPERATION
Is vacuum pump operation normal?
(See page BE–92)

No → Replace vaccum pump.

Yes

Connect connector to vacuum switch and pump.

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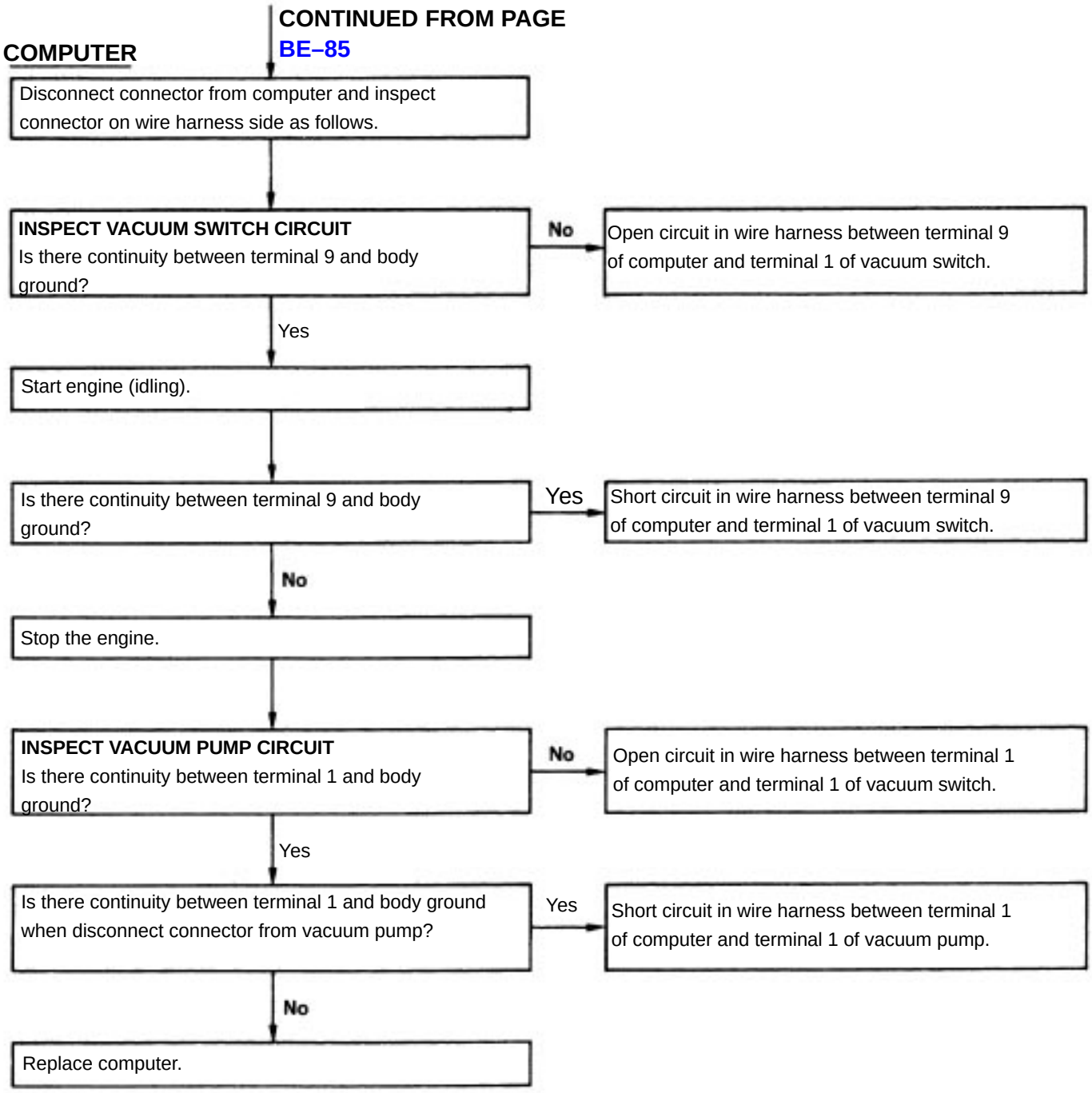
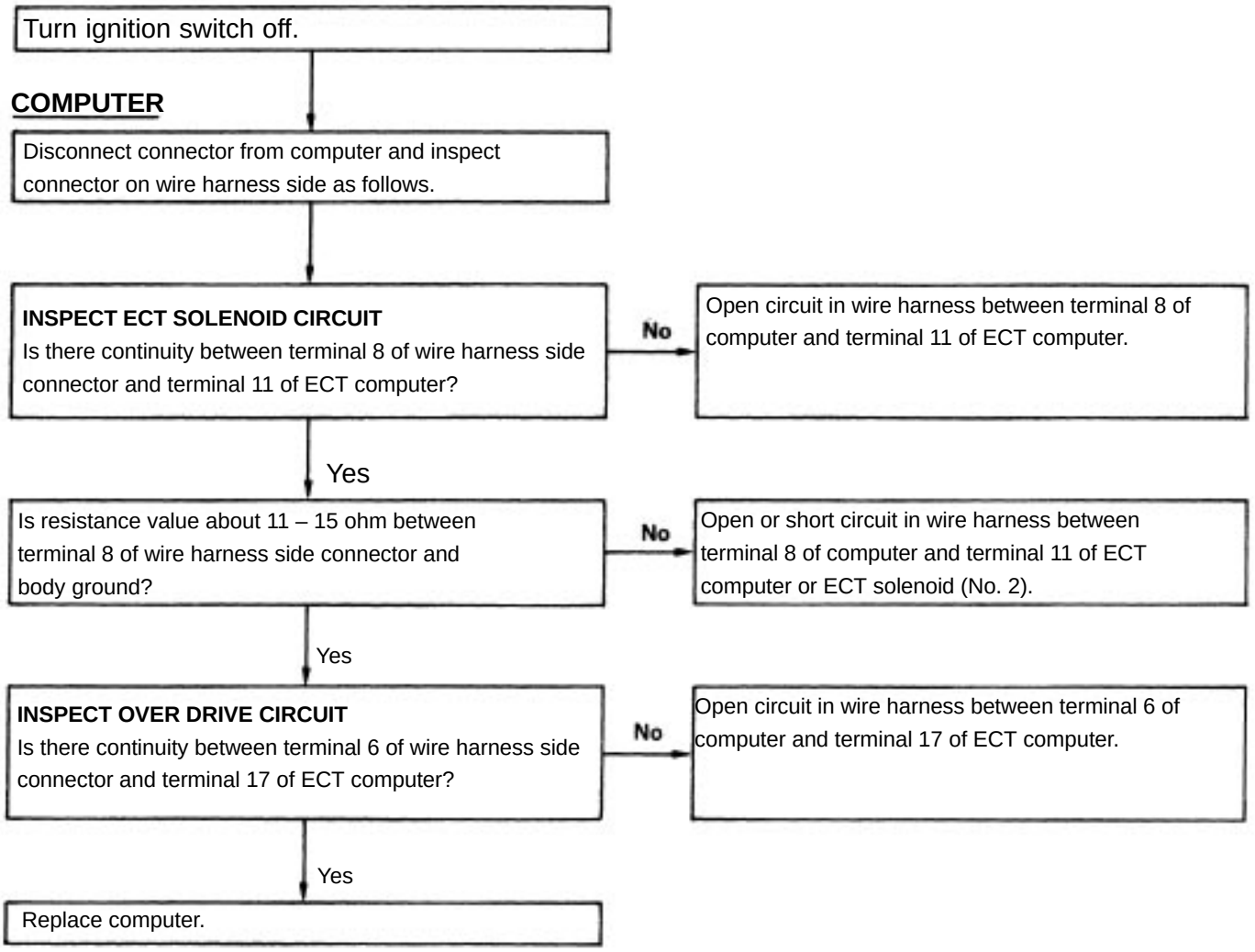
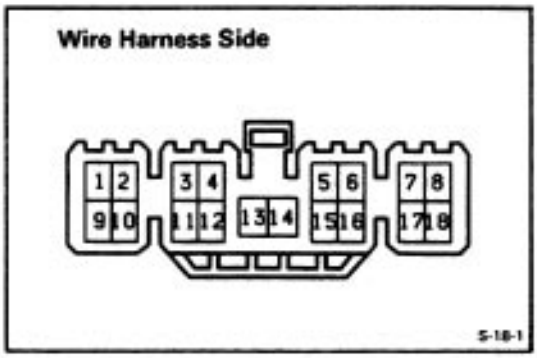
CONTINUED FROM PAGE BE–85



K INSPECTION OF ECT SOLENOID CIRCUIT

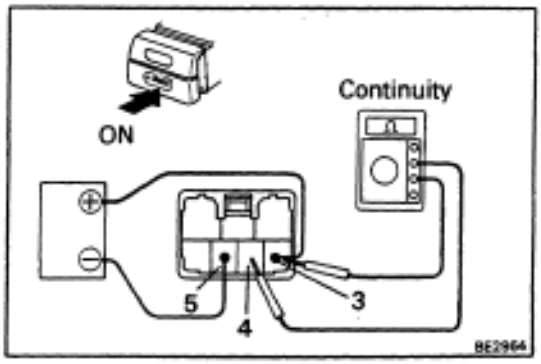




Cruise Control Computer Circuit
INSPECTION OF COMPUTER CIRCUIT

Disconnect the computer and inspect the connector on wire harness side as shown in the below.

Connection or measure rtem	Check for	Tester connection	Condition	Specified value
Stop Fuse	Voltage	16 – Body ground		Battery voltage
Stop Light Switch	Voltage	15 – Body ground	Brake pedal depressed	Battery voltage
			Brake pedal released	No voltage
Stop Light Switch and Release Valve	Resistance	2–14	Brake pedal released	Approx. 68Ω
Control Valve	Resistance	4–14	—	Approx. 30Ω
Control Switch	Voltage	10 – Body ground	Turn ignition switch and main switch on	Battery voltage
			Turn ignition switch and main switch off	No vohage
Control Switch (indicator circuit)	Voltage	3 – Body ground	Turn ignition switch and main switch on	Battery voltage
			Turn ignition switch and main switch off	No voltage
Control Switch (set/coast)	Continuity	5 – Body ground	Turn set/coast switch on	Continuity
			Turn set/coast switch off	No continuity
Control Switch (resunne/accel)	Continuity	17 – Body ground	Turn resume/accel switch on	Continuity
			Turn resume/accel switch off	No continuity
Speed Sensor	Continuity	7 – Body ground	Vehicle moving slowly	1 pulse each 44 cm (15.75 in.)
Clutch Switch (M/T) or Neutral Start Switch (A/T)	Continuity	11 – Body ground	Clutch pedal depressed or shifted into ”N” range	Continuity
			Clutch pedal released or shifted into only range except ”N” and ”P” range	No continuity
Parking Brake Switch	Voltage	12 – Body ground	Remove CHARGE fuse and ignition switch turned on with parking brake lever pulled up.	No voltage
			Remove CHARGE fuse and ignition switch turned on with parking brake lever released.	Battery voltage
Vacuum Switch	Continuity	9 – Body ground	Apply vacuum approx. 170 mmHg (fi.69 in.Hg, 22.7 kPa)	No continuity
			No vacuum	Continuity
Vacuum Pump	Continuity	1 – Body ground	—	Continuity
Body Ground	Continuity	13 – Body ground	—	Continuity



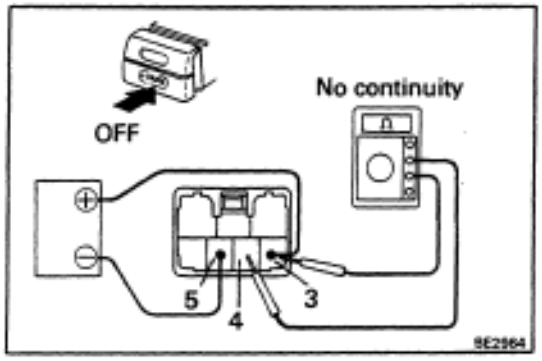
Main Switch

INSPECTION OF MAIN SWITCH

INSPECT SWITCH CONTINUITY

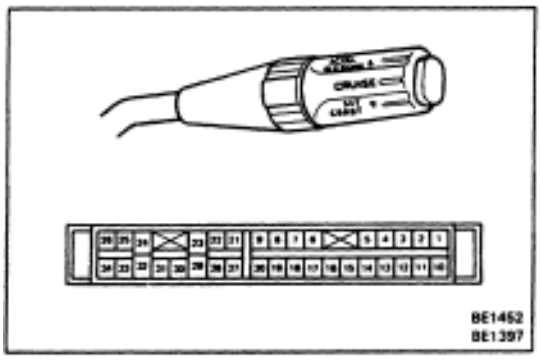
(a) Connect the positive (+) lead from the battery to terminal 3 and the negative () lead to terminal 5.

(b) Check that there is continuity b¿¿ween terminals 3 and 4 with the main switch pushed on.



(c) Check that there is no continuity between terminals 3 and 4 with the main switch pushed off.

If continuity is not as specified, replace the switch.



Control Switch

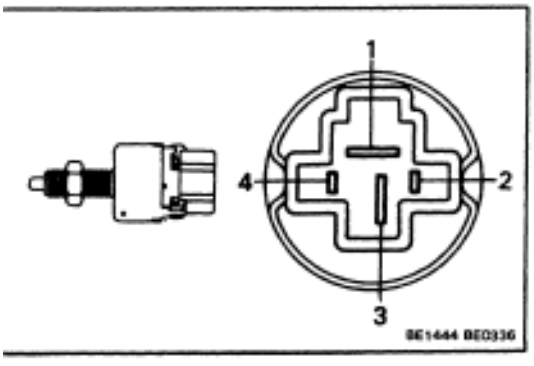
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch position \ Terminal	16	17	5
RESUME/ACCEL	○	○	
OFF			
SET/COAST	○		○

If continuity is not as specified, replace the switch.



Stop Light Switch

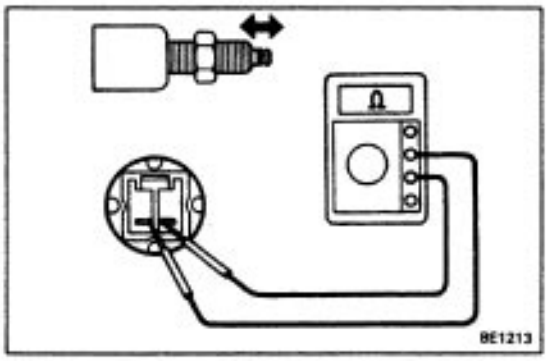
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch position \ Terminal	1	2	3	4
Switch free (Brake pedal depressed)	○		○	
Switch pin pushed (Brake pedal released)		○		○

If continuity is not as specified, replace the switch.



Clutch Switch

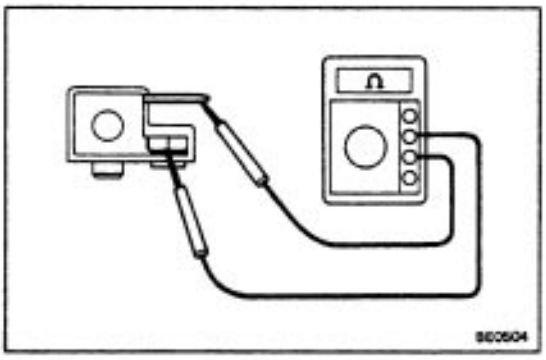
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

(a) Check that there is continuity between terminals with the switch free.
(Clutch pedal depressed)

(b) Check that there is no continuity between terminals with the switch pin pushed.
(Clutch pedal released)

If continuity is not as specified, replace the switch.



Parking Brake Switch

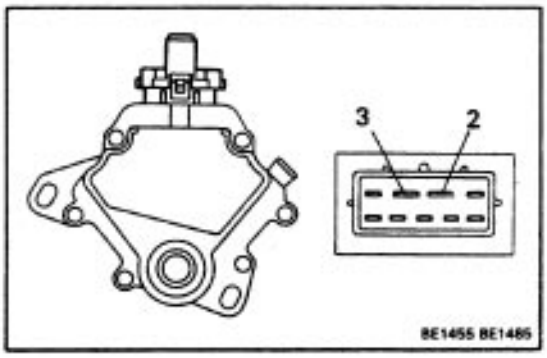
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

(a) Check that there is continuity between terminal and switch set .nu^ with the switch free.
(Parking brake lever pulled up)

(b) Check that there is no cintinuity between terminal and switch set nut with the switch pin pushed.
(Parking brake lever released)

If continuity is not as specified, replace the switch.



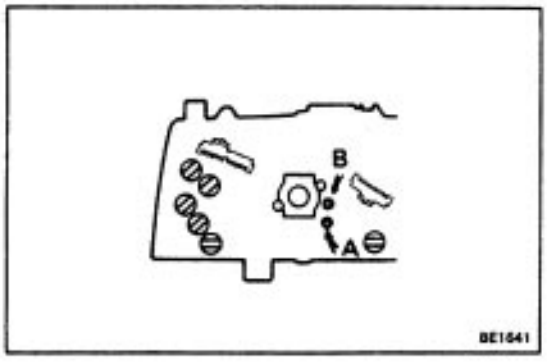
Neutral Start Switch

INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

Check that there is continuity between terminals 2 and 3 with switch position ”P” and ”N” ranges.

If continuity is not as specified, replace the switch.



Speed Sensor

INSPECTION OF SENSOR

INSPECT SENSOR CONTINUITY

Check that there is continuity between terminals A and6 four times per each revolution of the shaft.

If continuity is not as specified, replace the sensor.

Actuator

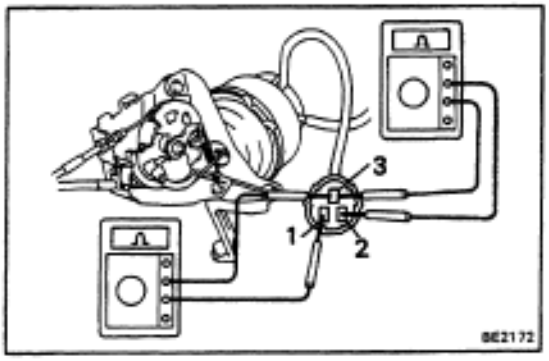
INSPECTION OF ACTUATOR

1. INSPECT CONTROL CABLE FREEPLAY

Measure the cable stroke to where the throttle valve begins to open.

Standard: Approx. within 10 mm (0.39 in.) with a slight amount of freeplay.

If freeplay is not as specified, adjust the control cable freeplay.



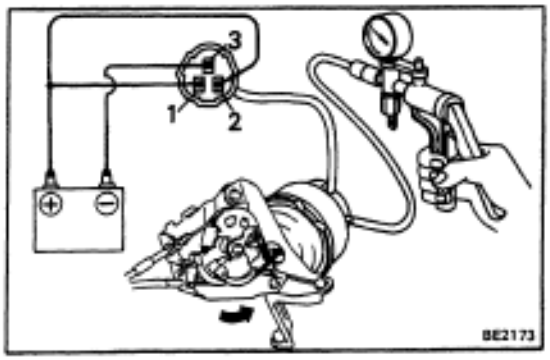
2. INSPECT ACTUATOR RESISTANCE

Measure the resistance value between terminals as follows.

Resistance: 2 – 3 approx. 30Ω

1 – 3 approx. 68 Ω

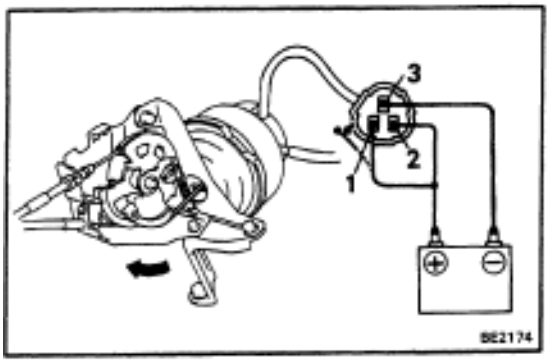
If the resistance value is not as specified, replace the actuator.



3. INSPECT ACTUATOR OPERATION

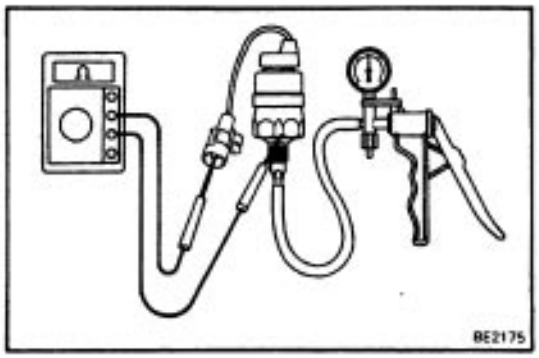
(a) Connect the positive (+) lead from battery to terminals 1, 2 and the negative H lead to terminal 3.

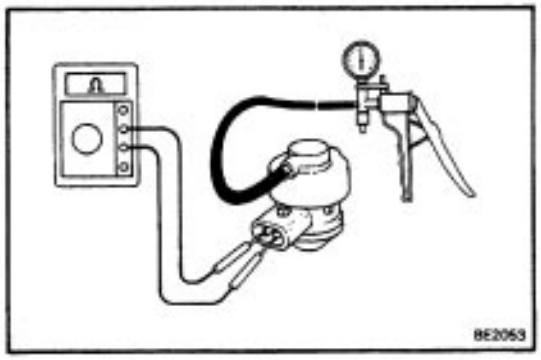
(b) Slowly apply vacuum from 0 300 mmHg (0 –11.81 in.Hg, 0 – 40.0 kPa), and check that the control cable can be pulled smoothly.



(c) Disconnect terminal 1 or 2, check that the control cable returns to its original position and the vacuum returns to 0 mmHg (0 in.Hg, 0 kPa).

If operation is not as specified, replace the actuator.





Vacuum Switch

INSPECTION OF SWITCH

INSPECT SWITCH OPERATION (w/ A.B.S.)

(a) Check that there is no continuity b¿¿ween terminal and body with a vacuum of 170 ±10 mmHg (6.69 t 0.39 in.Hg, 22.7 ±1.3 kPa) or above.

(b) Check that there is continuity between terminal and body with no vacuum.

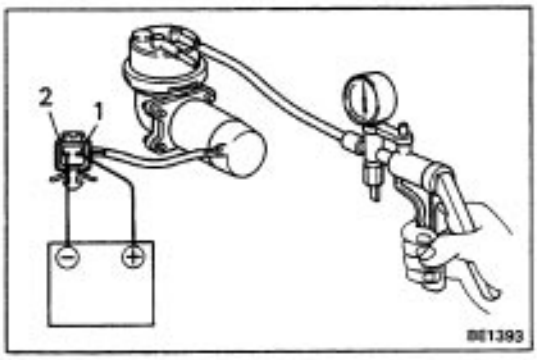
If operation is not as specified, replace the switch.

INSPECT SWITCH OPER¿¿ION (w/o A.B.S.)

(a) Check that there is no continuity between terminals with a vacuum of 170 ±10 mmHg (6.69 ±0.39 in.Hg, 22.7 ±1.3 kPa) or above.

(b) Check that there is continuity between terminals with no vacuum.

If operation is not as specified, replace the switch.



Vacuum Pump

INSPECTION OF PUMP

INSPECT VACUUM PUMP OPERATION

(a) Connect a vacuum gauge to the ACT side of the pump.

(b) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2.

(e) Check that there is the vacuum of 200 mmHg (7.87 in–Hg, 26.7 kPa) or above.

If operation is not as specified, replace the pump.

BRAKE SYSTEM

PRECAUTIONS

1. Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts of the same part number or equivalent.
2. It is very important to keep parts and the area clean when repairing the brake system.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Low or spongy pedal	Linings worn	Replace brake shoes	BR–26
	Brake pads worn	Replace pads	BR–18, 34
	Leak in brake system	Repair leak	
	Master cylinder faulty	Repair or replace master cylinder	
		Bleed brake system	BR–9
		Repair wheel cylinder	
	Air in brake system	Repair cylinder	BR–7
	Wheel cylinder faulty	Repair brake cylinder	BR–26
	Brake cylinder faulty	Repair or replace adjuster	BR–18, 34
	Piston seals worn or damaged		BR–18, 34
	Rear brake automatic adjuster faulty		
Brakes drag	Parking brake out of adjustment	Adjust parking brake	BR–8
	Binding parking brake wire	Repair as necessary	
	Booster push rod out of adjustment	Adjust push rod	BR–1 6
	Tension or return spring faulty	Replace spring	BR–26, 42
	Brake line restricted	Repair as necessary	
	Lining cracked or distorted	Replace shoe	
	Pad cracked or distorted	Replace pad	BR–26, 42
	Wheel cylinder or caliper piston sticking	Repair as necessary	BR–18,34
	Adjuster broken		BR–18, 26
	Master cylinder faulty		34
		Replace adjuster	
		Repair or replace master cylinder	BR–9
Brakes pull	Tires improperly inflated	Inflate tires to proper pressure	
		Check for cause. Replace shoes	
	Oil or grease on shoes or pads	or pads	BR–18, 26
		Replace brake shoes	34
	Brake shoes distorted, linings worn or glazed		BR–26, 42
	Brake pads distorted, worn or glazed		
	Drum or disc out of round	Replace pads	BR–18, 34
	Tension or return spring faulty	Replace drum or disc	BR–18, 26
	Wheel cylinder faulty	Replace spring	34
	Brake cylinder faulty	Repair wheel cylinder	BR–26, 42
	Piston frozen in brake cylinder	Repair cylinder	BR–26
	Brake pad sticking	Repair cylinder	BR–18, 34
		Replace pads	BR–18, 34
			BR–18, 34

PRECAUTIONS

1. Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts of the same part number or equivalent.
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TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Low or spongy pedal	Linings worn	Replace brake shoes	BR–26
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	Leak in brake system	Repair leak	
	Master cylinder faulty	Repair or replace master cylinder	
		Bleed brake system	BR–9
		Repair wheel cylinder	
	Air in brake system	Repair cylinder	BR–7
	Wheel cylinder faulty	Repair brake cylinder	BR–26
	Brake cylinder faulty	Repair or replace adjuster	BR–18, 34
	Piston seals worn or damaged		BR–18, 34
	Rear brake automatic adjuster faulty		
Brakes drag	Parking brake out of adjustment	Adjust parking brake	BR–8
	Binding parking brake wire	Repair as necessary	
	Booster push rod out of adjustment	Adjust push rod	BR–16
	Tension or return spring faulty	Replace spring	BR–26, 42
	Brake line restricted	Repair as necessary	
	Lining cracked or distorted	Replace shoe	
	Pad cracked or distorted	Replace pad	BR–26, 42
	Wheel cylinder or caliper piston sticking	Repair as necessary	BR–18,34
	Adjuster broken		BR–18, 26
	Master cylinder faulty		34
		Replace adjuster	
		Repair or replace master cylinder	BR–9
Brakes pull	Tires improperly inflated	Inflate tires to proper pressure	
		Check for cause. Replace shoes	
	Oil or grease on shoes or pads	or pads	BR–18, 26
		Replace brake shoes	34
	Brake shoes distorted, linings worn or glazed		BR–26, 42
	Brake pads distorted, worn or glazed		
	Drum or disc out of round	Replace pads	BR–18, 34
	Tension or return spring faulty	Replace drum or disc	BR–18, 26
	Wheel cylinder faulty	Replace spring	34
	Brake cylinder faulty	Repair wheel cylinder	BR–26, 42
	Piston frozen in brake cylinder	Repair cylinder	BR–26
	Brake pad sticking	Repair cylinder	BR–18, 34
		Replace pads	BR–18, 34
			BR–18, 34

TROUBLESHOOTING (Cont'd)

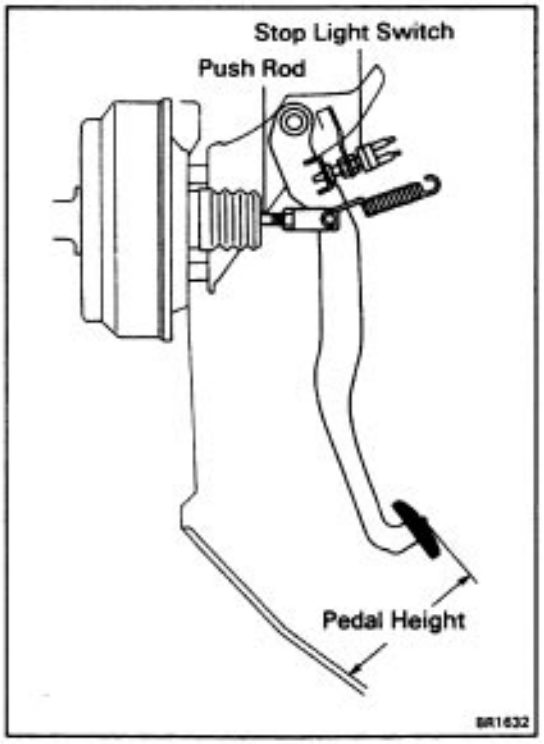
Problem	Possible cause	Remedy	Page
Hard pedal but brakes inefficient	Oil or grease on shoes or pads	Check for cause. Replace shoes or pads	BR–18,26 34
	Brake shoes distorted, linings worn or glazed, drums worn	Replace brake shoes	BR–26,
	Brake pads distorted, worn or glazed	Replace pads	BR–18,34
	Piston frozen in brake cylinder	Repair cylinder	BR–18,34
	Brake booster faulty	Repair booster	BR–15
	Vacuum leaks	Repair as necessary	
	Brake line restricted	Repair as necessary	
Snapping or clicking noise when brakes are applied	(Drum brake)		
	Brake shoes binding at backing plate ledges	Lubricate	BR–26
	Backing plate ledges worn	Replace and lubricate ledges	BR–26
	Loose or missing shoe hold–down spring	Replace shoe hold–down spring	BR–26
	Loose set bolt at backing plate	Tighten	BR–26
	(Disc brake)		
	Loose or missing pad support plate	Replace pad support plate	BR–18,34
	Loose installation bolt	Tighten	BR–18, 34
	Wear on slide bushing	Replace slide bushing	BR–18, 34
Scraping or grinding noise when brakes are applied	Worn brake linings or pads	Replace or refinish drums or rotors if heavily scored	BR–18, 26 34
	Caliper to wheel or rotor interference	Replace as required	BR–18, 34
	Dust cover to rotor or backing plate to drum interference	Correct or replace	BR– 18, 26 34
	Other brake system components faulty	Repair or replace as necessary	
	Tires rubbing against chassis and/or body	Repair as necessary	

TROUBLESHOOTING (Cont'd)

Problem	Possible cause	Remedy	. Page
Squeaking, squealing groaning or chattering noise when brakes are applied Note: Brake friction materials inherently generate noise and heat in order to dissipate eniergy. As a result, occasional squeal is normal and is aggravated by severe environmental conditions such as cold,' heat, wetness, snow, salt, mud, etc. This occasional squeal is not a functional problem and does not indicate any loss of brake effectiveness	Brake drums and linings, rotors and pads worn or scored Dirty, greased, contaminated or glazed linings or pads Improper linings or pads using Maladjustment of brake pedal or booster push rod (Disc brake) Missing or damaged brake pad anti–squeal shim Pad wear and pad wear indicator making contact with the rotor Burred or rusted calipers (Drum brake) Weak damaged or incorrect shoe hold–down springs, loose or damaged shoe hold–down spring pins and springs and grooved backing plate ledges	Inspect, repair or replace Clean or replace Inspect for correct usage or replace Inspect and adjust Replace Replace Clean or deburr –Inspect, repair or replace	BR–18, 26, 34 BR–18, 26 34 BR–6,16 BR–18, 34 BR–18, 34 BR–18, 34 BR–26
Squealing and squeaking noise when brakes are not applied	Maladjustment of brake pedal or booster push rod Poor return of brake booster or master cylinder or wheel cylinder (Disc brake) Rusted or stuck piston Improper positioning of pad in caliper Rotor rubbing against caliper housing Improper installation of disc brake pad support plate Pad wear and pad wear indicator making contact with the rotor (Drum brake) Weak, damaged or incorrect shoe hold–down springs Grooved backing plate ledges Bent or warped backing plate causing interference with drum Improper machining of drum causing interference with backing plate or shoe Other brake system components: Loose or extra parts in brakes Rear drum adjustment too tight causing lining to glaze Worn, damaged or insufficiently lubricated wheel bearings	Inspect and adjust Inspect, repair or replace Inspect and lubricate as necessary Repair or replace Repair or replace Repair or replace Replace Replace Repair or replace Repair or replace Replace drum Inspect, repair or replace as necessary	BR–6, 16 BR–9,15 26 BR– 18, 34 BR–18,34 BR–18, 34 BR–18, 34 BR–18, 34 BR–26, 42 BR–26, 42 BR–26, 42 BR–26, 42

TROUBLESHOOTING (Cont'd)

Problem	Possible cause	Remedy	Page
Groaning, clicking or rattling noise when brakes are not applied	Stones or foreign material trapped inside wheel covers	Remove foreign material	
	Loose wheel nuts	Tighten to correct torque Replace if stud holes are elongated	
	Maladjustment of brake pedal or booster push rod	Inspect and adjust	BR–6,16
	worn, damaged or dry wheel bearings	Inspect and lubricate or replace	
	(Disc brake) Loose or missing anti–rattle spring or pad		
	support plate or rimping on outer pad	Inspect, repair or replace	BR–21, 37
	Failure of shim Wear on slide bushing		
	Loose installation bolt	Inspect , replace if necessary	BR–21, 37
	Poor return of piston	Inspect , replace if necessary	BR–21, 37
	(Drum brake)	Inspect , tighten if necessary	BR–21, 37
	Loose or extra parts	Inspect , repair or replace	BR–21, 37
		Inspect and repair	BR–26, 42



CHECKS AND ADJUSTMENTS

CHECK AND ADJUSTMENT OF BRAKE PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT

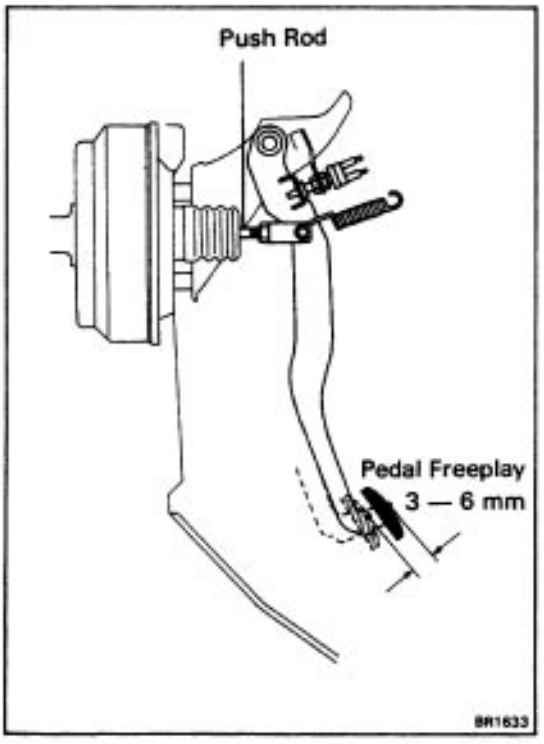
Pedal height from asphalt sheet:

177.5 – 187.5 mm (6.988 – 7.382 in.)

If incorrect, adjust the pedal height.

2. IF NECESSARY, ADJUST PEDAL HEIGHT

(a) If necessary, remove the instrument lower finish panel and air duct.
(b) Loosen the stop light switch lock nut.
(e) Sufficiently loosen the stop light switch.
(d) Loosen the push rod lock nut.
(e) Adjust the pedal height by turning the pedal push rod.
(f) Return the stop light switch until it lightly contacts the pedal stopper.
(g) Tighten the two lock nuts.
(h) Check that the stop lights light when the brake pedal depressed.
(i) After adjusting the pedal height, check and adjust the pedal freeplay.



3. CHECK THAT PEDAL FREEPLAY IS CORRECT

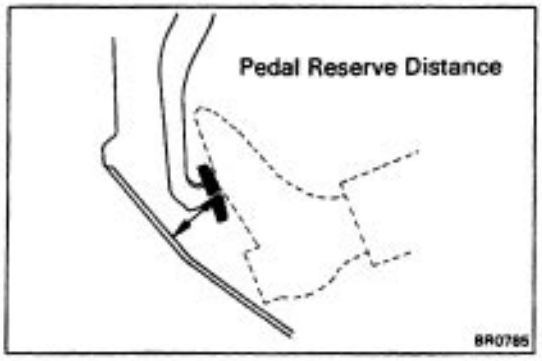
(a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.
(b) Push in the pedal until the beginning of resistance is felt. Measure the distance, as shown.

Pedal freeplay: 3 –6 mm (0.12 – 0.24 in.)

HINT: The freeplay to the first resistance is due to the play between the clevis and pin. And it is 1 3 mm (0.04–0.12 in.) on the pedal.

4. IF NECESSARY, ADJUST PEDAL FREEPLAY

(a) If incorrect, adjust the pedal freeplay by turning the pedal push rod.
(b) Start the engine and confirm that pedal freepiay exists.
(e) After adjusting the pedal freeplay, check the pedal height.
(d) Install the air duct and instrument lower finish panel.

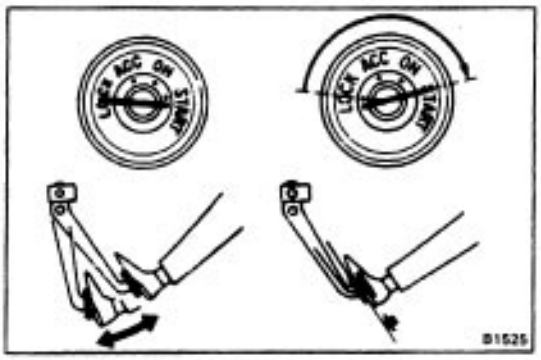


5. CHECK THAT PEDAL RESERVE DISTANCE IS CORRECT

Release the parking brake. With engine running, depress the pedal and measure the pedal reserve distance, as shown.

Pedal reserve distance from asphalt sheet at 50 kg (110.2 1b): More than 85 mm, (3.35 in.)

If incorrect, troubleshoot the brake system.



OPERATIONAL TEST OF BRAKE BOOSTER

HINT: If there is leakage or lack of vacuum, repair before testing. If available, use a brake booster tester to check the booster operating condition.

1. OPERATING CHECK

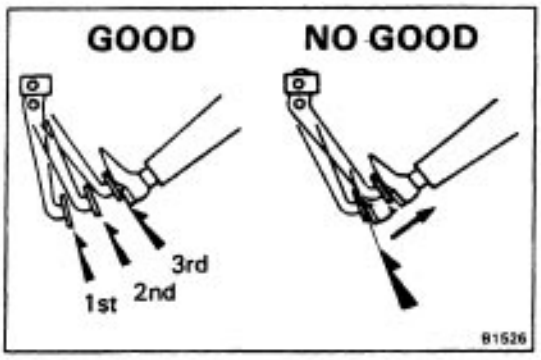
(a) Depress the brake pedal several times with the engine stopped, and check that is no change in the pedal reserve distance.

(b) Depress the brake pedal and start the engine. If the pedal goes down slightly, operation is normal.

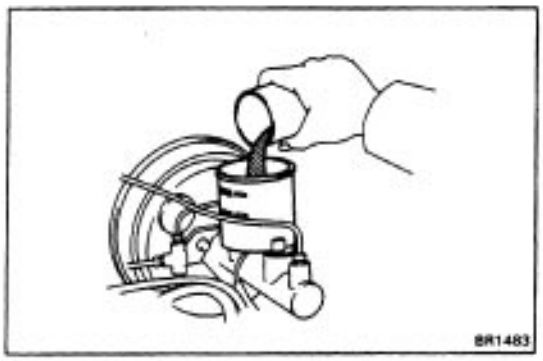
2. AIR TIGHTNESS CHECK

(a) Start the engine and stop it after one or two minutes. Depress the brake pedal several times slowly. If the pedal goes down furtherest the first time, but gradually rises after the second or third time, the booster is air tight.

(b) Depress the brake pedal while the engine is running, and stop it with the pedal depressed. If there is no change in pedal reserve travel after holding the pedal for thirty seconds, the booster is air tight.



BLEEDING OF BRAKE SYSTEM

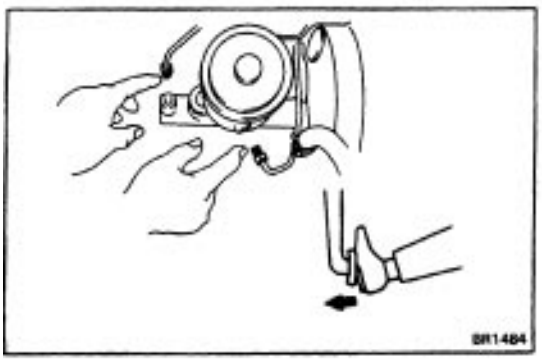


HINT: If any work is done on the brake system or if air is suspected in the brake lines, bleed the system of air.

NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. FILL BRAKE RESERVOIR WITH BRAKE FLUID

Check the fluid level in the reservoir. If necessary, add brake fluid.

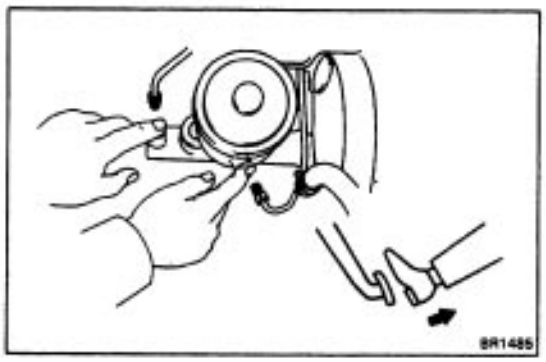


2. BLEED MASTER CYLINDER

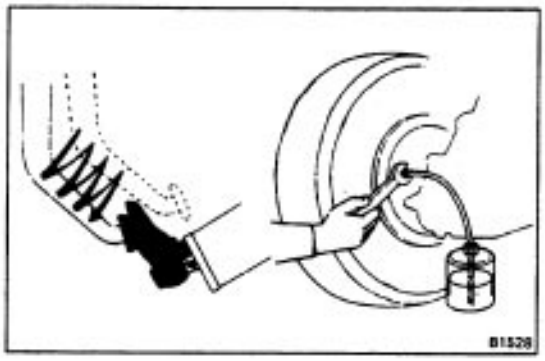
HINT: If the master cylinder was disassembled or if the reservoir becomes empty, bleed the air from the master cylinder.

(a) Disconnect the brake tubes from the master cylinder.

(b) Depress the brake pedal and hold it.



(c) Block off the outer holes with your fingers, and release the brake pedal.
(d) Repeat (b) and (c) three or four times.



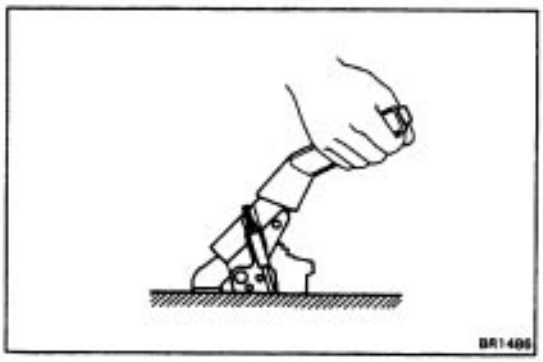
3. BEGIN BLEEDING AIR FROM BRAKE OR WHEEL CYLINDER WITH LONGEST HYDRAULIC LINE

(a) Connect the vinyl tube to the brake or wheel cylinder bleeder plug, and insert the other end of tube in a halffull container of brake fluid.
(b) Slowly pump the brake pedal several times.
(c) While having an assistant press on the pedal, loosen the bleeder plug until fluid starts to runout. Then close the bleeder plug.
(d) Repeat (b) and (c) until there are no more air bubbles in the fluid.
(e) Tighten the bleeder plug.

Bleeder plug tightening torque:
85 kg–cm (74 in.–!b, 8.3 N–m)

4. REPEAT PROCEDURE FOR EACH WHEEL

CHECK AND ADJUSTMENT OF PARKING BRAKE

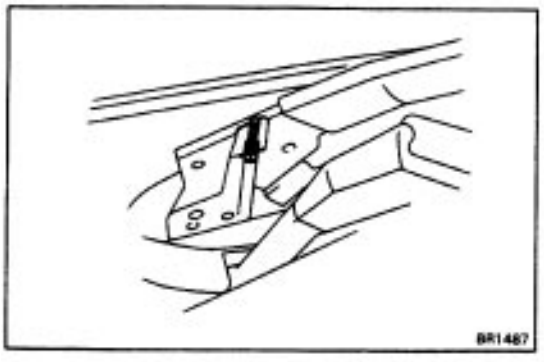


1. CHECK THAT PARKING BRAKE LEVER TRAVEL IS CORRECT

Pull the parking brake lever all the way up, and count the number of clicks.

Parking brake levertravel at 20 kg (44.1 lb, 196 N):
5 – 8 clicks

If incorrect, adjust the parking brake.



2. IF NECESSARY, ADJUST PARKING BRAKE LEVER TRAVEL

HINT: Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted.

For shoe clearance adjustment, see steps 8 and 9 on page BR–32 or step 8 on page 48.

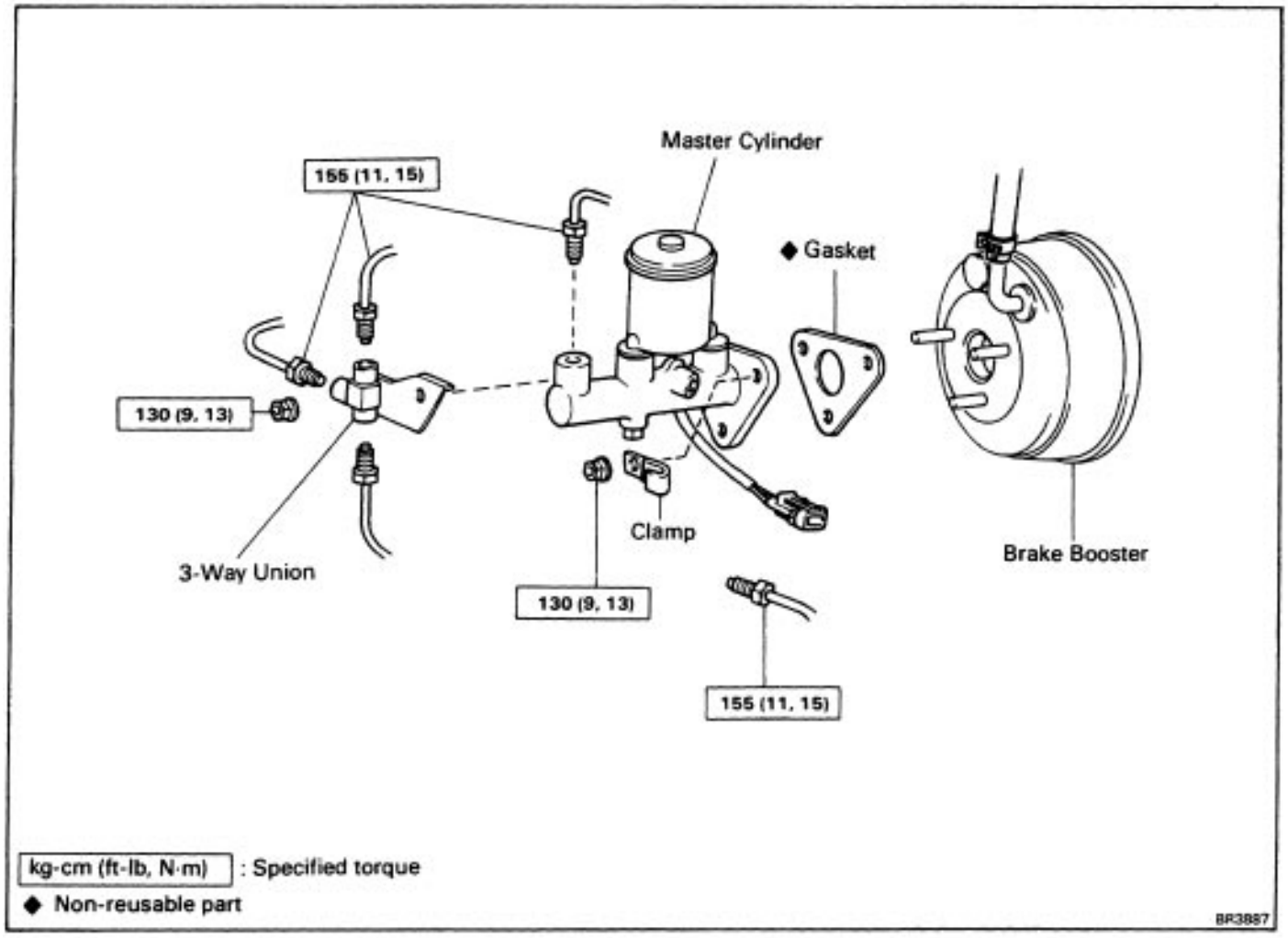
(a) Remove the console box.
(b) Loosen the lock nut and turn the adjusting nut until the lever travel is correct.
(e) Tighten the lock nut.

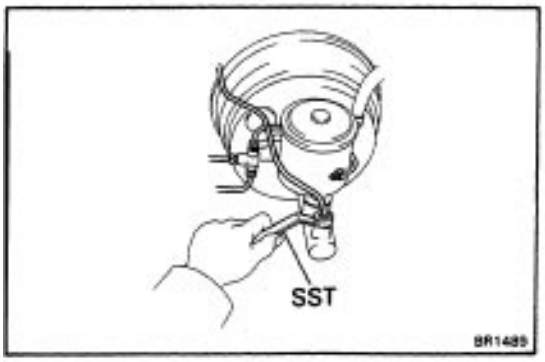
Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)

(d) Install the console box.

MASTER CYLINDER

REMOVAL OF MASTER CYLINDER





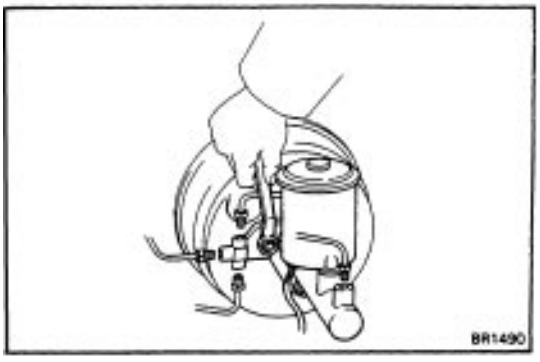
1. DISCONNECT LEVEL WARNING SWITCH CONNECTOR

2. TAKE OUT FLUID WITH SYRINGE

NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.

3. DISCONNECT BRAKE TUBES

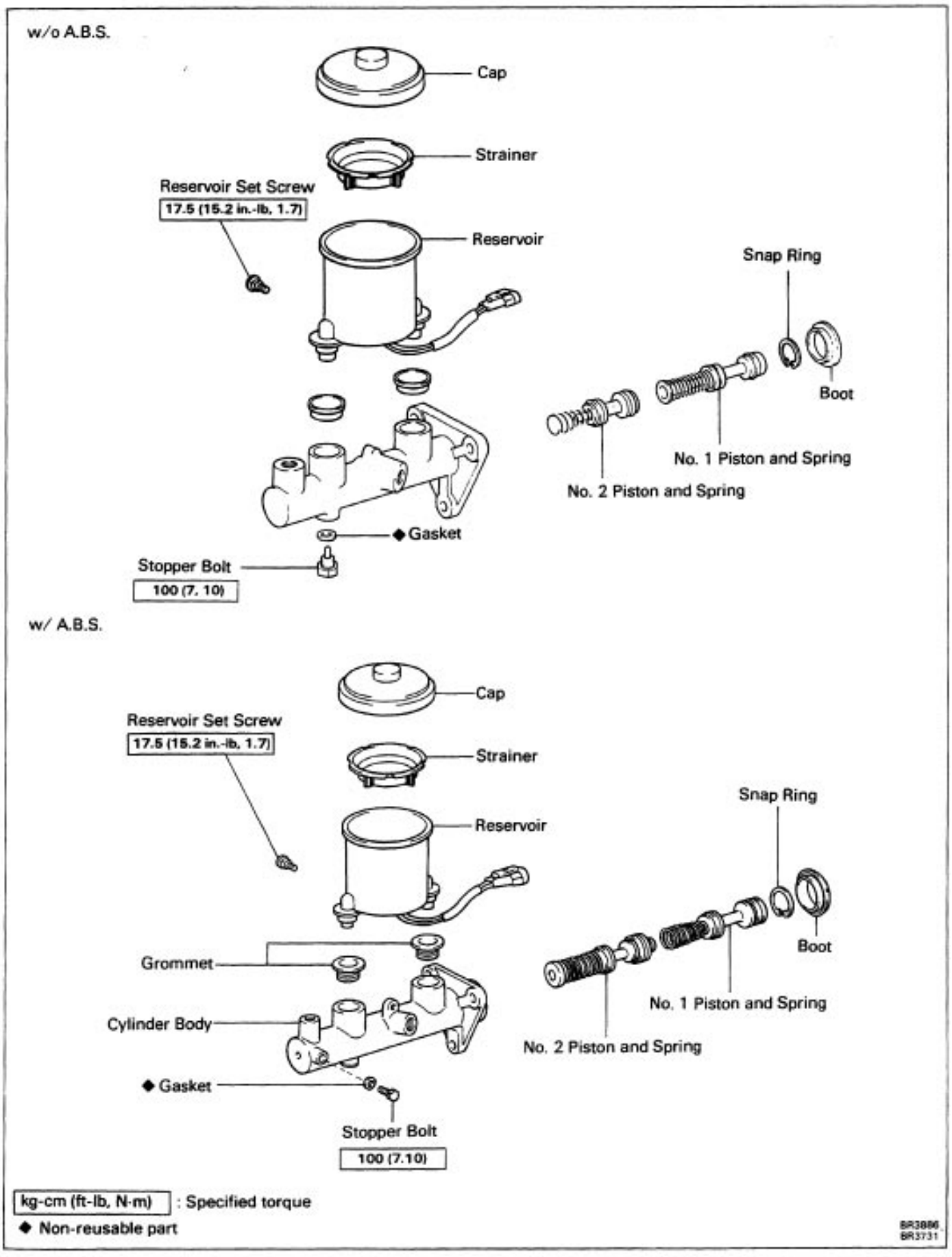
Using SST, disconnect brake tubes from the master cylinder.
SST 09751–36011

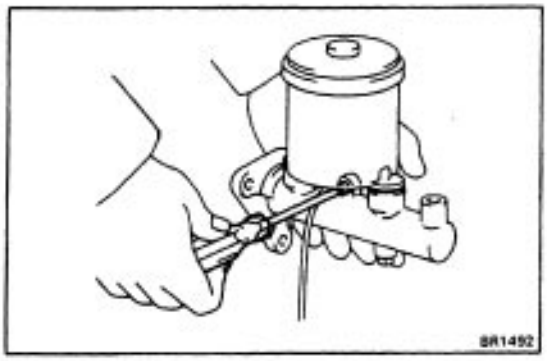


4. REMOVE MASTER CYLINDER

(a) Remove the three nuts and 3–way union.
(b) Remove the clamp.
(c) Remove the master cylinder from the brake booster and remove the gasket.

COMPONENTS


w/o A.B.S.
Cap
Strainer
Reservoir Set Screw
17.5 (15.2 in.-lb, 1.7)
Reservoir
Snap Ring
Boot
No. 1 Piston and Spring
No. 2 Piston and Spring
◆ Gasket
Stopper Bolt
100 (7, 10)
w/ A.B.S.
Cap
Reservoir Set Screw
17.5 (15.2 in.-lb, 1.7)
Strainer
Reservoir
Snap Ring
Boot
Grommet
Cylinder Body
No. 1 Piston and Spring
No. 2 Piston and Spring
◆ Gasket
Stopper Bolt
100 (7.10)
kg-cm (ft-lb, N·m) : Specified torque
◆ Non-reusable part
BR3886
BR3731



DISASSEMBLY OF MASTER CYLINDER

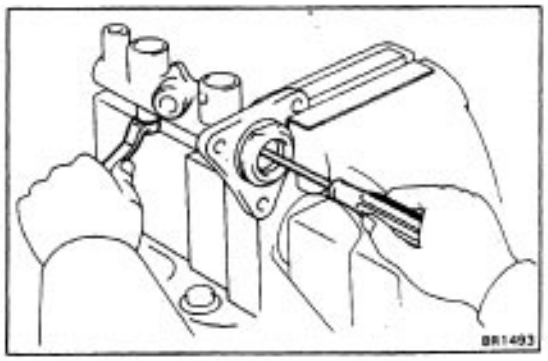
1. REMOVE RESERVOIR

(a) Remove the set screw and pull out the reservoir.

(b) Remove the cap and strainer from the reservoir.

2. REMOVE TWO GROMMETS

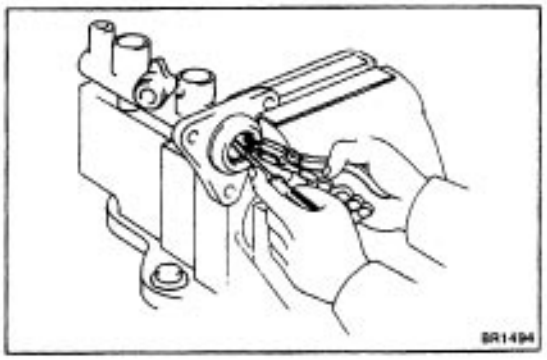
3. PLACE CYLINDER IN VISE



4. REMOVE PISTON STOPPER BOLT

Using a screwdriver, push the pistons in all the way and remove the piston stopper bolt and gasket.

HINT: Tape the screwdriver tip before use.

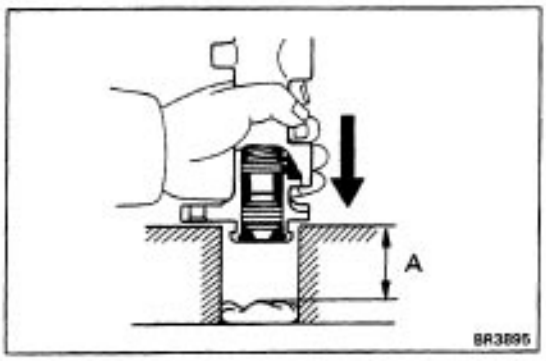


5. REMOVE TWO PISTONS AND SPRINGS

(a) Push in the piston with a screwdriver and remove the snap ring with snap ring pliers.

(b) Remove the No. 1 piston and spring hand, pulling straight out, not at an angle.

NOTICE: If pulled out at an angle, there is possibility of damaging the cylinder bore.



(c) Place a rag and two wooden blocks on the work table and lightly tap the cylinder flange against the blocks until the piston drops out of the cylinder.

HINT: Make sure the distance (A) from the rag to the top of the blocks is at least 100 mm (3.94 in.)

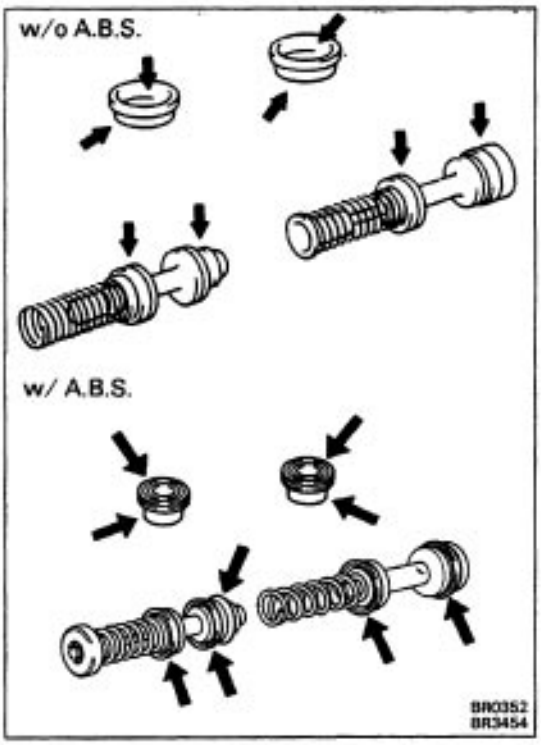
INSPECTION OF MASTER CYLINDER COMPONENTS

HINT: Clean the disassembled parts with compressed air.

1. INSPECT CYLINDER BORE FOR RUST OR SCORING

2. INSPECT CYLINDER FOR WEAR OR DAMAGE

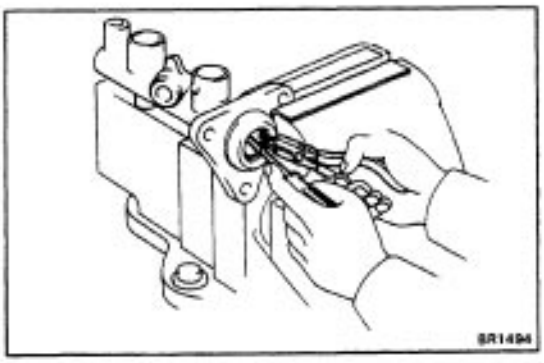
If necessary, clean or replace the cylinder.



ASSEMBLY OF MASTER CYLINDER

(See page BR–10)

1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO RUBBER PARTS INDICATED BY ARROWS



2. INSTALL TWO SPRINGS AND PISTONS

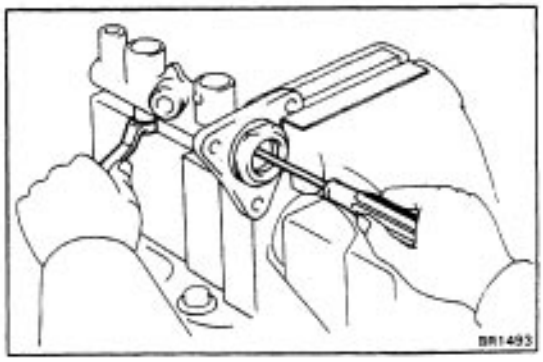
CAUTION: Be careful not to damage the rubber lips on the pistons.

(a) Insert the two springs and pistons straight in, not at an angle.

NOTICE: If insert at an angle, there is possibility of damaging the cylinder bore.

(b) Push in the piston with a screwdriver and install the snap ring with snap ring pliers.

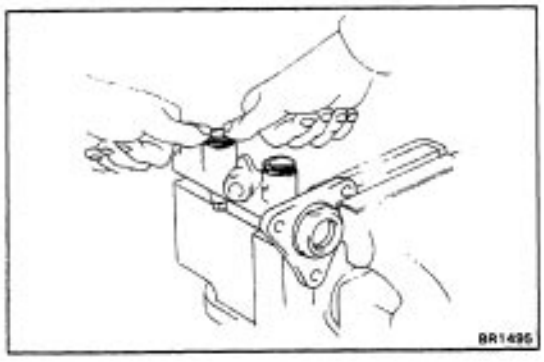
HINT: Tape the screwdriver tip before use.



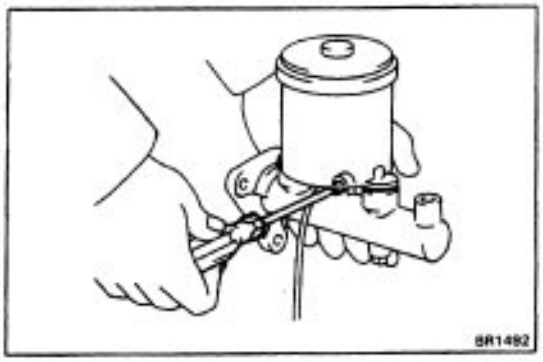
3. INSTALL PISTON STOPPER BOLT

Using a screwdriver, push the piston in all the way and install the piston stopper bolt over the gasket. Torque the bolt.

Torque: 100 kg–cm (7 ft–lb, 10 N–m)



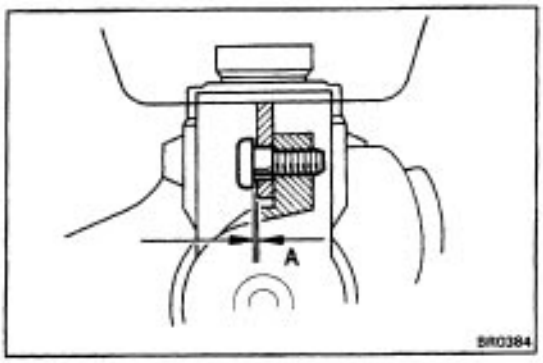
4. INSTALL TWO GROMMETS



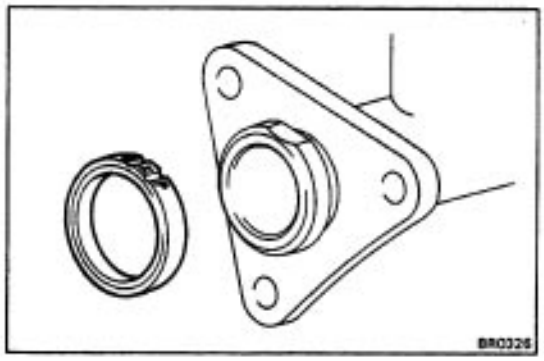
5. INSTALL RESERVOIR

(a) Install the cap and strainer to the reservoir.
(b) Push the reservoir onto the cylinder.
(c) Install the set screw while pushing on the reservoir.

Torque: 17.5 kg–cm (15.2 in.–lb, 1.7 N–m)



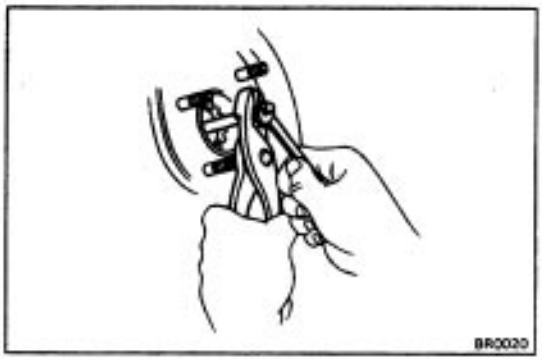
NOTICE: Because the master cylinder and reservoir tank union is a grommet type, the set screw is designed to not separate the reservoir from the cylinder and will not tighten down the reservoir. Therefore, there is a clearance at point A. Do not insert washers or an equivalent when tightening.



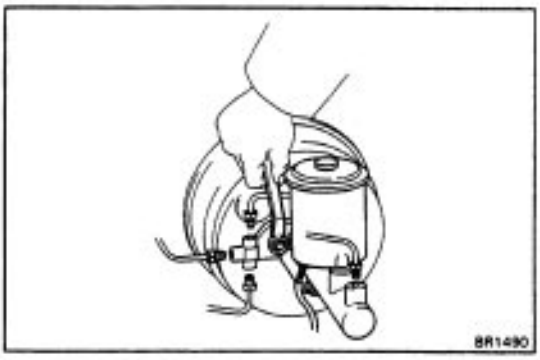
INSTALLATION OF MASTER CYLINDER

(See page BR–9)

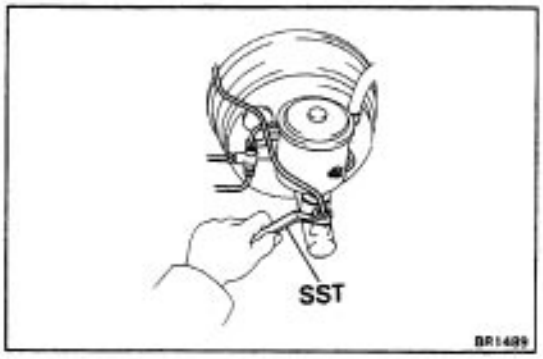
1. **CLEAN OUT GROOVE ON LOWER INSTALLATION SURFACE OF MASTER CYLINDER**
2. **CONFIRM THAT ”UP” MARK ON MASTER CYLINDER BOOT IS IN CORRECT POSITION**



3. **ADJUST LENGTH OF BRAKE BOOSTER PUSH ROD BEFORE INSTALLING MASTER CYLINDER**
   (See page BR–16)



4. **INSTALL MASTER CYLINDER**
   Set the new gasket and install the master cylinder, clamp and 3–way union on the brake booster with three nuts.
   Torque: 130 kg–cm (9 ft–lb, 13 N¿ m)

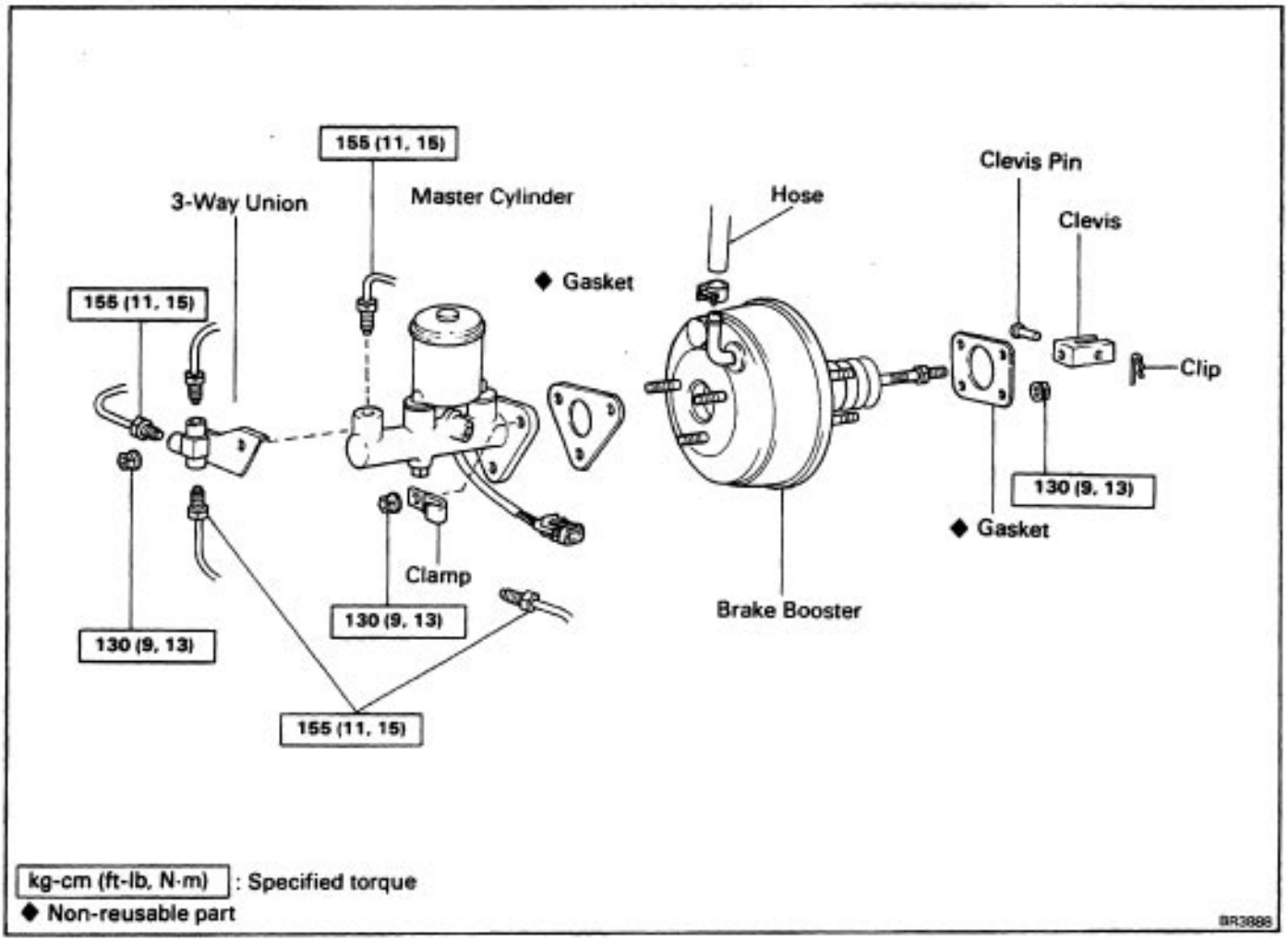


5. **CONNECT BRAKE TUBES**
   Using SST, connect. the brake tubes to the master cylinder.
   Torque the union nuts.
   SST 09751–36011
   Torque: 155 kg–cm (11 ft–ib, 15 N – m)

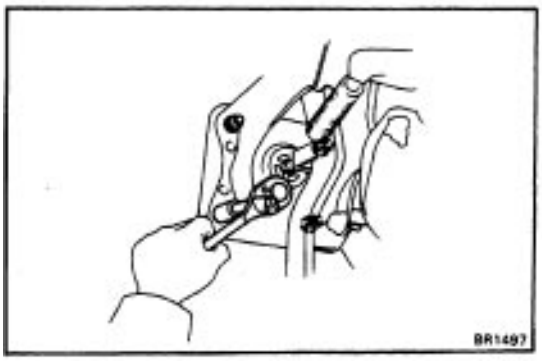
6. **CONNECT LEVEL WARNING SWITCH CONNECTOR**
7. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM**
   (See page BR–7)
8. **CHECK FOR FLUID LEAKAGE**
9. **CHECK AND ADJUST BRAKE PEDAL**
   (See page BR–6)

BRAKE BOOSTER

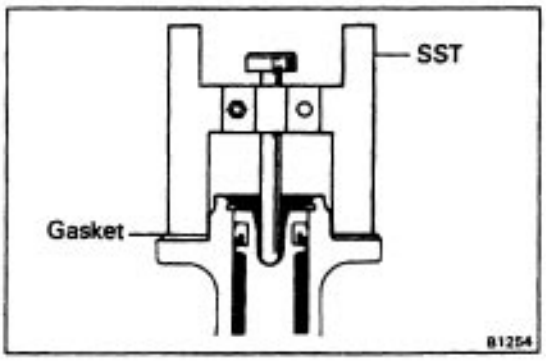
REMOVAL OF BRAKE BOOSTER



1. **REMOVE MASTER¿CYLINDER**
   (See page BR–9)
2. **DISCONNECT VACUUM HOSE FROM BRAKE BOOSTER**
3. **REMOVE PEDAL RETURN SPRING**
4. **REMOVE CLIP AND CLEVIS PIN**



5. **REMOVE BRAKE BOOSTER, GASKET AND CLEVIS**
   (a) Remove the four nuts and clevis.
   (b) Pull out the brake booster and gasket.



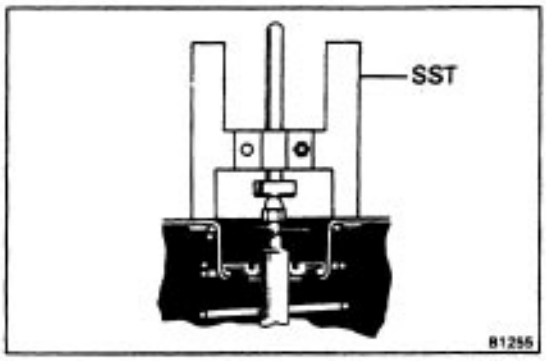
INSTALLATION OF BRAKE BOOSTER

(See page BR–15)

1. ADJUST LENGTH OF BOOSTER PUSH ROD

(a) Set the SST on the master cylinder with the gasket, and then lower the pin until its slightly touches the piston.

SST 09737–00010

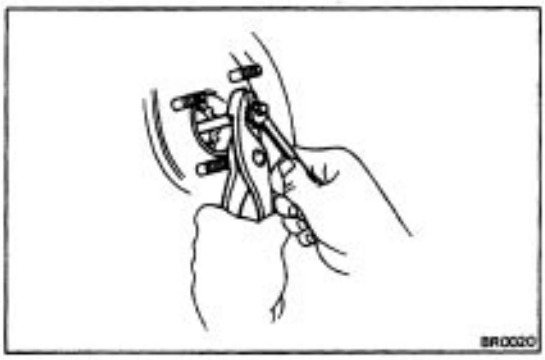


(b) Turn the SST upside down and set it on the booster.

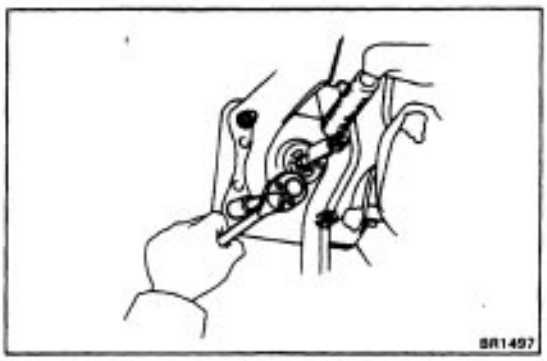
SST 49737–00010

(c) Measure the clearance between the booster push rod and pin head (SST).

Clearance: 0 mm (0 in.)



(d) Adjust the booster push rod length until the push rod lightly touches the pin head.



2. INSTALL BRAKE BOOSTER, GASKET AND CLEVIS

(a) Install the clevis lock nut and clevis to the brake booster.

(b) Install the brake booster and gasket.

(c) Install and torque the booster mounting nuts.

Torque: 130 kg–cm (9 ft–lb, 13 N¿ m)

3. CONNECT CLEVIS TO BRAKE PEDAL

Insert the clevis pin into the clevis and brake pedal, and install the clip to the clevis pin.

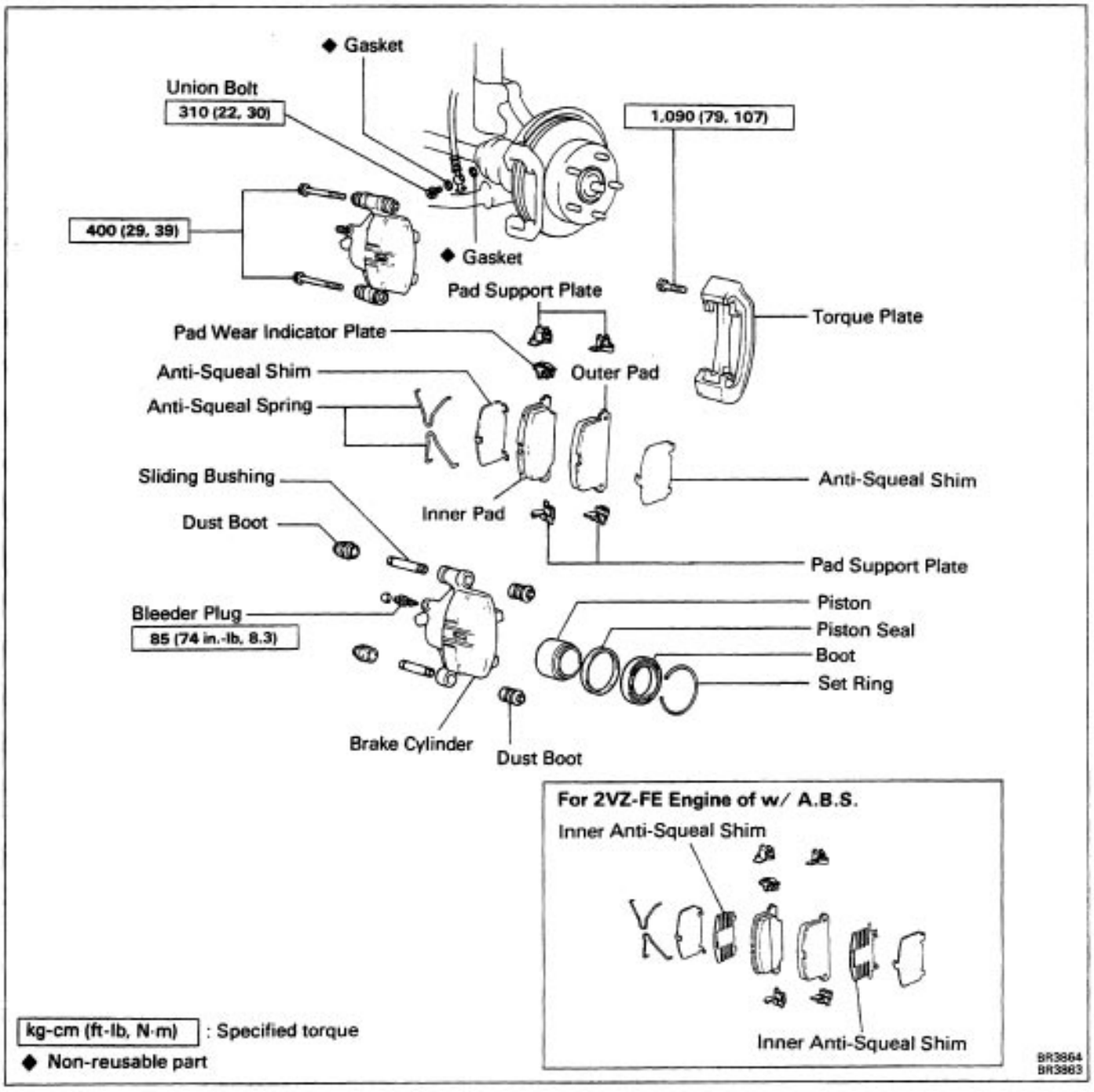
4. INSTALL PEDAL RETURN SPRING

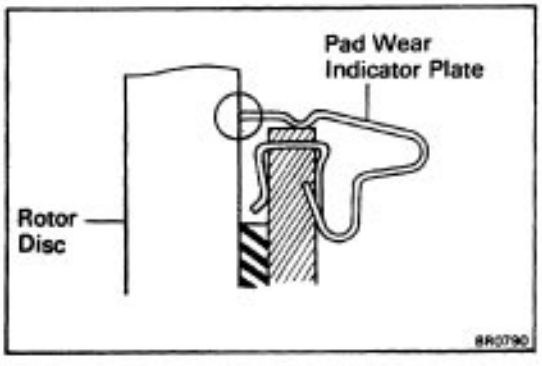
5. INSTALL INSTRUMENT LOWER FINISH PANEL

6. **INSTALL MASTER CYLINDER**
   (See page BR–14)
7. **CONNECT VACUUM HOSE TO BRAKE BOOSTER**
8. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM**
   (See page BR–7)
9. **CHECK FOR FLUID LEAKAGE**
10. **CHECK AND ADJUST BRAKE PEDAL**
    (See page BR–6)
    Check and adjust the brake pedal, then tighten the clevis lock nut.
    Torque: 260 kg–cm (19 ft–fb, 25 N–m)
11. **PERFORM OPERATIONAL CHECK**
    (See page BR–7)

FRONT BRAKE

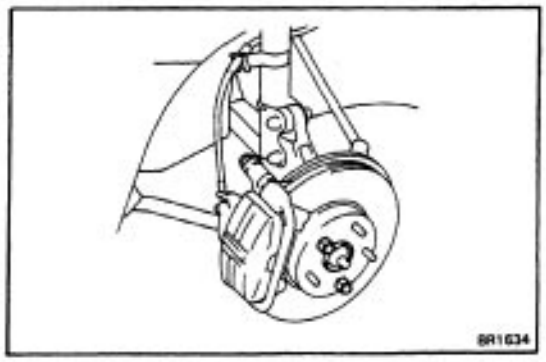
COMPONENTS





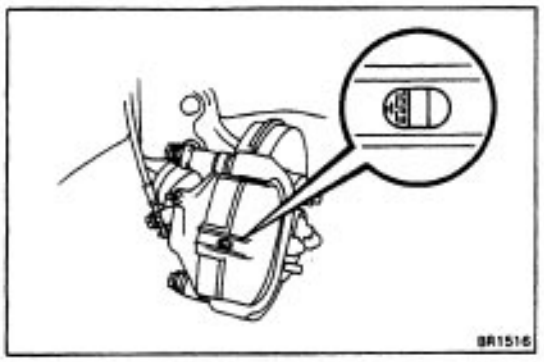
REPLACEMENT OF BRAKE PADS

HINT: If a squealing noise occurs from the front brakes while driving, check the pad wear indicator. If there are traces of the indicator contacting the rotor disc, the brake pad should be replaced.



1. REMOVE FRONT WHEEL

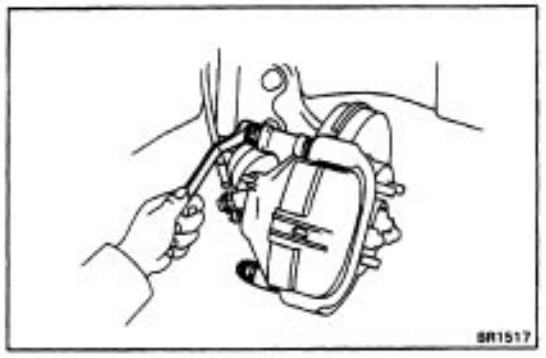
Remove the wheel and temporarily fasten the rotor disc with the hub nuts.



2. INSPECT PAD LINING THICKNESS

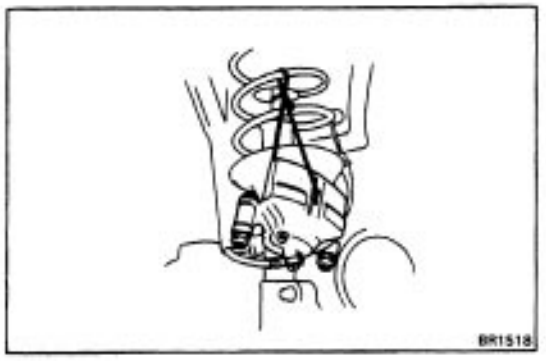
Check the pad thickness through the cylinder inspection hole and replace pads if not within specification.

Minimum thickness: 1.0 mm (0.039 in.)



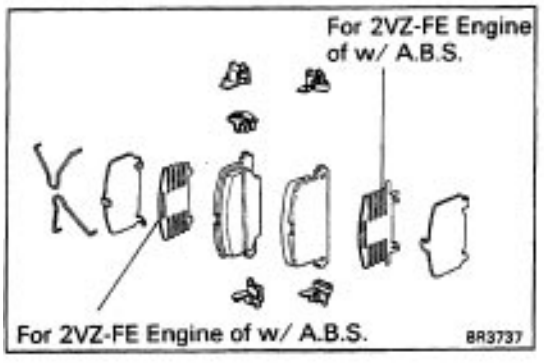
3. REMOVE CYLINDER FROM TORQUE PLATE

(a) Remove two installation bolts from the torque plate.



(b) Remove the brake cylinder and suspend it so the hose is not stretched.

HINT: Do not disconnect the brake hose.

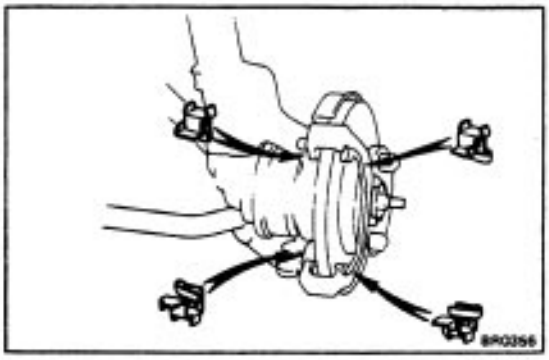


4. REMOVE FOLLOWING PARTS:

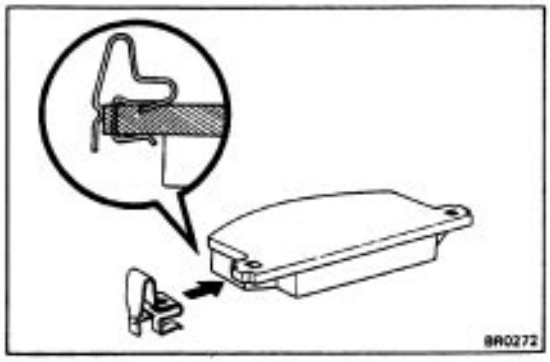
(a) Two anti–squeal springs.
(b) Two brake pads
(c) Two or four anti–squeal shims
(d) Two pad wear indicator plates
(e) Four pad support plates

5. CHECK ROTOR DISC THICKNESS
(See step 2 on page BR–23)

6. CHECK ROTOR DISC RUNOUT
(See step 3 on page BR–23)



7. INSTALL PAD SUPPORT PLATES



8. INSTALL NEW PADS

(a) Install new pad wear indicator plate to inner pad.
NINT: Be sure the arrow on the pad wear indicator plate is pointing i n the direction of the disc rotation.

(b) (Except 2VZ–FE Engine of w/ A.B.S.)
Install the one anti–squeal shim to the each pad.

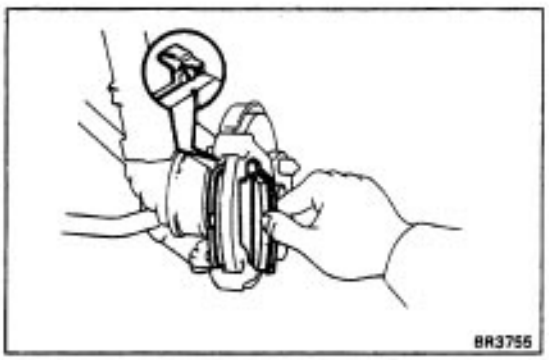
(c) (For 2VZ–FE Engine of w/ A.B.S.)
Install the two anti–squeal shims to the each pad.

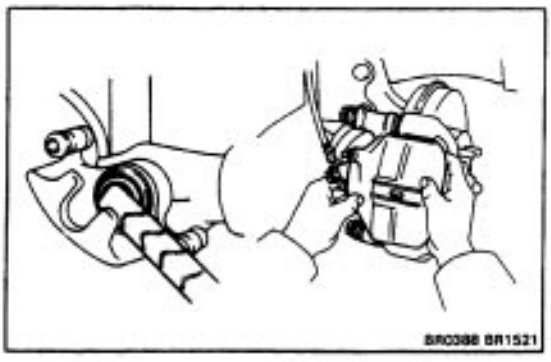
HINT: Apply disc brake grease to both side of the inner anti–squeal shim of the outside pad.

(d) Install the pads onto each support plate.

NOTICE: Do not allow oil or grease to get on the rubbing face.

(e) Install the two anti–squeal springs.





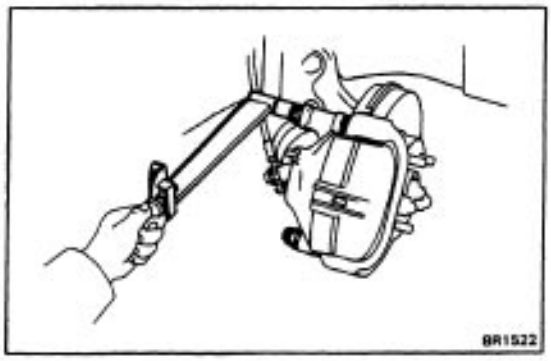
9. INSTALL CYLINDER

(a) Draw out a small amount of brake fluid from the reservoir.

(b) Press in piston with a hammer handle or an equivalent.

HINT: Always change the pad on one wheel at a time as there is a possibility of the opposite piston flying out.

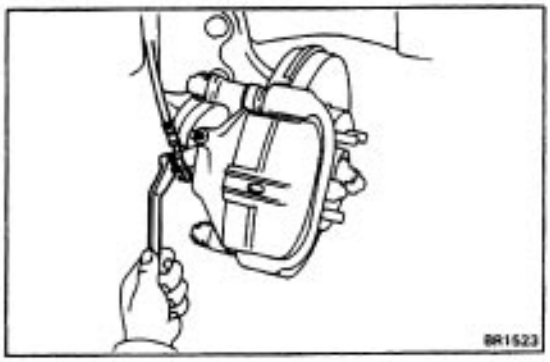
(c) Insert the brake cylinder carefully –so the boot is not wedged.



(d) Install and torque two installation bolts.
Torque: 400 kg–cm (29 ft–lb, 39 N¿m)

10. INSTALL FRONT WHEEL

11. CHECK THAT FLUID LEVEL IS MAX LINE

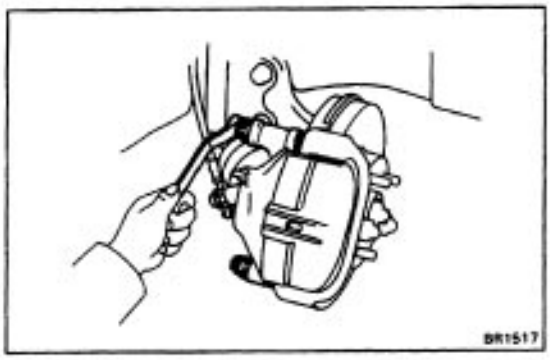


REMOVAL OF CYLINDER

(See page BR–18)

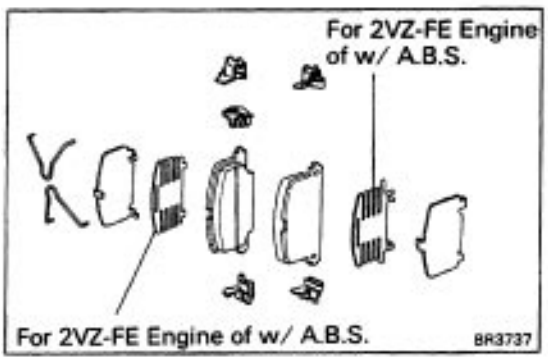
1. DISCONNECT BRAKE LINE

Remove the union bolt and disconnect the brake line. Use a container to catch the brake fluid.



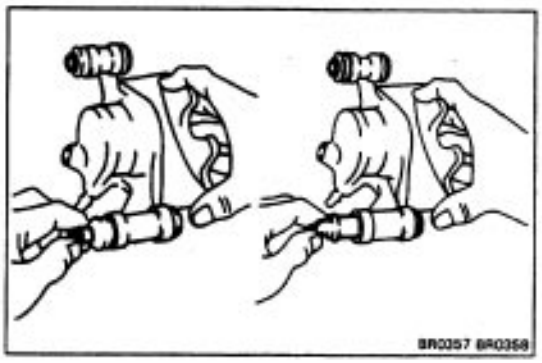
2. REMOVE CYLINDER FROM TORQUE PLATE

Remove the two installation bolts and cylinder.



3. REMOVE PADS

(See step 4 on page BR–19)



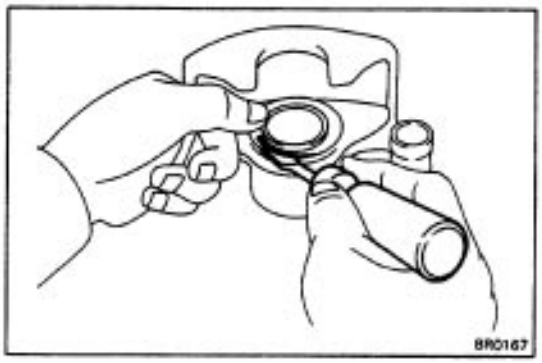
DISASSEMBLY OF CYLINDER

(See page BR–18)

1. REMOVE FOLLOWING PARTS:

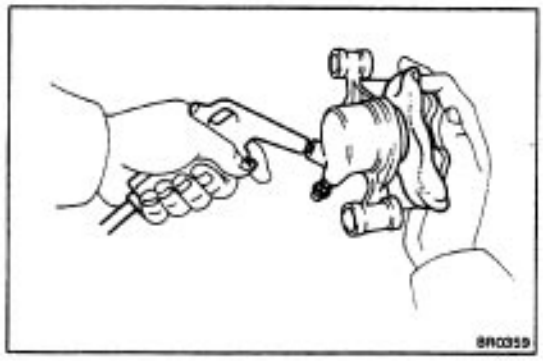
(a) Two sliding bushings

(b) Four dust boots



2. REMOVE CYLINDER BOOT SET RING AND CYLINDER BOOT

Using a screwdriver, remove the cylinder boot set ring and cylinder boot.

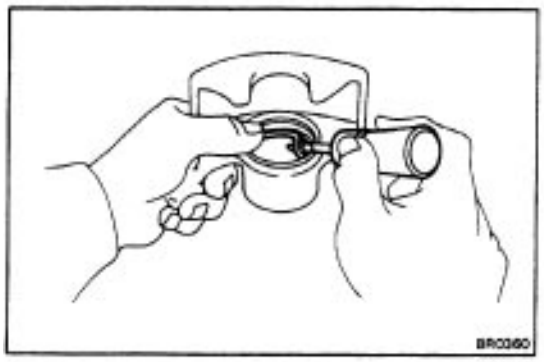


3. REMOVE PISTON FROM CYLINDER

(a) Put a piece of cloth or an equivalent between the piston and cylinder.

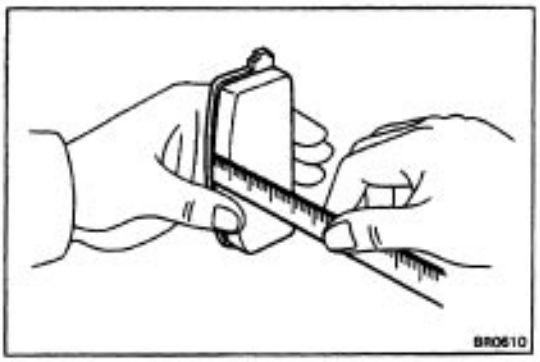
(b) Use compressed air to remove the piston from the cylinder.

CAUTION: Do not place your fingers in front of the piston when using compressed air.



4. REMOVE PISTON SEAL FROM BRAKE CYLINDER

Using a screwdriver, remove the piston seal.



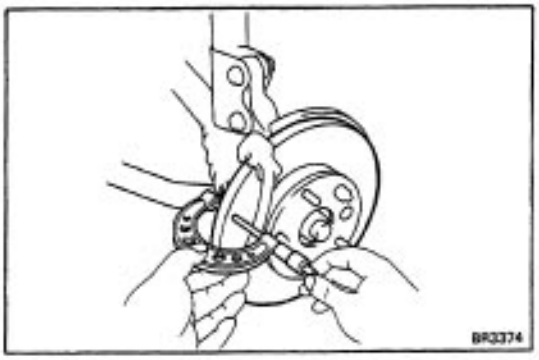
INSPECTION AND REPAIR OF FRONT BRAKE COMPONENTS

1. MEASURE PAD LINING THICKNESS

Standard thickness: 10.0 mm (0.394 in.)

Minimum thickness: 1.0 mm (0.039 in.)

Replace the pad if the thickness is less than the minimum or if it shows sign of uneven wear.

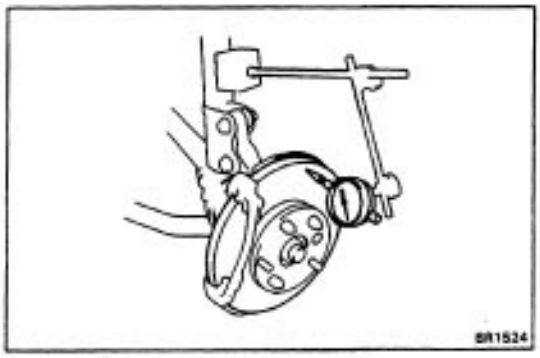


2. MEASURE ROTOR DISC THICKNESS

Standard thickness: 25.0 mm (4.984 in.)

Minimum thickness: 24.0 mm (0.945 in.)

If the disc is scored or worn, or if thickness is less than minimum, repair or replace the disc.



3. MEASURE ROTOR DISC RUNOUT

HINT: Before measuring the runout, confirm that the front hub bearing play is within specification.

Measure the rotor disc runout at 10 mm (0.39 in.) from the outer edge of the rotor disc.

Maximum disc runout: 4.07 mm (0.0028 in.)

If the runout is greater than the maximum, inspect and adjust it following the procedure below:

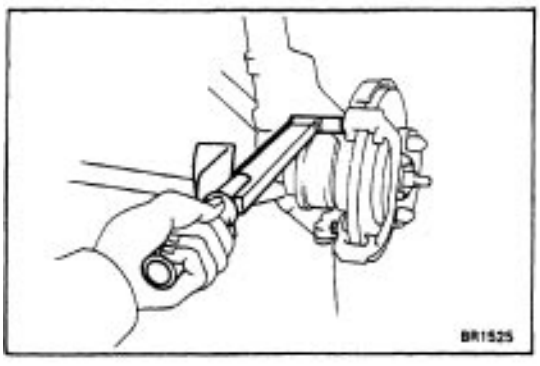
Then replace the disc if necessary.

(a) Remove the torque plate from the knuckle.

(b) Remove the hub nuts of the temporarily installed disc and pull off the rotor disc.

(c) Check that the hub bearing play is within specification, and replace the bearing if not within specification. (See page FA–7)

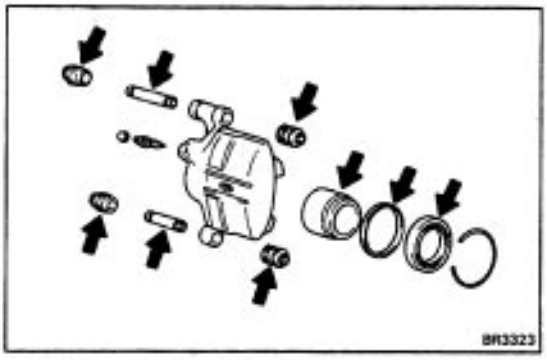
(d) Install the rotor disc and measure the disc runout, then shift the rotor disc one fifth of a turn and measure the disc runout. Similarly measure the runout at each position, and select the position where the runout is minimum.



(e) In this position, if the runout is within specification, install the torque plate and torque the mounting bolts.

Torque: 1,090 kg–cm (79 ft–lb, 107 N–m)

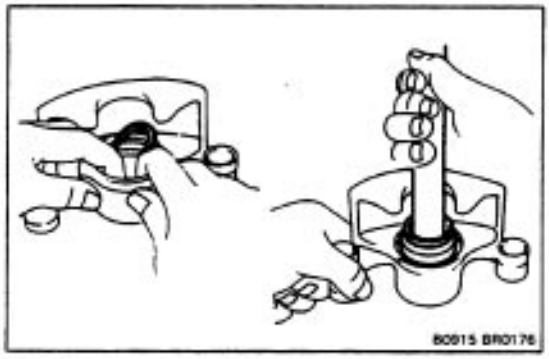
(f) If not within specification, replace the rotor disc, and repeat (d) and (e).



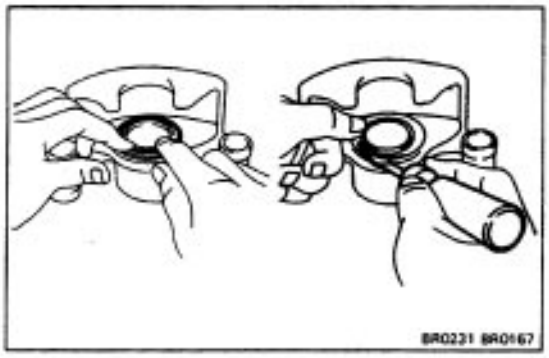
ASSEMBLY OF CYLINDER

(See page BR–18)

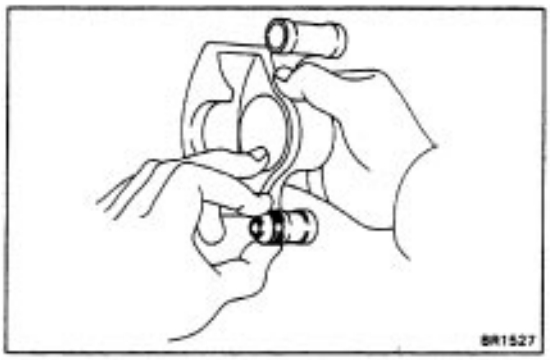
1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED WITH ARROWS



2. INSTALL PISTON SEAL AND PISTON IN CYLINDER

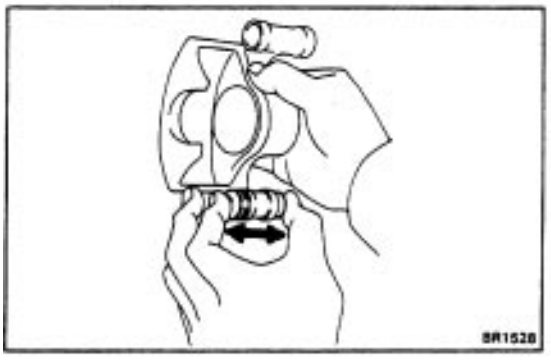


3. INSTALL CYLINDER BOOT AND SET RING IN CYLINDER

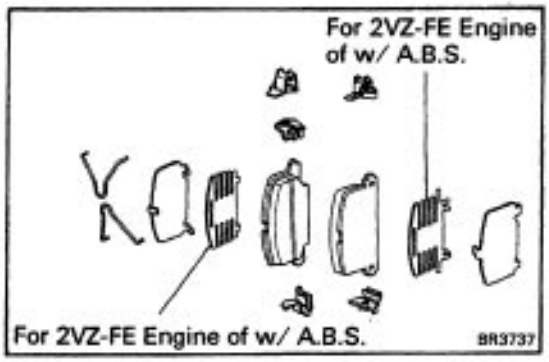


4. INSTALL DUST BOOTS AND SLIDING BUSHING

(a) Install the dust boots into the brake cylinder.
(b) Insure that the boot is secured firmly to the brake cylinder groove.



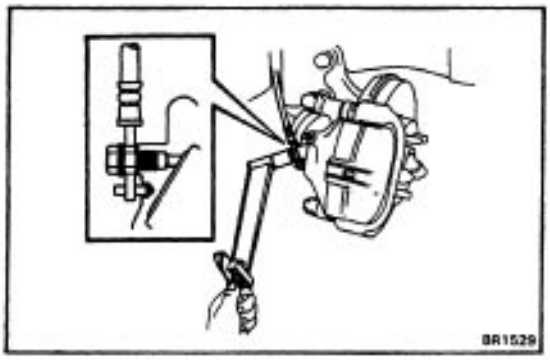
(c) Install the bushing into the boots.
(d) Insure that the boot is secured firmly to the bushing groove.



INSTALLATION OF CYLINDER

(See page BR–18)

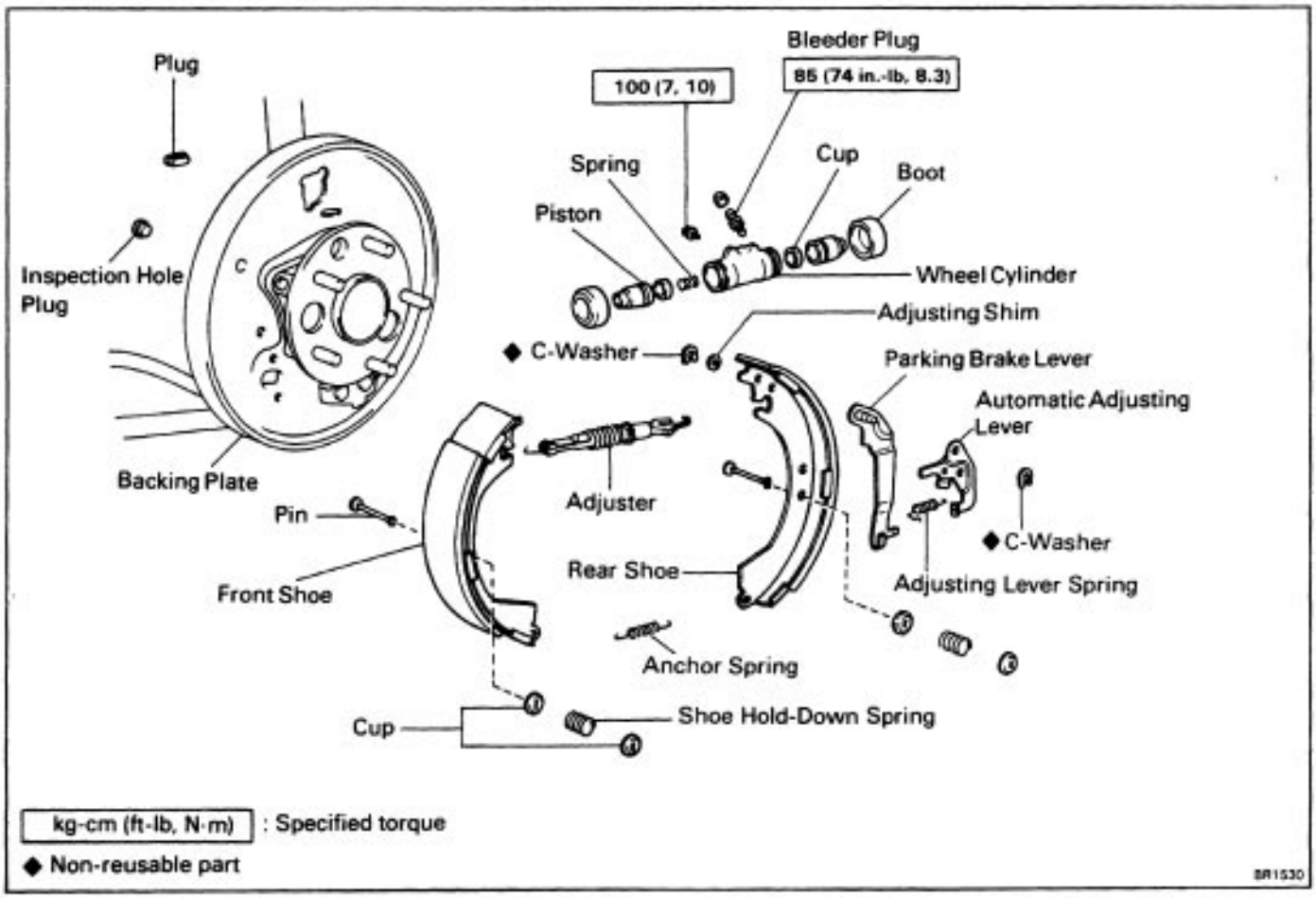
1. **INSTALL PADS**
   (See Steps 7 and 8 on page BR–20)
2. **INSTALL CYLINDER**
   (See step 9 on page BR–20)

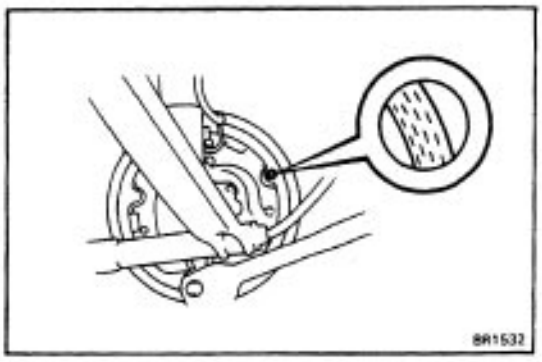


3. **INSTALL FLEXIBLE HOSE TO BRAKE CYLINDER**
   Set the flexible hose and new gaskets in position and install the union bolt.
   Torque: 310 kg–em(22 ft–lb, 30 N¿nn)

4. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM**
   (See page BR–7)
5. **CHECK FOR LEAKS**

REAR BRAKE
Drum Brake
COMPONENTS





REMOVAL OF REAR BRAKE

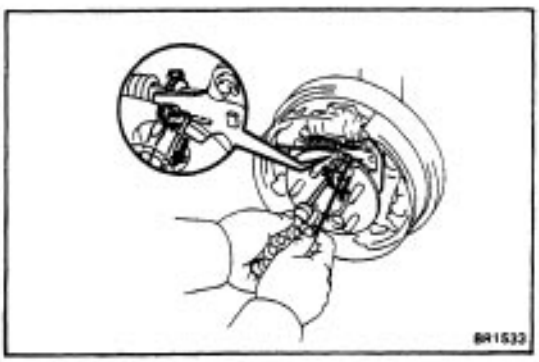
1. INSPECT SHOE LINING THICKNESS

Remove the inspection hole plug, and check the shoe lining the thickness through the hole.

If less than minimum, replace the shoes.

Minimum thickness: 1.0 mm (0.039 in.)

2. REMOVE REAR WHEEL

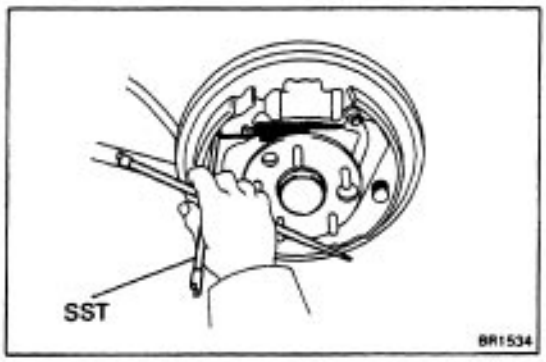


3. REMOVE BRAKE DRUM

HINT: If the brake drum cannot be removed easily, perform the following steps.

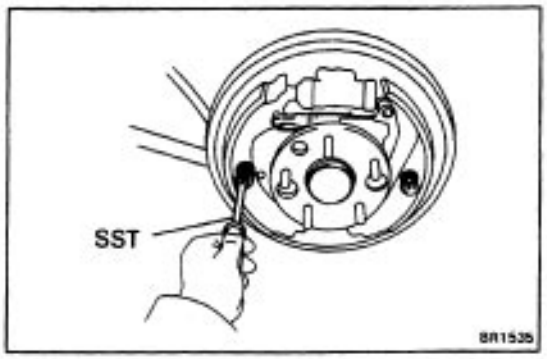
(a) Insert a bent wire or an equivalent through the hole in the brake drum, and hold the automatic adjusting lever away from the adjuster.

(b) Using a screwdriver, reduce the brake shoe adjustment by turning the adjuster.



4. REMOVE FRONT SHOE

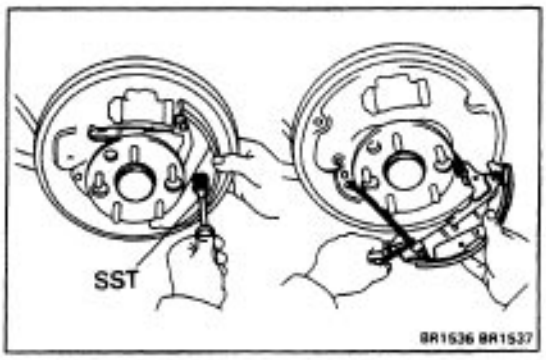
(a) Using SST, disconnect the return spring.
SST 09703–30010



(b) Using SST, remove the shoe hold–down spring, cups and pin.
SST 09718–00010

(c) Disconnect the anchor spring from the front shoe and remove the front shoe.

(d) Remove the anchor spring from the rear shoe.

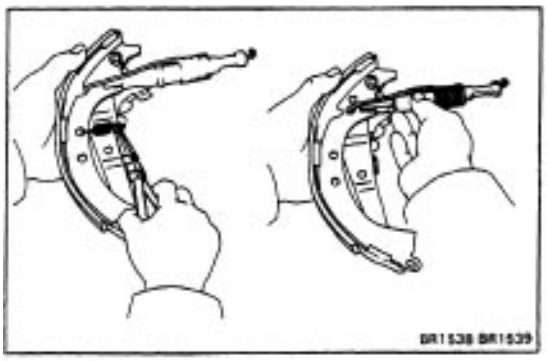


5. REMOVE REAR SHOE

(a) Using SST, remove the shoe hold–down spring, cups and pin.
SST 09718–00010

(b) Using a screwdriver, disconnect the parking brake. cable from the anchor plate.

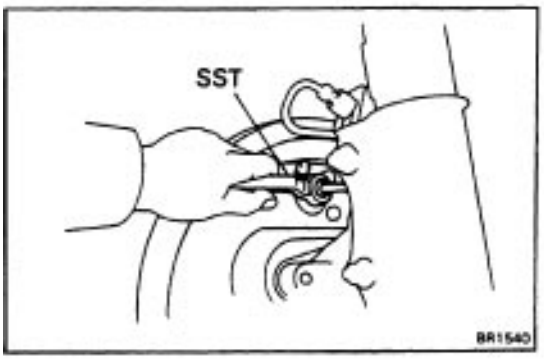
(c) Using pliers, disconnect the parking brake cable from the lever and remove the rear shoe together with the adjuster.



6. REMOVE ADJUSTER FROM REAR SHOE

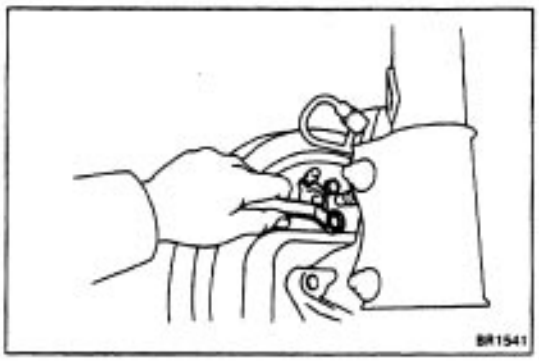
(a) Remove the adjusting lever spring.

(b) Remove the adjuster together with the return spring.



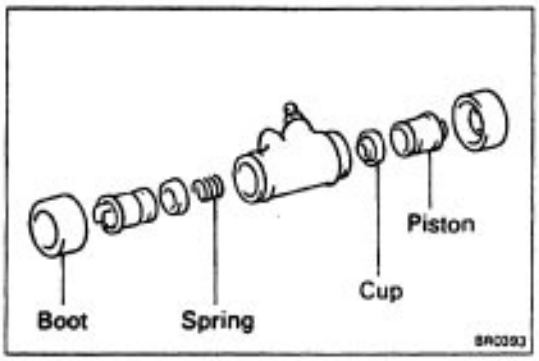
7. DISCONNECT BRAKE TUBE FROM WHEEL CYLINDER

Using SST, disconnect the brake line. Use a container to catch the brake fluid.
SST 09751–36011



8. REMOVE WHEEL CYLINDER

Remove the two bolts and the wheel cylinder.



9. IF NECESSARY, DISASSEMBLE WHEEL CYLINDER

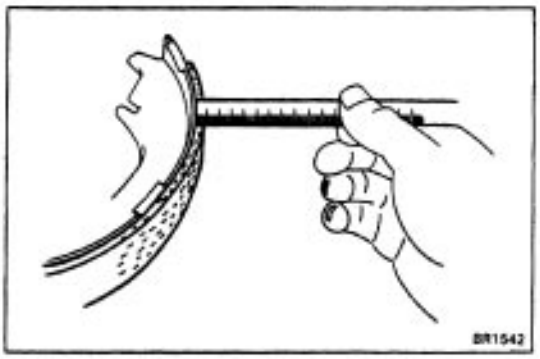
Remove the following parts from the wheel cylinder.

- Two boots
- Two pistons
- Two piston cups
- Spring _

INSPECTION AND REPAIR OF REAR BRAKE COMPONENTS

1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage.

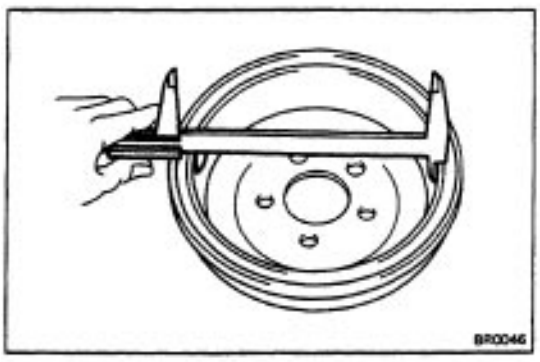


2. MEASURE BRAKE SHOE LINING THICKNESS

Standard thickness: 5.0 mm (0.197 in.)
Minimum thickness: 1 .0 mm (0.039 in.)

If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.

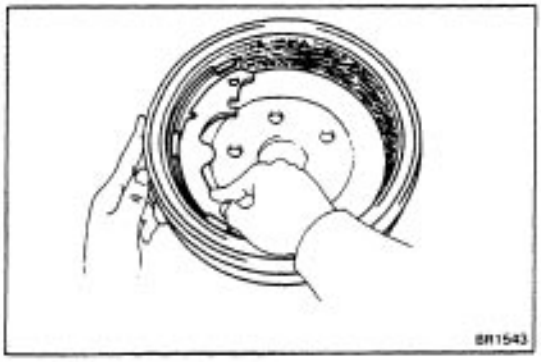
HINT: If any of the brake shoes have to be replaced, replace all of the rear shoes in order to maintain even braking.



3. MEASURE BRAKE DRUM INSIDE DIAMETER

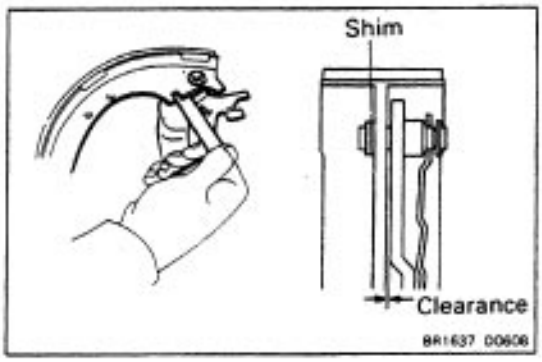
Standard inside diameter: 228.6 mm (9.000 in.)
Maximum inside diameter: 230.6 mm (9.079 in.)

If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.



4. INSPECT REAR BRAKE LINING AND DRUM FOR PROPER CONTACT

If the contact between the brake lining and drum is improper, repair the lining with a brake shoe grinder, or replace the brake shoe assembly.



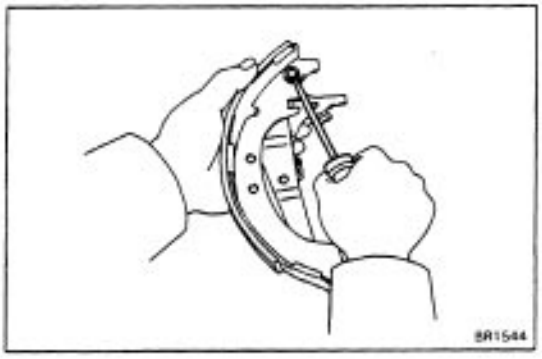
5. MEASURE CLEARANCE BETWEEN BRAKE SHOE AND LEVER

Using a feeler gauge, measure the clearance.

Standard clearance: Less than 0.35 mm (0.0138 in.)

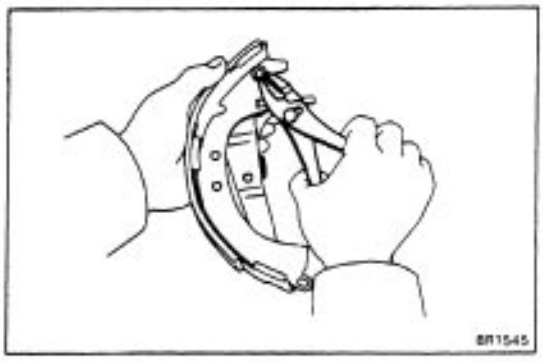
If the clearance is not within specification, replace the shim with one of the correct size.

Thickness	mm (in.)
0.2 (0.008)	0.5 (0.020)
0.3 (0.012)	0.6 (0.024)
0.4 (0.016)	0.9 (0.035)



6. IF NECESSARY, REPLACE SHIM

(a) Remove the parking brake lever, and install the correct size shim.



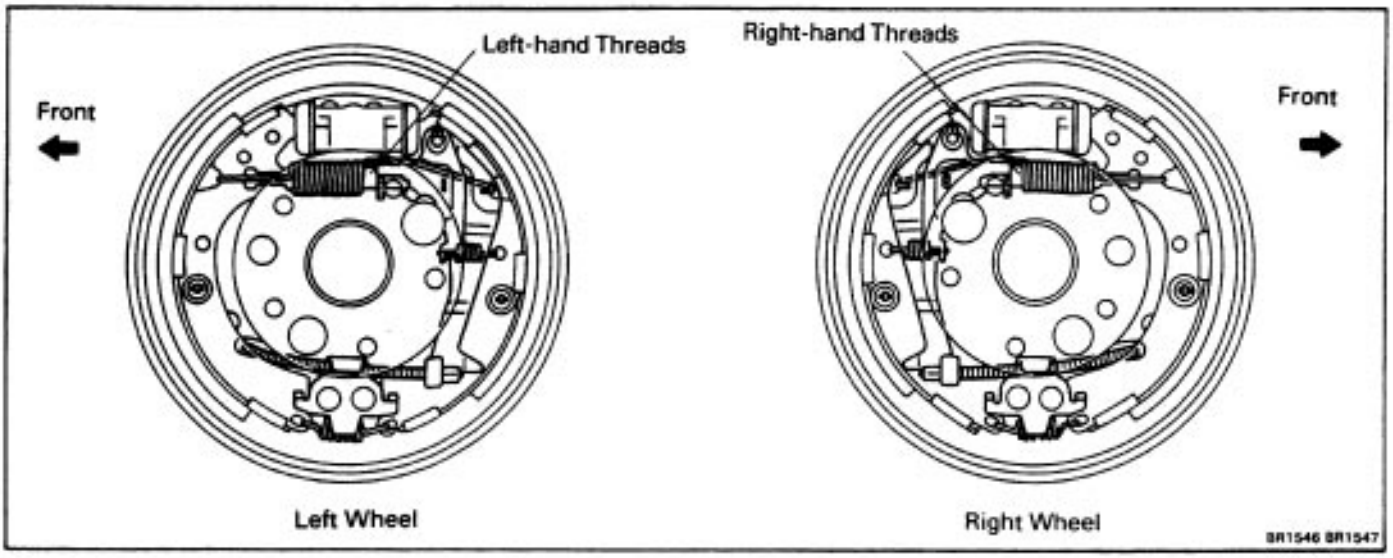
(b) Install the parking brake lever with a new C–washer.

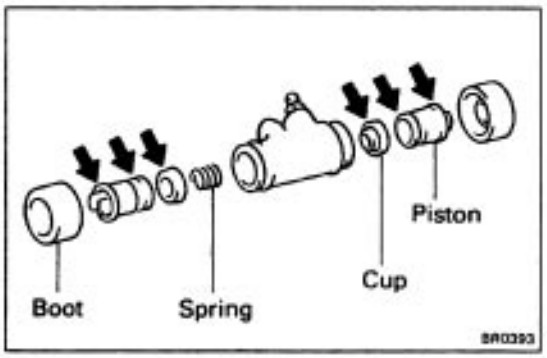
(c) Remeasure the clearance.

INSTALLATION OF REAR BRAKE

(See page BR–26)

HINT: Assemble the parts in the correct direction as shown.





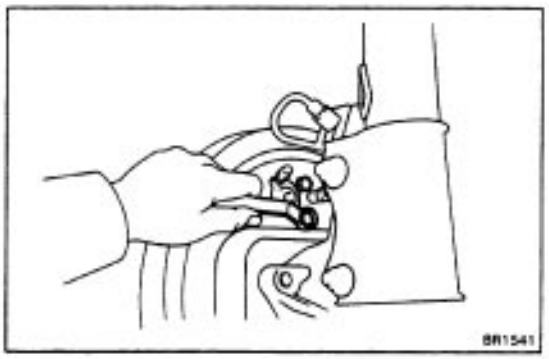
1. ASSEMBLE WHEEL CYLINDER

(a) Apply lithium soap base glycol grease to the cups and pistons as shown.

(b) Assemble the wheel cylinder.

HINT: Install in proper direction only.

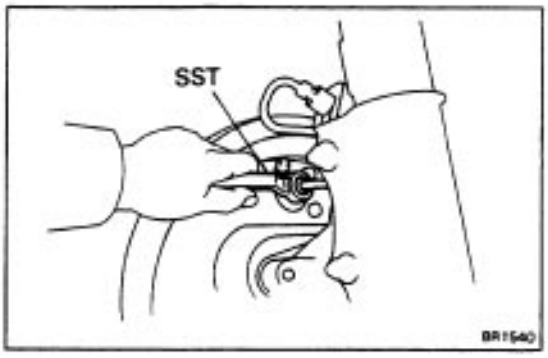
- Spring
- Two cups
- Two pistons
- Two boots .



2. INSTALL WHEEL CYLINDER

Install the wheel cylinder on the backing plate with two bolts.

Torque: 100 kg–cm (7 ft–lb, 10 N–m)

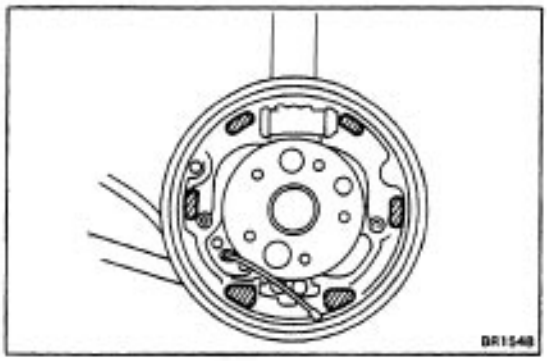


3. CONNECT BRAKE TUBE TO WHEEL CYLINDER

Using SST, connect the brake tube.

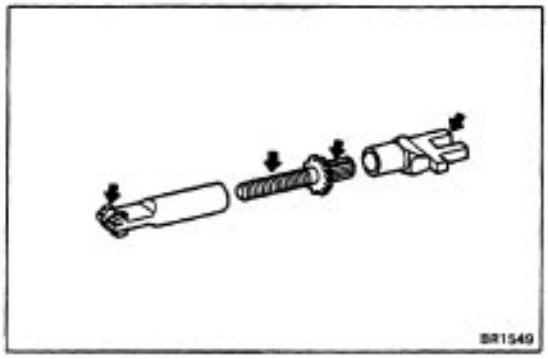
SST 09751–36011

Torque: 155 kg–crn (11 ft–lb, 15 N–m)

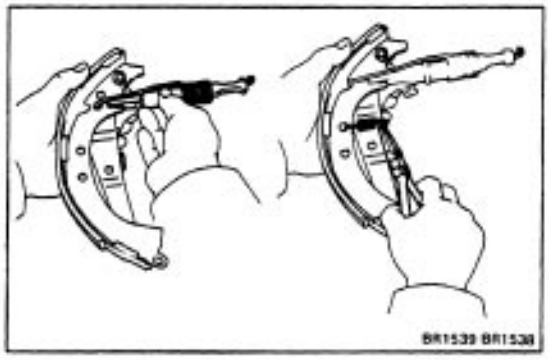


4. APPLY HIGH TEMPERATURE GREASE TO BACKING PLATE AND ADJUSTER

(a) Apply high temperature grease to the brake shoe contact surfaces as shown.

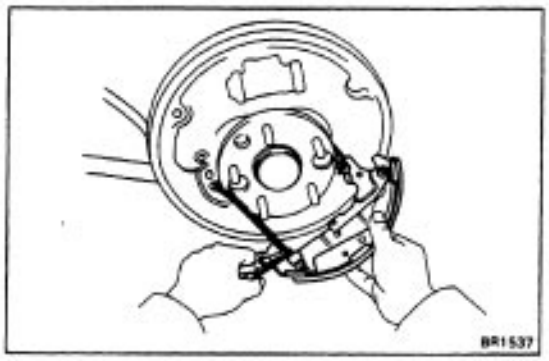


(b) Apply high temperature grease to the adjuster bolt threads and ends.



5. INSTALL ADJUSTER ONTO REAR SHOE

Set the adjuster and return spring in place and install the adjusting lever spring.

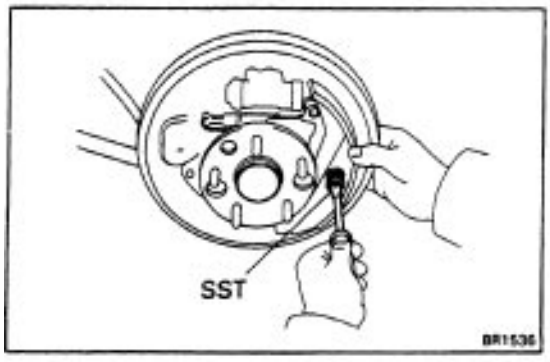


6. INSTALL REAR SHOE

(a) Using pliers, connect the parking brake cable to the lever.

(b) Pass the parking brake cable through the notch in the anchor plate.

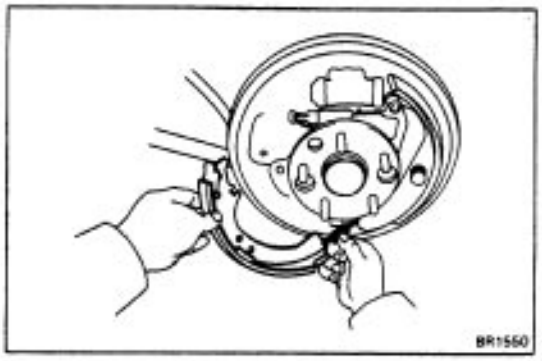
(c) Set the rear shoe in place with the end of the shoe inserted in the wheel cylinder and the other end in the anchor plate.



(d) Using SST, install the shoe hold–down spring, cups and pin.

SST 09718– 10

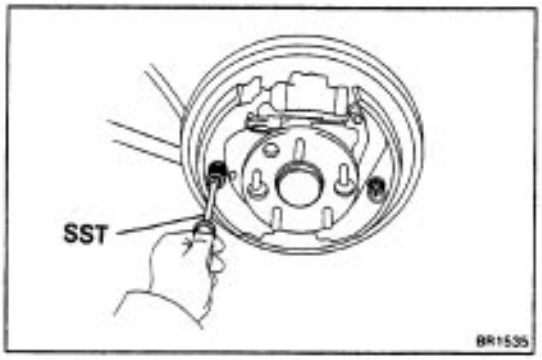
NOTICE: Do not allow oil or grease to get on the ru bing face.



7. INSTALL FRONT SHOE

(a) Install the anchor spring between the front and rear shoes.

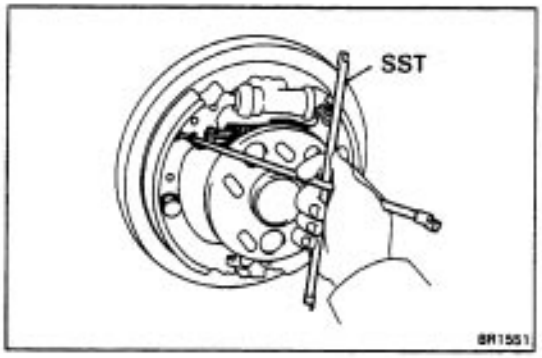
(b) Set the front shoe in place with the end of the shoe inserted in the wheel cylinder and the adjuster in place.



(c) Using SST, install the shoe hold–down spring, cups and pin.

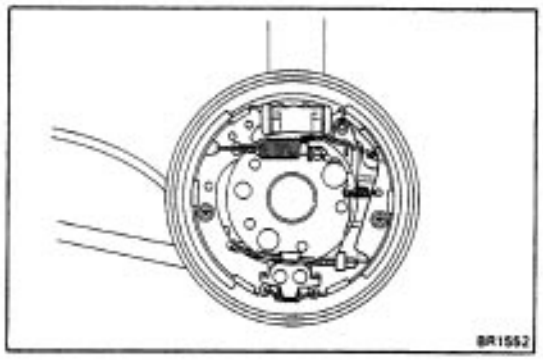
SST 09718–00010

NOTICE: Do not allow oil or grease to get on the ru bing face.



(d) Using SST, connect the return spring.

SST 09703–30010

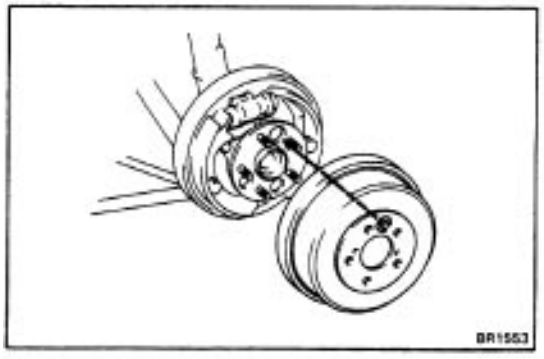


8. CHECK OPERATION OF AUTOMATIC ADJUSTING MECHANISM

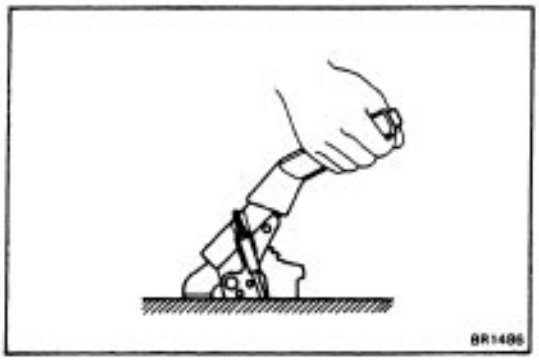
(a) Move the parking brake lever of the rear shoe back and forth, as shown. Check that the adjuster turns.

If the adjuster does not turn, check for incorrect installation of the rear brakes.

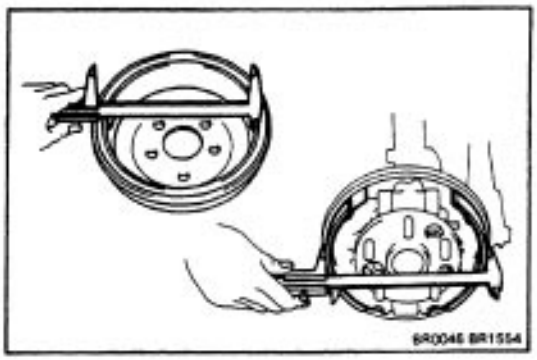
(b) Adjust the adjuster length to the shortest possible amount.



(c) Align the adjusting hole on the brake drum and largest hole on the axle carrier, install the brake drum.



(d) Pull the parking brake lever all the way up until a clicking sound can no longer be heard.



9. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

(a) Remove the brake drum.

(b) Measure the brake drum inside diameter and diameter of the brake shoes. Check that the difference between the diameters is the correct shoe clearance.
Shoe clearance: 0.6 mm (0.024 in.)

If incorrect, check the parking brake system.

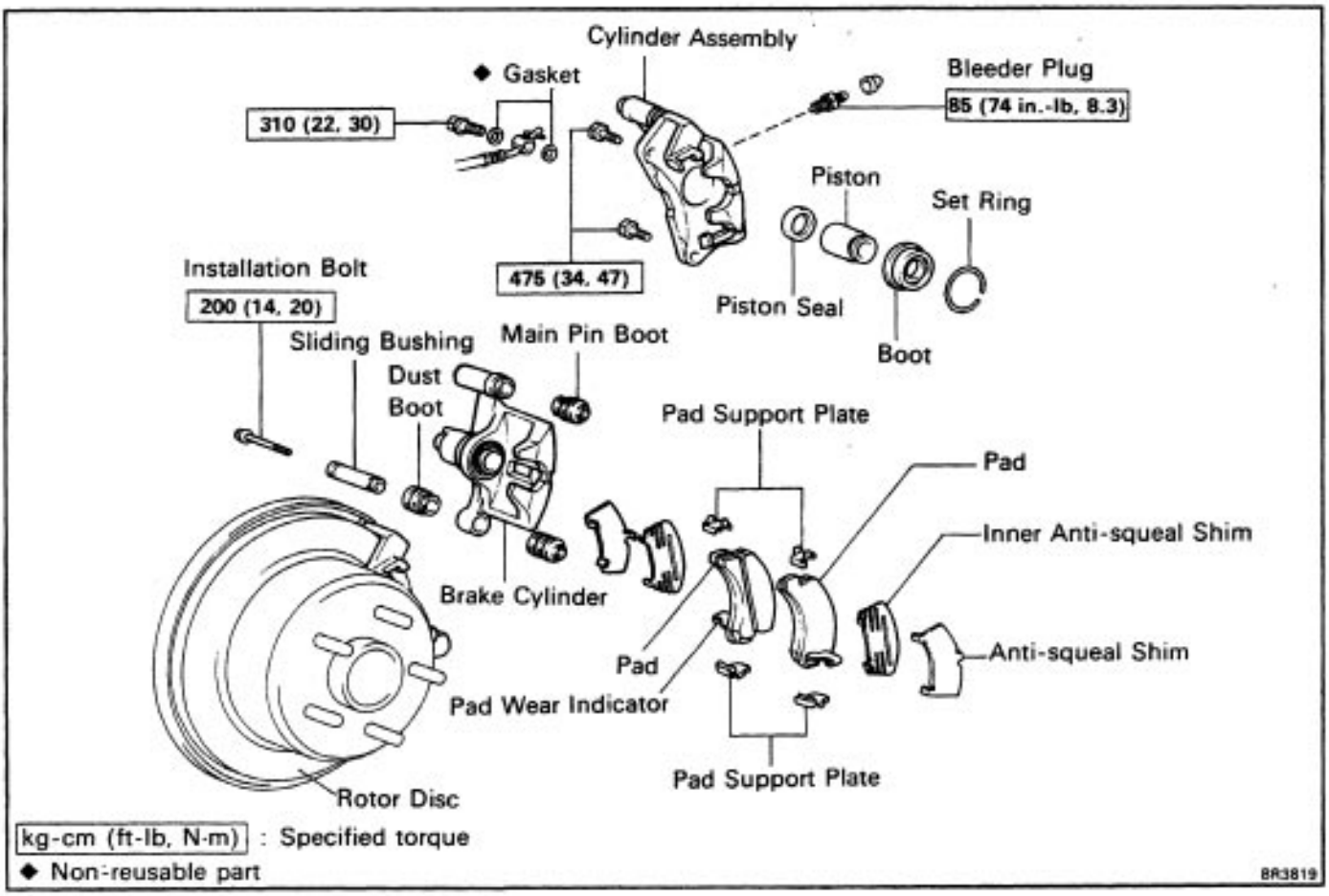
10. INSTALL BRAKE DRUM

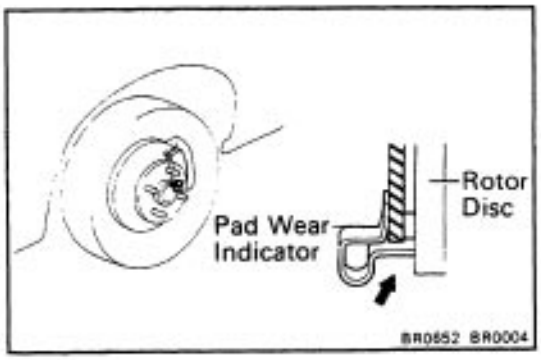
11. INSTALL REAR WHEEL

12. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(See page BR–7)

13. CHECK FOR FLUID LEAKAGE

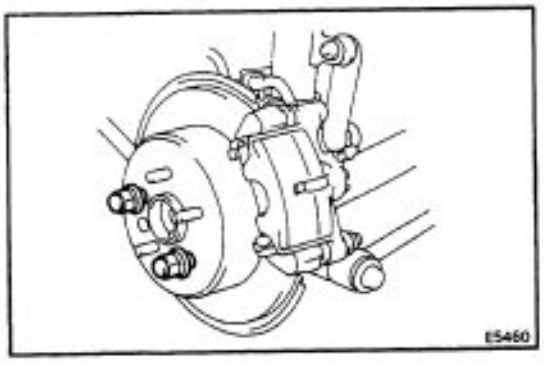
REAR BRAKE
Disc Brake
COMPONENTS





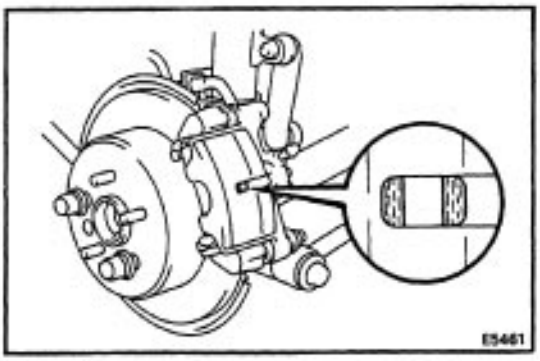
REPLACEMENT OF BRAKE PADS

HINT: If a squealing noise occurs from the brakes while driving, check the pad wear indicator. If there are traces of the indicator contacting the rotor disc, the brake pad should be replaced.



1. REMOVE REAR WHEEL

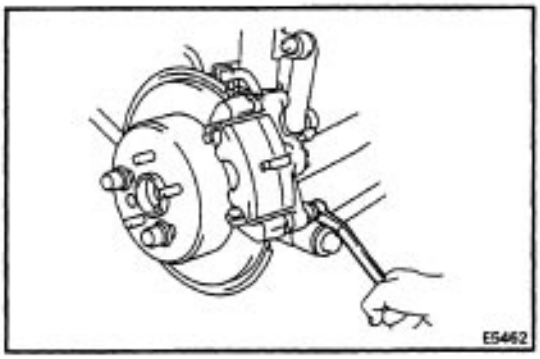
Remove the wheel and temporarily fasten the rotor disc with the hub nuts.



2. INSPECT PAD LINING THICKNESS

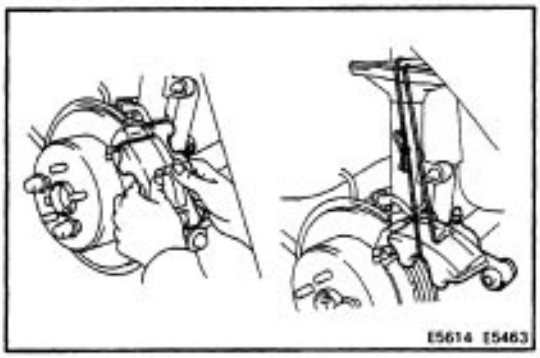
Check the pad thickness through the cylinder inspection hole and replace pads if not within specification.

Minimum thickness: 1.0 mm I0.039 in.)



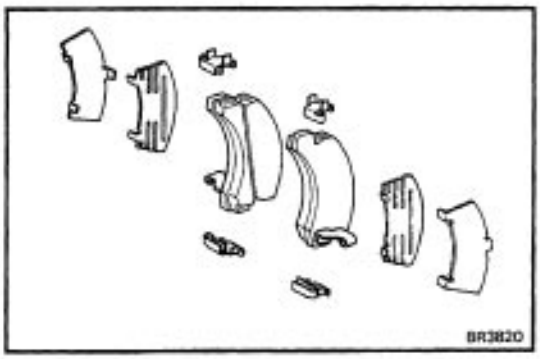
3. REMOVE CYLINDER FROM TORQUE PLATE

(a) Remove the installation bolt from the torque plate.



(b) Remove the brake cylinder and suspend it so the hose is not stretched.

HINT: Do not disconnect the brake hose.



4. REMOVE FOLLOWING PARTS:

(a) Two brake pads

(b) Four anti–squeal shims

(c) Four pad support plates

5. CHECK ROTOR DISC THICKNESS

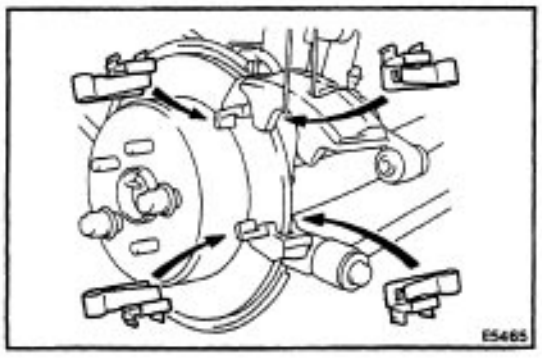
(See step 2 on page BR–39)

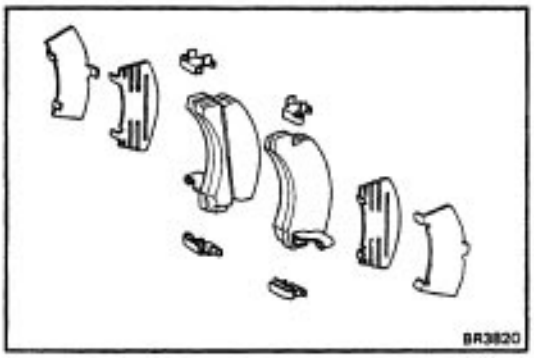
6. CHECK ROTOR DISC RUNOUT

(See step 3 on page BR–39)

7. INSTALL PAD SUPPORT PLATES

Install the four pad support plates.

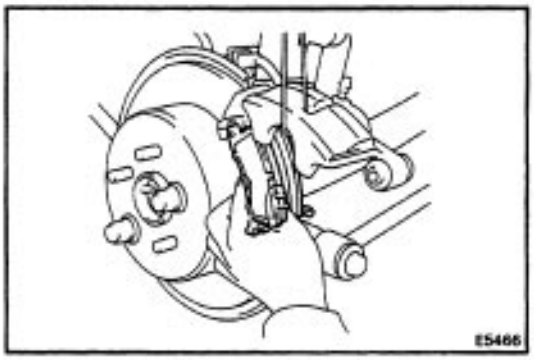




8. INSTALL NEW PADS

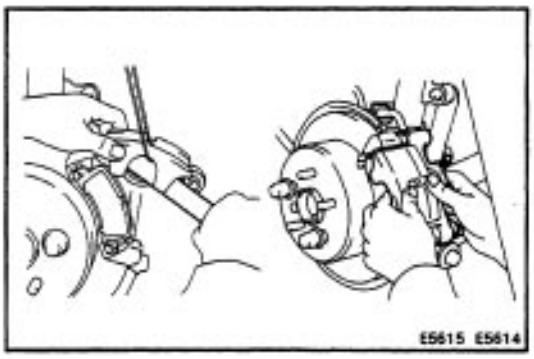
(a) Install the two anti–squeal shims to the each pad.

HINT: Apply disc brake grease to the both side of the inner anti–squeal shim.



(b) Install the two pads so the wear indicator plate is at the bottom side.

NOTICE: Do not allow oil or grease to get on the rubbing face.



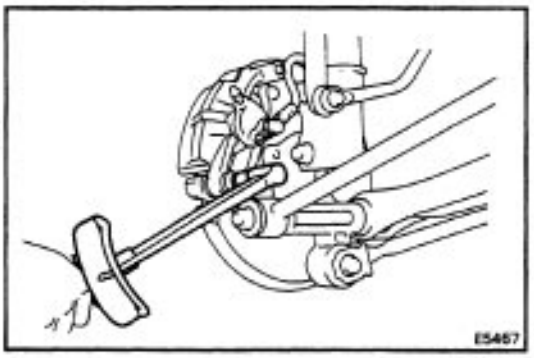
9. INSTALL CYLINDER

(a) Draw out a small amount of brake fluid from the reservoir.

(b) Press in piston with a hammer handle or an equivalent.

HINT: Always change the pad on one wheel at a time as there is a possibility of the opposite piston flying out.

(c) Insert the brake cylinder carefully so the boot is not wedged.

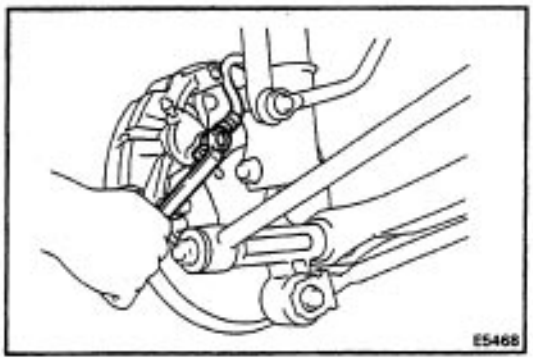


(d) Install and. torque the installation bolt.

Torque: 200 kg–cm (14 ft–lb, 20 N–m)

10. INSTALL REAR WHEEL

11. FILL BRAKE FLUID

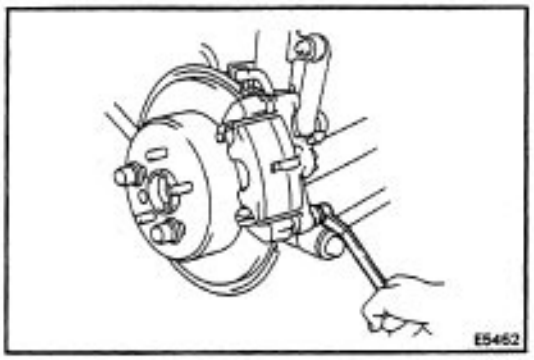


REMOVAL OF CYLINDER

(See page BR–34)

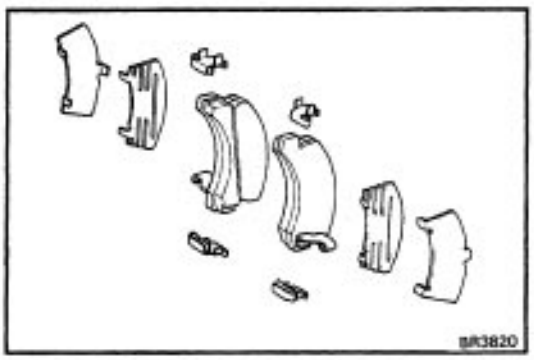
1. DISCONNECT BRAKE HOSE

Remove the union bolt and disconnect the brake hose.
Use a container to catch the brake fluid.



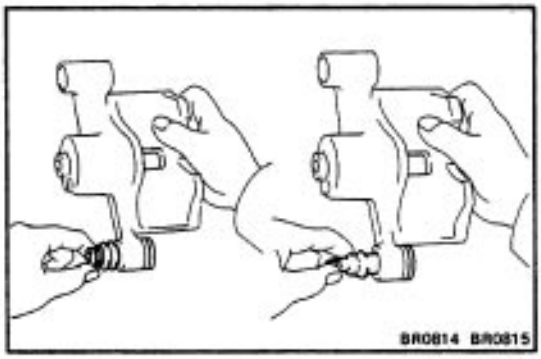
2. REMOVE CYLINDER FROM TORQUE PLATE

Remove the installation bolt and cylinder.



3. REMOVE PADS

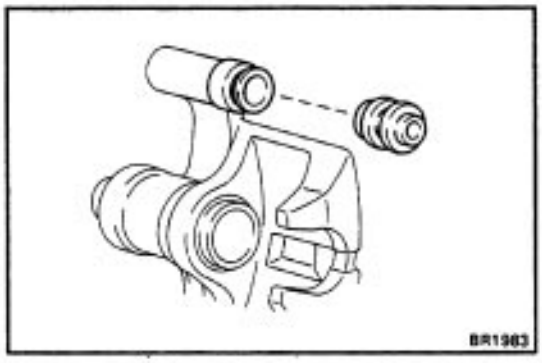
(See step 4 on page BR–35)



DISASSEMBLY OF CYLINDER

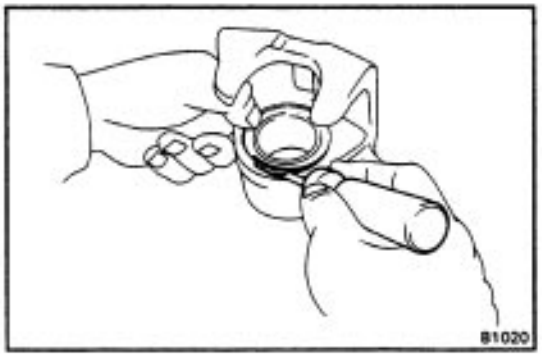
(See page BR–34)

1. REMOVE SLIDING BUSHING AND DUST BOOTS



2. REMOVE MAIN PIN BOOT

Pull out the main pin boot.



3. REMOVE CYLINDER BOOT SET RING AND CYLINDER BOOT

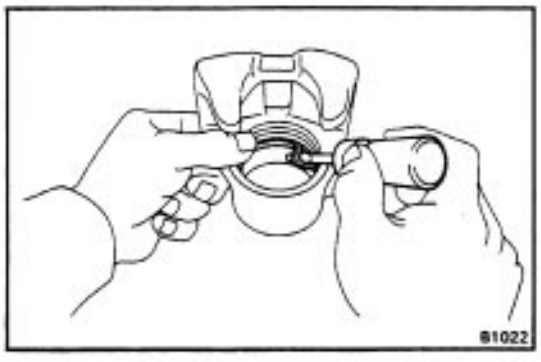
Using a screwdriver, remove the cylinder boot set ring and cylinder boot.

4. REMOVE PISTON FROM CYLINDER

(a) Put a piece of cloth or an equivalent as shown.

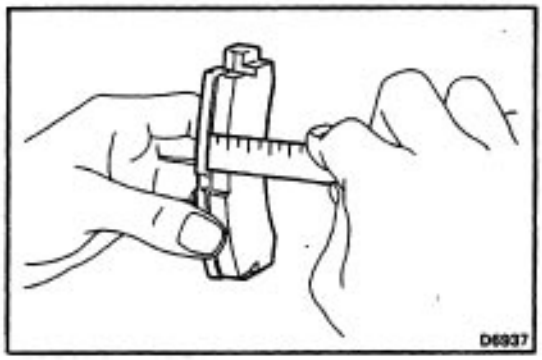
(b) Use compressed air to remove the piston from the cylinder.

CAUTION: Do not place your fingers in front of the piston when using compressed air.



5. REMOVE PISTON SEAL FROM BRAKE CYLINDER

Using a screwdriver, remove the piston seal.



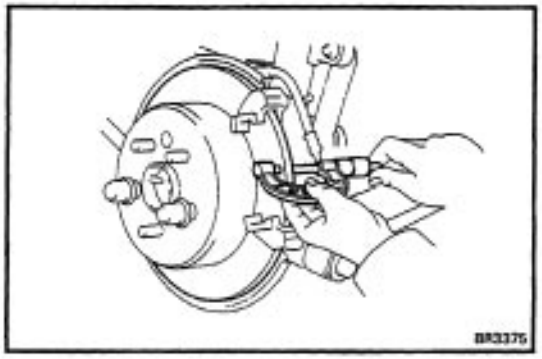
INSPECTION AND REPAIR OF REAR BRAKE COMPONENTS

1. MEASURE PAD LINING THICKNESS

Standard thickness: 10.0 mm (0.394 in.)

Minimum thickness: 1.0 mm (0.039 in.)

Replace the pad if the thickness is less than the minimum or if it shows sign of uneven wear.

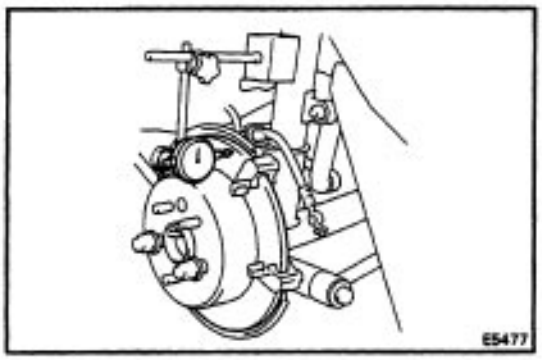


2. MEASURE ROTOR DISC THICKNESS

Standard thickness: 10.0 mm (0.394 in.)

Minimum thickness: 9.0 mm (0.354 in.)

If the disc is scored or worn, or if thickness is less than minimum, repair or replace the disc.



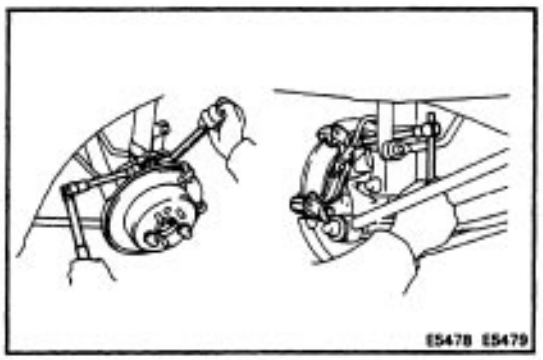
3. MEASURE ROTOR DISC RUNOUT

Measure the rotor disc runout at 10 mm (0.39 in.) from the outer edge of the rotor disc.

Maximum. disc runout: 0.15 mm (0.0059 in.)

If the runout is greater than the maximum, replace the disc.

HINT: Before measuring the runout, confirm that the hub bearing play is within speification.



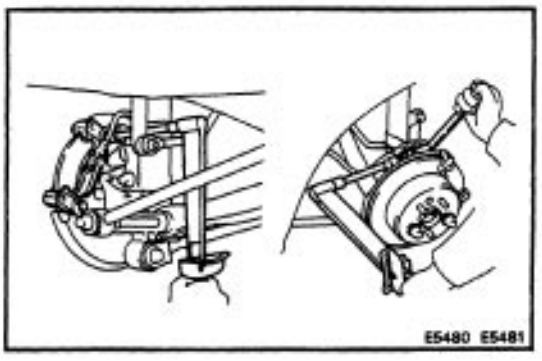
4. IF NECESSARY, REPLACE ROTOR DISC

(a) Remove the axle carrier mounting bolt and nut of upper side.

(b) Remove the torque plate.

(e) Remove the hub nuts of the temporarily installed disc and pull off the rotor disc.

(d) Install a new rotor disc and loosely install the hub nuts.

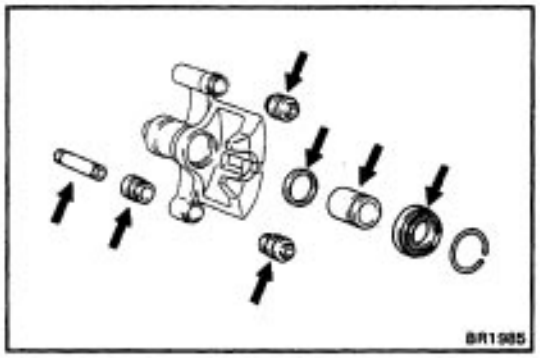


(e) Install the torque plate and tighten the mounting bolt.

Torque: 475 kg–cm (34 ft–lb, 47 N–m)

(f) Install the axle carrier mounting bolt and nut of upper side.

Torque: 2,600 kg–cm (188 ft–lb, 255 N–m)

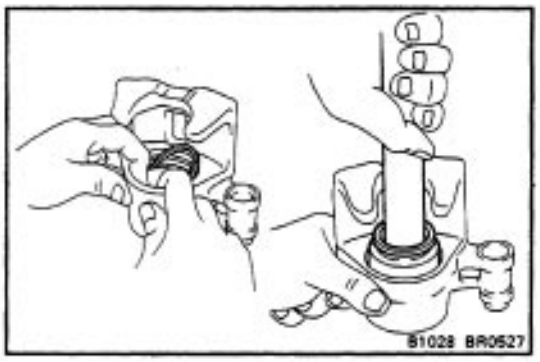


ASSEMBLY OF CYLINDER

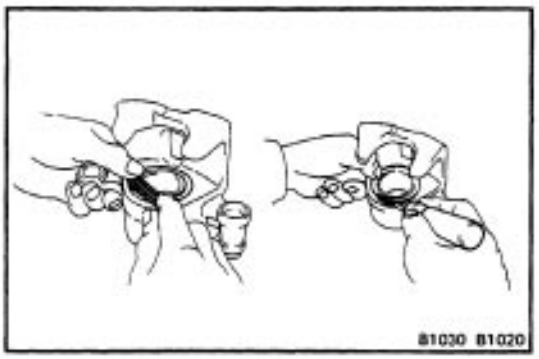
(See page BR–34)

1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO FOLLOWING PARTS:

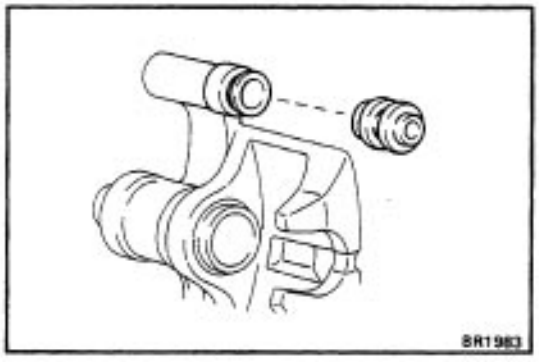
(a) Main pin boot
(b) Sliding bushing and dust boots
(e) Piston, piston seal and cylinder boot



2. INSTALL PISTON SEAL AND PISTON IN CYLINDER

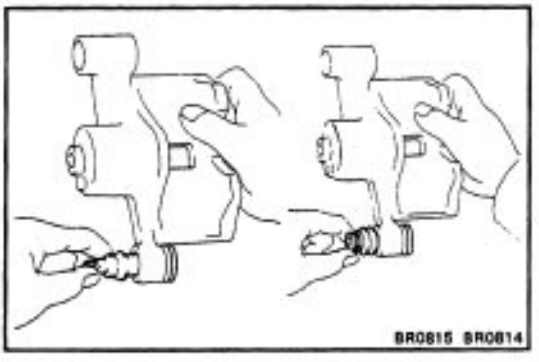


3. INSTALL CYLINDER BOOT AND SET RING IN CYLINDER



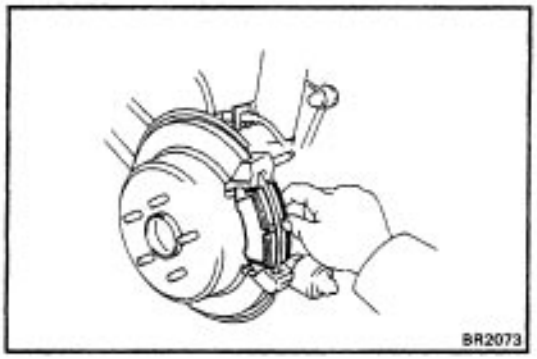
4. INSTALL MAIN PIN BOOT

Install the main pin boot in place.



5. INSTALL SLIDING BUSHING AND DUST BOOTS

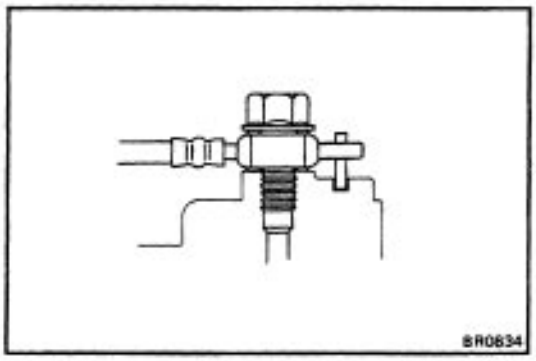
(a) Install the sliding bushing and dust boots into the brake cylinder.
(b) Insure that the boots are secured firmly to the brake cylinder groove.



INSTALLATION OF CYLINDER

(See page BR–34)

1. **INSTALL PADS**
   (See steps 7 and 8 on pages BR–35 and 36)
2. **INSTALL CYLINDER**
   (See step 9 on page BR–36)

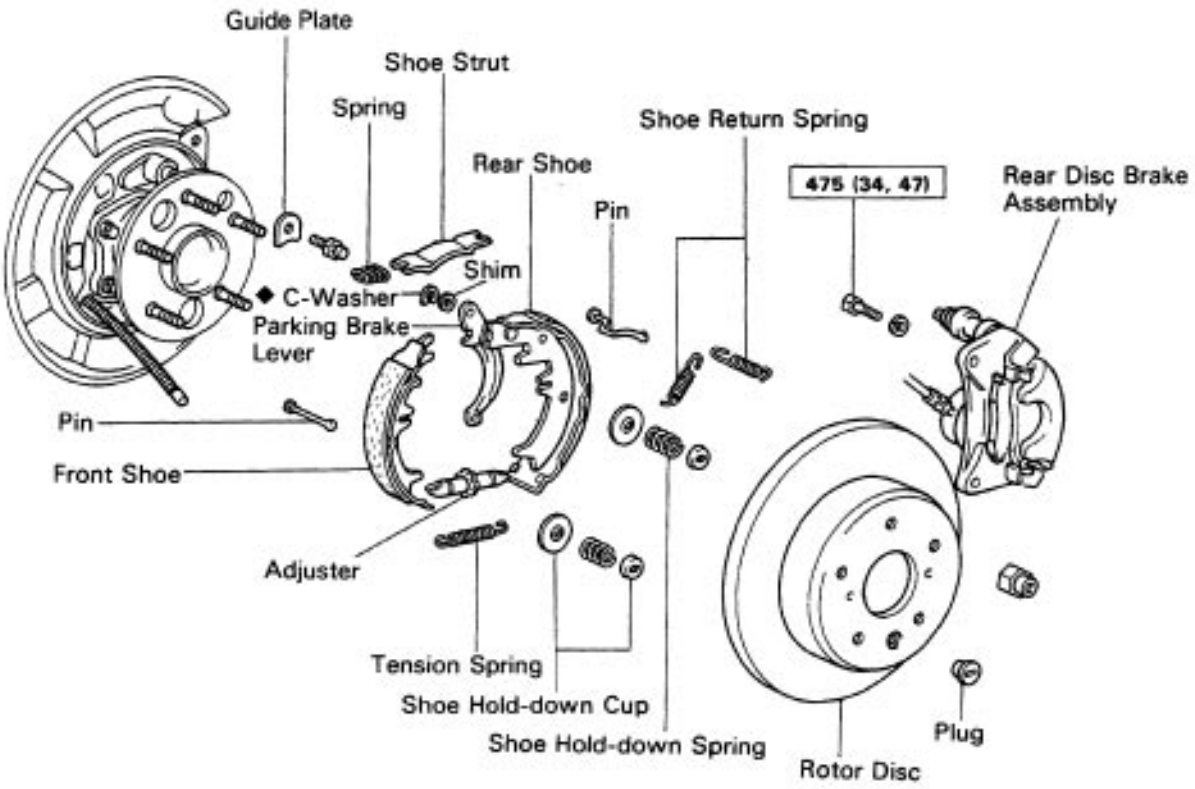


3. **INSTALL FLEXIBLE HOSE TO BRAKE CYLINDER**
   Set the flexible hose and new gaskets in position and install the union bolt and torque it.
   Torque: 310 kg–cm (22 ft–ib, 30 N–m)
4. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM**
   (See page BR–7)
5. **CHECK FOR LEAKS**

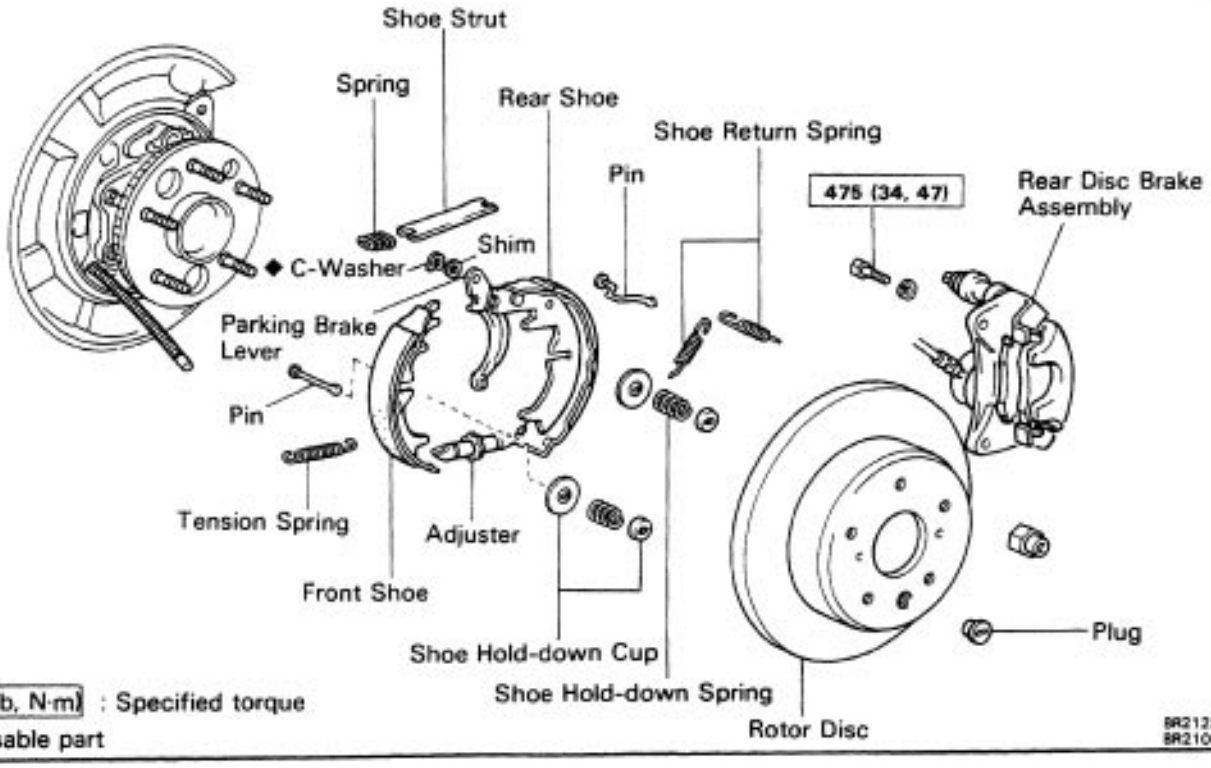
Parking Brake (For Rear Disc Brake)

COMPONENTS

2WD (w/o A.B.S.) and 4WD

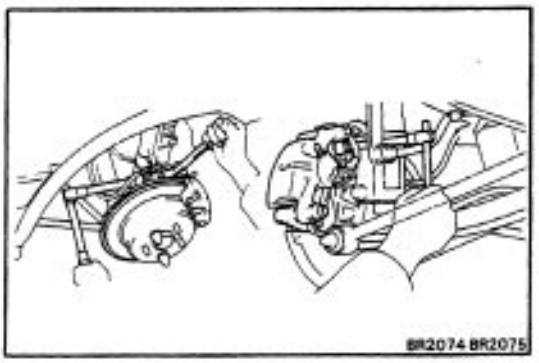


2WD (w/ A.B.S.)



kg-cm (ft-lb, N·m) : Specified torque
◆ Non-reusable part

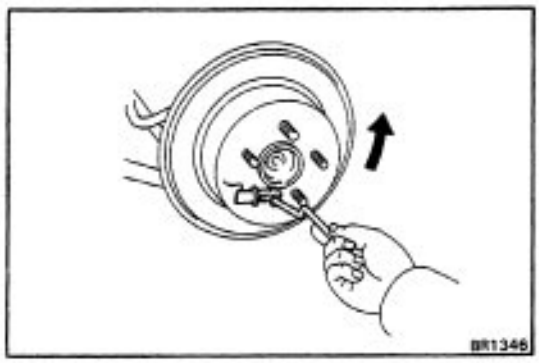
BR2122
BR2105



DISASSEMBLY OF PARKING BRAKE

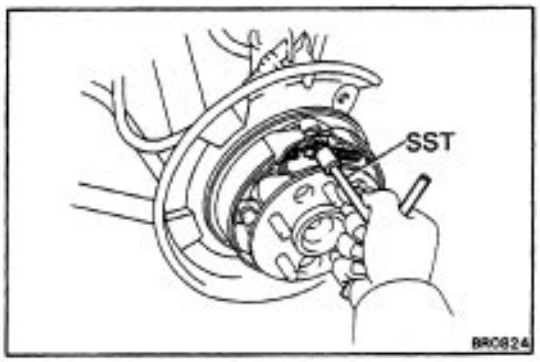
1. REMOVE REAR DISC BRAKE ASSEMBLY

(a) Remove the axle carrier mounting bolt and nut of upper side.
(b) Remove the two mounting bolts and remove the disc brake assembly.
(c) Suspend the disc brake so the hose is not stretched.



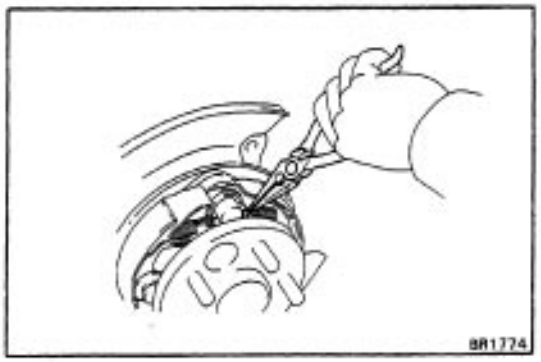
2. REMOVE ROTOR DISC

HINT: If the rotor disc cannot be removed easily, return the shoe adjuster until the wheel turns freely.

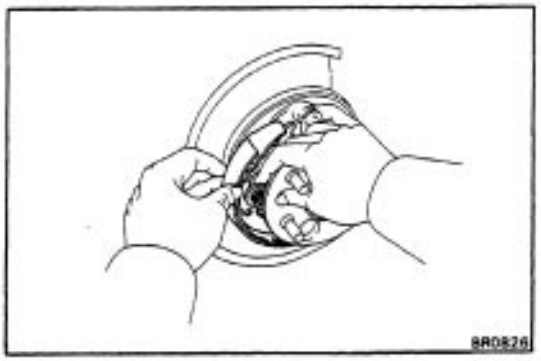


3. REMOVE SHOE RETURN SPRINGS

[2WD (w/o A.B.S.) and 4WD]
Using SST, remove the shoe return springs.
SST 09717–20010

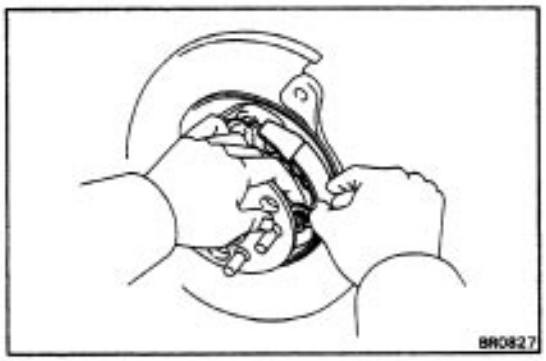


[2WD (w/ A.B.S.)]
Using needle–nose pliers, remove the shoe return springs.



4. REMOVE FRONT SHOE, ADJUSTER AND TENSION SPRING

(a) Slide out the front shoe and remove the shoe adjuster.
(b) Remove the shoe strut with spring.
(c) Disconnect the tension spring and remove the front shoe.



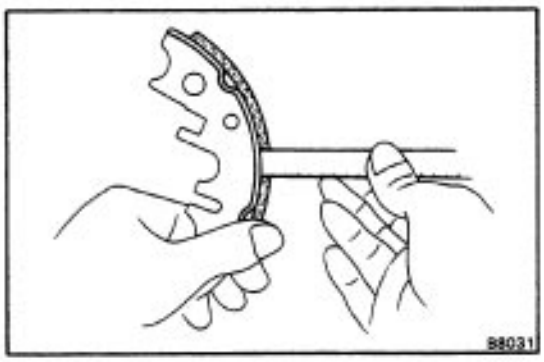
5. REMOVE REAR SHOE

(a) Slide out the rear shoe.
(b) Remove the tension spring from the rear shoe.
(c) Disconnect the parking brake cable from the parking brake shoe lever.
(d) Remove the shoe hold–down spring cups, springs and pins.

INSPECTION AND REPAIR OF PARKING BRAKE COMPONENTS

1. INSPECT DISASSEMBLED PARTS

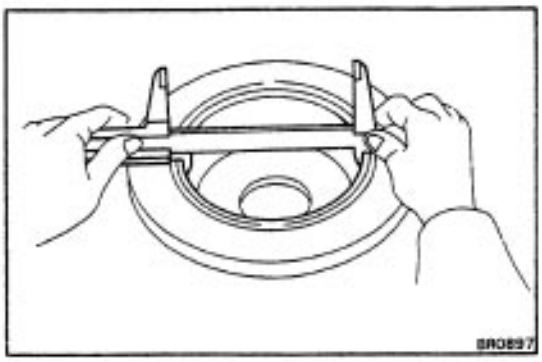
Inspect the disassembled parts for wear, rust or damage.



2. MEASURE BRAKE SHOE LINING THICKNESS

Standard thickness: 2.0 mm (0.079 in.)
Minimum thickness: 1.0 mm (0.039 in.)

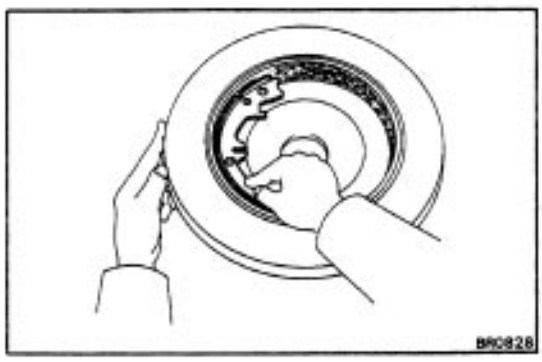
If the shoe lining is less than minimum or shows signs of uneven wear, replace the parking brake shoes.



3. MEASURE BRAKE DISC INSIDE DIAMETER

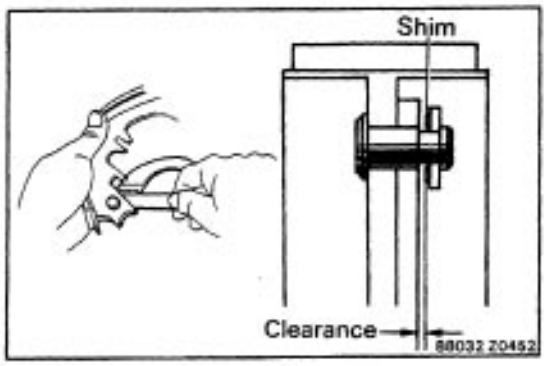
Standard inside diameter: 170 mm (6.69 in.)
Maximum inside diameter: 171 mm (6.73 in.)

If the disc is scored or worn, the brake disc may be lathed to the maximum inside diameter.



4. INSPECT PARKING BRAKE LINING AND DISC FOR PROPER CONTACT

If the contact between the brake lining and disc is improper, repair the lining with a brake shoe grinder, or replace the brake shoe assembly.

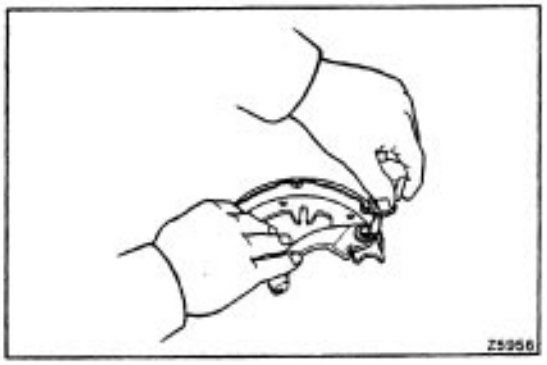


5. MEASURE CLEARANCE BETWEEN PARKING BRAKE SHOE AND LEVER

Using a feeler gauge, measure the clearance.

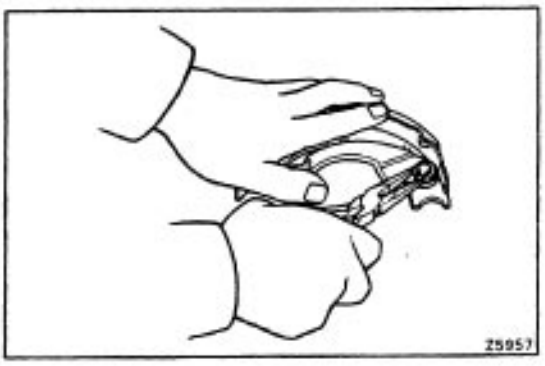
Standard clearance: Less than 0.35 rnm (0.0138 in.)

If the clearance is not within specification, replace the shim with one of the correct size.



6. IF NECESSARY, REPLACE SHIM

(a) Remove the parking brake lever, and install the correct size shim. .



(b) Install the parking brake lever with a new C–washer.

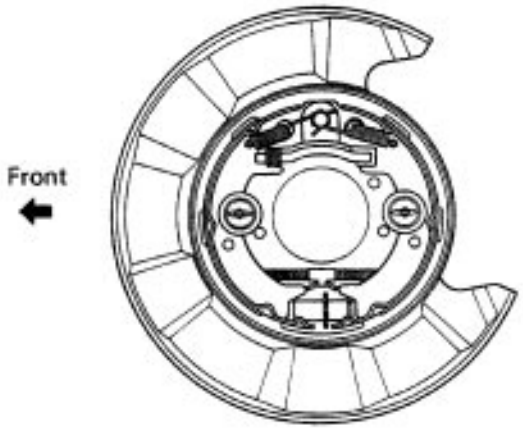
(c) Remeasure the clearance.

ASSEMBLY OF PARKING BRAKE

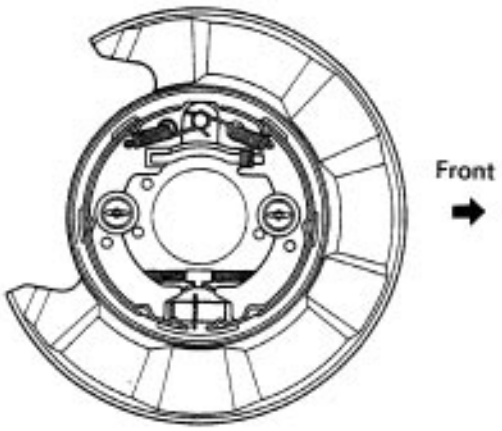
(See page BR–42)

HINT: Assemble the parts in the correct direction as shown.

2WD (w/o A. B. S. y and 4WD

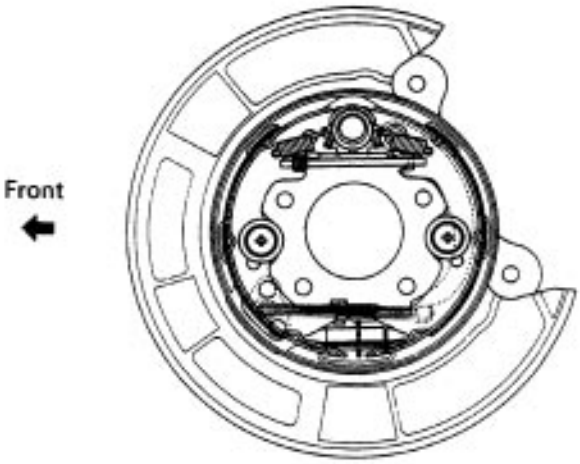


Left Wheel

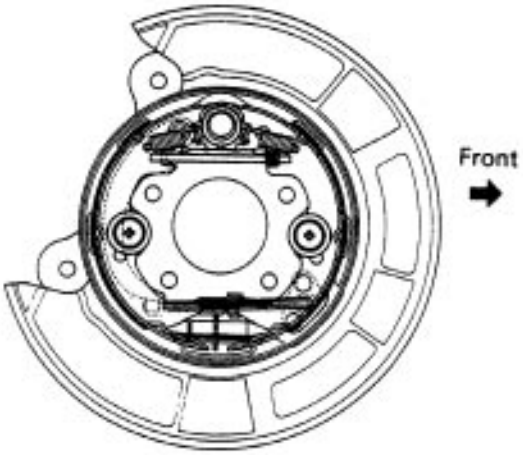


Right Wheel

2WD (w/ A.B.S.)

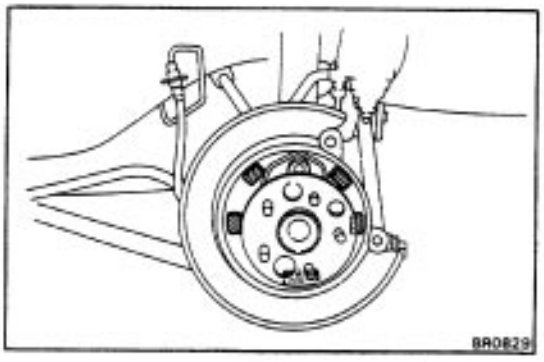


Left Wheel



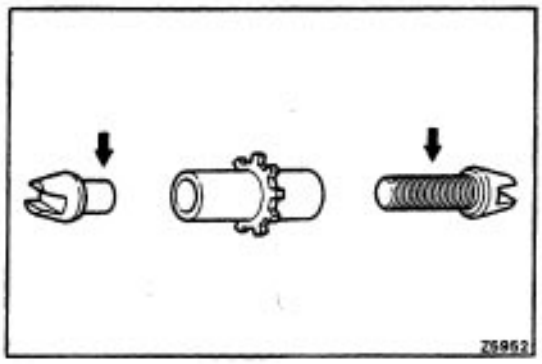
Right Wheel

BR0898 BR0898-R
KDB41-R KDB41

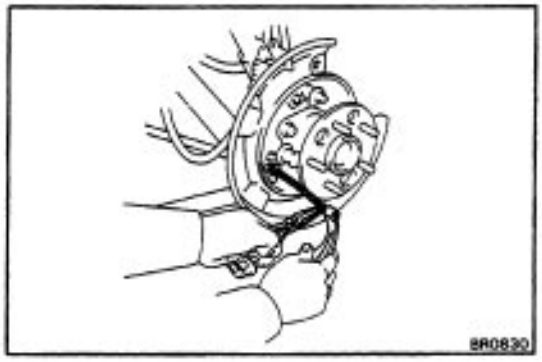


1. APPLY HIGH TEMPERATURE GREASE ON BACKING PLATE AS SHOWN

Apply high temperature grease to the sliding surfaces of the shoe.

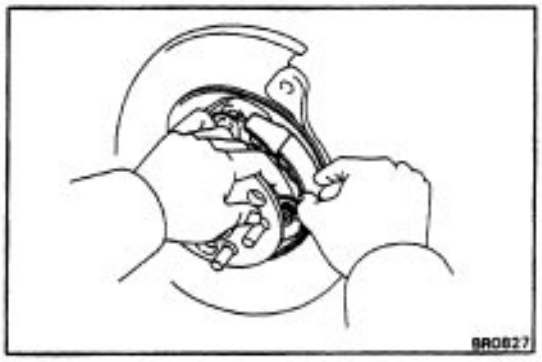


2. APPLY HIGH TEMPERATURE GREASE TO ADJUSTER AS SHOWN



3. CONNECT PARKING BRAKE CABLE TO PARKING BRAKE LEVER

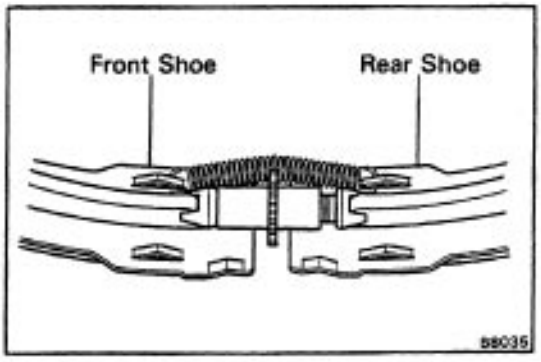
(a) Install the shoe hold–down springs, cups and pins.
(b) Connect the parking brake cable to the parking brake lever of the rear shoe.



4. INSTALL REAR SHOE

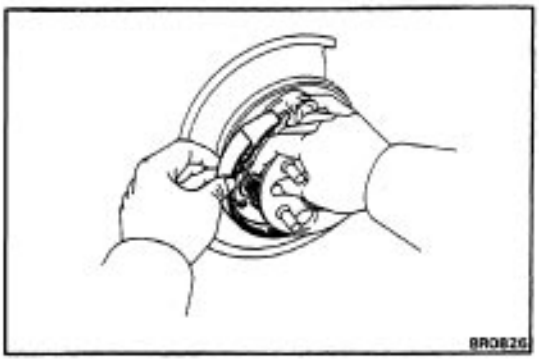
Slide in the rear shoe between the shoe hold–down spring cup and the backing plate.

NOTICE: Do not allow oil or grease to get on the rubbing face.

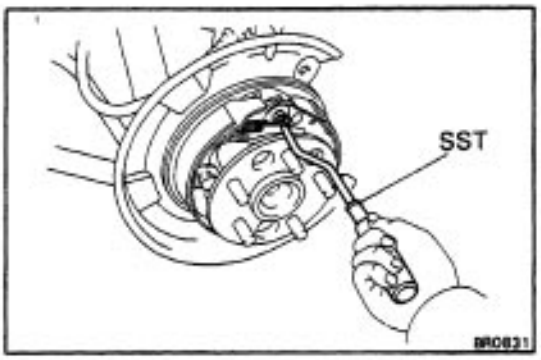


5. INSTALL TENSION SPRING, FRONT SHOE AND ADJUSTER

(a) Install the tension spring to the rear shoe.
(b) Install the front shoe to the tension spring.
(c) Install the adjuster between the front and rear shoes.
(d) Install the shoe strut with spring.



(e) Slide in the front shoe between the shoe hold–down spring cup and the backing plate.



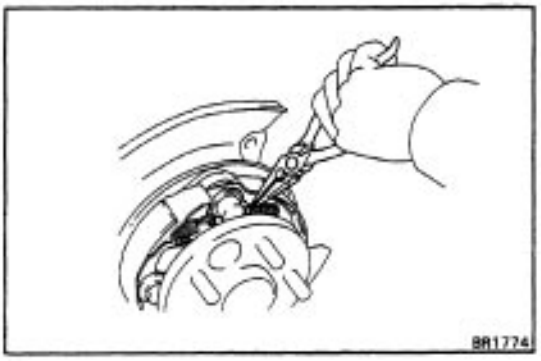
6. INSTALL SHOE RETURN SPRINGS

[2WD (w/o A.B.S.) and 4WD]

Using SST, install the front return spring and then install the rear return spring.

(See page BR–46)

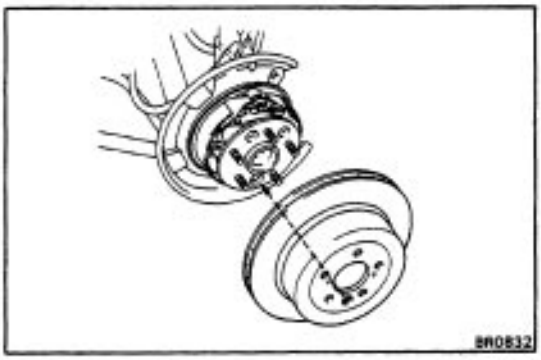
SST 09718–20010



[2WD (w/o A.B.S.)]

Using needle–nose pliers, install the shoe return springs.

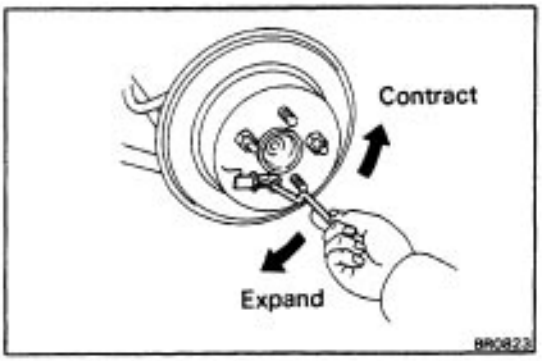
(See page BR–46)



7. INSTALL ROTOR DISC

(a) Before installing, polish the disc and shoe surfaces with sandpaper.

(b) Align the hole on the rear axle shaft flange and service hole on the disc.



8. ADJUST PARKING BRAKE SHOE CLEARANCE

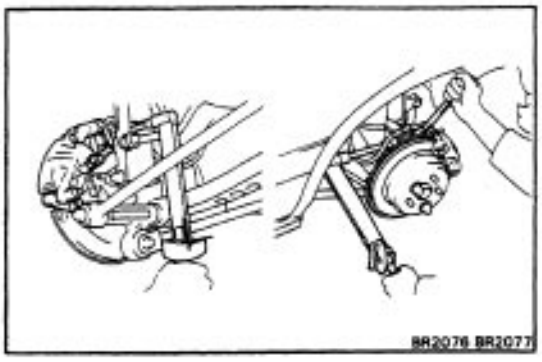
(a) Temporarily install the hub nuts.

(b) Remove the hole plug.

(c) Turn the adjuster and expand the shoes until the rotor disc locks.

(d) Return the adjuster eight notches.

(e) Install the hole plug.



9. INSTALL REAR DISC BRAKE ASSEMBLY

(a) Install the disc brake assembly and torque the two mounting bolts.

Torque: 475 kg–cm (34 ft–lb, 47 N–rn)

(b) Install the axle carrier bolt and nut of upper side.

Torque: 2,600 kg–cm (188 ft–lb, 255 N–m)

10. INSTALL REAR WHEEL

11. SETTLING PARKING BRAKE SHOES AND DISC

(a) Drive the vehicle at about 50 km/h (31 mph) on a safe, level and dry road.

(b) With the parking brake release button pushed in, pull on the lever with 9 kg (19.8 lb, 88 N) of force.

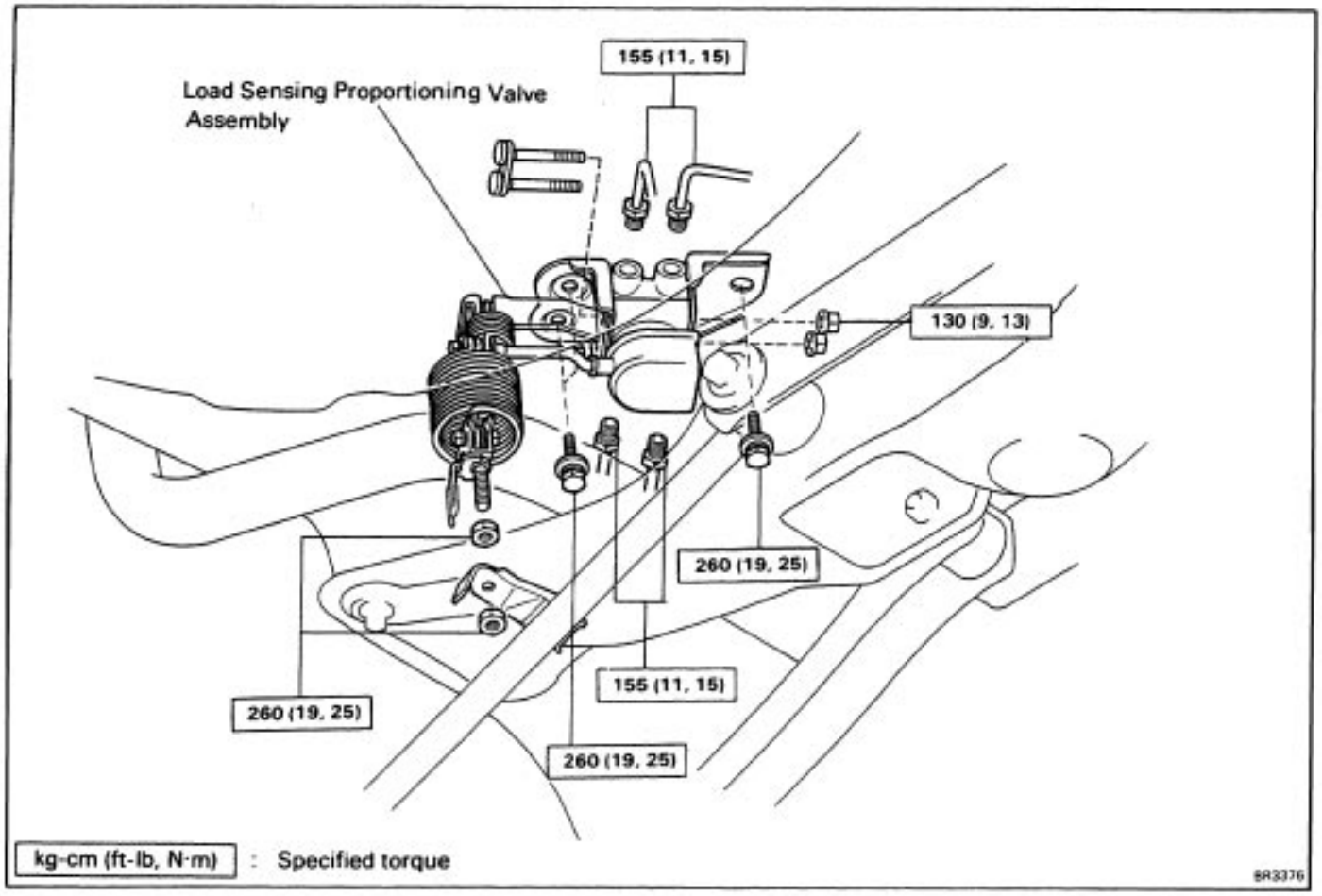
(c) Drive the vehicle for about 400 meters (0.25 mile) in this condition.

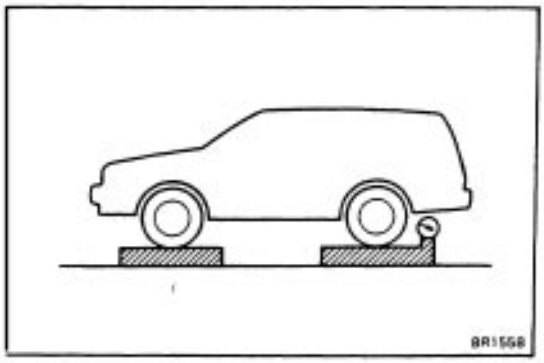
(d) Repeat this procedure two or three times.

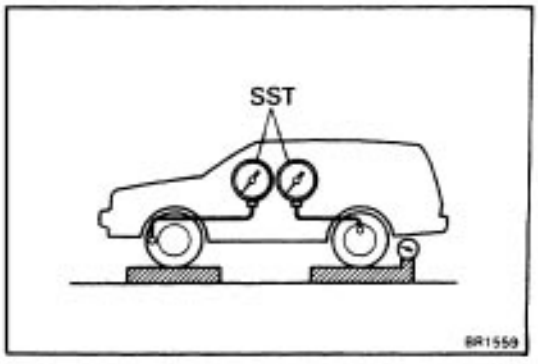
12. RECHECK AND ADJUST PARKING BRAKE LEVER TRAVEL

LOAD SENSING PROPORTIONING VALVE (LSPV)

COMPONENTS







CHECK AND ADJUSTMENT OF FLUID PRESSURE

1. SET REAR AXLE LOAD

(a) Set the vehicle unladen.

(b) Measure the rear axle load and note the value.

(e) Set the rear axle load.

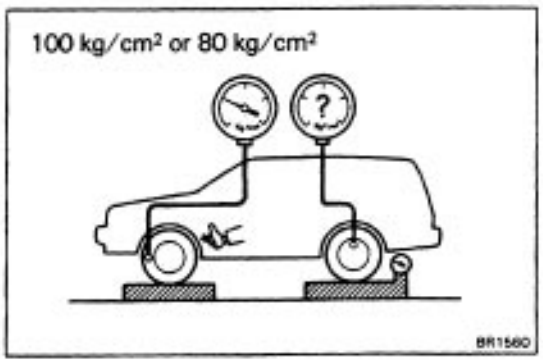
Rear axle load: RW + 100 kg (220 lb)

RW: Rear axle unladen weight

(Measurement taken in step (b))

2. INSTALL LSPV GAUGE (SST) AND BLEED BRAKE SYSTEM

SST 09709–29017

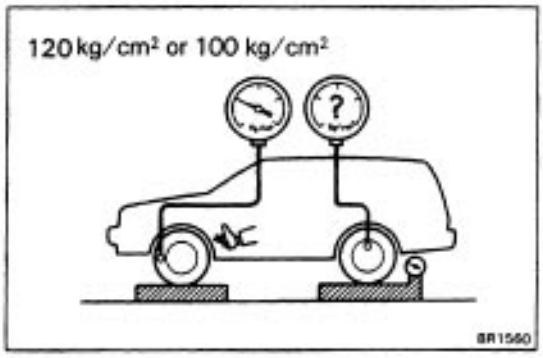


3. RAISE FRONT BRAKE PRESSURE TO 100 kg/cm² (1,422 psi, 9,807 kPa) O R 80 kg /eM2 (1,138 psi, 7,845 kPa) AND CHECK REAR BRAKE PRESSURE

Brake pressure: kg/cm² (psi, kPa)

		Front brake pressure	Rear brake pressure
w/ A.B.S.		100 (1,422, 9,807)	65.9 — 78.9 (937 — 1,122, 6,463 — 7,737)
w/o A.B .S.	21¿¿– FE	100 (1,422, 9,807)	63.7 — 76.7 (906 — 1,091, 6,247 — 7,522)
	Others	80 (1,138, 7,845)	41.0 — 54.0 (583 — 768, 4,021 — 5,296)

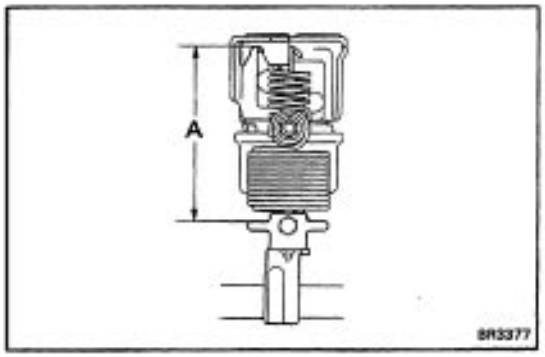
HINT: The brake pedal should not be depressed twice and/or returned while setting to the specified pressure. Read the value of rear pressure tvvo'seconds after adjusting the specified fluid pressure.



4. RAISE FRONT BRAKE PRESSURE TO 120 kg/cm² (1,705 psi, 11,768 kPa) OR 100 kg/cm² (1,422 psi, 9,807 kPa) AND CHECK REAR BRAKE PRESSURE

Brake pressure: kg/cm² (psi, kPa)

		Front brake pressure	Rear brake pressure
w/ A.6.S.		120 (1,707, 11,768)	73.3 — 86.3 (1,043 — 1,227, 7,188 — 8,463)
w/o A.B.S.	2VZ–FE	120 (1,707, 11,768)	71.1 — 84.1 (1,011 — 1,196, 6,973 — 8,247)
	Others	100 (1,422, 9,807)	48.4 — 61.4 (688 — 873, 4,746 — 6,021)



5. IF NECESSARY, ADJUST FLUID PRESSURE

(a) Adjust the fluid pressure by changing the spring lenght.

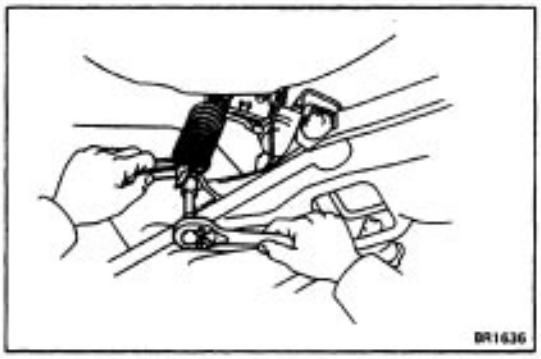
Low pressure – Shorten A

High pressure – Lengthen A

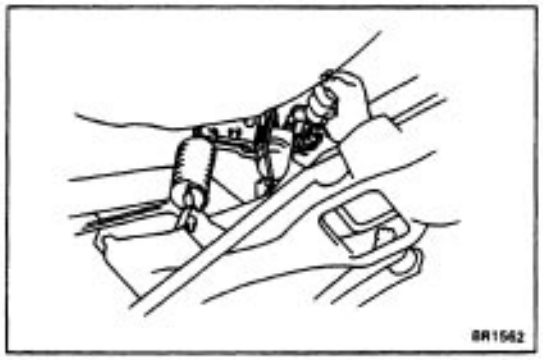
Initial set length: 2VZ–FE 167.6 mm (6.598 in.)

Others 166.9 mm (6.571 in.)

HINT: 1 mm (0.04 in.) displacement of the spring lengt changes the fluid pressure about 1.0 kg /cm2 (14.2 psi, 98 kPa).



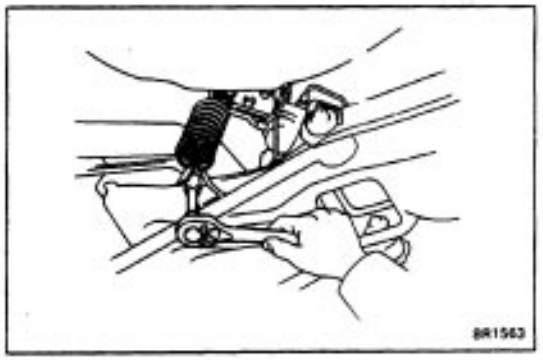
(b) Tighten the nuts.
Torque: 260 kg–cm (19 ft–lb, 25 N–m)



(c) In the event pressure cannot be adjusted by the spring length, raise or lower the valve body.
Low pressure – Lower
High pressure – Raise

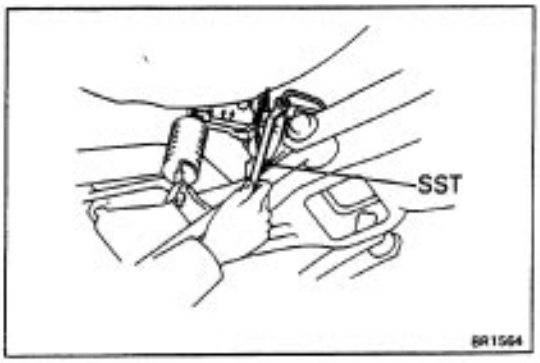
HINT: 1 mm (0.04 in.) displacement of the valve body changes the fluid pressure about 7.2 kg /cm^2 (102.4 psi, 706 kPa).

(d) Torque the nuts.
Torque: 130 kg–cm (9 ft–lb, 13 N–m)



(e) Adjust the fluid pressure by changing the spring length again.

If it cannot be adjusted, replace the valve assembly.



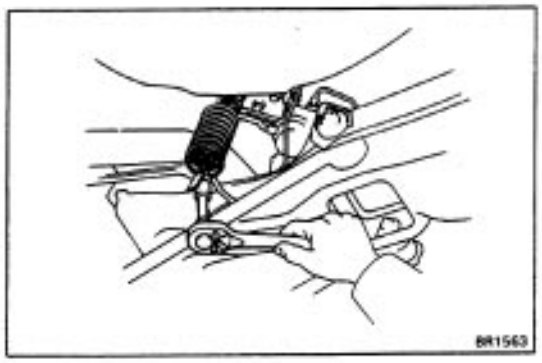
REMOVAL OF LSPV

(See page BR–50)

1. DISCONNECT BRAKE TUBES

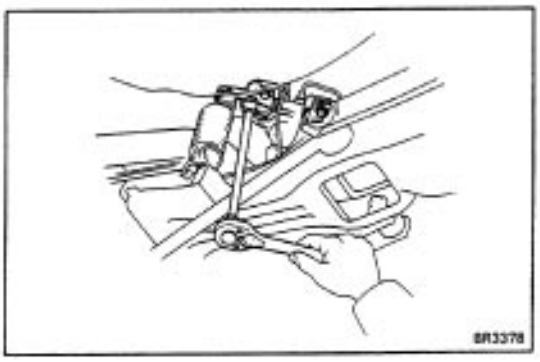
Using SST, disconnect the brake tubes from the valve body.

SST 09751–36011



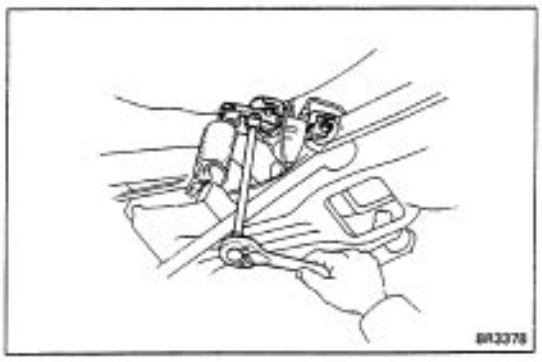
2. REMOVE LSPV ASSEMBLY

(a) Remove the adjusting nut and disconnect the spring from the rear suspension arm.



(b) Remove the three mounting bolts and remove the LSPV assembly.

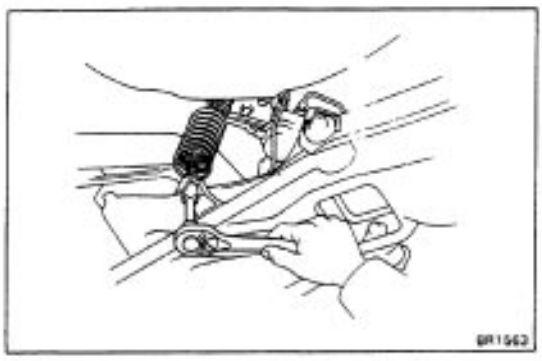
INSTALLATION OF LSPV



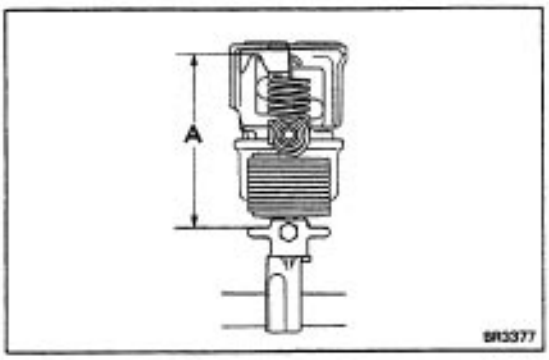
1. INSTALL LSPV ASSEMBLY

(a) Install the valve assembly with the three mounting bolts.

Torque: 260 kg–cm (19 ft–lb, 25 N–m)

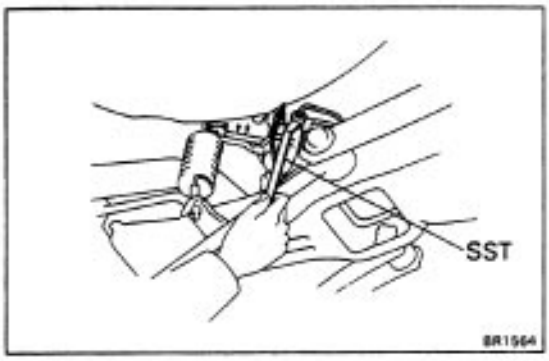


(b) Install the adjusting bolt lock nut to the adjusting bolt and then install the adjusting bolt to the rear suspension arm with the adjusting nut.



(c) Set spring length A to initial set length and temporarily tighten the adjusting bolt lock nut.

Initial set length: 2VZ–FE 167.6 mm (6.598 in.)
Others 166.9 mm (6.571 in.)



2. CONNECT BRAKE TUBES

Using SST, connect the brake tubes.
SST 09751–36011
Torque: 155 kg–cm (11 ft–lb, 15 N–m)

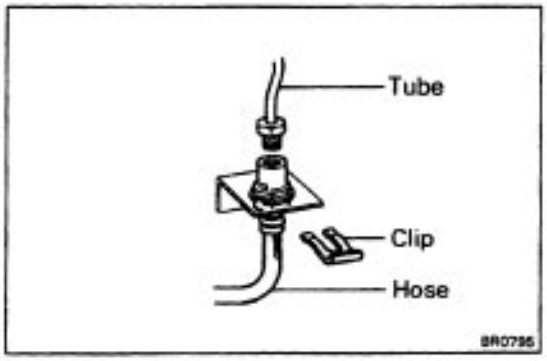
3. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(See page BR–7)

4. CHECK FOR FLUID LEAKAGE

5. CHECK AND ADJUST FLUID PRESSURE
(See page BR–50)

6. REMOVE SST AND BLEED BRAKE SYSTEM
SST 09709–29017

7. CHECK FOR FLUID LEAKAGE



BRAKE HOSES AND TUBES

DISCONNECT AND CONNECT HOSE AND TUBE

1. DISCONNECT NOSE AND TUBE

(a) Disconnect the clip.

(b) Using a wrench to hold the hose and SST,to hold the tube, disconnect the tube and hose.

SST 09751–36011

2. CONNECT HOSE AND TUBE

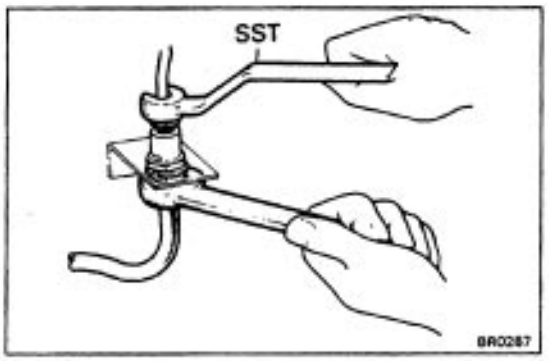
(a) Connect the hose and tube by hand.

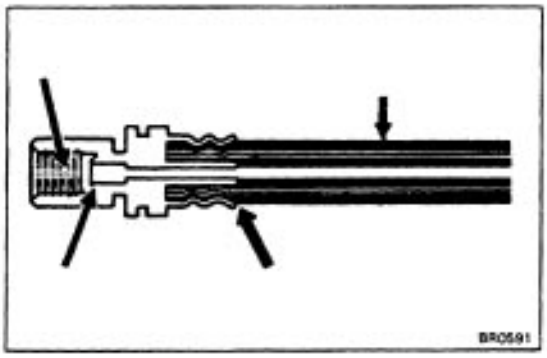
(b) Using a wrench to hold the hose and SST to hold the tube, torque the connection.

SST 09751–36011

Torque: 155 kg–cm (11 ft–lb, 15 N–m)

(c) Install a hose clip.



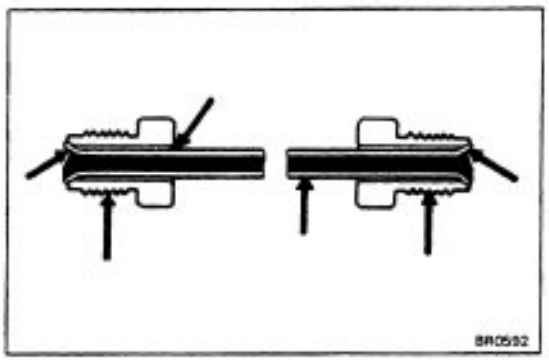


INSPECTION OF BRAKE HOSES AND TUBES

1. INSPECT BRAKE HOSES

(a) Inspect the hose for damage, cracks or swelling.

(b) Inspect the threads for damage.



2. INSPECT BRAKE TUBES

(a) Inspect the tube for damage, cracks, dents or corrosion.

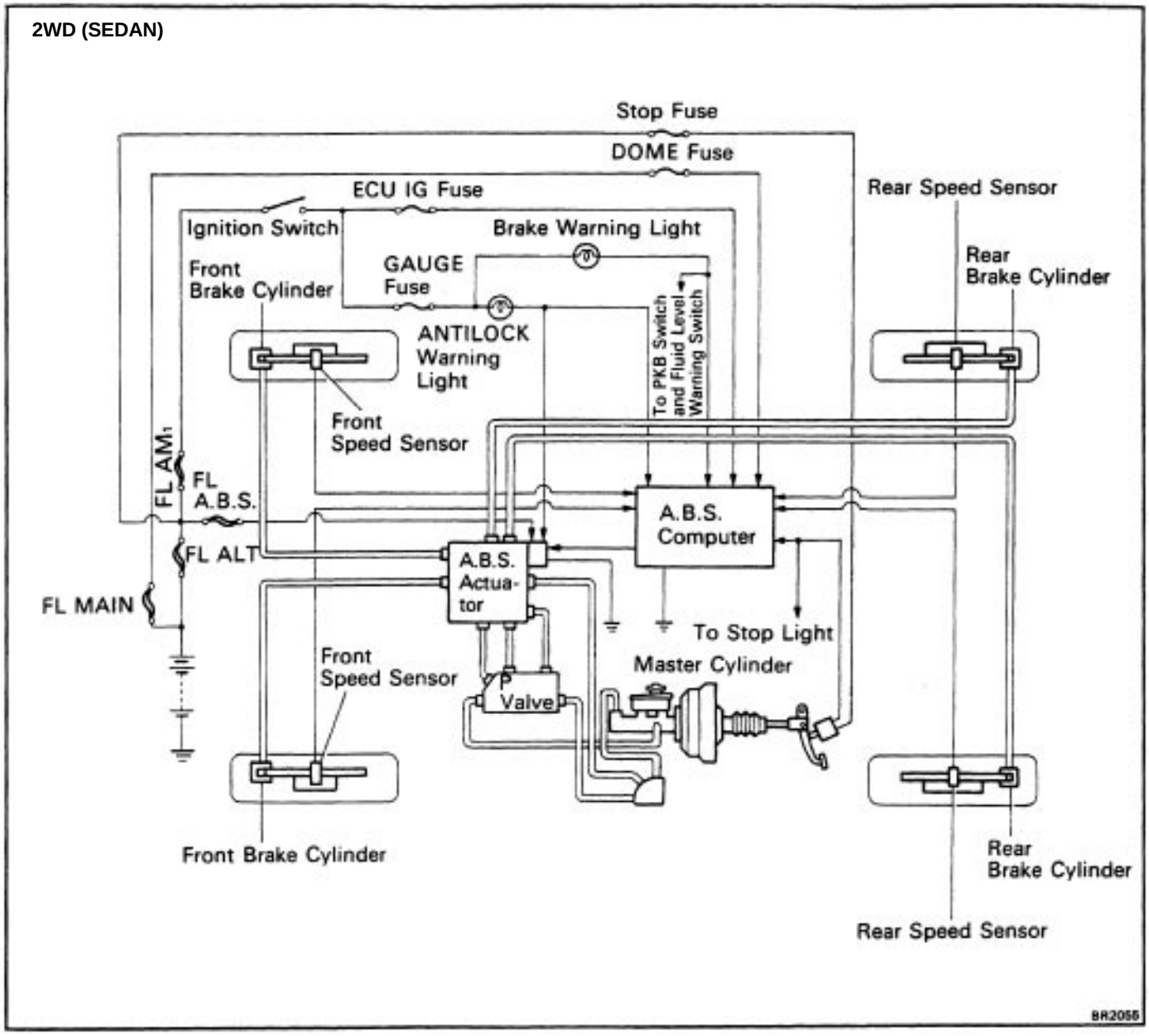
(b) Inspect the threads for damage.

ANTI–LOCK BRAKE SYSTEM (A.B.S.)

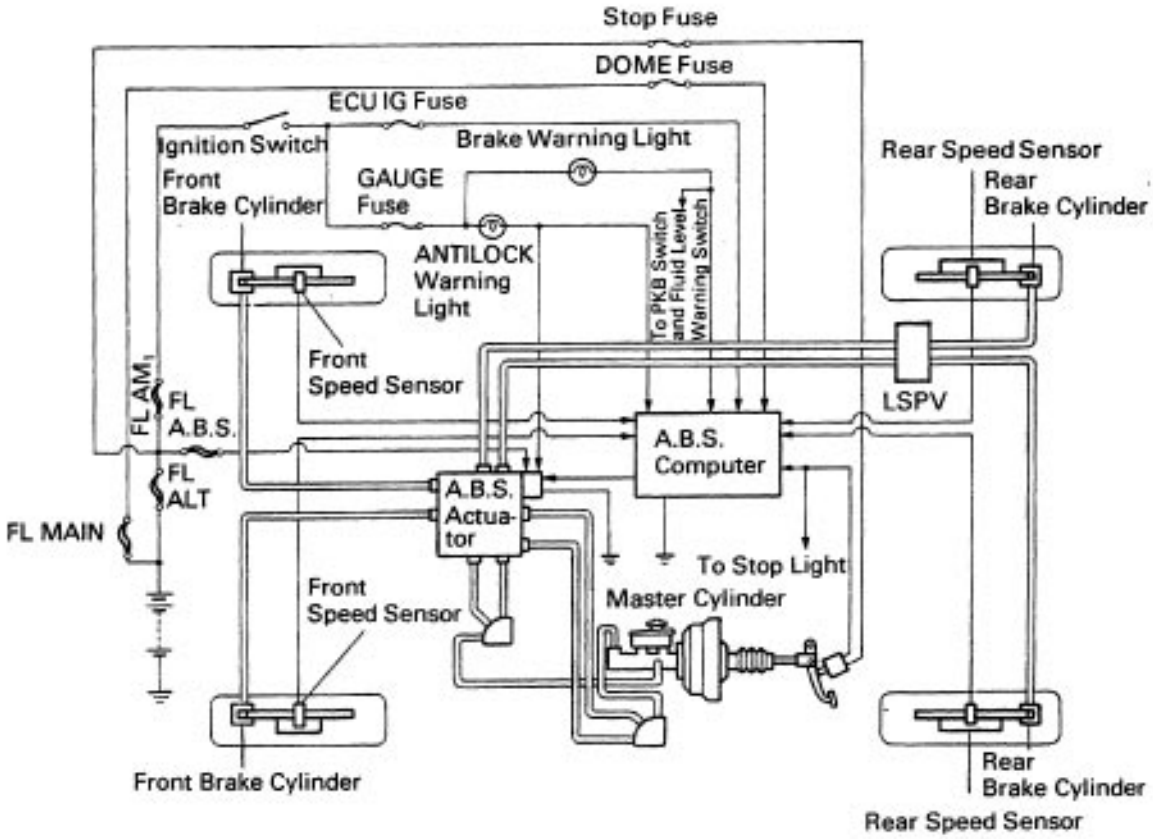
Description

- The A.B.S. is a brake system which controls the wheel cylinder hydraulic pressure of all four wheels during sudden braking and braking on slippery road surfaces, preventing the wheels from locking. This A.B.S. provides the following benefits:
  (1) Enables steering round an obstacle with a greater degree of certainty even when panic braking.
  (2) Enables stopping in a panic brake while keeping the effect upon stability and steerability to a minimum, even on curves.
- The function of the A.B.S. is to help maintain directional stability and vehicle steerability on most road conditions. However, the system cannot prevent the vehicle from skidding if the cornering speed limit is exceeded.
- The A.B.S. has a longitudinal deceleration sensor to match braking characteristics to the full–time four–wheel drive. (For 4WD)
- In case a malfunction occurs, a diagnosis function and fail–safe system have been adopted for the A.B.S. to increase serviceability.

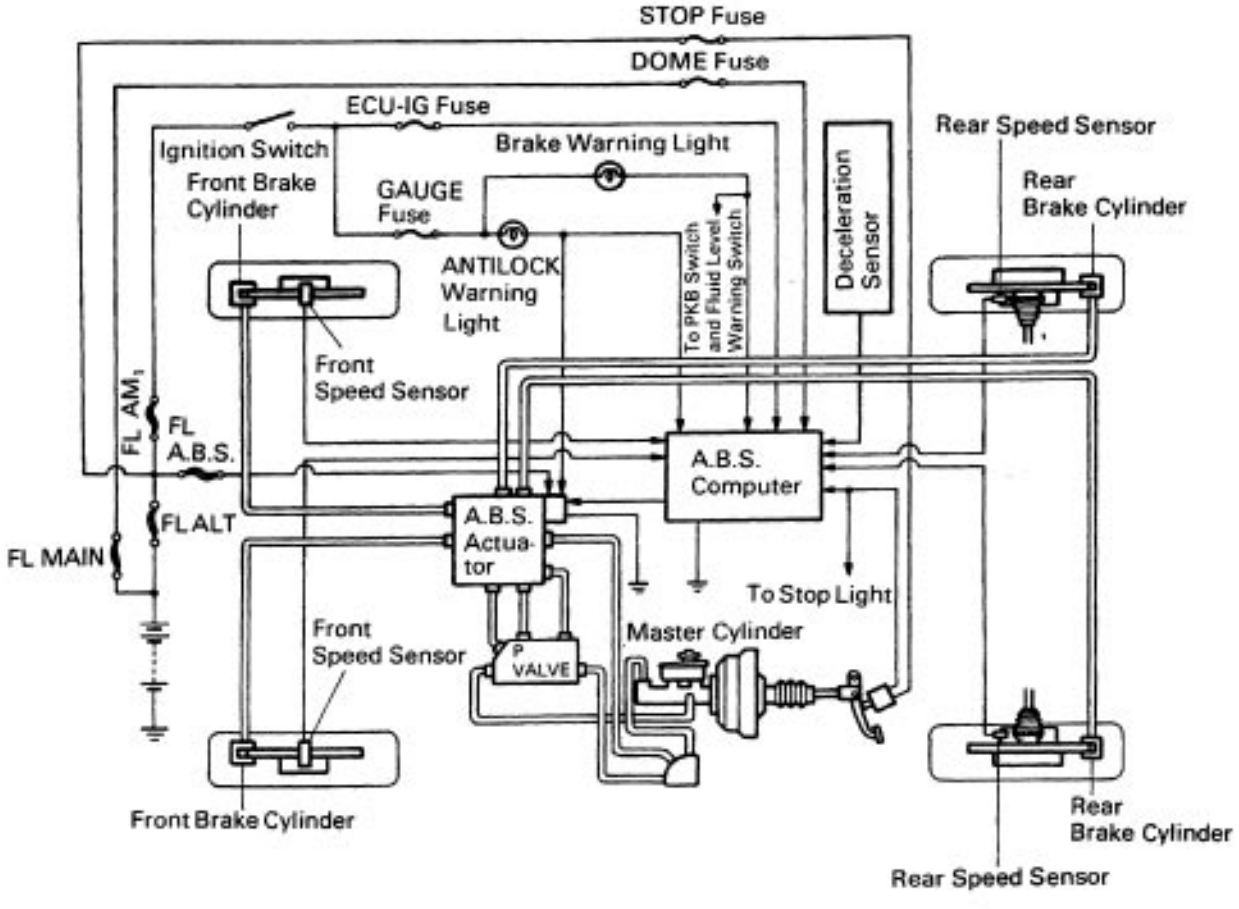
2WD (SEDAN)



2WD (WAGON)



4WD

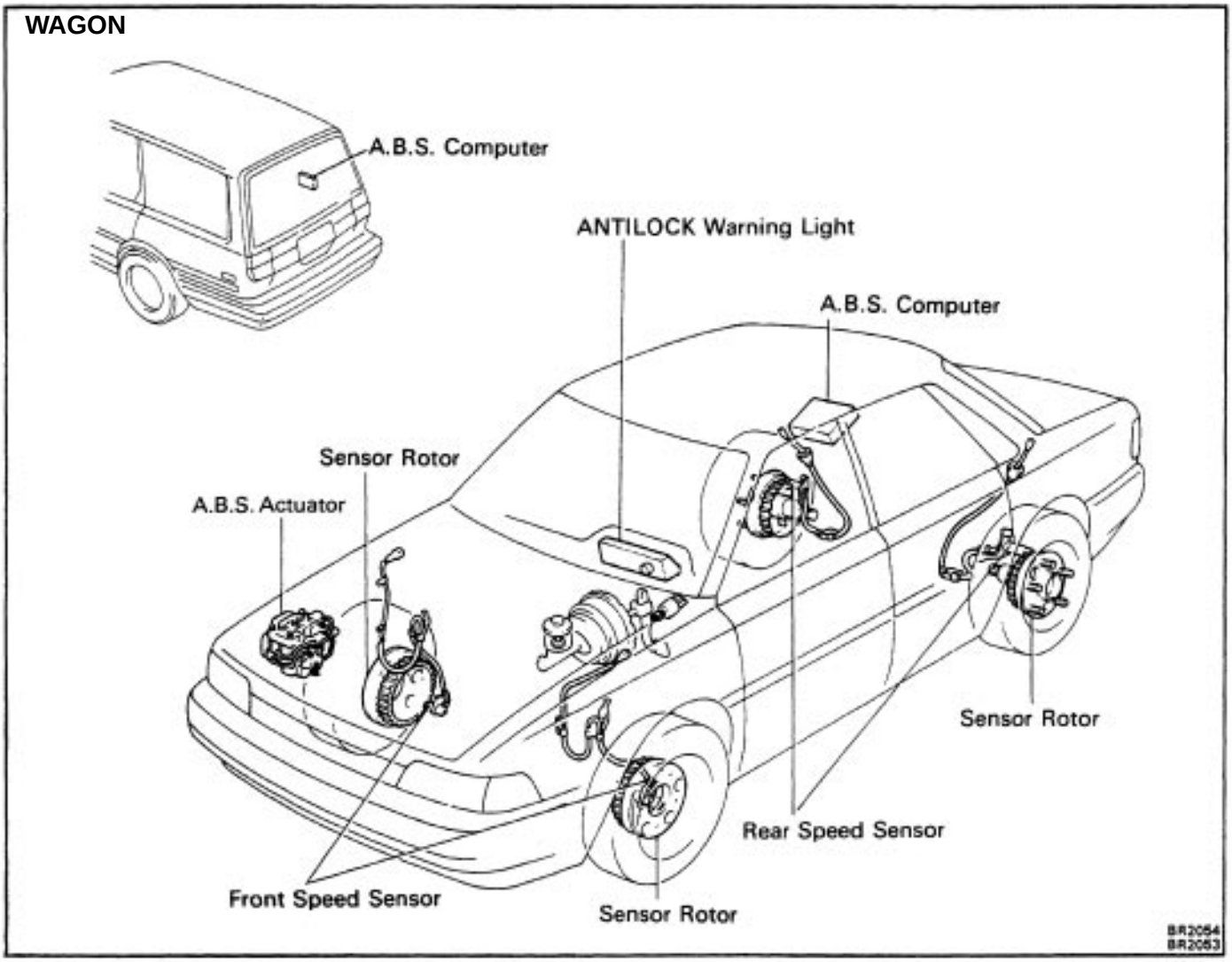


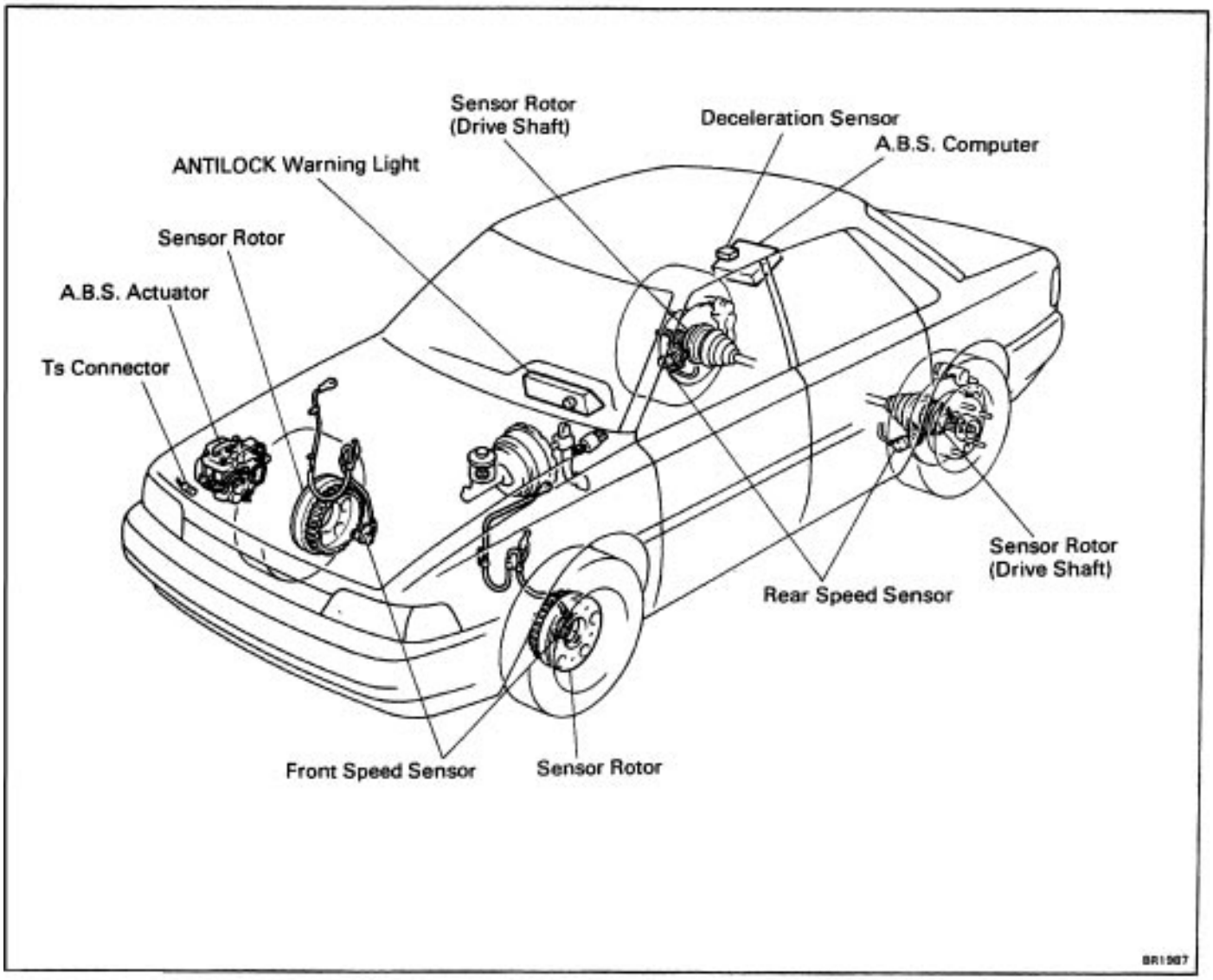
FUNCTION OF COMPONENTS

Component	Function
Front Speed Sensor	Detects the wheel speed of each of the left and right front wheels.
Rear Speed Sensor	Detects the wheel speed of each of the left and right rear wheels.
Deceleration Sensor (For 4WD)	Detects the deceleration speed of the vehicle and sends a signal accordingly to the A.6.S. computer.
ANTI LOCK Warning Light	Lights up to alert the driver when trouble has occured in the Anti–lock Brake System.
Actuator	Controls the brake fluid pressure to each disc brake cylinder through signals from the computer.
Anti–lock Brake System Computer	From the wheel speed signals from each sensor, it calculates acceleration, deceleration and slip values and sends signals to the actuator to control brake fluid pressure.

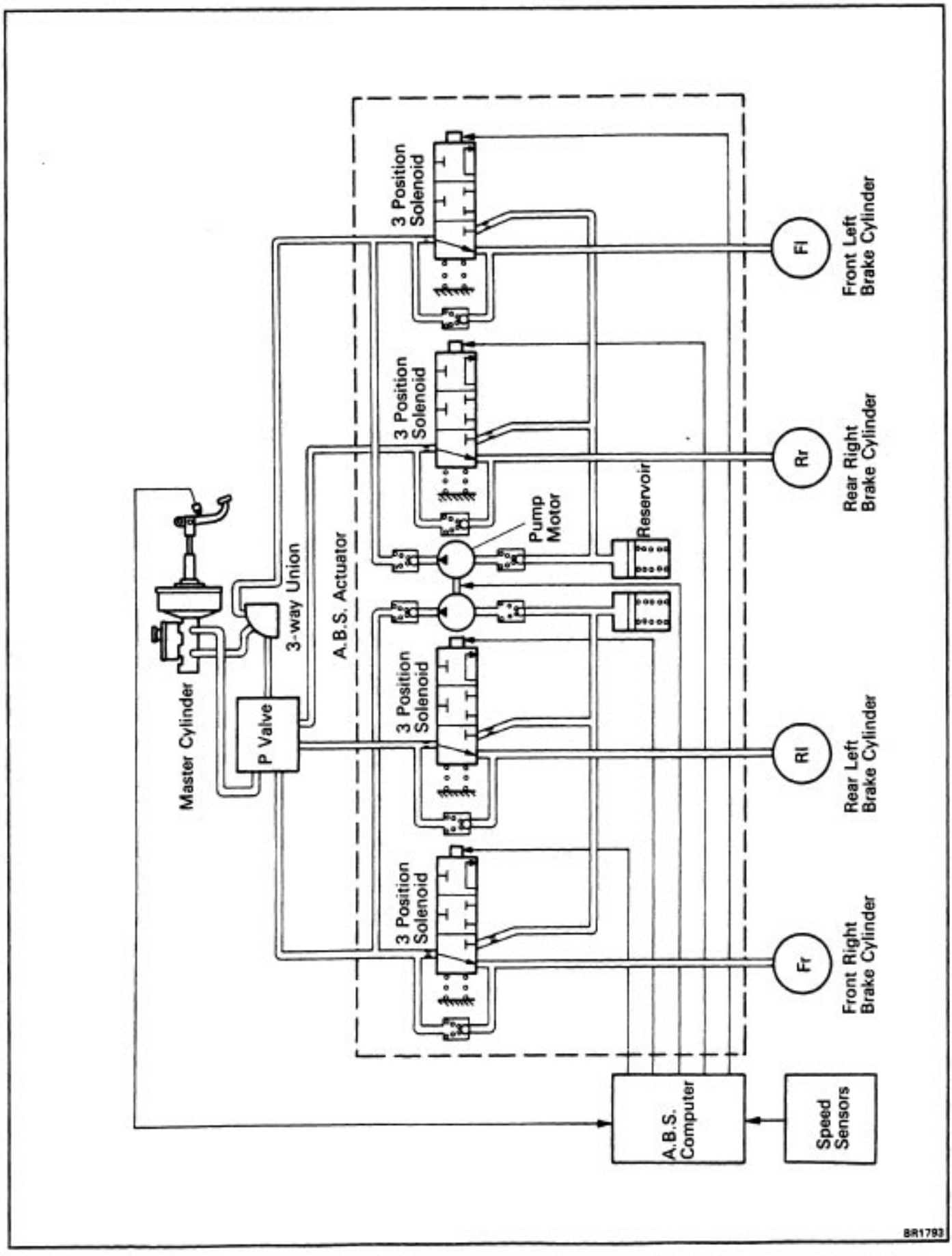
LOCATION OF SYSTEM PARTS

WAGON

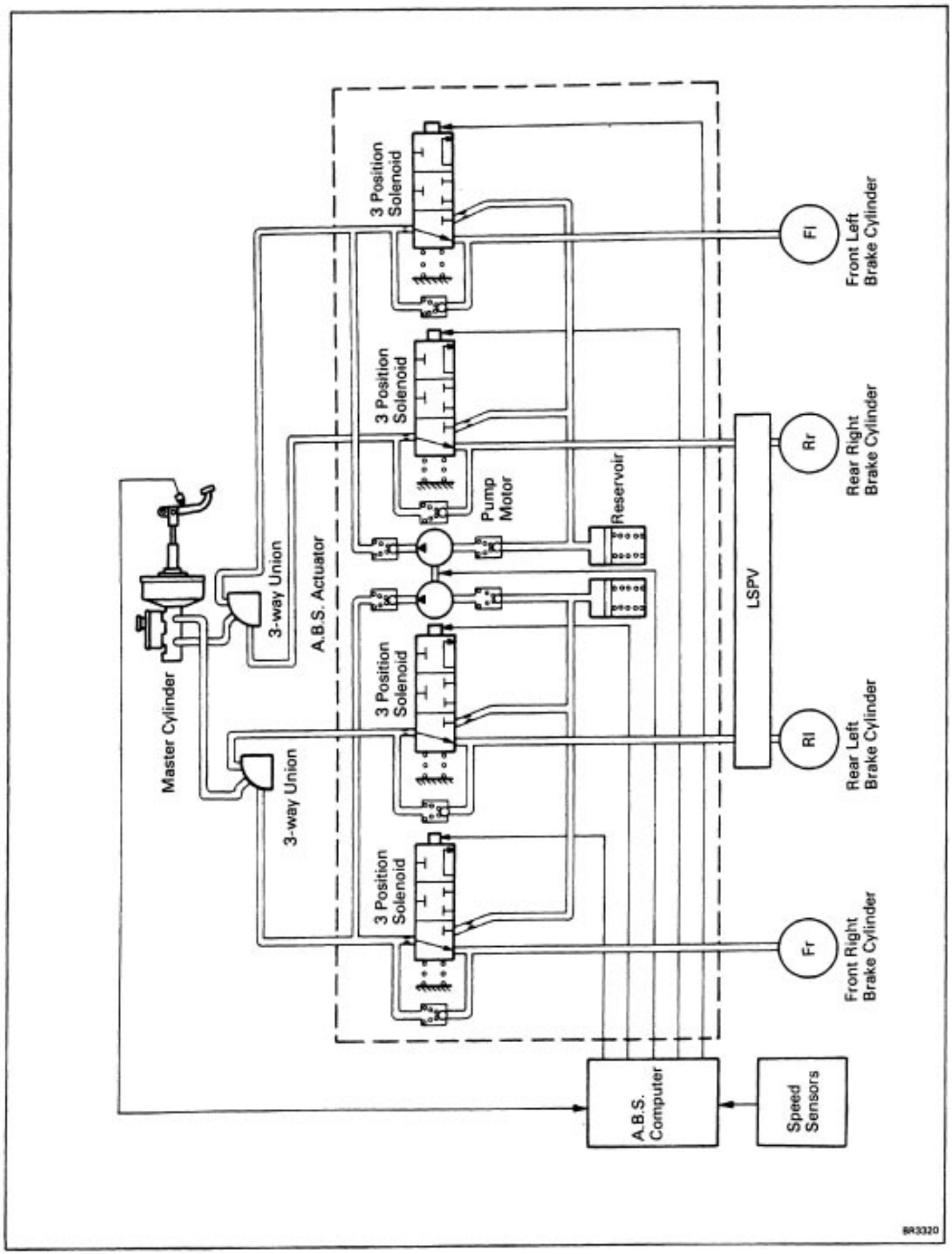



Sensor Rotor
(Drive Shaft)
Deceleration Sensor
A.B.S. Computer
ANTILOCK Warning Light
Sensor Rotor
A.B.S. Actuator
Ts Connector
Sensor Rotor
(Drive Shaft)
Rear Speed Sensor
Front Speed Sensor
Sensor Rotor
BR1987

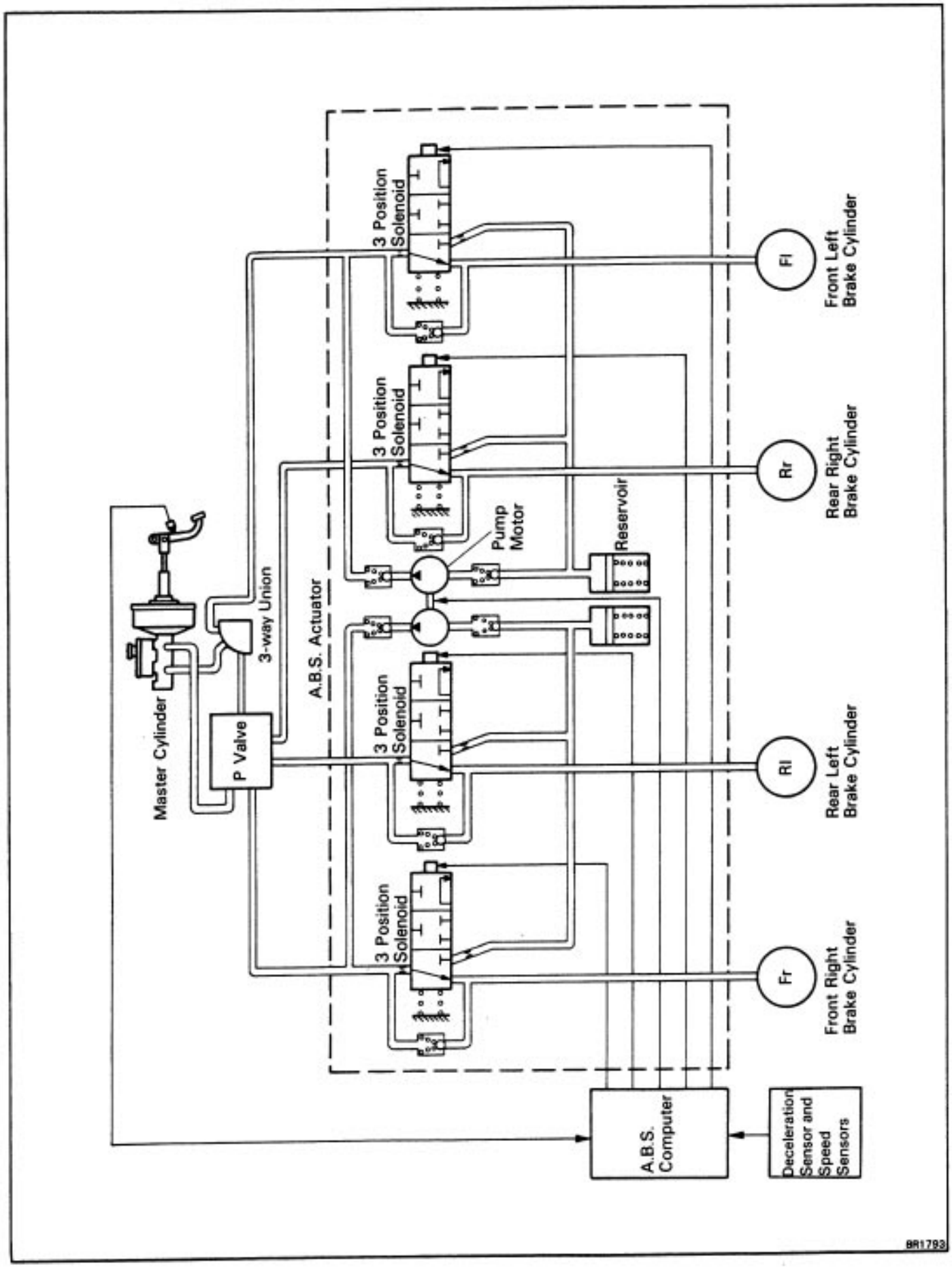
SYSTEM DIAGRAM (2WD OF SEDAN)



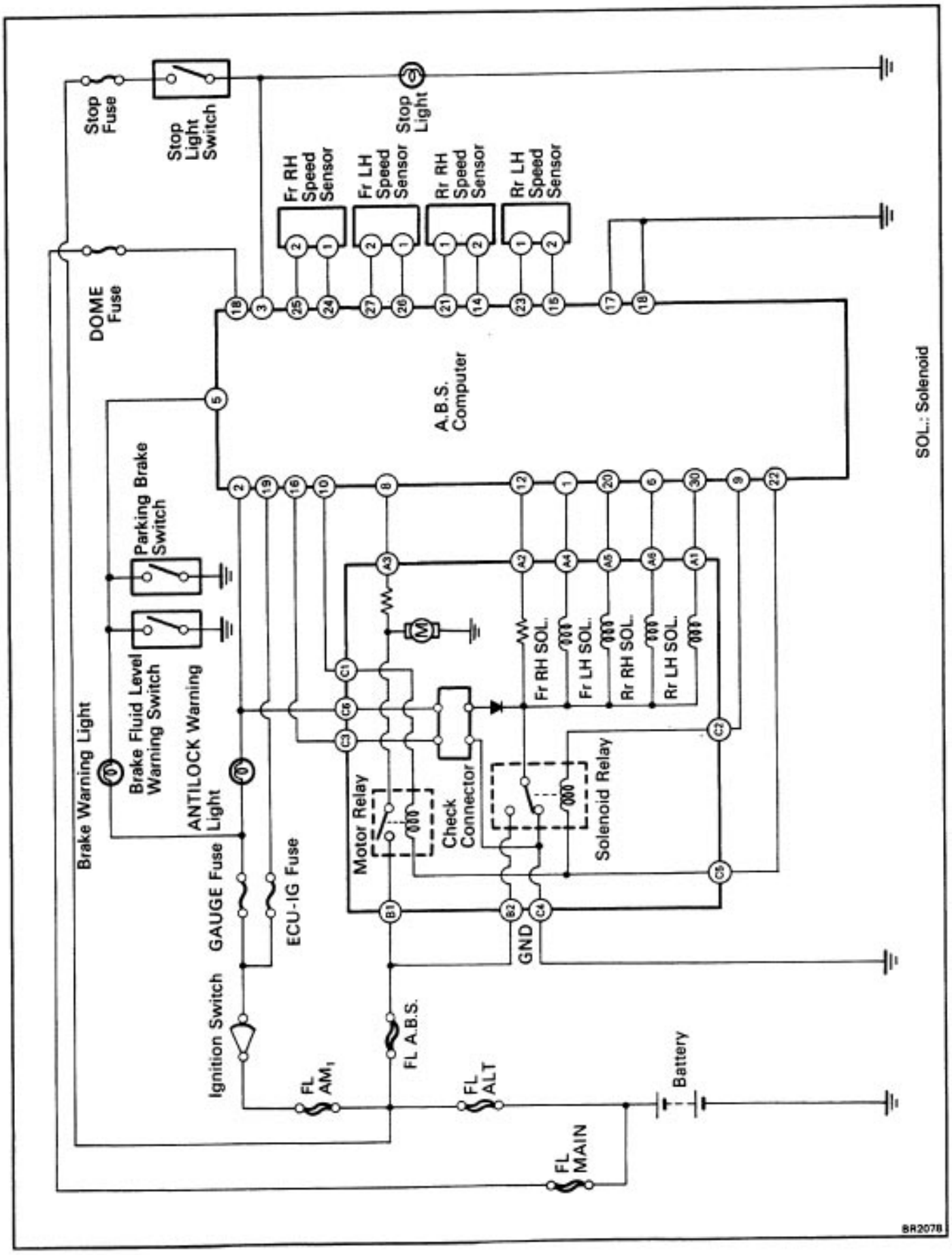
SYSTEM DIAGRAM (2WD OF WAGON)



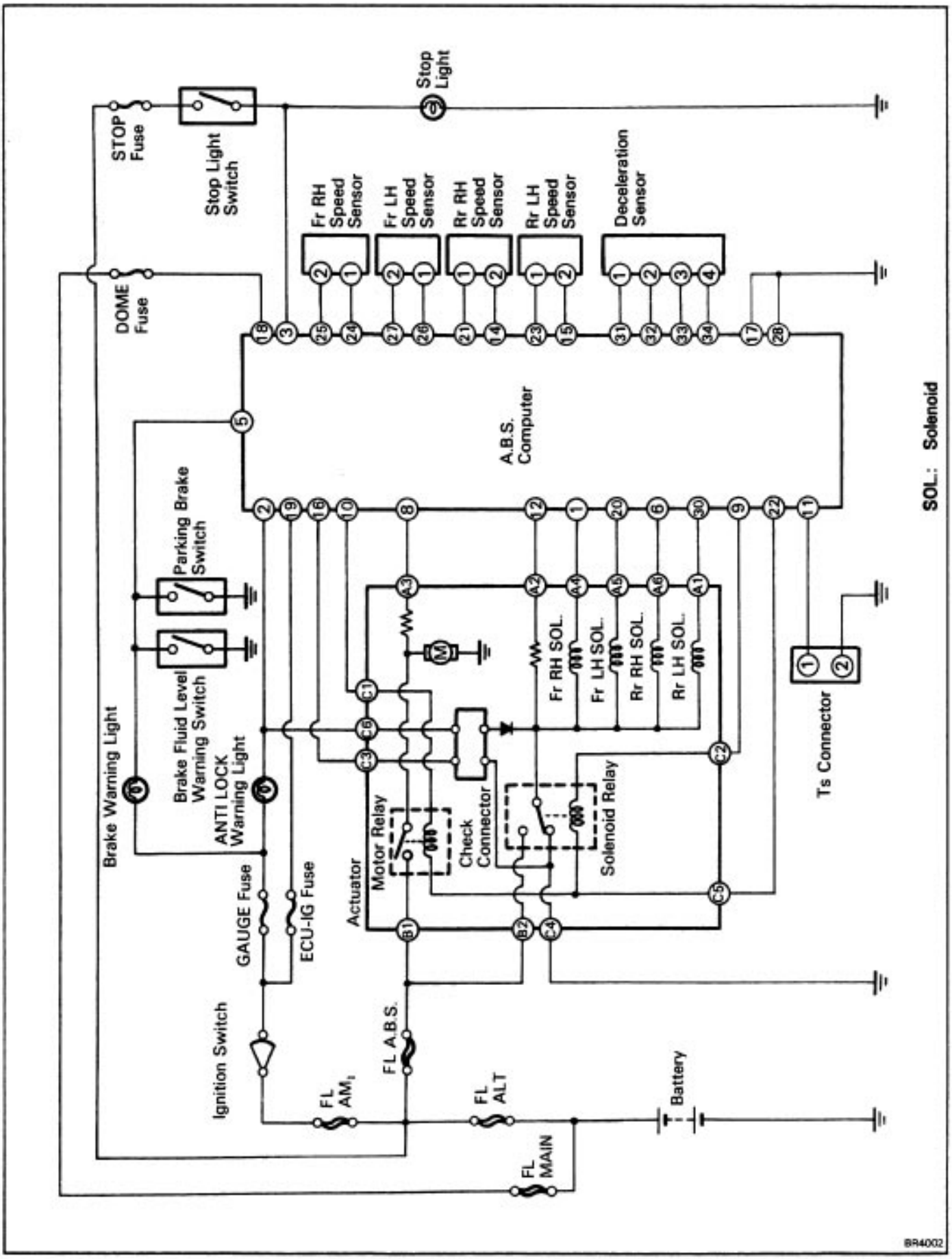
SYSTEM DIAGRAM (4WD)



WIRING DIAGRAM (2WD)



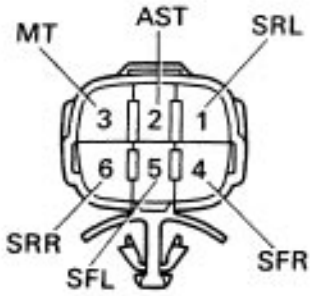
WIRING DIAGRAM (4WD)



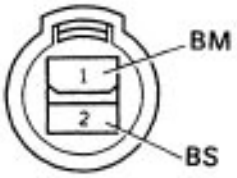
CONNECTORS (2WD)

Brake Actuator

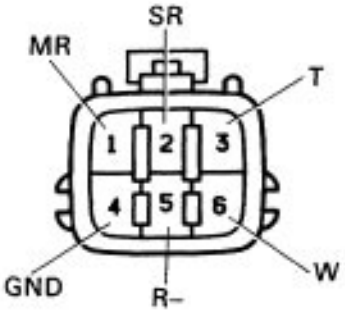
CONNECTOR A



CONNECTOR B



CONNECTOR C

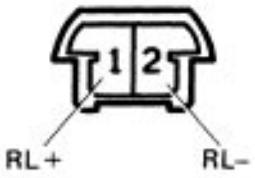


Check Connector

Front Speed Sensor (LH)

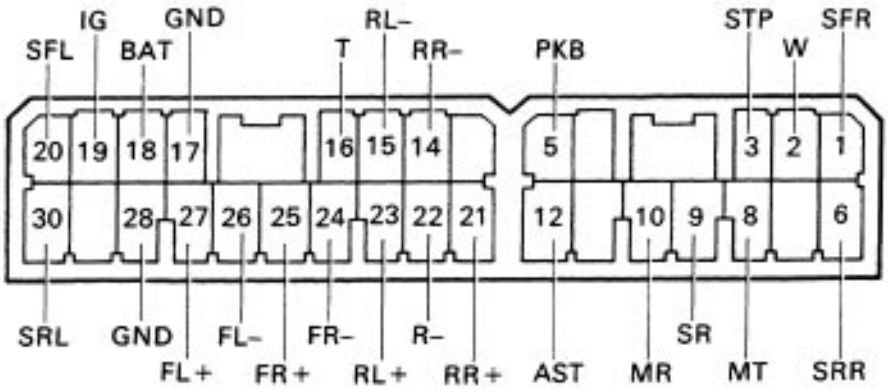
Front Speed Sensor (RH)

Rear Speed Sensor (LH)



Rear Speed Sensor (R H)

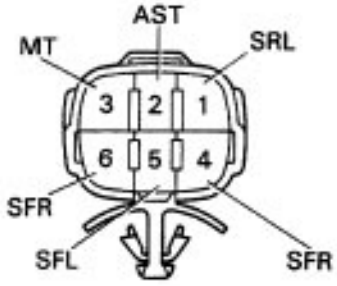
Anti–lock Brake System Computer



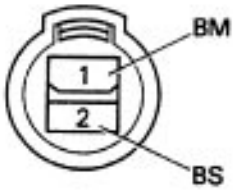
E2402 ID-2-2 IS-6-1-B
IS-2-1-B BR1798 BR1798
GA-2-1-C GA-2-1-1-C
E2403

CONNETORS (4WD)

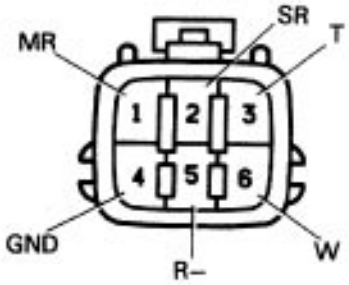
Brake Actuator
CONNECTOR A



CONNECTOR B



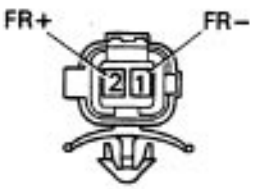
CONNECTOR C



Check Connector

Front Speed Sensor (LN)

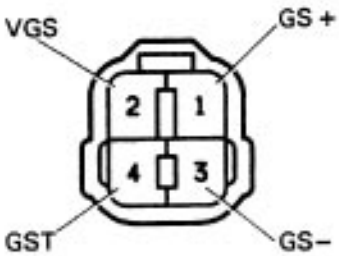
Front Speed Sensor (RH)



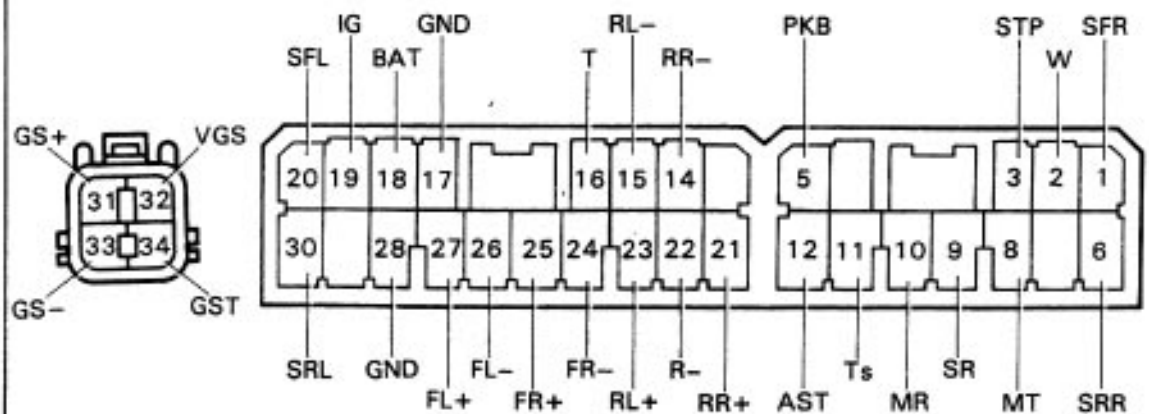
Rear Speed Sensor (LH)

Rear Speed Sensor (RH)

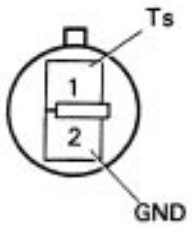
Deceleration Sensor



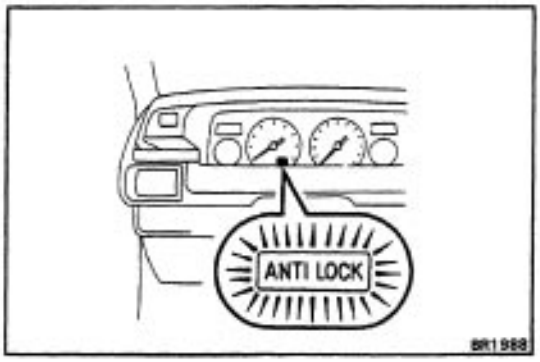
Anti–lock Brake System Computer



Ts Connector



E2402 ID-2-2 IS-6-1-8
IS-2-1-8 BR1798 BR1798
GA-2-1-C GA-3-1-C IS-4-2-8
IS-4-1-8 E2403 IC-2-1



Diagnosis System

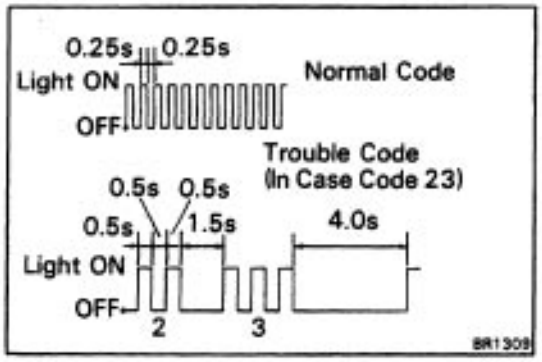
DESCRIPTION

If a malfunction occurs, the system will identify the problem and the computer will store the codes for the trouble items.

At the same time, the system informs the driver of a malfunction via the ”ANTILOCK” warning light in the combination meter.

By turning on the ignition switch and disconnecting the check connector, the trouble can be identified by the number of blinks (diagnostic code) of the warning light. In the event of two codes, that having the smallest number (code) will be identified first.

HINT: The warning light does not show the diagnostic codes while the vehicle is running.



INITIAL CHECK

CHECK ACTUATOR OPERATION NOISE

(a) Start the engine and drive at a speed over 6 km/h (4 mph).

(b) Check that the actuator operation noise is heard.

HINT: A initial check is carried out once each time after the engine has been started and initial speed exceeds 6 km/h (4 mph). The respective functions, in order, of the 3 position solenoid and pump motor in the actuator are checked. However, if the brake pedal is depressed, the initial check is not carried out, but is started after the pedal has been released.

INSPECTION OF DIAGNOSIS SYSTEM

1. INSPECT BATTERY VOLTAGE

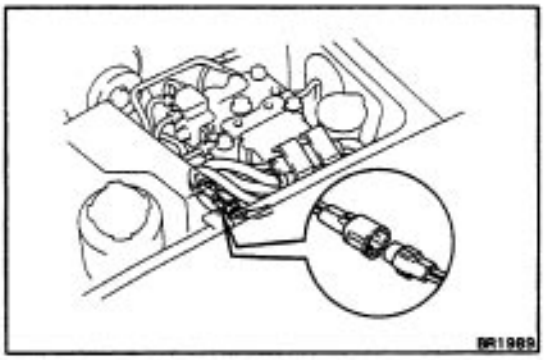
Inspect that the battery voltage is about 12 V.

2. CHECK THAT WARNING LIGHT TURNS ON

(a) Turn the ignition switch on.

(b) Check that the ”ANTILOCK” warning light turns on for 3 seconds.

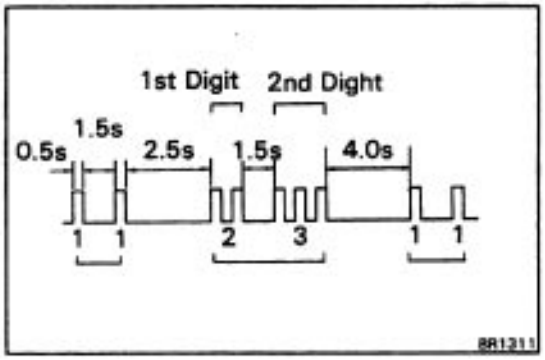
If not, inspect and repair or replace the fuse, bulb and wire harness.



3. READ DIAGNOSTIC CODE

(a) Turn the ignition switch on.

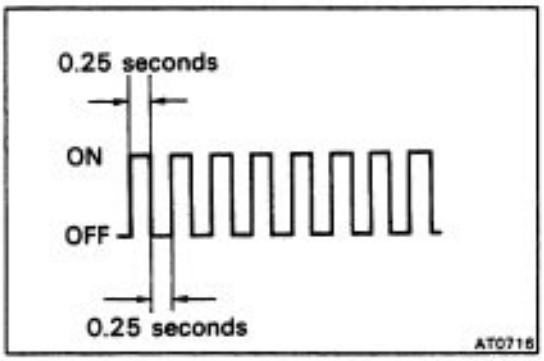
(b) Disconnect the check connector from the actuator.



(c) In event of a malfunction, 4 seconds later the warning light will begin to blink. Read the number of blinks. (See DIAGNOSTIC CODE on page BR–69)

HINT: The first number of blinks will equal the first digit of a two digit diagnostic code. After a 1.5 second pause, the
2nd number of blinks will equal the 2nd number of a two digit code. If there are two or more codes, there will be a 2.5 second pause between each, and indication will begin after 4.0 second pause from the smaller value and continue in order to larger.

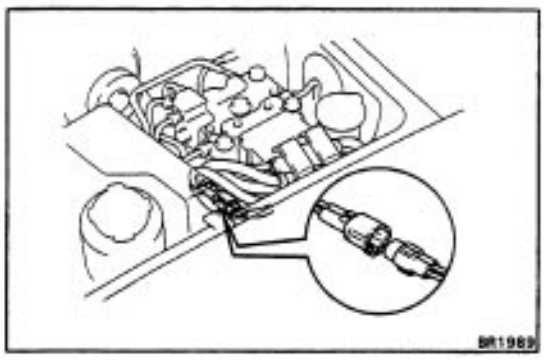
(d) If the system is operating normally (no malfunction), the warning light will blink 2 times per second.



(e) Repair the system.

(f) After the malfunctioning components has been repaired, clear the diagnostic codes stored in the computer.
(See page BR–70)

HINT: If you disconnect the battery cable while repairing, all diagnostic codes in the computer will erased.



(g) Connect the check connector.

(h) Turn the ignition switch on, and check that the ”ANTILOCK” warning light goes off after the warning light goes on for 3 seconds.

DIAGNOSTIC CODE

Code No.	Light Pattern	Diagnosis	Trouble Part
11	ON OFF	Open circuit in solenoid relay circuit	Actuator inside wire harness Solenoid relay Wire harness and connector of solenoid relay circuit
12		Short circuit in solenoid relay circuit	
13		Open circuit in pump motor relay circuit	Actuator inside wire harness Pump motor relay Wire harness and connector of pump motor relay circuit
14		Short circuit in pump motor relay circuit	
21		Open or short circuit in 3 position solenoid of front right wheel	Actuator solenoid Wire harness and connector of actuator solenoid circuit
22		Open or short circuit in 3 position solenoid of front left wheel	
23		Open or short circuit in 3 position solenoid of rear right wheel	
24		Open or short circuit in 3 position solenoid of rear left wheel	
31		Front right wheel speed sensor signal malfunction	Speed sensor Sensor rotor Wire harness and connector of speed sensor
32		Front left wheel speed sensor signal malfunction	
33		Rear right wheel speed sensor signal malfunction	
34		Rear left wheel speed sensor signal malfunction	
35		Open circuit in front left or rear right wheel speed sensor	
36		Open circuit in front right or rear left wheel speed sensor	
37		Wrong both rear axle hubs	Rear sensor rotors
41		Low battery voltage (9.5 V or lower)	Battery Voltage regulator
42		Abnormally high battery voltage 0 6.2 V or higher)	
43		Malfunction in deceleration sensor	Deceleration sensor Deceleration sensor installation Wire harness and connector of deceleration sensor
44		Open or short circuit in deceleration sensor	
51		Pump motor of actuator locked or open circuit in pump motor circuit in actuator	Pump motor, relay and battery Wire harness, connector and ground bolt or actuator pump motor circuit
Always on		Malfunction in computer	Computer

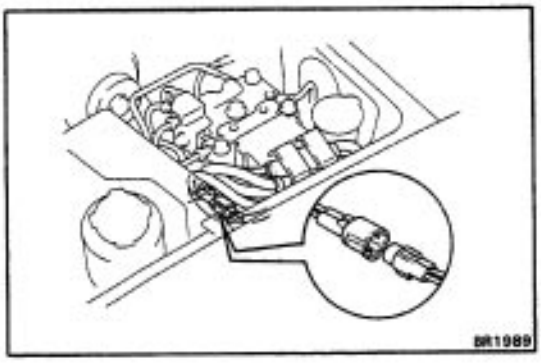
CLEARING OF DIAGNOSTIC CODES

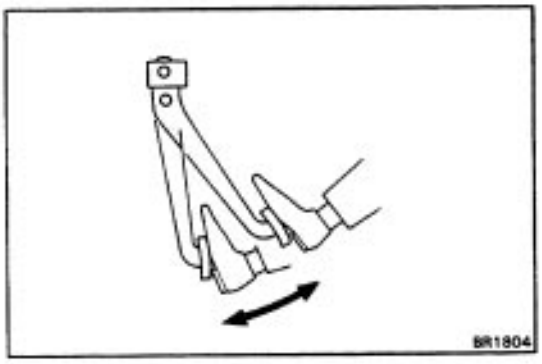
CLEAR DIAGNOSTIC CODES

(a) Turn the ignition switch on.

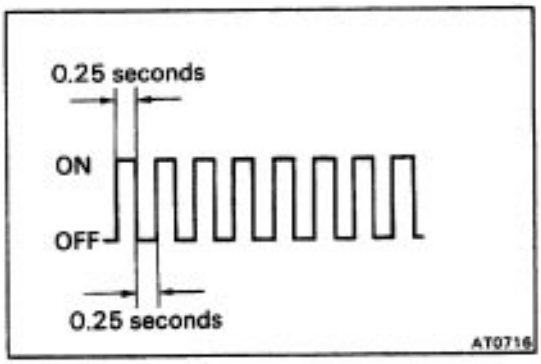
(b) Disconnect the check connector from actuator.

HINT: Keep the vehicle stopped [vehicle speed 0 km/h (0 mph)].

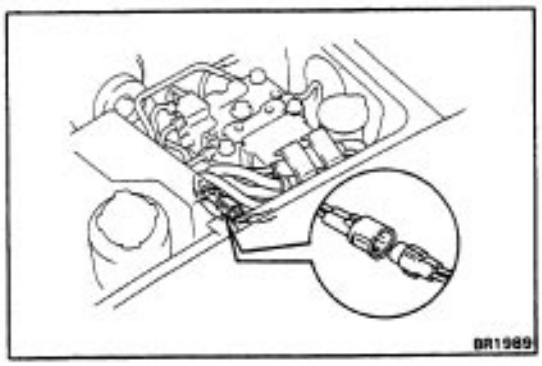




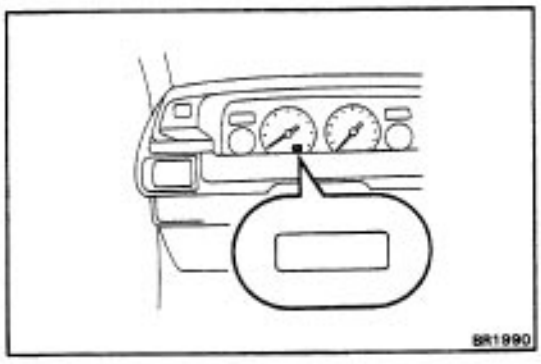
(c) Clear the diagnostic codes stored in computer by depressing the brake pedal 8 or more times within 3 seconds.



(d) Check that the warning light shows the normal code.



(e) Connect the check connector.



(f) Check that the warning light goes off.

Troubleshooting

Problem		No.
”ANTILOCK” warning light	Always comes on after ignition switch is turned on.	1
	Does not come on for 3 seconds after ignition switch on.	2
	Comes on and off.	3
	Comes on while running.	1
Brake working	Brakes pull.	4
	Braking inefficient.	4
	A.6.S. operates at ordinary braking.	4
	A.6.S. operates just before stopping at ordinary braking.	4
	Brake pedal pulsates abnormally while A.B.S. is operating.	4
	Skidding noise occurs while A.B.S. working. (A.B.S. works inefficiently)	5

”ANTIL4CK” warning light comes on.

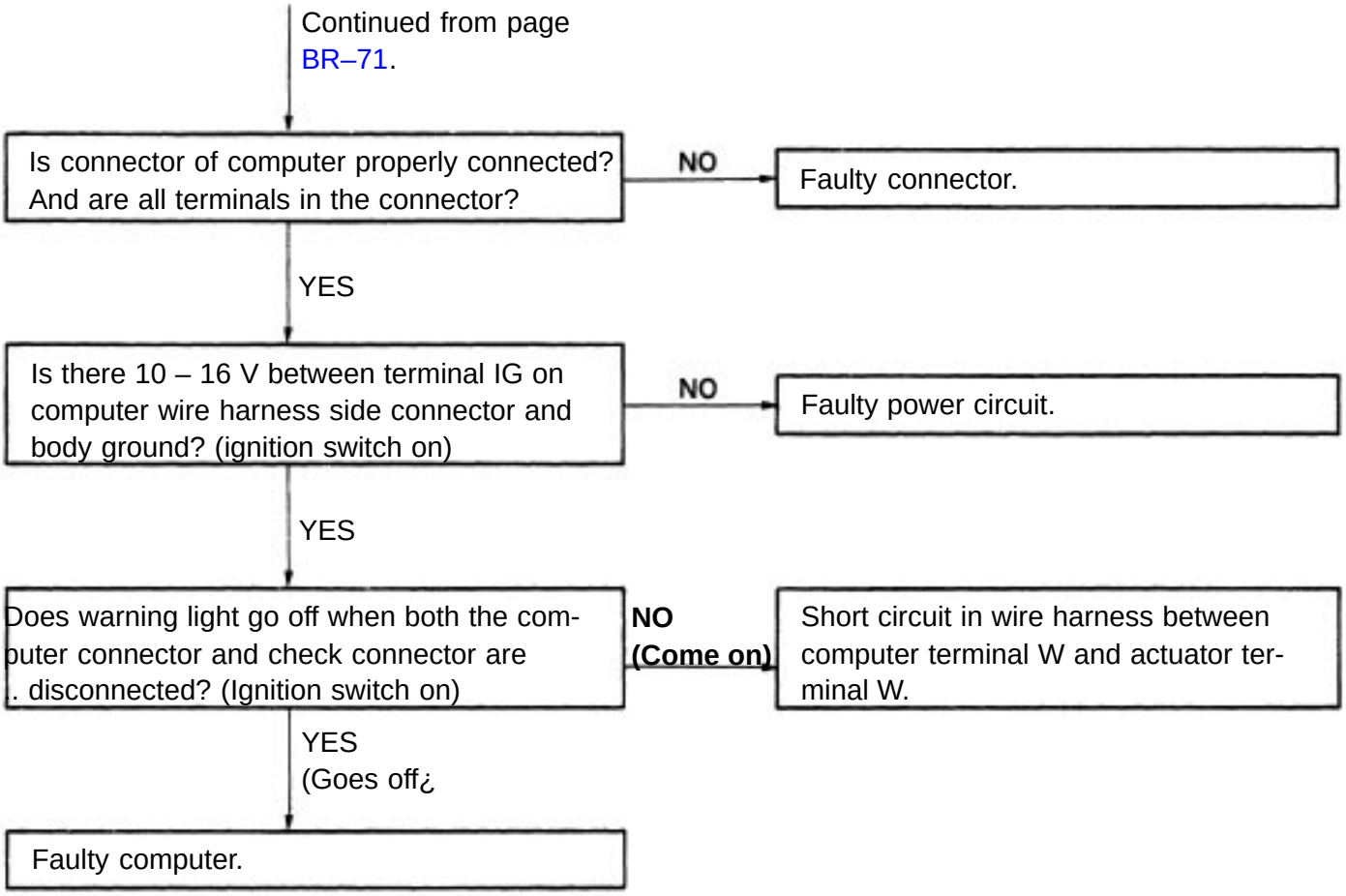
Disconnect check connector.
(See page BR–68)

Does warning light always come on or show the normal code?
(ignition switch on)

NO → See diagnostic code.
(See page BR–69)

YES

Continued on page BR–72.


Continued from page BR–71.
Is connector of computer properly connected? And are all terminals in the connector?
NO
Faulty connector.
YES
Is there 10 – 16 V between terminal IG on computer wire harness side connector and body ground? (ignition switch on)
NO
Faulty power circuit.
YES
Does warning light go off when both the computer connector and check connector are . disconnected? (Ignition switch on)
NO (Come on)
Short circuit in wire harness between computer terminal W and actuator terminal W.
YES (Goes off¿
Faulty computer.

2	”ANTILOCK” warning light does not come on for 3 seconds after ignition switch on.

Disconnect check connector from actuator, and ground the terminal W of the wire harness side connector.
(Ignition switch on)

↓

Does warning light come on? — NO → Bulb burned out or open circuit in wire harness between warning light and actuator terminal W.

↓ YES

Disconnect connectors from computer and actuator, and ground terminal W of computer wire harness side connector.
(Ignition switch on)

↓

Does warning light come on? — ON → Open circuit in wire harness between computer terminal W and warning light.

↓ YES

With ignition switch off, disconnect actuator connectors, and check continuity between terminal W and AST on actuator side.

↓

Reverse tester leads and check again.
Is there one way continuity between terminals? — NO → Short circuit in actuator inside diode.

↓ YES

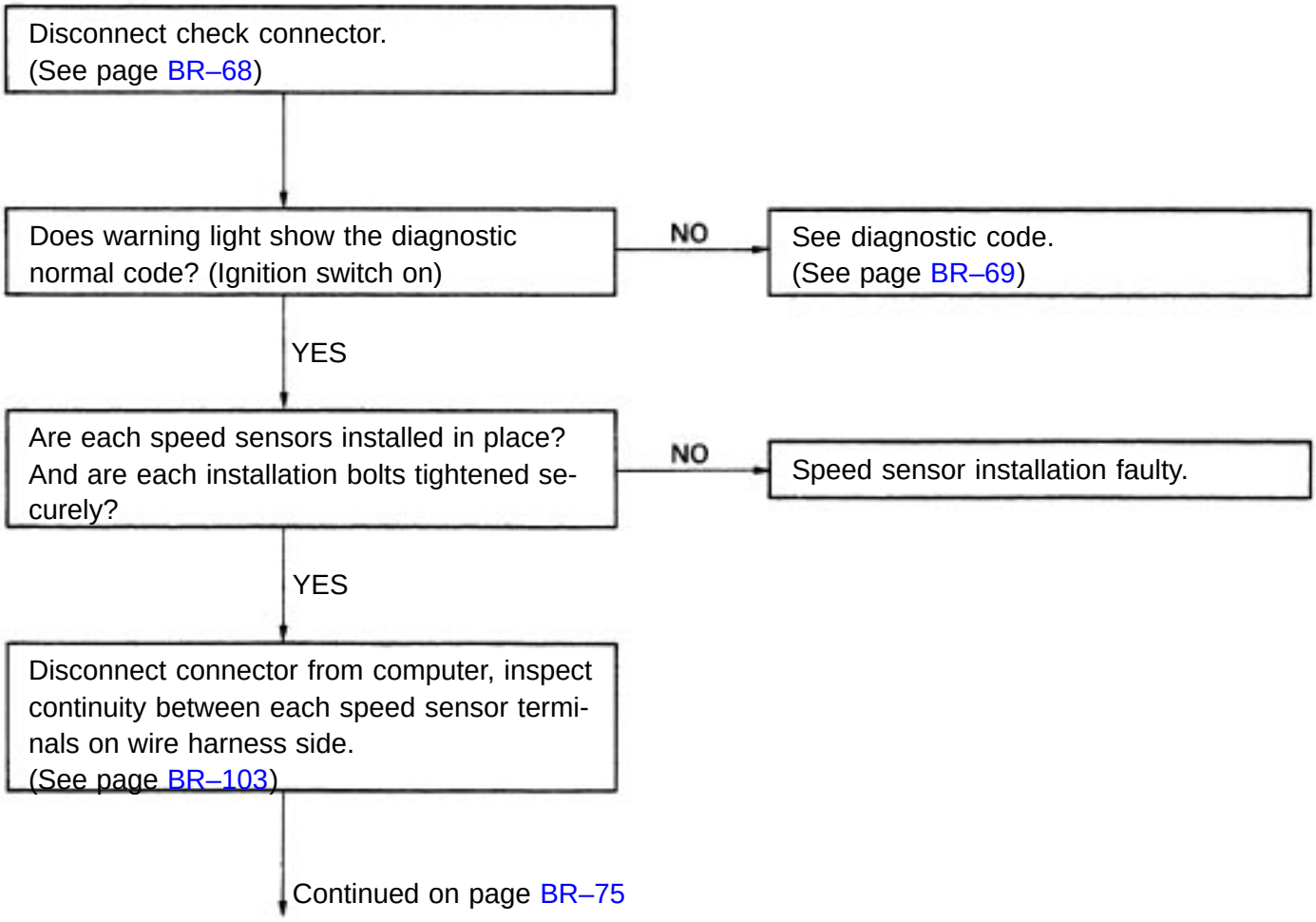
Faulty computer.

HINT: If the diode is short–circuited, a malfunction at computer terminal W will occur. When inspecting the terminal, connect the computer connector, and disconnect actuator connectors. Then turn the ignition switch on, and check that the warning fight goes on. If it does, the computer terminal is OK.

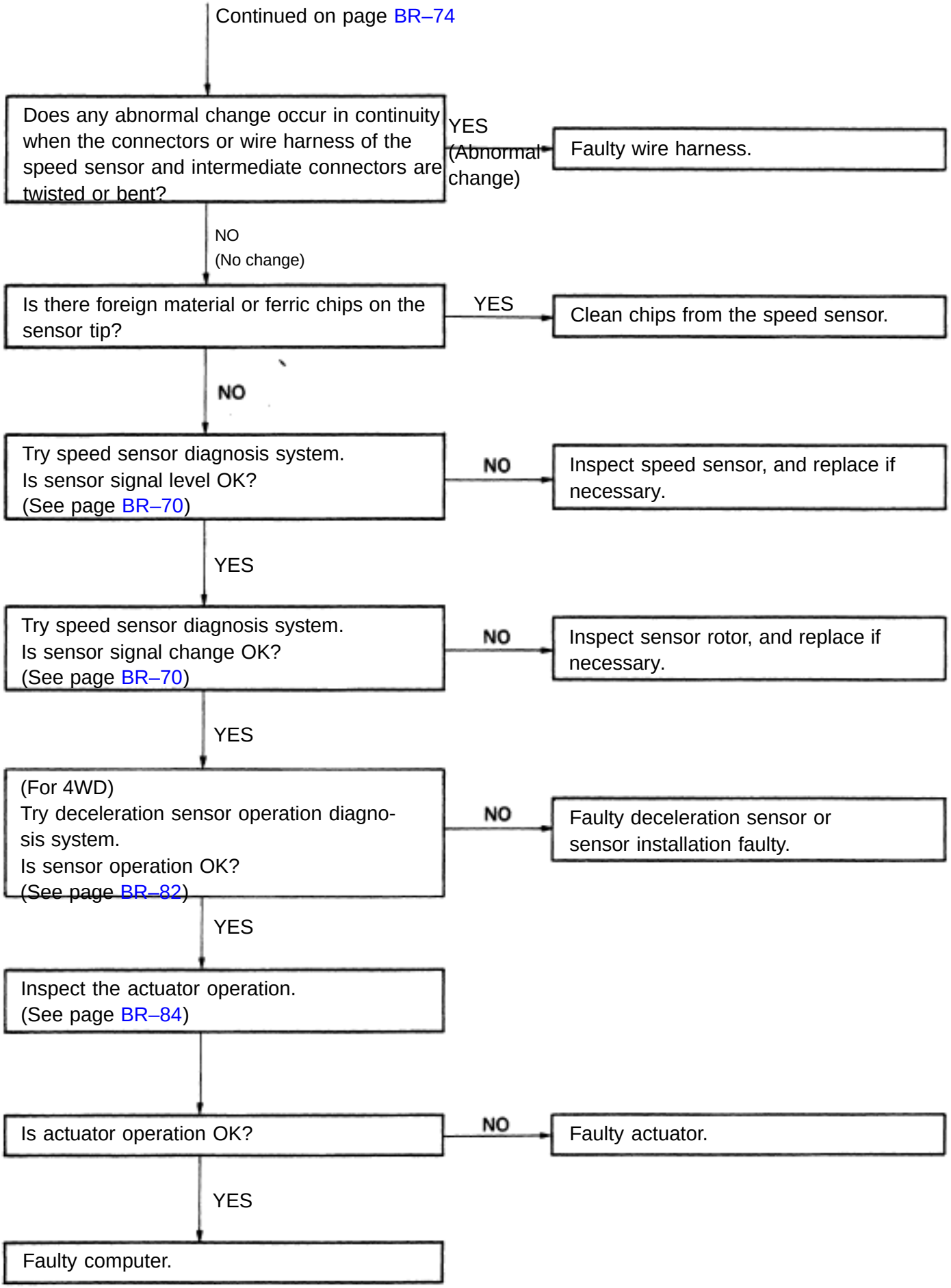
3	”ANTILOCK” warning light comes on and off.

- Check connector is disconnected.
- Open circuit in wire harness between computer terminal T and actuator terminal T.
- Actuator terminal GND is improperly connected or open circuit in wire harness between actuator terminal GND and body ground.
- Connect circuit in wire harness between computer terminal Ts and Ts connector. (For 4WD)

4	• Brakes pull. • Braking inefficient. • A.B.S. operates at ordinary braking. • A.B.S. operates just before stopping at ordinary braking. • Brake pedal pulsates abnormally while A.B.S. working.



Continued on page BR–74



5	Anti–lock brake system works inefficiently.

Disconnect check connector.
(See page BR–68)

↓

Does warning light show the diagnostic normal code? (ignition switch on)

NO → **See diagnostic code.**
(See page BR–69)

↓ YES

Is there battery voltage between computer terminal STP and body ground when depressing brake pedal?

NO → Open circuit in stop light switch and/or wire harness.

↓ YES

Inspect actuator.
(See page BR–84)

Speed Sensor Diagnosis System

PRECAUTION

While checking the speed sensor diagnosis system, A.B.S. does not work and brake system works as normal brake system.

INSPECTION OF DIAGNOSIS SYSTEM

1. INSPECT BATTERY VOLTAGE

Inspect that the battery voltage is about 12 V.

2. CHECK THAT WARNING LIGHT TURNS ON

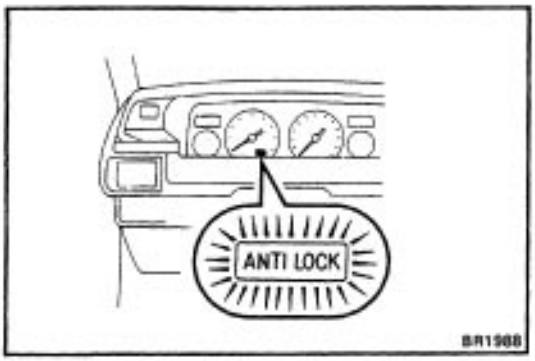
(a) Turn the ignition switch on.

(b) Check that the ”ANTILOCK” warning light turns on for 3 seconds.

If not, inspect and repair or replace the fuse, bulb and wire harness.

(c) Check that the ”ANTILOCK” warning light turns off.

(d) Turn the ignition switch off.

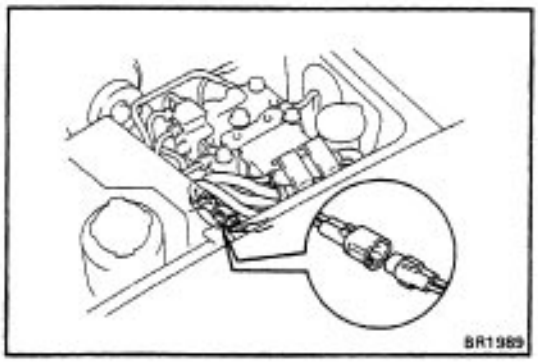


3. PERFORM FOLLOWING STEPS

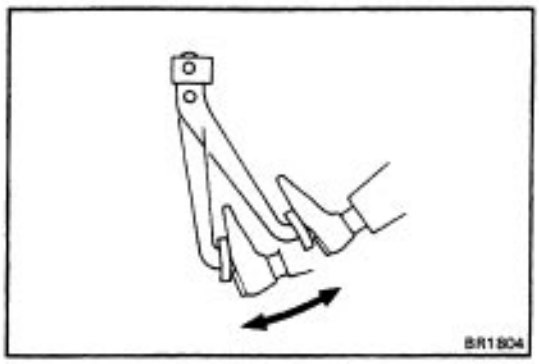
(2WD)

(a) Disconnect the check connector from the actuator.

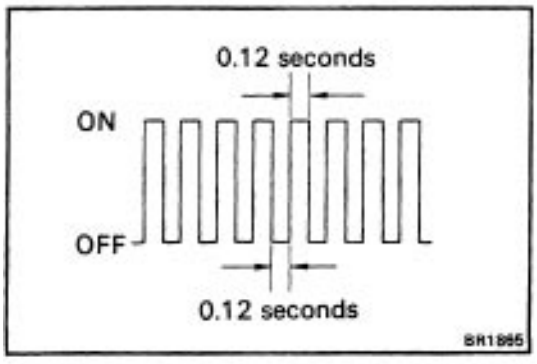
(b) Pull the parking brake lever up, and start the engine.

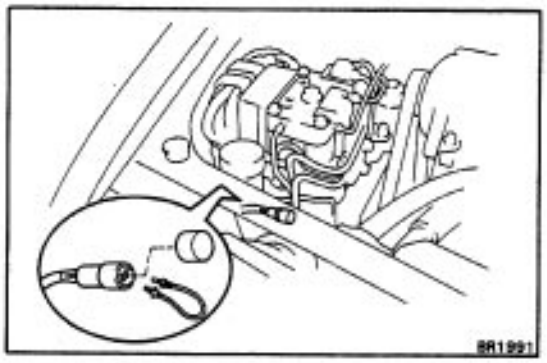


(c) Depress the brake pedal 4 to 6 times within 2 seconds.



(d) Check that the warning light blinks about 4 times every 1 second as shown.





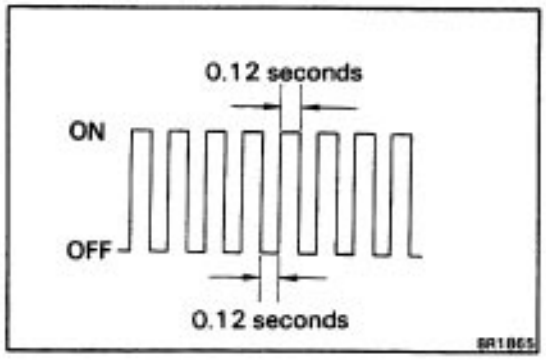
(4WD)

(a) Remove the rubber cap from the Ts connector located in front of the actuator.

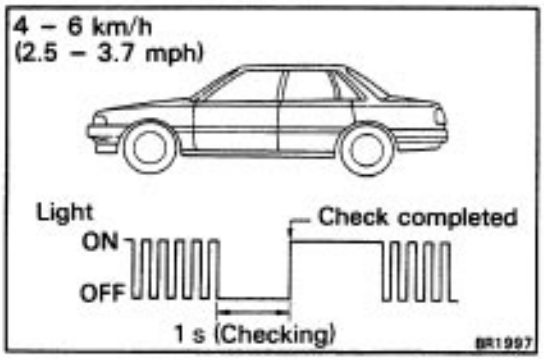
(b) Connect the terminals of Ts connector.

(c) Pull the parking brake lever up, and start the engine.

NOTICE: Do not depress the brake pedal.



(d) Check that the warning light blinks about 4 times every 1 second as shown.



4. INSPECT SENSOR SIGNAL LEVEL

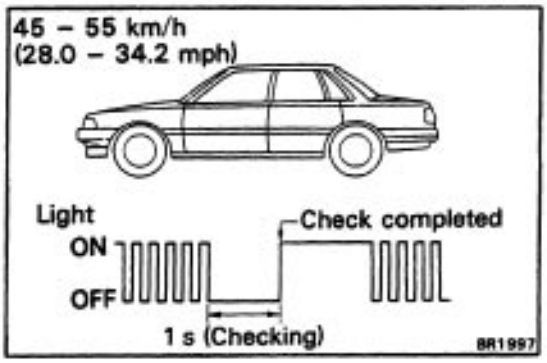
Drive the vehicle straight ahead at about 4 –6 km/h (2.5 – 3.7 mph), and check that the warning light turns on after a 1 second pause.

If the warning light turns on without blinking when the vehicle speed is not within the specified speed range above, stop the vehicle and read the diagnostic code, and repair the malfunctioning parts.

(See step S on page BR–79)

HINT: If the warning light turns on while the vehicle speed is within specified speed range above, the check is completed. And when the vehicle speed exceeds 6 km/h (3.7mph), the warning light will blink again. In this condition, speed sensors are OK.

NOTICE: While the warning light is off, do not give any shocks to vehicle such as acceleration, deceleration, braking, shift change, steering or shocks from the road condition.



5. INSPECT SENSOR SIGNAL CHANGE

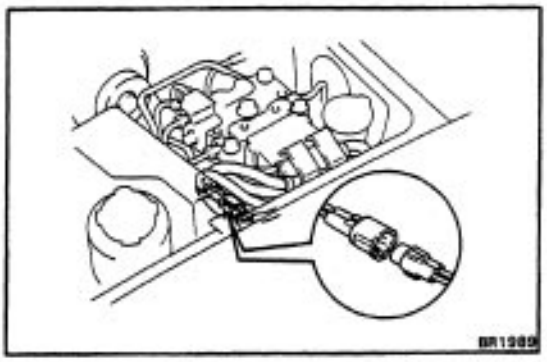
Drive the vehicle straight ahead at about 45 – 55 krn/h (28.0 – 34.2 mph), and check that the warning light turns on after a 1 second pause.

If the warning light turns on without blinking when the vehicle speed is not within the specified speed range above, stop the vehicle and read the diagnostic code, and repair the malfunctioning .parts.

(See step 6 on this page)

HINT: If the warning light turns on while the vehicle speed is within specified speed range above, the check is completed. And when the vehicle speed is not within specified speed range, the warning light will blink again. In this condition, sensor rotors are OK.

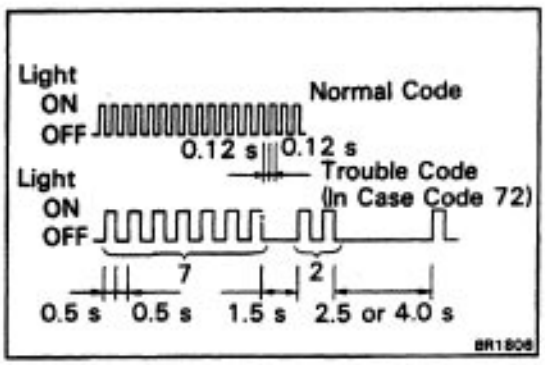
NOTICE: While the warning light is off, do not give any shocks to vehicle such as acceleration, deceleration, braking, shift change, steering or shocks from the road condition.



6. READ DIAGNOSTIC CODE

Stop the vehicle and disconnect the check connector, and warning light will begin to blink. Read the number of blinks.

(See DIAGNOSTIC CODE on page BR–81)

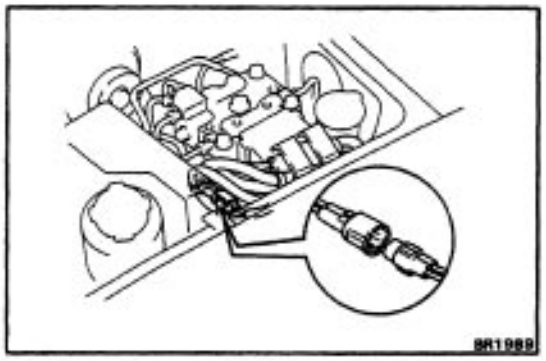


HINT: The first number of blinks will equal the first digit of a two digit diagnostic code. After a 1.5 second pause, the 2nd number of blinks will equal the 2nd number of a two digit code. If there are two or more codes, there will be a 2.5 second pause between each code, and then indication will begin again after a 4.0 second pause, continuing in order from the smaller value up to the larger one.

7. REPAIR MALFUNCTIONING PARTS

Repair or replace the malfunctioning parts.

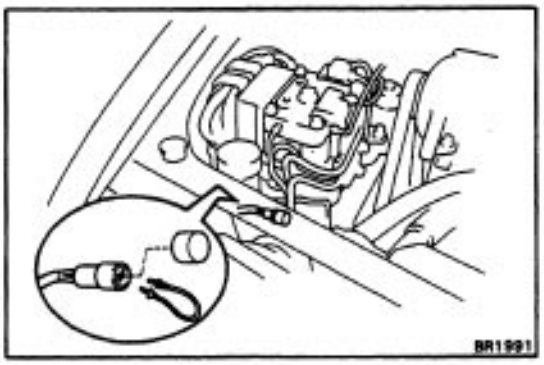
HINT: When repairing or replacing parts, turn the ignition switch OFF.



8. PERFORM FOLLOWING STEPS

(a) (2WD)
Turn the ignition switch on.
(4WD)
Turn the ignition switch off.

(b) Connect the check connector.



(For 4WD)

(c) Remove the short pin or wire from the Ts connector and install the rubber cap to it.

(d) Turn the ignition switch off.

DIAGNOSTIC CODE

Code No.	Light Pattern	Diagnosis	Malfunctioning Part
	ON / OFF	All speed sensors and sensor rotors are normal	
71		Low voltage of front right speed sensor signal	• Front right speed sensor • Sensor installation
72		Low voltage of front left speed sensor signal	• Front left speed sensor • Sensor installation
73		Low voltage of rear right speed sensor signal	• Rear right speed sensor • Sensor installation
74		Low voltage of rear left speed sensor signal	• Rear left speed sensor • Sensor installation
75		Abnormal change of front right speed sensor signal	• Front right sensor rotor
76		Abnormal change of front left speed sensor signal	• Front left sensor rotor
77		Abnormal change of rear right speed sensor signal	• Rear right sensor rotor
78		Abnormal change of rear left speed sensor signal	• Rear left sensor rotor

BR1007

Deceleration Sensor Operation Diagnosis System (For 4WD)

PRECAUTION

While checking the deceleration sensor diagnosis system, A.B.S. does not work and brake system works as normal brake system.

INSPECTION OF DIAGNOSIS SYSTEM

1. INSPECT BATTERY VOLTAGE

Inspect that the battery voltage is about 12 V.

2. CHECK THAT WARNING LIGHT TURNS ON

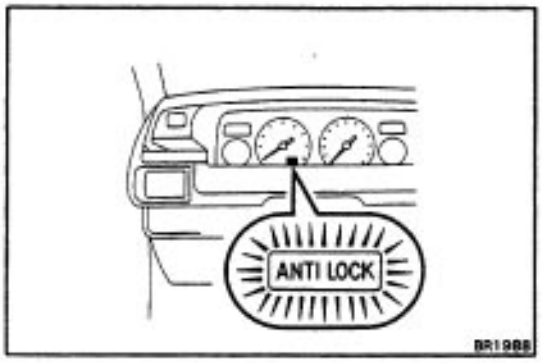
(a) Turn the ignition switch on.

(b) Check that the ”ANTILOCK” warning light turns on for 3 seconds.

If not, inspect and repair or replace the fuse, bulb and wire harness.

(e) Check that the ”ANTILOCK” warning light turns off.

(d) Turn the ignition switch off.

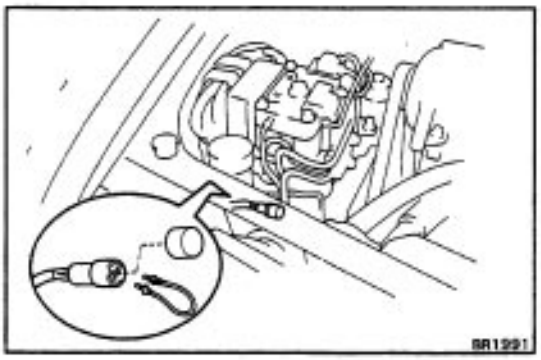


3. PERFORM FOLLOWING STEPS

(a) Remove the rubber cap from the Ts connector located in front of the actuator.

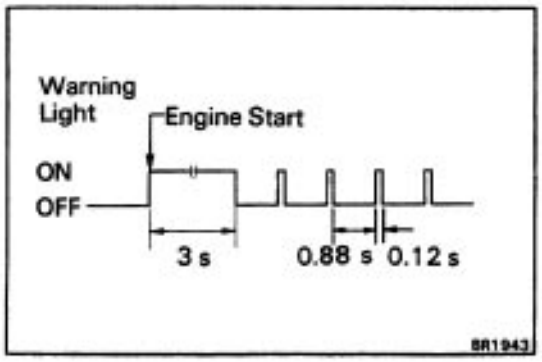
(b) Connect the terminals of Ts connector.

(c) Pull the parking brake lever up and depress the brake pedal, and start the engine.



(d) Check that the warning light blinks about 1 time every 1 second as shown.

If the warning light does not blink, inspect the parking brake switch, stop light switch, Ts connector, deceleration sensor installation and computer.



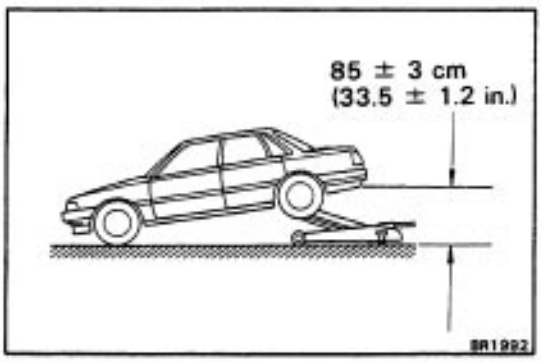
4. INSPECT SENSOR DETECTION POINT

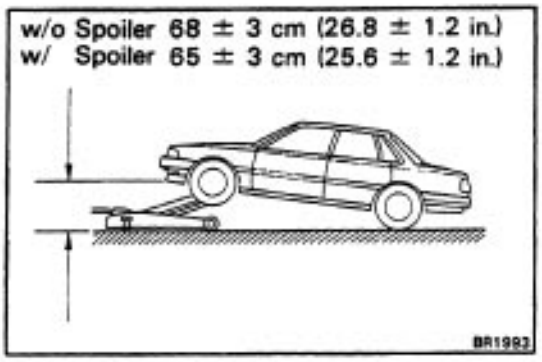
(a) Jack up the rear side of the vehicle slowly as shown.

HINT: When measuring the height, measure at the center of the rear bumper lower edge.

(b) Check that the warning light does not turn on.

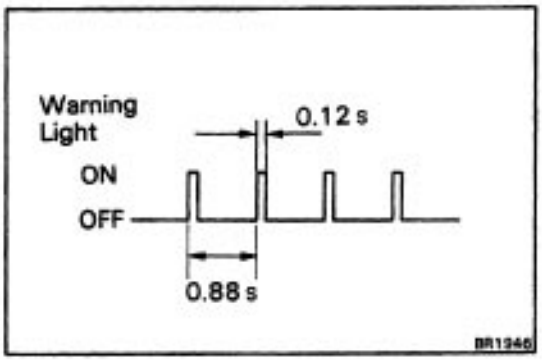
(c) Jack down the vehicle and check that the warning light blinking.





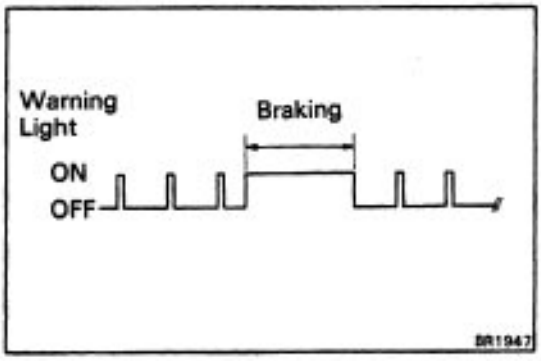
(d) Jack up the front side of the vehicle slowly as shown.
HINT: When measuring the height, measure at the center of the lower body or spoiler edge of the vehicle.
(e) Check that the warning light does not turn on.
(f) Jack down the vehicle and check that the warning light blinking.

If the warning light turns on, inspect the deceleration se sor installation. And if the sensor installation is –OK, r place the deceleration sensor.

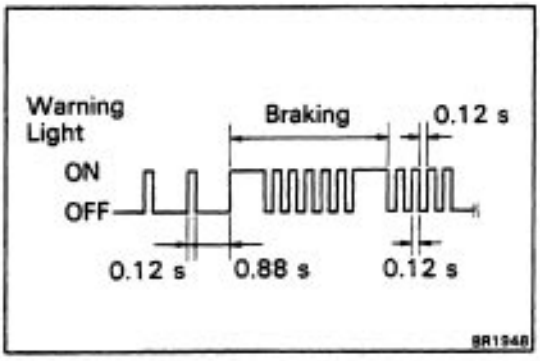


5. INSPECT SENSOR OPERATION

(a) Drive the vehicle straight ahead at about 10 km/h l6.2 mph) or more, lightly depress the brake pedal.
(b) Check that there is no change in the warning light light pattern.

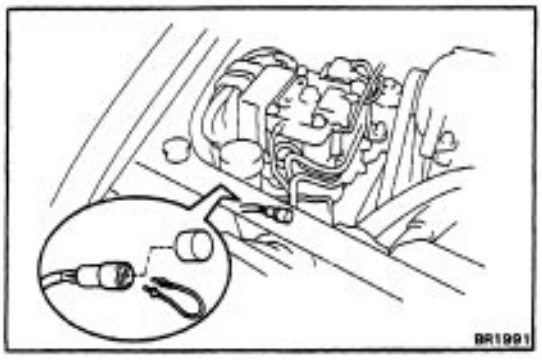


(c) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, depress the brake pedal a little strong.
(d) Check that the warning light turns on while braking.



(e) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, depress the brake pedal strong–ly.
(f) Check that the warning light light pattern changes af-ter braking as shown.

If the operation is not as specified, inspect the deceleration sensor installation. And if the sensor installation is OK, r place the deceleration sensor.

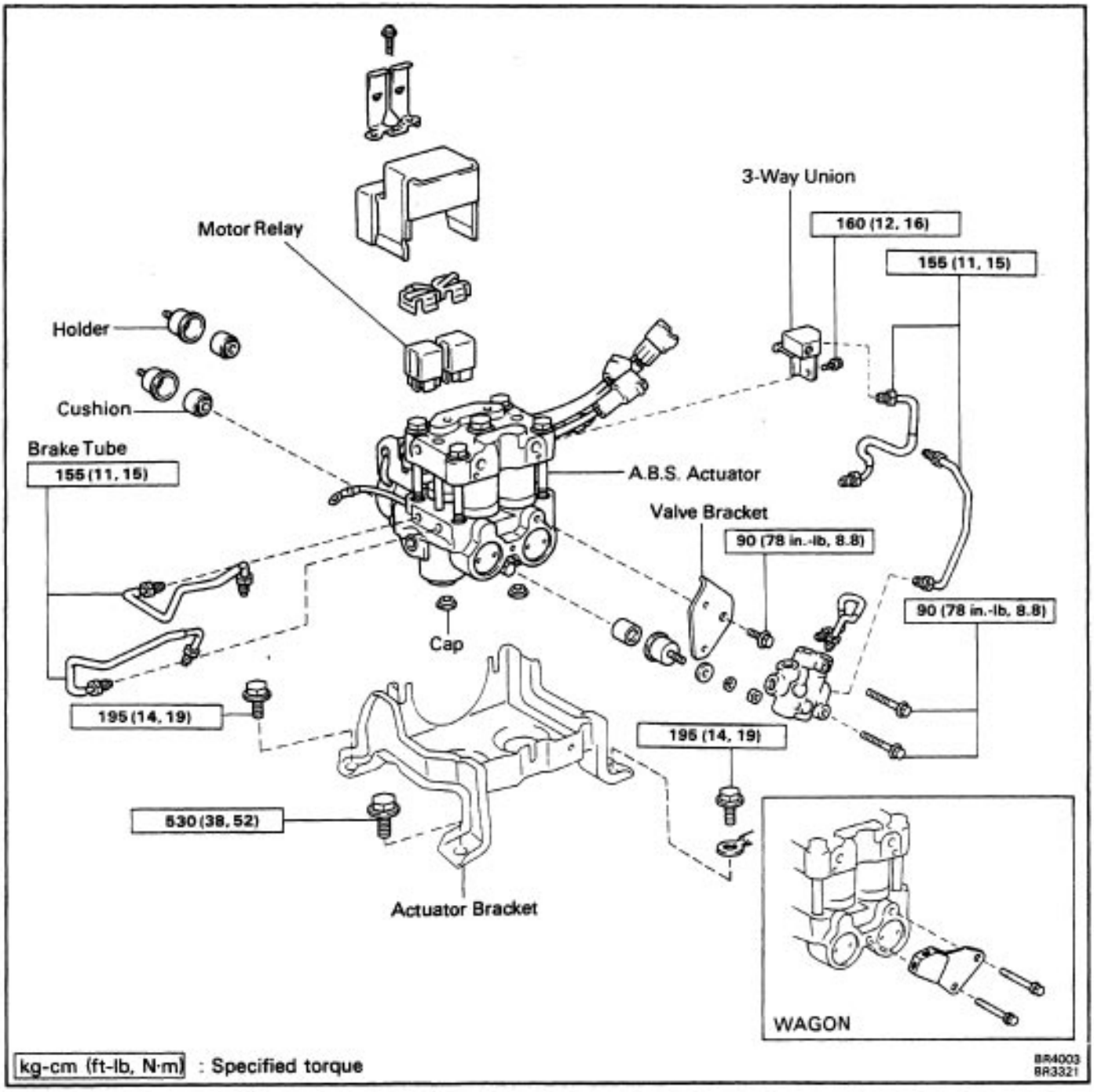


6. REMOVE SHORT PIN

(a) Stop the engine.
(b) Remove the short pin or wire from the Ts connector.
(c) Install the rubber cap to the Ts connector.

A.B.S. Actuator

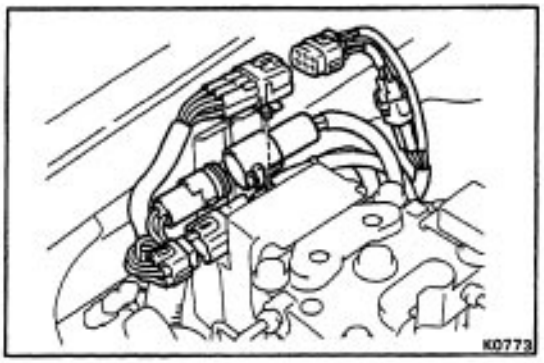
COMPONENTS



INSPECTION OF A.B.S. ACTUATOR OPERATION

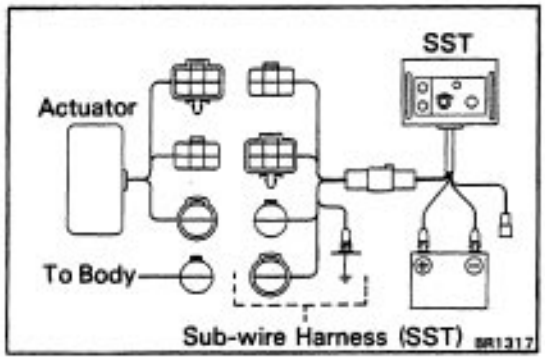
1. INSPECT BATTERY VOLTAGE

Battery voltage: 10 – 14.5 V



2. DISCONNECT CONNECTORS FROM ACTUATOR

Disconnect the three connectors from the actuator as shown.



3. CONNECT ACTUATOR CHECKER (SST) TO ACTUATOR

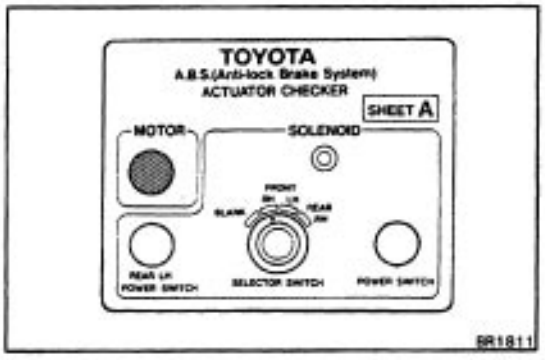
(a) Connect the actuator checker (SST) to the actuator and body side wire harness through the sub–wire harness (SST) as shown.

SST 09990–00150

(b) Connect the red cable of the checker to the battery positive i±y terminal and black to the negative (–¿terminal. Connect the black cable of the sub–wire harness to the battery negative (–) terminal or body ground.

(c) Place the ”SHEET A” (SST) on the actuator checker.

SST 09990–00163



4. INSPECT BRAKE ACTUATOR OPERATION

(a) Start the engine, and run it at idle.

(b) Turn the selector switch of the actuator checker to ”FRONT RH” position.

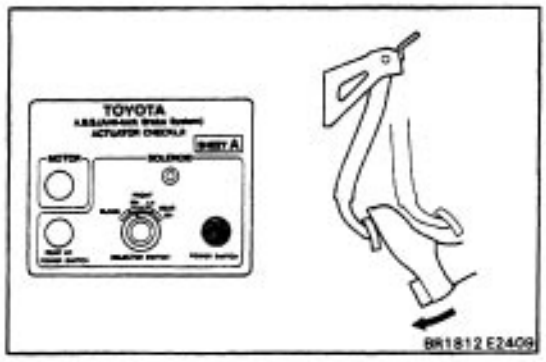
(c) Push and hold in the MOTOR switch for a few seconds.

(d) Depress the brake pedal and hold it until the step 1gf is completed.

(e) Push the POWER SWITCH, and check that the brake pedal does not go down.

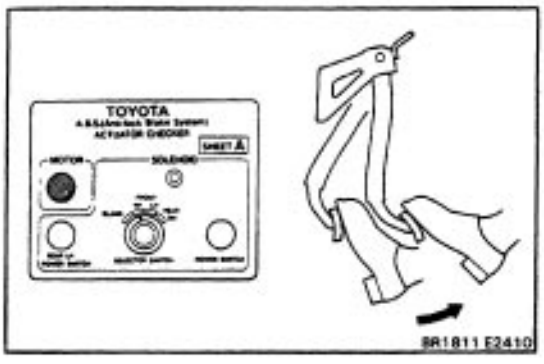
NOTICE: Do not keep the POWER SWITCH pushing more than 10 seconds.

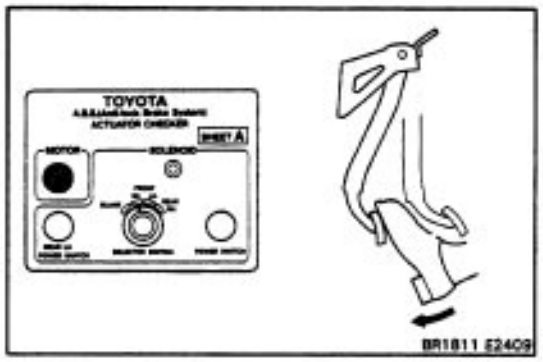
(f) Release the switch, and check that the pedal goes down.



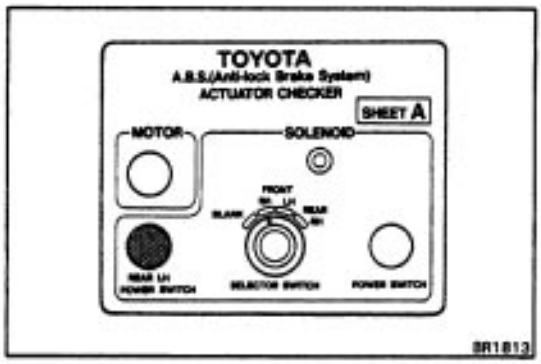
(g) Push and hold in the MOTOR switch for a few seconds, and check that the pedal returns.

(h) Release the brake pedal.





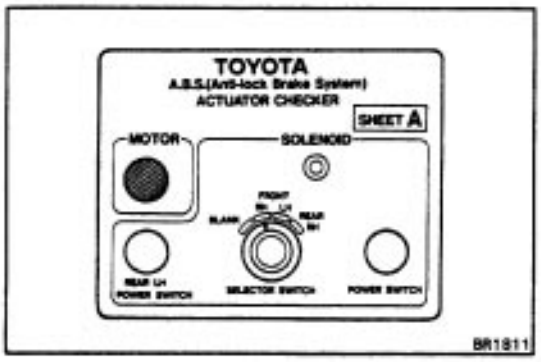
(i) Push and hold in the MOTOR switch for a few seconds.
(j) Depress the brake pedal and hold it for about 15 seconds. As you hold the pedal down, push the MOTOR switch for a few seconds. Check that the brake pedal does not pulsate.



5. INSPECT FOR OTHER WHEELS

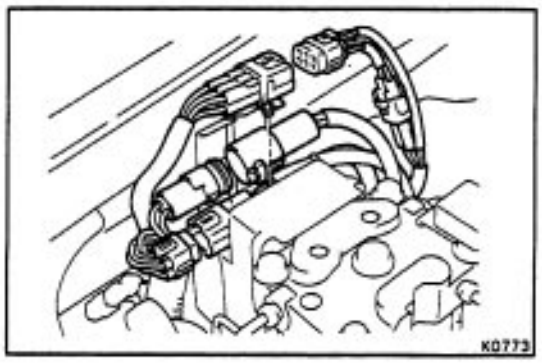
(a) Turn the selector switch to "FRONT LH" position.
(b) Repeating (c) to (j) of the step 4, check the actuator operation similarly.
(c) Similarly, inspect "REAR RH" and "REAR LH" position.

HINT: When inspecting "REAR LH" position, push the REAR LH switch instead of the POWER SWITCH, and you can inspect in any the selector switch position.



6. PUSH MOTOR SWITCH

Push and hold in the MOTOR switch for a few seconds.



7. DISCONNECT ACTUATOR CHECKER (SST) FROM ACTUATOR

(a) Remove the "SHEET A" (SST) and disconnect the actuator checker (SST) and sub–wire harness (SST) from the actuator.

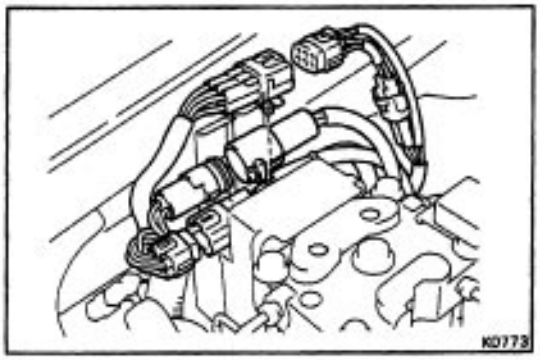
SST 09990–00150 and 09990–00163

(b) Connect the actuator connectors.
(e) Clear the diagnostic codes.
(See page BR–70)

REMOVAL OF BRAKE ACTUATOR

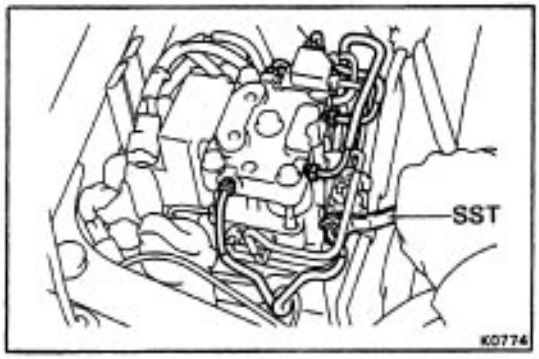
1. TAKE OUT FLUID WITH SYRINGE OR AN EQUIVALENT

CAUTION: Do not let brake fluid remain on a painted surface. Wash it off immediately.



2. DISCONNECT ACTUATOR CONNECTORS

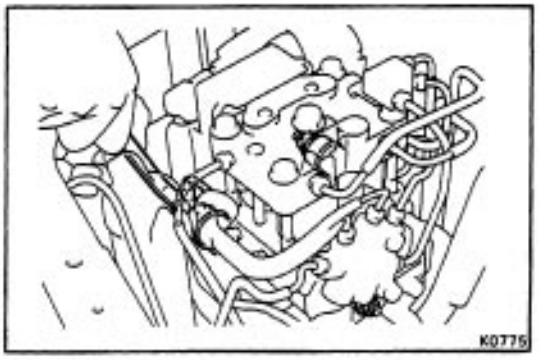
Disconnect the three connectors from the actuator.



3. REMOVE ACTUATOR

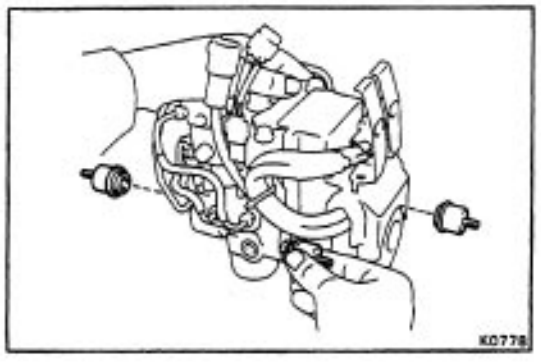
(a) Using SST, disconnect the six brake tubes from the actuator as shown.

SST 09751–36011



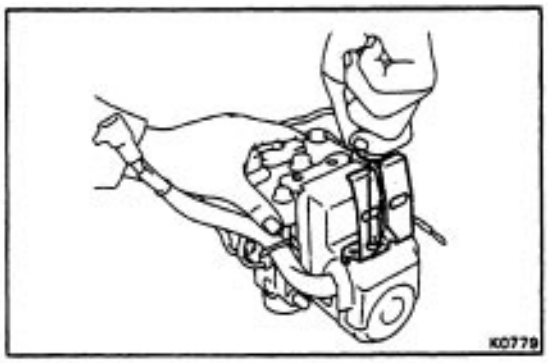
(b) Remove the three nuts, wave washers and washers.

(c) Remove the actuator from the actuator bracket.



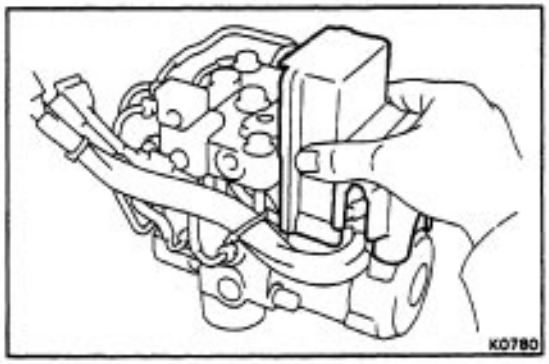
4. REMOVE THREE HOLDERS AND CUSHIONS

Remove the three holders and cushions.

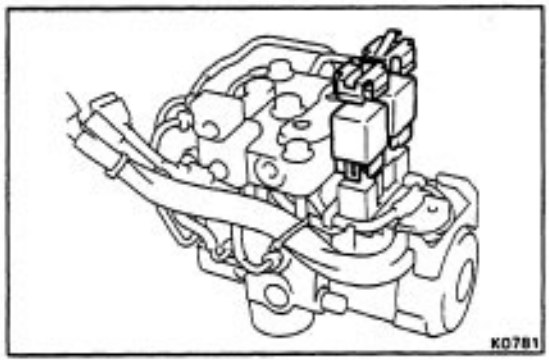


6. REMOVE CONTROL RELAYS

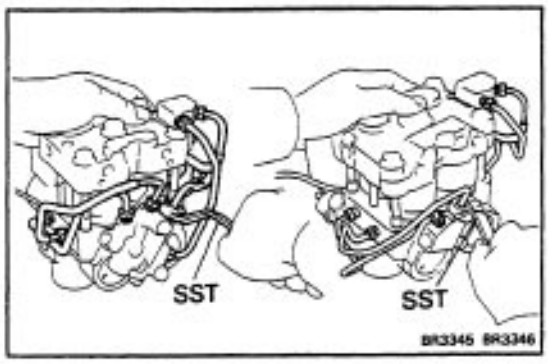
(a) Remove the connector from the wire harness clarnp.
(b) Remove the screw and remove the wire harness clamp.



(e) Remove the relay case.



(d) Remove the relay cap from the control relays.
(e) Remove the two control relays from the actuator.



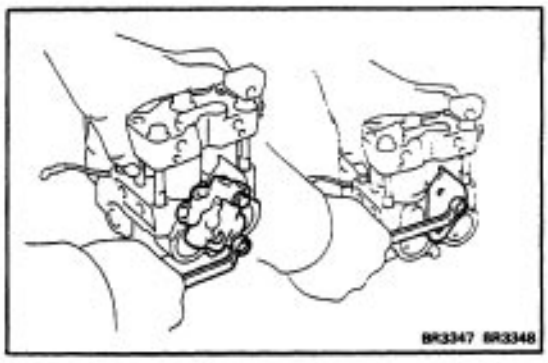
6. REMOVE BRAKE TUBES

(w/o LSPV)

Using SST, remove the five brake tubes from the actuator.
SST 09751–36011

(w/ LS PV)

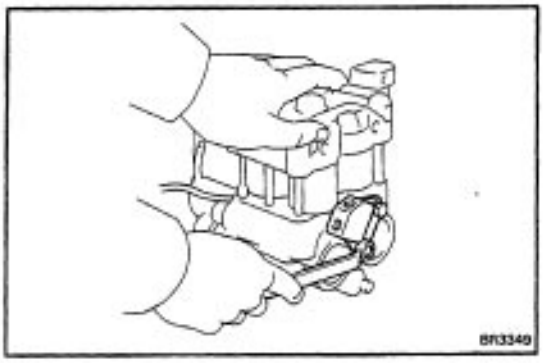
Using SST, remove the four brake tubes from actuator.
SST 09751–36011



7. REMOVE PROPORTIONING VALVE OR THREE–WAY UNION

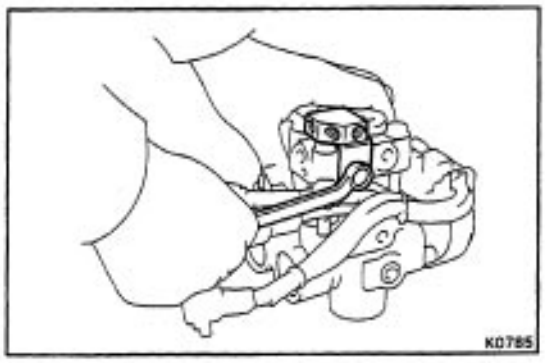
(w/o LSPV)

(a) Remove the two bolt and remove the proportioning valve from the actuator.
(b) Remove the bolt and remove the valve bracket.



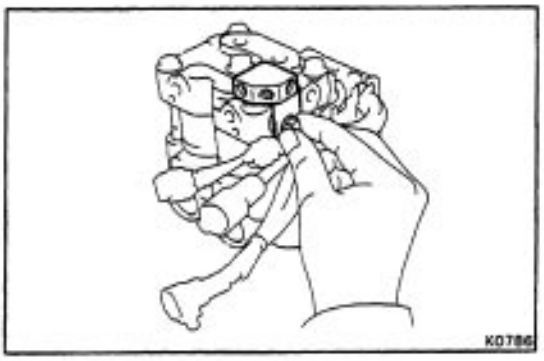
(w/ LS PV)

Remove the two bolts and remove the three–way union from the actuator.



8. REMOVE THREE–WAY UNION

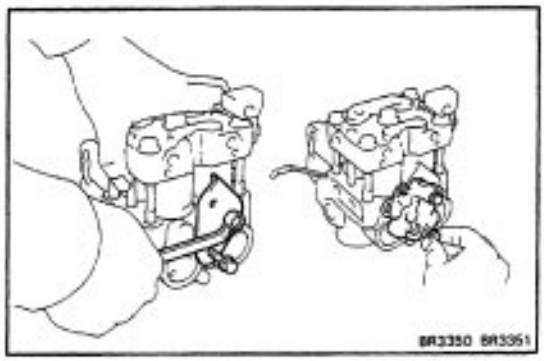
Remove the bolt and three–way union.



INSTALLATION OF BRAKE ACTUATOR

1. TEMPORARILY INSTALL FOLLOWING PARTS

(a) Temporarily install the three–way union with a bolt.



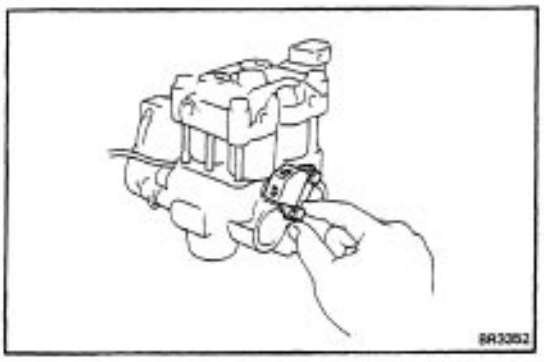
(w/o LSPV)

(b) Using a proportioning valve installation bolt, install the valve bracket in place and tighten the bolt.

Torque: 90 kg–cm (78 in.–lb, 8.8 N–m)

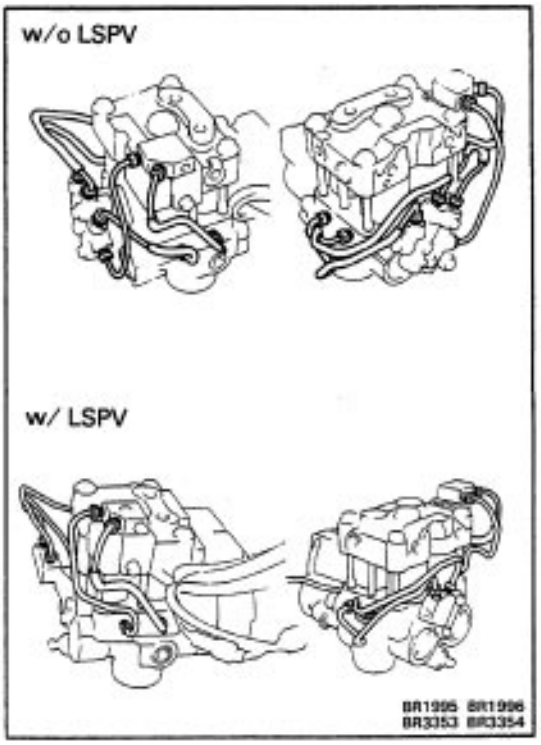
(c) Remove the proportioning valve installation bolt.

(d) Temporarily install the proportioning valve.

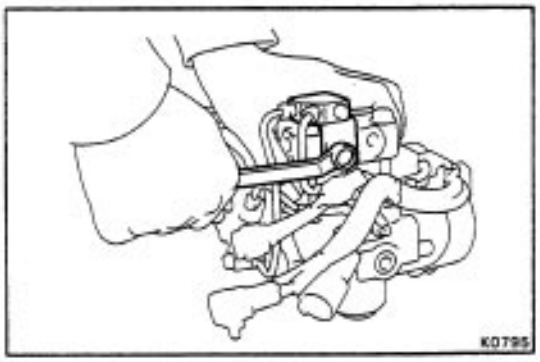


(w/ LSPV)

Temporarily install the three–way union.



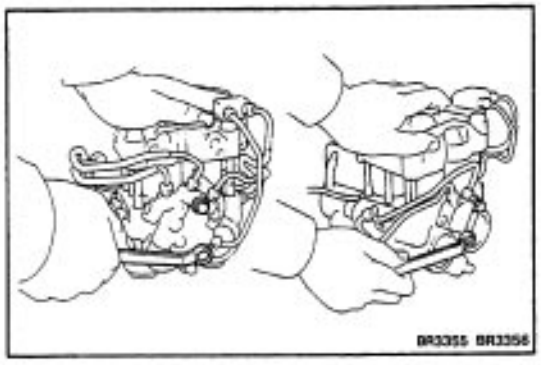
(e) Temporarily install the five or four brake tubes as shown.



2. TIGHTEN FOLLOWING PARTS

(a) Tighten the three–way union installation bolt.

Torque: 160 kg–cm (12 ft–lb, 16 N–m)



(b) **(w/o LSPV)**

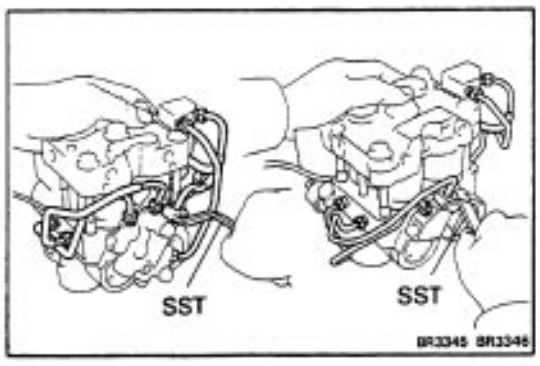
Tighten the two proportioning valve installation bolts.

Torque: 90 kg–cm (78 in.–lb, 8.8 N–m)

(w/ LS PV)

Tighten the two three–way union installation bolts.

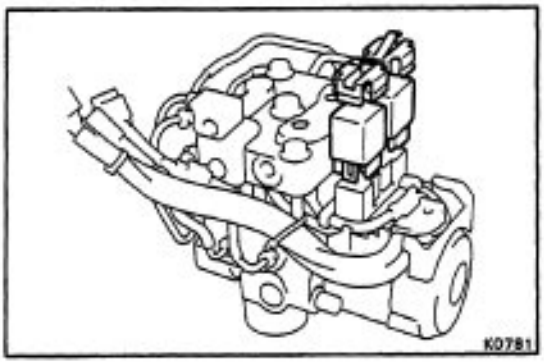
Torque: 90 kg–cm (78 in.–lb, 8.8 N–m)



(c) Using SST, tighten the five or four brake tubes.

SST 09751–36011

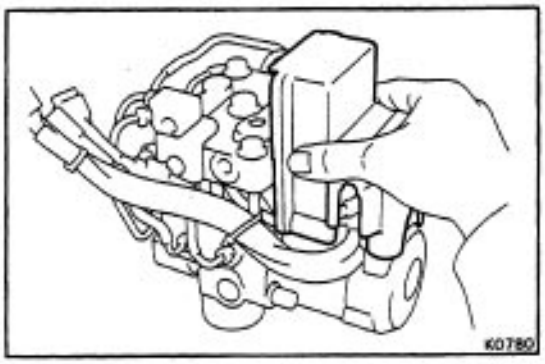
Torque: 155 kg–cm (11 ft–lb, 15 N–m)



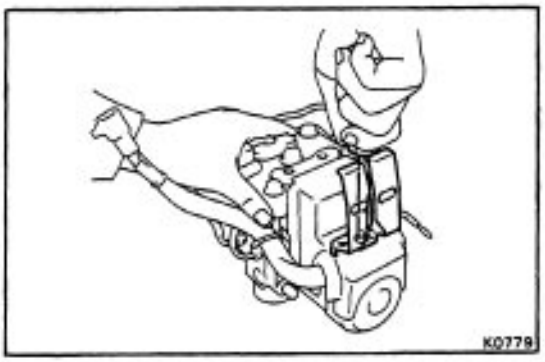
3. INSTALL CONTROL RELAYS

(a) Install the two control relays in position.

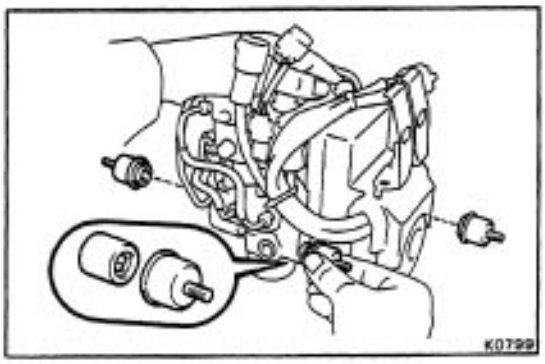
(b) Install the relay cap onto the control relays.



(c) Install the relay case.

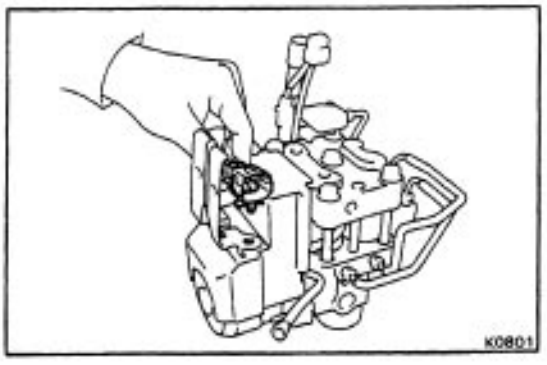


(d) Install the wire harness clamp with a screw.



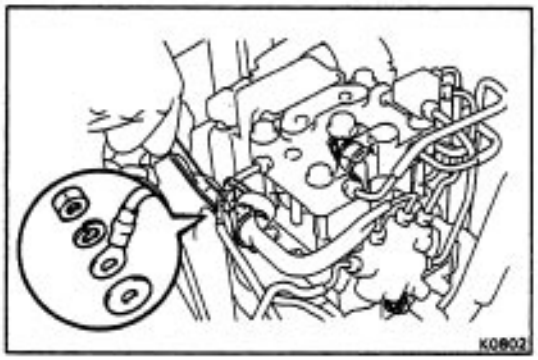
4. INSTALL THREE CUSHIONS AND HOLDERS

Install the three cushions to holders and install them to the actuator.



5. INSTALL CONNECTOR TO CLAMP

Install the connector to the wire harness clamp.

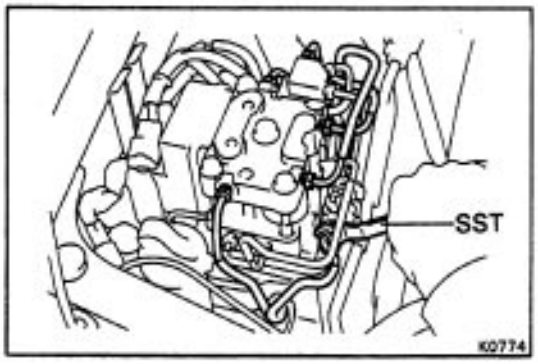


6. INSTALL ACTUATOR

(a) Install the actuator to the actuator bracket in place.
(b) Install the washers, wave washers and nuts.
(e) Tighten the three nuts.

Torque: 55 kg–cm (48 in.–lb, 5.4 N¿rn)

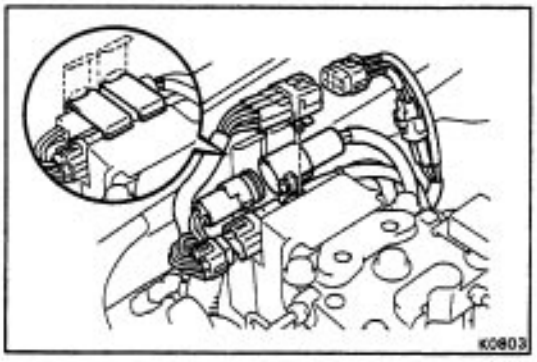
HINT: Before installing the front right side nut, install the motor ground terminal between the plate washer and spring washer.



(d) Using SST, connect the six brake tubes to the actuator.

SST 09751–36011

Torque: 155 kg–cm (11 ft–lb, 15 N–m)



7. CONNECT ACTUATOR CONNECTORS

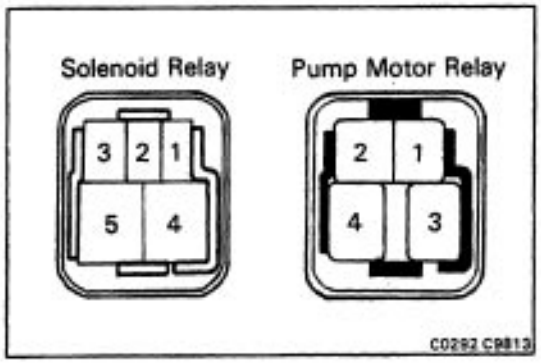
(a) Connect the three connectors to the actuator.
(b) Bend the wire harness clamp as shown.

8. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

9. CHECK FOR FLUID LEAKAGE

10. CHECK ACTUATOR OPERATION

(See page BR–84)

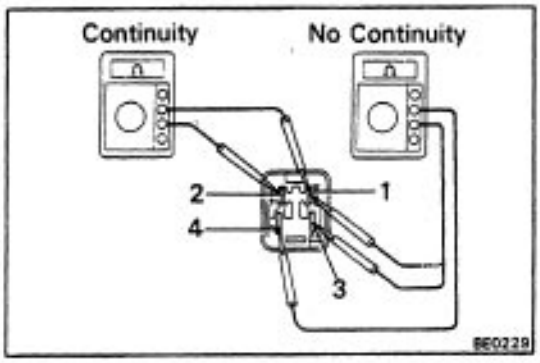


Control Relays

INSPECTION OF CONTROL RELAYS

1. REMOVE CONTROL RELAYS

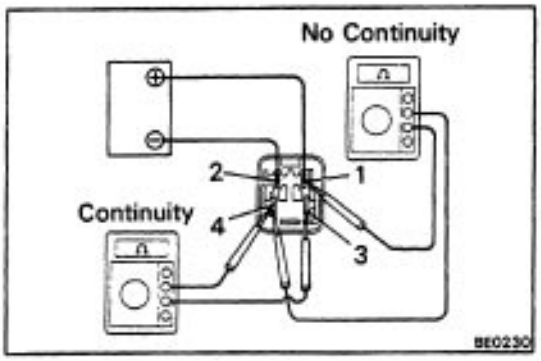
Remove the two control relays from the actuator.



2. INSPECT PUMP MOTOR RELAY CONTINUITY

(a) Check that there is continuity between terminals 1 and 2.
(b) Check that there is no continuity between terminals 3 and 4.
(c) Check that there is no continuity between terminals 1 and 4.

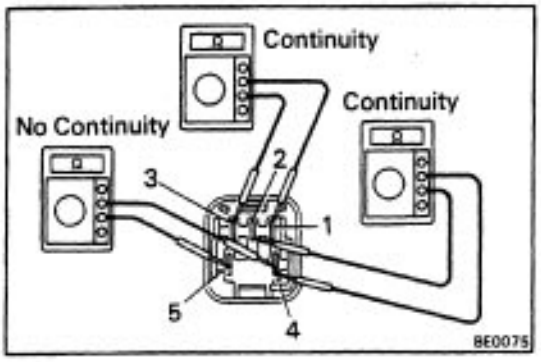
If continuity is not as specified, replace the relay.



3. INSPECT PUMP MOTOR RELAY OPERATION

(a) Apply battery voltage to terminals 1 and 2.
(b) Check that there is continuity between terminals 3 and 4.
(c) Check that there is no continuity between terminals 1 and 4.

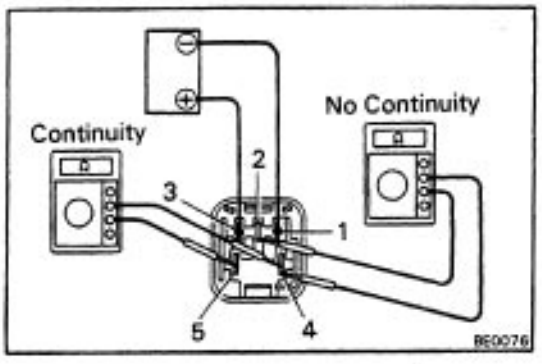
If operation is not as specified, replace the relay.



4. INSPECT SOLENOID RELAY CONTINUITY

(a) Check that there is continuity between terminals 1 and 3.
(b) Check that there is continuity between terminals 2 and 4.
(c) Check that there is no continuity between terminals 4 and 5.

If continuity is not as specified, replace the relay.



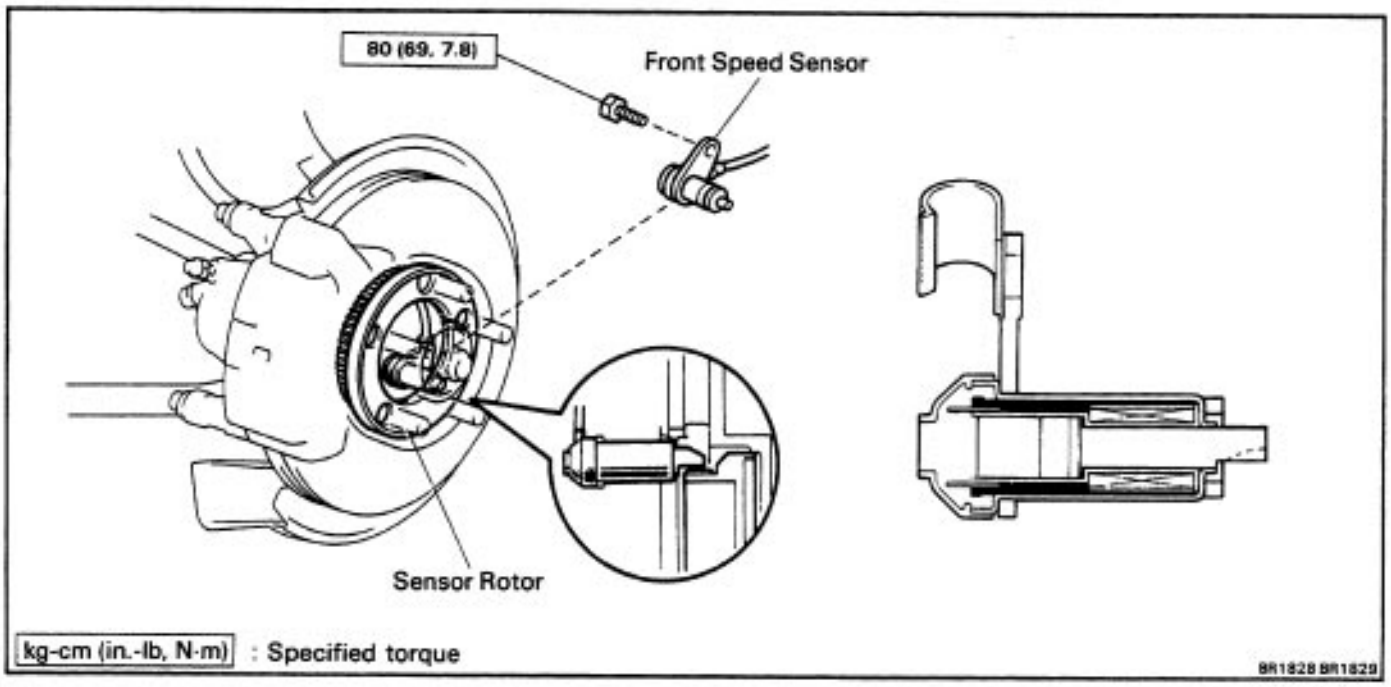
5. INSPECT SOLENOID RELAY OPERATION

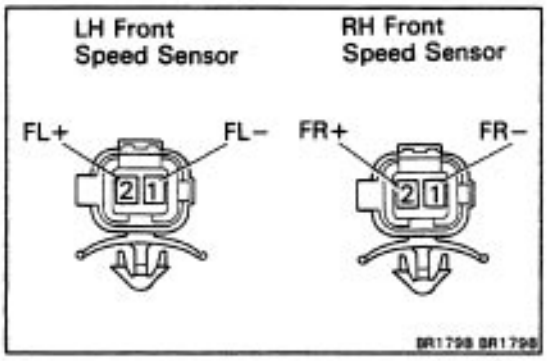
(a) Apply battery voltage to terminals 1 and 3.
(b) Check that there is continuity between terminals 4 and 5.
(c) Check that there is no continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.

6. INSTALL TWO CONTROL RELAYS

Front Speed Sensor





INSPECTION OF FRONT SPEED SENSOR

1. INSPECT SPEED SENSOR

(a) Remove the bolt from the pipe clamp of the wire harness.

(b) Disconnect the speed sensor connector.

(e) Measure the resistance between terminals.

Resistance: 0.85 – 1.30 K Ω

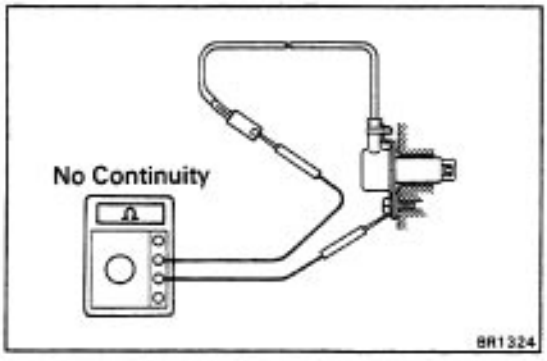
If resistance value is not as specified, replace the sensor.

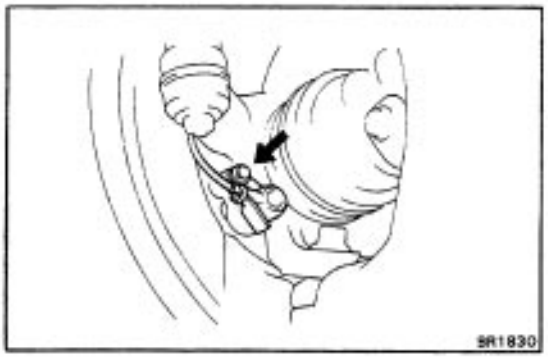
(d) Check that there is no continuity between each terminal and sensor body.

If there is continuity, replace the sensor.

(e) Connect the speed sensor connector.

(f) Install the bolt of the pipe clamp.

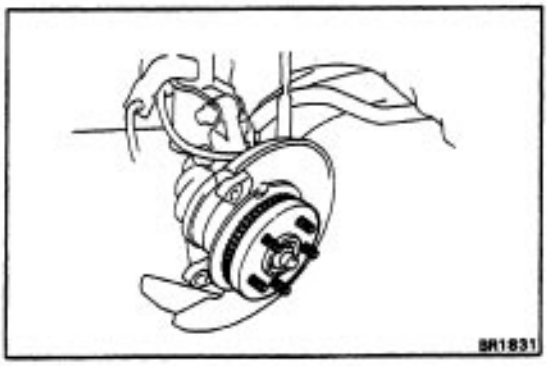




2. INSPECT SENSOR INSTALLATION

Check that the sensor installation bolt is tightened properly. If not, tighten the bolt.

Torque: 80 kg–cm (69 in.–lb, 7.8 N–m)



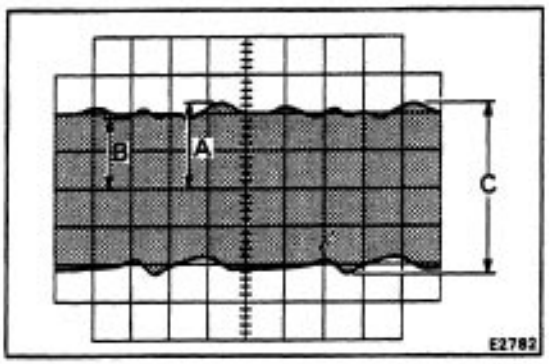
3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

(a) Remove the two bolts and remove the torque plate with brake cylinder.
(b) Remove the rotor disc.
(c) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth.
(d) Install the rotor disc and brake cylinder assembly with two bolts.

Torque:

2WD 960 kg–cm (69 ft–ib, 94 N–m)
4WD 1,090 kg–cm (79 ft–Ib, 107 N–m)

NOTICE: To prevent damage to the serrations, do not strike the axle hub.



INSPECTION OF FRONT SPEED SENSOR AND SENSOR ROTOR SERRATIONS (REFERENCE)

INSPECT FRONT SPEED SENSOR AND SENSOR ROTOR SERRATIONS BY USING AN OSCILLOSCOPE

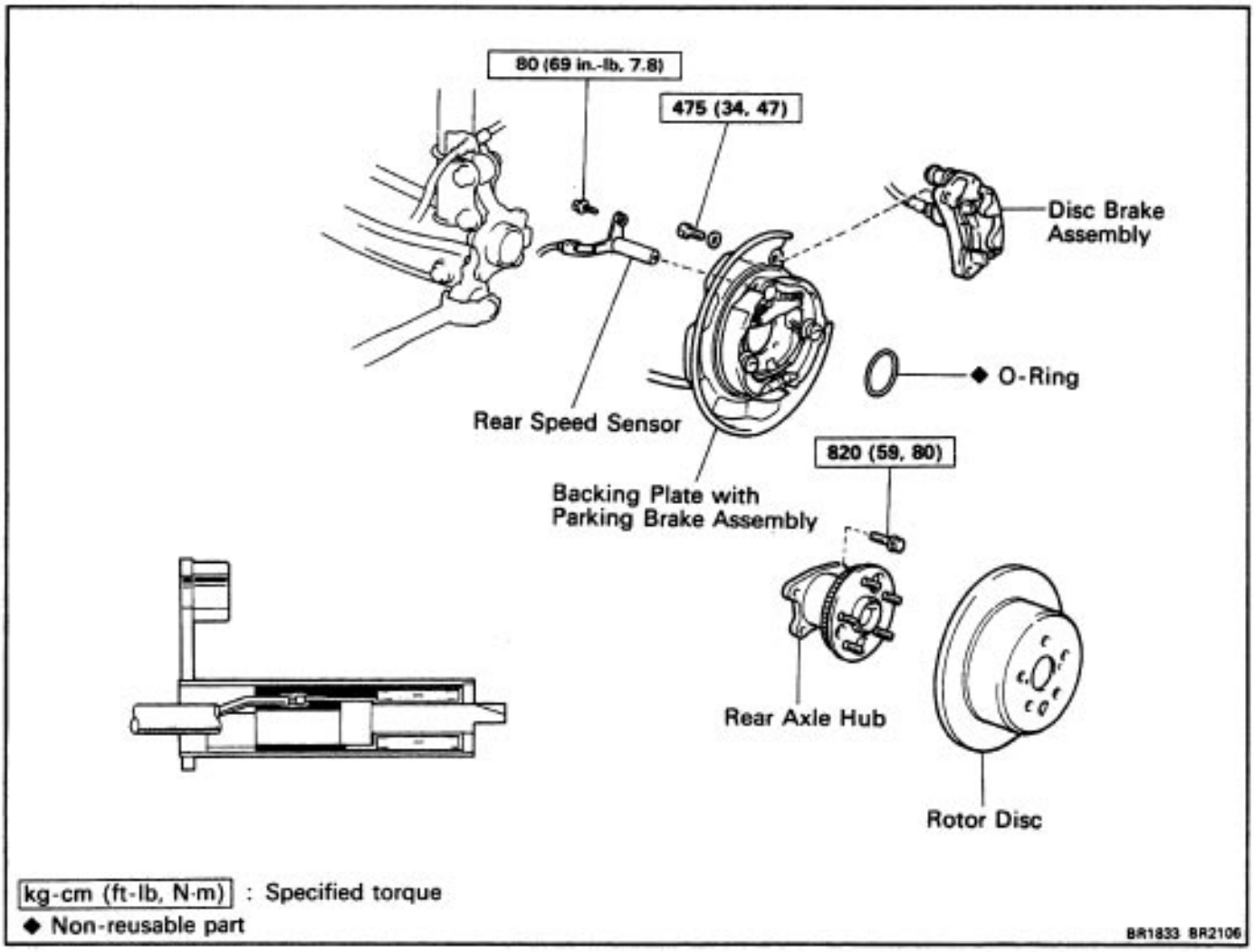
(a) Connect an oscilloscope to the speed sensor connector.
(b) Run the vehicle at 20 km/h (12.4 mph), and inspect speed sensor output wave.
(c) Check that C is 0.5 V or more.

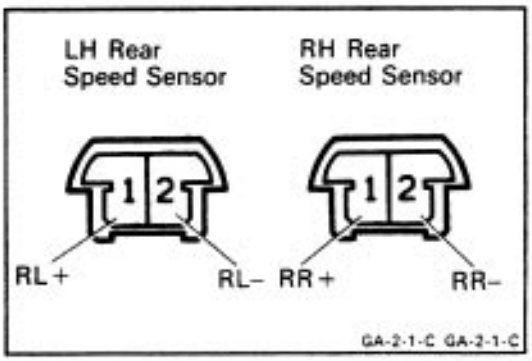
If not as specified, replace the speed sensor.

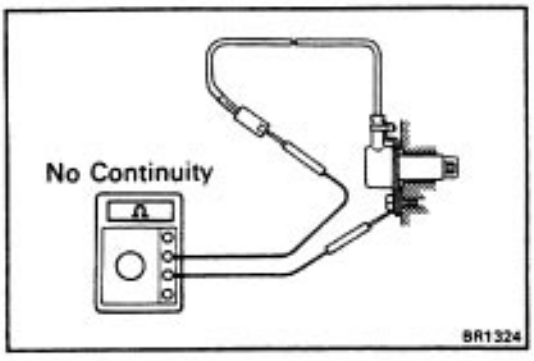
(d) Check that B is 70% or more of A.

It not as specified, replace the sensor rotor.

Rear Speed Sensor (2WD)







INSPECTION OF REAR SPEED SENSOR

1. INSPECT SPEED SENSOR

(a) Remove the seat cushion.

(b) Disconnect the speed sensor connector.

(e) Measure the resistance between terminals.

Resistance: 0.85 – 1.50 kΩ

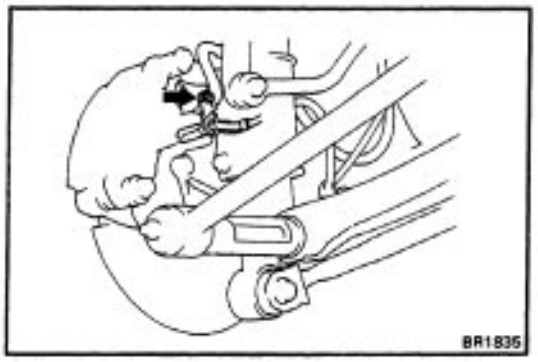
If resistance value is not as specified, replace the sensor.

(d) Check that there is no continuity between each terminal and sensor body.

If there is continuity, replace the sensor.

(e) Connect the speed sensor connector.

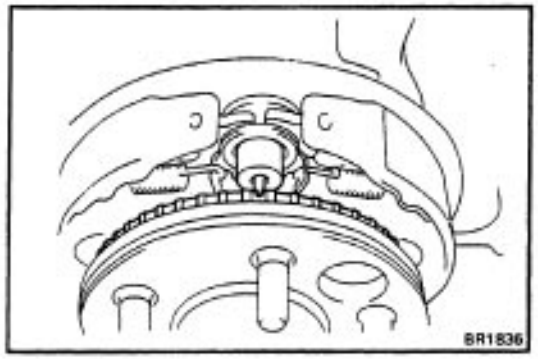
(f) Install the seat cushion.



2. INSPECT SENSOR INSTALLATION

Check that the sensor installation bolt is tightened properly. If not, tighten the bolt.

Torque: 80 kg–cm (69 in.–lb, 7.8 N–m)

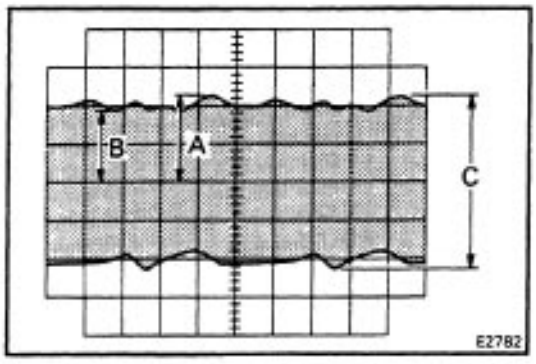


3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

(a) Remove the two bolts and remove the torque plate with brake cylinder.
(b) Remove the rotor disc.
(c) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth.
(d) Install the rotor disc and brake cylinder assembly with two bolts.

Torque: 475 kg–cm 134 ft–lb, 47 N–m)

NOTICE: To prevent damage to the serrations, do not strike the axle hub.



INSPECTION OF REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS (REFERANCE)

INSPECT REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS BY USING AN OSCILLOSCOPE

(a) Connect an oscilloscope to the speed sensor connector.
(b) Run the vehicle at 20 km/h (12.4 mph), and inspect speed sensor output wave.
(c) Check that C is 0.5 V or more.

If not as specified, replace the speed sensor.

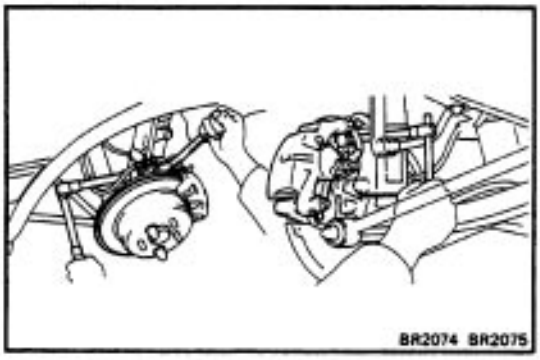
(d) Check that B is 70% or more of A.

If not as specified, replace the rear axle hub.

REMOVAL OF REAR SPEED SENSOR

1. DISCONNECT SPEED SENSOR CONNECTOR

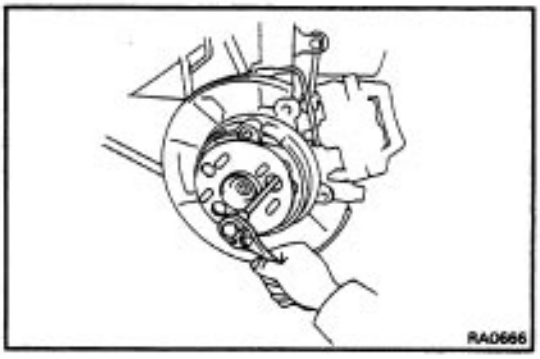
(a) Remove the seat cushion.
(b) Disconnect the sensor connector, and pull out the sensor wire harness.
(e) Remove the two clamp bolts holding the sensor wire harness to the body and suspension arm.



2. REMOVE REAR BRAKE ASSEMBLY

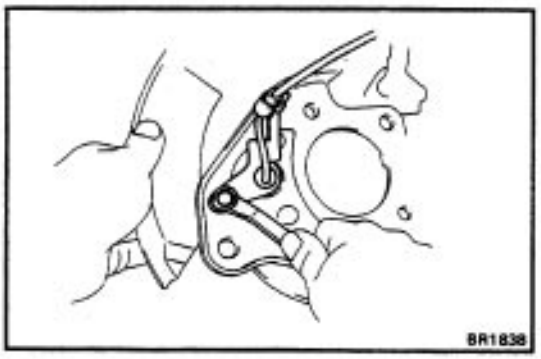
(a) Remove the axle carrier mounting bolt and nut of upper side.
(b) Remove the two bolts and remove the disc brake assembly.
(c) Suspend the disc brake so the hose is not stretched.

3. REMOVE ROTOR DISC



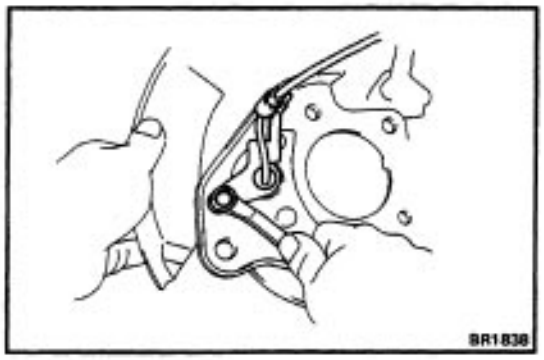
4. REMOVE REAR AXLE HUB

(a) Remove the four axle hub mounting bolts.
(b) Remove the rear axle hub.
(c) Remove the backing plate with parking brake assembly and O–ring.



5. REMOVE SPEED SENSOR

Remove the bolts and remove the speed sensor from the backing plate.

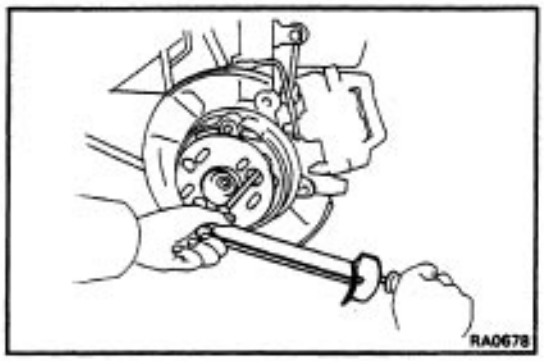


INSTALLATION OF REAR SPEED SENSOR

1. INSTALL SPEED SENSOR

Install the speed sensor to the backing plate with a bolt.

Torque: 80 kg–cm (69 in.–lb, 7.8 N–m)



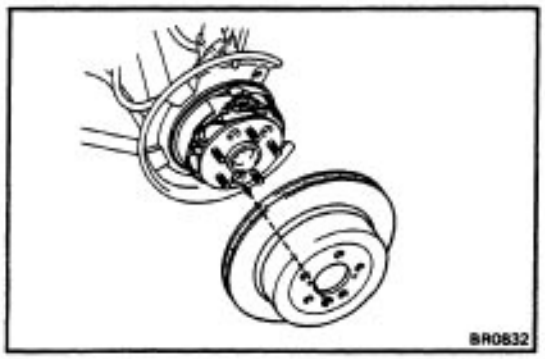
2. INSTALL REAR AXLE HUB

(a) Install the backing plate with parking brake assembly in place.

(b) Install a new O–ring to the axle carrier.

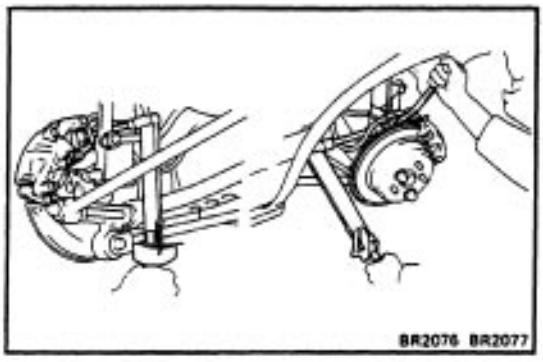
(c) Install the rear axle hub with the four bolts.

Torque: 820 kg–cm (59 ft–lb, 80 N–m)



3. INSTALL ROTOR DISC

Align the hole on the axle hub and service hole on the disc, and install the rotor disc.



4. INSTALL REAR BRAKE ASSEMBLY

(a) Install the disc brake assembly and torque the two mounting bolts.

Torque: 475 kg–cm (34 ft–lb, 47 N–m)

(b) Install the axle carrier mounting bolt and nut of upper side.

Torque:. 2,100 kg–cm (152 ft–lb, 206 N–m)

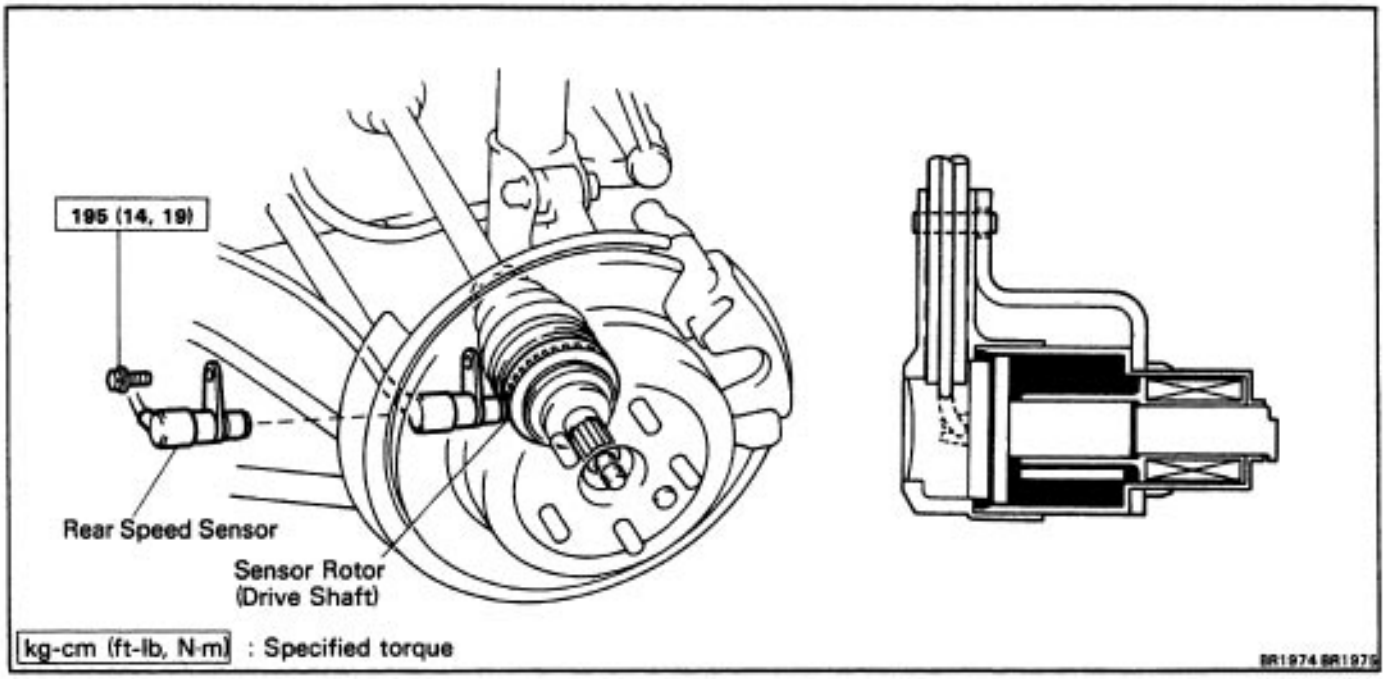
5. CONNECT SPEED SENSOR CONNECTOR

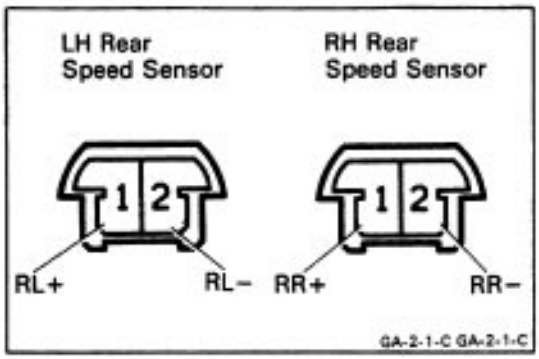
(a) Install the wire harness with clamps and bolts in place.

(b) Insert the wire harness connector to inside of the vehicle, and connect the connector.

(c) Install the seat cushion.

Rear Speed Sensor (4WD)





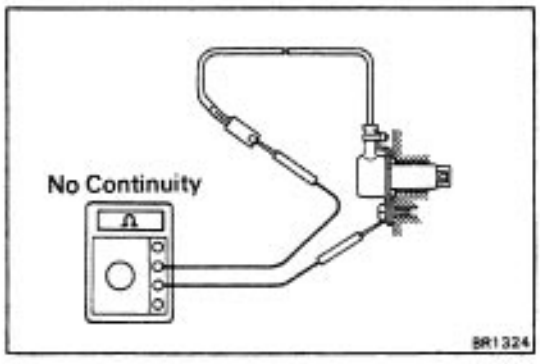
INSPECTION OF REAR SPEED SENSOR

1. INSPECT SPEED SENSOR

(a) Remove the rear seat cushion.
(b) Disconnect the speed sensor connector.
(c) Measure the resistance between terminals.

Resistance: 0.85 – 1.50 kΩ

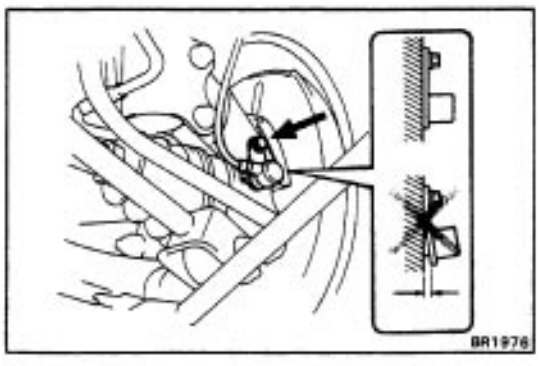
If resistance value is not as specified, replace the sensor.



(d) Check that there is no continuity between each terminal and sensor body.

If there is continuity, replace the sensor:

(e) Connect the speed sensor connector.
(f) Install the rear seat cushion.



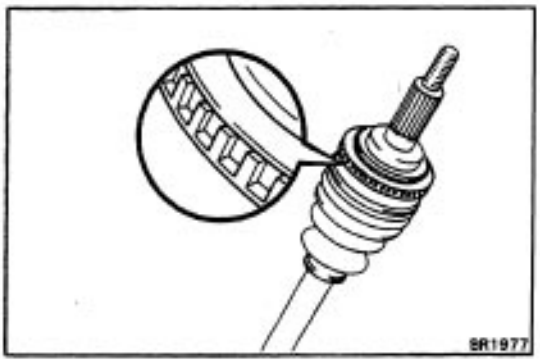
2. INSPECT SENSOR INSTALLATION

(a) Check that the sensor installation bolt is tightened properly. If not, tighten the bolt.

Torque: 195 kg–cm (14 ft–lb, 19 N–m)

(b) Check that there is no clearance between the sensor and rear axle carrier as shown.

If there is clearance, replace the sensor.



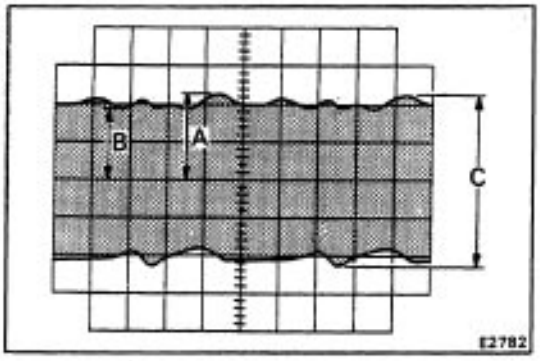
3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

(a) Remove the drive shaft.
(See page RA–21)

(b) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth.

(c) Install the drive shaft.
(See page RA–26)

NOTICE: To prevent damage to the serrations, do not strike the drive shaft.



INSPECTION OF REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS (REFERENCE)

INSPECT REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS BY USING AN OSCILLOSCOPE

(a) Connect an oscilloscope to the speed sensor connector.

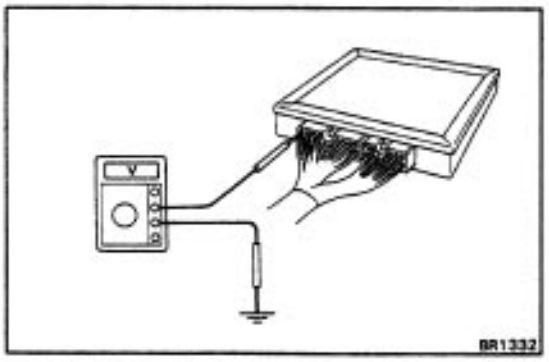
(b) Run the vehicle at 20 km/h (12.4 mph), and inspect speed sensor output wave.

(e) Check that C is 0.5 V or more.

If not as specified, replace the speed sensor.

(d) Check that B is 60% or more of A.

If not as specified, replace the rear drive shaft.



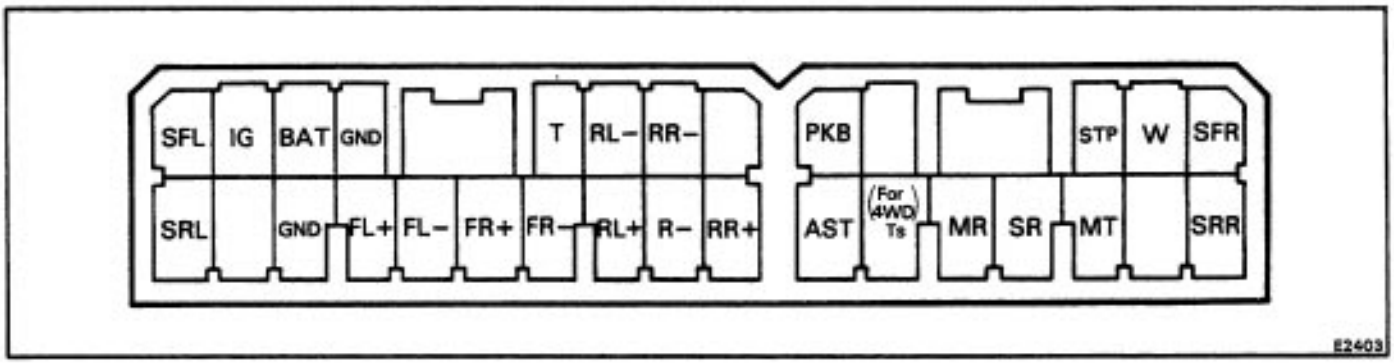
Anti–lock Brake System Circuit

INSPECTION OF SYSTEM CIRCUIT

1. INSPECT SYSTEM CIRCUIT WITH CONNECTOR CONNECTED

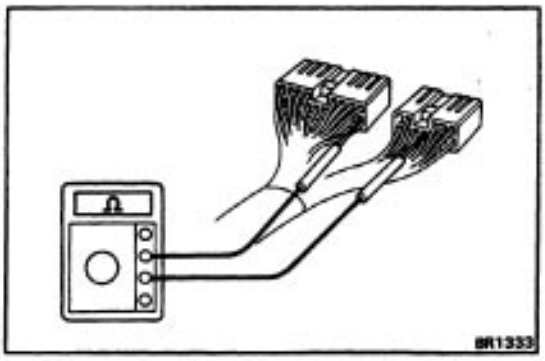
(a) Remove the A.B.S. computer.

(b) Using a voltmeter with high impedance (10 KΩ/V minimum), measure the voltage at each terminal and body ground.



Tester Connection	Condition	Voltage	Trouble Part
SFL – Body ground	Ignition switch on	Battery voltage	Actuator, control relays
	Ignition switch on and ”ANTI LOCK” warning light goes on	About 0 V	
SFR – Body ground	Ignition switch on	Battery voltage	
	Ignition switch on and ”ANTI LOCK” warning light goes on	About 0 V	
SRI – Body ground	Ignition switch on	Battery voltage	
	Ignition switch on and ”ANTI LOCK” warning light goes on	About 0 V	
SRR – Body ground	Ignition switch on	Battery voltage	
	Ignition switch on and ”ANTI LOCK” warning light goes on	About 0 V	
AST – Body ground	Ignition switch on	Battery voitage	
	Ignition switch on and ”ANTI LOCK” warning light goes on	About 0 V	
W – Body ground	Ignition switch on	Battery voltage	”ANTI LOCK” warning light bulb
	Ignition switch on and ”ANTI LOCK” warning light goes on	About 0 V	
T – Body ground	Check connector disconnected	Battery voltage	Check connector, computer
	Check connector connected	About 0 V	

If the circuit is not as specified, check and repair or replace the trouble part shown in the table above.



2. INSPECT SYSTEM CIRCUIT WITH CONNECTOR DISCONNECTED

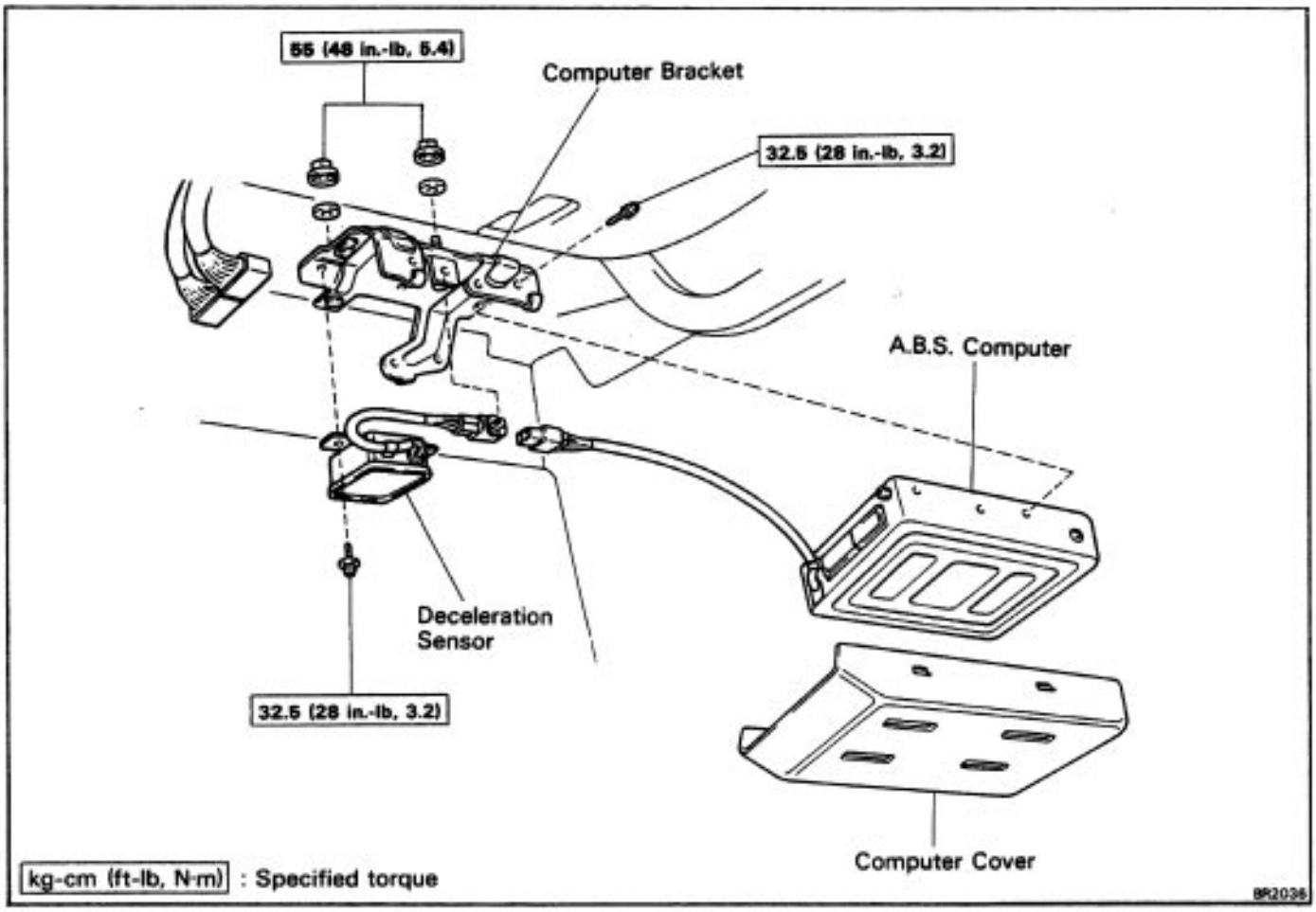
(a) Disconnect the connectors from the computer, inspect at the wire harness side connector.

Tester Connection	Chrak Item	Condition	Voltage or Resistance Value	Trouble Part
SFR – AST	Resistance	Ignition switch off	About 6Ω	Actuator
STP – Body ground	Voltage	Ignition switch off and brake pedal depressed	Battery voltage	Stop light switch, stop light
	Continuity	Ignition switch off and brake pedal returned	Continuity	
PKB – Body ground	Voltage	Ignition switch on and PKB lever pulled	About 0 v	Parking broke switch, level warning switch
		Engine running and PKB lever returned	Battery voltage	
SRR – AST	Resistance	Ignition switch off	About 6 0	Actuator
MT – Body ground	Continuity	Ignition switch off	Continuity	
SR – R ⊖	Resistance	Ignition switch off	65–100Ω	
MR – R ⊖	Resistance	Ignition switch off	50–80Ω	
Ts – Body ground (For 4WD)	Continuity	–	No continuity	Ts connector, wiring harness
		Ts connector shorted	Continuity	
AST – Body ground	Resistance	Ignition switch off	About 5Ω	Wiring harness
RR ⊖ – Body ground	Continuity	Ignition switch off	No continuity	Rear RH speed sensor
RL ⊖ – Body ground	Continuity	Ignition switch off	No continuity	Rear LH speed sensor
T – Body ground	Continuity	Ignition switch off	Continuity	Check connector, wiring harness
GND – Body ground	Continuity	Ignition switch off	Continuity	Wiring harness
BAT – Body ground	Vortege	–	Battery voltage	FOG fuse
IG – Body ground	Voltage	Ignition switch on	Battery voltage	ECU–IG fuse
SFL – AST	Resistance	Ignition switch off	About 6Ω	Actuator
RR ⊕ – RR ⊖	Resistance	–	0.85 – 1.50 kΩ	Rear RH speed sensor
R ⊖ – Body ground	Continuity	Ignition switch off	No continuity	Wiring harness
RL ⊕ – RL ⊖	Resistance	–	0.85 – 1.50 kΩ	Rear LH speed sensor
FR ⊖ – Body ground	Continuity	–	No continuity	Front RH speed sensor
FR ⊕ – FR ⊖	Resistance	–	0.85 – 1.30 k fl	
FL ⊖ – Body ground	Continuity	–	No continuity	FrontrH speed sensor
FL ⊕ – FL ⊖	Resistance	–	0.85– 1.30kΩ	
SRL – AST	Resistance	Ignition switch off	About 6Ω	Actuator

If the circuit is not as specified, check and repair or replace the trouble part shown in the table above.

(b) Connect the connectors, and install the computer cover.

REMOVAL AND INSTALLATION OF A.B.S. COMPUTER AND DECELERATION SENSOR (For 4WD)



1. REMOVE A.B.S. COMPUTER

(a) Remove the computer cover.

(b) Remove the five screws holding the computer to the computer bracket.

(e) Pull out the wire harness from the clamp on the bracket, and pull out the connector from the clamp on the bracket.

(d) Disconnect the three connectors, and remove the A.B.S. computer.

2. REMOVE DECELERATION SENSOR

Remove the two screws, and remove the deceleration sensor.

NOTICE: Do not drive without normal installation of deceleration sensor and computer assembly.

3. INSTALL DECELERATION SENSOR

(a) Install the deceleration sensor to the bracket with the two screws.

Torque: 32.5 kg–cm (28 in.–lb, 3.2 N–m)

(b) Install the connector to the clamp on the bracket.

(c) Check that the deceleration sensor is installed properly.

4. INSTALL A.B.S. COMPUTER

(a) Connect the three connectors and insert the wire harness to the clamp.

(b) Set the computer in place, and install it with the five screws.

Torque: 32.5 kg–cm (28 in.–lb, 3.2 N–m)

(c) Install the computer cover.

CHARGING SYSTEM

PRECAUTIONS

1. Check that the battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is given a quick charge.
3. Do not perform tests with a high voltage insulation resistance tester.
4. Never disconnect the battery when the engine is running.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Discharge warning light does not light with ignition ON and and engine not running	Fuse blown Light burned out Wiring connections loose IC regulator faulty	Check ”CHARGE” and ”IGN” fuses Replace light Tighten loose connections Replace IC regulator	 CH–6
Discharge warning light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn Battery cables loose, corroded or worm Fuse blown Fusible link blown IC regulator or alternator faulty Wiring faulty	Adjust or replace drive belt Repair or replace cables Check ”ENGINE” fuse Replace fusible link Check charging system Repair wiring	CH–3 CH–4

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TROUBLESHOOTING

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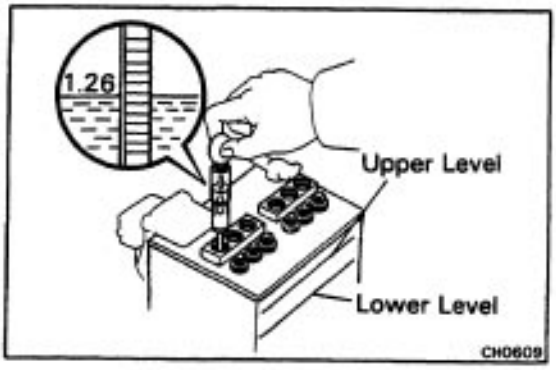


ON–VEHICLE INSPECTION

1. INSPECT BATTERY SPECIFIC GRAVITY AND ELECTROLYTE LEVEL

(a) Check the specific gravity of each cell.

Standard specific gravity:

1.25 – 1.27 when fully charged at 20˚C (68˚F)

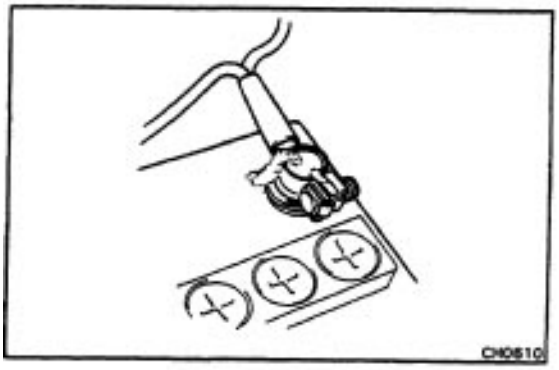
If not within specifications, charge the battery.

(b) Check the electrolyte quantity of each cell.

If insufficient, refill with distilled (or purified) water.

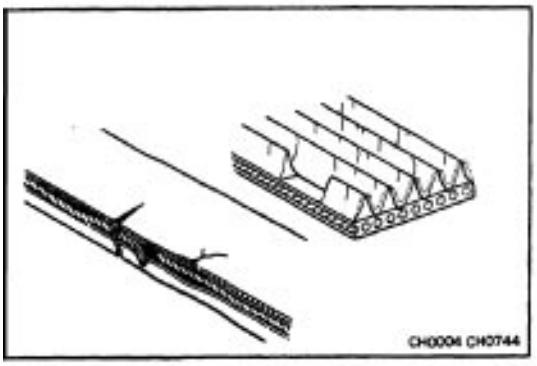
2. CHECK BATTERY TERMINALS, FUSIBLE LINKS AND FUSES

(a) Check that the battery terminals are not loose or corroded.



(b) Check the fusible links and fuses for continuity.

Fusible link:	**ALT**	**80A**
	AM1	**0.5G**
	AM2	**30A**
Fuse:	**ENGINE**	**10A**
	CHARGE	**7.5A**
	IGN	**7.5A**

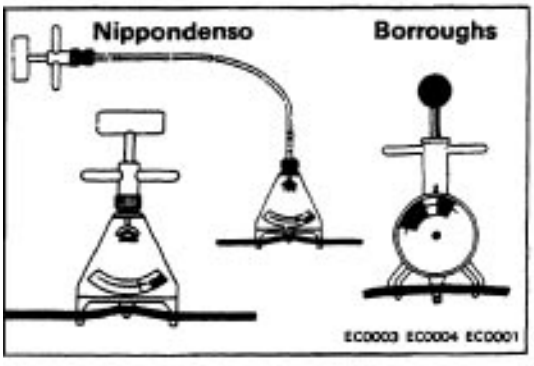


3. INSPECT DRIVE BELT

(a) Visually check the belt for excessive wear, frayed cords etc.

If necessary, replace the drive belt.

HINT: Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



(b) Using a belt tension gauge, measure the drive belt tension.

Belt tension gauge:

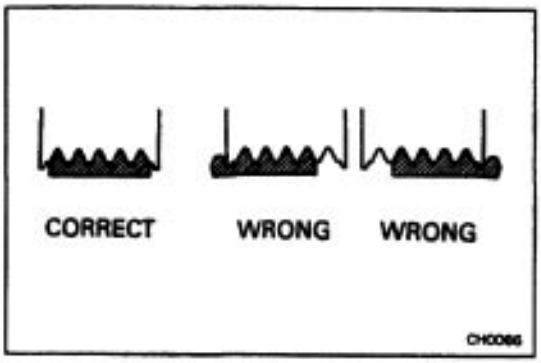
Nippondenso – BTG–20 (95506–00020)

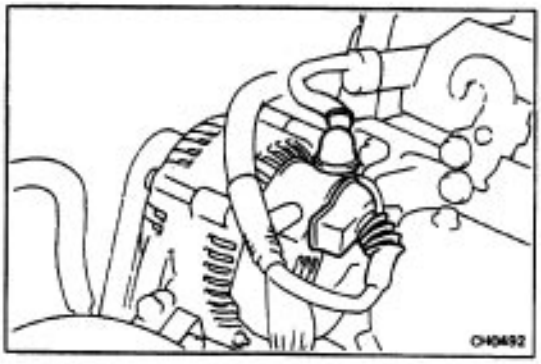
Boroughs No. BT–33–73F

Drive belt tension:

3S–FE	**w/ A/C**	**New belt 175 ± 5 lb**
		Used belt 130 ± 10 lb
	w/o A/C	**New belt 125 ± 25 lb**
		Used belt 95 ± 20 ib
2vZ–FE		**New belt 15± 51b**
		Used belt 5 ± 20 lb

If the belt tension is not as specified, adjust it.





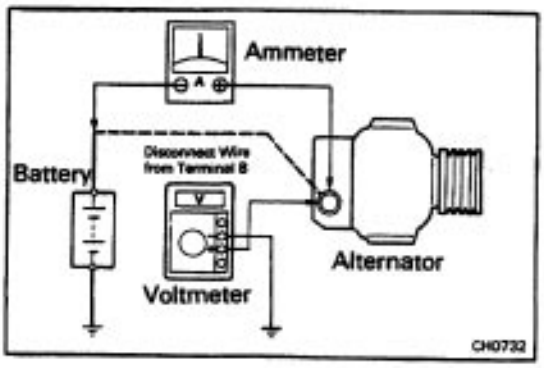
HINT:
- ”New belt” refer to a belt which has been used 5 minutes or less on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a belt, check that it fits properly in the ribbed grooves.
- Check by hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.

4. VISUALLY CHECK ALTERNATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.
(b) Check that there is no abnormal noise from the alternator white the engine is running.

5. INSPECT CHARGE WARNING LIGHT CIRCUIT

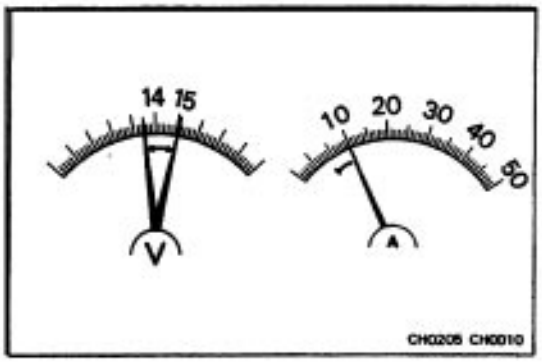
(a) Warm up the engine and then turn it off.
(b) Turn off all accessories.
(c) Turn the ignition switch to ”ON”. Check that the charge warning light is lit.
(d) Start the engine. Check that the light goes out.
If the light does not go off as specified, troubleshoot the charge light circuit.



6. INSPECT CHARGING CIRCUIT WITHOUT LOAD

HINT: If a battery/alternator tester is available, connect the tester to the charging circuit as per manufacturer’s instructions.

(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:
- Disconnect the wire from terminal B of the alternator and connect it to the negative H probe of the ammeter.
- Connect the positive (+) probe of the ammeter to terminals B of the alternator.
- Connect the positive (+) probe of the voltmeter to terminal B of the alternator.
- Ground the negative (–) probe of the voltmeter.



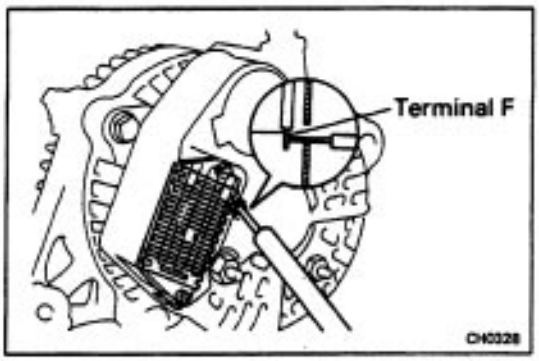
(b) Check the charging circuit as follows: .

With the engine running from idling to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

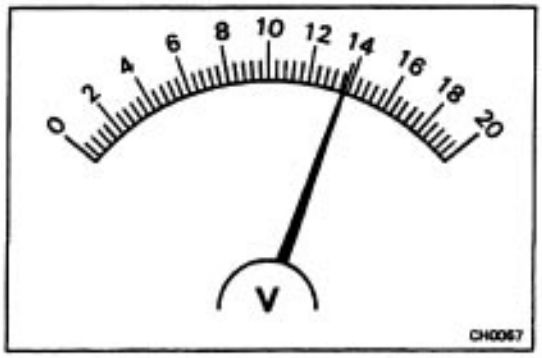
Standard voltage: 13.9 – 15.1 V at 25˚C (77˚F)
13.5 – 14.3 V at 115˚C (2390F)

If the voltmeter reading is greater than standard voltage, replace the IC regulator.



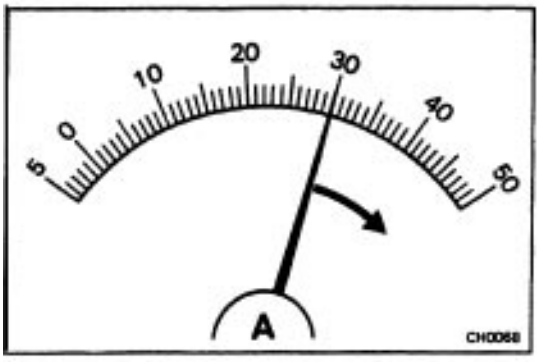
If the voltmeter reading is less than standard voltage, check the IC regulator and alternator as follows:

- With terminal F grounded, start the engine and check the voltmeter reading of terminal B.



- If the voltmeter reading is greater than standard voltage, replace the IC regulator.

.. If the voltmeter reading is less than standard voltage, check the alternator.

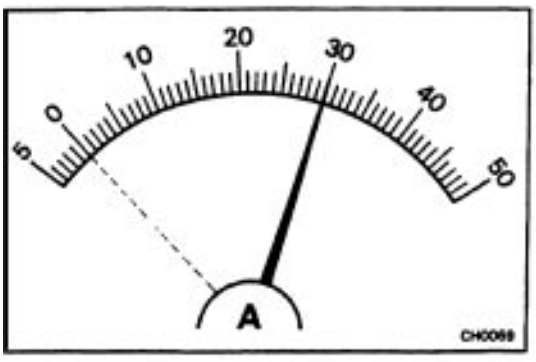


7. INSPECT CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater blower switch at ”HI”.

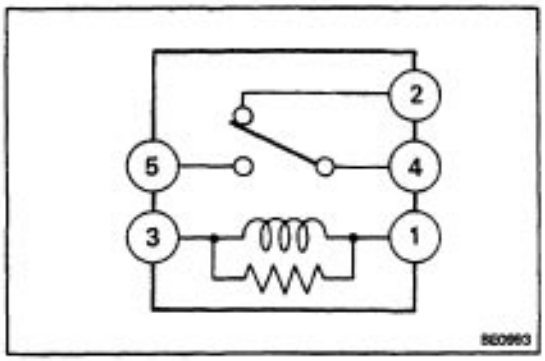
(b) Check the reading on the ammeter.

Standard amperage: 30 A or more



If the ammeter reading is less than standard amperage, repair the alternator. (See page CH–6)

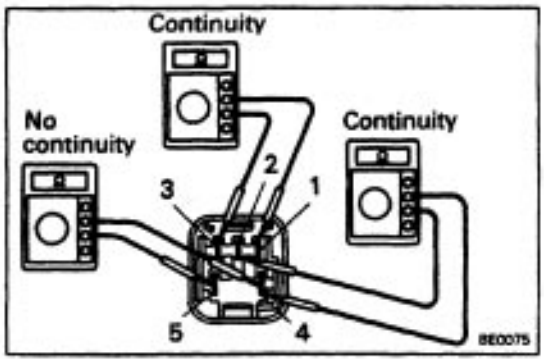
HINT: With the battery fully charged, the indication will sometimes be less than standard amperage.



ENGINE MAIN RELAY

INSPECTION OF ENGINE MAIN RELAY

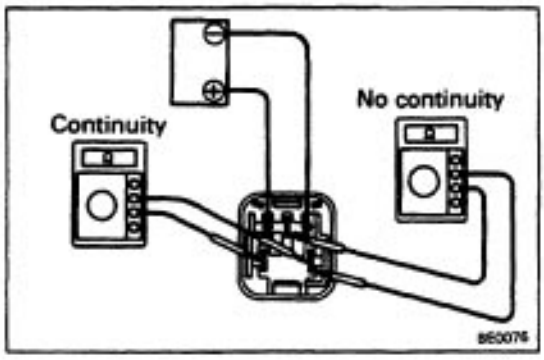
LOCATION:
3S–FE In the relay box in the engine compartment.
2VZ–FE On the LH fender apron rear side in the engine compartment.



1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.
(b) Check that there is continuity between terminals 2 and 4.
(c) Check that there is no continuity between terminals 4 and 5.

If continuity is not as specified, replace the relay.



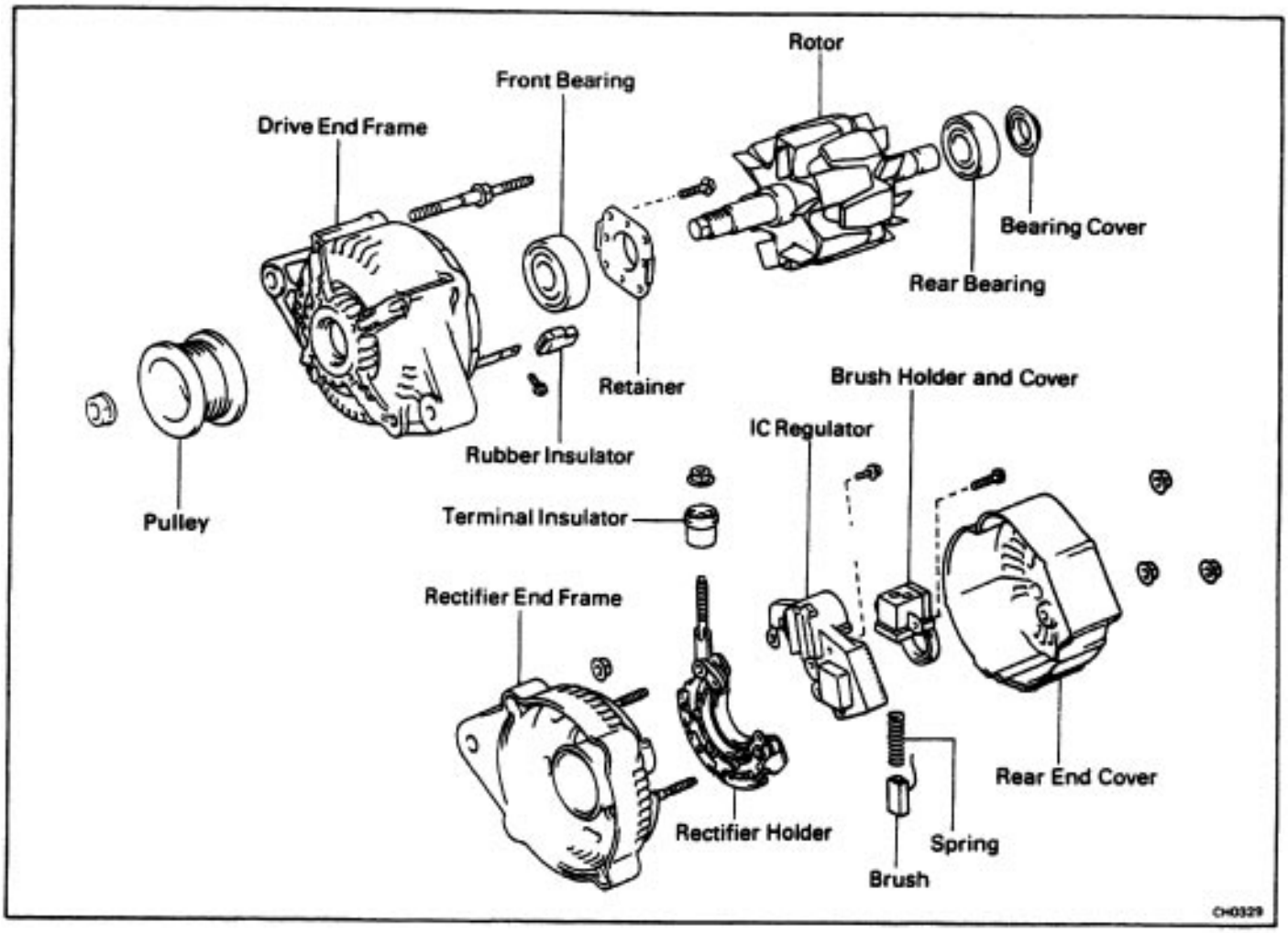
2. INSPECT RELAY OPERATION

(a) Apply battery voltage across terminals 1 and 3.
(b) Using an ohmmeter, check that there is continuity between terminals 4 and 5.
(e) Check that there is no continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.

ALTERNATOR

COMPONENTS

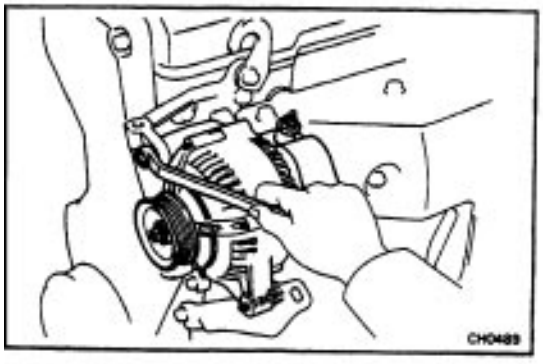


REMOVAL OF ALTERNATOR (3S–FE)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

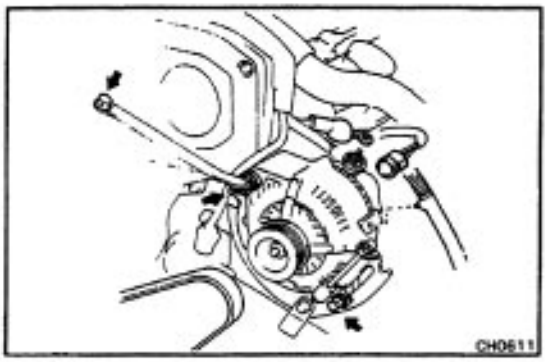
2. DISCONNECT CONNECTOR AND WIRE FROM ALTERNATOR

3. REMOVE DRIVE BELT



4. REMOVE ALTERNATOR

Remove the adjusting lock bolt, pivot bolt and alternator.



REMOVAL OF ALTERNATOR (2VZ–FE)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. REMOVE NO. 2 RH MOUNTING STAY

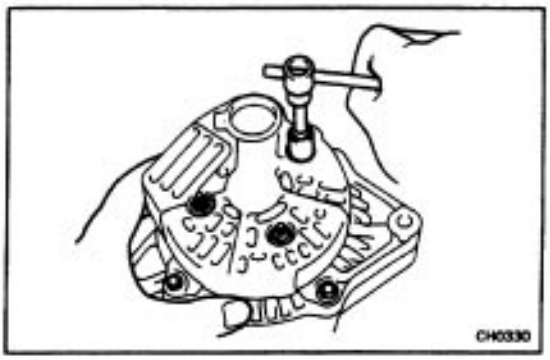
3. DISCONNECT CONNECTOR AND WIRE FROM ALTERNATOR

4. DISCONNECT WIRE HARNESS FROM CLIP

5. REMOVE DRIVE BELT

6. REMOVE ALTERNATOR

Remove the adjusting lock bolt, pivot bolt and alternator.



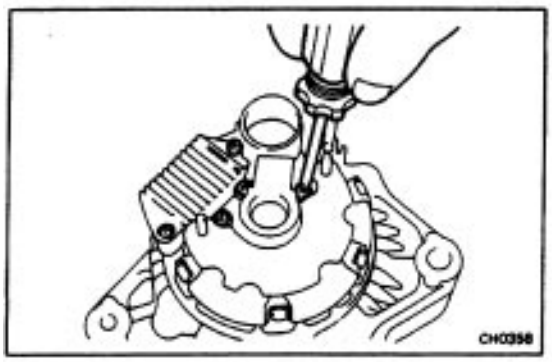
DISASSEMBLY OF ALTERNATOR

(See page CH–6)

1. REMOVE REAR END COVER

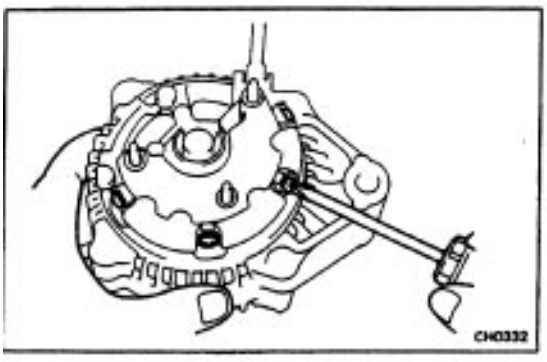
(a) Remove the nut and terminal insulator.

(b) Remove the three nuts and end cover.



2. REMOVE BRUSH HOLDER AND IC REGULATOR

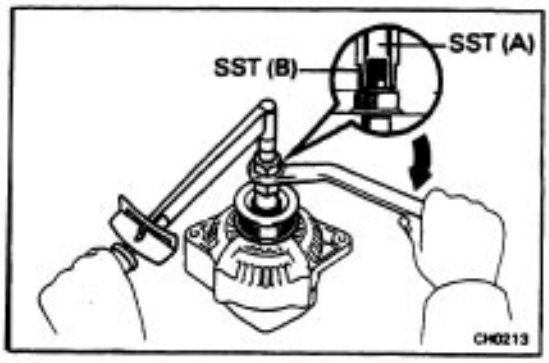
Remove the five screws, brush holder and IC regulator.



3. REMOVE RECTIFIER HOLDER

(a) Remove the four screws and rectifier holder.

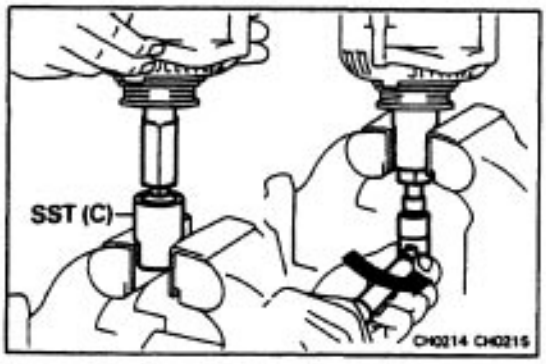
(b) Remove the four rubber insulators.



4. REMOVE PULLEY

(a) Hold SST(A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.
SST 09820–63010
Torque: 400 kg–cm (29 ft–lb, 39 N–m)

(b) Check that SST (A) is secured to the rotor shaft.



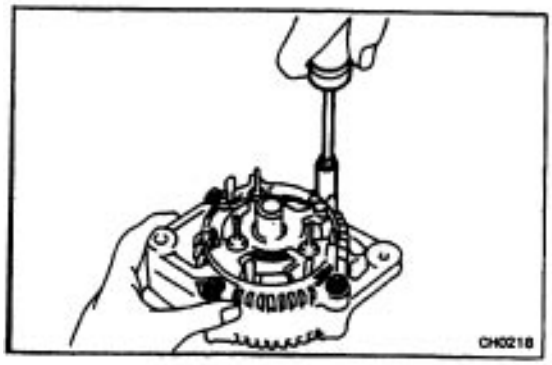
(c) AS shown in the illustration, mount SST (C) in a vise, and install the alternator to SST (C).

(d) To loosen the pulley nut turn SST (A) in the direction shown in the illustration.
NOTICE: To prevent damage to the rotor shaft, do not loosen the pulley nut more than one–half of a turn.

(e) Remove the alternator from SST (C).

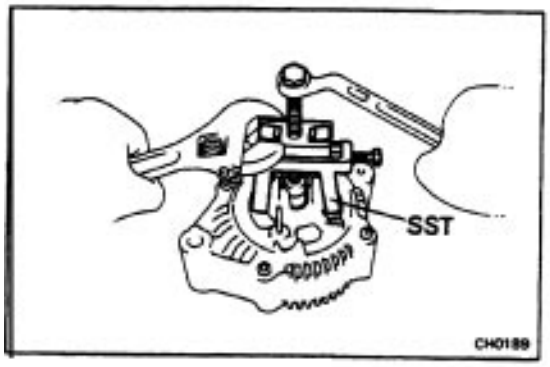
(f) Turn SST (B) and remove SST (A and B).

(g) Remove the pulley nut and pulley.



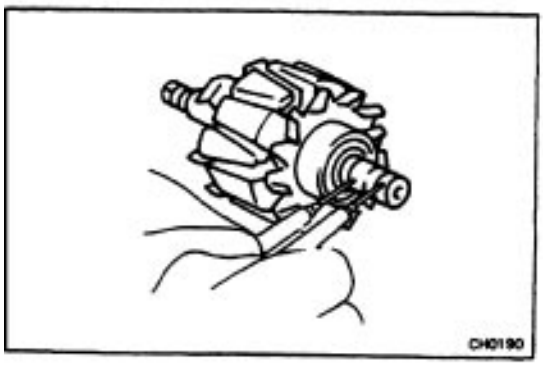
5. REMOVE RECTIFIER END FRAME

(a) Remove the four nuts.



(b) Using SST, remove the rectifier end frame.
SST 09286–46011

6. REMOVE ROTOR FROM DRIVE END FRAME



INSPECTION AND REPAIR OF ALTERNATOR

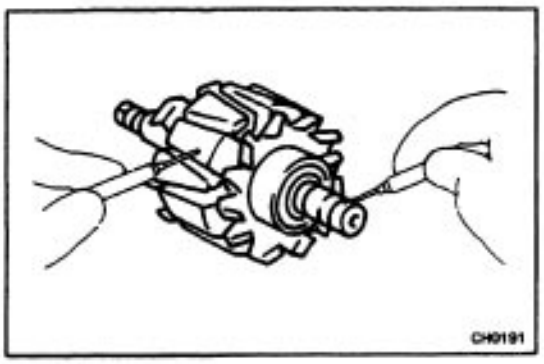
Rotor

1. INSPECT ROTOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance (Cold): 2.8 – 3.0Ω

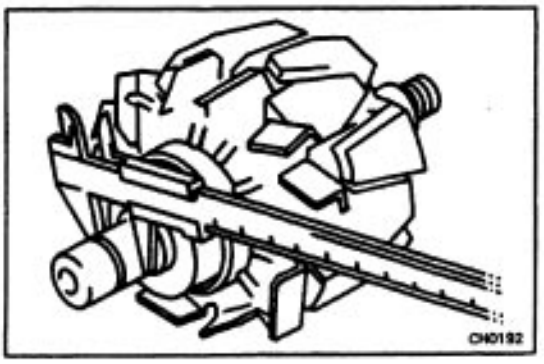
If there is no continuity replace the rotor.



2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.



3. INSPECT SLIP RINGS

(a) Check that the slip rings are not rough or scored.

If rough or scored, replace the rotor.

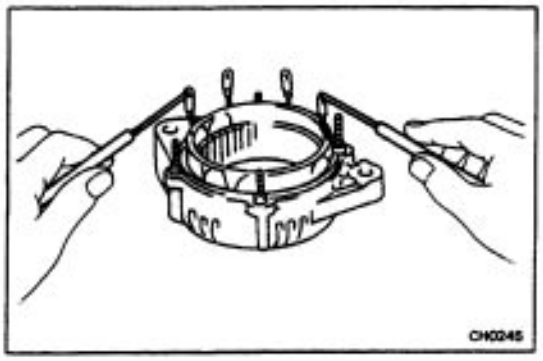
(b) Using calipers, measure the slip ring diameter.

Standard diameter. 14.2 –14.4 mm (0.559 – 0.567 in.)

Minimum diameter 12.8 mm (0.504 in.)

If the diameter is less than minimum, replace the rotor.

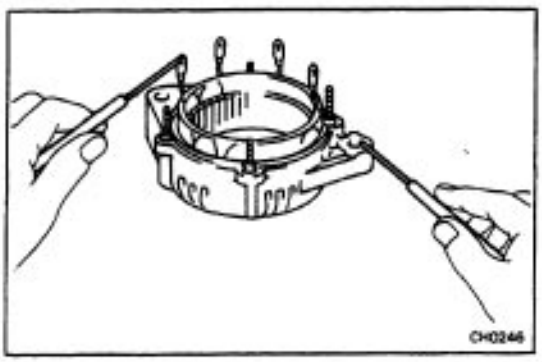
Stator



1. INSPECT STATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the coil leads.

If there is no continuity, replace the drive end frame assembly.

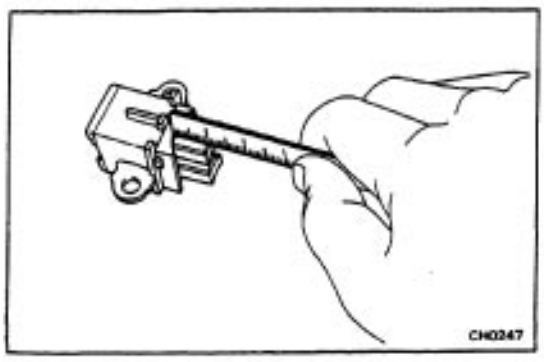


2. INSPECT STATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the coil lead and drive end frame.

If there is continuity, replace the drive end frame assembly.

Brushes



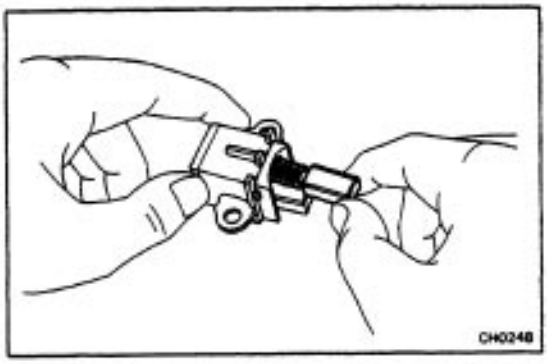
1. INSPECT EXPOSED BRUSH LENGTH

Using a scale, measure the exposed brush length.

Standard exposed length: 10.5 mm (0.413 in,)

Minimum exposed length: 1 .5 mm (0.069 in.)

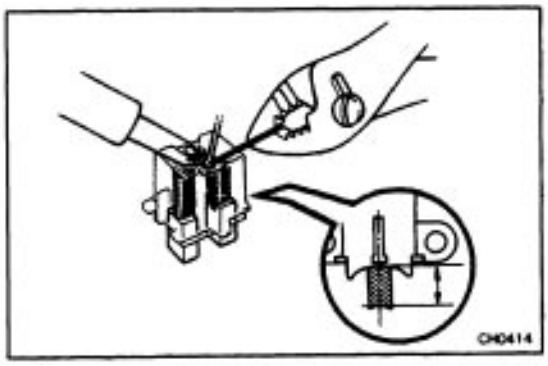
If the exposed length is less than minimum, replace the brushes.



2. IF NECESSARY, REPLACE BRUSHES

(a) Unsolder and remove the brush and spring.

(b) Run the wire of a new brush through the hole in the brush holder, and insert the spring and brush into the brush holder.



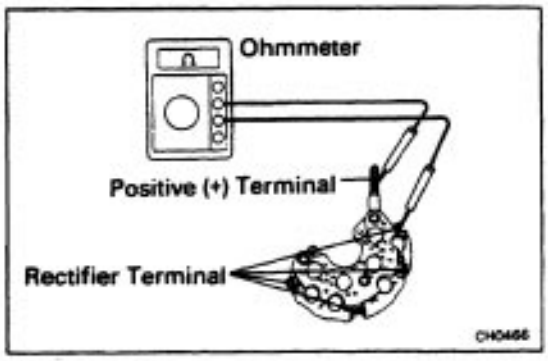
(c) Solder the brush wire to the brush holder at specified exposed length.
Exposed length: 10.5 mm (a.413 in.)

(d) Check that the brush moves smoothly in the brush holder.

(e) Cut off the excess wire.

(f) Apply insulation paint to the soldered point.

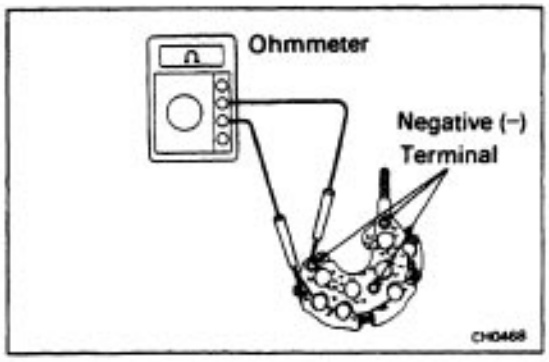
Rectifiers (Rectifier Holder)



1. INSPECT POSITIVE RECTIFIER

(a) Connect the ohmmeter positive (+) probe to each rectifier terminal and the negative (–) probe to the positive (+) terminal, and check that there is no continuity.

(b) Reverse the ohmmeter probes, and check that there is continuity.
If continuity is not as specified, replace the rectifier holder.

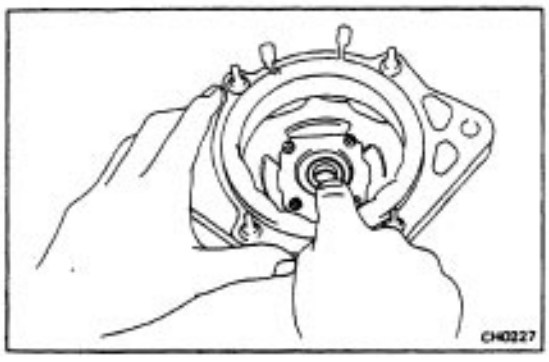


2. INSPECT NEGATIVE RECTIFIER

(a) Connect the ohmmeter positive (+) probe to each rectifier terminal and the negative (–) probe to each negative (–) terminal, check that there is continuity.

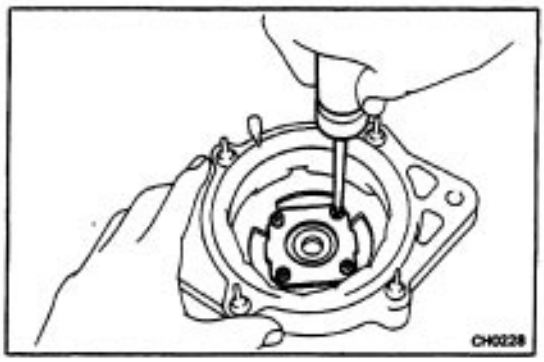
(b) Reverse the ohmmeter probes, and checK that there is no continuity.
If continuity is not as specified, replace the rectifier holder.

Bearings



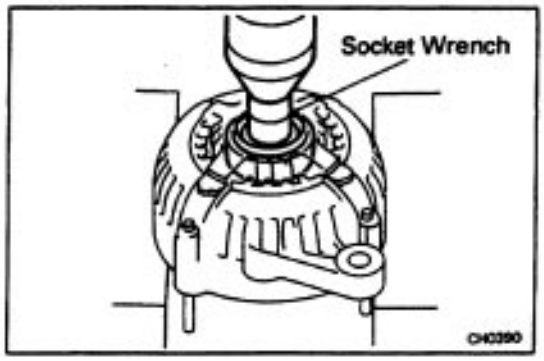
1. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.

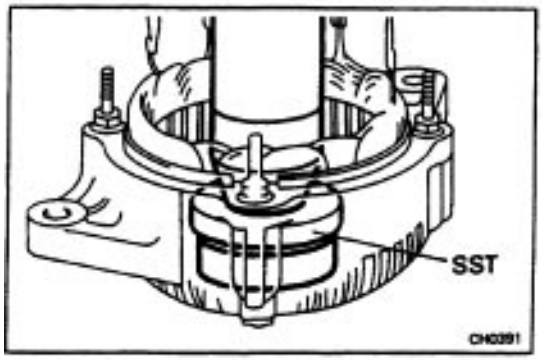


2. IF NECESSARY, REPLACE FRONT BEARING

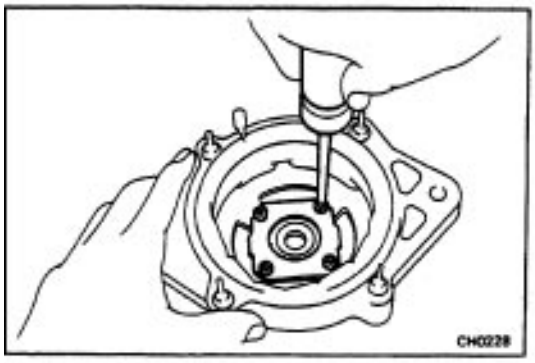
(a) Remove the four screws, bearing retainer and bearing.



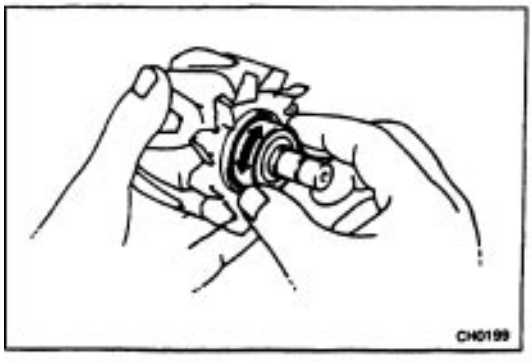
(b) Using a socket wrench and press, press out the bearing.



(c) Using SST and a press, press in a new bearing.
SST 09608–20012 (09608–00030)

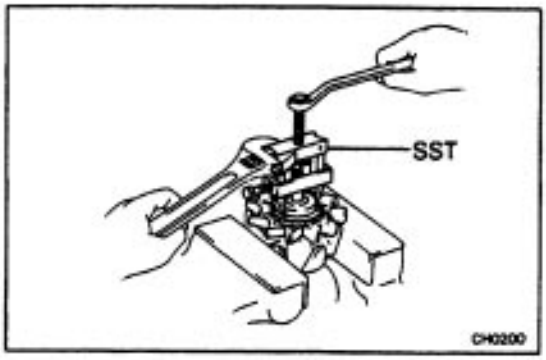


(d) Install the bearing retainer with the four screws.



3. INSPECT REAR BEARING

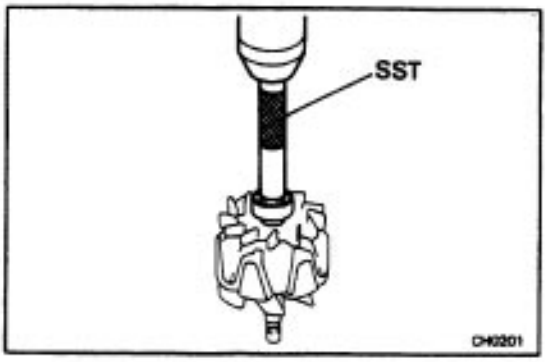
Check that the bearing is not rough or worn.



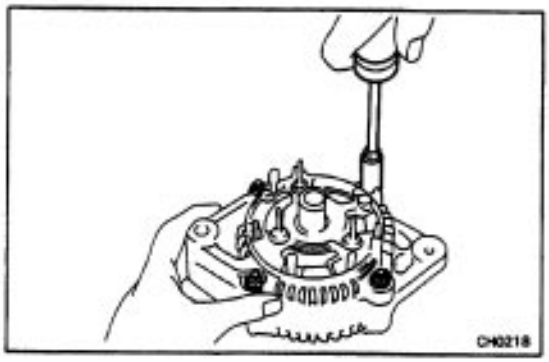
4. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing cover and bearing.
SST 09820–00021

NOTICE: Be careful not to damage the fan.



(b) Using SST and a press, press in a new bearing and bearing cover.
SST 09285–76010



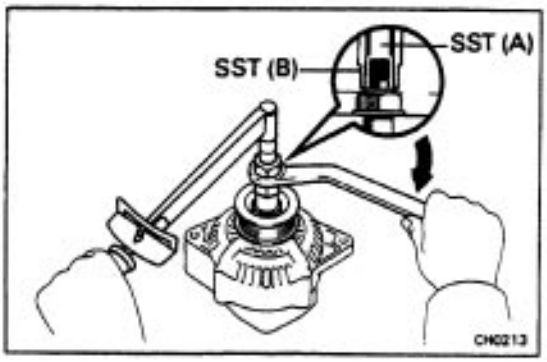
ASSEMBLY OF ALTERNATOR

(See page CH–6)

1. INSTALL ROTOR TO DRIVE END FRAME

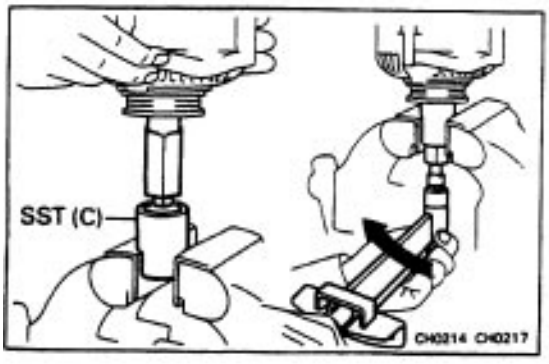
2. ASSEMBLE DRIVE END FRAME AND RECTIFIER END FRAME

(a) Using a plastic–faced hammer, lightly tap in the end frame.
(b) Install the four nuts.

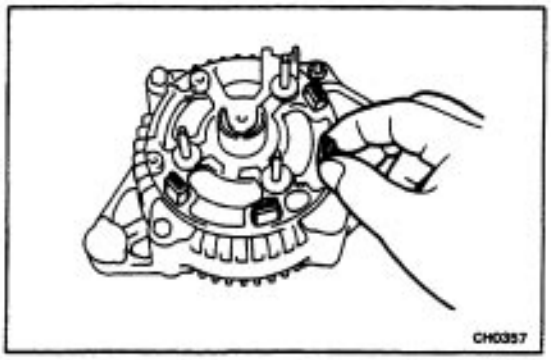


3. INSTALL PULLEY

(a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.
(b) Hold SST(A)with a torque wrench, and tighten SST (B) clockwise to the specified torque.
SST 09820–63010
Torque: 400 kg–cm (29 ft–lb, 39 N–m)
(c) Check that SST (A) is secured to the pulley shaft.

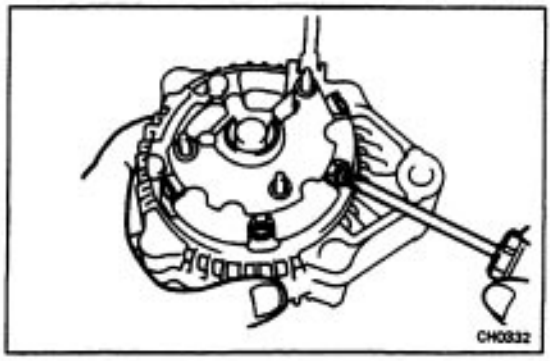


(d) As shown in the illustration, mount SST (C) in a vise, and install the alternator to SST (C).
(e) To torque the pulley nut turn SST (A) in the direction shown in the illustration.
Torque: 1,125 kg–cm (81 ft–lb, 110 N–m)
(f) Remove the alternator from SST (C).
(g) Turn SST (6) and remove SST (A and6).

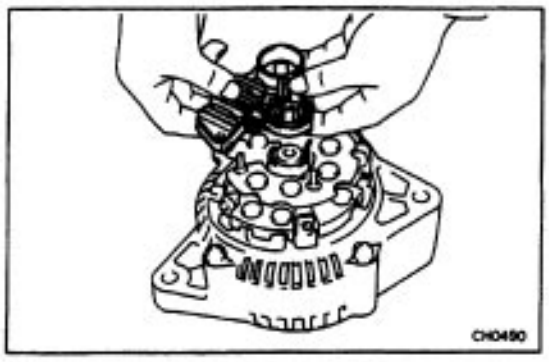


4. INSTALL RECTIFIER HOLDER

(a) Install the four rubber insulators on the lead wires.



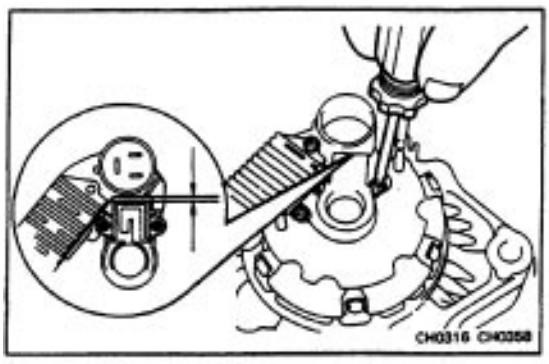
(b) Install the rectifier holder with the four screws.



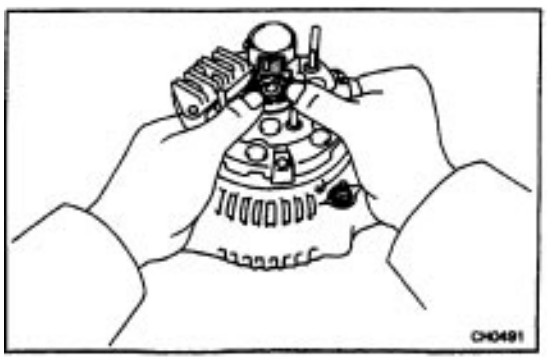
5. INSTALL IC REGULATOR AND BRUSH HOLDER

(a) Install the brush holder cover to the brush holder.

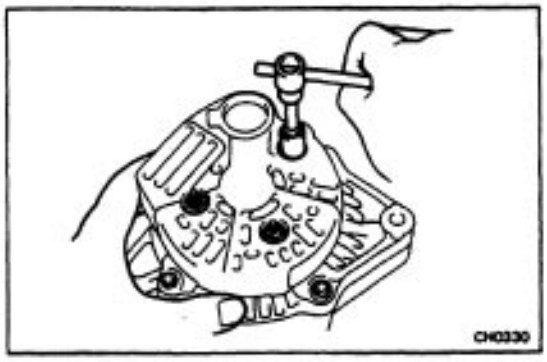
(b) Install the IC regulator together with the brush holder horizontally as shown.



(c) Install the five screws until there is a clearance of approx. 1 mm (0.04 in.) between the brush holder and connector.



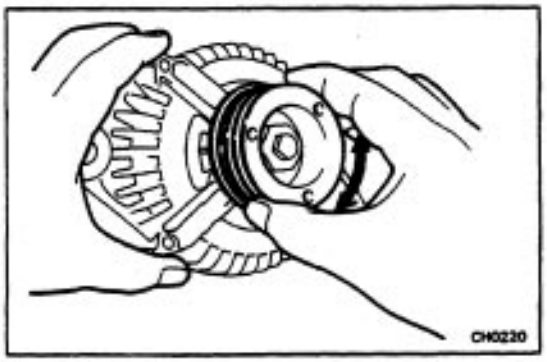
(d) Fit the brush holder cover.



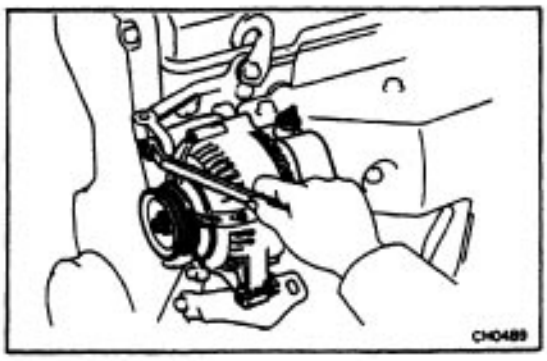
6. INSTALL REAR END COVER

(a) Install the end cover with the three nuts.

(b) Install the terminal insulator with the nut.



7. CHECK THAT ROTOR ROTATES SMOOTHLY



INSTALLATION OF ALTERNATOR

(3S–FE)

1. INSTALL ALTERNATOR

Mount the alternator on the alternator brackets with the pivot bolt and adjusting lock bolt. Do not tighten the bolts yet.

2. INSTALL DRIVE BELT

Adjust the drive belt tension. (See step 3 on page CH–3)

Drive belt tension:

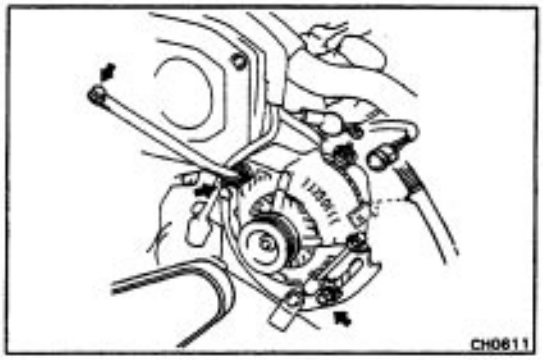
w/ A/C New belt 175 ± 5 lb
Used belt 130± 10 lb
w/o A/C New belt 125 t 25 lb
Used belt 95 ± 20 lb

3. CONNECT CONNECTOR AND WIRE TO ALTERNATOR

4. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

5. PERFORM ON–VEHICLE INSPECTION

(See steps 5 to 7 on pages CH–4 and 5)



INSTALLATION OF ALTERNATOR (2VA–FE)

1. INSTALL ALTERNATOR

Mount the alternator on the alternator bracket with the pivot bolt and adjusting lock bolt. Do not tighten the bolts yet.

2. INSTALL DRIVE BELT

Adjust the drive belt tension. (See step 3 on page **CH–3**)

Drive belt tension:

New belt 175 – 5 lb

Used belt 115 ± 20 lb

3. CONNECT CONNECTOR AND WIRE TO ALTERNATOR

4. CONNECT WIRE HARNESS TO CLIP

5. INSTALL NO.2 RH MOUNT STAY

Torque: Bolt 890 kg–cm (64 ft–lb, 87 N–m)

Nut 530 kg–cm (38 ft–lb, 52 N–m)

6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

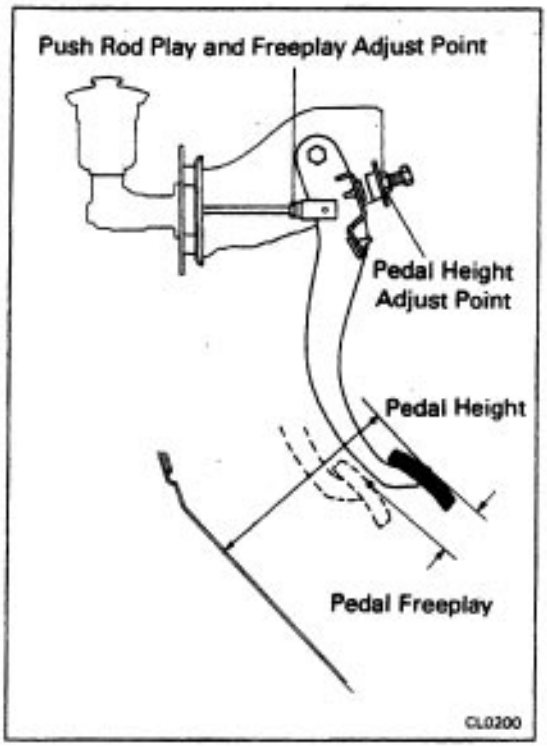
7. PERFORM ON–VEHICLE INSPECTION

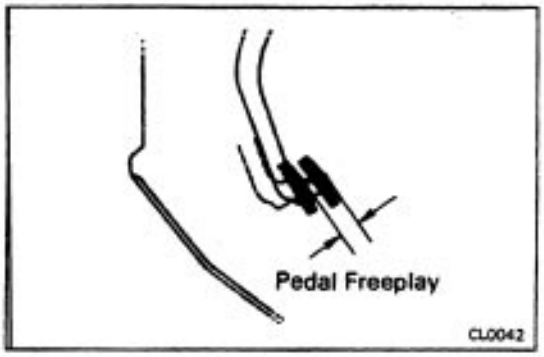
(See steps 5 to 7 on pages CH–4 **and 5)**

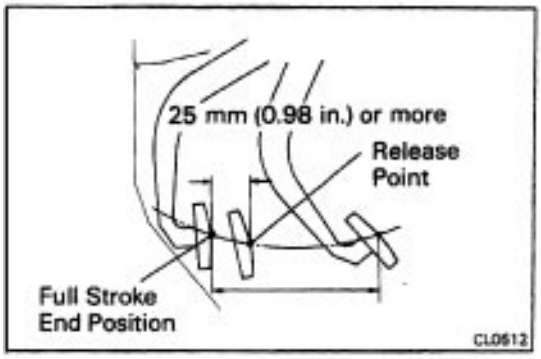
CLUTCH

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Hard to shift or will not shift	Clutch pedal freeplay excessive	Adjust pedal freeplay	CL–3
	Air in clutch lines	Bleed clutch system	CL–4
	Clutch release cylinder faulty	Repair release cylinder	CL–7
	Clutch master cylinder faulty	Repair master cylinder	CL–5
	Clutch disc out of true, runout is excessive or lining broken	Inspect clutch disc	CL–9
	Splines on input shaft or clutch disc dirty or burred	Repair as necessary	CL-9
	Clutch pressure plate faulty	Replace clutch cover	CL-9
Clutch slips	Clutch pedal freeplay insufficient	Adjust pedal freeplay	CL–3
	Clutch disc lining oily or worn out	inspect clutch disc	CL–9
	Pressure plate faulty	Replace clutch cover	CL–9
	Release fork binding	inspect release fork	CL–9
Clutch grabs/ chatters	Clutch disc lining oily or worn out	Inspect clutch disc	CL–9
	Pressure plate faulty	Replace clutch cover	CL–9
	Clutch diaphragm spring bent	Align clutch diaphragm spring	CL–9
	Engine mounts loose	Repair as necessary	
Clutch pedal spongy	Air in clutch lines	Bleed clutch system	CL–4
	Clutch release cylinder faulty	Repair release cylinder	CL–7
	Clutch master cylinder faulty	Repair master cylinder	CL–5
Clutch noisy	Loose part inside housing	Repair as necessary	CL-9
	Release bearing worn or dirty	Replace release bearing	







CHECK AND ADJUSTMENT OF CLUTCH PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT

Pedal height from asphalt shaft 181 – 191 mm (7:13 – 7.52 in.)

2. IF NECESSARY, ADJUST PEDAL HEIGHT

(a) Remove the instrument lower finish panel and disconnect the air duct.

(b) Loosen the lock nut and turn the stopper bolt (w/o Cruise control system) or clutch switch (w/ Cruise control system) until the height is correct. Tighten the lock nut.

HINT: Before rotating the clutch switch for pedal height adjustment, disconnect the clutch switch connector.

3. CHECK THAT PEDAL FREEPLAY AND PUSH ROD PLAY ARE CORRECT

(Pedal Freeplay)

Push in the pedal until the beginning of clutch resistance is felt.

Pedal freeplay: 5 – 15 mm (0.20 – 0.59 in.)

Push rod play at pedal top: 1.0 – 5.0 mm (0.039 – 0.197 in.)

4. IF NECESSARY, ADJUST PEDAL FREEPLAY AND PUSH ROD PLAY

(a) Loosen the lock nut and turn the push rod until the freeplay and push rod play are correct.

(b) Tighten the lock nut.

(e) After adjusting the pedal freeplay, check the pedal height.

(d) Connect the air duct and install the lower finish panel.

5. INSPECT CLUTCH RELEASE POINT

(a) Pull the parking brake lever and install wheel stopper.

(b) Start the engine and idle the engine.

(e) Without depressing the clutch pedal, slowly shift the shift lever into reverse position until the gears contact.

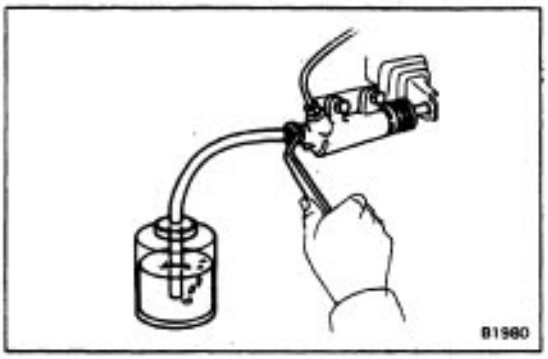
(d) Gradually depress the clutch pedal and measure the stroke distance from the point the gear noise stops (release point) up to the full stroke end position.

Standard distance: 25 mm (0.98 in.) or more

(From pedal stroke end position to release point)

If the distance is not as specified, perform the following operation.

- Inspect pedal height.
- Inspect push rod play and pedal free play.
- Bleed the clutch line.
- Inspect the clutch cover and disc.



BLEEDING OF CLUTCH SYSTEM

HINT: If any work is done on the clutch system or if air is suspected in the clutch lines, bleed the system of air.
CAUTION: Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. FILL CLUTCH RESERVOIR WITH BRAKE FLUID

Check the reservoir frequently. Add fluid if necessary.

2. CONNECT VINYL TUBE TO BLEEDER PLUG

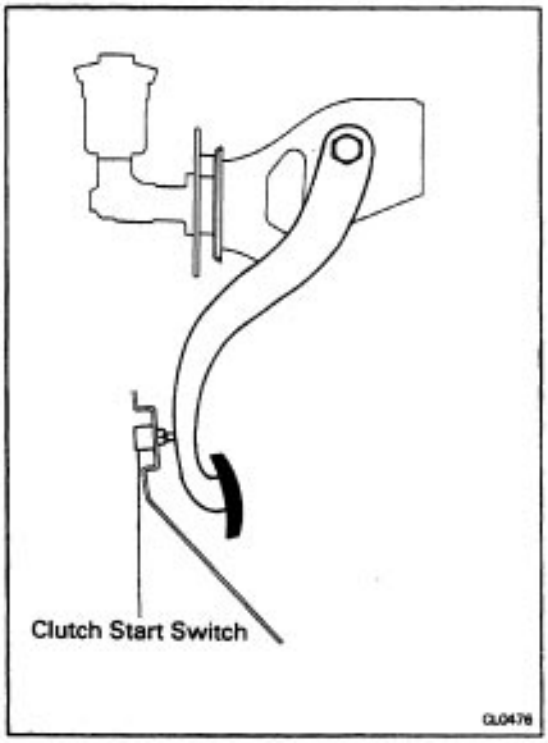
Insert the other of the tube in a half–filled container of brake fluid.

3. BLEED CLUTCH LINE

(a) Slowly pump the clutch pedal several times.

(b) While depressing the pedal, loosen the bleeder plug until the fluid starts to run out. Then close the bleeder plug.

(e) Repeat this procedure until there are no more air bubbles in the fluid.



INSPECTION OF CLUTCH START SYSTEM

CHECK CLUTCH PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT

(See page CL–3**)**

2. CHECK THAT PEDAL FREEPLAY AND PUSH ROD PLAY ARE CORRECT

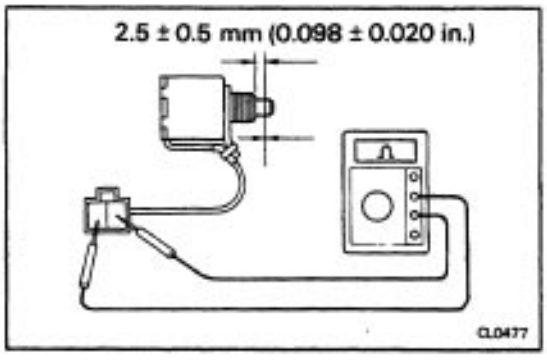
(See page CL–3**)**

CHECK CLUTCH START SYSTEM

(a) Check that the engine does not start when the clutch pedal is released.

(b) Check that the engine starts when the clutch pedal is fully depressed.

If necessary, inspect the clutch start switch.



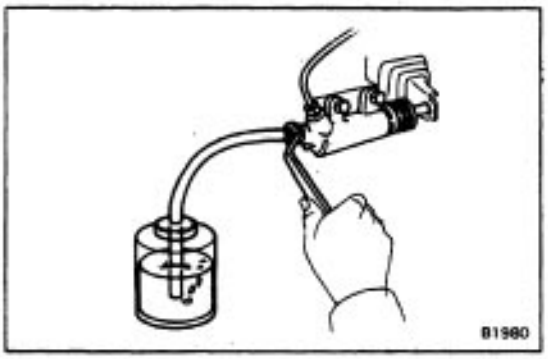
INSPECTION OF CLUTCH START SWITCH

INSPECT CONTINUITY OF CLUTCH START SWITCH

(a) Check that there is continuity between terminals when the switch in ON (pushed).

(b) Check that there is no continuity between terminals when the switch is OFF (released).

If continuity is not as specified, replace the switch.



BLEEDING OF CLUTCH SYSTEM

HINT: If any work is done on the clutch system or if air is suspected in the clutch lines, bleed the system of air.
CAUTION: Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. FILL CLUTCH RESERVOIR WITH BRAKE FLUID

Check the reservoir frequently. Add fluid if necessary.

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3. BLEED CLUTCH LINE

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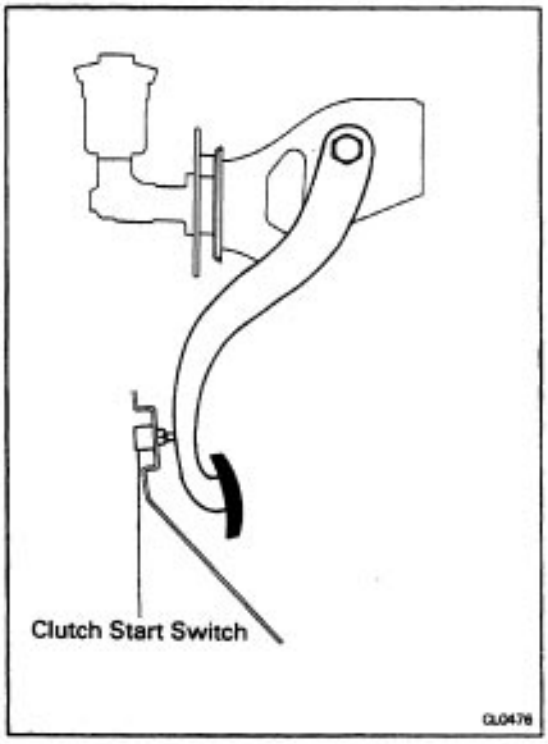
(e) Repeat this procedure until there are no more air bubbles in the fluid.



INSPECTION OF CLUTCH START SYSTEM

CHECK CLUTCH PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT

(See page CL–3**)**

2. CHECK THAT PEDAL FREEPLAY AND PUSH ROD PLAY ARE CORRECT

(See page CL–3**)**

CHECK CLUTCH START SYSTEM

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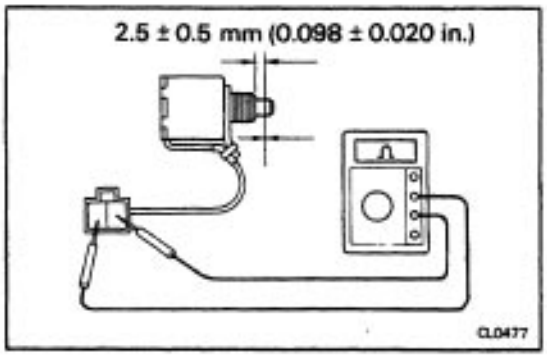

INSPECTION OF CLUTCH START SWITCH

INSPECT CONTINUITY OF CLUTCH START SWITCH

(a) Check that there is continuity between terminals when the switch in ON (pushed).

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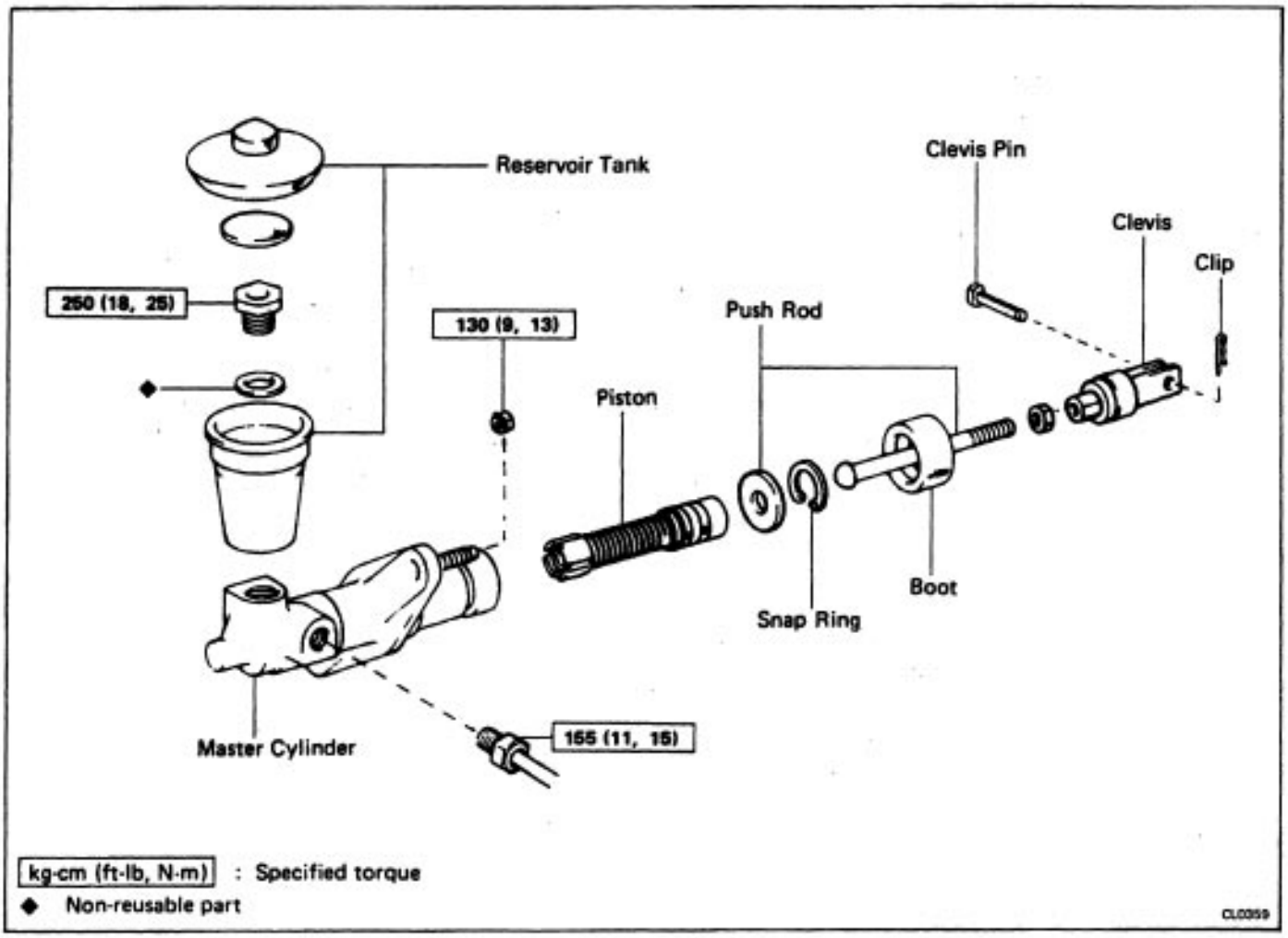
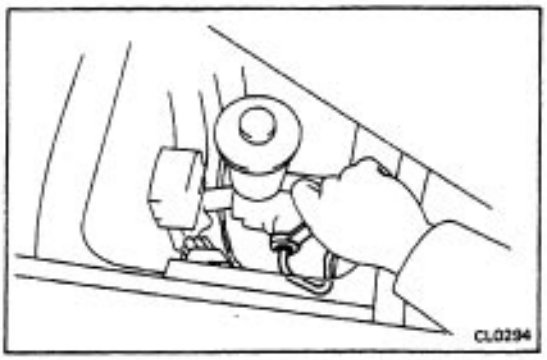
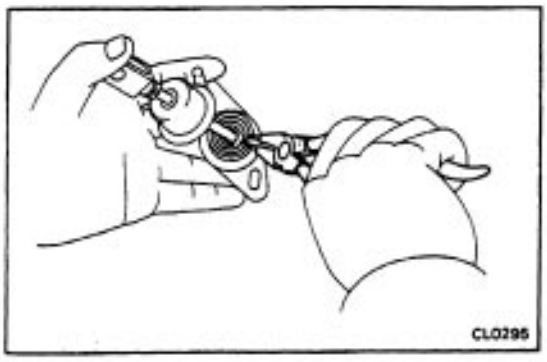
If continuity is not as specified, replace the switch.

CLUTCH MASTER CYLINDER

COMPONENTS







REMOVAL OF MASTER CYLINDER

1. DRAW OUT FLUID WITH SYRINGE

2. DISCONNECT CLUTCH LINE TUBE

3. REMOVE INSTRUMENT LOWER FINISH PANEL

Remove the lower instrument lower finish panel and disconnect the air duct from the instrument lower finish panel.

4. REMOVE CLEVIS PIN AND CLIP WITH SPRING WASHER

Remove the clip and clevis pin with the spring washer.

5. REMOVE MOUNTING NUTS AND PULL OUT MASTER CYLINDER

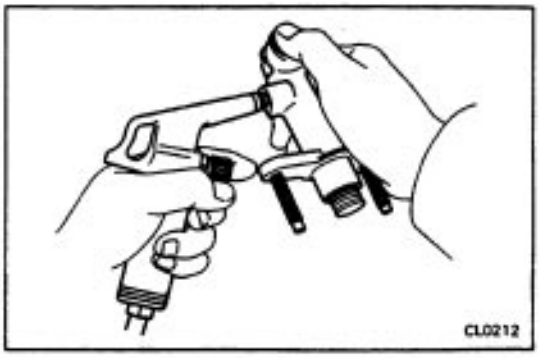
DISASSEMBLY OF MASTER CYLINDER

1. REMOVE RESERVOIR TANK

2. REMOVE PUSH ROD AND PISTON

(a) Pull back the boot and, using snap ring pliers, remove the snap ring.

(b) Pull out the push rod.



3. REMOVE PISTON

Using compressed air, remove the piston from the cylinder.

INSPECTION OF MASTER CYLINDER

HINT: Clean the disassembled parts with compressed air.

1. INSPECT MASTER CYLINDER BORE FOR SCORING OR CORROSION

If a problem is found, clean or replace the cylinder.

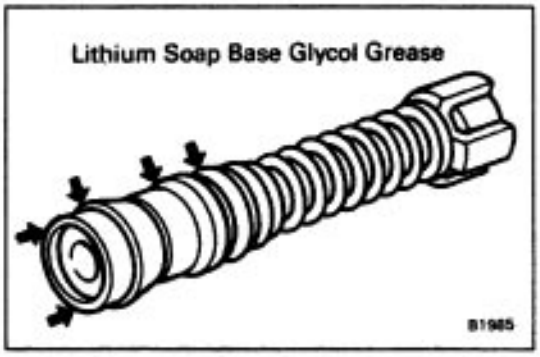
2. INSPECT PISTON AND CUPS FOR WEAR, SCORING, CRACKS OR SWELLING

If either one requires replacement, use the parts from the cylinder kit.

3. INSPECT PUSH ROD FOR WEAR OR DAMAGE

If necessary, replace the push rod.

ASSEMBLY OF MASTER CYLINDER



(See page CL–5)

1. COAT PARTS WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN

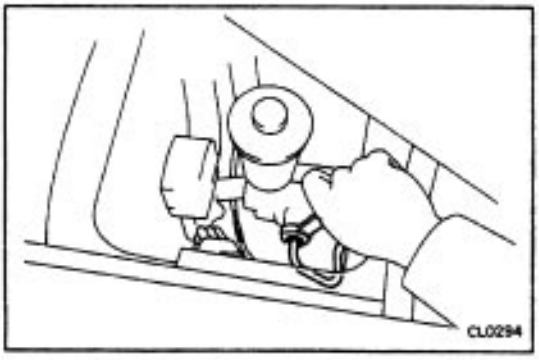
2. INSERT PISTON INTO CYLINDER

3. INSTALL PUSH ROD ASSEMBLY WITH SNAP RING

4. INSTALL RESERVOIR TANK

Torque: 250 kg–cm (18 ft–lb. 25 N–m)

INSTALLATION OF MASTER CYLINDER



(See page CL–5)

1. INSTALL MASTER CYLINDER WITH MOUNTING NUTS

2. CONNECT CLUTCH LINE TUBE

3. CONNECT CLEVIS, AND INSTALL CLEVIS PIN AND CLIP

Secure the clevis pin with the clip.

4. FILL CLUTCH RESERVOIR WITH BRAKE FLUID AND BLEED CLUTCH SYSTEM (See page CL–4)

5. CHECK FOR LEAKS

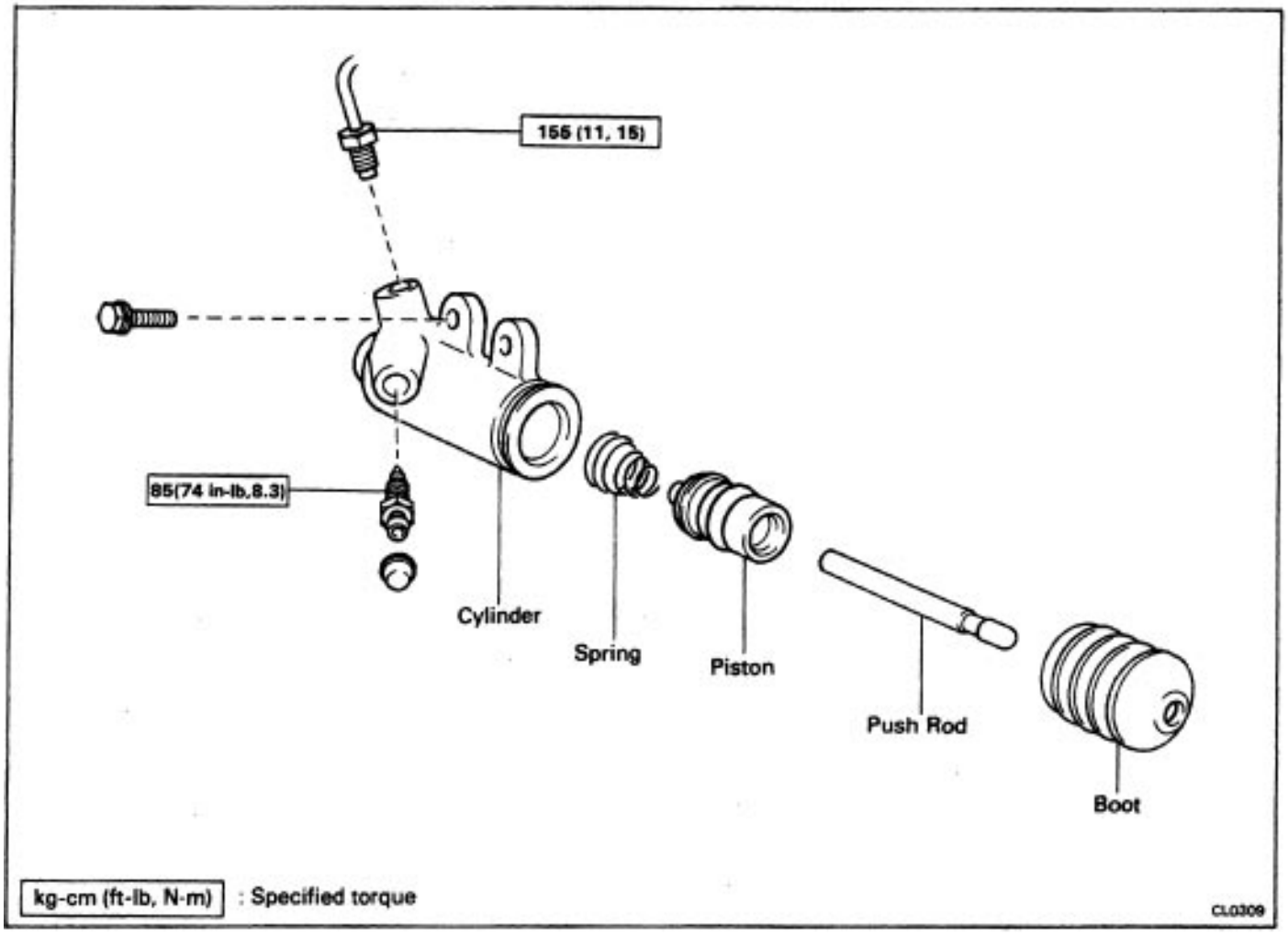
6. CHECK AND ADJUST CLUTCH PEDAL (See page CL–3)

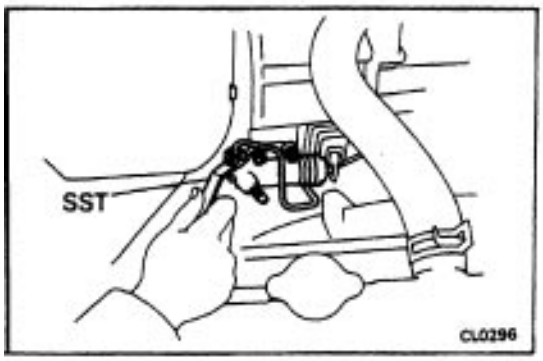
7. INSTALL INSTRUMENT LOWER FINISH PANEL

Connect the air duct to the instrument lower finish panel and install the instrument lower panel.

CLUTCH RELEASE CYLINDER

COMPONENTS





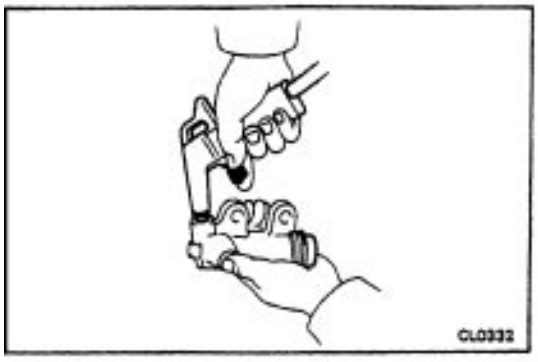
REMOVAL OF RELEASE CYLINDER

1. DISCONNECT CLUTCH LINE TUBE

Using SST, disconnect the tube. Use a container to catch the brake fluid.

SST 09751–36011

2. REMOVE TWO BOLTS AND PULL OUT RELEASE CYLINDER



3. REMOVE PISTON WITH SPRING

(a) Remove the boot and push rod from the cylinder.

(b) Using compressed air, remove the piston with spring from the cylinder.

INSPECTION OF RELEASE CYLINDER

HINT: Clean the disassembled part with compressed air.

1. INSPECT RELEASE CYLINDER BORE FOR SCORING OR CORROSION

If a problem is found, clean or replace the cylinder.

2. INSPECT PISTON AND CUPS FOR WEAR, SCORING. CRACKS OR SWELLING

If either one requires replacement, use the parts from the cylinder kit.

3. INSPECT PUSH ROD FOR WEAR OR DAMAGE

If necessary, replace the push rod.

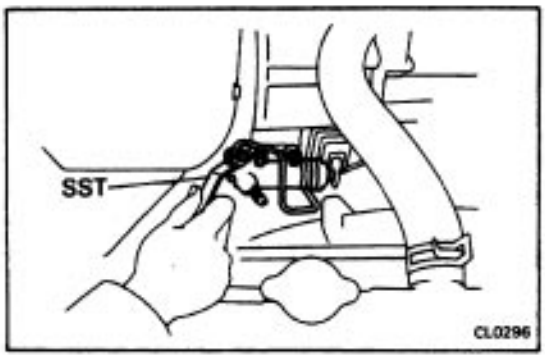
ASSEMBLY OF RELEASE CYLINDER

(see page CL–7)

1. COAT PISTON WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN

2. INSERT PISTON WITH SPRING

3. INSTALL BOOT AND INSERT PUSH ROD



INSTALLATION OF RELEASE CYLINDER

(see page CL–7)

1. INSTALL RELEASE CYLINDER WITH TWO BOLTS

2. CONNECT CLUTCH LINE TUBE

Using SST, connect the tube.

SST. 09751–36011

Torque: 155 kg–cm (11 ft–lb, 15 N–m)

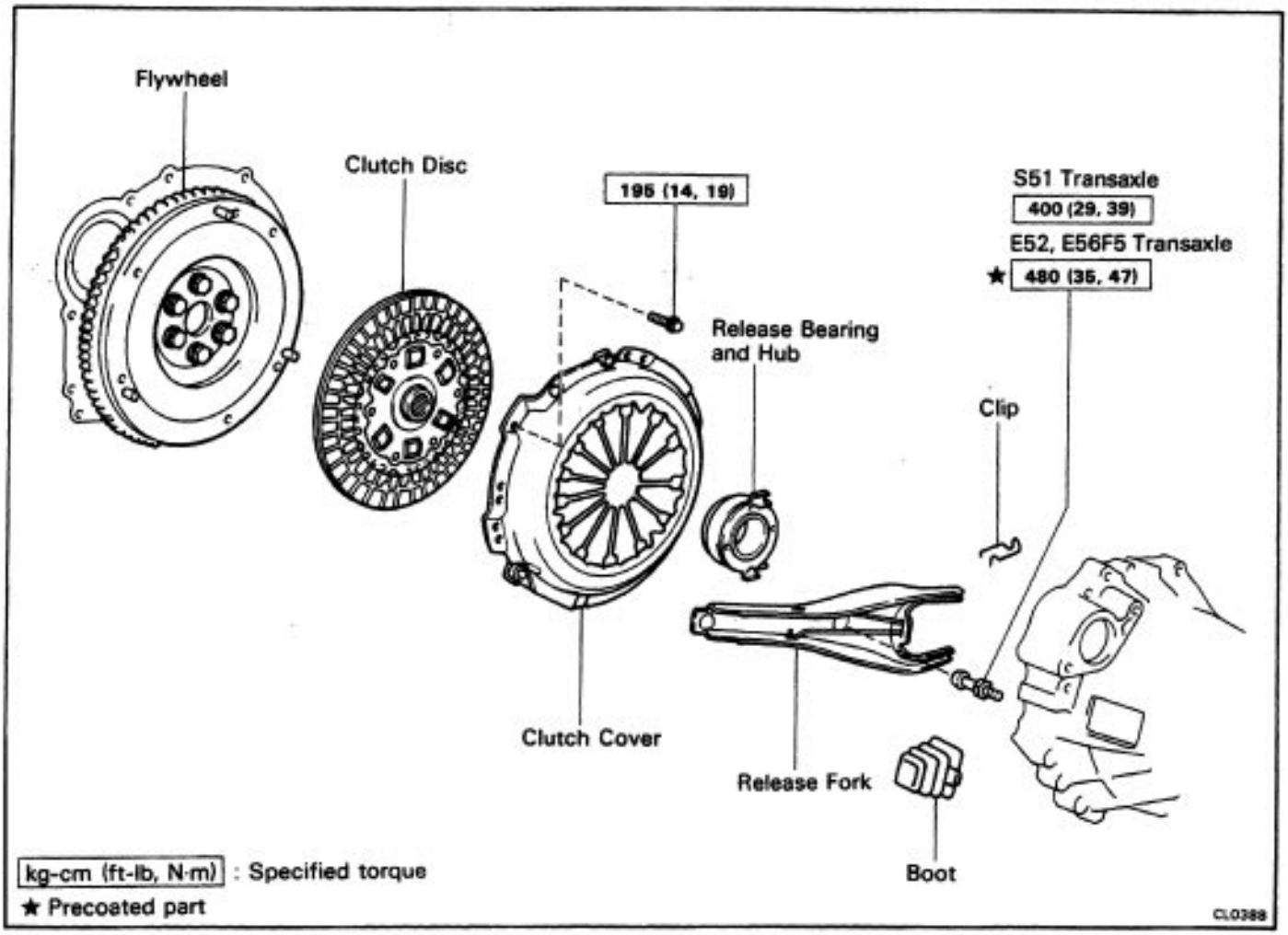
3. FILL CLUTCH RESERVOIR WITH BRAKE FLUID AND BLEED CLUTCH SYSTEM

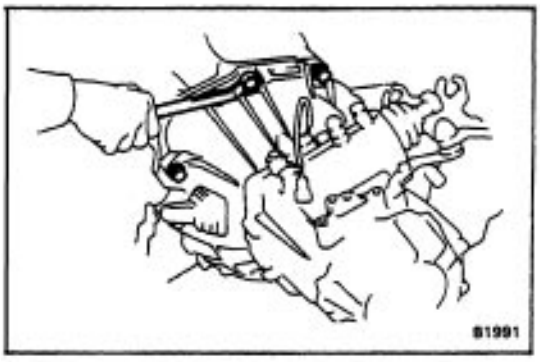
(See page CL–4)

4. CHECK FOR LEAKS

CLUTCH UNIT

COMPONENTS

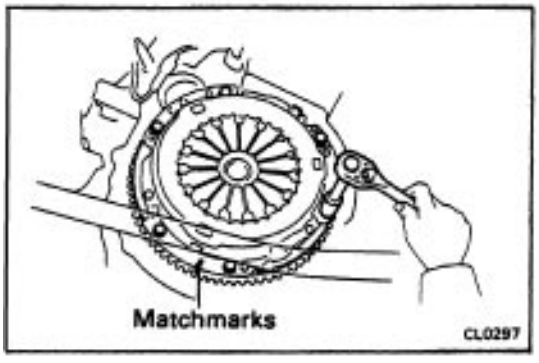




REMOVAL OF CLUTCH UNIT

1. REMOVE TRANSAXLE FROM ENGINE

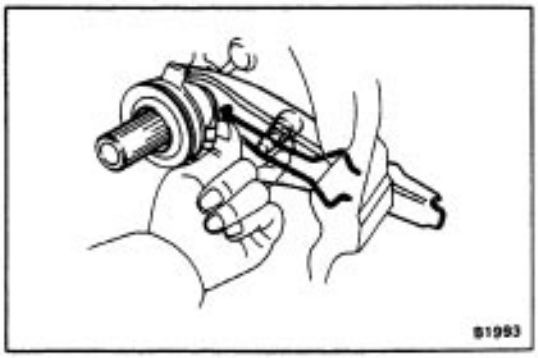
Transaxle	See page
S51 Transaxle (SV series/2WD)	MT–4
E52 Transaxle 1VZV series)	MT–45
E56F5 Transaxle (SV series/4WD)	MT–116



2. REMOVE CLUTCH COVER AND DISC

(a) Place rnatchmarks on the flywheel and clutch cover.
(b) Loosen each set bolt one turn at a time until spring tension is released. –
(c) Remove the set bolts, and pull off the clutch cover with the clutch disc.

NOTICE: Do not drop the clutch disc.

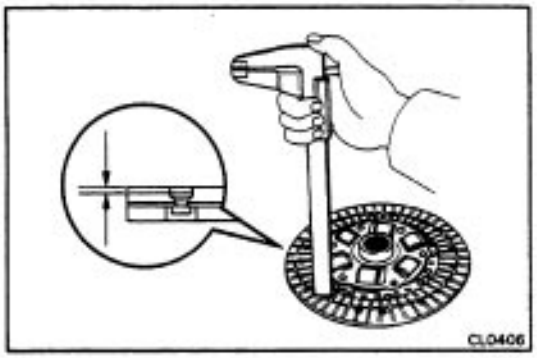


3. REMOVE RELEASE BEARING, FORK AND BOOT FROM TRANSAXLE

(a) Remove the bearing assembly together with the fork, and then separate them.

(b) Remove the boot.

INSPECTION AND REPAIR OF CLUTCH PARTS

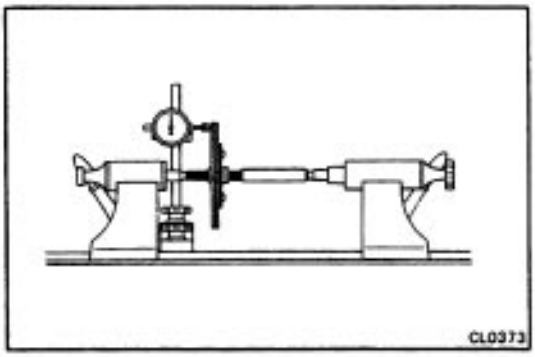


1. INSPECT CLUTCH DISC FOR WEAR OR DAMAGE

Using calipers, measure the rivet head depth.

Maximum rivet depth: 0.3 mm (0.012 in.)

If a problem is found, replace the clutch disc.

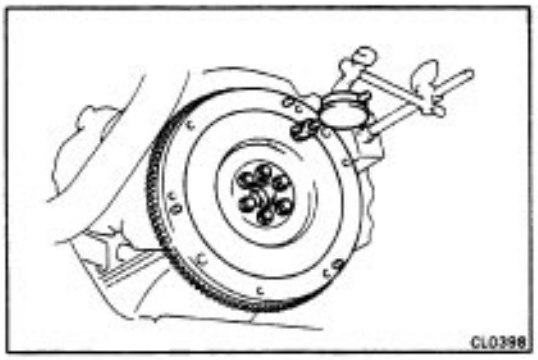


2. INSPECT CLUTCH DISC RUNOUT

Using a dial indicator, check the disc runout.

Maximum runout: 0.8 mm (0.031 in.)

If runout is excessive, replace the clutch disc.

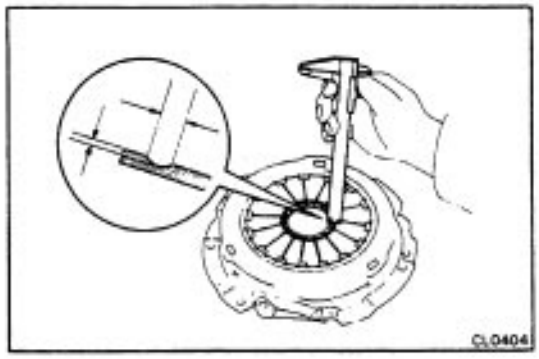


3. INSPECT FLYWHEEL RUNOUT

Using a dial indicator, check the flywheel runout.

Maximum runout: 0.1 mm (0.004 in.)

If runout is excessive, replace the flywheel.



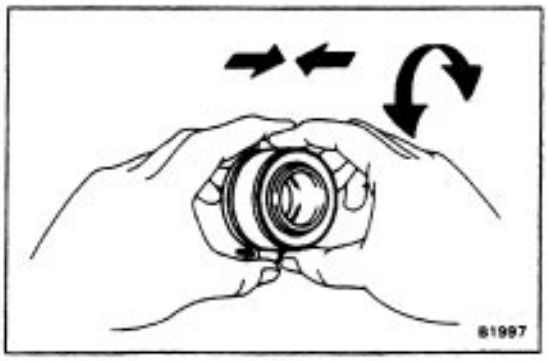
4. INSPECT DIAPHRAGM SPRING FOR WEAR

Using calipers, measure the diaphragm spring for depth and width of wear.

Maximum: Depth 0.6 mm (0.024 in.)

Width 5.0 mm (0.197 in.)

If necessary, replace the clutch cover.



5. INSPECT RELEASE BEARING

Turn the bearing by hand while applying force in the axial direction.

HINT: The bearing is permanently lubricated and requires no cleaning or lubrication.

If a problem is found, replace the bearing together with the hub.

INSTALLATION OF CLUTCH UNIT

(See page CL–8)

1. INSTALL CLUTCH DISC AND COVER ON FLYWHEEL

(a) Insert SST in the clutch disc, and then set them and the cover in position.

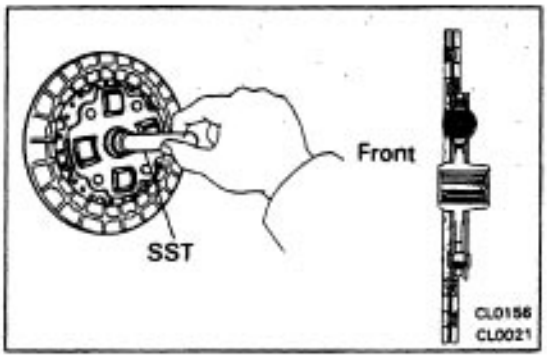
SST S51 Transaxle
09301–32010
E52, E56F5 Transaxle
09301–17010

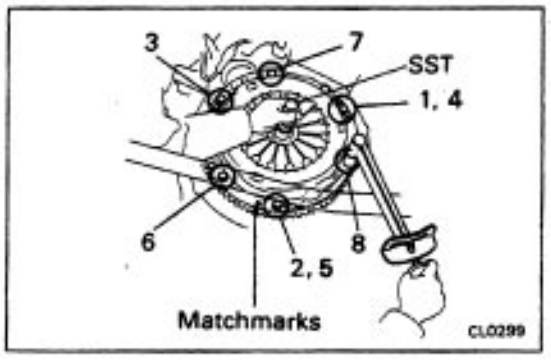
(b) Align the matchmarks on the clutch cover and flywheel.

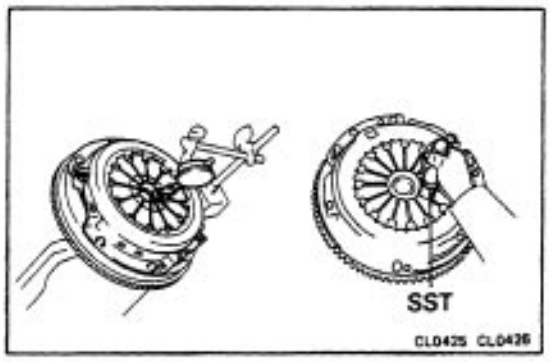
(e) Torque the bolts on the clutch cover in the order shown.

Torque: 195 kg–cm (14 ft–lb, 19 N–m)

HINT: Temporarily tighten the No.1 and No.2 bolts.







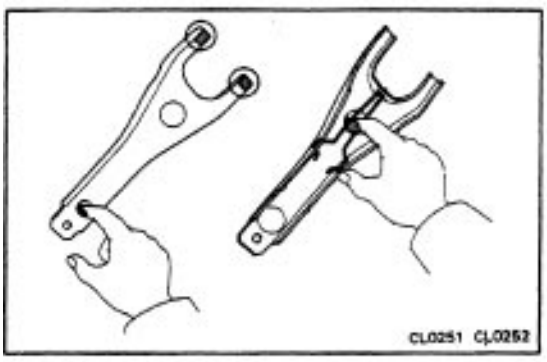
2. CHECK DIAPHRAGM SPRING TIP ALIGNMENT

Using a dial indicator with roller instrument, check the diaphragm spring tip alignment.

Maximum non–alignment: 0.5 mm (0.020 in.)

If alignment is not as specified, using SST, adjust the diaphragm spring tip alignment.

SST 09333–00013

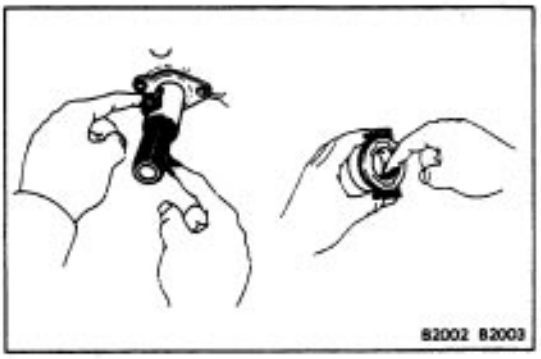


3. APPLY MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE(NLGI N0.2) TO FOLLOWING PARTS:

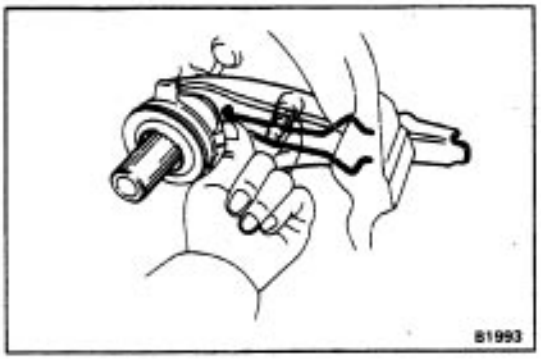
(a) Release fork and hub contact points.

(b) Release fork and push rod contact point.

(e) Release fork pivot point.

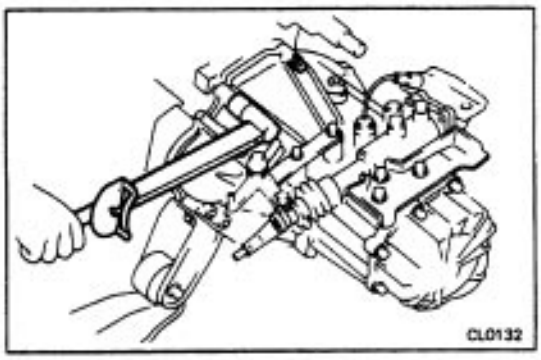


(d) Clutch disc spline.
(e) (S51 Transaxle)
Release bearing hub inside groove.



4. INSTALL RELEASE BEARING, FORK AND BOOT FROM TRANSAXLE

(a) Install the bearing assembly to the fork, and then install them to the transaxle.
(b) Install the boot.



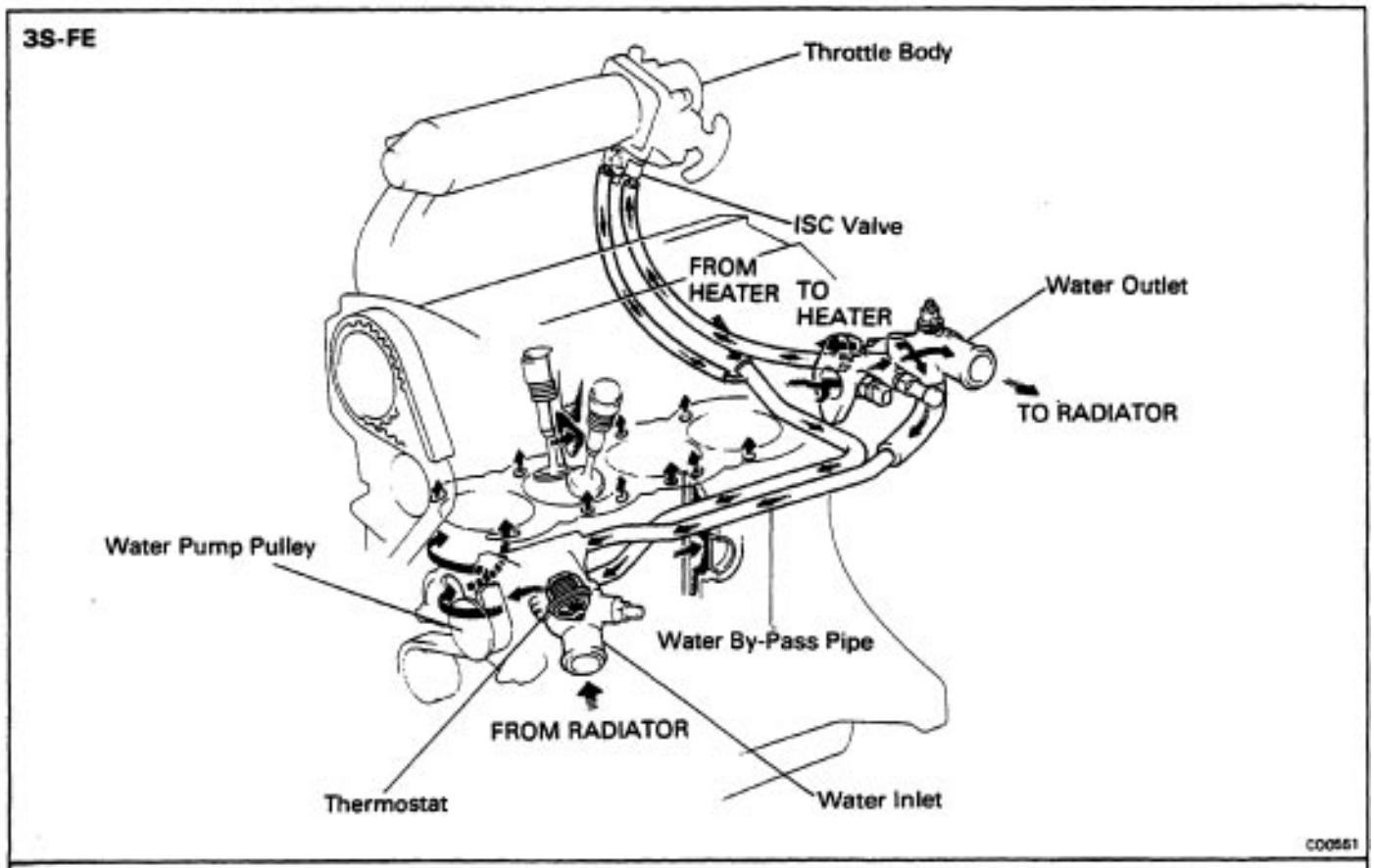
5. INSTALL TRANSAXLE TO ENGINE

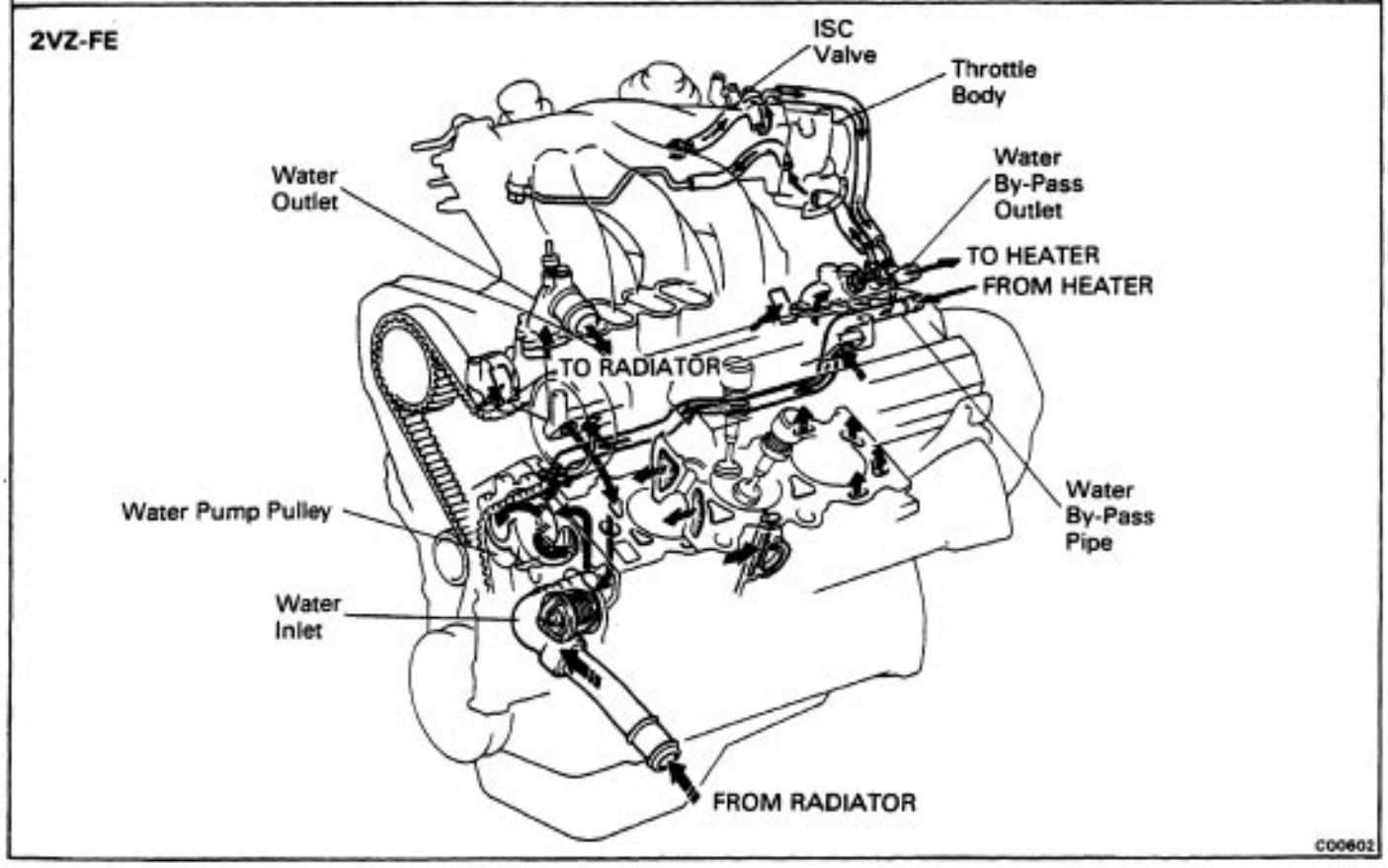
Transaxle	See page
S51 Transaxle (SV series/2WD)	MT–38
E52 Transaxle (M series)	MT–45
E56F5 Transaxle (SV series/4WD)	MT– 116

COOLING SYSTEM

DESCRIPTION

This engine utilizes a pressurized water forced circulation cooling system which includes a thermostat equipped with a by–pass valve mounted on the inlet side.





The cooling system is composed of the water jacket (inside the cylinder block and cylinder head), radiator, water pump, thermostat, electric fan, hoses and other components.
Coolant which is heated in the water jacket is pumped to the radiator, through which an electric fan blows air to cool the coolant as it passes through. Coolant which has been cooled is then sent back to the engine by the water pump, where it cools the engine.
The water jacket is a network of channels in the shell of the cylinder block and cylinder head through which coolant passes. It is designed to provide adequate cooling of the cylinders and combustion chambers which become heated during engine operation.

RADIATOR

The radiator performs the function of cooling the coolant which has passed through the water jacket and become hot, and it is mounted in the front of the vehicle. The radiator consists of an upper tank and lower tank, and a core which connects the two tanks. The upper tank contains the inlet for coolant from the water jacket and the filler inlet. It also has a hose attached through which excess coolant or steam can flow. The lower tank has an outlet and drain cock for the coolant. The core contains many tubes through which coolant flows from the upper tank to the lower tank as well as cooling fins which radiate heat away from the coolant in the tubes.
The air sucked through the radiator by the electric fan, as well as the wind generated by the vehicle's travel, passes through the radiator, cooling the coolant. Models with automatic transmission include an automatic transmission fluid cooler built into the lower tank of the radiator. A fan with an electric motor is mounted behind the radiator to assist the flow of air through the radiator. The fan operates when the coolant temperature becomes high in order to prevent it from becoming too high.

RADIATOR CAP

The radiator cap is a pressure type cap which seals the radiator, resulting in pressurization of the radiator as the coolant expands. The pressurization prevents the coolant from boiling even when the coolant temperature exceeds 100˚C (212˚F). A relief valve (pressurization valve) and a vacuum valve (negative pressure valve) are built into the radiator cap. The relief valve opens and lets steam escape through the overflow pipe when the pressure generated inside the cooling system exceeds the limit (coolant temperature: 110 – 120˚C, 230 – 248˚F, pressure; 0.3 –1.0 kg/cm^2, 4.3 –14.2 psi, 29.4 – 98.1 kPa). The vacuum valve opens to alleviate the vacuum which develops in the coolant system after the engine is stopped and the coolant temperature drops.
The valves's opening allows the coolant in the reservoir tank to return to the cooling system.

RESERVOIR TANK

The reservoir tank is used to catch coolant which overflows the cooling system as a result of volumetric expansion when the coolant is heated. The coolant in the reservoir rank returns to the radiator when the coolant temperature drops, thus keeping the radiator full at all times and avoiding needless coolant loss. Check the reservoir tank level to find out if the coolant needs to be replenished.

WATER PUMP

The water pump is used for forced circulation of coolant through the cooling system. It is mounted on the front of the cylinder block and driven by a timing belt.

THERMOSTAT

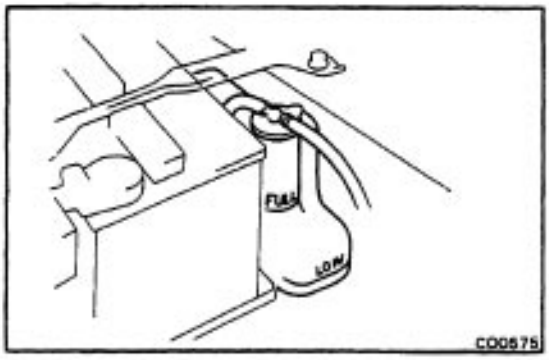
The thermostat has a wax type by–pass valve and is mounted in the water inlet housing. The thermostat includes a type of automatic valve operated by fluctuations in the coolant temperature. This valve closes when the coolant temperature drops, preventing the circulation of coolant through the engine and thus permitting the engine to warm up rapidly. The valve opens when the coolant temperature has risen, allowing the circulation of coolant. Wax inside the thermostat expands when heated and contracts when cooled. Heating the wax thus generates pressure which overpowers the force of the spring which keeps–the valve closed, thus opening the valve. When the wax cools, its contraction causes the force of the spring to take effect once more, closing the valve. The thermostat in this engine operates at a temperature of 82˚C (180˚F).

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine overheats	Dirt, leaves or insects on radiator or condenser	Clean radiator or condenser	
	Hoses, Water pump, thermostat housing, radiator, heater, core, plugs or head gasket leakage	Repair as necessary	
	Thermostat faulty	Check thermostat	CO–12, 13
	Incorrect ignition timing	Reset tinning	IG–17, 20
	Electric cooling system faulty	Inspect electric cooling system	CO–20, 22
	Radiator hose plugged or rotted	Replace hose	
	Water pump faulty	Replace water pump	CO–6, 9
	Radiator plugged or cap faulty	Check radiator and cap	
	Cylinder head or block cracked or water passage clogged	Repair as necessary	

HINT: If the engine tends to overheat, removal of the thermostat will adversely effect cooling efficiency.

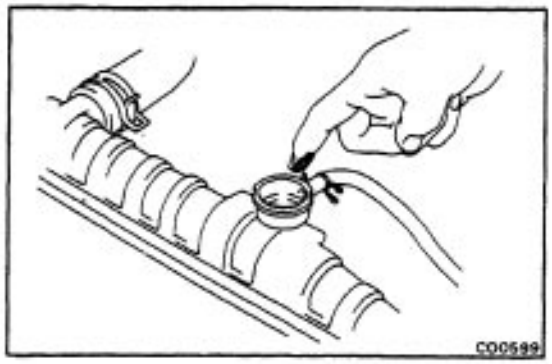
CHECK AND REPLACEMENT OF ENGINE COOLANT



1. CHECK ENGINE COOLANT LEVEL AT RESERVE TANK

The coolant level should be between the ”LOW” and ”FULL” lines.

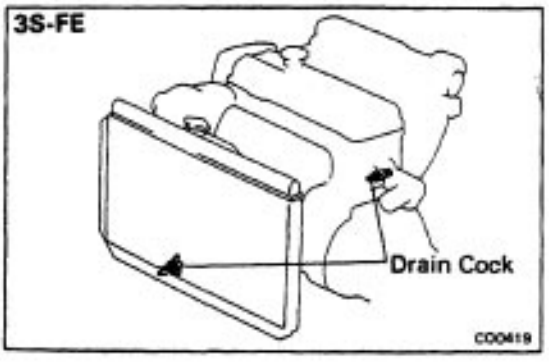
If low, check for leaks and add coolant up to the ”FULL” line.



2. CHECK ENGINE COOLANT QUALITY

There should not be any excessive deposits of rust or scales around the radiator cap or radiator filler hole, and the coolant should be free from oil.

If excessively dirty, replace the coolant.



3. (3S–FE)

REPLACE ENGINE COOLANT

(a) Remove the radiator cap.

CAUTION: To avoid the danger of being burned, do not remove it while the engine and radiator are still hot as fluid and steam can be blown out under pressure.

(b) Drain the coolant from the .radiator and engine drain cocks.
(Engine drain cock at the right rear of engine block.)

(c) Close the drain cocks.

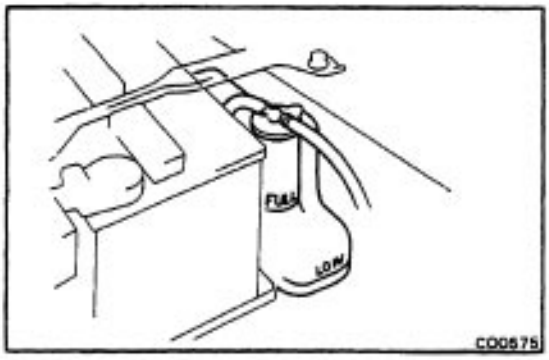
Torque (Engine drain cock):
130 kg–cm (9 ft–lb, 13 N–m)

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine overheats	Dirt, leaves or insects on radiator or condenser	Clean radiator or condenser	
	Hoses, Water pump, thermostat housing, radiator, heater, core, plugs or head gasket leakage	Repair as necessary	
	Thermostat faulty	Check thermostat	CO–12, 13
	Incorrect ignition timing	Reset tinning	IG–17, 20
	Electric cooling system faulty	Inspect electric cooling system	CO–20, 22
	Radiator hose plugged or rotted	Replace hose	
	Water pump faulty	Replace water pump	CO–6, 9
	Radiator plugged or cap faulty	Check radiator and cap	
	Cylinder head or block cracked or water passage clogged	Repair as necessary	

HINT: If the engine tends to overheat, removal of the thermostat will adversely effect cooling efficiency.

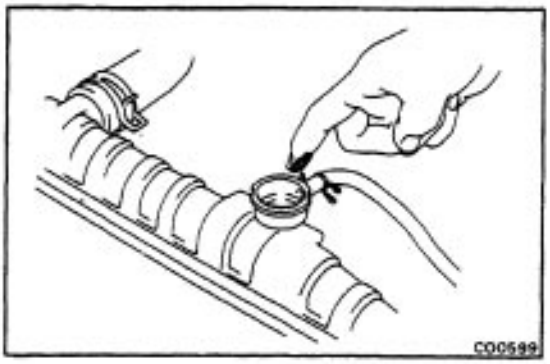
CHECK AND REPLACEMENT OF ENGINE COOLANT



1. CHECK ENGINE COOLANT LEVEL AT RESERVE TANK

The coolant level should be between the ”LOW” and ”FULL” lines.

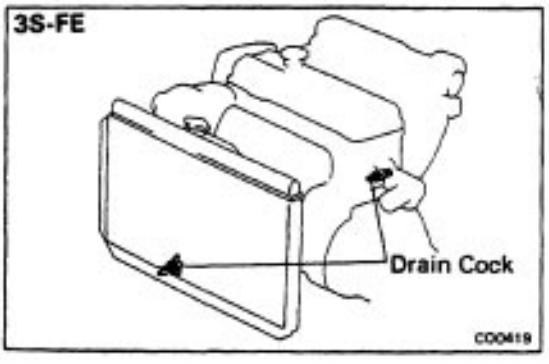
If low, check for leaks and add coolant up to the ”FULL” line.



2. CHECK ENGINE COOLANT QUALITY

There should not be any excessive deposits of rust or scales around the radiator cap or radiator filler hole, and the coolant should be free from oil.

If excessively dirty, replace the coolant.



3. (3S–FE)

REPLACE ENGINE COOLANT

(a) Remove the radiator cap.

CAUTION: To avoid the danger of being burned, do not remove it while the engine and radiator are still hot as fluid and steam can be blown out under pressure.

(b) Drain the coolant from the .radiator and engine drain cocks.

(Engine drain cock at the right rear of engine block.)

(c) Close the drain cocks.

Torque (Engine drain cock):
130 kg–cm (9 ft–lb, 13 N–m)

(d) Fill the system with coolant.
Use a good brand of ethylene–glycol base coolant, mixed according to the manufacturer's directions.
Using coolant which includes more than 5O% ethylene–glycol (but less than 70%) is recommended.

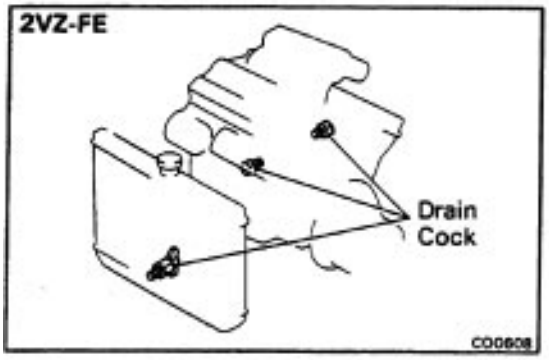
NOTICE:

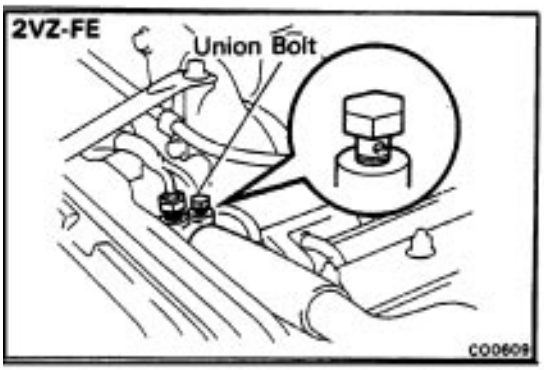
- **Do not use alcohol type coolant.**
- **The coolant should be mixed with demineralized water or distilled water.**

Capacity (w/ Heater).

M/T 6.4 liters (6.8 US qts, 5.6 Imp. qts)
A/T (2WD) 6.3 liters (6.7 US qts, 5.5 Imp. qts)
A/T (4WD) 6.8 liters (7.2 US qts, 6.0 Imp. qts)

(e) Install the radiator cap.
(f) Start the engine and check for leaks.
(g) Recheck the coolant level and refill as necessary.





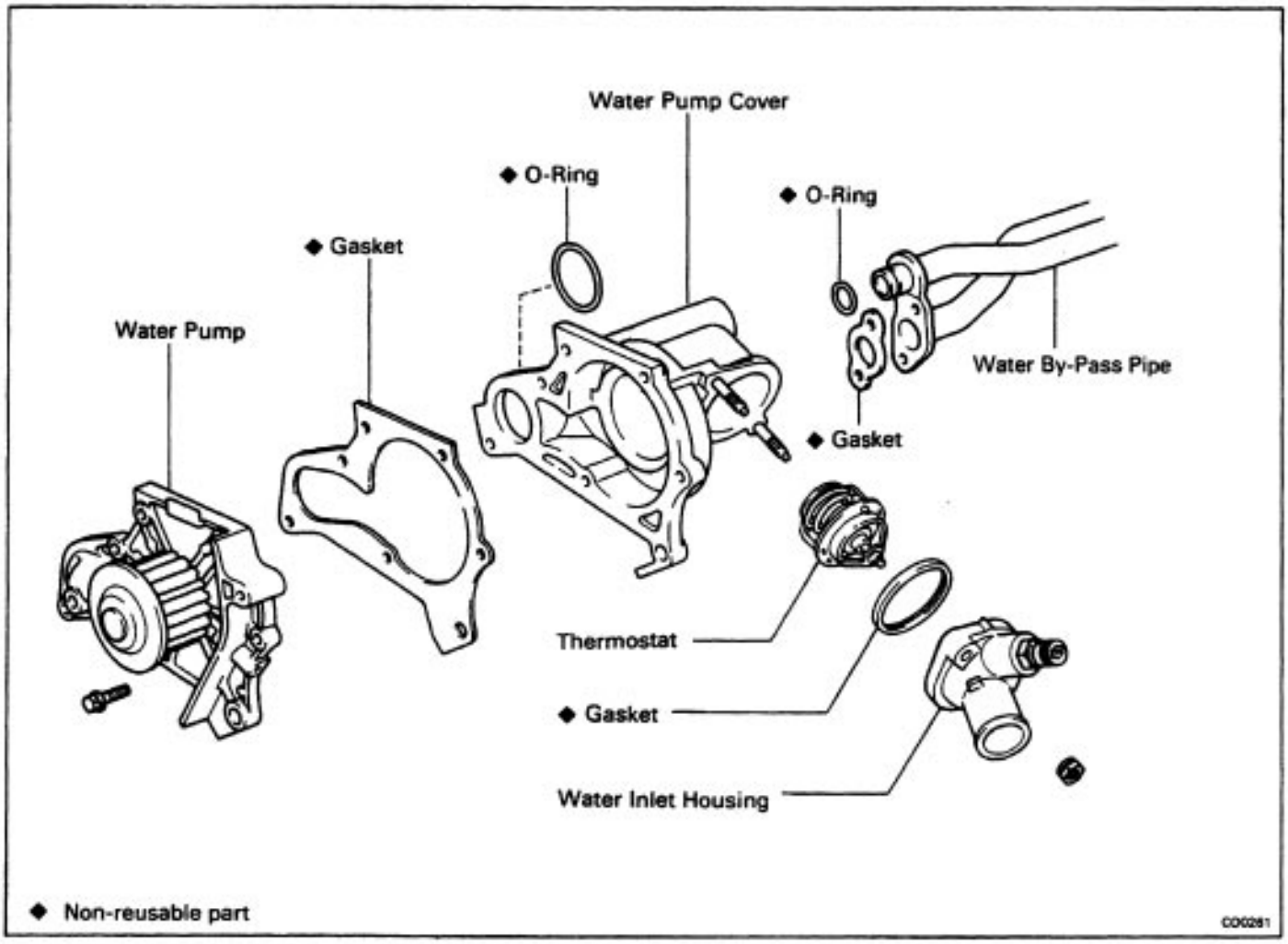
4. (2VZ–FE)
REPLACE ENGINE COOLANT

(a) Remove the radiator cap.
CAUTION: To avoid the danger of being burned, do not remove it while the engine and radiator are still hot as fluid and steam can be blown out under pressure.
(b) Drain the coolant from the radiator and engine drain cocks.
(Engine drain cocks are at the front center and rear right of the cylinder block.)
(c) Close the drain cocks.
Torque (Engine drain cock):
300 kg–cm (22 ft–lb, 29 N–m)

(d) To release the air, loosen the union bolt of the water outlet five revolutions.
(e) Slowly fill the system with coolant.
Use a good brand of ethylene–glycol base coolant, mixed according to the manufacturer's directions.
Capacity (w/ Heater):
M/T 9.5 liters (10.0 US qts, 8.4 Imp. qts)
A/T 9.4 liters (9.9 US qts, 8.3 Imp. qts)
(f) Tighten the union bolt of the water outlet.
Torque: 180 kg–cm (13 ft–lb, 18 N–m)
(g) Install the radiator cap.
(h) Start the engine and check for leaks.
(i) Recheck the coolant level and refill as necessary.
HINT: When the coolant has been depleted, refill with coolant and repeat steps (d) to (i).

WATER PUMP (3S–FE)

COMPONENTS



REMOVAL OF WATER PUMP

1. DRAIN ENGINE COOLANT (See page CO–4)

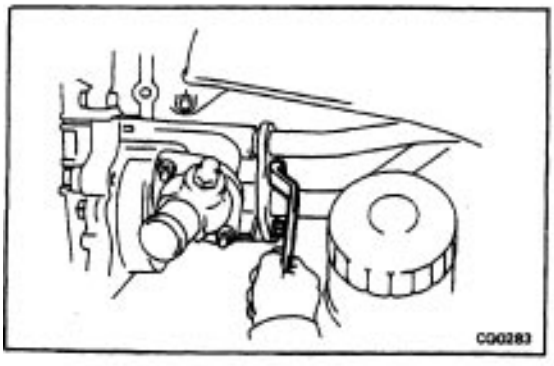
2. DISCONNECT WATER TEMPERATURE SWITCH CONNECTOR

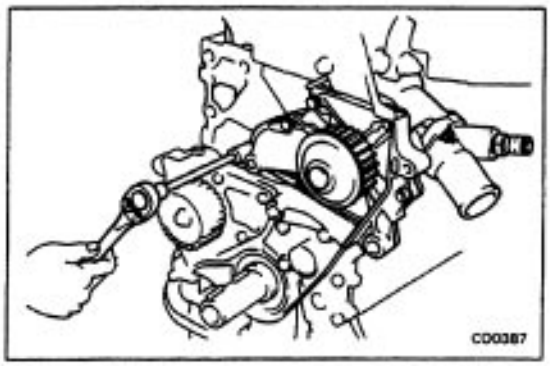
3. DISCONNECT RADIATOR LOWER HOSE FROM WATER INLET HOUSING

4. REMOVE TIMING BELT, PULLEYS (See pages EM–23 to 26)

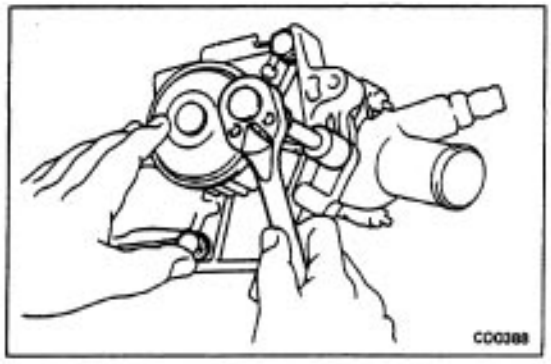
5. REMOVE WATER PUMP AND WATER PUMP COVER ASSEMBLY .

(a) Remove the two nuts holding the pump to the water by–pass pipe.



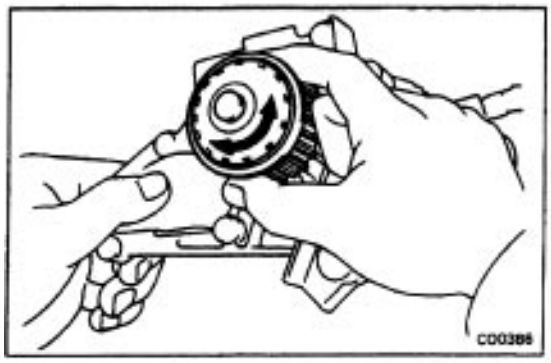


(b) Remove the three bolts in the sequence shown.
(c) Pull out the water pump together with pump cover.
(d) Remove the two Q–rings and gasket.



6. DISASSEMBLE WATER PUMP AND WATER PUMP COVER

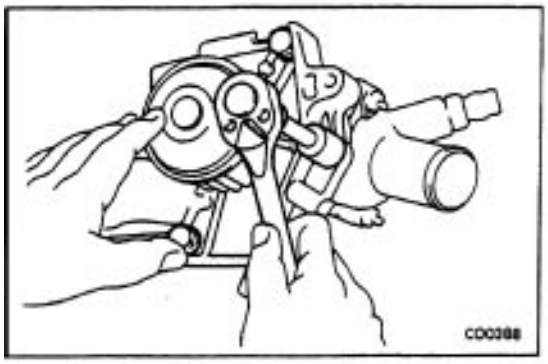
Remove the three bolts, water pump and gasket from the pump cover.



INSPECTION OF WATER PUMP

INSPECT WATER PUMP

Turn the pulley and check that the water pump bearing moves smoothly and quietly.



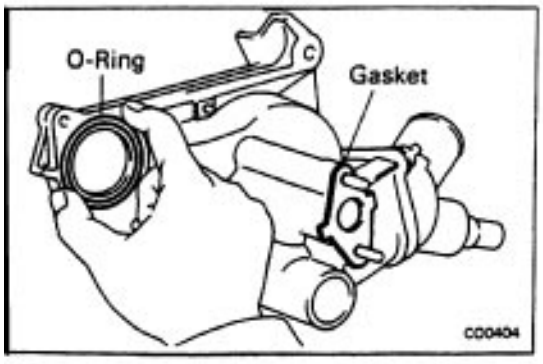
INSTALLATION OF WATER PUMP

(See page CO–6)

1. ASSEMBLE WATER PUMP AND WATER PUMP COVER

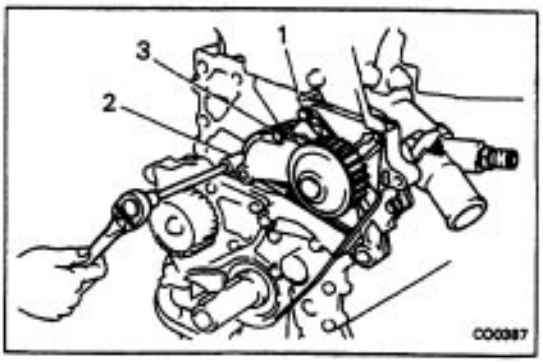
Install anew gasket and the pump to the pump cover with the three bolts.

Torque: 90 kg–cm (78 in.–lb, 8.8 N–m)

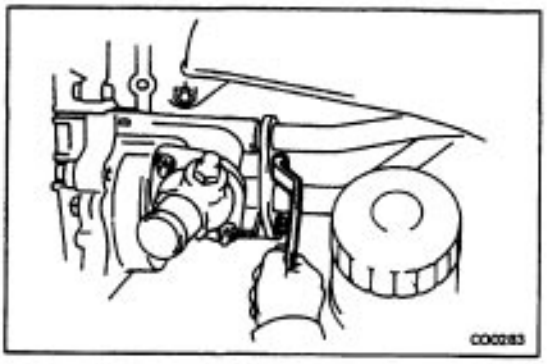


2. INSTALL WATER PUMP AND WATER PUMP COVER ASSEMBLY

(a) Install two new 0–rings and gasket to the pump cover and water by–pass pipe.



(b) Apply a fight coat of engine oil on the 4–ring of the water by–pass pipe.
(c) Connect the pump cover to the water by–pass pipe. Do not install the nuts yet.
(d) Install the water pump with the three bolts. Torque the bolts in the sequence shown.
Torque: 95 kg–cm (82 in.–lb, 9.3 N–m)

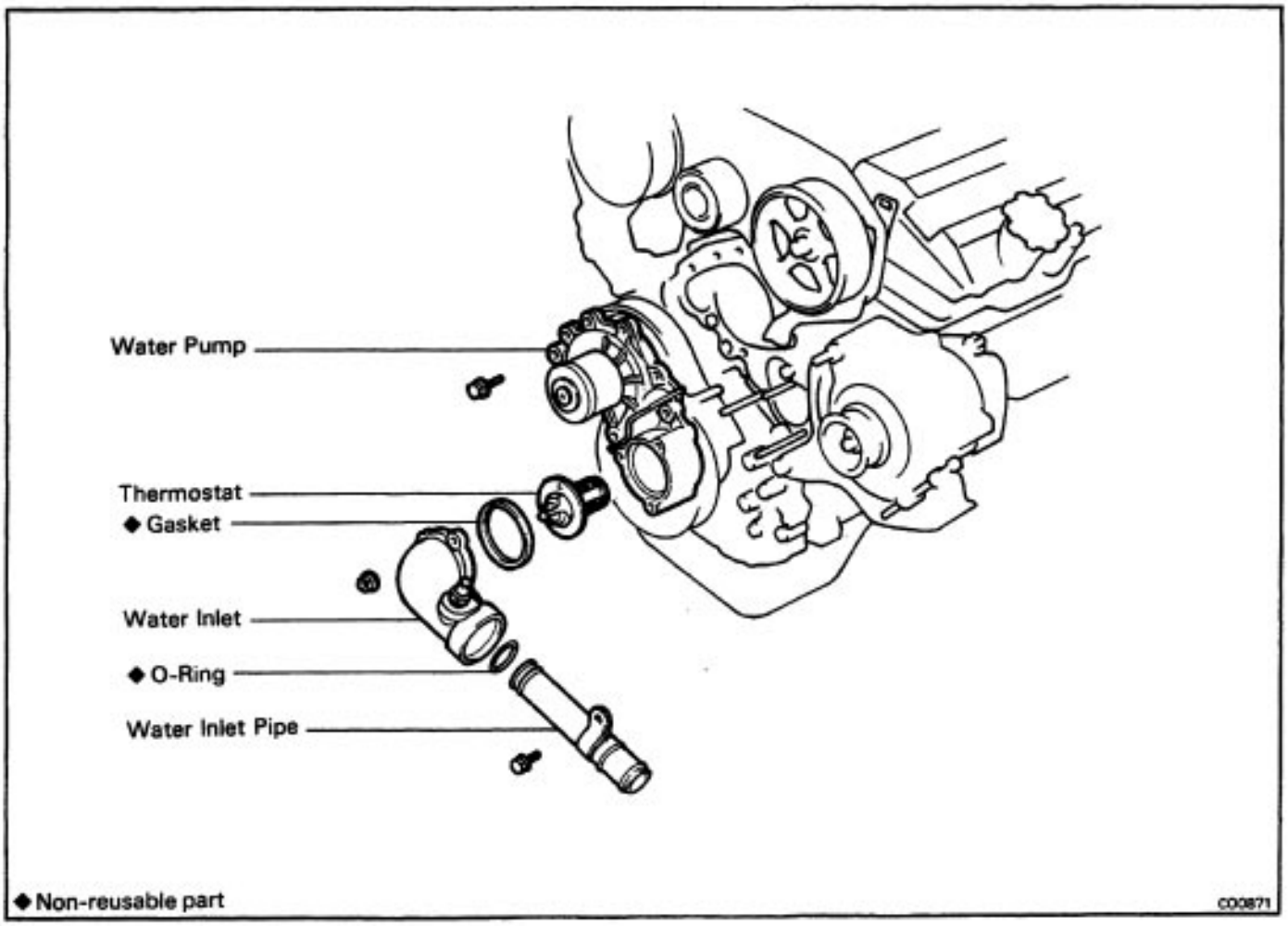


(e) Install the two nuts holding the pump cover to the water by–pass pipe.
Torque: 95 kg–cm (82 in.–lb, 9.3 N–m)

3. INSTALL PULLEYS AND TIMING BELT (See pages EM–29 to 33)
4. CONNECT RADIATOR LOWER HOSE
5. CONNECT WATER TEMPERATURE SWITCH CONNECTOR
6. FILL WITH ENGINE COOLANT (See page CO–5)

WATER PUMP(2VZ–FE)

COMPONENTS

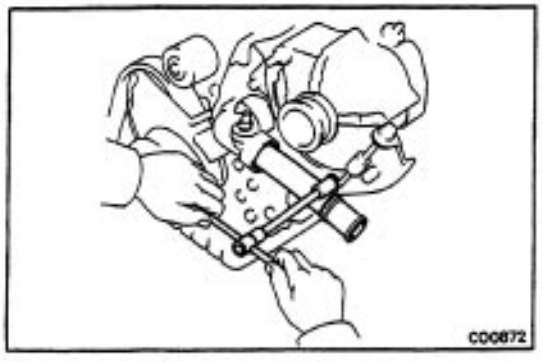


REMOVAL OF WATER PUMP

1. DRAIN ENGINE COOLANT (See page CO–5)

2. DISCONNECT RADIATOR LOWER NOSE FROM WATER INLET PIPE

3. DISCONNECT TIMING BELT FROM WATER PUMP PULLEY (See pages EM–34 to 39)

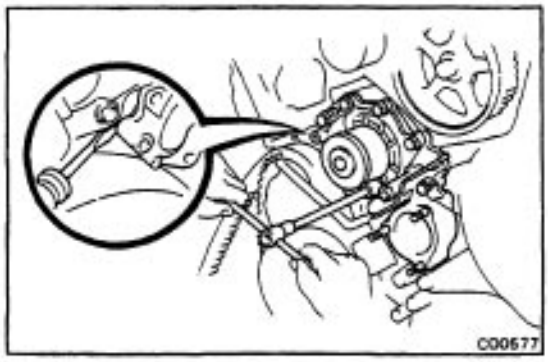


4. REMOVE WATER INLET PIPE

(a) Remove the bolt holding the water inlet pipe to the alternator belt adjusting bar.

(b) Remove the water inlet pipe and 0–ring.

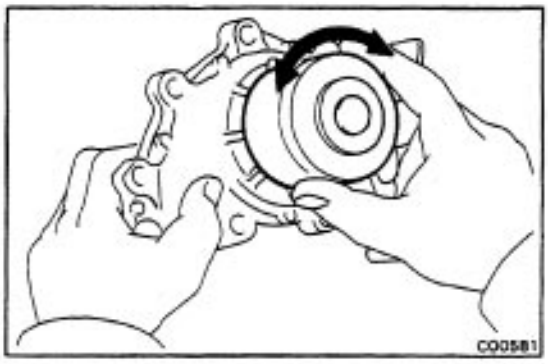
5. REMOVE WATER INLET AND THERMOSTAT (See steps 4 and 5 on page CO–13)



6. REMOVE WATER PUMP

(a) Remove the seven bolts.

(b) Remove the water pump by prying a screwdriver between the water pump and cylinder block.



INSPECTION OF WATER PUMP

INSPECT WATER PUMP

Turn the pulley and check that the water pump bearing moves smoothly and quietly.

INSTALLATION OF WATER PUMP

(See page CO–9)

1. INSTALL WATER PUMP

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the water pump and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the water pump groove.

Seal packing: Part No.08826–00100 or equivalent

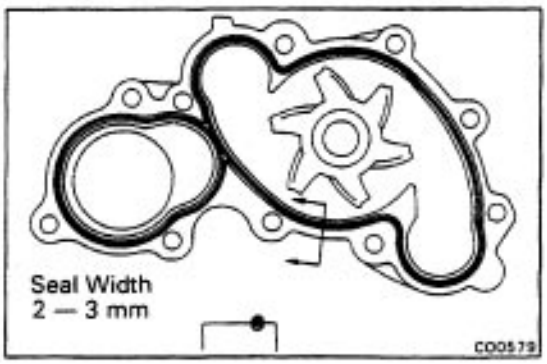
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

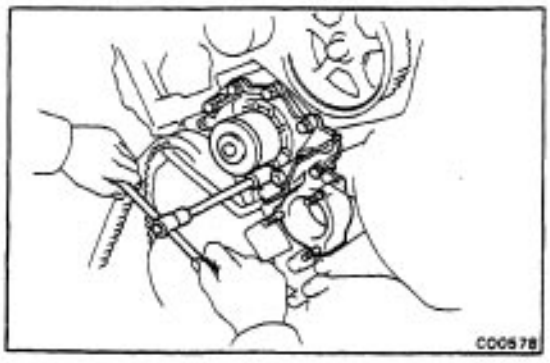
HINT: Avoid applying an excessive amount to the surface.

- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the water pump with the seven bolts.

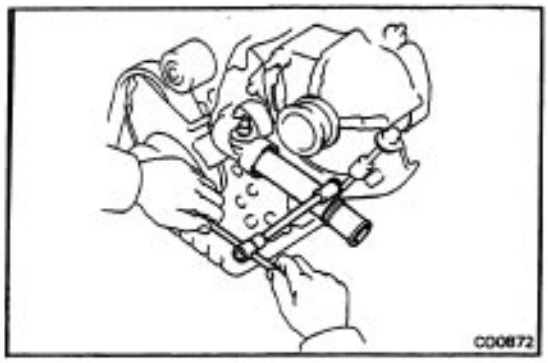
Torque: 200 kg–cm (14 ft–lb, 20 N–m)





2. INSTALL WATER INLET AND THERMOSTAT

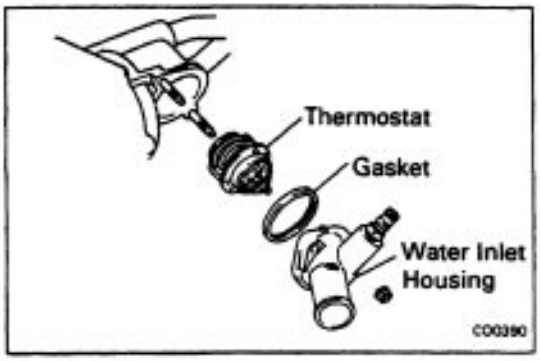
(See steps 1 and 2 on page CO–13)

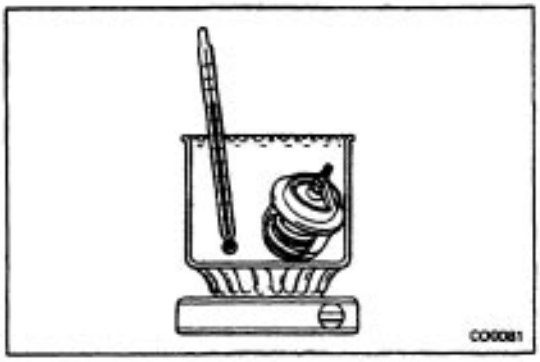


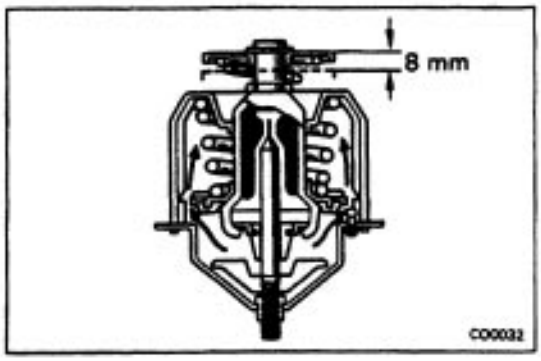
3. INSTALL WATER INLET PIPE

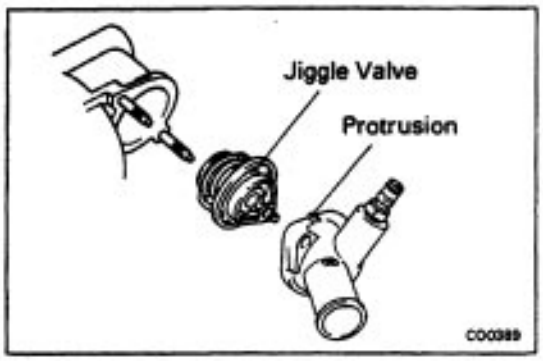
(a) Install a new 0–ring to the water inlet pipe.
(b) Apply soapy water to the O–ring.
(c) Connect the water inlet pipe to the water inlet.
(d) Install the bolt holding the water inlet pipe to the alternator belt adjusting bar.
Torque: 200 kg–cm (14 ft–lb, 20 N–m)

4. INSTALL TIMING BELT (See pages EM–42 to 46)
5. CONNECT RADIATOR LOWER HOSE
6. FILL WITH ENGINE COOLANT (See page CO–5)









THERMOSTAT (3S–FE)

REMOVAL OF THERMOSTAT

1. DRAIN ENGINE COOLANT (See page CO–4)

2. DISCONNECT WATER TEMPERATURE SWITCH CONNECTOR

3. DISCONNECT RADIATOR FROM WATER INLET HOUSING

4. REMOVE WATER INLET HOUSING

Remove the two nuts and water inlet housing from the waterpump.

5. REMOVE THERMOSTAT AND GASKET

INSPECTION OF THERMOSTAT

INSPECT THERMOSTAT

HINT: The thermostat is numbered with the valve opening temperature.

(a) Immerse the thermostat in water and gradually heat the water.

(b) Check the valve opening temperature.

Valve opening temperature:
80 – 84°C (176 – 183°F)

If the valve opening temperature is not as specified, replace the thermostat.

(e) Check the valve lift.

Valve lift:
8 mm (0.31 in.) or more at 95˚C (203˚F)

If the valve lift is less than specification, replace the thermostat.

INSTALLATION OF THERMOSTAT

1. PLACE THERMOSTAT IN WATER INLET HOUSING

(a) Install a new gasket to the thermostat.

(b) Align the jiggle valve of the thermostat with protrusion of the water inlet housing and, insert the thermostat in the water inlet housing.

2. INSTALL WATER INLET HOUSING AND THERMOSTAT ASSEMBLY

Install the water inlet housing and thermostat assembly with the two nuts.

Torque: 90 kg–cm (78 in.–lb, 8.8 N–m)

3. CONNECT RADIATOR LOWER HOSE

4. CONNECT WATER TEMPERATURE SWITCH CONNECTOR

5. FILL WITH ENGINE COOLANT (See page CO–5)

6. START ENGINE AND CHECK FOR LEAKS

THERMOSTAT (2VZ–FE)

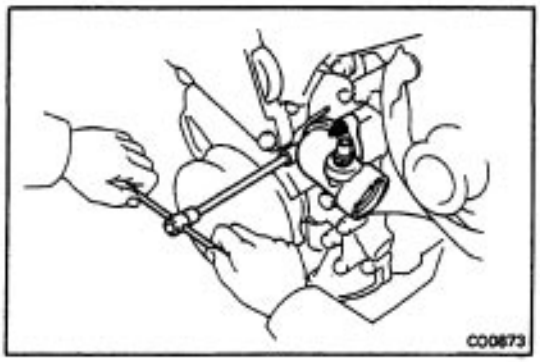
REMOVAL OF THERMOSTAT

1. DRAIN ENGINE COOLANT (See page CO–5)

2. REMOVE WATER INLET PIPE

(See steps 2 and 4 on page CO–9)

3. DISCONNECT WATER TEMPERATURE SENSOR CONNECTOR



4. REMOVE WATER INLET

Remove the three nuts and water inlet from the water pump.

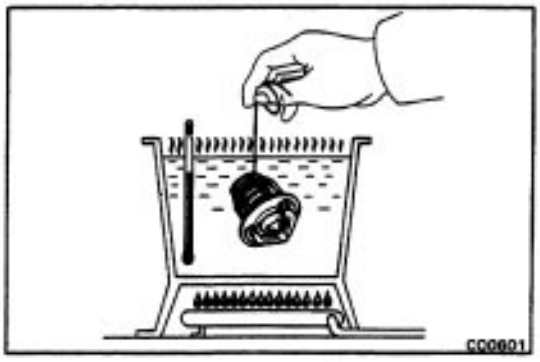
5. REMOVE THERMOSTAT AND GASKET

INSPECTION OF THERMOSTAT

INSPECT THERMOSTAT

HINT: The thermostat is numbered with the valve opening temperature.

(a) Immerse the thermostat in water and gradually heat the water.



(b) Check the valve opening temperature

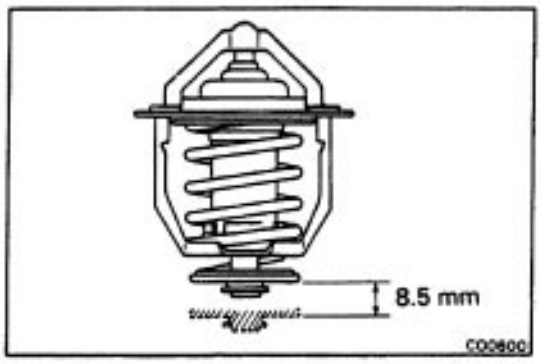
Valve opening temperature:
80 – 84°C (176 – 183°F)

If the valve opening temperature is not as specified, replace the thermostat.

(c) Check the valve lift.

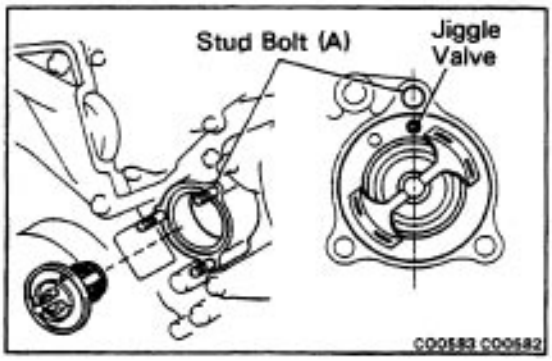
Valve lift:

8.5 mm (0.335 in.) or more at 95°C (203°F)



If the valve lift is less than specification, replace the thermostat.

(d) Check that the valve spring is tight when the thermostat is fully closed.

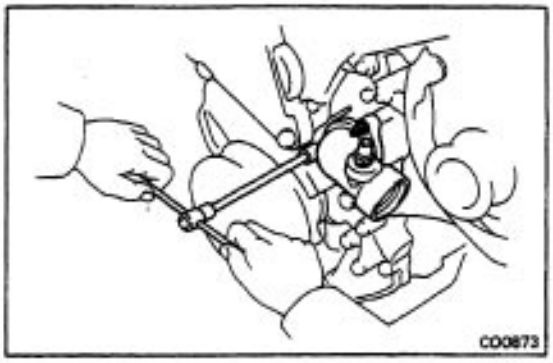


INSTALLATION OF THERMOSTAT

1. PLACE THERMOSTAT IN WATER PUMP

(a) install a new gasket to the thermostat.

(b) Align the jiggle valve of the thermostat with stud bolt (A), and insert the thermostat in the water pump.



2. INSTALL WATER INLET

Install the water inlet with the three nuts.

Torque: 200 kg–cm (14 ft–lb, 20 N–m)

3. CONNECT WATER TEMPERATURE SENSOR CONNECTOR

4. INSTALL WATER INLET PIPE

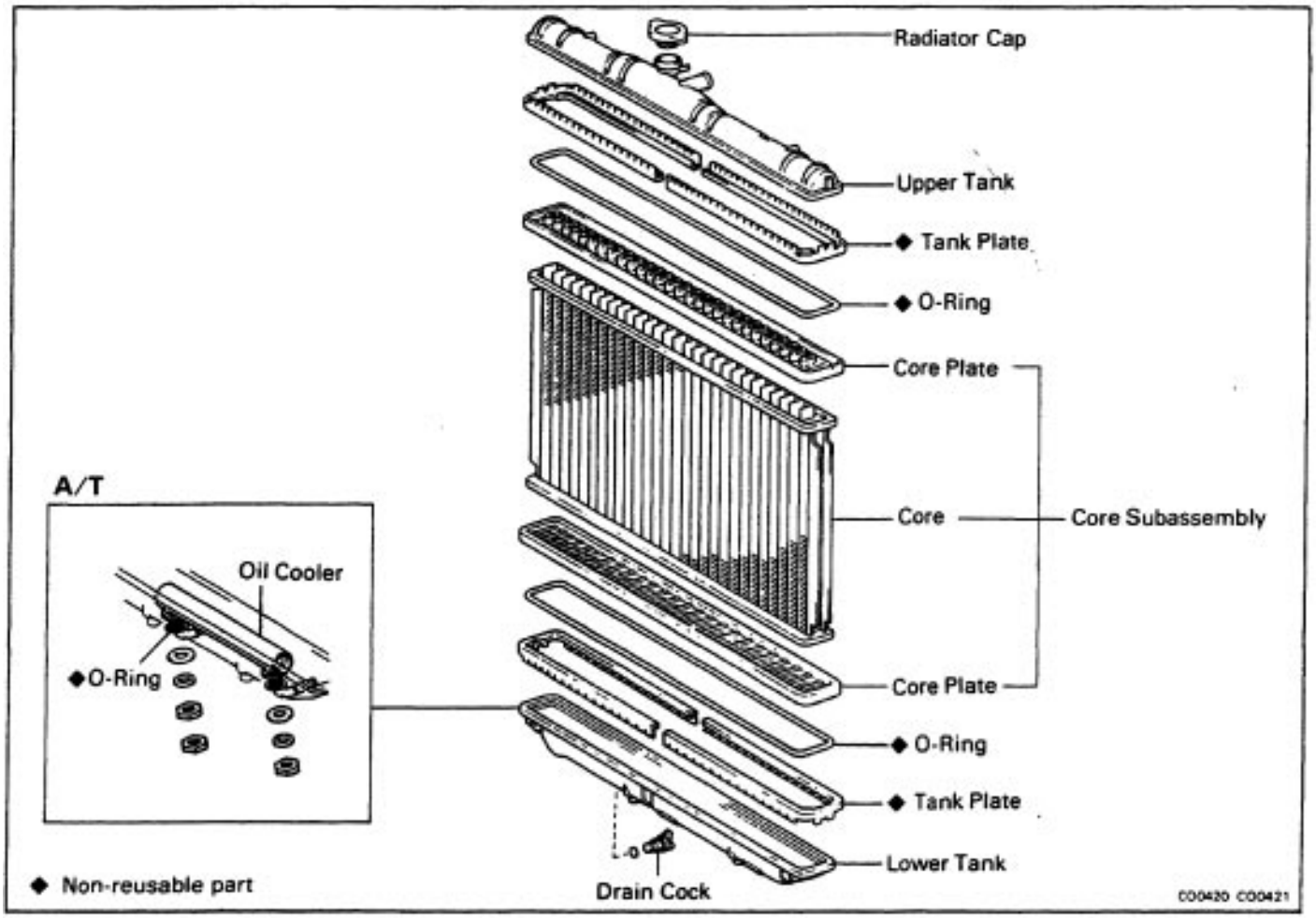
(See steps 3 and 5 on page CO–11)

5. FILL WITH ENGINE COOLANT (See page CO–5)

6. START ENGINE AND CHECK FOR LEAKS

RADIATOR

COMPONENTS

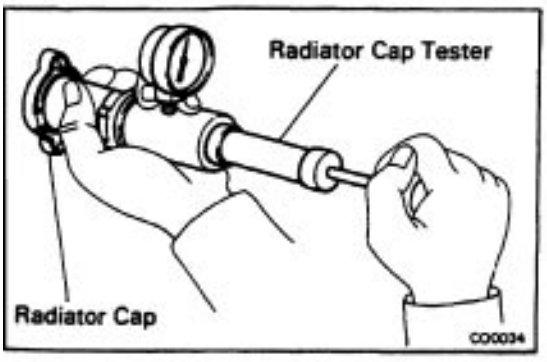


CLEANING OF RADIATOR

Using water or a steam cleaner, remove any mud and dirt from the radiator core.

NOTICE: If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. If the cleaner nozzle pressure is 30 – 35 kg/cm^2 (427 – 498 psi, 2,942 – 3,432), keep a distance at least 40 – 50 cm (15.75 – 19.69 in.) between the radiator core and cleaner nozzle.

INSPECTION OF RADIATOR

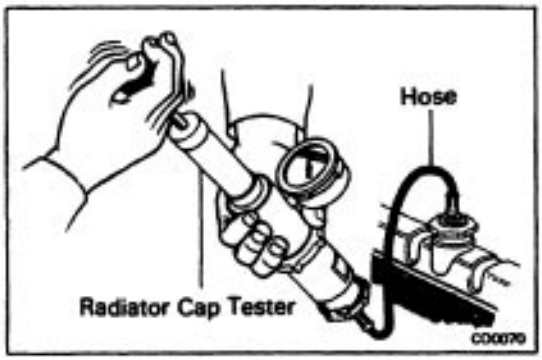


1. INSPECT RADIATOR CAP

Using a radiator cap tester, pump the tester and measure the relief valve opening pressure.

Standard opening pressure:
0.75 – 1.05 kg/cm^2
(10.7 – 14.9 psi, 74 – 103 kPa)
Minimum opening pressure:
0.6 kg/cm^2 (8.5 psi, 59 kPa)

If the opening pressure is less than minimum, replace the radiator cap.



2. INSPECT COOLING SYSTEM FOR LEAKS

(a) Fill the radiator with coolant and attach a radiator cap tester.

(b) Warm up the engine.

(c) Pump it to 1.2 kg/cm^2 (17.1 psi, 118 kPa), check that pressure does not drop.

If the pressure drops, check for leaks as the hoses, radiator or water pump. If no external leaks are found, check the heater core, cylinder block and head.

REMOVAL OF RADIATO

1. DRAIN ENGINE COOLANT (See page CO–4 or 5)

2. REMOVE BATTERY

3. REMOVE IGNITION COIL (2VZ–FE), IGNITER AND BRACKET ASSEMBLY

4. DISCONNECT COOLANT RESERVOIR HOSE

5. DISCONNECT RADIATOR NOSE

6. DISCONNECT COOLING FAN MOTOR CONNECTOR(S)

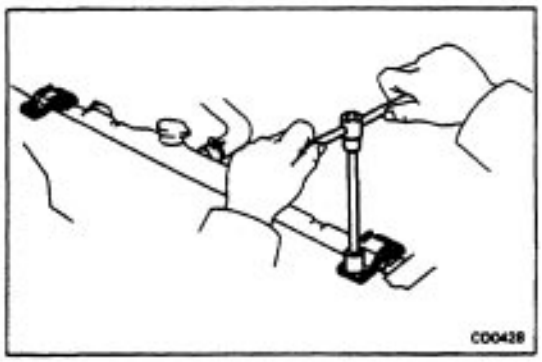
7. (A/T)

DISCONNECT OIL COOLER HOSES

8. REMOVE RADIATOR AND ELECTRIC COOLING FAN(S)

Remove the two bolts, supports and radiator.

9. REMOVE ELECTRIC COOLING FANS FROM RADIATOR



DISASSEMBLY OF RADIATOR

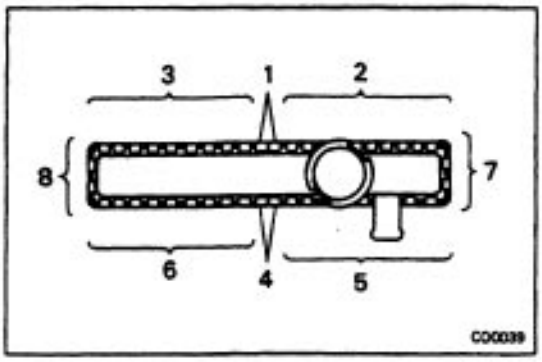
(See page CO–15)

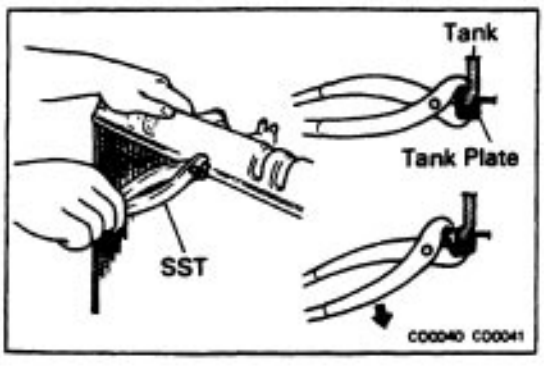
1. REMOVE TANK PLATE

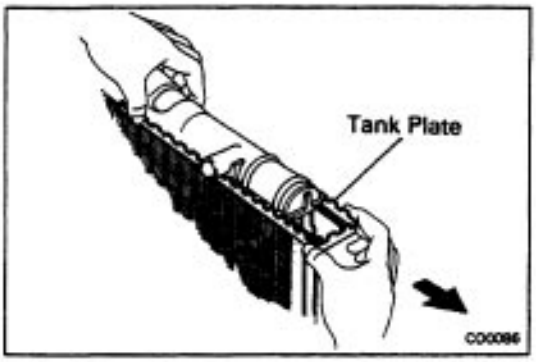
(a) Raise the claws of the tank plates with SST in the numerical order shown in the figure.

SST 09230–00010

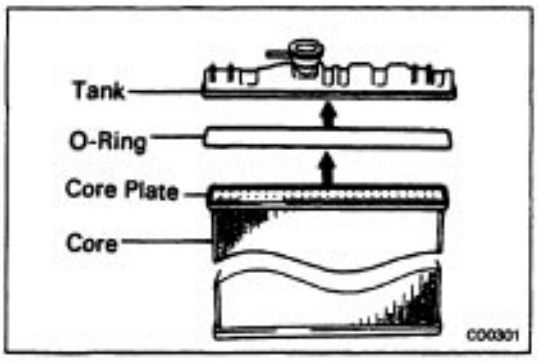
NOTICE: Be careful not to damage the core plate.







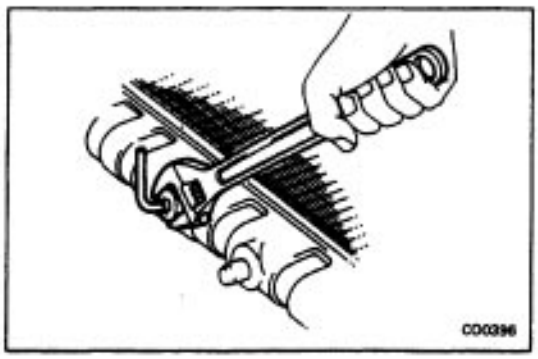
(b) Pull the tank plates outward.



2. REMOVE TANK

(a) Pull the tank upward.

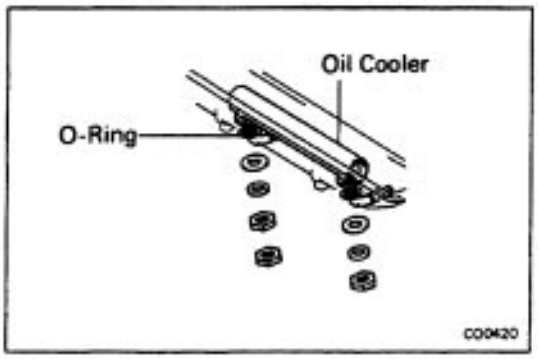
(b) Remove the 0–ring.



3. (A/T)

REMOVE OIL COOLER FROM LOWER TANK

Remove the two nuts, spring washers, plate washers, oil cooler and two 0–rings.



ASSEMBLY OF RADIATOR

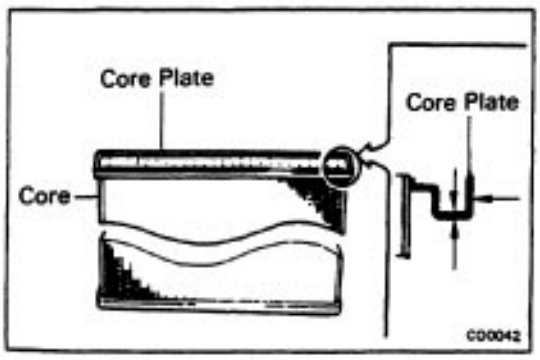
(See page CO–15)

1. (A/T)

INSTALL OIL COOLER TO LOWER TANK

(a) Install new two 0–rings to the oil cooler.

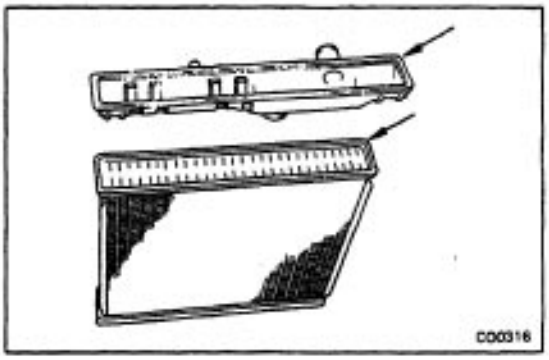
(b) Install the oil cooler with the two plate washers, spring washers and nuts.



2. CHECK CORE PLATE FOR DAMAGE

HINT:

- If the sides of the core plate groove are deformed, reassembly of the tank will be impossible. Therefore, first correct any deformation with pliers.
- Water leakage will result if the bottom of the core plate groove is damaged or dented. Therefore, repair or replace if necessary.

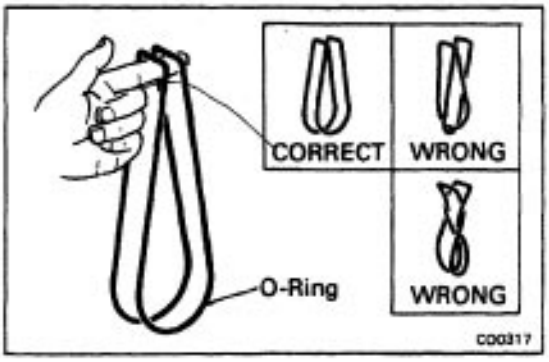


3. INSTALL TANK

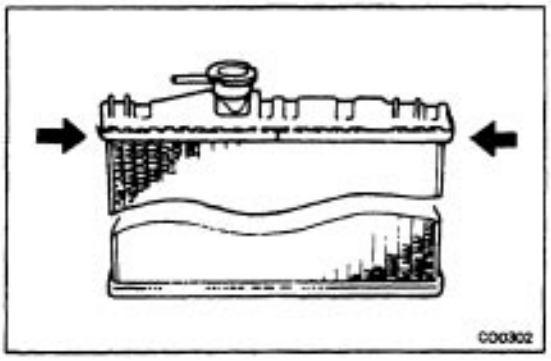
Install a new O–ring and the tank.

HINT:

- Clean the tank and core plate.

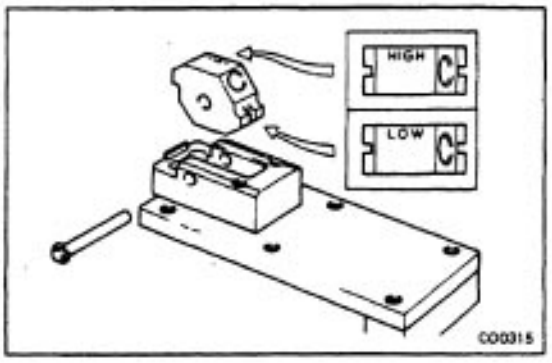


- Take out any twists.



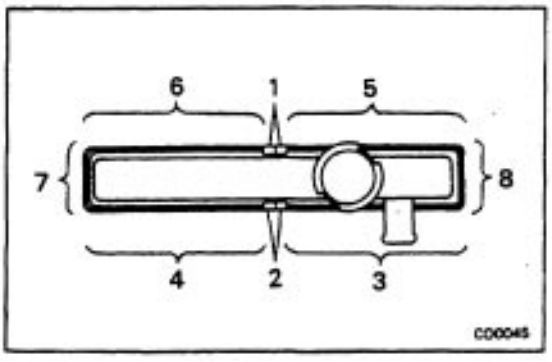
4. INSTALL TANK PLATE

Insert new tank plates from both ends in the direction of the arrows. Firmly set the tank plates in the core plate.

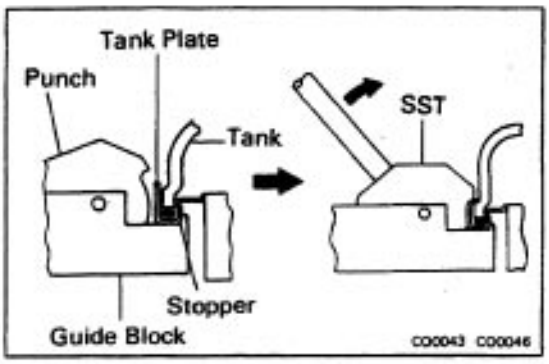


5. STAKE CLAWS OF TANK PLATES

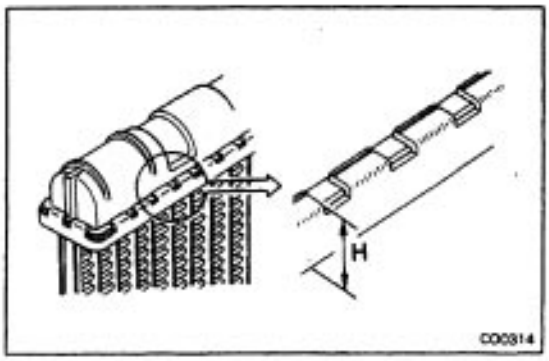
(a) Set the punch of SST to ”LOW”.
SST 09230–00010



(b) Stake the claws of the tank plates with SST in the numerical order shown in the figure.
SST 09230–00010

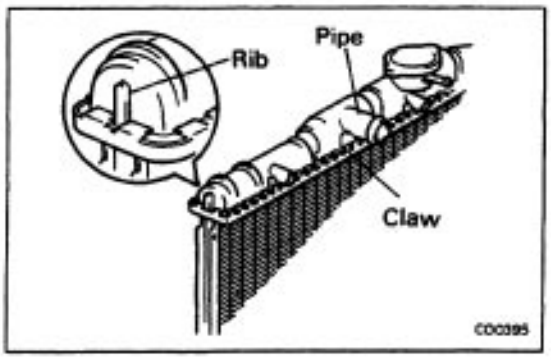


NOTICE: If the bottom of the core plate is staked with the SST on the guide block stopper, it may result in water leakage.

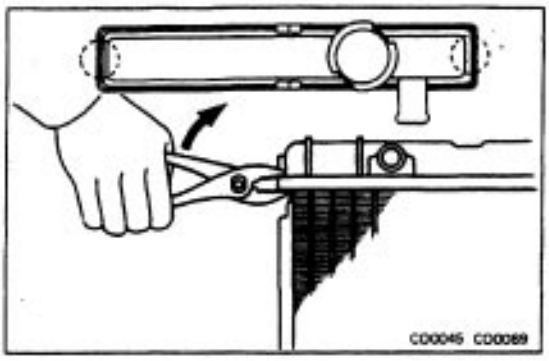


HINT:

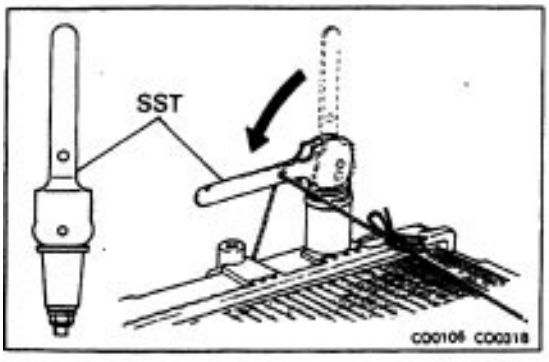
- Stake with just enough pressure to leave a mark on the claw. The staked plate height (H) should be as follows:
  Plate height (H):
  9.0–9.4 mm (0.354–0.370in.)



- Do not stake the areas protruding around the pipes, brackets or tank ribs.



- The points shown i n the illustration cannot be staked with the SST. Use pliers and be careful not to damage the core plates.

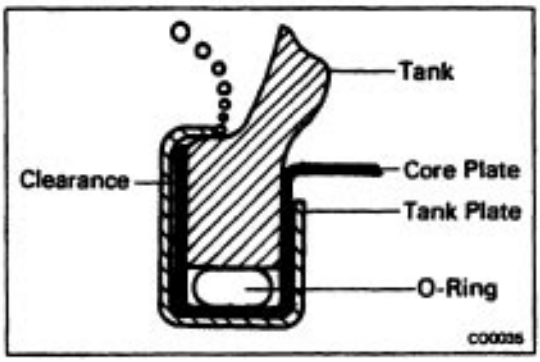


6. CHECK FOR WATER LEAKS

(a) Tighten the drain plug.

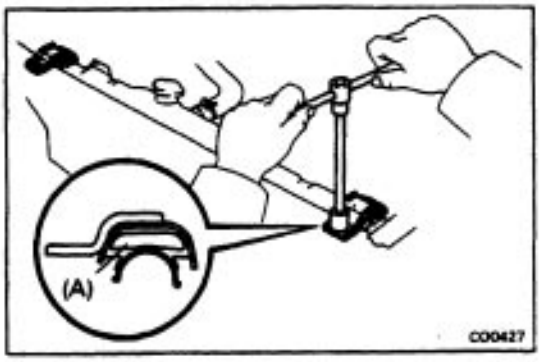
(b) Plug the inlet and outlet pipes of the radiator with SST.
SST 09230=00010

(c) Using a radiator cap tester, apply pressure to the radiator.
Test pressure: 1.8 kg/cm^2 (26 psi, 177 kPa)



(d) Check for water leaks.
HINT: On radiators with resin tanks, there is a clearance between the core plate and tank plate where a minute amount of air will remain, giving the appearance of an air leak when the radiator is submerged in water. Therefore, before performing the water leak test, first switch the radiator around in the water until all air bubbles disappear.

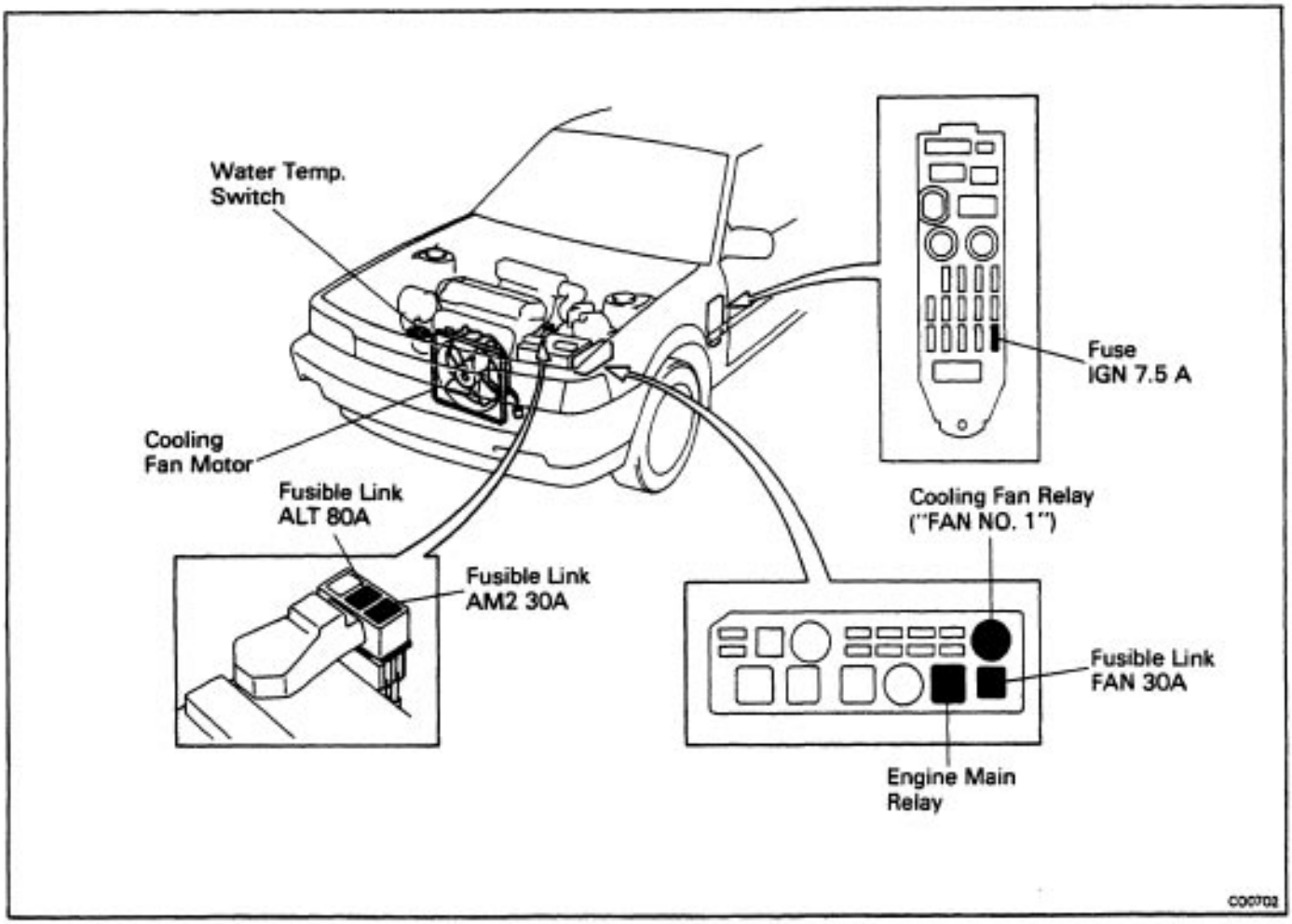
7. PAINT TANK PLATE
HINT: If the water leak test checks out okay, allow the radiator to completely dry and then paint the tank plate.

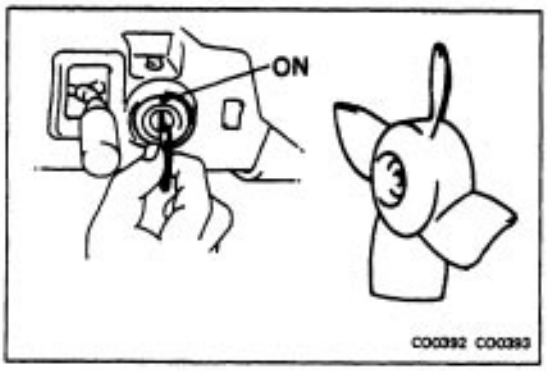


INSTALLATION OF RADIATOR
1. INSTALL ELECTRIC COOLING FANS TO RADIATOR
2. INSTALL RADIATOR
Place the radiator in position, and install the two supports with the two bolts.
HINT: After installation, check that the rubber cushion (A) of the supports are not depressed.
3. (A/T)
CONNECT OIL COOLER HOSES
4. CONNECT COOLING FAN MOTOR CONNECTORS
5. CONNECT RADIATOR HOSES
6. CONNECT COOLANT RESERVOIR HOSE
7. INSTALL IGNITION COIL (2VZ–FE), IGNITER AND BRACKET ASSEMBLY
8. INSTALL BATTERY
Connect the grand strap.
9. FILL WITH ENGINE COOLANT (See page CO–5)
10. START ENGINE AND CHECK FOR LEAKS
11. (A/T)
CHECK AUTOMATIC TRANSMISSION (A/T) FLUID LEVEL
NOTICE: Do not overfill.

ELECTRIC COOLING FAN (3S–FE)

LOCATION OF ELECTRIC COOLING FAN COMPONENTS





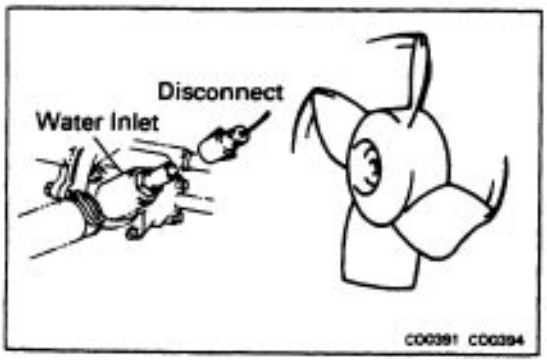
ON–VEHICLE INSPECTION

Low Temperature (Below 83°C (181°F))

1. TURN IGNITION SWITCH "ON"

Check that the fan stops.

If not, check the cooling fan relay and water temperature switch, and check for a separated connector or severed wire between the cooling fan relay and water temperature switch.

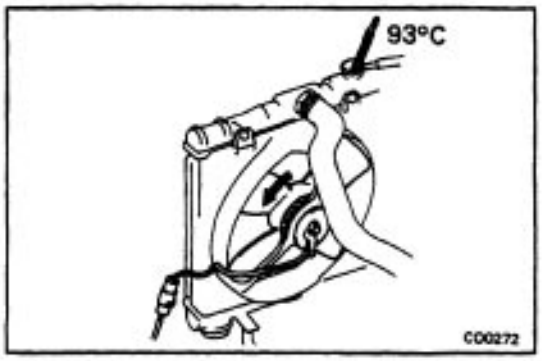


2. DISCONNECT WATER TEMPERATURE SWITCH CONNECTOR

Check that fan rotates.

If not, check the cooling fan relay, fan motor, engine main relay and fuse, and check for a short circuit between the cooling fan relay and water temperature switch.

3: CONNECT WATER TEMPERATURE SWITCH CONNECTOR



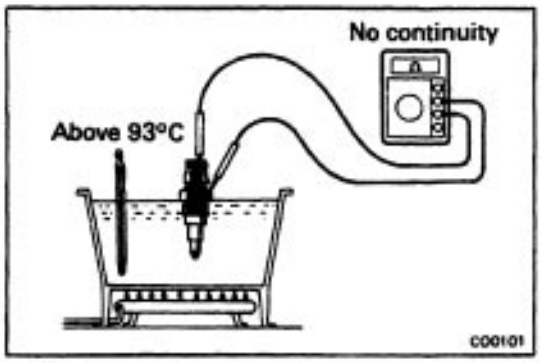
High Temperature (Above 93°C (199°F))

4. START ENGINE

(a) Raise coolant temperature to above 93˚C (199˚F).

(b) Check that the fan rotates.

If not, replace the water temperature switch.



INSPECTION OF ELECTRIC COOLING FAN COMPONENTS

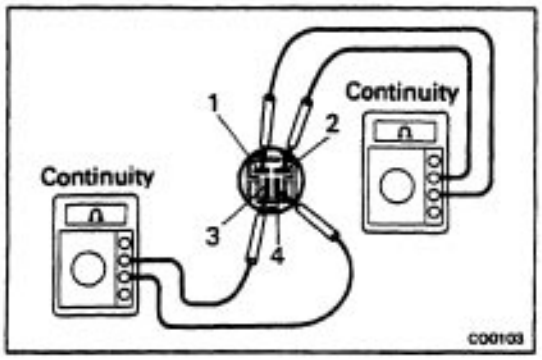
1. INSPECT WATER TEMPERATURE SWITCH

LOCATION: On the water inlet housing.

(a) Using an ohmmeter, check that there is no continuity between the terminal and body when the coolant temperature is above 93˚C (199˚F).

(b) Check that there is continuity between the terminal and body when the coolant temperature is below 83˚C (181 ˚F).

If continuity is not as specified, replace the switch.



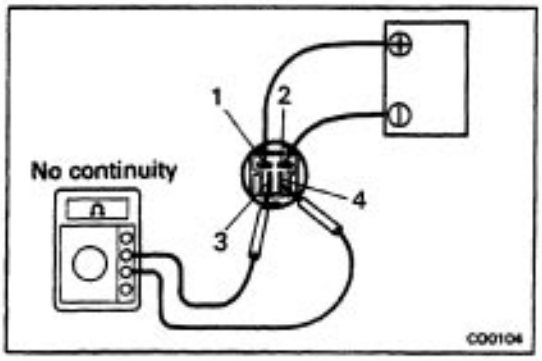
2. INSPECT COOLING FAN RELAY (”FAN NO.1 ”)

A. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

(b) Check that there is continuity between terminals 3 and 4.

If continuity is not as specified, replace the relay.



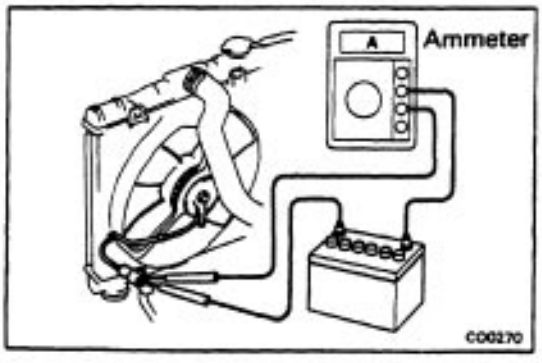
B. Inspect relay operation

(a) Apply battery voltage across terminal 1 and 2.

(b) Using an ohmmeter, check that there is no continuity between terminals 3 and 4.

If operation is not as specified, replace the relay.

3. INSPECT ENGINE MAIN RELAY (See page CH–16)



4. INSPECT COOLING FAN MOTOR

(a) Connect battery and ammeter to the fan motor connector.

(b) Check that the fan motor rotates smoothly, and check the reading on the ammeter.

Standard amperage:

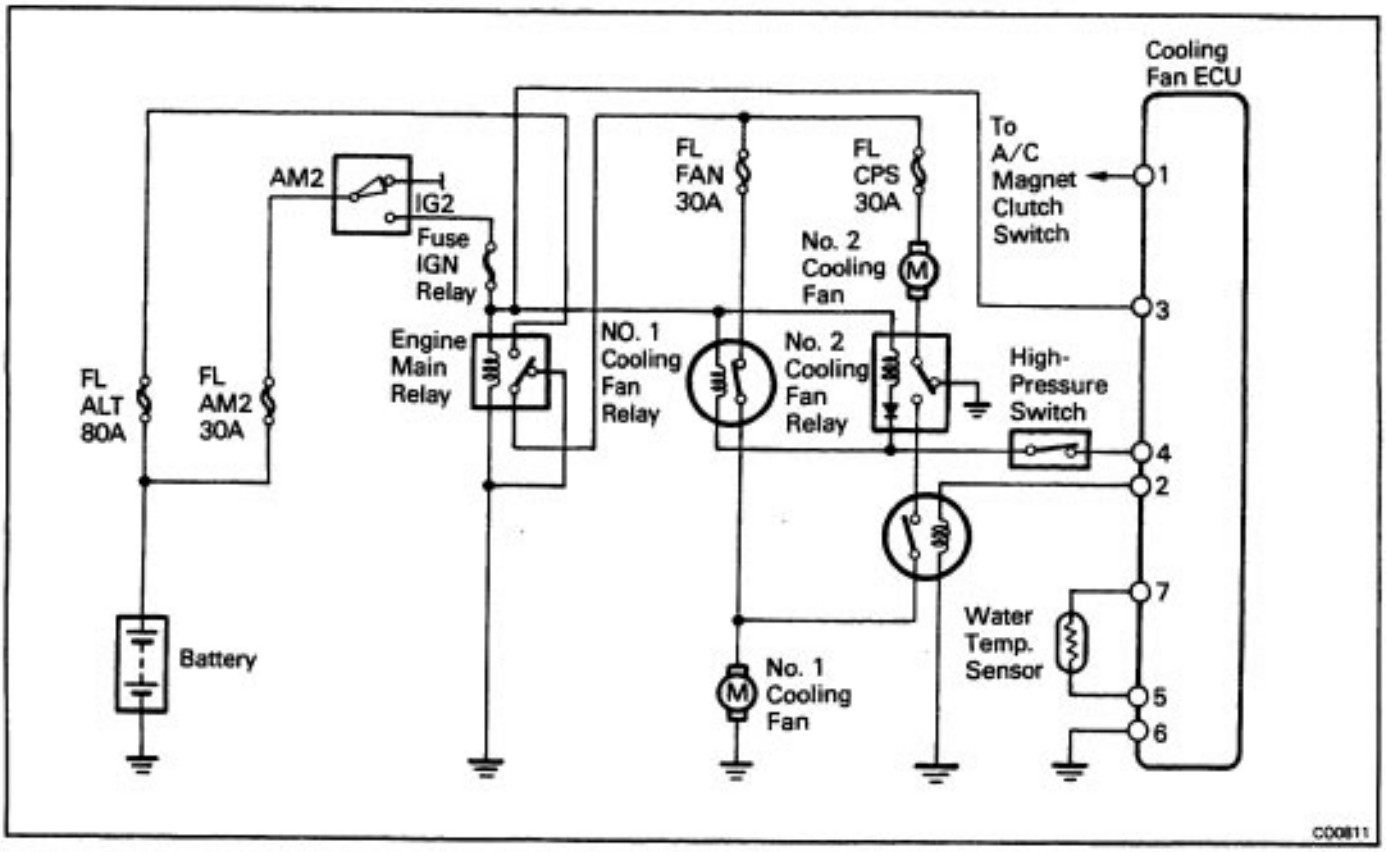
3.2– 4.4A 2WD M/T

5.8 – 7.4 A 2WD A/T and 4WD M/T

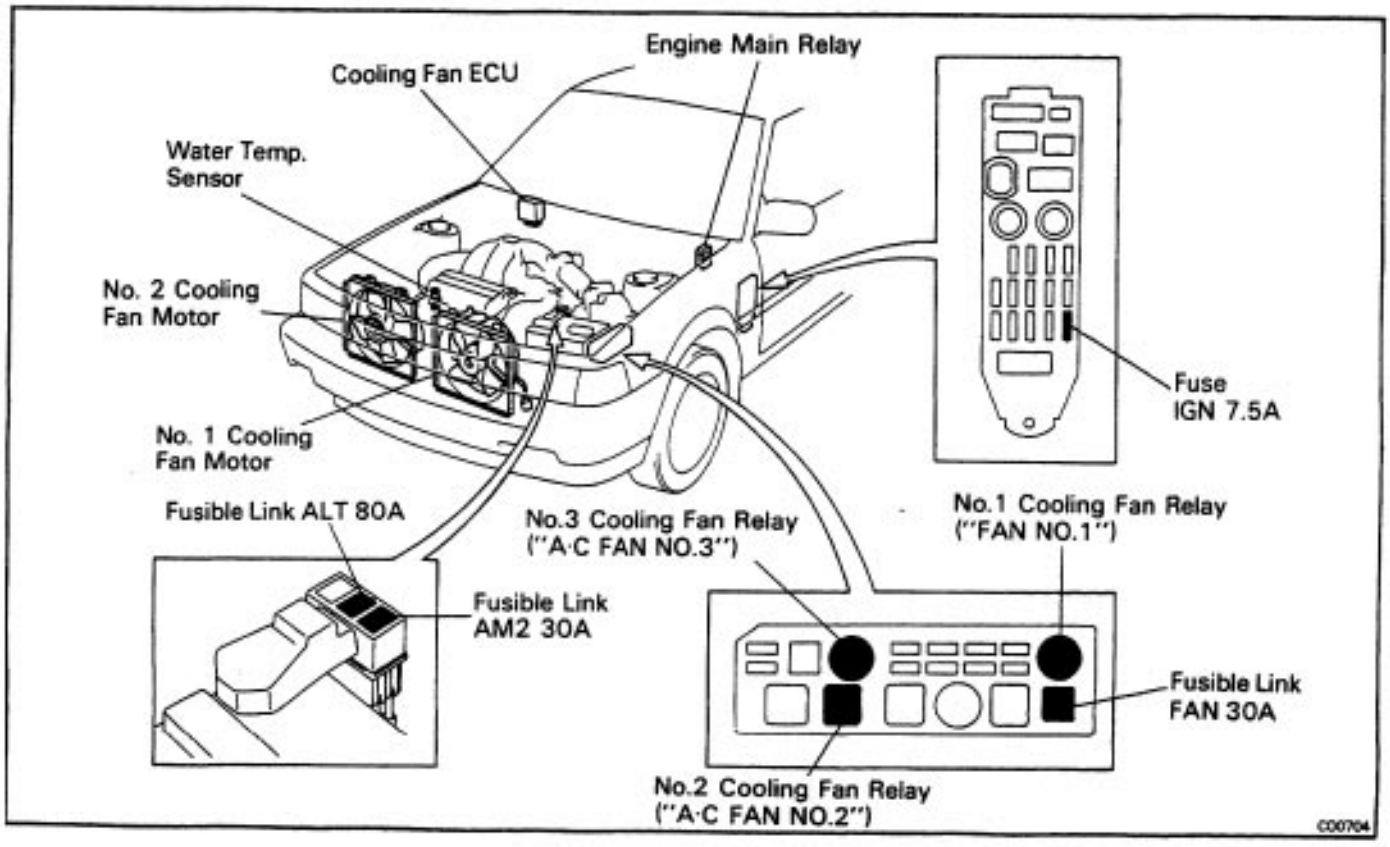
8.8 10.8A 4WD A/T

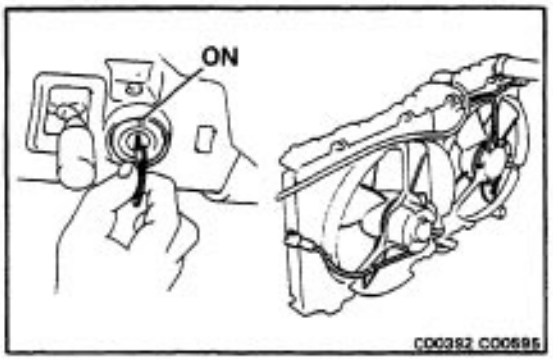
ELECTRIC COOLING FANS (2VZ–FE)

SYSTEM CIRCUIT



LOCATION OF ELECTRIC COOLING FAN COMPONENTS





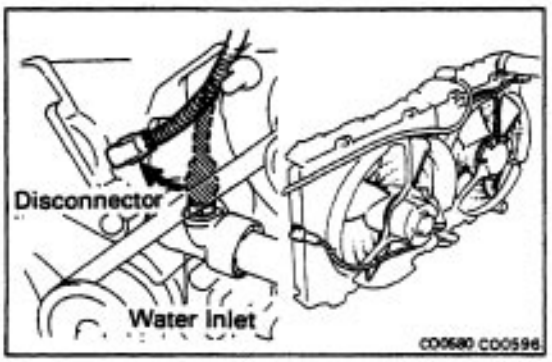
ON–VEHICLE INSPECTION

Low Temperature (Below 85˚C (185˚F))

1. TURN IGNITION SWITCH "ON"

Check that the fans stop.

If not, check the cooling fan relays and water temperature sensor, and check for a separated connector or severed wire between the cooling fan relay and water temperature sensor.

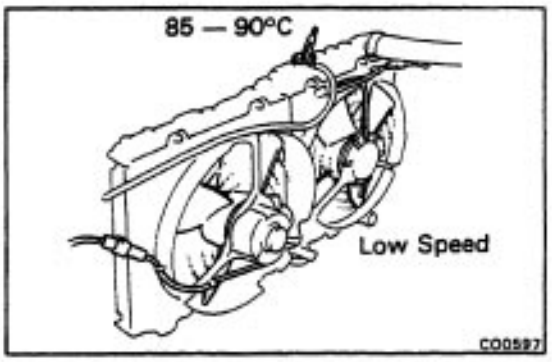


2. DISCONNECT WATER TEMPERATURE SENSOR CONNECTOR

Check that the fans rotate.

If not, check the cooling fan relays, fan motor, engine main relay and fuse, and check for a short circuit between the cooling fan relay and water temperature sensor.

3. CONNECT WATER TEMPERATURE SENSOR CONNECTOR



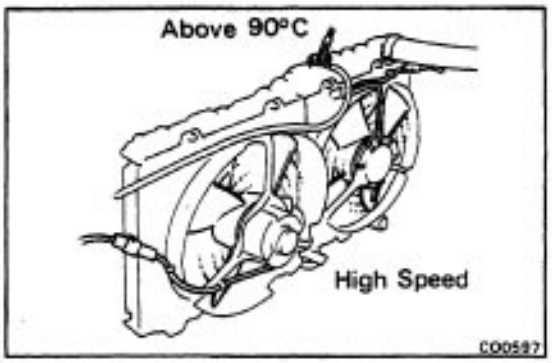
High Temperature (85 – 90˚C (185–194˚F))

4. START ENGINE

(a) Raise coolant temperature to 85 – 90˚C (185 –194˚F).

(b) Check that the fans rotate. (at low speed)

If not, replace the water temperature sensor.



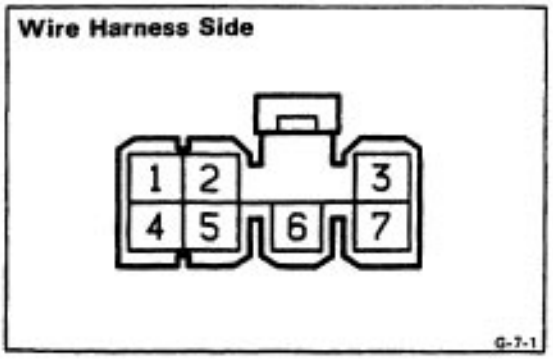
High Temperature (Above 90˚C (194˚F))

5. START ENGINE

(a) Raise coolant temperature to above 90˚C (194˚F).

(b) Check that the fans rotate. (at high speed)

If not, replace the water temperature sensor.

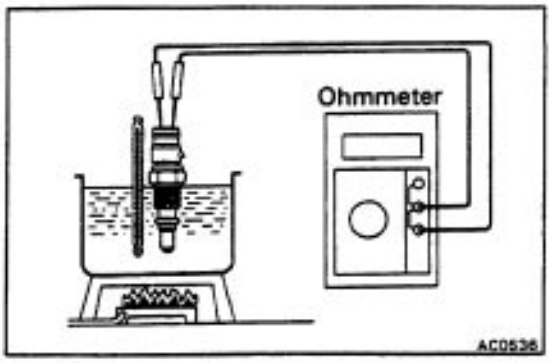


INSPECTION OF ELECTRIC COOLANT FAN COMPONENTS

1. INSPECT COOLING FAN ECC FOR CIRCUIT

Disconnect the cooling fan ECU, and check the connector on the wiring harness side as shown in the chart on the next page.

Check for	Tester connection	Condition		Specified valve
Continuity	2 – Ground	–		Continuity
Voltage	3 – Ground	Ignition switch ON		Battery voltage
Voltage	4 – Ground	Ignition switch ON		Battery voltage
Resistance	5 – 7	Coolant temp.	80°C (176°F)	Approx. 1.53 kΩ
			90°C (194°F)	Approx. 1.18 kΩ
			95°C (203°F)	Approx. 1.03 kΩ
Continuity	6 – Ground	–		Continuity



2. INSPECT WATER TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

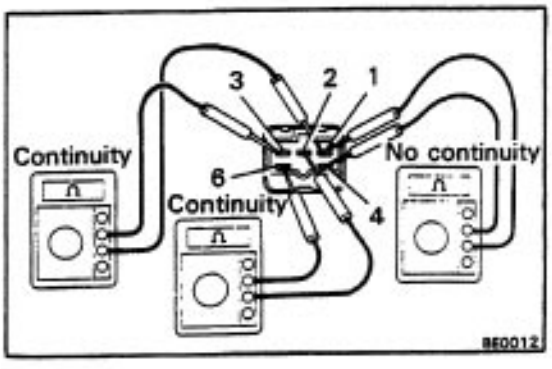
Resistance:

Approx. 1.53 kΩ at 80˚C (176˚ F)
Approx. 1.18 kΩ at 90˚C (194˚ F)
Approx. 1.03 kΩ at 95˚C (203˚F)

If resistance is not as specified, replace the sensor.

3. INSPECT ENGINE MAIN RELAY (See page CH–16)

4. INSPECT NO.1 COOLING FAN RELAY (”FAN NO.1 ”) (See page CO–22)



5. INSPECT NO–2 COOLING FAN RELAY (”AC FAN NO.2”)

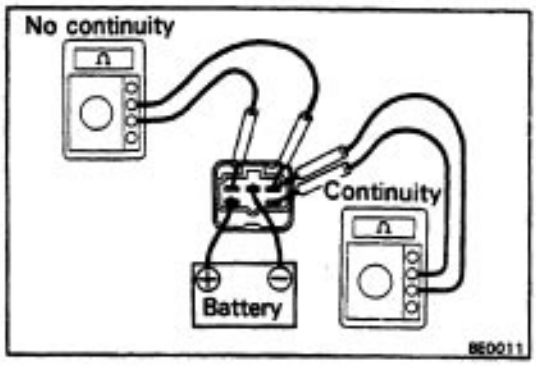
A. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals 2 and 6.

(b) Check that there is continuity between terminals 1 and 3.

(c) Check that there is no continuity between terminals 1 and 4.

If continuity is not as specified, replace the relay.



B. Inspect relay operation

(a) Apply battery voltage across terminal 2 and 6.

(b) Using an ohmmeter, check that there is no continuity between terminals 1 and 3.

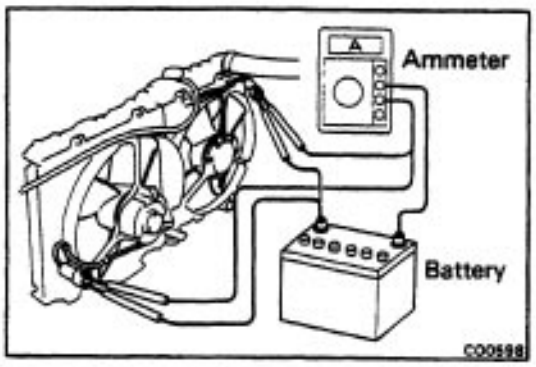
(c) Check that there is continuity between terminals 1 and 4.

If operation is not as specified, replace the relay.

6. INSPECT No.3 COOLING FAN RELAY

(”AC FAN NO.3”)

(See procedure EFI Main Relay on page FI–122**)**



7. INSPECT COOLING FAN MOTORS

(a) Connect battery and ammeter to the fan motor connector.

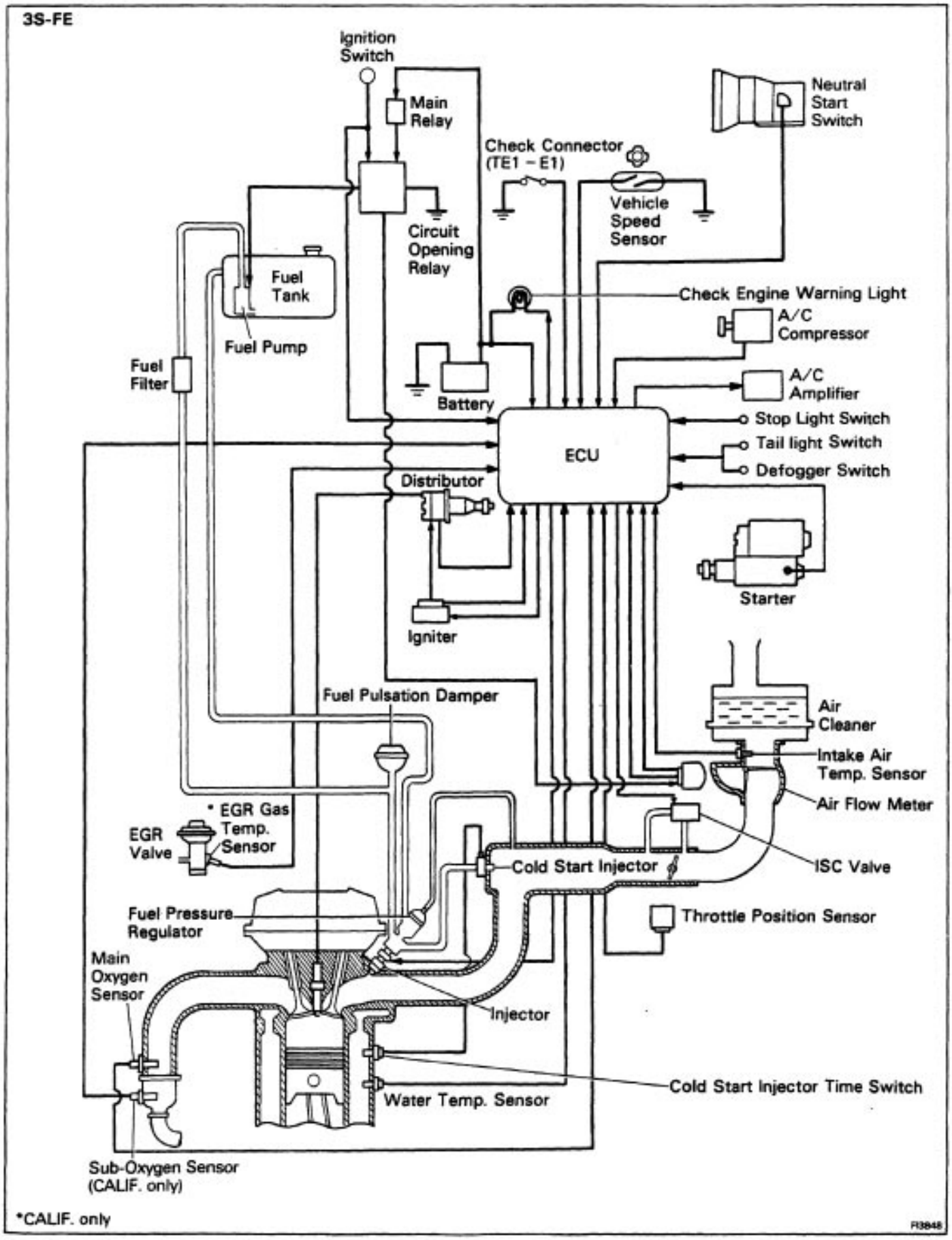
(b) Check that the fan motor rotates smoothly, and check the reading on the ammeter.

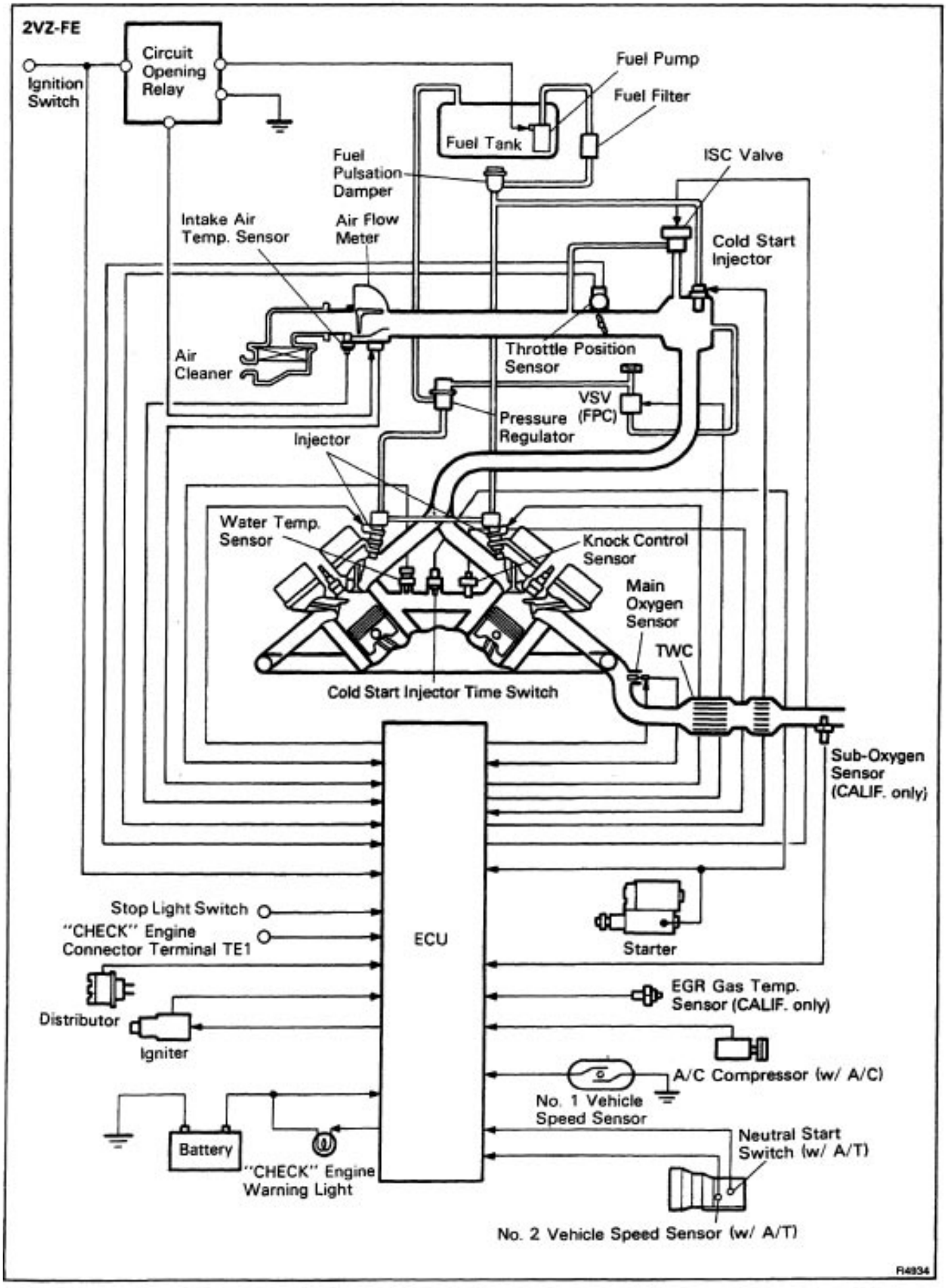
Standard amperage: No. 1 12.1 –15.1A

No.2 6.0–7.4A

EFI SYSTEM

SYSTEM DESCRIPTION




2VZ-FE
Circuit Opening Relay
Ignition Switch
Fuel Pump
Fuel Filter
Fuel Tank
Fuel Pulsation Damper
ISC Valve
Intake Air Temp. Sensor
Air Flow Meter
Cold Start Injector
Air Cleaner
Throttle Position Sensor
VSV (FPC)
Pressure Regulator
Injector
Water Temp. Sensor
Knock Control Sensor
Main Oxygen Sensor
TWC
Cold Start Injector Time Switch
Sub-Oxygen Sensor (CALIF. only)
Stop Light Switch
"CHECK" Engine Connector Terminal TE1
ECU
Starter
Distributor
Igniter
EGR Gas Temp. Sensor (CALIF. only)
A/C Compressor (w/ A/C)
No. 1 Vehicle Speed Sensor
Battery
"CHECK" Engine Warning Light
Neutral Start Switch (w/ A/T)
No. 2 Vehicle Speed Sensor (w/ A/T)
R4834

The ER system is composed of there basic sub–systems: Fuel, Air Induction and Electronic Control Systems.

FUEL SYSTEM

Fuel is supplied under constant pressure to the EFI injectors by an electric fuel pump. The injectors inject a metered quantity of fuel into the intake manifold in a accordance with signals from the ECU (Electronic Control Unit).

AIR INDUCTION SYSTEM

The air induction system provides sufficient air for engine operation.

ELECTRONIC CONTROL SYSTEM

The Camry 3S–FE and 2V1–FE engines are equipped with a Toyota Computer Control System (TCCS) which centrally controls the EFI, ESA, ISC, Diagnosis systems etc. by means of an Electronic Control Unit (ECU–formerly ER computer) employing a microcomputer.

By means of the ECU, the TCCS controls the following functions:

1. Electronic Fuel Injection (EFI)

   The ECU receives signals from various sensors indicating changing engine operation conditions such as:
   Intake air volume
   Intake air temperature
   Coolant temperature
   Engine rpm
   Acceleration/deceleration
   Exhaust oxygen content etc.
   The signals are utilized by the ECU to determine the injection duration necessary for an optimum air–fuel ratio.

2. Electronic Spark Advance (ESA)

   The ECU is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, coolant temperature, etc.), the microcomputer (ECU) triggers the spark at precisely the right instant. (See IG section)

3. Idle Speed Control (ISC)

   The ECU is programmed with target idling speed values to respond to different engine conditions (coolant temperature, air conditioner ON/OFF, etc.). Sensors transmit signals to the ECU which control the flow of air through the by–pass of the throttle valve and adjust idle speed to the target value. (See page FI–45,115 or 62, 117)

4. Diagnosis

   The ECU detects any malfunctions or abnormalities in the sensor network and lights a ”CHECK” engine warning light on the instrument panel. At the same time, the trouble is identified and a diagnosis code is recorded by the ECU. The diagnosis code can be read by the number of blinks of the ”CHECK” engine warning light when terminals TE1 and E1 are connected. The diagnostic codes are refer to the later page.
   (See page FI–25 or 27)

5. Fail–safe Function

   In the event of the sensor malfunctioning, a back–up circuit will take over to provide minimal drivability, and the ”CHECK” engine warning light.

PRECAUTIONS

1. Before working the fuel system, disconnect the cable from negative (–) terminal of the battery.

HINT: Any diagnostic code retained by the computer will be erased when the battery terminal is removed. Therefore, if necessary, read the diagnosis before removing the battery terminal.

2. Do not smoke or work open flame when working the fuel system.
3. Keep gasoline off rubber or leather parts.

INSPECTION PRECAUTIONS

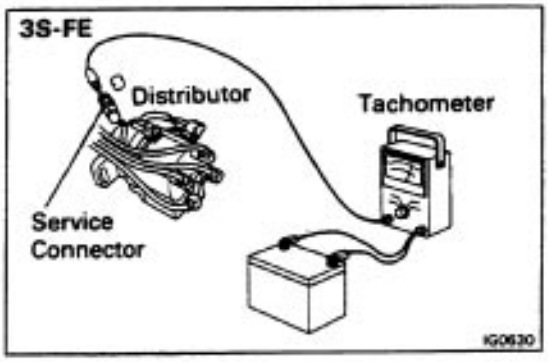
MAINTENANCE PRECAUTIONS

1. CHECK CORRECT ENGINE TUNE–UP
(See page EM–8)
2. PRECAUTIONS WHEN CONNECTING GAUGE

(a) Use the battery as the power source for the timing light, tachometer, etc.

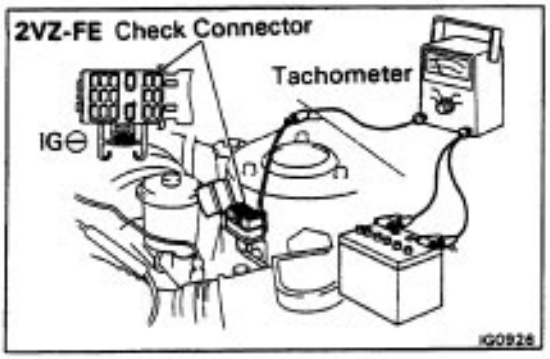
(b) (3S–FE)

Connect the test probe of a tachometer to the service connector of the distributor.



(c) (2VZ–FE)

Connect the test probe of a tachometer to the terminal IG – of the check connector.



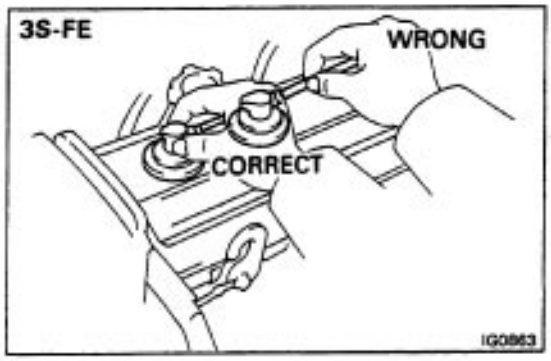
3. IN EVENT OF ENGINE MISFIRE FOLLOWING PRECAUTIONS SHOULD BE TAKEN

(a) Check proper connection of battery terminals, etc.

(b) Handle high–tension cords carefully.

(c) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.

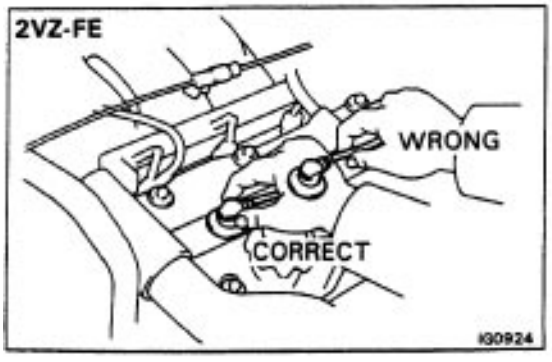
(d) When cleaning the engine compartment, be especially careful to protect the electrical system from water.



4. PRECAUTIONS WHEN HANDLING OXYGEN SENSOR(S)

(a) Do not allow the oxygen sensor to drop or hit against an object.

(b) Do not allow the sensor to come into contact with water.



PRECAUTIONS

1. Before working the fuel system, disconnect the cable from negative (–) terminal of the battery.

HINT: Any diagnostic code retained by the computer will be erased when the battery terminal is removed. Therefore, if necessary, read the diagnosis before removing the battery terminal.

2. Do not smoke or work open flame when working the fuel system.
3. Keep gasoline off rubber or leather parts.

INSPECTION PRECAUTIONS

MAINTENANCE PRECAUTIONS

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(See page EM–8)

2. PRECAUTIONS WHEN CONNECTING GAUGE

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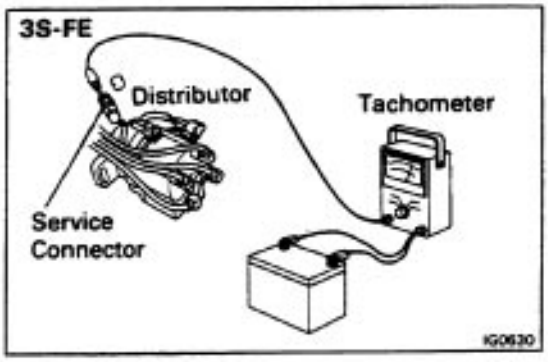
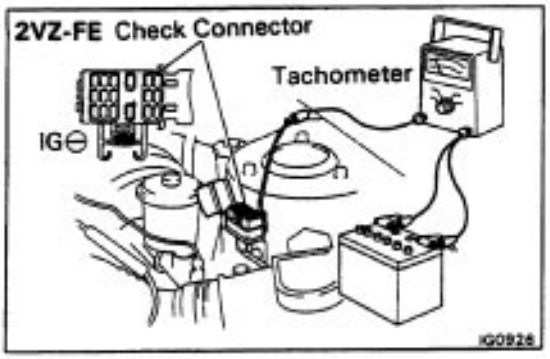


(c) (2VZ–FE)

Connect the test probe of a tachometer to the terminal IG – of the check connector.



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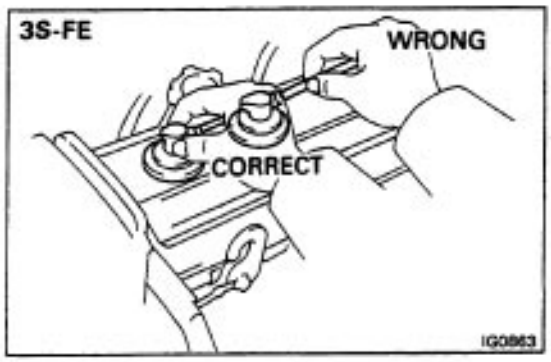
(d) When cleaning the engine compartment, be especially careful to protect the electrical system from water.



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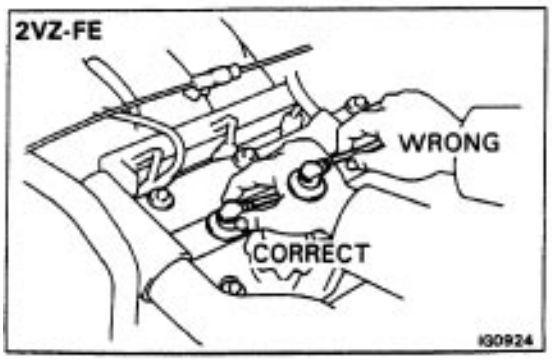
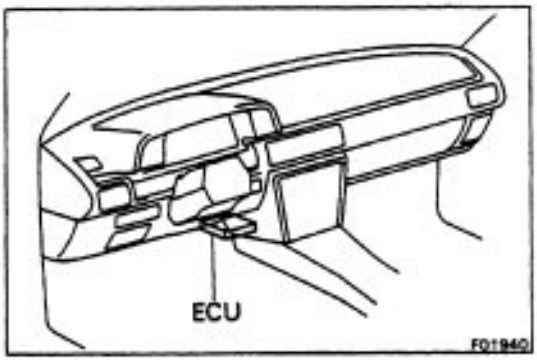


IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)

The ECU has been designed so that it will not be affected –by outside interference.

However, if your vehicle is equipped with a CB radio transceiver, etc. (even one with about 10 W output), it may, at times, have an affect upon ECU operation, especially if the antenna and feeder are installed nearby.

Therefore, observe the following precautions:

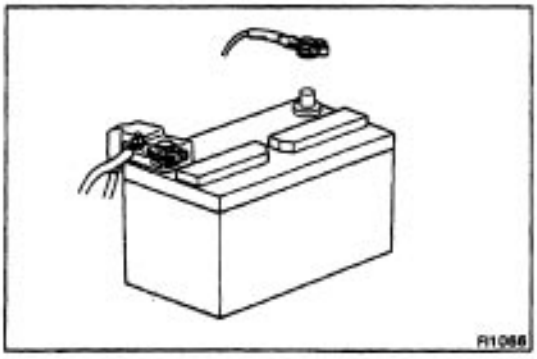


1. Install the antenna as far as possible from the ECU. The ECU is located under the radio so the antenna should be installed at the rear side of the vehicle.
2. Keep the antenna feeder as far away as possible from the ECU wires – at least 20 cm (7.87 in.) – and, especially, do not wind them together.
3. Check that the feeder and antenna are properly adjusted.
4. Do not equip your– vehicle with a powerful mobile radio system.
5. Do not open the cover or the case of the ECU unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

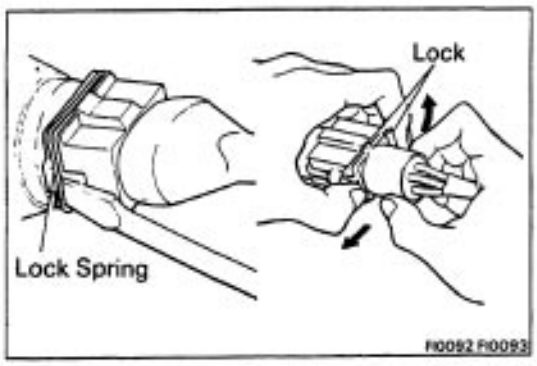
AIR INDUCTION SYSTEM

1. Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out¿¿ tune.
2. Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will allow air suction and cause the engine to run out of tune.

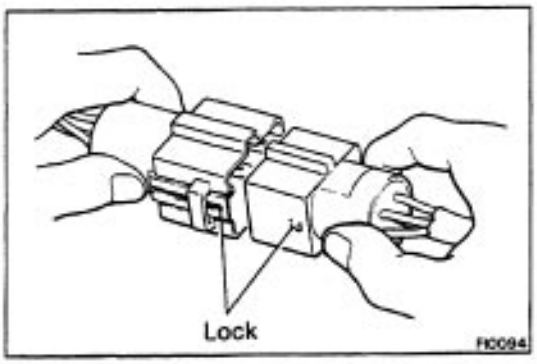
ELECTRONIC CONTROL SYSTEM



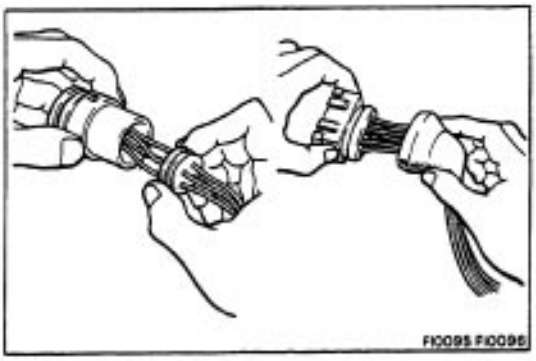
1. Before removing EFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch OFF or disconnecting the battery terminals.
2. When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (–) cables.
3. Do not permit parts to receive a severe impact during removal or installation. Handle all EFI parts carefully, especially the ECU.
4. Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can cause further troubles.
5. Do not open the ECU cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the ER parts and wiring connectors.
7. Parts should be replaced as an assembly.



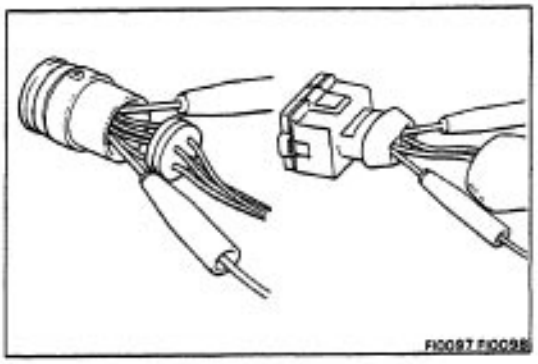
8. Care is required when pulling out and inserting wiring connectors.
(a) Release the lock and pull out the connector, pulling on the connectors.



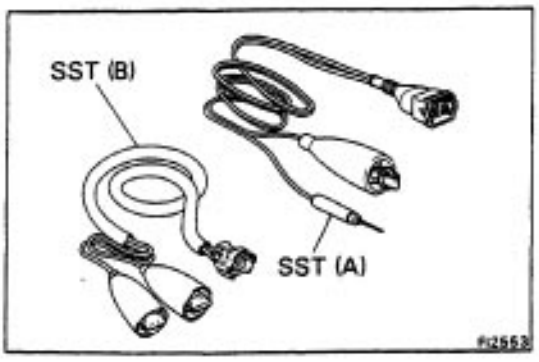
(b) Fully insert the connector and check that it is locked.



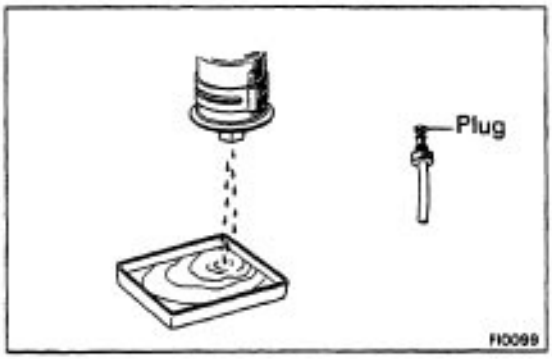
9. When inspecting a connector with a volt/ohmmeter.
(a) Carefully take out the water–proofing rubber if it is a water–proof type connector.



(b) Insert the test probe into the connector from wiring side when checking the continuity, amperage or voltage.
(c) Do not apply unnecessary force to the terminal.
(d) After checking, install the water–proofing rubber on the connector securely.



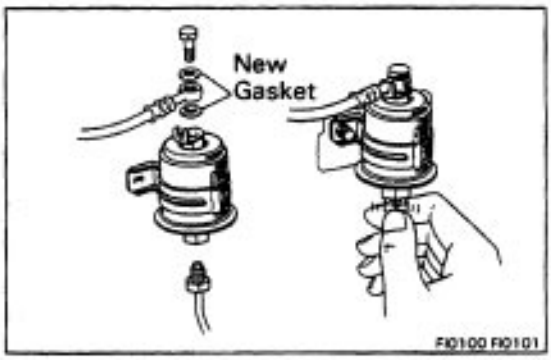
10. Use SST for inspection or test of the injector, cold start injector or its wiring connector.
SST 09842–30050 (A) and 09842–30070 (B)



FUEL SYSTEM

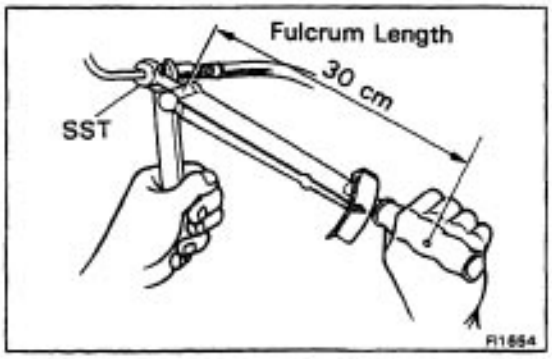
1. When disconnecting the high fuel pressure line, a large amount of gasoline will spill out, so observe the following procedure:

(a) Put a a container under the connection.
(b) Slowly loosen the connection.
(e) Disconnect the connection.
(d) Plug the connection with a rubber plug.



2. When connecting the flare nut or union bolt on the high pressure pipe union, observe the following procedure: (Union Bolt Type)

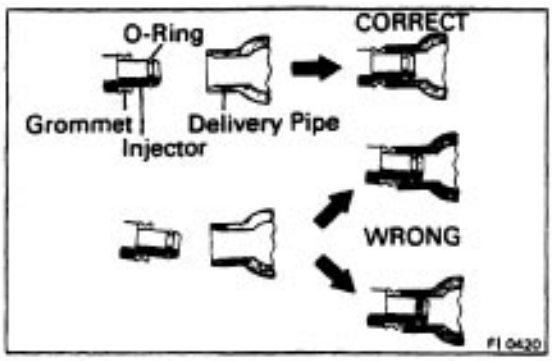
(a) Always use a new gasket.
(b) Tighten the union bolt by hand.
(c) Tighten the union bolt to the specified torque.
Torque: 300 kg–cm (22 ft–lb, 29 N–m)



(Flare Nut Type 3S–FE only)

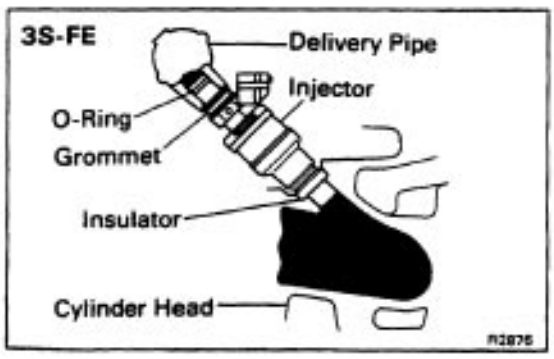
(a) Apply a light coat of engine oil to the flare and tighten the flare nut by hand.
(b) Using SST, tighten the flare nut to specified torque.
SST 09631–22020
Torque: 310 kg–cm (22 ft–ib, 30 N–m)

HINT: Use a torque wrench with a fulcrum length of 30 cm 0 1.81 in.).

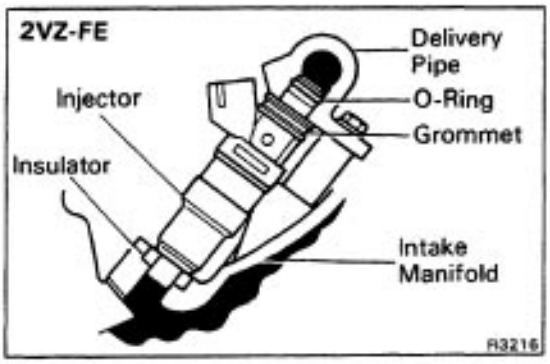


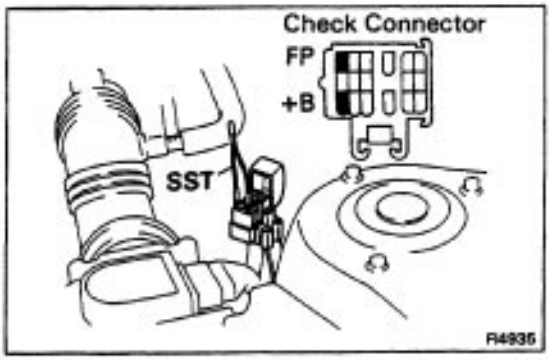
3. Observe the following precautions when removing and installing the injectors.

(a) Never reuse the 0–ring.
(b) When placing a new 0–ring on the injector, take care not to damage it in any way.
(c) Coat a new 0–ring with spindle oil or gasoline before installing never use engine, gear or brake oil.



4. Install the injector to delivery pipe and intake manifold as shown in the figure.

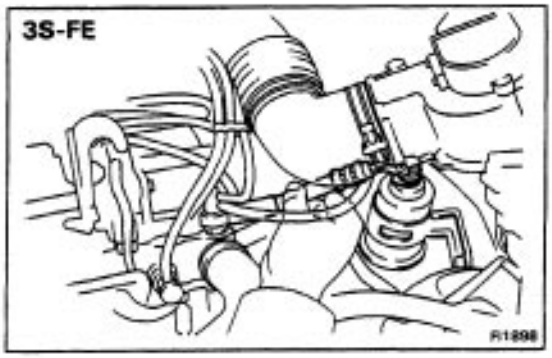




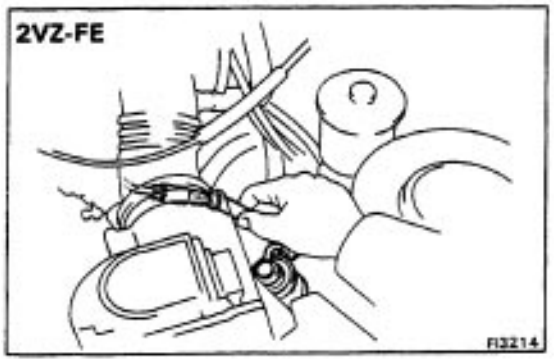
5. Check that there are no fuel leaks after performing any maintenance on the fuel system.

(a) with engine stopped, turn the ignition switch ON.

(b) Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020



(c) When the fuel return hose is pinched, the pressure within high pressure line will rise to approx. 4 kg/cm^2 (57 psi, 392 kPa). In this state, check to see that there are no leaks from any part of the fuel system.
NOTICE: Always pinch the hose. Avoid bending as it may cause the hose to crack.



TROUBLESHOOTING

TROUBLESHOOTING HINTS

1. Engine troubles is usually not caused by the EFI system. When troubleshooting, always first check the condition of the other systems.

(a) Electronic source
- Battery
- Fusible links
- Fuses

(b) Body ground

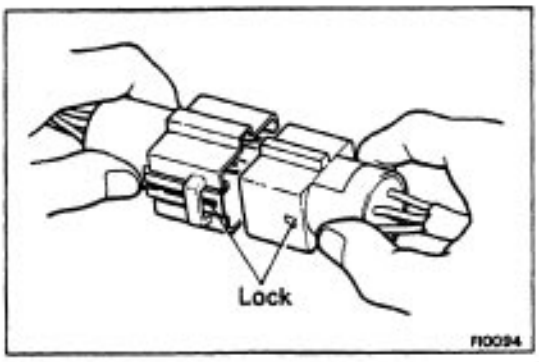
(e) Fuel supply
- Fuel leakage
- Fuel filter
- Fuel pump

(d) Ignition system
- Spark plugs
- High–tension cords
- Distributor
- Ignition coil
- Igniter

(e) Air induction system
- Vacuum leaks

(f) Emission control system
- PCV system
- EGR system

(g) Others
- Ignition timing (ESA system)
- dle speed (ISC system)
- etc.

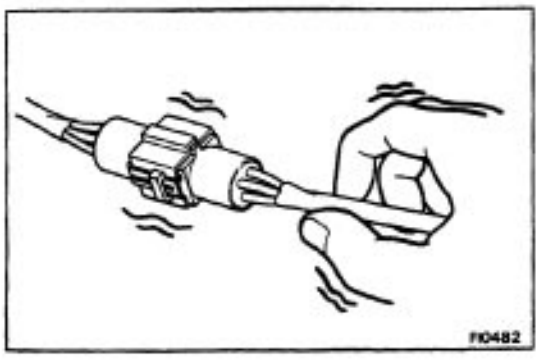


2. The most frequent cause of problems is simply a bad contact in wiring connectors. Always check that connections are secure.

   When inspecting the connector, pay particular attention to the following points:

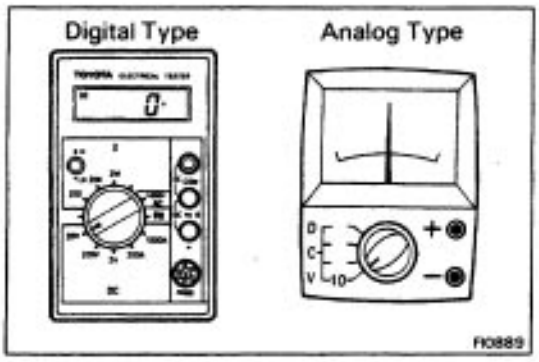
(a) Check to see that the terminals are not bent.

(b) Check to see that the connector is pushed in completely and locked.



(e) Check to see that there is no signal change when the connector is slightly tapped or wiggled.

3. Troubleshoot sufficiently for other causes before replacing the ECU, as the ECU is of high quality and it is expensive.



4. Use a volt/ohmmeter with high impedance (10 kΩN minimum) for troubleshooting of the electrical circuit. (See page FI–31)

TROUBLESHOOTING PROCEDURES

SYMPTOM–DIFFICULT START OR NO START (ENGINE WILL NOT CRANK OR CRANKS SLOWLY)

CHECK ELECTRIC SOURCE → BAD →
1. Battery
(1) Connection
(2) Gravity Drive belt Charging system
(3) Voltage

OK ↓

CHECK STARTING SYSTEM → BAD →
1. Ignition switch
2. Neutral start switch (A/T)
3. Clutch start switch (M/T)
4. Starter relay (M/T)
5. Starter
6. Wiring/Connection

SYMPTOM–DIFFICULT TO START OR NO START (CRANKS OK)

CHECK DIAGNOSIS SYSTEM
Check for output of diagnosis code.
(See page FI–22)
→ Malfunction code(s) →
Diagnostic code(s) (See page FI–25 or 27)

Normal code ↓

DOES ENGINE START WITH ACCELERATOR PEDAL DEPRESSED? → OK →
ISC system
(1) ISC valve
(2) Wiring connection

NO ↓

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE → BAD →
1. Oil filler cap
2. Oil dipstick
3. Hose connections
4. PCV hoses
5. EGR system EGR valve stays open

OK ↓

CHECK IGNITION SPARK
(See page IG–5 or 9)
→ BAD →
1. High–tension cords
2. Distributor
3. Ignition coil
4. Igniter

OK CONTINUED ON PAGE FI–12

OK CONTINUED FROM PAGE FI–11

CHECK SPARK PLUGS
Standard: 1.1 mm (0.043 in.)
HINT: Check compression pressure and valve clearance if necessary.

NO →
1. Spark plugs
2. Compression pressure
Minimum: 10.0 kg/cm2
(142 psi, 981 kPa)
at 250 rpm
3. Valve clearance
Standard:
3F–FE I N 0.19 – 0.29 mm
(0.007 – 0.011 in.)
EX 0.28 – 0.38 mm
(0.011 – 0.015 in.)
2VZ–FE IN 0.13 0.23 mm
(0–005 – 0.009 in.)
EX 0.27– 0.37 mm
(0.011 – 0.015 in.)

BAD All Plugs WET →
1. Injector(s) shorted or leaking
2. Injector wiring – short circuited
3. Cold start injector – leakage
(See page FI–78 or 81)
4. Cold start injector time switch
(See page FI–124)

OK ↓

CHECK FUEL SUPPLY TO INJECTOR
1. Fuel tank
2. Fuel pressure in fuel line
(1) Connect terminals +B and FP of the check connector.
(2) Fuel pressure at fuel hose of fuel filter can be felt. (See page FI–70)

BAD →
1. Fuel line – leakage – deformation
2. Fuse(s)
3. Fuel pump (See page FI–68)
4. Fuel filter
5. Fuel pressure regulator
(See page FI–84 or 86)

OK ↓

CHECK FUEL PUMP SWITCH IN AIR FLOW METER
Check continuity between terminals FC and E1 while measuring plate of air flow meter is open.

BAD →
Air flow meter (See page FI–104)

OK ↓

CHECK IGNITION TIMING
1. Connect terminals TE1 and E1 of the check connector.
2. Check ignition tinning.
Standard: 10˚ BTDC @ idle

BAD →
Ignition timing – Adjust
(See page IG–17 or 21)

OK CONTINUED ON PAGE FI–13

OK CONTINUED FROM PAGE FI–12

CHECK EFI ELECTRONIC CIRCUIT USING
VOLT/OHMMETER
(See page FI–31)

BAD

1. Wiring connection
2. Power to ECU
   (1) Fusible link(s)
   (2) Fuse(s)
   (3) ER main relay (See page FI–121)
3. Air flow meter (See page FI–104)
4. Water temp. sensor (See page FI–125)
5. Air temp. sensor (See page FI–104)
6. Injection signal circuit
   (1) Injector wiring
   (2) ECU (See page FI–130)

SYMPTOM – ENGINE OFTEN STALLS

CHECK DIAGNOSIS SYSTEM
Check for output of diagnosis code.
(See page FI–22)

Malfunction code(s)

Diagnostic code(s) (See page FI–25 or 27)

Normal code

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

BAD

1. Oil filler cap
2. Oil dipstick
3. Hose connections
4. PCV hoses
5. EGR system EGR valve stays open

OK

CHECK FUEL SUPPLY TO INJECTOR
1. Fuel tank
2. Fuel pressure in fuel line
   (1) Short terminals +B and FP of the check connector.
   (2) Fuel pressure at fuel return hose of fuel filter can be felt. (See page FI–70)

BAD

1. Fuel line leakage – deformation
2. Fuse(s)
3. Fuel pump (See page FI–68)
4. Fuel filter
5. Fuel pressure regulator
   (See page FI–86 or 88)

OK

CHECK AIR FILTER

BAD

Element – Clean or replace

OK

CHECK IDLE SPEED
Standard: 700 ± 50 rpm

BAD

1. ISC system
   (1) Wiring connection(s)
   (2) ISC valve (See page FI–116 or 118)
   (3) ECU (test by substitution)
2. (3S–FE) –
Idle speed – Adjust (See page EM–19)

OK CONTINUED ON PAGE FI–14

OK CONTINUED FROM PAGE FI–13

CHECK IGNITION TIMING
1. Connect terminals TE1 and E1 of the check connector.
2. Check ignition timing.
Standard: 10° BTDC @ idle

NO → Ignition timing – Adjust (See page IG–17 or 21)

OK ↓

CHECK SPARK PLUGS
Standard: 1.1 mm (0.043 in.)
HINT: Check compression pressure and valve clearance if necessary.

NO → 1. Spark plugs
2. Compression pressure
Minimum: 10.0 kg/cm 2 (142 psi, 981 kPa) at 250 rpm
3. Valve clearance
Standard:
3F–FE IN 0.19 – 0.29 mm (0.007 – 0.011 in.)
EX 0.28 – 0.38 mm (0.011 – 0.015 in.)
2VZ–FE IN 0.13 – 0.23 mm (0.005 – 0.009 in.)
EX 0.27– 0.37 mm (0.011 – 0.015 in.)

OK ↓

CHECK COLD START INJECTOR
(See page FI–78 or 81)

BAD → 1. Cold start injector (See page FI–78 or 81)
2. Cold start injector time switch (See page FI–124)

OK ↓

CHECK FUEL PRESSURE
(See page FI–70)

BAD → 1. Fuel pump (See page FI–68)
2. Fuel filter
3. Fuel pressure regulator (See page FI–84 or 86)

OK ↓

CHECK INJECTORS
(See page FI–88 or 93)

BAD → Injection condition

OK ↓

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI–31)

BAD →
1. Wiring connection
2. Power to ECU
(1) Fusible link(s)
(2) Fuse(s)
(3) ER main relay (See page FI–121)
3. Air flow meter (See page FI–104)
4. Water temp. sensor (See page FI–125)
5. Air temp. sensor (See page FI–104j
6. Injection signal circuit
(1) Injector wiring
(2) ECU (See page FI–130)

SYMPTOM – ENGINE SOMETIMES STALLS

CHECK DIAGNOSIS SYSTEM
Check for output of diagnosis code.
(See page FI–22)

→ Malfunction code(s) → Diagnostic code(s) (See page FI–25 or 27)

↓ Normal code

CHECK AIR FLOW METER
(See page FI–104)

→ BAD → Air flow meter

↓ OK

CHECK WIRING CONNECTORS AND RELAYS
Check for a signal change when the connector or relay is slightly tapped or wiggled.

→ BAD →
1. Connector(s)
2. ER main relay (See page FI–121)
3. Circuit opening relay (See page FI–123)

SYMPTOM – ROUGH IDLING AND/OR MISSING

CHECK DIAGNOSIS SYSTEM
Check for output of diagnosis code.
(See page FI–22)

→ Malfunction code(s) → Diagnostic code(s) (See page FI–25 or 27)

↓ Normal code

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

→ BAD →
1. Oil filler cap
2. Oil dipstick
3. Hose connections
4. PCV hoses
5. EGR system – EGR valve stays open

↓ OK

CHECK AIR FILTER

→ BAD → Element – Clean or replace

↓ OK

CHECK IDLE SPEED
Standard: 700 ± 50 rpm

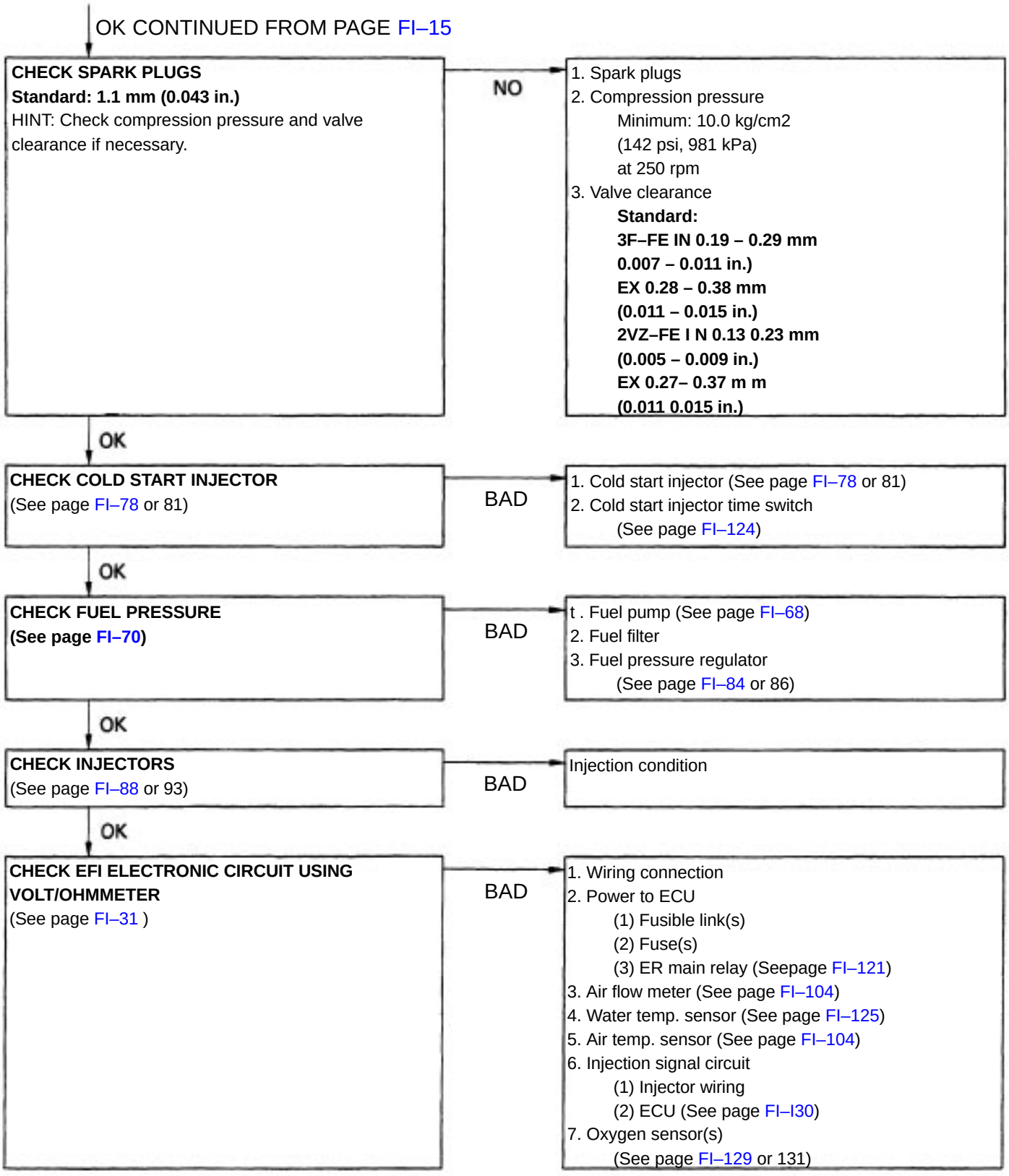
→ BAD →
1. ISC system
(1) Wiring connection(s)
(2) ISC valve (Seepage FI–116 or 118)
(3) ECU (test by substitution)
2. (3S–FE)
Idle speed – Adjust (See page EM–19)

↓ OK

CHECK IGNITION TIMING
1. Connect terminals TE1 and E1 of the check connector.
2. Check ignition timing.
Standard: 10° BTDC @ idle

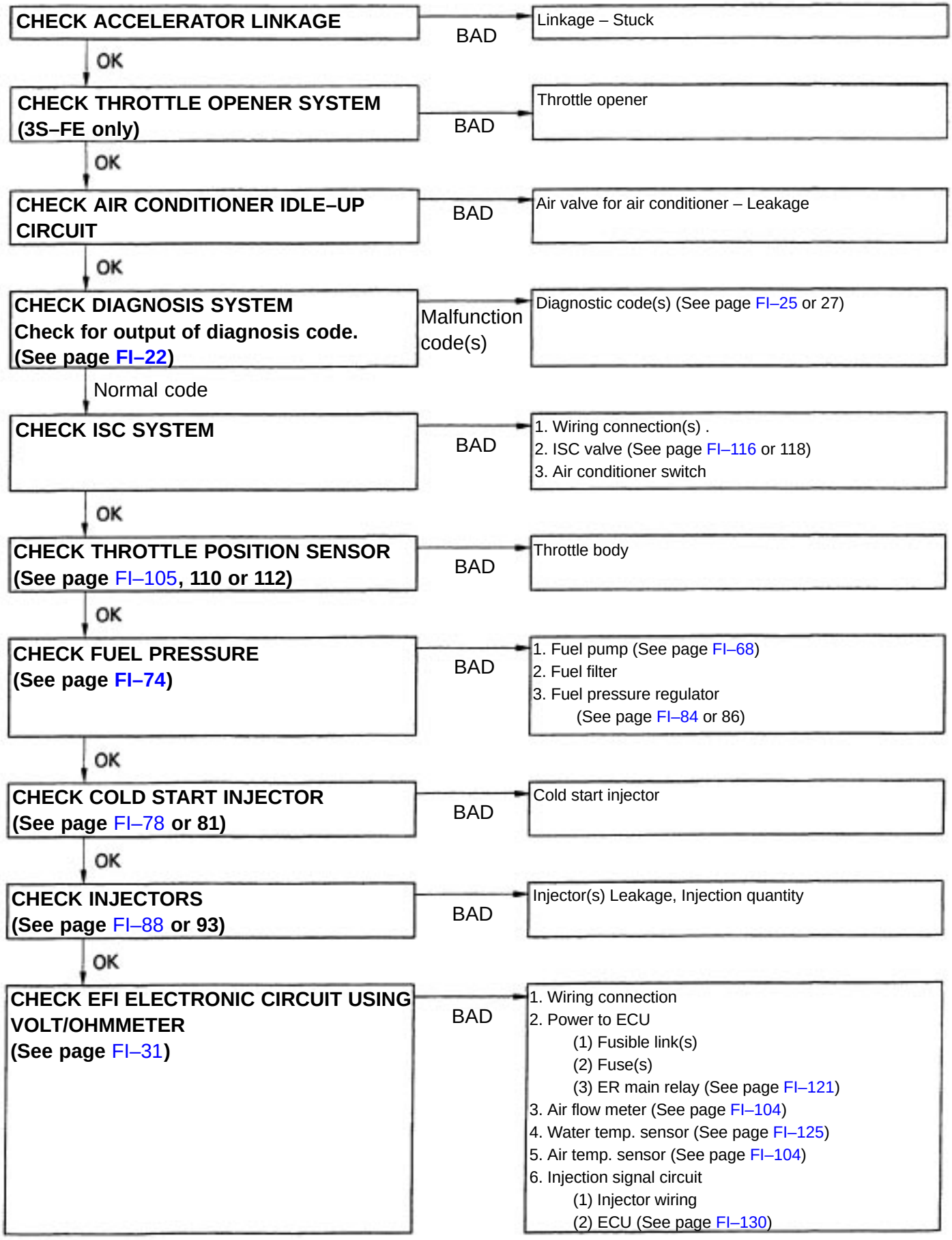
→ NO → Ignition timing Adjust
(See page IG–17 or 21)

↓ OK CONTINUED 4N PAGE FI–16



SYMPTOM – HIGH ENGINE IDLE SPEED (NO DROP)

HINT (3S–FE): Disconnecting the battery will cause the idling speed data in the ISC to be returned to the initial idling speed, causing the idling speed to rise above 700 rpm. should this happen, either carry out a driving test, including stop–go several times at a speed above 10 km/h, or start the engine, idle for 30 seconds and then turn the engine off repeatedly. By doing this, idle data will be stored in the ISC and the idle rpm will be at specified value.


CHECK ACCELERATOR LINKAGE
BAD
Linkage – Stuck
OK
CHECK THROTTLE OPENER SYSTEM (3S–FE only)
BAD
Throttle opener
OK
CHECK AIR CONDITIONER IDLE–UP CIRCUIT
BAD
Air valve for air conditioner – Leakage
OK
CHECK DIAGNOSIS SYSTEM
Check for output of diagnosis code.
(See page FI–22)
Malfunction code(s)
Diagnostic code(s) (See page FI–25 or 27)
Normal code
CHECK ISC SYSTEM
BAD
1. Wiring connection(s) .
2. ISC valve (See page FI–116 or 118)
3. Air conditioner switch
OK
CHECK THROTTLE POSITION SENSOR
(See page FI–105, 110 or 112)
BAD
Throttle body
OK
CHECK FUEL PRESSURE
(See page FI–74)
BAD
1. Fuel pump (See page FI–68)
2. Fuel filter
3. Fuel pressure regulator
(See page FI–84 or 86)
OK
CHECK COLD START INJECTOR
(See page FI–78 or 81)
BAD
Cold start injector
OK
CHECK INJECTORS
(See page FI–88 or 93)
BAD
Injector(s) Leakage, Injection quantity
OK
CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI–31)
BAD
1. Wiring connection
2. Power to ECU
(1) Fusible link(s)
(2) Fuse(s)
(3) ER main relay (See page FI–121)
3. Air flow meter (See page FI–104)
4. Water temp. sensor (See page FI–125)
5. Air temp. sensor (See page FI–104)
6. Injection signal circuit
(1) Injector wiring
(2) ECU (See page FI–130)

SYMPTOM – ENGINE BACKFIRES– Lean Fuel Mixture

CHECK DIAGNOSIS SYSTEM
Check for output of diagnosis code.
(See page FI–22)

Malfunction code(s) → Diagnostic code(s) (See page FI–25 or 27)

Normal code ↓

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

BAD →
1. Oil filler cap
2. Oil dipstick
3. Hose connections
4. PCV hoses
5. EGR system – EGR valve stays open

OK ↓

CHECK IGNITION TIMING
1. Connect terminals TE1 and E1 of the check connector.
2. Check ignition timing.
   Standard: 10° BTDC @ idle

NO → Ignition timing – Adjust
(See page IG–17 or 21)

OK ↓

CHECK COLD START INJECTOR
(See page FI–78 or 81)

BAD →
1. Cold start injector (See page FI–78 or 81)
2. Cold start injector time switch
   (See page FI–124)

OK ↓

CHECK FUEL PRESSURE
(See page FI–70)

BAD →
1. Fuel pump (See page FI–68)
2. Fuel filter
3. Fuel pressure regulator
   (See page FI–84 or 86)

OK ↓

CHECK INJECTORS
(See page FI–88 or 93)

BAD → Injectors – Clogged

OK ↓

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI–31)

BAD →
1. Wiring connection
2. Power to ECU
   (1) Fusible link(s)
   (2) Fuse(s)
   (3) ER main relay (See page FI–121)
3. Air flow meter (See page FI–104)
4. Water temp. sensor (See page FI–125)
5. Air temp. sensor (See page FI–104)
6. Injection signal circuit
   (1) Injection wiring
   (2) ECU (See page FI–130)
7. Oxygen sensor(s)
   (Seepage FI–129 or 131)

SYMPTOM – MUFFLER EXPLOSION (AFTER FIRE)–Rich Fuel Mixture–Misfire

CHECK DIAGNOSIS SYSTEM
Check for output of diagnosis code.
(See page FI–22)

→ Malfunction code(s) → Diagnostic code(s) (See page FI–25 or 27)

Normal code ↓

CHECK IGNITION TIMING
1. Connect terminals TE 1 and E 1 of the check connector.
2. Check ignition tinning.
   Standard: 10° BTDC @ idle

→ NO → Ignition timing – Adjust (See page IG–17 or 21)

OK ↓

CHECK COLD START INJECTOR
(See page FI–78 or 81)

→ BAD →
1. Cold start injector (See page FI–78 or 81)
2. Cold start injector time switch (See page FI–124)

OK ↓

CHECK FUEL PRESSURE
(See page FI–70)

→ BAD → Fuel pressure regulator (See page FI–84 or 86)

OK ↓

CHECK INJECTORS
(See page FI–88 or 93)

→ BAD → Injectors – Leakage

OK ↓

CHECK SPARK PLUGS
Standard: 1.1 mm (0.043 in.)
HINT: Check compression pressure and valve clearance if necessary.

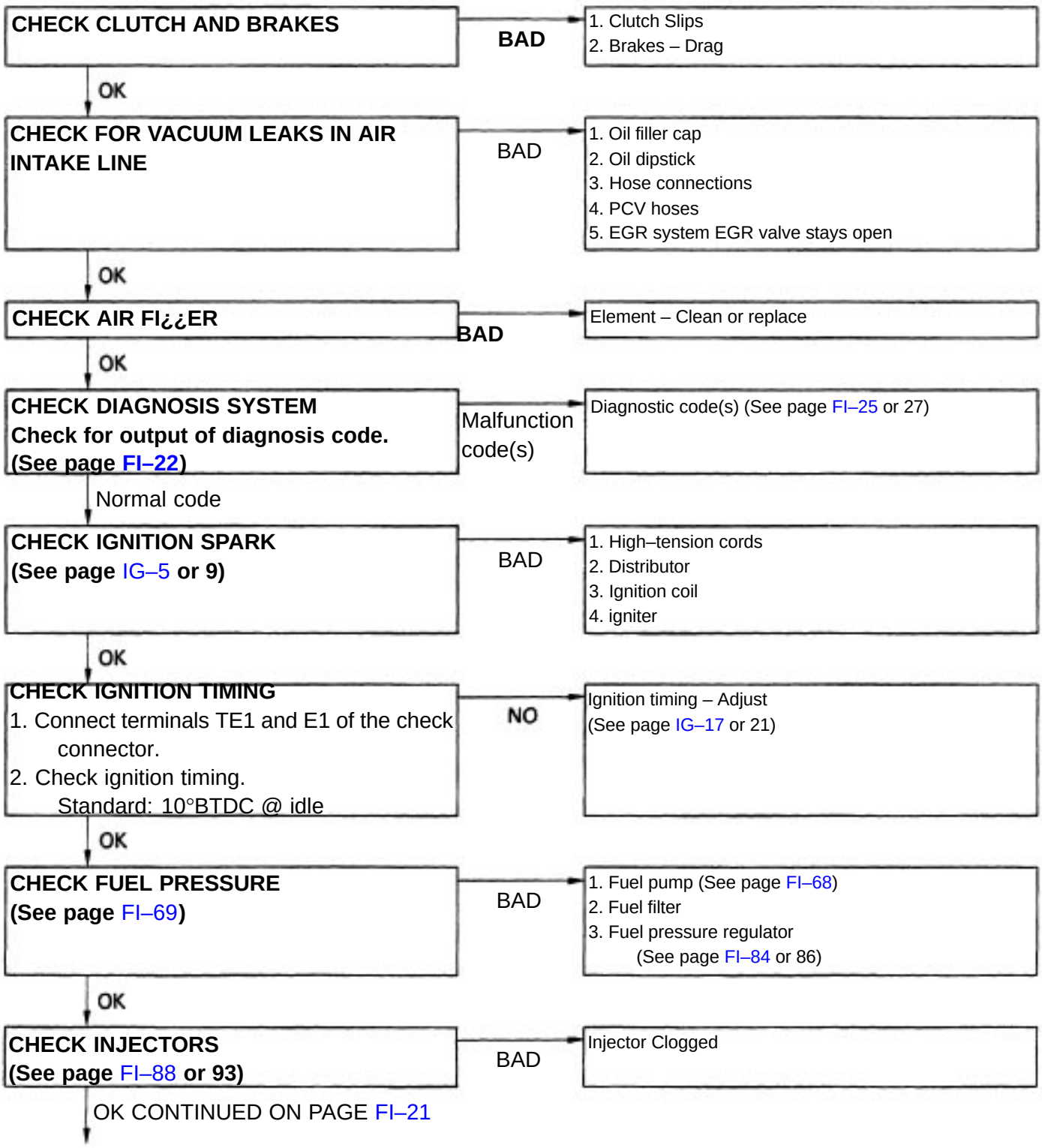
→ NO →
1. Spark plugs
2. Compression pressure
   Minimum: 10.0 kg/cm^2
   (142 psi, 981 kPa)
   at 250 rpm
3. Valve clearance
   Standard:
   3F–FE 1N 0.19 – 0.29 mm
   (0.007 – 0.011 in.)
   EX 0.28 – 0.38 mm
   (0.011 0.015 in.)
   2VZ–FE I N 0.13 – 0.23 mm
   (0.005 – 0.009 in.)
   EX 0.27– 0.37 mm
   (0.011 – 0.015 in.)

OK ↓

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI–31)

→ BAD →
1. Throttle position sensor
   (See page FI–106, 110 or 112)
2. Injection signal circuit
   (1) Injector wiring
   (2) Fuel cut RPM (See page FI–135)
   (3) ECU (See page FI–130)
3. Oxygen sensor(s)
   (See page FI–129 or 131)

SYMPTOM – ENGINE HESITATES AND/OR POOR ACCELERATION



OK CONTINUED FROM PAGE FI–20

CHECK SPARK PLUGS
Standard: 1.1 mm (0–043 in.)
HINT: Check compression pressure and valve clearance if necessary.

NO →
1. Spark plug
2. Compression pressure
   Minimum: 10.0 kg/cm^2
   (142 psi, 981 kPa)
   at 250 rpm
3. Valve clearance
   Standard:
   3F–FE IN 0.19–0.29 mm
   (0.007 – 0.011 in.)
   EX 0.28 – 0.38 mm
   (0.011 – 0.015 in.)
   2VZ–FE IN 0.13–0.23
   (0.005 – 0.009 in.)
   EX 0.27– 0.37 mm
   (0.011 – 0.015 in.)

OK ↓

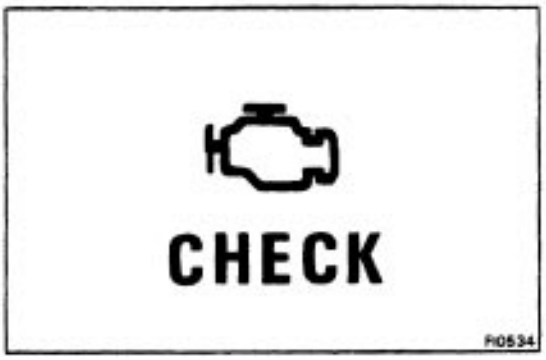
CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI–31)

BAD →
1. Wiring connection
2. Power to ECU
   (1) Fusible link(s)
   (2) Fuse(s)
   (3) ER main relay (See page FI–121)
3. Air flow meter (See page FI–104)
4. Water temp. sensor (See page FI–125)
5. Air temp. sensor (See page FI–104)
6. Throttle position sensor
(See page FI–106, 110 or 112)
7. Injection signal circuit
   (1) Injector wiring
   (2) ECU (See page FI–130)

DIAGNOSIS SYSTEM

DESCRIPTION

The ECU contains a built–in, self–diagnosis system which detects troubles within the engine signal network and then flashed a
warning on the ”CHECK” engine warning light on the instrument panel flashes.
By analyzing various signals shown in the tables (See pages FI–25 or 27) the ECU detects system malfunctions which are related to the various operating parameter sensors or actuator. The ECU
stores the failure code associated with the detected failure until the diagnosis system is cleared by removing the EFI fuse with the ignition switch OFF.
A ”CHECK” engine warning light on the instrument panel informs the driver that a malfunction has been detected.
The light goes oft automatically when the malfunction has been cleared.

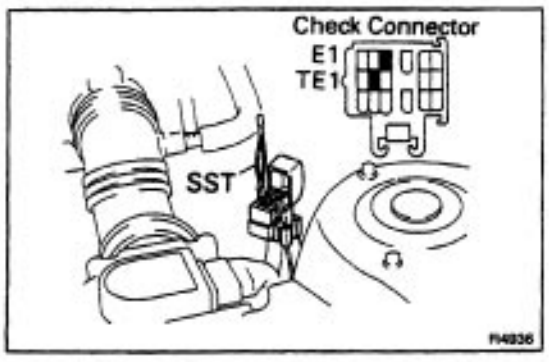


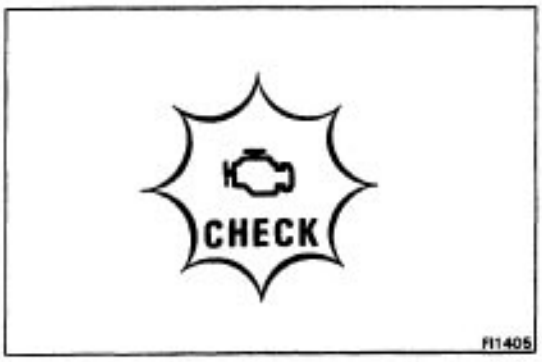
”CHECK” ENGINE WARNING LIGHT CHECK

1. The ”CHECK” engine warning light will come on when the ignition switch is placed at ON and the engine is not running.
2. When the engine is started, the ”CHECK” engine warning light should go off.
   If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

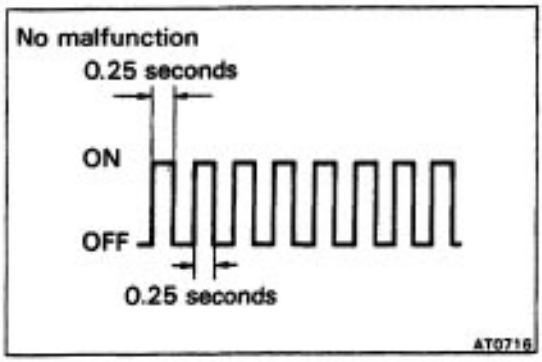
OUTPUT OF DIAGNOSTIC CODES

To obtain an output of diagnostic codes, proceed as follow:
1. Initial conditions
   (a) Battery voltage 11 V or more
   (b) Throttle valve fully closed (throttle position sensor IDL points closed)
   (e) Transmission in neutral position
   (d) Accessories switched OFF
   (e) Engine at normal operating temperature
2. Turn the ignition switch to ON. Do not start the engine.
3. Using SST, connect terminals TE1 and E1 of the check connector.
   SST 09843–18020

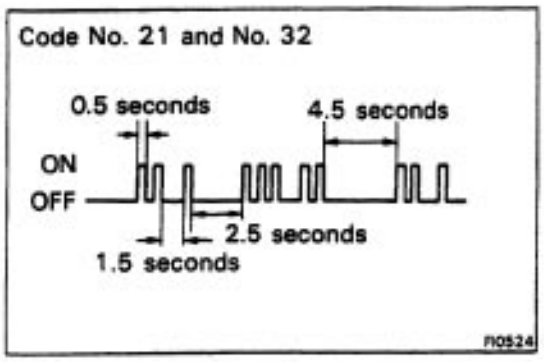




4. Read the diagnostic code as indicated by the number of flashes of the ”CHECK” engine warning light.

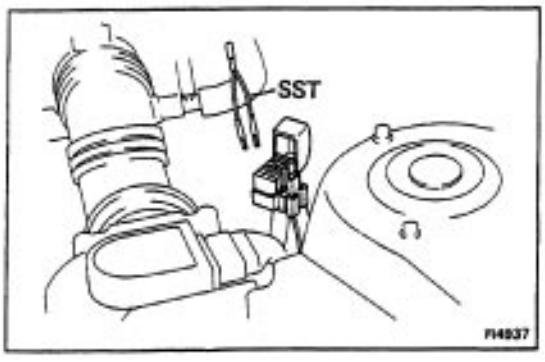


Diagnostic Codes (See page FI–25 or 27)
(a) Normal System Operation (no malfunction)
- The tight will alternately blink ON and OFF 2 times per second.

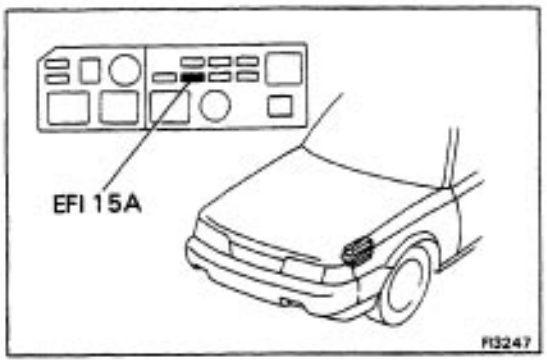


(b) Malfunction Code Indication
- In the event of a malfunction, the light will blink every 0.5 seconds. The first number of blinks will equal the first digit of a 2–digit diagnostic code and, after a 1.5 second pause, the 2nd number of blinks will equal the 2nd. If there are two or more codes, there will be a 2.5 second pause between each.
- After all the codes have been signalled there will be a 4.5 second pause and they will all be repeated as long as the terminals TE1 and E1 of the check connector are shorted.

HINT: In the event of a number of trouble codes, indication will begin from the smaller value and continue in order to the larger.



5. After the diagnostic check, remove the SST.
SST 09843–18020



CANCELLING DIAGNOSTIC CODE

1. After repair of the trouble area, the diagnostic code retained in memory by the ECU must be cancelled out by removing the EFI fuse (15 A) for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.

HINT:

- Cancellation can also be done by removing the battery negative (–) terminal, but in this case, other memory systems (clock, etc.) will also be cancelled out.
- If the diagnostic code is not cancelled out, it will be retained by the ECU and appear along with a new code in the event of future trouble.
- If it is necessary to work engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic code has been recorded.

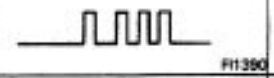
2. After cancellation, road test the vehicle to check that a normal code is now read on the ”CHECK” engine warning light.

If the same diagnostic code appears, it indicates that the trouble area has not been repaired thoroughly.

DIAGNOSIS INDICATION

1. (2VZ–FE)
   Including ”normal”, the ECU is programmed with the following 16 (Ex. CALIF.) or 18 (CALIF.) diagnostic codes.
2. When 2 or more codes are indicated, the lowest number (code) will appear first.
   However, no other code will appear along with code No.11.
3. All detected diagnostic codes, except code No.51, will be retained in memory by the ECU from the time of detection until cancelled out.
4. Once the malfunction is cleared, the ”CHECK” engine warning light on the instrument panel will go oft but the diagnostic code(s) remain stored in ECU memory (except for code No.51).

DIAGNOSTIC CODES (3S–FE)

Code No.	Number of Check engine blinks	System	Diagnosis	Trouble area	See page
—		Normal	This appears when none of the other codes (11 thru 71) are identified.		
12		RPM Signal	No NE or G signal to ECU within several seconds after engine is cracked.	• Distributor circuit • Distributor • Starter signal circuit • ECU	IG–4
13		RPM Signal	No NE signal to ECU when the engine speed is above 1,000 rpm.	• Distributor circuit • Distributor • ECU	
14		Ignition Signal	No IGF signal to ECU 4–5 times in succession.	• Ignition circuit (+B, IGT, IGF) • Igniter • ECU	FI–44
21		Main oxygen Sensor Signal	During air–fuel ratio feedback correction, voltage output from the main oxygen sensor does exceed a set valve on the lean side and the rich side continuously for a certain period.	• Main oxygen sensor circuit • Main oxygen sensor • ECU	FI–48
22		Water temp. Sensor Signal	Open or short circuit in water temp. sensor signal (TH1^).	• Water temp. sensor circuit • Water temp. sensor • ECU	FI–42
24		Intake air Temp. Sensor Signal	Open or short circuit in intake air temp. sensor signal (THA)	• Intake air temp. sensor circuit • Intake air temp. sensor • ECU	FI–41
25		Air–fuel ratio Lean Malfunction	When air–fuel ratio feedback compensation valve or adaptive control value continues at the upper (lean) or (rich) limit renewed for a certain period of time.	• Injector circuit • Injector • Oxygen sensor circuit Oxygen sensor • ECU • Fuel line pressure • Air flow meter • Water temp. sensor • Ignition system	
26		Air–fuel ratio Rich Malfunction		• Injector circuit • Injector • Fuel line pressure Cold start injector • Air flow meter • Water temp. sensor • ECU	
*27		Sub–oxygen Sensor Signal	Open or short circuit i n sub–oxygen sensor signal (OX2)	• Sub–oxygen sensor circuit • Sub–oxygen sensor • ECU	F–48
31		Air flow meter Signal	Open circuit in VC signal or short circuit between VC and E2 when idle contacts are closed.	• Air flow meter circuit • Air flow meter • ECU	FI–39
32		Air flow Meter Signal	Open circuit in E2 or short circuit between VC and VS.	Same as 31, above.	FI–39

*CALIF. only

DIAGNOSTIC CODES (3S–FE) (Cont'd)

Code No.	Number of Check engine blinks	System	Diagnosis	Trouble area	See page
41		Throttle Position Sensor Signal	(w/o ECT) IDL and PSW signals being output simultaneously for several seconds. (w/ ECT) Open or short circuit in throttle position sensor signal (VTA).	• Throttle position sensor circuit • Throttle position sensor • ECU	FI–36 or FI–37
42		Vehicle Speed Sensor Signal	No SPD signal for several seconds when engine speed is between 2,500 – 5,500 rpm and coolant temp. is below 80˚C (176˚F) except when racing the engine.	• Vehicle speed sensor circuit • Vehicle speed sensor • ECU	
43		Starter Signal	No STA signal to ECU when vehicle stopped and engine running over 800 rpm.	• IG switch circuit • IG switch • ECU	FI–43
*71		EGR Malfunction	EGR gas temp. below predetermined level for during EGR control.	• EGR system (EGR valve, EGR hose etc.) • EGR gas temp. sensor circuit • EGR gas temp. sensor • BVSV for EG R • BVSV for EGR circuit • ECU	FI–49
51		Switch Condition Signal	A/C signal or no IDL signal to ECU, when engine is idling with check Terminals TE1 and E1 connected.	• A/C switch circuit • A/C amplifier • Throttle position sensor circuit • Throttle position sensor • Accelerator pedal and cable	

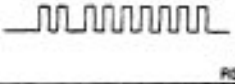
*CALIF. only

DIAGNOSTIC CODES (2VZ–FE)

Code No.	Number of Check engine blinks	System	Diagnosis	Trouble area	See page
—		Normal	This appears when none of the other codes are identified.		
12		RPM Signal	No NE or G signal to ECU within 2 seconds after engine has been cranked.	• Distributor circuit • Distributor • Starter signal circuit • ECU	IG–4
13		RPM Signal	No NE signal to ECU when the engine speed is above 1,000 rpm.	• Distributor circuit • Distributor • ECU	
14		Ignition Signal	No IGF signal to ECU FI–8 times in succession.	• Igniter and ignition coil circuit • Igniter and ignition coil • ECU	FI–62
16		ECT Control Signal	ECT control program faulty.	• ECU	
21		Main oxygen Sensor Signal	During air–fuel ratio feedback correction, voltage output from the main oxygen sensor does exceed a set value on the lean side and the rich side continuously for a certain period.	• Main oxygen sensor circuit • Main oxygen sensor • ECU	FI–66
		Main oxygen Sensor Heater Signal	Open or short circuit in main oxygen sensor heater signal (HT).	• Main oxygen heater circuit • Main oxygen sensor heater • ECU	
22		Water temp. Sensor Signal	Open or short circuit in water temp. sensor signal (THA).	• Water temp. sensor circuit • Water temp. sensor • ECU	FI–60
24		Intake air Temp. Sensor Signal	Open or short circuit in intake air temp. sensor signal (THA)	• Intake air temp. sensor circuit • Intake air temp. sensor • ECU	FI–59
25		Air–fuel Ratio Lean Malfunction	(CALIF.) • When air–fuel ratio feedback correction value or adaptive control value continues at the upper (lean) or lower (rich) limit for a certain period of time or adaptive control value is not renewed for a certain period of time. • When feedback frequency of air–fuel ratio feedback correction or adaptive control is abnormally high during feedback condition. (Others) • Oxygen sensor outputs a lean signal continuously for several seconds during air–fuel ratio feedback correction. • Open circuit in oxygen sensor signal (OX).	• Water temp. sensor • Injector circuit • Injector • Fuel line pressure • Air flow meter • Air intake system • Oxygen sensor circuits • Oxygen sensors • Ignition system • ECU	
26		Air–fuel Ratio Rich Malfunction		Water temp. sensor • Injector circuit • Injector • Fuel line pressure • Air flow meter • Cold start injector • ECU	

*CALIF. only

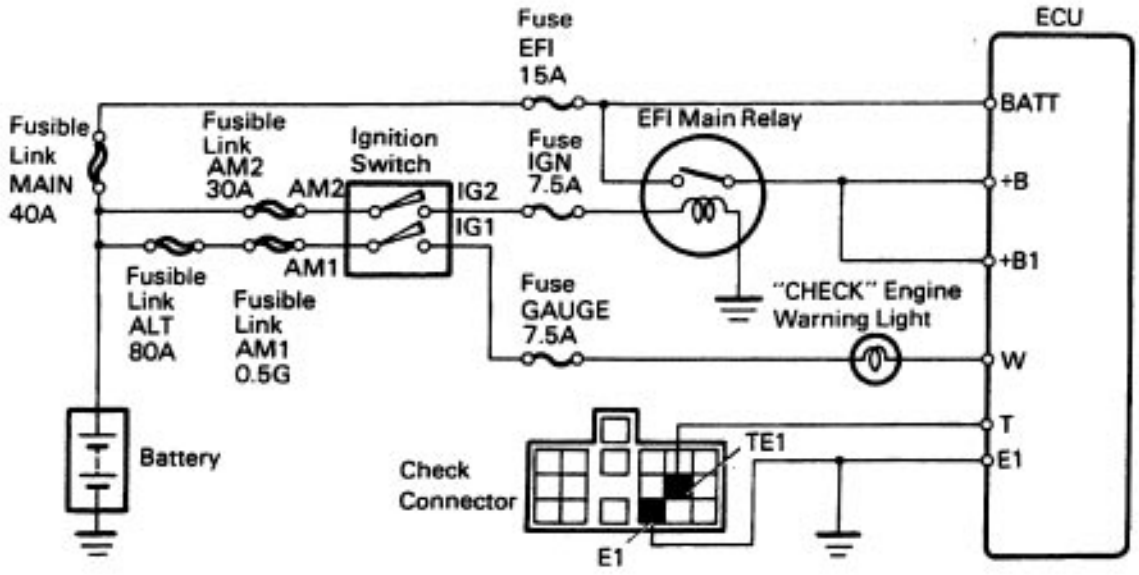
DIAGNOSTIC CODES (2VZ–FE) (Cont'd)

Code No.	Number of Check engine blinks	System	Diagnosis	Trouble area	See page
*27		Sub–oxygen Sensor Signal	Open or short circuit in sub–oxygen sensor signal (OX2)	• Sub–oxygen sensor circuit • Sub–oxygen sensor • ECU	
31		Air flow Meter Signal	Open circuit in VC signal or short circuit between VS and E2 when idle contacts are closed.	• Air flow meter circuit • Air flow meter • ECU	FI–57
32		Air Flow Meter Signal	Open circuit i n E2 or short circuit between VC and VS.	• Air flow meter circuit • Air flow meter • ECU	FI–57
41		Throttle Position Sensor Signal	Open or short circuit in throttle position sensor signal (VTA).	• Throttle position sensor circuit • Throttle position sensor • ECU	FI–55
42		Vehicle Speed Sensor Signal	No SPI signal for 8 seconds when engine speed in between 2,500 rpm and 4,500 rpm and coolant temp. is below 80˚V 07609 except when racing the engine.	• No. 1 vehicle speed sensor (Meter side) circuit • No. 1 vehicle speed sensor (Meter side) • ECU	
43		Starter Signal	No STA signal to ECU until engine speed reaches 800 rpm with vehicle not moving.	• Ignition switch circuit • Ignition switch • ECU	FI–61
52		Knock Sensor Signal	Open or short circuit in knock sensor signal (KNK).	• Knock sensor circuit • Knock sensor • ECU	
53		Knock Control Signal	Knock control program faulty.	• ECU	
*71		EG R System Malfunction	EGR gas temp. below predetermined level during EGR operation.	• EGR valve • EGR hose • EGR gas temp. sensor circuit • EGR gas temp. sensor • BVSV for EG R • BVSV circuit for EGR • ECU	FI–67
51		Switch Condition Signal	A/C signal, or no IDL signal or no NSW signal to ECU, with the check terminals TE1 and E1 shorted.	• A/C switch circuit • A/C switch • A/C amplifier • Throttle position sensor circuit • Throttle position sensor • Neutral position sensor • Neutral start switch circuit • Neutral start switch • Accelerator pedal and cable • ECU	

*CALIF. only

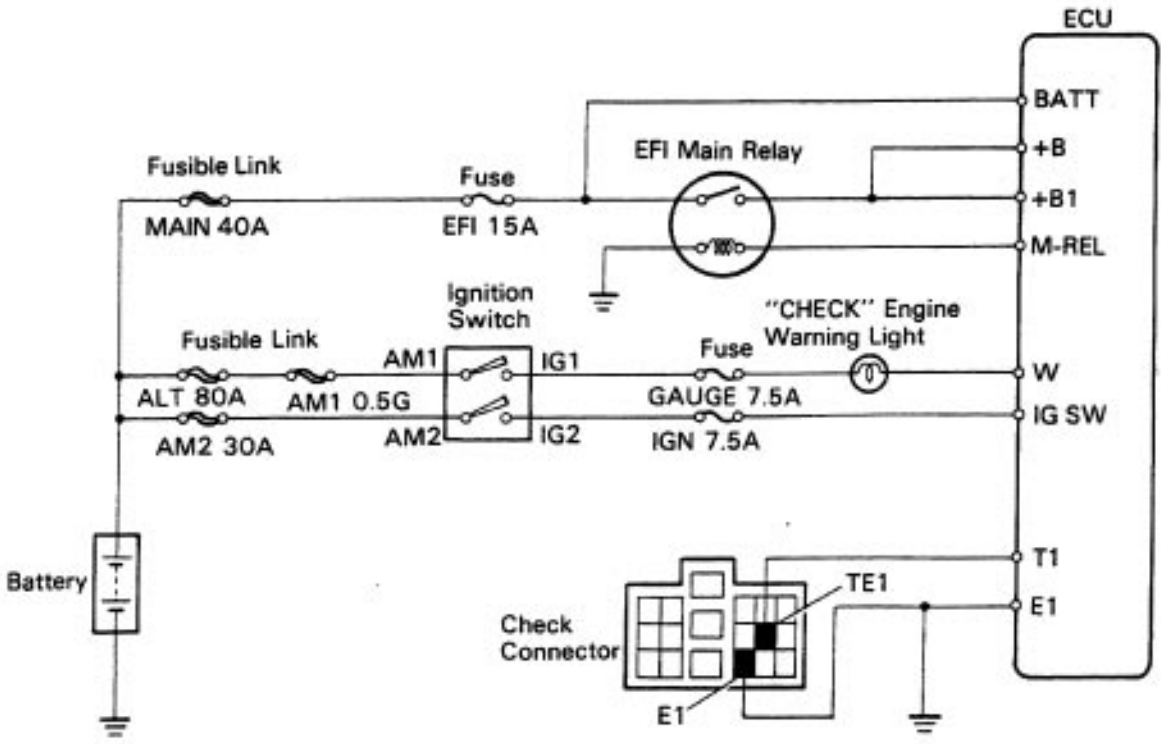
INSPECTION OF DIAGNOSIS CIRCUIT

3S-FE



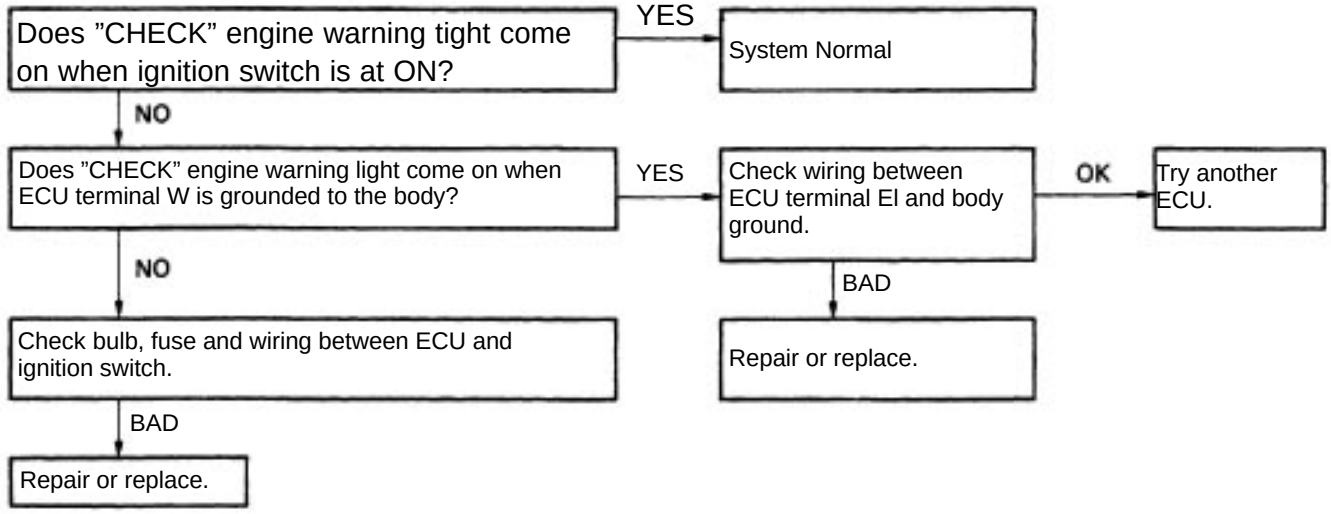
RI1846

2VZ-FE

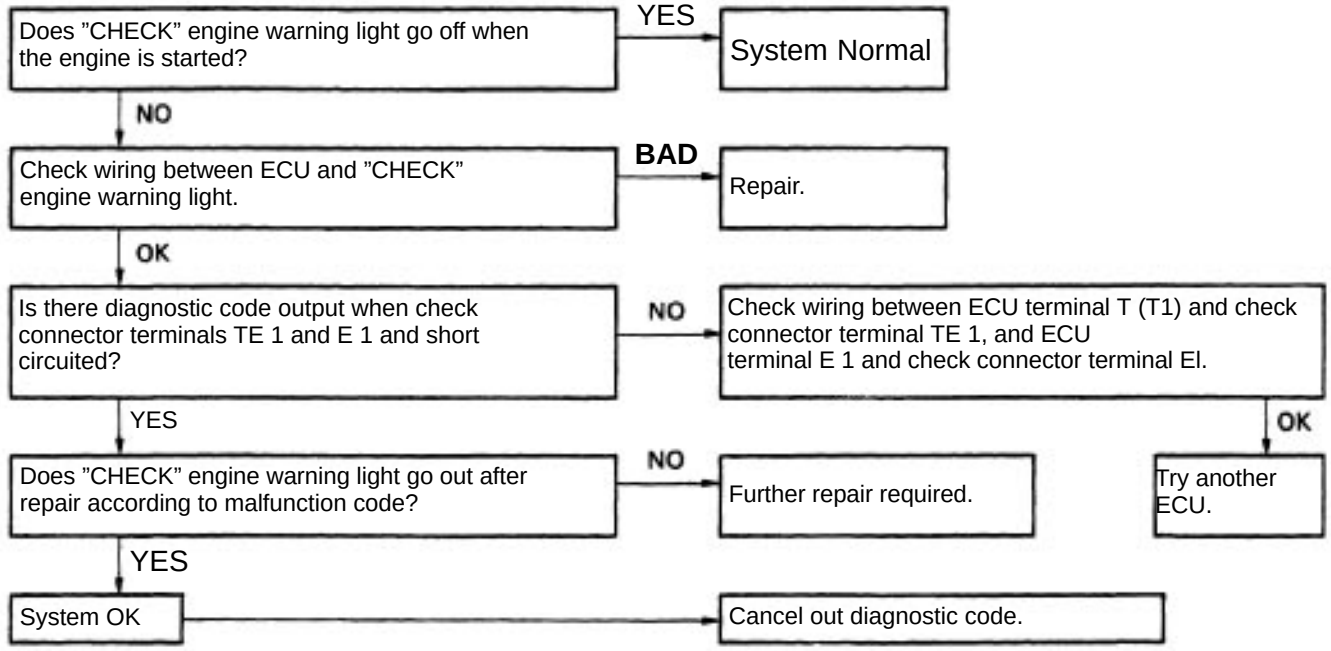


R3203

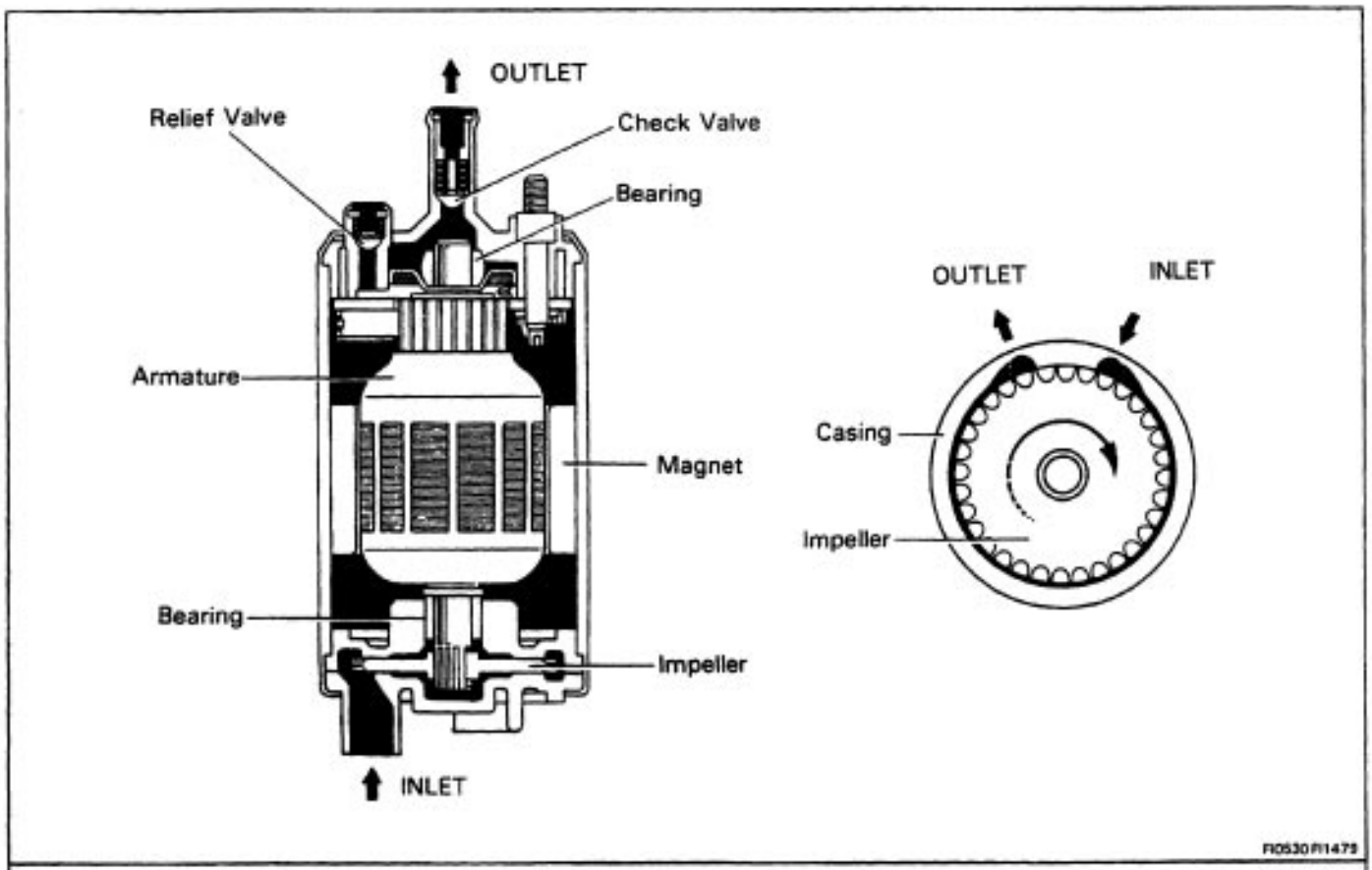
1.

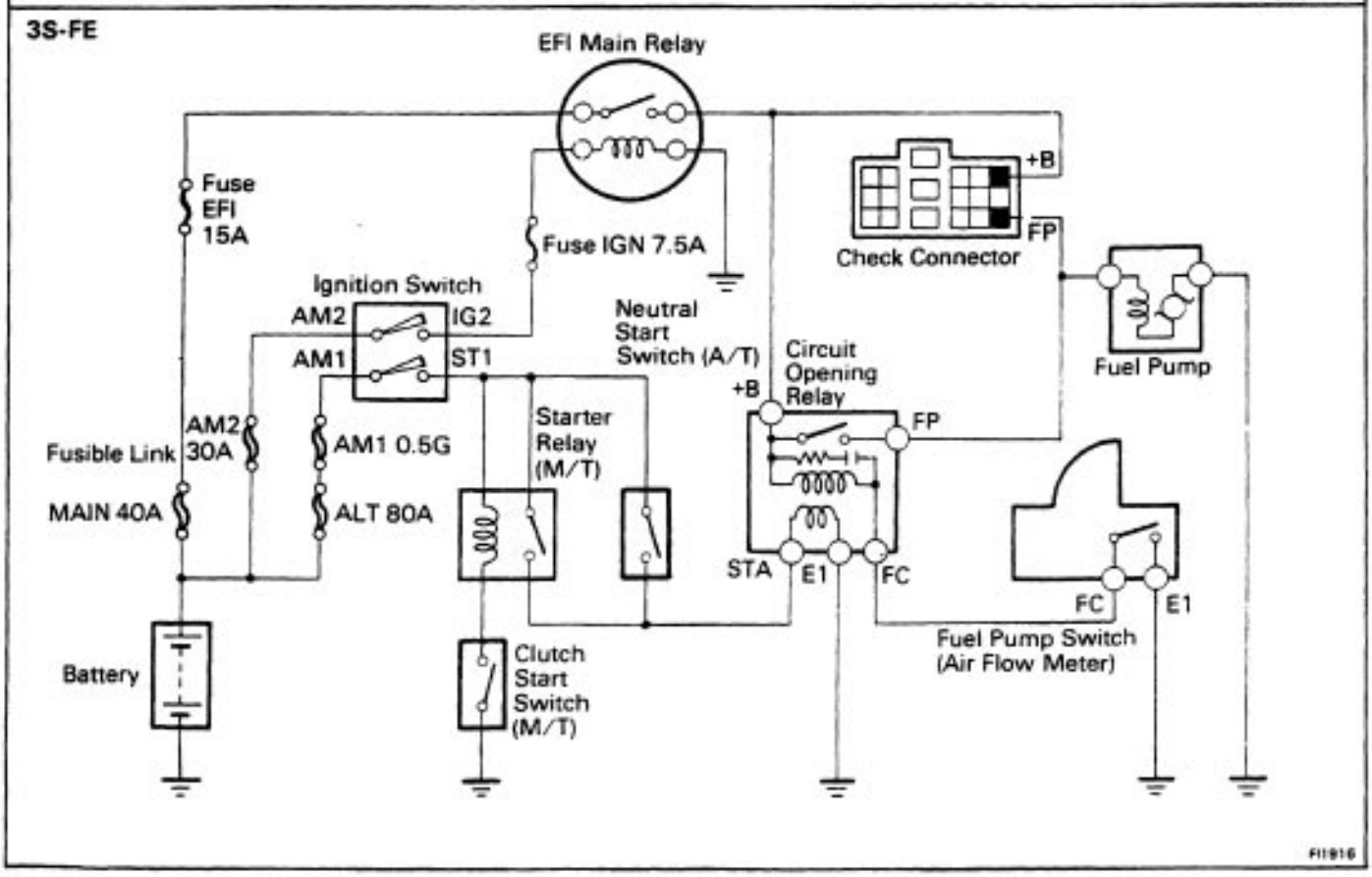

Does ”CHECK” engine warning tight come on when ignition switch is at ON?
YES
System Normal
NO
Does ”CHECK” engine warning light come on when ECU terminal W is grounded to the body?
YES
Check wiring between ECU terminal El and body ground.
OK
Try another ECU.
NO
BAD
Check bulb, fuse and wiring between ECU and ignition switch.
Repair or replace.
BAD
Repair or replace.

2.

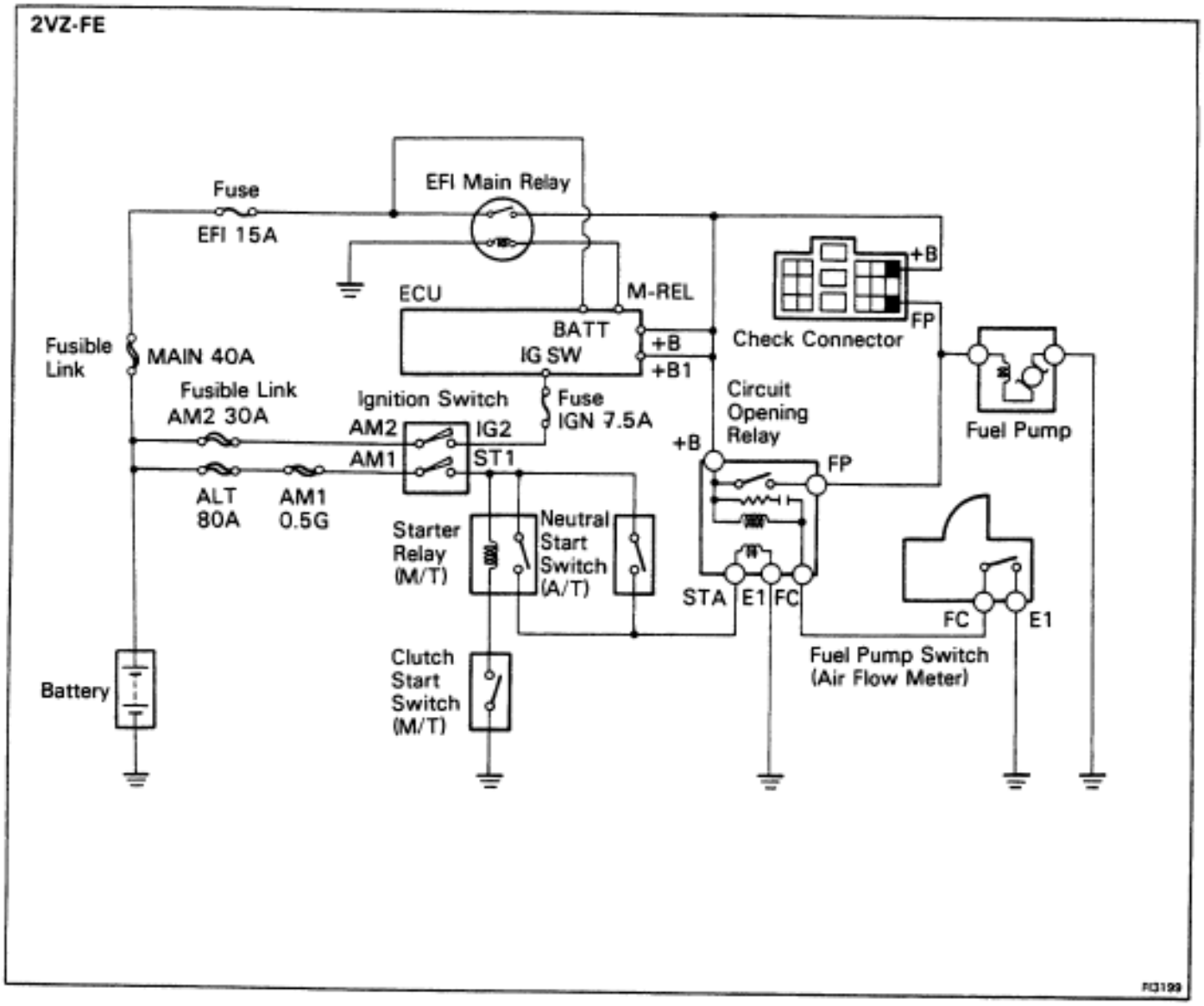

Does ”CHECK” engine warning light go off when the engine is started?
YES
System Normal
NO
Check wiring between ECU and ”CHECK” engine warning light.
BAD
Repair.
OK
Is there diagnostic code output when check connector terminals TE 1 and E 1 and short circuited?
NO
Check wiring between ECU terminal T (T1) and check connector terminal TE 1, and ECU terminal E 1 and check connector terminal El.
YES
OK
Does ”CHECK” engine warning light go out after repair according to malfunction code?
NO
Further repair required.
Try another ECU.
YES
System OK
Cancel out diagnostic code.

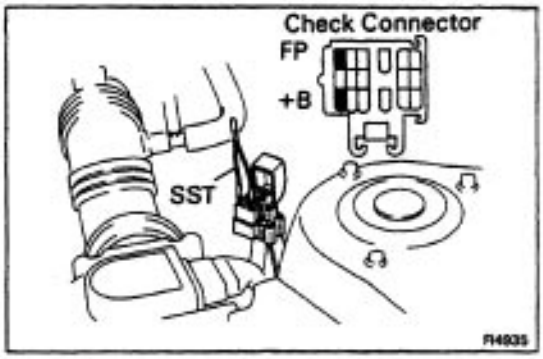
FUEL SYSTEM
Fuel Pump





2VZ-FE


Fuse
EFI 15A
EFI Main Relay
ECU
M-REL
BATT
IG SW
+B
+B1
+B
FP
Check Connector
Fusible Link
MAIN 40A
Fusible Link
AM2 30A
Ignition Switch
AM2
IG2
AM1
ST1
Fuse
IGN 7.5A
Circuit Opening Relay
+B
FP
Fuel Pump
ALT
80A
AM1
0.5G
Starter Relay (M/T)
Neutral Start Switch (A/T)
STA
E1
FC
FC
E1
Fuel Pump Switch (Air Flow Meter)
Battery
Clutch Start Switch (M/T)
FI3199



ON–VEHICLE INSPECTION

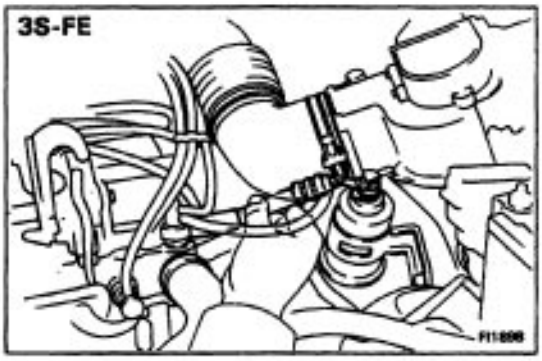
1. CHECK FUEL PUMP OPERATION

(a) Turn the ignition switch ON.

NOTICE: Do not start the engine.

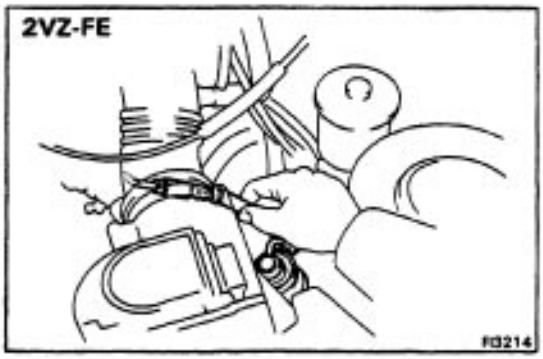
(b) Using SST, connect terminals +B and FP of the check connector.

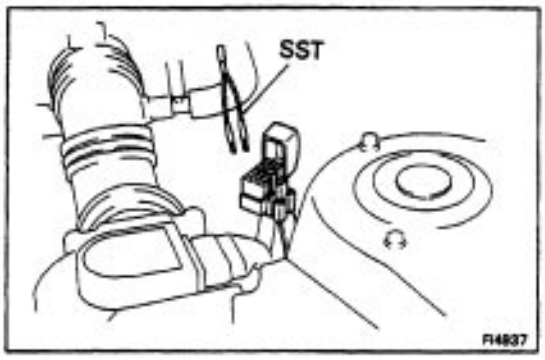
SST 09843–18020



(e) Check that there is pressure in the hose from the fuel filter.

HINT: At this time, you will hear fuel return noise.





(d) Remove SST.

SST 09843–18020

(e) Turn the ignition switch OFF.

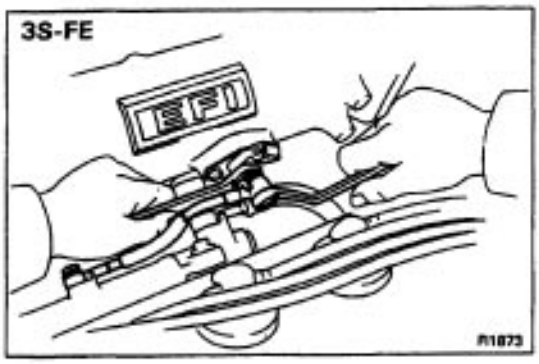
If there is no pressure, check the following parts:

- Fusible links
- Fuses (ER 15 A, IGN 7.5 A)
- ER main relay
- Fuel pump
- ECU
- Wiring connections

2. CHECK FUEL PRESSURE

(a) Check the battery voltage is above 12 volts.

(b) Disconnect the cable from the negative (–) terminal of the battery.

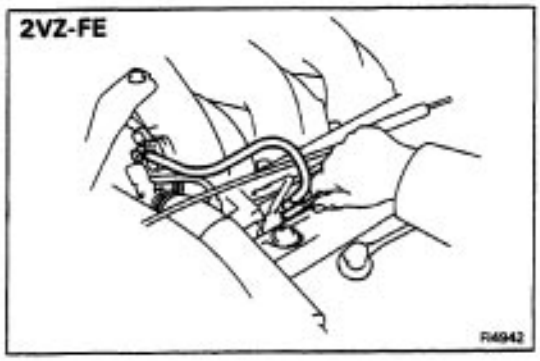


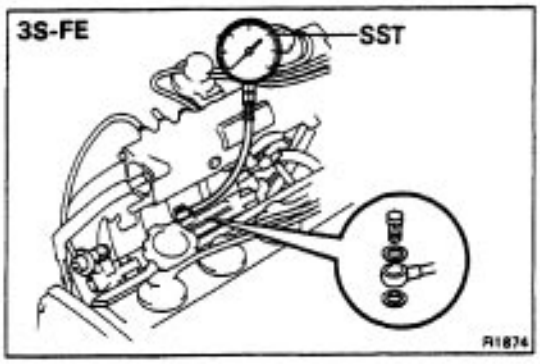
(c) Disconnect the cold start injector connector.

(d) Put a suitable container or shop towel under the cold start injector pipe (3S–FE) or tube (2VZ–FE).

(e) Remove the union bolt and two gaskets, and disconnect the cold start injector tube from the delivery pipe (3S–FE) or LH delivery pipe (2VZ–FE).

HINT: Slowly loosen the union bolt.





(f) Install SST (pressure gauge) to the delivery pipe (3S–FE) or LH delivery pipe (2VZ–FE) with new two gaskets and the union bolt.

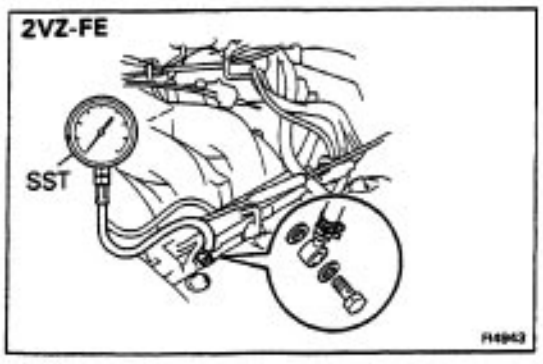
SST 09268–45012

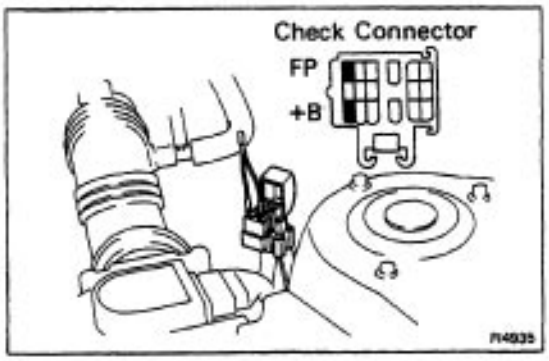
Torque: 3S–FE 180 kg–cm (13 ft–lb, 18 N–m)

2VZ–FE 200 kg–cm (14 ft–lb, 20 N –m)

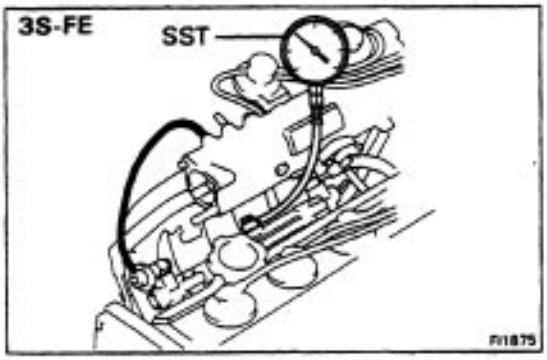
(g) Wipe off any splattered gasoline.

(h) Reconnect the battery negative H cable.



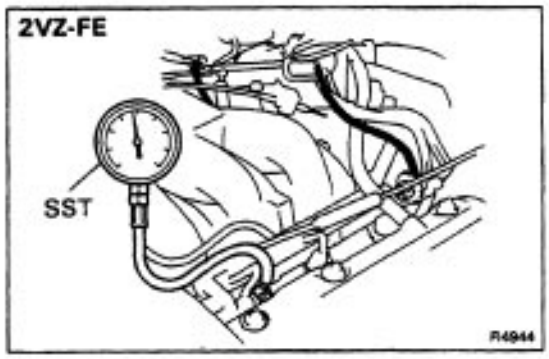


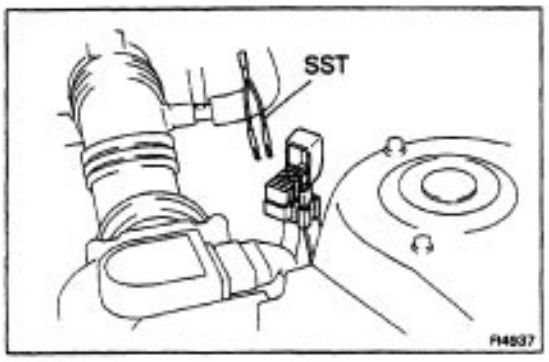
(i) Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020



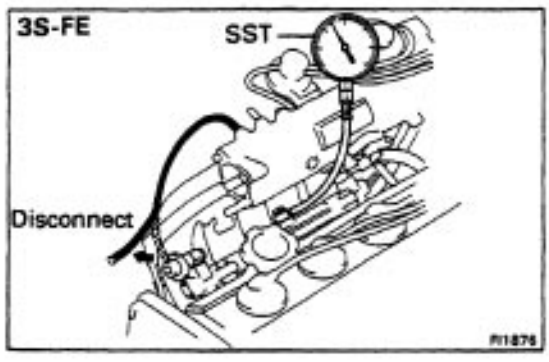
(j) Turn the ignition switch ON.
(k) Measure the fuel pressure.
Fuel pressure: 2.7 – 3.1 kg/cm^2
(38 – 44 pst, 265 – 304 kPa)
If pressure is high, replace the fuel pressure regulator.
If pressure is low, check the following parts:

- Fuel hoses and connection
- Fuel pump
- Fuel filter
- Fuel pressure regulator

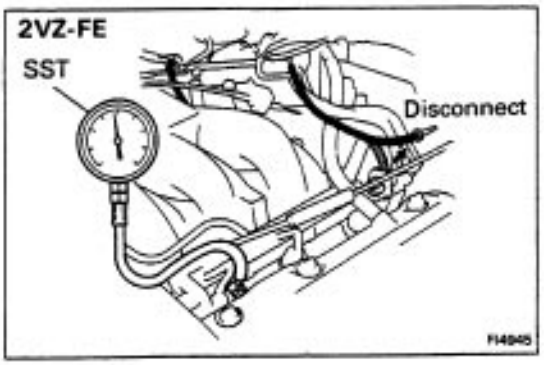


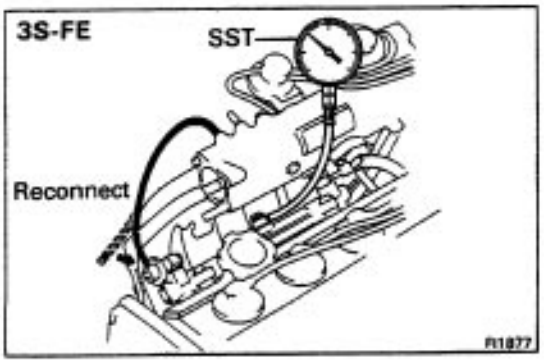


(l) Remove SST.
SST 09843–18020



(m) Start the engine. .
(n) Disconnect the vacuum sensing hose from the fuel pressure regulator, and plug the hose end.
(o) Measure the fuel pressure at idling.
Fuel pressure: 2.7 – 3.1 kg/cm^2
(38 – 44 psi, 265 – 304 kPa)





(p) Reconnect the vacuum sensing hose to the fuel pressure regulator.

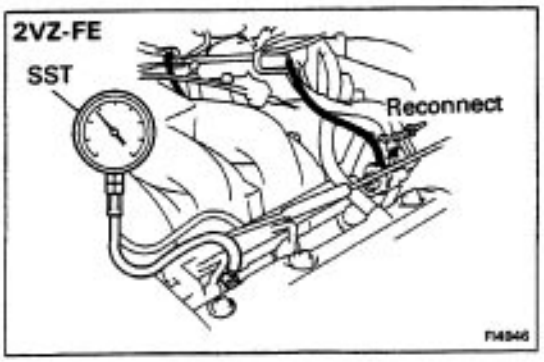
(q) Measure the fuel pressure at idling.

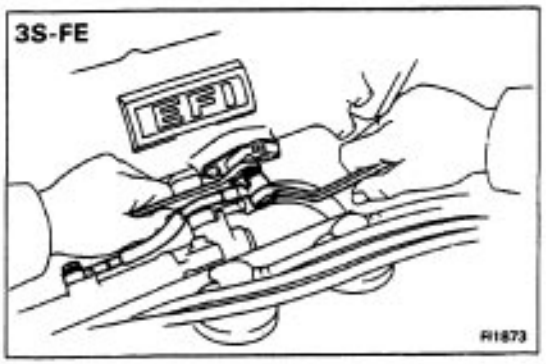
Fuel pressure: 2.3 – 2.6 kg/cm^2
(33 – 37 psi, 226 – 265 kPa)

If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.

(r) Stop the engine. Check that the fuel pressure remains 1.5 kg/cm^2 (21 psi, 147 kPa) or more for 5 minutes after the engine is turned off.

If pressure is not as specified, check the fuel pump, pressure regulator and/or injector.





(s) After checking fuel pressure, disconnect the battery negative (–) cable and carefully remove the SST to prevent gasoline from splashing.

SST 09268–45012

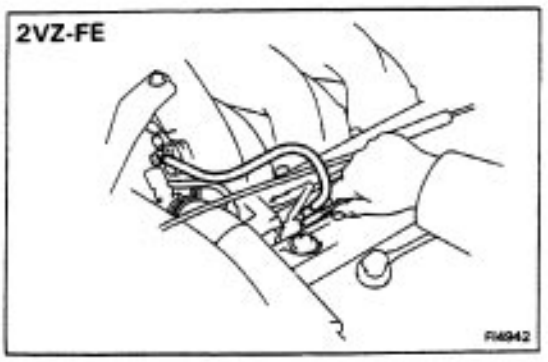
(t) Install the cold start injector pipe (3S–FE) or tube (2VZ–FE) with two new gaskets and the. union bolt.

Torque: 3S–FE 180 kg–cm (113 ft–lb, 18 N–m)
2VZ–FE 204 kg–cm (14 ft–lb, 20 N–m)

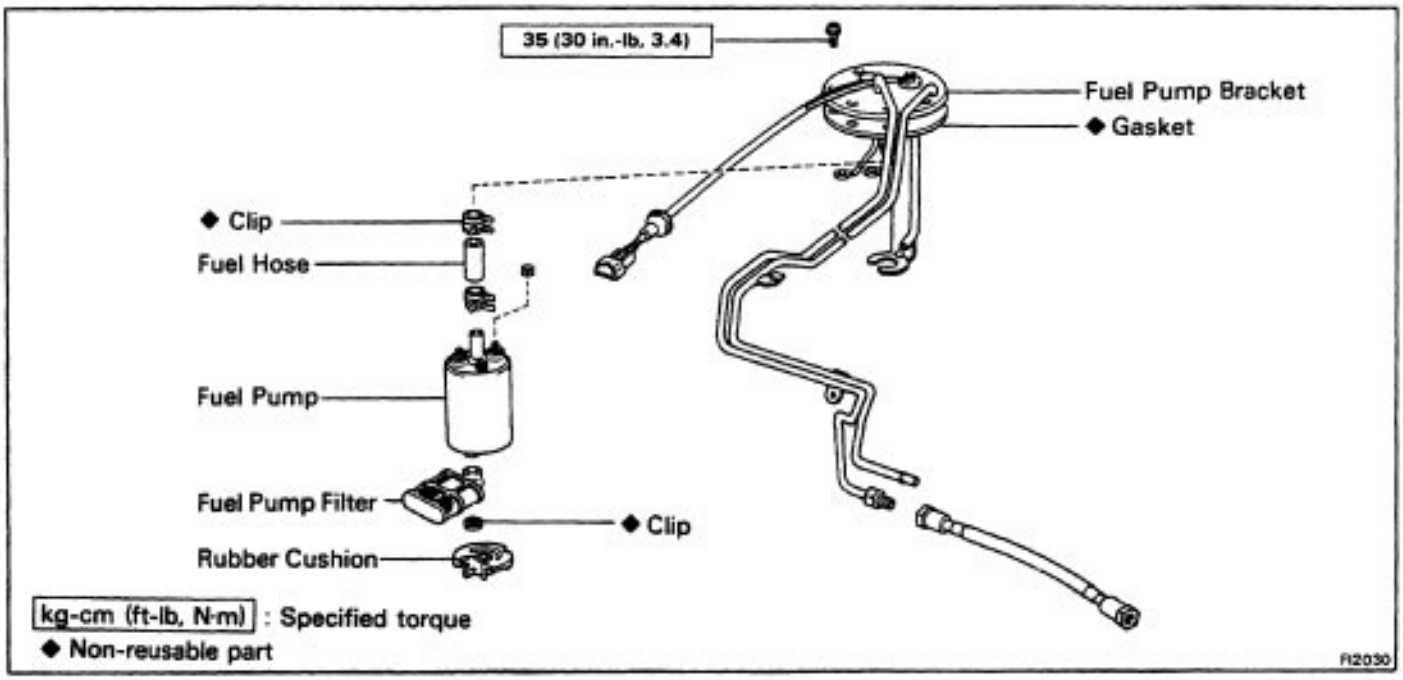
(u) Reconnect the cold start injector connector.

(v) Reconnect the cable to the negative (–) terminal of the battery.

(w) Check for fuel leakage.



COMPONENTS (2WD)

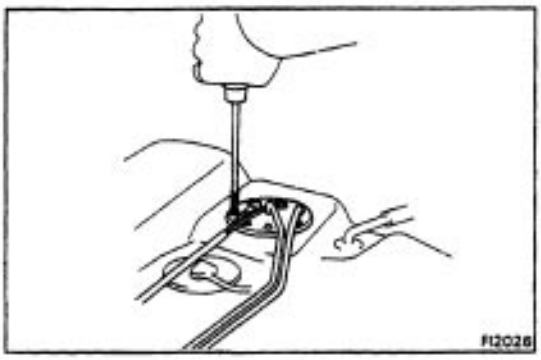


REMOVAL OF FUEL PUMP

CAUTION: Do not smoke or work near an open flame when working the fuel pump.

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

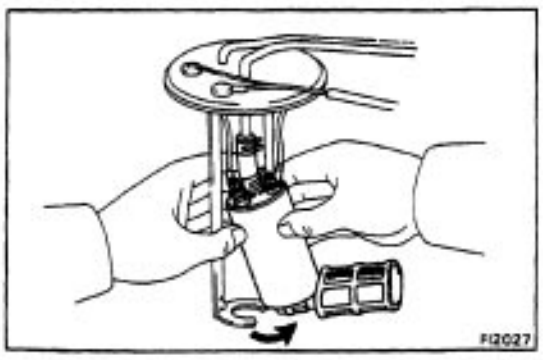
2. REMOVE FUEL TANK



3. REMOVE FUEL PUMP BRACKET FROM FUEL TANK

(a) Remove the bolt of the bracket.

(b) Remove the seven screws, pull out the pump bracket.

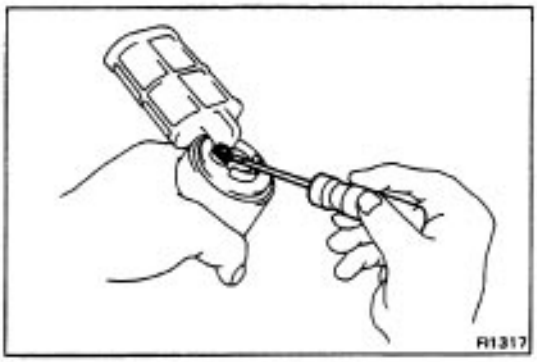


4. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET

(a) Pull off the lower side of the fuel pump from the bracket.

(b) Remove the two nuts, and disconnect the wires from the fuel pump.

(c) Disconnect the fuel hose from the fuel pump.



5. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

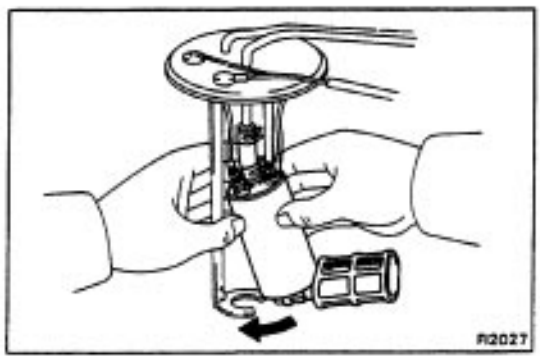
(a) Remove the rubber cushion.
(b) Using a small screwdriver, remove the clip.
(c) Pull out the pump filter.

INSTALLATION OF FUEL PUMP

(See page FI–74)

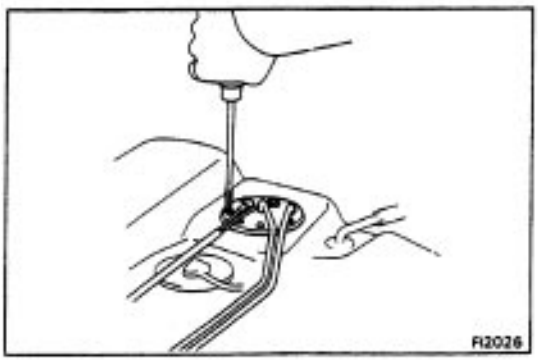
1. INSTALL FUEL PUMP FILTER TO FUEL PUMP

(a) Install the pump filter with a new clip.
(b) Install the rubber cushion.



2. INSTALL FUEL PUMP TO FUEL PUMP BRACKET

(a) Connect the fuel hose to the outlet port of the fuel pump.
(b) Connect the wires to the fuel pump with the two nuts.
(e) Push the lower side of the fuel pump, and install the fuel pump.



3. INSTALL FUEL PUMP BRACKET TO FUEL TANK

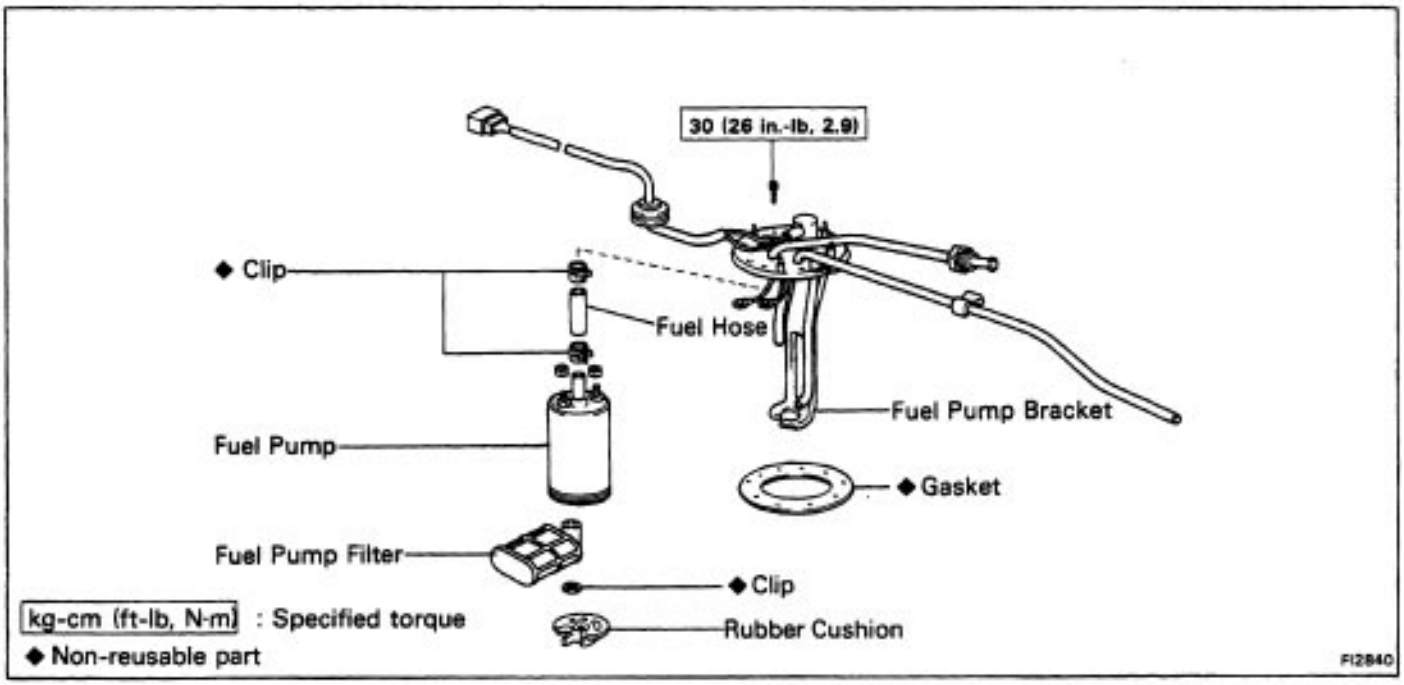
(a) Install a new gasket and the pump bracket with the seven screws.
Torque: 40 kg–cm (35 in.–lb, 3.9 N–m)
(b) Install the bolt of the bracket.

4. INSTALL FUEL TANK

When installing the fuel tank, refer to FI–65 for the installation position of the cushion and the tightening torque.

5. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

COMPONENTS (4WD)

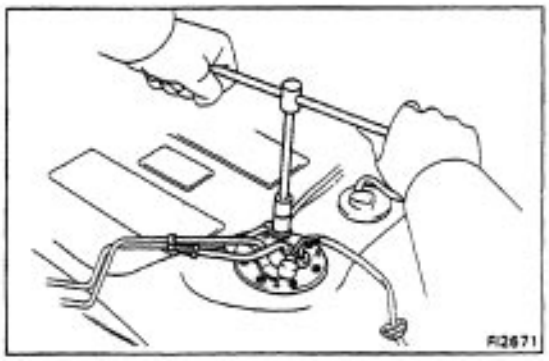


REMOVAL OF FUEL PUMP

CAUTION: Do not smoke or work near an open flame when working the fuel pump.

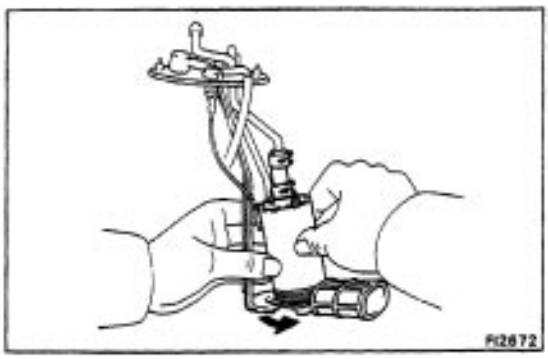
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. REMOVE FUEL TANK



3. REMOVE FUEL PUMP BRACKET FROM FUEL TANK

Remove the seven bolts, pull out the pump bracket.

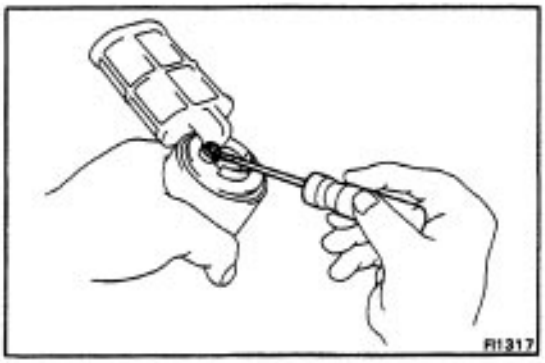


4. REMOVE FUEL PUMP–FROM FUEL PUMP BRACKET

(a) Pull off the lower side of the fuel pump from the bracket.

(b) Remove the two nuts, and disconnect the wires from the fuel pump.

(c) Disconnect the fuel hose from the fuel pump.



5. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

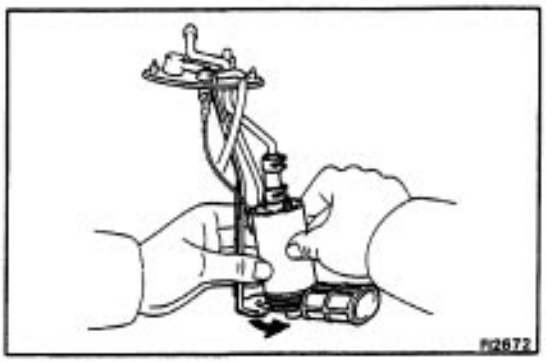
(a) Remove the rubber cushion.
(b) Using a small screwdriver, remove the clip.
(e) Pull out the pump filter.

INSTALLATION OF FUEL PUMP

(See page FI–76)

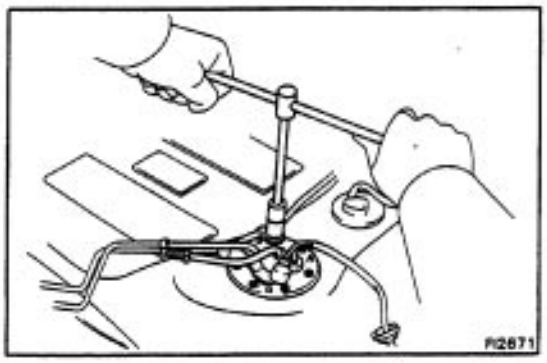
1. INSTALL FUEL PUMP FILTER TO FUEL PUMP

(a) Install the pump filter with a new clip.
(b) Install the rubber cushion.



2. INSTALL FUEL PUMP TO FUEL PUMP BRACKET

(a) Connect the fuel hose to the outlet port of the fuel pump.
(b) Connect the wires to the fuel pump with the two nuts.
(c) Push the lower side of the fuel pump, and install the fuel pump.



3. INSTALL FUEL PUMP BRACKET TO FUEL TANK

Install a new gasket and the pump bracket with the seven bolts.

Torque: 30 kg–cm (26 in.–lb, 2.9 N–m)

4. INSTALL FUEL TANK

When installing the fuel tank, refer to FI–65 for the installation position of the cushion and the tightening torque.

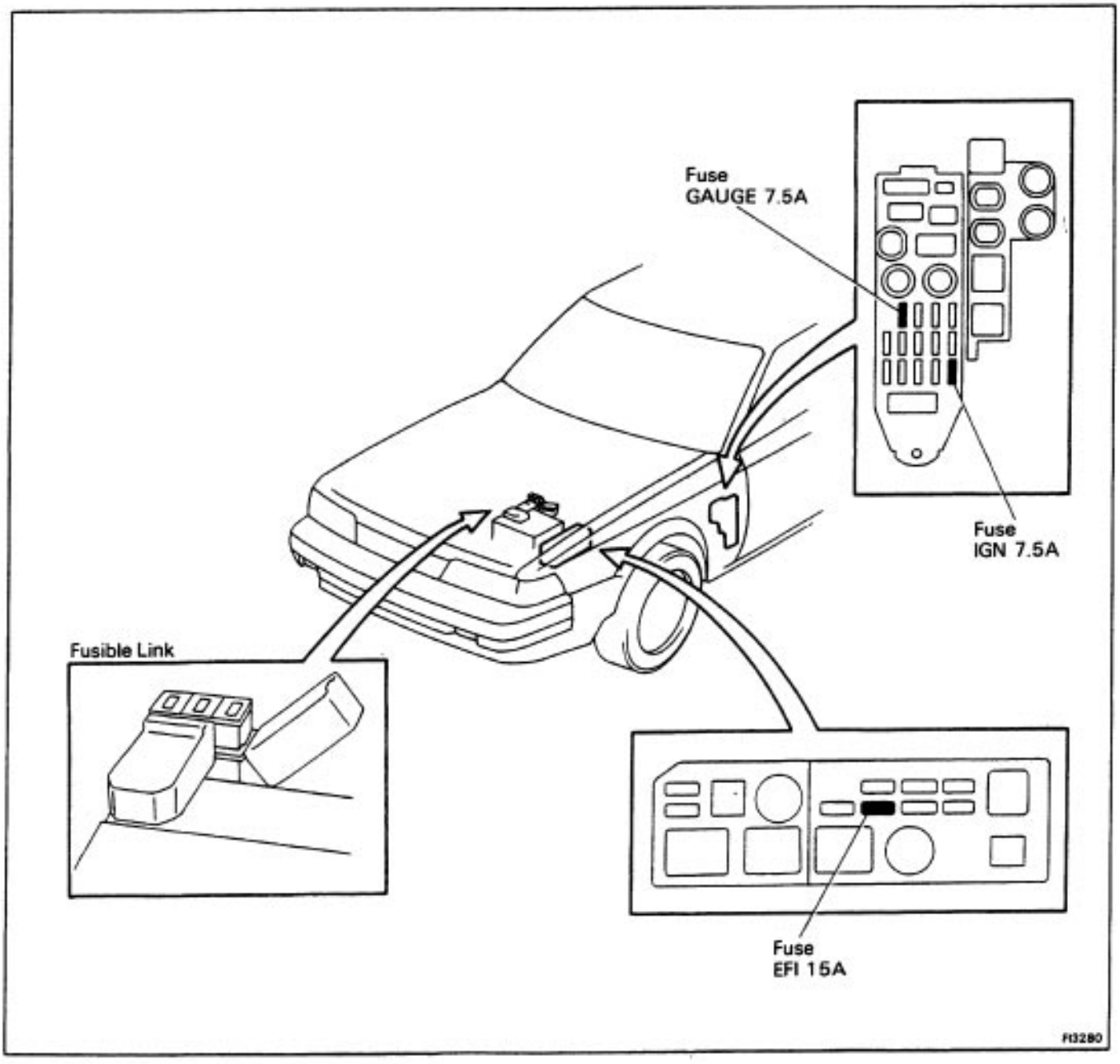
5. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

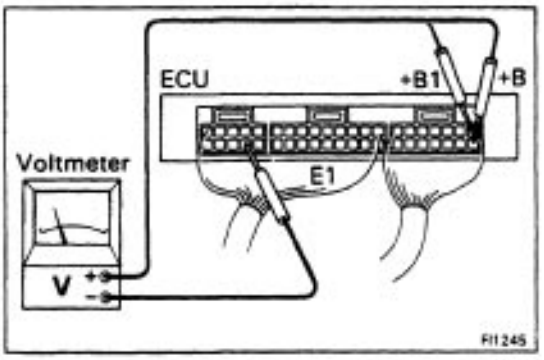
TROUBLESHOOTING WITH VOLT OHMMETER

HINT:

- The following troubleshooting procedures are designed for inspection of each separate system, and therefore
  the actual procedure may vary somewhat. However, troubleshooting should be performed while referring to the inspection methods described in this manual.
- Before beginning inspection, it is best to first make a simple check of the fuses, fusible links and the condition of the connectors.
- The following troubleshooting procedures are based on the supposition that the trouble lies in either a short or open circuit within the computer.
- If engine trouble occurs even though proper operating voltage is detected in the computer connector, then it can be assumed that the ECU is faulty and should be replaced. .

LOCATION OF FUSES AND FUSIBLE LINKS





EFI SYSTEM CHECK PROCEDURE (3S–FE)

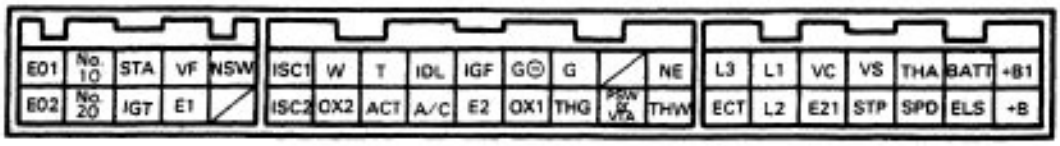
HINT:

- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in ”ON” position.
  Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors.

Terminals of ECU

Symbol	Terminal name	Symbol	Terminal name	Symbol	Terminal name
E01	ENGINE GROUND	*4ACT	A/C AMPLIFIER	*2ECT	ECT ECU
E02	**ENGINE GROUND**	IDL	THROTTLE POSITION SENSOR	*2L1	ECT ECU
No. 10	INJECTOR	*4A/C	A/C MAGNET SWITCH	*2L2	ECT ECU
No. 20	INJECTOR	IGF	IGNITER	VC	AIR FLOW METER
STA	STARTER SWITCH	E2	SENSOR GROUND	E21	**SENSOR GROUND**
IGT	IGNITER	G⊖	DISTRIBUTOR	VS	AIR FLOW METER
VF	CHECK CONNECTOR	OX1	**OXYGEN SENSOR**	STP	STOP LIGHT SWITCH
E1	ENGINE GROUND	G	DISTRIBUTOR	THA	AIR FLOW METER
NSW	NEUTRAL START SWITCH	*3THG	EGR GAS TEMP. SENSOR	SPD	SPEED SENSOR
ISC1	ISC VALVE	*1PSW	THROTTLE POSITION SENSOR	BATT	BATTERY
ISC2	ISC VALVE	*2VTA	THROTTLE POSITION SENSOR	ELS	HEADLIGHT and DEFOGGER
W	WARNING LIGHT	NE	DISTRIBUTOR	+B1	MAIN RELAY
*3OX2	**SUB–OXYGEN SENSOR**	THW	WATER TEMP. SENSOR	+B	MAIN RELAY
T	CHECK CONNECTOR	*2L3	ECT ECU		

ECU Terminals



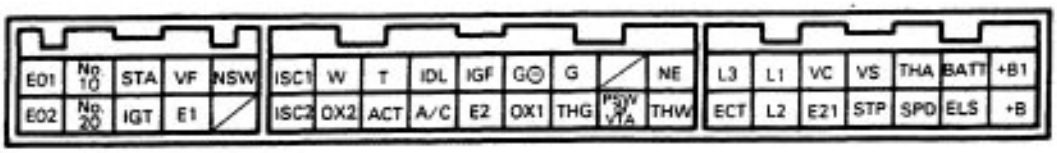
*1 w/o ECT
*2 w/ ECT
*3 CALIF. only
*5 w/ A/C

FI0505

Voltage at ECU Wiring Connectors (3S–FE)

No.	Terminals	Condition		STD voltage (V)	See page
1	+B, +B1 — E1	IG SW ON		10 — 14	FI–34
2	BATT — E1	—		10 — 14	FI–35
*1 3	IDL — E1	IG SW ON	Throttle valve open	8 — 14	FI–36
	PSW — E1		Throttle valve fully closed	4 — 6	
*2 4	IDL — E2		Throttle valve open	8 — 14	FI–37
	VC — E2		—	4 — 6	
	VTA — E2		Throttle valve fully closed	0.1 — 1.0	
			Throttle valve open	4 — 6	
5	VC — E2			4 — 6	FI–39
	VS — E2		Measuring plate fully closed	4.0 — 5.5	
			Measuring plate fully open	0 — 1	
		Idling		2.0 — 4.0	
		3,000 rpm		1.0 — 2.0	
6	No.10, No.20 — E01, E02	IG SW ON		10 — 14	FI–40
7	THA — E2	IG SW ON	Intake air temp. 20°C (68°F)	1 — 3	FI–41
8	THW — E2		Coolant temp. 80°C (176°F)	0.1 — 1.0	FI–42
9	STA — E1	Cranking		6 — 14	FI–43
10	IGT — E1	Cranking or idling		0.7 — 1.0	FI–44
11	ISC1, ISC2 — E1	IG SW ON		9 — 14	FI–45
12	W — E1	No trouble ("CHECK" engine warning light off) and engine running		10 — 14	FI–46
13	*3 A/C — E1	IG SW ON	Air conditioning ON	8 — 14	FI–47

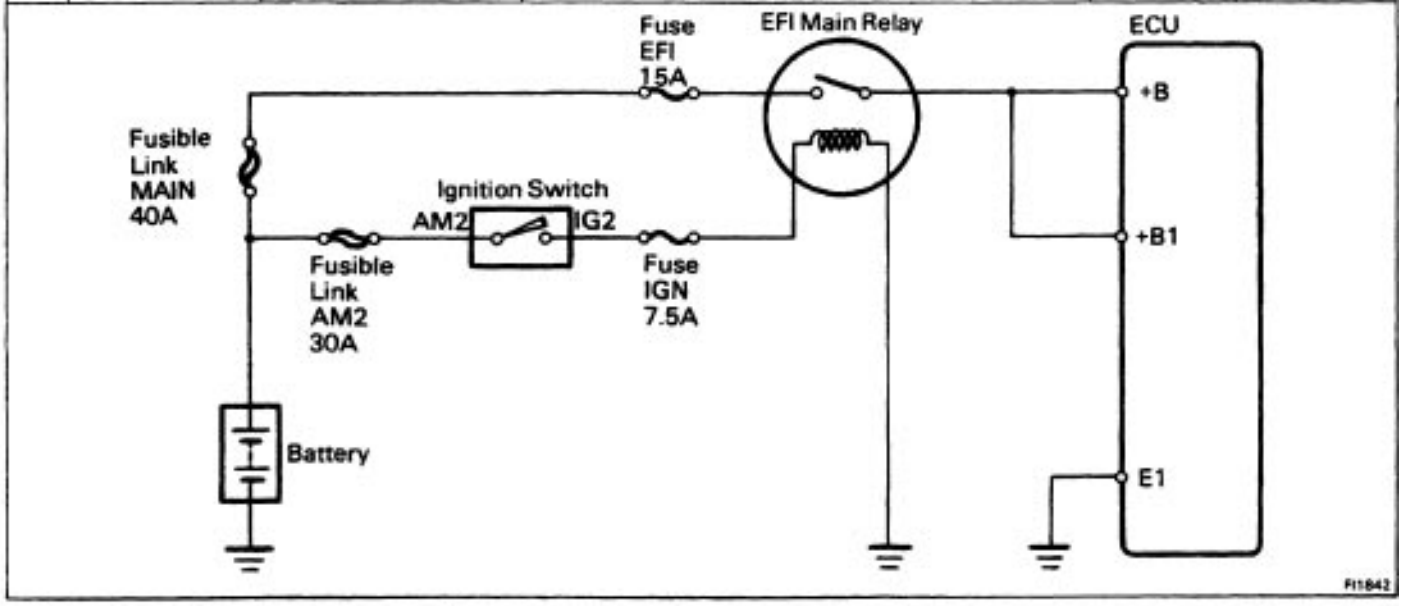
ECU Terminals

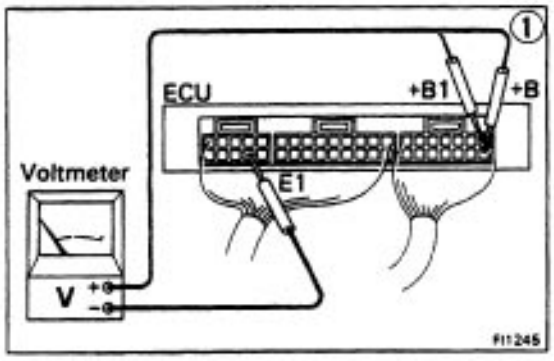


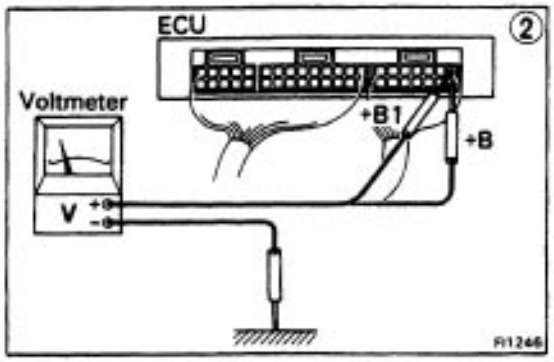
*1 w/o ECT
*2 w/ ECT
*3 w/ A/C

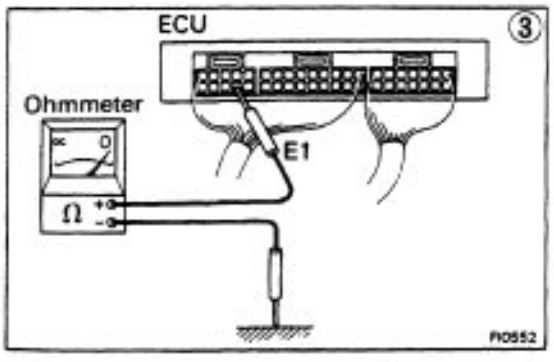
FI0605

No.	Terminals	Trouble	Condition	STD voltage
1	+B, +B1 — E1	No voltage	Ignition SW ON	10 — 14 V









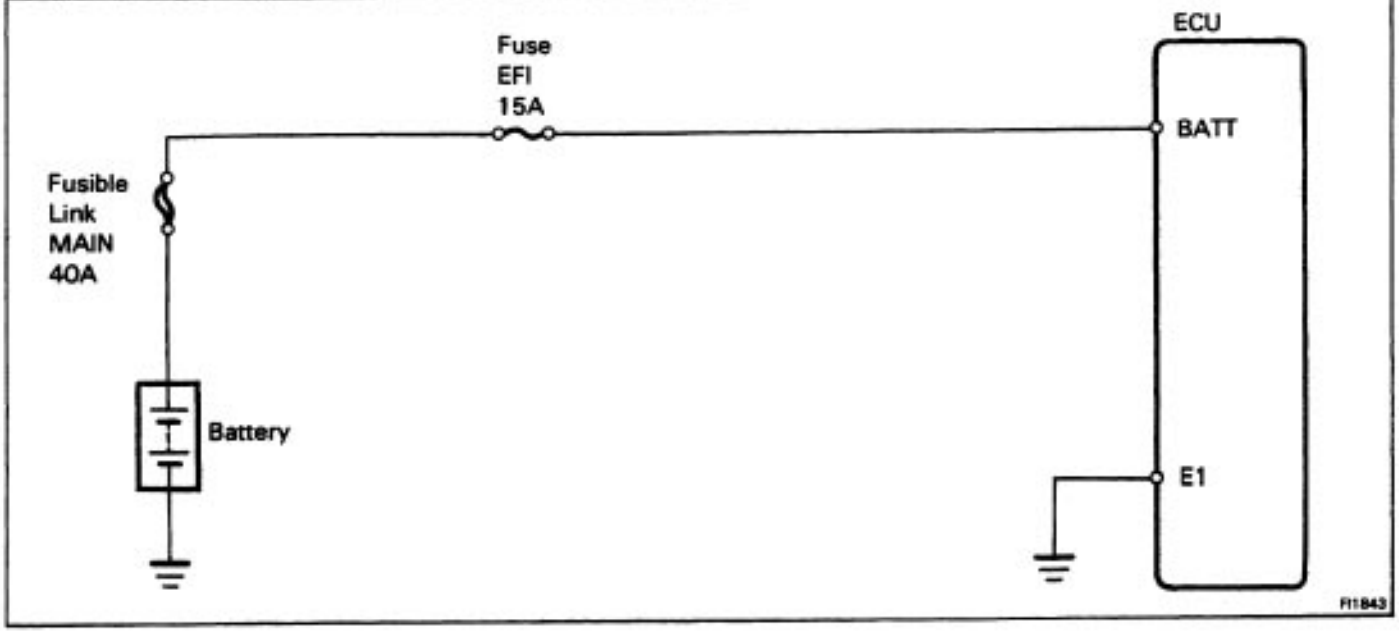
① No voltage between ECU terminals +B or +B1 and El. (IG SW ON)

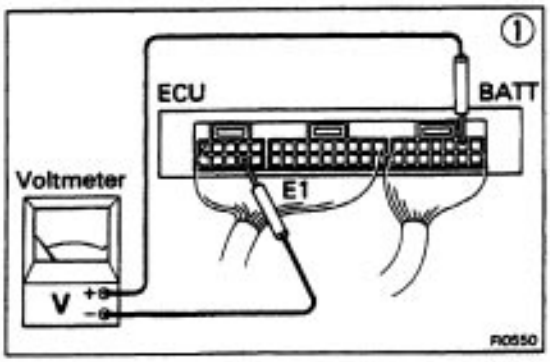
② Check that there is voltage between ECU terminal +B or +B1 and body ground. (IG SW ON)

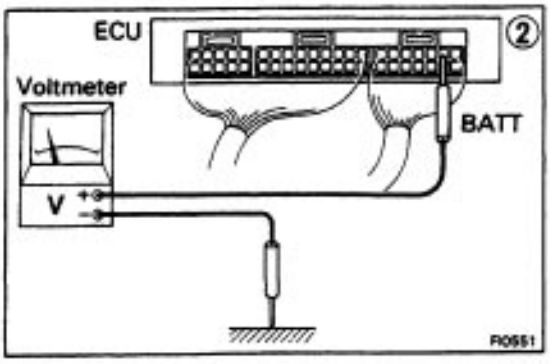
NO → Check fuse, fusible link and ignition switch.
- BAD → Repair or replace.
- OK → Check ER main relay.
  - BAD → Replace.
  - OK → Check wiring between ER main relay and battery.
    - BAD → Repair or replace.

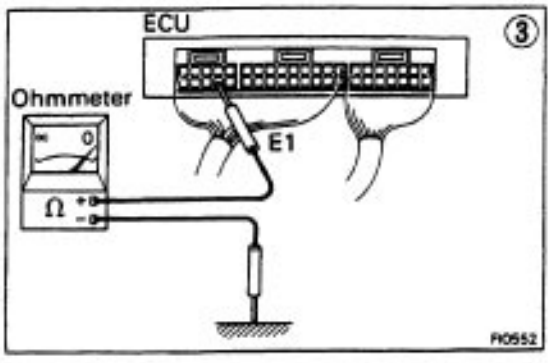
OK → ③ Check wiring between ECU terminal E1 and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD voltage
2	BATT — E1	No voltage	—	10 — 14 V









① No voltage between ECU terminals BATT and E1.

② Check that there is voltage between ECU terminal BATT and body ground.

NO

OK

③ Check wiring between ECU terminal El and body ground.

OK

Try another ECU.

BAD

Repair or replace.

Check fuse and fusible link.

BAD

Replace.

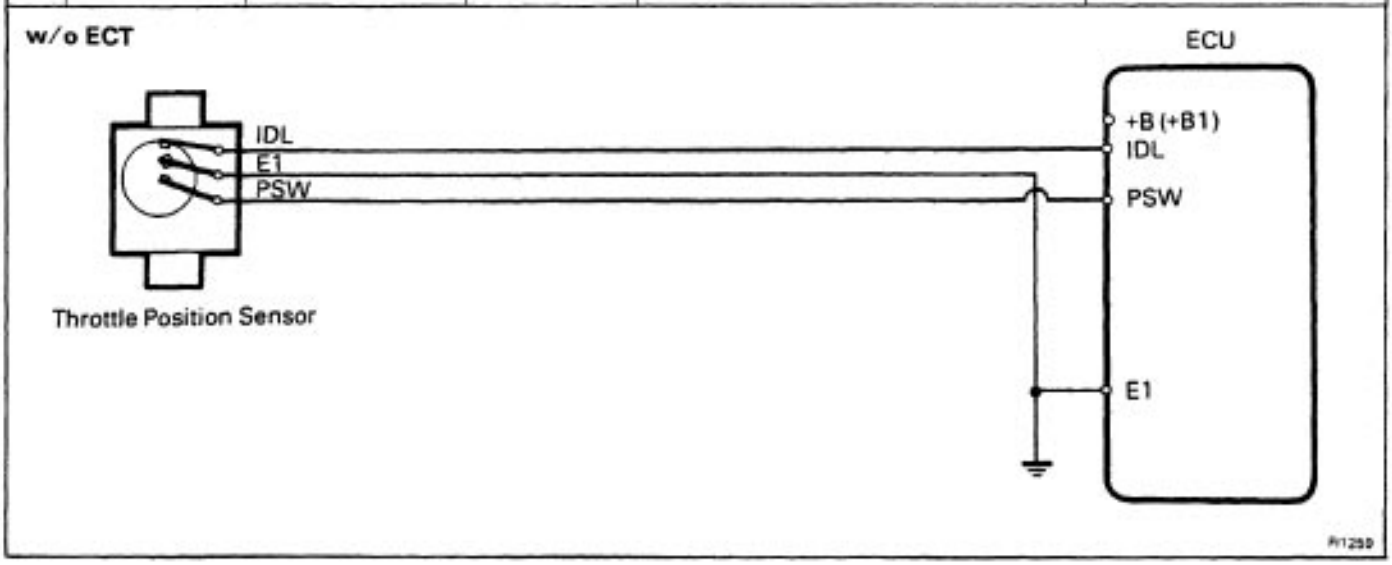
OK

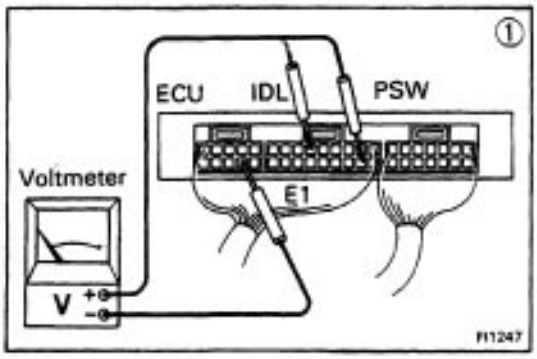
Check wiring between ECU terminal and battery.

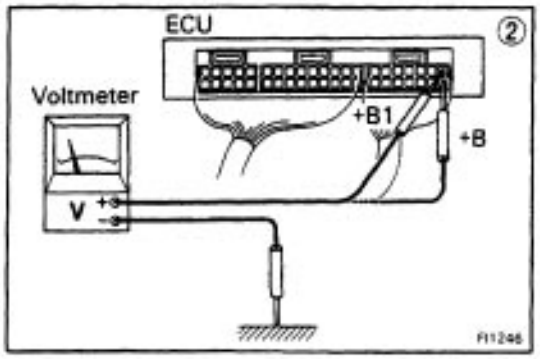
BAD

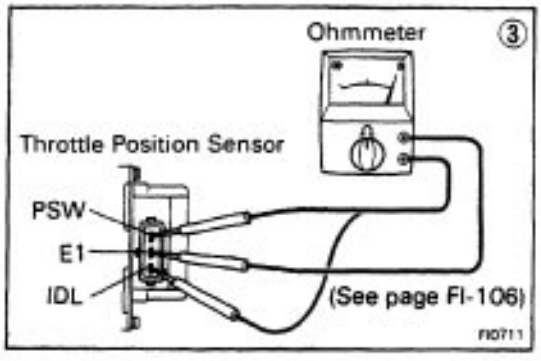
Repair or replace.

No.	Terminals	Trouble	Condition		STD voltage
3	IDL — E1	No voltage	IG SW ON	Throttle valve open	8 — 14 V
	PSW — E1			Throttle valve fully closed	4 — 6 V









① No voltage between ECU terminal 1D1. or PSW and E1. (IG SW ON)

② Check that there is voltage between ECU terminal + B or + B1 and body ground. (IG SW ON)

NO

OK

Check wiring between ECU terminal El and body ground.

BAD

Repair or replace.

Refer to No. 1. (See page FI–34)

BAD

Repair or replace.

OK

③ Check throttle position sensor. (See page FI–106)

BAD

OK

Replace or repair throttle position sensor.

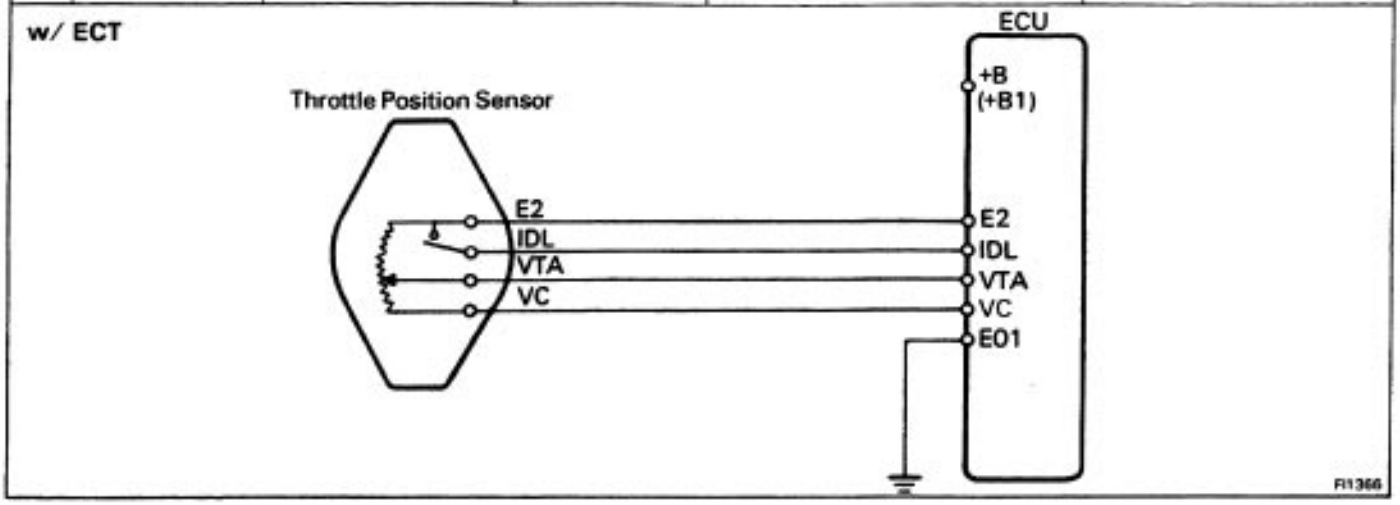
Check wiring between ECU and throttle position sensor.

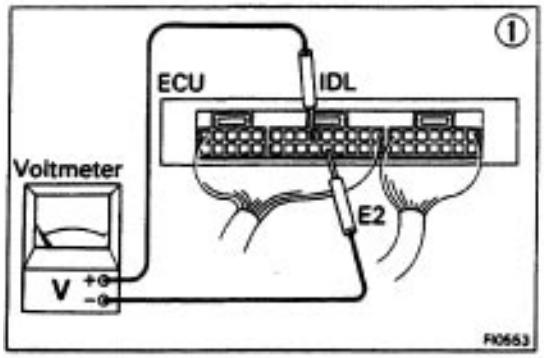
BAD

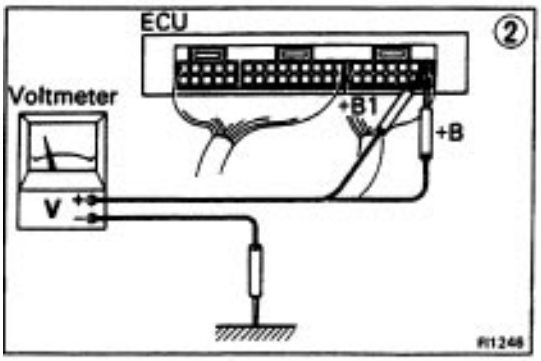
OK

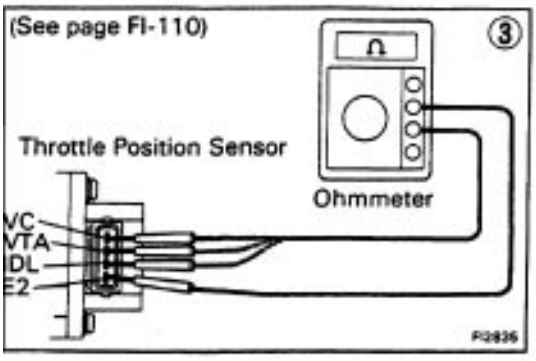
Try another ECU.

No.	Terminals	Trouble	Condition		STD voltage
4	IDL — E2	No voltage	IG SW ON	Throttle valve open	8 — 14V
	VC — E2			—	4 — 6 V
	VTA — E2			Throttle valve fully closed	0.1 — 1.0 V
				Throttle valve fully open	4 — 6









- IDL – E2

① No voltage between ECU terminals IDL and E2. OG SW ON) (Throttle valve open)

② Check that there is voltage between ECU terminal +B or +B1 and body ground. (IG SW 4111)

NO

OK

Check wiring between ECU terminal El and body ground.

OK

BAD

Repair or replace.

Refer to No. 1. (See page FI–34)

BAD

Repair or replace.

OK

③ Check throttle position sensor. (See page FI–110)

BAD

OK

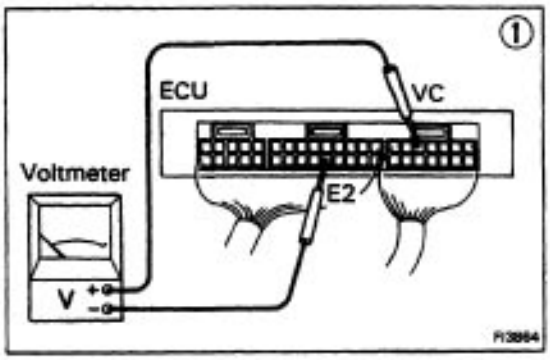
BAD

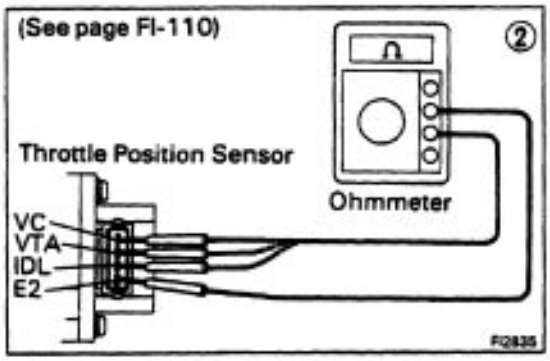
Repair or replace throttle position sensor.

Check wiring between ECU and throttle position sensor.

OK

Try another ECU.





- **VC–E2**

① No voltage between ECU terminals VC and E2. (IG SW ON)

Check that there is voltage between ECU terminal +B or +131 and body ground. (IG SW ON)

OK → ② Check throttle position sensor. (See page FI–110)

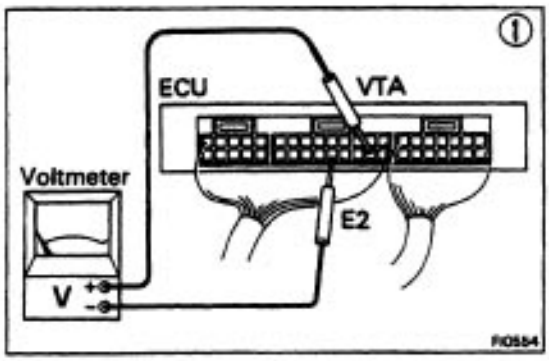
NO → Refer to NO–1. (See page FI–34)

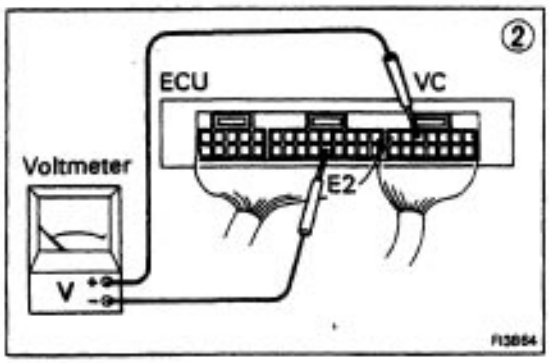
② BAD → Repair or replace.

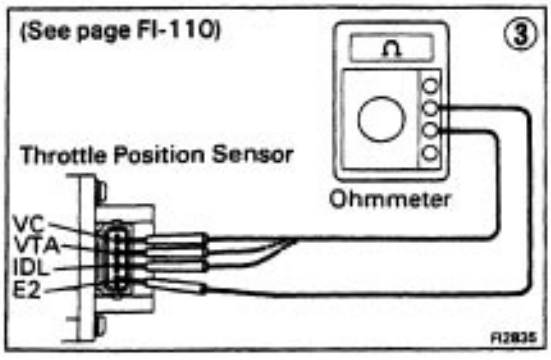
② OK → Check wiring between ECU and throttle position sensor.

Check wiring between ECU and throttle position sensor: OK → Try another ECU.

Check wiring between ECU and throttle position sensor: BAD → Repair or replace wiring.







- **NTA – E2**

① No specified voltage at ECU terminals VTA and E2. (IG SW ON)

② Check that there is voltage between ECU terminal VC and E2 (IG SW ON)

NO → Refer to VC–E2 trouble section

OK → ③ Check throttle position sensor (See page FI–110)

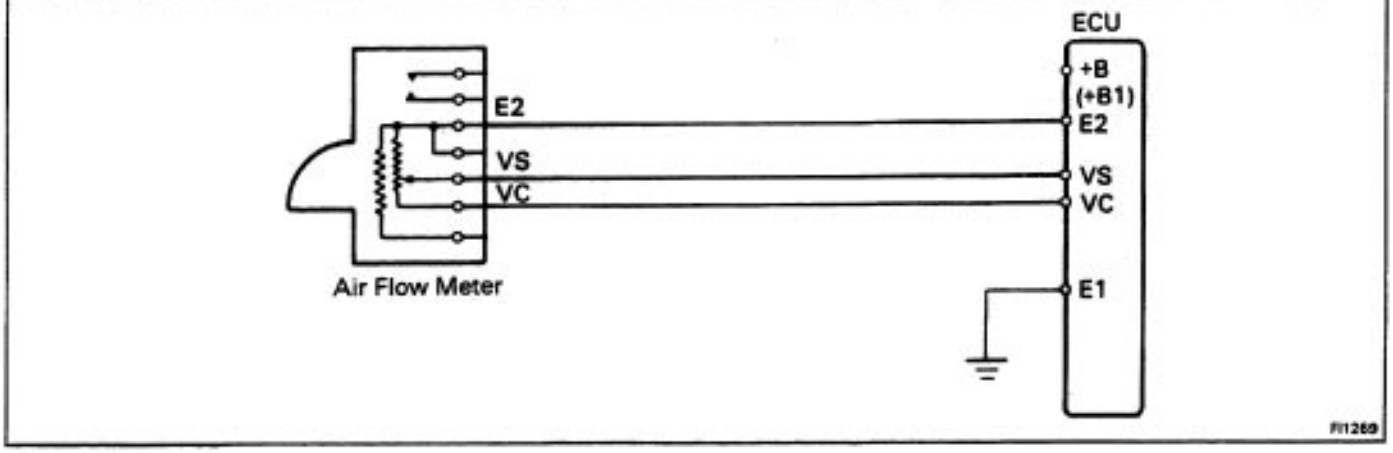
③ BAD → Repair or replace.

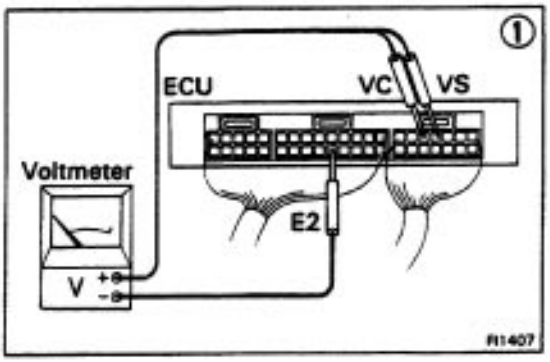
③ OK → Check wiring between ECU and throttle position sensor.

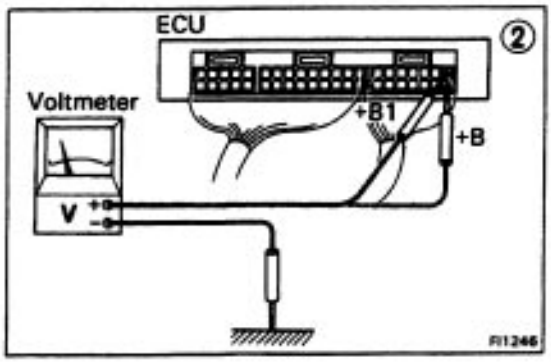
Check wiring between ECU and throttle position sensor: BAD → Repair or replace.

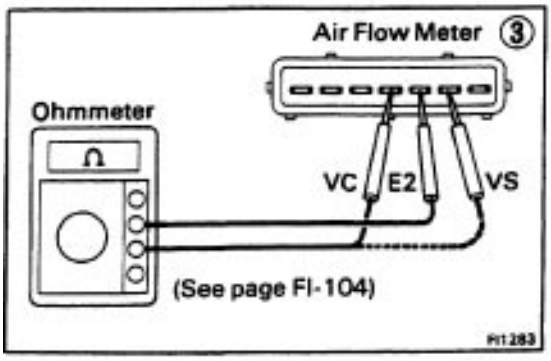
Check wiring between ECU and throttle position sensor: OK → Try another ECU.

No.	Terminals	Trouble	Condition		STD voltage
5	VC — E2	N o voltage	IG SW ON	—	4 — 6 V
	VS — E2			Measuring plate fully closed	4.0 — 5.5 V
				Measuring plate fully open	0 — 1 V
			Idling		2.0 — 4.0 V
			3,000 rpm		1.0 — 2.0 V









① No specified voltage at ECU terminals VC or VS and E2. (IG SW ON)

↓

② Check that there is voltage between ECU terminal +B or +B1 and body ground. (IG SW ON)

OK → ↓

NO → Refer to No. 1. –(See page FI–34)

↓

Check wiring between ECU terminal E1 and body ground.

OK → ↓

BAD → Repair or replace.

③ Check air flow meter. (See page FI–104)

BAD → Replace air flow meter.

OK → ↓

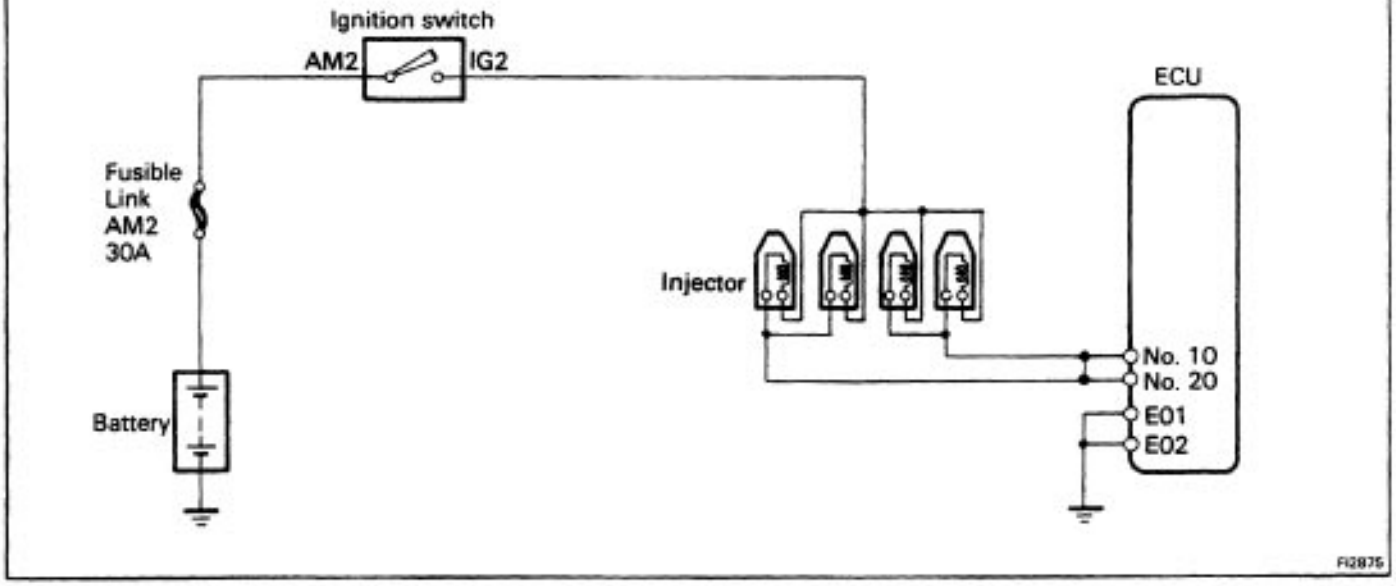
Check wiring between ECU and air flow meter.

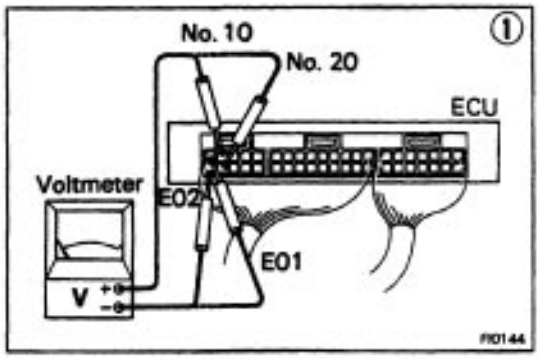
OK → ↓

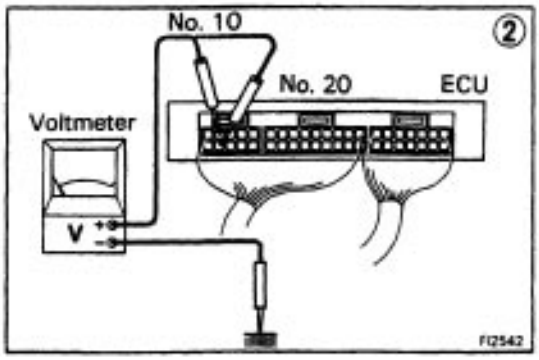
Try another ECU.

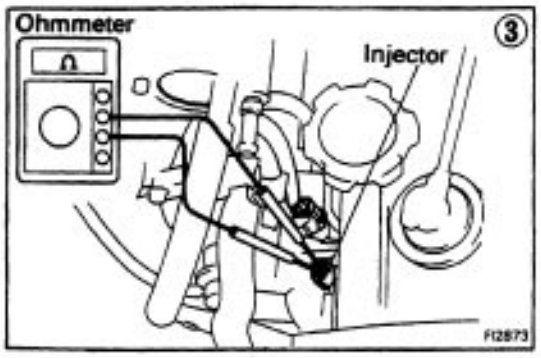
BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD voltage
6	No. 10 — E01 No. 20 — E02	No voltage	IG SW ON	10 — 14 V









① No voltage between ECU terminals No. 10 and/or No. 20 and E01 and/or E02. (IG SW ON)

↓

② Check that there is voltage between ECU terminal No. 10 and/or No. 20 and body ground.

NO → ↓

OK → Check wiring between ECU terminal E01 and/or E02 and body ground.

- OK → Try another ECU.
- BAD → Repair or replace.

↓

Check fuse, fusible link and ignition switch.

BAD → Repair or replace.

↓ OK

③ Check resistance of magnetic coil in each injector.
STD resistance: Approx. 13.8 11

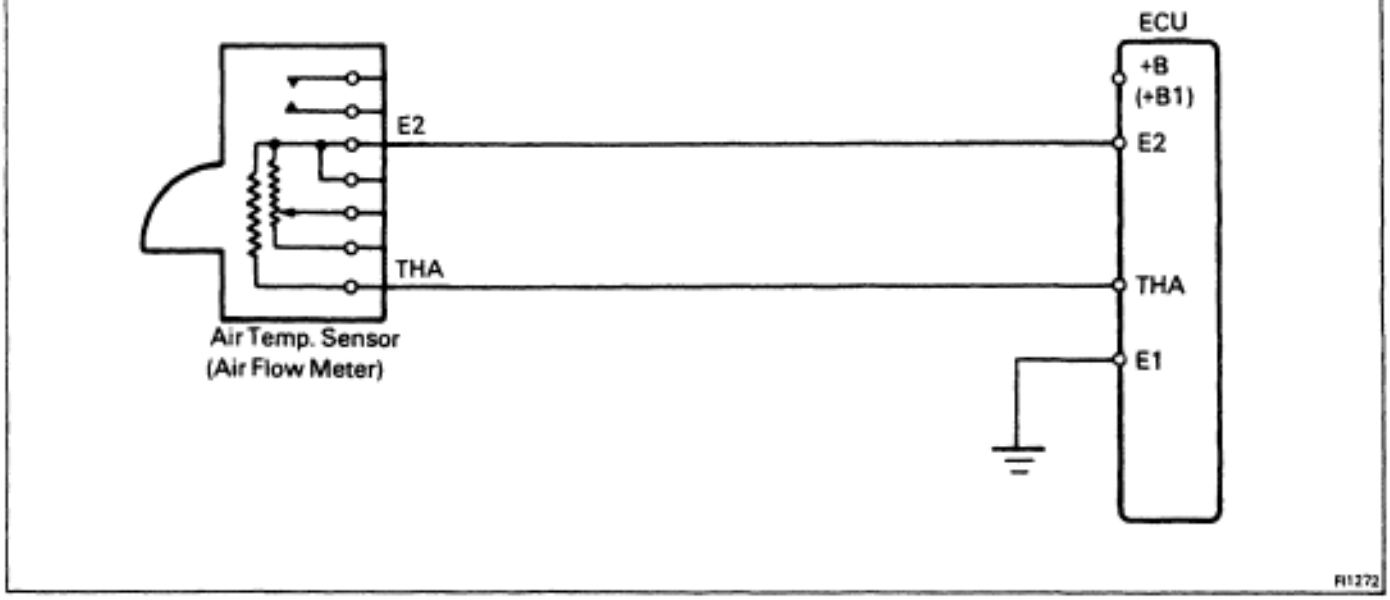
OK → ↓

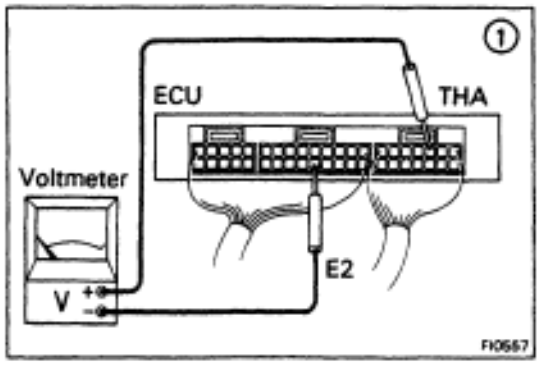
BAD → Replace injector.

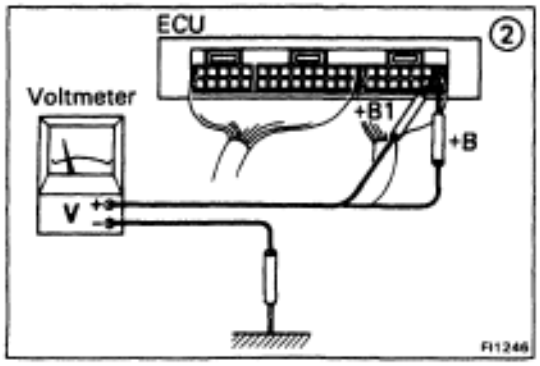
Check wiring between ECU terminal No. 10 and/or No. 20 and battery.

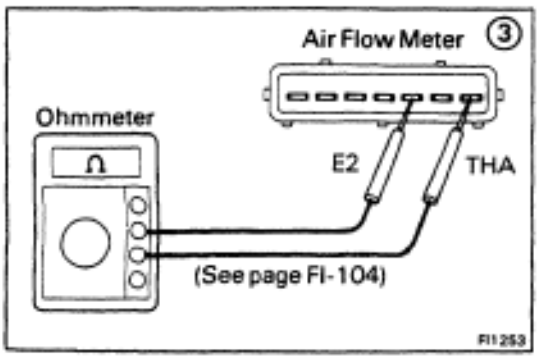
BAD → Repair or replace.

No.	Terminals	Trouble	Condition		STD voltage
7	THA — E2	No voltage	IG SW ON	Intake air temperature 20˚C (68˚F)	1 — 3 V









① No voltage between ECU terminals THA and E2. (IG SW ON)

↓

② Check that there is voltage between ECU terminal +B or +B1 and body ground. (IG SW 4N)

OK → ↓

NO → Refer to No. 1. (See page FI–34)

↓

Check wiring between ECU terminal E1 and body ground.

OK → ↓

BAD → Repair or replace.

↓

③ Check air temp. sensor. (See page FI–104)

BAD → Replace air flow meter.

OK → ↓

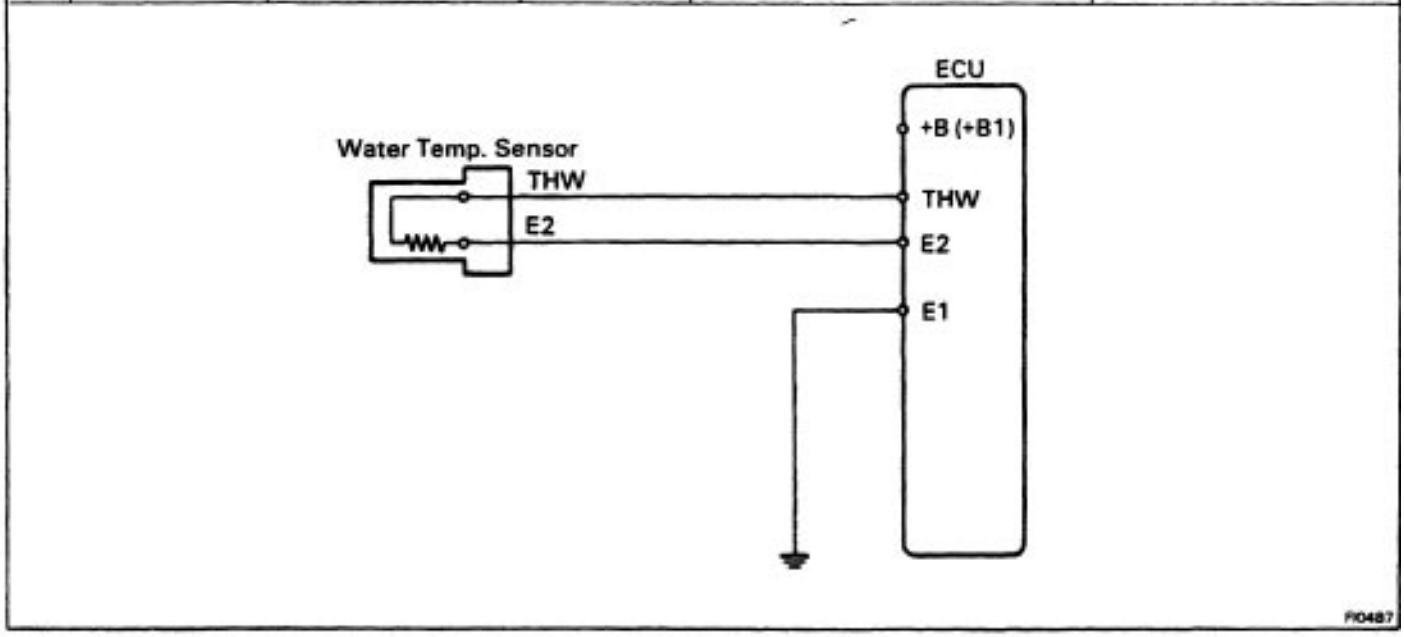
Check wiring between ECU and air temp. sensor.

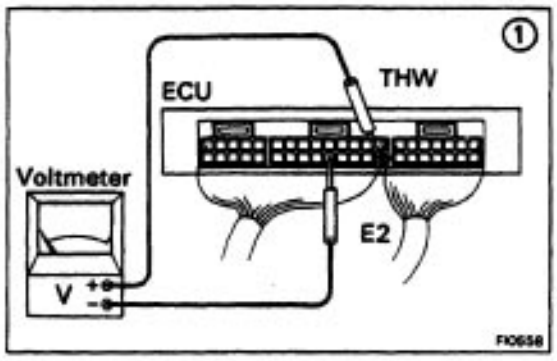
OK → ↓

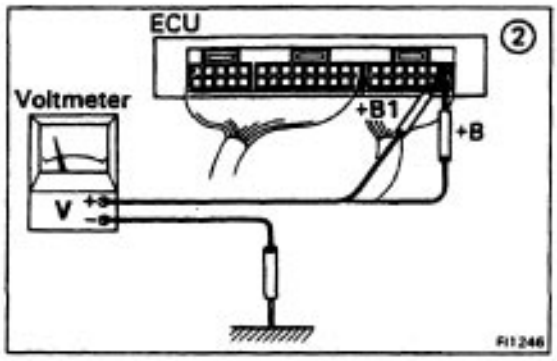
Try another ECU.

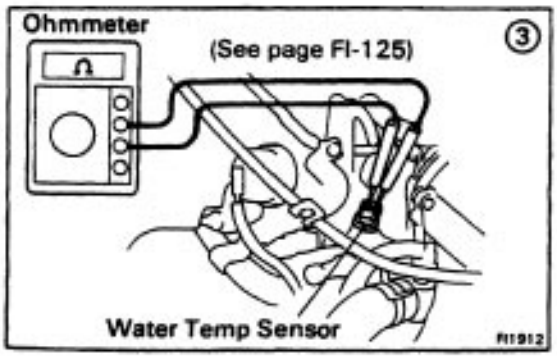
BAD → Repair or replace.

No.	Terminals	Trouble	Condition		STD voltage
8	THW — E2	No voltage	IG SW ON	Coolant temperature 80˚ (176˚F)	0.1 — 1.0 V









① No voltage between ECU terminals THW and E2.
(IG SW ON)

② Check that there is voltage between ECU terminal +B or +131 and body ground. (IG SW ON)

OK → Check wiring between ECU terminal El and body ground.

NO → Refer to NO. 1. (See page FI–34)

OK → ③ Check water temp. sensor. (See page FI– 1 Z5)

BAD → Repair or replace.

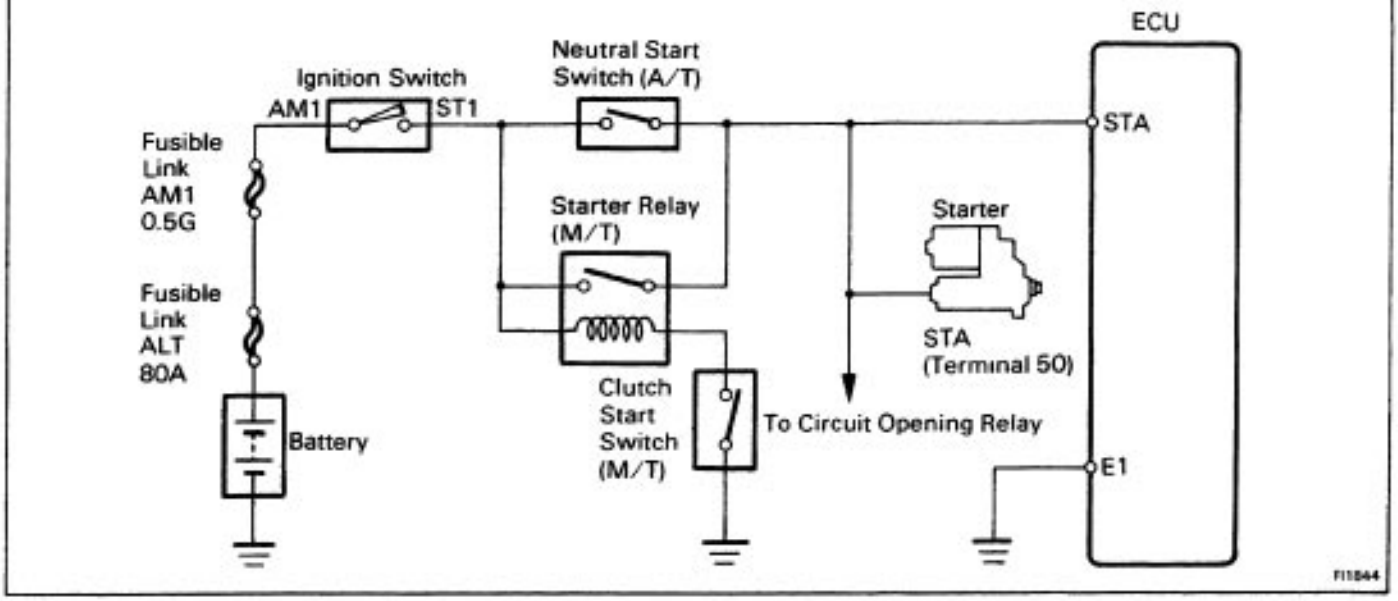
BAD → Replace water temp. sensor.

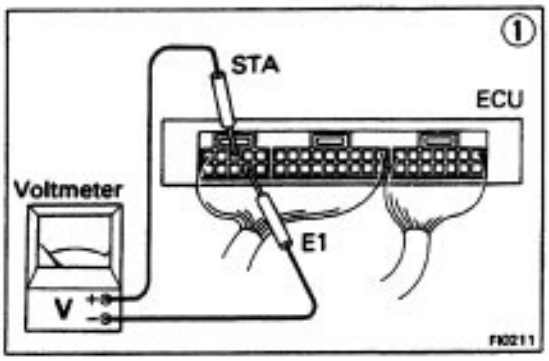
OK → Check wiring between ECU and water temp. sensor.

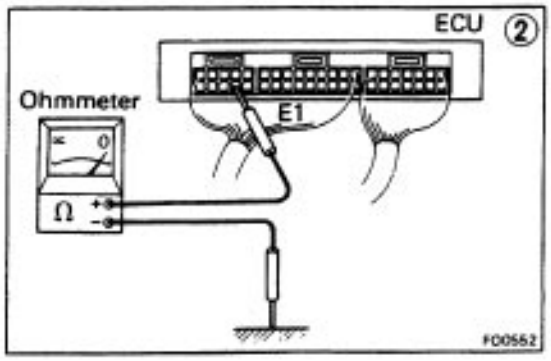
OK → Try another ECU.

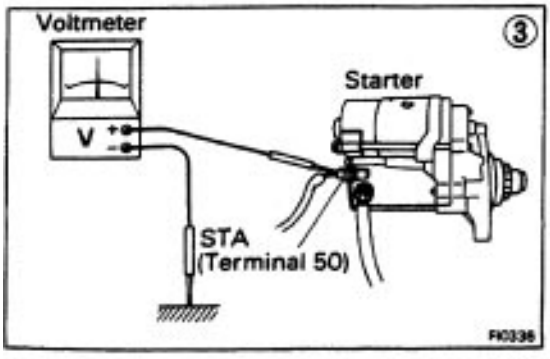
BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD voltage
9	STA — E1	No voltage	Cranking	6 — 14 V





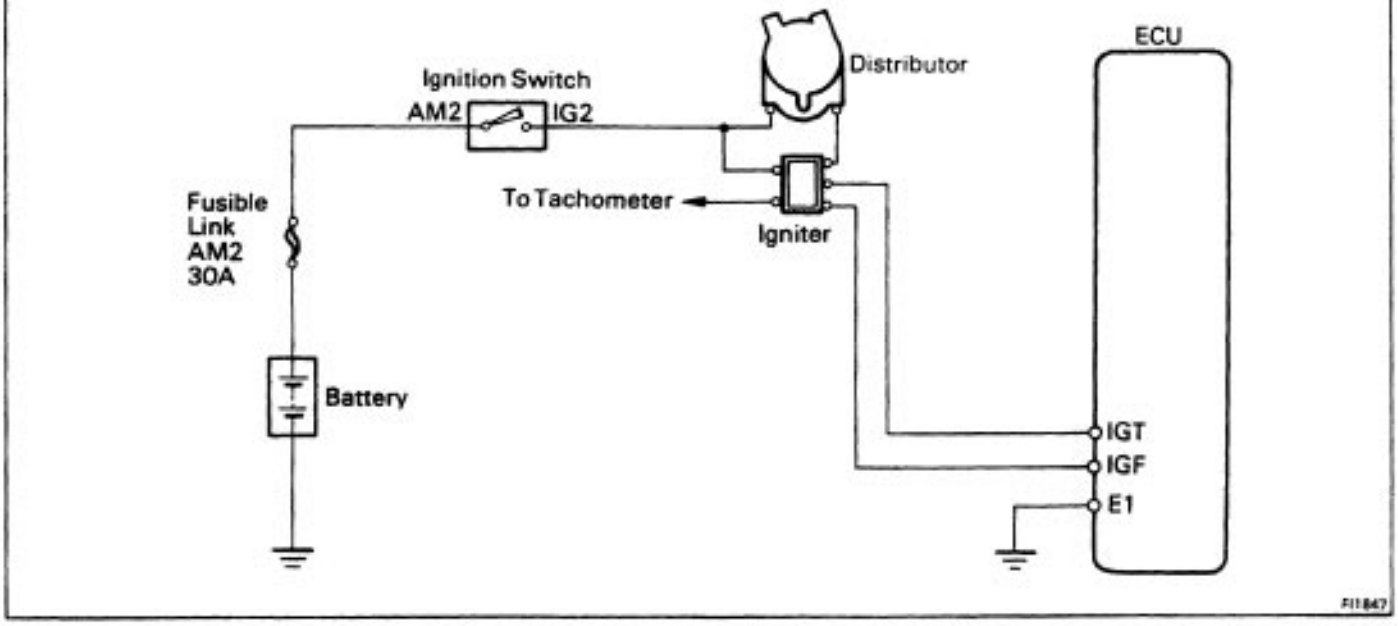


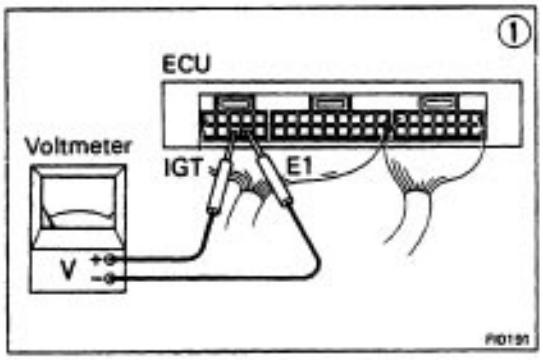


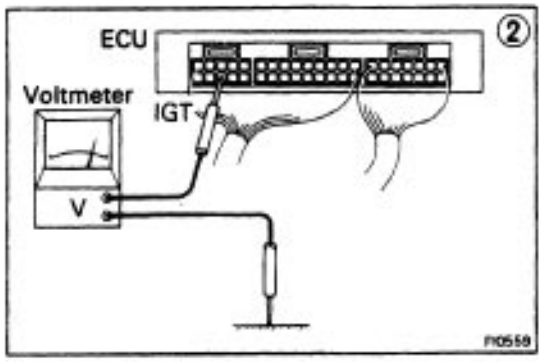
① No voltage between ECU terminals STA and E1. (IG SW START)

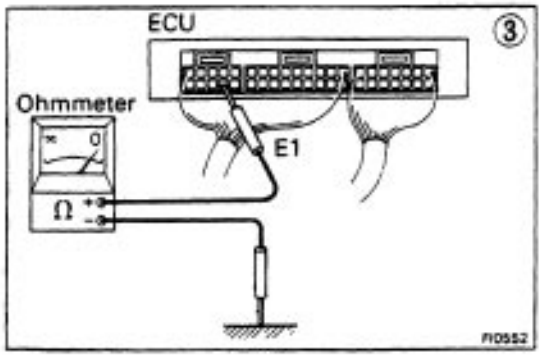
Check starter operation.
- OK → Check wiring between ECU terminal STA and ignition switch terminal ST1.
  - OK → ② Check wiring between ECU terminal E1 and body ground.
    - OK → Try another ECU.
    - BAD → Repair or replace.
  - BAD → Repair or replace.
- BAD → Check fusible link, battery, wiring, ignition switch clutch start switch, starter relay and neutral start switch..
  - BAD → Repair or replace.
  - OK → ③ Check that there is voltage at STA (50) terminal of starter. (IG SW START) STD voltage: 6 – 14 v
    - OK → Check starter.
    - NO → Check wiring between ignition switch terminal ST1 and starter terminal STA (50).

No.	Terminals	Trouble	Condition	STD voltage
10	IGT — E1	No voltage	Idling	0.7 — 1.0 V









① No voltage between ECU terminals IGT and EI. (idling)

② Check that there is voltage between ECU terminal IGT and body ground. (idling)

NO

OK

③ Check wiring between ECU terminal E1 and body ground. — BAD → Repair or replace.

OK

Try another ECU.

Check fusible link and ignition switch. — BAD → Repair or replace.

OK

Check distributor. (See page–IG–7) — BAD → Repair or replace.

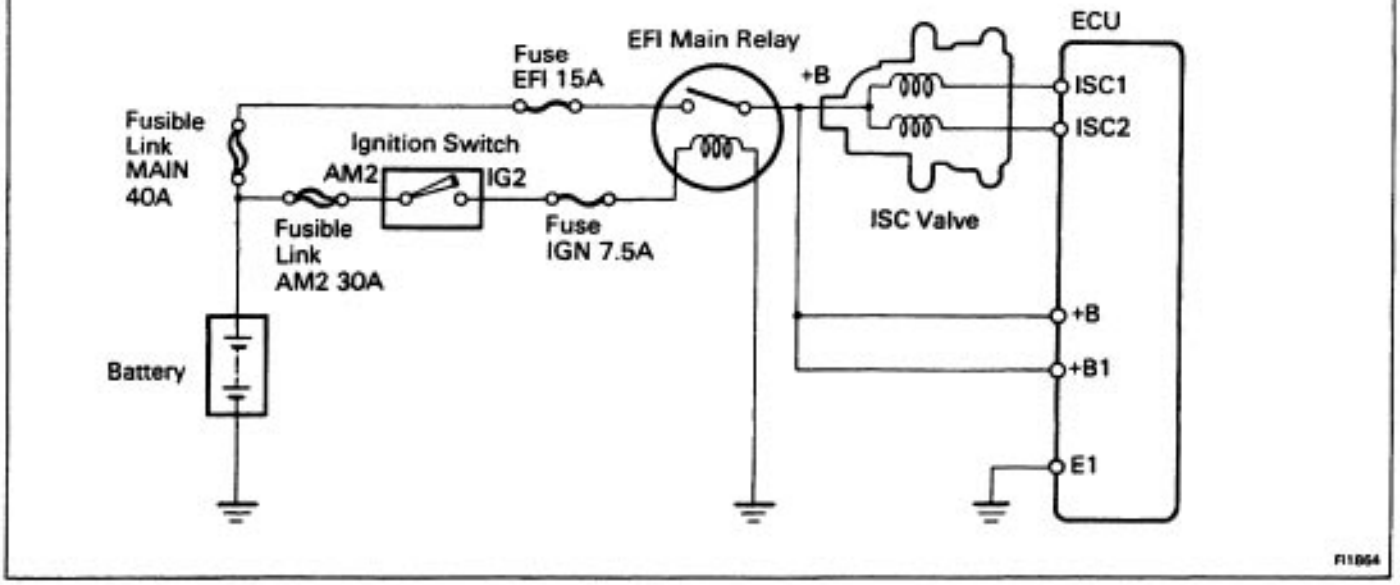
OK

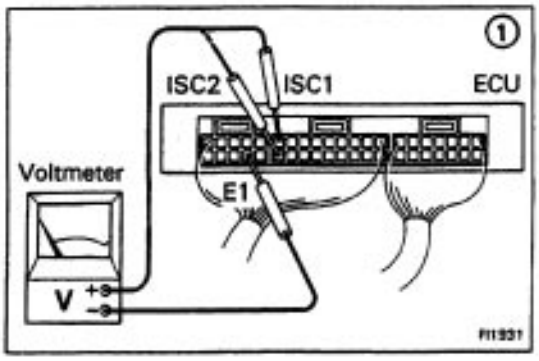
Check wiring between ECU and battery. — BAD → Repair or replace.

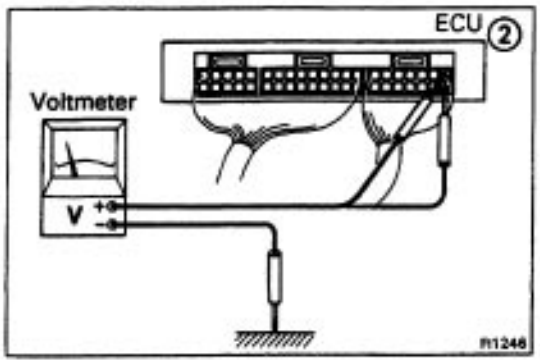
OK

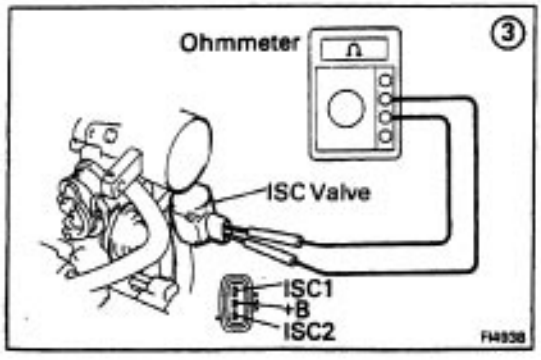
Check igniter. (See page IG–8) — BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD voltage
11	ISC1 ISC2 — E1	No voltage	IG SW ON	9 — 14 V









① There is no voltage between ECU terminals ISC1 or ISC2 and E1 (IG SW ON)

↓

② Check that there is voltage between ECU terminal +B or +B1 and body ground. (IG SW ON)

OK ↓

NO → Refer to No. 1. (See page FI–34)

↓

③ Check resistance between ISC valve terminals +B and ISC1 or ISC2. STD resistance: 16.0 – 17.0Ω

BAD → Replace ISC valve.

OK ↓

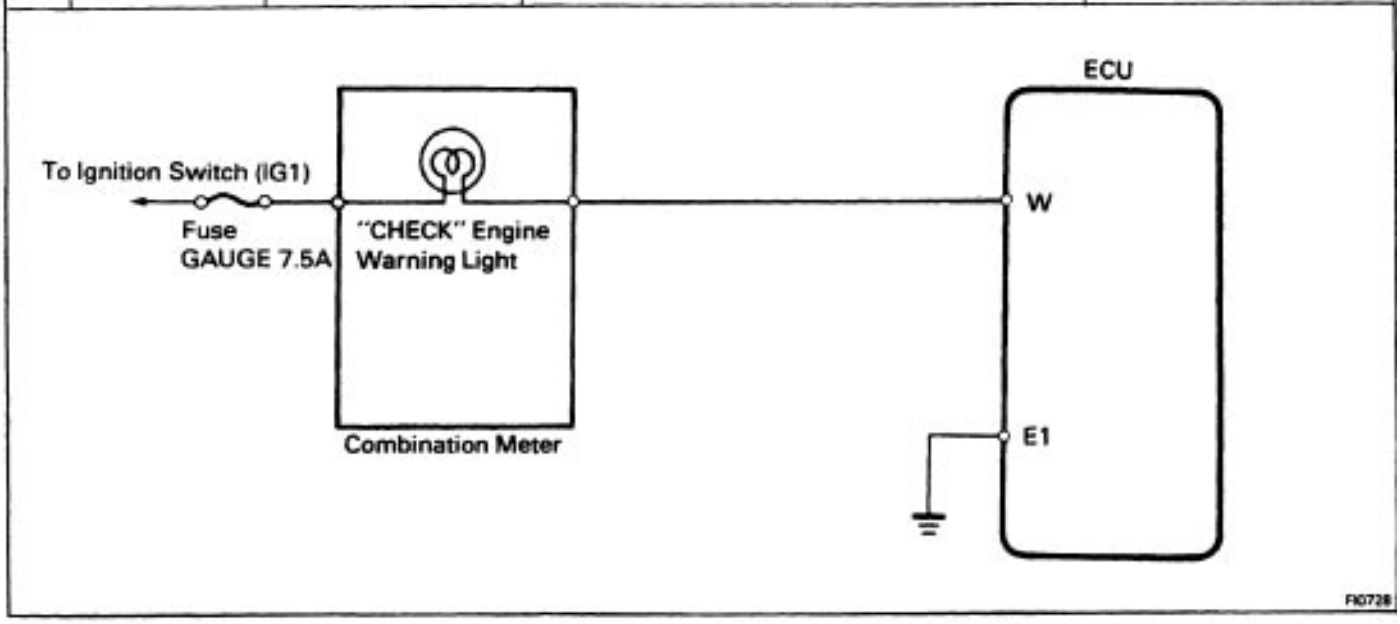
Check wiring between ECU and ISC valve.

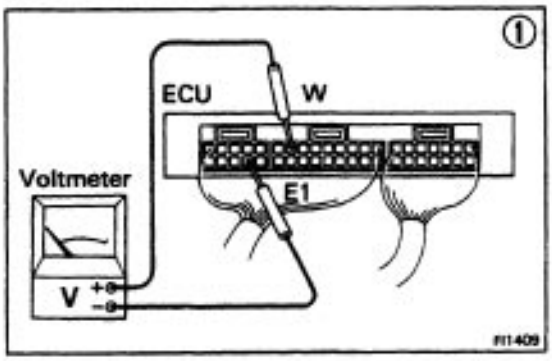
BAD → Repair or replace wiring.

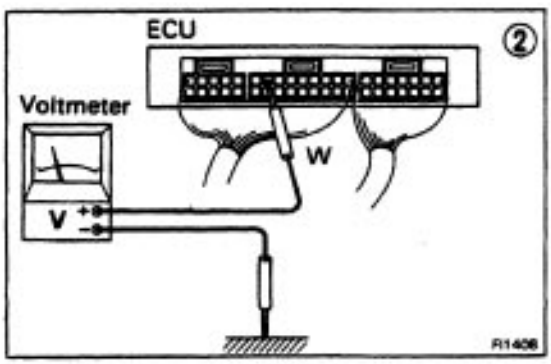
OK ↓

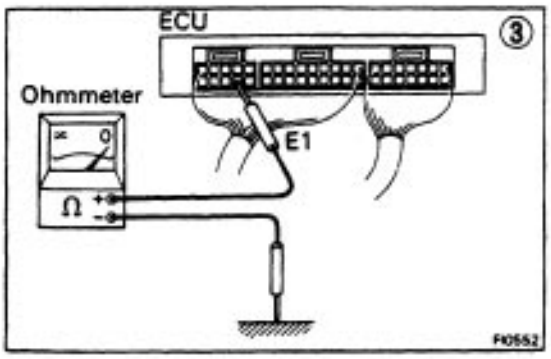
Try another ECU

No.	Terminals	Trouble	Condition	STD voltage
12	W — E1	No voltage	No trouble (”CHECK” engine warning light off) and engine running	10 — 14 V









① No voltage between ECU terminals W and E1. (idling)

② Check that there is voltage between ECU terminal W and body ground.

NO

OK

③ Check wiring between ECU terminal El and body ground.

OK

Try another ECU.

BAD

Repair or replace.

Check GAUGE fuse 7.5 A and ”CHECK” engine warning light.

OK

BAD

Repair or replace.

Fuse blows again

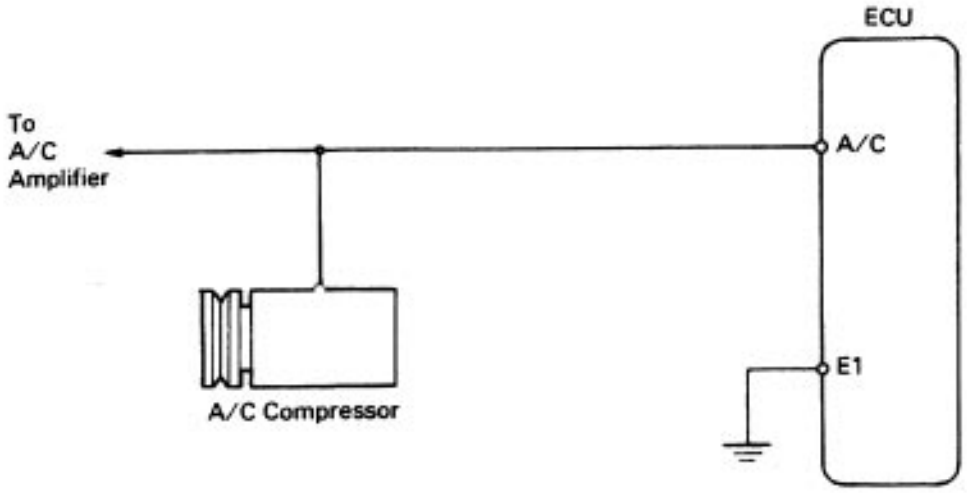
Check wiring between ECU terminal W and fuse.

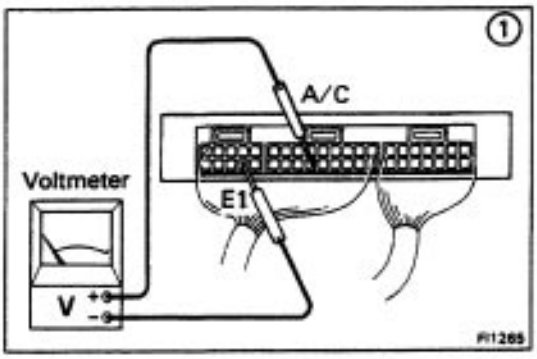
BAD

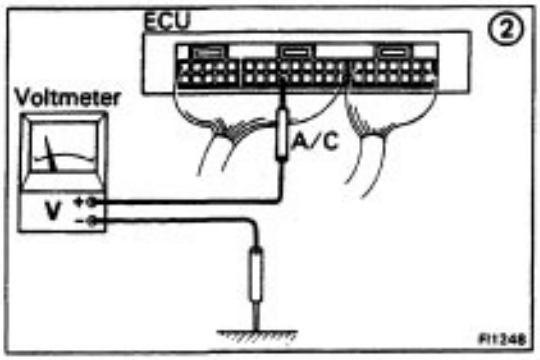
Repair or replace.

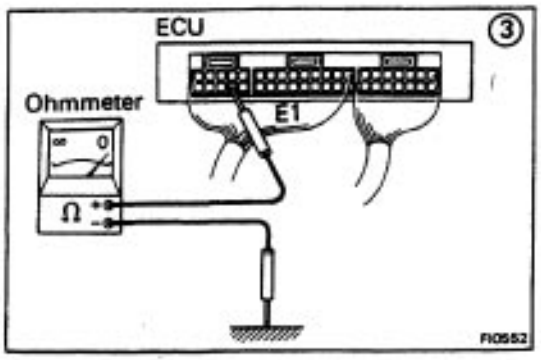
No.	Terminals	Trouble	Condition	STD voltage
13	A/C — E1	No voltage	Air conditioning O N	8— 14 V

w/ A/C









① No voltage between ECU terminals A/C and El .
(Air conditioning ON)

② Check that there is voltage between ECU terminal A/C and body ground.

NO

OK

③ Check wiring between ECU terminal El and body ground.

OK

Try another ECU.

BAD

Repair or replace.

Check compressor running.

OK

Check wiring between ECU terminal A/C and amplifier.

NO

BAD

Repair or replace.

Check that there is voltage between amplifier terminal and body ground.

BAD

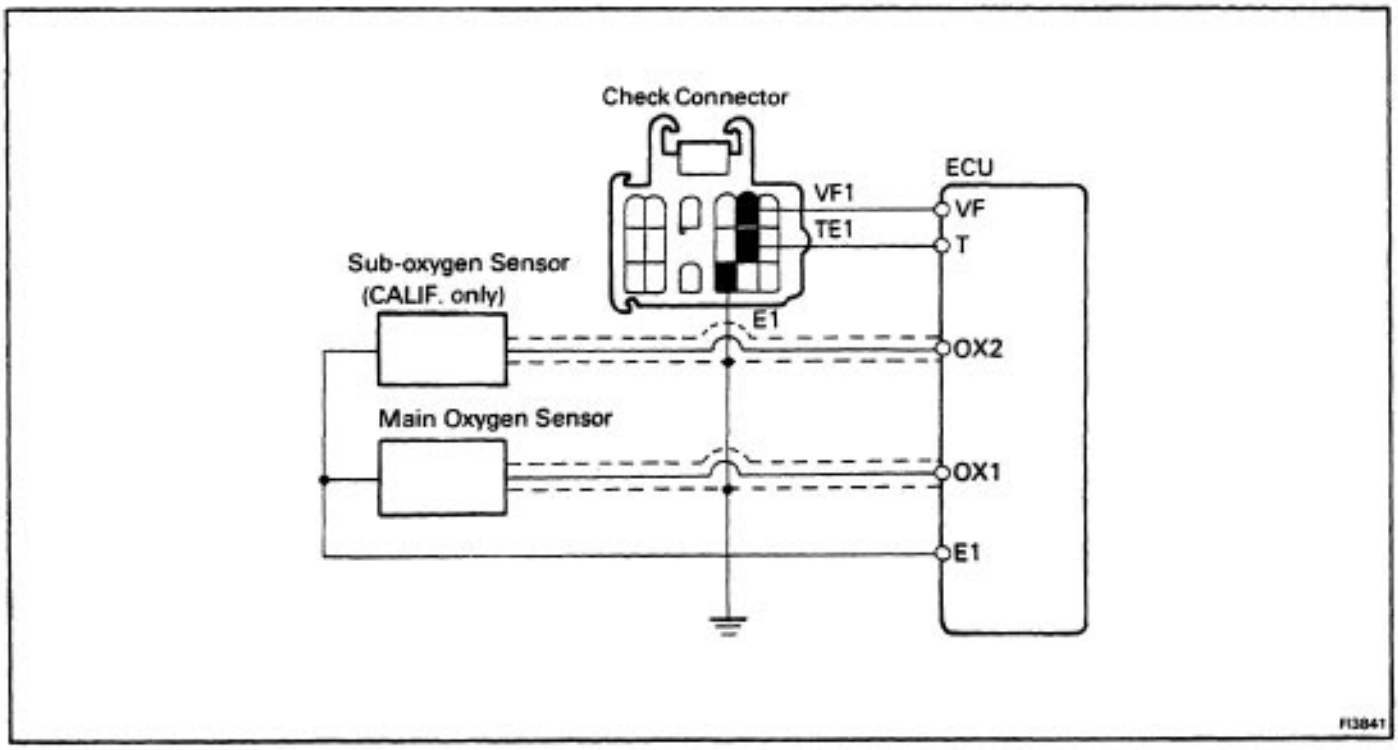
Repair or replace.

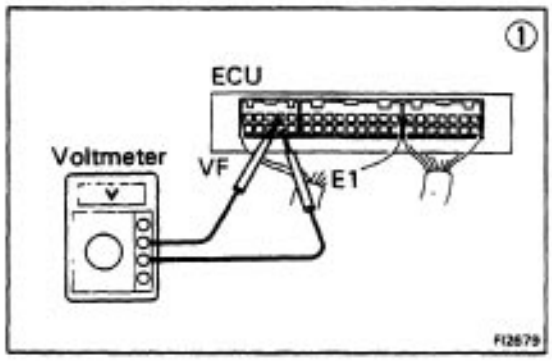
OK

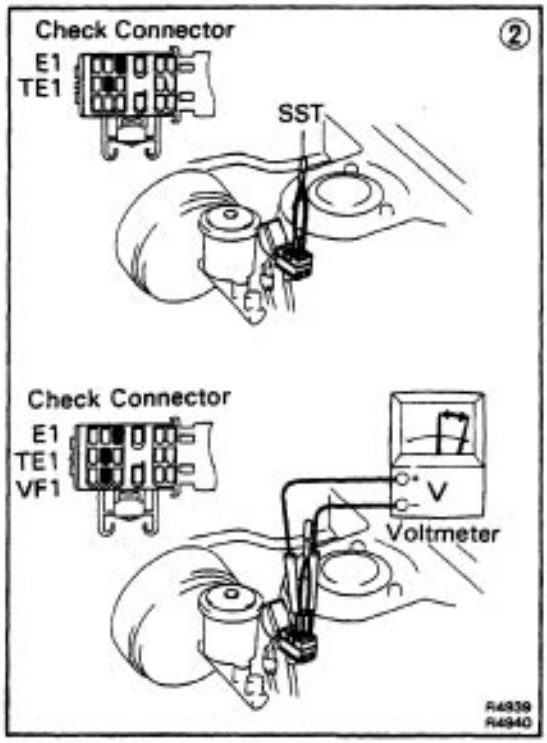
Check wiring between amplifier and ECU or compressor.

BAD

Repair or replace.







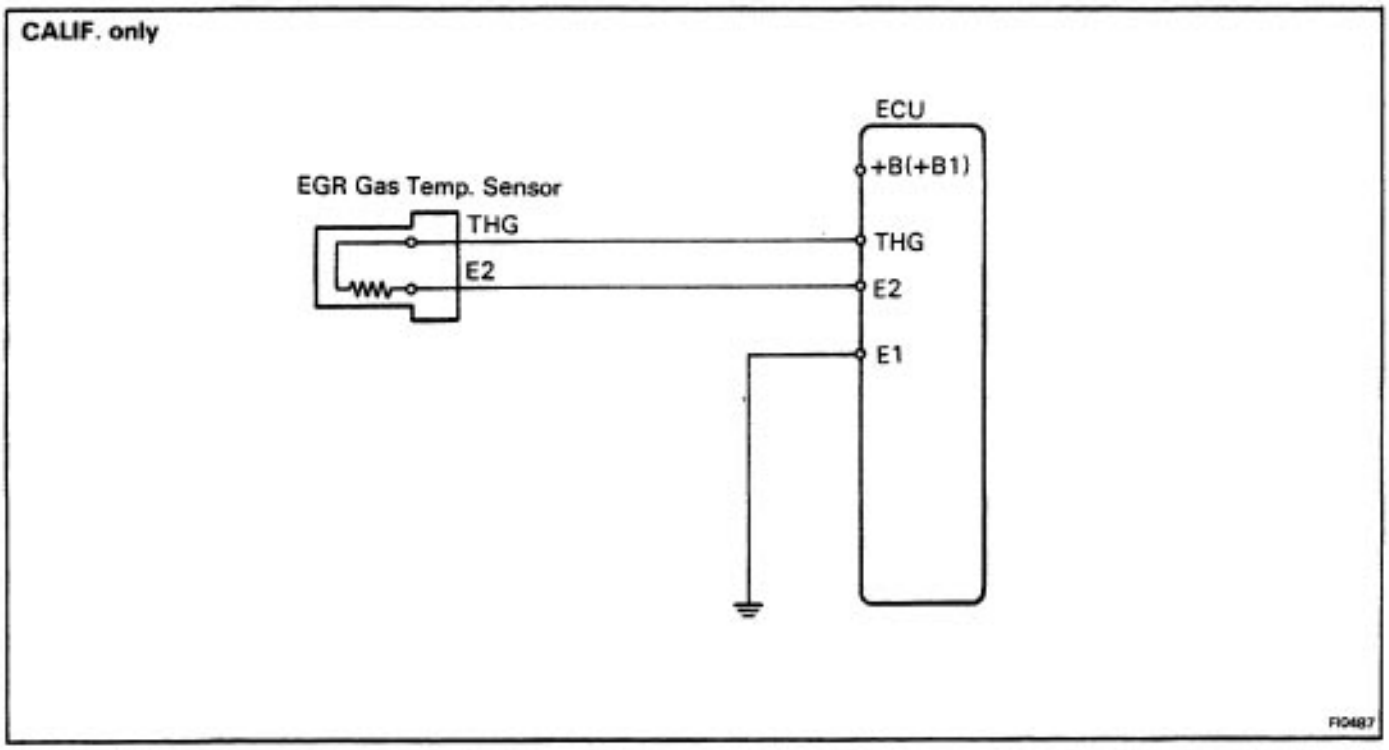
① There is no voltage between ECU terminals VF and E1.

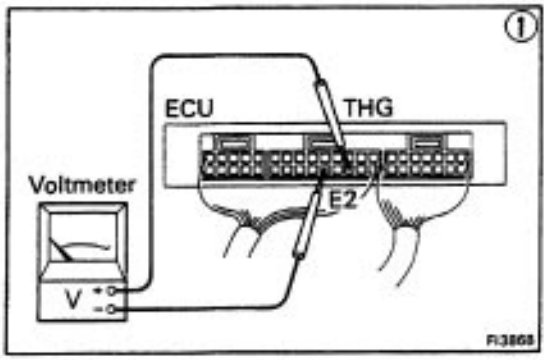
Check that there is specified voltage between ECU terminal VF and body ground.

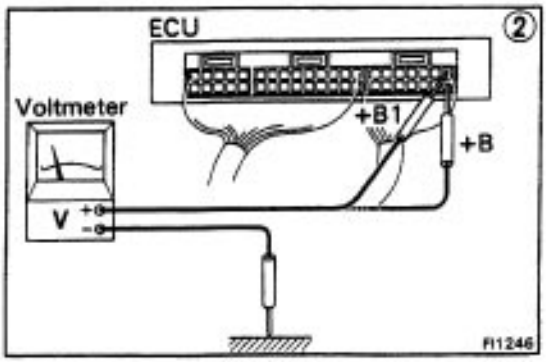
NO → OK: Check wiring between ECU terminal E1 and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

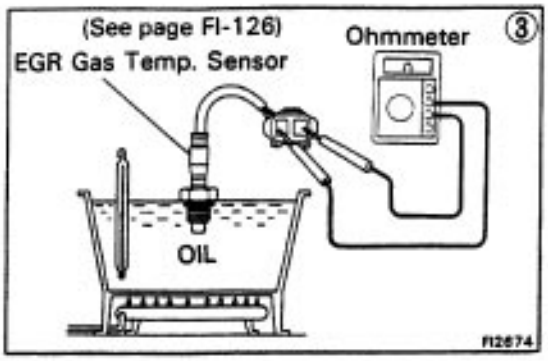
Check for suction of air into exhaust system.
- BAD → Repair air suction.
- OK → Check for air leak from air intake system.
  - BAD → Repair air leak.
  - OK → Check spark plugs.
    - BAD → Repair or replace.
    - OK → Check distributor and ignition system.
      - BAD → Repair or replace.
      - OK → Check fuel pressure.
        - BAD → Repair or replace.
        - OK → Check injectors.
          - BAD → Repair or replace.
          - OK → Check cold start injector–.
            - BAD → Repair or replace.
            - OK → Check air flow meter.
              - BAD → Repair or replace.
              - OK → ② Check operation of oxygen sensors.
                - OK → System normal.
                - BAD → Check wiring between oxygen sensors and ECU connectors.
                  - BAD → Repair wiring.
                  - OK → Replace oxygen sensors.

* Rich malfunction only









① No voltage between ECU terminals THG and E2. (IG SW ON)

② Check that there is voltage between ECU terminal +B or +131 and body ground. (IG SW ON)

OK

NO → Refer to No. 1. *(See page FI–34)

Check wiring between ECU terminal E1 and body ground.

OK

BAD → Repair or replace.

Check EGR system.

BAD → Repair or replace.

OK

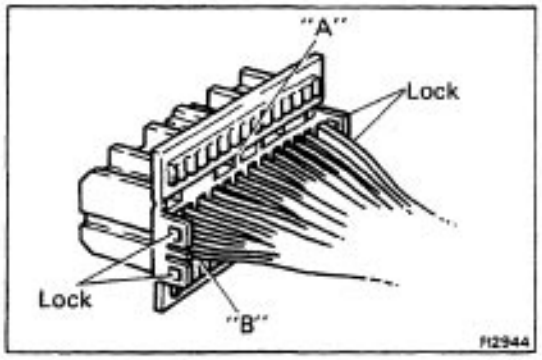
③ Check EGR gas temp. sensor. (See page FI–126)

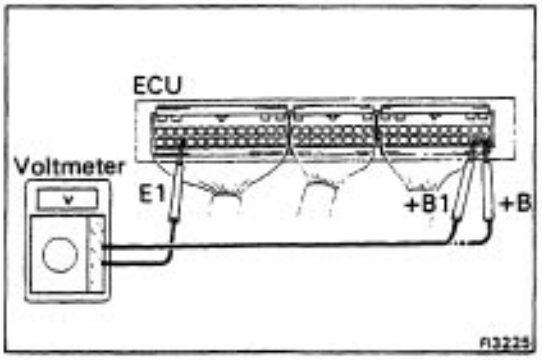
BAD → Replace EGR gas temp. sensor.

OK → Check wiring between ECU and EGR gas temp. sensor.

OK → Try another ECU.

BAD → Repair or replace.





EFI SYSTEM CHECK PROCEDURE (2VZ–FE)

PREPARATION

(a) Disconnect the connectors from the ECU.

(b) Remove the locks as shown in the illustration so that the tester probe(s) can easily come in.

NOTICE: Pay attention to sections "A" and "B" in the illustration which can be easily broken.

(e) Reconnect the connectors to the ECU.

HINT:

- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in "ON" position.

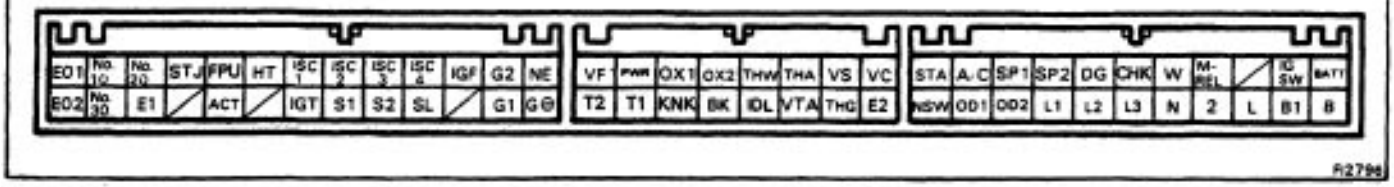
Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors.

Terminals of ECU

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	G2	DISTRIBUTOR	A/C	A/C COMPRESSOR
EO2	POWER GROUND	G1	DISTRIBUTOR	*1OD 1	CRUISE CONTROL COMPUTER
No. 10	INJECTOR (No. 1 and 6i	NE	DISTRIBUTOR	SP1	No. 1 SPEED SENSOR (Meter side)
No. 30	INJECTOR (No. 4 and 5)	G⊖	DISTRIBUTOR	*1OD2	OD MAIN SWITCH
No. 20	INJECTOR (No. 2 and 3)	VF	CHECK CONNECTOR	*1SP2	No. 2 SPEED SENSOR (AIT side)
E1	COMPUTER GROUND	T2	CHECK CONNECTOR	L1	TEMS ECU
S TJ	COLD START INJECTOR	*1PWR	PATTERN SELECT SWITCH	*1 DG	CHECK CONNECTOR
	—	T1	CHECK CONNECTOR	L2	TEMS ECU
EPU	FUEL PRESSURE CONTROL VSV	OX1	OXYGEN SENSOR	*2 CHK	SUB–OXYGEN SENSOR
ACT	A/C AMPLIFIER	KNK	KNOCK CONTROL SENSOR	L3	TEMS ECU
HT	OXYGEN SENSOR HEATER	*2OX2	SUB–OXYGEN SENSOR	W	WARNING LIGHT
	—	*1BK	BRAKE SWITCH	*1 N	SIFT POSITION SWITCH
ISC1	ISC MOTOR NO. 1 COIL	THW	WATER TEMP. SENSOR	M–REL	EFI MAIN RELAY (COIL)
IGT	IGNITER	1⍁L	THROTTLE POSITION SENSOR	*1 2	SIFT POSITION SWITCH.
1SC2	ISC MOTOR NO. 2 COIL	THA	AIR TEMP. SENSOR	*1R	SIFT POSITION SWITCH
*1S1	ECT SOLENOID	VTA	THROTTLE POSITION SENSOR	*1 L	SIFT POSITION SWITCH
ISC3	ISC MOTOR NO. 3 COIL	VS	AIR FLOW METER	IG SW	IGNITION SWITCH
*1S2	ECT SOLENOID	*2THG	EGR GAS TEMP. SENSOR	B1	EFt MAIN RELAY
ISC4	ISC MOTOR NO. 4 COIL	VC	AIR FLOW METER THROTTLE POSITION SENSOR	BATT	BATTERY
*1SL	ECT SOLENOID	E2	SENSOR GROUND	- B	EFI MAIN RELAY
IGF	IGNITER	STA	STARTER SWITCH		
	—	*2NSW	NEUTRAL START SWITCH		

* 1 w/ ECT
*2 CALIF. only

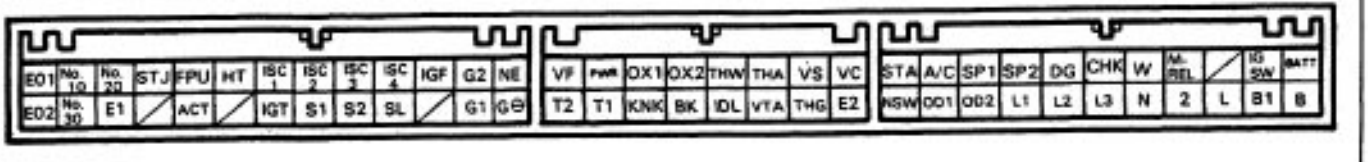
ECU Terminals



Voltage at ECU Wiring Connectors

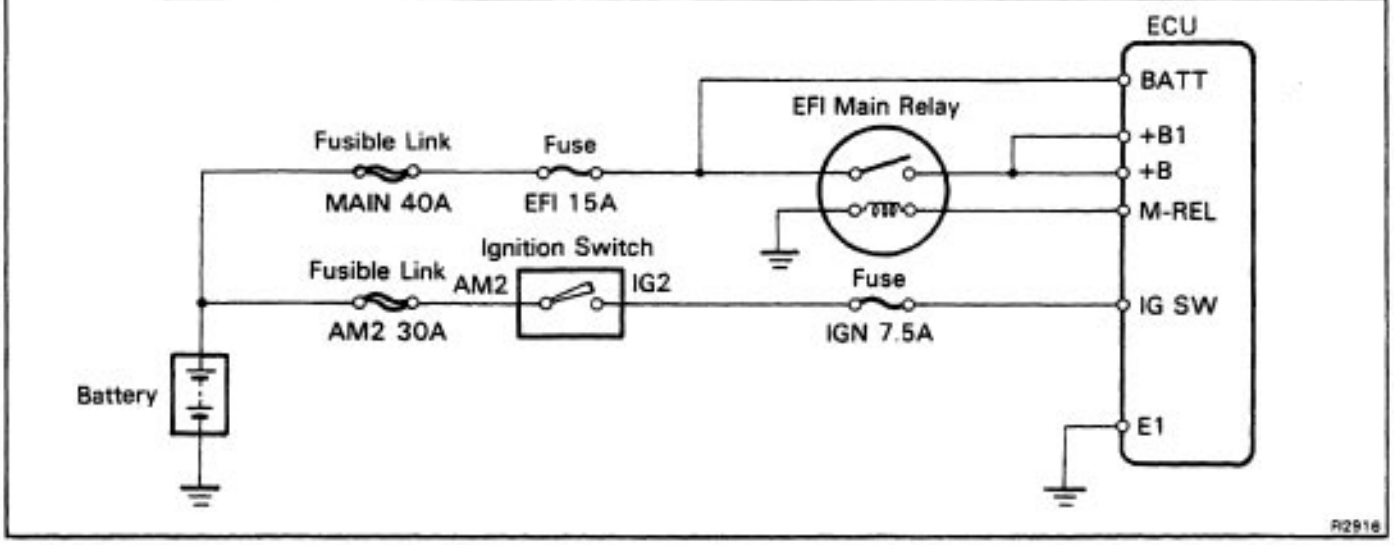
No.	Terminals	Condition		STD voltage (V)	See page
1	BATT — E1			10 — 14	FI–52
	IG SW — E1	IG SW ON			
	M-REL — E1				
	+B, +B1 — E1				
2	IDL — E2	IG SW ON	Throttle valve open	4 — 6	FI–55
	VC — E2			4 — 6	
	VTA — E2		Throttle valve fully closed	0.1 — 1.0	
			Throttle valve open	3.2 — 4.2	
3	VC — E2			4 — 6	FI–57
	VS — E2		Measuring plate fully closed	3.7 — 4.3	
			Measuring plate fully open	0.2 — 0.5	
		Idling		1.6 — 4.1	
		3,000 rpm		1.0 — 2.0	
4	No.10, No.20, No.30 — E01, E02	IG SW ON		10 — 14	FI–58
5	THA — E2	IG SW ON	Intake air temp. 20°C (68°F)	1 — 3	FI–59
6	THW — E2		Coolant temp. 80°C (176°F)	0.1 — 1.0	FI–60
7	STA — E1	Cranking		6 — 14	FI–61
8	IGT — E1	Cranking or idling		0.7 — 1.0	FI–62
9	ISC1, ISC2, ISC3, ISC4 — E1	IG SW ON		9 — 14	FI–63
10	W — E1	No trouble ("CHECK" engine warning light off) and engine running		10 — 14	FI–64
*11	A/C — E1	1G SW ON	Air conditioning ON	8 — 14	FI–65

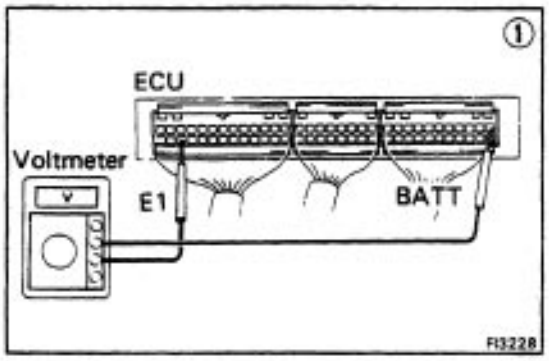
ECU Terminals * w/ A/C

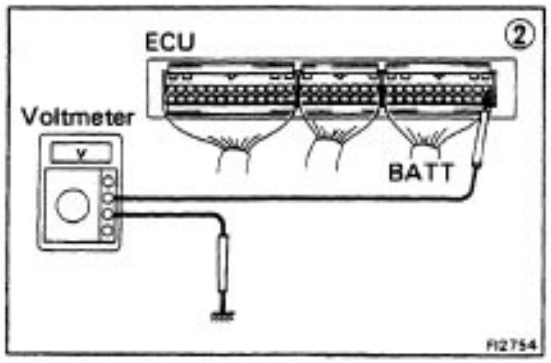


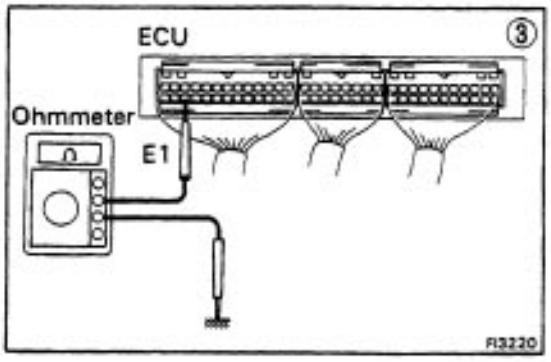
FI2796

No.	Terminals	Trouble	Condition	STD voltage
1	BATT – E1 IG SW – E1 M-REL – E1 +B (+B1) – E1	No voltage	**IG SW ON**	10 – 14 V









- **BATT – E1**

① There is no voltage between ECU terminals BATT and El.

↓

② Check that there is voltage between ECU terminal BATT and body ground.

NO → OK

↓

③ Check wiring between ECU terminal E1 and body ground.

OK → Try another ECU.

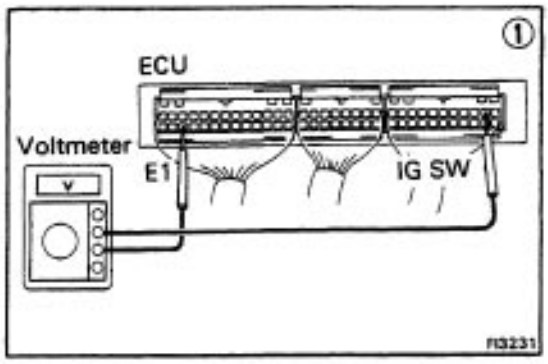
BAD → Repair or replace.

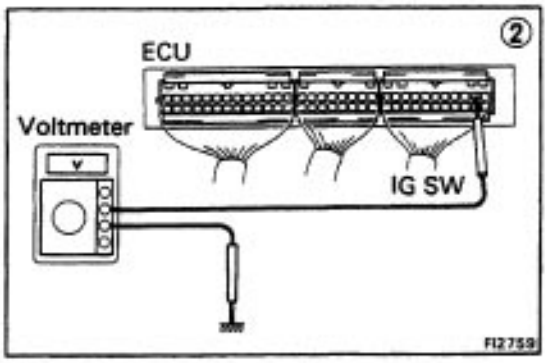
Check fuse and fusible link. BAD → Replace.

OK

↓

Check wiring between ECU terminal and battery. BAD → Repair or replace.





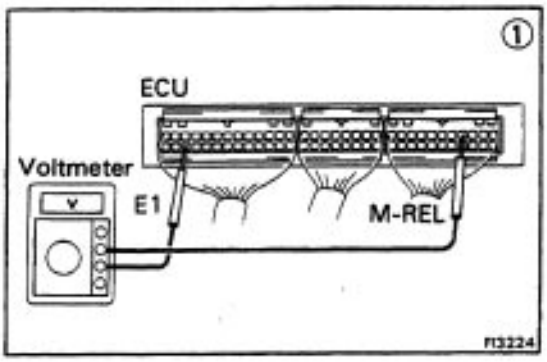
- **IG SW – E1**

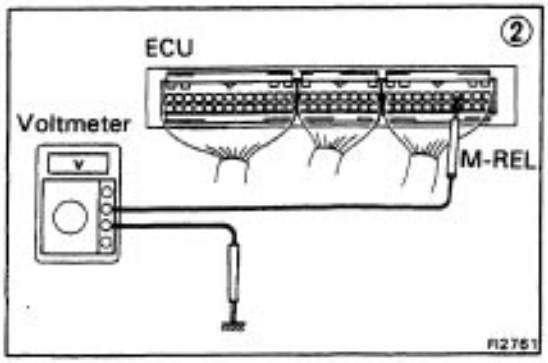
① There is no voltage between ECU terminals IG SW and El. (IG SW ON)

② Check that there is voltage between ECU terminal IG SW and body ground. (IG SW ON).

NO: Check wiring between ECU terminal E t and body ground.
- OK: Try another ECU.
- BAD: Repair or replace.

OK: Check fuse, fusible link and ignition switch.
- BAD: Repair or replace.





- **M–REL – E1**

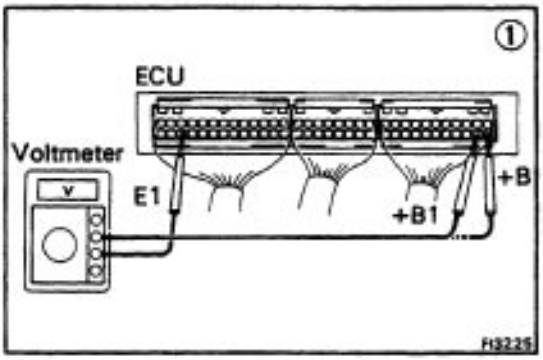
① There is no voltage between ECU terminals M–REL and El. (IG SW ON)

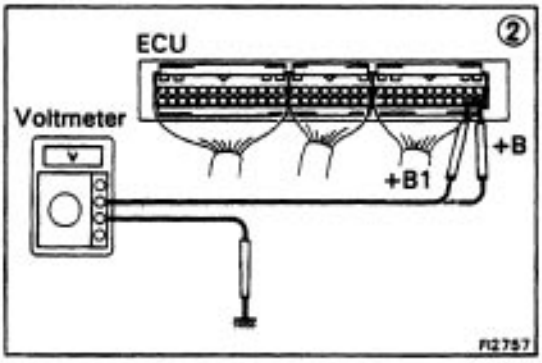
② Check that there is voltage between ECU terminal M–REL and body ground. (IG SW ON)

NO: Check wiring between ECU terminal E 1 and body ground.
- OK: Try another ECU.
- BAD: Repair or replace.

OK: Check EFI main relay and wiring harness. (See page F!–121)
- BAD: Replace.

OK: Try another ECU.





- **+B(+B1)–E1**

① There is no voltage between ECU terminals +B (+B1) and E1. (IG SW ON)

② Check that there is voltage between ECU terminal +B (+B1) and body ground. (IG SW ON)

NO → Check wiring between ECU terminal E1 and body ground. .

OK → Try another ECU.

BAD → Repair or replace.

OK → Check fuse, fusible link and wiring harness.

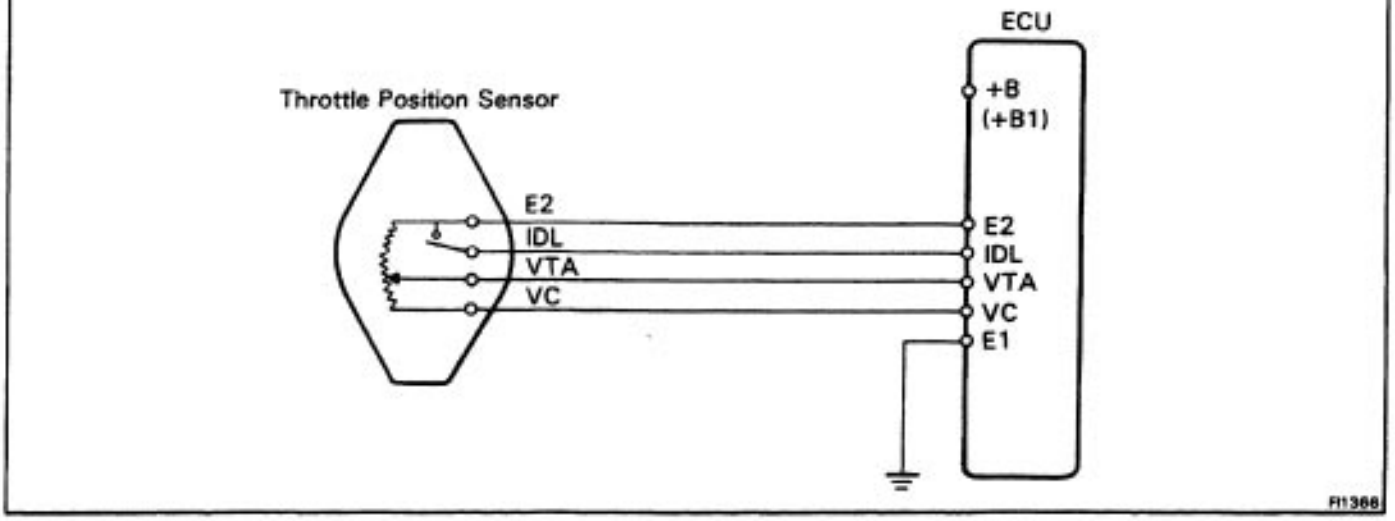
BAD → Repair or replace.

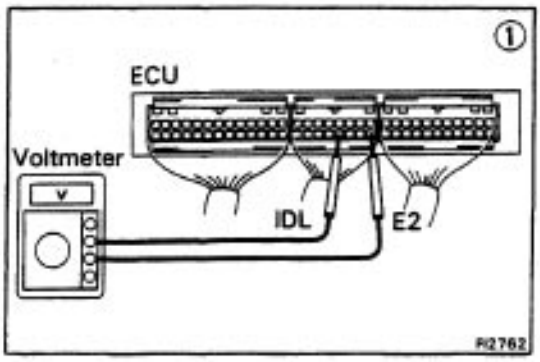
OK → Check EFI main relay. (See page FI–121)

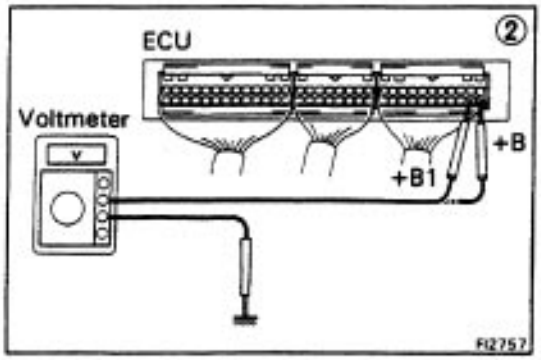
BAD → Replace.

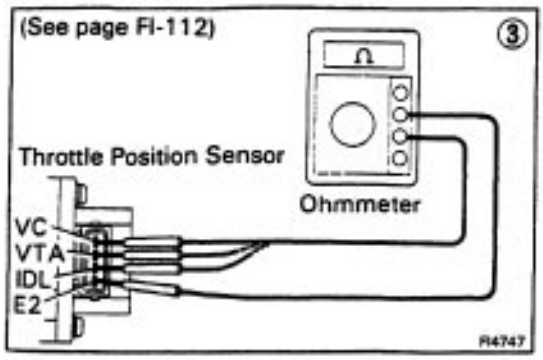
OK → Refer to M–REL – E1 trouble section.

No.	Terminals	Trouble	Condition		STD voltage
2	IDL – E2	No voltage	IG SW ON	Throttle valve open	4 – 6 V
	VC – E2				4 – 6 V
	VTA – E2			Throttle valve fully closed	0.1 – 1.0 V
				Throttle valve fully open	3.2 – 4.2 V









- **IDL – E2**

① There is no voltage between ECU terminals IDL and E2. (IG SW ON) (Throttle valve open)

② Check that there is voltage between ECU terminal +B (+B1) and body ground. (IG SW ON)

NO

OK

Check wiring between ECU terminal E 1 and body ground.

OK

Try another ECU.

BAD

Repair or replace.

Refer to No. 1. (See page FI–51)

BAD

Repair or replace.

OK

③ Check throttle position sensor. (See page FI–112)

BAD

OK

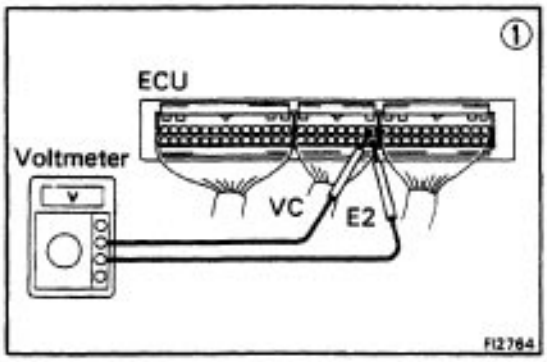
BAD

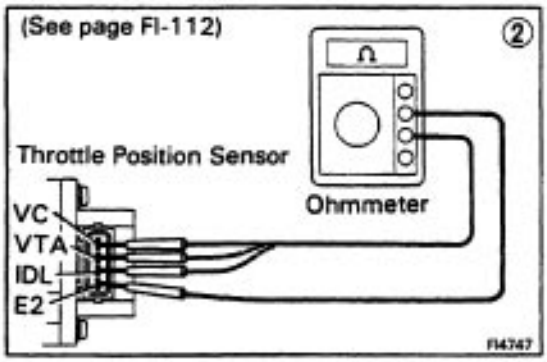
Repair or replace throttle position sensor.

Check wiring between ECU and throttle position sensor.

OK

Try another ECU.





- **VC – E2**

① There is no voltage between ECU terminals VC and E2. (IG SW ON)

↓

Check that there is voltage between ECU terminal +B (+B1) and body ground. (IG SW ON)

↓ OK

② Check throttle position sensor. (See page FI–112)

↓ BAD

Repair or replace.

↓ OK

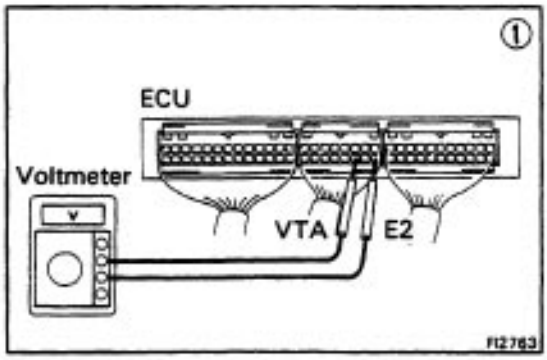
Check wiring between ECU and throttle position sensor.

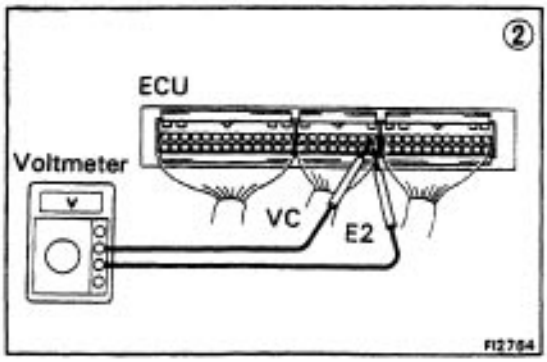
↓ OK

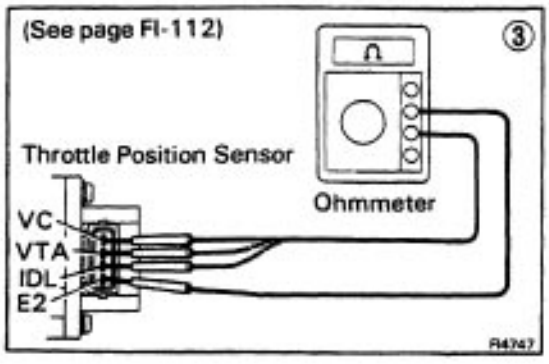
Try another ECU.

NO → Refer to No. 1. (See page FI–51)

BAD → Repair or replace wiring.







- **VTA – E2**

① There is no specified voltage at ECU terminals VTA and E2. (1O SW ON)

↓

② Check that there is voltage between ECU terminal VC and E2. (IG SW ON)

↓ NO

Refer to VC – E2 trouble section.

↓ OK

③ Check throttle position sensor. (See page FI–112)

↓ OK

Check wiring between ECU and throttle position sensor.

↓ OK

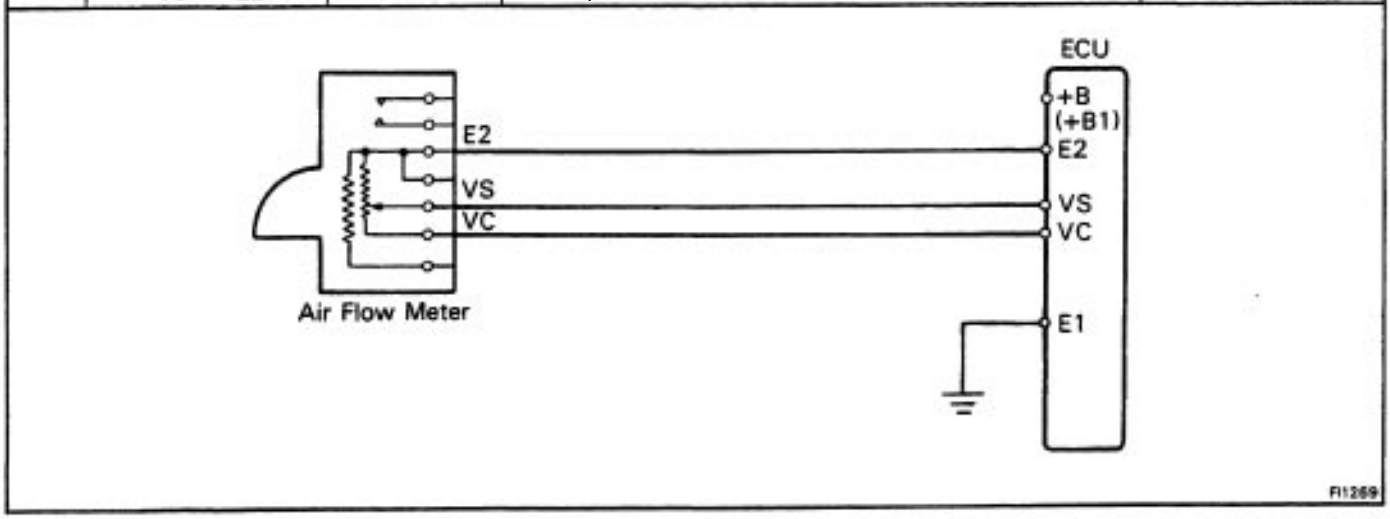
Try another ECU.

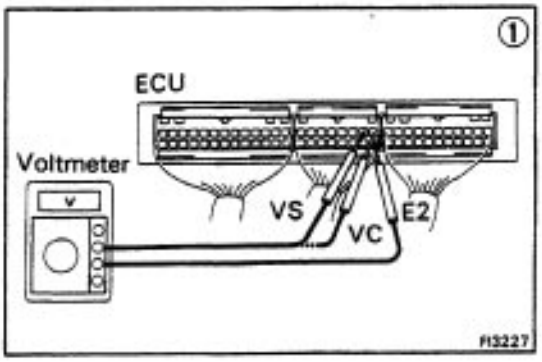
OK → ③ Check throttle position sensor. (See page FI–112)

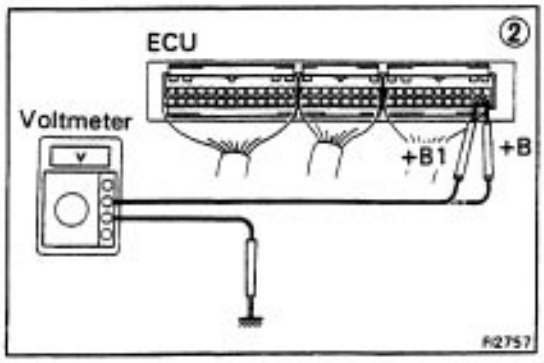
③ BAD → Repair or replace.

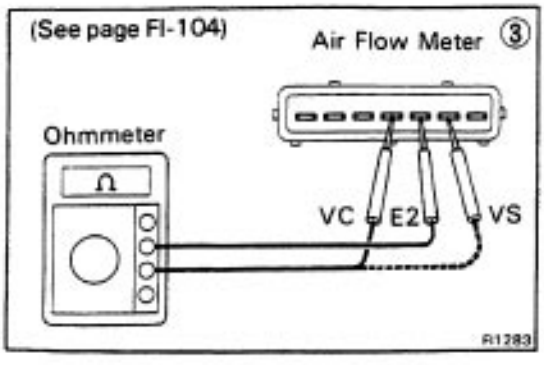
Check wiring between ECU and throttle position sensor. BAD → Repair or replace.

No.	Terminals	Trouble	Condition		STD voltage
3	VC – E2	No voltage	IG SW ON		4 – 6 V
	VS – E2			Measuring plate fully closed	3.7 – 4.3 V
	VS – E2			Measuring plate fully open	0.2 – 0.5 V
	VS – E2		Idling		1.6 – 4.1 V
	VS – E2		3,000 rpm		1.0 – 2.0 V









① There is no voltage between ECU terminals VC or VS and E2. (IG SW ON)

↓

② Check that there is voltage between ECU terminal +B (+Bl) and body ground. (IG SW ON)

¿ OK → ↓

NO → Refer to No. 1. (See page FI–52)

↓

Check wiring between ECU terminal E 1 and body ground.

OK → ↓

BAD → Repair or replace.

↓

③ Check air flow meter. (See page FI–104)

BAD → Replace air flow meter.

OK → ↓

Check wiring between ECU and air flow meter.

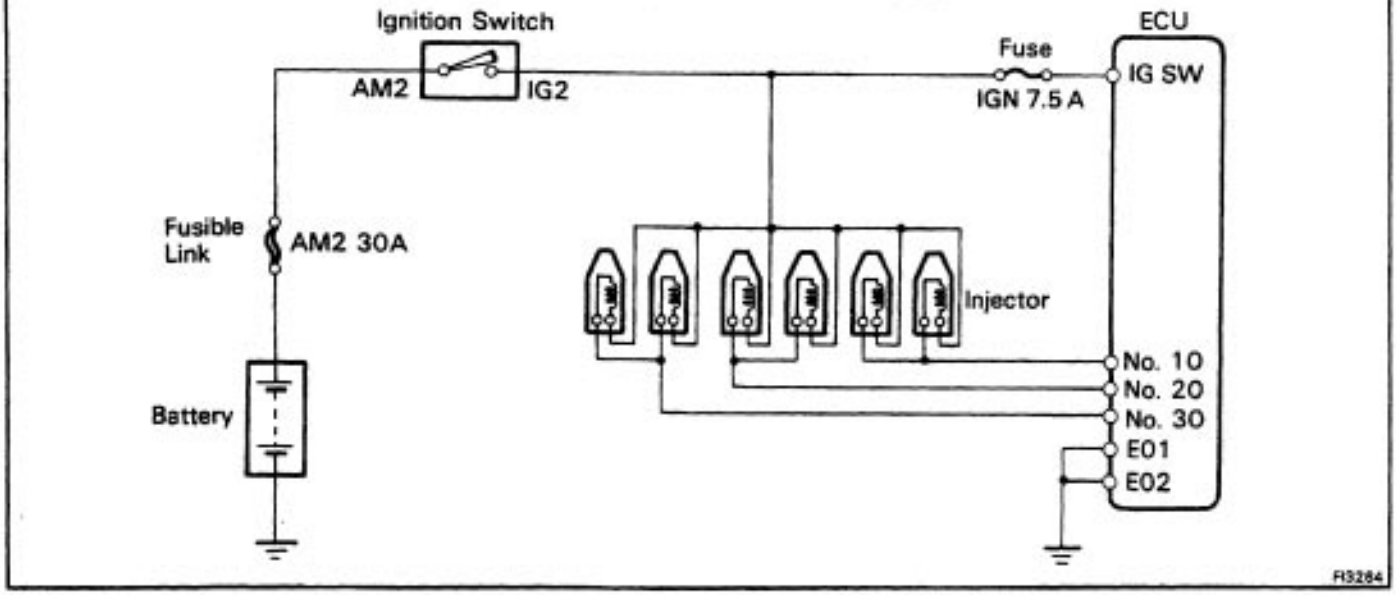
OK → ↓

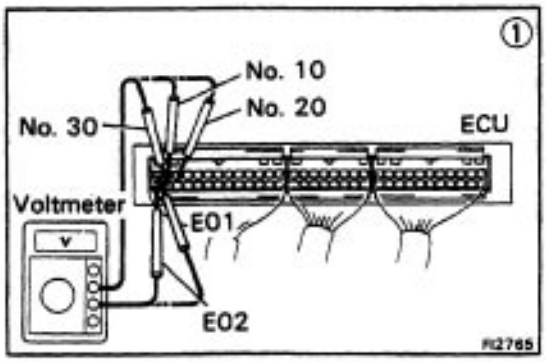
BAD → Repair or replace.

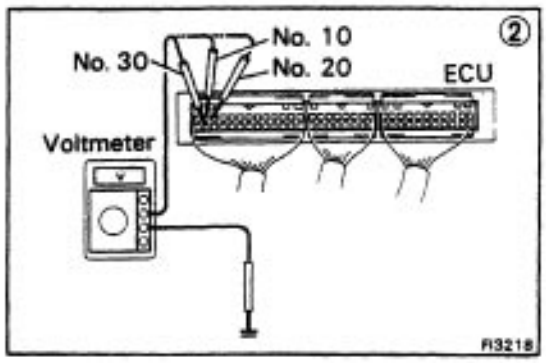
↓

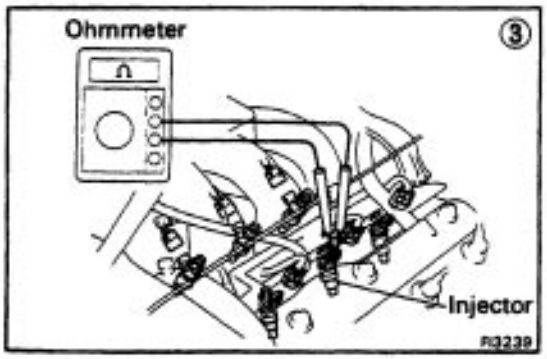
Try another ECU.

No.	Terminals	Trouble	Condition	STD voltage
4	No. 10 E01 No. 20 – No. 30 E02	No voltage	IG SW ON	10 – 14 V









① There is no voltage between ECU terminal No. 10, No. 20 and/or No. 30 and E41 and/or E02. (IG SW ON)

↓

② Check that there is voltage between ECU terminal No. 10, No. 20 or No. 30 and body ground.

NO → Check wiring between ECU terminal E01 and/or E02 and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

OK ↓

Check fusible link and ignition switch. — BAD → Repair or replace.

OK ↓

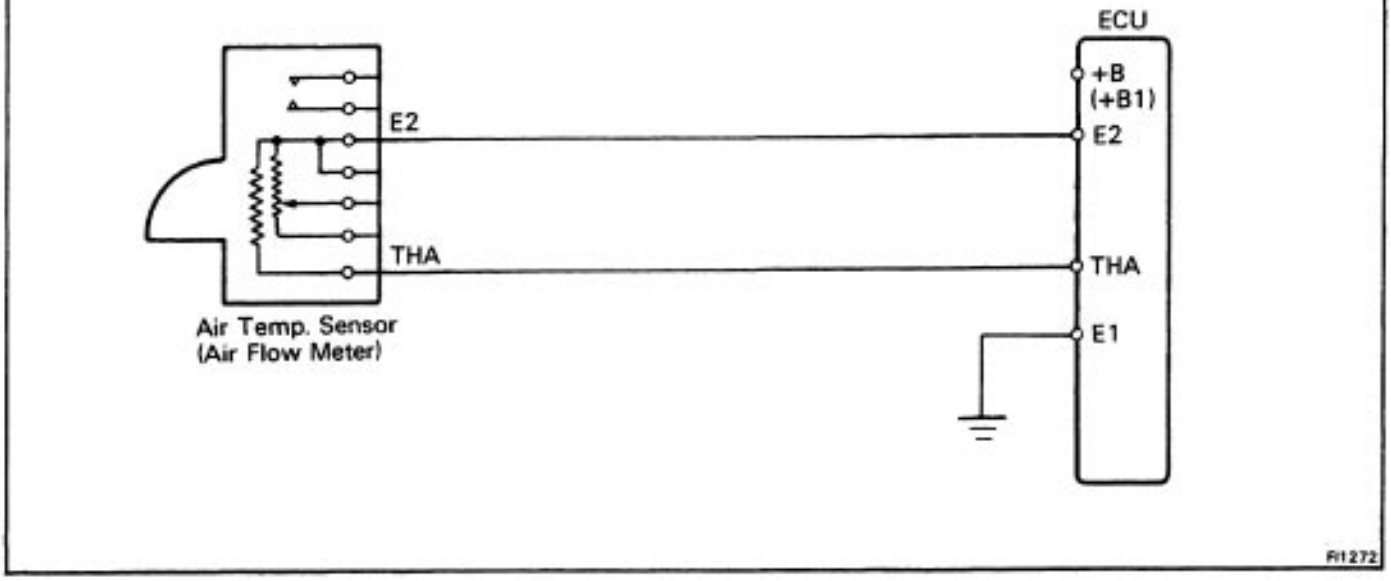
③ Check resistance of magnetic coil in each injector.
STD resistance: Approx. 13.8Ω

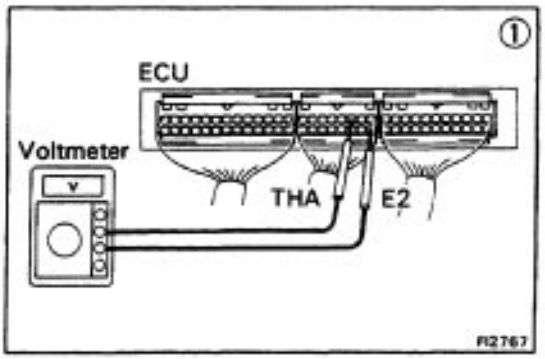
OK ↓

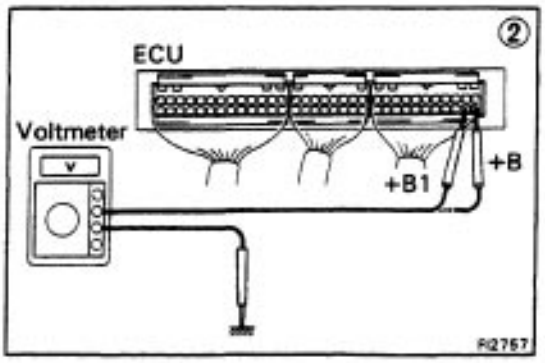
BAD → Replace injector.

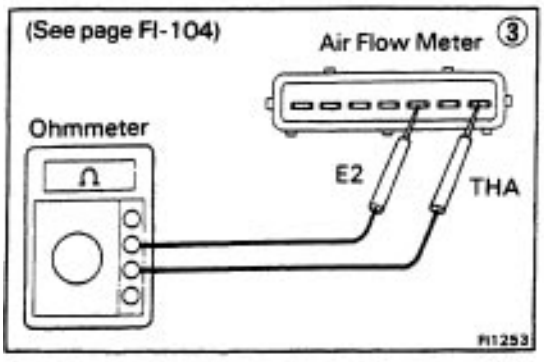
Check wiring between ECU terminal No. 10, No. 20 and/or No. 30 and battery. — BAD → Repair or replace.

No.	Terminals	Trouble	Condition		STD voltage
5	THA – E2	No voltage	IG SW ON	Intake air temperature 20˚C (68˚F)	1 – 3 V









① There is no voltage between ECU terminals THA and E2. (IG SW ON)

↓

② Check that there is voltage between ECU terminal +B (+B1) and body ground. (IG SW ON)

OK → ↓

NO → Refer to No. 1. (See page FI–52)

↓

Check wiring between ECU terminal E1 and body ground.

OK → ↓

BAD → Repair or replace.

↓

③ Check air temp. sensor. (See page FI–104)

BAD → Replace air flow meter.

OK → ↓

Check wiring between ECU and air temp. sensor.

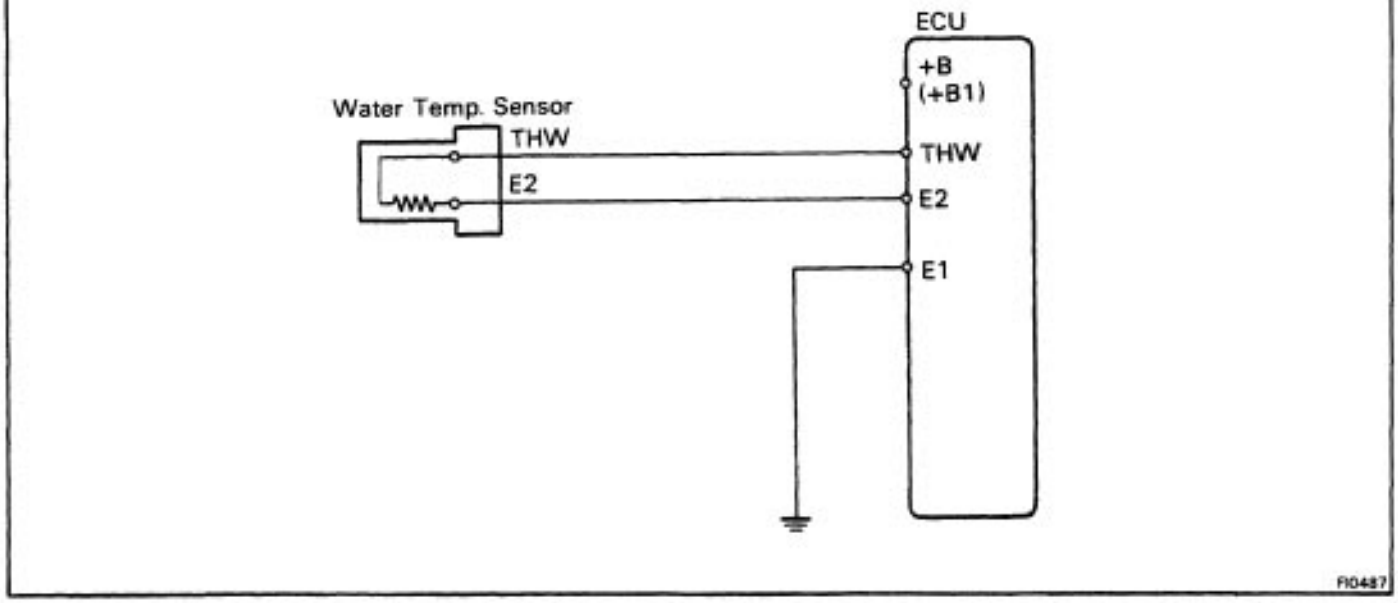
OK → ↓

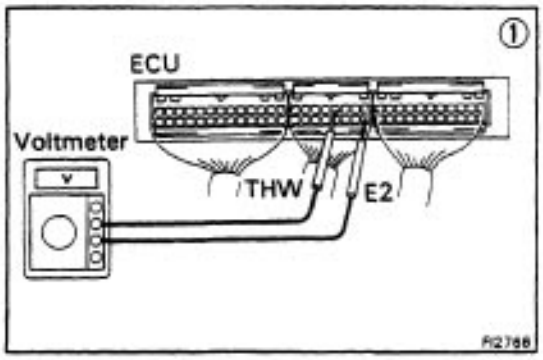
BAD → Repair or replace.

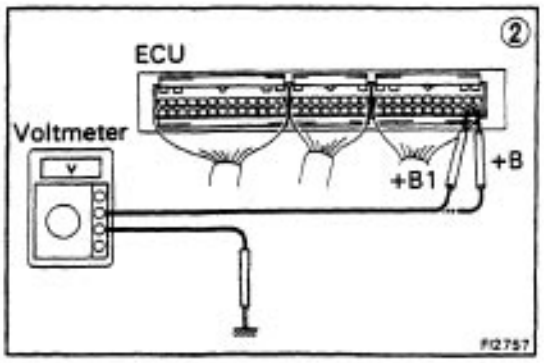
↓

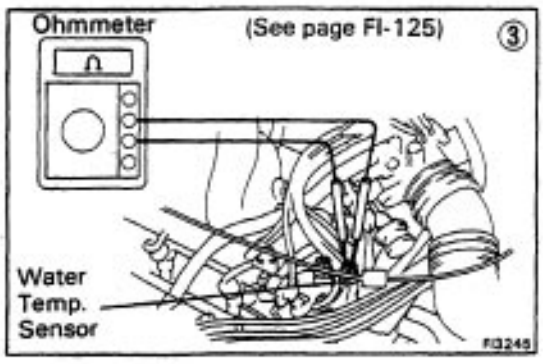
Try another ECU.

No.	Terminals	Trouble	Condition		STD voltage
6	THW – E2	No voltage	IG SW ON	Coolant temperature 80˚C (176˚F)	0.1 – 1.0 V









① There is no voltage between ECU terminals THW and E2. (IG SW ON)

↓

② Check that there is voltage between ECU terminal +B (+B1) and body ground. (IG SW ON)

OK → ↓

NO → Refer to No. 1. (See page FI–52)

↓

Check wiring between ECU terminal E1 and body ground.

OK → ↓

BAD → Repair or replace.

↓

③ Check water temp. sensor. (See page FI–125)

BAD → Replace water temp. sensor.

OK → ↓

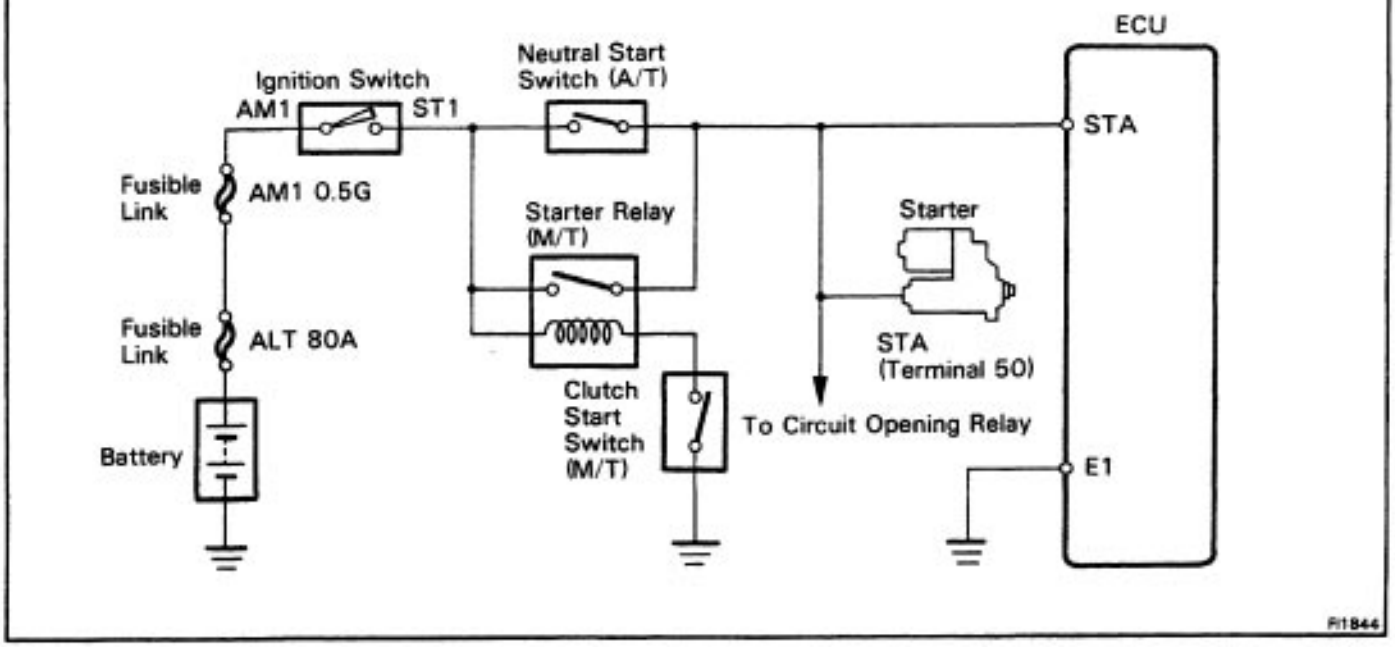
Check wiring between ECU and water temp. sensor.

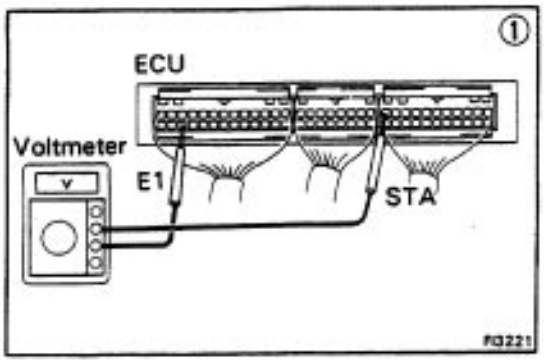
OK → ↓

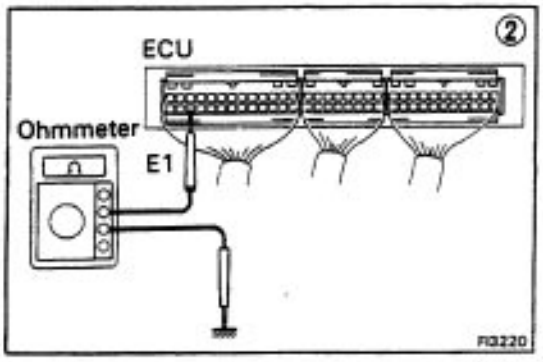
Try another ECU.

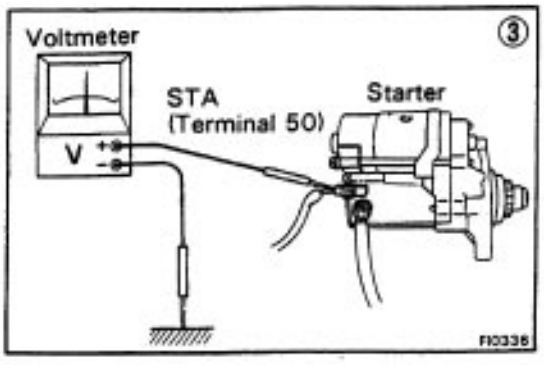
BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD voltage
7	STA – E1	No voltage	Cranking	6 – 14 V









① There is no voltage between ECU terminals STA and EI. (IG SW START)

Check starter operation. — OK → Check wiring between ECU terminal STA and ignition switch terminal ST1 .

BAD

OK → BAD → Repair or replace.

② Check wiring between ECU terminal E1 and body ground.

OK → Try another ECU.

BAD → Repair or replace.

Check fusible links, battery, wiring, ignition switch and neutral start switch. . — BAD → Repair or replace.

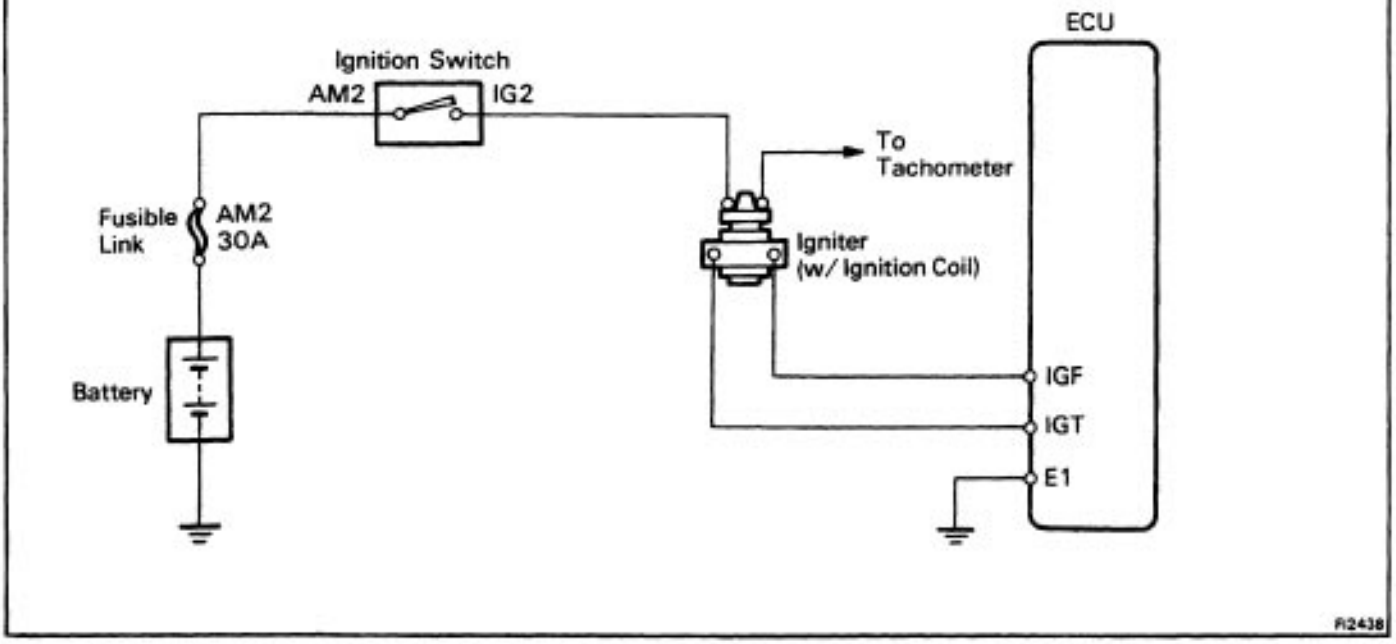
OK

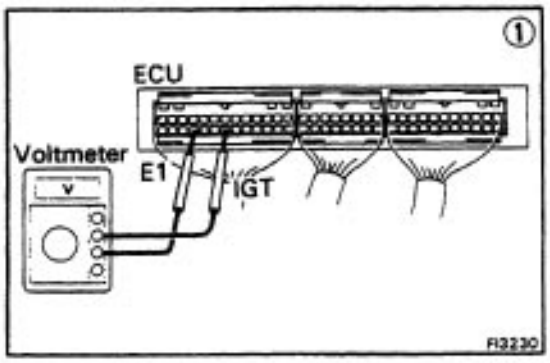
③ Check that there is voltage at STA (50) terminal of starter. (IG SW START) STD voltage: 6 – 14 V

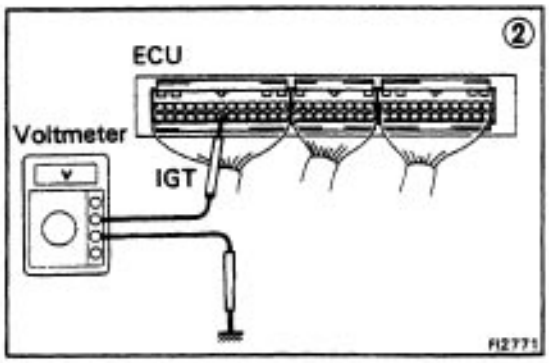
OK → Check starter.

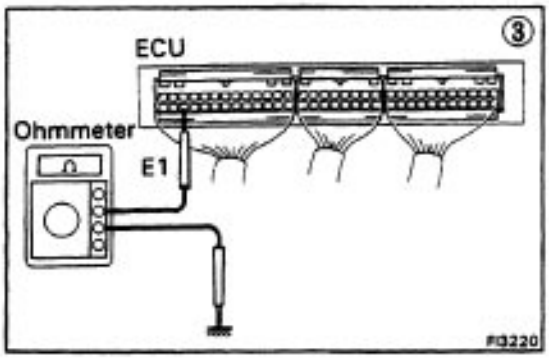
NO → Check wiring between ignition switch terminal ST1 and starter terminal STA (50)

No.	Terminals	Trouble	Condition	STD voltage
8	IGT – E1	No voltage	Idling	0.7 – 1.0 V









① There is no voltage between ECU terminals IGT and El. (idling)

② Check that there is voltage between ECU terminal IGT and body ground. (idling)

NO → ③ Check wiring between ECU terminal E 1 and body ground. → BAD → Repair or replace.

③ → OK → Try another ECU.

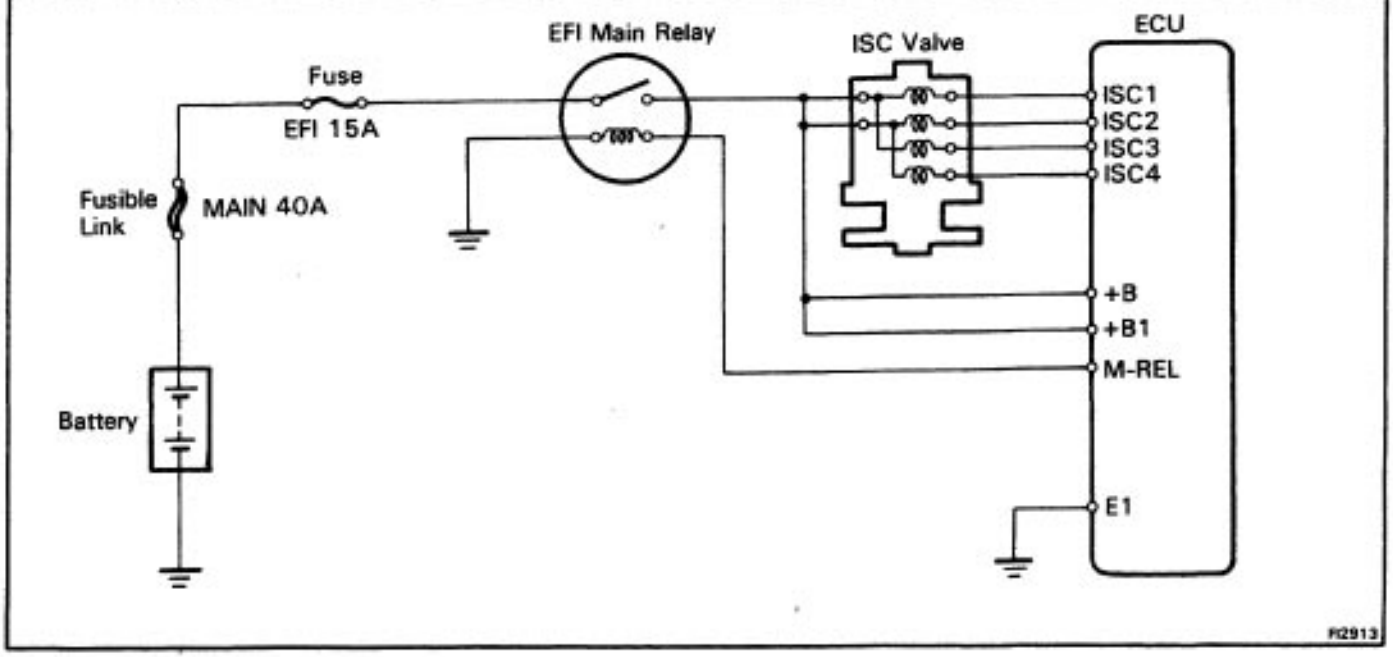
② → OK → Check fusible link and ignition switch. → BAD → Repair or replace.

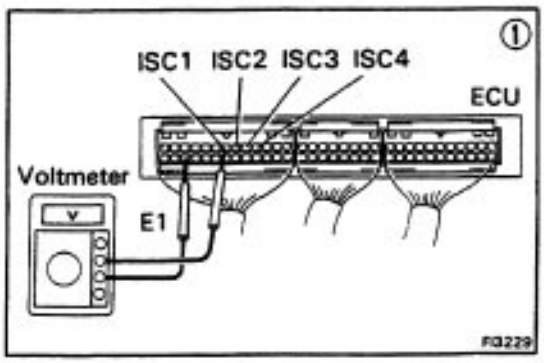
Check fusible link and ignition switch. → OK → Check distributor. (See page IG–8) → BAD → Repair or replace.

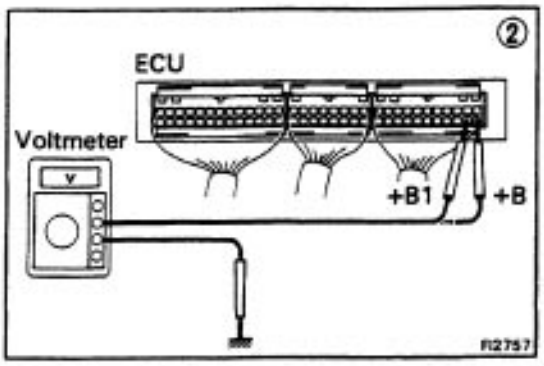
Check distributor. (See page IG–8) → OK → Check wiring between ECU and battery. → BAD → Repair or replace.

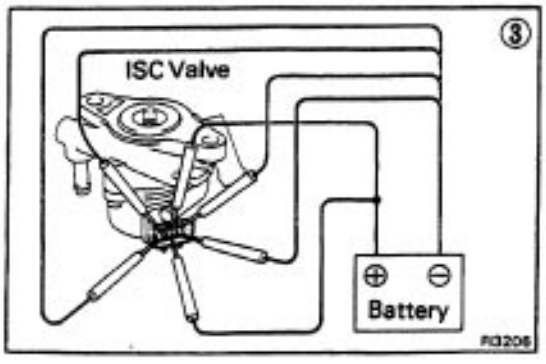
Check wiring between ECU and battery. → OK → Check igniter. → BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD voltage
9	ISC1~ISC4 – E1	No voltage	IG SW ON	9 – 14 V









① There is no voltage between ECU terminals ISC 1 – ISC4 and E1 . (IG SW ON)

② Check that there is voltage between ECU terminal +B (+BI) and body ground. (IG SW ON)

OK → Check wiring between ECU terminal E1 and body ground.

NO → Refer to No. 1. (See page FI–52)

OK → ③ Check ISC valve. (See page FI–118)

BAD → Repair or replace.

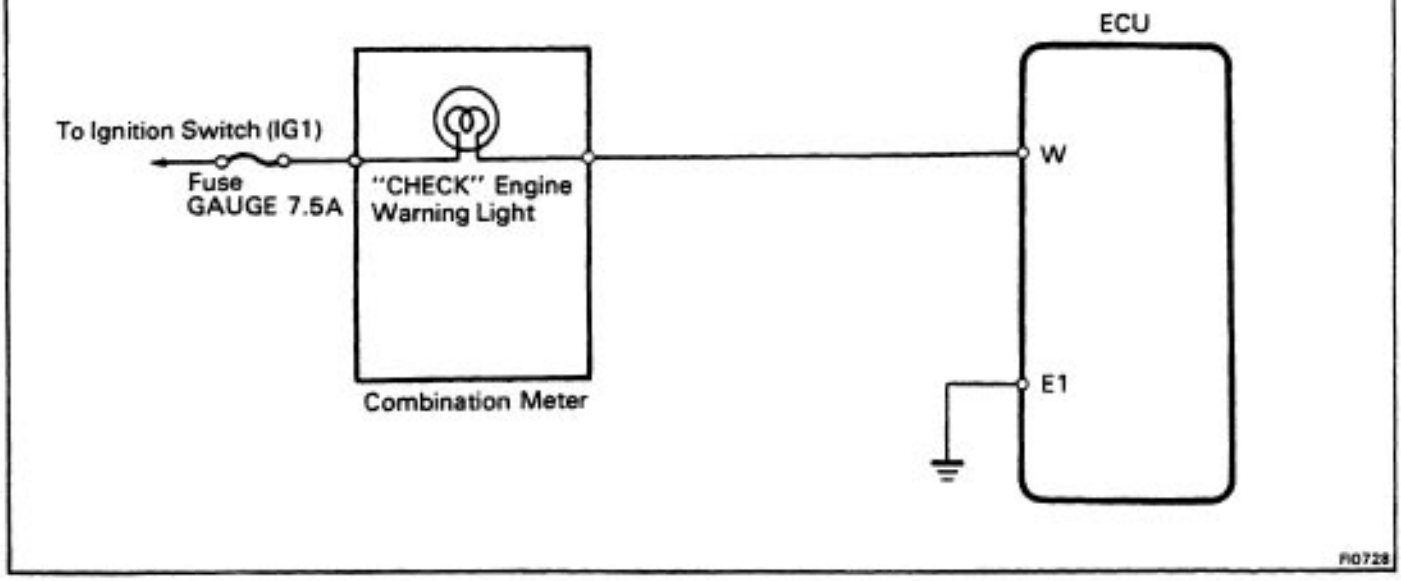
BAD → Replace ISC valve.

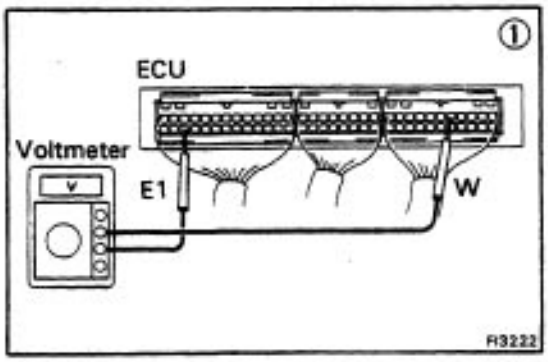
OK → Check wiring between ECU and EFI main relay.

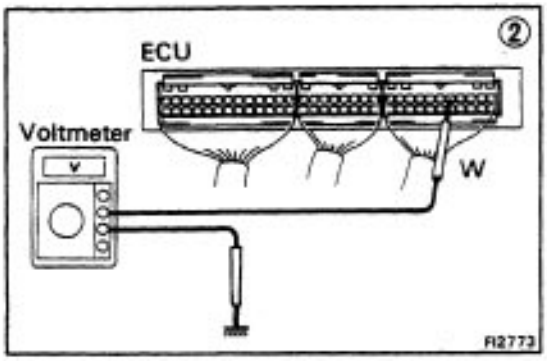
OK → Try another ECU. ..

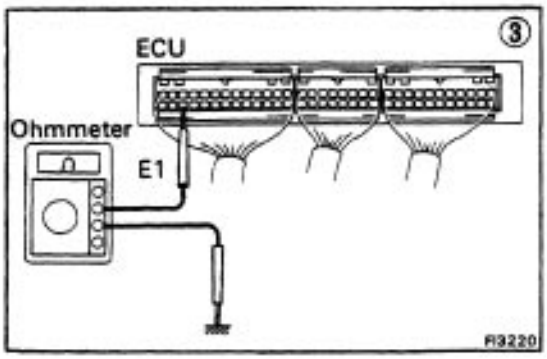
BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD voltage
10	W – E1	No voltage	No trouble (”CHECK” engine warning light off) and engine running	10 – 14 V









① There is no voltage between ECU terminals W and E1. (Idling)

↓

② Check that there is voltage between ECU terminal W and body ground.

NO ← ② → OK

OK → ③ Check wiring between ECU terminal E 1 and body ground. ’

③ → OK → Try another ECU.

③ → BAD → Repair or replace.

NO → Check GAUGE fuse 7.5A and ”CHECK” engine warning light.

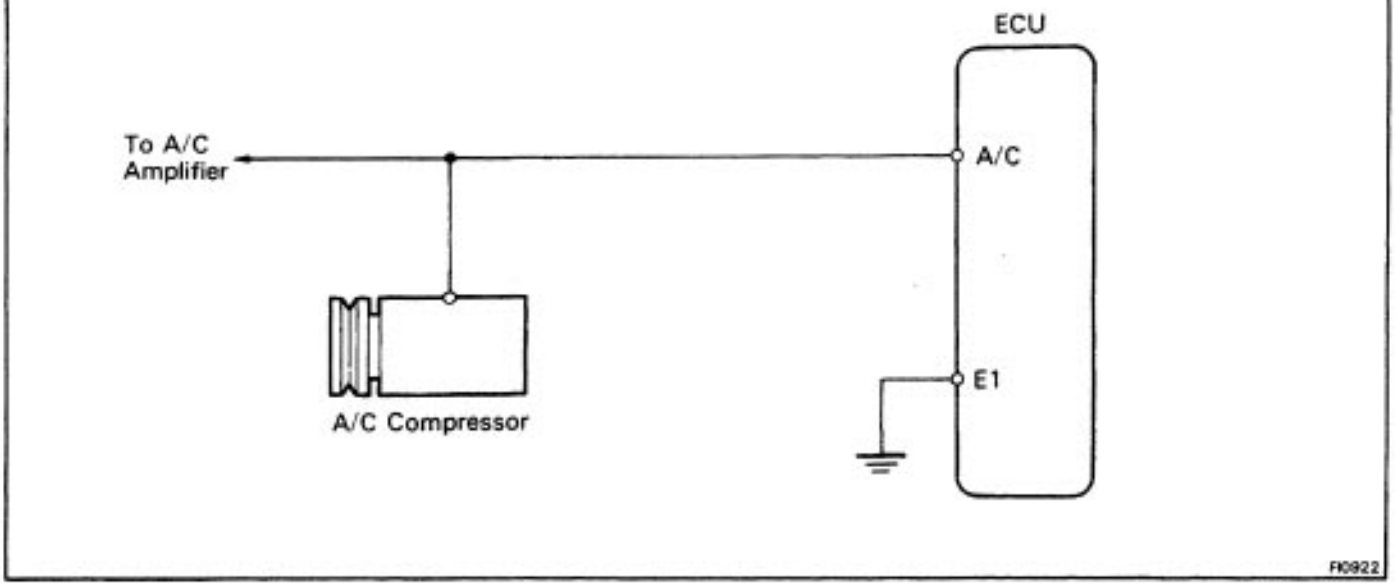
Check GAUGE fuse 7.5A and ”CHECK” engine warning light. → OK → Check wiring between ECU terminal W and fuse.

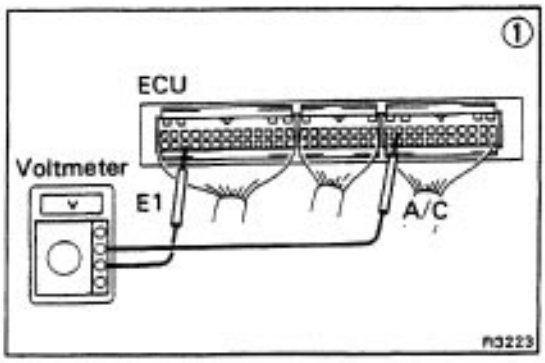
Check GAUGE fuse 7.5A and ”CHECK” engine warning light. → BAD → Repair or replace.

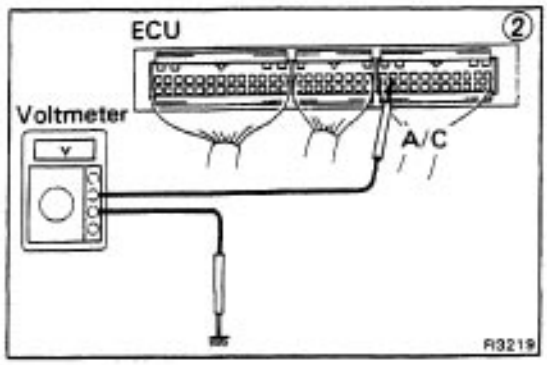
Repair or replace. → Fuse blows again → Check wiring between ECU terminal W and fuse.

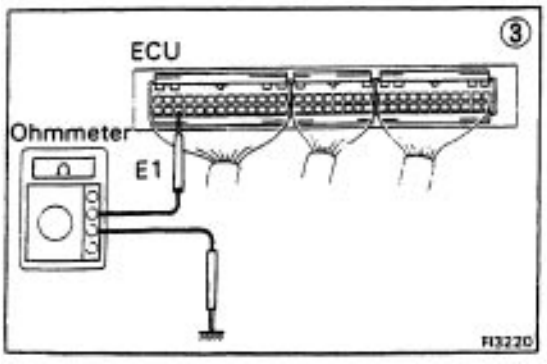
Check wiring between ECU terminal W and fuse. → Repair or replace.

No.	Terminals	Trouble	Condition		STD voltage
11	A/C – E1	No voltage	IG SW ON	Air conditioning ON	8 – 14 V









① There is no voltage between ECU terminals A/C and El. (Air conditioning ON)

② Check that there is voltage between ECU terminal A/C and body ground.

NO → OK

③ Check wiring between ECU terminal E 1 and body ground.

OK → Try another ECU.

BAD → Repair or replace.

Check compressor running.

OK → Check wiring between ECU terminal A/C and amplifier.

BAD → Repair or replace.

BAD → Repair or replace.

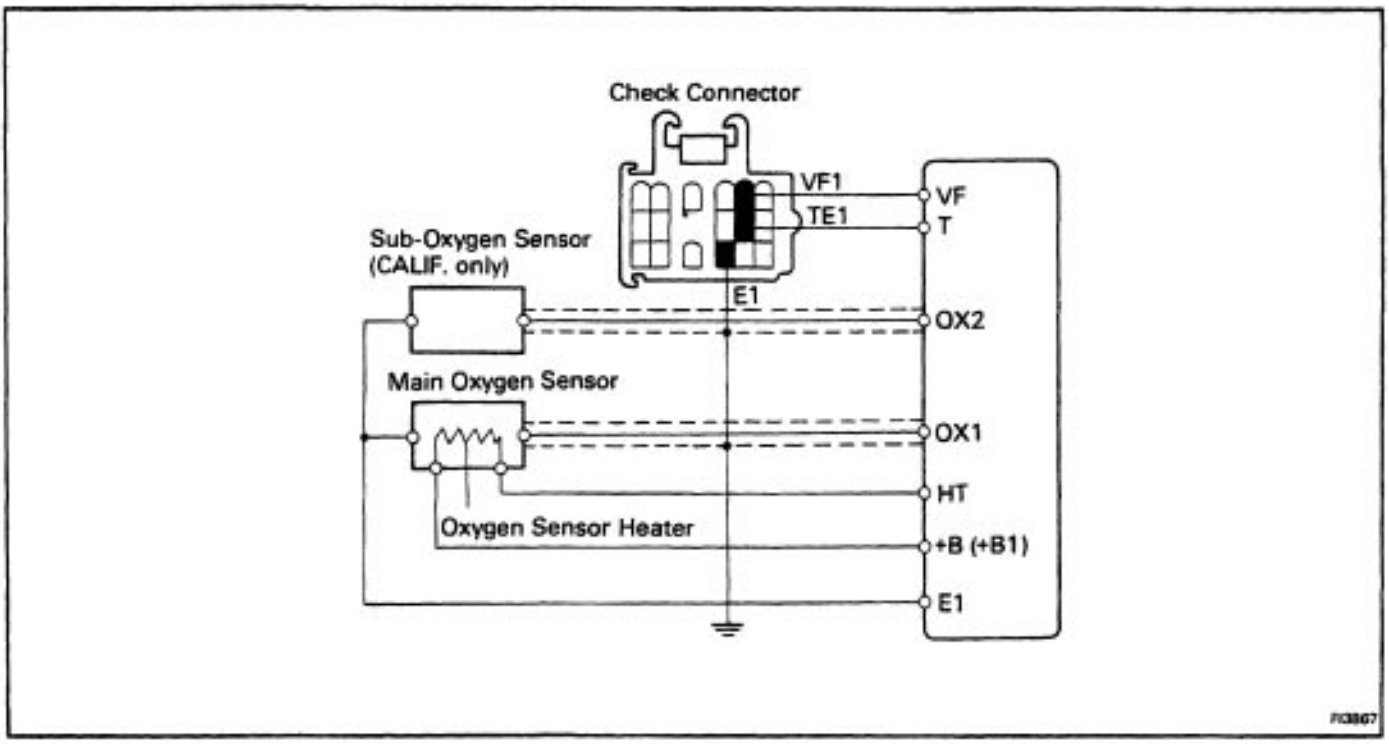
Check that there is voltage between amplifier terminal and body ground.

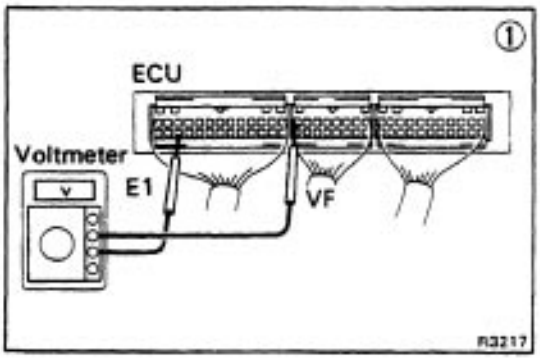
BAD → Repair or replace.

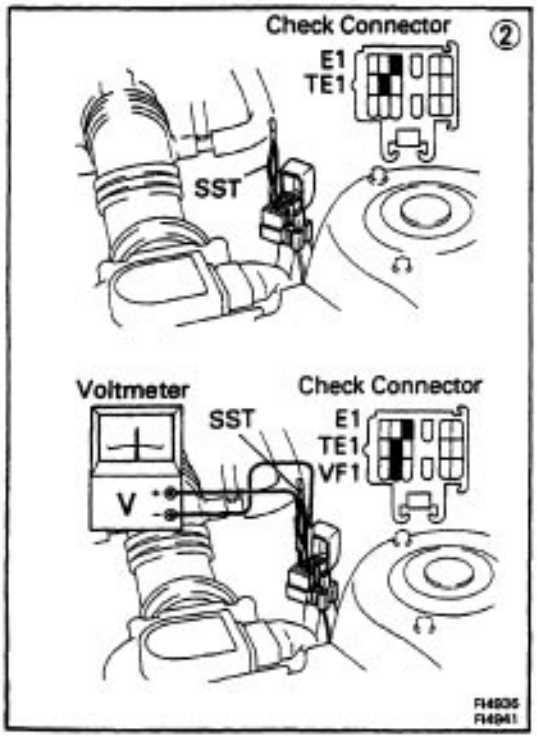
OK

Check wiring between amplifier and ECU or compressor.

BAD → Repair or replace.







¿ There is no voltage between ECU terminals VF and E 1.

Check that there is specified voltage between ECU terminals VF and body ground.

NO → OK: Check wiring between ECU terminal E i and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

Check for suction of air into exhaust system. — BAD → Repair air suction.

OK → Check for air leak from air intake system. — BAD → Repair air leak.

OK → Check spark plugs. — BAD → Repair or replace.

OK → Check distributor and ignition system. — BAD → Repair or replace.

OK → Check fuel pressure. — BAD → Repair or replace_

OK → Check injectors. — BAD → Repair or replace.

OK → Check cold start injector. — BAD → Repair or replace.

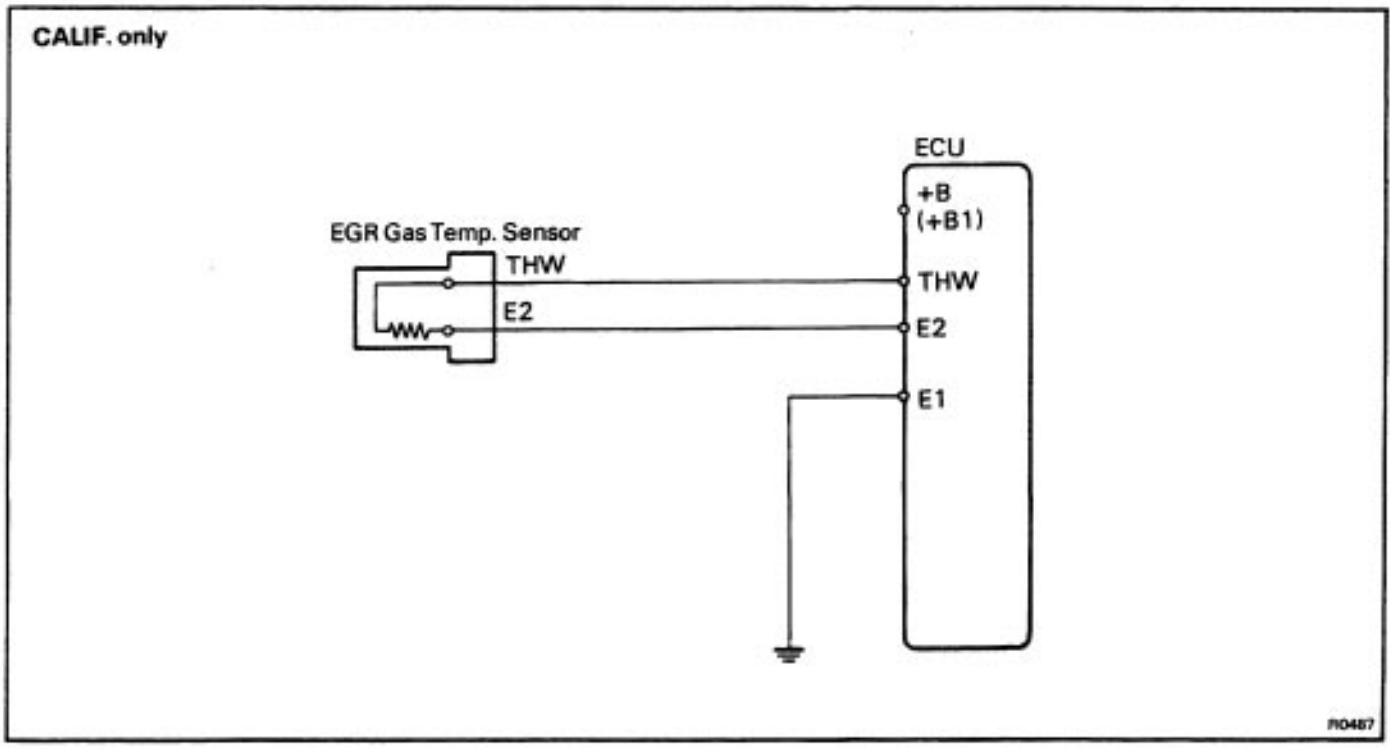
OK → Check air flow meter. — BAD → Repair or replace.

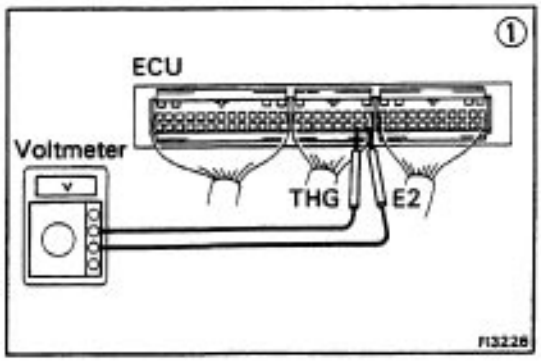
OK → ¿¿ Check operation of oxygen sensors. — OK → System normal.

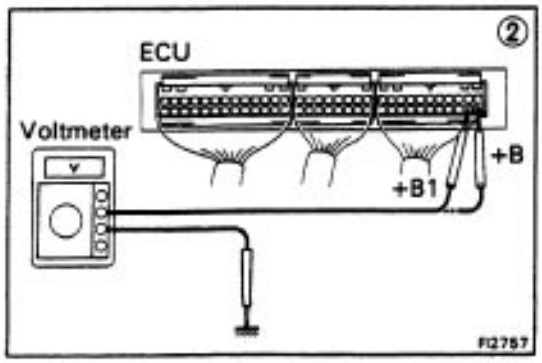
BAD → Check wiring between oxygen sensors and ECU connectors. — BAD → Repair wiring.

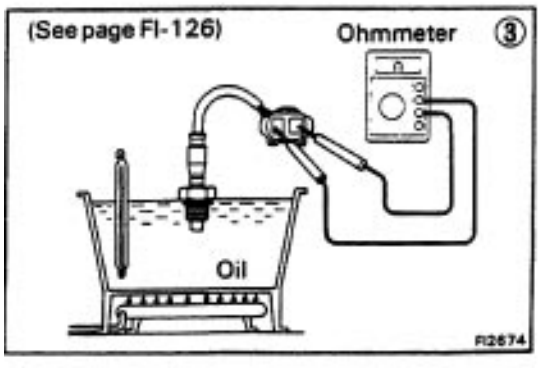
OK → Replace oxygen sensors.

* Rich malfunction only









① No voltage between ECU terminal THG and E2. (IG SW ON)

② Check that there is voltage between ECU terminal +B (+B1) and body ground. (IG SW ON)

OK → Check wiring between ECU terminal E1 and body ground.

NO → Refer to No. 1. (See page FI–32)

OK → Check EGR system.

BAD → Repair or replace.

OK → ③ Check EGR gas temp. sensor. (See page FI–126)

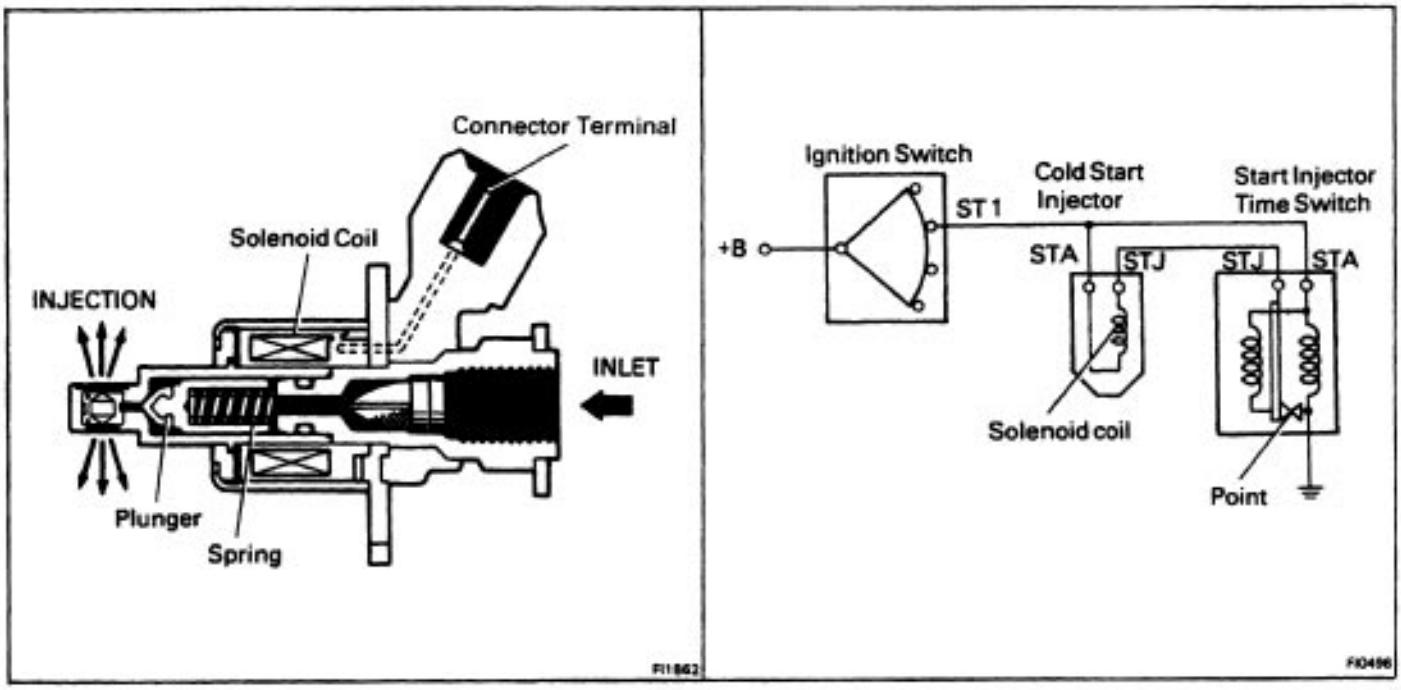
BAD → Replace EGR gas temp. sensor.

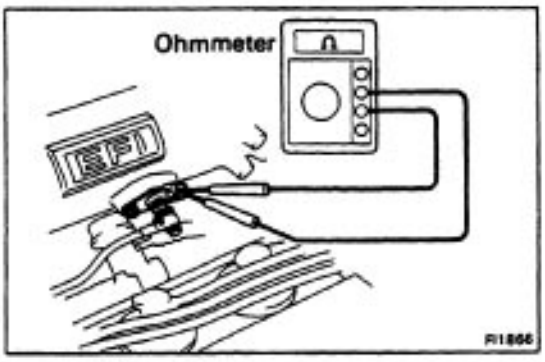
OK → Check wiring between ECU and EGR gas temp. sensor.

OK → Try another ECU.

BAD → Repair or replace.

Cold Start Injector (3S–FE)





ON–VEHICLE INSPECTION

INSPECT RESISTANCE OF COLD START INJECTOR

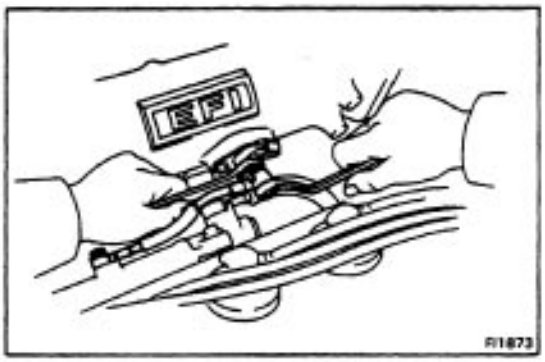
(a) Disconnect the cold start injector connector.

(b) Using an ohmmeter, measure the resistance between the terminals.

Resistance: 2 – 4)

If the resistance is not as specified, replace the cold start injector.

(e) Reconnect the cold start injector connector.



REMOVAL OF COLD START INJECTOR

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DISCONNECT COLD START INJECTOR CONNECTOR

3. DISCONNECT COLD START INJECTOR PIPE

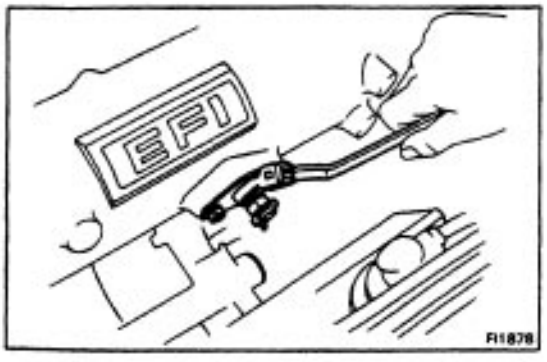
(a) Put a suitable container or shop towel under the injector tube.

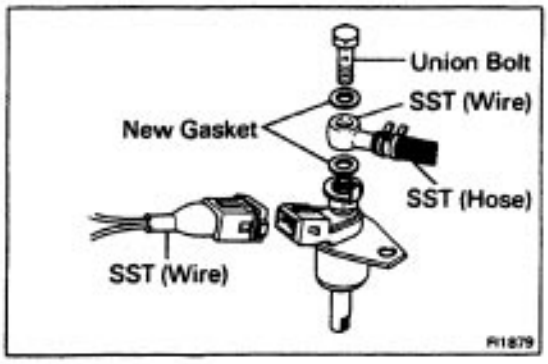
(b) Remove the two union bolts and four gaskets and injector pipe. .

HINT: Slowly loosen the union bolt.

4. REMOVE COLD START INJECTOR

Remove the two bolts, cold start injector and gasket.





INSPECTION OF COLD START INJECTOR

1. INSPECT INJECTION OF COLD START INJECTOR

NOTICE: Keep clear for sparks during the test.

(a) Install SST (two unions) to the injector and delivery pipe with new gaskets and the union bolts.
SST 09268–41045 (09268–41080)

(b) Connect SST (hose) to the unions.
SST 09268–41045

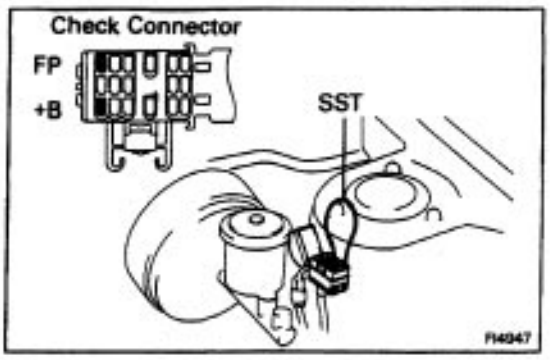
(c) Connect SST (wire) to the injector.
SST 09842–30050

(d) Put a container under the injector.

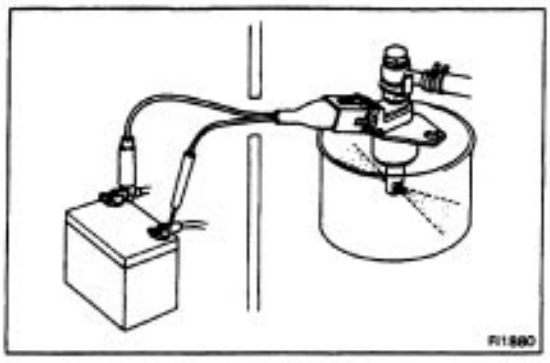
(e) Reconnect the battery negative (–) cable.

(f) Turn the ignition switch ON.

NOTICE: Do not start the engine.

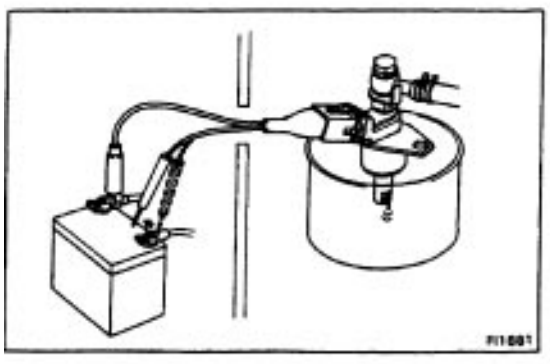


(g) Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020



(h) Connect the test probes of the SST (wire) to the battery, and check that the fuel spray is as shown.
SST 09842–30050

NOTICE: Perform this check within the shortest possible time.



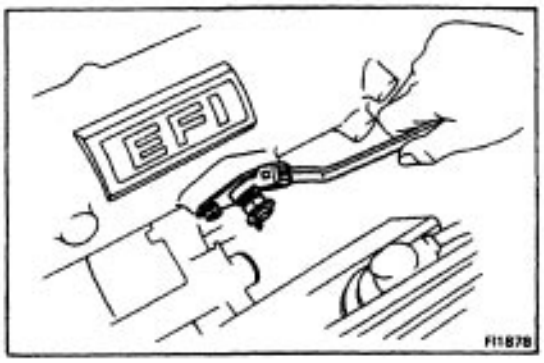
2. INSPECT LEAKAGE

(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check fuel leakage from the injector.
SST 09842–30050

Fuel drop: One drop or less per minute

(b) Disconnect the battery negative H cable.

(c) Remove SST and the service wire.
SST 09268–41045 and 09842–30050

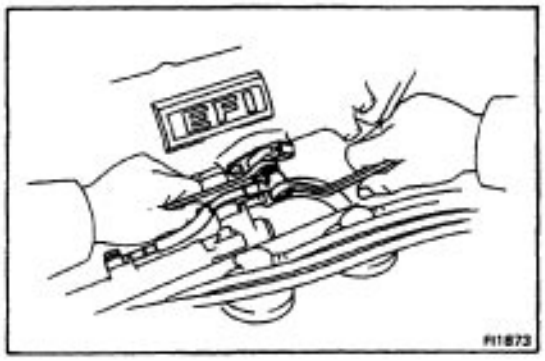


INSTALLATION OF COLD START INJECTOR

1. INSTALL COLD START INJECTOR

Install a new gasket and the injector with the two bolts.

Torque: 95 kg–cm (82 in.–lb, 9.3 N–m)



2. CONNECT COLD START INJECTOR PIPE

Install the injector pipe with new four gaskets and the two union bolts.

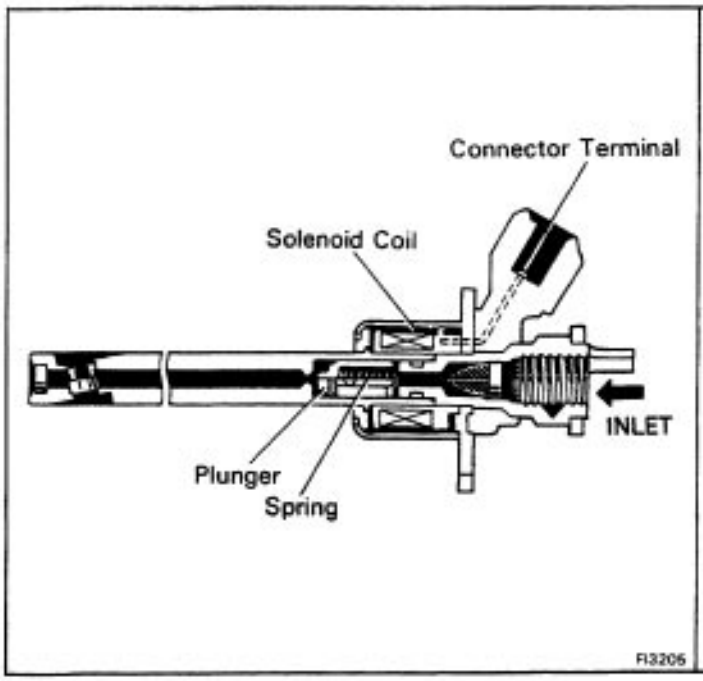
Torque: 180 kg–cm (13 ft–lb, 18 N–m)

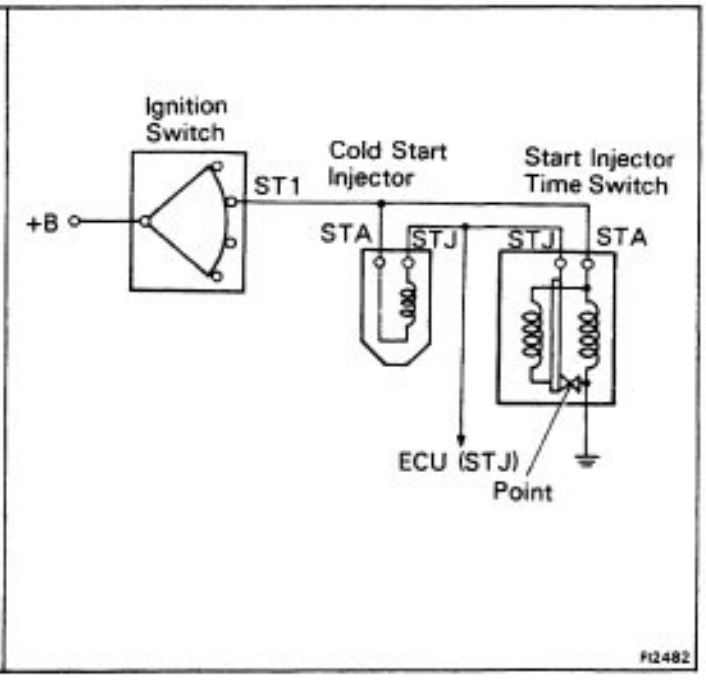
3. CONNECT COLD START INJECTOR CONNECTOR

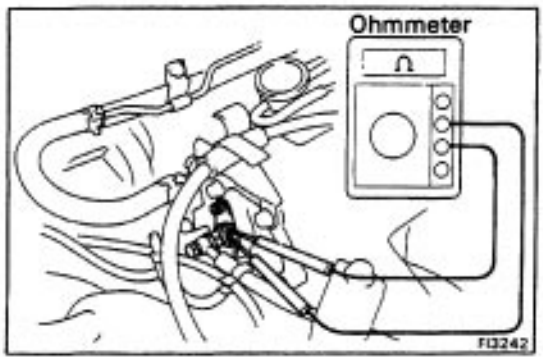
4. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

5. CHECK FOR FUEL LEAKAGE (See page FI–9)

Cold Start Injector (2VZ–FE)







ON–VEHICLE INSPECTION

INSPECT RESISTANCE OF COLD START INJECTOR

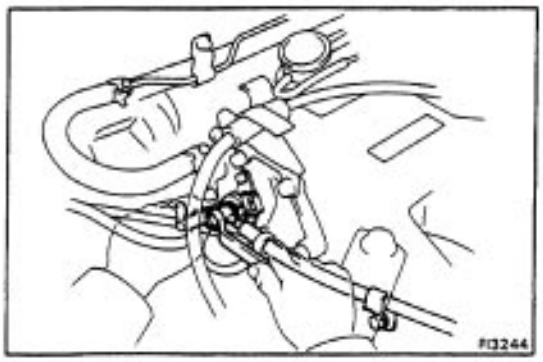
(a) Disconnect the cold start injector connector.

(b) Using an ohmmeter, measure the resistance between the terminals.

Resistance: 2 – 4)

If the resistance is not as specified, replace the cold start injector.

(e) Reconnect the cold start injector connector.



REMOVAL OF COLD START INJECTOR

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DISCONNECT COLD START INJECTOR CONNECTOR

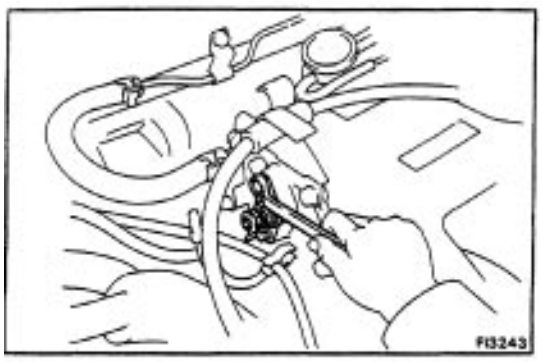
3. DISCONNECT COLD START INJECTOR TUBE

(a) Put a suitable container or shop towel under the injector tube.

(b) Remove the union bolt and two gaskets, and disconnect the injector tube.

HINT: Slowly loosen the union bolt.

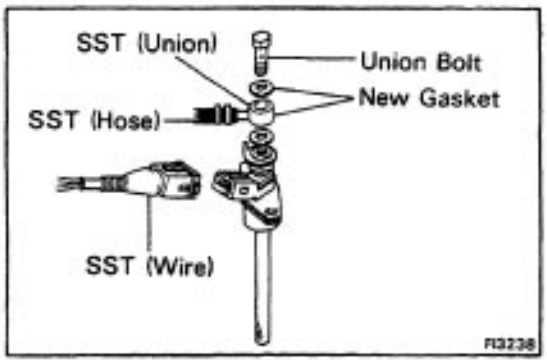
(e) Disconnect the injector tube from the clamp.



4. REMOVE COLD START INJECTOR

Remove the two bolts, cold start injector and gasket.

INSPECTION OF COLD START INJECTOR



1. INSPECT INJECTION OF COLD START INJECTOR

NOTICE: Keep clear for sparks during the test.

(a) Install SST (two unions) to the injector and delivery pipe with new gaskets and the union bolts.
SST 09268–41045 (09268–41080)

(b) Connect SST (hose) to the unions.
SST 09268–41045

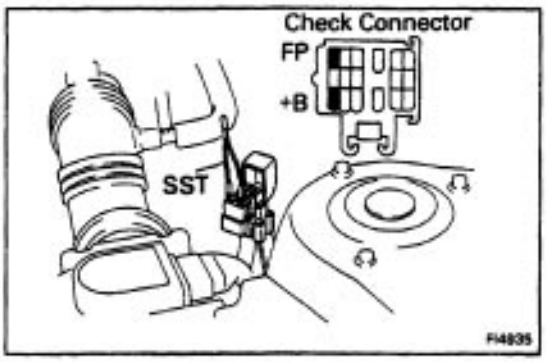
(e) Connect SST (wire) to the injector.
SST 09842–30050

(d) Put a container under the injector.

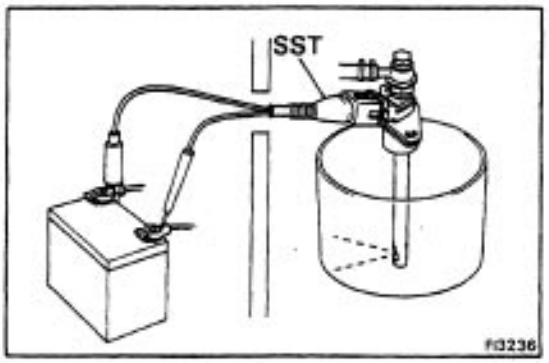
(e) Reconnect the battery negative (–) cable.

(f) Turn the ignition switch ON.

NOTICE: Do not start the engine.

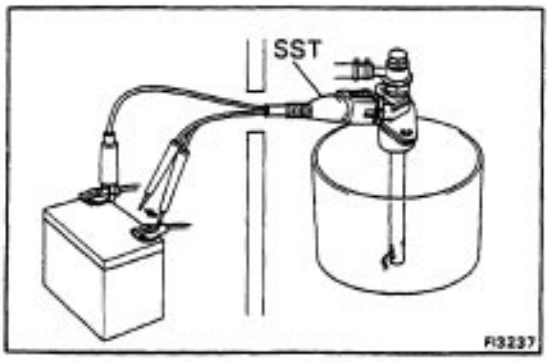


(g) Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020



(h) Connect the test probes of the SST (wire) to the battery, and check that the fuel spray is as shown.
SST 09842–30050

NOTICE: Perform this check within the shortest possible time.



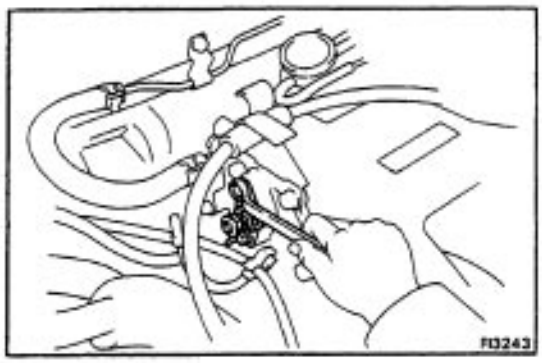
2. INSPECT LEAKAGE –

(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check fuel leakage from the injector.
SST 09842–30050

Fuel drop: One drop or less per minute

(b) Disconnect the battery negative (–) cable.

(c) Remove SST and the service wire.
SST 09268–41045,09842–30050 and 09843–18020

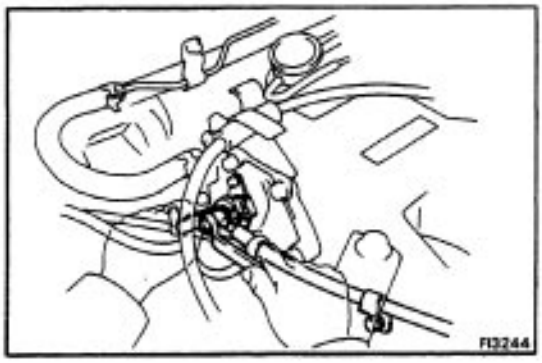


INSTALLATION OF COLD START INJECTOR

1. INSTALL COLD START INJECTOR

Install a new gasket and the injector with the two bolts.

Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)



2. CONNECT COLD START INJECTOR TUBE

(a) Connect the injector tube to clamp.

(b) Connect the injector tube with two new gaskets and the union bolt.

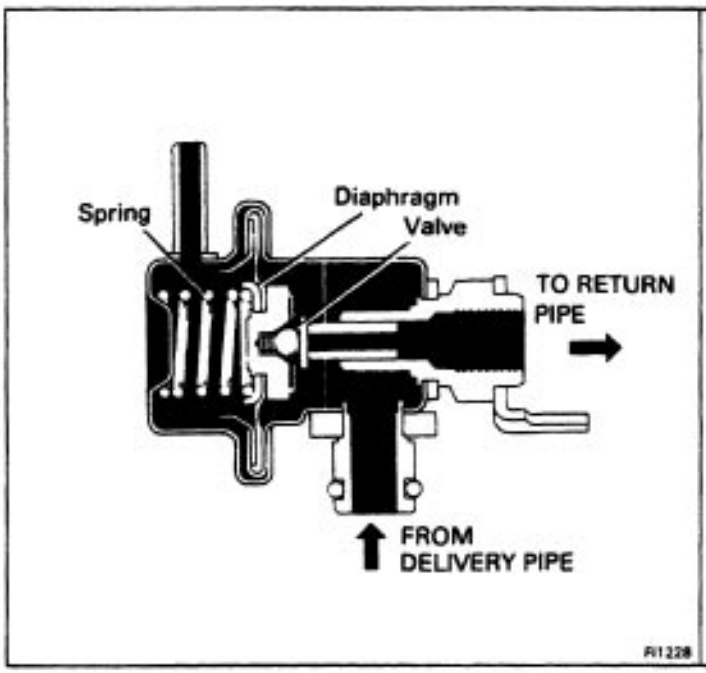
Torque: 200 kg–cm (14 ft–lb, 20 N–m)

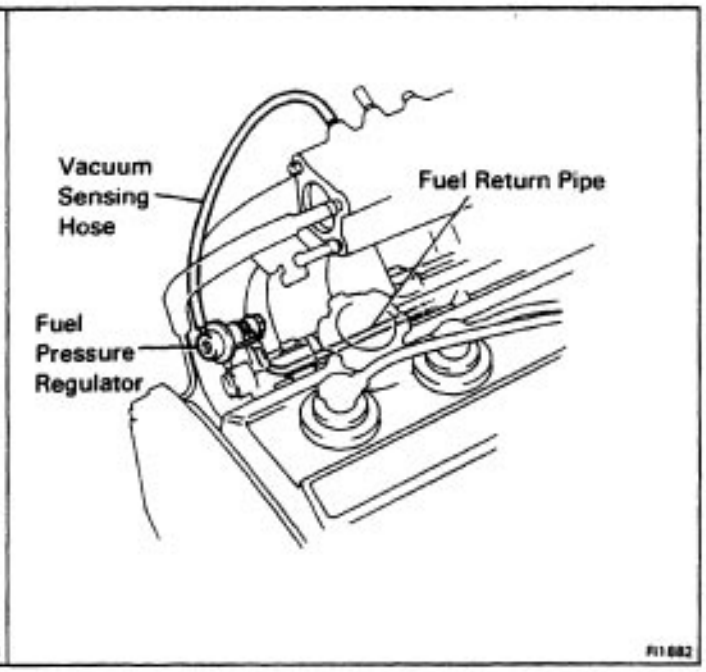
3. CONNECT COLD START INJECTOR CONNECTOR

4. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

5. CHECK FOR FUEL LEAKAGE (See page FI–9)

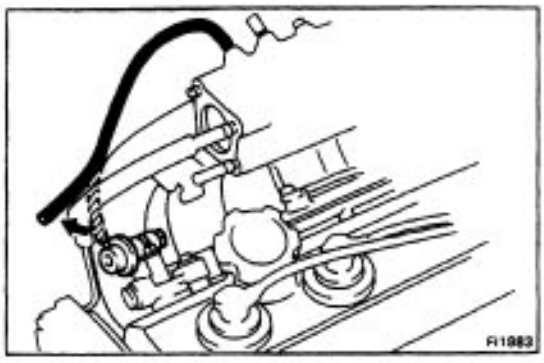
Fuel Pressure Regulator (3S–FE)





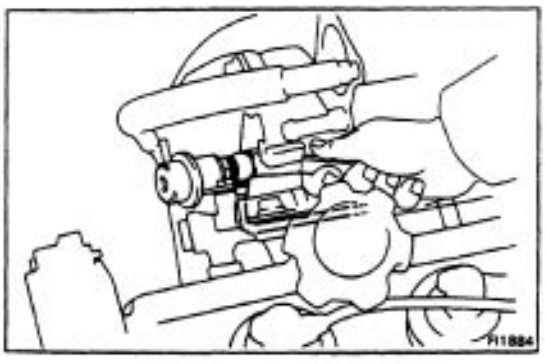
ON–VEHICLE INSPECTION

INSPECT FUEL PRESSURE (See page FI–70)



REMOVAL OF FUEL PRESSURE REGULATOR

1. DISCONNECT VACUUM SENSING HOSE

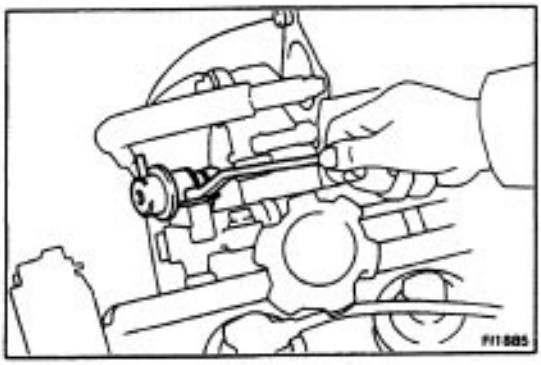


2. DISCONNECT FUEL RETURN PIPE

(a) Put a suitable container or shop towel under the pressure regulator.

(b) Remove the union bolt and two gasket, and disconnect the return pipe from the pressure regulator.

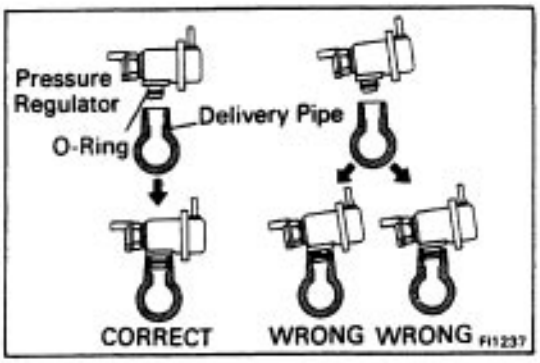
HINT: Slowly loosen the union bolt.



3. REMOVE FUEL PRESSURE REGULATOR

(a) Remove the two bolts, and pull out the pressure regulator.

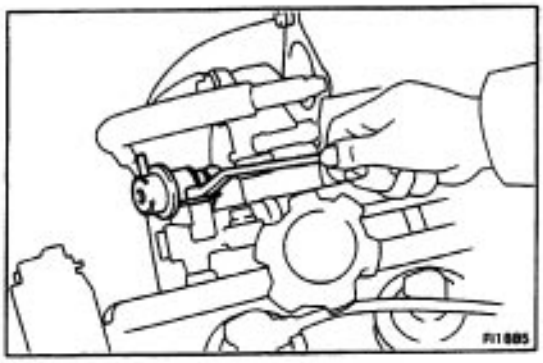
(b) Remove the 0–ring from the pressure regulator.



INSTALLATION OF FUEL PRESSURE REGULATOR

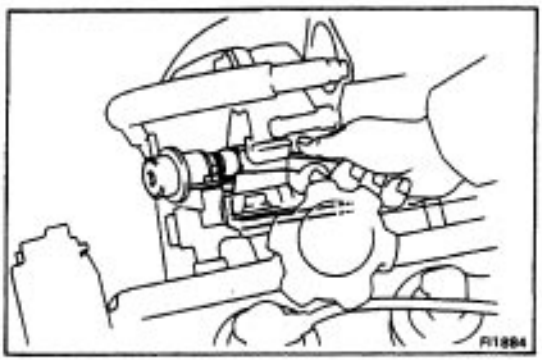
1. INSTALL FUEL PRESSURE REGULATOR

(a) Apply a light coat of gasoline to a new 0–ring, and install it to the pressure regulator.



(b) Install the pressure regulator with the two bolts.

Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)



2. CONNECT FUEL RETURN PIPE

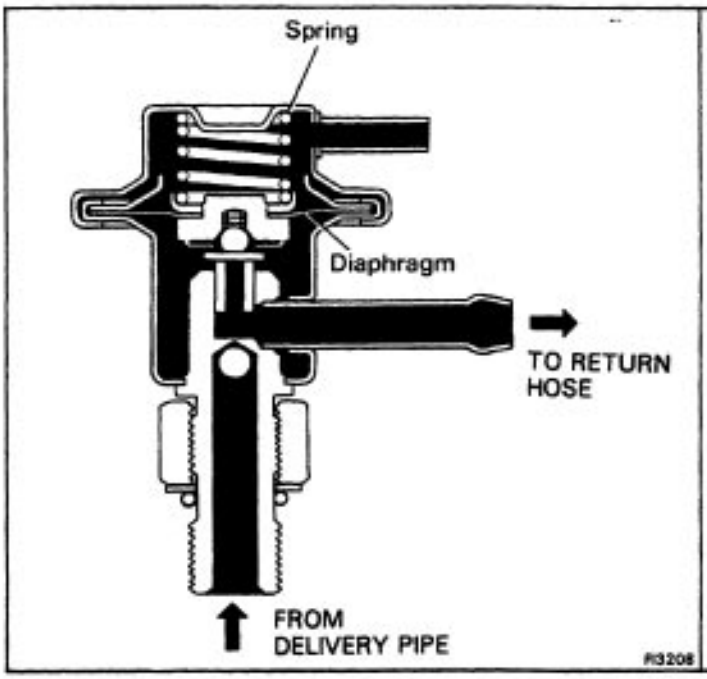
Install the return pipe with two new gasket and the union bolt.

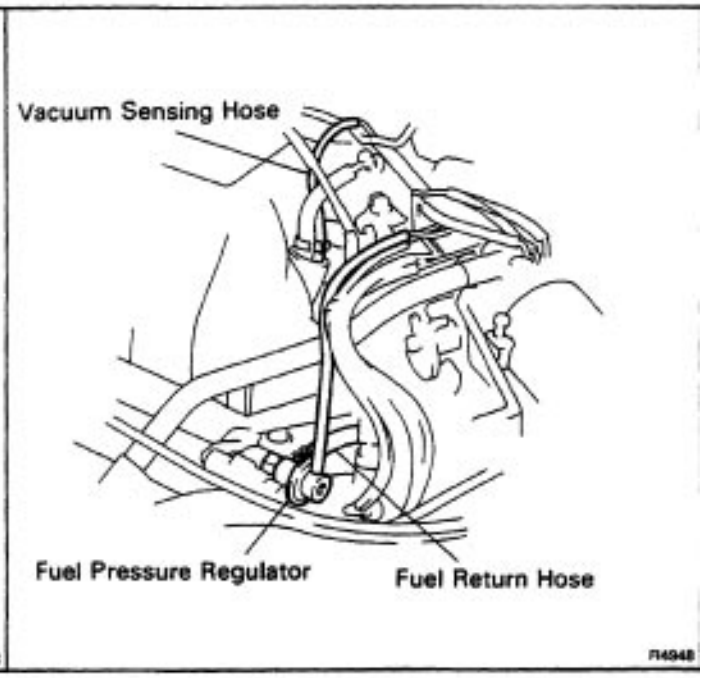
Torque: 180 kg–cm (13 ft–lb, 18 N–m)

3. CONNECT VACUUM SENSING HOSE

4. CHECK FOR FUEL LEAKAGE (See page FI–9)

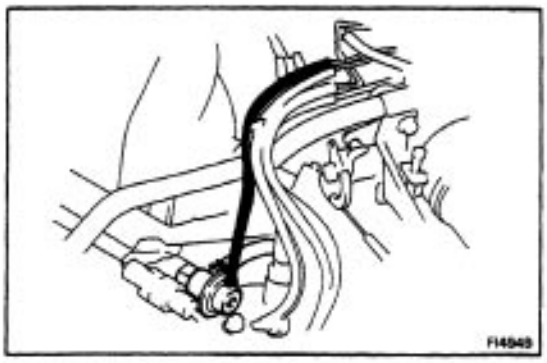
Fuel Pressure Regulator (2VZ–FE)





ON–VEHICLE INSPECTION

INSPECT FUEL PRESSURE (See page FI–70)



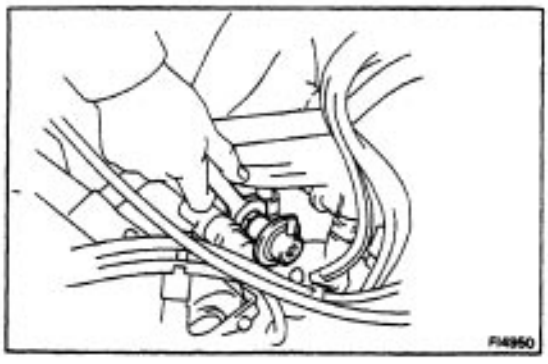
REMOVAL OF FUEL PRESSURE REGULATOR

1. DISCONNECT VACUUM SENSING HOSE

2. DISCONNECT FUEL R RN HOSE

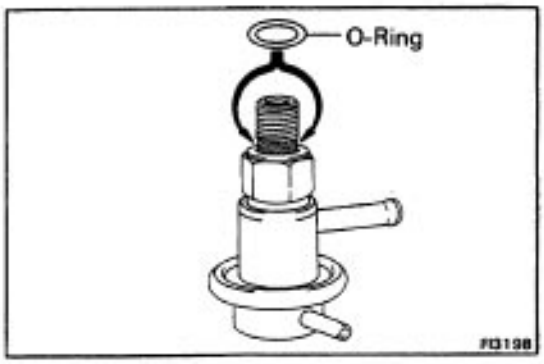
(a) Put a suitable container or shop towel under the pressure regulator.

(b) Disconnect the return hose from the pressure regulator.



3. REMOVE FUEL PRESSURE REGULATOR

Loosen the lock nut, and remove the pressure regulator.

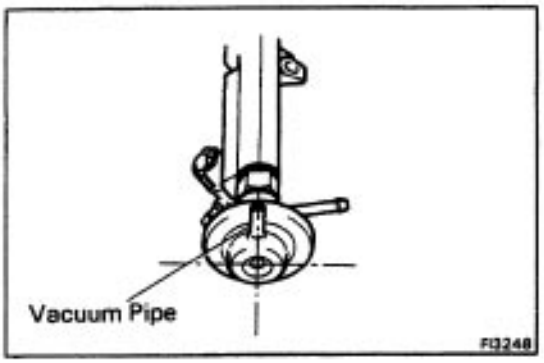


INSTALLATION OF FUEL PRESSURE REGULATOR

1. INSTALL FUEL PRESSURE REGULATOR

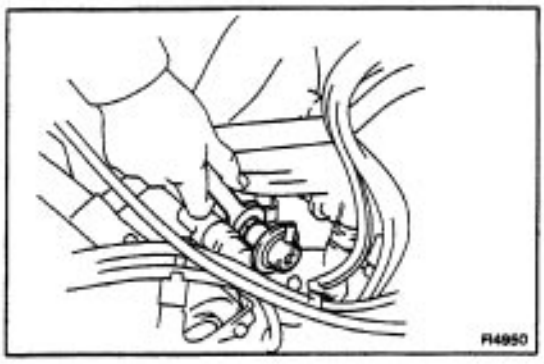
(a) Fully loosen the lock nut of the pressure regulator.

(b) Apply a light coat of gasoline to a new O–ring, and install it to the pressure regulator.



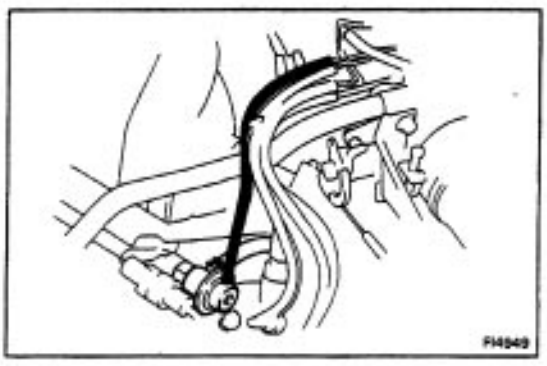
(c) Thrust the pressure regulator completely into the delivery pipe by hand.

(d) Turn the pressure regulator counterclockwise until the vacuum pipe faces in the direction indicated in the figure.



(e) Tighten the lock nut.

Torque: 330 kg–cm (24 ft–lb, 32 N–m)

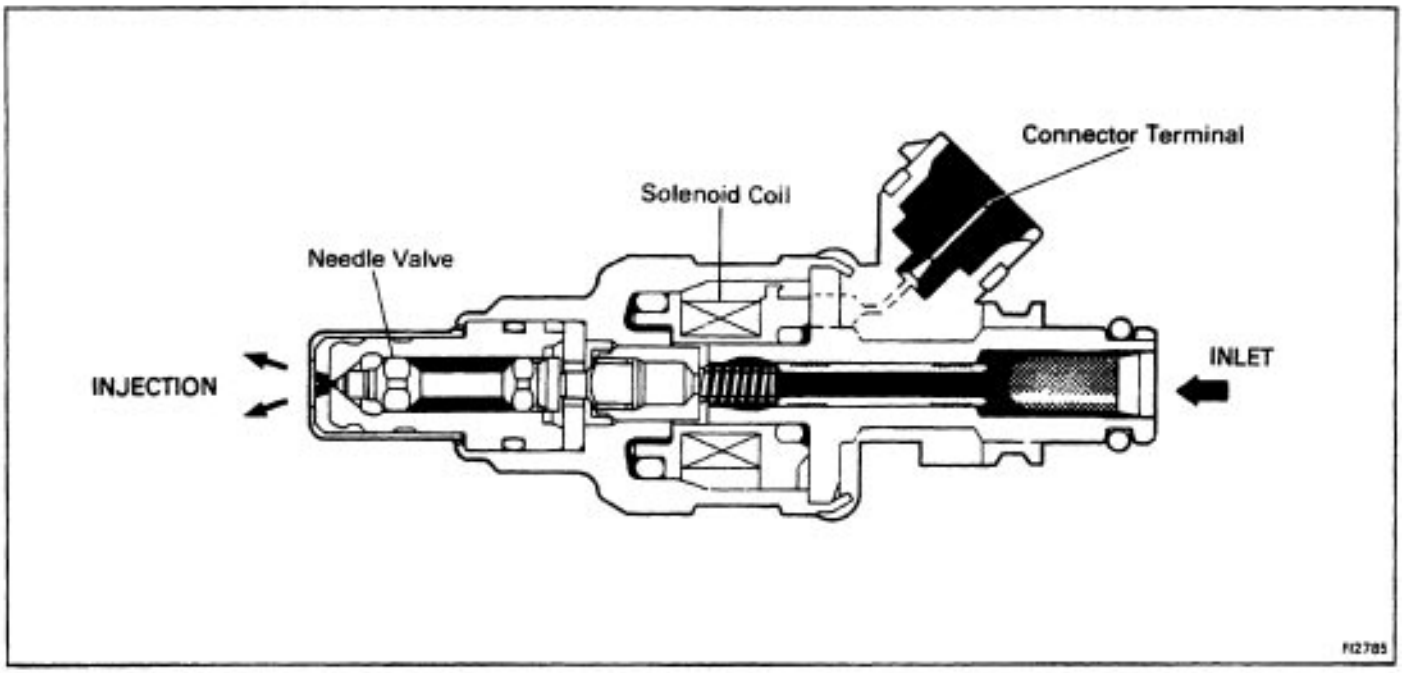


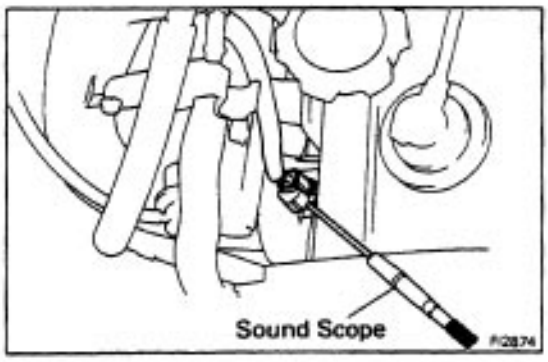
2. CONNECT FUEL RETURN HOSE

3. CONNECT VACUUM SENSING HOSE

4. CHECK FOR FUEL LEAKAGE (See page FI–9)

Injectors (3S–FE)



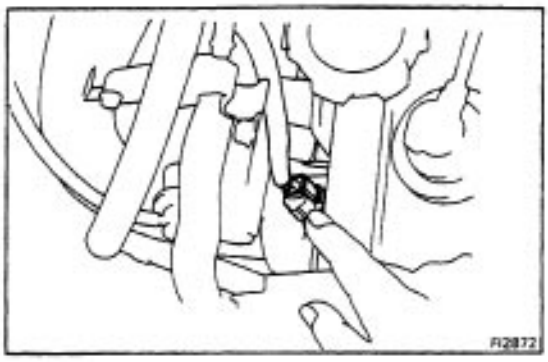


ON–VEHICLE INSPECTION

1. INSPECT INJECTOR OPERATION

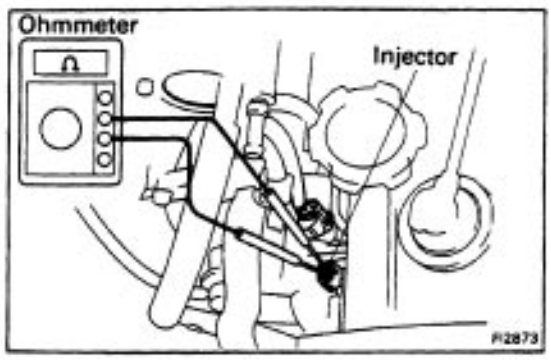
Check operation sound from each injector.

(a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine rpm.



(b) If you have no sound scope, you can check the injector transmission operation with your finger.

If no sound or an unusual sound is heard, check the wiring connector, injector or injection signal from ECU.



2. INSPECT INJECTOR RESISTANCE

(a) Disconnect the injector connector.

(b) Using an ohmmeter, measure the resistance between the terminals.

Resistance: Approx. 13.8)

If the resistance is not as specified, replace the injector.

(c) Reconnect the injector connector.

REMOVAL OF INJECTORS

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DISCONNECT COLD START INJECTOR PIPE
(See steps 2 and 3 on page FI–78)

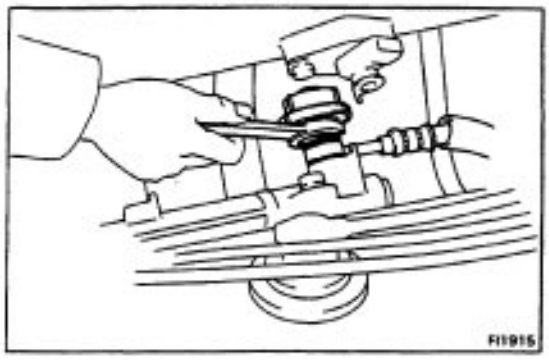
3. DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR (See step 1 on page FI–84)

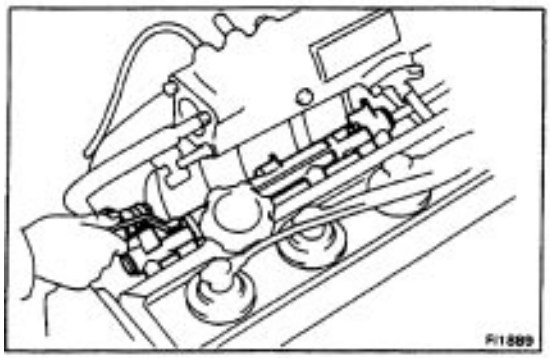
4. DISCONNECT INJECTOR CONNECTORS

5. DISCONNECT FUEL HOSE FROM FUEL RETURN PIPE

6. REMOVE FUEL PRESSURE PALSATION DAMPER

Remove the pulsation damper and two gaskets.





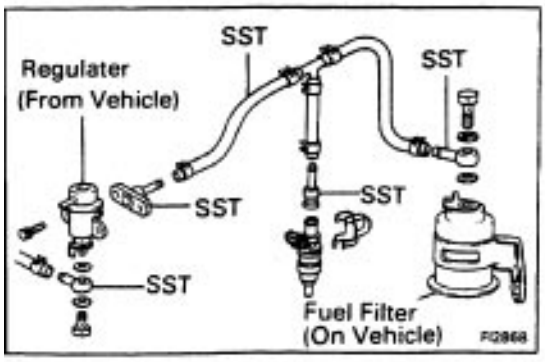
7. REMOVE DELIVERY PIPE AND INJECTORS

(a) Remove the two bolts and delivery pipe together with four injectors.

NOTICE: Be careful not to drop the injectors, when removing the delivery pipe.

(b) Remove the four insulators and two spacers from the cylinder head.

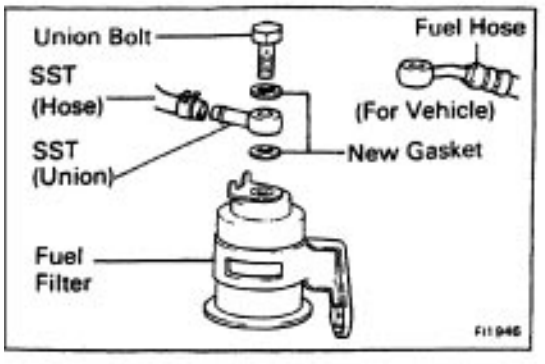
(c) Pull out the four injectors from the delivery pipe.



INSPECTION OF INJECTORS

1. INSPECT INJECTOR INJECTION

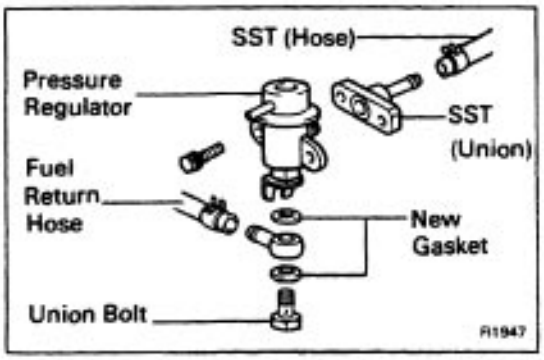
NOTICE: Keep clear for sparks during the test.



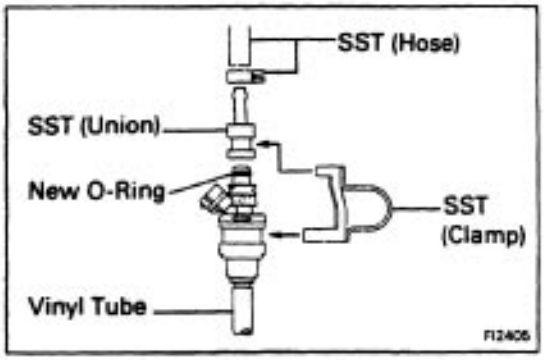
(a) Disconnect the fuel hose from the fuel filter outlet.

(b) Connect SST (union and hose) to the fuel filter outlet with two new gaskets and the union bolt.
SST 09268–41045 (90405–09015)

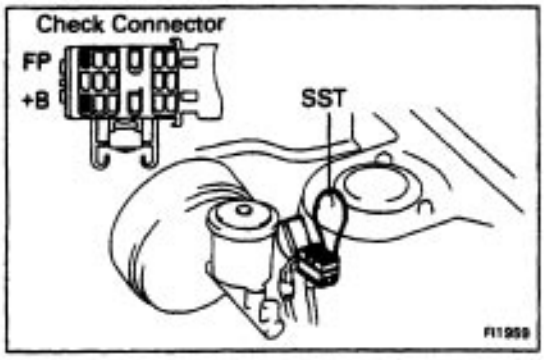
HINT: Use the vehicle's fuel filter.



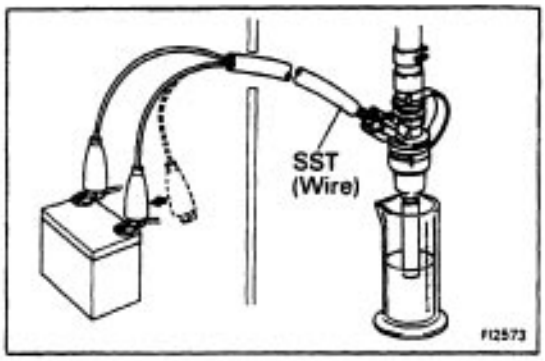
(e) Remove the pressure regulator. (See page FI–84)
(d) Connect the fuel return hose and SST (hose) to the pressure regulator with SST (union), two new gaskets and union bolt.
SST 09268–41045 (09268–41080, 09268–41090)



(e) Install a new O–ring to the injector.
(f) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268–41045
(g) Put the injector into the graduated cylinder.
HINT: Install the a suitable vinyl hose onto the injector to prevent gasoline from splashing out
(h) Reconnect the battery negative H cable.
(i) Turn the ignition switch ON.
HINT: Do not start the engine



(j) Using SST, connect terminals +B and FP of the check connector.
SST 49843–18020

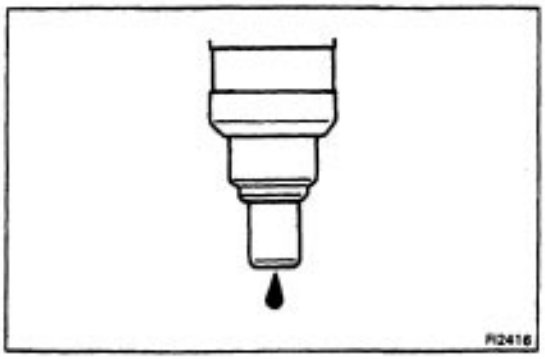


(k) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector two or three times.
SST 09842–30070

Volume: 45 – 55 cc (2.7 – 3.4 cu in.) per 15 sec.
Difference between each injector:
5 cc (0.3 cu in.) or less

If the injection volume is not as specified, replace the injector.

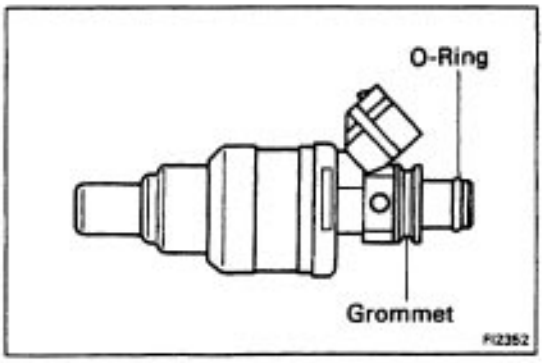
2. INSPECT LEAKAGE.



(a) In the condition above, disconnect the. test probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30070

Fuel drop: One drop or less per minute

(b) Disconnect the battery negative (–) cable.
(c) Remove SST and the service wire.
SST 09268–4.1045

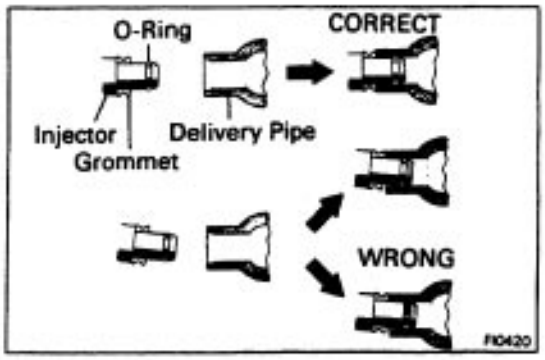


INSTALLATION OF INJECTORS

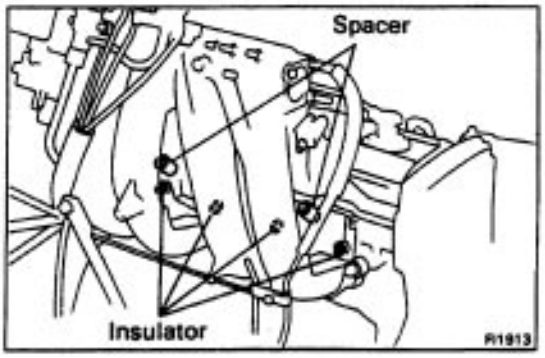
1. INSTALL INJECTORS AND DELIVERY PIPE

(a) Install a new grommet to the injector.

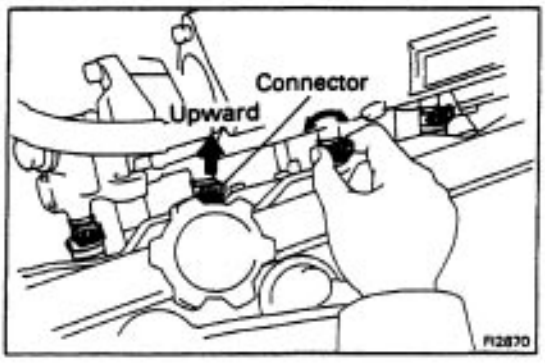
(b) Apply a light coat of gasoline to a new O–ring and install it to the injector.



(e) While turning the injector left and right, install it to the delivery pipes. Install the four injectors.



(d) Place the four insulators and two spacers in position on the cylinder head.

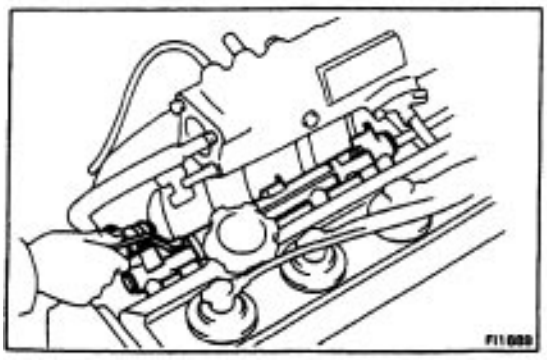


(e) Place the four injectors together with the delivery pipe in position on the cylinder head.

(f) Check that the injectors rotate smoothly.

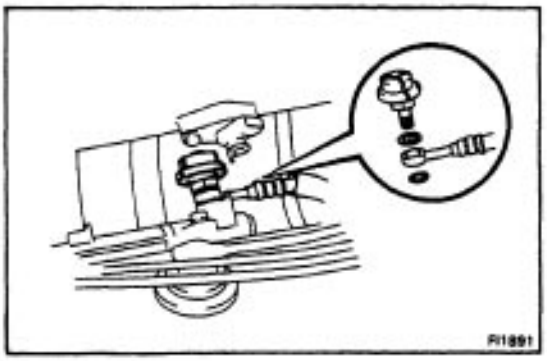
HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of O–rings. Replace the O–rings.

(g) Position the injector connector upward.



(h) Install the two bolt.

Torque: 130 kg–cm (9 ft–lb, 13 N–m)



2. INSTALL FUEL PRESSURE PULSATION DAMPER

Install a new gasket, the fuel hose, a new gasket and the pulsation damper.

3. CONNECT FUEL RETURN HOSE

4. CONNECT INJECTOR CONNECTORS

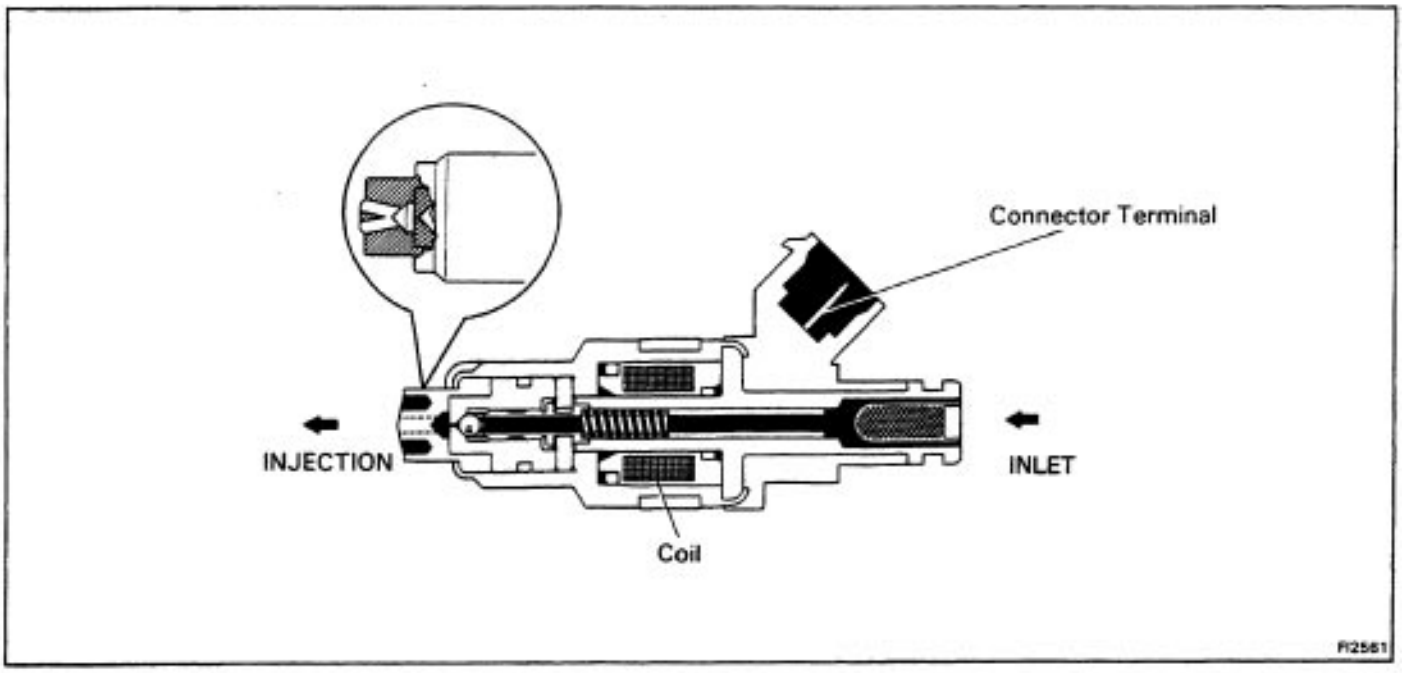
5. CONNECT VACUUM SENSING HOSE

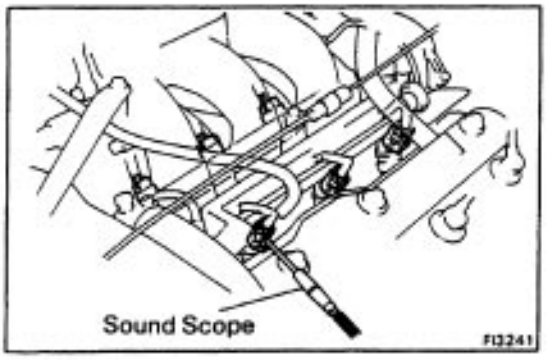
6. CONNECT COLD START INJECTOR PIPE

(See steps 2 and 3 on page FI–80)

7. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

Injectors (2VZ–FE)



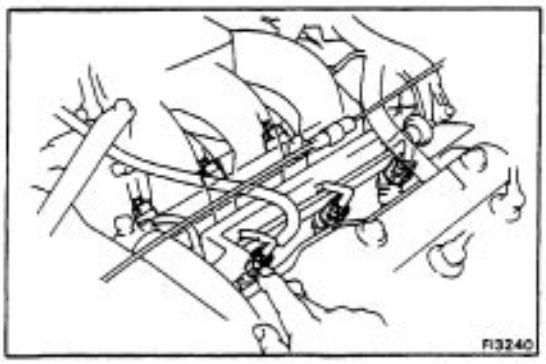


ON–VEHICLE INSPECTION

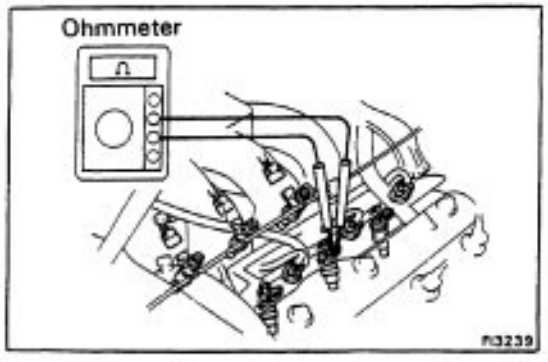
1. INSPECT INJECTOR OPERATION

Check operation sound from each injector.

(a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine rpm.



(b) If you have no sound scope, you can check the injector transmission operation with your finger.
If no sound or an unusual sound is heard, check the wiring connector, injector or injection signal from ECU.



2. INSPECT INJECTOR RESISTANCE

(a) Disconnect the injector connector.

(b) Using an ohmmeter, measure the resistance between the terminals.
Resistance: Approx. 13.8)
If the resistance is not as specified, replace the injector.

(c) Reconnect the injector connector.

REMOVAL OF INJECTORS

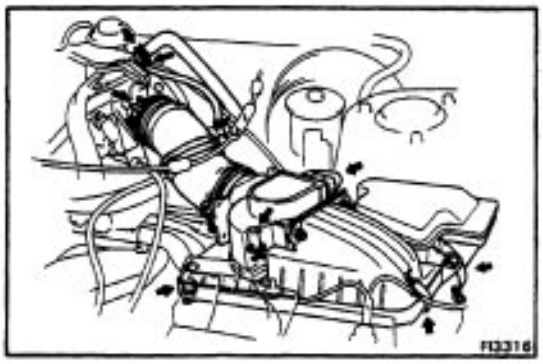
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DRAIN ENGINE COOLANT (See page CO–5)

3. (A/T)
DISCONNECT THROTTLE CABLE FROM THROTTLE BODY AND BRACKET

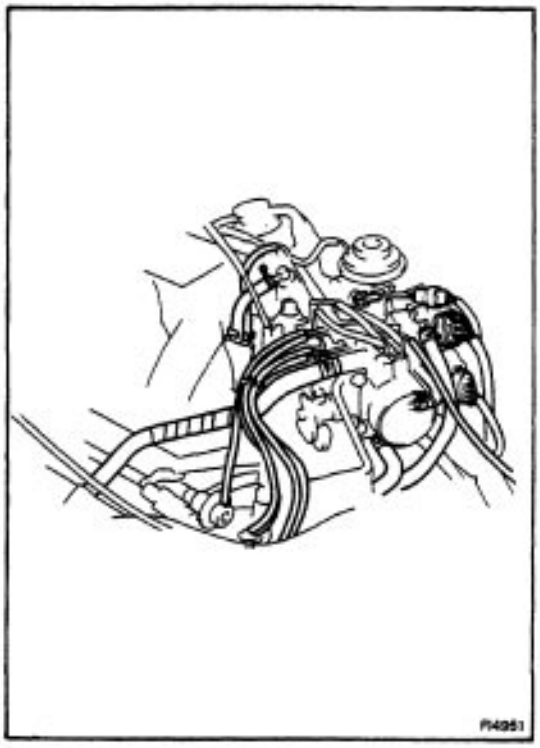
4. DISCONNECT ACCELERATOR CABLE AND BRACKET FROM THROTTLE BODY AND AIR INTAKE CHAMBER

5. REMOVE AIR CLEANER CAP, AIR FLOW METER AND AIR CLEANER HOSE

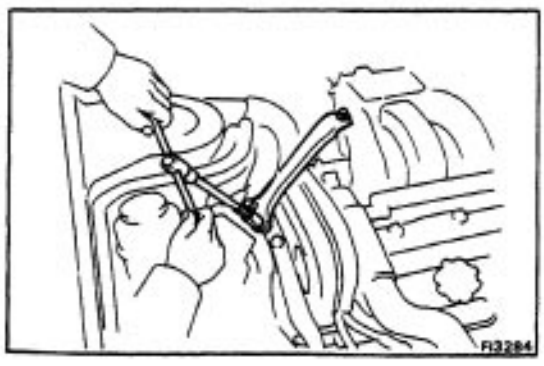


(a) Disconnect the. air flow meter connector.
(b) Disconnect the air hoses.
(e) Loosen the air cleaner hose clamp bolt.
(d) Disconnect the air cleaner cap clips.
(e) Remove the air cleaner cap and air flow meter together with the air cleaner hose.

6. DISCONNECT HOSES AND CONNECTORS



(a) PCV hoses
(b) Vacuum sensing hose
(e) Water by–pass hoses
(d) Fuel pressure control VSV hose
(e) Emission control vacuum hoses
(f) ISC connector
(g) Throttle position sensor connector
(h) (CALIF. only)
EGR gas temp. sensor connector

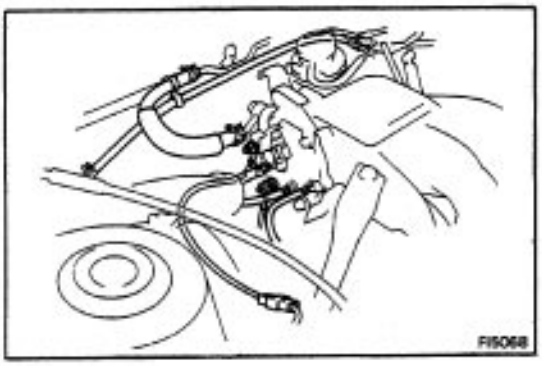


7. REMOVE NO. 1 RH ENGINE MOUNTING STAY

Remove the three bolts and mounting stay.

8. DISCONNECT COLD START INJECTOR CONNECTOR

9. DISCONNECT COLD START INJECTOR TUBE
(See step 3 on page FI–81)



10. DISCONNECT HOSES AND PARTS

(a) Brake booster vacuum hose
(b) PS vacuum and air hoses
(c) Cruise control vacuum hose
(d) Ground strap connector
(e) Wire harness clamp
Remove the nut, and disconnect the wire harness clamp.
(f) Fuel pressure control VSV hose.

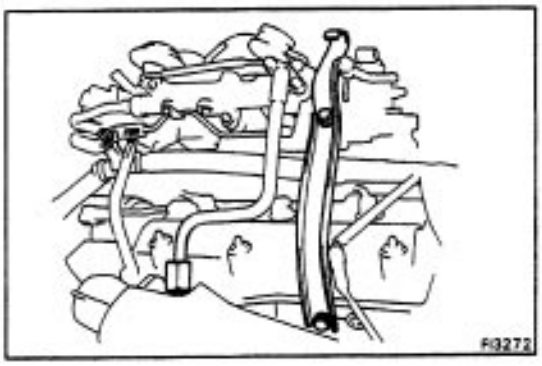
11. DISCONNECT WIRE HARNESS CLAMP

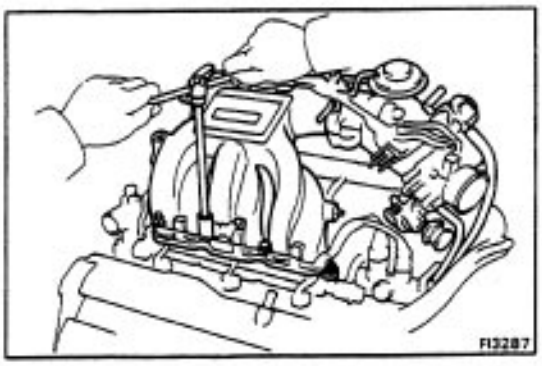
Remove the nut and disconnect the wire harness.

12. DISCONNECT EGR PIPE

13. REMOVE NO.1 ENGINE HANGER AND AIR INTAKE CHAMBER STAY

(a) Remove the two bolts and No.1 engine hanger.
(b) Remove the bolt, and disconnect the air intake chamber stay from air intake chamber.





14. REMOVE AIR INTAKE CHAMBER

Remove the two bolts, nuts, air intake chamber and gasket.

15. DISCONNECT CONNECTORS

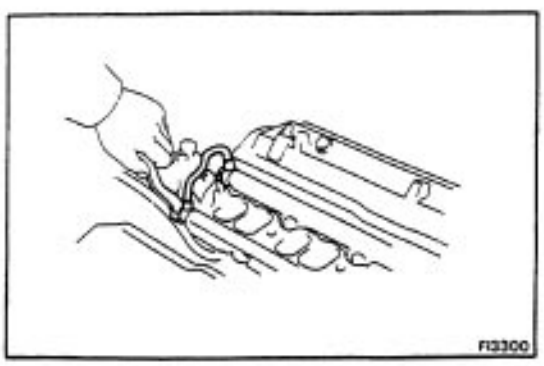
(a) Cold start injector connector
(b) Water temperature sensor connector
(c) Six injector connectors

16. DISCONNECT WIRE HARNESS CLAMPS FROM LH DELIVERY PIPE

Disconnect the three wire harness clamp.

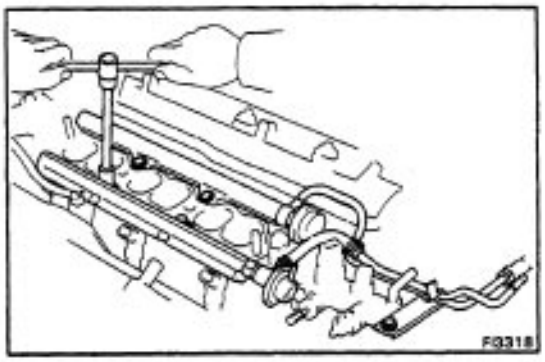
17. DISCONNECT FUEL INLET AND TWO RETURN HOSES

(a) Disconnect the fuel return hoses from the fuel pressure regulator and No.1 fuel pipe.
(b) Disconnect the fuel inlet hose from the fuel filter.



18. REMOVE NO.2 FUEL PIPE

Remove the two union bolts, four gaskets and No.2 fuel pipe.



19. REMOVE DELIVERY PIPES AND INJECTORS

(a) Remove the two bolts and LH delivery pipe together with three injectors.

NOTICE:. Be careful not to drop the injectors, when removing the delivery pipe.

(b) Remove the three bolts and RH delivery pipe with the No. 1 fuel pipe and three injectors.

NOTICE: Be careful not to drop the injectors, when removing the delivery pipe.

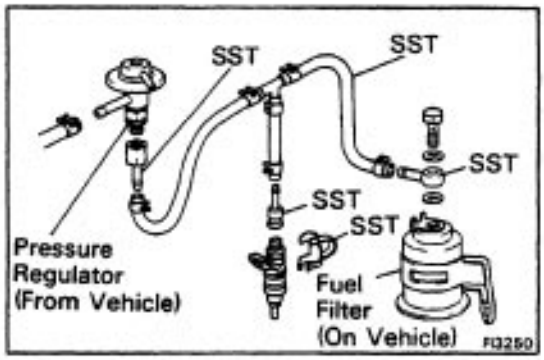
(c) Pull out the six injectors from the delivery pipes.

(d) Remove the six insulators and four spacers from the intake manifold.

INSPECTION OF INJECTORS

1. INSPECT INJECTOR INJECTION

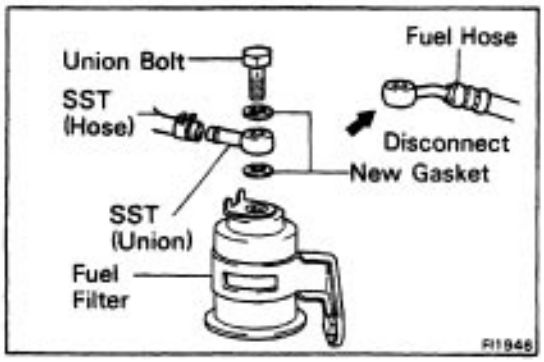
NOTICE: Keep clear for sparks during the test.



(a) Disconnect the fuel hose from the fuel filter outlet.

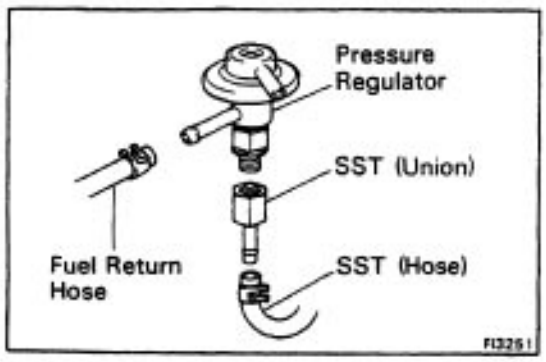
(b) Connect SST (union and hose) to the fuel fitter outlet with two new gaskets and the union bolt.
SST 49268–41045 (90405–09015)

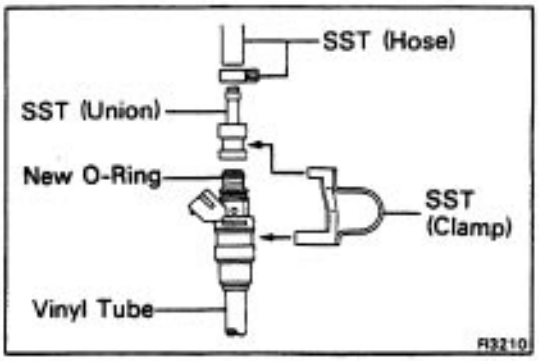
HINT: Use the vehicle's fuel filter.



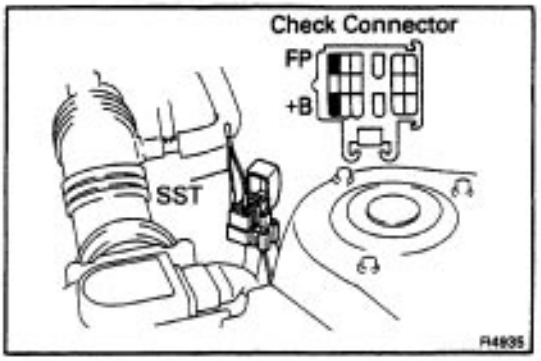
(e) Remove the pressure regulator. (See page FI–86)

(d) Connect the fuel return hose and SST (hose) to the pressure regulator with SST (union).
SST 09268–41045 (09268–41060)

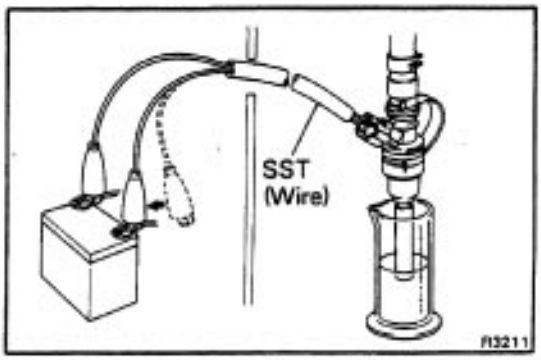




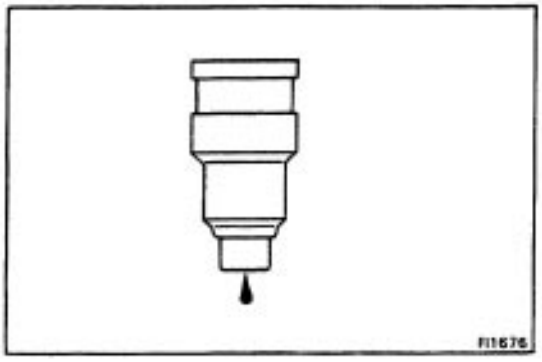
(e) Install a new O–ring to the injector.
(f) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268–41045
(g) Put the injector into the graduated cylinder.
HINT: Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.
(h) Reconnect the battery negative (–) cable.
(i) Turn the ignition switch ON.
NOTICE: Do not start the engine.



Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020



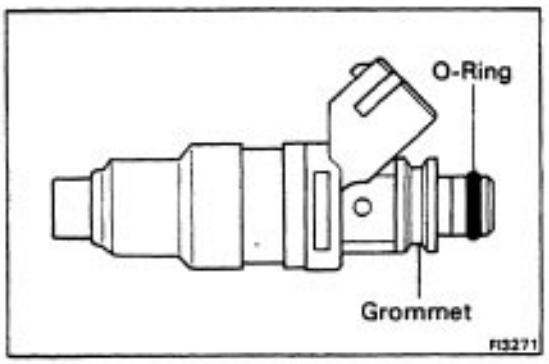
(k) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector two or three times.
SST 09842–30070 .
Volume: 45 – 55 cc (2.7 – 3.4 cu in.) per 15 sec.
Difference between each injector:
5 cc (0.3 cu in.) or less
If the injection volume is not as specified, replace the injector.



2. INSPECT LEAKAGE
(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30070
Fuel drop: One drop or less per minute
(b) Disconnect the battery negative (–) cable.
(c) Remove SST.
SST 09268–41045 and 09843–18020

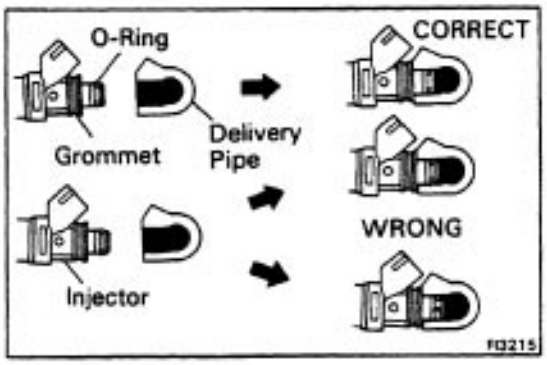
INSTALLATION OF INJECTORS

1. INSTALL INJECTORS AND DELIVERY PIPES

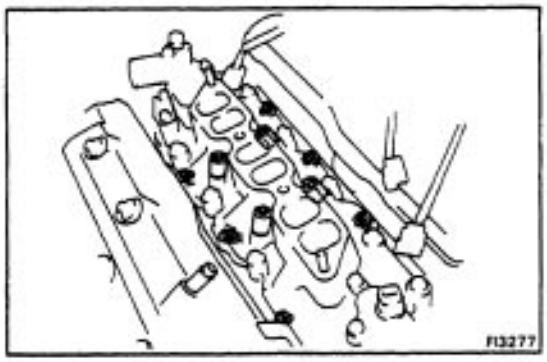


(a) Install a new grommet to the injector.

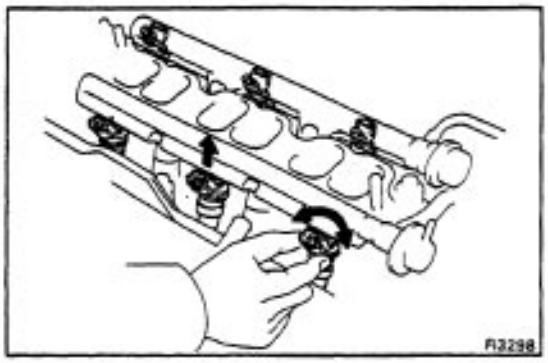
(b) Apply a light coat of gasoline to a new 0–ring and install it to the injector.



(c) While turning the injector left and right, install it to the delivery pipes. Instal! the six injectors.



(d) Place the six insulators and four spacers in position on the intake manifold.



(e) Place the three injectors together with the RH delivery pipe and No.1 fuel pipe in position on the intake manifold.

(f) Place the three injectors together with the LH delivery pipe in position on the intake manifold.

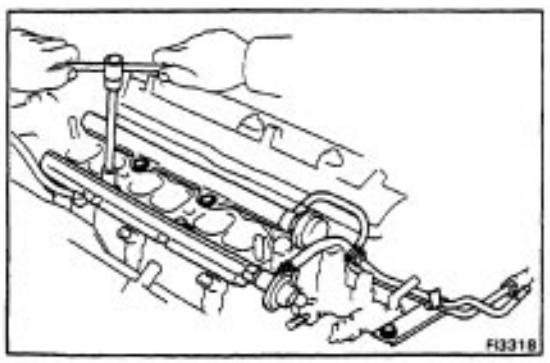
(g) Check that the injectors rotate smoothly.

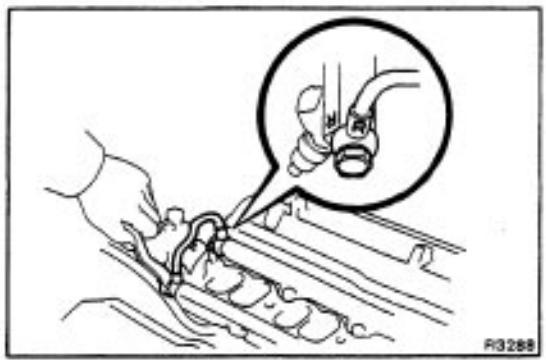
HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of 0–rings. Replace the O–rings.

(h) Position the injector connector upward.

(i) Install the five bolts:

Torque: 130 kg–cm (9 ft–lb, 13 N–m)





2. INSTALL NO.2 FUEL PIPE

Install the No.2 fuel pipe with four new gaskets and the union bolts as shown in the illustration.

Torque: 330 kg–cm (24 ft–lb, 32 N–m)

3. CONNECT FUEL INLET AND RETURN HOSES

(a) Connect the inlet hose to the fuel filter with two new gaskets and union bolt.

(b) Connect the two return hoses to the pressure regulator and No.1 fuel pipe.

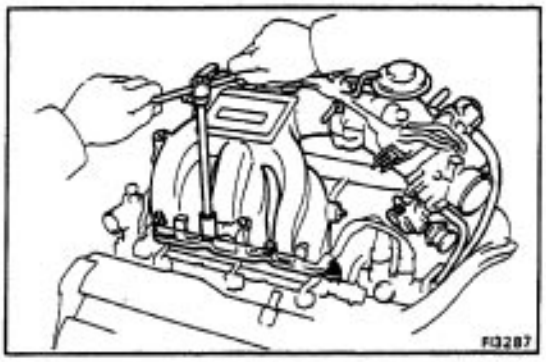
4. CONNECT THREE WIRE HARNESS CLAMPS TO LH DELIVERY PIPE

5. CONNECT CONNECTORS

(a) Six injector connectors

(b) Cold start injector connector

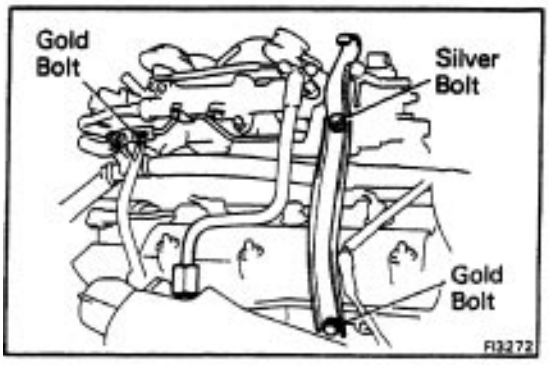
(e) Water temperature connector



6. INSTALL AIR INTAKE CHAMBER

Install a new gasket and the air intake chamber with the two bolts and nuts.

Torque: 440 kg–cm (32 ft–lb, 43 N–m)



7. CONNECT EGR PIPE

Torque: 800 kg–cm (58 ft–1b, 78 N–m)

8. CONNECT WIRE HARNESS CLAMP

Connect the wire harness clamp with the nut.

9. INSTALL NO.1 ENGINE HANGER AND AIR INTAKE CHAMBER STAY

(a) Connect the air intake chamber stay with the two bolts.

Torque: 380 kg–cm (27 ft–lb,37 N–m)

(b) Install the No.1 engine hanger with the two bolts.

Torque: 380 kg–cm (27 it–lb,37 N–m)

10. CONNECT HOSES AND PARTS

(a) Wire harness clamp

Connect the wire harness clamp with the nut.

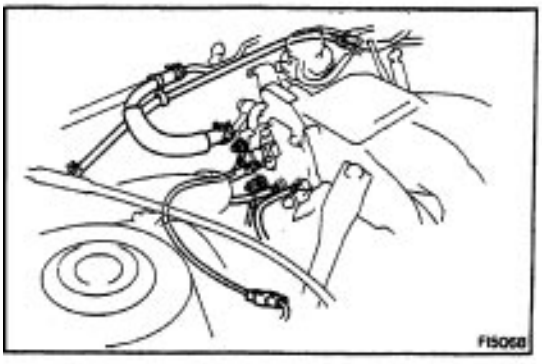
(b) Brake booster vacuum hose

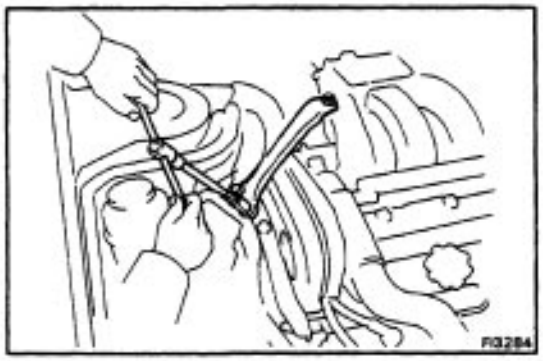
(c) PS vacuum and air hoses

(d) Cruise control vacuum hose

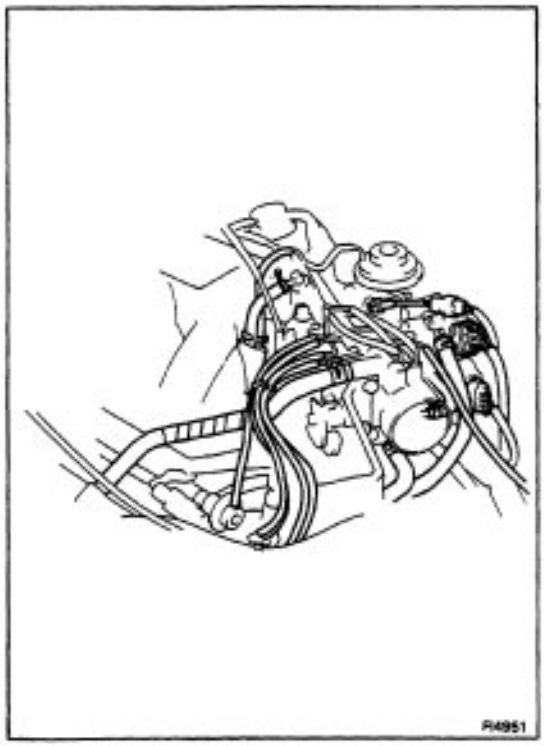
(e) Ground strap connector

(f) Fuel pressure control VSV hose

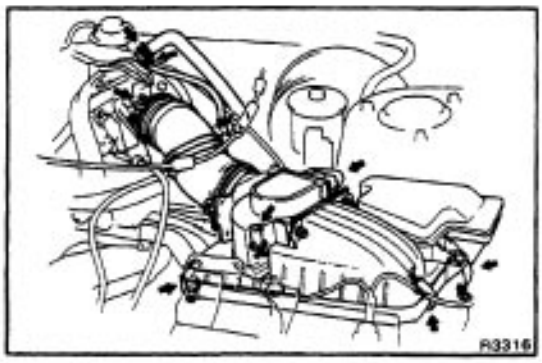




11. CONNECT COLD START INJECTOR TUBE
(See step 2 on page FI–83)
12. CONNECT COLD START INJECTOR CONNECTOR
13. INSTALL NO. 1 RH ENGINE MOUNTING STAY
Install the mounting stay with the three bolts.
Torque: 530 kg–cm (38 ft–lb, 52 N–m)



14. CONNECT CONNECTORS AND HOSES
(a) ISC connector
(b) Throttle position sensor connector
(c) (CALIF. only)
EGR gas temp. sensor connectors
(d) PCV hoses
(e) Vacuum sensing hoses
(f) Water by–pass hoses
(g) Fuel pressure VSV hose
(h) Emission control vacuum hoses

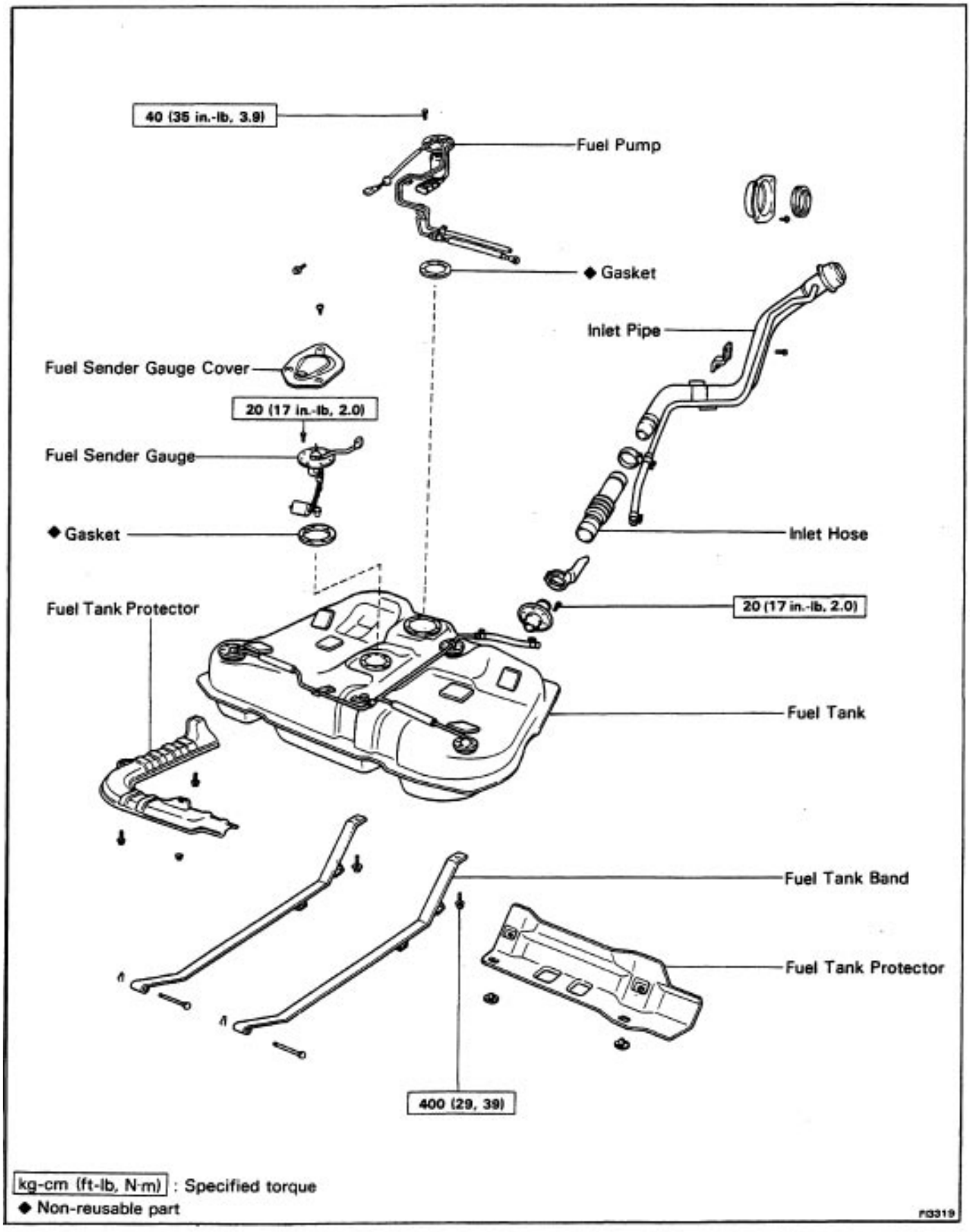


15. INSTALL AIR CLEANER CAP, AIR FLOW METER AND AIR CLEANER HOSE
(a) Connect the air cleaner hose, and install the air cleaner cap and air flow meter with the four clips.
(b) Tighten the air cleaner hose clamp bolt.
(c) Connect the air hoses.
(d) Connect the air flow meter connector.

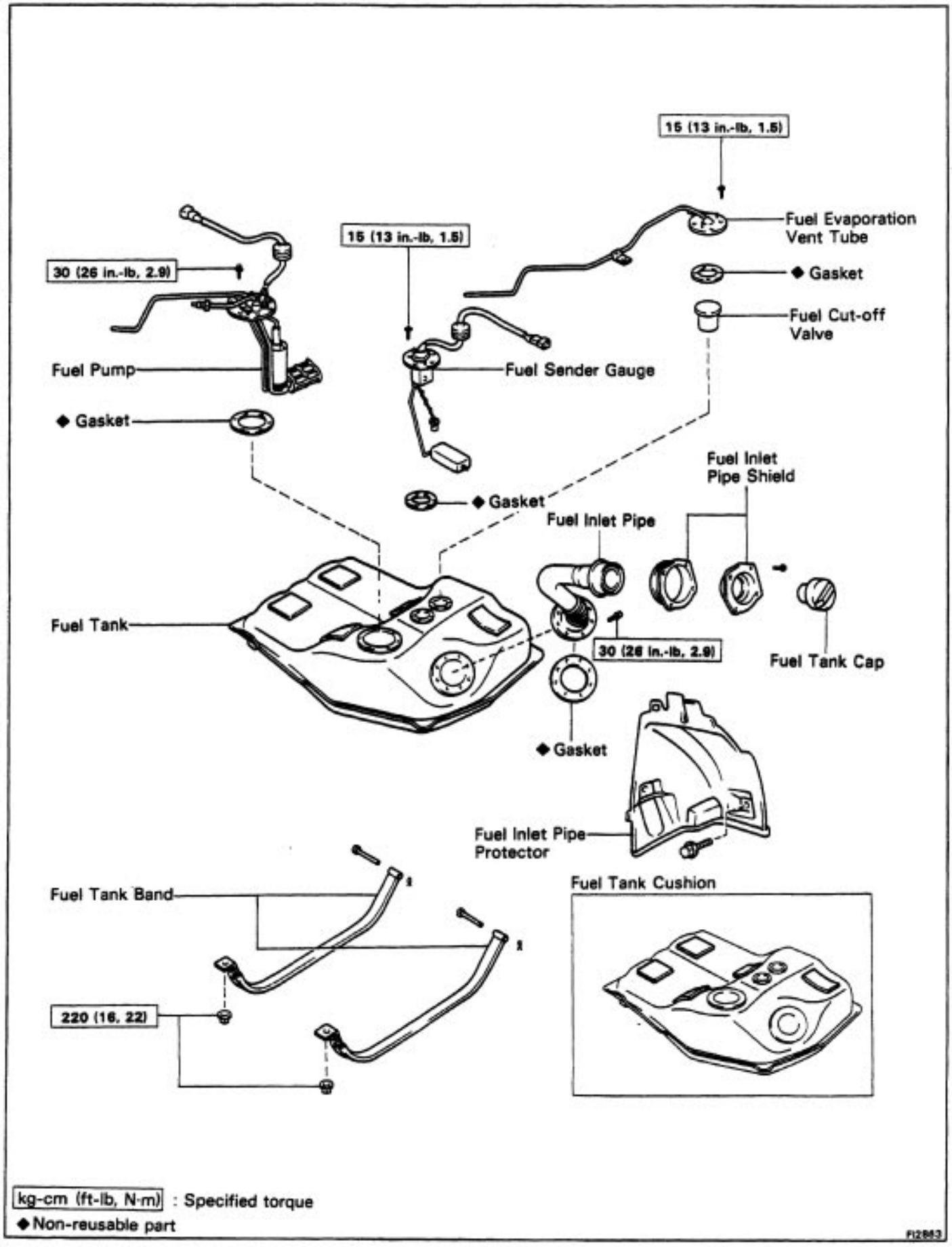
16. CONNECT ACCELERATOR CABLE AND BRACKET TO THROTTLE BODY AND AIR INTAKE CHAMBER
17. (A/T)
CONNECT THROTTLE CABLE TO THROTTLE BODY AND BRACKET, AND ADJUST IT
18. FILL WITH COOLANT (See page CO–5)
19. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

Fuel Tank and Lines

COMPONENTS (2WD)

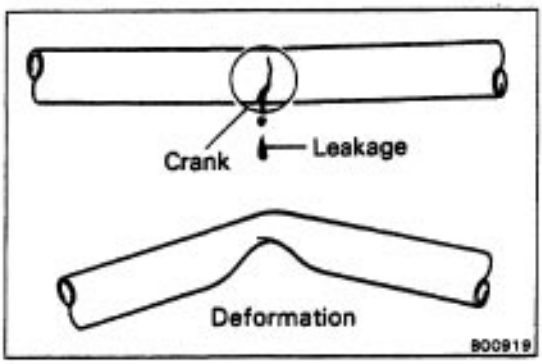


COMPONENTS (4WD)



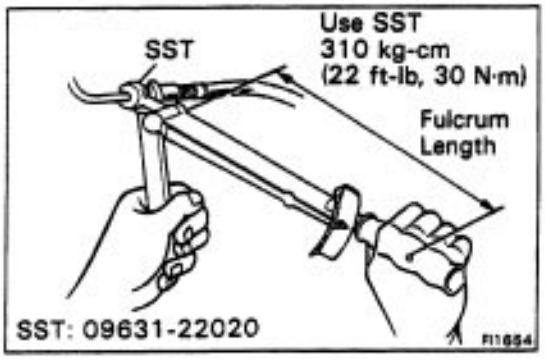
PRECAUTIONS

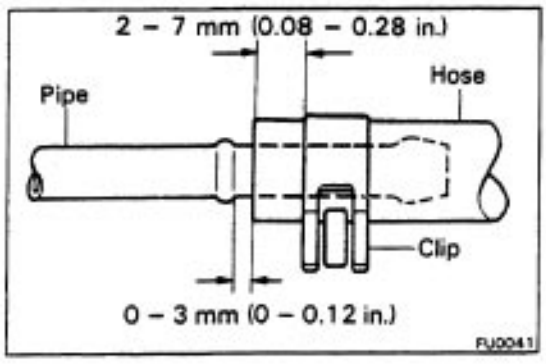
1. Always use new gaskets when replacing the fuel tank or component parts.
2. Apply the proper torque to all parts tightened.



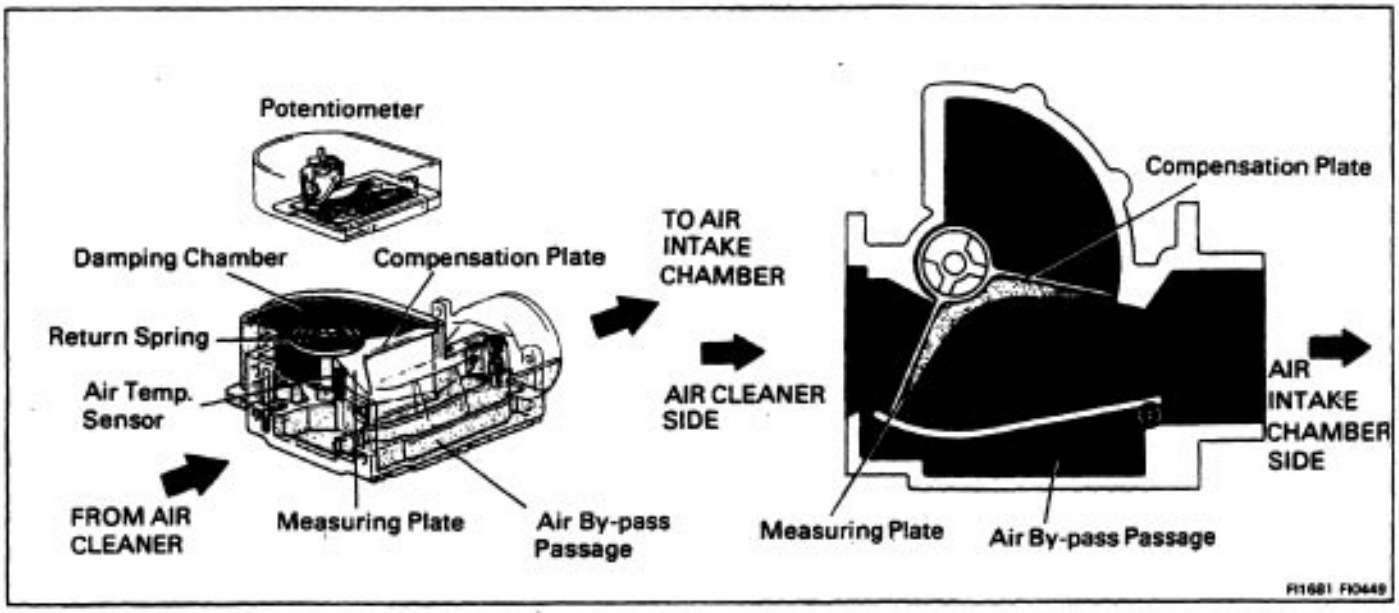
INSPECT FUEL LINES AND CONNECTIONS

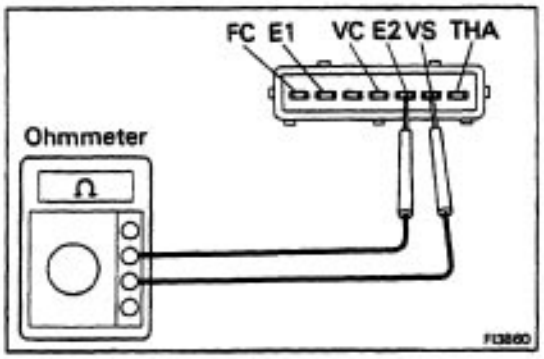
(a) Check the fuel lines for cracks or leakage, and all connections for deformation.
(b) Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.
(e) Check the fuel tank for deformation, cracks, fuel leakage or tank band looseness.
(d) Check the filler neck for damage or fuel leakage.
(e) Hose and tube connections are as shown in the illustration. If a problem is found, repair or replace the parts as necessary.

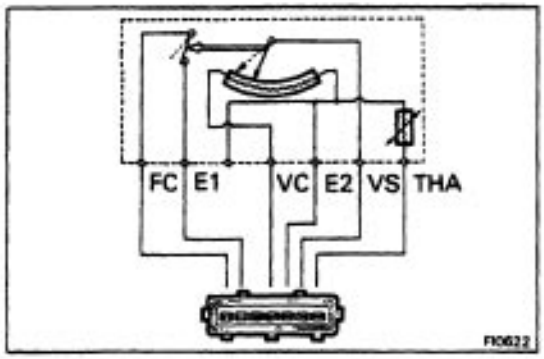




AIR INDUCTION SYSTEM
Air Flow Meter







ON–VEHICLE INSPECTION

INSPECT RESISTANCE OF AIR FLOW METER

(a) Disconnect the air flow meter connector.

(b) Using an ohmmeter, measure the resistance between each terminal.

Between terminals	Resistance (Ω)	Temp. °C (°F)
VS — E2	200 — 600	—
VC — E2 3S-FE 2VZ-FE	3,000 — 7,000 200 — 400	—
THA — E2	10,000 — 20,000 4,000 — 7,000 2,000 — 3,000 900 — 1,300 400 — 700	−20 (−4) 0 (32) 20 (68) 40 (104) 60 (140)
FC — E1	Infinity	—

If the resistance is not as specified, replace the air flow meter.

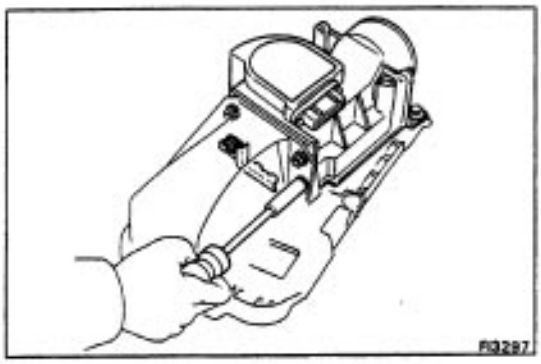
(e) Reconnect the air flow meter connector.

REMOVAL OF AIR FLOW METER

1. DISCONNECT AIR FLOW METER CONNECTOR

2. DISCONNECT AIR CLEANER HOSE

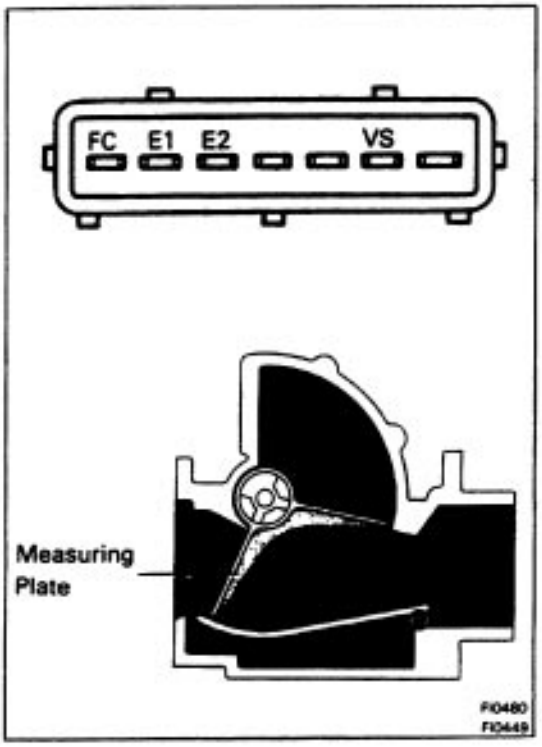
3. REMOVE AIR CLEANER CAP AND AIR FLOW METER ASSEMBLY



5. REMOVE AIR FLOW METER FROM AIR CLEANER CAP

(a) Remove the two bolts and resonator.

(b) Pry off the lock plate, and remove the bolt, four nuts, four plates washers, air flow meter and gasket.



INSPECTION OF AIR FLOW METER

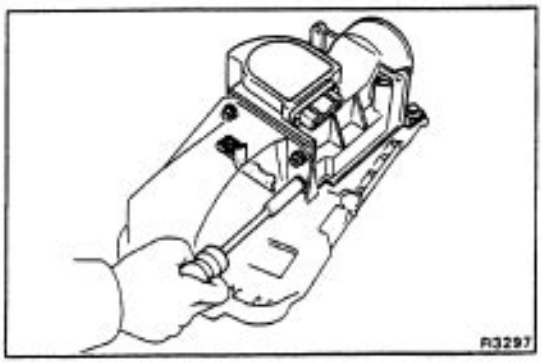
INSPECT RESISTANCE OF AIR FLOW METER

Using an ohmmeter, measure the resistance between each terminal by moving the measuring plate.

Between terminals	Resistance (fl)	Measuring plate opening
FC — E1	Infinity	Fully closed
	Zero	Other than closed
VS — E2	200 — 600	Fully closed
	20 — 1,000	Fully open

HINT: Resistance between terminals E2 and VS will change in a wave pattern as the measuring plate slowly opens.

If the resistance is not as specified, replace the meter.



INSTALLATION OF AIR FLOW METER

1. INSTALL AIR FLOW METER TO AIR CLEANER CAP

(a) Install the air flow meter with the gasket, lock plate, four plate washers, four nuts and bolt. Pry the lock plate on the nut.

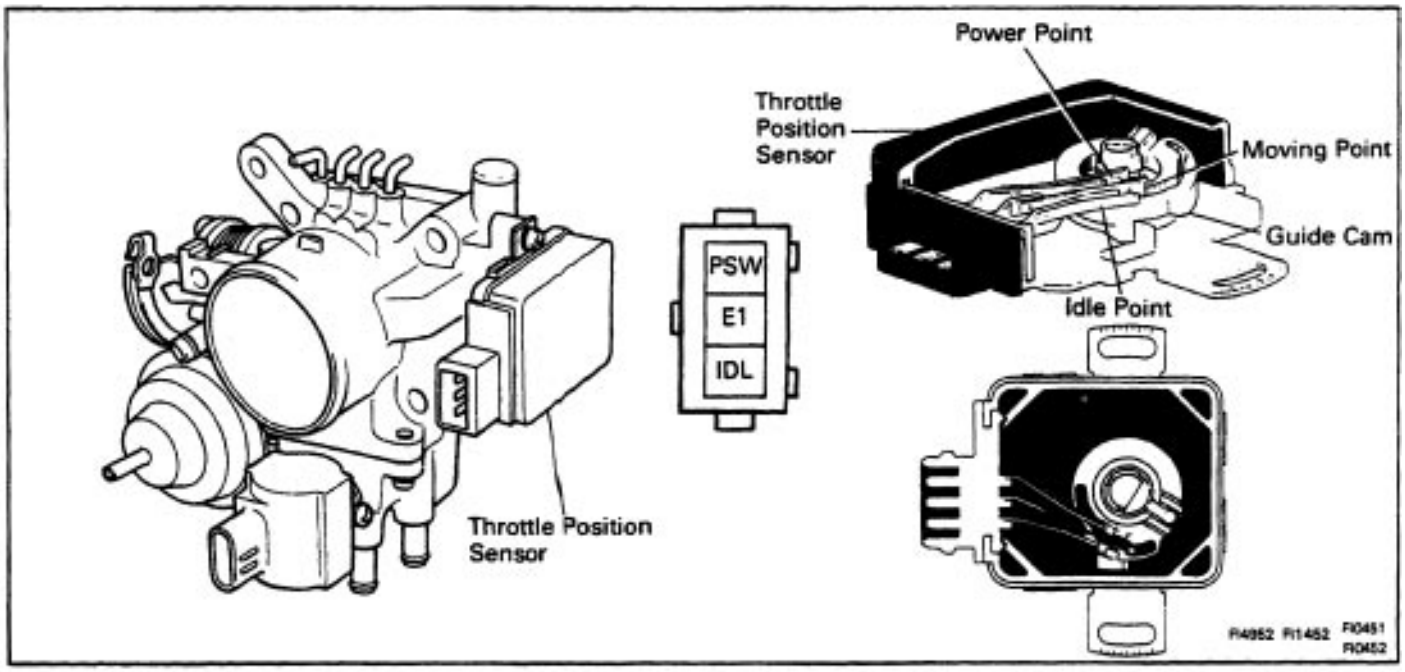
(b) Install the resonator with the two bolts.

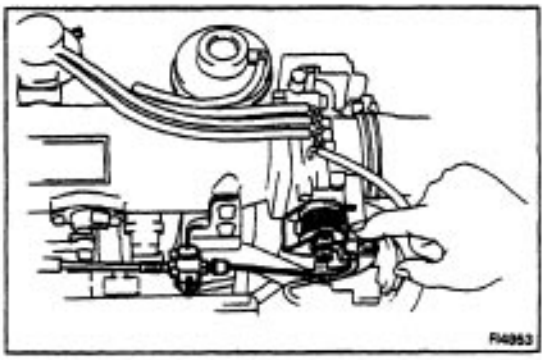
2. INSTALL AIR CLEANER CAP AND AIR FLOW METER ASSEMBLY

3. CONNECT AIR CLEANER HOSE

4. CONNECT AIR AIR FLOW METER CONNECTOR

Throttle Body (3S–FE w o ECT)

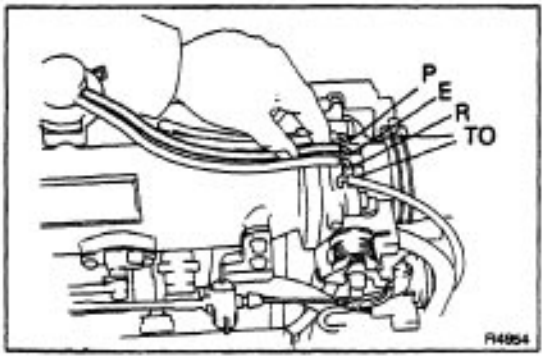




ON–VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

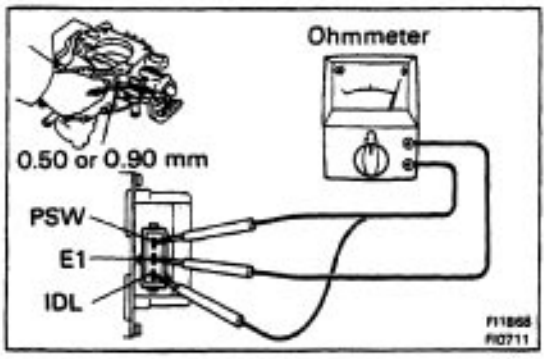
(a) Check that the throttle linkage moves smoothly.



(b) Check the vacuum at each port.

- Start the engine.
- Check the vacuum with your finger.

Port name	At idling	Other than idling
P	No vacuum	Vacuum
E	No vacuum	Vacuum
R	No vacuum	No vacuum
TO	Vacuum	Vacuum



2. INSPECT THROTTLE POSITION SENSOR

(a) Disconnect the sensor connector.

(b) Insert a feeler gauge between the throttle stop screw and stop lever.

(c) Using an ohmmeter, measure the resistance between each terminal.

Clearance between lever and stop screw	Continuity between terminals	
	ID – EI	PSW – E 1
0.50 mm (0.020 in.)	Continuity	No continuity
0.90 mm (0.035 in.)	No continuity	No continuity
Throttle valve fully opened	No continuity	Continuity

(d) Reconnect the sensor connector.

REMOVAL OF THROTTLE BODY

1. DRAIN ENGINE COOLANT (See page CO–4)

2. (A/T)

DISCONNECT THROTTLE CABLE FROM THROTTLE LINKAGE

3. DISCONNECT ACCELERATOR CABLE FROM THROTTLE LINKAGE

4. DISCONNECT AIR CLEANER HOSE

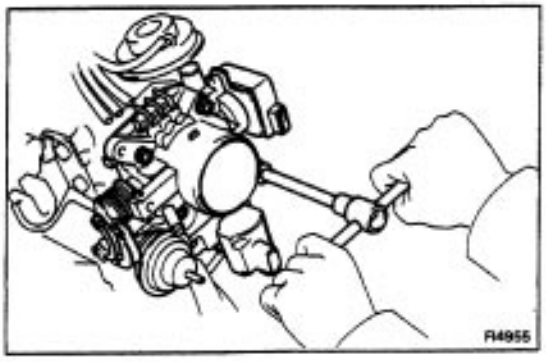
5. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR

6. DISCONNECT ISC VALVE CONNECTOR

7. REMOVE THROTTLE BODY

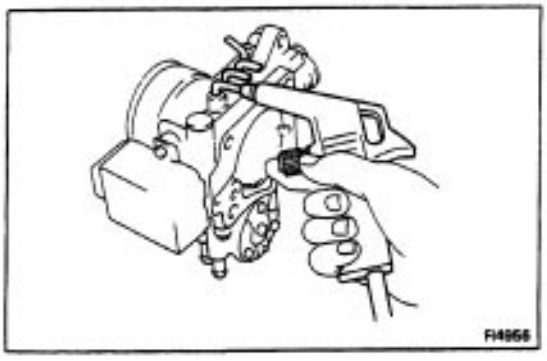
(a) Disconnect the following hoses:

- PCV hose
- Water by–pass hoses
- Air tube hose
- Emission control vacuum hoses



(b) Remove the four bolts, throttle body and gasket.

8. IF NECESSARY, REMOVE ISC VALVE FROM THROTTLE BODY (See page FI–116)



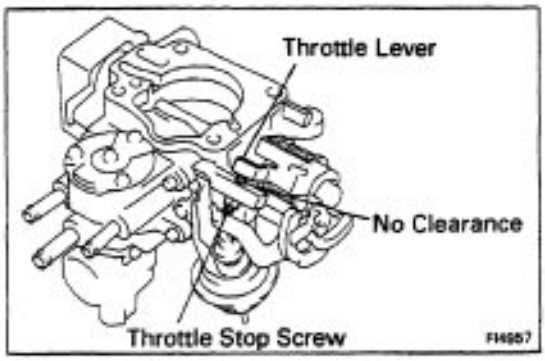
INSPECTION OF THROTTLE BODY

1. CLEAN THROTTLE BODY

(a) Using a soft brush and carburetor cleaner, clean the cast parts.

(b) Using compressed air, clean all the passages and apertures.

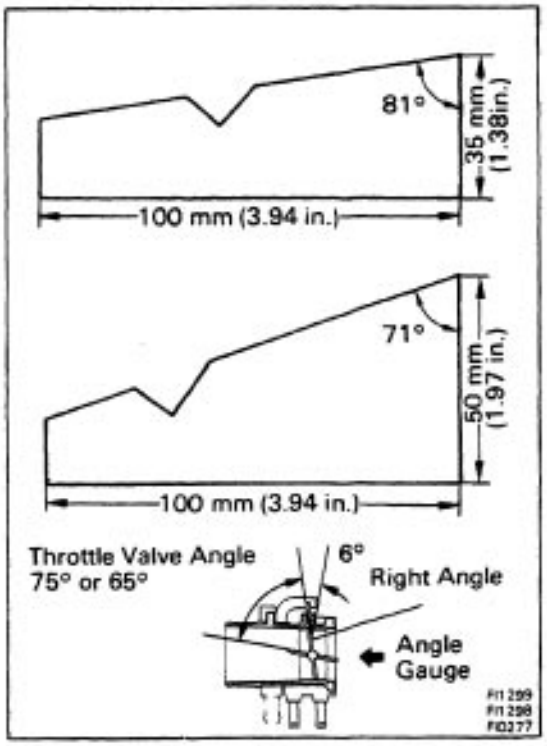
NOTICE: To prevent deterioration, do not clean the throttle position sensor.



2. INSPECT THROTTLE VALVE

(a) Apply the vacuum to the throttle opener.

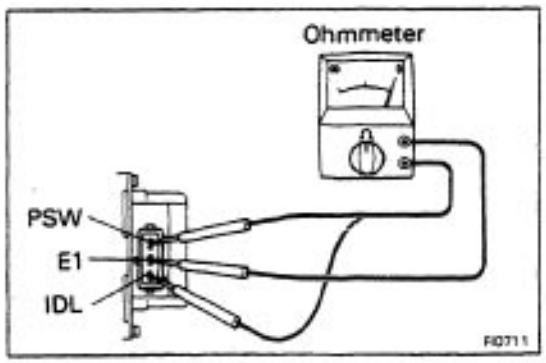
(b) Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.



3. INSPECT THROTTLE POSITION SENSOR

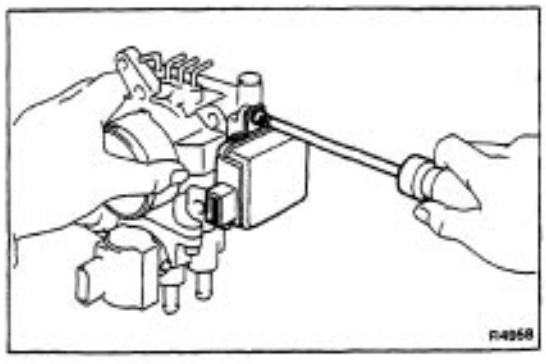
(a) Make an angle gauge as shown in the figure.

(b) Set the throttle valve opening to 810 or 710 from the vertical position (incl. throttle valve fully closed angle 6°).



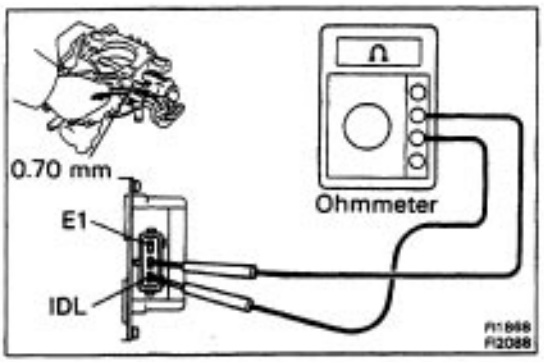
(c) Using an ohmmeter, check the continuity between each terminal.

Throttle valve opening angle	Continuity	
	IDL – E1	PSW–E1
710 from vertical	No continuity	No continuity
810 from vertical	No continuity	Continuity
Less than 7.5˚ from vertical	Continuity	No continuity

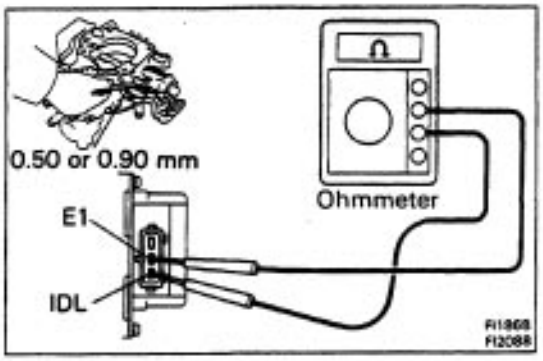


4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

(a) Loosen the two set screws of the sensor.

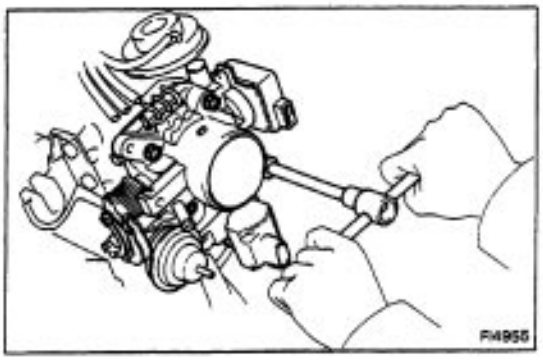


(b) Insert a 0.70 mm (0.028 in.) feeler gauge, between the throttle stop screw and stop lever.
(c) Connect the test probe of an ohmmeter to the terminals IDL and E1 of the sensor.
(d) Gradually turn the sensor clockwise until the ohmme–ter deflects, and secure it with the two set screws.



(e) Recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDL – El)
0.50 mm (0.002 in.)	Continuity
0.90 mm (0.035 in.)	No continuity



INSTALLATION OF THROTTLE BODY

1. INSTALL ISC VALVE TO THROTTLE BODY
(See page FI–117)

2. INSTALL THROTTLE BODY

(a) Install a new gasket and the throttle body with the four bolts.
Torque: 195 kg–cm (14 ft–lb, 19 N–m)

(b) Connect the following hoses:
- PCV hose
- Water by–pass hoses
- Air tube hose
- Emission control vacuum hoses

3. CONNECT ISC VALVE CONNECTOR

4. CONNECT THROTTLE POSITION SENSOR CONNECTOR

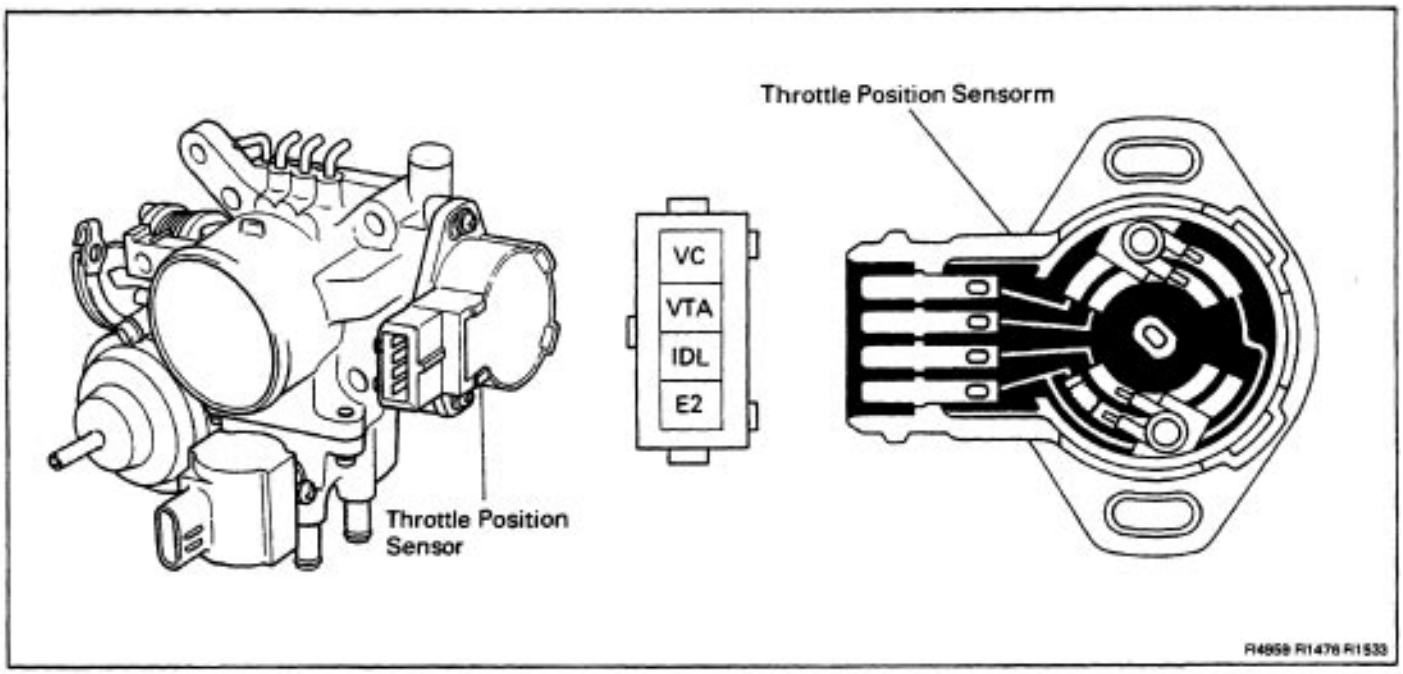
5. CONNECT AIR CLEANER HOSE

6. CONNECT ACCELERATOR CABLE, AND ADJUST IT

7. (A/T)
CONNECT THROTTLE CABLE, AND ADJUST IT

8. FILL WITH ENGINE COOLANT (See page CO–5)

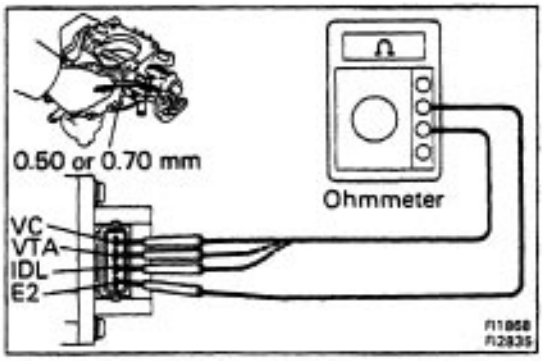
Throttle Body (3S–FE w ECT)

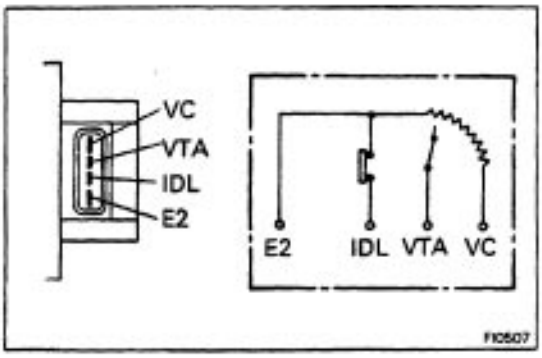


ON–VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

(See step 1 on page FI–106)





2. INSPECT THROTTLE POSITION SENSOR

(a) Disconnect the sensor connector.

(b) Insert a feeler gauge between the throttle stop screw and stop lever.

(c) Using an ohmmeter, measure the resistance between each terminal.

Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA — E2	0.2 — 0.8 kΩ
0.50 mm (0.020 in.)	IDL — E2	2.3 kΩ or less
0.70 mm (0.028 in.)	IDL — E2	Infinity
Throttle valve fully opened	VTA — E2	3.3 — 10 kΩ
—	VC — E2	3 — 7 kΩ

(d) Reconnect the sensor connector.

REMOVAL OF THROTTLE BODY

(See page FI–107)

INSPECTION OF THROTTLE BODY

1. CLEAN THROTTLE BODY

(See step 1 on page FI–107)

2. INSPECT THROTTLE VALVE

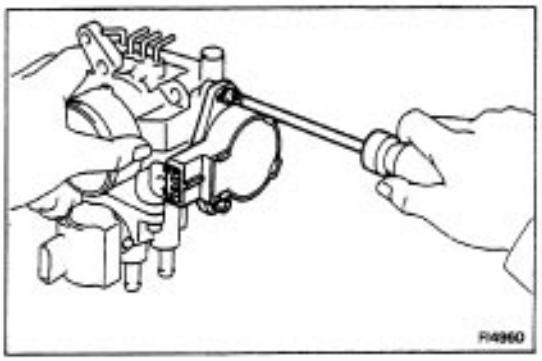
(See step 2 on page FI–108)

3. INSPECT THROTTLE POSITION SENSOR

(See step 2 on page FI–110)

4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

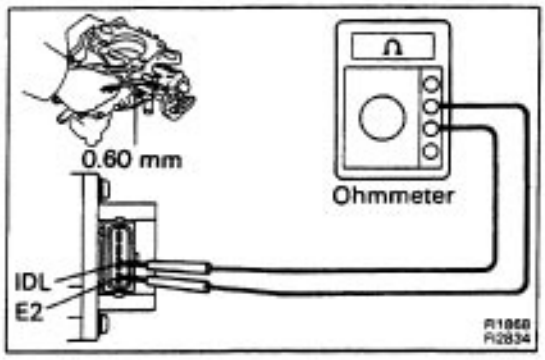
(a) Loosen the two set screws of the sensor.



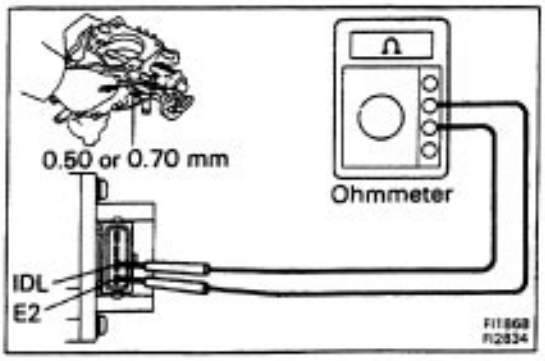
(b) Insert a 0.60 mm (0.024 in.) feeler gauge, between the throttle stop screw and stop lever.

(c) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.

(d) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the two set screws.



(e) Recheck the continuity between terminals IDL and E2.

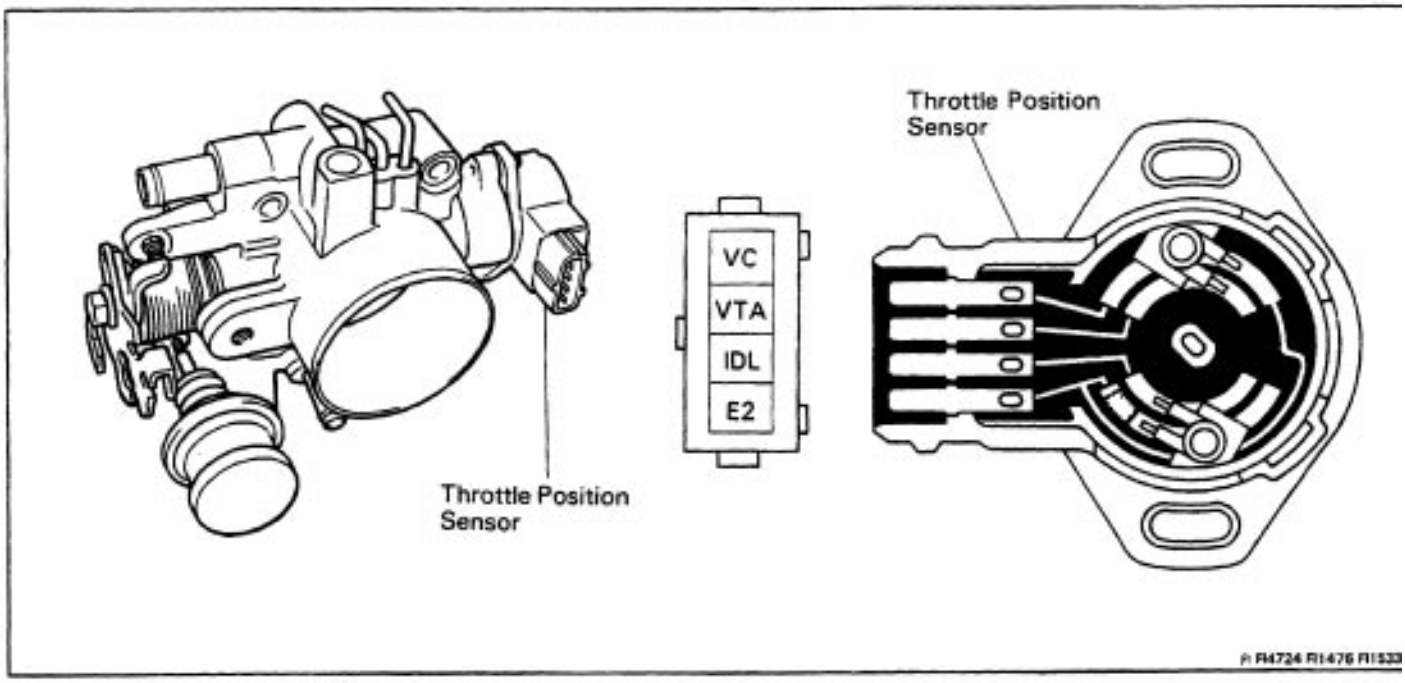


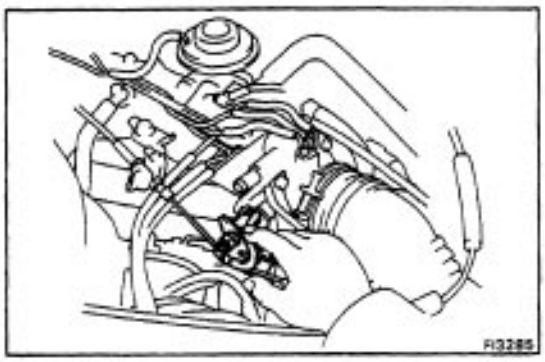
Clearance between fever and stop screw	Continuity (IDL – E2)
0.50 mm (0.020 in.)	Continuity
0.70 mm (0.028 in.)	No continuity

INSTALLATION OF THROTTLE BODY

(See page FI –109)

Throttle Body (2VZ–FE)

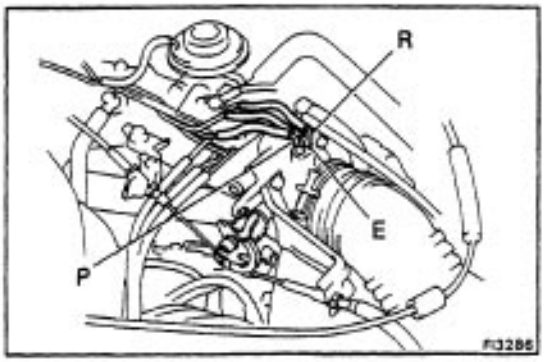




ON–VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

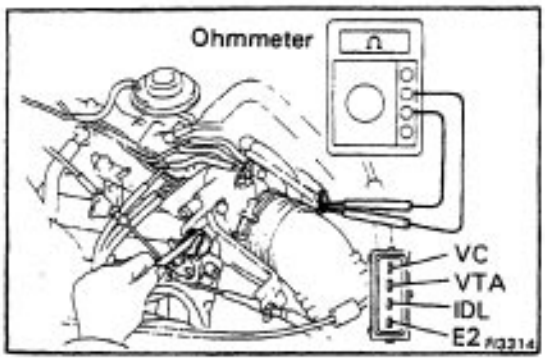
(a) Check that the throttle linkage moves smoothly.



(b) Check the vacuum at each port.

- Start the engine.
- Check the vacuum with your finger.

Port name	At idling	Other than idling
P	No vacuum	Vacuum
E	No vacuum	Vacuum
R	No vacuum	Vacuum

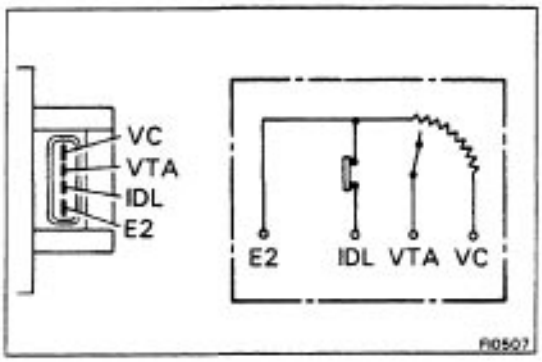


2. INSPECT THROTTLE POSITION SENSOR

(a) Disconnect the sensor connector.

(b) Insert a feeler gauge between the throttle stop screw and stop lever.

(c) Using an ohmmeter, measure the resistance between each terminal.



Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA — E2	0.3 — 6.3 kΩ
0.30 mm (0.012 in.)	IDL — E2	2.3 kΩ or less
0.70 mm (0.028 in.)	IDL — E2	Infinity
Throttle valve fully opened	VTA — E2	3.5 — 10.3 kΩ
—	VC — E2	4.25 — 8.25 kΩ

(d) Reconnect the sensor connector.

REMOVAL OF THROTTLE BODY

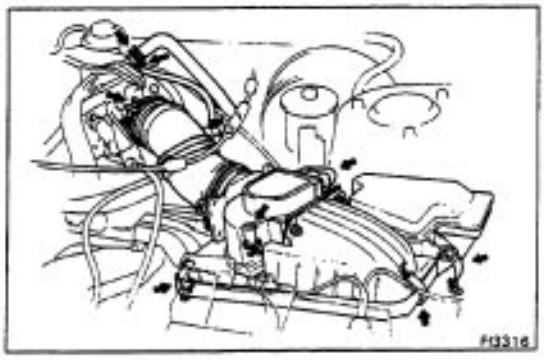
1. DRAIN ENGINE COOLANT (See page CO–5)

2. (A/T)

DISCONNECT THROTTLE CABLE FROM THROTTLE LINKAGE

3. DISCONNECT ACCELERATOR CABLE FROM THROTTLE LINKAGE

4. REMOVE AIR CLEANER CAP, AIR FLOW METER AND AIR CLEANER HOSE



(a) Disconnect the air flow meter connector.

(b) Disconnect the air hoses.

(c) Loosen the air cleaner hose clamp bolt.

(d) Disconnect the air cleaner cap clips.

(e) Remove the air cleaner cap, air flow meter and air cleaner hose assembly.

5. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR

6. REMOVE THROTTLE BODY

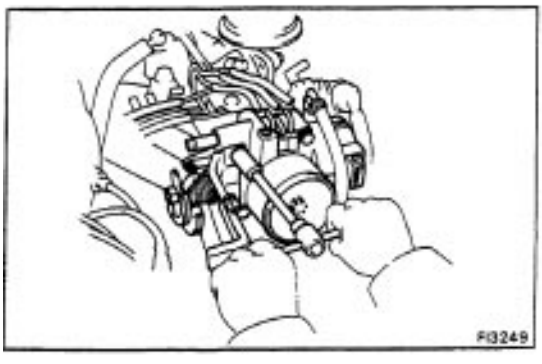
(a) Disconnect the following hoses:

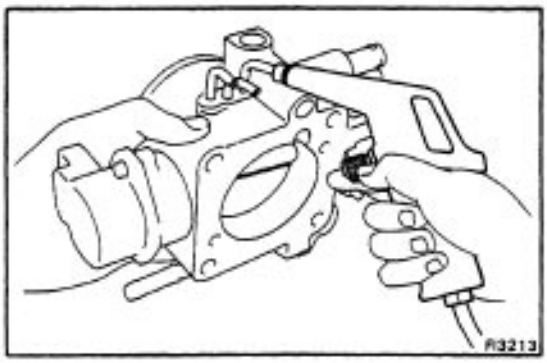
- PCV hose
- Water by–pass hoses
- Emission control vacuum hoses

(b) (A/T)

Remove the two bolts and throttle cable bracket.

(c) Remove the four (M/T) or three (A/T) bolts, throttle body and gasket.





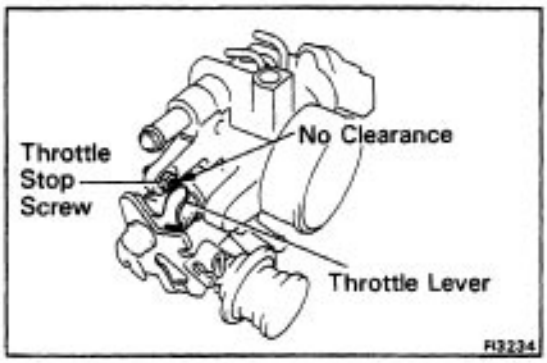
INSPECTION OF THROTTLE BODY

1. CLEAN THROTTLE BODY

(a) Using a soft brush and carburetor cleaner, clean the cast parts.

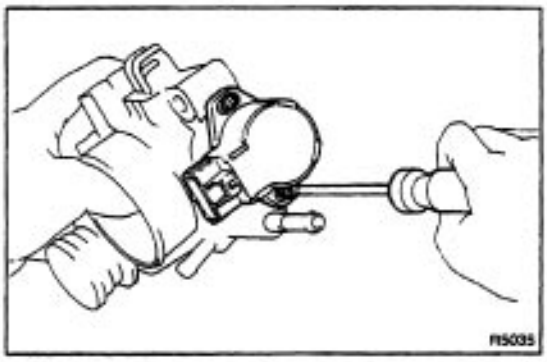
(b) Using compressed air, clean all the passages and apertures.

NOTICE: To prevent deterioration, do not clean the throttle position sensor.



2. INSPECT THROTTLE VALVE

Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.

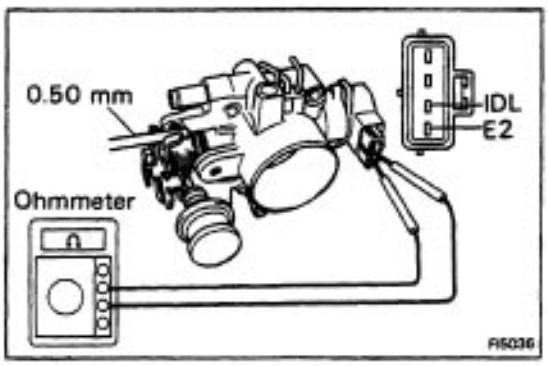


3. INSPECT THROTTLE POSITION SENSOR

(See step 2 on page FI–112)

4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

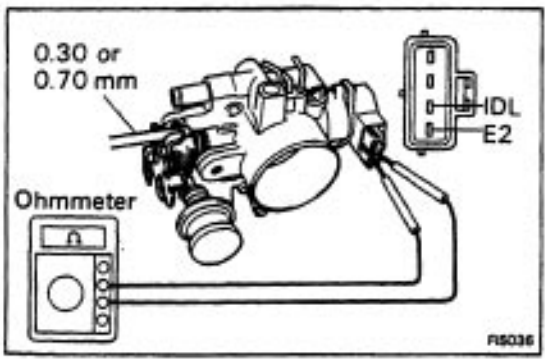
(a) Loosen the two set screws of the sensor.



(b) Insert a 0.50 mm (0.020 in.) feeler gauge, between the throttle stop screw and stop lever.

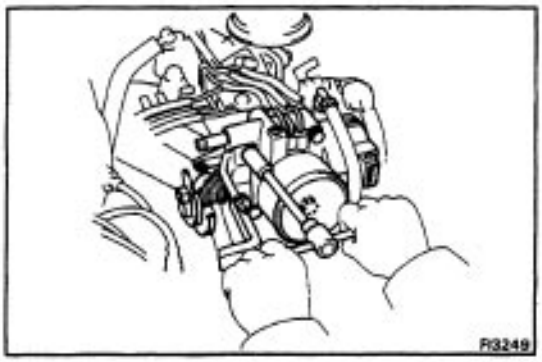
(c) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.

(d) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the two set screws.



(e) Recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDL–E2)
0.30 mm (0.012 in.)	Continuity
0.70 mm (0.028 in.)	No continuity



INSTALLATION OF THROTTLE BODY

1. INSTALL THROTTLE BODY

(a) Install a new gasket and the throttle body with the four (M/T) or three (A/n bolts.

Torque: 130 kg–cm (9 ft–lb, 13 N–m)

(b) (A/T)

Install the throttle cable bracket with the two bolts.

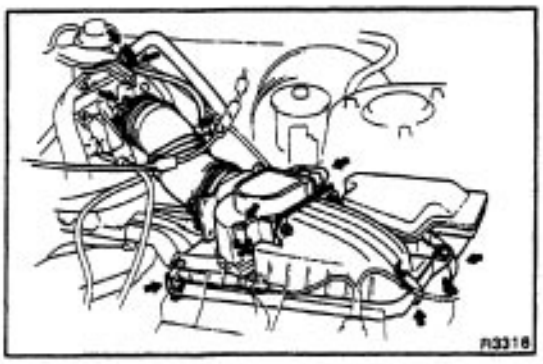
Torque: 130 kg–cm (9 ft–lb, 13 N–m)

(c) Connect the following hoses:

- PCV hose
- Water by–pass hoses
- Emission control vacuum hoses

2. CONNECT THROTTLE POSITION SENSOR CONNECTOR

3. INSTALL AIR CLEANER CAP, AIR FLOW METER AND AIR CLEANER HOSE



(a) Connect the air cleaner hose, and install the air cleaner cap and air flow meter with the four clips.

(b) Tighten the air cleaner hose clamp bolt.

(c) Connect the air hoses.

(d) Connect the air flow meter connector.

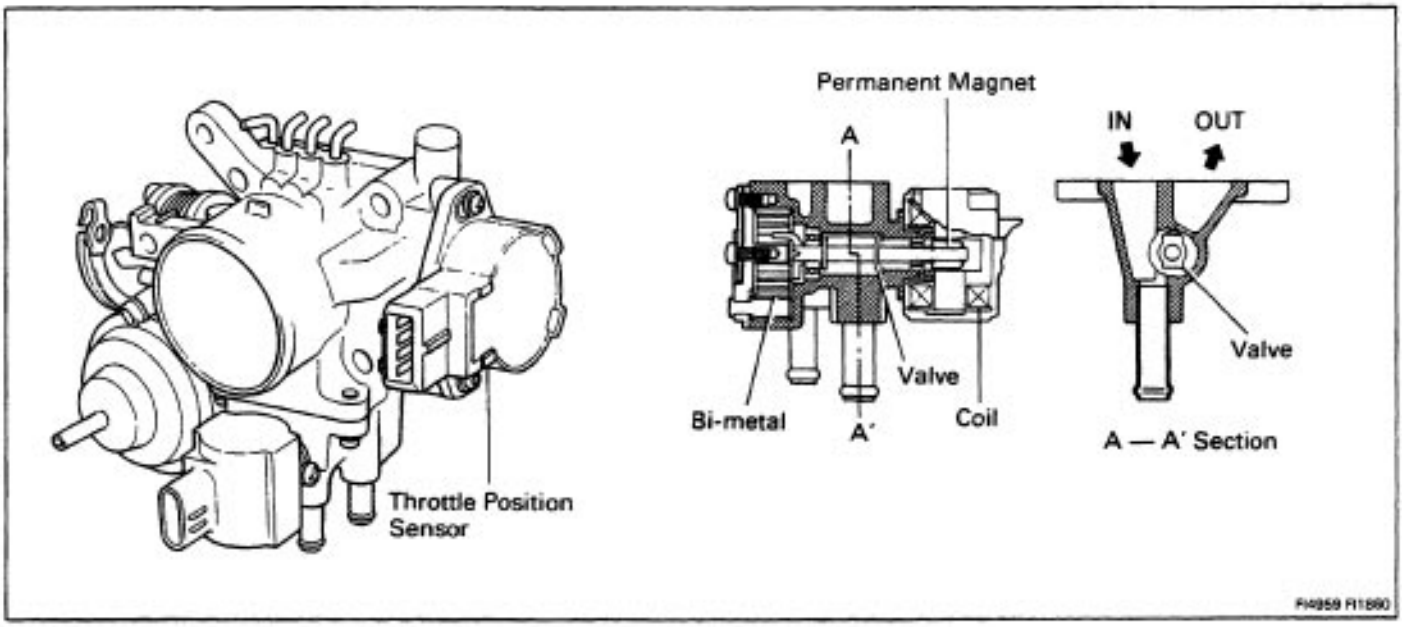
4. CONNECT ACCELERATOR CABLE, AND ADJUST IT

5. (A/T)

CONNECT THROTTLE CABLE, AND ADJUST IT

6. FILL WITH ENGINE COOLANT (See page CO–5)

Idle Speed Control (ISC) Valve (3S–FE)

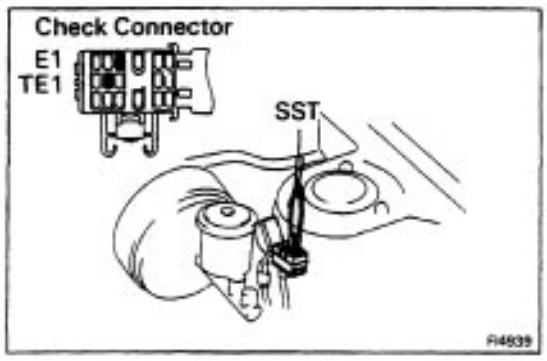


ON–VEHICLE INSPECTION

1. INSPECT ISC VALVE OPERATION

(a) Initial conditions:

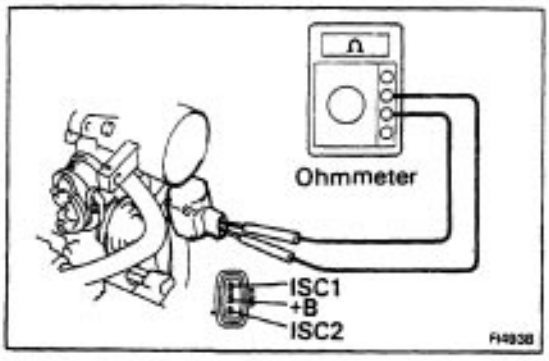
- Engine at normal operating temperature
- Idle speed set correctly
- Transmission in ”N” range



(b) Using SST, connect terminals TE1 and E1 of the check connector.
SST 09843–18020

(c) After engine rpm are kept at 1,000 – 1,300 rpm for 5 seconds, check that they return to idle speed.
If the rpm operation is not as specified, check the ISC valve, wiring and ECU.

(d) Remove the service wire.



2. INSPECT ISC VALVE RESISTANCE

(a) Disconnect the ISC valve connector.

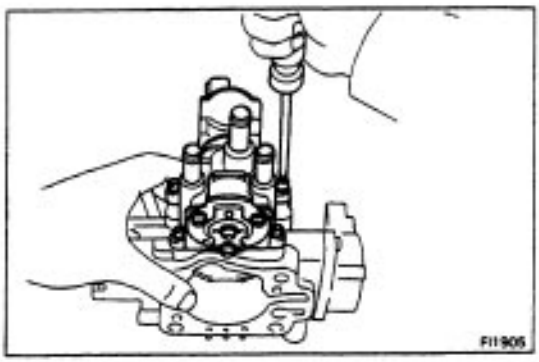
(b) Using an ohmmeter, measure the resistance between terminal +B and other terminals (ISC1, ISC2).
Resistance: 16.0 – 17.0)
If the resistance is not as specified, replace the ISC valve.

(c) Reconnect the ISC valve connector.

REMOVAL OF ISC VALVE

1. REMOVE THROTTLE BODY

(See steps 1 to 7 on page FI–107)



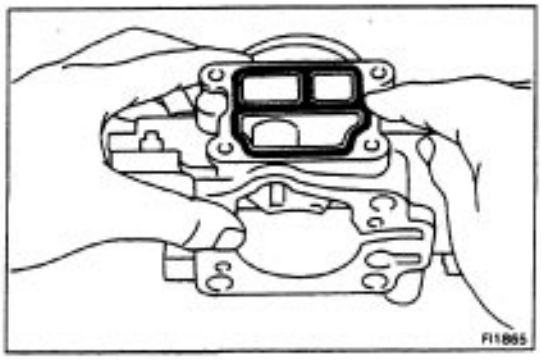
2. REMOVE ISC VALVE

Remove the four screws, ISC valve and gasket.

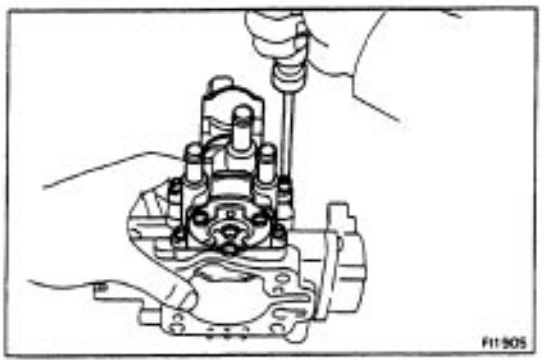
INSTALLATION OF ISC VALVE

1. INSTALL ISC VALVE

(a) Place a new gasket on the throttle body.



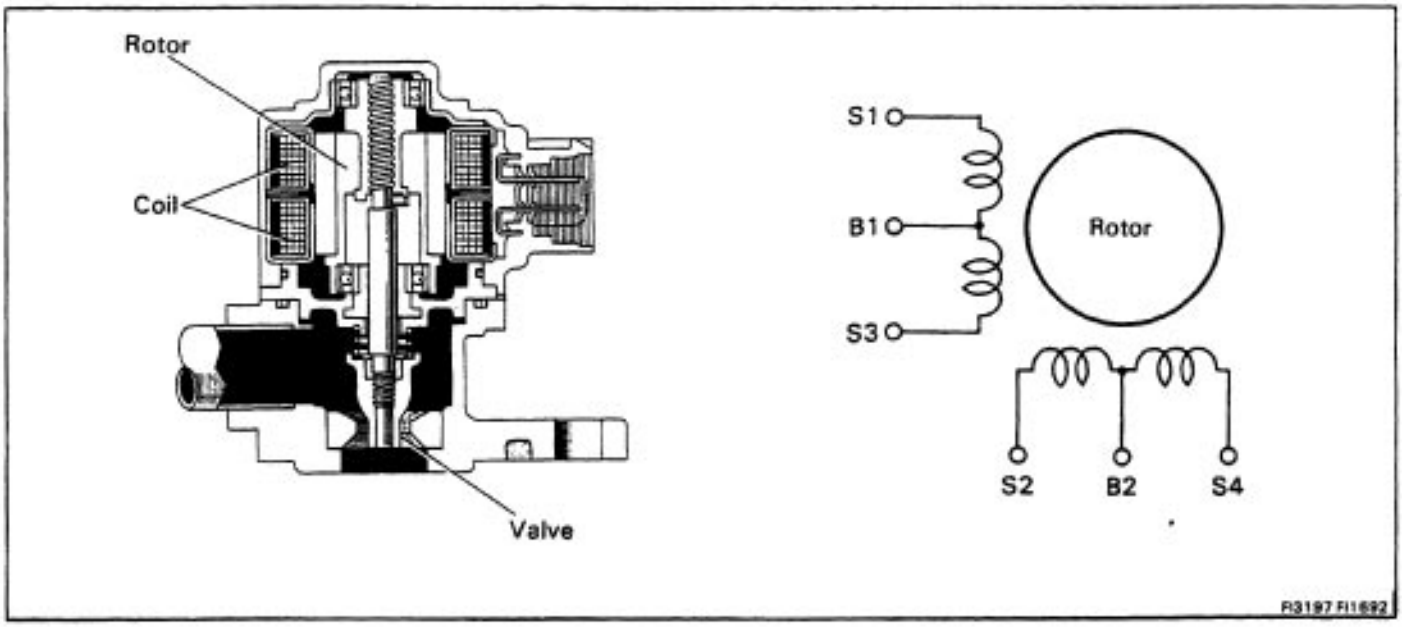
(b) Install the ISC valve with the four screws.



2. INSTALL THROTTLE BODY

(See steps 2 to 8 on page FI–109)

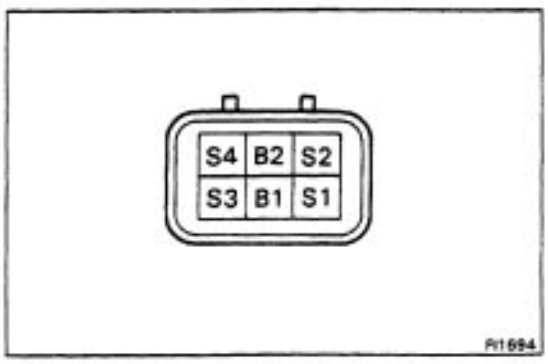
Idle Speed Control (ISC) Valve (2VZ–FE)



ON–VEHICLE INSPECTION

1. CHECK FOR OPERATING SOUND FROM ISC VALVE

Check that there is a clicking sound immediately stopping the engine.



2. INSPECT ISC VALVE RESISTANCE

(a) Disconnect the ISC valve connector.

(b) Using an ohmmeter, measure the resistance between terminal 131 – S1 or S3, and B2 – S2 or S4.

Resistance: B1 – S1 or S3 10 – 30)

B2 – S2 or S4 10 – 30)

If the resistance is not as specified, replace the ISC valve.

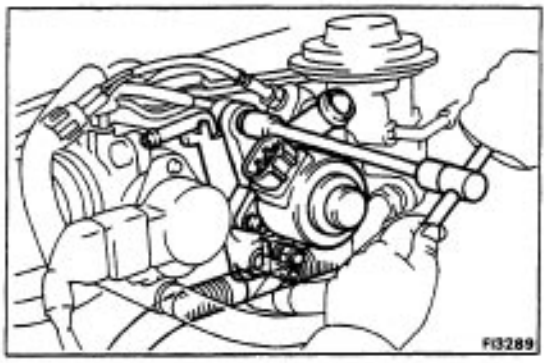
(c) Reconnect the ISC valve connector.

REMOVAL OF ISC VALVE

1. DRAIN ENGINE COOLANT (See page CO–5)

2. DISCONNECT ISC VALVE CONNECTOR

3. DISCONNECT AIR HOSE AND TWO WATER BY–PASS HOSES



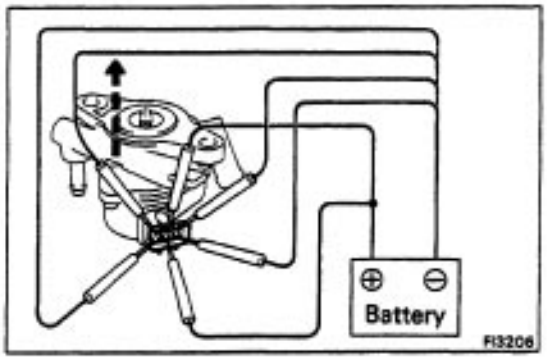
4. REMOVE ISC VALVE

(a) Remove the nut, and disconnect the wire harness clamp.

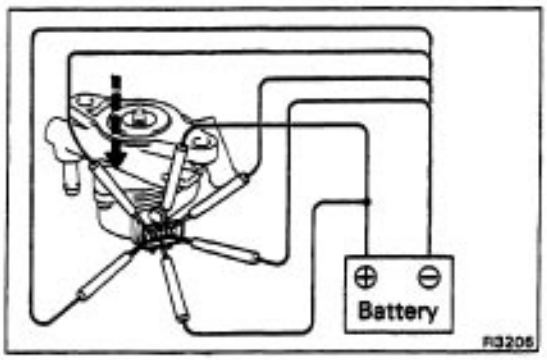
(b) Remove the two bolts, ISC valve and gasket.

INSPECTION OF ISC VALVE

INSPECT ISC VALVE OPERATION



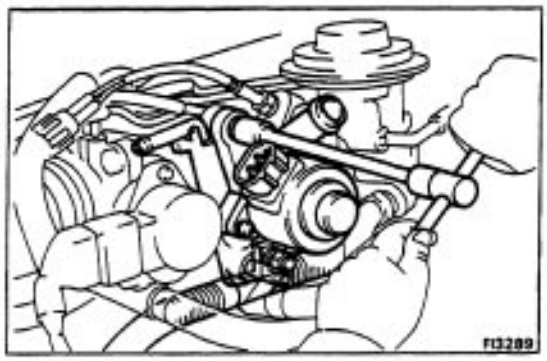
(a) Apply battery voltage to terminals 81 and B2, and while repeatedly grounding S1 – S2 – S3 – S4 – S1 in sequence, check that the valve moves to¿¿rd the closed position.



(b) Apply battery voltage to terminals 81 and 82, and while repeatedly grounding S4 – S3 S2 – S 1 – S4 in sequence, check that the valve moves toward the open position.

If operation is not as specified, replace the ISC valve.

INSTALLATION OF ISC VALVE



1. INSTALL ISC VALVE

(a) Install a new gasket and the ISC valve with the two bolts.

Torque: 130 kg–cm (9 ft–lb, 13 N–m)

(b) Connect the wire harness clamp with the nut.

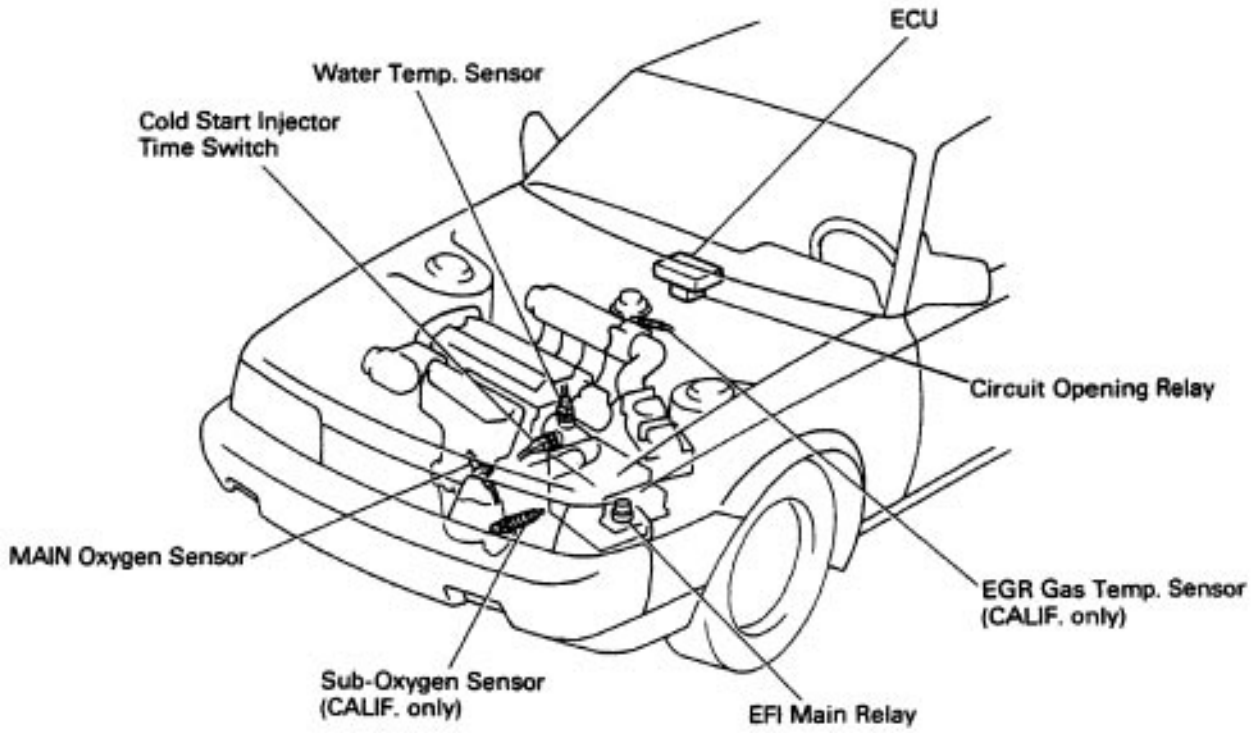
2. CONNECT TWO WATER BY–PASS HOSES AND AIR HOSE

3. CONNECT ISC VALVE CONNECTOR

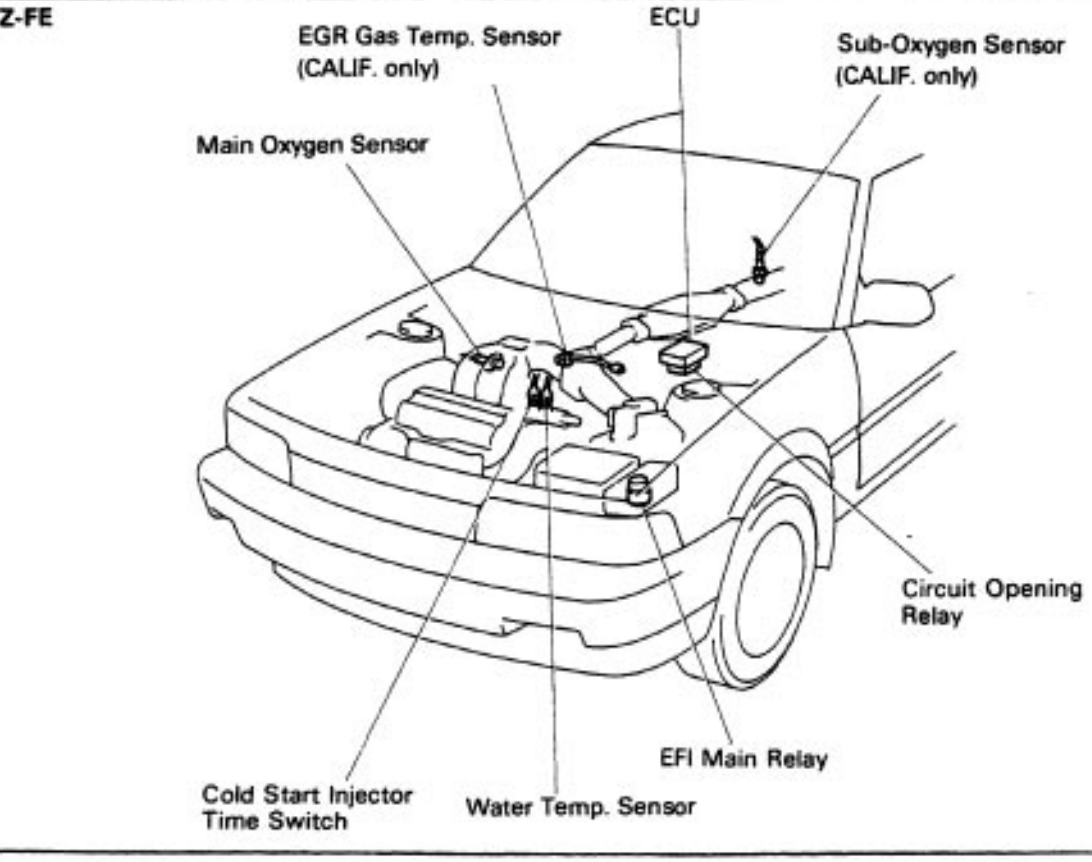
4. FILL WITH ENGINE COOLANT (See page CO–5)

ELECTRONIC CONTROL SYSTEM
Location of Electronic Control Parts

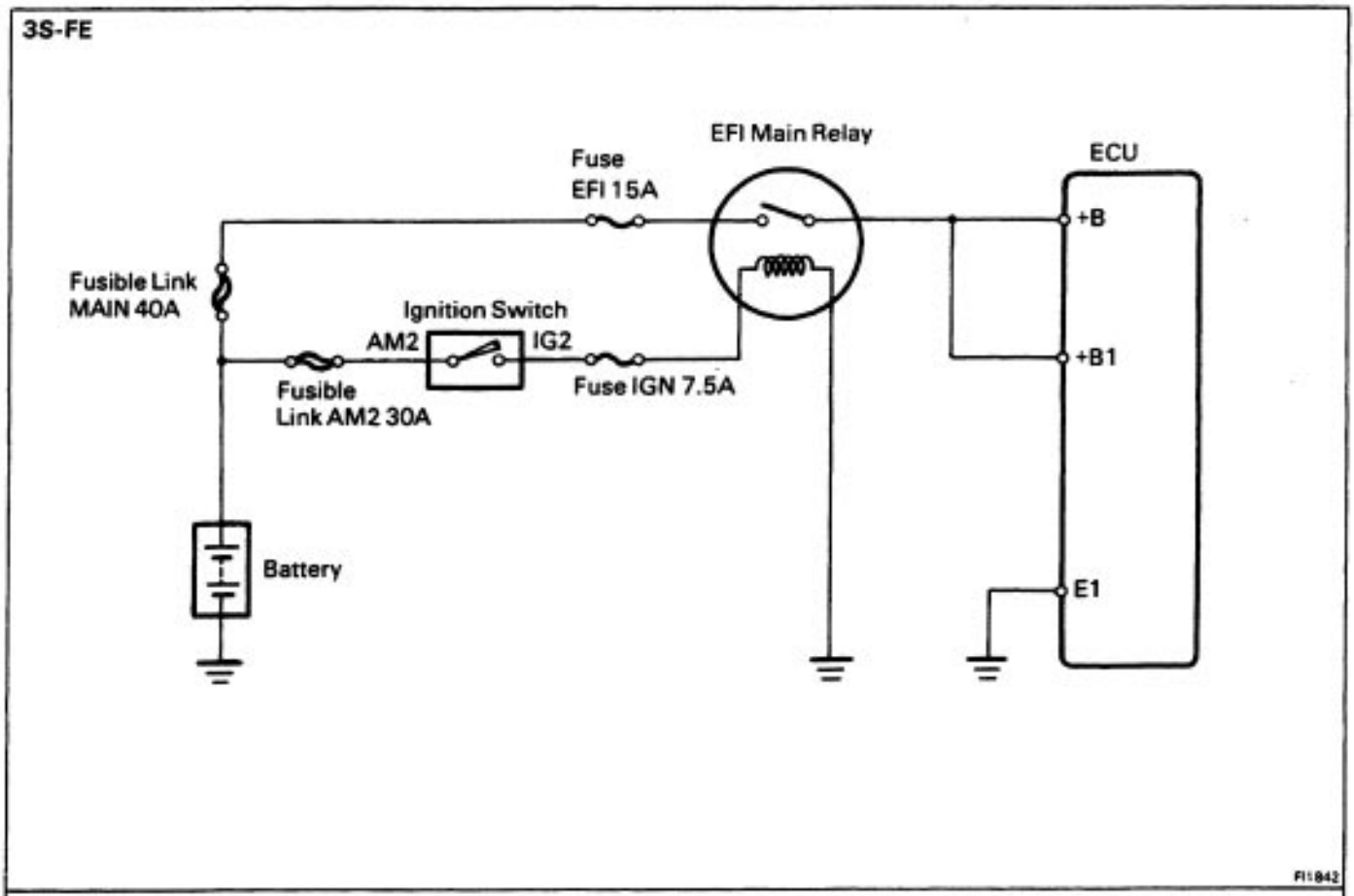
3S-FE

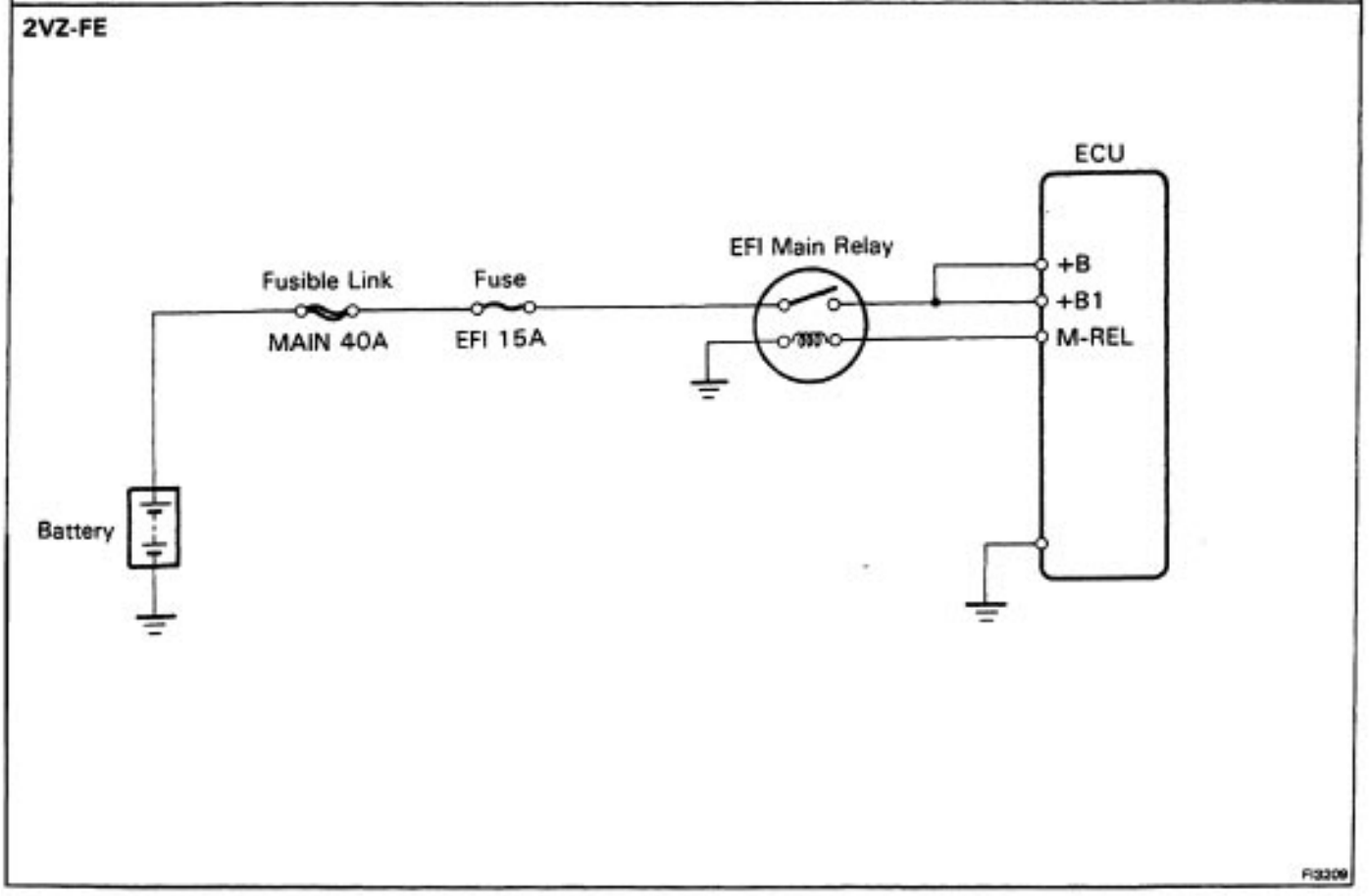


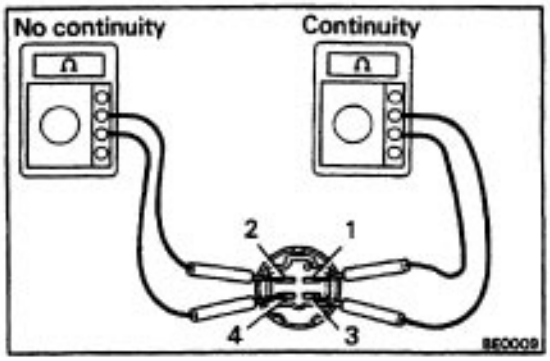
2VZ-FE



EFI Main Relay







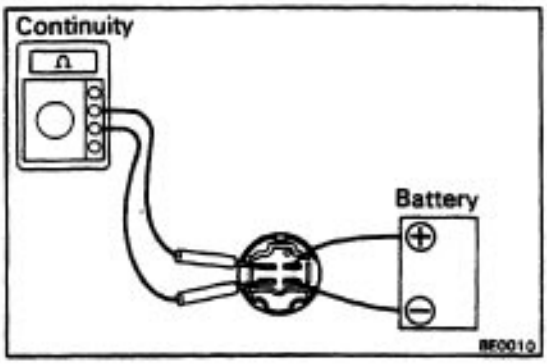
INSPECTION OF EFI MAIN RELAY

1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.

(b) Check that there is no continuity between terminals 2 and 4.

If continuity is not as specified, replace the relay.



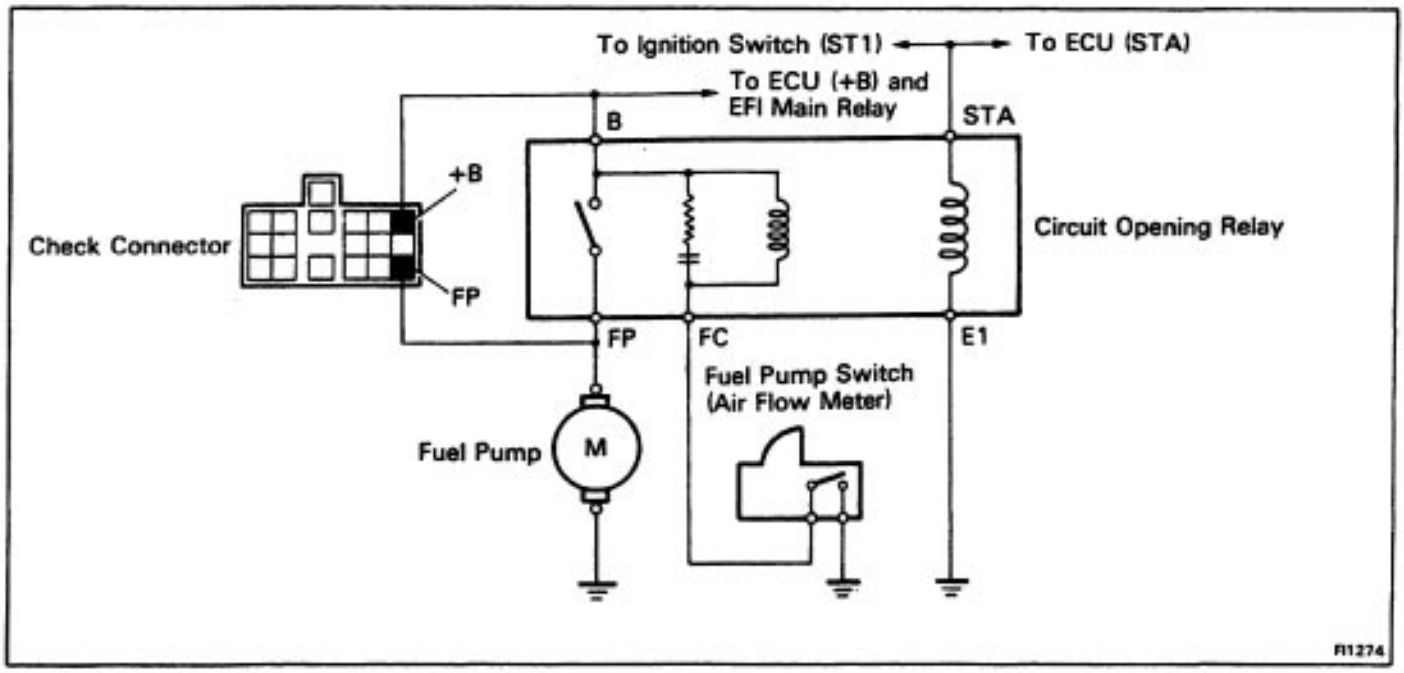
2. INSPECT RELAY OPERATION

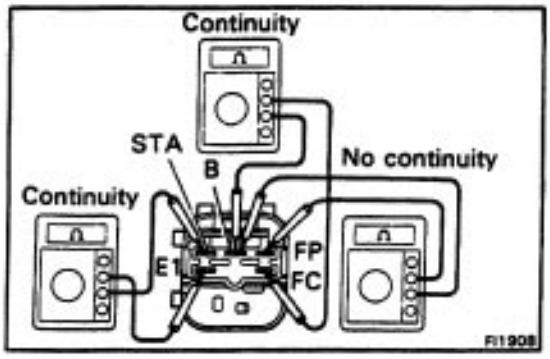
(a) Apply battery voltage across terminals 1 and 3.

(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.

Circuit Opening Relay





INSPECTION OF CIRCUIT OPENING RELAY

1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals STA and E1.

(b) Check that there is continuity between terminals B and FC.

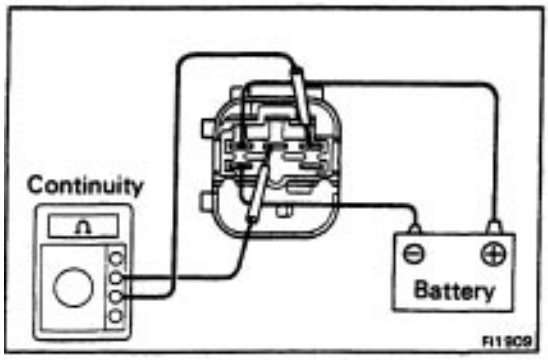
(c) Check that there is no continuity between terminals B and FP.

If continuity is not as specified, replace the relay.

2. INSPECT RELAY OPERATION

(a) Apply battery voltage across terminals STA and E1.

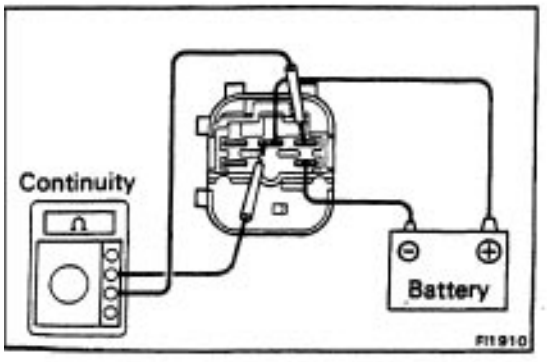
(b) Using an ohmmeter, check that there is continuity between terminals B and FP.



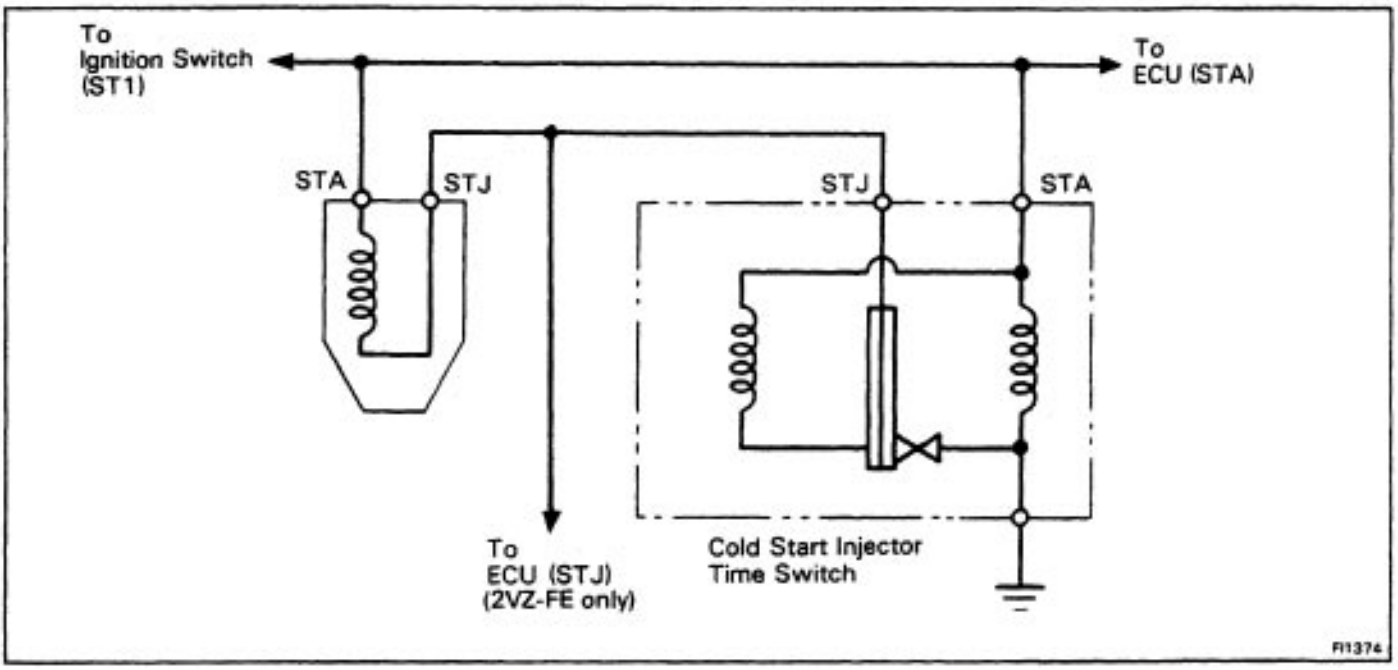
(c) Apply battery voltage across terminals B and FC.

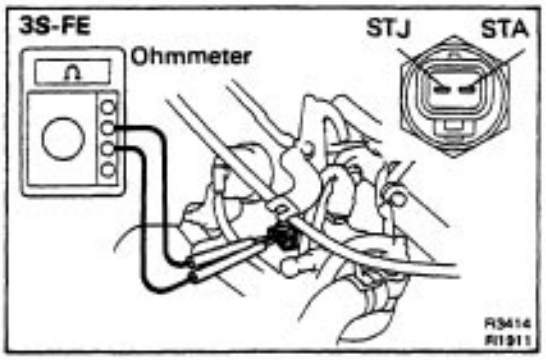
(d) Check that there is continuity between terminals B and FP.

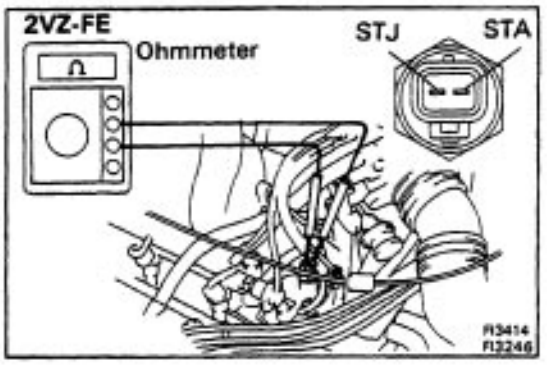
If operation is not as specified, replace the relay.



Cold Start Injector Time Switch







INSPECTION OF COLD START INJECTOR TIME SWITCH

INSPECT RESISTANCE OF COLD START INJECTOR TIME SWITCH

Using an ohmmeter, measure the resistance between each terminal.

Resistance:

3S–FE STA – STJ

20 – 40Ω below 30˚C (86˚F)

40 – 60) above 40˚C (I04˚F)

STA – Ground

20 – 80)

2VZ–FE STA – STJ

25 – 45) below 15˚C (59˚F)

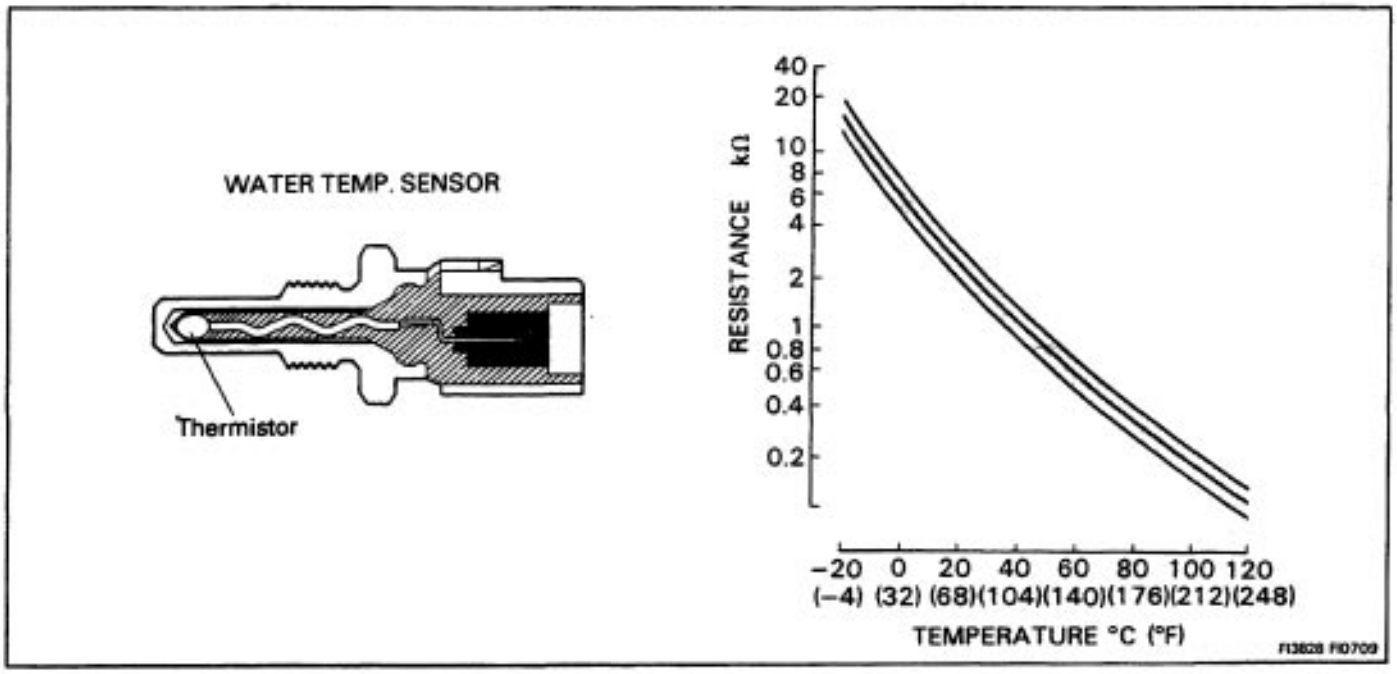
65 – 85) above 30˚C (86˚F)

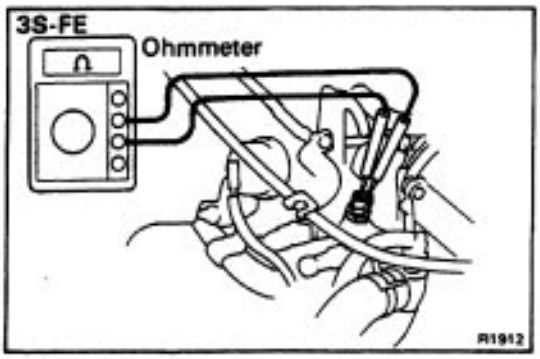
STA – Ground

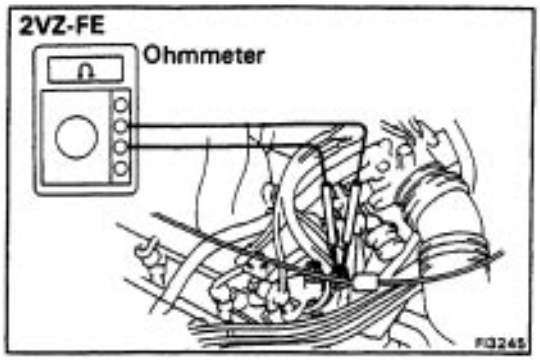
25 – 85)

If the resistance is not as specified, replace the switch.

Water Temperature Sensor







INSPECTION OF WATER TEMPERATURE SENSOR

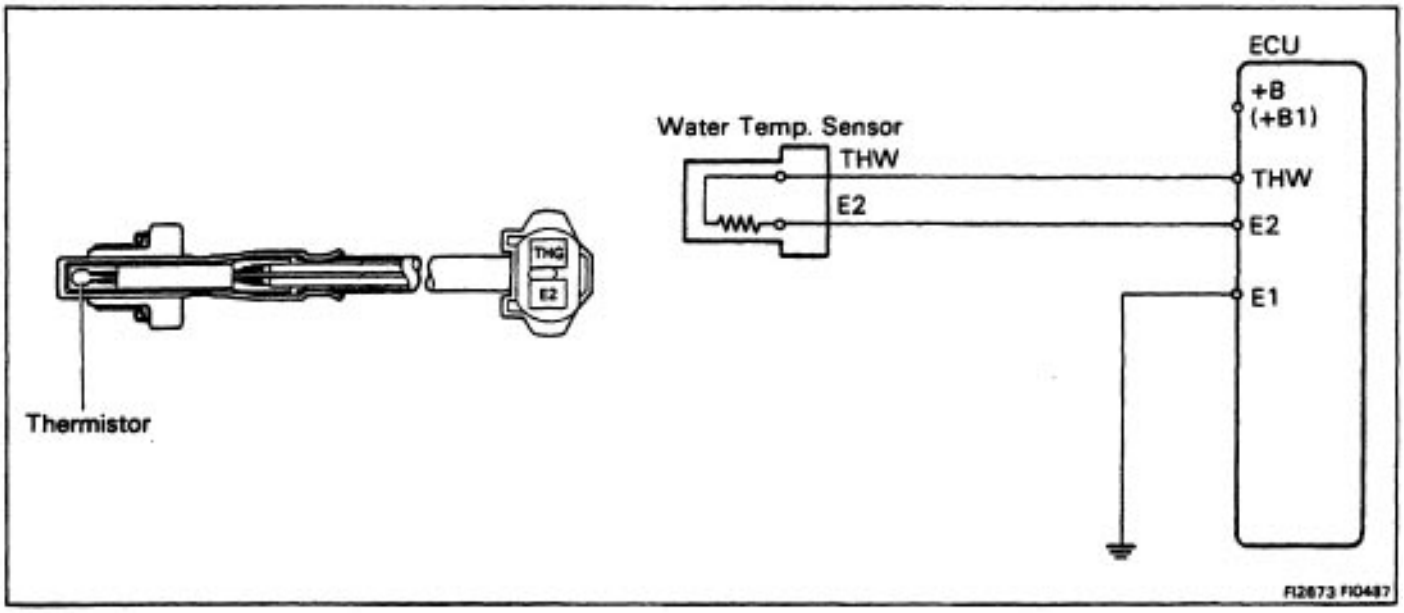
INSPECT RESISTANCE OF WATER TEMPERATURE SENSOR

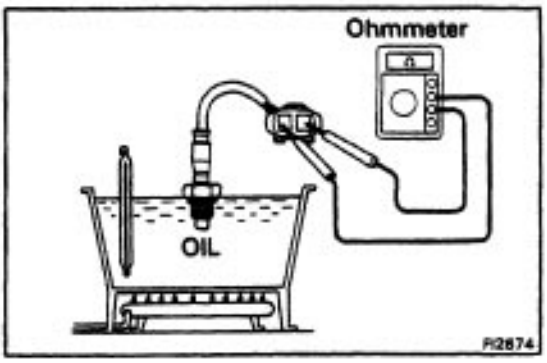
Using an ohmmeter, measure the resistance between the terminals.

Resistance: Refer to chart

If the resistance is not as specified, replace the sensor.

EGR Gas Temperature Sensor (CALIF. only)





INSPECTION OF EGR GAS TEMPERATURE SENSOR

INSPECT EGR GAS TEMPERATURE SENSOR

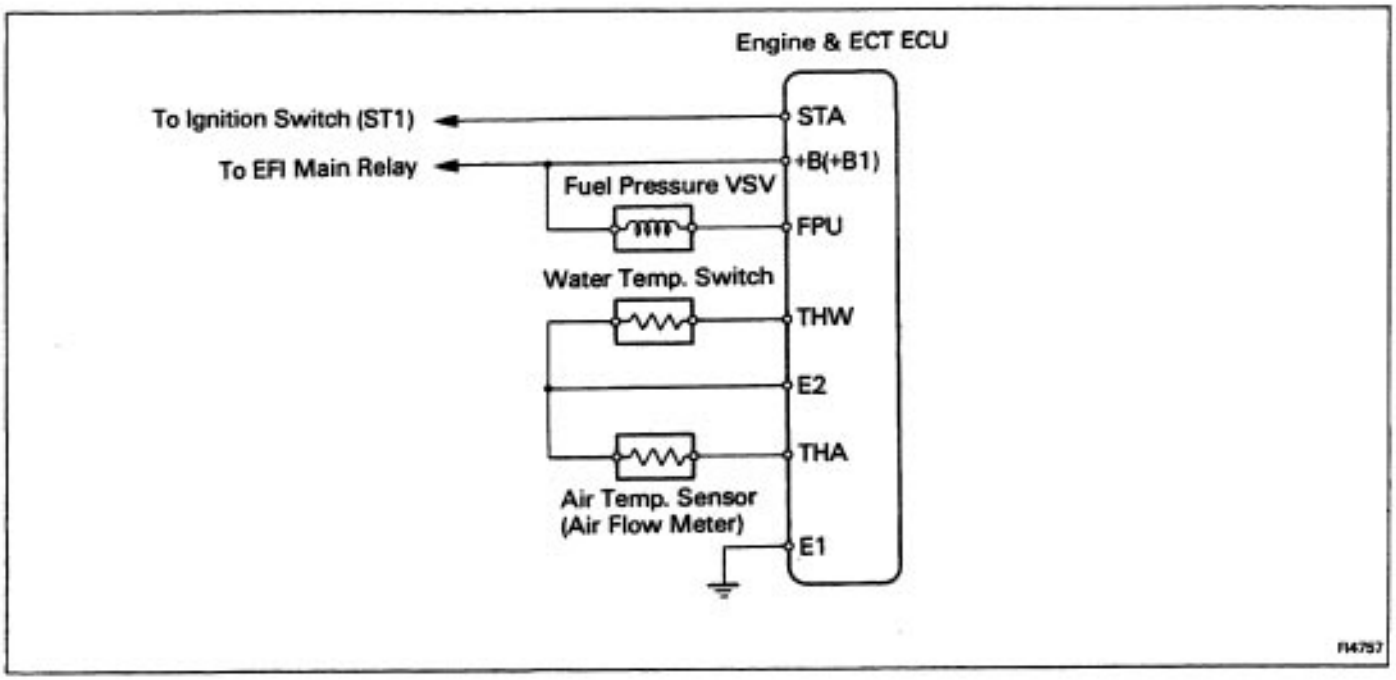
Using an ohmmeter, measure the resistance between the terminals.

Resistance:

69.40 – 88.50 kΩ at 50˚ C (11210 F)
11.89 –14.37 kΩ at 100˚ C (212˚ F)
2.79 – 3.59 k) at 150˚ C (302˚ F)

If the resistance is not as specified, replace the sensor.

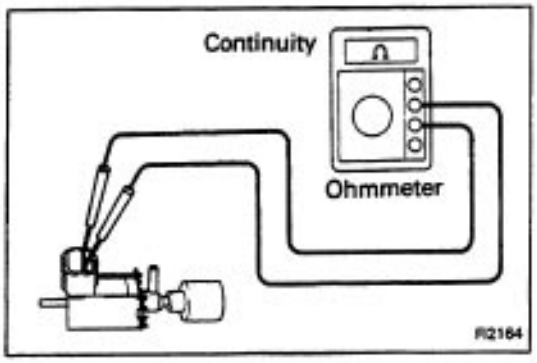
Fuel Pressure Control System



INSPECTION OF FUEL PRESSURE CONTROL SYSTEM.

1. INSPECT WATER TEMPERATURE SENSOR
(See page FI–49)

2. INSPECT INTAKE AIR TEMPERATURE SENSOR
(See page FI–37)



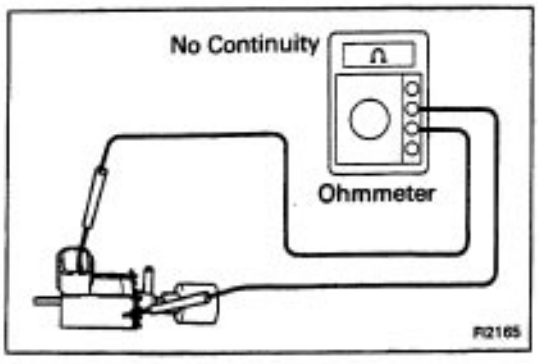
3. INSPECT FUEL PRESSURE VSV

A. Inspect VSV for open circuit.

Using an ohmmeter, check that there is continuity between terminals.

Resistance (Cold): 33 – 39)

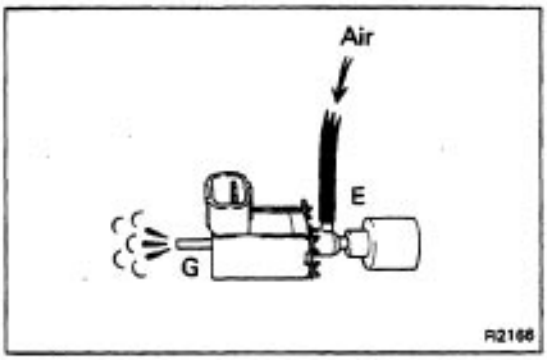
If there is no continuity, replace the VSV.



B. Inspect VSV for ground.

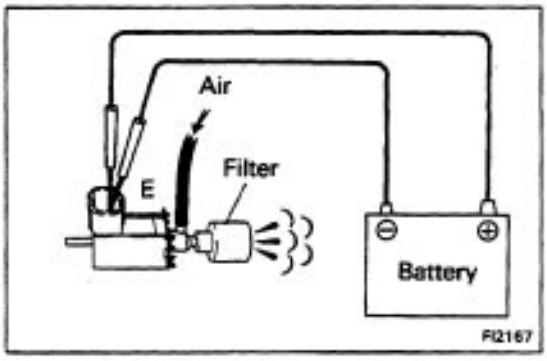
Using an ohmmeter, check that there is no continuity between each terminal and body.

If there is continuity, replace the VSV.



C. Inspect VSV operation

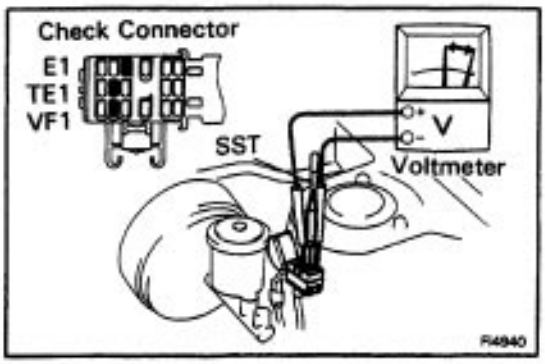
(a) Check that air flow from pipes E to G.



(b) Apply battery voltage across the terminals

(c) Check that air flows from pipe E to filter.

If operation is not as specified, replace the VSV.



Main Oxygen Sensor

INSPECTION OF OXYGEN SENSOR

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

2. INSPECT FEEDBACK VOLTAGE

Connect the positive (+) probe of a voltmeter to terminal VF1 of the check connector, and negative (–) probe to terminal E1. Perform the test as follows:

Warm up the oxygen sensor with the engine at 2,500 rpm for approx. 90 seconds.

Connect terminals TE1 and E1 of the check connector. And maintain engine speed at 2,500 rpm.

Check the number of times the voltmeter needle fluctuates in 10 seconds.

Less than 8 times

Warm up the oxygen sensor with the engine at 2,500 rpm for approx. 90 seconds. And maintain engine at 2,500 rpm.

Check the number of times the voltmeter needle fluctuates in 10 seconds.

Less than 8 times

Disconnect terminals TE1 and E1 of the check connector. And maintain engine speed at 2,500 rpm.

Measure voltage between terminals VF 1 and E 1.

More than 0 V

0 V

Read and record diagnostic codes. (See page FI–25 or 27)

Normal code, code Nos. 21, 25 and 26

Malfunction code(s) (Ex. code Nos. 21, 25 and 26y

Repair the relevant diagnostic code.

Replace the ECU.

Zero again

After replacing the oxygen sensor

8 times or more

Zero

Normal

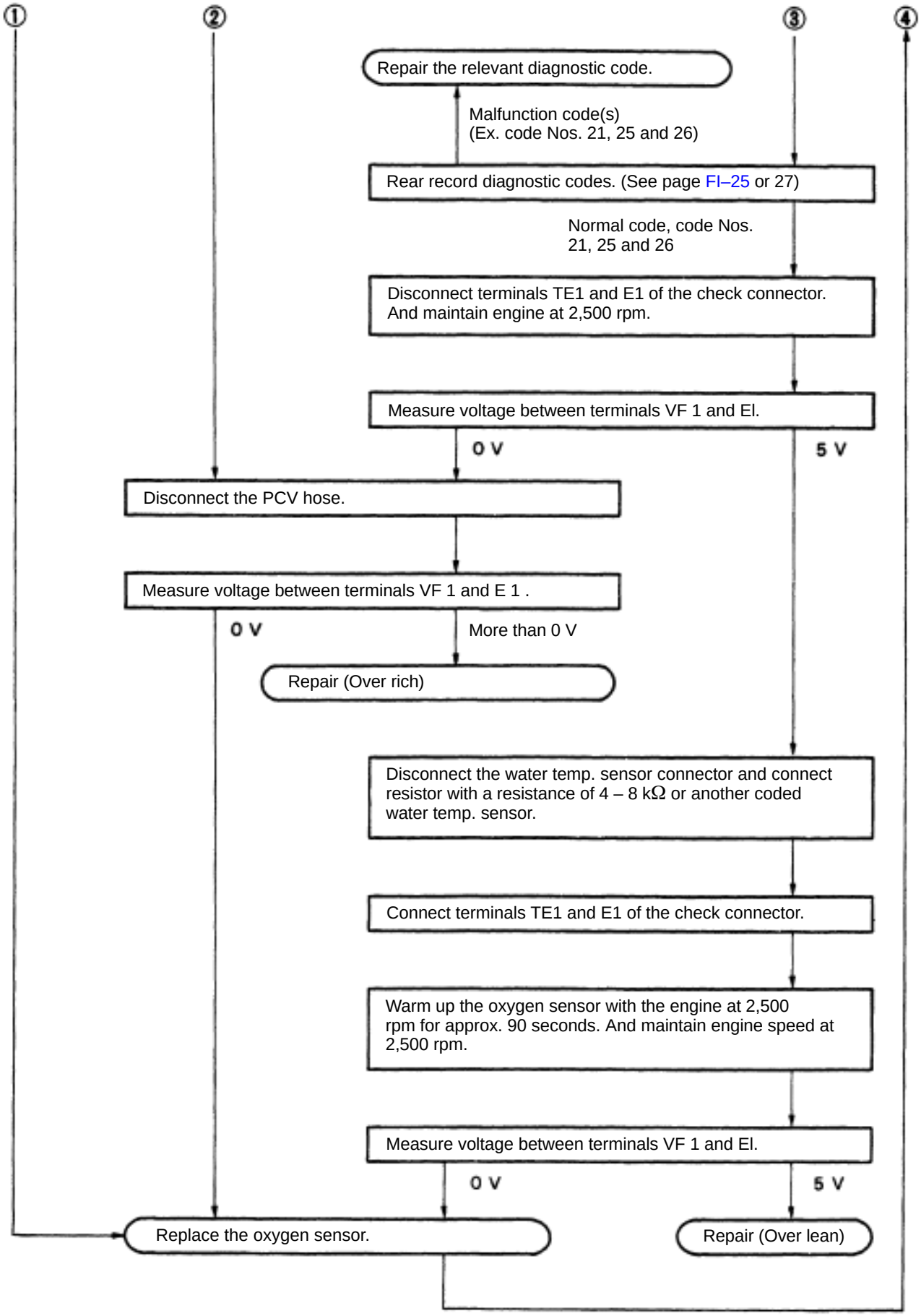
8 times of more

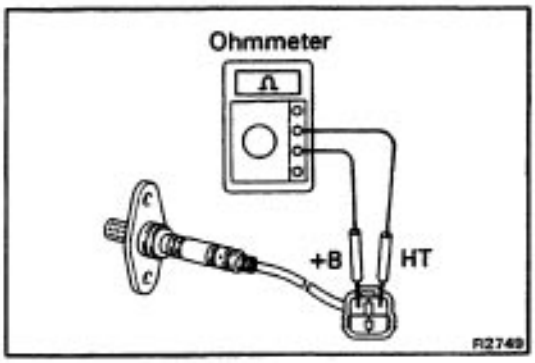
Zero

① ② ③ ④

CONTINUED ON PAGE FI–30

CONTINUED FROM PAGE FI–129





3. (2VZ–FE)

INSPECT HEATER RESISTANCE OF OXYGEN SENSOR

Using an ohmmeter, measure the resistance between the terminal +B and HT.

Resistance (Cold): 5.1 6.3) at 20˚C (68˚F)

If the resistance is not as specified, replace the sensor.

Sub–Oxygen Sensor (CALIF. only)

INSPECTION OF SUB–OXYGEN SENSOR

INSPECT SUB–OXYGEN SENSOR

HINT: Inspect only when code No.27 is displayed.

(a) Diagnostic code cancellation.

(See page FI–24)

(b) Warm up the engine until it reaches normal operating temperature.

(a) (M/T)

Drive for 5 minutes or more between 80 km/h (50 mph) and 100 km/h in 4th or 5th gear.

(A/T)

Drive for 5 minutes or more between 80 km/h (50 mph) and 100 km/h (62 mph) in ”D” range.

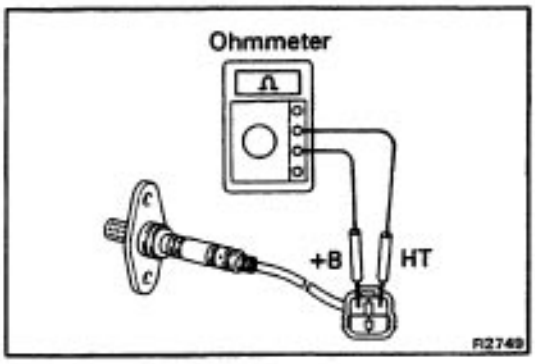
(d) Following the conditions in step (e), press fully on the accelerator pedal for 2 seconds or more.

HINT: Do not exceed 100 km/h (62 mph), or diagnostic code will be cancelled.

(e) Stop the vehicle and turn the ignition switch to OFF.

(f) Carry out steps (b), (c) and (d) again to test acceleration.

If code No. 27 reappears again, check the sub–oxygen sensor circuit. If the circuit is normal, replace the suboxygen sensor.



3. (2VZ–FE)

INSPECT HEATER RESISTANCE OF OXYGEN SENSOR

Using an ohmmeter, measure the resistance between the terminal +B and HT.

Resistance (Cold): 5.1 6.3) at 20˚C (68˚F)

If the resistance is not as specified, replace the sensor.

Sub–Oxygen Sensor (CALIF. only)

INSPECTION OF SUB–OXYGEN SENSOR

INSPECT SUB–OXYGEN SENSOR

HINT: Inspect only when code No.27 is displayed.

(a) Diagnostic code cancellation.
(See page FI–24)

(b) Warm up the engine until it reaches normal operating temperature.

(a) (M/T)
Drive for 5 minutes or more between 80 km/h (50 mph) and 100 km/h in 4th or 5th gear.
(A/T)
Drive for 5 minutes or more between 80 km/h (50 mph) and 100 km/h (62 mph) in ”D” range.

(d) Following the conditions in step (e), press fully on the accelerator pedal for 2 seconds or more.

HINT: Do not exceed 100 km/h (62 mph), or diagnostic code will be cancelled.

(e) Stop the vehicle and turn the ignition switch to OFF.

(f) Carry out steps (b), (c) and (d) again to test acceleration.

If code No. 27 reappears again, check the sub–oxygen sensor circuit. If the circuit is normal, replace the suboxygen sensor.

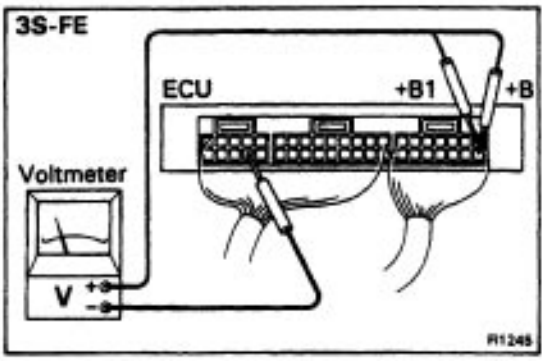
Electronic Controlled Unit (ECU)

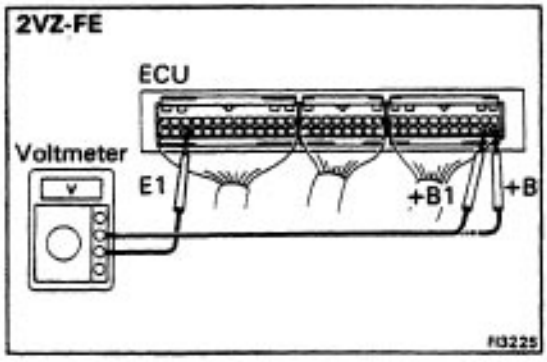
INSPECTION OF ECU

HINT: The EFI circuit can be checked by measuring the resistance and voltage at the wiring connectors of the ECU.

1. (2VZ–FE)

PREPARATION (See page FI–50)





2. INSPECT VOLTAGE OF ECU

Check the voltage between each terminal of the wiring connectors.

- Turn the ignition switch ON.
- Measure the voltage at each terminal.

HINT:

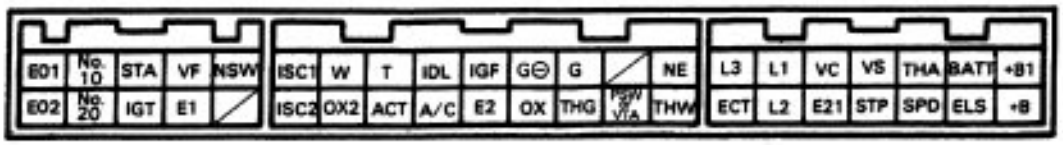
- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is ON.

Voltage at ECU Wiring Connectors (3S–FE)

Terminals	Condition		STD voltage (V)
+B, +B1 — E1	1G SW ON		10 — 14
BATT — E1	—		10 — 14
*1IDL — E1	IG SW ON	Throttle valve open	8 — 14
*1PSW — E1		Throttle valve fully closed	4 — 6
*2IDL — E2		Throttle valve open	8 — 14
*2VTA — E2		Throttle valve fully closed	0.1 — 1.0
		Throttle valve open	4 — 6
VC — E2			4 — 6
VS — E2		Measuring plate fully closed	4.0 — 5.5
		Measuring plate fully open	0 — 1
	Idling		2.0 — 4.0
	3,000 rpm		1.0 — 2.0
No.10, No.20 — E01, E02	IG SW ON		10 — 14
THA — E2	IG SW ON	Intake air temp. 20°C (68°F)	1 — 3
THW — E2		Coolant temp. 80°C (1 760F)	0.1 — 1.0
STA — E1	Cranking		6 — 14
IGT — E1	Cranking or idling		0.7 — 1.0
ISC1, ISC2 — E1	IG SW ON		9 — 14
W — E1	No trouble (”CHECK” engine warning light off) and engine running		10 — 14
*3A/C — E1	IG SW ON	Air conditioning ON	8 — 14
*3ACT — E1		Heater blower SW ON	4 — 6
T — E1		Check connector TE1 – E1 not connected	10 — 14
		Check connector TE 1 – E 1 connected	0.5 or less
NSW — E1		Shift position P or N range	0 — 2
		Ex. shift position P or N range	6 — 14
STP — E1	Stop light SW 4N (Brake pedal depressed) or defogger SW ON		10 — 14

ECU Terminals

*1 w/o ECT
*2 w/ ECT
*3 w/ A/C



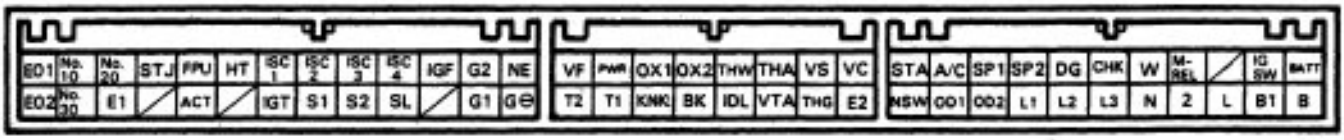
FI0605

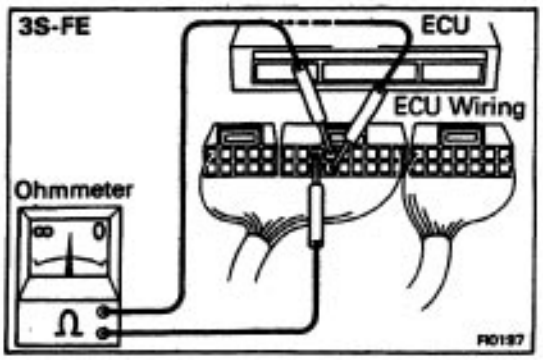
Voltage at ECU Wiring Connectors (2VZ–FE)

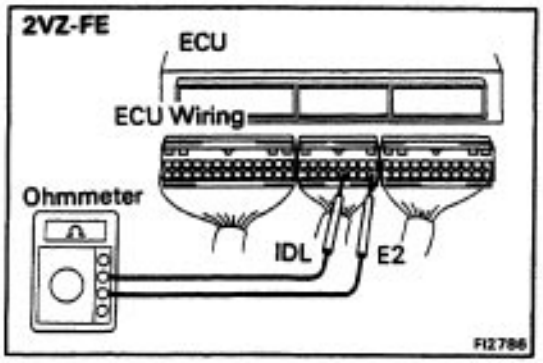
Terminals	Condition		Sm voltage (V)
BATT — E1			10 — 14
IG SW — E1	IG SW ON		
M-REL — E1			
+B, +B1 — E1			
IDL — E2	1G SW ON	Throttle valve open	4 — 6
VTA — E2		Throttle valve fully closed	0.1 — 1.0
		Throttle valve open	3.2 — 4.2
VC — E2			4 — 6
VS — E2		Measuring plate fully closed	3.7 — 4.3
		Measuring plate fully open	0.2 — 0.5
	Idling		1.6 — 4.1
	3,000 rpm		1.0 — 2.0
No.10, No.20, No.30 — E01, E02	IG SW ON		10 — 14
THA — E2	IG SW ON	Intake air temp. 20°C (68°F)	1 — 3
THW — E2		Coolant temp. 80°C (176°F)	0.1 — 1.0
STA — E1	Cranking		6 — 14
IGT — E1	Cranking or idling		0.7 — 1.0
ISC1, ISC2, ISC3, ISC4 — E1	IG SW ON		9 — 14
W — E1	No trouble ("CHECK" engine warning light off) and engine running		10 — 14
*1A/C — E1	IG SW ON	Air conditioning ON	8 — 14
*1ACT — E1		Heater blower SW ON	4 — 6
T — E1		Check connector TE1 – E1 not connected	4 — 6
		Check connector TE1 – E1 connected	0.5 or less
*2NSW — E1		Shift position P or N range	0 — 2
		Ex. shift position P or N range	10 — 14
*2BK — E1	Stop light SW ON (Brake pedal depressed)		10 — 14

ECU Terminals

*1 w/ A/C
*2 w/ ECT







2. INSPECT RESISTANCE OF ECU

NOTICE:

- **Do not touch the ECU terminals.**
- **The tester probe should be inserted into the wiring connector from the wiring side.**

Check the resistance between each terminal of the wiring connectors.

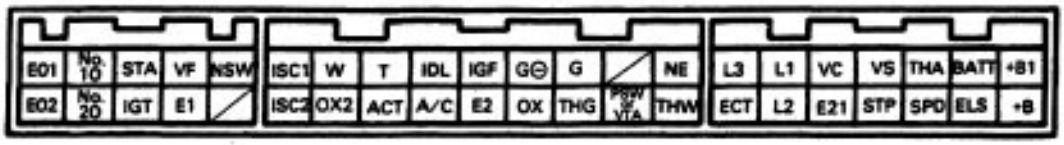
- Disconnect the connectors from the ECU.
- Measure the resistance at each terminal.

Resistance of ECU Wiring Connectors (3S–FE)

Terminals	Condition	STD resistance ( )
*1IDL — E1	Throttle valve open	Infinity
	Throttle valve fully closed	0
*1PSW — E1	Throttle valve fully open	0
	Throttle valve fully closed	Infinity
*2IDL — E2	Throttle valve open	Infinity
	Throttle valve fully closed	2,300 or less
*2VTA — E2	Throttle valve fully open	3,300 — 10,000
	Throttle valve fully closed	200 — 800
VC — E2	—	3,000 — 7,000
VS — E2	Measuring plate fully closed	200 — 600
	Measuring plate fully open	20 — 1,200
THA — E2	Intake air temp. 20˚C (68˚F)	2,000 — 3,000
THW — E2	Coolant temp. 80˚C (176˚F)	200 — 400
G, NE — G⊖	—	140 — 180
ISC1, ISC2 — +B, +B1		16.0 — 17.0

ECU Terminals

*1 w/o ECT
*2 w/ ECT



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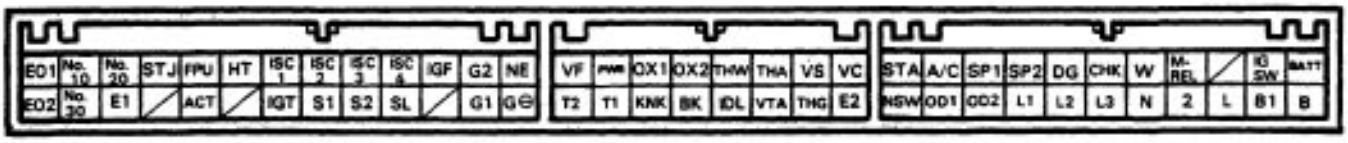
Resistance of ECU Wiring Connectors (2VZ–FE)

Terminals	Condition	STD resistance ( )
IDL — E2	Throttle valve open	Infinity
	Throttle valve fully closed	2,300 or less
VTA — E2	Throttle valve fully open	3,500 — 10,300
	Throttle valve fully closed	300 — 6,300
VC — E2		200 — 400
VS — E2	Measuring plate fully closed	200 — 600
	Measuring plate fully open	20 — 1,200
THA — E2	Intake air temp. 20˚C (68˚F)	2,000 — 3,000
THW — E2	Coolant temp. 80˚C (176˚F)	200 — 400
G1 G2 — G⊖ NE	—	140 — 180
ISC1 ISC2 — +B ISC3 — +B1 ISC4		10 — 30

ECU Terminals



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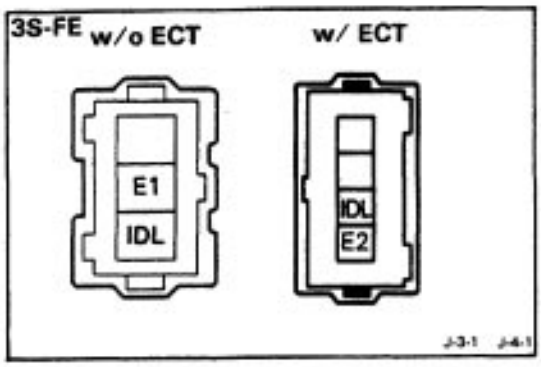
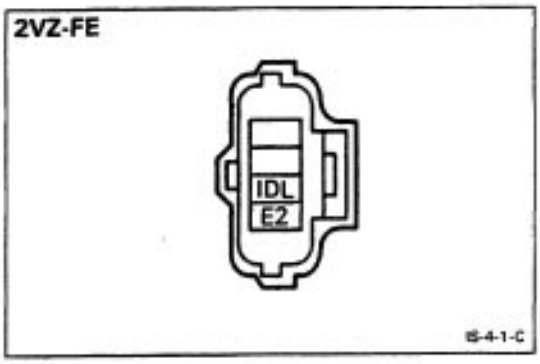
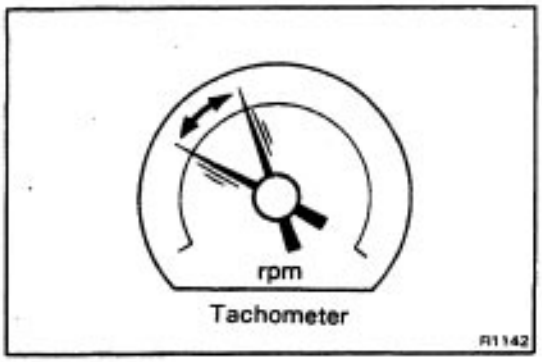






Fuel Cut RPM

INSPECTION OF FUEL CUT RPM

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

2. INSPECT FUEL CUT RPM

(a) Disconnect the connector from the throttle position sensor.

(b) Connect terminals IDL and E1 (3S–FE (w/o ECT)) or E2 (others) of the wiring connector.

(e) Gradually raise the engine rpm and check that there is fluctuation between the fuel cut and fuel return points.

HINT:

- The vehicle should be stopped.
- Measure with the A/C OFF.

Fuel cut rpm: 3S–FE 1,500 – 2,100 rpm
2VZ–FE 1,800 rpm

Fuel return rpm: 3S–FE 1,000 rpm
2VZ–FE 1,200 rpm

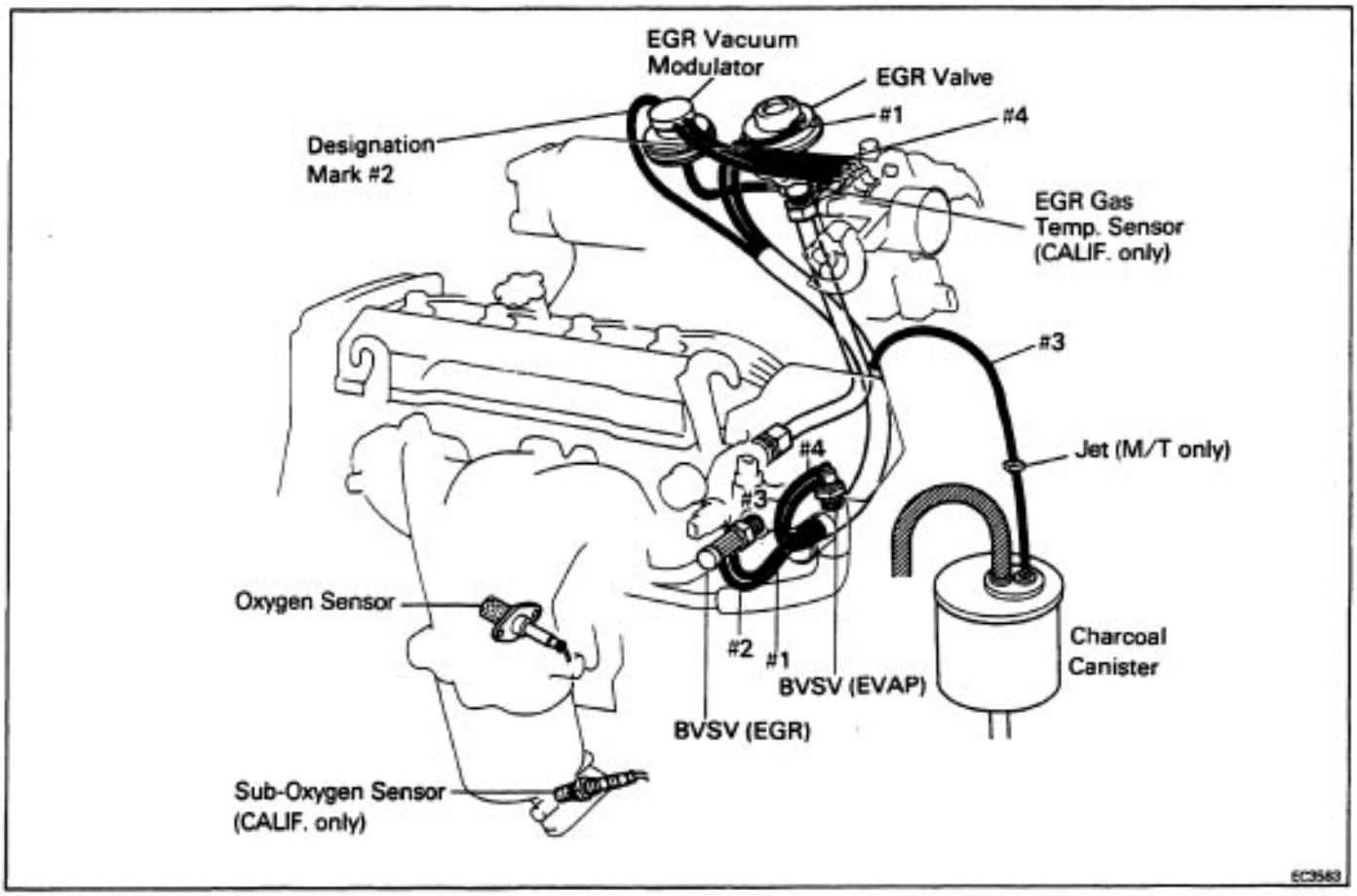
EMISSION CONTROL SYSTEMS

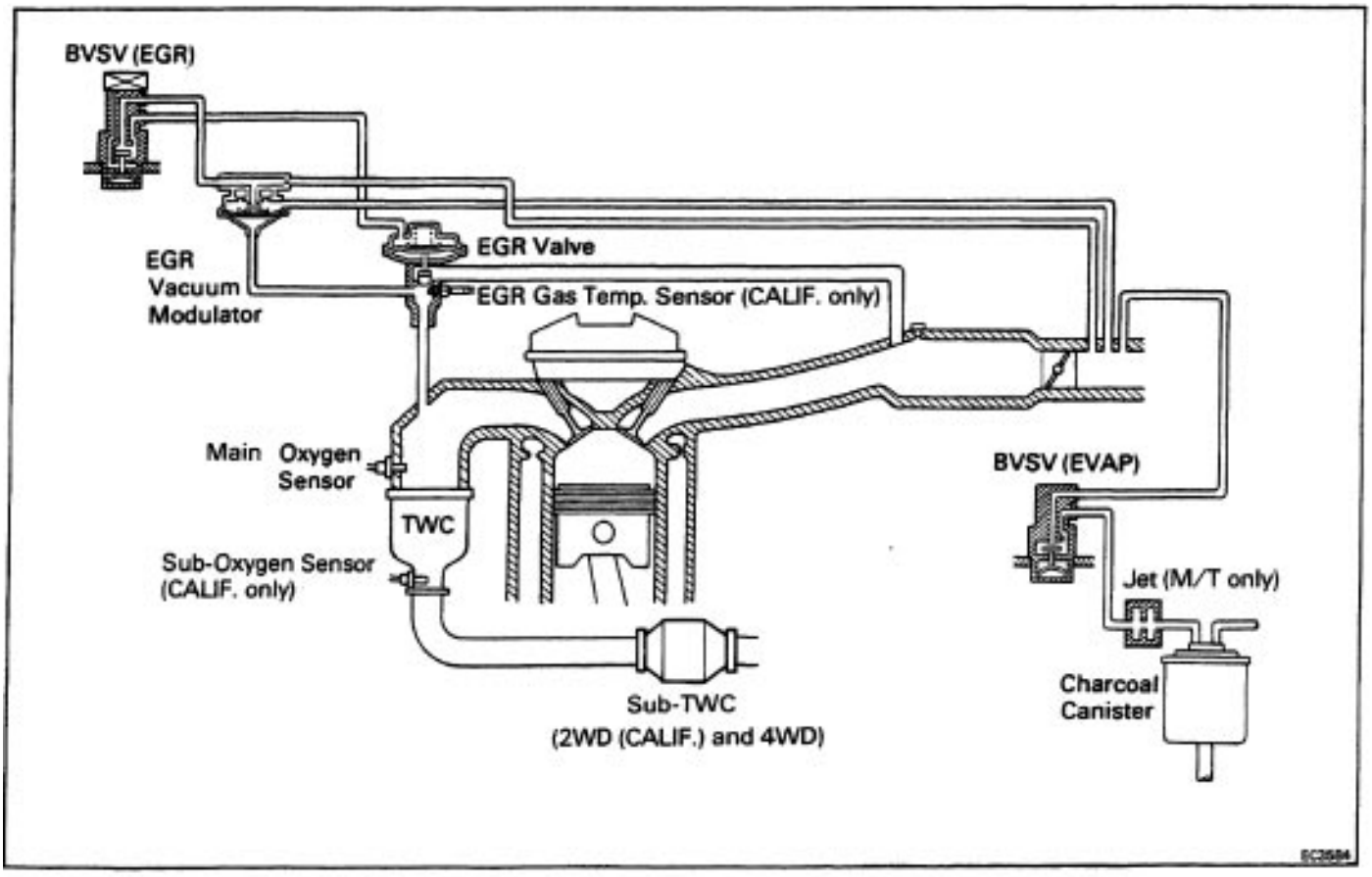
SYSTEM PURPOSE

System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduced blow–by gas (HC)
Fuel evaporative emission control	EVAP	Reduced evaporative HC
Exhaust gas recirculation	EGR	Reduces NOx
Three–way catalyst	TWC	Reduces HC_1 CO and NOx
Electronic fuel injection*	EFI	Regulates all engine conditions for reduction of exhaust emissions.

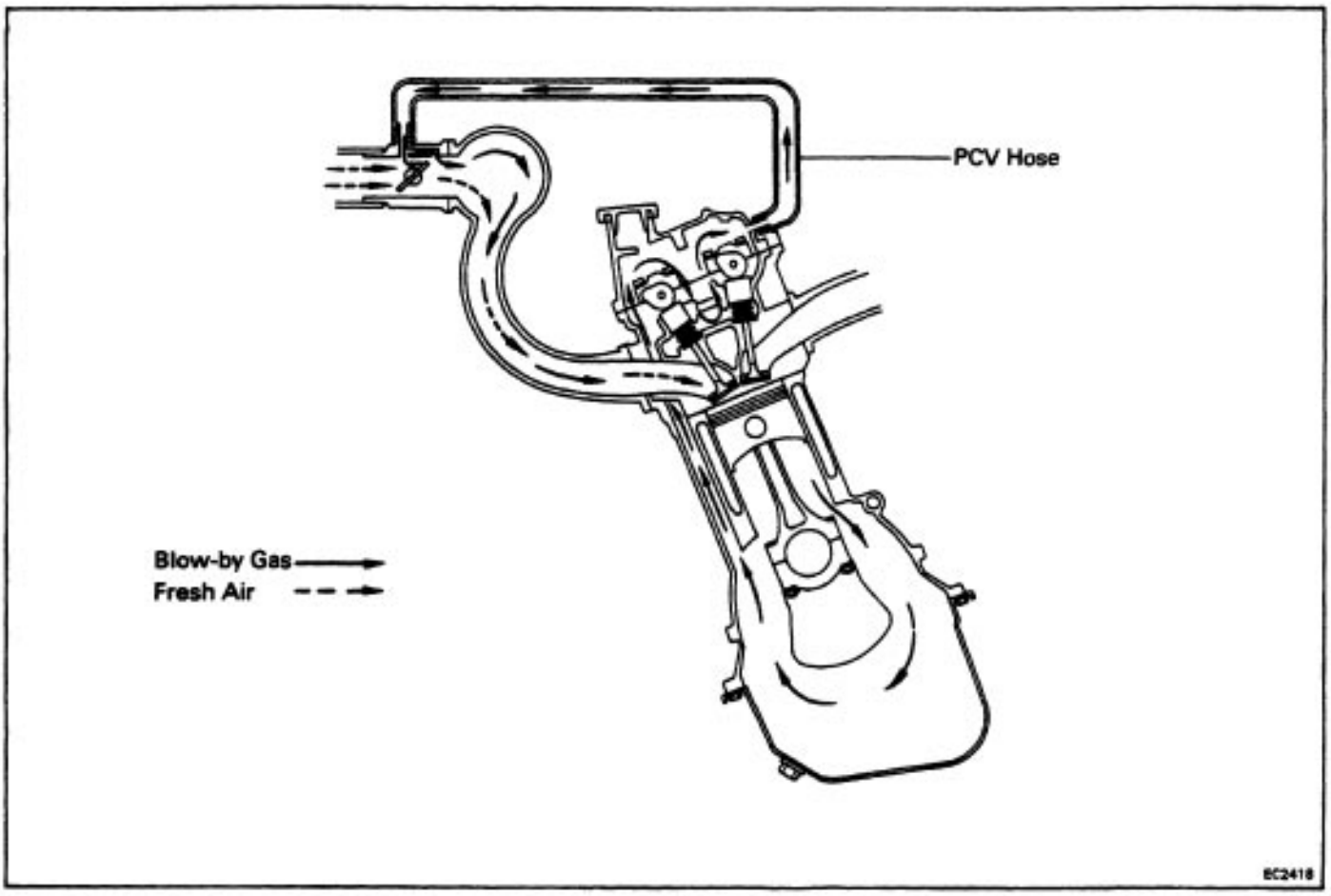
Remarks *For inspection and repair of the EFI system, refer to the EFI section of this manual.

COMPONENT LAYOUT AND SCHEMATIC DRAWING

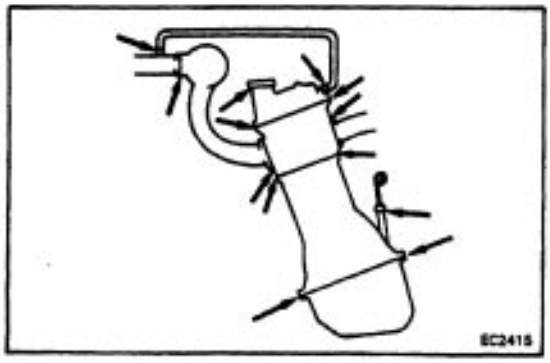




POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



To reduce HC emission, crankcase blow–by gas (HQ is routed to the intake manifold for combustion in the cylinders.

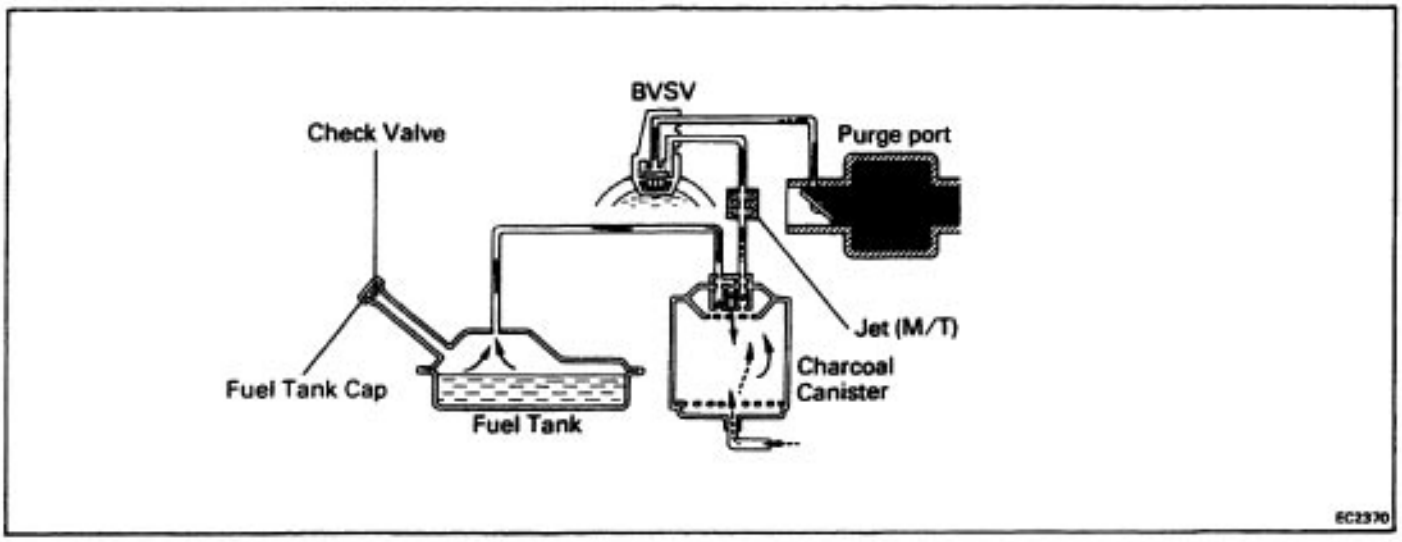


INSPECTION OF PCV HOSE AND CONNECTIONS

VISUALLY INSPECT HOSE AND CONNECTIONS

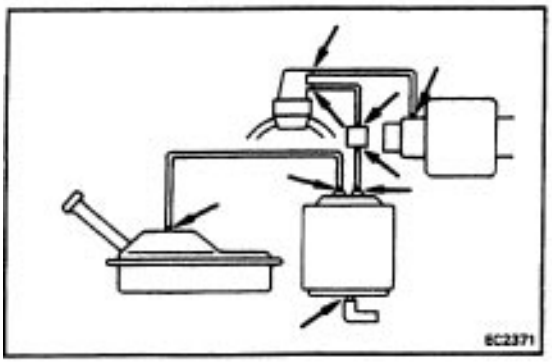
Check for cracks, leaks, or damage.

FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM



To reduce HC emission, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

Coolant Temp.	SVSV	Throttle Valve Opening	Canister Check Valve			Check Valve in Cap	Evaporated Fuel (HO
			(1)	(2)	(3)		
Below 35˚C (95˚F)	CLOSED	–	–	–	–	–	NC from tank is absorbed into the canister.
Above 54˚C(129˚ F)	OPEN	Positioned below purge port	CLOSED	–	–	–	
		Positioned above purge port	OPEN	–	–	–	HC from canister is led into air intake chamber.
High pressure in tank	–	–	–	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister.
High vacuum in tank	–	–	–	CLOSED	OPEN	OPEN	Air is led into the fuel tank.



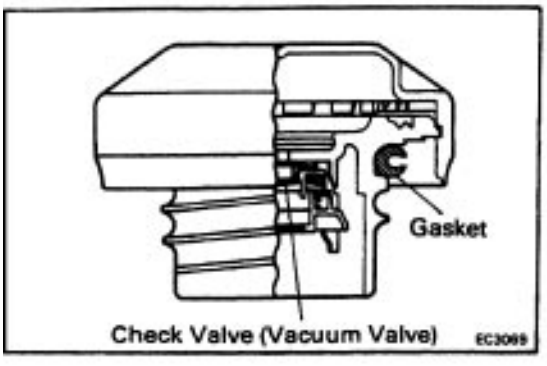
INSPECTION OF FUEL VAPOR LINES, FUEL TANK AND TANK CAP

1. VISUALLY INSPECT LINES AND CONNECTIONS

Look for loose connections, sharp bends or damage.

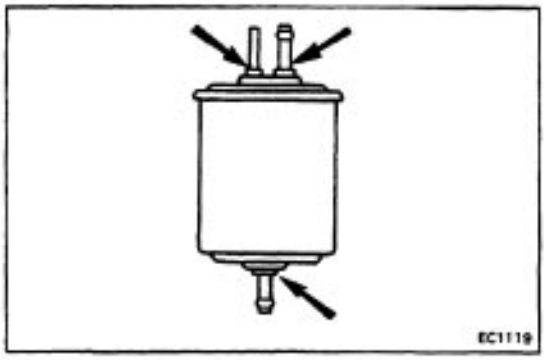
2. VISUALLY INSPECT FUEL TANK

Look for deformation, cracks or fuel leakage.



3. VISUALLY INSPECT FUEL TANK CAP

Check if the cap and/or gasket are deformed or damaged if necessary, repair or replace. the cap.



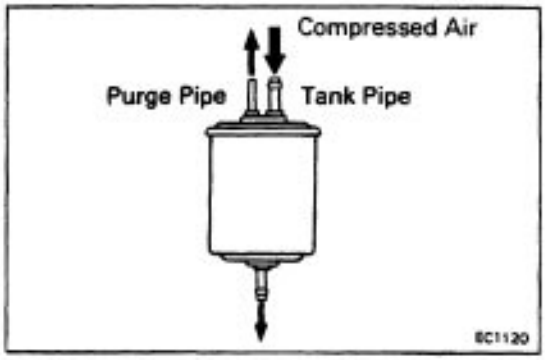
INSPECTION OF CHARCOAL CANISTER

1. REMOVE CHARCOAL CANISTER

2. REMOVE DUST COVER FROM CHARCOAL CANISTER

3. VISUALLY INSPECT CHARCOAL CANISTER

Look for cracks or damage.

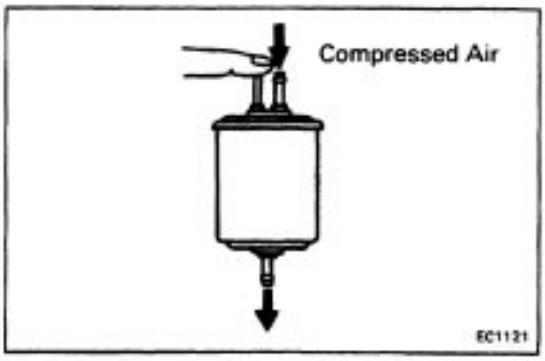


4. CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE

(a) Using low pressure compressed air, blow into the tank pipe and check that air flows without resistance from the other pipes.

(b) Slow into the purge pipe and check that air does not flow from the other pipes.

If a problem is found, replace the charcoal canister.



5. CLEAN FILTER IN CANISTER

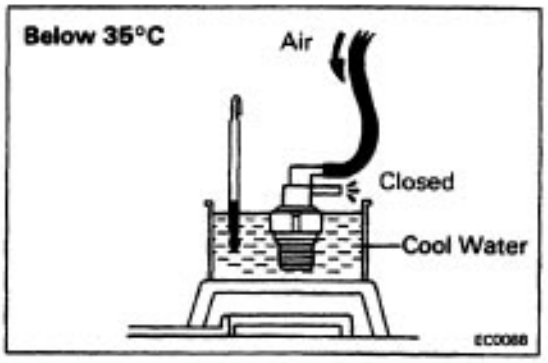
Clean the filter by blowing 3 kg/cm2 (43 psi, 294 kPa) of compressed air into the tank pipe while holding the other upper canister pipe closed.

HINT:

- Do not attempt to wash the canister.
- No activated carbon should come out.

6. REINSTALL DUST COVER TO CHARCOAL CANISTER

7. REINSTALL CHARCOAL CANISTER



INSPECTION OF BVSV

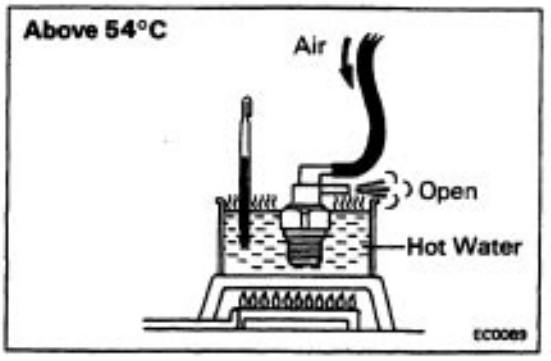
CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV.

(c) Cool the BVSV to below 35˚C (95˚F) with cool water.

(d) Blow air into a pipe and check that the BVSV is closed.



(e) Heat the BVSV to above 54˚C (129˚F) with hot water.

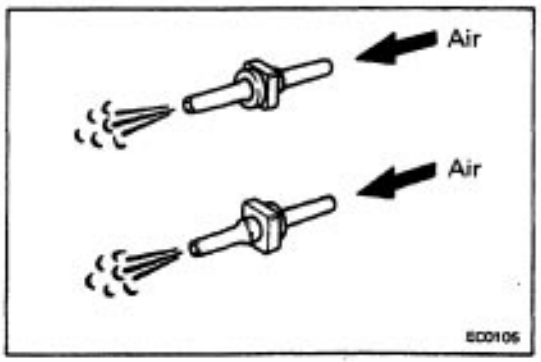
(f) Blow air into a pipe and check that the BVSV is open.

If a problem is found, replace the BVSV.

(g) Apply adhesive to two or three threads of the BVSV, and reinstall.

Adhesive: Part No. 08833–00070, THREE BOND 1324 or equivalent

(h) Refill the radiator with coolant.

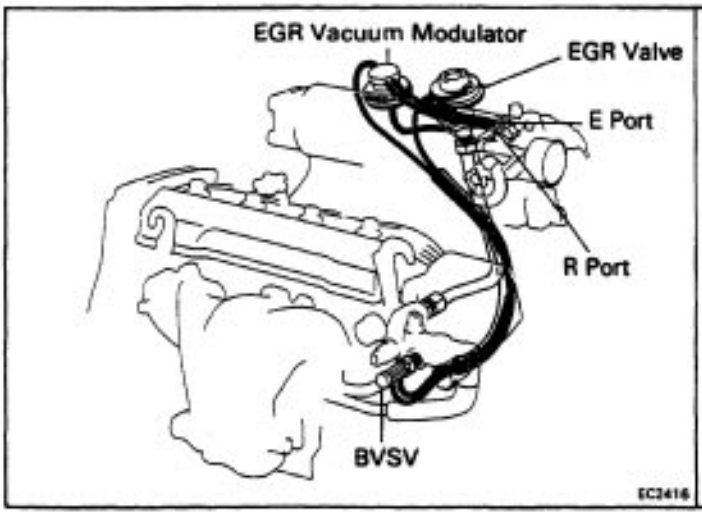


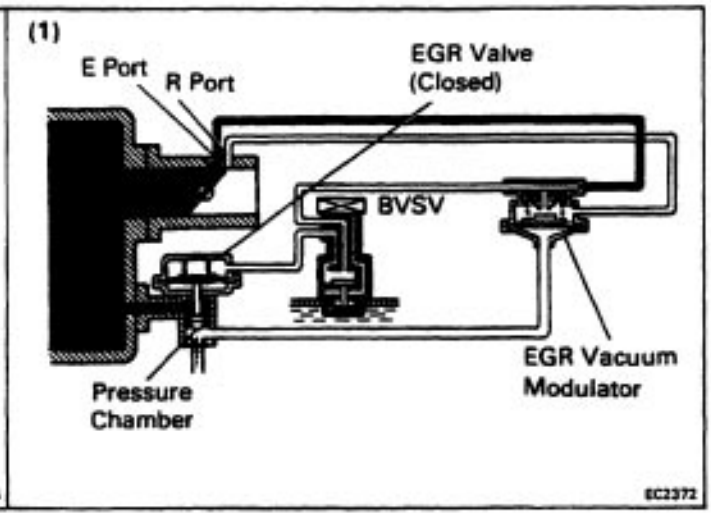
INSPECTION OF JET (M/T only)

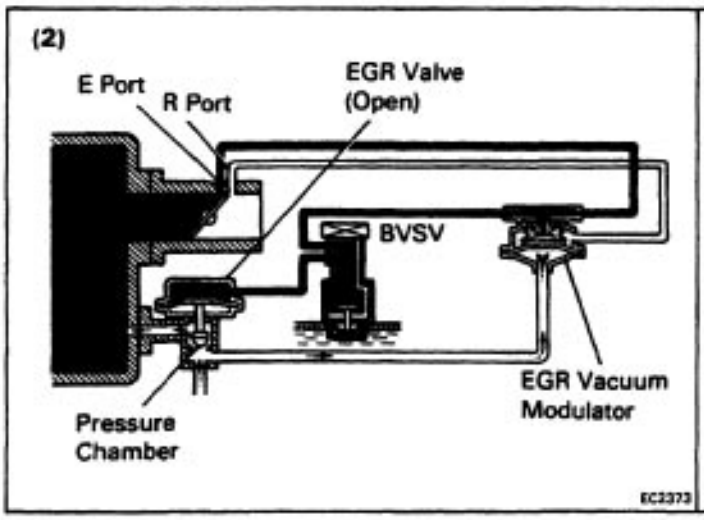
CHECK JET BY BLOWING AIR FROM EACH SIDE

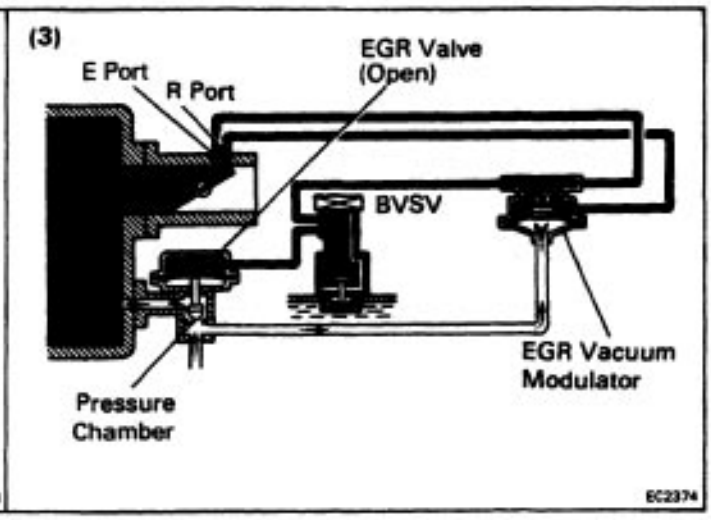
Check for stoppage**.**

EXHAUST GAS RECIRCULATION (EGR) SYSTEM







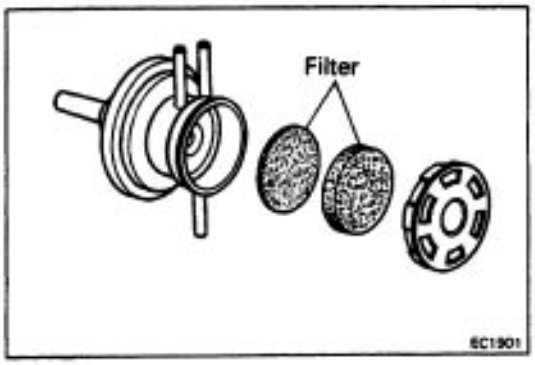


To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

Coolant Temp.	BVSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 45°C (113°F)	CLOSED	–	–		–	CLOSED	Not recirculated
Above 66°C (151°F)	OPEN	Positioned below E port	–		–	CLOSED	Not recirculated
		Positioned between E port and R port	(1) LOW	*Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
			(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated
		Positioned above R port	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

Remarks: *Pressure increase → Modulator closes → EGR valve opens → Pressure drops
EGR valve closes ← Modulator opens ←

**When the throttle valve is positioned above the R port, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.

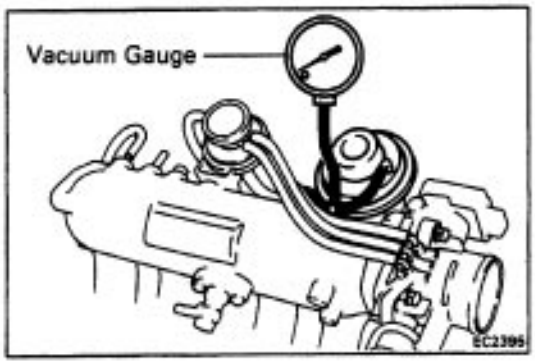


INSPECTION OF EGR SYSTEM

1. CHECK AND CLEAN FILTERS IN EGR VACUUM MODULATOR

(a) Check the filters for contamination or damage.

(b) Using compressed air, clean the filters

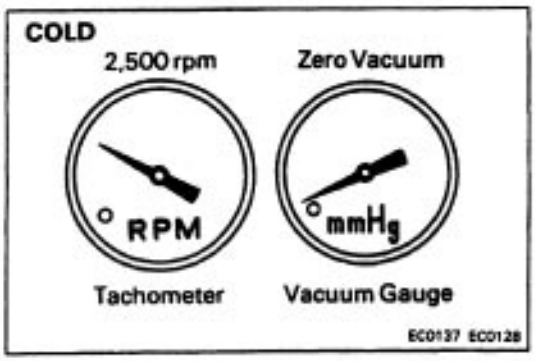


2. PREPARATION

Using a 3–way connector, connect a vacuum gauge to the hose between the EGR valve and vacuum pipe.

3. CHECK SEATING OF EGR VALVE

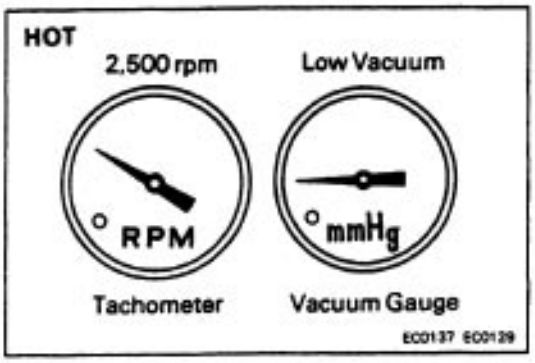
Start the engine and check that the engine starts and runs at idle.



4. CHECK6VSV WITH COLD ENGINE

(a) The coolant temperature should be below 45°C (113° F).

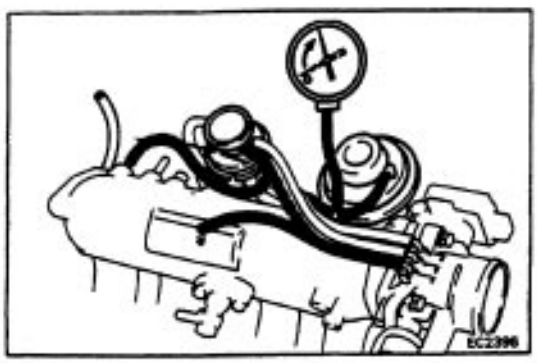
(b) Check that the vacuum gauge indicates zero at 2,500 rpm.



5. CHECK6VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indicates low vacuum at 2,500 rpm.

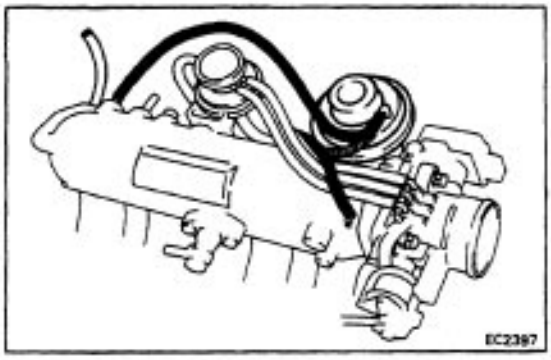


(e) Disconnect the vacuum hose from port R of the EGR vacuum modulator and connect port R directly to the intake manifold with another hose.

(d) Check that the vacuum gauge indicates high vacuum at 2,500 rpm.

HINT: As large amount of EGR gas enters, the engine will misfire slightly.

(e) Remove the vacuum gauge and reconnect the vacuum hoses to the proper locations.



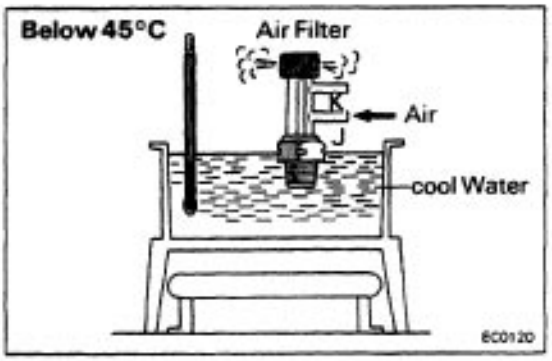
6. CHECK EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idling.

(b) Check that the engine runs rough or dies.

(e) Reconnect the vacuum hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, SYSTEM IS OK; OTHERWISE INSPECT EACH PART



INSPECTION OF BVSV

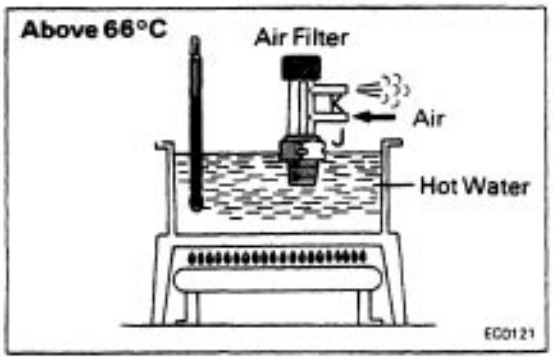
CHECK BVSV BY SLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV from the water outlet.

(e) Cool the BVSV to below 45˚C (113˚F) with cool water.

(d) Check that air flows from pipe J to the air filter.



(e) Heat the BVSV to above 66˚C (51˚F) with hot water.

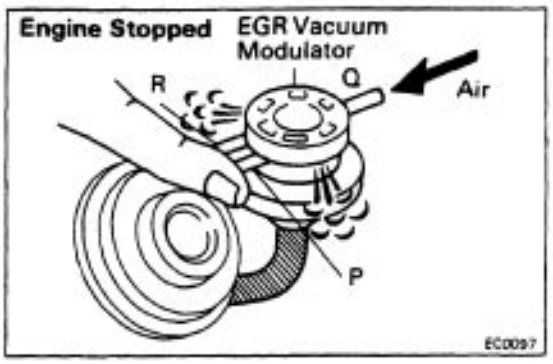
(f) Check that air flows from pipe J to pipe K.

If a problem is found, replace the BVSV.

(g) Apply adhesive to two or three threads of the BVSV, and reinstall.

Adhesive: Part No. 08833–00070, THREE BOND 1324 or equivalent

(h) Refill the radiator with coolant.



INSPECTION OF EGR VACUUM MODULATOR

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from ports P, Q and R of the EGR vacuum modulator.

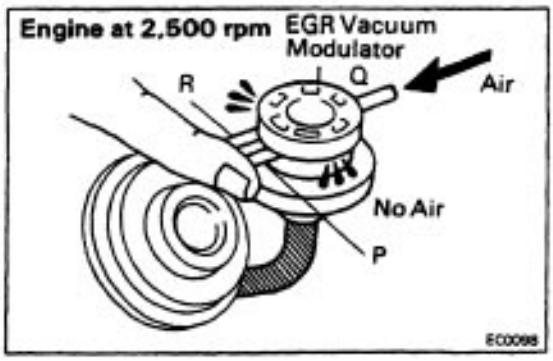
(b) Block ports P and R with your finger.

(e) Blow air into port Q and check that the air passes through to the air filter side freely.

(d) Start the engine and maintain speed at 2,500 rpm.

(e) Repeat the above test. Check that there is a strong resistance to airflow.

(f) Reconnect the vacuum hoses to the proper locations.



INSPECTION OF EGR VALVE

1. REMOVE EGR VALVE

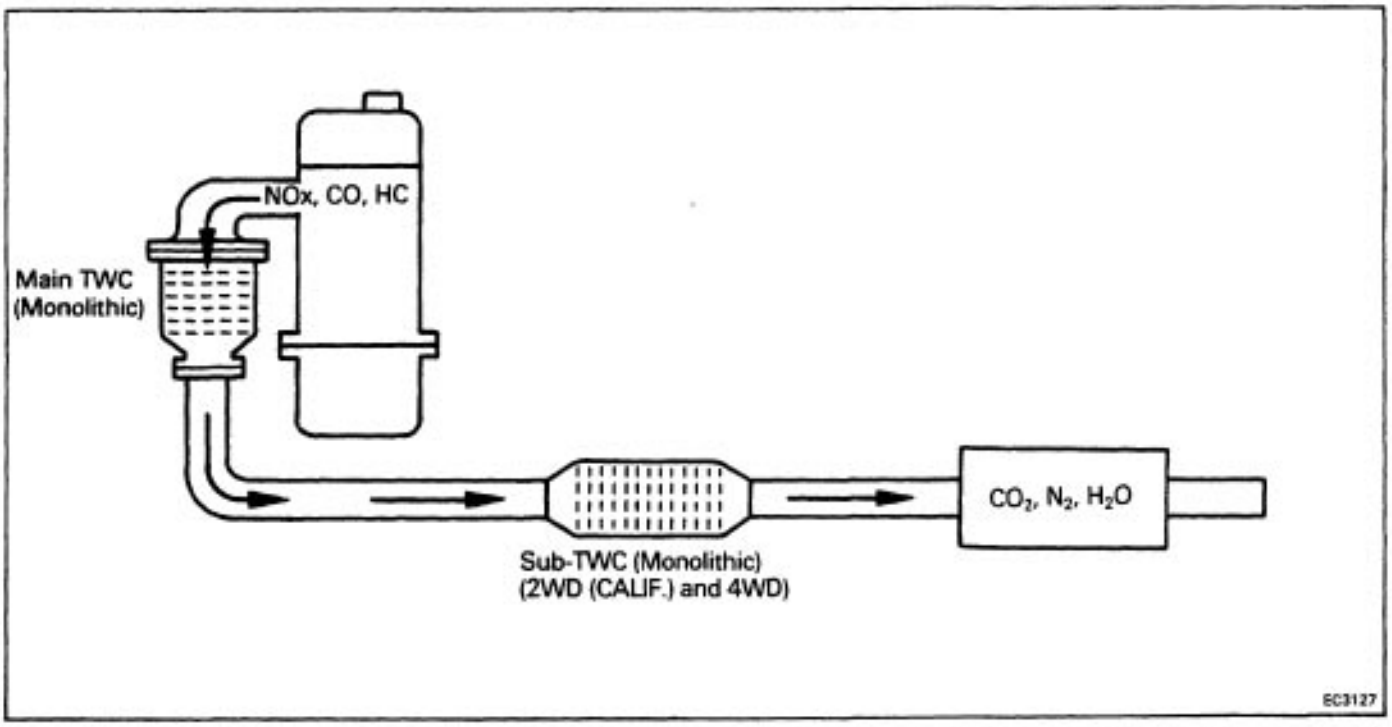
Check for sticking and heavy carbon deposits.

If a problem is found, replace the valve.

2. REINSTALL EGR VALVE

Install a new gasket.

THREE–WAY CATALYST (TWC) SYSTEM



To reduce HC, CO and NOx emissions, they are oxidized, reduced and converted to nitrogen (N2), carbon dioxide (C02) and water (H20) by the catalyst.

Exhaust Port		Main TWC		**Sub–TWC**		**Exhaust Gas**
HC, CO AND NOx	→	OXIDATION AND REDUCTION	→	OXIDATION AND REDUCTION	→	**c02** H2O N2

INSPECTION OF EXHAUST PIPE ASSEMBLY

CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE

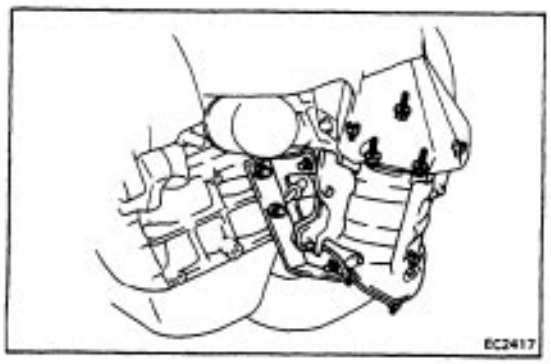
REPLACEMENT OF CATALYTIC CONVERTERS

1. REMOVE CONVERTERS

(a) Jack up the vehicle.

(b) Check that the converter is cool.

(e) Remove the suspension lower crossmember.
(See page EM–44)



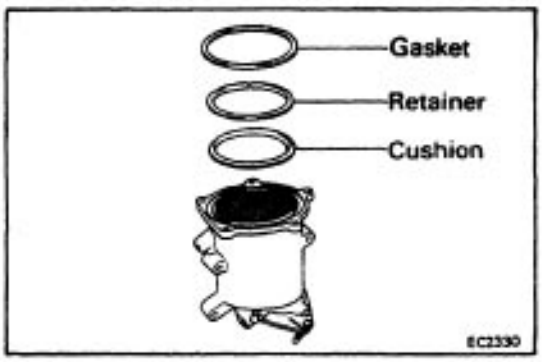
(d) Remove the front exhaust pipe (Sub–converter).

- Loosen the bolt, and disconnect the clamp the exhaust pipe bracket.
- Remove the three nuts, and remove the exhaust pipe. Remove the three nuts, and remove the exhaust pipe. Remove the gasket.

(e) Remove the two bolts, two nuts and two converter stays.

(f) Remove the three bolts, two nuts, gasket, retainer, cushion and main converter.

(g) Remove the eight bolts and two heat insulators from the main converter.



2. INSTALL CONVERTERS

(a) Install the two heat insulators to the main converter with the nine bolts.

(b) Place a new cushion, retainer and gasket on the main converter.

(e) Install the main converter with the three bolts and two nuts. Torque the bolts and nuts.

Torque: 300 kg–cm (21 ft–lb, 29 N–m)

(d) Install the two converter stays with the two bolt and two nuts.

Torque: 650 kg–cm (46 ft–lb, 64 N–m)

(e) Install the front exhaust pipe (Sub–converter).

- Place new two gaskets on the exhaust pipe.
- Install the exhaust pipe with the two bolts and five nuts.

Torque: To converter 630 kg–cm (46 ft–lb, 63 N–m)

To center exhaust pipe

440 kg–cm (32 ft–lb, 43 N–m)

- Install the exhaust pipe clamp with the bolt.

(f) Install the suspension lower crossmember

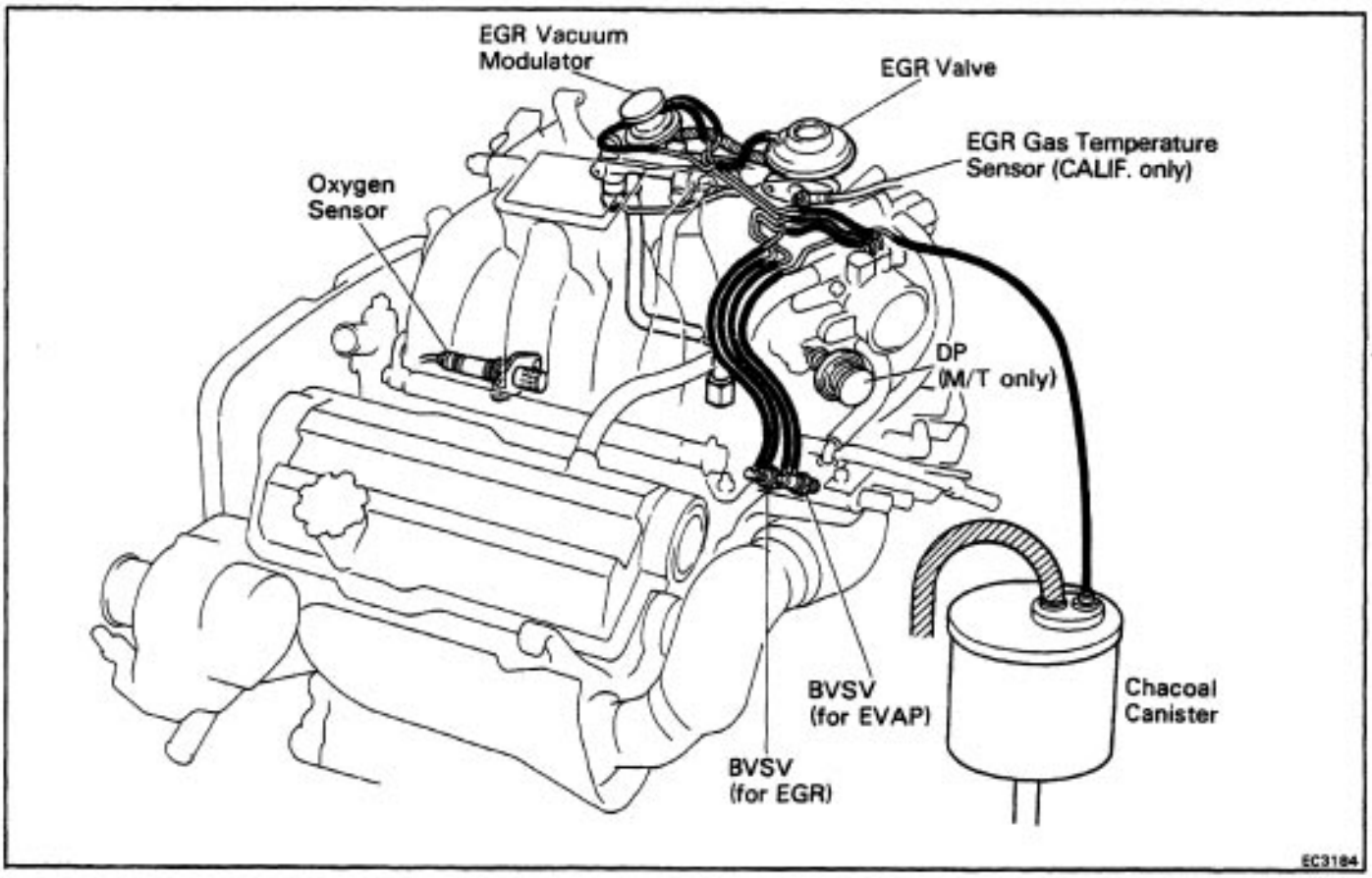
(See page EM–50)

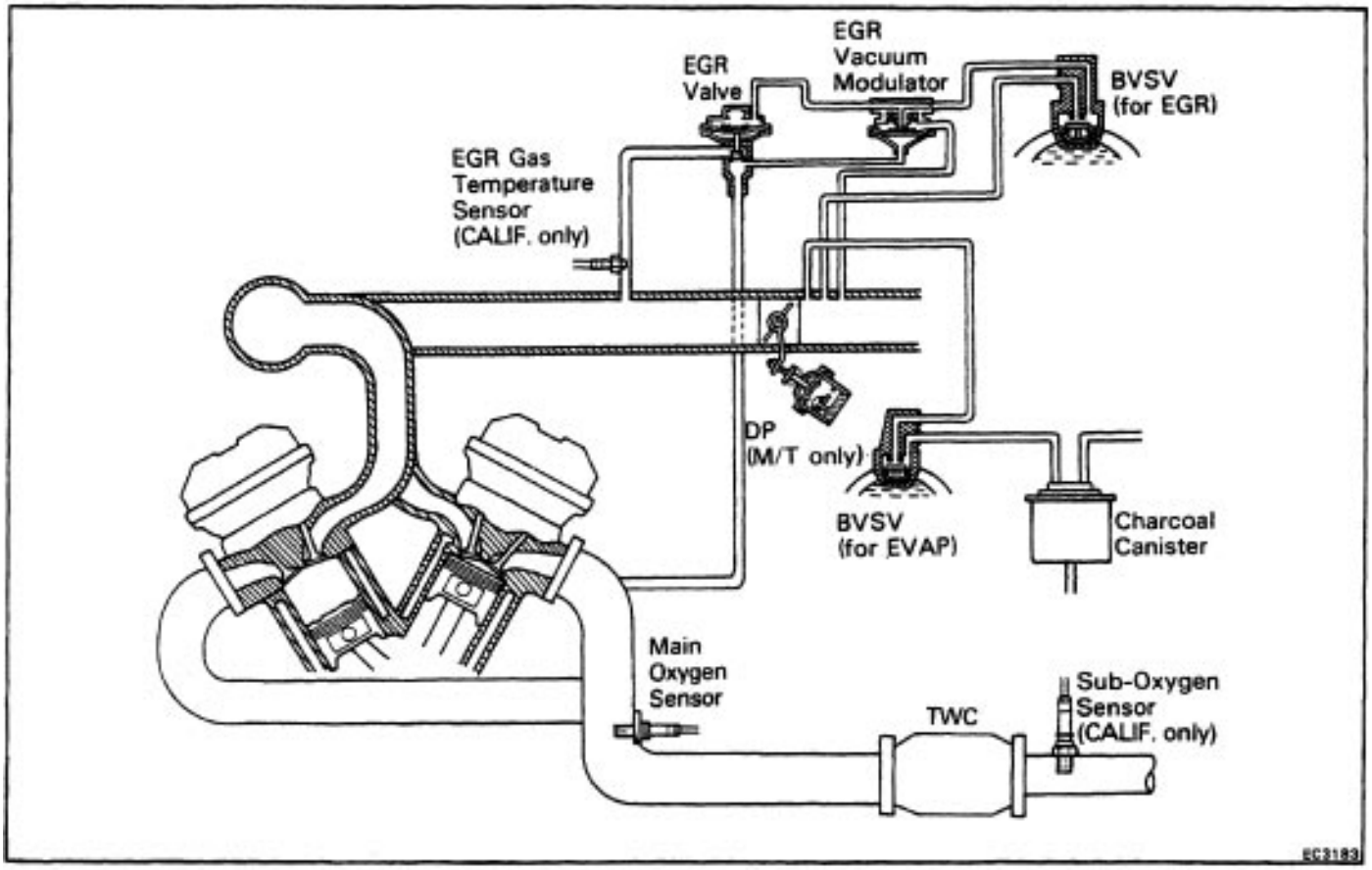
SYSTEM PURPOSE

System	Abbreviation	Purpose
Positive Crankcase ventilation	PCV	Reduces blow–by gas (HC)
Fuel evaporative emission control	EVAP	Reduces evaporative HC
Dash pot	DP	Reduces HC and CO
Exhaust gas recirculation	EGR	Reduces NOx
Three–way catalyst	TWC	Reduces HC, CO and NOx
Electronic fuel injection*	EFI	Regulates all engine conditions for reduction of exhaust emissions.

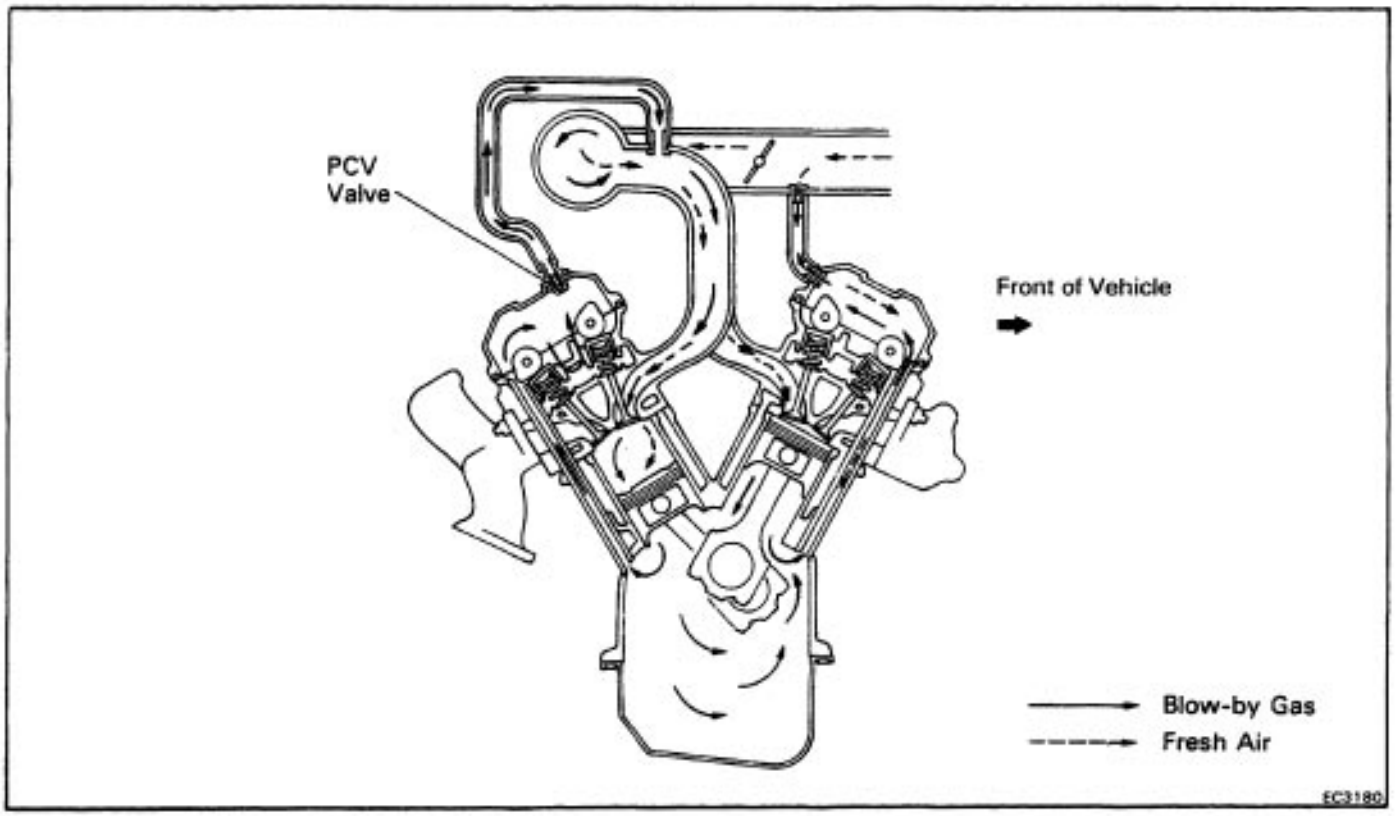
Remarks *For inspection and repair of the EFI system, refer to EFI section of this manual.

COMPONENT LAYOUT AND SCHEMATIC DRAWING



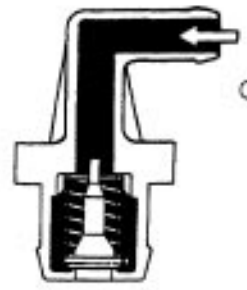


POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



To reduce HC emission, crankcase blow–by gas (HC) is routed through the PCV valve to the air intake chamber for combustion in the cylinders.

Engine not Running or Backfiring

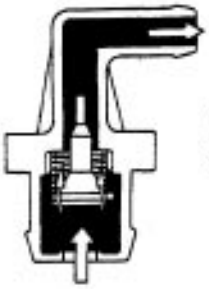


○ PCV VALVE IS CLOSED.

Normal Operation

○ PCV VALVE IS OPEN.
○ VACUUM PASSAGE IS LARGE.

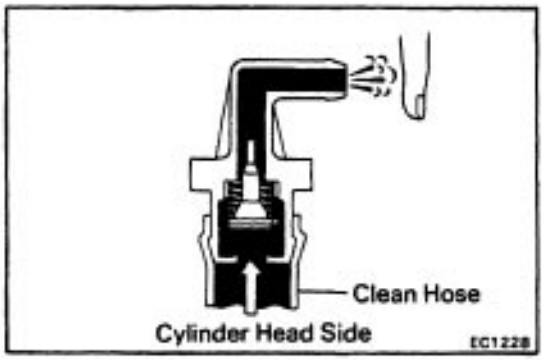
Idling or Deceleration



○ PCV VALVE IS OPEN.
○ VACUUM PASSAGE IS SMALL.

Acceleration or High Load

○ PCV VALVE IS FULLY OPEN.



INSPECTION OF PCV VALVE

1. REMOVE PCV VALVE

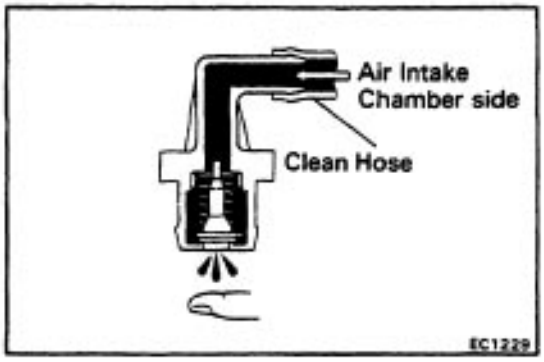
2. INSTALL CLEAN HOSE TO PCV VALVE

3. BLOW FROM CYLINDER HEAD SIDE

Check that air passes through easily.

NOTICE: Do not suck air through the valve.

Petroleum substances inside the valve are harmful.



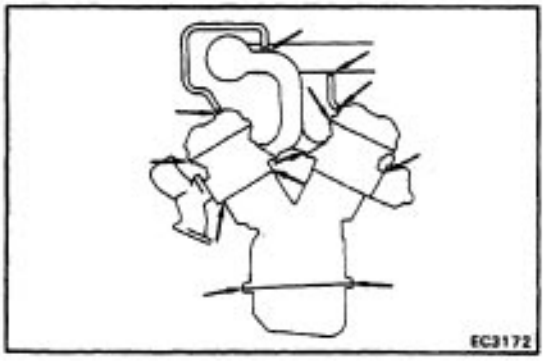
4. BLOW FROM AIR INTAKE CHAMBER SIDE

Check that air passes through with difficulty.

If the PCV valve fails either of the checks, replace it.

5. REMOVE CLEAN HOSE FROM PCV VALVE

6. REINSTALL PCV VALVE

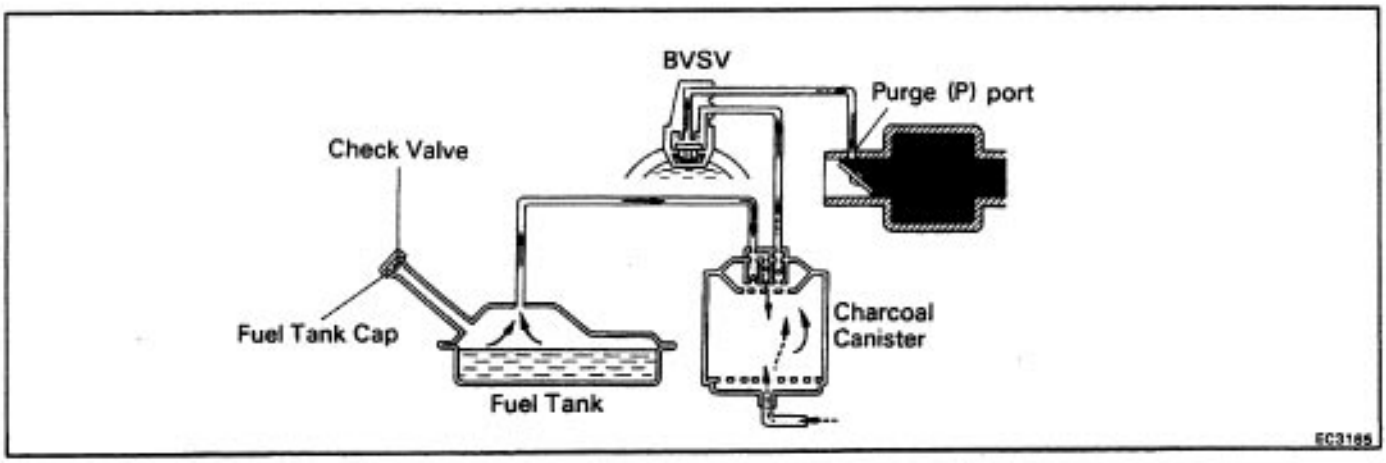


INSPECTION OF PCV HOSE AND CONNECTIONS

VISUALLY INSPECT HOSE AND CONNECTIONS

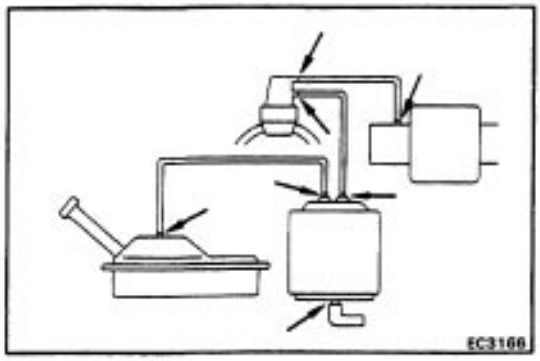
Check for cracks, leaks, or damage.

FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM



To reduce HC emissions, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

Coolant Temp.	BVSV	Throttle Valve Opening	Canister Check Valve (1)	Canister Check Valve (2)	Canister Check Valve (3)	Check Valve in Cap	Evaporated Fuel (HC)
Below 35°C (95°F)	CLOSED	–	–	–	–	–	HC from tank is absorbed into the canister.
Above 54°C (129°F)	OPEN	Positioned below purge port	CLOSED	–	–	–	
		Positioned above purge port	OPEN	–	–	–	HC from canister is led into air intake chamber.
High pressure in tank	–	–	–	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister.
High vacuum in tank	–	–	–	CLOSED	OPEN	OPEN	Air is led into the fuel tank.



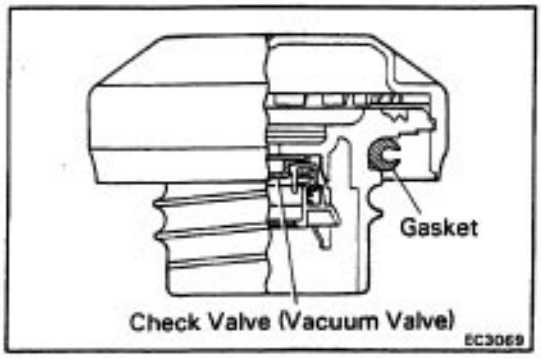
INSPECTION OF FUEL VAPOR LINES, FUEL TANK AND TANK CAP

1. VISUALLY INSPECT LINES AND CONNECTIONS

Look for loose connections, sharp bends or damage.

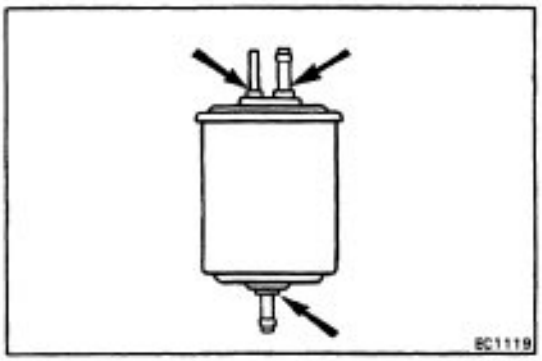
2. VISUALLY INSPECT FUEL TANK

Look for deformation, cracks or fuel leakage.



3. VISUALLY INSPECT FUEL TANK CAP

Check if the cap and/or gasket are deformed or damaged.
If necessary, repair or replace the cap.



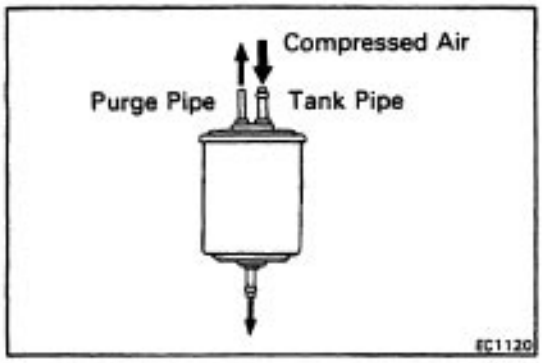
INSPECTION OF CHARCOAL CANISTER

1. REMOVE CHARCOAL CANISTER

2. REMOVE DUST COVER FROM CHARCOAL CANISTER

3. VISUALLY INSPECT CHARCOAL CANISTER

Look for cracks or damage.

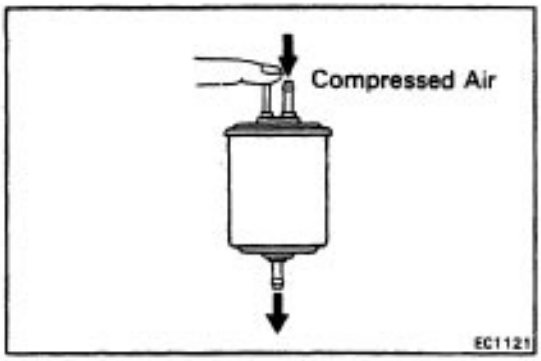


4. CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE

(a) Using low pressure. compressed air, blow into the tank pipe and check that air flows without resistance from the other pipes.

(b) Blow into the purge pipe and check that air¿does not flow from the other pipes.

If a problem is found, replace the charcoal canister.



5. CLEAN FILTER IN CANISTER

Clean the filter by blowing 3 kg/cm^2 (43 psi, 294 kPa) of air into the tank pipe while holding the other upper canister pipe closed.

HINT

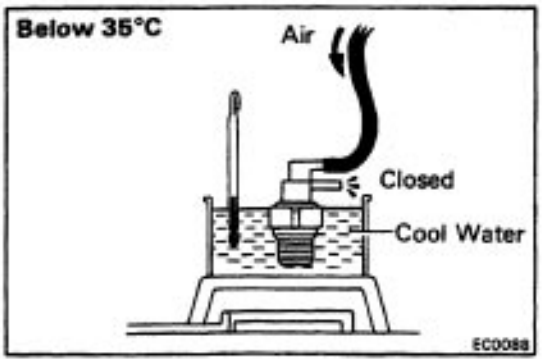
- Do not attempt to wash the canister.
- No activated carbon should come out.

6. REINSTALL DUST COVER TO CHARCOAL CANISTER

7. REINSTALL CHARCOAL CANISTER

INSPECTION OF BVSV CHECK BVSV

BY BLOWING AIR INTO PIPE



(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV from the water by–pass outlet.

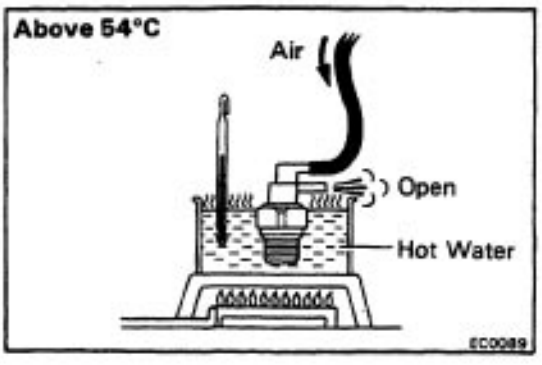
(c) Cool the BVSV to below 35˚C (95˚f) with cool water.

(d) Blow air into a pipe and check that the BVSV is closed.

(e) Heat the BVSV to above 54˚C (129˚F) with hot water.

(f) Blow air into a pipe and check that the BVSV is open.

If a problem is found, replace the BVSV.

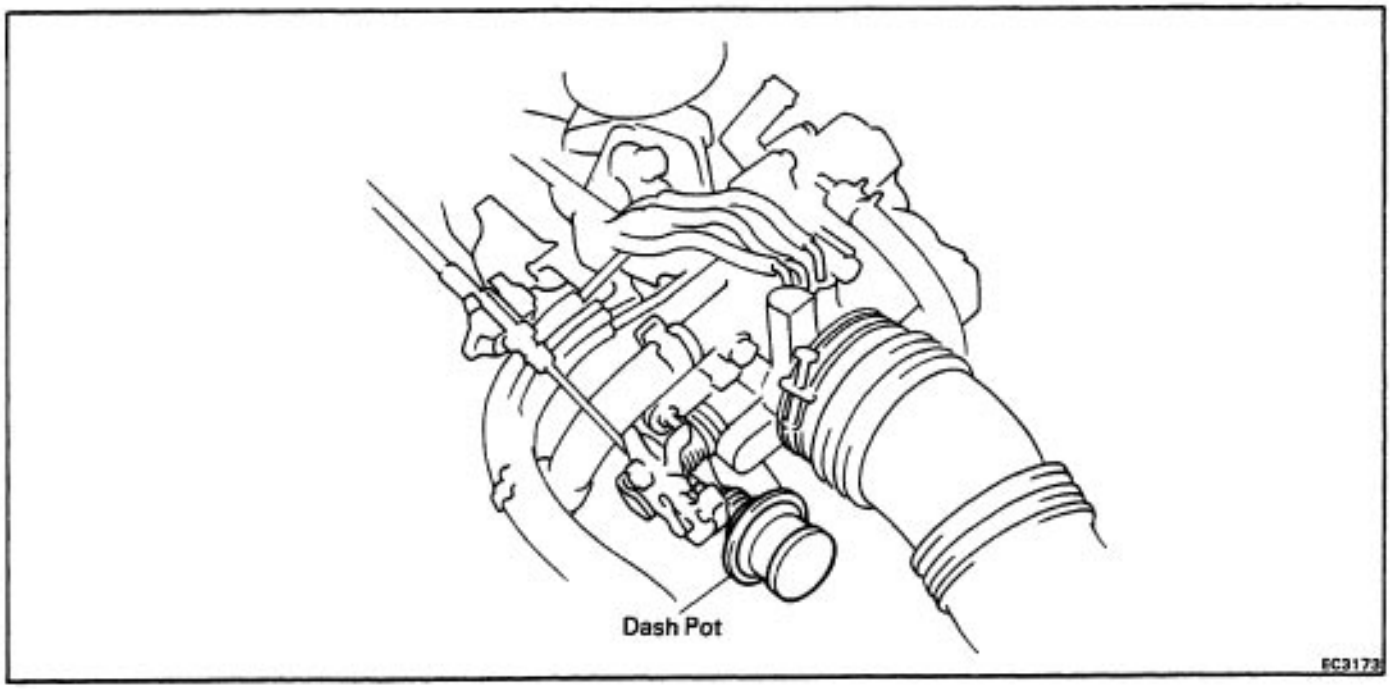


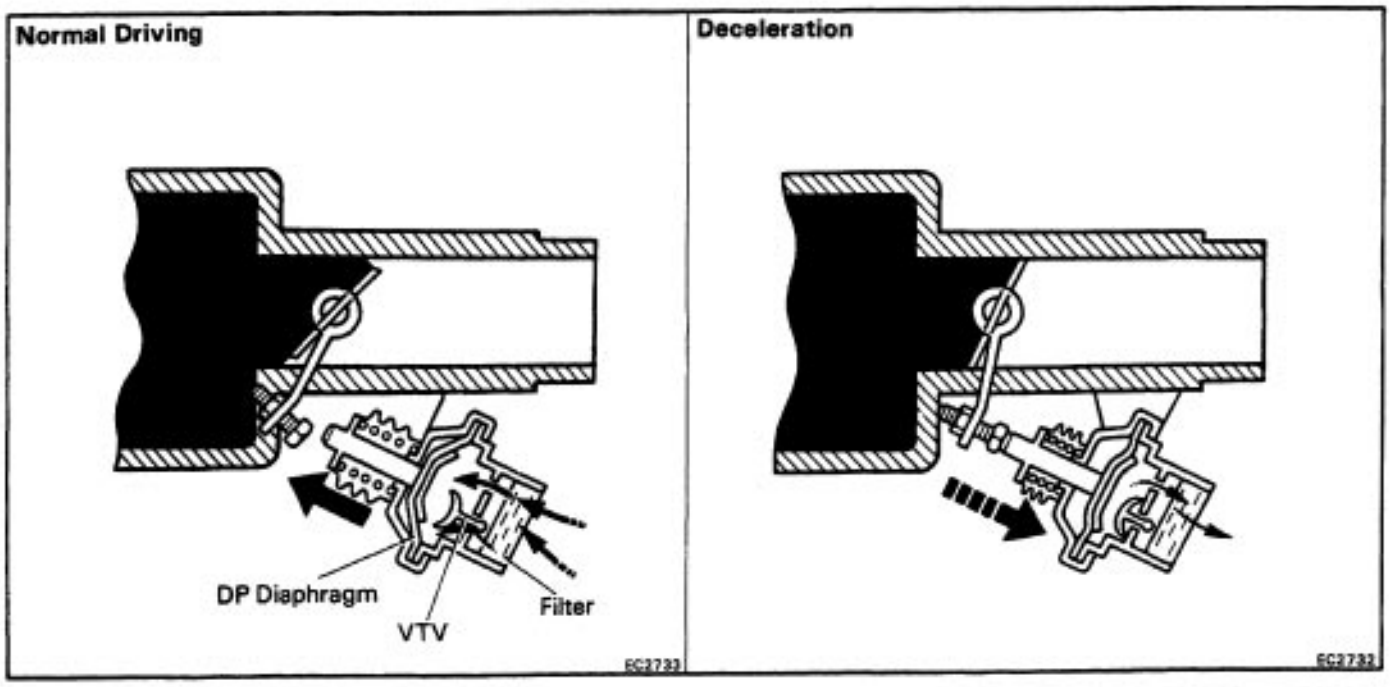
(g) Apply adhesive to two or three threads of the BVSV, and re-install.

Adhesive: Part No. O8833–00070, THREE BOND 1324 or equivalent

(h) Refill the radiator with coolant.

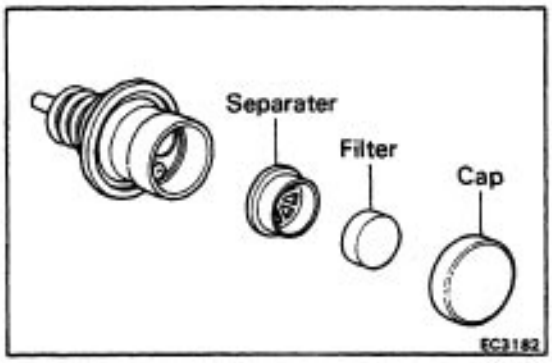
DASH POT (DP) SYSTEM (MT only)





To reduce NC and CO emissions, when decelerating the dash pot opens the throttle valve slightly more than at idle. This causes the air–fuel mixture to bum completely.

Condition	Diaphragm	VTV	Throttle Valve
Idling	Pushed in by return force of throttle valve	**CLOSED**	Idle speed position
Normal driving	Pushed out by diaphragm spring	OPEN	High speed position
Deceleration	Pushed in by return force of throttle valve	CLOSED	Slightly opens and then slowly closes to idle position



INSPECTION OF DASH POT (DP) SYSTEM

1. WARM UP ENGINE

Allow the engine to normal operating temperature.

2. CHECK IDLE SPEED

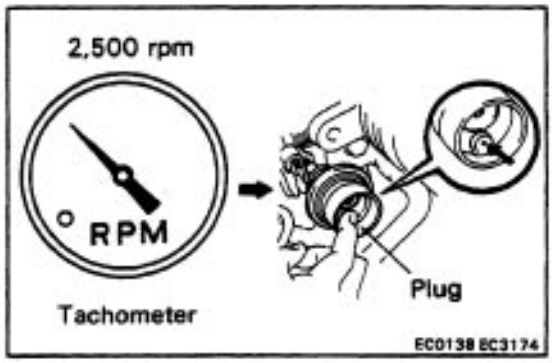
Idle speed: 700 rpm

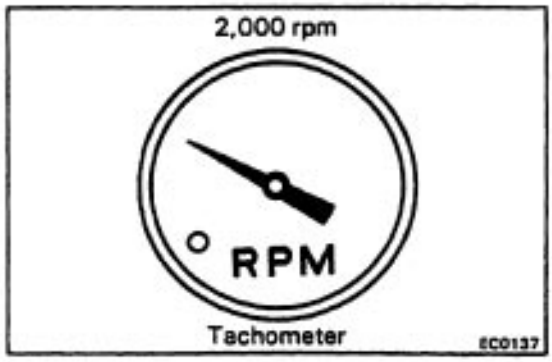
3. REMOVE CAP, FILTER AND SEPARATOR FROM DP

4. CHECK DP SETTING SPEED

(a) Maintain the engine at 2,500 rpm.

(b) Plug the VTV hole, with your finger.





(c) Release the throttle valve.

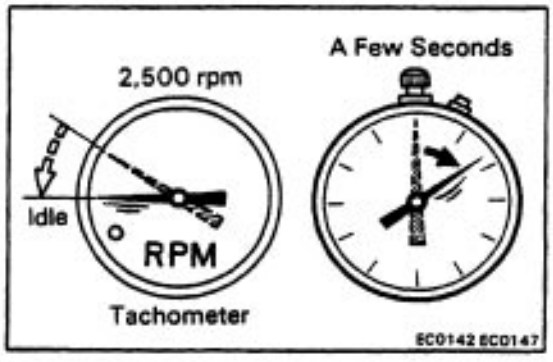
(d) Check that the DP is set.

DP setting speed: 2,000 rpm
(w/ Cooling fan OFF)

If not as specified, adjust with the DP adjusting screw.

5. REINSTALL DP SEPARATOR, FILTER AND CAP

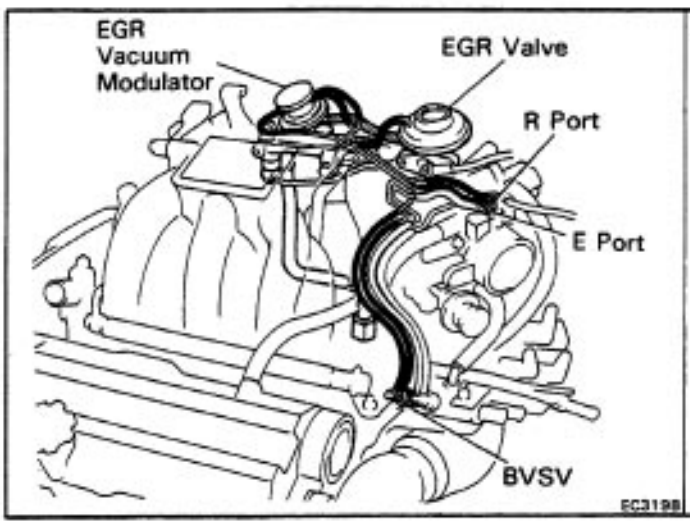
HINT: Install the filter with the coarser surface facing the atmospheric side (outward).



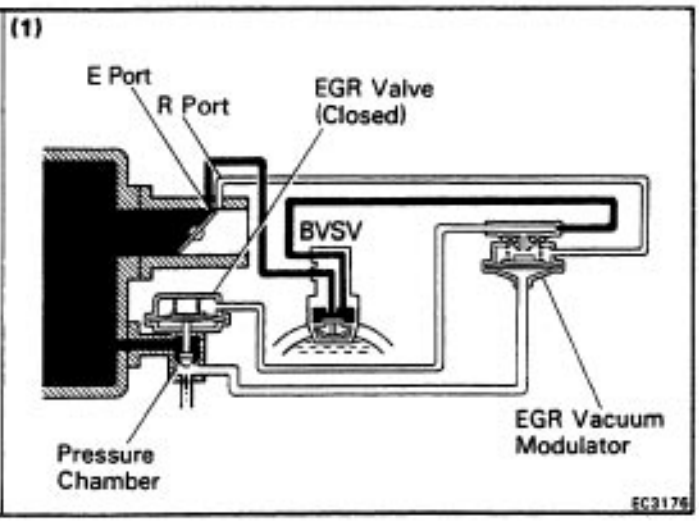
6. CHECK VTV OPERATION

Race the engine at 2,500 rpm for a few seconds, release the throttle valve and check that the engine returns to idle in a few seconds.

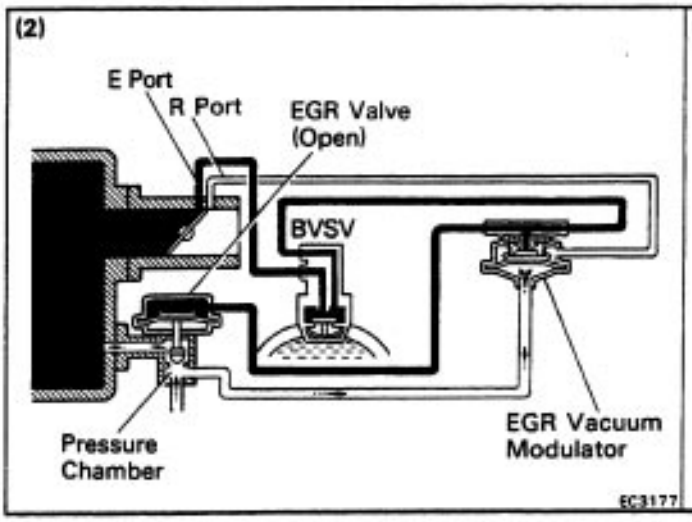
EXHAUST GAS RECIRCULATION (EGR) SYSTEM



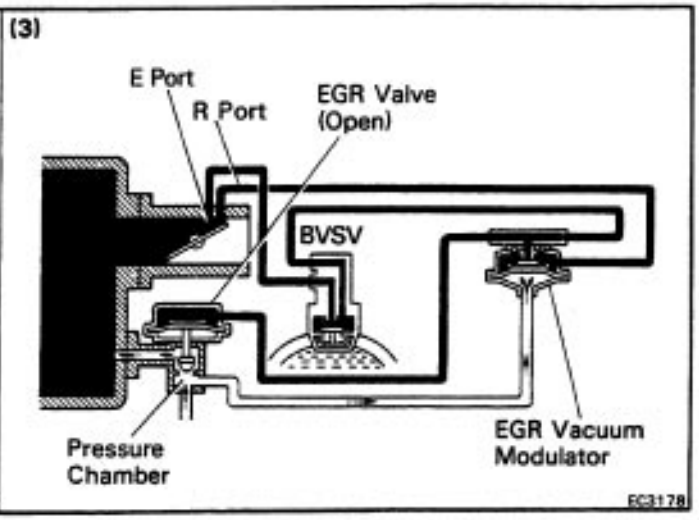
(1)



(2)



(3)

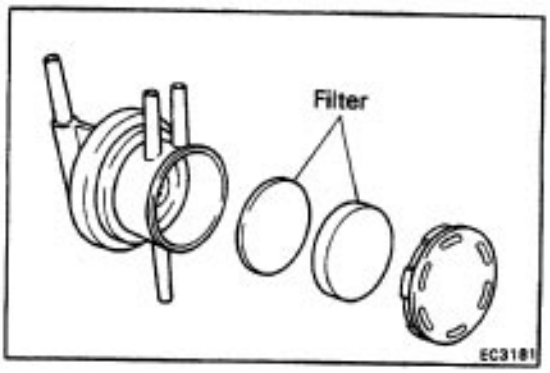


To reduce NOx emissions, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

Coolant Temp.	BVSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 40°C (104°F)	CLOSED	–	–		–	CLOSED	Not recirculated
Above 54°C (129°F)	OPEN	Positioned below E port	–		–	CLOSED	Not recirculated
		Positioned between E port and and R port	(1) LOW	*Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
			(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated
		Positioned above R port	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

Remarks: * Pressure increase → Modulator closes → EGR valve opens → Pressure drops → EGR valve closes → Modulator opens →

** When the throttle valve is positioned above the R port, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.



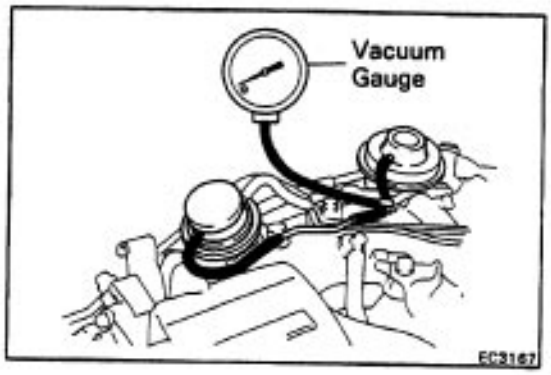
INSPECTION OF EGR SYSTEM

1. CHECK AND CLEAN FILTERS IN EGR VACUUM MODULATOR

(a) Check the filters for contamination or damage.

(b) Using compressed air, clean the filters.

HINT: Install the filters with the coarser surface facing the atmospheric side (outward).

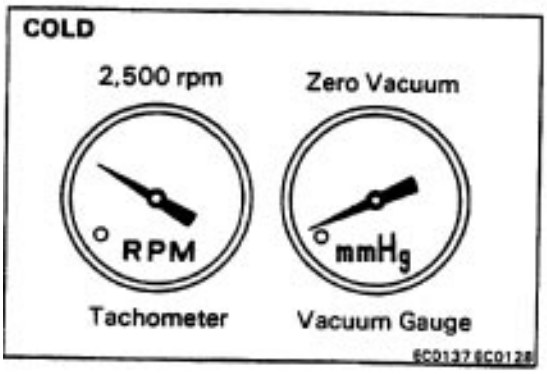


2. PREPARATION

Using a 3–way connector, connect a vacuum gauge to the hose between the EGR valve and vacuum pipe.

3. CHECK SEATING OF EGR VALVE

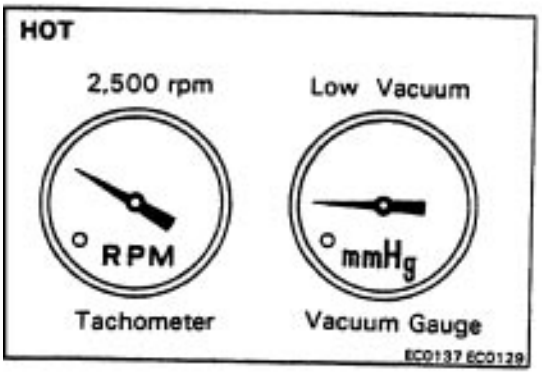
Start the engine and check that the engine starts and runs at idle.



4. CHECK6VSV WITH COLD ENGINE

(a) The coolant temperature should be below 40˚C (104˚F).

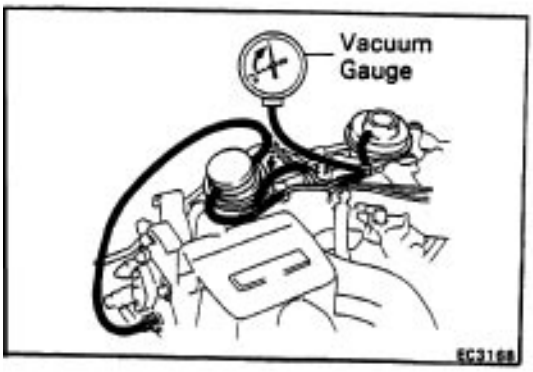
(b) Check that the vacuum gauge indicates zero at 2,500 rpm.



5. CHECK6VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warn n up the engine.

(b) Check that the vacuum gauge indicates low vacuum at 2,500 rpm.

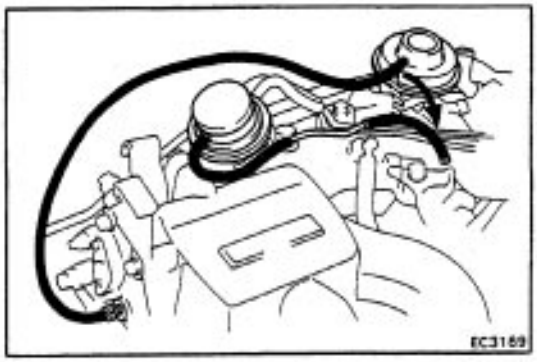


(c) Disconnect the vacuum hose from the R port of the EGR vacuum modulator and connect the R port directly to the intake manifold with another hose.

(d) Check that the vacuum gauge indicates high vacuum at 3,500 rpm.

HINT: As large amount of EGR gas enters, the engine will misfire slightly.

(e) Remove the vacuum gauge and reconnect the vacuum hoses to the proper locations.



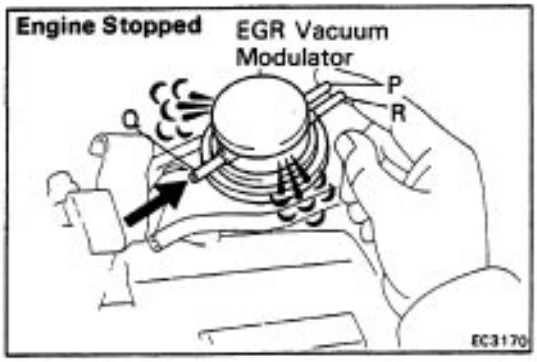
6. CHECK EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idling.

(b) Check that the engine runs rough or dies.

(c) Reconnect the vacuum hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, SYSTEM IS OK; OTHERWISE INSPECT EACH PART



INSPECTION OF EGR VACUUM MODULATOR

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from ports P, Q and R of the EGR vacuum modulator.

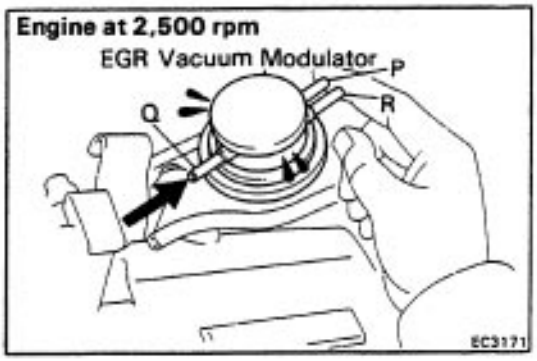
(b) Block ports P and R with your finger.

(e) Blow air into port Q, and check that the air passes through to the air filter side freely.

(d) Start the engine, and maintain speed at 3,500 rpm.

(e) Repeat the above test. Check that there is a strong resistance to air flow.

(f) Reconnect the vacuum hoses to the proper locations.



INSPECTION OF EGR VALVE

1. REMOVE EGR VALVE

Check for sticking and heavy carbon deposits.

If a problem is found, replace the valve.

2. REINSTALL EGR VALVE

Install a new gasket.

INSPECTION OF BVSV

CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV from the water by–pass outlet.

(e) Cool the BVSV to below 40˚C (104˚F) with cool water.

(d) Blow air into the pipe, and check that the BVSV is closed.

(e) Heat the BVSV to above 54˚C (129˚F) with hot water.

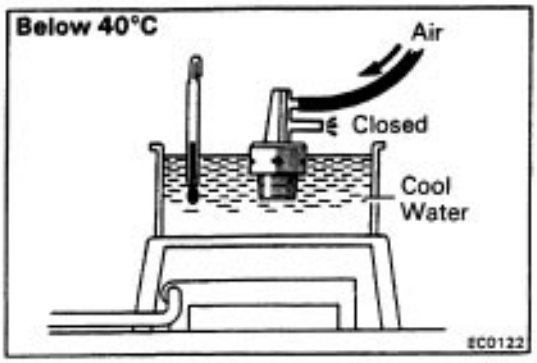
(f) Blow air into the pipe, and check that the BVSV is open.

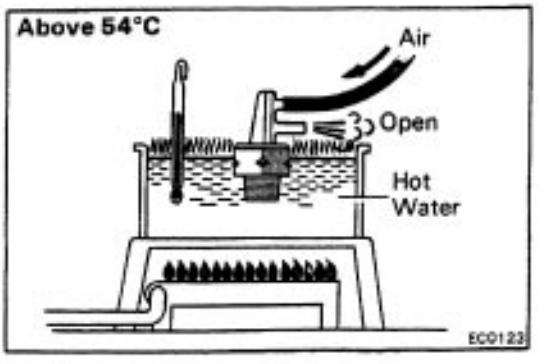
If a problem is found, replace the BVSV.

(g) Apply adhesive to two or three threads of the BVSV, and reinstall.

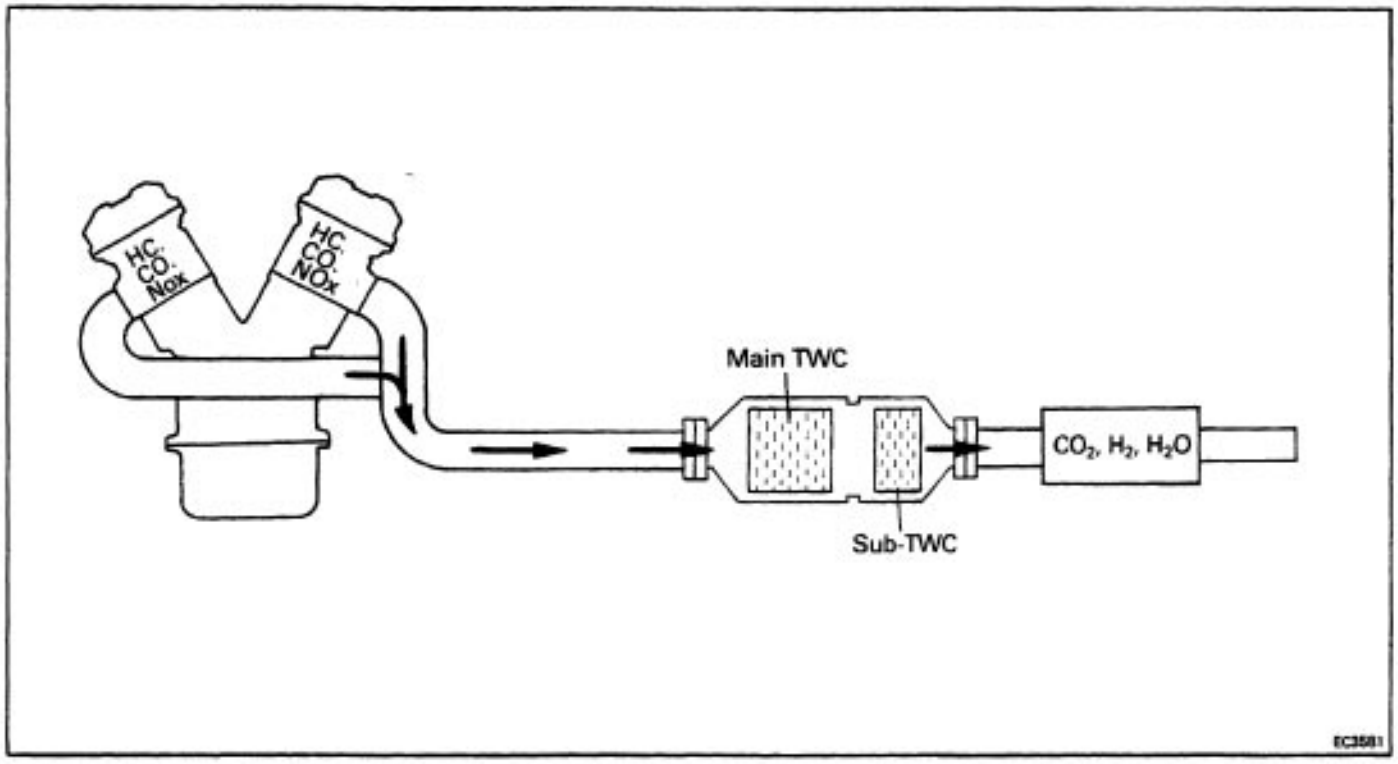
Adhesive: Part No. 08833–00070, THREE BOND 1324 or equivalent

(h) Refill the radiator with coolant.





THREE–WAY CATALYST (TWC) SYSTEM



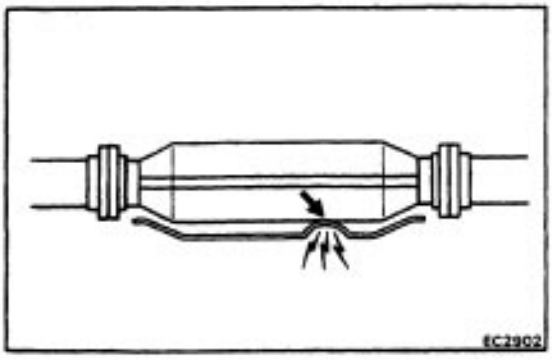
To reduce HC, CO and NOx emissions, they are oxidized, reduced and converted to nitrogen (NO, carbon dioxide (C02) and water (H20) by the catalyst.

Exhaust Port		Main TWC		Sub–TWC		Exhaust Gas
HC, CO AND NOx	→	**OXIDATION AND REDUCTION**	→	OXIDATION AND REDUCTION	→	$C0_2$ H_2O N_2

INSPECTION OF EXHAUST PIPE ASSEMBLY

1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE

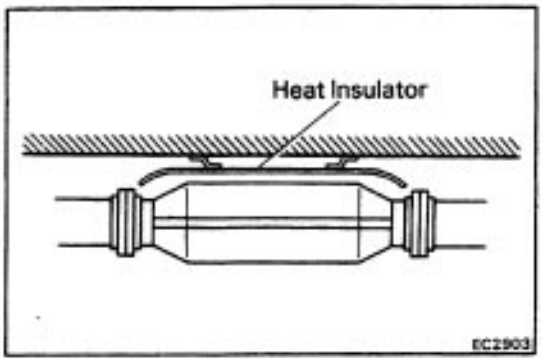
2. CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE



INSPECTION OF CATALYTIC CONVERTER

CHECK FOR DENTS OR DAMAGE

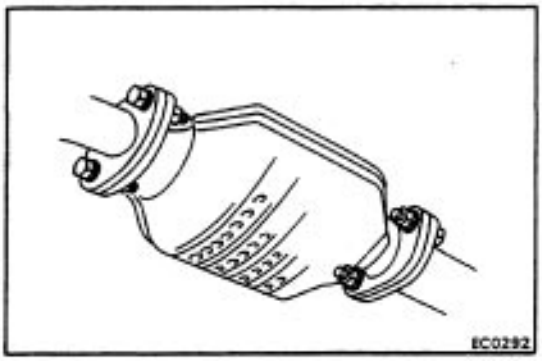
If any part of protector is damaged or dented to the extent that it contacts the converter, repair or replace it.



INSPECTION OF HEAT INSULATOR

1. CHECK HEAT INSULATOR FOR DAMAGE

2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR



REPLACEMENT OF CATALYTIC CONVERTER

1. REMOVE CONVERTER

(a) Jack up the vehicle.

(b) Check that the converter is cool.

(c) Remove the four bolts and nuts holding the pipes to the converter.

(d) Remove the converter and two gaskets.

2. REINSTALL CONVERTER

(a) Place new two gaskets on the front and rear pipes.

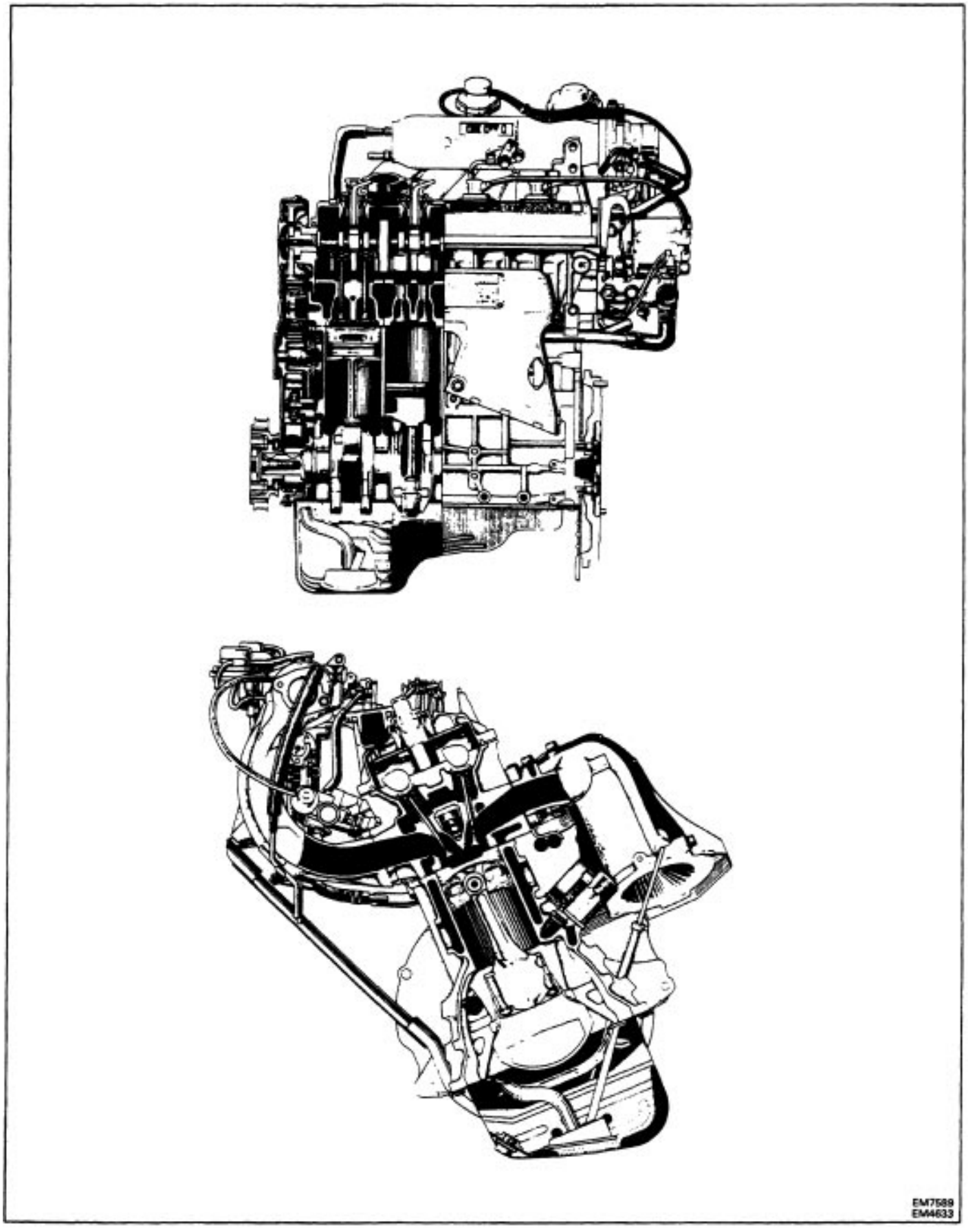
(b) Install the converter with the bolts and nuts. Torque the bolts and nuts. ,

Torque: 440 kg–cm (32 ft–lb, 43 N–m)

ENGINE MECHANICAL

DESCRIPTION (3S–FE)

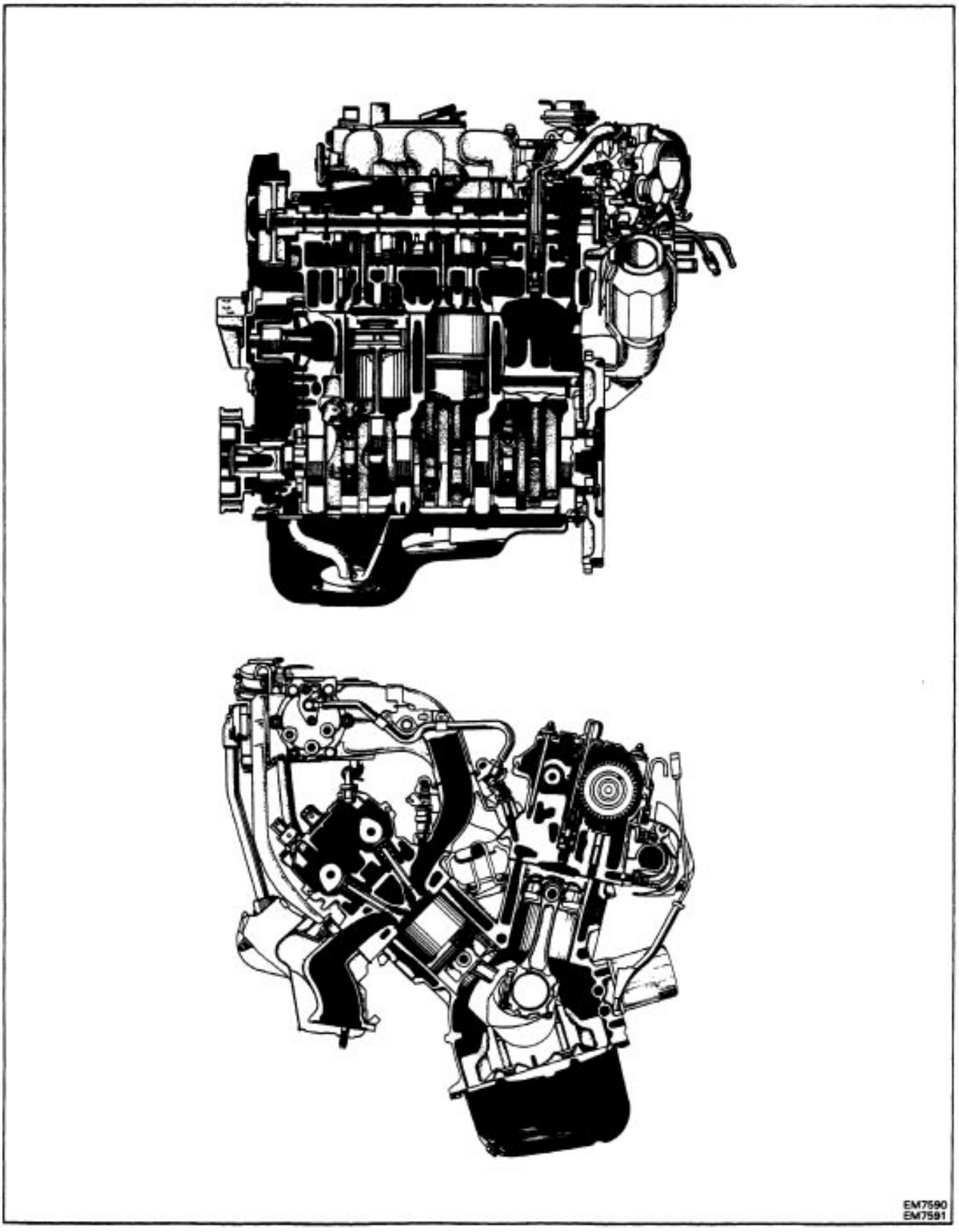
The 3S–FE engine is an in–line 4–cylinder 2.0 liter DOHC 16 valve engine.



The 3S–FE engine is an in–line 4–cylinder engine with the cylinders numbered 1 – 2 – 3 – 4 from the front.
The crankshaft is supported by 5 bearing inside the crankcase. These bearing are made of aluminum alloy.
The crankshaft is integrated with 8 weights for balance. Oil holes are placed in the center of the crankshaft to supply oil to the connecting rods, bearing, pistons and other components.
This engine's ignition order is 1 – 3 – 4 – 2. The cylinder head is made of aluminum alloy, with a cross flow type intake and exhaust layout and with pent–roof type combustion chambers. The spark plugs are located in the center of the combustion chamber.
The intake manifold has 8 independent long ports and utilizes the inertial supercharging effect to improve engine torque at low and medium speeds.
Exhaust and intake valves are equipped with irregular pitch springs made of special valve spring carbon steel which are capable of functioning no matter what the engine speed.
The intake side camshaft is driven by a timing belt, and a gear on the intake side camshaft engages with a gear on the exhaust side camshaft to drive it. The cam journal is supported at 5 places between the valve lifters of each cylinder and on the front end of the cylinder head. Lubrication of the cam journal and gear is accomplished by oil being supplied through the oiler port in the center of the camshaft.
Adjustment of the valve clearance is done by means of outer shim type system, in which valve adjusting shims are located above the valve lifters. This permits replacement of the shims without removal of the camshafts.
The resin timing belt cover is made of 2 pieces. A service hole is provided in the No. 1 belt cover for adjusting the timing belt tension.
Piston are made of high temperature–resistant aluminum alloy, and a depression is built into the piston head to prevent interference with the valves.
Piston pins are the semi–floating type, with the pins fastened to the connecting rods by pressure fitting, allowing the pistons and pins to float.
The No. 1 compression ring is made of steel and the No. 2 compression ring is made of cast iron. The oil ring is made of a combination of steel and stainless steel. The outer diameter of each piston ring is slightly larger than the diameter of the piston and the flexibility of the rings allows them to hug the cylinder walls when they are mounted on the piston rings No. 1 and No. 2 work to prevent gas leakage from the cylinder and oil ring works to clear oil off the cylinder walls to prevent it from entering the combustion chambers.
The cylinder block is made of cast iron. It has 4 cylinders which are approximately 2 times the length of the piston stroke. The top of the cylinders is closed off by the cylinder head and the lower end of the cylinders becomes the crankcase, in which the crankshaft is installed. In .addition, the cylinder block contains a water jacket, through which coolant is pumped to cool the cylinders.
The oil pan is bolted onto the bottom of the cylinder block. The oil pan is an oil reservoir made of pressed steel shoot. A dividing plate is included inside the oil pan to keep sufficient oil in the bottom of the pan even when the vehicle is tilted. This dividing plate also prevents the oil from making waves when the vehicle is topped suddenly and thus shifting the oil away from the oil pump suction pipe.

DESCRIPTION (2VZ–FE)

The 2VZ–FE engine is a V type 6–cylinder 2.5 liter DOHC 24 valve engine.



EM7590
EM7591

The 2VZ–FE engine has 6 cylinder in a V arrangement at bank of 60˚. From the front of the RH bank cylinders are numbered 1 – 3 – 5, and from the front of the LH bank cylinders are numbered 2 – 4 –r 6. The crankshaft is supported by 4 bearings inside the crankcase. These bearing are made of copper and lead alloy.

The crankshaft is integrated with 5 weights for balance. Oil holes are placed in the center of the crankshaft for supplying oil to the connecting rods, pistons and other components.

This engine's ignition order is 1 – 2 – 3 – 4 – 5 – 6. The cylinder head is made of aluminum alloy, with a cross flow type intake and exhaust layout and with pent–roof type combustion chambers. The spark plugs are located in the center of the combustion chambers.

At,the front and rear of the intake port of the intake manifold, a water passage has been provided which connects the RH and LH cylinder heads.

Exhaust and intake valves are equipped with irregular pitch springs made of special valve spring carbon steel which are capable of functioning no matter what the engine speed.

The RH and LH intake camshaft are driven by a single timing belt, and a gear on the intake side camshaft engages with a gear on the exhaust side camshaft to drive it. The cam journal is supported at 5 (intake) or 4 (exhaust) places between the valve liters of each cylinder and on the front end of the cylinder head. Lubrication of the cam journals and gears is accomplished by oil being supplied through the oiler port in the center of the camshaft.

Adjustment of the valve clearance is done by means of outer shim type system, in which valve adjusting shims are located above the valve lifters. The permits replacement of the shims without removal of the camshafts.

The timing belt cover is composed of resin type No. 2 and No. 1 above and below the RH mounting bracket.

Piston are made high temperature–resistant aluminum alloy, and a depression is built into the piston head to prevent interference with the valves.

Piston pins are the semi–floating type, with the pins fastened to the connecting rods by pressure fitting, allowing the pistons and pins to float.

The No. 1 compression ring is made of steel and the No. 2 compression ring is made–of cast iron. The oil ring is made of a combination of steel and stainless steel. The outer diameter of each piston ring is slightly larger than the diameter of the piston and the flexibility of the rings allows them to hug the cylinder walls when they are mounted on the piston. Compression rings No. 1 and No. 2 work to prevent gas leakage from the cylinder and oil ring works to clear oil off the cylinder walls to prevent it from entering the combustion chambers.

The cylinder block is made of cast iron with a bank angle of 60˚. It has 6 cylinders which are approximately 2 times the length of the piston stroke. The top of the cylinders is closed off by the cylinder heads and the lower end of the cylinders becomes the crankcase, in which the crankshaft is installed. In addition, the cylinder block contains a water jacket, through which coolant is pumped to cool the cylinders.

The oil pan is bolted onto the bottom of the cylinder block. The oil pan is an oil reservoir made of pressed steel sheet. A dividing plate is included inside the oil pan to keep sufficient oil in the bottom of the pan even when the vehicle is tilted. This dividing plate also prevents the oil from making waves when the vehicle is stopped suddenly and thus shifting the oil away from the oil pump suction pipe.

TROUBLESHOOTING

ENGINE OVERHEATING

Problem	Possible cause	Remedy	Page
Engine overheats	Cooling system faulty Incorrect ignition timing	Troubleshoot cooling system Reset timing	CO–4

HARD STARTING

Problem	Possible cause	Remedy	Page
Engine will not crank or cranks slowly	Starting system faulty	Troubleshoot starting system	ST–2
Engine will not start/ hard to start (cranks OK)	No fuel supply to injector • No fuel in tank • Fuel pump no working • Fuel filter clogged • Fuel line clogged or leaking	Troubleshoot EFI system	FI–10
	EFI system problems	Repair as necessary	
	Ignition problems • Ignition coil • Igniter • Distributor	Perform spark test	IG–5, 9
	Spark plug faulty	Inspect plugs	IG–6, 10
	High–tension cord disconnected or broken	Inspect cords	IG–6, 10
	Vacuum leaks • PCV line • EGR line • Intake manifold • Air intake chamber • Throttle body • ISC valve • Brake booster tine	Repair as necessary	
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Low compression	Check compression	EM–22

ROUGH IDLING

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses	Spark plug faulty	Inspect plugs	IG–6, 10
	High–tension cord faulty	Inspect cords	IG–6, 10
	Ignition problems • Ignition coil • Igniter • Distributor	Inspect coil Inspect igniter Inspect distributor	IG–7, 12 IG–8, 12 IG–7, 12
	Incorrect ignition timing	Reset timing	IG–16, 20
	Vacuum leaks • PCV line • EGR line • Intake manifold	Repair as necessary	

ROUGH IDLING (Cont'd)

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses (Cont'd)	Vacuum leaks (Cont'd) • Air intake chamber • Throttle body • ISC valve • Brake booster line Pulling in air between air flow meter and throttle body Incorrect idle speed Incorrect valve clearance EFI system problems Engine overheats Low compression	 Check ISC system Adjust valve clearance Repair as necessary Check cooling system Check compression	 FI–116, 118 EM–11, 15 CO–4 EM–22

ENGINE HESITATES/POOR ACCELERATION

Problem	Possible cause	Remedy	Page
Engine hesitates/ poor acceleration	Spark plug faulty High–tension cord faulty Vacuum leaks • PCV line • EGR line • Intake manifold • Air intake chamber • Throttle body • ISC valve • Brake booster line Pulling in air between air flow meter and throttle body Incorrect ignition timing Incorrect valve clearance Fuel system clogged Air cleaner clogged EFI system problems Emission control system problem (cold engine) • EGR system always on Engine overheats Low compression	Inspect plugs Inspect cords Repair as necessary Repair as necessary Reset timing Adjust valve clearance Check fuel system Check air cleaner Repair as necessary Check EGR system Check cooling system Check compression	IG–6, 10 IG–6, 10 IG–16, 20 EM–11, 15 MA–5 EC–8,21 Co–4 EM–22

ENGINE DIESELING

Problem	Possible cause	Remedy	Page
Engine diesels (runs after ignition switch is turned off)	EFI system problems Incorrect ignition timing EGR system faulty	Repair as necessary Reset timing Check EGR system	 IG–16, 20 EC–8, 21

AFTER FIRE, BACKFIRE

Problem	Possible cause	Remedy	Page
Muffler explosion (after fire) on deceleration only	Deceleration fuel cut system always off	Check EFI (fuel cut) system	
Muffler explosion (after fire) all the time	Air cleaner clogged EM system problem Incorrect ignition timing	Check air cleaner Repair as necessary Reset timing	MA–5 IG–16, 20
Engine backfires	EFI system problem Vacuum leak a PCV line • EGR tine • Intake manifold • Air intake chamber • Throttle body • ISC valve • Brake booster fine Pulling in air between air flow meter and throttle body Insufficient fuel flow incorrect ignition timing Incorrect valve clearance Carbon deposits in combustion chambers	Repair as necessary Check hoses and repair as necessary Repair as necessary Troubleshoot fuel system Reset timing Adjust valve clearance Inspect cylinder head	 FI–10 IG –16, 20 EM–11, 15 EM–56, 84

EXCESSIVE OIL CONSUMPTION

Problem	Possible cause	Remedy	Page
Excessive oil consumption	Oil leak PCV line clogged Piston ring worn or damaged Valve stem and guide bushing worn Valve stem oil seal worn	Repair as necessary Check PCV system Check rings Check valves and guide bushing Check seals	 EC–4, 15 EM–123, 156 EM–57,85

EXCESSIVE FUEL CONSUMPTION

Problem	Possible cause	Remedy	Page
Poor gasoline mileage	Fuel leak	Repair as necessary	
	Air cleaner clogged	Check air cleaner	MA–5
	Incorrect ignition timing	Reset timing	IG–16, 20
	EFI system problems	Repair as necessary	
	• Injector faulty		
	• Deceleration fuel cut system faulty		
	Idle speed too high	Check ISC system	
	Spark plug faulty	Inspect plugs	
	EGR system always on	Check EGR system	
	Low compression	Check compression	FI–116,118
	Tires improperly inflated	Inflate tires to proper pressure	IG–6, 10
	Clutch slips	Troubleshoot clutch	EC–8, 21
	Brakes drag	Troubleshoot brakes	EM–22

UNPLEASANT ODOR

Problem	Possible cause	Remedy	Page
Unpleasant odor	Incorrect idle speed	Check ISC system	FI–116, 118
	Incorrect ignition timing	Reset timing	IG–16, 20
	Vacuum leaks	Repair as necessary	
	• PCV line		
	• EGR line		
	• Intake manifold		
	• Air intake chamber		
	• Throttle body		
	• ISC valve		
	• Brake booster line		
	EFI system problems	Repair as necessary	

ENGINE TUNE–UP

INSPECTION OF ENGINE COOLANT

(See steps 1 and 2 on page CO–4)

INSPECTION OF ENGINE OIL

(See steps 1 and 2 on page LU–6)

INSPECTION OF BATTERY

(See steps 1 and 2 on page CH–3)

Standard specific gravity:

1.25 –1.27 when fully charged at 2O˚C (68˚F)

INSPECTION OF AIR FILTER

(See step 3 on page MA–5)

INSPECTION OF HIGH–TENSION CORDS

(See page IG–6 or 10)

Maximum resistance: 25 kΩ per cord

INSPECTION OF SPARK PLUGS (3S–FE)

(See page IG–6)

Correct electrode gap: 1.1 mm (0.043 in.)

Recommended spark plugs:

ND Q16R–U11

NGK BCPR5EY11

INSPECTION OF SPARK PLUGS (2VZ–FE)

(See page IG–10)

Correct electrode gap of new plug:

1.1 mm (0.043 in.)

Maximum electrode gap: 1.3 mm (0.051 in.)

Recommended spark plugs:

ND P020R

NGK BCPR6EP11

INSPECTION OF ALTERNATOR DRIVE BELT

(See step 3 on page CH–3)

Drive belt tension:

3S–FE w/ A/C New belt 175 ±5 lb

Used belt 130 ±10 lb

w/o A/C New belt 125 ±25 lb

Used belt 95 ±20 lb

2VZ–FE New belt 175 ±5 lb

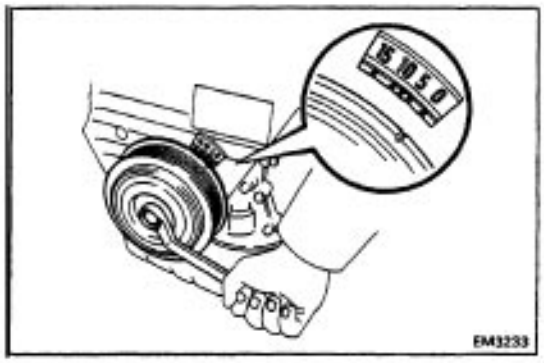
Used belt 115 ±20 lb

ADJUSTMENT OF VALVE CLEARANCE (3S–FE)

HINT: Adjust the valve clearance while the engine is cold.

1. REMOVE CYLINDER HEAD COVER

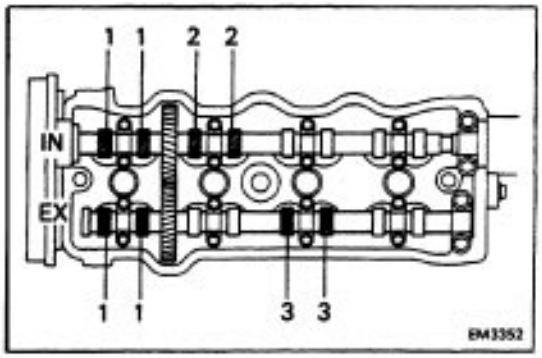
(See step 29 on page EM–52)



2. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley and align its groove with the timing mark ”0” of the No–1 timing belt cover.

(b) Check that the valve lifters, on the No–1 cylinder are loose and valve lifters on the No.4 are tight.
If not, turn the crankshaft one revolution (360˚) and align the mark as above.



3. ADJUST VALVE CLEARANCE

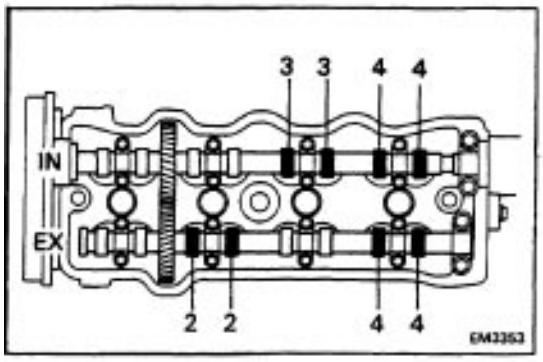
(a) Check the only those valves indicated.

- Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
- Record the valve clearance measurements which are out of specification. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):

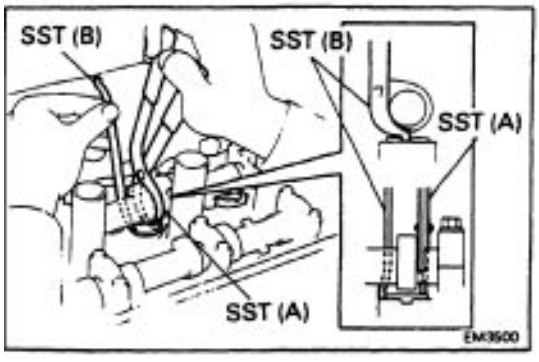
Intake 0.19 – 0.29 mm (0.007 – 0.011 in.)

Exhaust 0.28 – 0.38 mm(0.011 – 0.015 in.)



(b) Turn the crankshaft one revolution (360˚) and align the mark as above. (See procedure step 2)

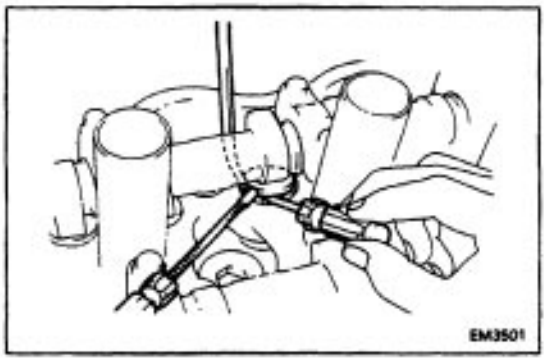
(c) Check only the valves indicated as shown.
Measure the valve clearance. (See procedure step (a))



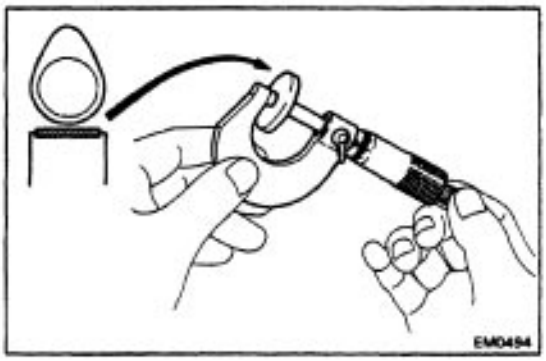
(d) Remove the adjusting shim.

- Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward.
- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter.
Remove SST (A).
SST 09248–55010

HINT: Before pressing down the valve lifter, position the notch the spark plug.



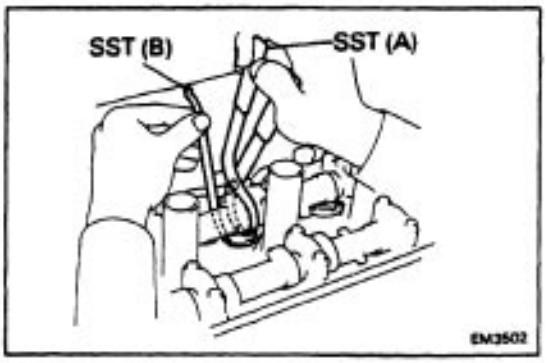
- Remove the adjusting shim with a small screwdriver and magnetic finger.



(e) Determine the replacement adjusting shim size by following the Formula or Charts:

- Using a micrometer, measure the thickness of the removed shim.
- Calculate the thickness of a new shim so that the valve clearance comes within specified value.
  T ..... Thickness of used shim
  A ..... Measured valve clearance
  N ..... Thickness of new shim
  Intake N = T + (A – 0.24 mm (0.009 in.))
  Exhaust N = T + (A – 0.33 mm (0–013 in.))
- Select a new shim with a thickness as close as possible to the calculated valve.

HINT: Shims are available in twenty–seven sizes of mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm A 1299 in.).



(f) Install a new adjusting shim.

- Place a new adjusting shim on the valve lifter.
- Using SST 1Ay, press down the valve lifter and remove SST (B).
  SST 09248–55010

(g) Recheck the valve clearance.

4. REINSTALL CYLINDER HEAD COVER

(See step 5 on page EM–70)

Adjusting Shim Selection Using Chart
INTAKE

Measured clearance (mm)	Installed shim thickness (mm)																																							
	2.500	2.550	2.600	2.620	2.640	2.650	2.660	2.680	2.700	2.720	2.740	2.750	2.760	2.780	2.800	2.820	2.840	2.850	2.860	2.880	2.900	2.920	2.940	2.950	2.960	2.980	3.000	3.020	3.040	3.050	3.060	3.080	3.100	3.120	3.140	3.150	3.160	3.180	3.200	3.250	3.300
0.000-0.025								02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	24
0.026-0.050					02	02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	24	26
0.051-0.075				02	02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	26
0.076-0.100			02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	26	28
0.101-0.125			02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	28
0.126-0.150		02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	28	30
0.151-0.175		02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	30
0.176-0.189		02	04	04	06	06	06	06	08	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	30	32
0.190-0.290																																									
0.291-0.300	04	06	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	
0.301-0.325	04	06	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	
0.326-0.350	06	08	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34		
0.351-0.375	06	08	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34		
0.376-0.400	08	10	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34			
0.401-0.425	08	10	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34				
0.426-0.450	10	12	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34						
0.451-0.475	10	12	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34								
0.476-0.500	12	14	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34									
0.501-0.525	12	14	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34										
0.526-0.550	14	16	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34												
0.551-0.575	14	16	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34														
0.576-0.600	16	18	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34															
0.601-0.625	16	18	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34																
0.626-0.650	18	20	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34																		
0.651-0.675	18	20	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34																				
0.676-0.700	20	22	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34																					
0.701-0.725	20	22	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34																						
0.726-0.750	22	24	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34																								
0.751-0.775	22	24	26	28	28	28	30	30	30	32	32	32	34	34	34																										
0.776-0.800	24	26	28	28	30	30	30	32	32	32	34	34	34	34																											
0.801-0.825	24	26	28	30	30	30	32	32	32	34	34	34	34																												
0.826-0.850	26	28	30	30	32	32	32	34	34	34	34																														
0.851-0.875	26	28	30	32	32	32	34	34	34																																
0.876-0.900	28	30	32	32	34	34	34	34																																	
0.901-0.925	28	30	32	34	34	34	34																																		
0.926-0.950	30	32	34	34	34																																				
0.951-0.975	30	32	34																																						
0.976-1.000	32	34																																							
1.001-1.025	34	34																																							
1.026-1.090	34																																								

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
02	2.50 (0.0984)	20	2.95 (0.1161)
04	2.55 (0.1004)	22	3.00 (0.1181)
06	2.60 (0.1024)	24	3.05 (0.1201)
08	2.65 (0.1043)	26	3.10 (0.1220)
10	2.70 (0.1063)	28	3.15 (0.1240)
12	2.75 (0.1083)	30	3.20 (0.1260)
14	2.80 (0.1102)	32	3.25 (0.1280)
16	2.85 (0.1122)	34	3.30 (0.1299)
18	2.90 (0.1142)		

Intake valve clearance (Cold):

0.19 – 0.29 mm (0.007 – 0.011 in.)

EXAMPLE: The 2.800 mm 10.1102 in.) shim is installed and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 22 shim.

Adjusting Shim Selection Using Chart

EXHAUST

Measured clearance (mm)	Installed shim thickness (mm)																																								
	2.500	2.550	2.600	2.620	2.640	2.650	2.660	2.680	2.700	2.720	2.740	2.750	2.760	2.780	2.800	2.820	2.840	2.850	2.860	2.880	2.900	2.920	2.940	2.950	2.960	2.980	3.000	3.020	3.040	3.050	3.060	3.080	3.100	3.120	3.140	3.150	3.160	3.180	3.200	3.250	3.300
0.000–0.025													02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	20	22
0.026–0.050											02	02	02	02	02	04	04	04	04	06	06	08	08	08	08	10	10	12	12	12	12	14	14	16	16	16	16	18	18	20	22
0.051–0.075										02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	22	24
0.076–0.100								02	02	02	02	02	02	04	04	06	06	06	06	08	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	24
0.101–0.125							02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	24	26
0.126–0.150					02	02	02	02	02	04	04	04	04	06	06	08	08	08	08	10	10	12	12	12	12	14	14	16	16	16	16	18	18	20	20	20	20	22	22	24	26
0.150–0.175				02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	26	28
0.176–0.200			02	02	02	02	02	04	04	06	06	06	06	08	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	28
0.201–0.225			02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	28	30
0.226–0.250		02	02	04	04	04	04	06	06	08	08	08	08	10	10	12	12	12	12	14	14	16	16	16	16	18	18	20	20	20	20	22	22	24	24	24	24	26	26	28	30
0.251–0.275		02	04	04	04	06	06	08	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	30	32
0.275–0.279		02	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	30	32
0.280–0.380																																									
0.381–0.400	04	06	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	
0.401–0.425	06	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	
0.426–0.450	06	08	10	12	12	12	12	14	14	16	16	16	16	18	18	20	20	20	20	22	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34		
0.451–0.475	08	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34		
0.476–0.500	08	10	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34				
0.501–0.525	10	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34					
0.526–0.550	10	12	14	16	16	16	16	18	18	20	20	20	20	22	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34							
0.551–0.575	12	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34								
0.576–0.600	12	14	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34									
0.601–0.625	14	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34											
0.626–0.650	14	16	18	20	20	20	20	22	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34													
0.651–0.675	16	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34														
0.676–0.700	16	18	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34															
0.701–0.725	18	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34																	
0.726–0.750	18	20	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34																			
0.751–0.775	20	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34																				
0.776–0.800	20	22	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34																					
0.801–0.825	22	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34																							
0.826–0.850	22	24	26	28	28	28	28	30	30	32	32	32	32	34	34	34																									
0.851–0.875	24	26	28	28	28	30	30	30	32	32	32	34	34	34	34																										
0.876–0.900	24	26	28	30	30	30	30	32	32	34	34	34	34	34																											
0.901–0.925	26	28	30	30	30	32	32	32	34	34	34	34																													
0.926–0.950	26	28	30	32	32	32	32	34	34	34																															
0.951–0.975	28	30	32	32	32	34	34	34	34																																
0.976–1.000	28	30	32	34	34	34	34	34																																	
1.001–1.025	30	32	34	34	34	34																																			
1.026–1.050	30	32	34	34																																					
1.051–1.075	32	34	34																																						
1.076–1.100	32	34																																							
1.101–1.125	34	34																																							
1.126–1.180	34																																								

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
02	2.50 (0.0984)	20	2.95 (0.1161)
04	2.55 (0.1004)	22	3.00 (0.1181)
06	2.60 (0.1024)	24	3.05 (0.1201)
08	2.65 (0.1043)	26	3.10 (0.1220)
10	2.70 (0.1063)	28	3.15 (0.1240)
12	2.75 (0.1083)	30	3.20 (0.1260)
14	2.80 (0.1102)	32	3.25 (0.1280)
16	2.85 (0.1122)	34	3.30 (0.1299)
18	2.90 (0.1142)		

Exhaust valve clearance:

0.28 – 0.38 mm (0.011 – 0.015 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 18 shim.

ADJUSTMENT OF VALVE CLEARANCE (2VZ–FE)

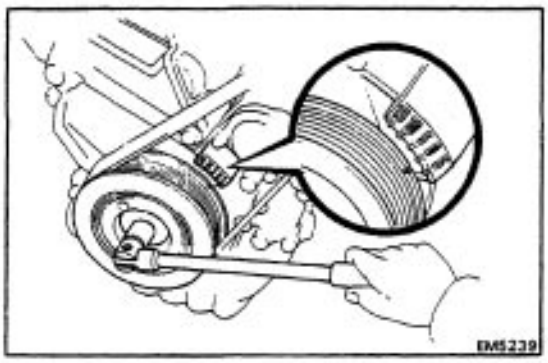
HINT: Adjust the valve clearance while the engine is cold.

1. REMOVE AIR INTAKE CHAMBER

(See steps 1 to 21 on page FI–76 and 77)

2. REMOVE CYLINDER HEAD COVERS

(See step 32 on page EM–80)

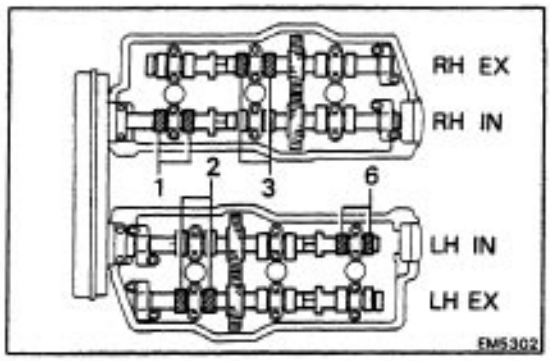


3. SET NO.1 CYLINDER TO TDCI COMPRESSION

(a) Turn the crankshaft pulley, and align its groove with the timing mark ”0” of the No.1 timing belt cover.

(b) Check that the valve lifters on the No. 1 (IN) are loose and valve lifters on the No.1 (EX) are tight.

If not, turn the crankshaft one revolution (360˚) and align the mark as above.



4. ADJUST VALVE CLEARANCE

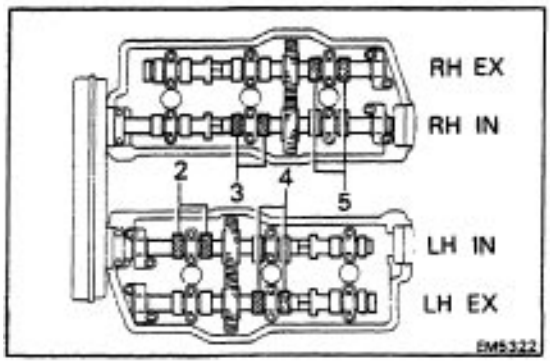
(a) Check only those valves indicated in the figure.

- Using a feeler gauge, measure the clearance between the valve lifter and camshaft.
- Record the valve clearance measurements which are out of specification. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):

Intake 0.13 – 0:23 mm (0.005 – 0.009 in.)

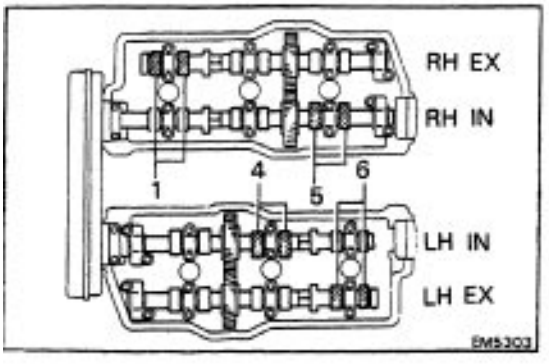
Exhaust 0.27 – 0.37 mm (0.011 – 0.015 in.)



(b) Turn the crankshaft 2/3 of a revolution (240˚), and check only the valves indicated in the figure.

Measure the valve clearance.

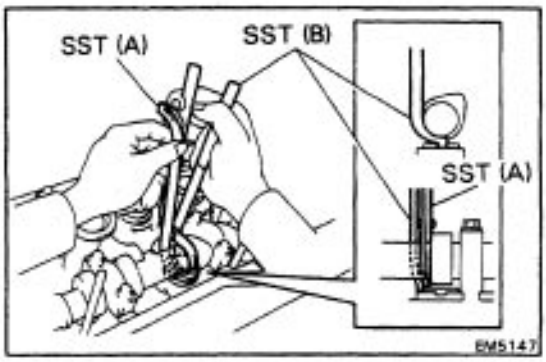
(See procedure step W)



(c) Turn the crankshaft a further 2I3 of a revolution (240˚), and check only the valves indicated in the figure.

Measure the valve clearance.

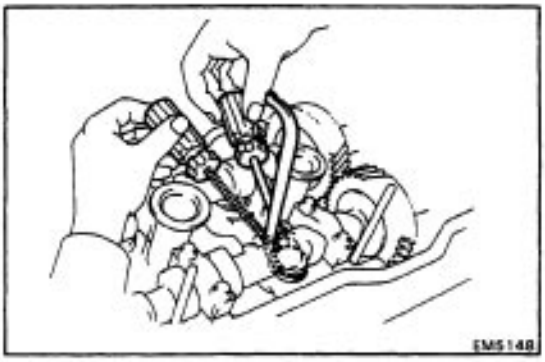
(See procedure step (a))



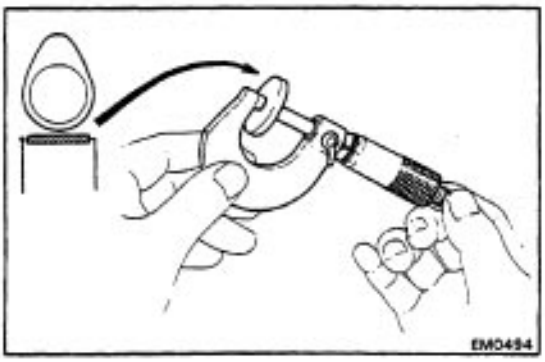
(d) Remove the adjusting shim.

- Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward.
- Press down the valve lifter with SST (A), and place SST (B) between the camshaft and valve lifter. Remove SST (A).
  SST 09248–55010

HINT: Before pressing down the valve lifter, position the notch the spark plug.



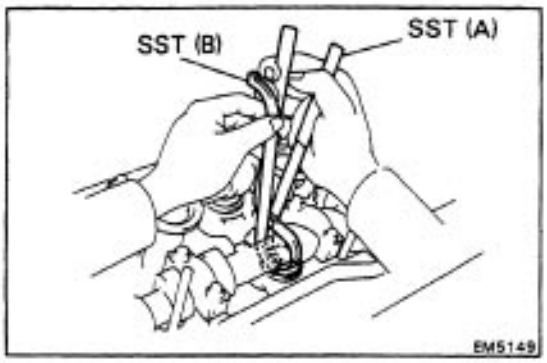
- Remove the adjusting shim with a small screwdriver and magnetic finger.



(e) Determine the replacement adjusting shim size by following the Formula or Charts:

- Using a micrometer, measure the thickness of the. removed shim.
- Calculate the thickness of a new shim so that the. valve clearance comes within specified value.
  T ..... Thickness of used shim
  A ..... Measured valve clearance
  N ..... Thickness of new shim
  Intake N = T + (A – 0.18 mm (0.007 in.))
  Exhaust N = T + (A – 0.32 mm (0.013 in.))
- Select a new. shim with a thickness as close as possible to the calculated values.

HINT: Shims are available in seventeen sizes of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).



(f) Install a new adjusting shim.

- Place a new adjusting shim on the valve lifter.
- Press down the valve lifter with SST (A), and remove SST (B).
  SST 09248–55010

(g) Recheck the valve clearance.

5. REINSTALL CYLINDER HEAD COVERS
(See step 8 on page EM–102)
6. REINSTALL AIR INTAKE CHAMBER
(See steps 18 to 40 pages FI–105 to 106)

Adjusting Shim Selection Using Chart

INTAKE

Measured clearance (mm)	Installed shim thickness (mm)																																												
	2.500	2.525	2.550	2.575	2.600	2.620	2.640	2.650	2.660	2.680	2.700	2.720	2.740	2.750	2.760	2.780	2.800	2.820	2.840	2.850	2.860	2.880	2.900	2.920	2.940	2.950	2.960	2.980	3.000	3.020	3.040	3.050	3.060	3.080	3.100	3.120	3.140	3.150	3.160	3.180	3.200	3.225	3.250	3.275	3.300
0.000 – 0.025						02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	26	26	28
0.026 – 0.050					02	02	02	02	02	04	04	06	06	06	06	08	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	28	28
0.051 – 0.075				02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	28	28	30
0.076 – 0.100			02	02	02	04	04	04	04	06	06	08	08	08	08	10	10	12	12	12	12	14	14	16	16	16	16	18	18	20	20	20	20	22	22	24	24	24	24	26	26	28	28	30	30
0.101 – 0.125		02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	30	30	32
0.126 – 0.129		02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	32
0.130 – 0.230																																													
0.231 – 0.250	04	06	06	08	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	
0.251 – 0.275	06	06	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	
0.276 – 0.300	06	08	08	10	10	12	12	12	12	14	14	16	16	16	16	18	18	20	20	20	20	22	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34	34		
0.301 – 0.325	08	08	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34			
0.326 – 0.350	08	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34	34				
0.351 – 0.375	10	10	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34						
0.376 – 0.400	10	12	12	14	14	16	16	16	16	18	18	20	20	20	20	22	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34	34	34							
0.401 – 0.425	12	12	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34									
0.426 – 0.450	12	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34	34										
0.451 – 0.475	14	14	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34												
0.476 – 0.500	14	16	16	18	18	20	20	20	20	22	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34	34	34													
0.501 – 0.525	16	16	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34															
0.526 – 0.550	16	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34	34																
0.551 – 0.575	18	18	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34																		
0.576 – 0.600	18	20	20	22	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34	34	34																			
0.601 – 0.625	20	20	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34																					
0.626 – 0.650	20	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34	34																						
0.651 – 0.675	22	22	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34																								
0.676 – 0.700	22	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34	34	34																									
0.701 – 0.725	24	24	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34																											
0.726 – 0.750	24	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34																													
0.751 – 0.775	26	26	28	28	30	30	30	32	32	32	34	34	34	34	34																														
0.776 – 0.800	26	28	28	30	30	32	32	32	32	34	34	34	34	34																															
0.801 – 0.825	28	28	30	30	32	32	32	34	34	34	34	34																																	
0.826 – 0.850	28	30	30	32	32	32	34	34	34	34	34																																		
0.851 – 0.875	30	30	32	32	34	34	34	34	34																																				
0.876 – 0.900	30	32	32	34	34	34	34	34																																					
0.901 – 0.925	32	32	34	34	34	34																																							
0.926 – 0.950	32	34	34	34	34																																								
0.951 – 0.975	34	34	34	34																																									
0.976 – 1.000	34	34	34																																										
1.001 – 1.025	34	34																																											
1.026 – 1.030	34																																												

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
02	2.500 (0.0984)	20	2.950 (0.1161)
04	2.550 (0.1004)	22	3.000 (0.1181)
06	2.600 (0.1024)	24	3.050 (0.1201)
08	2.650 (0.1043)	26	3.100 (0.1220)
10	2.700 (0.1063)	28	3.150 (0.1240)
12	2.750 (0.1083)	30	3.200 (0.1260)
14	2.800 (0.1102)	32	3.250 (0.1280)
16	2.850 (0.1122)	34	3.300 (0.1299)
18	2.900 (0.1142)		

Intake valve clearance (Cold):

0.13 – 0.23 mm (0.005 – 0.009 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 24 shim.

Adjusting Shim Selection Using Chart

EXHAUST

Measured clearance (mm)	Installed Shim thickness (mm)																																												
	2.500	2.525	2.550	2.575	2.600	2.620	2.640	2.650	2.660	2.680	2.700	2.720	2.740	2.750	2.760	2.780	2.800	2.820	2.840	2.850	2.860	2.880	2.900	2.920	2.940	2.950	2.960	2.980	3.000	3.020	3.040	3.050	3.060	3.080	3.100	3.120	3.140	3.150	3.160	3.180	3.200	3.225	3.250	3.275	3.300
0.000 – 0.025														02	02	02	02	02	04	04	04	04	06	06	08	08	08	08	10	10	12	12	12	12	14	14	16	16	16	16	18	18	20	20	22
0.026 – 0.050												02	02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	22	22
0.051 – 0.075											02	02	02	02	02	02	04	04	06	06	06	06	08	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	24
0.076 – 0.100										02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	24	24
0.101 – 0.125								02	02	02	02	02	04	04	04	04	06	06	08	08	08	08	10	10	12	12	12	12	14	14	16	16	16	16	18	18	20	20	20	20	22	22	24	24	26
0.126 – 0.150						02	02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	26	26
0.151 – 0.175					02	02	02	02	02	02	04	04	06	06	06	06	08	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	28
0.176 – 0.200				02	02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	28	28
0.201 – 0.225			02	02	02	02	04	04	04	04	06	06	08	08	08	08	10	10	12	12	12	12	14	14	16	16	16	16	18	18	20	20	20	20	22	22	24	24	24	24	26	26	28	28	30
0.226 – 0.250		02	02	02	02	04	04	04	06	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	30	30
0.251 – 0.269		02	02	02	04	04	06	06	06	06	08	08	10	10	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	32
0.270 – 0.370																																													
0.371 – 0.375	04	06	06	08	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	34	34	34	
0.376 – 0.400	04	06	06	08	08	10	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	
0.401 – 0.425	06	06	08	08	10	10	12	12	12	12	14	14	16	16	16	16	18	18	20	20	20	20	22	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34		
0.426 – 0.450	06	08	08	10	10	12	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34			
0.451 – 0.475	08	08	10	10	12	12	14	14	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34				
0.476 – 0.500	08	10	10	12	12	14	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34					
0.501 – 0.525	10	10	12	12	14	14	16	16	16	16	18	18	20	20	20	20	22	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34	34	34						
0.526 – 0.550	10	12	12	14	14	16	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34								
0.551 – 0.575	12	12	14	14	16	16	18	18	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34										
0.576 – 0.600	12	14	14	16	16	18	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34											
0.601 – 0.625	14	14	16	16	18	18	20	20	20	20	22	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34	34	34												
0.626 – 0.650	14	16	16	18	18	20	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34														
0.651 – 0.675	16	16	18	18	20	20	22	22	22	22	24	24	26	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34																
0.676 – 0.700	16	18	18	20	20	22	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34																	
0.701 – 0.725	18	18	20	20	22	22	24	24	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34	34	34																		
0.726 – 0.750	18	20	20	22	22	24	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34																				
0.751 – 0.775	20	20	22	22	24	24	26	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34	34																						
0.776 – 0.800	20	22	22	24	24	26	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34																							
0.801 – 0.825	22	22	24	24	26	26	28	28	28	28	30	30	32	32	32	32	34	34	34	34	34																								
0.826 – 0.850	22	24	24	26	26	28	28	28	30	30	30	32	32	32	34	34	34	34	34																										
0.851 – 0.875	24	24	26	26	28	28	30	30	30	30	32	32	34	34	34	34	34																												
0.876 – 0.900	24	26	26	28	28	30	30	30	32	32	32	34	34	34	34	34																													
0.901 – 0.925	26	26	28	28	30	30	32	32	32	32	34	34	34	34	34																														
0.926 – 0.950	26	28	28	30	30	32	32	32	34	34	34	34	34																																
0.951 – 0.975	28	28	30	30	32	32	34	34	34	34	34																																		
0.976 – 1.000	28	30	30	32	32	34	34	34	34	34																																			
1.001 – 1.025	30	30	32	32	34	34	34	34	34																																				
1.026 – 1.050	30	32	32	34	34	34	34																																						
1.051 – 1.075	32	32	34	34	34																																								
1.076 – 1.100	32	34	34	34																																									
1.101 – 1.125	34	34	34																																										
1.126 – 1.150	34	34																																											
1.151 – 1.170	34																																												

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
02	2.500 (0.0984)	20	2.950 (0.1161)
04	2.550 (0.1004)	22	3.000 (0.1181)
06	2.600 (0.1024)	24	3.050 (0.1201)
08	2.650 (0.1043)	26	3.100 (0.1220)
10	2.700 (0.1063)	28	3.150 (0.1240)
12	2.750 (0.1083)	30	3.200 (0.1260)
14	2.800 (0.1102)	32	3.250 (0.1280)
16	2.850 (0.1122)	34	3.300 (0.1299)
18	2.900 (0.1142)		

Exhaust valve clearance:

0.27 – 0.37 mm (0.011 – 0.015 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 18 shim.

ADJUSTMENT OF IGNITION TIMING

3S–FE (See steps 7 to 10 on pages IG–16 and 17)
2VZ–FE (See steps 6 to 11 on pages IG–20 and 21)
Ignition timing:
10˚BTDC @ idle
(w/ Terminals TE1 and E1 connected)

ADJUSTMENT OF IDLE SPEED (3S–FE)

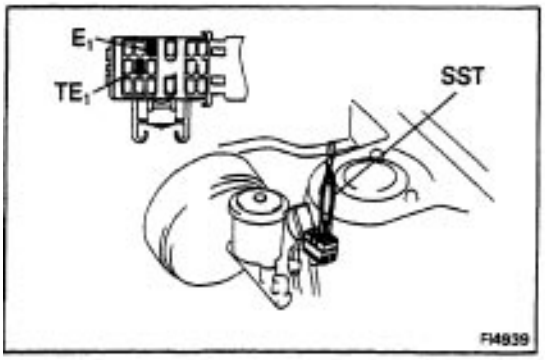
(See HINT on page FI–17)

1. INITIAL CONDITIONS

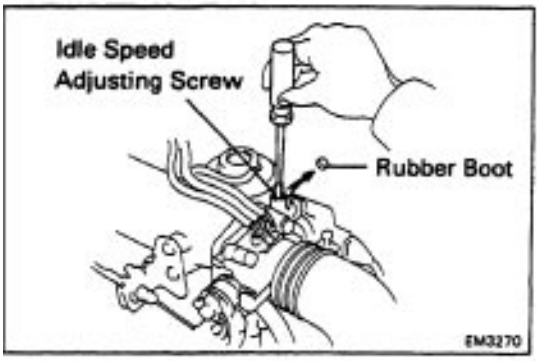
(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All vacuum lines connected
HINT: All vacuum hoses for EGR systems, etc. should be properly connected.
(e) EFI system wiring connectors fully plugged
(f) All accessories switched OFF
(g) Transmission in N range

2. CONNECT TACHOMETER (See page IG–16)

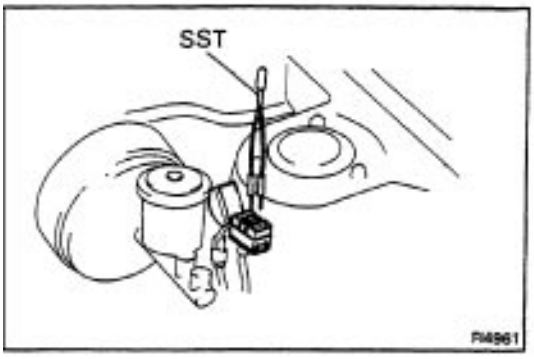
3. ADJUST IDLE SPEED



(a) Using SST, connect terminals TE1 and E1 of the check connector.
SST 09845–18020
HINT: Decrease the rpm after the engine maintains a speed of the 1,000 – 1,300 rpm for 5 seconds.



(b) Check the idle speed.
Idle speed: 660 rpm or more
(c) If the idle speed is not as specified, adjust the idle speed by turning the IDLE SPEED ADJUSTING SCREW.



(d) Remove SST.

4. FURTHER CHECK IDLE SPEED

Idle speed: 700 ± 5O rpm

If the idle speed is not within these values, carry out either of the below listed procedures and then recheck the idle speed.
Carry out a driving test, including stop–go several times at a speed above 10 km/h, or– start the engine, idle for 30 seconds and then turn the engine 'off repeatedly. By doing this, idle data will be stored in the ISC and the idle rpm will be at specified value.

IDLE AND OR 2,500 RPM HC CO CONCENTRATION CHECK METHOD

HINT: This check is used only to determine whether or not the idle HC/CO complies with regulations.

1. INITIAL CONDITIONS

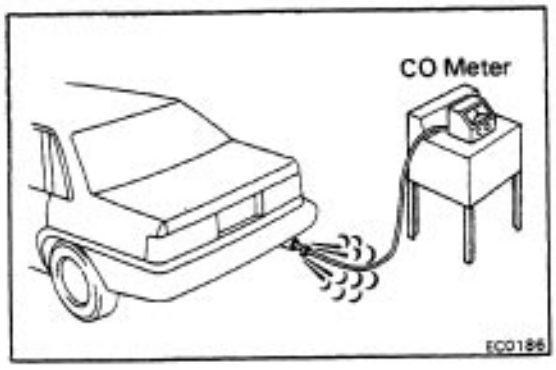
(b) Engine at normal operating temperature
(b) Air cleaner installed
(e) All pipes and hoses of air induction system connected
(d) All operating accessories switched OFF
(e) All vacuum lines properly connected

HINT: All vacuum hoses for EGR systems, etc. should be properly connected.

(f) EFI system wiring connectors fully plugged
(g) Ignition timing set correctly
(h) Transmission in N range
(i) Tachometer and HC/CO meter calibrated and at hand

2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX. 2 MINUTES



4. INSERT HC/CO METER TESTING PROBE INTO TAILPIPE AT LEAST 40 cm (1.3 ft)

5. CHECK HC/CO CONCENTRATION AT IDLE

Complete the measuring within three times.

HINT: When performing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the regulations.

If the HC/CO concentration at 2,500 rpm does not comply with regulations, try the following procedure.

Race the engine again at 2,500 rpm for approx. 1 minute and quickly repeat steps 4 and 5 above.

This may correct the problem.

Troubleshooting

If the HC/CO concentration does not comply with regulations, perform troubleshooting in the order given below.

(a) Check oxygen sensor operation.
(See page FI–129)

(b) See the table below for possible causes, and then inspect and correct the applicable causes if necessary.

HC	CO	Problem	Cause
High	Normal	Rough idle	1. Faulty ignition: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high–tension cords • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valve 4. Leaky intake and exhaust valves 5. Leaky cylinder
High	Low	Rough idle (Fluctuating HC reading)	1. Vacuum leak: • PCV hose • EGR valve • Intake manifold • Air intake chamber • Throttle body • ISC valve • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Faulty EFI system • Faulty pressure regulator • Clogged fuel return line • Defective water temp. sensor • Defective air temp. sensor • Faulty ECU • Faulty injector • Faulty cold start injector • Faulty throttle position sensor • Air flow meter

COMPRESSION CHECK

HINT: If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. WARM UP AND STOP ENGINE

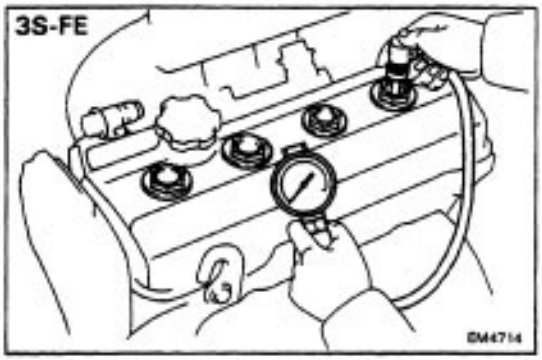
Allow the engine to warm up to normal operating temperature.

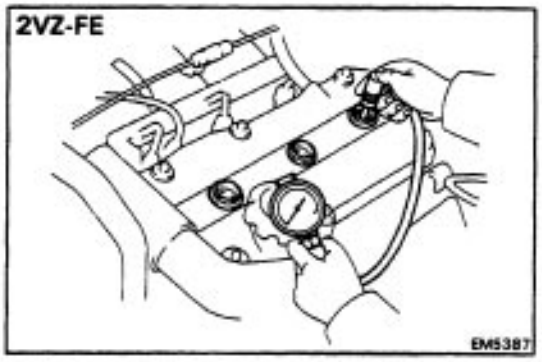
2. DISCONNECT COLD START INJECTOR CONNECTOR

3. DISCONNECT DISTRIBUTOR CONNECTOR

4. REMOVE SPARK PLUGS (See page IG–6 or 11)

5. CHECK CYLINDER COMPRESSION PRESSURE





(a) Insert a compression gauge into the spark plug hole.

(b) Fully open the throttle.

(c) While cranking the engine, measure the compression pressure.

HINT: Always use a fully charged battery to obtain engine speed of 250 rpm or more.

(d) Repeat steps (a) through (c) for each cylinder.

NOTICE: This measurement must be in as short a time as possible.

Compression pressure:

12.5 kg–cm^2 (178 psi, 1,226 kPa) or more

Minimum pressure:

10.0 kg/cm^2 (142 psi, 981 kPa)

Difference between each cylinder:

1.0 kg/cm^2 (14 psi, 98 kPa) or less

(e) if the cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (e) for cylinders with low compression.

- If adding oil helps the compression chances are that the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.

6. REINSTALL SPARK PLUGS (See page IG–7 or 11)

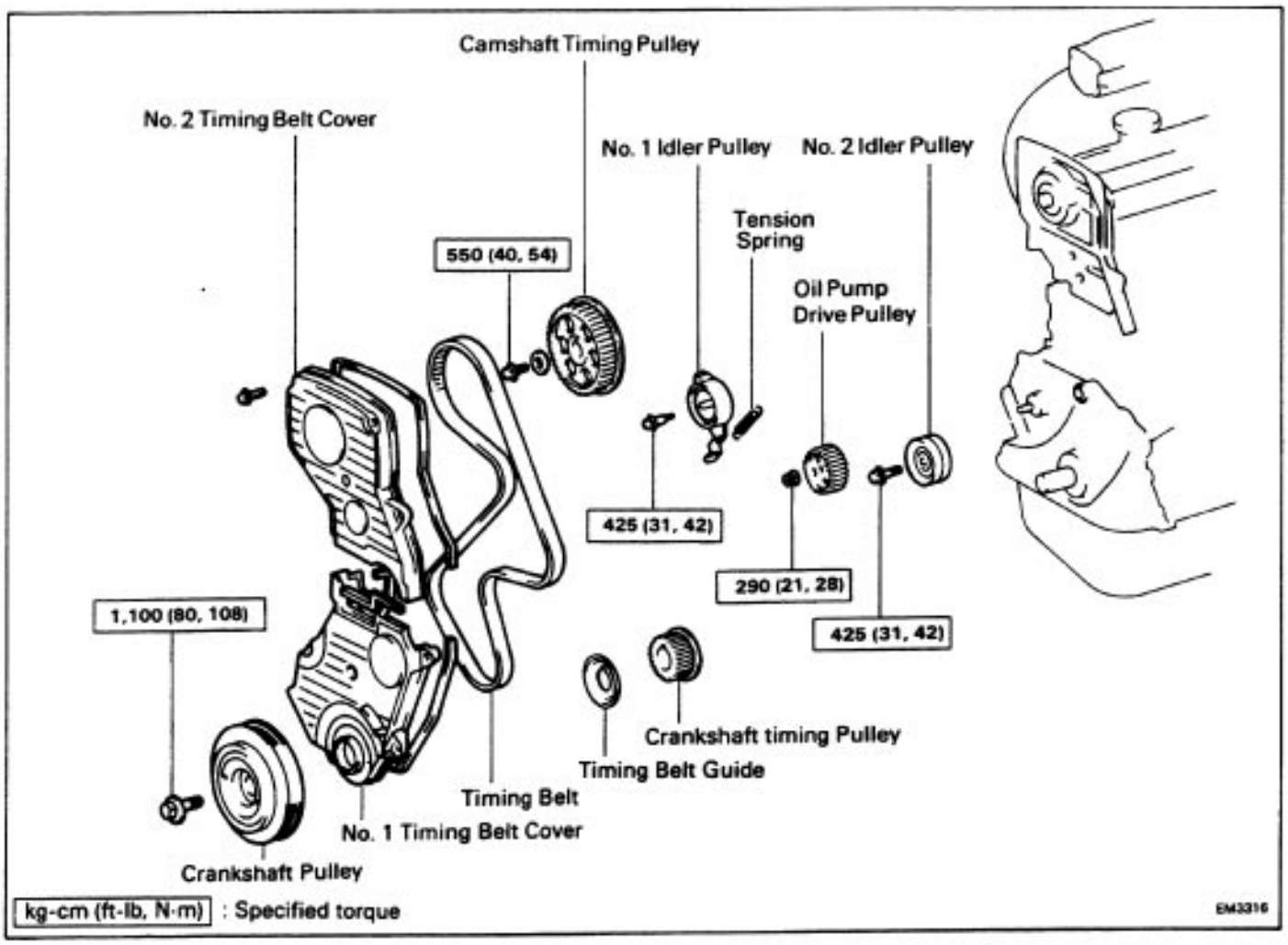
Torque: 180 kg–cm 0 3 ft–lb, 18 N–m)

7. RECONNECT DISTRIBUTOR CONNECTOR

8. RECONNECT COLD START INJECTOR CONNECTOR

TIMING BELT (3S–FE)

COMPONENTS



REMOVAL OF TIMING BELT

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. REMOVE RN FRONT WHEEL

3. REMOVE ENGINE RH UNDER COVER

4. REMOVE CRUISE CONTROL ACTUATOR

(See step 9 on page EM–108)

5. REMOVE DRIVE BELTS

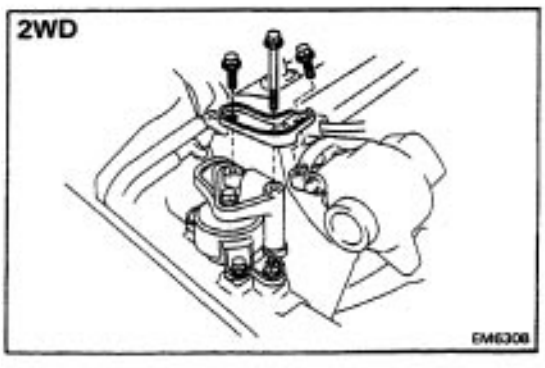
6. REMOVE ALTERNATOR (See page CH–6)

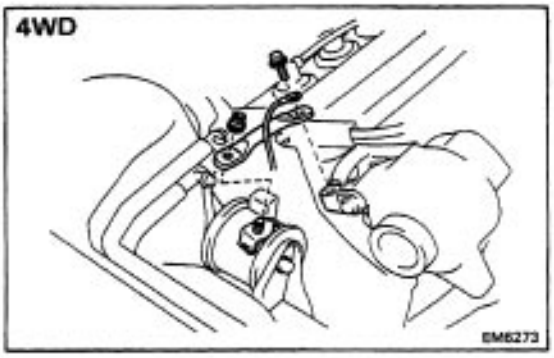
7. REMOVE ALTERNATOR BRACKET

8. REMOVE RH MOUNTING STAY

(2WD)

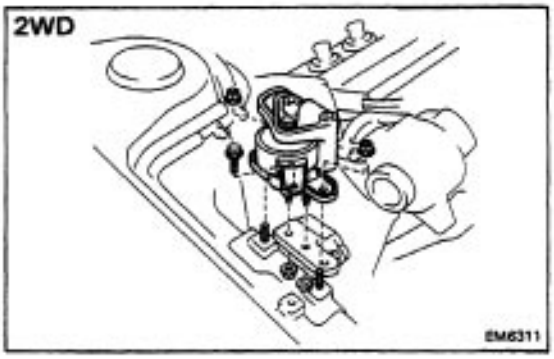
Remove the three bolts and mounting stay.





(4WD)

Remove the bolt, nut, ground strap and mounting stay.



9. SLIGHTLY JACK UP ENGINE

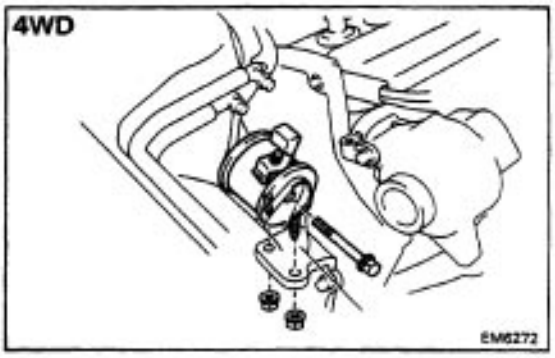
.

Raise the engine enough to remove the weight from the engine mounting on the right side.

10. REMOVE ENGINE RH MOUNTING INSULATOR AND BRACKET

(a) (2WD)

Remove the four nuts, bolt and mounting insulator.

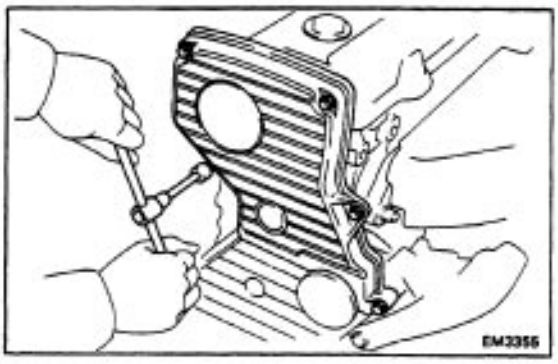


(b) (4WD)

Remove through bolt, two nuts and mounting insulator.

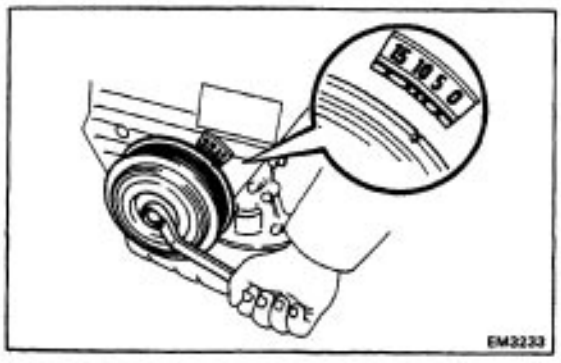
(c) Remove the three bolts and mounting bracket.

11. REMOVE SPARK PLUGS (See page IG–6)



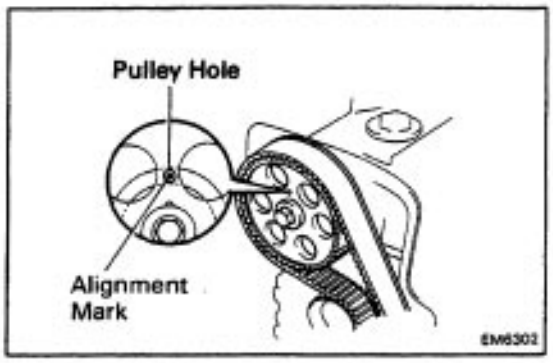
12. REMOVE No.2 TIMING BELT COVER

Remove the five bolts, belt cover and gaskets.

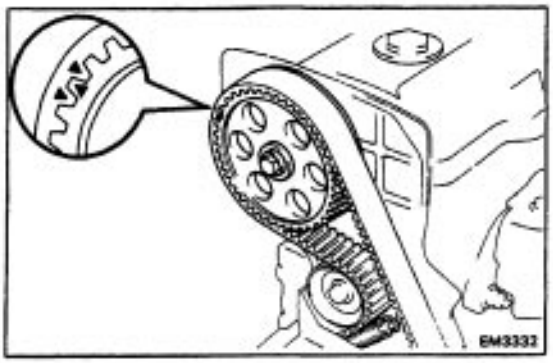


13. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley and align its groove with the timing mark ”0” of the No. 1 timing belt cover.

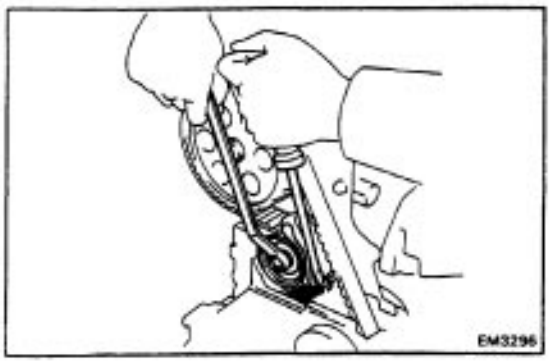


(b) Check that the hole of the camshaft timing pulley is aligned with the alignment mark of the bearing cap.
If not, turn the crankshaft one revolution (360°).

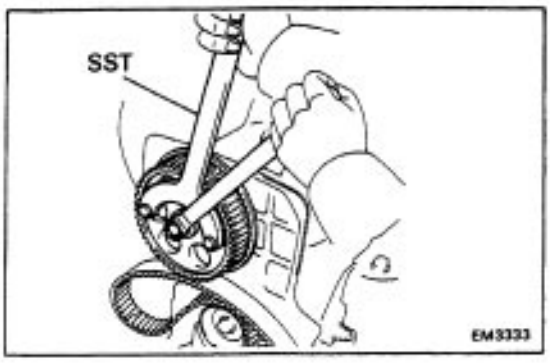


14. REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEY

HINT: If reusing the timing belt, place the matchmarks on the timing belt and camshaft timing pulley.

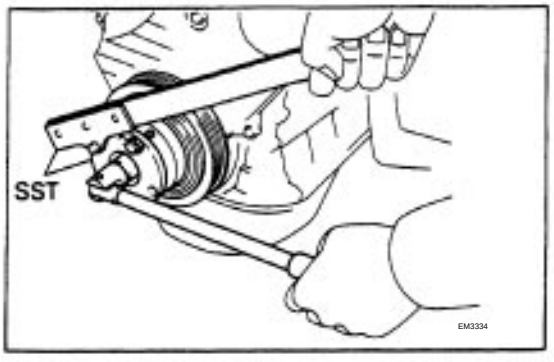


(a) Loosen the mount bolt of the No. 1 idler pulley and shift the pulley toward the left as far as it will go, temporarily tighten it.
(b) Remove the timing belt from the camshaft tinning pulley.



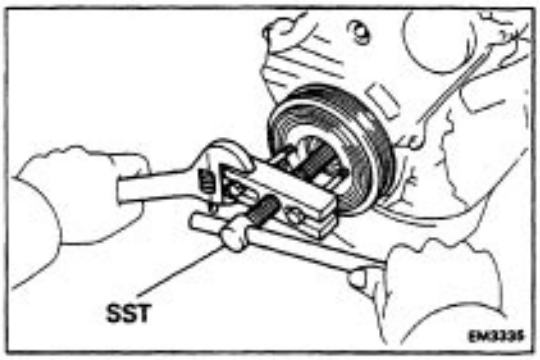
15. REMOVE CAMSHAFT TIMING PULLEY

Using SST, remove the bolt, plate washer and pulley.
SST 09278–54012

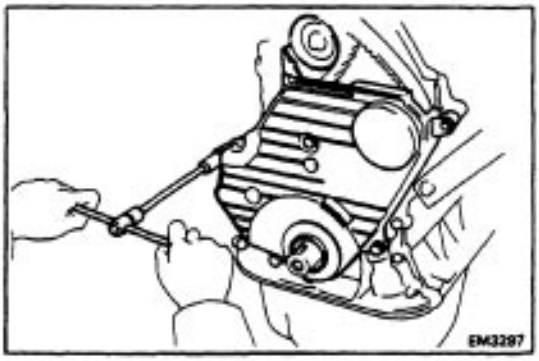


16. REMOVE CRANKSHAFT PULLEY

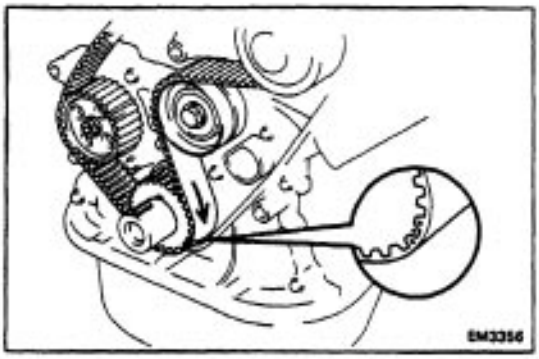
(a) Using SST, remove the pulley mount bolt.
SST 09213–54015 (09214–00030) and 09330–00021



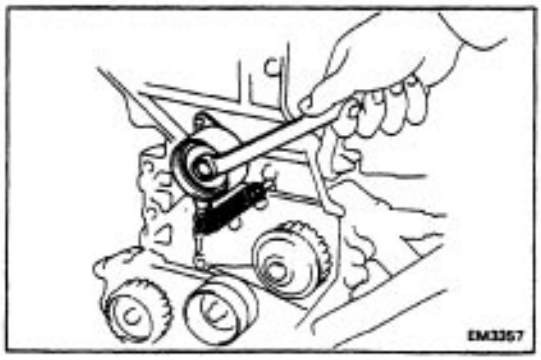
(b) Using SST, remove the pulley.
SST 09213–60017 (09213–00020, 09213–00030 09213–00050)



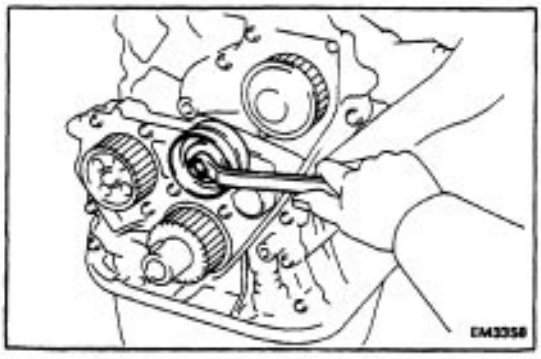
17. REMOVE NO.1 TIMING BELT COVER
Remove the four bolts, belt cover and gasket.



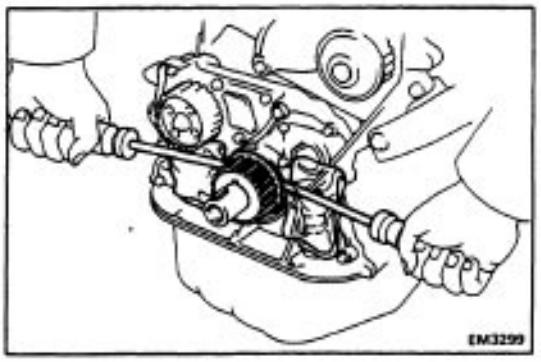
18. REMOVE TIMING BELT AND BELT GUIDE
HINT: If reusing the tinning belt, draw a direction arrow on the timing belt (in direction of engine revolution), and place the matchmarks on the timing belt and crankshaft timing pulley.



19. REMOVE NO.1 IDLER PULLEY AND TENSION SPRING
Remove the bolt, pulley and tension spring.



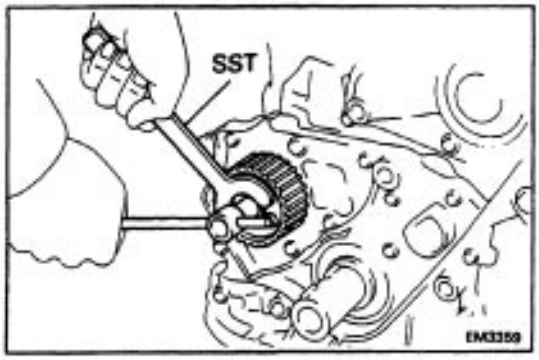
20. REMOVE NO.2 IDLER PULLEY
Remove the bolt and pulley.



21. REMOVE CRANKSHAFT TIMING PULLEY

If the pulley cannot be removed by hand, use two screwdrivers.

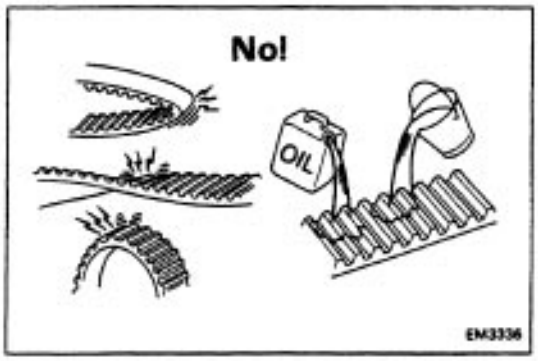
HINT: Position shop rags as shown to prevent damage.



22. REMOVE OIL PUMP PULLEY

Using SST, remove the nut and pulley.

SST 09616–30011

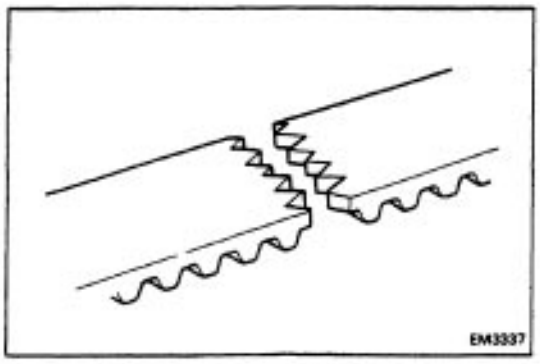


INSPECTION OF TIMING BELT COMPONENTS

1. INSPECT TIMING BELT

NOTICE:

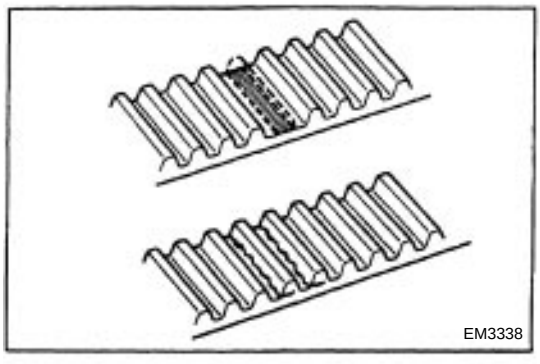
- **Do not bend, twist or turn the timing belt inside out.**
- **Do not allow the timing belt to come into contact with oil, water or steam.**
- **Do not utilize timing belt tension when installing or removing the mount bolt of the camshaft timing pulley.**



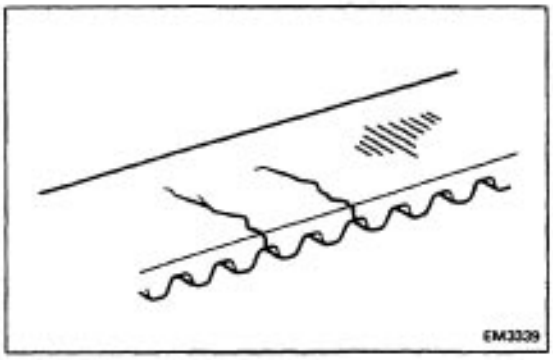
If there are any defects as shown in the figures, check the following points:

(a) Premature parting

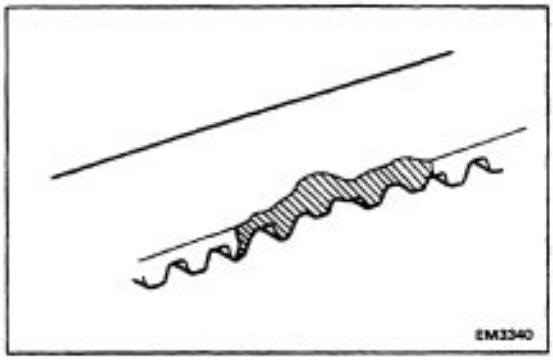
- Check for proper installation.
- Check the timing cover gasket for damage and proper installation.



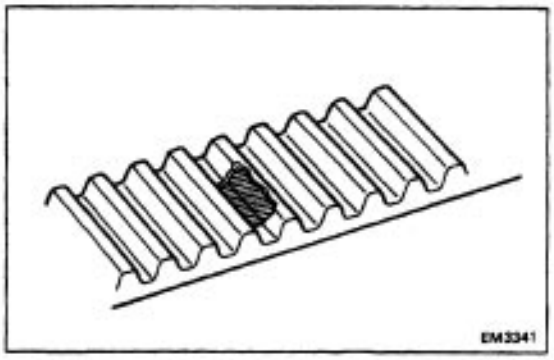
(b) If the belt teeth are cracked or damaged, check to see if either the camshaft, water pump is locked.



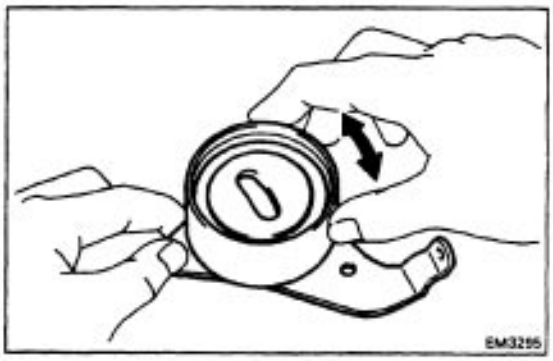
(c) If there are cracks or noticeable wear on the belt face, check to see if there are nicks on the side of the idler pulled lock.



(d) If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.

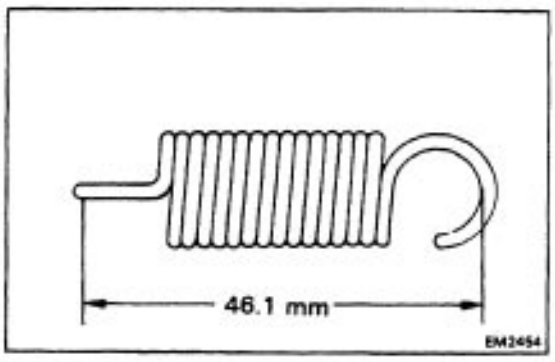


(e) If there is noticeable wear on the belt teeth, check timing cover for damage and check for correct gasket installation. Check for foreign material on the pulley teeth.
If necessary, replace the timing belt.



2. INSPECT IDLER PULLEYS

Check the turning smoothness of the idler pulley.
If necessary, replace the idler pulley.



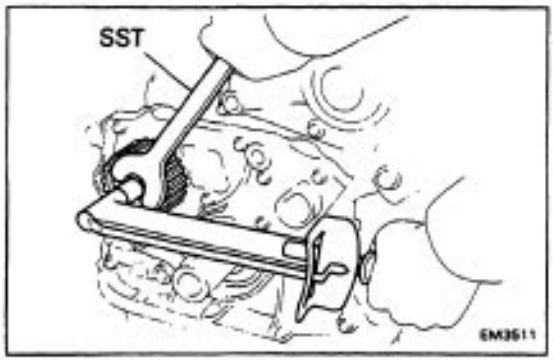
3. INSPECT TENSION SPRING

(a) Measure the free length of tension spring.
Free length: 46.1 mm (1.815 in.)

If the free length is not as specified, replace the tension spring.

(b) Measure the tension of the tension spring at the specified installed length.
Installed tension:
6.0 – 7.0 kg (13.2 – 15.4 lb, 59 – 69 N–m)
at 50.5 mm (1.988 in.)

If the installed tension is not as specified, replace the tension spring.



INSTALLATION OF TIMING BELT

(See page EM–23)

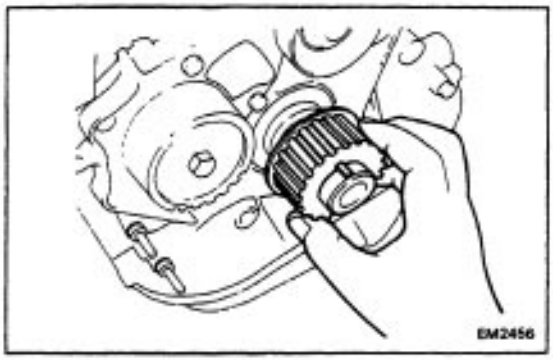
1. INSTALL OIL PUMP PULLEY

(a) Align the cutouts of the pulley and shaft, and slide the pulley.

(b) Using SST, install and torque the nut.

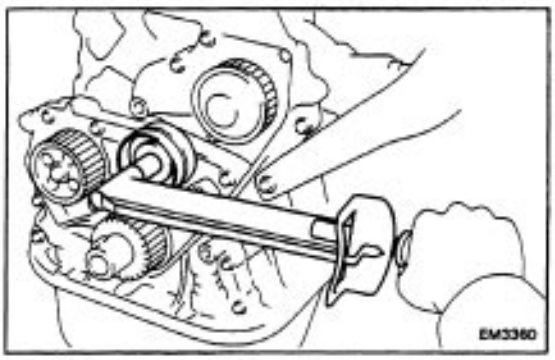
SST 09616–30011

Torque: 290 kg–cm (21 ft–lb, 28 N–m)



2. INSTALL CRANKSHAFT TIMING PULLEY

Align the pulley set key with the key groove of the pulley, and slide the pulley.



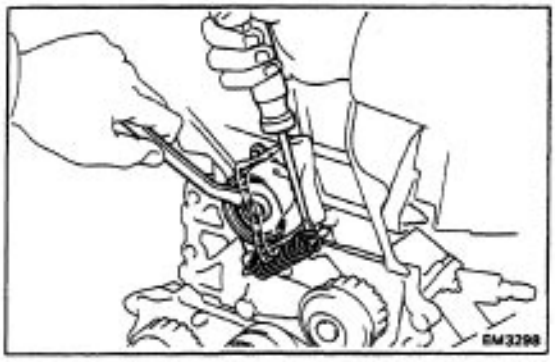
3. INSTALL NO.2 IDLER PULLEY

(a) Install the pulley with the bolt. Torque the bolt.

Torque: 425 kg–cm (31 ft–lb, 42 N–m)

(b) Check that the pulley moves smoothly.

HINT: Remove any oil or water on the idler pulley and keep it clean.

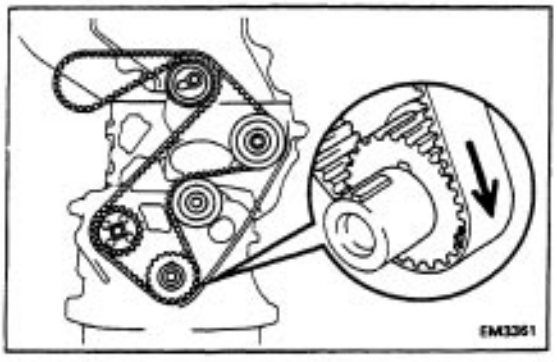


4. TEMPORARILY INSTALL NO.1 IDLER PULLEY AND TENSION SPRING

(a) Install the pulley with the bolt. Do not tighten the bolt yet.

(b) Install the tension spring.

(e) Pry the pulley toward the left as far as it will go and tighten the bolt.

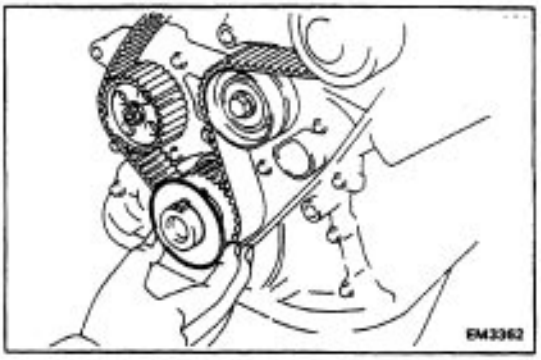


5. TEMPORARILY INSTALL TIMING BELT

NOTICE: The engine should be cold.

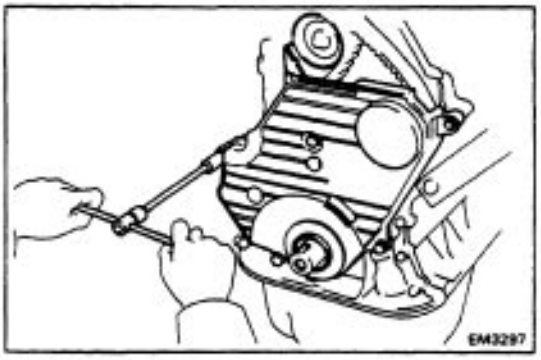
Install the timing belt on the crankshaft timing, oil pump, No–2 idler and water pump pulleys.

HINT: If reusing the timing belt, align the points marked during removal, and install the belt with the arrow pointing in the direction of engine revolution.



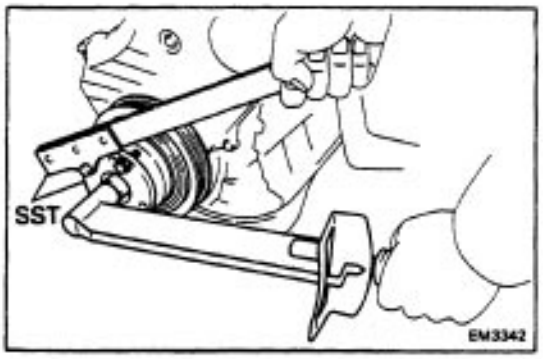
6. INSTALL TIMING BELT GUIDE

Install the guide, facing the cup side outward.



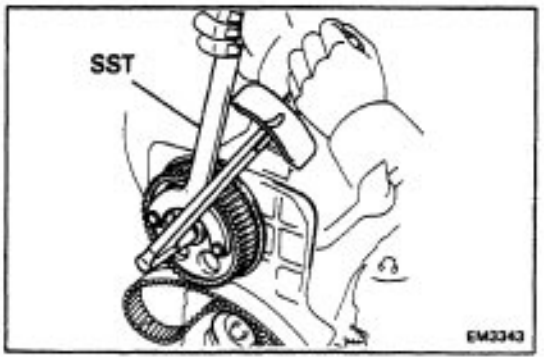
7. INSTALL NO.1 TIMING BELT COVER

(a) Install the gasket to the belt cover.
(b) Install the belt cover with the four bolts.



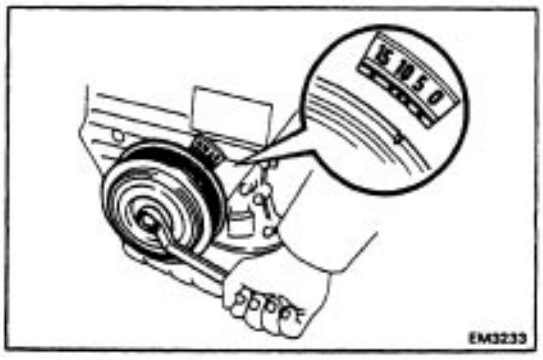
8. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the pulley, slide the pulley.
(b) using SST, install and torque the bolt.
SST 09213–54015 (09213–00030) and 09330– 21
Torque: 1,100 kg–cm (80 ft–lb, 108 N–m)



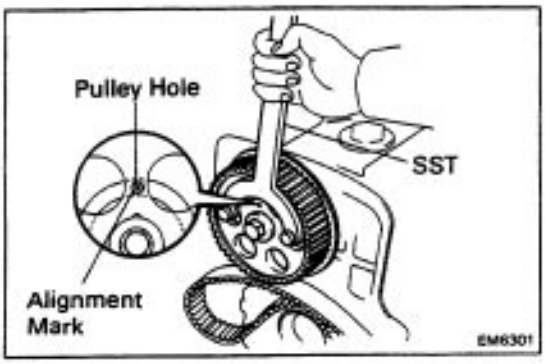
9. INSTALL CAMSHAFT TIMING PULLEY

(a) Align the camshaft knock pin with the knock pin groove of the pulley, and slide the pulley.
(b) Using SST, install the plate washer and bolt.
Torque the bolt.
SST 09278–54012
Torque: 550 kg–cm (40 ft–lb, 54 N–m)

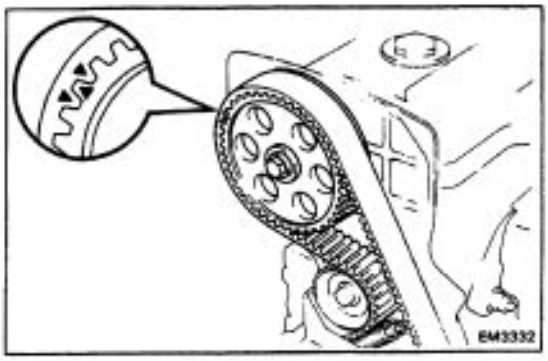


10. SET NO.1 CYLINDER .TO TDC/COMPRESSION

(a) Turn the crankshaft pulley, and align the its groove with the ”0” timing mark of the No. 1 timing belt cover.

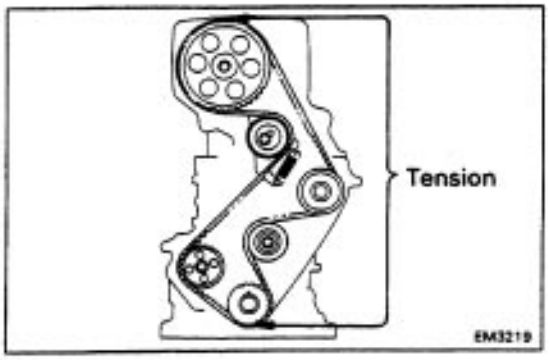


(b) Using SST, turn the camshaft, and align the hole of the camshaft timing pulley with the matchmark of the bearing cap.
SST 09278–54012

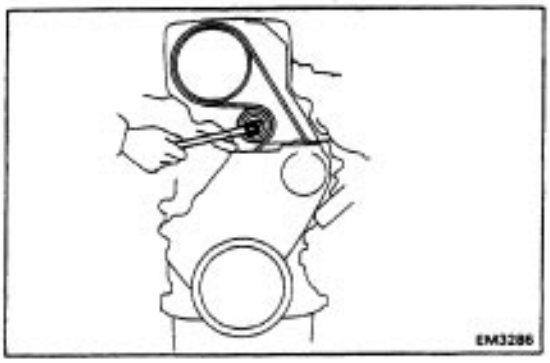


11. INSTALL TIMING BELT

HINT: If reusing the timing belt, first align the rnatchmarks of the timing belt and camshaft timing pulley.

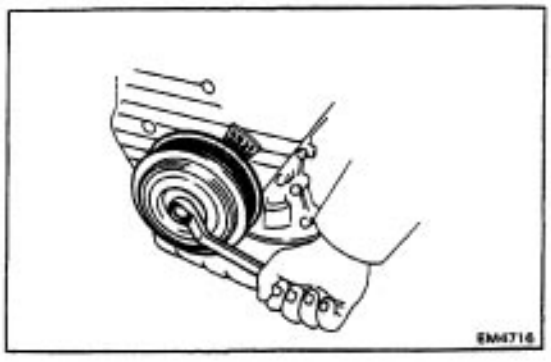


Install the timing belt, insure that there is tension between the crankshaft timing pulley, water pump pulley and camshaft timing pulley.



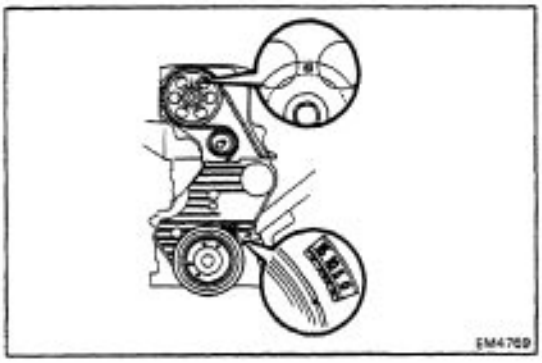
12. CHECK VALVE TIMING

(a) Loosen the No. 1 idler pulley mount bolt 1/2 turn.

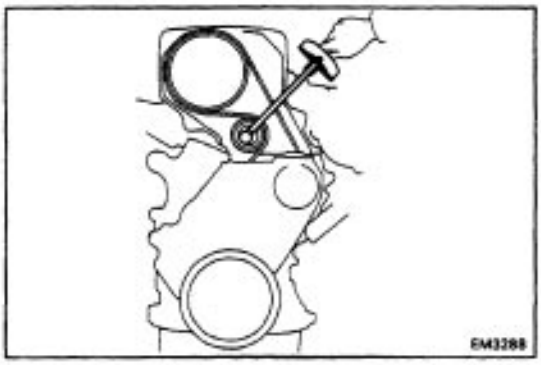


(b) Turn the crankshaft pulley two revolutions from TDC to TDC.

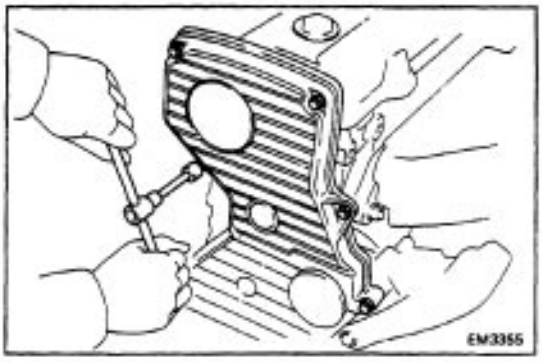
HINT: Always turn the crankshaft clockwise.



(c) Check that each pulley aligns with the timing marks as shown in the figure.
If the marks do not align, remove the timing belt and reinstall it.



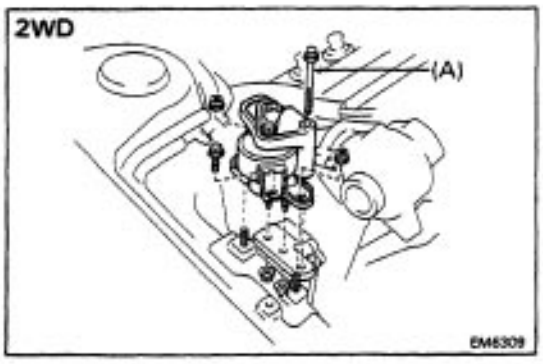
(d) Torque the mount bolt of the No.1 idler pulley.
Torque: 425 kg–cm (31 ft–lb, 42 N–m)



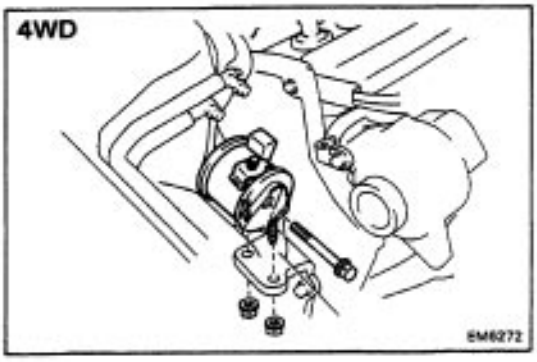
13. INSTALL NO–2 TIMING BELT COVER
(a) Install the two gaskets to the No. 1 and No.2 belt covers.
(b) Install the belt cover with the five bolts.

14. INSTALL SPARK PLUGS (See page IG–7)
Torque: 180 kg–cm (13 ft–lb, 18 N–m)

15. INSTALL ENGINE RH MOUNTING INSULATOR AND BRACKET
(a) Install the bracket with the three bolts. Torque the bolts.
Torque: 530 kg–cm (38 ft–ib, 52 N–m)



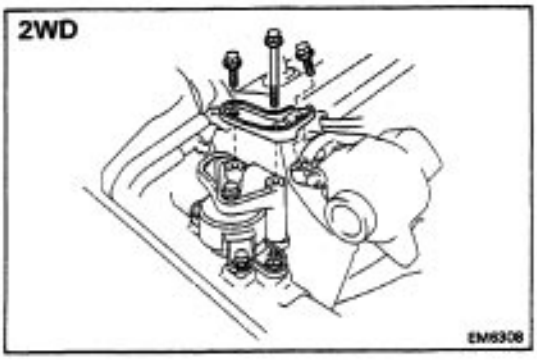
(b) (2WD)
Install the mounting insulator to the mounting bracket and body, and temporarily install the mounting insulator bolt, four nuts and mounting stay bolt (A). Torque the mounting insulator bolt and four nuts. Do not torque the mounting stay bolt (A) yet.
Torque:
Bolt 650 kg–cm (47 ft–lb, 64 N–m)
Nut To bracket 530 kg–cm (38 ft–lb, 52 N–m)
To body 900 kg–cm (65 ft–11b, 88 N–m)



(c) (4WD)
Install the mounting insulator with the through bolt and two nuts. Torque the through bolt and nuts.

Torque:
Through bolt 890 kg–cm (64 ft–lb, 87 N–m)
Nut 530 kg–cm (38 ft–lb, 52 N–m)

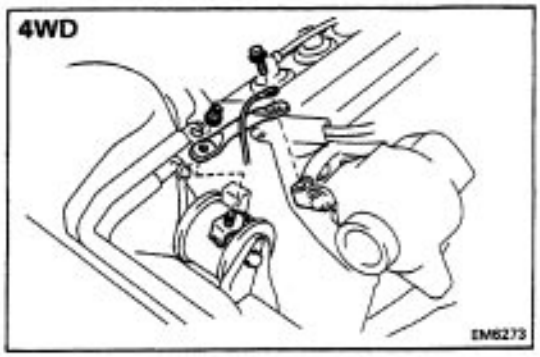
16. LOWER ENGINE



17. INSTALL ENGINE RH MOUNTING STAY (2WD)

Install the mounting stay with the three bolts. Torque the bolts.

Torque: 740 kg–cm (54 ft–lb, 73 N–m)



(4WD)

Install the mounting stay and ground strap with the bolt and nut. Torque the bolt and nut.

Torque: 740 kg–cm (54 ft–lb, 73 N–m)

18. INSTALL ALTERNATOR BRACKET

Torque: 425 kg–cm (31 ft–lb, 42 N–m)

19. INSTALL ALTERNATOR (See page CH–14)

20. INSTALL DRIVE BELTS

Adjust the drive belts. (See page CH–3)

Drive belt tension:
Alternator w/ A/C . New belt 175 ± 5 lb
Used belt 130 ± 10 lb
w/o, A/C New belt 125 ± 25 lb
Used belt 9 5 ± 20 lb
PS pump New belt 125 ± 10 lb
Used belt 80 ± 20 lb

21. INSTALL CRUISE CONTROL ACTUATOR (See step 26 on page EM–137)

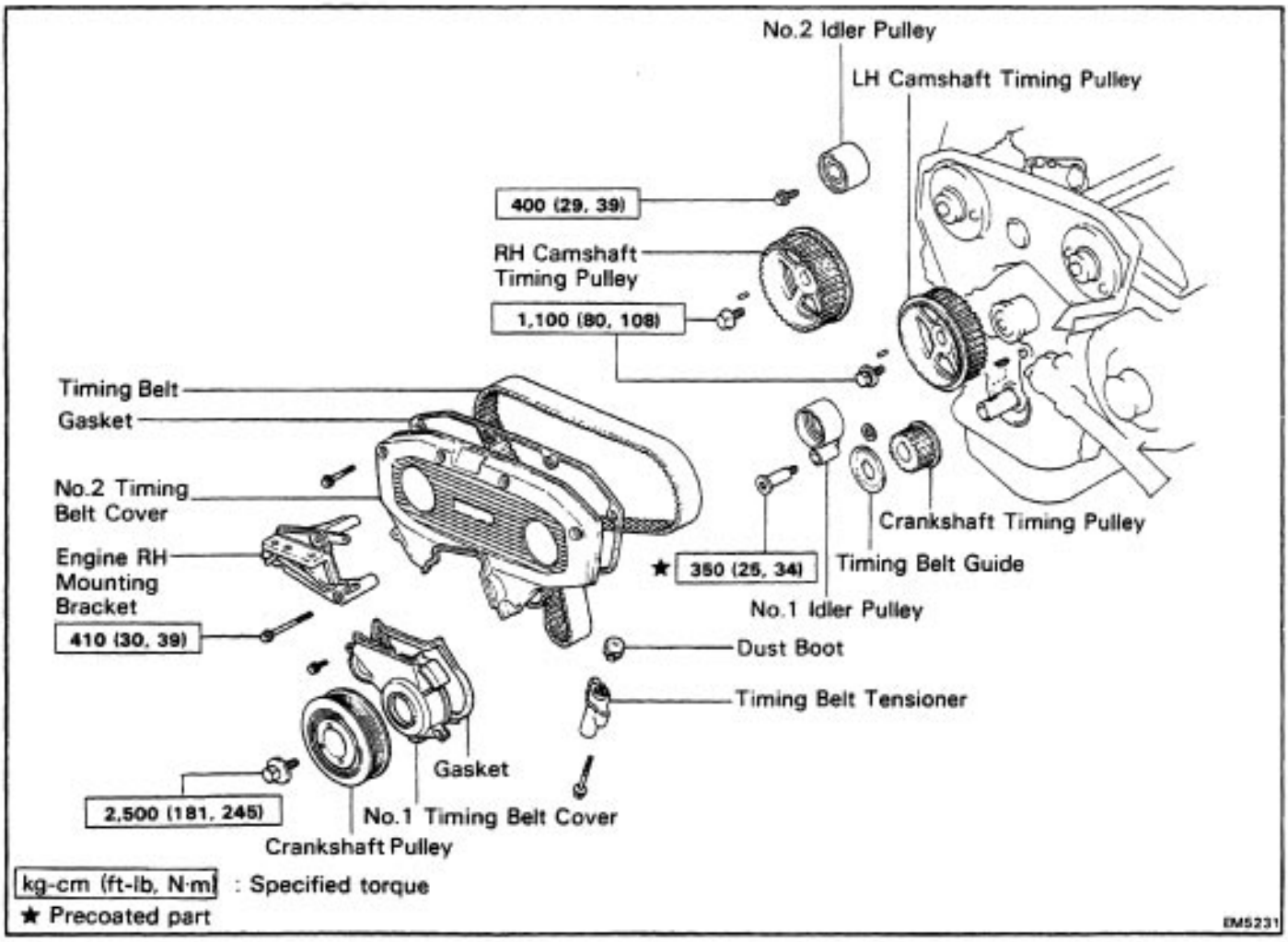
22. INSTALL ENGINE RH UNDER COVER

23. INSTALL RH FRONT WHEEL

24. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

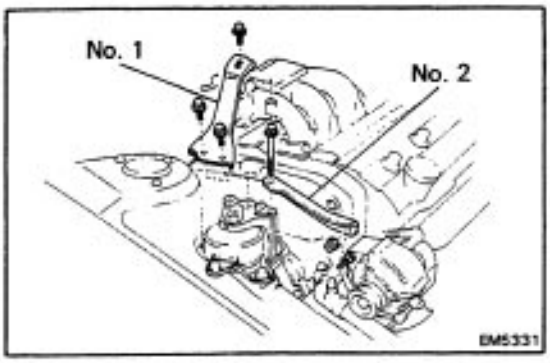
TIMING BELT (2VZ–FE)

COMPONENTS



REMOVAL OF TIMING BELT

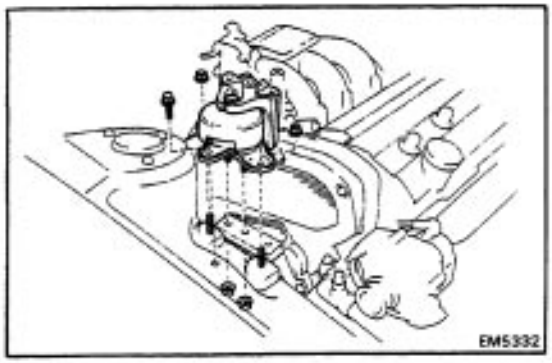
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. (w/ CRUISE CONTROL SYSTEM)
   REMOVE CRUISE CONTROL ACTUATOR AND VACUUM PUMP
   (See step 14 on page EM–140 or 141)
3. REMOVE PS OIL RESERVOIR TANK WITHOUT DISCONNECTING HOSES
   (See step 35 on page EM–144)
4. REMOVE RH FRONT WHEEL
5. REMOVE ALTERNATOR DRIVE BELT
6. REMOVE RH FENDER APRON SEAL
7. REMOVE PS DRIVE BELT



8. REMOVE ENGINE RH MOUNTING STAYS

(a) Remove the three bolts and No.1 mounting stay.

(b) Remove the bolt, nut and No.2 mounting stay.



9. SLIGHTLY JACK UP ENGINE

Raise the engine enough to remove the weight from the engine mounting on the right side.

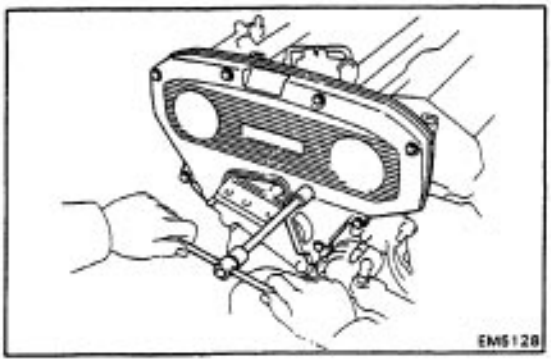
10. REMOVE ENGINE RH MOUNTING INSULATOR

(a) (w/ A.B.S..)

Remove the clamp bolts of the PS oil cooler pipes.

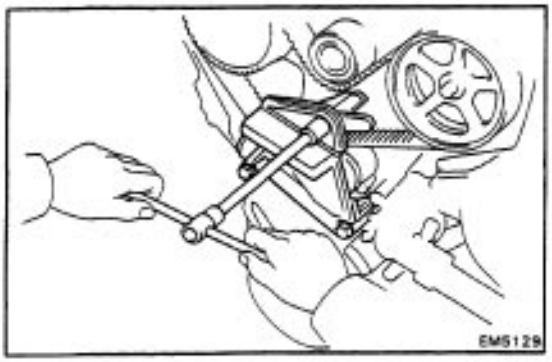
(b) Remove the bolt, four nuts and mounting insulator.

11. REMOVE SPARK PLUGS (See page IG–11)



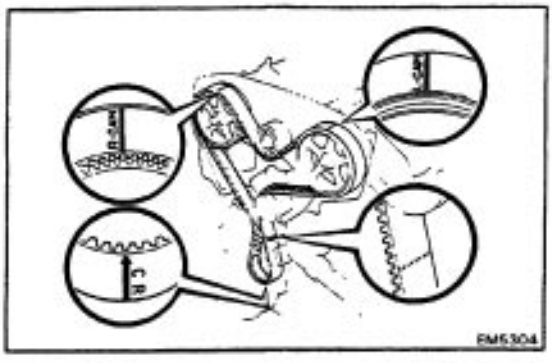
12. REMOVE NO.2 TIMING BELT COVER

Remove the eight bolts, timing belt cover and gasket.



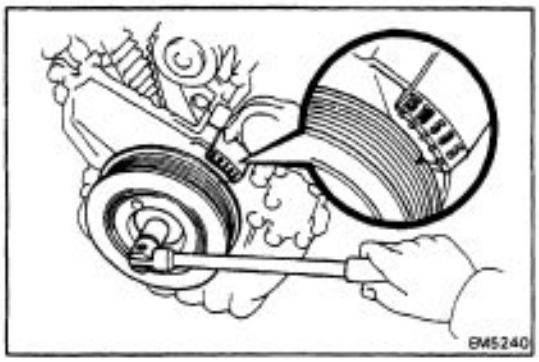
13. REMOVE ENGINE RH MOUNTING BRACKET

Remove the three bolts and mounting bracket.



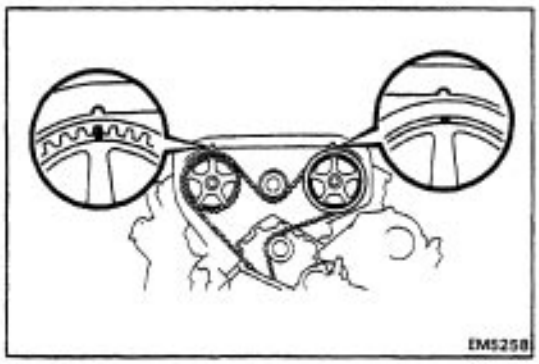
14. IF RE–USING TIMING BELT, CHECK INSTALLATION MARKS ON TIMING BELT

Check that there are four installation marks on the timing belt by turning the crankshaft pulley as shown in the illustration. If the installation marks have disappeared, place a new installation mark on .the timing belt before removing each part.

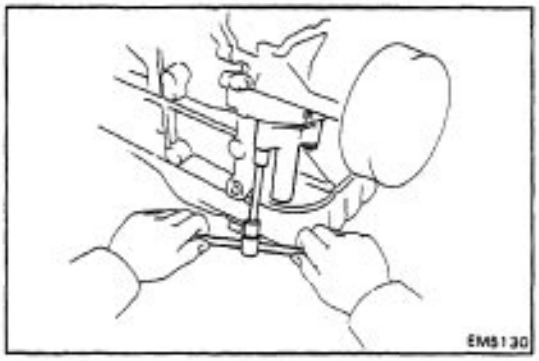


15. SET NO.1 CYLINDER TO TDCI COMPRESSION

(a) Turn the crankshaft pulley and align its groove with the timing mark ”0” of the No.1 timing belt cover.

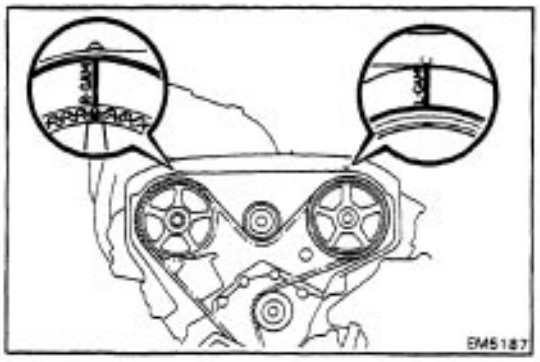


(b) Check that timing marks of the camshaft timing pulleys and No–3 timing belt cover are aligned. If not, turn the crankshaft one revolution (360˚).



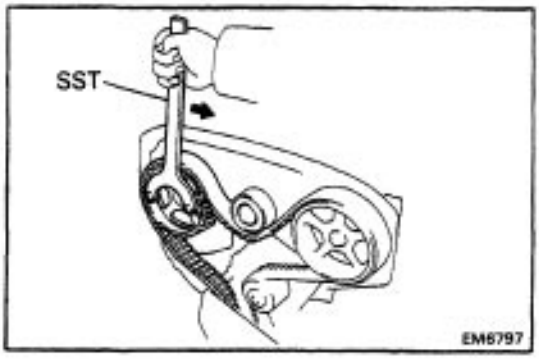
16. REMOVE TIMING BELT TENSIONER

Remove the two bolts, tensioner and dust boot.

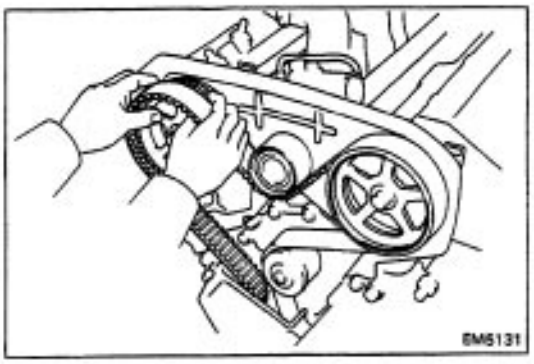


17. REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEY

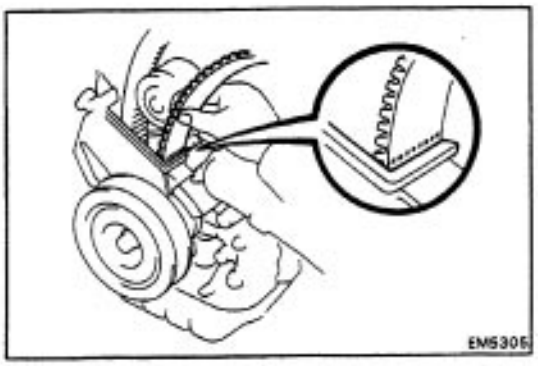
HINT (Re–using timing belt): If the installation marks have disappeared, before removing the timing belt, place new instillation marks on the timing belt to match the timing marks of the camshaft timing pulleys.



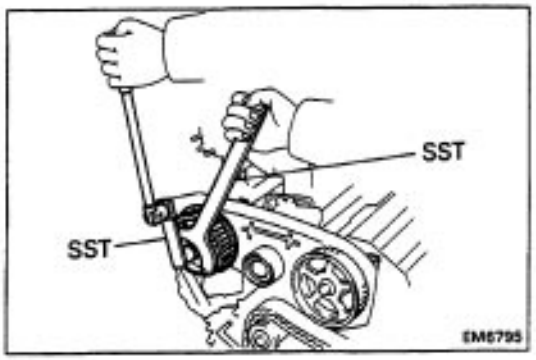
(a) Using SST, loosen– the tension between the LH and RH camshaft timing pulleys by slightly turning the RH camshaft timing pulley clockwise.
SST 09278–54012



(b) Remove the timing belt from the camshaft timing pulleys.



HINT (Re–using timing belt): If the installation marks have disappeared, after removing the timing belt from the camshaft timing pulleys, place new installation mark on the timing belt to match the end of the No. 1 timing belt cover.



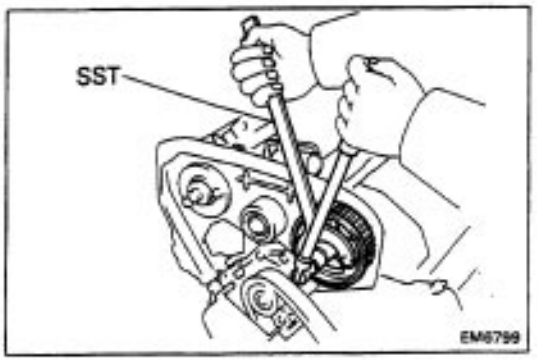
20. REMOVE CAMSHAFT TIMING PULLEYS

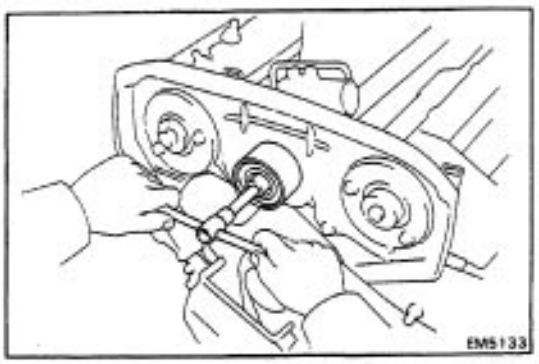
Using SST, remove the bolt, timing pulley and knock pin. Remove the two timing pulleys.

SST R H 09249–63010 and 09278–54012

LH 09278–54012

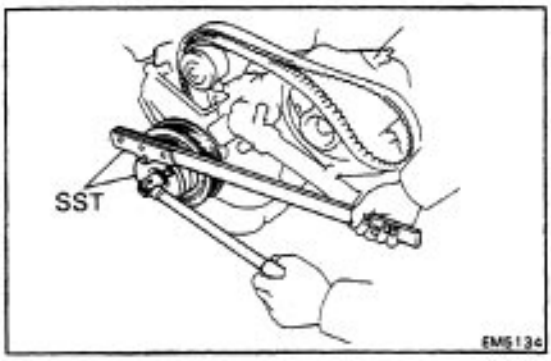
HINT: Arrange the RH and LH pulleys.





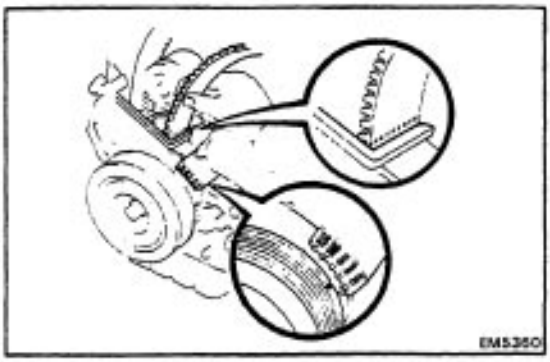
21. REMOVE NO. 2 IDLER PULLEY

Remove the bolt and idler pulley.

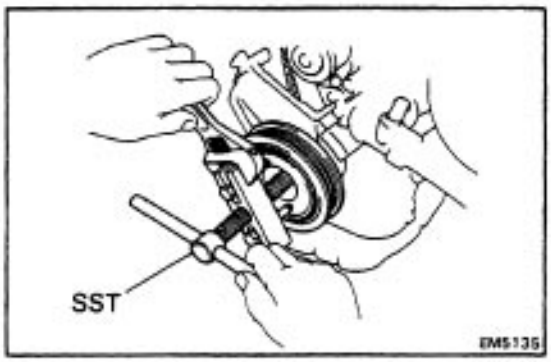


22. REMOVE CRANKSHAFT PULLEY

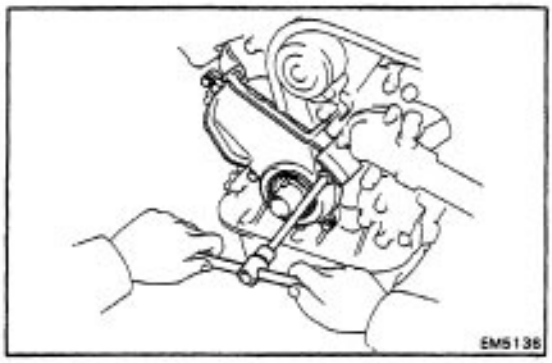
(a) Using SST, remove the pulley bolt.
SST 09213–54014 (Body),
90213–70010 (90105–08076 (Bolt)) and 09330–00021



HINT (Re–using timing belt): When the crankshaft pulley bolt is loosened, the position of the timing mark of the crankshaft pulley and also the installation mark may slip, so check and align them again.

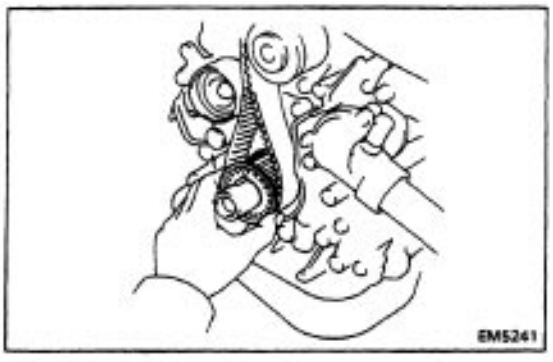


(b) Using SST, remove the pulley.
SST 09213–60017

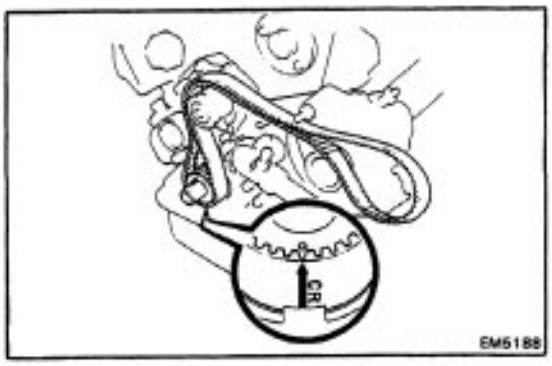


23. REMOVE NO. 1 TIMING BELT COVER

Remove the four bolts, timing belt cover and gasket.

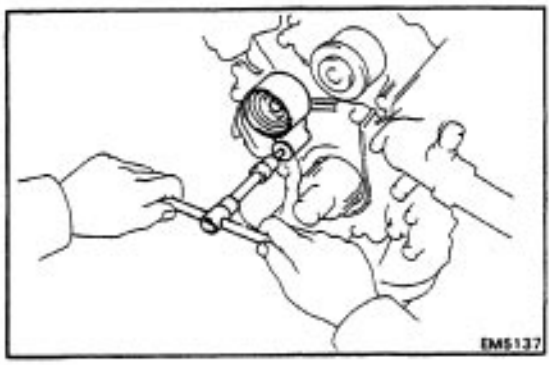


24. REMOVE TIMING BELT GUIDE



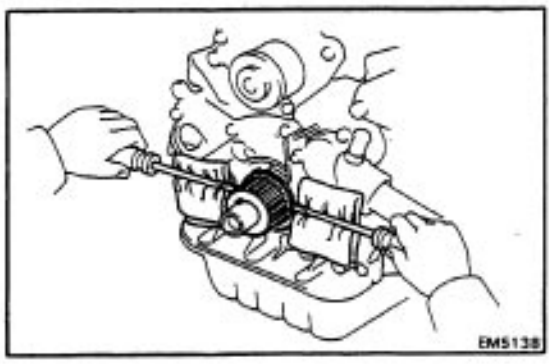
25. REMOVE TIMING BELT

HINT (Re–using timing belt): If the installation marks have disappeared, place new installation mark on the timing belt to match the drilled mark of the crankshaft timing pulley.



26. REMOVE NO. 1 IDLER PULLEY

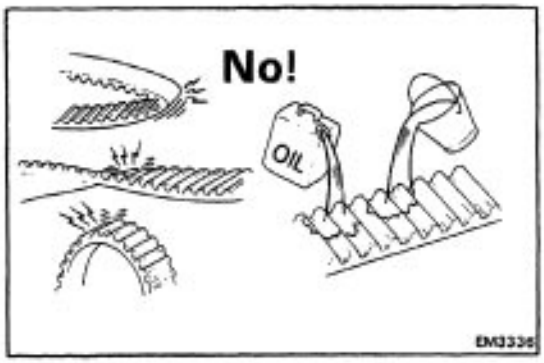
Using a 8 mm hexagon wrench, remove the bolt, idler pulley and plate washer.



27. REMOVE CRANKSHAFT TIMING PULLEY

If the pulley cannot be removed by hand, use two screwdrivers.

HINT: Position shop rags as shown to prevent damage.



INSPECTION OF TIMING BELT COMPONENTS

1. INSPECT TIMING BELT

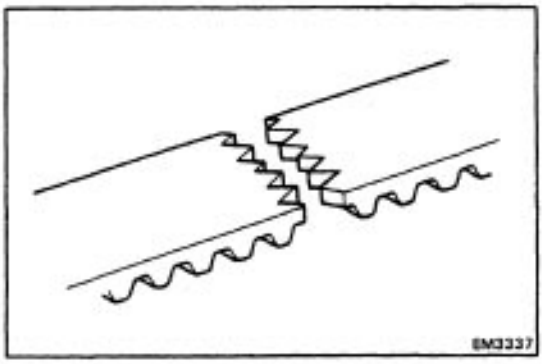
NOTICE:

- Do not bend, twist or turn the timing belt inside out.
- Do not allow the timing belt to come into contact with oil, water or steam.
- Do not utilize timing belt tension when installing or removing the mount bolt of the camshaft timing pulley.

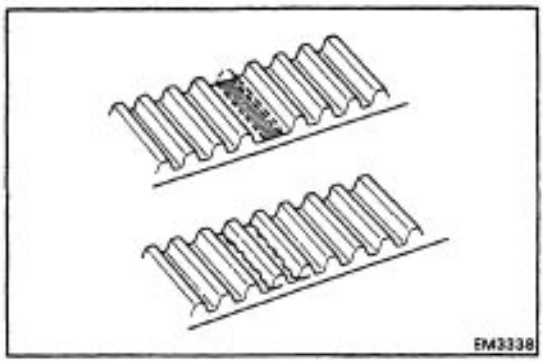
If there are any defects as shown in the figures, check the following points:

(a) Premature parting

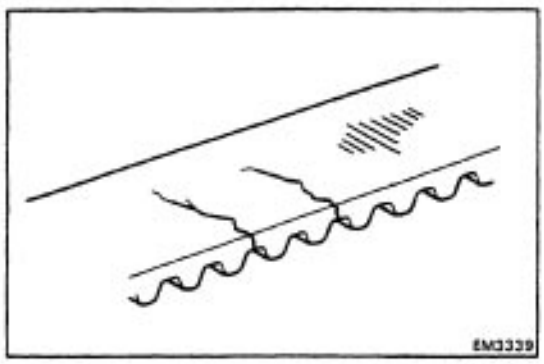
- Check for proper installation.
- Check the timing cover gasket for damage and proper installation.



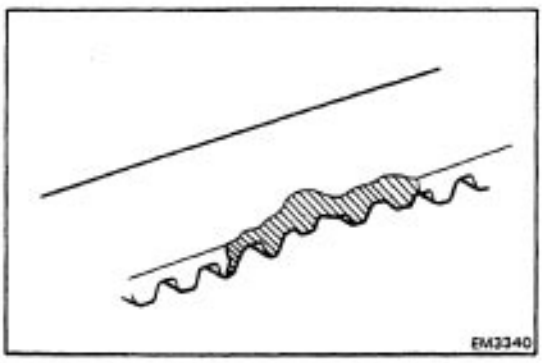
(b) If the belt teeth are cracked or damaged, check to see if either camshaft is locked.

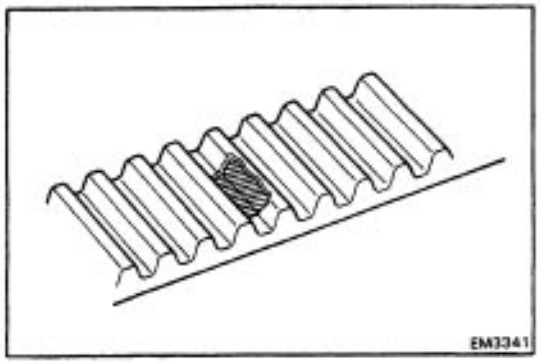


(c) If there are cracks or noticeable wear on the belt face, check to see if there are nicks on the side of the idler pulley lock and water pump.

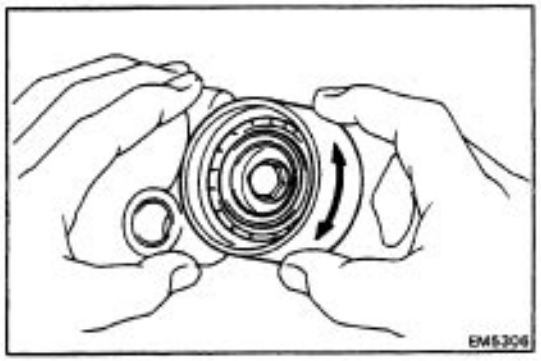


(d) If there is wear or damage on only one side of the belt, check the belt guide 'and the alignment of each pulley.

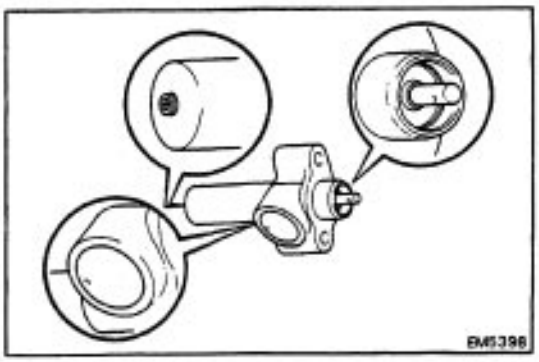




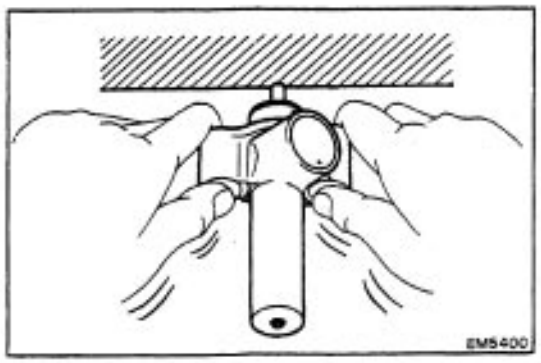
(e) If there is noticeable wear on the belt teeth, check timing cover for damage and check for correct gasket installation. Check for foreign material on the pulley teeth.
If necessary, replace the timing belt.



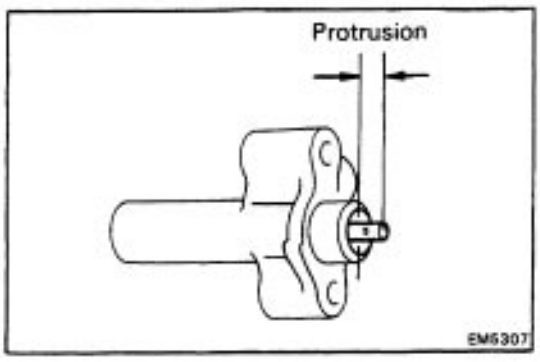
2. INSPECT IDLER PULLEYS
Check the turning smoothness of the idler pulley.
If necessary, replace the idler pulley.



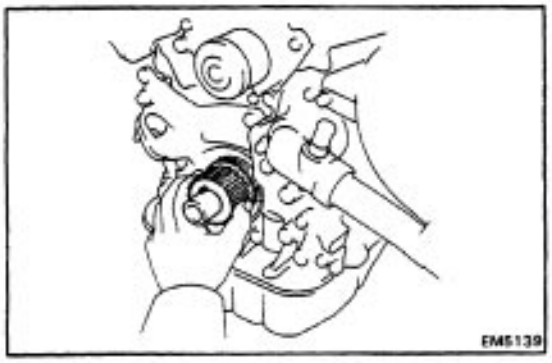
3. INSPECT TIMING BELT TENSIONER
(a) Visually check tensioner for oil leakage.
HINT: If there is only the faintest trace of oil on the seal on the push rod side, the tensioner is all right.
If leakage is found, replace the tensioner.



(b) Hold the tensioner with both hands and push the push rod strongly against the floor or wall to check that it doesn't move.
If the push rod moves, replace the tensioner.



(c) Measure the protrusion of the push rod from the housing end.
Protrusion: 10.5 – 11.5 mm (0.413 – 0.453 in.)
If the protrusion is not as specified, replace the tensioner.



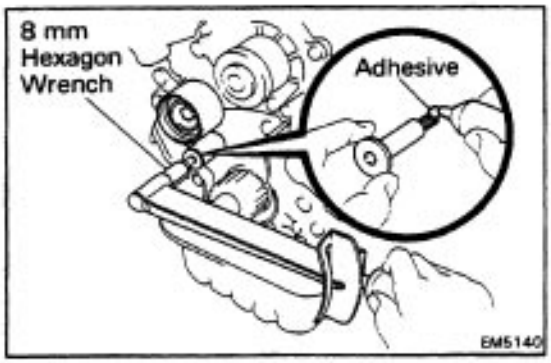
INSTALLATION OF TIMING BELT

(See page EM–34)

1. INSTALL CRANKSHAFT TIMING PULLEY

(a) Align the pulley set key with the key groove of the timing pulley.

(b) Slide the timing pulley, facing the flange side inward.

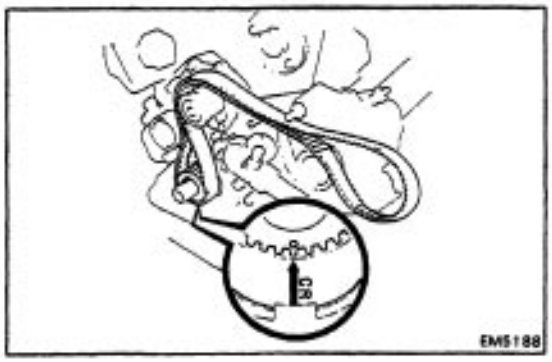


2. INSTALL NO–1 IDLER PULLEY

(a) Apply adhesive to two or three threads of the mount bolt end.
Adhesive: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Using a 8 mm hexagon wrench, install the idler pulley with the plate washer and bolt. Torque the bolt.
Torque: 350 kg–cm (25 ft–lb, 34 N–m)

(c) Check that the pulley bracket moves smoothly.



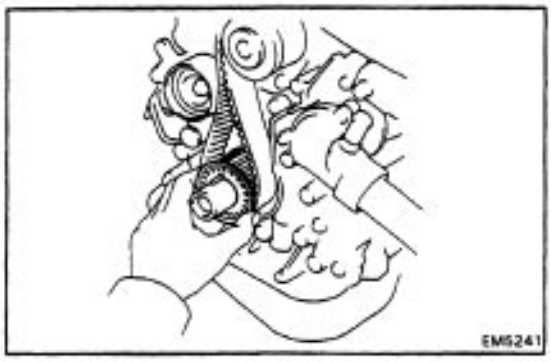
3. TEMPORARILY INSTALL TIMING BELT

NOTICE: The engine should be cold.

(a) Remove any oil or water on the crankshaft timing, No.1 idler and water pump pulleys, and keep them clean.

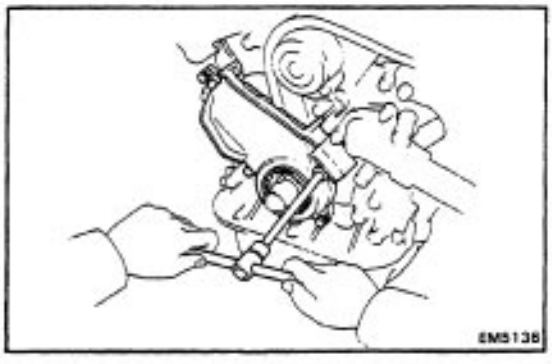
(b) Align the installation mark on the timing belt with the drilled mark of the crankshaft timing pulley.

(c) Install the timing belt on the crankshaft timing, No.1 idler and water pump pulleys.



4. INSTALL TIMING BELT GUIDE

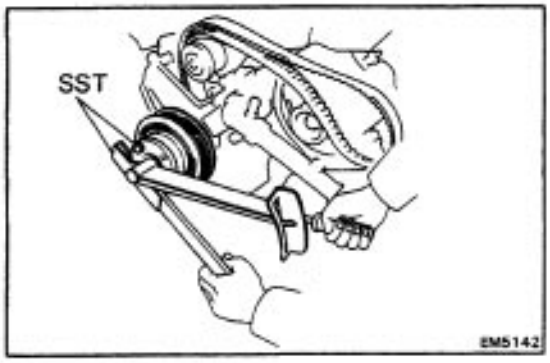
Install the belt guide, facing the cup side outward.



5. INSTALL NO.1 TIMING BELT COVER

(a) Install the gasket to the tinning belt cover.

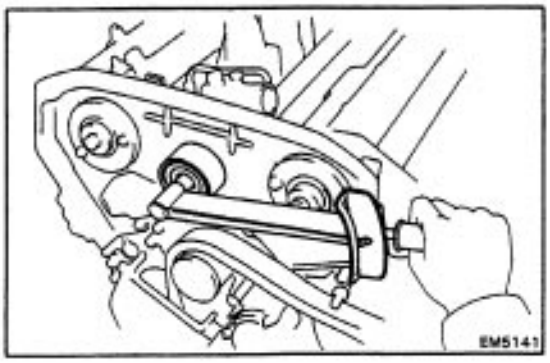
(b) Install the tinning belt cover with the four bolts.



6. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the pulley, slide the pulley.

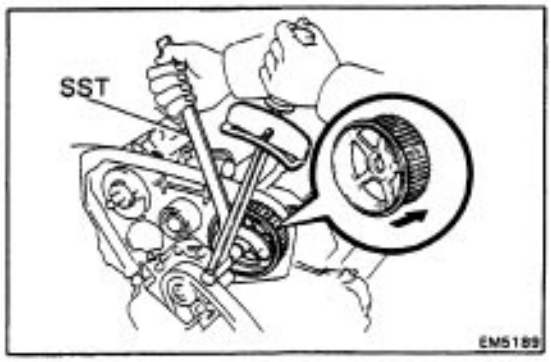
(b) Using SST, install and torque the the bolt.
SST 09213–54014 (Body),
09213–70010 (90105–08076 (Bolt)) and
09330–00021
Torque: 2,500 kg–cm (181 ft–ib, 245 N–m)



7. INSTALL NO.2 IDLER PULLEY

(a) Install the idler pulley with the bolt. Torque the bolt.
Torque: 400 kg–cm (29 ft–lb, 39 N–m)

(b) Check that the idler pulley moves smoothly.

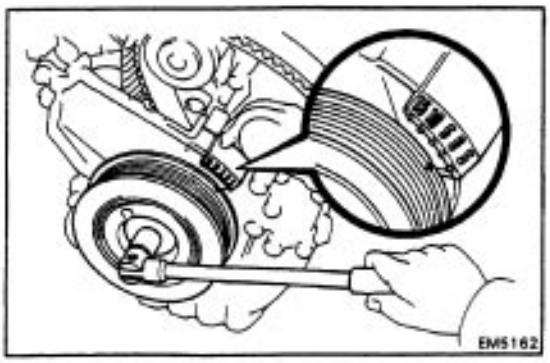


8. INSTALL LH CAMSHAFT TIMING PULLEY

(a) Slide the timing pulley, facing the flange side outward.

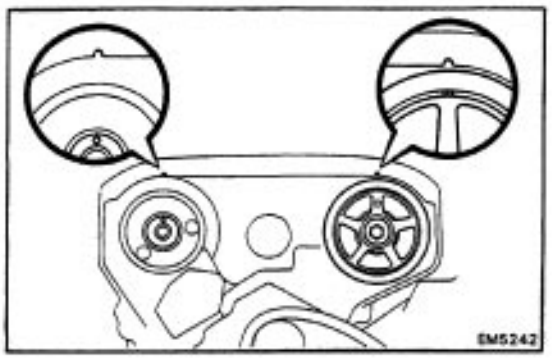
(b) Align the knock pin hole of the camshaft with the knock pin groove of the timing pulley, and install the knock pin.

(c) Using SST, install and torque the bolt.
SST 09278–54012
Torque: 1,100 kg–cm (80 ft–lb, 108 N–m)



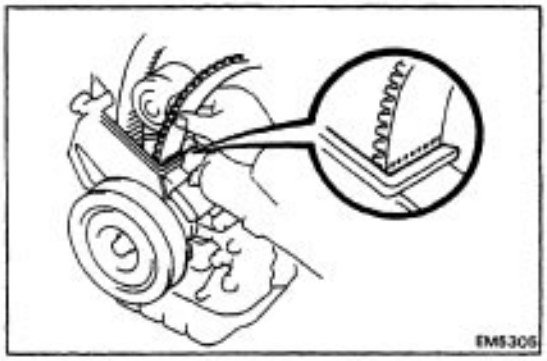
9. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) (Crankshaft Position)
Turn the crankshaft pulley, and align the its groove with the ”0” timing mark of the No.1 timing belt cover.



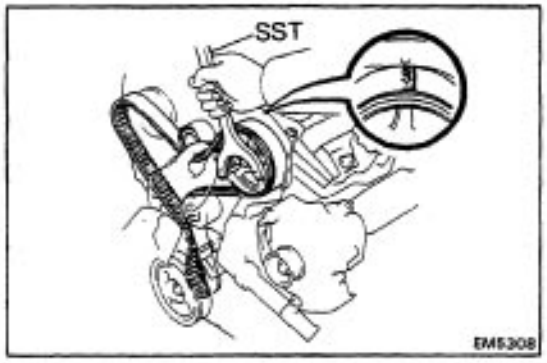
(b) (RH Camshaft Pulley Position)
Turn the camshaft, align the knock pin hole of the camshaft with the timing mark of the No.3 timing belt cover.

(c) (LH Camshaft Pulley Position)
Turn the camshaft timing pulley, align the timing marks of the camshaft timing pulley and No.3 timing belt cover.

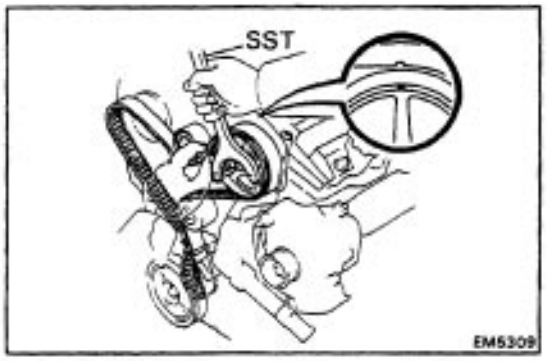


10. INSTALL TIMING BELT TO LH CAMSHAFT TIMING PULLEY

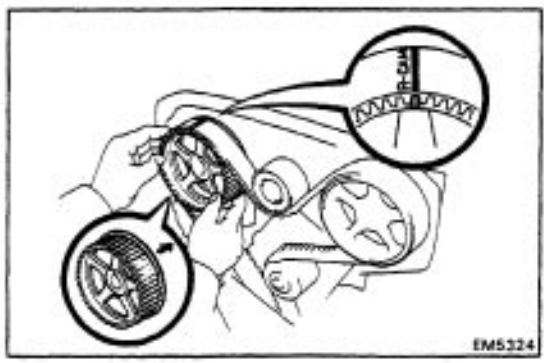
(a) Check that the installation mark on the timing belt matches the end of the No.1 timing belt cover–.
If the installation mark do not align, shift the meshing of the timing belt and crankshaft timing pulley until they align.



(b) Remove any oil or water on the LH camshaft timing pulley, and keep it clean.
(c) Using SST, slightly turn the LH camshaft timing pulley clockwise. Align the installation mark on the timing belt with the timing mark of the camshaft timing pulley, and hang the timing belt on the LH camshaft timing pulley.
SST 09278–54012

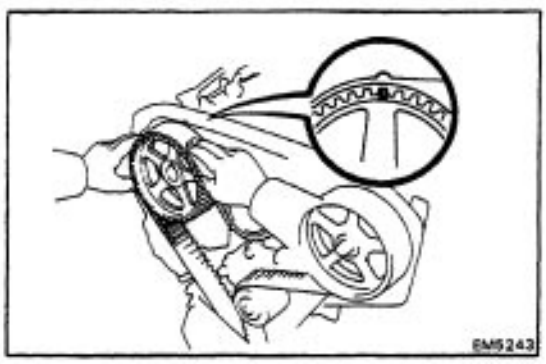


(d) Using SST, align the timing marks of the LH camshaft pulley and No.3 timing belt cover.
SST 09278–54012
(e) Check that the timing belt has tension between the crankshaft timing and LH camshaft timing pulleys.

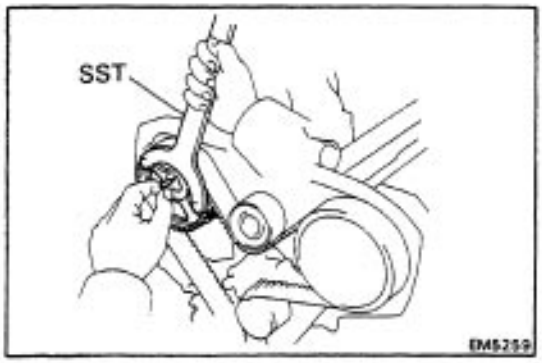


11. INSTALL RH CAMSHAFT TIMING PULLEY AND TIMING BELT

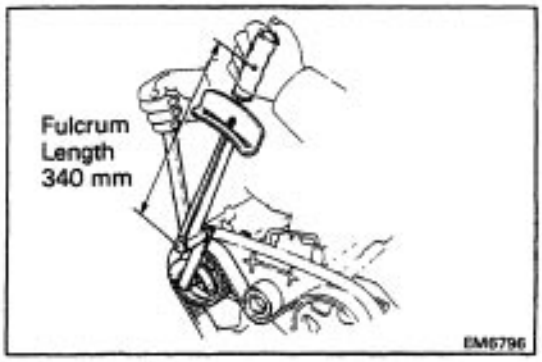
(a) Remove any oil or water on the RH camshaft timing and No–2 idler pulleys, and keep them clean.
(b) Align the installation mark on the timing belt with the timing mark of the RH camshaft timing pulley.
(c) Hang the timing belt on the RH camshaft timing pulley, facing the flange side inward.



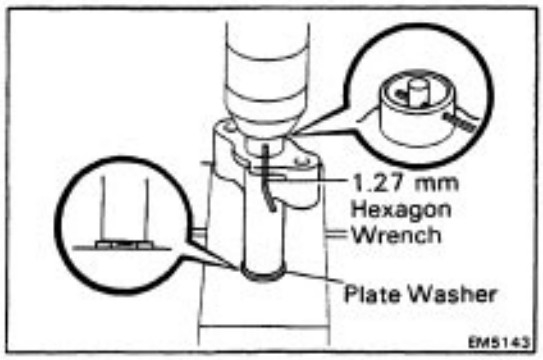
(d) Align the timing .marks of the RH camshaft timing pulley and No.3 timing belt cover.
(e) Slide the RH camshaft timing pulley on the camshaft.



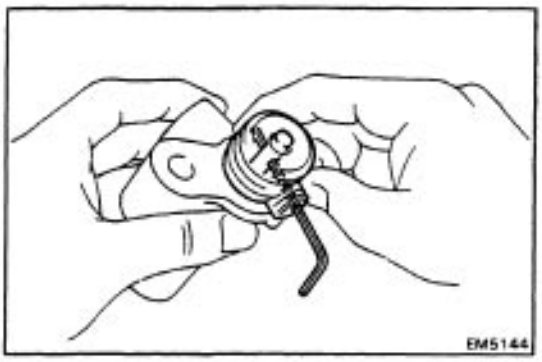
(f) Using SST, align the knock pin hole of the camshaft with the knock pin groove of the pulley and install the knock pin.
SST 09278–54012

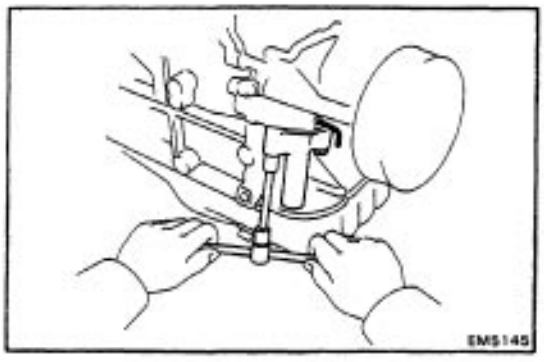


(g) Using SST, install and torque the bolt.
SST09249–63010 and 09278–54012
Torque: 760 kg–cm (55 ft–lb, 75 N–m)
HINT: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.).

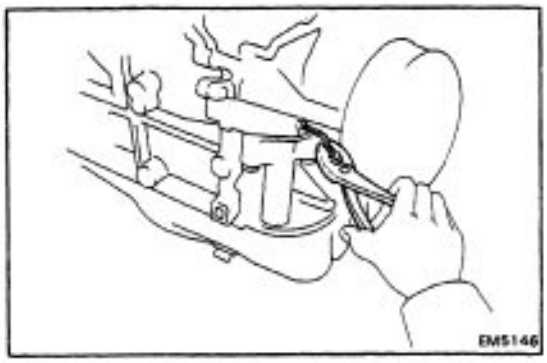


12. SET TIMING BELT TENSIONER
(a) Place a plate washer between the tensioner and a block.
(b) Using a press, slowly press in the push rod using 100 – 1,000 kg (220 – 2,205 ib, 981 – 9,807 N) of pressure.
(c) Align the holes of the push rod and housing, pass a 1.27 mm hexagon wrench (sized 1.27 mm) through the holes to keep the setting position of the push rod.
(d) Release the press.
(e) Install the dust boot to the tensioner.

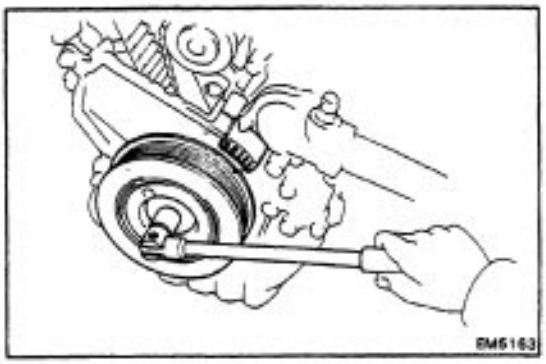




13. INSTALL TIMING BELT TENSIONER
(a) Install the tensioner with the two bolts.
Torque: 270 kg–cm (20 ft–lb, 26 N–m)



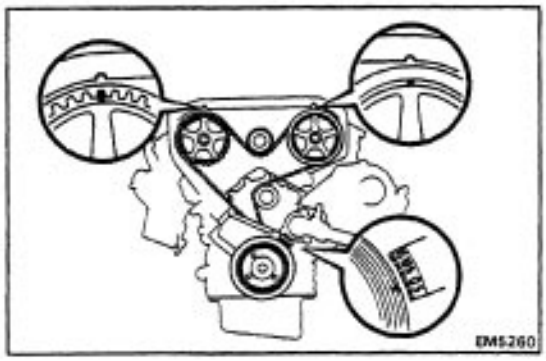
(b) Remove the 1.27 mm hexagon wrench (sized 1.27 mm) from the tensioner.



14. CHECK VALVE TIMING

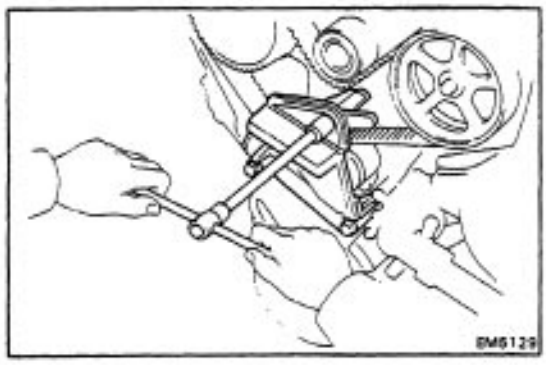
(a) Turn the crankshaft pulley two revolutions from TDC to TDC.

HINT: Always turn the crankshaft clockwise.



(b) Check that each pulley aligns with the timing marks as shown in the figure.

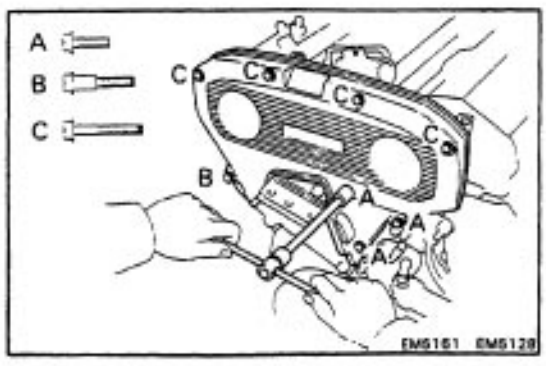
If the marks do not align, remove the timing belt and reinstall it.



15. INSTALL ENGINE RH MOUNTING BRACKET

Install the mounting bracket with the three bolt.

Torque: 410 kg–cm (30 ft–lb, 39 N–m)



16. INSTALL NO.2 TIMING BELT COVER

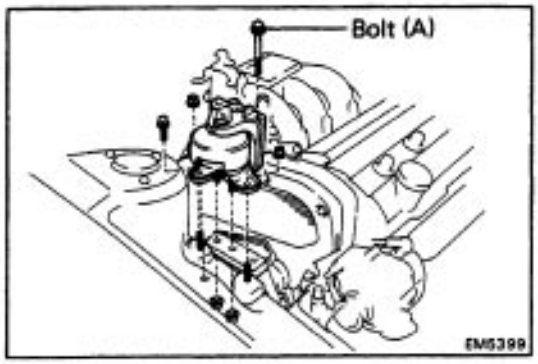
(a) Install the gasket to the timing belt cover.

(b) Install the timing belt cover with the eight bolts.

HINT: Use the bolts indicated by A, B and C.

17. INSTALL SPARK PLUGS (See page IG–11)

Torque: 180 k9–cm (13 ft–lb, 18 N–m)



18. INSTALL ENGINE RH MOUNTING INSULATOR

(a) Attach the mounting insulator to the mounting bracket and body, and temporarily install the mounting insulator bolt, four nuts and the mounting stay bolt (A).

(b) Torque the mounting insulator bolt and four nuts. Do not torque the mounting stay bolt (A) yet.

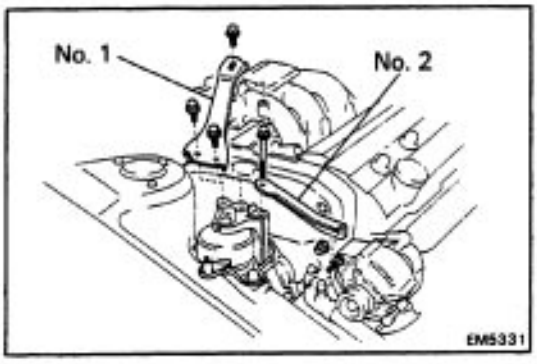
Torque:

Bolt	**650 kg–cm (47 ft–lb, 64 N–m)**
Nut To bracket	**530 kg–cm (38 ft–lb, 52 N–m)**
To body	**900 kg–cm (65 ft–lb, 88 N–m)**

(c) (w/ A.B.S..)

Install the two clamp bolts of the PS oil cooler pipes.

19. LOWER ENGINE



20. INSTALL ENGINE RH MOUNTING STAYS

(a) Install the No–1 mounting stay with the three bolts. Torque the bolts.

Torque: 530 kg–cm (38 ft–lb, 52 N–m)

(b) Install the No.2 mounting stay with the bolt and nut. Torque the bolt and nut.

Torque:

Bolt 670 kg–cm (48 ft–lb, 66 N–m)
Nut 530 kg–cm (38 ft–lb, 52 N–m)

21. INSTALL PS PUMP DRIVE BELT

Adjust the drive belt.

Drive belt tension: New belt 125 ± 20 lb
Used belt 80 ± 25 lb

22. INSTALL ALTERNATOR DRIVE BELT

Adjust the drive belt. (See page CH–3)

Drive belt tension: New belt 175 ± 5 lb
Used belt 115 ± 20 lb

23. INSTALL RH FRONT FENDER APRON SEAL

24. INSTALL RH FRONT WHEEL

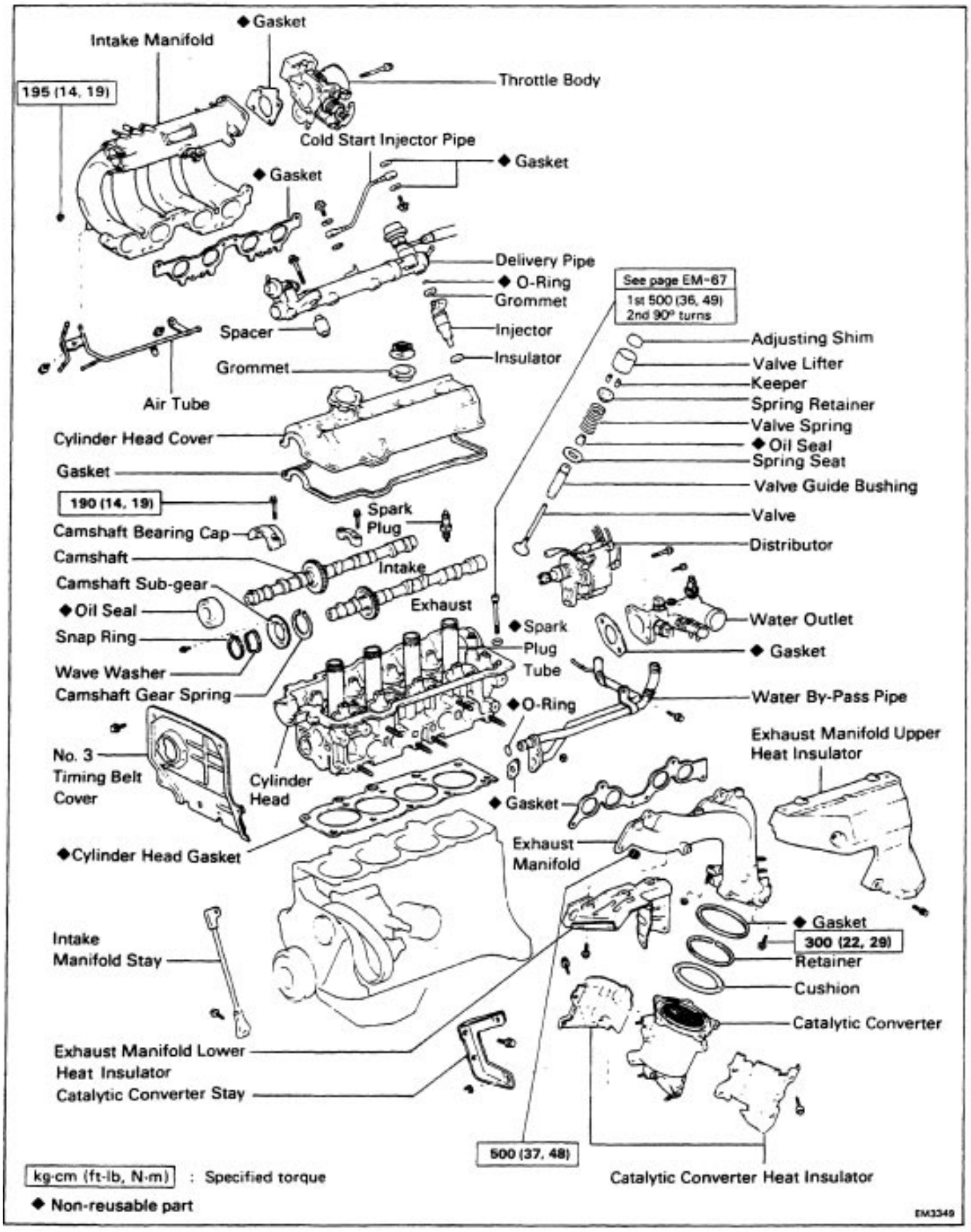
25. INSTALL PS OIL RESERVOIR TANK
(See step 6 on page EM–170)

26. (w/ CRUISE CONTROL SYSTEM)
INSTALL CRUISE CONTROL ACTUATOR AND VACUUM PUMP (See step 27 on page EM–173)

27. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

CYLINDER HEAD (3S–FE)

COMPONENTS



REMOVAL OF CYLINDER HEAD

(See page EM–48)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DRAIN ENGINE COOLANT (See page CO–4)

3. (A/T)

DISCONNECT THROTTLE CABLE AND BRACKET FROM THROTTLE BODY

4. DISCONNECT ACCELERATOR CABLE AND BRACKET FROM THROTTLE BODY AND AIR INTAKE CHAMBER

5. REMOVE CRUISE CONTROL ACTUATOR
(See step 9 on page EM–108)

6. REMOVE AIR CLEANER HOSE

7. REMOVE ALTERNATOR (See page CH–6)

8. REMOVE OIL PRESSURE SWITCH, ENGINE HANGERS AND ALTERNATOR UPPER BRACKET

9. RAISE VEHICLE
NOTICE: Be sure the vehicle is securely supported.

10. REMOVE RH FRONT WHEEL

11. REMOVE ENGINE RH UNDER COVER

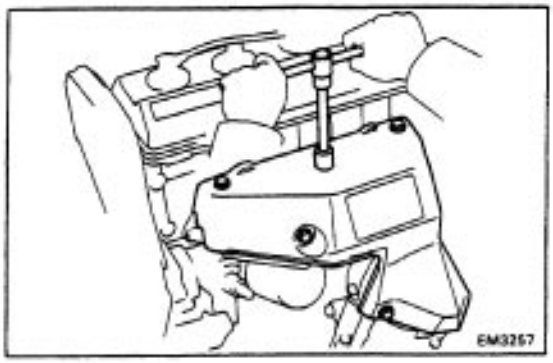
12. REMOVE SUSPENSION LOWER CROSSMEMBER
(See step 20 on page EM–109)

13. DISCONNECT FRONT EXHAUST PIPE FROM CATALYTIC CONVERTER
(See step 25 on page EM–110)

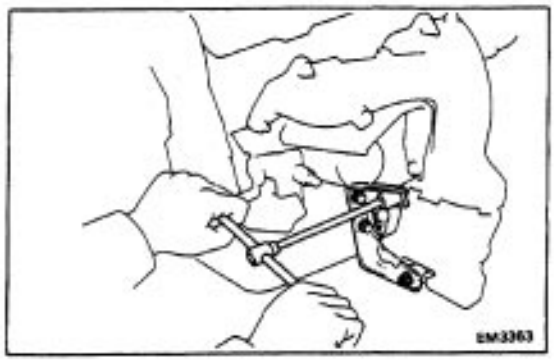
14. REMOVE EXHAUST MANIFOLD AND CATALYTIC CONVERTER ASSEMBLY

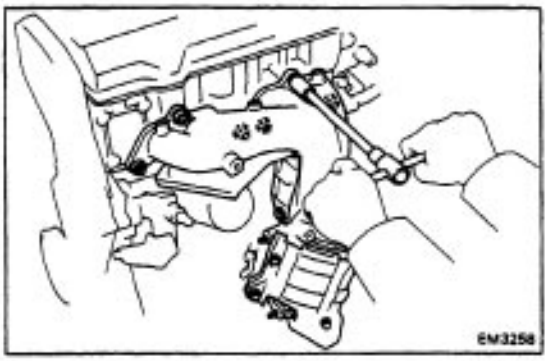
(a) Disconnect the oxygen sensor connector(s).

(b) Remove the six bolts and manifold upper heat insulator.

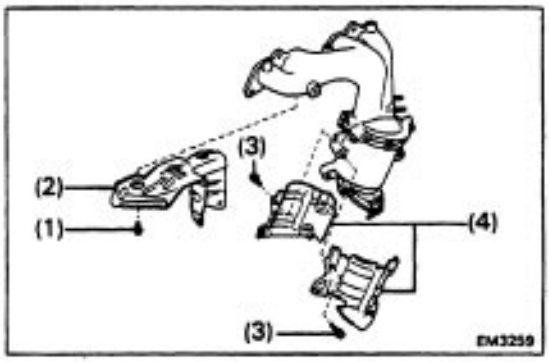


(c) Remove the two–bolts, two nuts and catalytic converter stay.



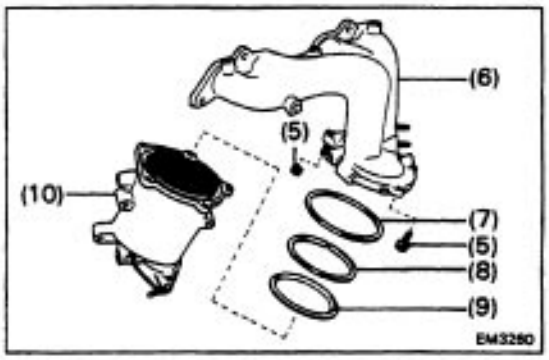


(d) Remove the six nuts, the exhaust manifold and catalytic converter assembly.



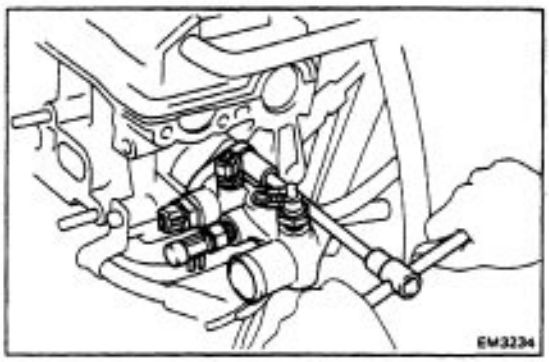
15. SEPARATE EXHAUST MANIFOLD AND CATALYTIC CONVERTER

Remove the following parts:
(1) Five bolts
(2) Manifold lower heat insulator
(3) Eight bolts
(4) Two catalytic converter heat insulators



(5) Three bolts and two nuts
(6) Exhaust manifold
(7) Gasket
(8) Retainer
(9) Cushion
(10) Catalytic converter

16. REMOVE DISTRIBUTOR (Seepage IG–13)



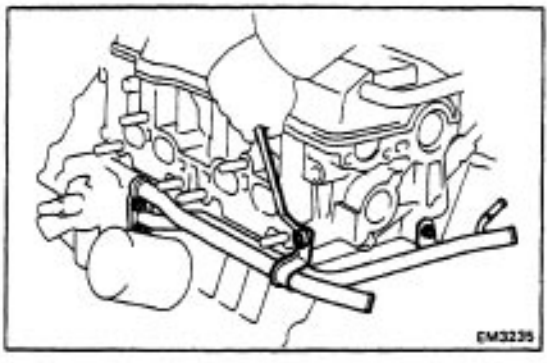
17. REMOVE WATER OUTLET

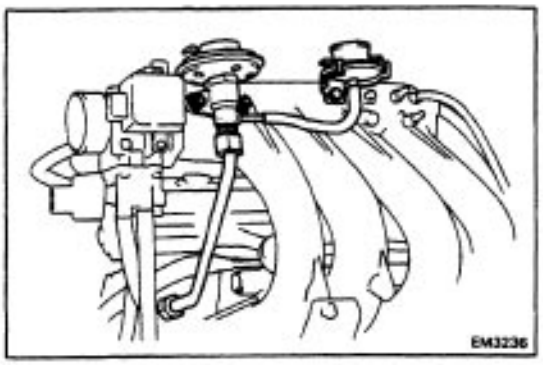
(a) Disconnect the following connectors and hoses:
(1) Water temperature sender gauge connector
(2) Water temperature sensor connector
(3) Cold start injector time switch connector
(4) Radiator upper hose
(5) Water hoses
(6) Emission control vacuum hoses

(b) Remove the two bolts, water outlet and gasket.

18. REMOVE WATER BY–PASS PIPE

(a) Disconnect the water hoses.
(b) Remove the two bolts, two nuts, water by–pass pipe, gasket and O–ring.

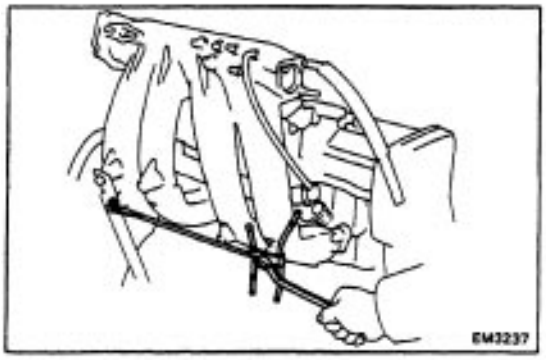




19. REMOVE EGR VALVE AND MODULATOR

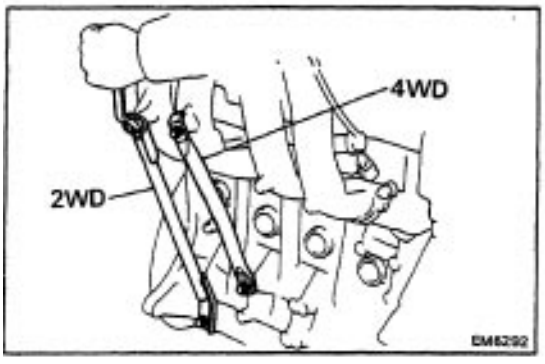
(a) Remove the vacuum hoses.
(b) Loosen the union nut of the EGR pipe, and remove two bolts, EGR modulator and gasket.
(c) Remove the bolt and EGR valve.

20. REMOVE THROTTLE BODY
(See steps 5 to 7 on page FI–107)
21. REMOVE COLD START INJECTOR PIPE
(See step 3 on page FI–78)



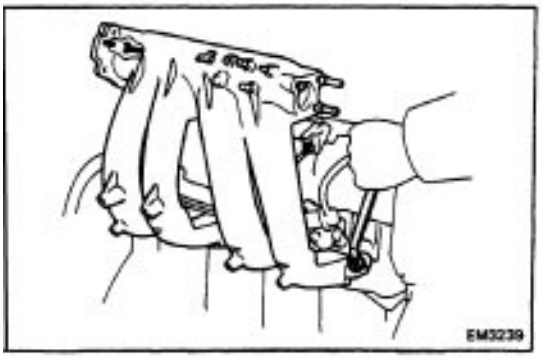
22. REMOVE AIR TUBE

(a) Disconnect the following air hoses:
(1) Air intake chamber air hose
(2) Throttle body air hose
(3) (w/ PS)
PS pump air hoses
(b) Remove the two bolts and air tube.



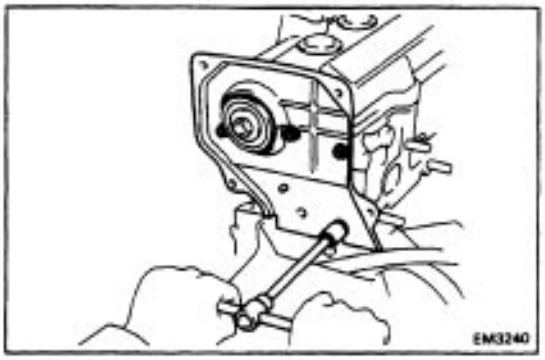
23. REMOVE INTAKE MANIFOLD

(a) Remove the two bolts and manifold stay.

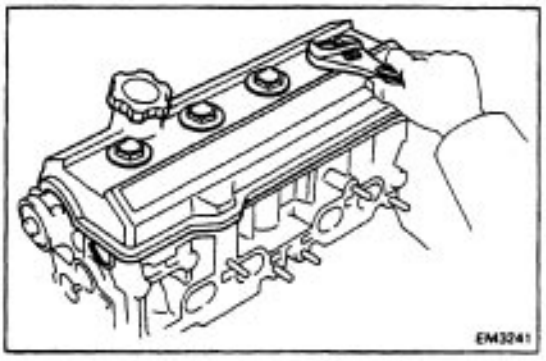


(b) Disconnect the vacuum sensing hose.
(c) Remove the six bolts, two nuts, intake manifold and gasket.

24. REMOVE DELIVERY PIPE AND INJECTORS
(See steps 3 and 7 on page FI–89)
25. REMOVE SPARK PLUGS (See page IG–6)
26. REMOVE CAMSHAFT TIMING PULLEY
(See steps 2 to 14 on pages EM–23 and 25)
27. REMOVE NO. 1 IDLER PULLEY AND TENSION SPRING
(See step 18 on page FI–26)

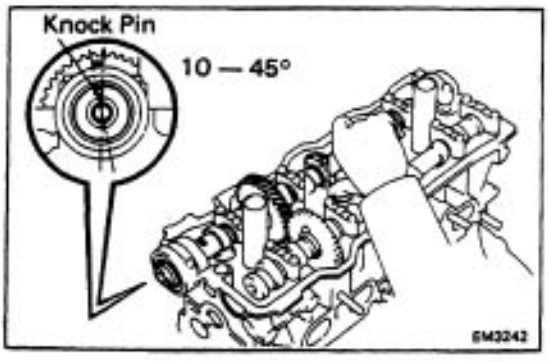


28. REMOVE NO. 3 TIMING BELT COVER
Remove the four bolts and belt cover.
HINT:
- Support the belt so the meshing of the crankshaft timing pulley and timing belt does not shift.
- Be careful not to drop anything inside the timing belt cover.
- Do not allow the belt to come into contact with oil, water or dust.

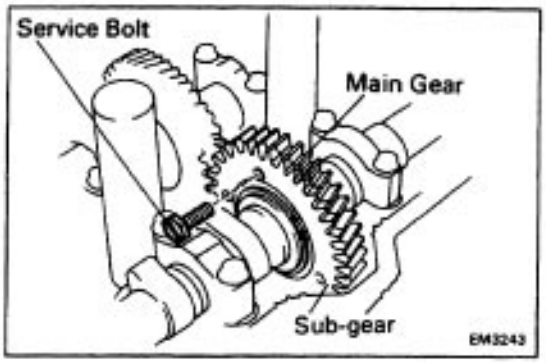


29. REMOVE CYLINDER HEAD COVER
Remove the four nuts, grommets, head cover and gasket.
HINT: Arrange the grommets in correct order, so that they can be reinstalled into their original positions. This minimizes any possibility of oil leakage due to reuse of grommets.

30. REMOVE CAMSHAFTS
HINT: Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being removed.
If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



A. Remove exhaust camshaft
(a) Set the knock pin of the intake camshaft at 10 – 450 BTDC of camshaft angle.
HINT: The above angle helps to lift the exhaust camshaft level and evenly by pushing No. 2 and No. 4 cylinder cam lobes of the exhaust camshaft to their valve lifters.



(b) Secure the exhaust camshaft sub–gear to main gear with a service bolt.

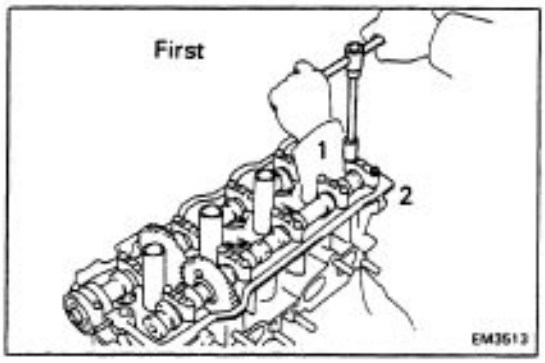
Recommended service bolt:

Thread diameter6 mm

Thread pitch 1.0 mm

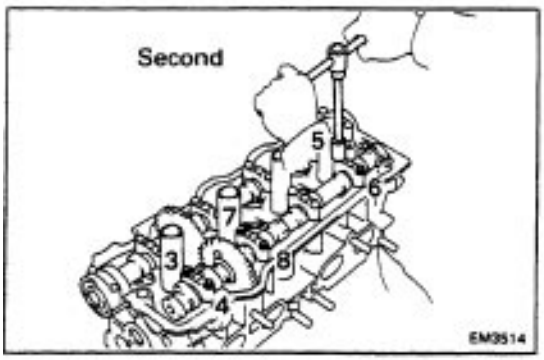
Bolt length 16 – 20 mm (O.63 – 0.79 in.)

HINT: When removing the camshaft, make certain that the torsional spring force of the sub–gear has been eliminated by the above operation.



(c) Remove rear bearing cap bolts 1 and 2.

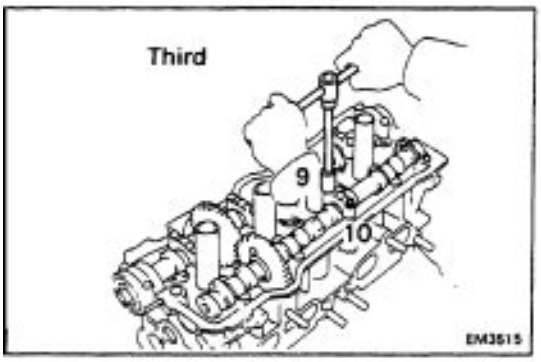
(d) Remove the rear bearing cap.



(e) Uniformly loosen and remove bearing cap bolts 3 to 8 in several passes in the sequence shown.

HINT: Do not remove the No. 3 bearing cap bolts at this stage.

(f) Remove the No. 1, No. 2 and No. 4 bearing cap.

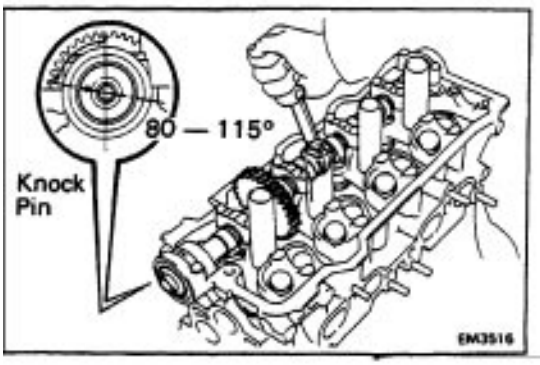


Alternately loosen and remove No. 3 bearing cap bolts 9 and 10.

HINT:

- As bearing cap bolts 9 and 10 are loosened, check that the camshaft is being lifted out straight and level.
- If the camshaft is not being lifted out straight and level, tighten bearing cap bolts 9 and 10. Then reverse the order of above steps from (f) to (a) and reset the knock pin of the intake camshaft at 10 – 45° BTDC, and repeat the steps from (b) and (g) once again.

NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.

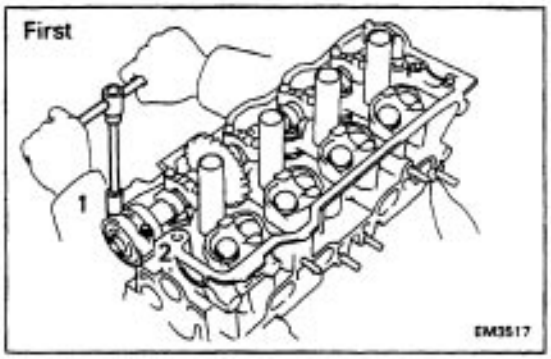


(h) Remove the No. 3 bearing cap and exhaust camshaft.

B. Remove intake camshaft

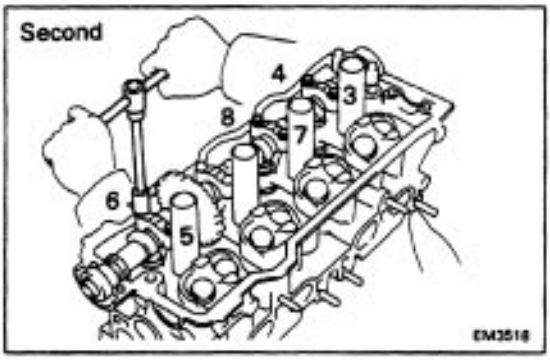
(a) Set the knock pin of the intake camshaft at 80 – 115° BTDC of camshaft angle.

NOTE: The above angle allows No. 1 and No. 3 cylinder cam lobes of the intake camshaft to push their valve lifters evenly.



(b) Remove the front bearing cap bolts i and 2.
(e) Remove the front bearing cap and oil seal.

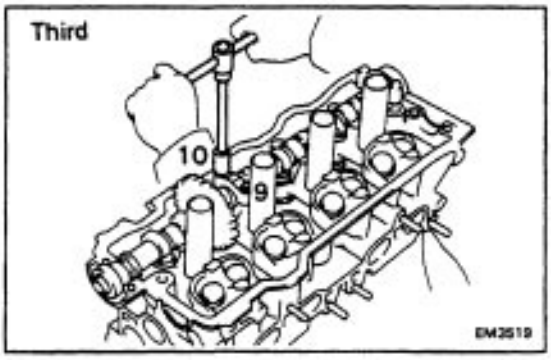
NOTICE: If the front bearing cap is not removable by hand, do not try to remove by force but leave as it is without bolts.



(d) Uniformly loosen and remove bearing cap bolts 3 to 8 in several pass in the sequence shown.

HINT: Do not remove the No. 2 bearing cap bolts at this stage.

(e) Remove the No. 1, No. 3 and No. 4 bearing caps.



(f) Alternately loosen and remove No. 2 bearing cap bolts 9 and 10.

HINT:

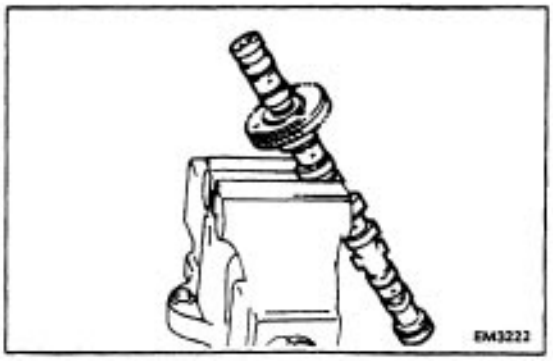
- As bearing cap bolts 9 and 10 are loosened, check that the camshaft is being lifted out straight and level, after breaking adhesion on the front bearing cap.
- If the camshaft is not being lifted out straight and level, re-tighten bearing cap bolts 9 and 10. Reverse the order of above steps from (f) to (a) and reset the knock pin of the intake camshaft at 80 – 115° BTDC, and repeat steps from (b) to (f) once again.

NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.

(g) Remove the No. 2 bearing cap and camshaft.

31. DISASSEMBLE EXHAUST CAMSHAFT

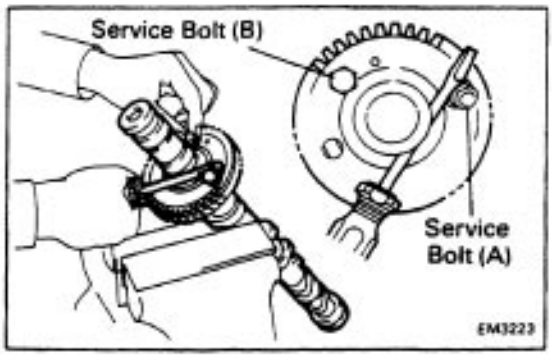
(a) Mount the hexagonal wrench head portion of the camshaft in a vise.

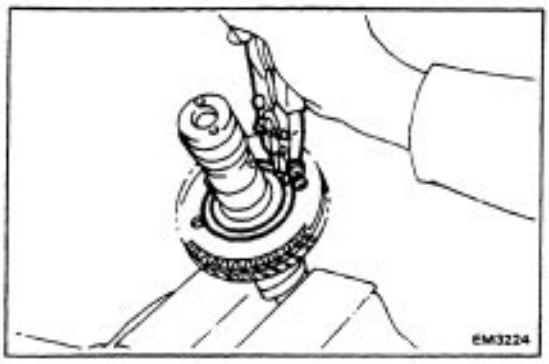


(b) Insert service bolt (A) into the service hole of the camshaft sub–gear.

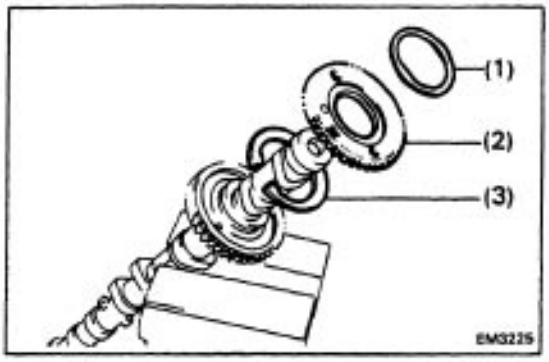
(c) Using a screwdriver, turn the sub–gear clockwise, and remove the service bolt (B).

NOTICE: Be careful not to damage the camshaft.





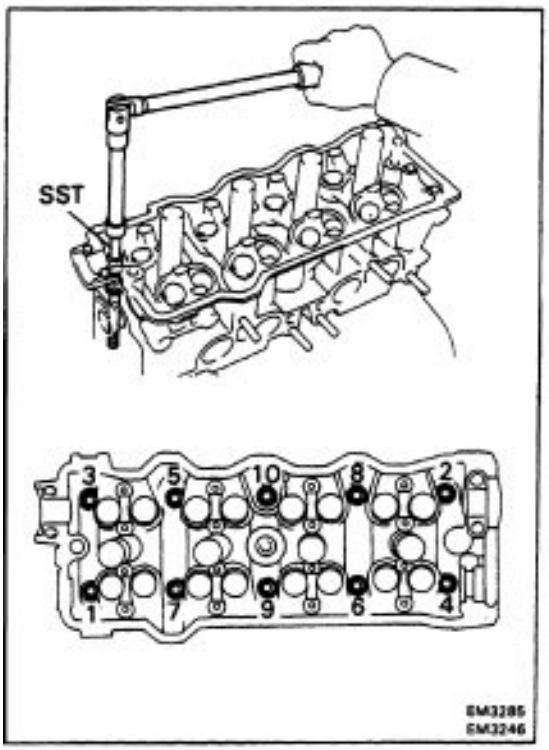
(d) Using snap ring pliers, remove the snap ring.



(e) Remove the following parts:
(1) Wave washer
(2) Camshaft sub–gear
(3) Camshaft gear spring

32. IF NECESSARY, REMOVE SPARK PLUG TUBES

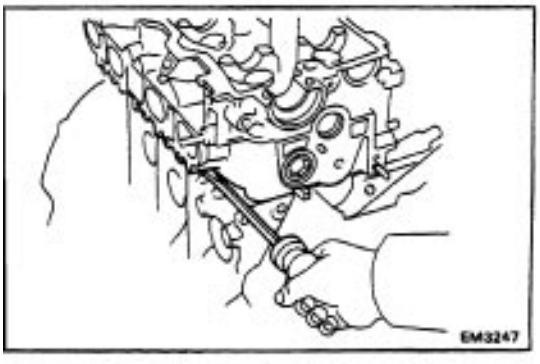
Using a pipe wrench, remove the four spark tubes.



33. REMOVE CYLINDER HEAD

(a) Using SST, uniformly loosen and remove the ten cylinder head bolts in several passes in the sequence shown.
SST 09043–88010

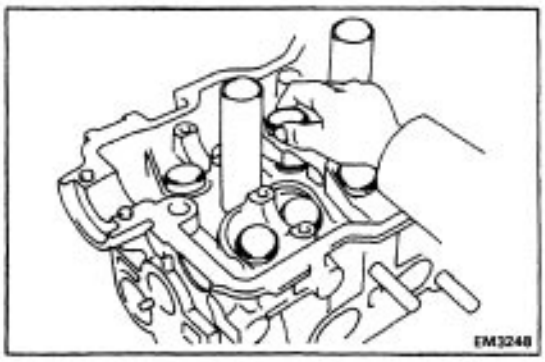
NOTICE: Head warpage or cracking could result from removing bolts in incorrect order.



(b) Lift the cylinder head from the dowels on the cylinder block and place the head on wooden blocks on a bench.

HINT: If the cylinder head is difficult to lift off, pry with a screwdriver between the cylinder head and block saliences.

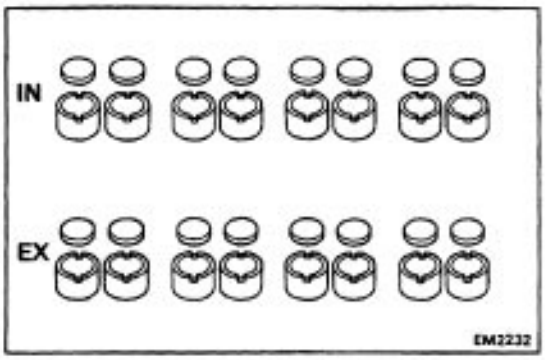
NOTICE: Be careful not to damage the cylinder head and cylinder block surfaces of cylinder head gasket side.



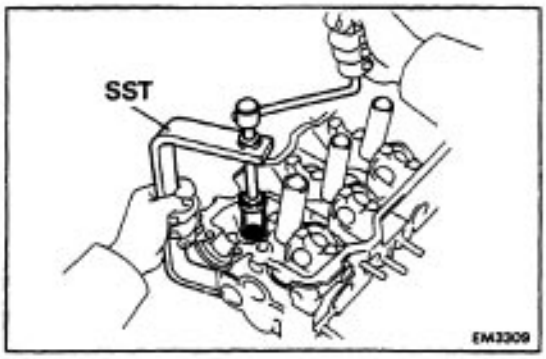
DISASSEMBLY OF CYLINDER HEAD

(See page EM–47)

1. REMOVE VALVE LIFTERS AND SHIMS



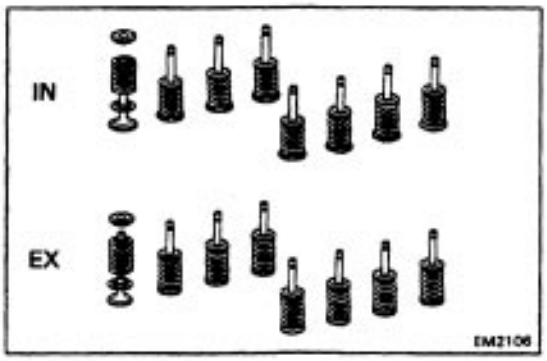
HINT: Arrange the valve lifters and shims in correct order.



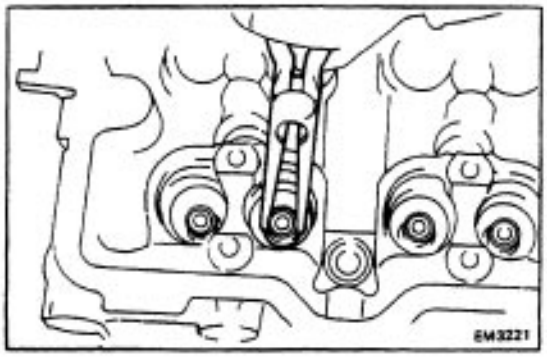
2. REMOVE VALVES

(a) Using SST, compress the valve spring and remove the two keepers.
SST 09202–70010

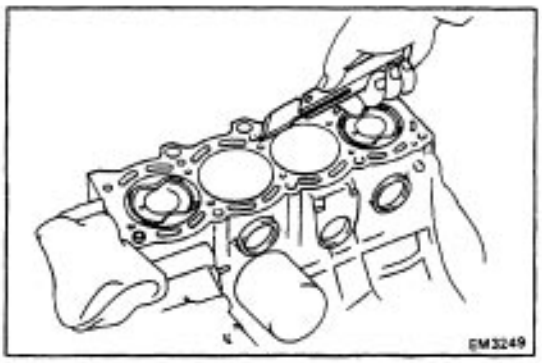
(b) Remove the spring retainer, valve spring, valve and spring seat.



HINT: Arrange the valves, valve springs, spring seats and spring retainers in correct order.



(c) Using needle–nose pliers, remove the oil seal.

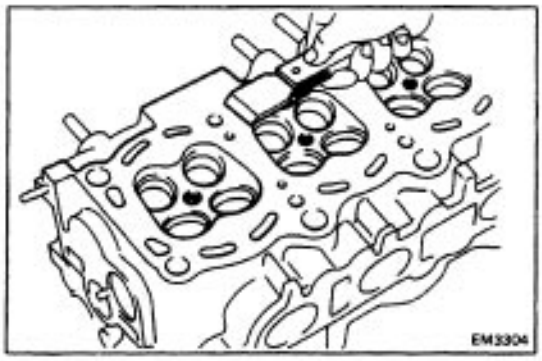


INSPECTION, CLEANING AND REPAIR OF CYLINDER HEAD COMPONENTS

1. CLEAN TOP OF PISTONS AND TOP OF BLOCK

(a) Turn the crankshaft and bring each piston to top dead center (TDC).
Using a gasket scraper, remove all the carbon from the piston top.
(b) Remove all the gasket material from the top of the cylinder block.
(e) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION: Protect your eyes when using high pressure air.



2. REMOVE GASKET MATERIAL

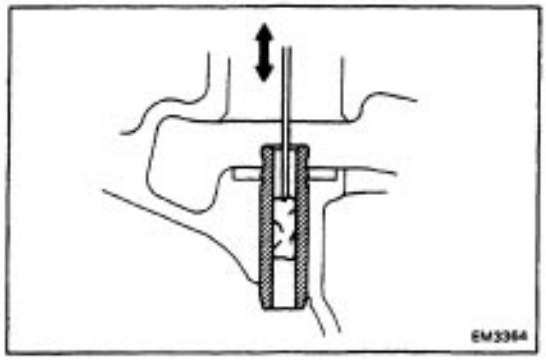
Using a gasket scraper, remove all the gasket material from the manifold and cylinder head surface.

NOTICE: Be careful not to scratch the surfaces.

3. CLEAN COMBUSTION CHAMBERS

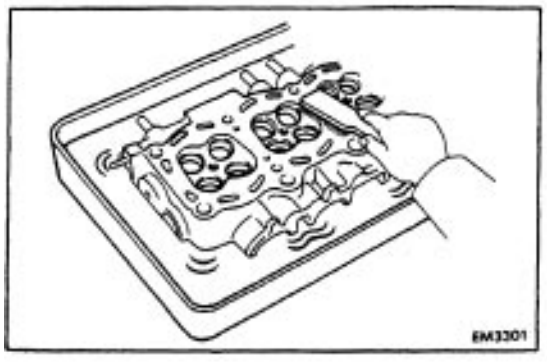
Using a soft brush, remove all the carbon from the combustion chambers.

NOTICE: Be careful not to scratch the head gasket contact surface.



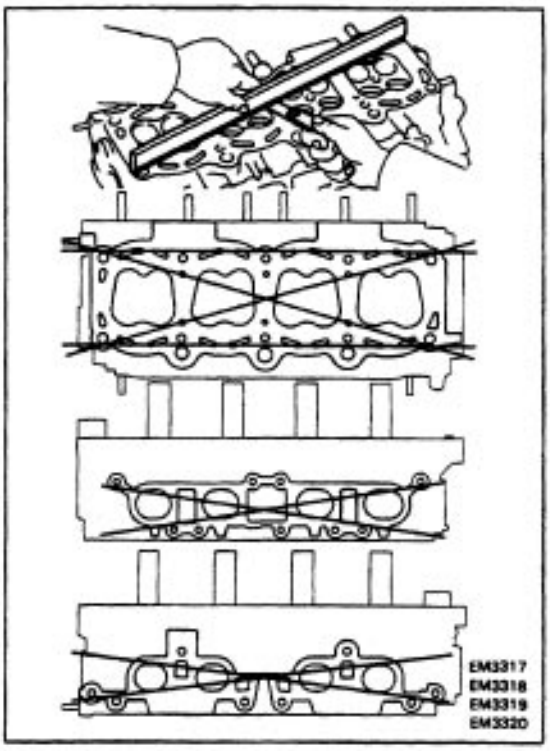
4. CLEAN VALVE GUIDE BUSHINGS

Using a valve guide bushing brush and solvent, clean all the guide bushings.



5. CLEAN CYLINDER HEAD

Using a soft brush and solvent, thoroughly clean cylinder head.



6. INSPECT CYLINDER HEAD FOR FLATNESS

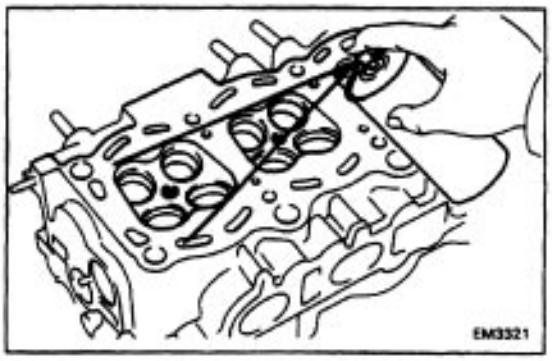
Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block manifolds for warpage.

Maximum warpage:

Cylinder block side 0.05 mm (0.0020 in.)

Manifold side 0.08 mm (0.0031 in.)

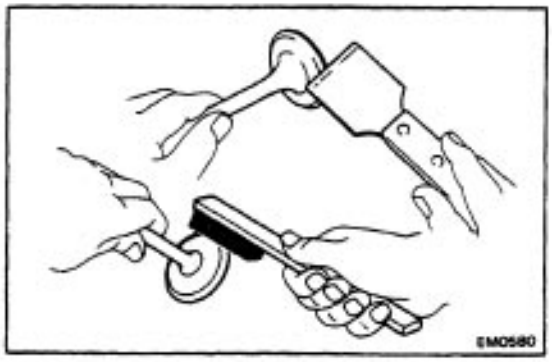
If warpage is greater than maximum, replace the cylinder head.



7. INSPECT CYLINDER HEAD FOR CRACKS

Using a dye penetrant, check the combustion chamber, intake and exhaust ports, head surface and the top of the head for cracks.

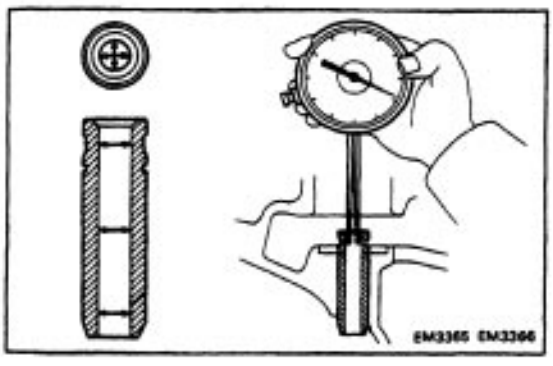
If cracked, replace the cylinder head.



8. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

(b) Using a wire brush, thoroughly clean the valve.

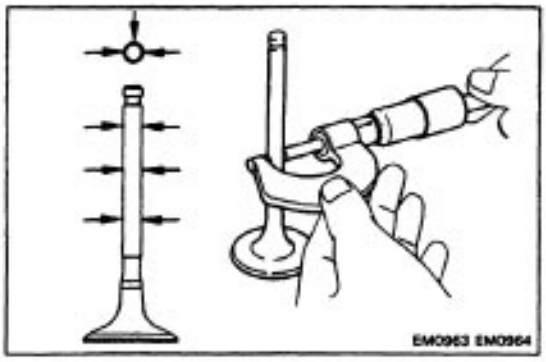


9. INSPECT VALVE STEMS AND GUIDE BUSHINGS

(a) Using a caliper gauge, measure the inside diameter of the guide bushing.

Bushing inside diameter:

6.010 – 6.030 mm (0.2366 – 4.2374 in.)



(b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

Intake 5.970 – 5.985mm
(0.2350 – 0.2356 in.)

Exhaust 5.965 – 5.980 mm
(0.2348 – 0.2354 in.)

(c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

Standard oil clearance:

Intake 0.025 – 0.060 mm
(0.0010 – 0.0024 in.)

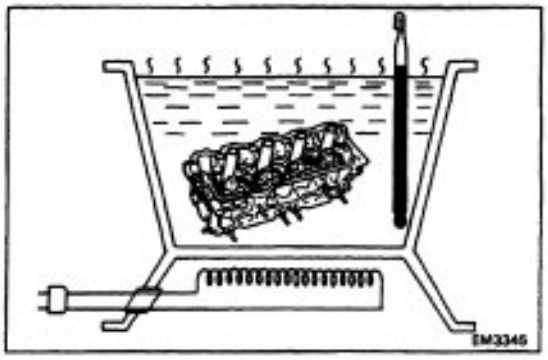
Exhaust 0.030 – 0.065 mm
(0.0012 – 0.0026 in.)

Maximum oil clearance:

Intake 0.08 mm (0.0031 in.)

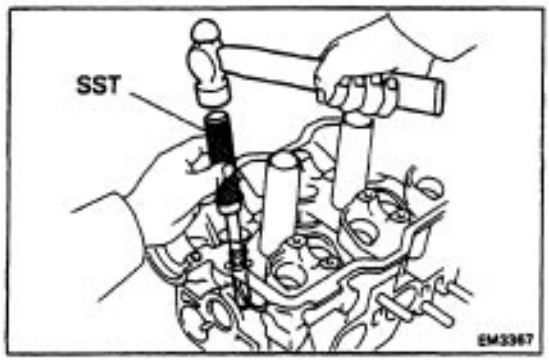
Exhaust 0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing.

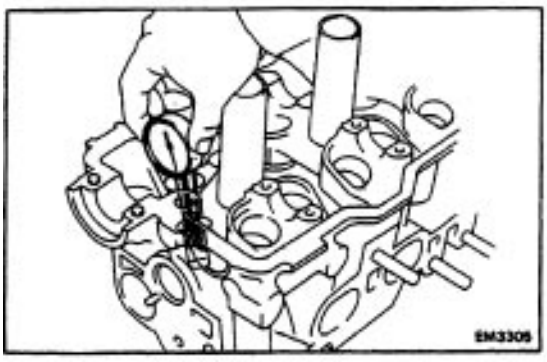


10. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

(a) Gradually heat the cylinder head to 80 –100˚C (176–212˚F).



(b) Using SST and a hammer, tap out the guide bushing.
SST 09201 –700 10



(c) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

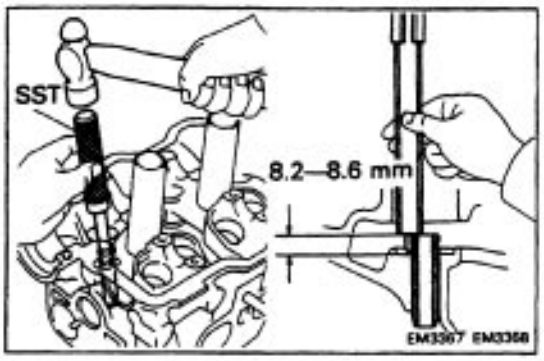
Both intake and exhaust

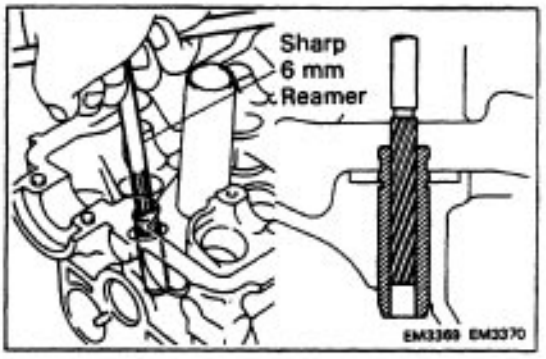
Bushing bore diameter mm (in.)	Bushing size
11.000 — 11.027 (0.4331 — 0.4342)	Use STD
11.050 — 11.077 (0.4350 — 0.4361)	Use O/S 0.05

(d) Select a new guide bushing (STD size or 0/S 0.05).
If the bushing bore diameter of the cylinder head is greater than 11.027 mm (0.4341 in.), machine the bushing bore to the following dimension:
Rebored cylinder head bushing bore dimension:
11. 050 – 11.077 mm (0.4350 – 0.4361 in.)
If the bushing bore diameter of the cylinder head is greater than 11.077 mm (0.4361 in.), replace the cylinder head.

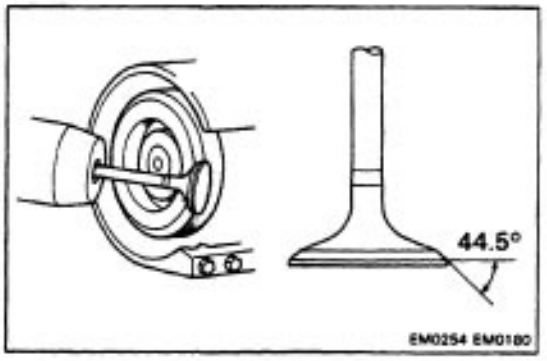
(e) Gradually heat the cylinder head to 80 100˚C (176 – 212˚F).

(f) Using SST and a hammer, tap in a newguide bushing to where there is 8.2 – 8.6 mm (0.303 0.339 in.) protruding from the cylinder head.
SST 09201–70010





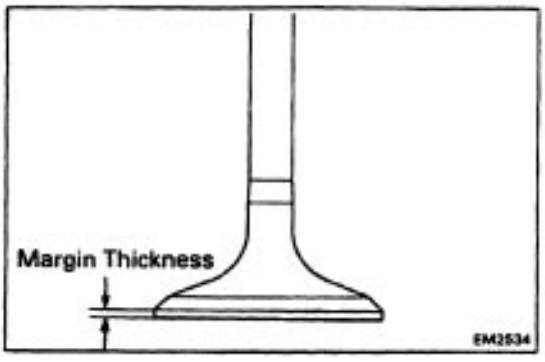
Using a sharp 8 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page EM–58) between the guide bushing and valve stem.



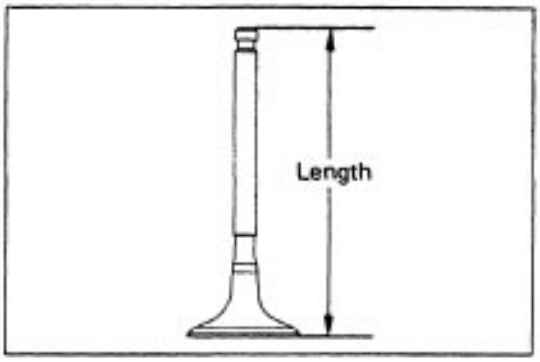
11. INSPECT AND GRIND VALVES

(a) Grind the valve enough to remove pits and carbon.

(b) Check that the valve is ground to the correct valve face angle.
Valve face angle: 44.5˚



(c) Check the valve head margin thickness.
Standard margin thickness: 0.8 –1.2 mm
(0.031 0.047 in.)
Minimum margin thickness: 0.5 mm (0.020 in.)
If the margin thickness is less than minimum, replace the valve.



(d) Check the valve overall length.

Standard overall length:

Intake 100.60 mm (3.9606 in.)

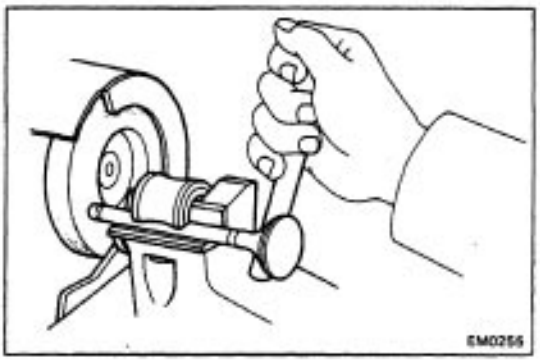
Exhaust 100.45 mm (3.9547 in.)

Minimum overall length:

Intake 100.1 mm (3.941 in.)

Exhaust 100.0 mm (3.937 in.)

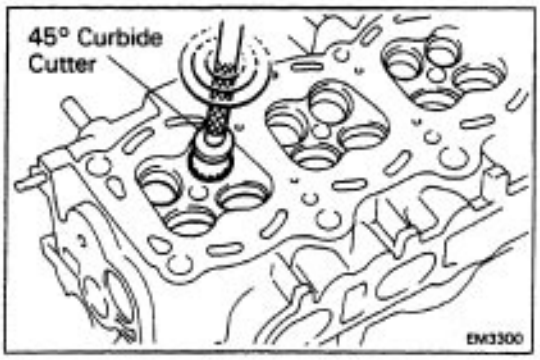
If the overall length is less than minimum, replace the valve.



(e) Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

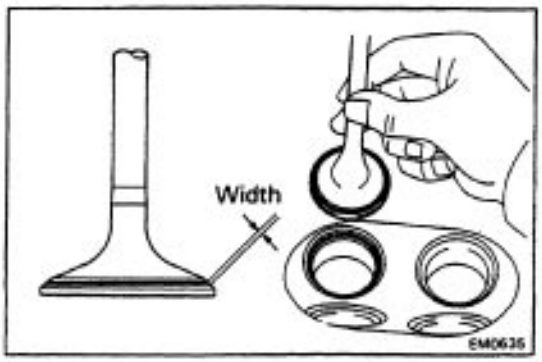
NOTICE: Do not grind off more than the minimum.



12. INSPECT AND CLEAN VALVE SEATS

(a) Using a 45˚ carbide cutter, resurface the valve seats.

Remove only enough metal to clean the seats.



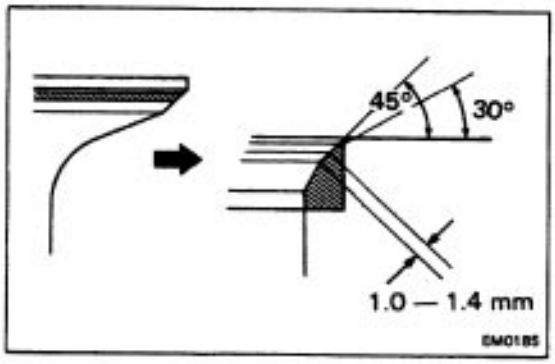
(b) Check the valve seating position.

Apply a thin coat of Prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

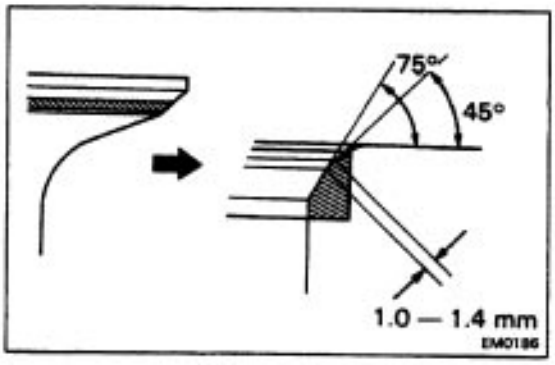
(c) Check the valve face and seat for the following:

- If blue appears 360˚ around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360˚ around the valve seat, the guide and are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:

  1.0 – 1.4 mm (0.039 – 0.055 in.)

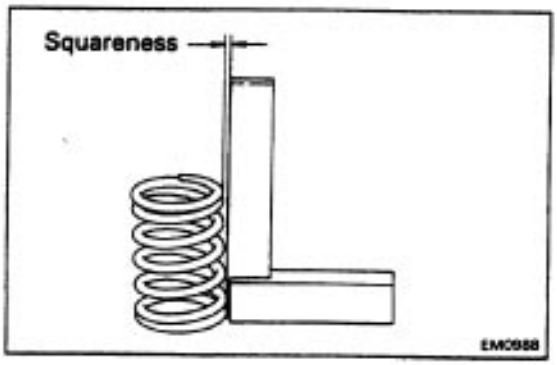


If not, correct the valve seats as follows:
(1) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

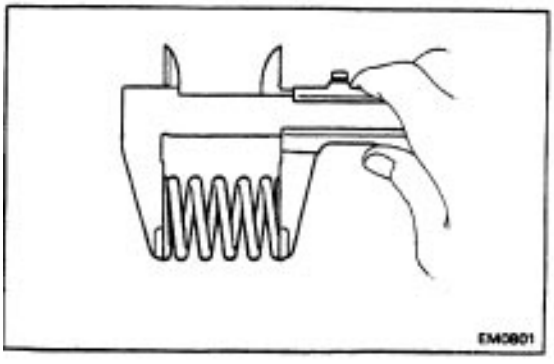


(2) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.

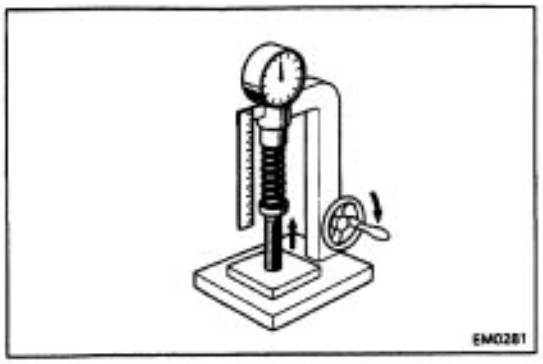
(d) Hand–lap the valve and valve seat with an abrasive compound.
(e) After hand–lapping, clean the valve and valve seat.



13. INSPECT VALVE SPRINGS
(a) Using a steel square, measure the squareness of the valve spring.
Maximum squareness: 2.0 mm (0.075 in.)
If squareness is greater than maximum, replace the valve spring.



(b) Using calipers, measure the free length of the valve spring.
Free length: 45.0 mm (1.772 in.)
If the free length is not as specified, replace the valve spring.



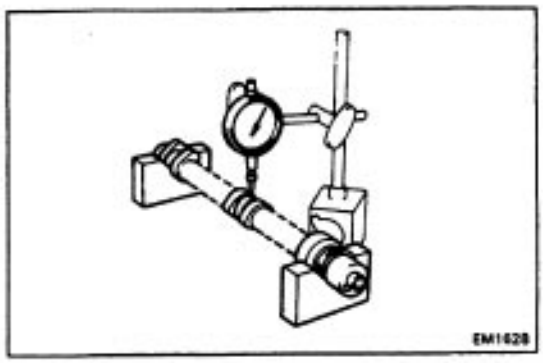
(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

16.7 19.3 kg (36.8 42.5 lb, 164 189 N)

at 34.7 mm (0.000 in.)

If the installed tension is not as specified, replace the valve spring.



14. INSPECT CAMSHAFTS AND BEARINGS

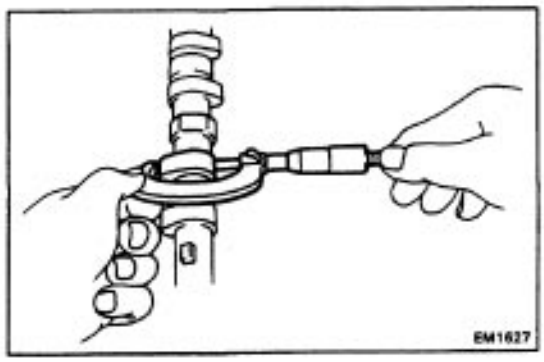
A. Inspect camshaft for runout

(a) Place the camshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.04 mm (0.0016 in.)

If the circle runout is greater than maximum, replace the camshaft.



B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake 34.910 – 35 .010 mm

(1.3744 – 1.3783 in.)

Exhaust 35.560 – 35.660 mm

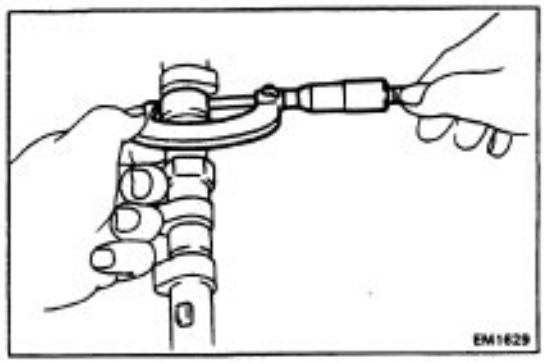
(1.4000 – 1.4039 in.)

Minimum cam lobe height:

Intake 34.80 mm (1.3701 in.)

Exhaust 35.45 mm (1 .3957 in.)

If the cam lobe height is greater than maximum, replace the camshaft.



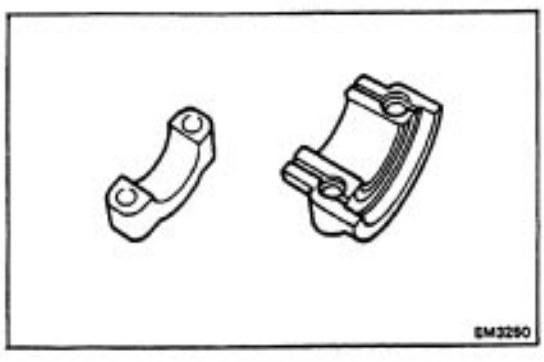
C. Inspect camshaft journals

Using a micrometer, measure the journal diameter.

Journal diameter: 26.959 – 26.975 mm

0.0614 – 1.0620 in.)

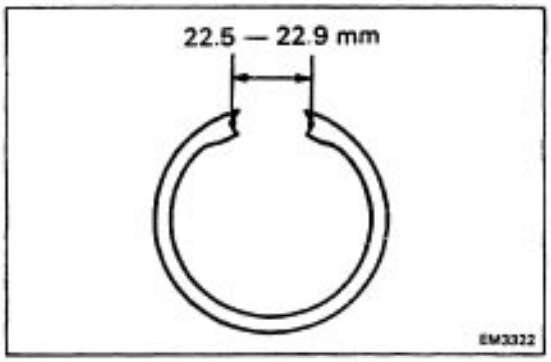
If the journal diameter is not as specified, check the oil clearance.



D. Inspect camshaft bearings

Check the bearings for flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.

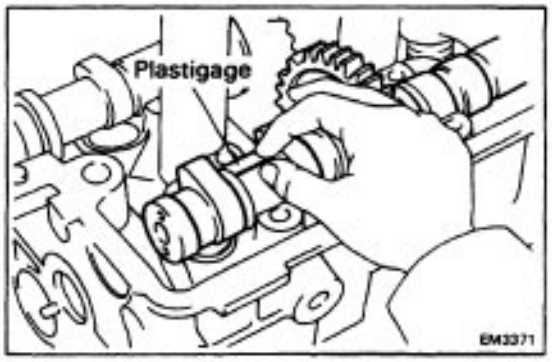


E. Inspect camshaft gear spring

Using calipers, measure the free distance between the spring end.

Free distance: 22.5 – 22.9 mm (0.886 – 0.902 in.)

If the free distance is not as specified, replace the gear spring.



F. Inspect camshaft journal oil clearance

(a) Clean the bearing caps and camshaft journals.

(b) Place the camshafts on the cylinder head.

(c) Lay a strip of Plastigage across each of the camshaft journals.

(d) Install the bearing caps.

(See step 4 on pages EM–68 and 69)

Torque: 190 kg–cm (14 ft–lb, 19 N–m)

HINT: Do not turn the camshaft.

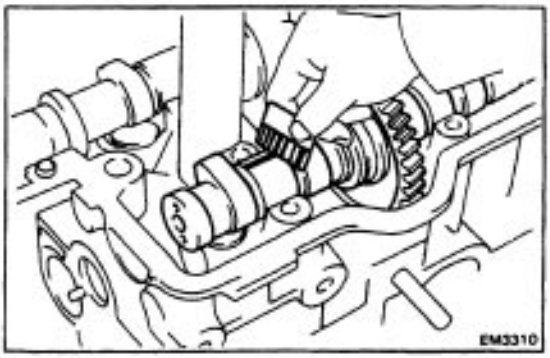
(e) Remove the bearing caps.

(f) Measure the Plastigage at its widest point.

Standard oil clearance: 0.025 – 0.062 (0.0010 – 0.0024 in.)

Maximum oil clearance 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.



(g) Completely remove the Plastigage.

G. Inspect camshaft thrust clearance

(a) Install the camshafts.

(See step 4 on pages EM–67 and 69)

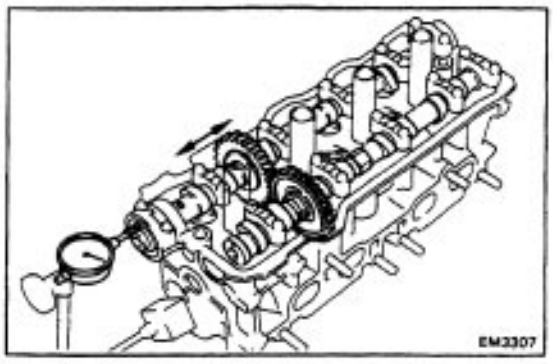
(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:

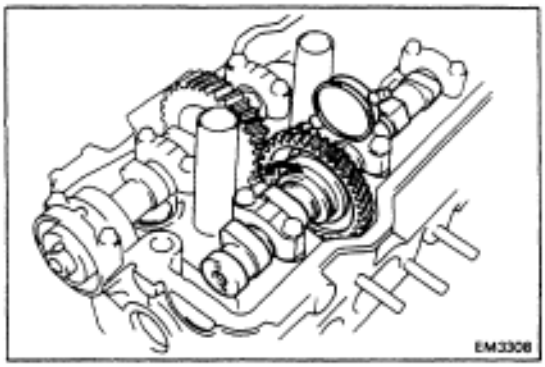
Intake	**0.045 – 0.100 mm (0.0018 – 0.0039 in.)**
Exhaust	**0.030 – 0.085 mm (0.0012 – 0.0033 in.)**

Maximum thrust clearance:

Intake	**0.12 mm (0.0047 in.)**
Exhaust	**0.10 mm (0.0039 in.)**



If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.



H. Inspect camshaft gear backlash

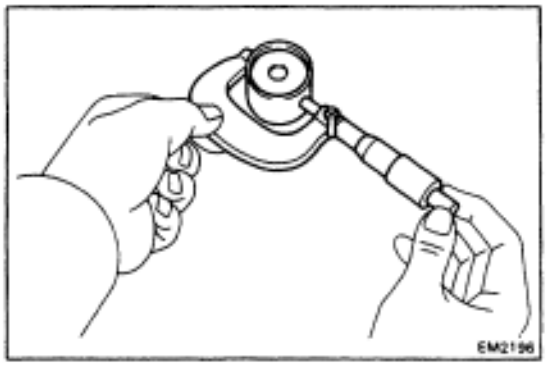
(a) Install the camshafts without installing the exhaust cam sub–gear.
(See step 4 o n page EM–68 to 70)

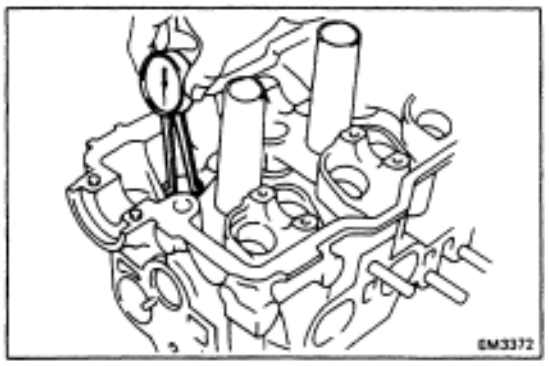
(b) Using a dial indicator, measure the backlash.
Standard backlash: 0.020 – 0.200 mm (0.0008 – 0.0079 in.)
Maximum backlash 0.30 mm (0.0188 in.)

If the backlash is greater than maximum, replace the camshafts.

15. INSPECT VALVE LIFTERS AND LIFTER BORES

(a) Using a micrometer, measure the lifter diameter.
Lifter diameter: 27.975 – 27.985 mm (1.1014 – 1.1018 in.)

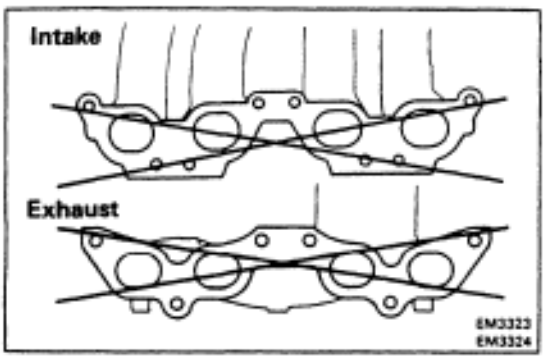




(b) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter: 28.000 – 28.021 mm (1.1024 – 1.1032 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.
Standard oil clearance: 0.015 – 0.046 mm (0.0005 – 0.0018 in.)
Maximum oil clearance: 0.07 mm (0.0028 in.)

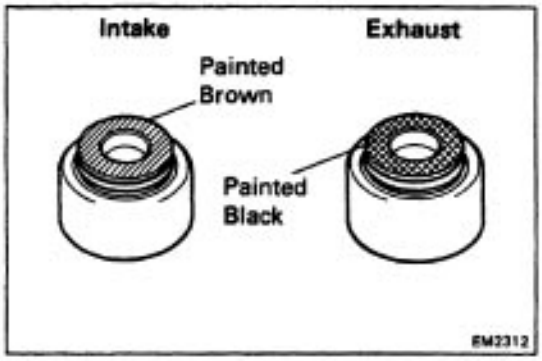
If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.



16. INSPECT INTAKE AND EXHAUST MANIFOLDS

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.
Maximum warpage: 0.30 mm (0.0118 in.)

If warpage is greater than maximum, replace the manifold.



ASSEMBLY OF CYLINDER HEAD

(See page EM–48)

HINT:

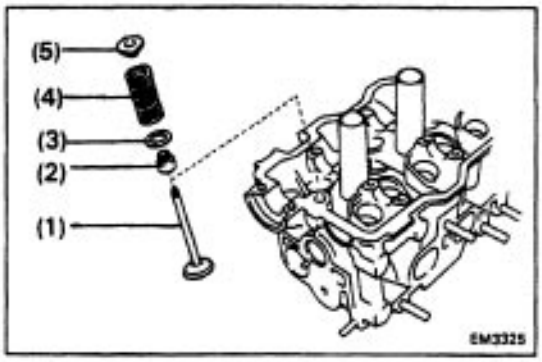
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.

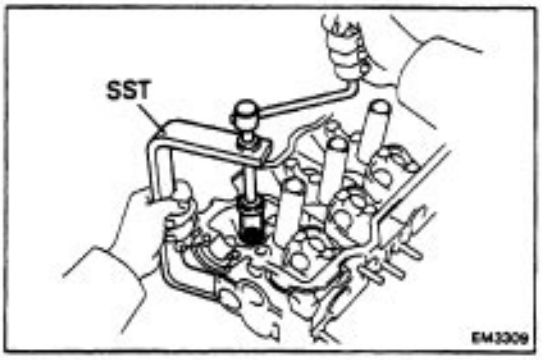
1. INSTALL VALVES

HINT: The intake valve oil seal is brown and the exhaust valve oil seal is black.

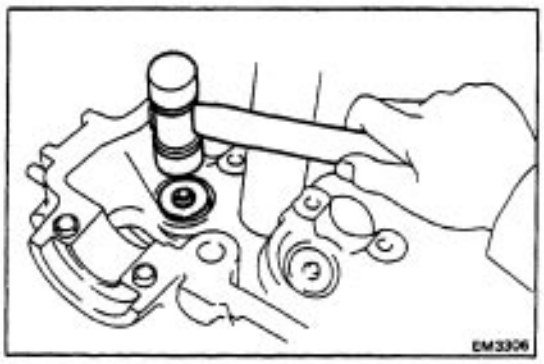
(a) Install the following parts:

(1) Oil seal
(2) Valve
(3) Spring seat
(4) Valve spring
(5) Spring retainer

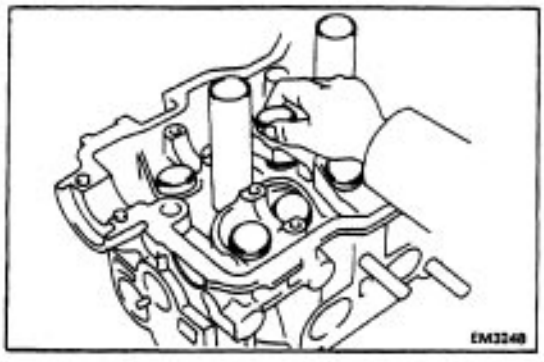




(b) Using SST, compress the valve spring and place the two keepers around the valve stem.
SST 09202–70010

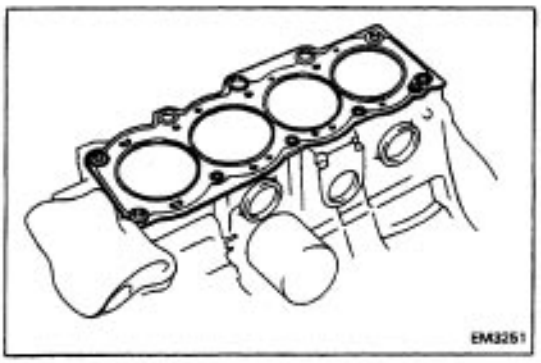


(c) Using a plastic–faced hammer, lightly tap the valve stem tip to assure proper fit.



2. INSTALL VALVE LIFTERS AND SHIMS

(a) Install the valve lifter and shim.
(b) Check the valve lifter rotates smoothly by hand.



INSTALLATION OF CYLINDER HEAD

(See page EM–48)

1. INSTALL CYLINDER HEAD

A. Place cylinder head on cylinder block

(a) Place a new cylinder head gasket in position on the cylinder block.

NOTICE: Be careful of the installation direction.

(b) Place the cylinder head in position on the cylinder head gasket.

B. Install cylinder head bolts

HINT:

- The cylinder head bolts are tightened in two progressive steps (steps (b) and (d)).
- If any cylinder head bolt is broken or deformed, replace it.

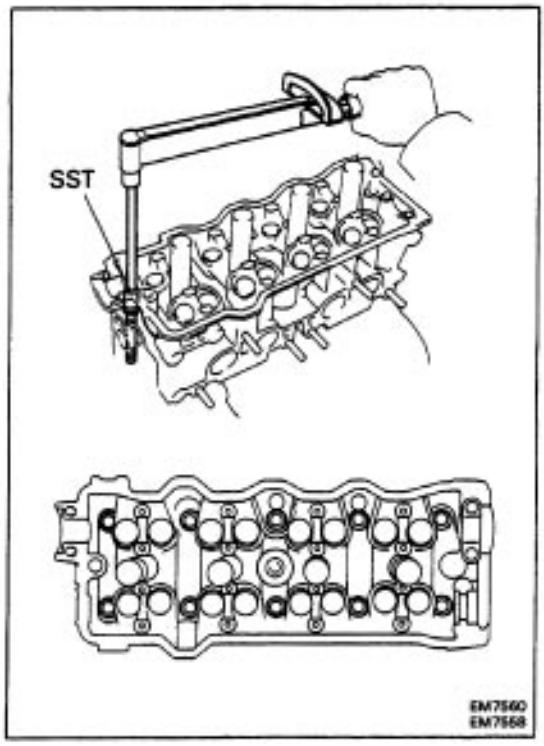
(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

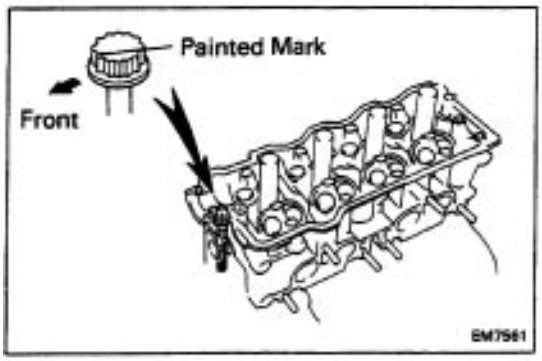
(b) First, using SST, install and uniformly tighten the ten cylinder head bolts in several passes in the sequence shown.

SST 09011–38121

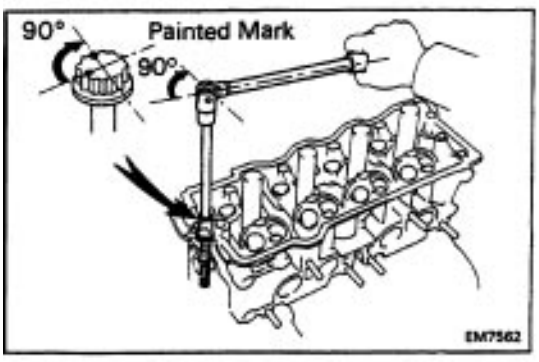
Torque: 500 kg–cm (36 ft–lb, 49 N–m)

If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.



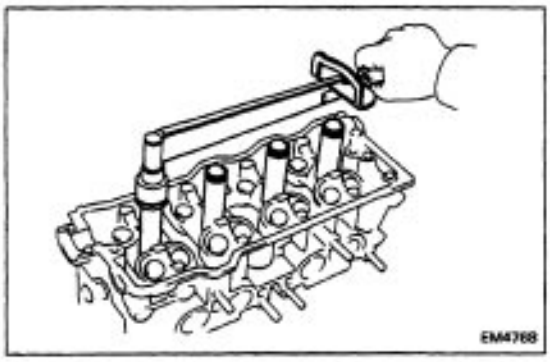


(c) Mark the front of the cylinder head bolt head with paint. .



(d) 2nd, retighten the cylinder head bolts 90˚ in the numerical order shown.

(e) Check that the painted mark is now at a 90˚ angle to front.



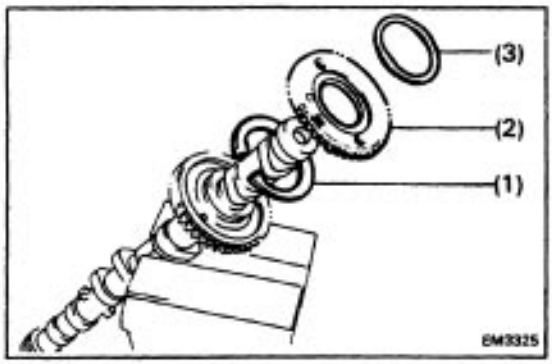
2. INSTALL SPARK PLUG TUBES

(a) Clean the cylinder head tube holes of any residual adhesive, oil foreign particles. Remove any oil with kerosene or gasoline.

(b) Screw the threads of the spark plug tube coated with adhesive into the cylinder head.

(c) Install the spark plug tube nut and using a 30 mm socket wrench, torque the nuts.

Torque: 400 kg–cm (29 ft–lb, 39 N–m)

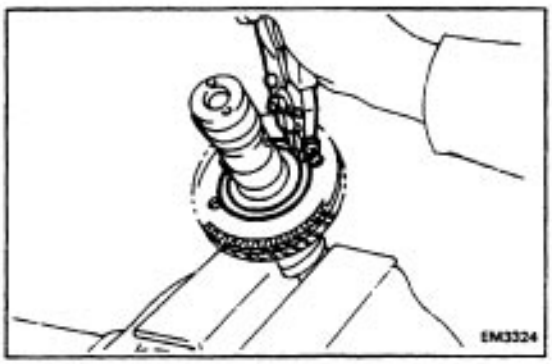


3. ASSEMBLE EXHAUST CAMSHAFT

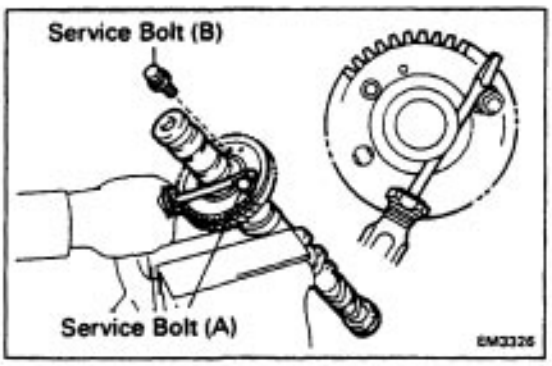
(a) Mount the hexagonal wrench head portion of the camshaft in a vice.

(b) Install the following parts:

(1) Camshaft gear spring
(2) Camshaft sub–gear
(3) Wave washer



(c) Using snap ring pliers, install the snap ring.



(d) Insert a service bolt (A) into the service hole of the camshaft sub–gear.

(e) Using a screwdriver, align the holes of the camshaft main gear and sub–gear by turning camshaft sub–gear clockwise, and install a service bolt (B).

NOTICE: Be careful not damage the camshaft.

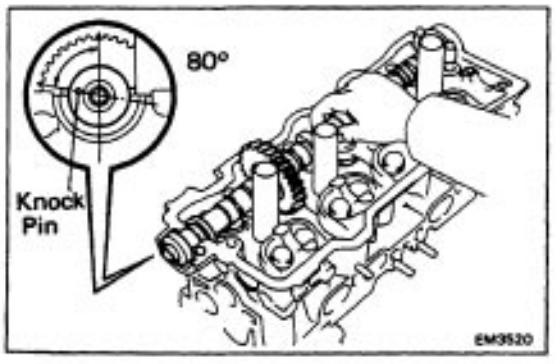
4. INSTALL CAMSHAFTS

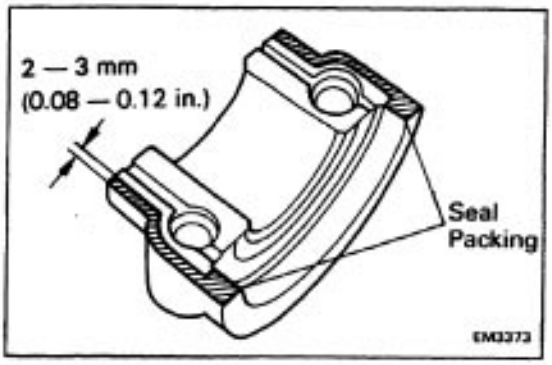
HINT: Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.

A. Install intake camshaft

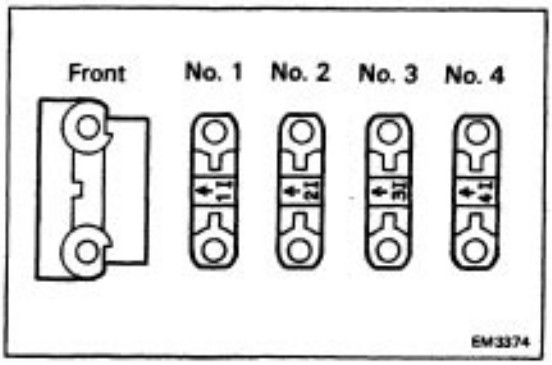
(a) Apply MP grease to the thrust portion of the camshaft.

(b) Place the intake camshaft at 80˚ BTDC of camshaft angle on the cylinder head.

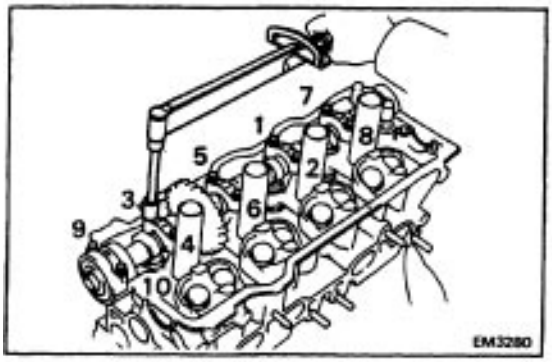




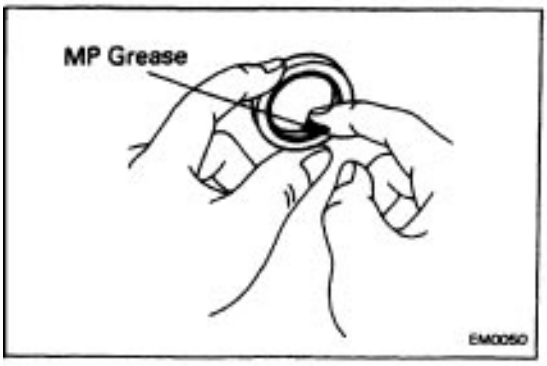
(c) Apply seal packing to the front bearing cap as shown.
Seal packing: Part No. 08826–00080 or equivalent



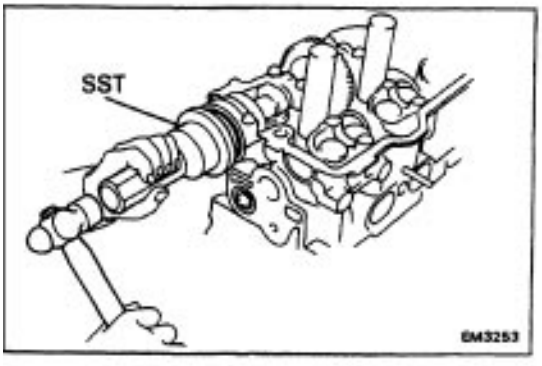
(d) Install the bearing caps in their proper locations.



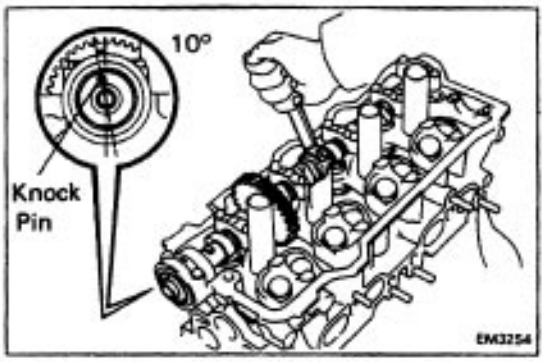
(e) Apply alight coat of engine oil on the threads and under the heads of the bearing cap bolts.
(f) Install and uniformly tighten the ten bearing cap bolts in several passes in the sequence shown.
Torque: 190 kg–cm (14 ft–lb, 19 N–m)



(g) Apply MP grease to a new oil seal lip.

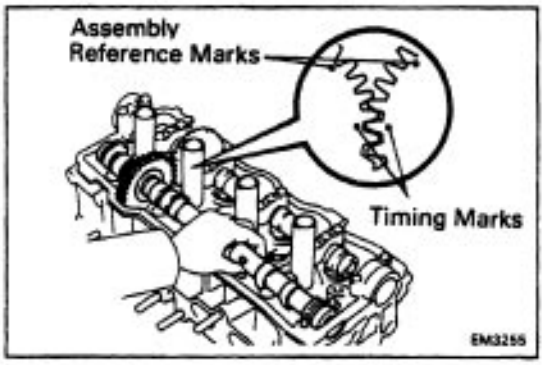


(h) Using SST, tap in the oil seal.
SST 09223–46011



B. Install exhaust camshaft

(a) Set the knock pin of the intake camshaft at 100 BTDC of camshaft angle.

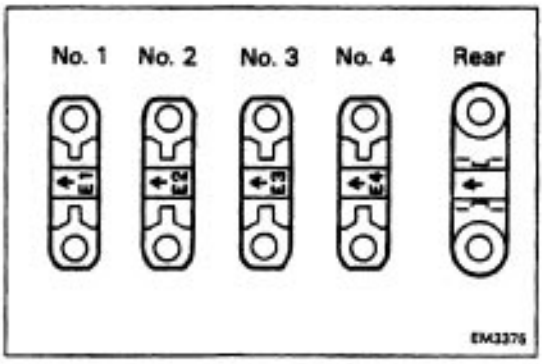


(b) Apply MP grease to the thrust portion of the camshaft.

(c) Engage the exhaust camshaft gear gear to the intake camshaft gear by matching the timing marks on each gear.

(d) Roll down the exhaust camshaft onto the bearing journals while engaging gears with each other.

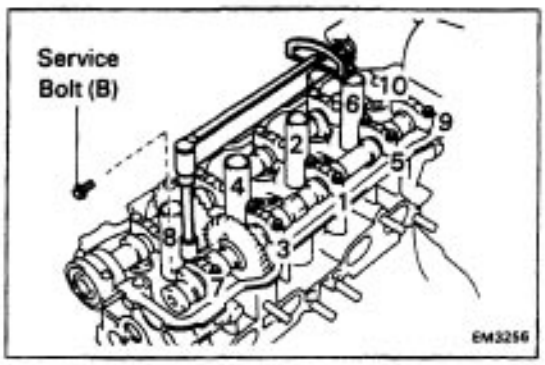
NOTICE: There are also assembly reference marks on each gear as shown in the illustration. Do not use these marks.



(e) Turn the intake camshaft clockwise or counterclockwise little by little until the exhaust camshaft sits in the bearing journals evenly without rocking the camshaft on the bearing journals.

NOTICE: This is very important to replace the camshaft in the bearing journals evenly while tightening bearing caps in the subsequent steps.

(f) Install the bearing caps in their proper location.

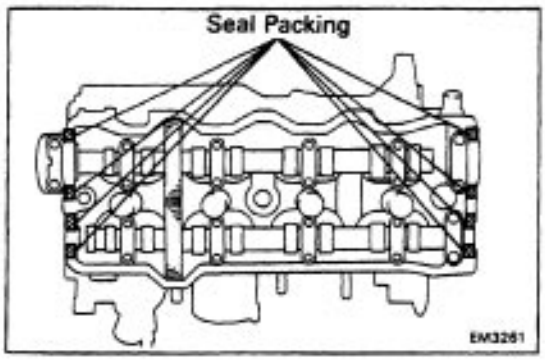


(g) Apply alight coat of engine oil on the threads and under the heads of bearing cap bolts.

(h) Install and uniformly tighten the ten bearing cap bolts in several passes in the sequence shown.

Torque: 190 kg–cm (14 ft–lb, 19 N–m)

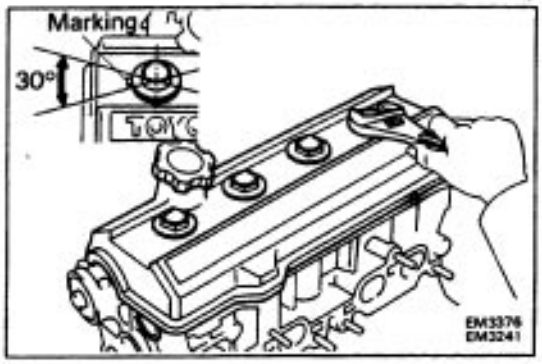
(i) Remove the service bolt (8).



5. INSTALL CYLINDER HEAD COVER

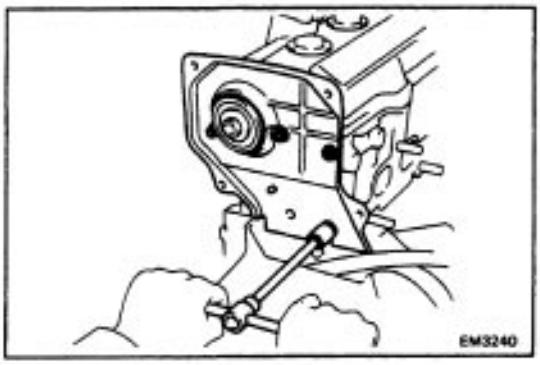
(a) Apply seal packing to the cylinder head as shown in the figure.

Seal packing: Part No.08826–00080 or equivalent



(b) Install the gasket to the head cover.
(c) Install the head cover with the four grommets and nuts.
Torque: 230 kg–cm (17 ft–lb, 23 N–m)

HINT: Install the grommets so that it's markings are as shown in the illustration. Then install the grommet to its original position.



6. INSTALL N0.3 TIMING BELT COVER

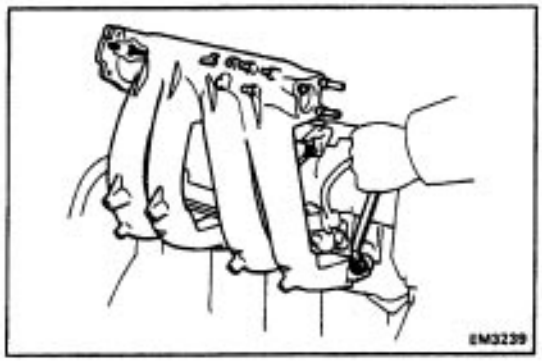
Install the timing belt cover with the four bolts.

7. INSTALL NO.1 IDLER PULLEY AND TENSION SPRING
(See step 4 on page EM–29)

8. INSTALL CAMSHAFT TIMING PULLEY
(See steps 9 to 13 on pages EM–30 to 32)

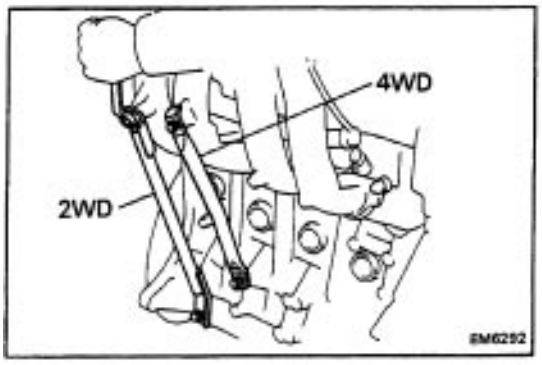
9. INSTALL SPARK PLUGS (See page IG–7)
Torque: 180 kg–cm (13 ft–lb, 18 N–m)

10. INSTALL INJECTOR AND DELIVERY PIPE
(See steps 1 and 5 on pages FI–91 to 92)



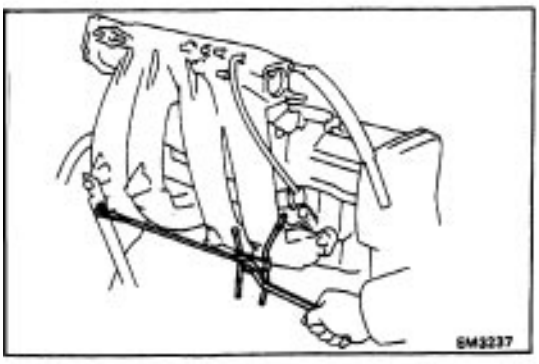
11. INSTALL INTAKE MANIFOLD

(a) Install a new gasket and the intake manifold with the six bolts and two nuts.
Torque: 195 kg–cm (14 ft–lb, 19 N–m)



(b) Install the two manifold stay with the four bolts.
Torque:
12 mm bolt head 195 kg–cm (14 ft–I b, 19 N–m)
14 mm bolt head 425 kg–cm (31 ft–lb, 42 N–m)

(c) Connect the vacuum sensing hose.

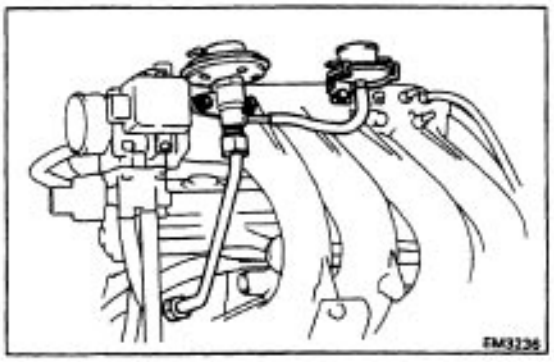


12. INSTALL AIR TUBE

(a) Install the air tube with the two bolts.
lbf Connect the following air hoses:
(1) Air intake chamber air hose
(2) Throttle body air hose
(3) (w/ PS)
PS pump air hose

13. INSTALL COLD START INJECTOR PIPE
(See steps 2 and 3 on page FI–80)

14. INSTALL THROTTLE BODY
(See steps 2 and 4 on page FI–109)



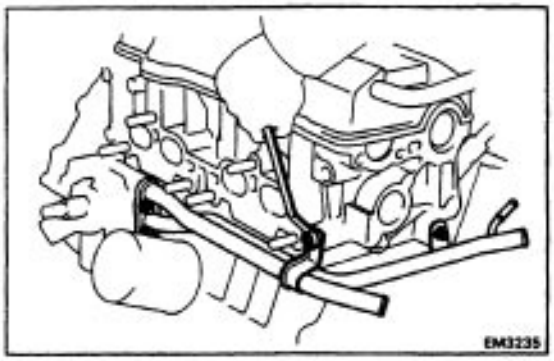
15. INSTALL EGR VALVE AND MODULATOR

(a) Install the EGR modulator with the bolt.

(b) Install a new gasket and the EGR valve with the union nut and two bolts.

Torque:
Union nut 600 kg–cm (43 ft–lb, 59 N–m)
Bolt and nut 130 kg–cm (9 fit–lb, 13 N–m)

(c) Install the vacuum hoses.



16. INSTALL WATER BY–PASS PIPE

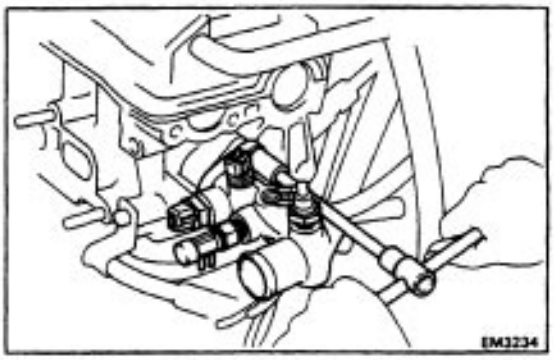
(a) Install a new O–ring to the by–pass pipe.

(b) Apply a light of engine oil on the 0–ring.

(c) Install a new gasket and the by–pass pipe with the two nuts and two bolts.

Torque(Nut): 95 kg–cm (82 in.–lb, 9.3 N–m)

(d) Connect the water hoses.



17. INSTALL WATER OUTLET

(a) Install a new gasket and the water outlet with the two bolts.

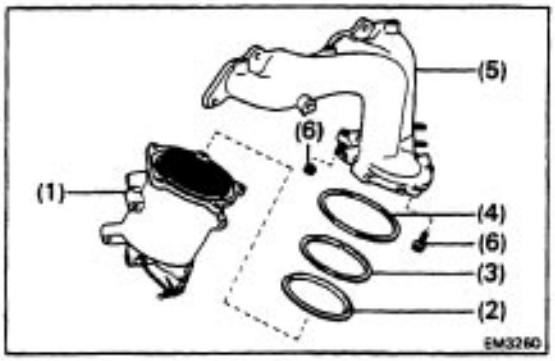
Torque: 150 kg–cm (11 ft–lb, 15 N–m)

(b) Connect the following hoses and connectors:

(1) Radiator upper hose
(2) Water hose
(3) Emission control vacuum hoses
(4) Water temperature sender gauge connector
(5) Water temperature sensor connector
(6) Cold start injector time switch connector

18. INSTALL DISTRIBUTOR

(See steps 1 and 4 on page IG–16)



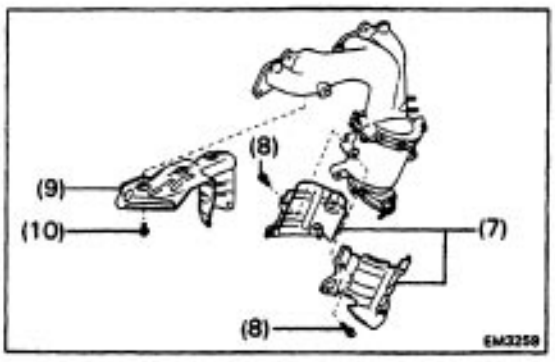
19. ASSEMBLE EXHAUST MANIFOLD AND CATALYTIC CONVERTER

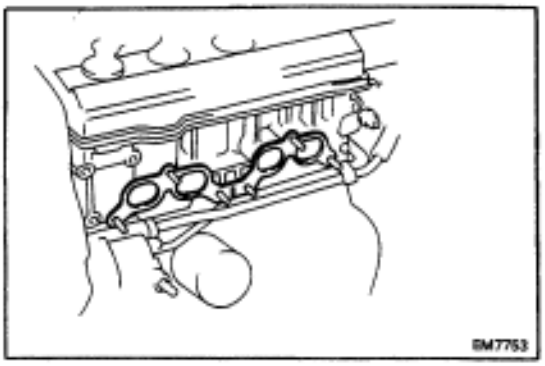
Assemble the following parts:

(1) Catalytic converter
(2) Cushion
(3) Retainer
(4) New gasket
(5) Exhaust manifold
(6) Three bolts and two nuts

Torque: 300 kg–cm (22 ft–lb, 29 N–m)

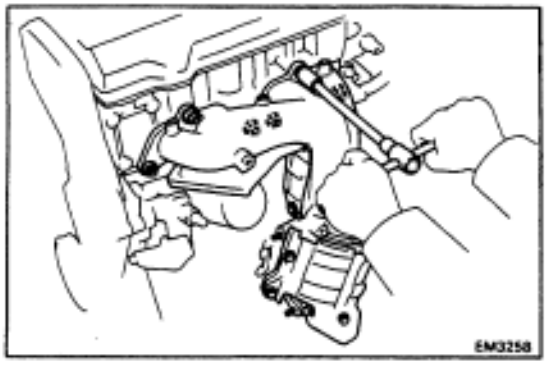
(7) Two catalytic converter heat insulators
(8) Eight bolts
(9) Manifold lower heat insulator
(10) Five bolts



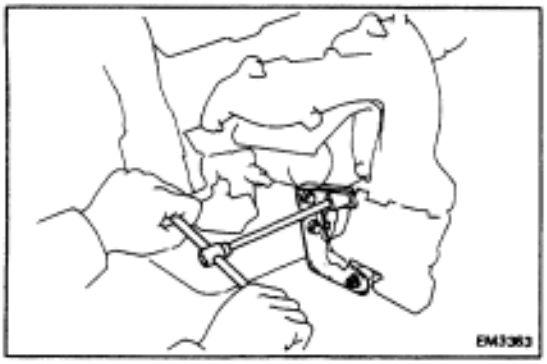


20. INSTALL EXHAUST MANIFOLD AND CATALYTIC CONVERTER ASSEMBLY

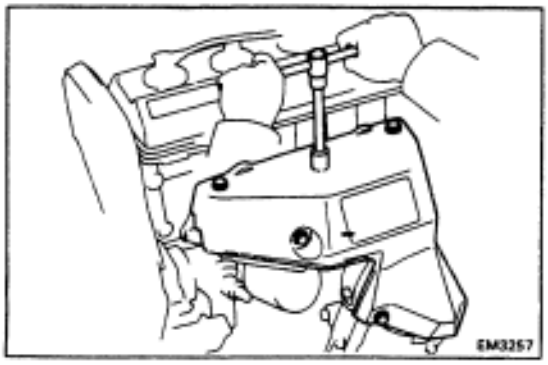
(a) Install a gasket.



(b) Install the exhaust manifold and catalytic converter assembly with new six nuts.
Torque: 500 kg–cm (37 ft–lb, 48 N–m)



(c) Install the catalytic converter stay with the two bolts and two nuts.



(d) Install the manifold lower heat insulator with the six bolts.
(e) Connect the oxygen sensor connector(s).

21. CONNECT FRONT EXHAUST PIPE TO CATALYTIC CONVERTER
(See step 12 on page EM–136)
22. INSTALL SUSPENSION LOWER CROSSMEMBER
(See step 17 on page EM–136)
23. INSTALL ENGINE RH UNDER COVER
24. INSTALL RH FRONT WHEEL
25. LOWER VEHICLE

26. INSTALL OIL PRESSURE SWITCH, ENGINE HANGERS AND ALTERNATOR BRACKET

Torque the bolts.

Torque: 500 kg–cm (37 ft–lb, 48 N–m)

27. INSTALL ALTERNATOR (See page CH–14)

28. INSTALL AIR CLEANER HOSE

29. INSTALL CRUISE CONTROL ACTUATOR (See step 26 on page EM–137)

30. INSTALL RADIATOR RESERVOIR TANK

31. INSTALL ACCELERATOR CABLE, AND ADJUST IT

32. (A/T)

CONNECT THROTTLE CABLE, AND ADJUST IT

33. FILL WITH ENGINE COOLANT (See page CO–5)

Capacity (w/ Heater):
M/T 6.4 liters (6.8 US qts, 5.6 Imp. qts)
A/T (2WD) 6.3 liters (6.7 US qts, 5.5 Imp. qts)
A/T (4WD) 6.8 liters (7.2 US qts, 6.0 Imp. qts)

34. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

35. START ENGINE AND CHECK FOR LEAKS

36. PERFORM ENGINE ADJUSTMENT

(a) Adjust the valve clearance. (See page EM–11)

Valve clearance (Cold):
Intake 0.19 – 0.29 mm (0.007 – 0.011 in.)
Exhaust 0.28 – 0.38 mm (0.011 – 0.015 in.)

(b) Adjust the ignition timing.

(See steps 7 to 10 on pages IG–16 and 17)

Ignition timing:
10° BTDC @ idle
(w/ Terminals TE 1 and E 1 connected)

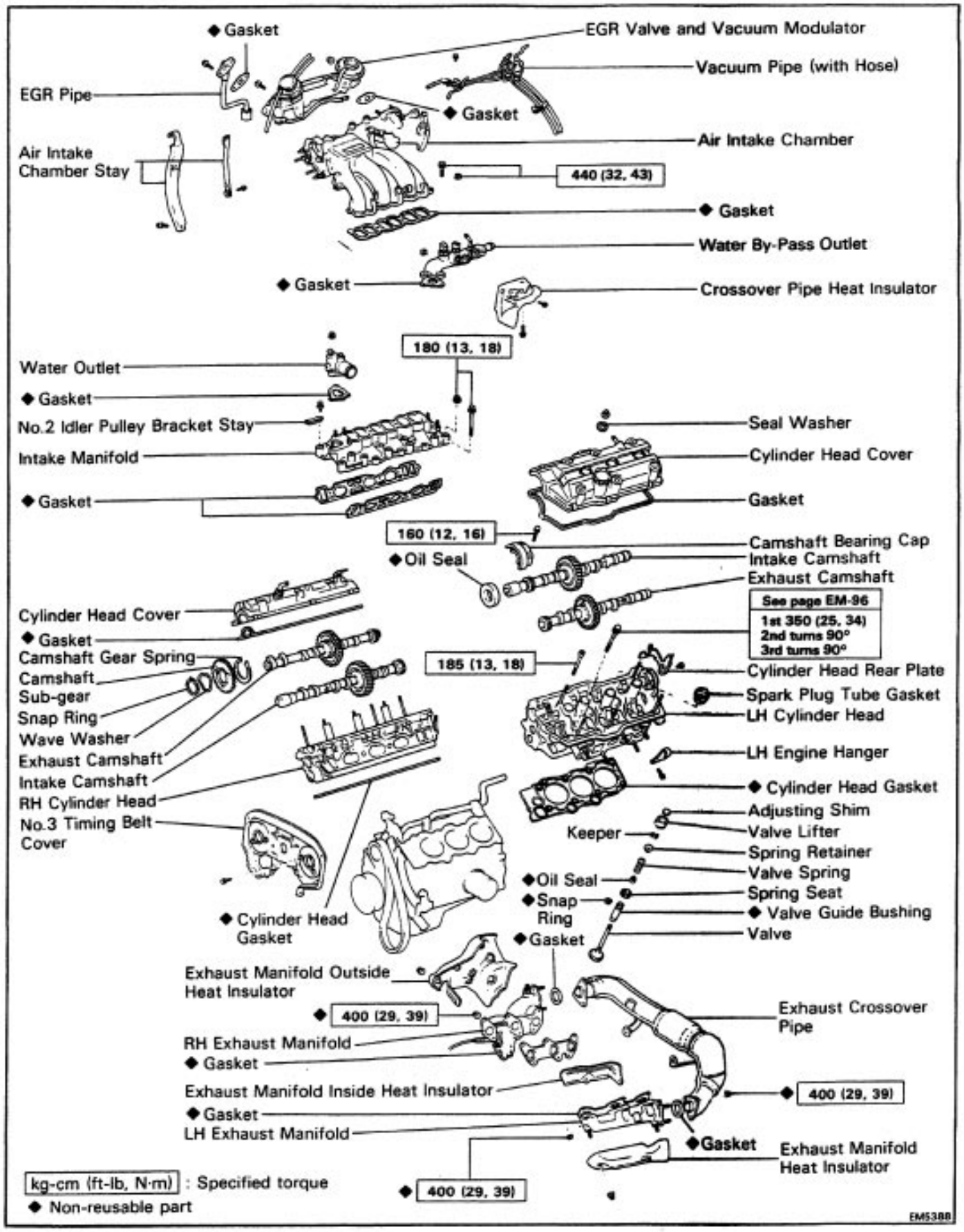
37. CHECK TOE–IN (See page FA–5)

38. PERFORM ROAD TEST

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

39. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL

CYLINDER HEADS (2VZ–FE) COMPONENTS



REMOVAL OF CYLINDER HEADS

(See page EM–75)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DRAIN ENGINE COOLANT (See page CO–5)

3. (A/T)

DISCONNECT THROTTLE CABLE FROM THROTTLE BODY

4. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

5. (w/ CRUISE CONTROL SYSTEM)

REMOVE CRUISE CONTROL ACTUATOR AND VACUUM PUMP (See step 74 on page EM–140)

6. REMOVE AIR CLEANER HOSE

(a) Disconnect the following hoses:

(1) RSC valve air hose

(2) Vacuum pipe hose

(b) Remove the air cleaner hose.

7. RAISE VEHICLE

NOTICE: Be sure the vehicle is securely supported.

8. REMOVE ENGINE RH UNDER COVER

9. REMOVE SUSPENSION LOWER CROSSMEMBER

(See step 26 on page EM–142)

10. REMOVE FRONT EXHAUST PIPE

(See step 27 on page EM–142)

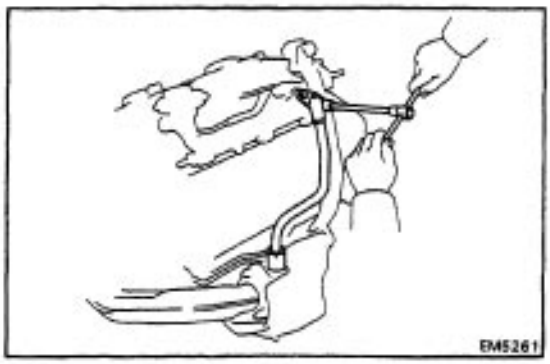
11. REMOVE ALTERNATOR (See page CH–7)

12. REMOVE ISC VALVE

(See steps 2 to 4 on pages FI–118 and 119)

13. REMOVE THROTTLE BODY

(See steps 5 to 6 on page FI–113)



14. REMOVE EGR PIPE

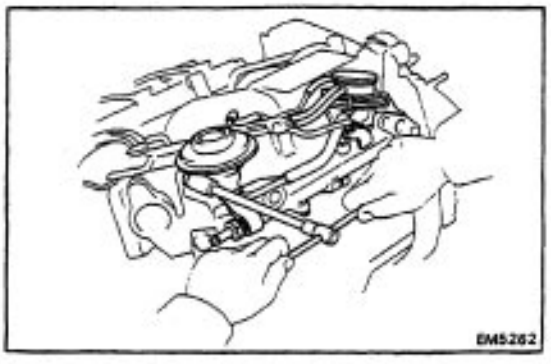
(a) Loosen the union nut.

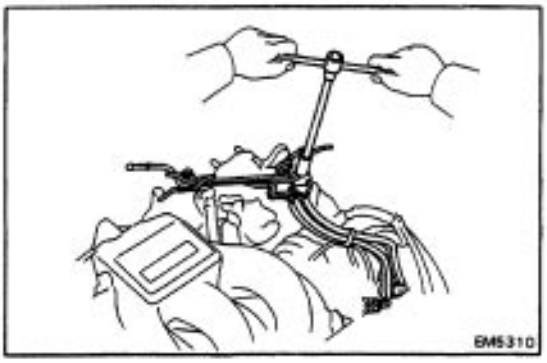
(b) Remove the two bolts, EGR pipe and gasket.

15. REMOVE EGR VALVE– AND VACUUM MODULATOR

(a) Disconnect the four vacuum pipe hoses.

(b) Remove the two bolts, two nuts, the EGR valve, vacuum modulator assembly and gasket.



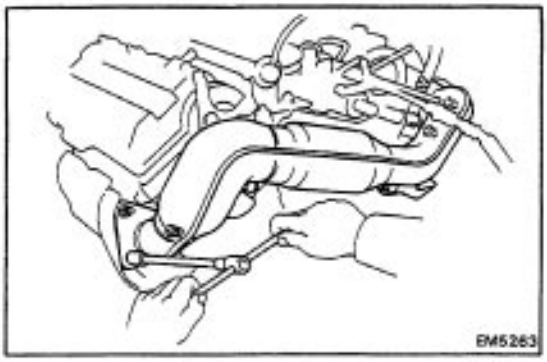


16. REMOVE VACUUM PIPE

(a) Disconnect the following hoses:
  (1) Four– BVSV vacuum hoses
  (2) Fuel pressure control VSV hose
  (3) A/C control valve vacuum hose

(b) Remove the two bolts and vacuum pipe.

17. REMOVE DISTRIBUTOR (See page IG–18)



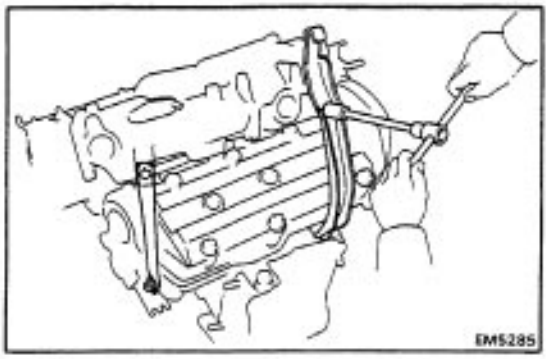
18. REMOVE EXHAUST CROSSOVER PIPE

Remove the six nuts, two bolts, crossover pipe and two gaskets.

19. DISCONNECT COLD START INJECTOR CONNECTOR

20. REMOVE COLD START INJECTOR TUBE

(See step 3 on page FI–81)

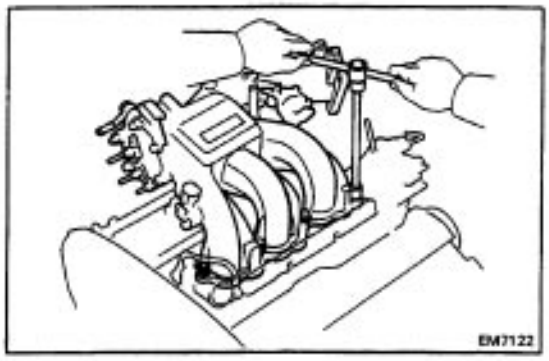


21. REMOVE AIR INTAKE CHAMBER

(a) Disconnect the following hoses:
  (1) PCV hose
  (2) Vacuum sensing hose
  (3) Fuel pressure control VSV
  (4) (Calif. only)
  EGR gas temperature sensor connector
  (5) A/C control valve vacuum hose

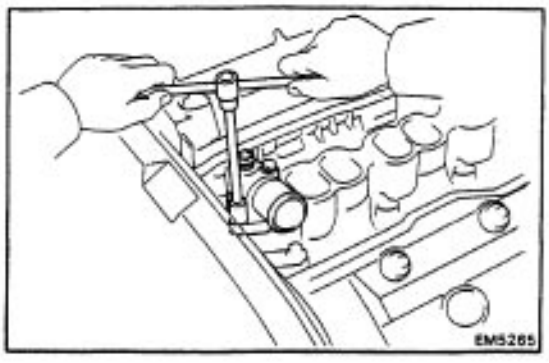
(b) Remove the four bolts and two intake chamber stays.

(c) Remove the two bolts, two nuts, intake chamber and two gaskets.



22. REMOVE DELIVERY PIPES AND INJECTORS

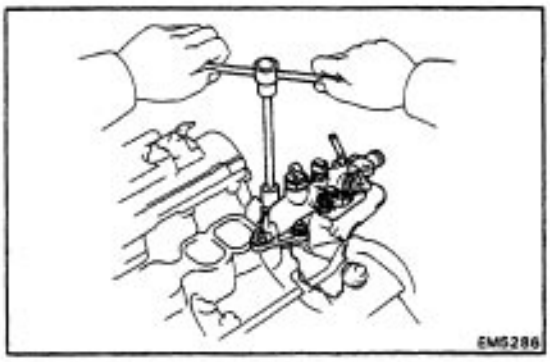
(See steps 15 to 19 on pages FI–95 and 96)



23. REMOVE WATER OUTLET

(a) Disconnect the following connector and hose:
  (1) Water temperature sensor connector
  (2) Radiator upper hose

(b) Remove the three nuts, water outlet and gasket.



24. REMOVE WATER BY–PASS OUTLET

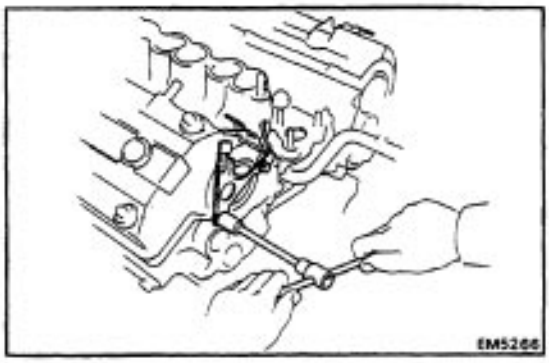
(a) Disconnect the following connectors and hose:
  (1) Cold start injector time switch connector
  (2) Water temperature sensor connector
  (3) Heater water by–pass hose

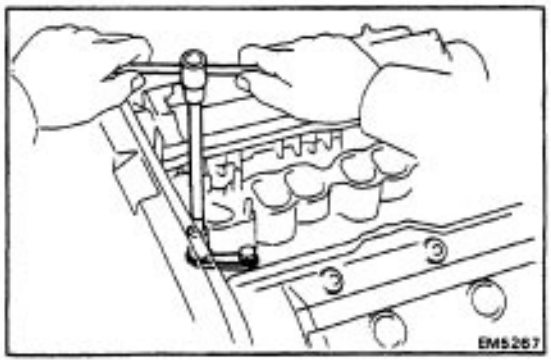
(b) Remove the three nuts, water by–pass outlet and gasket.

(c) Remove the two bolts and crossover pipe heat insulator from the water by–pass outlet.

25. REMOVE CYLINDER HEAD REAR PLATE

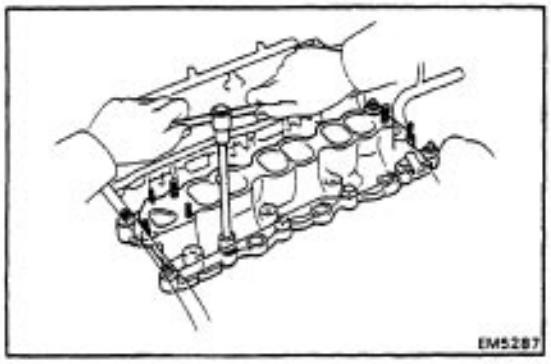
Remove the two bolts and rear plate.



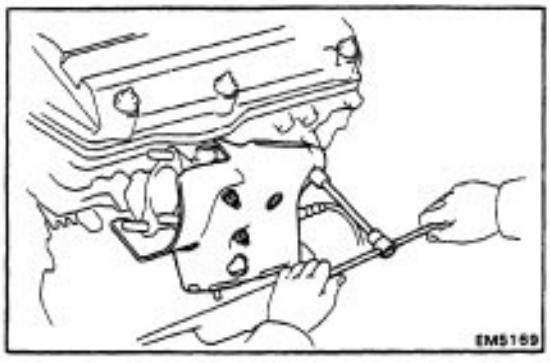


26. REMOVE INTAKE MANIFOLD

(a) Remove the two bolts and No.2 idler pulley bracket stay.



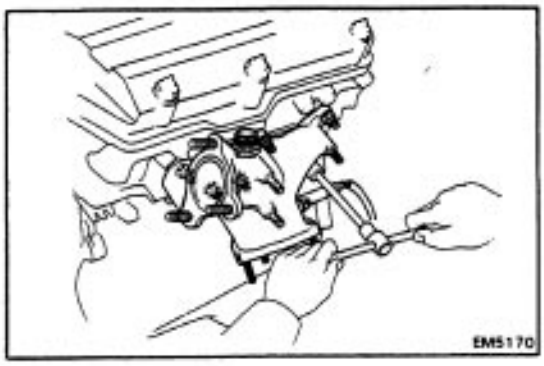
(b) Remove the eight bolts, four nuts, intake manifold and two gaskets.



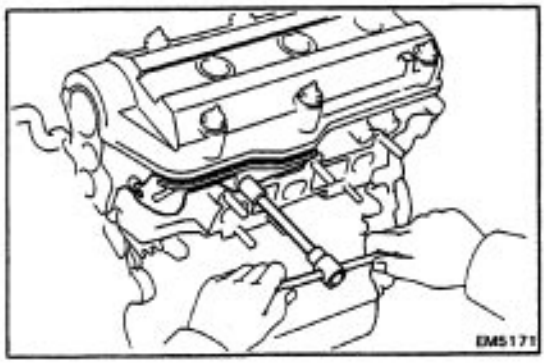
27. REMOVE RH EXHAUST MANIFOLD

(a) Disconnect the oxygen sensor connector.

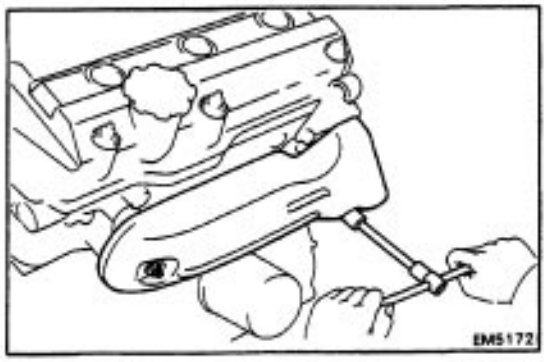
(b) Remove the three. nuts and outside heat insulator.



(c) Remove the six nuts, exhaust manifold and gasket.

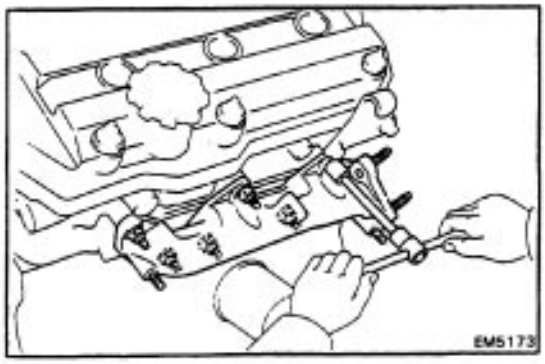


(d) Remove the bolt and inside heat insulator.



28. REMOVE LH EXHAUST MANIFOLD

(a) Remove the two nuts and heat insulator.

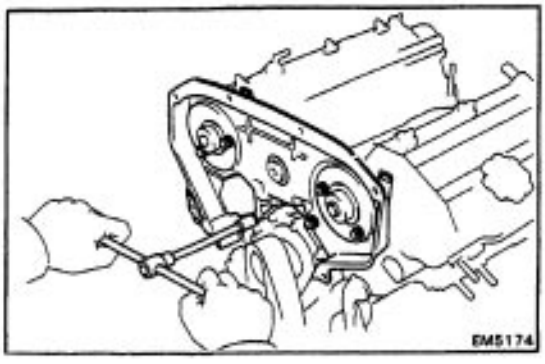


(b) Remove the six nuts, exhaust manifold and gasket.

29. REMOVE SPARK PLUGS (See page IG–11)

30. REMOVE TIMING BELT, CAMSHAFT TIMING PULLEYS AND No.2 IDLER PULLEY

(See steps 3 to 19 on pages EM–34 to 37)

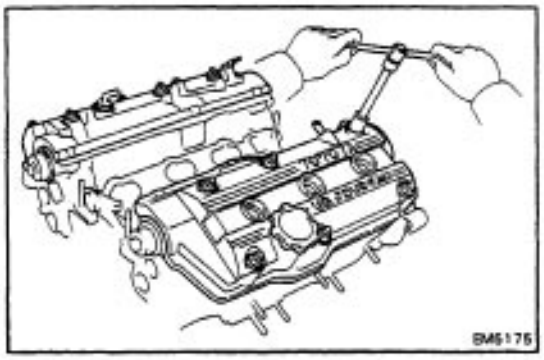


31. REMOVE NO.3 TIMING BELT COVER

Remove the six bolts and timing belt cover.

NOTICE:

- Support the belt so the meshing of the crankshaft timing pulley and timing belt does not shift.
- Be careful not to drop anything inside the timing belt cover.
- Do not allow the belt to come into contact with oil, water or dust.



32. REMOVE CYLINDER HEAD COVERS

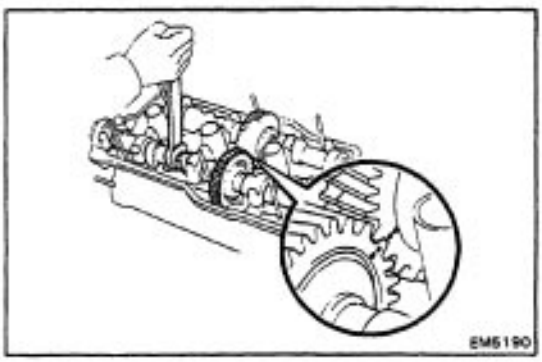
Remove the six nuts, seal washers, cylinder head cover and gasket. Remove the two cylinder head covers.

33. REMOVE SPARK PLUG TUBE GASKETS

Remove the six tube gaskets.

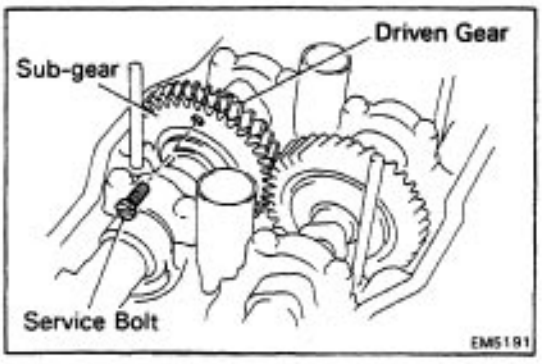
34. REMOVE CAMSHAFTS

NOTICE: Since the thrust clearance of the. camshaft is small, the camshaft must be held level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



A. Remove exhaust camshaft of RH cylinder head

(a) Align the timing marks (two pointed marks) of the camshaft drive and driven gears by turning the camshaft with a wrench.



(b) Secure the exhaust camshaft sub–gear to the driven gear with a service bolt.

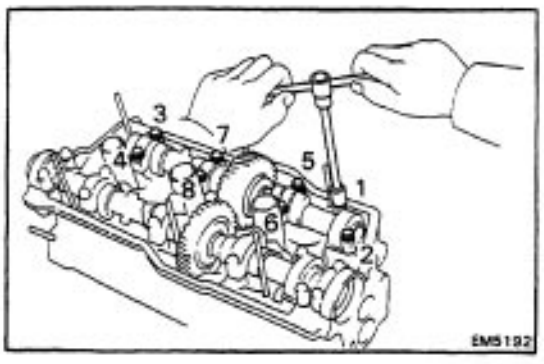
Recommended service bolt:

Thread diameter 6 mm

Thread pitch 1.0 mm

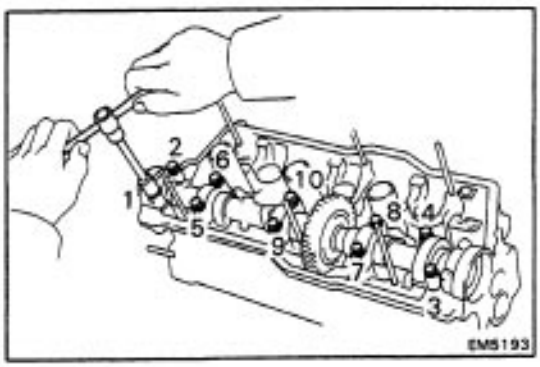
Bolt length 16 – 20 mm (0.63 – 0.79 in.)

HINT: When removing the camshaft, make certain that the torsional spring force of the sub–gear has been eliminated by the above operation.



(c) Uniformly loosen and remove the eight bearing cap bolts in several passes in the sequence shown.

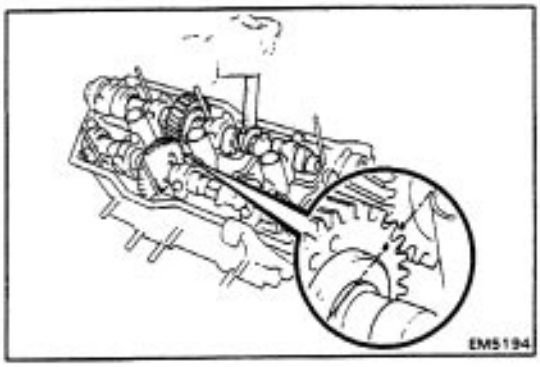
(d) Remove the four bearing caps and exhaust camshaft.



B. Remove intake camshaft of RH cylinder head

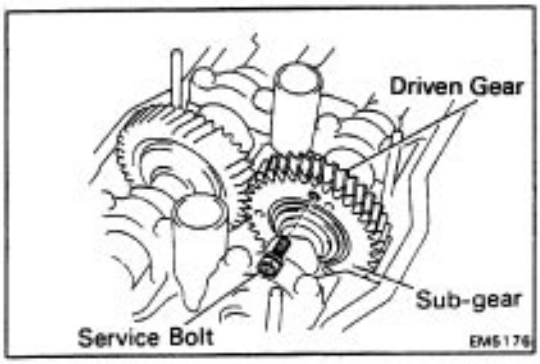
(a) Uniformly loosen and remove the ten bearing cap bolts in several passes in the sequence shown.

(b) Remove the five bearing caps, oil seal and intake camshaft.



C. Remove exhaust camshaft of LH cylinder head

(a) Align the timing marks (one pointed mark) of the camshaft drive and driven gears by turning the camshaft with a wrench.



(b) Secure the exhaust camshaft sub–gear to the driven gear with a service bolt.

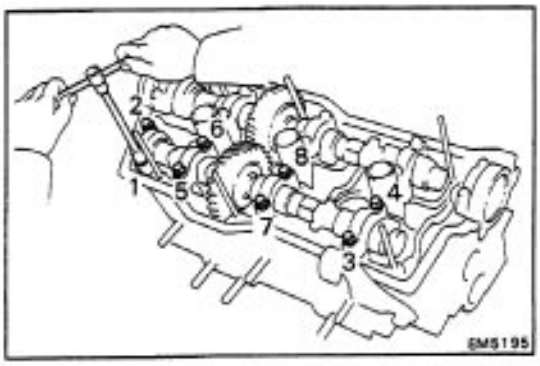
Recommended service bolt:

Thread diameter 6 mm

Thread pitch 1.0 mm

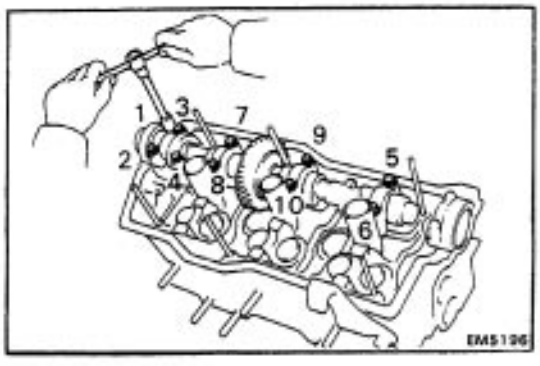
Bolt length 16 – 20 mm (0.63 – 0.79 in.)

HINT: When removing the camshaft, make certain that the torsional spring force of the sub–gear has been eliminated by the above operation.



(c) Uniformly loosen and remove the eight bearing cap bolts in several passes in the sequence shown.

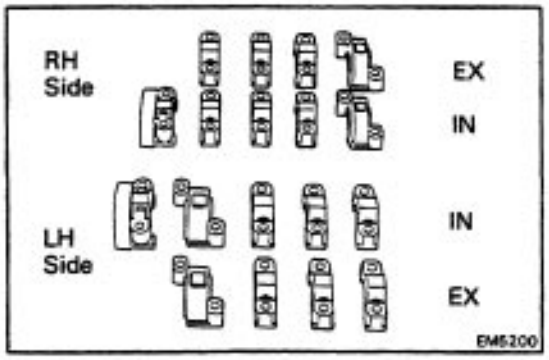
(d) Remove the four bearing caps and exhaust camshaft.



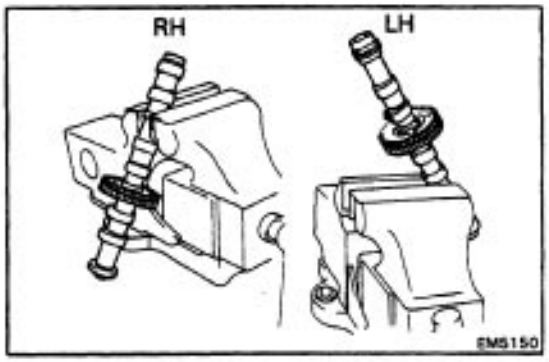
D. Remove intake camshaft of LH cylinder head

(a) Uniformly loosen and remove the ten bearing cap bolts in several passes in the sequence shown.

(b) Remove the five bearing caps, oil seal and intake camshaft.



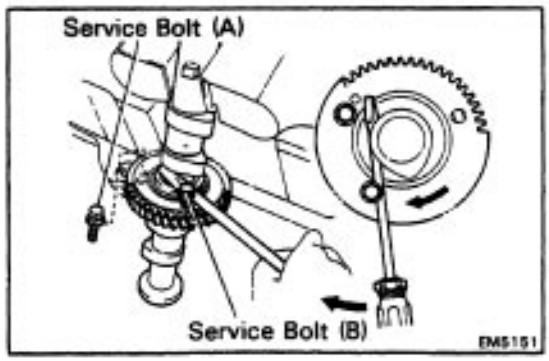
HINT: Arrange the bearing caps incorrect order.



35. DISASSEMBLE EXHAUST CAMSHAFTS

(a) Mount the hexagonal wrench head portion of the camshaft in a vise.

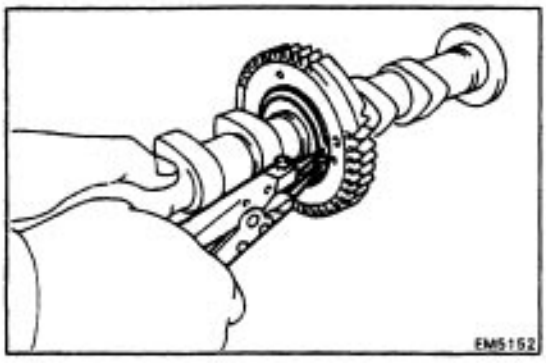
NOTICE: Be careful not to damage the camshaft.



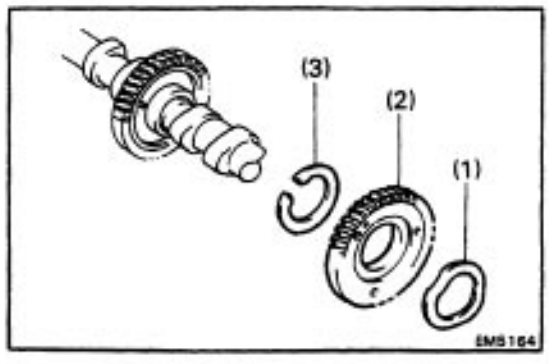
(b) Insert service bolt (A) into the service hole of the camshaft sub–gear.

(c) Using a screwdriver, turn the sub–gear clockwise, and remove the service bolt (B).

NOTICE: Be careful not to damage the camshaft.



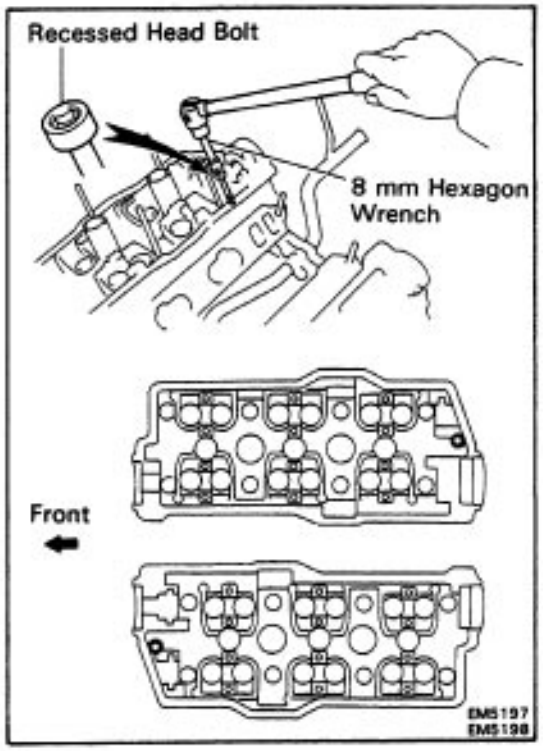
(d) Using snap ring pliers, remove the snap ring.



(e) Remove the following parts:

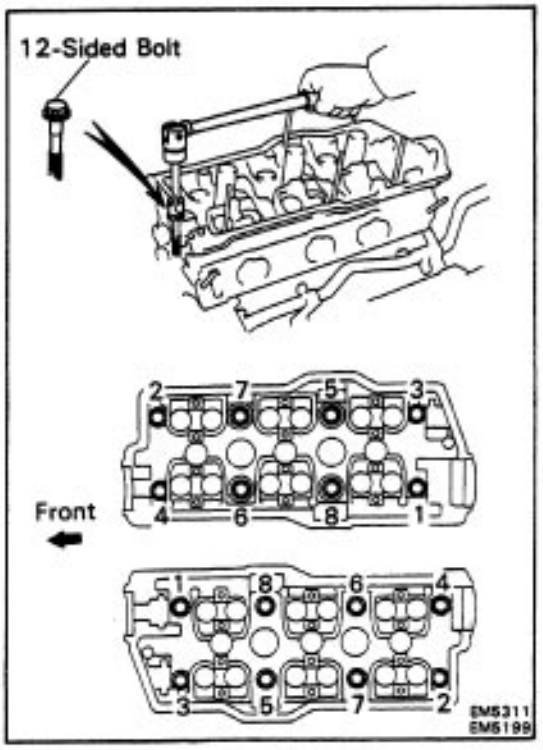
(1) Wave washer
(2) Camshaft sub–gear
(3) Camshaft gear spring

HINT: Arrange the camshaft sub–gears and gear springs (RH and LH).

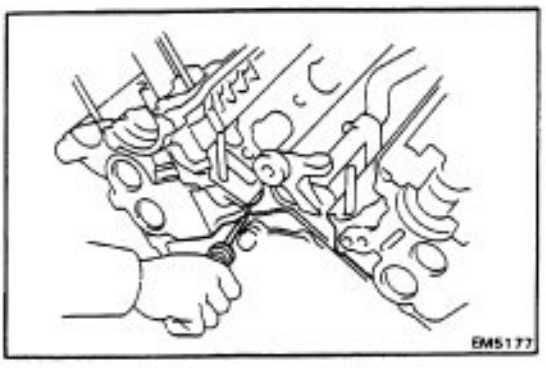


36. REMOVE CYLINDER HEADS

(a) Using a 8 mm hexagon wrench, remove the cylinder head (recessed head) bolts.



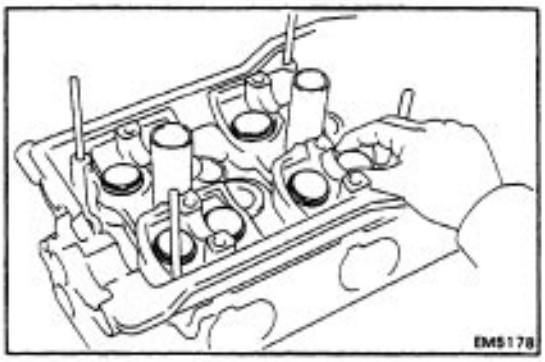
(b) Uniformly loosen and remove the cylinder head (12–sided) bolts in several passes in the sequence shown.
NOTICE: Head warpage or cracking could result from removing bolts in incorrect order.



(c) Lift the cylinder head from the dowels on the cylinder block and place the heads on wooden blocks on a bench.

HINT:

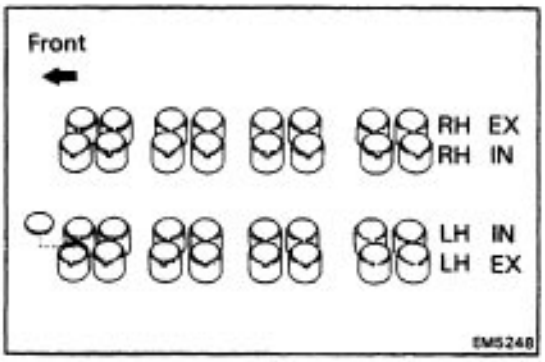
- If the cylinder head is difficult to lift off, pry with a screwdriver between the cylinder head and block.
- Arrange the RH and LH cylinder heads.
  NOTICE: Be careful not to damage the cylinder head and cylinder block surfaces of cylinder head gasket side.



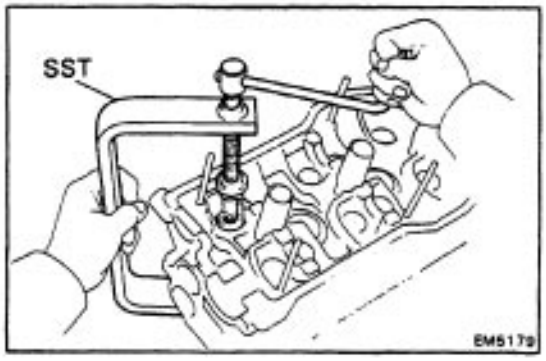
DISASSEMBLY OF CYLINDER HEADS

(See page EM–75)

1 . REMOVE VALVE LIFTERS AND SHIMS



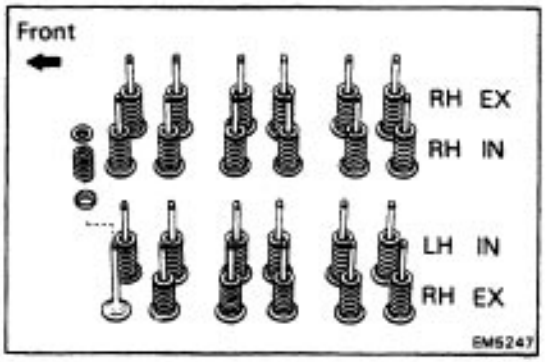
HINT: Arrange the valve lifters and shims in correct order.



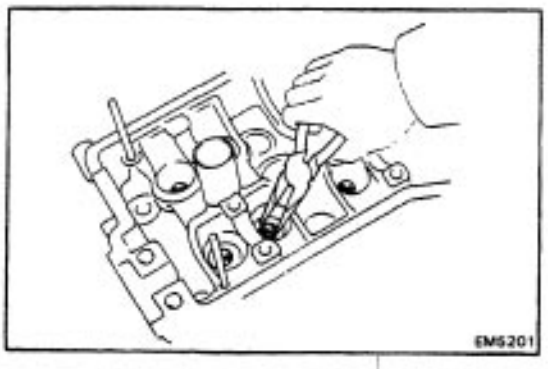
2. REMOVE VALVES

(a) Using SST, compress the valve spring and remove the two keepers.
SST 09202–70010

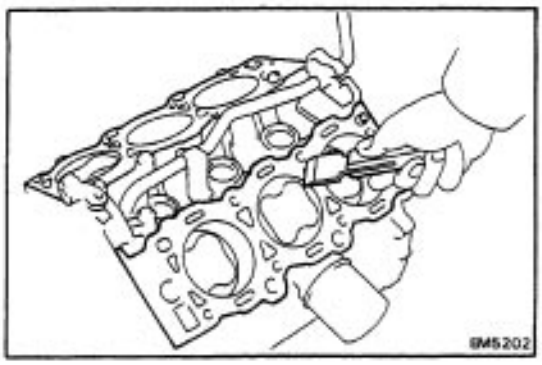
(b) Remove the spring retainer, valve spring, valve and spring seat.



HINT: Arrange the valves, valve springs, spring seats and spring retainers in correct order.



(c) Using needle–nose pliers, remove the oil seal.



INSPECTION, CLEANING AND REPAIR OF CYLINDER HEAD COMPONENTS

1. CLEAN TOP OF PISTONS AND TOP OF BLOCK

(a) Turn the crankshaft and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top.

(b) Remove all the gasket material from the top of the cylinder block.

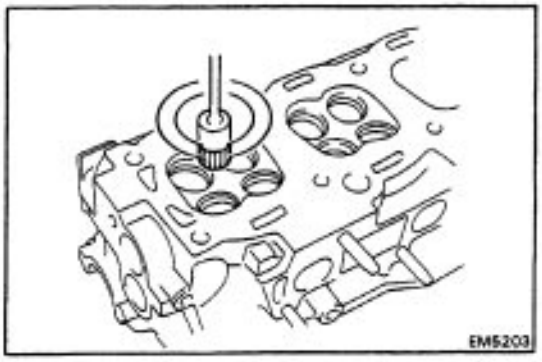
(c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION: Protect your eyes when using high pressure air.

2. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket material from the manifold and cylinder head surface.

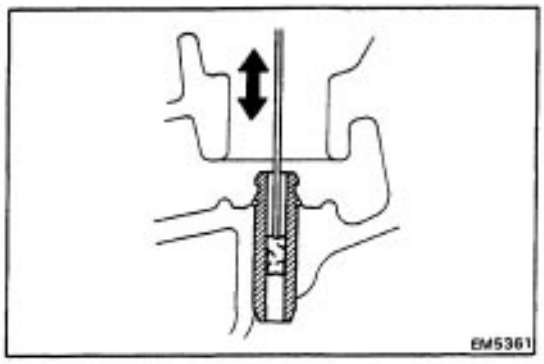
NOTICE: Be careful not to scratch the surfaces.



3. CLEAN COMBUSTION CHAMBERS

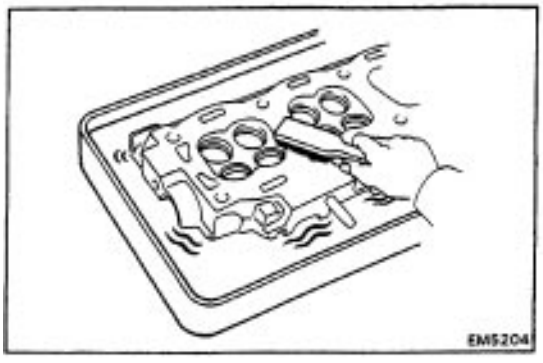
Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE: Be careful not to scratch the head gasket contact surface.



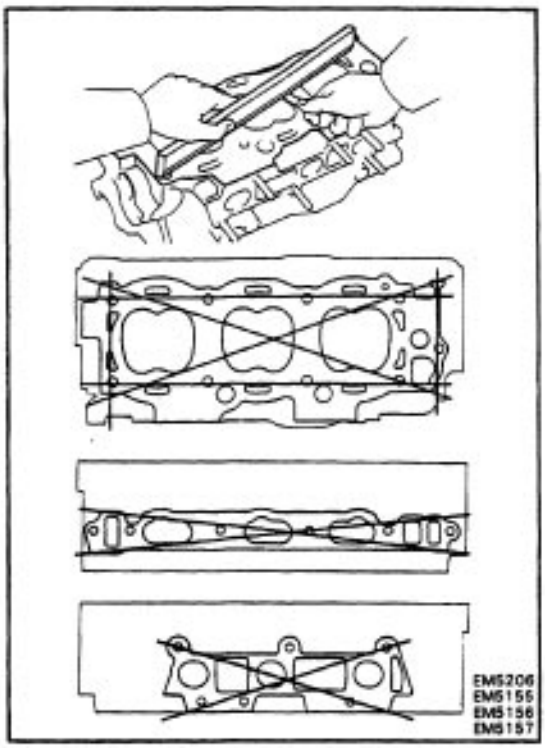
4. CLEAN VALVE GUIDE BUSHINGS

Using a valve guide bushing brush and solvent, clean all the guide bushings.



5. CLEAN CYLINDER HEADS

Using a soft brush and solvent, thoroughly clean cylinder heads.

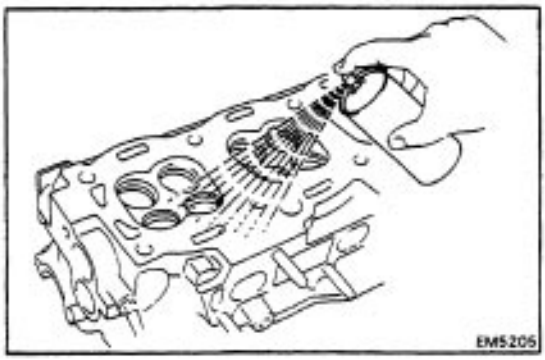


6. INSPECT CYLINDER HEADS FOR FLATNESS

Using a precision straight edge and thickness gauge, measure the surfaces contacting the cylinder block manifolds for warpage.

Maximum warpage: 0.10 mm (0.0039 in.)

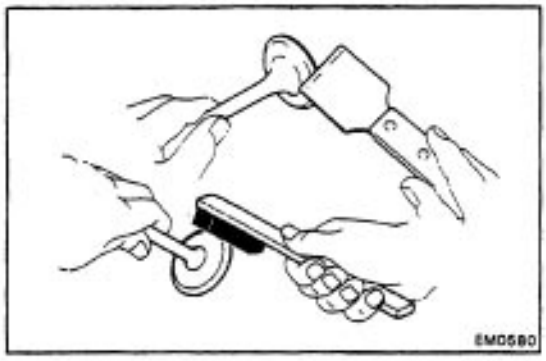
If warpage is greater than maximum, replace the cylinder head.



7. INSPECT CYLINDER HEAD FOR CRACKS

Using a dye penetrant, check the combustion chamber, intake and exhaust ports, head surface and the top of the head for cracks:

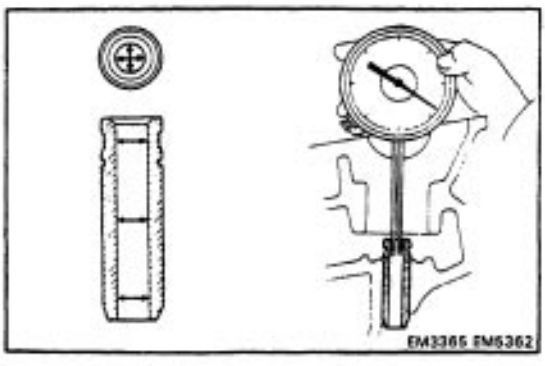
If cracked, replace the cylinder head.



8. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

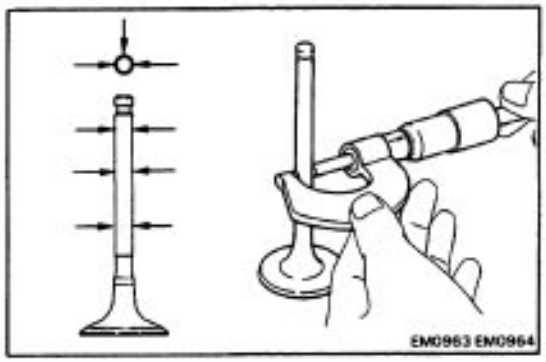
(b) Using a wire brush, thoroughly clean the valve.



9. INSPECT VALVE STEMS AND GUIDE BUSHINGS

(a) Using a caliper gauge, measure the inside diameter of the guide bushing.

Bushing inside diameter:
6.010 – 6.030 mm (0.2366 – 0.2374 in.)



(b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

Intake 5.970 – 5.985 mm (0.2350 – 0.2356 in.)

Exhaust 5.965 – 5.980 mm (0.2348 – 0.2354 in.)

(c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

Standard oil clearance:

Intake 0.025 – 0.060 mm (0.0010 – 0.0024 in.)

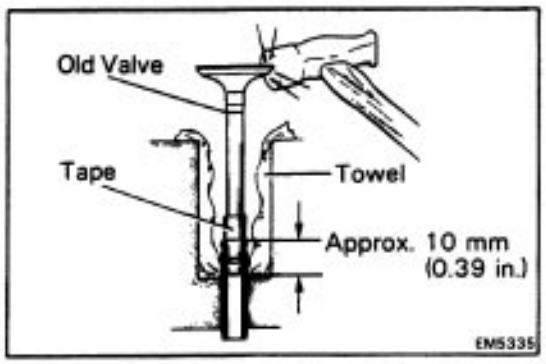
Exhaust 0.030 – 0.065 mm (0.0012 – 0.0026 in.)

Maximum oil clearance:

Intake 0.08 mm (0.0031 in.)

Exhaust 0.10 mm (0.0039 in.)

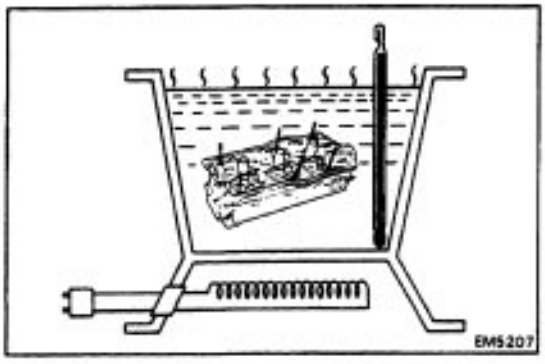
If the clearance is greater than maximum, replace the valve and guide bushing.



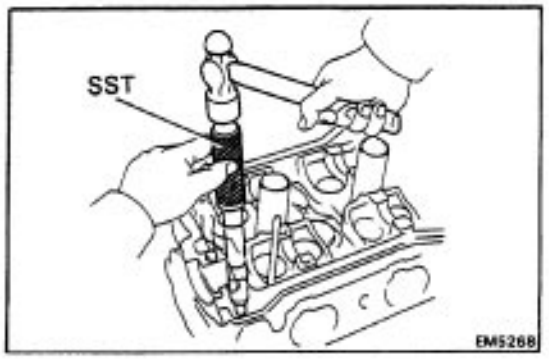
10. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

(a) Insert an old valve wrapped with tape into the valve guide bushing, and break off the valve guide bushing by hitting it with a hammer.

NOTICE: Be careful not to damage the valve lifter hole.

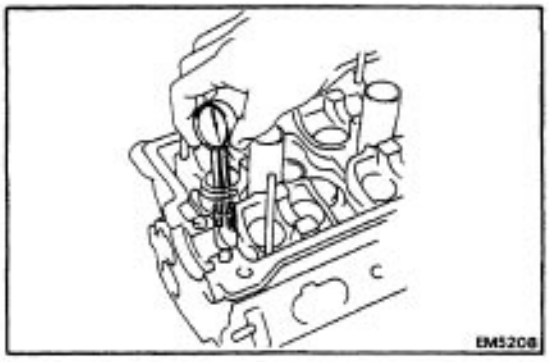


(b) Gradually heat the cylinder head to 80 –100˚C (176 – 212˚F).



(c) Using SST and a hammer, tap out the guide bushing.

SST 09201– 70010

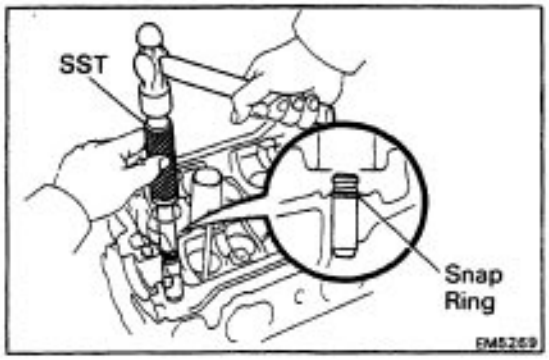


(d) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

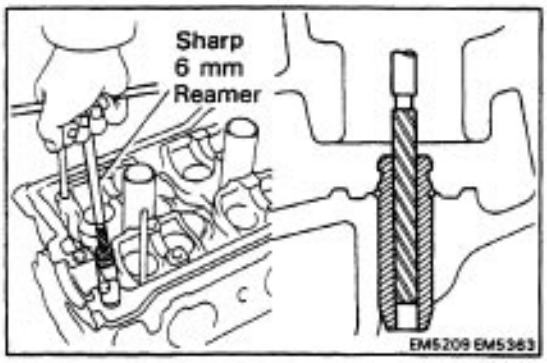
Both intake and exhaust

Bushing bore diameter mm (in.)	Bushing size
11.000 – 11.027 (0.4331 – 0.4342)	Use STD
11.050 – 11.077 (0.4350 – 0.4361)	Use O/S 0.05

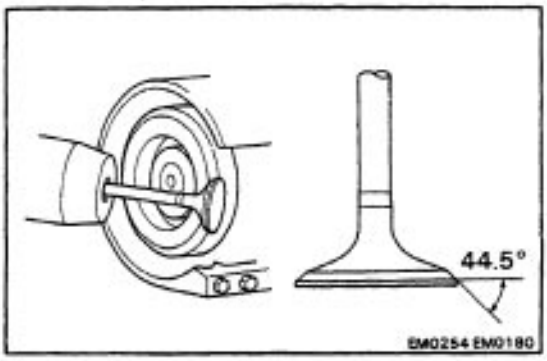
(e) Select a new guide bushing (STD size or O/S 0.05).
If the bushing bore diameter of the cylinder head is greater than 11.027 mm (0.4341 in.), machine the bushing bore to the following dimension:
Rebored cylinder head bushing bore dimension:
11.050 – 11.077 mm (0.4350 – 0.4361 in.)
If the bushing bore diameter of the cylinder head is greater than 11.077 mm (0.4361 in.), replace the cylinder head.



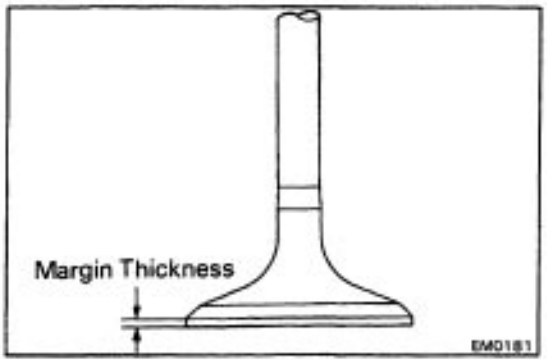
(f) Gradually heat the cylinder head to 80 –100°C 076 – 212°F).
(g) Using SST and a hammer, tap in a new guide bushing until the snap ring makes contact with the cylinder head.
SST 09201–70010



(h) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page EM–86) between the guide bushing and valve stem.



11. INSPECT AND GRIND VALVES
(a) Grind the valve enough to remove pits and carbon.
(b) Check that the valve is ground to the correct valve face angle.
Valve face angle: 44.5°



(c) Check the valve head margin thickness.

Standard margin thickness: 1.0 mm (0.039 in.)
Minimum margin thickness: 0.5 mm (0.020 in.)

If the margin thickness is less than minimum, replace the valve.

(d) Check the valve overall length.

Standard overall length:
Intake 96.1 mm (3.783 in.)
Exhaust 96.2 mm (3.787 in.)
Minimum overall length:
Intake 95.6 mm (3.754 in.)
Exhaust 95.7 mm (3.768 in.)

If the overall length is less than minimum, replace the valve.

(e) Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

NOTICE: Do not grind off more than the minimum.

12. INSPECT AND CLEAN VALVE SEATS

(a) Using a 45° carbide cutter, resurface the valve seats.

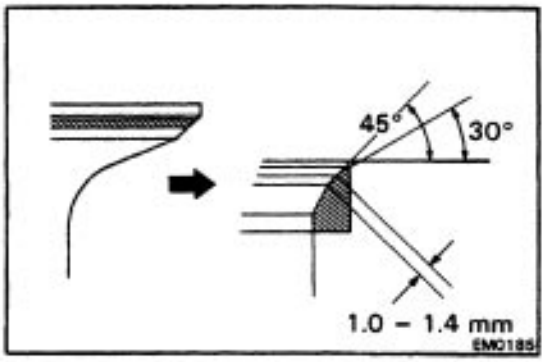
Remove only enough metal to clean the seats.

(b) Check the valve seating position.

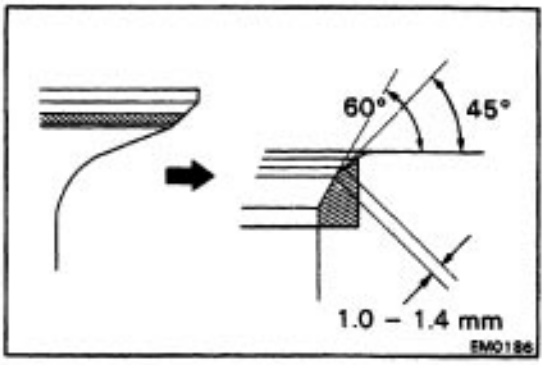
Apply a thin coat of Prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

(c) Check the valve face and seat for the following:

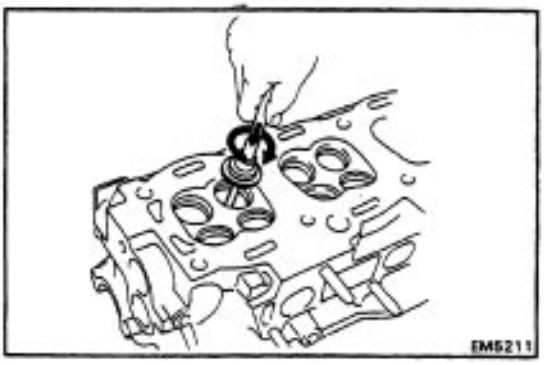
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:
  1.0 – 1.4 mm (0.039 – 0.055 in.)



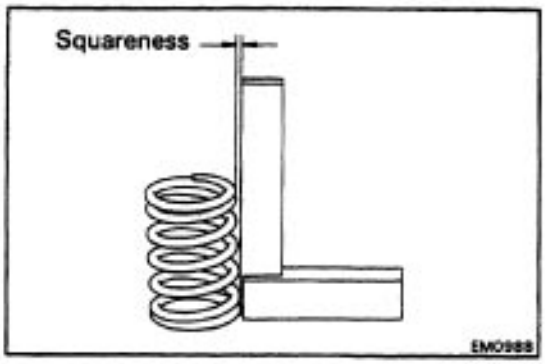
If not, correct the valve seats as follows:
111 If the seating is too high on the valve face, use 30˚ and 45˚ cutters to correct the seat.



(2) If the seating is too low on the valve face, use 60˚ and 45˚ cutters to correct the seat.

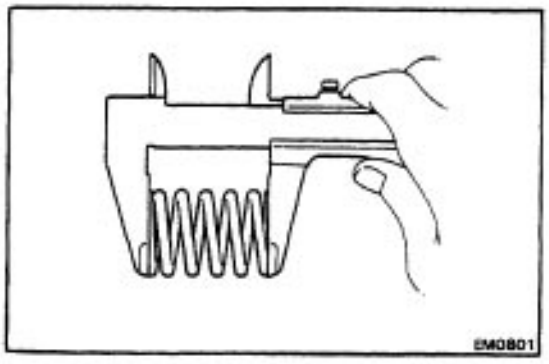


(d) Hand–lap the valve and valve seat with an abrasive compound.
After hand–lapping, clean the valve and valve seat.

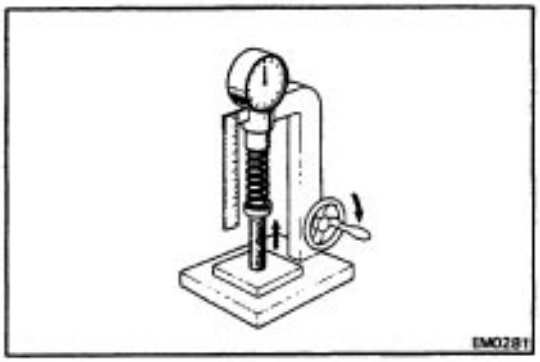


13. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the squareness of the valve spring.
Maximum squareness: 2.0 mm (0.075 in.)
if squareness is greater than maximum, replace the valve spring.



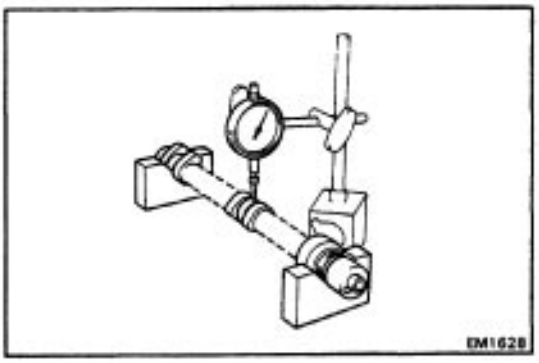
(b) Using calipers, measure the free length of the valve spring.
Free length: 42.6 mm (1.677 in.)
If the free length is not as specified, replace the valve spring.



(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:
18.6 – 21.4 kg (41.0 – 47.2 1b, 182 – 210 N)
at 33.8 mm (1.331 in.)

If the installed tension is not as specified, replace the valve spring.



14. INSPECT CAMSHAFTS AND BEARINGS

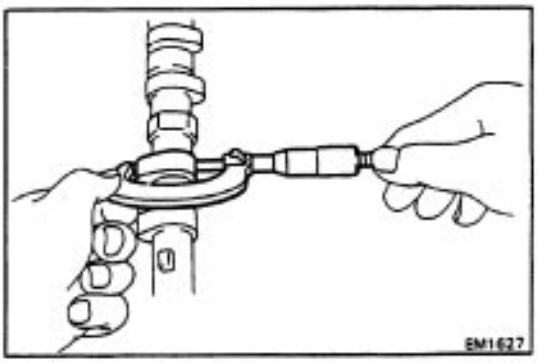
A. Inspect camshaft for runout

(a) Place the camshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the camshaft.



B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

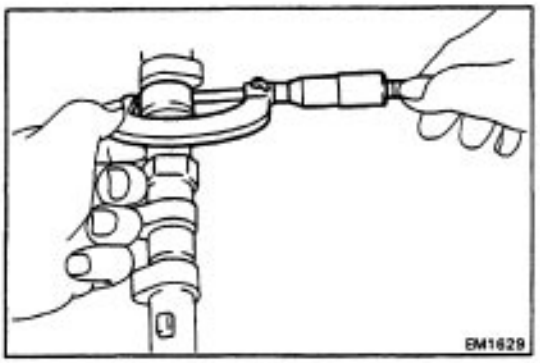
Standard cam lobe height:

Intake	**39.510 – 39.610 mm (1.5555 – 1.5594 in.)**
Exhaust	**38.960 – 39.060 mm (1.5339 – 1.5378 in.)**

Minimum cam lobe height:

Intake	**39.36 mm (1.5496 in.)**
Exhaust	**38.81 mm (1.5279 in.)**

If the cam lobe height is greater than maximum, replace the camshaft.

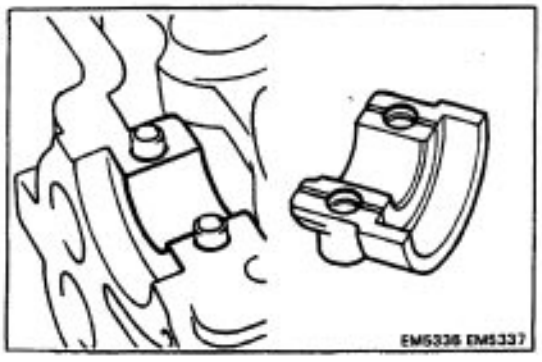


C. Inspect camshaft journals

Using a micrometer, measure the journal diameter.

Journal diameter: 26.949 – 26.965 mm (1.0610 – 1.0616 in.)

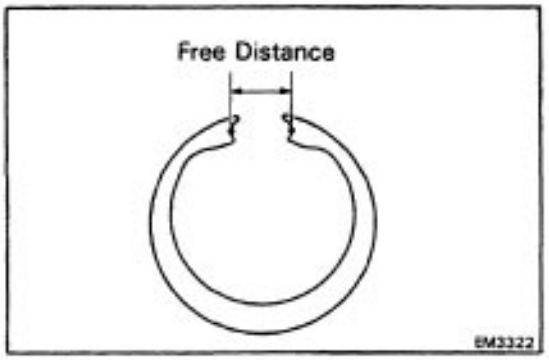
If the journal diameter is not as specified, check the oil clearance.



D. Inspect camshaft bearings

Check the bearings for flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.

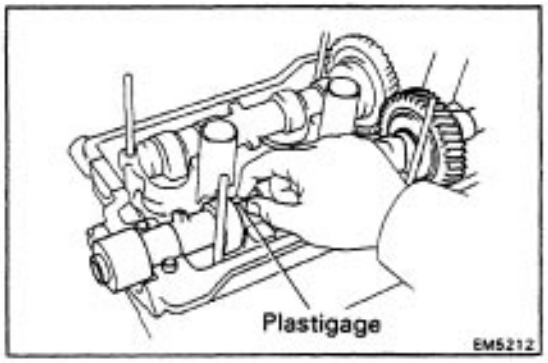


E. Inspect camshaft gear spring

Using calipers, measure the free distance between the spring end.

Free distance: 18.2 – 18.8 mm (0.712 – 0.740 in.)

If the free distance is not as specified, replace the gear spring.

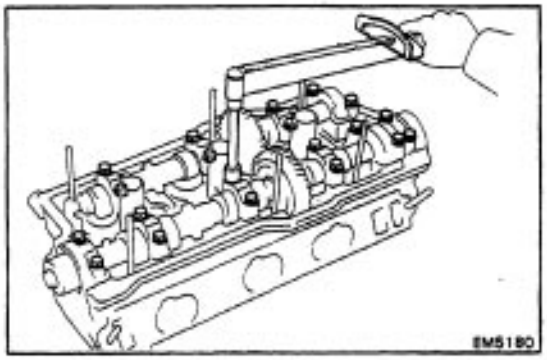


F. Inspect camshaft journal oil clearance

(a) Clean the bearing caps and camshaft journals.

(b) Place the camshafts on the cylinder head.

(c) Lay a strip of Plastigage across each of the camshaft journals.

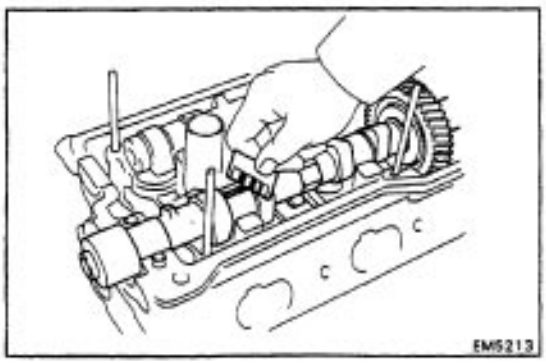


(c) Install the bearing caps.

(See step 4 on pages EM–97 to 99)

Torque: 160 kg–cm (12 ft–1b, 16 N–m)

NOTICE: Do not turn the camshaft.



(e) Remove the bearing caps.

(f) Measure the Plastigage at its widest point.

Standard oil clearance: 0.035 – 0.072 mm. (0.0014 – 0.0028 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(g) Completely remove the Plastigage.

G. Inspect camshaft thrust clearance

(a) Install the camshafts.

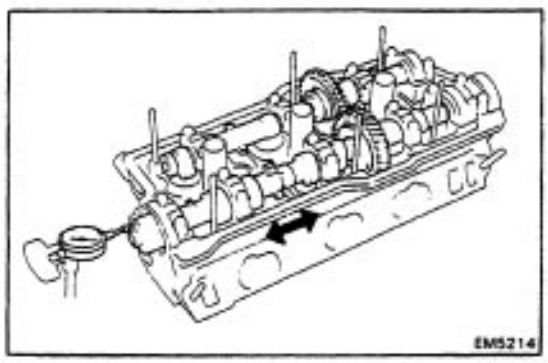
(See step 4 on pages EM–98)

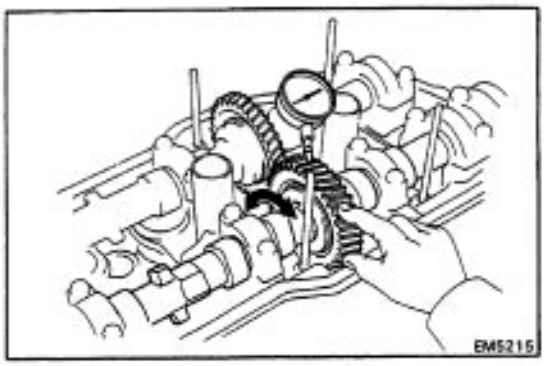
(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance: 0.030 – 0.080 mm (0.0012 – 0.0031 in.)

Maximum thrust clearance: 0.12 mm (0.0047 in.)

If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.





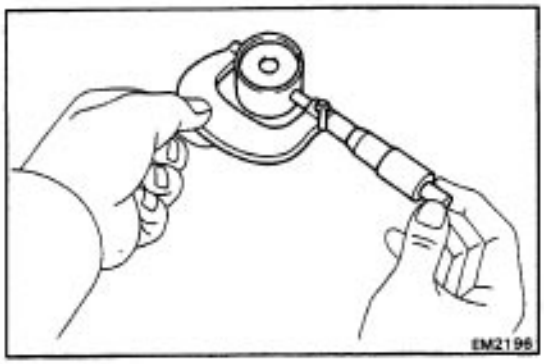
H. Inspect camshaft gear backlash

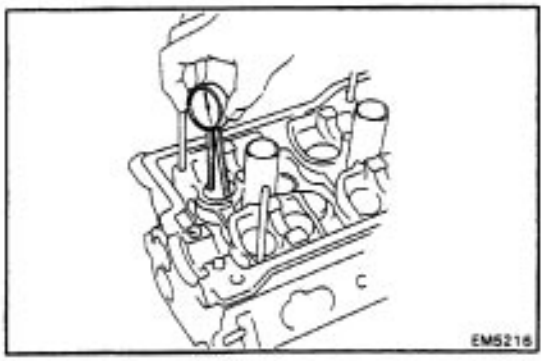
(a) Install the camshafts without installing the exhaust camshaft sub–gear.
(See step 4 on pages EM–96 to 99)

(b) Using a dial indicator, measure the backlash.
Standard backlash: 0.020 – 0.200 mm (0.0008 – 0.0079 in.)
Maximum backlash: 0.30 mm (0.0188 in.)
If the backlash is greater than maximum, replace the camshafts.

15. INSPECT VALVE LIFTERS AND LIFTER BORES

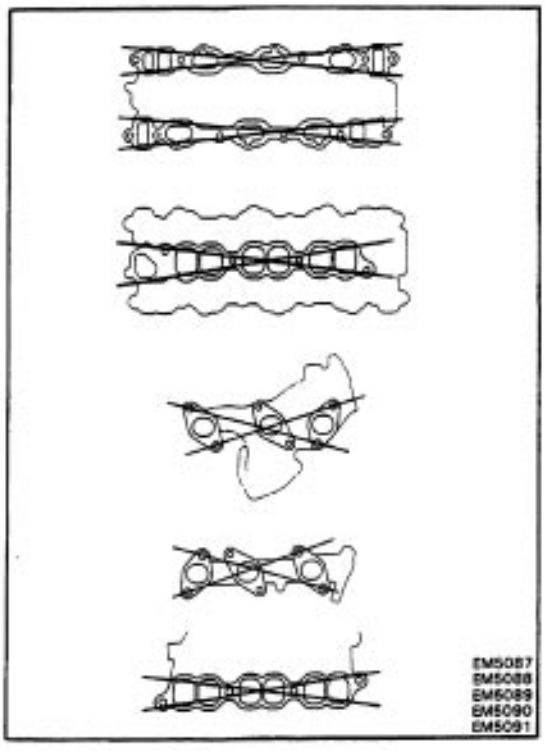
(a) Using a micrometer, measure the lifter diameter.
Lifter diameter: 27.975 – 27.985 mm (1.1014 – 1.1018 in.)





(b) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter: 28.000 – 28.021 mm (1.1024 – 1.1032 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.
Standard oil clearance: 0.015 – 0.046 mm (0.0005 – 0.0018 in.)
Maximum oil clearance: 0.07 mm (0.0028 in.)
If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.



16. INSPECT INTAKE, EXHAUST MANIFOLDS AND AIR INTAKE CHAMBER

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head, intake manifold or air intake chamber for warpage.

Maximum warpage:
Intake manifold 0.10 mm (0.0039 in.)
Exhaust manifold 1.00 mm (0.0394 in.)
Air intake chamber 0.10 mm (0.0039 in.)

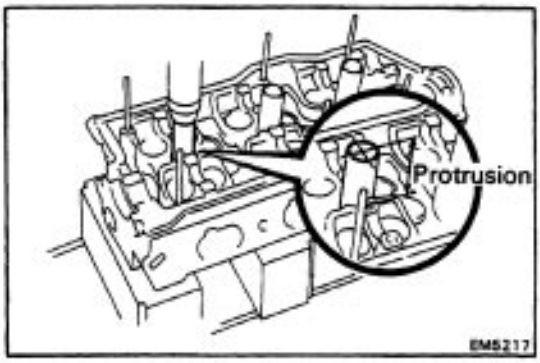
If warpage is greater than maximum, replace the manifold.

ASSEMBLY OF CYLINDER HEADS

(See page EM–75)

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.

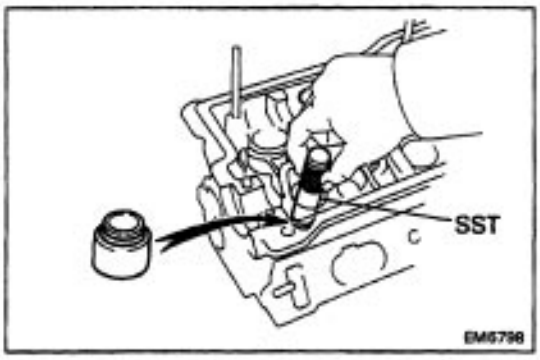


1. INSTALL SPARK PLUG TUBES

HINT: When using a new cylinder head, spark plug tubes must be installed.

Using a press, in a new spark plug tube until there is 45.5–45.9 mm (1.791–1.807 in.) protruding from the camshaft bearing cap installation surface of the cylinder head.

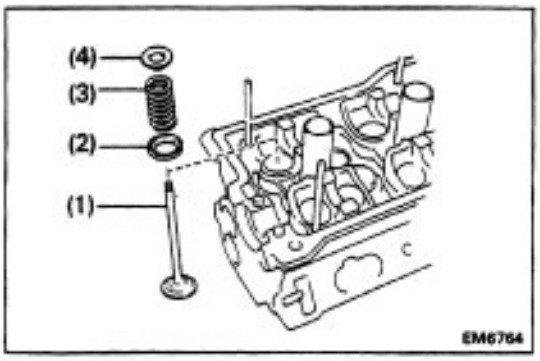
NOTICE: Avoid. pressing a new spark plug tube in too far by measuring the amount of protrusion while pressing.



2. INSTALL VALVES

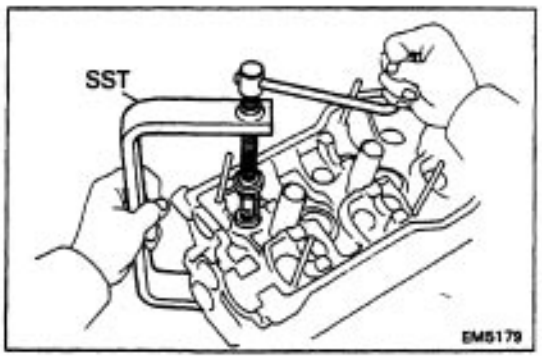
(a) Using SST, push in a new oil seal.

SST 09201–41020



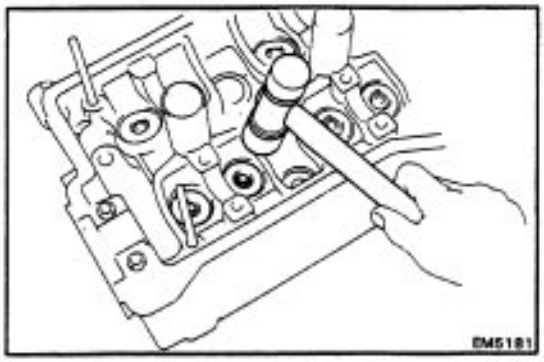
(b) Install the following parts:

(1) Valve
(2) Spring seat
(3) Valve spring
(4) Spring retainer

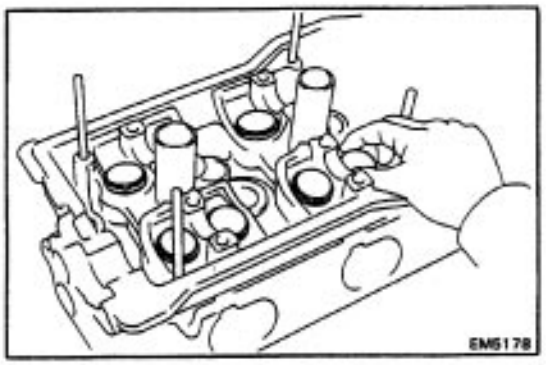


(c) Using SST, compress the valve spring and place the two keepers around the valve stem.

SST 09202–70010

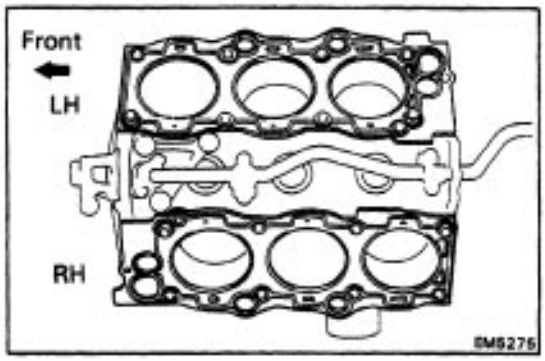


(c) Using a plastic–faced hammer, lightly tap the valve stern tip to assure proper fit.



3. INSTALL VALVE LIFTERS AND SHIMS

Check the valve lifter rotates smoothly by hand.



INSTALLATION OF CYLINDER HEADS

(See page EM–75)

1. INSTALL CYLINDER HEADS

A. Place cylinder head on cylinder block

(a) Place a new cylinder head gasket in position on the cylinder block.

NOTICE: Be careful of the installation direction.

(b) Place the cylinder head in position on the cylinder head gasket.

B. Install cylinder head (12–sided) bolts

HINT:

- The cylinder head bolts are tightened in three progres–

sive steps (steps (b), (d) and (e)).

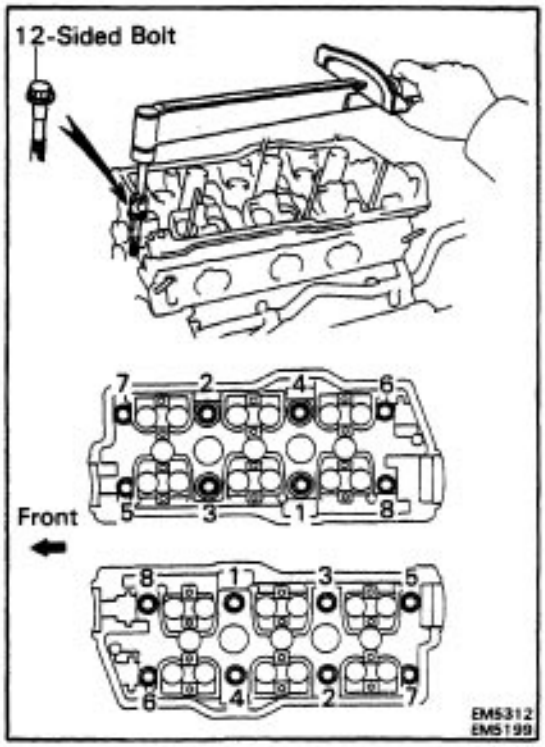
- If any bolts is broken or deformed, replace them.

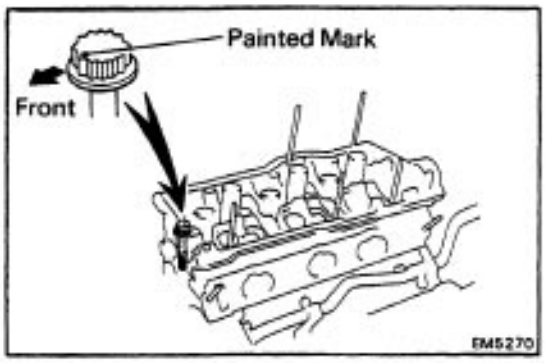
(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Install and uniformly tighten the cylinder head bolts in several passes in the sequence shown.

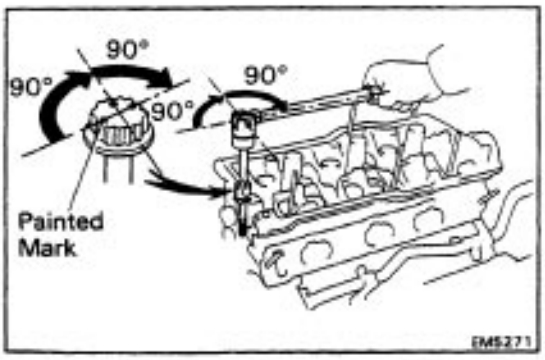
Torque: 350 kg–cm (25 ft–lb, 34 N–m)

If any one of the bolts does not meet the torque specification, replace the bolt.





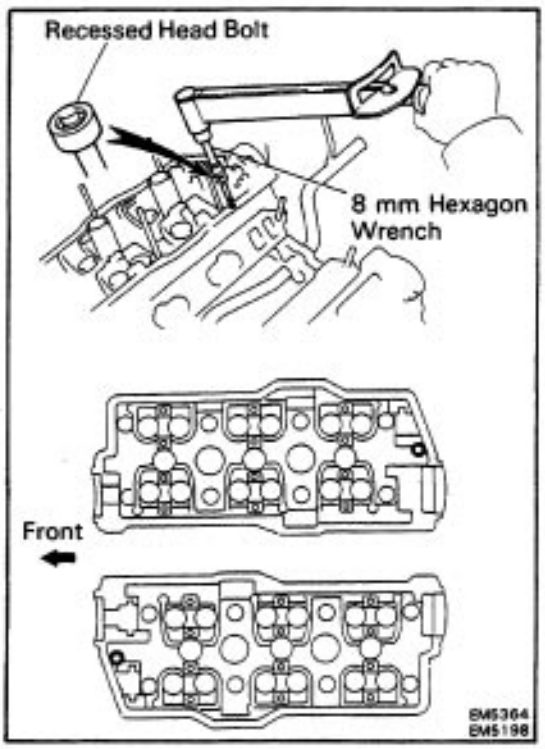
(c) Mark the front of the cylinder head bolt head with paint.



(d) Retighten the cylinder head bolts 90˚ in the numerical order shown.

(e) Retighten cylinder head bolts by an additional 90˚.

(f) Check that the painted mark is now facing rearward.



c. Install cylinder head (recessed head) bolts

(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Using a 8 mm hexagon wrench, install the cylinder head bolts.

Torque: 185 kg–cm (13 ft–lb, 18 N–m)

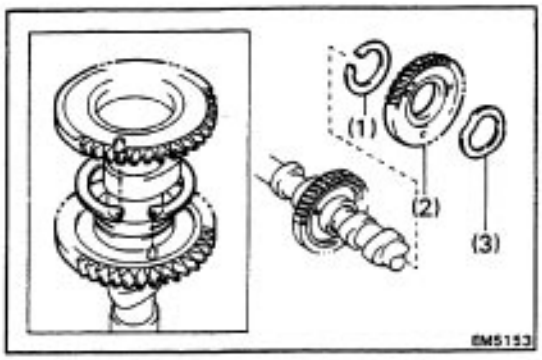
2. INSTALL LH ENGINE HANGER

Torque: 380 kg–cm (27 ft–lb, 37 N–m)

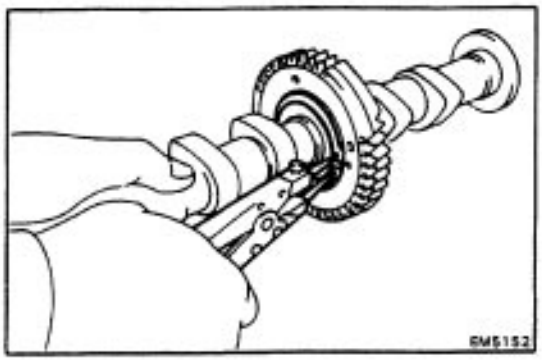
3. ASSEMBLE EXHAUST CAMSHAFTS

(a) Install the following parts:

(1) Camshaft gear spring
(2) Camshaft sub–gear
(3) Wave washer

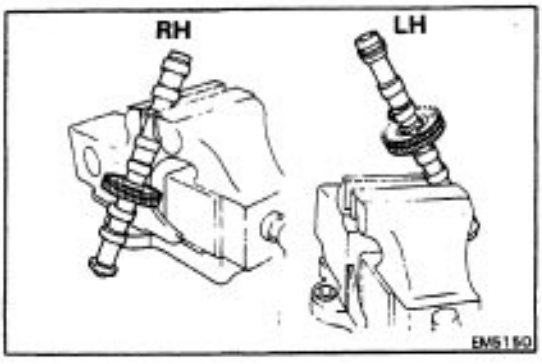


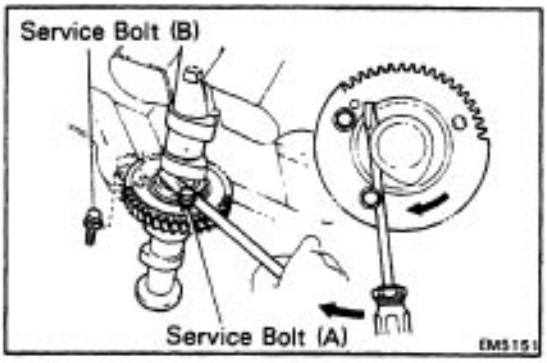
(b) Using snap ring pliers, install the snap ring.



(c) Mount the hexagonal wrench head portion of the camshaft in a vise.

NOTICE: Be careful not to damage the camshaft.

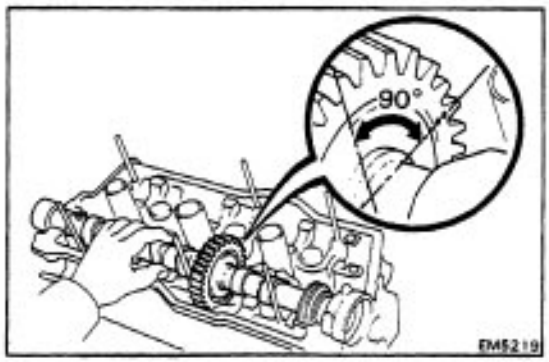




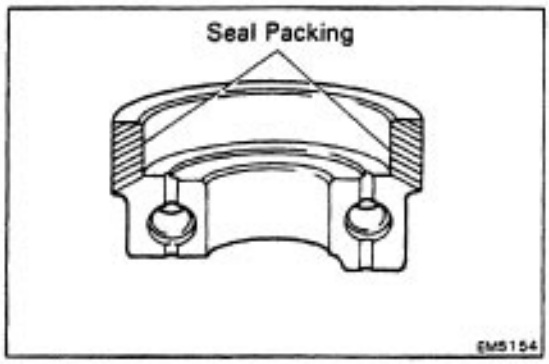
(d) Insert a service bolt (A) into the service hole of the camshaft sub–gear.
(e) Using a screwdriver, align the holes of the camshaft driven gear and sub–gear by turning camshaft sub-gear clockwise, and install a service bolt (B).
NOTICE: Be careful not to damage the camshaft.

4. INSTALL CAMSHAFTS

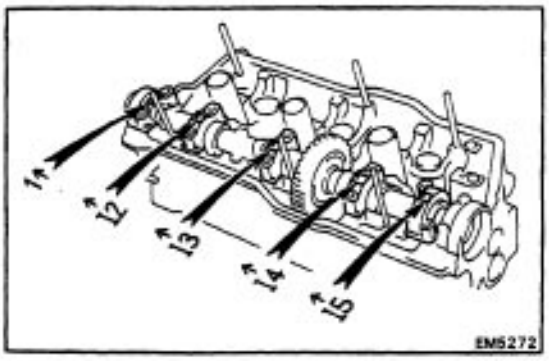
NOTICE: Since the thrust clearance of the camshaft is small, the camshaft must be held level white it is being installed. If the camshaft is not level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



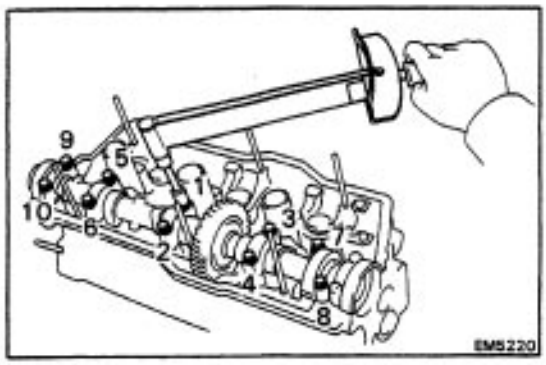
A. Install intake camshaft of R H cylinder head
(a) Apply MP grease to the thrust portion of the camshaft.
(b) Place the intake camshaft at 90° angle of timing mark (two pointed marks) on the cylinder head.



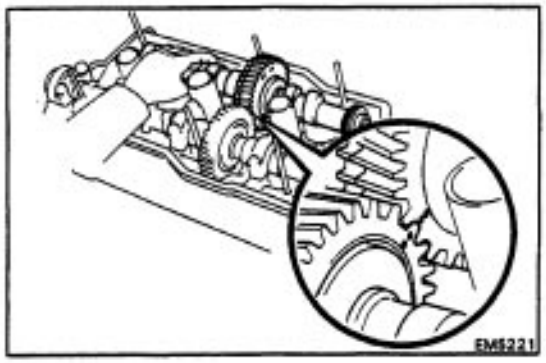
(c) Apply seal packing to the No. 1 bearing cap as shown.
Seal packing: Part No. 08826–00080 or equivalent



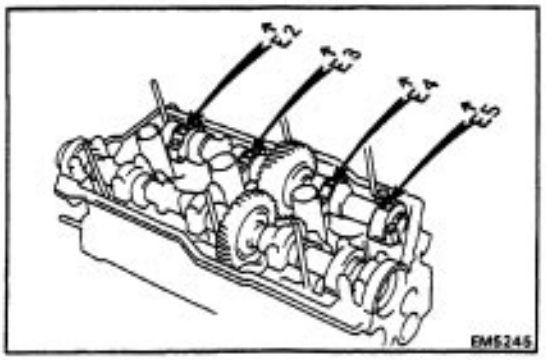
(d) Install the five bearing caps in their proper locations.



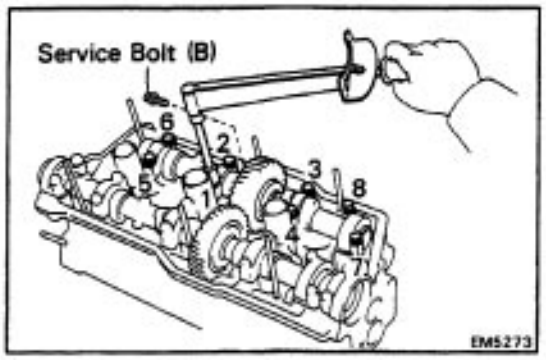
(e) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(f) Install and uniformly tighten the ten bearing cap bolts in several passes in the sequence shown.
Torque: 160 kg–cm (12 ft–lb, 16 N–m)



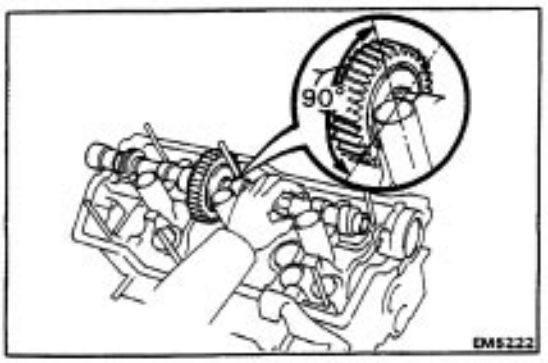
6. Install exhaust camshaft of RH cylinder head
(a) Apply MP grease to the thrust portion of the camshaft.
(b) Align the timing marks (two pointed marks) of the camshaft drive and driven gears.
(c) Place the exhaust camshaft on the cylinder head.



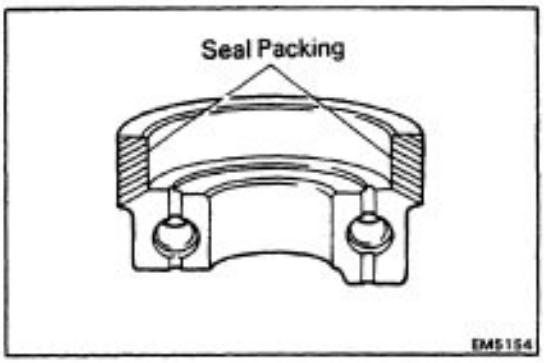
(d) Install the four bearing caps in their proper location.



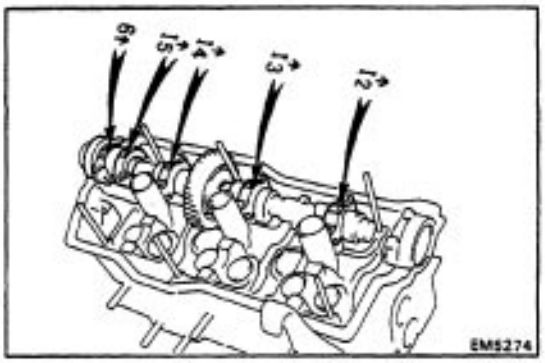
(e) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(f) Install and uniformly tighten the eight bearing cap bolts in several passes in the sequence shown.
Torque: 16o kg–cm (12 ft–lb, 16 N–m)
(g) Remove the service bolt (6).



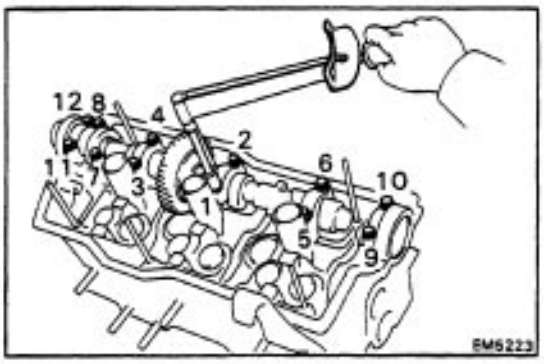
C. Install intake camshaft of LH cylinder head
(a) Apply MP grease to the thrust portion of the camshaft.
(b) Place the intake camshaft at 90° angle of timing mark (one pointed mark) on the cylinder head.



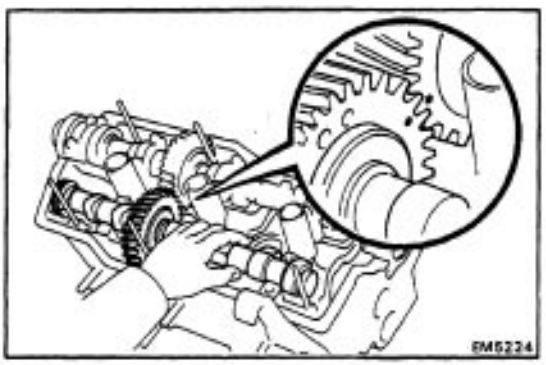
(c) Apply seal packing to the No. 1 bearing cap as shown.
Seal packing: Part No. 08826–00080 or equivalent



(d) Install the five bearing caps in their proper locations.

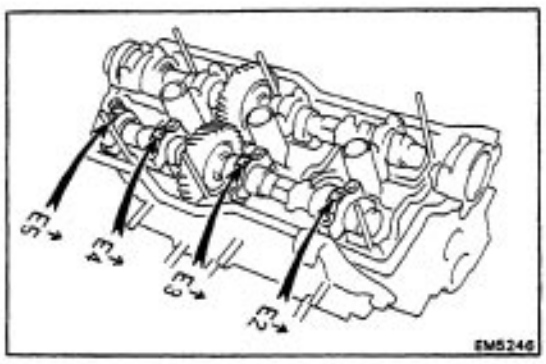


(e) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
M Install and uniformly tighten the ten bearing cap bolts in several passes in the sequence shown.
Torque: 160 kg–cm (12 ft–lb, 16 N–m)

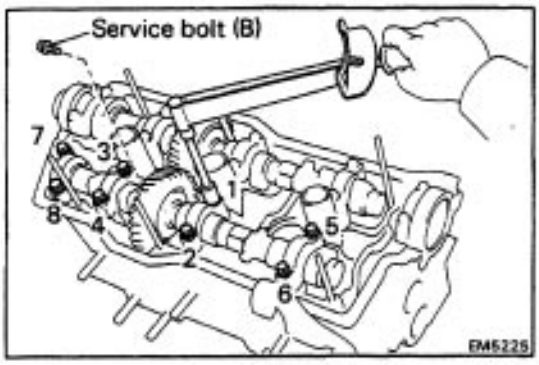


D. Install exhaust camshaft of LH cylinder head

(a) Apply MP grease to the thrust portion of the camshaft.
(b) Align the timing marks (one pointed mark) of the camshaft drive and driven gears.
(c) Place the intake camshaft on the cylinder head.

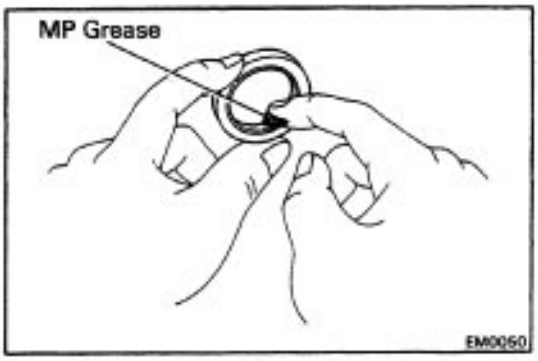


(d) Install the four bearing caps in their proper location.

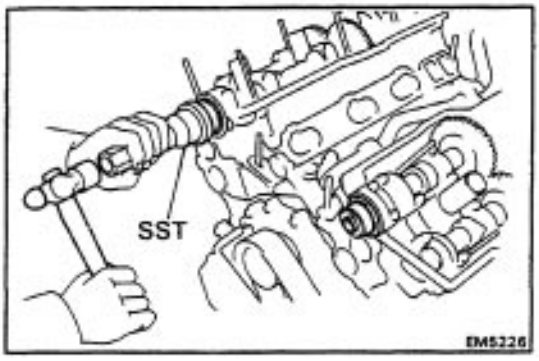


(e) Apply a light coat of engine oil on the threads and under the heads of bearing cap bolts.
(f) Install and uniformly tighten the eight bearing cap bolts in several passes in the sequence shown.
Torque: 160 kg–cm (12 ft–lb, 16 N–m)
Remove the service bolt (6).

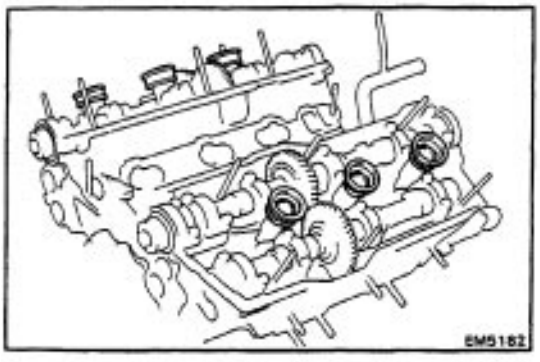
5. CHECK AND ADJUST VALVE CLEARANCE
(See page EM–9)
Turn the camshaft and position the cam lobe upward, check and adjust the valve clearance.
Valve clearance (Cold):
Intake 0.13 – 0.23 mm (0.005 – 0.009 in.)
Exhaust 0.27 – 0.37 mm (0.011 – 0.015 in.)



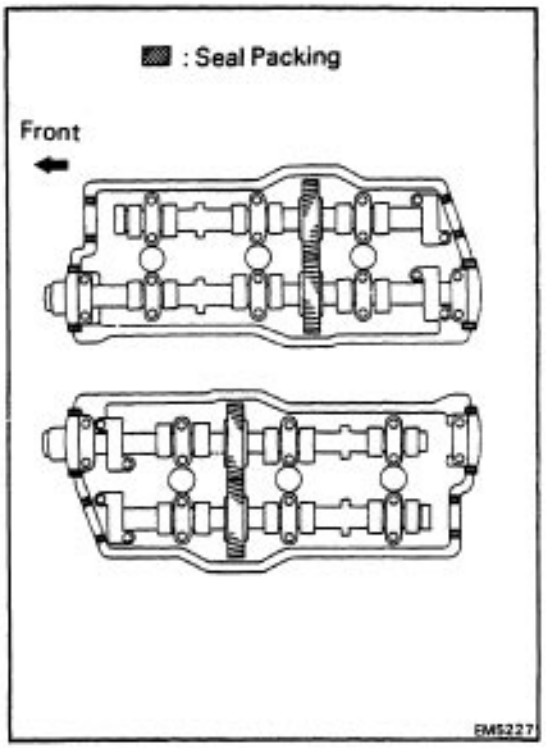
6. INSTALL CAMSHAFT OIL SEALS
(a) Apply MP grease to a new oil seal lip.



(b) Using SST, tap in the oil seals.
SST 09223–46011

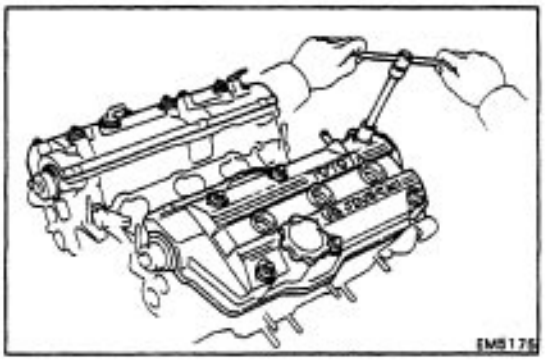


7. INSTALL SPARK PLUG TUBE GASKETS
Install the six tube gaskets.

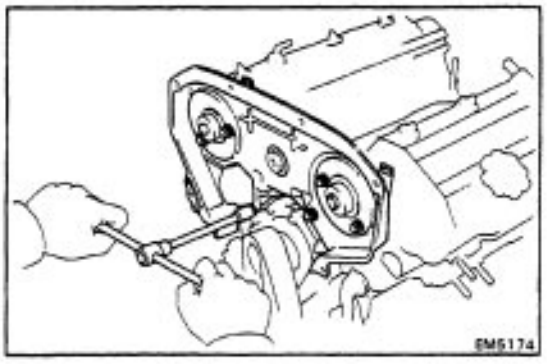


8. INSTALL CYLINDER HEAD COVERS

(a) Apply seal packing to the cylinder heads as shown in the figure.
Seal packing: Part No.08826–00080 or equivalent



(b) Install the gasket to the cylinder head cover.
(c) Install the cylinder head cover with the six seal washers and nuts. Install the two cylinder head covers.
Torque: 60 kg–cm (5Z in.–lb, 5.9 N–m)

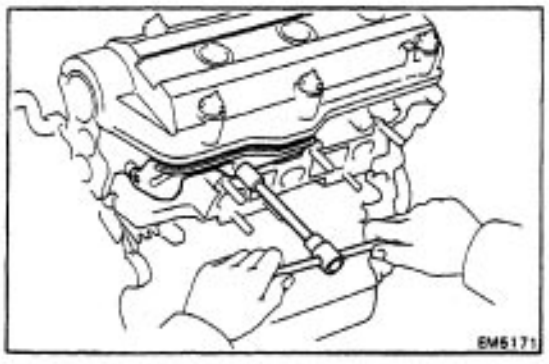


9. INSTALL NO.3 TIMING BELT COVER

Install the timing belt cover. with the six bolts.
Torque: 75 kg–cm (65 in.–lb, 7.4 N–m)

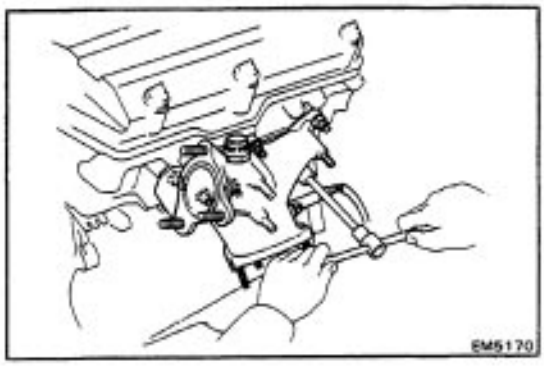
10. INSTALL NO.2 IDLER PULLEY, CAMSHAFT TIMING PULLEYS AND TIMING BELT
(See steps 7 to 26 on pages EM–43 to 47)

11. INSTALL SPARK PLUGS (See page IG–11)
Torque: 180kg–cm (13 ft–lb, 18 N–m)

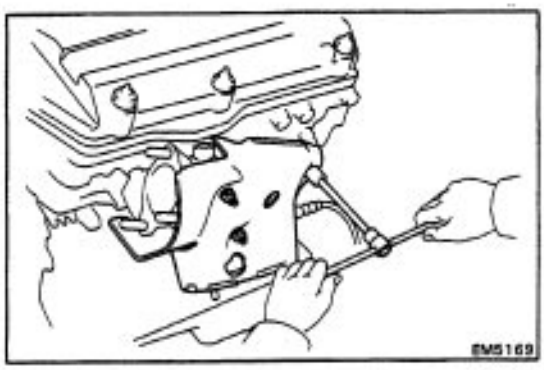


12. INSTALL RH EXHAUST MANIFOLD

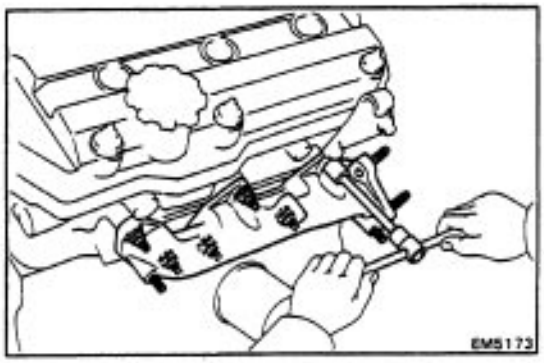
(a) Install the inside heat insulator with the bolt.



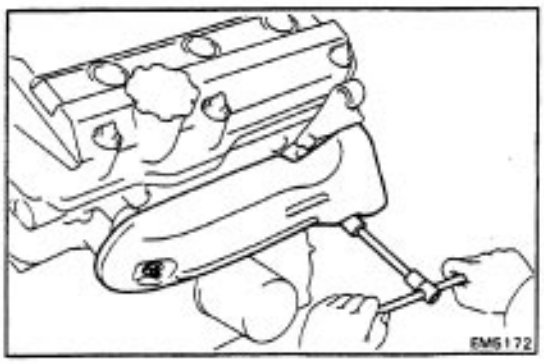
(b) Install a new gasket and the exhaust manifold with new six nuts.
Torque: 400 kg–cm (29 ft–lb, 39 N–m)



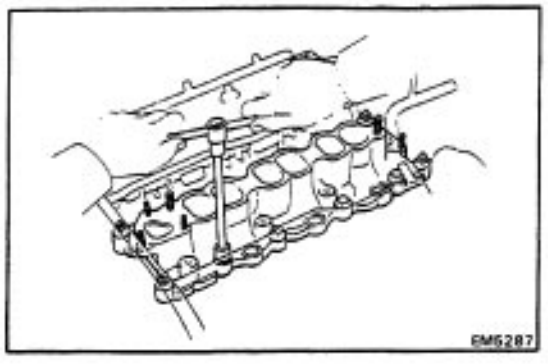
(c) Install the outside heat insulator with the three nuts.
(d) Connect the oxygen sensor connector.



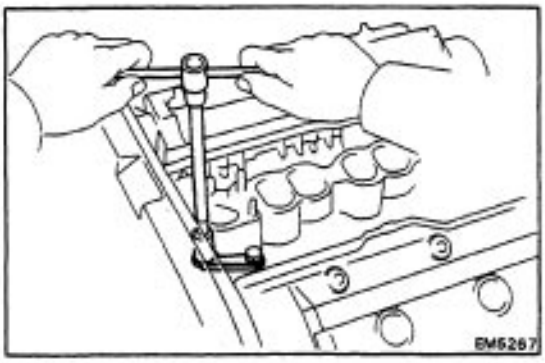
13. INSTALL LH EXHAUST MANIFOLD
(a) Install a new gasket and the exhaust manifold with new six nuts.
Torque: 400 kg–cm (29 ft–lb, 39 N–m)



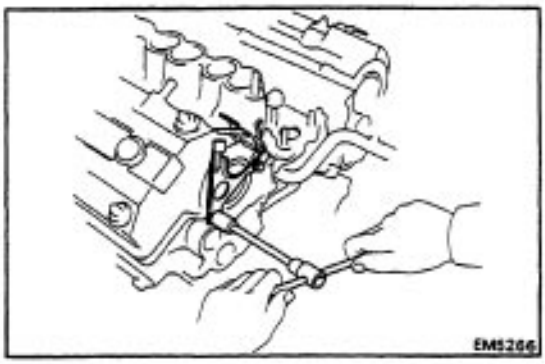
(b) Install the heat insulator with the two nuts.



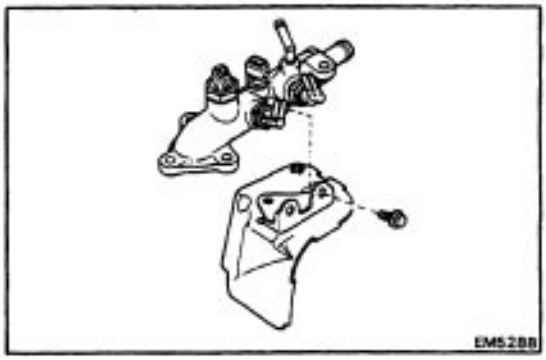
12. INSTALL INTAKE MANIFOLD
(a) Install two new gaskets and the intake manifold with the eight bolts and four nuts.
Torque: 180 kg–cm (13 ft–lb, 18 N–m)



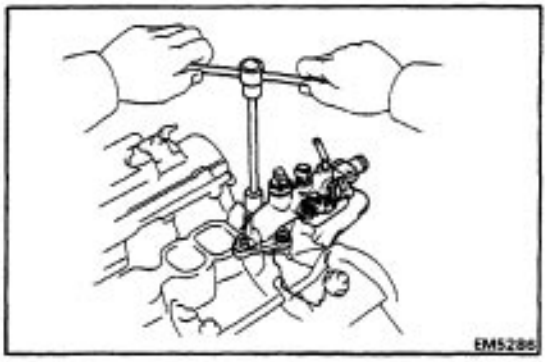
(b) Install the No.2 idler pulley bracket stay with the two bolts.
Torque: 185 kg–cm (13 ft–tb. 18 N–m)



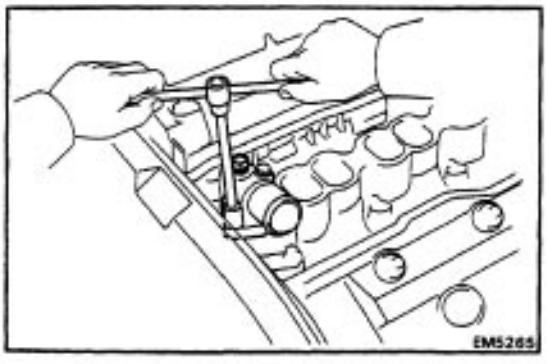
14. INSTALL CYLINDER HEAD REAR PLATE
Install the rear plate with the two bolts.



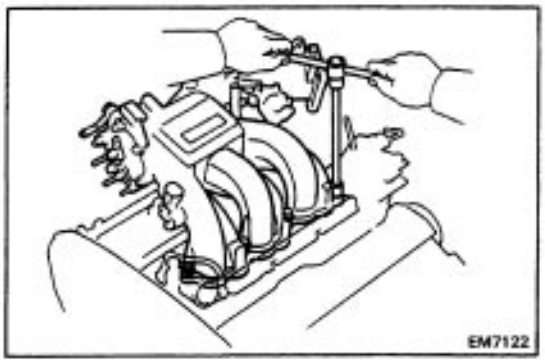
15. INSTALL WATER BY–PASS OUTLET
(a) Install the crossover pipe heat insulator with the two bolts.



(b) Install a new gasket and the water by–pass outlet with the three nuts.
Torque: 200 kg–cm (14 ft–tb, 20 N–m)
(c) Connect the following connectors and hose:
(1) Heater water by–pass hose
(2) Cold start injector time switch connector
(3) Water temperature switch



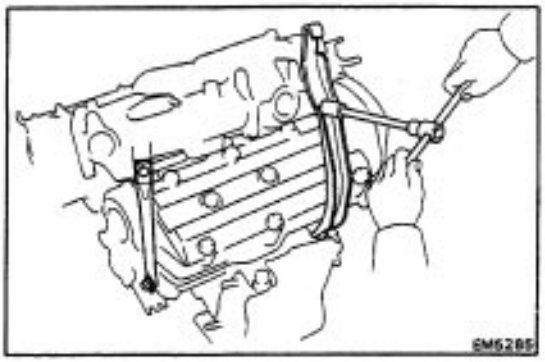
16. INSTALL WATER OUTLET
(a) Connect the following hose and connector:
(1) Radiator upper hose
(2)Water temperature sensor connector
(b) Install a new gasket and the water outlet with the three nuts.
Torque: 85 kg–cm (73 in.–lb, 8.3 N–m)
17. INSTALL INJECTORS AND DELIVERY PIPES
(See steps 1 to 5 on pages FI–98 and 99)



18. INSTALL AIR INTAKE CHAMBER

(a) Install two new gaskets and the intake chamber with the two bolts and two nuts.

Torque: 440 kg–cm (32 ft–lb, 43 N–m)



(b) Install the two intake chamber stays with the four bolts.

Torque: 380 kg–cm (27 ft–lb, 37 N–m)

(c) Connect the following hoses:

(1) PCV hose
(2) Vacuum sensing hose
(3) (CALIF. only)
EGR gas temperature sensor connector
(4) A/C control valve air hose

19. INSTALL COLD START INJECTOR TUBE

(See step 2 on page FI–83)

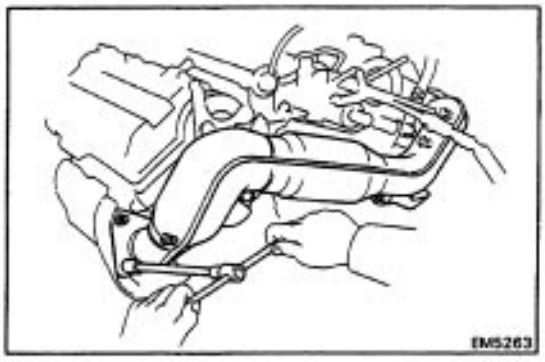
20. CONNECT COLD START INJECTOR CONNECTOR

21. INSTALL EXHAUST CROSSOVER PIPE

(a) Install two new gaskets to the RH and LH exhaust manifolds.

(b) install the crossover pipe with the six nuts and two bolts.

Torque:
Nut 400 kg–cm (29 ft–lb, 39 N–m)
Bolt 350 kg–cm (25 ft–lb, 34 N–m)



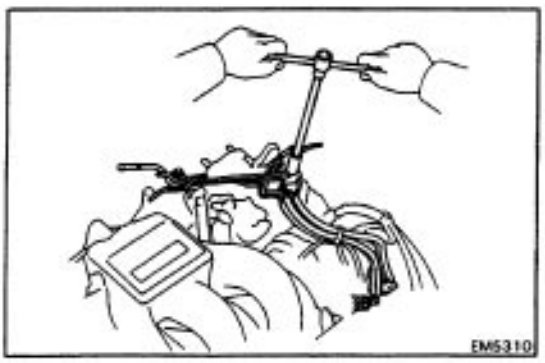
22. INSTALL DISTRIBUTOR (Seepage IG–19)

23. INSTALL VACUUM PIPE

(a) Install the vacuum pipe with the two bolts.

(b) Connect the following hoses:

(1) Four BVSV vacuum hoses
(2) A/C control valve vacuum hose

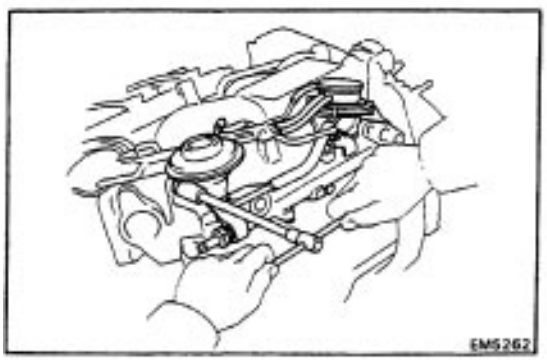


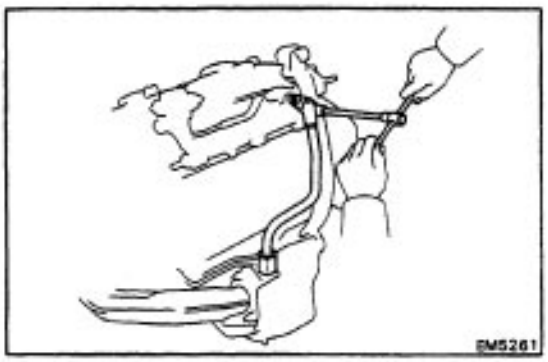
24. INSTALL EGR VALVE AND VACUUM MODULATOR

(a) Install a new gasket and the EGR valve and vacuum modulator with the two bolts and two nuts.

Torque: 185. kg–cm (13 ft–lb, 18 N–m)

(b) Install the four vacuum pipe hoses.





25. INSTALL EGR PIPE

Install a new gasket and the EGR pipe with the two bolts and union nut.

Torque:

Bolt 185 kg–cm (13 f t–lb, 18 N–m)

Nut 800 kg–cm (58 ft–lb, 78 N–m)

26. INSTALL THROTTLE BODY

(See steps 1 and 2 on page FI–115)

27. INSTALL ISC VALVE

(See steps 1 to 3 on page FI–119)

28. INSTALL ALTERNATOR (See page CH–15)

29. INSTALL FRONT EXHAUST PIPE

(See step 14 on page EM–172)

30. INSTALL ENGINE RH UNDER COVER

31. INSTALL AIR CLEANER HOSE

32. INSTALL CRUISE CONTROL ACTUATOR

(See step 27 on page EM–173)

33. INSTALL ACCELERATOR CABLE, AND ADJUST IT

34. (A/T)

CONNECT THROTTLE CABLE, AND ADJUST IT

35. FILL WITH ENGINE COOLANT (See page CO–5)

Capacity (w/ Heater):

M/T 9.5 liters (110.0 US qts, 8.4 Imp. qts)

A/T 9.4 liters (9.9 US qts, 8.3 Imp. qts)

36. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

37. START ENGINE AND CHECK FOR LEAKS

38. ADJUST IGNITION TIMING (See on page IG–21)

Ignition timing:

10˚ BTDC @ idle

(w/ Terminals TE1 and E1 connected)

39. PERFORM ROAD TEST

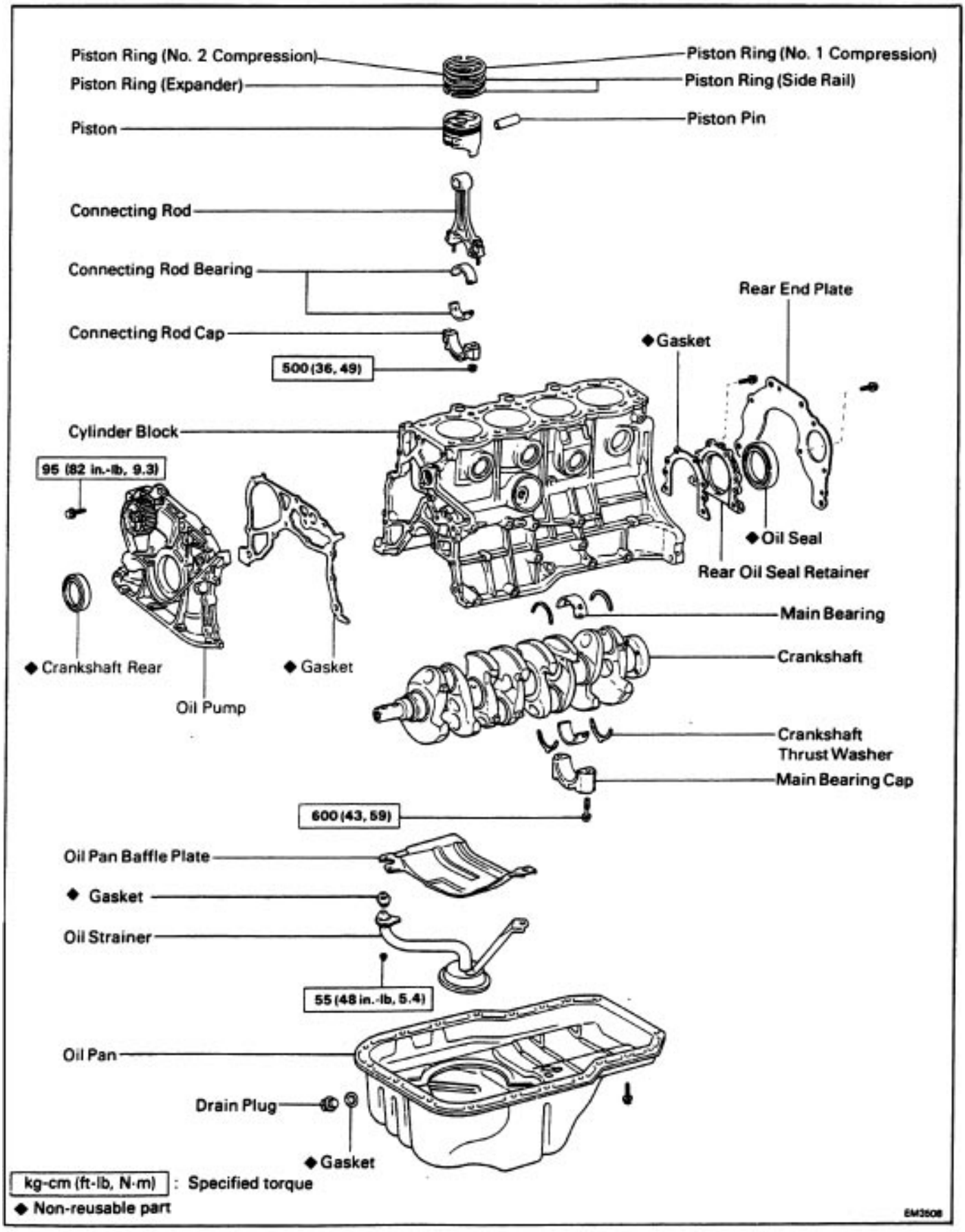
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

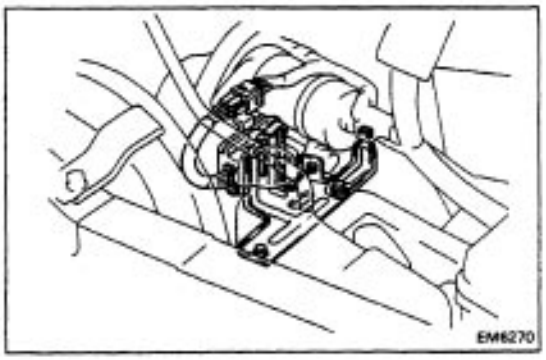
40. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL

,

CYLINDER BLOCK (3S–FE)

COMPONENTS





REMOVAL OF ENGINE

1. REMOVE BATTERY

2. DRAIN ENGINE COOLANT (See page CO–4)

3. REMOVE HOOD

4. REMOVE IGNITER AND BRACKET ASSEMBLY

(a) Disconnect the igniter connector.

(b) Disconnect the ground strap from the bracket.

(c) Remove the two bolts, the igniter and bracket assembly.

5. REMOVE RADIATOR (See page CO–16)

6. REMOVE RADIATOR RESERVOIR TANK

7. (A/T)

DISCONNECT THROTTLE CABLE FROM THROTTLE BODY

8. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

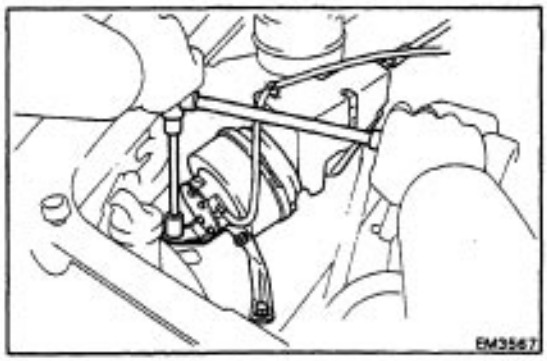
9. (w/ CRUISE CONTROL SYSTEM)

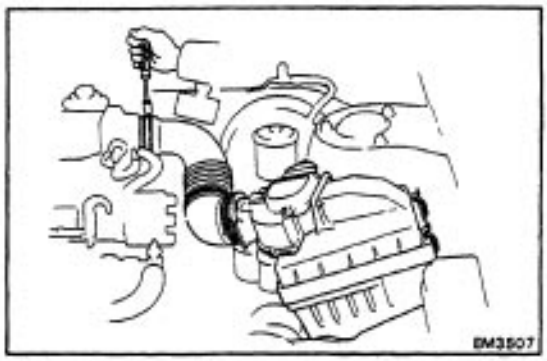
REMOVE CRUISE CONTROL ACTUATOR

(a) Disconnect the actuator vacuum hose.

(b) Disconnect the actuator connector.

(c) Remove the bolts, actuator and bracket.





10. REMOVE AIR CLEANER ASSEMBLY

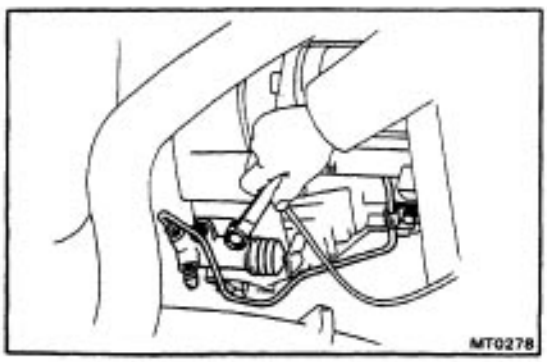
(a) Disconnect the air flow meter connector.

(b) Disconnect the four air cleaner cap clips.

(c) Disconnect the air cleaner hose, and air flow meter assembly.

(d) Remove the air cleaner element.

(e) Remove the three bolts and air cleaner case.

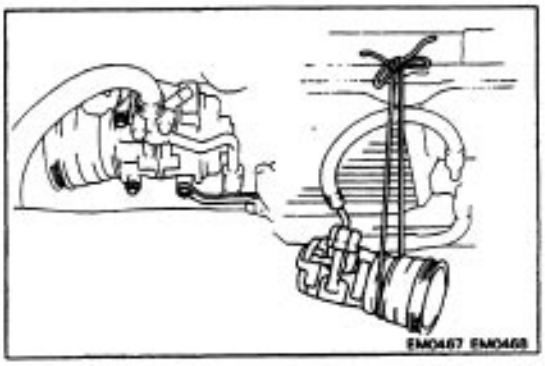


11. (M/T)

REMOVE CLUTCH RELEASE CYLINDER AND TUBE BRACKET WITHOUT DISCONNECTING TUBE

12. DISCONNECT SPEEDOMETER CABLE

13. DISCONNECT TRANSAXLE CONTROL CABLES



14. (w/ A/C)

REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES

(a) Disconnect the two connectors.

(b) Remove the four compressor bolts.

HINT: Put aside the compressor, and suspend it to the radiator support with a string.

15. DISCONNECT HOSES

(a) Two heater water by–pass hoses

(b) Two fuel hoses

NOTICE: Catch leaking fuel in a container.

(c) Brake booster vacuum hose

(d) A/C control valve vacuum hoses

(e) Charcoal canister vacuum hose

16. DISCONNECT WIRES AND CONNECTORS

(a) Check connector

(b) Ground straps from LH fender apron

(e) Connectors from relay box

(d) Engine room wire connector

17. RAISE VEHICLE

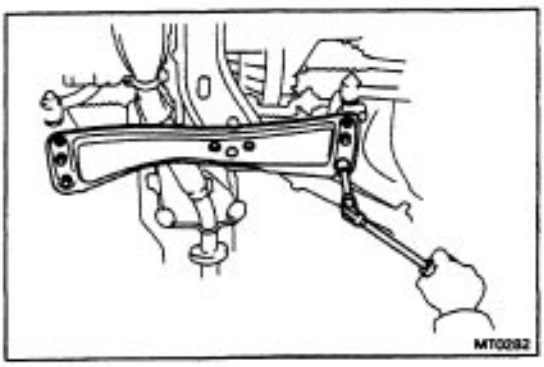
NOTICE: Be sure the vehicle is securely supported.

18. REMOVE ENGINE UNDER COVERS

19. DRAIN ENGINE OIL (See page LU–7)

20. REMOVE SUSPENSION LOWER CROSSMEMBER

Remove the four bolts, two nuts and crossmember.



21. REMOVE DRIVE SHAFTS

22. (4WD) .

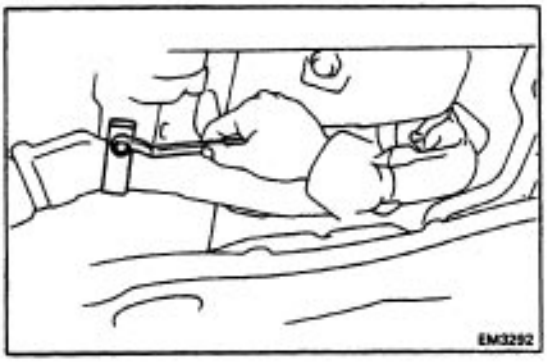
REMOVE PROPELLER SHAFT

23. (4WD)

REMOVE DEFECTOR FROM TRANSFER EXTENSION HOUSING

24. REMOVE PS PUMP WITHOUT DISCONNECTING HOSES

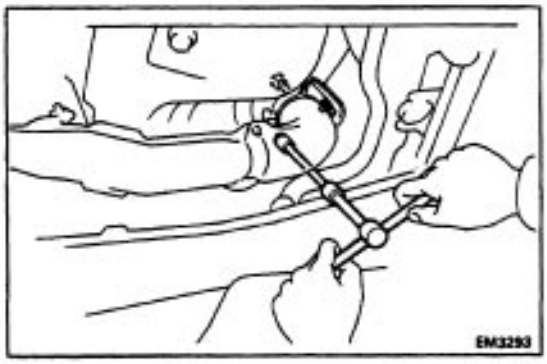
HINT: Put aside the pump and suspend it to the cowl with a string.



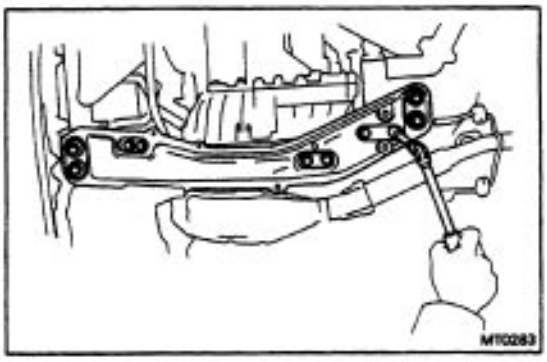
25. REMOVE FRONT EXHAUST PIPE

(a) Loosen the bolt, and disconnect the clamp from the bracket.

(b) Remove the two bolts and nuts, and disconnect the front pipe from the center pipe. Remove the gasket.



(c) Remove the three nuts, front pipe and gasket.



26. REMOVE ENGINE MOUNTING CENTER MEMBER (2WD)

Remove the eight bolts, two nuts and center member.

(4WD)

Remove the eight bolts, two nuts and center member.

27. REMOVE ENGINE FRONT MOUNTING INSULATOR AND BRACKET

28. (2WD)

REMOVE ENGINE CENTER MOUNTING INSULATOR AND BRACKET ASSEMBLY

29. REMOVE ENGINE REAR MOUNTING INSULATOR AND BRACKET

30. LOWER VEHICLE

31. DISCONNECT ENGINE WIRE

(a) Remove the glove compartment box.

(b) Disconnect the following connectors:

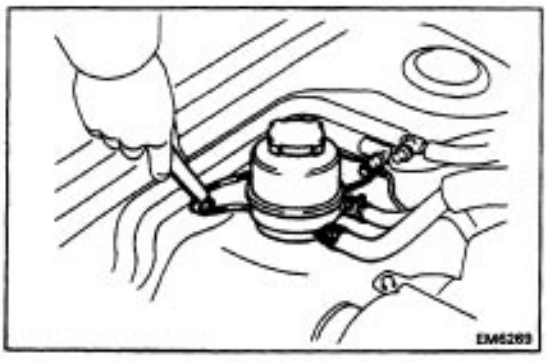
(1) Three TCCS ECU connectors

(2) Circuit opening relay connector

(3) Cowl wire connector

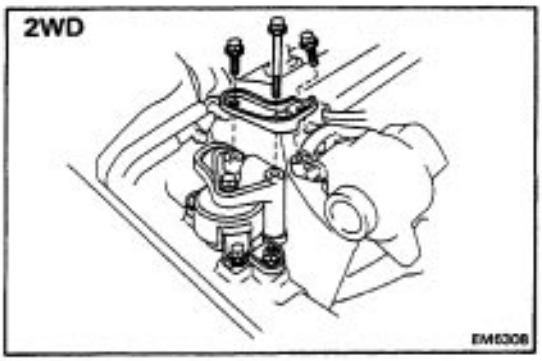
(4) Instrument panel wire connector

(c) Pull out the engine wire from the cowl panel.



32. REMOVE PS OIL RESERVOIR TANK WITHOUT DISCONNECTING HOSES

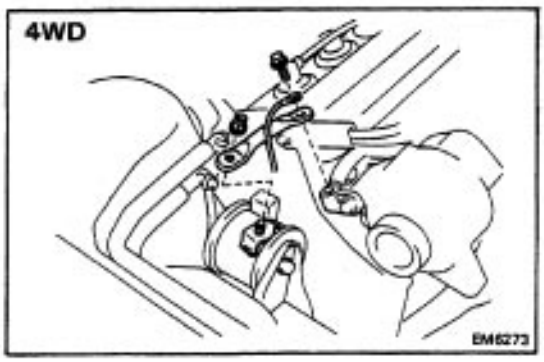
Remove the two bolts.



33. REMOVE RH MOUNTING STAY

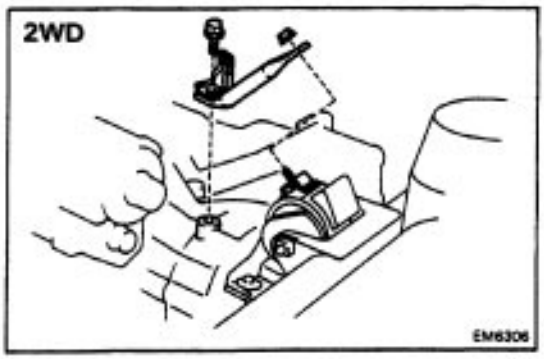
(2WD)

Remove the three bolts and mounting stay.



(4WD)

Remove the bolt, nut, ground strap and mounting stay.

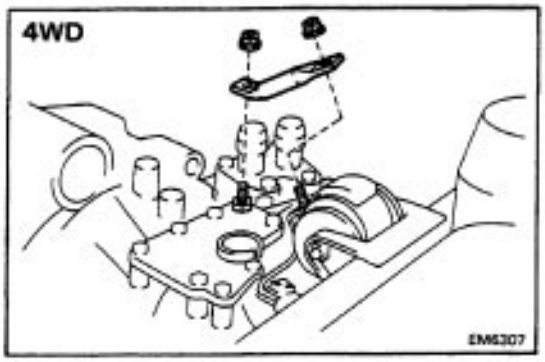


34. (A/T)

REMOVE LH MOUNTING STAY

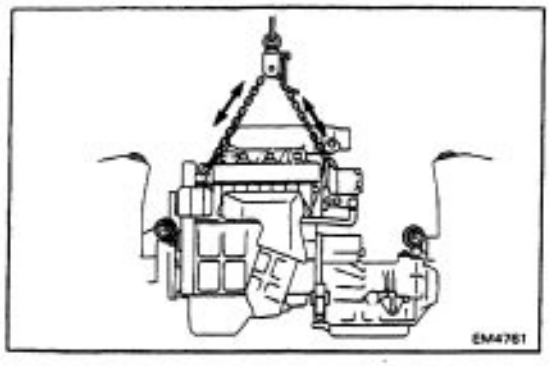
(2WD)

Remove the bolt, nut and mounting stay.



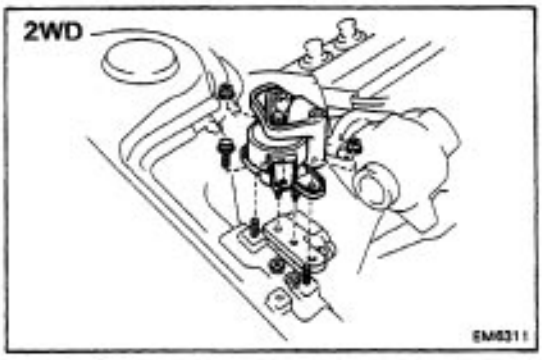
(4WD)

Remove the two nuts and mounting stay.

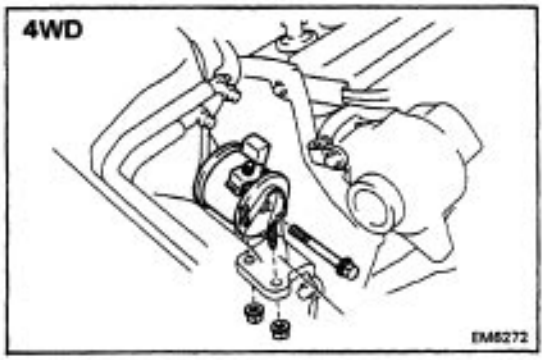


35. REMOVE ENGINE AND TRANSAXLE ASSEMBLY FROM VEHICLE

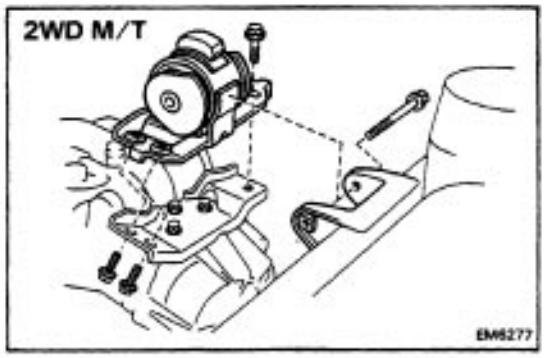
(a) Attach the engine hoist chain to the engine hangers.



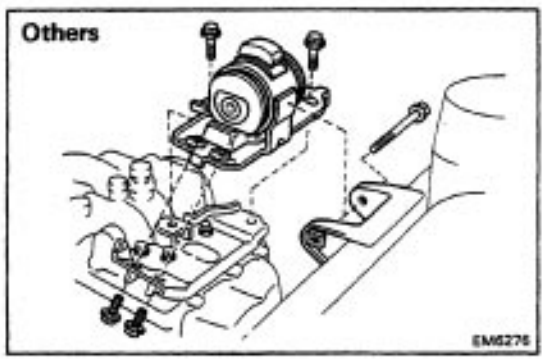
(b) (2WD)
Remove the bolt, four nuts and RH mounting insulator.

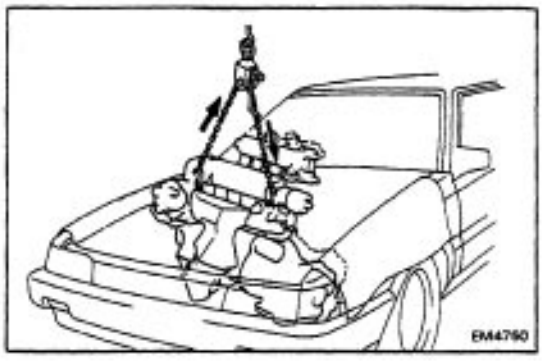


(c) (4WD)
Remove the through bolt, two nuts and RH mounting insulator.



(d) Remove the through bolt, three bolts (2WD, M/T), four bolts (Others) and LH mounting insulator.
(e) Remove the three bolts and LH mounting bracket.



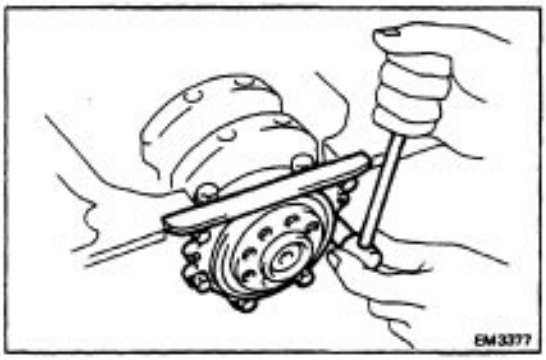


(f) Lift the engine out of the vehicle slowly and carefully.
NOTICE: Be careful not to hit the PS gear housing or neutral start switch.
(g) Make sure the engine is clear of all wiring, hoses and cables.
(h) Place the engine and transaxle assembly onto the stand.

36. SEPARATE ENGINE AND TRANSAXLE

PREPARATION FOR DISASSEMBLY

1. (M /T)
REMOVE CLUTCH COVER AND DISC
2. (M /T)
REMOVE FLYWHEEL
3. 1A/T)
REMOVE DRIVE PLATE
4. REMOVE REAR END PLATE
5. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY
6. REMOVE ALTERNATOR (See page CH–6)
7 REMOVE DISTRIBUTOR (See page IG–13)
8. REMOVE TIMING BELT AND PULLEYS (See page EM–23)
9. REMOVE CYLINDER HEAD (See page EM–48)
10. REMOVE WATER PUMP (See page CO–6)
11. REMOVE OIL PAN AND OIL PUMP (See page LU–9)

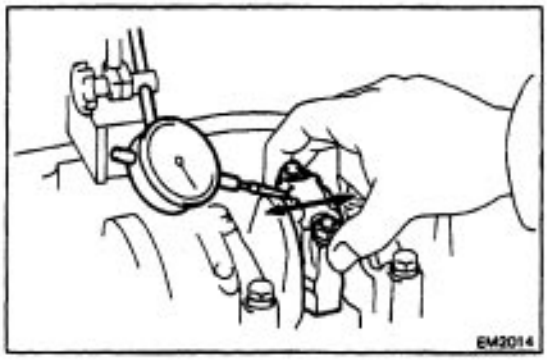


DISASSEMBLY OF CYLINDER BLOCK

(See page EM–107)

1. REMOVE REAR OIL SEAL RETAINER

Remove the six bolts, retainer and gasket.



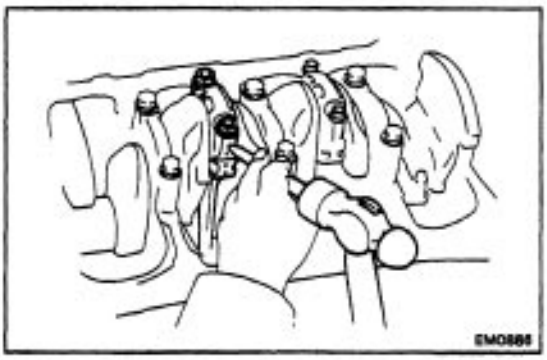
2. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance: 0.160 – 0.312 mm (0.0063 – 0.0123 in.)

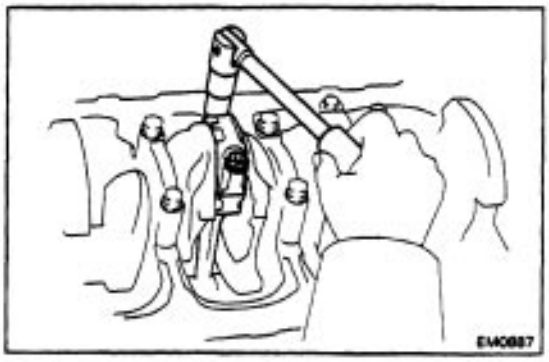
Maximum thrust clearance: 0.35 mm (0.0138 in.)

If the thrust clearance is greater than maximum replace the connecting rod assembly. If necessary, replace the crankshaft.

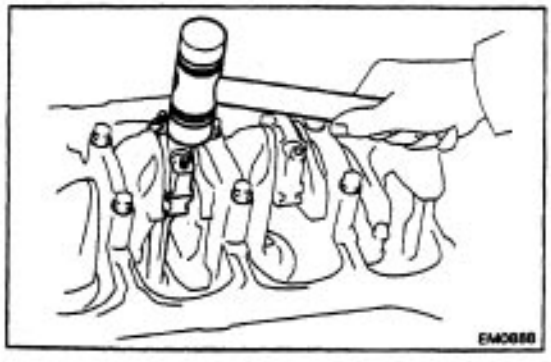


3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Using a punch or numbering stamp, place the match–marks on the connecting rod and cap to ensure correct reassembly.

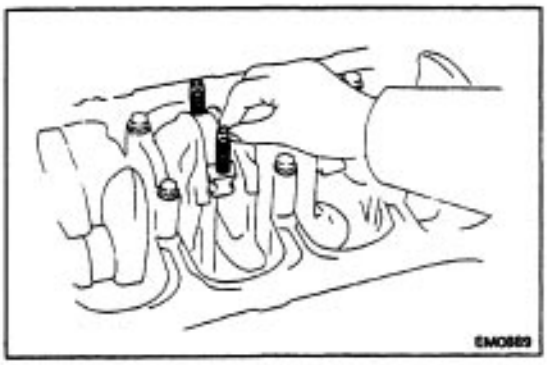


(b) Remove the connecting rod cap nuts.

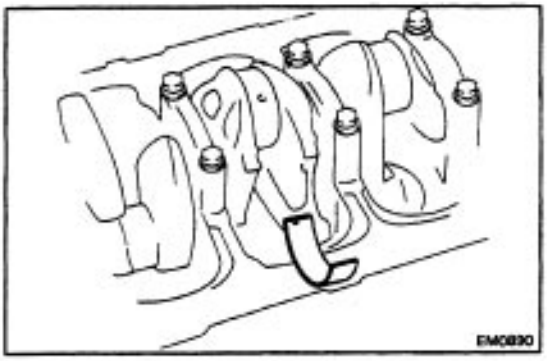


(c) Using a plastic–faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.

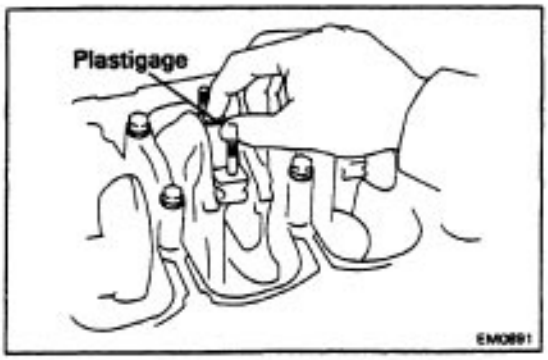
HINT: Keep the lower bearing inserted with the connecting cap.



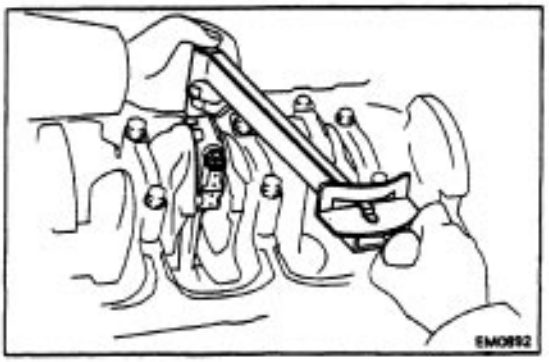
(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



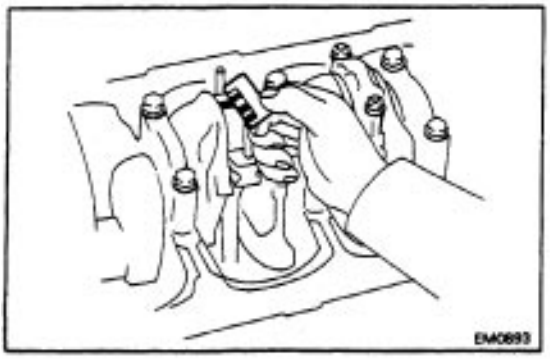
(e) Clean crank pin and bearing.
(f) Check the crank pin and bearing for pitting and scratches.
If the crank pin or bearing are damaged, replace the bearings.
If necessary, replace the crankshaft.



(g) Lay a strip of Plastigage across the crank pin.



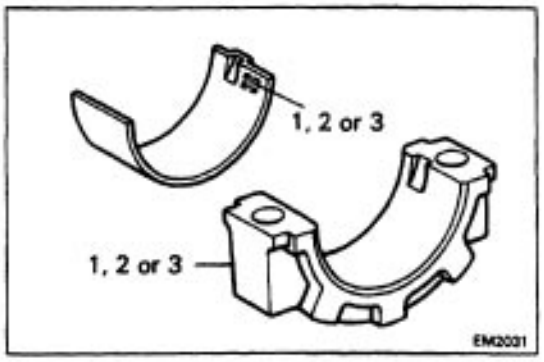
(h) Install the connecting rod cap.
(See step 6 on page EM–129)
Torque: 500 kg–cm (36 ft–lb. 49 N–m)
HINT: Do not turn the crankshaft.



(i) Remove the connecting rod cap.
(j) Measure the Plastigage at widest point.
Standard oil clearance:

STD	**0.024 – 0.055 mm (0.0009 – 0.0022 in.)**
U/S	**0.25 0.023 – 0.069 mm (0.0009 – 0.0027 in.)**

Maximum oil clearance: 0.08 mm (0.0031 in.)
If the oil clearance is greater than maximum, replace the bearings. If necessary, replace the crankshaft.



HINT: If using a standard bearing, replace with one having the same number marked on the connecting rod cap. There are three sizes of standard bearings, marked "1", "2' and "3" accordingly.

(Reference)

Standard sized bearing thickness (at center wall):

Mark "1 "	**1.484 – 1.488 mm (0.0584 – 0.0586 in.)**
Mark "2"	**1.488 – 1.492 :N» (0.0586 – 0.0587 in.)**
Mark "3"	**1.492 – 1.496 mm (0.0587 – 0.0589 in.)**

(k) Completely remove the Plastigage.

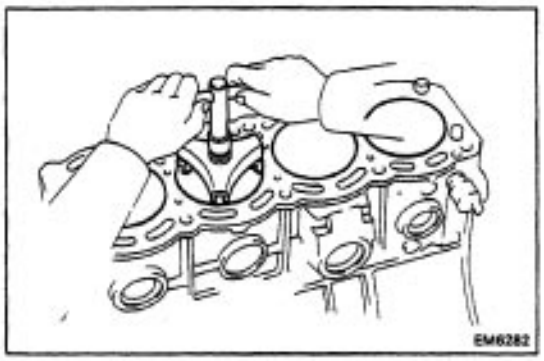
4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

(a) Remove the ail carbon from the piston ring ridge.

(b) Cover the connecting rod bolts.

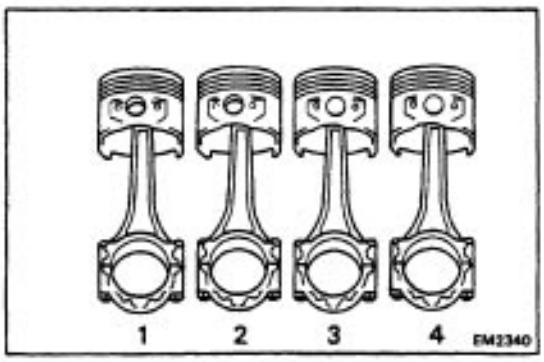
(See page EM–115)

(c) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.



HINT:

- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.



5. CHECK CRANKSHAFT THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

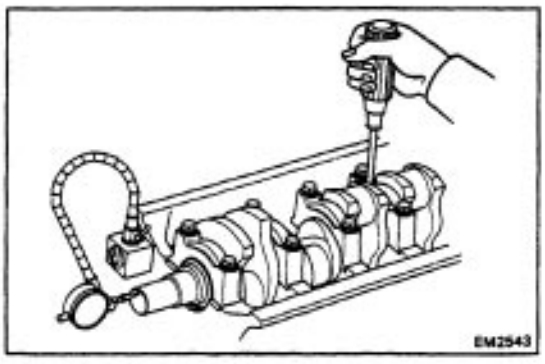
Standard thrust clearance: 0.020 – 0.220 mm (0.0008 – 0.0087 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

If the thrust clearance is greater than maximum, replace the thrust washers as a set.

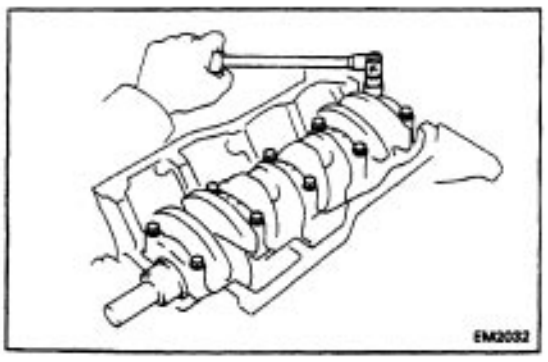
Thrust washer thickness (STD size only):

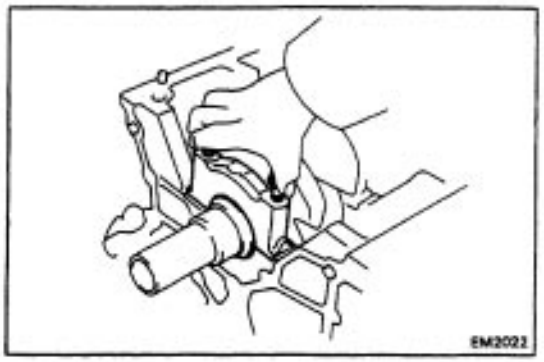
2.440 – 2.490 mm (0.0961 – 0.0980 in.)



6. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

(a) Remove the main bearing cap bolts.





(b) Using the removed main bearing cap bolts, pry the main bearing cap back and forth, and remove the main bearing caps, lower bearings and lower thrust washers
(No.3 main bearing cap only).

HINT:

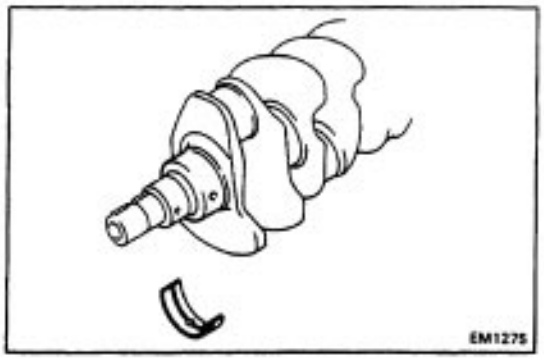
- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in correct order.

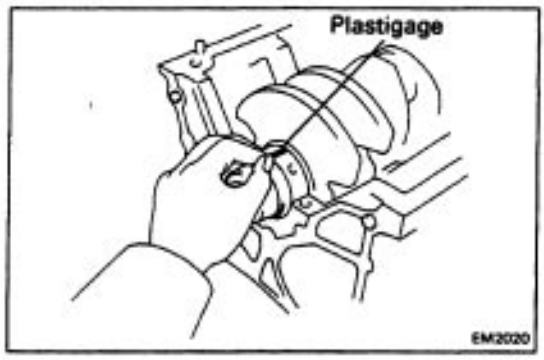
(c) Lift out the crankshaft.

HINT: Keep the upper bearing and upper thrust washers together with the cylinder block.

(d) Clean each main journal and bearing.

(e) Check each main journal and bearing for pitting and scratches.
If the journal or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.





(f) Place the crankshaft on the cylinder block.
Lay a strip of Plastigage across each journal.

(h) Install the main bearing caps.
(See step 4 on page EM–128)
Torque: 600 kg–cm (43 ft–tb, 59 N–m)

HINT: Do not turn the crankshaft

(i) Remove the main bearing caps.

(j) Measure the Plastigage at its widest point.

Standard oil clearance:

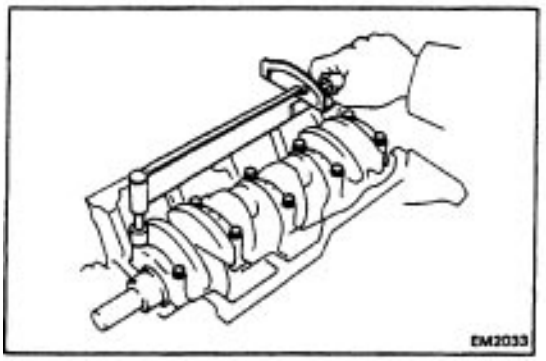
No. 3	**STD**	**0.025 0.044mm (0.0010 .– 0.0017 in.)**
	U /S	**0.25 0.027 – 0.067 mm (0. 0011 – 0. 0026 in.)**
Others	**STD**	**0.015 0.034 mm (0.0006 – 0.0013 in.)**
	U/S	**0.25 0. 019 – 0.059 mm (0.0007 0.0023 in.)**

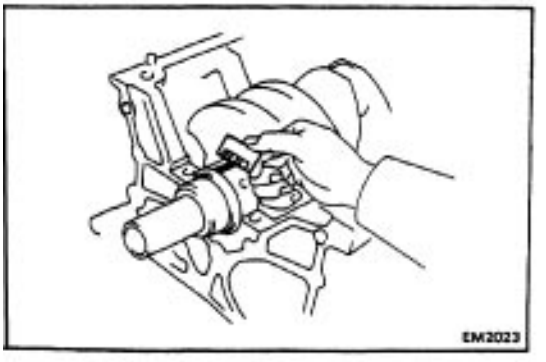
Maximum oil clearance: 0.08 mm (0.0031 in.)

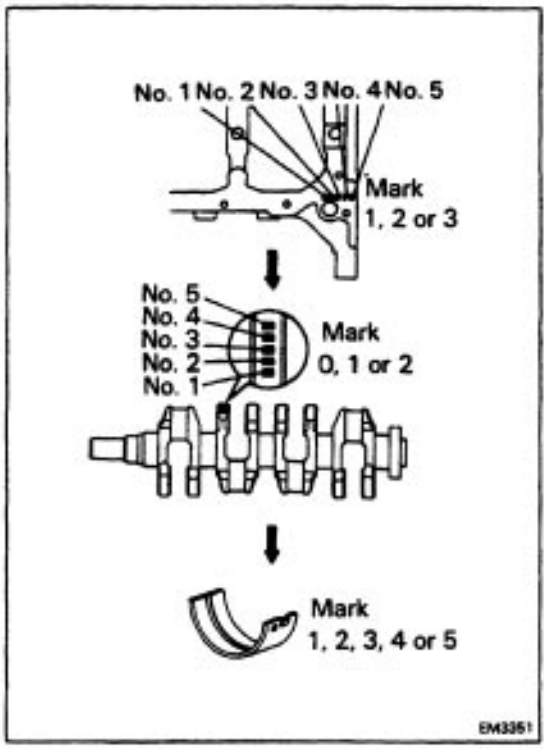
HINT: If replacing the cylinder block subassembly, the bearing standard clearance will be:

No. 3	**0.027 – 0.054 mm (0.0011 0.0021 in.)**
Others	**0.017 0.044 mm (0.0007 – 0.0017 in.)**

If the oil clearance is greater than maximum, replace the bearings, if necessary, replace the crankshaft.







HINT: If using a standard bearing, replace with one having the same number. If the number of the bearing de determined, select a bearing from the table below according to the numbers imprinted on the cylinder block and crankshaft. There are five sizes of standard bearings, marked “1,” “2,” “3,” “4,” and “5.”

	Number marked								
Cylinder block	1			2			3		
Crankshaft	0	1	2	0	1	2	0	1	2
Bearing	1	2	3	2	3	4	3	4	5

EXAMPLE: Cylinder block ”2” + Crankshaft ”1” = Bearing ”3”

(Reference)

Cylinder block main journal bore diameter:

Mark ”1 ” 59.020 – 59.026 mm (2.3236 – 2.3239 in.)

Mark ”2” 59.026 – 29.032 mm (2.3239 – 2.3241 in.)

Mark ”3” 59.032 – 59.038 mm (2.3241 – 2.3243 in.)

Crankshaft journal diameter:

Mark ”0” 54.998 – 55.003 mm (2.1653 – 2.1655 in.)

Mark ”1” 54.993 – 54.998 mm (2.1651 – 2.1653 in.)

Mark ”2” 54.988 – 54.993 mm (2.1649 – 2.1651 in.)

Standard sized bearing thickness tat center wall):

No. 3 Mark ”1 ” 1.992 – 1.995 mm (0.0784 – 0.0785 in.)

Mark ”2” 1.995 – 1.998 mm (0.0785 – 0.0787 in.)

Mark ”3” 1.998 – 2.001 mm (0.0787 – 0.0788 in.)

Mark ”4” 2.00 1 – 2.004 mm (0.0788 – 0.0789 In.)

Mark ”5” 2.004 – 2.007 mm (0.0789 – 0.0790 In.)

Others Mark ”1 ” 1.997 – 2.000 mm (0.0786 – 0.0787 in.)

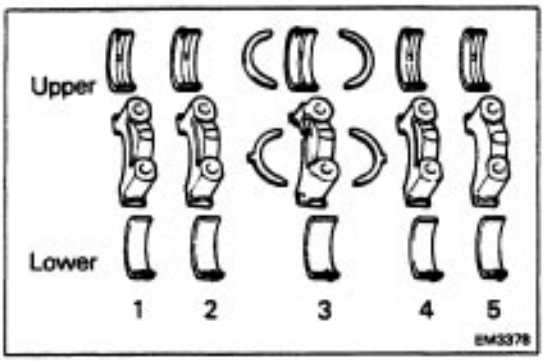
Mark ”2’ 2.000 – 2.003 mm (0.0787 – 0.0789 in.)

Mark ”3” 2.003 – 2.006 mm (0.0789 – 0.0790 in.)

Mark ”4” 2.006 – 2.009 mm (0.0790 – 0.0791 in.)

Mark ”5” 2.009 – 2.012 mm (0.0791 – 0.0792 in.)

(k) Completely remove the Plastigage.

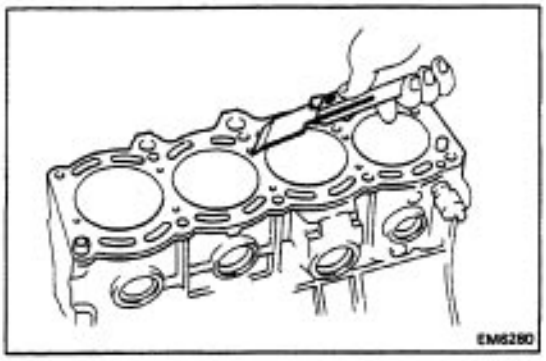


7. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the upper bearings and upper thrust washers from cylinder block.

HINT: Arrange the main bearing caps, bearings and thrust washers in correct order. .



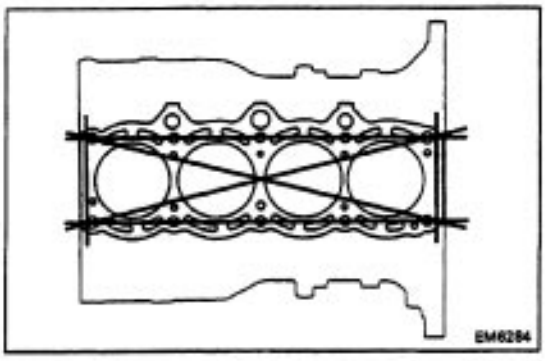
INSPECTION OF CYLINDER BLOCK

1. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket material from the cylinder block surface.

2. CLEAN CYLINDER BLOCK

Using a soft brush and solvent, clean the cylinder block.

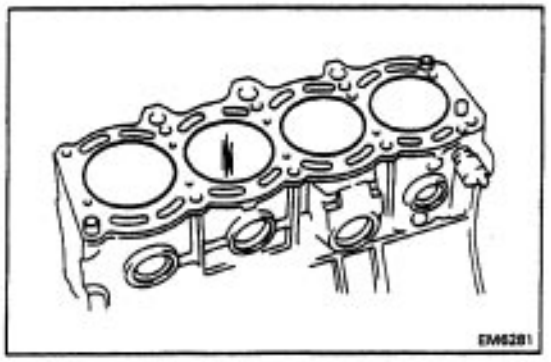


3. INSPECT TOP OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head gasket for warp–age.

Maximum warpage: 0.05 mm (0.0020 in.)

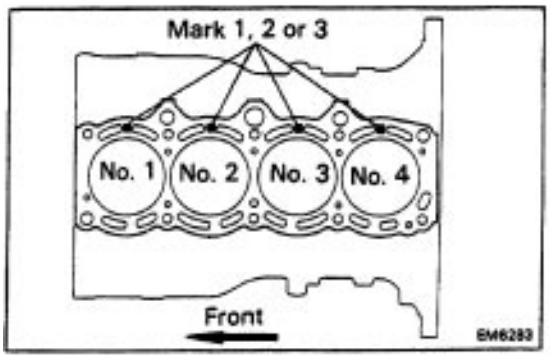
if warpage is greater than maximum, replace the cylinder block.



4. INSPECT CYLINDER FOR VERTICAL SCRATCHES

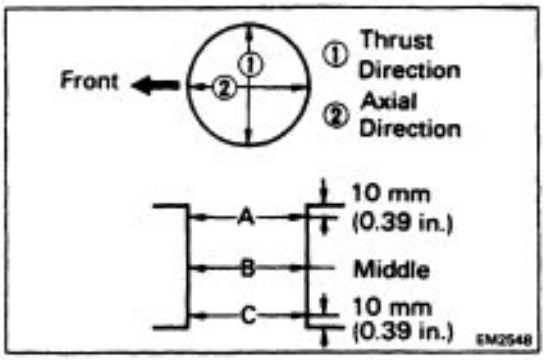
Visually check the cylinder for vertical scratches.

If deep scratches are present, replace the cylinder block.



5. INSPECT CYLINDER BORE DIAMETER

HINT: There are three sizes of the standard cylinder bore diameter, marked ”l,” ”2,” and ”3” accordingly. The marked is stamped on the top of the cylinder block.



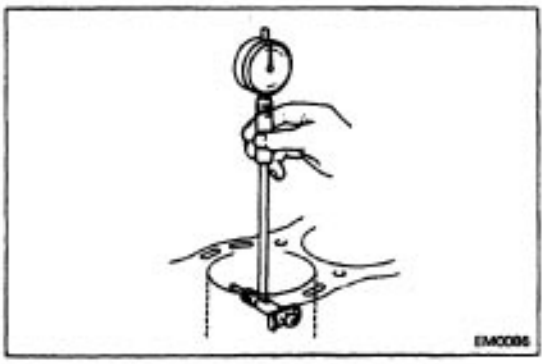
Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust axial directions.

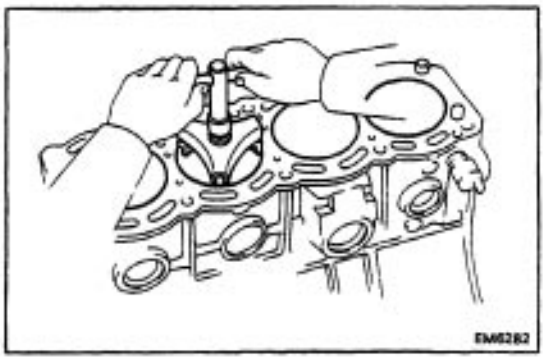
Standard diameter:

Mark ”1 ”	**86.000 – 86.010 mm (3.3858 – 3.3862 in.)**
Mark ”2”	**86.010 86.020 mm (3.3862 – 3.3866 in.)**
Mark ”3”	**86.020 – 86.030 mm (3.3866 3.3870 in.)**

Maximum diameter: 86.23 mm (3.3949 in.)

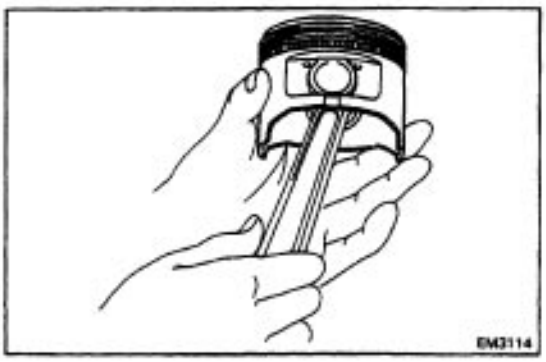
If the diameter is greater than maximum, replace the cylinder block.





6. REMOVE CYLINDER RIDGE

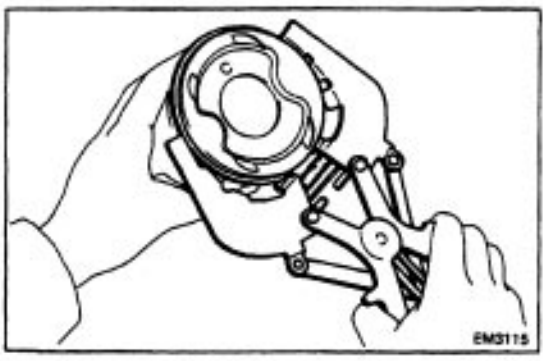
If the wear is less than 0.2 mm (0.008 in.), use a ridge reamer to machine the piston ring ridge at the top of the cylinder.



DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

1. CHECK FIT BETWEEN PISTON AND PISTON PIN

Try to move the piston back and forth on the piston pin.
If any movement is felt, replace the piston and pin as a set.

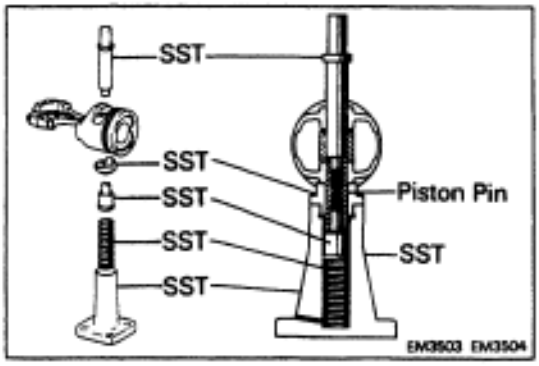


2. REMOVE PISTON RINGS

(a) Using a piston ring expander, remove the two compression rings.

(b) Remove the two side rails and oil ring expander by hand.

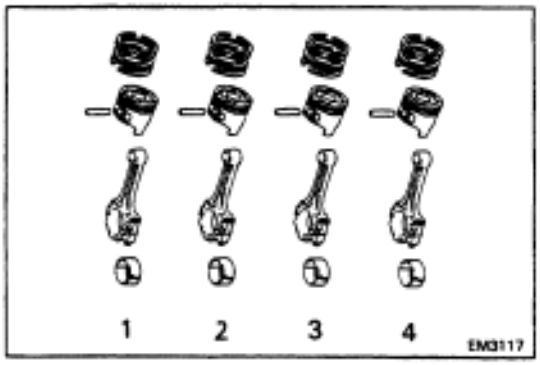
HINT: Arrange the rings in correct order only.



3. DISCONNECT CONNECTING ROD FROM PISTON

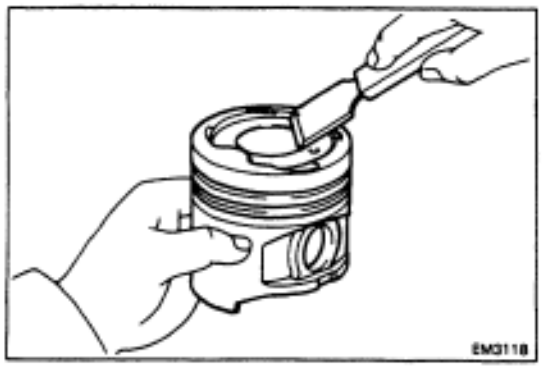
Using SST, press out the piston pin from the piston.

SST 09221–25024 (09221–00020,09221–00030, 09221–00060,09221–00160,09221–00170)



HINT:

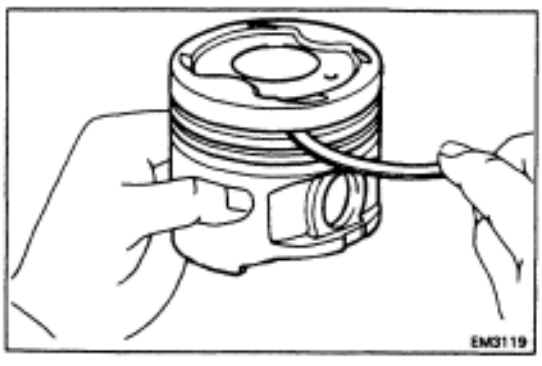
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.



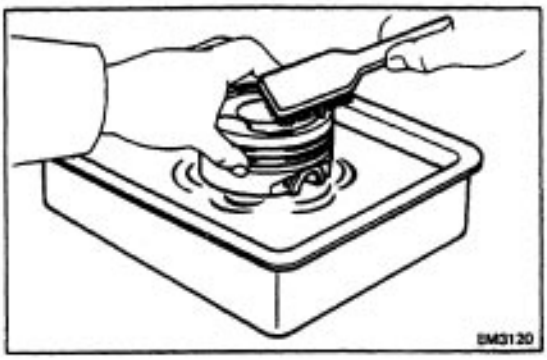
INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLIES

1. CLEAN PISTON

(a) Using a gasket scraper, remove the carbon from the piston top.

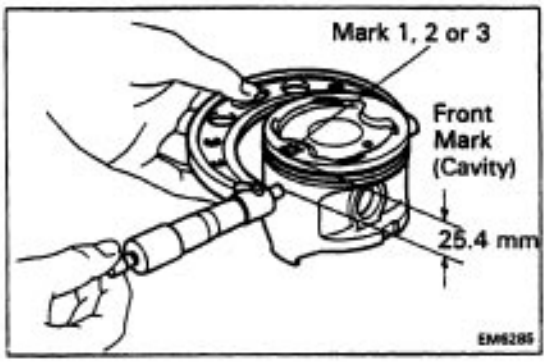


(b) Using a groove cleaning broken ring, clean the piston ring grooves.



(c) Using solvent and a brush, thoroughly clean the piston.

NOTICE: Do not use a wire brush.



2. INSPECT PISTON DIAMETER AND OIL CLEARANCE

HINT: There are three sizes of the standard piston diameter, marked ”1 ”, ”2” and ”3” accordingly. The mark is stamped on the top of the piston.

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 25.4 mm 1.000 in.) from the piston head.

Piston diameter Mark ”1” 85.945 – 85.955 mm (3.3836 – 3.3840 in.)
Mark ”2” 85.955 – 85.965 mm (3.3840 – 3.3844 in.)
Mark ”3” 85.965 – 85.975 mm (3.3844 3.3848 in.)

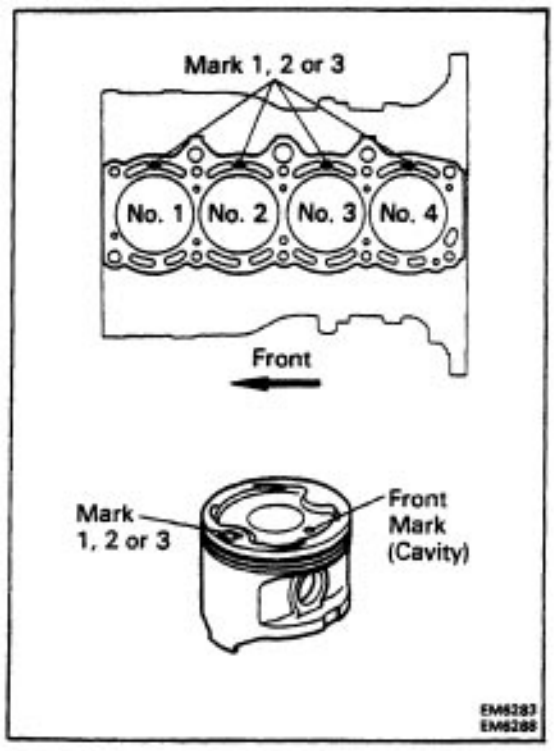
(b) Measure the cylinder bore diameter in the thrust directions.
(See step 5 on page EM–118)

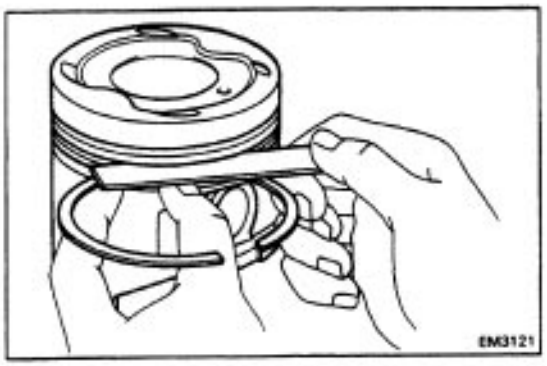
(e) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance: 0.045 – 0.065 mm (0.0018 – 0.0026 in.)
Maximum oil clearance: 0.085 mm (0.0033 in.)

If the oil clearance is greater than maximum, replace all four pistons. If necessary, replace the cylinder block.

HINT: (Use cylinder block subassembly): When installing a standard piston, install one with the same number mark as the standard bore diameter mark on the cylinder block.



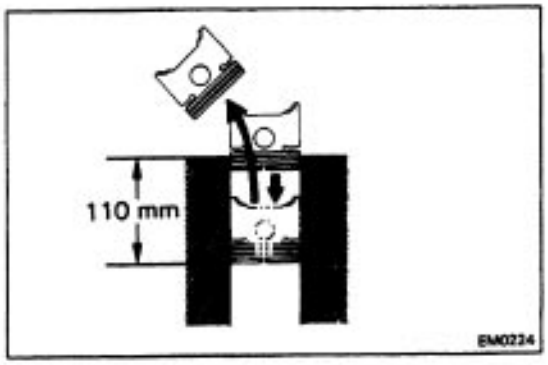


3. INSPECT CLEARANCE BETWEEN WALL OF RING GROOVE AND NEW PISTON RING

Using a feeler gauge, measure the clearance between new piston ring and the wall of the piston ring groove.

Ring groove clearance: 0.030 – 0.070 mm (0.0012 – 0.0028 in.)

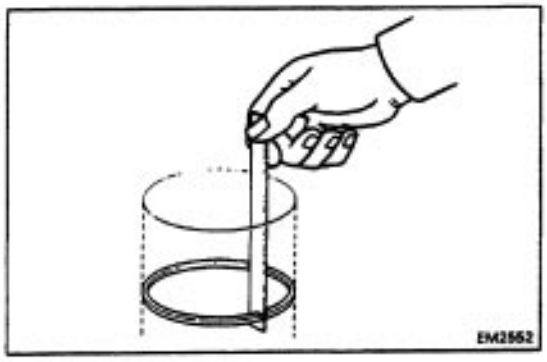
If the clearance is greater than maximum, replace the piston.



4. INSPECT PISTON RING END GAP

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 114 mm (4:33 in.) from the top of the cylinder block.



(c) Using a feeler gauge, measure the end gap.

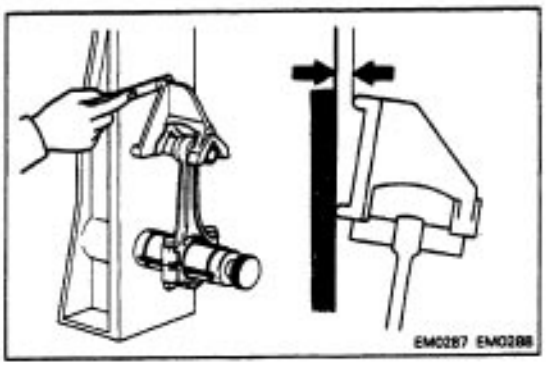
Standard end gap:

No–1	**0.270 – 0.500 mm (0.0106 – 0.0197 in.)**
No. 2	**0.270 – 0.510 m m (0.0106 – 0.0201 in.)**
Oil (Side rail)	**0.200 – 0.550 mm (0.0079 – 0.0217 in.)**

Maximum end gap:

No.1	**1.10–mm (0.0433 in.)**
No.2	**1.11 mm (0.0437 in.)**
Oil (Side rail)	**1.15 mm (0.0453 in.)**

If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, replace the cylinder block.



5. INSPECT CONNECTING ROD

Using a rod aligner, check the connecting rod alignment.

- Check for bending.

Maximum bending:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

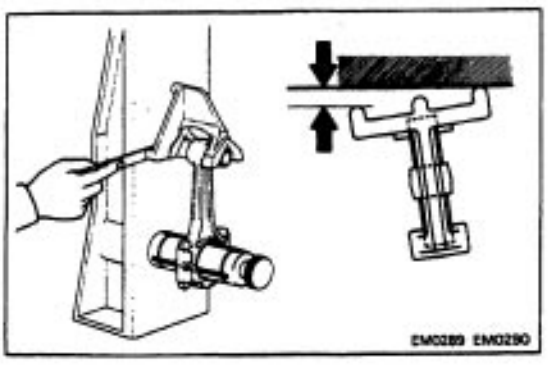
If bent is greater than maximum, replace the connecting rod assembly.

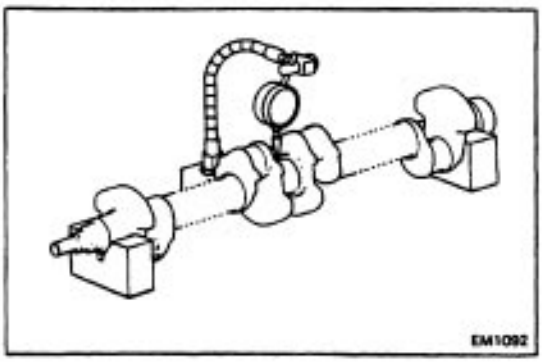
- Check for twist.

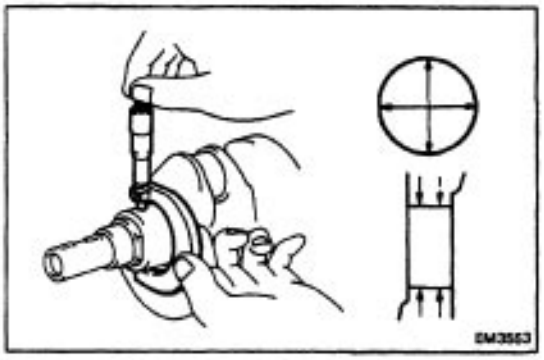
Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connecting rod assembly.







INSPECTION AND REPAIR OF CRANKSHAFT

1. INSPECT CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the crankshaft.

2. INSPECT MAIN JOURNALS AND CRANK PINS

(a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

STD size 54.988 – 55.003 mm (2.1649 – 2.1655 in.)

U/S 0.25 54.745 – 54.755 mm (2.1553 – 2.1557 in.)

Crank pin diameter:

STD size 47.985 – 48.000 mm (1.8892 –1. 8898 in.)

U/S 0.25 47.745 – 47.755 mm» (1.8797 – 1.8801 in.)

If the diameter is not as specified, check the oil clearance (See pages EM–114 to 117).

(b) Check each main journal and crank pin for taper and out–of–round as shown.

Maximum taper and out–of–round: 0.02 mm (0.0008 in.)

If the taper and out–of–round is greater than maximum, grind or replace the crankshaft.

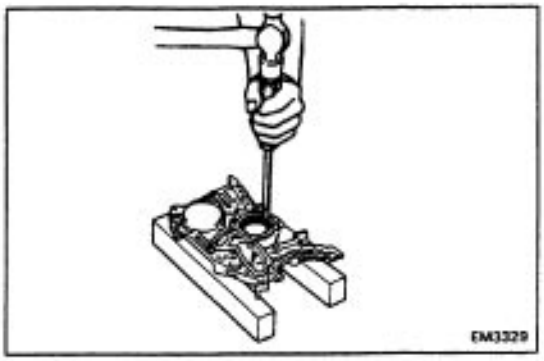
3. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure step 2).

Install new main journal and/or crank pin undersized bearings.

REPLACEMENT OF CRANKSHAFT OIL SEALS

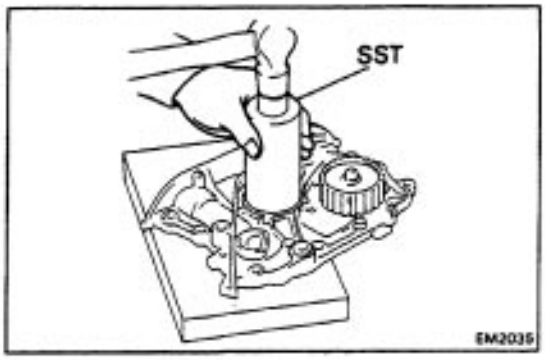
HINT: There are two methods (A and B) to replace the oil seal as follows:



1. REPLACE CRANKSHAFT FRONT OIL SEAL

A. If oil pump is removed from cylinder block:

(a) Using screwdriver and hammer, tap out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump case edge.
SST 09226–10010

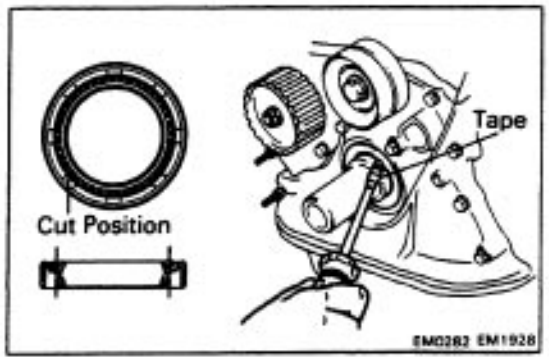
(c) Apply MP grease to the oil seal lip.

B. If oil pump is installed to the cylinder block:

(a) Using a knife, cut off the oil seal lip.

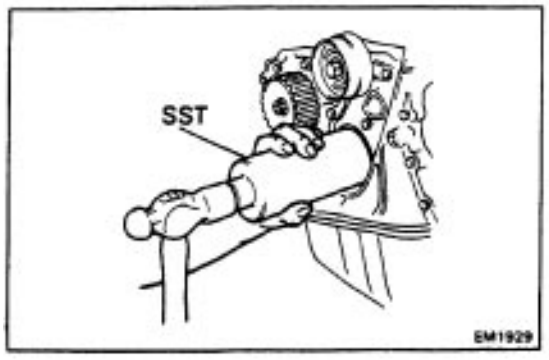
(b) Using a screwdriver, pry out the oil seal.

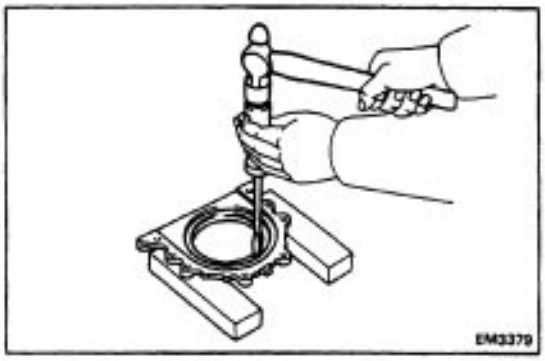
CAUTION: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump case edge.
SST 09226–10010

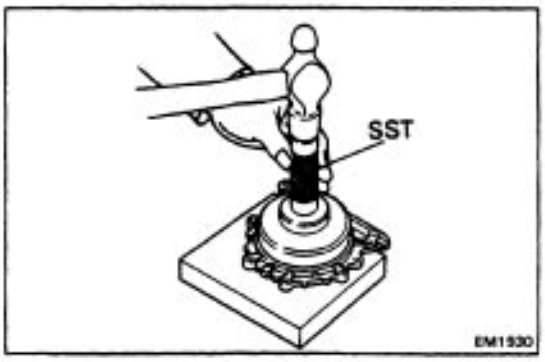




2. REPLACE CRANKSHAFT REAR OIL SEAL

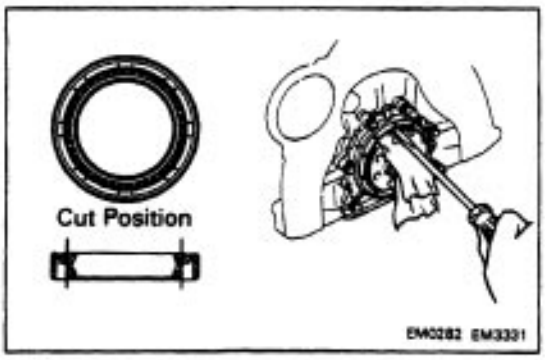
A. If rear oil seal retainer is removed from cylinder block:

(a) Using a screwdriver and hammer, tap out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal edge.
SST 09223–63010

(c) Apply IMP grease to the oil seal lip.

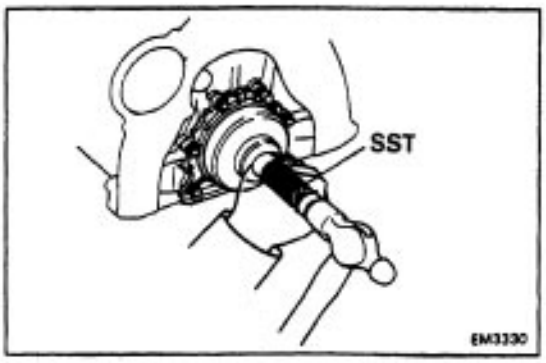


B. If near oil seal retainer is installed to cylinder block:

(a) Using a knife, cut off the oil seal lip.

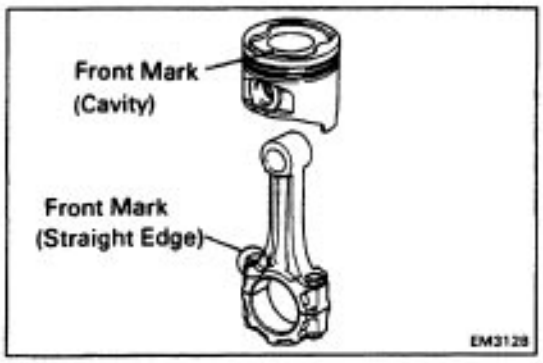
(b) Using a screwdriver, pry out the oil seat.

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

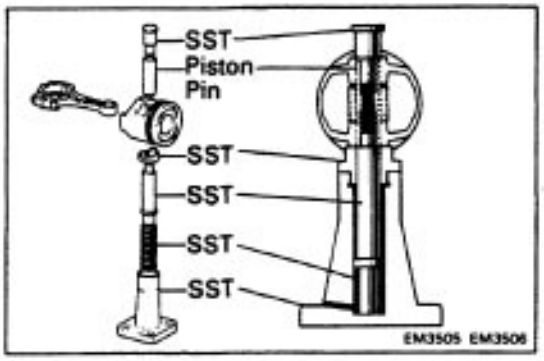
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–63010



ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

1. ASSEMBLE PISTON AND CONNECTING ROD

(a) Align the front marks of the piston and connecting rod.



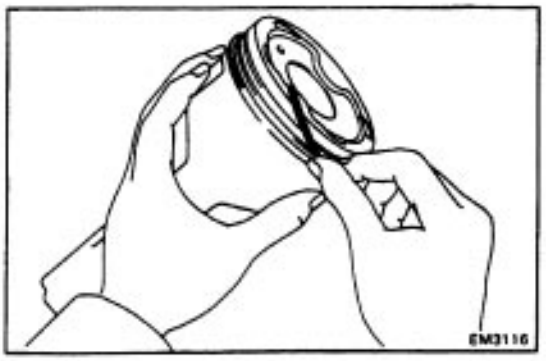
(b) Coat the piston pin and piston hole of the piston with engine oil.

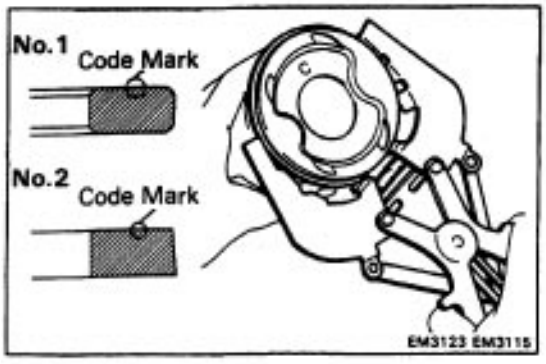
(c) Using SST, press in the piston pin.
SST 09221–25024 (09221–00020,09221–00030, 09221–00060,09221–00160,09221–00170)

(d) Check that the piston smoothly moves back and forth on the piston pin.

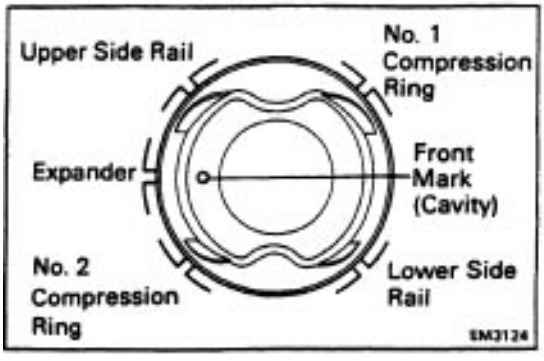
2. INSTALL PISTON RINGS

(a) Install the oil ring expander and two side rails by hand.

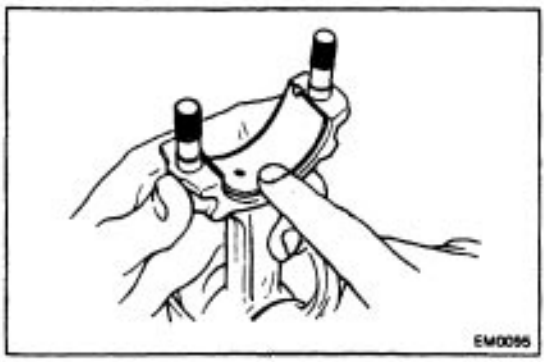




(b) Using a piston ring expander, install the two compression rings with the code mark facing upward.
Code mark: No. 11T or 1N
No. 2 2T or 2N



(c) Position the piston rings so that the ring ends are as shown.
NOTICE: Do not align the ring ends.



3. INSTALL BEARINGS

(a) Align the bearing claw with the groove of the connecting rod or connecting cap.

(b) Install the bearings in the connecting rod and connecting rod cap.

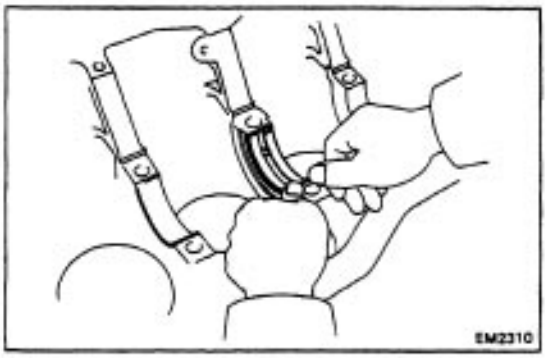
NOTICE: Install the bearing with the oil hole in the connecting rod.

ASSEMBLY OF CYLINDER BLOCK

(See page EM–107)

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets. O–rings and oil seals with new pants.

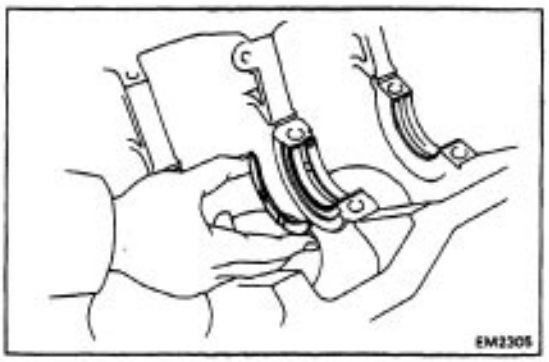


1. INSTALL MAIN BEARINGS

(a) Align the bearing claw with the claw groove of the main bearing cap or cylinder block.

(b) Install the bearings in the cylinder block and main bearing caps.

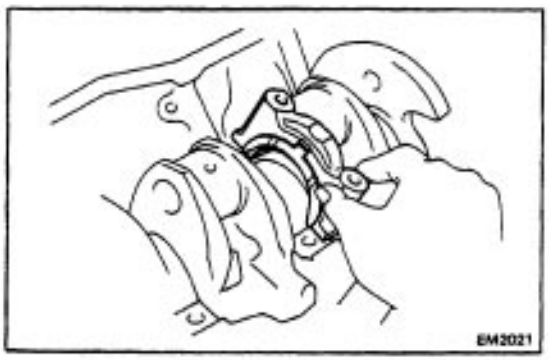
NOTICE: Install the bearing with the oil hole in the cylinder block.



2. INSTALL UPPER THRUST WASHERS

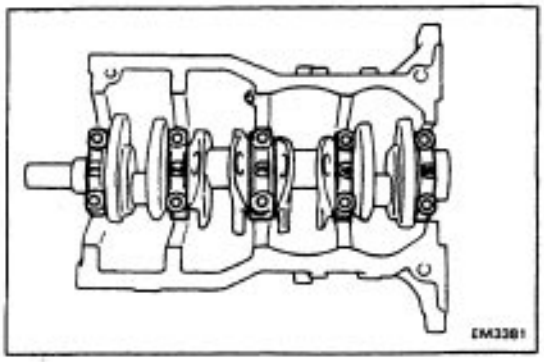
Install the thrust washers under the No. 3 main bearing cap position of the block with the oil grooves facing outward.

3. PLACE CRANKSHAFT ON CYLINDER BLOCK

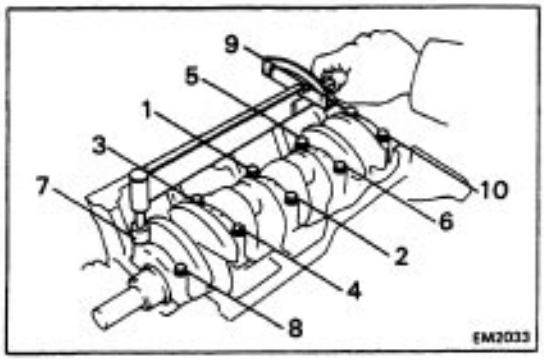


4. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS

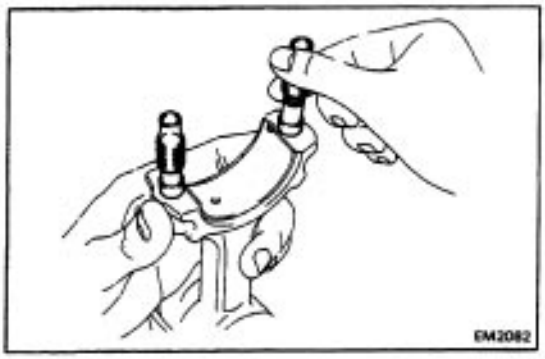
(a) Install the thrust washers on the No. 3 bearing cap with the grooves facing outward.



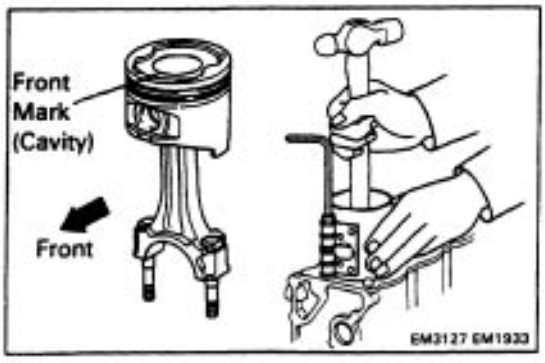
(b) Install the main bearing caps in their proper location.
HINT: Each bearing cap has a number and front mark.



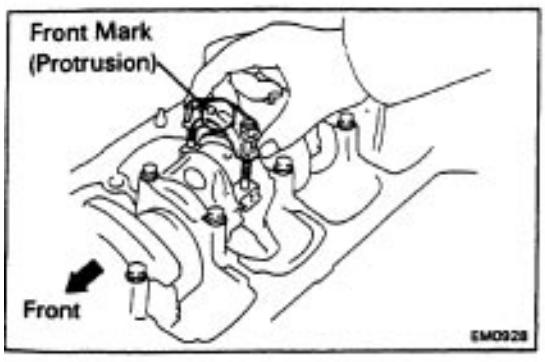
(c) Apply alight coat of engine oil on the threads and under the heads of the main bearing caps.
(d) Install and uniformly tighten the ten bolts of the main bearing caps in several passes in the sequence shown.
Torque: 600 kg–cm (43 ft–ib, 59 N–m)
(e) Check that the crankshaft turns smoothly.
(f) Check the crankshaft thrust clearance.
(See step 5 –on page EM–116)



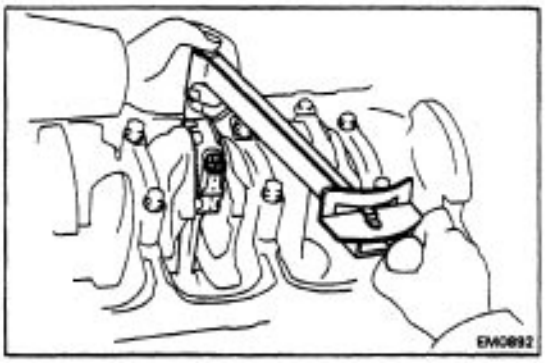
5. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES
(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



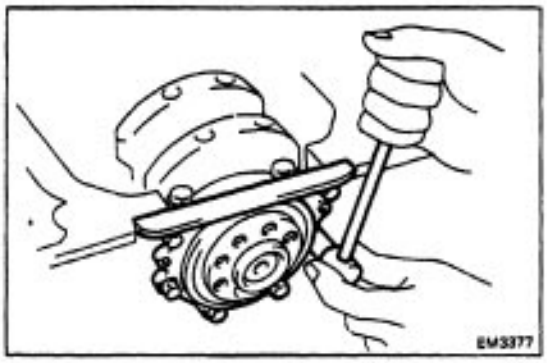
(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



6. INSTALL CONNECTING ROD CAPS
(a) Match the numbered connecting rod cap with the connecting rod.
(b) Install the connecting rod cap with the front mark facing forward.



(c) Apply a light of engine oil on the threads and under the nuts of the connecting rod cap.
(d) Install and alternately tighten the nuts of the connecting rod cap in several passes.
Torque: 500 kg–cm (36 ft–lb, 49 N–m)
(e) Check that the crankshaft turns smoothly.
M Check the connecting rod thrust clearance.
(See step 2 on page EM–114)

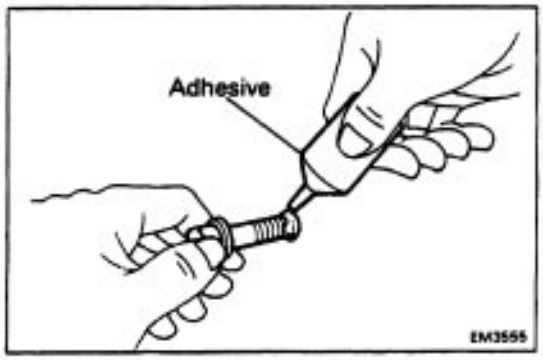


7. INSTALL REAR OIL SEAL RETAINER

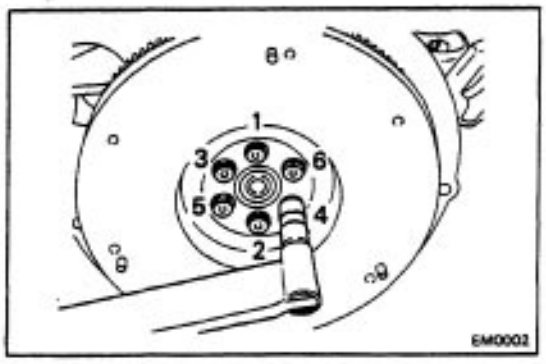
Install a new gasket and the retainer with the six bolts.
Torque: 95 kg–cm (82 in.–lb, 9.3 N–m)

POST ASSEMBLY

1. INSTALL OIL PUMP AND OIL PAN
(See page LU–14)
2. INSTALL WATER PUMP (See page CO–7)
3. INSTALL CYLINDER HEAD (See page EM–67)
4. INSTALL PULLEYS AND TIMING BELT
(See page EM–29)
5. INSTALL ALTERNATOR (See page CH–14)
6. INSTALL DISTRIBUTOR (See page IG–16)
7. REMOVE ENGINE STAND
8. INSTALL REAR END PLATE
Torque: 95 kg–cm (82 ft–lb, 9.3 N–m)

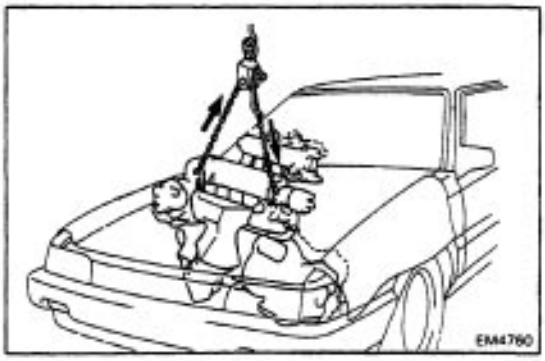


9. (M/T)
INSTALL FLYWHEEL
(a) Apply adhesive to two or three threads of the mount bolt end.
Adhesive: Part No.08833–00070, THREE BOND 1324 or equivalent



(b) Install the flywheel on the crankshaft.
(c) Install and uniformly tighten the mount bolts in several passes in the sequence shown.
Torque: 900 kg–cm (65 ft–lb. 88 N–m)

10. (A/T)
INSTALL DRIVE PLATE
(See procedure step 9)
Torque: 850 kg–cm (61 ft–lb, 83 N–m)
11. (M/T)
INSTALL CLUTCH DISC AND COVER



INSTALLATION VF ENGINE

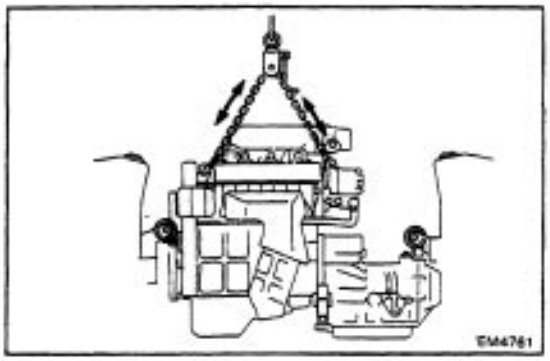
1. ASSEMBLE ENGINE AND TRANSAXLE

2. INSTALL ENGINE AND TRANSAXLE ASSEMBLY IN VEHICLE

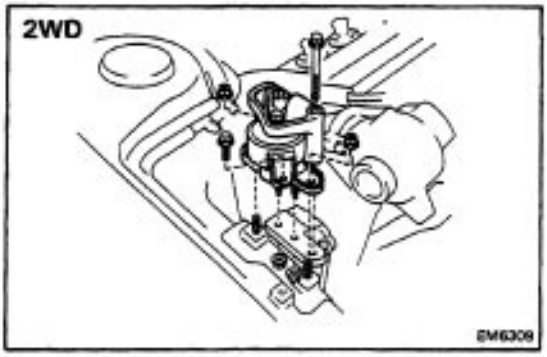
(a) Attach the engine hoist chain to the engine hangers.

(b) Lower the engine into the engine compartment. Tilt the transaxle downward, lower the engine and clear the LH mounting.

NOTICE: Be careful not to hit the PS gear housing or neutral start switch.



(c) Keep the engine level, and align RH and LH mounting with the body bracket.

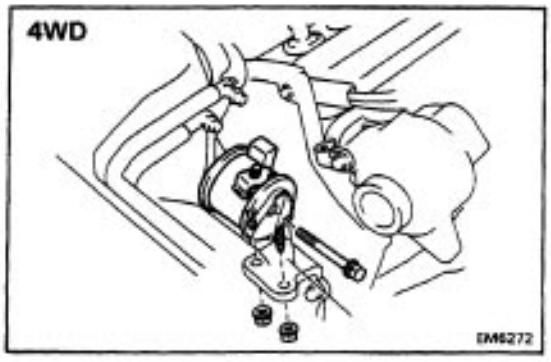


(d) (2WD)

Attach the RH mounting insulator to the mounting bracket and body, and temporarily install the bolt and nut.

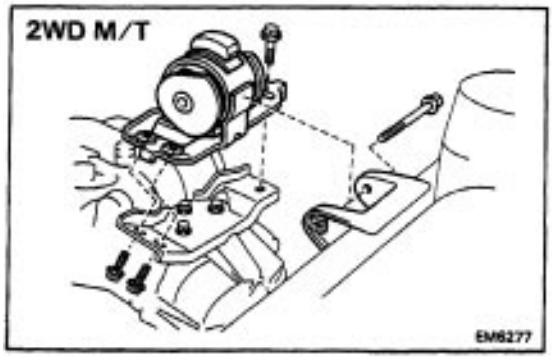
(e) (2WD)

Temporarily install the mounting stay bolt (A).



(f) (4WD)

Attach the RN mounting insulator to the mounting bracket and body, and temporarily install the through bolt and two nuts.



(g) Install the LH mounting bracket to the transaxle case with the three bolts. Torque the bolts.

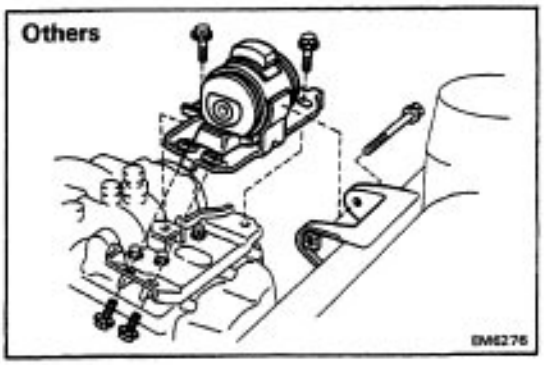
Torque: 530 kg–cm (38 ft–tb, 52 N–m)

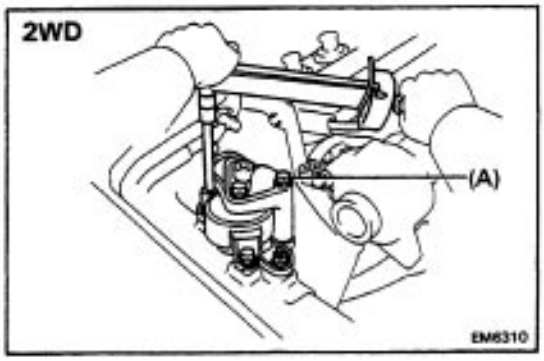
(h) Attach the LH mounting insulator to the mounting bracket and body with the through bolt and three bolts (2WD M/T) or four bolts (Others), and install and torque the bolts.

Torque:

Bolt 530 kg–cm (38 ft–Ib, 52 N–m)

Through bolt 890 kg–cm (64 ft–lb, 87 N–m)





(i) (2WD)

Torque the bolt and four nuts of the RH mounting insulator. Do not torque the bolt (A) yet.

Torque:

Nut To bracket 530 kg–cm (38 ft–lb, 52 N–m)

To body 900 kg–cm (65 ft–lb, 88 N–m)

Bolt 650 kg–cm (47 ft–lb, 64 N–m)

(j) (4WD)

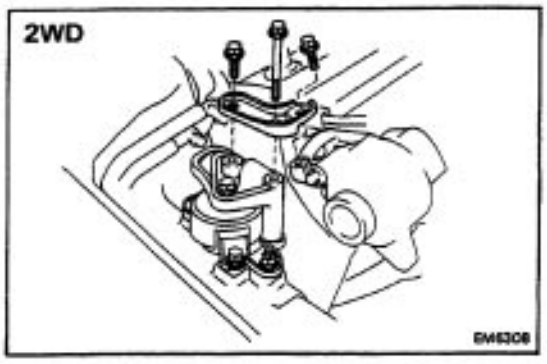
Torque the through bolt and two nuts of the RH mounting insulator.

Torque:

Nut 530 kg–cm (38 ft–lb, 62 N–m)

Through bolt 890 kg–cm (64 ft–lb, 87 N–m)

(k) Remove the engine hoist chain from the engine.

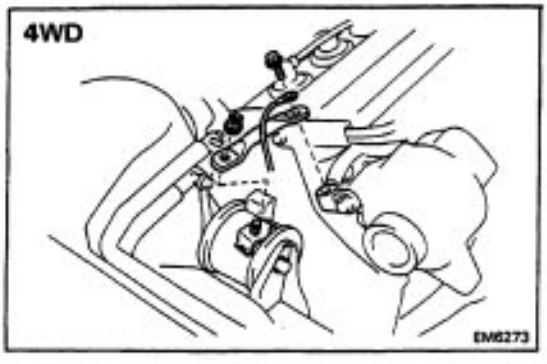


3. INSTALL ENGINE RH MOUNTING STAY

(2WD)

Install the mounting stay with the three botts. Torque the bolts.

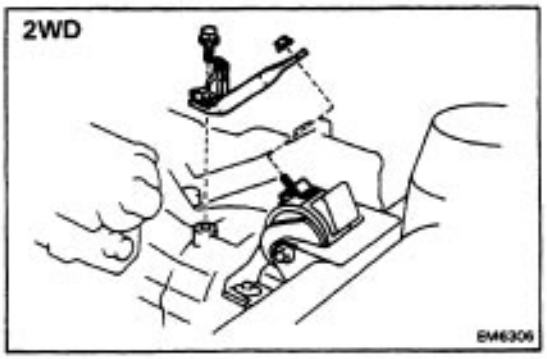
Torque: 740 kg–cm (54 ft–lb, 73 N–m)



(4WD)

Install the mounting stay with the bolt and nut. Torque the bolt and nut.

Torque: 740 kg–cm (54 ft–lb, 73 N–m)

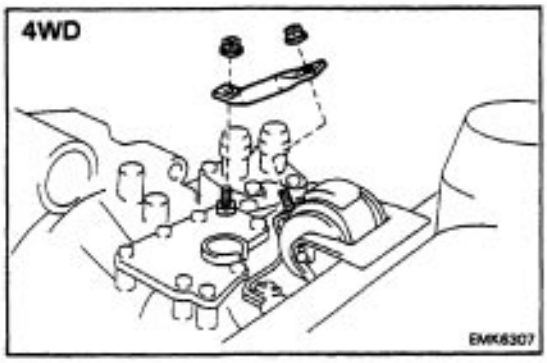


4. (A/T)

INSTALL ENGINE LH MOUNTING STAY (2WD)

Install the mounting stay with the bolt and nut. Torque the bolt and nut.

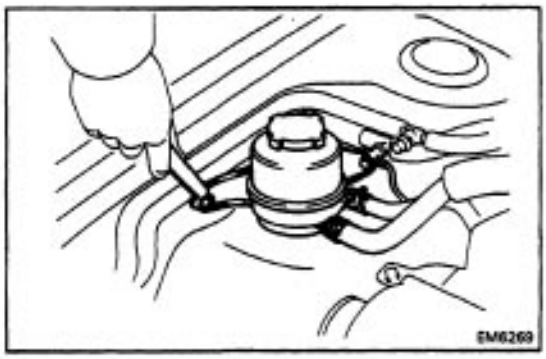
Torque: 210 kg–cm (15 ft–lb, 21 N–m)



(4WD)

Install the mounting stay with the two nuts.

Torque: 210 kg–cm (15 ft–lb. 21 N–m)



5. INSTALL PS OIL RESERVOIR TANK

Install the two bolts.

6. CONNECT ENGINE WIRE

(a) Push in the engine wire through the cowl panel.

(b) Connect the following connectors.

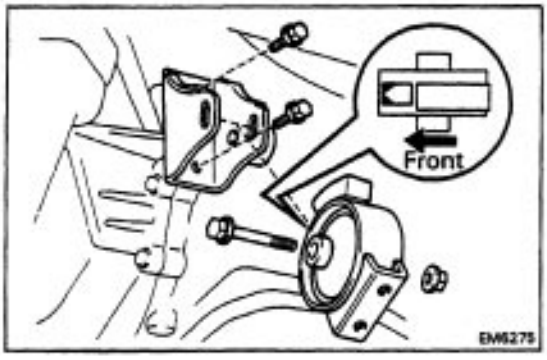
(1) Three TCCS ECU connectors

(2) Circuit opening relay connector

(3) Cowl wire connector

(4) Instrument panel wire connector

(c) Install the glove compartment box.



7. RAISE VEHICLE

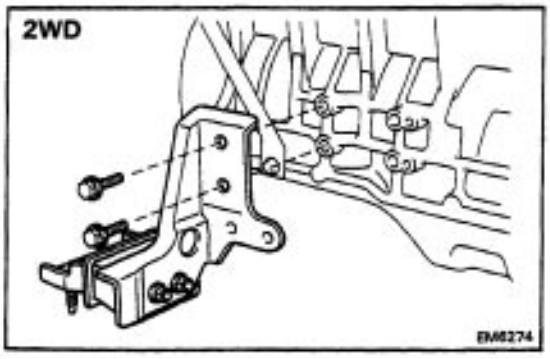
NOTICE: Be sure vehicle is securely supported.

8. INSTALL ENGINE FRONT MOUNTING BRACKET AND INSULATOR

(a) Install the mounting bracket with the two bolts. Torque the bolts.

Torque: 790 kg–cm (57 ft–lb, 77 N–m)

(b) Temporarily install the mounting insulator with the through bolt and nut.

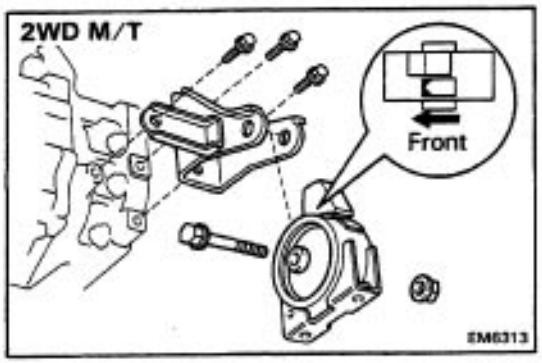


9. (2WD)

INSTALL ENGINE CENTER MOUNTING BRACKET AND INSULATOR ASSEMBLY

Install the mounting bracket and insulator assembly with the two bolts. Torque the bolts.

Torque: 490 kg–cm (35 ft–lb, 48 N–m)

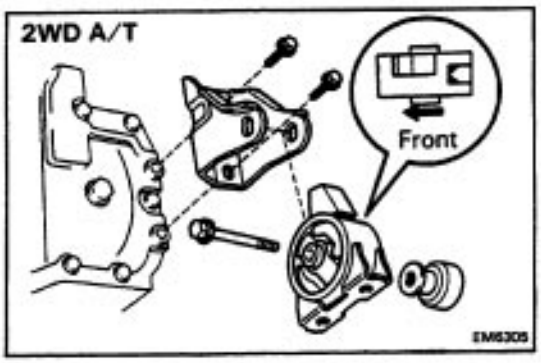


10. INSTALL ENGINE REAR MOUNTING BRACKET AND INSULATOR

(M/T)

(a) Install the mounting bracket with the three bolts. Torque the bolts.
Torque: 790 kg–cm (57 ft–lb, 77 N–m)

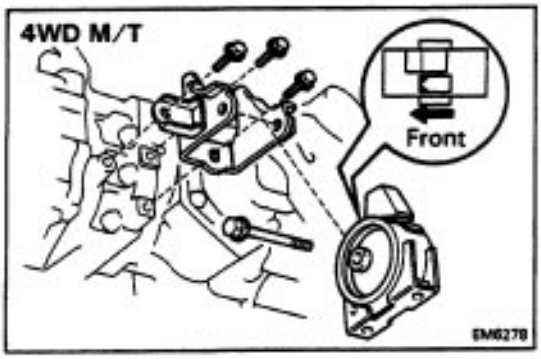
(b) Temporarily install the mounting insulator with the through bolt and nut:



(2WD A/T)

(a) Install the mounting bracket with the two bolts. Torque the bolts.
Torque: 790 kg–cm (57ft–lb, 77 N–m)

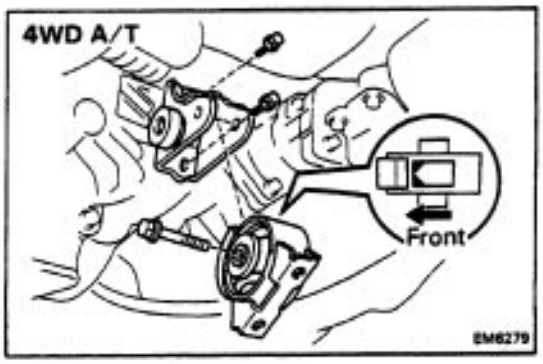
(b) Temporarily install the mounting insulator with the through bolt and nut (damper).



(4WD M/T)

(a) Install the mounting bracket with the three bolts. Torque the bolts.
Torque: 790 kg–cm (57 ft–tb, 77 N–m)

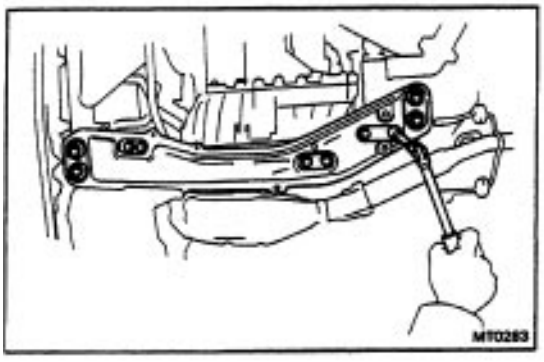
(b) Temporarily install the mounting insulator with the through bolt.



(4WD A/T)

(a) Install the mounting bracket with the two bolts. Torque the bolts.
Torque: 790 kg–cm (57 ft–lb, 77 N–m)

(b) Temporarily install the mounting insulator with the through bolt.

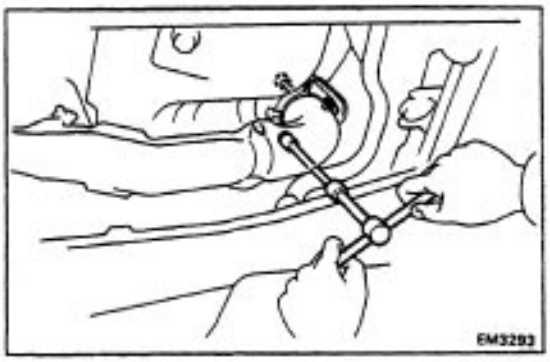


11. INSTALL ENGINE MOUNTING CENTER MEMBER

(a) Install the engine mounting center member with the four bolts. Torque the bolts.
Torque: 400 kg–cm (29 ft–lb, 39 N–m)

(b) Install and torque the four bolts and two nuts (2WD) holding the mounting insulators to the center member.
Torque: Nut 490 kg–cm (35 ft–lb, 48 N–m)
Bolt 740 kg–cm (54 ft–1b, 73 N–m)

(c) Torque the mounting insulator through bolts (front and rear.)
Torque: 890 kg–cm (64 ft–lb, 87 N–m)



12. INSTALL FRONT EXHAUST PIPE

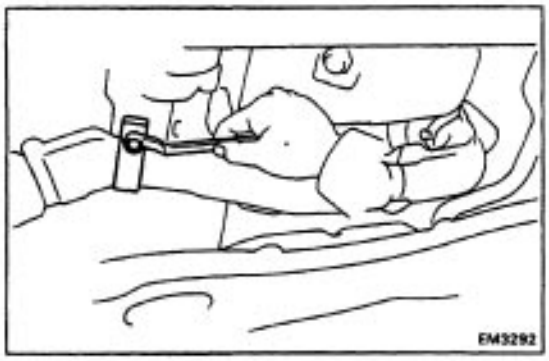
(a) Place two new gaskets on the front and rear of the front pipe.

(b) Install the front pipe with the two bolts and new five nuts. Torque the nuts.

Torque:

To manifold: 830 kg–cm (46ft–lb, 62 N–m)

To converter: 440 kg–cm (32ft–lb, 43 N–m)



(c) Install the clamp with the bolt.

13. INSTALL PS PUMP

14. (4WD)

INSTALL DEFLECTOR TO TRANSFER EXTENSION HOUSING

15. (411VD)

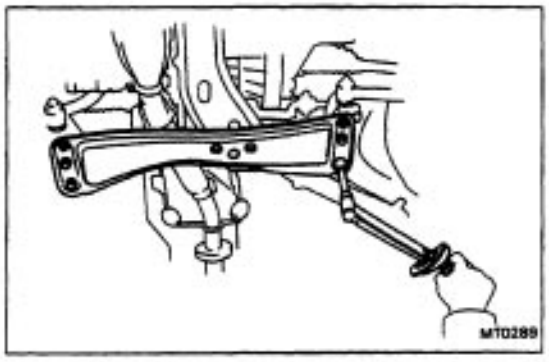
INSTALL PROPELLER SHAFT

16. INSTALL DRIVE SHAFTS

17. INSTALL SUSPENSION LOWER CROSSMEMBER

(a) Install the crossmember with the two bolts and two nuts. Torque the bolts and nuts.

Torque: 2,100 kg–cm (153 ft–lb, 207 N–m)



(b) Install the two bolts holding the crossmember to the center member. Torque the bolts.

Torque: 400 kg–cm (29 ft–lb, 39 N–m)

18. INSTALL ENGINE UNDER COVERS

19. CONNECT WIRES AND CONNECTORS

(a) Check connector

(b) Ground straps from LH fender apron

(c) Connectors from relay box

(d) Engine room wire connector

20. CONNECT HOSES

(a) Two heater water by–pass hoses

(b) Two fuel hoses

(c) Brake booster vacuum hoses

(d) A/C idle–up vacuum hoses

(e) Charcoal canister vacuum hose

21. (w/ A/C)

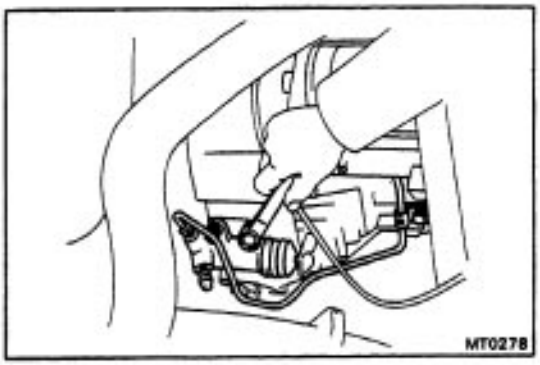
INSTALL A/C COMPRESSOR

(a) Install the compressor with the four bolts.

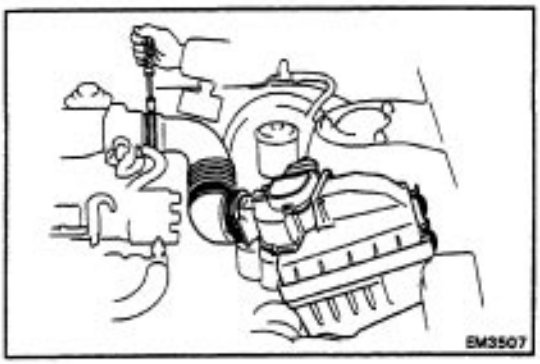
(b) Connect the two connectors.

22. CONNECT TRANSAXLE CONTROL CABLE

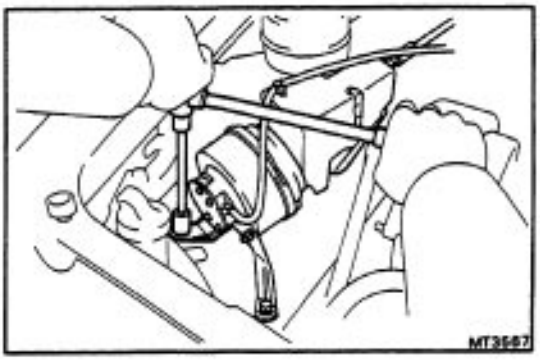
23. CONNECT SPEEDOMETER CABLE



24. (M/T)
INSTALL CLUTCH RELEASE CYLINDER AND TUBE CLAMP

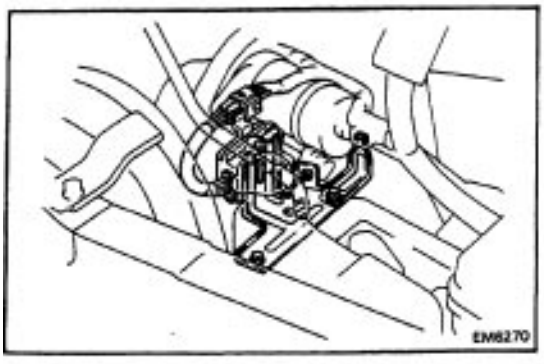


25. INSTALL AIR CLEANER ASSEMBLY
(a) Install the air cleaner case with the three bolts.
(b) Install the air cleaner element.
(c) Connect the air cleaner hose, and Install the air cleaner cap and air flow meter assembly with the four clips.
(d) Connect the air flow meter connector.



26. (w/ CRUISE CONTROL SYSTEM)
INSTALL CRUISE CONTROL ACTUATOR
(a) Install the actuator and bracket with the bolts.
(b) Connect the actuator connector.
(c) Connect the actuator vacuum hose.

27. (A/T)
INSTALL THROTTLE CABLE, AND ADJUST IT
28. INSTALL ACCELERATOR CABLE, AND ADJUST IT
29. INSTALL RADIATOR RESERVOIR TANK
30. INSTALL RADIATOR (See page CO–19)



31. INSTALL IGNITER AND BRACKET ASSEMBLY
(a) Install the igniter and bracket assembly with the two bolts.
(b) Connect the igniter connector.
(c) Connect the ground strap.

32. INSTALL BATTERY

33. FILL WITH ENGINE COOLANT (See page CO–5)

Capacity (w/ Heater):
M/T 6.4 liters (6.8 US qts, 5.6 Imp. qts)
A/T (2WD) 6.3 liters (6.7 US qts, 5.5 Imp. qts)
A/T (4WD) 6.8 liters (7.2 US qts, 6.0 Imp. qts)

34. FILL WITH ENGINE OIL (See page LU–8)

Capacity:
Drain and refill
w/ Oil filter change
3.9 liters (4.1 US qts, 3.4 Imp. qts)
w/o Oil filter change
3.7 liters (3.9 US qts, 3.3 Imp. qts)
Dry fill 4.3 liters (4.5 US qts, 3.8 Imp. qts)

35. START ENGINE AND CHECK FOR LEAKS

36. PERFORM ENGINE ADJUSTMENT

(a) Adjust the alternator drive belt.
(See page CH–3)
Drive belt tension:

w/ A/C	**New belt 175 ± 5 lb**
	Used belt 130 ± 10 lb
w/o A/C	**New belt 125 ± 25 lb**
	Used belt 95 ± 20 lb

(b) Adjust the PS drive belt.
Drive belt tension: New belt 125 ± 25 lb
Used belt 80 ± 20 lb

(c) Adjust the ignition timing.
(See steps 7 to 10 on pages IG–16 and 17)
Ignition timing:
10° BTDC @ idle
(w/ Terminals TE 1 and E1 connected)

(d) Adjust the valve. clearance. (See page EM–11)
Valve clearance:
Intake 0.19 – 0.29 mm (0.007 – 0.011 in.)
Exhaust 0.28 – 0.38 mm (0.011 – 0.015 in.)

37. INSTALL HOOD

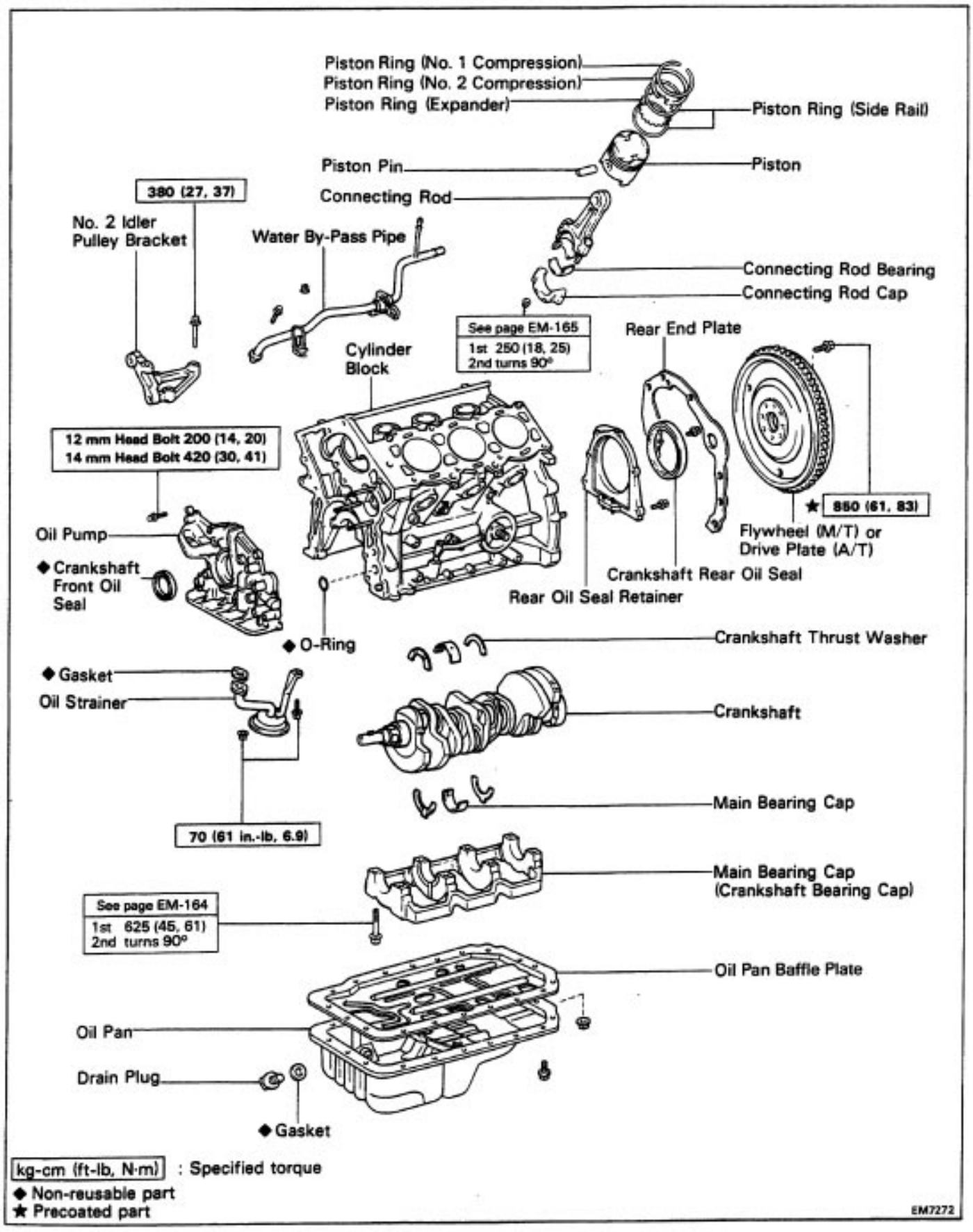
38. PERFORM ROAD TEST

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

39. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS

CYLINDER BLOCK (2VZ–FE)

COMPONENTS



REMOVAL OF ENGINE

1. REMOVE BATTERY

Disconnect the grand strap.

2. DRAIN ENGINE COOLANT (See page CO–5)

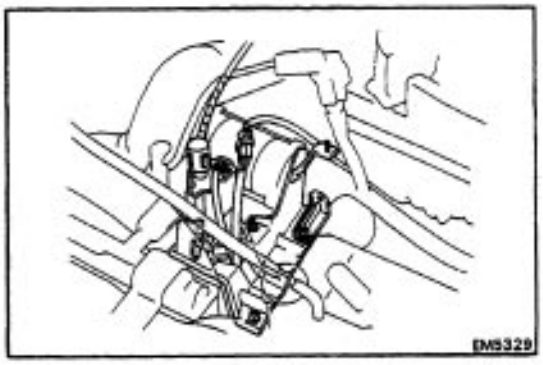
3. REMOVE HOOD

4. REMOVE ENGINE UNDER COVERS

5. DRAIN ENGINE COOLANT (See page CO–5)

6. DRAIN ENGINE OIL

7. REMOVE IGNITION COIL, IGNITER AND BRACKET ASSEMBLY



(a) Disconnect the following cord and connectors:
  (1) Igniter connector
  (2) Noise filter connector
  (3) High–tension cord

(b) Remove the two bolts, the ignition coil, igniter and bracket assembly.

8. REMOVE RADIATOR (See page CO–16)

9. REMOVE ALTERNATOR (See page CH–6)

10. REMOVE ALTERNATOR BELT ADJUSTING BAR

11. REMOVE RADIATOR RESERVOIR TANK

12. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

13. (A/T)

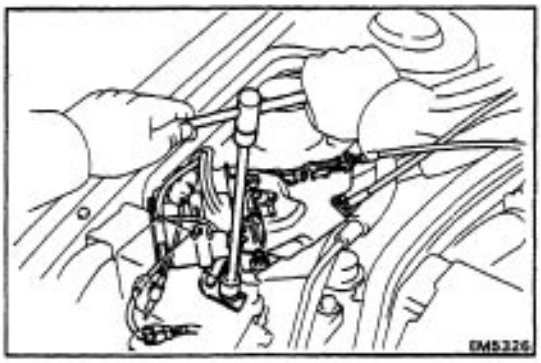
DISCONNECT THROTTLE CABLE FROM THROTTLE BODY

14. (w/ CRUISE CONTROL SYSTEM)

REMOVE CRUISE CONTROL ACTUATOR AND VACUUM PUMP

(w/A.B.S..)

(a) Remove the dust cover.

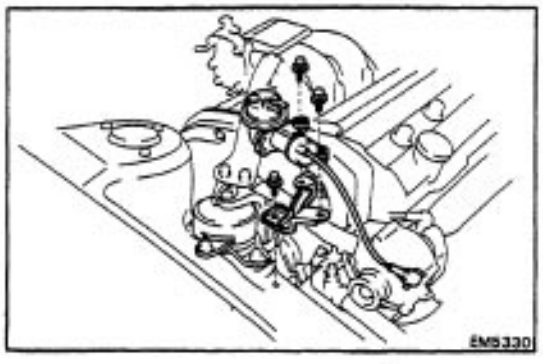


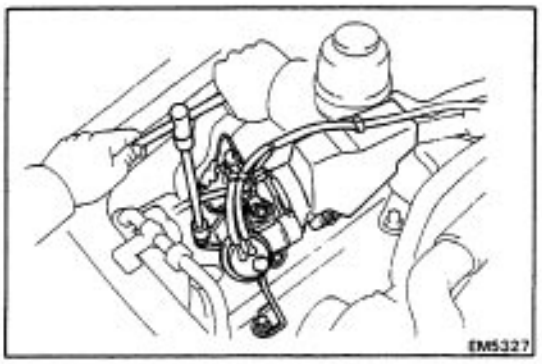
(b) Disconnect the following hoses and connector:
  (1) Actuator vacuum hoses
  (2) Actuator connector

(c) Remove the four bolts, actuator and bracket.

(d) Disconnect the vacuum pump connector.

(e) Remove the three bolts, vacuum pump and bracket.

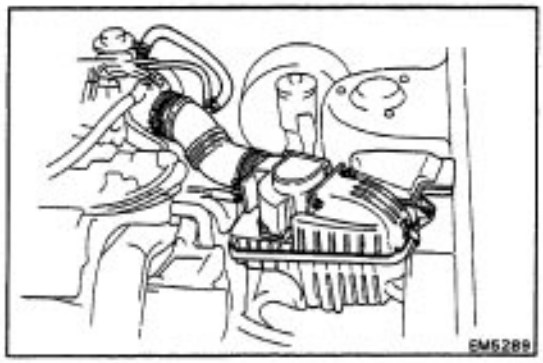




(w/o A.B.S..)

(a) Disconnect the following the hose and connectors:
  (1) Actuator vacuum hose from air intake chamber
  (2) Actuator connector
  (3) Vacuum pump connector
  (4) Vacuum switch connector

(b) Remove the three bolts, the actuator, vacuum pump and vacuum switch assembly.



15. REMOVE AIR CLEANER ASSEMBLY

(a) Disconnect the following connector and hoses:
  (1) Air flow meter connector
  (2) ISC valve air hose
  (3) Vacuum pipe air hose

(b) Disconnect the four air cleaner cap clips.

(c) Disconnect–the air cleaner hose, and remove the air cleaner cap, hoses, and air flow meter assembly.

(d) Remove the air cleaner element.

(e) Remove the three bolts and air cleaner case.

16. DISCONNECT WIRES AND CONNECTORS

(a) Check connector

(b) Ground straps from LH fender apron

(c) Connectors from relay box

(d) Engine room wire connecter

17. DISCONNECT VACUUM HOSES

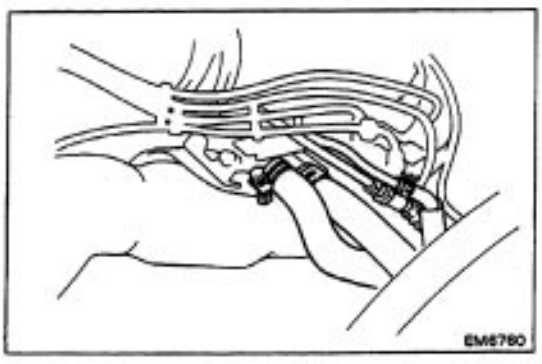
(a) Brake booster vacuum hose from air intake chamber

(b) A/C control valve vacuum hose from air intake chamber

(c) A/C control valve vacuum hose from vacuum pipe (on air intake chamber)

(d) Charcoal canister vacuum hose from vacuum pipe (on air intake chamber)

18. DISCONNECT GROUND STRAP FROM TRANSAXLE



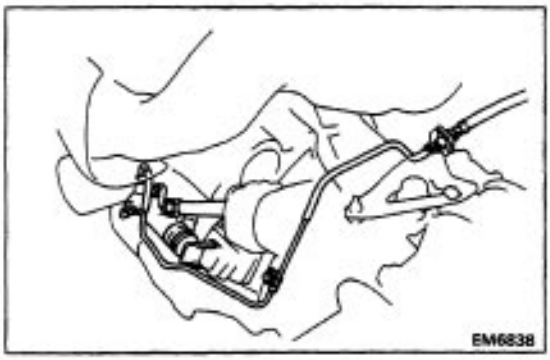
19. DISCONNECT HEATER HOSES

20. DISCONNECT FUEL HOSE

CAUTION: Catch leaking fuel in a container.

(M/T)

21. REMOVE STARTER



22. (M /T)
REMOVE CLUTCH RELEASE CYLINDER AND TUBE CLAMP WITHOUT DISCONNECTING TUBE

23. DISCONNECT SPEEDOMETER CABLE

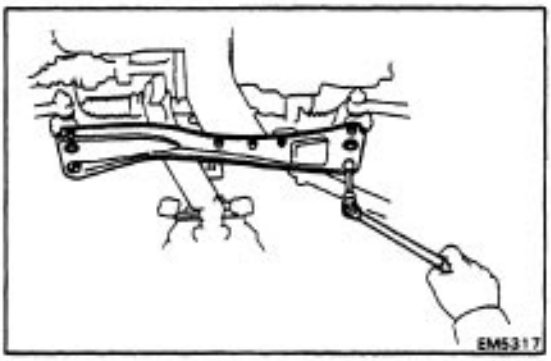
24. DISCONNECT TRANSAXLE CONTROL CABLE(S)

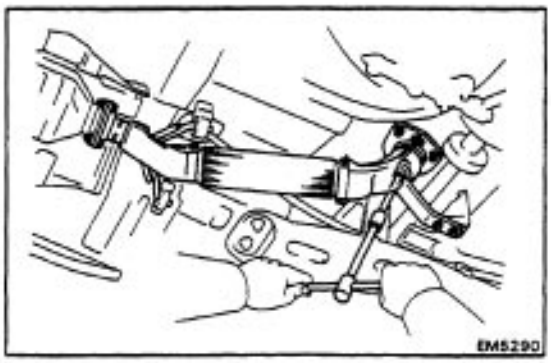
25. DISCONNECT ENGINE WIRE FROM CABIN

(a) Remove the under cover.
(b) Remove the glove compartment box.
(c) Disconnect the following connectors:
(1) Three engine & ECT ECU connectors
(2) Circuit opening relay connector
(3) Cowl wire connector
(4) Instrument panel wire connector
(d) Pull out the engine wire from the cowl panel.

26. REMOVE SUSPENSION LOWER CROSSMEMBER

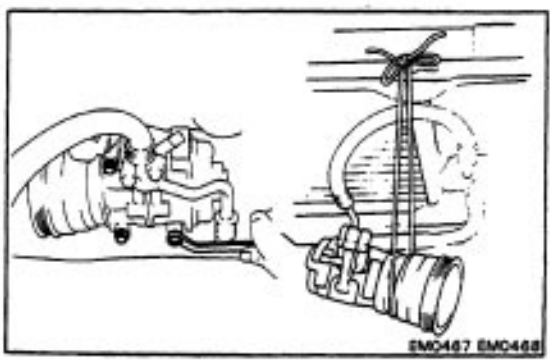
Remove the two bolts, two nuts and crossmember.





27. REMOVE FRONT EXHAUST PIPE

(a) Remove the two pipe stay bolts.
(b) Remove the two bolts and nuts, and disconnect the front pipe from the center pipe. Remove the gasket.
(c) Remove the three nuts, front pipe and gasket.



28. REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES

(a) Disconnect the two connectors.
(b) Remove the four compressor bolts.

HINT: Put aside the compressor, and suspend it to the radiator support with a string.

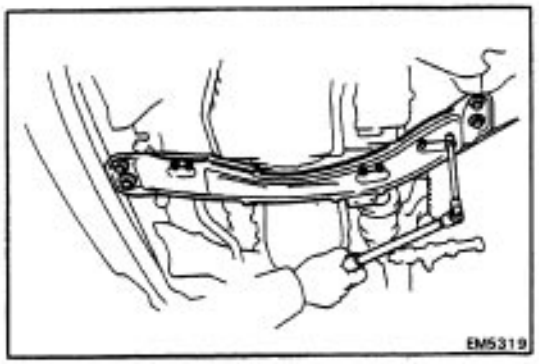
29. REMOVE DRIVE SHAFTS

30. REMOVE PS PUMP WITHOUT DISCONNECTING HOSES

HINT: Put aside the pump and suspend it to the cowl with a string.

31. REMOVE ENGINE MOUNTING CENTER MEMBER

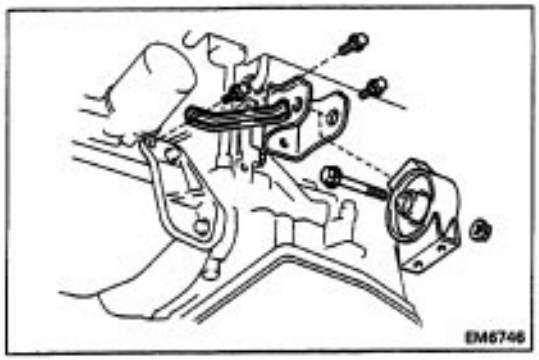
Remove the eight bolts, two nuts and center member.



32. REMOVE FRONT ENGINE MOUNTING INSULATOR AND BRACKET

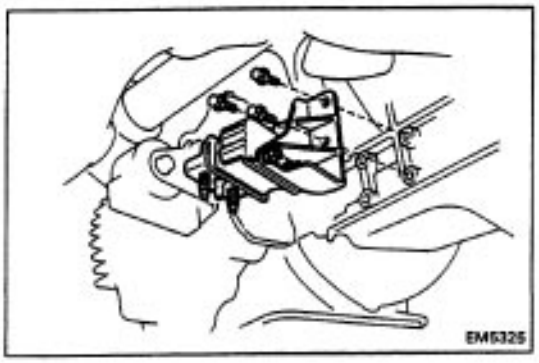
(a) Remove the nut, through bolt and mounting insulator.

(b) Remove the three bolts and mounting bracket.



33. REMOVE CENTER ENGINE MOUNTING INSULATOR AND BRACKET ASSEMBLY

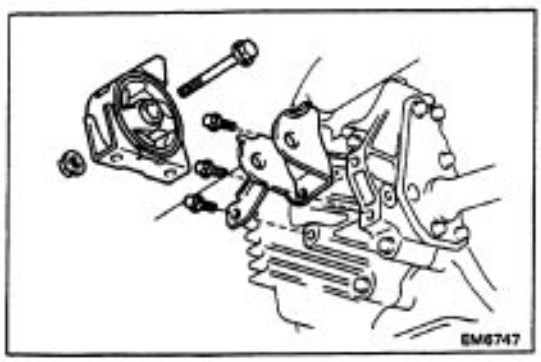
Remove the three bolts, the mounting bracket and insulator assembly.

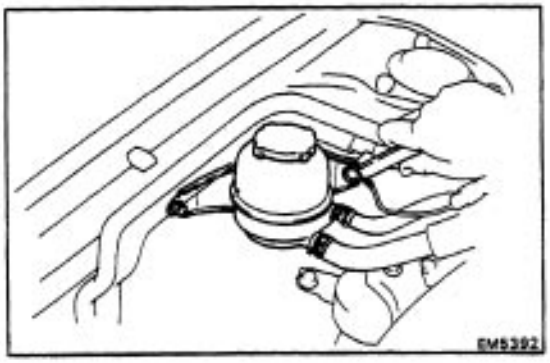


34. REMOVE REAR ENGINE MOUNTING INSULATOR AND BRACKET

(a) Remove the nut, through bolt and mounting insulator.

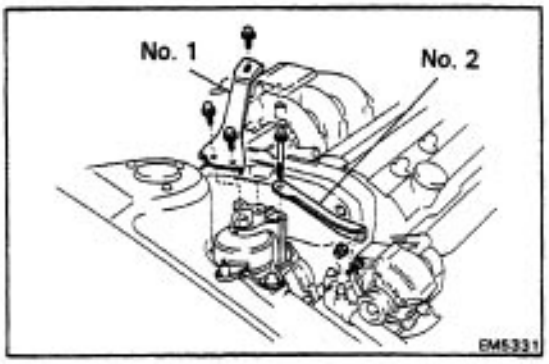
(b) Remove the three bolts and mounting bracket.





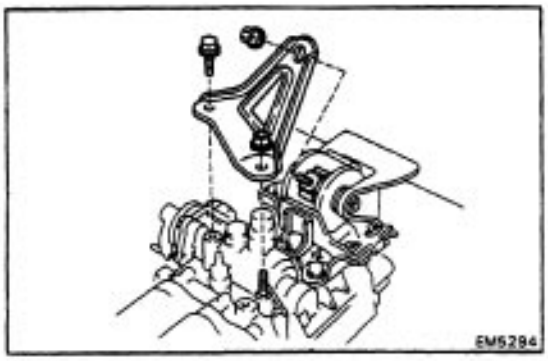
35. REMOVE PS OIL RESERVOIR TANK WITHOUT DISCONNECTING HOSES

Remove the two bolts and reservoir tank. Disconnect the ground strap.



36. REMOVE ENGINE RH MOUNTING STAYS

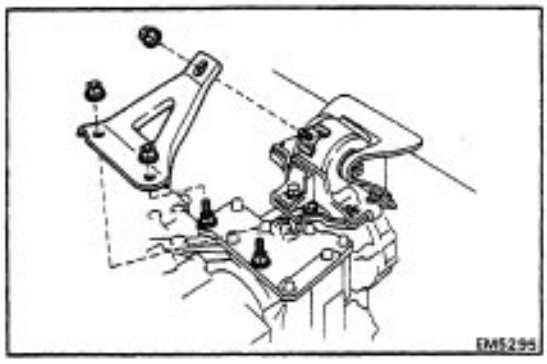
(a) Remove the three bolts and No. 1 mounting stay.
(b) Remove the bolt, nut and No. 2 mounting stay.



37. REMOVE ENGINE LH MOUNTING STAY

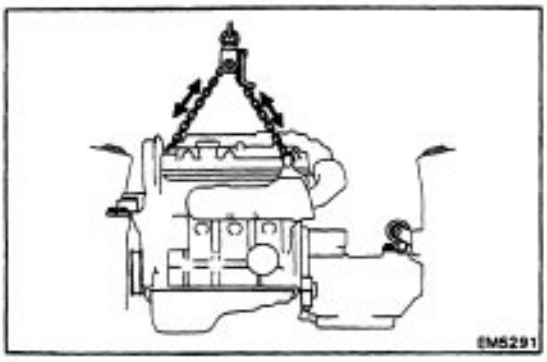
(M/T)

Remove the bolt, two nuts and mounting stay.



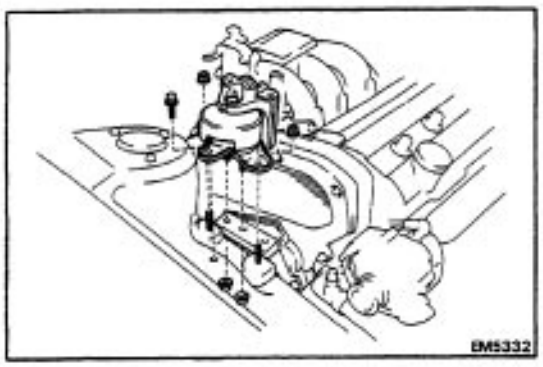
(A/T)

Remove the three nuts and mounting stay.

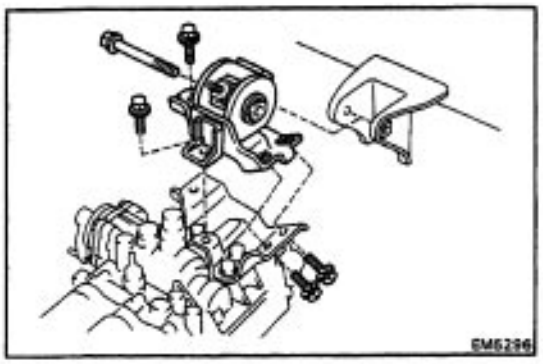


38. REMOVE ENGINE AND TRANSAXLE ASSEMBLY FROM VEHICLE

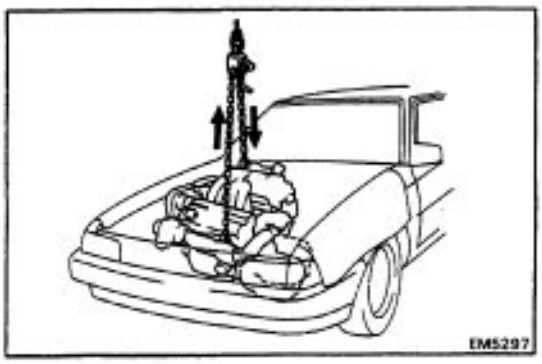
(a) Attach the engine hoist chain to the engine hangers.



(b) (w/ A.B.S.)
Remove the clamp bolts of the PS oil cooler pipes.
(c) Remove the bolt, four nuts and RH mounting insulator.



(d) Remove the through bolt, nut, four bolts and LH mounting insulator.
(e) Remove the three bolts and LH mounting bracket.

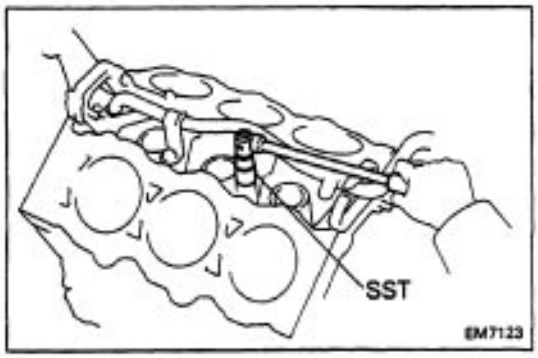


(f) Lift the engine out of the vehicle slowly and carefully.
NOTICE: Be careful not to hit the PS gear housing or neutral start switch.
(g) Make sure the engine is clear of all wiring, hoses and cables.
(h) Place the engine. and transaxle assembly onto the stand.

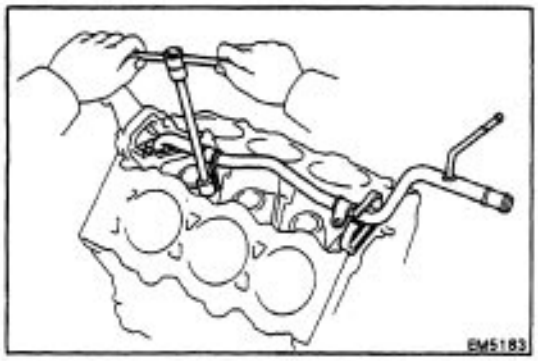
39. (A/T)
REMOVE STARTER
40. SEPARATE ENGINE AND TRANSAXLE

PREPARATION FOR DISASSEMBLY

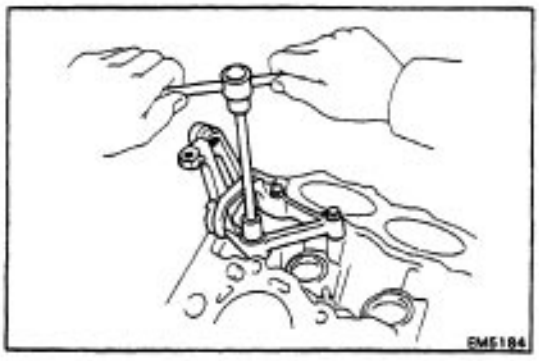
1. (M/T)
REMOVE CLUTCH COVER AND DISC
2. (M/T)
REMOVE FLYWHEEL
3. (A/T)
REMOVE DRIVE PLATE
4 REMOVE REAR END PLATE
Remove the bolt and end plate.
5. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY
6. REMOVE DISTRIBUTOR (See page IG–18)
7. REMOVE TIMING BELT AND PULLEYS (See page EM–34)
8. REMOVE CYLINDER HEADS (See page EM–76)
9. REMOVE WATER PUMP (See page CO–9)
10. REMOVE OIL PAN AND OIL PUMP (See page LU–17)
11. REMOVE OIL FILTER (See page LU–7)
12. REMOVE KNOCK SENSOR
Using SST, remove the knock sensor.
SST 09816–30010

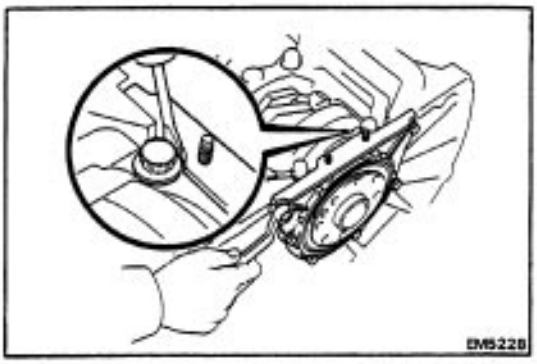


13. REMOVE WATER BY–PASS PIPE
Remove the two bolts, two nuts and by–pass pipe.



14. REMOVE NO.2 IDLER PULLEY BRACKET
Remove the three bolts and mounting bracket.



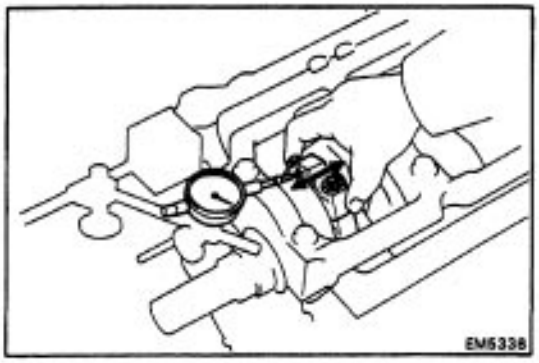


DISASSEMBLY OF CYLINDER BLOCK

(See page EM–139)

1. REMOVE REAR OIL SEAL RETAINER

Remove the six bolts and retainer.



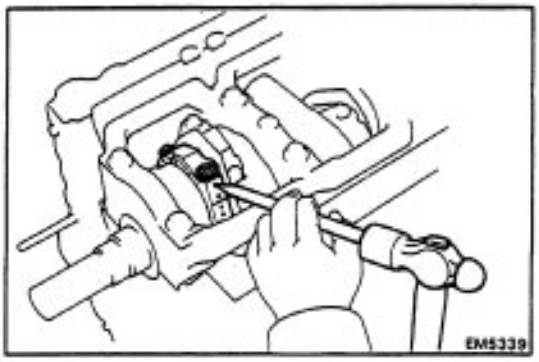
2. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance: 0.150 – 0.330 mm (0.0059 – 0.0130 in.)

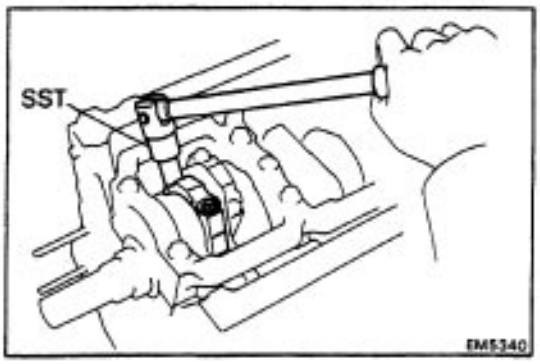
Maximum thrust clearance: 0.38 mm (0.0150 in.)

If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.

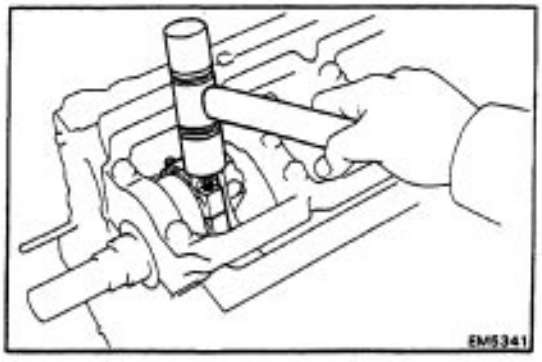


3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Using a punch or numbering stamp, place the rnatchmarks on the connecting rod and cap to ensure correct reassembly.

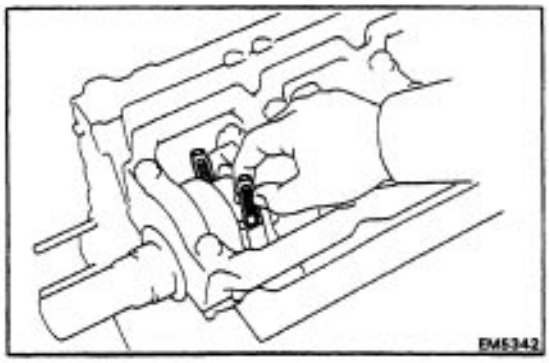


(b) Using SST, remove the connecting rod cap nuts.
SST 09011–38121

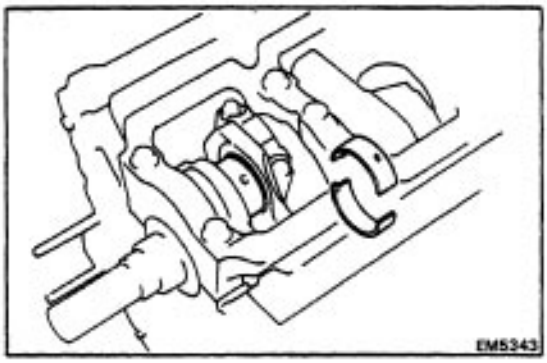


(c) Using a plastic–faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.

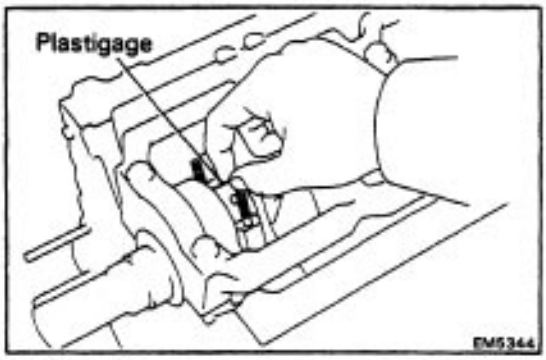
HINT: Keep the lower bearing inserted with the connecting cap.



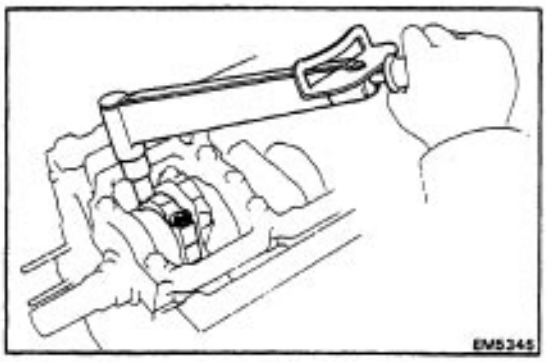
(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



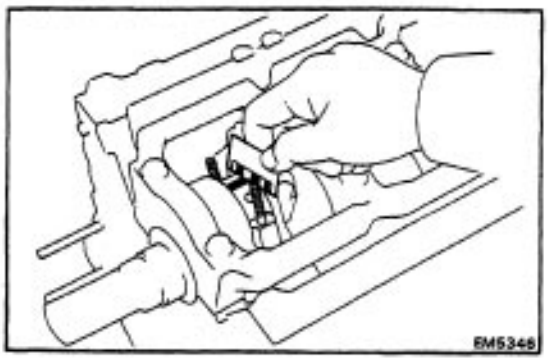
(e) Clean the crank pin and bearing.
(f) Check the crank pin and bearing for pitting and scratches.
If the crank pin or bearing is damaged, replace the bearing.
If necessary, grind or replace the crankshaft.



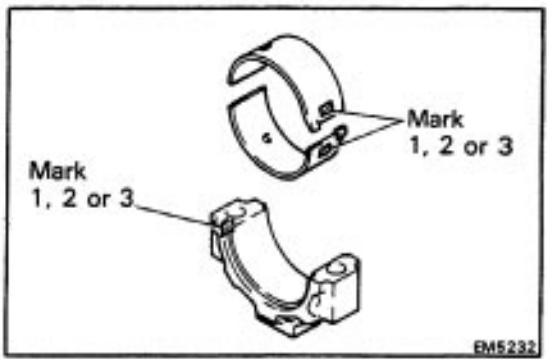
(g) Lay a strip of Plastigage across the crank pin.

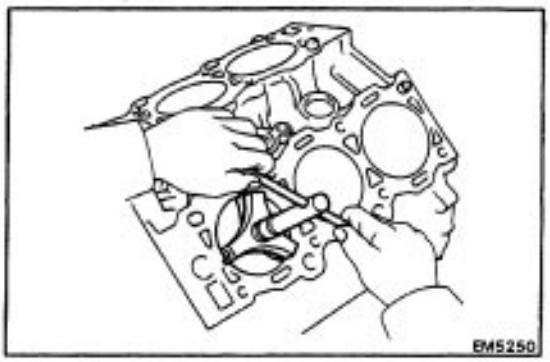


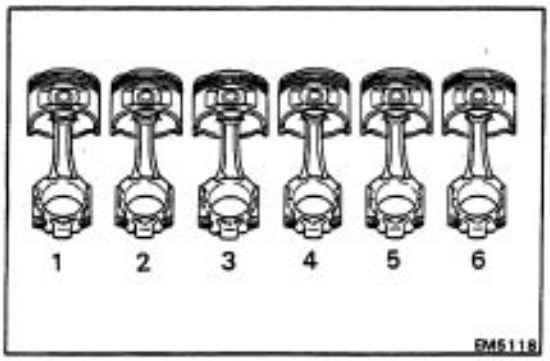
(h) Install the connecting rod cap.
(See step 6 on page EM–165)
Torque: 1st 250 kg–cm (18 ft–ib, 25 N–m)
2nd turns 90°
NOTICE: Do not turn the crankshaft



(i) Remove the connecting rod cap.
(j) Measure the Plastigage at widest point.
Standard oil clearance:
STD 0.028 – 0.065 mm
(0.0011 – 0.0026 in.)
U/S 0.25 0.027 – 0.080 mm
(0.0011 – 0.0031 in.)
Maximum oil clearance: 0.08 mm (0.0031 in.)
If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.







HINT: If using a standard bearing, replace with one having the same number marked on the connecting rod cap. There are three sizes of standard bearings, marked "1 ", "2" and "3" accordingly.

(Reference)

Standard sized bearing center wall thickness:

Mark "1" 1.484 – 1.488 mm (0.0584 – 0.0586 in.)

Mark "2" 1.488 – 1.492 mm (0.0586 – 0.0587 in.)

Mark "3" 1.492 – 1.496 mm (0.0587 – 0.0589 in.)

(k) Completely remove the Plastigage.

4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

(a) Remove the all carbon from the piston ring ridge.

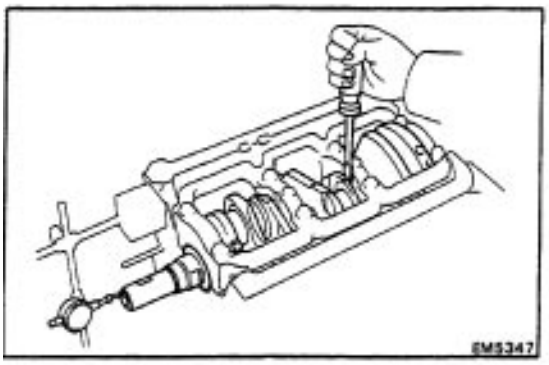
(b)Cover the connecting rod bolts.

(See page EM–145)

(c) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

- Keep the bearing, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.



5. CHECK CRANKSHAFT THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

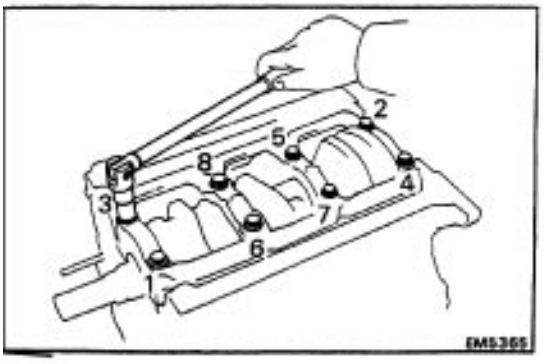
Standard thrust clearance: 0.020 – 0.220 mm (0.0008 – 0.0087 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

If the thrust clearance is greater than maximum, replace the thrust washers as a set.

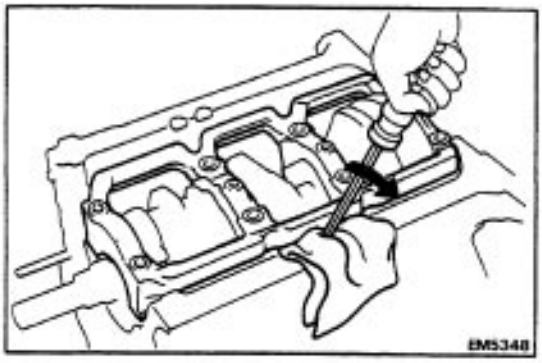
Thrust washer thickness (STD size only):

2.440 – 2.490 mm (0.0961 – 0.0980 in.)



6. REMOVE MAIN BEARING CAP AND CHECK OIL CLEARANCE

(a) Uniformly loosen and remove the main bearing cap bolts in several passes in the sequence shown.

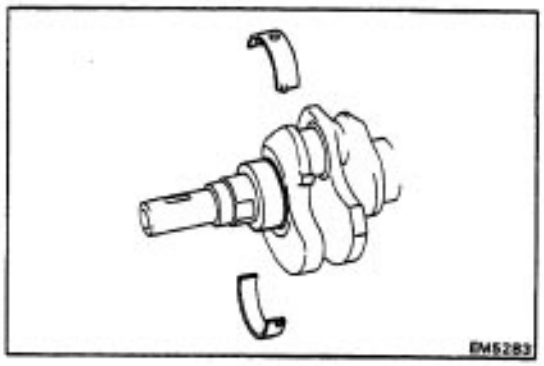


(b) Using a screwdriver, pry up the main bearing cap, and remove the main bearing cap, lower main bearings and lower thrust washers (No. 2 journal position of main bearing cap only).

HINT: Keep the lower main bearings and lower thrust washers together with the main bearing cap.

(c) Lift out the crankshaft.

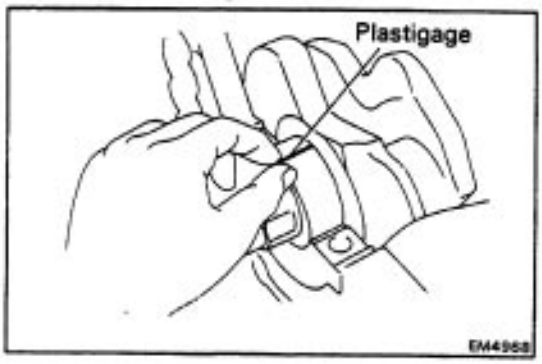
NOTE: Keep the upper main bearings and upper thrust washers together with the cylinder block.



(d) Clean each main journal and bearing.

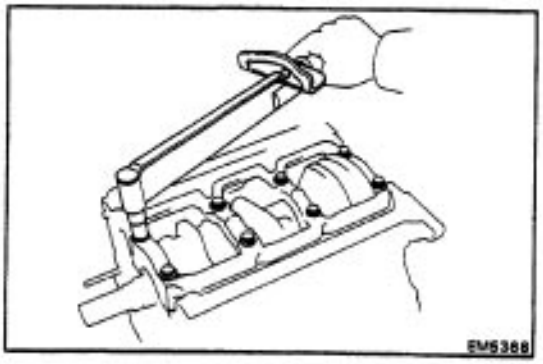
(e) Check each main journal and bearing for pitting and scratches.

If the journal or bearing is damaged, replace the bearing. If necessary, grind or replace the crankshaft.



(f) Place the crankshaft on the cylinder block.

(g) Lay a strip of Plastigage across each journal.



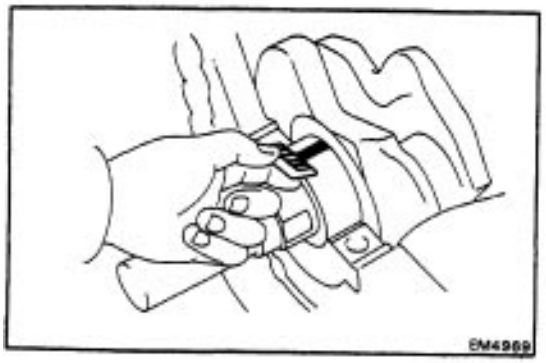
(h) Install the main bearing cap.

(See step 4 on page EM–164)

Torque: 1 st 625 kg–cm (45 ft–lb, 61 N–m)

2nd turns 90°

NOTICE: Do not turn the crankshaft



(i) Remove the main bearing cap.

(j) Measure the Plastigage at its widest point.

Standard clearance:

STD 0.029 – 0.056 mm
(0.0011 – 0.0022 in.)

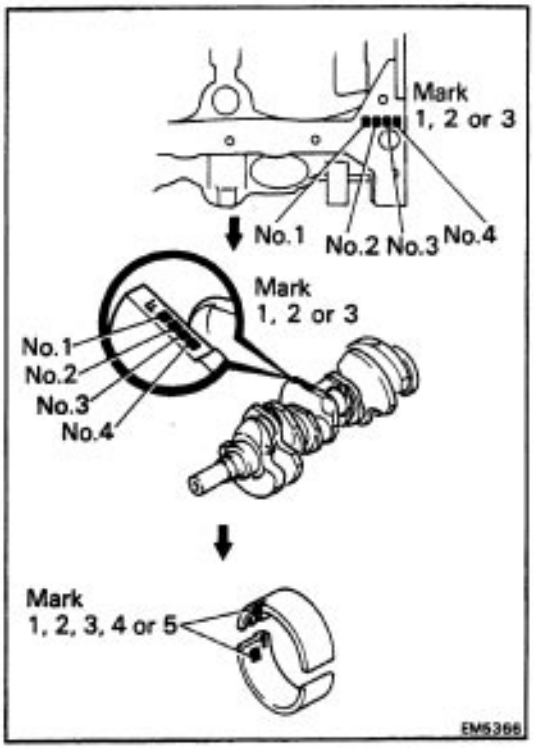
U/S 0.25 0.028 – 0.080 mm
(0.0011 – 0.0031 in.)

Maximum clearance: 0.08 mm (0.0031 in.)

HINT: If replacing the cylinder block sub–assembly, the bearing standard clearance will be:

0.031 0.067 mm
(0.0012 – 0.0026 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.



HINT: If using a standard bearing, replace with one having the same number. If the number of the bearing be determined, select a bearing from the table below according to the numbers imprinted on the cylinder block and crankshaft. There are five sizes of standard bearings, marked ”1 ”, ”2”, ”3”, “4,“ and ”5” accordingly.

	Number marked								
Cylinder block	1			2			3		
Crankshaft	0	1	2	0	1	2	0	1	2
Bearing	1	2	3	2	3	4	3	4	5

EXAMPLE: Cylinder block ”2” + Crankshaft ”1”
= Bearing ”T’

(Reference)

Cylinder block main journal bore diameter:

Mark ”1 ” 68.010 – 68.0 16 mm
(2.6776 – 2.6778’in.)
Mark ”2” 68.016 – 68.022 mm
(2.6778 – 2.6780 in.)
Mark ”3” 68.022 – 68.028 mm
(2.6780 – 2.6783 in.)

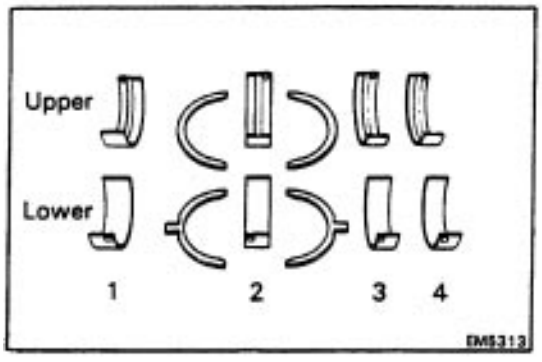
Crankshaft journal diameter:

Mark ”0” 63.996 – 64.000 mm
(2.5195 – 2.5197 in.)
Mark ”1” 63.990 – 63.996 mm
(2.5193 – 2.5195 in.)
Mark ”2” 63.985 – 63.990 mm
(2.5191 – 2.5193 in.)

Standard sized bearing center wall thickness:

Mark ”1 ” 1.989 – 1.992 mm
(0.0783 – 0.0784 in.)
Mark ”2” 1.992 – 1.995 mm
(0.0784 – 0.0785 in.)
Mark ”3” 1.995 – 1.998 mm
(0.0785 – 0.0787 in.)
Mark ”4” 1.998 – 2.001 mm
(0.0787 – 0.0788 in.)
Mark ”5” 2.001 – 2.004 mm
(0.0788 – 0.0789 in.)

(k) Completely remove the Plastigage.

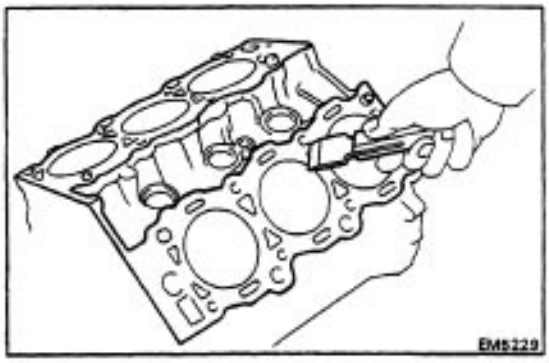


7. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the upper main bearings and upper thrust washers from cylinder block.

HINT: Arrange the main bearings and thrust washers in correct order.



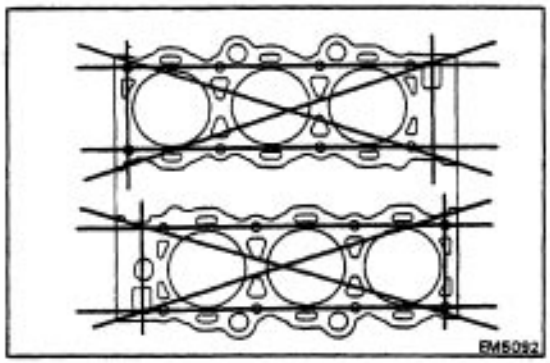
INSPECTION OF CYLINDER BLOCK

1. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket material from the cylinder block surface.

2. CLEAN CYLINDER BLOCK

Using a soft brush and solvent, clean the cylinder block.

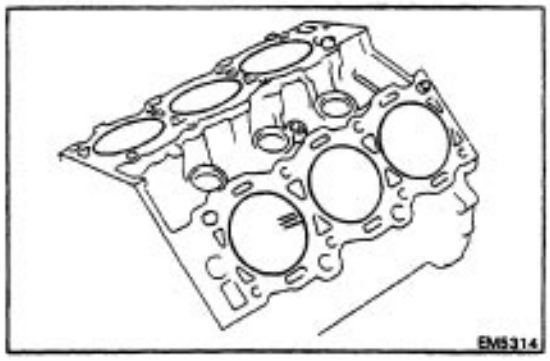


3. INSPECT TOP OF CYLINDER BLOCK FOR FLATNESS

Using a –precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head gasket for warpage.

Maximum warpage: 0.05 mm (0.0020 in.)

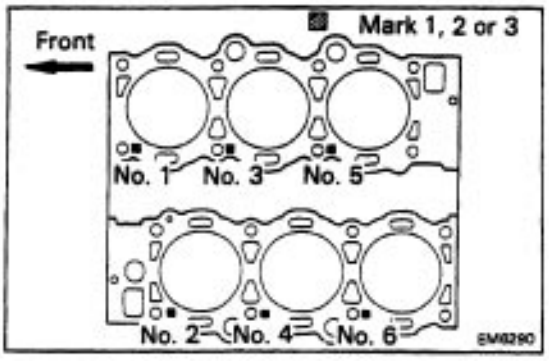
If warpage is greater than maximum, replace the cylinder block.



4. INSPECT CYLINDER FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches.

If deep scratches are present, rebore all the six cylinders or replace the cylinder block.



5. INSPECT CYLINDER BORE DIAMETER

HINT: There are three sizes of the standard cylinder bore diameter, marked ”1 ”, ”2” and ”3” accordingly. The mark is stamped on the top of the cylinder block.

Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust axial directions.

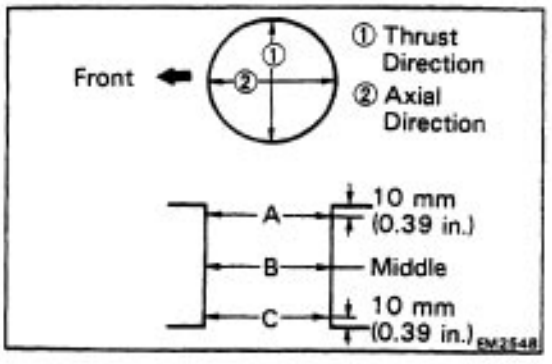
Standard diameter:

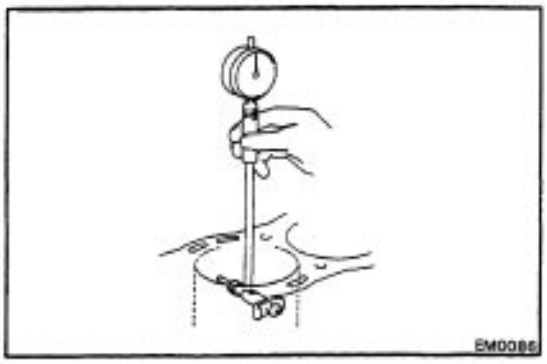
STD mark ”1 ”	**87.500 – 87.510 mm (3.4449 – 3.4453 in.)**
STD mark ”2”	**87.510 – 87.520 mm (3.4453 – 3.4457 in.)**
STD mark ”3”	**87.520 – 87.530 mm (3.4457 – 3.4461 in.)**

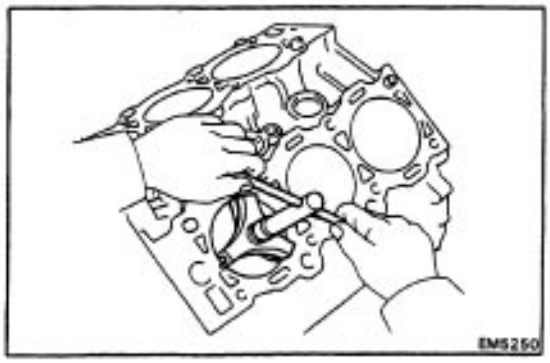
Maximum diameter:

STD	**87.73 mm (3.4539 in.)**
O/S 0.50	**88.23 mm (3.4736 in.)**

If the diameter is greater than maximum, rebore all the six cylinders or replace the cylinder block.

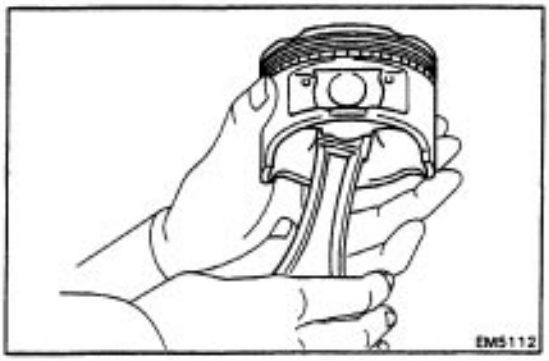






6. REMOVE CYLINDER RIDGE

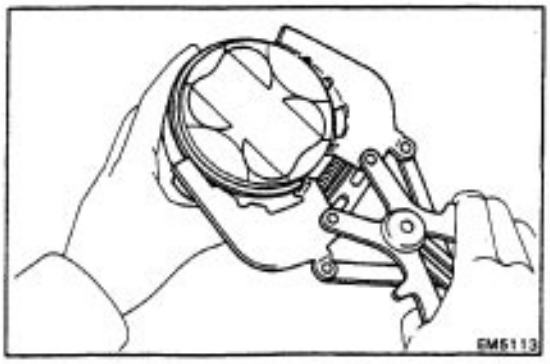
If the wear is less than 0.2 mm (0.008 in.), use a ridge reamer to machine the piston ring ridge at the top of the cylinder.



DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

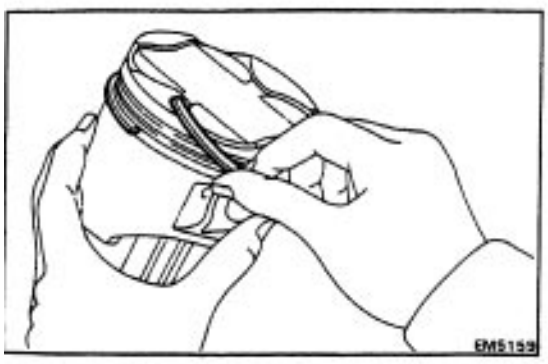
1. CHECK FIT BETWEEN PISTON AND PISTON PIN

Try to move the piston back and forth on the piston pin.
If any movement is felt, replace the piston and pin as a set.



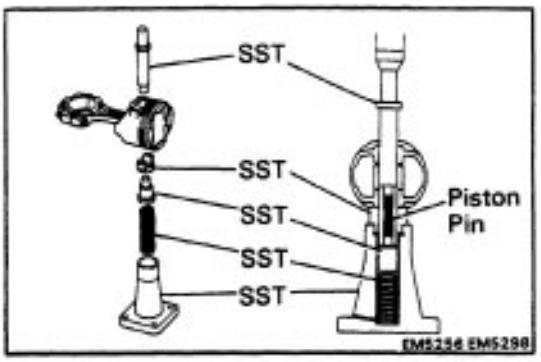
2. REMOVE PISTON RINGS

(a) Using a piston ring expander, remove the two compression rings.



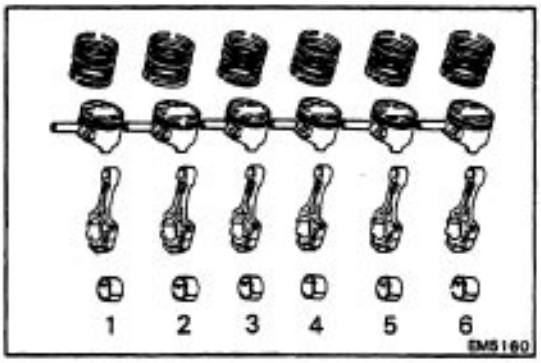
(b) Remove the two side rails and oil ring expander by hand.

HINT: Arrange the rings in correct order only.



3. DISCONNECT CONNECTING ROD FROM PISTON

Using SST, press out the piston pin from the piston.
SST 09221–25024 (09221–00020, 09221–00030, 09221–00181, 09221–00190, 09221–00200)



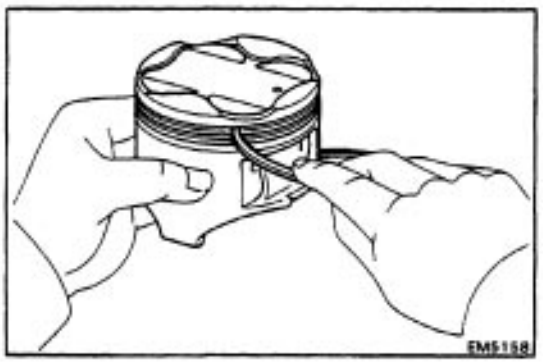
HINT:

- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.

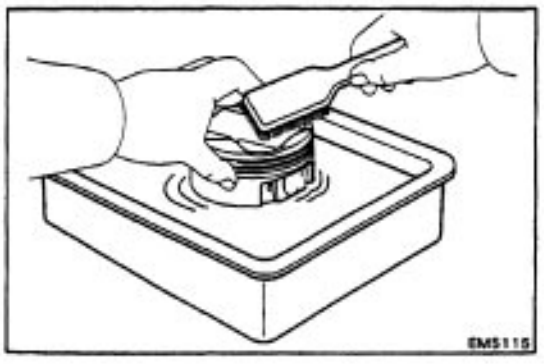
INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLIES

1. CLEAN PISTON

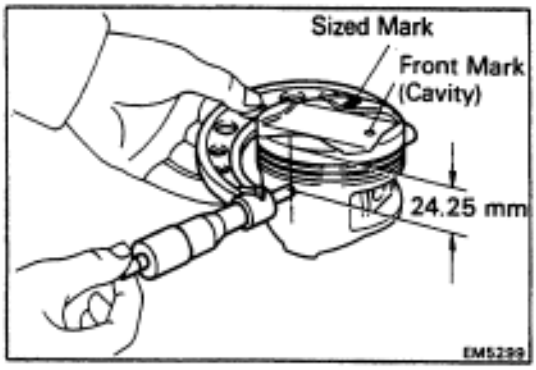
(a) Using a gasket scraper, remove the carbon from the piston top.



(b) Using a groove cleaning or broken ring, clean the piston ring grooves.



(c) Using solvent and a brush, thoroughly clean the piston.
NOTICE: Do not use a wire brush.



2. INSPECT PISTON DIAMETER AND OIL CLEARANCE

HINT: There are three sizes of the standard piston diameter, marked ”1 ”, ”2” and ”3” accordingly. The marked is stamped on the top of the piston.

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 24.25 mm (0.9547 in.) from the piston head.

Piston diameter:

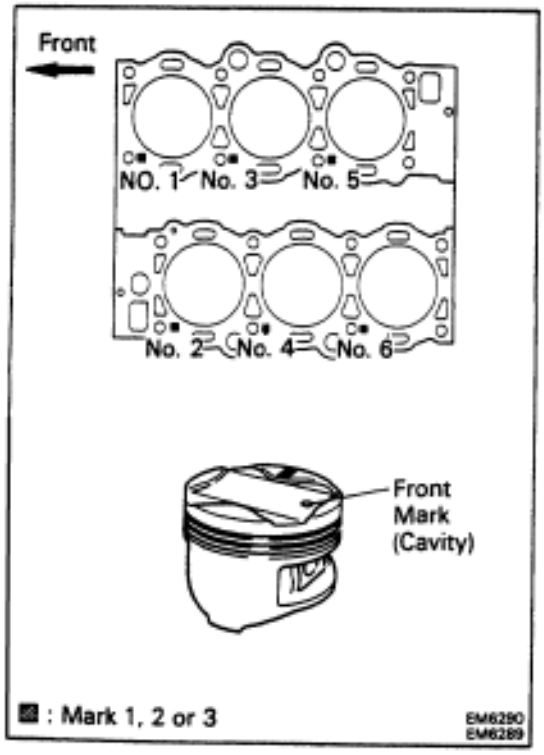
STD mark 87.445 87.455 mm
(3.4427 – 3.4431 in.)
STD mark ”2” 87.455 87.465 mm
(3.4431 – 3.. 5 in.)
STD mark ”3” 87.465 – 87.475 mm
(3.4435 – 3.4439 in.)
O/S 0.50 87.945 – 87.975 mm
(3.4624 – 14636 in.)

(b) Measure the cylinder bore diameter in the thrust directions. (See step 5 on page EM–149)

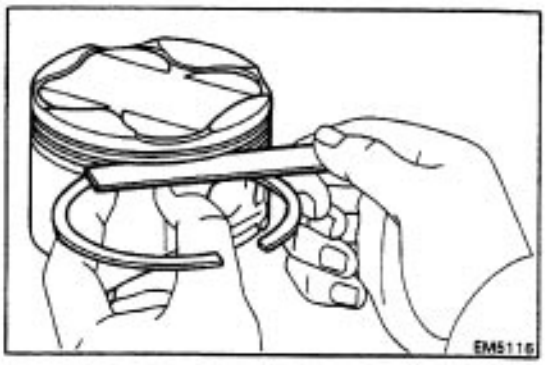
(c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance: 0.045 – 0.065 mm
(0.0018 – 0.0026 in.)
Maximum oil clearance: 0.085 mm (0.0033 in.)

If the oil clearance is greater than maximum, replace all six pistons. If necessary, rebore all six cylinders or replace the cylinder block.



HINT (Use cylinder block subassembly): when installing a standard piston, install one with the same number mark as the standard bore diameter marked on the cylinder block.



3. INSPECT CLEARANCE BETWEEN WALL OF RING GROOVE AND NEW PISTON RING

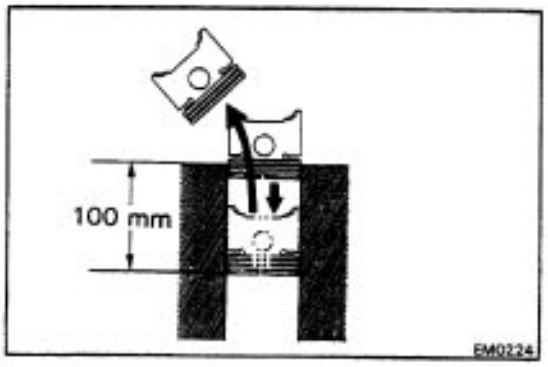
Using a feeler gauge, measure the clearance between new piston ring and the wall of the piston ring groove.

Ring groove clearance:

No.1 0.010 – 0.080 mm (0.0004 – 0.0031 in.)

No.2 0.030 – 0.070 mm (0.0012 – 0.0028 in.)

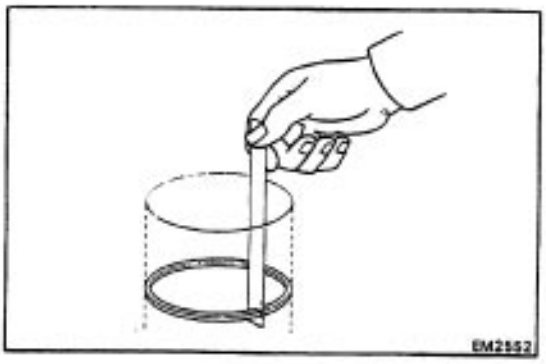
If the clearance is greater than maximum, replace the piston.



4. INSPECT PISTON RING END GAP

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 100 mm (3.94 in.) from the top of the cylinder block.



(c) Using a feeler gauge, measure the end gap.

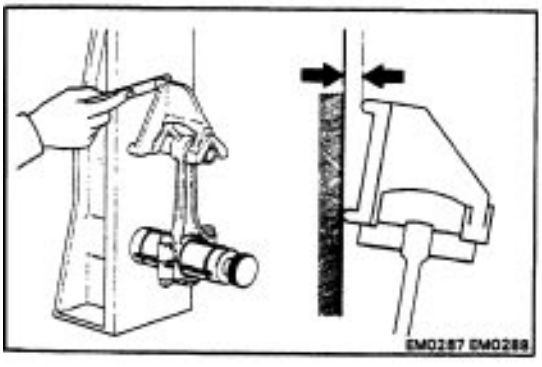
Standard end gap:

No.1	**0.300 0.520 mm (0.0118 – 0.0205 in.)**
No.2	**0.350 – 0.600 (0.0138 0.0236 in.)**
Oil (Slide rail)	**0.200 0.550 mm (0.0079 0.0217 in.)**

Maximum end gap:

No.1	**1.12 mm (0.0441 in.)**
No.2	**1.20 mm (0.0472 in.)**
Oil (Slide rail)	**1.15 mm (0.0453 in.)**

If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, rebore all six cylinders or replace the cylinder block.



5. INSPECT CONNECTING ROD

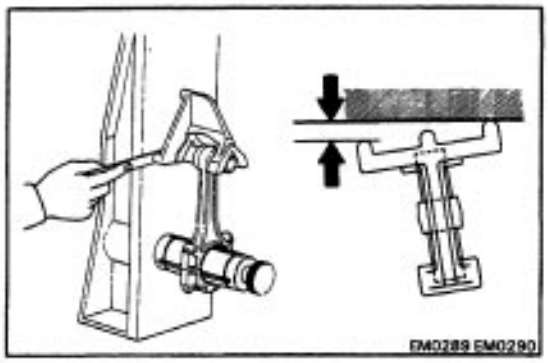
Using a rod aligner, check the connecting rod alignment.

- Check for bending.

Maximum bending:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If bent is greater than maximum, replace the connecting rod assembly.

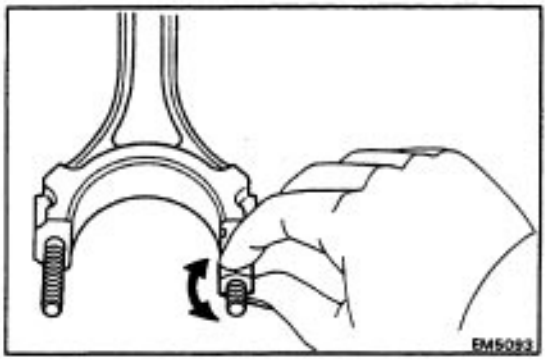


- Check for twist.

Maximum twist:

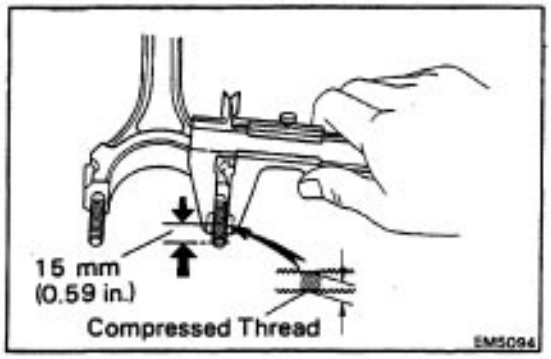
0.15 mm (0.0059 in.) per 100 mm (3–94 in.)

If twist is greater than maximum, replace the connecting rod assembly.



6. INSPECT CONNECTING ROD BOLTS

(a) Install the cap nut to the connecting rod bolt. Check that the cap nut can be turned easily by hand to the end of the thread.



(b) If the cap nut cannot be turned easily, measure the outer diameter of the compressed thread with calipers.

Standard outer diameter: 7.860 – 8.000 mm
(0.3094 – 0.3150 in.)

Minimum outer diameter: 7.60 mm (0.2992 in.)

HINT: If the location of this area cannot be judged by visual inspection, measure the outer diameter at the location shown in the illustration.

If the outer diameter is less than minimum, replace the connecting rod bolt and cap nut as a set.

BORING OF CYLINDERS

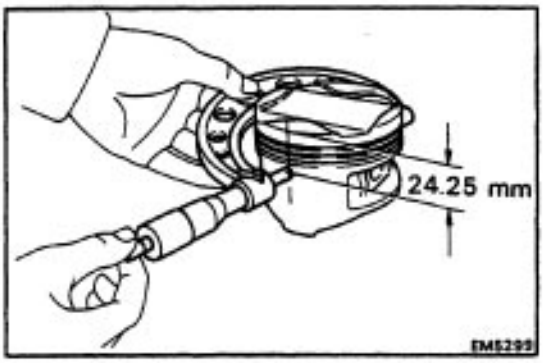
HINT:

- Bore all the six cylinders for the oversized piston outside diameter.
- Replace the piston rings with ones to match the oversized pistons.

1. KEEP OVERSIZED PISTONS

Oversized piston diameter:

O/S 0.50 87.945 – 87.975 mm
(3.4624 – 3.4636 in.)



2. CALCULATE AMOUNT TO BORE CYLINDER

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 24.25 mm (0.9547 in.) from the piston head.

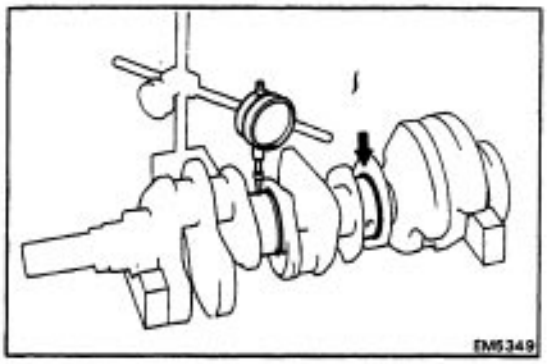
(b) Calculate the amount each cylinder is to be rebored as follows:

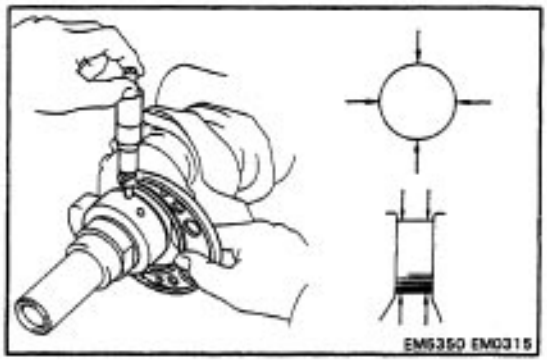
Size to be .rebored = P + C – H
P= Piston diameter
C = Piston oil clearance
0.045 – 0.065 mm (0.0018 – 0.0026 in.)
H = Allowance for honing
0.02 mm (0.0008 in.) or less

3. BORE AND HONE CYLINDERS TO CALCULATED DIMENSIONS

Maximum honing: 0.02 mm (0.0008 in.)

NOTICE: Excess honing will destroy the finished roundness.





INSPECTION AND REPAIR OF CRANKSHAFT

1. INSPECT CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the crankshaft.

2. INSPECT MAIN JOURNALS AND CRANK PINS

(a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

STD 63.985 – 64.000 mm
(2.5191 – 2.5197 in.)
U/S 0.25 63.745 – 63.755 mm
(2.5096 – 2.5100 in.)

Crank pin diameter:

STD 47.987 – 48.000 mm .
(1.8892 – 1.8898 in.)
U/S 0.25 47.745 – 47.755 mm
(1.8797 – 1.8801 in.)

If the diameter is not as specified, check the oil clearance (See pages EM–147 to 150).

(b) Check each main journal and crank pin for taper and out–of–round as shown.

Maximum taper and out–of–round: 0.42 mm (0.0008 in.)

If the taper or out–of–round is greater than maximum, grind or replace the crankshaft.

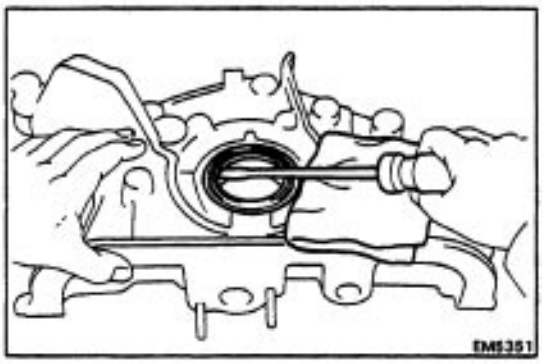
3. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure step 2).

Install new main journal and/or crank pin undersized bearings.

REPLACEMENT OF CRANKSHAFT OIL SEALS

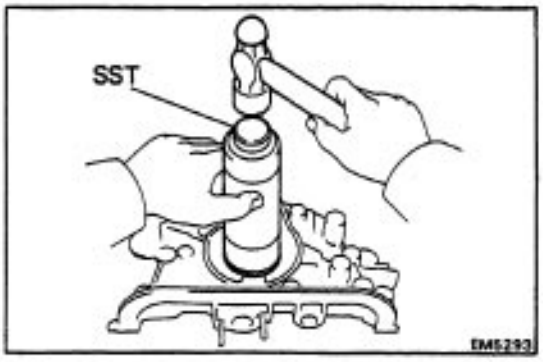
HINT: There are two methods (A an B) to replace the oil seal as follows:



1. REPLACE CRANKSHAFT FRONT OIL SEAL

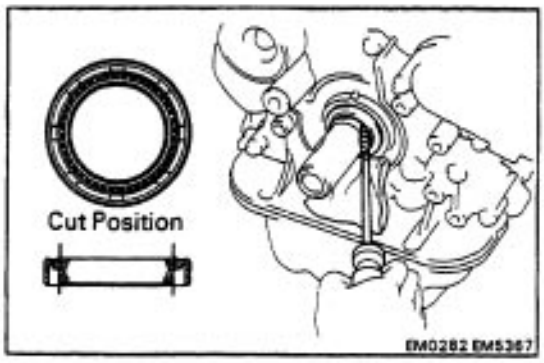
A. If Oil Pump 1s removed from cylinder block:

(a) Using a screwdriver and hammer, tap out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump case edge.
SST 09309–37010

(c) Apply MP grease to the oil seal lip.

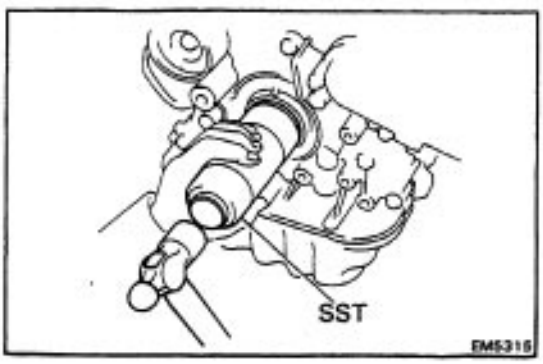


B. If oil pump is installed to the cylinder block:

(a) Using a knife, cut off the oil seal lip.

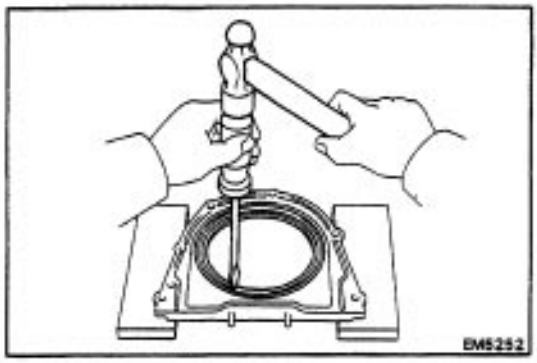
(b) Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply IMP grease to a new oil seal lip.

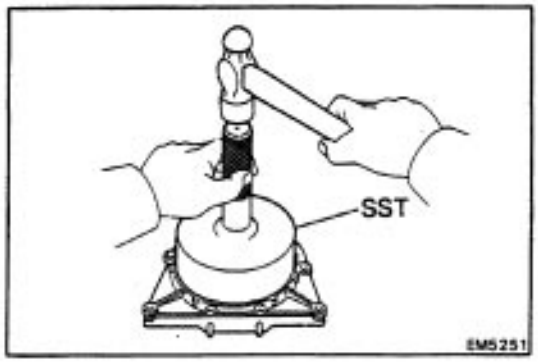
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump case edge.
SST 09309–37010



2. REPLACE CRANKSHAFT REAR OIL SEAL

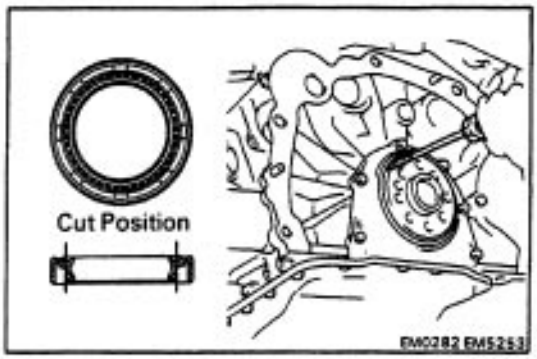
A. If rear oil seal retainer is removed from cylinder block:

(a) Using a screwdriver and hammer, tap out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal edge.
SST 09223–56010

(c) Apply MP grease to the oil seal lip.

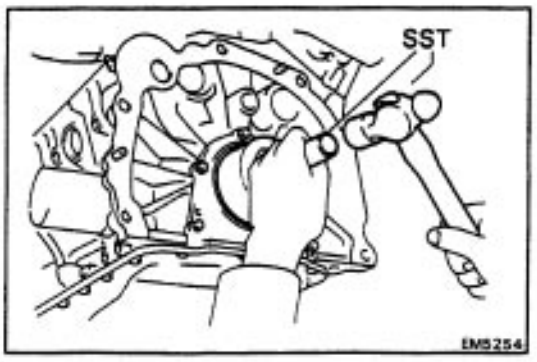


6. If rear oil seal retainer is installed to cylinder block:

(a) Using a knife, cut off the oil seal lip.

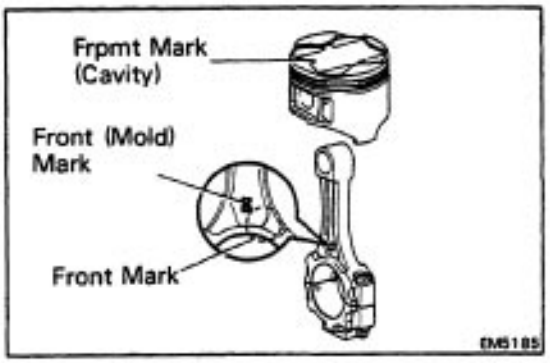
(b) Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–56010

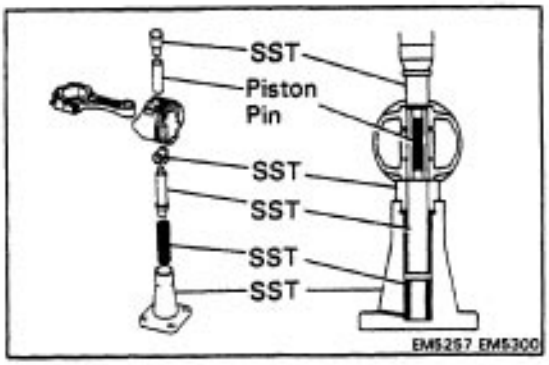


ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

1. ASSEMBLE PISTON AND CONNECTING ROD

(a) Align the front marks of the piston and connecting rod.

Connecting rod front (mold) mark:
B6, 1 B, 8A, C3 or etc.



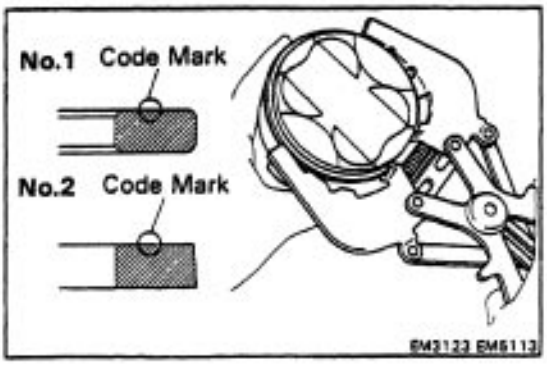
(b) Coat the piston pin and piston hole of the piston with engine oil. .

(c) Using SST, press in the piston pin.
SST 09221–25024 (09221–00020, 09221–00030, 09221–00181, 09221–00190, 09221–00200)

(d) Check that the piston smoothly moves back and forth on the piston pin.

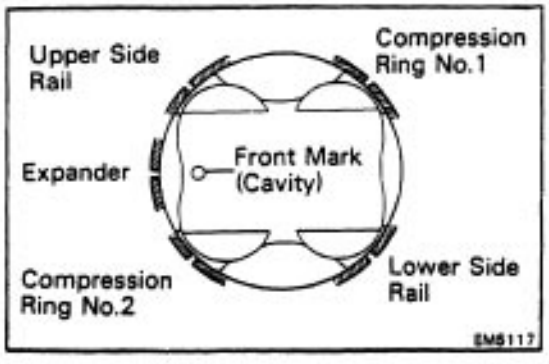
2. INSTALL PISTON RINGS

(a) Install the oil ring expander and two side rails by hand.



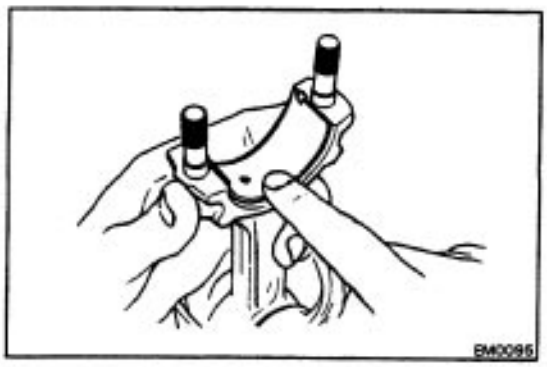
(b) Using a piston ring expander, install the two compression rings with the code mark facing upward.

Code mark: No.1 T or 1R
No.2 T2 or 2R



(c) Position the piston rings so that the ring ends are as shown.

NOTICE: Do not align the ring ends.



3. INSTALL BEARINGS

(a) Align the bearing claw with the groove of the connecting rod or connecting cap.

(b) Install the bearings in the connecting rod and connecting rod cap.

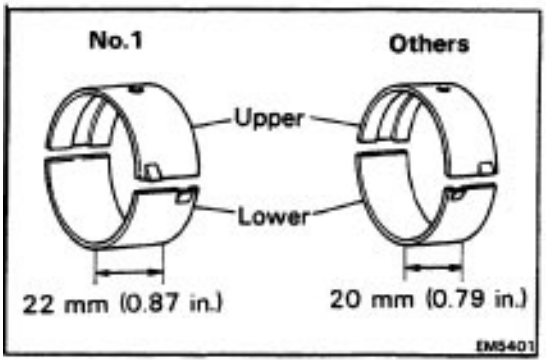
NOTICE: Install the bearing with the oil hole in the connecting rod.

ASSEMBLY OF CYLINDER BLOCK

(See page EM–139**)**

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets. 0–rings and oil seals with new parts.



1. INSTALL MAIN BEARINGS

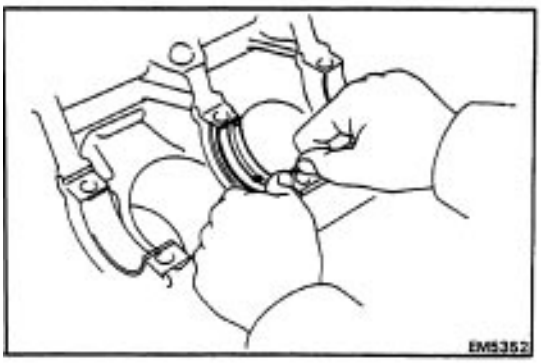
HINT:

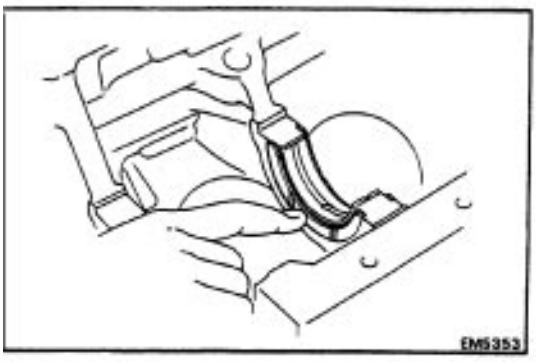
- Main bearings come in widths of 20 mm (0.79 in.) and 22 mm (0.87 in.). Install the 22 mm (0.87 in.) bearings in the No. 1 cylinder block journal position with the main bearing caps. Install the 20 mm (0.79 in.) bearings in the other positions.
- Upper bearings have on oil groove and oil holes; lower bearings do not.

(a) Align the bearing claw with the claw groove of the main bearing cap or cylinder block.

(b) Install the bearings in the cylinder block and main bearing cap.

NOTICE: Install the bearing with the oil hole in the cylinder block.

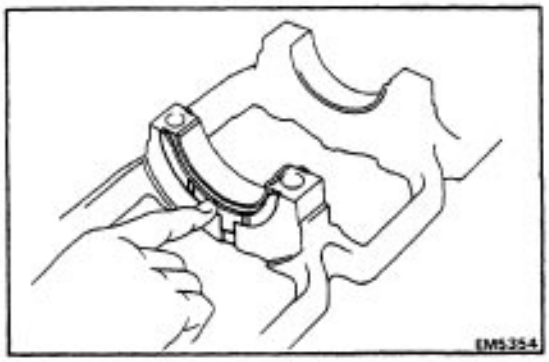




2. INSTALL UPPER THRUST WASHERS

Install the thrust washers under the No.2 journal position of the block with the oil grooves facing outward.

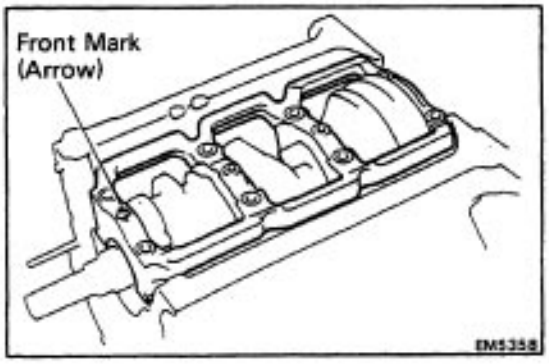
3. PLACE CRANKSHAFT ON CYLINDER BLOCK



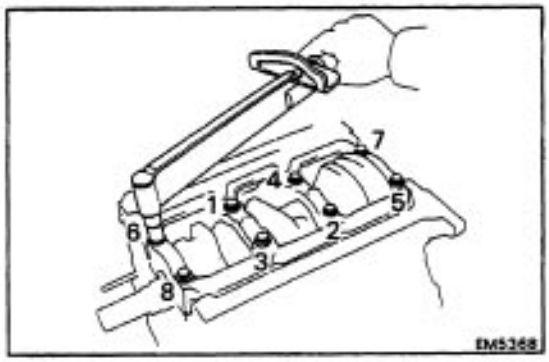
4. INSTALL MAIN SEARING CAP AND LOWER THRUST WASHERS

A. Place main bearing cap and lower thrust washers on cylinder block.

(a) Install the thrust washers on the No. 2 journal position of the bearing cap with the grooves facing outward.



(b) Install the main bearing cap with the front mark facing forward.



6. Install main bearing cap bolts

HINT:

- The main bearing cap bolts are tightened in two progressive steps.
- If any the main bearing cap bolt is broken or deformed, replace it.

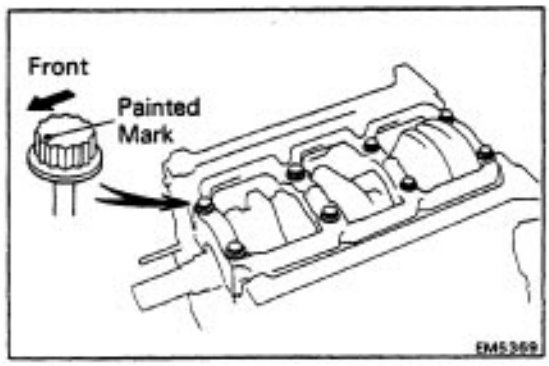
(a) Apply a light coat of engine oil on the threads and under the heads of the main bearing caps.

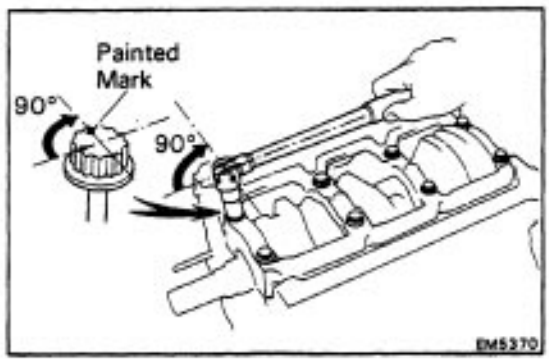
(b) 1st, install and uniformly tighten the eight main bearing cap bolts in several passes in the sequence shown.

Torque: 625 kg–cm (45 ft–lb, 61 N–m)

If any one of the main bearing cap bolts does not meet the torque specification, replace the cap bolt.

(c) Mark the front of the connecting rod cap nut with paint.



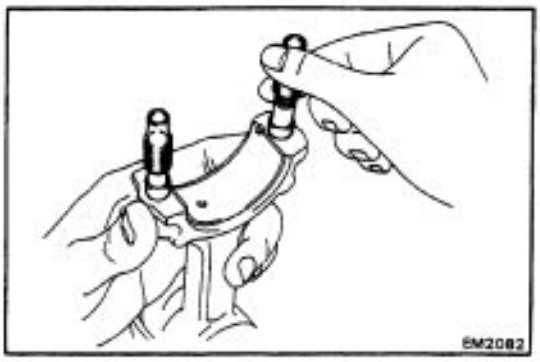


(c) 2nd, retighten the main bearing cap bolts 90° and angle to the front.

(f) Check that the crankshaft turns smoothly.

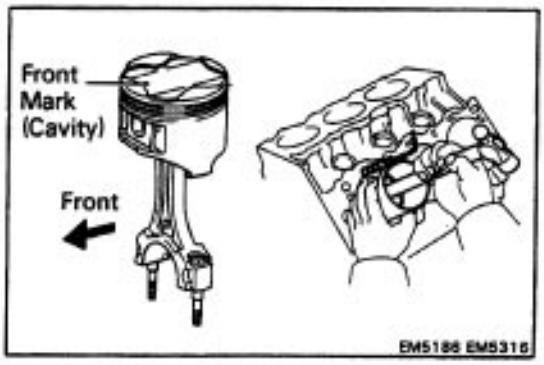
(g) Check the crankshaft thrust clearance.

(See step 5 on page EM–149)

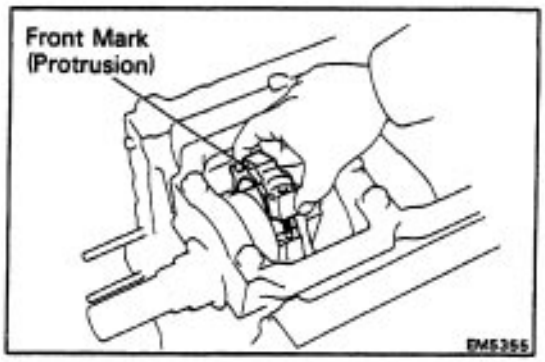


5. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.

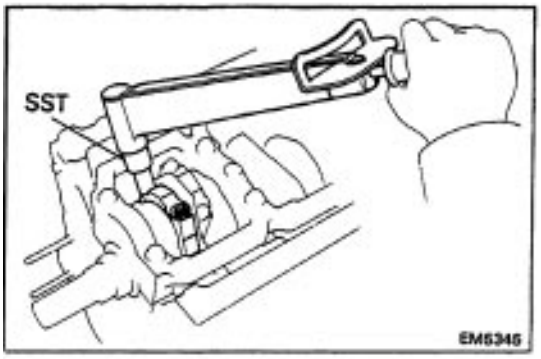


6. INSTALL CONNECTING ROD CAPS

A. Place connecting rod cap on connecting rod

(a) Match the numbered connecting rod cap with the connecting rod.

(b) Install the connecting rod cap with the front mark facing forward.



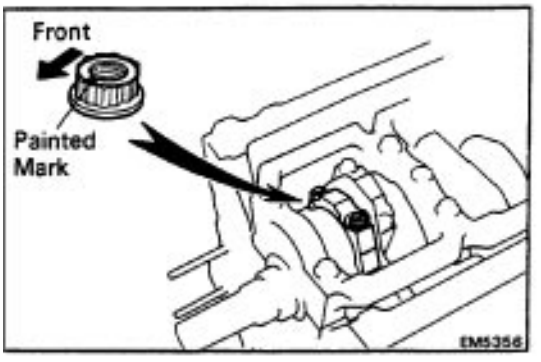
B. Install connecting rod cap nuts

HINT:

- The connecting rod cap nuts are tightened in two progressive steps.
- If any the connecting rod bolt is broken or deformed, replace them.

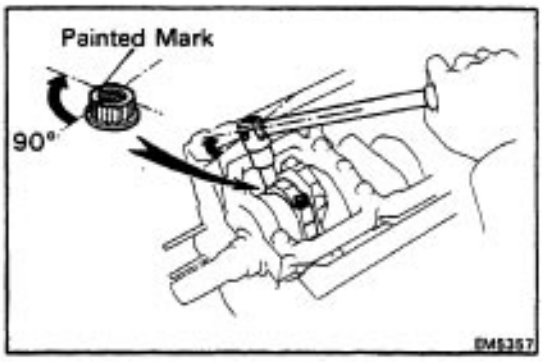
(a) Apply a light of engine oil on the threads and under the nuts of the connecting rod cap.

(b) 1st, using SST, install and alternately tighten the nuts of the connecting rod cap in several passes.
SST 09011–38121
Torque: 250 kg–cm(18 ft–lb, 25 N–m)



If any one of the connecting rod cap nuts does not meet the torque specification, replace the cap nut.

(c) Mark the front of the connecting rod cap nut with paint.

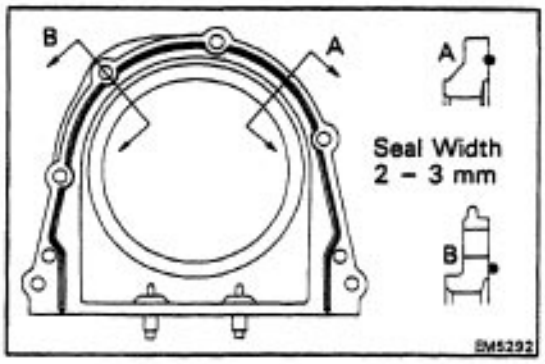


(d) 2nd, retighten the connecting rod cap nuts 90° in the numerical order shown.
(e) Check that the painted mark is now at a 90° angle to the front.
(f) Check that the crankshaft turns smoothly.
(g) Check the connecting rod thrust clearance.
(See step 2 on page EM–147)

7. INSTALL REAR OIL SEAL RETAINER

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surface of the retainer and cylinder block.

- Using a razor blade an gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.



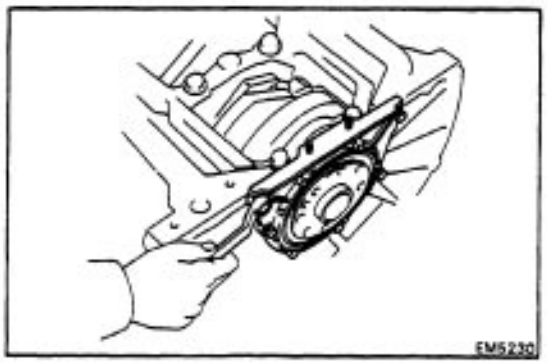
(b) Apply seal packing to the retainer as shown in the figure.
Seal packing: Part No. 08826–00080 or equivalent

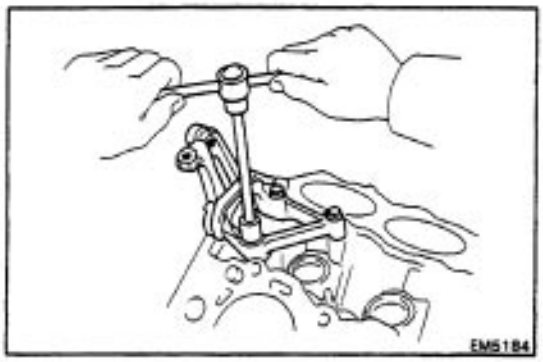
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the retainer with the six bolts.
Torque: 80 kg–cm (69 in.–lb, 7.8 N–m)





POST ASSEMBLY

1. INSTALL NO. 2 IDLER PULLEY BRACKET

Install the pulley bracket with the three bolts. Torque the bolts.

Torque: 380 kg–cm (27 ft–lb, 37 N–m)

2. INSTALL WATER BY–PASS PIPE

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the bypass pipe and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the groove of the by–pass pipe.

Seal packing: Part No. 08826–00100 or equivalent

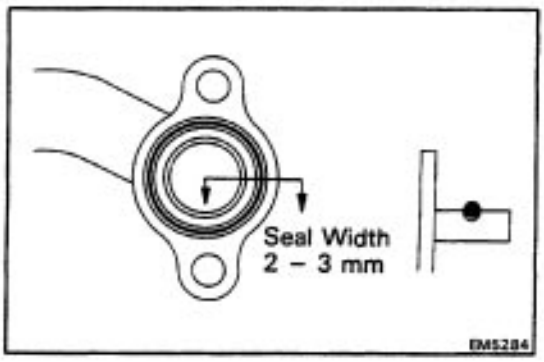
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 0.12 in.) opening.

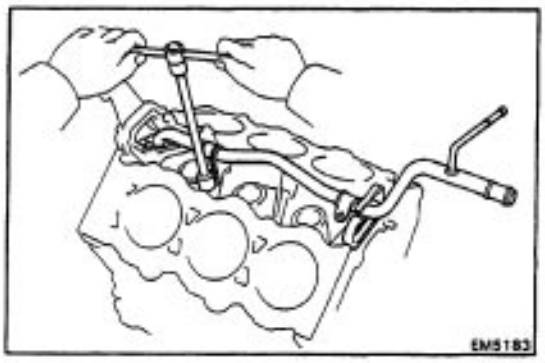
HINT: Avoid applying an excessive amount to the surface.

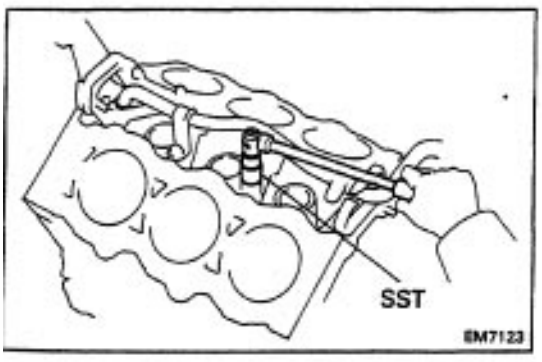
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the by–pass pipe with the two bolts and two nuts.

Torque: 85 kg–cm (74 in.–lb, 8.3 N–m)







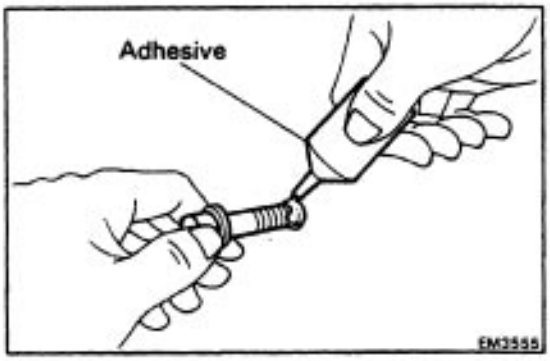
3. INSTALL KNOCK SENSOR

Using SST, install the knock sensor.

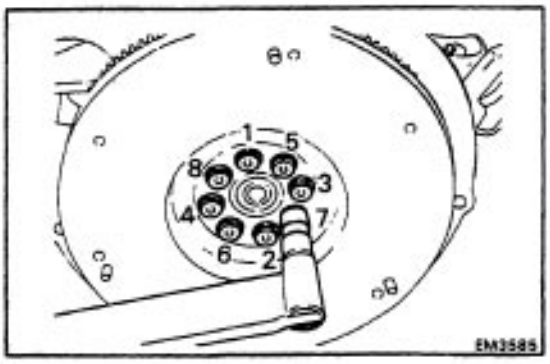
SST 09816–30010

Torque: 450 kg–cm (33 ft–lb, 44 N–m)

4. INSTALL OIL FILTER (See page LU–7)
5. INSTALL OIL PUMP AND OIL PAN
(See page LU–14)
6. INSTALL WATER PUMP (See page CO–6)
7. INSTALL CYLINDER HEADS
(See pages EM–96 to 106)
8. INSTALL PULLEYS AND TIMING BELT
(See pages EM–42 to 47)
9. INSTALL DISTRIBUTOR (See page IG–19)
10. REMOVE ENGINE STAND
11. INSTALL REAR END PLATE
Install the end plate with the bolt.
Torque: 75 kg–cm (65 in.–lb, 7.4 N–m)



12. (M/T)
INSTALL FLYWHEEL
(a) Apply adhesive to two or three threads of the mount bolt end.
Adhesive: Part No. 08833–00070, THREE BOND 1324 or equivalent



(b) Install the flywheel on the crankshaft.
(c) Install and uniformly tighten the eight mount bolts in several passes, in the sequence shown.
Torque: 850 kg–cm (61 ft–lb, 83 N–m)

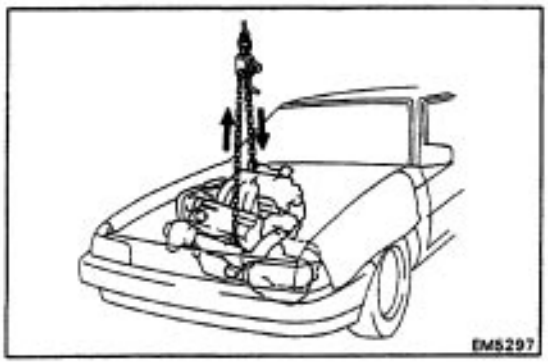
13. (A/T)
INSTALL DRIVE PLATE (See procedure step 12)
Torque: 854 kg–cm (61 ft–lb, 83 N–m)
14. (M/T)
INSTALL CLUTCH DISC AND COVER

INSTALLATION OF ENGINE

1. ASSEMBLE ENGINE AND TRANSAXLE

2. (A/T)

INSTALL STARTER



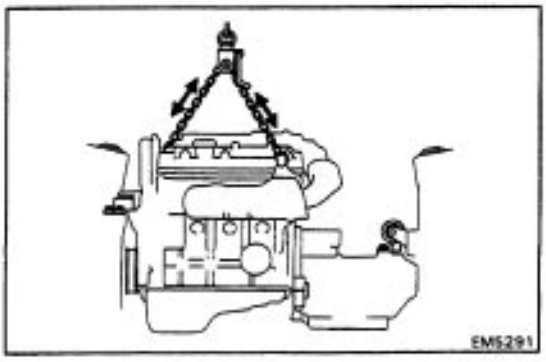
3. INSTALL ENGINE AND TRANSAXLE ASSEMBLY IN VEHICLE

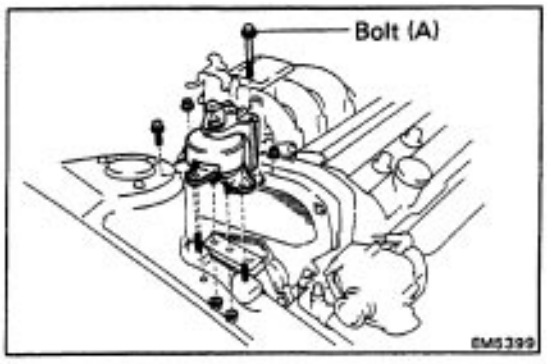
(a) Attach the engine chain hoist to the engine hangers.

(b) Lower the engine into the engine compartment. Tilt the transaxle downward, lower the engine and clear the LH mounting.

NOTICE: Be careful not to hit the PS gear housing or neutral start switch.

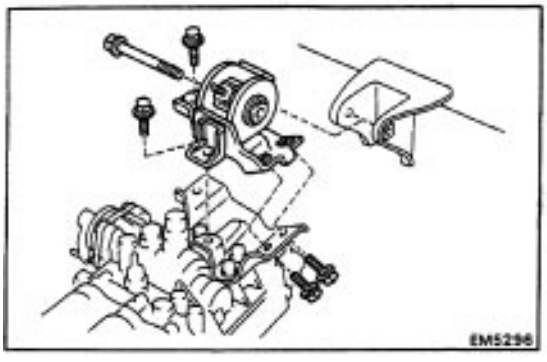
(c) Keep the engine level, and align RH and LH mounting with the body bracket.





(d) Attach the RH mounting insulator to the mounting bracket and body, and temporarily install the bolt and four nuts.

(e) Temporarily install the No. 2 mounting stay bolt (A).



M Install the LH mounting bracket to the transaxle case with the three bolts. Torque the bolts.

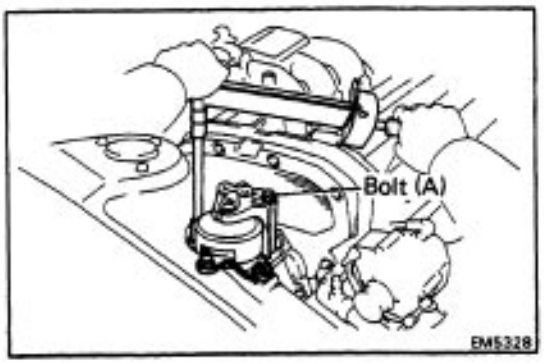
Torque: 530 kg–cm (38 ft–lb, 52 N–m)

Attach the LH mounting insulator to the mounting bracket with the three bolts, and install and torque the four bolts and through bolt.

Torque:

Bolt 530 kg–cm (38 ft–lb, 52 N–m)

Through bolt 890 kg–cm (64 ft–lb, 87 N–m)



(h) Torque the bolt and four nuts of the RH mounting insulator. Do not torque the bolt (A) yet.

Torque:

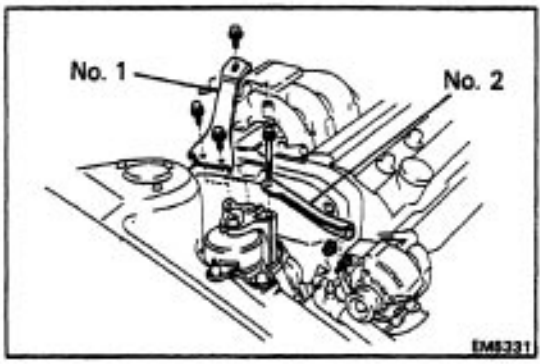
Bolt– 650 kg–cm (47 ft–lb, 64 N–m)

Nut To bracket 530 kg–cm (38 ft–lb, 52 N–m)

To body 900 kg–cm (65 ft–lb, 88 N–m)

(i) Remove the engine hoist chain from the engine. (w/ A.B.S..)

Install the two clamp bolts of the PS oil cooler pipes.



4. INSTALL ENGINE RH MOUNTING STAYS

(a) Install the No. 1 mounting stay with the three bolts. Torque the bolts.

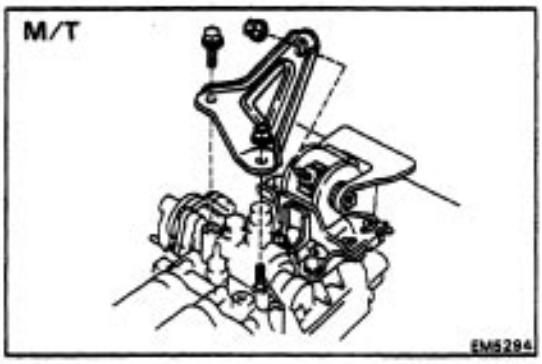
Torque: 530 kg–cm (38 ft–lb, 52 N–m)

(b) Install the No. 2 mounting stay with the bolt and nut. Torque the bolt and nut.

Torque:

Bolt 670 kg–cm (48 ft–lb, 66 N–m)

Nut 530 kg–cm (38 ft–lb, 52 N–m)



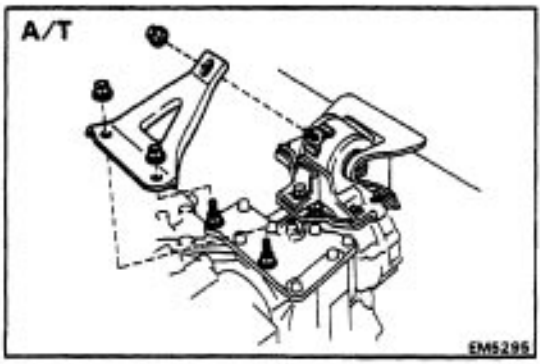
5. INSTALL ENGINE LH MOUNTING STAY

(M /T)

Install the mounting stay with the bolt and two nuts. Torque the bolt and nuts.

Torque: Nut 530 kg–cm (38 ft–1b, 52 N–m)

Bolt 195 kg–cm (14 ft–lb, 19 N–m)

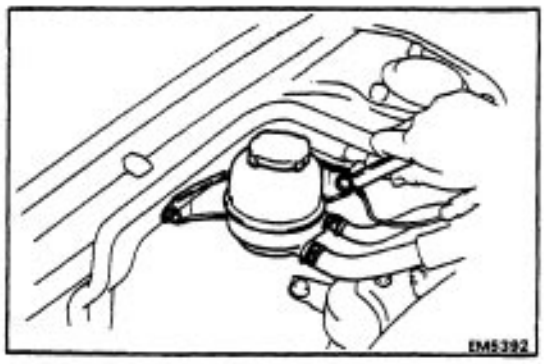


(A/T)

Install the mounting stay with the three nuts. Torque the nuts.

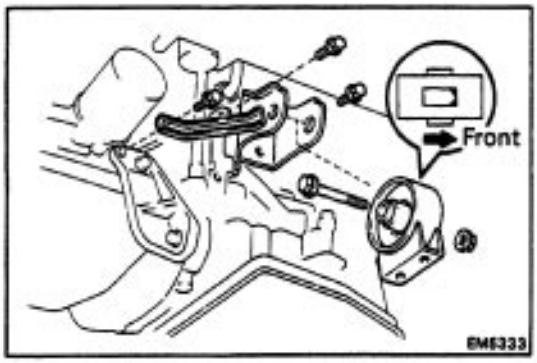
Torque: 12 mm nut 210 kg–cm (15 ft–lb, 21 N–m)

14 mm nut 530 kg–cm (38 ft–lb, 52 N–m)



6. INSTALL PS OIL RESERVOIR TANK

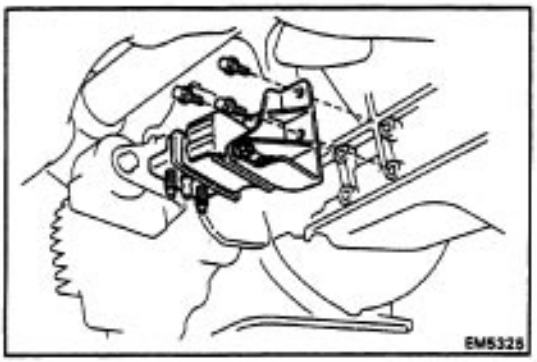
Install the reservoir tank with the two bolts. Connect the ground strap.



7. INSTALL FRONT ENGINE MOUNTING BRACKET AND INSULATOR

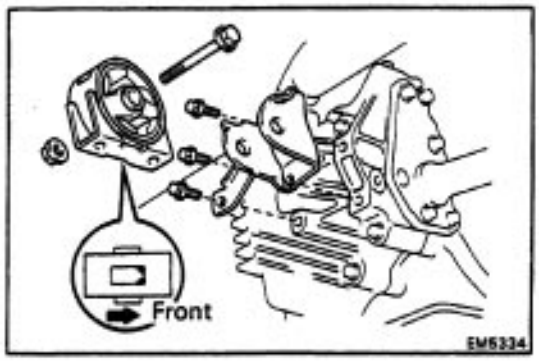
(a) Install the mounting bracket with the three bolts.
Torque the bolts.
Torque: 790 kg–cm (57 ft–lb, 77 N–m)

(b) Temporarily install the mounting insulator with the through bolt and a new nut.



8. INSTALL CENTER ENGINE MOUNTING BRACKET AND INSULATOR ASSEMBLY

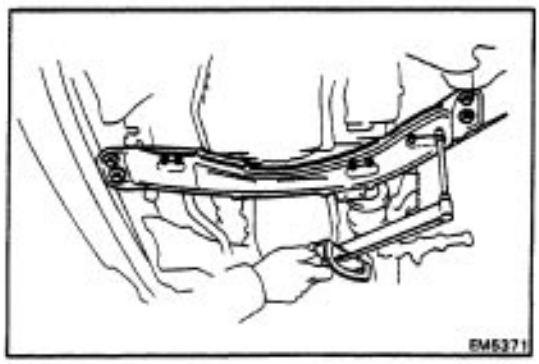
Install the mounting bracket and insulator assembly with the three bolts. Torque the bolts.
Torque: 530 kg–cm (38 ft–lb, 61 N–m)



9. INSTALL REAR ENGINE MOUNTING BRACKET AND INSULATOR

(a) Install the mounting bracket with the three bolts.
Torque the bolts.
Torque: 790 kg–cm (57 ft–lb, 77 N–m)

(b) Temporarily install the mounting insulator with the through bolt and a new nut.



10. INSTALL ENGINE MOUNTING CENTER MEMBER

(a) Install the engine mounting center member with the four bolts. Torque the bolts.
Torque: 400 kg–cm (29 ft–lb, 39 N–m)

(b) Install and torque the four bolts and two nuts holding the insulators (front, center and rear) to the center member.
Torque: 740 kg–cm (54 ft–lb, 73 N–m)

(c) Torque the mounting insulator through bolts (front and rear).
Torque: 895 kg–cm–(64 ft–lb, 87 N–m)

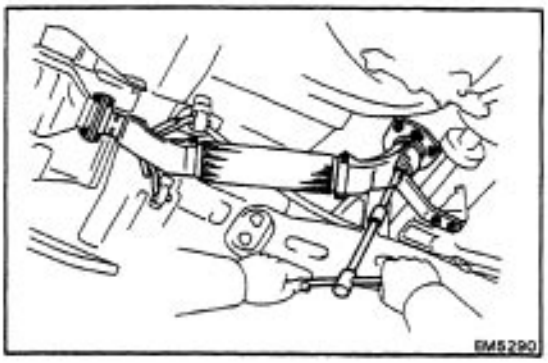
11. INSTALL PS PUMP

12. INSTALL DRIVE SHAFTS

13. (w/ A/C)
INSTALL A/C COMPRESSOR

(a) Install the compressor with the four bolts.

(b) Connect the two connectors.



14. INSTALL FRONT EXHAUST PIPE

(a) Place two new gaskets on the front pipe.

(b) Install the front pipe with the two bolts and five new nuts.

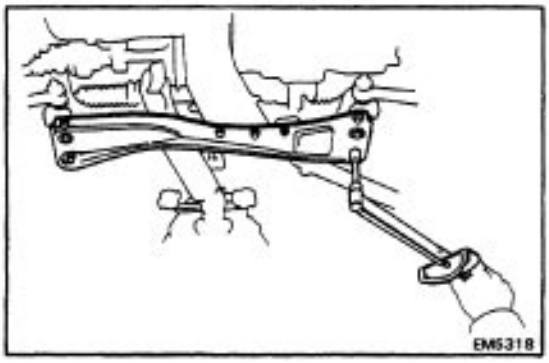
Torque the nuts.

Torque:

To manifold 630 kg–cm (46 ft–lb, 62 N–m)

To converter 440 kg–cm (32 t–lb, 43 N–m)

(c) Install the two pipe stay bolts.



15. INSTALL SUSPENSION LOWER CROSSMEMBER

Install the crossmember with the two bolts and two nuts.

Torque the bolts and nuts.

Torque: 2,120 kg–cm (153 ft–lb, 207 N–m)

16. CONNECT ENGINE WIRE TO CABIN

(a) Push in the engine wire through the cowl panel.

(b) Connect the following connectors.

(1) Three TCCS ECU connectors

(2) Circuit opening relay connector

(3) Cowl wire connector

(4) Instrument panel wire connector

(c) Install the glove compartment box.

(d) Install the under cover.

17. CONNECT TRANSAXLE CONTROL CABLE(S)

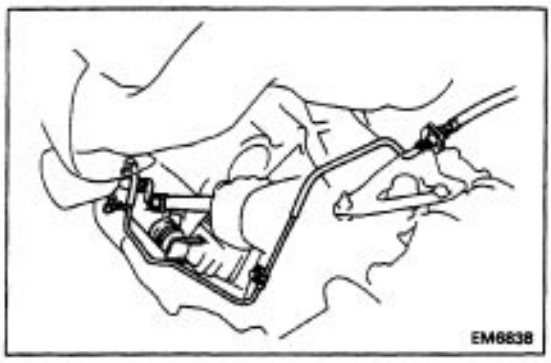
18. CONNECT SPEEDOMETER CABLE

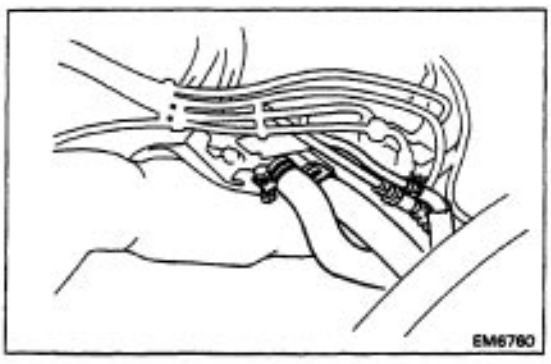
19. (M /T)

INSTALL CLUTCH RELEASE CYLINDER AND TUBE CLAMP

20. (M /T)

INSTALL STARTER





21. CONNECT FUEL HOSES

22. CONNECT HEATER HOSES

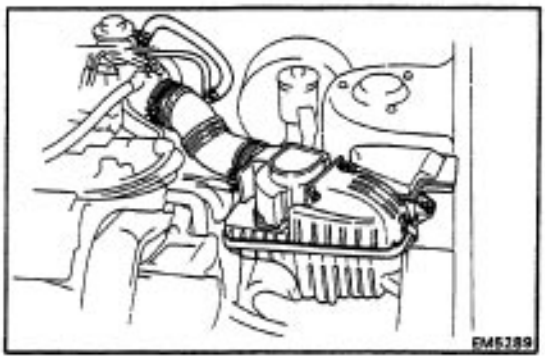
23. CONNECT GROUND STRAP TO TRANSAXLE

24. CONNECT VACUUM HOSES

(a) Brake booster vacuum hose to air intake chamber
(b) A/C idle–up vacuum hose to air intake chamber
(c) A/C idle–up vacuum hose to vacuum pipe (on air intake chamber)
(d) Charcoal canister vacuum hose to vacuum pipe (on air intake chamber)

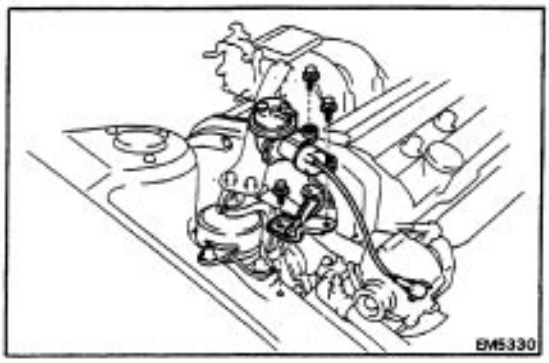
25. CONNECT WIRES AND CONNECTORS

(a) Check connector
(b) Ground straps from OH fender apron
(c) Connectors from relay box
(d) Engine room wire connector



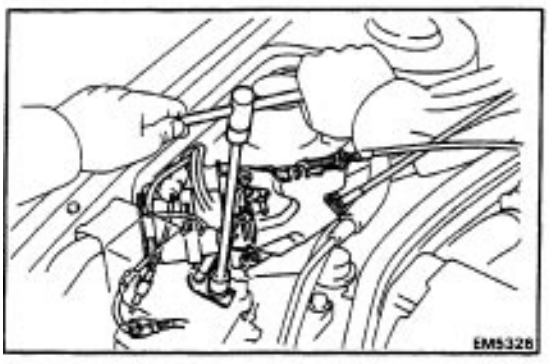
26. INSTALL AIR CLEANER ASSEMBLY

(a) Install the air cleaner case with the three bolts.
(b) Install the air cleaner element.
(c) Connect the air cleaner hose, and Install the air cleaner cap and air flow meter assembly with the four clips.
(d) Connect the following connector and hoses:
  (1) Air flow meter connector
  (2) ISC valve air hose
  (3) Vacuum pipe air hose

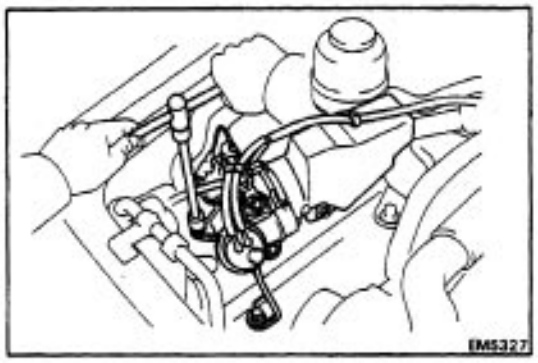


27. (w/ CRUISE CONTROL SYSTEM)
INSTALL CRUISE CONTROL ACTUATOR
(w/ A. B. S.)

(a) Install the vacuum pump and bracket with the three bolts.
(b) Connect the vacuum pump connector.



(c) Install the actuator and bracket with the four bolts.
(d) Connect the following hoses and connector:
  (1) Actuator vacuum hoses
  (2) Actuator connector
  (3) Install the dust cover.



(w/o A.B.S..)

(a) Install the actuator, vacuum pump and vacuum switch assembly with the three bolts.

(b) Connect the following the hose and connectors:

(1) Actuator vacuum hose from air intake chamber
(2) Actuator connector
(3) Vacuum pump connector
(4) Vacuum switch connector

28. (A/T)
INSTALL THROTTLE CABLE, AND ADJUST IT

29. INSTALL ACCELERATOR CABLE, AND ADJUST IT

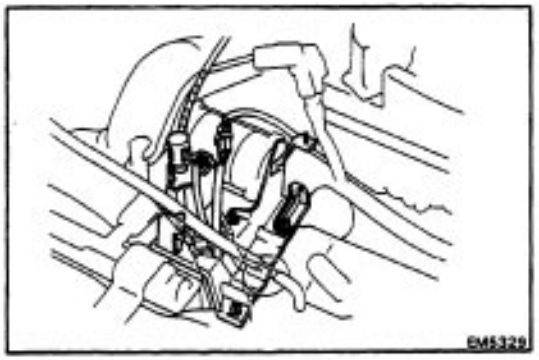
30. INSTALL RADIATOR RESERVOIR TANK

31. INSTALL ALTERNATOR BELT ADJUSTING BAR

32. INSTALL ALTERNATOR (See page CH–15)

33. INSTALL RADIATOR (See page CO–20)

34. INSTALL IGNITION COIL, IGNITER AND BRACKET ASSEMBLY



(a) Install the ignition coil, igniter and bracket assembly with the two bolts.

(b) Connect the following cord and connectors:

(1) Igniter connector
(2) Noise filter connector
(3) High–tension cord

35. INSTALL BATTERY

Connect the grand strap.

36. FILL WITH ENGINE COOLANT (See page CO–5)
Capacity (w/ Heater):
M /T 9.5 liters (10.0 US qts, 8.4 Imp. qts)
A/T 9.4 liters (9.9 US qts, 8.3 Imp. qts)

37. FILL WITH ENGINE OIL (See page LU–8)
Capacity:
Drain and refill
w/ Oil filter –change
3.9 liters (4.1 US qts, 3.4 Imp. qts)
w/o Oil filter change
3.7 liters (3.9 US qts, 3.3 Imp. qts)
Dry fill 4.6 liters (4.8 US qts, 4.0 Imp. qts)

38. START ENGINE AND CHECK FOR LEAKS

39. PERFORM ENGINE ADJUSTMENT

(a) Adjust the alternator drive belt.

(See page CH–3)

Drive belt tension: New belt 175 ± 5 lb

Used belt 115 ± 20 lb

(b) Adjust PS pump drive belt.

Drive belt tension: New belt 125 ± 25 lb

Used belt 80 ± 20 lb

(c) Adjust the ignition timing.

(See page IG–21)

Ignition timing:

10˚BTDC @ idle

(w/ Terminals TE1 and E1 connected)

(d) Adjust the valve clearance.

Valve clearance:

Intake 0.13 – 0.23 mm (0. 005 – 0.009 in.)

Exhaust 0.27 – 0.37 mm l0.011 – 0.015 in.)

40. INSTALL HOOD

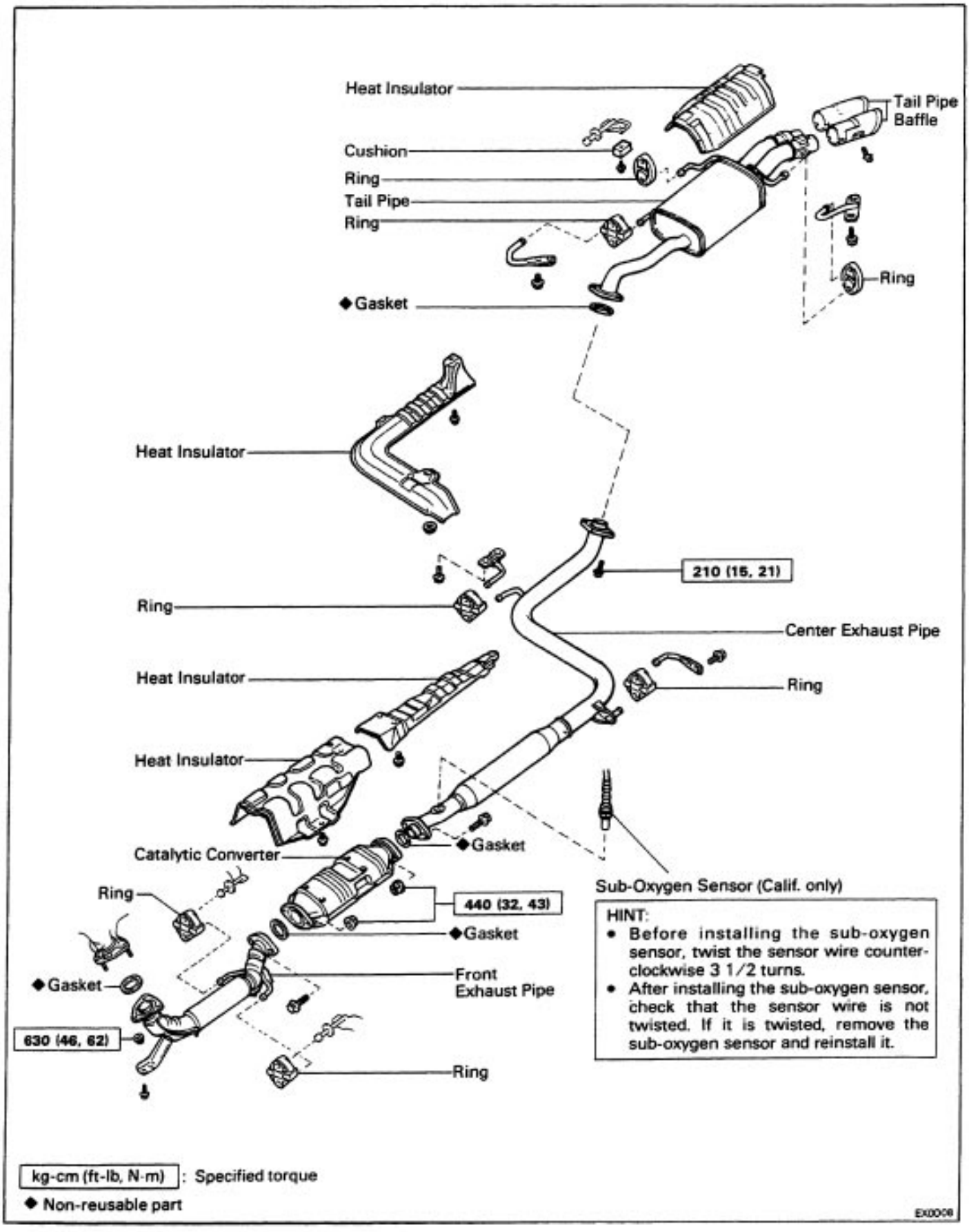
41. PERFORM ROAD TEST

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

42. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS

EXHAUST PIPES AND HEAT INSULATORS (2VZ–FE)

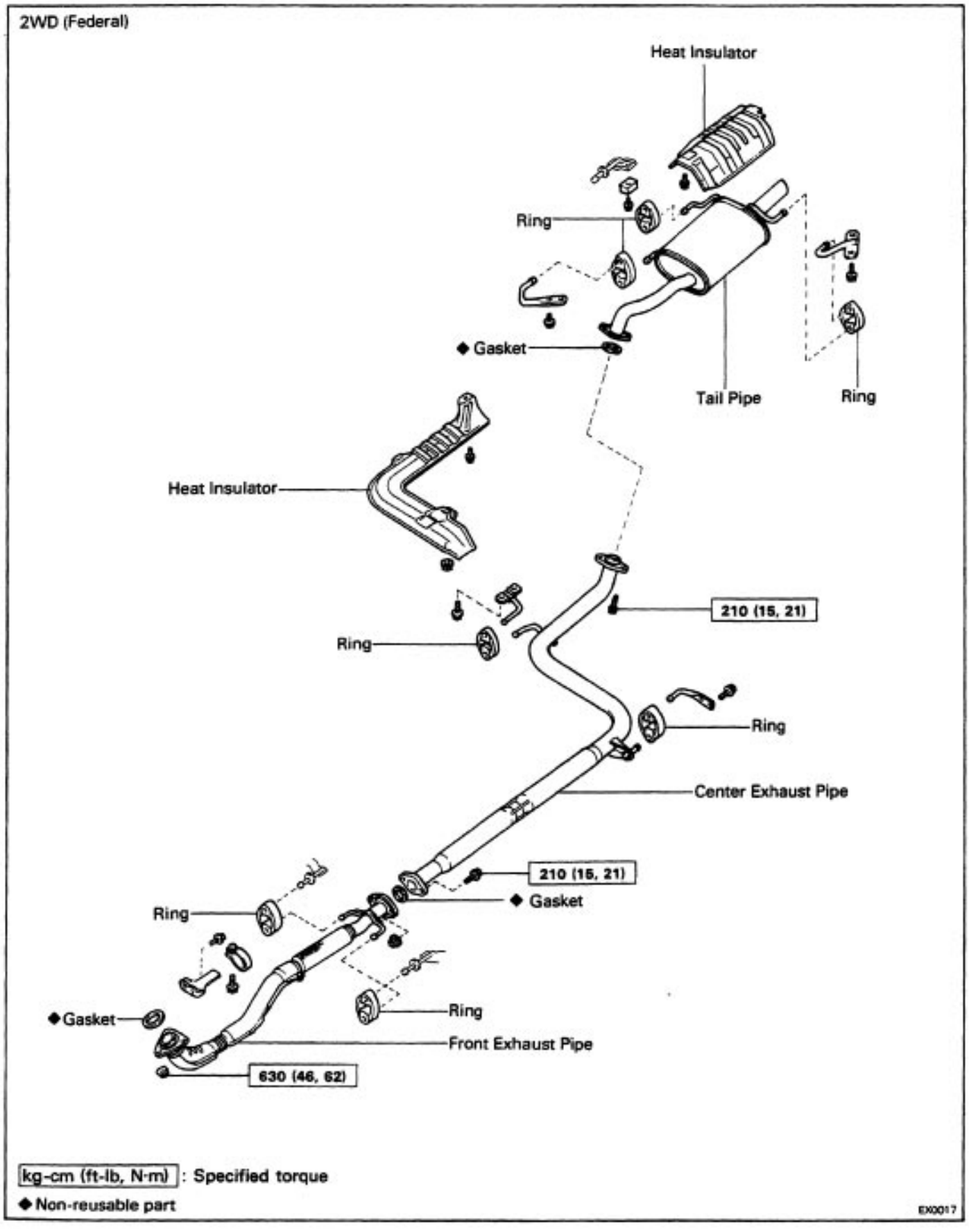
COMPONENTS



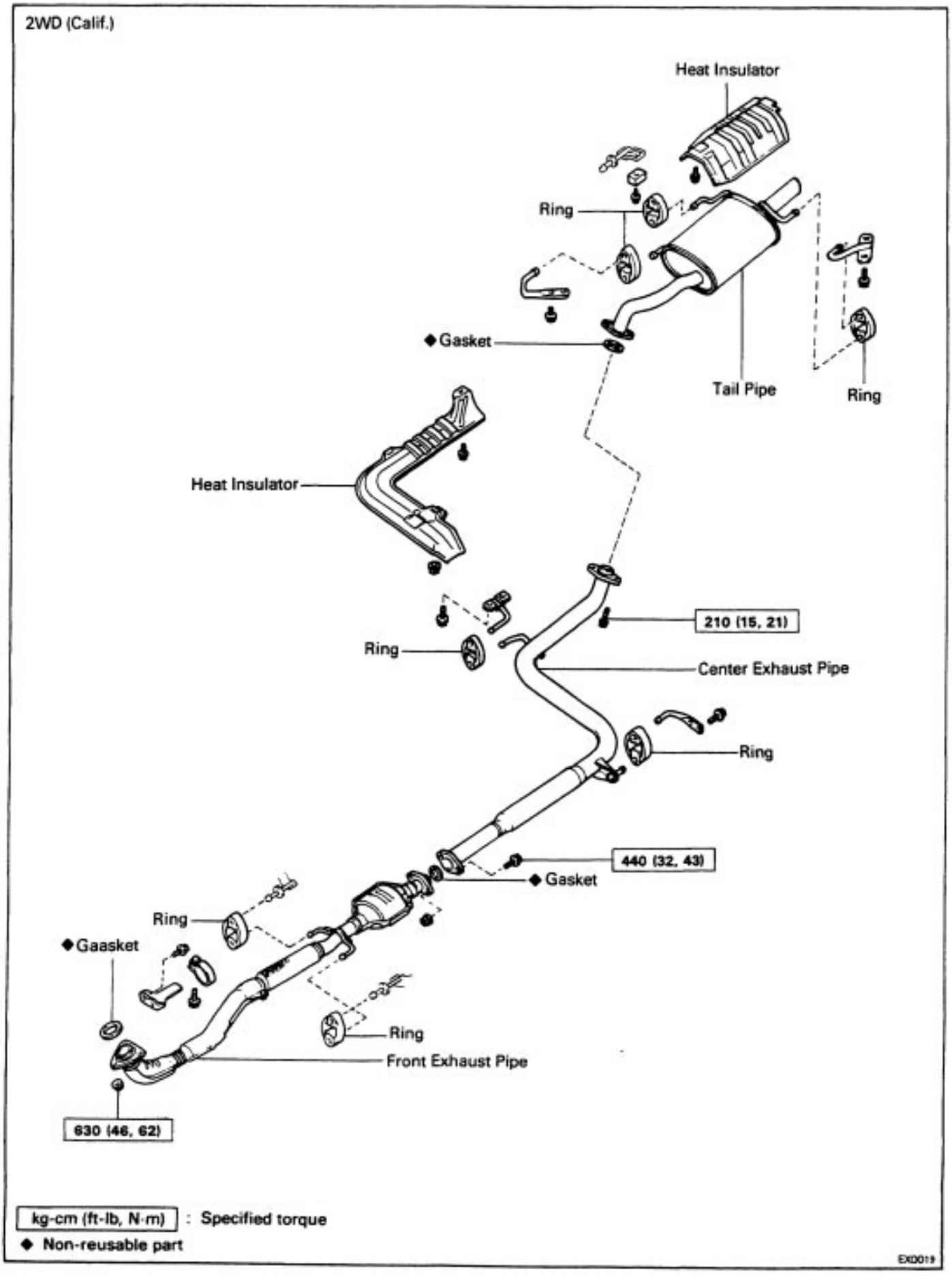
EXHAUST SYSTEM

EXHAUST PIPES AND HEAT INSULATORS (3S–FE)

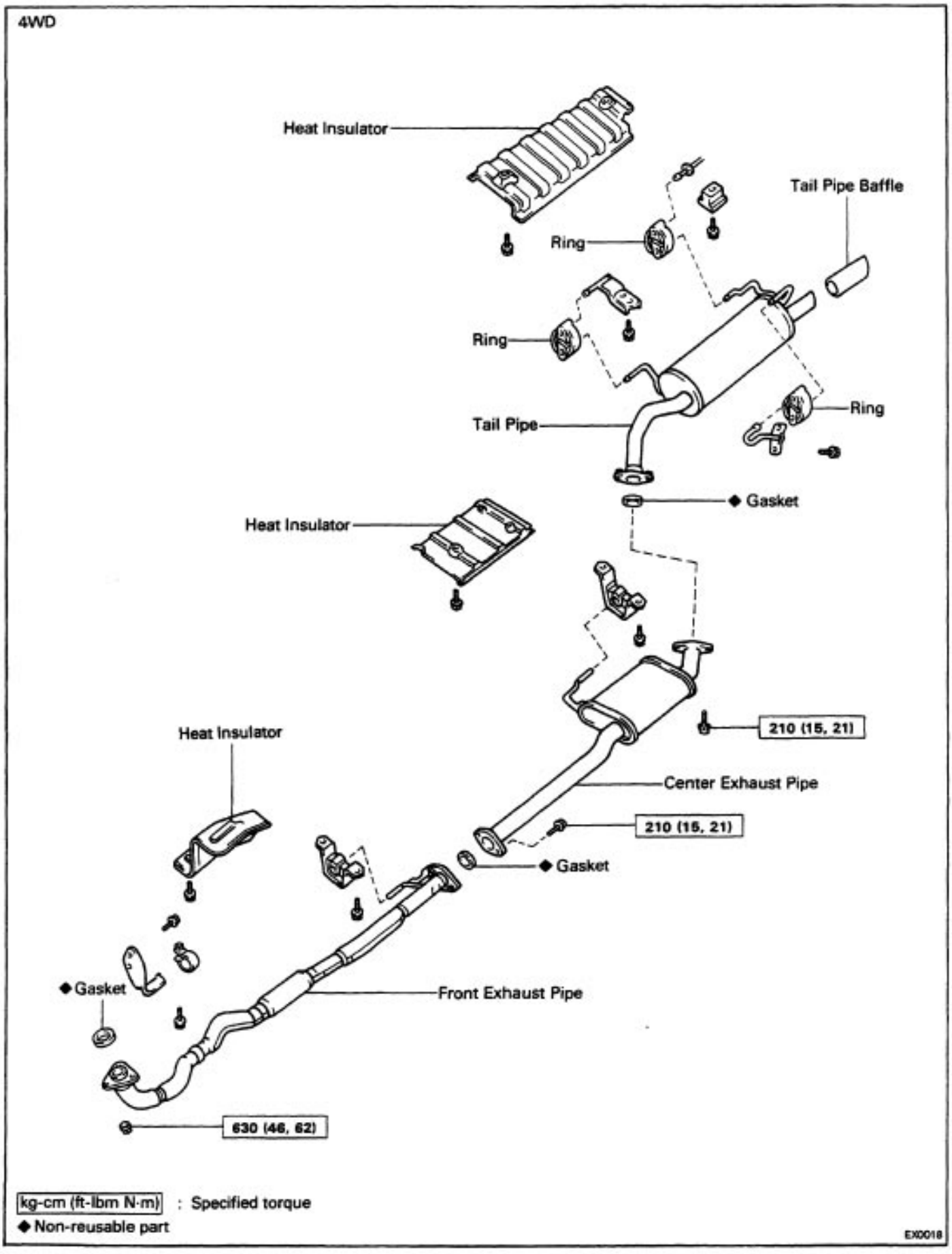
COMPONENTS



COMPONENTS


2WD (Calif.)
Heat Insulator
Ring
◆ Gasket
Tail Pipe
Ring
Heat Insulator
210 (15, 21)
Ring
Center Exhaust Pipe
Ring
440 (32, 43)
◆ Gasket
Ring
◆ Gaasket
Ring
Front Exhaust Pipe
630 (46, 62)
kg-cm (ft-lb, N·m) : Specified torque
◆ Non-reusable part
EX0019

COMPONENTS


4WD
Heat Insulator
Ring
Tail Pipe Baffle
Ring
Ring
Tail Pipe
◆ Gasket
Heat Insulator
210 (15, 21)
Heat Insulator
Center Exhaust Pipe
210 (15, 21)
◆ Gasket
◆ Gasket
Front Exhaust Pipe
630 (46, 62)
kg-cm (ft-lbm N·m) : Specified torque
◆ Non-reusable part
EX0018

FRONT AXLE AND SUSPENSION

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Wanders/pulls	Tires worn or improperly inflated	Replace tire or inflate tires to proper pressure	FA–3
	Alignment incorrect	Check front wheel alignment	FA–3
	Hub bearing worn	Replace hub bearing	FA–7
	Front or rear suspension parts loose or broken	Tighten or replace suspension parts	
	Steering linkage loosen or worn	Tighten or replace steering linkage	
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–43, 45 48
Bottoming	Vehicle overloaded	Check loading	
	Shock absorber worn out	Replace shock absorber	FA–51
	Springs weak	Replace spring	FA–51
Sways/ pitches	Tires improperly inflated	Inflate tires to proper pressure	FA–3
	Stabilizer bar bent or broken	Inspect stabilizer bar	FA–61
	Shock absorber worn out	Replace shock absorber	FA–51
Front wheel shimmy	Tires worn or improperly inflated	Replace tire or inflate tires to proper pressure	FA–3
	Wheels out of balance	Balance wheels	
	Shock absorber worn out	Replace shock absorber	FA–51
	Alignment incorrect	Check front wheel alignment	FA–3
	Hub bearings worn	Replace hub bearings	FA–7
	Ball joints or bushings worn	Inspect bail joints and bushings	FA–56
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–43,45. 48
Abnormal tire wear	Tires improperly inflated	Inflate tires to proper pressure	FA–3
	Shock absorbers worn out	Replace shock absorber	FA–51
	Alignment incorrect	Check toe–in	FA–3
	Suspension parts worn	Replace suspension parts	

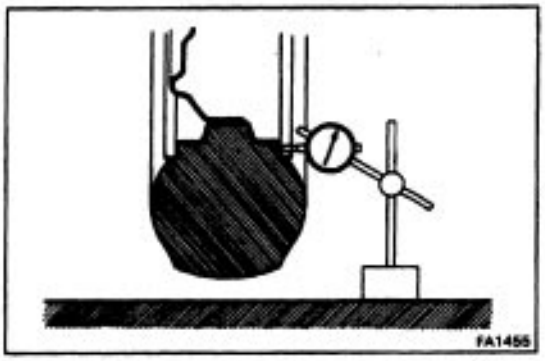
FRONT WHEEL ALIGNMENT

1. MAKE FOLLOWING CHECKS AND CORRECT ANY PROBLEMS

(a) Check the tires for wear, size and proper inflation.

Cold tire inflation pressure:
FWD/SV21 and 4WD 2.1 kg–cm2 (30 psi, 206 kPa)
FWD/VZV21 2.2 kg–cm2 (31 psi, 216 kPa)

(b) Check the front wheel bearings for looseness.

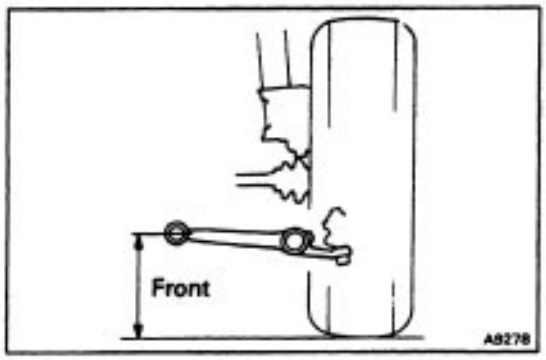


(c) **Check the wheel runout.**
Lateral runout: Less than 1.0 mm (0.039 in.)

(d) Check the front suspension for looseness.

(e) Check the steering linkage for looseness.

(f) Check that the front shock absorber function properly by using the standard bounce test.



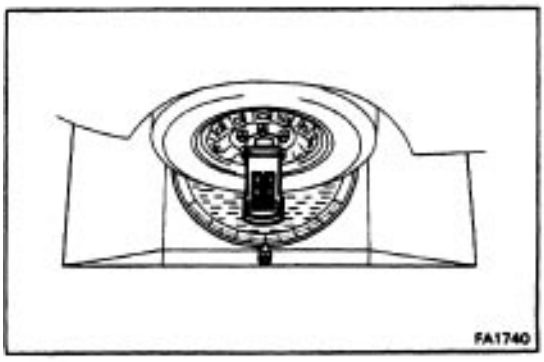
2. MEASURE CHASSIS GROUND CLEARANCE

Chassis ground clearance: mm (in.)

	Sedan	Wagon
FWD/SV21	233 (9.17)	231 (9.09)
4WD	233 (9.17)	—
FWD /VZV21	227 (8.94)	225 (8.86)

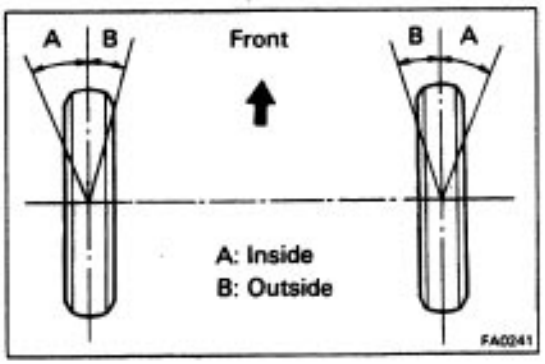
If the clearance of the vehicle is not standard, try to level by locking it down. If still not correct, check for bad springs or suspension parts.

HINT: Before inspecting wheel alignment, adjust chassis ground clearance to specification.



3. INSTALL WHEEL ALIGNMENT EQUIPMENT

Follow the specific instructions of the equipment manufacturer.

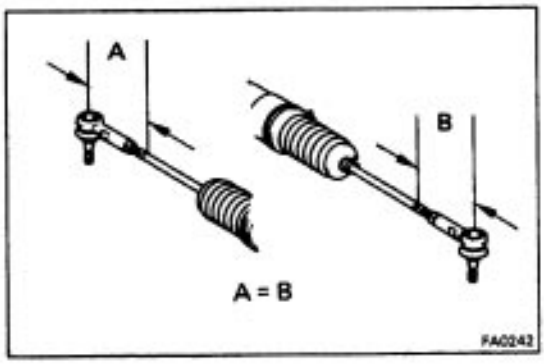


4. CHECK WHEEL ANGLE

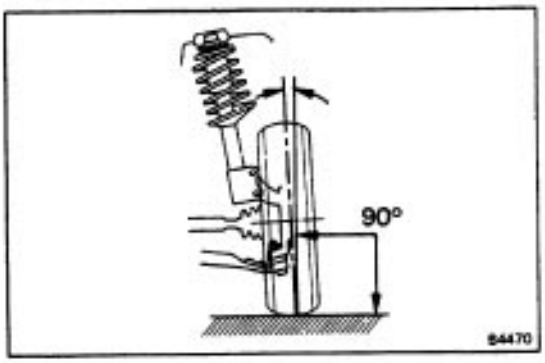
Wheel angle:

Maximum angle	Inside wheel (A)	Outside wheel (B)
FWD/SV21 4WD	37°30′ ± 1°00′	30°45′
FWD/VZV21	35°45′	29°45′

At 20˚ (Outside wheel) inside wheel: 22˚00’



If steering angles differ from the standard specifications, check to see if the lengths of the left and right tie rods are the same.
HINT: If the tie rod lengths are not equal, the steering angle cannot be adjusted properly.
If the tie rod lengths were changed to adjust the wheel angle, reinspect the toe–in.

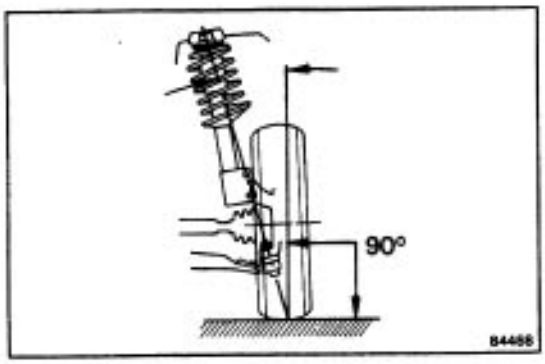


5. CHECK CAMBER

Camber:

	Sedan	Wagon
Inspection standard	0°35′ ± 45′	0°30′ ± 45′
Left–right error	30′	30′

HINT: Camber is not adjustable, if measurement is not within specification, inspect and replace the suspension parts.

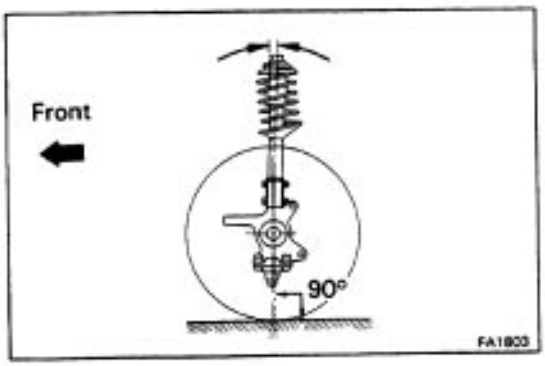


6. CHECK STEERING AXIS INCLINATION

Steering axis inclination:

	Sedan	Wagon
Inspection standard	12°45′ ± 45′	12°50′ ± 45′
Left–right error	30′	30′

Steering axis inclination is not adjustable,if measurement is not within specification, inspect and replace the suspension parts.

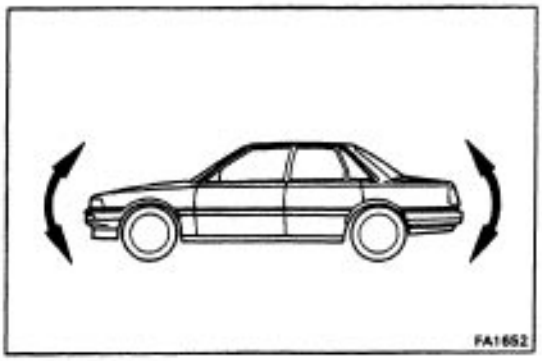


7. CHECK CASTER

Caster:

	Sedan	Wagon
Inspection standard	1°40 ± 45′	1°00′ ± 45′
Adjustment standard	1°40′ ± 30′	1°00 ± 30′
Left–right error	30′	30′

If caster is not within specification, adjust by increasing or decreasing the spacers. (See page FA–61)



HINT:

- Caster changes 30’ with each spacer.
- Do not install more than two spacers.

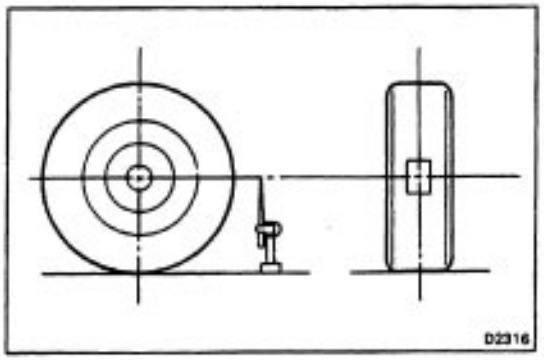
8. INSPECT TOE–IN

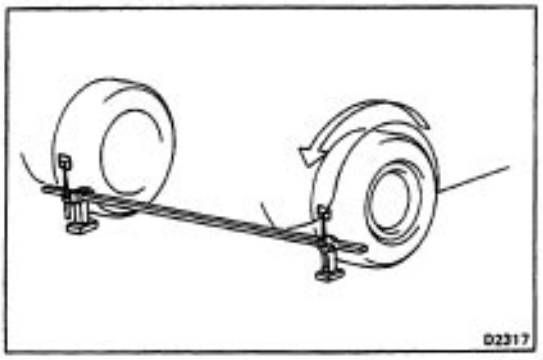
Measure toe–in with a toe–in gauge in the following procedure.

(a) Bounce the vehicle up and down to stabilize the suspension.

(b) Move the vehicle forward about 5 m (16.4 ft) with the front wheel in the straight–ahead position on a level place.

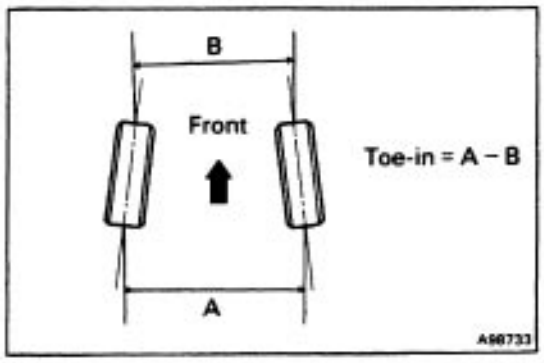
(c) Mark the center of each rear tread and measure the distance between the marks of the right and left tires.





(d) Advance the vehicle until the marks on the rear sides of the tires come to the measuring heights of the gauge on the front side.

HINT: If the tire rolls too far, repeat from step (b).



(e) Measure the distance between the marks on the front of the tires.

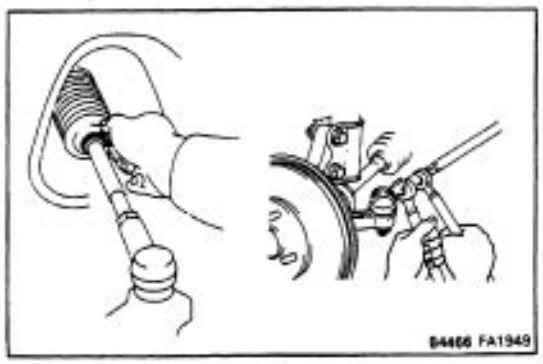
Inspection standard: 1 ± 2 mm (0.04 ± 0.08 in.)

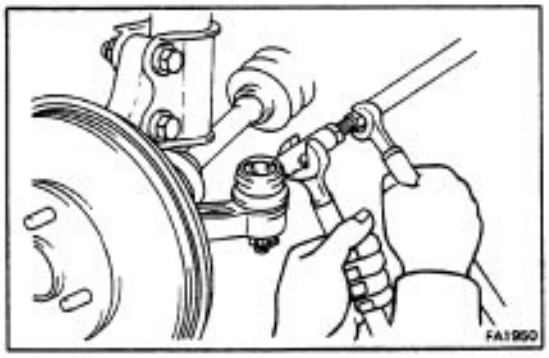
If necessary, adjust the toe–in.

9. ADJUST TOE–!N

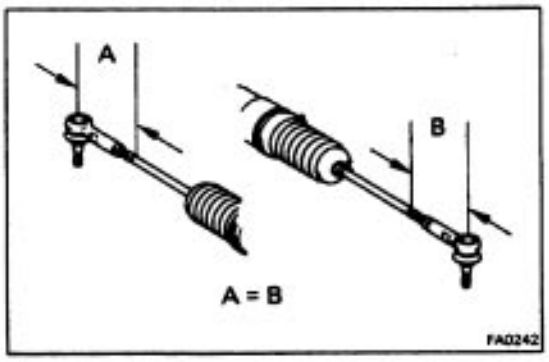
(a) Remove the boot clips.

(b) Loosen the tie rod end lock nut.

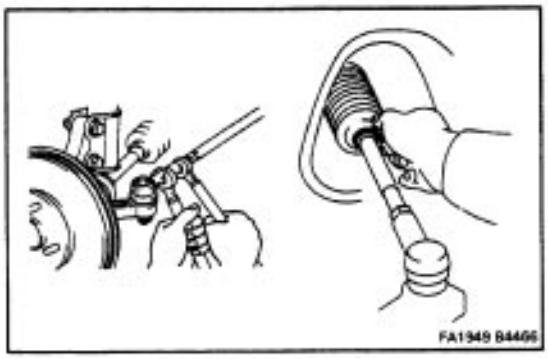




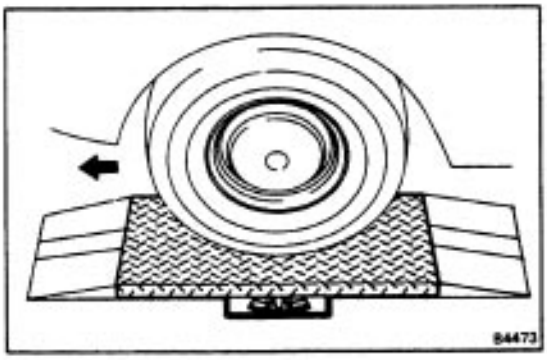
(e) Turn the left and right tie rod ends an equal amount to adjust the toe–in.
Adjustment standard: 1 ± 1 mm (0.04 ± 0.04 in.)



HINT: Insure that the lengths of the left and right tie rod ends length are the same.
Tie rod end length left–right error:
Less than 1.5 mm (0.059 in.)



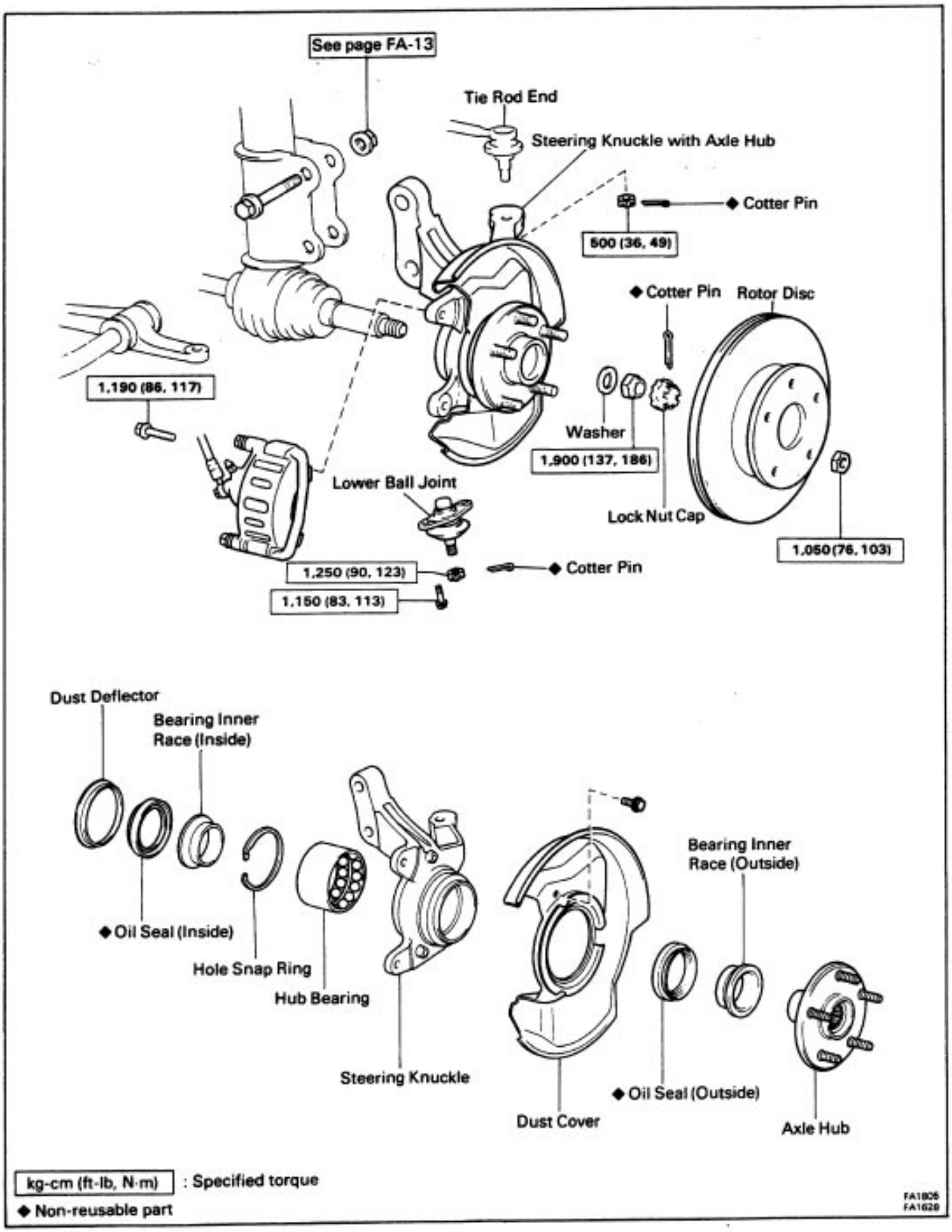
(d) Torque the tie rod end lock nuts.
Torque: 570 kg–cm (41 ft–lb , 56 N–M)
(e) Place the boot on the seat and clamp it.
HINT: Insure that the boots are not twisted.



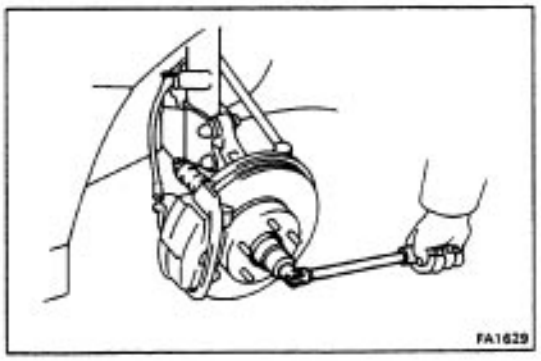
10. INSPECT SIDE SLIP (REFERENCE ONLY)
Side slip: Less than 3.0 mm/m (0.118 in./3.3 ft)

FRONT AXLE HUB

COMPONENTS



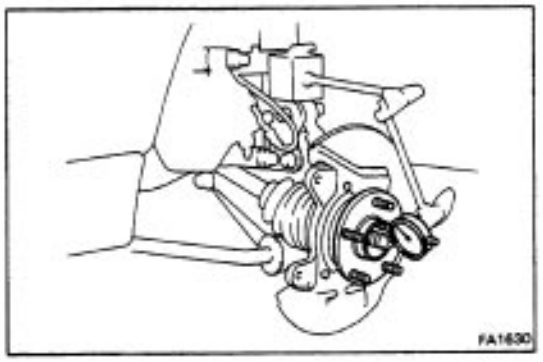
REMOVAL OF FRONT AXLE HUB



1. REMOVE COTTER PIN, LOCK NUT CAP AND BEARING LOCK NUT

(a) Remove the cotter pin and lock nut cap.

(b) Before removing¿the disc brake caliper, loosen the bearing lock nut while depressing the brake pedal.



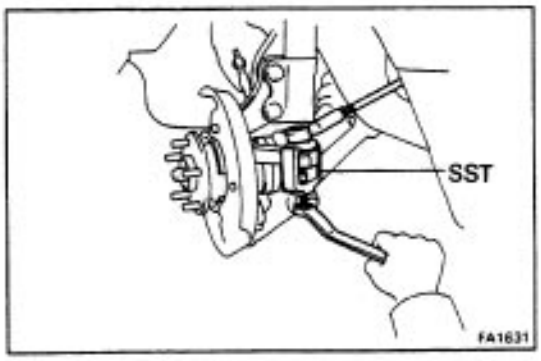
2. REMOVE DISC BRAKE CALIPER

Remove the disc brake caliper from the steering knuckle, and suspended it with wire.

3. REMOVE ROTOR DISC

4. CHECK BEARING PLAY IN AXIAL DIRECTION

Limit: 0.05 mm (0.0020 in.)

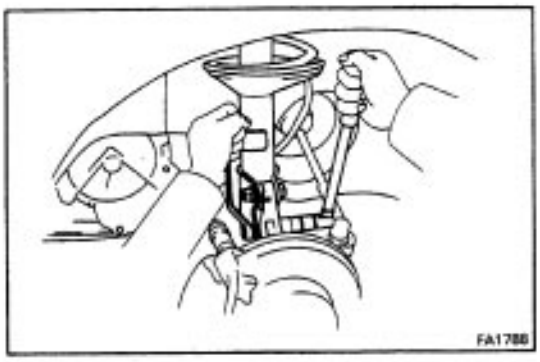


5. DISCONNECT TIE ROD END

(a) Remove the cotter pin and nut.

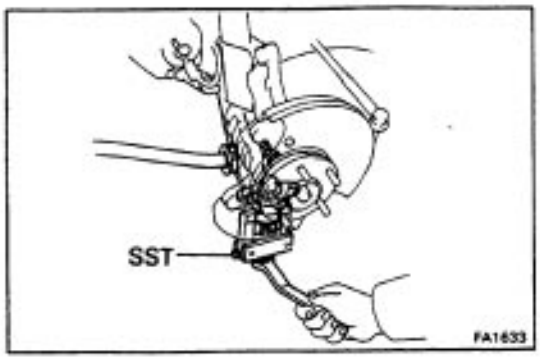
(b) Using SST, disconnect the tie rod end from the steering knuckle.

SST 09610–55012



6. DISCONNECT STEERING KNUCKLE FROM SHOCK ABSORBER

Remove two nuts and bolts, and disconnect the steering knuckle from the shock absorber.

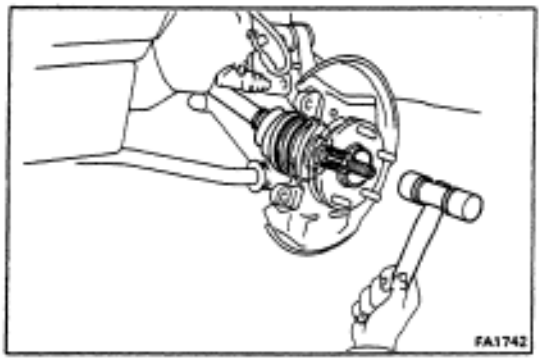


7. DISCONNECT STEERING KNUCKLE FROM LOWER SUSPENSION ARM

(a) Remove the cotter pin and the nut.

(b) Using SST, disconnect the steering knuckle from the lower suspension arm.

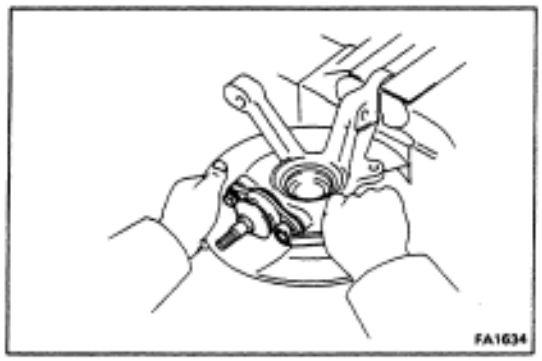
SST 096 10–55012



8. REMOVE STEERING KNUCKLE FROM FRONT DRIVE SHAFT

Using a plastic hammer, tap the drive shaft and remove the steering knuckle.

NOTICE: Cover the drive shaft boot with cloth to protect it from damage.

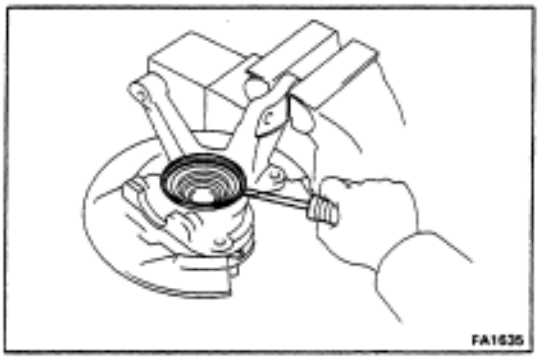


9. REMOVE BALL JOINT FROM STEERING KNUCKLE

(a) Clamp the steering knuckle in a vise.

HINT: Use a set of soft jaws in the vise to protect the steering knuckle.

(b) Remove the ball joint.

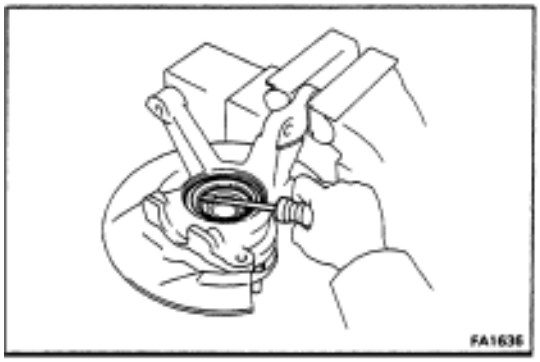


DISASSEMBLY OF FRONT AXLE HUB

(See page FA–7)

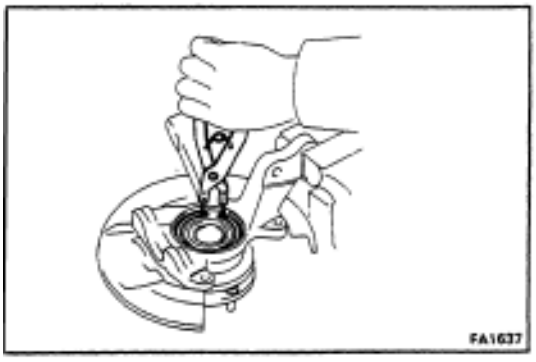
1. REMOVE DUST DEFLECTOR

Using a screwdriver remove the dust deflector.



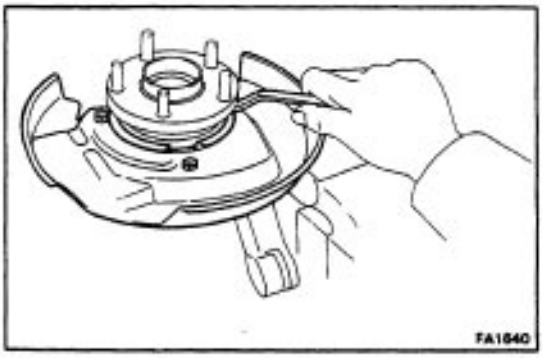
2. REMOVE INNER OIL SEAL

Using a screwdriver, remove the inner oil sea! from the steering knuckle.



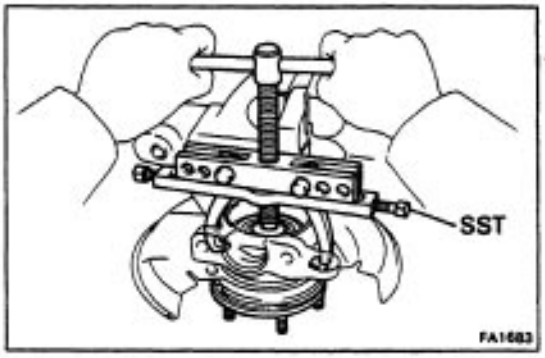
3. REMOVE HOLE SNAP RING

Using snap ring pliers, remove the hole snap ring from the steering knuckle.



4. SEPARATE DISC BRAKE DUST COVER ANY STEERING KNUCKLE

Remove the three bolts and separate the disc brake dust cover and the steering knuckle.



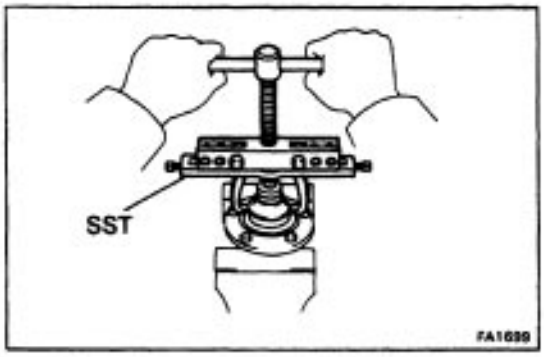
5. REMOVE AXLE HUB FROM STEERING KNUCKLE

(a) Using SST, push out the axle hub.

HINT: If the axle hub has been removed, be sure to replace.

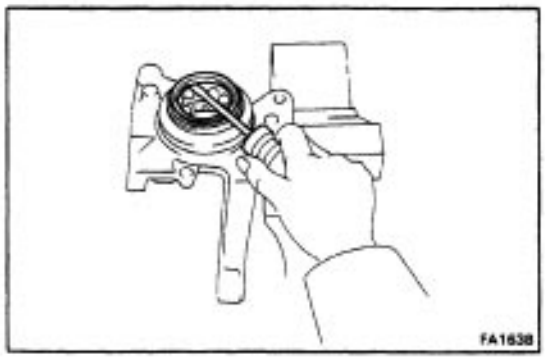
SST 09950–20017

(b) Remove the bearing inner race (inside) from the bearing.



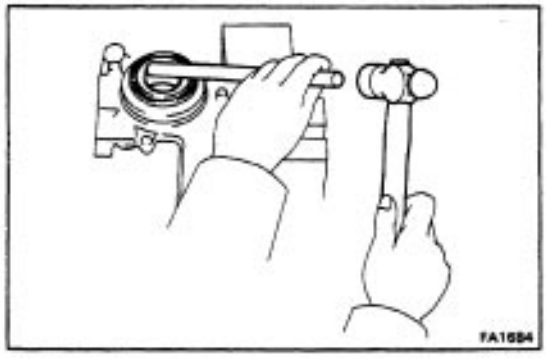
(c) Using SST, remove the bearing inner race (outside) from the axle hub.

SST 09950–20017



6. REMOVE OUTER OIL SEAL

Using a screwdriver, remove the oil seal from the steering knuckle.

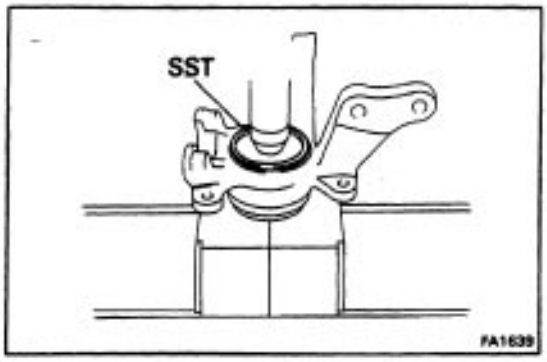


7. REMOVE BEARING

(a) First install the inner race (outside) of the bearing to be removed.

(b) Using a brass bar and a hammer, remove the bearing.

NOTICE: Always replace the bearing as an assembly.

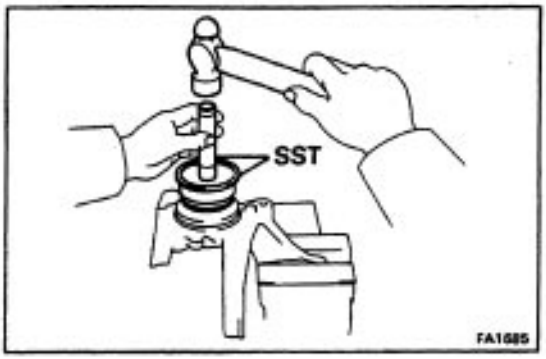


ASSEMBLY OF FRONT AXLE HUB

(See page FA–7)

1. INSTALL BEARING

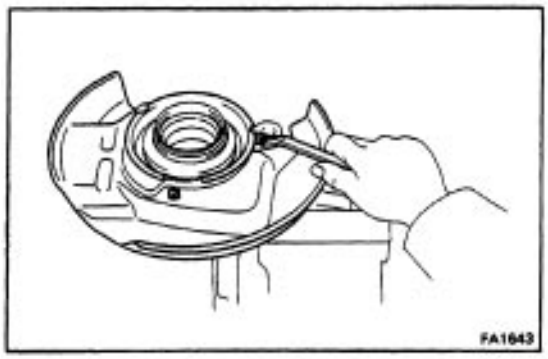
Using SST, install a new bearing into the steering knuckle.
SST 09608–32010



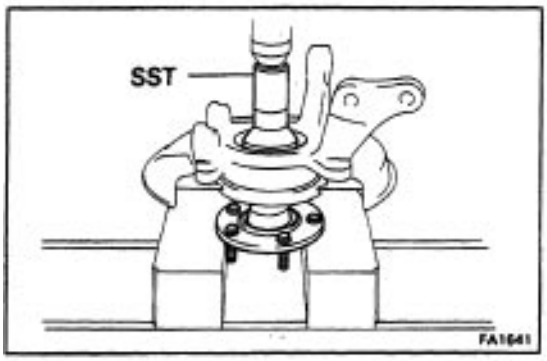
2. INSTALL OUTER OIL SEAL

(a) Rotate and insert the side tip of a new oil seal into the SST.
SST 09608–32010

(b) Using SST, install the oil seal into the steering knuckle.
SST 09608–32010 and 09710–14012 (09710–00050)



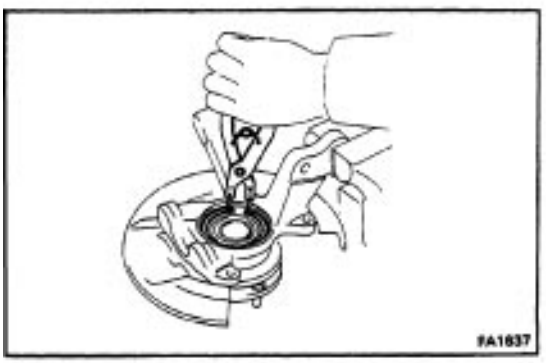
3. INSTALL DISC BRAKE DUST COVER



4. INSTALL AXLE HUB

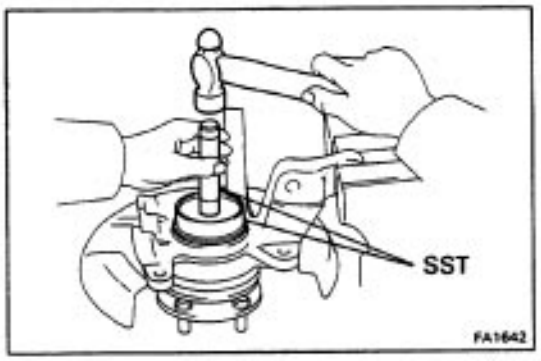
(a) Apply MP grease between the oil seal lip, oil seal and the bearing.

(b) Using SST, install the axle hub into the steering knuckle.
SST 09310–35010



5. INSTALL HOLE SNAP RING

Using snap ring pliers, install the hole snap ring into the steering knuckle.



6. INSTALL INNER OIL SEAL

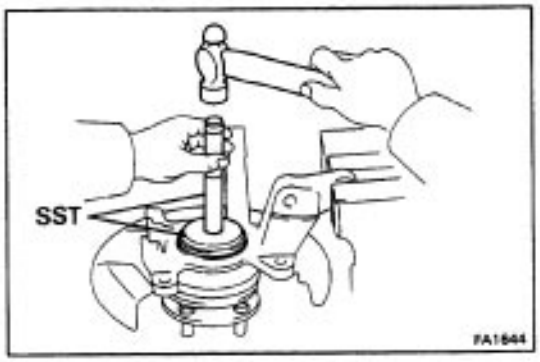
(a) Rotate and insert the side lip of a new oil seal into the SST.

SST 09608–32010

(b) Using SST, install the oil seal into the steering knuckle.

SST 09608–32010 and 09710–14012 (09710–00050)

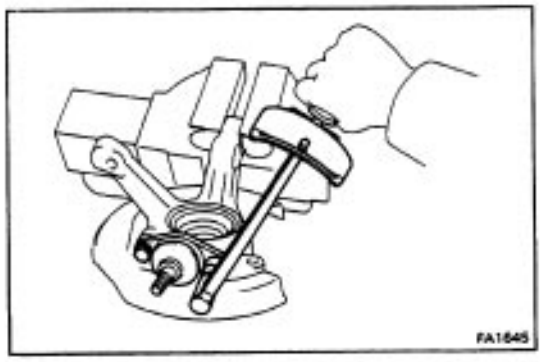
(c) Coat the oil seal lip with MP grease.



7. INSTALL DUST DEFLECTOR

Using SST, drive the dust deflector to the steering knuckle.

SST 09608–35014 (09608–06020,09608–06180)

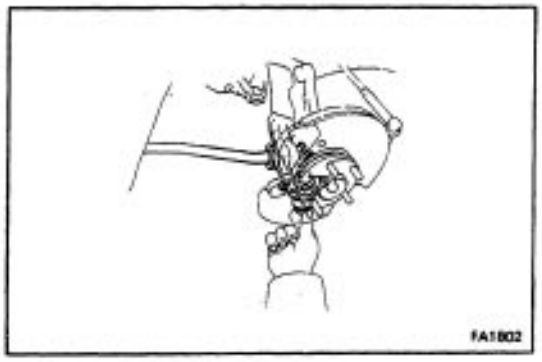


8. INSTALL BALL JOINT TO STEERING KNUCKLE

Torque: 1,150 kg–cm (83 ft–lb, 113 N–m)

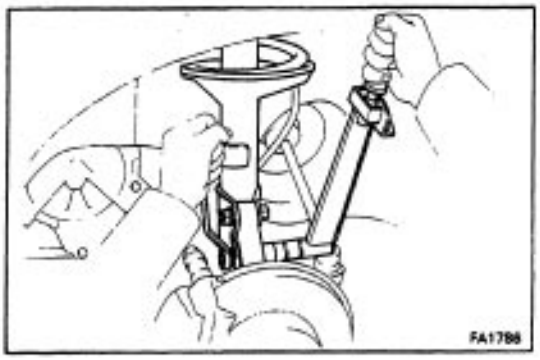
INSTALLATION OF FRONT AXLE HUB

(See page FA–7)



1. INSTALL STEERING KNUCKLE TO LOWER SUSPENSION ARM

install the steering knuckle to the lower suspension arm, and temporarily install the nut.



2. CONNECT STEERING KNUCKLE TO SHOCK ABSORBER

NOTICE: Apply engine oil to the threads of the two bolts.

(a) Connect the steering knuckle to the shock absorber lower bracket.

(b) Insert the bolts and align the matchmarks of the camber adjusting cam.

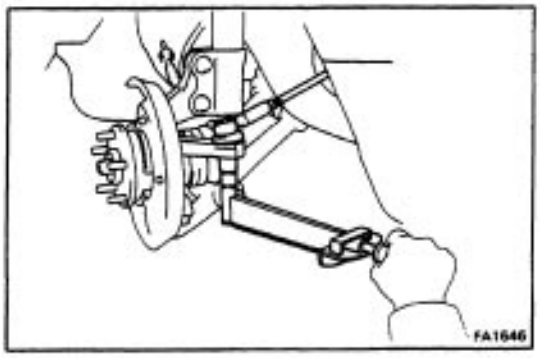
(c) Torque the nuts.

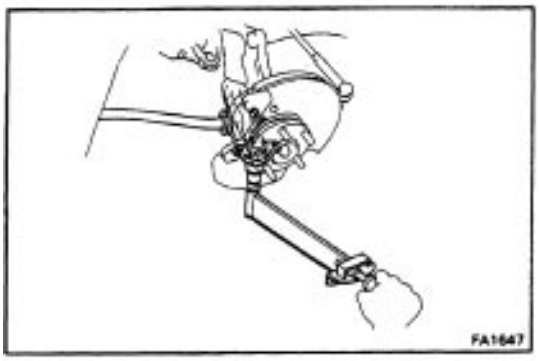
Torque: 3,100 kg–cm (224 ft–lb, 304 N–m)

3. CONNECT TIE ROD END TO STEERING KNUCKLE

Torque the castle nut and secure it with a new cotter pin.

Torque: 500 kg–cm (36 ft–lb, 49 N–m)



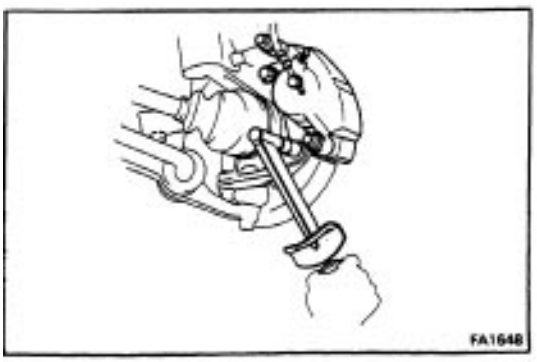


4. TORQUE BALL JOINT TO LOWER ARM

Install and torque the castle nut and secure it with a new cotter pin.

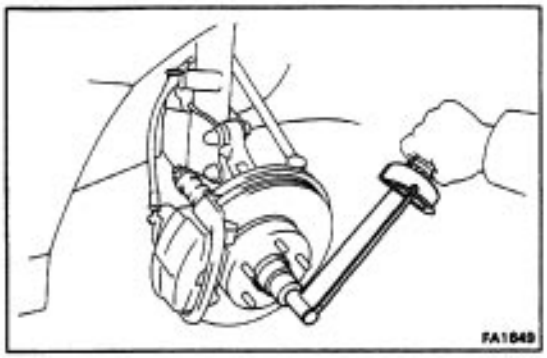
Torque: 1,250 kg–cm (90 ft–lb, 123 N–m)

5. INSTALL ROTOR DISC TO AXLE HUB



6. INSTALL DISC BRAKE CALIPER TO STEERING KNUCKLE

Torque: 1,190 kg–cm (86 ft–lb, 117 N–m)



7. INSTALL BEARING LOCK NUT, LOCK NUT CAP AND COTTER PIN

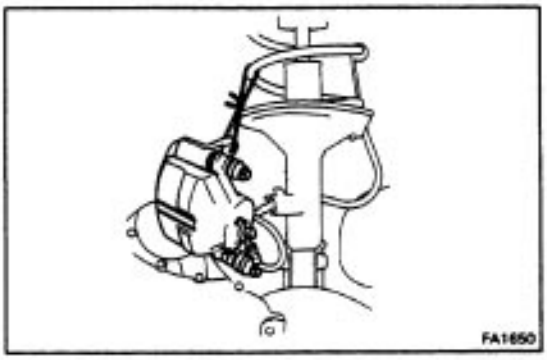
(a) Torque the bearing lock nut while depressing the brake pedal.

Torque: 1,900 kg–cm (137 ft–lb , 186 N–m)

(b) Install the lock nut cap, and secure it with a new cotter pin.

8. CHECK FRONT WHEEL ALIGNMENT

(See page FA–3)

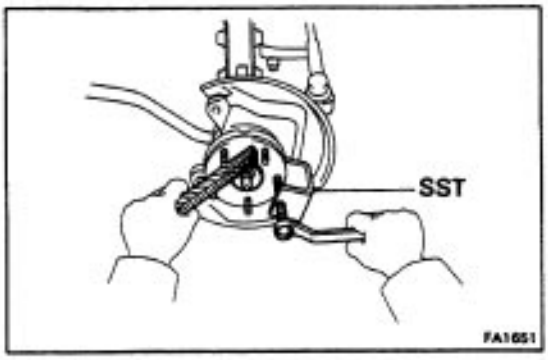


REPLACEMENT OF FRONT AXLE HUB BOLT

1. MOVE DISC BRAKE CALIPER

Remove the disc brake caliper from the steering knuckle and suspended it with wire.

2. REMOVE ROTOR DISC

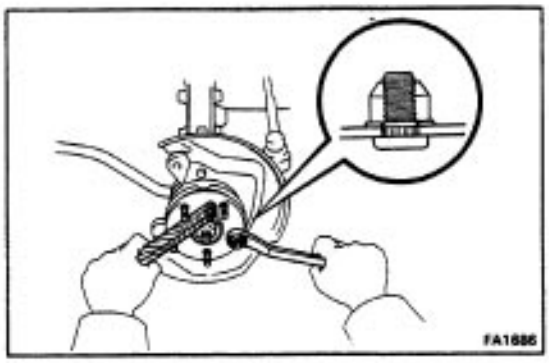


3. REMOVE FRONT AXLE HUB BOLT

(a) Align the disc brake dust cover cutting portion and axle hub bolt.

(b) Using SST, remove the axle hub bolt.

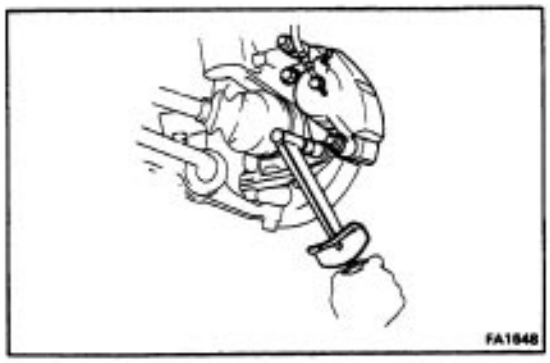
SST 09650–17011



4. INSTALL FRONT AXLE HUB BOLT

(a) Hold the front axle hub, and install a new hub bolt.

5. INSTALL ROTOR DISC

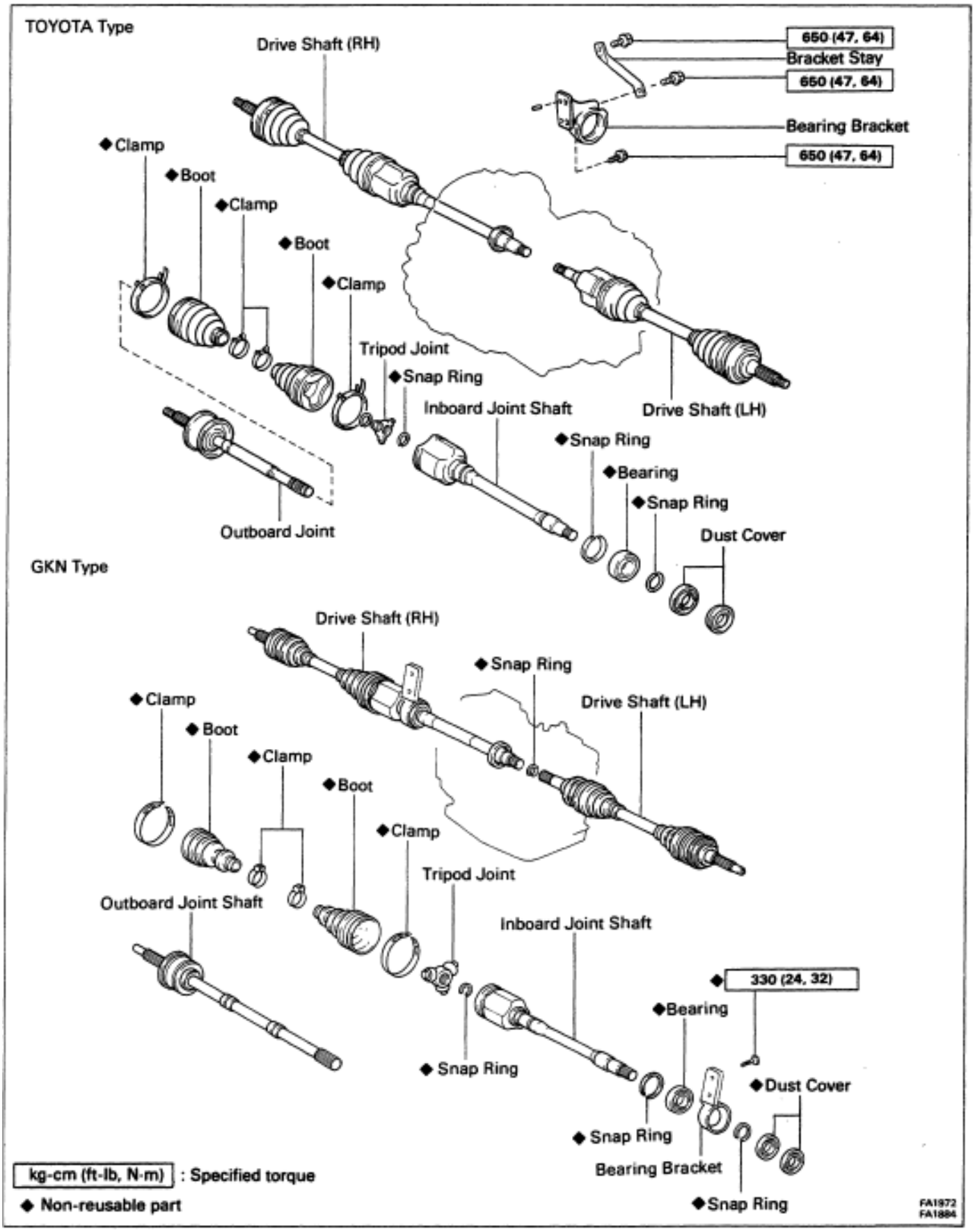


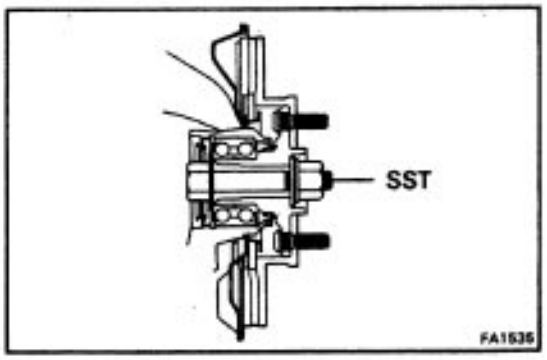
6. INSTALL DISC BRAKE CALIPER TO STEERING KNUCKLE

Torque: 1,190kg–cm (86 ft–lb , 117 N–m)

FRONT DRIVE SHAFT (4WD)

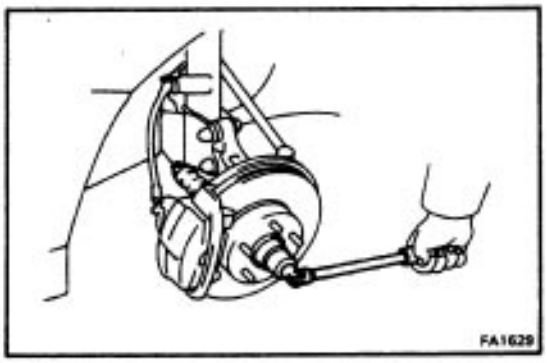
COMPONENTS





NOTICE: The hub bearing could be damaged if it is subjects to the vehicle weight, such as when moving the vehicle with the drive shaft removed. Therefore, if it is bearing first support it with SST.
SST 09608–16041 (09608–02020,09608–02040)

REMOVAL OF FRONT DRIVE SHAFT

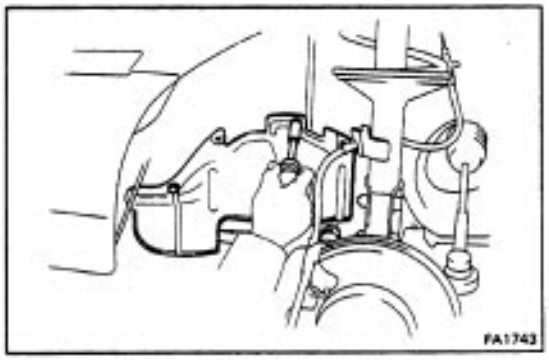


1. REMOVE COTTER PIN, LOCK NUT CUP AND LOCK NUT

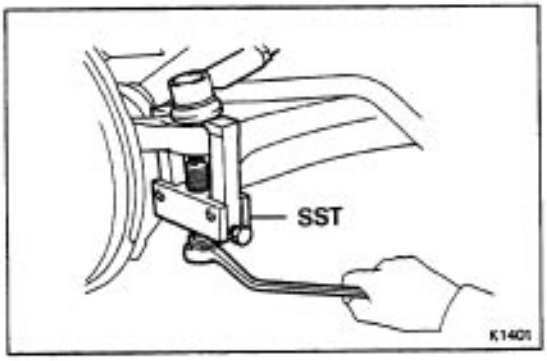
(a) Remove the cotter pin and lock nut cap.

(b) Loosen the bearing lock nut while depressing the brake pedal.

2. REMOVE ENGINE UNDER COVER



3. REMOVE FRONT FENDER APRON SEAL

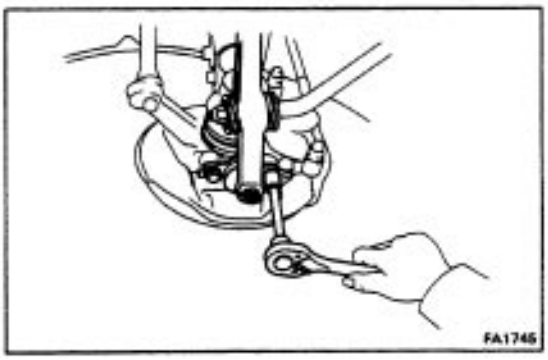


4. DRAIN OUT GEAR OIL FLUID

5. DISCONNECT TIE ROD END FROM STEERING KNUCKLE

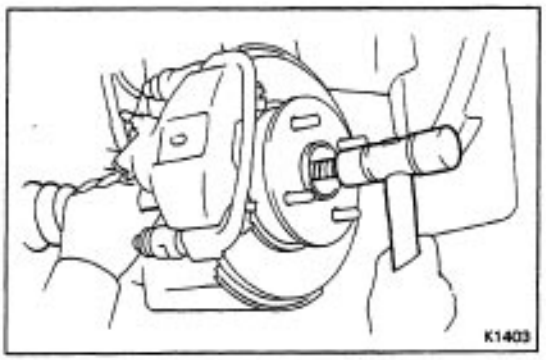
(a) Remove the cotter pin and nut from the steering knuckle.

(b) Using SST, disconnect the tie rod end from the steering knuckle.
SST 09628–62011



6. DISCONNECT STEERING KNUCKLE FROM LOWER BALL JOINT

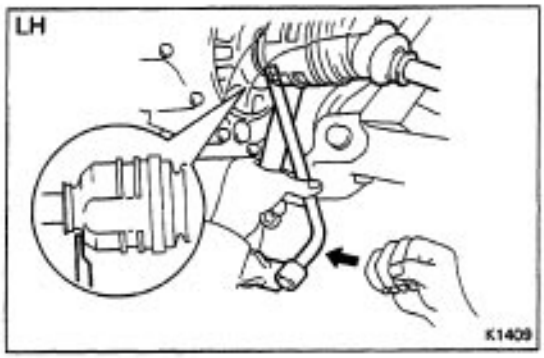
Remove the two bolts and disconnect the steering knuckle from lower ball joint.



7. DISCONNECT DRIVE SHAFT FROM AXLE HUB

Using a plastic hammer, disconnect the drive shaft from the axle hub.

NOTICE: Cover the drive shaft boot with cloth to protect it from damage.



8. REMOVE LH DRIVE SHAFT

Using hub nut wrench and hammer handle or an equivalent; remove the front drive shaft as shown.

HINT: Be careful not to damage the dust cover.

9. REMOVE RH DRIVE SHAFT

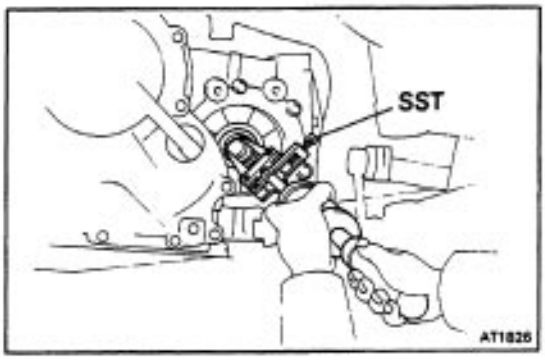
(a) Remove the drive shaft.

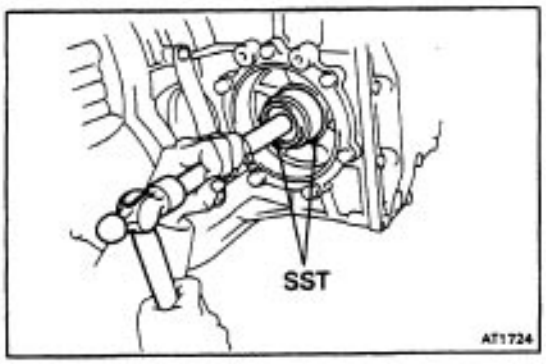
(b) Remove the three bolts, bearing bracket and stay.

10. IF NECESSARY, REPLACE DRIVE SHAFT OIL SEAL

(a) Using SST, drive out the oil seal.

SST 09308–00010

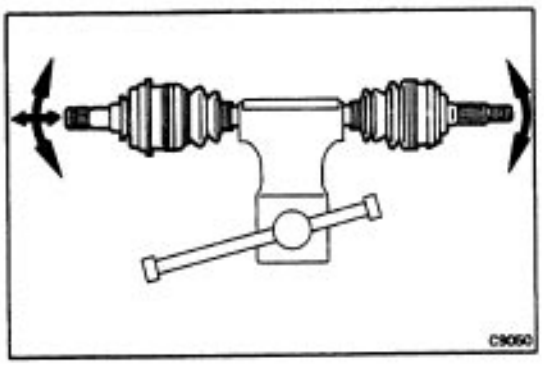




(b) Using SST, press in a new oil seal.

SST A/T 09350–32013 (09351–32150),09631–12020

M/T 09316–60010 (09316–00010)



DISASSEMBLY OF FRONT DRIVE SHAFT

(See page FA–15)

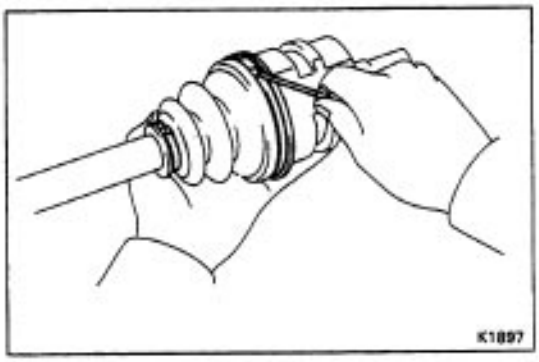
1. CHECK DRIVE SHAFT

(a) Check to see that there is no play in the inboard and outboard joints.

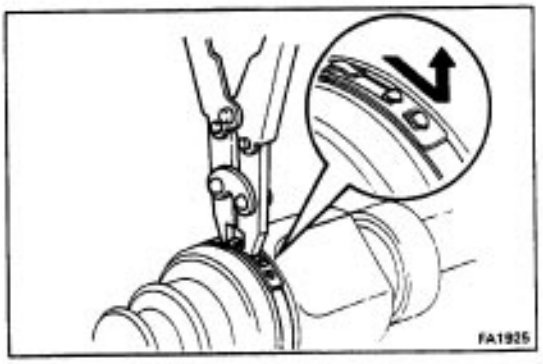
(b) Check to see that the inboard joint slide smoothly in the thrust direction.

(c) Check to see that there is no remarkable play in the radial direction of the inboard joint.

(d) Check the damage of boot.

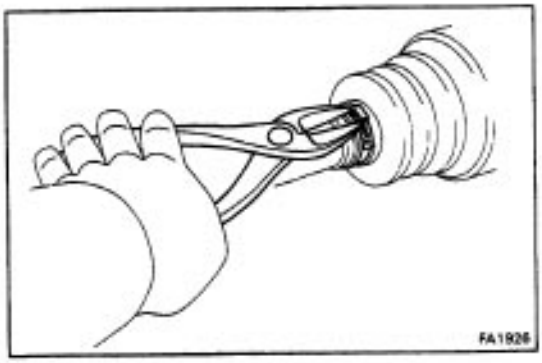


2–1. (TOYOTA TYPE)
REMOVE INBOARD JOINT BOOT CLAMP

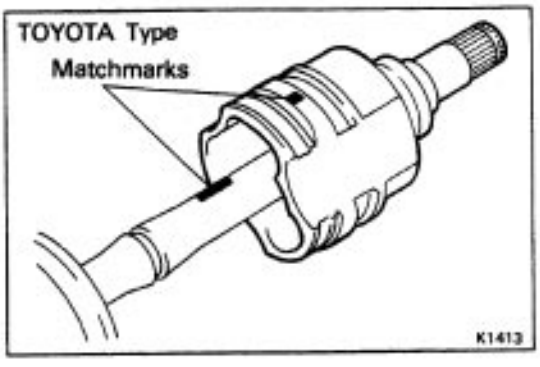


2–2. (GKN TYPE)
REMOVE INBOARD JOINT BOOT CLAMP

(a) Using a boot clamp tool, draw hooks together and remove the large clamp.



(b) Using side cutters, cut small boot clamp and remove it.

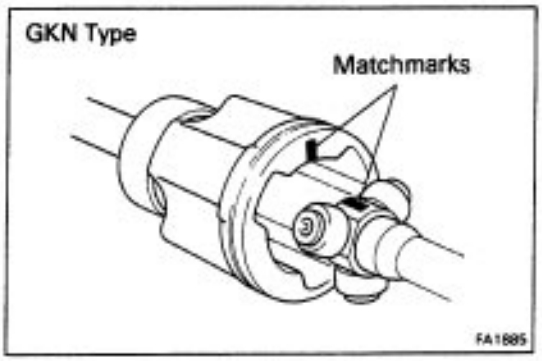


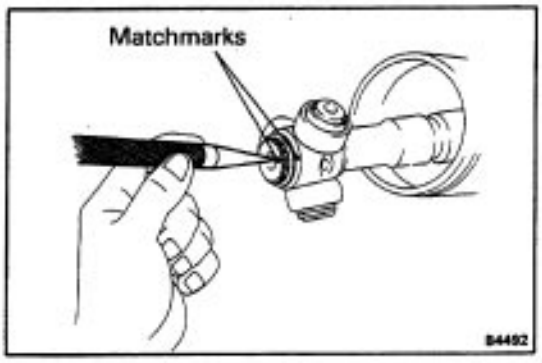
3. DISASSEMBLE INBOARD JOINT TULIP

(a) Place matchmarks on the inboard joint tulip and tripod.

NOTICE: Do not punch the marks.

(b) Remove the inboard joint tulip from the drive shaft.

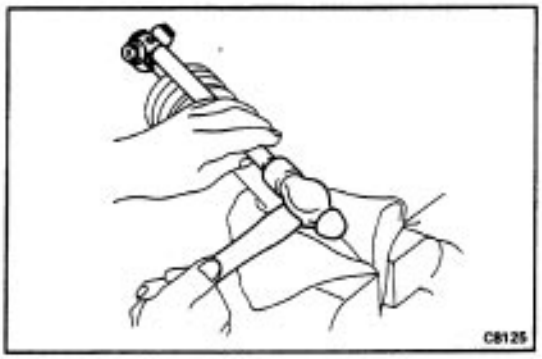




4. DISASSEMBLE TRIPOD JOINT

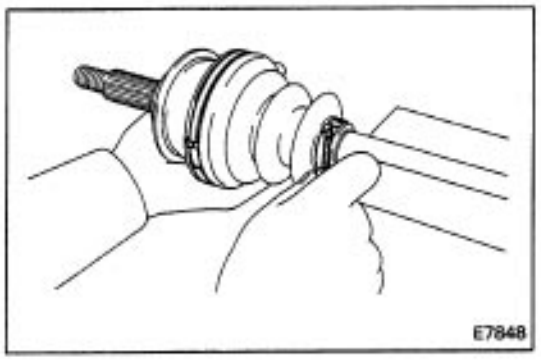
(a) Using snap ring pliers, remove the snap ring.

(b) Using a punch, place matchmarks on the shaft and tripod.



(c) Using a brass bar and hammer, remove the tripod joint from the drive shaft.

5. REMOVE JOINT BOOT

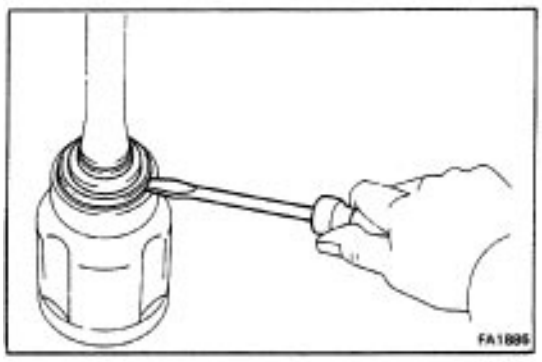


6. (TOYOTA TYPE)

REMOVE OUTBOARD JOINT BOOT

Remove two boot clamp and the boot.

NOTICE: Do not disassemble the outboard joint.

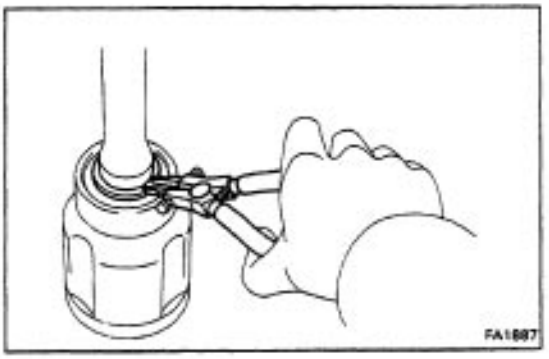


7. REMOVE DUST COVER

Using a screwdriver, remove dust covers.

8. REMOVE SNAP RING

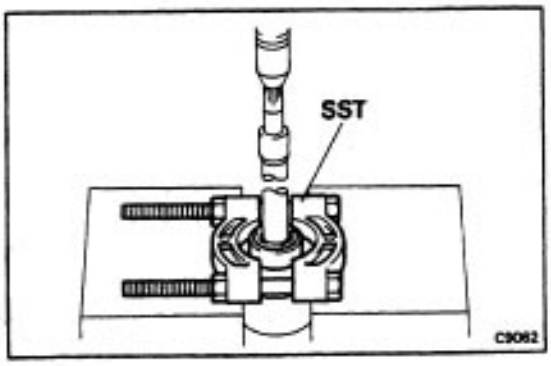
Using snap ring pliers, remove the snap ring.



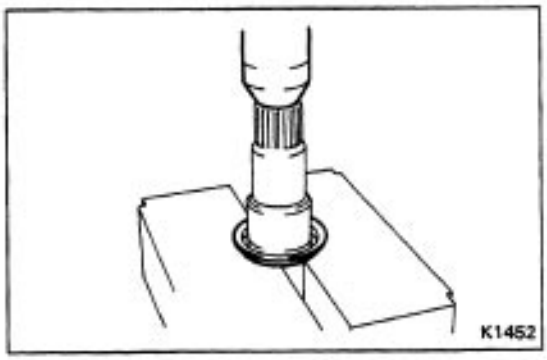
9. REMOVE BEARING

(a) Using SST and a press, press out the bearing.
SST 09950–00020

(b) Remove the snap ring.

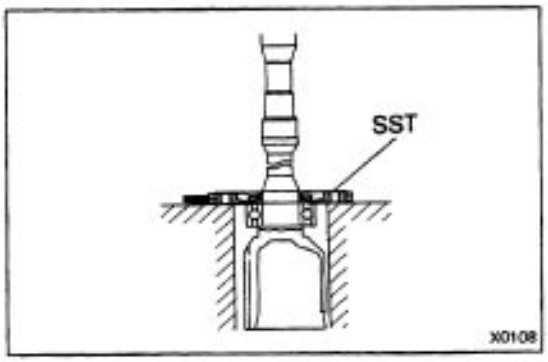


10. REMOVE INBOARD JOINT DUST COVER



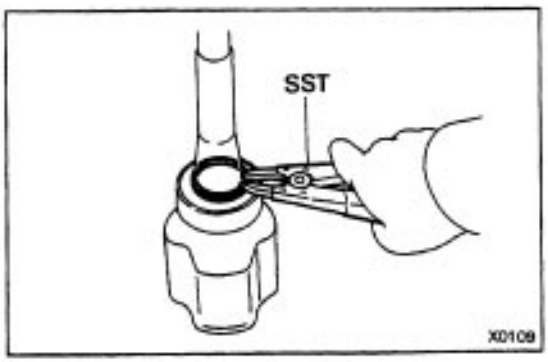
1. REMOVE DUST COVER

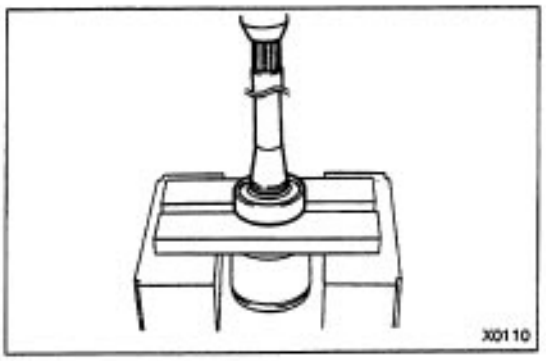
Using SST, press out the dust cover.
SST 09950–00020



12. REMOVE BEARING

(a) Using snap ring pliers, remove the snap ring.

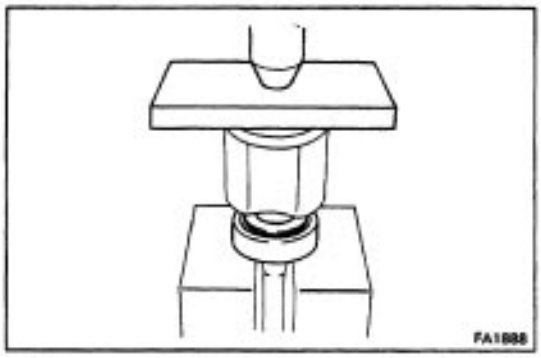




(b) Using a press, remove the bearing from the inboard joint.
(c) Remove the snap ring.

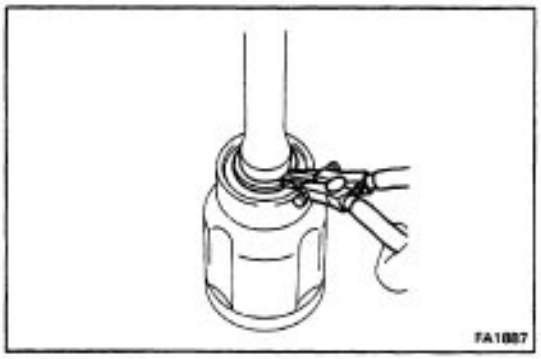
ASSEMBLE OF FRONT DRIVE SHAFT

(See page FA–15)



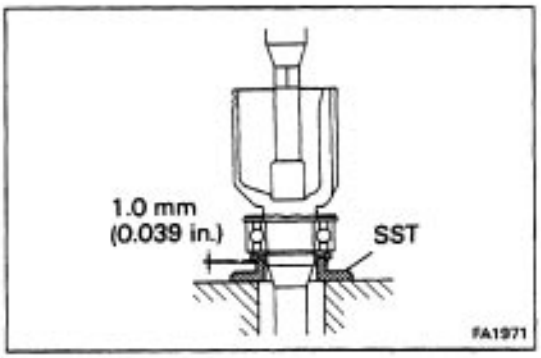
1. INSTALL BEARING

Using a steel plate, press in the bearing.



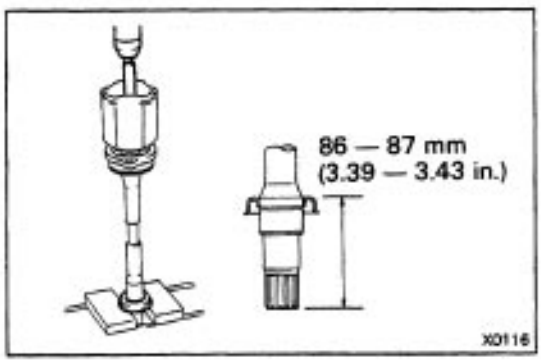
2. INSTALL SNAP RING

Using snap ring pliers, install a new snap ring.

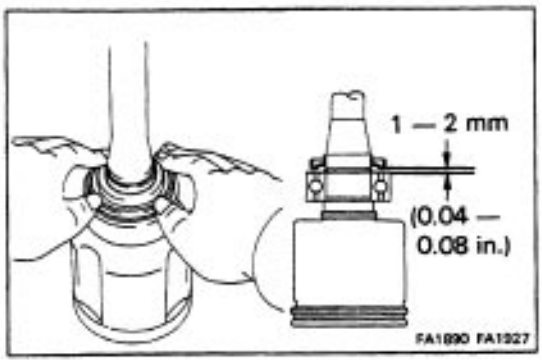


3–1. (TOYOTA TYPE)
INSTALL DUST COVERS

(a) Using SST, press in the dust cover.
SST 09506–35010

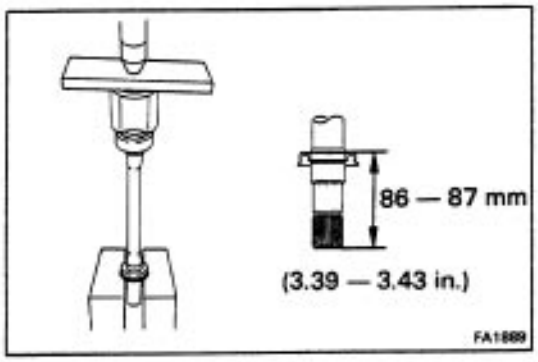


(b) Press in the dust cover as shown.

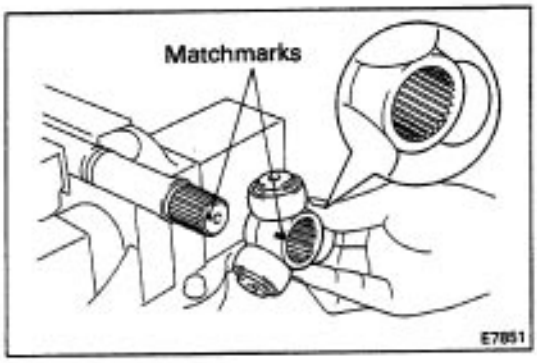


3–2. (GKN TYPE)
INSTALL DUST COVERS

a) Install the dust cover by your hand. (Drive shaft side)
HINT: The clearance between the dust cover and the bearing should be kept in the range shown in the illustration.

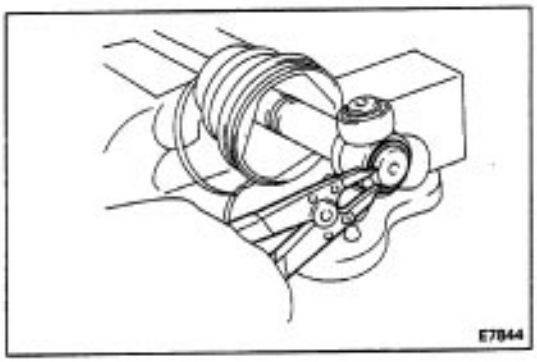


(b) Using a steel plate and press, press in the dust cover.
(Transaxle side)

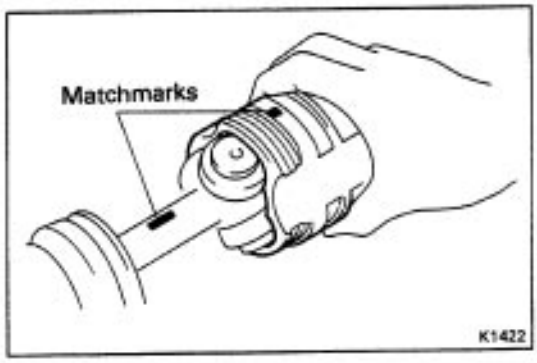


4. INSTALL TRIPOD JOINT

(a) Install a new snap ring.
(b) Align matchmarks to the tripod joint and drive shaft.
(c) Drive in the tripod joint.
HINT: do not drive the tripod joint roller.



(d) Using snap ring pliers, install the snap ring.

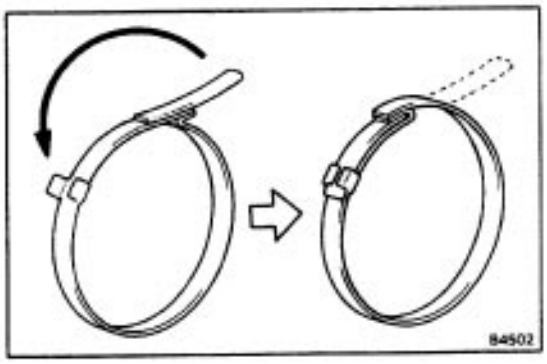


5. ASSEMBLE INBOARD JOINT

(a) Pack in grease to the inboard joint tulip.
HINT: Use the grease supplied in the boot kit.
Grease capacity:
TOYOTA Type: 232 g (0.51 lb)
GKN Type: 185 – 215 g (0.41 – 0.47 lb)
Grease color: Yellow ocher
(b) Align matchmarks drive shaft and inboard joint tulip.

8. PACK IN GREASE. TO OUTBOARD JOINT

(a) Pack in grease to the outboard joint.
HINT: Use the grease supplied in the boot kit:
Grease capacity:
TOYOTA Type: 120 g (0.26 lb)
GKN Type: 80 – 100 g (0.18 – 0.22 lb)
Grease color: Black



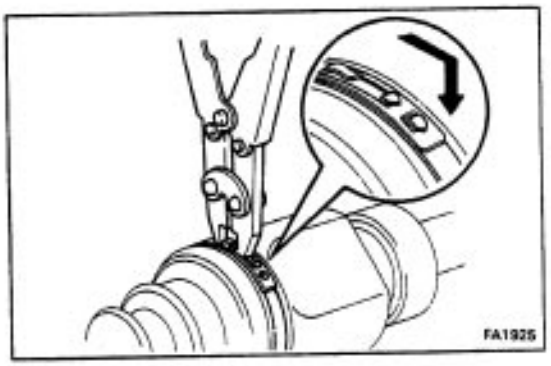
7.(TOYOTA TYPE)
INSTALL BOOT CLAMPS TO BOTH BOOT

(a) Be sure the boot is on the shaft groove.
(b) Bend the band and lock it as shown.

(c) Insure that the boot is no stretched or contracted when the drive shaft is at standard length.

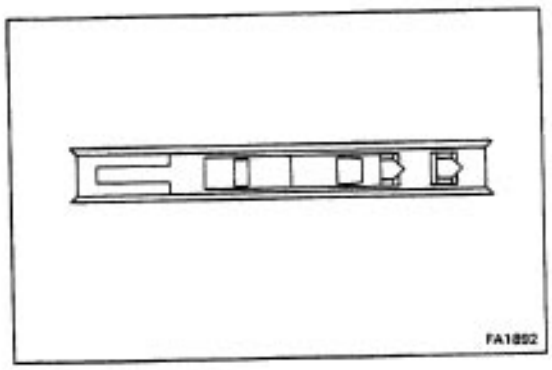
Drive shaft length:

LH 558.7 ± 5.0 mm (21.996 ± 0.197 in.)
R H 845.2 ± 5.0 mm (33.276 ± 0.197 in.)

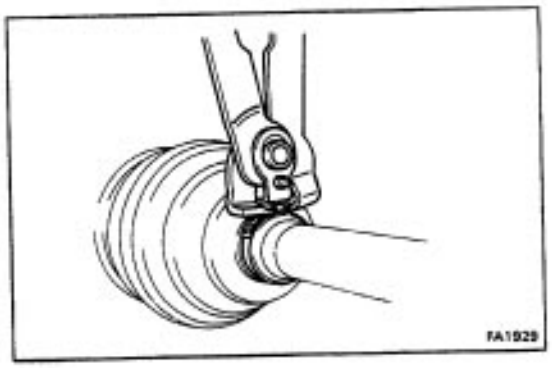


7–2. (GKN TYPE)
ASSEMBLE BOOT CLAMPS TO BOTH BOOT

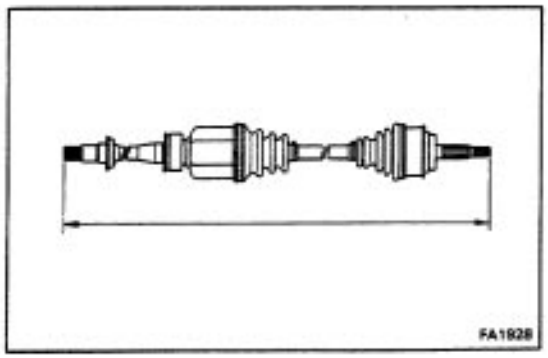
(a) Be sure the boot (large side) is on shaft groove.
(b) Using a boot clamp tool, place pincer jaws in closing hooks of large clamp.
(c) Secure clamp by drawing closing hooks together.



(d) Check that the clamp at closed position is the same as in the illustration.



(e) Be sure the boot (small side) is on the shaft groove.
(f) Using a boot clamp tool, tighten the clamp.

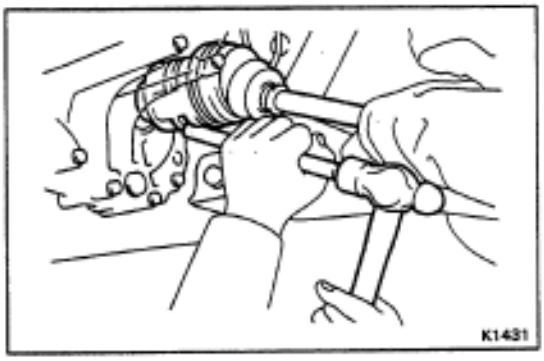


Insure that the boot is no stretched or contracted when the drive shaft is at standard length.

Drive shaft length:

LH 652.0 ± 6.0 mm (25.669 ± 0:236 in.)

R H 937.0 ± 6.0 mm (36.890 ± 0.236 in.)



INSTALLATION OF FRONT DRIVE SHAFT

(See page FA–15)

1. INSTALL LH DRIVE SHAFT

(a) Coat gear oil to the inboard joint tulip and differential case sliding surface.

(b) Using a brass bar and hammer, tap in the drive shaft unit it makes contact with the pinion shaft.

HINT:

Before installing the drive shaft, set the snap ring opening side facing downward.

Whether or not the drive shaft is making contact with the pinion shaft can be known by the sound or feeling when driving it in.

2. INSTALL RH DRIVE SHAFT

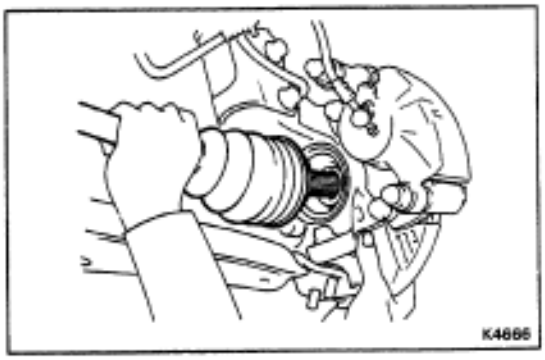
(a) Install the bearing bracket and stay with three bolts.

Torque: 650 kg–cm (47 ft–lb, 64 N–m)

(b) Coat gear oil to the inboard joint and differential sliding surface.

(e) Insert the RH drive shaft.

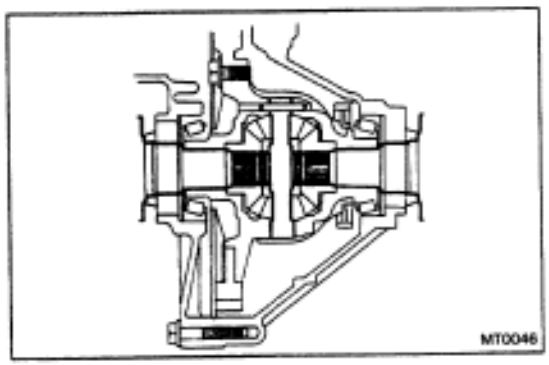
NOTICE: Do not damage the oil seal lip.



3. CONNECT DRIVE SHAFT TO AXLE HUB

Install the outboard joint side of the drive shaft to the axle hub.

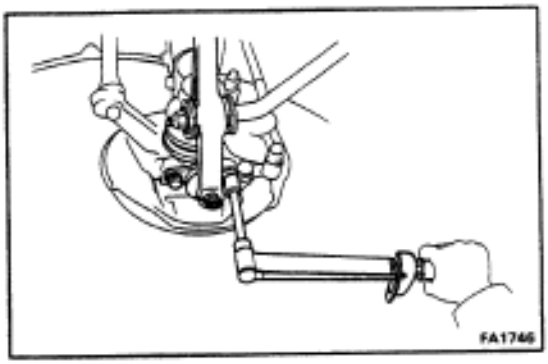
NOTICE: Do not damage the boot.



4. CHECK INSTALLATION OF FRONT DRIVE SHAFT

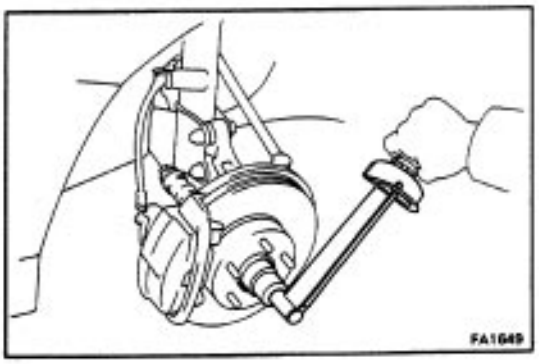
(a) Check that there is 2 3 mm (0.08 0.12 in.) of play in axial direction.

(b) Check that the drive shaft will not come out by trying to pull it completely out by hand.



5. CONNECT STEERING KNUCKLE TO LOWER BALL JOINT

Torque: 1,150 kg–cm (83 ft–lb, 113 N–m)



6. INSTALL BEARING LOCK NUT, LOCK NUT CAP AND NEW COTTER PIN

(a) Install and torque the bearing lock nut.

Torque: 1,900 kg–cm (137 ft–lb, 187 N–m)

(b) Install the lock nut cap and secure it with a new cotter pin.

7. FILL TRANSAXLE WITH FLU I6

(See page MT–39)

8. INSTALL FRONT FENDER APRON SEAL

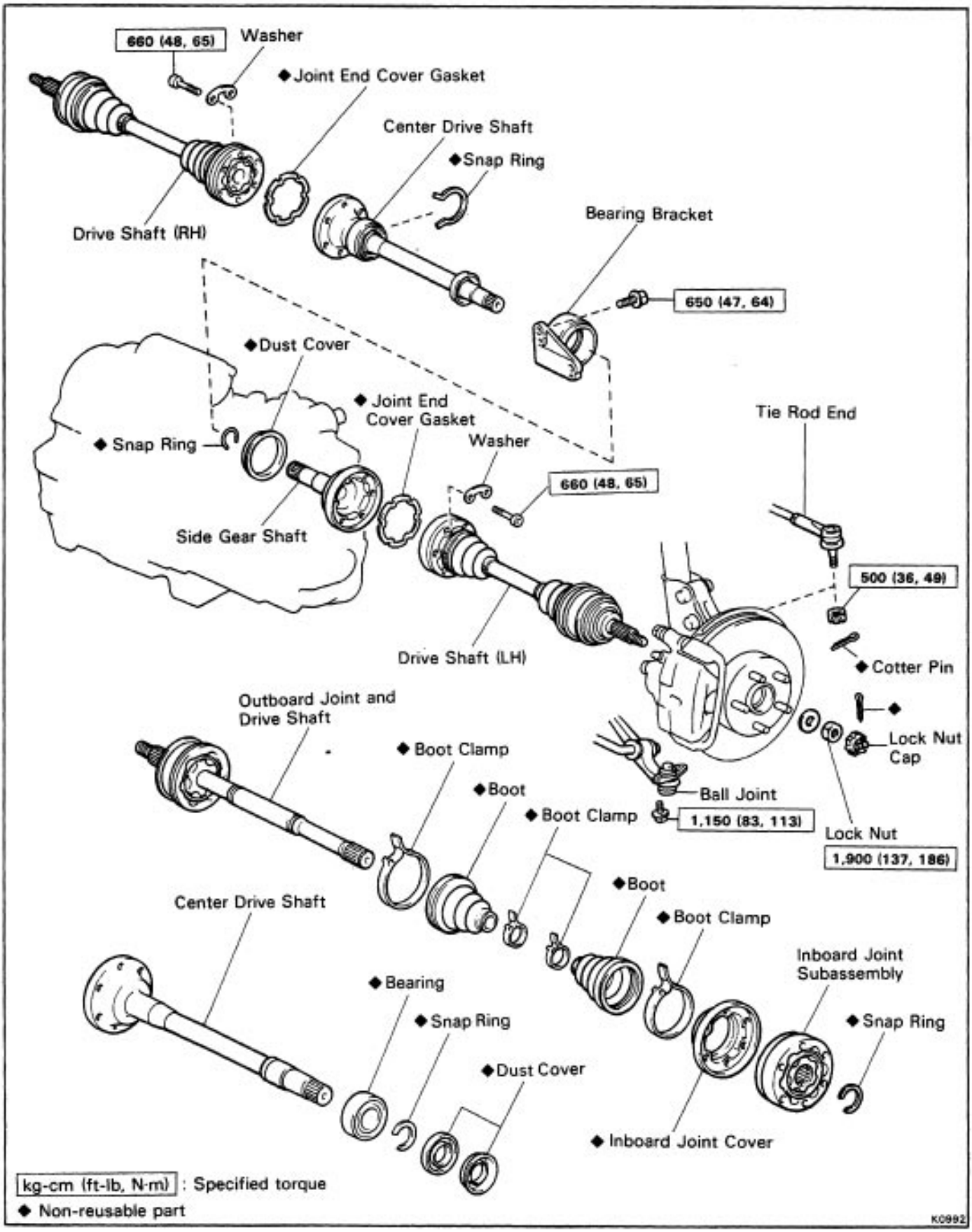
9. INSTALL ENGINE UNDER COVER

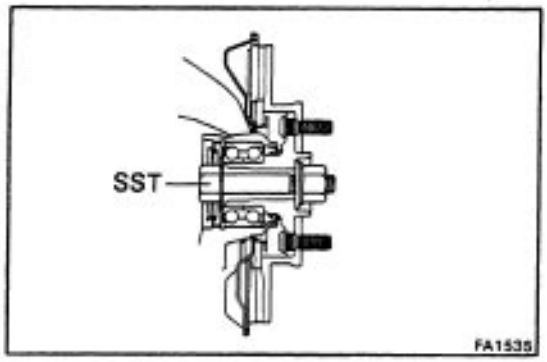
10. CHECK FRONT WHEEL ALIGNMENT

(See page FA–3)

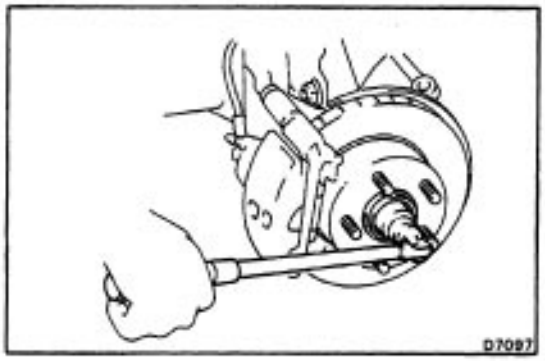
FRONT DRIVE SHAFT (FWD VZV21)

COMPONENTS





NOTICE: The hub bearing could be damaged if it is subjected to the vehicle weight, such as when moving the vehicle with the drive shaft removed. Therefore, if it is absolutely necessary to place the vehicle weight on the hub bearing, first support it with SST. .
SST 09608–16041 (09608–02020,09608–02040)



REMOVAL OF DRIVE SHAFT

(See page FA–28)

1. REMOVE COTTER PIN, LOCK NUT CAP AND LOCK NUT

(a) Remove the cotter pin and lock nut cap.

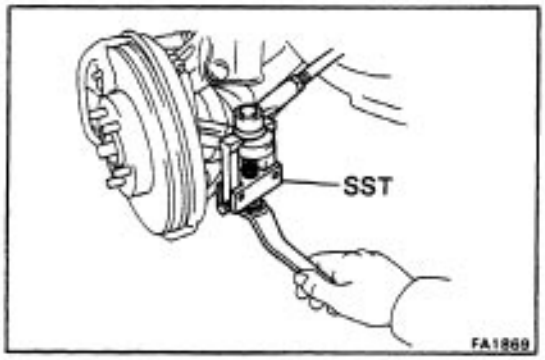
(b) Loosen the bearing lock nut while depressing the brake pedal.

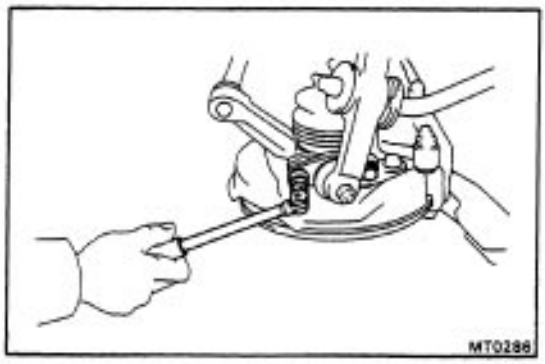
2. REMOVE ENGINE UNDER COVERS

3. DISCONNECT TIE ROD END

(a) Remove the cotter pin and nut from the tie rod end.

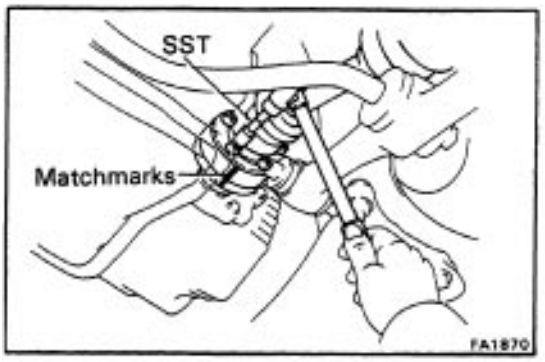
(b) Using SST, disconnect the tie rod end from the steering knuckle.
SST 09628–62011





4. DISCONNECT STEERING KNUCKLE FROM LOWER ARM

Remove the two bolts and disconnect the steering knuckle from the lower arm.



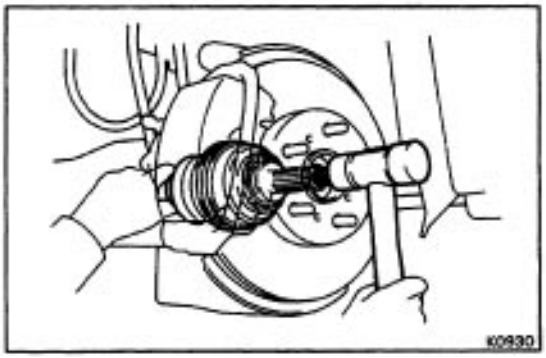
5. LOOSEN SIX BOLTS HOLDING DRIVE SHAFT TO DIFFERENTIAL SIDE GEAR SHAFT OR CENTER DRIVE SHAFT

(a) Place matchmarks on the drive shaft and side gear shaft or center drive shaft.

NOTICE: Do not use a punch to mark the matchmarks. Use paint, etc.

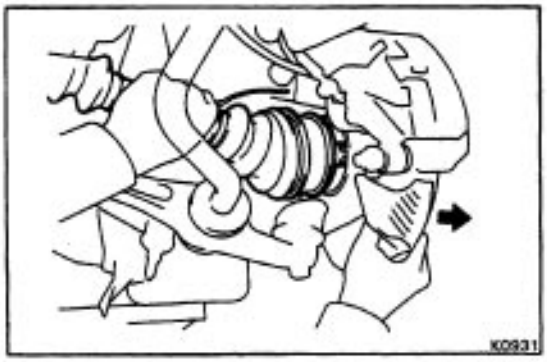
(b) Using SST, loosen the six hexagon bolts while depressing the brake pedal.
SST 09043–88010

HINT: Do not remove the bolts, finger tighten them not to drop down the drive shaft.

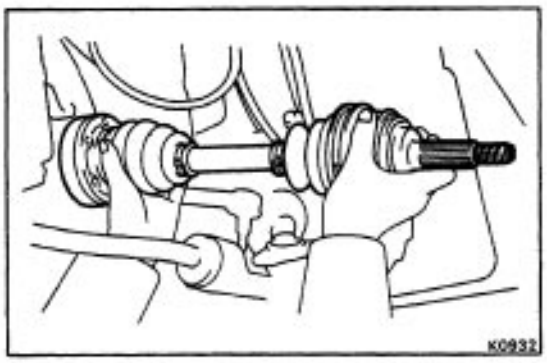


(c) Using a plastic hammer, disconnect the drive shaft from axle hub.

NOTICE: Cover the drive shaft boot with cloth to protect it from damage.



(d) Push the front axle hub toward the outside of the vehicle, and separate the drive shaft from the axle hub.

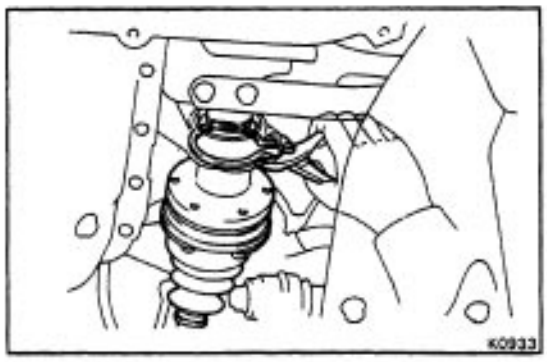


6. REMOVE DRIVE SHAFT (LH drive shaft)

(a) Remove the six bolts and three washers, and remove the LH drive shaft carefully.

NOTICE: When moving the drive shaft, do not compress the inboard boot so that the inside bails might be dropped out.

(b) Remove the joint end cover gasket from the drive shaft.

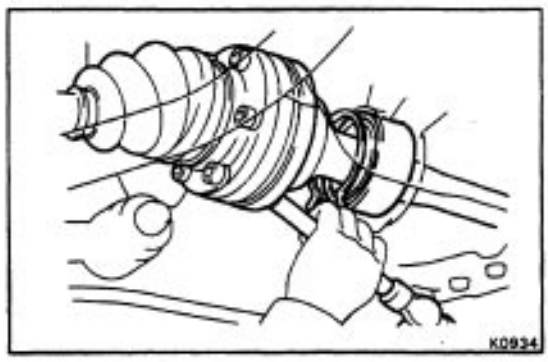


(RH drive shaft)

(a) Drain out the gear oil.

(b) Remove the bearing lock bolt.

(c) Using pliers, remove the snap ring, and pull out the drive shaft with the center drive shaft.



HINT: If the drive shaft could not be pulled out, using a brass bar and a hammer, tap out the drive shaft.

7. (LH SIDE)

DRAIN OUT GEAR OIL

8. (LH SIDE)

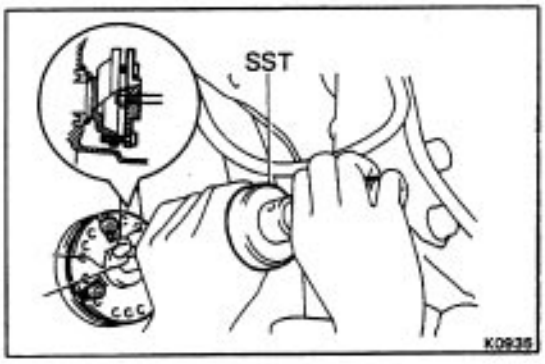
REMOVE SIDE GEAR SHAFT FROM TRANSAXLE

(a) In order to install the side gear shaft, push the side gear shaft to the differential.

Measure and note the distance between the transaxle case and the side gear shaft.

(b) Using SST, drive out the side gear shaft.

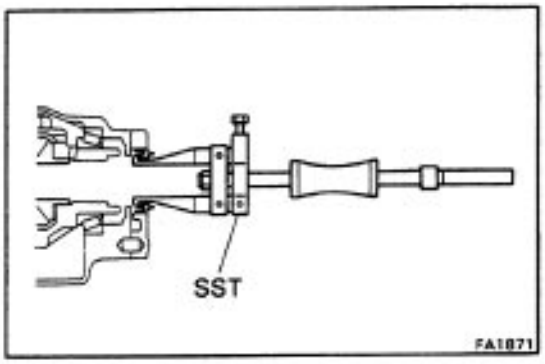
SST 09520–32012



9. IF NECESSARY, REPLACE SIDE GEAR SHAFT OIL SEAL

(a) Using SST, pull out the oil seal from the case.

SST 09308–00010

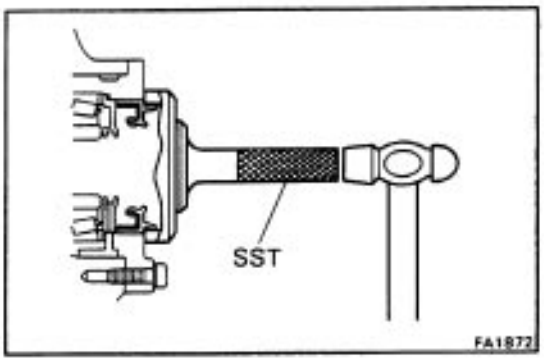


(b) Using SST and a hammer, tap in a new oil seal.

SST LH side

09223–15010

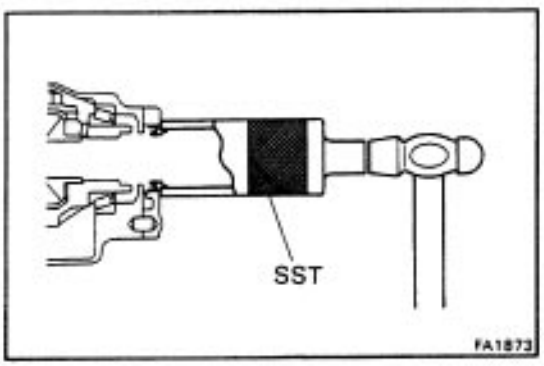
HINT: Coat the oil seal lip with MP grease.



SST RH side

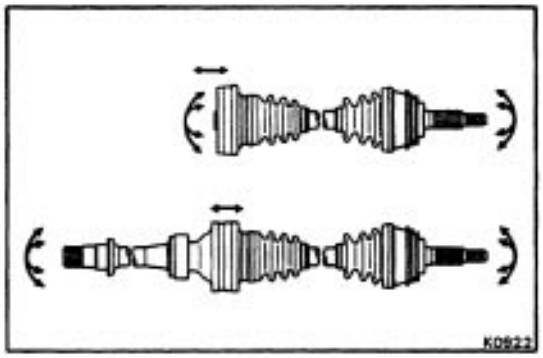
09316–60010 (09316–00010)

HINT: Coat the oil seal lip with MP grease.



DISASSEMBLY OF FRONT DRIVE SHAFT

(See page FA–28)



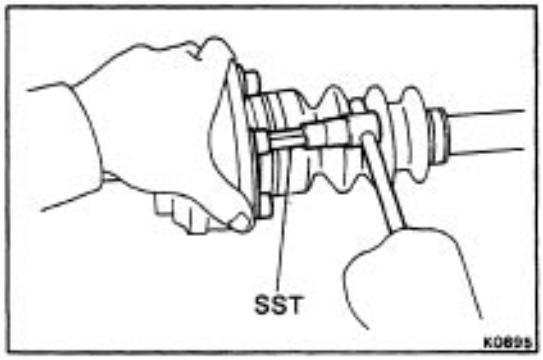
1. CHECK DRIVE SHAFT

(a) Check to see that there is no play in the inboard and outboard joints.

(b) Check to see that the inboard joint slides smoothly in the thrust direction.

(e) Check to see that there is no play in the radial direction of the inboard joint.

W Check the damage of boot.



2. (RH DRIVE SHAFT)

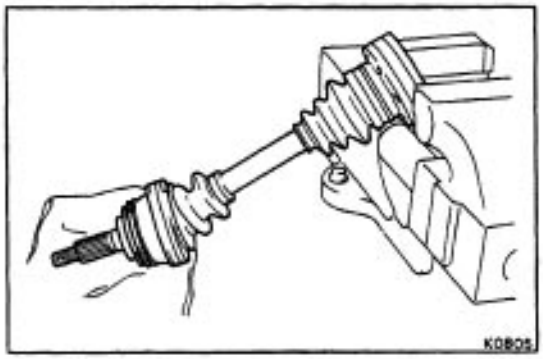
DISCONNECT CENTER DRIVE SHAFT

(a) Using SST, remove the six bolts and three washers, and disconnect the center drive shaft from the RH drive shaft.

SST 09923–00020

NOTICE: Do not compress the inboard boot.

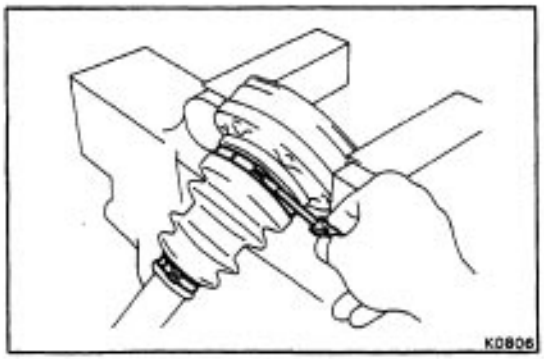
(b) Remove the joint end cover gasket from the drive shaft.



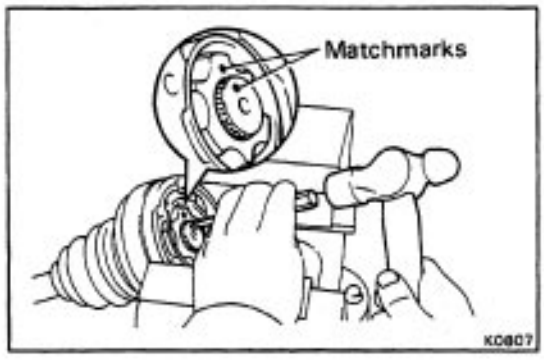
3. REMOVE INBOARD JOINT BOOT CLAMPS

(a) Using soft jaws, clamp the inboard joint in the vise.

NOTICE: Do not tighten the vise too tight not to damage the inboard joint.

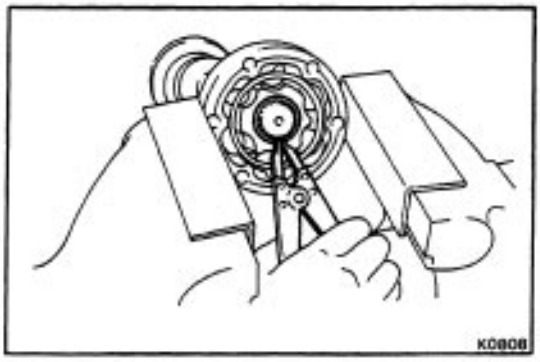


(b) Using a screwdriver, remove the inboard joint boot clamps.

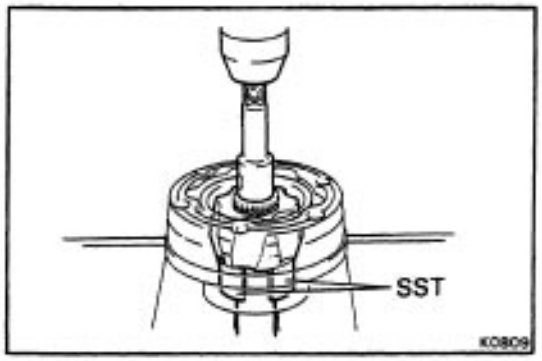


4. DISASSEMBLE INBOARD JOINT

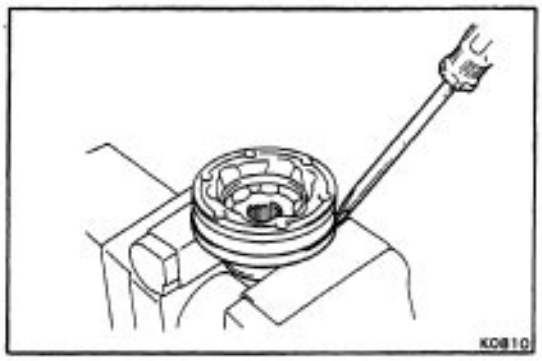
(a) Using a punch and a hammer, place the matchmarks on the shaft and inner race.



(b) Using snap ring pliers, remove the snap ring.

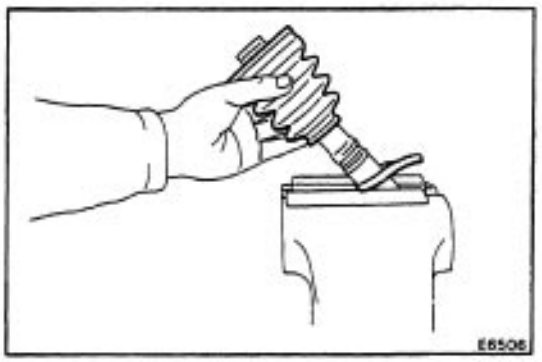


(c) Using SST, an extension bar and a press, remove the inboard joint from the drive shaft.
SST 09726–10010 (09726–00030)



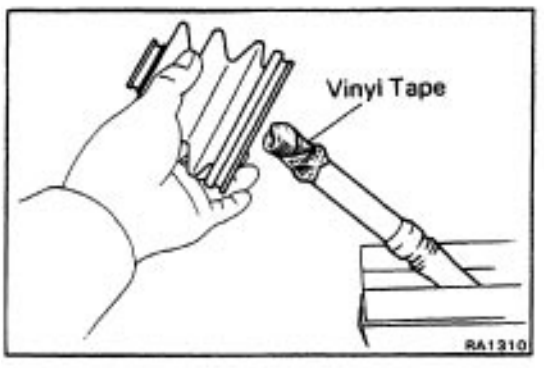
(d) Using a screwdriver and a hammer, remove the inboard joint from inboard joint cover.

NOTICE: When lifting the inboard joint, hold onto the inner race and outer race.



5. REMOVE BOOTS

(a) Remove the inboard joint boot and outboard joint boot.
(b) Check the inside and outside of the boots for damage.

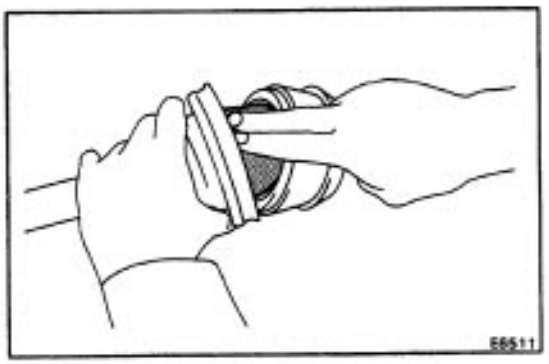


ASSEMBLY OF DRIVE SHAFT

(See page FA–28)

1. INSTALL OUTBOARD JOINT BOOT AND NEW BOOT CLAMP

HINT: Before installing the boot, wrap vinyl tape around the spline of the shaft to prevent damaging the boot.
Temporarily install the boot and a new clamp to the out–board joint.

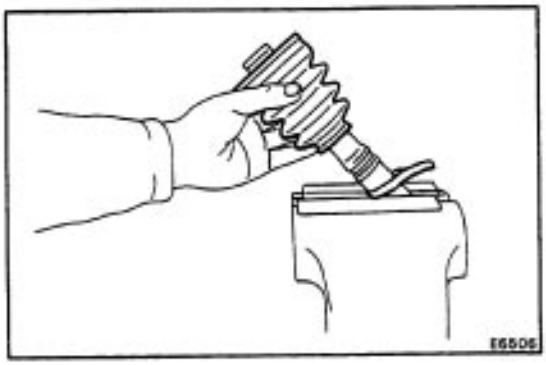


2. ASSEMBLE BOOT TO OUTBOARD JOINT

Before assembling the boot, pack in grease.

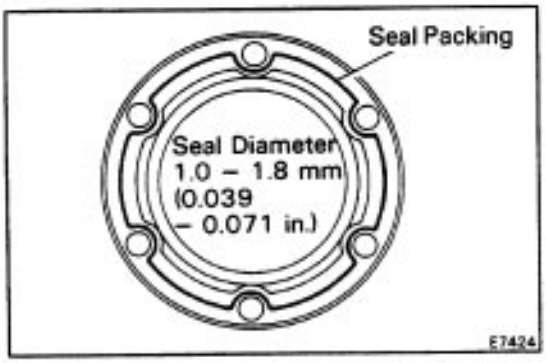
HINT: Use the grease supplied in the boot kit.

Grease capacity: 120 – 130 g (0.26 0.29 lb)



3. INSTALL NEW BOOT CLAMPS AND INBOARD JOINT BOOT

Temporarily install the two new boot clamps and inboard joint.

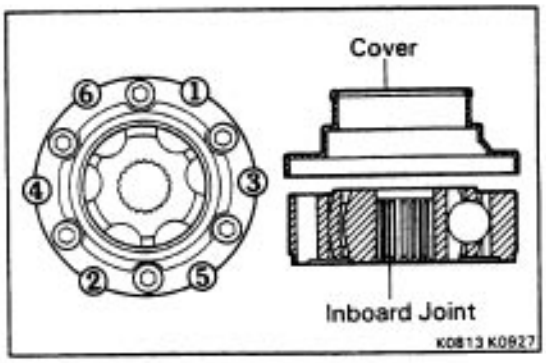


4. ASSEMBLE NEW INBOARD JOINT COVER

(a) Apply seal packing to the inboard joint cover as shown in the illustration.

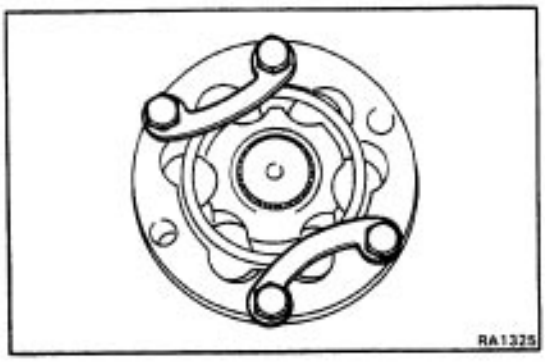
Seal packing: Part No. 08826–00801, THREE BOND 1121 or equivalent

HINT: Avoid applying an excess amount to the surface.



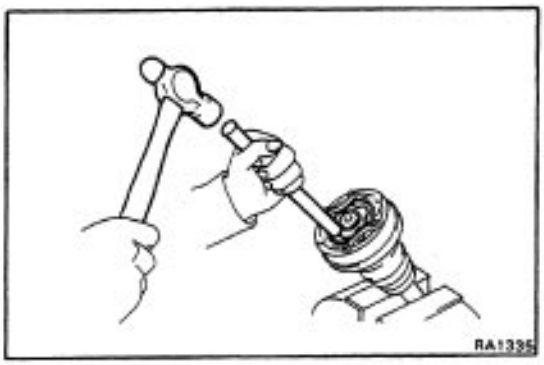
(b) Align the bolt holes of the cover with those of the inboard joint, then insert the hexagon bolts.

(c) Using a plastic hammer to tap the rim of the inboard joint cover into place. Do this in the order shown, and repeat several times.



(d) Use bolts, nuts and washers to keep the inboard joint together.

NOTICE: Tighten the bolts by hand to avoid scratching the flange surface.



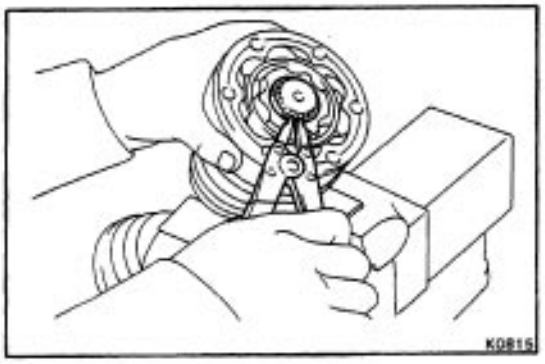
5. ASSEMBLE INBOARD JOINT

(a) Align the nnatchmarks placed before disassembly.

(b) Using a brass bar and hammer, tap the inboard joint onto the drive shaft.

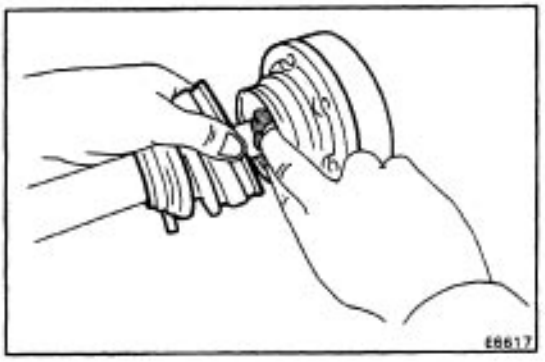
NOTICE: Make sure that the brass bar is touching the inner race, and not the cage.

(c) Remove the bolts, nuts and washers.



(d) Using snap ring pliers, install a new snap ring.

NOTICE: Work carefully not to come off the outer race.

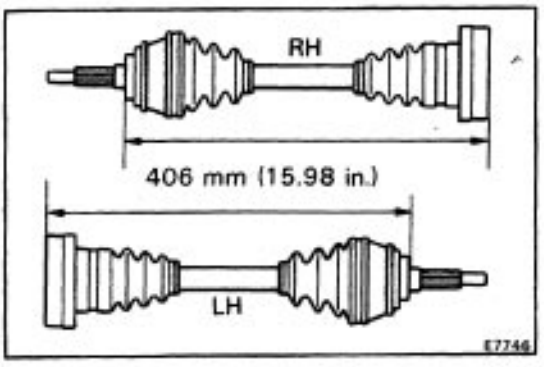


6. ASSEMBLE INBOARD JOINT BOOT TO INBOARD JOINT

Pack in grease to the inboard tulip and boot.

HINT: Use the grease supplied in the boot kit.

Grease capacity: 90 – 100 g (0.20 – 0.22 lb)

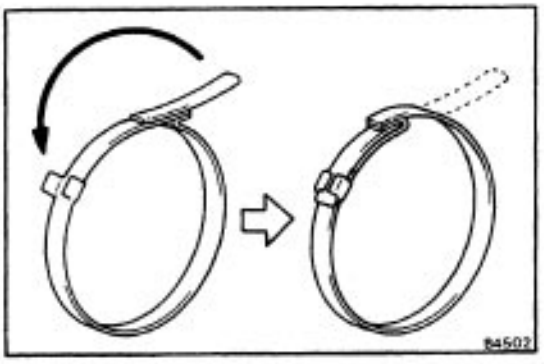


7. ASSEMBLE BOOT CLAMPS TO BOTH BOOTS

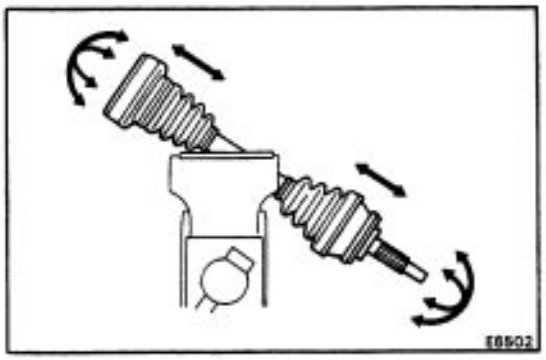
(a) Be sure the boot is on the shaft groove.

(b) Insure that the boot is not stretched or contracted when the drive shaft is at standard length.

Drive shaft length: 406 mm (15.98 in.)



(c) Bend the band and lock it as shown.

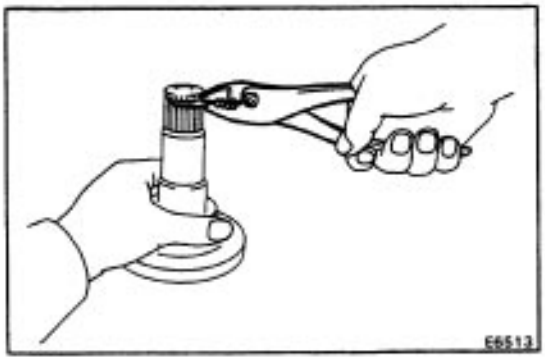


8. CHECK DRIVE SHAFT

(a) Check to see that there is no play in the inboard joint and outboard joint.

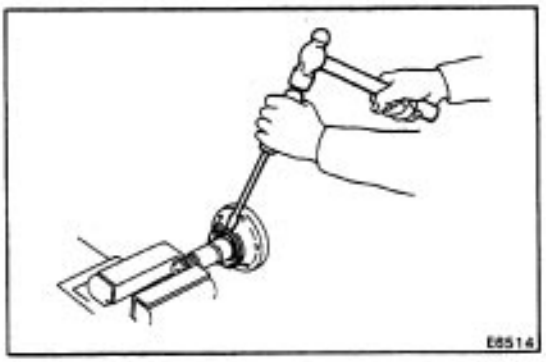
(b) Check to see that the inboard joint slides smoothly in the thrust direction.

DISASSEMBLY OF SIDE GEAR SHAFT



1. REMOVE SNAP RING

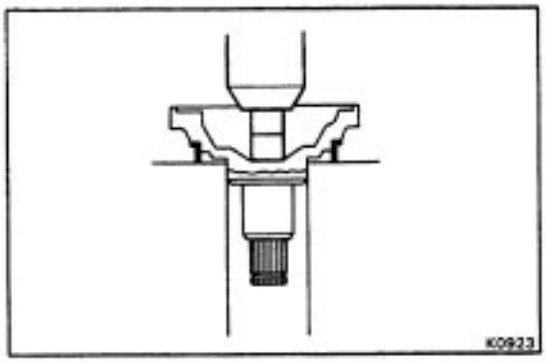
Using pliers, remove the snap ring.



2. REMOVE DUST COVER

Using a screwdriver and a hammer, remove the dust cover.

ASSEMBLY OF SIDE GEAR SHAFT

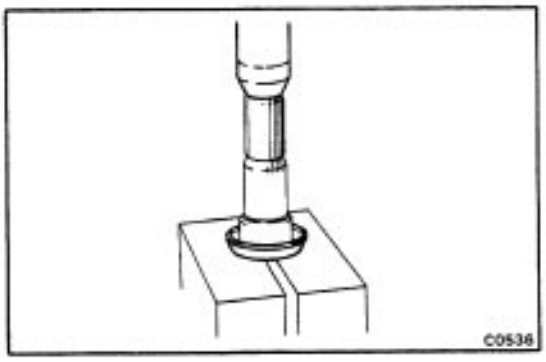


1. INSTALL DUST COVER

Using a press, press in the dust cover.

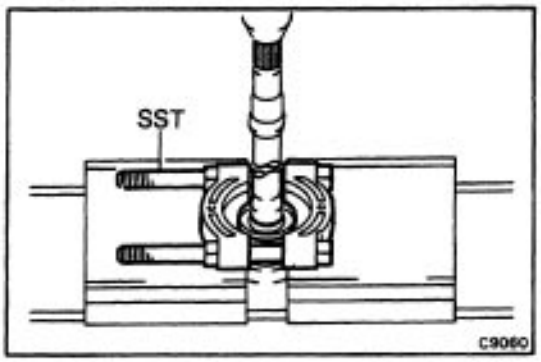
2. INSTALL SNAP RING

DISASSEMBLY OF CENTER DRIVE SHAFT

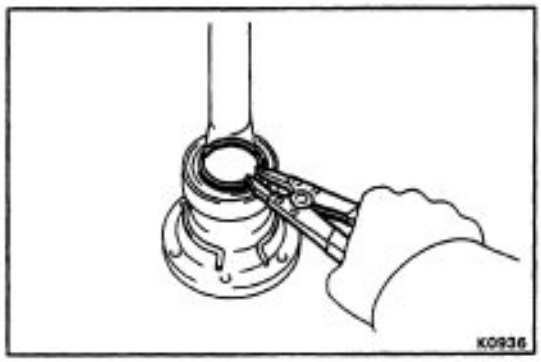


1. REMOVE DUST COVERS

(a) Using a press, press out the transaxle side dust cover.

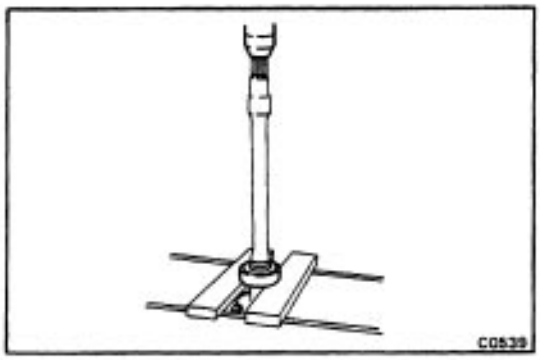


(b) Using SST and a press, press out the drive shaft side dust cover.
SST 09950–00020



2. REMOVE SNAP RING

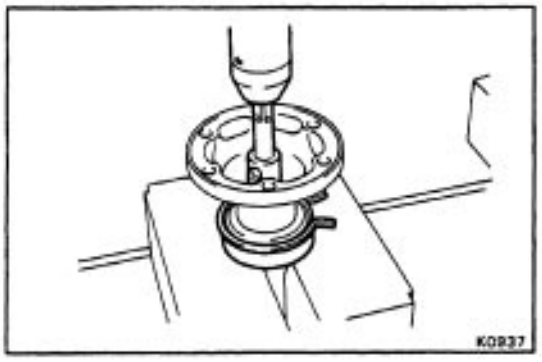
Using snap ring pliers, remove the snap ring.



3. REMOVE BEARING

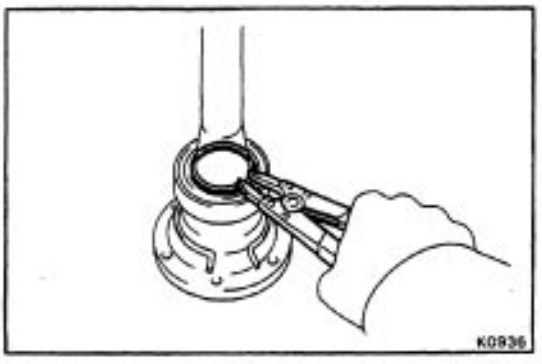
(a) Using a press, press out the bearing.
(b) Remove the snap ring.

ASSEMBLY OF CENTER DRIVE SHAFT

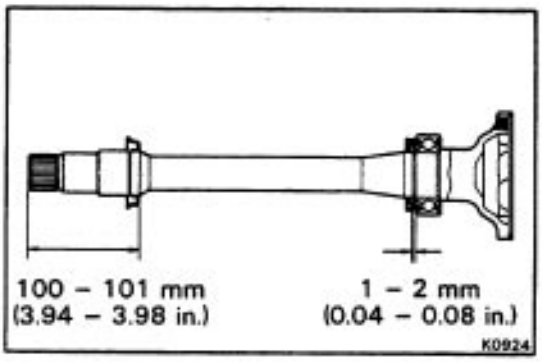


1. INSTALL BEARING

(a) Install the snap ring to the center drive shaft.
(b) Using a press and extension bar, press in the bearing.



(c) Using snap ring pliers, install a new snap ring.

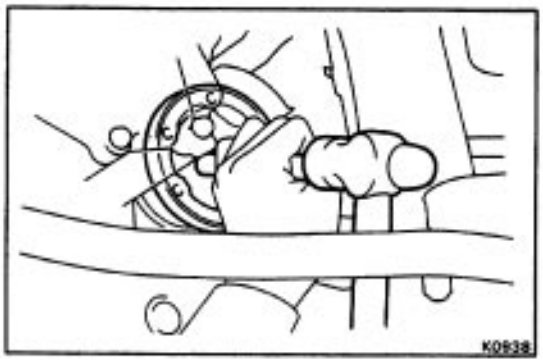


2. INSTALL DUST COVERS

(a) Using a press, press in the drive shaft side dust cover.

HINT: The clearance between the dust cover and the bearing should be kept in the range shown in the illustration.

(b) Using a press, press in the transaxle side dust cover.



INSTALLATION OF DRIVE SHAFT

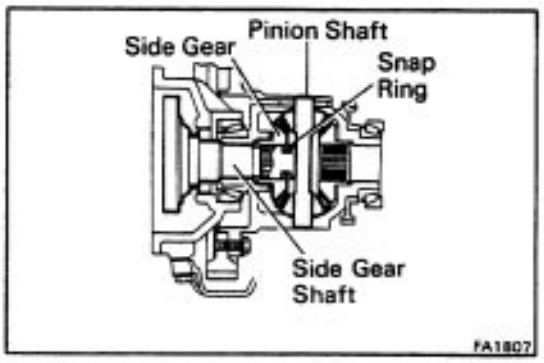
1. INSTALL SIDE GEAR SHAFT

(a) Insure that a new snap ring is positioned securely in the groove of the side gear shaft.

(b) Using a brass bar and hammer, tap in the drive shaft until it makes contact with the pinion shaft.

HINT:

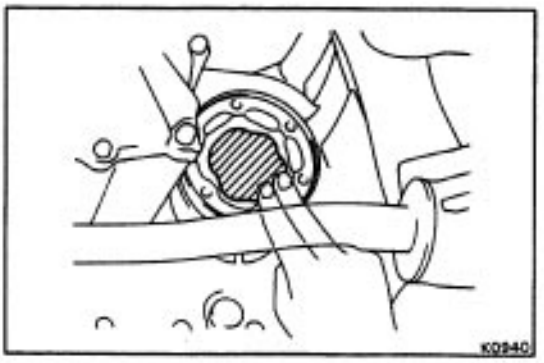
- Before installing the drive shaft, set the snap ring opening side facing downward.
- Whether or not the side gear shaft is making contact with the pinion shaft can be known by the sound or feeling when driving it in.



2. CHECK INSTALLATION OF SIDE GEAR SHAFT

(a) Check that the side gear shaft will not come out by trying to pull it completely out by hand.

(b) Push the side gear shaft to the differential and measure the distance between the side gear shaft and the transaxle case. Check that the distance between the two is the same as the measurement taken before removing the side gear shaft.



3. PACK IN GREASE TO SIDE GEAR SHAFT

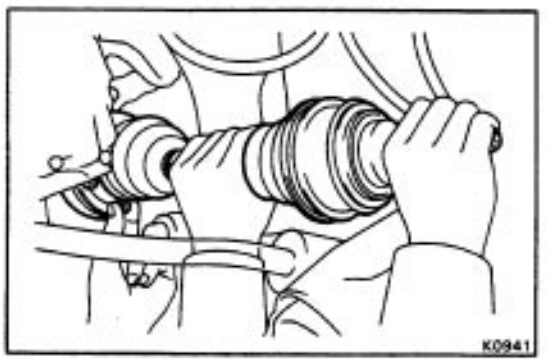
Pack in grease to the side gear shaft.

Grease capacity: 43 – 53 g (0.09 – 0.12 lb)

HINT: Use the grease supplied in the boot kit.

Supply of grease only is also available.

Part No. 90999–94029



4. INSTALL DRIVE SHAFT

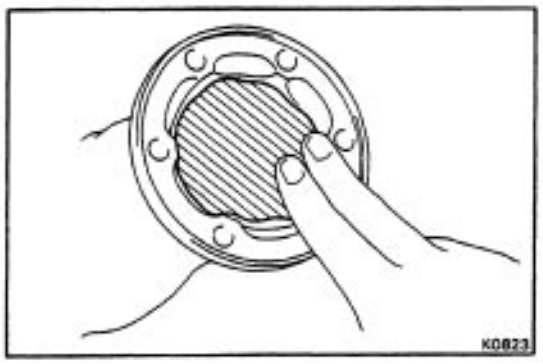
(LH drive shaft)

(a) Place the new gasket on the inboard joint.

(b) Align the matchmarks on the side gear shaft and inboard joint.

NOTICE: When moving the drive shaft, do not compress the inboard boot.

(c) Insert and finger tighten the six hexagon bolts and the three washers.



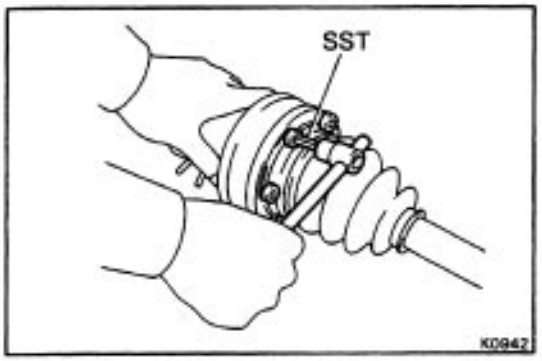
(RH drive shaft)

(a) Pack in grease to the center drive shaft.

Grease capacity: 43 53 g (0.O9 0.12 !b)

HINT: Use the grease supplied in the boot kit.
Supply of grease only is also available.
Part No. 90999–94029

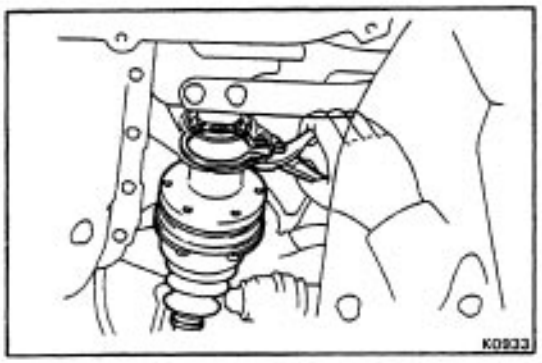
(b) Place the new gasket on the inboard joint.



(c) Install the center drive shaft to the RH drive shaft.

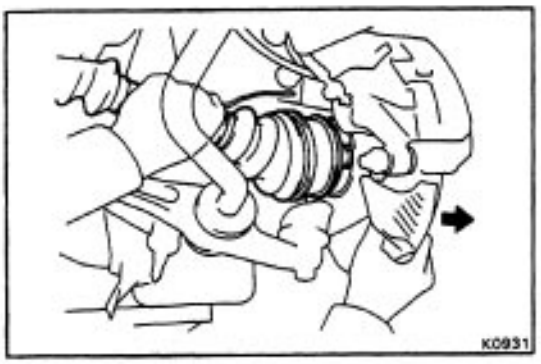
NOTICE: When moving the drive shaft, do not compress the inboard boot.

(d) Install the three washers and six hexagon bolts, and using SST, temporarily tighten them.
SST 09923–00020



(e) Install the drive shaft with the center drive shaft to the transaxle through the bearing bracket.

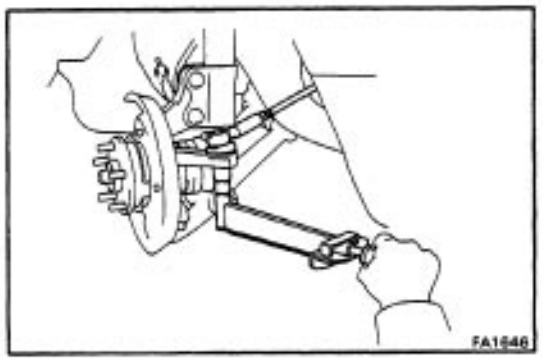
(f) Using pliers, install the snap ring.



5. INSTALL DRIVE SHAFT TO AXLE HUB

Install the outboard joint side of the drive shaft to the axle hub.

NOTICE: Be careful not to damage the boot, oil seal and deflector.



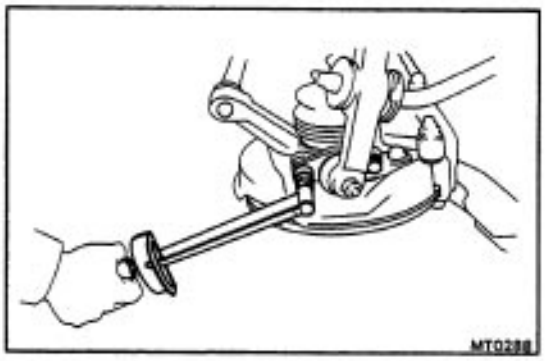
6. CONNECT TIE ROD END TO STEERING KNUCKLE

(a) Install and torque the nut.

Torque: 500 kg–cm (36 ft–lb, 49 N–m)

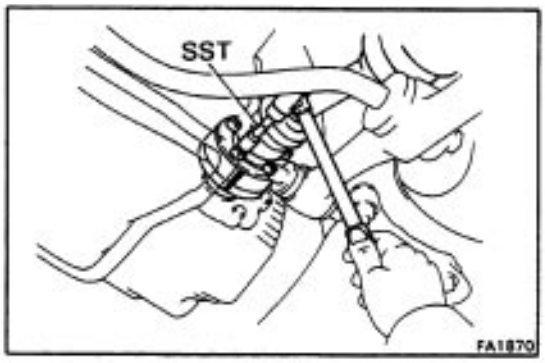
(b) Install a new cotter pin.

HINT: If the cotter pin hole does not line up, correct by tightening the nut by the smallest amount possible.



7. CONNECT STEERING KNUCKLE TO LOWER ARM

Torque: 1,150 kg–cm (83 ft–lb, 113 N–m)

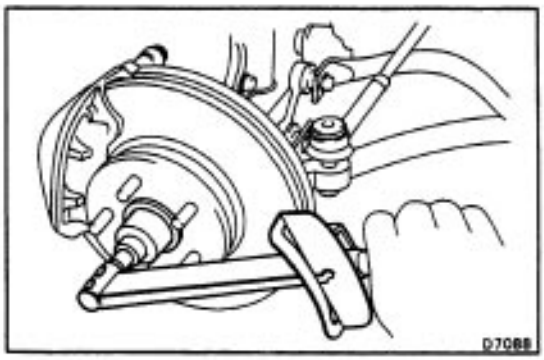


8. TIGHTEN SIX HEXAGON BOLTS

Using SST, tighten the six hexagon bolts while depressing the brake pedal.

SST 09043–88010

Torque: 660 kg–cm (48 ft–lb, 65 N–m)



9. INSTALL BEARING LOCK NUT, LOCK NUT CAP AND NEW COTTER PIN

(a) Torque the bearing lock nut while depressing the brake pedal.

Torque: 1,900 kg–cm (137 ft–lb, 186 N–m)

(b) Install the lock nut cap and, using pliers, install a new cotter pin.

10. FILL TRANSAXLE WITH GEAR OIL

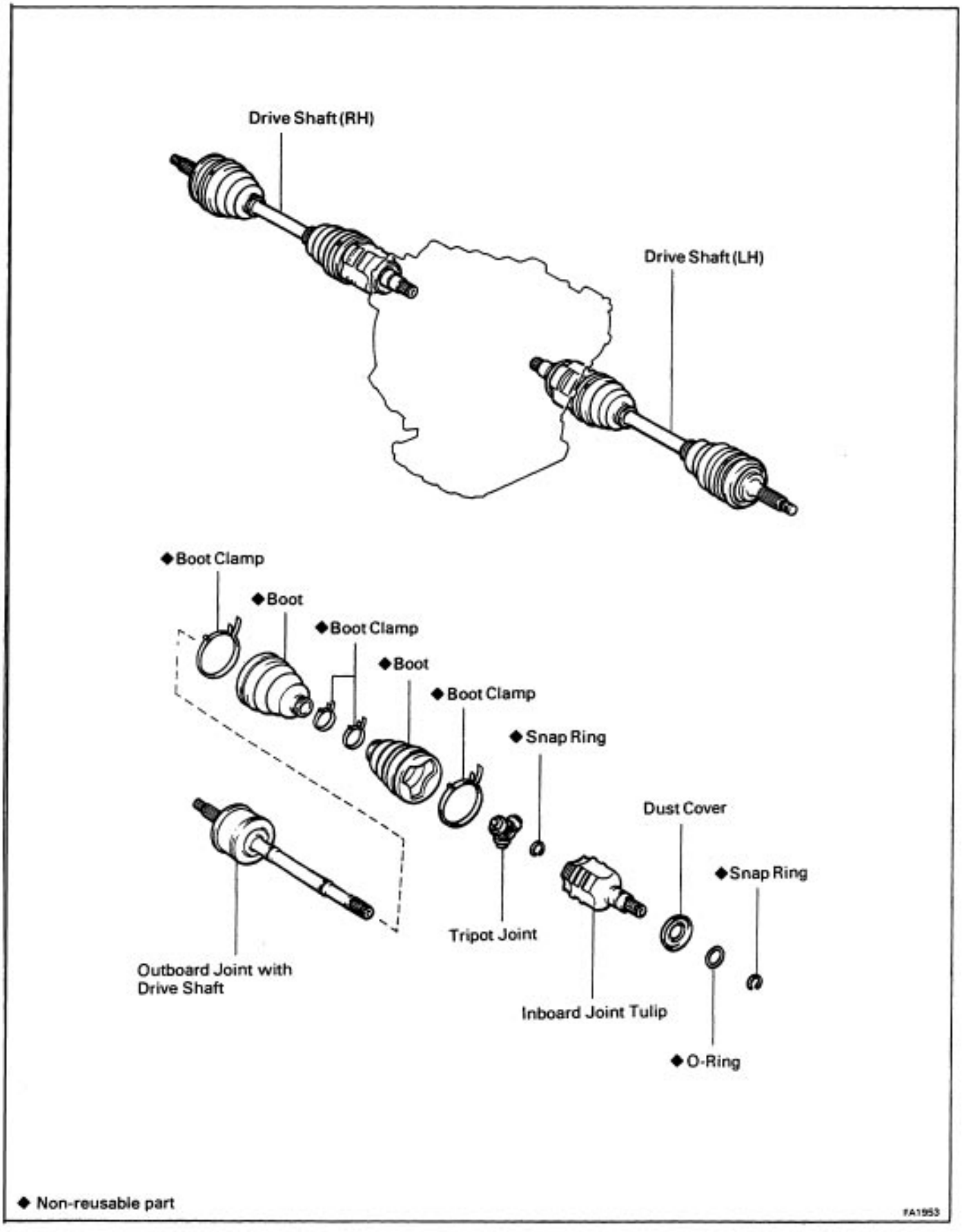
(See page MT–45)

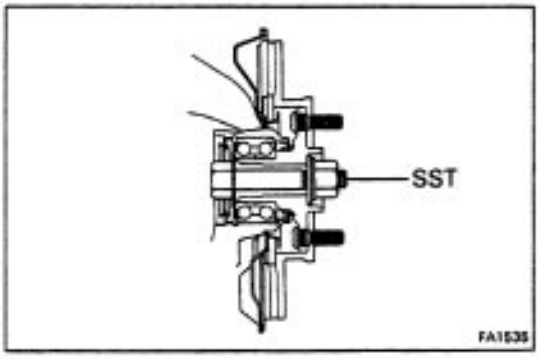
11. INSTALL ENGINE UNDER COVERS

12. CHECK FRONT WHEEL ALIGNMENT

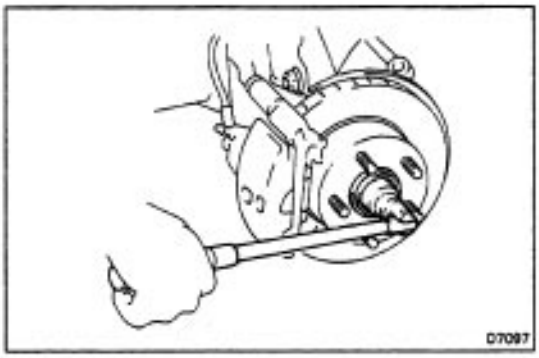
FRONT DRIVE SHAFT (4WD)

COMPONENTS





NOTICE: The hub bearing could be damaged if it is subjected to the vehicle weight, such as when moving the vehicle with the drive shaft removed. Therefore, if it is absolutely necessary to place the vehicle weight on the hub bearing, first support it with SST..
SST09608–16041 (09608–02020,09608–02040)



REMOVAL OF FRONT DRIVE SHAFT

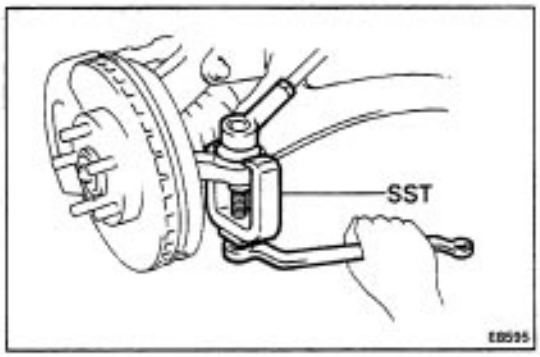
(See page FA–41)

1. REMOVE COTTER PIN, LOCK NUT CAP AND LOCK NUT

(a) Remove the cotter pin and lock nut cap.

(b) Loosen the bearing lock nut while depressing the brake pedal.

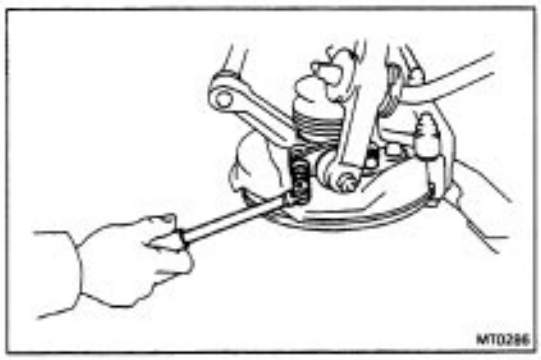
2. REMOVE ENGINE UNDER COVER RH AND LH



3. DISCONNECT TIE ROD END

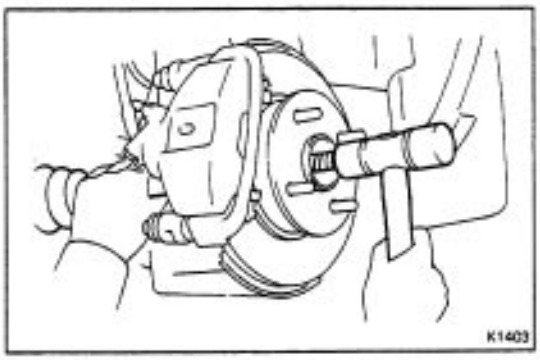
(a) Remove the cotter pin and nut from the tie rod end.

(b) Using SST, disconnect the tie rod end from the steering knuckle.
SST 09610–55021



4. DISCONNECT STEERING KNUCKLE FROM LOWER ARM

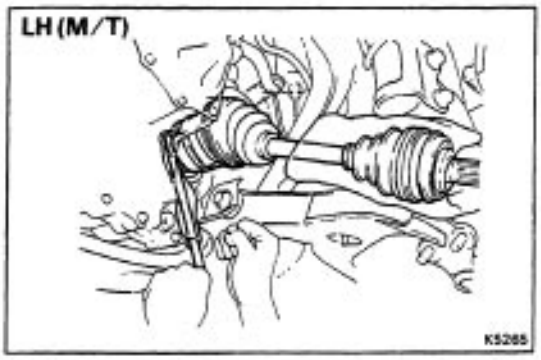
Remove the bolt and two nuts and disconnect the steering knuckle from the lower arm.



5. REMOVE FRONT DRIVE SHAFT

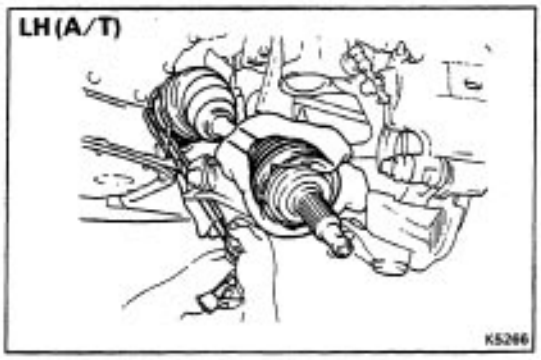
(a) Using a plastic hammer, disconnect the drive shaft from the axle hub.

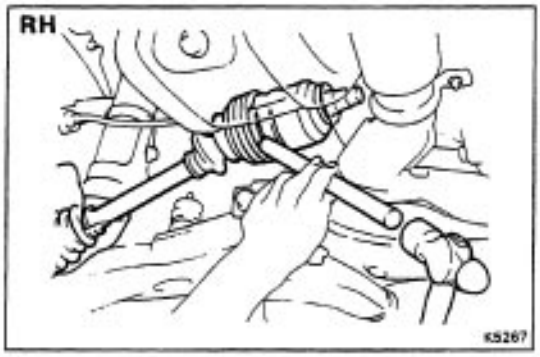
NOTICE: Cover the drive shaft boot with cloth to protect it from damage.



(b) Using hub nut wrench, remove the LH drive shaft as shown.

HINT: Be careful not to damage the dust cover.

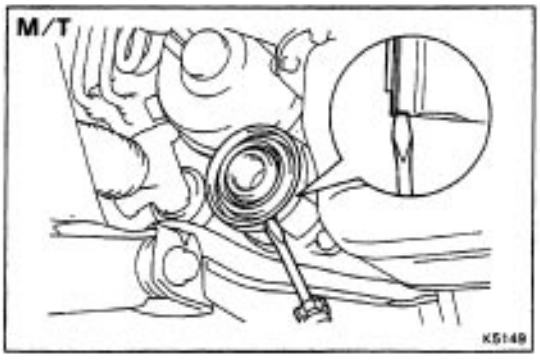


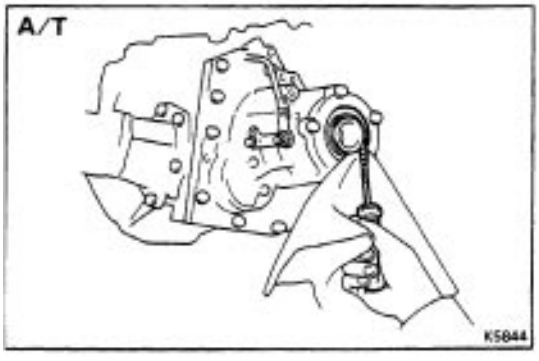


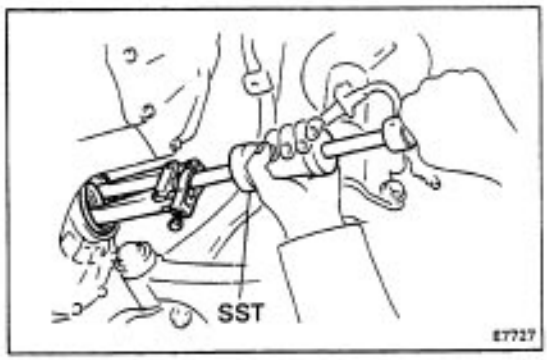
(c) Using a brass bar and a hammer, remove the RH drive shaft.

6. IF NECESSARY, REPLACE OIL SEAL

(a) Using a screwdriver, remove the RH oil seal.

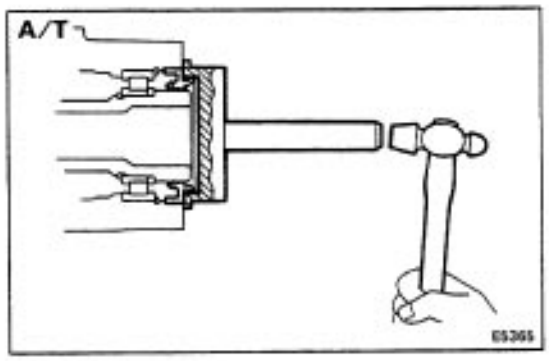




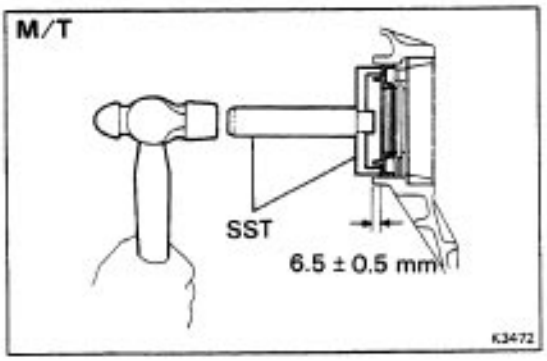


(b) Using SST, pull out the LH oil seal.
SST 09308–00010

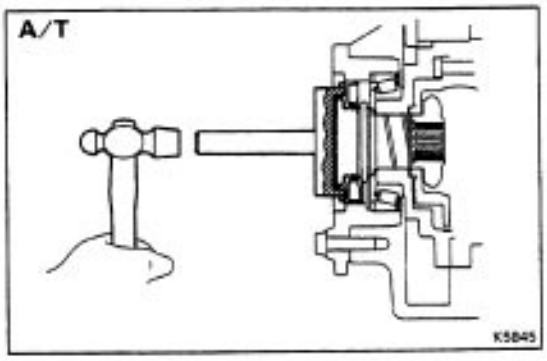
(c) Before installing the RH oil seal, coat the lip of oil seal with IMP grease.
(d) (M/T)
Using a blass bar, drive in a new oil seal.



(e) (A/T)
Using SST, drive in a new oil seal.
SST 09608–30022 (09608–05010), 09608–32010
Oil seal depth: 0 ± 0.3 mm (0.012 in.)



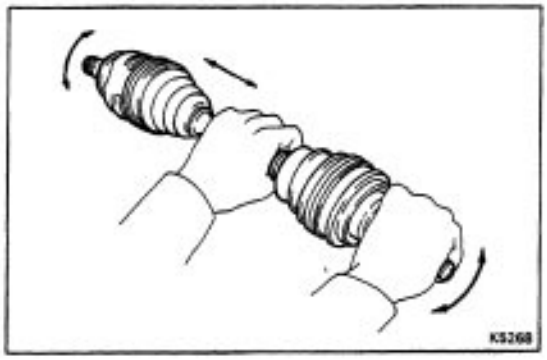
(f) Before installing the LH oil seal, coat the lip of oil seal with MP grease.
(9) (M/T)
Using SST, drive in a new oil seal.
SST 09550–22011 (09550–00020, 09550–00031)
Drive in depth: 6.5 ± 0.5 mm (0.26 ± 0.02 in.)



(h) (A/T)
Using SST, drive in a new oil seal.
SST 09608–30022 (09608–05010), 09608–32010
Drive in depth: 0 ± 0.5 mm (0 ± 0.02 in.)

DISASSEMBLY OF FRONT DRIVE SHAFT

(See page FA–41)



1. CHECK DRIVE SHAFT

(a) Check to see that there is no play in the outboard joint.

(b) Check to see that the inboard joint slides smoothly in the thrust direction.

(c) Check to see that there is not remarkable play in the radial direction of the inboard joint.

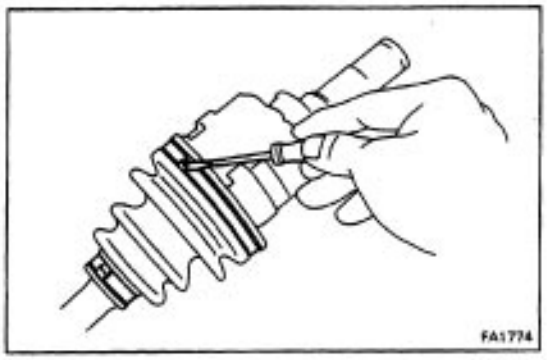
(d) Check for damage to boots.

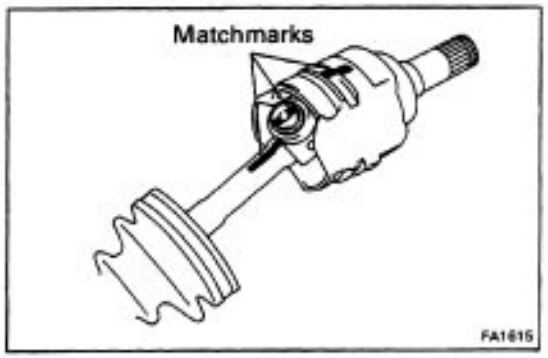
2. REMOVE SNAP RING FROM INBOARD JOINT SHAFT

3. REMOVE INBOARD JOINT BOOT CLAMPS

(a) Using a screwdriver, remove the two boot clamps.

(b) Slide the inboard joint boot toward the outboard joint.



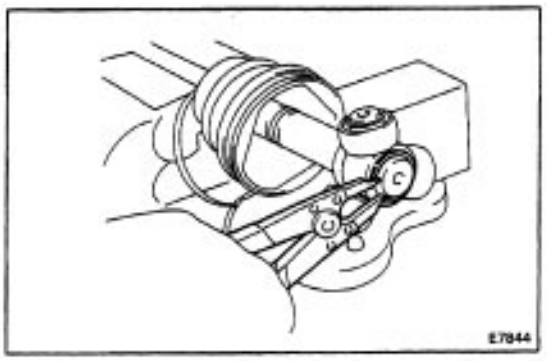


4. REMOVE INBOARD JOINT TULIP

(a) Place the matchmarks on the inboard joint tulip and tripod.

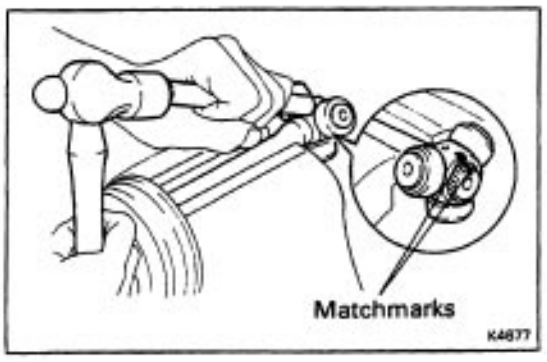
NOTICE: Do not punch the marks.

(b) Remove the inboard joint tulip from the drive shaft.



5. REMOVE TRIPOD JOINT

(a) Using snap ring pliers, remove the snap ring.



(b) Place the matchmarks on the drive shaft and tripod.

(c) Using a brass bar and a hammer, remove the tripod joint from the drive shaft.

NOTICE: Do not tap the roller.

6. REMOVE INBOARD JOINT BOOT

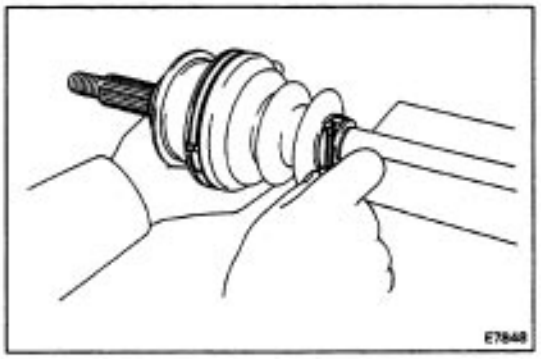
Slide out the inboard joint boot.

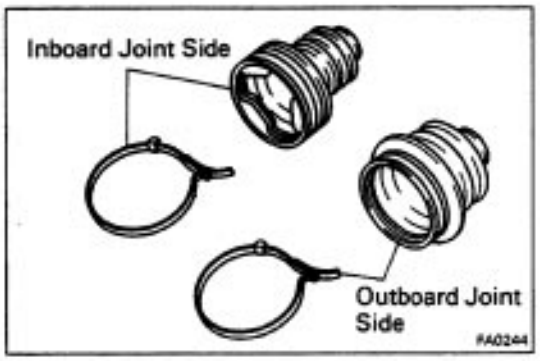
7. REMOVE OUTBOARD JOINT BOOT

(a) .Using a screwdriver, remove the two boot clamps of the outboard joint boot.

(b) Remove the boot from the outboard joint.

NOTICE: Do not disassemble the outboard joint.



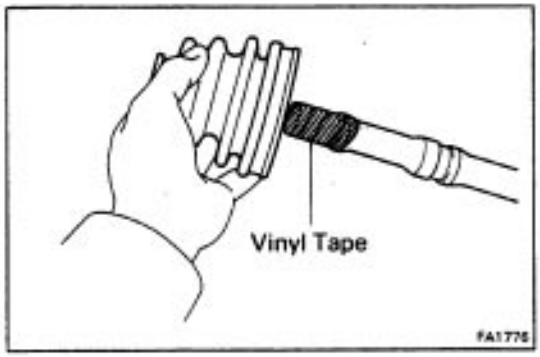


ASSEMBLE OF FRONT DRIVE SHAFT

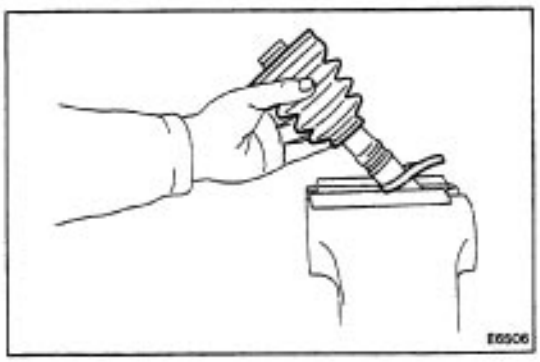
(See page FA–41)

1. TEMPORARILY INSTALL NEW OUTBOARD JOINT BOOT AND NEW BOOT CLAMPS

NOTICE: The boot and clamp of the outboard joint are smaller than those of the inboard joint.

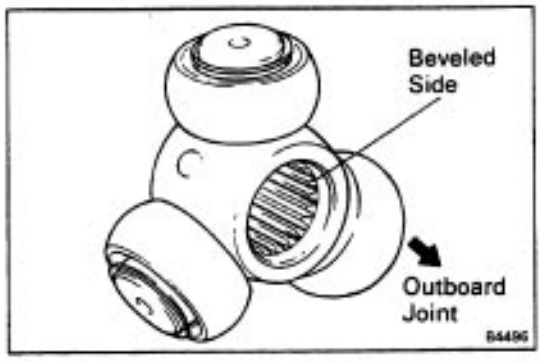


Temporarily install the boot and two new boot clamps for the outboard joint to the drive shaft.
HINT: Before installing the boot, wrap vinyl tape around the spline of the drive shaft to prevent damaging the boot.



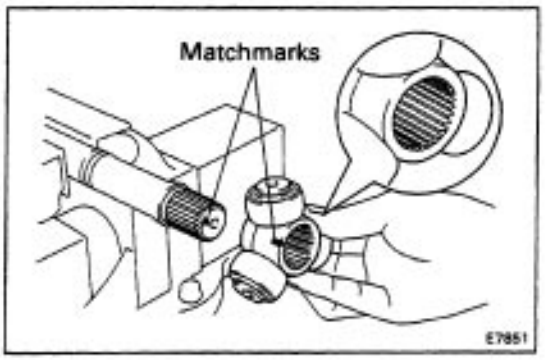
2. TEMPORARILY INSTALL INBOARD JOINT BOOT AND NEW BOOT CLAMPS

Temporarily install the boot and two new boot clamps for the inboard joint to the drive shaft.

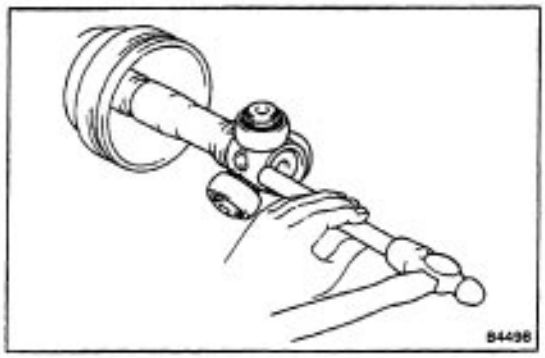


3. INSTALL TRIPOD JOINT

(a) Place the beveled side of the tripod joint axial spline toward the outboard joint.

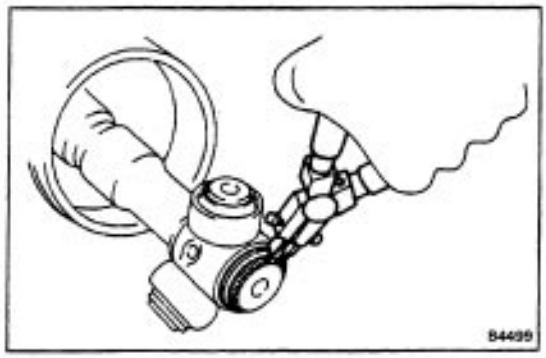


(b) Align the matchmarks placed before remove.

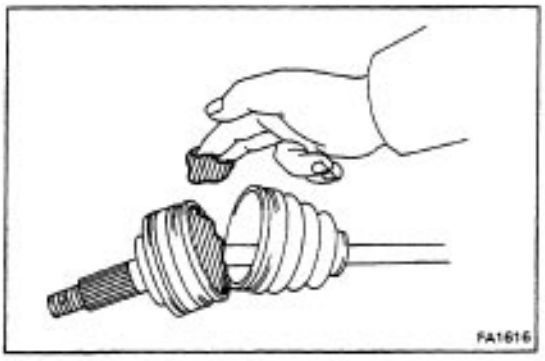


(c) Using a brass bar and a hammer, tap in the tripod joint to the drive shaft.

NOTICE: Do not tap the roller.



(d) Using snap ring pliers, install a new snap ring.



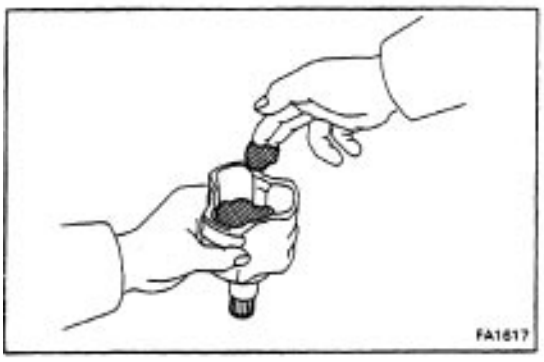
4. INSTALL BOOT TO OUTBOARD JOINT

Before assembling the boot, fill grease into the outboard joint and boot.

HINT: Use the grease supplied in the boot kit.

Grease capacity: 120 – 130 g (0.26 – 0.29 lb)

Grease color: Black



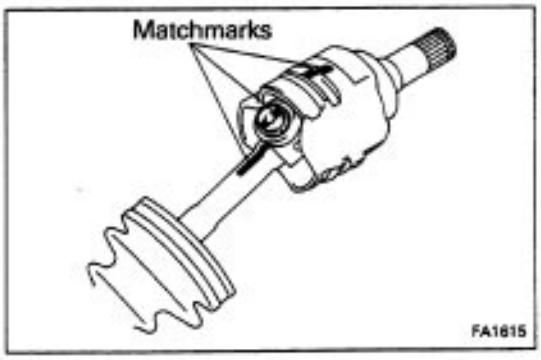
INSTALL INBOARD JOINT TULIP TO FRONT DRIVE SHAFT

(a) Pack in the grease to the inboard joint tulip and boot.

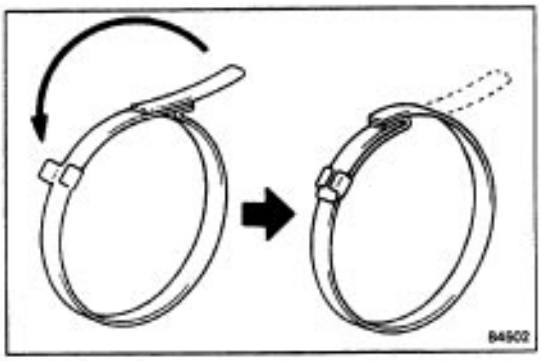
HINT: Use the grease supplied in the boot kit.

Grease capacity: 180 – 190 g (0.40 – 0.42 lb)

Grease color: Yellow ocher

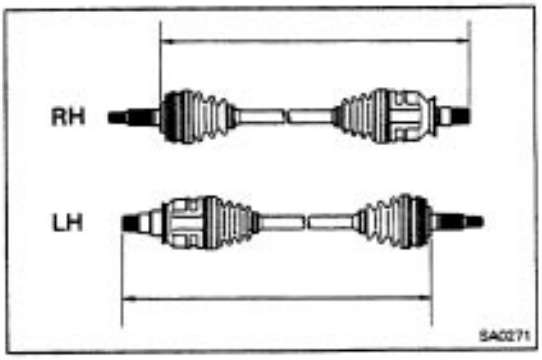


(b) Align the matchmarks placed before remove, and install the inboard joint tulip to the drive shaft.
(e) Install the boot to the inboard joint tulip.



6. ASSEMBLE BOOT CLAMPS

(a) Be sure the boot is on the shaft groove.
(b) Using a screwdriver, bend the band and lock it as shown in the illustration.



(c) Insure that the boot is not stretched or contracted when the drive shaft is at standard length.

Drive shaft standard length:

(M/T) LH 512.5 ± 5.0 mm (20.177 ± 0.197 in.)
R H 512.5 ± 5.0 mm (20.177 ± 0.197 in.)
(A/T) LH 512.5 ± 5.0 mm (20.177 ± 0.197 in.)
R H 515.7 ± 5.0 mm (20.303 ± 0.197 in.)

(d) Install the snap ring.

INSTILLATION OF FRONT DRIVE SHAFT

(See page FA–41)

1. INSTALL FRONT DRIVE SHAFT

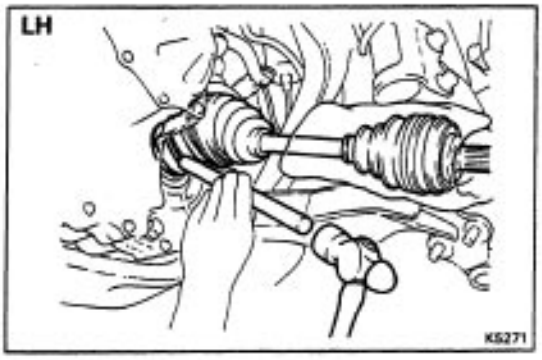
(a) Coat MP grease to the oil seal lip.

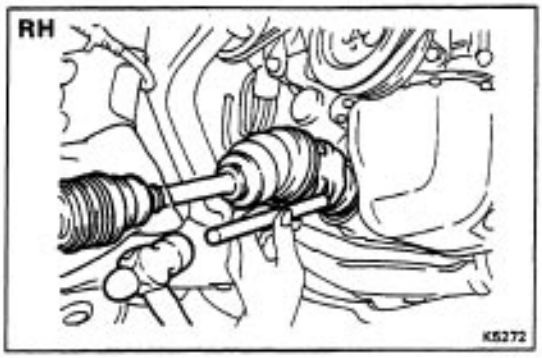
(b) Using a brass bar and a hammer, tap in the drive shaft until it makes contact with the pinion shaft.

NOTICE: Be careful not to damage the boots.

HINT:

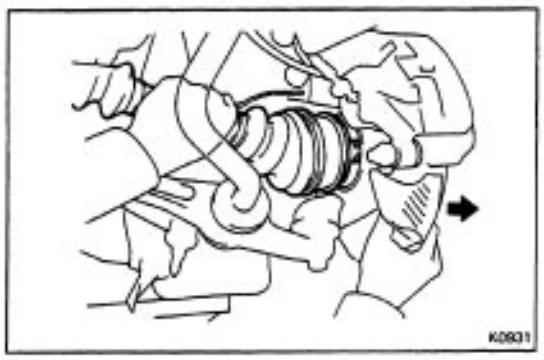
- Before installing the drive shaft, set the snap ring opening side facing downward.
- Whether or not the drive shaft is making contact with the pinion shaft can be known by the sound or feeling when driving it in.





(c) Install the outboard joint side of the drive shaft to the axle hub.

NOTICE: Be careful not to damage the boot.

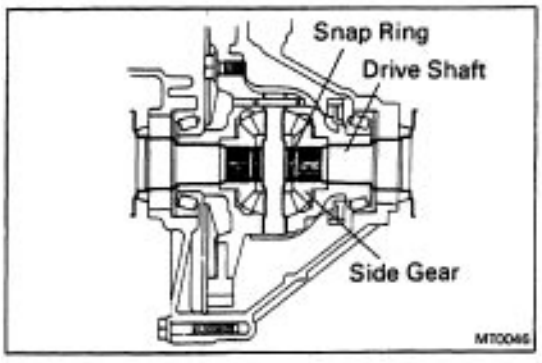


2. CHECK INSTALLATION OF FRONT DRIVE SHAFT

(a) Check that there is 2 3 mm (0.08 0.12 in.) of play in axial direction.

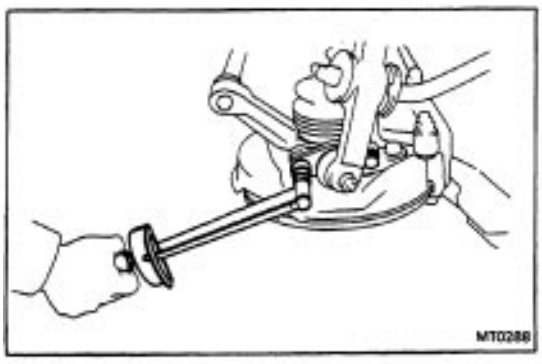
(b) Check that the drive shaft will not come out by trying to pull it completely out by hand.

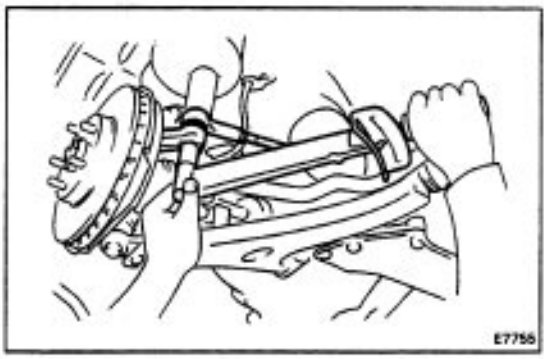
HINT: When checking pull the inboard joint so as not to damage the boot.



3. CONNECT STEERING KNUCKLE TO LOWER ARM

Torque: 1,15O kg–cm (83 ft–lb, 113 N–m)

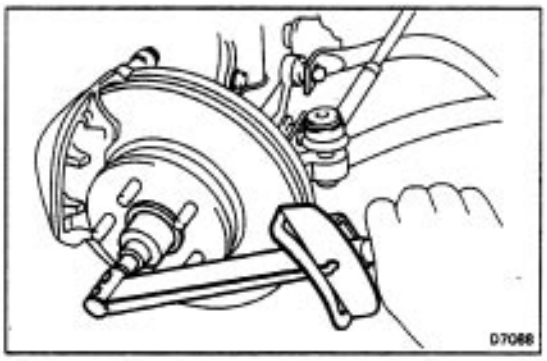




4. CONNECT TIE ROD END TO STEERING KNUCKLE

Install and torque the nut, and secure it with a new cotter pin.

Torque: 500 kg–cm (36 ft–lb, 49 N–m)



5. INSTALL BEARING LOCK NUT, LOCK NUT CAP AND COTTER PIN

(a) Torque the bearing lock nut while depressing the brake pedal.

Torque: 1, 900 kg–cm (137 ft–lb, 186 N–m)

(b) Install the lock nut cap and, using pliers, install a new cotter pin.

6. FILL TRANSAXLE WITH GEAR OIL OR FLUID

M/T (See page MT–1 17)

A/T Fluid type: ATF DEXRON® II

7. INSTALL ENGINE UNDER COVERS

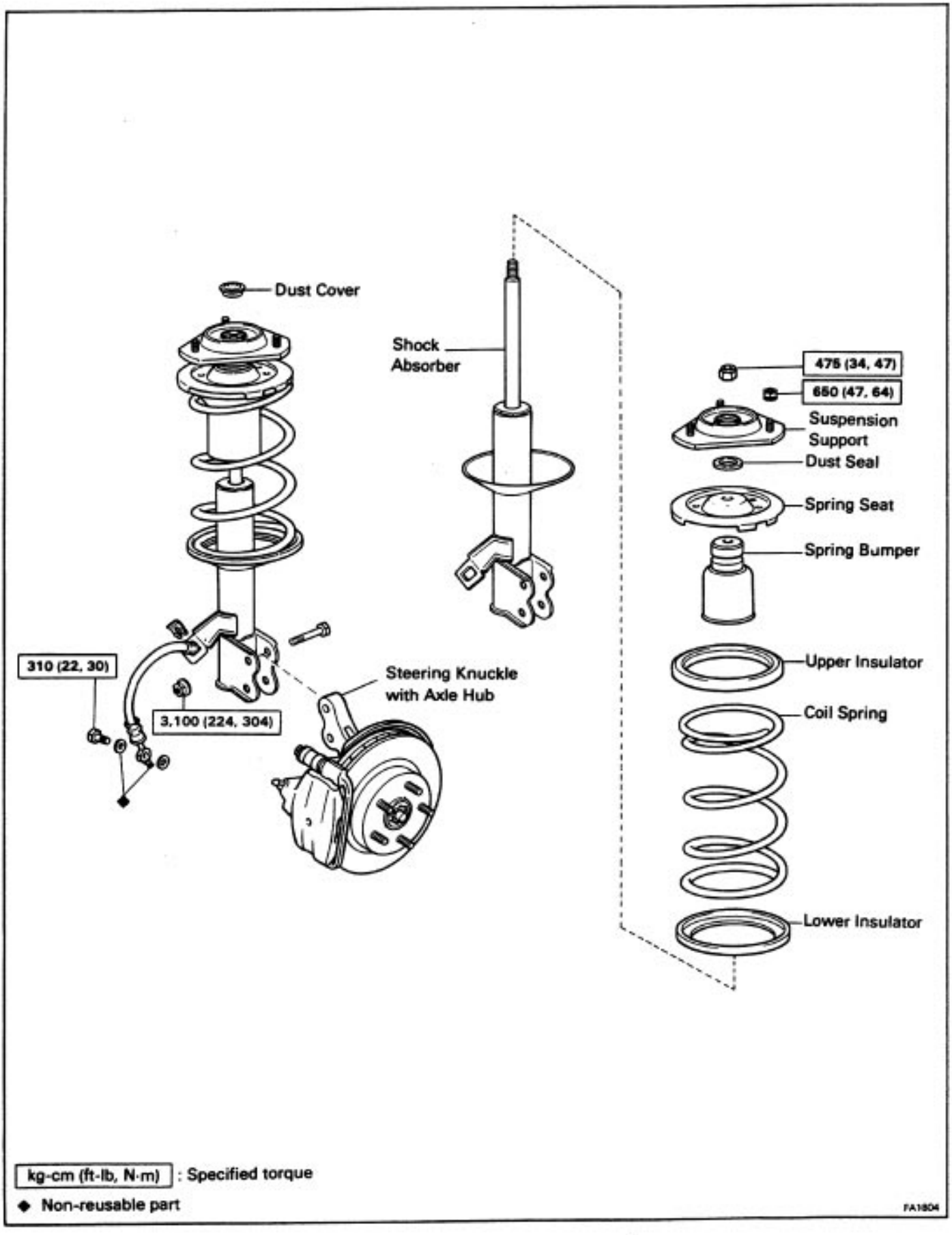
8. INSTALL WHEELS

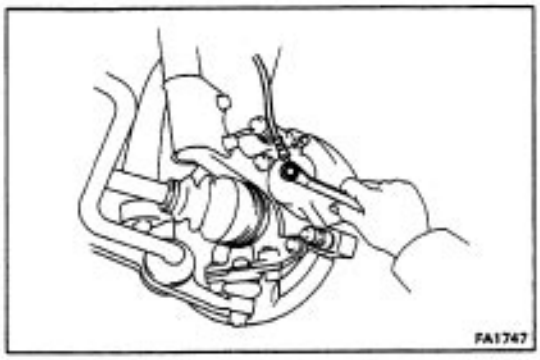
9. CHECK FRONT WHEEL ALIGNMENT

(See page FA–3)

FRONT SHOCK ABSORBER

COMPONENTS



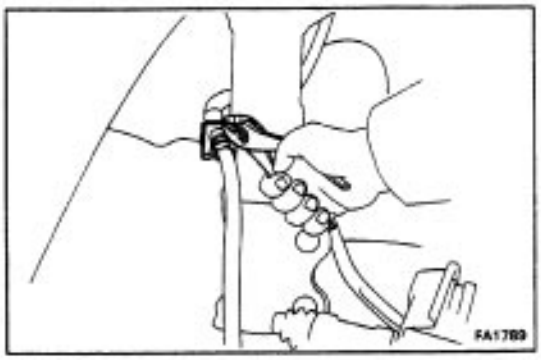


REMOVAL OF FRONT SHOCK ABSORBER ASSEMBLY

1. DISCONNECT BRAKE HOSE

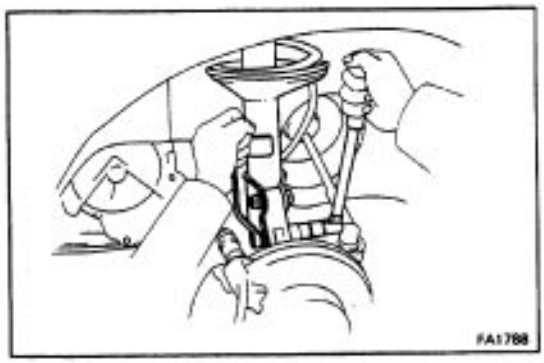
(a) Remove union bolt, and disconnect the brake hose from the disc brake caliper.

(b) Drain the brake fluid into a container.



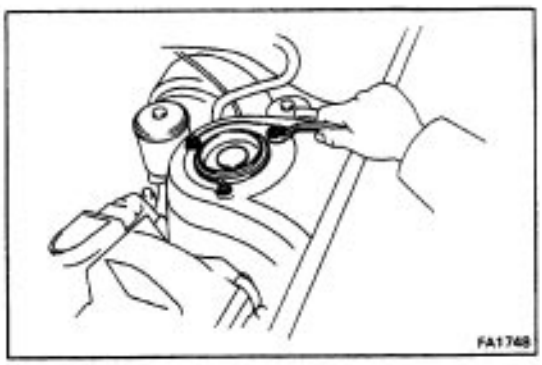
(c) Remove the clip from the brake hose bracket.

(d) Pull off the brake hose from the brake hose bracket.



2. DISCONNECT STEERING KNUCKLE FROM SHOCK ABSORBER

Remove the bolts and nuts, and disconnect the steering knuckle from the shock absorber.

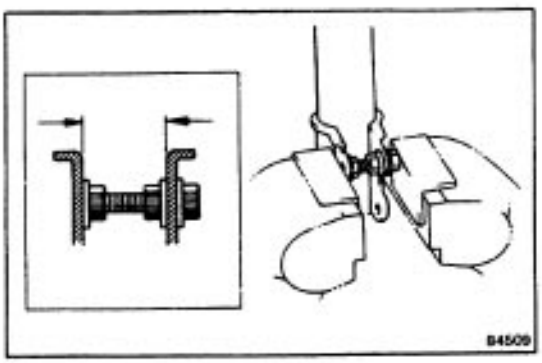


3. REMOVE SHOCK ABSORBER FROM BODY

(a) Remove the three bolts holding the top of the suspension support.

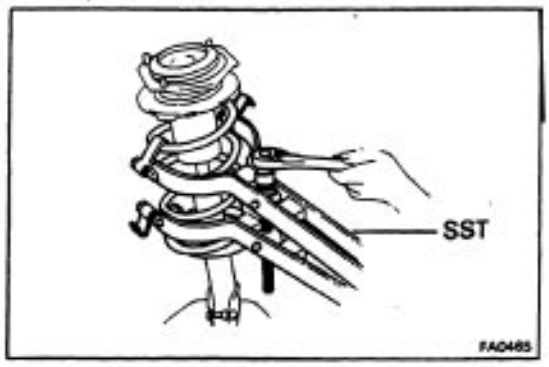
(b) Remove the shock absorber from the body.

NOTICE: Cover the drive shaft boot with cloth to avoid damaging it.



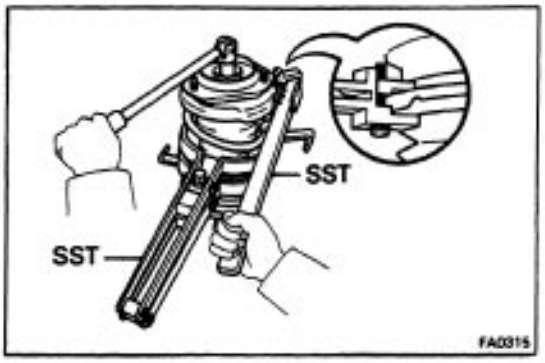
4. CLAMP SHOCK ABSORBER IN VISE

Install a bolt and two nuts to the bracket at the lower portion of the shock absorber shell and secure it in a vise.

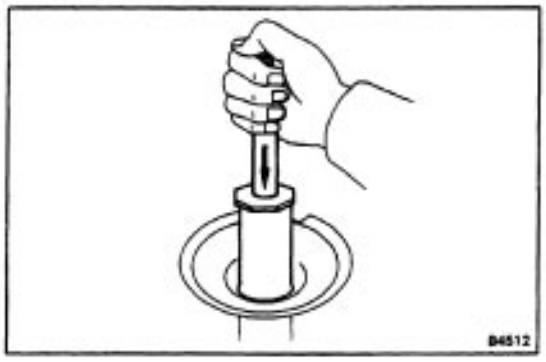


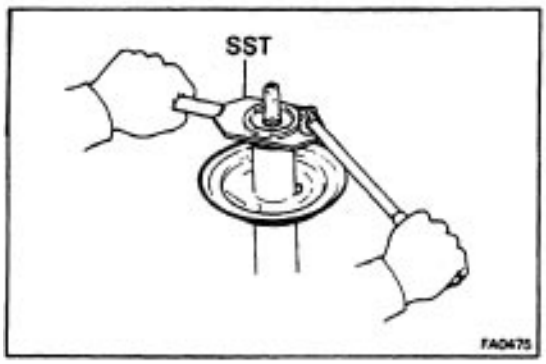
5. REMOVE COIL SPRING

(a) Using SST, compress the coil spring.
SST 09727–22032 or 09727–30020



(b) Using SST, hold the spring seat so that it will not turn, and remove the nut.
SST 09727–22032 or 09727–30020,09729–22031
(c) Remove the suspension support, spring seat, spring, insulators and bumper.



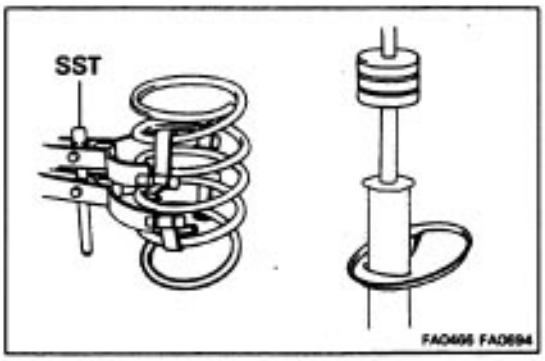


INSPECTION OF FRONT SHOCK ABSORBER

INSPECT FRONT SHOCK ABSORBER

(a) While pushing the piston rod, check that the pull through out the stroke is even, and there is no abnormal resistance or noise.
(b) Push the piston rod in fully and release it. Check that it returns at a con¿¿ant speed through out.
If the shock absorber operation is defective, replace the shock absorber as an assembly.

NOTICE: Before discarding the shock absorber, first loosen the ring nut 2 or 3 turns with SST to release the gas completery.
SST 09720–00012 (09721–00071)



INSTALLATION OF FRONT SHOCK ABSORBER

(See page FA–51)

1. INSTALL BUMPER, COIL SPRING. INSULATOR, SPRING SEAT AND DUST SEAL

(a) Install the bumper to piston rod.

(b) Using SST, compress the coil spring.
SST 09727–22032 or 09727–30020

(e) Install the lower insulator.

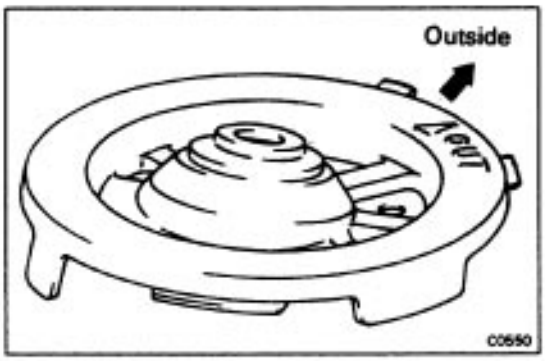
(d) Align the coil spring end with the lower seat hollow and install.

(e) Install the upper insulator.

(f) Face the ”OUT” mark of the spring seat toward the outside of the vehicle.

(g) Install the dust seal on the spring seat.

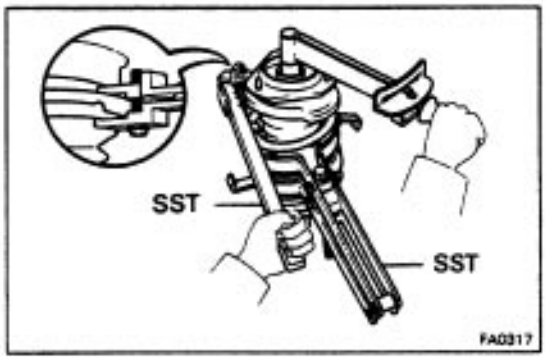
(h) Install the suspension support.



(i) Using SST, install and torque a new suspension support nut.

Torque: 475 kg–cm (34 ft–lb, 47 N–m)

SST 09727–22032 or 09727–30020, 09729–22031

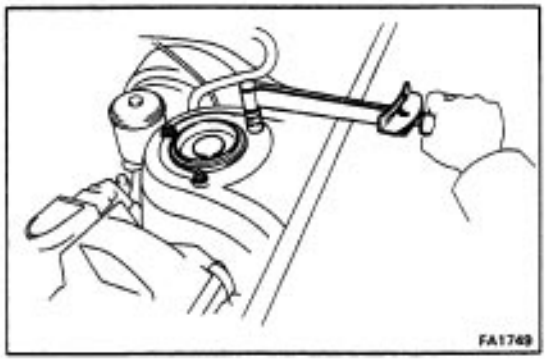


2. INSTALL SHOCK ABSORBER TO BODY

Install the three bolts holding the shock absorber to the body.
Torque the nut.

Torque: 650 kg–cm (47 ft–lb, 64 N–m)

NOTICE: Be careful not to damage the drive shaft boot.

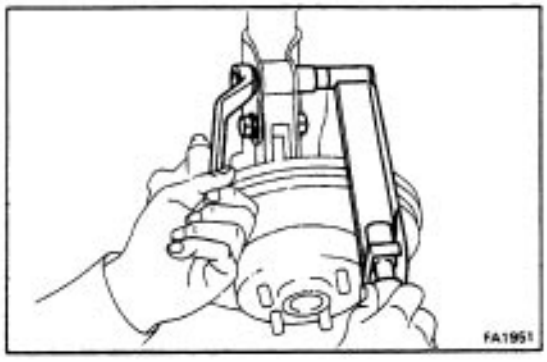


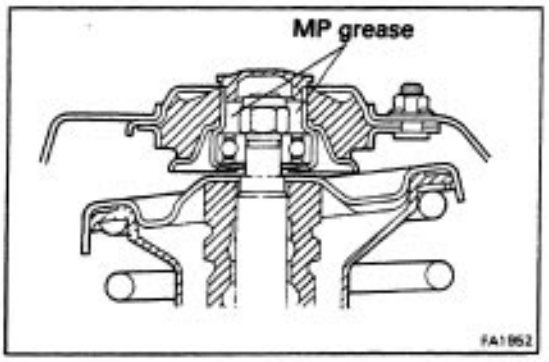
3. CONNECT STEERING KNUCKLE TO SHOCK ABSORBER

(a) Connect the steering knuckle to shock absorber lower bracket.

(b) Torque the nuts.

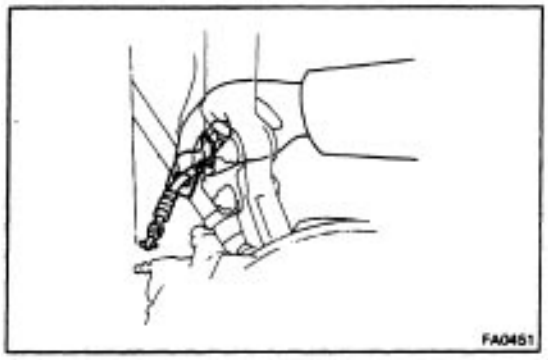
Torque: 3,100 kg–cm (224 ft–lb, 304 N–m)





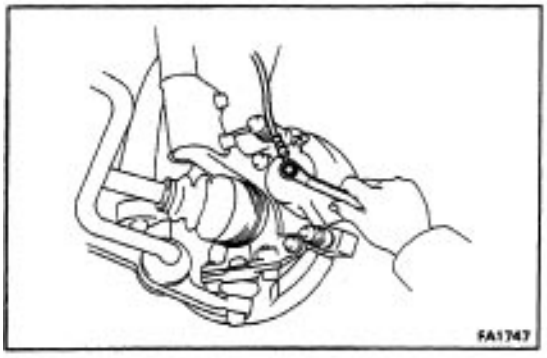
4. INSTALL DUST COVER

Pack the bearing in the suspension support with MP grease, and install the dust cover.

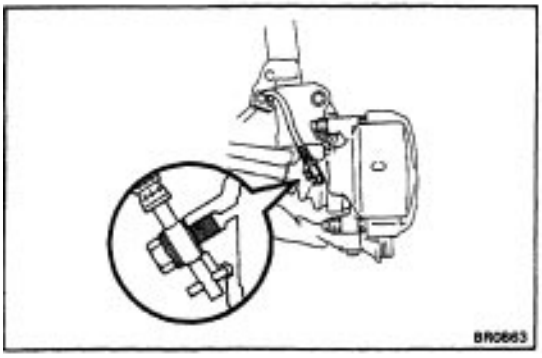


5. CONNECT BRAKE HOSE

(a) Run the brake hose through the brake hose bracket.
(b) Install the clip to the brake hose bracket.



(c) Connect the brake hose with the union bolt and new gaskets to the disc brake caliper.
Torque: 310 kg–cm (22 ft–lb, 30 N – m)

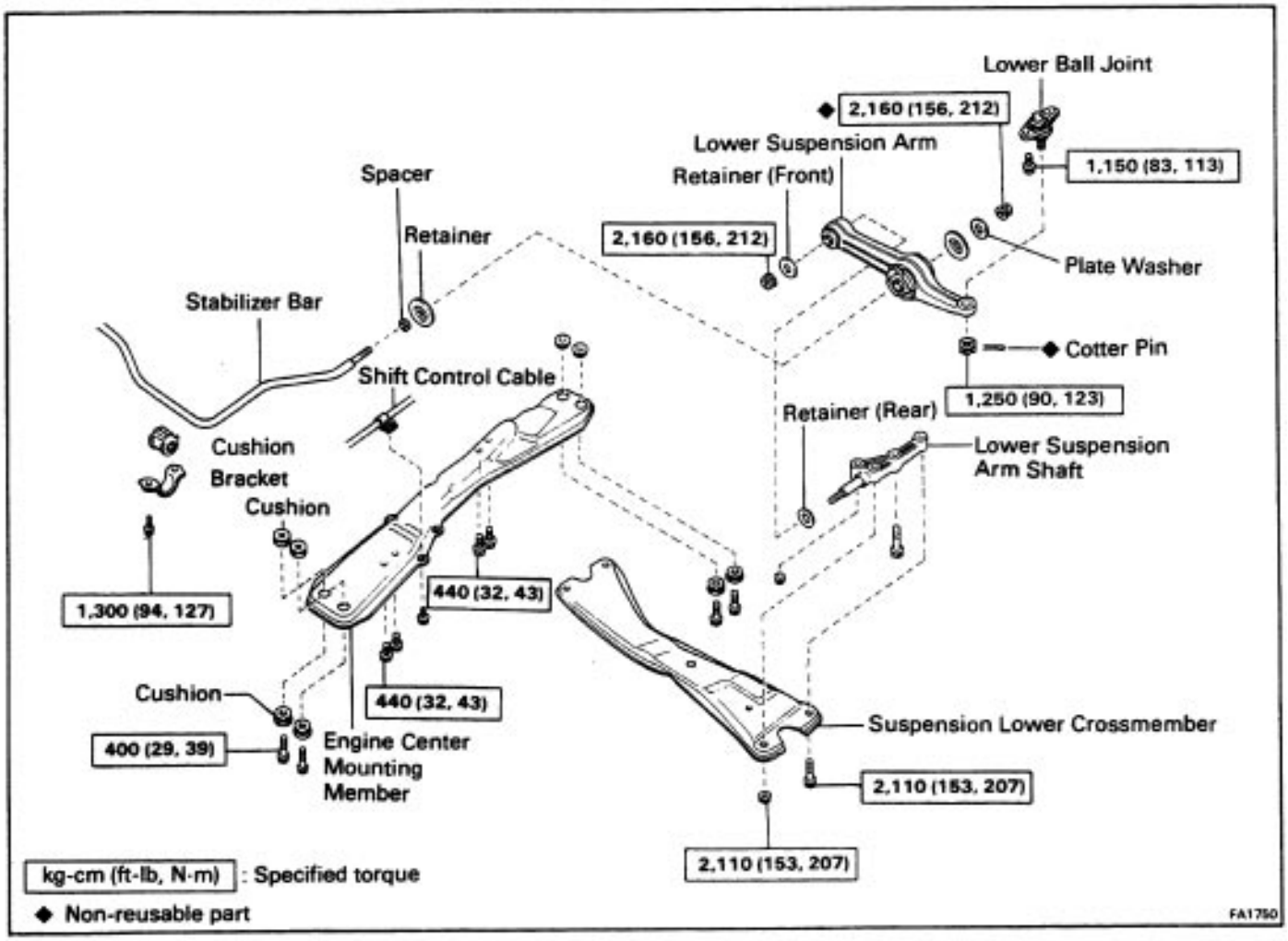


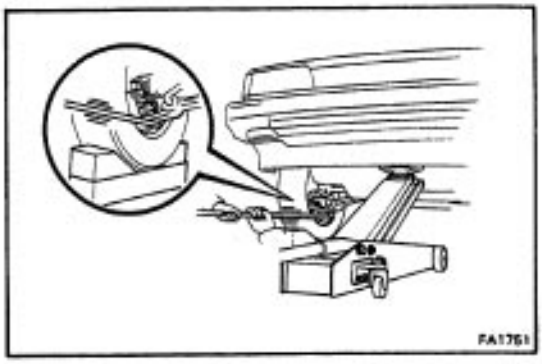
HINT: When connecting the brake hose to the disc brake caliper, connect so the peg aligns with the hole.

6. INSTALL CLIP
7. BLEED BRAKE LINE (See page BR–7)
8. INSPECT CAMBER (See page FA–4)

FRONT SUSPENSION

COMPONENTS





Ball Joints

INSPECTION OF BALL JOINTS

1. INSPECT BALL JOINTS FOR EXCESSIVE LOOSENESS

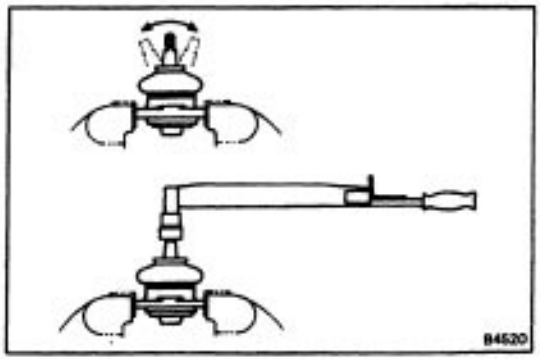
(a) Jack up the front of the vehicle and place a wooden block with the height of 180 – 200 mm (7.09 – 7.87 in.) under one front tire.

(b) Lower the jack until there is about half a load on one front of coil spring. Place stands under the vehicle for safety.

(e) Make sure the front wheels are in a straight forward position and block the wheel with chocks.

(d) Move the lower arm up and down and check that the ball joint has no excessive play.

Ball joint vertical play: 0 mm (0 in.)



2. INSPECT BALL JOINT ROTATION CONDITION

(a) Remove the ball joint. (See page **FA–8**)

(b) Flip the ball joint stud back and forth 5 times as shown in the figure, before installing the nut.

(e) Using a torque gauge, turn the nut continuously on turn each 2 –4 seconds and take the torque reading on the fifth turn.

Torque (turning):

10 – 33 kg–cm (9 – 29 in.–lb, 1.0 – 3.2 N–m)

If not within specification, replace the ball joint.

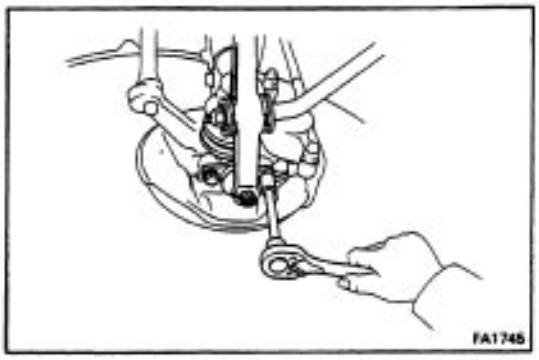
(d) Install the ball joint.

(See page FA–13)

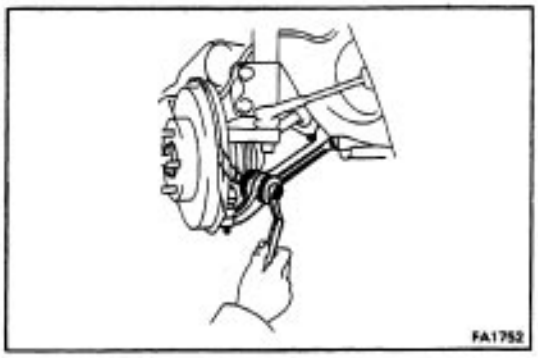
Lower Suspension Arm

(See page FA–56)

REMOVAL OF LOWER SUSPENSION ARM

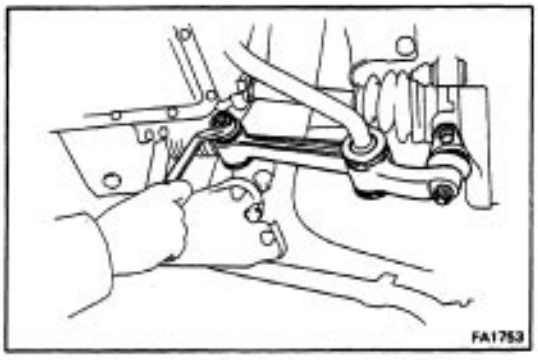


1. DISCONNECT LOWER BALL JOINT FROM STEERING KNUCKLE



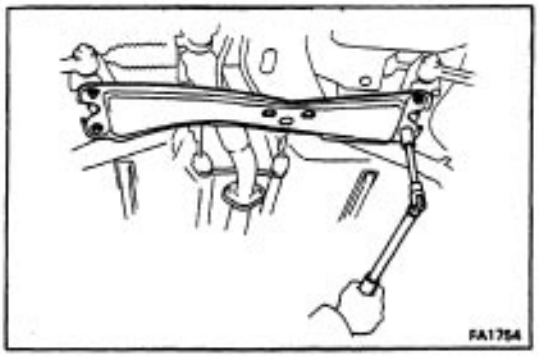
2. REMOVE STABILIZER NUT AND RETAINER

Remove the stabilizer nut holding the stabilizer bar to the lower arm.



3. REMOVE LOWER SUSPENSION ARM SHAFT NUT AND RETAINER

Remove the lower arm shaft nut holding the lower arm shaft to the lower arm.



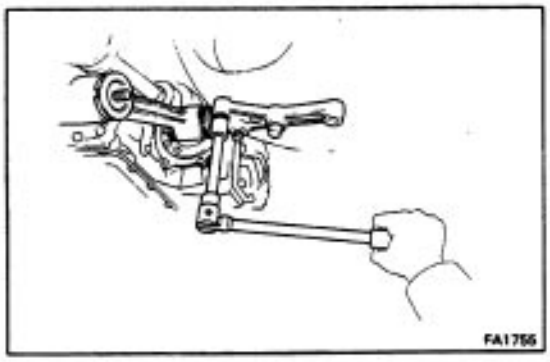
4. REMOVE SUSPENSION LOWER CROSSMEMBER

Remove the two bolts and the two nuts, and the suspension lower crossmember.

5. REMOVE LOWER SUSPENSION ARM WITH LOWER SUSPENSION ARM SHAFT

(a) Remove the lower arm shaft mounting nut and bolt.

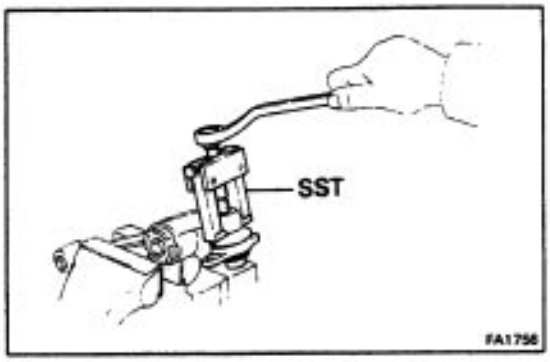
(b) Remove the lower arm with the lower arm shaft.



S. REMOVE LOWER BALL JOINT FROM LOWER SUSPENSION ARM

(a) Remove the cotter pin and the nut.

(b) Using SST, remove the lower ball joint from the lower arm.
SST 09628–62011

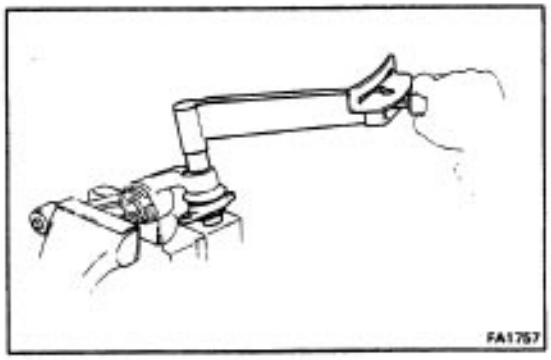


INSTALLATION OF LOWER SUSPENSION ARM

1. INSTALL LOWER BALL JOINT TO LOWER SUSPENSION ARM

Install the lower ball joint to the lower arm and torque the nut. Install a new cotter pin.

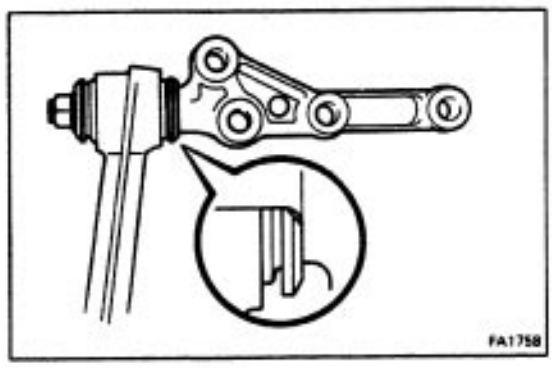
Torque: 1,250 kg–cm (90 ft–lb , 123 N–m)



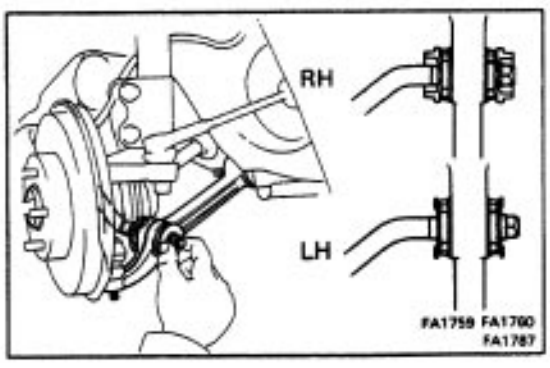
2. TEMPORARILY INSTALL LOWER SUSPENSION ARM SHAFT TO LOWER SUSPENSION ARM

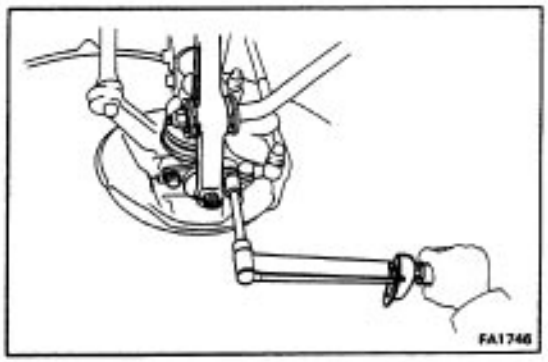
(a) First insert the lower arm to the stabilizer bar, and then install the lower arm shaft to the body.

(b) Temporarily install the lower arm installation nut with the retainer.



(c) Temporarily install the stabilizer nut with the retainer and washer, holding the stabilizer bar to the lower arm.

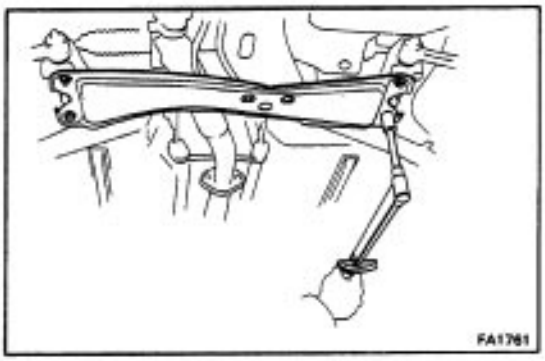




3. CONNECT LOWER BALL JOINT TO STEERING KNUCKLE

Connect the steering knuckle to the lower ball joint and torque the two bolts.

Torque: 1,150 kg–cm (83 ft–lb, 113 N – m)

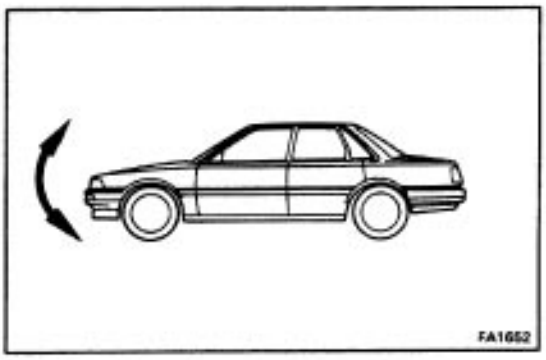


4. INSTALL SUSPENSION LOWER CROSSMEMBER

Temporarily install the two bolts and two nuts by hand, and then torque the bolts and nuts.

Torque: 2,110 kg–cm (153 ft–lb, 207 N–m)

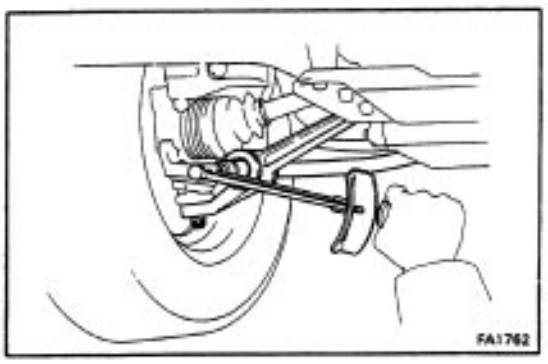
HINT: Temporarily first install the lower arm shaft to the body with lower arm shaft installation bolt and nut and then temporarily install the suspension lower cross-member.



5. INSTALL WHEELS AND LOWER VEHICLE

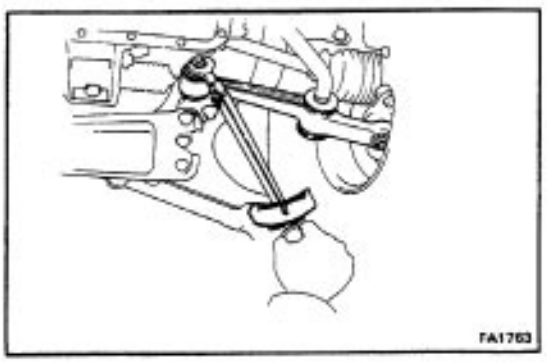
(a) Install the wheels.

(b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.



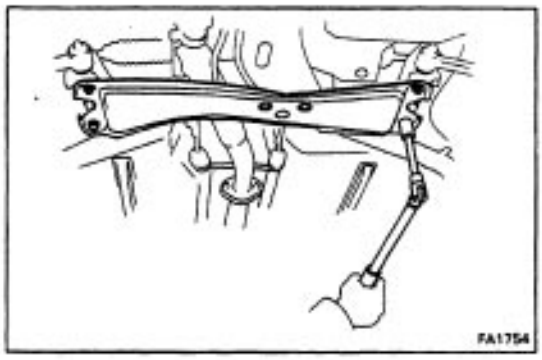
6. TORQUE LOWER SUSPENSION ARM INSTALLATION NUT

Torque: Stabilizer bar X Lower suspension arm
2,160 kg–cm (156 ft–lb, 212 N–m)



Torque: Lower arm shaft x Lower suspension arm
2,160 kg–cm (156 ft–lb , 212 N–m)

7. CHECK FRONT WHEEL ALIGNMENT

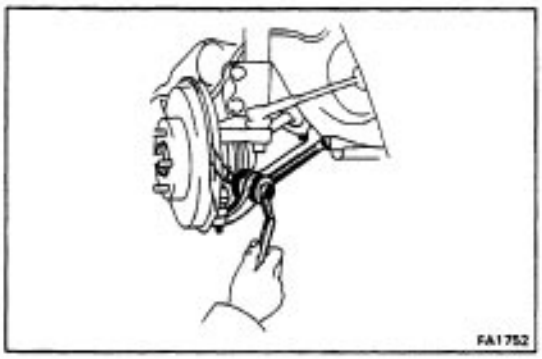


Stabilizer Bar

REMOVAL OF STABILIZER BAR

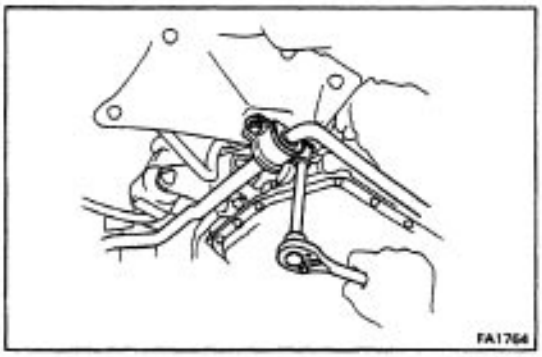
1. REMOVE SUSPENSION LOWER CROSSMEMBER

Remove the two bolts, two nuts and the suspension lower crossmember.

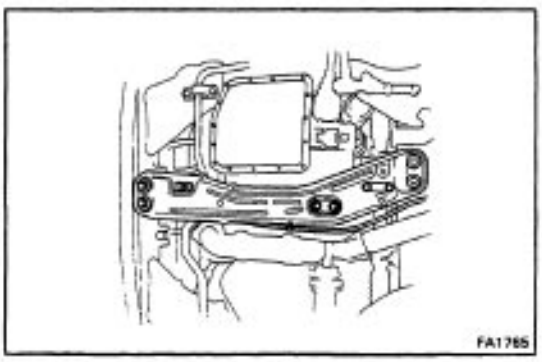


2. REMOVE STABILIZER NUTS AND RETAINER

Remove the stabilizer nuts holding the stabilizer bar to the lower arm.



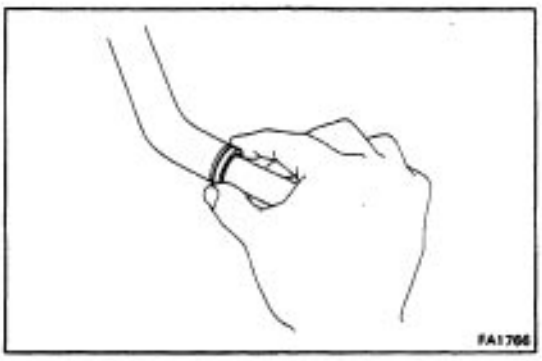
3. REMOVE STABILIZER BAR BRACKET



4. REMOVE ENGINE CENTER MOUNTING MEMBER

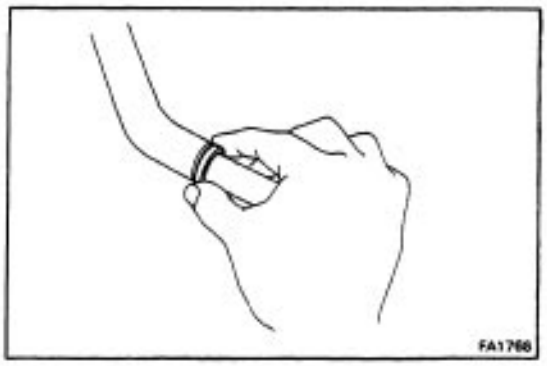
(a) Remove the control cable clamp bolt from the engine center mounting member.

(b) Remove the ten bolts and the engine center mounting member.



5. PULL OFF STABILIZER BAR FROM LOWER SUSPENSION ARMS

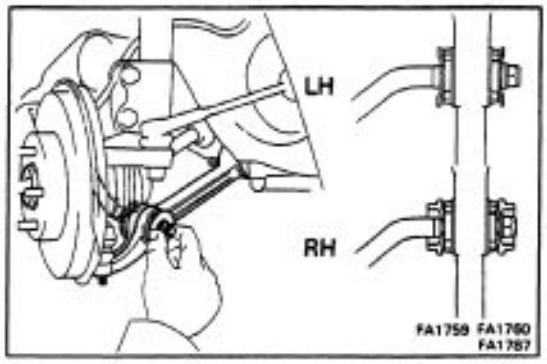
6. REMOVE RETAINERS AND SPACERS FROM STABILIZER BAR



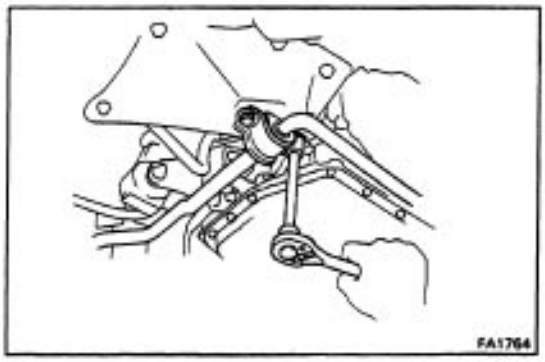
INSTALLATION OF STABILIZER BAR

1. INSTALL SPACERS AND RETAINERS TO STABILIZER BAR

2. INSTALL STABILIZER BAR TO LOWER SUSPENSION ARMS

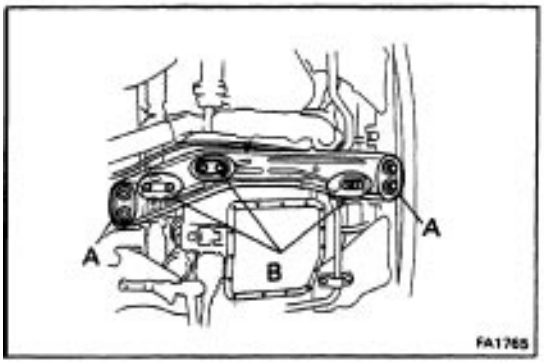


3. INSTALL RETAINERS, WASHERS AND TEMPORARILY INSTALL TWO NUTS TO STABILIZER BAR



4. INSTALL STABILIZER BAR BRACKETS WITH CUSHIONS

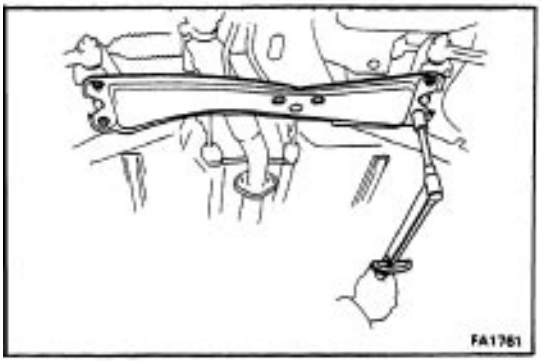
Torque: 1,300 kg–cm (94 ft–lb, 127 N–m)



5. INSTALL ENGINE CENTER MOUNTING MEMBER

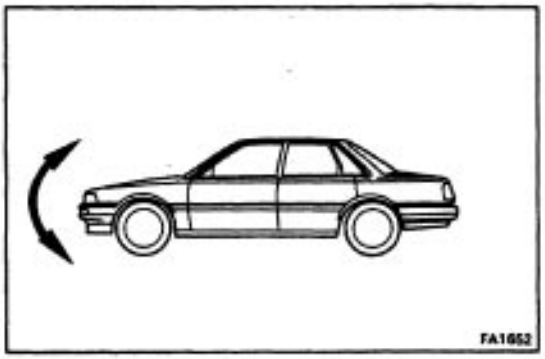
Torque: A 400 kg–cm (29 ft–lb, 39 N–m)

B 440 kg–cm (32 ft–lb, 43 N–m)



6. INSTALL AND TORQUE SUSPENSION LOWER CROSSMEMBER

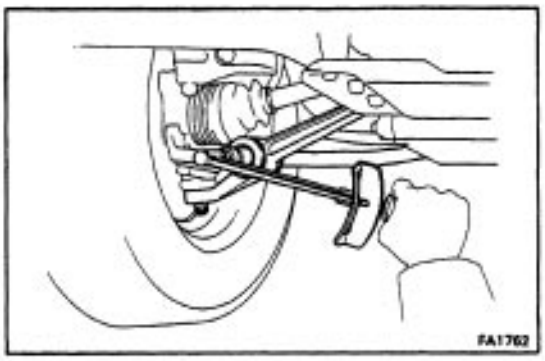
Torque: 2,110 kg–cm (153 ft–lb, 207 N– m)



7. INSTALL WHEELS AND LOWER VEHICLE

(a) Install the wheels.

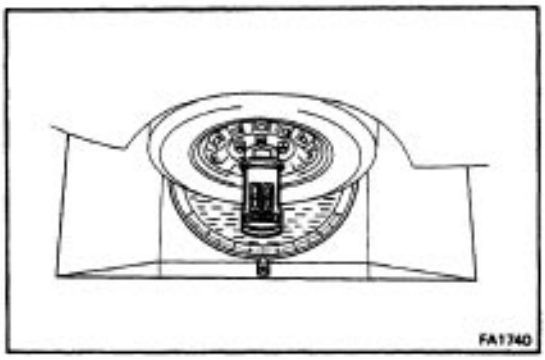
(b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.



8. TORQUE STABILIZER NUTS

Torque the stabilizer nuts holding the stabilizer bar to the lower arm.

Torque: 2,160 kg–mm (156 ft–lb, 212 N–m)



9. CHECK FRONT WHEEL ALIGNMENT

(See page FA–3)

FOREWORD

This manual has been prepared for use when performing terminal repairs, wire repairs, or connector repairs on vehicles.

A step–by–step section on connector repair and terminal repair is included.

There is a section of charts with terminal and connector illustrations, part numbers, and notes on terminal removal.

By using this guide, a satisfactory repair of the wiring harness and connectors in Toyota vehicles will be easy to achieve.

All information in this manual is based on the latest product information at the time of publication. However, specifications and procedures are subject to change without notice.

TOYOTA MOTOR CORPORATION

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GENERAL INFORMATION

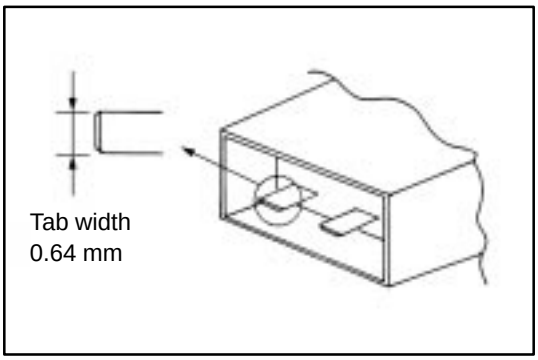
This manual provides instruction in the following repairs:

- How to Inspect for System Inspection
- Circuit Protection
- Terminal and Connector Repair Procedure

NOTICE:
When inspecting or repairing the SRS AIRBAG, be sure to carefully read the precautionary instructions and procedure in the Repair Manual for the applicable model.

A

After any electrical repair is made, always test the circuit by operating the devices in the circuit. This confirms not only that the repair is correct, but also that the cause of the complaint was correctly identified.



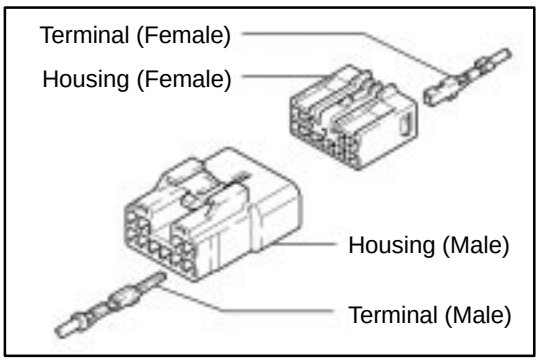
Terminal type number name

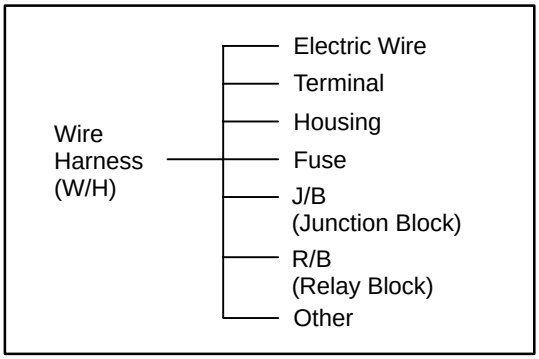
The terminal type number naming system has changed: the metric system will be used in place of the inch system. To be more specific, male tab width ”in millimeters” will be used as terminal type number from now on — in place of male tab width in inches which has been in use so far.

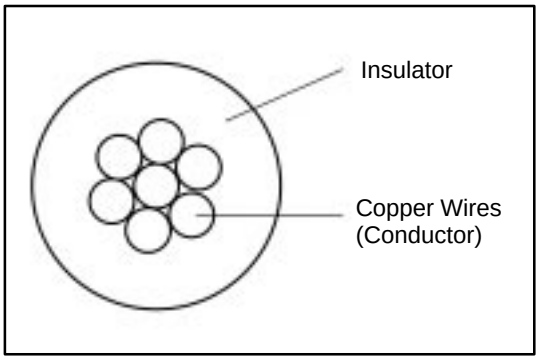
Below is a table of comparison:

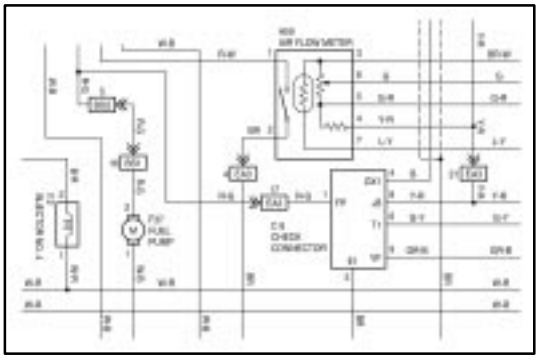
Old terminal type No. (inch)		New terminal type No. (mm)
025	→	0.64
040 (II, III, IV)	→	1.0 (II, III, IV)
050	→	1.3
070 (II)	→	1.8 (II)
090 (II)	→	2.3 (II)
187	→	4.8
250 (II)	→	6.3 (II)
305	→	7.7
312	→	8.0
375	→	9.5

For those connectors which are not shown above, the terminal type numbers remain unchanged.









B	=	Black	W	=	White
L	=	Blue	BR	=	Brown
V	=	Violet	SB	=	Sky Blue
R	=	Red	G	=	Green
P	=	Pink	LG	=	Light Green
Y	=	Yellow	GR	=	Gray
O	=	Orange			

What is Wire Harness?

The wire harness (W/H) is systems of electric wires for automobiles to connect all the electronics parts in automobile electrically and work them. As more electronics parts are introduced in automobiles recently, the electric wires used for the wire harness are increasing in number and the structure is becoming more complicated. As a result of that, there are hundreds of connectors, which is the parts which connects wires mechanically and electrically, in one vehicle. Therefore, numbers of the connector terminal (Terminal) or the connector housing (Housing) are designed to meet many kinds of uses of circuits. Various components have been improved to ensure the product reliability or realize a wider space in the vehicles.

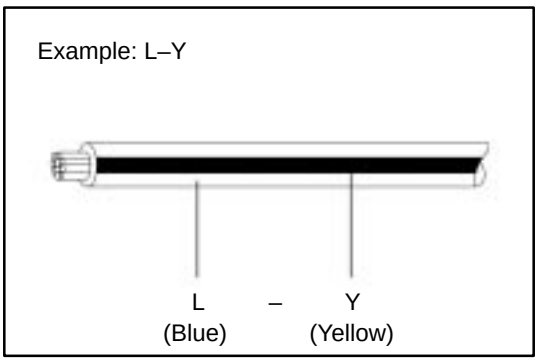
Wire Harness Components

Wire harness mainly consists of wires, terminals, or housings.
There are various components are designed for many parts of vehicles, such as one with high heat–resistance, water–resistance, or bending ability, ones have different current capacities, or ones are hardly influenced by electromagnetic noise.

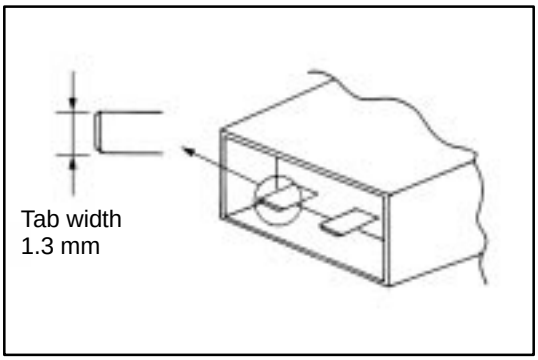
Electric Wire

The electric wires used for the wire harness consists of the conductor made from numbers of twisted mild copper wire with a diameter of less than 0.5 mm and the insulator surrounding the conductor.
The insulator is generally made from vinyl chloride and covers the conductor with even thickness. The insulators are color–coded in order to distinguish each wire. The base colors or the stripe patterns is used to make difference between insulators. Each color of wires is indicated by the abbreviation in the repair manual and the electrical wiring diagram.

A



The first letter indicates the basic wire color and the second letter indicates the color of the stripe.



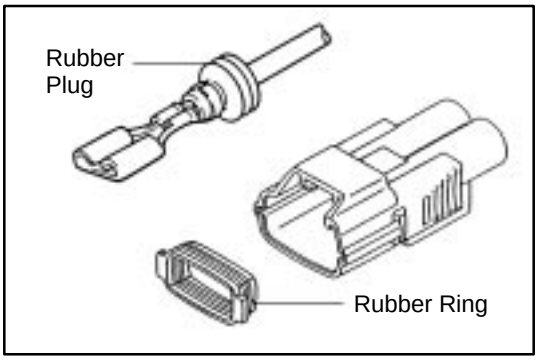
Terminal and housing

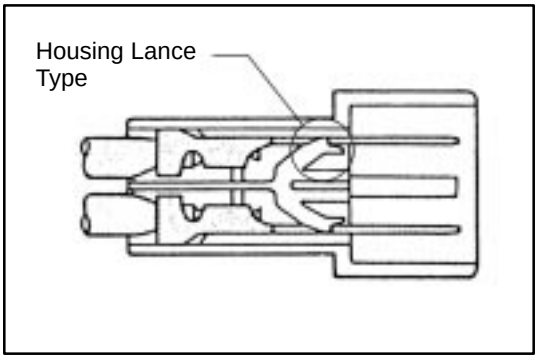
Terminal connects wires and housing insulates connecting parts.

There are the male terminal and the female terminal. The types of terminals are decided by tab width of male terminal. And the terminal with the rubber plug or the rubber ring is used in the part, such as the engine compartment, which become wet. For the circuit with slight current at EFI system or ABS system, the gold–plated terminal is introduced for ensuring reliabilities.

As the number of the circuit is increasing recently, there are new types of parts introduced. For example, there is the hybrid type housing, which is a combination of terminals with different tab width, such as the power source terminal or the signal terminal. Also, new type of connector such as the double lock housing, which is designed with the retainer in addition to the lance to prevent terminal from slipping off, is available. The new type of connectors are produced to realize higher product reliabilities and utilized widely recently. The major characteristics of these new connectors are shown in the table 1.

There are two types of lances: housing lance, which is inside the housing and terminal lance, which is inside the terminal.





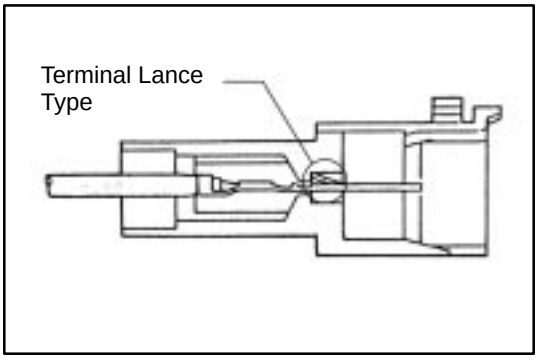
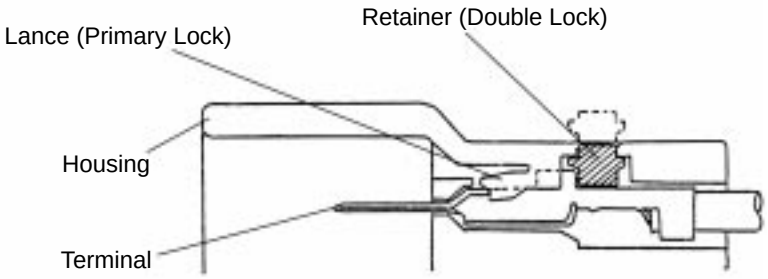
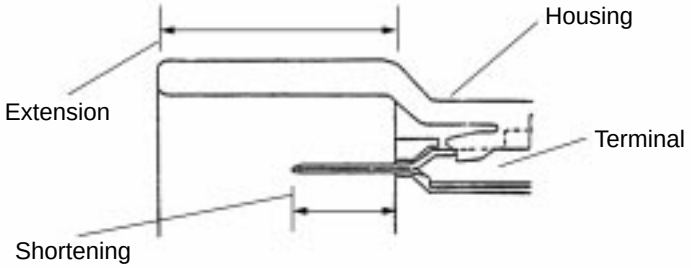
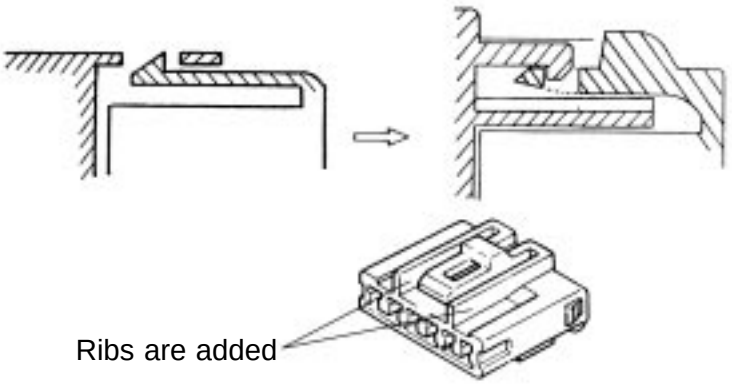


Table 1 : Characteristics of the new types of connector (Improvement)

Characteristics (Improvement)	Note
1. Double Lock  	If terminal is not inserted to housing correctly, the retailer does not fit.
2. Extension of Housing  	This is to prevent deformation of the terminal when it is inserted diagonally.
3. Change of Contact Structure and Introduction of Box–Shaped Structure 	Expansion of contact section Stabilization of contact pressure
4. Change of Locking Shape  	This improves the close fit of locking and you can hear the click sound and feel that the connector is completely installed.

HOW TO PERFORM FOR SYSTEM INSPECTION

This inspection procedure is a simple troubleshooting which should be carried out on the vehicle during system operation and is based on the assumption of system component trouble

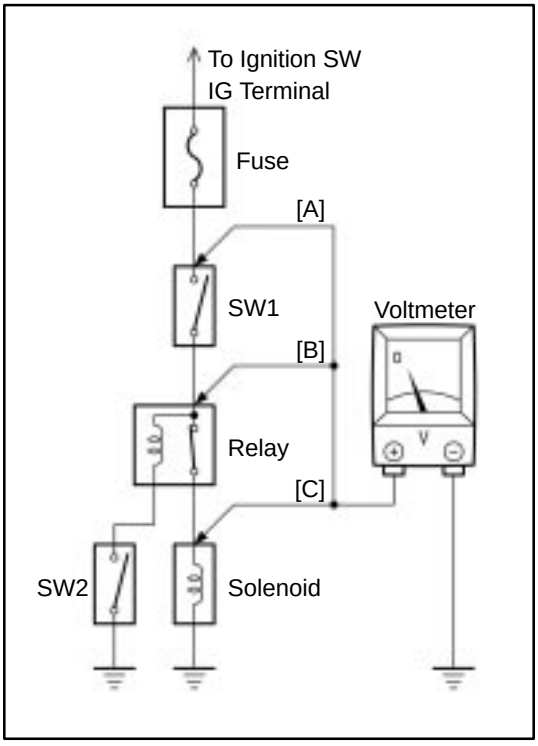
Always inspect the trouble taking the following items into consideration:

- Ground point fault
- Open or short circuit of the wire harness
- Connector or terminal connection fault
- Fuse or fusible link fault

A

NOTICE:

- **This is an on–vehicle inspection during system operation. Therefore, inspect the trouble with due regard for safety.**
- **If connecting the battery directly, be careful not to cause a short circuit, and select the applicable voltage.**

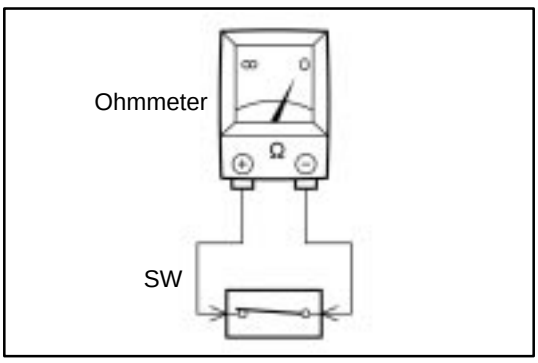


1. Voltage Check

(a) Establish conditions in which voltage is present at the check point.

Example:
[A] – Ignition SW on
[B] – Ignition SW and SW 1 on
[C] – Ignition SW, SW 1 and Relay on (SW 2 off)

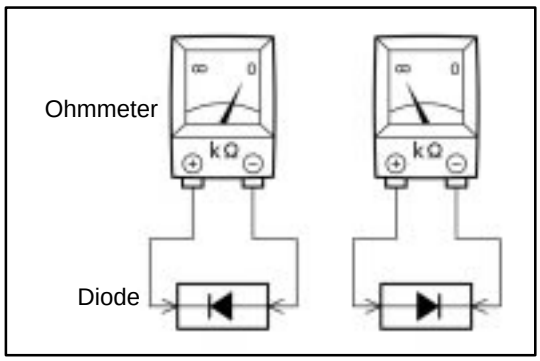
(b) Using a voltmeter, connect the negative (–) lead to a good ground point or negative (–) battery terminal and the positive (+) lead to the connector or component terminal. This check can be done with a test bulb instead of a voltmeter.



2. Continuity and Resistance Check

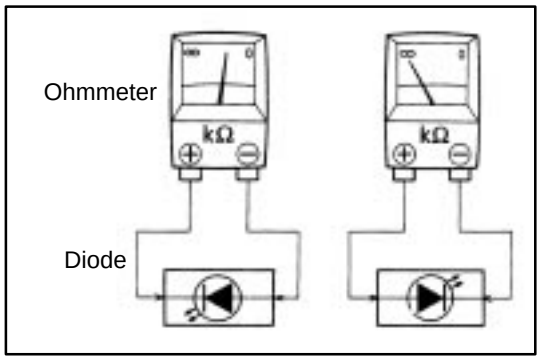
(a) Disconnect the battery terminal or wire so there is no voltage between the check points.

(b) Contact the two leads of an ohmmeter to each of the check points.



If the circuit has diodes, reverse the two leads and check again.
When touching the negative (–) lead to the diode positive (+) side and the positive (+) lead to the negative (–) side, there should be continuity. When touching the two leads in reverse, there should be no continuity.

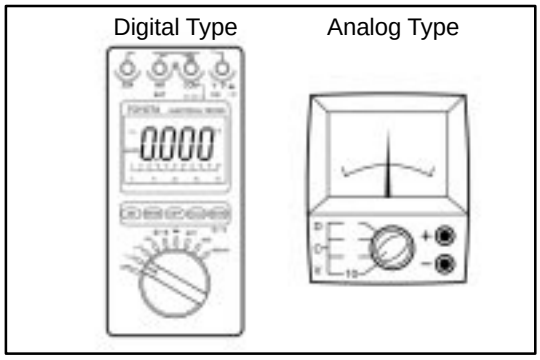
HINT: Specifications may vary depending on the type of tester, so refer to the tester's instruction manual before performing the inspection.



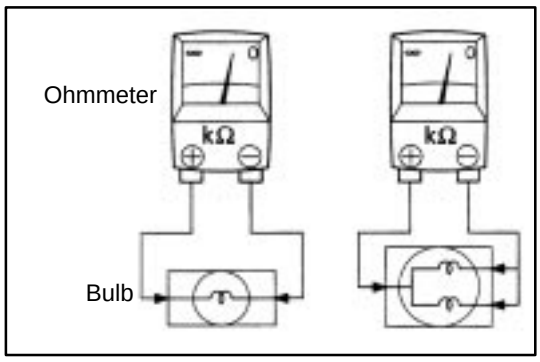
Check LED (Light Emitting Diode) in the same manner as that for diodes.

HINT:

- Use a tester with a power source of 3V or greater to overcome the circuit resistance.
- If a suitable tester is not available, apply battery voltage and check that the LED lights up.



(c) Use a volt/ohmmeter with high impedance (10kΩ/V minimum) for troubleshooting of the electrical circuit.



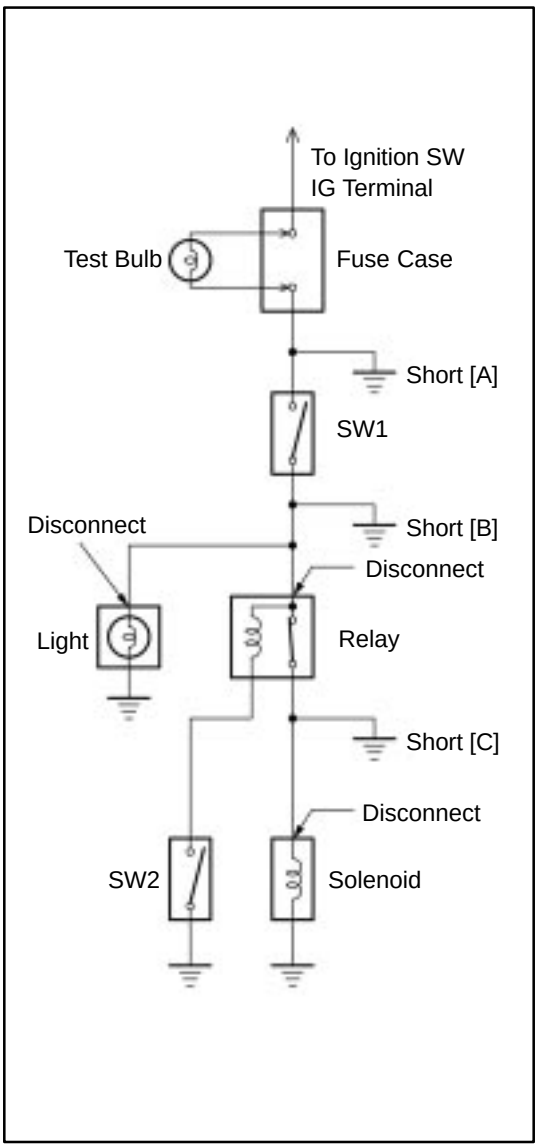
3. Bulb Check

(a) Remove the bulb.

(b) There should be continuity between the respective terminals of the bulb together with a certain amount of resistance.

(c) Apply the two leads of the ohmmeter to each of the terminals.

(d) Apply battery voltage and check that the bulb light up.



4. Finding a Short Circuit

(a) Remove the blown fuse and eliminate all loads from the fuse.

(b) Connect a test bulb in place of the fuse.

(c) Establish conditions in which the test bulb comes on.

Example:
[A] – Ignition SW on
[B] – Ignition SW and SW 1 on
[C] – Ignition SW, SW 1 and Relay on (Connect the Relay) and SW 2 off (or disconnect SW 2)

(d) Disconnect and reconnect the connectors while watching the test bulb. The short lies between the connector where the test bulb stays lit and the connector where the bulb goes out.

(e) Find the exact location of the short by lightly shaking the problem wire along the body.

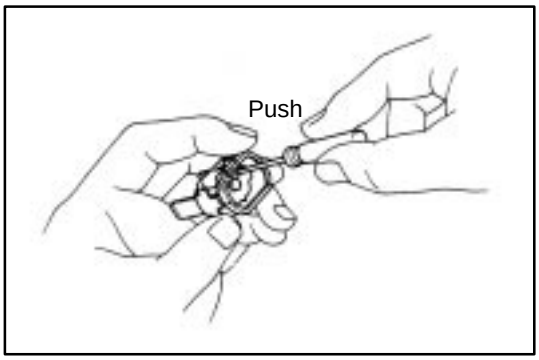
CAUTION:

(a) **Do not open the cover or the case of the ECU unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)**

(b) **When replacing the internal mechanism (ECU part) of the digital meter, be careful that no part of your body or clothing comes in contact with the terminals of leads from the IC, etc. of the replacement part (spare part).**

CIRCUIT PROTECTION

All electrical circuits are protected against excessive loads which might occur because of shorts or overloads in the wiring system. Such protection is provided by a fuse, circuit breaker, or fusible link, A short circuit may cause a fuse to blow or a circuit breaker to open.



RESET CIRCUIT BREAKER

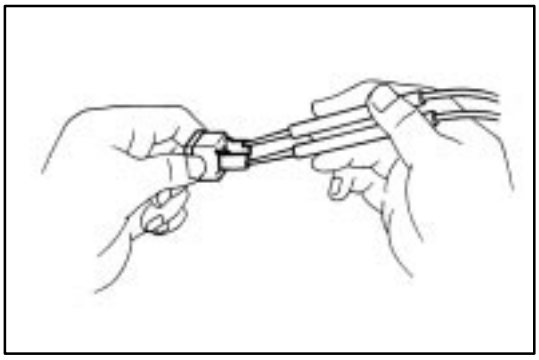
1. Remove Circuit Breaker

(a) Disconnect the negative (–) cable from the battery.

(b) Remove the circuit breaker.

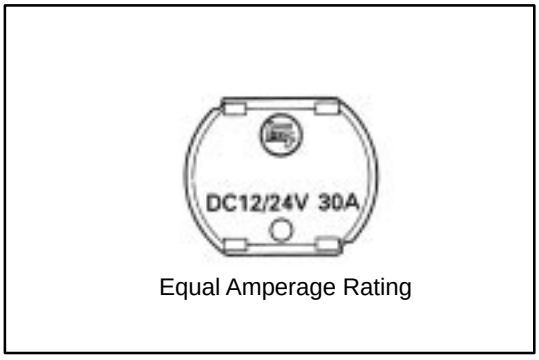
2. Reset Circuit Breaker

(a) Insert the needle into the reset hole and push it.



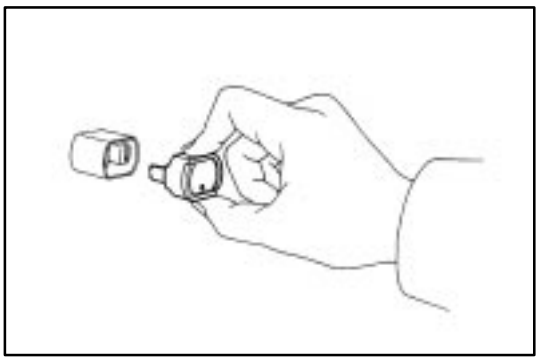
(b) Using an ohmmeter, check that there is continuity between both terminals of the circuit breaker.

If continuity is not as specified, replace the circuit breaker.



Equal Amperage Rating

HINT: If replacing the circuit breaker, be sure to replace it with a breaker with an equal amperage rating.

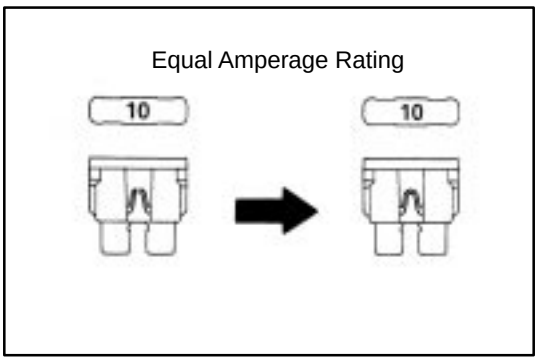


3. Install Circuit Breaker

(a) Install the circuit breaker.

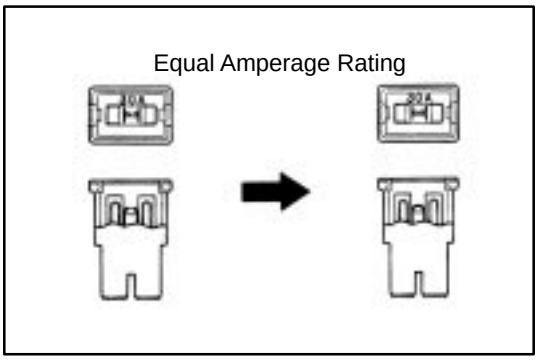
(b) Connect the negative (–) cable to the battery.

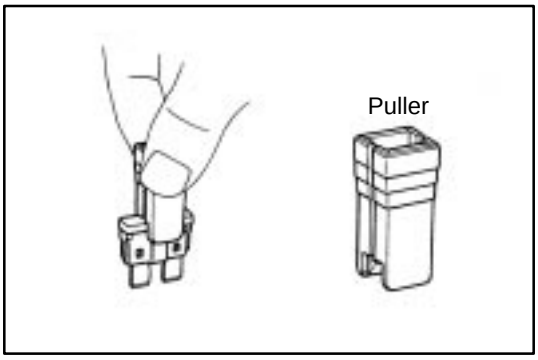
HINT: If a circuit breaker continues to cut out, a short circuit is indicated. Have the system checked by a qualified technician.



REPLACEMENT OF FUSE AND FUSIBLE LINK

HINT: If replacing the fuse or fusible link, be sure to replace it with a fuse or fusible link with an equal amperage rating.





NOTICE:

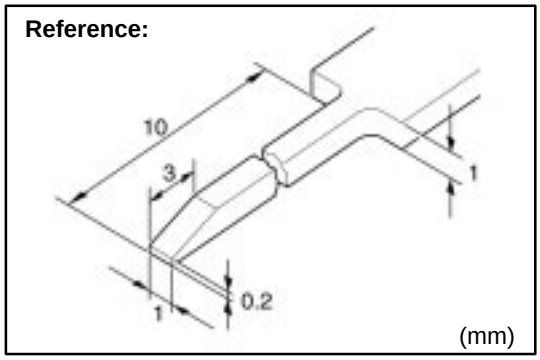
1. **Turn off all electrical components and the ignition switch before replacing a fuse or fusible link. Do not exceed the fuse or fusible link amperage rating.**
2. **Always use a fuse puller for removing and inserting a fuse. Remove and insert straight in and out without twisting. Twisting could force open the terminals too much, resulting in a bad connection.**

If a fuse or fusible link continues to blow, a short circuit is indicated. The system must be checked by a qualified technician.

HINT: The puller is located at Junction Block No.2.

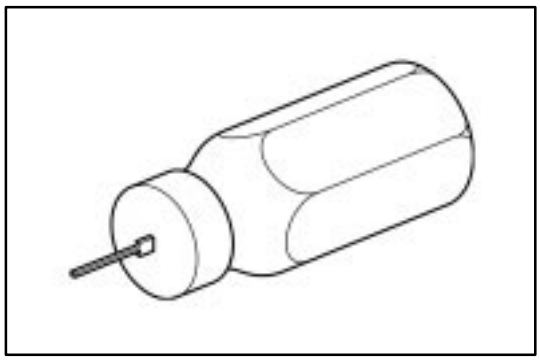
PREPARATORY ITEMS

Tool	Crimping tool	AMP Part No. 169060	For caulking press sleeves
	Special tool	Refer to the following illustration	To remove the terminal
	SST	09991–00500	To remove the 0.64 connector terminal
Gauge	Caliper	0–150 mm	To measure the diameter of the core
Others	Press sleeve	82999–12010 (Red) 82999–12020 (Blue) 82999–12030 (Yellow)	To connect wires
	Silicon tape	08231–00045	To waterproof the connected section



Special Tool

HINT: To remove the terminal from the connector, please construct and use the special tool or like object shown on the left.



Preparation of the SST to release the 0.64 connector terminal.
SST 09991–00500

HINT:
This is a SST for releasing terminals from 0.64 connectors.

CONNECTOR REPAIR

The repair parts now in supply are limited to those connectors having common shapes and terminal cavity numbers. Therefore, when there is no available replacement connector of the same shape or terminal cavity number, please use one of the alternative methods described below. Make sure that the terminals are placed in the original order in the connector cavities, if possible, to aid in future diagnosis.

1. When a connector with a different number of terminals than the original part is used, select a connector having more terminal cavities than required, and replace both the male and female connector parts.

   EXAMPLE: You need a connector with six terminals, but the only replacement available is a connector with eight terminal cavities. Replace both the male and female connector parts with the eight terminal part, transferring the terminals from the old connectors to the new connectors.

2. When several different type terminals are used in one connector, select an appropriate male and female connector part for each terminal type used, and replace both male and female connector parts.

   EXAMPLE: You need to replace a connector that has two different types of terminals in one connector. Replace the original connector with two new connectors, one connector for one type of terminal, another connector for the other type of terminal.

3. When a different shape of connector is used, first select from available parts a connector with the appropriate number of terminal cavities, and one that uses terminals of the same size as, or larger than, the terminal size in the vehicle. The wire lead on the replacement terminal must also be the same size as, or larger than, the nominal size of the wire in the vehicle. (”Nominal” size may be found by looking at the illustrations in the section F or by direct measurement across the diameter of the insulation). Replace all existing terminals with the new terminals, then insert the terminals into the new connector.

   EXAMPLE: You need to replace a connector that is round and has six terminal cavities. The only round replacement connector has three terminal cavities. You would select a replacement connector that has six or more terminal cavities and is not round, then select terminals that will fit the new connector. Replace the existing terminals, then insert them into the new connector and join the connector together.

TERMINAL REPLACEMENT

These steps **must** be followed when replacing a terminal.

Step 1. Identify the connector and the terminal type.

Step 2. Disconnect the terminal from the connector.

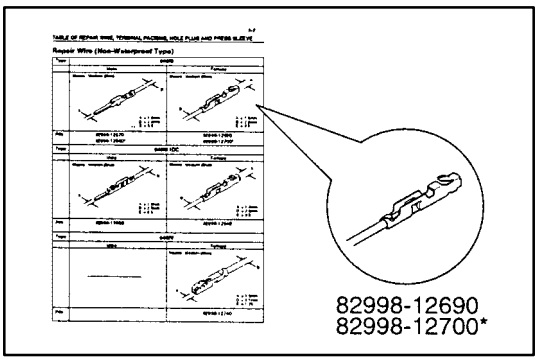
Step 3. Replace the terminal.

Step 4. Install the terminal into the connector.

Step 1. Identify the connector and the terminal type.

Confirm whether the connector you require is the non–waterproof, waterproof or combined terminal type connector from the pictures provided in the following charts.

Connector	Description
Non–Waterproof Type	Those connectors which are not of the waterproof or combined terminal type.
Waterproof Type	Waterproof material (hole plug or terminal packing) is provided on the terminal/connector body.
Combined Terminal Type	Terminals of different shape/size are located in one connector.



1. Terminal with Wire

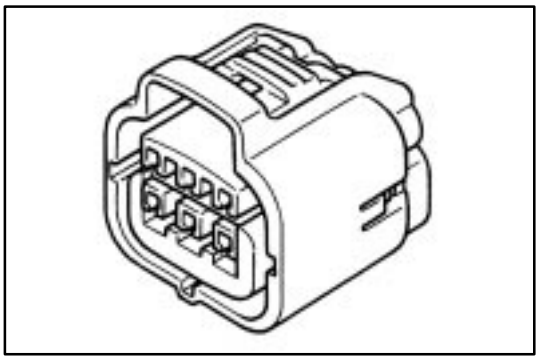
Identify the part number of the terminal with wire by picking out the corresponding illustration from the pictures provided on the following charts.

HINT: In some of the illustrations, there are two part numbers for the same illustration of terminal with wire, because although the shapes of the terminals are completely the same, there is a difference in with /without gold–plating (gilded).

Remark: The length of the wire connected to the terminal is approximately 150 mm.

NOTICE:

- **When the terminal used is gold plated, be sure to replace it with a gold plated terminal when marking repairs.**
- **Do not use male and female terminals which are made of different materials from each other.**



2. Connector Body

(a) Identify the part number of the corresponding terminal with wire according to the above–mentioned 1.

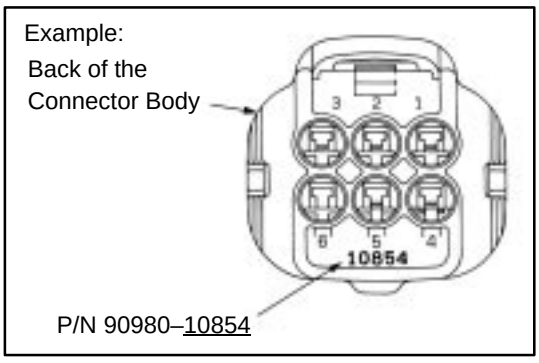
(b) Identify the part number of the connector body by picking out the correct one from the illustrations according to the number of terminals and the shape.

HINT:

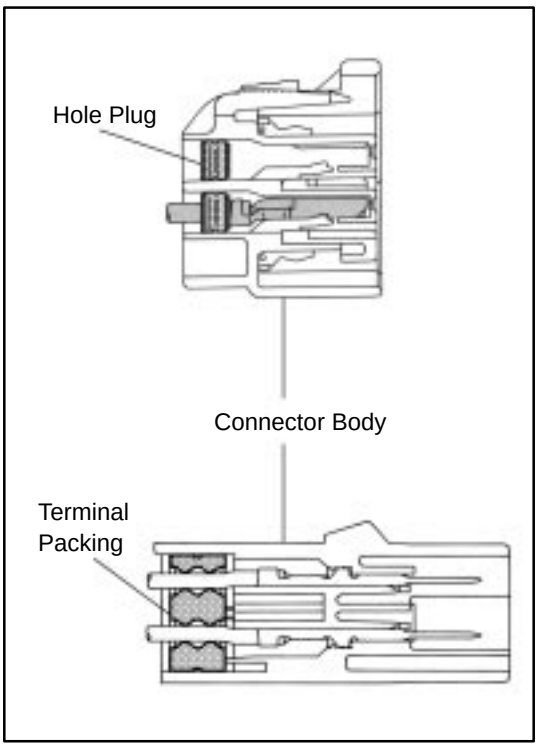
(a) If you can find no connector which matches the type you require, pick out male and female connector bodies as a set which have more terminals than you require.

For the combined terminal type connector body, pick out and appropriate connector body for each terminal being used.

Example:
When two types of terminal are used in one connector body, pick out a male and female for two different connector bodies.



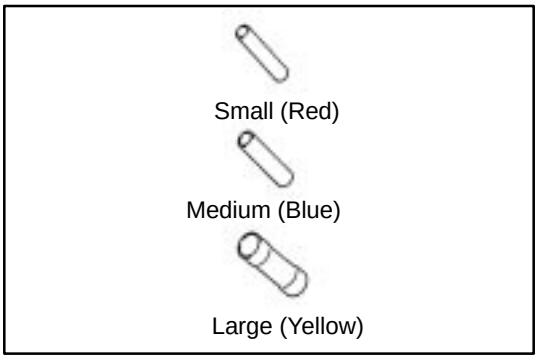
(b) The part number has been stamped on the back of the connector body. (This will continue to be done to new types of connector.)



3. Hole Plug/Terminal Packing

(a) Identify the part number of the appropriate terminal with wire/connector body from the illustrations of waterproof type connector according to the above–mentioned 1 and 2.

(b) Identify the part number of the hole plug/terminal packing from the corresponding illustration.

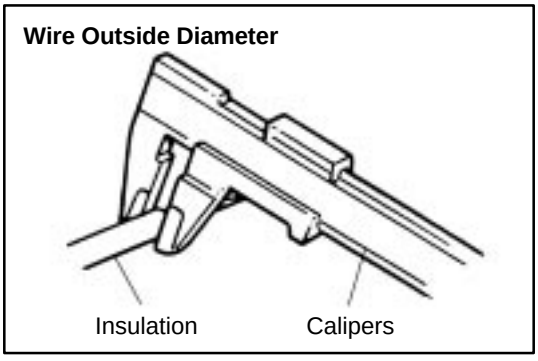


4. Sleeve

When connecting two wires using a sleeve, select the sleeve according to the following table.

Wire Outside Diameter	Sleeve Size (Color)
0.2–1.0 mm	Small (Red)
1.0–2.0 mm	Medium (Blue)
3.0–5.0 mm	Large (Yellow)

(a) When size is based on the outside diameter of the wire.

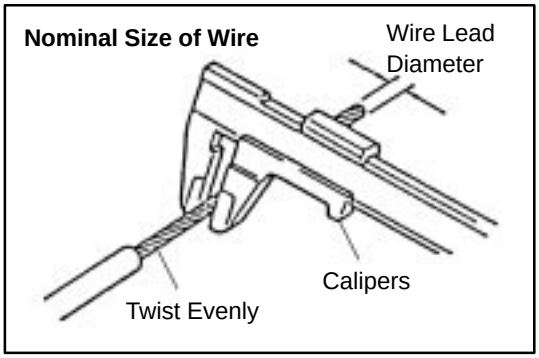


＊ \ ＊	0.3	0.5	0.85	1.25	2	3	5
0.3	S	M	M	M	M	L	L
0.5	M	M	M	M	M	L	L
0.85	M	M	M	M	L	L	L
1.25	M	M	M	M	L	L	L
2	M	M	L	L	L	L	—
3	L	L	L	L	L	L	—
5	L	L	L	L	—	—	—

＊ Nominal size of the wire

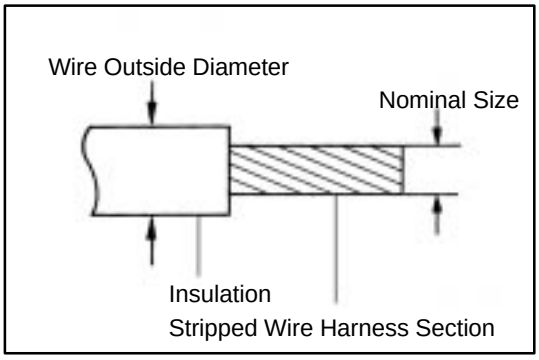
(b) When size is based on the nominal size of the wire.

Sleeve size
S : Small (Red)
M : Medium (Blue)
L : Large (Yellow)



HINT: To calculate the ”Nominal Size” of the wire.

$$\text{Nominal size} = \frac{3.14 \times (\text{Diameter of stripped wire harness})^2}{4}$$



HINT: Outside Diameter and Nominal Size

B

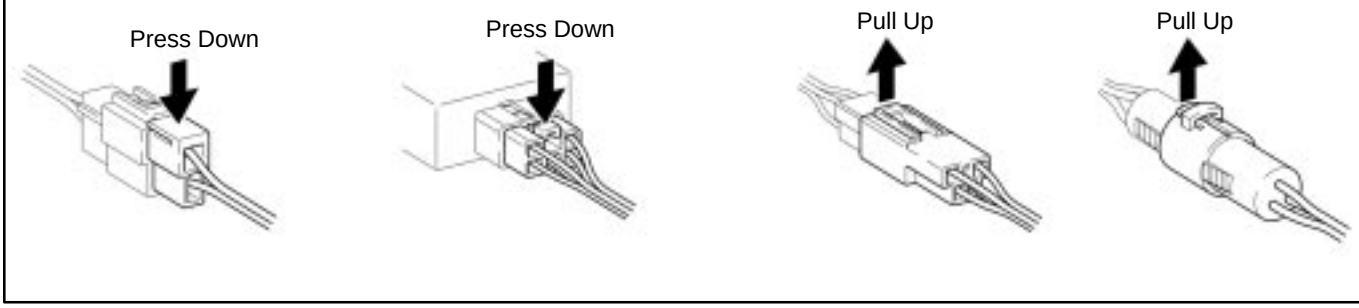
Step 2. Disconnect the Terminal from the Connector.

1. Disconnect Connector

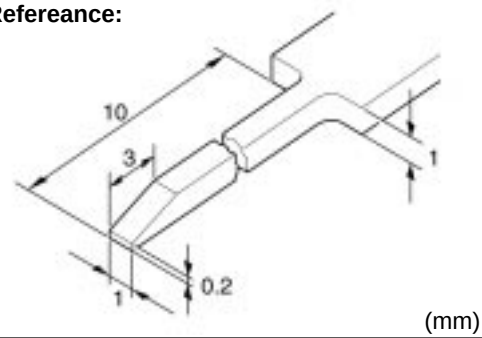
To pull apart the connectors, pull on the connector itself, not the wire harness.

HINT: Check to see what kind of connector you are disconnecting before pulling apart.
Press down type is mainly used.

Example:



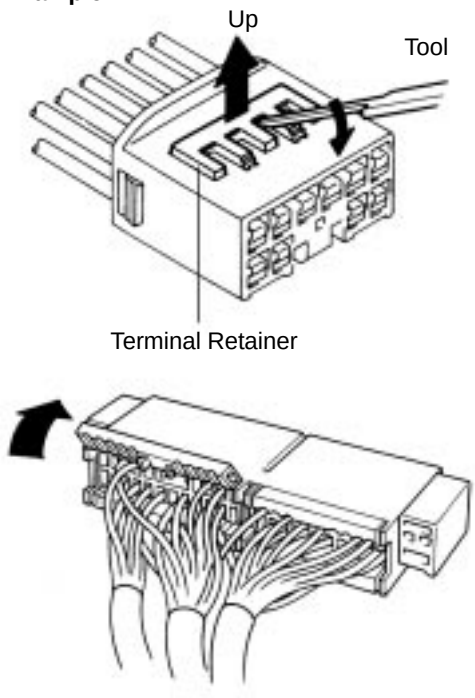
Refereance:



2. Prepare the Special Tool

HINT: To remove the terminal from the connector, please construct and use the special tool or like object shown on the left.

Example:

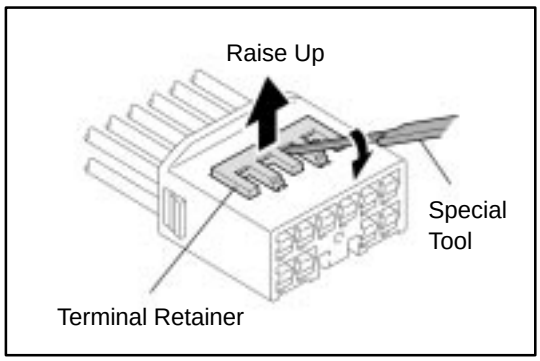


3. Disengage the double locking device or terminal retainer.

(a) Locking device must be disengaged before the terminal locking clip can be released and the terminal removed from the connector.

(b) Use a special tool or the terminal pick to unlock the double locking device.

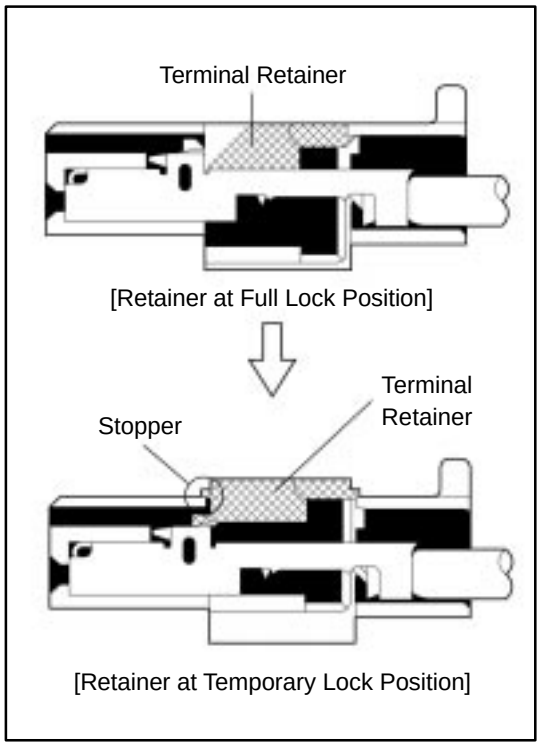
NOTICE:
Do not remove the terminal retainer from connector body.

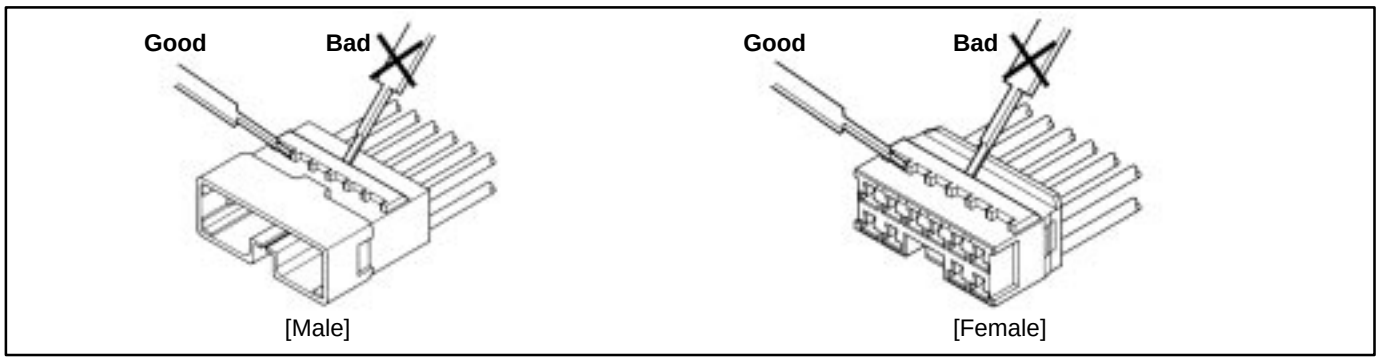


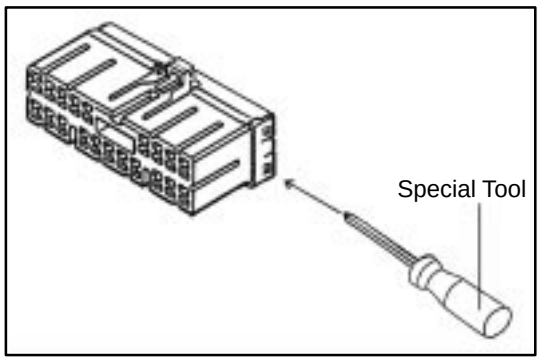
Type A (For 1.0II, 1.8, 2.3II, 4.8 and 8.0 of Non–Waterproof Type Connector)

(1) Using the special tool, raise the retainer up to the temporary lock position.

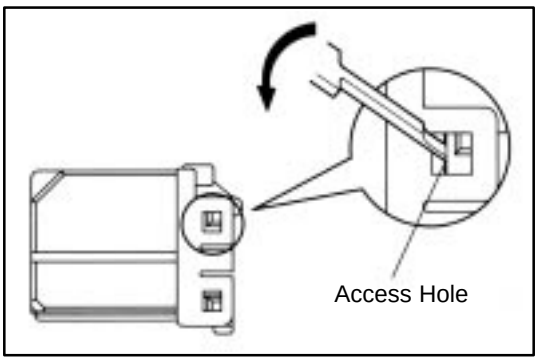
HINT: The needle insertion position varies according to the connector's shape (number of terminals, etc.), so check the position before inserting it.





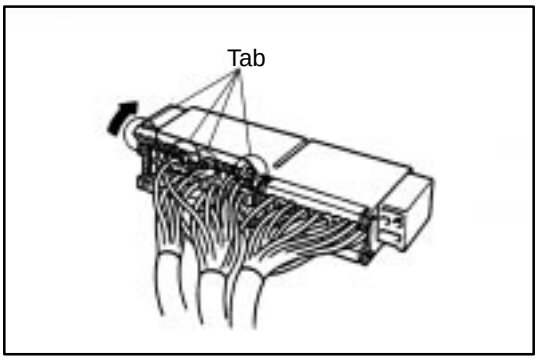


Type B (For 1.8, 1.0 and TLC of Non–Waterproof Type Connector)



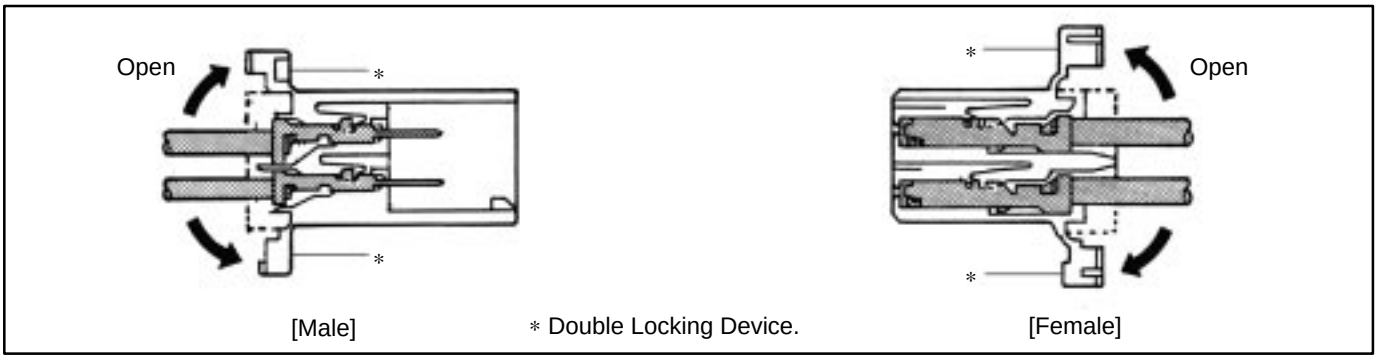
(1) Press the special tool at a 45° angle into the locking lug access hole as shown.

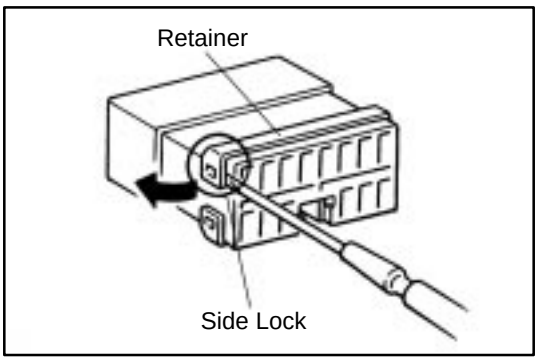
Raise the double locking device up as far as possible.



(2) Remove the special tool and open the double locking device

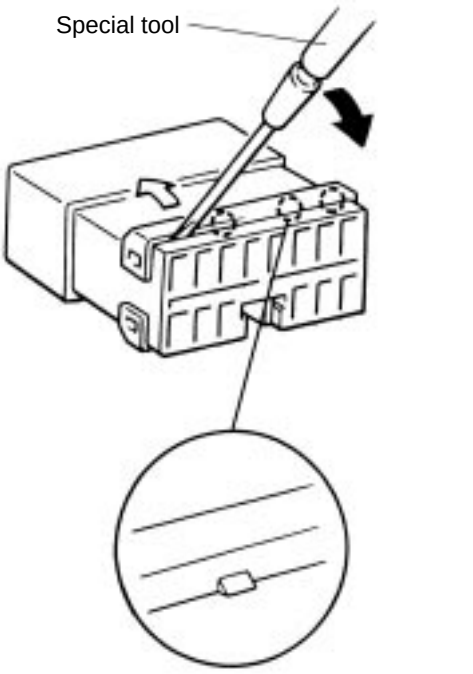
NOTICE:
TLC housing is not be reusable. Please replace it with the new one after replacement of the terminal.





Type C (For TNS, FTC Type Connector)

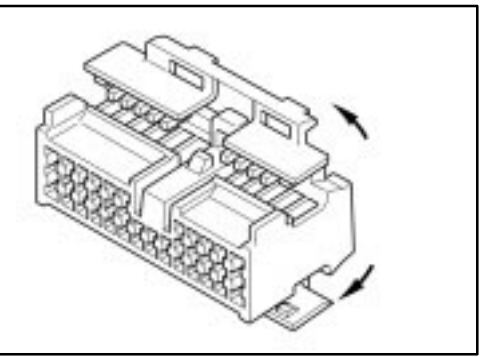
(1) Widen the side lock part of the retainer from side to side using the special tool.



(2) Inset the special tool into the chink between the retainer and the terminal itself. Then pry it to the direction of the arrow shown in the illustration and push the retainer up to release the lock.

NOTICE:

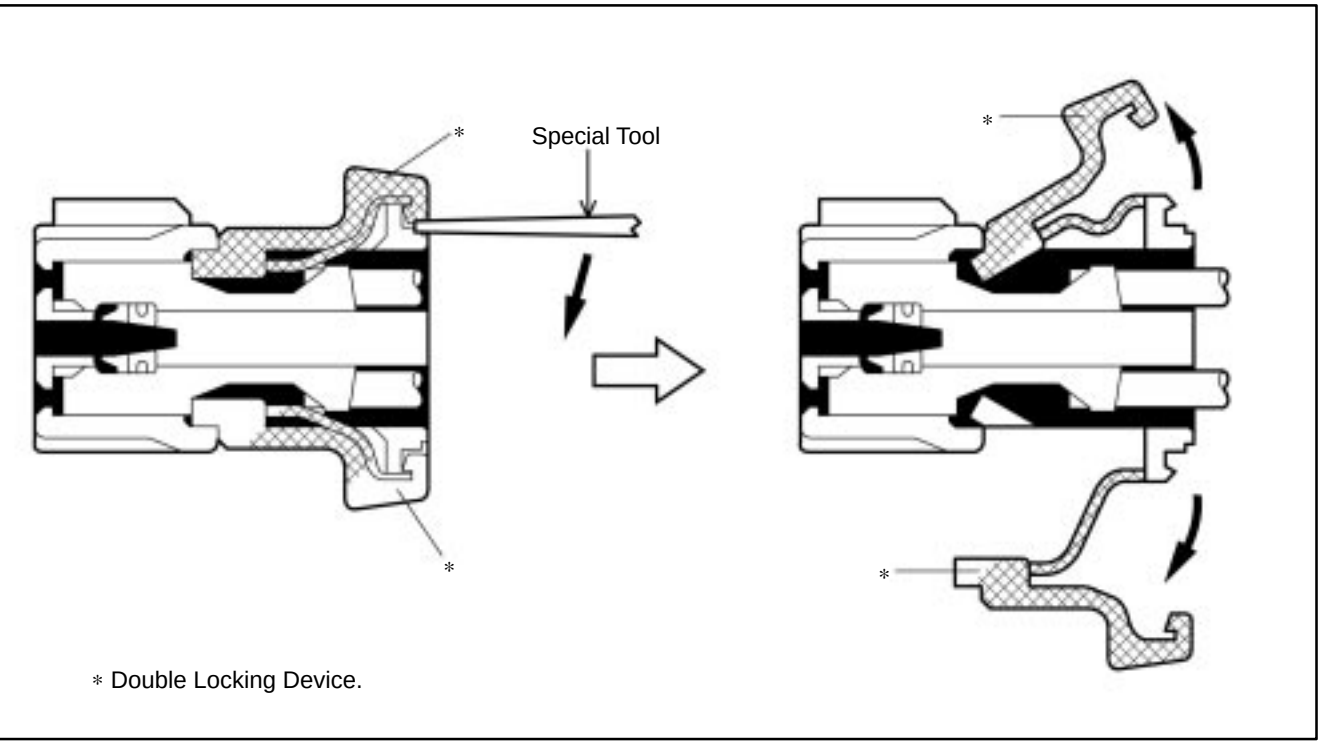
- **Do not insert the special tool too much. It may cause damage on the fit section of the terminal and the wire harness.**
- **TNS housing is not reusable. Please replace it with the new one after replacement of the terminal.**

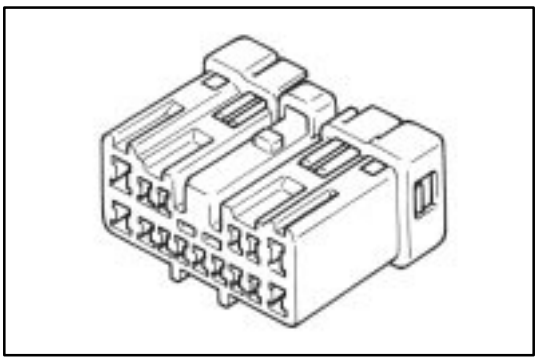


Type D (For 1.3 of Non–Waterproof Type Connector)

[Case 1]

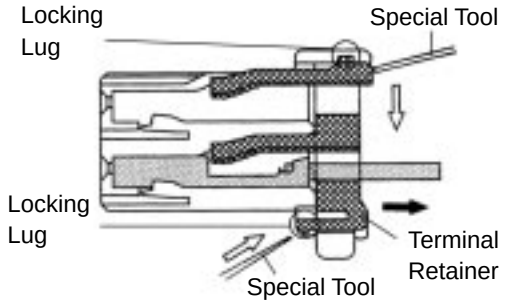
(1) Use the special tool to unlock the double locking device.



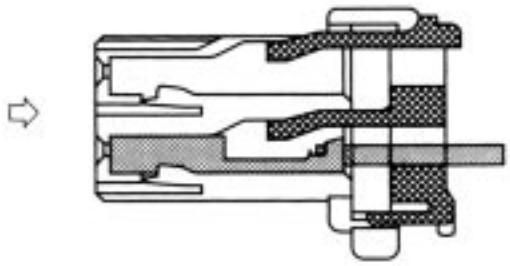


[Case 2]

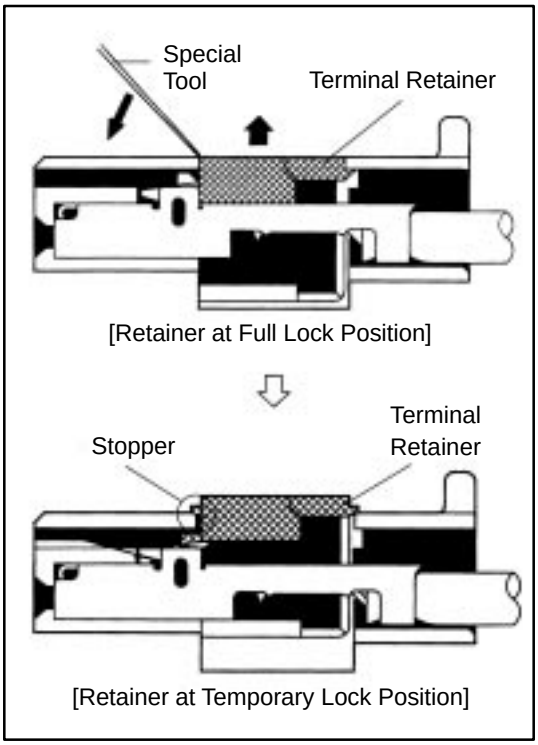
(1) Using the special tool, push the terminal retainer locking lug (clip) and pull the terminal retainer up to the temporary lock position.



[Retainer at Full Lock Position]



[Retainer at Temporary Lock Position]

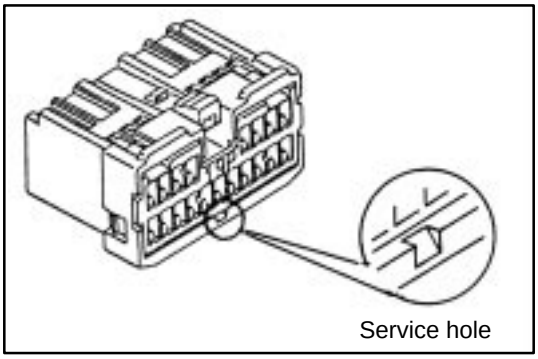


[Retainer at Full Lock Position]

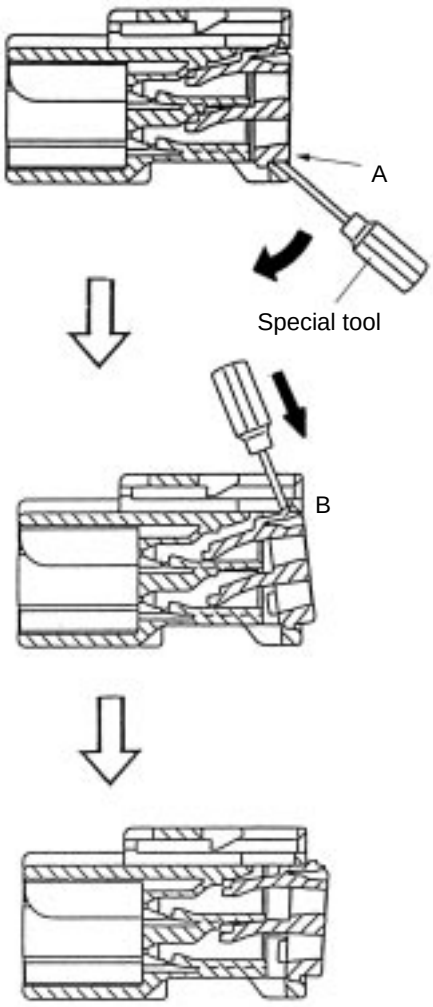
[Retainer at Temporary Lock Position]

[Case 3]

(1) Using the special tool, raise the retainer up to the temporary lock position.



[Case 4]



Appearance when the double locking is released

(1) Insert the special tool into the service hole and move it to the direction of the arrow to release the lock on the side A.

(2) Push the lock on the side B up by the special tool and release the lock. Then pull the retainer forward.

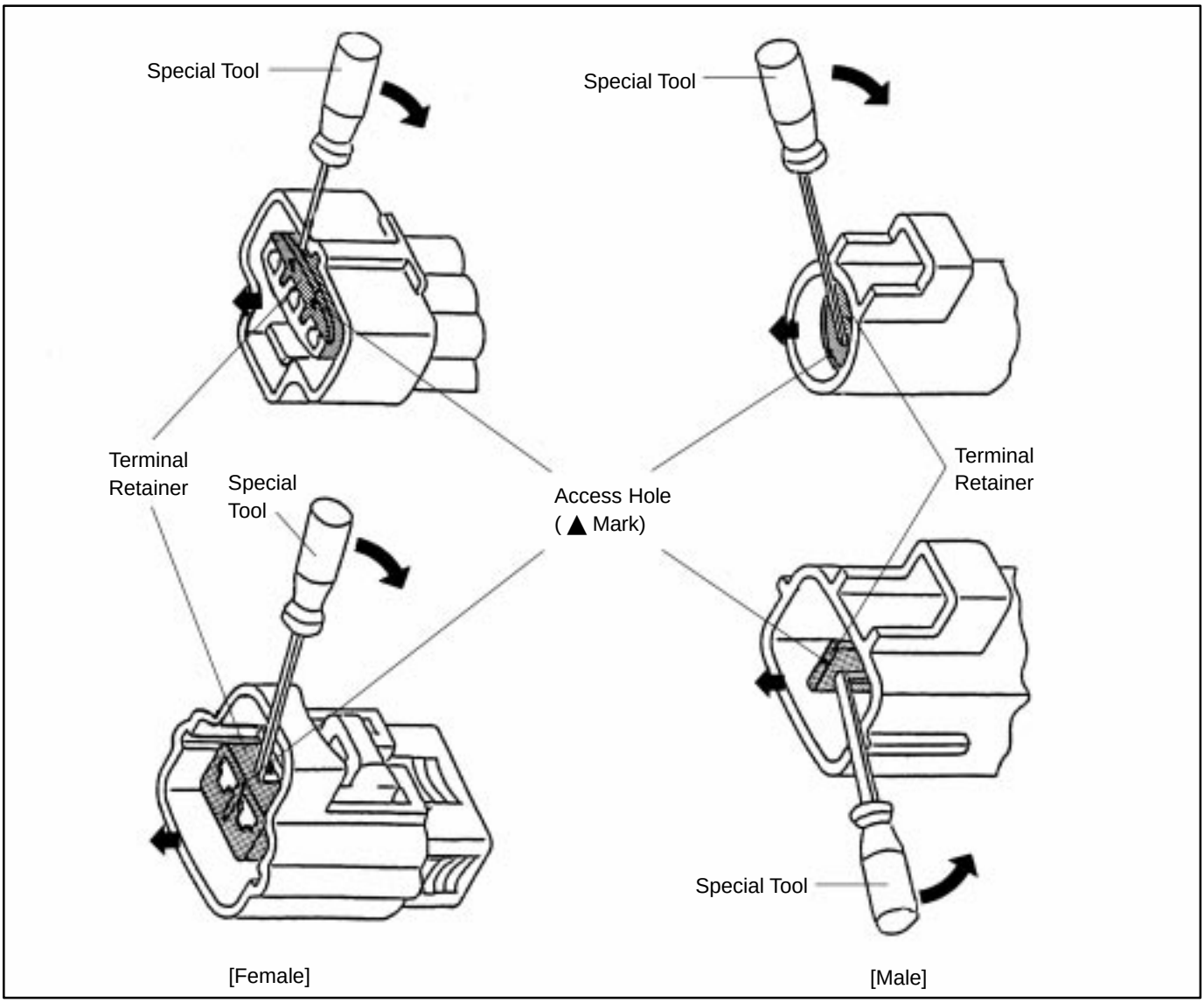
Type E (For 1.8, 2.3, 2.3II, 4.8, 6.3 and 8.0 of Waterproof Type Connector)

HINT: Terminal retainer color is different according to connector body.
Example:

Terminal Retainer	:	Connector body
Black or White	:	Gray
Black or White	:	Dark Gray
Gray or White	:	Black

[Case 1]

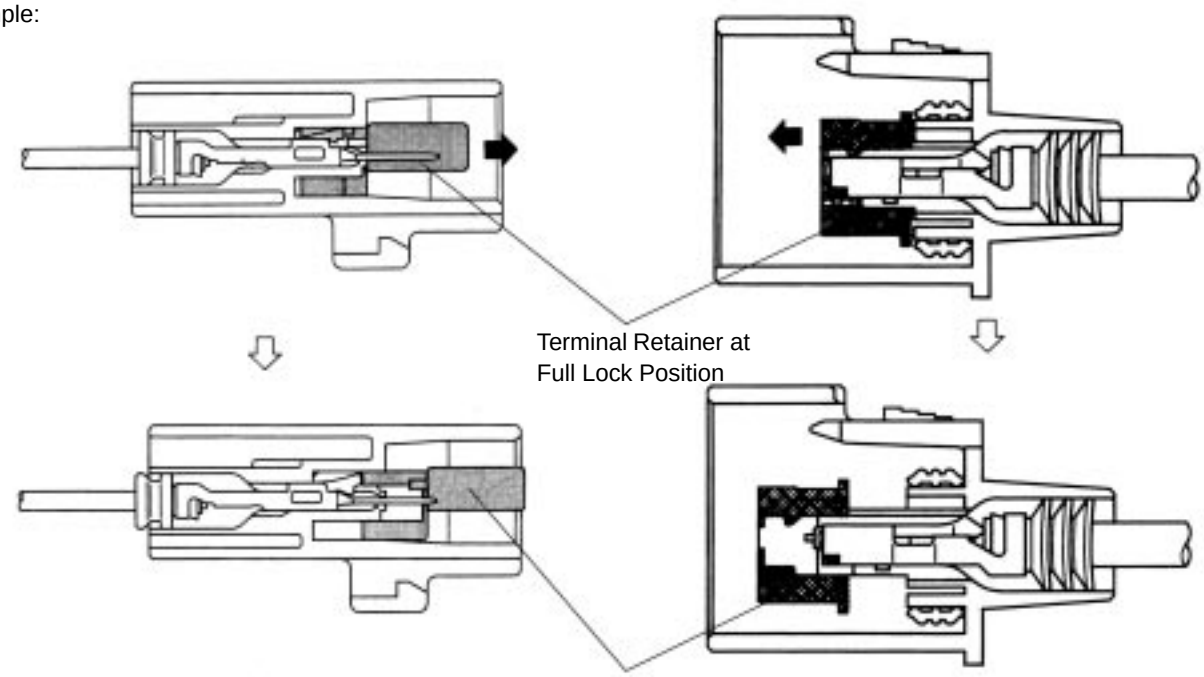
Type where terminal retainer is pulled up to the temporary lock position (Pull Type).

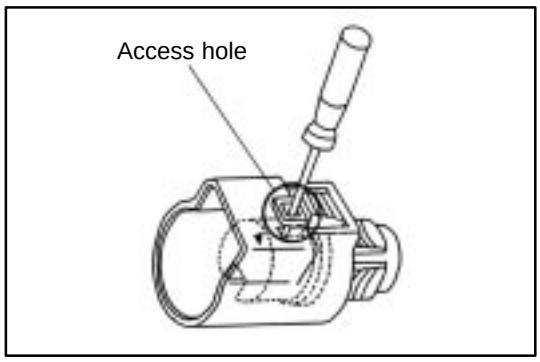


(1) Insert the special tool into the terminal retainer access hole (▲ Mark) and pull the terminal retainer up to the temporary lock position.

HINT: The needle insertion position varies according to the connector's shape (Number of terminals etc.), so check the position before inserting it.

Example:



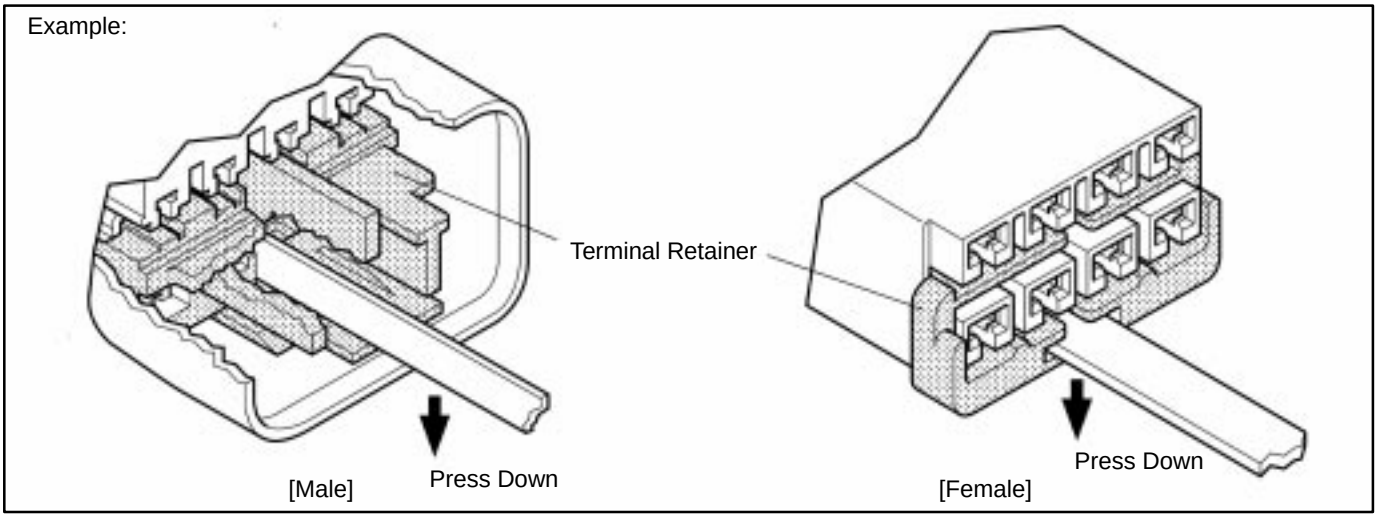


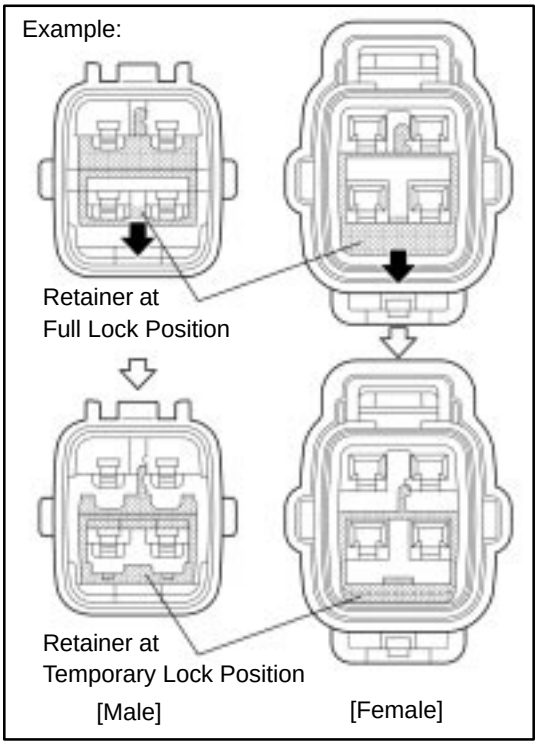
HINT: In some cases insert the special tool from the access hole on the flank of the housing.

[Case 2]

Type which cannot be pulled as far as Power Lock

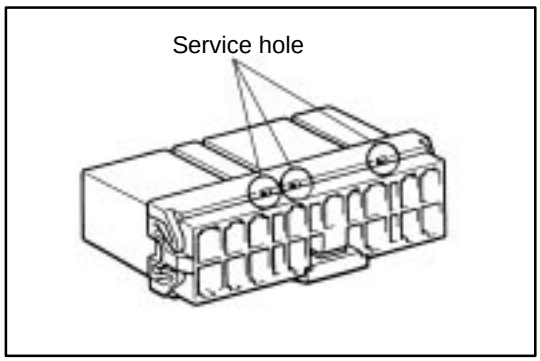
HINT: There are few cases of this type of connector





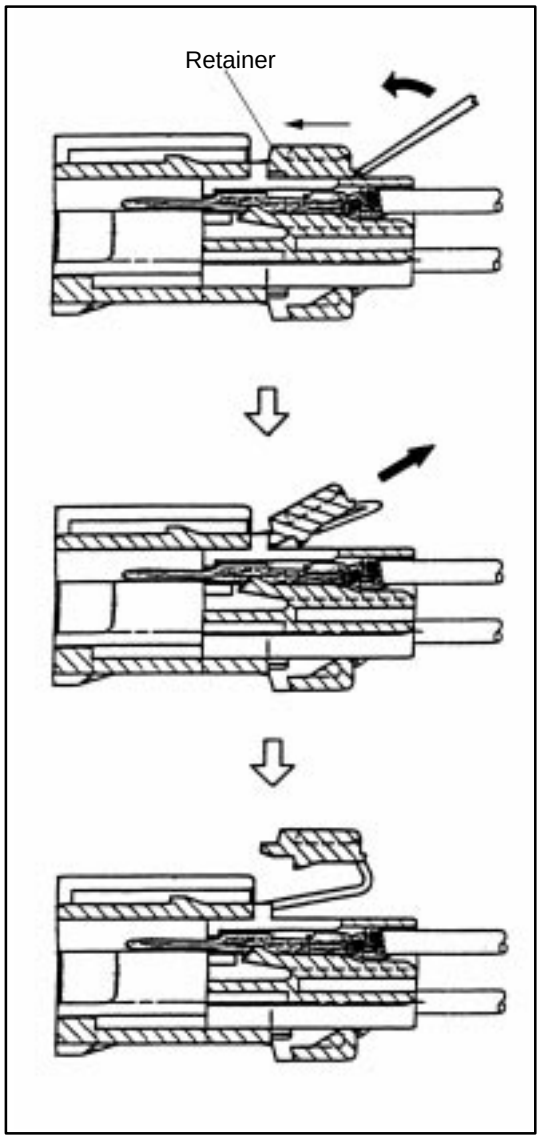
(1) Insert the tool straight into the access hole of terminal retainer as shown.

Push the terminal retainer down to the temporary lock position.



Type F (For C–Type Connector)

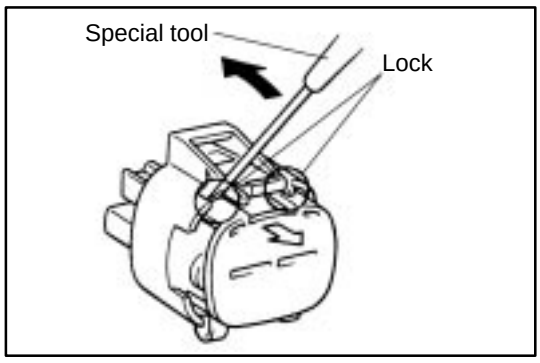
(1) Insert the special tool into the service hole.



(2) Move the special tool to the direction of the arrow and release the lock.

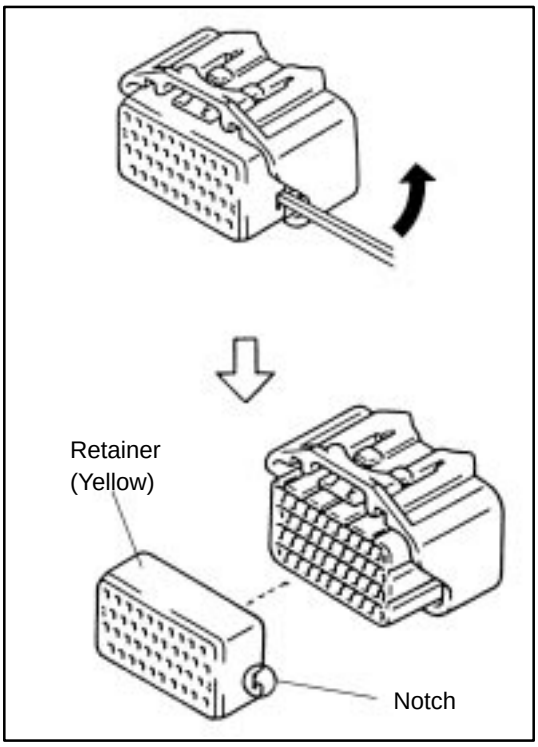
HINT: Lift the retainer up after moving it to the direction of the thin arrow shown in the illustration.

(3) Pull the retainer forward by hand and remove the retainer from the housing.



Type G

- Insert the special tool into the position shown in the illustration. Pry it to the direction of the arrow and push the lock up to release it.

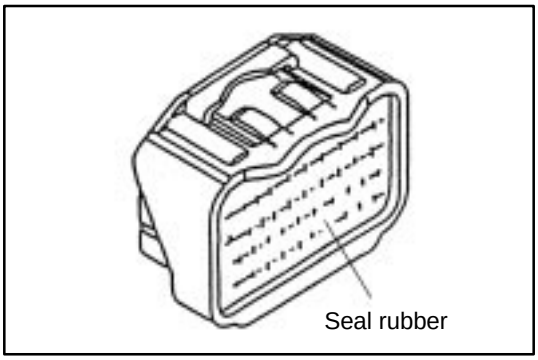


Type H (For 1.0II Type Connector)

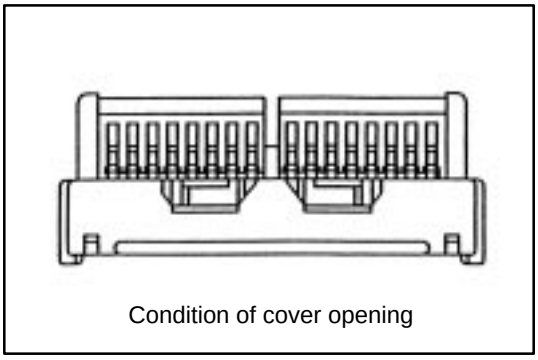
(1) Move the special tool into the notch of the retainer to the direction of the arrow with the edge of the housing as the fulcrum. Then the pull the retainer out.

NOTICE:
Do not insert the special tool into areas except notches. (This may damage the seal ring that is attached behind the retainer.)

(2) As same as the procedure (1), pull the retainer straight out using hand after releasing the lock on the other side.

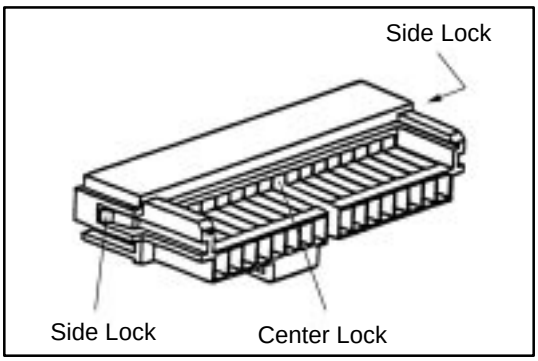


NOTICE:
- **Do not remove the seal rubber when pulling the terminal out.**
- **If the seal rubber is peeled off when puling the terminal out, press it down to stick it to the original condition.**
- **Be sure and not fit the connector when the retainer is not installed**.



Type I (For SFPC Type Connector)

(1) Open the cover (white)

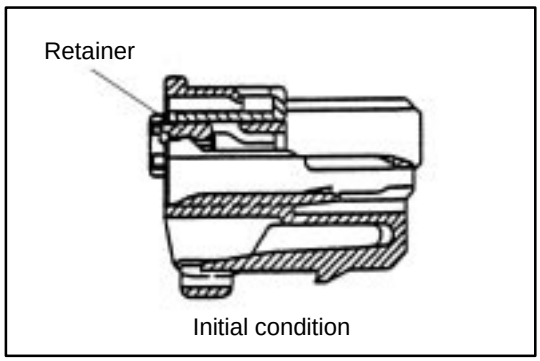


(2) Remove the side lock of the retainer. (One side)

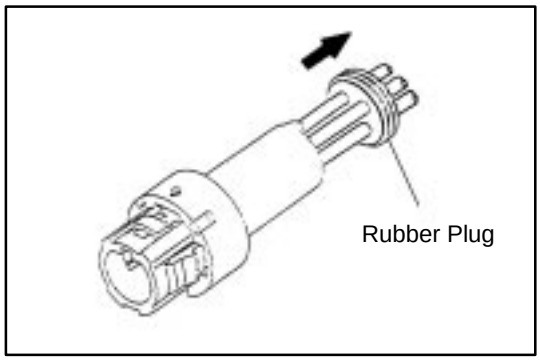
(3) Remove the center lock of the housing.

(4) Remove the side lock of the retainer. (The other side)

NOTICE:
- **Following the above order is not required.**
- **No center lock on the housing with ten poles.**



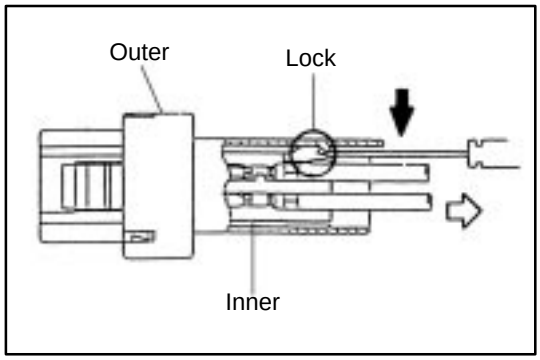
(5) Move the retainer until it becomes the initial condition.



Type J

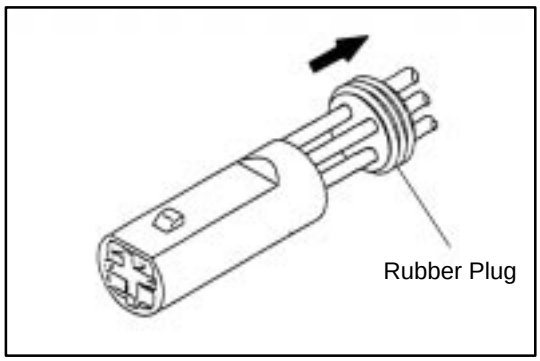
[Male]

(1) Remove the rubber plug.



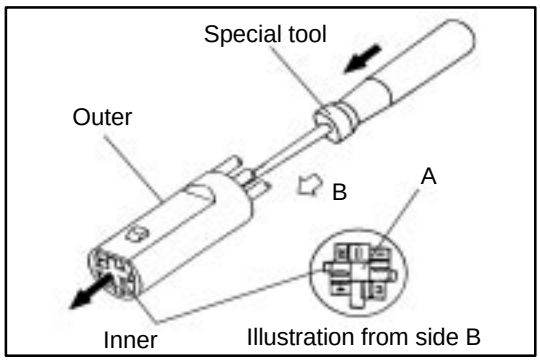
(2) Push the lock of the inner using the special tool.

(3) Pull the wire to the direction of the arrow pushing the lock up and remove the inner from the outer.

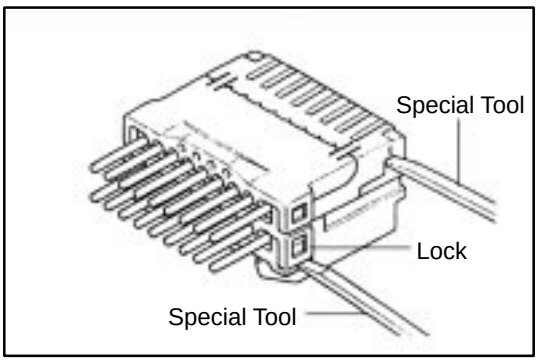


[Female]

(1) Remove the rubber plug.



(2) Insert the special tool into the outer shown in the illustration. Then push the area A of the inner and remove the inner from the outer.

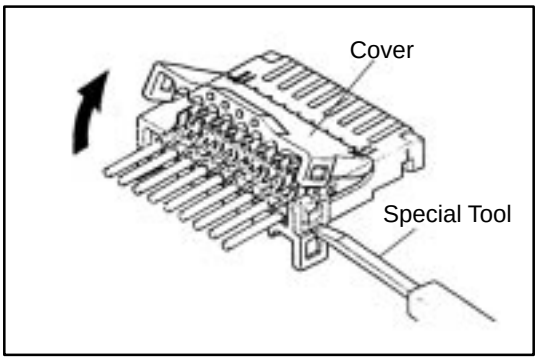


Type J (For Insulation Displacement Connector)

(1) Separate Connector

Using a special tool, release the lock and separate the connector into 2.

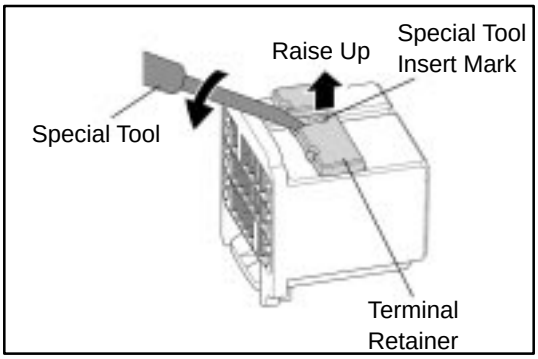
NOTICE:
Do not apply too muck force to the lock arm.



(2) w/ Cover : Open Connector Cover

Using a special tool, release the lock and open the cover.

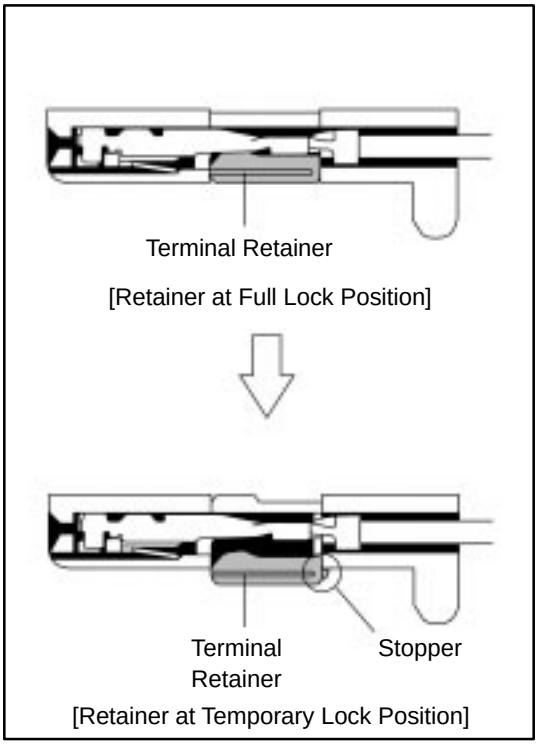
NOTICE:
Do not apply too much force to the lock arm.

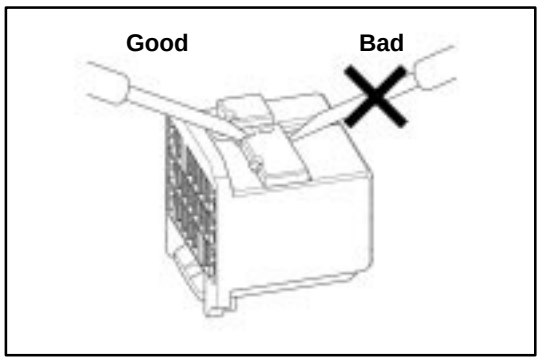


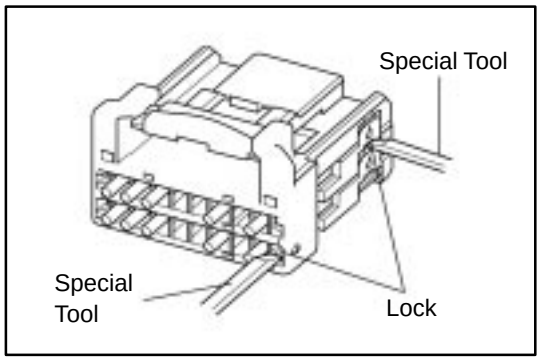
Type K (0.64 Type Connector)

(1) Using the special tool, raise the retainer up to the temporary lock position.

HINT: The needle insertion position varies according to the connector's shape (number of terminals, etc.), so check the position before inserting it.





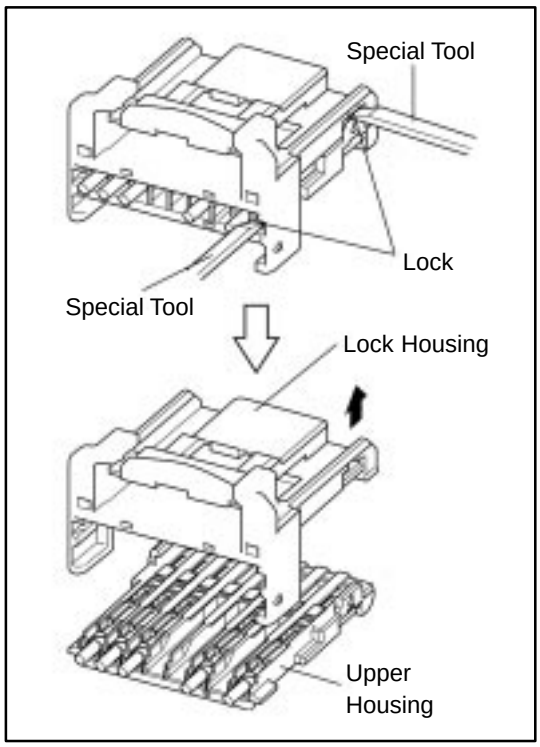


Type L (0.64 of Insulation Displacement Connector (IDC) Type)

(1) Remove the Lower Housing

Using a special tool, release the lock and remove the lower housing.

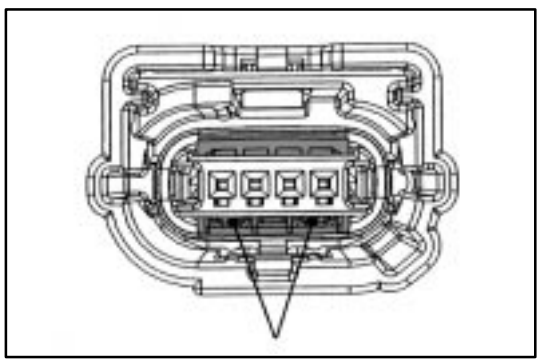
NOTICE:
- **Do not apply too much force to the lock arm.**
- **Mark the upper housing and lower housing to prevent mistakes when putting them together.**



(2) Remove the Upper Housing

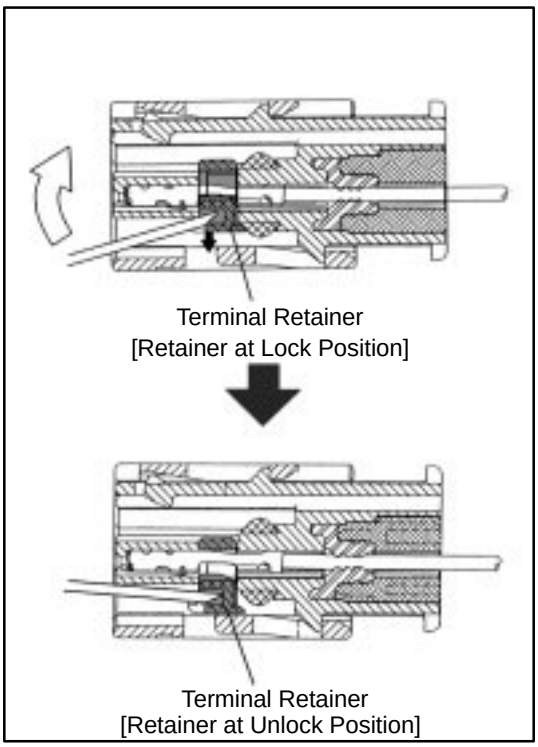
Using a special tool, release the lock and remove the upper housing from the lock housing.

NOTICE:
- **Do not apply too much force to the lock arm.**
- **Mark the upper housing and lower housing to prevent mistakes when putting them together.**

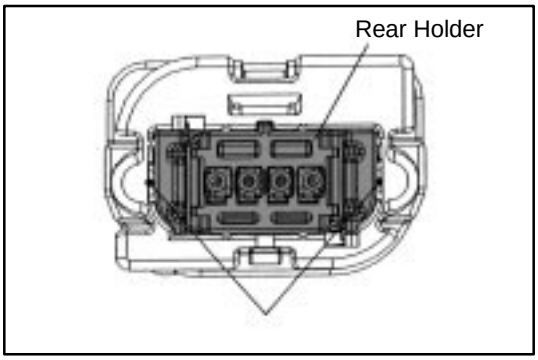


Type M (0.64 of Splash Proof Connector)

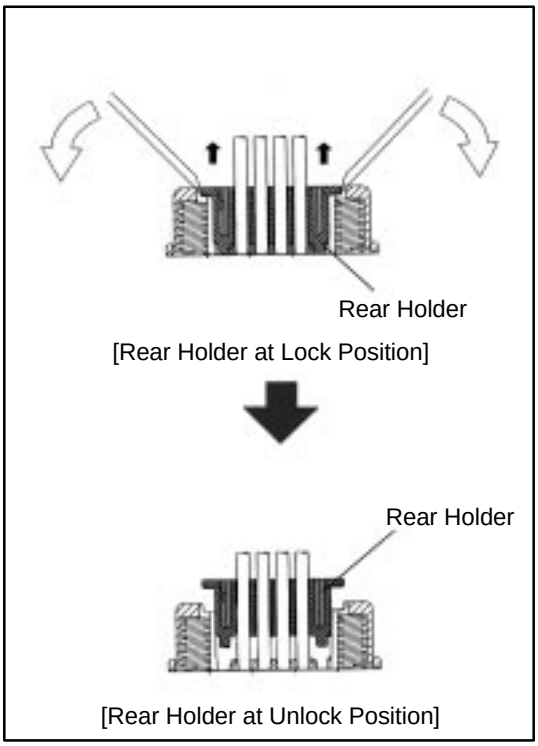
(1) Release Terminal retainer.
Insert Special Tool at the location shown in the figure left.



Move Special Tool in the direction of arrow.



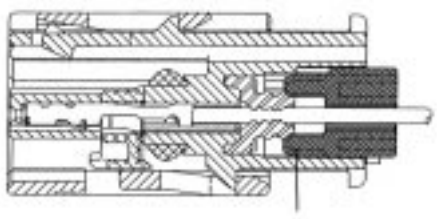
(2) Release Rear holder.
Insert Special Tool at the location shown in the figure left.

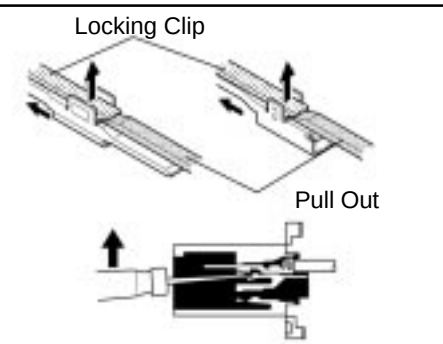


Move Special Tool in the direction of arrow.

NOTICE:

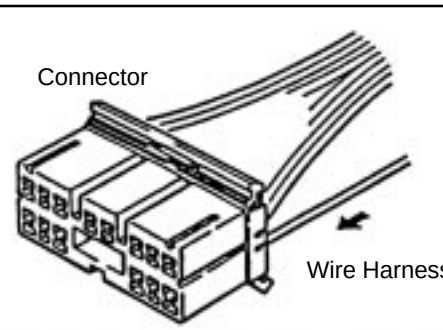
- **Do not remove Rear holder from Connector housing.**
- **If Rear holder completely comes off the housing, replace Connector with a new one.**



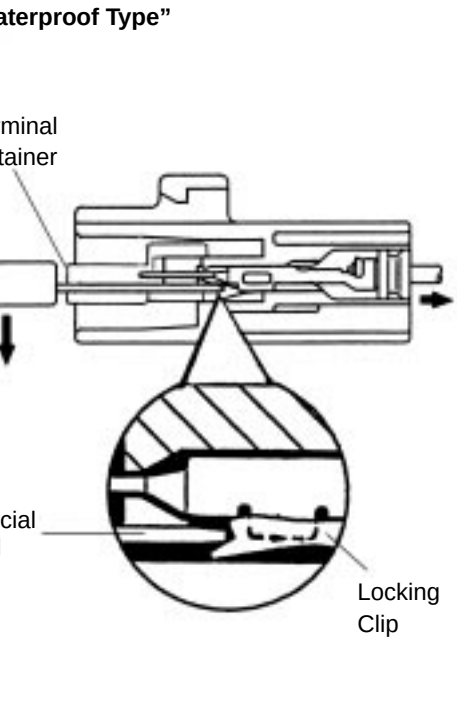


4. Disconnect Terminal from Connector

(a) Determine the primary locking system from the charts.
1. Lock Located on terminal
2. Lock Located on connector
3. Method of entry and operation



(b) Push the terminal gently into the connector and hold it in this position.



(c) Insert the special tool into the connector in the direction shown in the chart.

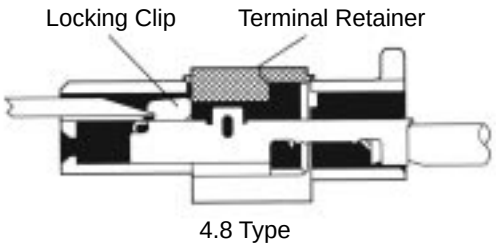
(d) Move the locking clip to the unlock position and hold it there.

NOTE: Do not apply excessive force to the terminal. Do not pry on the terminal with the special tool.

(e) Carefully withdraw the terminal from the connector by pulling the lead toward the rear of the connector.

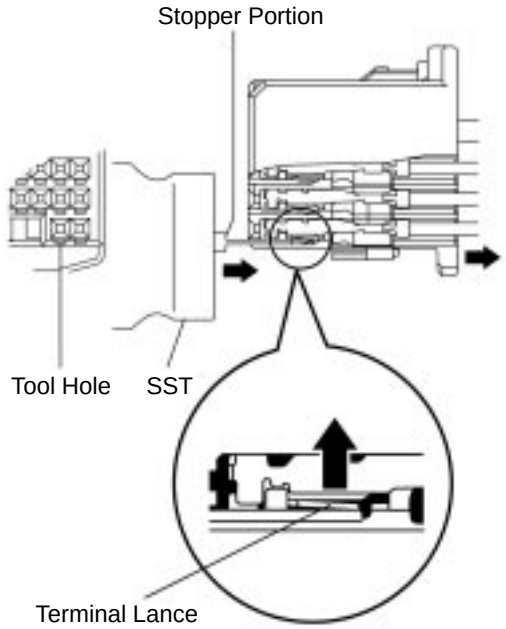
NOTE: Do not use too much force. If the terminal does not come out easily, repeat steps (a) through (e).

”Non–Waterproof Type”



4.8 Type

0.64 Type



(f) Insert the SST into the connector in the direction shown in the chart.

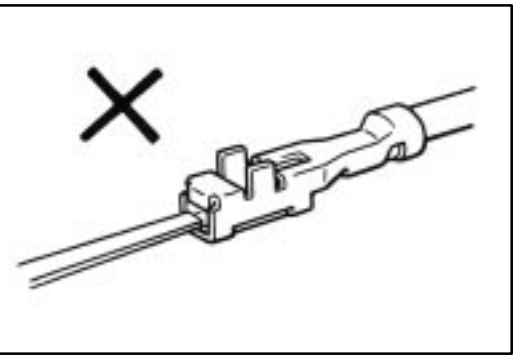
(g) Insert the SST fully to the tool hole, and push the terminal lance.

NOTICE:

- **The terminal has a lance shape, therefore, the housing may be damaged and the terminal may get stuck if forcibly pried by wires etc.**
- **Insert the SST so that the stopper portion surface is facing up.**

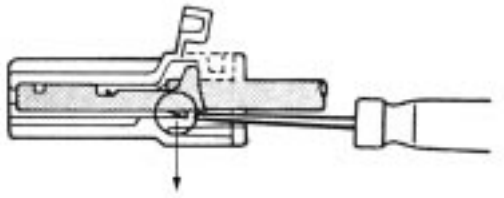
(h) Carefully withdraw the terminal from the connector by pulling the lead toward the rear of the connector.

NOTICE:
Removal of the terminal from housing cavity will cause damage to the wire seal section, deteriorating waterproofing performance. Replace the connector with a new one.



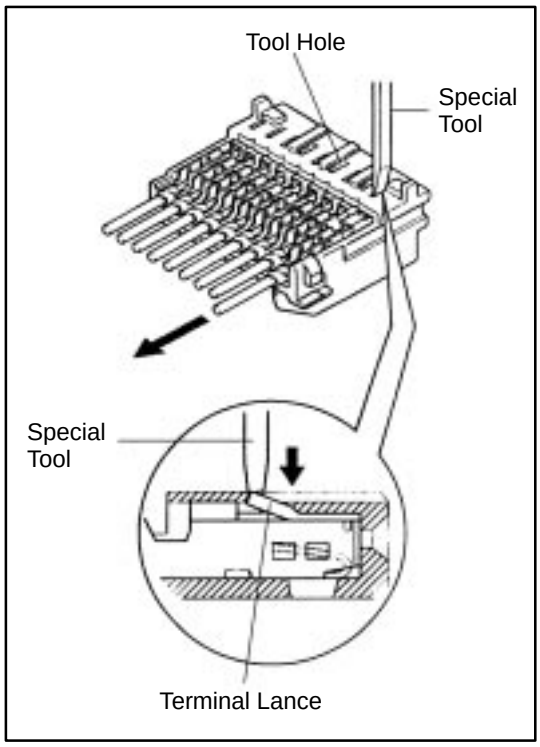
NOTICE:
Do not insert the special tool into the female terminal box. If you do so, replace the terminal with the new one whether the terminal is broken or not.

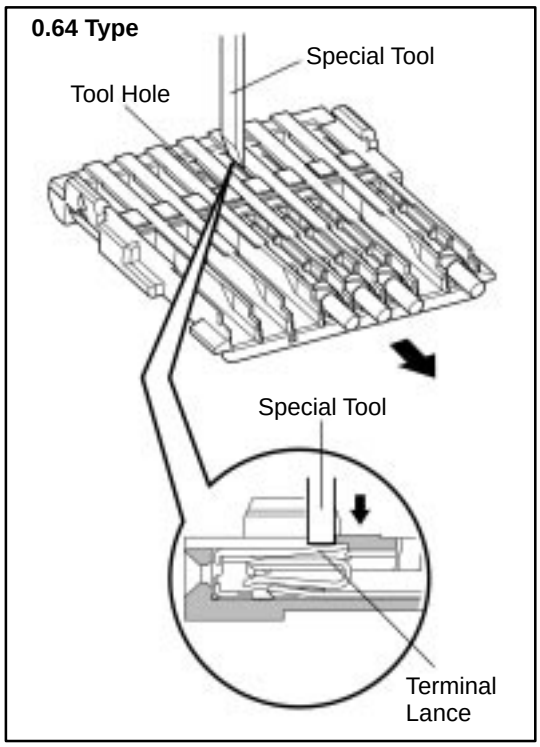
Non–waterproof type TLC housing



Insert the tool from wire harness side

NOTICE:
As for Non–waterproof type TLC housing, insert the special tool into the housing from wire harness side.





Insulation Displacement Connector Type

(a) Using a special tool, push the terminal lance from the tool hole.

(b) Carefully withdraw the terminal from the connector by pulling the lead toward the rear of the connector.

NOTICE:

- **Do not use too much force. If the terminal does not come out easily, repeat step (a).**
- **Always change the wire with the repair wire, in accordance with page B–27.**

Terminal Deformation

(1) Terminal Bending in Vertical Direction

1˚ or less

1˚ or less

(2) Terminal Bending in Horizontal Direction

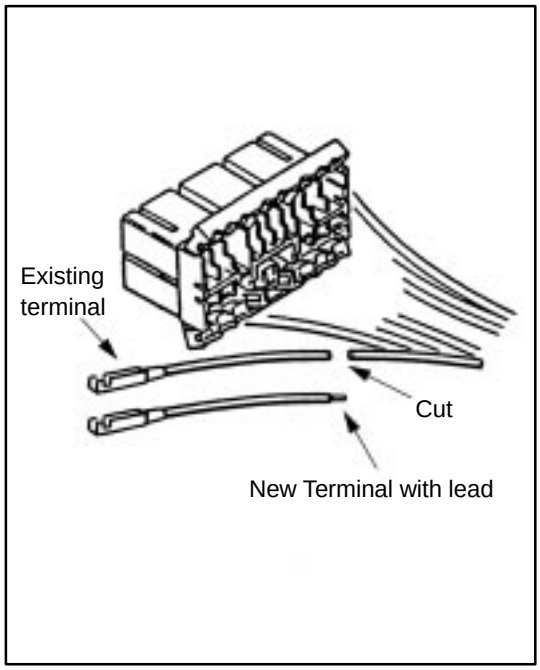
3˚ or less

5. Inspect the terminal and the connector for damage.

NOTE:

- The locking clip is easily damaged.
- Do not reuse the damaged part.

Step 3. Replace the terminal.

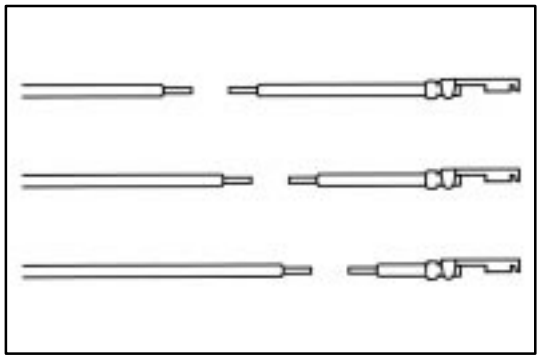


1. Cut the Old Terminal from the Harness.

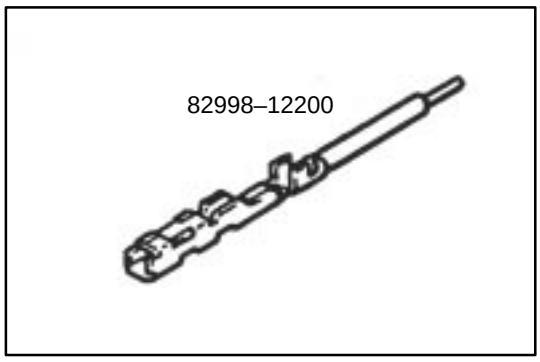
(a) Use the new wire lead as a guide for proper length.

NOTE: If the length of wire removed is not approximately the same length as the new piece, the following problems may develop:

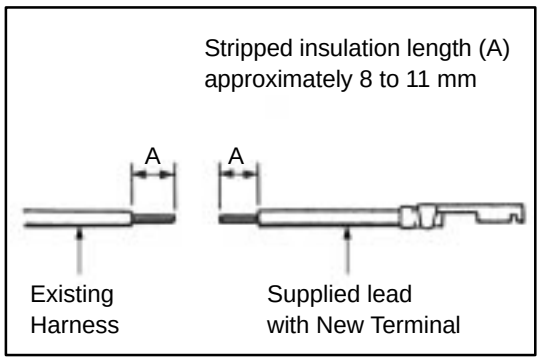
- Too short — tension on the terminal, splice, or the connector, causing and open circuit.
- Too long — excessive wire near the connector, may get pinched or abraded, causing a short circuit.



HINT: When connecting a wire harness at there or more spots to the same connector, cut the wire harness as shown on the left.

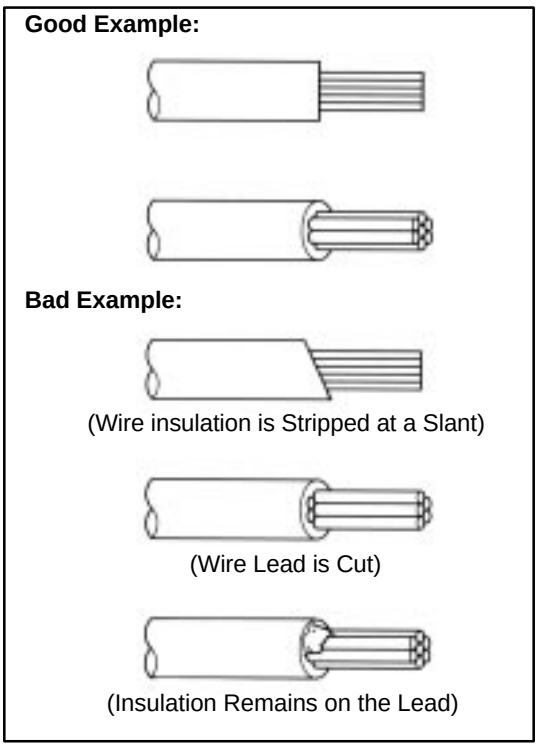


2. Select the correct replacement terminal with lead, from the supply parts.



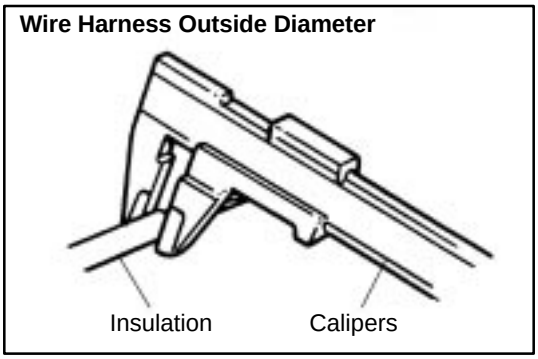
3. Strip insulation from wire on the harness and replacement terminal lead.

Start stripping at least 8 mm (0.31 in.) to 11 mm (0.43 in.) away from the end of the existing harness at vehicle side and also from the end of the repair wire.



NOTICE:
Take care not to damage the wire when stripping the wire harness lead. After finishing the operation, visually inspect the wire. If there is any damage, perform the operation again.

HINT:
If the wire size is not known, start with largest stripper hole and work down until a clean strip of the insulation is removed without nicking or cutting the wire lead.

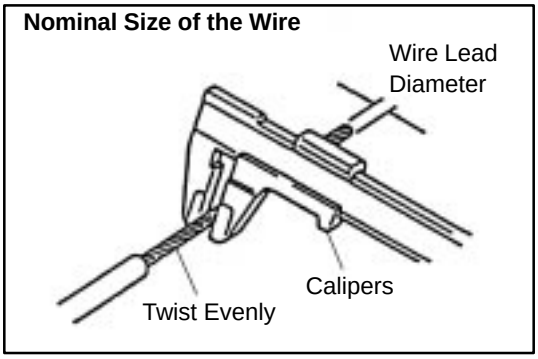


4. Select Correct Size of Sleeve from the Supply Parts.

(a) Measure the diameter of wire by using the measuring device as following:

- When size is based on the outside diameter of the wire harness

  Measure the outside diameter of the wire harness by placing a measuring device, such as a micrometer or Vernier Caliper, across the diameter of the insulation on the lead and taking a reading.

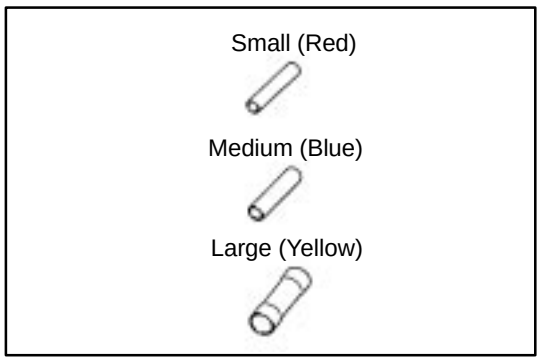


- When size is based on the nominal size of the wire lead.

  Measure the diameter of the wire lead by placing a measuring device, such as a micrometer or Vernier Caliper, across the diameter of the wire lead and taking a reading.

HINT:
To calculate the ”nominal size” of wire

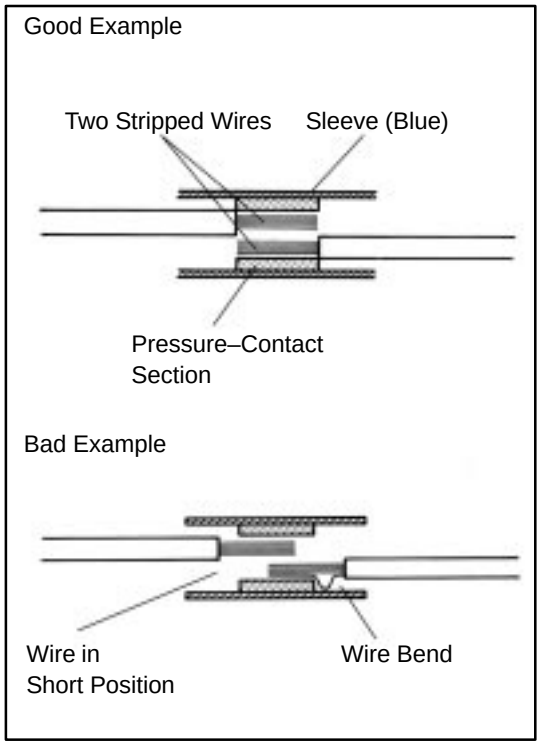
$$\text{Nominal size} = \frac{3.14 \times (\text{Diameter of wire lead})^2}{4}$$



(b) Use the table to determine proper sleeve size

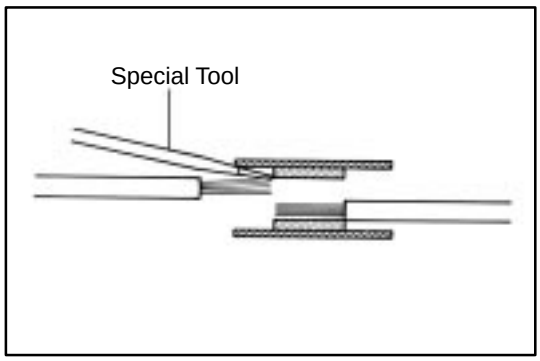
	Part Number	Nominal size of wire (Outside Diameter of wire)
Small	82999–12010	0.3 or less (1.0 – 0.2 mm)
Medium	82999–12020	0.5 – 1.25 (2.0 – 1.0 mm)
Large	82999–12030	2 or more (5.0 – 3.0 mm)

NOTE: For details, refer to sleeve size table on item 4 of STEP 1

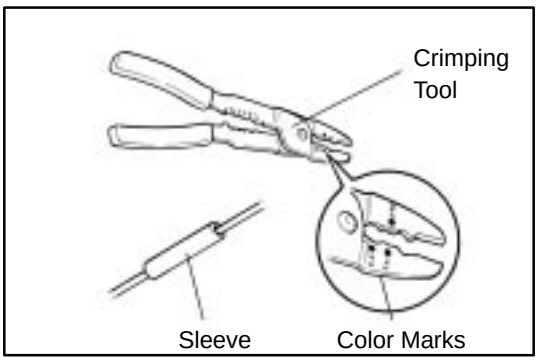


5. Crimp the Replacement Terminal Lead to the Harness Lead.

(a) Overlap the two stripped wire ends inside the sleeve as illustrated on the left.

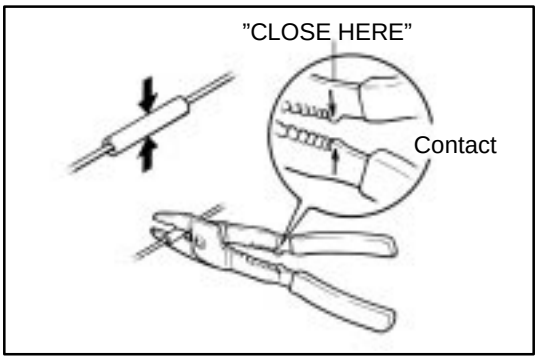


HINT: You might find it easier if you use a miniature special tool as a guide as you insert wires into the sleeve.



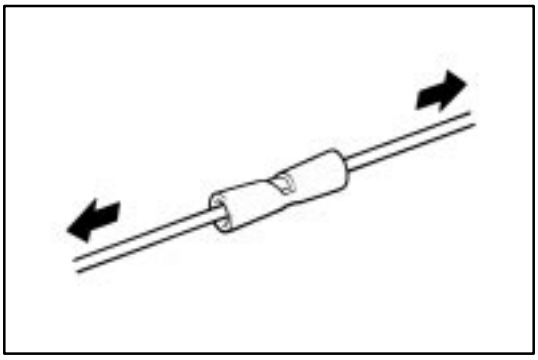
(b) The crimping tool (AMP Part No. 169060) has color marks on it. Place the sleeve in the correct section of the tool according to the color of the sleeve itself.

HINT: For the crimping tool, AMP ”Part No. 169060” is convenient to use.



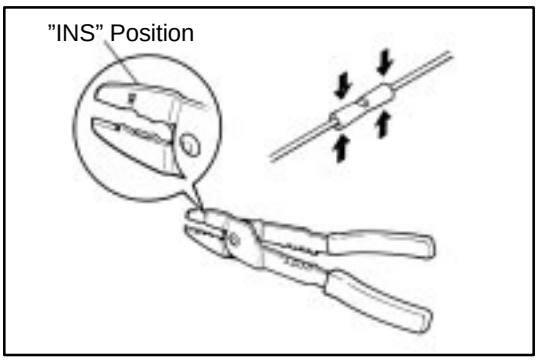
(c) With the center of the sleeve correctly placed between the crimping jaws, squeeze the crimping tool until either end comes into contact at the section marked by ”CLOSE HERE”.

HINT: Check to see that the sleeve and wires are still in the correct position before closing the crimping tool ends with steady pressure.

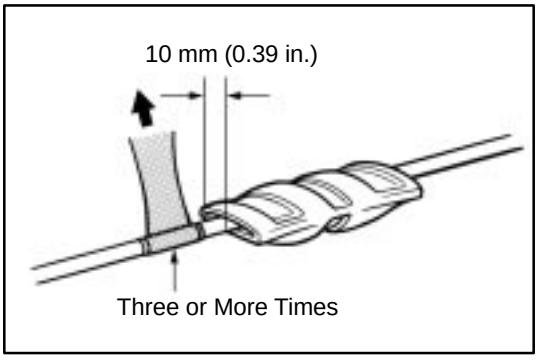


(d) Pull the joined wires to either end. Make sure that they are joined firmly by the sleeve.

NOTICE:
If the joined wires come loose the splice is defective, so replace the sleeve and repeat the procedure.



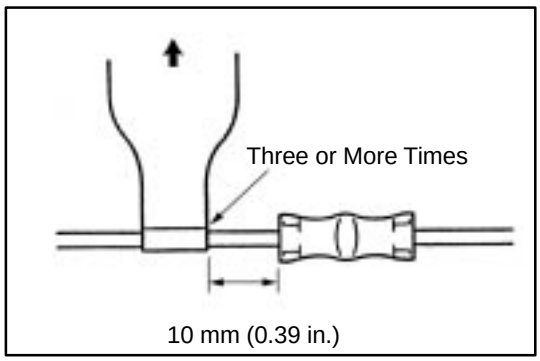
(e) Crimp both ends of the sleeve with the crimping tool at the ”INS” position.



6. Protect Joined Section

Wrap silicon tape around the joins to protect them from moisture.

NOTE: This job is required in repairs of the engine compartment, under the floor and other moisture entry positions.



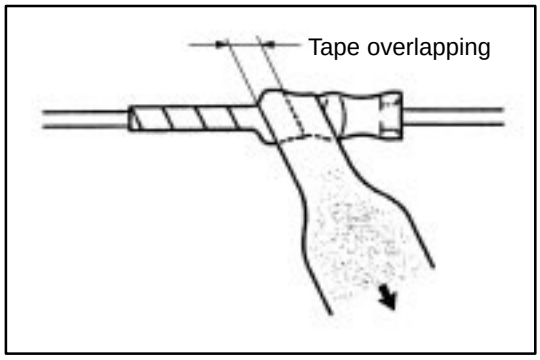
HINT:

- Before starting the operation, thoroughly wipe dirt and grease off the sections to be joined.
- If the adhesive surfaces of two tapes come in contact they will stick together and will not come apart, so do not remove the backing film except when using the tape.
- Do not let oil and dust, etc. get on the tape surface.

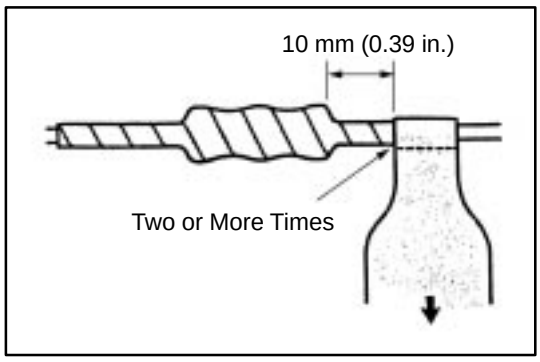
(a) Ready about 100 mm (3.94 in.) of silicon tape (Part No. 08231–00045) and peel off the film.

(b) Stretch the silicon tape until its width is reduced by half.

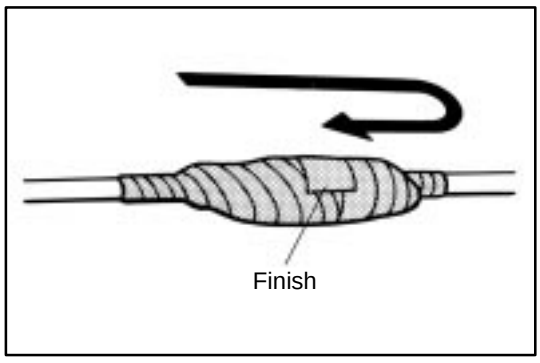
(c) About 10 mm (0.39 in.) from the end of the sleeve, wrap the silicon tape around the sleeve three or more times while stretching the tape.



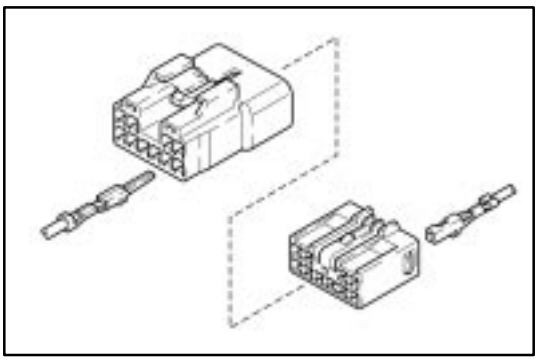
(d) Wrap the remaining part of the sleeve with half of the tape overlapping at each turn.



(e) Firmly wrap the tape two times or more about 10 mm (0.39 in.) from the other end of the sleeve, then wrap the tape back towards the start again and firmly finish winding the tape around the center of the sleeve.



Step 4. Install the terminal into the connector.

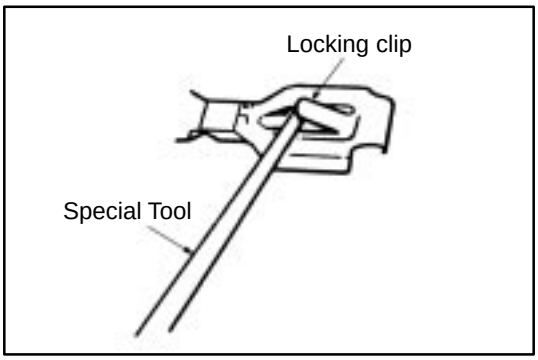


HINT:

(a) Make sure the terminal is positioned correctly.

(b) Insert the terminal until the locking clip locks firmly.

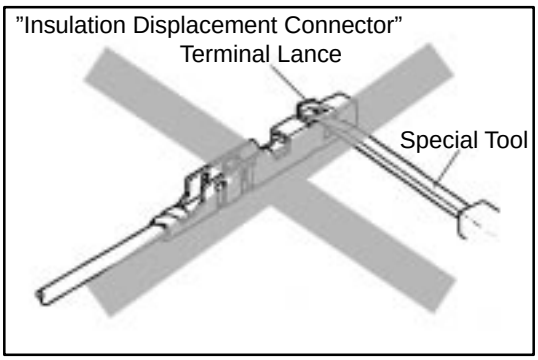
(c) Insert the terminal with terminal retainer in the temporary lock position, if equipped.



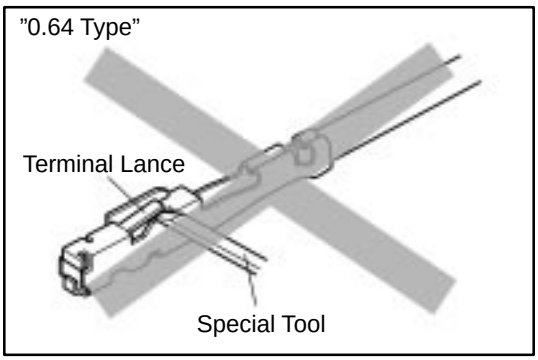
NOTE: If reusing a terminal, check that the locking clip is still in good condition and in the proper position.

(a) If it is on the terminal and not in the proper position, use the special tool to gently bend the locking clip back to the original shape.

(b) Check that the other parts of the terminal are in their original shape.



NOTICE:
Do not readjust or reuse the terminal lance of the insulation displacement connector type terminal. Always change the wire with the repair wire.

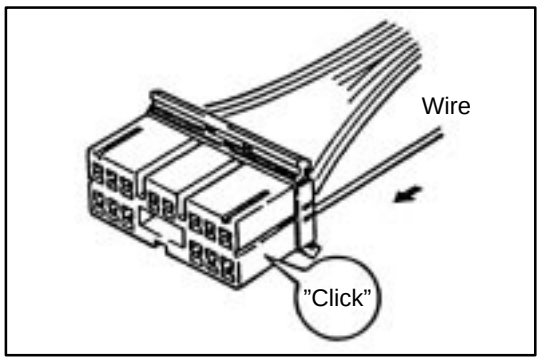


NOTICE:
As for 0.64 type terminal, do not adjust the terminal lance with the special tool.

Splash Proof Type Connector

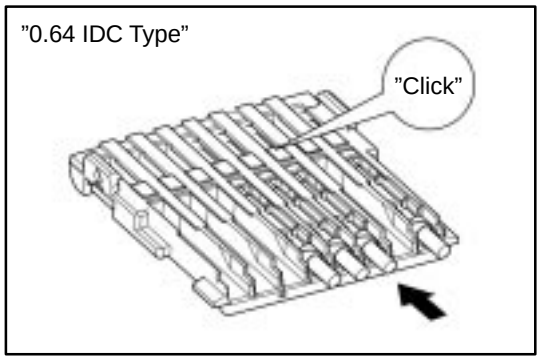
NOTICE:

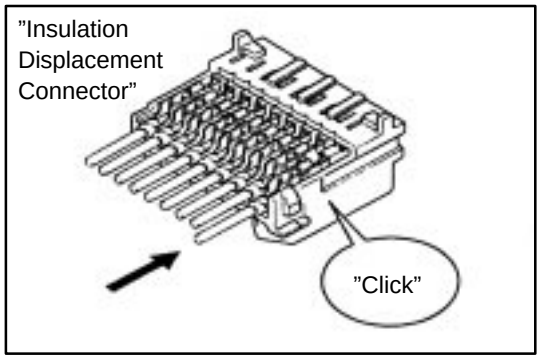
- **Removal of the terminal from housing cavity will cause damage to rubber plug material (the wire seal), deteriorating waterproofing performance. Be sure to replace the housing with a new one.**
- **Check the withdrawn terminal for the following if trying to use it again.**
  - **It is free of deformation and damage**
  - **It is free of adherents such as rubber plug material (wire seal)**
  - **Replace any deformed terminal.**

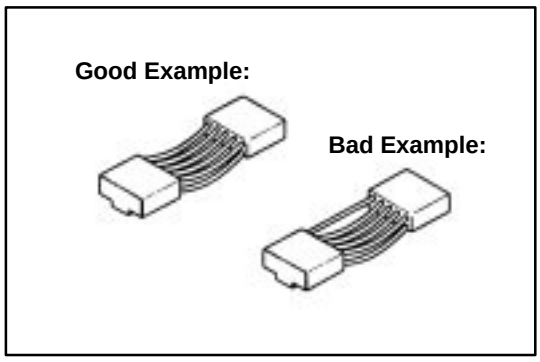


1. Push the Terminal into the Connector until you hear a ”click”.

NOTE: Not all terminals will give and audible ”click”.





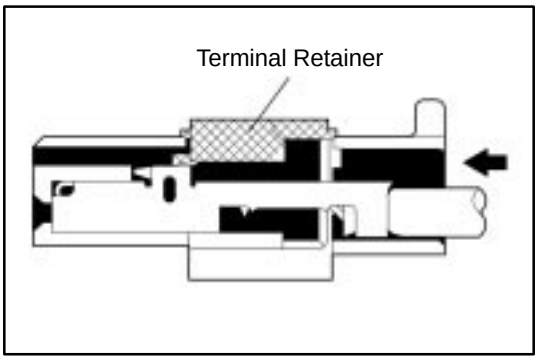


NOTICE:

- **After repairing, never let only one harness stretch.**
- **In cese that it becomes short, do over again using the repair wire.**

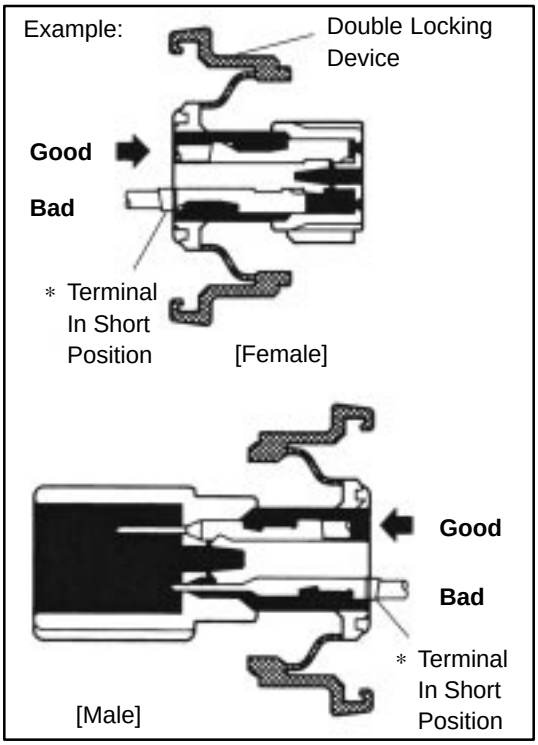
2. Double Locking Type Connector (with terminal retainer or double locking device)

The connector is fitted with a terminal retainer, or a double locking device, it is in the temporary lock position at insert the terminal.



Type A (For 1.0, 1.0II, 1.3, 1.8, 2.3II 4.8 and 8.0 of Non–Waterproof Type Connector)

(a) Insert the terminal.



HINT:

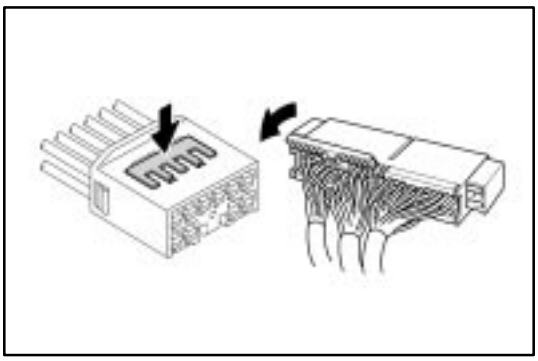
1. Make sure the terminal is positioned correctly.
2. Insert the terminal with terminal retainer in the temporary lock position.

(b) Insert the terminal until the locking clip locks firmly.

HINT:

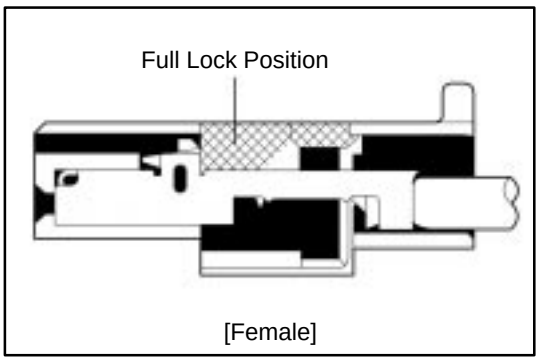
1. Pull the terminal back gently to check whether it is locked correctly.
2. If it cannot be inserted easily, check the terminal and the connector for damage.

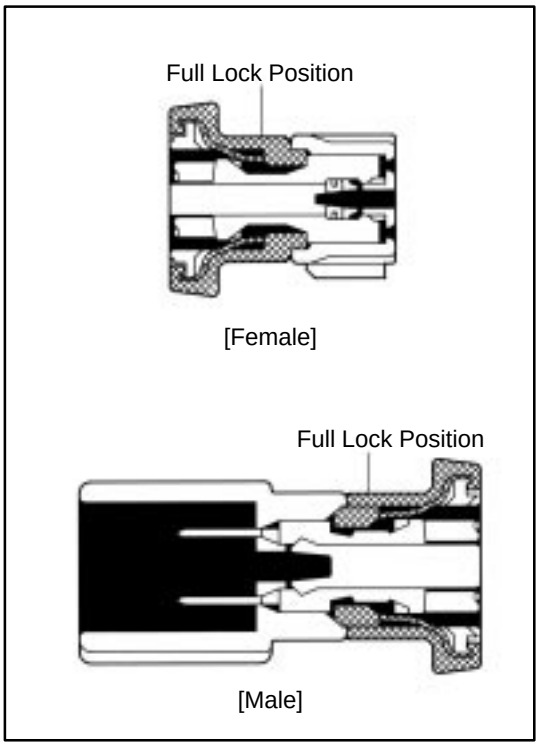
NOTE: If the terminal to locking clip does not lock firmly, the double locking device cannot lock or terminal retainer does not lock at full lock position so the terminal backs out from connector.

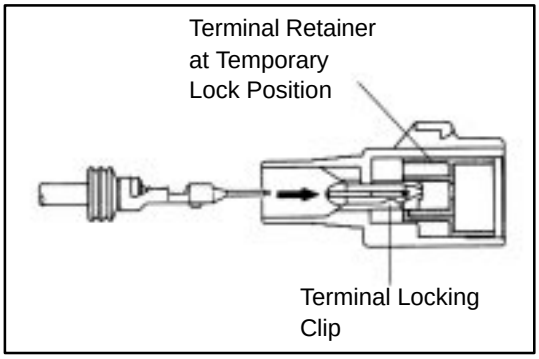


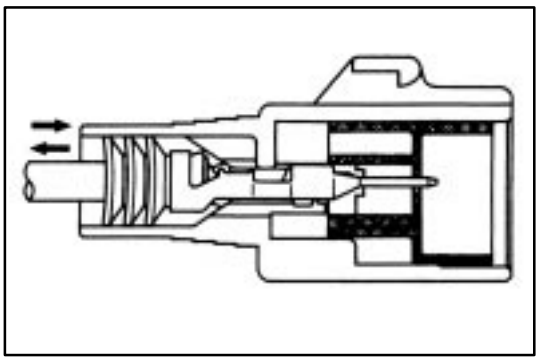
(c) Close terminal retainer or double locking device.

The connector is fitted with a terminal retainer, or a double locking device, return it to the full lock position.









Type B (For 1.8, 2.3, 2.3II, 4.8, 6.3 and 8.0 of Waterproof Type)

(For Male Connector)

(a) Insert the terminal.

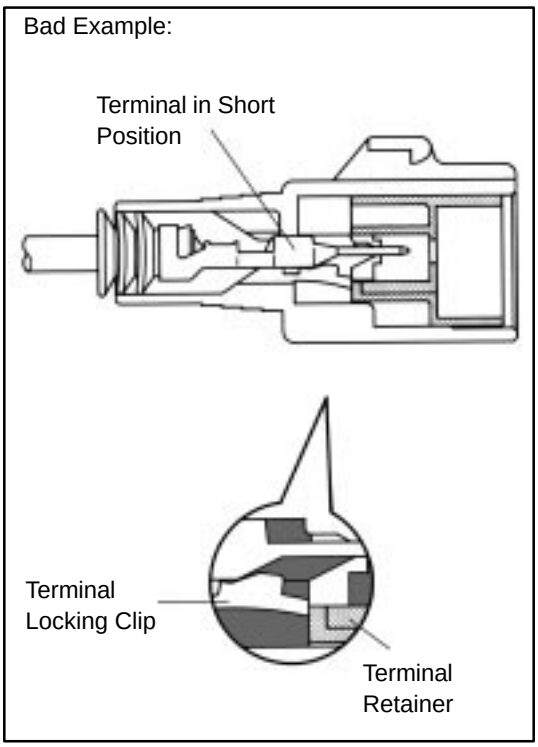
HINT:

1. Make sure the terminal is positioned correctly.
2. Insert the terminal with terminal retainer in the temporary lock position.

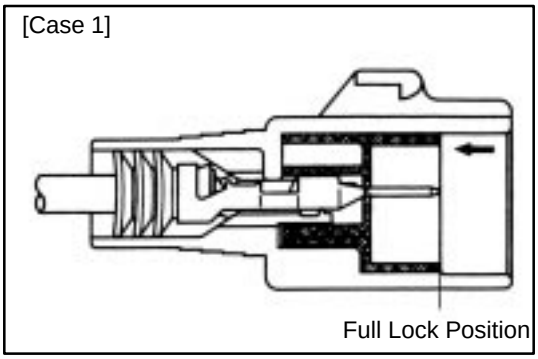
(b) Insert the terminal until the locking clip locks firmly.

HINT:

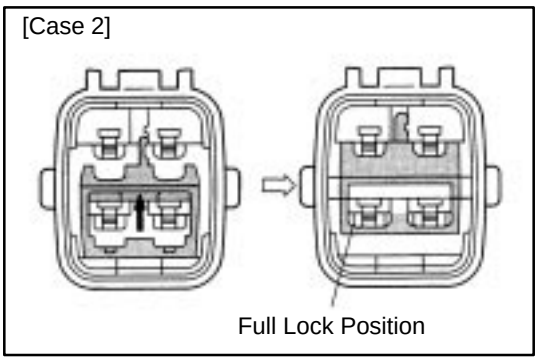
1. Pull the terminal back gently to check whether it is locked correctly.
2. If it cannot be inserted easily, check the terminal and the connector for damage.



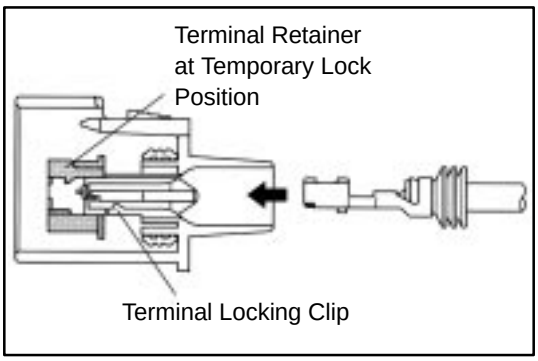
NOTE: If the terminal to locking clip does not lock firmly, terminal retainer can not lock at full lock position so the terminal backs out from connector.



(c) ”For Case 1”
Push the terminal retainer in to the full lock position.



”For Case 2”
Raise the terminal retainer up to the full lock position.

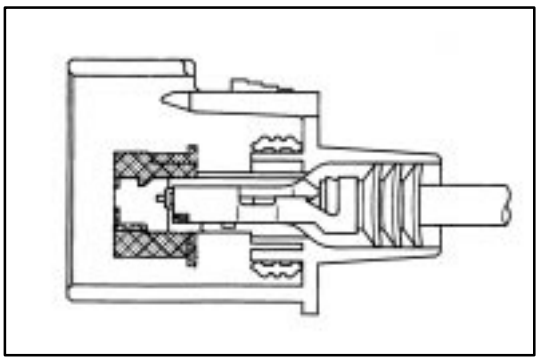


(For Female Connector)

(a) Insert the terminal.

HINT:

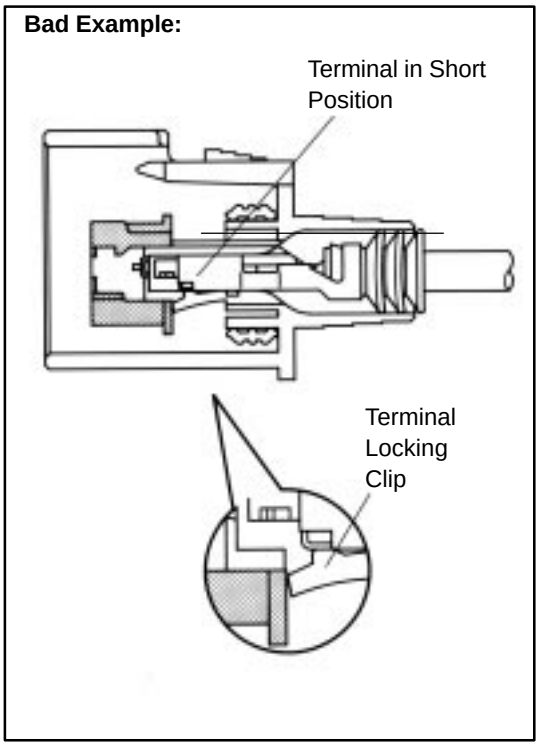
1. Make sure the terminal is positioned correctly.
2. Insert the terminal with terminal retainer in the temporary lock position.



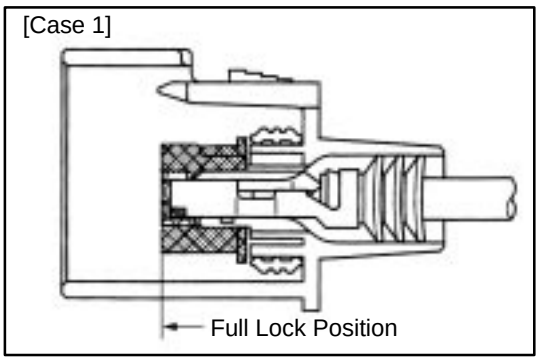
(b) Insert the terminal until the locking clip locks firmly.

HINT:

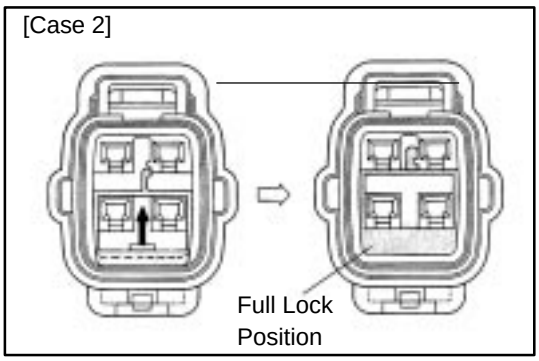
1. Pull the terminal back gently to check whether it is locked correctly.
2. If it cannot be inserted easily, check the terminal and the connector for damage.



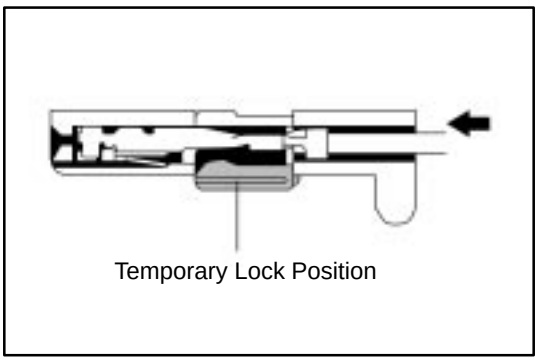
NOTE: If the terminal to locking clip does not lock firmly, terminal retainer can not lock at full lock position so the terminal backs out from connector.



(c) ”For Case 1”
Push the terminal retainer in to the full lock position.



”For Case 2”
Raise the terminal retainer up to the full lock position.



Type C (For 0.64 Type Connector)

(a) Insert the terminal.

HINT:

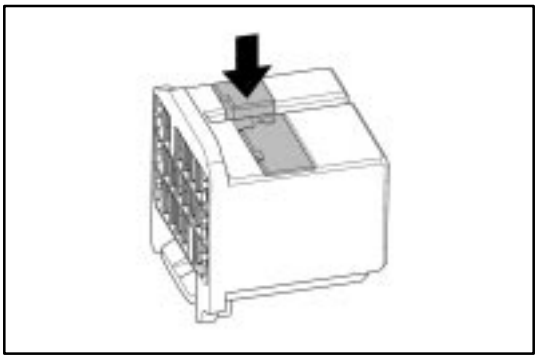
1. Make sure the terminal is positioned correctly.
2. Insert the terminal with terminal retainer in the temporary lock position.

(b) Insert the terminal until the terminal lance locks firmly.

HINT:

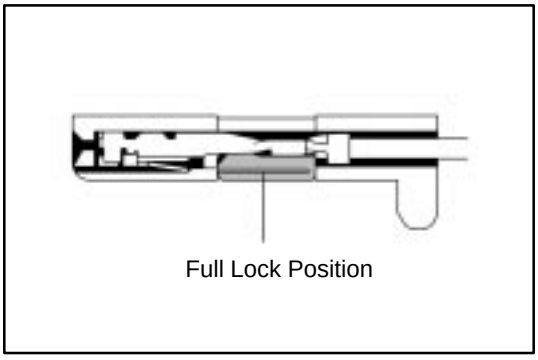
1. Pull the terminal back gently to check whether it is locked correctly.
2. If it cannot be inserted easily, check the terminal and the connector for damage.

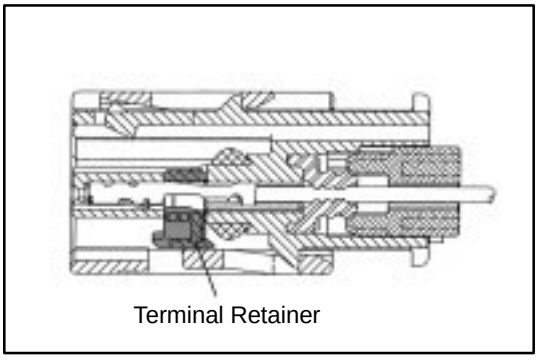
NOTE: If the terminal to terminal lance does not lock firmly, the double locking device cannot lock or terminal retainer does not lock at full lock position so the terminal backs out from connector.



(c) Close terminal retainer.

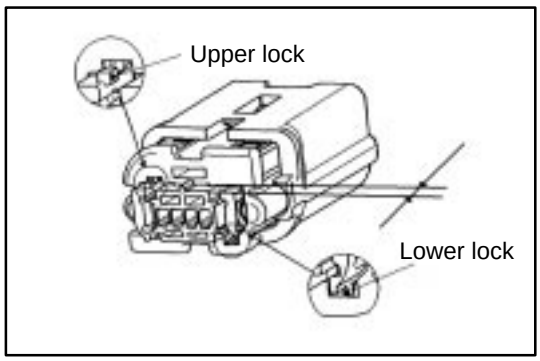
The connector is fitted with a terminal retainer, return it to the full lock position.





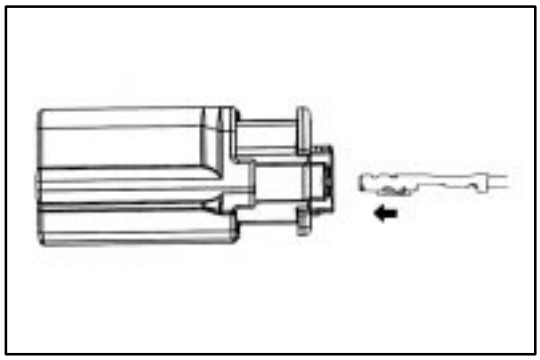
Type D (For 0.64 Splash Proof Type Connector)

(a) Verify that the terminal retainer is at unlocked position.



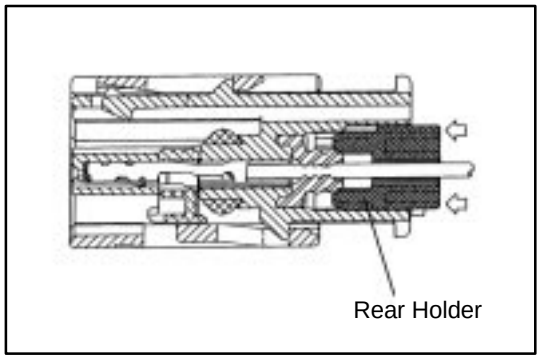
(b) Verify that Rear Holder is at unlocked position.

NOTICE:
If Rear holder or wire seal has been removed, replace it with new one.

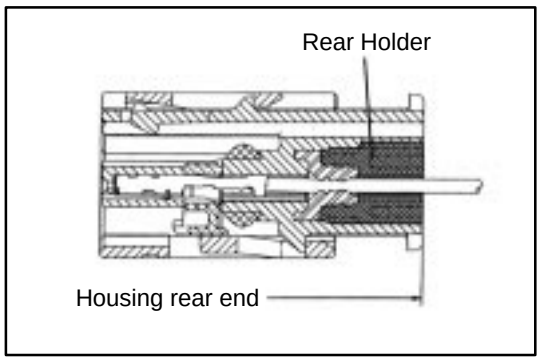


(c) Insert the terminal fully into the housing until it is locked.

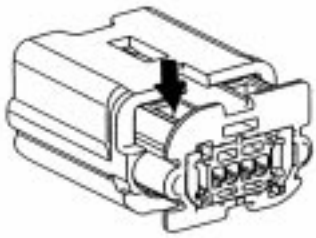
HINT: The terminal has a longer insertion stroke than conventional ones.



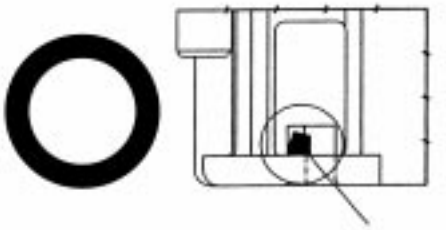
(d) Set Rear holder to locked position.
Push Rear holder in the direction of arrow until it is locked.



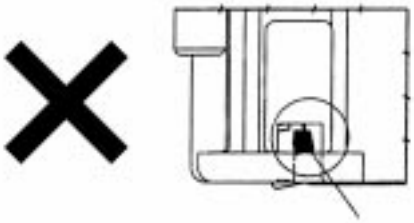
(e) Verify that Rear holder is at the specified position.
The rear end of Rear holder is flush with the rear end of Housing.



Lock check position, upper

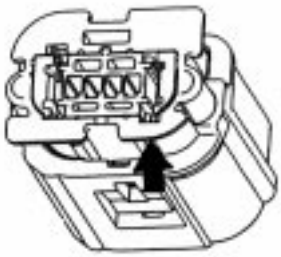


Lock normal engagement position



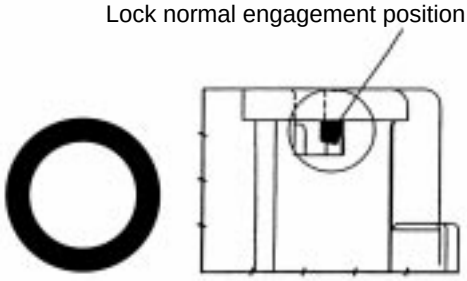
Incomplete lock engagement

Verify that the lock (upper side) is at the specified position under locked status.

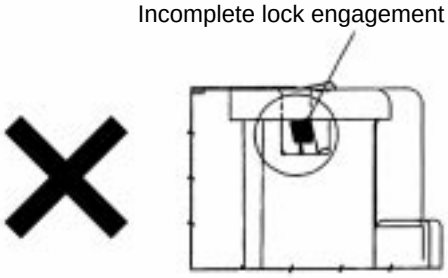


Lock check position, lower

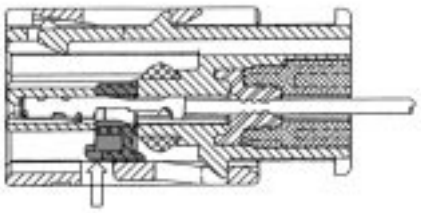
Lock normal engagement position



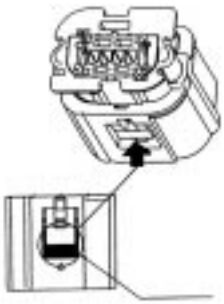
Incomplete lock engagement



Verify that the lock (lower side) is at the specified position under the locked status.

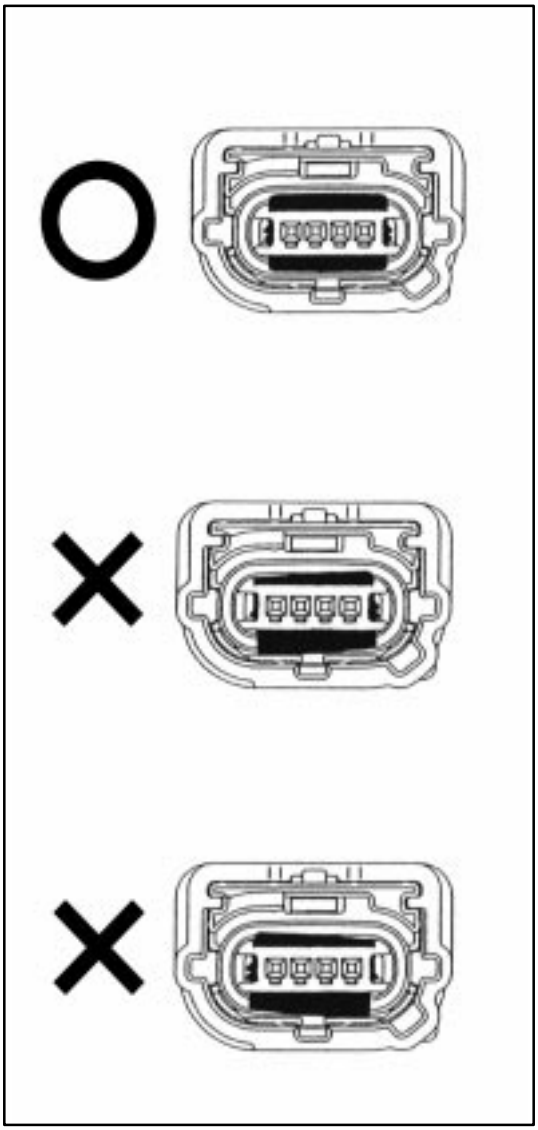


Insert Special Tool



Special Tool hole (U shaped)

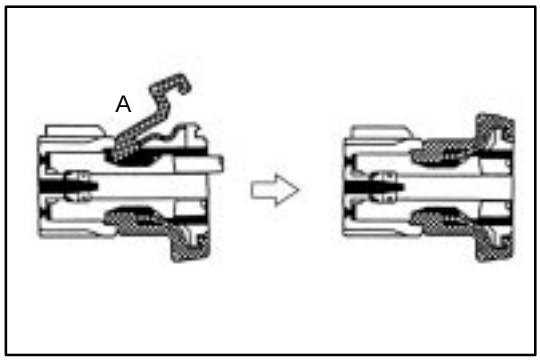
(f) Set Terminal retainer to Lock position.
Insert Special tool into the hole specified in the left and push Terminal retainer.



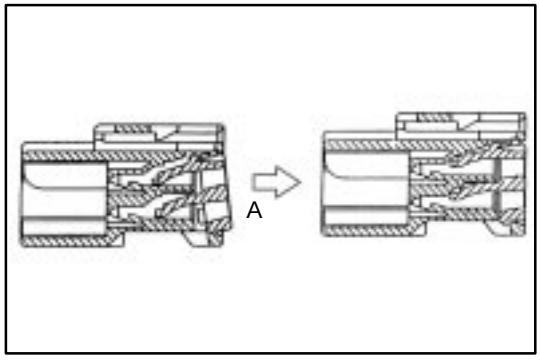
(g) Verify that Terminal retainer is inserted to the specified position.

NOTICE:
If Terminal retainer is stopped at its middle of insertion, holding wire, push Terminal to help it for full insertion.

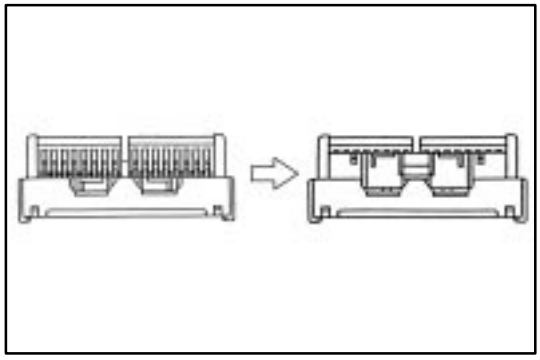
SPECIAL EXAMPLE



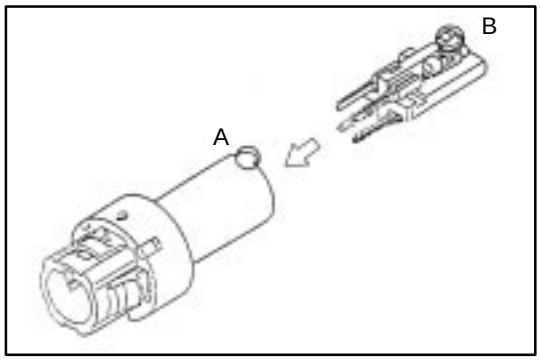
- First fit the section A.



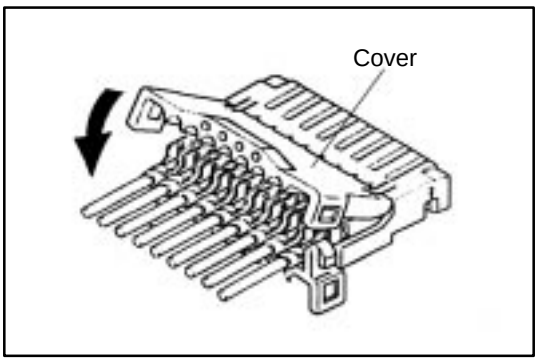
- Install the lock of the section A first.



- Install the lock of the retainer and pull the white cover until you hear a click sound.



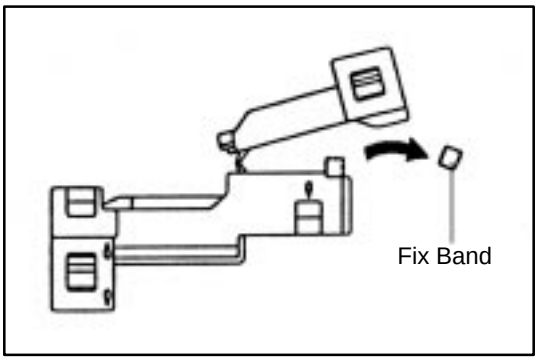
- Install the convex part (A) of the outer part correctly to the section B of the inner part.



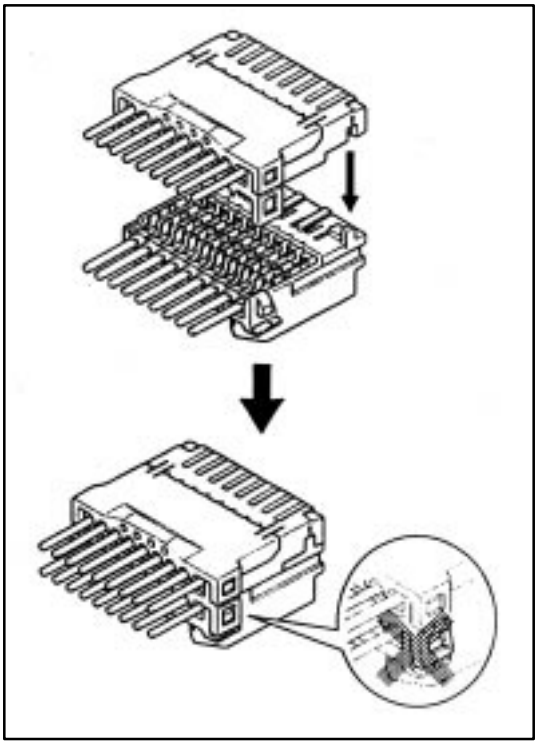
Insulation Displacement Connector

w/ Cover : CLOSE COVER

NOTICE:
Securely lock it



HINT:
When replacing it to a new connector, cut off the fixing band without leaving it.

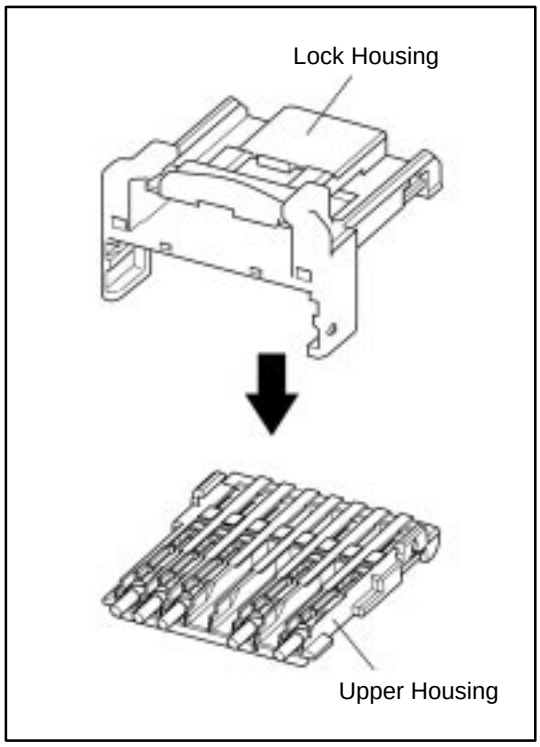


UNITE CONNECTOR

Make the projection of the front lock of the upper housing meet the ditch of the front lock of the lower housing and fix the rear lock.

NOTICE:

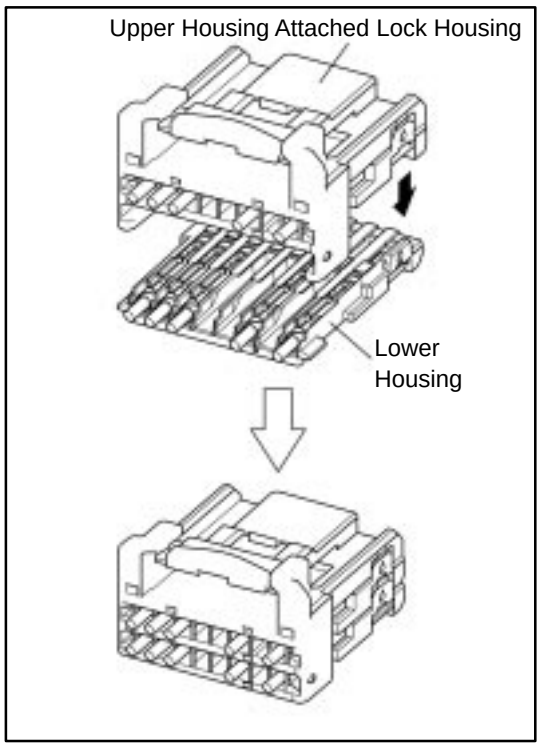
- **After uniting, securely lock it for not leaving the rear lock arm deformed.**
- **Make sure that the terminals will not become loose by pulling the wires lightly.**



Insulation Displacement Connector (0.64 Type)

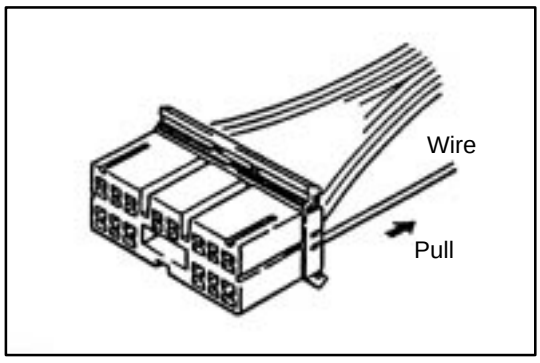
(a) Install the upper housing to the lock housing.

NOTICE:
- **Securely Lock it.**
- **Be careful not to mistake the upper housing and lower housing when putting together.**

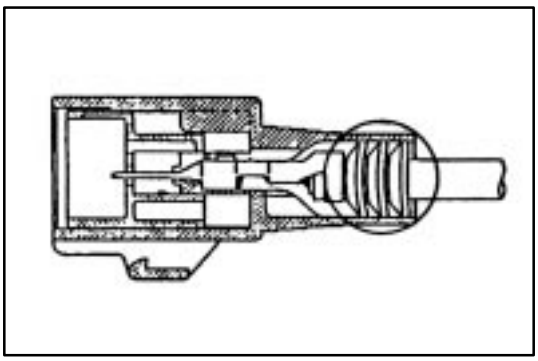


(b) Make the projection of the front lock of the upper housing attached lock housing meet the ditch of the front lock of the lower housing and fix the rear lock.

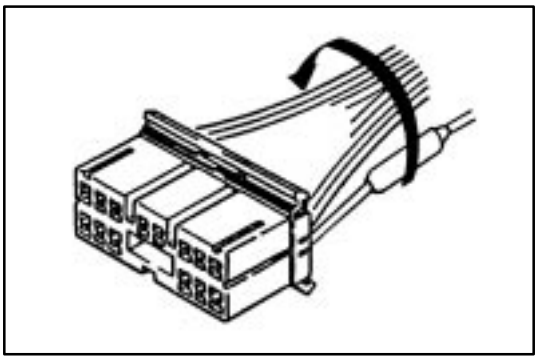
NOTICE:
- **Afteruniting, securely lock it for not leaving the rear lock arm deformed.**
- **Make sure that the terminals will not become loose by pulling the wires lightily.**
- **Be careful not to mistake the upper housing and lower housing when putting together.**



3. When properly installed, pulling gently on the wire lead will prove the terminal is locked in the connector.

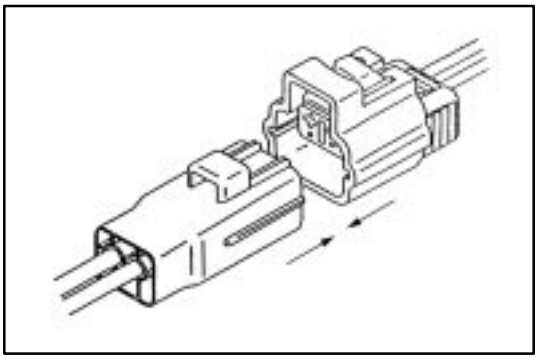


NOTICE:
If you working on the waterproof type, make sure that a rubber plug or a terminal gasket is inserted into the housing securely.



4. Secure the Repaired Wire to the Harness

If the wire is not in the conduit, or secured by other means, wrap vinyl tape around the bundle to keep it together with the other wires.



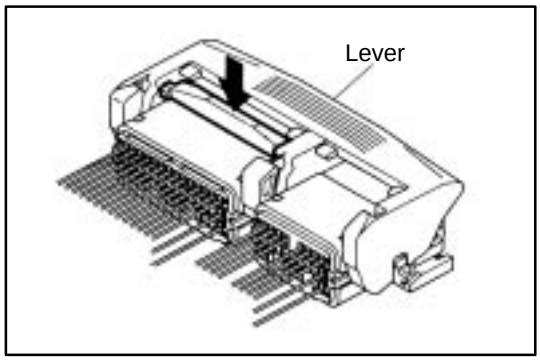
5. Connect Connector

- Fit the male connector to the female terminal.

NOTICE:
- **Do not twist the connector when fitting.**
- **Insert it until fully locked.**

HOW TO INSTALL AND REMOVE SPECIAL CONNECTORS

Low Fit and Lever Type Connector

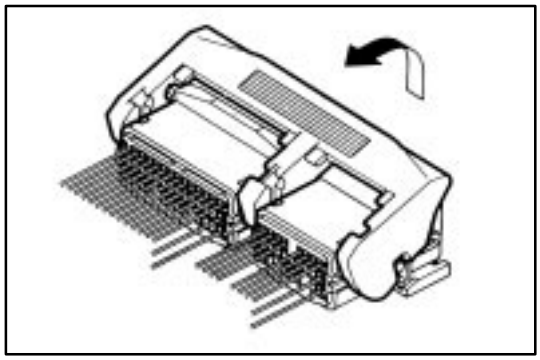


[Case 1]

1. Cut the connection of the connector

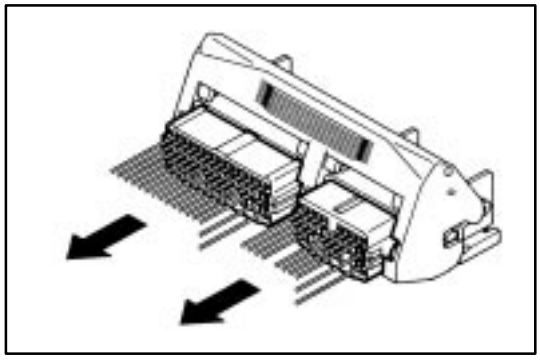
(1) Push the place indicated by the arrow.

(2) The lock is released and lever is lifted up.



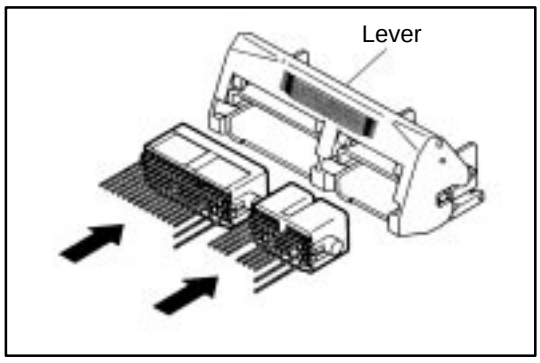
(3) Lift the lever up until it stops.

an



(4) Cut the connection of the connector.

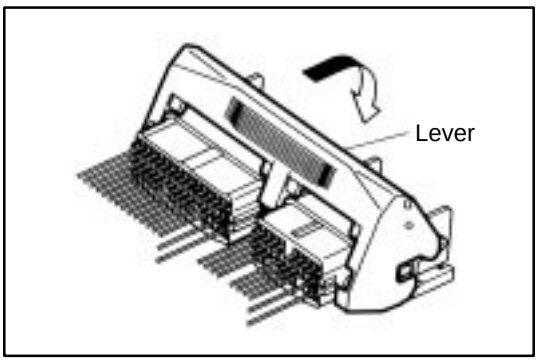
NOTICE:
Do not hold the wire harness to pull it.



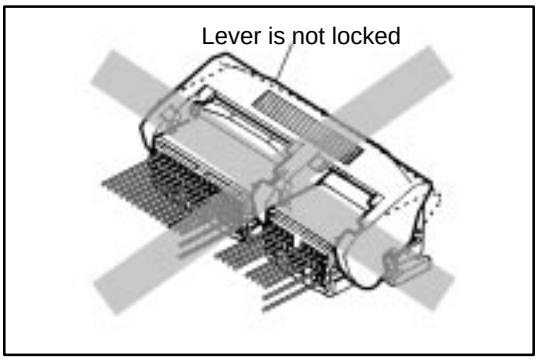
2. Connect the connector

(1) Connect the connector in the condition that the lever is fully lifted up.

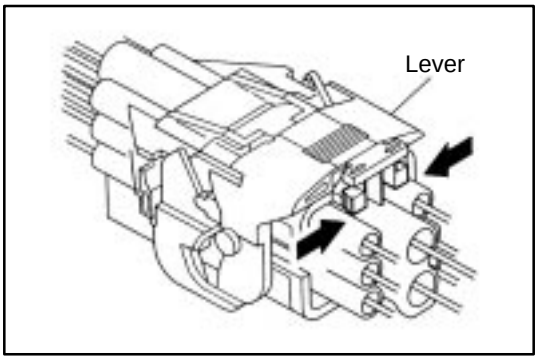
HINT: If the lever is locked at the lower position, follow the procedure [Case 1]. (1) to (3) and lift the lever up fully.



(2) Hold the connector to prevent it from slip off and push it down until you hear a click to lock it.



(3) Confirm that the lever is securely locked.

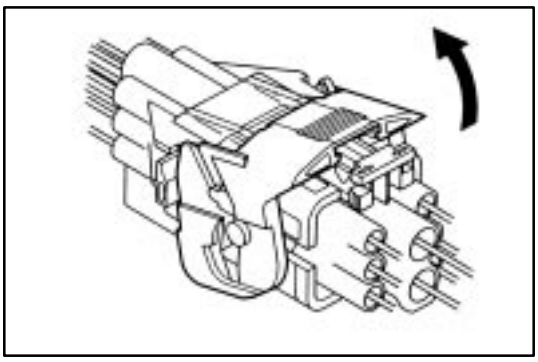


[Case 2]

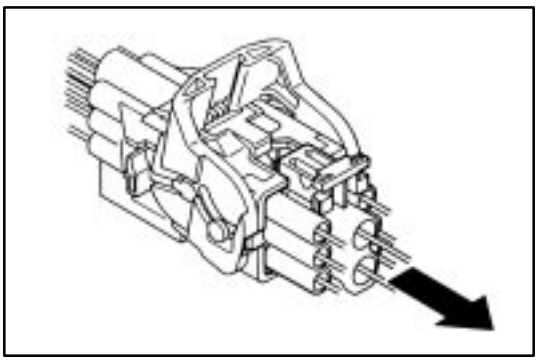
1. Cut the connection of the connector

(1) Hold the area indicated by the arrow in the illustration

(2) The lock is released and the lever is lifted up.

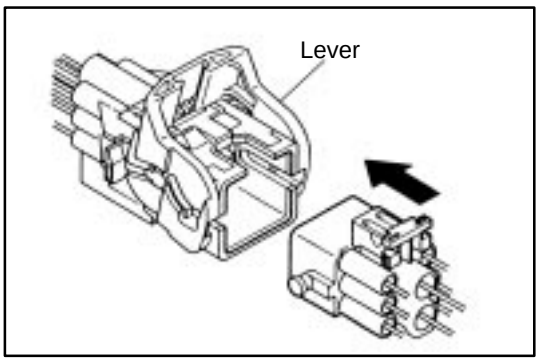


(3) Lift the lever up fully.



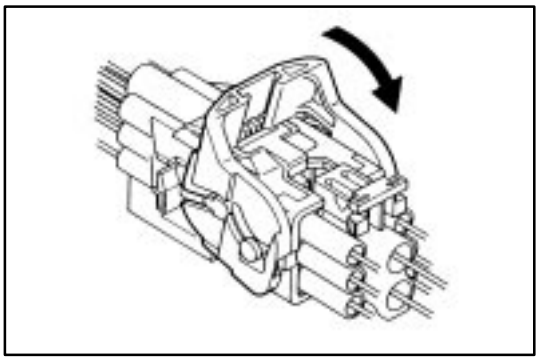
(4) Cut the connection of the connector.

NOTICE:
Do not hold the wire harness to pull it.

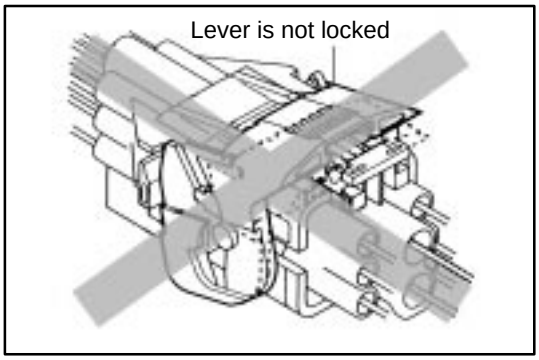


2. Connect the connector

(1) Connect the connector in the condition that the lever is fully lifted up.



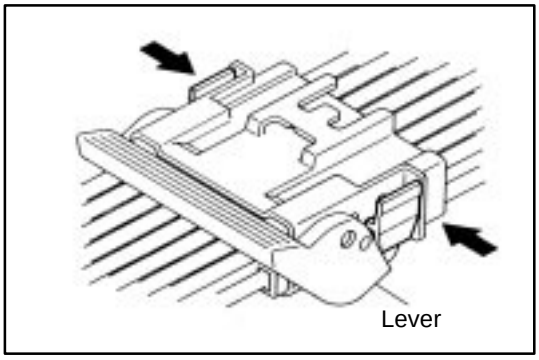
(2) Hold the connector to prevent it from slip off and push it down until you hear a click to lock it.



(3) Confirm that the lever is securely locked.

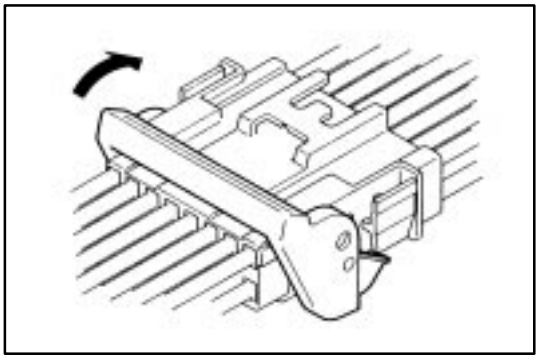
[Case 3]

1. Cut the connection of the connector

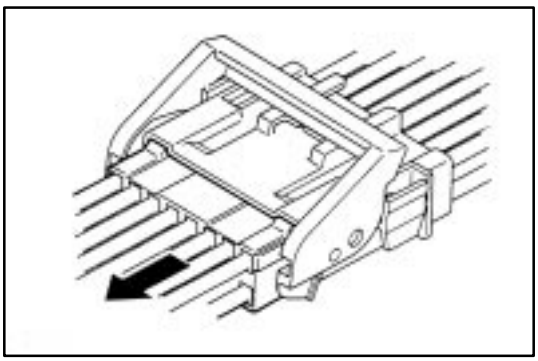


(1) Pick the part indicated in the illustration by fingers.

(2) The lock is released and the lever is lifted up.

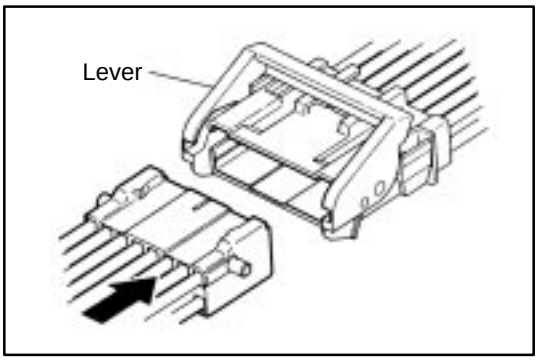


(3) Lift the lever up fully.



(4) Cut the connection of the connector.

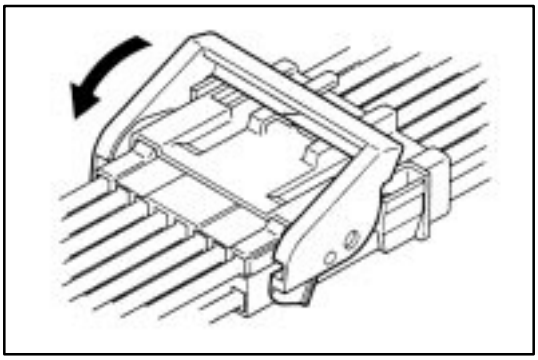
NOTICE:
Do not hold the wire harness to pull it.



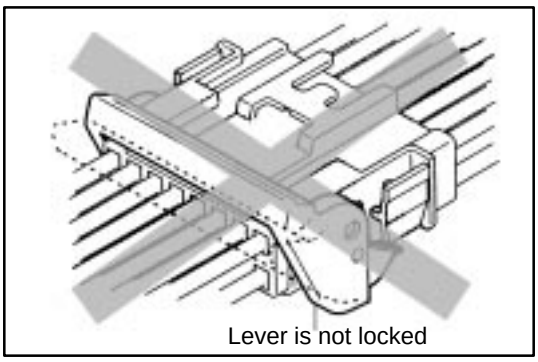
2. Connect the connector

(1) Connect the connector in the condition that the lever is fully lifted up.

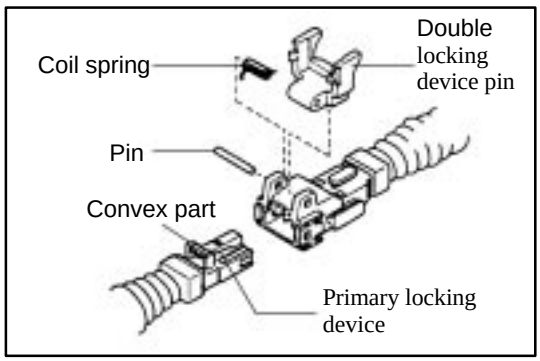
HINT: If the lever is locked at the lower position, follow the procedure [Case 3]. (1) to (3) and lift the lever up fully.



(2) Hold the connector to prevent it from slip off and push it down until you hear a click to lock it.



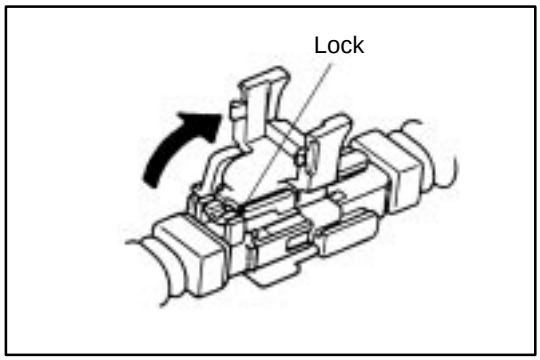
(3) Confirm that the lever is securely fitted



The connector with secondary locking device

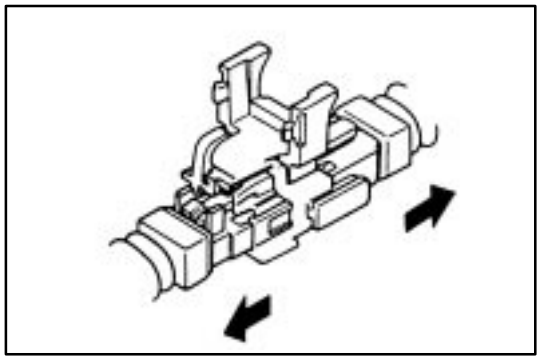
1. Area used

- Wire harness for SRS airbag deployment



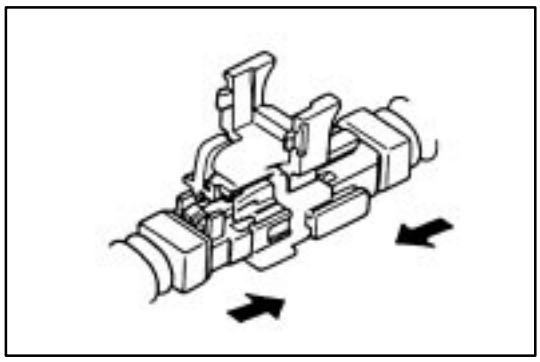
2. Cut the connection of the connector.

(1) Release the double locking.



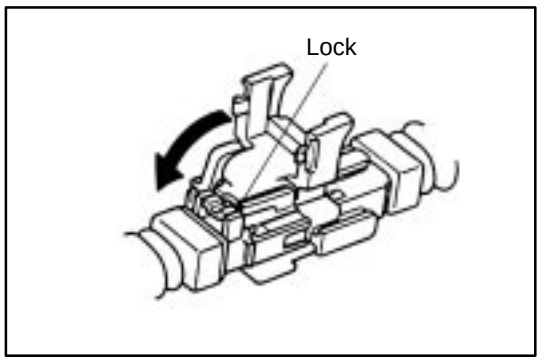
(2) Release the primary locking and separate the connector.

NOTICE:
Do not hold the wire harness to pull it.



3. Connect the connector

(1) Install the primary locking device and connect the connector.



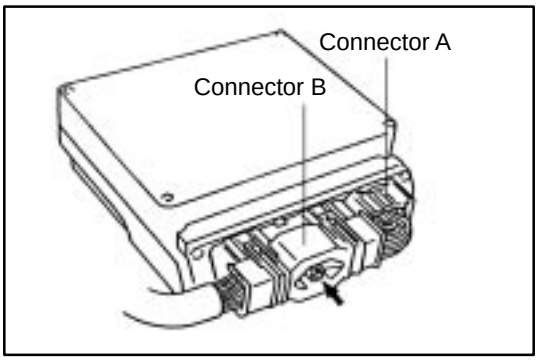
(2) Install the double locking device.

NOTICE:
The double locking device can not be installed unless the primary locking device is installed.

Connector fixed by bolts

1. Area used

- Engine control computer harness

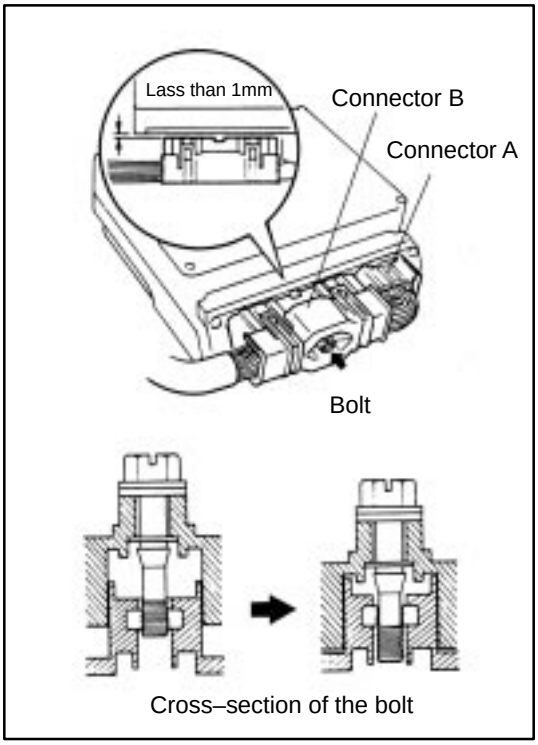


2. Cut the connection of the connector.

(1) Remove the connector A.

(2) Loose the bolt using a tool like driver until the connector B can be removed by hand and separate the connector.

HINT: If the bolt can not be removed, roll it while pulling forward.



3. Connection of the connector

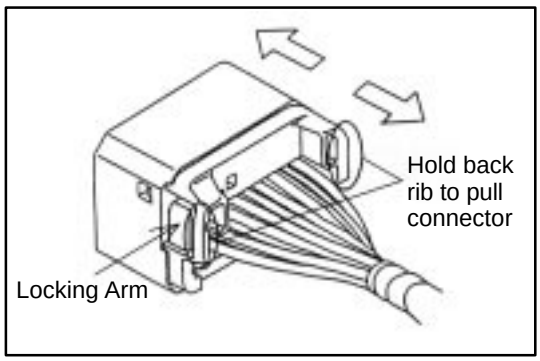
(1) Temporarily fit the connector B.

(2) Tighten the bolt by using tool like driver and fit the connector B completely.

NOTICE:

- **Tighten the bolt until feeling it lighter. Then confirm that the width of chink of the connector B is less than 1mm.**
- **The bolt can be rolled after it is fitted.**
- **If the impact wrench is used, do not let it rolling more than three seconds. (The housing may be deformed by generated heat)**
- **Be sure and connect the connector B straight. Do not incline it while connecting.**

(3) Connect the connector A.

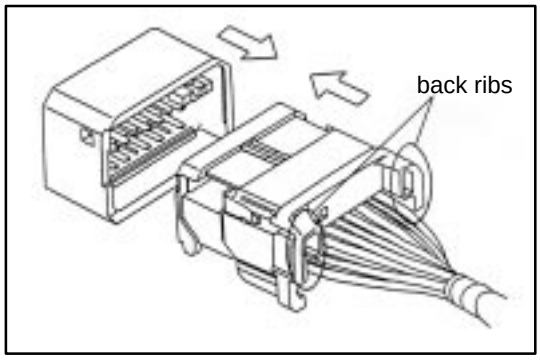


1. Cut the connection of the connector

(1) Push down on locking arm to unlock. Then hold the back ribs of connector to remove connector.

(2) Cut the Connection of the connector.

NOTICE:
Do not hold the wire harness to pull it.



2. Connect the Connector

(1) Align the direction of locking feature in same direction and mate the connector holding the back ribs in straight direction.

(2) Insert it until a lock securely locks, and pull the connector lightly after the insertion, and confirm that a lock is enabled.

TABLE OF HOUSING CROSS SECTION

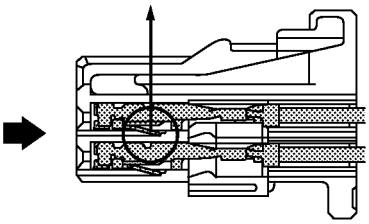
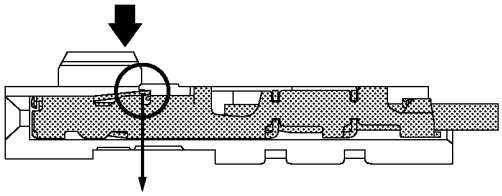
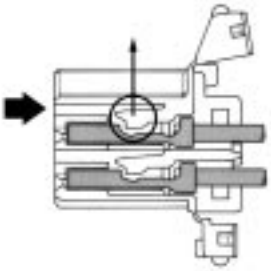
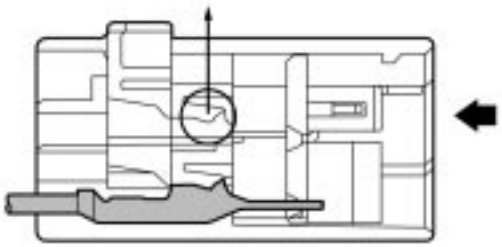
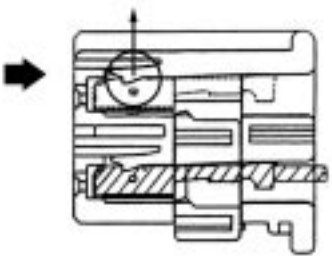
Type	○ : Position of the lance ↑ : Direction of lock released ↑ : Direction of the special tool inserted	
	Male	Female
0.64		 (Double Lock Type) [Terminal Lance]
0.64 IDC		 [Terminal Lance]
1.0		 (Double Lock Type) [Housing Lance]
1.0II Non–waterproof Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]

TABLE OF HOUSING CROSS SECTION

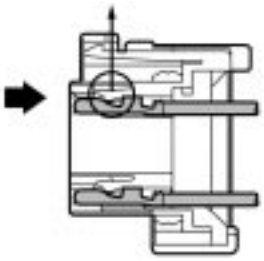
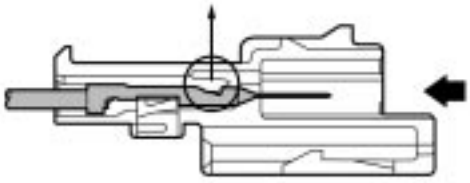
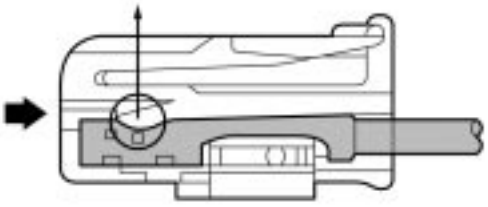
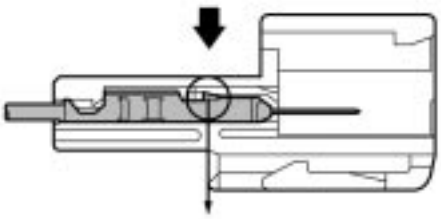
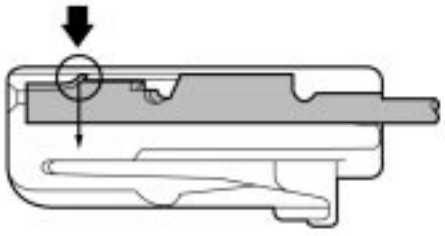
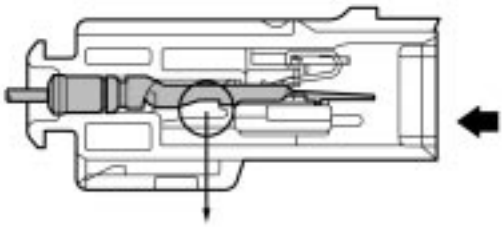
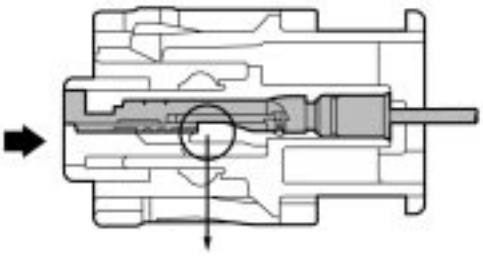
Type	○ : Position of the lance ↑ : Direction of lock released ↑ : Direction of the special tool inserted	
	Male	Female
1.0II Waterproof Type		 [Housing Lance]
1.0III 1.0IV Non–waterproof Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]
1.0III IDC	 [Terminal Lance]	 [Terminal Lance]
1.0III Waterproof Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]

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TABLE OF HOUSING CROSS SECTION

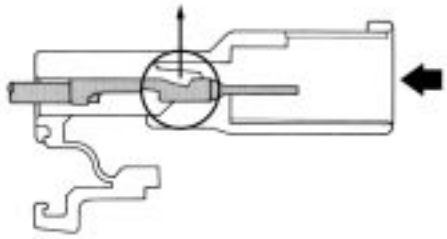
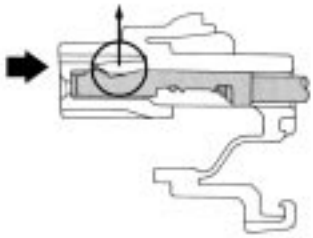
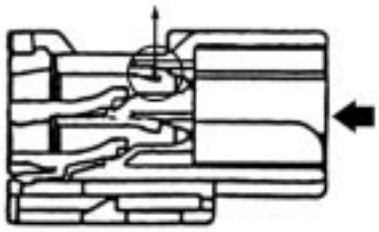
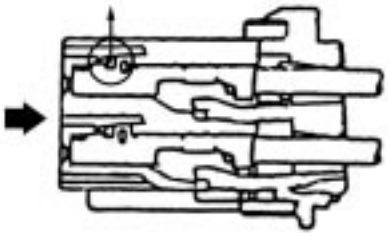
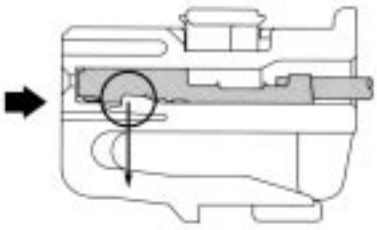
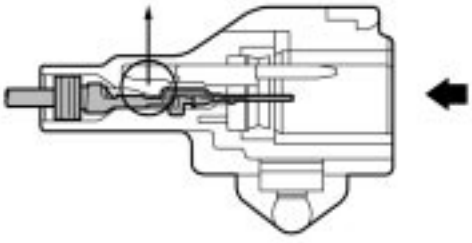
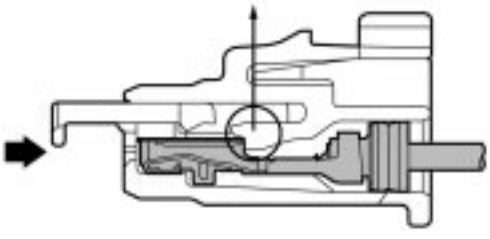
Type	○ : Position of the lance ↑ : Direction of lock released ⬆ : Direction of the special tool inserted	
	Male	Female
1.3 Non–waterproof Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]
1.3 Non–waterproof Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]
1.3 Non–waterproof Type	— 	 (Double Lock Type) [Housing Lance]
1.3 Waterproof Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]

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TABLE OF HOUSING CROSS SECTION

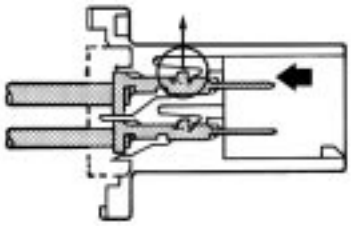
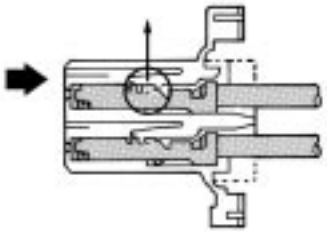
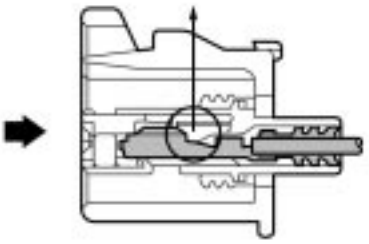
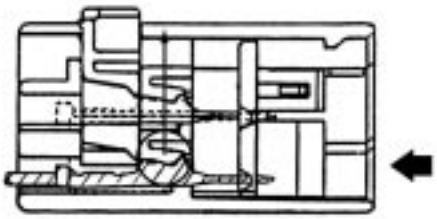
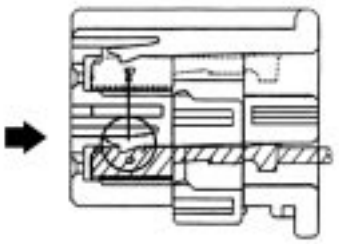
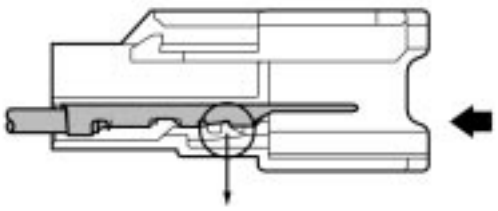
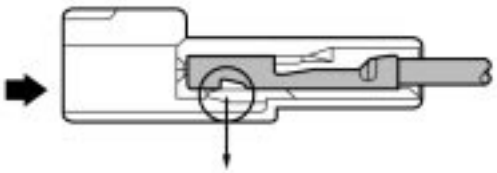
Type	○ : Position of the lance ↑ : Direction of lock released ⬆ : Direction of the special tool inserted	
	Male	Female
1.8 Non–waterproof Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]
1.8 Waterproof Type	—	 (Double Lock Type) [Housing Lance]
1.8II	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]
2.3 Non–waterproof Type	 [Housing Lance]	 [Housing Lance]

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TABLE OF HOUSING CROSS SECTION

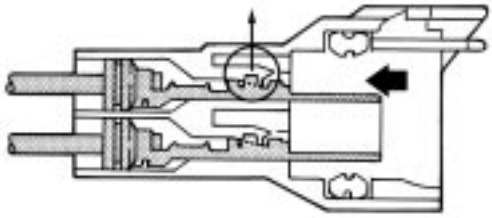
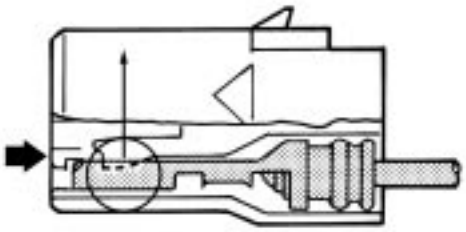
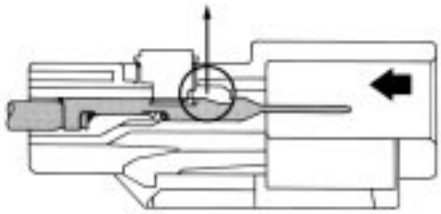
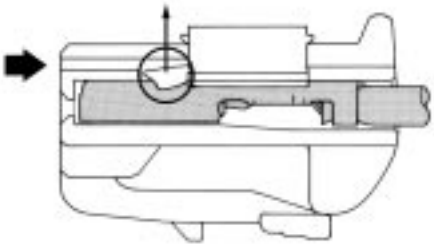
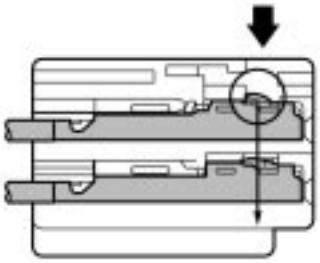
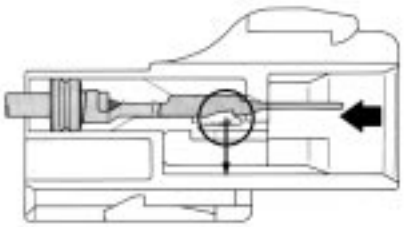
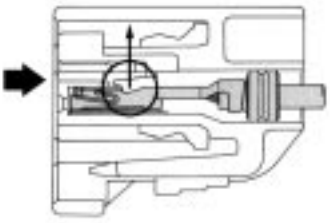
Type	○ : Position of the lance ↑ : Direction of lock released ↑ : Direction of the special tool inserted	
	Male	Female
2.3 Waterproof Type	 [Housing Lance]	 [Housing Lance]
2.3II Non–waterproof Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]
2.3II IDC	—	 [Terminal Lance]
2.3II Waterproof Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]

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TABLE OF HOUSING CROSS SECTION

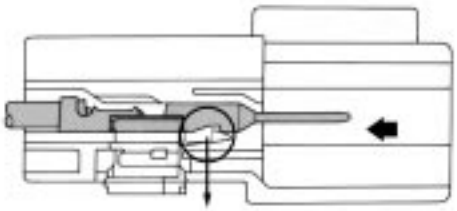
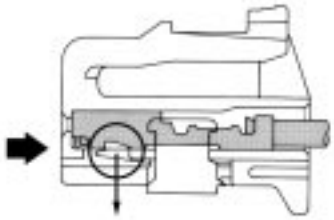
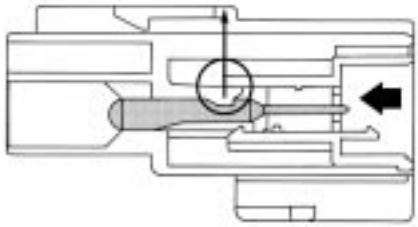
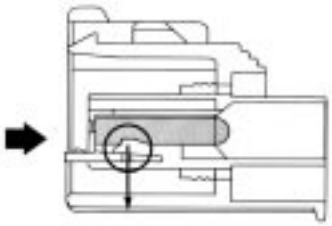
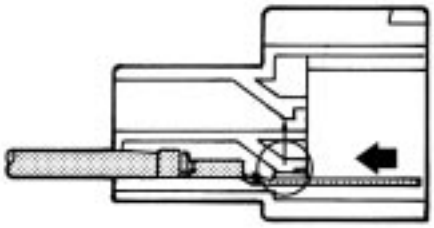
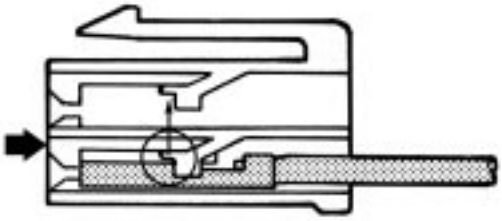
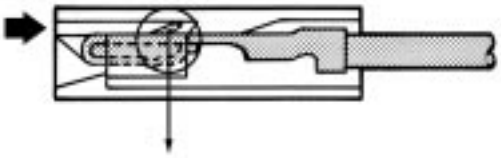
Type	○ : Position of the lance ↑ : Direction of lock released ⬆ : Direction of the special tool inserted	
	Male	Female
4.8 Non–waterproof Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]
4.8 Waterproof Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]
6.3 Non–waterproof Type	 [Housing Lance]	 [Housing Lance]
6.3 Single Terminal		 [Terminal Lance]

TABLE OF HOUSING CROSS SECTION

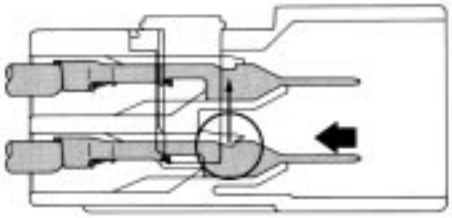
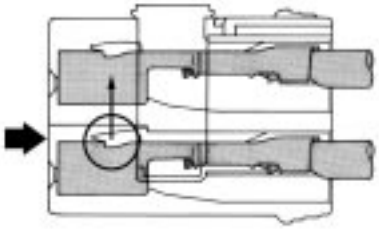
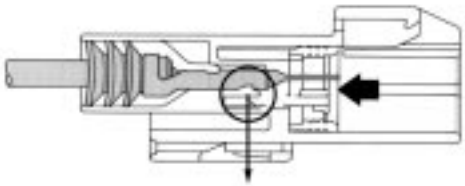
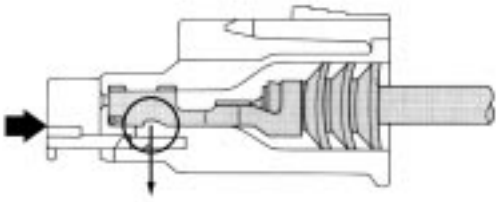
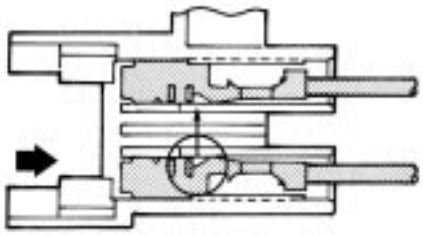
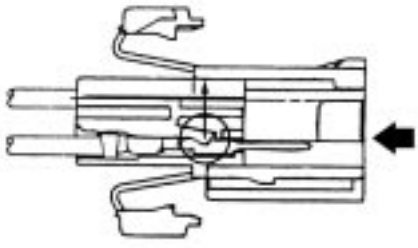
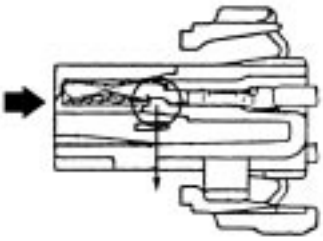
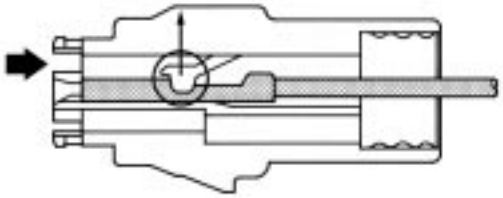
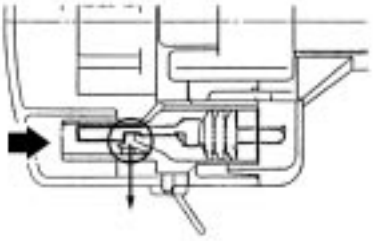
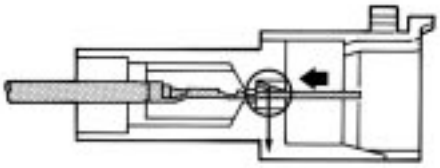
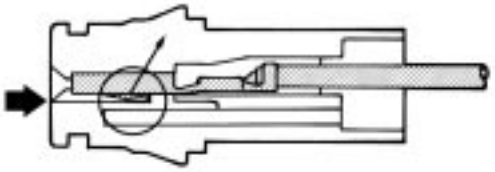
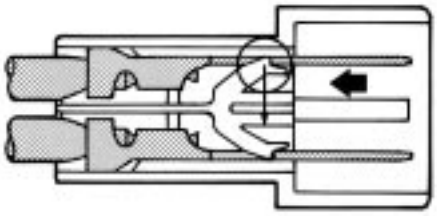
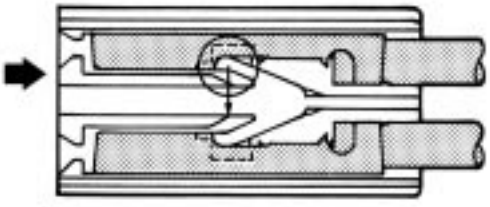
Type	○ : Position of the lance ↑ : Direction of lock released ↑ : Direction of the special tool inserted	
	Male	Female
8.0 Non–waterproof Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]
8.0 Waterproof Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]
BLADE FUSE	—	 [Housing Lance]
C–Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]

TABLE OF HOUSING CROSS SECTION

Type	○ : Position of the lance ↑ : Direction of lock released ⬆ : Direction of the special tool inserted	
	Male	Female
6.3 Waterproof Type		 [Housing Lance]
6.3 Waterproof Type		 [Housing Lance]
7.7	 [Terminal Lance]	 [Terminal Lance]
7.7	 [Housing Lance]	 [Housing Lance]

C

TABLE OF HOUSING CROSS SECTION

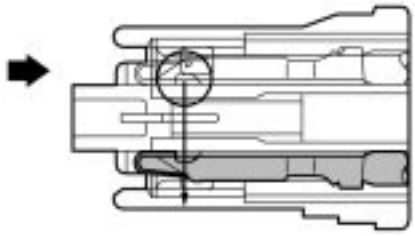
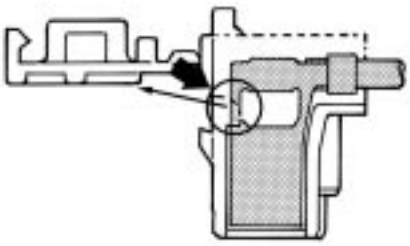
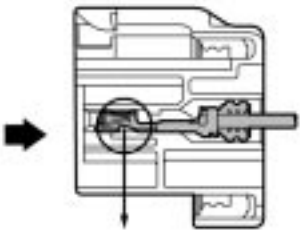
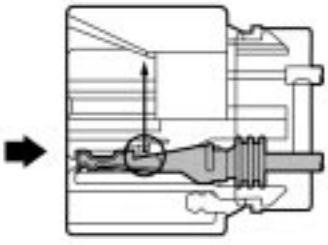
Type	○ : Position of the lance ↑ : Direction of lock released ↑ : Direction of the special tool inserted	
	Male	Female
FOG–LP		 (Double Lock Type) [Housing Lance]
FTC		 (Double Lock Type) [Housing Lance]
HEAD LAMP Waterproof Type		 [Housing Lance]
HB3 HB4		 [Housing Lance]

TABLE OF HOUSING CROSS SECTION

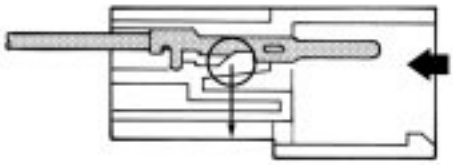
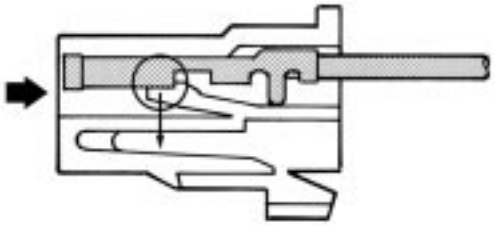
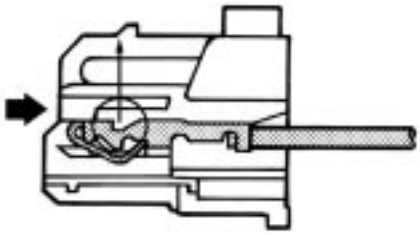
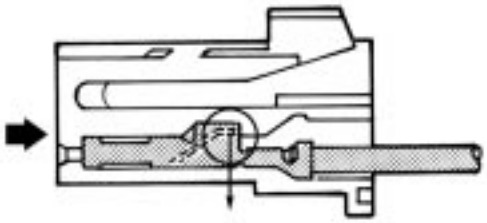
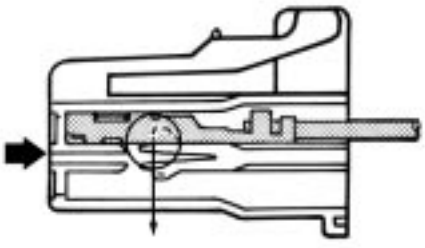
Type	○ : Position of the lance ↑ : Direction of lock released ↑ : Direction of the special tool inserted	
	Male	Female
LAC	 [Housing Lance]	 [Housing Lance]
MFPC	———	 [Housing Lance]
MIC	———	 [Terminal Lance]
PULSE LOCK	———	 [Housing Lance]

TABLE OF HOUSING CROSS SECTION

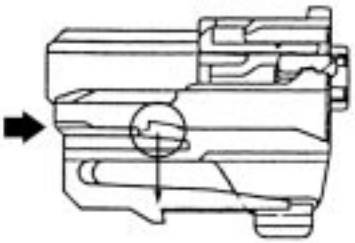
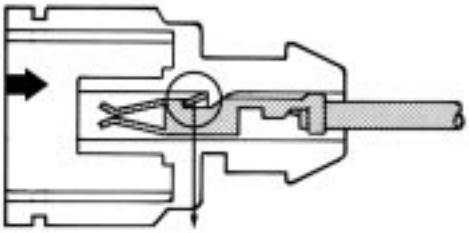
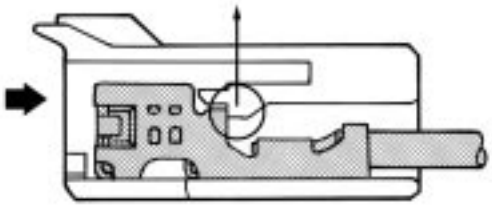
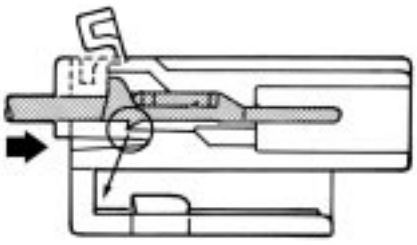
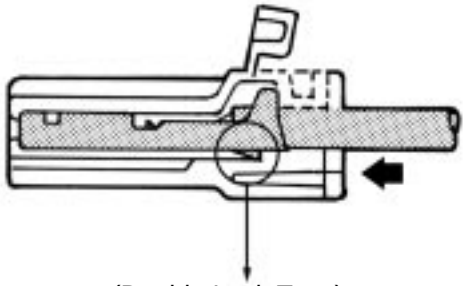
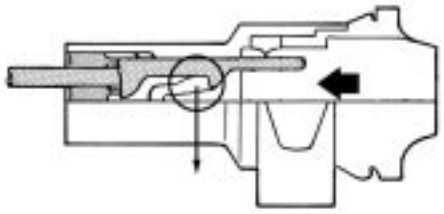
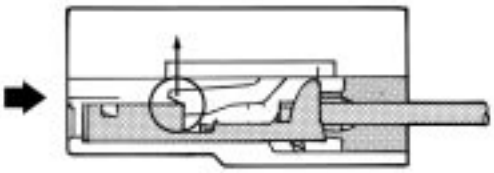
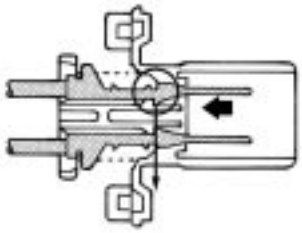
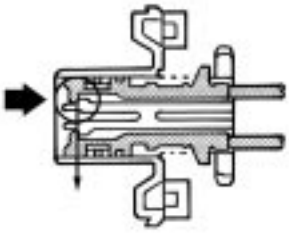
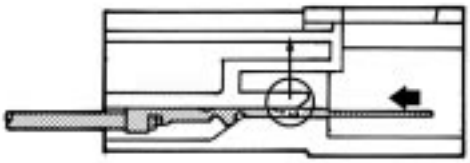
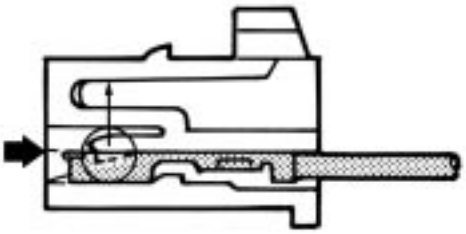
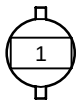
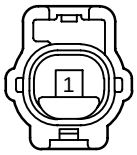
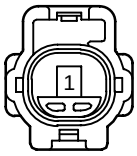
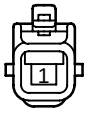
Type	○ : Position of the lance ↑ : Direction of lock released ↑ : Direction of the special tool inserted	
	Male	Female
SFPC		 [Housing Lance]
SL		 [Terminal Lance]
SP		 [Housing Lance]
TLC Non–waterproof Type	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]

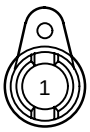
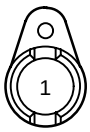
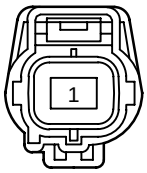
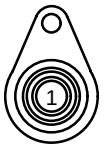
TABLE OF HOUSING CROSS SECTION

Type	○ : Position of the lance ↑ : Direction of lock released ⬆ : Direction of the special tool inserted	
	Male	Female
TLC Waterproof Type	 [Housing Lance]	 [Housing Lance]
TNS	 (Double Lock Type) [Housing Lance]	 (Double Lock Type) [Housing Lance]
TODC	 [Housing Lance]	 (Double Lock Type) [Housing Lance]

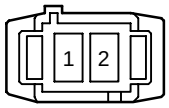
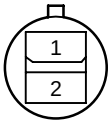
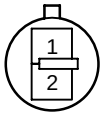
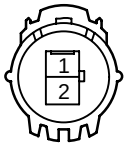
<FEMALE> 1P Waterproof Type

			
90980–10090	90980–10115	90980–10197	90980–10201
90980–10241	90980–10247 90980–10705	90980–10439	90980–10837
			
90980–10893	90980–10983	90980–11007	90980–11166
90980–11184	90980–11243	90980–11252	90980–11271
			
90980–11282	90980–11363	90980–11400	90980–11428

<FEMALE> 1P Waterproof Type

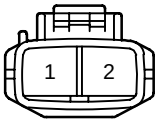
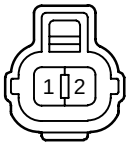
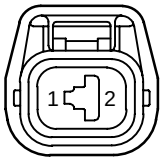
 90980–11941	 90980–11942	90980–11943	90980–11944
 90980–11963	90980–12125	 90980–12129 90980–12136	

<FEMALE> 2P Waterproof Type

			
90980–10092	90980–10123	90980–10157	90980–10184
90980–10193	90980–10243	90980–10474	90980–10496
90980–10498 90980–10706	90980–10532	90980–10534	90980–10556
90980–10567	90980–10572	90980–10576	90980–10578
90980–10581	90980–10583	90980–10593	90980–10595

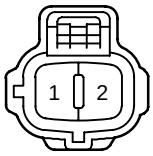
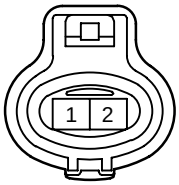
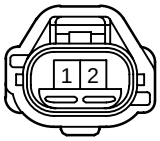
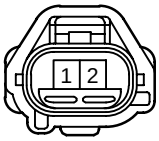
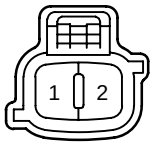
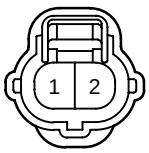
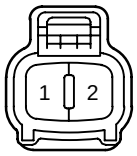
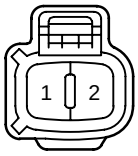
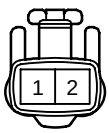
D

<FEMALE> 2P Waterproof Type

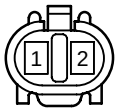
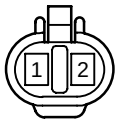
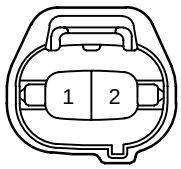
90980–10598	90980–10609	90980–10617	90980–10622
90980–10623	90980–10626	90980–10702	90980–10720
90980–10734	90980–10735	90980–10736	90980–10737
			
90980–10748 90980–10846	90980–10839	90980–10843	90980–10847
			
90980–10853	90980–10887	90980–10899	90980–10901

D

<FEMALE> 2P Waterproof Type

 90980–10923	 90980–10928	90980–10947	90980–10949
90980–10974	90980–11003	 90980–11005	 90980–11009
 90980–11019	 90980–11025 90980–11401	90980–11030	90980–11032
90980–11038	 90980–11051	90980–11061	90980–11062
 90980–11068	90980–11070	 90980–11075	90980–11095

<FEMALE> 2P Waterproof Type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		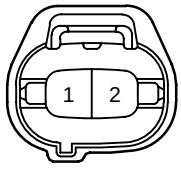	
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		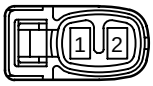	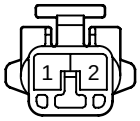
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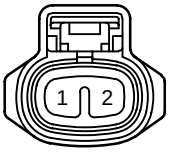		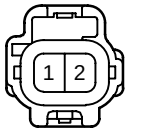	
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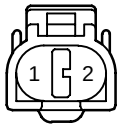
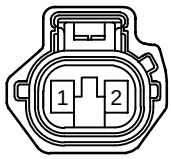
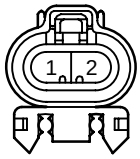
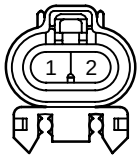
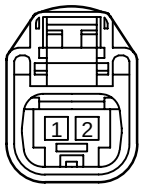
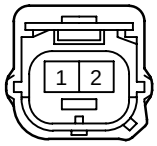
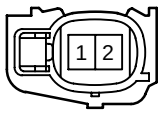
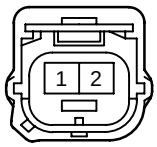
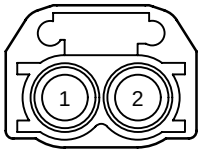
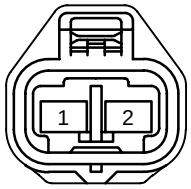
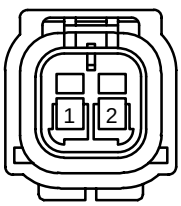
<FEMALE> 2P Waterproof Type

 90980–11286	90980–11410	90980–11448	 90980–11467
 90980–11659	 90980–11660	90980–11773	 90980–11790
 90980–11856	90980–11859	90980–11864	 90980–11875
 90980–11898	90980–11900	 90980–12028	 90980–12068
90980–12117	90980–12188	 90980–12195	

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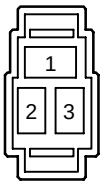
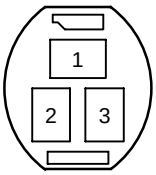
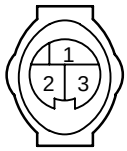
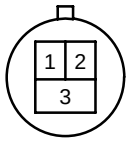
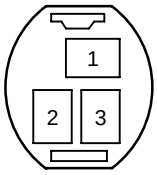
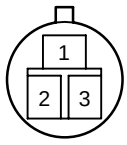
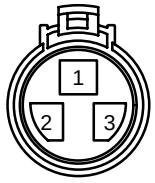
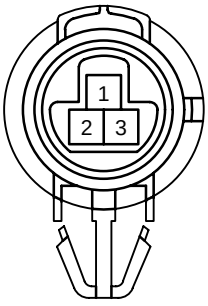
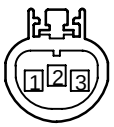
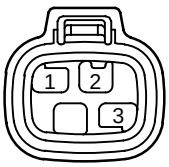
<FEMALE> 3P Waterproof Type

 90980–10088	 90980–10110	 90980–10191	 90980–10199
 90980–10239	90980–10245	 90980–10249	 90980–10341 90980–11491
 90980–10353	90980–10395	90980–10494	90980–10501
90980–10554	90980–10574	 90980–10579	90980–10629
90980–10683	90980–10690 90980–11157	90980–10695	 90980–10834

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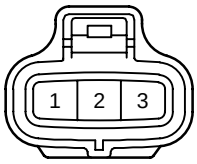
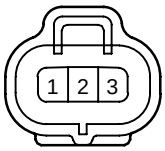
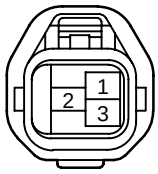
<FEMALE> 3P Waterproof Type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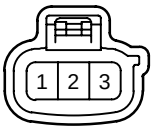	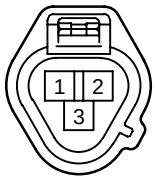	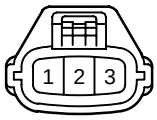	
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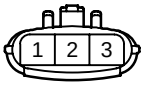
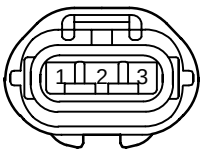
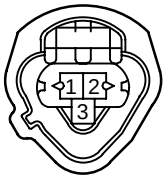
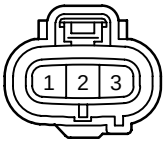
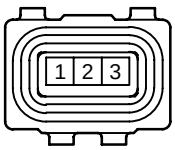
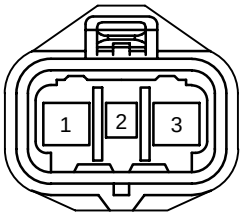
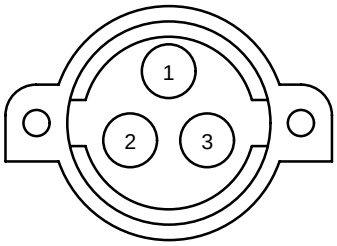
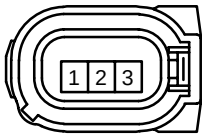
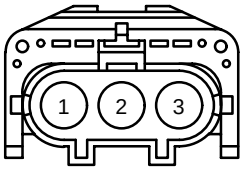
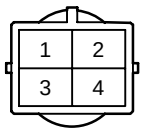
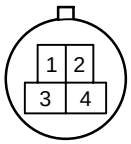
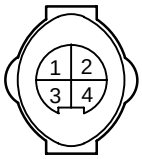
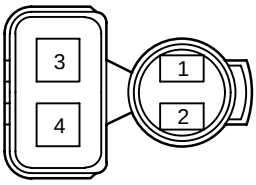
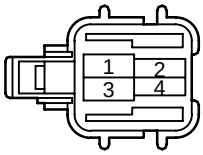
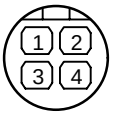
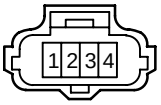
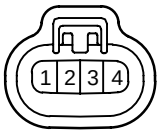
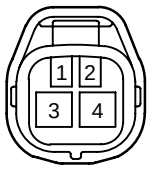
90980–11108	90980–11132	90980–11143	90980–11145
90980–11161	90980–11170	90980–11245	90980–11261
			
90980–11294	90980–11349	90980–11451	90980–11860

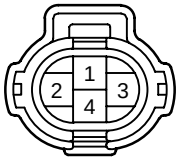
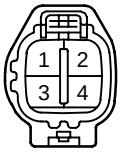
<FEMALE> 3P Waterproof Type

 90980–11907	 90980–12058	 90980–12095	 90980–12168
 90980–12228			

<FEMALE> 4P Waterproof Type

 90980–10095	 90980–10140 90980–10220	 90980–10203	90980–10218
 90980–10373	90980–10476	 90980–10549	90980–10551
90980–10591	90980–10649	 90980–10663 90980–10664	90980–10685
90980–10701	 90980–10711	 90980–10831	 90980–10844
90980–10869	90980–10929	90980–10940	90980–10942

<FEMALE> 4P Waterproof Type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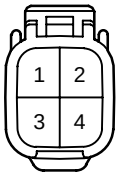	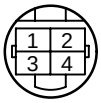		
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	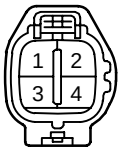		
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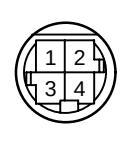
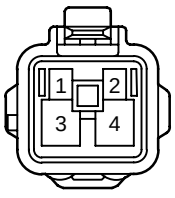
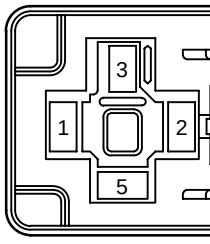
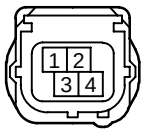
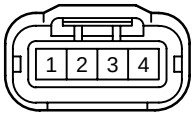
			
90980–11288	90980–11292	90980–11304	90980–11329 90980–11330
			
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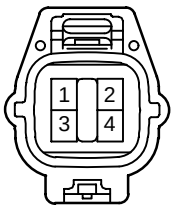
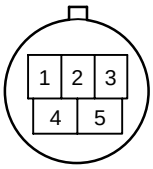
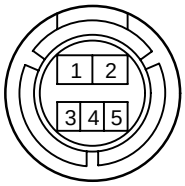
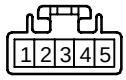
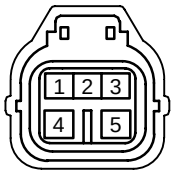
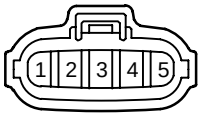
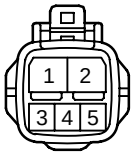
<FEMALE> 4P Waterproof Type

			
90980–11930	90980–11964	90980–12005	90980–12057

<FEMALE> 5P Waterproof Type

			
90980–10162	90980–10393	90980–10550	90980–10558
			
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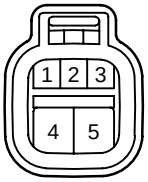
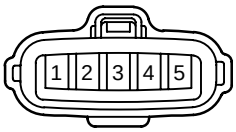
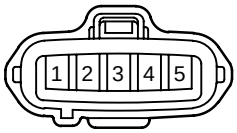
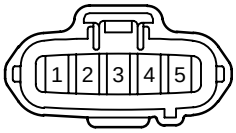
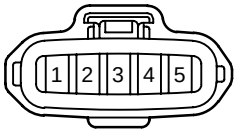
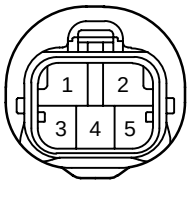
			
90980–11022	90980–11024	90980–11049	90980–11077
			
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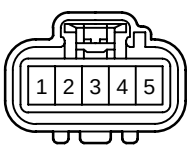
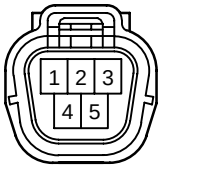
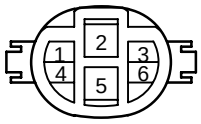
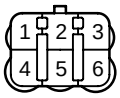
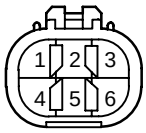
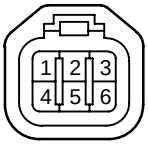
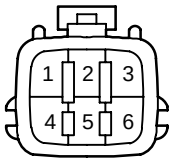
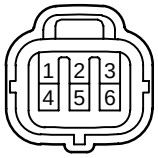
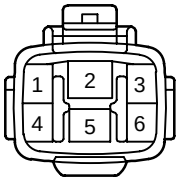
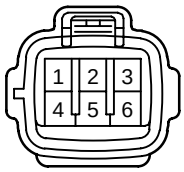
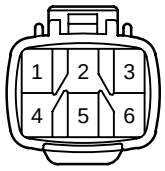
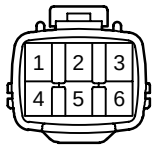
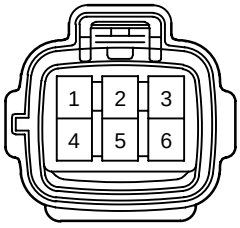
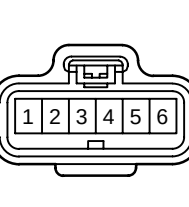
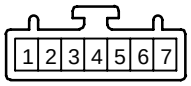
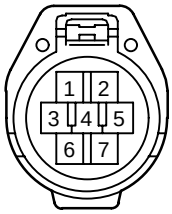
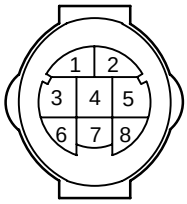
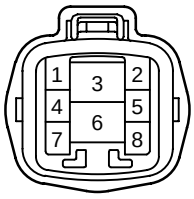
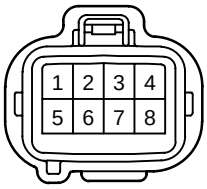
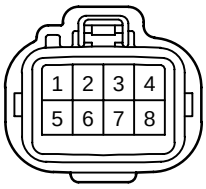
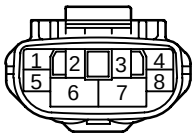
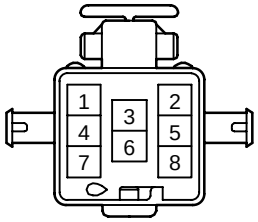
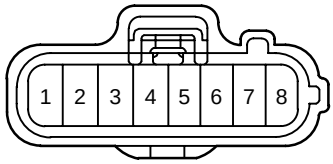
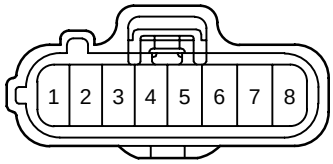
			
90980–11599	90980–11904	90980–11960	

<FEMALE> 6P Waterproof Type

			
90980–10097	90980–10195	90980–10478	90980–10597
			
90980–10643	90980–10651	90980–10854	90980–10939
			
90980–10988	90980–11034	90980–11144	90980–11194
			
90980–11197	90980–11290	90980–11663	90980–11858

<FEMALE> 7P, 8P Waterproof Type

			
90980–10628	90980–10931	90980–11172	90980–10205
			
90980–10891	90980–10895	90980–10897	90980–11190
			
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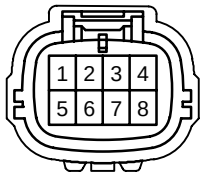	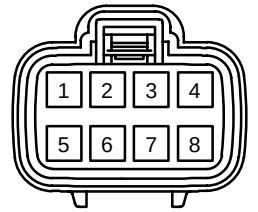		
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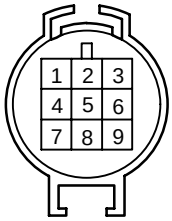
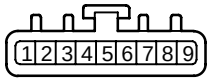
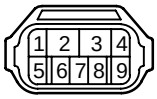
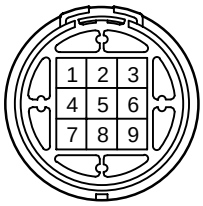
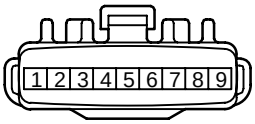
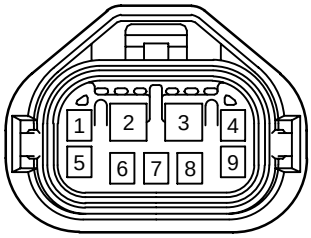
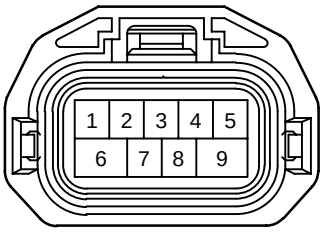
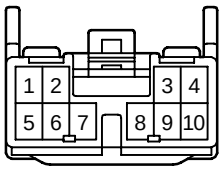
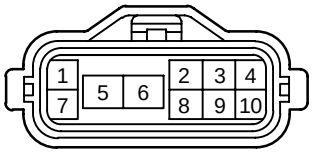
<FEMALE> 9P Waterproof Type

 90980–10380 90980–10381	 90980–10678	 90980–10686
 90980–10776	 90980–11192	 90980–11643
 90980–11784		

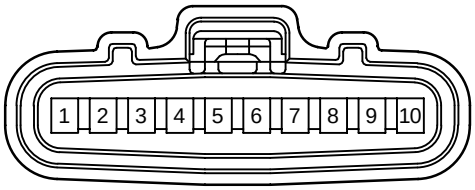
<FEMALE> 10P Waterproof Type



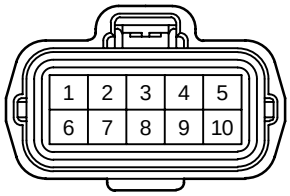
90980–11231



90980–11332

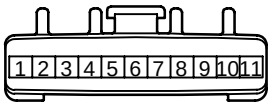


90980–11653

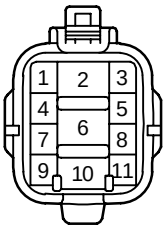


90980–11658

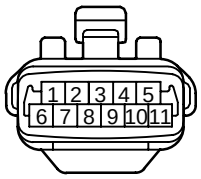
<FEMALE> 11P Waterproof Type



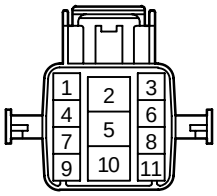
90980–11174



90980–11240

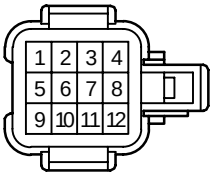


90980–11257

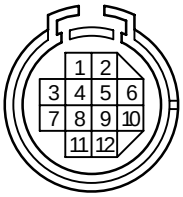


90980–11612

<FEMALE> 12P Waterproof Type

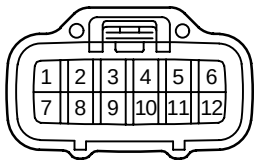


90980–10548

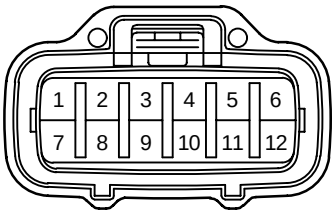


90980–10569

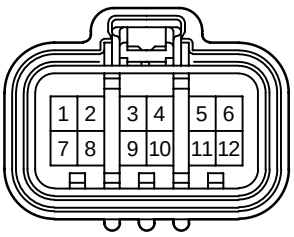
90980–11087



90980–11151

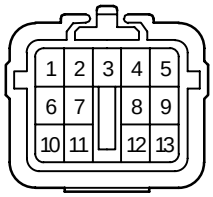


90980–11664

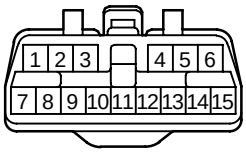


90980–11698

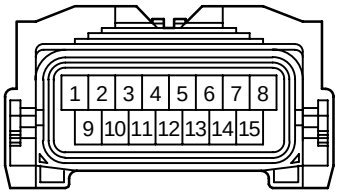
<FEMALE> 13P, 15P Waterproof Type



90980–10654

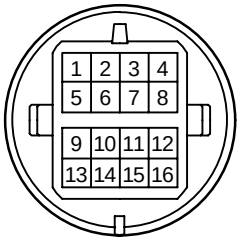


90980–11089

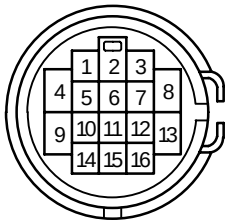


90980–11677

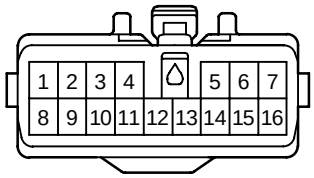
<FEMALE> 16P, 17P, 23P Waterproof Type



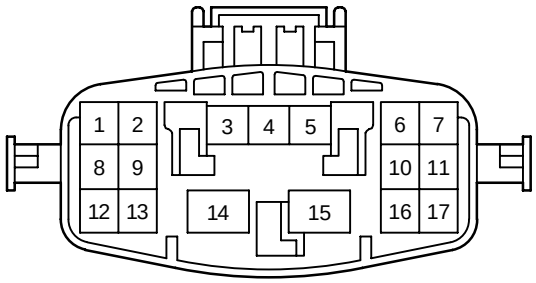
90980–10101



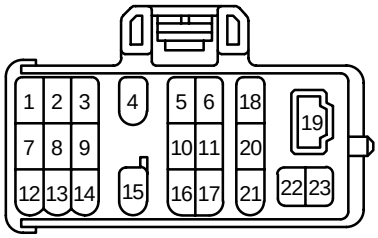
90980–10288



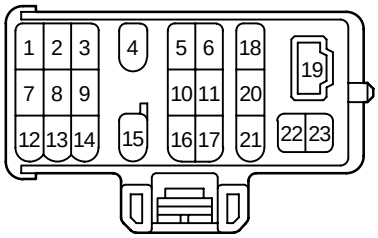
90980–11463



90980–11601

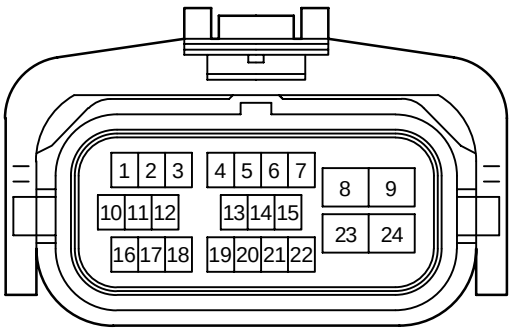


90980–11195

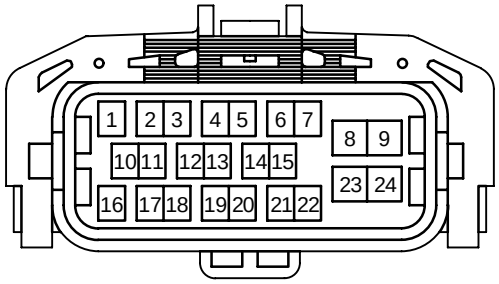


90980–11323

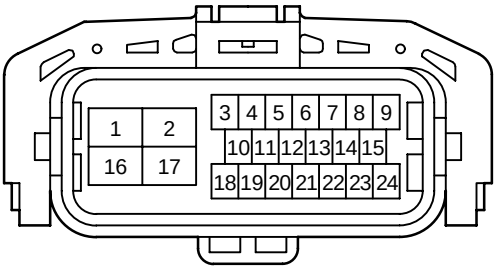
<FEMALE> 24P, 25P Waterproof Type



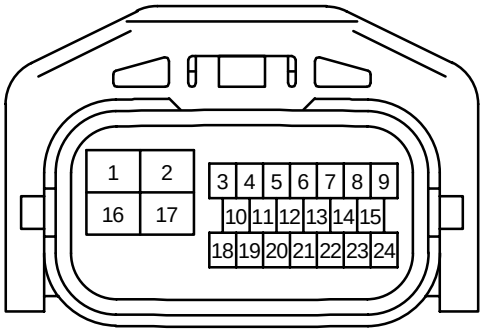
90980–11851



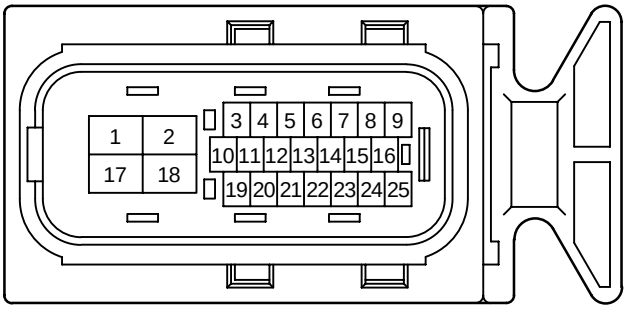
90980–11882



90980–11893

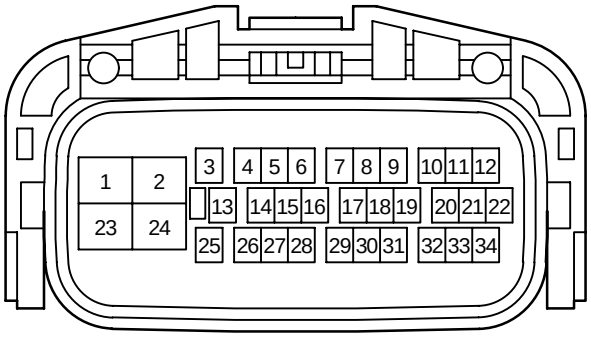


90980–12116

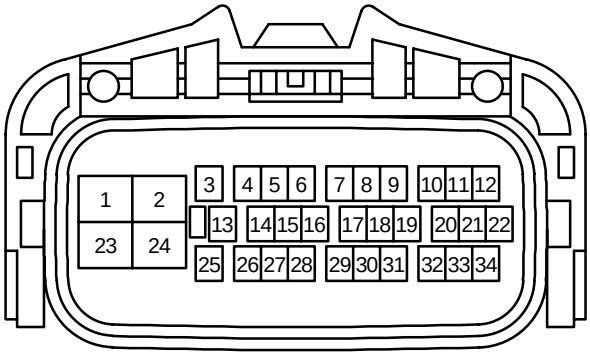


90980–11861

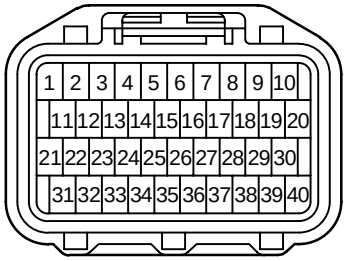
<FEMALE> 34P, 40P Waterproof Type



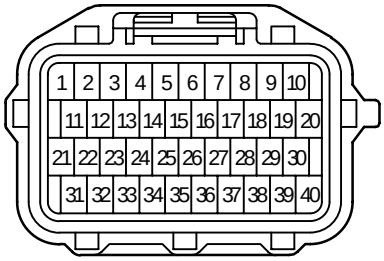
90980–12020



90980–12021
90980–12022

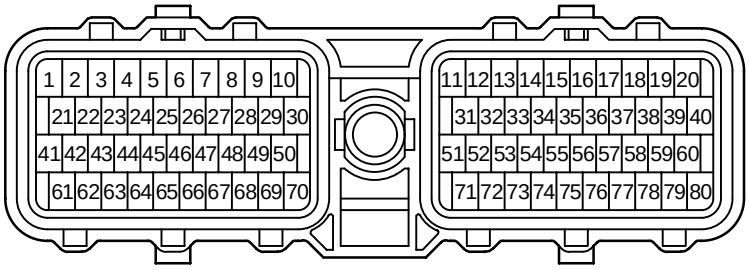


90980–11215



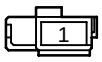
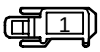
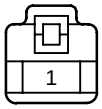
90980–11566

<FEMALE> 80P Waterproof Type

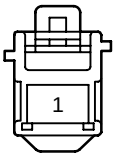
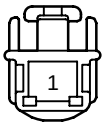


90980–11214

<FEMALE> 1P Non–waterproof Type

90980–10165	90980–10179	90980–10183	 90980–10229
90980–10250	90980–10252	90980–10254	90980–10332
90980–10343	90980–10359	90980–10363	90980–10398
90980–10435	 90980–10619	90980–10652	 90980–10688
90980–10703	90980–10782	90980–10786	90980–10792

<FEMALE> 1P Non–waterproof Type

90980–10871	90980–10911	90980–10912	90980–10913
			
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		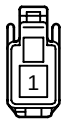	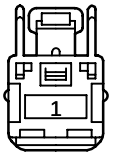
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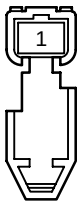	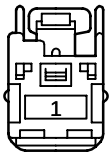		
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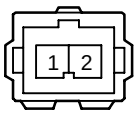
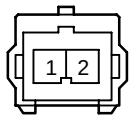
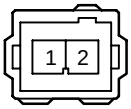
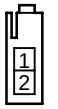
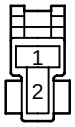
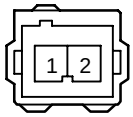
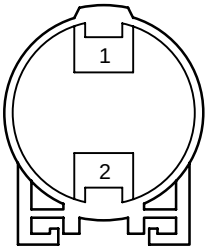
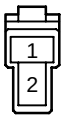
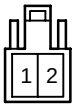
<FEMALE> 2P Non–waterproof Type

			
90980–10012	90980–10039	90980–10069	90980–10108
			
90980–10109	90980–10121	90980–10124	90980–10141
			
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			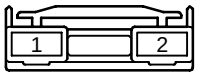
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		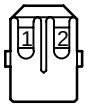	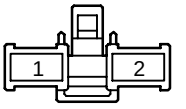
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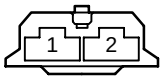
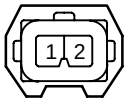
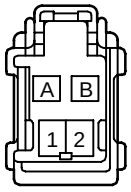
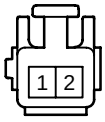
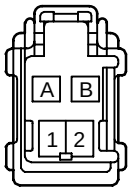
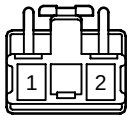
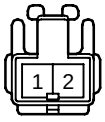
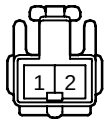
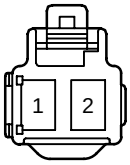
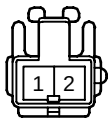
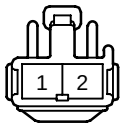
<FEMALE> 2P Non–waterproof Type

			
90980–10423	90980–10425	90980–10426	90980–10465
90980–10481	90980–10482	90980–10491	90980–10511
90980–10512	90980–10559	90980–10621	90980–10637
			
90980–10679	90980–10760	90980–10783	90980–10823
			
90980–10825	90980–10835	90980–10850	90980–10855

<FEMALE> 2P Non–waterproof Type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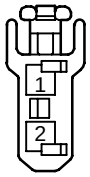
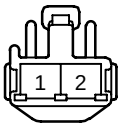
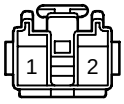
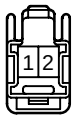
			
90980–10935	90980–10960	90980–10962	90980–11080
			
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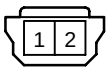
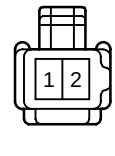
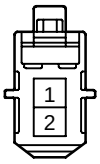
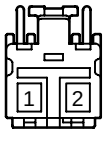
			
90980–11227	90980–11278	90980–11306	90980–11369
			
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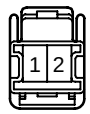
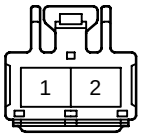
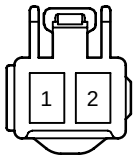
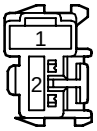
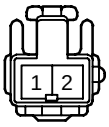
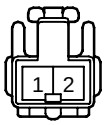
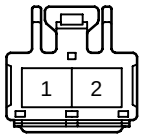
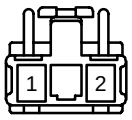
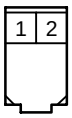
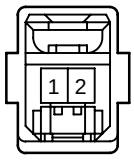
<FEMALE> 2P Non–waterproof Type

			
90980–11436	90980–11579	90980–11608	90980–11684
			
90980–11687	90980–11736	90980–11769	90980–11824
			
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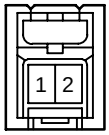	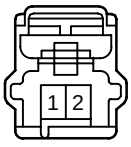	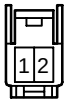	
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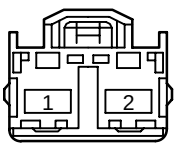	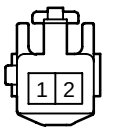	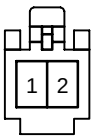	
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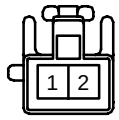
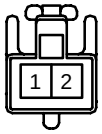
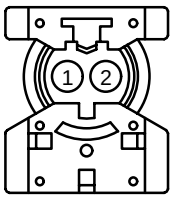
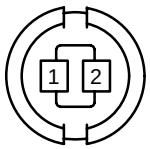
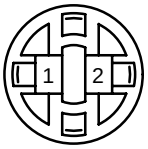
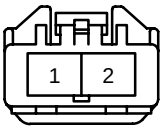
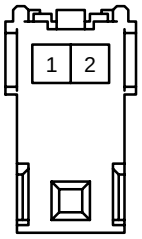
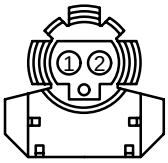
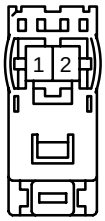
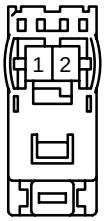
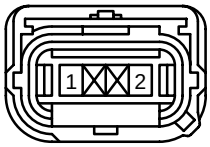
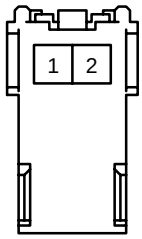
<FEMALE> 2P Non–waterproof Type

 90980–12088	 90980–12089	 90980–12109	 90980–12110
 90980–12111	 90980–12120	 90980–12138	 90980–12191
 90980–12219 90980–12242	 90980–12224 90980–12243	 90980–12241	 90980–12253

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	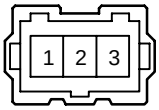	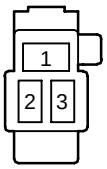	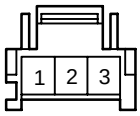
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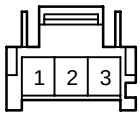	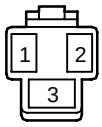	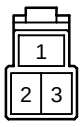	
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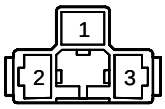		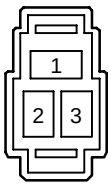	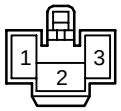
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	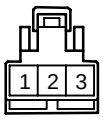	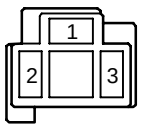	
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	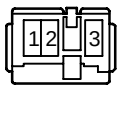	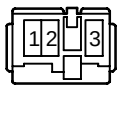	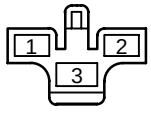
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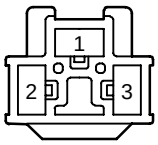
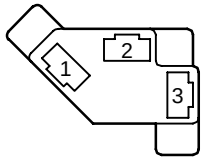
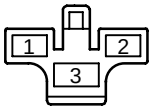
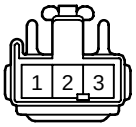
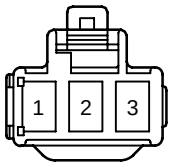
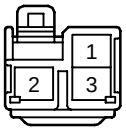
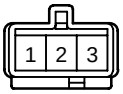
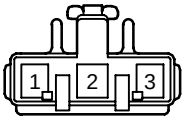
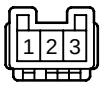
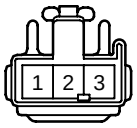
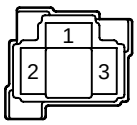
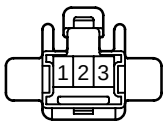
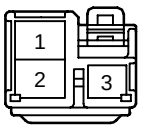
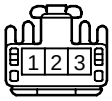
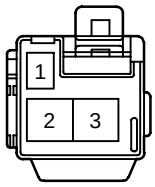
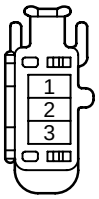
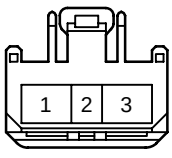
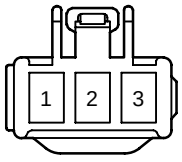
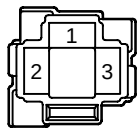
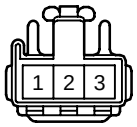
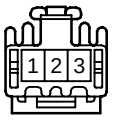
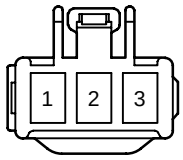
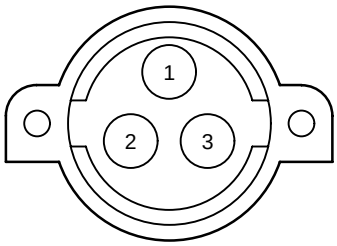
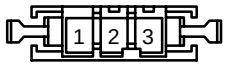
<FEMALE> 3P Non–waterproof Type

90980–10638 90980–10660	 90980–10704	 90980–10747	 90980–10784
 90980–10908	 90980–10956	 90980–10980	90980–11053
 90980–11071	 90980–11079	 90980–11251	 90980–11296
 90980–11314	 90980–11336	 90980–11387	 90980–11471
 90980–11485	 90980–11490	 90980–11667	 90980–11685

<FEMALE> 3P Non–waterproof Type

 90980–11731	 90980–11764	 90980–11777	 90980–11880
 90980–11938	90980–11987	 90980–12197	

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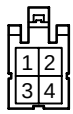		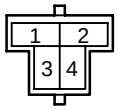	
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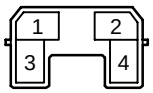	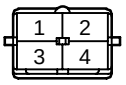	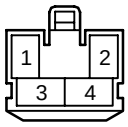	
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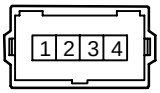	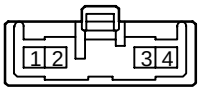		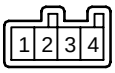
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		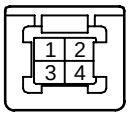	
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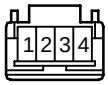	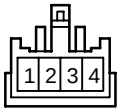		
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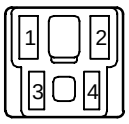
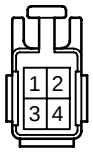
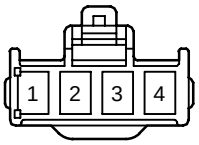
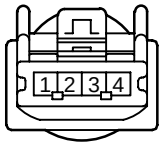
<FEMALE> 4P Non–waterproof Type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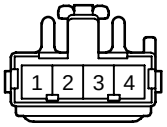	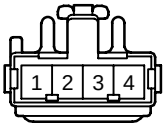	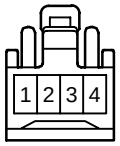	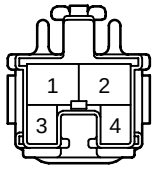
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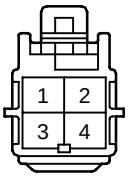	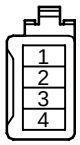	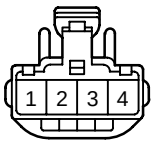	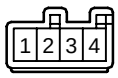
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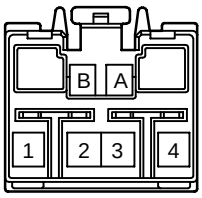	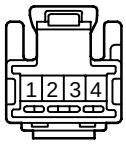	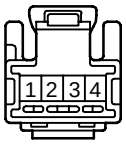	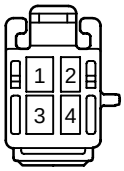
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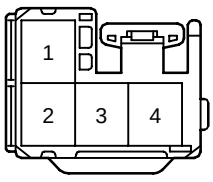	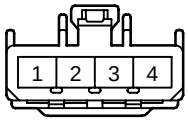	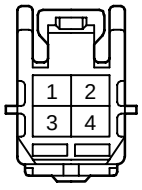	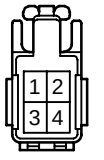
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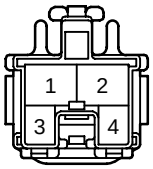
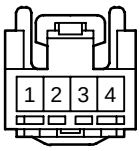
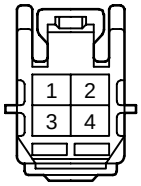
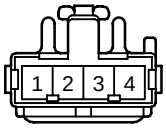
<FEMALE> 4P Non–waterproof Type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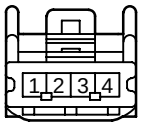	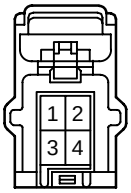	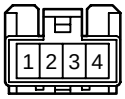	
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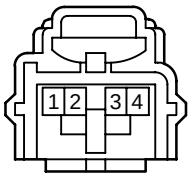	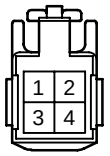		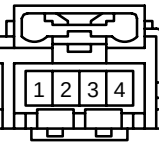
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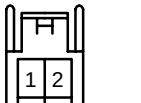
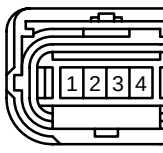
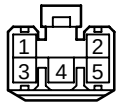
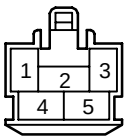
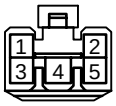
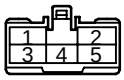
			
90980–12211	90980–12225		

<FEMALE> 5P Non–waterproof Type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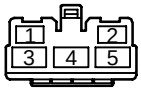	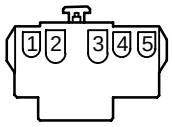	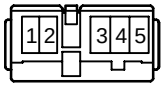	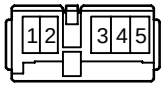
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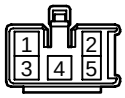	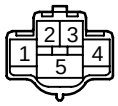	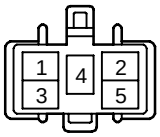	
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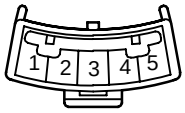	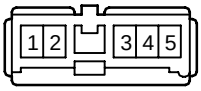	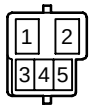	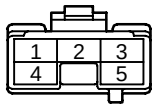
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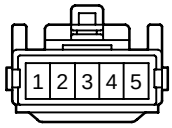	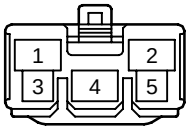	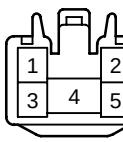	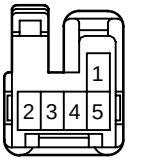
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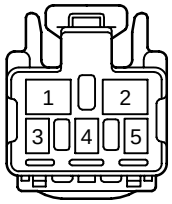
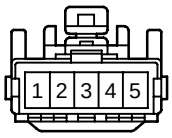
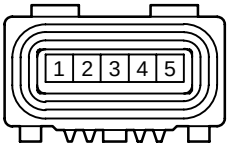
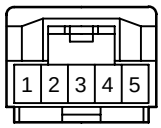
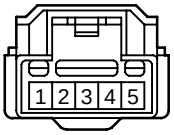
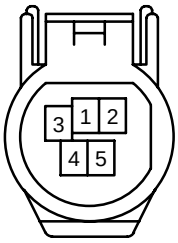
 90980–11603	 90980–11772	 90980–11908	 90980–11909
 90980–11921	 90980–12190		

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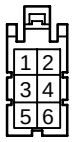	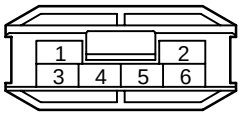	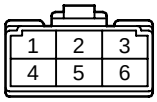	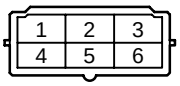
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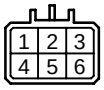	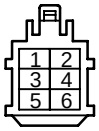	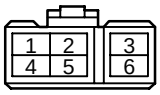	
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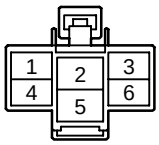	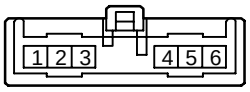	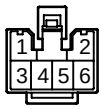	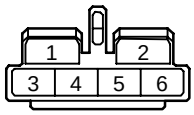
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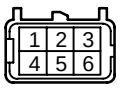			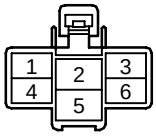
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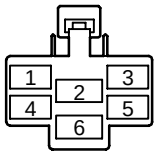	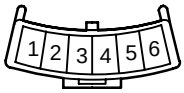	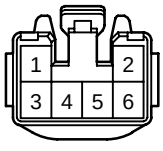	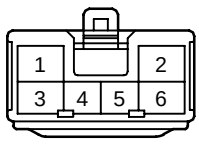
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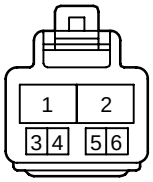
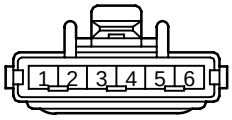
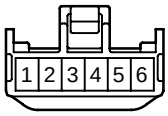
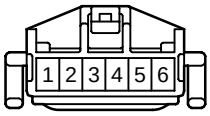
<FEMALE> 6P Non–waterproof Type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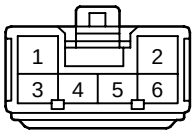	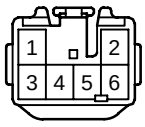	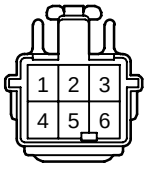	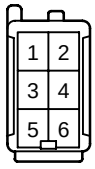
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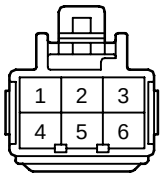	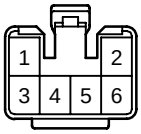	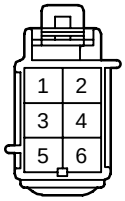	
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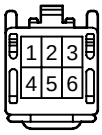	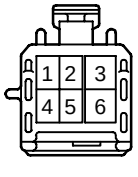	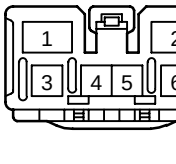	
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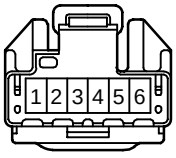	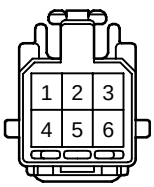	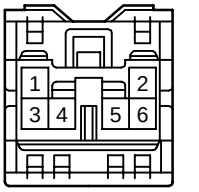	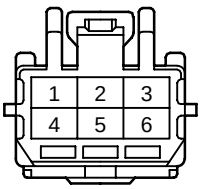
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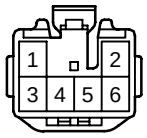
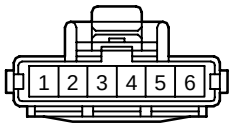
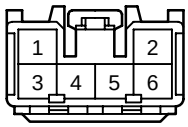
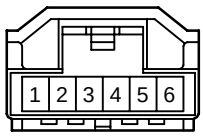
<FEMALE> 6P Non–waterproof Type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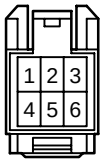	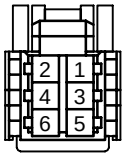	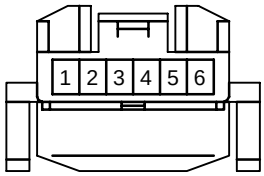	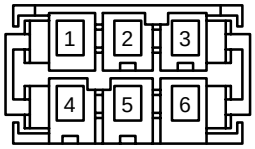
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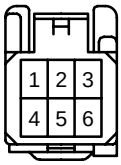			
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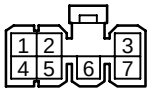
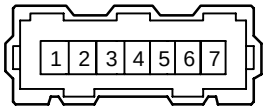
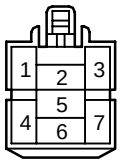
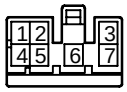
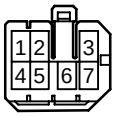
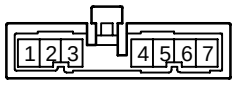
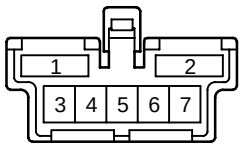
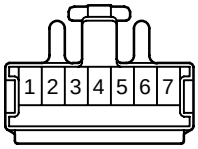
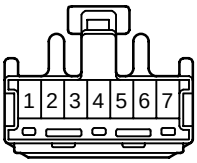
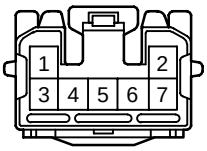
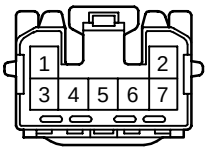
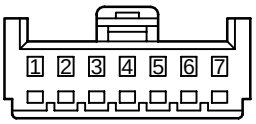
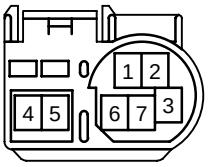
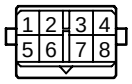
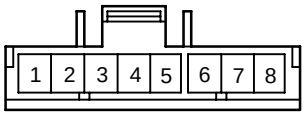
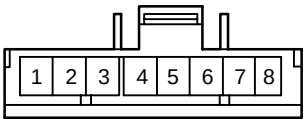
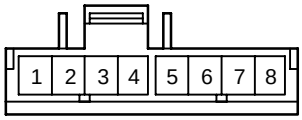
<FEMALE> 7P Non–waterproof Type

 90980–10043	 90980–10071	 90980–10264	 90980–10311
 90980–10452	 90980–10460	 90980–10729 90980–10772	 90980–11165
 90980–11340	 90980–11529	 90980–11740	 90980–11794
 90980–12060			

<FEMALE> 8P Non–waterproof Type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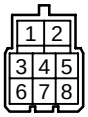	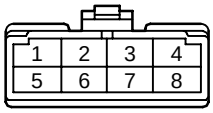	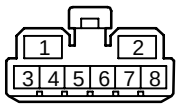	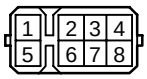
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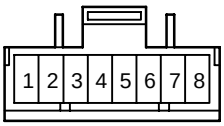	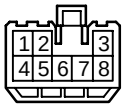	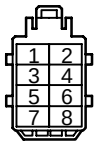	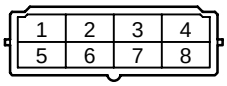
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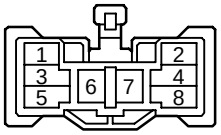
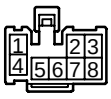
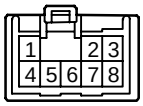
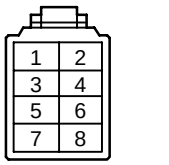
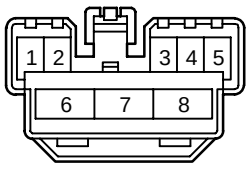
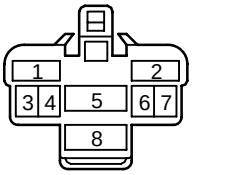
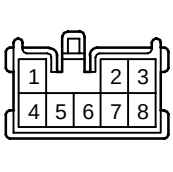
			
90980–10404	90980–10419	90980–10431	90980–10449
			
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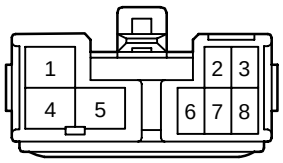
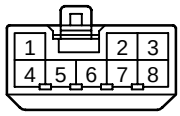
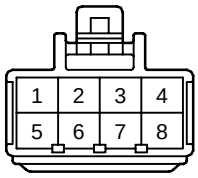
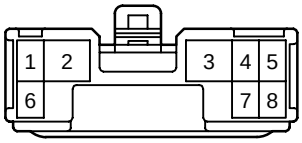
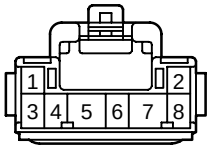
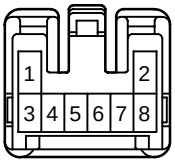
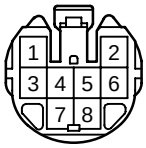
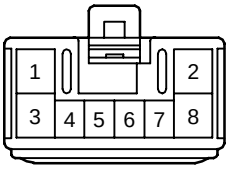
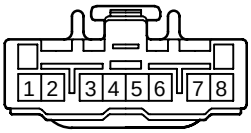
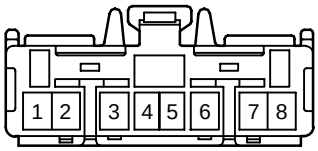
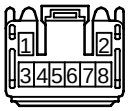
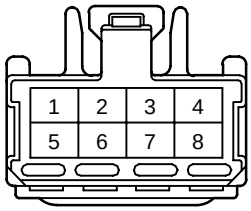
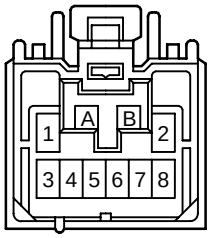
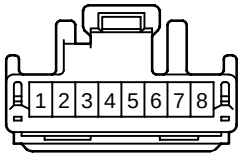
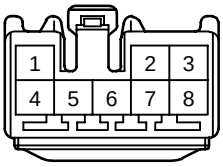
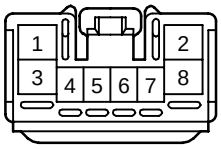
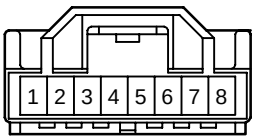
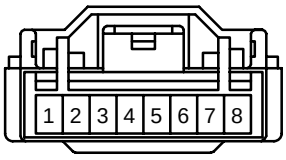
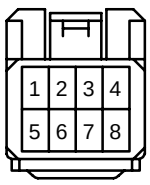
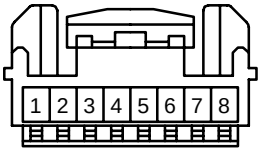
<FEMALE> 8P Non–waterproof Type

 90980–10877 90980–11439	 90980–10926	 90980–11092	 90980–11130
 90980–11279	 90980–11321	 90980–11354	 90980–11362
 90980–11397	 90980–11459	 90980–11533	 90980–11615
 90980–11630	 90980–11633	 90980–11686	 90980–11701
 90980–11989	 90980–12091	 90980–12113	 90980–12217

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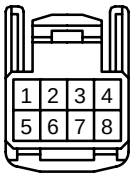 90980–12221			

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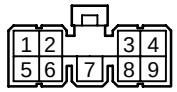
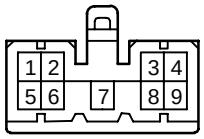
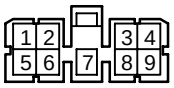
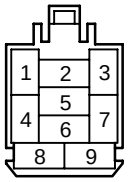
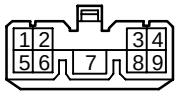
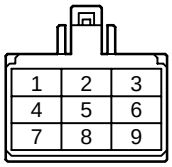
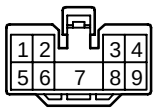
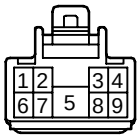
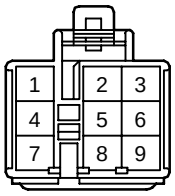
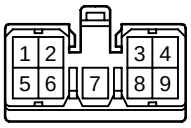
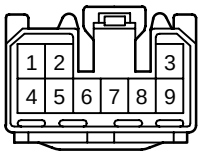
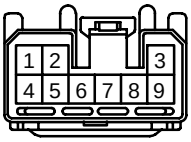
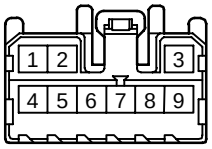
 90980–10045	 90980–10133	 90980–10152	 90980–10266
 90980–10318	 90980–10386	 90980–10536	 90980–11277
 90980–11302	 90980–11479	 90980–11535	 90980–11710
 90980–12026			

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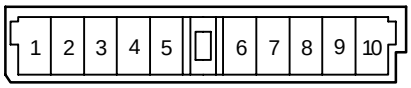

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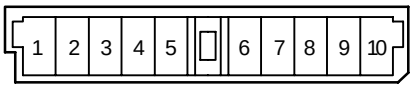

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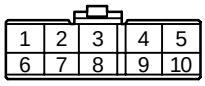

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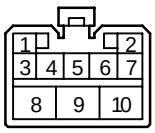

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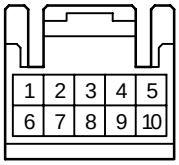

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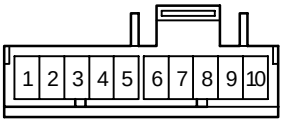

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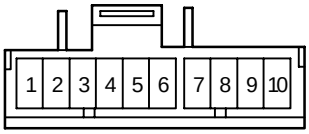

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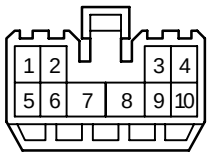

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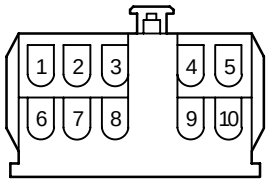

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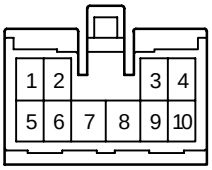

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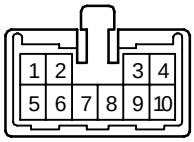

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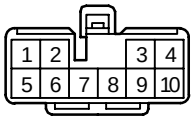

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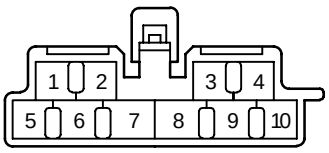
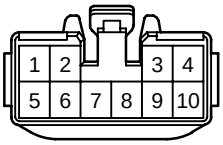
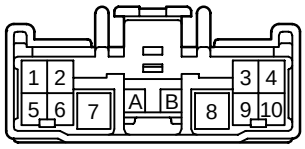
<FEMALE> 10P Non–waterproof Type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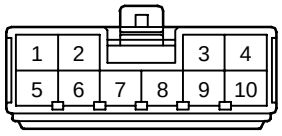	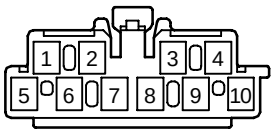	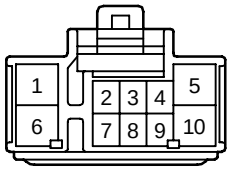
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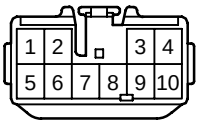	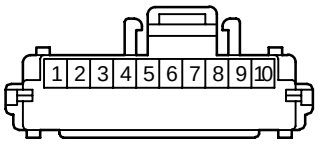	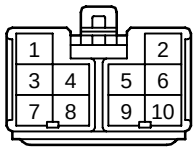
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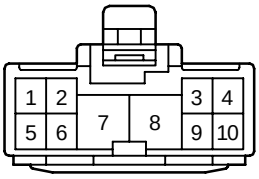	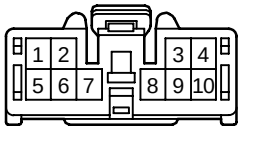	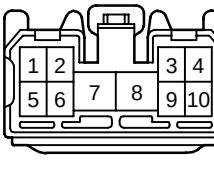
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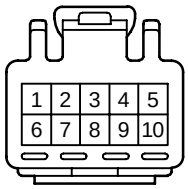
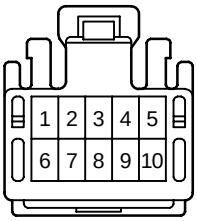
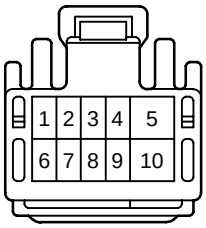
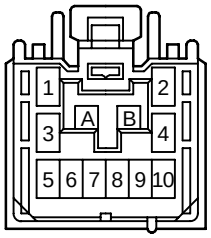
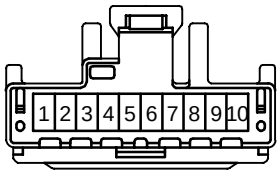
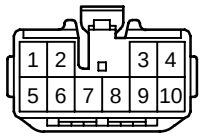
<FEMALE> 10P Non–waterproof Type

		
90980–11537	90980–11581	90980–11614
		
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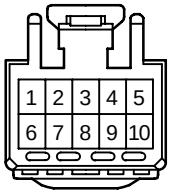	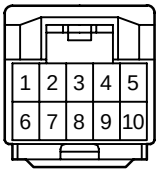	
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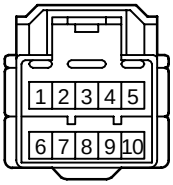
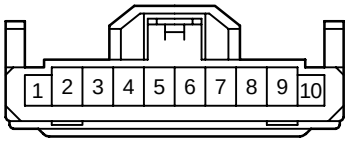
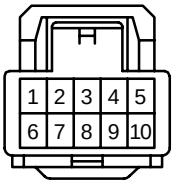
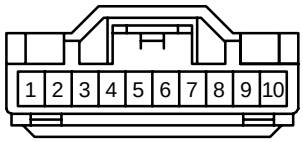
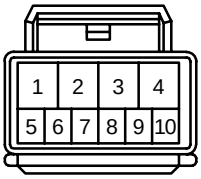
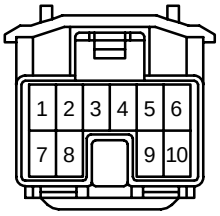
		
90980–11948	90980–12008	90980–12135

<FEMALE> 10P Non–waterproof Type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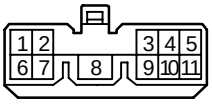
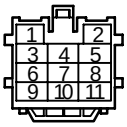
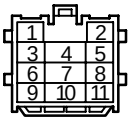
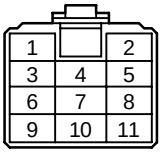
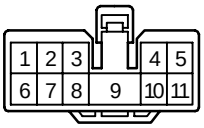
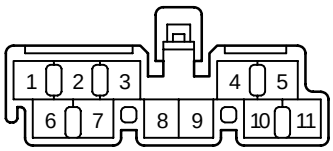
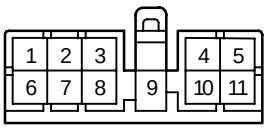
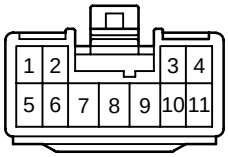
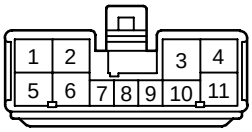
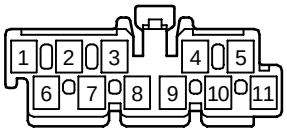
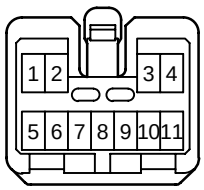
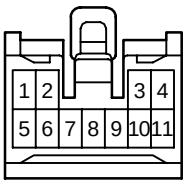
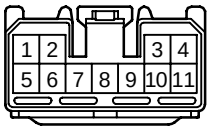
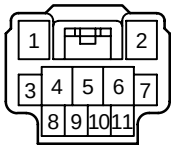
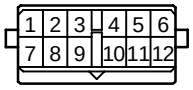
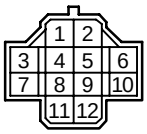
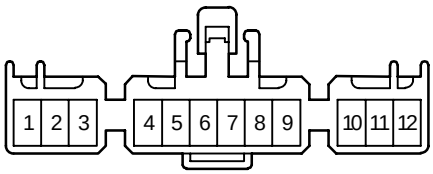
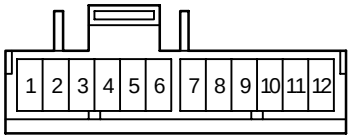
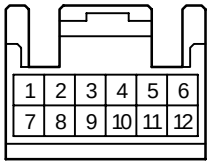
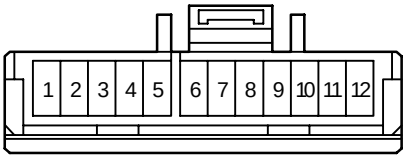
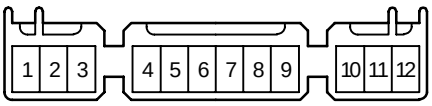
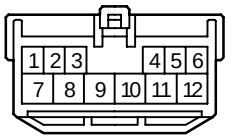
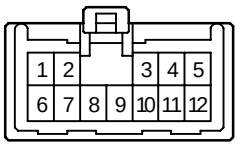
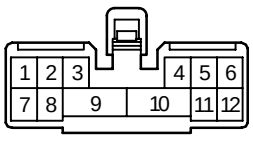
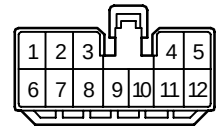
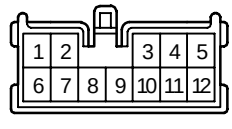
<FEMALE> 11P Non–waterproof Type

 90980–10319	 90980–10337	 90980–10338
 90980–10450	 90980–10537	 90980–10723
90980–10727	 90980–10781	 90980–10830
 90980–10873	 90980–10966	 90980–11041

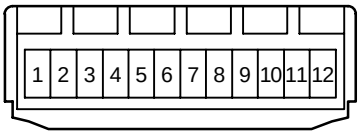
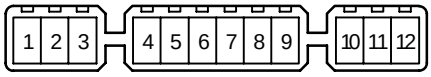
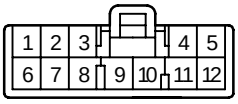
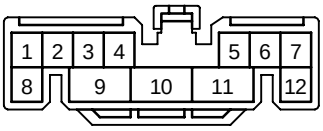
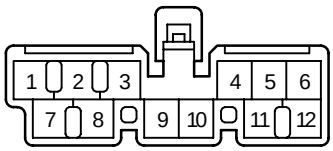
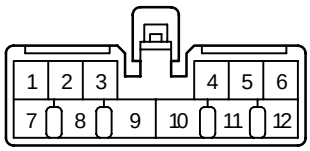
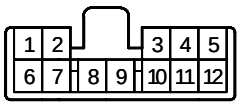
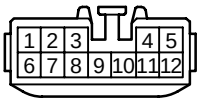
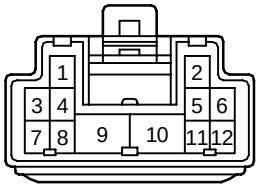
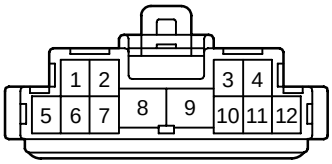
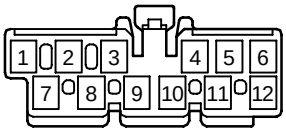
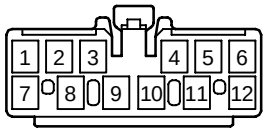
<FEMALE> 11P Non–waterproof Type

		
90980–11083	90980–11539	90980–12003

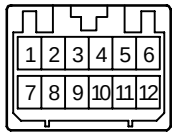
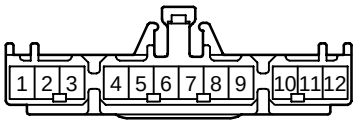
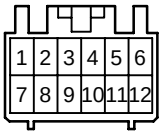
<FEMALE> 12P Non–waterproof Type

		
90980–10006	90980–10150	90980–10153
		
90980–10303	90980–10351	90980–10372
		
90980–10397	90980–10406	90980–10408
		
90980–10421	90980–10432	90980–10524

<FEMALE> 12P Non–waterproof Type

 90980–10565	 90980–10632	 90980–10658
 90980–10714	 90980–10724	 90980–10725
 90980–10743	 90980–10803	 90980–10879
 90980–10932	 90980–10967	 90980–10968

<FEMALE> 12P Non–waterproof Type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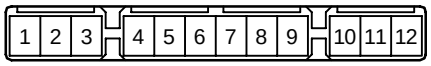	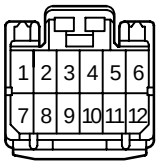	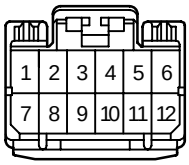
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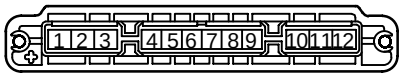	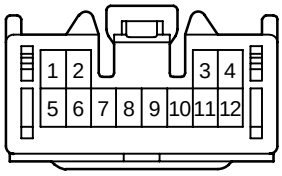	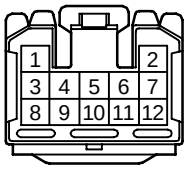
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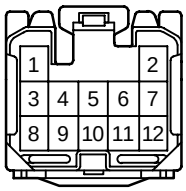	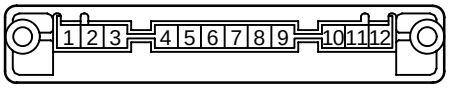	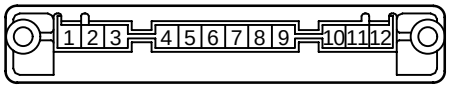
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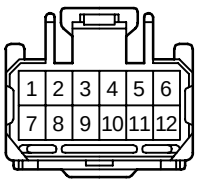
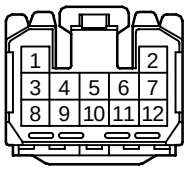
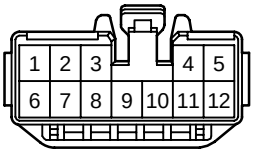
<FEMALE> 12P Non–waterproof Type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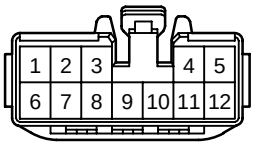	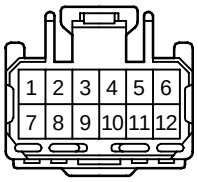	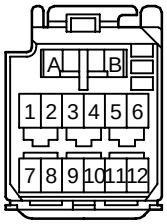
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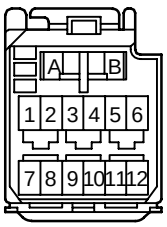	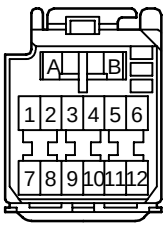	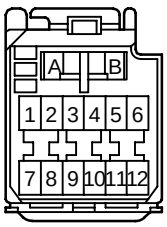
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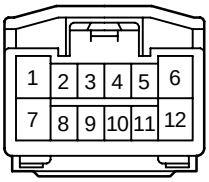	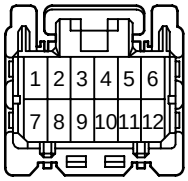	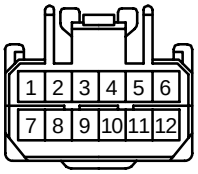
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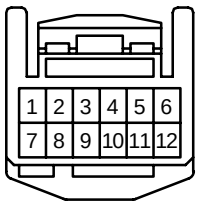
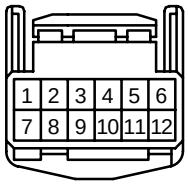
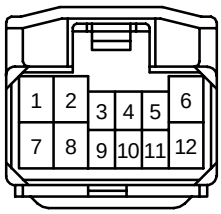
<FEMALE> 12P Non–waterproof Type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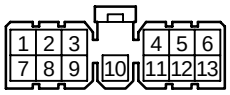
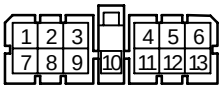
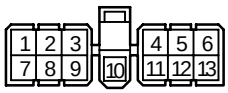
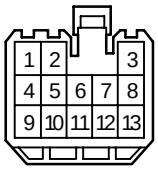
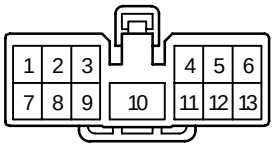
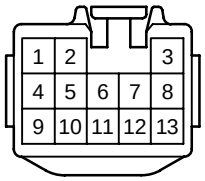
		
90980–10033	90980–10062	90980–10132
		
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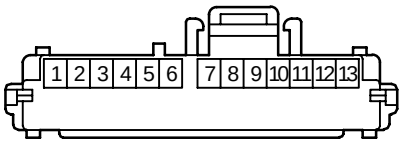
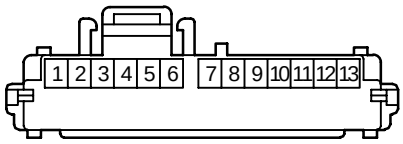
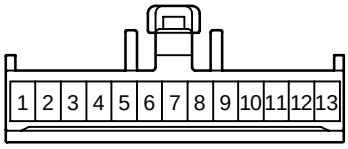
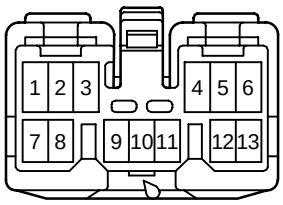
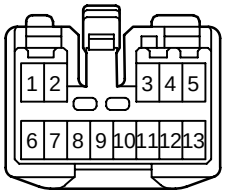
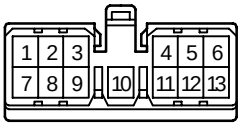
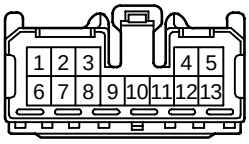
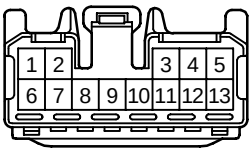
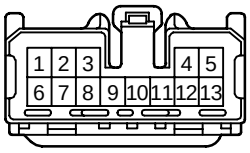
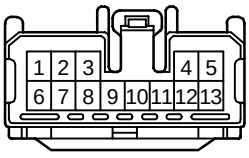
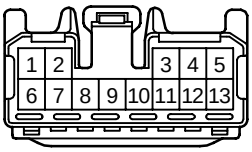
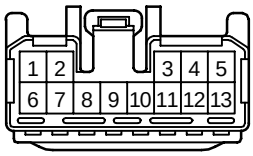
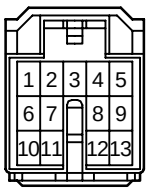
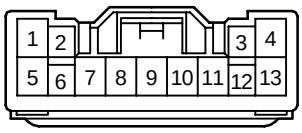
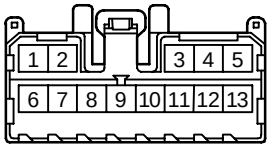
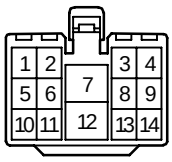
		
90980–11114	90980–11115	90980–11199
		
90980–11350	90980–11394	90980–11478

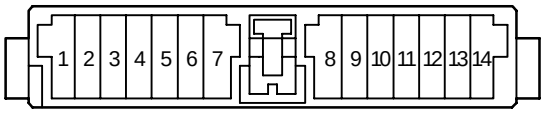
<FEMALE> 13P Non–waterproof Type

		
90980–11542	90980–11604	90980–11695
		
90980–11714	90980–11827	90980–11848
		
90980–11952	90980–12007	90980–12027

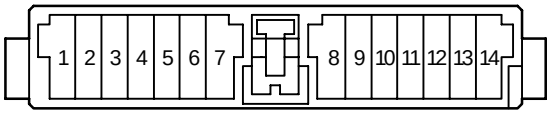
<FEMALE> 14P Non–waterproof Type



90980–10330



90980–10368



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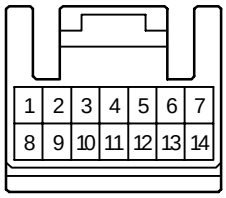

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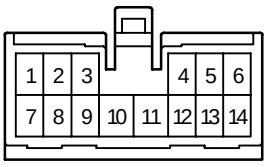
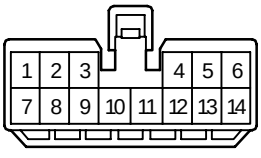
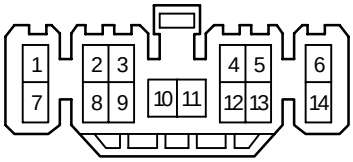


90980–10471

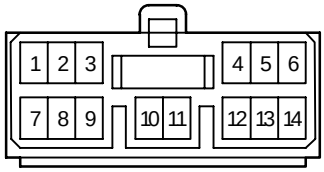


90980–10507

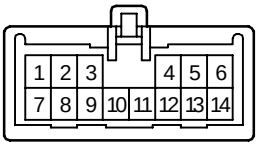
<FEMALE> 14P Non–waterproof Type



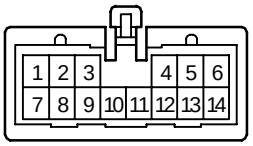
90980–10538



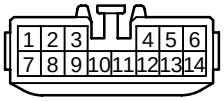
90980–10608



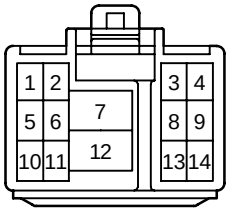
90980–10633



90980–10634

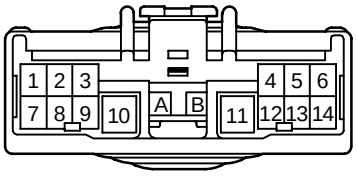


90980–10807
90980–11437

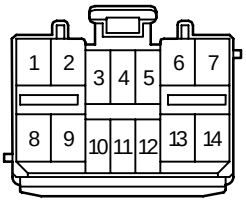


90980–10813

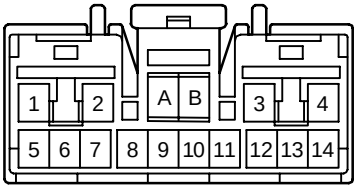
<FEMALE> 14P Non–waterproof Type



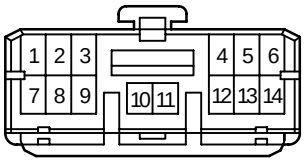
90980–10852



90980–11225



90980–11383



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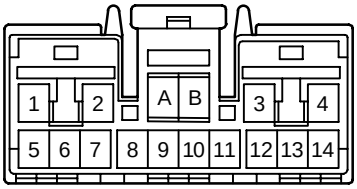

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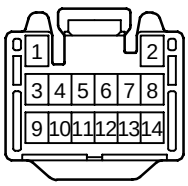
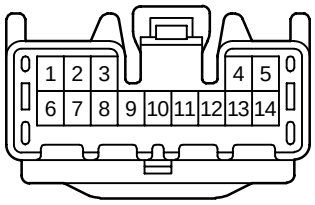


90980–11511

<FEMALE> 14P Non–waterproof Type



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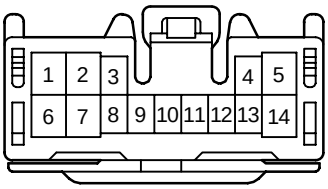
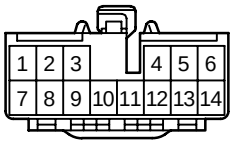
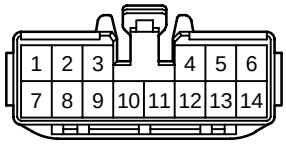


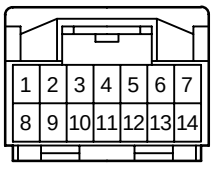
90980–11591



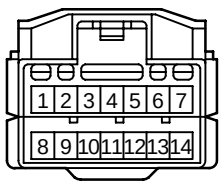
90980–11791



90980–11805

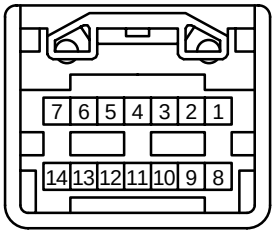


90980–11911

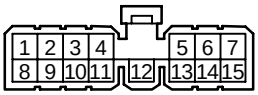


90980–11925

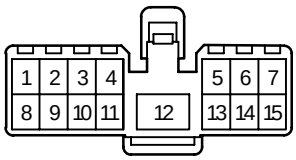
<FEMALE> 14P Non–waterproof Type

 90980–12082	

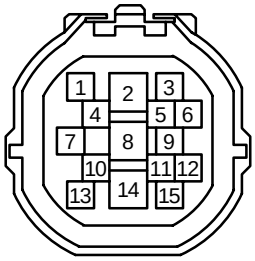
<FEMALE> 15P Non–waterproof Type



90980–10066



90980–10331



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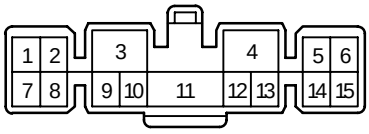
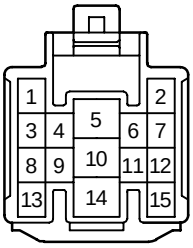
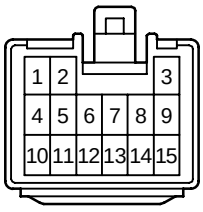


90980–10563

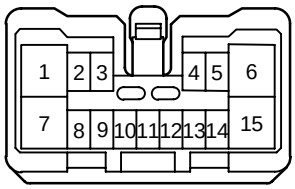


90980–10815

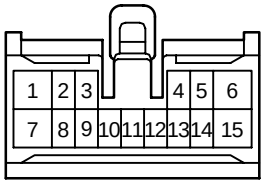


90980–10828

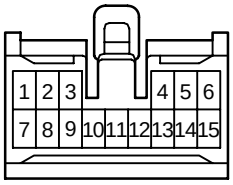
<FEMALE> 15P Non–waterproof Type



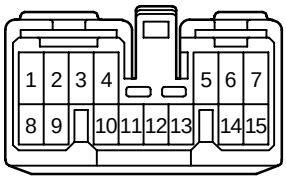
90980–11042



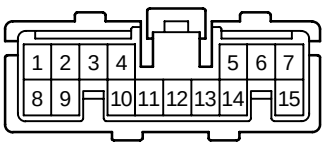
90980–11056



90980–11179

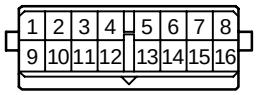


90980–11264

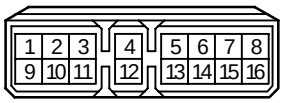


90980–11372

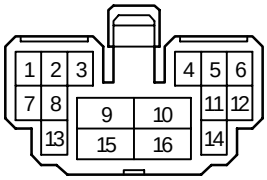
<FEMALE> 16P Non–waterproof Type



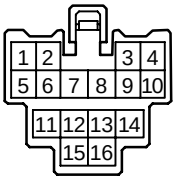
90980–10008



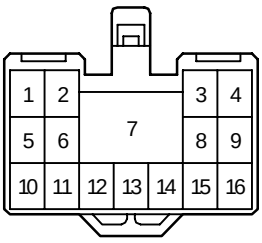
90980–10028



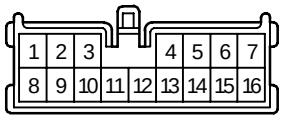
90980–10454



90980–10486

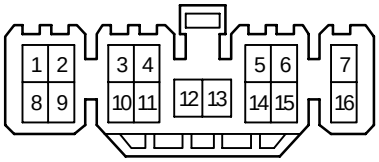


90980–10522

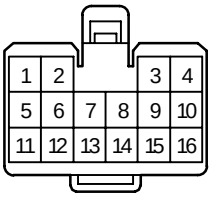


90980–10525

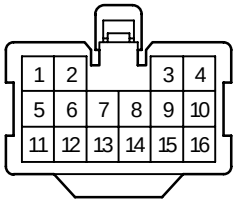
<FEMALE> 16P Non–waterproof Type



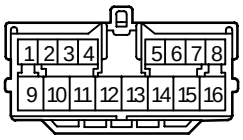
90980–10539



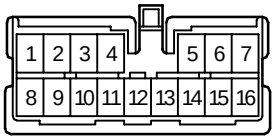
90980–10543



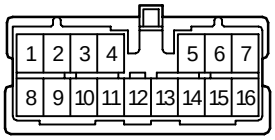
90980–10561



90980–10611

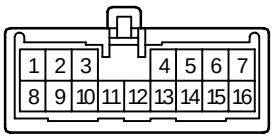


90980–10613

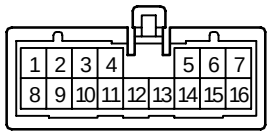


90980–10614

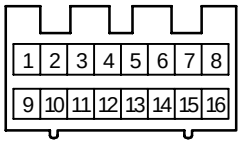
<FEMALE> 16P Non–waterproof Type



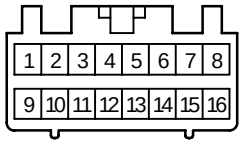
90980–10635



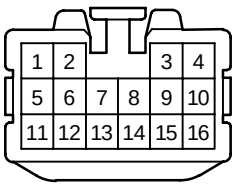
90980–10636



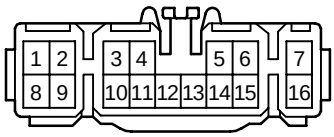
90980–10740



90980–10764

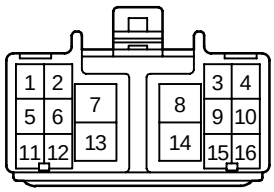


90980–10809
90980–11445

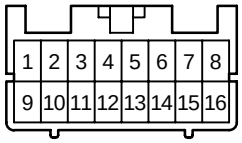


90980–10848

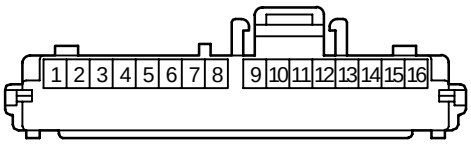
<FEMALE> 16P Non–waterproof Type



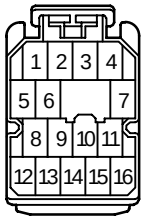
90980–10885



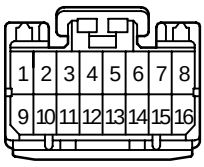
90980–11082



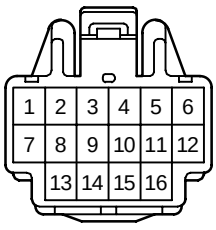
90980–11113



90980–11219

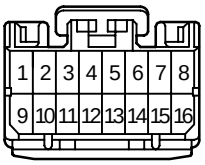


90980–11391

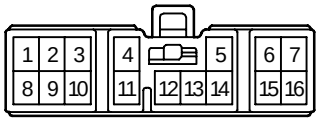


90980–11416

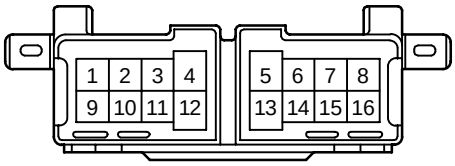
<FEMALE> 16P Non–waterproof Type



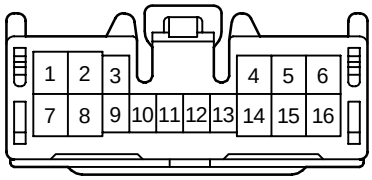
90980–11425



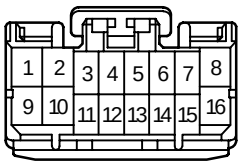
90980–11435



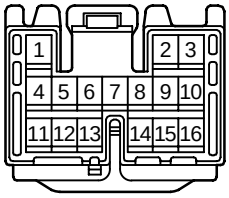
90980–11547



90980–11562

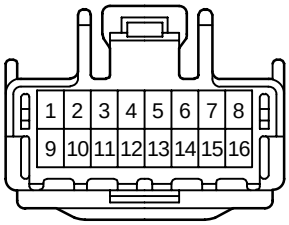


90980–11565

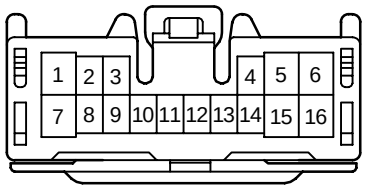


90980–11574

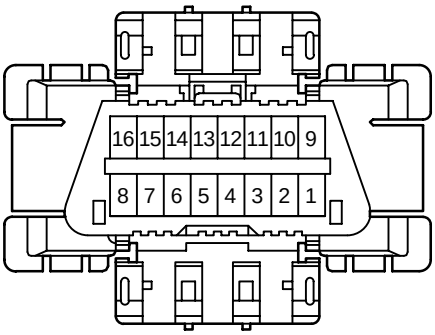
<FEMALE> 16P Non–waterproof Type



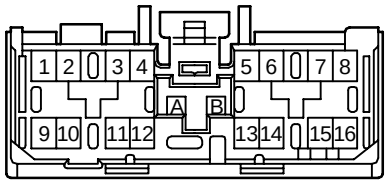
90980–11648



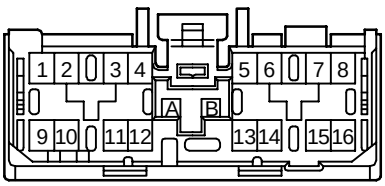
90980–11652



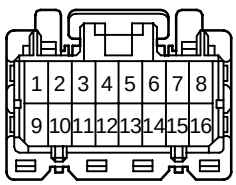
90980–11665
90980–11978



90980–11681

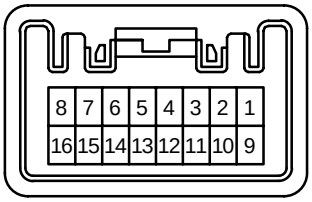


90980–11683

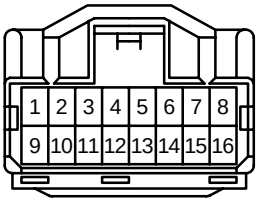


90980–11787

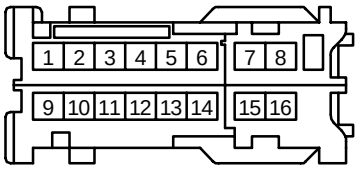
<FEMALE> 16P Non–waterproof Type



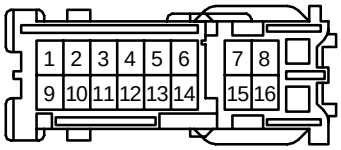
90980–12093



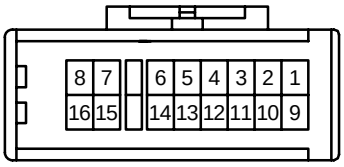
90980–12094



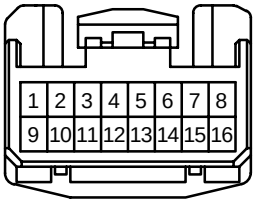
90980–12101



90980–12104

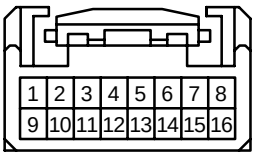


90980–12105



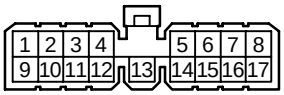
90980–12155

<FEMALE> 16P Non–waterproof Type

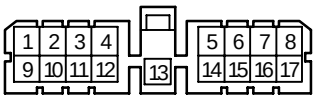


90980–12156

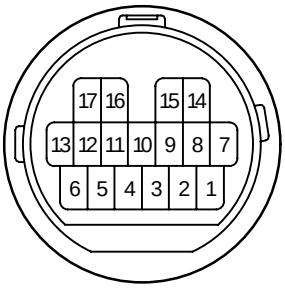
<FEMALE> 17P Non–waterproof Type



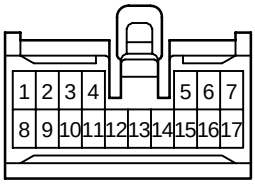
90980–10031



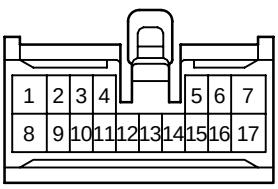
90980–10037



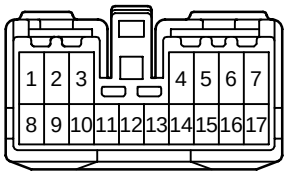
90980–10731
90980–11417
90980–11420



90980–11203

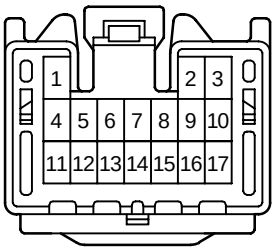


90980–11310

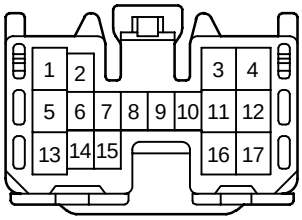


90980–11335

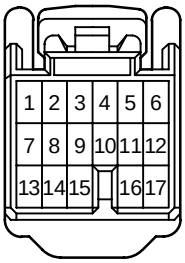
<FEMALE> 17P Non–waterproof Type



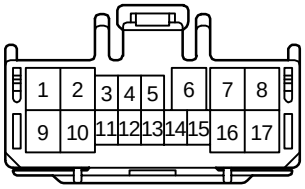
90980–11506



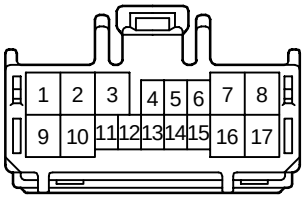
90980–11560



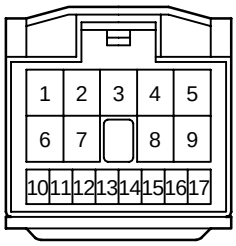
90980–11586



90980–11671

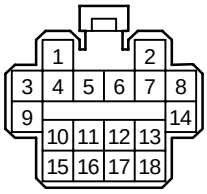


90980–11672

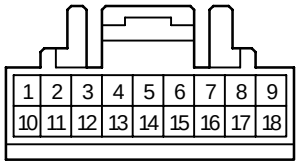


90980–11954

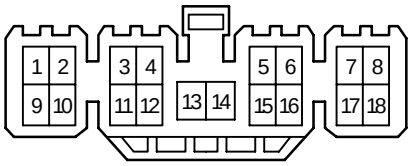
<FEMALE> 18P Non–waterproof Type



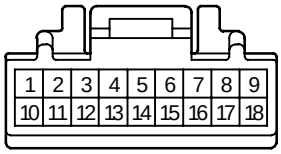
90980–10285



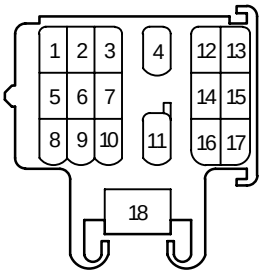
90980–10295



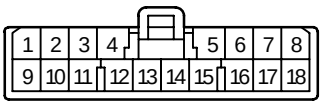
90980–10326



90980–10350

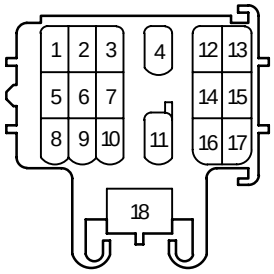


90980–10530

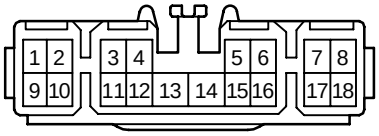


90980–10656

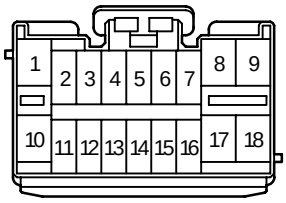
<FEMALE> 18P Non–waterproof Type



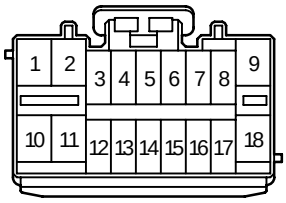
90980–10778



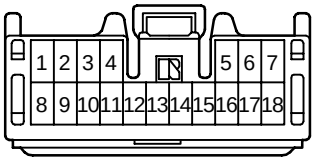
90980–10819



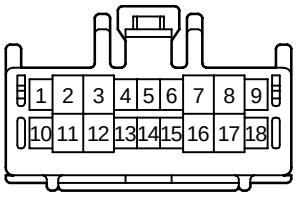
90980–11224



90980–11226

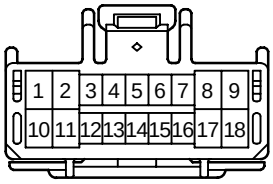


90980–11497

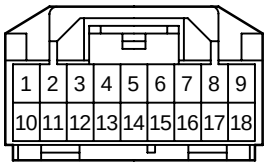


90980–11594

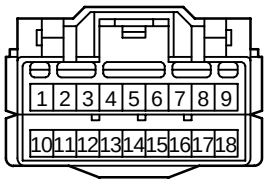
<FEMALE> 18P Non–waterproof Type



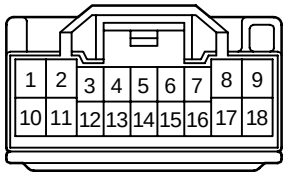
90980–11595



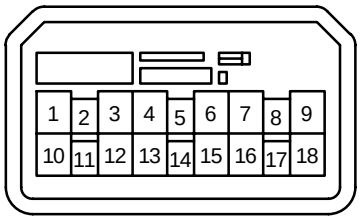
90980–11913



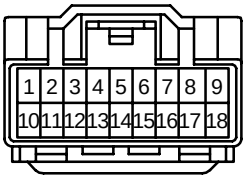
90980–11914



90980–11973

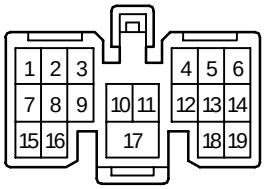


90980–12122

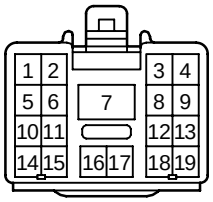


90980–12174

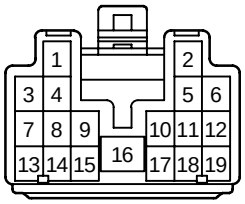
<FEMALE> 19P Non–waterproof Type



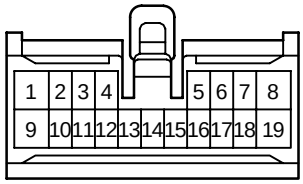
90980–10675



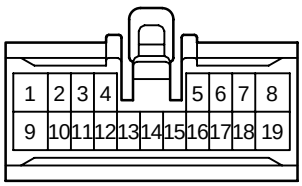
90980–10857



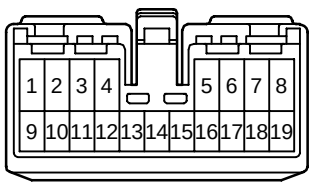
90980–10883



90980–11205

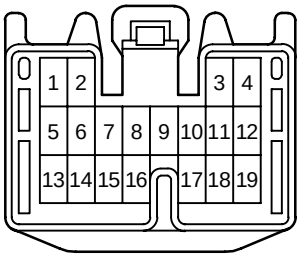


90980–11308

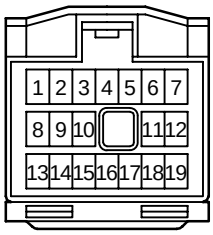


90980–11377

<FEMALE> 19P Non–waterproof Type

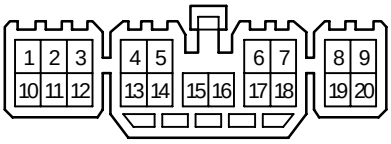


90980–11571

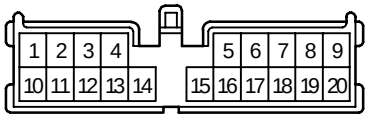


90980–11955

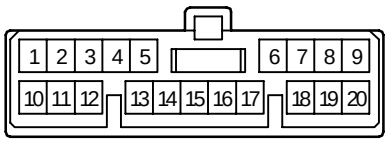
<FEMALE> 20P Non–waterproof Type



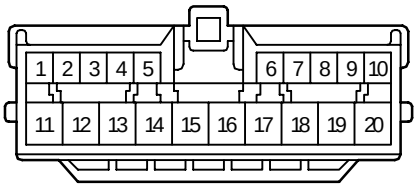
90980–10327



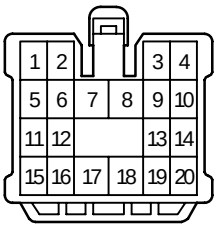
90980–10589



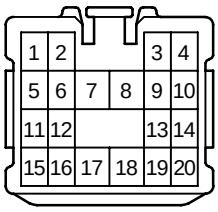
90980–10607



90980–10612

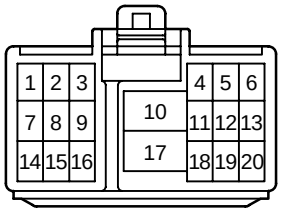


90980–10640

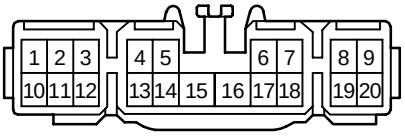


90980–10811
90980–11441

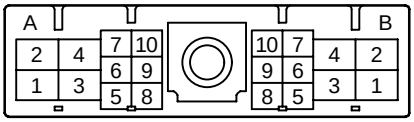
<FEMALE> 20P Non–waterproof Type



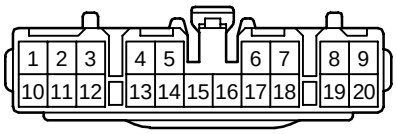
90980–10817



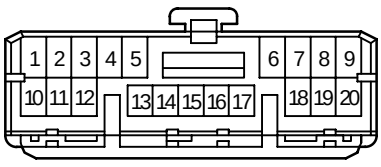
90980–10821



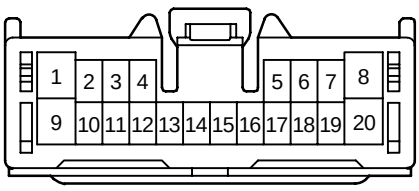
90980–10952



90980–11260

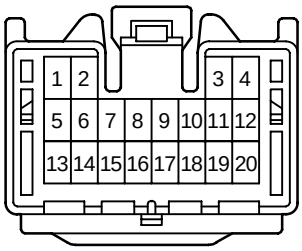


90980–11432

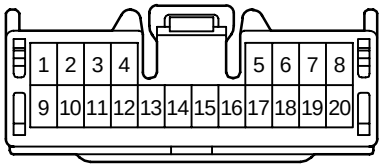


90980–11469

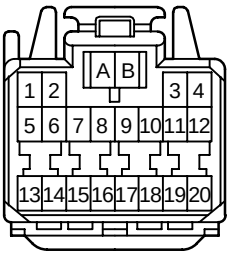
<FEMALE> 20P Non–waterproof Type



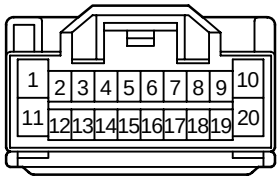
90980–11499



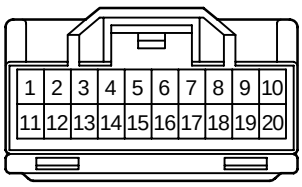
90980–11558



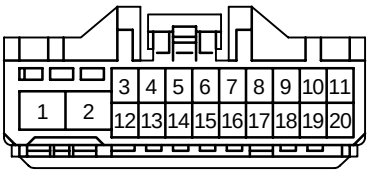
90980–11868



90980–11971

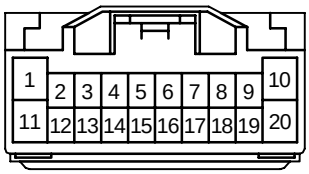


90980–11974

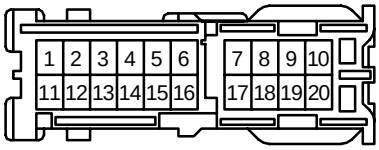


90980–12034

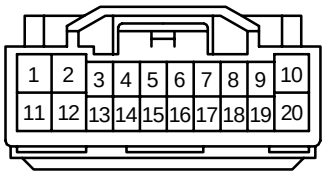
<FEMALE> 20P Non–waterproof Type



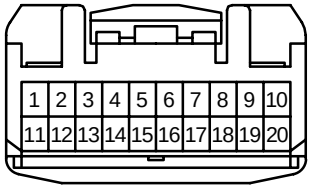
90980–12038



90980–12106

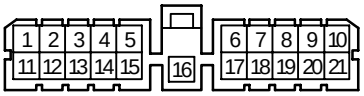


90980–12166

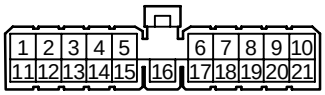


90980–12259

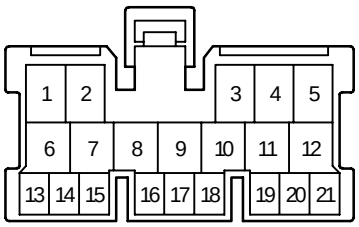
<FEMALE> 21P Non–waterproof Type



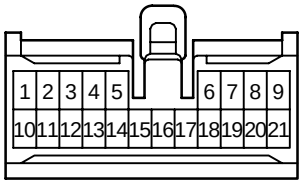
90980–10064



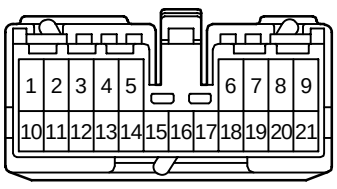
90980–10207



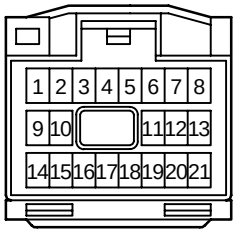
90980–10473



90980–11125

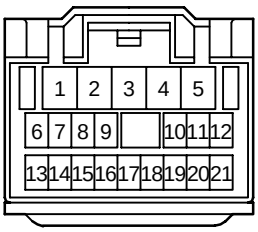


90980–11379



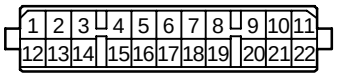
90980–11956

<FEMALE> 21P Non–waterproof Type

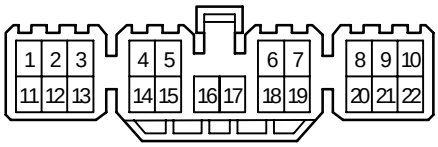


90980–11957

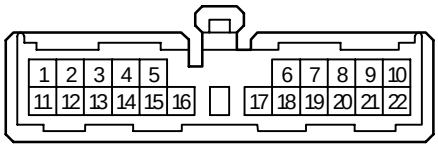
<FEMALE> 22P Non–waterproof Type



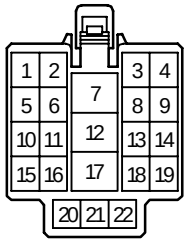
90980–10010



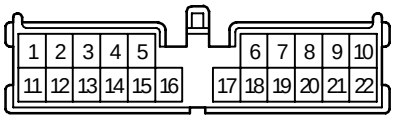
90980–10328



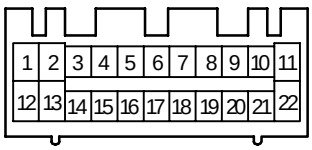
90980–10456



90980–10458

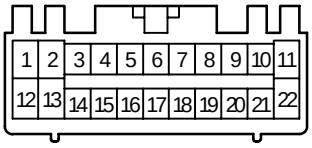


90980–10526

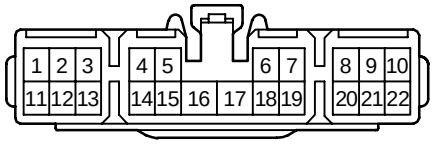


90980–10741

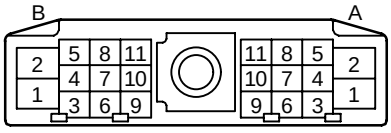
<FEMALE> 22P Non–waterproof Type



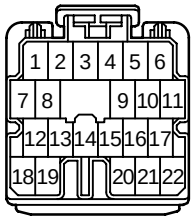
90980–10765



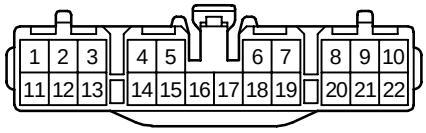
90980–10875



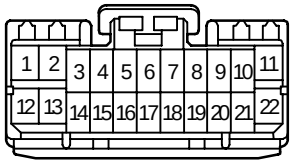
90980–10953



90980–11220

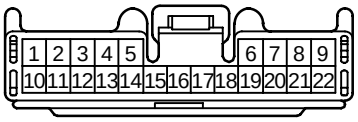


90980–11238

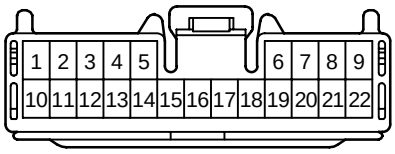


90980–11392

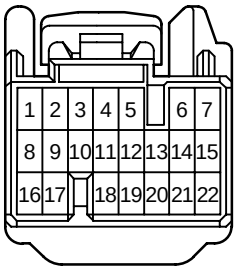
<FEMALE> 22P Non–waterproof Type



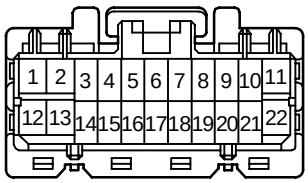
90980–11502



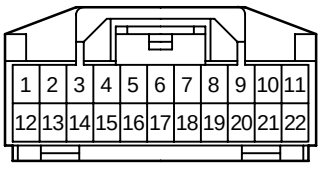
90980–11628



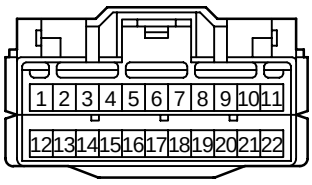
90980–11638



90980–11788

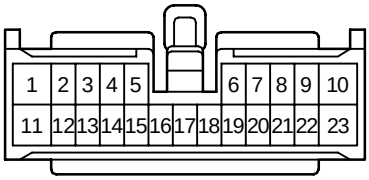


90980–11915

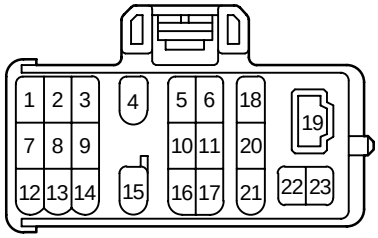


90980–11927

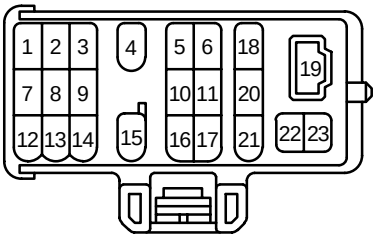
<FEMALE> 23P Non–waterproof Type



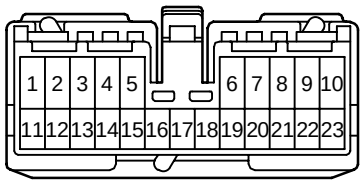
90980–10921



90980–11195

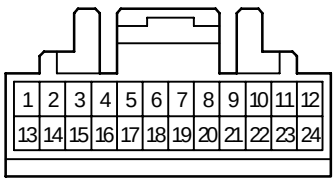


90980–11323

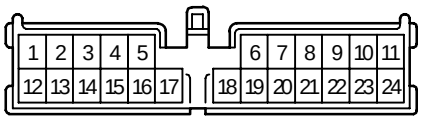


90980–11381

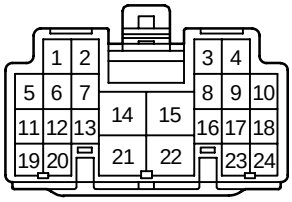
<FEMALE> 24P Non–waterproof Type



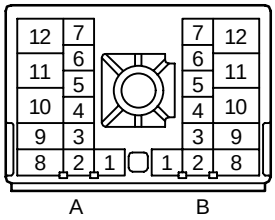
90980–10296



90980–10585

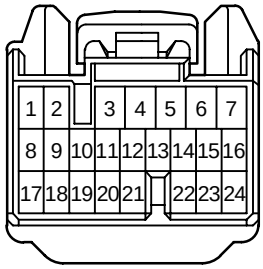


90980–10881

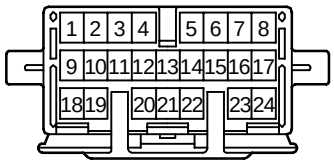


90980–10955

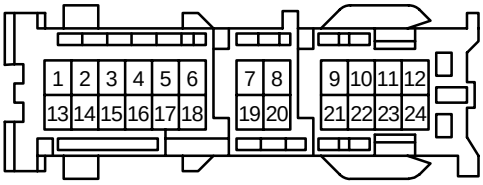
<FEMALE> 24P Non–waterproof Type



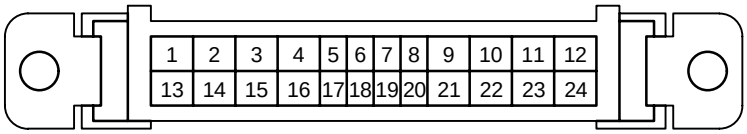
90980–11476



90980–11509

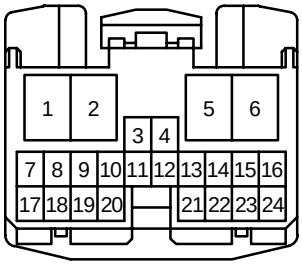


90980–12070

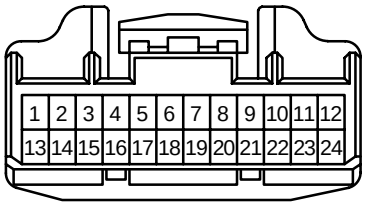


90980–12079

<FEMALE> 24P Non–waterproof Type

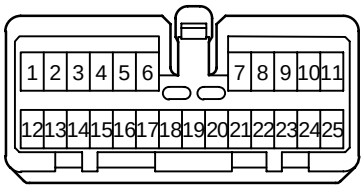


90980–12149

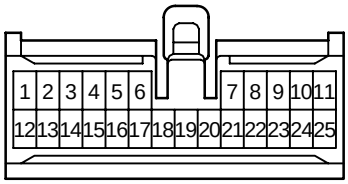


90980–12200

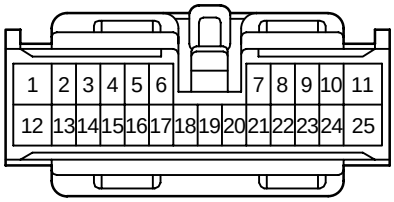
<FEMALE> 25P Non–waterproof Type



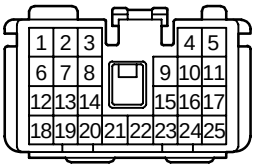
90980–11043



90980–11055

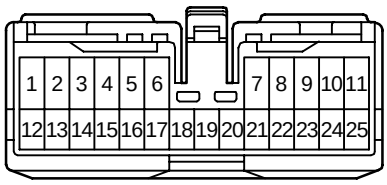


90980–11058

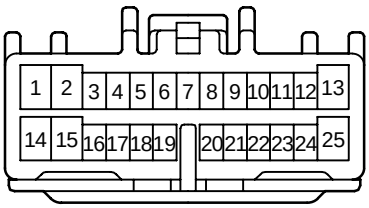


90980–11375

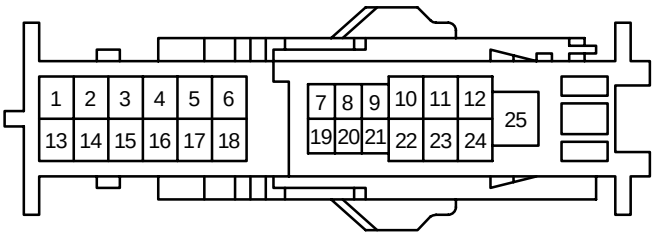
<FEMALE> 25P Non–waterproof Type



90980–11404

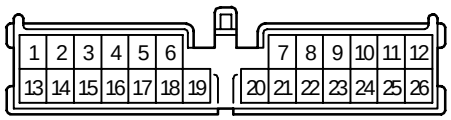


90980–11877

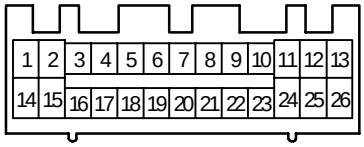


90980–12278

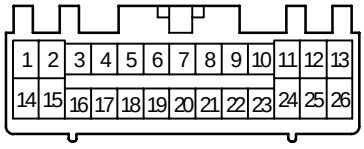
<FEMALE> 26P Non–waterproof Type



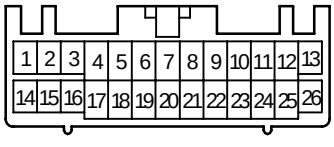
90980–10587



90980–10739

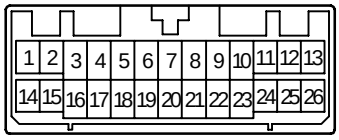


90980–10763

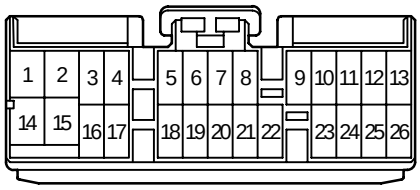


90980–10918

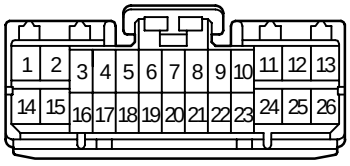
<FEMALE> 26P Non–waterproof Type



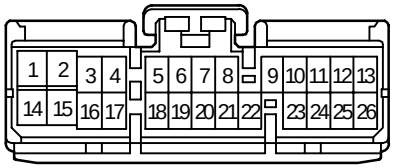
90980–10925



90980–11234

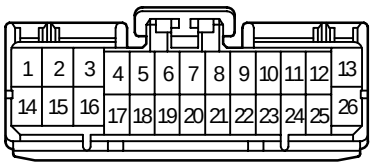


90980–11390

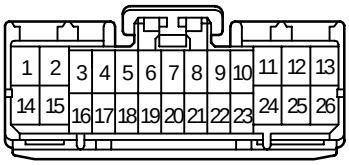


90980–11406

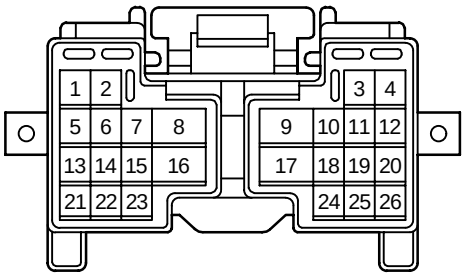
<FEMALE> 26P Non–waterproof Type



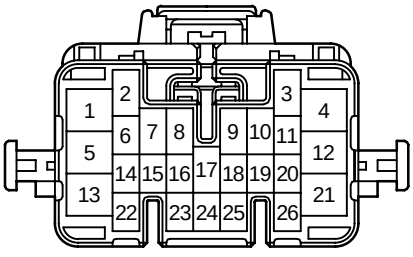
90980–11422



90980–11423

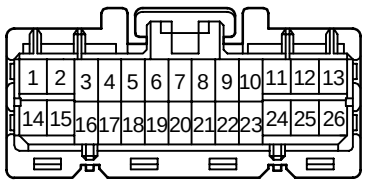


90980–11611

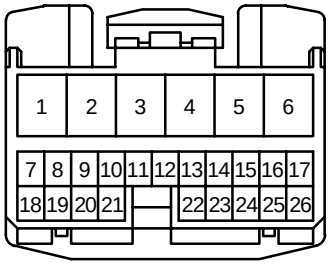


90980–11632

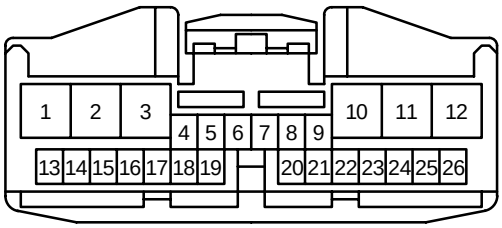
<FEMALE> 26P Non–waterproof Type



90980–11786

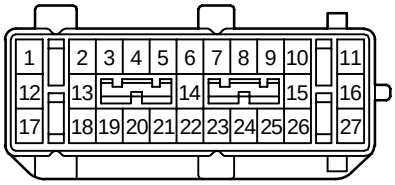


90980–12150



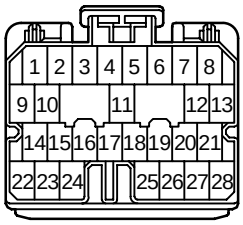
90980–12203

<FEMALE> 27P Non–waterproof Type

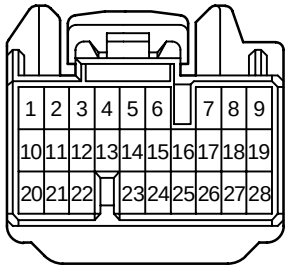


90980–11670

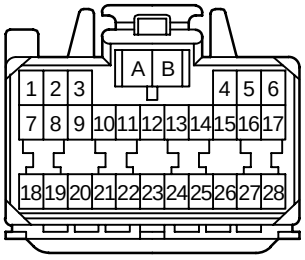
<FEMALE> 28P Non–waterproof Type



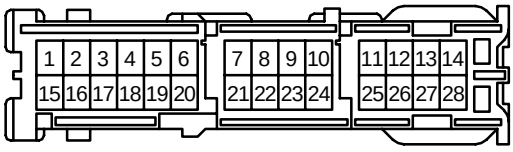
90980–11218



90980–11637

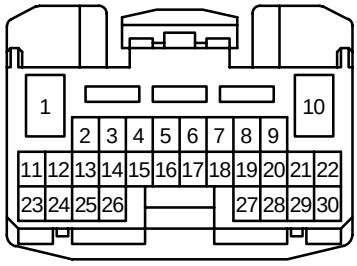


90980–11872

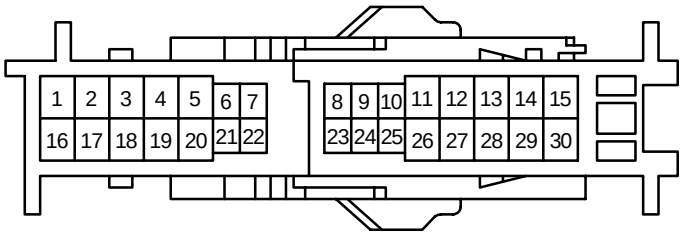


90980–12102

<FEMALE> 30P Non–waterproof Type

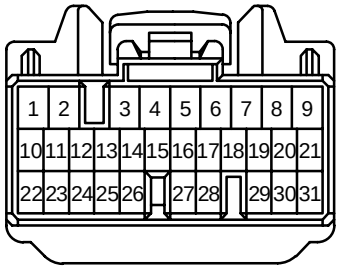


90980–12151

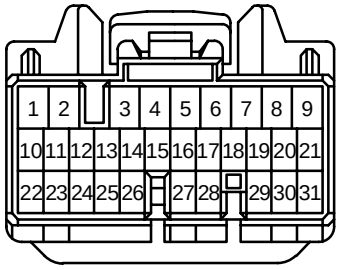


90980–12277

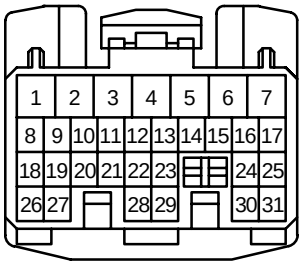
<FEMALE> 31P Non–waterproof Type



90980–11421

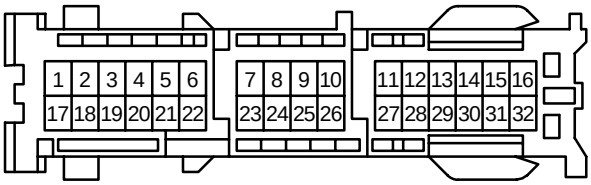


90980–11935

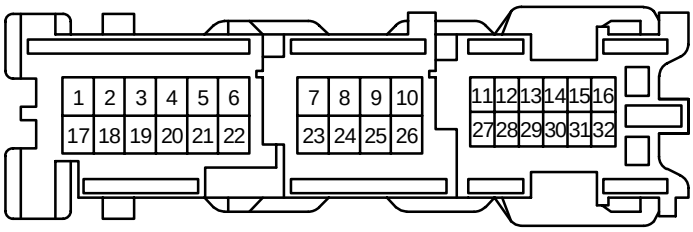


90980–12142

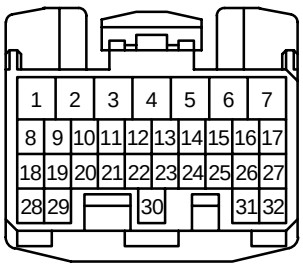
<FEMALE> 32P Non–waterproof Type



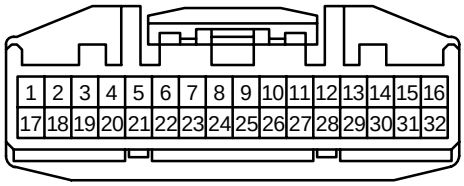
90980–12071



90980–12096

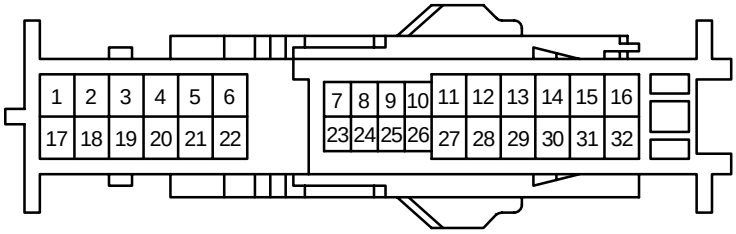


90980–12143



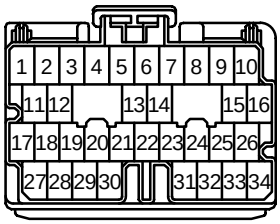
90980–12153

<FEMALE> 32P Non–waterproof Type

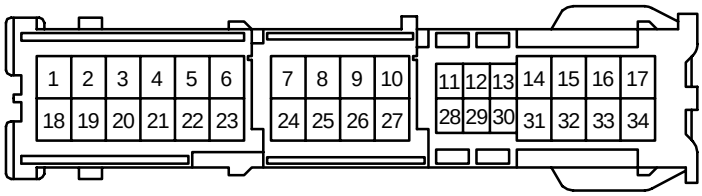


90980–12275

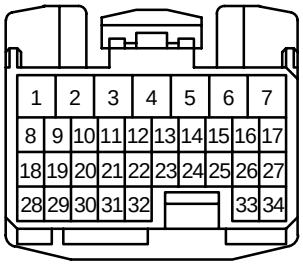
<FEMALE> 34P Non–waterproof Type



90980–11221

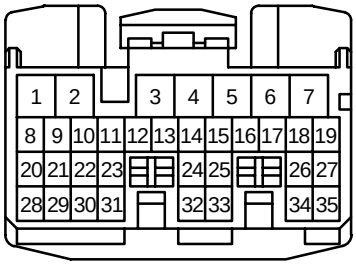


90980–12114

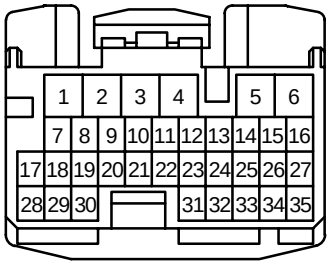


90980–12144

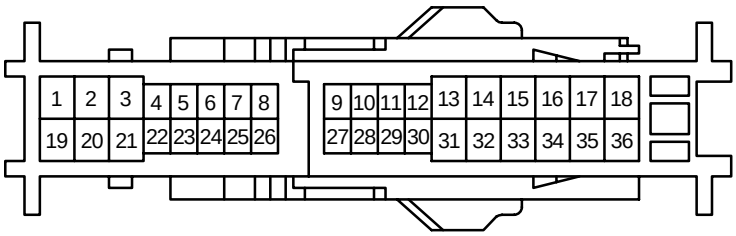
<FEMALE> 35P, 36P Non–waterproof Type



90980–12145

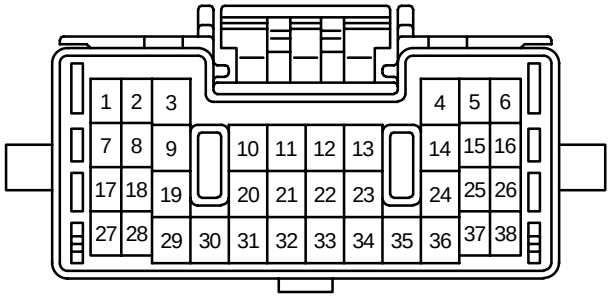


90980–12146

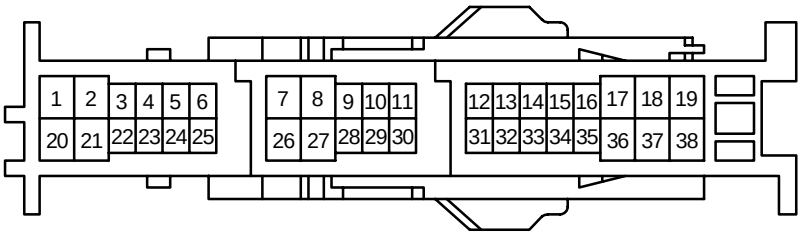


90980–12274

<FEMALE> 38P Non–waterproof Type

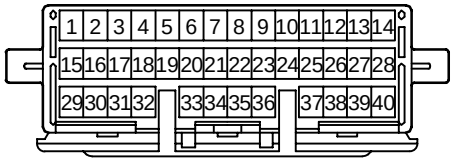


90980–11555

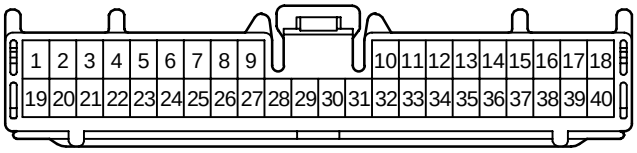


90980–12276

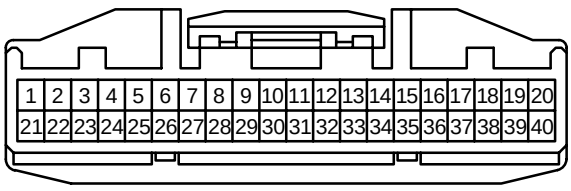
<FEMALE> 40P Non–waterproof Type



90980–11508

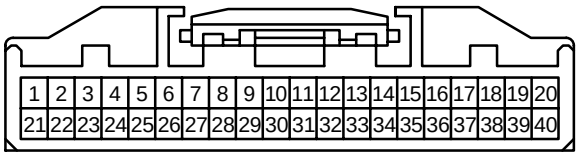


90980–11618



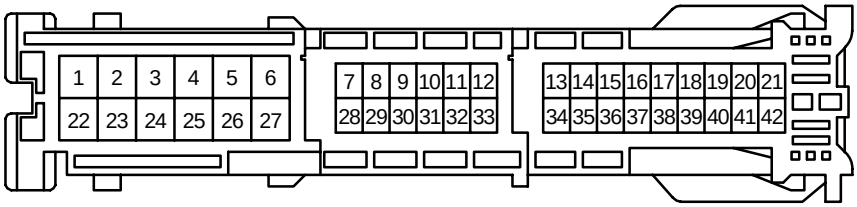
90980–12169

<FEMALE> 40P Non–waterproof Type

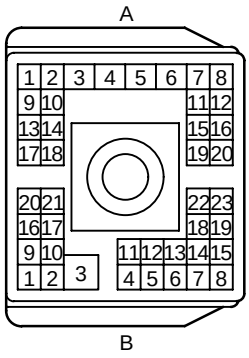


90980–12170

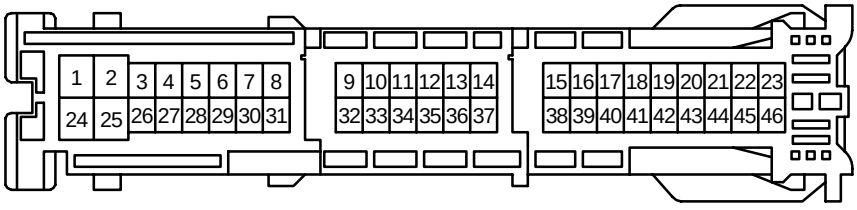
<FEMALE> 42P, 43P, 46P Non–waterproof Type



90980–12184

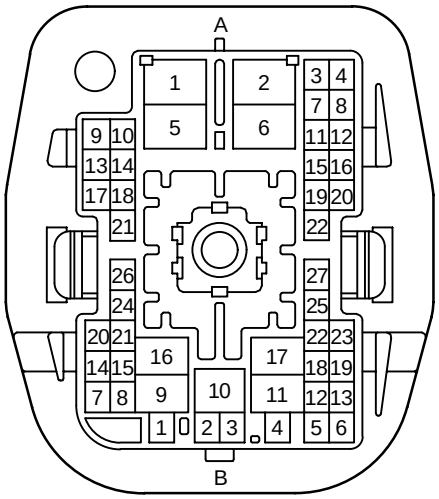


90980–11360

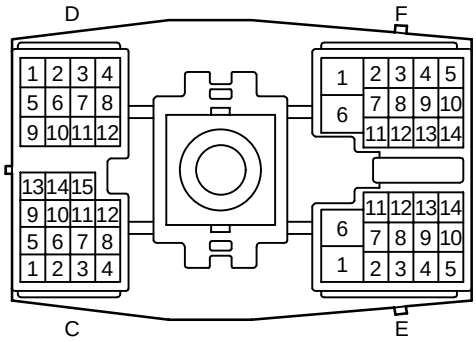


90980–12179

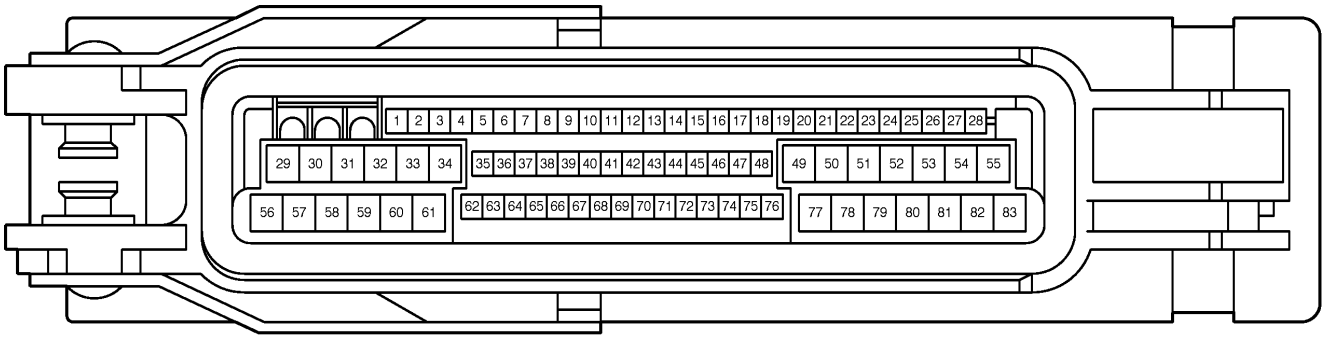
<FEMALE> 49P, 55P, 83P Non–waterproof Type



90980–11431

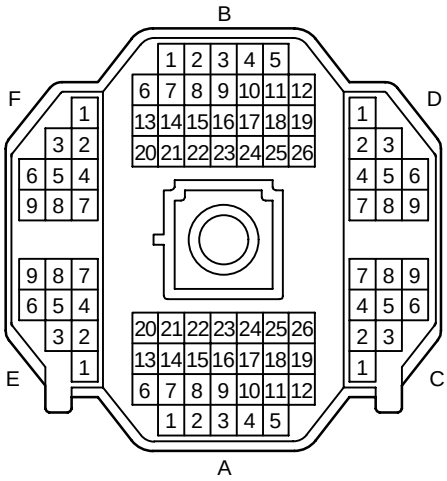


90980–11359



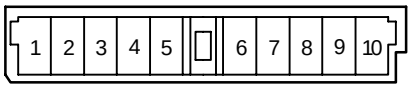
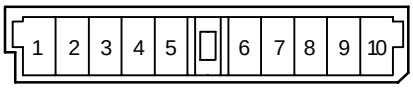
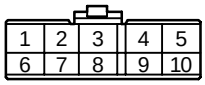
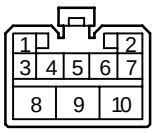
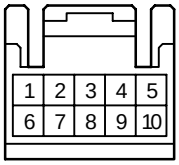
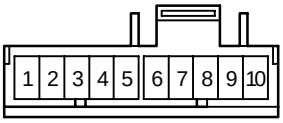
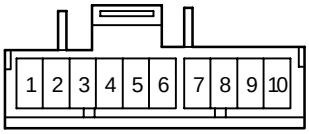
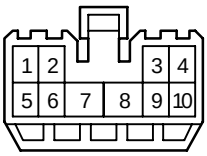
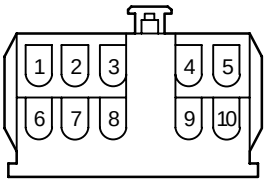
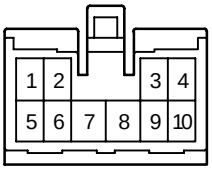
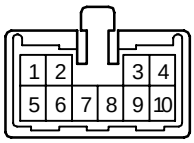
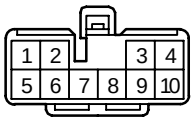
90980–11906

<FEMALE> 88P Non–waterproof Type

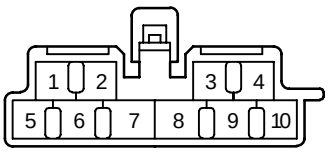
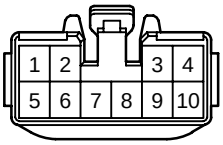
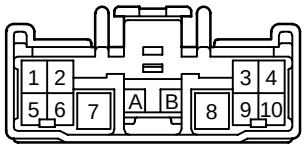
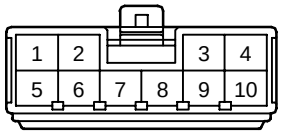
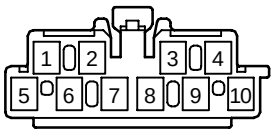
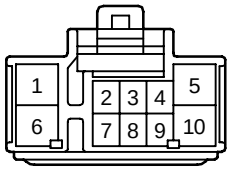


90980–10950

<FEMALE> 10P Non–waterproof Type

 90980–10158	 90980–10159	 90980–10177
 90980–10282	 90980–10294	 90980–10302
 90980–10304	 90980–10322	 90980–10377
 90980–10469	 90980–10528	 90980–10669

<FEMALE> 10P Non–waterproof Type

		
90980–10721	90980–10801	90980–10822
		
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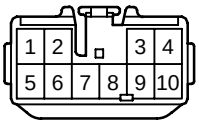	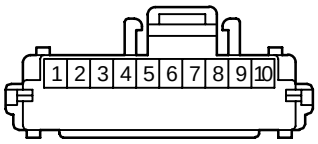	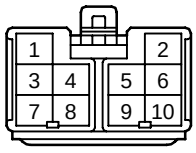
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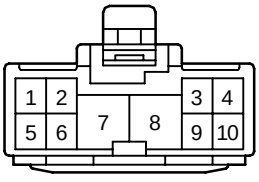
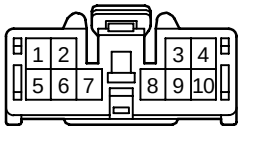
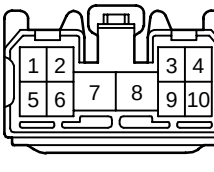
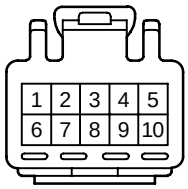
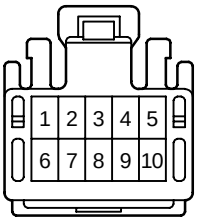
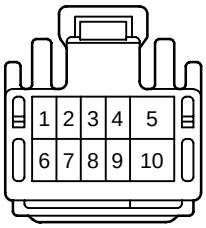
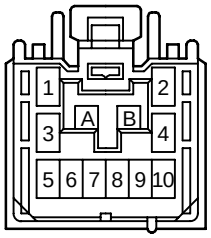
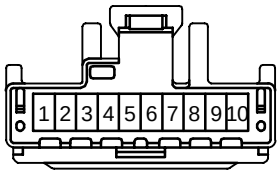
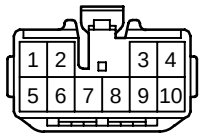
		
90980–11366	90980–11450	90980–11527

<FEMALE> 10P Non–waterproof Type

		
90980–11537	90980–11581	90980–11614
		
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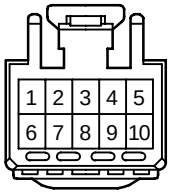	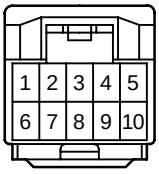	
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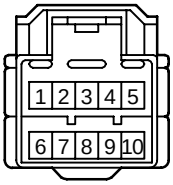
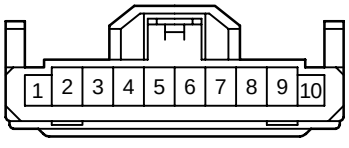
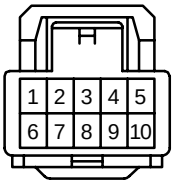
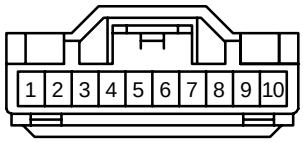
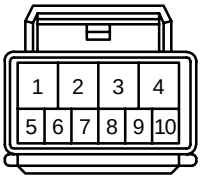
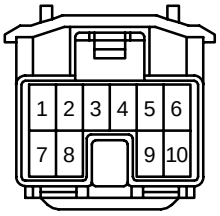
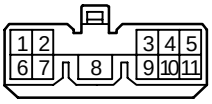
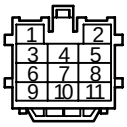
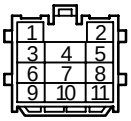
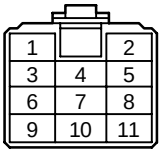
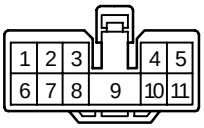
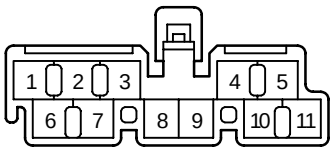
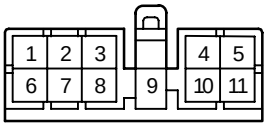
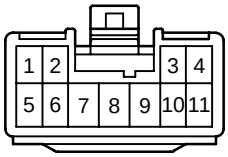
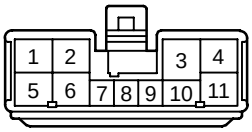
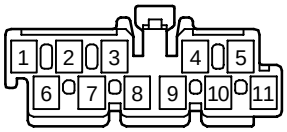
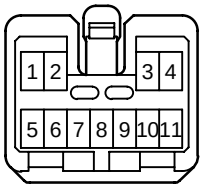
		
90980–11948	90980–12008	90980–12135

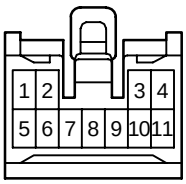
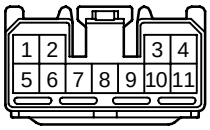
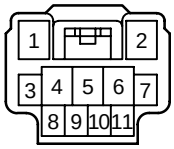
<FEMALE> 10P Non–waterproof Type

		
90980–12162	90980–12226	90980–12272

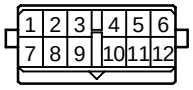
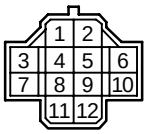
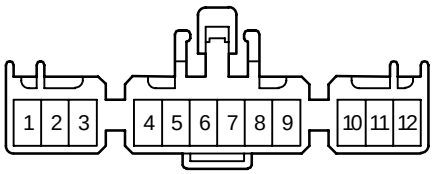
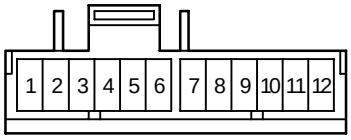
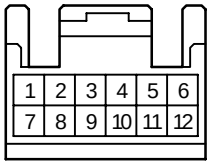
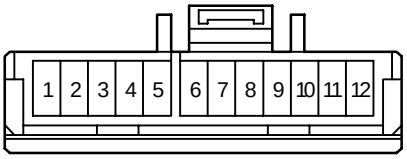
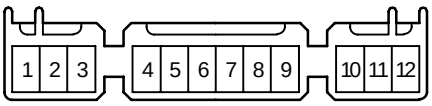
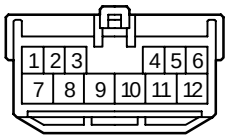
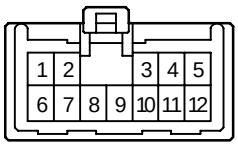
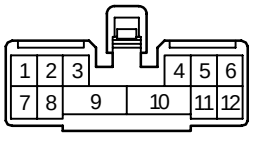
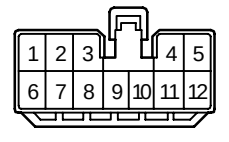
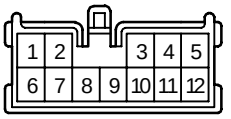
<FEMALE> 11P Non–waterproof Type

 90980–10319	 90980–10337	 90980–10338
 90980–10450	 90980–10537	 90980–10723
90980–10727	 90980–10781	 90980–10830
 90980–10873	 90980–10966	 90980–11041

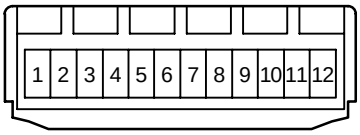
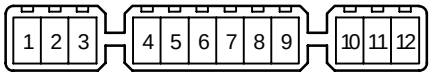
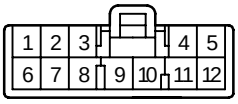
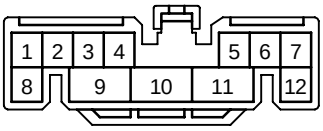
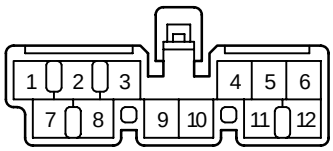
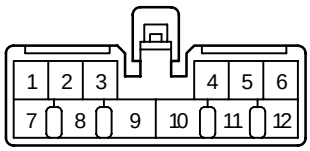
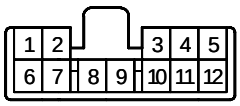
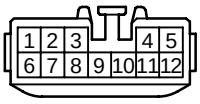
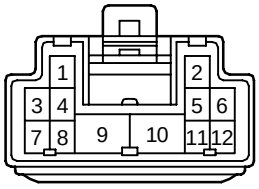
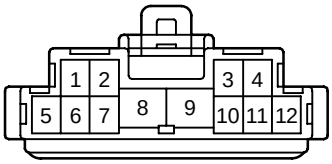
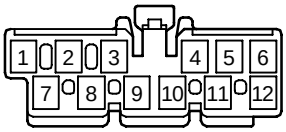
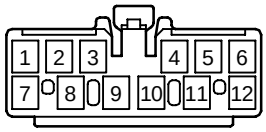
<FEMALE> 11P Non–waterproof Type

		
90980–11083	90980–11539	90980–12003

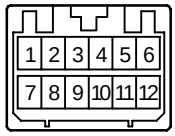
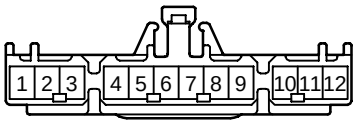
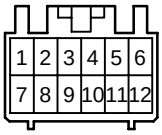
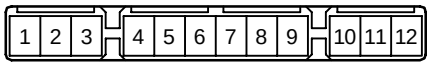
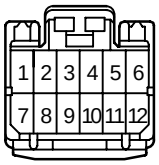
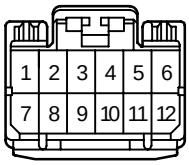
<FEMALE> 12P Non–waterproof Type

		
90980–10006	90980–10150	90980–10153
		
90980–10303	90980–10351	90980–10372
		
90980–10397	90980–10406	90980–10408
		
90980–10421	90980–10432	90980–10524

<FEMALE> 12P Non–waterproof Type

 90980–10565	 90980–10632	 90980–10658
 90980–10714	 90980–10724	 90980–10725
 90980–10743	 90980–10803	 90980–10879
 90980–10932	 90980–10967	 90980–10968

<FEMALE> 12P Non–waterproof Type

		
90980–10973	90980–11121	90980–11129
		
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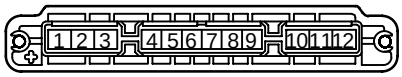	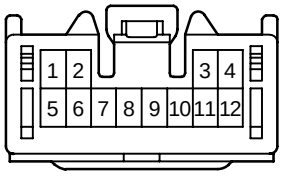	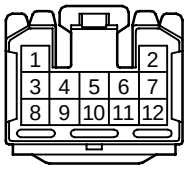
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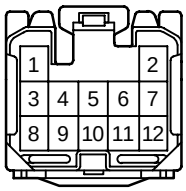	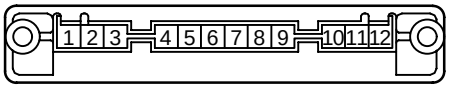	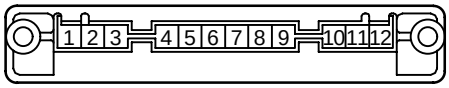
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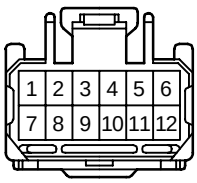
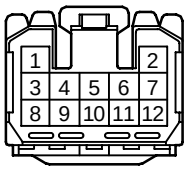
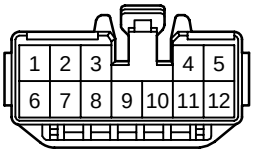
<FEMALE> 12P Non–waterproof Type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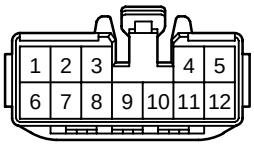	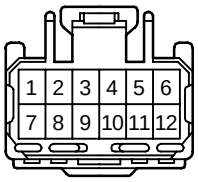	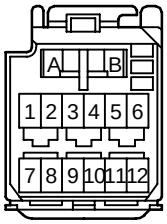
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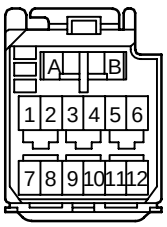	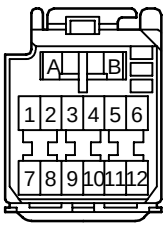	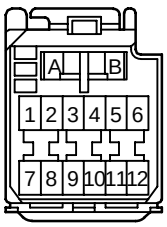
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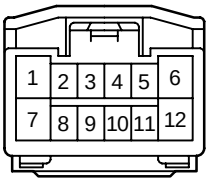
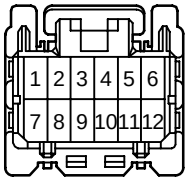
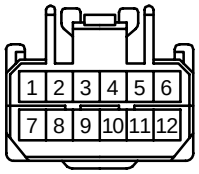
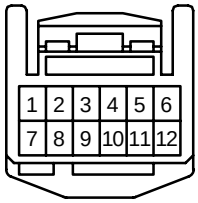
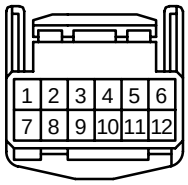
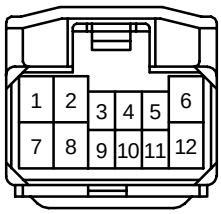
		
90980–11947	90980–12032	90980–12090

<FEMALE> 12P Non–waterproof Type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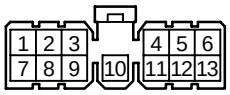
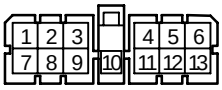
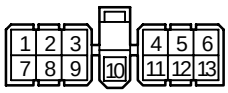
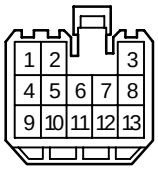
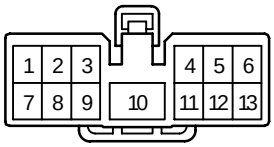
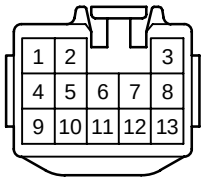
		
90980–10033	90980–10062	90980–10132
		
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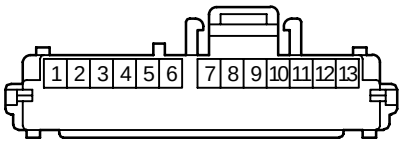
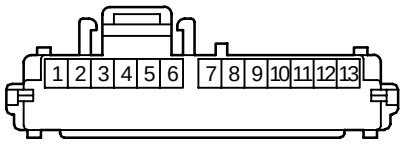
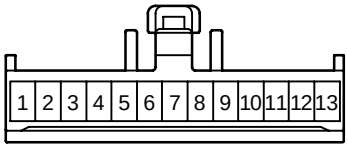
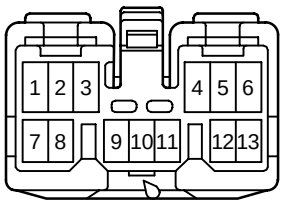
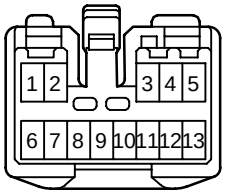
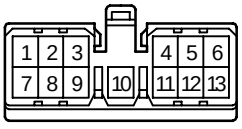
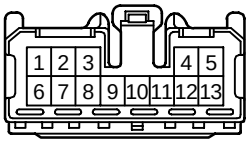
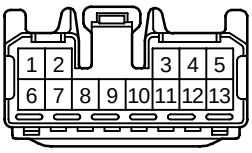
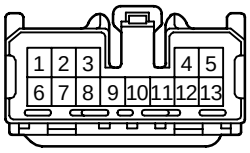
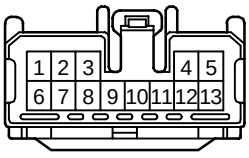
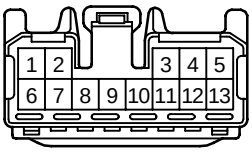
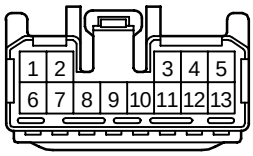
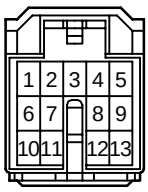
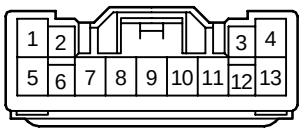
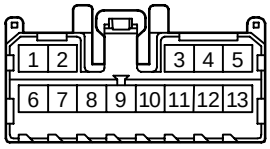
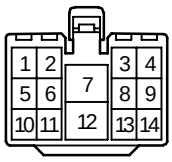
		
90980–11114	90980–11115	90980–11199
		
90980–11350	90980–11394	90980–11478

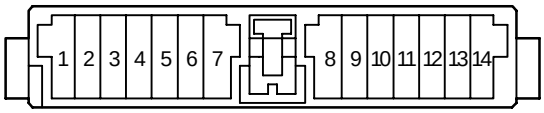
<FEMALE> 13P Non–waterproof Type

		
90980–11542	90980–11604	90980–11695
		
90980–11714	90980–11827	90980–11848
		
90980–11952	90980–12007	90980–12027

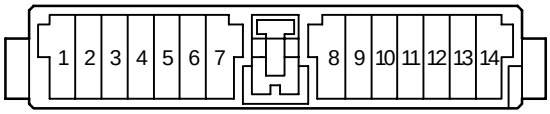
<FEMALE> 14P Non–waterproof Type



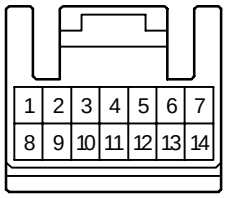
90980–10330



90980–10368



90980–10369



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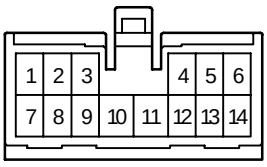
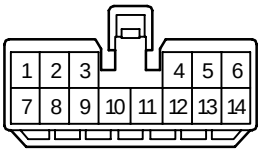
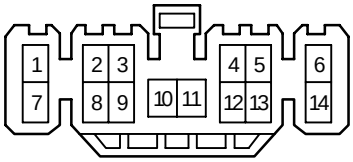


90980–10471

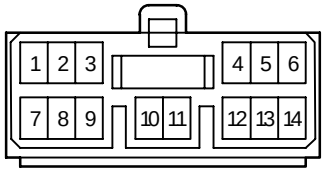


90980–10507

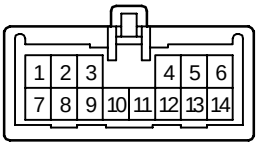
<FEMALE> 14P Non–waterproof Type



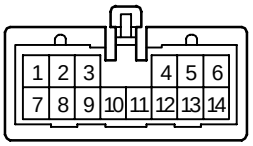
90980–10538



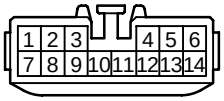
90980–10608



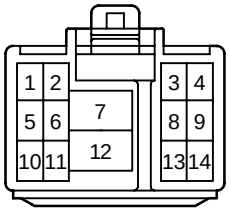
90980–10633



90980–10634

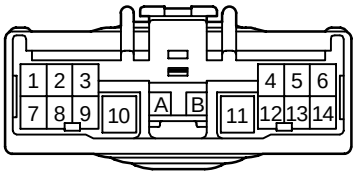


90980–10807
90980–11437

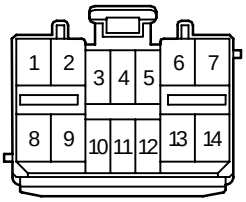


90980–10813

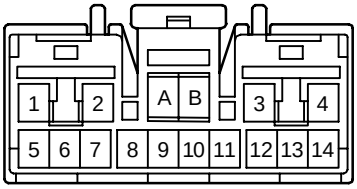
<FEMALE> 14P Non–waterproof Type



90980–10852



90980–11225



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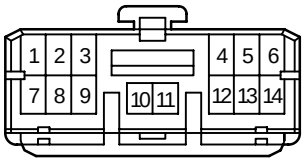

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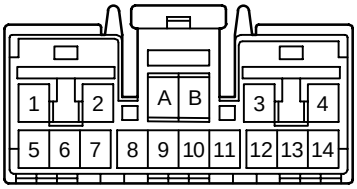

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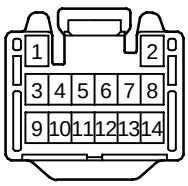
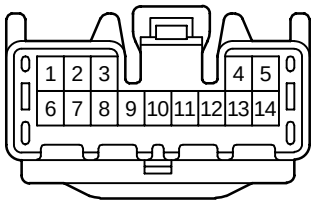
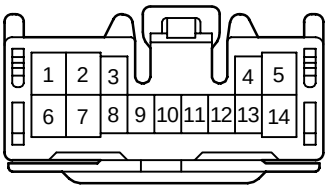


90980–11511

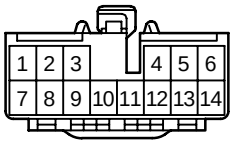
<FEMALE> 14P Non–waterproof Type



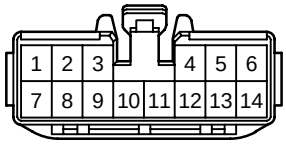
90980–11556



90980–11591



90980–11791



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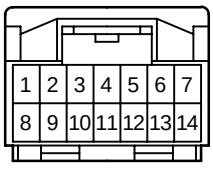
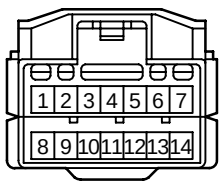
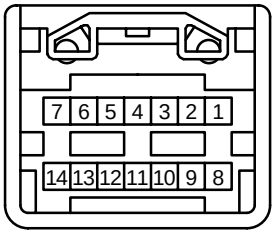


90980–11911

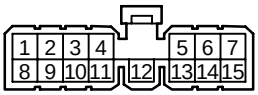


90980–11925

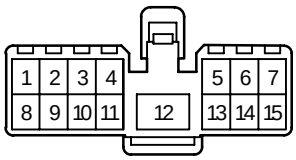
<FEMALE> 14P Non–waterproof Type

 90980–12082	

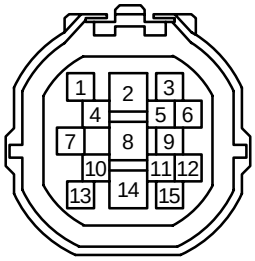
<FEMALE> 15P Non–waterproof Type



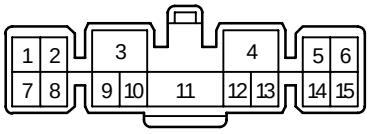
90980–10066



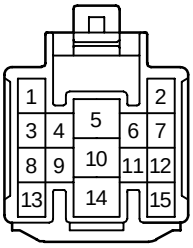
90980–10331



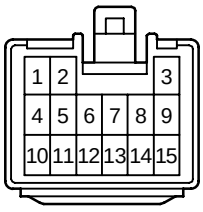
90980–10443



90980–10563

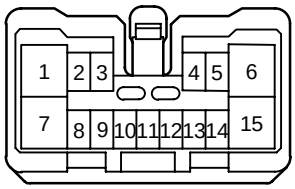


90980–10815

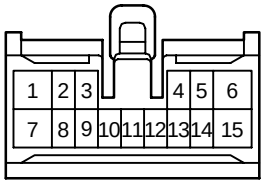


90980–10828

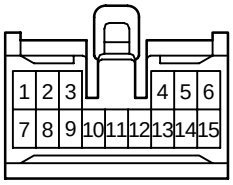
<FEMALE> 15P Non–waterproof Type



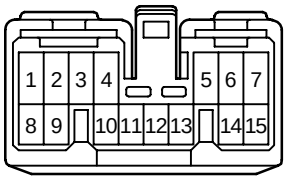
90980–11042



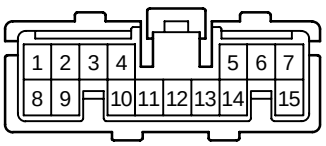
90980–11056



90980–11179

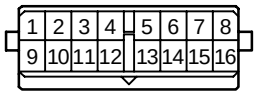


90980–11264

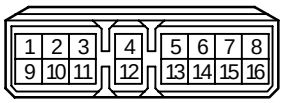


90980–11372

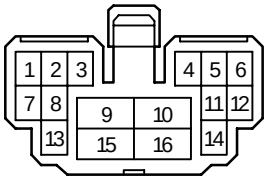
<FEMALE> 16P Non–waterproof Type



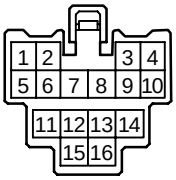
90980–10008



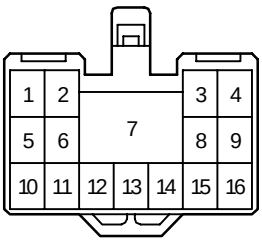
90980–10028



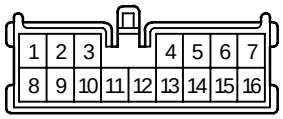
90980–10454



90980–10486

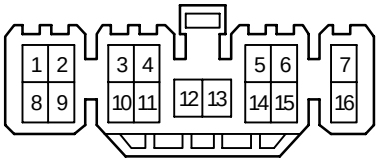


90980–10522

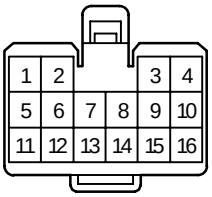


90980–10525

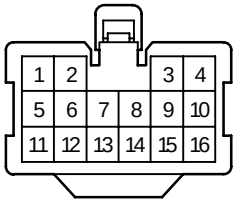
<FEMALE> 16P Non–waterproof Type



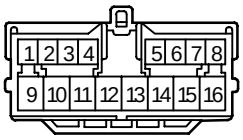
90980–10539



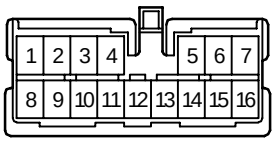
90980–10543



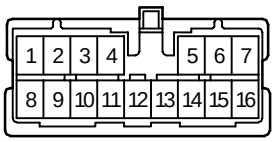
90980–10561



90980–10611

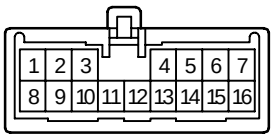


90980–10613

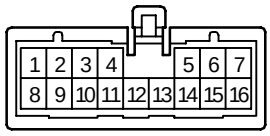


90980–10614

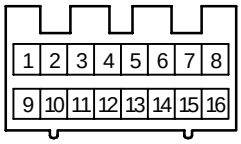
<FEMALE> 16P Non–waterproof Type



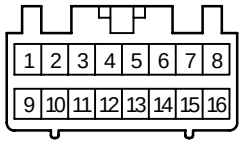
90980–10635



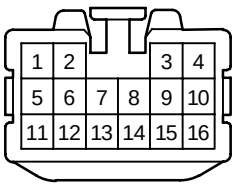
90980–10636



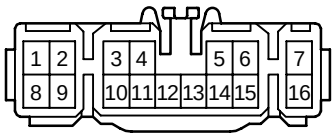
90980–10740



90980–10764

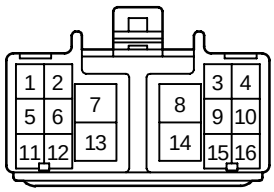


90980–10809
90980–11445

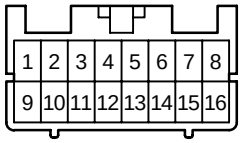


90980–10848

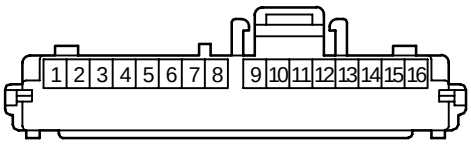
<FEMALE> 16P Non–waterproof Type



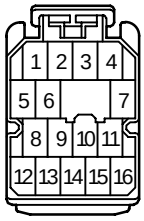
90980–10885



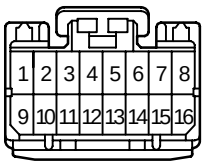
90980–11082



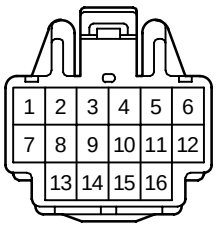
90980–11113



90980–11219

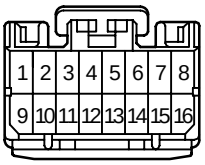


90980–11391

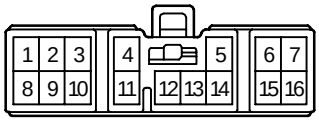


90980–11416

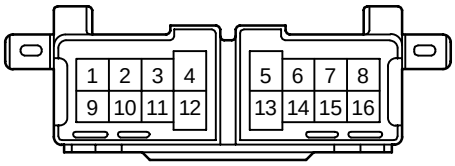
<FEMALE> 16P Non–waterproof Type



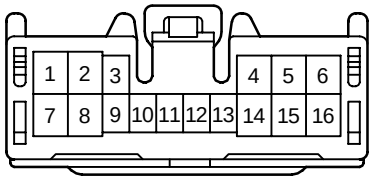
90980–11425



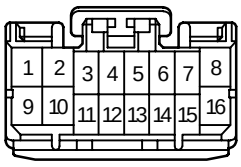
90980–11435



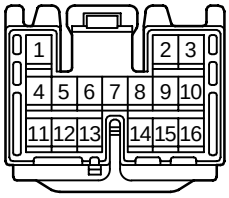
90980–11547



90980–11562

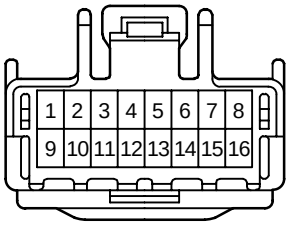


90980–11565

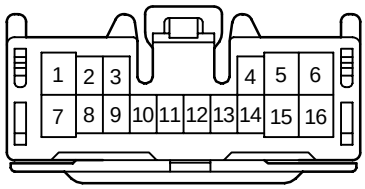


90980–11574

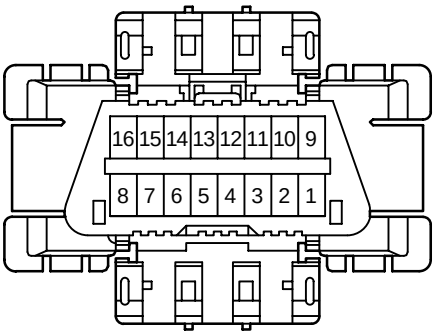
<FEMALE> 16P Non–waterproof Type



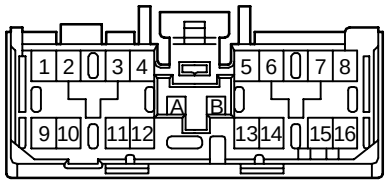
90980–11648



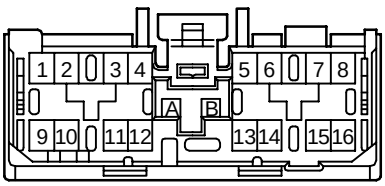
90980–11652



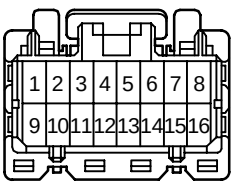
90980–11665
90980–11978



90980–11681

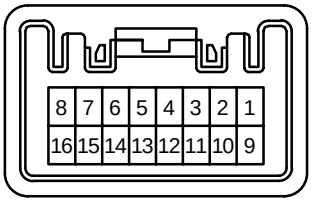


90980–11683

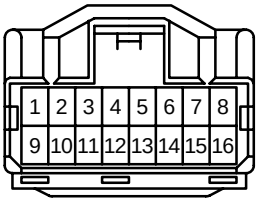


90980–11787

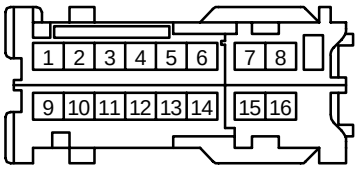
<FEMALE> 16P Non–waterproof Type



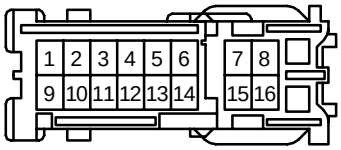
90980–12093



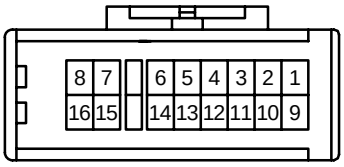
90980–12094



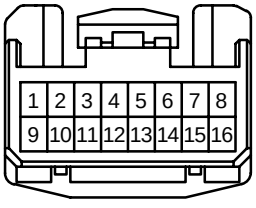
90980–12101



90980–12104

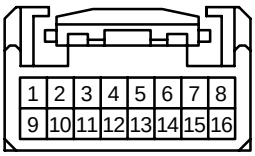


90980–12105



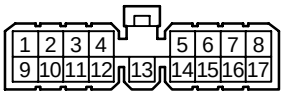
90980–12155

<FEMALE> 16P Non–waterproof Type

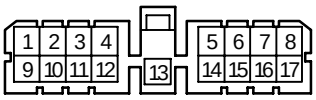


90980–12156

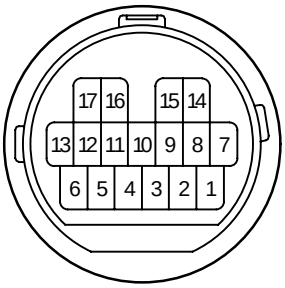
<FEMALE> 17P Non–waterproof Type



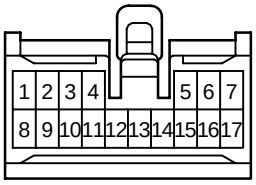
90980–10031



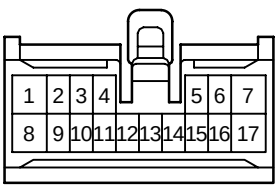
90980–10037



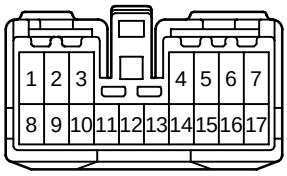
90980–10731
90980–11417
90980–11420



90980–11203

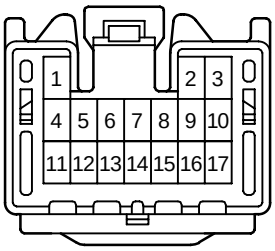


90980–11310

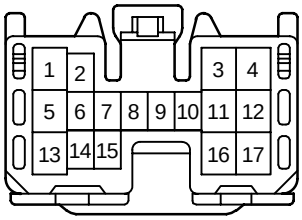


90980–11335

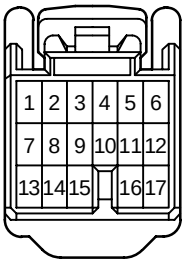
<FEMALE> 17P Non–waterproof Type



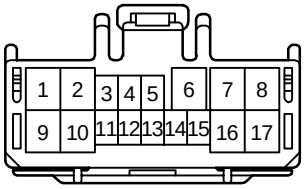
90980–11506



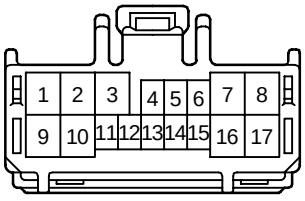
90980–11560



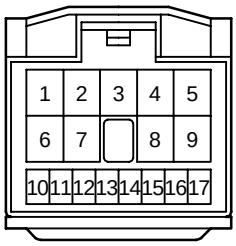
90980–11586



90980–11671

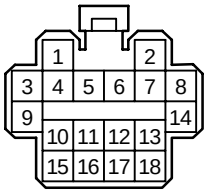


90980–11672

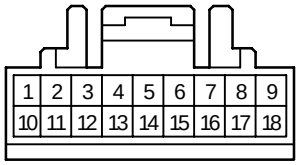


90980–11954

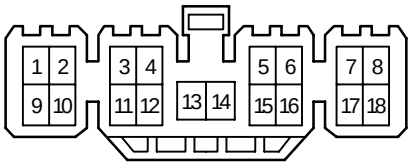
<FEMALE> 18P Non–waterproof Type



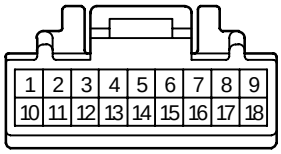
90980–10285



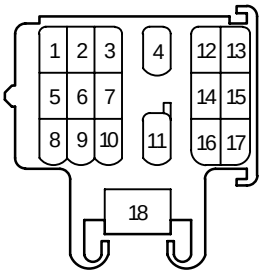
90980–10295



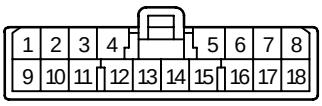
90980–10326



90980–10350

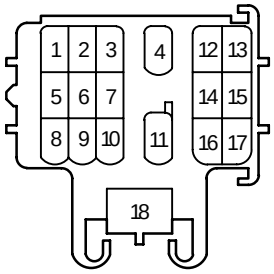


90980–10530

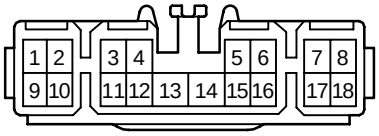


90980–10656

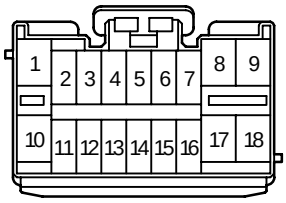
<FEMALE> 18P Non–waterproof Type



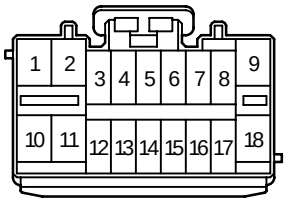
90980–10778



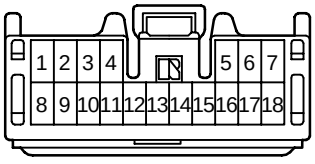
90980–10819



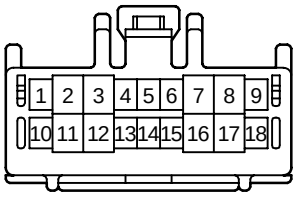
90980–11224



90980–11226

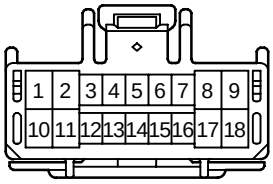


90980–11497

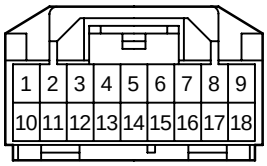


90980–11594

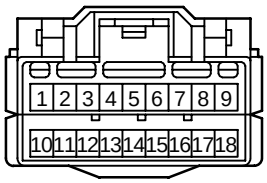
<FEMALE> 18P Non–waterproof Type



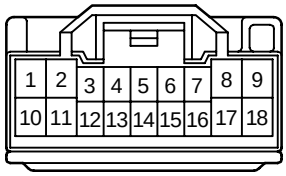
90980–11595



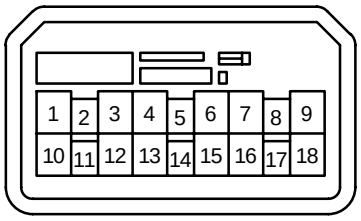
90980–11913



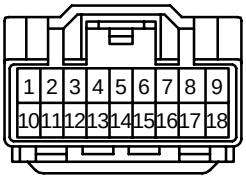
90980–11914



90980–11973

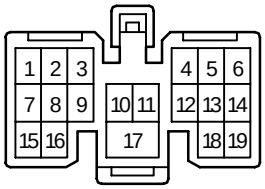


90980–12122

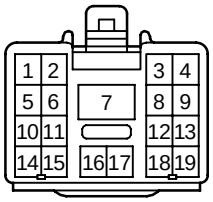


90980–12174

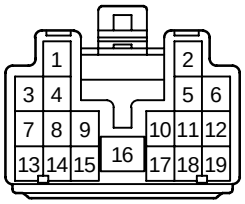
<FEMALE> 19P Non–waterproof Type



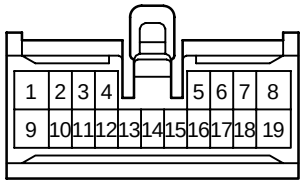
90980–10675



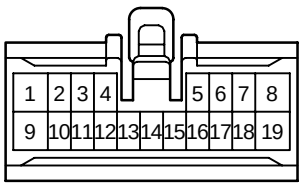
90980–10857



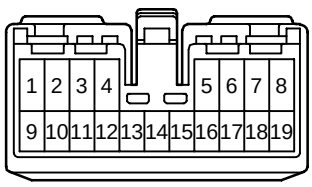
90980–10883



90980–11205

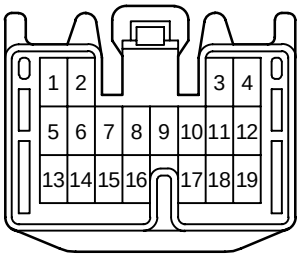
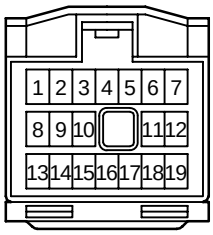


90980–11308

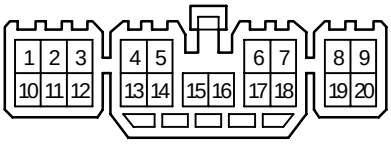


90980–11377

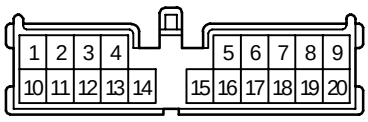
<FEMALE> 19P Non–waterproof Type

	
90980–11571	90980–11955

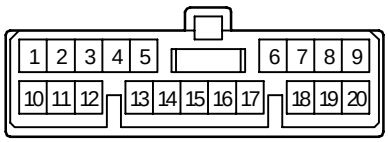
<FEMALE> 20P Non–waterproof Type



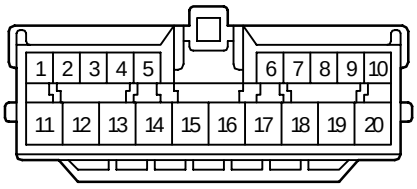
90980–10327



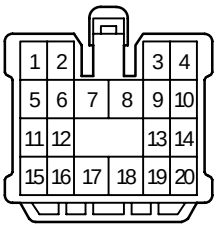
90980–10589



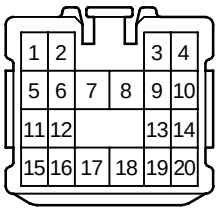
90980–10607



90980–10612

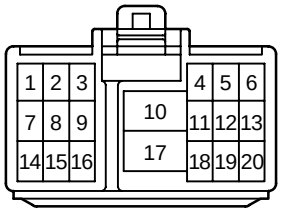


90980–10640

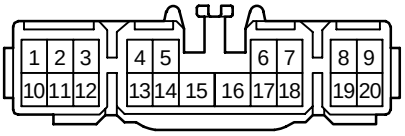


90980–10811
90980–11441

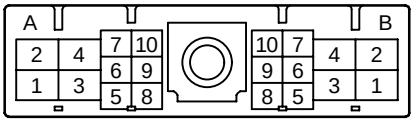
<FEMALE> 20P Non–waterproof Type



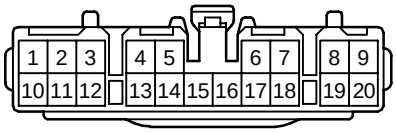
90980–10817



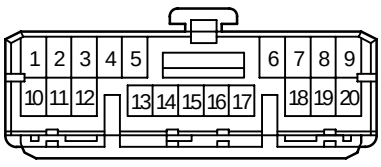
90980–10821



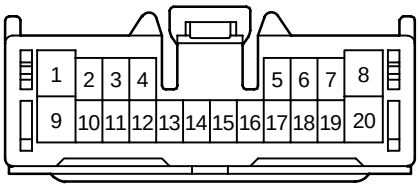
90980–10952



90980–11260

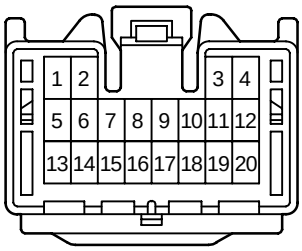


90980–11432

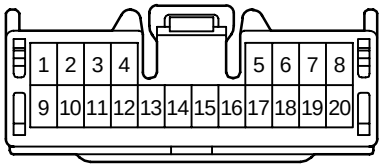


90980–11469

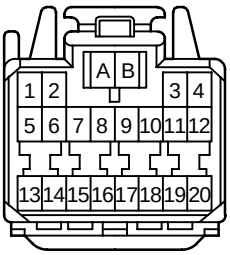
<FEMALE> 20P Non–waterproof Type



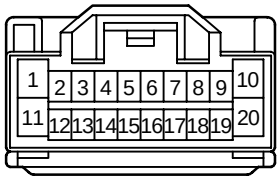
90980–11499



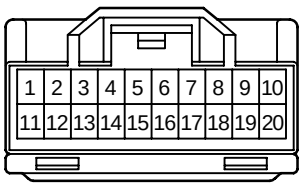
90980–11558



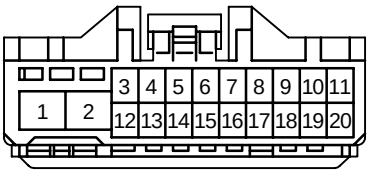
90980–11868



90980–11971

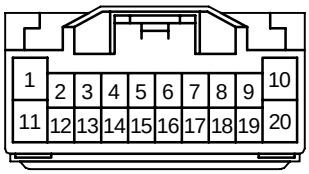


90980–11974

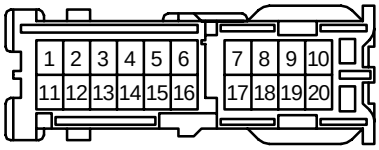


90980–12034

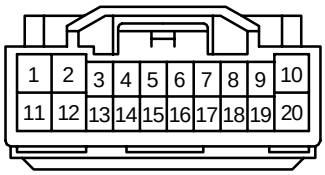
<FEMALE> 20P Non–waterproof Type



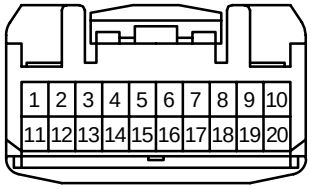
90980–12038



90980–12106

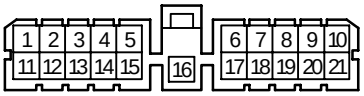


90980–12166

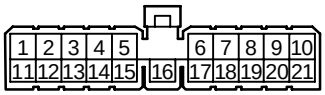


90980–12259

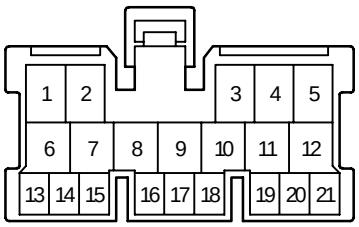
<FEMALE> 21P Non–waterproof Type



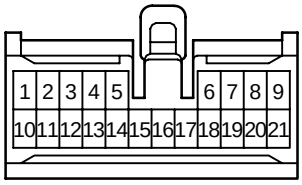
90980–10064



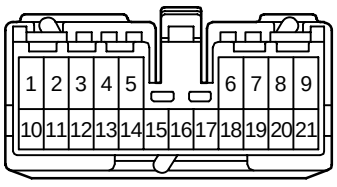
90980–10207



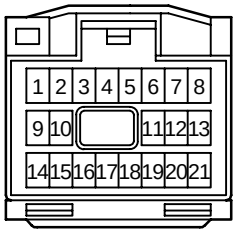
90980–10473



90980–11125

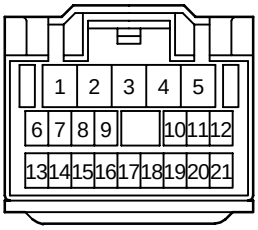


90980–11379



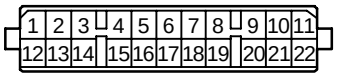
90980–11956

<FEMALE> 21P Non–waterproof Type

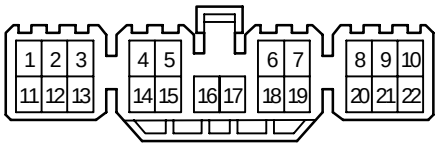


90980–11957

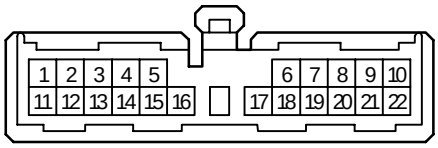
<FEMALE> 22P Non–waterproof Type



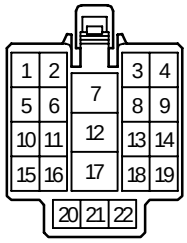
90980–10010



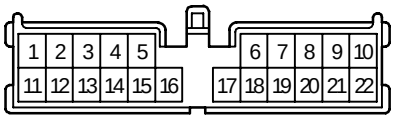
90980–10328



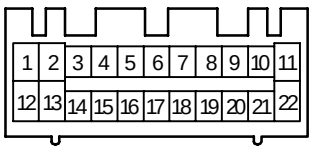
90980–10456



90980–10458

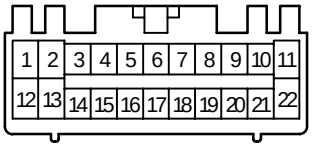


90980–10526

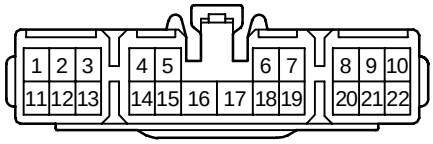


90980–10741

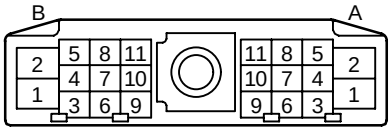
<FEMALE> 22P Non–waterproof Type



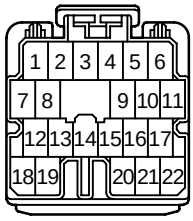
90980–10765



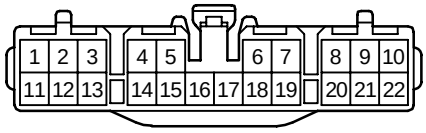
90980–10875



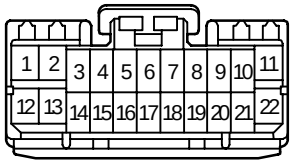
90980–10953



90980–11220

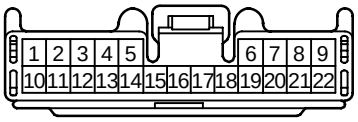


90980–11238

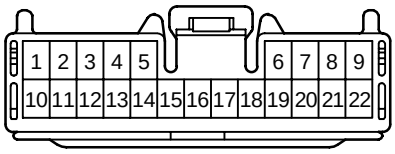


90980–11392

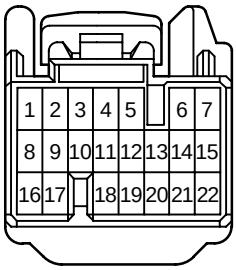
<FEMALE> 22P Non–waterproof Type



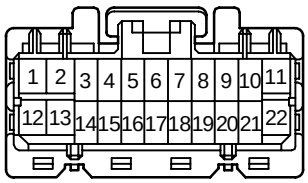
90980–11502



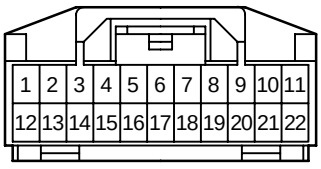
90980–11628



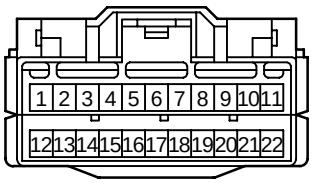
90980–11638



90980–11788

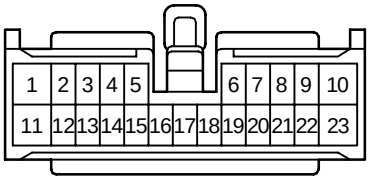


90980–11915

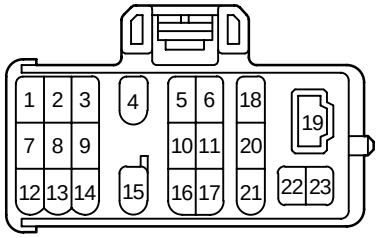


90980–11927

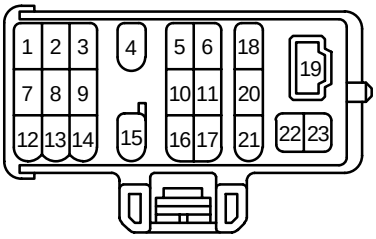
<FEMALE> 23P Non–waterproof Type



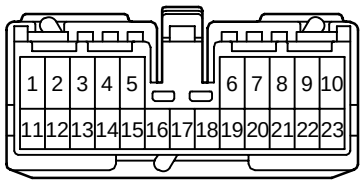
90980–10921



90980–11195

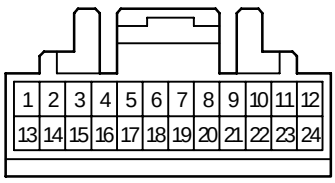


90980–11323

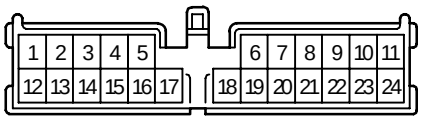


90980–11381

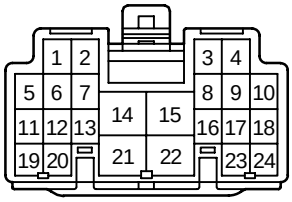
<FEMALE> 24P Non–waterproof Type



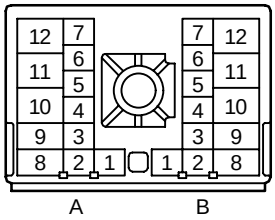
90980–10296



90980–10585

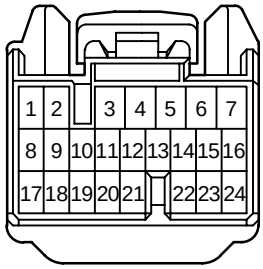


90980–10881

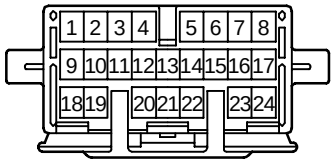


90980–10955

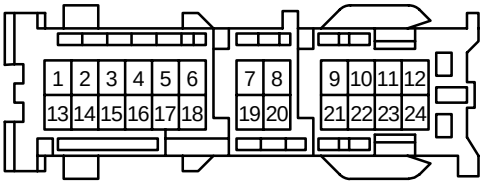
<FEMALE> 24P Non–waterproof Type



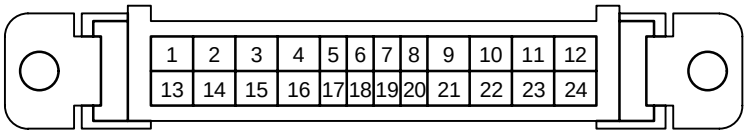
90980–11476



90980–11509

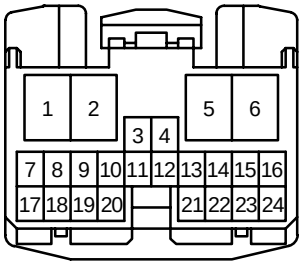


90980–12070

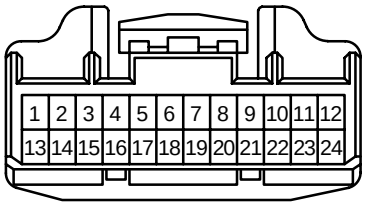


90980–12079

<FEMALE> 24P Non–waterproof Type

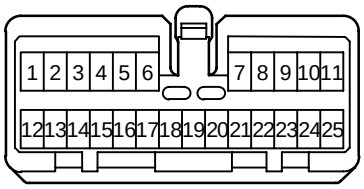


90980–12149

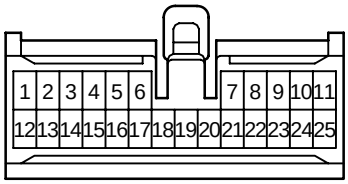


90980–12200

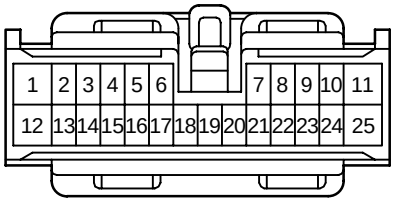
<FEMALE> 25P Non–waterproof Type



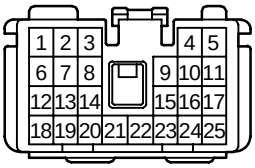
90980–11043



90980–11055

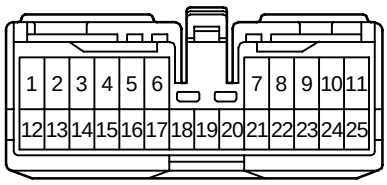


90980–11058

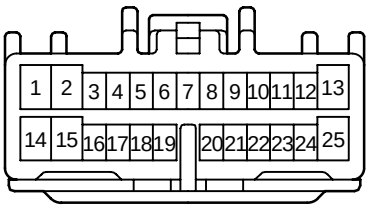


90980–11375

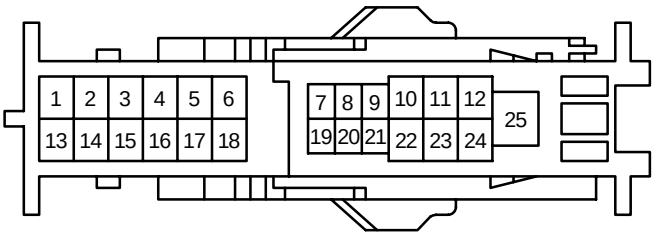
<FEMALE> 25P Non–waterproof Type



90980–11404

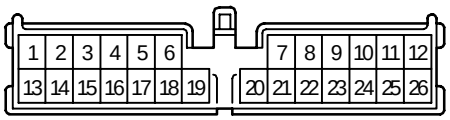


90980–11877

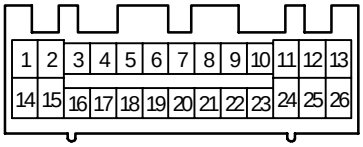


90980–12278

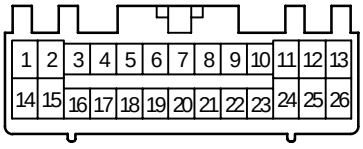
<FEMALE> 26P Non–waterproof Type



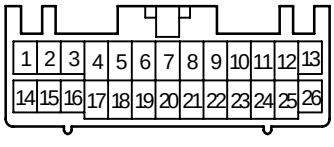
90980–10587



90980–10739

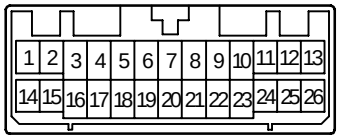


90980–10763

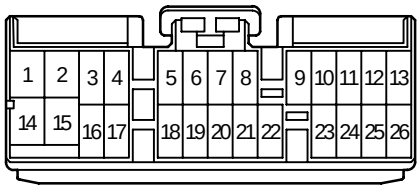


90980–10918

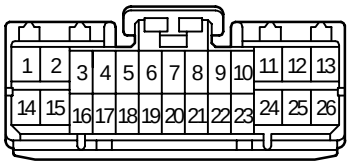
<FEMALE> 26P Non–waterproof Type



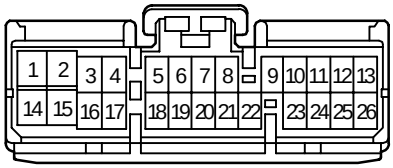
90980–10925



90980–11234

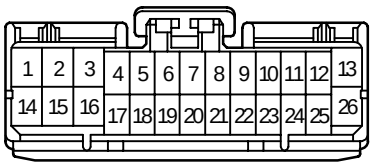


90980–11390

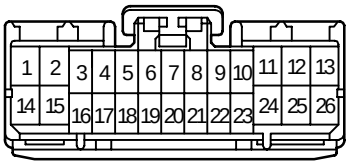


90980–11406

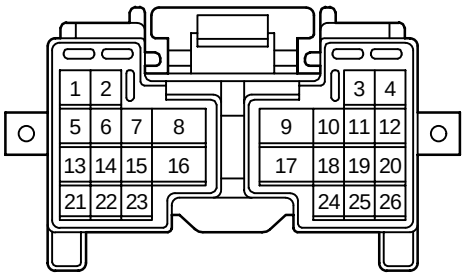
<FEMALE> 26P Non–waterproof Type



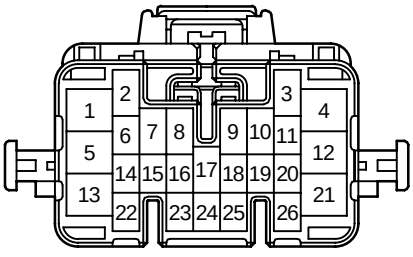
90980–11422



90980–11423

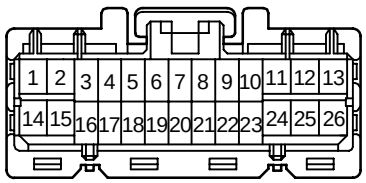


90980–11611

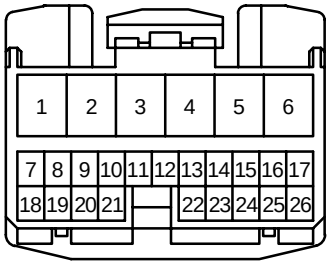


90980–11632

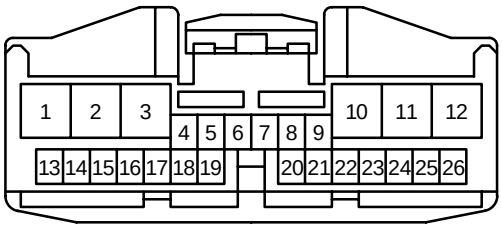
<FEMALE> 26P Non–waterproof Type



90980–11786

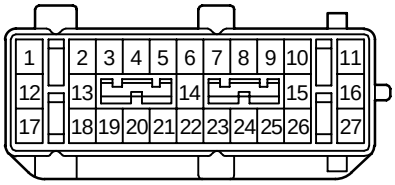


90980–12150



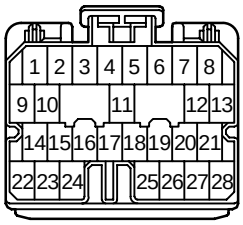
90980–12203

<FEMALE> 27P Non–waterproof Type

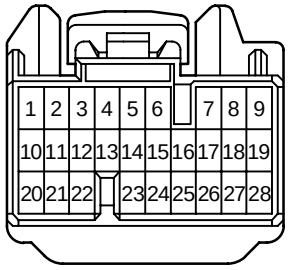


90980–11670

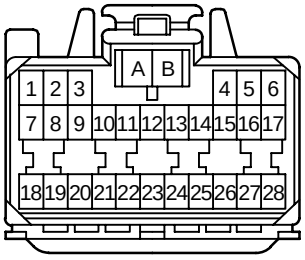
<FEMALE> 28P Non–waterproof Type



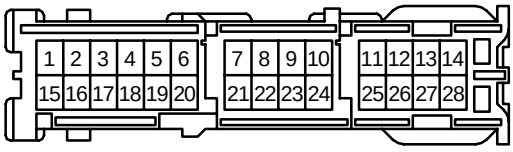
90980–11218



90980–11637

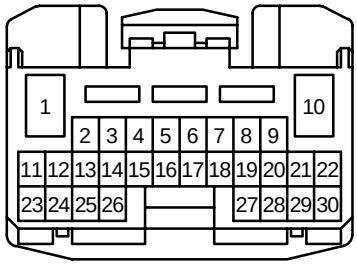


90980–11872

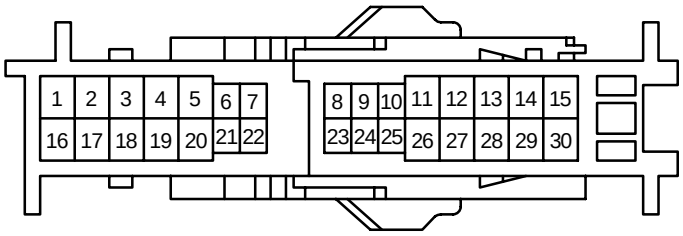


90980–12102

<FEMALE> 30P Non–waterproof Type

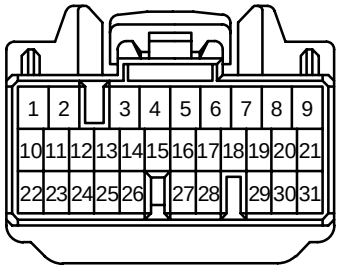


90980–12151

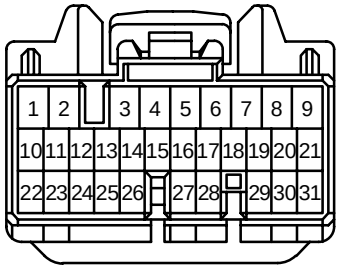


90980–12277

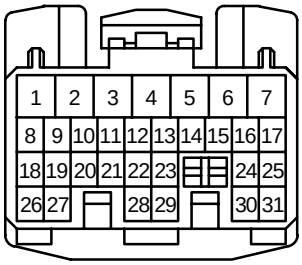
<FEMALE> 31P Non–waterproof Type



90980–11421

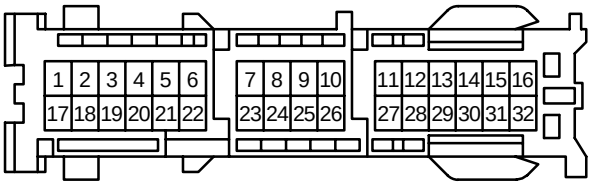


90980–11935

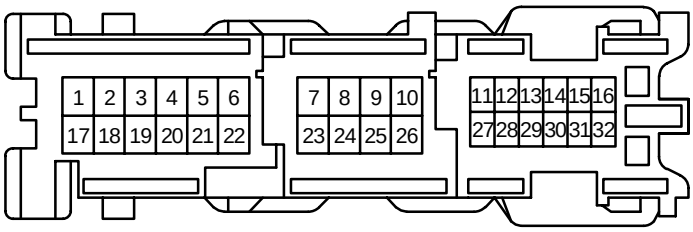


90980–12142

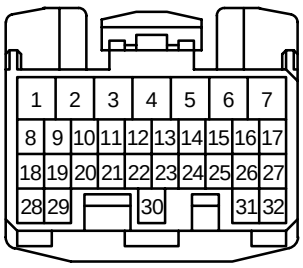
<FEMALE> 32P Non–waterproof Type



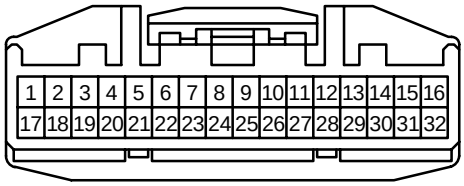
90980–12071



90980–12096

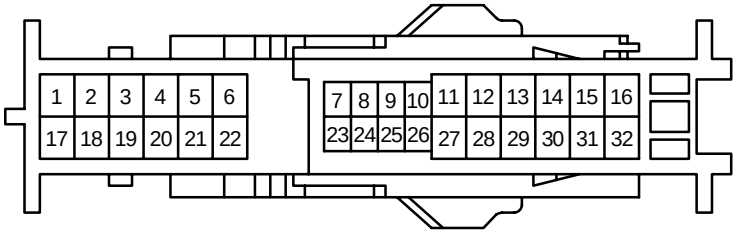


90980–12143



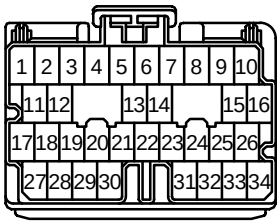
90980–12153

<FEMALE> 32P Non–waterproof Type

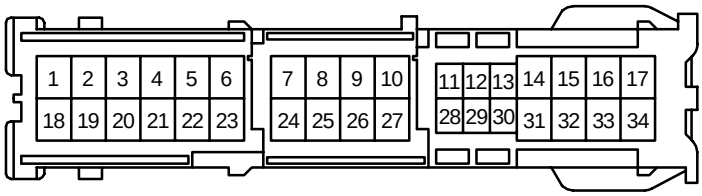


90980–12275

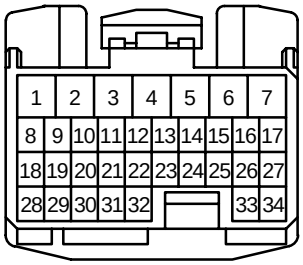
<FEMALE> 34P Non–waterproof Type



90980–11221

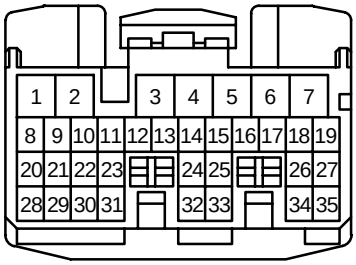


90980–12114

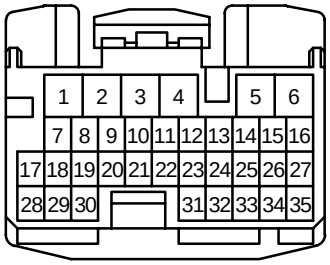


90980–12144

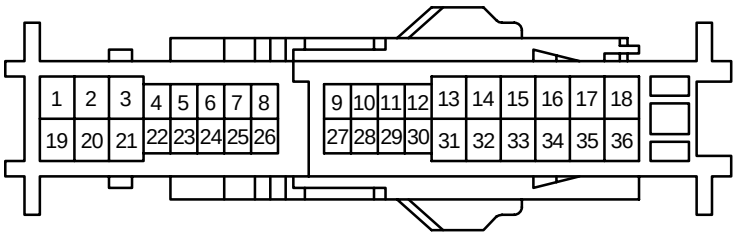
<FEMALE> 35P, 36P Non–waterproof Type



90980–12145

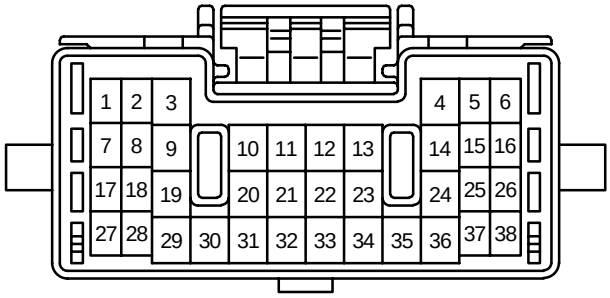


90980–12146

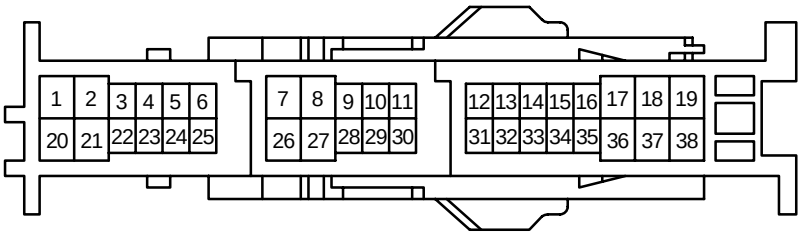


90980–12274

<FEMALE> 38P Non–waterproof Type

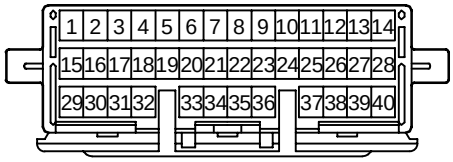


90980–11555

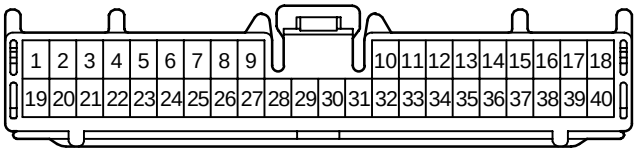


90980–12276

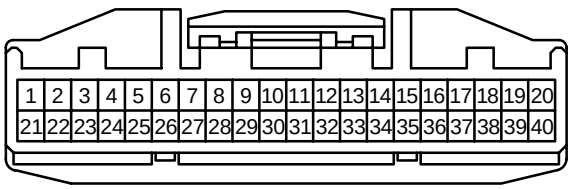
<FEMALE> 40P Non–waterproof Type



90980–11508

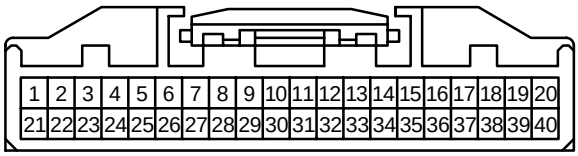


90980–11618



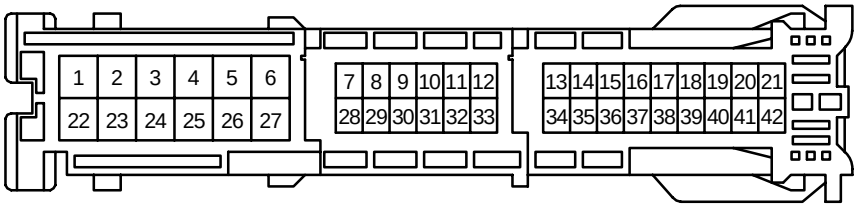
90980–12169

<FEMALE> 40P Non–waterproof Type

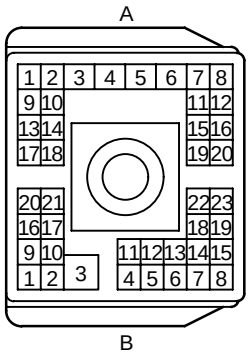


90980–12170

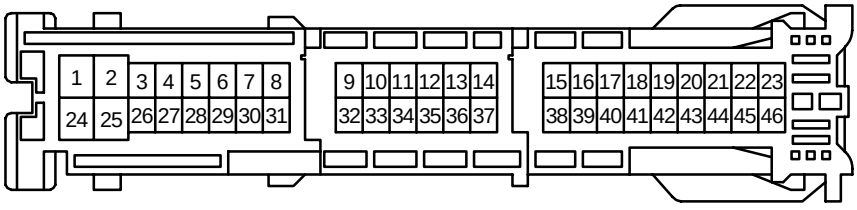
<FEMALE> 42P, 43P, 46P Non–waterproof Type



90980–12184

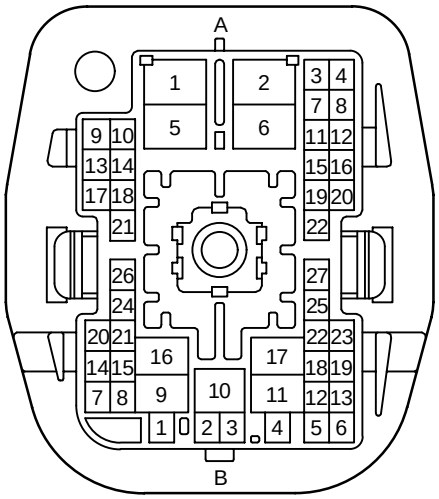


90980–11360

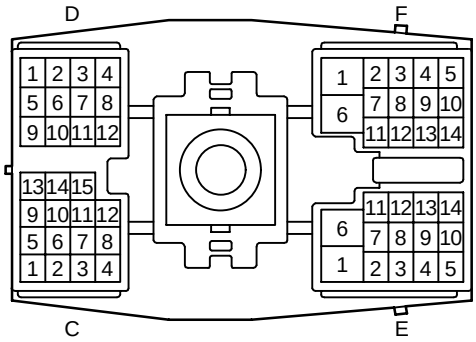


90980–12179

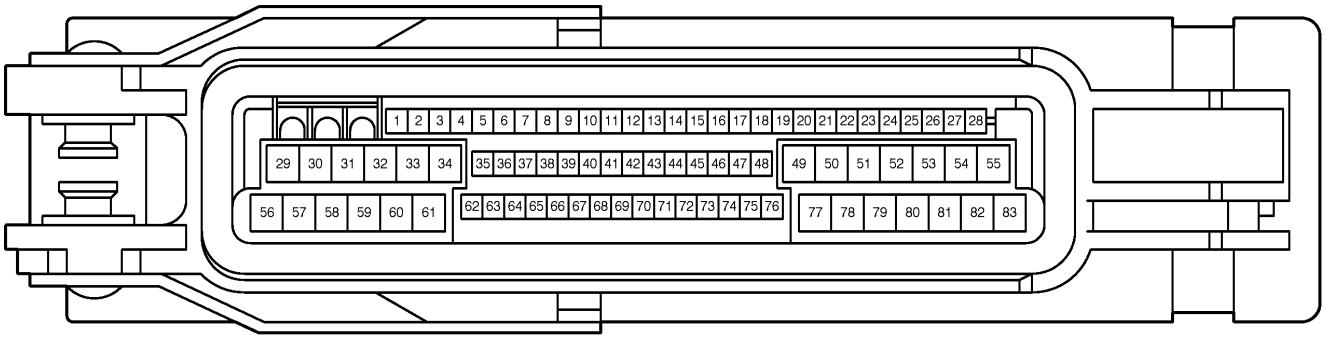
<FEMALE> 49P, 55P, 83P Non–waterproof Type



90980–11431

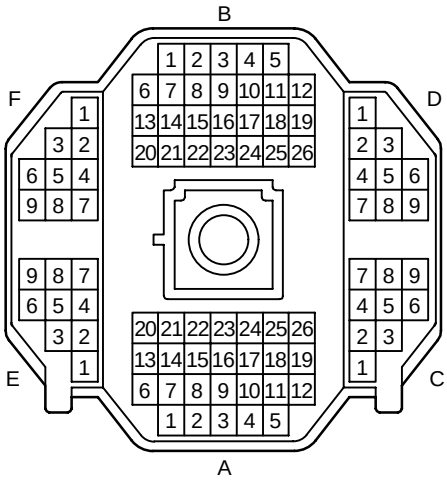


90980–11359



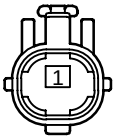
90980–11906

<FEMALE> 88P Non–waterproof Type

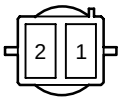
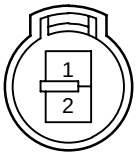
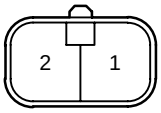
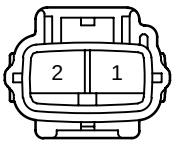


90980–10950

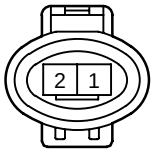
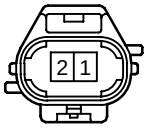
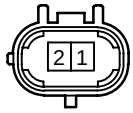
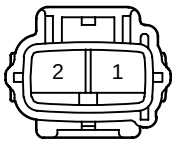
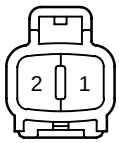
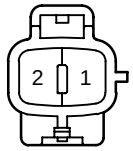
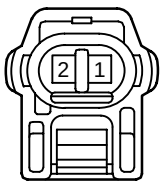
<MALE> 1P Waterproof Type

90980–10114	90980–10125	90980–10200	90980–10240
90980–10246	90980–10438	90980–10836	90980–10892
90980–10982	 90980–11006	90980–11183	90980–11270
90980–11962			

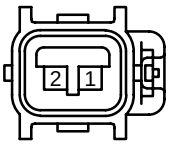
<MALE> 2P Waterproof Type

 90980–10091	90980–10122	 90980–10156 90980–10412	90980–10192
90980–10242	 90980–10374	90980–10495	90980–10497
90980–10533	90980–10555 90980–10707	90980–10566	90980–10571
90980–10575	90980–10580	90980–10582	90980–10592
90980–10594	90980–10625 90980–10788	90980–10665	 90980–10838

<MALE> 2P Waterproof Type

90980–10842	90980–10886	90980–10898	90980–10900
			
90980–10927	90980–10948	90980–10959	90980–10970
			
90980–11002	90980–11004	90980–11008	90980–11029
			
90980–11031	90980–11050	90980–11069	90980–11072
			
90980–11073 90980–11074	90980–11137	90980–11141	90980–11155

<MALE> 2P Waterproof Type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			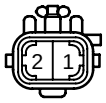
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	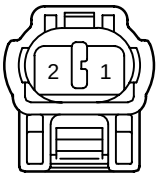		
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	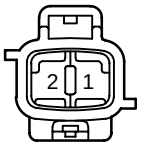	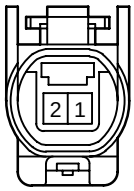	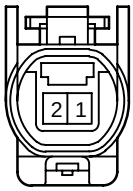
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	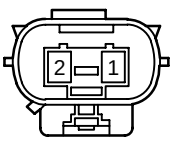	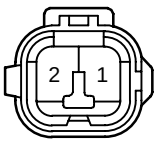	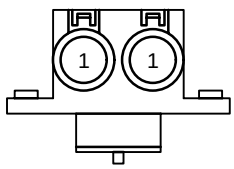
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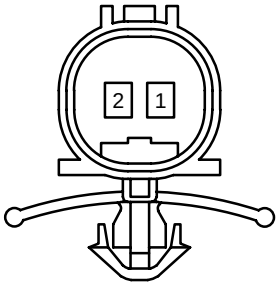
<MALE> 2P Waterproof Type

 90980–12194			

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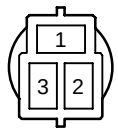
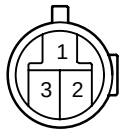
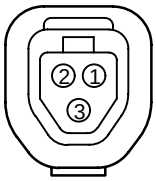
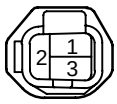
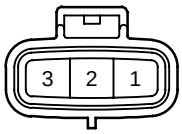
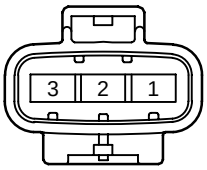
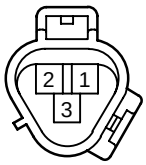
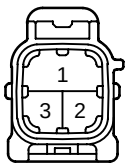
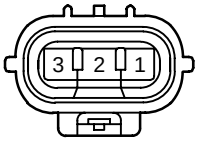
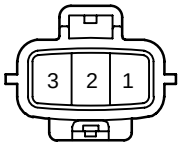
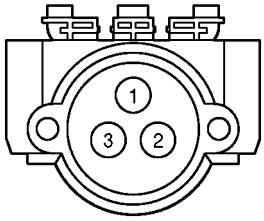
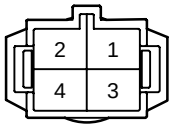
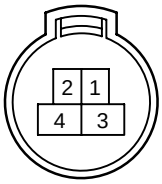
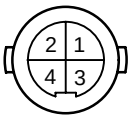
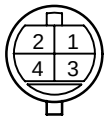
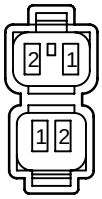
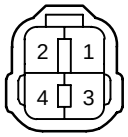
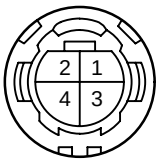
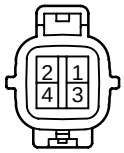
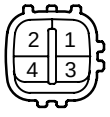
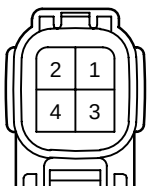
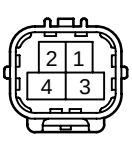
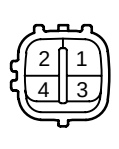
 90980–10093	 90980–10190	 90980–10235	 90980–10244
 90980–10248 90980–10347	 90980–10394 90980–10444	 90980–10492 90980–10493 90980–10774 90980–10787	 90980–10500
 90980–10553 90980–10577 90980–10777	 90980–10682	 90980–10689	 90980–10698
 90980–10840	 90980–10944	 90980–11015	 90980–11044
 90980–11131	 90980–11160	 90980–11169	 90980–11244 90980–11295 90980–11407

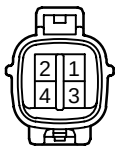
<MALE> 3P Waterproof Type

90980–11293	90980–11341	 90980–11348	 90980–11607
90980–11622	 90980–12131		

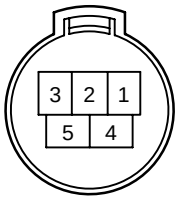
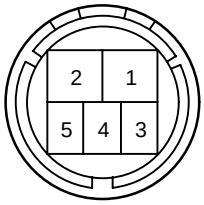
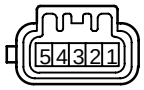
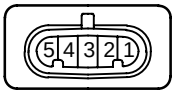
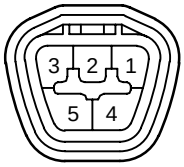
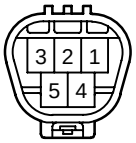
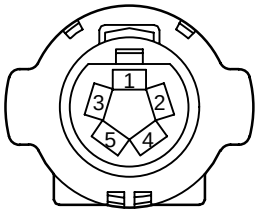
<MALE> 4P Waterproof Type

			
90980–10094	90980–10139	90980–10202	90980–10217
			
90980–10475	90980–10510 90980–11076	90980–10590	90980–10648
			
90980–10662	90980–10749	90980–10751 90980–10768	90980–10868
			
90980–10941	90980–10989	90980–11027	90980–11035
			
90980–11063 90980–11064	90980–11122	90980–11138	90980–11177

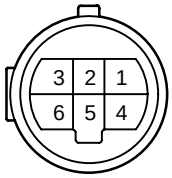
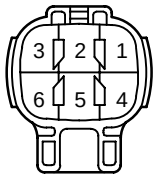
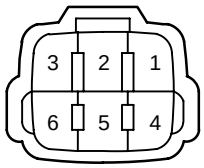
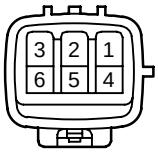
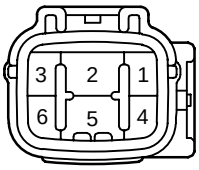
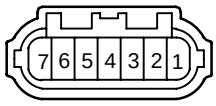
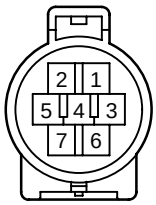
<MALE> 4P Waterproof Type

 90980–11262 90980–11328	 90980–11268	 90980–11287	 90980–11291
 90980–11929	 90980–12177		

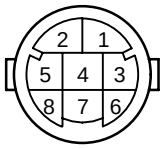
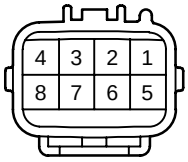
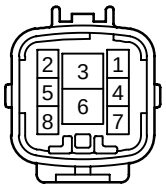
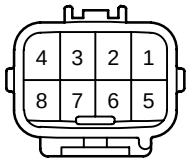
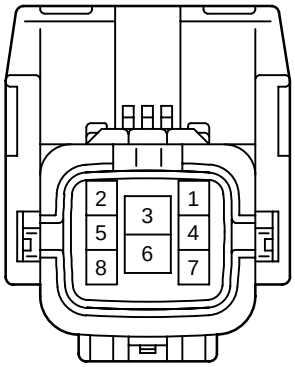
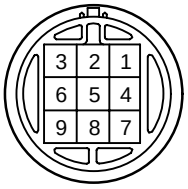
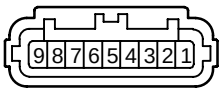
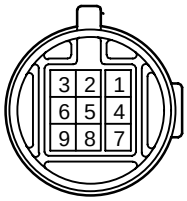
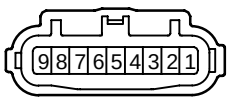
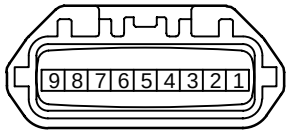
<MALE> 5P Waterproof Type

			
90980–10161	90980–10392	90980–10557 90980–10570	90980–10642
			
90980–10709	90980–10945	90980–11021	90980–11078
			
90980–11181	90980–11412	90980–11598	90980–11689

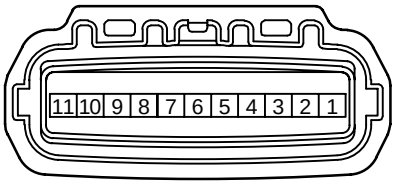
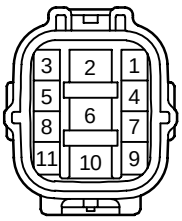
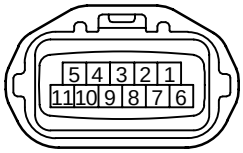
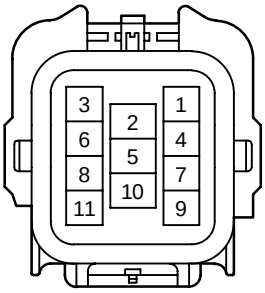
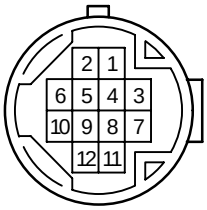
<MALE> 6P, 7P Waterproof Type

 90980–10194	90980–10477	 90980–10596	 90980–10650 90980–10984
90980–10987	90980–11033	 90980–11193	90980–11196
 90980–11267	90980–11289	 90980–10627	 90980–10930
90980–11171			

<MALE> 8P, 9P Waterproof Type

		
90980–10204	90980–10890	90980–10894
		
90980–10896	90980–11241	90980–11460
		
90980–10379	90980–10677	90980–10775
		
90980–10826	90980–11191	

<MALE> 11P, 12P, 13P, 15P Waterproof Type

		
90980–11173	90980–11239	90980–11256
		
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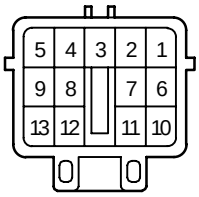
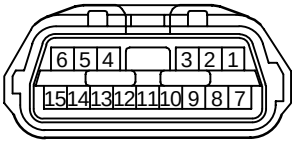
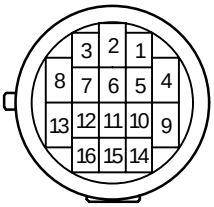
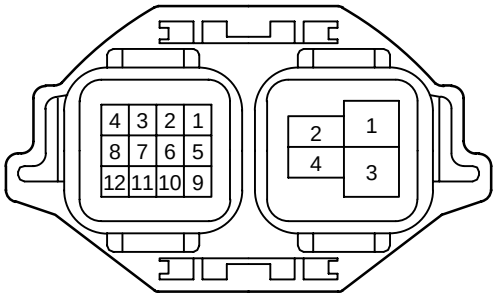
		
90980–10653	90980–11088	

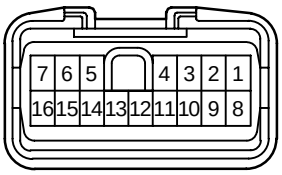
<MALE> 16P, 17P Waterproof Type



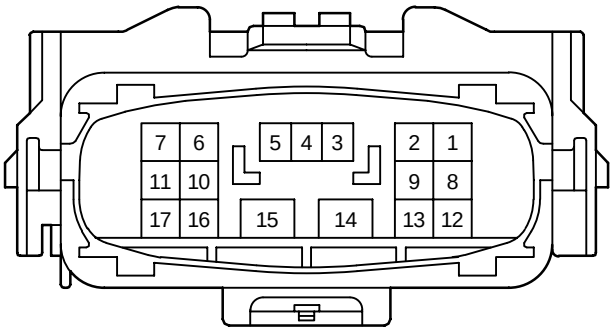
90980–10287



90980–10547

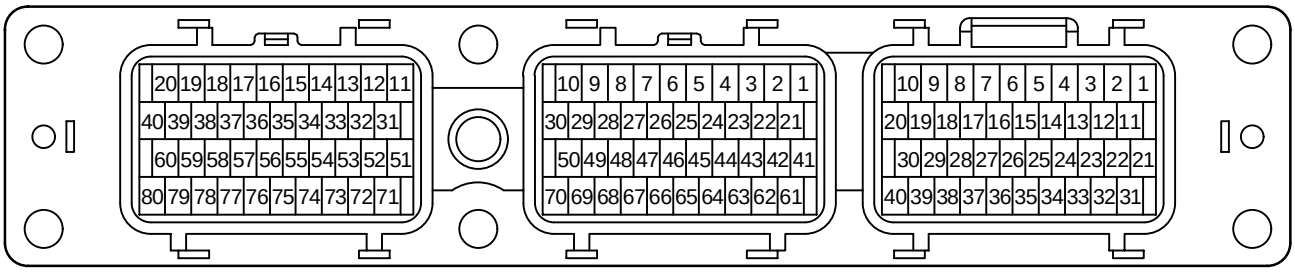


90980–11462



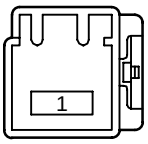
90980–11600

<MALE> 120P Waterproof Type

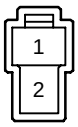
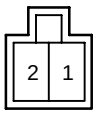
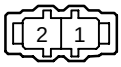
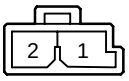
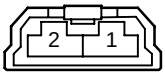
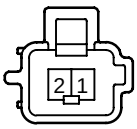
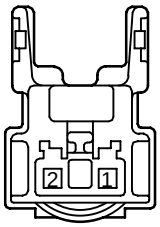
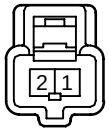
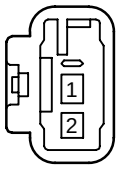
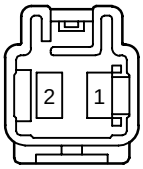


90980–11213

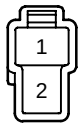
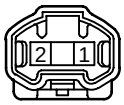
<MALE> 1P Non–waterproof Type

90980–10160	90980–10178	90980–10182	90980–10251
90980–10253	90980–10342	90980–10396	90980–10433 90980–10434
90980–10870 90980–11026 90980–11097	90980–10994	90980–11146	90980–11258
90980–11737	 90980–11774	90980–12041	

<MALE> 2P Non–waterproof Type

90980–10011	90980–10038	 90980–10213 90980–10305	 90980–10255
 90980–10286	 90980–10297	90980–10344 90980–10346	90980–10354 90980–10437
90980–10356	 90980–10424	90980–10620	90980–10687
90980–10824	 90980–10833 90980–11299	 90980–10849	 90980–10859
90980–10905	90980–10915	 90980–10934	 90980–10958

<MALE> 2P Non–waterproof Type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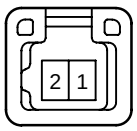
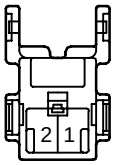
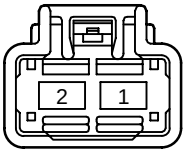
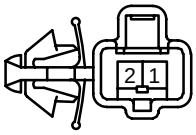
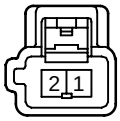
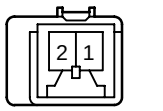
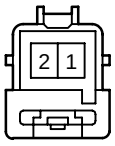
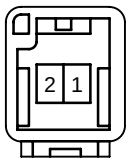
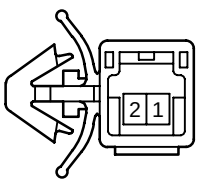
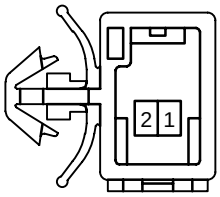
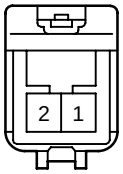
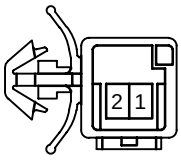
90980–11211	90980–11300	90980–11305	90980–11367
			
90980–11368	90980–11395	90980–11545	90980–11589
			
90980–11655	90980–11724	90980–11735	90980–11883
			
90980–11889	90980–11917	90980–11933	90980–11967

<MALE> 2P Non–waterproof Type

 90980–11992	 90980–12062		

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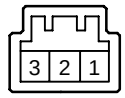
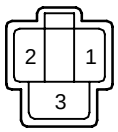
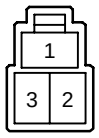
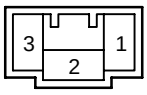
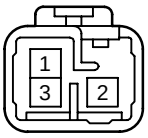
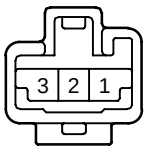
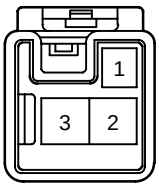
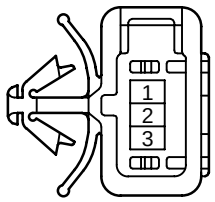
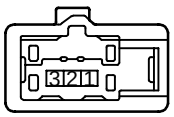
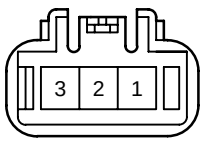
 90980–10055 90980–10163	 90980–10188	 90980–10215 90980–10283 90980–10299	 90980–10231
 90980–10257 90980–10300 90980–10410	 90980–10364 90980–10573	 90980–10544	 90980–10907
 90980–10979	 90980–11052	 90980–11229	 90980–11298
 90980–11385	 90980–11470	 90980–11484	 90980–11489
 90980–11620	 90980–11763	 90980–11874	 90980–11936

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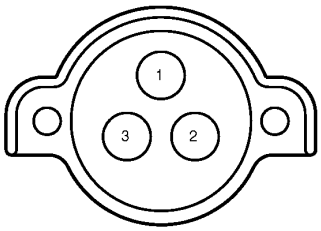	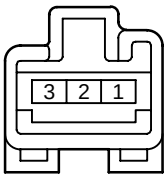	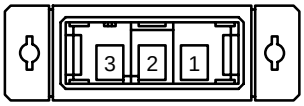	
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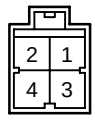	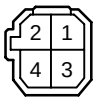	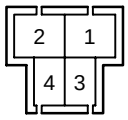	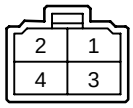
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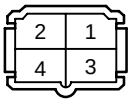	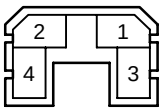	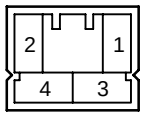	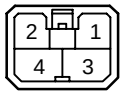
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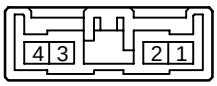			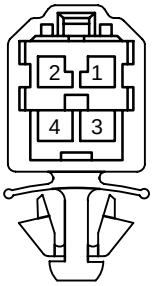
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	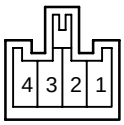	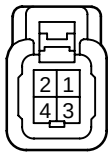	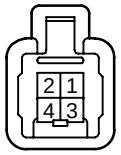
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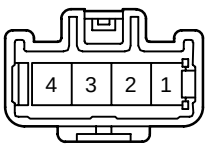	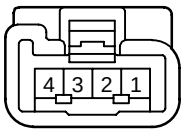	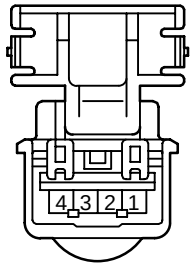	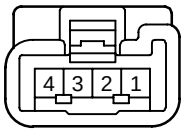
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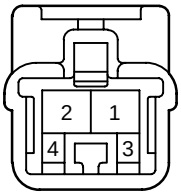
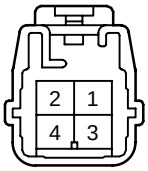
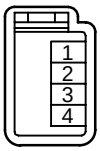
<MALE> 4P Non–waterproof Type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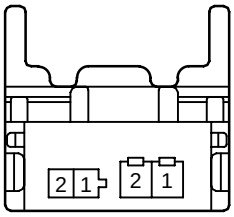		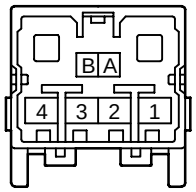	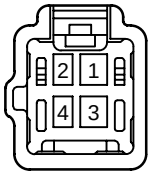
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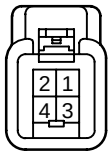	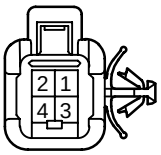	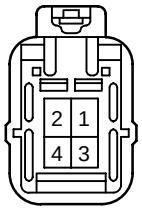	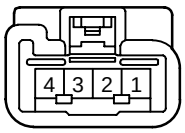
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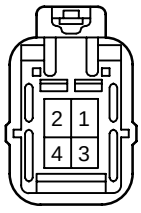	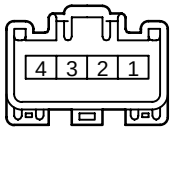	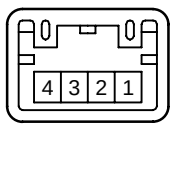	
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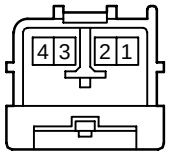	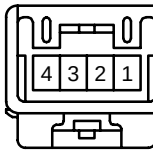	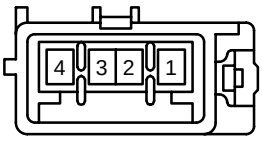	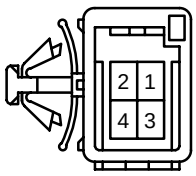
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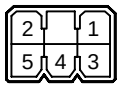
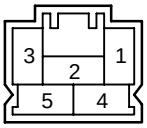
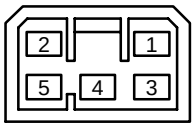
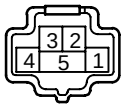
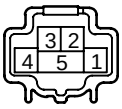
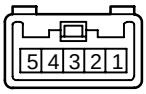
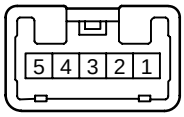
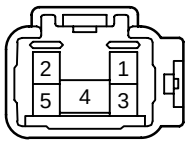
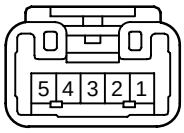
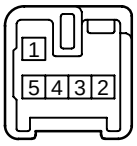
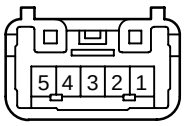
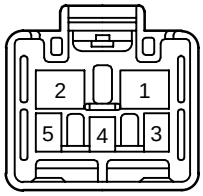
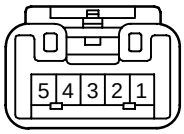
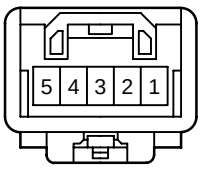
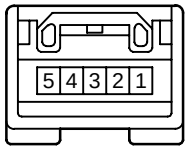
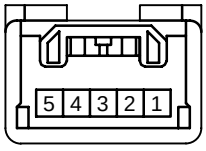
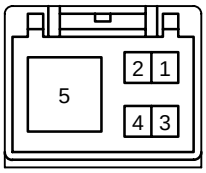
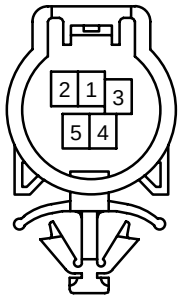
 90980–10040	 90980–10261	 90980–10308	 90980–10518
 90980–10519	 90980–10762	 90980–10790	 90980–10985
 90980–11085	 90980–11318	 90980–11327	 90980–11602
 90980–11843	 90980–11920	 90980–11968	 90980–12036
 90980–12050	 90980–12189		

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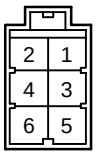
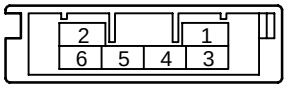
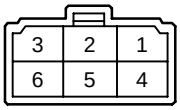
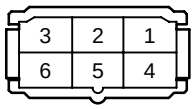
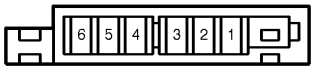
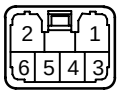
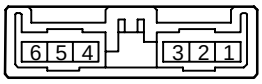
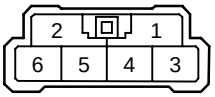
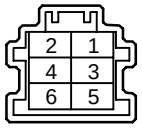
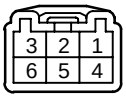
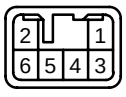
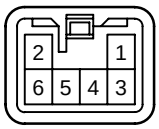
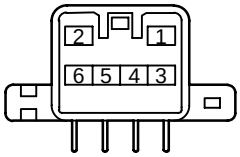
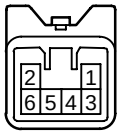
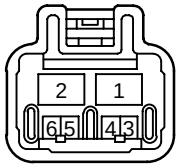
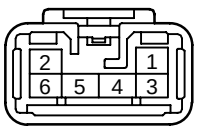
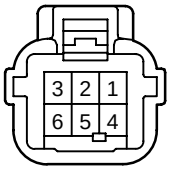
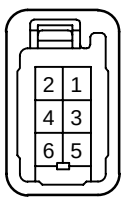
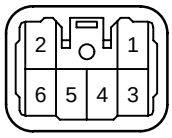
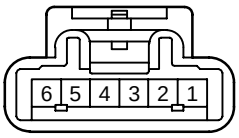
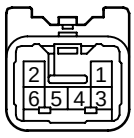
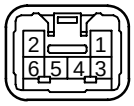
 90980–10003	 90980–10027	 90980–10172	 90980–10223
 90980–10289	 90980–10312	 90980–10366 90980–10505	 90980–10384 90980–10416 90980–10641
 90980–10401	 90980–10446	 90980–10602	 90980–10603
 90980–10671	 90980–10694	 90980–10793	 90980–10796
 90980–10909	 90980–10975	 90980–10998	 90980–11010

<MALE> 6P Non–waterproof Type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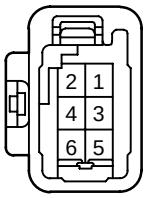			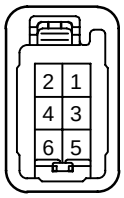
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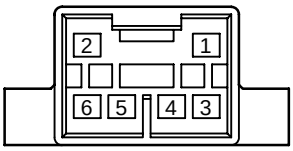	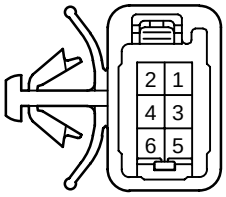	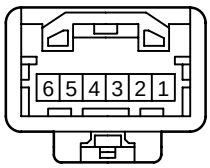	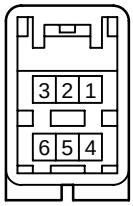
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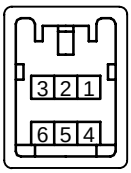	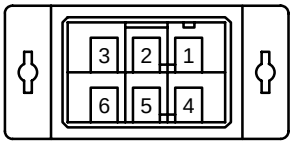	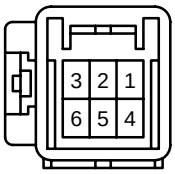	
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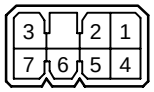
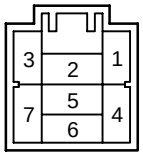
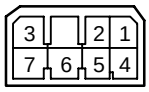
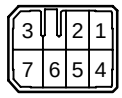
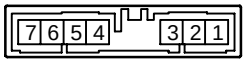
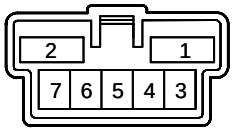
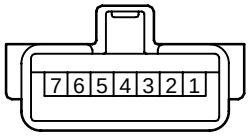
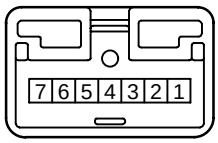
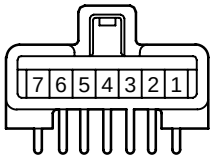
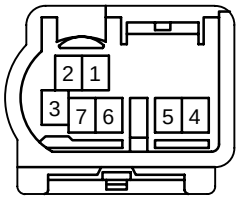
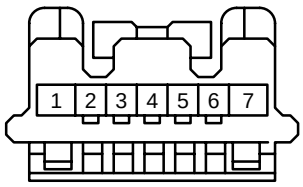
 90980–10042	 90980–10263	 90980–10310	 90980–10451
 90980–10459	 90980–10728 90980–10771	 90980–11164	 90980–11339
 90980–11402	 90980–11528	 90980–11739	 90980–12059
 90980–12092			

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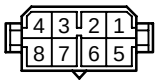
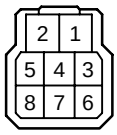
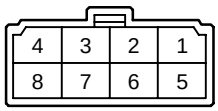
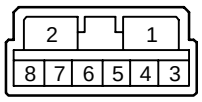
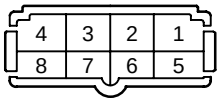
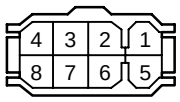
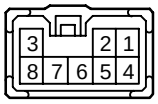
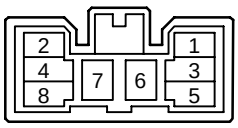
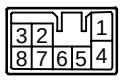
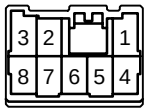
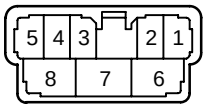
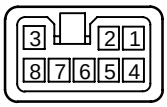
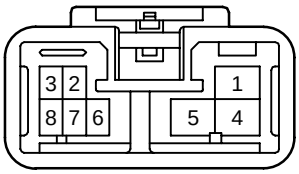
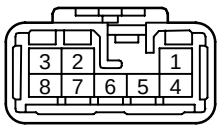
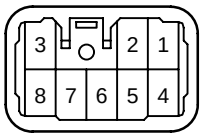
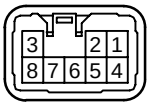
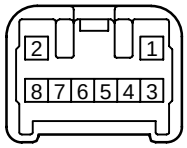
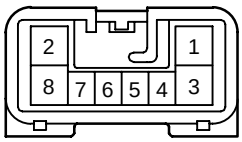
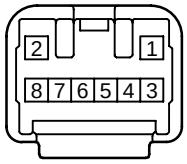
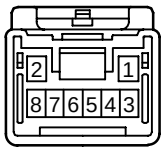
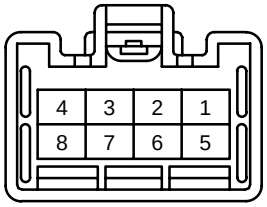
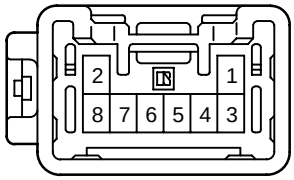
 90980–10018	 90980–10147	 90980–10174
 90980–10208 90980–10210 90980–10383 90980–10411	 90980–10225	 90980–10279
 90980–10360	 90980–10403	 90980–10418
 90980–10430 90980–10546	 90980–10462	 90980–10769

<MALE> 8P Non–waterproof Type

 90980–10798	 90980–10876 90980–11438	 90980–10963
 90980–11123	 90980–11134	 90980–11320
 90980–11353	 90980–11361	 90980–11389
 90980–11532	 90980–11551	 90980–11582

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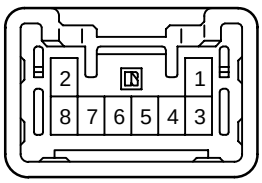
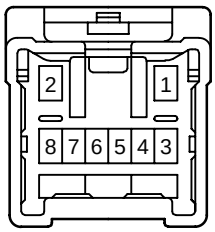
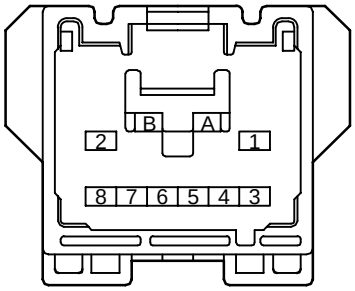
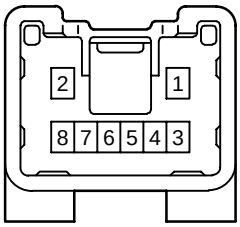
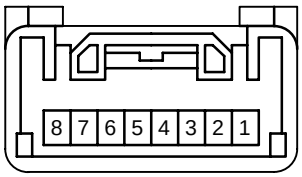
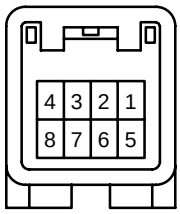
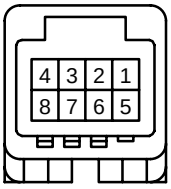
 90980–11588	 90980–11623	 90980–11629
 90980–11636	 90980–12061	 90980–12112
 90980–12220		

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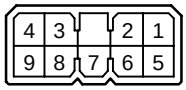	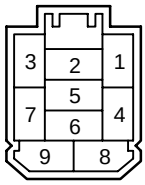	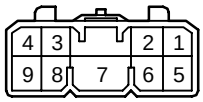
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	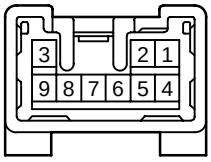	
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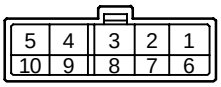
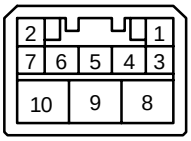
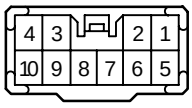
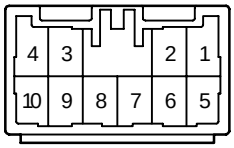
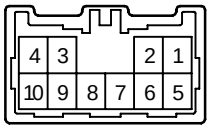
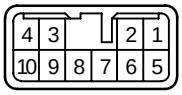
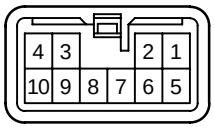
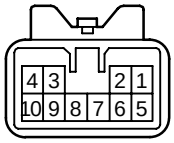
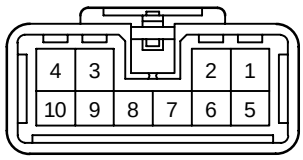
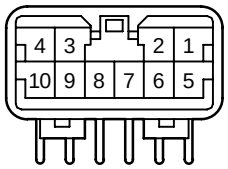
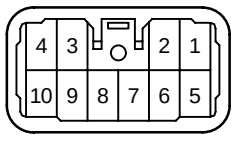
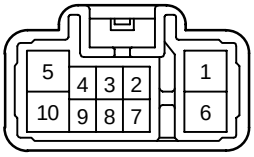
 90980–10176	 90980–10281	 90980–10375 90980–10417 90980–10427 90980–10516
 90980–10468	 90980–10527 90980–10719	 90980–10666
 90980–10693	 90980–10800	 90980–10861
 90980–10865 90980–11419	 90980–10961	 90980–10992

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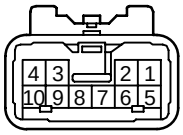
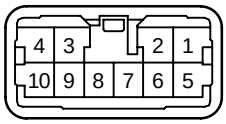
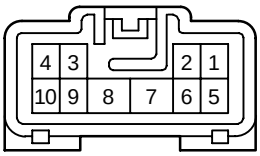
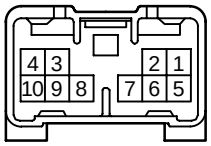
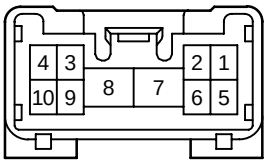
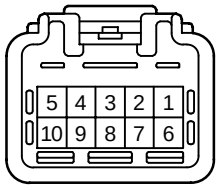
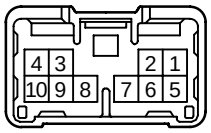
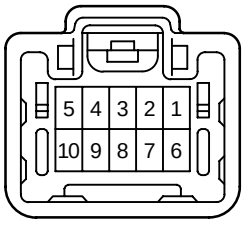
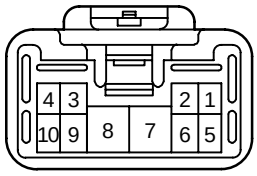
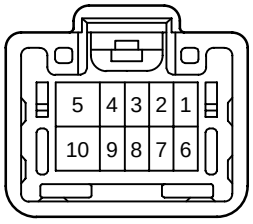
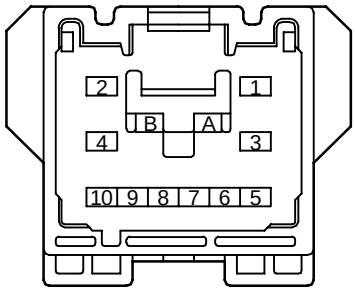
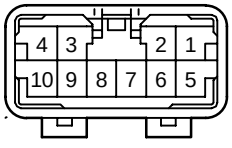
 90980–11102	 90980–11325 90980–11331	 90980–11365
 90980–11449	 90980–11526	 90980–11536
 90980–11544	 90980–11580	 90980–11596
 90980–11613	 90980–11641	 90980–11752

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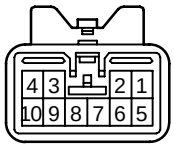
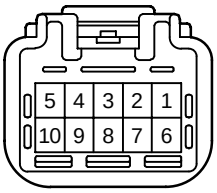
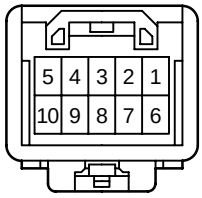
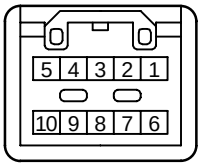
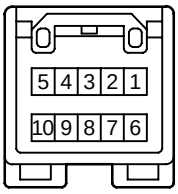
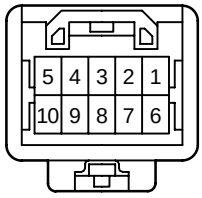
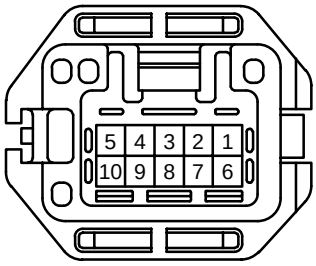
 90980–11757	 90980–11823	 90980–11922
 90980–11993	 90980–12009	 90980–12023
 90980–12249		

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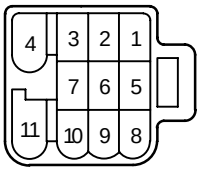
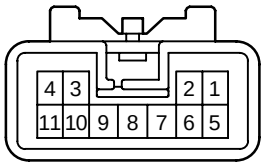
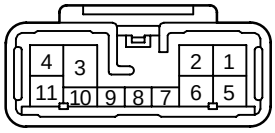
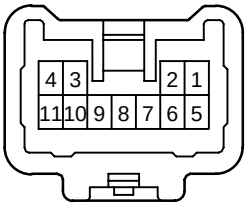
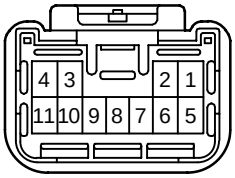
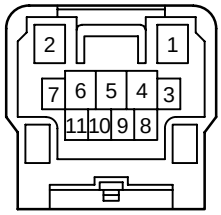
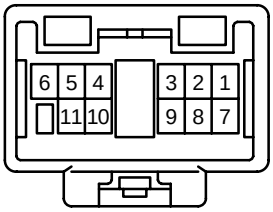
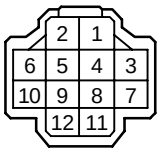
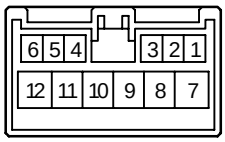
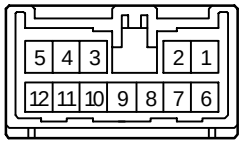
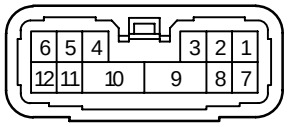
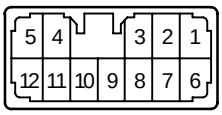
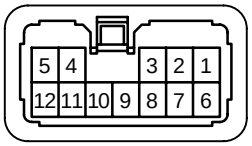
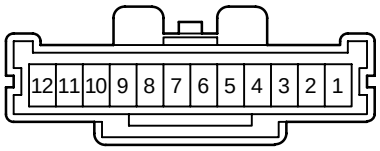
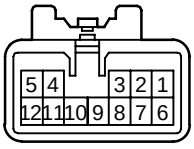
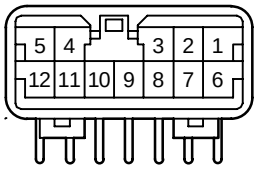
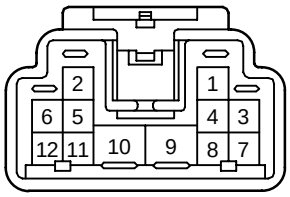
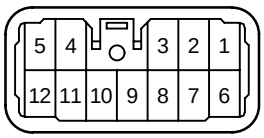
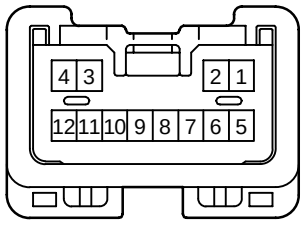
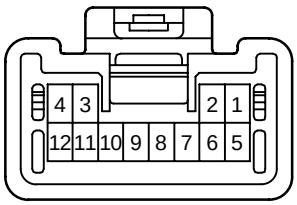
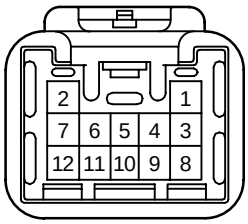
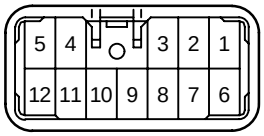
 90980–10531	 90980–10829	 90980–10872
 90980–11200	 90980–11538	 90908–12002
 90980–12250		

<MALE> 12P Non–waterproof Type

 90980–10149	 90980–10405	 90980–10407 90980–10529
 90980–10415	 90980–10436 90980–10440	 90980–10513
 90980–10564	 90980–10802	 90980–10864
 90980–10878	 90980–10938 90980–11105	 90980–11474

<MALE> 12P Non–waterproof Type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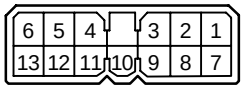
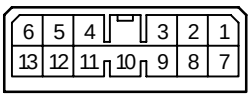
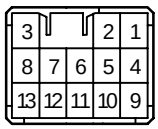
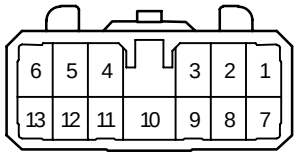
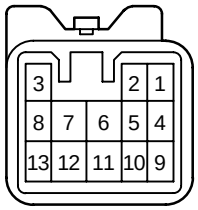
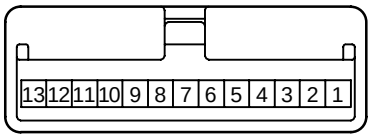
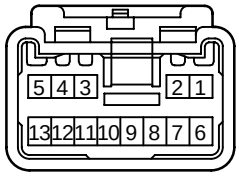
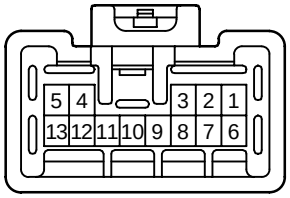
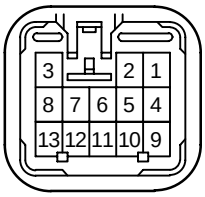
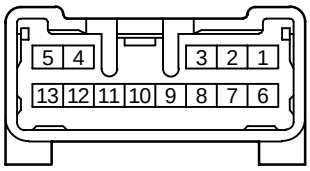
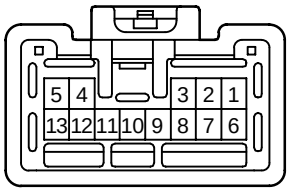
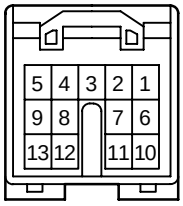
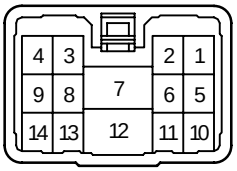
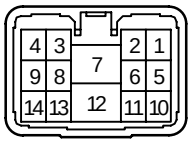
		
90980–10032	90980–10061	90980–10323
		
90980–10479	90980–10804	90980–11198
		
90980–11393	90980–11541	90980–11568
		
90980–11635	90980–11694	90980–11951

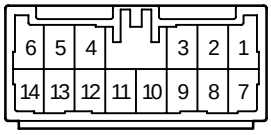
<MALE> 14P Non–waterproof Type



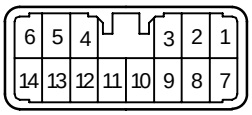
90980–10329



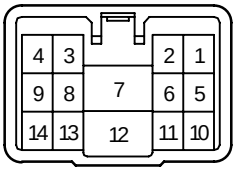
90980–10422



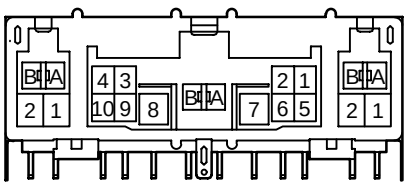
90980–10470



90980–10506
90980–10715

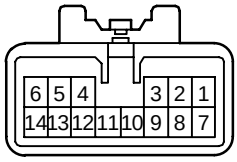


90980–10545

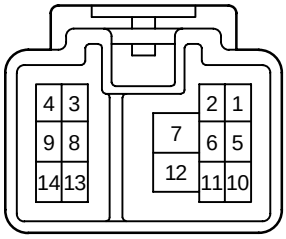


90980–10767

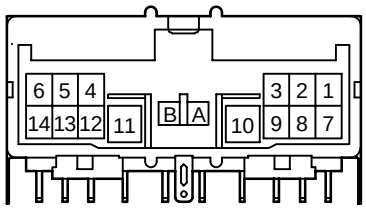
<MALE> 14P Non–waterproof Type



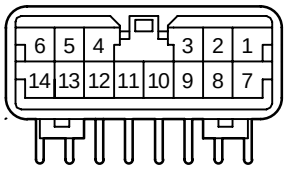
90980–10806



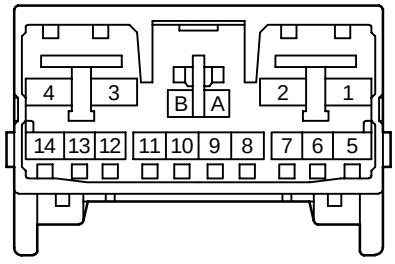
90980–10812



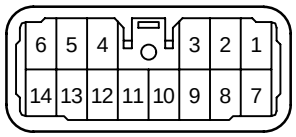
90980–10851



90980–10971
90980–11265

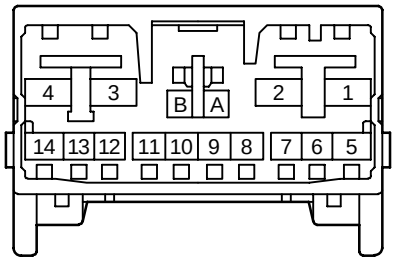


90980–11312

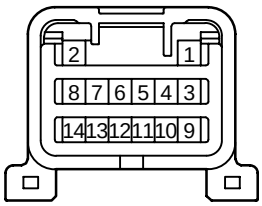


90980–11337

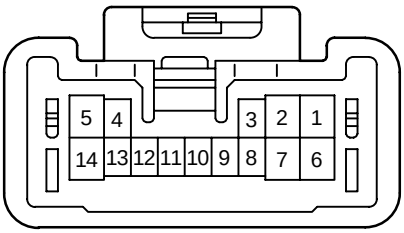
<MALE> 14P Non–waterproof Type



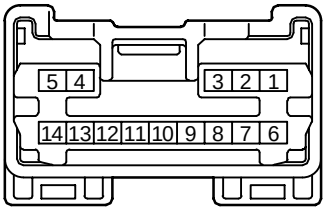
90980–11464



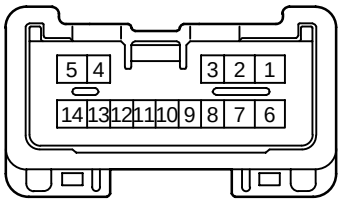
90980–11510



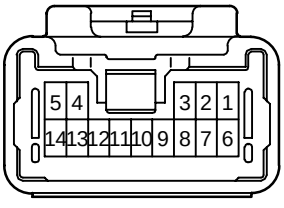
90980–11590



90980–11644
90980–11743
90980–11744

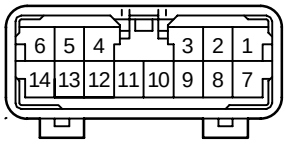


90980–11651

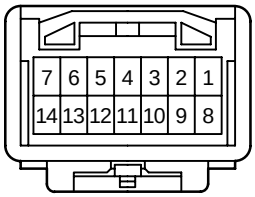


90980–11654

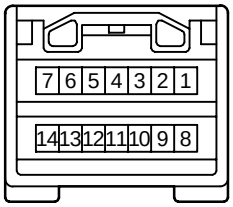
<MALE> 14P Non–waterproof Type



90980–11753

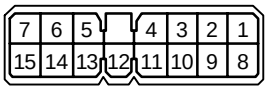


90980–11910

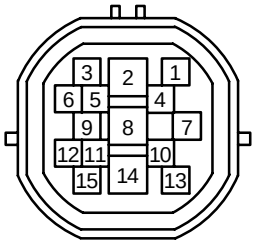


90980–11969
90980–12015

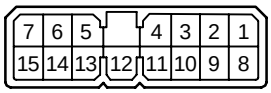
<MALE> 15P Non–waterproof Type



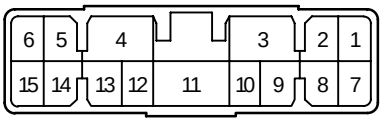
90980–10065



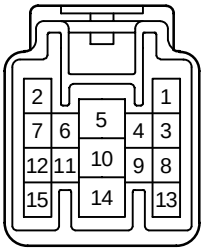
90980–10442



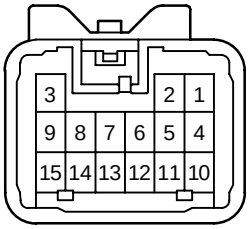
90980–10461



90980–10562

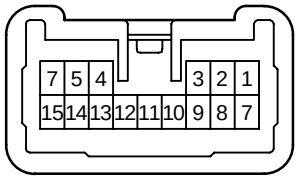


90980–10814

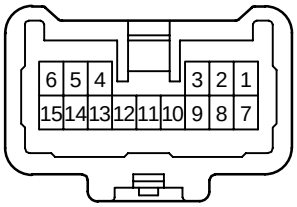


90980–10827

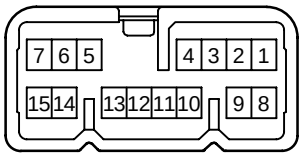
<MALE> 15P Non–waterproof Type



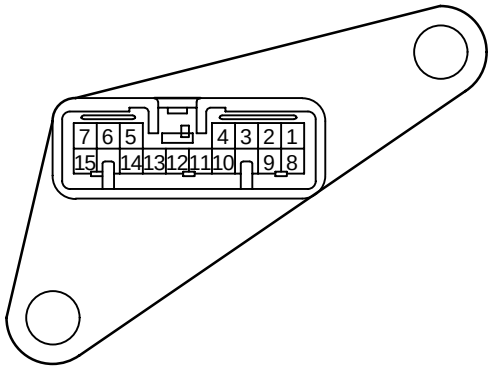
90980–11180



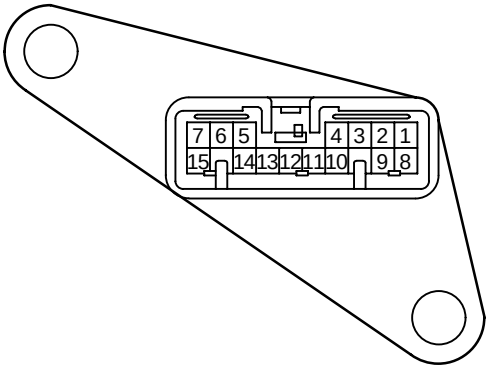
90980–11201



90980–11263

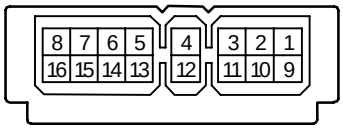


90980–11370

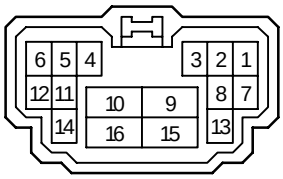


90980–11371

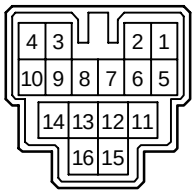
<MALE> 16P Non–waterproof Type



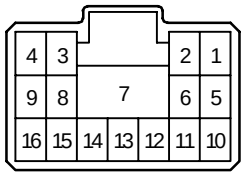
90980–10026



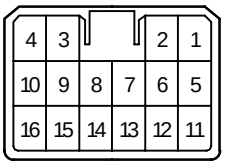
90980–10453



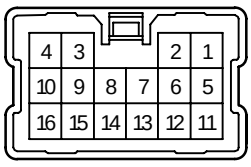
90980–10485



90980–10521

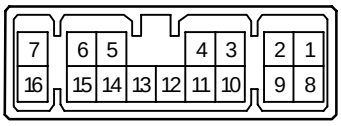


90980–10542

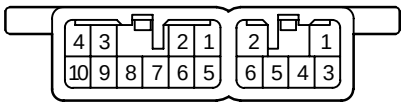


90980–10560

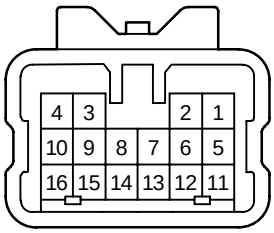
<MALE> 16P Non–waterproof Type



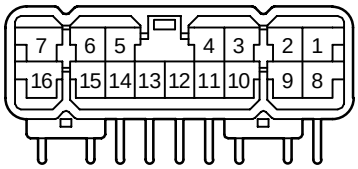
90980–10744



90980–10753



90980–10808
90980–11444



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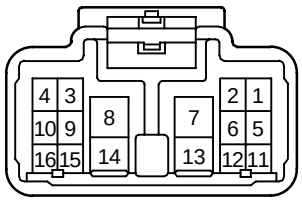

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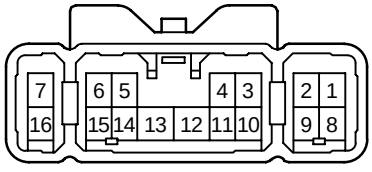
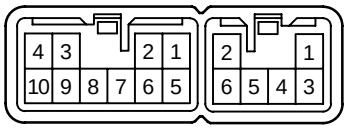
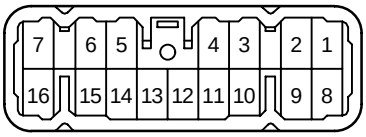


90980–11167

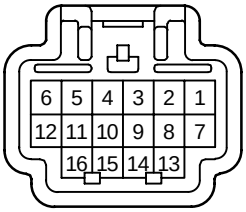
<MALE> 16P Non–waterproof Type



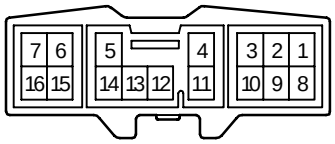
90980–11324



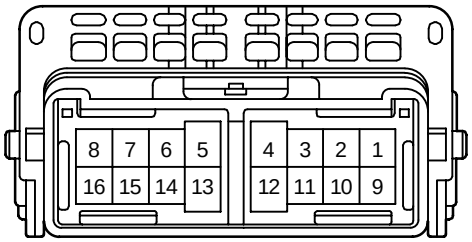
90980–11351



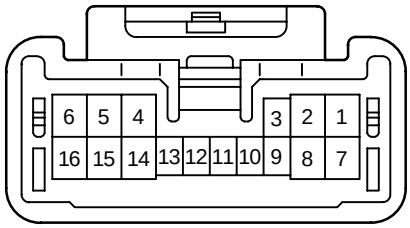
90980–11415



90980–11434

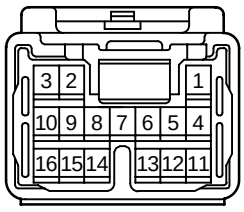


90980–11546

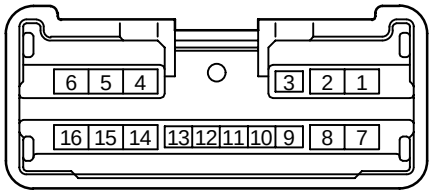


90980–11561

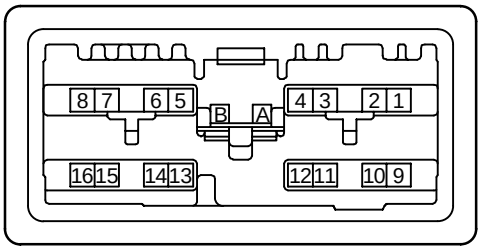
<MALE> 16P Non–waterproof Type



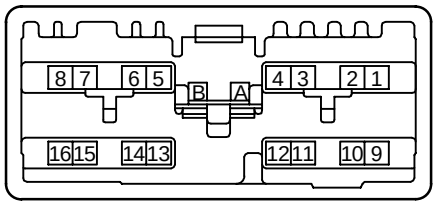
90980–11573



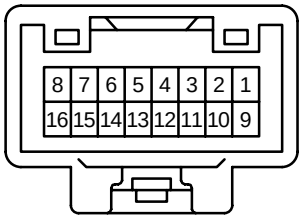
90980–11624



90980–11680

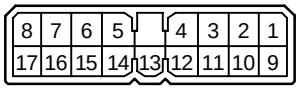


90980–11682

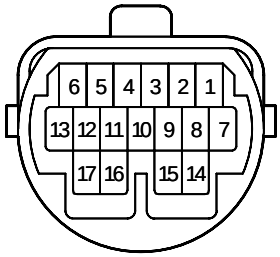


90980–12192

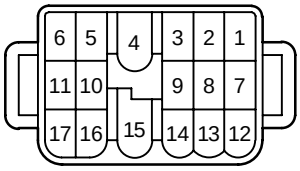
<MALE> 17P Non–waterproof Type



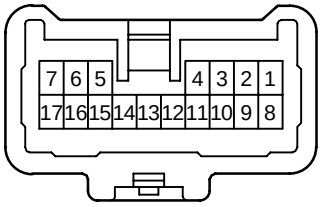
90980–10030



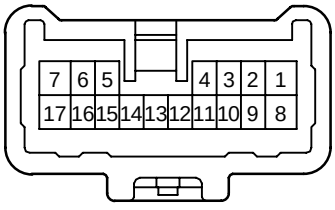
90980–10730



90980–11046



90980–11202



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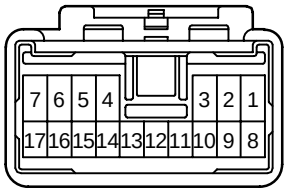
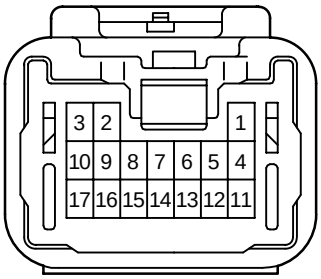
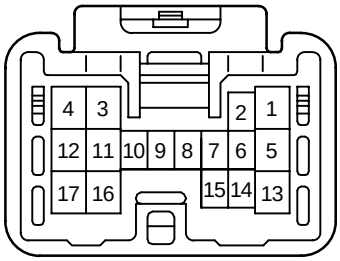


90980–11334

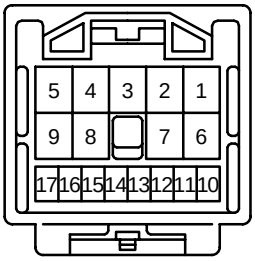
<MALE> 17P Non–waterproof Type



90980–11505

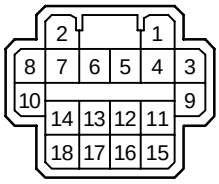


90980–11559

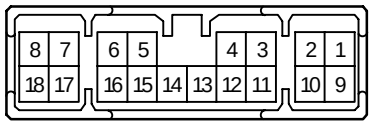


90980–12161

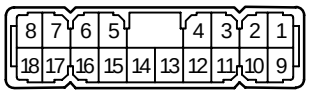
<MALE> 18P Non–waterproof Type



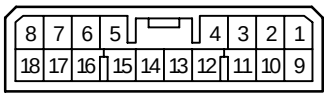
90980–10284



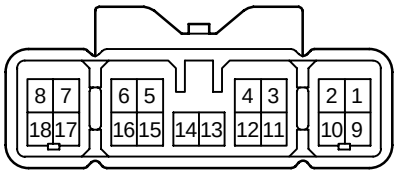
90980–10325



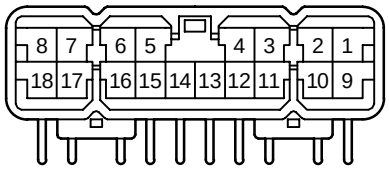
90980–10441



90980–10655
90980–11017

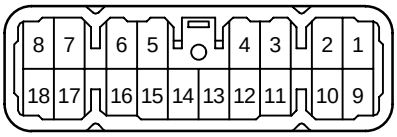


90980–10818

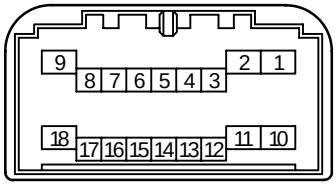


90980–10863

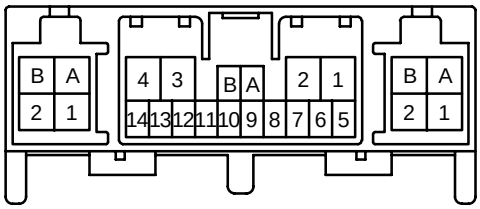
<MALE> 18P Non–waterproof Type



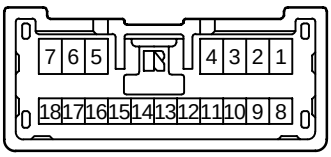
90980–10937
90980–11127



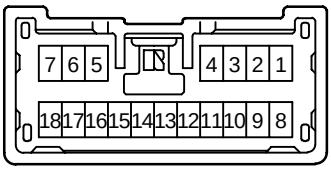
90980–11223



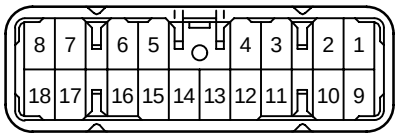
90980–11382



90980–11496

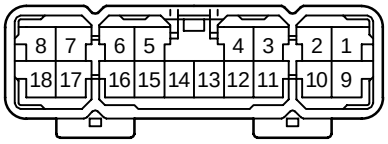


90980–11745

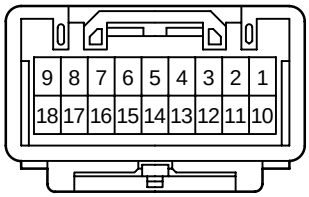


90980–11748

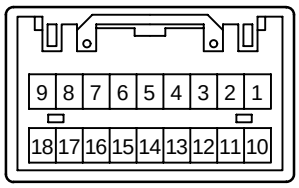
<MALE> 18P Non–waterproof Type



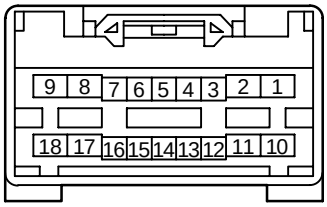
90980–11751



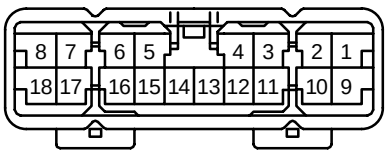
90980–11912



90980–11949

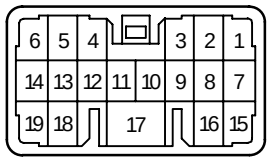


90980–12010

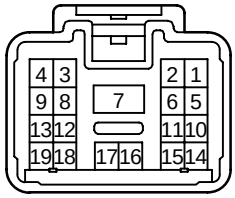


90980–12108

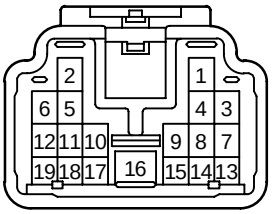
<MALE> 19P Non–waterproof Type



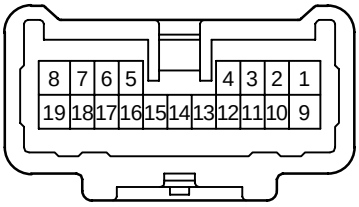
90980–10674



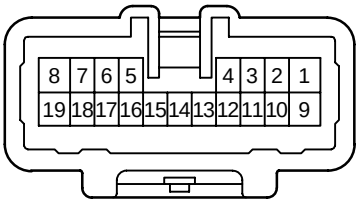
90980–10856



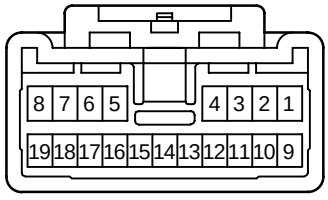
90980–10882



90980–11204

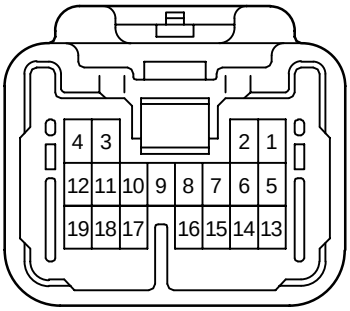


90980–11307



90980–11376

<MALE> 19P Non–waterproof Type



90980–11570

List of equivalent for the gold and tin–plated repair wire

Repair Wire Part No.	
Tin–plated (Sn)	Gold–plated (Au)
82998–12160 (2.3.M.U)	82998–24050
–12190 (1.8.F.U)	–12300
–12260 (2.3.M.S)	–24070
–12270 (2.3.F.S)	–24080
–12310 (1.0.F.U)	–12320
–12330 (2.3II.M.U)	–12350
–12340 (2.3II.F.U)	–12360
–12430 (2.3II.M.S)	–12450
–12440 (2.3II.F.S)	–12460
–12790 (2.3II.F.S)	–12780
–12670 (1.0III.M.U)	–12680
–12690 (1.0III.F.U)	–12700
–12720 (1.0III.F.S)	–12730
–24020 (1.0II.F.U)	–24110
–24090 (1.8II.M.U)	–24130

HOUSING PART NUMBER LIST

* Example : 82998–24050 indicates the gold–plated 82998–12160.

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10001	X	BHC	M	4	U	–	–	–	
10002	X	BHC	F	4	U	–	–	–	
10003	X	BHC	M	6	U	–	–	–	
10004	X	BHC	F	6	U	–	–	–	
10006	X	BHC	F	12	U	–	–	–	
10008	X	BHC	F	16	U	–	–	–	
10010	X	BHC	F	22	U	–	–	–	
10011	X	BHC	M	2	U	–	–	–	
10012	X	BHC	F	2	U	–	–	–	
10018	X	BHC	M	8	U	–	–	–	
10019	X	BHC	F	8	U	–	–	–	
10026	X	TODC	M	16	U	12080	–	L,Y	
10027	X	6.3 7.7	M	6 6	U	– 12010	– –	– Y	
10028	X	TODC	F	16	U	12090	–	L,Y	
10029	X	6.3 7.7	F	6 6	U	– 12020	– –	– Y	
10030	X	TODC	M	17	U	12080	–	L,Y	
10031	X	TODC	F	17	U	12090	–	L,Y	
10032	X	TODC	M	13	U	12080	–	L,Y	
10033	X	TODC	F	13	U	12090	–	L,Y	
10037	O	MIC	F	17	U	12120	–	L,Y	
10038	X	TODC	M	2	U	12080	–	L,Y	
10039	X	TODC	F	2	U	12090	–	L,Y	
10040	O	TODC	M	5	U	12080	–	L,Y	
10041	X	TODC	F	5	U	12090	–	L,Y	
10042	X	TODC	M	7	U	12080	–	L,Y	
10043	X	TODC	F	7	U	12090	–	L,Y	
10044	O	TODC	M	9	U	12080	–	L,Y	
10045	O	TODC	F	9	U	12090	–	L,Y	
10055	X	TODC	M	3	U	12080	–	L,Y	
10056	X	TODC	F	3	U	12090	–	L,Y	
10057	X	–	–	–	–	–	–	–	
10061	X	MIC	M	13	U	–	–	–	PCB
10062	O	MIC	F	13	U	12120	–	L,Y	
10063	X	MIC	M	21	U	–	–	–	PCB
10064	X	MIC	F	21	U	12120	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10065	X	TODC	M	15	U	12080	–	L,Y	
10066	X	TODC	F	15	U	12090	–	L,Y	
10068	X	TODC	M	9	U	–	–	–	PCB
10069	X	SL	F	2	U	12130	–	L,Y	
10070	O	SL	F	3	U	12130	–	L,Y	
10071	O	SL	F	7	U	12130	–	L,Y	
10072	X	6.3	F	3	U	12060	12580	Y	
10087	X	TODC	M	9	U	12080	–	L,Y	
10088	X	6.3	F	3	S	–	–	–	
10090	X	6.3	F	1	S	–	–	–	
10091	X	6.3	M	2	S	–	–	–	
10092	X	6.3	F	2	S	–	–	–	
10093	X	6.3	M	3	S	–	–	–	
10094	X	6.3	M	4	S	–	–	–	
10095	X	6.3	F	4	S	–	–	–	
10096	X	TODC	M	6	S	–	–	–	
10097	X	TODC	F	6	S	–	–	–	
10100	X	TODC	M	16	S	–	–	–	
10101	X	TODC	F	16	S	–	–	–	
10106	X	TODC	M	9	U	–	–	–	PCB
10108	X	SL	F	2	U	12130	–	L,Y	
10109	X	SL	F	2	U	12130	–	L,Y	
10110	X	6.3	F	3	S	–	–	–	
10111	X	FPC	F	3	U	–	–	–	
10112	X	FPC	F	8	U	–	–	–	
10113	X	FPC	F	8	U	–	–	–	
10114	O	7.7	M	1	S	–	–	–	
10115	O	7.7	F	1	S	–	–	–	
10116	X	6.3	F	2	S	–	–	–	
10117	X	TODC	M	5	U	12080	–	L,Y	
10119	X	FPC	F	8	U	–	–	–	
10121	X	TODC	F	2	U	12090	–	L,Y	
10122	X	7.7	M	2	S	–	–	–	
10123	X	7.7	F	2	S	–	–	–	
10124	X	6.3	F	2	U	–	–	–	
10125	X	TODC	M	1	S	–	–	–	
10126	X	TODC	M	4	U	12080	–	L,Y	
10127	X	TODC	F	4	U	12090	–	L,Y	
10130	X	TODC	M	5	U	–	–	–	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 10131	X	LAC	M	22	U	82998– 12100	82998– –	L,Y	
10132	O	LAC	F	13	U	12110	–	L,Y	
10133	X	LAC	F	9	U	12110	–	L,Y	
10138	X	MIC	M	13	U	–	–	–	PCB
10139	X	6.3	M	4	S	–	–	–	
10140	X	6.3	F	4	S	–	–	–	
10141	X	SL	F	2	U	12130	–	L,Y	
10142	X	6.3	F	4	U	–	–	–	
10143	X	FPC	F	3	U	–	–	–	
10144	X	6.3	M	4	U	–	–	–	
10145	X	6.3 7.7	M	3 3	U	– 12010	– –	– Y	
10146	X	6.3 7.7	F	2 1	U	– 12040	– –	– Y	
10147	X	TODC	M	8	U	12080	–	L,Y	
10148	X	TODC	F	8	U	12090	–	L,Y	
10149	X	TODC	M	12	U	12080	–	L,Y	
10150	X	TODC	F	12	U	12090	–	L,Y	
10151	X	MIC	M	22	U	–	–	–	PCB
10152	O	MIC	F	9	U	12120	–	L,Y	
10153	X	2.3	F	12	U	12170	–	L	
10154	X	6.3 7.7	M	3 3	U	– –	– –	– –	
10156	O	6.3	M	2	S	–	–	–	w/o Clamp
10157	O	6.3	F	2	S	–	–	–	
10158	X	FPC	F	10	U	–	–	–	
10159	X	FPC	F	10	U	–	–	–	
10160	X	7.7	M	1	U	12010	–	Y	
10161	X	6.3	M	5	S	–	–	–	w/o Clamp
10162	O	6.3	F	5	S	–	–	–	
10163	X	TODC	M	3	U	12080	–	L,Y	
10164	X	TODC	F	3	U	12090	–	L,Y	
10165	X	7.7	F	1	U	12020	–	Y	
10170	X	6.3	M	4	U	12050	–	Y	w/o Clamp
10171	O	6.3	F	4	U	12060	12580	Y	
10172	O	6.3	M	6	U	12050	–	Y	
10173	O	6.3	F	6	U	12060	12580	Y	
10174	O	6.3	M	8	U	12050	–	Y	
10175	O	6.3	F	8	U	12060	12580	Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 10176	O	6.3	M	10	U	82998– 12050	82998– –	Y	
10177	O	6.3	F	10	U	12060	12580	Y	
10178	O	6.3	M	1	U	12050	–	Y	
10179	O	6.3	F	1	U	12060	12580	Y	
10182	O	TODC	M	1	U	12080	–	L,Y	
10183	O	TODC	F	1	U	12090	–	L,Y	
10184	X	TODC	F	2	S	–	–	–	
10185	X	7.7	F	2	U	12040	–	Y	
10186	X	6.3 7.7	M	2 1	U	12050 12030	– –	Y Y	
10187	X	6.3 7.7	M	2 1	U	12050 12030	– –	Y Y	
10188	X	6.3 7.7	M	2 1	U	12050 12030	– –	Y Y	
10189	X	6.3 7.7	F	2 1	U	12060 12040	12580 –	Y Y	
10190	X	EJ	M	3	S	–	–	–	
10191	X	EJ	F	3	S	–	–	–	
10192	X	EJ	M	2	S	–	–	–	
10193	X	EJ	F	2	S	–	–	–	
10194	X	TODC	M	6	S	–	–	–	
10195	X	TODC	F	6	S	–	–	–	
10196	X	6.3	F	4	U	12060	12580	Y	
10197	X	TODC	F	1	S	–	–	–	
10198	X	6.3 7.7	M	2 1	S	– –	– –	– –	
10199	X	6.3 7.7	F	2 1	S	– –	– –	– –	
10200	X	EJ	M	1	S	–	–	–	
10201	X	EJ	F	1	S	–	–	–	
10202	X	EJ	M	4	S	–	–	–	
10203	X	EJ	F	4	S	–	–	–	
10204	X	EJ	M	8	S	–	–	–	
10205	X	EJ	F	8	S	–	–	–	
10206	X	TODC	M	13	U	–	–	–	PCB
10207	X	TODC	F	21	U	12090	–	L,Y	
10208	X	6.3 TODC	M	8 8	U	– 12080	– –	– L,Y	w/ Flange

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10209	X	6.3 TODC	F	2 6	U	12060 12090	12580 –	Y L,Y	
10210	X	6.3 TODC	M	2 6	U	12050 12080	– –	Y L,Y	w/o Clamp
10211	X	TODC	M	7	U	12080	–	L,Y	
10212	X	TODC	M	13	U	12080	–	L,Y	
10213	O	6.3	M	2	U	12050	–	Y	w/o Clamp
10214	O	6.3	F	2	U	12060	12580	Y	
10215	X	6.3	M	3	U	12050	–	Y	w/o Clamp
10216	O	6.3	F	3	U	12060	12580	Y	
10217	X	TODC	M	4	S	–	–	–	
10218	X	TODC	F	4	S	–	–	–	
10219	X	6.3	M	4	U	12050	–	Y	
10220	X	6.3	F	4	S	–	–	–	
10221	X	6.3	F	4	U	12060	12580	Y	
10222	X	6.3	F	3	U	12060	12580	Y	
10223	X	6.3	M	6	U	12050	–	Y	
10224	X	6.3	F	6	U	12060	12580	Y	
10225	X	6.3	M	8	U	12050	–	Y	
10228	X	HEAD-LAMP	F	3	U	24140	24200	L,Y	
10229	X	6.3	F	1	U	12060	12580	Y	
10231	X	6.3	M	3	U	12050	–	Y	
10232	X	6.3	F	3	U	12060	12580	Y	
10233	X	6.3 TODC	M	25 25	U	12050 12080	– –	Y L,Y	
10234	X	6.3	F	3	U	–	–	–	
10235	X	6.3 7.7	M	2 1	S	– –	– –	– –	
10236	X	6.3 7.7	F	2 1	S	– –	– –	– –	
10237	X	6.3	M	4	U	12050	–	Y	
10238	X	7.7	F	2	U	12020	–	Y	
10239	X	6.3	F	3	S	–	–	–	
10240	O	TODC	M	1	S	–	–	–	
10241	O	TODC	F	1	S	–	–	–	
10242	X	TODC	M	2	S	–	–	–	
10243	X	TODC	F	2	S	–	–	–	
10244	O	TODC	M	3	S	–	–	–	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–10245	X	TODC	F	3	S	82998––	82998––	–	
10246	O	6.3	M	1	S	–	–	–	
10247	O	6.3	F	1	S	–	–	–	
10248	X	6.3	M	3	S	–	–	–	w/o Clamp
10249	O	6.3	F	3	S	–	–	–	
10250	X	6.3	F	1	U	12060	12580	Y	
10251	X	6.3	M	1	U	12050	–	Y	w/o Clamp
10252	X	6.3	F	1	U	12060	12580	Y	
10253	X	6.3	M	1	U	12050	–	Y	
10254	X	6.3	F	1	U	12060	12580	Y	
10255	X	6.3	M	2	U	12050	–	Y	
10256	X	6.3	F	2	U	12060	12580	Y	
10257	X	6.3	M	3	U	12050	–	Y	w/o Clamp
10258	X	6.3	F	3	U	12060	12580	Y	
10259	X	6.3	M	4	U	12050	–	Y	
10260	X	6.3	F	4	U	12060	12580	Y	
10261	X	6.3	M	5	U	12050	–	Y	
10262	X	6.3	F	5	U	12060	12580	Y	
10263	X	6.3	M	7	U	12050	–	Y	
10264	X	6.3	F	7	U	12060	12580	Y	
10265	X	6.3	M	9	U	12050	–	Y	
10266	X	6.3	F	9	U	12060	12580	Y	
10267	X	MIC	M	9	U	–	–	–	PCB
10272	X	LC	M	8	U	–	–	–	
10273	X	LC	F	8	U	–	–	–	
10274	O	TODC	F	5	U	12090	–	L,Y	
10275	X	TODC	M	7	U	12080	–	L,Y	
10276	X	6.3	M	5	U	12050	–	Y	
10277	X	6.3	M	7	U	12050	–	Y	
10278	X	6.3	M	9	U	12050	–	Y	
10279	X	TODC	M	8	U	12080	–	L,Y	
10280	X	TODC	F	8	U	12090	–	L,Y	
10281	X	6.3 TODC	M	3 7	U	12050 12080	– –	Y L,Y	
10282	X	6.3 TODC	F	3 7	U	12060 12090	12580 –	Y L,Y	
10283	O	6.3	M	3	U	12050	–	Y	w/ Clamp
10284	X	TODC	M	18	U	12080	–	L,Y	
10285	X	TODC	F	18	U	12090	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 10286	X	TODC	M	2	U	82998– 12080	82998– –	L,Y	
10287	X	TODC	M	16	S	–	–	–	
10288	X	TODC	F	16	S	–	–	–	
10289	X	LC	M	6	U	–	–	–	
10290	X	LC	F	6	U	–	–	–	
10291	X	LC	M	14	U	–	–	–	
10292	X	LC	F	14	U	–	–	–	
10293	X	PULSE LOCK	M	52	U	–	–	–	PCB
10294	O	PULSE LOCK	F	10	U	12200	–	L,Y	
10295	O	PULSE LOCK	F	18	U	12210	–	L	
10296	O	PULSE LOCK	F	24	U	12210	–	L	
10297	X	TODC	M	2	U	12080	–	L,Y	
10298	X	TODC	F	2	U	12090	–	L,Y	
10299	X	6.3	M	3	U	12050	–	Y	
10300	X	6.3	M	3	U	12050	–	Y	w/ Flange
10301	X	MFPC	F	8	U	12150	–	L	
10302	O	MFPC	F	10	U	12150	–	L	
10303	O	MFPC	F	12	U	12150	–	L	
10304	X	MFPC	F	10	U	12150	–	L	
10305	X	6.3	M	2	U	12050	–	Y	w/ Clamp
10306	X	6.3 TODC	M	2 2	U	12050 12080	– –	Y L,Y	
10307	X	6.3 TODC	F	2 2	U	12060 12090	12580 –	Y L,Y	
10308	X	MIC	M	5	U	–	–	–	PCB
10309	X	MIC	F	5	U	12120	–	L,Y	
10310	X	MIC	M	7	U	–	–	–	PCB
10311	X	MIC	F	7	U	12120	–	L,Y	
10312	X	TODC	M	6	U	12080	–	L,Y	
10313	X	TODC	F	6	U	12090	–	L,Y	
10314	X	TODC	M	5	U	12080	–	L,Y	
10315	X	MODU	M	26	U	–	–	–	
10316	X	MODU	F	26	U	–	–	–	
10317	X	6.3 TODC	M	1 8	U	12050 12080	– –	Y L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10318	X	6.3	F	1	U	12060	12580	Y	
		TODC		8		12090	–	L,Y	
10319	X	6.3	F	1	U	12060	12580	Y	
		TODC		10		12090	–	L,Y	
10320	X	2.3	F	2	U	12170	–	L	
10321	X	2.3	F	8	U	12170	–	L	
10322	O	2.3	F	10	U	12170	–	L	
10323	X	2.3	M	13	U	12160*	–	L	
10324	X	2.3	F	13	U	12170	–	L	
10325	O	2.3	M	18	U	12160*	–	L	
10326	O	2.3	F	18	U	12170	–	L	
10327	X	2.3	F	20	U	12170	–	L	
10328	X	2.3	F	22	U	12170	–	L	
10329	X	2.3	M	12	U	12160*	–	L	
		6.3		2		12050	–	Y	
10330	X	2.3	F	12	U	12170	–	L	
		6.3		2		12060	12580	Y	
10331	X	2.3	F	14	U	12170	–	L	
		6.3		1		12060	12580	Y	
10332	X	7.7	F	1	U	12040	–	Y	
10333	X	6.3	F	2	U	12060	12580	Y	
10334	X	6.3	F	6	U	12060	12580	Y	
10335	X	6.3	F	6	U	12060	12580	Y	
10336	X	6.3	F	8	U	12060	12580	Y	
10337	X	6.3	F	11	U	12060	12580	Y	
10338	X	6.3	F	11	U	12060	12580	Y	
10339	X	6.3	F	4	U	12060	12580	Y	
		7.7		1		12040	–	Y	
10340	X	6.3	F	2	U	12060	12580	Y	
		7.7		3		12040	–	Y	
10341	X	6.3	F	3	S	12540	–	Y	
10342	X	7.7	M	1	U	12030	–	Y	
10343	X	7.7	F	1	U	12040	–	Y	
10344	X	6.3	M	2	U	12050	–	Y	w/o Clamp
10345	X	6.3	F	2	U	12060	12580	Y	
10346	X	6.3	M	2	U	12050	–	Y	w/ Clamp
10347	O	6.3	M	3	S	12050	–	Y	w/ Clamp
10348	X	6.3	F	2	U	12060	12580	Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 10349	X	PULSE LOCK	M	30	U	82998– –	82998– –	–	PCB
10350	X	PULSE LOCK	F	18	U	12200	–	L,Y	
10351	O	PULSE LOCK	F	12	U	12200	–	L,Y	
10352	X	TODC	F	2	S	–	–	–	
10353	O	TODC	F	3	S	–	–	–	
10354	X	2.3	M	2	U	12160*	–	L	w/o Clamp
10355	O	2.3	F	2	U	12170	–	L	
10356	O	7.7	M	2	U	12030	–	Y	
10357	O	7.7	F	2	U	12040	–	Y	
10358	X	6.3	F	8	U	12060	12580	Y	
10359	O	6.3	F	1	U	12060	12580	Y	
10360	X	2.3	M	8	U	12160*	–	L	
10361	X	2.3	M	20	U	12160*	–	L	
10362	O	SP	F	2	U	12530	–	L,Y	
10363	X	5.2	F	1	U	–	–	–	
10364	X	2.3	M	3	U	12160*	–	L	w/o Clamp
10365	O	2.3	F	3	U	12170	–	L	
10366	O	2.3	M	6	U	12160*	–	L	w/o Clamp
10367	O	2.3	F	6	U	12170	–	L	
10368	X	MFPC	F	14	U	12150	–	L	
10369	O	MFPC	F	14	U	12150	–	L	
10370	X	PULSE LOCK	M	42	U	–	–	–	PCB
10371	O	PULSE LOCK	F	14	U	12210	–	L	
10372	X	MFPC	F	12	U	12150	–	L	
10373	X	7.7 TODC	F	2 2	S	– –	– –	– –	
10374	X	7.7	M	2	S	–	–	–	
10375	X	2.3	M	10	U	12160*	–	L	w/o Flange
10376	X	SP SP	F	5 5	U	12520 12530	– –	L,Y L,Y	
10377	X	SP	F	10	U	12530	–	L,Y	
10378	O	MIC	F	4	U	12120	–	L,Y	
10379	X	TODC	M	9	S	–	–	–	
10380	X	TODC	F	9	S	–	–	–	w/o Clamp
10381	X	TODC	F	9	S	–	–	–	w/ Clamp

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10382	X	6.3	F	4	U	12060	12580	Y	
		7.7		2		12040	–	Y	
10383	X	6.3	M	2	U	–	–	–	w/ Flange
		TODC		6		12080	–	L,Y	
10384	O	2.3	M	6	U	12160*	–	L	w/o Flange
10385	X	7.7	F	2	U	12040	–	Y	
10386	X	6.3	F	9	U	12060	12580	Y	
10392	X	TLC	M	3	S	12280	–	R	
		TODC		2		–	–	–	
10393	X	TLC	F	3	S	12290	–	R	
		TODC		2		–	–	–	
10394	X	TLC	M	3	S	12280	–	R	w/ Clamp
10395	X	TLC	F	3	S	12290	–	R	
10396	X	TLC	M	1	U	12220	–	L	
10397	X	2.3	F	12	U	12170	–	L	
10398	X	TLC	F	1	U	12230	–	L	
10399	O	TLC	M	4	U	12220	–	L	
10400	X	TLC	F	4	U	12230	–	L	
10401	O	TLC	M	6	U	12220	–	L	
10402	O	TLC	F	6	U	12230	–	L	
10403	X	TLC	M	6	U	12220	–	L	
		TODC		2		12080	–	L,Y	
10404	X	TLC	F	6	U	12230	–	L	
		TODC		2		12090	–	L,Y	
10405	X	2.3	M	6	U	12160*	–	L	
		TLC		6		12220	–	L	
10406	X	2.3	F	6	U	12170	–	L	
		TLC		6		12230	–	L	
10407	X	TLC	M	12	U	12220	–	L	
10408	X	TLC	F	12	U	12230	–	L	
10410	X	6.3	M	3	U	12050	–	Y	w/ Clamp
10411	X	6.3	M	2	U	12050	–	Y	w/ Clamp
		TODC		6		12080	–	L,Y	
10412	X	6.3	M	2	S	–	–	–	w/ Clamp
10413	X	2.3	M	18	U	12160*	–	L	
10414	O	2.3	F	6	U	12170	–	L	
10415	X	2.3	M	10	U	12160*	–	L	
		6.3		2		12050	–	Y	
10416	X	2.3	M	6	U	–	–	–	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–10417	X	2.3	M	10	U	82998––	82998––	–	PCB
10418	X	2.3 TODC	M	6 2	U	12160* 12080	– –	L L,Y	
10419	X	2.3 TODC	F	6 2	U	12170 12090	– –	L L,Y	
10420	X	2.3	F	3	U	12170	–	L	
10421	X	2.3 6.3	F	10 2	U	12170 12060	– 12580	L Y	
10422	X	2.3 6.3	M	12 2	U	12160* 12050	– –	L Y	
10423	X	MIC	F	2	U	12120	–	L,Y	
10424	X	6.3	M	2	U	12050	–	Y	
10425	X	6.3	F	2	U	12060	12580	Y	
10426	X	MIC	F	2	U	12120	–	L,Y	
10427	X	2.3	M	10	U	12160*	–	L	w/ Flange
10428	O	HEAD-LAMP	F	3	U	24140	24200	L,Y	
10429	X	PULSE LOCK	M	24	U	–	–	–	PCB
10430	X	TLC	M	8	U	12220	–	L	
10431	X	TLC	F	8	U	12230	–	L	
10432	O	2.3	F	12	U	12170	–	L	
10433	X	2.3	M	1	U	12160*	–	L	w/o Clamp
10434	X	2.3	M	1	U	12160*	–	L	w/ Clamp
10435	X	2.3	F	1	U	12170	–	L	
10436	X	2.3	M	12	U	–	–	–	PCB
10437	O	2.3	M	2	U	12160*	–	L	w/ Clamp
10438	X	2.3	M	1	S	12260*	–	L	
10439	X	2.3	F	1	S	12270*	12600	L	
10440	X	2.3	M	12	U	–	–	–	PCB
10441	X	2.3	M	18	U	–	–	–	PCB
10442	X	1.8 6.3	M	12 3	U	12180 12050	– –	L Y	
10443	X	1.8 6.3	F	12 3	U	12190* 12060	– 12580	L Y	
10444	X	TLC	M	3	S	12280	–	R	w/o Clamp
10445	X	TODC	M	13	U	–	–	–	PCB
10446	X	6.3 7.7	M	4 2	U	12050 12030	– –	Y Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10447	O	6.3	F	4	U	12060	12580	Y	
		7.7		2		12040	–	Y	
10448	X	6.3 II	M	4	U	–	–	–	
10449	X	6.3 II	F	8	U	24170	–	Y	
10450	X	6.3 II	F	11	U	24170	–	Y	
10451	X	6.3	M	7	U	12050	–	Y	
10452	X	6.3	F	7	U	12060	12580	Y	
10453	X	2.3	M	12	U	12160*	–	L	
		6.3		4		12050	–	Y	
10454	X	2.3	F	12	U	12170	–	L	
		6.3		4		12060	12580	Y	
10455	X	TLC	M	22	U	12220	–	L	
10456	X	TLC	F	22	U	12230	–	L	
10457	X	2.3	M	19	U	12160*	–	L	
		6.3		3		12050	–	Y	
10458	X	2.3	F	19	U	12170	–	L	
		6.3		3		12060	12580	Y	
10459	X	TLC	M	7	U	–	–	–	PCB
10460	X	TLC	F	7	U	12230	–	L	
10461	X	TODC	M	15	U	12080	–	L,Y	
10462	X	2.3	M	5	U	12160*	–	L	
		6.3		3		12050	–	Y	
10463	O	2.3	F	5	U	12170	–	L	
		6.3		3		12060	12580	Y	
10464	X	TODC	F	3	U	12090	–	L,Y	
10465	X	2.3	F	2	U	12170	–	L	
10466	X	TNS	M	4	U	12240	–	L	
10467	O	TNS	F	4	U	12250	–	L	
10468	X	TNS	M	10	U	12240	–	L	
10469	X	TNS	F	10	U	12250	–	L	
10470	O	TNS	M	14	U	12240	–	L	
10471	O	TNS	F	14	U	12250	–	L	
10472	X	2.3	M	12	U	12160*	–	L	
		TNS		9		12240	–	L	
10473	X	2.3	F	12	U	12170	–	L	
		TNS		9		12250	–	L	
10474	O	2.3	F	2	S	12270*	12600	L	
10475	O	2.3	M	4	S	12260*	–	L	
10476	O	2.3	F	4	S	12270*	12600	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–10477	X	2.3	M	6	S	82998–12260*	82998– –	L	
10478	X	2.3	F	6	S	12270*	12600	L	
10479	X	2.3 6.3	M	12 1	U	12160* 12050	– –	L Y	
10480	X	2.3 6.3	F	12 1	U	12170 12060	– 12580	L Y	
10481	O	6.3	F	2	U	12060	12580	Y	
10482	X	2.3	F	2	U	12170	–	L	
10483	X	2.3	F	3	U	12170	–	L	
10484	X	2.3	F	4	U	12170	–	L	
10485	X	2.3 TODC	M	10 6	U	12160* 12080	– –	L L,Y	
10486	X	2.3 TODC	F	10 6	U	12170 12090	– –	L L,Y	
10487	O	FTC	F	5	U	12510	–	L,Y	
10488	O	FTC	F	5	U	12510	–	L,Y	
10489	O	FTC	F	3	U	12510	–	L,Y	
10490	O	FTC	F	3	U	12510	–	L,Y	
10491	X	MIC	F	2	U	12120	–	L,Y	
10492	X	2.3	M	3	S	12260*	–	L	w/o Clamp
10493	X	2.3	M	3	S	12260*	–	L	w/ Clamp
10494	X	2.3	F	3	S	12270*	12600	L	
10495	O	2.3	M	2	S	12260*	–	L	
10496	O	2.3	F	2	S	12270*	12600	L	
10497	X	2.3	M	2	S	12260*	–	L	
10498	O	2.3	F	2	S	12270*	12600	L	
10499	X	6.3	M	1	U	12050	–	Y	w/ Clamp
10500	X	2.3	M	3	S	12260*	–	L	
10501	X	2.3	F	3	S	12270*	12600	L	
10502	X	2.3	M	4	U	12160*	–	L	
10503	X	2.3	M	4	U	12160*	–	L	
10504	O	2.3	F	4	U	12170	–	L	
10505	X	2.3	M	6	U	12160*	–	L	w/ Clamp
10506	X	2.3	M	14	U	–	–	–	PCB
10507	X	2.3	F	14	U	12170	–	L	
10508	X	2.3	M	20	U	–	–	–	PCB
10509	X	TODC	F	5	U	12090	–	L,Y	
10510	X	TNS	M	4	S	–	–	–	w/o Clamp
10511	X	TNS	F	2	U	12250	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–10512	X	TNS	F	2	U	82998–12250	82998– –	L	
10513	O	2.3	M	12	U	12160*	–	L	
10514	X	2.3 6.3	F	2 2	U	12170 12060	– 12580	L Y	
10515	X	2.3	F	4	U	12170	–	L	
10516	X	2.3	M	10	U	–	–	–	PCB
10517	X	2.3 6.3 7.7	F	4 2 2	U	12170 12060 12040	– 12580 –	L Y Y	
10518	X	2.3 6.3	M	4 1	U	12160* 12050	– –	L Y	
10519	X	2.3 6.3	M	4 1	U	12160* 12050	– –	L Y	
10520	X	2.3 6.3	F	4 1	U	12170 12060	– 12580	L Y	
10521	X	2.3 7.7	M	15 1	U	12160* 12030	– –	L Y	
10522	X	2.3 7.7	F	15 1	U	12170 12040	– –	L Y	
10523	X	TNS	F	8	U	12250	–	L	
10524	X	TNS	F	12	U	12250	–	L	
10525	X	TNS	F	16	U	12250	–	L	
10526	O	TNS	F	22	U	12250	–	L	
10527	X	TLC	M	10	U	–	–	–	PCB
10528	O	TLC	F	10	U	12230	–	L	
10529	X	TLC	M	12	U	–	–	–	PCB
10530	X	2.3 6.3	F	17 1	U	12170 12060	– 12580	L Y	
10531	X	2.3	M	11	U	12160*	–	L	
10532	O	2.3	F	2	S	12270*	12600	L	
10533	X	2.3	M	2	S	12260*	–	L	
10534	X	2.3	F	2	S	12270*	12600	L	
10535	X	2.3	M	3	U	–	–	–	PCB
10536	X	2.3 6.3	F	8 1	U	12170 12060	– 12580	L Y	
10537	X	2.3 6.3	F	10 1	U	12170 12060	– 12580	L Y	
10538	X	2.3	F	14	U	12170	–	L	
10539	X	2.3	F	16	U	12170	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10542	X	2.3	M	16	U	12160*	–	L	
10543	X	2.3	F	16	U	12170	–	L	
10544	X	2.3	M	3	U	12160*	–	L	
10545	X	2.3	M	12	U	12160*	–	L	
		6.3		2		12050	–	Y	
10546	X	TLC	M	8	U	12220	–	L	
10547	X	2.3	M	12	S	12260*	–	L	
		6.3		2		–	–	–	
		7.7		2		–	–	–	
10548	X	2.3	F	12	S	12270*	12600	L	
10549	X	6.3	F	2	S	–	–	–	
		7.7		2		–	–	–	
10550	X	2.3	F	3	S	12270*	12600	L	
		6.3		2		–	–	–	
10551	X	6.3	F	4	S	–	–	–	
10552	O	TNS	M	22	U	12240	–	L	
10553	X	TLC	M	3	S	12280	–	R	w/ Clamp
10554	O	TLC	F	3	S	12290	–	R	
10555	X	2.3	M	2	S	12260*	–	L	
10556	X	2.3	F	2	S	12270*	12600	L	
10557	X	TLC	M	5	S	12280	–	R	w/ Clamp
10558	X	TLC	F	5	S	12290	–	R	
10559	X	7.7	F	2	U	12040	–	Y	
10560	X	2.3	M	16	U	12160*	–	L	
10561	X	2.3	F	16	U	12170	–	L	
10562	X	2.3	M	12	U	12160*	–	L	
		6.3		2		12050	–	Y	
		7.7		1		12030	–	Y	
10563	X	2.3	F	12	U	12170	–	L	
		6.3		2		12060	12580	Y	
		7.7		1		12040	–	Y	
10564	X	1.8	M	12	U	12180	–	L	
10565	X	1.8	F	12	U	12190*	–	L	
10566	X	6.3	M	2	S	–	–	–	
10567	X	6.3	F	2	S	12540	–	Y	
10568	X	TODC	M	12	S	–	–	–	
10569	X	TODC	F	12	S	–	–	–	
10570	X	TLC	M	5	S	12280	–	R	w/o Clamp
10571	X	2.3	M	2	S	12260*	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 10572	O	2.3	F	2	S	82998– 12270*	82998– 12600	L	
10573	O	2.3	M	3	U	12160*	–	L	w/ Clamp
10574	X	HEAD-LAMP	F	3	S	24150	24190	L,Y	
10575	O	2.3	M	2	S	12260*	–	L	
10576	X	2.3	F	2	S	12270*	12600	L	
10577	O	TLC	M	3	S	12280	–	R	w/ Clamp
10578	X	2.3	F	2	S	12270*	12600	L	
10579	X	HEAD-LAMP	F	3	S	24150	24190	L,Y	
10580	O	2.3	M	2	S	12260*	–	L	
10581	X	2.3	F	2	S	12270*	12600	L	
10582	X	2.3	M	2	S	12260*	–	L	
10583	X	2.3	F	2	S	12270*	12600	L	
10584	X	TNS	M	38	U	–	–	–	PCB
10585	X	TNS	F	24	U	12250	–	L	
10586	X	TNS	M	26	U	–	–	–	PCB
10587	O	TNS	F	26	U	12250	–	L	
10588	X	TNS	M	20	U	–	–	–	PCB
10589	X	TNS	F	20	U	12250	–	L	
10590	O	2.3	M	4	S	12260*	–	L	
10591	X	2.3	F	4	S	12270*	12600	L	
10592	O	2.3	M	2	S	12260*	–	L	
10593	X	2.3	F	2	S	12270*	12600	L	
10594	X	2.3	M	2	S	12260*	–	L	
10595	X	2.3	F	2	S	12270*	12600	L	
10596	X	2.3	M	6	S	12260*	–	L	
10597	X	2.3	F	6	S	12270*	12600	L	
10598	O	2.3	F	2	S	12270*	12600	L	
10599	O	TNS	M	26	U	12240	–	L	
10600	X	2.3	M	4	U	12160*	–	L	
10601	O	2.3	F	4	U	12170	–	L	
10602	X	2.3	M	6	U	12160*	–	L	
10603	X	2.3	M	6	U	12160*	–	L	
10604	X	2.3	F	6	U	12170	–	L	
10605	X	2.3	F	6	U	12170	–	L	
10606	X	1.8	M	34	U	12180	–	L	
10607	X	1.8	F	20	U	12190*	–	L	
10608	X	1.8	F	14	U	12190*	–	L	
10609	O	2.3	F	2	S	12270*	12600	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10610	X	2.3	F	1	U	12170	–	L	
		TNS		4		12250	–	L	
10611	X	2.3	F	8	U	12170	–	L	
		TNS		8		12250	–	L	
10612	X	2.3	F	10	U	12170	–	L	
		TNS		10		12250	–	L	
10613	X	TNS	F	16	U	12250	–	L	
10614	X	TNS	F	16	U	12250	–	L	
10615	X	TODC	M	7	U	–	–	–	PCB
10616	X	6.3	F	4	S	12540	–	Y	
10617	X	2.3	F	2	S	12270*	12600	L	
10618	X	6.3	F	2	U	12060	12580	Y	
		7.7		1		12040	–	Y	
10619	O	6.3	F	1	U	12060	12580	Y	
10620	X	TLC	M	2	U	12220	–	L	
10621	X	TLC	F	2	U	12230	–	L	
10622	X	2.3	F	2	S	12270*	12600	L	
10623	X	2.3	F	2	S	12270*	12600	L	
10624	X	2.3	F	5	S	12270*	12600	L	
10625	X	2.3	M	2	S	12260*	–	L	w/ Clamp
10626	X	2.3	F	2	S	12270*	12600	L	
10627	X	TLC	M	7	S	12280	–	R	
10628	X	TLC	F	7	S	12290	–	R	
10629	X	2.3	F	3	S	12270*	12600	L	
10630	X	2.3	M	18	U	–	–	–	PCB
10631	X	2.3	F	5	U	12170	–	L	
10632	X	2.3	F	12	U	12170	–	L	
10633	X	TLC	F	14	U	12230	–	L	
10634	X	TLC	F	14	U	12230	–	L	
10635	X	TLC	F	16	U	12230	–	L	
10636	X	TLC	F	16	U	12230	–	L	
10637	X	2.3	F	2	U	12170	–	L	
10638	X	2.3	F	3	U	12170	–	L	
10639	X	2.3	M	20	U	12160*	–	L	
10640	X	2.3	F	20	U	12170	–	L	
10641	X	2.3	M	6	U	12160*	–	L	w/ Flange
10642	X	2.3	M	5	S	–	–	–	PCB
10643	X	2.3	F	6	S	12270*	12600	L	
10644	X	2.3	F	5	U	12170	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–10645	O	MFPC	F	4	U	82998–12150	82998–––	L	
10646	X	6.3	M	4	S	–	–	–	
10647	X	6.3	M	5	S	–	–	–	w/ Clamp
10648	O	2.3	M	4	S	12260*	–	L	
10649	X	2.3	F	4	S	12270*	12600	L	
10650	O	2.3	M	6	S	12260*	–	L	w/ Clamp
10651	X	2.3	F	6	S	12270*	12600	L	
10652	X	7.7	F	1	U	12040	–	Y	
10653	X	1.8	M	13	S	–	–	–	
10654	X	1.8	F	13	S	12620	–	L	
10655	X	1.8	M	18	U	–	–	–	PCB
10656	X	1.8	F	18	U	12190*	–	L	
10657	X	1.8	M	30	U	–	–	–	PCB
10658	O	1.8	F	12	U	12190*	–	L	
10659	X	FTC	F	5	U	12510	–	L,Y	
10660	X	2.3	F	3	U	12170	–	L	
10661	X	TNS	M	14	U	–	–	–	PCB
10662	X	TNS	M	4	S	–	–	–	
10663	X	TNS	F	4	S	–	–	–	Outer
10664	X	TNS	F	4	S	–	–	–	Inner
10665	X	2.3	M	2	S	12260*	–	L	
10666	X	2.3	M	10	U	–	–	–	PCB
10667	X	2.3	M	10	U	–	–	–	PCB
10668	X	2.3	M	10	U	–	–	–	PCB
10669	O	2.3	F	10	U	12170	–	L	
10670	X	2.3	M	6	U	–	–	–	PCB
10671	X	2.3	M	6	U	–	–	–	PCB
10672	O	2.3	F	6	U	12170	–	L	
10673	X	6.3 7.7	F	4 2	U	12060 12040	12580 –	Y Y	
10674	X	2.3 6.3	M	18 1	U	12160* 12050	– –	L Y	
10675	X	2.3 6.3	F	18 1	U	12170 12060	– 12580	L Y	
10676	X	TLC	M	7	S	12280	–	R	
10677	X	TLC	M	9	S	12280	–	R	
10678	X	TLC	F	9	S	12290	–	R	
10679	O	2.3	F	2	U	12170	–	L	
10680	X	TLC	M	10	U	–	–	–	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–10681	X	TNS	M	20	U	82998––	82998––	–	PCB
10682	X	TNS	M	3	S	–	–	–	
10683	X	TNS	F	3	S	–	–	–	
10684	X	TNS	F	3	S	–	–	–	
10685	X	2.3 6.3	F	2 2	S	12270* 12540	12600 –	L Y	
10686	O	2.3 6.3	F	7 2	S	12270* 12540	12600 –	L Y	
10687	X	2.3	M	2	U	12160*	–	L	
10688	X	5.2	F	1	U	–	–	–	
10689	X	2.3	M	3	S	12260*	–	L	
10690	X	2.3	F	3	S	12270*	12600	L	
10691	X	TNS	M	4	U	–	–	–	PCB
10692	X	TNS	F	4	U	12250	–	L	
10693	X	2.3	M	10	U	12160*	–	L	
10694	X	2.3	M	6	U	12160*	–	L	
10695	X	2.3	F	3	S	12270*	12600	L	
10696	O	1.8	F	20	U	12190*	–	L	
10697	O	1.8	F	14	U	12190*	–	L	
10698	X	TLC	M	3	S	12280	–	R	
10699	X	TLC	M	10	U	–	–	–	PCB
10700	X	6.3	M	2	U	12050	–	Y	
10701	X	6.3	F	4	S	12540	–	Y	
10702	O	2.3	F	2	S	12270*	12600	L	
10703	X	6.3	F	1	U	12060	12580	Y	
10704	X	6.3	F	3	U	12060	12580	Y	
10705	X	6.3	F	1	S	–	–	–	
10706	O	2.3	F	2	S	12270*	12600	L	
10707	X	2.3	M	2	S	12260*	–	L	
10708	X	6.3	F	3	S	–	–	–	
10709	X	2.3 TLC	M	2 3	S	12260* 12280	– –	L R	
10710	X	2.3 TLC	F	2 3	S	12270* 12290	12600 –	L R	
10711	O	1.8	F	4	S	12620	–	L	
10712	X	2.3	F	5	S	12270*	12600	L	
10713	X	6.3 7.7	F	3 2	U	12060 12040	12580 –	Y Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10714	X	2.3 6.3	F	9 3	U	12170 12060	– 12580	L Y	
10715	X	2.3	M	14	U	12160*	–	L	
10716	X	2.3	F	4	U	12170	–	L	
10717	X	2.3	F	4	U	12170	–	L	
10718	X	6.3	F	5	U	12060	12580	Y	
10719	O	TLC	M	10	U	12220	–	L	
10720	O	2.3	F	2	S	12270*	12600	L	
10721	X	2.3	F	10	U	12170	–	L	
10722	X	1.8	M	34	U	12180	–	L	
10723	X	2.3	F	11	U	12170	–	L	
10724	X	2.3	F	12	U	12170	–	L	
10725	X	2.3	F	12	U	12170	–	L	
10726	X	PULSE LOCK	M	30	U	–	–	–	PCB
10727	X	2.3 6.3	F	9 2	U	12170 12060	– 12580	L Y	
10728	X	2.3 6.3	M	5 2	U	– –	– –	– –	PCB
10729	X	2.3 6.3	F	5 2	U	12170 12060	– 12580	L Y	
10730	X	2.3	M	17	U	12160*	–	L	
10731	X	2.3	F	17	U	12170	–	L	
10732	X	TNS	M	14	U	–	–	–	PCB
10733	X	TNS	M	20	U	–	–	–	PCB
10734	X	1.8	F	2	S	12620	–	L	
10735	X	1.8	F	2	S	12620	–	L	
10736	X	1.8	F	2	S	12620	–	L	
10737	O	1.8	F	2	S	12620	–	L	
10738	X	1.8 1.0	M	16 48	U	– –	– –	– –	PCB
10739	X	1.8 1.0	F	10 16	U	12190* 12310*	– –	L L	
10740	X	1.0	F	16	U	12310*	–	L	
10741	X	1.8 1.0	F	6 16	U	12190* 12310*	– –	L L	
10742	X	1.8	M	42	U	–	–	–	PCB
10743	O	1.8	F	12	U	12190*	–	L	
10744	X	2.3	M	16	U	–	–	–	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–10745	X	2.3	M	6	U	82998––	82998––	–	PCB
10747	X	8.0	F	3	U	12400	–	Y	
10748	X	2.3	F	2	S	12270*	12600	L	
10749	O	4.8 2.3 II	M	2 2	S	12470 12430*	– –	Y L,Y	
10750	X	TNS	M	26	U	12240	–	L	
10751	X	2.3	M	4	S	12260*	–	L	w/ Clamp
10752	X	1.8	M	30	U	–	–	–	PCB
10753	X	2.3	M	16	U	–	–	–	PCB
10758	X	6.3	M	4	U	12050	–	Y	w/ Clamp
10759	X	6.3 7.7	F	2 2	U	12060 12040	12580 –	Y Y	
10760	X	5.2 6.3	F	1 1	U	– 12060	– 12580	– Y	
10761	X	1.8 1.0	M	16 48	U	– –	– –	– –	PCB
10762	X	2.3	M	5	U	12160*	–	L	
10763	O	1.8 1.0	F	10 16	U	12190* 12310*	– –	L L	
10764	O	1.0	F	16	U	12310*	–	L	
10765	O	1.8 1.0	F	6 16	U	12190* 12310*	– –	L L	
10766	X	6.3 7.7	F	4 2	U	12060 12040	12580 –	Y Y	
10767	X	2.3 II	M	14	U	–	–	–	PCB
10768	X	2.3	M	4	S	12260*	–	L	w/o Clamp
10769	X	2.3	M	8	U	–	–	–	PCB
10770	X	PULSE LOCK	M	24	U	–	–	–	PCB
10771	X	2.3 6.3	M	5 2	U	– –	– –	– –	PCB
10772	X	2.3 6.3	F	5 2	U	12170 12060	– 12580	L Y	
10773	X	1.8 1.0	M	16 48	U	– –	– –	– –	PCB
10774	X	2.3	M	3	S	12260*	–	L	w/ Clamp
10775	X	TODC	M	9	S	–	–	–	
10776	X	TODC	F	9	S	–	–	–	
10777	X	TLC	M	3	S	12280	–	R	w/ Clamp

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
		2.3		2	S	12270*	12600	L	
10778	X	2.3	F	15	U	12170	–	L	
		6.3		1		12060	12580	Y	
10779	X	TNS	M	24	U	12240	–	L	
10780	X	1.8	M	16	U	–	–	–	PCB
		1.0		48		–	–	–	
10781	X	MIC	F	11	U	12120	–	L,Y	
10782	X	7.7	F	1	U	12040	–	Y	
10783	X	7.7	F	2	U	12040	–	Y	
10784	X	6.3	F	2	U	12060	12580	Y	
		7.7		1		12040	–	Y	
10785	X	2.3	F	6	U	12170	–	L	
10786	O	6.3	F	1	U	12070	–	Y	
10787	X	2.3	M	3	S	12260*	–	L	w/ Clamp
10788	X	2.3	M	2	S	12260*	–	L	w/ Clamp
10789	O	2.3 II	F	5	U	12340*	–	L,Y	
10790	X	2.3 II	M	5	U	–	–	–	PCB
10791	X	2.3	M	2	U	12160*	–	L	
		6.3		2		12050	–	Y	
10792	O	6.3	F	1	U	12060	12580	Y	
10793	X	2.3 II	M	6	U	–	–	–	PCB
10794	O	2.3 II	M	4	U	12330*	–	L,Y	
10795	O	2.3 II	F	4	U	12340*	–	L,Y	
10796	O	2.3 II	M	6	U	12330*	–	L,Y	
10797	O	2.3 II	F	6	U	12340*	–	L,Y	
10798	O	2.3 II	M	8	U	12330*	–	L,Y	
10799	O	2.3 II	F	8	U	12340*	–	L,Y	
10800	O	2.3 II	M	10	U	12330*	–	L,Y	
10801	O	2.3 II	F	10	U	12340*	–	L,Y	
10802	O	2.3 II	M	12	U	12330*	–	L,Y	
10803	O	2.3 II	F	12	U	12340*	–	L,Y	
10804	O	2.3 II	M	13	U	12330*	–	L,Y	
10805	O	2.3 II	F	13	U	12340*	–	L,Y	
10806	O	2.3 II	M	14	U	12330*	–	L,Y	
10807	O	2.3 II	F	14	U	12340*	–	L,Y	
10808	O	2.3 II	M	16	U	12330*	–	L,Y	
10809	O	2.3 II	F	16	U	12340*	–	L,Y	
10810	O	2.3 II	M	20	U	12330*	–	L,Y	
10811	O	2.3 II	F	20	U	12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10812	O	4.8	M	2	U	12370	–	Y	
		2.3 II		12		12330*	–	L,Y	
10813	O	4.8	F	2	U	12380	–	Y	
		2.3 II		12		12340*	–	L,Y	
10814	O	4.8	M	3	U	12370	–	Y	
		2.3 II		12		12330*	–	L,Y	
10815	O	4.8	F	3	U	12380	–	Y	
		2.3 II		12		12340*	–	L,Y	
10816	O	4.8	M	2	U	12370	–	Y	
		2.3 II		18		12330*	–	L,Y	
10817	O	4.8	F	2	U	12380	–	Y	
		2.3 II		18		12340*	–	L,Y	
10818	O	2.3 II	M	18	U	12330*	–	L,Y	
10819	O	2.3 II	F	18	U	12340*	–	L,Y	
10820	O	2.3 II	M	20	U	12330*	–	L,Y	
10821	O	2.3 II	F	20	U	12340*	–	L,Y	
10822	O	2.3 II	F	10	U	12340*	–	L,Y	
10823	O	2.3 II	F	2	U	12340*	–	L,Y	
10824	O	2.3 II	M	2	U	12330*	–	L,Y	
10825	O	2.3 II	F	2	U	12340*	–	L,Y	
10826	X	TLC	M	9	S	12280	–	R	
10827	O	2.3 II	M	15	U	12330*	–	L,Y	
10828	O	2.3 II	F	15	U	12340*	–	L,Y	
10829	O	2.3 II	M	11	U	12330*	–	L,Y	
10830	O	2.3 II	F	11	U	12340*	–	L,Y	
10831	X	2.3	F	4	S	12270*	12600	L	
10833	O	2.3 II	M	2	U	12330*	–	L,Y	w/ Clamp
10834	O	2.3 II	F	3	S	12440*	12590	L,Y	
10835	O	2.3 II	F	2	U	12340*	–	L,Y	
10836	O	8.0	M	1	S	12490	–	Y	
10837	O	8.0	F	1	S	12500	–	Y	
10838	O	8.0	M	2	S	12490	–	Y	
10839	O	8.0	F	2	S	12500	–	Y	
10840	O	4.8	M	3	S	12470	–	Y	
10841	O	4.8	F	3	S	12480	–	Y	
10842	O	2.3 II	M	2	S	12430*	–	L,Y	
10843	O	2.3 II	F	2	S	12440*	12590	L,Y	
10844	O	4.8	F	2	S	12480	–	Y	
		2.3 II		2		12440*	12590	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10845	O	2.3 II	F	3	S	12440*	12590	L,Y	
10846	X	2.3	F	2	S	12270*	12600	L	
10847	X	2.3	F	2	S	12270*	12600	L	
10848	O	2.3 II	F	16	U	12340*	–	L,Y	
10849	X	2.3 II	M	2	U	12330*	–	L,Y	
10850	O	2.3 II	F	2	U	12340*	–	L,Y	
10851	X	2.3 II	M	14	U	–	–	–	PCB
10852	O	2.3 II	F	14	U	12340*	–	L,Y	
10853	X	2.3 II	F	2	S	12440*	12590	L,Y	
10854	O	2.3 II	F	6	S	12440*	12590	L,Y	
10855	O	2.3 II	F	2	U	12340*	–	L,Y	
10856	O	2.3 II	M	18	U	12330*	–	L,Y	
		8.0		1		12390	–	Y	
10857	O	2.3 II	F	18	U	12340*	–	L,Y	
		8.0		1		12400	–	Y	
10858	O	2.3 II	M	4	U	12330*	–	L,Y	
10859	O	2.3 II	M	2	U	12330*	–	L,Y	
10860	O	2.3 II	F	2	U	12340*	–	L,Y	
10861	O	4.8	M	10	U	12370	–	Y	
10862	O	4.8	F	10	U	12380	–	Y	
10863	X	2.3 II	M	18	U	–	–	–	PCB
10864	O	2.3 II	M	12	U	–	–	–	PCB
10865	X	2.3 II	M	10	U	–	–	–	PCB
10866	O	8.0	M	4	U	12390	–	Y	
10867	O	8.0	F	4	U	12400	–	Y	
10868	O	2.3 II	M	4	S	12430*	–	L,Y	
10869	O	2.3 II	F	4	S	12440*	12590	L,Y	
10870	O	2.3 II	M	1	U	12330*	–	L,Y	w/o Clamp
10871	O	2.3 II	F	1	U	12340*	–	L,Y	
10872	O	4.8	M	7	U	12370	–	Y	
		2.3 II		4		12330*	–	L,Y	
10873	O	4.8	F	7	U	12380	–	Y	
		2.3 II		4		12340*	–	L,Y	
10874	O	2.3 II	M	16	U	–	–	–	PCB
10875	O	2.3 II	F	22	U	12340*	–	L,Y	
10876	O	4.8	M	3	U	12370	–	Y	
		2.3 II		5		12330*	–	L,Y	
10877	O	4.8	F	3	U	12380	–	Y	
		2.3 II		5		12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10878	O	4.8	M	2	U	12370	–	Y	
		2.3 II		10		12330*	–	L,Y	
10879	O	4.8	F	2	U	12380	–	Y	
		2.3 II		10		12340*	–	L,Y	
10880	O	4.8	M	4	U	12370	–	Y	
		2.3 II		20		12330*	–	L,Y	
10881	O	4.8	F	4	U	12380	–	Y	
		2.3 II		20		12340*	–	L,Y	
10882	O	4.8	M	1	U	12370	–	Y	
		2.3 II		18		12330*	–	L,Y	
10883	O	4.8	F	1	U	12380	–	Y	
		2.3 II		18		12340*	–	L,Y	
10884	O	4.8	M	4	U	12370	–	Y	
		2.3 II		12		12330*	–	L,Y	
10885	O	4.8	F	4	U	12380	–	Y	
		2.3 II		12		12340*	–	L,Y	
10886	O	2.3 II	M	2	S	12430*	–	L,Y	
10887	O	2.3 II	F	2	S	12440*	12590	L,Y	
10888	O	4.8	F	2	U	12380	–	Y	
		8.0		3		12400	–	Y	
10889	O	4.8	F	4	U	12380	–	Y	
		8.0		2		12400	–	Y	
10890	O	2.3 II	M	8	S	12430*	–	L,Y	
10891	O	2.3 II	F	8	S	12440*	12590	L,Y	
10892	O	2.3 II	M	1	S	12430*	–	L,Y	
10893	O	2.3 II	F	1	S	12440*	12590	L,Y	
10894	O	4.8	M	2	S	12470	–	Y	
		2.3 II		6		12430*	–	L,Y	
10895	O	4.8	F	2	S	12480	–	Y	
		2.3 II		6		12440*	12590	L,Y	
10896	O	2.3 II	M	8	S	12430*	–	L,Y	
10897	O	2.3 II	F	8	S	12440*	12590	L,Y	
10898	O	2.3 II	M	2	S	12430*	–	L,Y	
10899	O	2.3 II	F	2	S	12440*	12590	L,Y	
10900	O	2.3 II	M	2	S	12430*	–	L,Y	
10901	O	2.3 II	F	2	S	12440*	12590	L,Y	
10902	O	2.3 II	F	3	S	12440*	12590	L,Y	
10903	O	8.0	F	2	U	12400	–	Y	
10904	O	2.3 II	F	4	U	12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10905	O	2.3 II	M	2	U	12330*	–	L,Y	
10906	O	2.3 II	F	2	U	12340*	–	L,Y	
10907	O	2.3 II	M	3	U	12330*	–	L,Y	
10908	O	2.3 II	F	3	U	12340*	–	L,Y	
10909	O	2.3 II 8.0	M	4 2	U	12330* 12390	– –	L,Y Y	
10910	O	2.3 II 8.0	F	4 2	U	12340* 12400	– –	L,Y Y	
10911	O	4.8	F	1	U	12380	–	Y	
10912	O	4.8	F	1	U	12380	–	Y	
10913	X	6.3	F	1	U	12060	12580	Y	
10914	X	6.3	F	1	U	12060	12580	Y	
10915	O	4.8	M	2	U	12370	–	Y	
10916	O	4.8	F	2	U	12380	–	Y	
10917	X	1.8 1.0	M	8 18	U	– –	– –	– –	PCB
10918	X	1.8 1.0	F	8 18	U	12190* 12310*	– –	L L	
10919	O	2.3 II	F	3	S	12440*	12590	L,Y	
10920	O	1.3 2.3 II	M	19 4	U	12410 12330*	– –	L L,Y	
10921	O	1.3 2.3 II	F	19 4	U	12420 12340*	– –	L L,Y	
10923	O	2.3 II	F	2	S	12440*	12590	L,Y	
10924	X	1.8 1.0	M	16 10	U	– –	– –	– –	PCB
10925	O	1.8 1.0	F	10 16	U	12190* 12310*	– –	L L	
10926	O	4.8	F	8	U	12380	–	Y	
10927	O	4.8	M	2	S	12470	–	Y	
10928	O	4.8	F	2	S	12480	–	Y	
10929	X	1.8	F	4	S	12620	–	L	
10930	O	2.3 II	M	7	S	12430*	–	L,Y	
10931	O	2.3 II	F	7	S	12440*	12590	L,Y	
10932	O	4.8 2.3 II	F	2 10	U	12380 12340*	– –	Y L,Y	
10933	O	2.3 II	F	6	U	12340*	–	L,Y	
10934	O	2.3 II	M	2	U	12330*	–	L,Y	
10935	O	2.3 II	F	2	U	12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10936	X	2.3 II	M	20	U	–	–	–	PCB
10937	X	2.3 II	M	18	U	–	–	–	PCB
10938	X	2.3 II	M	12	U	–	–	–	PCB
10939	O	4.8 2.3 II	F	2 4	S	12480 12440*	– 12590	Y L,Y	
10940	O	4.8 2.3 II	F	2 2	S	12480 12440*	– 12590	Y L,Y	
10941	O	2.3 II	M	4	S	12430*	–	L,Y	
10942	O	2.3 II	F	4	S	12440*	12590	L,Y	
10943	O	2.3 II	F	4	S	12440*	12590	L,Y	
10944	O	4.8	M	3	S	12470	–	Y	
10945	O	4.8 2.3 II	M	2 3	S	12470 12430*	– –	Y L,Y	
10946	O	4.8 2.3 II	F	2 3	S	12480 12440*	– 12590	Y L,Y	
10947	O	2.3 II	F	2	S	12440*	12590	L,Y	
10948	O	2.3 II	M	2	S	12430*	–	L,Y	
10949	O	2.3 II	F	2	S	12440*	12590	L,Y	
10950	X	2.3 II	F	88	U	12340*	–	L,Y	
10951	X	2.3 II	M	52	U	12330*	–	L,Y	
10952	X	4.8 8.0	F	12 8	U	12380 12400	– –	Y Y	
10953	X	4.8 8.0	F	18 4	U	12380 12400	– –	Y Y	
10954	X	4.8 8.0	M	18 6	U	12370 12390	– –	Y Y	
10955	X	4.8 8.0	F	18 6	U	12380 12400	– –	Y Y	
10956	O	8.0	F	3	U	12400	–	Y	
10957	O	2.3 II	F	6	U	12340*	–	L,Y	
10958	O	8.0	M	2	U	12390	–	Y	
10959	O	2.3 II	M	2	S	12430*	–	L,Y	
10960	X	MIR-ROR	F	2	U	–	–	–	
10961	X	2.3 II	M	10	U	–	–	–	PCB
10962	O	2.3 II	F	2	U	12340*	–	L,Y	
10963	O	4.8	M	8	U	12370	–	Y	
10964	O	2.3 II	F	6	U	12340*	–	L,Y	
10965	O	2.3 II	F	10	U	12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
10966	O	2.3 II	F	11	U	12340*	–	L,Y	
10967	O	2.3 II	F	12	U	12340*	–	L,Y	
10968	O	2.3 II	F	12	U	12340*	–	L,Y	
10969	X	1.8 1.0	M	10 32	U	– –	– –	– –	PCB
10970	X	7.7	M	2	S	–	–	–	
10971	X	2.3 II	M	14	U	–	–	–	PCB
10972	X	1.8 1.0	M	22 32	U	– –	– –	– –	PCB
10973	O	1.8	F	12	U	12190*	–	L	
10974	O	2.3 II	F	2	S	12440*	12590	L,Y	
10975	O	4.8	M	6	U	12370	–	Y	
10976	O	4.8	F	6	U	12380	–	Y	
10977	O	2.3 II	M	22	U	12330*	–	L,Y	
10978	O	1.8 1.0	M	16 10	U	– –	– –	– –	PCB
10979	X	4.8	M	3	U	12370	–	Y	
10980	O	4.8	F	3	U	12380	–	Y	
10981	O	2.3 II	F	3	S	12440*	12590	L,Y	
10982	O	4.8	M	1	S	12470	–	Y	
10983	O	4.8	F	1	S	12480	–	Y	
10984	X	2.3	M	6	S	12260*	–	L	w/o Clamp
10985	O	4.8 2.3 II	M	1 4	U	12370 12330*	– –	Y L,Y	
10986	O	4.8 2.3 II	F	1 4	U	12380 12340*	– –	Y L,Y	
10987	O	2.3 II	M	6	S	12430*	–	L,Y	
10988	O	2.3 II	F	6	S	12440*	12590	L,Y	
10989	O	4.8	M	4	S	12470	–	Y	
10990	O	4.8	F	4	S	12480	–	Y	
10991	X	1.8 1.0	M	18 16	U	– –	– –	– –	PCB
10992	X	4.8 2.3 II	M	4 6	U	– –	– –	– –	PCB
10993	O	4.8 2.3 II	F	4 6	U	12380 12340*	– –	Y L,Y	
10994	O	8.0	M	1	U	12390	–	Y	
10995	O	8.0	F	1	U	12400	–	Y	
10996	O	2.3 II	F	6	U	12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 10997	O	2.3 II	F	10	U	82998– 12340*	82998– –	L,Y	
10998	O	2.3 II	M	6	U	12330*	–	L,Y	
11001	O	2.3 II	F	6	U	12340*	–	L,Y	
11002	O	2.3 II	M	2	S	12430*	–	L,Y	
11003	O	2.3 II	F	2	S	12440*	12590	L,Y	
11004	O	2.3 II	M	2	S	12430*	–	L,Y	
11005	O	2.3 II	F	2	S	12440*	12590	L,Y	
11006	O	2.3 II	M	1	S	12430*	–	L,Y	
11007	O	2.3 II	F	1	S	12440*	12590	L,Y	
11008	O	2.3 II	M	2	S	12430*	–	L,Y	
11009	O	2.3 II	F	2	S	12440*	12590	L,Y	
11010	O	2.3 II	M	6	U	12330*	–	L,Y	
11011	O	2.3 II	F	6	U	12340*	–	L,Y	
11012	O	2.3 II	M	4	U	12330*	–	L,Y	
11013	O	2.3 II	F	4	U	12340*	–	L,Y	
11014	X	6.3	M	2	U	12050	–	Y	
11015	O	2.3 II	M	3	S	12430*	–	L,Y	
11016	O	2.3 II	F	3	S	12440*	12590	L,Y	
11017	X	1.8	M	18	U	–	–	–	PCB
11018	X	1.8	M	42	U	–	–	–	PCB
11019	O	2.3 II	F	2	S	12440*	12590	L,Y	
11020	O	2.3 II	F	3	S	12440*	12590	L,Y	
11021	O	4.8 2.3 II	M	2 3	S	12470 12430*	– –	Y L,Y	
11022	O	4.8 2.3 II	F	2 3	S	12480 12440*	– 12590	Y L,Y	
11023	O	2.3 II	M	4	U	12330*	–	L,Y	
11024	O	2.3 II	F	5	S	12440*	12590	L,Y	
11025	O	2.3 II	F	2	S	12440*	12590	L,Y	
11026	O	2.3 II	M	1	U	12330*	–	L,Y	w/ Clamp
11027	O	2.3 II	M	4	S	12430*	–	L,Y	
11028	O	2.3 II	F	4	S	12440*	12590	L,Y	
11029	O	2.3 II	M	2	S	12430*	–	L,Y	
11030	O	2.3 II	F	2	S	12440*	12590	L,Y	
11031	O	8.0	M	2	S	12490	–	Y	
11032	O	8.0	F	2	S	12500	–	Y	
11033	O	2.3 II	M	6	S	12430*	–	L,Y	
11034	O	2.3 II	F	6	S	12440*	12590	L,Y	
11035	O	4.8	M	4	S	12470	–	Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11036	O	4.8	F	4	S	82998– 12480	82998– –	Y	
11037	O	2.3 II	F	4	S	12440*	12590	L,Y	
11038	O	2.3 II	F	2	S	12440*	12590	L,Y	
11039	X	1.8 1.0	M	16 18	U	– –	– –	– –	PCB
11040	X	1.3 2.3 II	M	47 4	U	– –	– –	– –	PCB
11041	O	1.3	F	11	U	12420	–	L	
11042	O	1.3 2.3 II	F	11 4	U	12420 12340*	– –	L L,Y	
11043	O	1.3	F	25	U	12420	–	L	
11044	O	4.8 8.0	M	2 1	S	12470 12490	– –	Y Y	
11045	O	4.8 8.0	F	2 1	S	12480 12500	– –	Y Y	
11046	X	2.3 II	M	17	U	12330*	–	L,Y	
11049	O	2.3 II	F	5	S	12440*	12590	L,Y	
11050	O	2.3 II	M	2	S	12430*	–	L,Y	
11051	O	2.3 II	F	2	S	12440*	12590	L,Y	
11052	O	1.3	M	3	U	12410	–	L	
11053	O	1.3	F	3	U	12420	–	L	
11054	X	1.3 2.3 II	M	55 8	U	– –	– –	– –	PCB
11055	O	1.3	F	25	U	12420	–	L	
11056	O	1.3 2.3 II	F	11 4	U	12420 12340*	– –	L L,Y	
11057	X	1.3 2.3 II	M	21 4	U	– –	– –	– –	PCB
11058	O	1.3 2.3 II	F	21 4	U	12420 12340*	– –	L L,Y	
11059	X	1.8 1.0	M	18 16	U	– –	– –	– –	PCB
11060	O	2.3 II	M	2	U	12330*	–	L,Y	
11061	X	1.8	F	2	S	12620	–	L	
11062	O	1.8	F	2	S	12620	–	L	
11063	O	1.3	M	4	S	12630	–	L	Outer
11064	O	1.3	M	4	S	12630	–	L	Inner
11065	O	1.3	F	4	S	12650	–	L	Outer
11066	O	1.3	F	4	S	12650	–	L	Inner

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–11067	X	2.3 II	M	6	U	82998– –	82998– –	–	PCB
11068	O	2.3 II	F	2	S	12440*	12590	L,Y	
11069	O	2.3 II	M	2	S	12430*	–	L,Y	
11070	O	2.3 II	F	2	S	12440*	12590	L,Y	
11071	O	2.3 II	F	3	U	12340*	–	L,Y	
11072	O	2.3 II	M	2	S	12430*	–	L,Y	
11073	O	2.3 II	M	2	S	12430*	–	L,Y	w/o Clamp
11074	O	2.3 II	M	2	S	12430*	–	L,Y	w/ Clamp
11075	O	2.3 II	F	2	S	12440*	12590	L,Y	
11076	X	TNS	M	4	S	–	–	–	w/ Clamp
11077	O	2.3 II	F	5	S	12440*	12590	L,Y	
11078	O	2.3 II	M	5	S	12430*	–	L,Y	
11079	O	2.3 II	F	3	U	12340*	–	L,Y	
11080	O	2.3 II	F	2	U	12340*	–	L,Y	
11081	X	1.8 1.0	M	10 32	U	– –	– –	– –	PCB
11082	X	1.0	F	16	U	12310*	–	L	
11083	O	1.3	F	11	U	12420	–	L	
11084	X	1.3 2.3 II	M	30 4	U	– –	– –	– –	PCB
11085	O	2.3 II	M	5	U	12330*	–	L,Y	
11086	O	2.3 II	M	12	S	12430*	–	L,Y	
11087	O	2.3 II	F	12	S	12440*	12590	L,Y	
11088	O	1.3	M	15	S	12630	–	L	
11089	O	1.3	F	15	S	12650	–	L	
11090	O	2.3 II	F	4	U	12340*	–	L,Y	
11091	O	4.8	F	6	U	12380	–	Y	
11092	O	4.8	F	8	U	12380	–	Y	
11093	O	4.8	M	2	U	12370	–	Y	
11094	O	4.8	F	2	U	12380	–	Y	
11095	O	HEAD-LAMP	F	2	S	24150	24190	L,Y	
11096	O	HEAD-LAMP	F	2	S	24150	24190	L,Y	
11097	O	2.3 II	M	1	U	12330*	–	L,Y	w/ Clamp
11098	O	2.3 II	F	2	U	12340*	–	L,Y	
11099	O	2.3 II	M	6	U	12330*	–	L,Y	
11100	O	2.3 II	M	4	U	12330*	–	L,Y	
11101	O	2.3 II	M	6	U	12330*	–	L,Y	
11102	O	2.3 II	M	10	U	12330*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11103	X	1.8 1.0	M	8 18	U	82998– –	82998– –	– –	PCB
11104	X	2.3 II	M	20	U	–	–	–	PCB
11105	X	2.3 II	M	12	U	–	–	–	PCB
11106	X	1.3	M	4	U	–	–	–	PCB
11107	O	1.3	F	4	U	12420	–	L	
11108	X	HEAD-LAMP	F	3	S	24150	24190	L,Y	
11110	O	2.3 II	M	6	U	12330*	–	L,Y	
11111	O	–	–	–	–	–	–	–	
11113	O	SFPC	F	16	U	24180	–	L	
11114	O	SFPC	F	13	U	24180	–	L	
11115	O	SFPC	F	13	U	24180	–	L	
11116	O	SFPC	F	10	U	24180	–	L	
11117	X	2.3 II	M	20	U	–	–	–	PCB
11118	O	4.8 2.3 II	F	2 2	U	12380 12340*	– –	Y L,Y	
11119	X	1.3	M	21	U	–	–	–	PCB
11120	X	1.3 2.3 II	M	19 4	U	– –	– –	– –	PCB
11121	O	2.3 II	F	12	U	12340*	–	L,Y	
11122	O	2.3 II	M	4	S	12430*	–	L,Y	
11123	X	2.3 II	M	8	U	–	–	–	PCB
11124	X	1.8	M	30	U	–	–	–	PCB
11125	O	1.3	F	21	U	12420	–	L	
11126	O	4.8 2.3 II	M	2 2	U	12370 12330*	– –	Y L,Y	
11127	O	2.3 II	M	18	U	–	–	–	PCB
11128	X	1.8 1.0	M	16 60	U	– –	– –	– –	PCB
11129	O	1.0	F	12	U	12310*	–	L	
11130	O	4.8 2.3 II	F	2 6	U	12380 12340*	– –	Y L,Y	
11131	O	2.3 II	M	3	S	12430*	–	L,Y	
11132	O	2.3 II	F	3	S	12440*	12590	L,Y	
11133	O	1.3	M	25	U	12410	–	L	
11134	O	2.3 II	M	8	U	–	–	–	PCB
11135	O	4.8	M	4	U	12370	–	Y	
11136	O	4.8	F	4	U	12380	–	Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11137	O	2.3 II	M	2	S	82998– 12430*	82998– –	L,Y	
11138	O	4.8 8.0	M	2 2	S	12470 12490	– –	Y Y	
11139	O	4.8 8.0	F	2 2	S	12480 12500	– –	Y Y	
11140	O	2.3 II	F	2	S	12440*	12590	L,Y	
11141	O	2.3 II	M	2	S	12430*	–	L,Y	
11142	O	2.3 II	F	2	S	12440*	12590	L,Y	
11143	O	2.3 II	F	3	S	12440*	12590	L,Y	
11144	O	2.3 II	F	6	S	12440*	12590	L,Y	
11145	O	2.3 II	F	3	S	12440*	12590	L,Y	
11146	O	2.3 II	M	1	U	12330*	–	L,Y	
11147	O	2.3 II	F	1	U	12340*	–	L,Y	
11148	O	2.3 II	F	2	U	12340*	–	L,Y	
11149	O	2.3 II	F	2	S	12440*	12590	L,Y	
11150	O	2.3 II	F	4	S	12440*	12590	L,Y	
11151	O	2.3 II	F	12	S	12440*	12590	L,Y	
11152	O	2.3 II	F	4	S	12440*	12590	L,Y	
11153	O	2.3 II	F	2	S	–	12790*	L,Y	
11154	O	2.3 II	F	2	S	–	12790*	L,Y	
11155	O	2.3 II	M	2	S	12430*	–	L,Y	
11156	O	2.3 II	F	2	S	12440*	12590	L,Y	
11157	X	2.3 II	F	3	S	12440*	12590	L,Y	
11158	O	1.3 2.3 II	M	21 4	U	12410 12330*	– –	L L,Y	
11159	O	2.3 II	M	2	U	12330*	–	L,Y	
11160	O	4.8 2.3 II	M	1 2	S	12470 12430*	– –	Y L,Y	
11161	O	4.8 2.3 II	F	1 2	S	12480 12440*	– 12590	Y L,Y	
11162	O	2.3 II	F	2	S	12440*	12590	L,Y	
11163	O	2.3 II	F	2	S	12440*	12590	L,Y	
11164	X	1.3	M	7	U	–	–	–	PCB
11165	O	1.3	F	7	U	12420	–	L	
11166	O	2.3 II	F	1	S	12440*	12590	L,Y	
11167	O	2.3 II	M	16	U	12330*	–	L,Y	
11168	O	2.3 II	M	2	S	12430*	–	L,Y	
11169	O	1.3	M	3	S	12630	–	L	
11170	O	1.3	F	3	S	12650	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11171	O	1.3	M	7	S	12630	–	L	
11172	O	1.3	F	7	S	12650	–	L	
11173	O	1.3	M	11	S	12630	–	L	
11174	O	1.3	F	11	S	12650	–	L	
11175	O	2.3 II	M	2	S	12430*	–	L,Y	
11176	O	2.3 II	F	2	S	12440*	12590	L,Y	
11177	O	2.3 II	M	4	S	12430*	–	L,Y	
11178	O	2.3 II	F	4	S	12440*	12590	L,Y	
11179	O	1.3	F	15	U	12420	–	L	
11180	X	1.3	M	15	U	–	–	–	PCB
11181	O	1.3	M	5	S	12630	–	L	
11182	O	1.3	F	5	S	12650	–	L	
11183	O	8.0	M	1	S	12490	–	Y	
11184	O	8.0	F	1	S	12500	–	Y	
11186	O	1.3	M	4	U	12410	–	L	
11187	O	1.3	F	4	U	12420	–	L	
11188	O	1.3	M	2	S	12630	–	L	
11189	O	1.3	F	2	S	12650	–	L	
11190	O	2.3 II	F	8	S	12440*	12590	L,Y	
11191	O	1.3	M	9	S	12630	–	L	
11192	O	1.3	F	9	S	12650	–	L	
11193	O	2.3 II	M	6	S	12430*	–	L,Y	
11194	O	2.3 II	F	6	S	12440*	12590	L,Y	
11195	O	2.3 II	F	22	S	12440*	12590	L,Y	
		2.3 II		22	U	12340*	–	L,Y	
		6.3 II		1	S	24160	–	L	
11196	O	2.3 II	M	6	S	12430*	–	L,Y	
11197	O	2.3 II	F	6	S	12440*	12590	L,Y	
11198	X	1.3	M	13	U	–	–	–	PCB
11199	X	1.3	F	13	U	12420	–	L	
11200	X	1.3	M	11	U	12410	–	L	
11201	X	1.3	M	15	U	12410	–	L	
11202	X	1.3	M	17	U	12410	–	L	
11203	X	1.3	F	17	U	12420	–	L	
11204	X	1.3	M	15	U	12410	–	L	
		2.3 II		4		12330*	–	L,Y	
11205	X	1.3	F	15	U	12420	–	L	
		2.3 II		4		12340*	–	L,Y	
11206	X	1.3	M	21	U	12410	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11207	O	2.3 II	F	2	S	82998– 12440*	82998– 12590	L,Y	
11208	O	1.3 2.3 II	M	19 4	U	12410 12330*	– –	L L,Y	
11211	O	1.3	M	2	U	12410	–	L	
11212	O	1.3	F	2	U	12420	–	L	
11213	X	1.0	M	120	S	–	–	–	PCB
11214	O	1.0	F	80	S	–	–	–	
11215	O	1.0	F	40	S	–	–	–	
11216	O	–	–	–	–	–	–	–	
11217	X	1.0 II	M	100	U	–	–	–	PCB
11218	O	1.0 II	F	28	U	24020*	–	L	
11219	O	1.0 II	F	16	U	24020*	–	L	
11220	O	1.0 II	F	22	U	24020*	–	L	
11221	O	1.0 II	F	34	U	24020*	–	L	
11222	O	1.0 II 1.8 II 1.8 II	M	18 14 14	U	24010 24030 24090	– – –	L L,Y L,Y	
11223	O	1.0 II 1.8 II 1.8 II	M	12 6 6	U	24010 24030 24090	– – –	L L,Y L,Y	
11224	O	1.0 II 1.8 II 1.8 II	F	12 6 6	U	24020* 24040 24100*	– – –	L L,Y L,Y	
11225	O	1.0 II 1.8 II 1.8 II	F	6 8 8	U	24020* 24040 24100*	– – –	L L,Y L,Y	
11226	O	1.0 II 1.8 II 1.8 II	F	12 6 6	U	24020* 24040 24100*	– – –	L L,Y L,Y	
11227	O	2.3 II	F	2	U	12340*	–	L,Y	
11228	O	1.8 1.0	M	18 16	U	– –	– –	– –	PCB
11229	X	2.3 II	M	3	U	–	–	–	PCB
11230	X	2.3 II	M	5	U	–	–	–	PCB
11231	O	2.3 II	F	10	S	12440*	12590	L,Y	
11232	O	2.3 II	F	5	S	12440*	12590	L,Y	
11233	X	1.8 1.0	M	4 22	U	– –	– –	– –	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11234	X	1.8 1.0	F	4 22	U	82998– 12190* 12310*	82998– – –	 L L	
11235	O	2.3 II	F	2	S	12440*	12590	L,Y	
11236	X	4.8	M	2	S	12470	–	Y	
11237	O	4.8	F	2	S	12480	–	Y	
11238	X	2.3 II	F	22	U	12340*	–	L,Y	
11239	O	4.8 2.3 II	M	3 8	S	12470 12430*	– –	Y L,Y	
11240	O	4.8 2.3 II	F	3 8	S	12480 12440*	– 12590	Y L,Y	
11241	O	2.3 II 8.0	M	6 2	S	12430* 12490	– –	L,Y Y	
11242	O	2.3 II 8.0	F	6 2	S	12440* 12500	12590 –	L,Y Y	
11243	O	2.3 II	F	1	S	12440*	12590	L,Y	
11244	O	2.3 II	M	3	S	12430*	–	L,Y	w/ Clamp
11245	O	2.3 II	F	3	S	12440*	12590	L,Y	
11246	O	2.3 II	F	2	S	12440*	12590	L,Y	
11247	O	2.3 II	M	2	S	12430*	–	L,Y	
11248	O	2.3 II	F	2	S	12440*	12590	L,Y	
11249	X	2.3 II	M	2	S	12430*	–	L,Y	
11250	O	2.3 II	F	2	S	12440*	12590	L,Y	
11251	X	2.3 II	F	3	U	12340*	–	L,Y	
11252	O	2.3 II	F	1	S	12440*	12590	L,Y	
11253	X	1.0 III 1.0 III	M	5 52	U	– –	– –	– –	PCB
11254	X	2.3 II	M	2	S	12430*	–	L,Y	
11255	O	2.3 II	F	2	S	12440*	12590	L,Y	
11256	X	1.3	M	11	S	12630	–	L	
11257	X	1.3	F	11	S	12650	–	L	
11258	O	4.8	M	1	U	12370	–	Y	
11259	O	4.8	F	1	U	12380	–	Y	
11260	X	2.3 II	F	20	U	12340*	–	L,Y	
11261	O	2.3 II	F	3	S	12440*	12590	L,Y	
11262	X	1.3	M	4	S	12630	–	L	Outer
11263	X	1.3	M	15	U	–	–	–	PCB
11264	O	1.3	F	15	U	12420	–	L	
11265	X	2.3 II	M	14	U	–	–	–	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11266	X	1.8 1.0	M	10 32	U	82998– – –	82998– – –	– –	PCB
11267	X	4.8 2.3 II	M	2 4	S	12470 12430*	– –	Y L,Y	
11268	X	2.3 II	M	4	S	12430*	–	L,Y	
11269	X	2.3 II	F	4	S	12440*	12590	L,Y	
11270	O	2.3 II	M	1	S	12430*	–	L,Y	
11271	O	2.3 II	F	1	S	12440*	12590	L,Y	
11272	O	2.3 II	M	2	S	12430*	–	L,Y	
11273	O	2.3 II	F	2	S	12440*	12590	L,Y	
11274	O	–	–	–	–	–	–	–	
11276	X	4.8	F	10	U	12380	–	Y	
11277	X	4.8 2.3 II	F	1 8	U	12380 12340*	– –	Y L,Y	
11278	O	2.3 II	F	2	U	12340*	–	L,Y	
11279	O	4.8 2.3 II	F	2 6	U	12380 12340*	– –	Y L,Y	
11280	O	2.3 II	F	6	U	12340*	–	L,Y	
11281	X	1.0 III 1.0 IV	M	98 24	U	– –	– –	– –	PCB
11282	X	2.3 II	F	1	S	12440*	12590	L,Y	
11283	X	4.8 2.3 II	F	2 2	S	12480 12440*	– 12590	Y L,Y	
11284	O	2.3 II	F	2	S	–	12790*	L,Y	
11285	O	2.3 II	F	2	S	–	12790*	L,Y	
11286	X	2.3 II	F	2	S	12440*	12590	L,Y	
11287	X	2.3 II 8.0	M	2 2	S	12430* 12490	– –	L,Y Y	
11288	X	2.3 II 8.0	F	2 2	S	12440* 12500	12590 –	L,Y Y	
11289	O	2.3 II	M	6	S	12430*	–	L,Y	
11290	O	2.3 II	F	6	S	12440*	12590	L,Y	
11291	O	2.3 II	M	4	S	12430*	–	L,Y	
11292	O	2.3 II	F	4	S	12440*	12590	L,Y	
11293	X	2.3 II	M	3	S	12430*	–	L,Y	
11294	O	2.3 II	F	3	S	12440*	12590	L,Y	
11295	O	2.3 II	M	3	S	12430*	–	L,Y	w/ Clamp
11296	X	2.3 II	F	3	U	12340*	–	L,Y	
11297	X	4.8	F	6	U	12380	–	Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11298	X	2.3 II	M	3	U	82998– 12330*	82998– –	L,Y	
11299	O	2.3 II	M	2	U	12330*	–	L,Y	w/ Clamp
11300	O	2.3 II	M	2	U	12330*	–	L,Y	
11301	X	2.3 II	M	4	U	12330*	–	L,Y	
11302	X	4.8	F	9	U	12380	–	Y	
11303	X	2.3 II	M	2	S	12430*	–	L,Y	
11304	O	4.8 2.3 II	F	2 2	S	12480 12440*	– 12590	Y L,Y	
11305	X	1.3	M	2	U	12410	–	L	
11306	X	1.3	F	2	U	12420	–	L	
11307	X	1.3 2.3 II	M	15 4	U	12410 12330*	– –	L L,Y	
11308	X	1.3 2.3 II	F	15 4	U	12420 12340*	– –	L L,Y	
11309	X	1.3 2.3 II	M	13 4	U	12410 12330*	– –	L L,Y	
11310	X	1.3 2.3 II	F	13 4	U	12420 12340*	– –	L L,Y	
11311	O	2.3 II	F	12	U	12340*	–	L,Y	
11312	X	2.3 II	M	14	U	–	–	–	PCB
11313	X	2.3 II	F	4	U	12340*	–	L,Y	
11314	O	HEAD-LAMP	F	3	U	24140	24200	L,Y	
11315	X	2.3 II	F	1	U	12340*	–	L,Y	
11316	X	2.3 II 6.3 II	M	20 1	U	12330* –	– –	L,Y –	
11317	O	2.3 II	F	5	S	12440*	12590	L,Y	
11318	X	1.3	M	5	U	–	–	–	PCB
11319	O	1.3	F	5	U	12420	–	L	
11320	X	1.3	M	8	U	–	–	–	PCB
11321	X	1.3	F	8	U	12420	–	L	
11322	X	2.3 II	M	2	S	12430*	–	L,Y	
11323	O	2.3 II 2.3 II 6.3 II	F	22 22 1	S U S	12440* 12340* 24160	12590 – –	L,Y L,Y L	
11324	X	2.3 II	M	16	U	–	–	–	PCB
11325	X	2.3 II	M	10	U	–	–	–	PCB
11326	X	2.3 II	F	6	U	12340*	–	L,Y	
11327	X	2.3 II	M	5	U	12330*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11328	X	1.3	M	4	S	12630	–	L	Inner
11329	X	1.3	F	4	S	12650	–	L	Outer
11330	X	1.3	F	4	S	12650	–	L	Inner
11331	X	2.3 II	M	10	U	–	–	–	PCB
11332	O	4.8 2.3 II	F	2 8	S	12480 12440*	– 12590	Y L,Y	
11333	X	1.8 1.0	M	4 22	U	12180 –	– –	L –	
11334	X	1.3	M	17	U	12410	–	L	
11335	X	1.3	F	17	U	12420	–	L	
11336	X	1.3	F	3	U	12420	–	L	
11337	X	2.3 II	M	14	U	–	–	–	PCB
11338	X	1.0	M	80	S	–	–	–	
11339	X	1.3	M	7	U	–	–	–	PCB
11340	X	1.3	F	7	U	12420	–	L	
11341	X	2.3 II	M	3	S	12430*	–	L,Y	
11342	X	1.0	M	40	U	–	–	–	
11343	X	1.0	M	28	U	–	–	–	PCB
11344	X	1.0	M	16	U	–	–	–	
11345	X	1.0	M	22	U	–	–	–	
11346	X	1.0	M	34	U	–	–	–	
11347	X	LA	F	40	U	–	–	–	
11348	O	2.3 II	M	3	S	12430*	–	L,Y	
11349	O	2.3 II	F	3	S	12440*	12590	L,Y	
11350	X	1.3	F	13	U	12420	–	L	
11351	X	2.3 II	M	16	U	–	–	–	PCB
11352	X	1.0 II 1.8 II	M	60 16	U	– –	– –	– –	PCB
11353	X	2.3 II	M	8	U	12330*	–	L,Y	
11354	X	2.3 II	F	8	U	12340*	–	L,Y	
11355	X	4.8 2.3 II 8.0	M	4 38 1	U	12370 12330* 12390	– – –	Y L,Y Y	
11356	X	4.8 2.3 II	M	4 24	U	12370 12330*	– –	Y L,Y	
11357	X	2.3 II	M	27	U	12330*	–	L,Y	
11359	X	4.8 2.3 II	F	4 51	U	12380 12340*	– –	Y L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
		4.8		4		12380	–	Y	
11360	X	2.3 II	F	38	U	12340*	–	L,Y	
		8.0		1		12400	–	Y	
11361	X	4.8	M	4	U	–	–	–	PCB
		2.3 II		4		–	–	–	
11362	X	4.8	F	4	U	12380	–	Y	
		2.3 II		4		12340*	–	L,Y	
11363	O	2.3 II	F	1	S	12440*	12590	L,Y	
11364	O	1.0 III	M	81	U	–	–	–	PCB
		1.0 IV		24		–	–	–	
11365	X	4.8	M	2	U	–	–	–	PCB
		2.3 II		8		–	–	–	
11366	X	4.8	F	2	U	12380	–	Y	
		2.3 II		8		12340*	–	L,Y	
11367	X	1.3	M	2	U	12410	–	L	
11368	O	1.3	M	2	U	12410	–	L	
11369	O	1.3	F	2	U	12420	–	L	
11370	X	2.3 II	M	15	U	12330*	–	L,Y	
11371	X	2.3 II	M	15	U	12330*	–	L,Y	
11372	X	2.3 II	F	15	U	12340*	–	L,Y	
11373	X	2.3 II	M	25	U	12330*	–	L,Y	
11374	X	2.3 II	M	25	U	12330*	–	L,Y	
11375	X	2.3 II	F	25	U	12340*	–	L,Y	
11376	X	1.3	M	19	U	12410	–	L	
11377	X	1.3	F	19	U	12420	–	L	
11378	X	1.3	M	21	U	12410	–	L	
11379	X	1.3	F	21	U	12420	–	L	
11380	X	1.3	M	23	U	12410	–	L	
11381	X	1.3	F	23	U	12420	–	L	
11382	X	2.3 II	M	14	U	–	–	–	PCB
11383	X	2.3 II	F	14	U	12340*	–	L,Y	
11384	X	1.3	M	13	U	–	–	–	PCB
11385	X	8.0	M	3	U	12390	–	Y	
11386	X	8.0	F	2	U	12400	–	Y	
11387	X	4.8	F	1	U	12380	–	Y	
		8.0		2		12400	–	Y	
11388	X	2.3 II	F	2	U	12340*	–	L,Y	
11389	X	1.3	M	8	U	–	–	–	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11390	O	1.0 II	F	16	U	24020*	–	L	
		1.8 II		10		24100*	–	L,Y	
11391	O	1.0 II	F	16	U	24020*	–	L	
11392	O	1.0 II	F	16	U	24020*	–	L	
		1.8 II		6		24100*	–	L,Y	
11393	X	1.3	M	13	U	12410	–	L	
11394	X	1.3	F	13	U	12420	–	L	
11395	X	2.3 II	M	2	U	12330*	–	L,Y	
11396	X	2.3 II	F	2	U	12340*	–	L,Y	
11397	X	2.3 II	F	8	U	12340*	–	L,Y	
11398	X	2.3 II	F	4	U	12340*	–	L,Y	
11399	O	2.3 II	M	4	U	12330*	–	L,Y	
11400	O	4.8	F	1	S	12480	–	Y	
11401	X	2.3 II	F	2	S	12440*	12590	L,Y	
11402	X	1.3	M	7	U	–	–	–	PCB
11403	X	1.3	M	25	U	12410	–	L	
11404	X	1.3	F	25	U	12420	–	L	
11405	X	1.8	M	12	U	–	–	–	
		1.0 II		32		–	–	–	PCB
		1.8 II		10		–	–	–	
11406	X	1.0 II	F	22	U	24020*	–	L	
		1.8 II		4		24100*	–	L,Y	
11407	X	2.3 II	M	3	S	12430*	–	L,Y	w/o Clamp
11408	O	1.0 II	F	12	U	24020*	–	L	
11409	X	4.8	M	2	S	12470	–	Y	
11410	O	4.8	F	2	S	12480	–	Y	
11411	X	1.3	M	21	U	–	–	–	PCB
		2.3 II		4		–	–	–	
11412	O	4.8	M	3	S	12470	–	Y	
		2.3 II		2		12430*	–	L,Y	
11413	O	4.8	F	3	S	12480	–	Y	
		2.3 II		2		12440*	12590	L,Y	
11414	X	SL	F	3	S	–	–	–	
11415	X	2.3 II	M	16	U	12330*	–	L,Y	
11416	X	2.3 II	F	16	U	12340*	–	L,Y	
11417	O	2.3 II	F	17	U	12340*	–	L,Y	
11418	X	1.8	M	12	U	–	–	–	
		1.0 II		16		–	–	–	PCB
		1.8 II		10		–	–	–	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–11419	X	2.3 II	M	10	U	82998––	82998––	–	PCB
11420	X	2.3	F	17	U	12170	–	L	
11421	O	1.0 III	F	20	U	12690*	–	L	
		1.0 IV		11		12740	–	L	
11422	X	1.0 II	F	18	U	24020*	–	L	
		1.8 II		8		24100*	–	L,Y	
11423	O	1.0 II	F	16	U	24020*	–	L	
		1.8 II		10		24100*	–	L,Y	
11424	O	1.8 II	F	12	U	24100*	–	L,Y	
11425	X	1.0 II	F	16	U	24020*	–	L	
11426	X	2.3 II	M	4	U	–	–	–	PCB
11427	X	2.3 II	F	4	U	12340*	–	L,Y	
11428	O	2.3 II	F	1	S	12440*	12590	L,Y	
11429	X	2.3 II	F	2	U	12340*	–	L,Y	
11430	X	4.8	M	4	U	12370	–	Y	
		2.3 II		40		12330*	–	L,Y	
		8.0		5		12390	–	Y	
11431	X	4.8	F	4	U	12380	–	Y	
		2.3 II		40		12340*	–	L,Y	
		8.0		5		12400	–	Y	
11432	X	1.8 II	F	20	U	24100*	–	L,Y	
11433	O	1.8 II	F	14	U	24040	–	L,Y	
		1.8 II		14		24100*	–	L,Y	
11434	X	C–TYPE	M	16	U	12560	–	L	
11435	X	C–TYPE	F	16	U	12570	–	L	
11436	O	1.3	F	2	U	12420	–	L	
11437	X	2.3 II	F	14	U	12340*	–	L,Y	
11438	X	4.8	M	3	U	12370	–	Y	
		2.3 II		5		12330*	–	L,Y	
11439	X	4.8	F	3	U	12380	–	Y	
		2.3 II		5		12340*	–	L,Y	
11440	X	2.3 II	M	20	U	12330*	–	L,Y	
11441	X	2.3 II	F	20	U	12340*	–	L,Y	
11442	X	2.3 II	M	20	U	12330*	–	L,Y	
11443	X	2.3 II	F	20	U	12340*	–	L,Y	
11444	O	2.3 II	M	16	U	12330*	–	L,Y	
11445	X	2.3 II	F	16	U	12340*	–	L,Y	
11447	X	2.3 II	M	2	S	12430*	–	L,Y	
11448	X	2.3 II	F	2	S	12440*	12590	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–11449	X	1.3	M	10	U	82998––	82998––	–	PCB
11450	O	1.3	F	10	U	12420	–	L	
11451	O	2.3 II	F	3	S	–	12790*	L,Y	
11452	X	2.3 II	M	6	U	12330*	–	L,Y	
11453	X	2.3 II	F	12	U	12340*	–	L,Y	
11459	X	2.3 II	F	8	U	12340*	–	L,Y	
11460	X	4.8 2.3 II	M	2 6	S	12470 12430*	– –	Y L,Y	
11461	X	4.8 2.3 II	F	2 6	S	12480 12440*	– 12590	Y L,Y	
11462	X	1.3	M	16	S	12630	–	L	
11463	X	1.3	F	16	S	12650	–	L	
11464	X	2.3 II	M	14	U	–	–	–	PCB
11465	X	2.3 II	F	14	U	12340*	–	L,Y	
11466	X	2.3 II	M	2	S	12430*	–	L,Y	
11467	O	2.3 II	F	2	S	12440*	12590	L,Y	
11468	X	1.3	M	22	U	–	–	–	PCB
11469	O	1.3 2.3 II	F	16 4	U	12420 12340*	– –	L L,Y	
11470	X	1.3	M	3	U	12410	–	L	
11471	O	1.3	F	3	U	12420	–	L	
11472	X	1.3 2.3 II	M	30 4	U	– –	– –	– –	PCB
11473	X	1.3 2.3 II	M	21 4	U	– –	– –	– –	PCB
11474	X	1.3	M	12	U	–	–	–	PCB
11475	O	1.3	F	12	U	12420	–	L	
11476	O	1.0 III 1.0 IV	F	17 7	U	12690* 12740	– –	L L	
11477	X	LAC	M	22	U	12100	–	L,Y	
11478	X	LAC	F	13	U	12110	–	L,Y	
11479	X	LAC	F	9	U	12110	–	L,Y	
11483	X	1.3 2.3 II	M	21 4	U	– –	– –	– –	PCB
11484	X	2.3 II 8.0	M	1 2	U	12330* 12390	– –	L,Y Y	
11485	X	2.3 II 8.0	F	1 2	U	12340* 12400	– –	L,Y Y	
11486	O	2.3 II	M	2	S	12430*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11487	X	1.3	M	6	U	82998– 12410	82998– –	L	
11488	X	1.3	F	6	U	12420	–	L	
11489	X	1.3	M	3	U	12410	–	L	
11490	O	1.3	F	3	U	12420	–	L	
11491	X	6.3	F	3	S	12540	–	Y	
11492	X	1.3 2.3 II	M	4 2	U	12410 12330*	– –	L L,Y	
11493	X	1.3 2.3 II	F	4 2	U	12420 12340*	– –	L L,Y	
11494	O	1.3	F	4	U	12420	–	L	
11495	X	1.3	F	4	U	12420	–	L	
11496	X	1.3	M	18	U	–	–	–	PCB
11497	X	1.3	F	18	U	12420	–	L	
11498	X	1.3	M	20	U	12410	–	L	
11499	X	1.3	F	20	U	12420	–	L	
11500	X	1.3	M	12	U	12410	–	L	
11501	O	1.3 2.3 II	M	16 4	U	– –	– –	– –	PCB
11502	O	1.3	F	22	U	12420	–	L	
11503	O	1.3	M	22	U	12410	–	L	
11504	O	1.3 2.3 II	M	16 4	U	12410 12330*	– –	L L,Y	
11505	X	1.3	M	17	U	12410	–	L	
11506	X	1.3	F	17	U	12420	–	L	
11507	X	1.3	M	64	U	–	–	–	PCB
11508	X	1.3	F	40	U	12420	–	L	
11509	X	1.3	F	24	U	12420	–	L	
11510	X	1.3	M	14	U	–	–	–	PCB
11511	X	1.3	F	14	U	12420	–	L	
11512	X	ABS	F	2	U	–	–	–	
11514	X	ABS	F	32	U	–	–	–	
11517	X	ABS	F	6	S	–	–	–	
11519	X	ABS	F	2	S	–	–	–	
11520	X	ABS	F	2	S	–	–	–	
11522	X	ABS	F	4	S	–	–	–	
11524	X	ABS	F	12	U	–	–	–	
11526	X	4.8 2.3 II	M	2 8	U	– –	– –	– –	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11527	O	4.8	F	2	U	12380	–	Y	
		2.3 II		8		12340*	–	L,Y	
11528	O	2.3 II	M	7	U	12330*	–	L,Y	
11529	O	2.3 II	F	7	U	12340*	–	L,Y	
11530	O	2.3 II	M	12	U	12330*	–	L,Y	
11531	O	2.3 II	F	12	U	12340*	–	L,Y	
11532	O	1.3	M	8	U	12410	–	L	
11533	O	1.3	F	8	U	12420	–	L	
11534	O	2.3 II	M	9	U	12330*	–	L,Y	
11535	O	2.3 II	F	9	U	12340*	–	L,Y	
11536	O	2.3 II	M	10	U	12330*	–	L,Y	
11537	O	2.3 II	F	10	U	12340*	–	L,Y	
11538	O	2.3 II	M	11	U	12330*	–	L,Y	
11539	O	2.3 II	F	11	U	12340*	–	L,Y	
11540	X	2.3 II	F	2	S	12440*	12590	L,Y	
11541	O	2.3 II	M	13	U	12330*	–	L,Y	
11542	O	2.3 II	F	13	U	12340*	–	L,Y	
11543	X	2.3 II	M	9	U	–	–	–	PCB
11544	O	1.3	M	10	U	–	–	–	PCB
11545	X	2.3 II	M	2	U	12330*	–	L,Y	
11546	X	4.8	M	4	U	12370	–	Y	
		2.3 II		12		12330*	–	L,Y	
11547	X	4.8	F	4	U	12380	–	Y	
		2.3 II		12		12340*	–	L,Y	
11548	X	1.8	M	8	U	–	–	–	PCB
		1.0		18		–	–	–	
11549	X	1.8 II	M	34	U	24030	–	L,Y	
		1.8 II		34		24090	–	L,Y	
11550	X	1.8	M	12	U	–	–	–	PCB
11551	X	4.8	M	8	U	12370	–	Y	
11552	O	1.3	F	16	U	12420	–	L	
		2.3 II		22		12340*	–	L,Y	
11553	X	1.3	M	5	U	–	–	–	PCB
11554	X	1.3	M	16	U	12410	–	L	
		2.3 II		22		12330*	–	L,Y	
11555	X	1.3	F	16	U	12420	–	L	
		2.3 II		22		12340*	–	L,Y	
11556	O	1.3	F	14	U	12420	–	L	
11557	X	1.3	M	60	U	–	–	–	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–11558	X	1.3	F	20	U	82998–12420	82998– –	L	
11559	X	1.3 2.3 II	M	8 9	U	12410 12330*	– –	L L,Y	
11560	X	1.3 2.3 II	F	8 9	U	12420 12340*	– –	L L,Y	
11561	X	1.3 2.3 II	M	6 10	U	12410 12330*	– –	L L,Y	
11562	X	1.3 2.3 II	F	6 10	U	12420 12340*	– –	L L,Y	
11563	O	1.8 1.0	M	10 32	U	– –	– –	– –	PCB
11564	O	1.0 II 1.8 II	M	26 16	U	– –	– –	– –	PCB
11565	O	1.0 II 1.8 II	F	10 6	U	24020* 24100*	– –	L L,Y	
11566	X	1.0 II	F	40	S	24060	–	L	
11567	X	1.0 II	M	40	S	–	–	–	PCB
11568	X	2.3 II	M	13	U	12330*	–	L,Y	
11569	X	2.3 II 8.0	F	2 2	S	12440* 12500	12590 –	L,Y Y	
11570	O	1.3	M	19	U	12410	–	L	
11571	O	1.3	F	19	U	12420	–	L	
11572	O	1.3	M	52	U	–	–	–	PCB
11573	O	1.3	M	16	U	12410	–	L	
11574	O	1.3	F	16	U	12420	–	L	
11575	O	1.8 1.0	M	22 32	U	– –	– –	– –	PCB
11576	O	1.8 1.0	M	16 48	U	– –	– –	– –	PCB
11577	O	1.8 1.0	M	16 60	U	– –	– –	– –	PCB
11578	O	1.0	M	100	U	–	–	–	PCB
11579	O	8.0	F	2	U	12400	–	Y	
11580	X	1.3	M	10	U	12410	–	L	
11581	X	1.3	F	10	U	12420	–	L	
11582	X	1.3	M	8	U	12410	–	L	
11583	O	4.8	F	6	U	12380	–	Y	
11585	X	2.3 II	M	16	U	–	–	–	PCB
11586	X	1.0 III	F	17	U	12640	–	L	IDC

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–11587	O	2.3 II	M	6	U	82998–12330*	82998– –	L,Y	
11588	X	1.3	M	8	U	12410	–	L	
11589	X	1.3	M	2	U	–	–	–	PCB
11590	X	1.3 2.3 II	M	8 6	U	12410 12330*	– –	L L,Y	
11591	X	1.3 2.3 II	F	8 6	U	12420 12340*	– –	L L,Y	
11592	O	2.3 II	F	8	S	12440*	12590	L,Y	
11593	X	2.3 II	F	8	S	12440*	12590	L,Y	
11594	O	1.3 2.3 II	F	10 8	U	12420 12340*	– –	L L,Y	
11595	O	1.3 2.3 II	F	10 8	U	12420 12340*	– –	L L,Y	
11596	O	4.8 2.3 II	M	2 8	U	12370 12330*	– –	Y L,Y	
11597	X	1.8 1.0	M	10 32	U	– –	– –	– –	PCB
11598	O	2.3 II	M	5	S	12430*	–	L,Y	
11599	O	2.3 II	F	5	S	12440*	12590	L,Y	
11600	O	4.8 2.3 II 8.0	M	3 12 2	S	12470 12430* 12490	– – –	Y L,Y Y	
11601	X	4.8 2.3 II 8.0	F	3 12 2	S	12480 12440* 12500	– 12590 –	Y L,Y Y	
11602	X	4.8 2.3 II	M	2 3	U	12370 12330*	– –	Y L,Y	
11603	X	4.8 2.3 II	F	2 3	U	12380 12340*	– –	Y L,Y	
11604	O	2.3 II	F	13	U	12340*	–	L,Y	
11605	X	1.3 2.3 II	M	2 2	U	12410 12330*	– –	L L,Y	
11606	X	1.3 2.3 II	F	2 2	U	12420 12340*	– –	L L,Y	
11607	X	2.3 II	M	3	S	12430*	–	L,Y	
11608	O	2.3 II	F	2	U	12340*	–	L,Y	
11609	X	4.8 2.3 II	M	3 8	S	12470 12430*	– –	Y L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11610	X	4.8	M	4	U	12370	–	Y	
		2.3 II		22		12330*	–	L,Y	
11611	X	4.8	F	4	U	12380	–	Y	
		2.3 II		22		12340*	–	L,Y	
11612	X	4.8	F	3	S	12480	–	Y	
		2.3 II		8		12440*	12590	L,Y	
11613	O	1.3	M	8	U	12410	–	L	
		2.3 II		2		12330*	–	L,Y	
11614	X	1.3	F	8	U	12420	–	L	
		2.3 II		2		12340*	–	L,Y	
11615	O	4.8	F	8	U	12380	–	Y	
11616	O	1.3	F	6	U	12420	–	L	
11617	X	2.3 II	F	6	U	12340*	–	L,Y	
11618	X	1.3	F	40	U	12420	–	L	
11619	X	1.0 II	M	16	U	–	–	–	PCB
		1.8 II		18		–	–	–	
11620	X	1.3	M	3	U	–	–	–	PCB
11621	X	1.3	M	22	U	–	–	–	PCB
11622	O	2.3 II	M	3	S	12430*	–	L,Y	
11623	O	1.3	M	8	U	12410	–	L	
11624	X	1.3	M	6	U	–	–	–	PCB
		2.3 II		10		–	–	–	
11625	X	1.3	M	5	U	–	–	–	PCB
		4.8		2		–	–	–	
		2.3 II		17		–	–	–	
11626	X	2.3 II	F	12	U	12340*	–	L,Y	
11627	X	1.3	M	20	U	12410	–	L	
11628	O	1.3	F	22	U	12420	–	L	
11629	O	1.3	M	8	U	–	–	–	PCB
11630	O	1.3	F	8	U	12420	–	L	
11631	O	4.8	M	6	U	12370	–	Y	
		2.3 II		20		12330*	–	L,Y	
11632	X	4.8	F	6	U	12380	–	Y	
		2.3 II		20		12340*	–	L,Y	
11633	X	1.3	F	8	U	12420	–	L	
11634	X	1.3	M	12	U	–	–	–	PCB
11635	X	1.3	M	13	U	–	–	–	PCB
11636	X	1.3	M	8	U	–	–	–	PCB
11637	O	1.0 III	F	28	U	12690*	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
11638	O	1.0 III	F	16	U	12690*	–	L	
		1.0 IV		6		12740	–	L	
11639	X	–	–	–	–	–	–	–	
11640	X	6.3 II	F	4	S	24160	–	L	
11641	O	1.3	M	10	U	–	–	–	PCB
11642	O	1.3	F	10	U	12420	–	L	
11643	O	4.8	F	2	S	12480	–	Y	
		2.3 II		7		12440*	12590	L,Y	
11644	X	1.3	M	14	U	–	–	–	PCB
11645	X	1.3	M	60	U	–	–	–	PCB
		2.3 II		10		–	–	–	
11646	X	1.3	M	36	U	–	–	–	PCB
		2.3 II		16		–	–	–	
11647	X	1.3	M	20	U	–	–	–	PCB
		2.3 II		16		–	–	–	
11648	X	1.3	F	16	U	12420	–	L	
11649	O	2.3 II	F	12	U	12340*	–	L,Y	
11650	X	1.8	M	22	U	–	–	–	PCB
		1.0		32		–	–	–	
11651	X	1.3	M	8	U	–	–	–	PCB
		2.3 II		6		–	–	–	
11652	X	1.3	F	10	U	12420	–	L	
		2.3 II		6		12340*	–	L,Y	
11653	O	2.3 II	F	10	S	12440*	12590	L,Y	
11654	O	1.3	M	14	U	12410	–	L	
11655	O	8.0	M	2	U	12390	–	Y	
11656	O	2.3 II	F	12	U	12340*	–	L,Y	
11657	O	1.3	F	10	U	12420	–	L	
11658	O	2.3 II	F	10	S	12440*	12590	L,Y	
11659	O	HEAD-LAMP	F	2	S	24150	24190	L,Y	
11660	O	HEAD-LAMP	F	2	S	24150	24190	L,Y	
11661	O	2.3 II	F	12	U	12340*	–	L,Y	
11662	X	8.0	F	4	U	12400	–	Y	
11663	X	2.3 II	F	6	S	12440*	12590	L,Y	
11664	X	2.3 II	F	12	S	12440*	12590	L,Y	
11665	O	OBD II	F	16	U	–	–	–	
11666	X	–	–	–	–	–	–	–	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11667	X	4.8 8.0	F	1 2	U	82998– 12380 12400	82998– – –	 Y Y	
11669	X	2.3 II	M	27	U	12330*	–	L,Y	
11670	X	2.3 II	F	27	U	12340*	–	L,Y	
11671	O	1.3 2.3 II	F	8 9	U	12420 12340*	– –	L L,Y	
11672	X	1.3 2.3 II	F	8 9	U	12420 12340*	– –	L L,Y	
11676	X	8.0	F	4	U	12400	–	Y	
11677	X	2.3 II	F	15	S	12440*	12590	L,Y	
11680	X	1.3	M	16	U	12410	–	L	
11681	X	1.3	F	16	U	12420	–	L	
11682	X	1.3	M	16	U	12410	–	L	
11683	X	1.3	F	16	U	12420	–	L	
11684	O	8.0	F	2	U	12400	–	Y	
11685	O	8.0	F	3	U	12400	–	Y	
11686	O	4.8	F	8	U	12380	–	Y	
11687	X	6.3	F	2	U	12060	12580	Y	
11688	X	1.3	M	5	S	12630	–	L	
11689	X	1.3	M	5	S	12630	–	L	
11690	X	1.3	F	5	S	12650	–	L	Outer
11691	X	1.3	F	5	S	12650	–	L	Inner
11693	X	2.3 II	F	12	U	12340*	–	L,Y	
11694	X	2.3 II	M	13	U	12330*	–	L,Y	
11695	X	2.3 II	F	13	U	12340*	–	L,Y	
11696	X	1.5	M	6	U	–	–	–	PCB
11697	X	1.5	F	6	U	–	–	–	
11698	O	1.3	F	12	S	12650	–	L	
11700	X	1.0 II 1.8 II	M	32 10	U	– –	– –	– –	PCB
11701	O	4.8 2.3 II	F	4 4	U	12380 12340*	– –	Y L,Y	
11703	X	2.3 II	F	1	U	12340*	–	L,Y	
11709	X	2.3 II	M	9	U	12330*	–	L,Y	
11710	X	2.3 II	F	9	U	12340*	–	L,Y	
11714	X	2.3 II	F	13	U	12340*	–	L,Y	
11716	X	1.3 2.3 II	F	10 8	U	12420 12340*	– –	L L,Y	
11720	X	2.3 II	F	12	U	12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–11724	X	2.3 II	M	2	U	82998–12350*	82998– –	L,Y	
11731	X	HEAD-LAMP	F	3	U	24140	24200	L,Y	
11733	O	1.8	M	22	U	–	–	–	PCB
		1.0		16		–	–	–	
		1.0 II		16		–	–	–	
		1.8 II		22		–	–	–	
11735	X	2.3 II	M	2	U	12330*	–	L,Y	
11736	O	2.3 II	F	2	U	12340*	–	L,Y	
11737	X	2.3 II	M	1	U	12330*	–	L,Y	
11738	X	2.3 II	F	1	U	12340*	–	L,Y	
11739	X	2.3 II	M	7	U	12330*	–	L,Y	
11740	X	2.3 II	F	7	U	12340*	–	L,Y	
11742	O	4.8	F	4	U	12380	–	Y	
11743	X	1.3	M	14	U	–	–	–	PCB
11744	X	1.3	M	14	U	–	–	–	PCB
11745	X	1.3	M	18	U	–	–	–	PCB
11746	X	1.3	M	22	U	–	–	–	PCB
11747	X	2.3 II	M	12	U	–	–	–	PCB
11748	X	2.3 II	M	18	U	–	–	–	PCB
11749	X	2.3 II	M	20	U	–	–	–	PCB
11750	X	2.3 II	M	20	U	–	–	–	PCB
11751	X	2.3 II	M	18	U	–	–	–	PCB
11752	X	2.3 II	M	10	U	–	–	–	PCB
11753	X	2.3 II	M	14	U	–	–	–	PCB
11757	X	2.3 II	M	10	U	12330*	–	L,Y	
11763	X	2.3 II	M	3	U	12330*	–	L,Y	
11764	O	2.3 II	F	3	U	12340*	–	L,Y	
11765	X	2.3 II	M	4	U	12330*	–	L,Y	
11766	X	2.3 II	F	4	U	12340*	–	L,Y	
11767	X	2.3 II	M	1	U	12330*	–	L,Y	
11769	X	2.3 II	F	2	U	12340*	–	L,Y	
11771	X	4.8	F	2	U	12380	–	Y	
		2.3 II		2		12340*	–	L,Y	
11772	X	2.3 II	F	5	U	12340*	–	L,Y	
11773	X	2.3 II	F	2	S	12440*	12590	L,Y	
11774	X	9.5	M	1	U	–	–	–	
11775	X	9.5	F	1	U	–	–	–	
11777	X	1.3	F	3	U	12420	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–11778	O	4.8	F	6	U	82998–12380	82998– –	Y	
11779	O	2.3 II	M	4	U	12330*	–	L,Y	
11780	O	2.3 II	F	6	U	12340*	–	L,Y	
11781	X	2.3 II	F	10	U	12340*	–	L,Y	
11782	X	2.3 II	F	12	U	12340*	–	L,Y	
11784	O	4.8 2.3 II	F	2 7	S	12480 12440*	– 12590	Y L,Y	
11785	X	1.0 J 1.8 J	M	48 16	U	– –	– –	– –	PCB
11786	X	1.0 J 1.8 J	F	16 10	U	– –	– –	– –	
11787	X	1.0 J	F	16	U	–	–	–	
11788	X	1.0 J 1.8 J	F	16 6	U	– –	– –	– –	
11789	X	1.0 III	M	2	S	12710	–	L	
11790	X	1.0 III	F	2	S	12720*	–	L	
11791	X	2.3 II	F	14	U	12340*	–	L,Y	
11792	X	2.3 II	F	4	U	12340*	–	L,Y	
11794	X	VH	F	7	U	–	–	–	
11797	X	2.3 II	F	5	U	12340*	–	L,Y	
11799	X	4.8	F	4	U	12380	–	Y	
11800	X	2.3 II	F	10	U	12340*	–	L,Y	
11805	X	2.3 II	F	14	U	12340*	–	L,Y	
11809	X	4.8	M	4	U	12370	–	Y	
11812	X	2.3 II	M	4	U	12330*	–	L,Y	
11814	X	2.3 II	M	6	U	12330*	–	L,Y	
11817	X	2.3 II	F	10	U	12340*	–	L,Y	
11820	X	2.3 II	F	6	U	12340*	–	L,Y	
11823	X	2.3 II	M	10	U	12330*	–	L,Y	
11824	X	8.0	F	2	U	12400	–	Y	
11827	X	2.3 II	F	13	U	12340*	–	L,Y	
11839	X	2.3 II	F	2	U	12340*	–	L,Y	
11840	X	2.3 II	F	2	U	12340*	–	L,Y	
11841	X	2.3 II	F	4	U	12340*	–	L,Y	
11842	X	2.3 II	F	4	U	12340*	–	L,Y	
11843	X	2.3 II	M	5	U	12330*	–	L,Y	
11847	X	2.3 II	F	12	U	12340*	–	L,Y	
11848	X	2.3 II	F	13	U	12340*	–	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11851	X	4.8 2.3 II	F	4 20	S	82998– 12480 –	82998– – 12790*	Y L,Y	
11853	X	6.3	F	1	U	12060	12580	Y	
11854	X	1.0 III	M	2	S	12710	–	L	
11856	O	1.0 III	F	2	S	12720*	–	L	
11857	X	1.0 III	F	4	S	12720*	–	L	
11858	O	2.3 II	F	6	S	12440*	12590	L,Y	
11859	X	2.3 II	F	2	S	12440*	12590	L,Y	
11860	X	2.3 II	F	3	S	12440*	12590	L,Y	
11861	X	4.8 1.5	F	25 25	S	12480 –	– –	Y –	
11862	O	PAI 1	F	2	U	–	–	–	
11863	X	1.0 III	M	2	S	12710	–	L	
11864	X	1.0 III	F	2	S	12720*	–	L	
11865	X	1.0 III	M	2	S	12710	–	L	
11866	X	1.0 III	M	44	U	–	–	–	PCB
11867	X	1.0 III	F	12	U	12690*	–	L	
11868	X	1.0 III	F	20	U	12690*	–	L	
11869	X	1.0 III	F	12	U	12690*	–	L	
11870	X	1.0 III	M	52	U	–	–	–	PCB
11871	X	1.0 III	F	12	U	12690*	–	L	
11872	X	1.0 III	F	28	U	12690*	–	L	
11873	X	1.0 III	F	12	U	12690*	–	L	
11874	X	2.3 II	M	3	U	–	–	–	PCB
11875	O	2.3 II	F	2	S	–	12790*	L,Y	
11876	X	1.0 III 2.3 II	M	19 6	U	– –	– –	– –	PCB
11877	O	1.0 III 2.3 II	F	19 6	U	12690* 12340*	– –	L L,Y	
11878	O	4.8	M	4	U	12370	–	Y	
11879	X	4.8	F	6	U	12380	–	Y	
11880	X	8.0	F	3	U	12400	–	Y	
11881	X	9.5	F	1	U	–	–	–	
11882	X	4.8 2.3 II	F	4 20	S	12480 –	– 12790*	Y L,Y	
11883	X	1.0 III	M	2	U	12670*	–	L	
11884	X	1.0 III	F	2	U	12690*	–	L	
11885	O	2.3 II	F	4	S	–	12790*	L,Y	
11886	O	1.0 III	F	2	U	12690*	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11889	X	1.0 III	M	2	U	82998– 12670*	82998– –	L	
11890	X	1.0 III	F	2	U	12690*	–	L	
11891	X	1.0 III	M	4	U	12670*	–	L	
11892	X	1.0 III	F	4	U	12690*	–	L	
11893	X	4.8 2.3 II	F	4 20	S	12480 –	– 12790*	Y L,Y	
11898	X	1.0 III	F	2	S	12720*	–	L	
11899	X	1.8 1.0	M	8 18	U	– –	– –	– –	PCB
11900	X	2.3 II	F	2	S	–	12790*	L,Y	
11901	X	2.3 II	M	2	S	12430*	–	L,Y	
11902	O	1.8 1.0	M	6 32	U	– –	– –	– –	PCB
11903	X	1.0 III 1.0 III	M	5 44	U	– –	– –	– –	PCB
11904	X	1.0 III	M	5	S	12710	–	L	
11905	X	1.3 2.3 II	M	16 4	U	– –	– –	– –	PCB
11906	X	SL	F	83	U	12130	–	L,Y	
11907	X	SL	F	3	S	–	–	–	
11908	X	SL	F	5	U	12130	–	L,Y	
11909	O	1.0 III	F	5	U	12690*	–	L	
11910	X	1.0 III	M	14	U	12670*	–	L	
11911	O	1.0 III	F	14	U	12690*	–	L	
11912	X	1.0 III	M	18	U	12670*	–	L	
11913	O	1.0 III	F	18	U	12690*	–	L	
11914	O	1.0 III	F	18	U	12640	–	L	IDC
11915	O	1.0 III	F	22	U	12690*	–	L	
11916	X	1.0 III	M	40	U	–	–	–	PCB
11917	X	1.0 III	M	2	U	12670*	–	L	
11918	O	1.0 III	F	2	U	12690*	–	L	
11919	O	1.0 III	F	2	U	12640	–	L	IDC
11920	O	1.0 III	M	5	U	12670*	–	L	
11921	O	1.0 III	F	5	U	12640	–	L	IDC
11922	X	1.0 III	M	10	U	12670*	–	L	
11923	O	1.0 III	F	10	U	12690*	–	L	
11924	O	1.0 III	F	10	U	12640	–	L	IDC
11925	O	1.0 III	F	14	U	12640	–	L	IDC
11926	O	1.0 III	M	22	U	12670*	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–11927	O	1.0 III	F	22	U	82998–12640	82998– –	L	IDC
11928	X	1.0 III	M	54	U	–	–	–	PCB
11929	X	2.3 II	M	4	S	12430*	–	L,Y	
11930	X	2.3 II	F	4	S	12440*	12590	L,Y	
11933	X	1.0 III	M	2	U	12670*	–	L	
11934	X	1.0 III 1.0 IV	M	81 24	U	– –	– –	– –	PCB
11935	X	1.0 III 1.0 IV	F	20 11	U	12690* 12740	– –	L L	
11936	X	8.0	M	3	U	12390	–	Y	
11937	X	INVERT-ER	M	3	U	–	–	–	
11938	X	INVERT-ER	F	3	U	–	–	–	
11939	O	–	–	–	–	–	–	–	
11940	X	PIN	M	2	S	–	–	–	
11941	X	LA	F	1	S	–	–	–	
11942	O	LA	F	1	S	–	–	–	
11943	X	SOCK-ET	F	1	S	–	–	–	
11944	O	SOCK-ET	F	1	S	–	–	–	
11945	O	PIN	M	2	S	–	–	–	
11946	X	1.0 III	M	5	U	–	–	–	PCB
11947	X	1.0 III 2.3 II	F	8 4	U	12690* 12340*	– –	L L,Y	
11948	O	1.0 III	F	10	U	12640	–	L	IDC
11949	X	1.0 III	M	18	U	–	–	–	PCB
11950	X	1.0 III	F	4	U	12690*	–	L	
11951	X	1.0 III	M	13	U	–	–	–	PCB
11952	X	1.0 III	F	13	U	12690*	–	L	
11953	X	1.0 III 2.3 II	M	64 14	U	– –	– –	– –	PCB
11954	X	1.0 III 2.3 II	F	8 9	U	12690* 12340*	– –	L L,Y	
11955	X	1.0 III	F	19	U	12690*	–	L	
11956	X	1.0 III	F	21	U	12690*	–	L	
11957	X	1.0 III 2.3 II	F	16 5	U	12690* 12340*	– –	L L,Y	
11960	X	2.3 II	F	5	S	12440*	12590	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 11961	X	1.0 III 1.0 III	M	5 28	U	82998– –	82998– –	– –	PCB
11962	X	9.5	M	1	S	–	–	–	
11963	X	9.5	F	1	S	–	–	–	
11964	O	2.3 II	F	4	S	12440*	12590	L,Y	
11965	X	8.0	M	4	U	–	–	–	PCB
11966	X	1.0 II	M	22	U	–	–	–	PCB
11967	O	1.0 III	M	2	U	12670*	–	L	
11968	X	1.0 III	M	5	U	–	–	–	PCB
11969	X	1.0 III	M	14	U	–	–	–	PCB
11970	X	1.0 III 2.3 II	M	16 4	U	– –	– –	– –	PCB
11971	X	1.0 III 2.3 II	F	16 4	U	12690* 12340*	– –	L L,Y	
11972	X	1.0 III 2.3 II	M	49 14	U	– –	– –	– –	PCB
11973	O	1.0 III 2.3 II	F	10 8	U	12690* 12340*	– –	L L,Y	
11974	X	1.0 III	F	20	U	12690*	–	L	
11976	O	–	–	–	–	–	–	–	
11978	X	OBD II	F	16	U	–	–	–	
11985	X	1.0 III	M	4	U	–	–	–	PCB
11986	O	1.0 III	F	6	U	12690*	–	L	
11987	X	1.0 III	F	3	U	12690*	–	L	
11988	O	1.0 III	F	4	U	12640	–	L	IDC
11989	X	1.0 III	F	8	U	12690*	–	L	
11990	X	1.0 III 2.3 II	M	37 18	U	– –	– –	– –	PCB
11992	X	1.0 III	M	2	U	12670*	–	L	
11993	X	1.0 III	M	10	U	–	–	–	PCB
11994	X	2.3 II	M	3	U	–	–	–	PCB
11995	O	–	–	–	–	–	–	–	
11996	X	9.5	F	2	U	–	–	–	
12002	X	1.0 III 2.3 II	M	6 5	U	12670* 12330*	– –	L L,Y	
12003	X	1.0 III 2.3 II	F	6 5	U	12690* 12340*	– –	L L,Y	
12004	X	1.0	M	6	U	–	–	–	IDC
12005	X	2.3 II	F	4	S	–	12790*	L,Y	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–12006	O	–	–	–	–	82998– –	82998– –	–	
12007	X	1.0 III 2.3 II	F	4 9	U	12690* 12340*	– –	L L,Y	
12008	O	1.0 III 2.3 II	F	2 8	U	12690* 12340*	– –	L L,Y	
12009	X	1.0 III	M	10	U	–	–	–	PCB
12010	X	1.0 III 2.3 II	M	10 8	U	– –	– –	– –	PCB
12011	X	1.0 III	M	18	U	–	–	–	PCB
12012	X	1.0 III	F	6	U	12690*	–	L	
12013	X	1.0 III	M	6	U	–	–	–	PCB
12014	X	2.3 II	F	2	U	12340*	–	L,Y	
12015	X	1.0 III	M	14	U	–	–	–	PCB
12016	X	1.0 III	M	4	U	12670*	–	L	
12017	X	1.0 III	F	4	U	12690*	–	L	
12018	X	2.3 II	F	4	U	12340*	–	L,Y	
12019	X	1.0 III	F	4	U	12640	–	L	IDC
12020	O	4.8 1.0 III	F	4 30	S	12480 12720*	– –	Y L	
12021	O	4.8 1.0 III	F	4 23	S	12480 12720*	– –	Y L	
12022	X	4.8 1.0 III	F	4 16	S	12480 12720*	– –	Y L	
12023	X	1.0 III	M	10	U	12660	–	L	IDC
12024	X	1.0 III	M	22	U	12670*	–	L	
12025	X	1.0 III 2.3 II	M	16 4	U	12670* 12330*	– –	L L,Y	
12026	X	2.3 II	F	9	U	24220	–	L	IDC
12027	X	2.3 II	F	13	U	24220	–	L	IDC
12028	O	2.3 II	F	2	S	12440*	12590	L,Y	
12029	X	1.0	M	2	U	–	–	–	
12030	X	1.0 III	M	22	U	–	–	–	PCB
12031	X	1.0 J 1.8 J	M	60 16	U	– –	– –	– –	PCB
12032	X	1.0 J	F	12	U	–	–	–	
12033	X	4.8 1.0 III	M	2 18	U	– –	– –	– –	PCB
12034	X	4.8 1.0 III	F	2 18	U	12380 12690*	– –	Y L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980– 12035	X	1.0 III 2.3 II	M	41 6	U	82998– –	82998– –	– –	PCB
12036	X	1.0 III	M	5	U	–	–	–	PCB
12037	X	1.0 III 2.3 II	M	16 4	U	– –	– –	– –	PCB
12038	O	1.0 III 2.3 II	F	16 4	U	12690* 12340*	– –	L L,Y	
12039	X	VH	F	2	U	–	–	–	
12041	X	HFC	M	1	U	–	–	–	
12050	X	1.0 III	M	5	U	–	–	–	PCB
12055	X	1.0 III 1.0 IV	M	100 22	U	– –	– –	– –	PCB
12056	X	0.64	F	6	U	–	–	–	
12057	X	2.3 II	F	4	S	12440*	12590	L,Y	
12058	X	4.8 8.0	F	1 2	S	12480 12500	– –	Y Y	
12059	X	1.0 III	M	7	U	12670*	–	L	
12060	X	1.0 III	F	7	U	12690*	–	L	
12061	X	1.0 III	M	8	U	–	–	–	PCB
12062	X	1.0 III	M	2	U	12670*	–	L	
12063	X	1.0 III	F	2	U	12690*	–	L	
12064	X	1.0 III	M	6	U	–	–	–	PCB
12067	X	1.0 III	F	6	U	12690*	–	L	
12068	X	8.0	F	2	S	12500	–	Y	
12070	X	2.3 II	F	24	U	12340*	–	L,Y	
12071	X	2.3 II	F	32	U	12340*	–	L,Y	
12079	X	B TO J	F	24	U	–	–	–	
12080	X	1.0 III	F	8	S	12720*	–	L	
12081	X	1.0 III	M	29	U	12670*	–	L	
12082	X	1.0 III	F	14	U	12690*	–	L	
12087	X	1.0 III	M	20	U	–	–	–	PCB
12088	O	2.3 II	F	2	U	12340*	–	L,Y	
12089	X	2.3 II	F	2	U	12340*	–	L,Y	
12090	X	2.3 II	F	12	U	12340*	–	L,Y	
12091	X	1.0 III	F	8	U	12690*	–	L	
12092	O	0.64 1.0 IV	F	5 2	U	– 12740	– –	– L	
12093	X	1.0 III	M	16	U	–	–	–	PCB
12094	X	1.0 III	F	16	U	12690*	–	L	

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–12095	X	M6 NUT	F	3	S	82998– –	82998– –	–	
12096	X	1.0 III 2.3 II	F	12 20	U	12690* 12340*	– –	L L,Y	
12101	X	2.3 II	F	16	U	12340*	–	L,Y	
12102	X	2.3 II	F	28	U	12340*	–	L,Y	
12104	X	2.3 II	F	16	U	12340*	–	L,Y	
12105	X	2.3 II	M	16	U	12330*	–	L,Y	
12106	X	2.3 II	F	20	U	12340*	–	L,Y	
12108	X	2.3 II	M	18	U	–	–	–	PCB
12109	X	PAI 1	F	2	U	–	–	–	
12110	X	VALVE	F	2	U	–	–	–	
12111	X	VALVE	F	2	U	–	–	–	
12112	X	1.0 III	M	8	U	–	–	–	PCB
12113	X	1.0 III	F	8	U	12690*	–	L	
12114	X	1.0 III 2.3 II	F	6 28	U	12690* 12340*	– –	L L,Y	
12116	O	4.8 1.0 III	F	4 20	S	12480 12720*	– –	Y L	
12117	X	2.3 II	F	2	S	–	12790*	L,Y	
12118	X	8.0	M	2	U	–	–	–	PCB
12119	X	8.0	M	2	U	–	–	–	PCB
12120	X	8.0	F	2	U	12400	–	Y	
12122	X	1.0 III 2.3 II	F	6 12	U	12690* 12340*	– –	L L,Y	
12123	X	1.0 III	M	4	U	12670*	–	L	
12125	X	LA	F	1	S	–	–	–	
12129	X	LA	F	1	S	–	–	–	
12131	X	BUS–BAR	M	3	S	–	–	–	
12134	X	1.0 III	M	10	U	–	–	–	PCB
12135	X	1.0 III	F	10	U	12690*	–	L	
12136	X	LA	F	1	S	–	–	–	
12137	X	1.0 III 2.3 II	M	14 6	U	– –	– –	– –	PCB
12138	O	PAI 1	F	2	U	–	–	–	
12140	X	1.0 II 1.8 II	M	48 16	U	– –	– –	– –	PCB
12141	X	0.64 1.0 IV	M	133 34	U	– –	– –	– –	PCB

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
12142	X	0.64	F	24	U	12750*	–	L	
		1.0 IV		7		12740	–	L	
12143	X	0.64	F	25	U	12750*	–	L	
		1.0 IV		7		12740	–	L	
12144	X	0.64	F	27	U	12750*	–	L	
		1.0 IV		7		12740	–	L	
12145	X	0.64	F	28	U	12750*	–	L	
		1.0 IV		7		12740	–	L	
12146	X	0.64	F	29	U	12750*	–	L	
		1.0 IV		6		12740	–	L	
12147	X	0.64	M	68	U	–	–	–	PCB
		2.3 II		12		–	–	–	
12148	X	0.64	M	40	U	–	–	–	PCB
		2.3 II		10		–	–	–	
12149	X	0.64	F	20	U	12750*	–	L	
		2.3 II		4		12340*	–	L,Y	
12150	X	0.64	F	20	U	12750*	–	L	
		2.3 II		6		12340*	–	L,Y	
12151	X	0.64	F	28	U	12750*	–	L	
		2.3 II		2		12340*	–	L,Y	
12152	X	0.64	M	32	U	–	–	–	PCB
12153	X	0.64	F	32	U	12750*	–	L	
12155	X	0.64	F	16	U	12750*	–	L	
12156	X	0.64	F	16	U	12770	–	L	IDC
12157	X	0.64	M	16	U	–	–	–	PCB
12159	X	1.0 III	M	4	U	12670*	–	L	
12160	X	1.0 III	F	4	U	12690*	–	L	
12161	X	1.0 III	M	8	U	12670*	–	L	
		2.3 II		9		12330*	–	L,Y	
12162	X	1.0 III	F	10	U	12690*	–	L	
12163	X	2.3 II	M	8	S	12430*	–	L,Y	
12164	X	2.3 II	F	8	S	12440*	12590	L,Y	
12165	O	–	–	–	–	–	–	–	
12166	X	1.0 III	F	14	U	12690*	–	L	
		2.3 II		6		12340*	–	L,Y	
12167	X	1.0 III	M	8	U	–	–	–	PCB
12168	X	1.0 III	F	3	S	12720*	–	L	
12169	X	0.64	F	40	U	12750*	–	L	
12170	X	0.64	F	40	U	12770	–	L	IDC

HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–12171	X	0.64	M	40	U	82998––	82998––	–	PCB
12174	X	1.0 II	F	18	U	24020*	–	L	IDC
12176	O	2.3 II	F	4	S	–	12790*	L,Y	
12177	X	2.3 II	M	4	S	–	–	L,Y	
12179	X	1.0 III 2.3 II	F	42 4	U	12690* 12340*	– –	L L,Y	
12182	X	0.64	M	12	U	–	–	–	PCB
12183	X	0.64	F	12	U	12750*	–	L	
12184	X	1.0 III 2.3 II	F	30 12	U	12690* 12340*	– –	L L,Y	
12188	X	2.3 II	F	2	S	12440*	12590	L,Y	
12189	X	1.0 III	M	5	U	12670*	–	L	
12190	X	1.0 III	F	5	U	12690*	–	L	
12191	X	PAI 1	F	2	U	–	–	–	
12192	X	0.64	M	16	U	–	–	–	
12193	X	0.64	M	24	U	–	–	–	
12194	X	1.0 III	M	2	S	12710	–	L	
12195	X	1.0 III	F	2	S	12720*	–	L	
12196	X	D–3	M	3	U	–	–	–	
12197	X	D–3	F	3	U	–	–	–	
12198	X	D–3	M	6	U	–	–	–	
12199	X	D–3	F	6	U	–	–	–	
12200	X	0.64	F	24	U	12750*	–	L	
12202	X	0.64 2.3 II	M	20 6	U	– –	– –	– –	PCB
12203	X	0.64 2.3 II	F	20 6	U	12750* 12340*	– –	L L,Y	
12204	X	1.0 III	M	6	U	12670*	–	L	
12205	X	2.3 II	M	12	U	–	–	–	PCB
12206	X	2.3 II	M	16	U	–	–	–	PCB
12207	X	1.0 III 2.3 II	M	26 8	U	– –	– –	– –	PCB
12208	X	1.0 III	M	6	U	–	–	–	PCB
12209	O	1.0 III	F	6	U	12690*	–	L	
12210	X	1.0 III	M	4	U	–	–	–	PCB
12211	O	1.0 III	F	4	U	12690*	–	L	
12212	X	1.0 III	M	4	U	12670*	–	L	
12213	X	0.64	M	40	U	–	–	–	PCB
12214	X	0.64	M	24	U	–	–	–	PCB

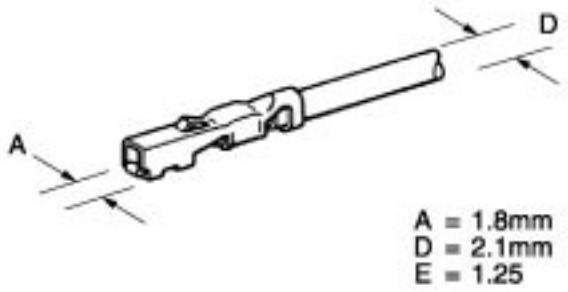
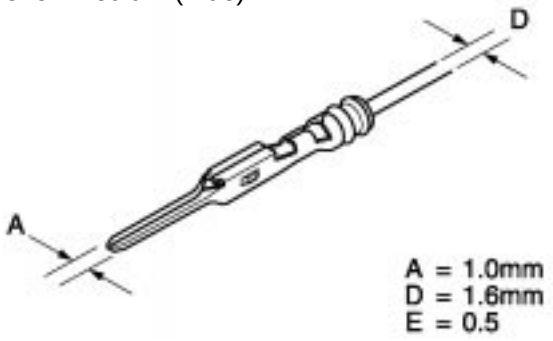
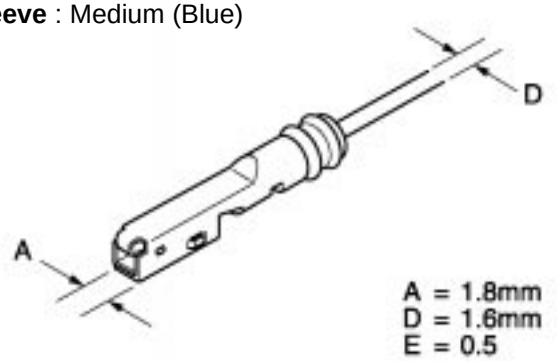
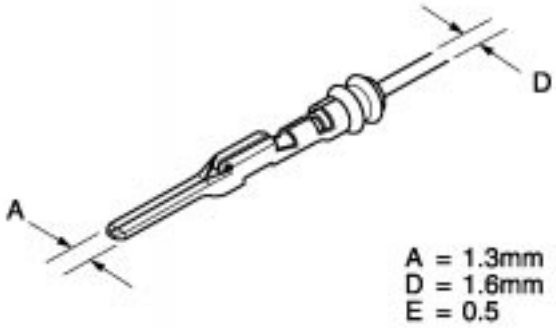
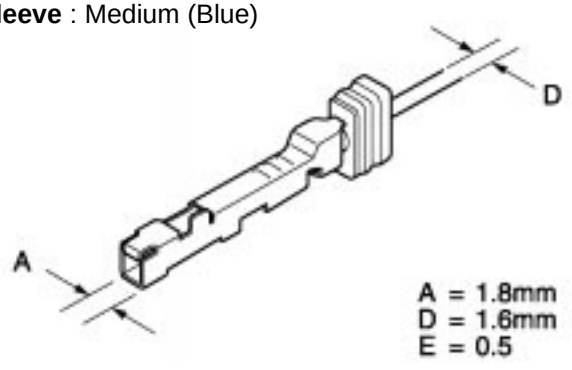
HOUSING PART NUMBER LIST

Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–12215	X	0.64	M	24	U	82998– –	82998– –	–	PCB
12216	X	0.64	M	8	U	–	–	–	PCB
12217	X	0.64	F	8	U	12750*	–	L	
12218	X	PAI 1	M	2	U	–	–	–	
12219	X	PAI 1	F	2	U	–	–	–	
12220	X	0.64	M	8	U	–	–	–	PCB
12221	X	0.64	F	8	U	12750*	–	L	
12222	X	0.64	F	12	U	12750*	–	L	
12223	X	PAI 1	M	2	U	–	–	–	
12224	X	PAI 1	F	2	U	–	–	–	
12225	X	0.64	F	4	U	12750*	–	L	Splash Proof
12226	X	1.0 III 2.3 II	F	6 4	U	12690* 12340*	– –	L L,Y	
12227	X	9.5	M	3	S	–	–	–	
12228	X	9.5	F	3	S	–	–	–	
12230	X	LA	F	1	S	–	–	–	
12231	X	LA	F	1	S	–	–	–	
12232	X	0.64 1.0 IV	M	108 27	U	– –	– –	– –	PCB
12233	X	0.64 2.3 II	M	20 6	U	– –	– –	– –	PCB
12234	X	4.8	M	3	S	12470	–	Y	
12237	X	4.8	F	3	S	12480	–	Y	
12241	X	0.64	F	2	U	12750*	–	L	Splash Proof
12242	X	PAI 1	F	2	U	–	–	–	
12243	X	PAI 1	F	2	U	–	–	–	
12249	X	2.3 II	M	10	U	12330*	–	L,Y	
12250	X	0.64	M	11	U	–	–	–	
12251	X	0.64	F	11	U	12750*	–	L	
12252	X	0.64	M	16	U	–	–	–	
12253	O	PAI 1	F	2	U	–	–	–	
12258	X	0.64	M	20	U	–	–	–	PCB
12259	X	0.64	F	20	U	12750*	–	L	
12260	X	0.64	M	24	U	–	–	–	PCB
12269	X	0.64	M	12	U	–	–	–	PCB
12270	X	0.64	M	24	U	–	–	–	PCB
12271	X	1.0 III 2.3 II	F	20 6	U	12690* 12340*	– –	L L,Y	
12272	X	1.0 III	F	10	U	12690*	–	L	

HOUSING PART NUMBER LIST

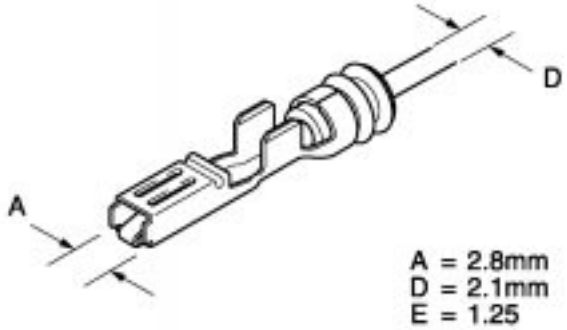
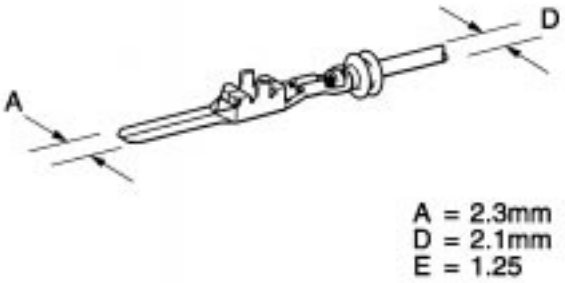
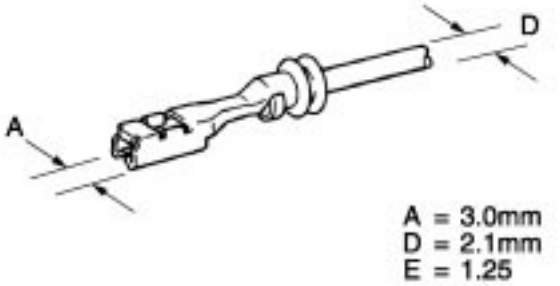
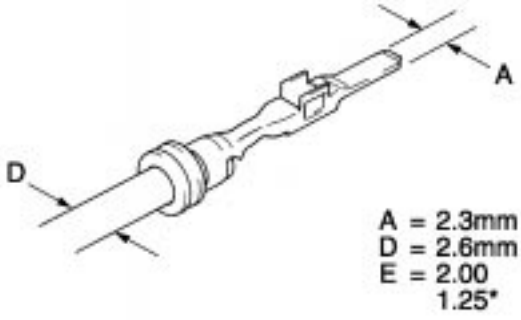
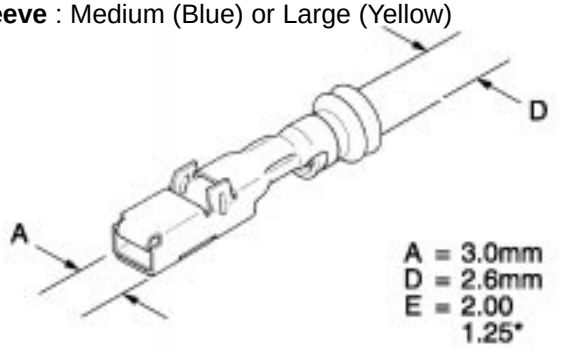
Part No. of Connector Body	Supply	Terminal	Male Female	Cav. No.	Sealing Ability	Part No. of Repair Wire		Sleeve Color	Memo
						160 mm Type	500 mm Type		
90980–						82998–	82998–		
12273	X	1.0 III	F	6	U	12690*	–	L	
		2.3 II		6		12340*	–	L,Y	
12274	X	1.0 III	F	18	U	12690*	–	L	
		2.3 II		18		12340*	–	L,Y	
12275	X	1.0 III	F	8	U	12690*	–	L	
		2.3 II		24		12340*	–	L,Y	
12276	X	1.0 III	F	24	U	12690*	–	L	
		2.3 II		14		12340*	–	L,Y	
12277	X	1.0 III	F	10	U	12690*	–	L	
		2.3 II		20		12340*	–	L,Y	
12278	X	4.8	F	1	U	12380	–	Y	
		1.0 III		6		12690*	–	L	
		2.3 II		18		12340*	–	L,Y	
12291	X	1.0 III	M	39	U	–	–	–	PCB
12296	X	0.64	F	3	U	12750*	–	L	

Repair Wire (Waterproof Type)

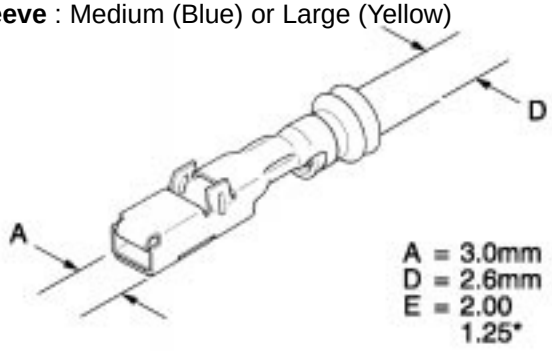
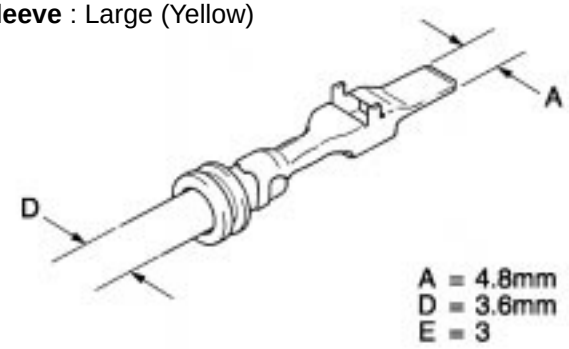
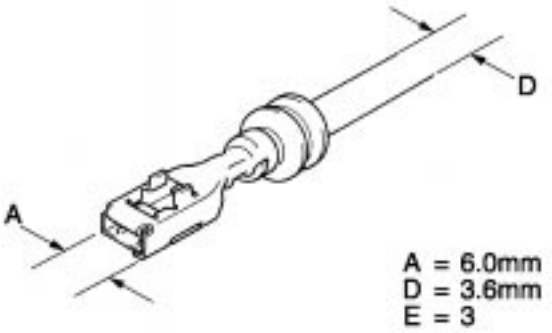
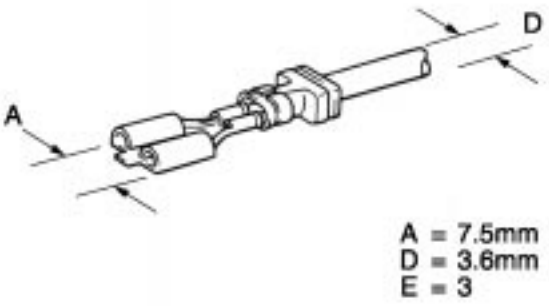
Type	**1.0II**	
	Male	Female
		
P/N		82998–24060
Type	**1.0III**	
	Male	Female
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
P/N	82998–12710	82998–12720 82998–12730*
Type	**1.3**	
	Male	Female
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
P/N	82998–12630	82998–12650

F

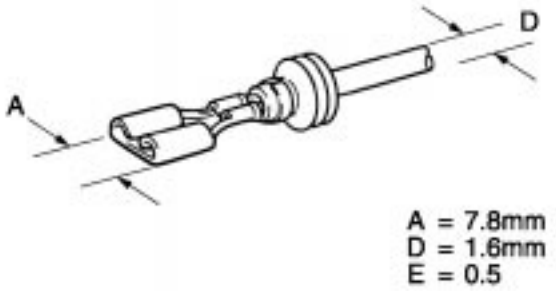
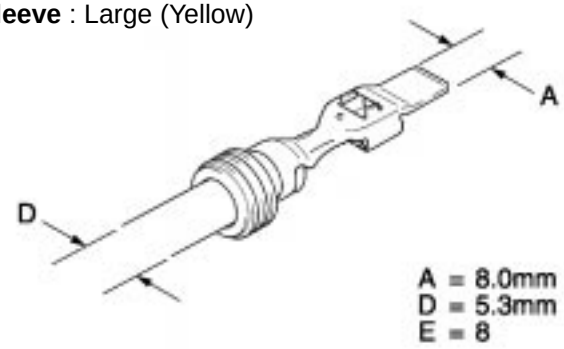
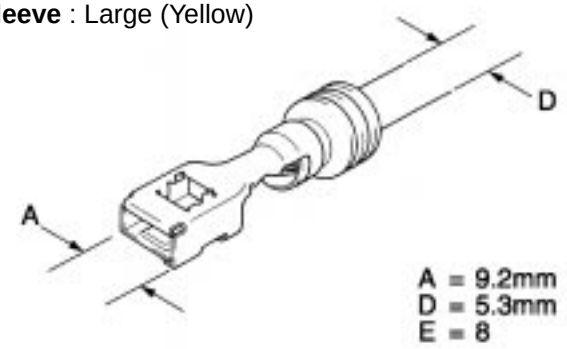
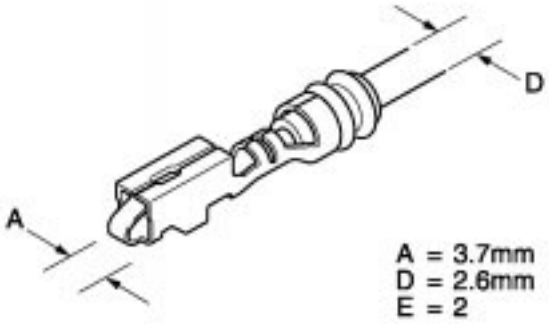
Repair Wire (Waterproof Type)

Type	1.8	
	Male	Female
		Sleeve : Medium (Blue) 
P/N		82998–12620
Type	**2.3**	
	Male	Female
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
P/N	82998–12260 82998–24070*	82998–12270(160mm) 82998–12600(500mm) 82998–24080*
Type	**2.3II (6mm Pitch Type)**	
	Male	Female
	Sleeve : Medium (Blue) or Large (Yellow) 	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N	82998–12430 82998–12450*	82998–12440(160mm) 82998–12590(500mm) 82998–12460*

Repair Wire (Waterproof Type)

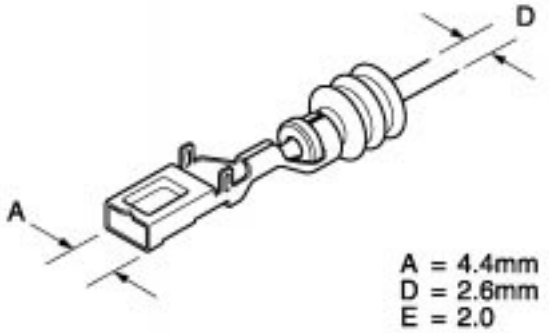
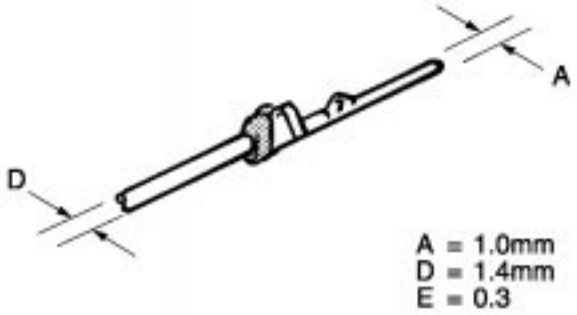
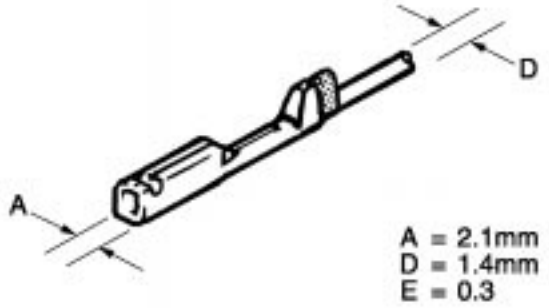
Type	2.3II (5mm Pitch Type)	
	Male	Female
	—	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N		82998–12790 82998–12780*
Type	**4.8**	
	Male	Female
	Sleeve : Large (Yellow) 	
P/N	82998–12470	82998–12480
Type	**6.3**	
	Male	Female
	—	
P/N		82998–12540

Repair Wire (Waterproof Type)

Type	6.3II	
	Male	Female
		Sleeve : Medium (Blue) 
P/N		82998–24160
Type	8.0	
	Male	Female
	Sleeve : Large (Yellow) 	**Sleeve** : Large (Yellow) 
P/N	82998–12490	82998–12500
Type	HEAD LAMP	
	Male	Female
		Sleeve : Medium (Blue) or Large (Yellow) 
P/N		82998–24150(160mm) 82998–24190(500mm)

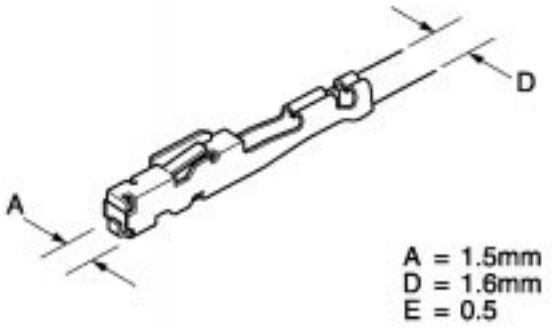
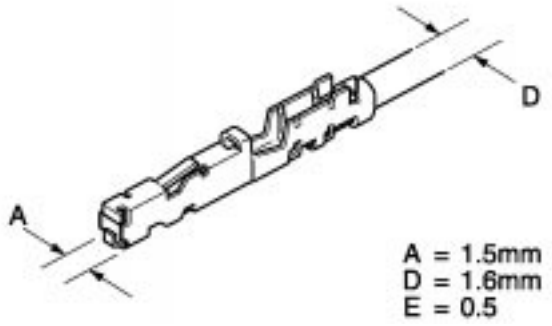
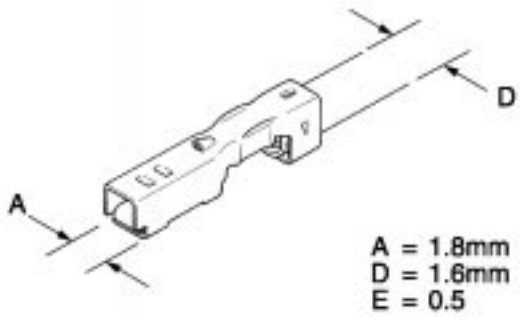
F

Repair Wire (Waterproof Type)

Type	HB3, HB4	
	Male	Female
		Sleeve : Medium (Blue) or Large (Yellow) 
P/N		82998–12550(160mm) 82998–12610(500mm)
Type	**TLC**	
	Male	Female
	Sleeve : Small (Red) 	**Sleeve** : Small (Red) 
P/N	82998–12280	82998–12290

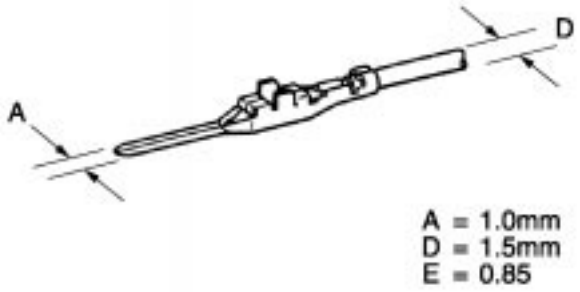
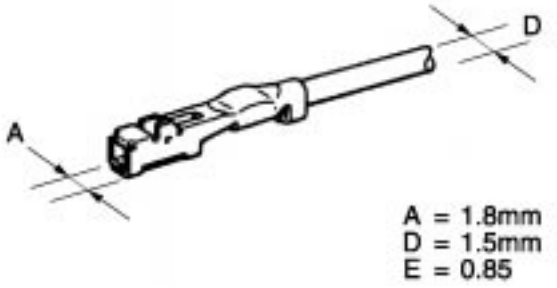
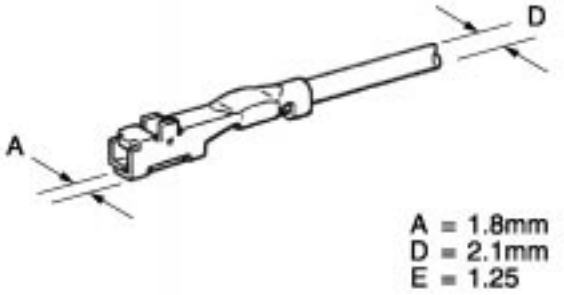
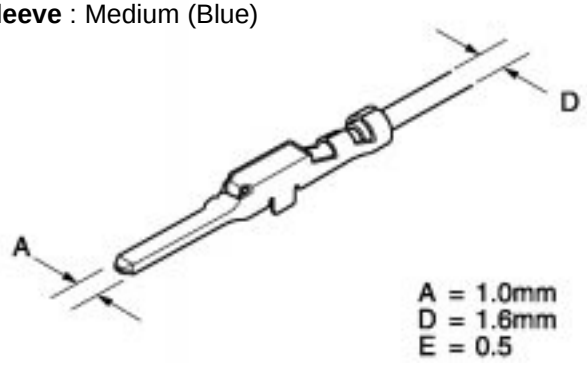
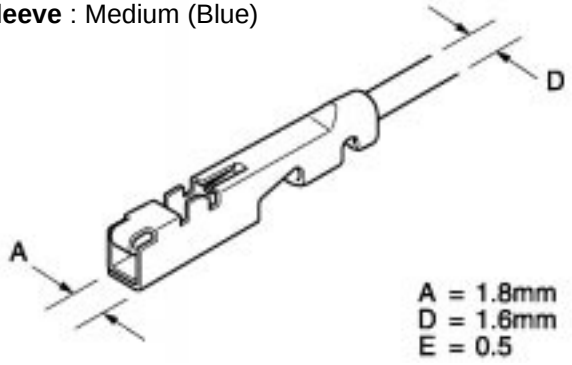
F

Repair Wire (Non–waterproof Type)

Type	0.64	
	Male	Female
		Sleeve : Medium (Blue) 
P/N		82998–12750 82998–12760*
Type	**0.64 IDC**	
	Male	Female
		Sleeve : Medium (Blue) 
P/N		82998–12770
Type	**1.0**	
	Male	Female
		
P/N		82998–12310 82998–12320*

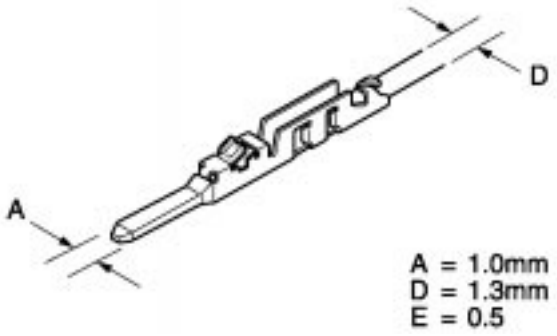
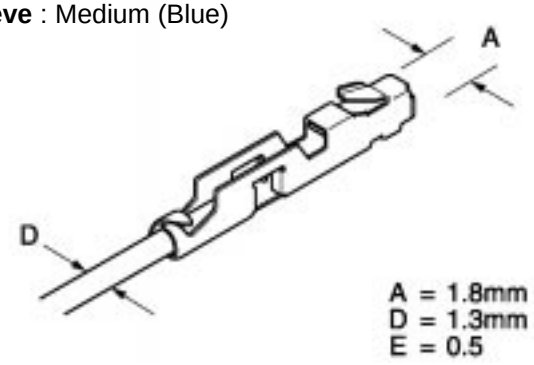
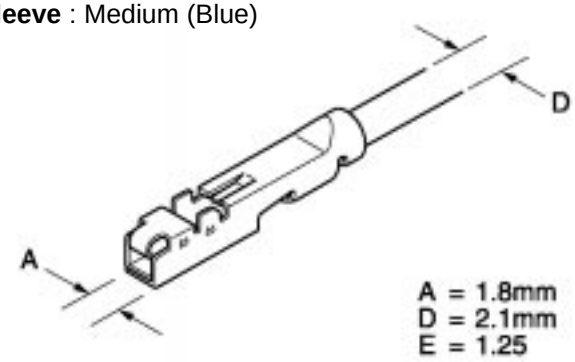
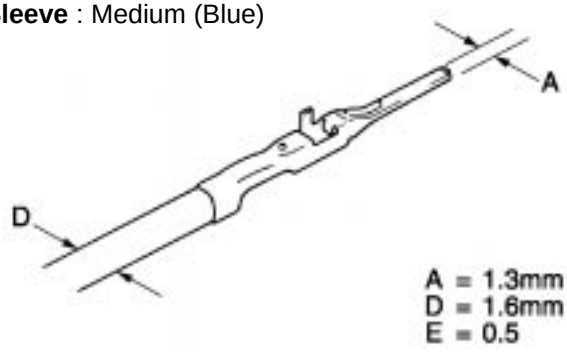
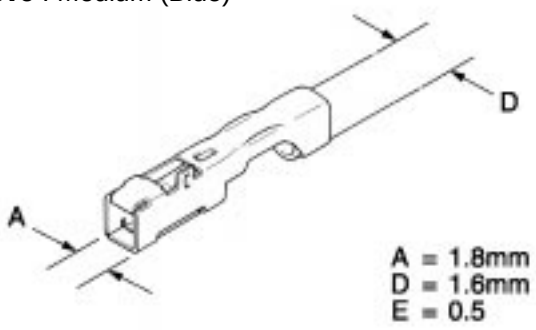
F

Repair Wire (Non–waterproof Type)

Type	1.0II	
	Male	Female
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) **Size : S** 
P/N	82998–24010	82998–24020 82998–24110*
Type	**1.0II**	
	Male	Female
		Sleeve : Medium (Blue) **Size : M** 
P/N		82998–24120*
Type	**1.0III**	
	Male	Female
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
P/N	82998–12670 82998–12680*	82998–12690 82998–12700*

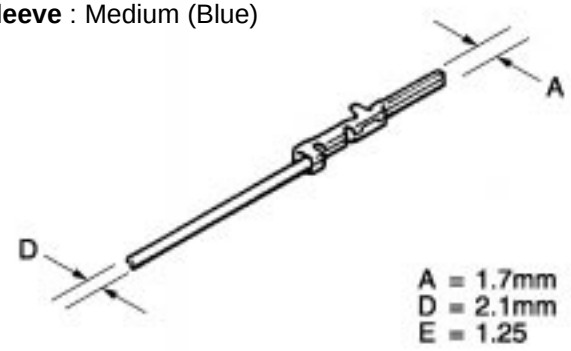
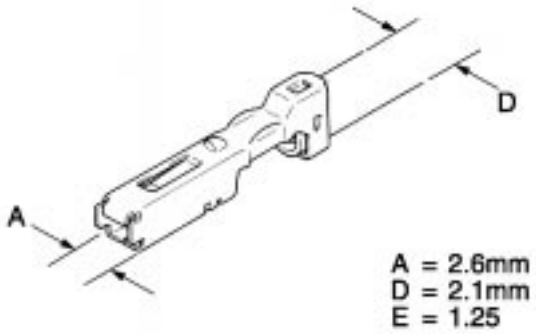
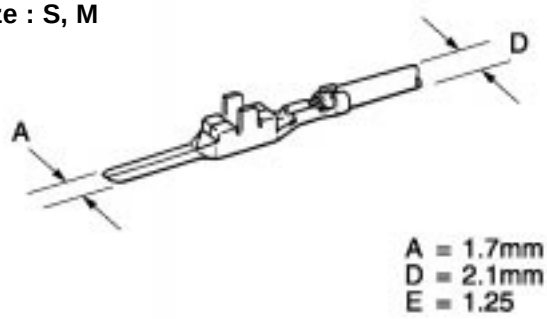
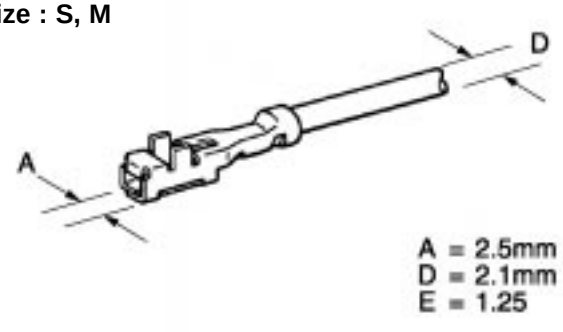
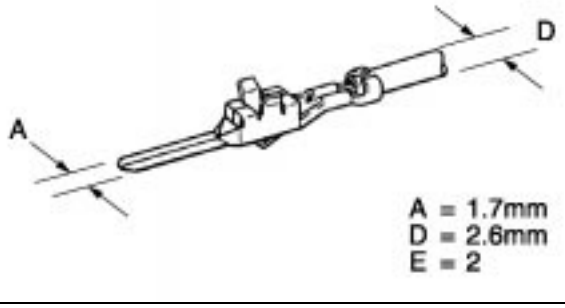
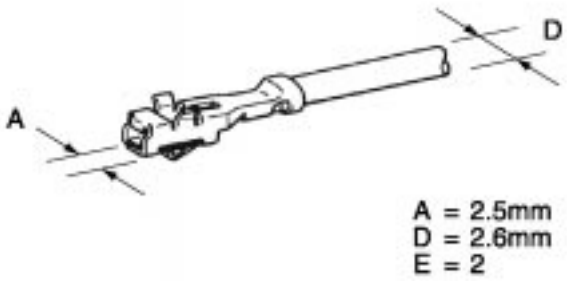
F

Repair Wire (Non–waterproof Type)

Type	1.0III IDC	
	Male	Female
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
P/N	82998–12660	82998–12640
Type	**1.0IV**	
	Male	Female
		Sleeve : Medium (Blue) 
P/N		82998–12740
Type	**1.3**	
	Male	Female
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
P/N	82998–12410	82998–12420

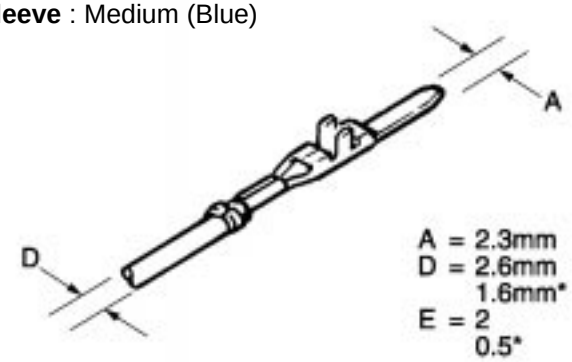
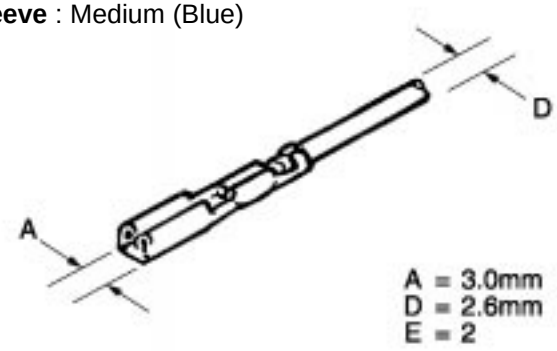
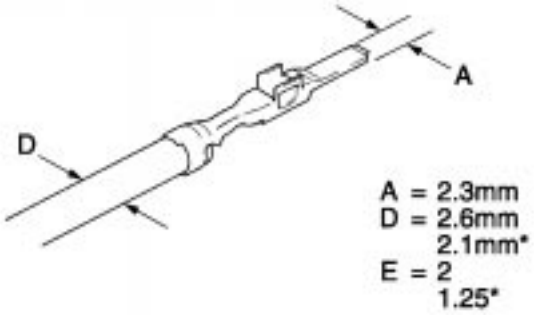
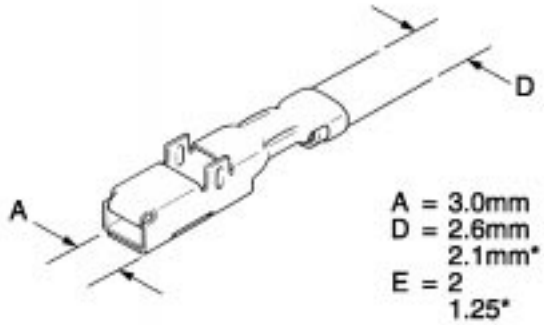
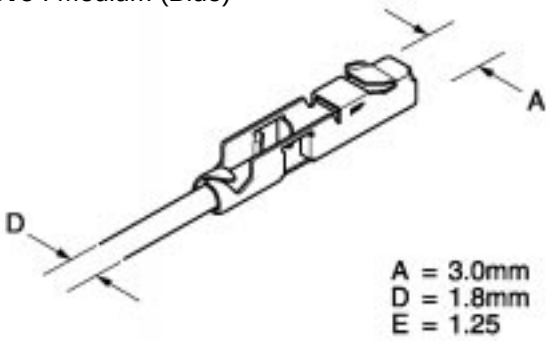
F

Repair Wire (Non–waterproof Type)

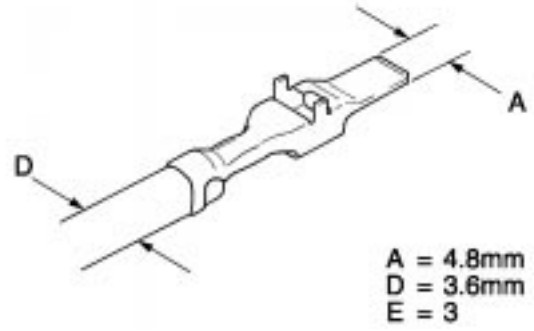
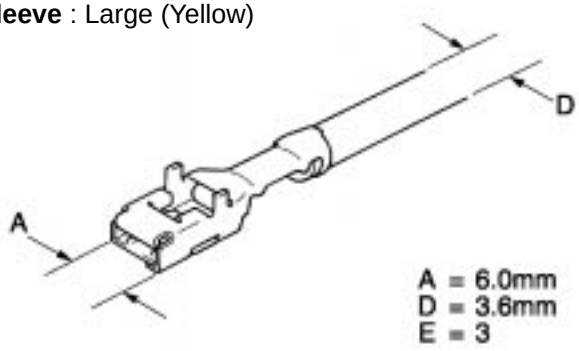
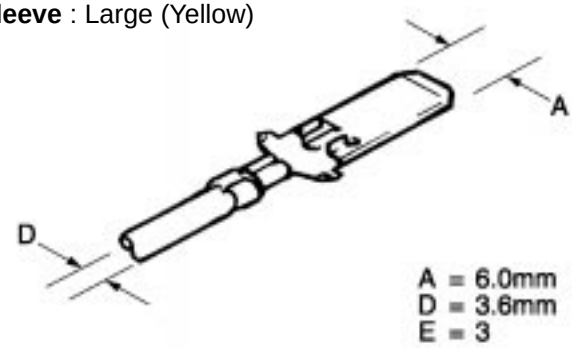
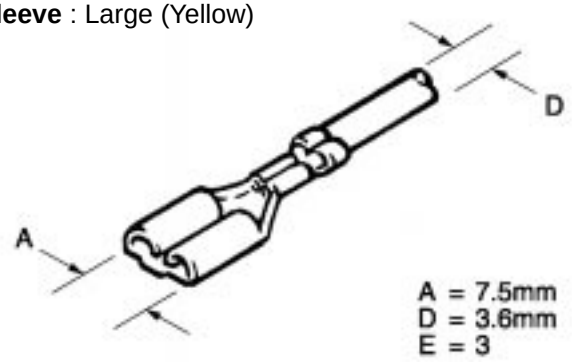
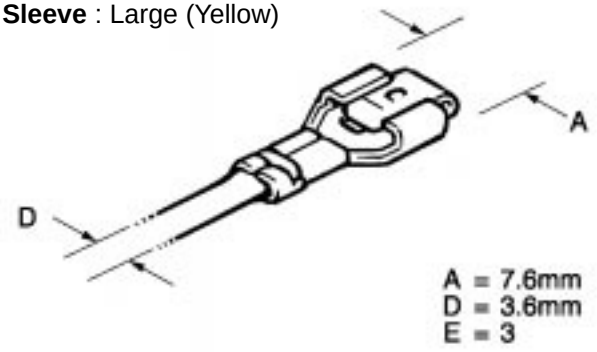
Type	1.8	
	Male	Female
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
P/N	82998–12180	82998–12190 82998–12300*
Type	**1.8II**	
	Male	Female
	Sleeve : Medium (Blue) or Large (Yellow) **Size : S, M** 	**Sleeve** : Medium (Blue) or Large (Yellow) **Size : S, M** 
P/N	82998–24090 82998–24130*	82998–24100
Type	**1.8II**	
	Male	Female
	Sleeve : Medium (Blue) or Large (Yellow) **Size : L** 	**Sleeve** : Medium (Blue) or Large (Yellow) **Size : L** 
P/N	82998–24030	82998–24040

F

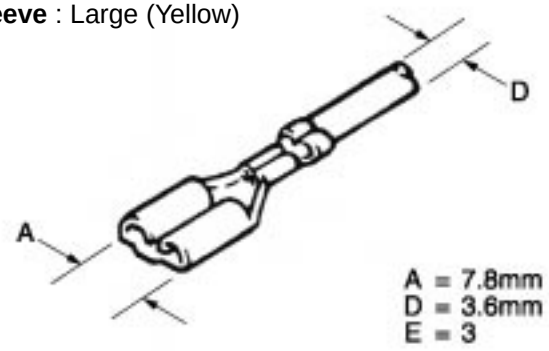
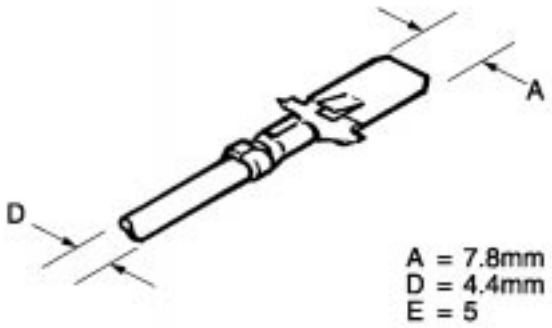
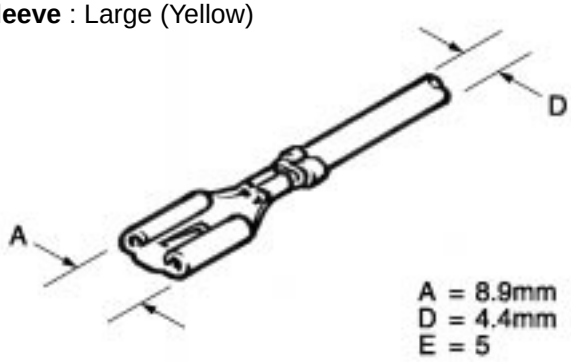
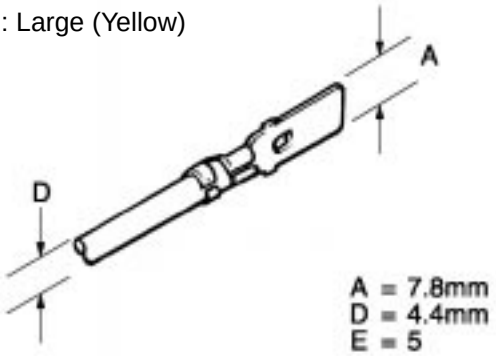
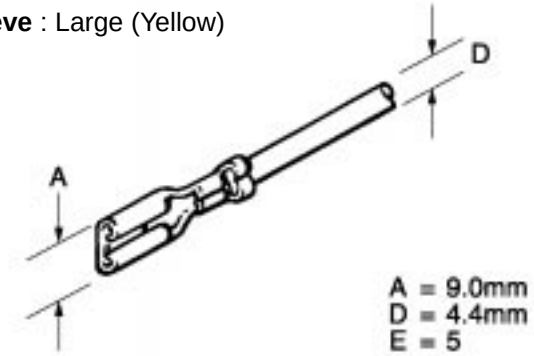
Repair Wire (Non–waterproof Type)

Type	2.3	
	Male	Female
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
P/N	82998–12160 82998–24050*	82998–12170
Type	**2.3II**	
	Male	Female
	Sleeve : Medium (Blue) or Large (Yellow) 	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N	82998–12330 82998–12350*	82998–12340 82998–12360*
Type	**2.3II IDC**	
	Male	Female
		Sleeve : Medium (Blue) 
P/N		82998–24220

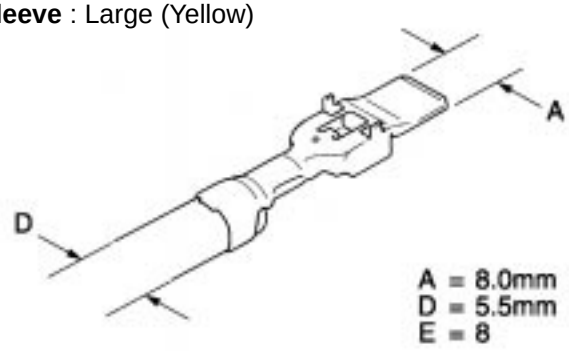
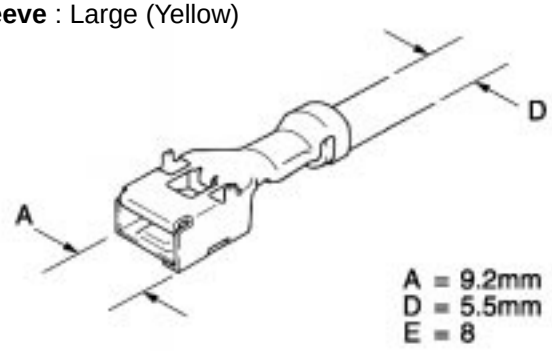
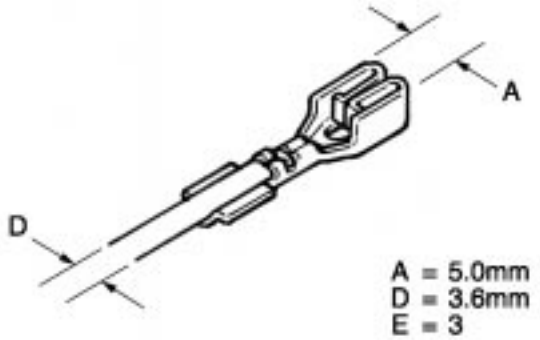
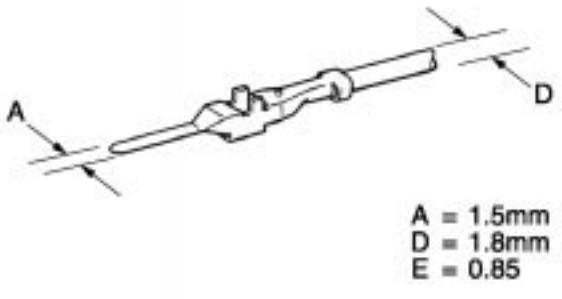
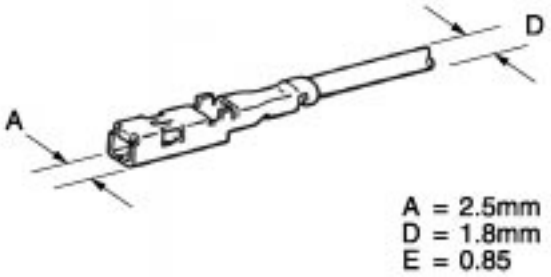
Repair Wire (Non–waterproof Type)

Type	4.8	
	Male	Female
	Sleeve : Large (Yellow) 	**Sleeve** : Large (Yellow) 
P/N	82998–12370	82998–12380
Type	**6.3**	
	Male	Female
	Sleeve : Large (Yellow) 	**Sleeve** : Large (Yellow) 
P/N	82998–12050	82998–12060(160mm) 82998–12580(500mm)
Type	**6.3**	
	Male	Female
		Sleeve : Large (Yellow) 
P/N		82998–12070

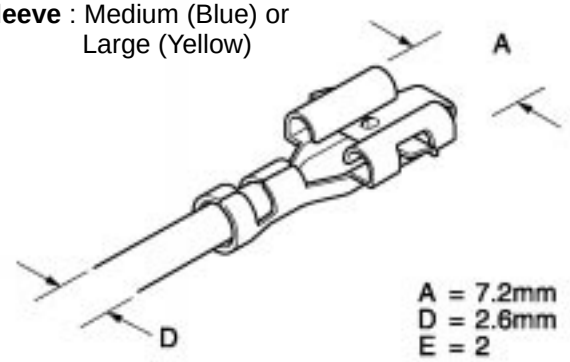
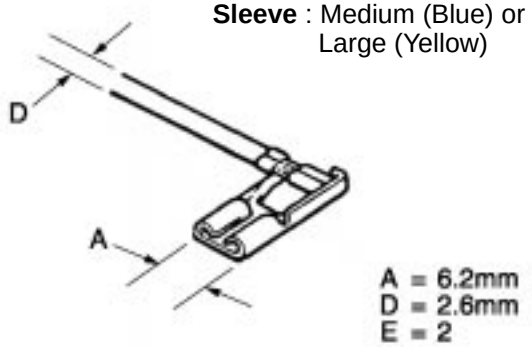
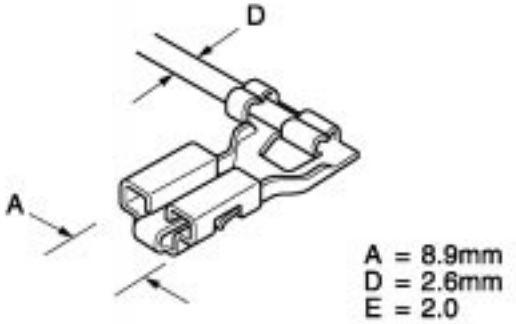
Repair Wire (Non–waterproof Type)

Type	6.3II	
	Male	Female
		Sleeve : Large (Yellow) 
P/N		82998–24170
Type	**7.7 Terminal Lance**	
	Male	Female
	Sleeve : Large (Yellow) 	**Sleeve** : Large (Yellow) 
P/N	82998–12010	82998–12020
Type	**7.7 Housing Lance**	
	Male	Female
	Sleeve : Large (Yellow) 	**Sleeve** : Large (Yellow) 
P/N	82998–12030	82998–12040

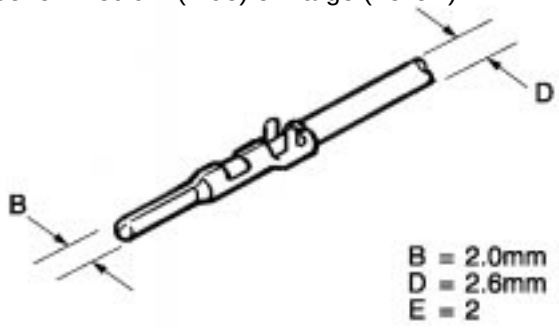
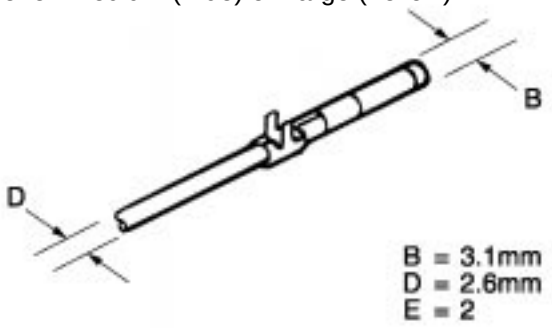
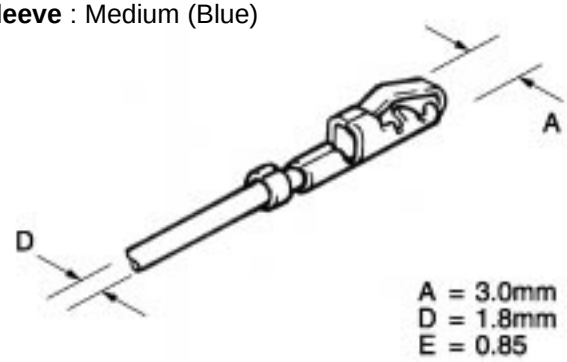
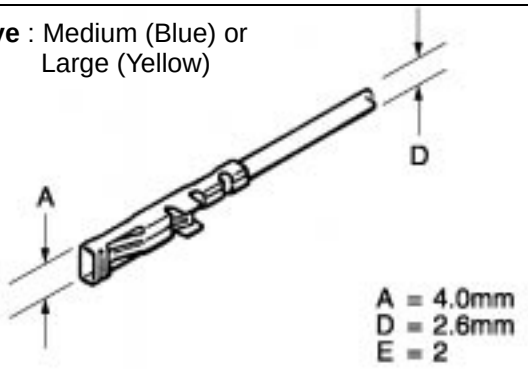
Repair Wire (Non–waterproof Type)

Type	8.0	
	Male	Female
	Sleeve : Large (Yellow) 	**Sleeve** : Large (Yellow) 
P/N	82998–12390	82998–12400
Type	**BLADE FUSE**	
	Male	Female
		
P/N		82998–12140
Type	**C–Type**	
	Male	Female
		
P/N	82998–12560	82998–12570

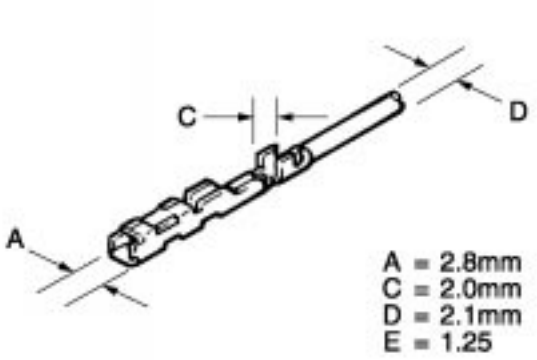
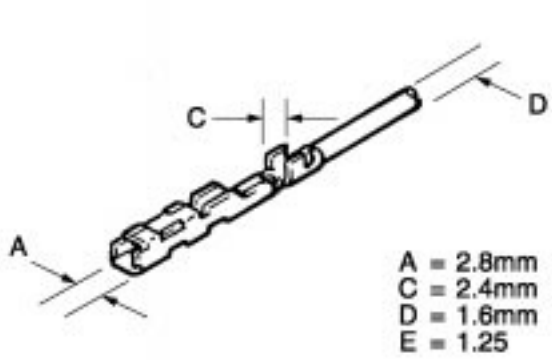
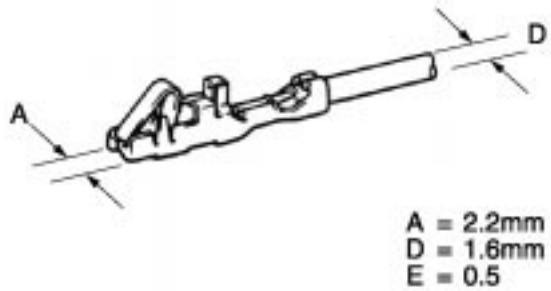
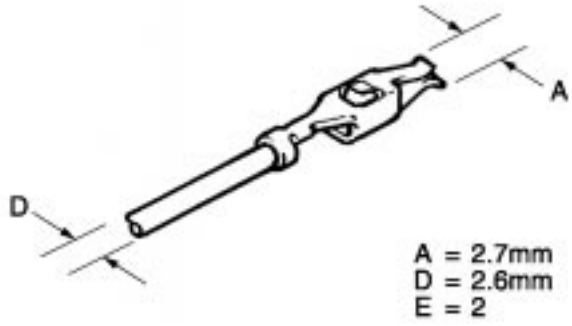
Repair Wire (Non–waterproof Type)

Type	FOG–LP	
	Male	Female
		Sleeve : Medium (Blue) or Large (Yellow) 
P/N		82998–24210
Type	**FTC**	
	Male	Female
		Sleeve : Medium (Blue) or Large (Yellow) 
P/N		82998–12510
Type	**HEAD LAMP**	
	Male	Female
		Sleeve : Medium (Blue) or Large (Yellow) 
P/N		82998–24140(160mm) 82998–24200(500mm)

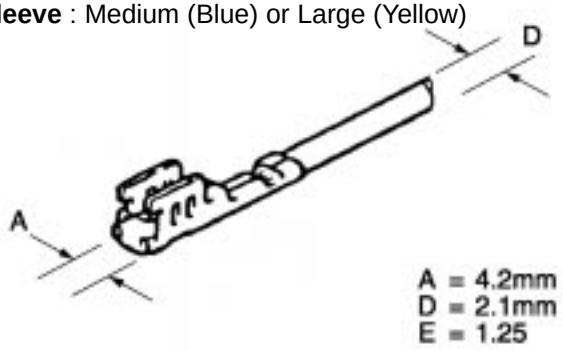
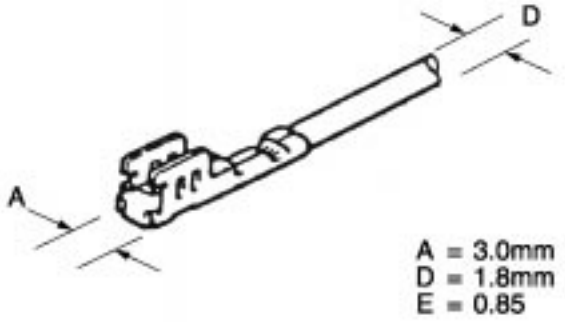
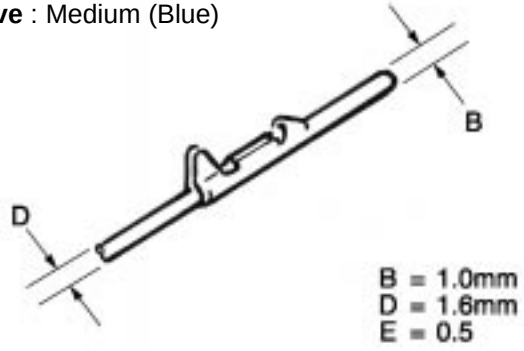
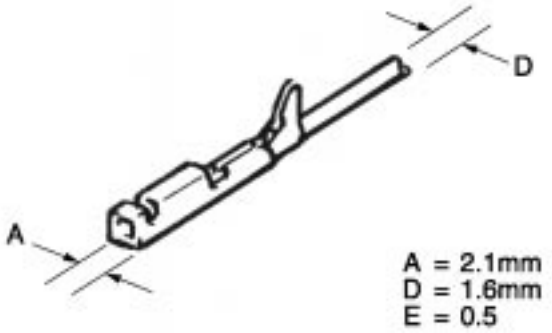
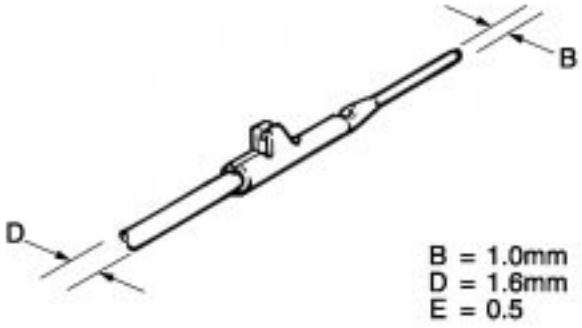
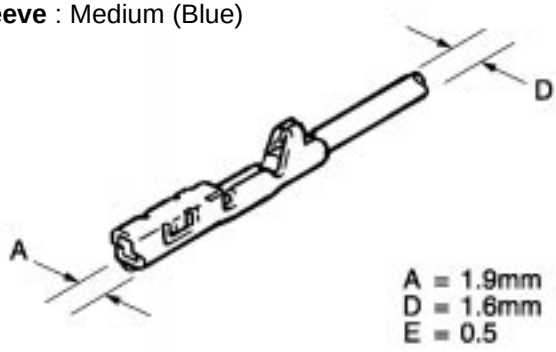
Repair Wire (Non–waterproof Type)

Type	LAC	
	Male	Female
	Sleeve : Medium (Blue) or Large (Yellow) 	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N	82998–12100	82998–12110
Type	**MFPC**	
	Male	Female
	—	**Sleeve** : Medium (Blue) 
P/N		82998–12150
Type	**MIC**	
	Male	Female
	—	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N		82998–12120

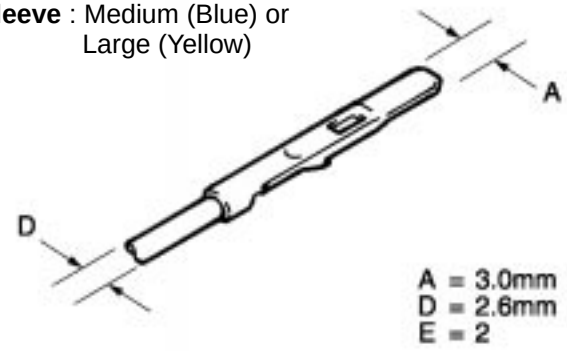
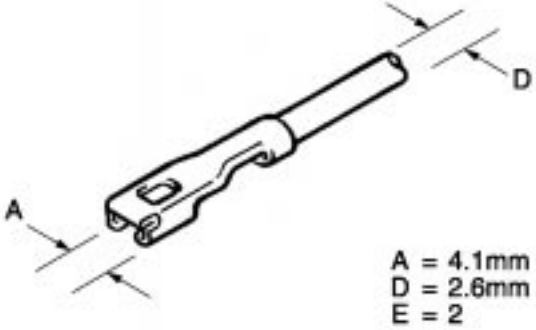
Repair Wire (Non–waterproof Type)

Type	PULSE LOCK	
	Female (Power)	Female (Signal)
		
P/N	82998–12200	82998–12210
Type	SFPC	
	Male	Female
	—	**Sleeve** : Medium (Blue) 
P/N		82998–24180
Type	SL	
	Male	Female
	—	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N		82998–12130

Repair Wire (Non–waterproof Type)

Type	**SP**	
	Female (Power)	Female (Signal)
	Sleeve : Medium (Blue) or Large (Yellow) 	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N	82998–12520	82998–12530
Type	**TLC**	
	Male	Female
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
P/N	82998–12220	82998–12230
Type	**TNS**	
	Male	Female
	Sleeve : Medium (Blue) 	**Sleeve** : Medium (Blue) 
P/N	82998–12240	82998–12250

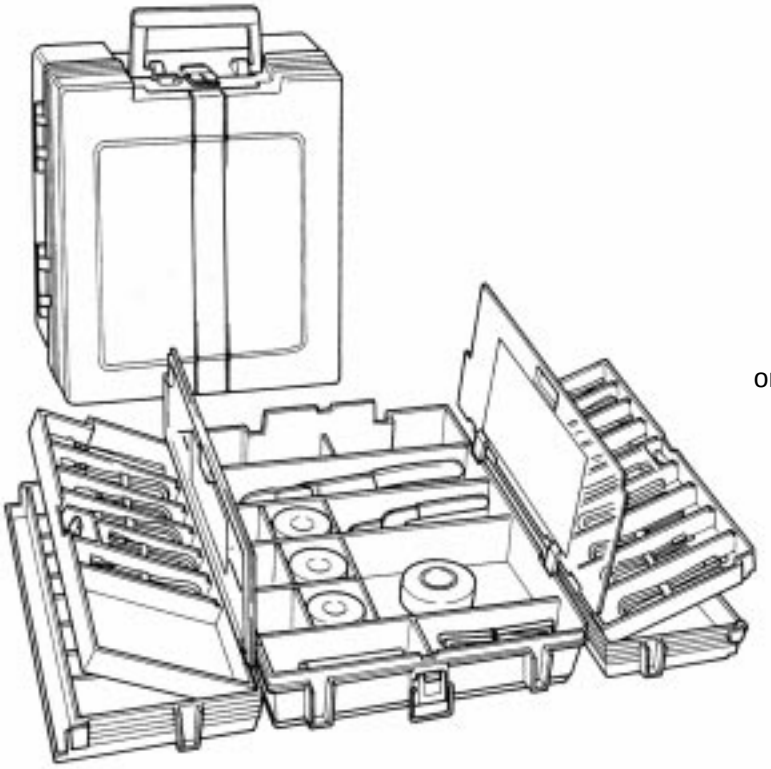
Repair Wire (Non–waterproof Type)

Type	TODC	
	Male	Female
	Sleeve : Medium (Blue) or Large (Yellow) 	**Sleeve** : Medium (Blue) or Large (Yellow) 
P/N	82998–12080	82998–12090

WIRE HARNESS REPAIR KIT WITH CASE (REFERENCE ONLY)

We would like to recommend to you use of the ”Wire Harness Repair Kit with the Case” according to your after service market demand.

Example:



[portable type]

or

[stationary type]

Remark: This kind of kit is not available from Toyota Motor Corporation.

REPORTING OF WIRE HARNESS PROBLEM

It is more difficult to understand the cause of wire harness problems and to make production improvements, due to the number of wire harness routings and connectors and their wide scope of use.
The position of the problem occurrence and the problem cause will be very clear if you proceed with wire harness/connector repairs.
We request that when you perform repairs, you fill in the attached ”WIRE HARNESS/CONNECTOR PROBLEM CHECK SHEET” and send it to your distributor.
Toyota Motor Corporation will be able to make production improvements more quickly and surely based on the results of the above mentioned reports (Check Sheets).

WIRE HARNESS/CONNECTOR PROBLEM CHECK SHEET page 1/3

Please use the TOYOTA ELECTRICAL WIRING DIAGRAM (EWD) manual to answer this questionnaire accurately.

Dealer Name _____ Dealer Code _____

Full Model Code _____ Frame No. _____

P/D ____/____ km-reading/Mileage Date of Problem ____/____/____

Customer Complaint: _____

Electrical Component with Problem: _____

Condition: ☐ Intermittent operation ☐ Inoperative ☐ Others

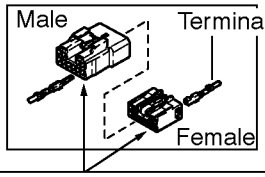
Symptom: ☐ Short ☐ Open circuit ☐ Moisture

☐ Others (Eg.Rattle,Noise etc. - Please proceed to "Box B" on next page.)

CONNECTOR PROBLEM:

Please fill in the required information in the brackets and check the appropriate box.

EWD page ( )
CONNECTOR NO.( )



☐ TERMINAL
- ☐ Male ☐ Female

PIN No. ( )
WIRE COLOR ( )

- ☐ TERMINAL MISSING (Terminal Coming off)
- ☐ TERMINAL BROKEN
- ☐ TERMINAL BENT (Male)
- ☐ TERMINAL EXPANDED (Female)
- ☐ WIRE POORLY CRIMPED AT TERMINAL
- ☐ CORROSION, RUST, MOISTURE
- ☐ POOR CONTACT
- ☐ OTHERS ( )

- ☐ NON-WATERPROOF TYPE
- ☐ WATERPROOF TYPE
  - WATER ENTERING FROM:
    - ☐ SEAL PACKING ☐ WIRE HARNESS
    - ☐ TERMINAL PACKING ☐ UNCLEAR, OTHERS

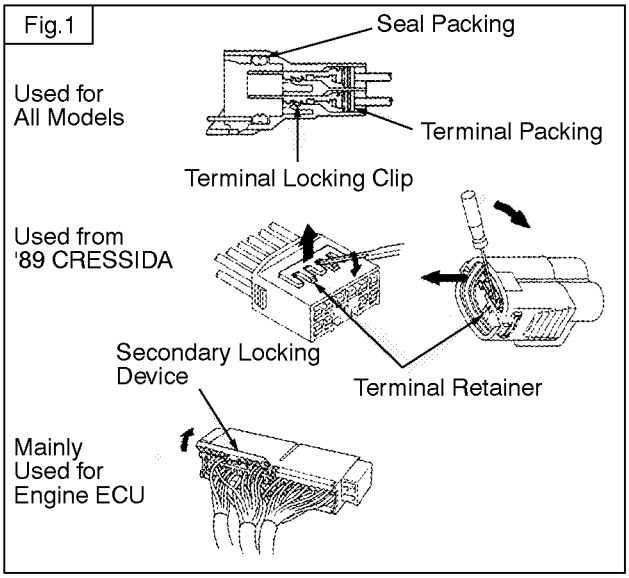
Please refer to Fig. 1

- ☐ BROKEN LOCKING CLIP OF CONNECTOR
- ☐ TERMINAL LOCKING CLIP MISSING
- ☐ TERMINAL RETAINER BROKEN
- ☐ SECONDARY LOCKING PLATE MISSING
- ☐ OTHERS; ( )

☐ CONNECTOR BODY
- ☐ Male ☐ Female

- ☐ NOT CONNECTED/HALF CONNECTED
- ☐ BROKEN CONNECTOR
- ☐ BROKEN LOCKING CLIP OF CONNECTOR
- ☐ OTHERS ( )

Fig.1



WIRE HARNESS PROBLEM:

page 2/3

Please fill in the required information in the brackets and check the appropriate box.

E.W.D Page ( )

Problem occurred between { *CONNECTOR NO.A ( ) / PIN NO. ( ) / WIRE COLOR ( ) } and { CONNECTOR NO.B ( ) / PIN NO. ( ) / WIRE COLOR ( ) }

* The problem indicated below occurred at a distance of (mm) from connector A ( )

☐ SHORT

☐ OPEN

☐ POOR CONTACT OF RING TYPE TERMINAL

☐ PINCHED
☐ INTERFERENCE/ABRATION
☐ MOISTURE
☐ CORROSION, RUST
☐ OTHERS;

☐ CUT WIRE
☐ SPLICE POINT
☐ OTHRES;

☐ EARTH TERMINAL
☐ POWER SOURCE TERMINAL
  ☐ BATTERY
  ☐ STARTER
  ☐ ALTERNATOR

Name of the other part which causef the short/open of wire

☐ BODY ☐ PART ☐ OTHERS — Name ( )

INSULATION:
☐ YES ☐ NO
  ☐ CONDUIT TUBE
  ☐ VINYL TUBE
  ☐ VINYL TAPE
  ☐ VINYL SHEET
  ☐ OTHERS ( )

☐ LOOSE SET BOLT
☐ CORROSION, RUST
☐ OTHERS ( )

G

Note: If possible, attach an illustration or photo to show the part causing the short or open, and the position of the wire and the other part.
This will help to make the cause of the problem clear and help us to take prompt action.

Box B

If you checked the "Others" box in the "Symptom" section on page 3-1, please describe:

Symptom: _____

Condition: _____

Related Wire Harness or Connector;

Name or Part NO.: _____

Location: _____

REPAIR:

page 3/3

1. Please identify repair method:

Troubleshooting methods

☐ WIRING DIAGRAM

☐ VOLTMETER: ANALOG _____ , DIGITAL _____

2. Please check one box and fill in prethesis:

☐ REPLACE WIRE HARNESS

☐ REPLACE CONNECTOR OR TERMINAL

☐ REPAIR TERMINAL

☐ OTHERS ( )

WIRE HARNESS TOOLS

☐ CRIMPING PLIERS

☐ PICK

☐ OTHERS ( )

☐ SOLDER CONNECTION

3. Please attach a copy of the TOYOTA ELECTRICAL WIRING DIAGRAM for the vehicle repaired:

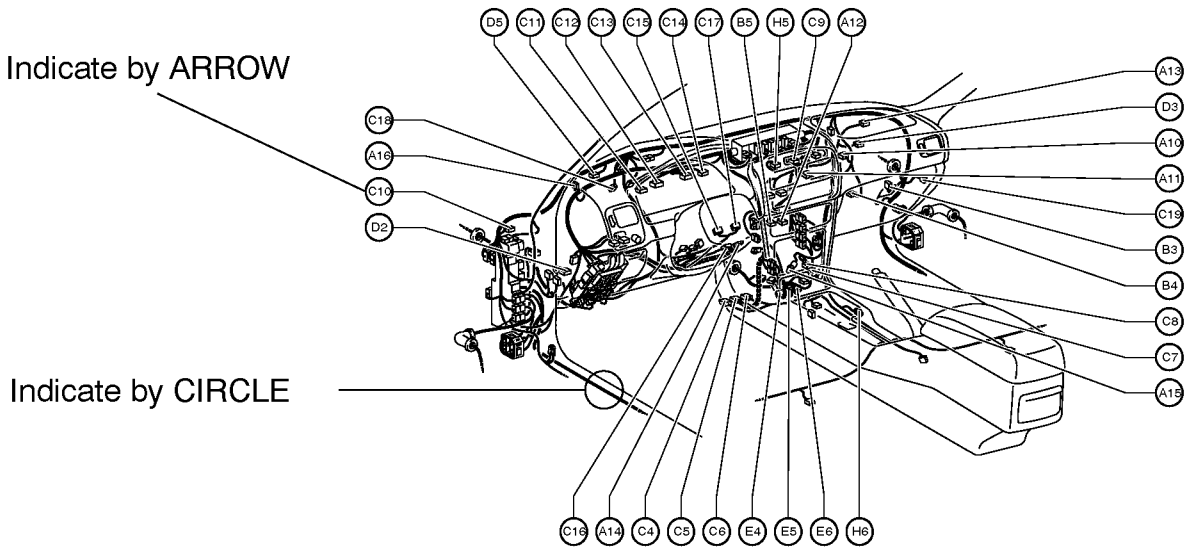
Indicate the affected connector number by arrow, or circle and identify the affected wire harness.

EXAMPLE: COROLLA (ZZE 110)

Condition: Engine does not start

Cause: Connector pin backed out from female connector at clutch start switch

Component: Clutch start awitch inoperation



G

Waterproof Type [1]

(Cont. next page)

	1	2				3		4	5	6	7	8	9	10	11
1.0															
1.0 III		M:11863	F:11856												
1.3		M:11188 F:11189				M:11169 F:11170		M:11063 F:11065	M:11181 F:11182		M:11171 F:11172		M:11191 F:11192		M:11173 F:11174
								M:11064 F:11066							
1.8		F:10737						F:10711							
		F:11062													
2.3		M:10495 F:10496	M:10580	F:10609				M:10475 F:10476		M:10650					
		F:10474	M:10592	F:10532				M:10590							
		M:10575	F:10598	F:10572				M:10648							
2.3 II	M:10892 F:10893	M:10842 F:10843	M:11486 F:11019	M:11247 F:11248	F:11207	M:11015 F:11016	F:11143	M:10868 F:10869	M:11078 F:11077	M:10987 F:10988	M:10930 F:10931	M:10890 F:10891		F:11231	
	M:11006 F:11007	M:10886 F:10887	M:11029 F:11030	M:11272 F:11273	F:11235	M:11131 F:11132	F:11145	M:10941 F:10942	F:11024	M:11033 F:11034		M:10890 F:11190			
	M:11270 F:11271	M:10898 F:10899	M:11137 F:11038	F:10974	F:11246	M:11244 F:11245	F:11261	M:11027 F:11028	F:11049	M:11193 F:11194		M:10896 F:10897			
	F:11166	M:10900 F:10901	M:11050 F:11051	F:11025	F:11250	M:11295 F:11245	F:11294	M:11122 F:11037	F:11232	M:11196 F:11197					
	F:11243	M:11072 F:10923	M:11069 F:11070	F:11068	F:11255	F:10834	F:11349	M:11177 F:11178	F:11317	M:11289 F:11290					
	F:11363	M:10959 F:10947	M:11073 F:11075	F:11140	F:11285	F:10845	M:11348	M:11291 F:11292	F:11599	F:10854					
	F:11428	M:10948 F:10949	M:11074 F:11075	F:11149	F:12028	F:10902		F:10943		F:11144					
	F:11252	M:11002 F:11003	M:11141 F:11142	F:11153		F:10919		F:11150		F:11858					
		M:11004 F:11005	M:11155 F:11156	F:11154		F:10981		F:11152							
		M:11008 F:11009	M:11168 F:11162	F:11163		F:11020									

M : Male F : Female

Waterproof Type [1] (Cont'd)

	12	15	40	80											
1.0			F:11215	F:11214											
1.0 III															
1.3	F:11698	M:11088 F:11089													
1.8															
2.3															
2.3 II	M:11086 F:11087														
	F:11151														

M : Male F : Female

Waterproof Type [2]

	1	2		3		4	5	6	8	9	10	11	23	34	
4.8	M:10982 F:10983	M:10927 F:10928		M:10840 F:10841		M:10989 F:10990									
	F:11400	F:11237		M:10944 F:10841		M:11035 F:11036									
6.3	M:10246 F:10247	M:10156 F:10157		M:10347 F:10249											
7.7	M:10114 F:10115														
8.0	M:10836 F:10837	M:10838 F:10839													
	M:11183 F:11184	M:11031 F:11032													
HB3		F:11095	F:11659												
HB4		F:11096	F:11660												
PIN		M:11945													
TLC				F:10554	M:10577										
TODC	M:10240 F:10241			M:10244	F:10353										
1.0 III+4.8														F:12020	F:12021
2.3+6.3										F:10686					
2.3 II+4.8				M:11160 F:11161		M:10749 F:10844	M:10945 F:10946	F:10939	M:10894 F:10895	F:11643	F:11332	M:11239			
						F:10940	M:11021 F:11022			F:11784					
							M:11412 F:11413								
2.3 II+6.3 II													F:11195		
													F:11323		
2.3 II+8.0									M:11241 F:11242						
4.8+8.0				M:11044 F:11045		M:11138 F:11139									

M : Male F : Female

Non–waterproof Type [1]

(Cont. next page)

	1	2			3	4	5	6		7	8		9	10	11
1.0															
1.0 II															
1.0 III		M:11967 F:11919				F:11988	F:11921							F:11924	
							F:11909							F:11948	
1.3		M:11211 F:11212			M:11052 F:11053	M:11186 F:11187	F:11319	F:11616		F:11165	M:11532 F:11533	M:11623		F:11450	F:11041
		M:11368 F:11369			F:11471	F:11107					F:10630			F:11642	F:11083
		F:11436				F:11494								F:11657	
1.8															
1.8 II															
2.3		M:10437 F:10355			M:10573 F:10365	F:10504		M:10384 F:10414	F:10672					F:10322	
						F:10601								F:10669	
2.3 II	M:10870 F:10871	M:10824 F:10825	M:10905 F:10906	F:11080	M:10907 F:10908	M:10794 F:10795		M:10796 F:10797	F:10957	M:11528 F:11529	M:10798 F:10799		M:11534 F:11535	M:10800 F:10801	M:10829 F:10830
	M:11026 F:10871	M:10833 F:10825	M:10934 F:10935	F:11098	F:11071	M:10858 F:10795		M:11110 F:10797	F:10964					M:11102 F:10997	M:11538 F:11539
	M:11097 F:10871	M:11299 F:10825	M:11159 F:11148	F:11227	F:11079	M:11399 F:10795		M:11099 F:10933	F:11280					M:11536 F:11537	F:10966
	M:11146 F:11147	M:11300 F:10825	F:10823	F:11278		M:11012 F:11013		M:11101 F:10996						F:10822	
		M:10849 F:10850	F:10835	F:11608		M:11023 F:10904		M:10998 F:11001						F:10965	
		M:10859 F:10860	F:10855			M:11100 F:11090		M:11010 F:11011							
		M:11060 F:10860	F:10962			M:11085 F:10789		M:11587 F:11011							

M : Male F : Female

Non–waterproof Type [1] (Cont'd)

	12		13	14	15	16	17	18	19	20	21	22	25	28	34
1.0	F:11129					F:10764									
1.0 II	F:11408					F:11219						F:11220		F:11218	F:11221
						F:11391									
1.0 III				F:11925				F:11914				M:11962 F:11927			
				F:11911				F:11913				M:11926 F:11915			
1.3				M:11654 F:11556	F:11179	M:11573 F:11574			M:11570 F:11571		F:11125	M:11503 F:11502	M:11133 F:11055		
					F:11264							F:11628	F:11043		
1.8	F:10658	F:10973		F:10697				F:10656		F:10696					M:10722
	F:10743														
1.8 II	F:11424			F:11433											
2.3	M:10513 F:10432							M:10325 F:10326							
2.3 II	M:10802 F:10803		M:10804 F:10805	M:10806 F:10807	M:10827 F:10828	M:10808 F:10809	F:11417	M:10818 F:10819		M:10810 F:10811		M:10977 F:10875			
	M:11530 F:11531		M:11541 F:11542	F:10852		M:11167 F:10848				M:10820 F:10821		F:11552			
	F:10967		F:11604												
	F:10968														
	F:11121														
	F:11661														

M : Male F : Female

Non–waterproof Type [2]

	1	2	3	4	5	6		8	9	10	12	13	14	17	22
4.8	M:11258 F:11259	M:10915 F:10916	F:10980	M:11135 F:11136		M:10975 F:10976	F:11778	M:10963 F:10926		M:10861 F:10862					
	F:10911	M:11093 F:11094		M:11878 F:11742		F:11091		F:11092							
	F:10912					F:11583		F:11615							
								F:11686							
6.3	M:10178 F:10179	M:10213 F:10214	M:10283 F:10216			M:10172 F:10173		M:10174 F:10175		M:10176 F:10177					
	F:10619														
	F:10786														
	F:10792														
7.7		M:10356 F:10357													
8.0	M:10994 F:10995	M:10958 F:10903	F:10956	M:10866 F:10867											
		M:11655 F:11579	F:11314												
		F:11684	F:11685												
FOG–LP		F:10481													
FTC			F:10489		F:10487										
			F:10490		F:10488										
HEAD–LANP			F:10428												
LAC									F:10133			F:10132			M:10131
LC						M:10289									
MFPC				F:10645				F:10301		F:10302	F:10303		F:10369		
										F:10304	F:10372				

M : Male F : Female

Non–waterproof Type [3]

(Cont. next page)

	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16
MIC				F:10378					F:10152			F:10062			
OBD II															F:11665
PULSE LOCK										F:10294	F:10351		F:10371		
SFPC										F:11116		F:11114			F:11113
												F:11115			
SL			F:10070				F:10071								
SP		F:10362			F:10376										
TLC						M:10401 F:10402				M:10719 F:10528					F:10635
TNS				M:10466 F:10467									M:10470 F:10471		
TODC	M:10182 F:10183				M:10040 F:10274				M:10044 F:10045						
1.0+1.8															
1.0 II+1.8 II													F:11225		F:11565
1.0 III+2.3 II															
1.3+2.3 II										M:11613				F:11042	
														F:11056	
2.3+6.3								F:10463							

M : Male F : Female

Non–waterproof Type [3] (Cont'd)

	17	18		20	22	23	24	25	26		32				
MIC	F:10037														
OBD II															
PULSE LOCK		F:10295					F:10296								
		F:10350													
SFPC															
SL															
SP															
TLC															
TNS					M:10552 F:10526				M:10599 F:10587						
TODC															
1.0+1.8					F:10765				F:10925	F:10918					
									F:10763						
1.0 II+1.8 II		M:11223 F:11226	M:11223 F:11224		F:11392				F:11390	F:11423	M:11222				
1.0 III+2.3 II								F:11877							
1.3+2.3 II	F:11671	F:11594		F:11469		M:10920 F:10921		M:11158 F:11058							
		F:11595		M:11504 F:11469		M:11208 F:10921									
2.3+6.3															

M : Male F : Female

Non–waterproof Type [4]

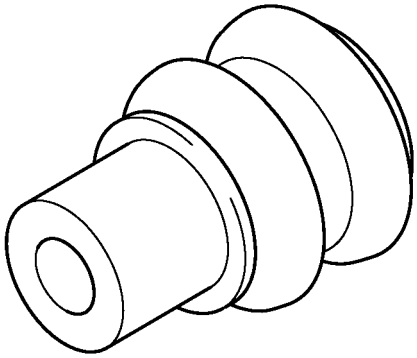
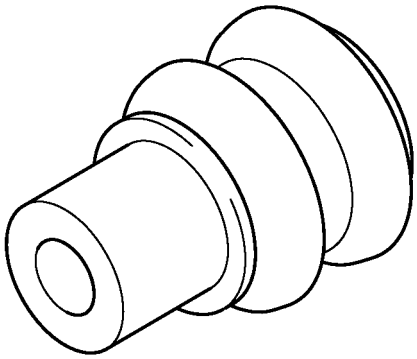
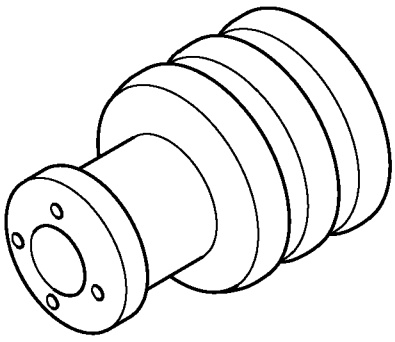
	4	5	6	8	10	11	12	14	15	16	19	20	24	26	
2.3 II+4.8	M:11126 F:11118	M:10985 F:10986		M:10876 F:10877	M:11596 F:11527	M:10872 F:10873	M:10878 F:10879	M:10812 F:10813	M:10814 F:10815	M:10884 F:10885	M:10882 F:10883	M:10816 F:10817	M:10880 F:10881	M:11631	
				F:11130	F:10993		F:10932								
				F:11279											
				F:11701											
2.3 II+8.0			M:10909 F:10910								M:10856 F:10857				
4.8+8.0		F:10888	F:10889												
6.3+7.7			F:10447												

M : Male F : Female

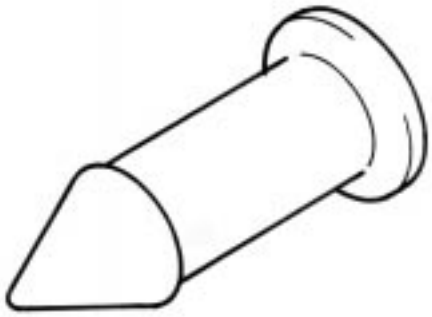
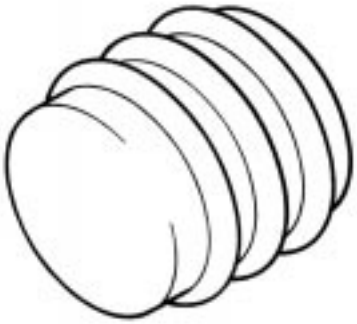
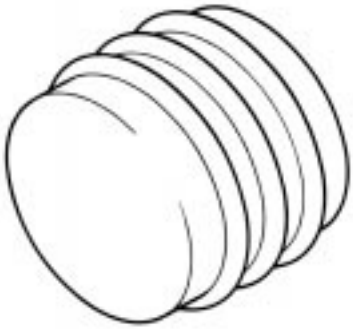
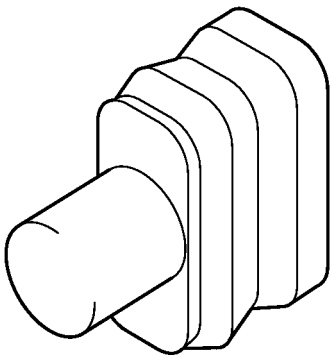
Terminal Packing

Type	6.3	
Cav. No.	1	3
P/N	90980–09210	90980–09211
Type	7.7	
Cav. No.	1	
P/N	90980–09380	
Type	TODC	
Cav. No.	1	3
P/N	90980–09378	90980–09379

Terminal Packing

Type	**2.3**	
Cav. No.	1	
		
P/N	90980–09148, 09151, 09149	
Type	**2.3II**	
Cav. No.	1	
		
P/N	90980–09451	
Type	**HB3, HB4**	
Cav. No.	1	
		
P/N	90980–09396	

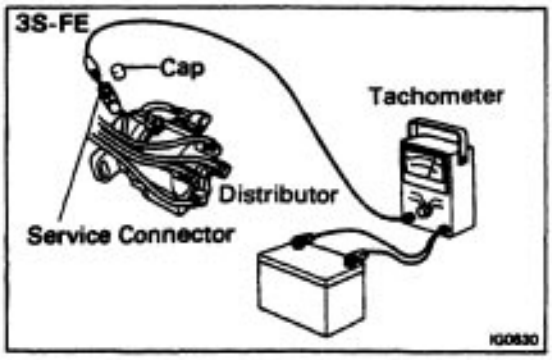
Hole Plug

Type	**6.3, 7.7, TODC**	**4.8**
		
P/N	90950–01730	90980–09325
Type	**8.0**	**2.3, 2.3II**
		
P/N	90980–09353	90980–09152
Type	**TLC**	**1.3**
		
P/N	90980–09162	90980–09414

Press Sleeve

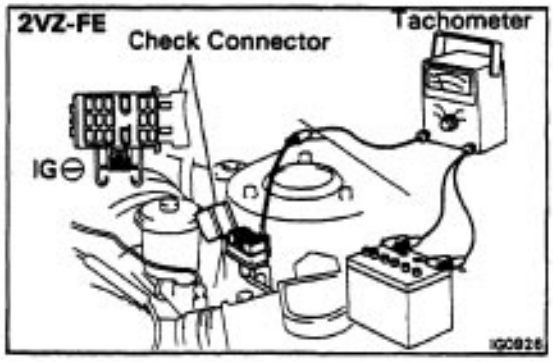
Color	YELLOW	BLUE
P/N	82999–12030	82999–12020
Color	RED	
P/N	82999–12010	

IGNITION SYSTEM



PRECAUTIONS

1. Do not leave the ignition switch on for more than 10 minutes if the engine will not start.
2. (3S–FE)
   When a tachometer is connected to the system, connect the test probe of the tachometer to service connector of the distributor.

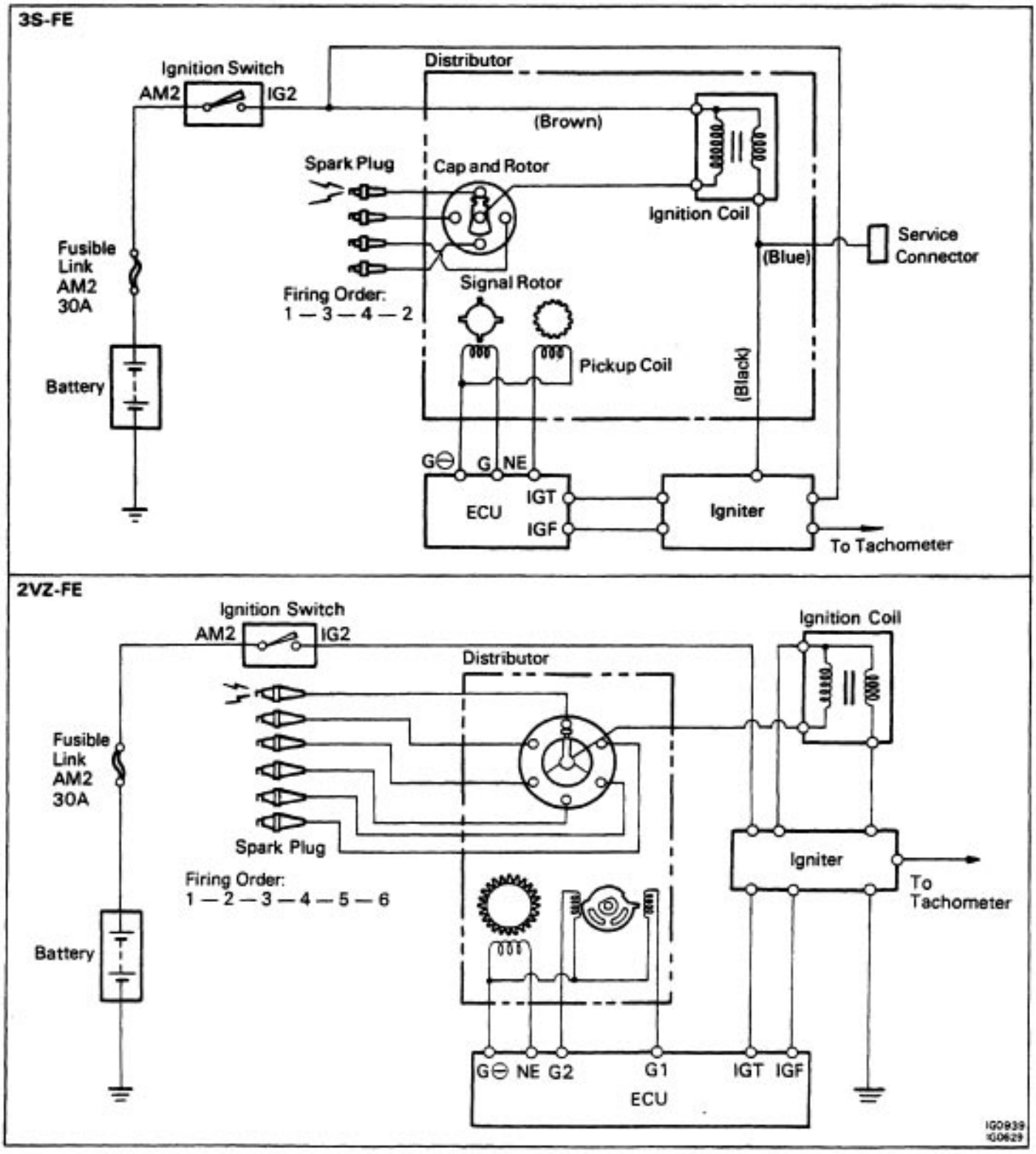


3. (2VZ–FE)
   When a tachometer is connected to the system, connect the test probe of the tachometer to terminal IG E) of the check connector.
4. As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.
5. NEVER allow the tachometer test probe to touch ground as this could damage the igniter and/or ignition coil.
6. Do not disconnect the battery when the engine is running.
7. Check that the igniter is properly grounded to the body.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not start/ hard to start (cranks OK)	Incorrect ignition timing Ignition problems • Ignition coil • Igniter • Distributor • High–tension cords Ignition wiring disconnected or broken	Reset timing Inspect coil Inspect igniter Inspect distributor Inspect high–tension cords Inspect wiring	IG–17, 20 IG–7, 12 IG–8, 12 IG–7, 12 IG–6, 10
Rough idle or stalls	Spark plug faulty Ignition wiring faulty Incorrect ignition timing Ignition problems • Ignition coil • Igniter • Distributor • High–tension cords	Inspect plugs inspect wiring Reset timing Inspect coil Inspect igniter Inspect distributor Inspect high–tension cords	IG–6, 10 IG–17, 20 IG–7, 12 IG–8, 12 IG–7, 12 IG–6, 10
Engine hesitates/ poor acceleration	Spark plug faulty Ignition wiring faulty Incorrect ignition timing	Inspect plugs Inspect wiring Reset tinning	IG–6, 10 IG–17, 20
Engine dieseling (runs after ignition switch is turned off)	Incorrect ignition timing	Reset timing	IG–17, 20
Muffler explosion (after fire) all the time	Incorrect ignition timing	Reset timing	IG–17, 20
Engine backfires	Incorrect ignition timing	Reset timing	IG–17, 20
Poor gasoline mileage	Spark plug faulty Incorrect ignition timing	Inspect plugs Reset timing	IG–6, 10 120
Engine overheats	Incorrect ignition timing	Reset timing	IG–17, 20

IGNITION SYSTEM CIRCUIT



ELECTRONIC SPARK ADVANCE (ESA)

The ECU is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, intake air volume, eng. temperature, etc.) the microcomputer (ECU) triggers the spark at precisely the right instant.

ON–VEHICLE INSPECTION (3S–FE)

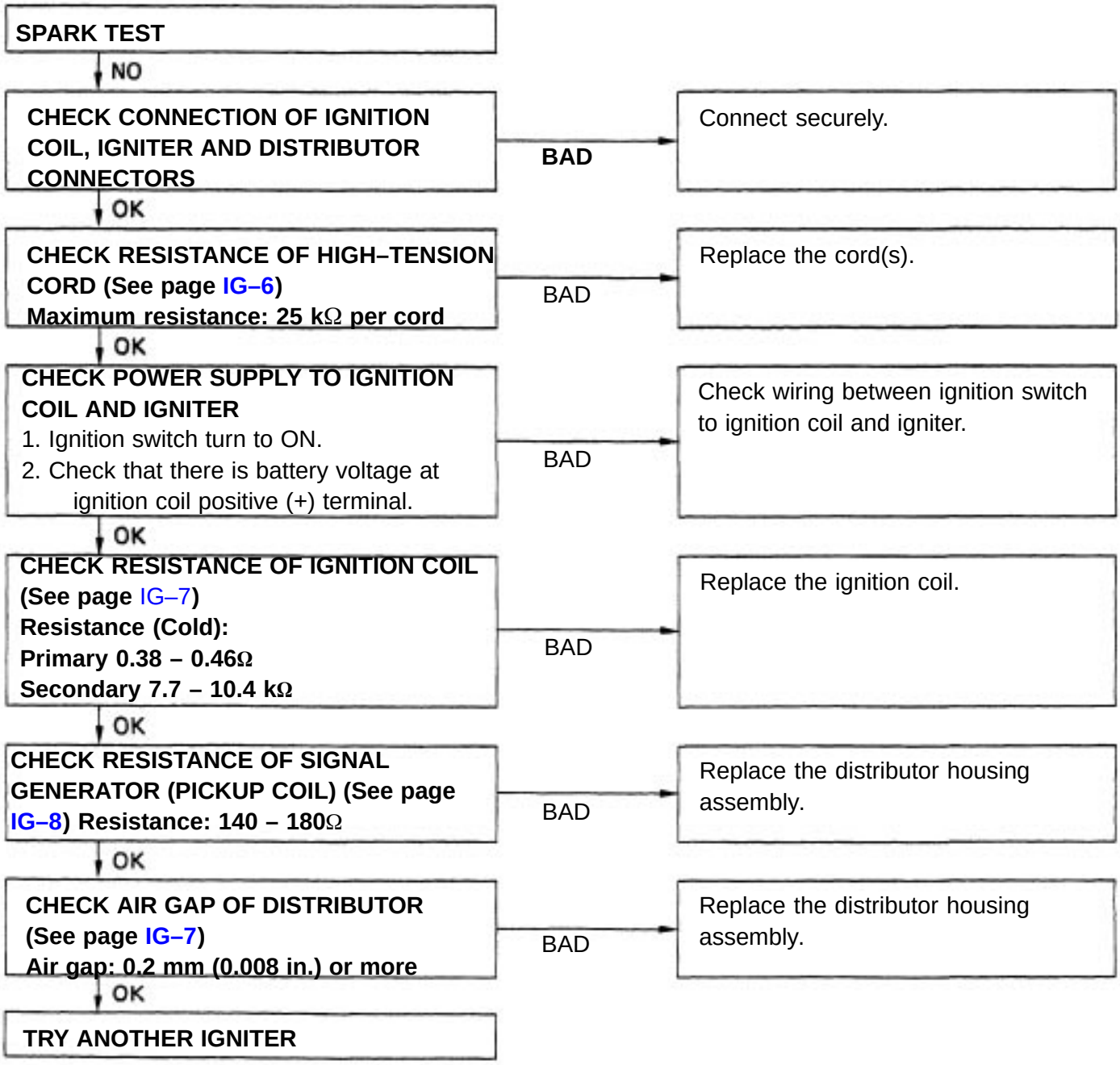
SPARK TEST

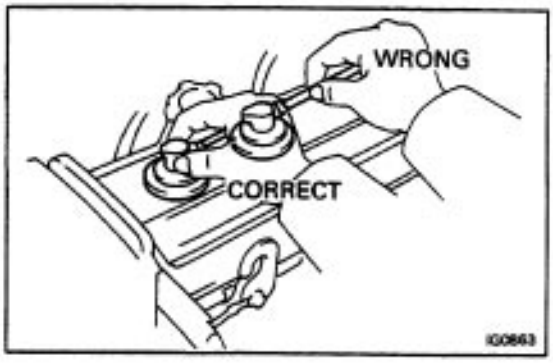
CHECK THAT SPARK OCCURS

(a) Disconnect the high–tension cords from the spark plugs.
(b) Remove the spark plugs.
(c) Install the spark plugs to each high–tension cord.
(d) Ground the spark plug.
(e) Check if spark occurs while engine is being cranked.

HINT: To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 – 2 seconds at a time.

If the spark does not occurs, perform the test as follows:

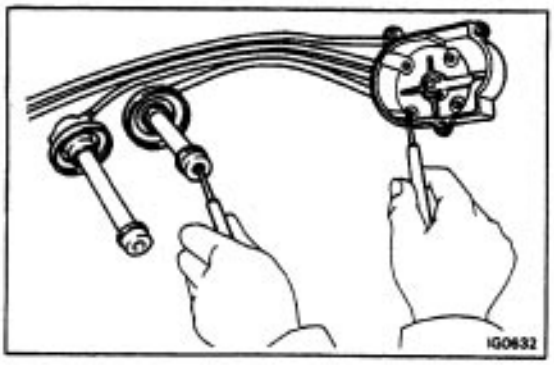




INSPECTION OF HIGH–TENSION CORDS

1. CAREFULLY REMOVE HIGH–TENSION CORDS BY THEIR RUBBER BOOTS FROM SPARK PLUGS

NOTICE: Pulling on or bending the cords may damage the conductor inside.

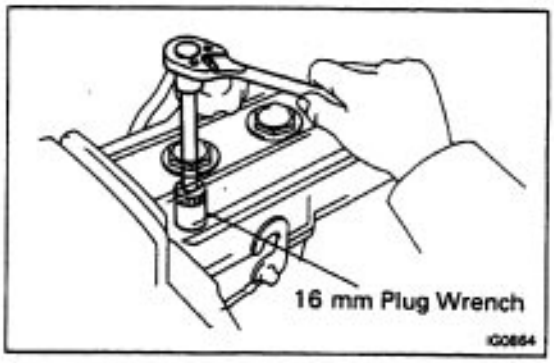


2. INSPECT HIGH–TENSION CORD RESISTANCE

Using an ohmmeter, measure the resistance without disconnecting the distributor cap.

Maximum resistance: 25 kΩ per cord

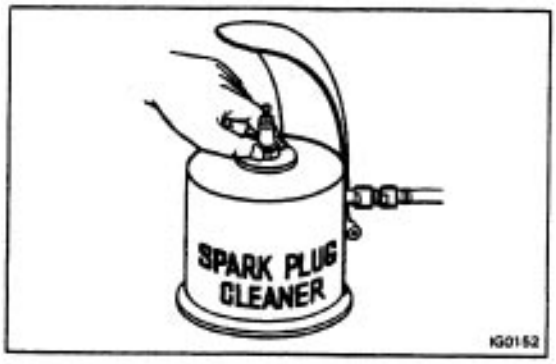
If the resistance is greater than maximum, check the terminals. If necessary, replace the high–tension cord and/or distributor cap.



INSPECTION OF SPARK PLUGS

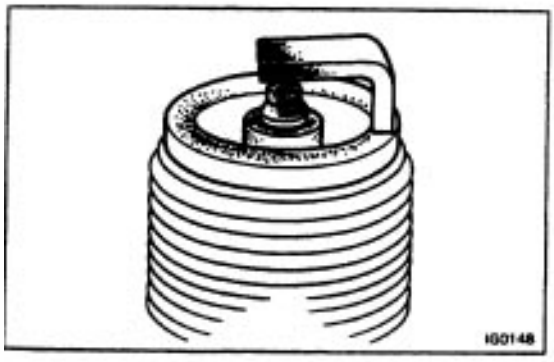
1. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug.



2. CLEAN SPARK PLUG

Using a spark plug cleaner or wire brush, clean the spark plug.

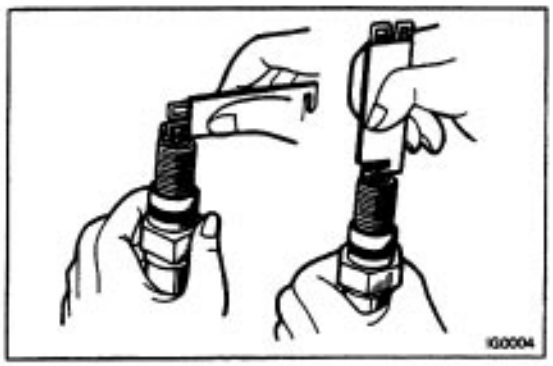


3. VISUALLY INSPECT SPARK PLUGS

Check the spark plug for electrode wear, thread damage or insulation damage.

If abnormal, replace the spark plug.

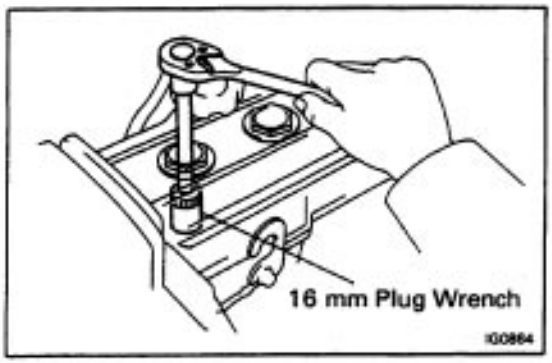
Recommended spark plug: ND Q1 6R–U11
NGK6CPR5EY11



4. ADJUST ELECTRODE GAP

Carefully bend the outer electrode to obtain the correct electrode gap.

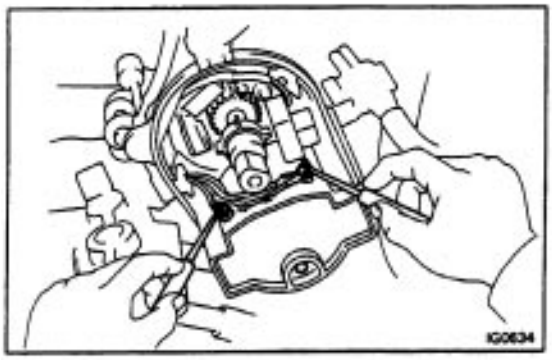
Correct electrode plug: 1.1 mm (0.043 in.)



5. INSTALL SPARK PLUGS

Using a 16 mm plug wrench, install the spark plug.

Torque: 180 kg–cm (13 ft–lb, 18 N–m)



INSPECTION OF IGNITION COIL

1. INSPECT PRIMARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between positive (+) and negative (–) terminals.

Primary coil resistance (Cold): 0.38 – 0.46Ω

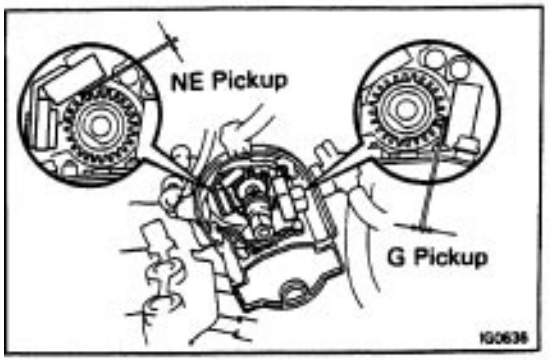
If the resistance is not as specified, replace the ignition coil.

2. INSPECT SECONDARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) and high–tension terminals.

Secondary coil resistance (Cold): 7.7 –10.4 kΩ

If the resistance is not as specified, replace the ignition coil.



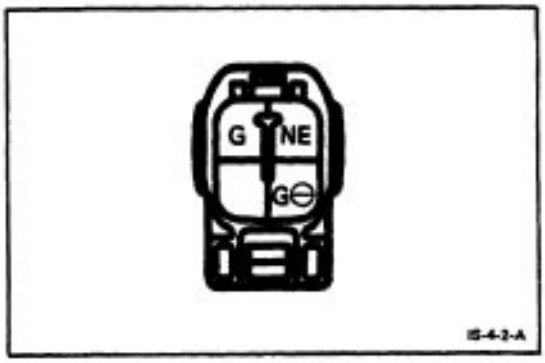
INSPECTION OF DISTRIBUTOR

1. INSPECT AIR GAP

Using a feeler gauge, measure the gap between the signal rotor and pickup coil projection.

Air gap: 0.2 mm (0.008 in.) or more

If the air gap is not as specified, replace the distributor housing assembly.



2. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

G pickup coil resistance (G – G[–]): 140 – 180Ω

N E pickup coil resistance (NE – G[–]): 140 –180Ω

If the resistance is not as specified, replace the distributor housing assembly.

INSPECTION OF IGNITER

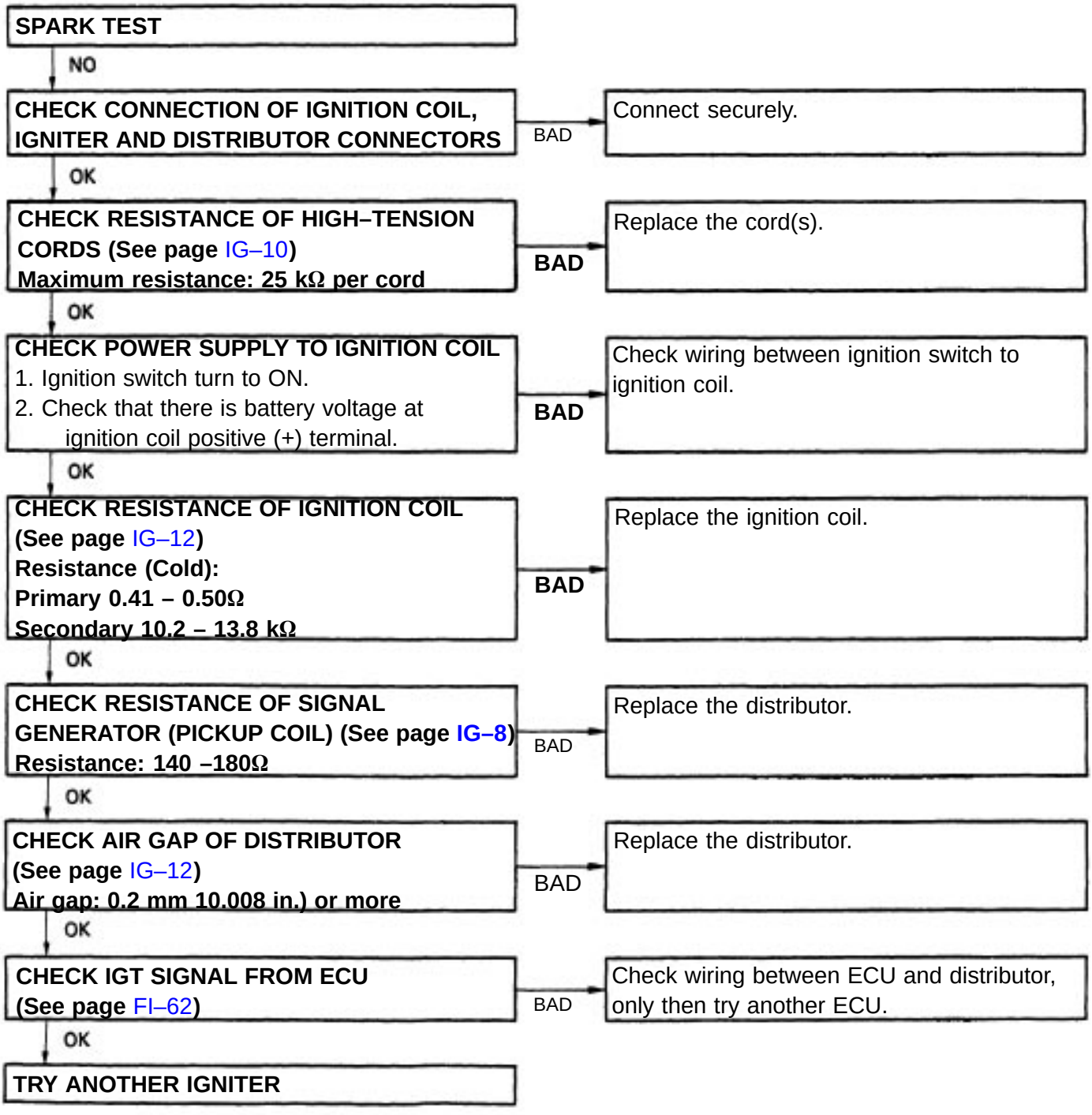
(See procedure Spark Test on page IG–5)

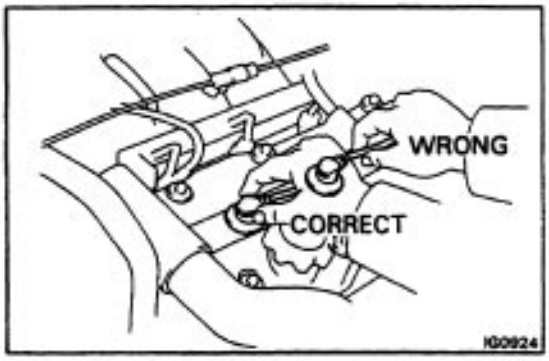
ON–VEHICLE INSPECTION (2VZ–FE)

SPARK TEST

CHECK THAT SPARK OCCURS

(a) Disconnect the high–tension cord from the distributor.
(b) Hold the end approx. 12.5 mm (0.50 in.) from body of vehicle.
(c) See if spark occurs ’while engine is being cranked.
HINT: To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 – 2 seconds at time.
If the spark does not occurs, perform the test as follows:

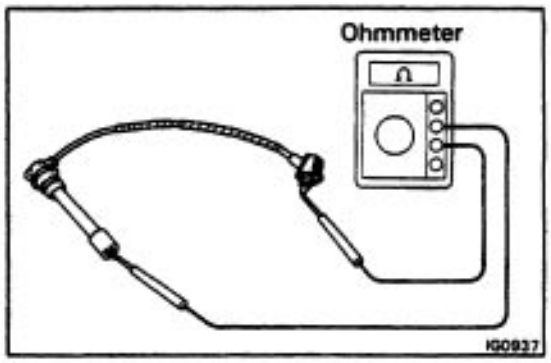




INSPECTION OF HIGH–TENSION CORDS

1. CAREFULLY REMOVE HIGH–TENSION CORDS BY THEIR RUBBER BOOTS FROM SPARK PLUGS

NOTICE: Pulling on or bending the cords may damage the conductor inside.



2. INSPECT HIGH–TENSION CORD RESISTANCE

Using an ohmmeter, measure the resistance.

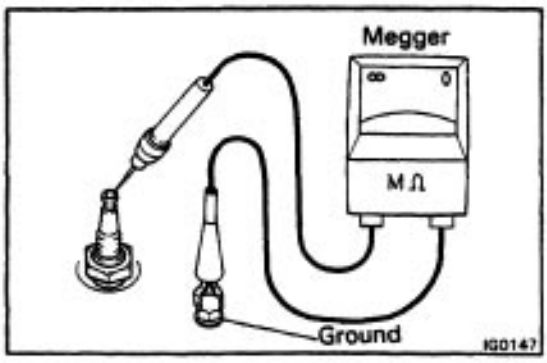
Maximum resistance: 25 kΩ per cord

If the resistance is greater than maximum, replace the high–tension cord.

INSPECTION OF SPARK PLUGS

NOTICE:

- Never use a wire brush for cleaning
- Never attempt to adjust the electrode gap on used spark plug.
- Spark plug should be replaced every 100,000 km I60,000 miles).



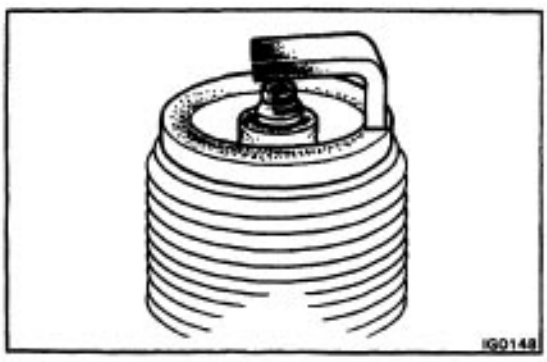
1. INSPECT ELECTRODE

A. If using a megger (insulation resistance motor):

Measure the insulation resistance.

Correct insulation resistance: 10 MΩ or more

If the resistance is less than specified, proceed step 2.



6. If not using a megger:

(a) Quickly race the engine to 4,000 rpm five times.

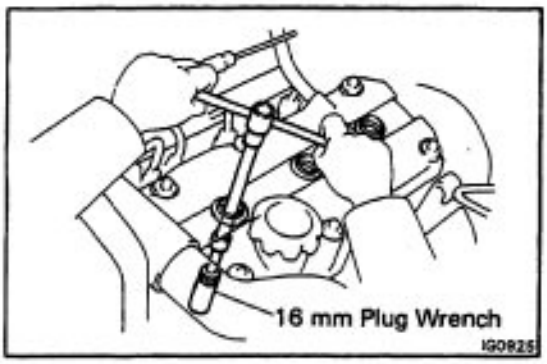
(b) Remove the spark plug.

(See step 2 on page IG–11)

(C) Visually check the spark plug.

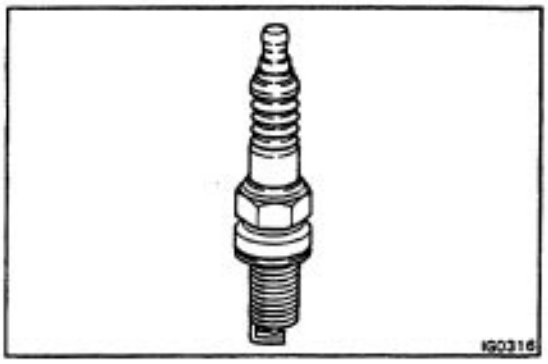
If the electrode is dry ... Okay

If the electrode is wet ... Proceed to step 3



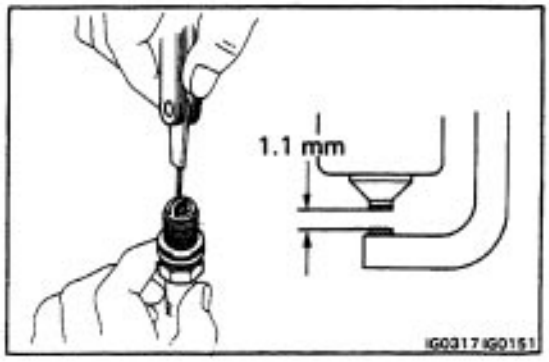
2. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug.



3. VISUALLY INSPECT SPARK PLUGS

Check the spark plug for thread or insulation damage.
If abnormal, replace the spark plug.
Recommended spark plug: ND PQ2OR
NGK6CPR6EP11

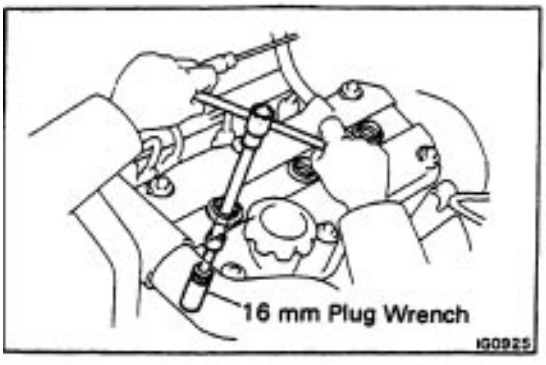


4. INSPECT ELECTRODE GAP

Maximum electrode gap: 1.3 mm, (0.051 in.)
If the gap is greater than maximum, replace the spark plug.
Correct electrode gap of new spark plug:
1.1 mm (0.043 in.)
If adjusting the gap of a new spark plug, bend only the base of the ground electrode. Do not touch the tip.

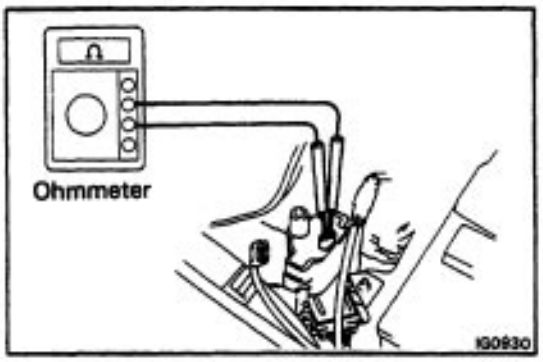
5. CLEAN SPARK PLUGS

If the electrode has traces of wet carbon, allow it to dry and then clean with a spark plug cleaner.
Air pressure: Below6 kg/cm^2 (85 psi, 588 kPa)
Duration: 20 seconds or less
HINT: If there are traces of oil, remove it with gasoline before using the spark plug cleaner.



6. INSTALL SPARK PLUGS

Using a 16 mm plug wrench, install and torque the spark plug.
Torque: 180 kg–cm (13 ft–Lb, 18 N–m)



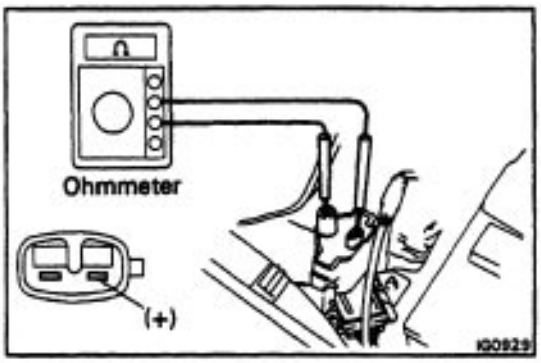
INSPECTION OF IGNITION COIL

1. INSPECT PRIMARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between positive (+) and negative (–) terminals.

Primary coil resistance (Cold): 0.41 – 0.50Ω

if the resistance is not as specified, replace the ignition coil.

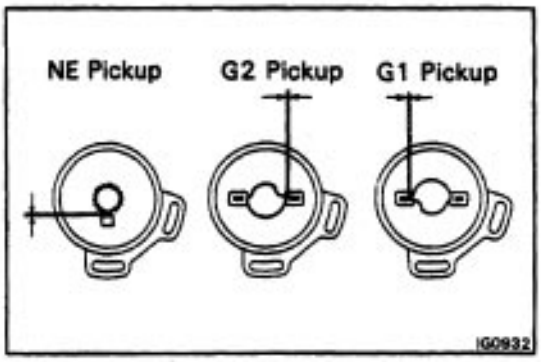


2. INSPECT SECONDARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive W and high–tension terminals.

Secondary coil resistance (Cold): 10.2 – 13.8 kΩ

If the resistance is not as specified, replace the ignition coil.



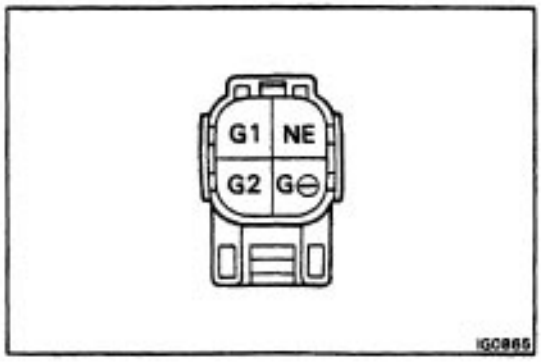
INSPECTION OF DISTRIBUTOR

1. INSPECT AIR GAPS

Using a thickness gauge, measure the gap between the signal rotor and pickup coil projection.

Air gap: 0.2 mm (0.008 in.) or more

If the air gap is not as specified, replace the distributor.



2. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

G1 pickup coil resistance (G 1 – G [–]): 140 – 180Ω
G2 pickup coil resistance (G2 – G [–]): 140 – 180Ω
N E pickup coil resistance (NE – G [–]): 140 – 180Ω

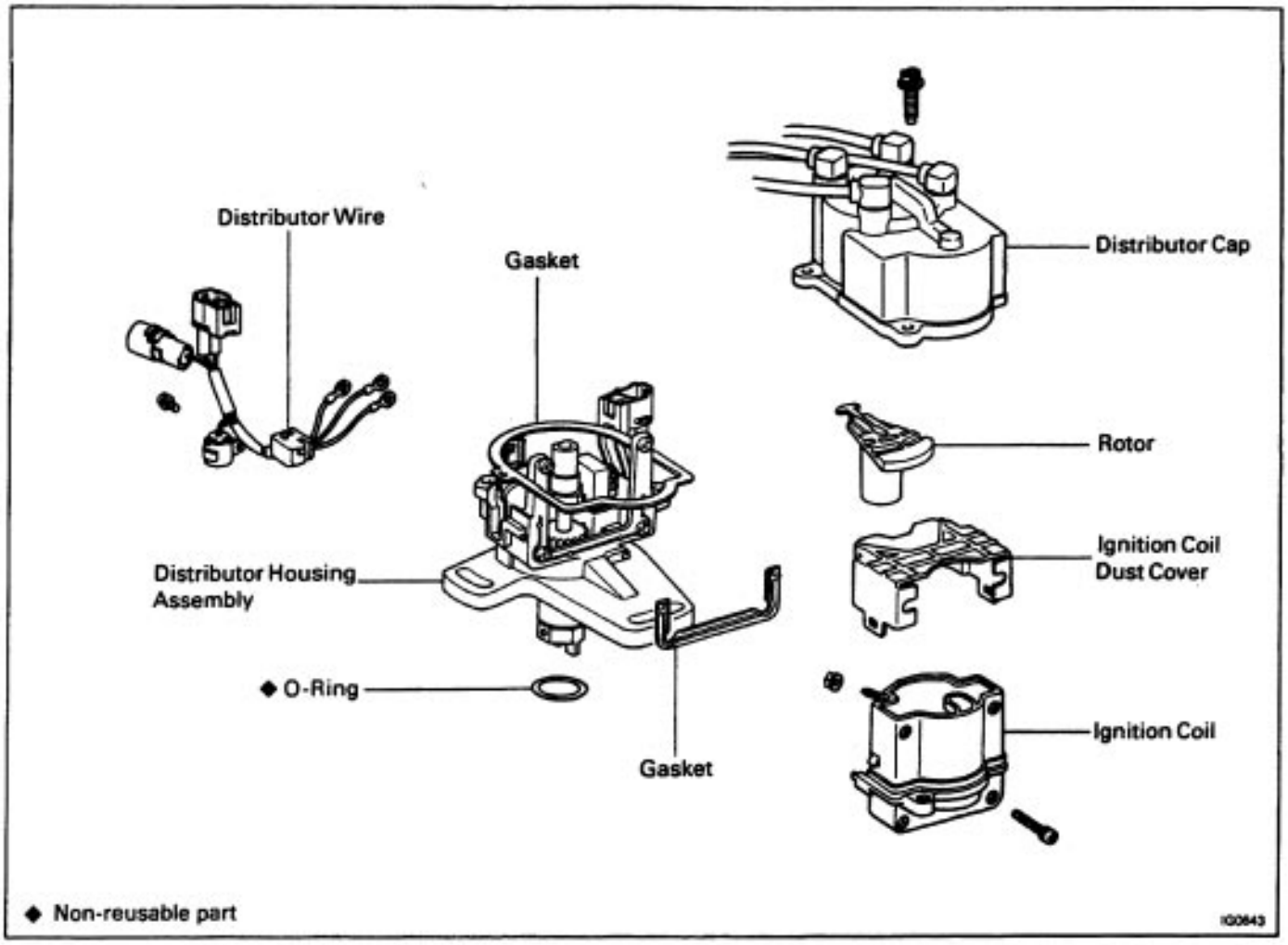
if the resistance is not as specified, replace the distributor housing assembly.

INSPECTION OF IGNITER

(See procedure Spark Test on page IG–9)

DISTRIBUTOR (3S–FE)

COMPONENTS



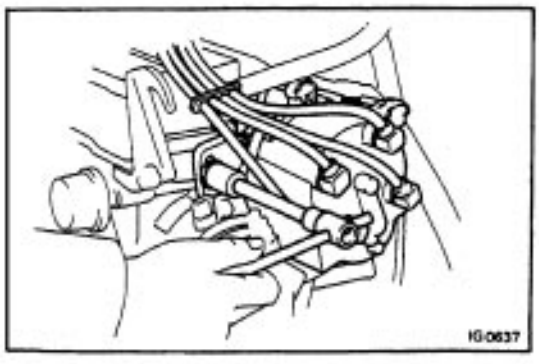
REMOVAL OF DISTRIBUTOR

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. REMOVE AIR CLEANER HOSE

3. DISCONNECT DISTRIBUTOR CONNECTORS

4. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS



5. REMOVE DISTRIBUTOR

Remove the two hold–down bolts and pull out the distributor. Remove the 0–ring.

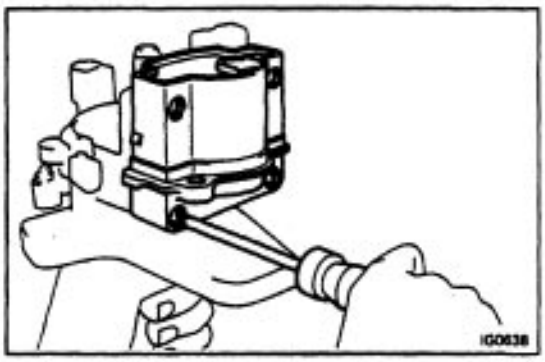
DISASSEMBIY OF DISTRIBUTOR

(See page IG–13)

1. REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH–TENSION CORDS

2. REMOVE ROTOR

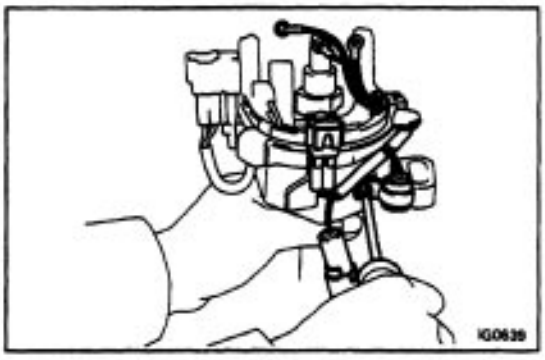
3. REMOVE IGNITION COIL DUST COVER



4. REMOVE IGNITION COIL

(a) Remove the two nuts and disconnect the three wires from the terminals of the ignition coil.

(b) Remove the four screws, ignition coil and gasket.



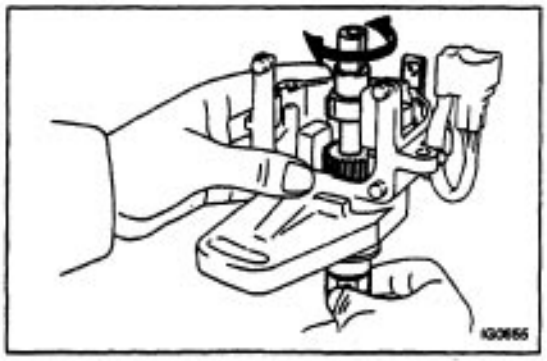
5. REMOVE DISTRIBUTOR WIRE

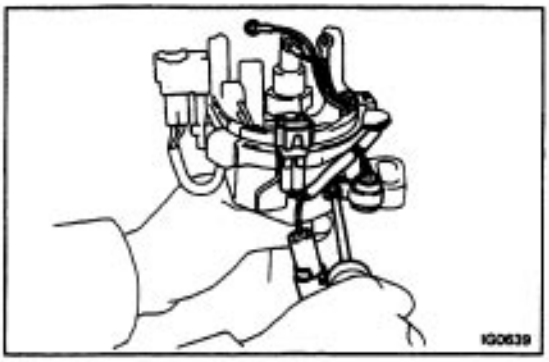
INSPECTION OF DISTRIBUTOR

INSPECT GOVERNOR SHAFT

Turn the governor shaft and check that it is not rough or worn.

If it feels rough or worn, replace the distributor housing assembly.

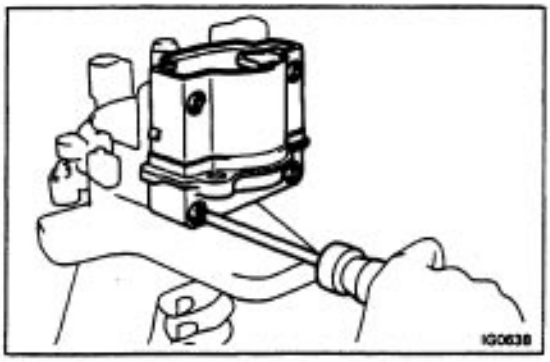




ASSEMBLY OF DISTRIBUTOR

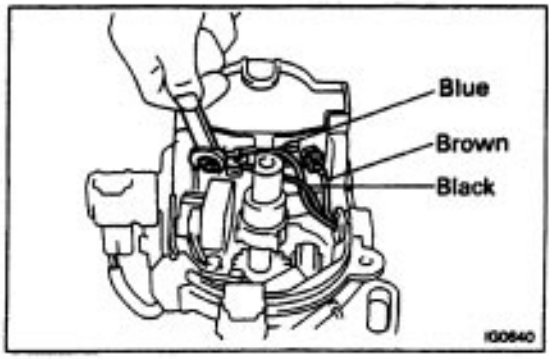
(See page IG–13)

1. INSTALL DISTRIBUTOR WIRE

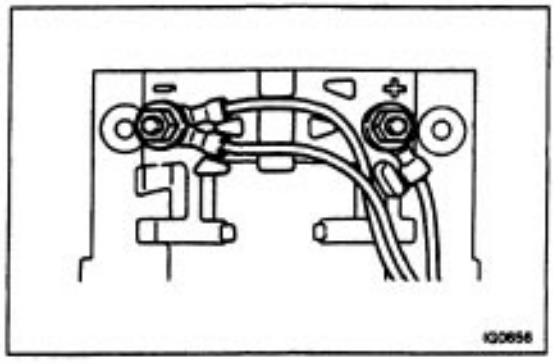


2. INSTALL IGNITION COIL

(a) Install the gasket and ignition coil with the four screws.



(b) Connect the three wires to the terminals of the ignition coil with the two nuts as shown.



NOTICE:

- when connecting the wires to the ignition coil, insert both properly into their grooves found on the side of the ignition coil.
- Be sure that of the wires do not contact with signal rotor or distributor housing.

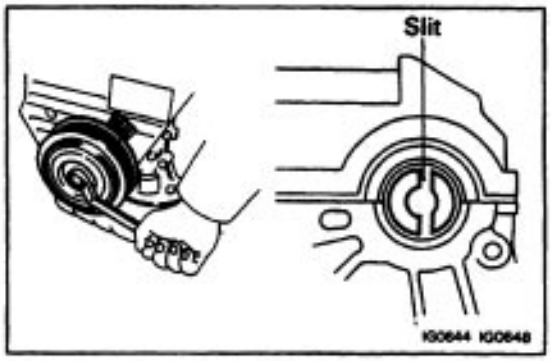
3. INSTALL IGNITION COIL DUST COVER

4. INSTALL ROTOR

5. INSTALL DISTRIBUTOR CAP AND HIGH–TENSION CORDS

(a) Place the gasket in position on the distributor housing.

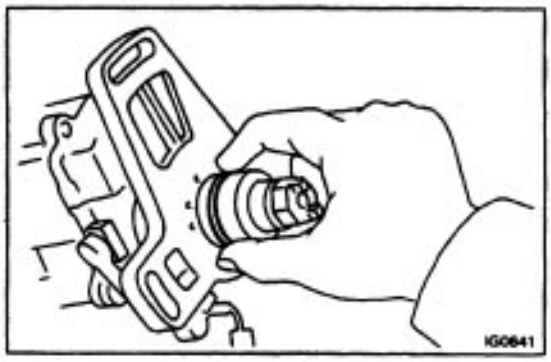
(b) Install the distributor cap with the three bolts.



INSTALLATION OF DISTRIBUTOR

1. SET NO.1 CYLINDER TO TDC/COMPRESSION

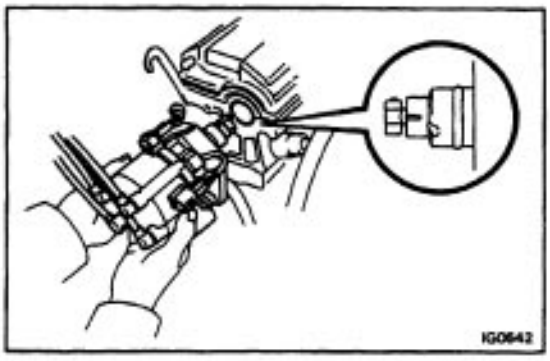
Turn the crankshaft clockwise, and position the slit of the intake camshaft as shown.



2. INSTALL DISTRIBUTOR

(a) Install a new 0–ring to the housing.

(b) Apply a light coat of engine oil on the 0–ring.



(c) Align the cutout of the coupling with the line of the housing.

(d) Insert the distributor, aligning the center of the flange with that of bolt hole on the cylinder head.

(e) Lightly tighten the two hold–down bolts.

3. CONNECT HIGH–TENSION CORDS TO SPARK PLUGS

Firing order: 1 – 3 – 4 – Z

4. CONNECT DISTRIBUTOR CONNECTORS

5. INSTALL AIR CLEANER HOSE

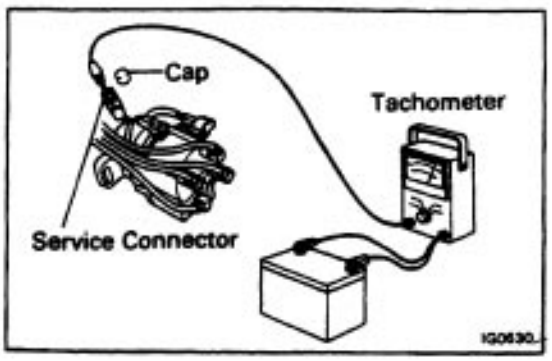
6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

7. WARM UP ENGINE

Allow the engine to normal operating temperature.

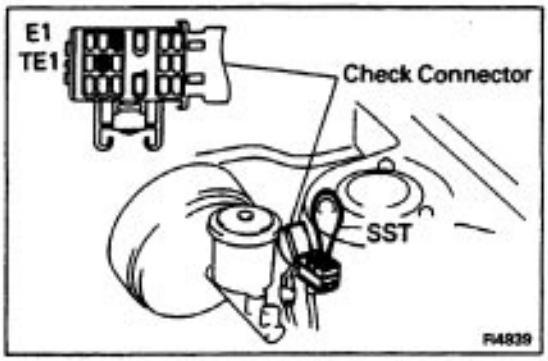
8. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE –

Connect the test probe of a tachometer to the service connector of the distributor.



NOTICE:

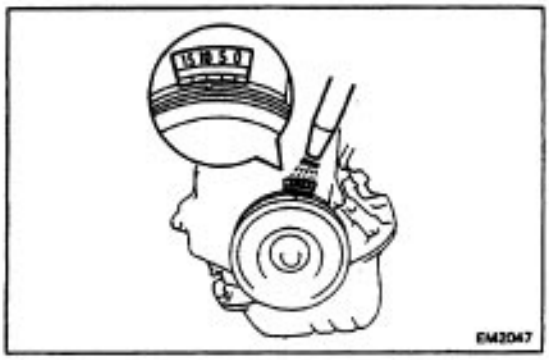
- **NEVER allow the tachometer test probe to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.**



9. ADJUST IGNITION TIMING

(a) Using SST connect terminals TE1 and E1 of the check connector.
SST 09843–18020

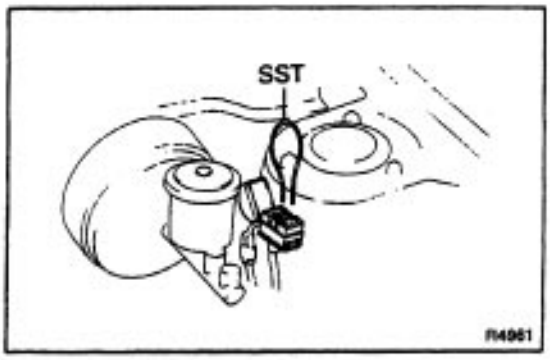
HINT: After engine rpm are kept at 1, 1,300 rpm for 5 seconds, check that they return to. idle speed.



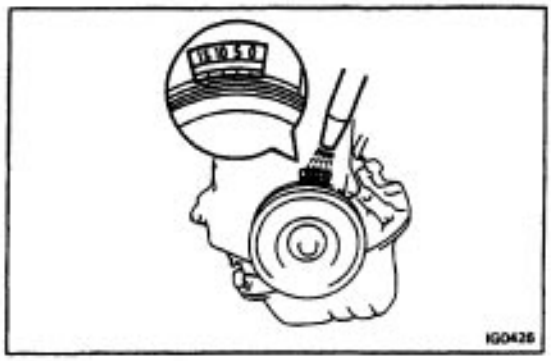
(b) Using a tinning light, check the ignition tinning.
Ignition timing: 10˚6TDC @ idle
(Transmission in N range)

(c) Loosen the two hold–down bolts, and adjust by turning the distributor.

(d) Tighten the hold–down bolts, and recheck the ignition timing.
Torque: 130 kg–cm (9 ft–lb, 13 N–m)



(e) Remove SST.
SST 09843–18020



10. FURTHER CHECK IGNITION TIMING

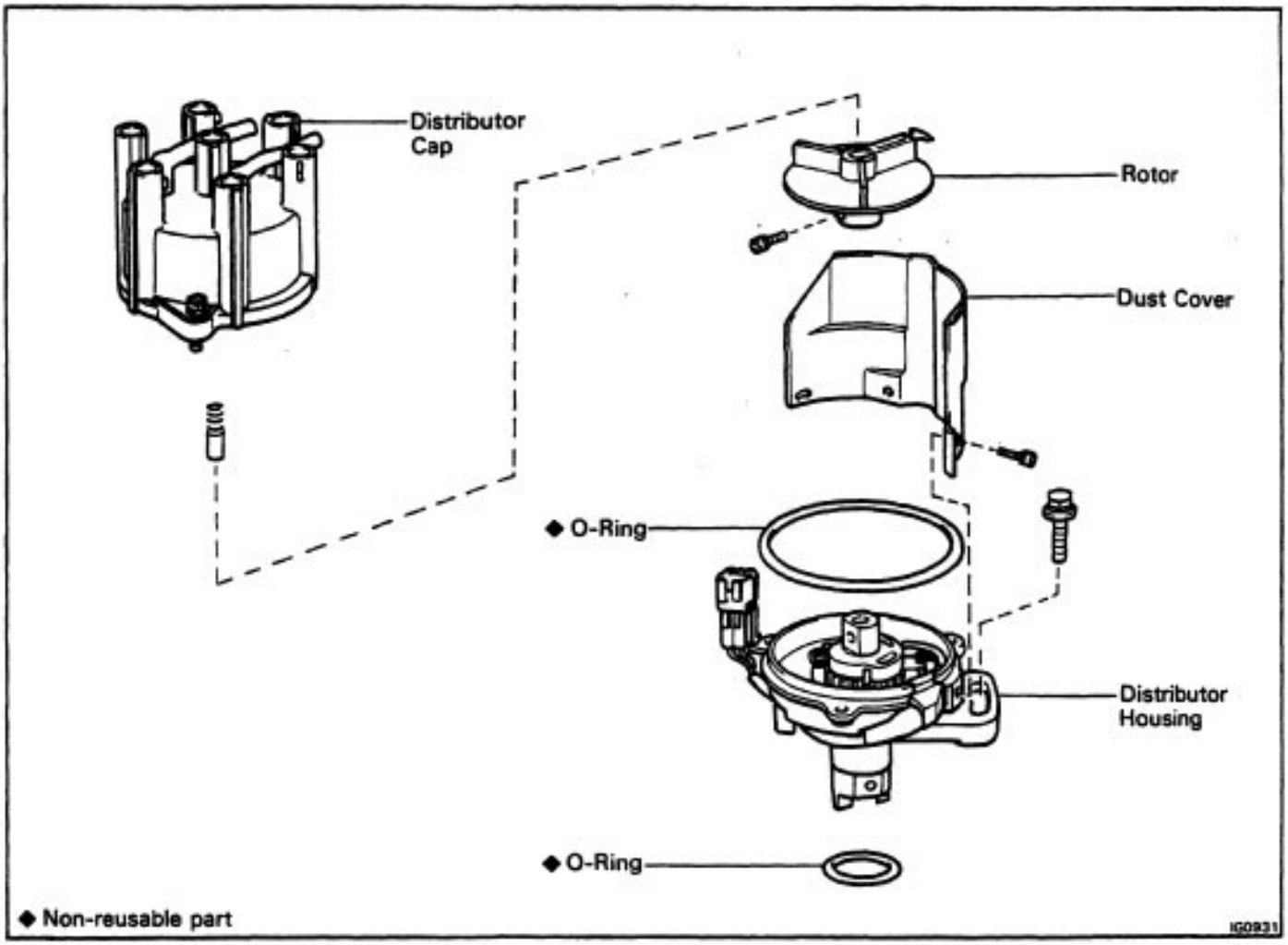
Ignition timing: 13 – 22˚ BTDC @ idle
(Transmission in N range)

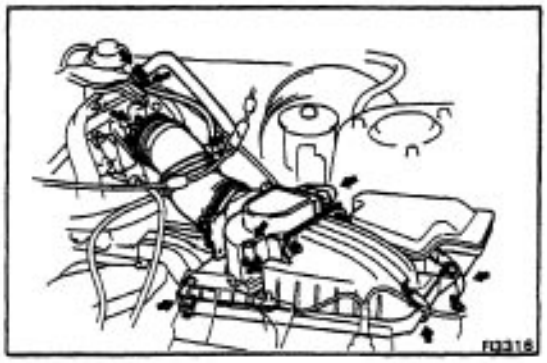
HINT: The timing mark moves in a range between 13˚ and 22˚.

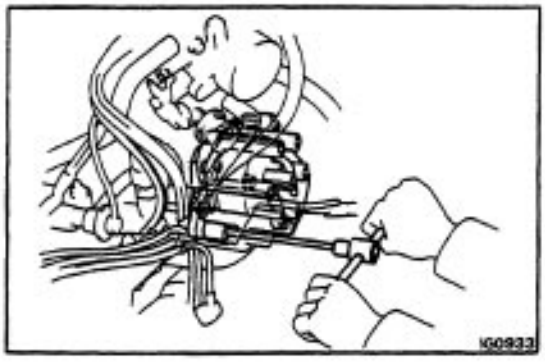
11. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

DISTRIBUTOR (2VZ–FE)

COMPONENTS







REMOVAL OF DISTRIBUTOR

1. REMOVE AIR CLEANER CAP, AIR FLOW METER AND AIR CLEANER HOSE

(a) Disconnect the air flow meter connector.
(b) Disconnect the air hoses.
(c) Loosen the air cleaner hose clamp bolt.
(d) Disconnect the air cleaner cap clips.
(e) Remove the air cleaner cap and air flow meter together with air cleaner hose.

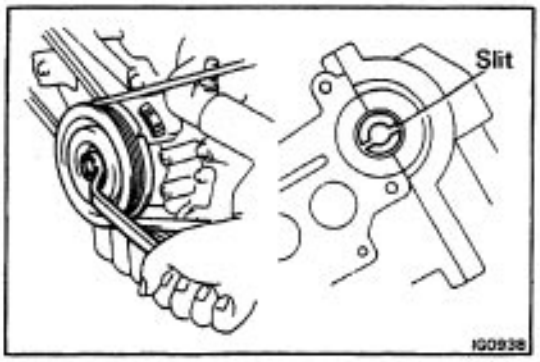
2. DISCONNECT HIGH–TENSION CORDS FROM DISTRIBUTOR CAP

HINT: When disconnect the high–tension cords, unlock the distributor cap.

3. DISCONNECT DISTRIBUTOR CONNECTOR

4. REMOVE DISTRIBUTOR

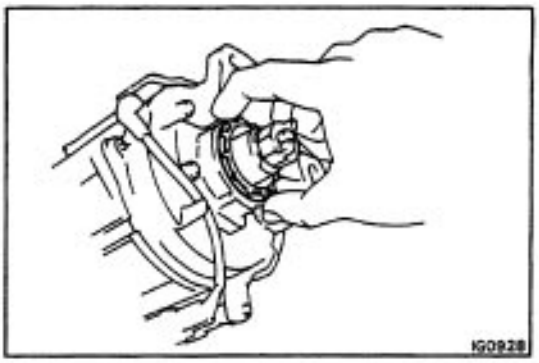
Remove the two hold–down bolts, and pull out the distributor.
Remove the 0–ring.



INSTALLATION OF DISTRIBUTOR

1. SET NO.1 CYLINDER TO TDC/COMPRESSION

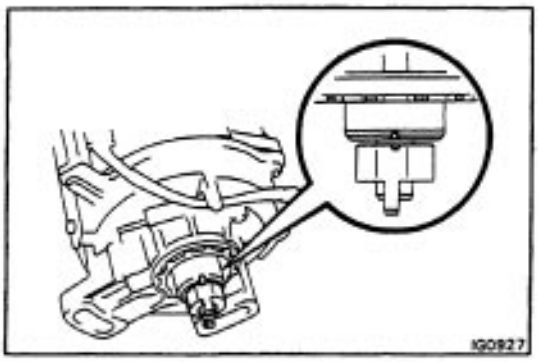
Turn the crankshaft clockwise, and position the the slit of the intake camshaft (RH cylinder head) as shown. Look at the distributor attachment hole to set.



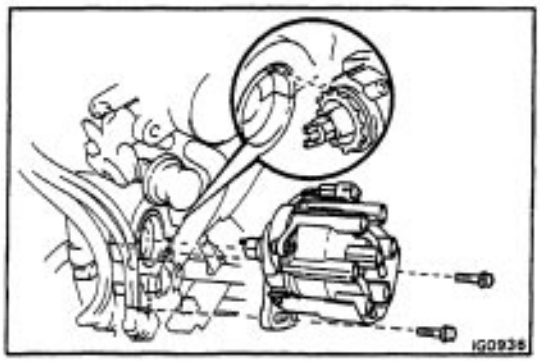
2. INSTALL DISTRIBUTOR

(a) Install a new O–ring to the housing.

(b) Apply a light coat of engine oil on the 0–ring.

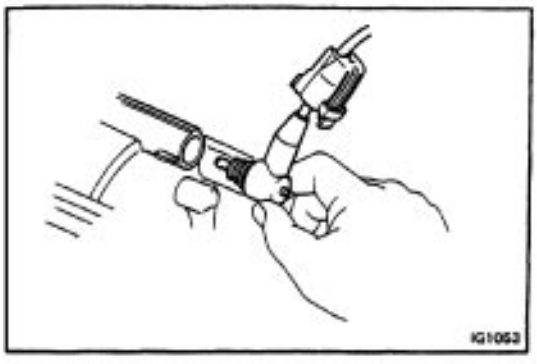


(c) Align the cutout marks of the coupling and housing.



(d) Insert the distributor, aligning the line of the housing with the cutout of the distributor attachment bearing cap.

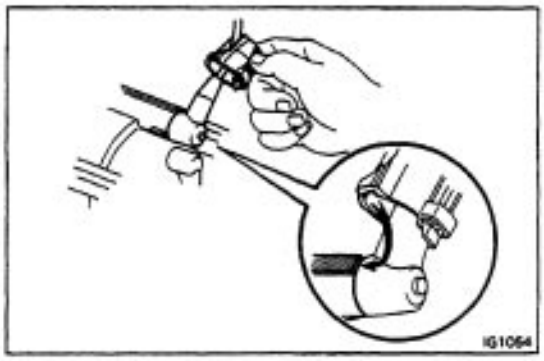
(e) Lightly tighten the two hold–down bolts.



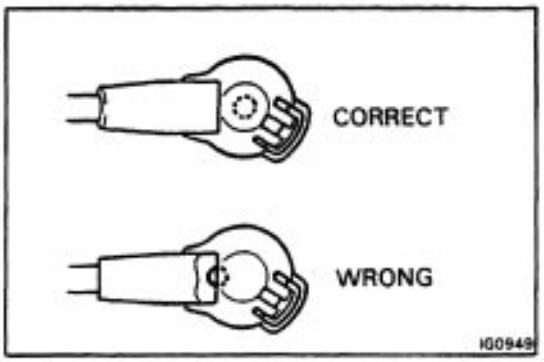
3. CONNECT HIGH–TENSION CORDS TO DISTRIBUTOR CAP

(a) (Ex. Center Cord)

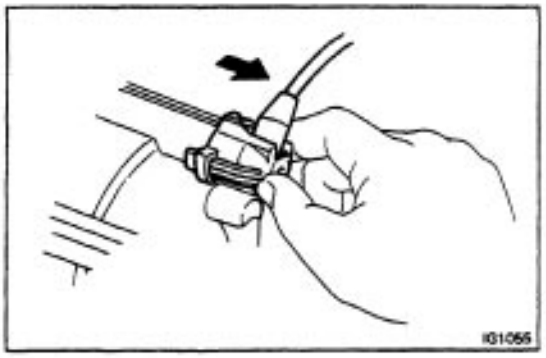
First, insert the grommet part only.



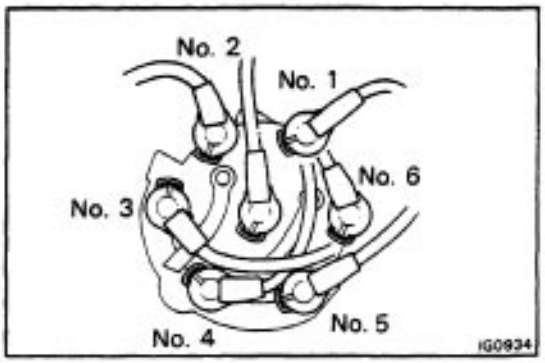
(b) (Ex Center Cord)
Align the spline of the distributor cap with the spline groove of the holder, and slide the holder.



NOTICE: Check that the holder is correctly installed to the grommet and distributor cap as shown in the illustration.

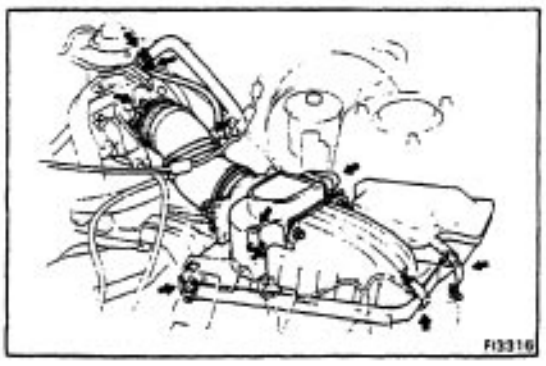


(c) Check that the claw of the holder is engaged by lightly pulling the holder.
(d) (Center Cord)
Insert the grommet and holder together.



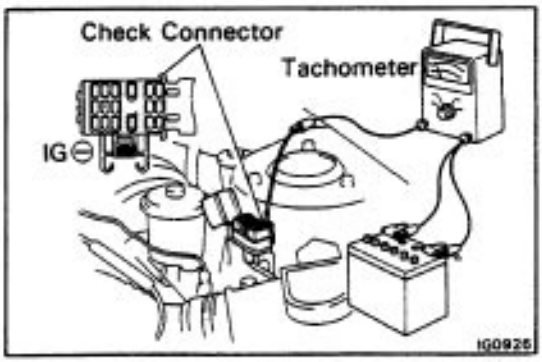
(e) Connect the high–tension cords as shown in the illustration.

4. CONNECT DISTRIBUTOR CONNECTOR



5. INSTALL AIR CLEANER CAP, AIR FLOW METER AND AIR CLEANER HOSE

(a) Connect the air cleaner hose, and install the air cleaner cap and air flow meter with the four clips.
(b) Tighten the air cleaner hose clamp bolt.
(c) Connect the air hoses.
(d) Connect the air flow meter connector.



6. WARM UP ENGINE

Allow the engine to normal operating temperature.

7. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

Connect the tachometer test probe to terminal IG **[–]** of the check connector.

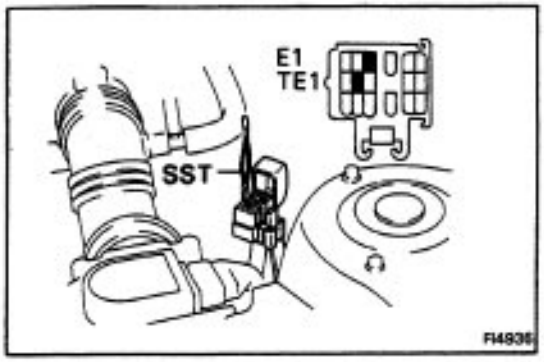
NOTICE:

- **NEVER allow the tachometer test probe to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommended that you confirm the compatibility of your unit before use.**

8. ADJUST IGNITION TIMING

(a) Check the idle speed.
Idle speed: 700 ± 50 rpm

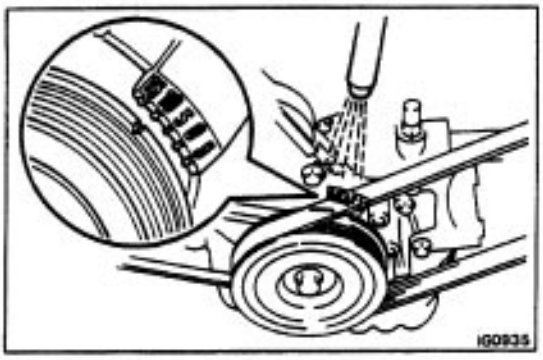
(b) Using SST connect terminals TE1 and E1 of the check connector.
SST 09843–18020



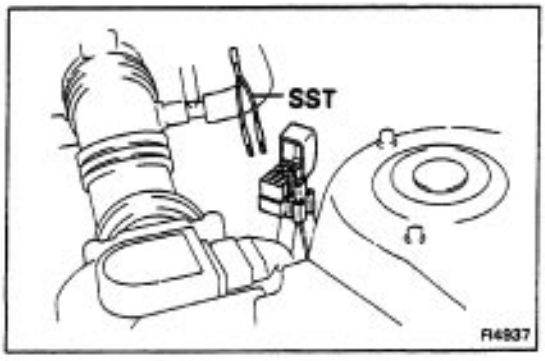
(c) Using a timing light, check the ignition timing.
Ignition timing: 10˚6TDC @ idle
(Transmission in N range)

(d) Loosen the two hold–down bolts, and adjust by turning the distributor.

(e) Tighten the hold–down bolts, and recheck the ignition timing.
Torque: 185 kg–cm (13 ft–lb, 18 N–m)



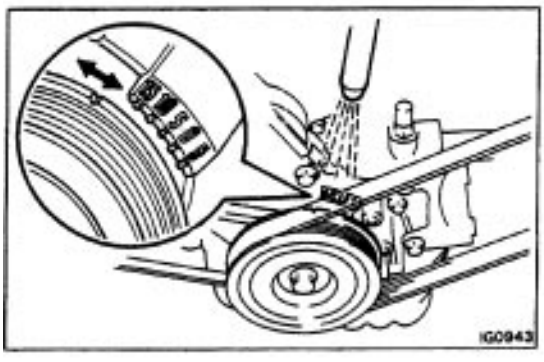
(f) Remove SST.
SST 09843–18020



9. FURTHER CHECK IGNITION TIMING

Ignition timing: 10˚BTDC @ idle
(Transmission in N range)

HINT: The timing mark moves in a range between 13˚ and 27˚.



10. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

INTRODUCTION

HOW TO USE THIS MANUAL

To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

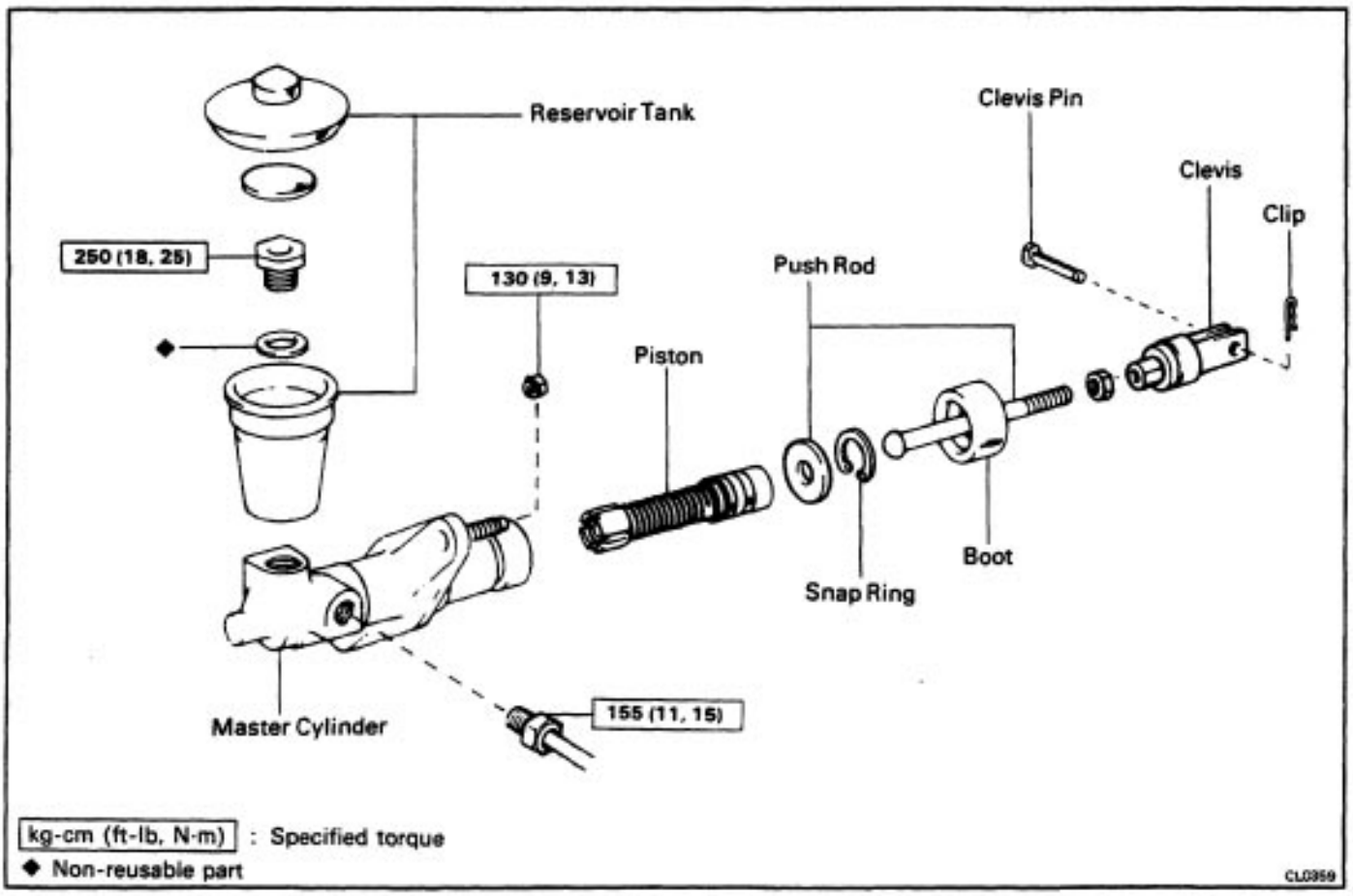
An **INDEX** is provided on the first page of each section to guide you to the item to be repaired.

At the beginning of each section, PRECAUTIONS are given that pertain to all repair operations contained in that section. *Read these precautions before starting any repair task.*

TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause. The repair for each possible cause is referenced in the remedy column to quickly lead you to the solution.

REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together. Example:

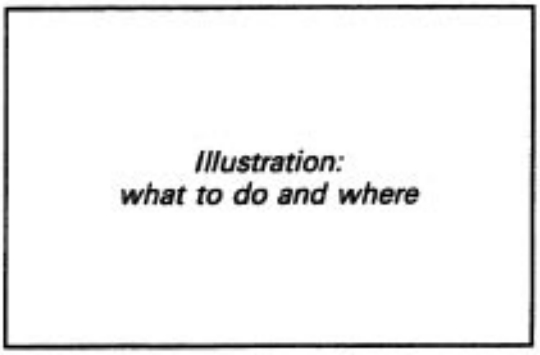


The procedures are presented in a step–by–step format:

- The illustration shows what to do and where to do it.
- The task heading tells what to do.
- The detailed text tells how to perform the task and gives other information such as specifications and warnings.

Example:

Task heading: what to do



21. CHECK PISTON STROKE OF OVERDRIVE BRAKE

(a) Place SST and a dial indicator onto the overdrive brake piston as shown in the figure.
SST 09350–30020 (09350–06120)

Set part No. Component part No.

Detailed text: how to do task

(b) Measure the stroke applying and releasing the compressed air (4 – 8 kg /cm^2, 57 –114 psi or 392 – 785 kPa) as shown in the figure.

Piston stroke: 1.40 –1.70 mm (0.0551 – 0.0669 in.)

Specification

This format provides the experienced technician with a FAST TRACK to the information needed. The upper case task heading can be read at a glance when necessary, and the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

REFERENCES

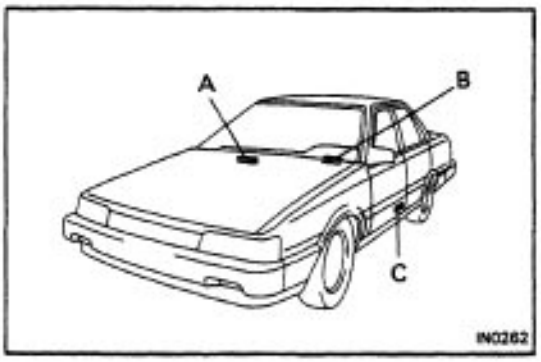
References have been kept to a minimum. However, when they are required you are given the page to refer to.

SPECIFICATIONS

Specifications are presented in bold type throughout the text where needed. You never have to leave the procedure to look up your specifications. They are also found in Appendix A, for quick reference.

CAUTIONS, NOTICES, HINTS:

- **CAUTIONS** are presented in bold type, and indicate there is a possibility of injury to you or other people.
- **NOTICES** are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- **HINTS** are separated from the text but do not appear in bold. They provide additional information to help you efficiently perform the repair.



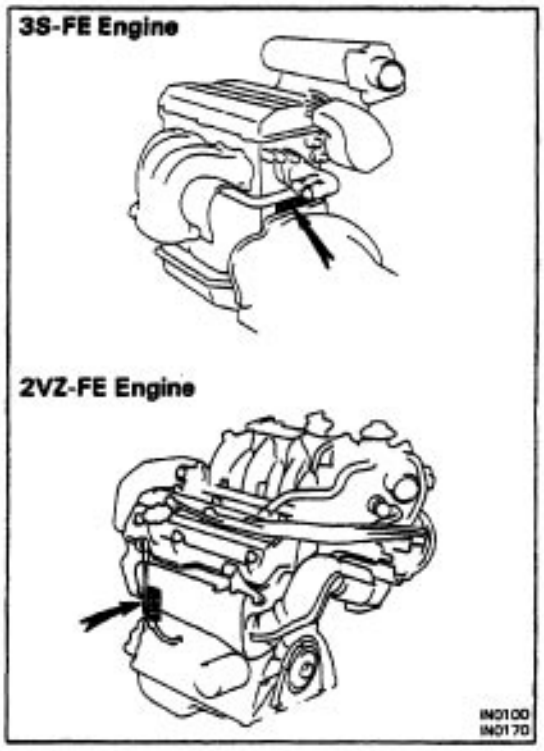
IDENTIFICATION INFORMATION

VEHICLE IDENTIFICATION NUMBER

The vehicle identification number is stamped on the cowl panel.

This number has also been stamped on the vehicle identification number plate and certification regulation label.

A. Vehicle Identification Number
B. Vehicle Identification Number Plate
C. Certification Regulation Label

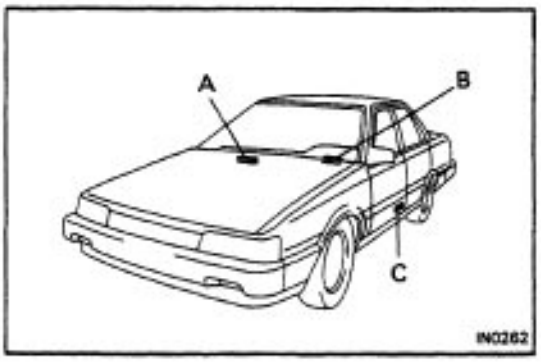


ENGINE SERIAL NUMBER

The engine serial number is stamped on the engine block as shown.

GENERAL REPAIR INSTRUCTIONS

1. Use fender seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in the appropriate order to facilitate reassembly.
3. Observe the following:
   (a) Before performing electrical work, disconnect the negative cable from the battery terminal.
   (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative H terminal which is grounded to the vehicle body.
   (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable straight up without twisting or prying it.
   (d) Clean the battery terminal posts and cable terminals with a shop rag. Do not scrape them with a file or other abrasive objects.
   (e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installation. Do not use a hammer to tap the terminal onto the post.
   (f) Be sure the cover for the positive (+) terminal is properly in place.
4. Check hose and wiring connectors to make sure that they are secure and correct.
5. Non–reusable parts
   (a) Always replace cotter pins, gaskets, 0–rings and oil seals etc. with new ones.
   (b) Non–reusable parts are indicated in the component illustrations by the "♦" symbol.



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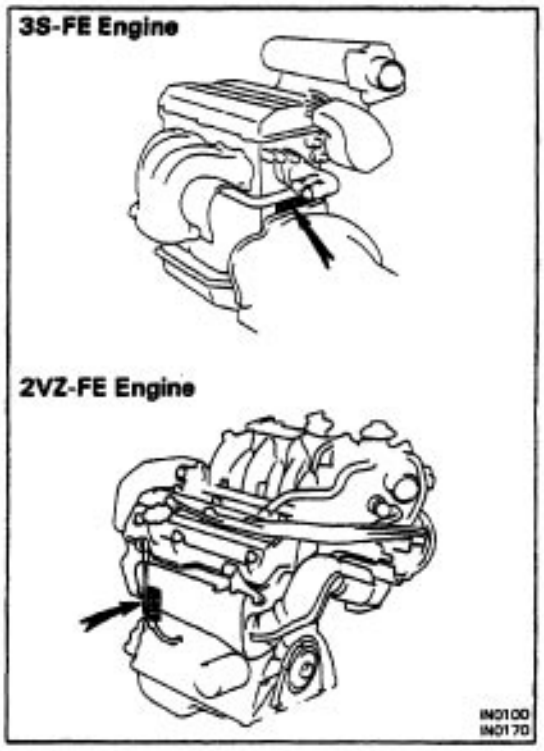

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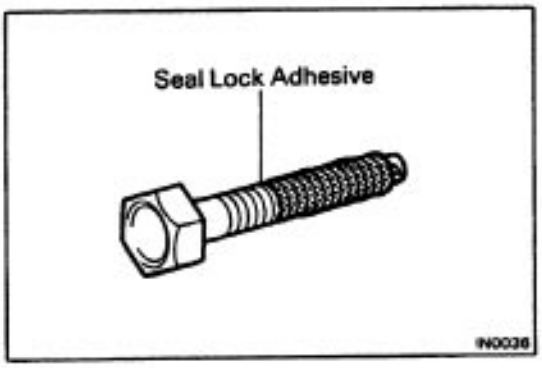
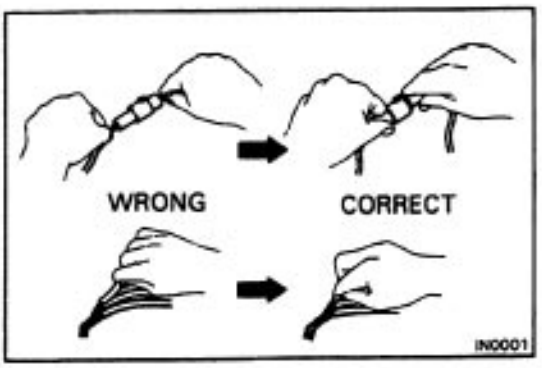
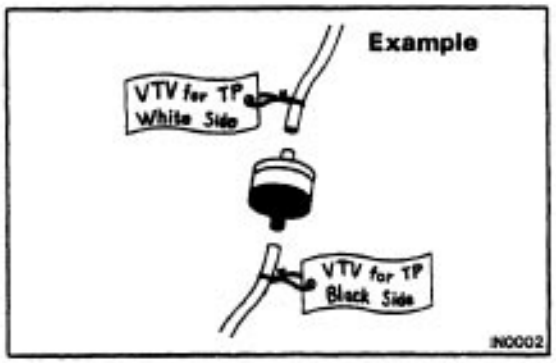


6. Precoated parts
   Precoated parts are bolts and nuts, etc. that are coated with a seal lock adhesive at the factory.
   (a) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.
   (b) Recoating of precoated parts
   (1) Clean off the old adhesive from the bolt, nut or threads.
   (2) Dry with compressed air.
   (3) Apply the specified sea! lock adhesive to the bolt or nut threads.
   (e) Precoated parts are indicated in the. component illustrations by the "♦" symbol.
7. When necessary, use a sealer on gaskets to prevent leaks.
8. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.
9. Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and
   SSM can be found at the back of this manual.
10. When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the rating or use one with a lower rating.
11. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations. (See page IN–27)
    (a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels at the apposite end in order to ensure safety.
    (b) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on a vehicle raised on a jack alone, even for a small job that can be finished quickly.



12. Observe the following precautions 'to avoid damage to the parts:
    (a) Do not open the cover or case of the ECU unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)
    (b) When replacing the internal mechanism (computer part) of the digital meter, be careful that no part of your body or clothing comes in contact with the terminals of the leads from the IC, etc. of the replacement part (spare part).
    (c) To disconnect vacuum hoses, pull on the end, not the middle of the hose.
    M To pull apart electrical connectors, pull on the connector itself, not the wires.
    (e) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.

(f) When steam cleaning an engine, protect the distributor, air filter and VCV from water.
(g) Never use an impact wrench to remove or install temperature switches or temperature sensors.
(h) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
(i) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step–down adapter instead. Once the hose has been stretched, it may leak.



13. Tag hoses before disconnecting them:
(a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
(b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.

PRECAUTIONS FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

CAUTION: If large amounts of unburned gasoline flow into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

1. Use only unleaded gasoline.

2. Avoid prolonged idling.
Avoid running the engine at idle speed for more than 20 minutes.

3. Avoid spark jump test.
(a) Spark jump test only when absolutely necessary. Perform this test as rapidly as possible.
(b) While testing, never race the engine.

4. Avoid prolonged engine compression measurement.
Engine compression tests must be made as rapidly as possible.

5. Do not run engine when fuel tank is nearly empty.
This may cause the engine to misfire and create an extra load on the converter.

6. Avoid coasting with ignition turned off and prolonged braking.

7. Do not dispose of used catalyst along with parts contaminated with gasoline or oil.

(f) When steam cleaning an engine, protect the distributor, air filter and VCV from water.
(g) Never use an impact wrench to remove or install temperature switches or temperature sensors.
(h) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
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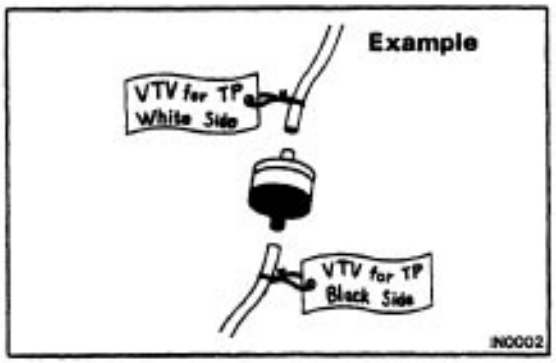

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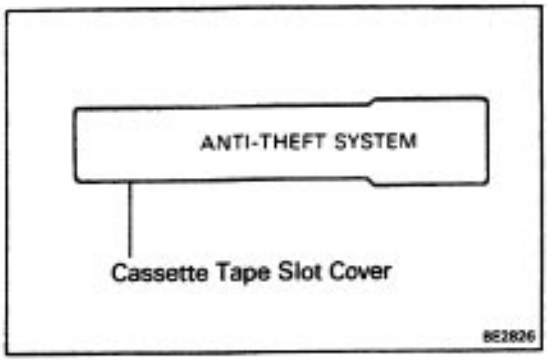
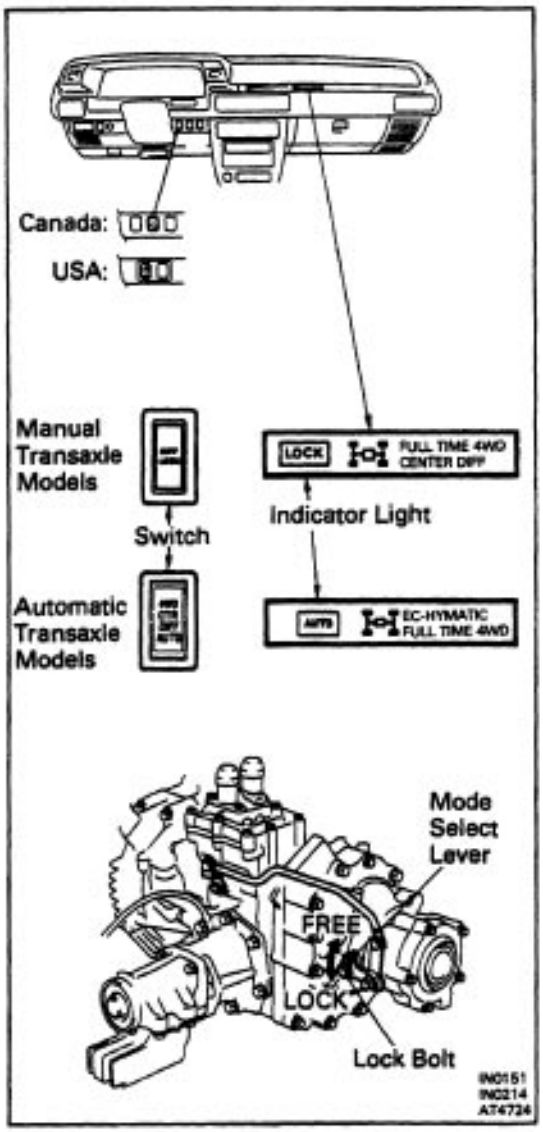
6. Avoid coasting with ignition turned off and prolonged braking.
7. Do not dispose of used catalyst along with parts contaminated with gasoline or oil.

PRECAUTIONS FOR VEHICLES WITH AN AUDIO SYSTEM WITH BUILT–IN ANTI–THEFT SYSTEM



Audio Systems displaying the sign ”ANTI–THEFT SYSTEM” shown on the left has a built–in anti–theft system which makes the audio system soundless if stolen. If the power source for the audio system is cut even once, the anti–theft system operates so that even if the power source is reconnected, the audio system will not produce any sound unless the ID number selected by the customer is input again. Accordingly, when performing repairs on vehicles equipped with this system, before disconnecting the battery terminals or removing the audio system the customer should be asked for the ID number so that the technician can input the ID number afterwards, or else a request made to the customer to input the ID number. For the method to input the ID number or cancel the anti–theft system, refer to the Owner’s Manual.



PRECAUTIONS WHEN SERVICING FULL–TIME 4WD VEHICLES

The 1990 model year full–time 4WD Camry is equipped with two types of transaxle – either the manual transaxle or the automatic transaxle. The center differential system of the manual transaxle is the mechanical lock type. The center differential system of the automatic transaxle is a hydraulic multiplate clutch control type. When carrying out any kind of servicing or testing on a full–time 4WD in which the front or rear wheels are made to rotate (braking test, speedometer test, on–vehicle wheel balancing, etc.), or when towing the vehicle, be sure to observe the precautions given below. If incorrect preparations or test procedures are used, the test cannot be successfully carried out, and may be dangerous as well. Therefore, before beginning any such servicing or test, be sure to check the following items:

(1) Center differential lock type
(2) Center differential mode position
(3) Whether wheels should be touching ground or jacked up
(4) Transmission gear position
(5) Maximum testing vehicle speed
(6) Maximum testing time

Also be sure to observe the following cautions:

(1) Never accelerate or decelerate the vehicle suddenly.
(2) Observe the other cautions given for each individual test.

1. MANUAL TRANSAXLE MODELS: (Mechanical Lock Type Center Differential)

BEFORE BEGINNING TEST

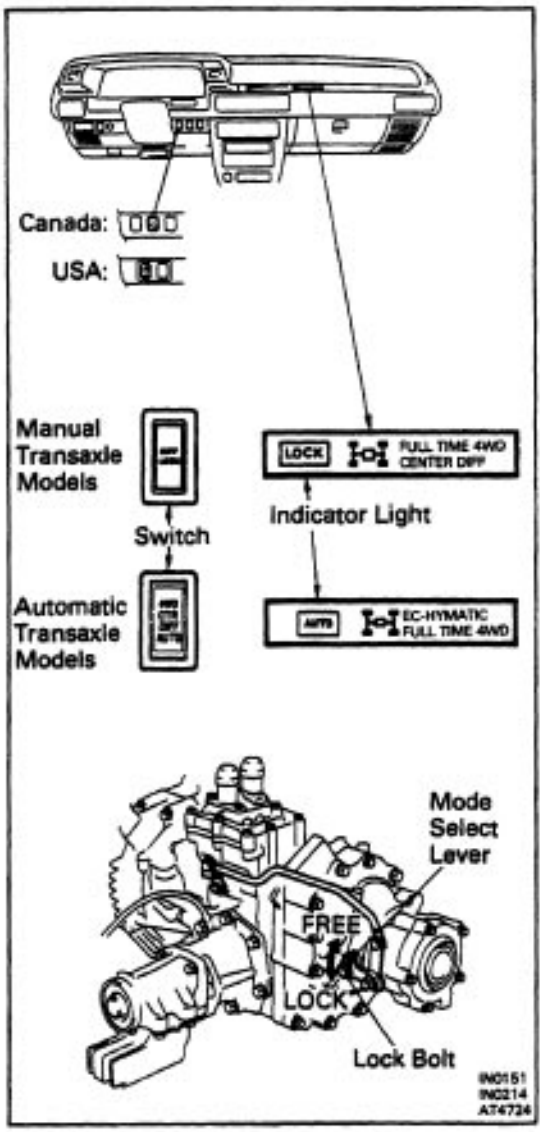
During tests with a brake tester or chassis dynamometer, such as braking force tests or speedometer tests, if only the front or rear wheels are to be rotated, it is necessary to set the position of the center differential to the FREE position or to the LOCK position depending on the type of test being perform.

(1) Select the position of the center differential by pushing the center differential control switch.
(2) After selecting the position, confirm the operations of indicator light and center differential as follows:

HINT: Move the vehicle backward or forward slightly if the indicator light does not operate correctly when the center differential control switch is turned ON or OFF.

CAUTIONS WHEN CENTER DIFFERENTIAL CONTROL SWITCH IS TURNED ON

- Operate the switch only when the all four wheels are stopped or when driving with the wheels in a straight line.
- Never operate the switch under the following conditions.
  (1) When any tire is slipping.
  (2) When any tire is spinning freely.
  (3) When swerving or cornering.



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(1) Center differential lock type
(2) Center differential mode position
(3) Whether wheels should be touching ground or jacked up
(4) Transmission gear position
(5) Maximum testing vehicle speed
(6) Maximum testing time

Also be sure to observe the following cautions:

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(1) Select the position of the center differential by pushing the center differential control switch.
(2) After selecting the position, confirm the operations of indicator light and center differential as follows:

HINT: Move the vehicle backward or forward slightly if the indicator light does not operate correctly when the center differential control switch is turned ON or OFF.

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- Operate the switch only when the all four wheels are stopped or when driving with the wheels in a straight line.
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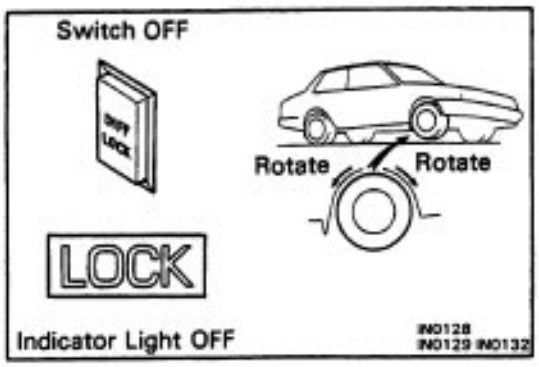
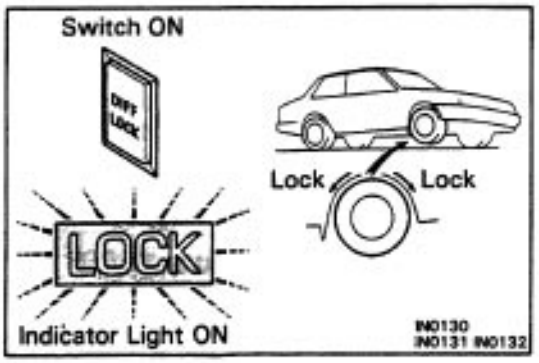
  (3) When swerving or cornering.





FREE Position

Center Differential		Wheel
Control Switch	Indicator Light	
OFF	OFF	A lifted wheel can be rotated even if only one wheel is lifted up, as long as transmission is in neutral.

LOCK Position

Center Differential		Wheel
Control Switch	Indicator Light	
ON	ON	A lifted wheel cannot be rotated if only one wheel is lifted up, even if transmission is in neutral.

CAUTIONS WHEN CENTER DIFFERENTIAL !S IN "FREE" OR "LOCK" POSITION

FREE POSITION

(1) Do not engage the clutch or pump the accelerator or brakes suddenly. Always start slowly and decelerate gradually.

(2) If either the front or the rear wheels are placed on the tester rollers in the FREE position, be careful not to exceed the following limits:

Maximum speed:

Speed indicated on speedometer

19 mph (30 km/h)

or

Wheel speed (Tester speed) 38 mph (60 km/h)

Maximum test time: 60 sec.

Note that the actual wheel speed (tester speed)is twice the speed indicated by the speedometer due to center differential operation.

LOCK POSITION

(1) Do not engage the clutch or pump the accelerator or brakes suddenly. Always start slowly and decelerate gradually.

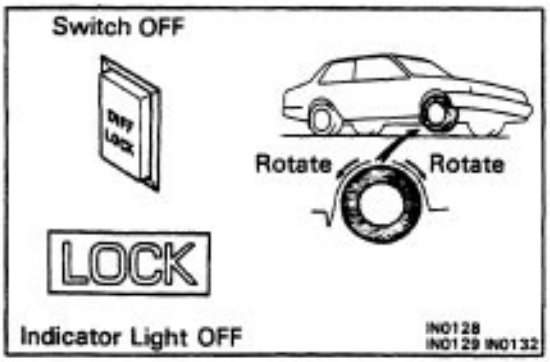
(2) Be sure to conduct the test with the rear propeller shaft removed.

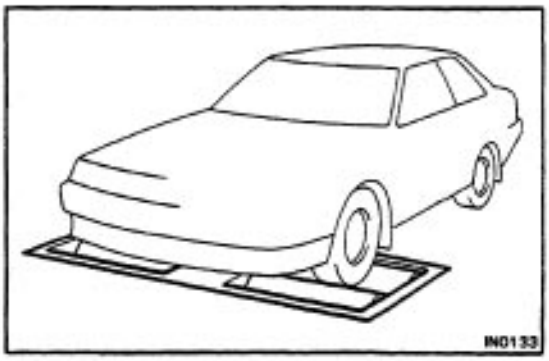
BRAKING FORCE TEST

HINT: According to the vehicle speed during the test, select one of the two test methods described below, either A or B.

Method A : (Low Speed Test) Conduct the test with the center differential in the ”FREE” position.

Method B : (High Speed Test) Conduct the test with the center differential in the ”LOCK” position and with the rear propeller shaft removed.





TEST METHOD A (Low Speed Test)

Speed indicates on speedometer:
Below 19 mph (30 km/h),
Wheel speed (tester speed):
Below 38 mph (60 km/h) and
Test time: Within 60 sec.

1. PUT CENTER DIFFERENTIAL IN ”FREE” POSITION

(1) Set the center differential control switch to OFF and check that the differential lock indicator light goes off.

(2) Put the transmission in neutral.

(3) Jack up one wheel and check that the wheel can be rotated by hand.

2. PLACE WHEELS (EITHER FRONT OR REAR) TO BE TESTED ON TESTER ROLLERS

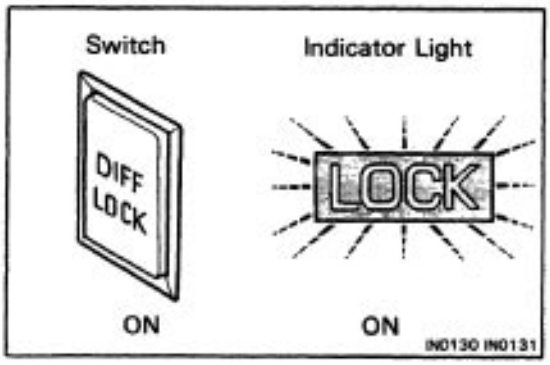
3. DISCONNECT INERTIA WEIGHT FROM TESTER ROLLER (If equipped with it)

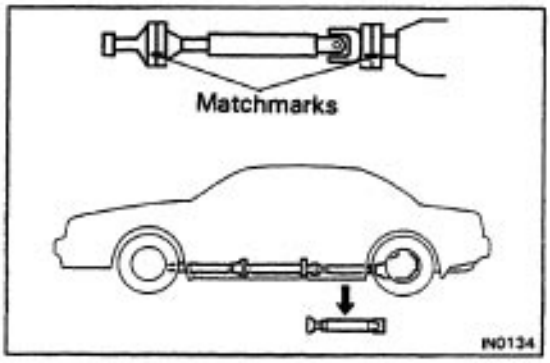
4. PUT TRANSMISSION IN NEUTRAL

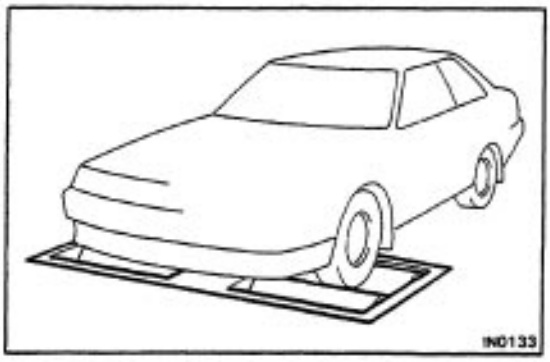
5. OPERATE TESTER ROLLERS AND MEASURE BRAKING FORCE

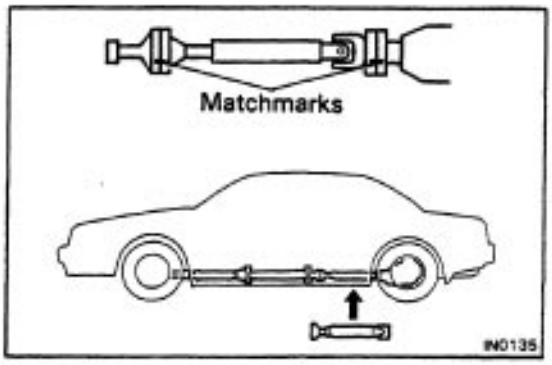
HINT:

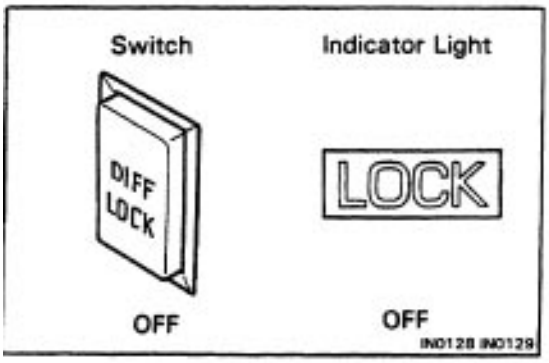
1. Since different types of tester are used, such as specialized brake testers and combination testers with built–in chassis dynamometer, speedometer tester, brake tester, etc., conduct the test in accordance with the instructions furnished for the tester model in use.
2. The actual wheel speed (tester speed) is twice the speed indicated by the speedometer due to center differential operation, so take adequate precautions.











TEST METHOD B (High Speed Test)

[Vehicle speed: Over 38 mph (60 km/h)]

1. PUT CENTER DIFFERENTIAL IN "LOCK" POSITION

(1) Set the center differential control switch to ON and check that the differential lock indicator light goes on.
HINT: If the indicator light does not go on when the center differential control switch is turned on, move the vehicle backward or forward slightly.

(2) Put the transmission in neutral.

(3) Jack up one wheel and check that the wheel cannot be rotated by hand.

2. REMOVE REAR PROPELLER SHAFT

Make matching marks on each end of the rear propeller shaft, then remove it.

3. PLACE WHEELS (EITHER FRONT OR REAR) TO BE TESTED ON TESTER ROLLERS

4. DISCONNECT INERTIA WEIGHT FROM TESTER\ROLLER (If equipped with it)

5. PUT TRANSMISSION IN NEUTRAL

6. OPERATE TESTER ROLLERS AND MEASURE BRAKING FORCE

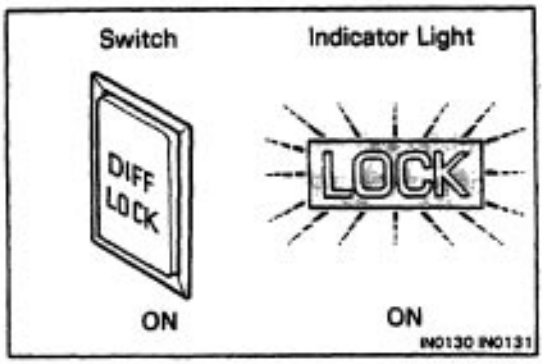
HINT: Since different types of tester are used, such as specialized brake testers and combination testers with built–in chassis dynamometer, speedometer tester, brake tester, etc., conduct the test in accordance with the instructions furnished for– the tester model in use.

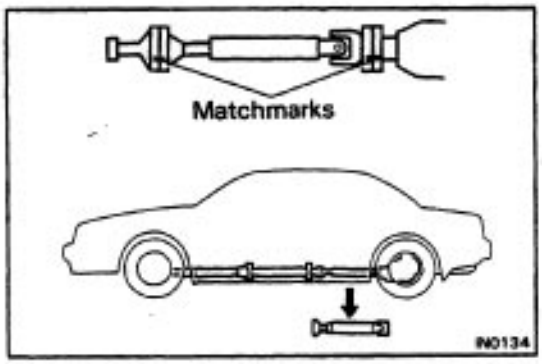
7. INSTALL REAR PROPELLER SHAFT

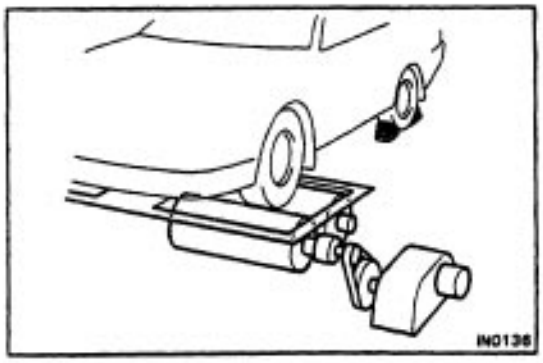
Align the matching marks made on the rear propeller shaft before removal, then install it.

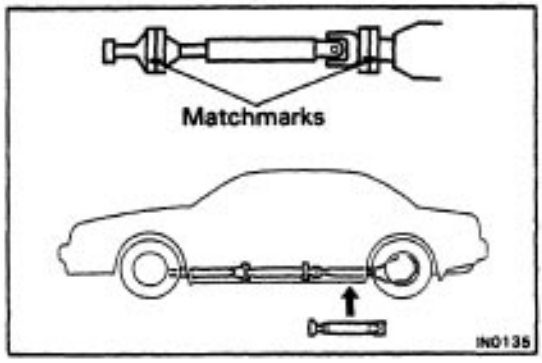
8. SET CENTER DIFFERENTIAL CONTROL SWITCH TO OFF

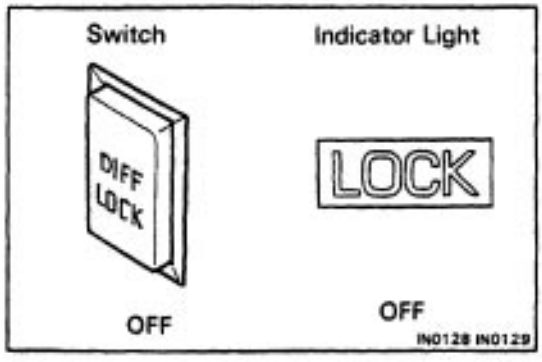
NOTE: If the indicator light does not go off when the center differential control switch is turned off, move the vehicle backward or forward slightly and check that the indicator light goes off.











SPEEDOMETER TEST OR OTHER TESTS (Using Speedometer Tester or Chassis Dynamometer)

1. PUT CENTER DIFFERENTIAL IN "LOCK" POSITION

(1) Set the differential control switch to ON and check that the differential lock indicator light goes on.
HINT: If the indicator light does not go on when the center differential control switch is turned on, move the vehicle backward or forward slightly.

(2) Put the transmission in neutral.

(3) Jack up one wheel and check that the wheel cannot be rotated by hand.

2. REMOVE REAR PROPELLER SHAFT

Make matching marks on each end of the rear propeller shaft, then remove it.

3. PLACE FRONT WHEELS ON TESTER ROLLERS

4. CHOCK REAR WHEELS

5. APPLY PARKING BRAKE

6. DISCONNECT INERTIA WEIGHT FROM TESTER ROLLER (If equipped with it)

7. TEST VEHICLE

(1) Start the engine.

(2) Engage the clutch slowly and gradually increase the speed as the test is conducted.

(3) After the test is finished, reduce the speed gradually and stop the engine.

8. INSTALL REAR PROPELLER SHAFT

Align the matching marks made on the rear propeller shaft before removal, then instal! it.

9. SET CENTER DIFFERENTIAL CONTROL SWITCH TO OFF

HINT: If the indicator light does not go off when the center differential control switch is turned off, move the vehicle backward or forward slightly and check that the indicator light goes off.

ON–VEHICLE WHEEL BALANCING

NOTICE:

1. When doing on–the–car wheel balancing on a fulltime 4WD vehicle, to prevent the wheels from rotating at different speeds or in different directions from each other (which could lead to damage to the center differential or transaxle gears), always be sure to observe the following precautions:

(1) Aft four wheels should be jacked up, clearing the ground completely.

(2) The wheels should be driven with both the engine and the wheel balancer.

(3) The mechanical lock–type center differential should be in the LOCK position.

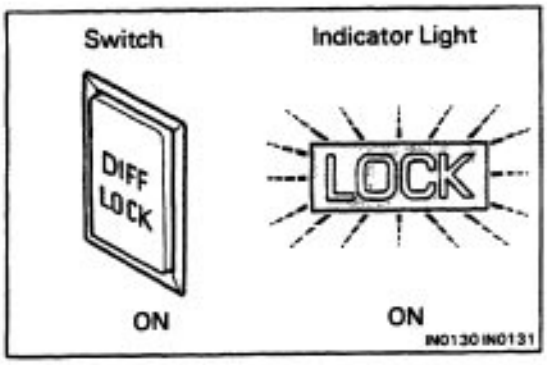
(4) The parking brake lever should be fully released.

(5) None of the brakes should be allowed to drag.

2. Avoid sudden acceleration, deceleration and braking.

3. Carry out the wheel balancing with the transmission in 3rd or 4th gear.

1. PUT CENTER DIFFERENTIAL IN "LOCK" POSITION

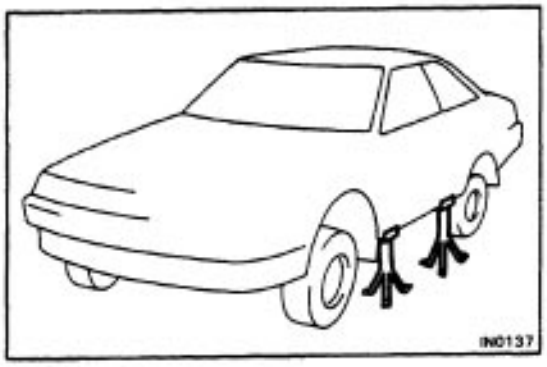


(1) Set the center differential control switch to ON and check that the differential lock indicator fight goes on.
HINT: If the indicator light does not go on when the center differential control switch is turned on, move the vehicle backward or forward slightly.

(2) Put the transmission in neutral.

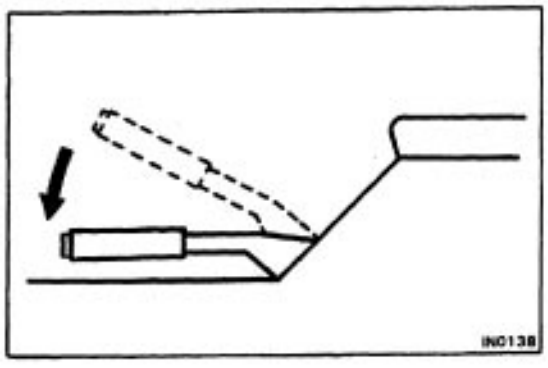
(3) Jack up one wheel and check that the wheel cannot be rotated by hand.

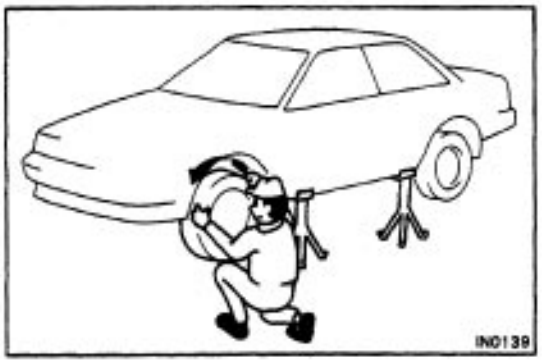
2. JACK UP VEHICLE SO THAT ALL FOUR WHEELS CAN ROTATE



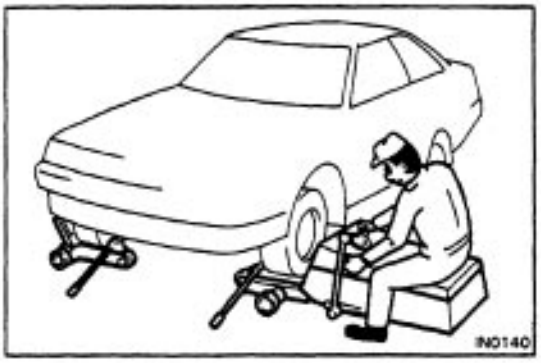
The wheels will be rotating fast, so make sure the vehicle is firmly supported on stands.

3. RELEASE PARKING BRAKE FULLY



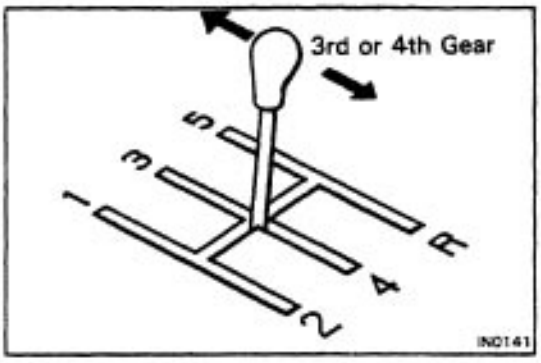


4. MAKE SURE THAT BRAKES ARE NOT DRAGGING ON ANY OF FOUR WHEELS



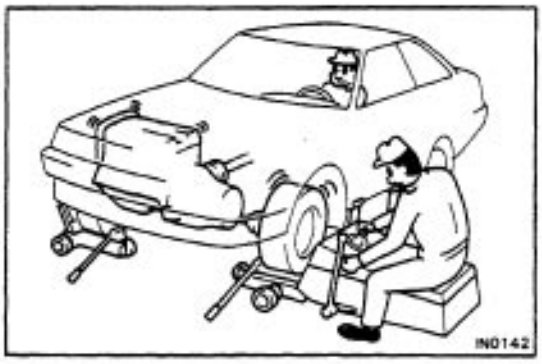
5. PLACE WHEEL TO BE BALANCED ON WHEEL BALANCER

Follow the procedure specified by the wheel balancer manufacturer.



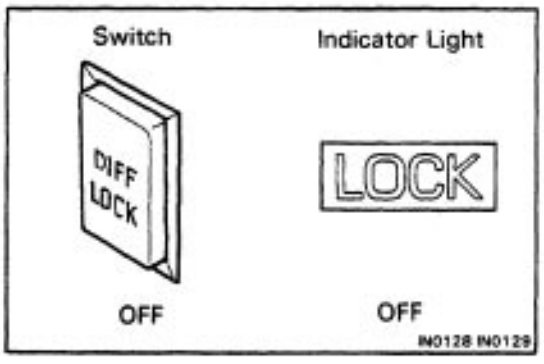
6. START ENGINE

7. PUT TRANSMISSION IN 3RD OR 4TH GEAR AND ENGAGE CLUTCH SLOWLY, THEN GRADUALLY INCREASE SPEED TO TEST SPEED



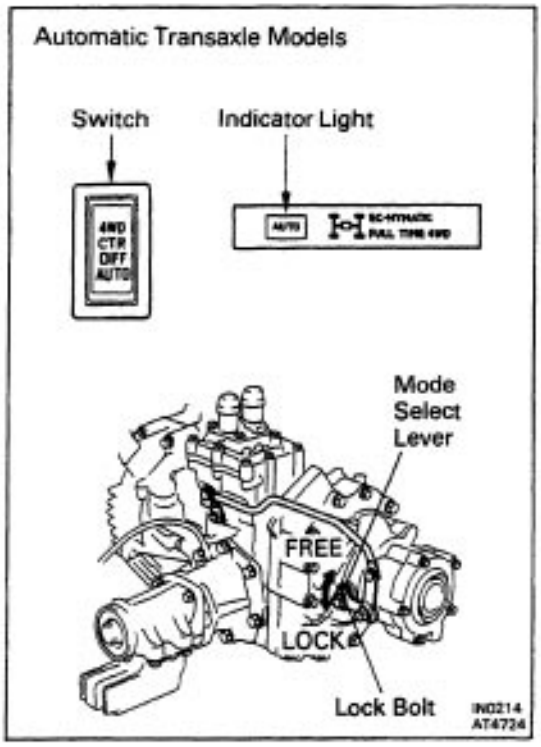
8. ROTATE WHEELS USING BOTH ENGINE'S DRIVING FORCE AND DRIVING FORCE OF WHEEL BALANCER AND CHECK WHEEL BALANCE

HINT: When doing this be careful of the other wheels, which will rotate at the same time.



9. SET CENTER DIFFERENTIAL CONTROL SWITCH TO OFF

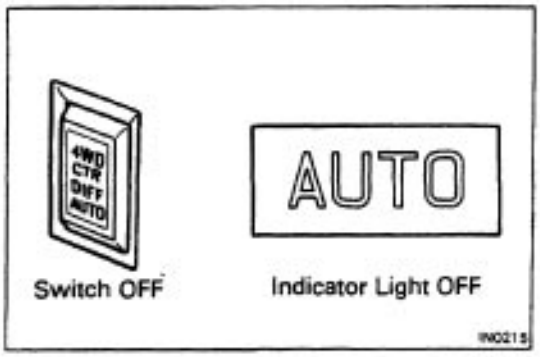
HINT: If the indicator light does not go off when the center differential control switch is turned off, move the vehicle backward or forward slightly and check that the indicator light goes off.



2. AUTOMATIC TRANSAXLE MODELS: (Hydraulic Multiplate Clutch Control Type Center Differential)

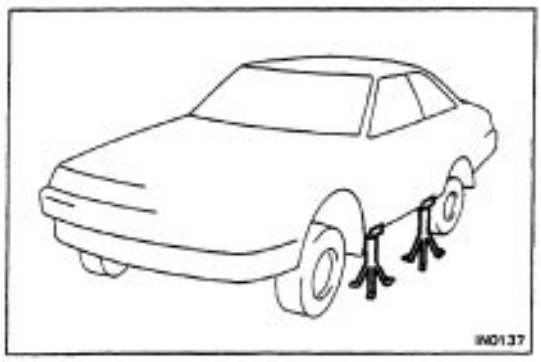
BEFORE BEGINNING TEST

During tests with a brake tester or chassis dynamometer, such as braking force tests or speedometer tests, if only the front or the rear wheels are to be rotated, it is necessary to first set the center differential control switch to OFF (Hydraulic multiplate clutch control is released), then set the Mode Select Lever on the automatic transaxle to the FREE (Normal) Mode or to the LOCK
Mode depending on the type of test being performed.



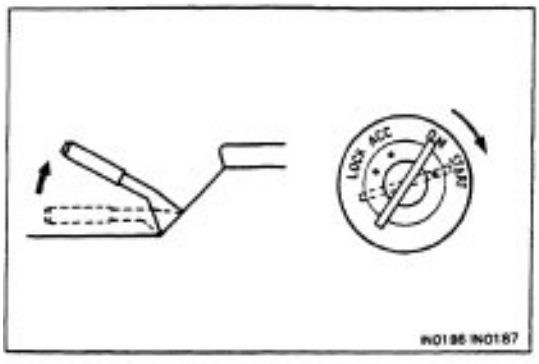
1. Release Hydraulic Multiplate Clutch Control of Center Differential

1. SET CENTER DIFFERENTIAL CONTROL SWITCH TO OFF AND CHECK THAT INDICATOR LIGHT GOES OFF

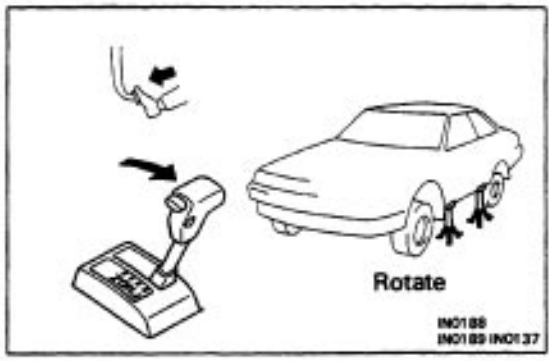


2. CHECK THAT OPERATION OF HYDRAULIC MULTIPLATE CLUTCH CONTROL IS IN "OFF" CONDITION

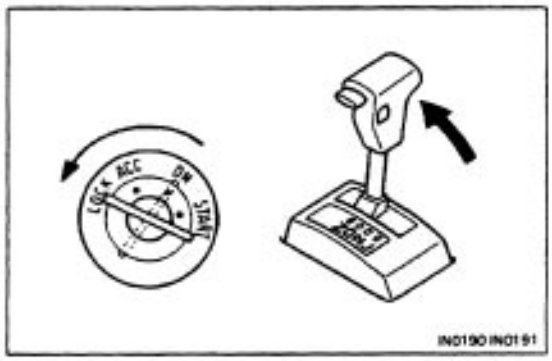
(1) Jack up the vehicle so that all four wheels can rotate.



(2) Apply the parking brake.
(3) Start the engine and run it at idle speed.
When the engine speed is high, warm–up the engine, then run it at idle speed.



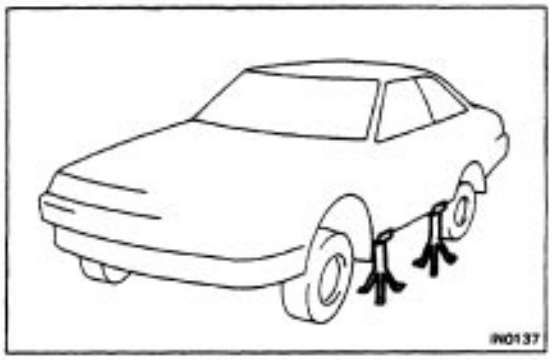
(4) Depress the brake pedal, shift into L range and gradually release the brake pedal.
(5) Check that the front wheels begin to rotate and that the rear wheels do not rotate.

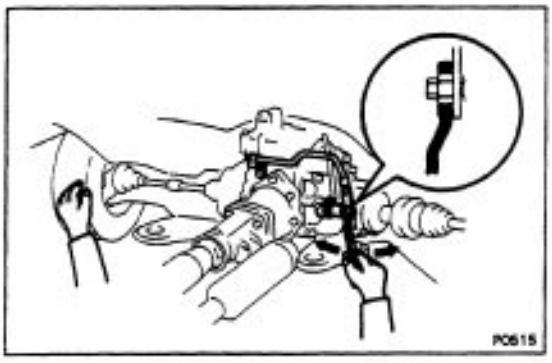


(6) Stop the engine and put the transmission in N range.

2. Moving Mode Select Lever

1. JACK UP VEHICLE



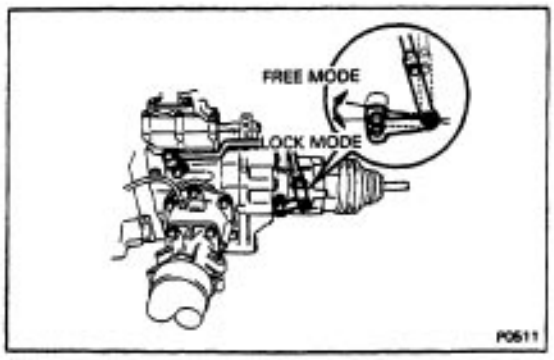


2. REMOVE MODE SELECT LEVER LOCK BOLT

3. MOVE MODE SELECT LEVER TO DESIRED MODE POSITION

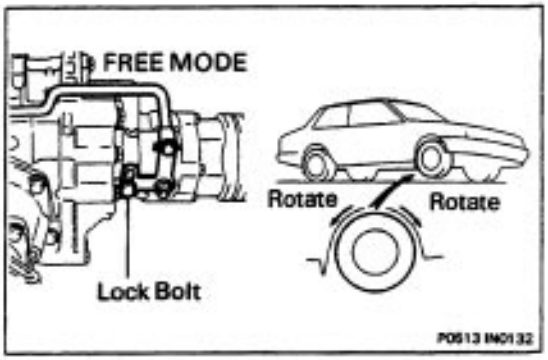
While rotating one front wheel by hand, shift the select lever towards the LOCK mode or FREE mode.

HINT: Do not use excessive force when moving the mode select lever.



4. AFTER MAKING SHIFT, LOCK MODE SELECT LEVER SECURELY WITH BOLT

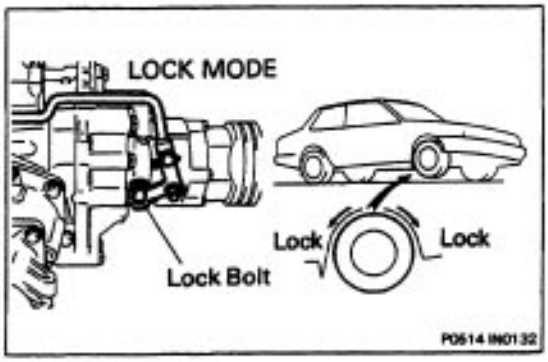
HINT: Be sure to tighten the lock bolt securely each time after moving the mode select lever.



5. CONFIRM MODE

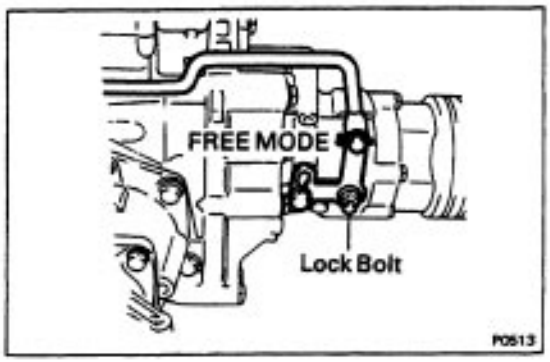
FREE (Normal) Mode:

A lifted wheel can be rotated even if only one wheel is lifted up, as long as transmission is in N range.



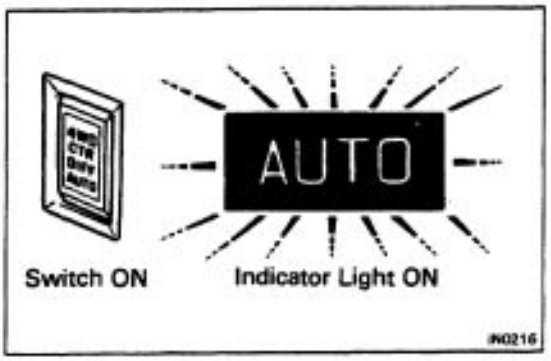
LOCK Mode:

A lifted wheel cannot be rotated if only one wheel is lifted up, even if transmission is in N range.



6. AFTER FINISHING TEST, RETURN MODE SELECT LEVER TO ”FREE (NORMAL)” MODE POSITION AND LOCK SELECT LEVER SECURELY WITH BOLT

7. SET CENTER DIFFERENTIAL CONTROL SWITCH TO AUTO



CAUTIONS WHEN MODE SELECT LEVER IS IN ”FREE” OR ”LOCK” MODE

FREE MODE

(1) Do not drive off suddenly or apply the accelerator or brakes suddenly. Always start slowly and decelerate gradually.

(2) If either the front or the rear wheels are placed on the tester rollers in the FREE mode, be careful not to exceed the following limits:

Maximum speed:

Speed indicated on speedometer

19 mph(30 km/h) or

Wheel speed (Tester speed)

38 mph160 km/h)

Maximum test time: 60 sec.

Note that the actual wheel speed (tester speedy is twice the speed indicated by the speedometer due to center differential operation.

LOCK MODE

(1) Do not drive off suddenly or apply the accelerator or brakes suddenly. Always start slowly and decelerate gradually.

(2) Be sure to conduct the test with the rear propeller shaft removed.

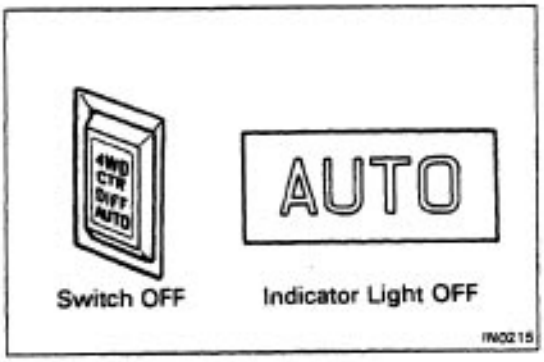
BRAKING FORCE TEST

HINT: According to the vehicle speed during the test, select one of the two test methods described below, either A or B.

Method A : (Low Speed Test) Conduct the test with the center differential control switch oft and the select lever on the transaxle in the FREE (Normal) mode.

Method B : (High Speed Test) Conduct the test with the center differential control switch off, the select lever on the transaxle in the LOCK mode and the rear propeller shaft removed.

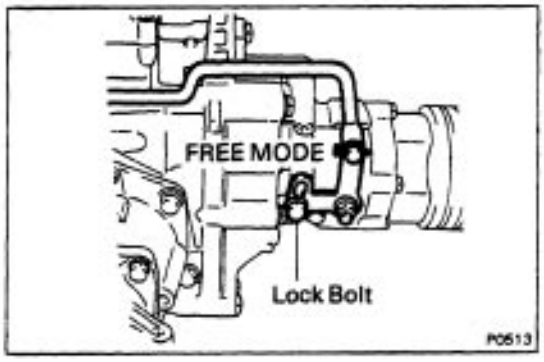
TEST METHOD A (Low Speed Test)
Speed indicated on speedometer:
Below 19 mph (30 km/h)
Wheel speed (tester speed):
Below 38 mph (60 km/h)
Test time: Within 60 sec.



1. SET CENTER DIFFERENTIAL CONTROL SWITCH TO OFF

(1) Check that the center differential control indicator light goes off.

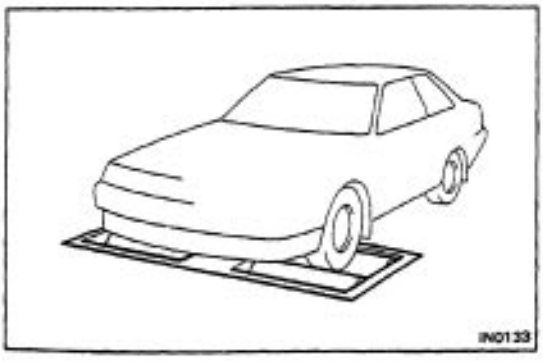
(2) Further check that operation of hydraulic multiplate clutch control of center differential is in OFF condition (See page IN–15).



2. MOVE MODE SELECT LEVER ON TRANSAXLE TO ”FREE (NORMAL)” MODE AND LOCK SELECT LEVER SECURELY WITH BOLT (Seepage IN–1)

HINT: During normal driving conditions select fever is already in FREE mode so there is no need to change it.

3. CONFIRM MODE SELECTION (See page IN–17)



4. PLACE WHEELS (EITHER FRONT OR REAR) TO BE TESTED ON TESTER ROLLERS

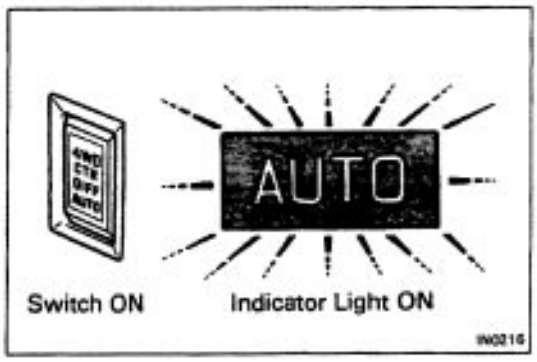
HINT: The actual wheel speed (tester speed) is twice the speed indicated by the speedometer due to center differential operation.

5. DISCONNECT INERTIA WEIGHT FROM TESTER ROLLER (If equipped with it)

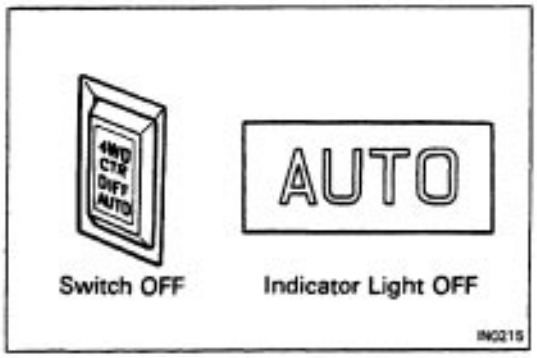
6. PUT TRANSMISSION IN ”N” RANGE

7. OPERATE TESTER ROLLERS AND MEASURE BRAKING FORCE WITH ENGINE AT IDLE

HINT: Since different types of tester are used, such as specialized brake testers and combination testers with built in chassis dynamometer, speedometer tester, brake tester, etc., conduct the test in accordance with the instructions furnished for the tester model used.



8. AFTER FINISHING TEST, RETURN CENTER DIFFERENTIAL CONTROL SWITCH TO "AUTO" AND CHECK THAT INDICATOR LIGHT GOES ON



TEST METHOD B (High Speed Test)

[Vehicle speed: Over 38 mph (60 km/h)]

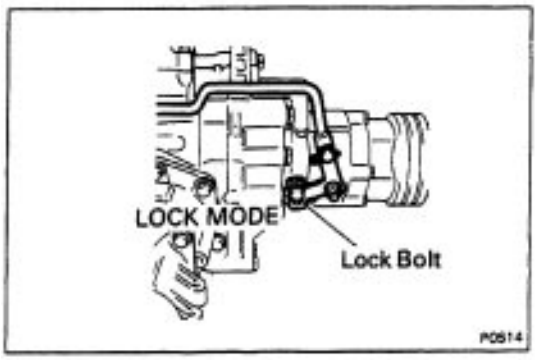
1. SET CENTER DIFFERENTIAL CONTROL SWITCH TO OFF

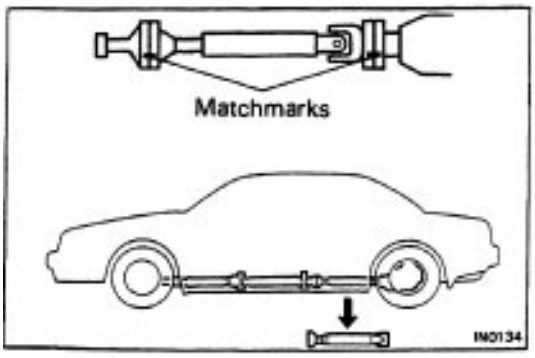
(1) Check that the center differential control indicator light goes oft.

(2) Further check that the operation of the hydraulic multi-plate clutch control of the center differential is in OFF condition.
(See page IN–15)

2. MOVE MODE SELECT LEVER ON TRANSAXLE TO "LOCK" MODE AND LOCK IT SECURELY WITH BOLT
(See page IN–16)

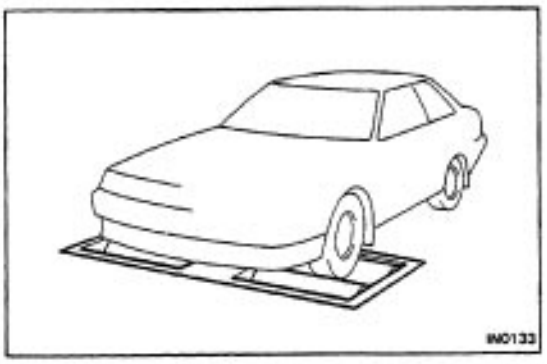
3. CONFIRM MODE SELECTION
(See page IN–17)





4. REMOVE REAR PROPELLER SHAFT

Make matching marks on each end of the propeller shaft, then remove it.



5. PLACE WHEELS (EITHER FRONT OR REAR) TO BE TESTED ON TESTER ROLLERS

6. CHOCK OTHER WHEELS

7. DISCONNECT INERTIA WEIGHT FROM TESTER ROLLER (if equipped with it)

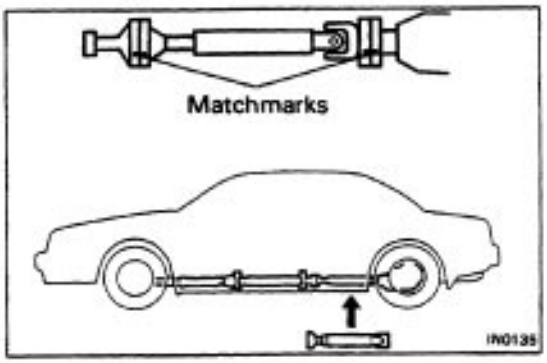
8. PUT TRANSMISSION IN N RANGE

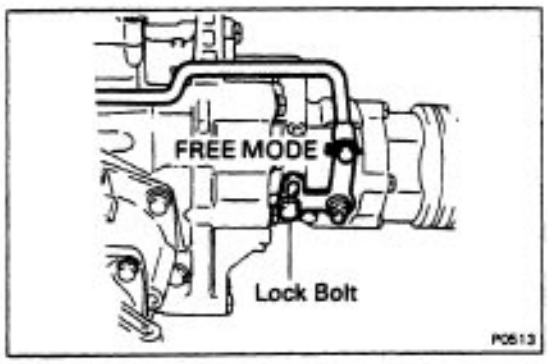
9. OPERATE TESTER ROLLERS AND MEASURE BRAKING FORCE WITH ENGINE AT IDLE

HINT: Since different types of tester are used, such as specialized brake testers and combination testers with builtin chassis dynamometer, speedometer tester, brake tester, etc., conduct the test in accordance with the instructions furnished for the tester in use.

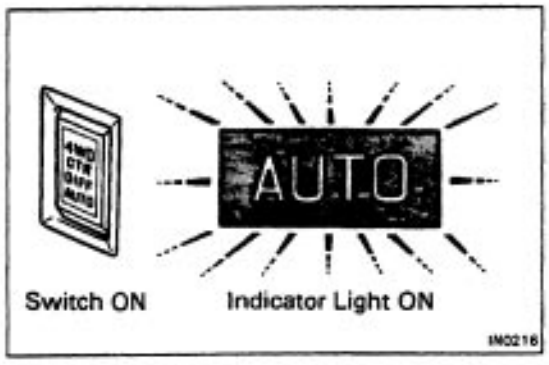
10. AFTER FINISHING TEST, INSTAL! REAR PROPELLER SHAFT

Align the matching marks made on the rear propeller shaft before removal, then install it.

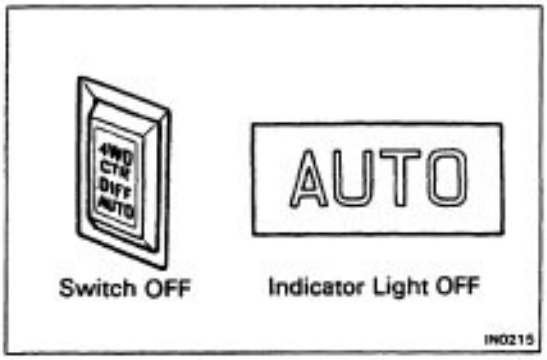




11. RETURN MODE SELECT LEVER TO "FREE (NORMAL)" MODE POSITION AND LOCK IT SECURELY WITH BOLT



12. SET CENTER DIFFERENTIAL CONTROL SWITCH TO AUTO



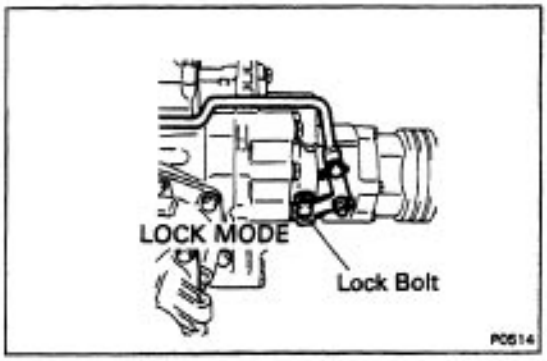
SPEEDOMETER TEST OR OTHER TESTS

[Using Speedometer Tester or Chassis Dynamometer]

1. SET CENTER DIFFERENTIAL CONTROL SWITCH TO OFF

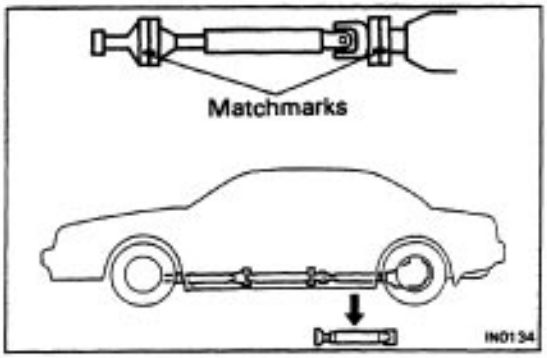
(1) Check that the center differential control indicator light goes oft.

(2) Further check that the operation of the hydraulic multiplate clutch control of the center differential is in OFF condition.
(See page IN–15)



2. MOVE MODE SELECT LEVER ON TRANSAXLE TO "LOCK" MODE AND LOCK IT SECURELY WITH BOLT (See page IN–16)

3. CONFIRM MODE SELECTION (See page IN–17)



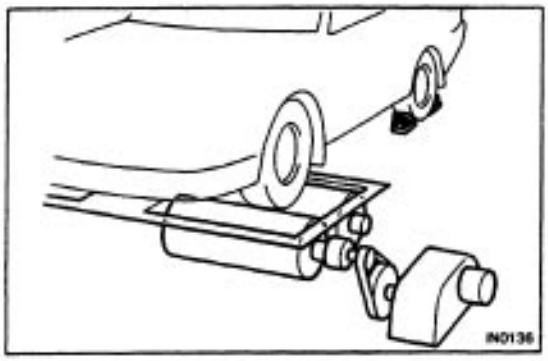
4. REMOVE REAR PROPELLER SHAFT

Make matching marks on each end of the rear propeller shaft, then remove it.

5. PLACE FRONT WHEELS ON TESTER ROLLERS

6. CHOCK REAR WHEELS

7. APPLY PARKING BRAKE



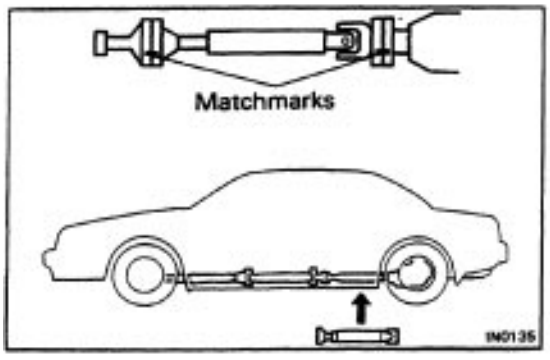
8. DISCONNECT INERTIA WEIGHT FROM TESTER ROLLER (If equipped with it)

9. TEST VEHICLE

(1) Start the engine.

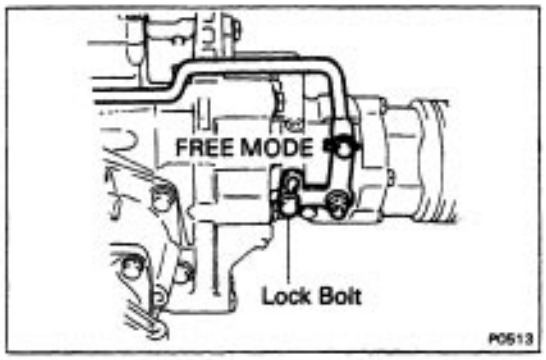
(2) Put the transmission in D range, then gradually increase the speed as the test in conducted.

(3) After the test is finished, reduce the speed gradually and stop the engine.

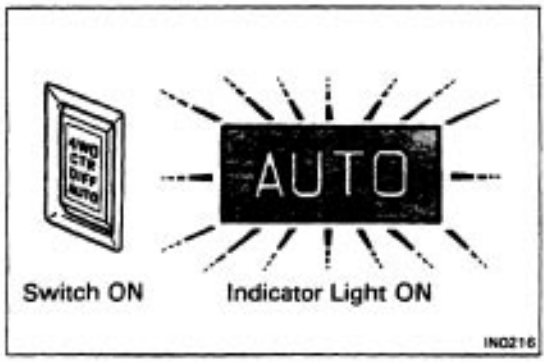


10. AFTER FINISHING TEST, INSTALL REAR PROPELLER SHAFT

Align the matching marks made on the rear propeller shaft before removal, then install it.



11. RETURN MODE SELECT LEVER TO "FREE (NORMAL)" MODE POSITION AND LOCK IT SECURELY WITH BOLT

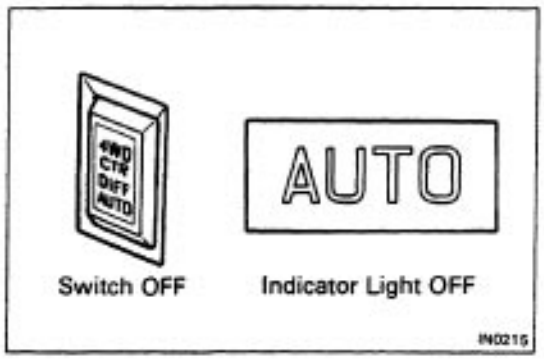


12. SET CENTER DIFFERENTIAL CONTROL SWITCH TO AUTO

ON–VEHICLE WHEEL BALANCING

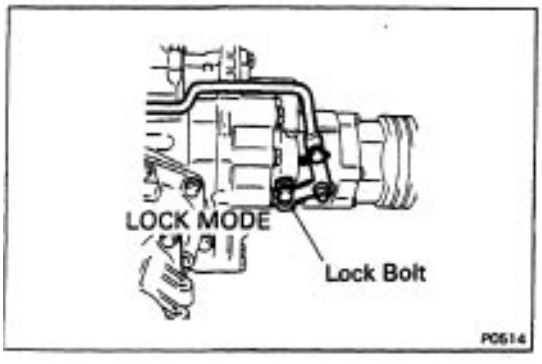
NOTICE:

1. When doing on–vehicle wheel balancing on a fulltime 4WD vehicle, to prevent the wheels from rotating at different speeds or in different directions from each other (which could lead to damage to the center differential or transaxle gears), always be sure to observe the following precautions:
   (1) A11 four wheels should be jacked up, completely clear of the ground.
   (2) The wheels should be driven by both the engine and the wheel balancer.
   (3) The center differential control switch should be in the OFF condition.
   (4) The mode select lever on the transaxle should be in the LOCK position.
   (5) The parking brake lever should be fully released.
   (6) None of the brakes should be allowed to drag.
2. Avoid sudden acceleration, deceleration and braking.
3. Carry out the wheel balancing with the transmission in D range.



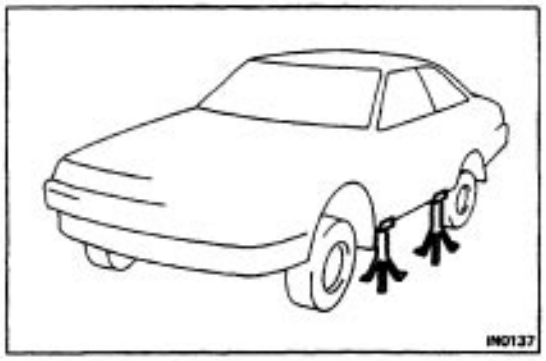
1. SET CENTER DIFFERENTIAL CONTROL SWITCH TO OFF

(1) Check that the center differential control indicator light goes off.
(2) Further check that hydraulic multiplate clutch control of the center differential is in OFF condition.
(See page IN–15)



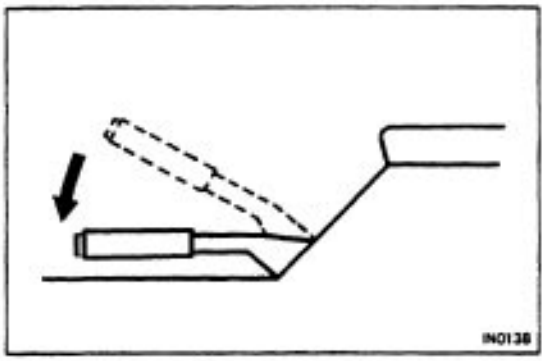
2. MOVE MODE SELECT LEVER ON TRANSAXLE TO ”LOCK” MODE AND LOCK IT SECURELY WITH BOLT (See page IN–16)

3. CONFIRM MODE SELECTION (See page IN–17)

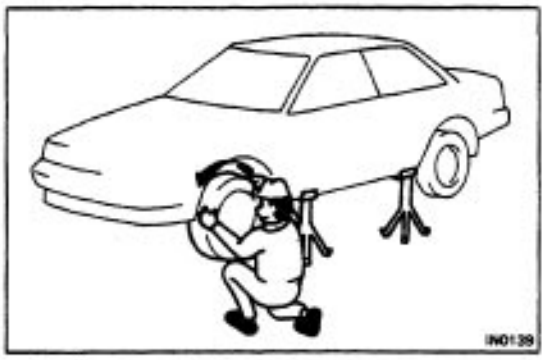


4. JACK UP VEHICLE So THAT ALL FOUR WHEELS CAN ROTATE

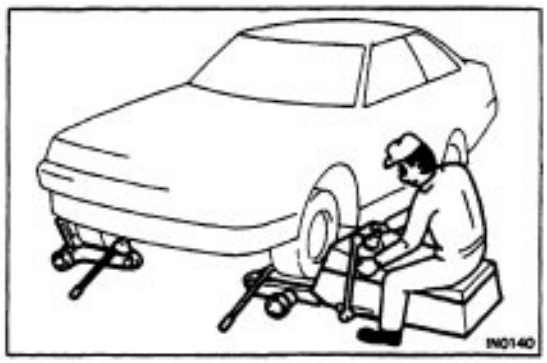
The wheels will be rotating fast, so make sure the vehicle is firmly supported on stands.



5. RELEASE PARKING BRAKE FULLY

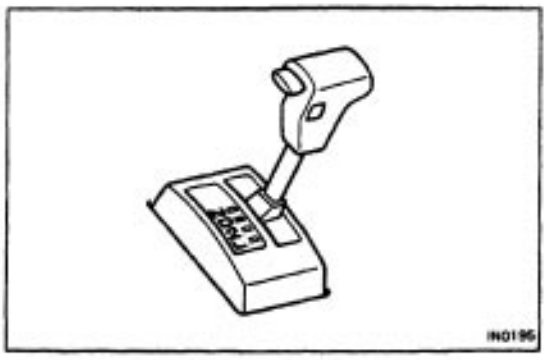


6. MAKE SURE THAT BRAKES ARE NOT DRAGGING ON ANY OF FOUR WHEELS



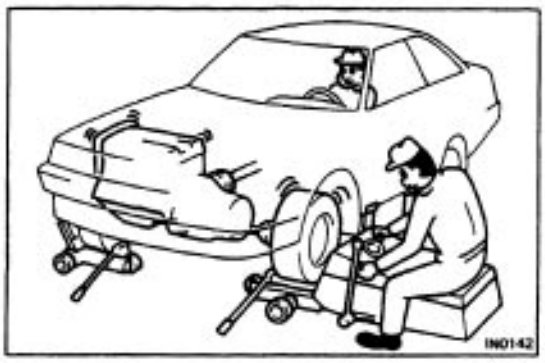
7. PLACE WHEEL TO BE BALANCED ON WHEEL BALANCER

Follow the procedure specified by the wheel balancer manufacturer.



8. START ENGINE

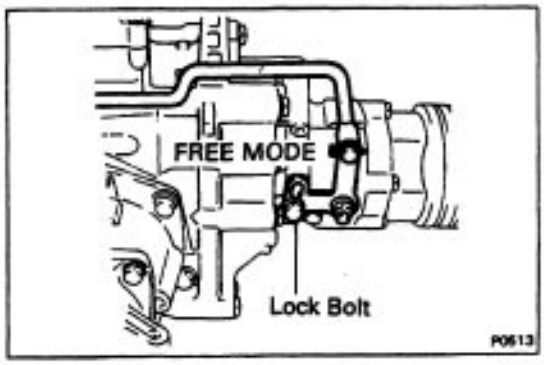
9. PUT TRANSMISSION IN ”D” RANGE, THEN GRADUALLY INCREASE SPEED TO TEST SPEED



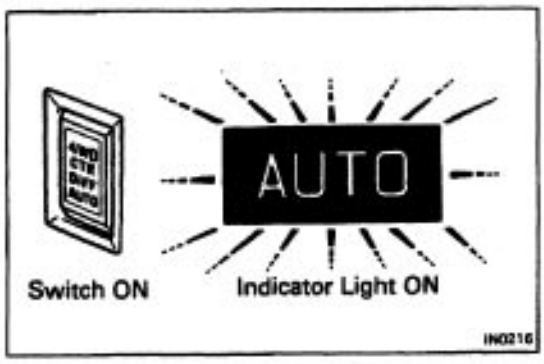
10. ROTATE WHEELS USING BOTH THE ENGINE'S DRIVING FORCE AND DRIVING FORCE OF WHEEL BALANCER AND CHECK WHEEL BALANCE

HINT:

1. When doing this be careful of the other wheel which will rotate at the same time.
2. Completely the measurement quickly, within a short time.



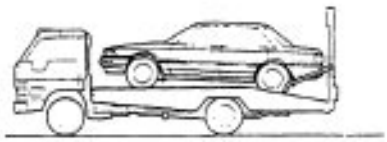
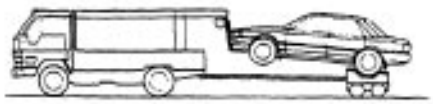
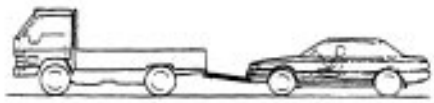
11. AFTER FINISHING WHEEL BALANCING, RETURN MODE SELECT LEVER TO "FREE (NORMAL)" MODE POSITION AND LOCK IT SECURELY WITH BOLT



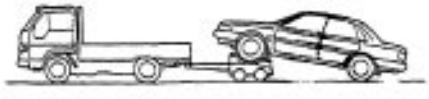
12. SET CENTER DIFFERENTIAL CONTROL SWITCH TO AUTO

PRECAUTIONS WHEN TOWING FULL–TIME 4WD VEHICLES

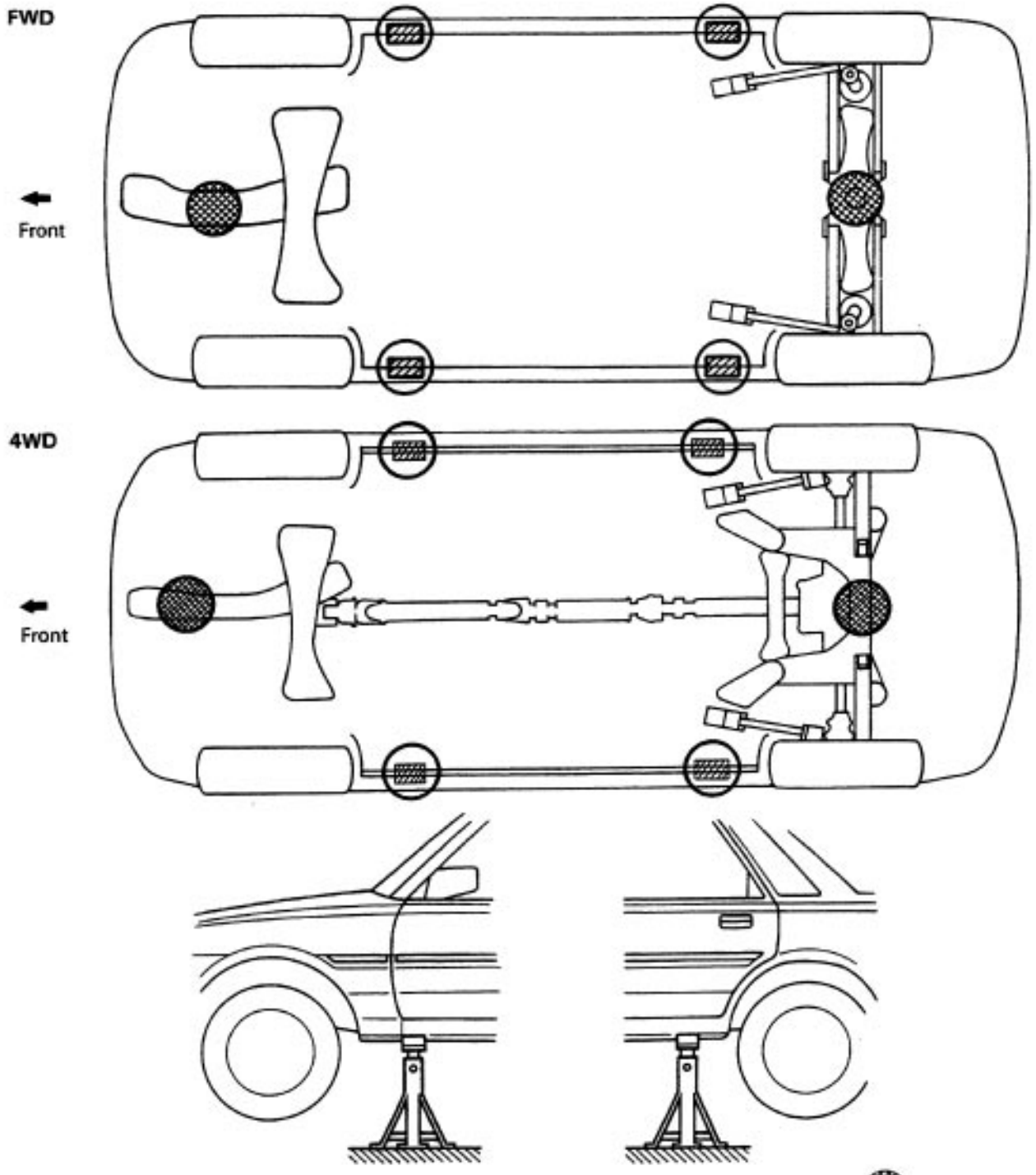
1. Use one of the methods shown below to tow the vehicle.
2. When there is trouble with the chassis and drivetrain, use method **[1]** (flat bed truck) or method T (sling type tow truck with doilies)
3. Recommended Methods: No. **[1]**, **[2]**, or **[3]**
   Emergency Method: No. **[4]**

Towing Method \ Type of Transaxle	Manual Transaxle			Automatic Transaxle			
	Parking Brake	T/M Shift Lever Position	Center Diff.	Parking Brake	T/M Shift Lever Position	Center Diff. Control Switch	Mode Select Lever on Transaxle
① Flat Bed Truck  P0442	Applied	1 st Gear	Free or Lock Center Differential Control Switch "ON" or "OFF"	Applied	"P" range	"AUTO" or "OFF"	Free (Normal Driving) No Special Operation Necessary
② Sling-Type Tow Truck with Dollies 							
③ Sling-Type Tow Truck (Front wheels must be able to rotate freely) P0438	Released	Neutral	Free Center Differential Control Switch "OFF"	Release	"N" range	"OFF"	
④ Towing with a Rope  P0437	Released	Neutral	Free Center Differential Control Switch "OFF"	Released	"N" range	"OFF"	
				HINT: Do not tow the vehicle at a speed faster than 18 mph (30 km/h) or a distance greater than 50 miles (80 km).			

HINT: Do not use any towing methods other than those shown above.
For example, the towing method shown below is dangerous, so do not use it

 P0481	During towing with this towing method, there is a danger of the drivetrain heating up and causing breakdown, or of the front wheels flying off the dolly.

VEHICLE LIFT AND SUPPORT LOCATIONS



JACK POSITION

Front . . . Center of engine mounting center member
Rear . . . . Jack up support of rear suspension member

PANTOGRAPH JACK POSITION

SUPPORT POSITION

Safety stand.....

IN0101
IN0145
IN0102

ABBREVIATIONS USED IN THIS MANUAL

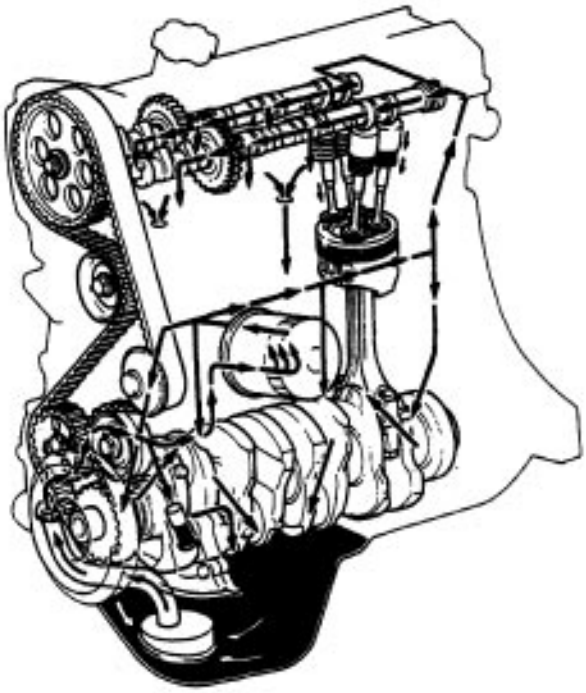
A.B.S.	Anti–Lock Brake System
A/C	Air Conditioner
ALR	Automatic Locking Retractor
Approx.	Approximation
A/T, ATM	Automatic Transaxle
ATF	Automatic Transmission Fluid
B_0	Overdrive Brake
B_1	Second Coast Brake
B_2	Second Brake
B_3	First and Reverse Brake
BDC	Bottom Dead Center
BTDC	Before Top Dead Center
BVSV	Bimetal Vacuum Switching Valve
C_0	Overdrive Clutch
C_1	Forward Clutch
C_2	Direct Clutch
CB	Circuit Breaker
DP	Dash Pot
CRS	Child Restraint System
ECT	Electronic Controlled Transaxle
ECU	Electronic Controlled Unit
EFI	Electronic Fuel Injection
E/G	Engine
EGR	Exhaust Gas Recirculation
ELR	Emergency Locking Retractor
ESA	Electronic Spark Advance
EVAP	Evaporative (Emission Control)
EX	Exhaust (manifold, valve)
Ex.	Except
F_0	Overdrive One–Way Clutch
F_1	No. 1 One–Way Clutch
F_2	No. 2 One–Way Clutch
FIPG	Formed in Place Gasket
FL	Fusible Link
Fr	Front
IG	Ignition
IN	Intake (manifold, valve)
ISC	Idle Speed Control
LED	Light Emitting Diode
LH	Left–Hand
LSPV	Load Sensing Proportioning Valve
Max.	Maximum
Min.	Minimum
MP	Multipurpose
M/T, MTM	Manual Transaxle
O/D, OD	Overdrive
O/S	Oversize
PCV	Positive Crankcase Ventilation
PKB	Parking Brake

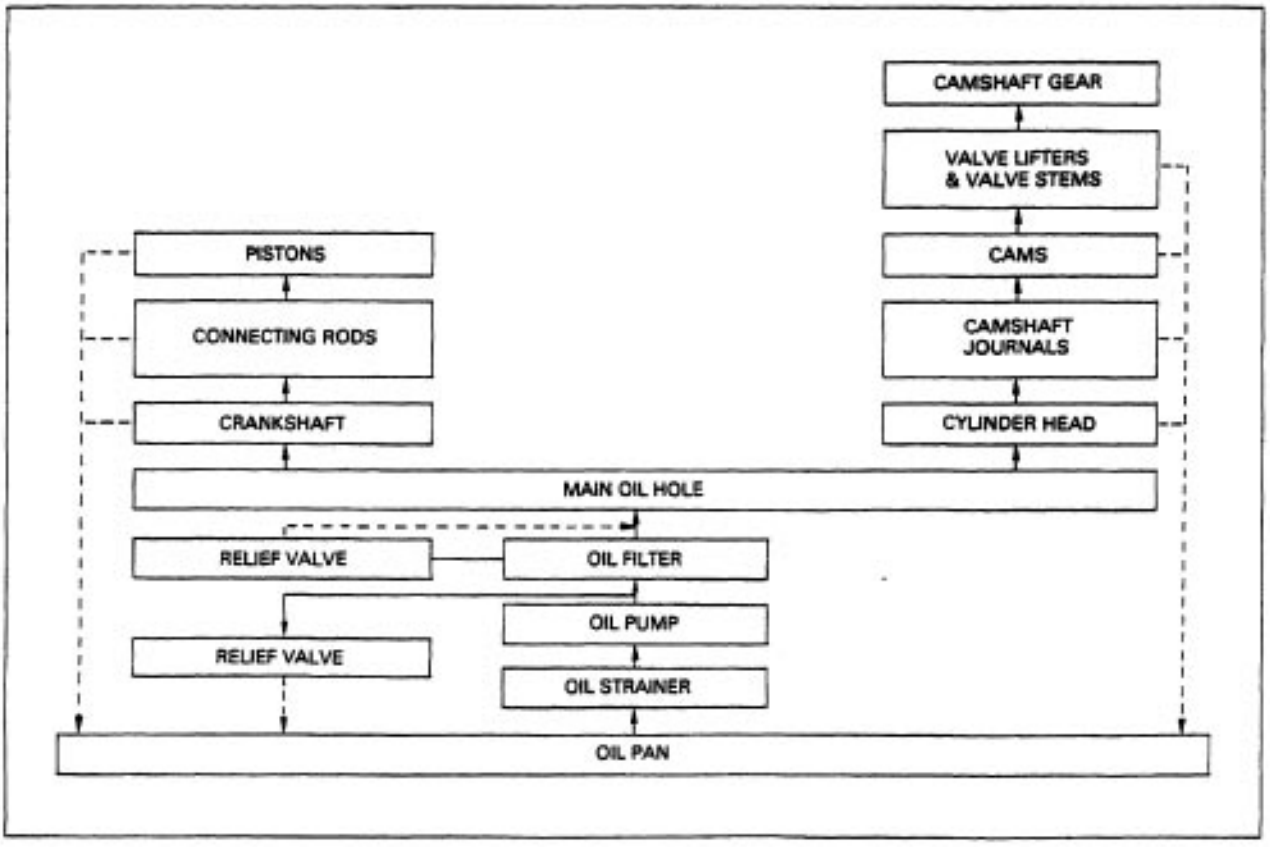
LUBRICATION SYSTEM

DESCRIPTION

A fully pressurized, fully filtered lubrication system has been adopted for this engine.

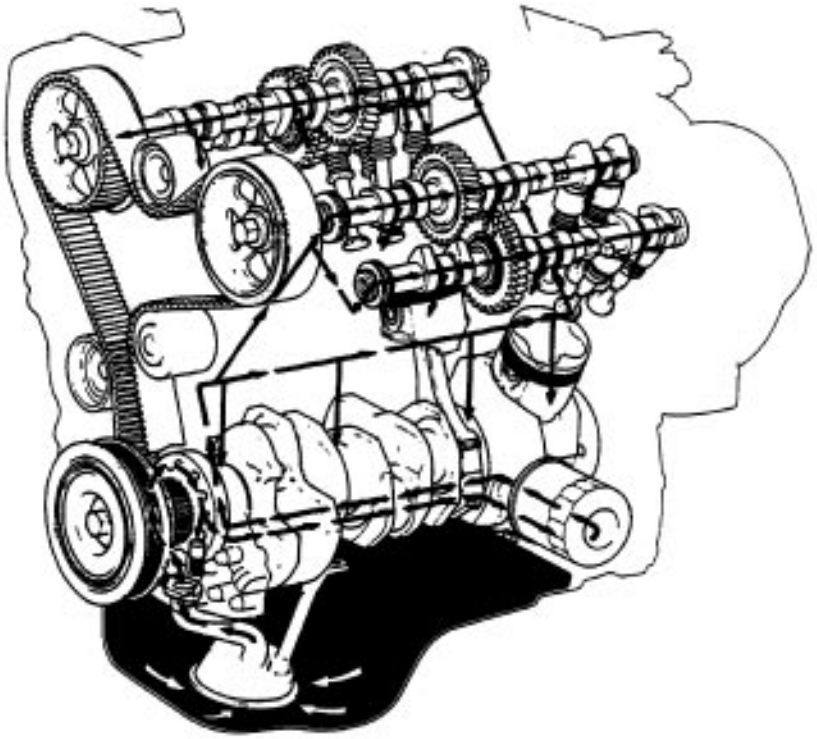
3S-FE

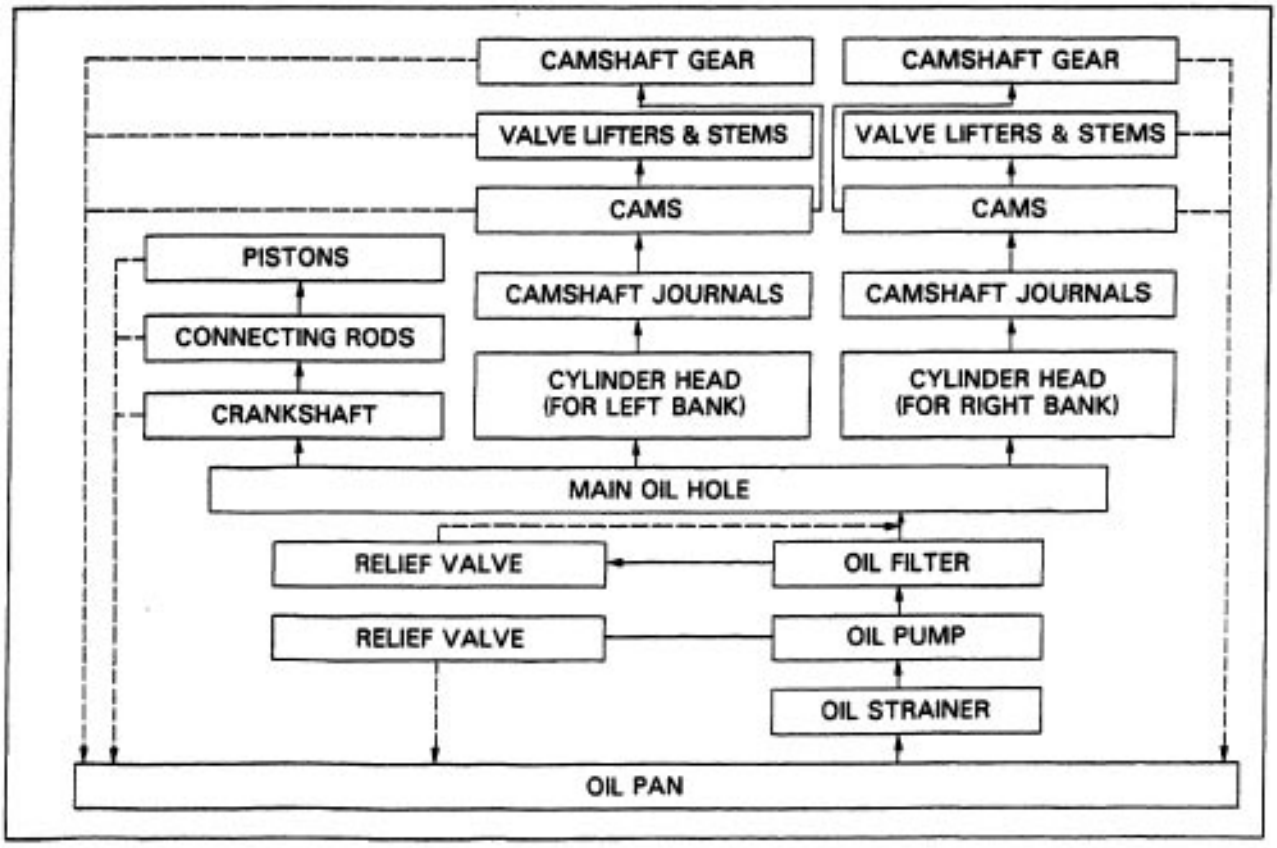




LU0564

2VZ-FE





LU0646

A pressure feeding lubrication system has been adopted to supply oil to the moving parts of this engine. The lubrication system consists of an oil pan, oil pump, oil filter and other external parts which supply oil to the moving parts in the engine block The oil circuit is shown in the illustration at the top of the previous page. Oil from the oil pan is pumped up by the oil pump. After it passes through the oil filter, it is fed through the various oil holes in the crankshaft and cylinder block. After passing through the cylinder block and performing its lubricating function, the oil is returned by gravity to the oil pan. A dipstick on the center left side of the cylinder block is provided to check the oil level.

OIL PUMP

The oil pump pumps up oil from the oil pan and sends it under pressure to the various parts of the engine.

An oil strainer is mounted in front of the inlet to the oil pump. The oil pump itself is a trochoid–type pump, inside of which is a drive rotor and a driven rotor. 'When the drive rotor rotates, the driven rotor rotates in the same direction, and since the axis of the driven rotor shaft is different from the center of the driven rotor, the space between the two rotors is changed as they rotate. Oil is drawn in when the space is wide and is discharged when the space in narrow.

OIL PRESSURE REGULATOR (RELIEF VALVE)

At high engine speeds, the engine oil supplied by the oil pump exceeds the capacity of the engine to utilize it.

For that reason, the oil pressure regulator works to prevent an oversupply of oil. During normal oil supply, a coil spring and valve keep the by–pass closed, but when too much oil is being fed, the pressure become extremely high, overpowering the force of the spring and opening the valves. This allows the excess oil to flow through the valve and return to the oil pan.

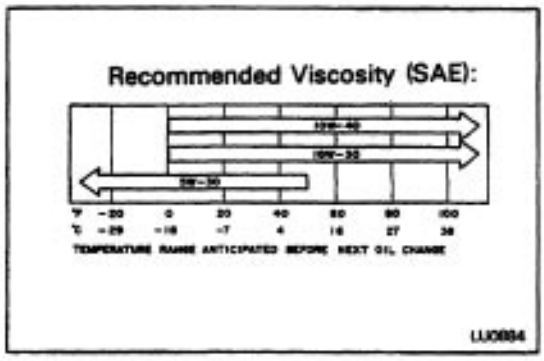
OIL FILTER

The oil filter is a full flow type filter with a built–in paper filter element, Particles of metal from wear, airborn dirt, carbon and other impurities can get in the oil during use and could cause accelerated wear or seizing if allowed to circulate through the engine. The oil filter, integrated into the oil line, removes these impurities as the oil passes through it. The filter is mounted outside the engine to simplify replacement of the filter element.

A relief valve is also included ahead of the filter element to relieve the high oil pressure in case the filter element becomes clogged with impurities. The relief valve opens when the oil pressure overpowers the force of the spring. Oil passing through the relief valve by–passes the oil filter and flows directly into the main oil hole in the engine.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Oil leakage	Cylinder head; cylinder block or oil pump body damaged or cracked	Repair as necessary	
	Oil seal faulty	Replace oil seal	EM–125, 160
	Gasket faulty	Replace gasket	LU–13
Low oil pressure	Oil leakage	Repair as necessary	
	Relief valve faulty	Repair relief valve	LU–9,16
	Oil pump faulty	Repair oil pump	LU–9,16
	Engine oil poor quality	Replace engine oil	LU–7
	Crankshaft bearing faulty	Replace bearing	EM–116, 149
	Connecting rod bearing faulty	Replace bearing	EM–114, 147
	Oil filter clogged	Replace oil filter	LU–7
High oil pressure	Relief valve faulty	Repair relief valve	LU–9, 16



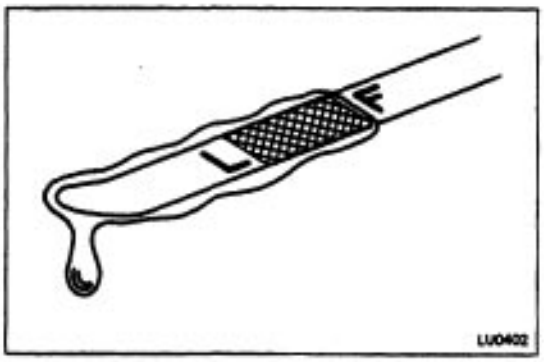
OIL PRESSURE CHECK

1. CHECK ENGINE OIL QUALITY

Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is poor, replace the oil.

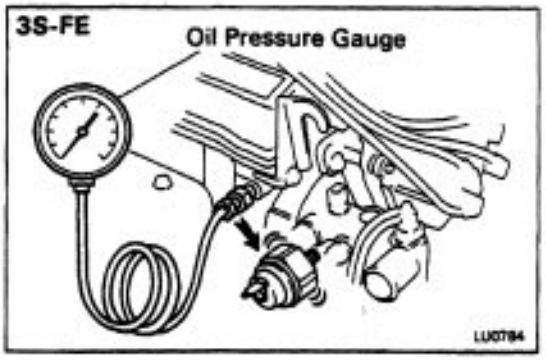
Use API grade SG multigrade, fuel– efficient and recommended viscosity oil.

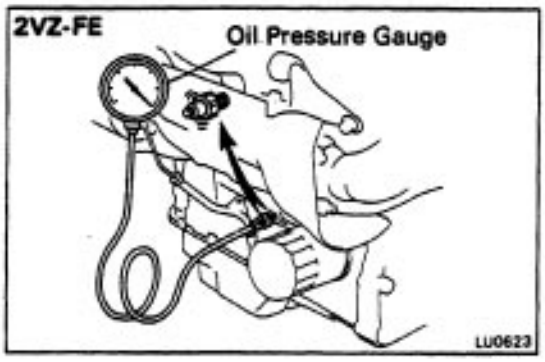


2. CHECK ENGINE OIL LEVEL

The oil level should be between the ”L” and ”F” marks on the dipstick.

If low, check for the leakage and add oil up to ”F” mark





3. REMOVE OIL PRESSURE SWITCH

4. INSTALL OIL PRESSURE GAUGE

5. WARM UP ENGINE

Allow the engine to normal operating temperature.

6. CHECK OIL PRESSURE

Oil pressure:

At idling 0.3 kg/cm^2 (4.3 pal, 29 kPa) or more

At 3,000 rpm

3S–FE 2.5 – 5.0 kg/cm^2 (36 – 71 psi, 245 – 490 kPa)

2vZ–FE 3.0 – 5.5 kg/cm^2 (43 – 78 psi, 294 – 539 kPa)

7. REINSTALL OIL PRESSURE SWITCH

Apply adhesive to two or three threads.

Adhesive: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

8. START ENGINE AND CHECK FOR LEAKS

REPLACEMENT OF ENGINE OIL AND OIL FILTER

NOTICE:

- **Prolonged and repeated contact with mineral oil will result in the removal of natural¿¿ts from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.**
- **Care should be taken, therefore, when changing engine oil, to minimize the frequency and length of time your skin is exposed to used engine oil. Protective clothing and gloves, that cannot be penetrated by oil, should be worn. The skin should be thoroughly washed with soap and water, or use waterless hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.**
- **In order to preserve the environment, used oil must be disposed of only at designated disposal sites.**

1. DRAIN ENGINE OIL

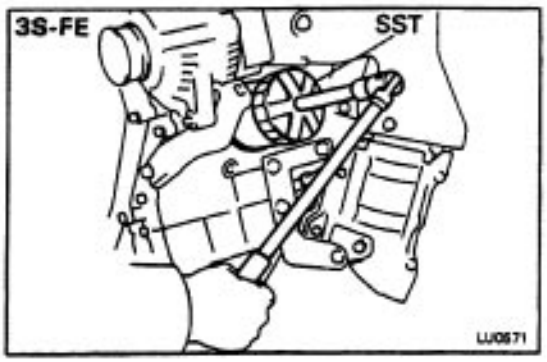
(a) Remove the oil filler cap.

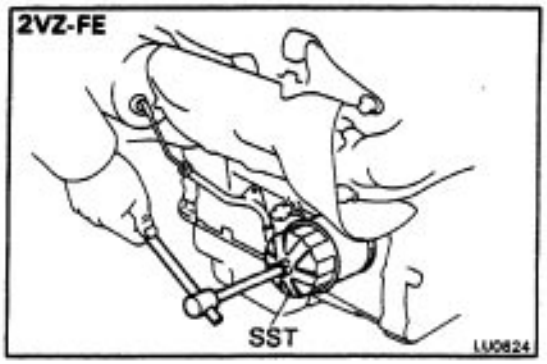
(b) Remove the oil drain plug, and drain the oil into a container.

2. REPLACE OIL FILTER

(a) Using SST, remove the oil filter.

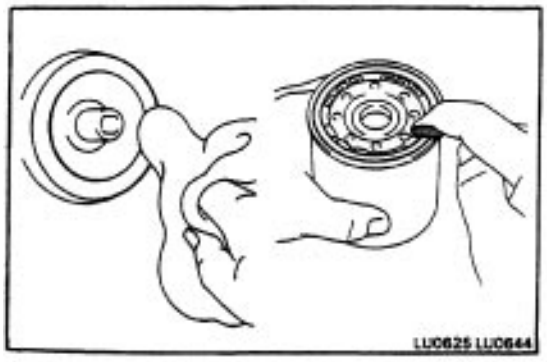
SST 09228–06500 (3S–FE)
09228–07500 (2VZ–FE)

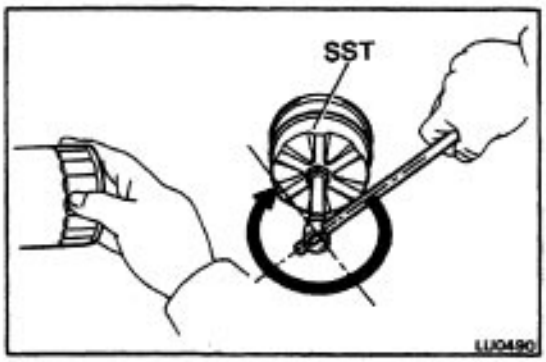




(b) Check and clean–the oil filter installation surface.

(c) Apply clean engine oil to the gasket of a new oil filter.





(d) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
(e) Using SST, tighten it an additional 3/4 turn.
SST 09228–06500 (3S–FE)
09228–07500 (2VZ=FE)

3. FILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.
Torque: 2VZ–FE 3S–FE 400 kg–cm (29 ft–lb, 39 N–m)
(b) Fill with new engine oil (API grade SG muitigrade, fuel–efficient and recommended viscosity oil).
Capacity (3S–FE):
Drain and refill
w/ Oil filter change
4.1 liters (4.3 U S qts, 3.6 Imp. qts)
w/o Oil filter change
3.7 liters (3.9 US qts, 3.3 Imp. qts)
Dry fill 4.5 liters (4.8 U S qts, 4.4 Imp. qts)
Capacity (2VZ–FE):
Drain and refill
w/ Oil filter change
3.9 liters (4.1 US qts, 3.4 Imp. qts)
w/o Oil filter change
3.7 liters (3.9 US qts, 3.3 Imp. qts)
Dry fill 4.6 liters (4.8 US qts, 4.4 Imp. qts)
(c) Install the oil filler cap.

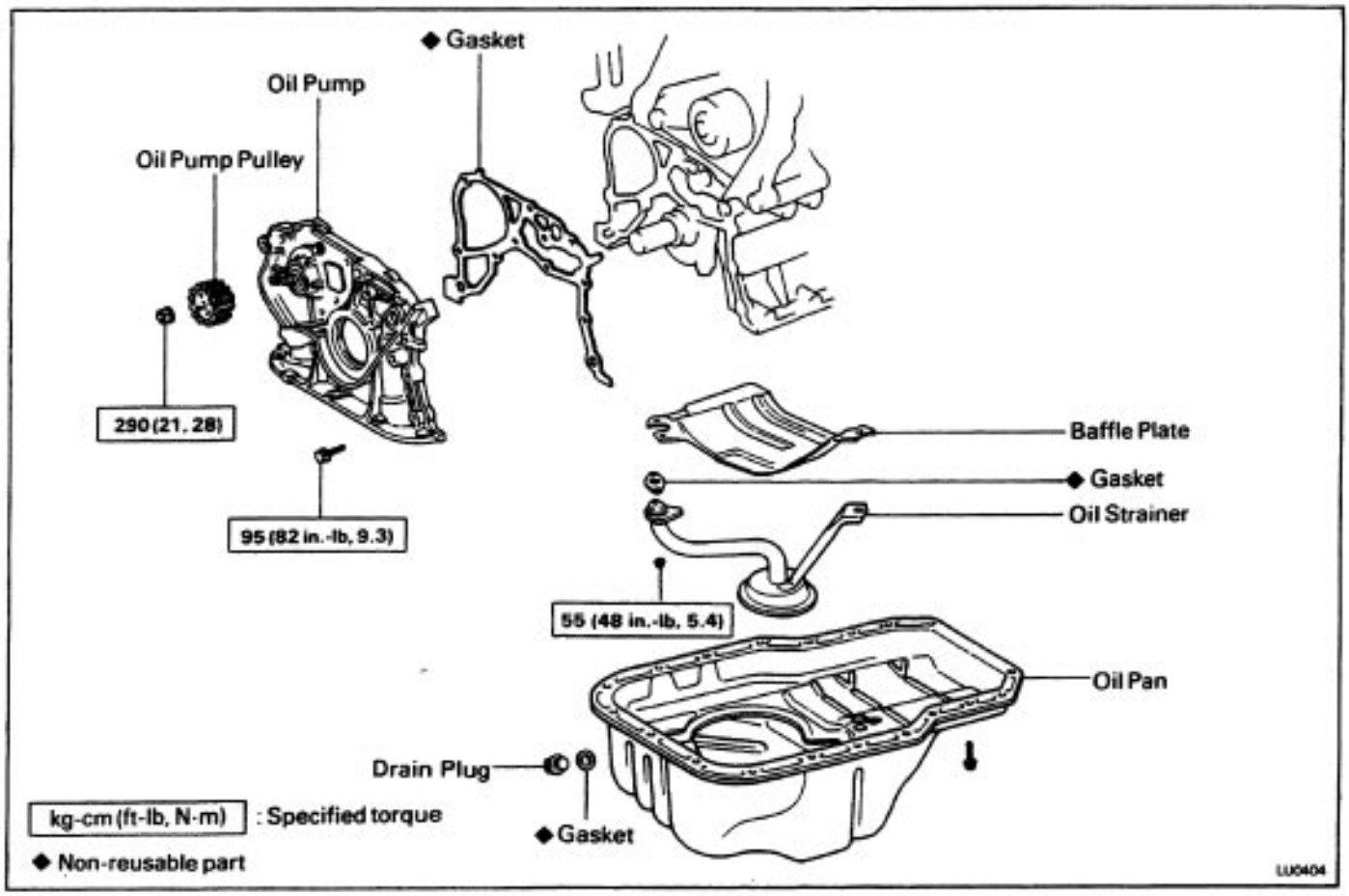
4. START ENGINE AND CHECK FOR LEAKS

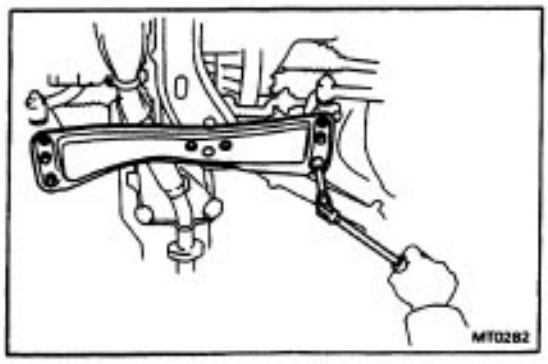
5. RECHECK ENGINE OIL LEVEL (See page LU–6)

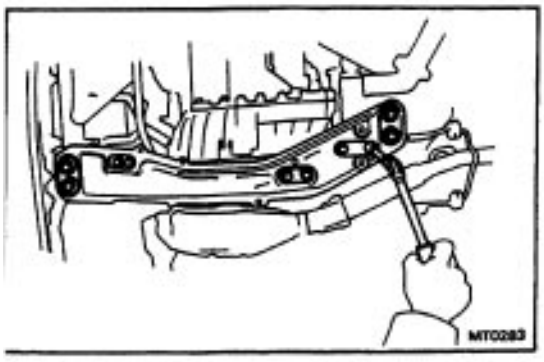
OIL PUMP (3S–FE)

REMOVAL OF OIL PUMP

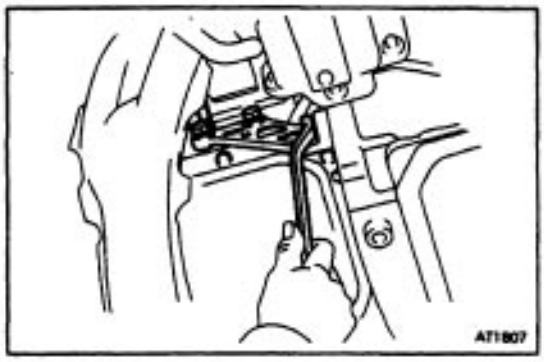
HINT: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.



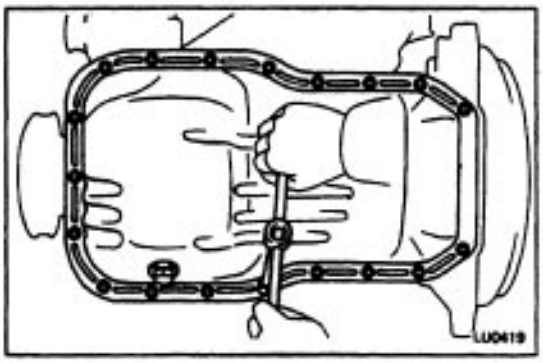




1. **REMOVE HOOD**
2. **RAISE VEHICLE**
   NOTICE: Be sure the vehicle is securely supported.
3. **REMOVE ENGINE UNDER COVERS**
4. **DRAIN ENGINE OIL (See page LU–7)**
5. **REMOVE FRONT EXHAUST PIPE**
   (See step 25 on page EM–110)
6. **REMOVE SUSPENSION LOWER CROSSMEMBER**
7. **REMOVE ENGINE MOUNTING CENTER MEMBER**



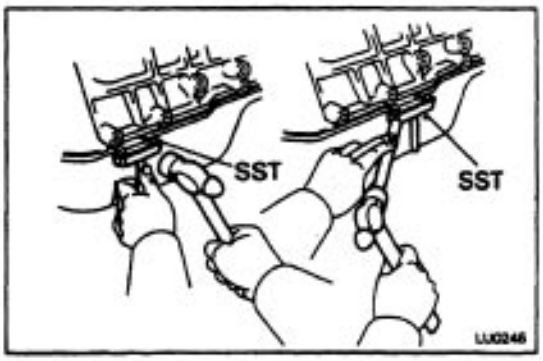
8. REMOVE STIFFENER PLATE



9. REMOVE OIL PAN

(a) Remove the dipstick.

(b) Remove the seventeen bolts and two nuts.

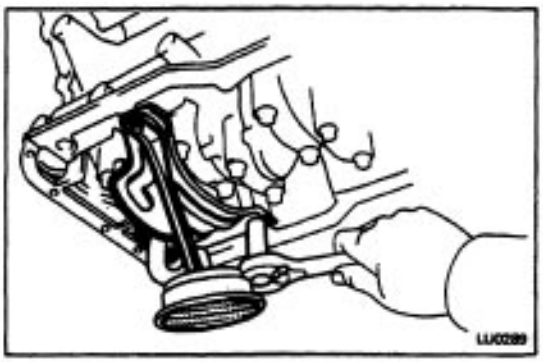


(c) Insert the blade of SST between the cylinder block and oil pan, cut off applied sealer and remove the oil pan.

SST 09032–04100

NOTICE:

- Do not use SST for the oil pump body side and rear oil seal retainer.
- Be careful not to damage the oil pan flange.



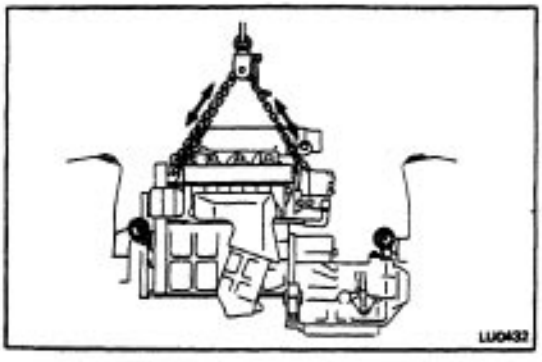
10. REMOVE OIL STRAINER

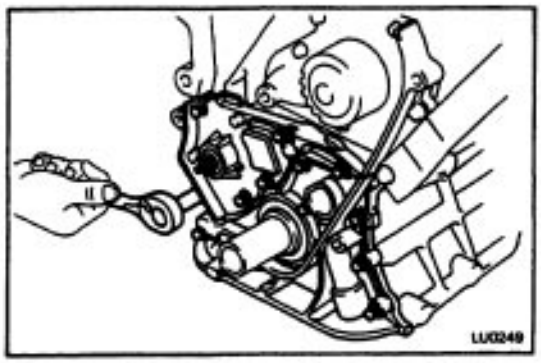
Remove the two bolts, two nuts, oil strainer, baffle plate and gasket.

11. SUSPEND ENGINE WITH ENGINE HOIST CHAIN

12. REMOVE TIMING BELT AND PULLEYS

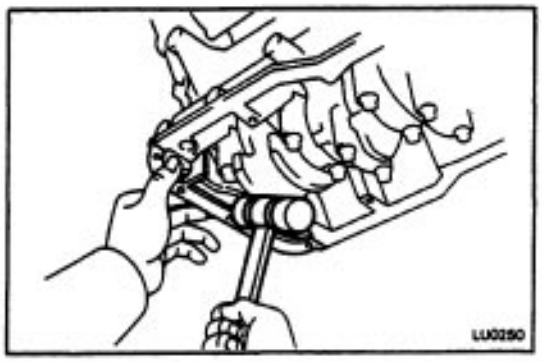
(See pages EM–23 to 26)





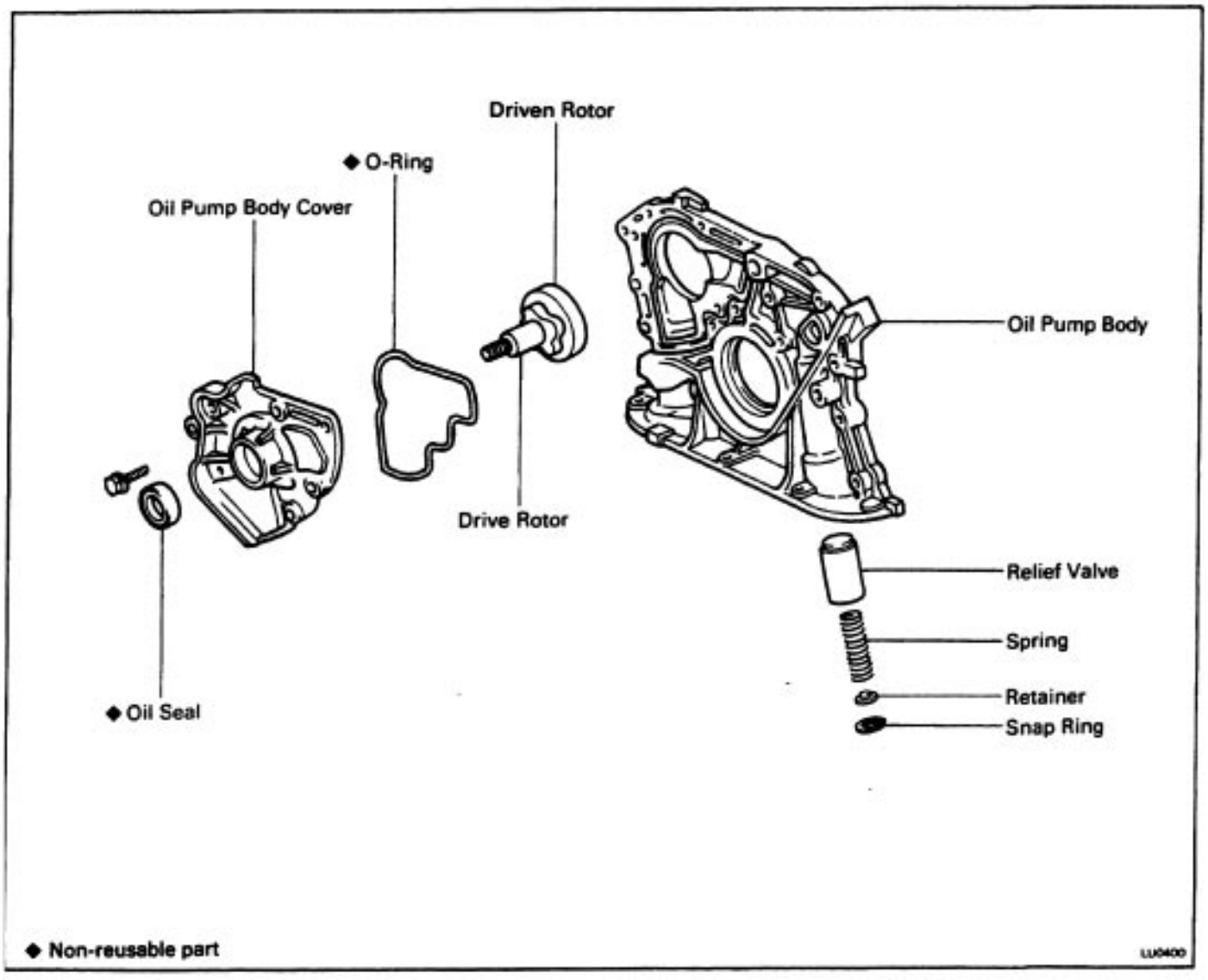
13. REMOVE OIL PUMP

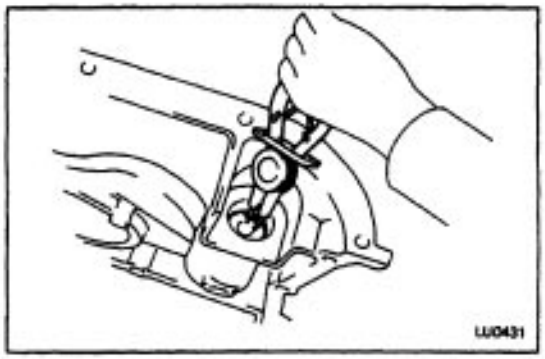
(a) Remove the twelve bolts.



(b) Using a plastic–faced hammer, careful tap off the oil pump.

COMPONENTS





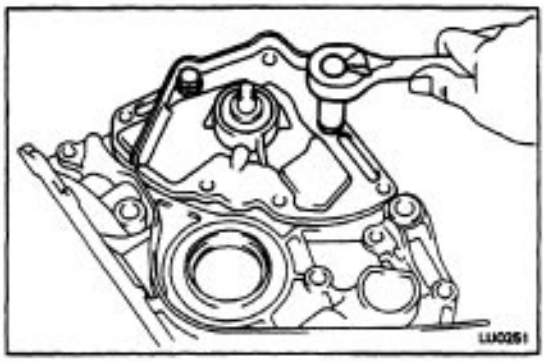
DISASSEMBLY OF OIL PUMP

(See page LU–11)

1. REMOVE RELIEF VALVE

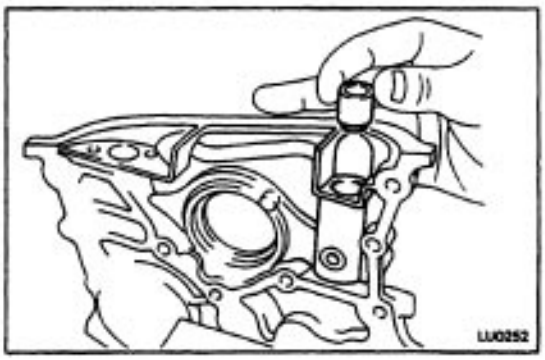
(a) Using snap ring pliers, remove the snap ring.

(b) Remove the retainer, spring and relief valve.



2. REMOVE DRIVE AND DRIVEN ROTORS

Remove the two bolts, pump body cover, O–ring, the drive and driven rotors.

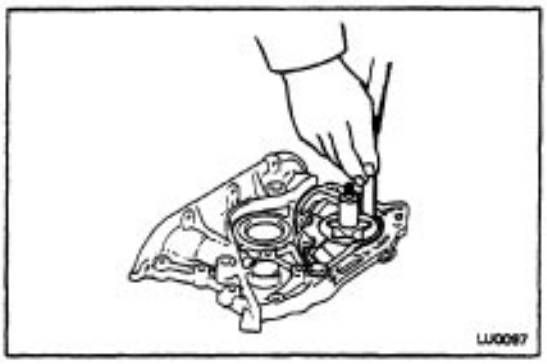


INSPECTION OF OIL PUMP

1. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If not, replace the relief valve. If necessary, replace the oil pump assembly.



2. INSPECT DRIVE AND DRIVEN ROTORS

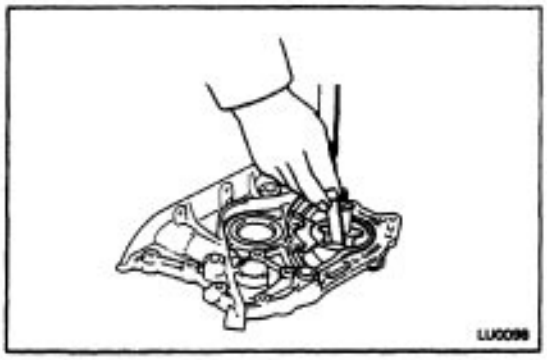
A. Inspect rotor body clearance

Using a feeler gauge, measure the clearance between the driven rotor and body.

Standard body clearance: 0.10 – 0.16 n nm
(0.0039 – 0.0063 in.)

Maximum body clearance: 0.20 mm (0.0079 in.)

If the body clearance is greater than maximum, replace the rotor as a set. If necessary, replace the oil pump assembly.



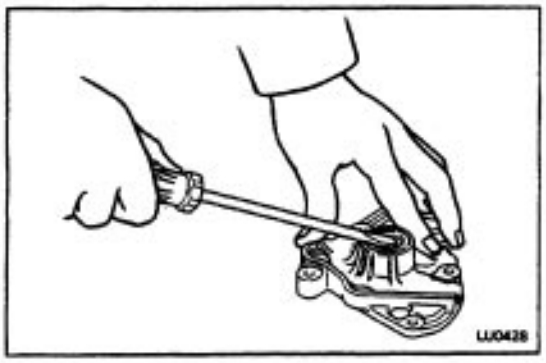
B. Inspect rotor tip clearance

Using a feeler gauge, measure the clearance between the drive and driven rotors.

Standard tip clearance: 0.04 – 0.16 mm
(0.0016 – 0.0063 in.)

Maximum tip clearance: 0.20 mm (0.0079 in.)

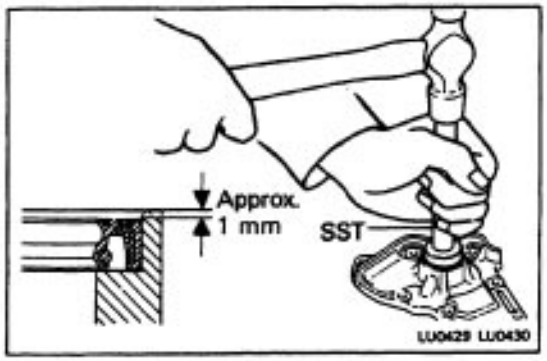
If the tip clearance is greater– than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



REPLACEMENT OF OIL SEAL

1. REMOVE OIL SEAL

Using a screwdriver, pry out the oil seal.

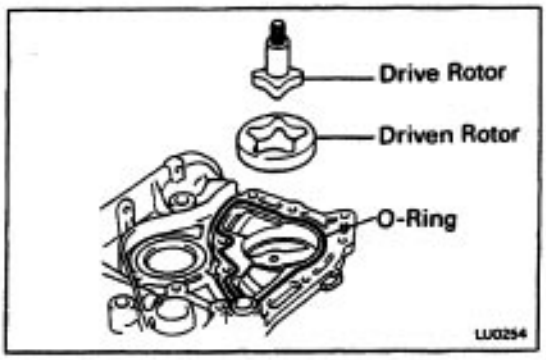


2. INSTALL OIL SEAL

(a) Using SST and a hammer, tap in a new oil sea! to a depth of approx.1 mm (0.04 in.) from the oil pump cover edge.

SST 09620–30010 (09627–30010, 09631 – 20)

(b) Apply MP grease to the oil seal lip.



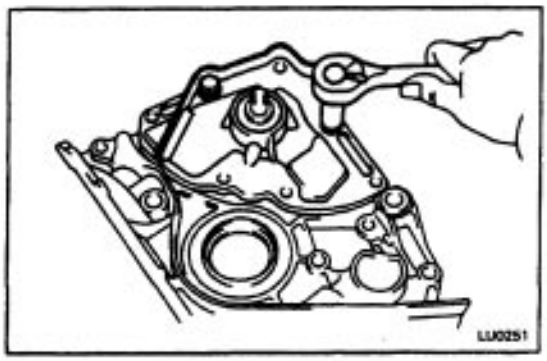
ASSEMBLY OF OIL PUMP

(See page LU–11)

1. INSTALL DRIVE AND DRIVEN ROTORS

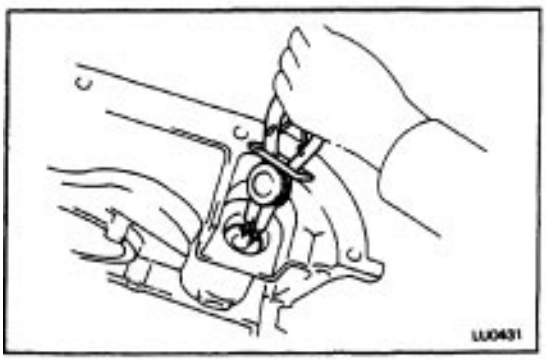
(a) Place a new 0–ring into the pump body groove.

(b) Place the drive and driven rotors into pump body.



(c) Install the pump body cover with the two bolts.

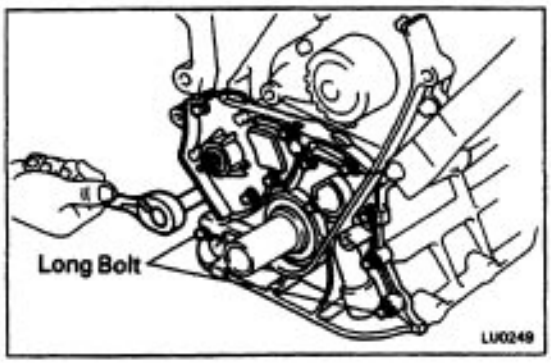
Torque: 90 kg–cm (78 in.–1b. 8.8 N–m)

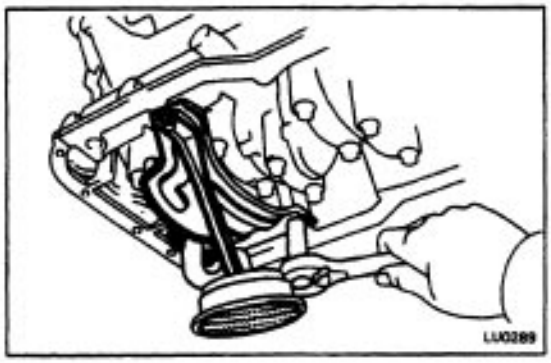


2. INSTALL RELIEF VALVE

(a) Insert the relief valve, spring and retainer into the pump body hole.

(b) Using snap ring pliers, install the snap ring.





INSTALLATION OF OIL PUMP

(See page LU–9)

1. INSTALL OIL PUMP

Install a new gasket and the oil pump with the twelve bolts.

Torque: 95 kg–cm (82 in.–lb, 9.3 N–m)

2. INSTALL PULLEYS AND TIMING BELT (See pages EM–29 and 33)

3. REMOVE ENGINE HOIST CHAIN FROM ENGINE

4. INSTALL OIL STRAINER

Install a new gasket, the baffle plate and oil pan with the two bolts and two nuts.

Torque: 55 kg–cm (48 in.–lb. 5.4 N–m)

5. INSTALL OIL PAN

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pan and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the

loose material.

- Using a non–residue solvent, clean both sealing surfaces.

NOTICE: Do not use a solvent which will affect the painted surfaces.

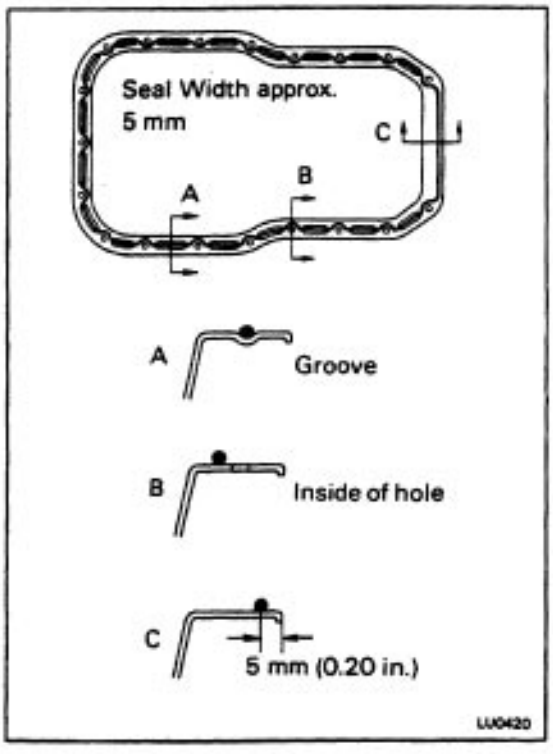
(b) Apply seal packing to the oil pan as shown in the figure.

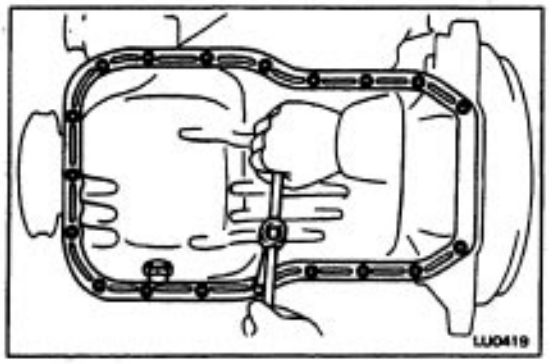
Seal packing: Part No.08828–00080 or equivalent

- Install a nozzle that has been cut to a 5 mm (o.20 in.) opening.

HINT: Avoid applying an excessive amount to the surface. Be particularly careful near oil passages.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

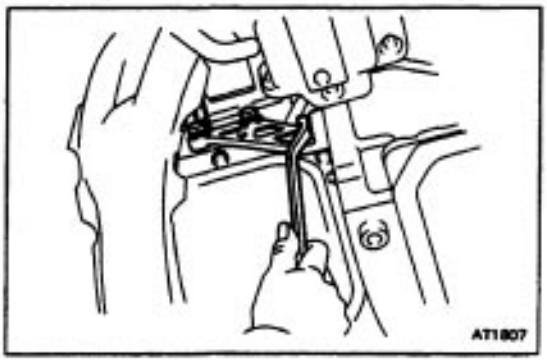




(c) Install the oil pan with the seventeen bolts and two nuts.

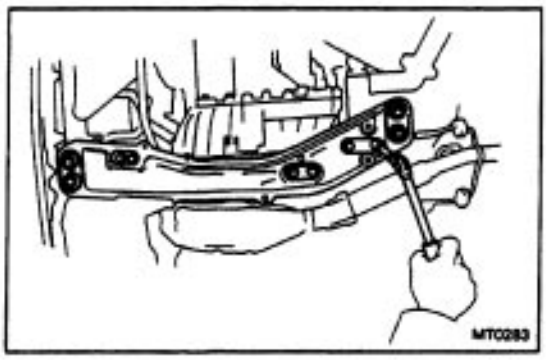
Torque: 55 kg–cm (48 in.–lb. 5.4 N–m)

(d) Install the dipstick.



6. INSTALL STIFFENER PLATE

Torque: 380 kg–cm (27–lb, 37 N–m)



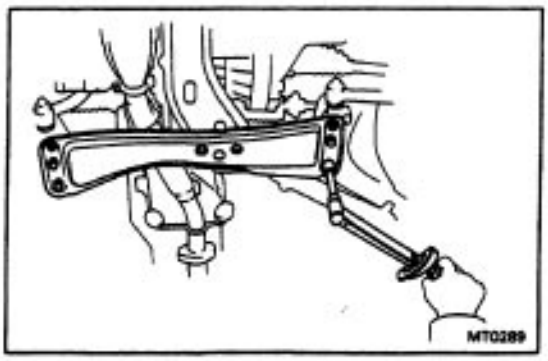
7. INSTALL ENGINE MOUNTING CENTER MEMBER

Torque:

To body 400 kg–cm (29 ft–lb, 39 N–m)

To mounting insulator

490 kg–cm (35 ft–tb, 48 N–m)



8. INSTALL SUSPENSION LOWER CROSSMEMBER

Torque:

14 mm head bolt

400 kg–cm (32 ft–lb, 43 N–m)

19 mm head bolt

2,120 kg–cm (153 ft–lb, 208 N–m)

9. INSTALL FRONT EXHAUST PIPE
(See step 12 on page EM–134)

10. INSTALL ENGINE UNDER COVERS

11. LOWER VEHICLE

12. FILL WITH ENGINE OIL (See page LU–8)

13. START ENGINE AND CHECK FOR LEAKS

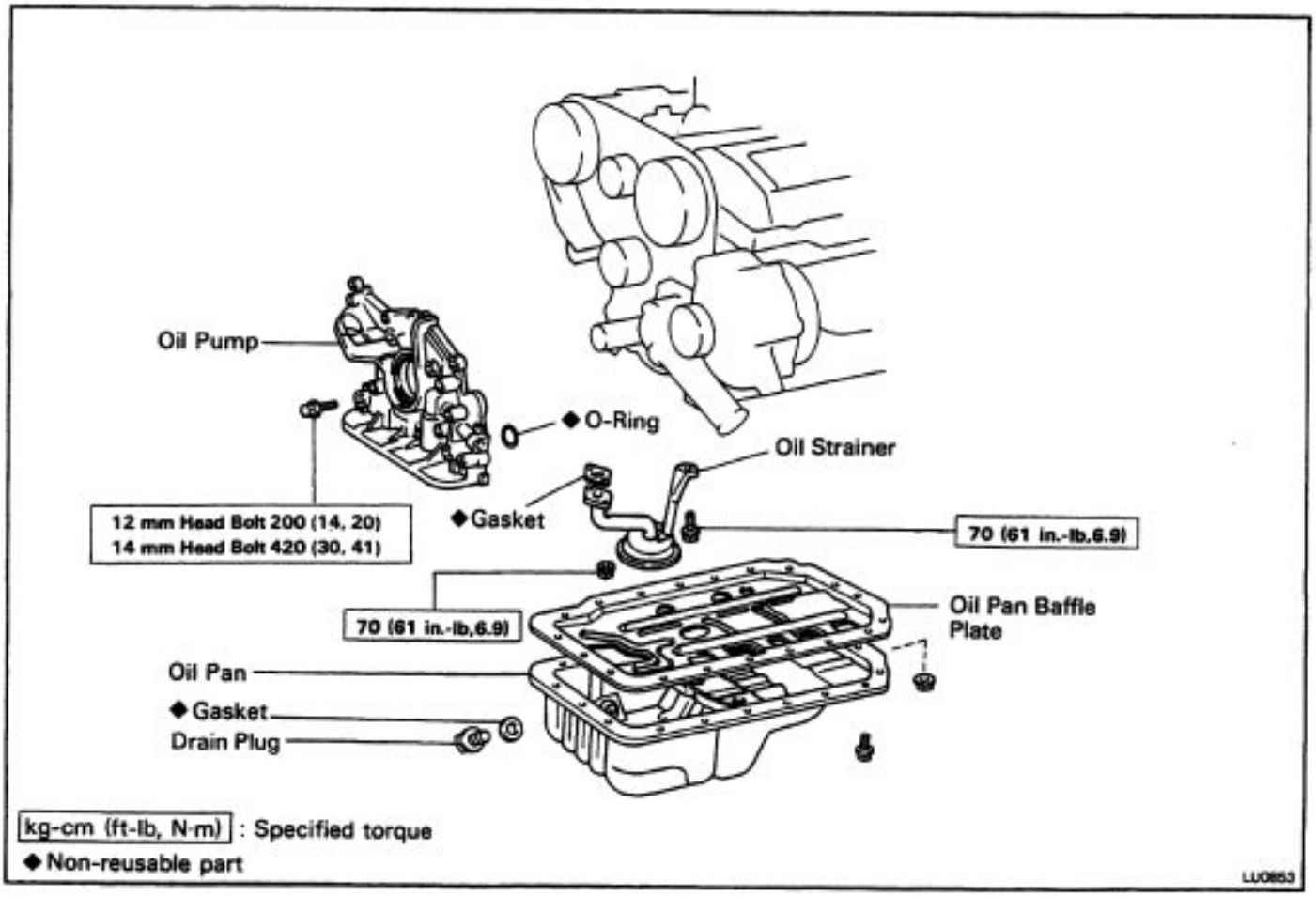
14. RECHECK ENGINE OIL LEVEL (See page LU–6)

15. INSTALL HOOD

OIL PUMP (2VZ–FE)

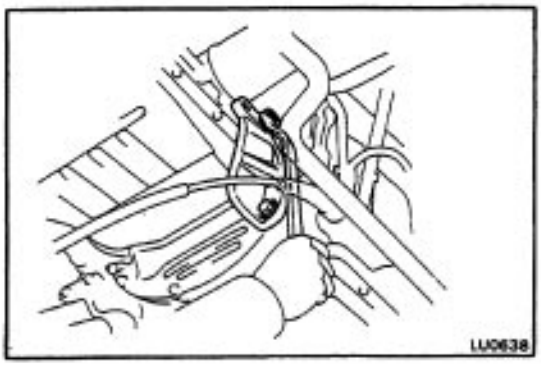
REMOVAL OF OIL PUMP

HINT: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.



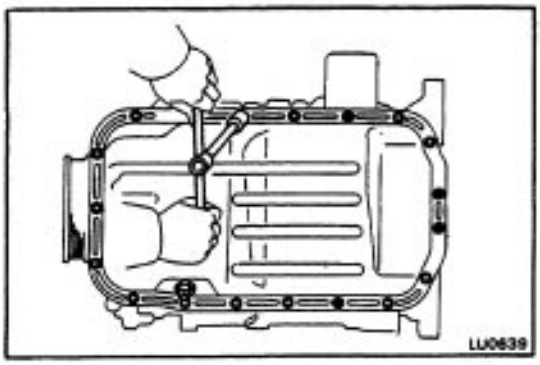
1. **REMOVE HOOD**
2. **RAISE VEHICLE**

   NOTICE: Be sure the vehicle is securely supported.
3. **REMOVE ENGINE UNDER COVERS**
4. **DRAIN ENGINE OIL (See page LU–7)**
5. **REMOVE SUSPENSION LOWER CROSSMEMBER (See step 26 on page EM–142)**
6. **REMOVE FRONT EXHAUST PIPE (See step 27 on page EM–142)**
7. **REMOVE ENGINE MOUNTING CENTER MEMBER (See step 31 on page EM–143)**
8. **REMOVE FRONT ENGINE MOUNTING INSULATOR AND BRACKET**



9. REMOVE STIFFENER PLATE

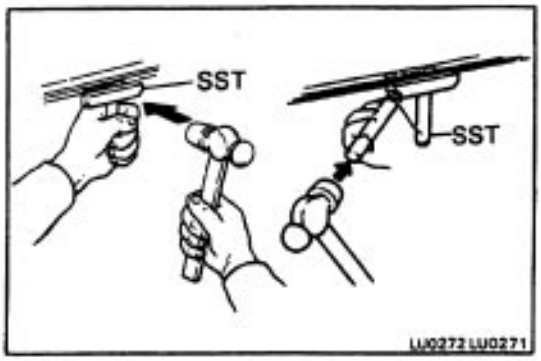
Remove the two bolts and stiffener plate.



10. REMOVE OIL PAN

(a) Remove the dipstick.

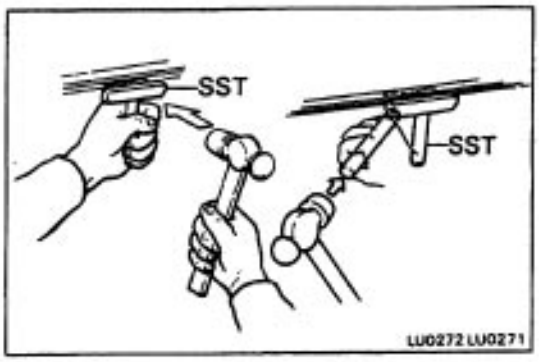
(b) Remove the fifteen bolts and four nuts.



(c) Insert the blade of SST between the cylinder block and oil pan, cut off applied sealer and remove the oil pan.
SST 09032–00100

NOTICE:

- **Do not use SST for the oil pump body side and rear oil seal retainer.**
- **Be careful not to damage the oil pan flange.**



11. REMOVE OIL PAN BAFFLE PLATE

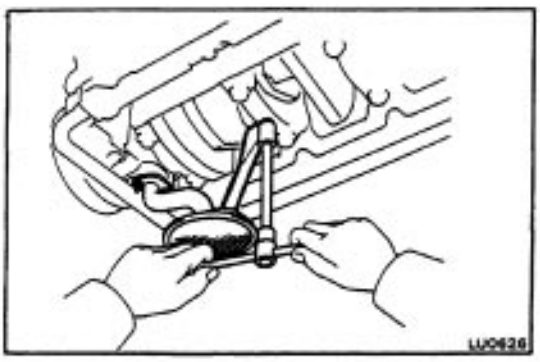
Insert the blade of SST between the cylinder block and baffle plate, cut off applied sealer and remove the baffle plate.
SST 09032–00100

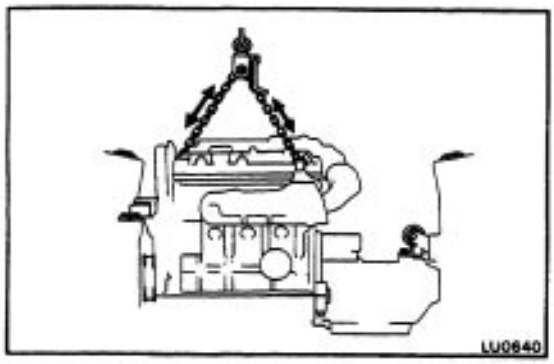
NOTICE:

- **Do not use SST for the oil pump body side and rear oil seal retainer.**
- **Be careful not to damage the baffle plate flange.**

12. REMOVE OIL STRAINER

Remove the bolt, two nuts, oil strainer and gasket.





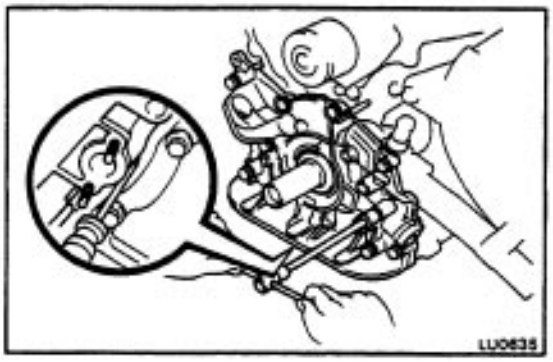
13. SUSPEND ENGINE WITH ENGINE HOIST CHAIN

14. REMOVE TIMING BELT, NO.1 IDLER AND CRANKSHAFT TIMING PULLEYS
(See pages EM–34 to 39)

15. (w/ A/C)
REMOVE ALTERNATOR (Seepage CH–6)

16. (w/ A/C)
REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES
(See step 28 on page EM–142)

17. (w/ A/C)
REMOVE A/C COMPRESSOR BRACKET



18. REMOVE PS BELT ADJUSTING BAR

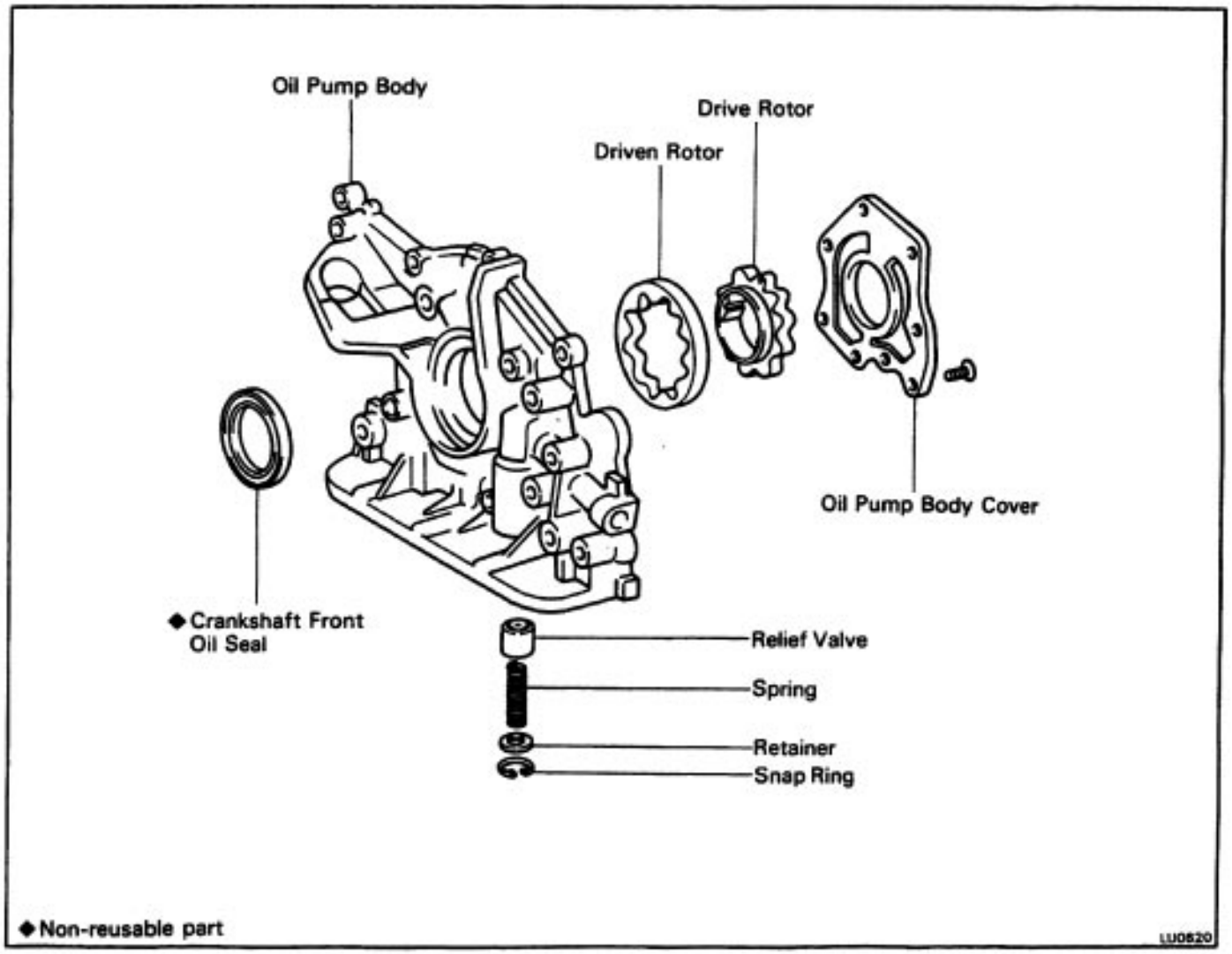
19. REMOVE OIL PUMP

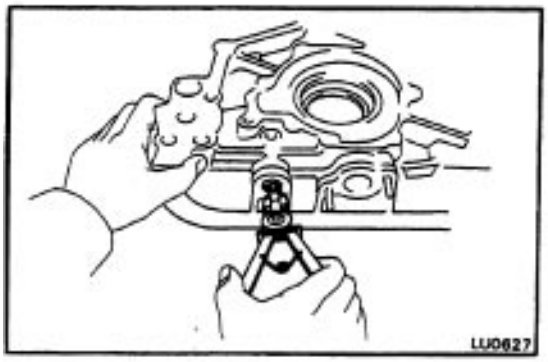
(a) Remove the nine bolts.

(b) Remove the oil pump by prying a screwdriver between the oil pump and main bearing cap.

(c) Remove the 0–ring.

COMPONENTS

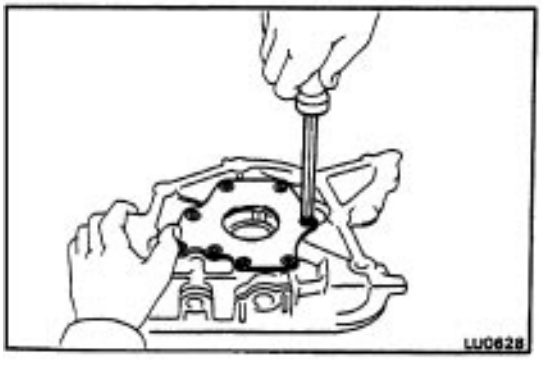




DISASSEMBLY OF OIL PUMP

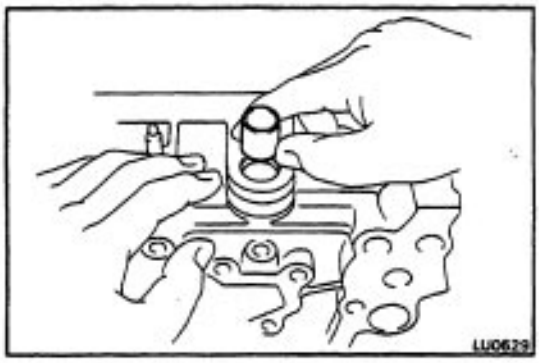
1. REMOVE RELIEF VALVE

(a) Using snap ring pliers, remove the snap ring.
(b) Remove the retainer, spring and relief valve.



2. REMOVE DRIVE AND DRIVEN ROTORS

Remove the eight screws, pump body cover, the drive and driven rotors.

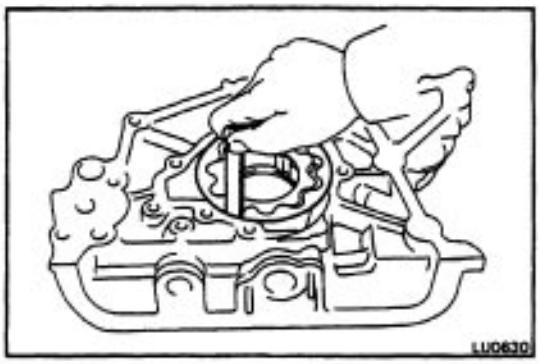


INSPECTION OF OIL PUMP

1. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight

If it does not, replace the relief valve. If necessary, replace the oil pump assembly.



2. INSPECT DRIVE AND DRIVEN ROTORS

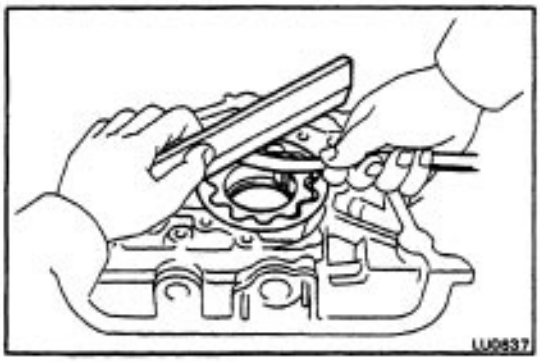
A. Inspect rotor body clearance

Using a feeler gauge, measure the clearance between the driven rotor and body.

Standard body clearance: 0.100 – 0.175 mm (0.0039 – 0.0069 in.)

Maximum body clearance: 0.30 mm (0.0118 in.)

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



B. Inspect rotor side clearance

Using a feeler gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

Standard side clearance: 0.030 – 0.090 mm (0.0012 – 0.0035 in.)

Maximum side clearance: 0.15 mm (0.0059 in.)

If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.

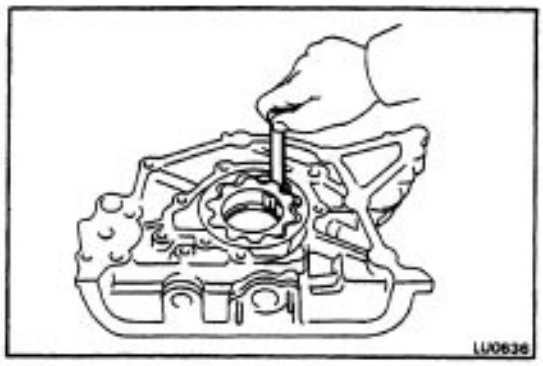
C. Inspect rotor tip clearance

Using a feeler gauge, measure the clearance between the drive and driven rotors.

Standard tip clearance: 0.110 – 0.240 mm (0.0043 – 0.0094 in.)

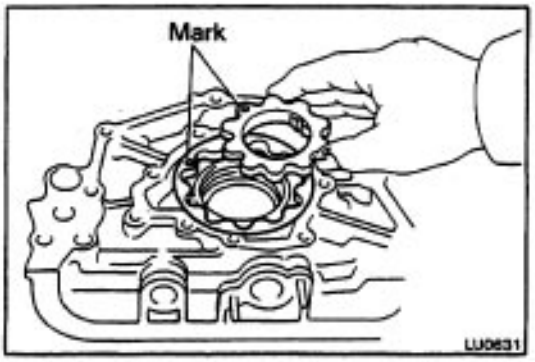
Maximum tip clearance: 0.35 mm (0.0138 in.)

If the tip clearance is greater than maximum, replace the rotors as a set.



REPLACEMENT OF CRANKSHAFT FRONT OIL SEAL

(See page EM–160**)**

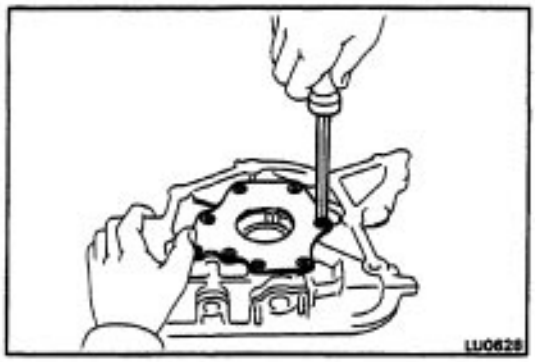


ASSEMBLY OF OIL PUMP

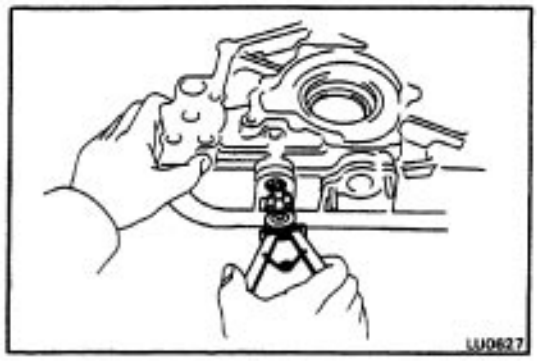
(See page LU–19)

1. INSTALL DRIVE AND DRIVEN ROTORS

(a) Place the drive and driven rotors into pump body with the marks facing the pump body cover side..



(b) Install the pump body cover with the eight screws.



2. INSTALL RELIEF VALVE

(a) Insert the relief valve, spring and retainer into the pump body hole.

(b) Using snap ring pliers, install the snap ring.

INSTALLATION OF OIL. PUMP

(See page LU–16)

1. INSTALL OIL PUMP

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pump and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

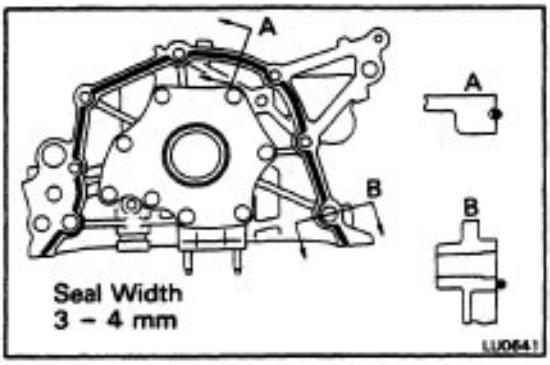
(b) Apply seal packing to the oil pump as shown in the figure.

Seal packing: Part No.08826–00080 or equivalent

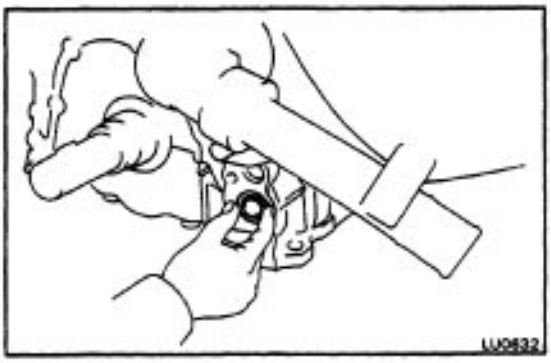
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

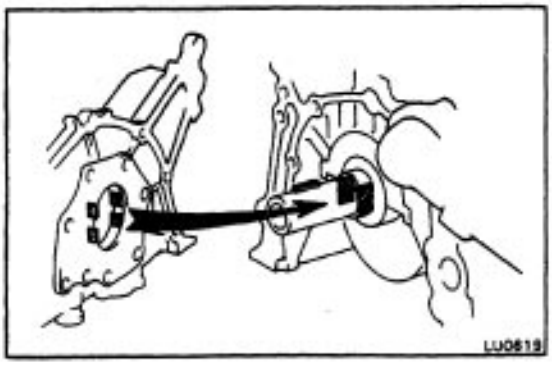
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Place a new 0–ring in position on the cylinder block.



(d) Engage the spline teeth of the oil pump drive gear with the large teeth of the crankshaft, and slide.



(e) Install the oil pump with the nine bolts.

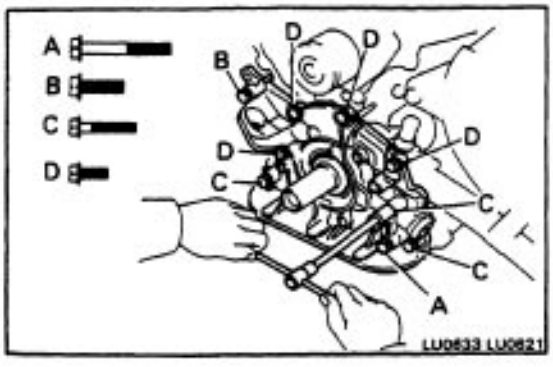
Torque:

12 mm head bolt (C and D)

200 kg–cm (14 ft–lb, 20 N–m)

14 mm head bolt (A and 8)

420 kg–cm (30 ft–lb, 41 N–m)



2. INSTALL PS BELT ADJUSTING BAR

3. (w/ A/C)
INSTALL A/C COMPRESSOR BRACKET

4. (w/ A/C)
INSTALL ALTERNATOR (Seepage CH–15)

5. (w/ A/C)
INSTALL A/C COMPRESSOR BRACKET

6. INSTALL CRANKSHAFT TIMING PULLEY, NO.1 IDLER PULLEY AND TIMING BELT
(See pages EM–42 to 47)

7. REMOVE ENGINE HOIST CHAIN FROM ENGINE

8. INSTALL OIL PAN BAFFLE PLATE

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the baffle plate and cylinder block.

- **Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.**
- **Thoroughly clean all components to remove all the loose material.**
- **Using a non–residue solvent, clean both sealing surfaces.**

NOTICE: Do not use a solvent which will affect the painted surfaces.

(d) Apply seal packing to the baffle plate as shown in the figure.

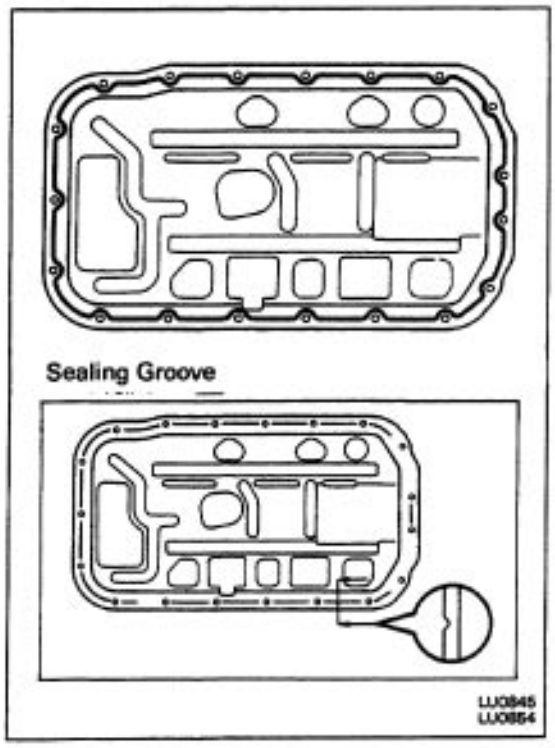
Seal packing: Part No. 08826–00080 or equivalent

- Install a nozzle that has been cut to a 3 – 4 mm (12 – 0.16 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

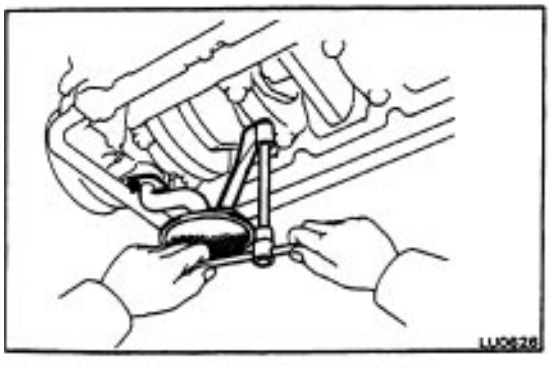
(c) Install the baffle plate.



9. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with the bolt and two nuts.

Torque: 70 kg–cm (61 in.–lb, 6.9 N–m)

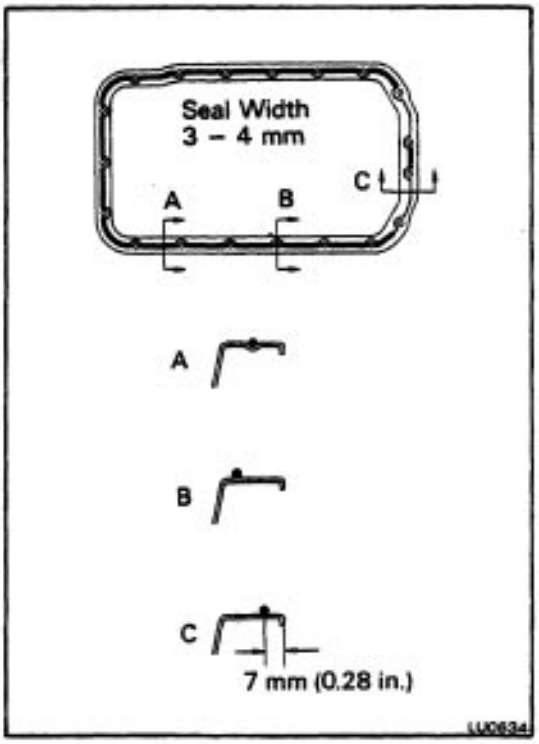


10. INSTALL OIL PAN

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pan and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (F1PG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

NOTICE: Do not use a solvent which will affect the painted surfaces.



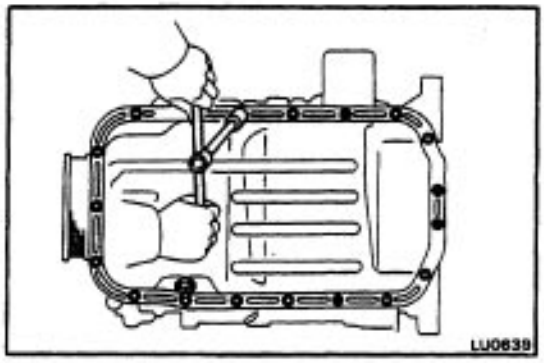
(b) Apply seal packing to the oil pan as shown in the figure.

Seal packing: Part No.08826–00080 or equivalent

- Install a nozzle that has been cut to a 3 – 4 mm (0.12 – 0.16 in.) opening.

HINT: Avoid applying an excessive amount to the surface. Be particularly careful near oil passages.

- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Install the oil pan with the fifteen bolts and four nuts.

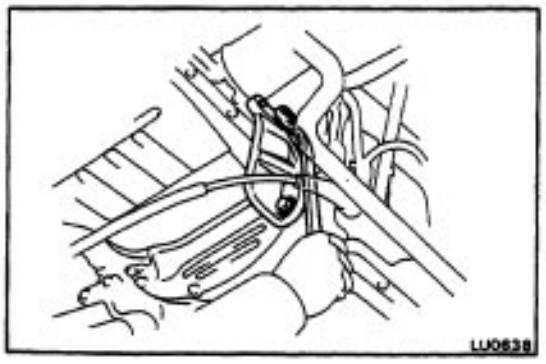
Torque: 60 kg–cm (52 in.–lb, 5.9 N–m)

(d) Install the dipstick.

10. INSTALL STIFFENER PLATE

Install the stiffener plate with the two bolts.

Torque: 380 kg–cm (27 ft–lb, 37 N–m)



11. INSTALL FRONT ENGINE MOUNTING BRACKET AND INSULATOR
    (See step 7 on page EM–171)
12. INSTALL ENGINE MOUNTING CENTER MEMBER
    (See step 10 on page EM–171)
13. REMOVE FRONT EXHAUST PIPE
    (See step 14 on page EM–172)
14. INSTALL SUSPENSION LOWER CROSSMEMBER
    (See step 15 on page EM–172)
15. INSTALL ENGINE UNDER COVERS
16. LOWER VEHICLE
17. FILL WITH ENGINE OIL (See page LU–8)
18. START ENGINE AND CHECK FOR LEAKS
19. RECHECK ENGINE OIL LEVEL (See page LU–6)
20. INSTALL HOOD

MAINTENANCE

MAINTENANCE SCHEDULE

SCHEDULE A

CONDITIONS:

- Towing a trailer, using a camper or car top carrier.
- Repeated short trips less than 5 miles (8 km) and outside temperatures remain below freezing.
- Extensive idling and/or low speed driving for a long distance such as police, taxi or door–to–door delivery use.
- Operating on dusty, rough, muddy or salt spread roads.

Maintenance operations: A = Check and adjust if necessary;
R = Replace, change or lubricate;
I = Inspect and correct or replace if necessary

System	Service interval (Odometer reading or months, whichever comes first) Maintenance items	Maintenance services beyond 60,000 miles (96,000 km) should continue to be performed at the same intervals shown for each maintenance schedule.																Months	See page (item No.)
	Miles x 1,000	3.75	7.5	11.25	15	18.75	22.5	26.25	30	33.75	37.5	41.25	45	48.75	52.5	56.25	60		
	km x 1,000	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96		
ENGINE	Timing belt (1)																R		MA–4 (item 1)
	Valve clearance																A	A: Every 72 months	MA–7 (item 12)
	Drive belts	I: First period, 60,000 miles (96,000 km) or 72 months. I: After that every 7,500 miles (12,000 km) or 12 months																	MA–4 (item 2)
	Engine oil and oil filter	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R: Every 6 months	MA–6 (item 6)
	Engine coolant	R: First period, 45,000 miles (72,000 km) or 36 months. R: After that every 30,000 miles (48,000 km) or 24 months																	AAA–6 (item 7)
	Exhaust pipes and mountings				I				I				I				I	I: Every 24 months	MA–7 (item 11
FUEL	Air filter¿21*	I	I	I	I	I	I	I	R	I	I	I	I	I	I	I	R	I: Every 36 months R: Every 36 months	MA–5 (item 3,4)
	Fuel lines and connections (3)								I								I	I: Every 36 months	MA–7 (item 10)
	Fuel tank cap gasket																R	R: Every 72 months	MA–6 (item 9)
IGNITION	Spark plugs 3S-FE engine *								R								R	R: Every 36 months	MA–5 (item 5)
	Spark plugs (platinum tipped) 2VZ-FE engine																R	R: Every 72 months	
EVAP	Charcoal canister																I	I: Every 72 months	MA–8 (item 8)
BRAKES	Brake linings and drums (4)		I		I		I		I		I		I		I		I	I: Every 12 months	MA–8 (item 14)
	Brake pads and discs (Front and rear) (5)		I		I		I		I		I		I		I		I	I: Every 12 months	MA–8 (item 151
	Brake line pipes and hoses				I				I				I				I	I: Every 24 months	MA–7 (item 13)
CHASSIS	Steering linkage		I		I		I		I		I		I		I		I	I: Every 12 months	MA–8 (item 16)
	Drive shaft boots		I		I		I		I		I		I		I		I	I: Every 12 months	MA–9 (item 18)
	Ball joints and dust covers		I		I		I		I		I		I		I		I	I: Every 12 months	MA–9 (item 19)
	Manual transaxle, automatic transaxle and differential				R				R				R				R	R: Every 24 months	MA–10 (item 20)
	Steering gear housing oil (6)				I				I				I				I	I: Every 24 months	MA–9 (item 17)
	Bolts and nuts on chassis and body (7)		I		I		I		I		I		I		I		I	I: Every 12 months	MA–14 item 221

Maintenance services indicated by a star (*) or asterisk (*) are required under the terms of the Emission Control Systems Warranty. See Owner's Guide or Warranty Booklet for complete warranty information.

* For vehicles sold in California

* For vehicles sold outside California

(1) Applicable to vehicles operated under conditions of extensive idling and /or low speed driving for long distances such as police, taxi or door–to–door delivery use.

(2) Applicable when operating mainly on dusty roads. If not, follow SCHEDULE B.

(3) Includes inspection of fuel tank band and vapor vent system.

(4) Also applicable to lining drum for parking brake.

(5) Check for leakage.

(6) Check for oil leaks from steering gear housing.

(7) Applicable only when operating mainly on rough, muddy roads. The applicable parts are listed below. For other usage conditions, refer to SCHEDULE B.

- Front and rear suspension member to body
- 0 Strut bar bracket to body bolts
- Bolts for sheet installation

SCHEDULE B

CONDITIONS: Conditions other than those listed for SCHEDULE A.

System	Service interval (Odometer reading or months, whichever comes first) Maintenance items	Maintenance service beyond 60,000 miles (96,000 km) should continue to be performed at the same intervals shown for each maintenance schedule.									See page (item No.)
		Miles x 1,000	7.5	15	22.5	30	37.5	45	52.5	60	Months
		km x 1,000	12	24	36	48	60	72	84	96	
ENGINE	Valve clearance									A	A: Every 72 months	MA–7 (item 12)
	Drive belts		I: First period, 60,000 miles (96,000 km) or 72 months. I: After that every 7,500 miles (12,000 km) or 12 months									MA–4 (item 2)
	Engine oil and oil filter		R	R	R	R	R	R	R	R	R: Every 12 months	MA–6 (item 7)
	Engine coolant		R: First period, 45,000 miles (72,000 km) or 36 months. R: After that every 30,000 miles (48,000 km) or 24 months									MA–6 (item 7)
	Exhaust pipes and mountings					I				I	I: Every 36 months	MA–7 (item 11)
FUEL	Air filter					R				R	I: Every 36 months	MA–5 (item 4)
	Fuel lines and connections (31					I				I	I: Every 36 months	MA–7 (item 10)
	Fuel tank cap gasket									R	R: Every 72 months	MA–6 (item 9)
IGNITION	Spark plugs	3S-FE engine*'				R				R	R: Every 36 months	MA–5 (item 5)
	Spark plugs (platinum tipped	2VZ-FE engine								R	R: Every 72 months	
EVAP	Charcoal canister									I	I: Every 72 months	MA–6 (item 8)
BRAKES	Brake linings and drums (4)			I		I		I		I	I: Every 24 months	MA–8 (item 14)
	Brake pads and discs (Front and rear			I		I		I		I	I: Every 24 months	MA–8 (item 15)
	Brake line pipes and hoses			I		I		I		I	I: Every 24 months	MA–7 (item 13)
CHASSIS	Steering linkage			I		I		I		I	I: Every 24 months	MA–8 (item 16)
	Drive shaft boots			I		I		I		I	I: Every 24 months	MA–9 (item 18)
	Ball joints and dust covers			I		I		I		I	I: Every 24 months	MA–9 (item 19)
	Manual transaxle, automatic transaxle and differential (3)			I		I		I		I	R: Every 24 months	MA–10 (item 20)
	Steering gear housing oil 1s)			I		I		I		I	I: Every 24 months	MA–9 (item 17)
	Bolts and nuts on chassis and body 17)			I		I		I		I	I: Every 24 months	MA–14 (item 22)

Maintenance services indicated by a star (*) or asterisk (*) are required under the terms of the Emission Control Systems Warranty.

See Owner's Guide or Warranty

Booklet for complete warranty information.

©For vehicles sold in California

* For vehicles sold outside California

(1) Includes inspection of fuel tank band and vapor vent system.

(2) Also applicable to drum lining for parking brake.

(3) Check for leakage.

(4) Check for oil leaks from steering gear housing.

(5) The applicable part are listed below

- Front and rear suspension member to body
- Strut bar bracket to body bolts
- Bolts for sheet installation

GENERAL MAINTENANCE

These are the maintenance and inspection items which are considered to be the owner's responsibility, They can be performed by the owner or he can have then done at a service shop. These items include those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are considered to be reasonable for the owner to perform.
Items and procedures for general maintenance are as follows:

OUTSIDE VEHICLE

1. TIRES

(a) Check the pressure with a gauge. Adjust if necessary.

(b) Check for cuts, damage or excessive wear.

2. WHEEL NUTS

When checking the tires, check the nuts for looseness or for missing nuts. If necessary, tighten them.

3. TIRE ROTATION

It is recommended that tires be rotated every 7,500 miles (12,000 km).

4. WINDSHIELD WIPER BLADES

Check for wear or cracks whenever they do not wipe clean. Replace if necessary.

5. FLUID LEAKS

(a) Check underneath for leaking fuel, oil, water or other fluid.

(b) If you smell gasoline fumes or notice any leak, have the cause found and corrected.

6. DOORS AND ENGINE HOOD

(a) Check that all doors including the trunk lid and back door operate smoothly, and that all latches lock securely.

(b) Check that the engine hood secondary latch secures the hood from opening when the primary latch is released.

INSIDE VEHICLE

7. LIGHTS

(a) Check that the headlights, stop lights, taillights, turn signal lights, and other lights are all working.

(b) Check the headlight aiming.

8. WARNING LIGHTS AND BUZZERS

Check that all warning lights and buzzers function properly.

9. HORN

Check that it is working.

10. WINDSHIELD GLASS

Check for scratches, pits or abrasions.

11. WINDSHIELD WIPER AND WASHER

(a) Check operation of the wipers and washer.

(b) Check that the wipers do not streak.

12. WINDSHIELD DEFROSTER

Check that air comes out from the defroster outlet when operating the heater or air conditioner at defroster mode.

13. REAR VIEW MIRROR

Check that it is mounted securely.

14. SUN VISORS

Check that they move freely and are mounted securely.

15. STEERING WHEEL

Check that it has the specified freeplay. Be alert for changes in steering condition, such as hard steering, excessive freeplay or strange noise.

16. SEATS

(a) Check that all front seat controls such as seat adjusters, seatback recliner, etc. operate smoothly.

(b) Check that a11 latches lock securely in any position.

(c) Check that the locks hold securely in any latched position.

(d) Check that the head restraints move up and down smoothly and that the locks hold securely in any latched position.

(e) For folding–down rear seat backs, check that the latches lock securely.

17. SEAT BELTS

(a) Check that the seat belt system such as buckles, retractors and anchors operate properly and smoothly.

(b) Check that the belt webbing is not cut, frayed, worn or damaged.

18. ACCELERATOR PEDAL

Check the pedal for smooth operation and uneven pedal effort or catching.

19. CLUTCH PEDAL (See page CL–3)

Check the pedal for smooth operation.

Check that the pedal has the proper freeplay.

20. BRAKE PEDAL (See page BR–6)

(a) Check the pedal for smooth operation.

(b) Check that the pedal has the proper reserve distance and freeplay.

(c) Check the brake booster function.

21. BRAKES

At a safe place, check that the brakes do not pull to one side when applied.

22. PARKING BRAKE (See page BR–8)

(a) Check that the lever has the proper travel.

(b) On a safe incline, check that the vehicle is held securely with only the parking brake applied.

23. AUTOMATIC TRANSMISSION PARK MECHANISM

(a) Check the lock release button of the selector lever for proper and smooth operation.

(b) On a safe incline, check that vehicle is held securely with the selector lever in the ”P” position and all brakes released.

UNDER HOOD

24. WINDSHIELD WASHER FLUID

Check that there is sufficient fluid in the tank.

25. ENGINE COOLANT LEVEL

Check that the coolant level is between the ”FULL” and ”LOW” lines on the see–through reservoir.

26. RADIATOR AND HOSES

(a) Check that the front of the radiator is clean and not blocked with leaves, dirt or bugs.

(b) Check the hoses for cracks, kinks, rot or loose connections.

27. BATTERY ELECTROLYTE LEVEL

Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case. If level is low, add distilled water only.

28. BRAKE AND CLUTCH FLUID LEVELS

(a) Check that the brake fluid level is near the upper level line on the see–through reservoir.

(b) Check that the clutch fluid level is within ± 5 mm (0.20 in.) of the reservoir hem.

29. ENGINE DRIVE BELTS

Check all drive belts for fraying, cracks, wear or oiliness.

30. ENGINE OIL LEVEL

Check the level on the dipstick with the engine turned off.

31. POWER STEERING FLUID LEVEL

Check the level.

The level should be in the ”HOT” or ”COLD” range depending on the fluid temperature.

32. AUTOMATIC TRANSMISSION FLUID LEVEL

(a) Park the vehicle on a level surface.

(b) With the engine idling and the parking brake applied, shift the selector into all positions from ”P” to ”L”, and then shift into ”P”.

(c) Pull out the dipstick and wipe off the fluid with a clean rag. Re–insert the dipstick and check that the fluid level is in the HOT range.

(d) Perform this check with the fluid at normal driving temperature (70 – 80˚C or 158 – 176˚F).

NOTE: Wait about 30 minutes before checking the fluid level after extended driving at high speeds i n hot weather, driving i n heavy traffic or with a trailer.

33. EXHAUST SYSTEM

Visually inspect for cracks, holes or loose supports.

If any change in the sound of the exhaust oK smell of the exhaust fumes is noticed, have the cause located and corrected.

MAINTENANCE OPERATIONS

ENGINE

Cold Engine Operations

1. REPLACE TIMING BELT

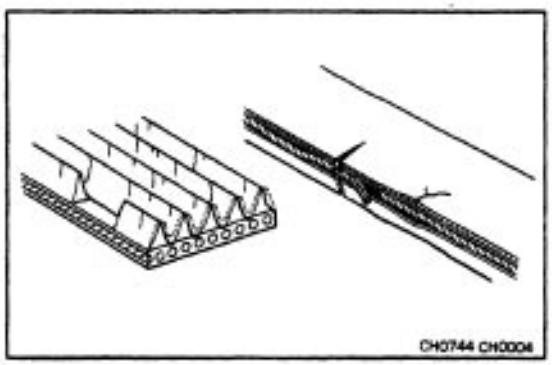
(a) Remove the timing belt.
3S–FE (See pages EM–23 to 26)
2VZ–FE (See pages EM–34 to 39)

(b) Install the timing belt.
3S–FE (See pages EM–29 to 33)
2VZ–FE (See pages EM–42 to 47)

2. INSPECT DRIVE BELTS

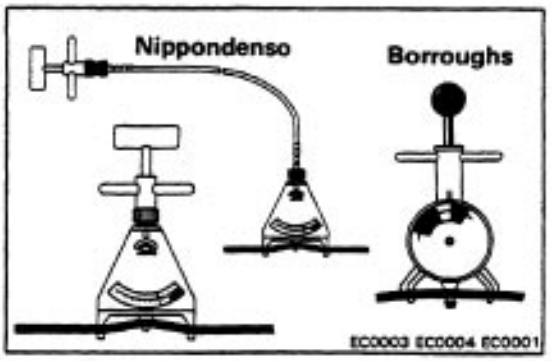
(a) Visually check the belt for excessive wear, frayed cords etc.
If necessary, replace the drive belt.

HINT: Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



(b) Using a belt tension gauge, measure the drive belt tension.

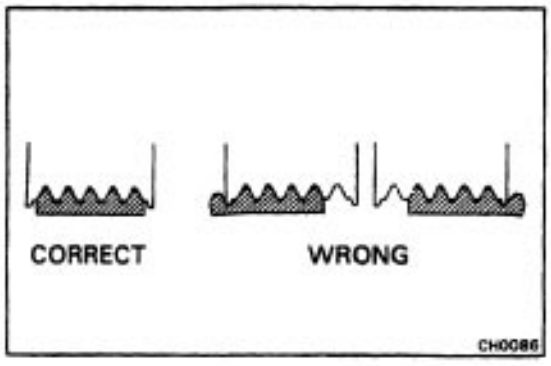
Belt tension gauge:
Nippondenso BTG–20 (95506–00020)
Borroughs NO.BT–33–73F
Drive belt tension:
Alternator (3S–FE)
w/ A/C New belt 175 ± 5lb
Used belt 130 ± 10 lb
w/o A/C New belt 125 ± 25 lb
Used belt 95 ± 20 lb
Alternator (2vZ–FE) New belt 175 ± 5 lb
Used belt 115 ± 20 lb
PS pump New belt 125 ± 25 lb
Used belt 80 ± 20 lb

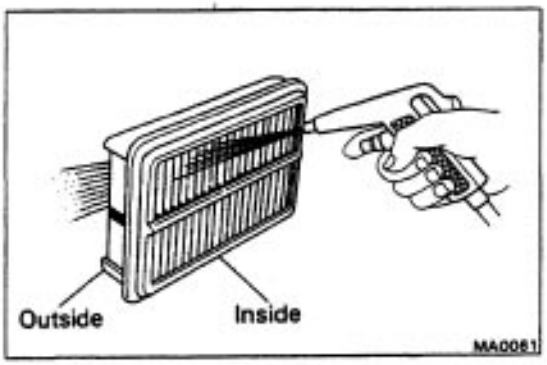


If necessary, adjust the drive belt tension.

HINT:

- ”New belt” refers to a belt which has been used 5 minutes or less on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the belt, check that it fits properly i n the ribbed grooves.
- Check by hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley. .
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.





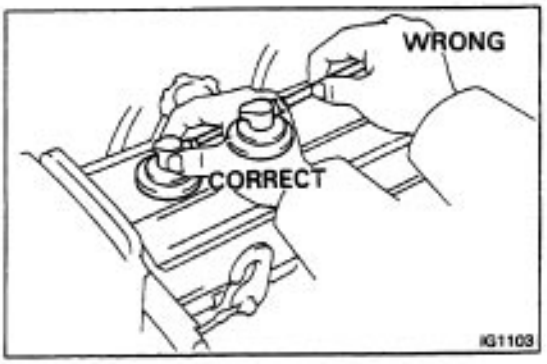
3. INSPECT AIR FILTER

(a) Visually check that the air cleaner element is not excessively, damaged or oily.
If necessary, replace the air cleaner element.

(b) Clean the element with compressed air.
First blow from the inside thoroughly, then blow off the outside of the element.

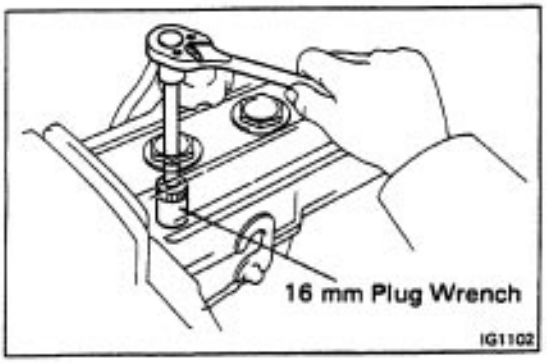
4. REPLACE AIR FILTER

Replace the air cleaner element with a new one.

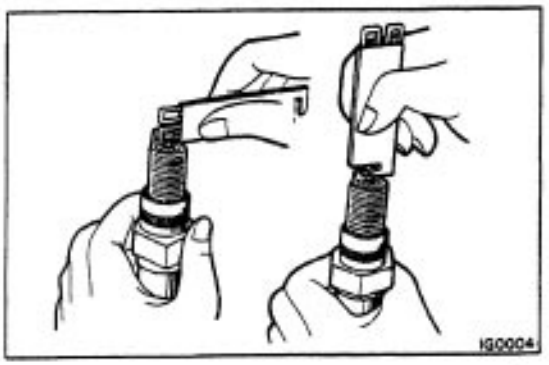


5. REPLACE SPARK PLUGS

(a) Disconnect the spark plug cords at the rubber boot. DO NOT pull on the cords.



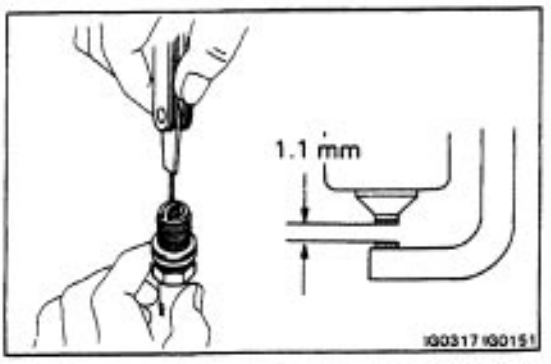
(b) Using a 16 mm plug wrench, remove the spark plugs.



(c) PS–FE)

Adjust the electrode gap of new spark plugs.

Correct electrode gap: 1.1 mm (0.043 in.)
Recommended spark plugs: ND Q1 6R–U1 1
NGK BCPR5EY11



(d) 2VZ–FE)

Check the electrode gap of new spark plugs.

Correct electrode gap: 1.1 mm (0.043 in.)
Recommended spark plugs: ND PQ20R
NGK BCPR6EP11

HINT: If adjusting the gap of a new plug, bend only the base of the ground electrode. DO NOT touch the tip. Never attempt to adjust the gap on a used plug.

6. REPLACE ENGINE OIL AND OIL FILTER

(See page LU–7)

Oil grade: API grade SG, multigrade, fuel–efficient and recommended viscosity oil

Drain and refill with oil filter change capacity:
3.9 liters (4.1 US qts, 3.4 Imp. qts)

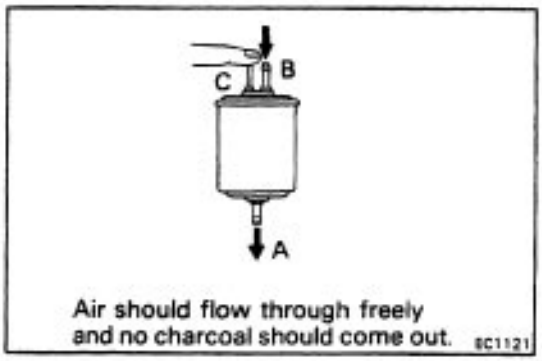
7. REPLACE ENGINE COOLANT

(See page CO–4)

Use a good brand of ethylene–glycol base coolant, mixed according to the manufacturer's instructions.

Coolant capacity (w/ Heater):

3S–FE	**M/T**	**6.4 liters (6.8 US qts, 5.6 Imp. qts)**
	A/T (2WD)	**6.3 liters (6.7 US qts, 5.5 Imp. qts)**
	A/T (4WD)	**6.8 liters (7.2 US qts. 6.0 Imp. qts)**
2VZ–FE	**M/T**	**9.5 liters (10.0 US qts, 8.4 Imp. qts)**
	A/T	**9.4 liters (9.9 US qts, 8.3 Imp. qts)**



8. INSPECT CHARCOAL CANISTER

(a) Remove the canister dust cover.

M Disconnect the hoses from the charcoal canister. Label hoses for correct installation.

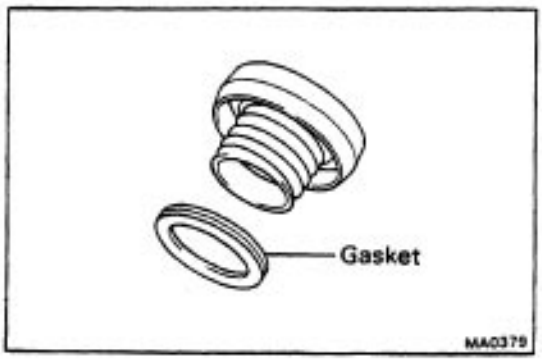
(c) Plug pipe C with your finger, and blow compressed air (3kg/cm^2, 43 psi or 294 kPa) through pipe B (fuel tank side).

- Check that air comes out of the bottom pipe A without resistance.
- Check that no activated charcoal comes out. If necessary, replace the charcoal canister.

NOTICE: Do not attempt to wash the charcoal.

(d) Reconnect the hoses to the charcoal canister.

(e) Reinstall the canister dust cover.



9. REPLACE GASKET IN FUEL TANK CAP

(a) Remove the old gasket (O–ring) from the tank cap. Do not damage the cap.

(b) Install a new gasket by hand.

(c) Check the cap for damage or cracks.

(d) Install the cap and check the torque limiter.

10. INSPECT FUEL LINES AND CONNECTIONS

Visually check the fuel lines for cracks, leakage, loose connections, deformation or tank band looseness.

11. INSPECT EXHAUST PIPES AND MOUNTINGS

Visually check the pipes, hangers and connections for severe corrosion, leaks or damage.

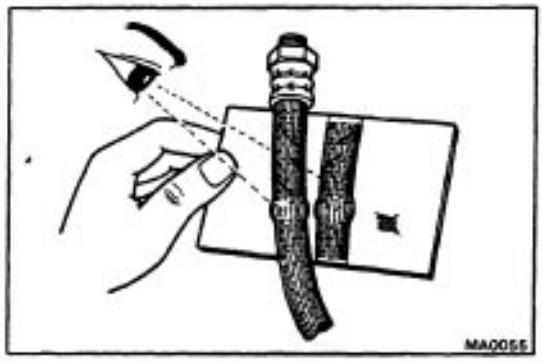
12. ADJUST VALVE CLEARANCE

3S–FE (See page EM–11)

2VZ–FE (See page EM–15)

Valve clearance (Cold):

3S–FE	**Intake**	**0.19 – 0.29 mm (0.007 – 0.011 in.)**
	Exhaust	**0.28 0.38 mm (0.011 0.015 in.)**
2VZ–FE	**Intake**	**0.13 – 0.23 mm (0.005 – 0.009 in.)**
	Exhaust	**0.27 – 0.37 mm (0.011 – 0.015 in.)**



BRAKES

13. INSPECT BRAKE LINE PIPES AND HOSES

HINT: Check in a well lighted area. Check the entire circumference and length of the brake hoses using a mirror as required. Turn the front wheels fully right or left before checking the front brake.

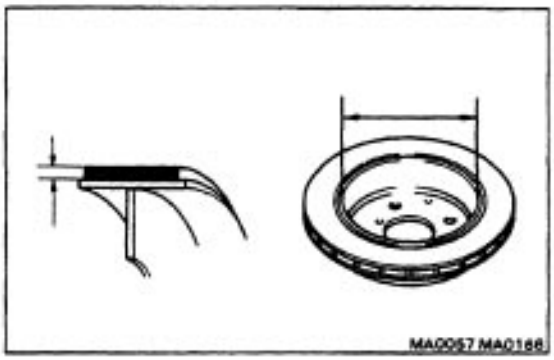
(a) Check all brake lines and hoses for:

- Damage
- Wear
- Deformation
- Cracks
- Corrosion
- Leaks
- Bends
- Twists

(b) Check all clamps for tightness and connections for leakage.

(c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system.

(d) Check that the lines installed in grommets pass through the center of the grommets.



14. INSPECT BRAKE LININGS AND DRUMS

Drum brake (See page BR–31)

Disc brake (See page BR–47)

(a) Check the lining–to–drums contact condition and lining wear.

Minimum lining thickness: 1.0 mm (0.0039 in.)

(b) Check the brake drums for scoring or wear.

Maximum drum inside diameter:

Drum brake 230.6 mm (9.079 in.)

Disc brake 171.0 mm (6.732 in.)

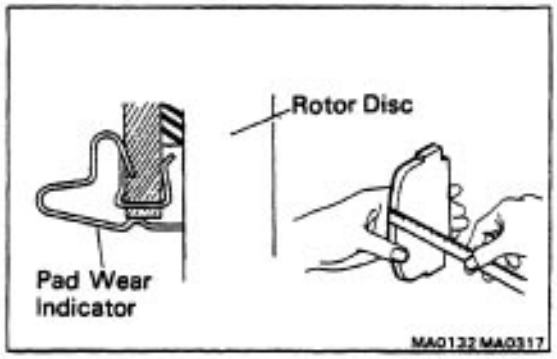
(c) Clean the brake parts with a damp cloth.

HINT: Do not use compressed air to clean the brake parts.

(d) Settle the parking brake shoes and drum. When performing the road test in item 23, do the following:

- Drive the vehicle at approx. 50 km/h (30 mph) on a safe, level and dry road.
- With the parking brake release button pushed in, pull on the lever with 9 kg (20 Ib, 88 N) of force.
- Drive the vehicle for approx. m (1 /4 mile) in this condition.
- Repeat this procedure 2 or 3 times.
- Check parking lever travel.

If necessary, adjust the parking brake.



15. INSPECT BRAKE PADS AND DISCS

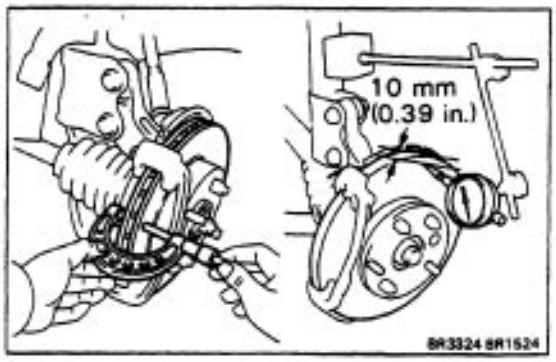
Front (See page BR–26)

Rear (See page BR–42)

(a) Check the thickness of the disc brake pads and check for irregular wear.

Minimum pad thickness: 1.0 mm (0.039 in.)

HINT: If a squealing or scraping noise comes from the brake during driving, check the pad wear indicator to see if it is contacting the disc rotor. If so, the disc pad should be replaced.



Minimum disc thickness:

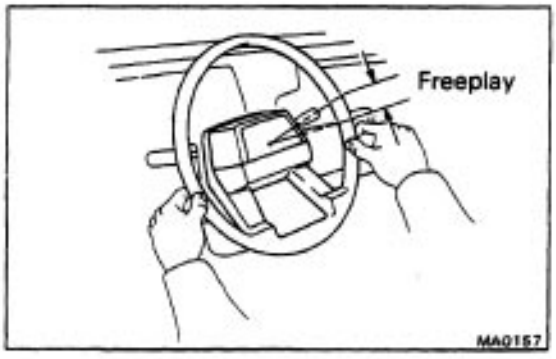
Front 24.0 mm (0.945 in.)

Rear 9.0 mm (0.354 in.)

Maximum disc runout:

Front 0.07 mm (0.0028 in.)

Rear 0.15 mm (0.0059 in.)



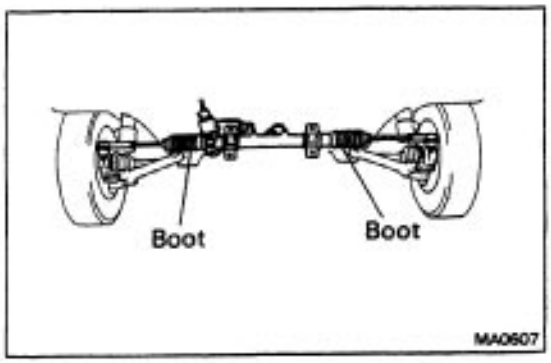
CHASSIS

16. INSPECT STEERING LINKAGE

(a) Check the steering wheel freeplay.

Maximum steering wheel freeplay: 30 mm (1.18 in.)

With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure.

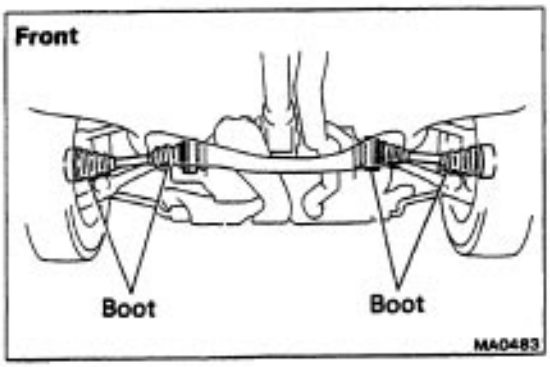


(b) Check the steering linkage for looseness or damage.
Check that:

- Tie rod ends so not have excessive play.
- Dust seals and boots are not damage.
- Boot clamps are not loose.

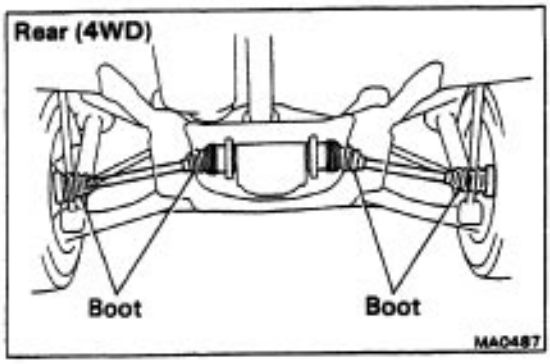
17. INSPECT STEERING GEAR HOUSING OIL

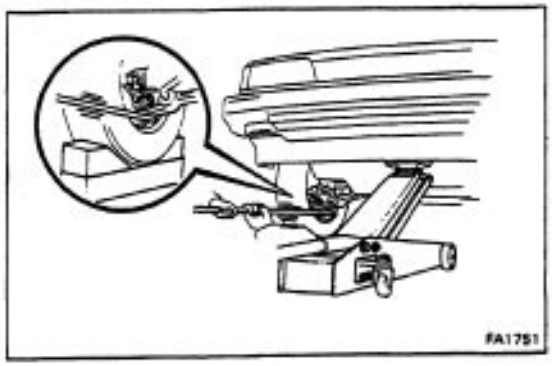
Check the steering gear box for oil leakage.



18. INSPECT FRONT AND REAR DRIVE SHAFT BOOTS

Check the drive shaft boots for clamp looseness, leakage or damage.





19. INSPECT BALL JOINTS AND DUST COVERS

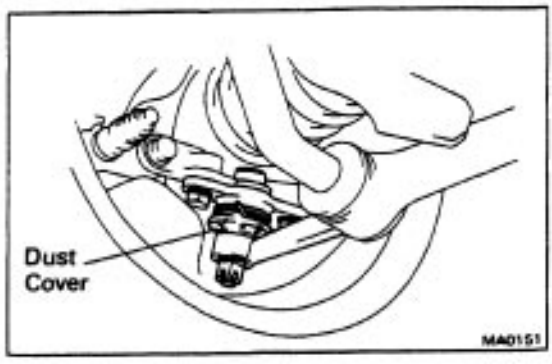
(a) Inspect the ball joints for excessive looseness.

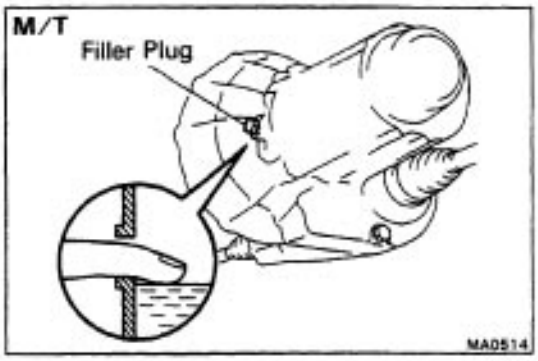
- Jack up the front of the vehicle and place wooden blocks with a height of 180 – 200 m m (7.09–7.87 in.) under the front tires.
- Lower the jack until there is about half a load on the front coil springs. Place stands under the vehicle for safety.
- Check that the front wheels are in a straight forward position, and block them with chocks.
- Using a lever, pry up the end of the lower arm, and check the amount of play.

  Maximum ball joint vertical play: 0mm (0 in.)

If there is play, replace the ball joint.

(b) Check the dust cover for damage.





20. CHECK TRANSAXLE, TRANSFER AND DIFFERENTIAL OIL (FLUID)

A. (M/T)

Check manual transaxle oil (fluid)

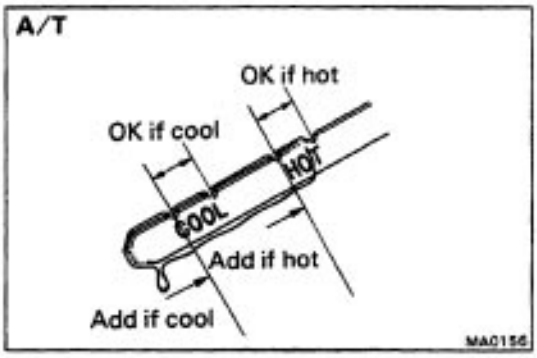
(a)Visually check the transaxle for oil (fluid) leakage.
If leakage is found, check for cause and repair.

(b) Remove the filler plug and feel inside the hole with your finger. Check that the oil (fluid) comes to within 5 mm (0.20 in.) of the bottom edge of the filler hole.
If the level is low, add oil (fluid) until it begins to run out the filler hole.

Transaxle fluid:
2WD (3S–FE) See step 21 (A)

Transaxle oil:
2WD (2VZ–FE) See step 21 (B)

Transaxle oil (Incl. transfer):
4WD (3S–FE) See step 21 (C)



B. (A/T)

Check automatic transaxle fluid

(a) Visually check the transaxle for fluid leakage.
If leakage is found, check for cause and repair.

(b) (Transmission (2WD))
Check the fluid level
If the level is low, add fluid.

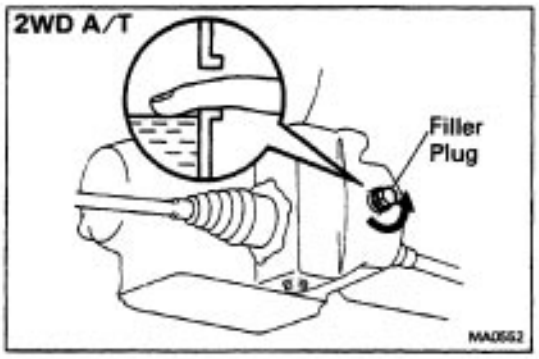
Transmission fluid: See step 21 (D)

(c) (Transaxle (4WD))
Check the fluid level
If the level is low, add fluid.

Transaxle fluid: See step 21 (E)

(d) (Front Differential (2WD))
Remove the filler plug and feel inside the hole with your finger. Check that the fluid comes to within 5 mm (0.20 in.) of the bottom edge of the filler hole.
If the level is low, add fluid until it begins to run out the filler hole.

Differential fluid: See step 21 (D)



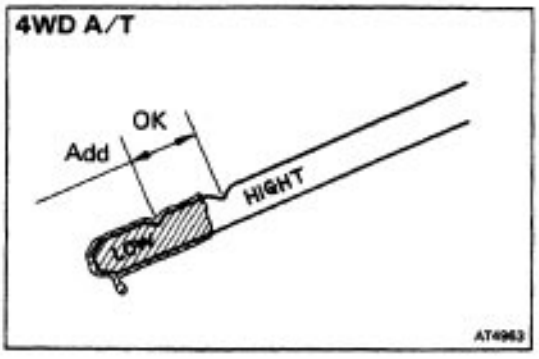
C. (4WD A/T) .

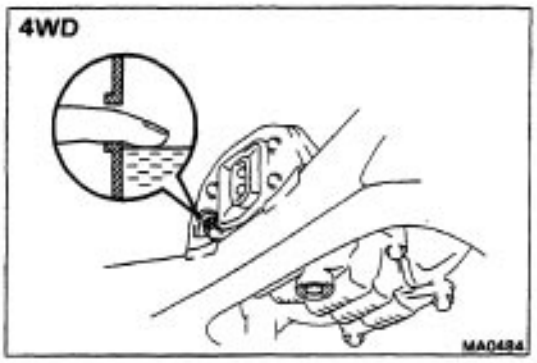
Check transfer oil

(a) Visually check the transaxle for oil leakage.
If leakage is found, check for cause and repair.

(b) Check the oil level
If the level is low, add oil.

Transfer oil: See step 21 (F)





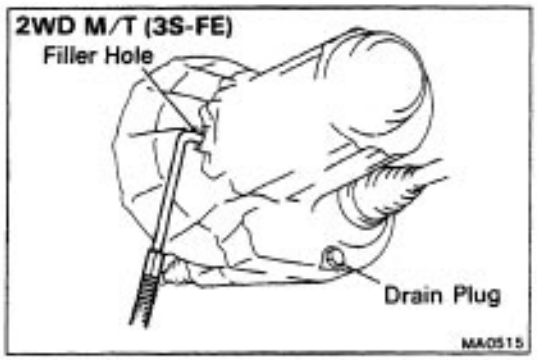
D. (4WD)

Check Rear differential oil

(a) Visually check the differential for oil leakage.
If leakage is found, check for cause and repair.

(b) Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the filler hole.
If the level is low, add oil until it begins to run out the filler hole.

Differential oil: See step 21 (G)

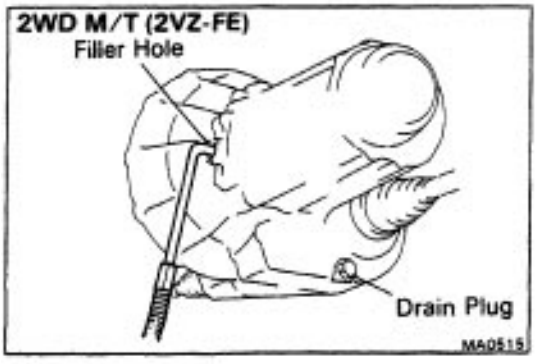


21. REPLACE TRANSAXLE, TRANSFER AND DIFFERENTIAL OIL (FLUID)

A. (2WD M/T (3S–FE))

Replace transaxle fluid

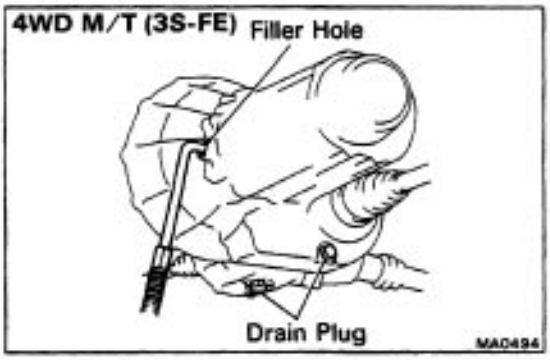
(a) Remove the engine under cover.
(b) Remove the filler and drain plugs, and drain the fluid.
(c) Reinstall the drain plug securely.
(d) Add new fluid until it beings to run out of the filler hole.
Transaxle fluid: ATF DEXRON©II
Capacity: 2.6 liters (2.7 US qts, 2.3 Imp. qts)
(e) Reinstall the filler plug securely.
(f) Reinstall the engine under cover.



6. (2WD M/T (2vZ–FE))

Replace transaxle oil

(a) Remove the engine under cover.
(b) Remove the filler and drain plugs, and drain the oil.
(c) Reinstall the drain plug securely.
(d) Add new oil until it begins to run out of the filler hole.
Transaxle oil:
Oil grade API GL–4 or GL–5
Viscosity SAE 75W–9O or 80W–90
Capacity: 4.2 liters (4.4 US qts, 3.7 Imp. qts)
(e) Reinstall the filler plug securely.
(f) Reinstall the engine under cover.



C. (4WD M/T (3S–FE))

Replace transaxle (incl. transfer) oil

(a) Remove the engine under cover.
(b) Remove the filler and drain plugs, and drain the oil.
(c) Reinstall the drain plug securely.
(d) Add new oil until it begins to run out of the filler hole.

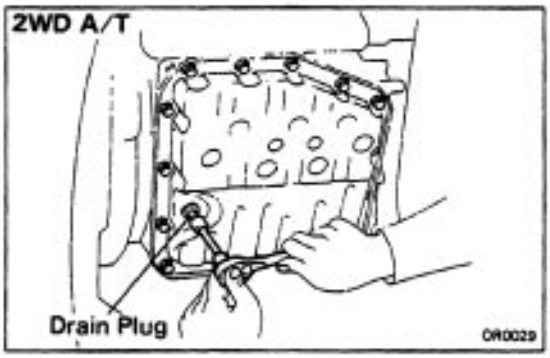
Transaxle oil: Transaxle oil E50 (08885–80206) or equivalent

Recommended transaxle oil:

Oil grade API GL–5
Viscosity SAE 75w–90 or 80W–90
Above –18˚C (0˚F) SAE 90
Below –18˚C (0˚F) SAE 80W

Capacity: 5.0 liters (5.3 US qts, 4.4 Imp. qts)

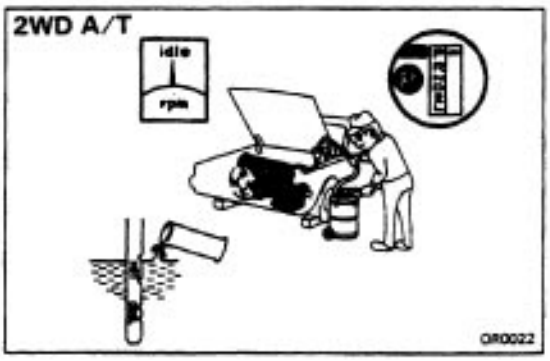
(e) Reinstall the filler plug securely.
(f) Reinstall the engine under cover.



D. (2WD A/T)

Replace transaxle fluid (Transmission)

(a) Remove the engine under cover.
(b) Using a 10 mm hexagon wrench, remove the drain plug and drain the fluid.
(e) Reinstall the drain plug securely.



(d) with the engine OFF, add new fluid through the dipstick tube.

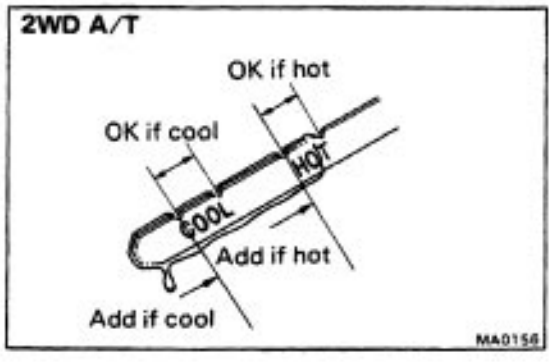
Transmission fluid: ATF DEXRON©II

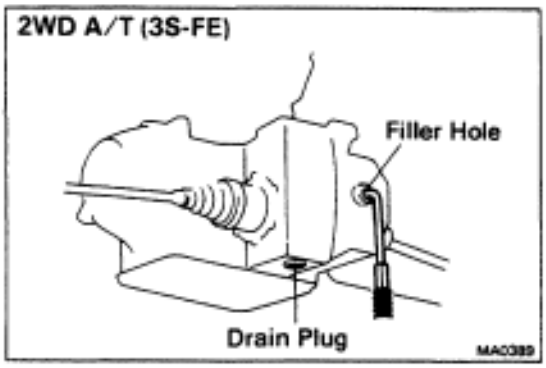
Drain and refill capacity: 2.5 liters (2.6 us qts, 2.2 Imp. qts)

(e) Start the engine and shift the selector into all positions from ”f”' through ”L”, and then shift into ”P”.
(f) With the engine idling, check the fluid level. Add fluid up to the ”COOL” level on the dipstick.

NOTICE: Do not overfill. The transmission and differential are separate units.

(g) Recheck the fluid level with the normal temperature (70 – 80˚C (158 – 176˚F)) and add as necessary.
(h) Reinstall the engine under cover.



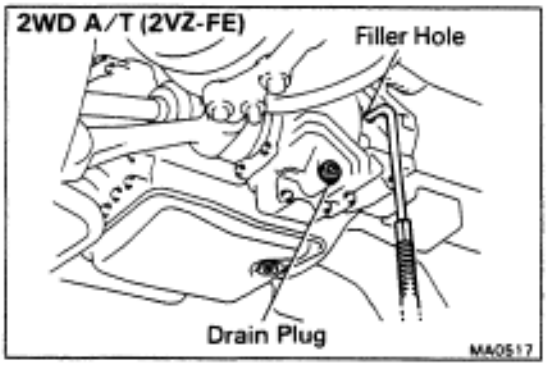


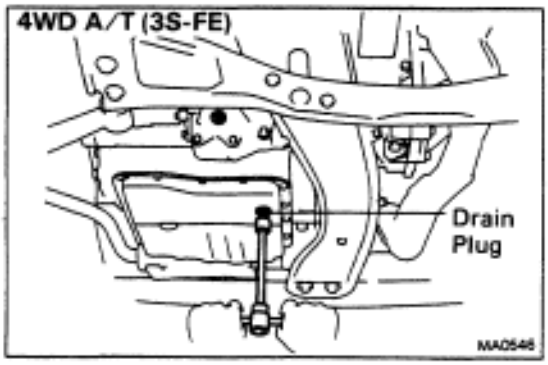
(Front Differential)

(a) Remove the engine under cover.
(b) Using a 10 mm hexagon wrench, remove the drain plug and drain the fluid.
(c) Reinstall the drain plug securely.
(d) Add new fluid until it beings to run out of the filler hole.

Transaxle fluid: ATF DEXRON©II
Capacity: 3S–FE 1.6 liters
(1.7 US qts, 1.4 Imp. qts)
2VZ–FE 1.0 liters
(1.1 US qts, 0.9 Imp. qts)

(e) Reinstall the filler plug securely.
(f) Reinstall the engine under cover.

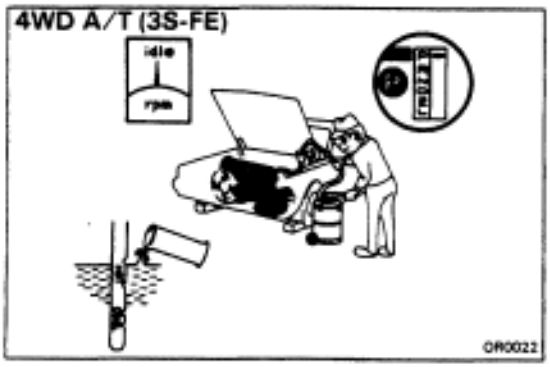




E. (4WD A/T (3S–FE))

Replace transaxle fluid

(a) Remove the engine under cover.
(b) Using a 1 0 mm hexagon wrench, remove the drain plugs and drain the fluid.
(c) Reinstall the drain plug securely.



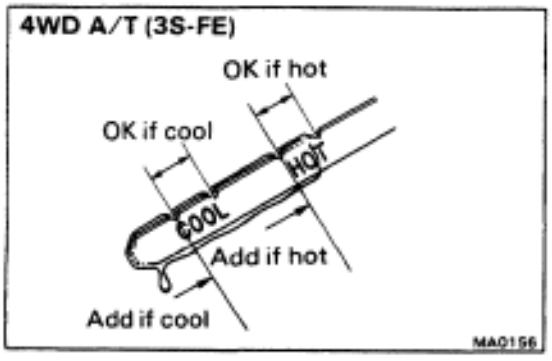
(d) With the engine OFF, add new fluid through the dipstick tube.

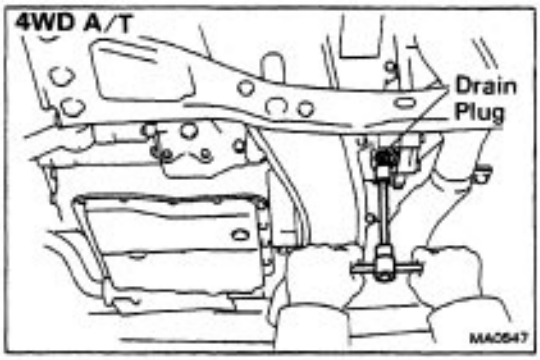
Transaxle fluid: ATF Type T (O8886–08405) or equivalent
Drain and refill capacity:
3.5 liters (3.7 US dts, 3.0 Imp. qts)

(e) Start the engine and shift the selector into all positions from ”P” through ”L”, and then shift into ”P”.
(f) With the engine idling, check the fluid level. Add fluid up to the ”COOL” level on the dipstick.

NOTICE: Do not overfill.

(g) Recheck the fluid level with the normal temperature (70 80˚C (158 176˚F)) and add as necessary.
(h) Reinstall the engine under cover.





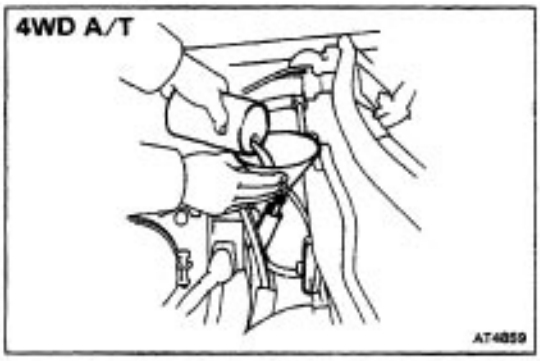
F. (4WD A/T)

Replace transfer oil

(a) Remove the engine under cover.

(b) Using a 10 mm hexagon wrench, remove the drain plug and drain the oil.

(c) Reinstall the drain plug securely.



(d) Add new oil through the dipstick tube.

Transaxle oil: Transaxle oil E50 (08885–80206) or equivalent

Recommended transaxle oil:

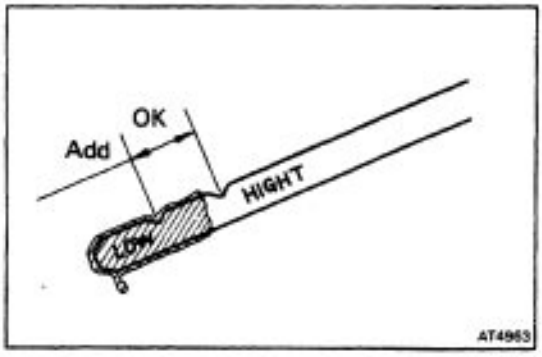
Oil grade API GL–5

Viscosity SAE 75W–90 or 80w–90

Above –18˚C (0˚F) SAE 90

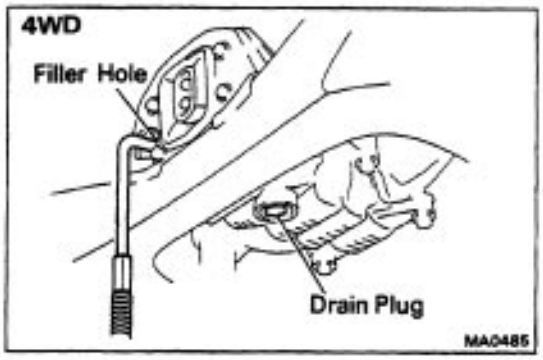
Below –18˚C (0˚F) SAE 80W

Capacity: 0.7 liters (0.74 US qts, 0.62 Imp. qts)



(e) Check the oil level and add as necessary.

M Reinstall the engine under cover.



G. (4WD)

Replace rear differential oil

(a) Remove the filler and drain plugs, and drain the oil.

(b) Reinstall the drain plug securely.

(c) Add new oil until it beings to run out of the filler hole.

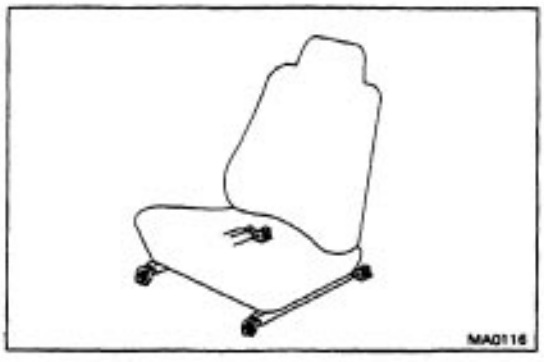
Rear differential oil:

Oil grade API GL–5 hypoid gear oil

Viscosity Above –18˚C (0˚F) SAE 90

Below –18˚C (0˚F) SAE 80W–90

Capacity: 1.1 liters (1.2 U S qts, 1.0 Imp. qts)



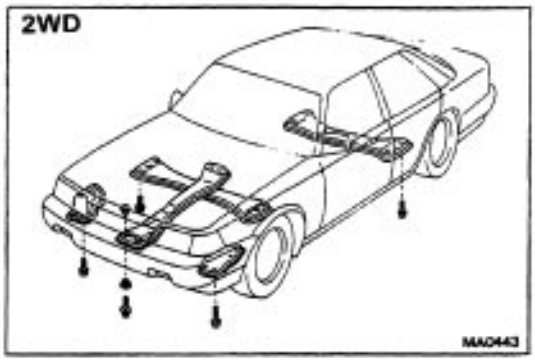
(d) Reinstall the filler plug securely.

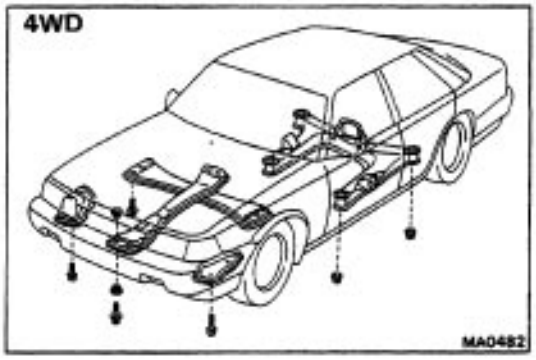
22. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

Tighten the following parts:

- Front seats mount bolts

Torque: 375 kg–cm (27 ft–lb, 37 N–m)





- Strut/stabilizer bar bracket–to–body mount bolts (LH and RH)
  Torque: 620 kg–cm (45 ft–lb, 61 N–m)
- Engine mounting center member–to–body mount bolts
  Torque: 400 kg–cm 129 ft–lb, 39 N–m)
- Front suspension lower cross member–to–body mount bolts
  Torque: 2,110 kg–cm (153 ft–lb, 206 N–m)
- Rear suspension lower crossmember–to–body mount bolts
  Torque: 2WD 710 kg–cm (51 ft–lb, 70 N–m)
  4WD 1,620 kg–cm (117 ft–lb, 159 N–m)

23. FINAL INSPECTION

(a) Check the operation of the body parts:

- Hood
  Auxiliary catch operation properly
  Hood locks securely when closed
- Front and rear doors
  Door locks operate properly
  Doors close properly
- Luggage compartment door and back door
  Door sock operates properly
- Seats
  Seat adjusts easily and locks securely in any position
  Front seat back locks securely in any position
  Folding–down rear seat backs lock securely

(b) Road test

- Check the engine and chassis for abnormal noises.
- Check that the vehicle does not wander or pull to one side.
- Check that the brakes work properly and do not drag.
- Perform bedding down of the parking brake shoes and drum. (See page MA–8)

(c) Be sure to deliver a clean car especially check:

- Steering wheel
- Shift lever knob
- All switch knobs
- Door handles
- Seats

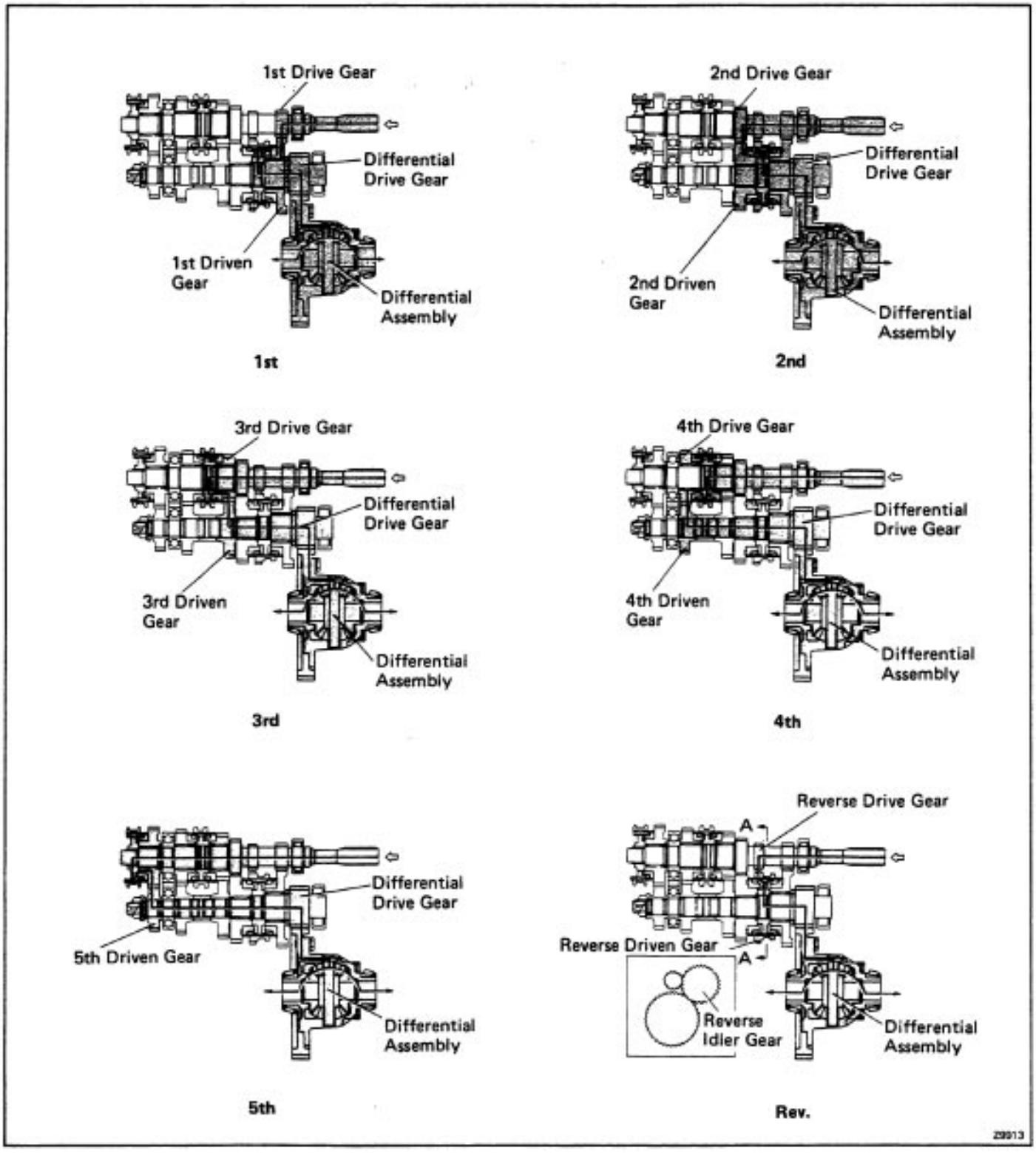
MANUAL TRANSAXLE

DESCRIPTION

- **Transaxle types S51 are constant mesh synchronizers for forward gears, and a sliding mesh reverse gear.**
- **The input shaft is composed of the 1st and 2nd speed gears and the reverse drive gear, and the output shaft is composed of the drive gear (for use with the ring gear).**
- **The oil used in transaxle is as follows:**

S51 ..... ATF type DEXRON® II

- **The illustrations below show the engagements– of transaxle gears.**



PRECAUTIONS

When working with FIPG material, you must be observe the following.

- **Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.**
- **Thoroughly clean all components to remove all the loose material.**
- **Clean both seating surfaces with a non–residue solvent.**
- **Apply the seal packing in approx.1 mm (0.04 in.) bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.**

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Noise	Transmission or differential faulty Wrong oil grade Oil level low	Disassemble and inspect transmission or differential Replace oil Add oil .	MT–7,42
Oil leakage	Oil level too high Oil seal, 4–ring or gasket worn or damaged	Drain oil Replace oil seal, O–ring or gasket	MT–7
Hard to shift or will not shift	Control cable faulty Transmission faulty	Replace control cable Disassemble and inspect transmission	MT–7
Jumps out of gear	Transmission faulty	Disassemble and inspect transmission	MT–7

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TROUBLESHOOTING

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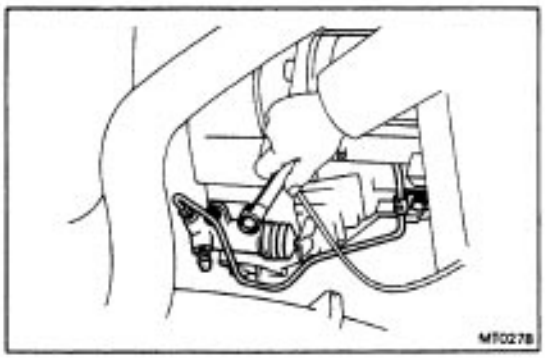
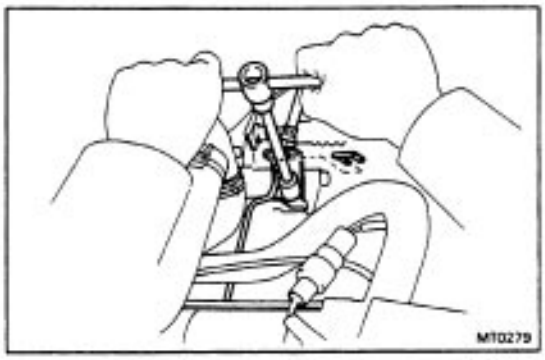
Oil leakage	Oil level too high Oil seal, 4–ring or gasket worn or damaged	Drain oil Replace oil seal, O–ring or gasket	MT–7
Hard to shift or will not shift	Control cable faulty Transmission faulty	Replace control cable Disassemble and inspect transmission	MT–7
Jumps out of gear	Transmission faulty	Disassemble and inspect transmission	MT–7



S51 TRANSMISSION
REMOVAL OF TRANSAXLE

1. REMOVE NEGATIVE BATTERY CABLE

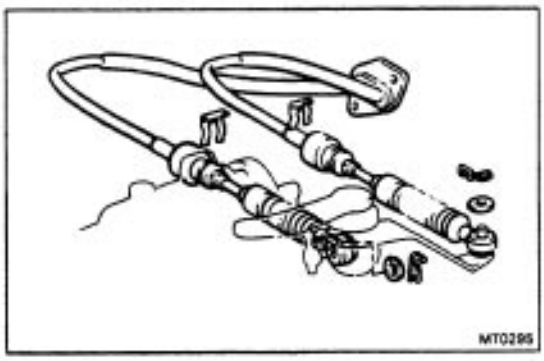
2. REMOVE CLUTCH RELEASE CYLINDER AND TUBE CLAMP



3. REMOVE–.CLUTCH TUBE BRACKET

(a) Remove the retainer from the bracket.

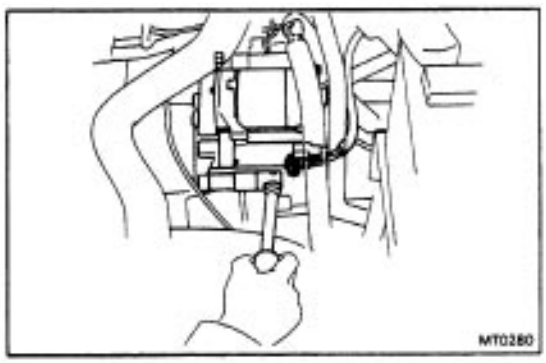
(b) Remove the bolt and bracket.



4. DISCONNECT CONTROL CABLES

(a) Remove the clips and washers.

(b) Remove the retainer from the cables.



5. REMOVE STARTER

(a) Disconnect the cable and connector.

(b) Remove the starter with the two bolts.

6. DISCONNECT BACK–UP LIGHT SWITCH CONNECTOR AND GROUND STRAP

7. REMOVE TRANSAXLE MOUNTING BOLTS OF TRANSAXLE UPPER

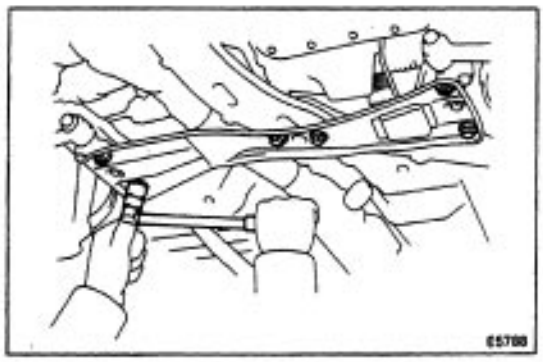
8. RAISE VEHICLE

NOTICE: Be sure the vehicle is securely supported.

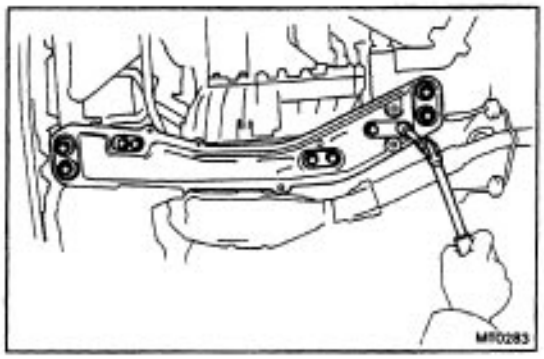
9. REMOVE UNDER COVERS

10. DRAIN OUT FLUID

11. DISCONNECT SPEEDOMETER CABLE

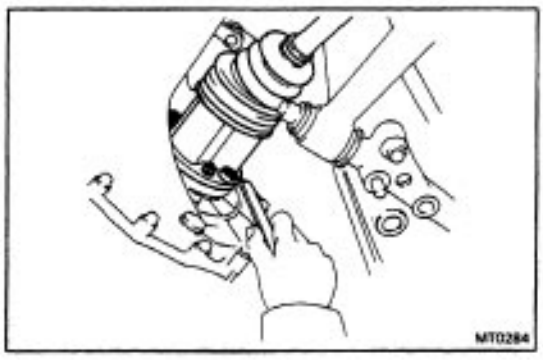


12. REMOVE SUSPENSION LOWER CROSSMEMBER



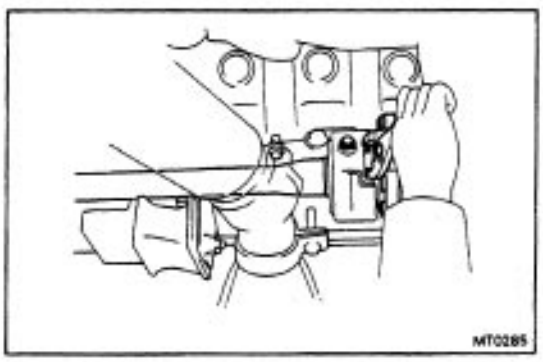
13. REMOVE ENGINE MOUNTING CENTER MEMBER

(a) Remove the front and rear engine mounting bolts.
(b) Remove the engine mounting center member.



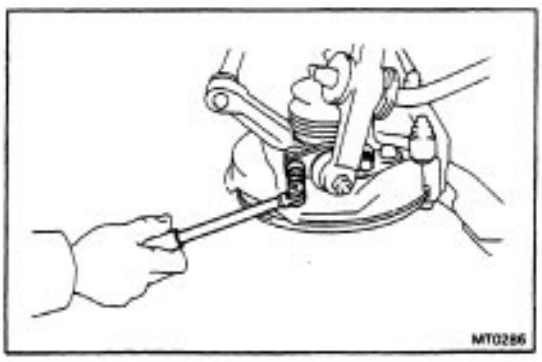
14. DISCONNECT BOTH DRIVE SHAFTS

Loosen the six nuts while depressing the brake pedal.



15. REMOVE CENTER DRIVE SHAFT

(a) Using pliers, remove the snap ring from the bearing bracket.
(b) Remove the bolt on the bearing bracket.
(c) Pull out the center drive shaft.



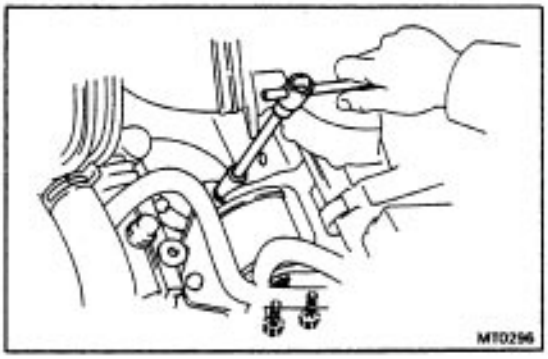
16. DISCONNECT LEFT STEERING KNUCKLE FROM LOWER ARM

(a) Disconnect the steering knuckle from the tower arm.
(b) Pull the steering knuckle toward the outside and remove the drive shaft.

17. REMOVE STABILIZER BAR

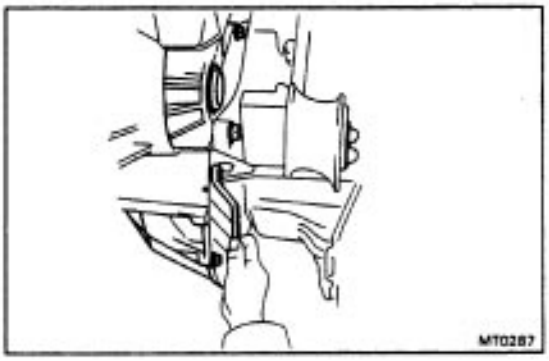
(See page FA–34**)**

18. DISCONNECT LEFT ENGINE MOUNTING



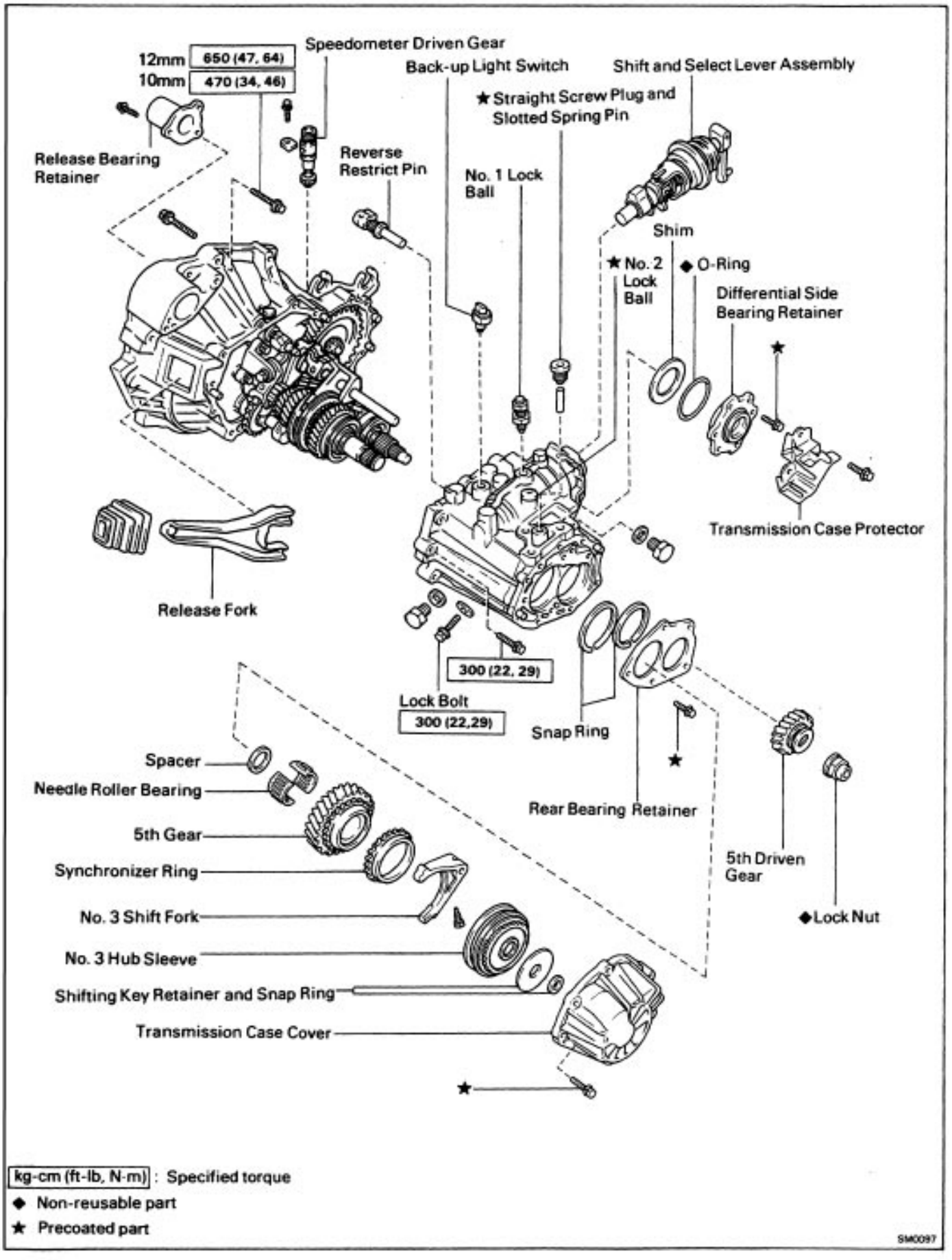
(a) Raise the transaxle and engine slightly with a jack and wooden block in between.
(b) Disconnect the left engine mounting.

19. REMOVE TRANSAXLE

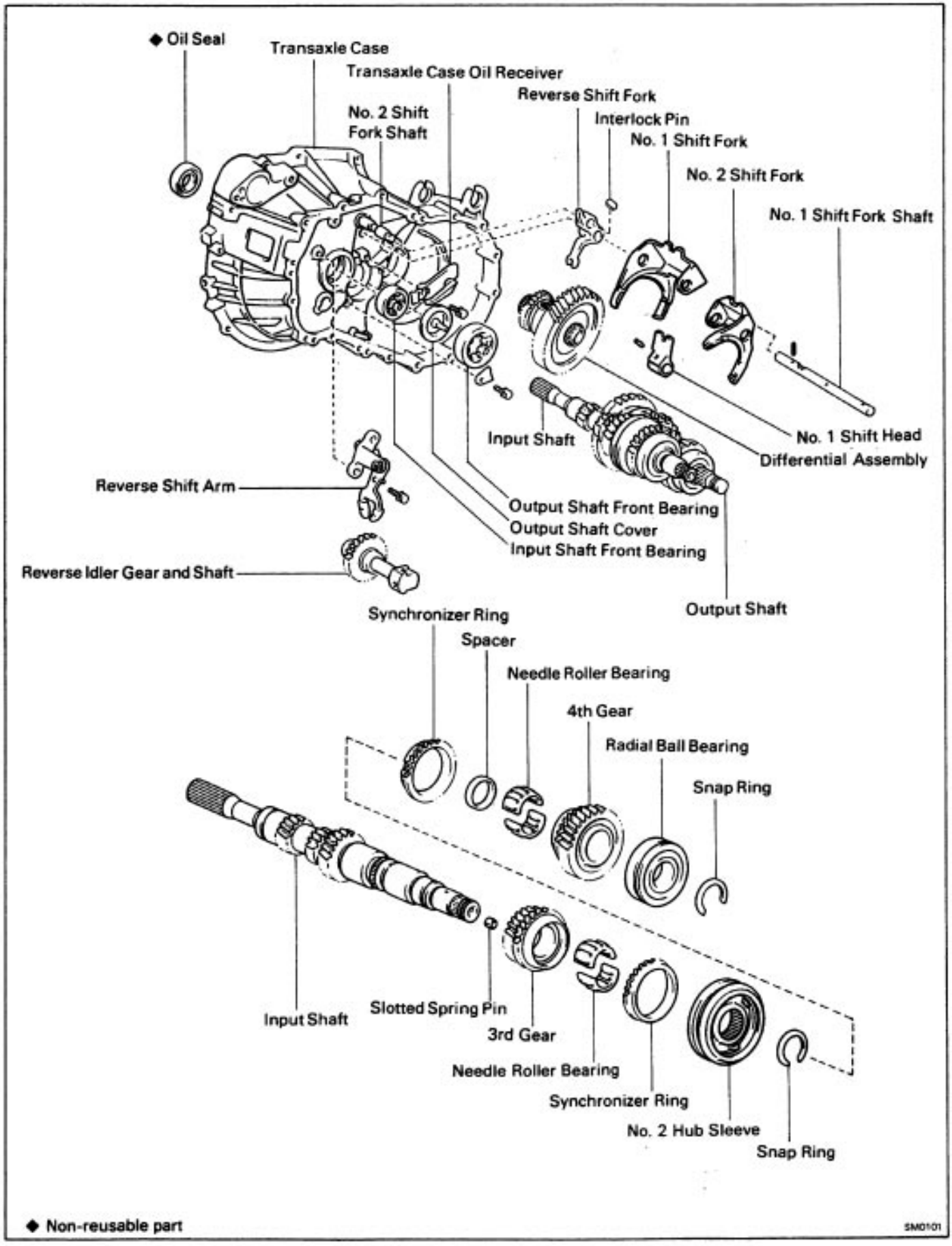


(a) Remove the transaxle mounting bolts from the engine.
(b) Lower the engine left side and remove the transaxle from the engine.

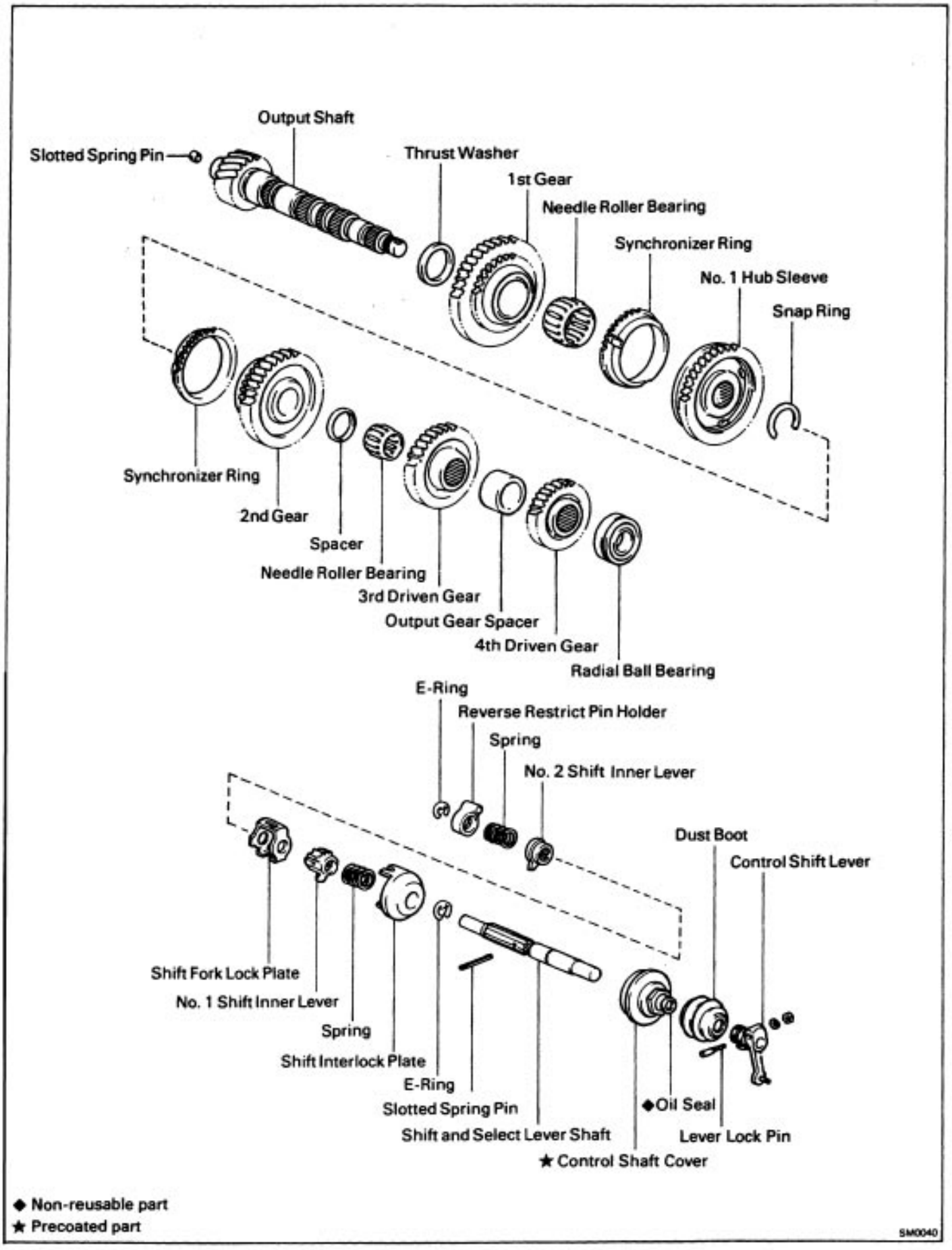
COMPONENTS


12mm 650 (47, 64)
10mm 470 (34, 46)
Speedometer Driven Gear
Back-up Light Switch
Shift and Select Lever Assembly
★ Straight Screw Plug and Slotted Spring Pin
Release Bearing Retainer
Reverse Restrict Pin
No. 1 Lock Ball
Shim
★ No. 2 Lock Ball
◆ O-Ring
Differential Side Bearing Retainer
Transmission Case Protector
Release Fork
300 (22, 29)
Lock Bolt
300 (22,29)
Snap Ring
Spacer
Needle Roller Bearing
5th Gear
Synchronizer Ring
No. 3 Shift Fork
No. 3 Hub Sleeve
Shifting Key Retainer and Snap Ring
Transmission Case Cover
Rear Bearing Retainer
5th Driven Gear
◆ Lock Nut
kg-cm (ft-lb, N-m) : Specified torque
◆ Non-reusable part
★ Precoated part
SM0097

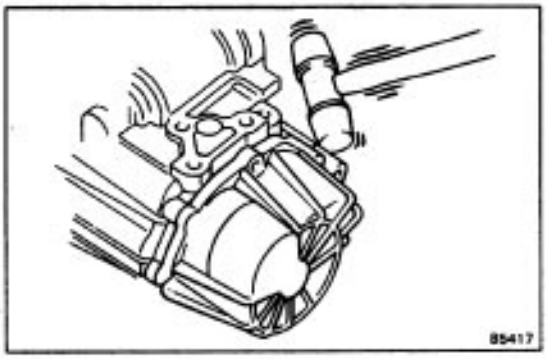
COMPONENTS (Cont'd)



COMPONENTS (Cont'd)



DISASSEMBLY OF TRANSMISSION



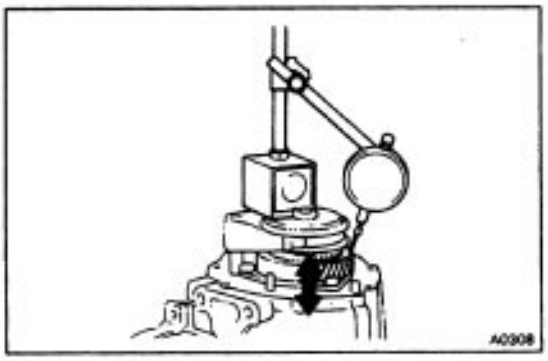
(See pages MT–7 to 9)

1. REMOVE RELEASE FORK, BEARING, BACK–UP LIGHT SWITCH AND SPEEDOMETER DRIVEN GEAR

2. REMOVE RELEASE BEARING RETAINER

3. REMOVE TRANSMISSION CASE COVER

4. REMOVE NO. 3 SHIFT FORK SECURING BOTH

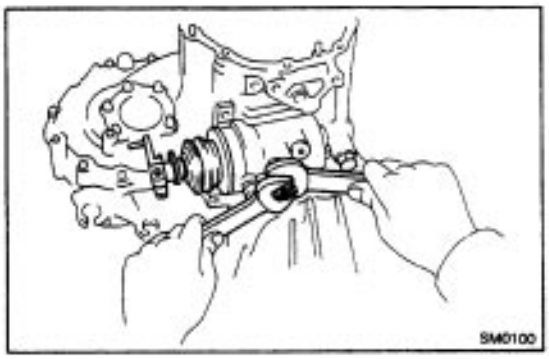


5. MEASURE FIFTH GEAR THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance.

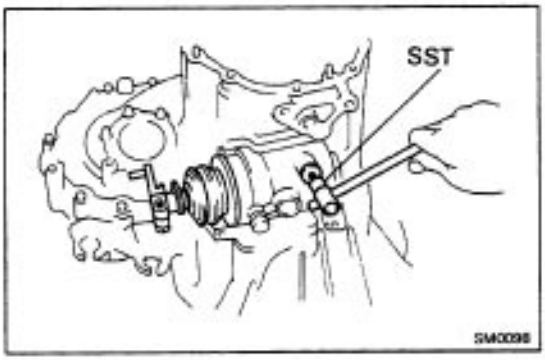
Standard clearance: 0.20 – 0.40 mm (0.0079 – 0.0157 in.)

Maximum clearance: 0.45 mm (0.0177 in.)



6. REMOVE NO. 1 AND NO.2 LOCK BALL ASSEMBLIES

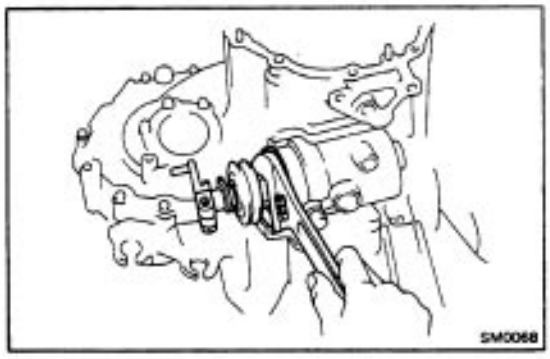
(a) Loosen the lock nut and remove the No. 1 lock ball.



(b) Using SST and remove the No. 2 lock ball.

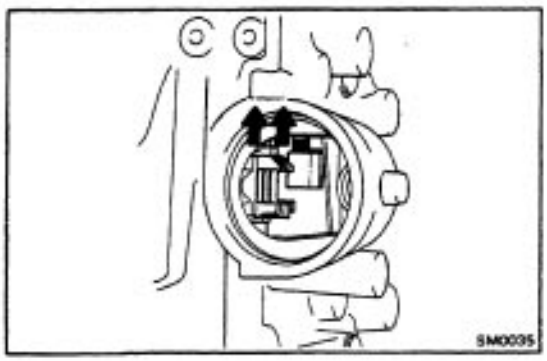
SST 09313–30021

7. REMOVE SELECTING BELLCRANK

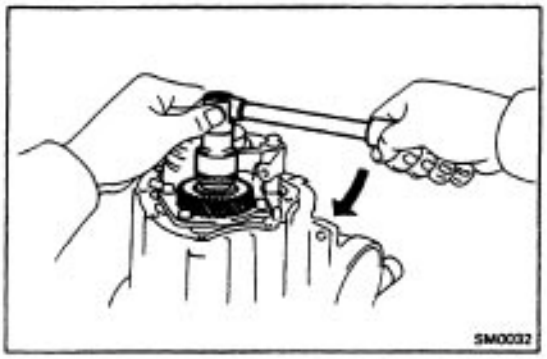


8. REMOVE SHIFT AND SELECT LEVER ASSEMBLY

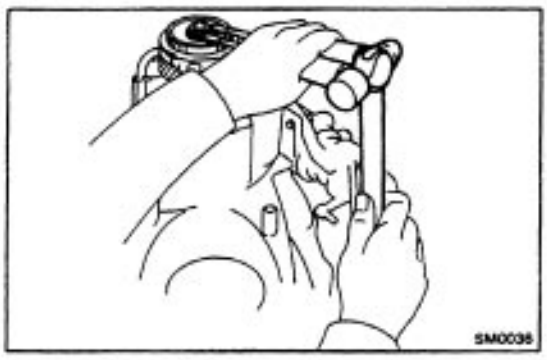
9. REMOVE. OUTPUT SHAFT LOCK NUT



(a) Unstake the nut.
(b) Engage the gear double meshing.

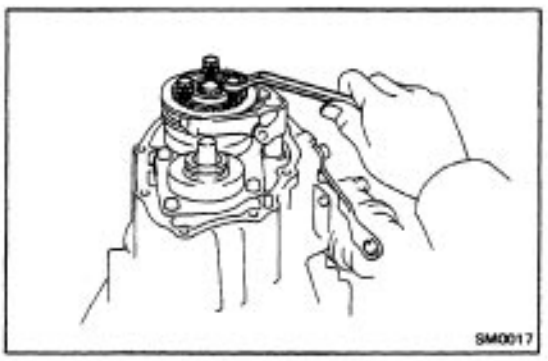


(c) Remove the lock nut.
HINT: The lock nut has LH threads.
(d) Disengage the gear double meshing.



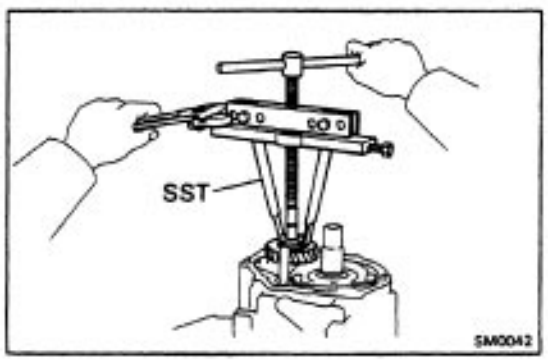
10. REMOVE NO. 3 HUB SLEEVE ASSEMBLY AND SHIFT FORK

(a) Using two screwdrivers and a hammer, tap out the snap ring.
(b) Remove the shifting key retainer.



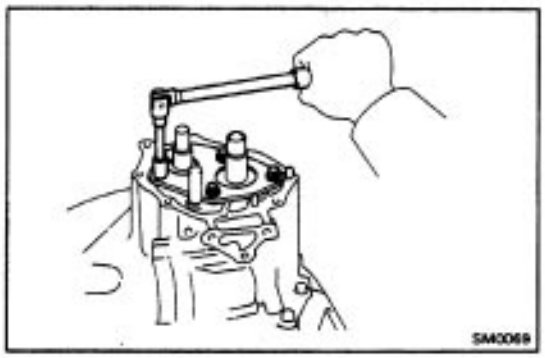
(e) Using the three case cover set bolts, tighten the three bolts a little at a time and remove No. 3 hub sleeve assembly and shift fork.

11. REMOVE FIFTH GEAR, SYNCHRONIZER RING, NEEDLE ROLLER BEARINGS AND SPACER



12. REMOVE FIFTH DRIVEN GEAR

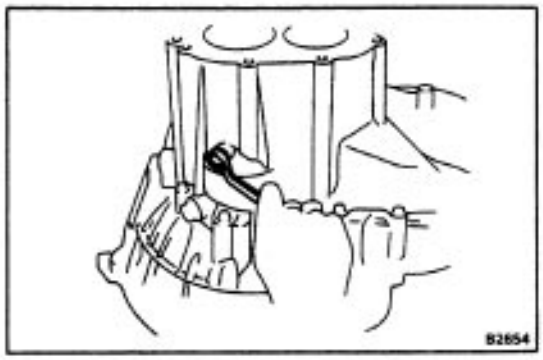
Using SST, remove the 5th driven gear.
SST 09950–20017



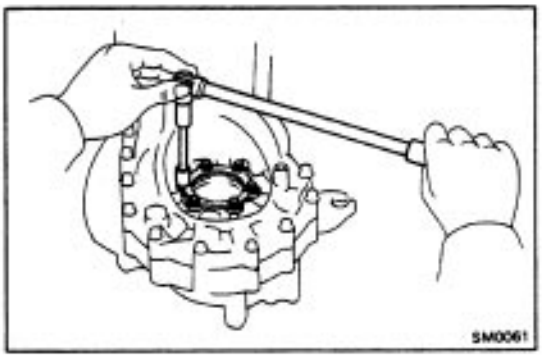
13. REMOVE REAR BEARING RETAINER

14. REMOVE BEARING SNAP RINGS

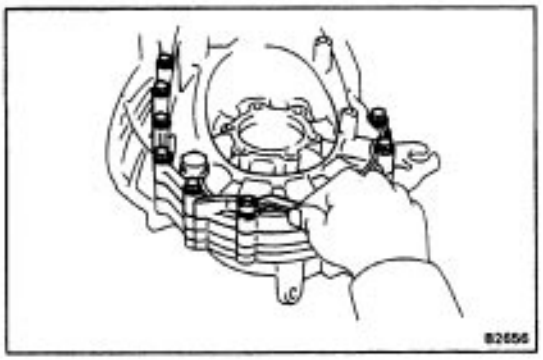
Using snap ring pliers, remove the two snap rings.



15. REMOVE REVERSE IDLER GEAR SHAFT¿¿ LOCK BOLT

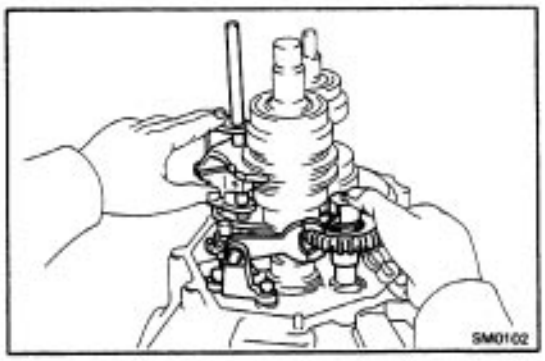


16. REMOVE DIFFERENTIAL SIDE BEARING RETAINER AND SHIM



17. REMOVE TRANSMISSION CASE

Remove the seventeen bolts and tap off the case with a plastic hammer.



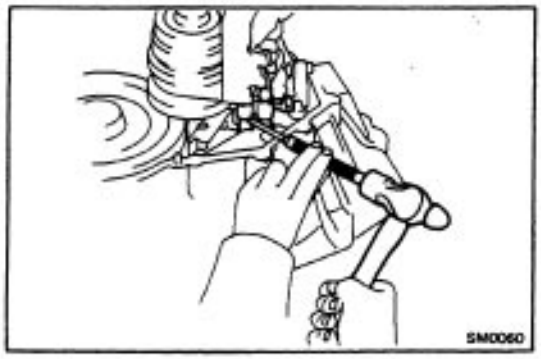
18. REMOVE REVERSE SHIFT ARM

(a) Shift the fork shaft into reverse.

(b) Remove the two bolts and pull off the reverse shift arm.

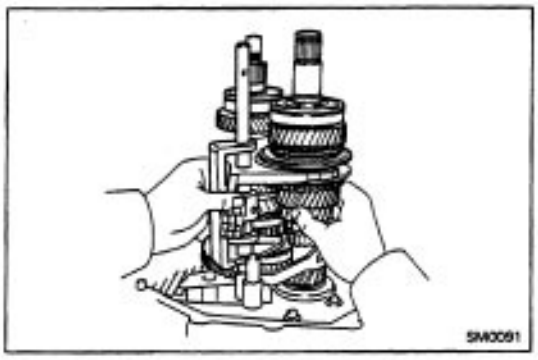
19. REMOVE REVERSE IDLER GEAR AND SHAFT

Pull out the shaft.

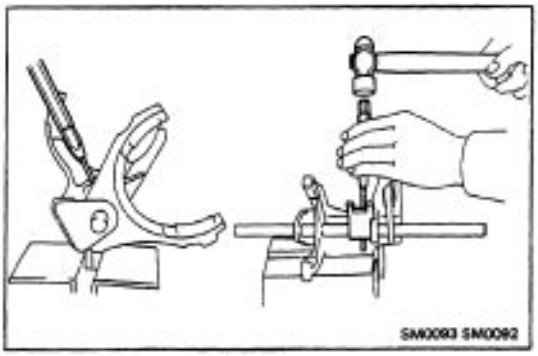


20. REMOVE NO. 1 SHIFT FORK SHAFT, NO. 1 SHIFT HEAD, NO. 1 AND NO. 2 SHIFT FORKS, INPUT SHAFT AND OUTPUT SHAFT.

(a) Drive out the slotted spring pin from No. 1 fork shaft.



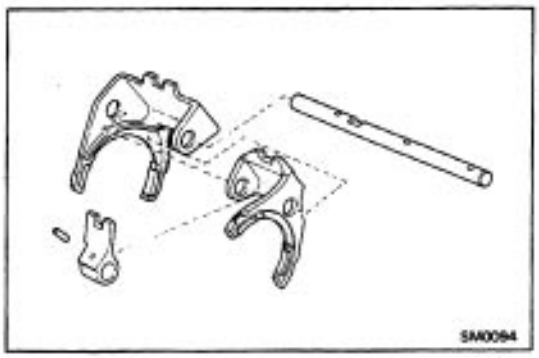
(b) Remove the input shaft and output shaft together with No. 1 fork shaft and shift head and shift forks from the transaxle case.



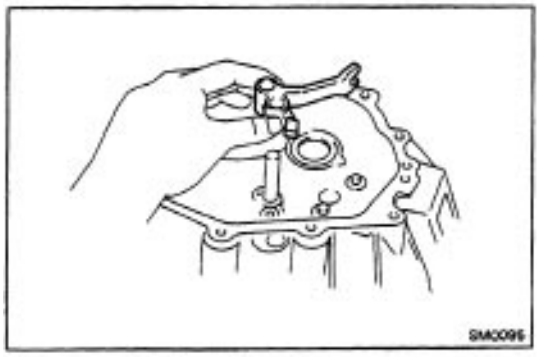
21. SEPARATE THE NO. 1 FORK SHAFT, NO. 1 SHIFT HEAD, No. 1 AND NO. 2 SHIFT FORKS

(a) Mount the shift forks to the vise.

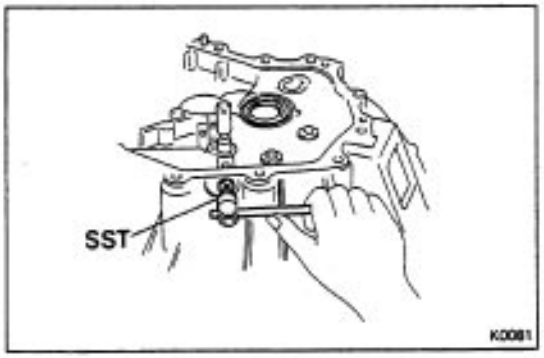
(b) Drive out the slotted spring pin from No. 1 fork shaft as shown in the figure.



(c) Separate the No. 1 shift fork, shaft, No. 1 shift head, No. 1 and No. 2 shift fork.

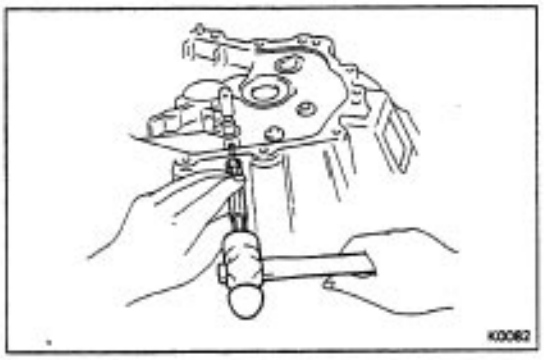


22. REMOVE REVERSE SHIFT FORK AND INTERLOCK PIN



23. REMOVE NO. 2 FORK SHAFT

(a) Using SST, remove the straight screw plug.
SST 09312–30021

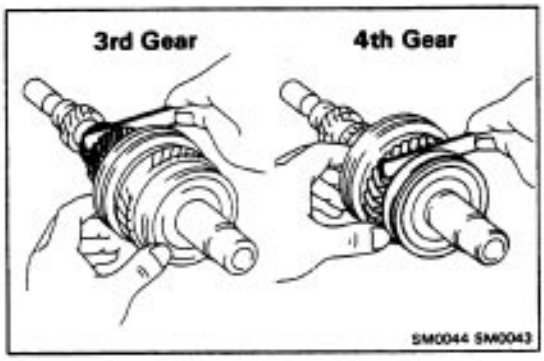


(b) Using a pin punch and hammer, drive out the slotted spring pin.

(e) Pull out the shaft.

24. REMOVE DIFFERENTIAL ASSEMBLY

25. REMOVE MAGNET



26. MEASURE THIRD AND FOURTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the thrust clearance.

Standard clearance:

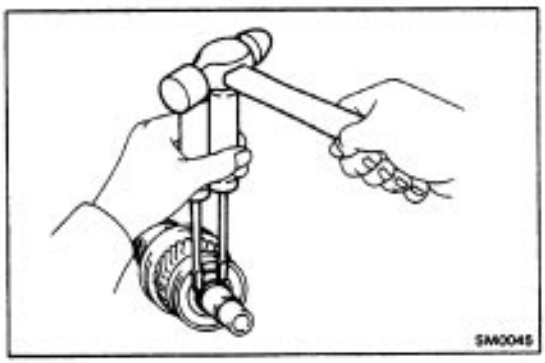
3rd gear 0.10 – 0.25 mm
(0.0039 – 0.0098 in.)

4th gear 0.20 – 0.45 mm
(0.0079 – 0.0177 in.)

Maximum clearance:

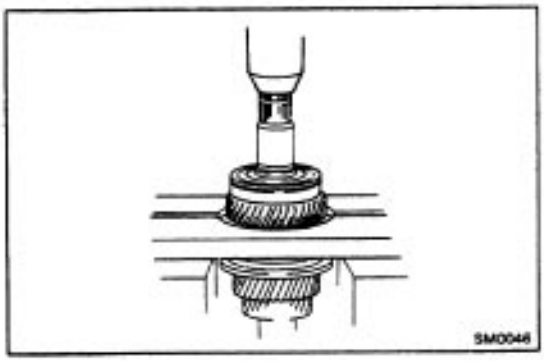
3rd gear 0.30 mm (0.0118 in.)

4th gear 0.50 mm (0.0197 in.)



27. REMOVE SNAP RING FROM INPUT SHAFT

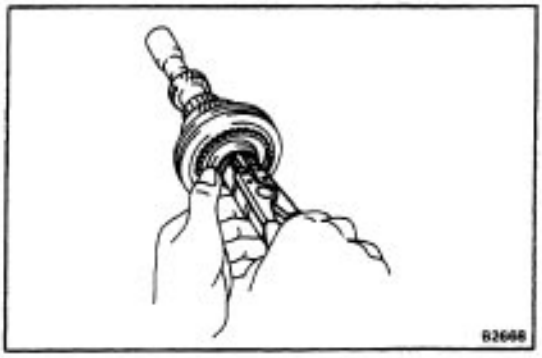
Using two screwdrivers and a hammer, tap out the snap ring.



28. REMOVE RADIAL BALL BEARING, FOURTH GEAR, NEEDLE ROLLER BEARINGS, SYNCHRONIZER RING AND SPACER FROM INPUT SHAFT

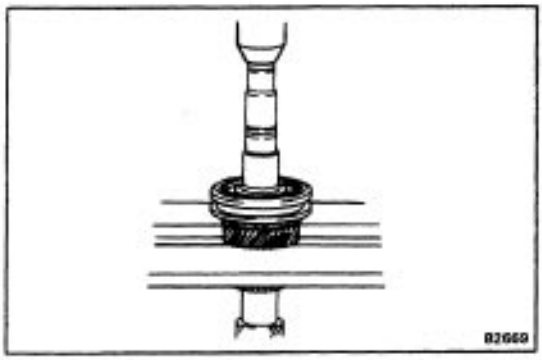
(a) Using a press, remove the radial ball bearing and 4th gear.

(b) Remove the needle roller bearings, synchronizer ring and spacer.



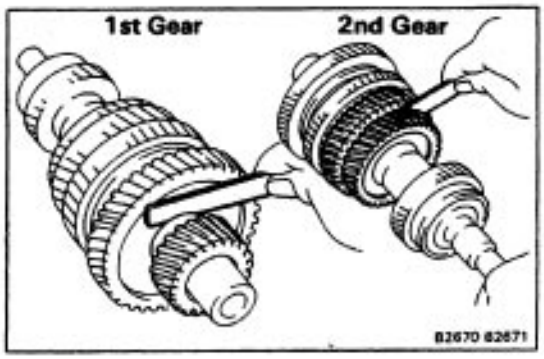
29. REMOVE SNAP RING

Using snap ring pliers, remove the snap ring.



30. REMOVE NO. 2 HUB SLEEVE ASSEMBLY, THIRD GEAR, SYNCHRONIZER RING AND NEEDLE ROLLER BEARINGS

Using a press, remove No. 2 hub sleeve, 3rd gear, synchronizer ring and needle roller bearings.



31. MEASURE FIRST AND SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the thrust clearance.

Standard clearance:

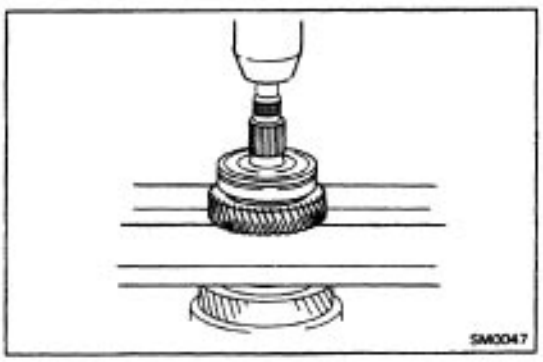
1 st gear 0.10 0.29 mm
(0.0039 – 0.0114 in.)

2nd gear 0.20 0.44 mm
(0.0079 – 0.0173 in.)

Maximum clearance:

1 st gear 0.35 mm (0.0138 in.)

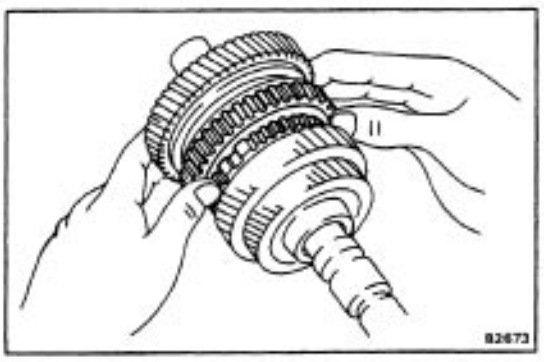
2nd gear 0.50 mm (0.0197 in.)



32. REMOVE RADIAL BALL BEARING, FOURTH DRIVEN GEAR AND OUTPUT GEAR SPACER FROM OUTPUT SHAFT

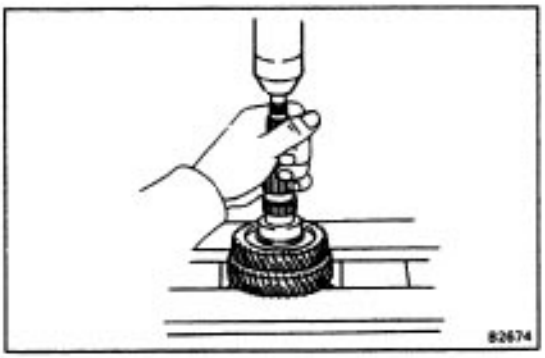
(a) Using a press, remove the radial ball bearing and 4th driven gear.

(b) Remove the spacer.

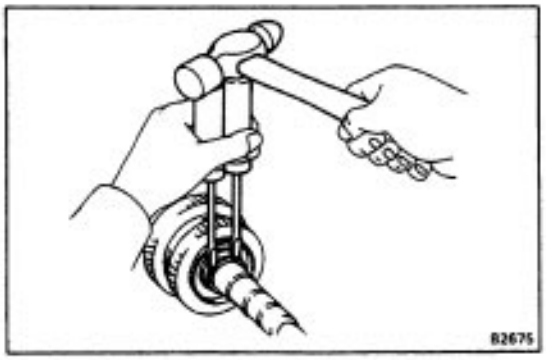


33. REMOVE THIRD DRIVEN GEAR, SECOND GEAR, NEEDLE ROLLER BEARING, SPACER AND SYNCHRONIZER RING

(a) Shift No. 1 hub sleeve into the 1st gear.

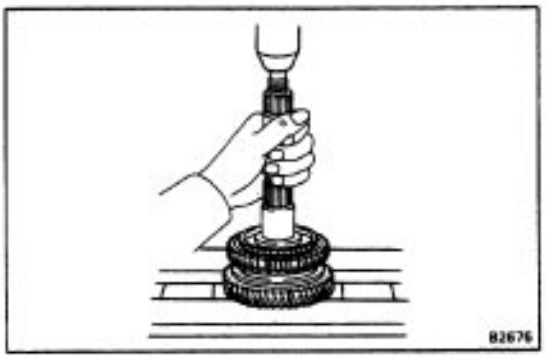


(b) Using a press, remove the 3rd driven gear and 2nd gear.
(c) Remove the needle roller bearing, spacer and synchronizer ring.



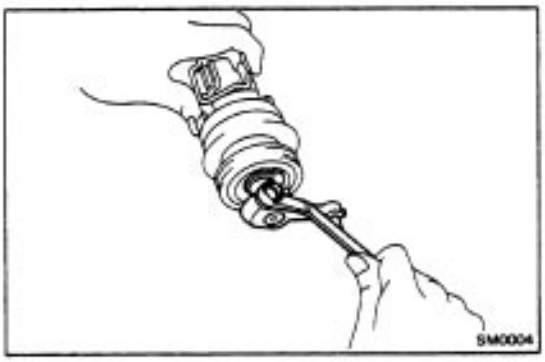
34. REMOVE SNAP RING

Using two screwdrivers and a hammer, tap out the snap ring.



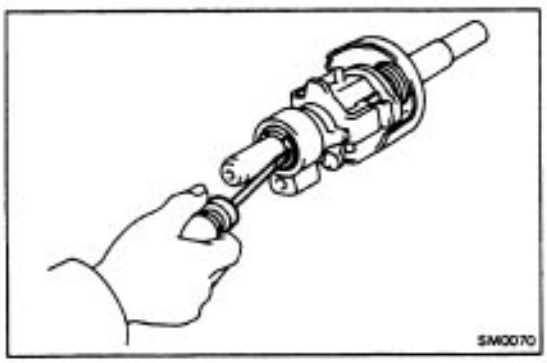
35. REMOVE NO. 1 HUB SLEEVE ASSEMBLY, FIRST GEAR, SYNCHRONIZER RING, NEEDLE ROLLER BEARING AND THRUST WASHER

(a) Using a press, remove No. 1 hub sleeve, 1 st gear and synchronizer ring.
(b) Remove the needle roller bearing and thrust washer.

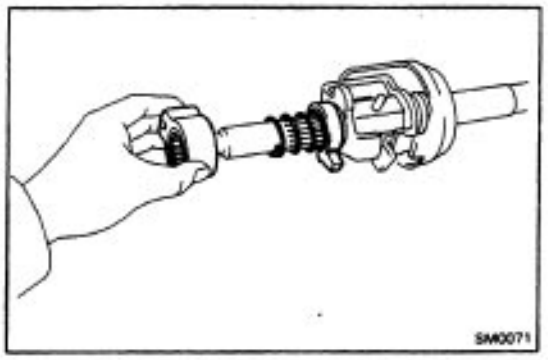


36. DISASSEMBLE SHIFT AND SELECT LEVER ASSEMBLY

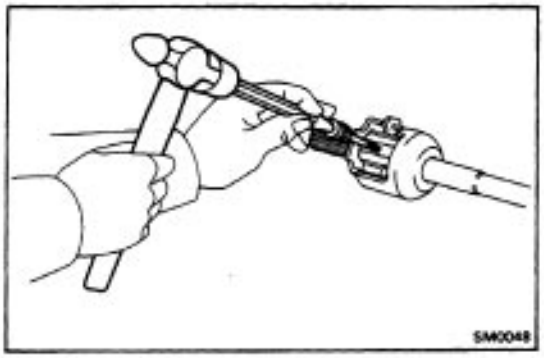
(a) Remove the lever lock pin and nut.
(b) Remove the control shift lever.
(c) Remove the dust boot.
(d) Remove the control shaft cover.



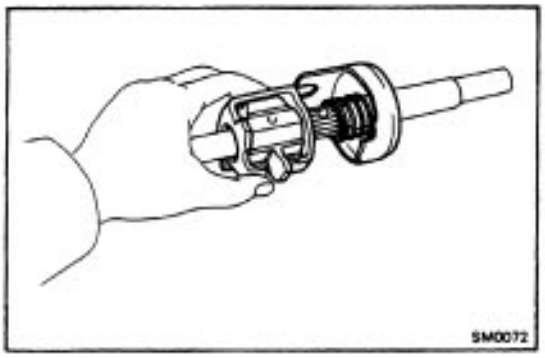
(e) Remove the E–ring.



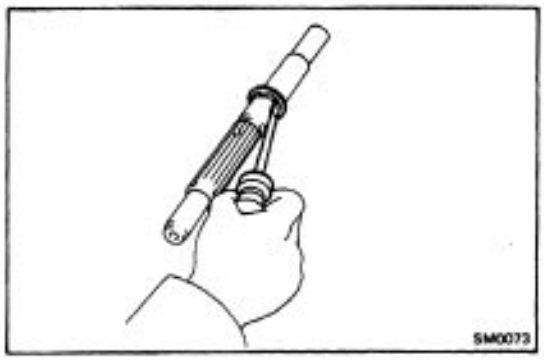
(f) Remove the reverse restrict pin holder, spring and No. 2 shift inner lever.



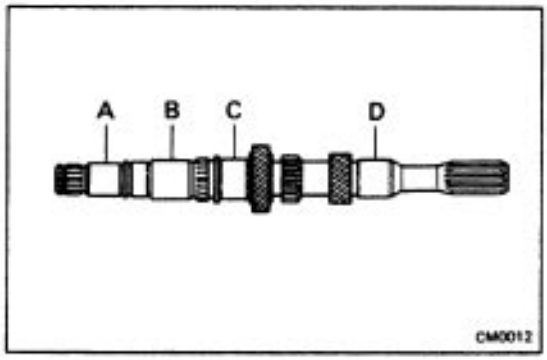
(g) Using a pin punch and hammer, drive out the slotted spring pin.



(h) Remove the shift fork lock plate, No. 1 shift inner lever, spring and shift interlock plate.



(i) Remove the E–ring from the shaft.



INSPECTION OF TRANSMISSION COMPONENTS

1. INSPECT INPUT SHAFT

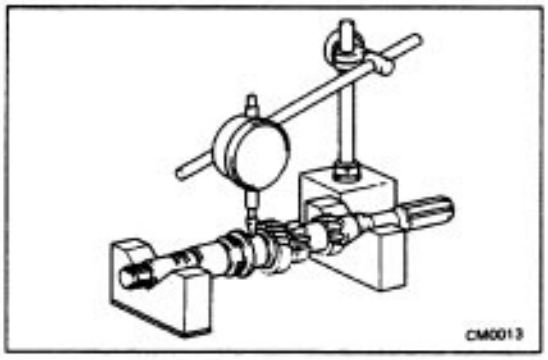
(a) Using a micrometer, measure the outer diameter of the input shaft journal surface.

Minimum outer diameter:

Part A 26.970 mm (1.0618 in.)
B 32.470 mm (1.2783 in.)
C 33.090 mm (7.3028 in.)
D 29.970 mm (1.1799 in.)

(b) Using a dial indicator, check the shaft runout.

Maximum runout: 0.05 mm (0.0020 in.)

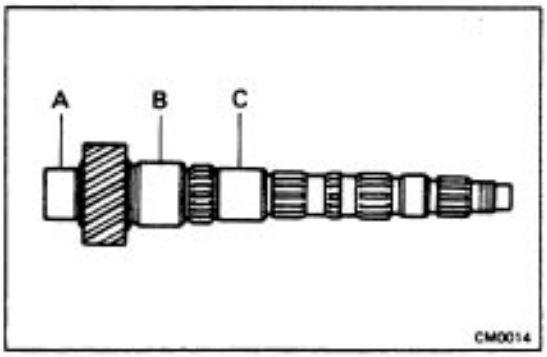


2. INSPECT OUTPUT SHAFT

(a) Using a micrometer, measure the outer diameter of the output shaft journal surface.

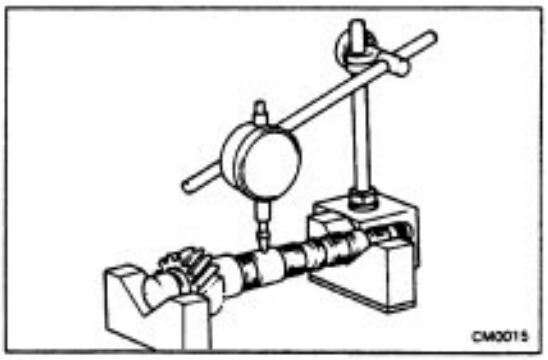
Minimum outer diameter:

Part A 31.970 mm (1.2587 in.)
6 37.970 mm (1.4949 in.)
C 31.970 mm (1.2587 in.)



(b) Using a dial indicator, check the shaft runout.

Maximum runout: 0.05 mm (0.0020 in.)



3. CHECK OIL CLEARANCE OF EACH GEAR

Using a dial indicator, measure the oil clearance between the gear and input or output shaft with the needle roller bearing installed.

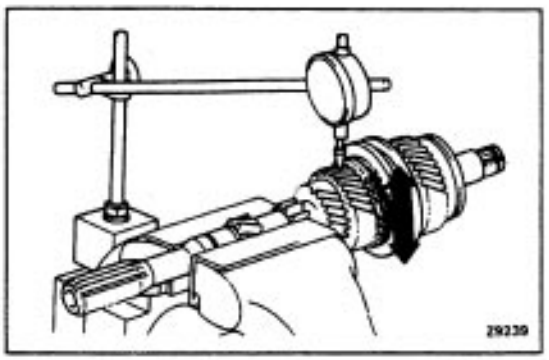
Standard clearance:

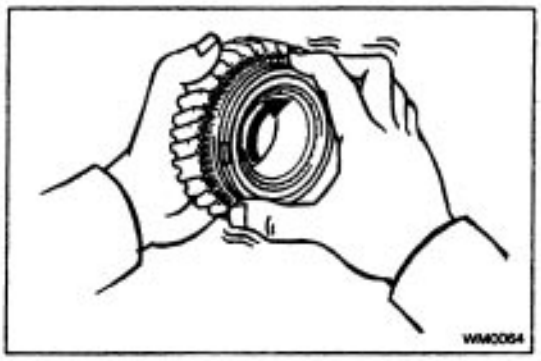
1 st, 2nd, 3rd and 4th gears
0.009 – 0.053 mm
(0.0004 – 0.0021 in.)

5th gear 0.009 – 0.050 mm
(0.0004 – 0.0020 in.)

Maximum clearance: 0.070 mm (0.0028 in.)

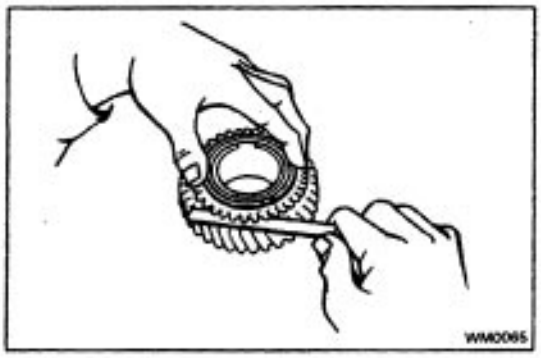
if the clearance exceeds the limit, replace the gear, needle roller bearing or shaft.





4. INSPECT SYNCHRONIZER RINGS

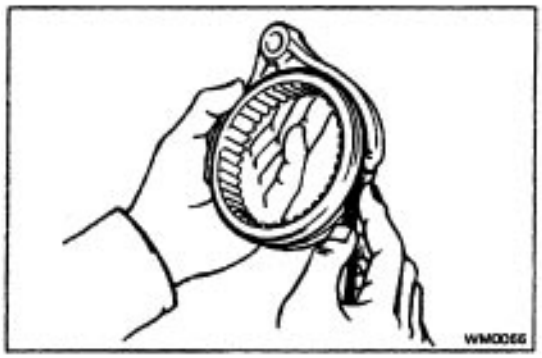
(a) Turn the ring and push it in to check the braking action.



(b) Measure the clearance between the synchronizer ring back and the gear spline end.

Minimum clearance: 0.6 mm 10.024 in.)

If the clearance is less than the limit, replace the synchronizer ring.

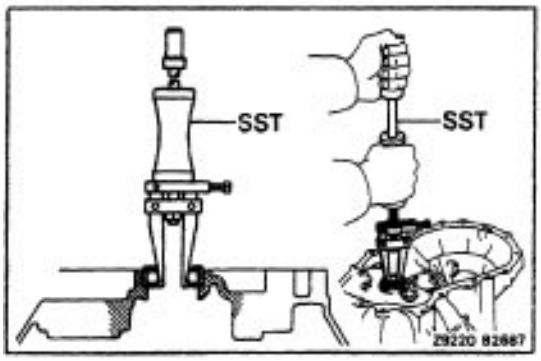


5. MEASURE CLEARANCE OF SHIFT FORKS AND HUB SLEEVES

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.

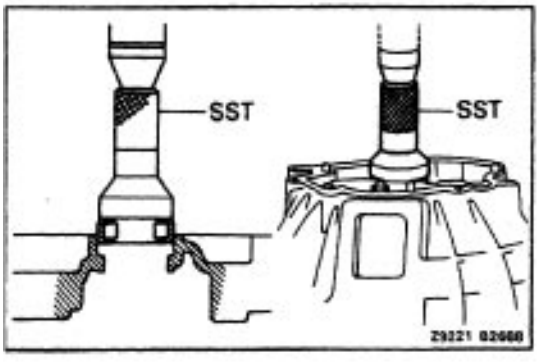


6. IF NECESSARY, REPLACE INPUT SHAFT FRONT BEARING

(a) Remove the bolt and transaxle case oil receiver.

(b) Using SST, pull out the bearing.

SST 09308–00010

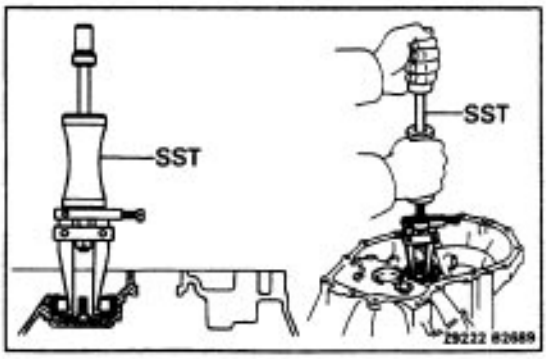


(e) Using SST, press in a new bearing.

SST 09310–35010 .

(d) Install the transaxle case oil receiver and torque the bolt.

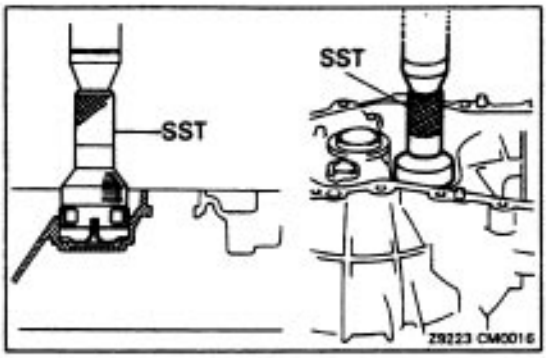
Torque: 75 kg–cm (65 in.–lb, 7.4 11f–m)



7. IF NECESSARY, REPLACE OUTPUT SHAFT FRONT BEARING

(a) Remove the bolt and bearing lock plate.

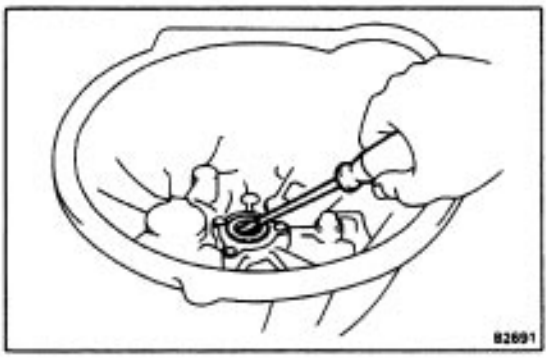
(b) Using SST, pull out the bearing.
SST 09308–00010



(c) Using SST, press in a new bearing.
SST 09310–35010

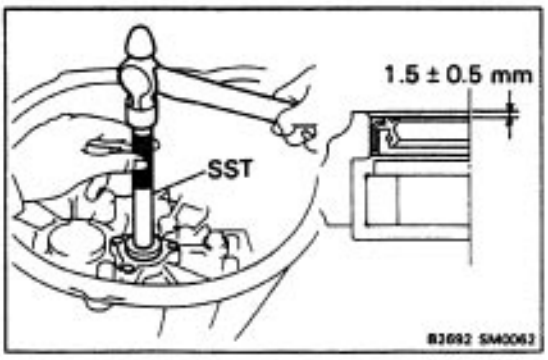
(d) Install the bearing lock plate and torque the bolt.

Torque: 185 kg–cm (13 ft–lb, 18 N–m)



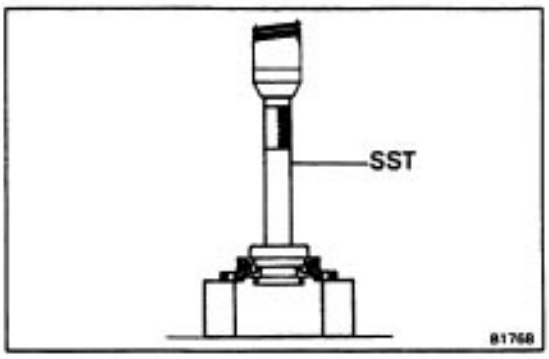
8. IF NECESSARY, REPLACE INPUT SHAFT FRONT OIL SEAL

(a) Using a screwdriver, pry out the oil seal.



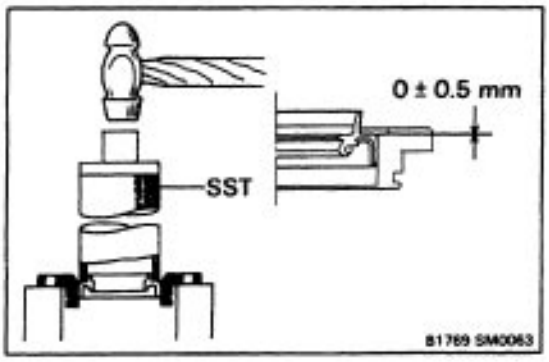
(b) Using SST, drive in a new oil seal.
SST 09608–20012 (09608–00080, 09608–03020)
Drive in depth: 1.0 – 2.0 mm (0.039 – 0.079 in.)

(c) Coat the lip of the oil seal with MP grease.

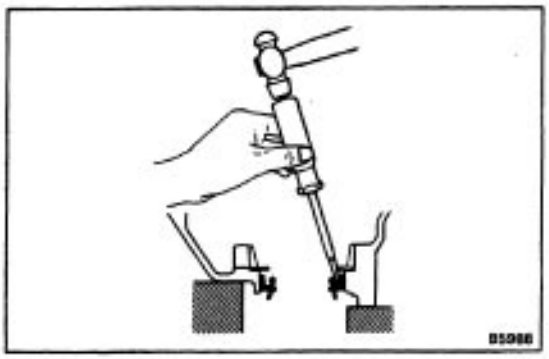


9. IF NECESSARY, REPLACE LH SIDE OIL SEAL

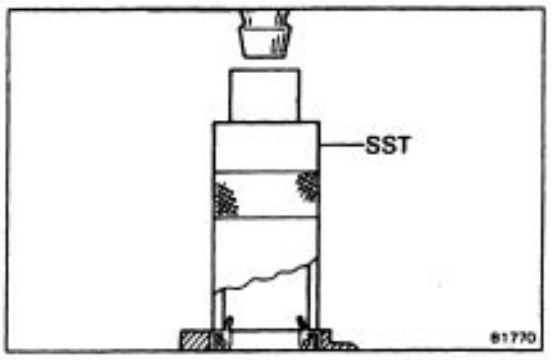
(a) Using SST, press out the oil seal from the retainer.
SST 09608–20012 (09608–00030,09608–03020)



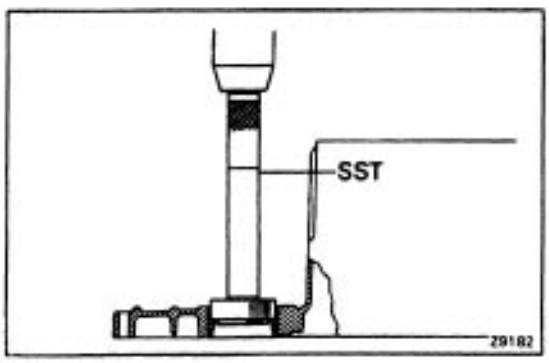
(b) Using SST, press in a new oil seal until its surface is flush with the case surface.
SST 09316–60010 (09316–00010)
(c) Coat the lip of the oil seal with IMP grease.



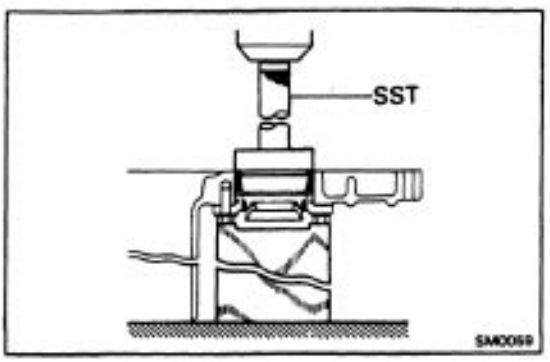
10. IF NECESSARY, REPLACE RH SIDE OIL SEAL
(a) Drive out the oil seal with a screwdriver.

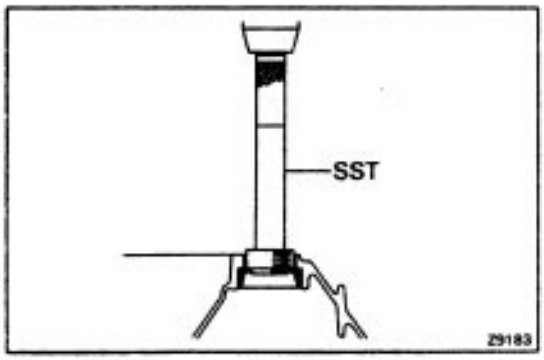


(b) Using SST, drive in a new oil seal until its surface is flush with the case surface.
SST 09316–60010 (09316–00010)
(e) Coat the lip of the oil seal with MP grease.



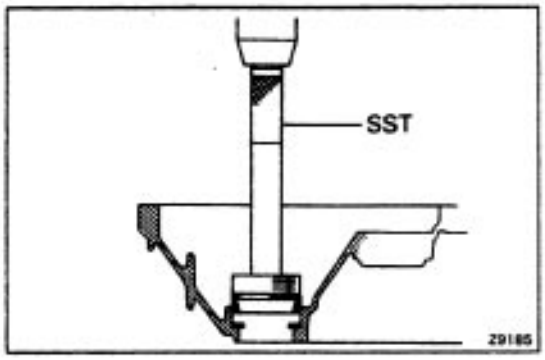
11. IF NECESSARY, REPLACE LH OUTER RACE OF SIDE BEARING
(a) Using SST, press out the outer race.
SST 09608–20012 (09608–00060,09608–03020)
(b) Install the bearing retainer without an O–ring.
(e) Install and torque the retainer bolts.
Torque: 185 kg–cm(13 ft–lb, 18 N–m)
(d) Place the thinnest shim into the case.
(See table on page MT–28)
(e) Using SST, press in a new outer race.
SST 09608–20012 (09608–03020,09608–03060)



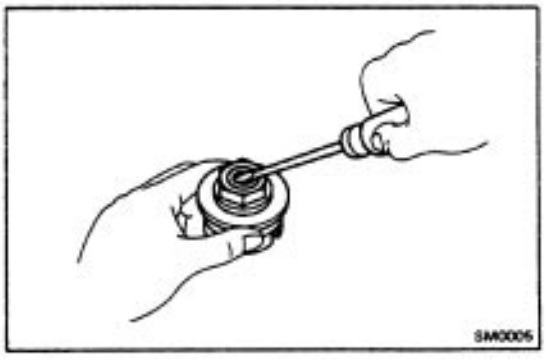


12. IF NECESSARY, REPLACE RH OUTER RACE OF SIDE BEARING

(a) Using SST, press out the outer race and shim.
SST 09608–20012 (09608–00030,09608–03020)

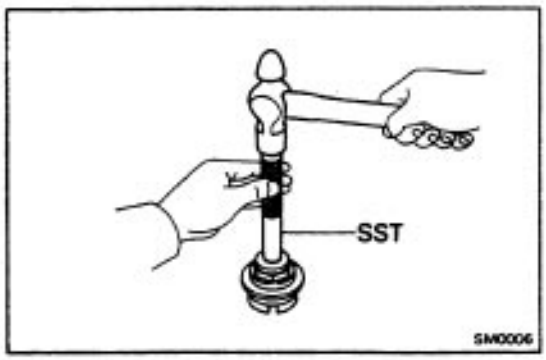


(b) Place the shim into the case.
(c) Using SST, press in a new outer race.
SST 09608–20012 (09608–03020,09608–03060)

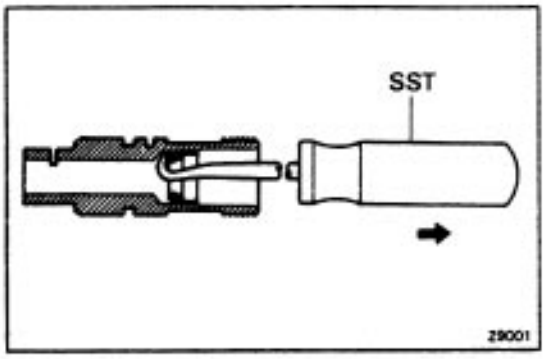


13. IF NECESSARY, REPLACE CONTROL SHAFT COVER OIL SEAL

(a) Using a screwdriver, pry out the oil seal.

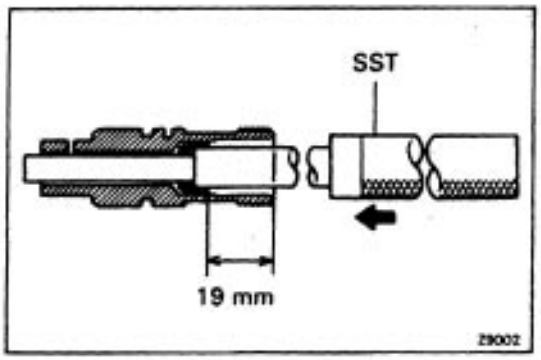


(b) Using SST, drive in a new oil seal until its surface is flush with the cover surface.
SST 09608–200 12 (09608–00080, 09608–03020)
(c) Coat the lip of the oil seal with MP grease.

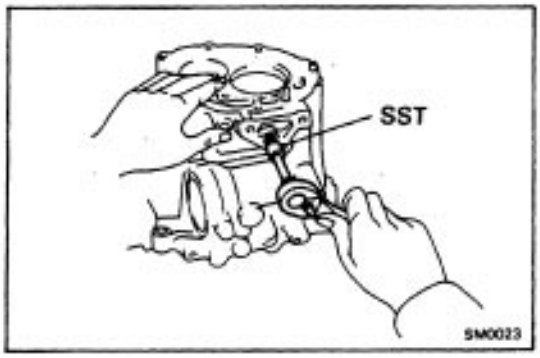


14. IF NECESSARY, REPLACE SPEEDOMETER DRIVEN GEAR OIL SEAL

(a) Using SST, pull out the oil seal.
SST 09921–00010



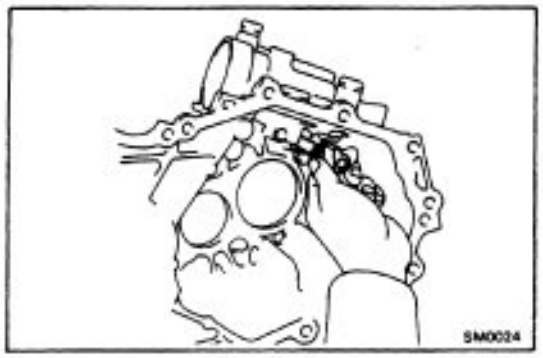
(b) Using SST, drive in a new oil seal.
SST 09201–60011
Drive in depth: 19 mm (0.75 in.)



15. IF NECESSARY, REPLACE REVERSE RESTRICT PIN

(a) Using SST, remove the straight screw plug.
SST 09313–30021

(b) Using a pin punch and hammer, drive out the slotted spring pin.

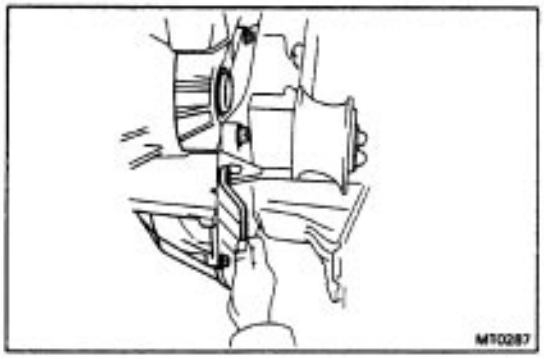


(c) Replace the reverse restrict pin.

(d) Drive in the slotted spring pin.

(e) Apply sealant to the plug threads.
Sealant: Part No. 4.8833–00080, THREE6ON D 1344, LOCTITE 242 or equivalent

(f) Using SST, install the straight screw plug.
SST 09313–30021
Torque: 130 kg–cm (9 ft–lb, 13 N–m)



INSTALLATION OF TRANSAXLE

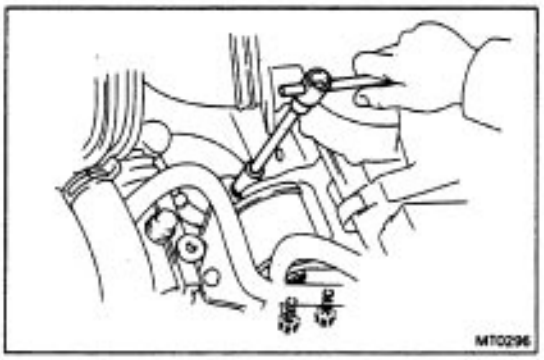
1. INSTALL TRANSAXLE TO ENGINE

Align the input shaft spline with the clutch disc, and install the transaxle to the engine. Torque the bolts.

Torque:

12 mm bolt 650 kg–cm (47 ft–lb, 64 N–m)

10 mm bolt 470 kg–cm (34 ft–lb, 46 N–m)



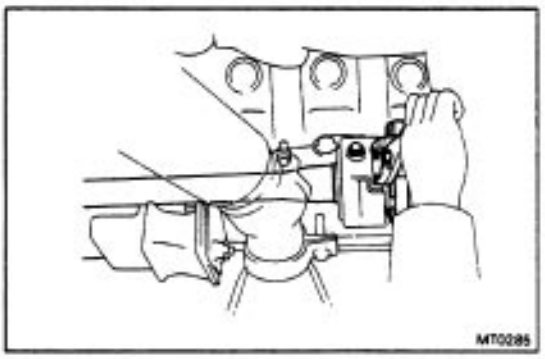
2. CONNECT LEFT ENGINE MOUNTING

Connect the left engine mounting with the bolts. Torque the bolts.

Torque: 530 kg–cm (38 ft–lb, 52 N–rm)

3. INSTALL STABILIZER BAR

(See page FA–35)



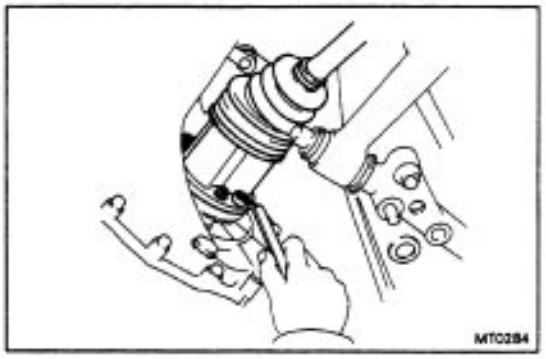
4. INSTALL CENTER DRIVE SHAFT

(a) Insert the center drive shaft to the transaxle through the bearing bracket.

(b) Secure the center drive shaft with the snap ring.

(c) Tighten a new bolt on the bearing bracket.

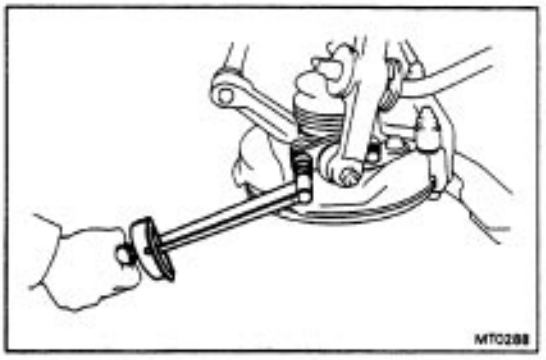
Torque: 330 kg–cm (24 ft–lb, 32 N–m)



5. CONNECT BOTH DRIVE SHAFTS

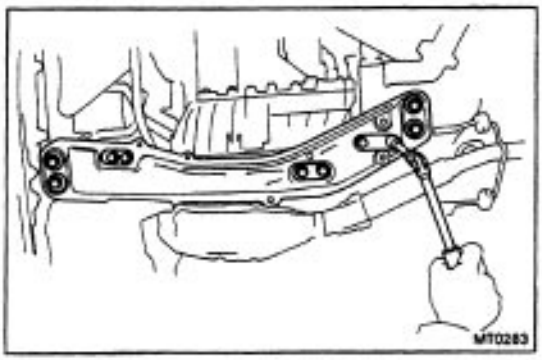
Connect the drive shaft and torque the six nuts while depressing the brake pedal.

Torque: 370 kg–cm (27 ft–lb, 36 N–m)



6. CONNECT LEFT STEERING KNUCKLE TO LOWER ARM

Torque: 1,150 kg–cm (83 ft–lb, 113 N–m)



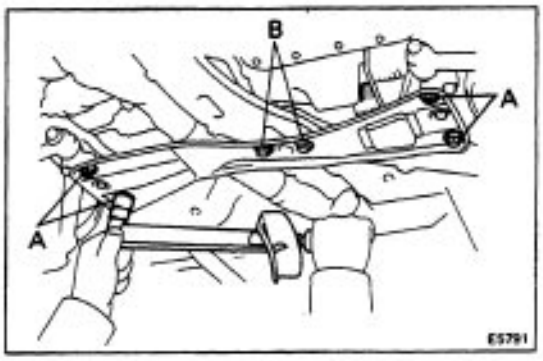
7. INSTALL ENGINE MOUNTING CENTER MEMBER

(a) Install the engine mounting center member with the four bolts. Torque the bolts.

Torque: 400 kg–cm (29 ft–lb, 39 N–m)

(b) Install the front and rear engine mounting bolts. Torque the bolts.

Torque: 440 kg–cm (32 ft–lb, 43 N–m)



8. INSTALL SUSPENSION LOWER CROSSMEMBER

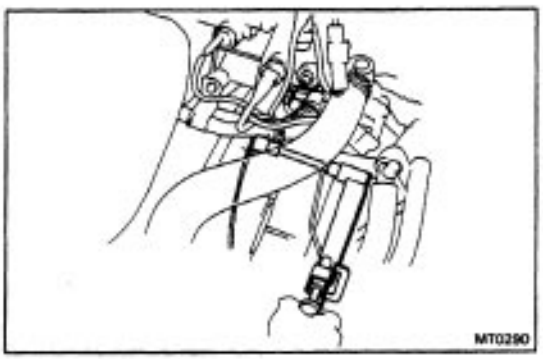
Torque: A 2,110 kg–cm (153 ft–lb, 207 N–m)
8400 kg–cm (29 ft–lb, 39 N–m))

9. CONNECT SPEEDOMETER CABLE

10. FILL TRANSAXLE WITH ATF DEXRON® II

Capacity: 2.6 liters (2.7 U S qts, 2.3Imp. qts)

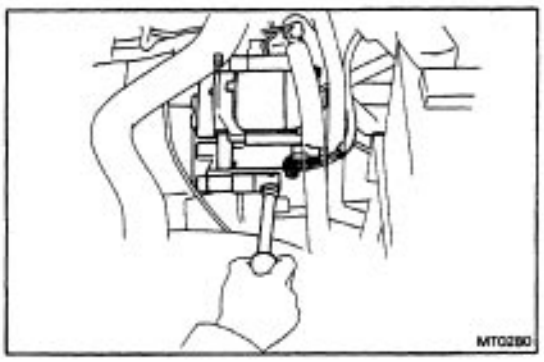
11. INSTALL UNDER COVERS



12. INSTALL TRANSAXLE MOUNTING BOLTS OF TRANSAXLE UPPER

Torque: 650 kg–cm (47 ft–lb, 64 N–m)

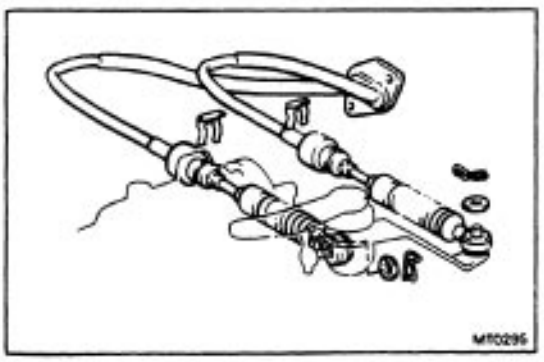
13. CONNECT BACK–UP LIGHT SWITCH CONNECTOR AND GROUND STRAP



14. INSTALL STARTER

(a) Install the starter with the two bolts.

(b) Connect the connector and cable.



15. CONNECT CONTROL CABLES

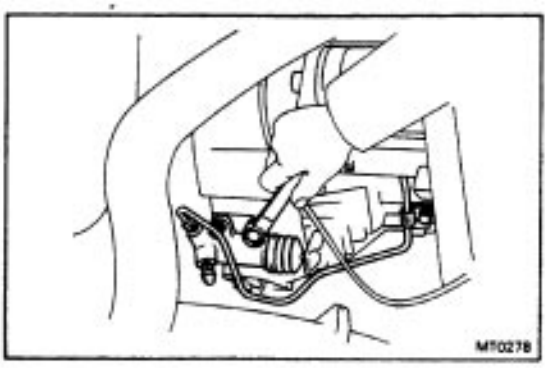
(a) Install the retainers.

(b) Connect the cables to the linkage with the washer and clip.

16. INSTALL CLUTCH TUBE BRACKET

(a) Install the bracket with a bolt.

(b) Install the retainer to the bracket.



17. INSTALL CLUTCH RELEASE CYLINDER AND TUBE CLAMP

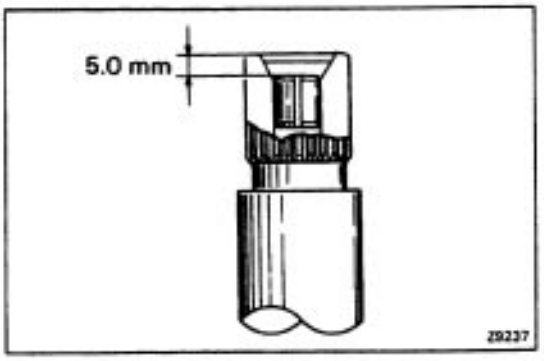
18. INSTALL NEGATIVE BATTERY CABLE

19. CHECK FRONT WHEEL ALIGNMENT

(See page FA–3)

20. PERFORM ROAD TEST

Check for any abnormal noise or operation.

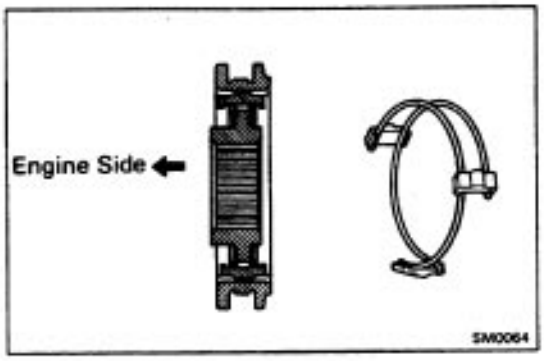


ASSEMBLY OF TRANSMISSION

(See pages MT–7 to 9)

1. IF INPUT SHAFT WAS REPLACED, DRIVE IN SLOTTED SPRING PIN

If the input shaft was replaced, drive the slotted spring pin in the input shaft to a depth of 5.0 mm (O.197 in.).

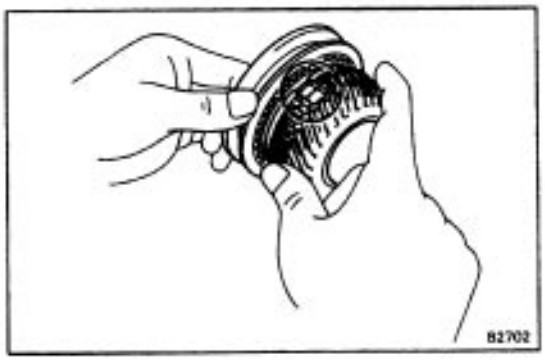


2. INSERT NO. 2 CLUTCH HUB INTO HUB SLEEVE

(a) install the clutch hub and shifting keys– to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

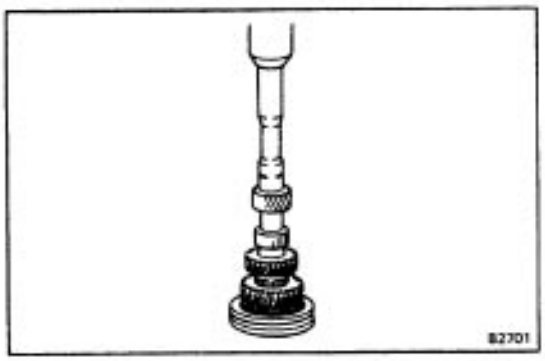
NOTICE: Install the key springs positioned so that their end gaps are not in line.



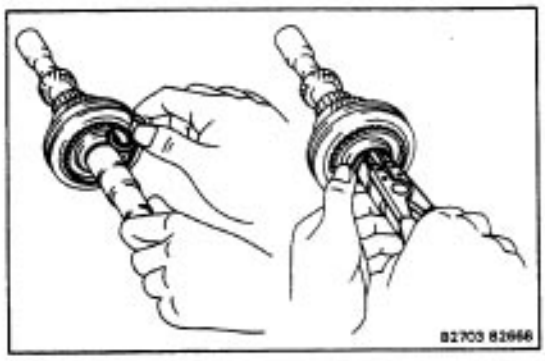
3. INSTALL THIRD GEAR, NEEDLE ROLLER BEARINGS, SYNCHRONIZER RING AND NO. 2 HUB SLEEVE ASSEMBLY TO INPUT SHAFT

(a) Apply ATF to the needle roller bearings.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.



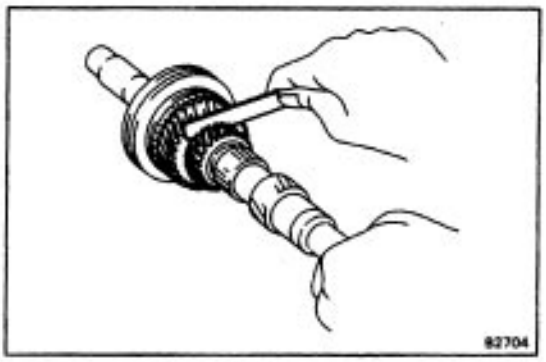
(c) Using a press, install the 3rd gear and No. 2 hub sleeve.



4. INSTALL SNAP RING

Select a snap ring that will allow minimum –axial play and install it on the shaft.

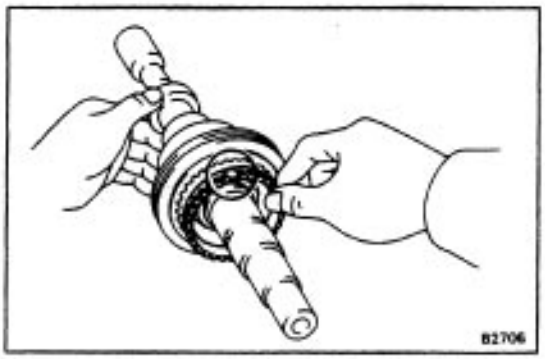
Mark	Thickness mm (in.)
1	1.95 — 2.00 (0.0768 — 0.0787)
2	2.00 — 2.05 (0.0787 — 0.0807)
3	2.05 — 2.10 (0.0807 — 0.0827)
4	2.10 — 2.15 (0.0827 — 0.0846)
5	2.15 — 2.20 (0.0846 — 0.0866)
6	2.20 — 2.25 (0.0866 — 0.0886)



5. MEASURE THIRD GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 3rd gear thrust clearance.

Standard clearance: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)

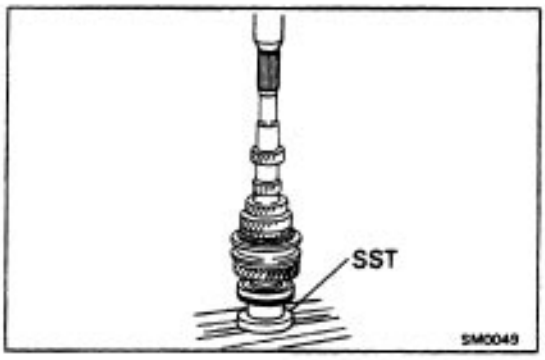


6. INSTALL SYNCHRONIZER RING, SPACER, NEEDLE ROLLER BEARINGS, FOURTH GEAR AND RADIAL BALL BEARING

(a) Install the spacer.

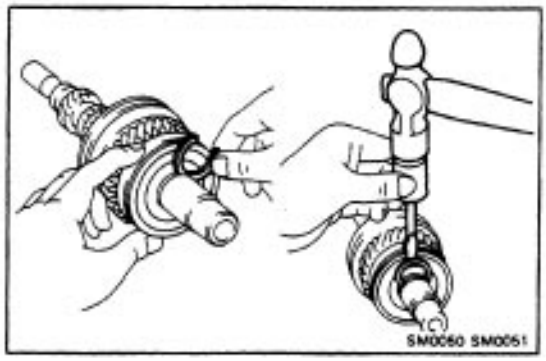
(b) Apply ATF to the needle roller bearings.

(c) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.



(d) Using SST, press in the 4th gear and radial ball bearing.

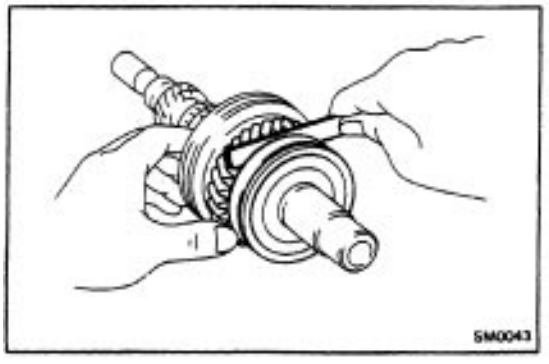
SST 09608–20012 (09608–03070)



7. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

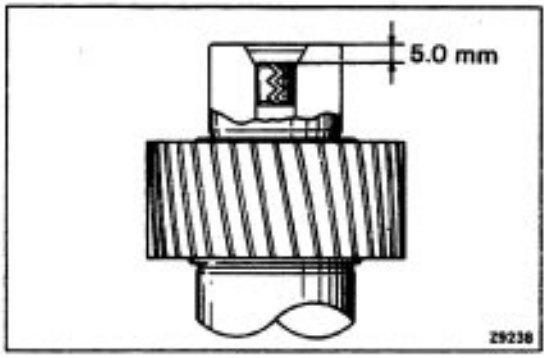
Mark	Thickness mm (in.)
A	2.15 — 2.20 (0.0846 — 0.0866)
B	2.20 — 2.25 (0.0866 — 0.0886)
C	2.25 — 2.30 (0.0886 — 0.0906)
D	2.30 — 2.35 (0.0906 — 0.0925)
E	2.35 — 2.40 (0.0925 — 0.0945)



8. MEASURE FOURTH GEAR THRUST CLEARANCE

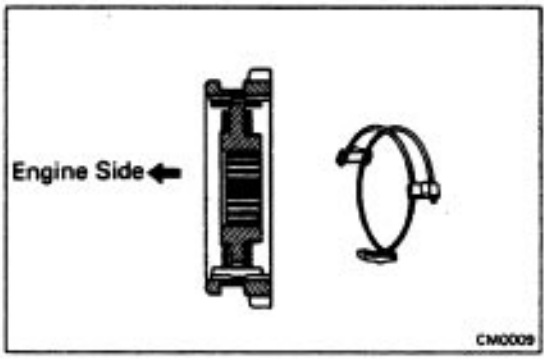
Using a feeler, gauge, measure the 4th gear thrust clearance.

Standard clearance: 0.20 – 0.45 mm (0.0079 .– 0.0177 in.)



9. IF OUTPUT SHAFT WAS REPLACED, DRIVE IN SLOTTED SPRING PIN

If the output shaft was replaced, drive the slotted spring pin in the output shaft to a depth of 5.0 mm (0.197 in.).

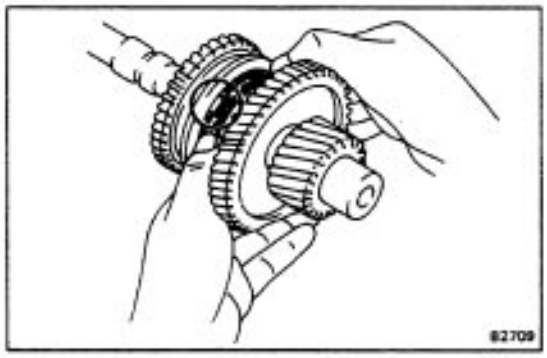


10. INSERT NO. 1 CLUTCH HUB INTO HUB SLEEVE

(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

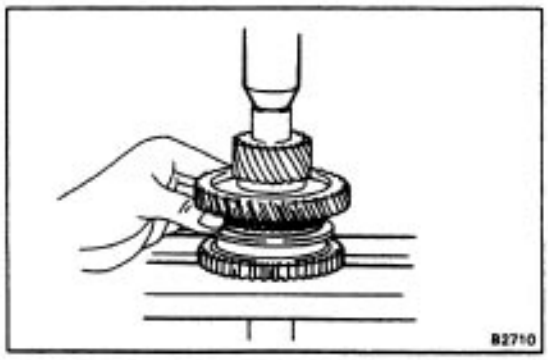
NOTICE: Install the key springs positioned so that their end gaps are not in line.



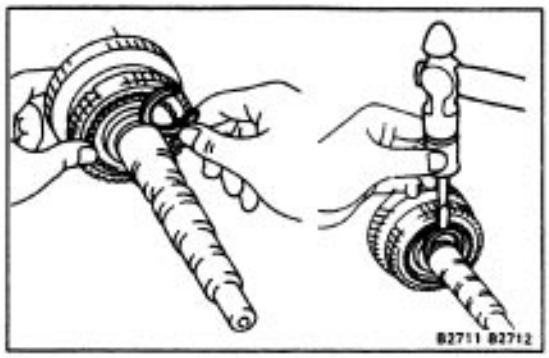
11. INSTALL THRUST WASHER, FIRST GEAR, NEEDLE ROLLER BEARING, SYNCHRONIZER RING AND NO. 1 HUB SLEEVE ASSEMBLY TO OUTPUT SHAFT

(a) Apply ATF to the needle roller bearing.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.



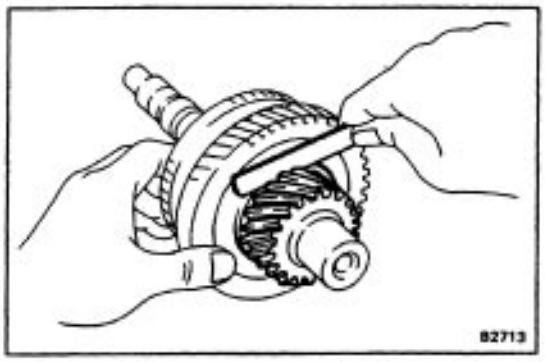
(e) Using a press, install the 1 st gear and No. 1 hub sleeve.



12. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

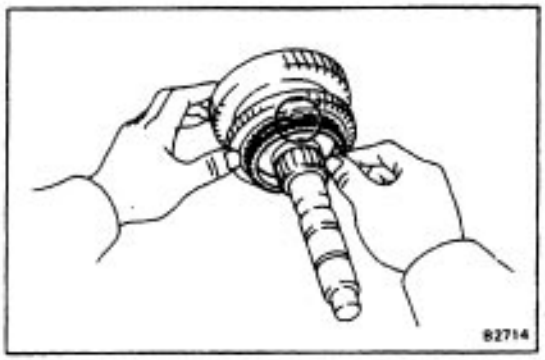
Mark	Thickness mm (in.)
1	2.50 — 2.55 (0.0984 — 0,1004)
2	2.55 — 2.60 (0.1004 — 0.1024)
3	2.60 — 2.65 (0.1024 — 0.1043)
4	2.65 — 2.70 (0.1043 — 0.1063)
5	2.70 — 2.75 (0.1063 — 0.1083)
6	2.75 — 2.80 (0.1083 — 0.1102)



13. MEASURE FIRST GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 1 st gear thrust clearance.

Standard clearance: 0.10 – 0.29 mm (0.0039 – 0.0114 in.)



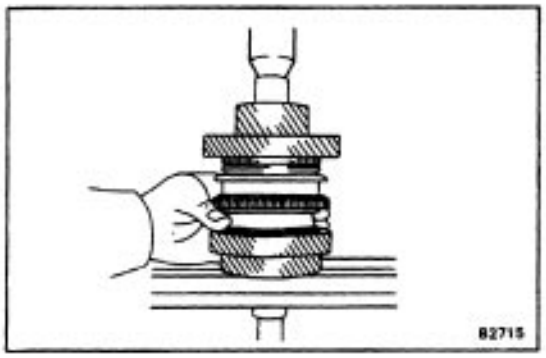
14. INSTALL SPACER, SYNCHRONIZER RING, SECOND GEAR, NEEDLE ROLLER BEARING AND THIRD DRIVEN GEAR

(a) Install the spacer.

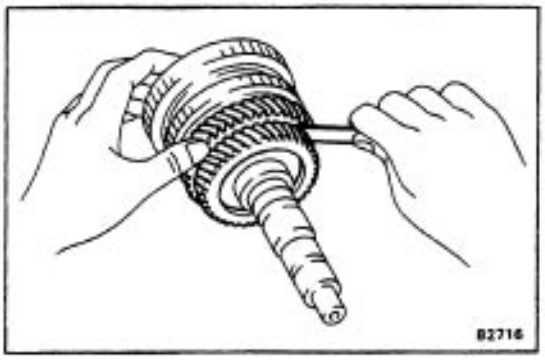
!by Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Apply ATF to the needle roller bearing.

(d) Install the 2nd gear.



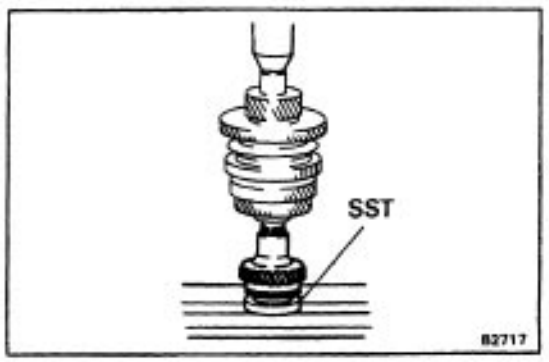
(e) Using a press, install the 3rd driven gear.



15. MEASURE SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 2nd gear thrust clearance.

Standard clearance: 0.20 – 0.44 mm (0.0079 – 0.0173 in.)

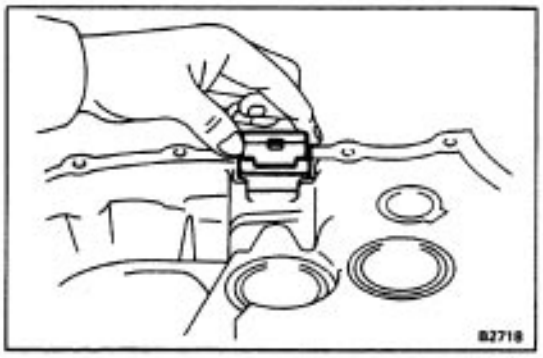


16. INSTALL OUTPUT GEAR SPACER, FOURTH DRIVEN GEAR AND RADIAL BALL BEARING

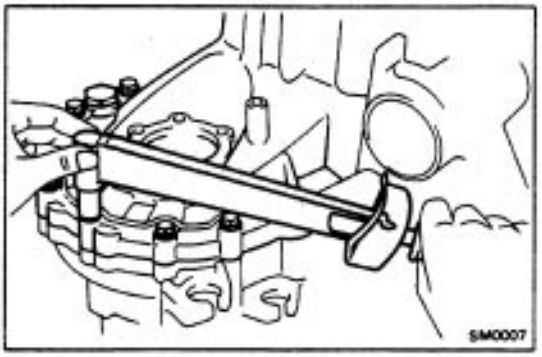
(a) Install the spacer.

(b) Using SST, press in the 4th driven gear and bearing.

SST 09608–12010 (09608–00070)

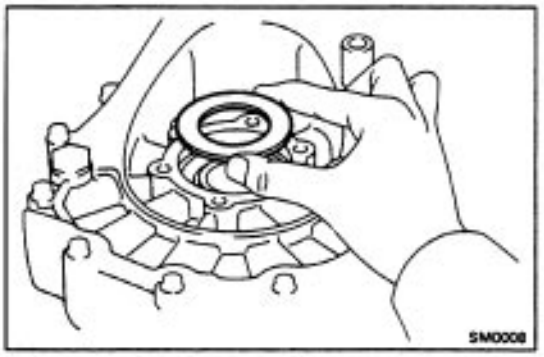


17. INSTALL MAGNET

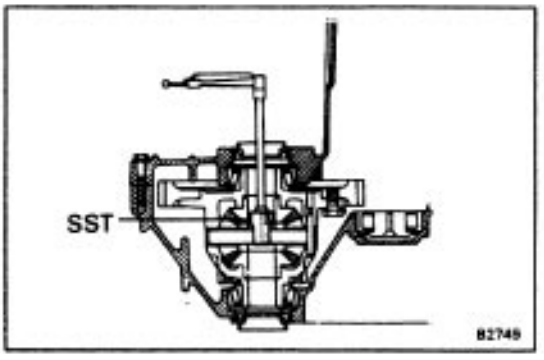


18. MEASURE DIFFERENTIAL SIDE BEARING PRELOAD

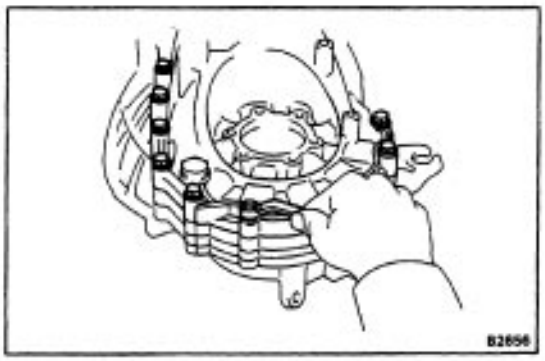
HINT: If the transmission case, transaxle case, differential
side bearing, differential case, transaxle case side shim or side bearing retainer was replaced, install the thinnest shim into the transmission case.
(Follow the step 11 on page MT–21)
(a) Install the differential to the transaxle case.
(b) Install the transmission case.
(c) Install and torque the case bolts.
Torque: 300 kg–cm (22 ft–lb, 29 N–m))
(d) Install the shim into the transmission case.
(e) Install the bearing retainer without an O–ring.
(f) Install and torque the retainer bolts.
Torque: 185 kg–cm (13 ft–lb, 18 N–m)



(g) Using SST and torque meter, measure the preload.
SST 09564–32011
Preload (starting): 10 – 16 kg–cm
(8.7 – 13.9 in.–lb, 1.0 – 1.6 N–m)
If the preload is not within specification, remove the bearing retainer. Select another shim.
NOTICE: When selecting the shim begin with one of the thinner shims in the table below and work toward thicker one.
HINT: The preload will change about 3 4 kg–cm (2.6 – 3.5 in.–lb, 0.3 – 0.4 N–m) with each shim thickness.



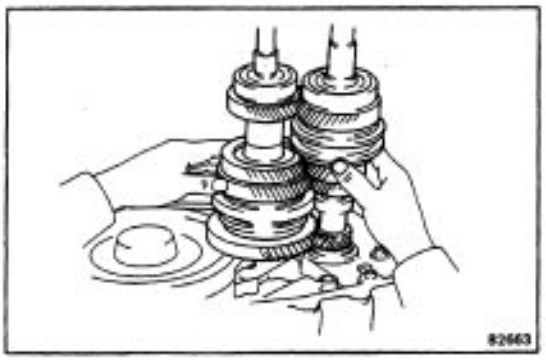
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
1	1.90 (0.0748)	11	2.40 (0.0945)
2	1.95 (0.0768)	12	2.45 (0.0965)
3	2.00 (0.0787)	13	2.50 (0.0984)
4	2.05 (0.0807)	14	2.55 (0.1004)
5	2.10 (0.0827)	15	2.60 (0.1024)
6	2.15 (0.0846)	16	2.65 (0.1043)
7	2.20 (0.0866)	17	2.70 (0.1063)
8	2.25 (0.0886)	18	2.75 (0.1083)
9	2.30 (0.0906)	19	2.80 (0.1102)
10	2.35 (0.0925)		



19. REMOVE BEARING RETAINER, SHIM AND TRANSMISSION CASE

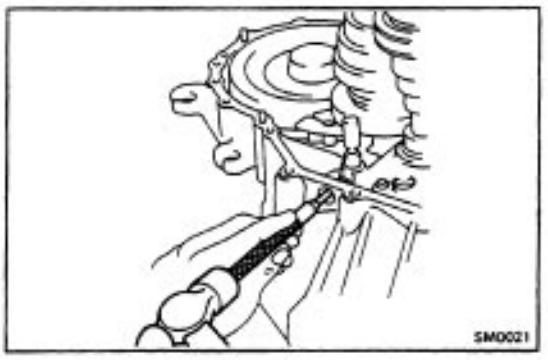
If the preload is adjusted within specification, remove the bearing retainer, shim and transmission case.

Be careful not to lose the adjusted shim.



20. INSTALL INPUT AND OUTPUT SHAFTS

Install the input shaft and output shaft together.



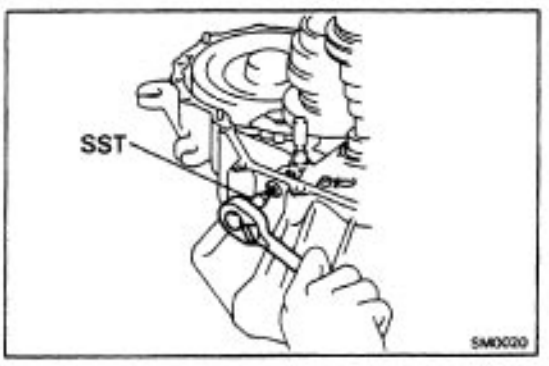
21. INSTALL NO. 2 FORK SHAFT

(a) Insert No. 2 fork shaft to the transaxle case and align the slotted spring pin hole.

(b) Using a pin punch and hammer, drive in the slotted spring pin.

(c) Apply sealant to the plug threads.

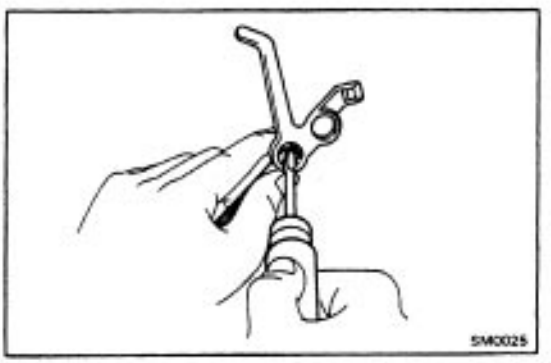
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent



(d) Using SST, install the straight screw plug.

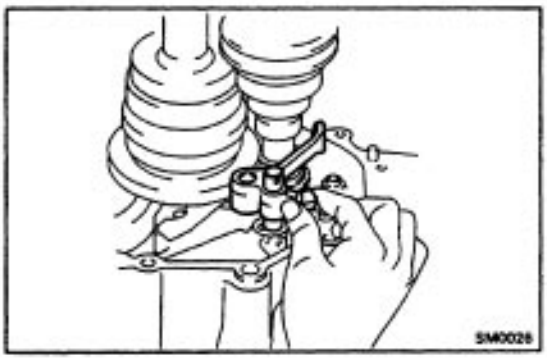
SST 09313–30021

Torque: 130 kg–cm (9 ft–lb, 13 N–m)

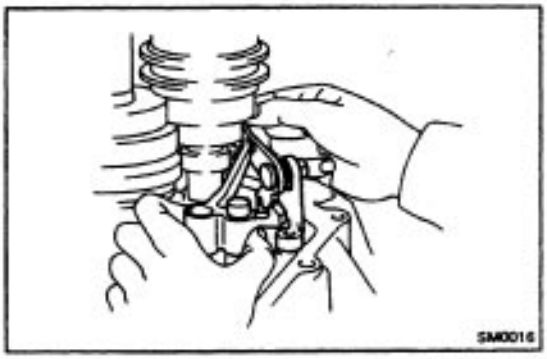


22. INSTALL REVERSE SHIFT FORK AND INTERLOCK PIN

(a) Insert interlock pin into the reverse shift fork hole.



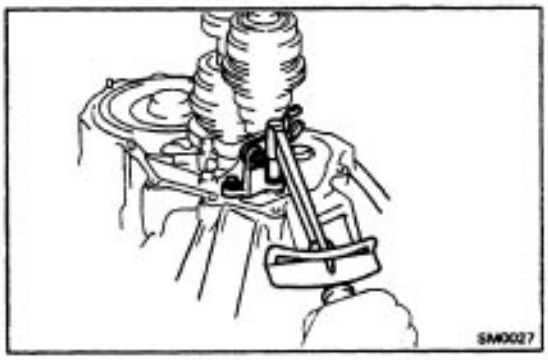
(b) Install the reverse shift fork onto No. 2 fork shaft.



23. INSTALL REVERSE SHIFT ARM

(a) Put the reverse shift arm pivot into the reverse shift fork and install the reverse shift arm to the transaxle case.

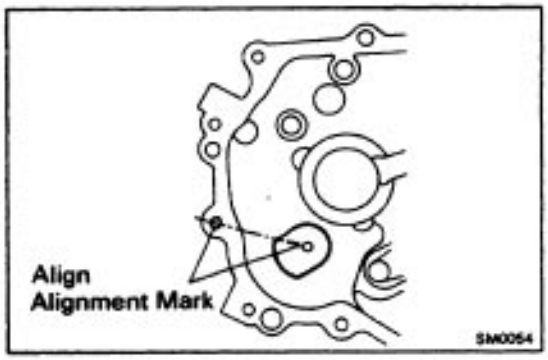
(b) Shift the reverse shift arm into reverse.



(e) Install and torque the bolts.

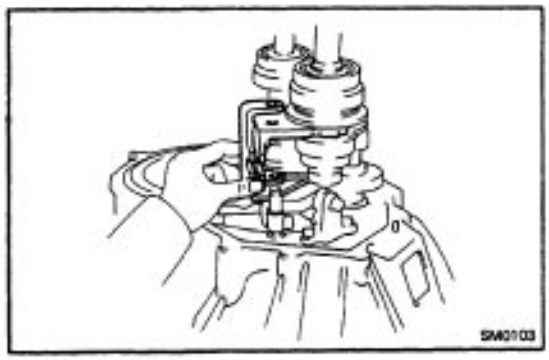
Torque: 185 kg–cm (13 ft–lb, 18 N–m)

(d) Shift the reverse shift arm to neutral position.



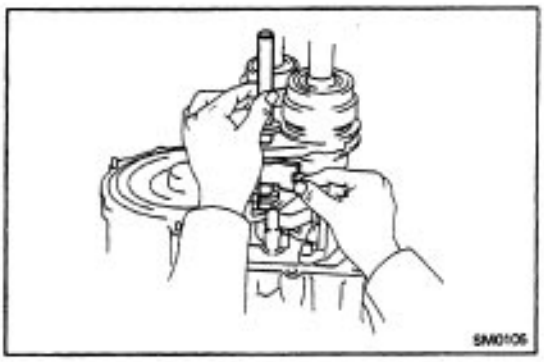
24. INSTALL REVERSE IDLER GEAR AND SHAFT

Install the reverse idler gear and shaft as shown.

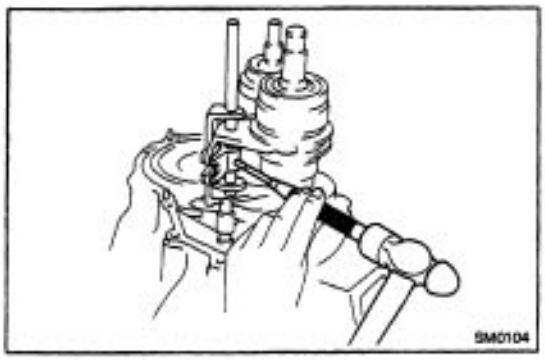


25. INSTALL NO. 1 AND NO. 2 SHIFT FORKS, NO. 1 SHIFT HEAD AND NO. 1 FORK SHAFT

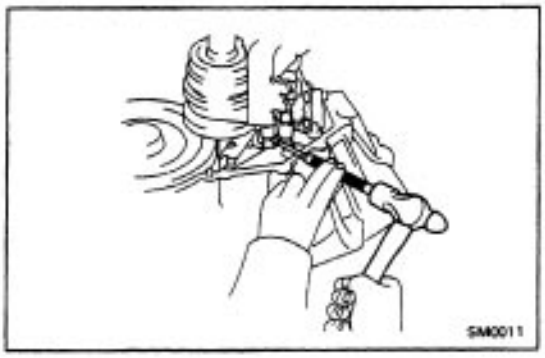
(a) Place No. 1 and No. 2 shift forks into the groove of No. 1 and No. 2 hub sleeves.



(b) Hold No. 1 shift head and insert No. 1 fork shaft into the transaxle case through No. 1 and No. 2 shift forks, No. 1 shift head and reverse shift fork.

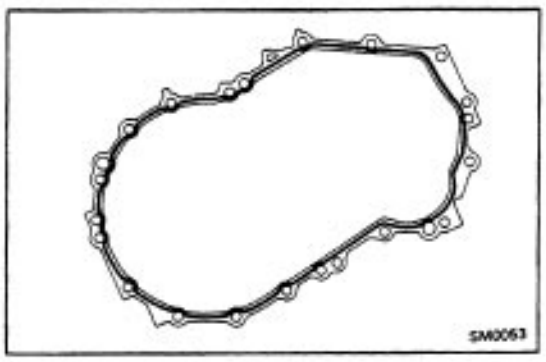


(e) Using a pin punch and hammer, drive the slotted spring pin into No. 1 shift head.



(d) Shift the fork shaft into reverse.

(e) Using a pin punch and hammer, drive the slotted spring pin into No. 1 fork shaft.



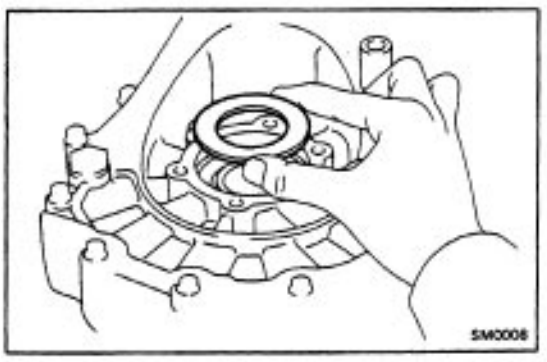
26. INSTALL TRANSMISSION CASE

(a) Apply seal packing to the transmission case as shown in the figure.

Seal packing: Part No. O8826–00090, THREE BOND 1281 or equivalent

(b) Install and torque the seventeen bolts.

Torque: 300 kg–cm (22 ft–tb, 29 N–m)



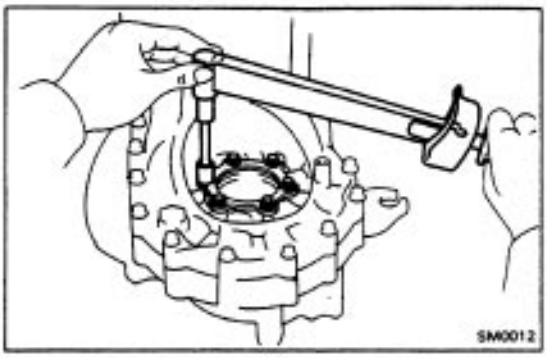
27. INSTALL SHIM AND SIDE BEARING RETAINER WITH O–RING

(a) Install a new 4–ring on the retainer.

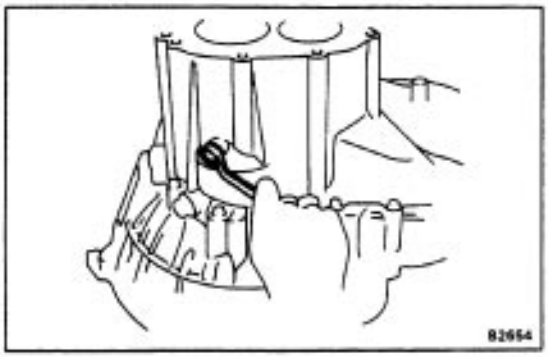
(b) Install the shim and retainer.

(c) Apply sealant to the bolt threads.

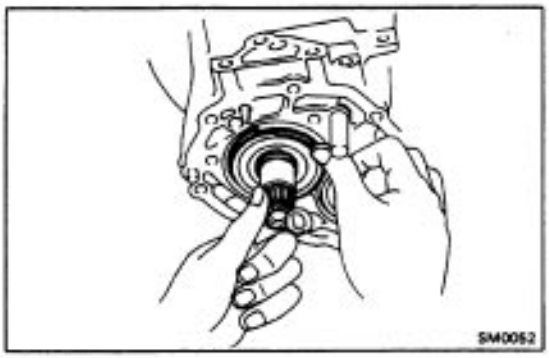
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent



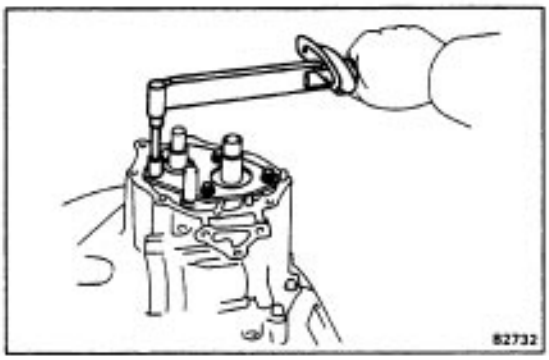
(d) Install and torque the six bolts.
Torque: 185 kg–cm (13 ft–lb, 18 N –m)



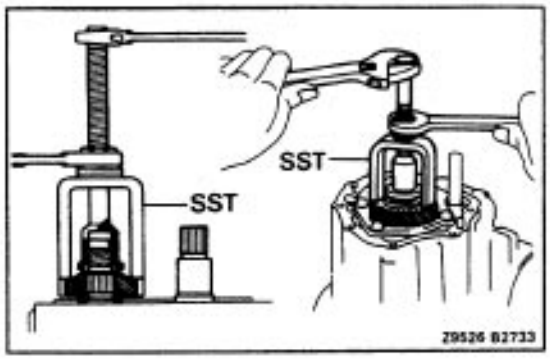
28. INSTALL AND TORQUE REVERSE IDLER GEAR SHAFT LOCK BOLT
Torque: 300 kg–cm (22 ft–lb, 29 N–m)



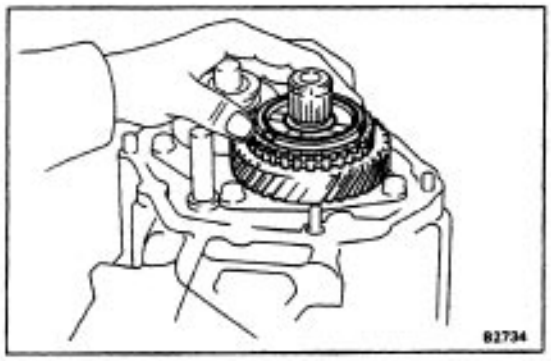
29. INSTALL BEARING SNAP RINGS



30. INSTALL REAR BEARING RETAINER
(a) Apply sealant to the bolt threads.
Sealant: Part No. 08833–00070, THREE BOND 1324, or equivalent
(b) Install and torque the five bolts.
Torque: 210 kg–cm (15 ft–lb, 21 N– m)

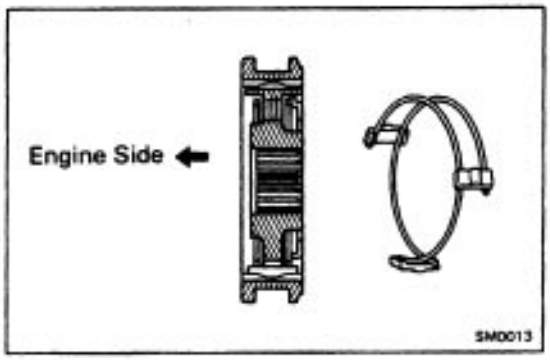


31. INSTALL FIFTH DRIVEN GEAR
Using SST, install the 5th driven gear.
SST 09309–32050



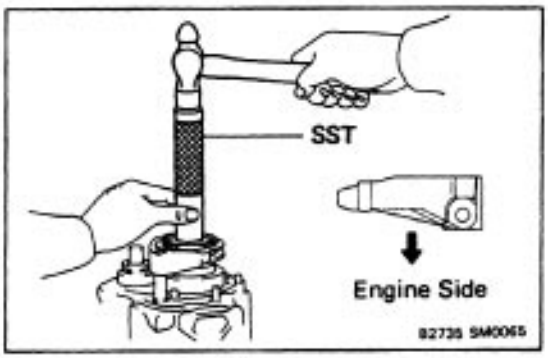
32. INSTALL SPACER, NEEDLE ROLLER BEARINGS, FIFTH GEAR AND SYNCHRONIZER RING

(a) Install the spacer.
(b) Apply ATF to the needle roller bearings.
(e) Install the 5th gear with the needle roller bearings and synchronizer ring.



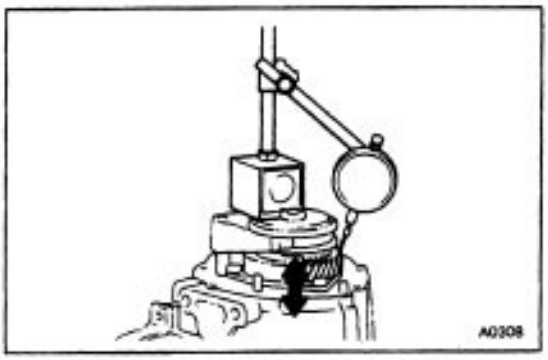
33. INSERT NO. 3 CLUTCH HUB INTO HUB SLEEVE

(a) Install the clutch hub and shifting keys to the hub sleeve.
(b) install the shifting key springs under the shifting keys.
NOTICE: Install the key springs positioned so that their end gaps are not in line.



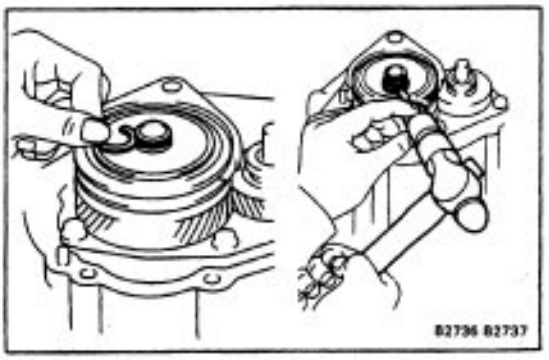
34. INSTALL NO. 3 HUB SLEEVE ASSEMBLY WITH SHIFT FORK

(a) Support the tip of the input shaft with a spacer or such to raise the transaxle assembly.
(b) Using SST, drive in No. 3 hub sleeve with shift fork.
SST 09612–22011
NOTICE: Align the synchronizer ring slots with the shifting keys.



35. MEASURE FIFTH GEAR THRUST CLEARANCE

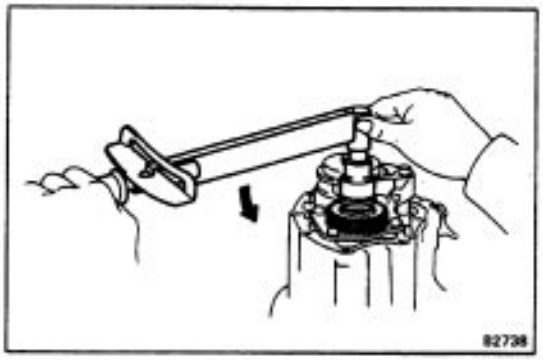
Using a dial indicator, measure the thrust clearance.
Standard clearance: 0.20 – 0.40 mm (0.0079 – 0.0157 in.)



36. INSTALL SHIFTING KEY RETAINER AND SNAP RING

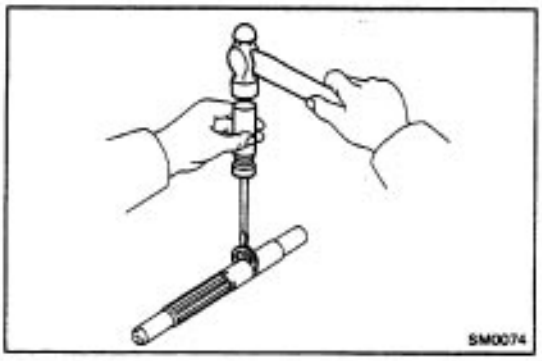
(a) Install the retainer.
(b) Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
1	1.60 — 1.65 (0.0630 — 0.0650)	9	2.00 — 2.05 (0.0787 — 0.0807)
2	1.65 — 1.70 (0.0650 — 0.0669)	10	2.05 — 2.10 (0.0807 — 0.0827)
3	1.70 — 1.75 (0.0669 — 0.0689)	11	2.10 — 2.15 (0.0827 — 0.0846)
4	1.75 — 1.80 (0.0689 — 0.0709)	12	2.15 — 2.20 (0.0846 — 0.0866)
5	1.80 — 1.85 (0.0709 — 0.0728)	13	2.20 — 2.25 (0.0866 — 0.0886)
6	1.85 — 1.90 (0.0728 — 0.0748)	14	2.25 — 2.30 (0.0886 — 0.0906)
7	1.90 — 1.95 (0.0748 — 0.0768)	15	2.30 — 2.35 (0.0906 — 0.0925)
8	1.95 — 2.00 (0.0768 — 0.0787)		



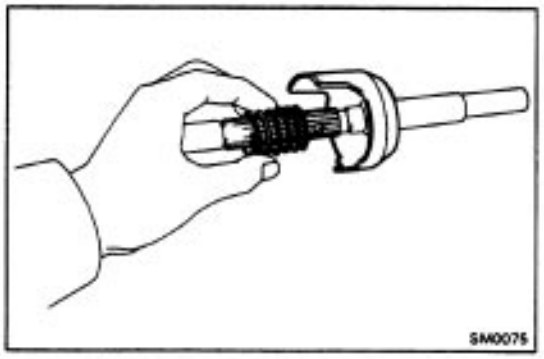
37. INSTALL LOCK NUT

(a) Engage the gear double meshing.
(b) Install and torque the nut.
Torque: 1,250 kg–cm (90 ft–lb, 123 N–m)
HINT: The lock nut has LH threads.
(c) Disengage the gear double meshing.
(d) Stake the lock nut.

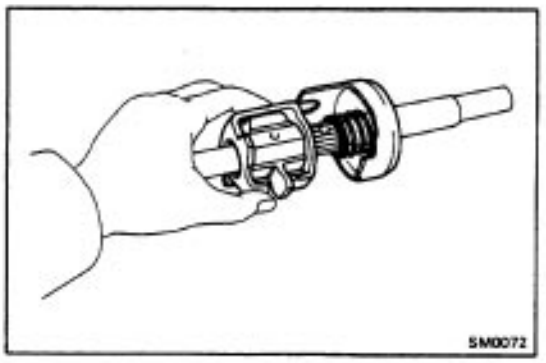


38. ASSEMBLE SHIFT AND SELECT LEVER ASSEMBLY

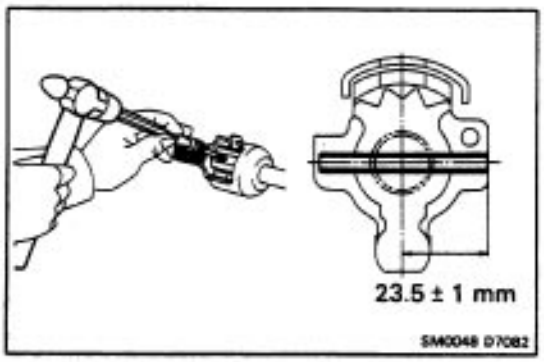
(a) Apply ATF to the shaft.
(b) Install the E–ring.



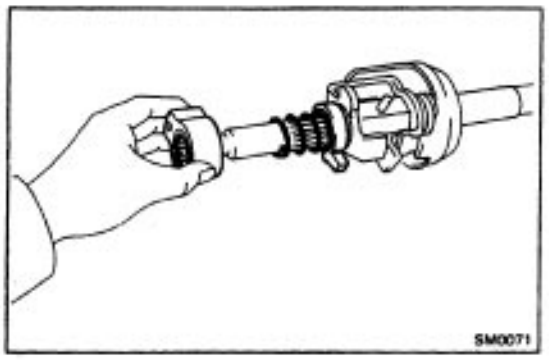
(c) Install shift interlock plate and spring.



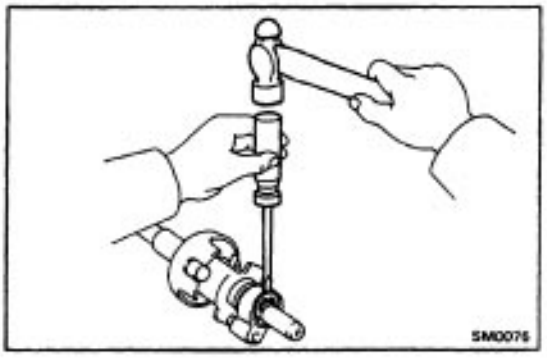
(d) Install No. 1 shift inner lever with the shift fork lock plate.
HINT: One of the spline teeth of the shift and select lever shaft has been eliminated. Therefore, be certain to correctly align this portion to the matching portions on the parts during assembly.



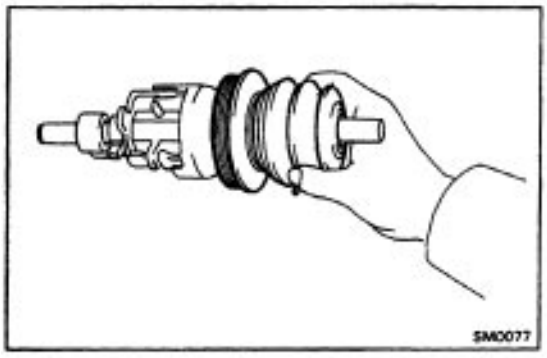
(e) Using a pin punch and hammer, drive i n the slotted spring pin.



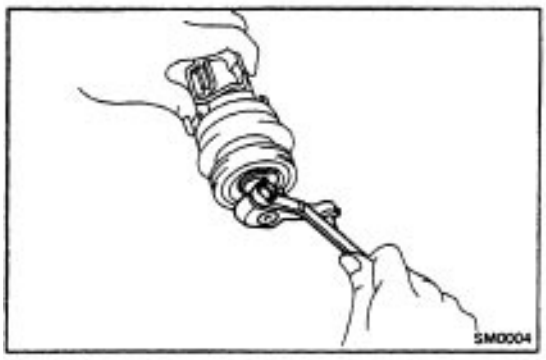
(f) Install No. 2 shift inner lever, spring and reverse restrict pin holder.



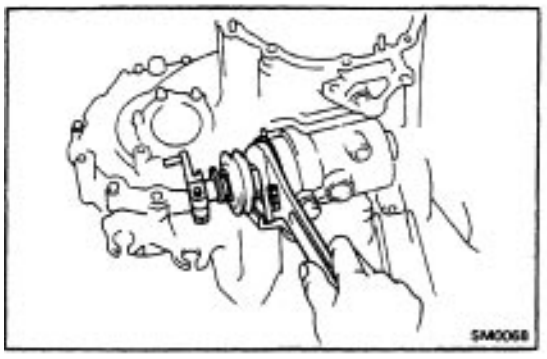
(g) Install the E–ring.



(h) Install the control shift cover and dust boot.
HINT: Make sure to install the boot in correct direction. Position the air bleed of the boot downward.



Install the control shift lever and insert the lever lock pin to the lever. Install the washer and lock nut.



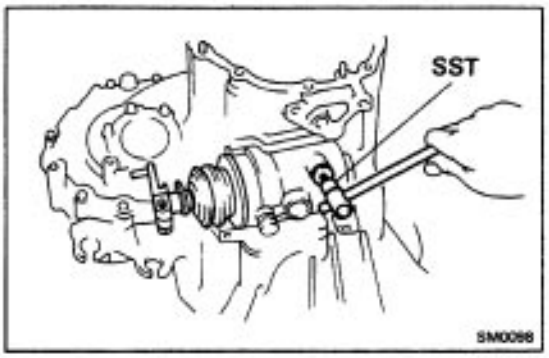
39. INSTALL SHIFT AND SELECT LEVER ASSEMBLY

(a) Apply seal packing to the underside of the flanged portion of the control shift cover.
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

(b) Install the shift and select lever assembly and torque the control shaft cover. ._

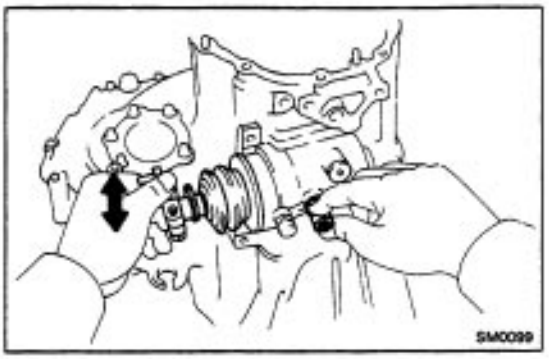
Torque: 375 kg–cm (27 ft–lb, 37 N–m)

40. INSTALL NO. 2 LOCK BALL ASSEMBLY

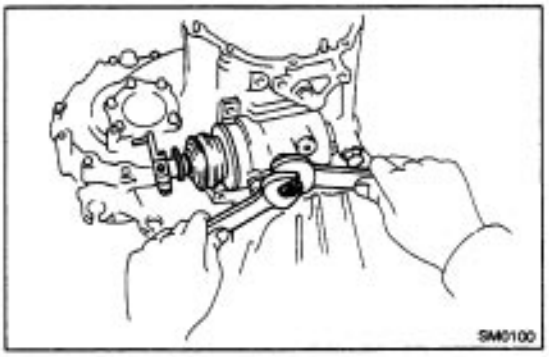


(a) Apply sealant to the lock ball assembly threads.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(b) Using SST, install and torque the plug.
SST 09313–30021
Torque: 230 kg–cm (117 ft–lb, 23 N–m)

41. INSTALL AND ADJUST NO. 1 LOCK BALL ASSEMBLY



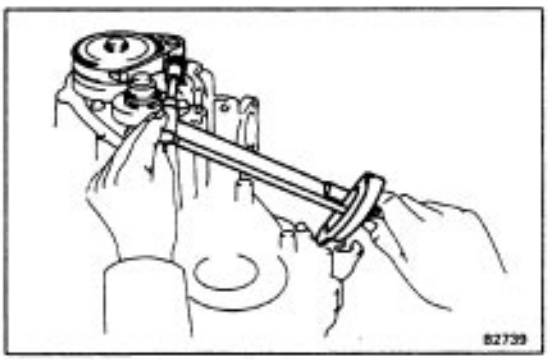
(a) Fully loosen the lock nut.
(b) Fully screw in the lock ball.
(e) Loosen the lock ball to where the play at the shift outer lever tip is 0.1 – 0.5 mm (0.004 – 0.020 in.).



(d) Hold the lock ball and tighten the lock nut.
Torque: 375 kg–cm (27 ft–lb, 37 N–m)
(e) Check the shift outer lever tip play.
Lever tip play: 0.1 – 0.5 mm (0.004 – 0.020 in.)

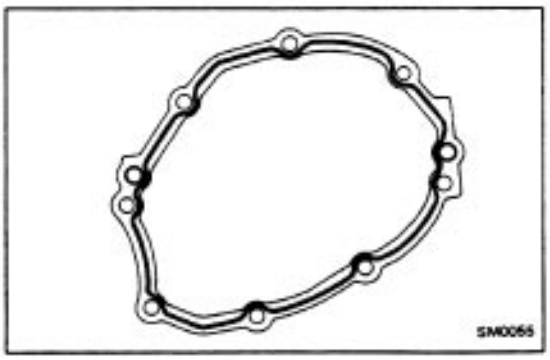
42. INSTALL SELECTING BELLCRANK

43. INSTALL NO. 3 SHIFT FORK SECURING BOLT

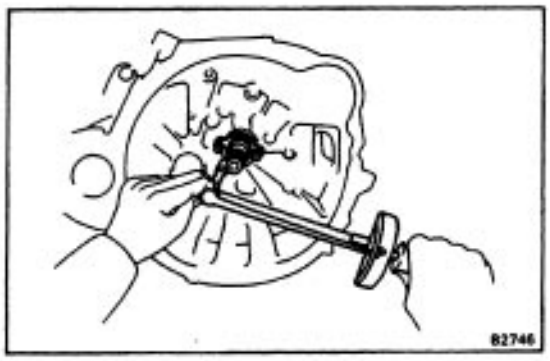


Install and torque the bolt.
Torque: 185 kg–cm (13 ft–lb, 18 N–m)

44. INSTALL TRANSMISSION CASE COVER

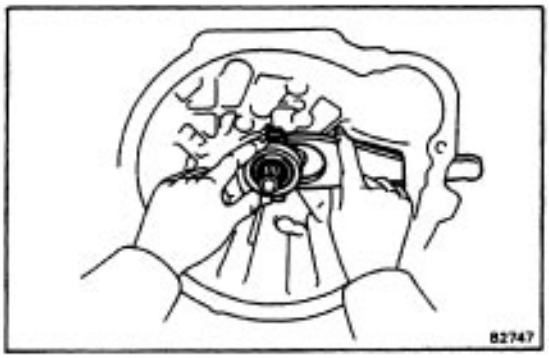


(a) Apply seal packing to the transmission case as shown in the figure.
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent
(b) Apply sealant to the bolt threads.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(c) Install and torque the eight bolts.
Torque: 300 kg–cm (22 ft–lb, 29 N–m)



45. INSTALL RELEASE BEARING RETAINER

Torque: 75 kg–cm (65 in.–lb, 7.4 N–m)



46. INSTALL RELEASE FORK AND BEARING

(a) Apply molybdenum disulphide lithium base grease to the following parts:

- Release bearing hub inside groove
- Input shaft spline
- Release fork contact surface

(b) Apply MP grease to the front surface of the release bearing.

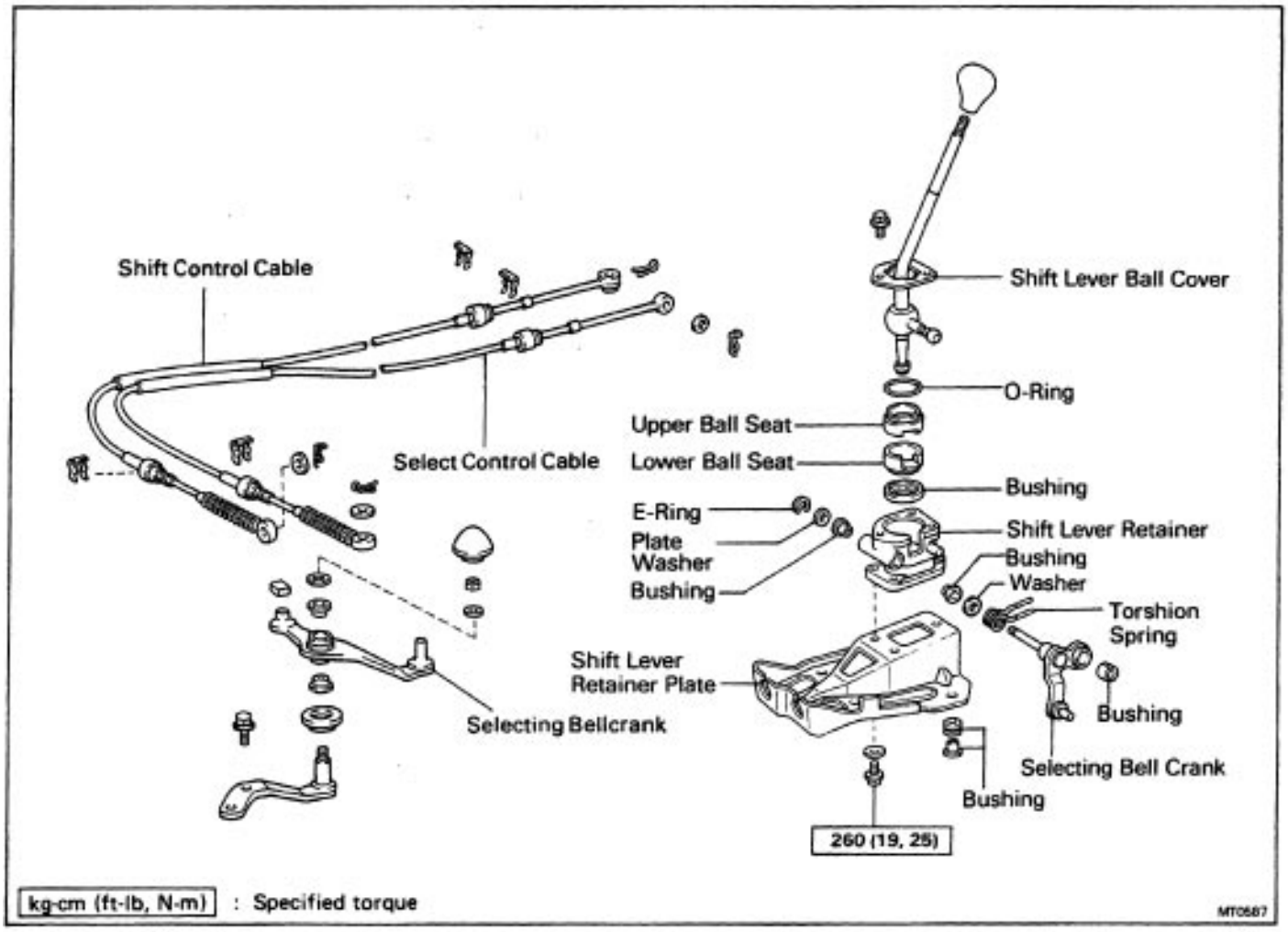
47. INSTALL BACK–UP LIGHT SWITCH

Torque: 450 kg–cm (33 ft–lb, 44 N–m)

48. INSTALL SPEEDOMETER DRIVEN GEAR

SHIFT LEVER AND CONTROL CABLE

COMPONENTS



DIFFERENTIAL

REMOVAL OF DIFFERENTIAL

1. REMOVE TRANSAXLE
(See pages MT–4 to 6)
2. REMOVE DIFFERENTIAL ASSEMBLY
(See steps 1 to 24 on pages MT–10 to 14)

REPLACEMENT OF DIFFERENTIAL

(See pages AT–158 to 160)

ADJUSTMENT OF DIFFERENTIAL CASE

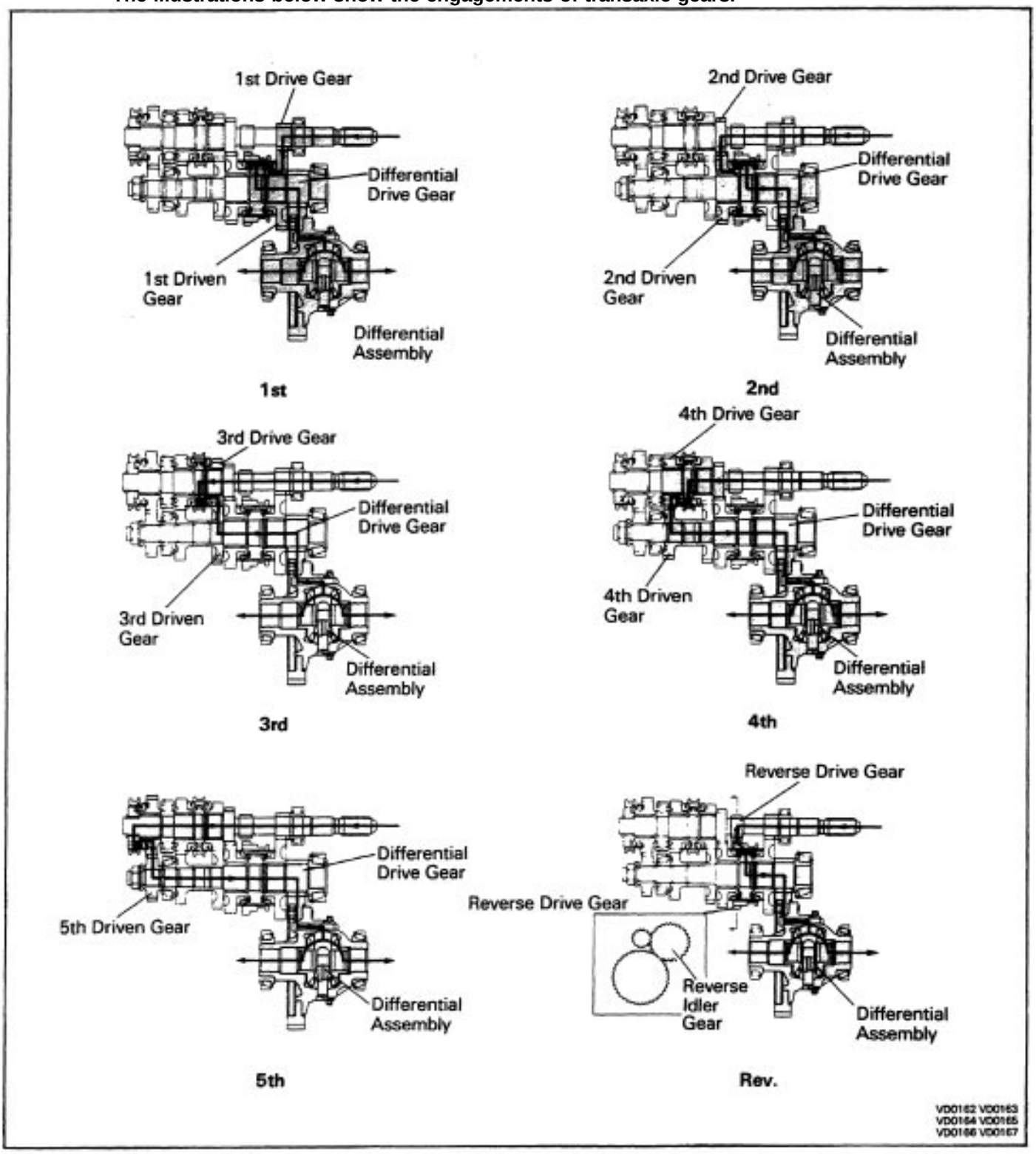
(See pages AT–161, 162)

INSTALLATION OF DIFFERENTIAL

1. INSTALL DIFFERENTIAL ASSEMBLY TO TRANSAXLE
(See steps 18 to 37 and 39 to 48 on pages MT–28 to 37)
2. INSTALL TRANSAXLE
(See pages MT–38 to 40)

DESCRIPTION

- **Transaxle types E52 are constant mesh synchronizers for forward gears, and a sliding mesh reverse gear.**
- **The input shaft is composed of the 1 st and 2nd speed gears and the reverse drive gear, and the output shaft is composed of the drive gear (for use with the ring gear).**
- **The oil used in transaxle is as follows:**
  E52 . . . . . : . . . . SAE75W–90 or 80W–90
- **The illustrations below show the engagements of transaxle gears.**



PRECAUTIONS

When working with FIPG material, you must be observe the following.

- **Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.**
- **Thoroughly clean all components to remove all the loose material.**
- **Clean both sealing surfaces with a non–residue solvent.**
- **Apply the seal packing in approx.1 mm (0.04 in.) bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of apptication. Otherwise, the packing (FIPG) material must be removed and reapplied.**

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Noise	Transmission or differential faulty Wrong oil grade Oil level low	Disassemble and inspect transmission or differential Replace oil Add oil	MT–47,85
Oil leakage	Oil level too high Oil seal, O–ring or gasket worn or damaged	Drain oil Replace oil seal, O–ring or gasket	MT–47
Hard to shift or will not shift	Control cable faulty Transmission faulty	Replace control cable Disassemble and inspect transmission	MT–47
Jumps out of gear	Transmission faulty	Disassemble and inspect transmission	MT–47

PRECAUTIONS

When working with FIPG material, you must be observe the following.

- **Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.**
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- **Clean both sealing surfaces with a non–residue solvent.**
- **Apply the seal packing in approx.1 mm (0.04 in.) bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of apptication. Otherwise, the packing (FIPG) material must be removed and reapplied.**

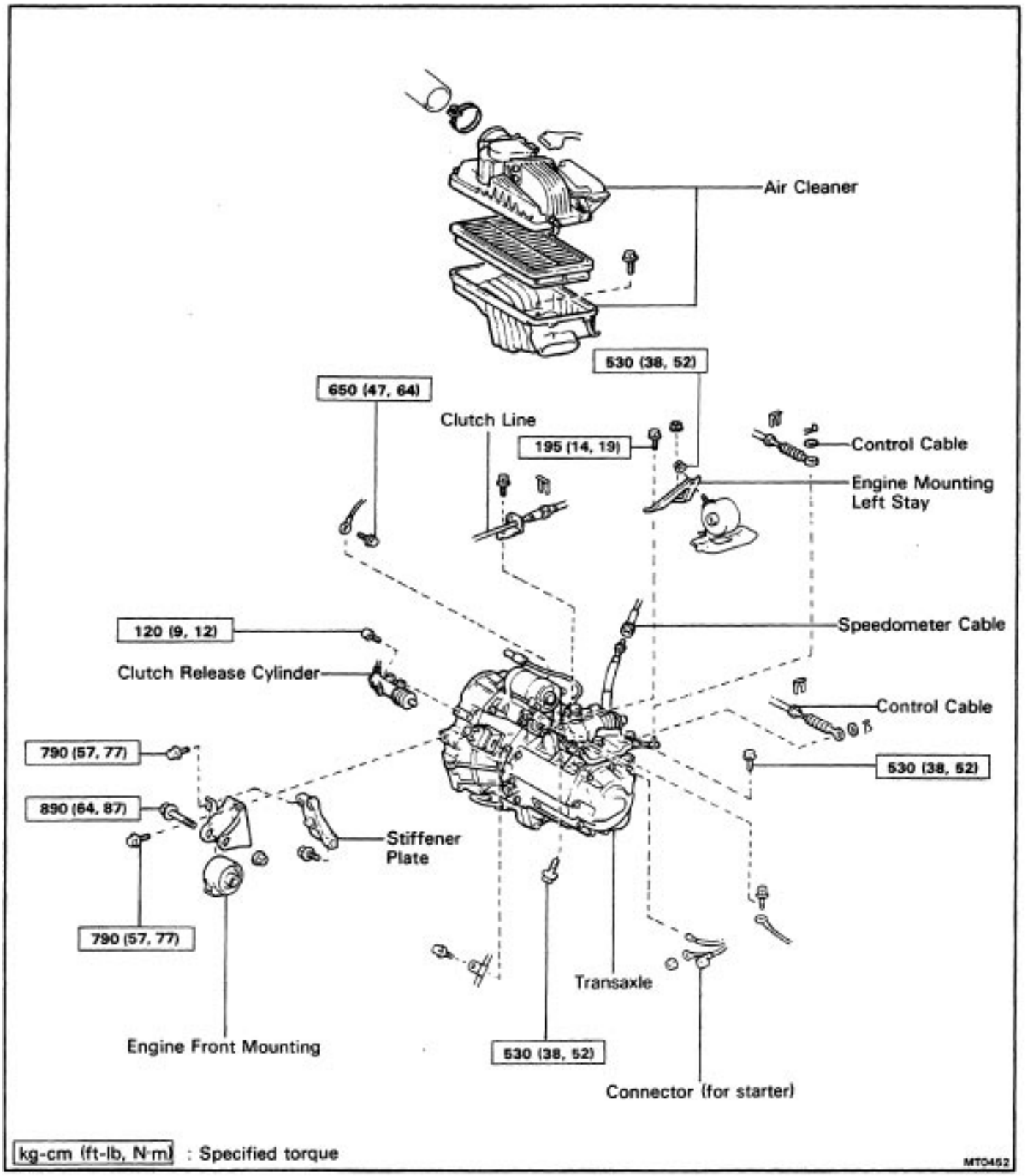
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Noise	Transmission or differential faulty Wrong oil grade Oil level low	Disassemble and inspect transmission or differential Replace oil Add oil	MT–47,85
Oil leakage	Oil level too high Oil seal, O–ring or gasket worn or damaged	Drain oil Replace oil seal, O–ring or gasket	MT–47
Hard to shift or will not shift	Control cable faulty Transmission faulty	Replace control cable Disassemble and inspect transmission	MT–47
Jumps out of gear	Transmission faulty	Disassemble and inspect transmission	MT–47

REMOVAL AND INSTALLATION OF TRANSAXLE

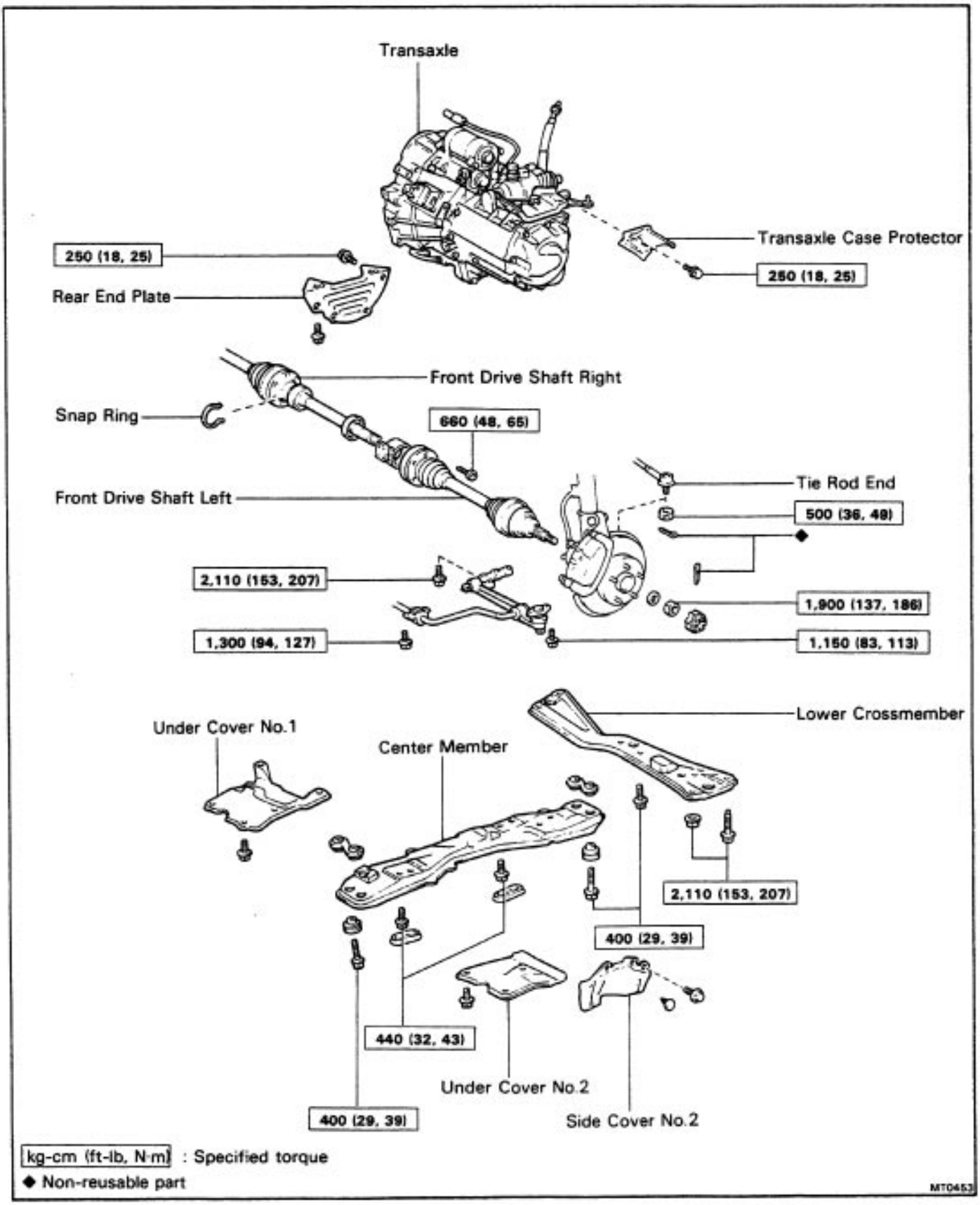
Remove and install the parts as shown.

HINT: Oil grade: API GL–4 or GL–5
Viscosity: SAE 75W–90 or 80W–90
Capacity: 4.2 litter (4.4 US qts, 3.7 Imp. qts)

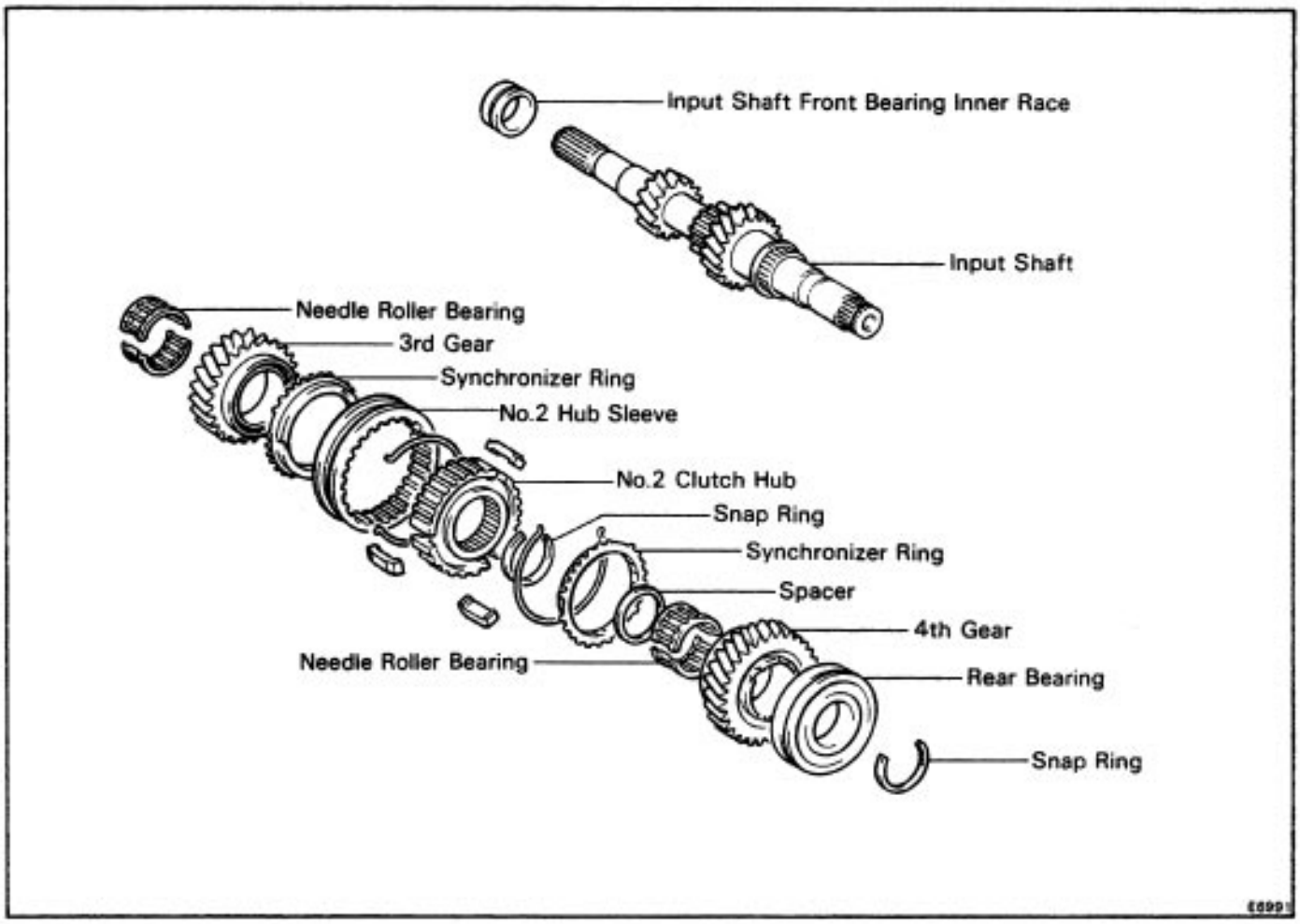


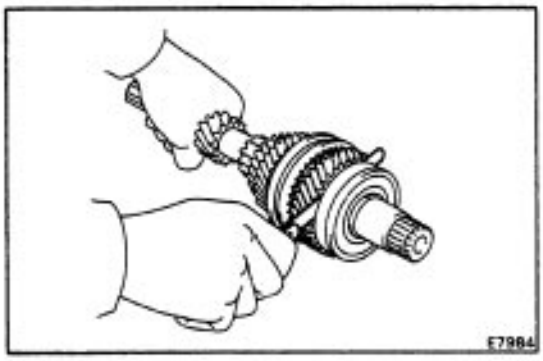
REMOVAL AND INSTALLATION OF TRANSAXLE Cont'd

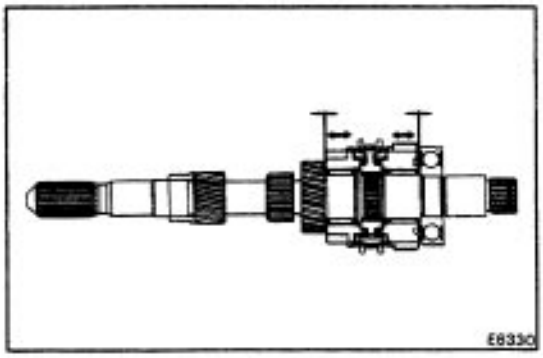
Remove and install the parts as shown.



COMPONENT PARTS
Input Shaft Assembly







DISASSEMBLY OF INPUT SHAFT ASSEMBLY

1. MEASURE THIRD AND FOURTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the thrust clearance.

Standard clearance:

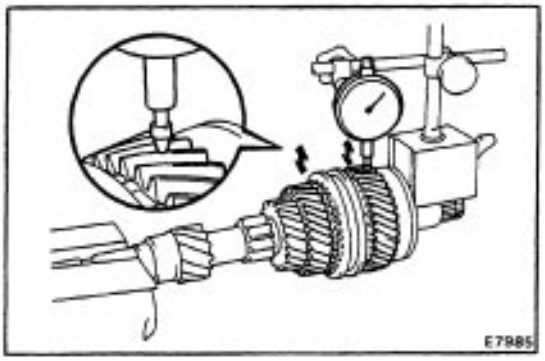
3rd gear 0.10 – 0.35 mm (0.0039 – 0.0138 in.)

4th gear 0.10 – 0.55 mm (0.0039 – 0.0217 in.)

Maximum clearance:

3rd gear 0.40 mm (0.0157 in.)

4th gear 0.60 mm (0.0236 in.)



2. CHECK OIL CLEARANCE OF THIRD AND FOURTH GEAR

Using dial indicator, measure the oil clearance between the gear and shaft.

Standard clearance:

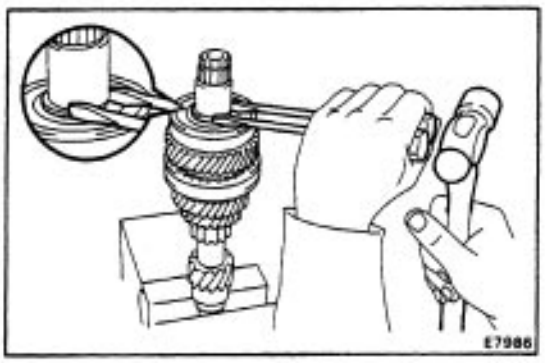
3rd gear 0.009 – 0.053 mm (0.0004 – 0.0021 in.)

4th gear 0.009 – 0.051 mm (0.0004 – 0.0020 in.)

Maximum clearance:

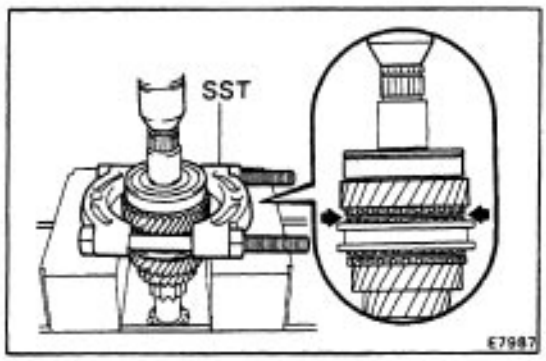
3rd and 4th gear 0.070 mm (0.0028 in.)

If clearance exceeds the limit, replace the gear, needle roller bearing or shaft.



3. REMOVE SNAP RING

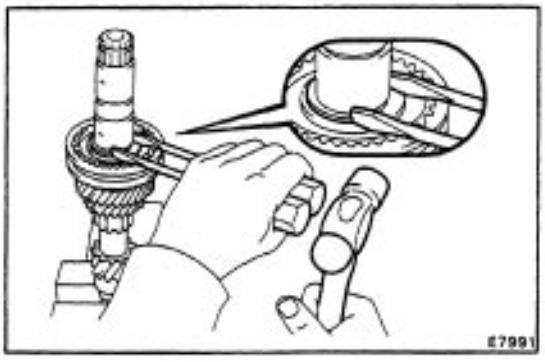
Using two screwdrivers and a hammer, tap out the snap ring.



4. REMOVE RADIAL BALL BEARING AND FOURTH GEAR

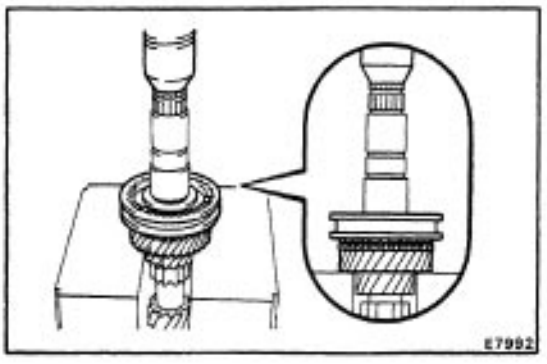
Using SST and a press, remove the radial ball bearing.
SST 09950–00020

5.REMOVE NEEDLE ROLLER BEARINGS, SPACER AND SYNCHRONIZER RING



6. REMOVE SNAP RING

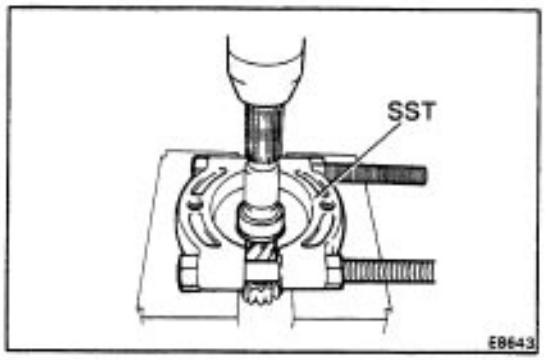
Using two screwdrivers and a hammer, tap out the snap ring.



7. REMOVE NO.2 CLUTCH HUB ASSEMBLY, SYNCHRONIZER RING AND THIRD GEAR

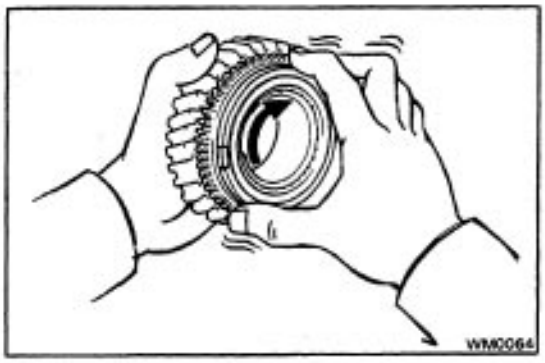
Using a press, remove No.2 hub sleeve, 3rd gear, synchronizer ring and needle roller bearings.

8. REMOVE NEEDLE ROLLER BEARING



9. REMOVE INPUT SHAFT FRONT BEARING INNER RACE

Using SST and a press, remove the inner race.
SST 09950–00020

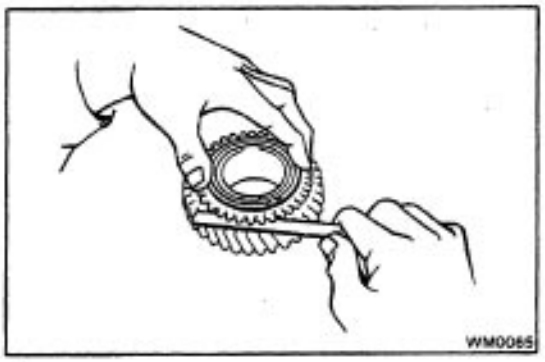


INSPECTION OF INPUT SHAFT COMPONENT PARTS

1. INSPECT SYNCHRONIZER RINGS

(a) Check for wear or damage.

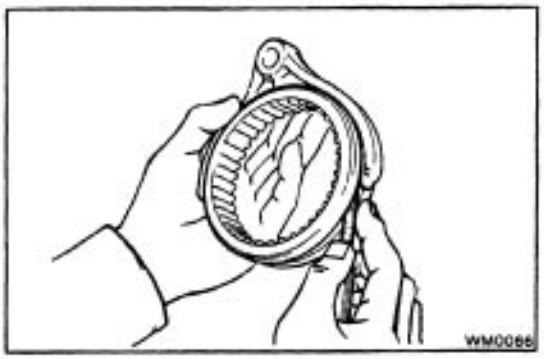
(b) Turn the ring and push it in to check the braking action.



(c) Measure the clearance between the synchronizer ring back and the gear spline end.

Minimum clearance: 0.6 mm (0.024 in.)

If the clearance is less than the limit, replace the synchronizer ring.

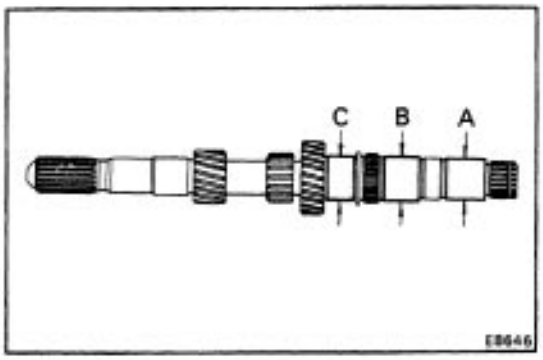


2. MEASURE CLEARANCE OF NO.2 SHIFT FORK AND HUB SLEEVE

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.



3. INSPECT INPUT SHAFT

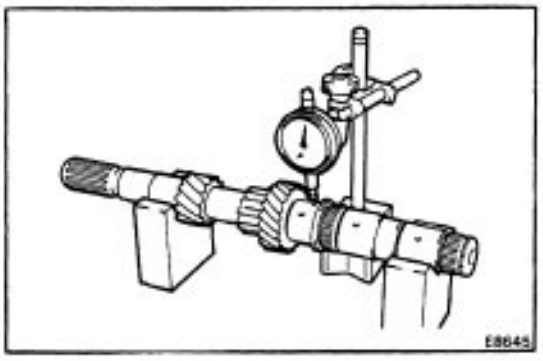
(a) Check the input shaft for wear or damage.

(b) Using a micrometer, measure the outer diameter of the input shaft journal surface.

Minimum outer diameter:

Part A 32.930 mm (1.2965 in.)

Part B **and C 35.950 mm (1.4154 in.)**



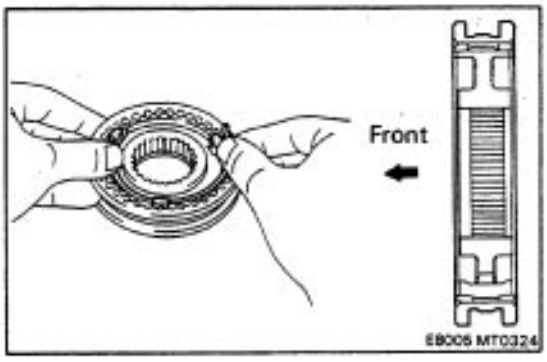
(c) Using a dial indicator, check the shaft runout.

Maximum runout: 0.05 mm (0.0020 in.)

ASSEMBLY OF INPUT SHAFT ASSEMBLY

(See page MT–62)

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

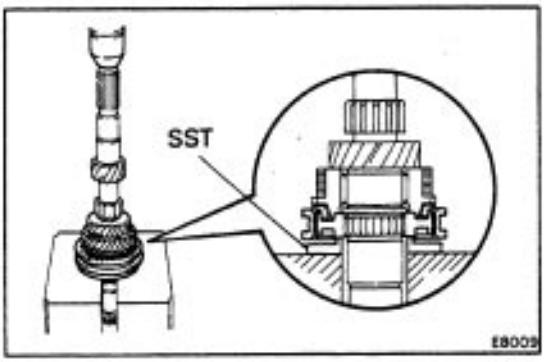


1. INSERT NO.2 CLUTCH HUB INTO HUB SLEEVE

(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

NOTICE: Install the shifting key springs positioned so that their end gaps are not in line.



2. INSTALL NEEDLE ROLLER BEARING, THIRD GEAR, SYNCHRONIZER RING AND NO.2 HUB SLEEVE ASSEMBLY TO INPUT SHAFT

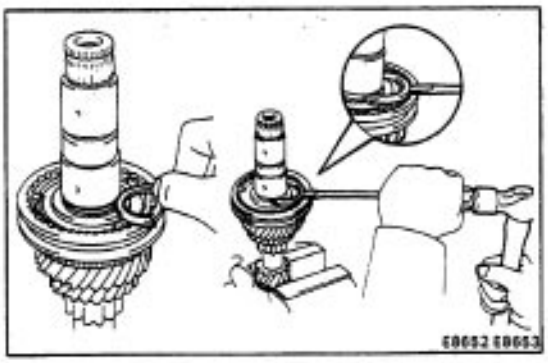
(a) Apply MP grease to the needle roller bearings.

(b) Assemble the needle roller bearings into the 3rd gear.

(c) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(d) Using SST and a press, install the 3rd gear and No–2 hub sleeve.

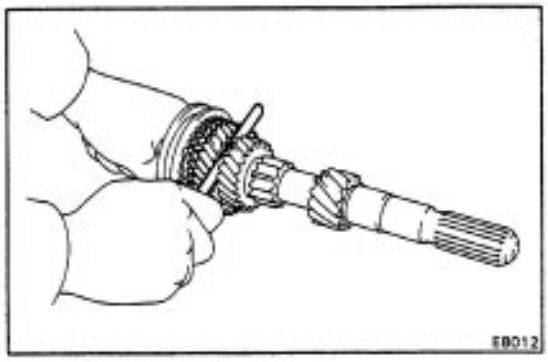
SST 09506–35010



3. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

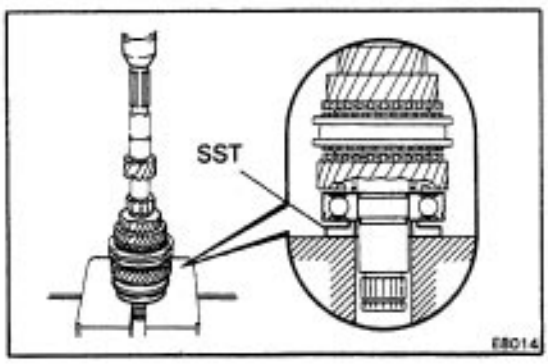
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
H	2.30 – 2.35 (0.0906 – 0.0925)	M	2.50 – 2.55 (0.0984 – 0.1004)
J	2.35 – 2.40 (0.0925 – 0.0945)	N	2.55 – 2.60 (0.1004 – 0.1024)
K	2.40 – 2.45 (0.0945 – 0.0965)	P	2.60 – 2.65 (0.1024 – 0.1043)
L	2.45 – 2.50 (0.0965 – 0.0984)		



4. MEASURE THIRD GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 3rd gear thrust clearance.

Standard clearance: 0.10 – 0.35 mm (0.0039 – 0.0138 in.)



5. INSTALL SPACER, SYNCHRONIZER RING, NEEDLE ROLLER BEARINGS, FOURTH GEAR AND RADIAL BALL BEARING

(a) Install the spacer.

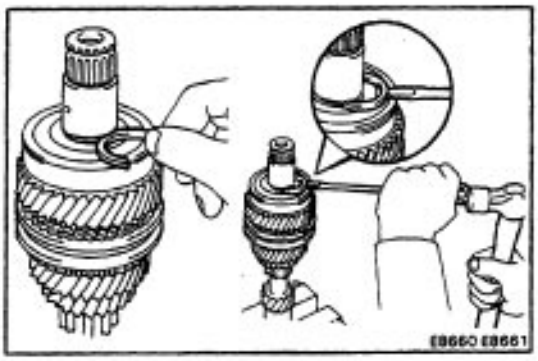
(b) Apply MP grease to the needle roller bearings.

(c) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(d) Install the 4th gear.

(e) Using SST and a press, install the radial ball bearing.

SST 09506–35010

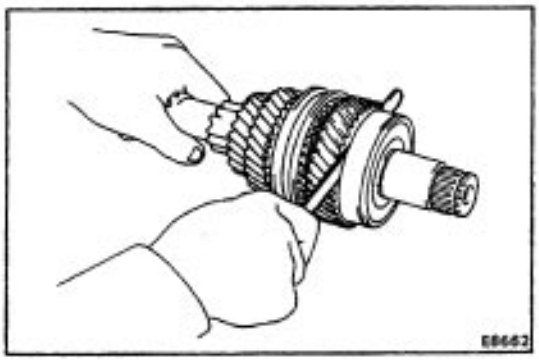


6. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
1	2.35 – 2.40 (0.0925 – 0.0945)	5	2.55 – 2.60 (0.1004 – 0.1024)
2	2.40 – 2.45 (0.0945 – 0.0965)	6	2.60 – 2.65 (0.1024 – 0.1043)
3	2.45 – 2.50 (0.0965 – 0.0984)	7	2.65 – 2.70 (0.1043 – 0.1063)
4	2.50 – 2.55 (0.0984 – 0.1004)	8	2.70 – 2.75 (0.1063 – 0.1083)

7. MEASURE FOURTH GEAR TH . RUST CLEARANCE

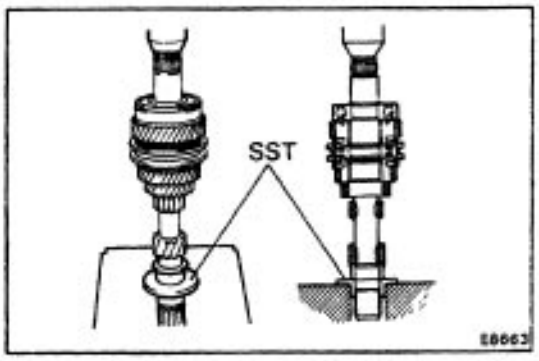


Using a feeler gauge, measure the 4th gear thrust clearance.

Standard clearance: 0.10 – 0.55 mm

(0.0039 – 0.0217 in:)

8. INSTALL INPUT SHAFT FRONT BEARING INNER RACE

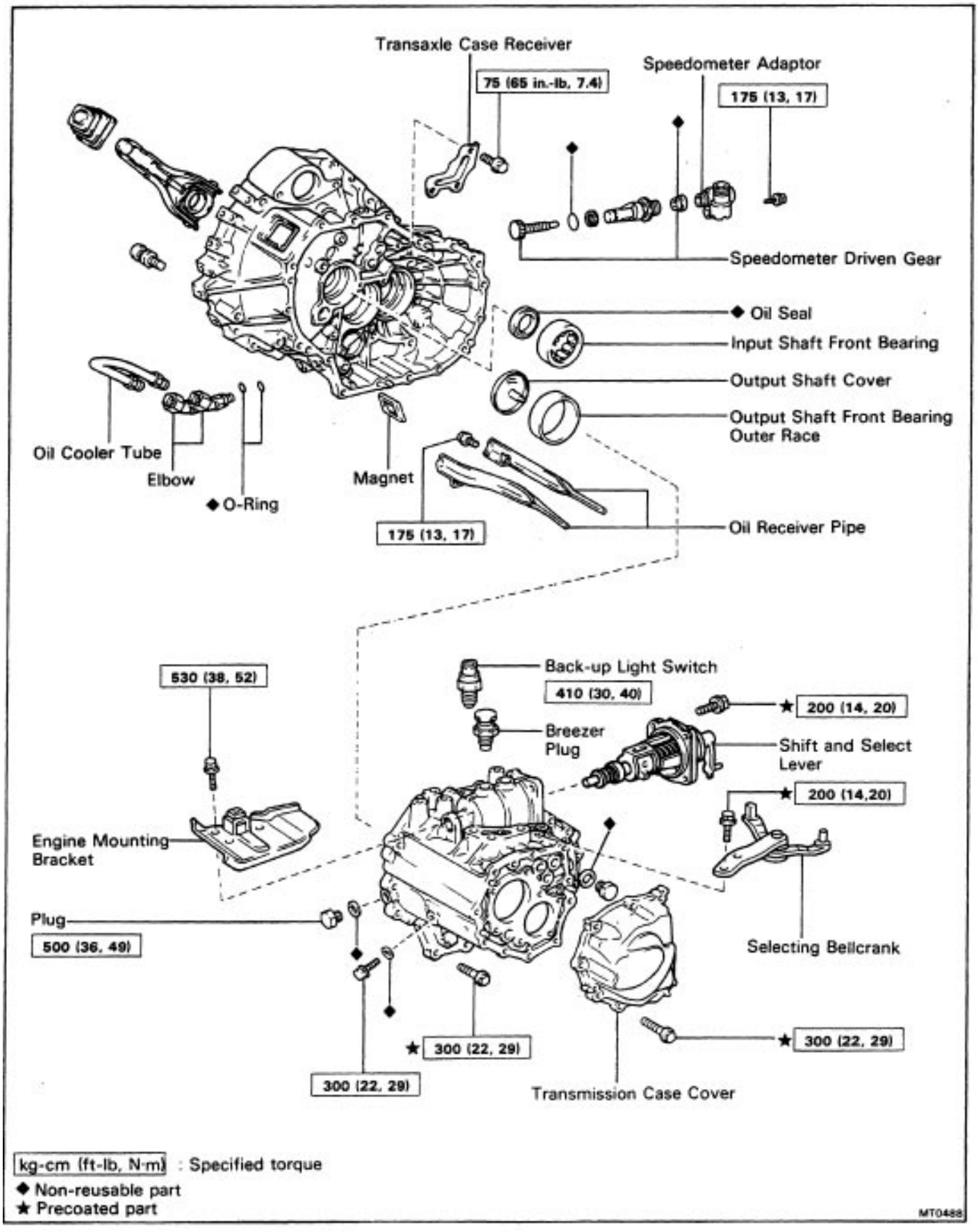


Using SST and a press, install the input shaft front bearing inner race.

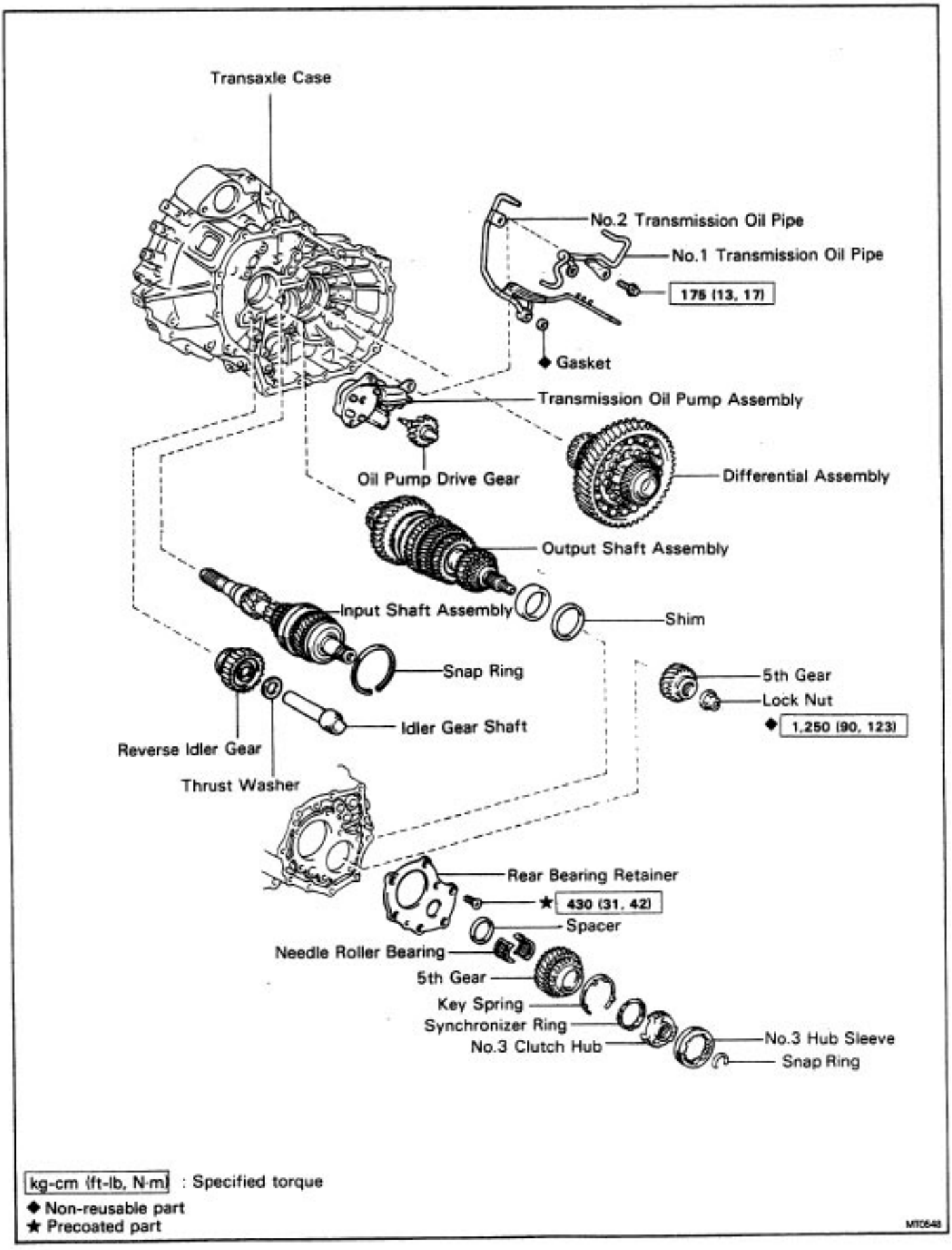
SST 09316–60010 (09316–00020)

REMOVAL OF COMPONENT PARTS

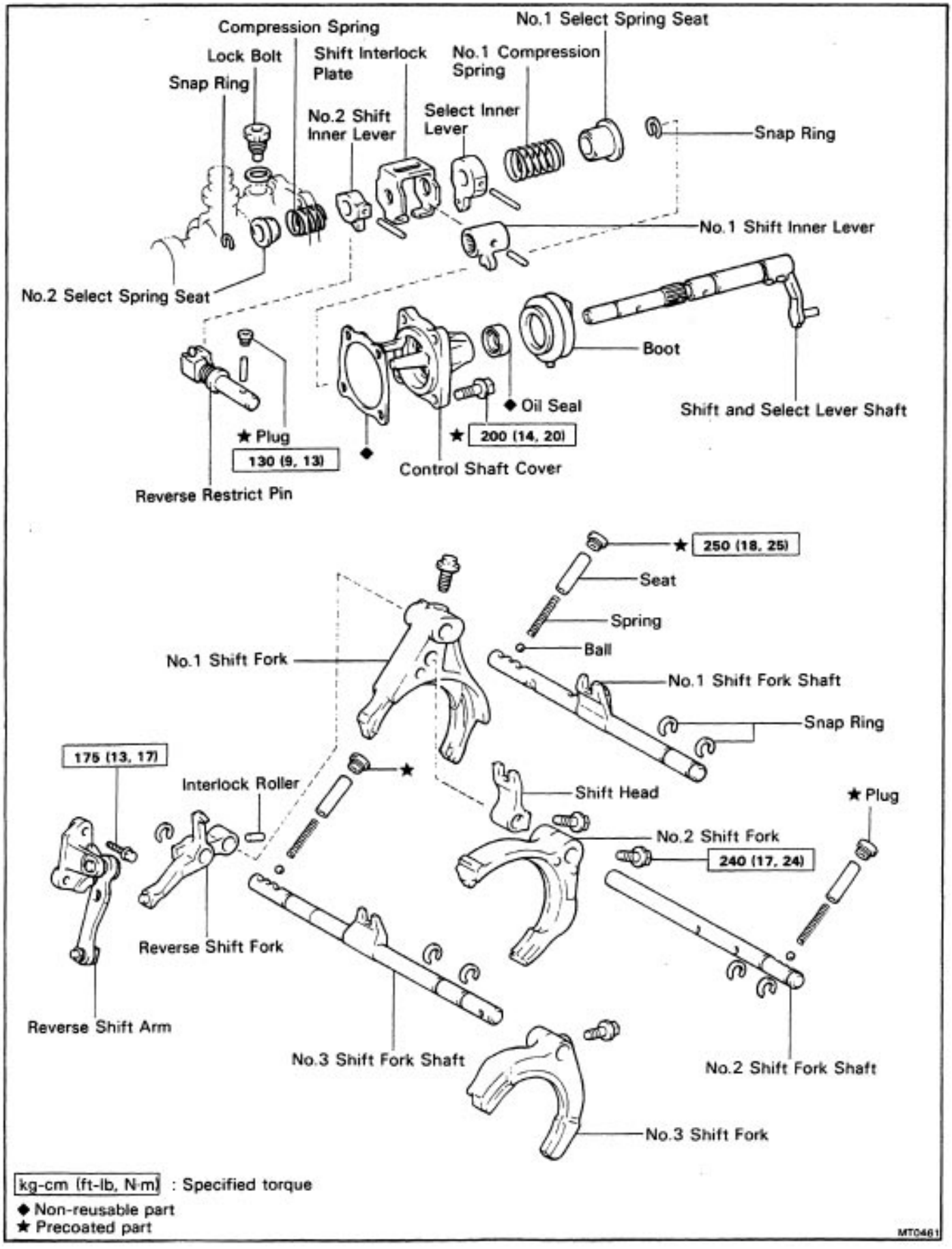
COMPONENTS



COMPONENTS (Cont'd)



COMPONENTS (Cont'd)



REMOVAL OF COMPONENT PARTS

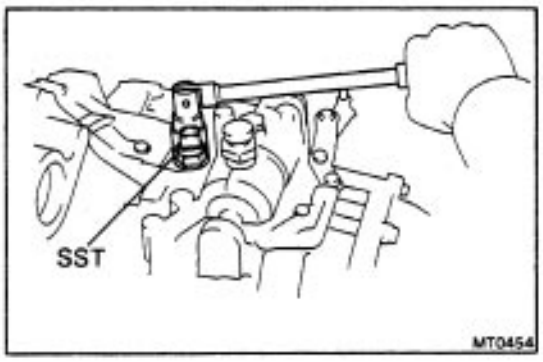
(See pages MT–47 to 49)

1. REMOVE RELEASE FORK AND BEARING

2. REMOVE BACK–UP LIGHT SWITCH

Using SST, remove the back–up light switch.

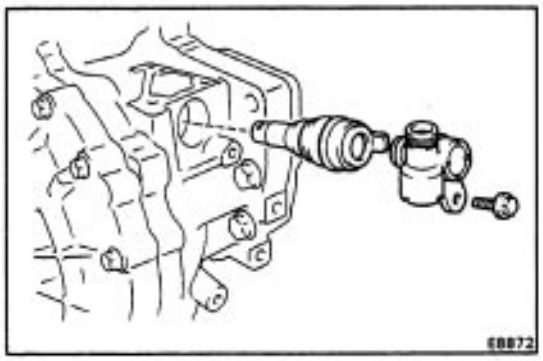
SST 09817–16011



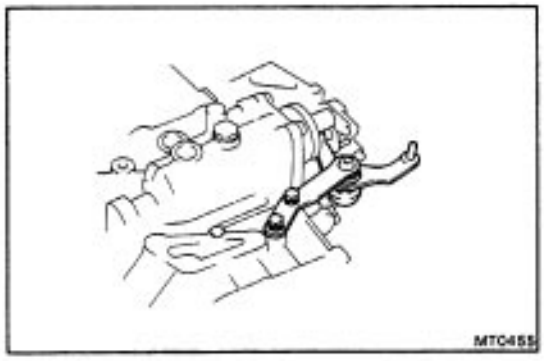
3. REMOVE SPEEDOMETER DRIVEN GEAR

(a) Remove the set bolt and speedometer adaptor.

(b) Remove the speedometer driven gear.

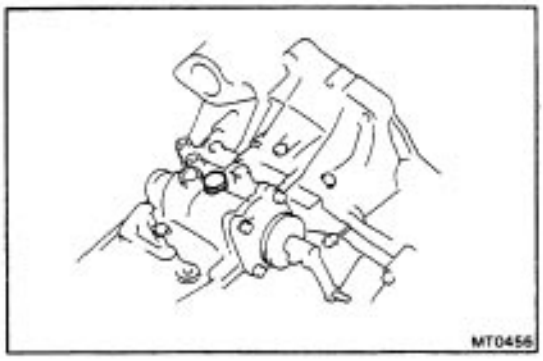


4. REMOVE SELECTING BELLCRANK ASSEMBLY

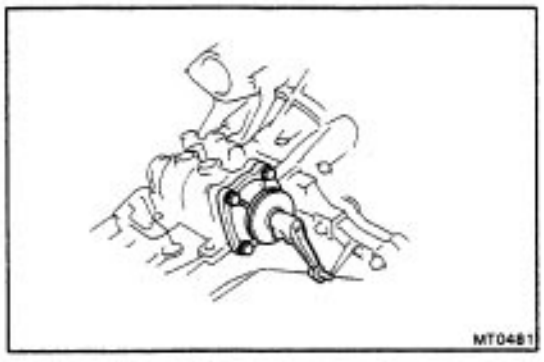


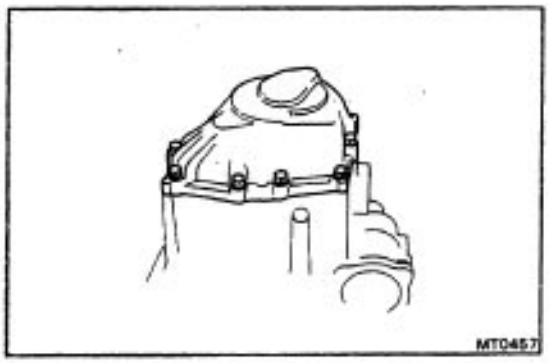
5. REMOVE SHIFT AND SELECT LEVER

(a) Remove the lock bolt.

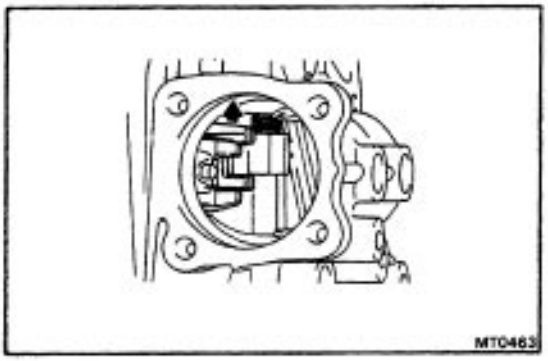


(b) Remove the four bolts and pull out the shift and select lever.



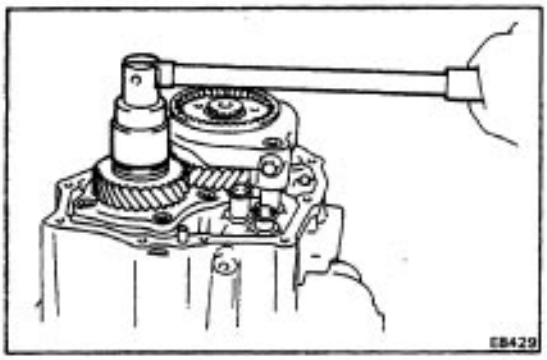


6. REMOVE TRANSMISSION CASE COVER

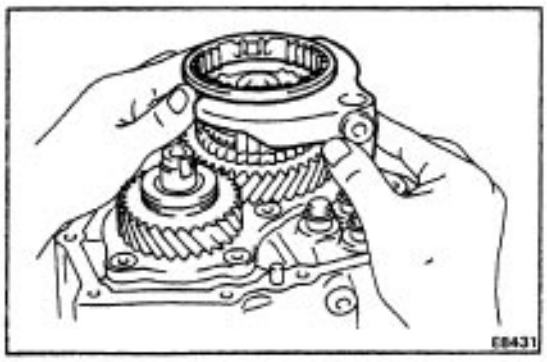


7. REMOVE LOCK NUT

(a) Unstake the lock nut.
(b) Engage the gear double meshing.

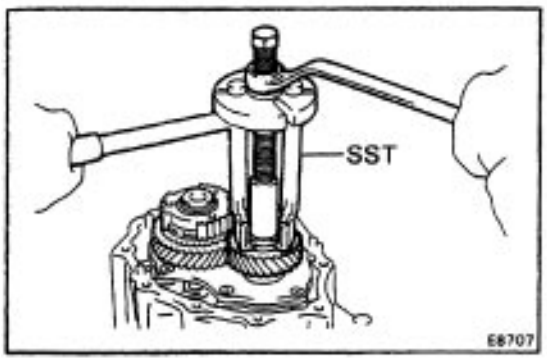


(c) Remove the lock nut.
(d) Disengage the gear double meshing.



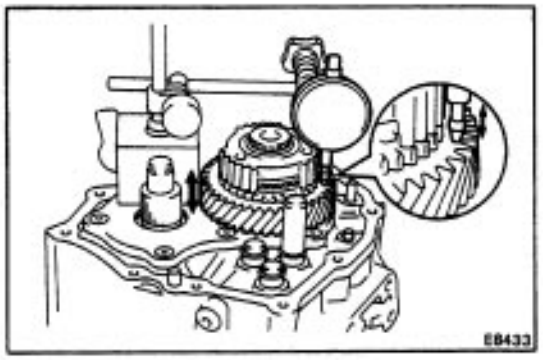
8. REMOVE NO.3 HUB SLEEVE AND NO.3 SHIFT FORK

(a) Remove the No.3 shift fork set bolt.
(b) Remove the No.3 hub sleeve and No–3 shift fork.



9. REMOVE FIFTH DRIVEN GEAR

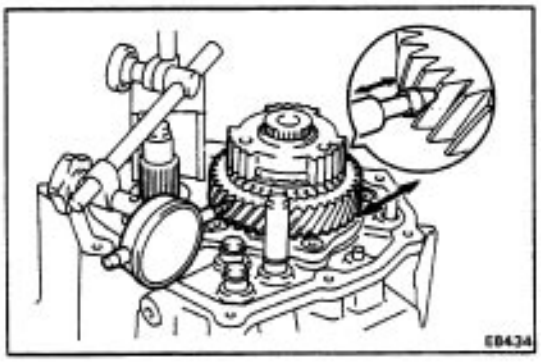
Using SST, remove the 5th driven gear.
SST 09310–17010 (09310–07010, 09310–07020, 09310–07040, 09310–07050)



10. MEASURE FIFTH GEAR THRUST CLEARANCE AND OIL CLEARANCE

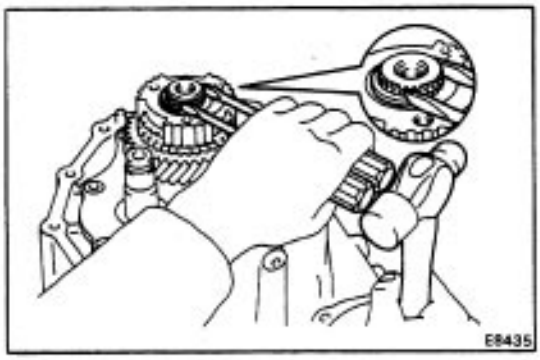
(a) Using a dial indicator, measure the thrust clearance.

Standard clearance: 0.10 – 0.57 mm
(0.0039 – 0.0224 in.)
Maximum clearance: 0.65 mm (0.0256 in.)



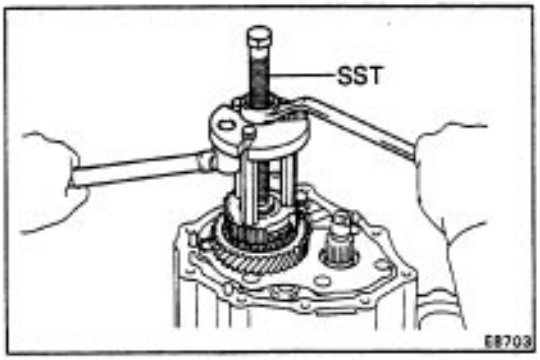
(b) Using a dial indicator, measure the oil clearance.

Standard clearance: 0.009 – 0.050 mm
(0.0004 – 0.0020 in.)
Maximum clearance: 0.070 mm t0:0028 in.)



11. REMOVE NO–3 CLUTCH HUB AND FIFTH GEAR

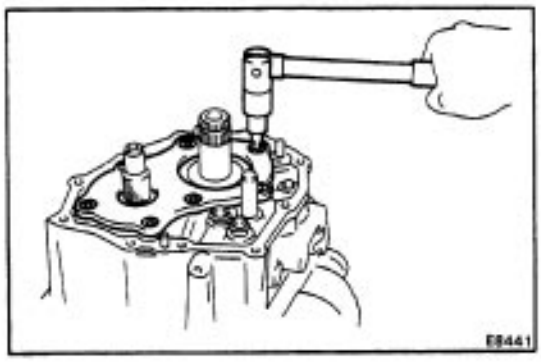
(a) Using two screwdrivers and a hammer, tap out the snap ring.



(b) Using SST, remove the No.3 clutch hub with synchronizer ring and 5th gear.

SST 09310–17010 (09310–07010, 09310–07020, 09310–07040, 09310–07050)

12. REMOVE NEEDLE ROLLER BEARING AND SPACER

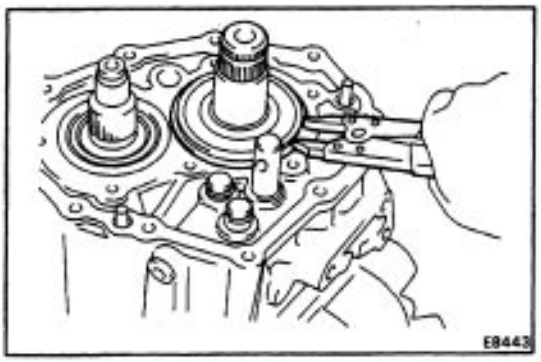


13. REMOVE REAR BEARING RETAINER

(a) Using a torx socket wrench, remove the seven torx screws and bearing retainer.

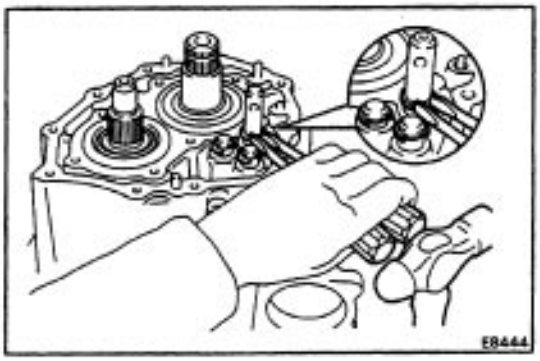
Torx wrench T45 09042–00050

(b) Remove the adjust shim.

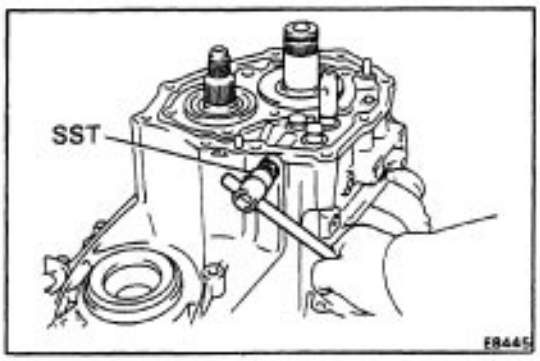


14. REMOVE SNAP RING

(a) Using snap ring pliers, remove the snap ring.



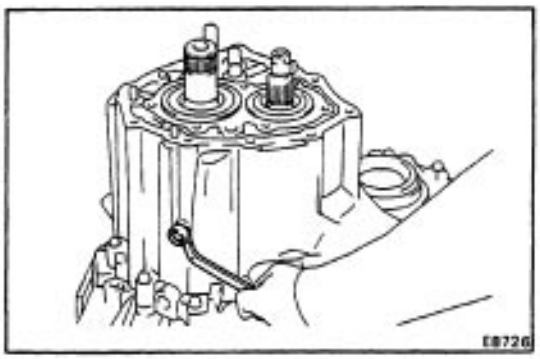
(b) Using two screwdrivers and a hammer, remove the three snap rings.



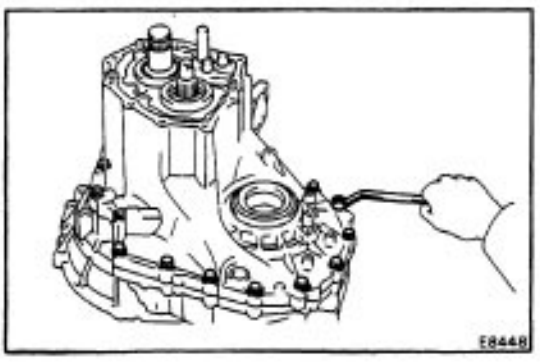
15. REMOVE PLUG, SEAT, SPRING AND LOCKING BALL

(a) Using SST, remove the plug.
SST 09313–30021

(b) Using a magnetic finger, remove the seat, spring and locking ball.

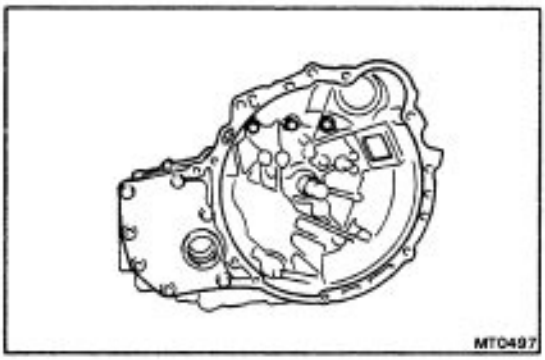


16. REMOVE REVERSE IDLER GEAR SHAFT RETAINING BOLT

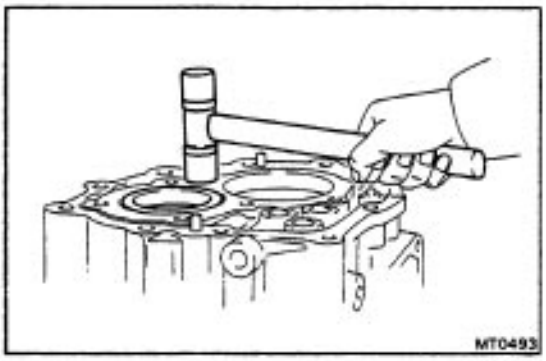


17. REMOVE TRANSMISSION CASE

(a) Remove the fourteen bolts from the transmission case side.

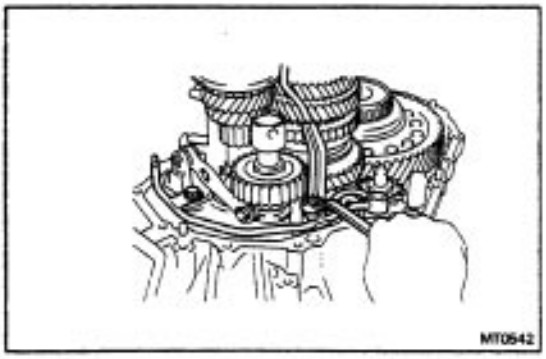


(b) Remove the three bolts from the transaxle case side and tap off the case with a plastic hammer.



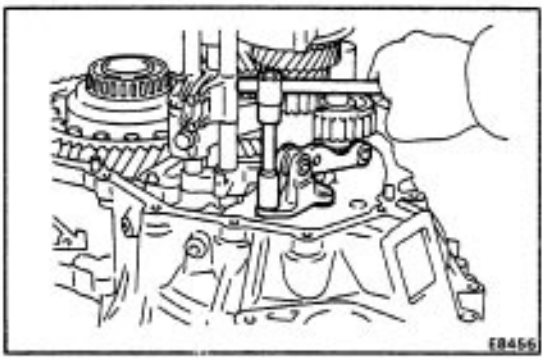
18. REMOVE OUTPUT SHAFT REAR TAPERED ROLLER BEARING OUTER RACE

Using a plastic hammer, drive out the outer race.



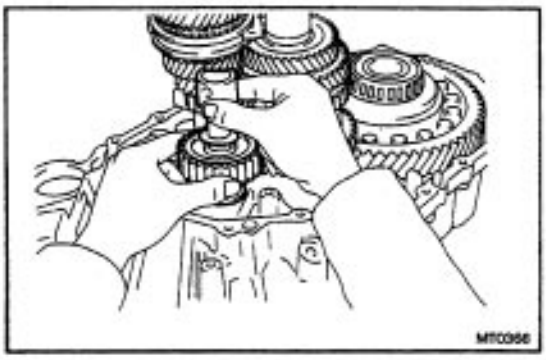
19. REMOVE NO.2 OIL PIPE

(a) Remove the gasket.
(b) Remove the two bolts and oil pipe.



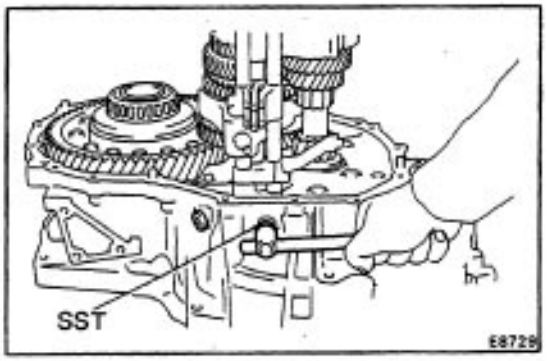
20. REMOVE REVERSE SHIFT ARM BRACKET

Remove the two bolts and pull off the bracket.



21. REMOVE REVERSE IDLER GEAR AND SHIFT

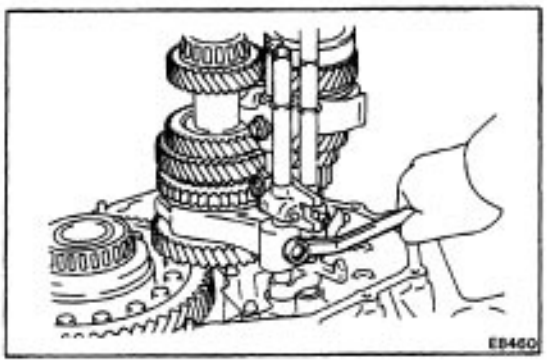
Pull out the shift, remove the reverse idler gear and thrust washer.



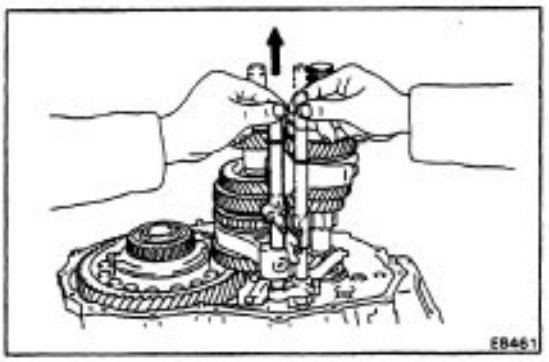
22. REMOVE STRAIGHT SCREW, LOCKING BALLS AND SPRINGS

(a) Using SST, remove the two plugs.
SST 09313–30021

(b) Using a magnetic finger, remove the two spring seats, springs and balls.

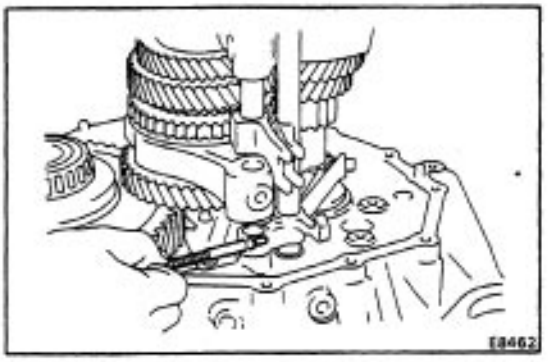


23. REMOVE SET BOLT



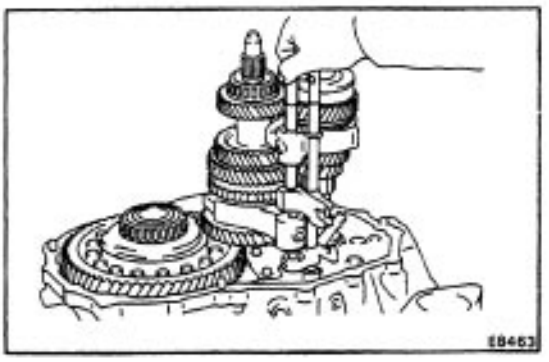
24. REMOVE NO.1 SHIFT FORK SHAFT

Pull up No.3 shift fork shaft, remove the No.1 shift fork shaft.



25. REMOVE INTERLOCK ROLLER

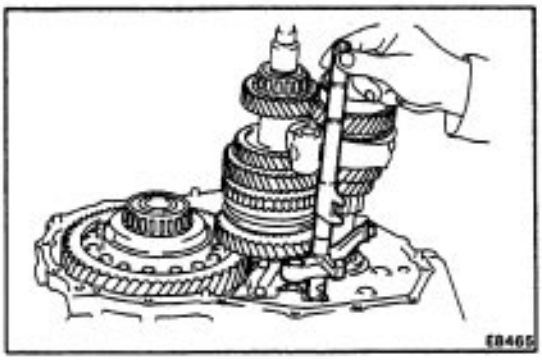
Using a magnetic finger, remove the interlock roller from the reverse shift fork.



26. REMOVE NO.2 SHIFT FORK SHAFT, SHIFT HEAD AND NO.1 SHIFT FORK

(a) Pull out the No.2shift fork shaft.

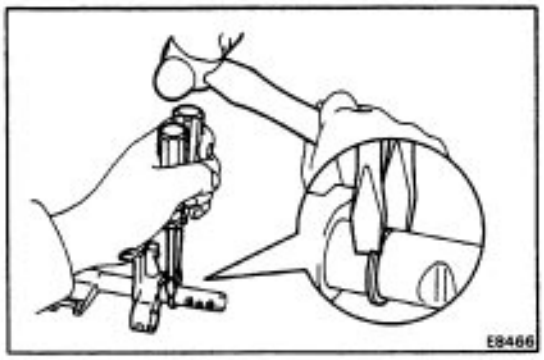
(b) Remove the shift head and No.1 shift fork.



27. REMOVE NO.3 SHIFT FORK SHAFT WITH REVERSE SHIFT FORK AND NO.2 SHIFT FORK

(a) Pull out the No.3 shift fork shaft with reverse shift fork.

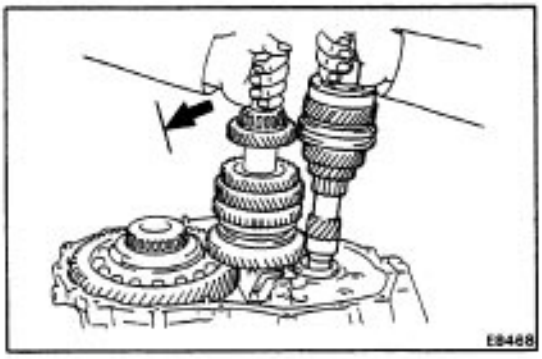
(b) Remove the No–2 shift fork.



28. REMOVE SNAP RINGS

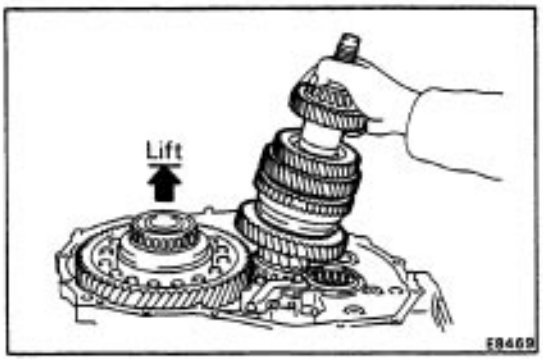
(a) Using two screwdrivers and a hammer, remove the snap ring and reverse shift fork from the No.3 shift fork shaft.

(b) Using two screwdrivers and a hammer, remove the snap rings from the No.1, No.2 and No.3 shift fork shafts.

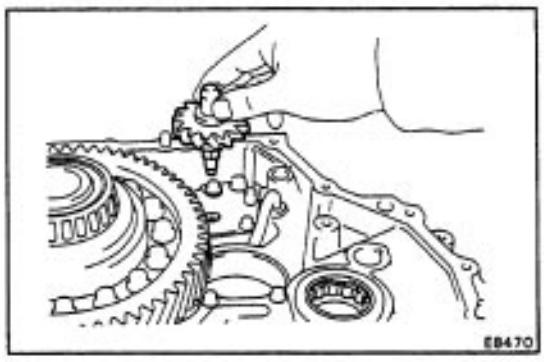


29. REMOVE INPUT AND OUTPUT SHAFT ASSEMBLY

(a) Leaning the output shaft to the differential side, remove the input shaft assembly.

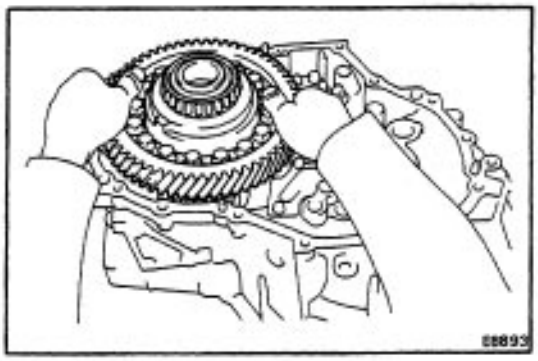


(b) Lift up the differential case assembly, remove the output shaft.

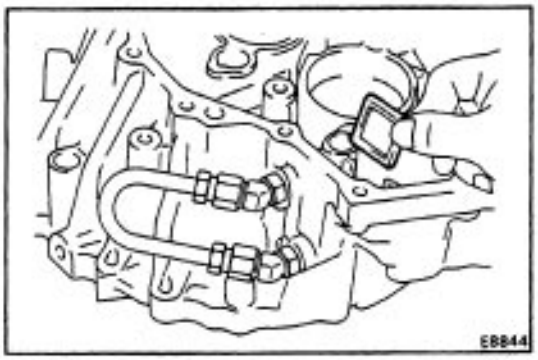


30. REMOVE DIFFERENTIAL ASSEMBLY

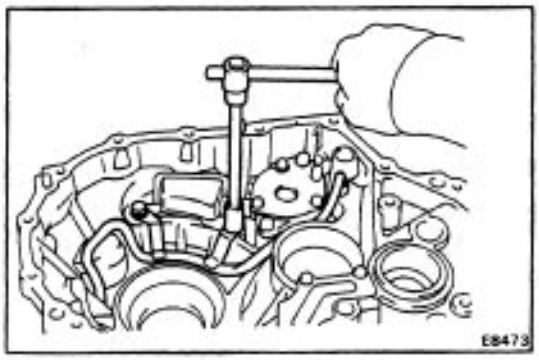
(a) Remove the oil pump drive gear.



(b) Remove the differential case assembly.

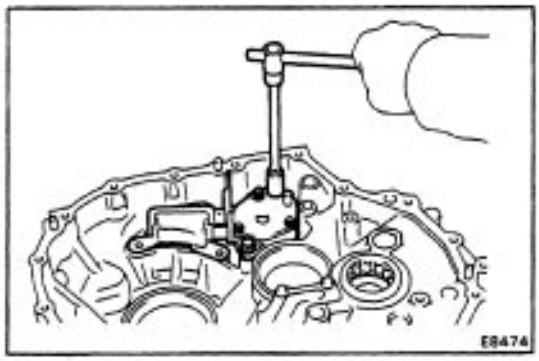


31. REMOVE MAGNET FROM TRANSAXLE CASE



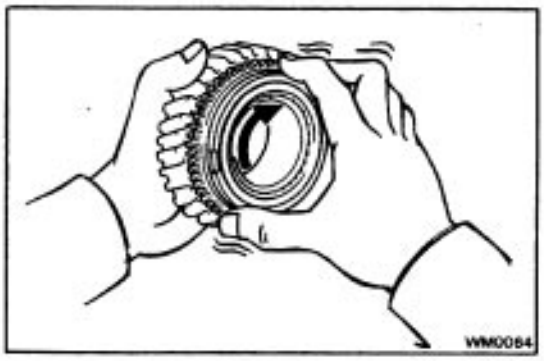
32. REMOVE OIL PUMP ASSEMBLY

(a) Remove the two bolts and oil pipe.



(b) Remove the two bolts and oil pump.

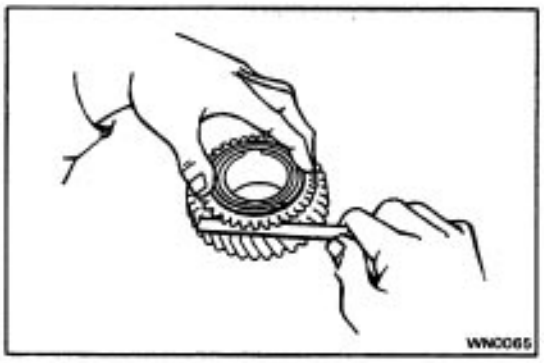
INSPECTION OF COMPONENT PARTS



1. INSPECT SYNCHRONIZER RING FOR FIFTH GEAR

(a) Check for wear or damage.

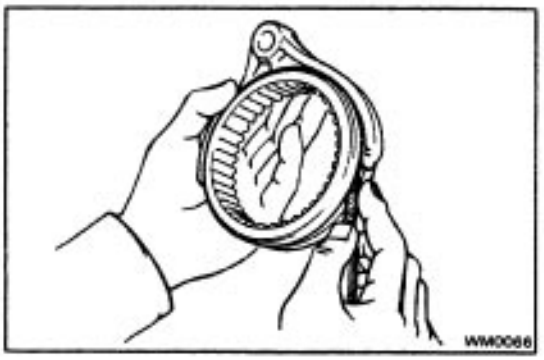
(b) Turn the ring and push it in to check the braking action.



(e) Measure the clearance between the synchronizer ring back and the gear spline end.

Minimum clearance: 0.6 mm (0.024 in.)

If the clearance is less than the limit, replace the synchronizer ring.

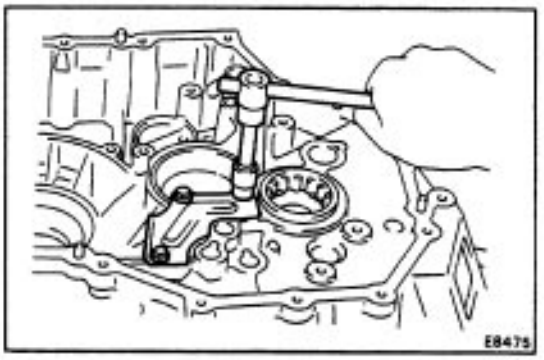


2. MEASURE CLEARANCE OF SHIFT FORKS AND HUB SLEEVE

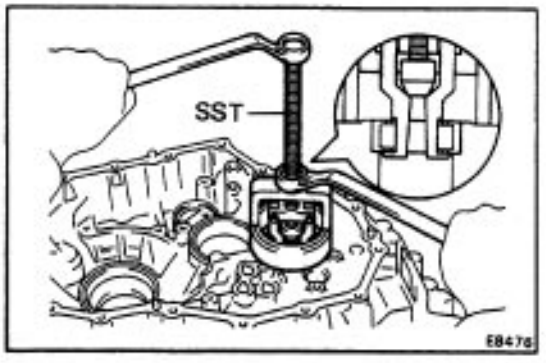
Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.



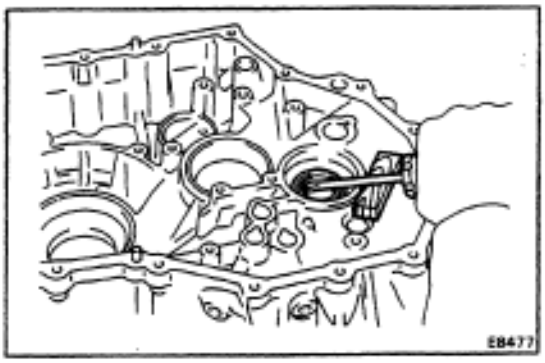
3. REMOVE TRANSAXLE CASE RECEIVER



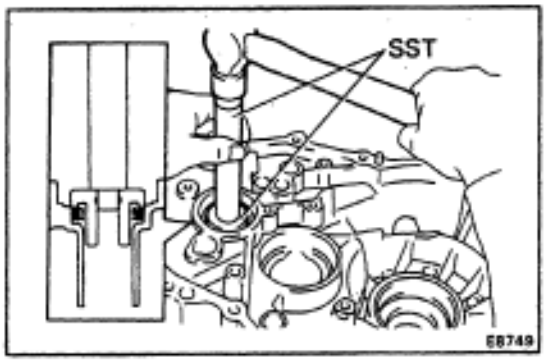
4. IF NECESSARY, REPLACE INPUT SHAFT BEARING AND OIL SEAL

(a) Using SST, pull out the bearing.

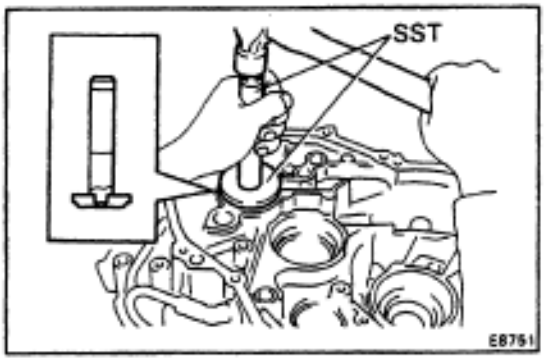
SST 09812–65014



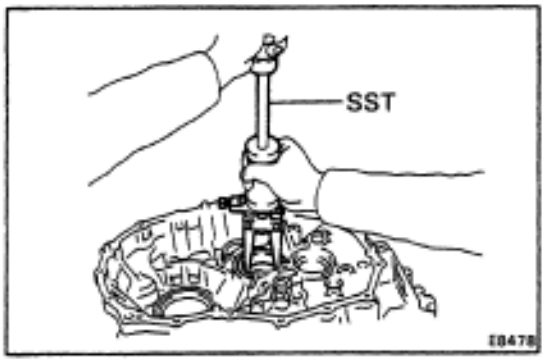
(b) Using a screwdriver; remove the oil seal.



(c) Using SST, drive in a new oil seal.
SST 09608–12010 (09608–00020, 09608–00080)
(d) Coat the lip of seal with NIP grease.

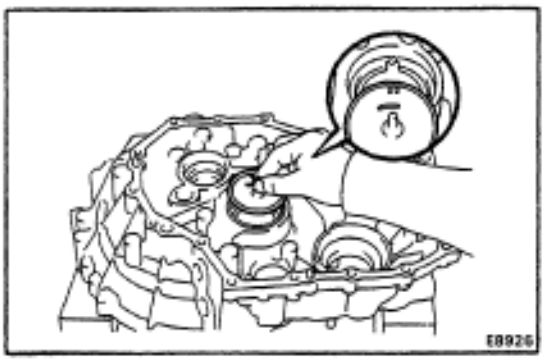


(e) Using SST, drive in a new bearing.
SST 09608–12010 (09608–00020, 09608–00060)

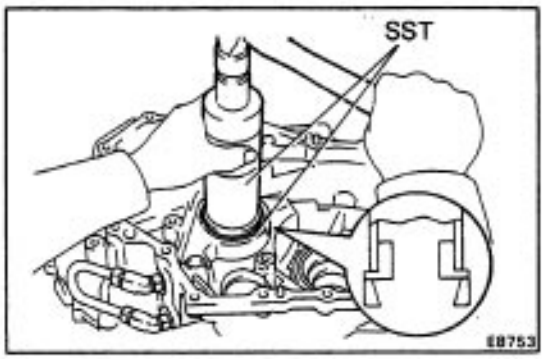


5. IF NECESSARY, REPLACE OUTPUT SHAFT FRONT OUTER RACE AND OUTPUT SHAFT COVER

(a) Using SST, pull out the outer race.
SST 09308–000 10
(b) Remove the output shaft cover.



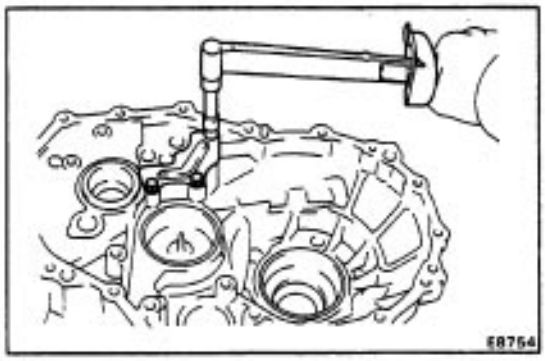
(e) Install the output shaft front cover.
HINT: Install the shaft cover projection into the case side groove.



(d) Using SST, press in a new outer race.
SST 09316–60010 (09316–00010, 09316–00020)

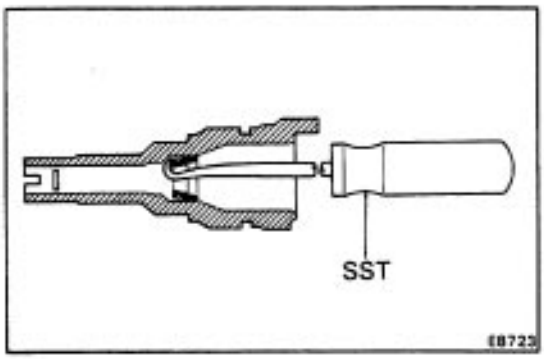
6. INSTALL AND TORQUE TRANSAXLE CASE RECEIVER

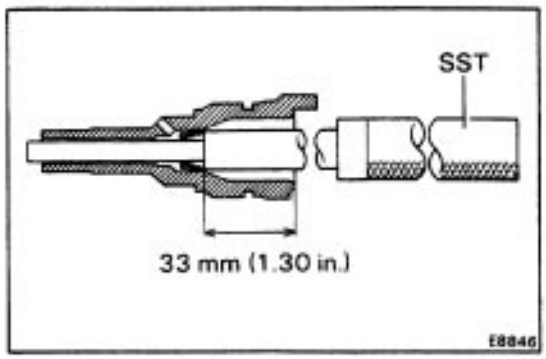
Torque: 75 kg–cm (65 in.–lb, 7.4 N–m)



7. IF NECESSARY, REPLACE SPEEDOMETER DRIVEN GEAR OIL SEAL

(a) Using SST, pull out the oil seal.
SST 09921–00010

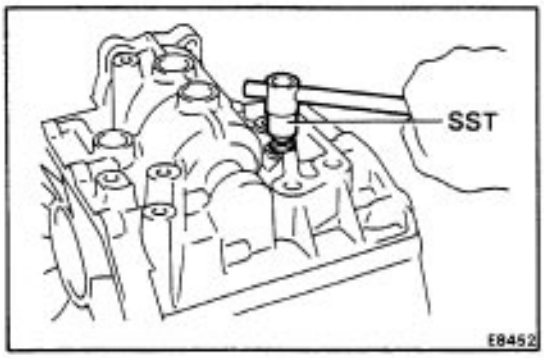


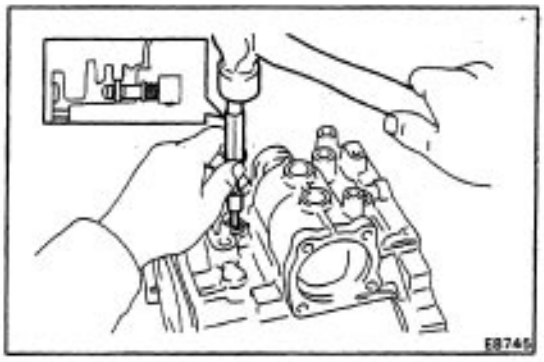


(b) Using SST, drive in a new oil seal.
SST 09201–60011
Drive in depth: 33 mm (1.30 in.)
(c) Coat the lip of oil seal with MP grease.

8. IF NECESSARY, REPLACE REVERSE RESTRICT PIN

(a) Using SST, remove the screw plug.
SST 09313–30021
(b) Using a pin punch and hammer, drive out the slotted spring pin.



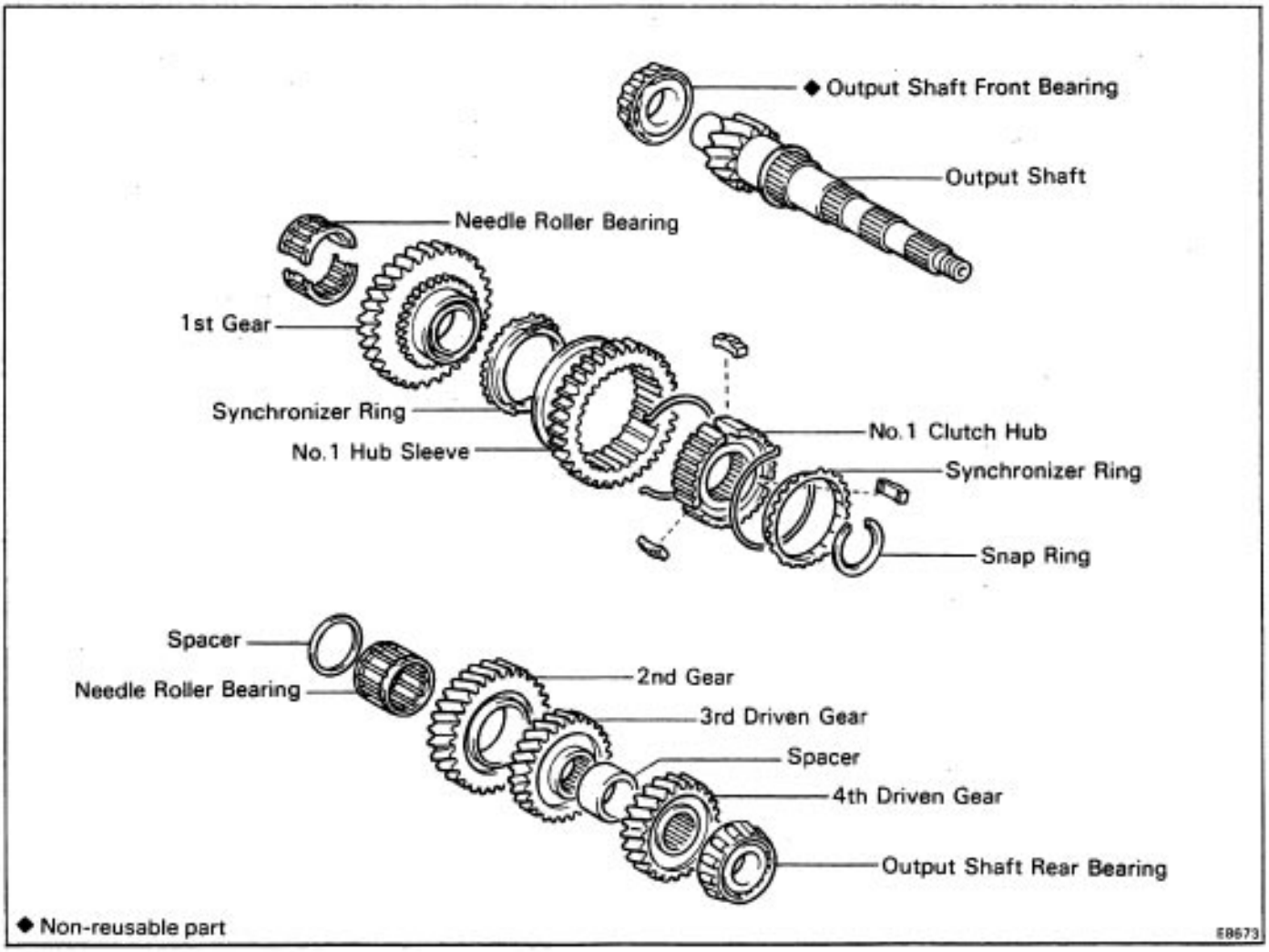


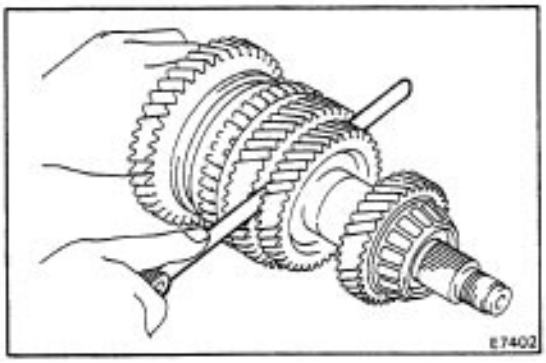
(c) Replace the reverse restrict pin.
(d) Using a pin punch and hammer, drive in the slotted spring pin.
(e) Apply sealant to the plug threads.

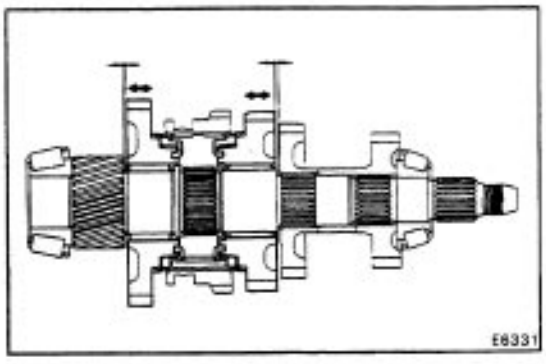
Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(f) Using SST, install the screw plug.
SST 09313–30021

Output Shaft Assembly







DISASSEMBLY OF OUTPUT SHAFT ASSEMBLY

1. MEASURE FIRST AND SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the thrust clearance.

Standard clearance:

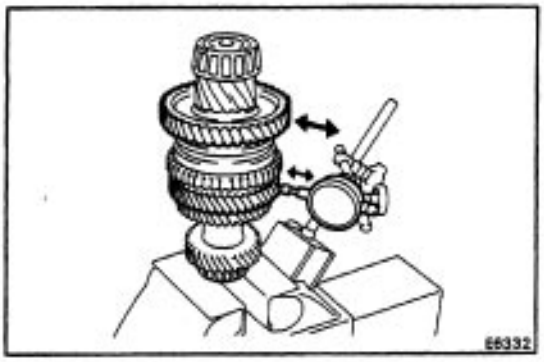
1 st gear 0.10 – 0.35 mm
(0.0039 – 0.0138 in.)

2nd gear 0.10 – 0.45 mm
(0.0039 – 0.0177 in.)

Maximum clearance:

1 st gear 0.40 mm (0.0157 in.)

2nd gear 0.50 mm (0.0197 in.)



2.CHECK– OIL CLEARANCE OF FIRST AND SECOND GEAR

Using dial indicator, measure the oil clearance between the gear and shaft. .

Standard clearance: .

1st gear 0.009 – 0.051 mm .

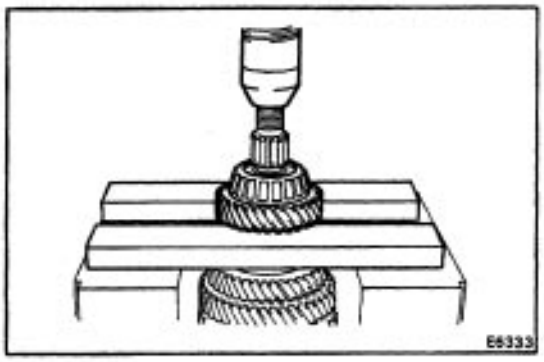
(0.0004 – 0.0020 in.)

2nd gear 0.009 – 0.053 mm(0.0004 – 0.0021 in.)

Maximum clearance:

1 st and 2nd gear 0.070 mm'(0.0028 in.)

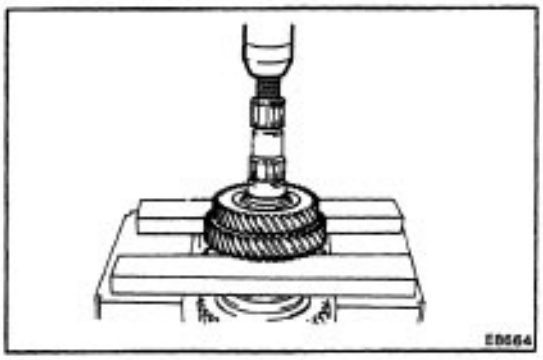
If the clearance exceeds the limit, replace the gear, needle roller bearing or shaft.



3. REMOVE OUTPUT SHAFT REAR– BEARING, FOURTH DRIVEN GEAR AND SPACER

(a) Using a press, remove the bearing and 4th driven gear.

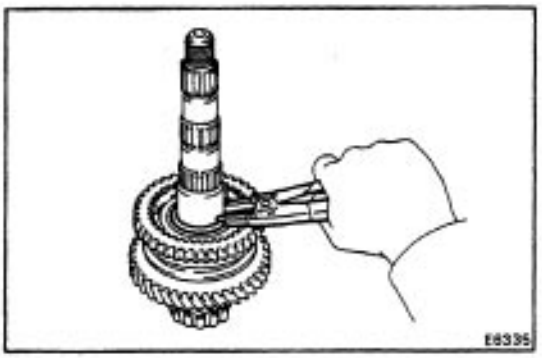
(b) Remove the spacer.



4. REMOVE THIRD DRIVEN GEAR AND SECOND GEAR

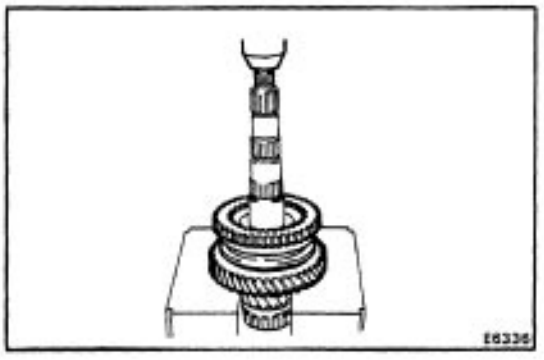
Using a press, remove the 3rd driven gear and 2nd gear.

5. REMOVE NEEDLE ROLLER BEARINGS, SPACER AND SYNCHRONIZER RING



6. REMOVE SNAP RING

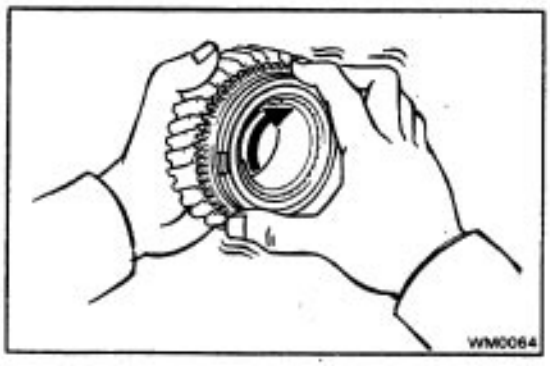
Using snap ring pliers, remove the snap ring.



7. REMOVE NO.1 HUB SLEEVE ASSEMBLY AND FIRST GEAR

Using a press, remove No. 1 hub sleeve and 1 st gear.

8. REMOVE SYNCHRONIZER RING AND NEEDLE ROLLER' BEARING



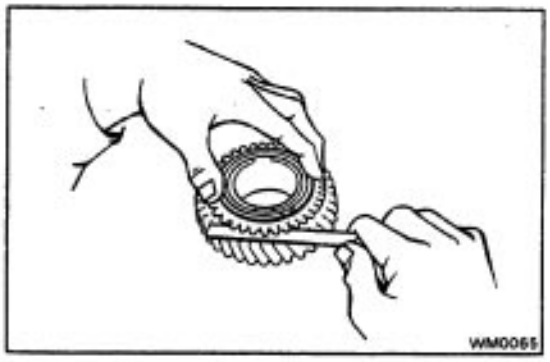
INSPECTION OF OUTPUT SHAFT

COMPONENT PARTS

1. INSPECT SYNCHRONIZER RINGS

(a) Check for wear or damage.

(b) Turn the ring and push it in to check the braking action.



(c) Measure the clearance between the synchronizer ring back and the gear spline end.

Maximum clearance: 0.6 mm (0.024 in.)

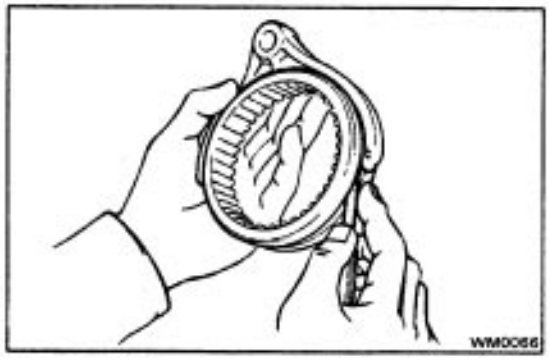
If the clearance is less than the limit, replace the synchronizer ring.

2. MEASURE CLEARANCE OF NO–1 SHIFT FORK AND HUB SLEEVE

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1 .0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.

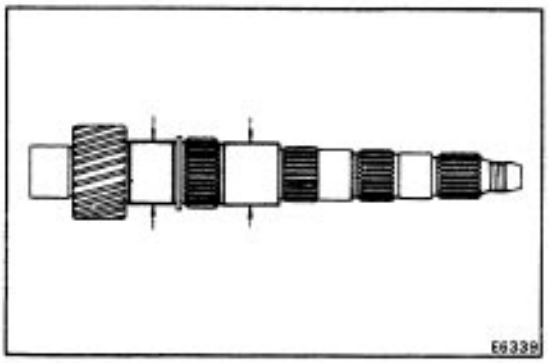


3. INSPECT OUTPUT SHAFT

(a) Check the output shaft for wear or damage.

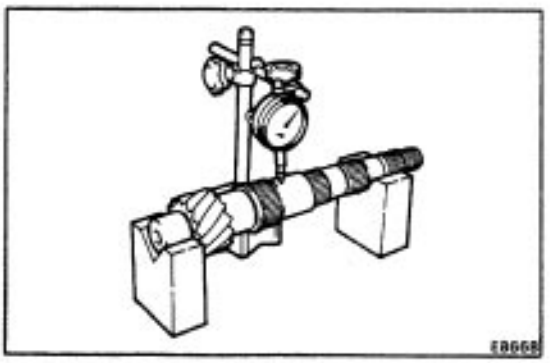
(b) Using a micrometer, measure the outer diameter of the output shaft journal surface.

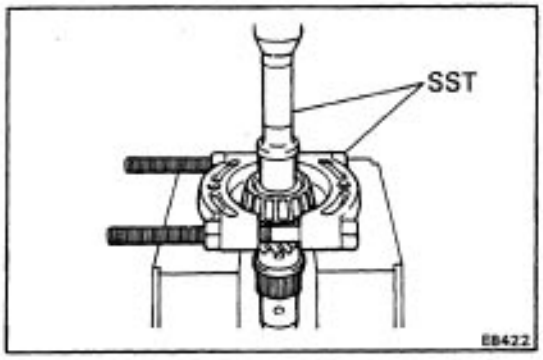
Minimum outer diameter: 38.950 mm (1.5335 in.)



(c) Using a dial indicator, check the shaft runout.

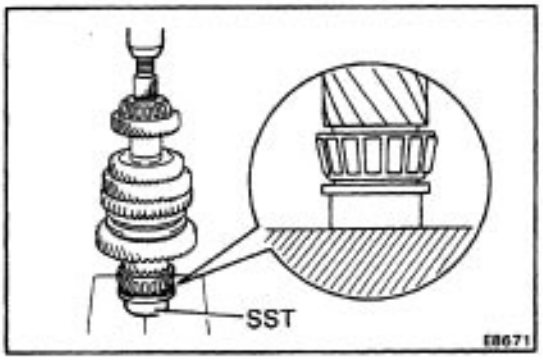
Maximum runout: 0.06 mm (0.0024 in.)



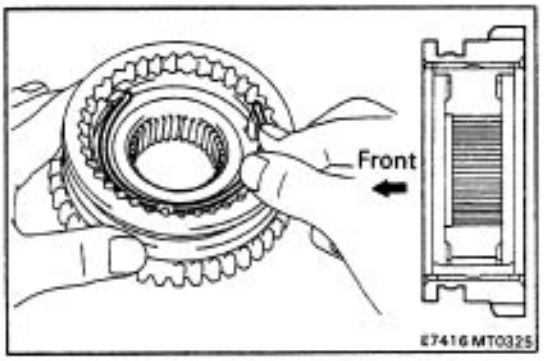


4. IF NECESSARY, REPLACE OUTPUT SHAFT FRONT BEARING

(a) Using SST and a press, remove the bearing.
SST 09307–12010, 09950–00020



(b) Using SST and a press, install the new bearing.
SST 09316–60010 (09316–00070)



ASSEMBLY OF OUTPUT SHAFT ASSEMBLY

(See page MT–68)

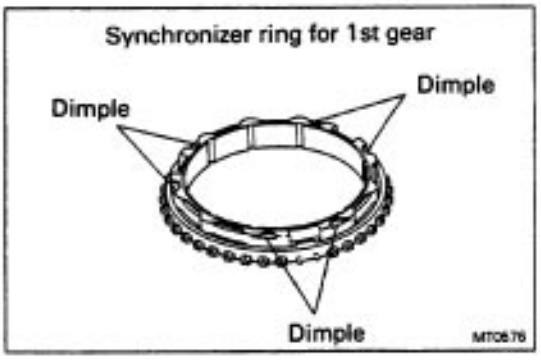
HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

1. INSERT NO.1 CLUTCH HUB INTO HUB SLEEVE

(a) Install the clutch hub and shifting keys to the hub sleeve.

Install the shifting key springs under the shifting keys.

NOTICE: Install the key springs positioned so that their end gaps are not in line.



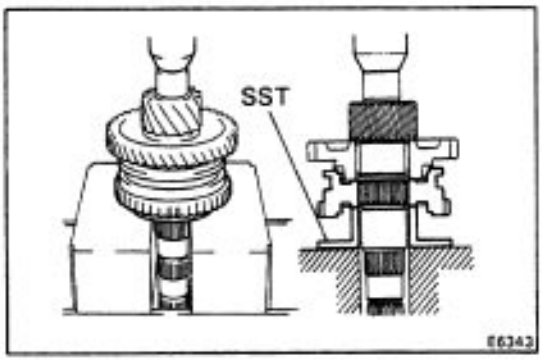
2. INSTALL NEEDLE ROLLER BEARING, FIRST GEAR, SYNCHRONIZER RING AND NO.1 HUB SLEEVE TO OUTPUT SHAFT

(a) Apply MP grease to the needle roller bearings.

(b) Install the 1st gear.

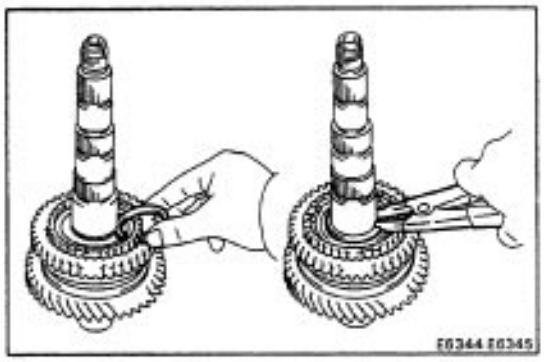
(e) Place the synchronizer ring (for 1st gear) on the gear and align the ring slots with the shifting keys.

NOTICE: Do not install the synchronizer ring for 2nd gear.



(d) Using SST and a press, install the 1 st gear and No. 1 hub sleeve.

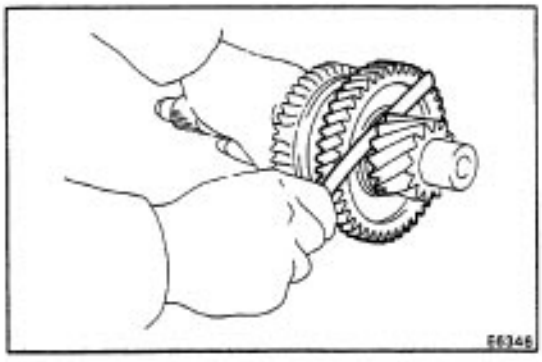
SST 09316–60010 (09316–00040)



3. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

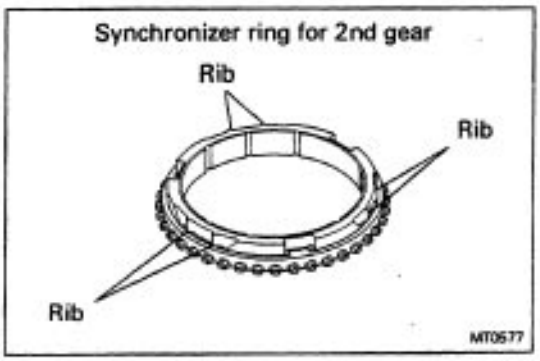
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.80 (0.1102)	E	3.00 (0.1181)
B	2.85 (0.1122)	F	3.05 (0.1201)
C	2.90 (0.1142)	G	3.10 (0.1220)
D	2.95 (0.1161)		



4. MEASURE FIRST GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 1st gear thrust clearance.

Standard clearance: 0.10 – 0.35 mm (0.0039 – 0.0138 in.)



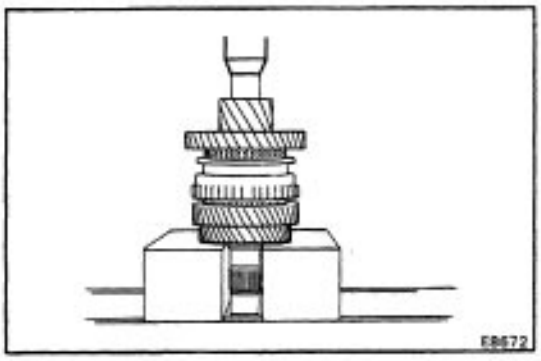
5. INSTALL SPACER, NEEDLE ROLLER BEARING, SYNCHRONIZER RING, SECOND GEAR AND THIRD DRIVEN GEAR

(a) Install the spacer.

(b) Apply MP grease to the needle roller bearing.

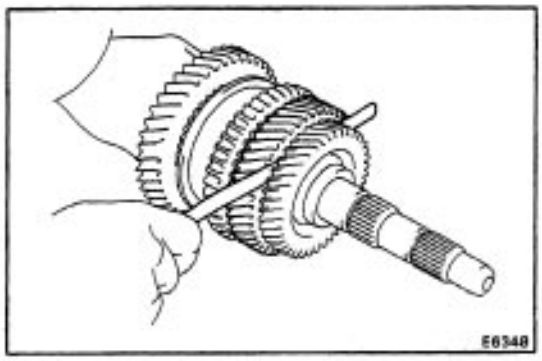
(c) Place the synchronizer ring (for 2nd gear) on the gear and align the ring slots with the shifting keys.

NOTICE: Do not install the synchronizer ring for 1st gear.



(d) Install the 2nd gear.

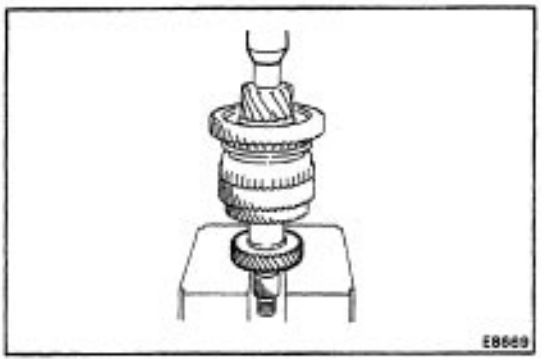
(e) Using a press, install the 3rd driven gear.



6. MEASURE SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 2nd gear thrust clearance.

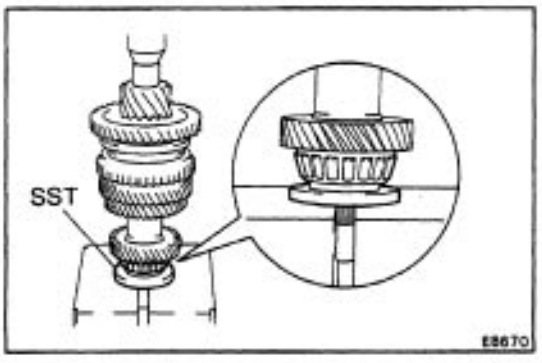
Standard clearance: 0.10 – 0.45 mm (0.0039 – 0.0177 in.)



7. INSTALL SPACER AND FOURTH DRIVEN GEAR

(a) Install the spacer.

(b) Using a press, install the 4th driven gear.

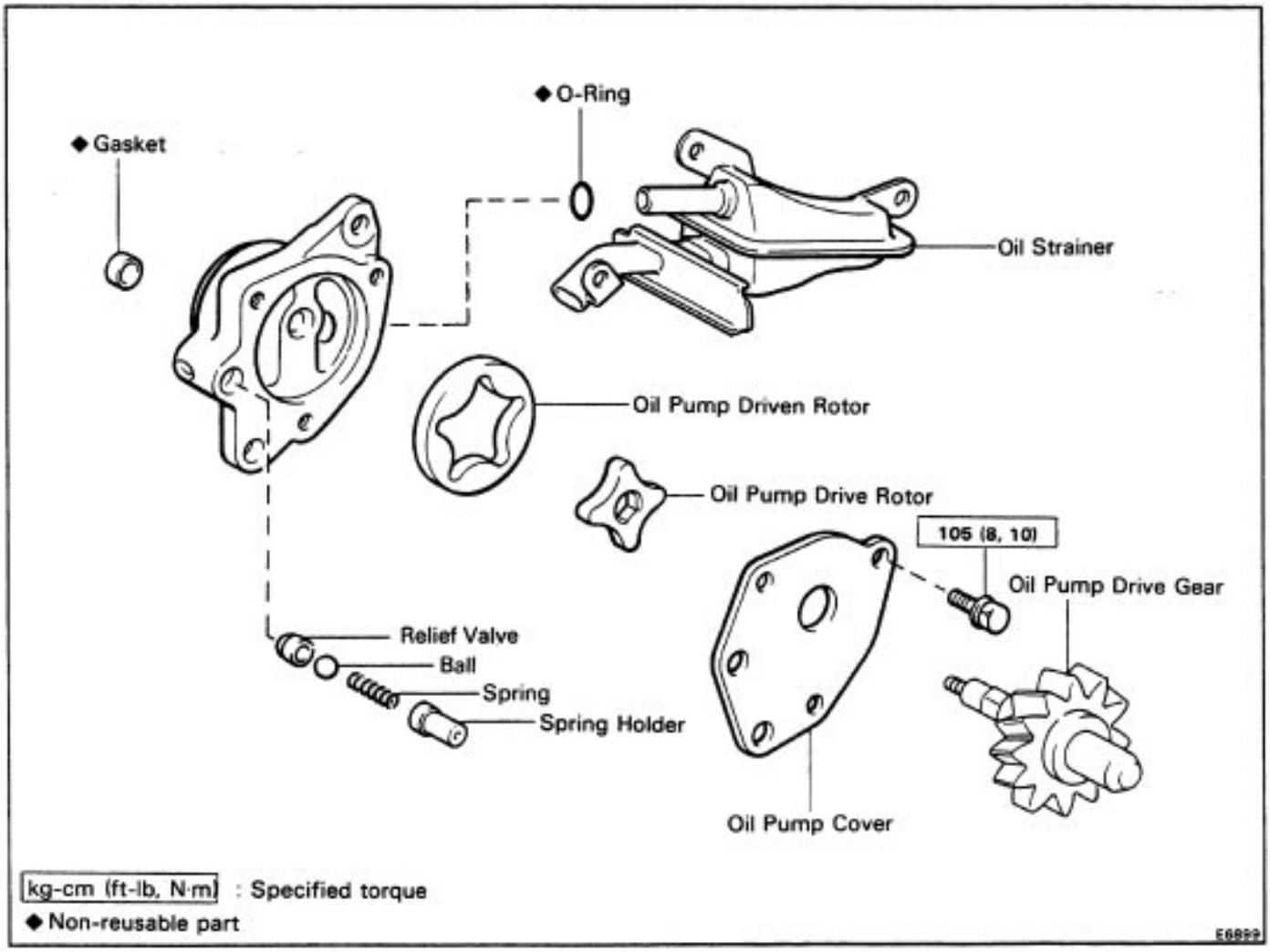


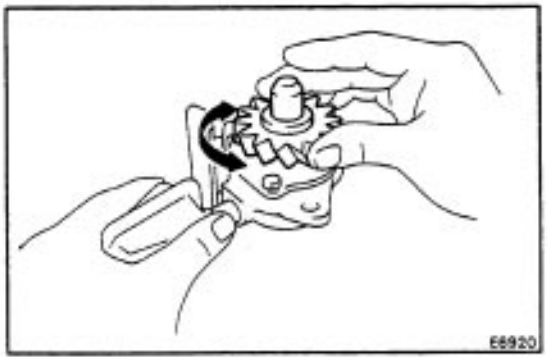
8. INSTALL OUTPUT SHAFT REAR BEARING

Using SST and a press, instal! the bearing.

SST 09506–30012

Oil Pump Assembly

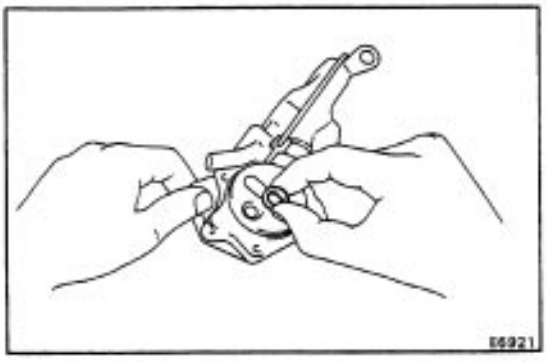




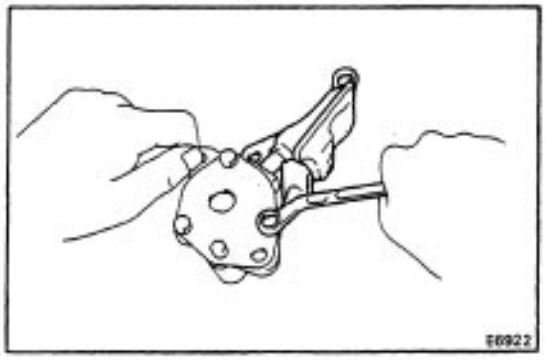
DISASSEMBLY OF OIL PUMP

1. CHECK OPERATION OF OIL PUMP

Install the oil pump drive gear to the drive rotor, check that the drive rotor turn smoothly.



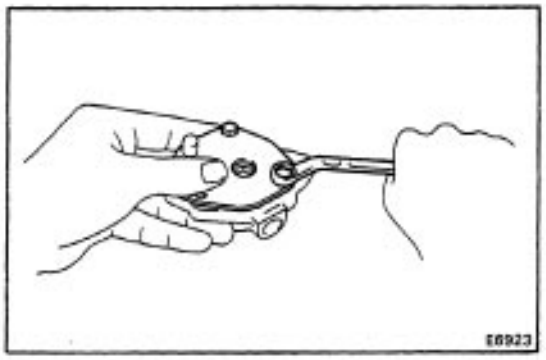
2. REMOVE GASKET TO OIL PUMP CASE

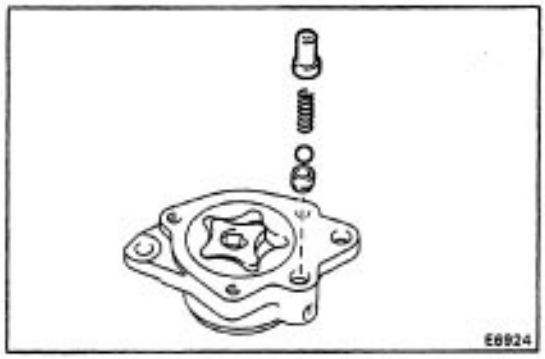


3. REMOVE BOLT AND OIL STRAINER

4. REMOVE OIL PUMP COVER

(a) Hold the oil pump cover, remove the two bolts and a cover.





(b) Remove the spring holder, spring, ball and relief valve seat.

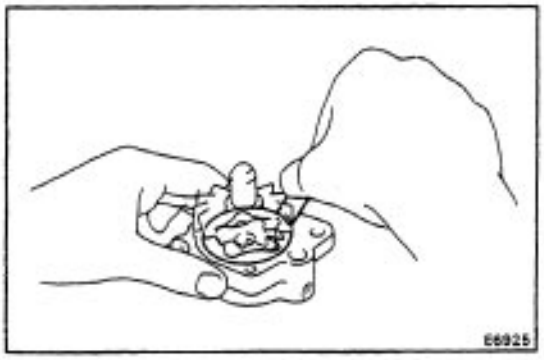
5. CHECK ROTOR BODY CLEARANCE

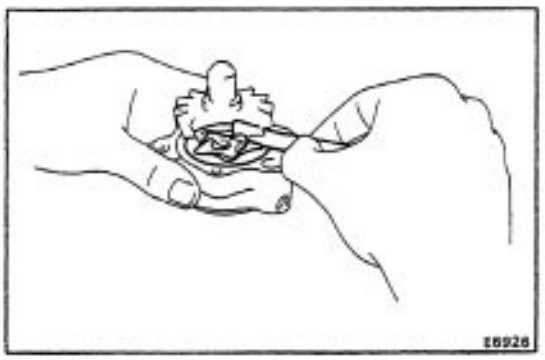
(a) Install the oil pump drive gear to the drive rotor.

(b) Using a feeler gauge, measure the body clearance between the drive rotor and oil pump case.

Standard clearance: 0.10 – 0.16 mm (0.004 – 0.006 in.)

Maximum clearance: 0.30 mm (0.012 in.)





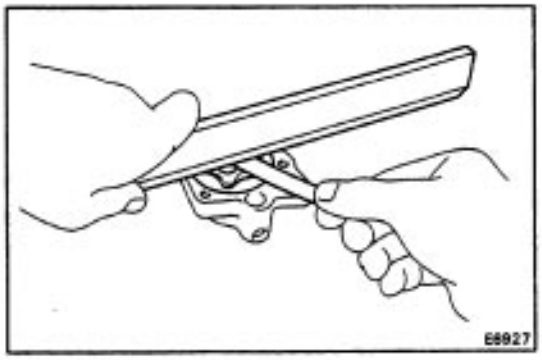
6. CHECK ROTOR TIP CLEARANCE

(a) Install the oil pump drive gear to the drive rotor.

(b) Using a feeler gauge, measure the tip clearance between the drive and driven rotors.

Standard clearance: 0.08 – 0.15 mm (0.003 – 0.006 in.)

Maximum clearance: 0.30 mm (0.012 in.)

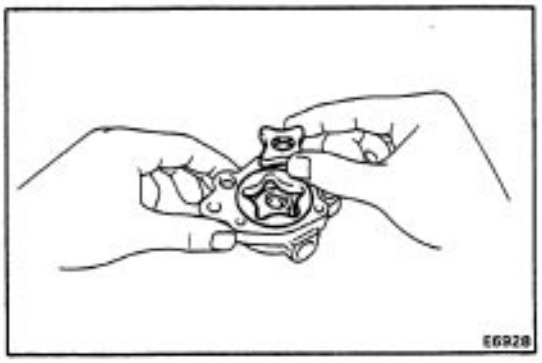


7. CHECK SIDE CLEARANCE

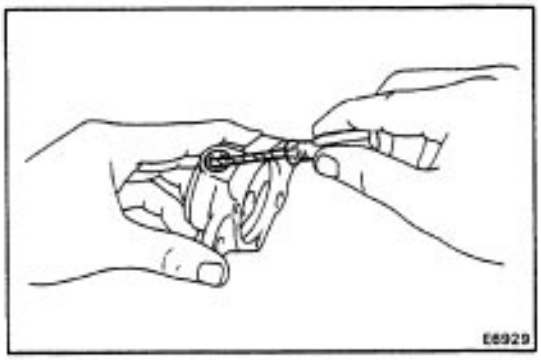
Using a precision straight edge and feeler gauge, measure the side clearance of both rotors.

Standard clearance: 0.03 – 0.08 mm (0.001 – 0.003 in.)

Maximum clearance: 0.15 mm (0.006 in.)

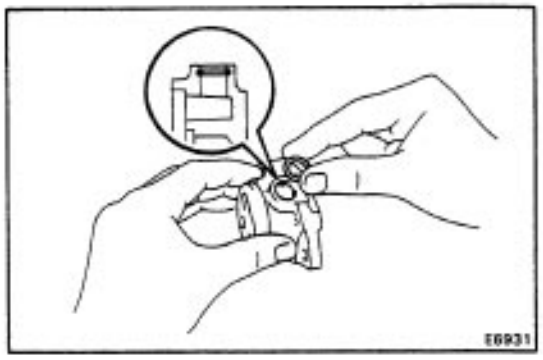


8. REMOVE OIL PUMP DRIVE ROTOR AND DRIVEN ROTOR



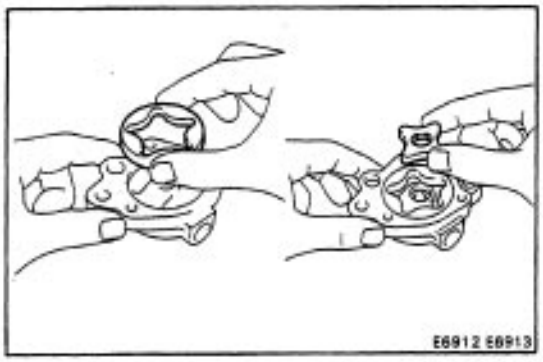
9. IF NECESSARY, REPLACE O–RING

(a) Using a screwdriver, remove the O–ring.



(b) Apply gear oil to the O–ring.

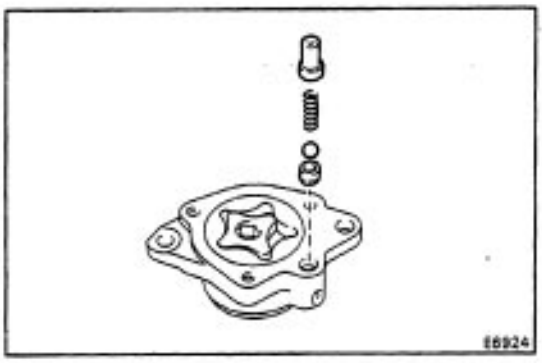
(c) Install the O–ring.



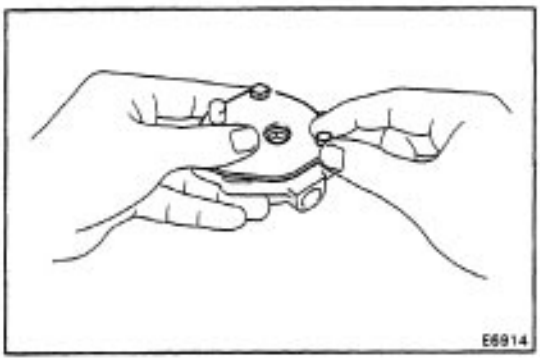
1. INSTALL DRIVEN ROTOR AND DRIVE ROTOR

2: INSTALL OIL PUMP COVER

(a) Install the relief valve, ball, spring and spring holder to the oil pump case.

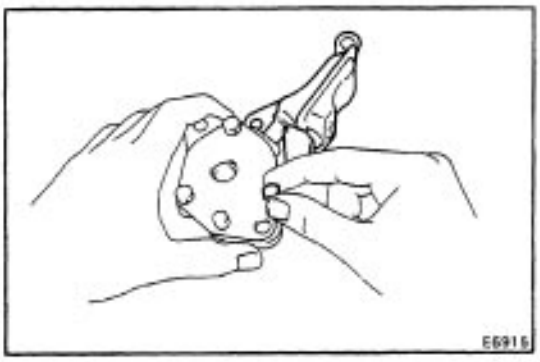


(b) Hold the oil pump cover, temporarily install the two bolts.



3. INSTALL OIL STRAINER

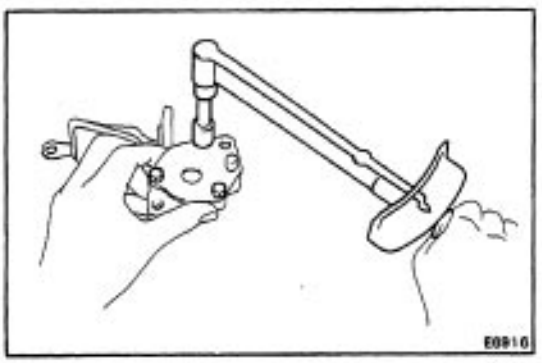
Install the oil strainer to the oil pump case, temporarily install the bolt.

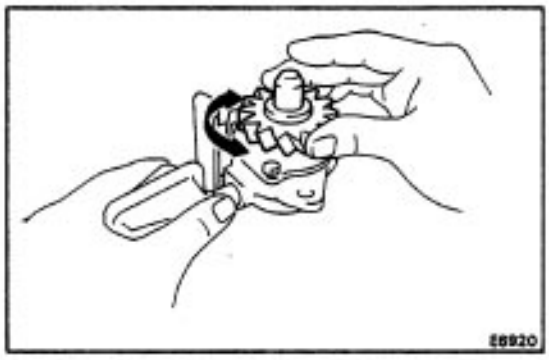


4. TORQUE OIL PUMP COVER BOLTS

Torque the three bolts evenly.

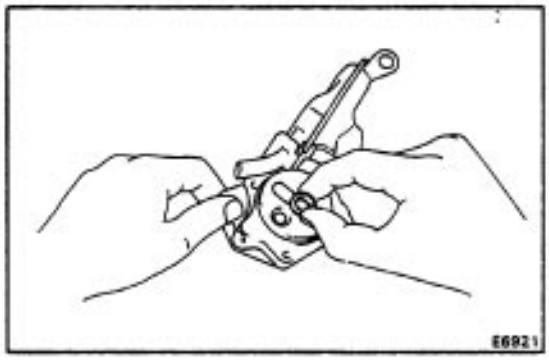
Torque: 105 kg–cm (8 ft–lb, 10 N–m)





5. CHECK OPERATION OF OIL PUMP

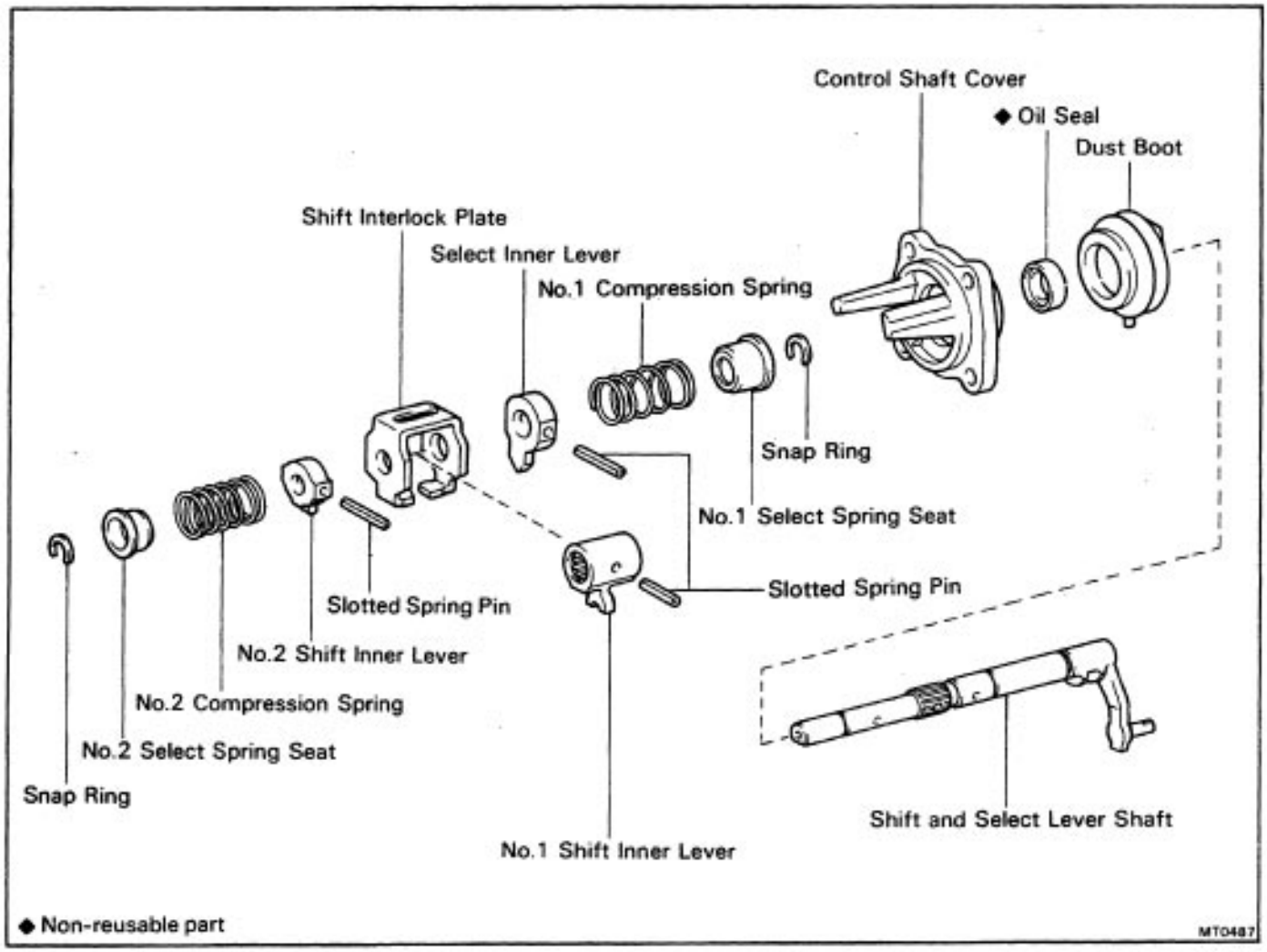
Insert the oil pump drive gear to the drive rotor, check that the drive rotor turn smoothly.

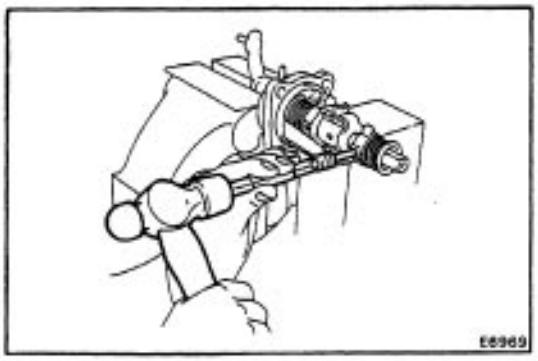


6. INSTALL GASKET

Install the new gasket to the oil pump case.

Shift and Select Lever Assembly

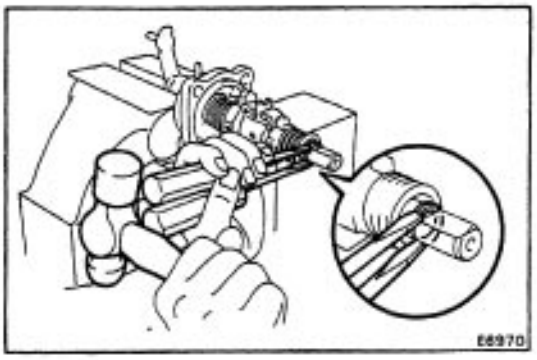




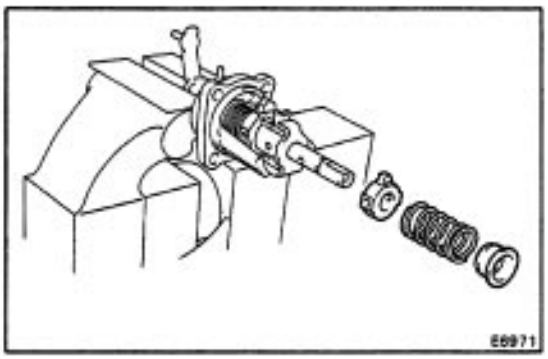
DISASSEMBLY OF SHIFT AND SELECT LEVER ASSEMBLY

1. REMOVE NO.2 SHIFT INNER LEVER

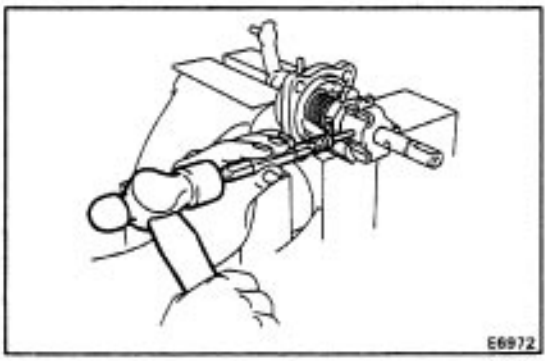
(a) Using a pin punch and hammer, drive out the slotted spring pin.



(b) Using two screwdrivers and a hammer, remove the snap ring.

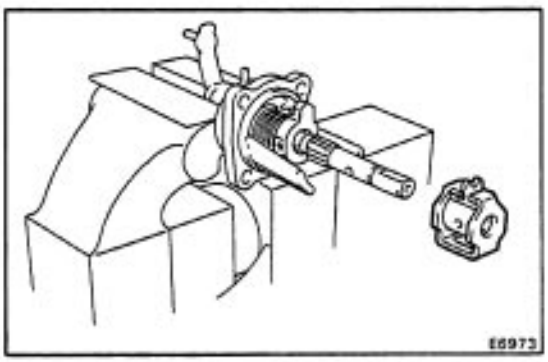


(c) Remove the No.2 select spring seat, No–2 compression spring and No.2 shift inner lever.

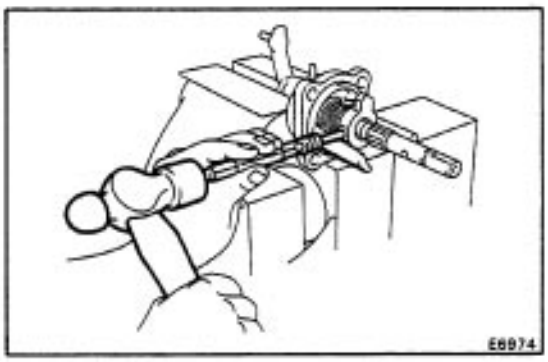


2. REMOVE SHIFT INTERLOCK PLATE AND NO.1 SHIFT INNER LEVER

(a) Using a pin punch and hammer, drive out the slotted spring pin.

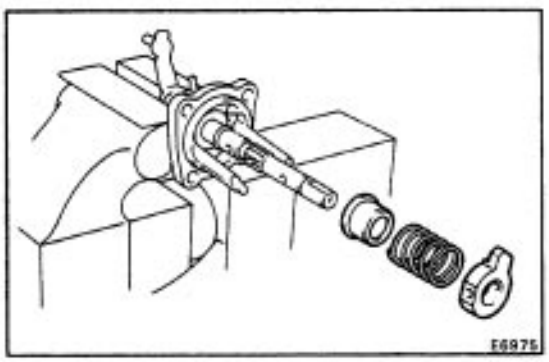


(b) Remove the shift interlock plate and No.1 shift inner lever.

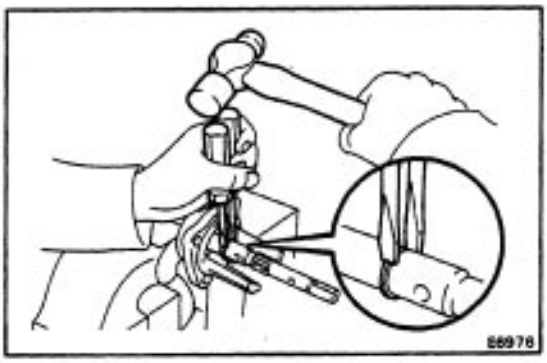


3. REMOVE SELECT INNER LEVER

(a) Using a pin punch and hammer, drive out the slotted spring pin.

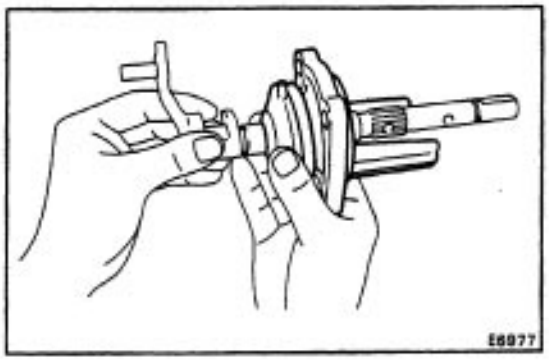


(b) Remove the select inner lever–, No. 1 compression spring and No. 1 select spring seat.



4. REMOVE SNAP RING

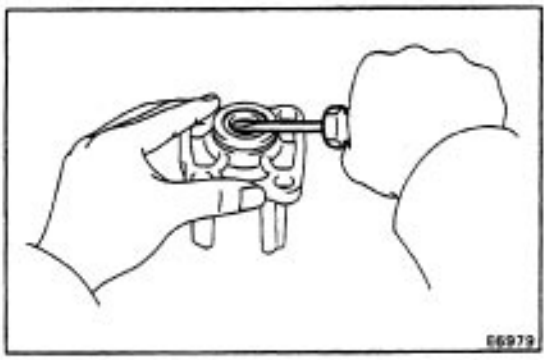
Using two screwdrivers and a hammer, remove the snap ring.



5. REMOVE CONTROL SHAFT COVER AND DUST BOOT

(a) Remove the control shaft cover with dust boot from the shaft.

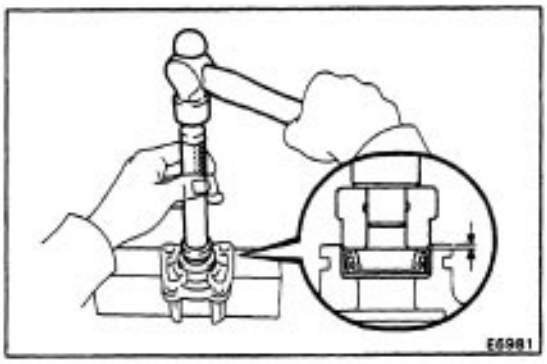
(b) Remove the dust boot from the control shaft cover.



INSPECTION AND REPLACEMENT OF SHIFT AND SELECT LEVER ASSEMBLY

IF NECESSARY, REPLACE CONTROL SHAFT COVER OIL SEAL

(a) Using a screwdriver, pry out the oil seal.



(b) Using SST, drive in a new oil seal.

SST 09620–30010 (09627–30010, 09631–00020)

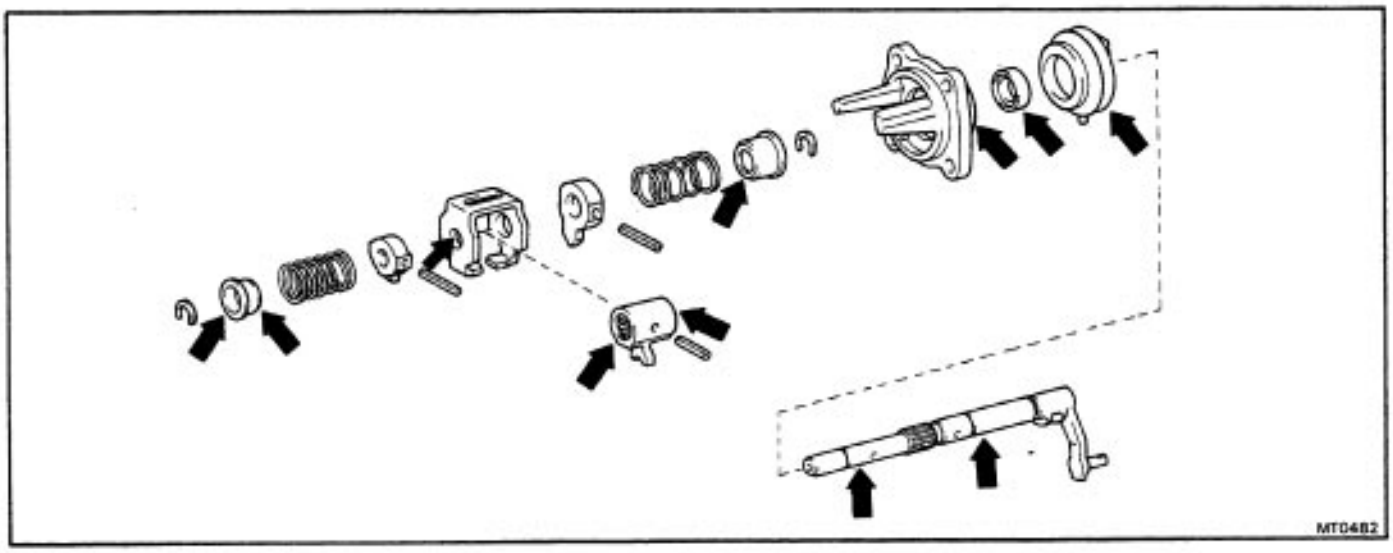
Drive in depth: 0.5 ± 0.5 mm (0.020 ± 0.020 in.)

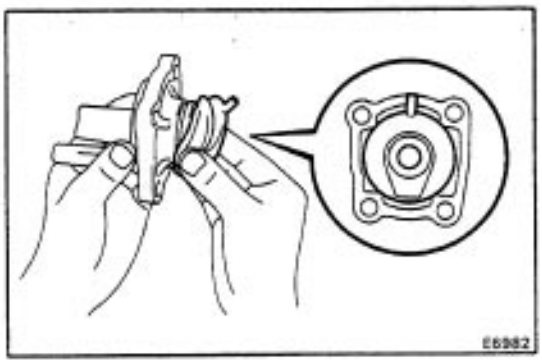
(c) Coat the oil seal lip with MP grease.

ASSEMBLY OF SHIFT AND SELECT LEVER ASSEMBLY

(See page MT–79)

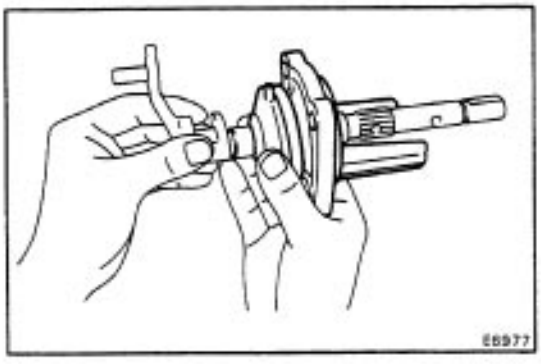
1. COAT SHAFT WITH MP GREASE, AS SHOWN



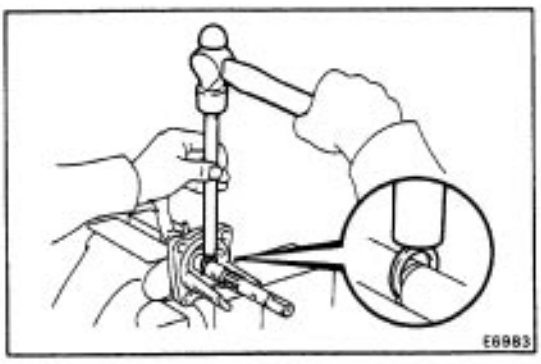


2. INSTALL DUST BOOT AND CONTROL SHAFT COVER

(a) Install the dust boot to the control shaft cover as shown.

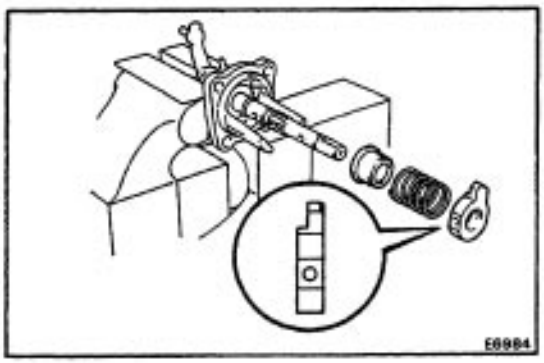


(b) Install the control shaft to the control shaft cover.



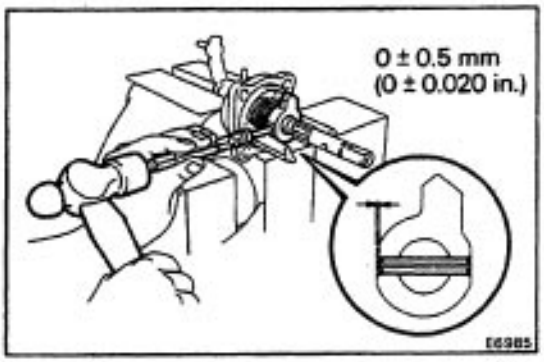
3. INSTALL SNAP RING

Using a brass bar and hammer, install! the snap ring.



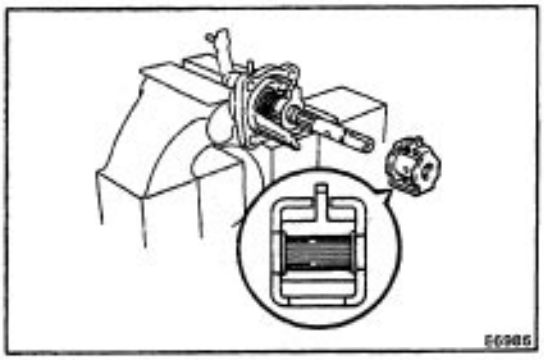
4. INSTALL SELECT INNER LEVER

(a) Install the No.1 select spring seat, No.1 compression spring and select inner lever.



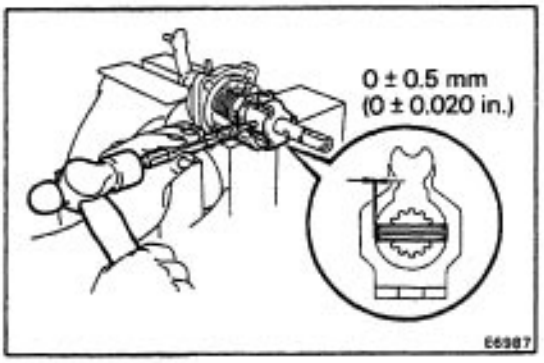
(b) Using a pin punch and hammer, drive in the slotted spring pin.

(c) Check that the No. 1 select spring seat slide smoothly.

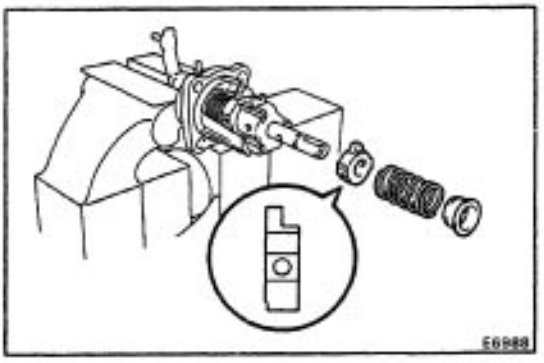


5. INSTALL SHIFT INTERLOCK PLATE AND No.1 SHIFT INNER LEVER

(a) Install the shift interlock plate and No.1 shift inner lever as shown.

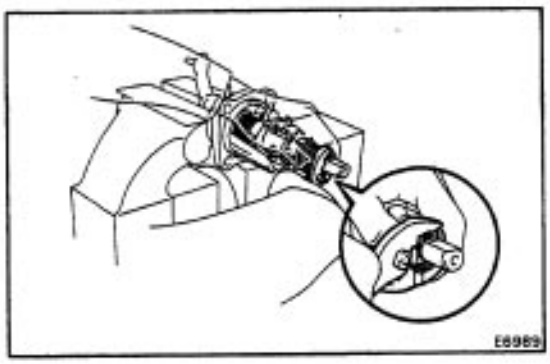


(b) Using a pin punch and hammer, drive in the slotted spring pin.

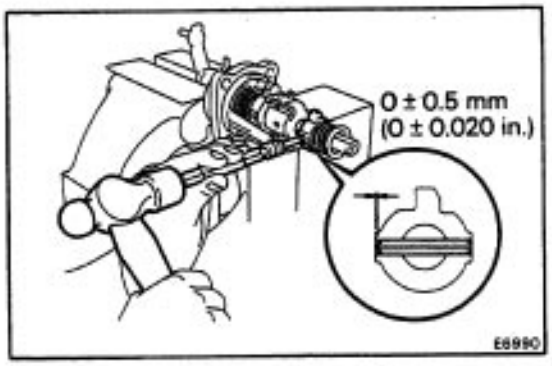


6. INSTALL NO.2 SHIFT INNER LEVER

(a) Install the No.2 shift inner lever, No–2 compression spring and No.2 select spring seat.



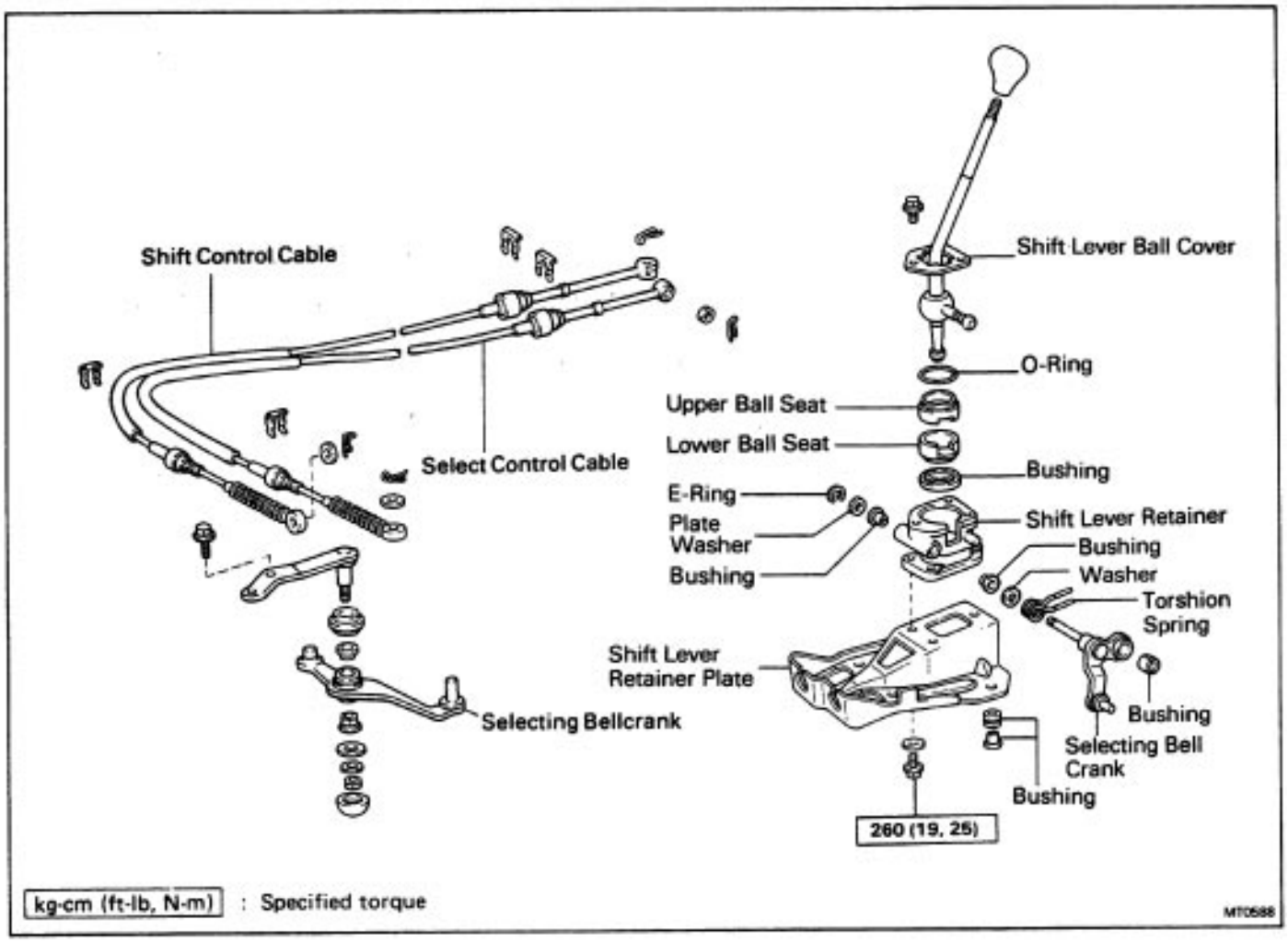
(b) Compress the spring and install the snap ring with pliers.



(c) Using a pin punch and hammer, drive in the slotted spring pin.
(d) Check that the No.2 select spring seat slide smoothly.

SHIFT LEVER AND CONTROL CABLE

COMPONENTS

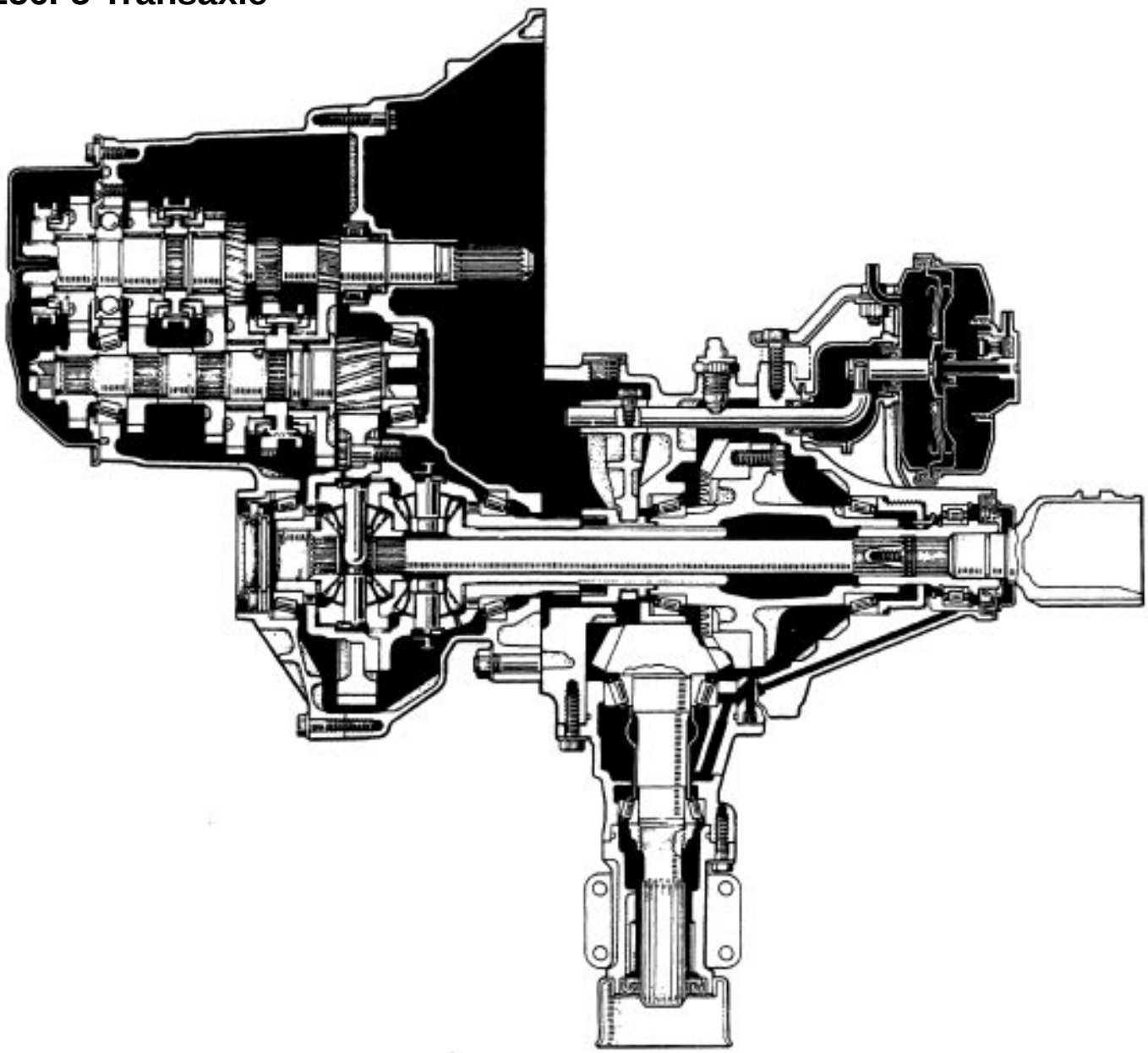


DESCRIPTION

GENERAL

- **The E56F5 transaxle has been made compact by arranging the transmission, the center differential, the front differential and the transfer on the same quadruple case axle.**
- **The center differential, which compensates for the difference between the rotation speed of the front and rear wheels, provide¿durability and reliability by utilizing bevel gear to distributing the engine power from the transmission to both the front and rear propeller shafts in a 50I50 split.– This center differential has been equipped with a lock mechanism which enables the vehicle to get out of the trouble spot more easily when one of the four wheels spins in the deep snow or muddy roads, etc.**

E56F5 Transaxle



	Transaxle type	E56 F5
Transmission	Operation method	Floor shift vehicles are provided will push–pull type remote control
	Transmission type	Forward: Constant mesh Reverse: Sliding mesh
Center differential	Reduction side (Gear type)	Helical gear
	Differential side (Gear type)	Bevel gear
	Type of differential control mechanism	Differential lock
Transfer	Gear type	Hypoid Gear

- **The oil used in each transaxle is as follows:**

Transaxle oil E50 (08885–80206)

Recommended oil

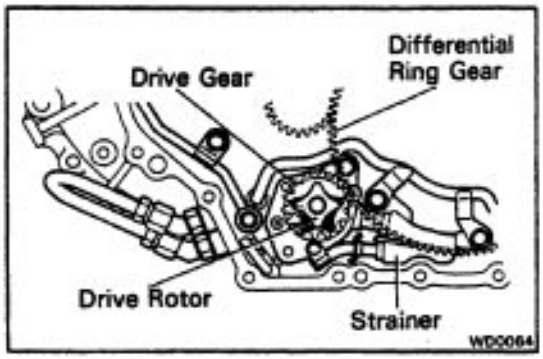
Oil grade: AN GL–5

Viscosity: SAE 75W–90 or 80W–90

Above –18˚C (0˚F) SAE 90

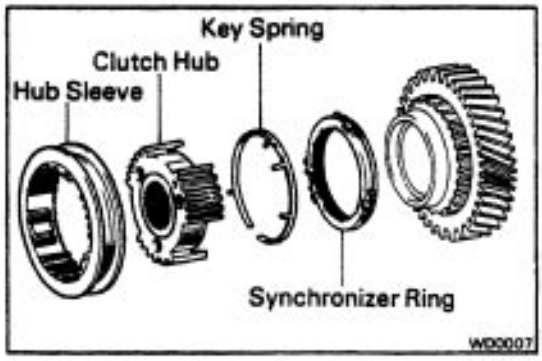
Above – 1 8˚C (0˚F) SAE 84W

- **Oil capacity: 5.0 Liters (s.3 Us qts, 4.4 Imp. qts)**



OIL PUMP

The oil pump is of the trochoid type, and is driven by the differential ring gear and the pump drive gear. It is located at the bottom of the transaxle case.



KEY–LESS TYPE SYNCHROMESH FUNCTION

*** HUB SLEEVE**

There are three protrusions on the inside of the hub sleeve to push the key spring.

*** CLUTCH HUB**

Three apertures are located around the clutch hub to secure the synchronizer ring and key spring in place.

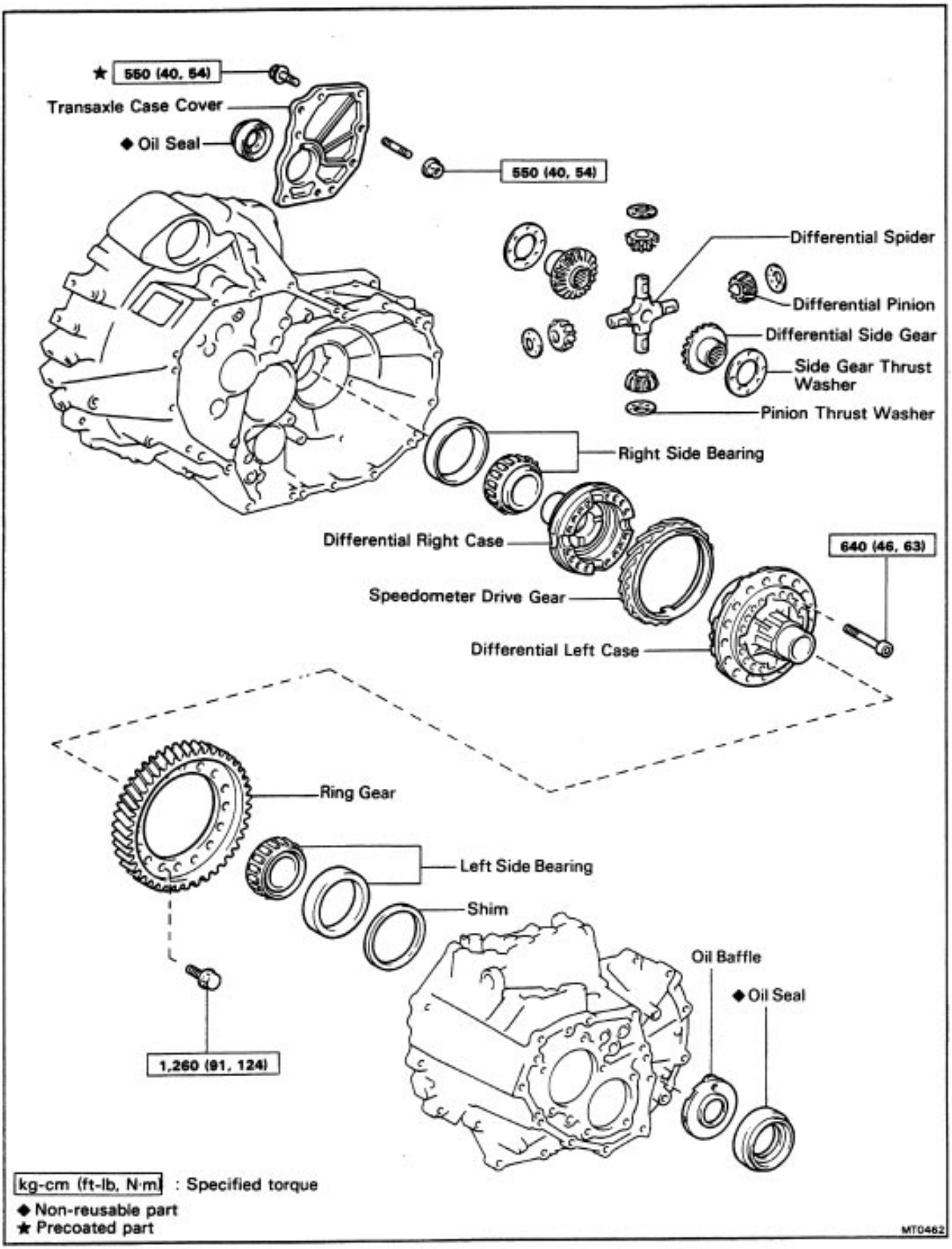
*** KEY SPRING**

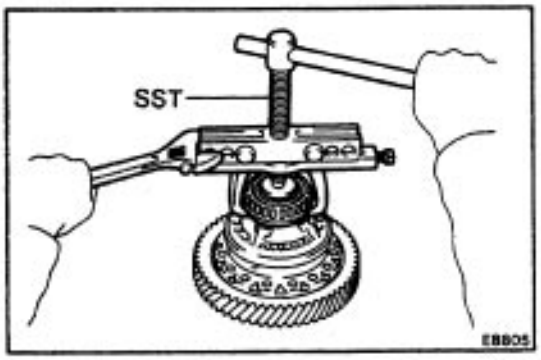
The key spring has four claws. One claw is to secure the key spring in place. Three claws also act as shifting keys as well as key springs.

SYNCHRONIZER RING

A chamfered ledge is provided at three points along the outer periphery and a bolt is provided in each to secure a key spring.

Differential

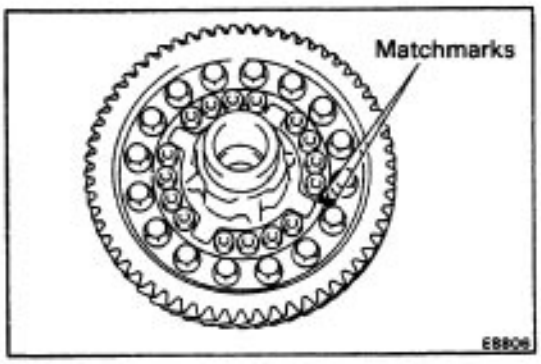




DISASSEMBLY OF DIFFERENTIAL CASE

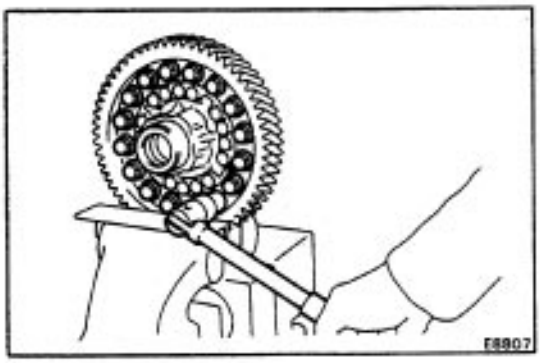
1. REMOVE SIDE BEARING

Using SST, remove the two side bearings.
SST 09950–20017

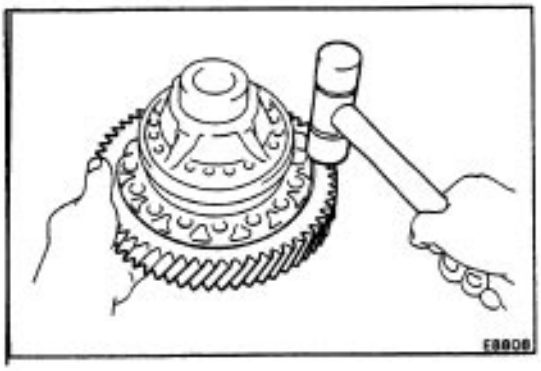


2. REMOVE RING GEAR

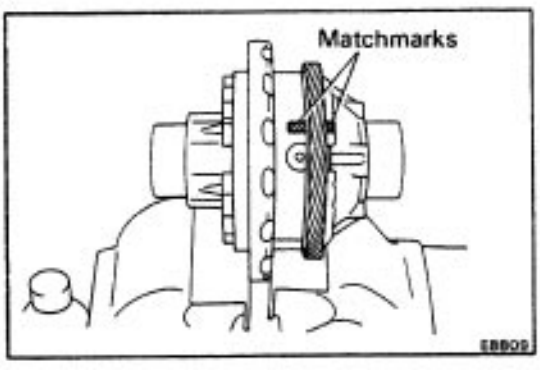
(a) Place the matchmarks on both the differential case and ring gear.



(b) Remove the sixteen bolts.

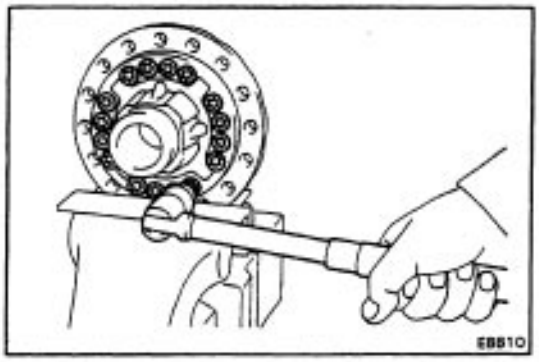


(c) Using a plastic hammer, tap out the ring gear.

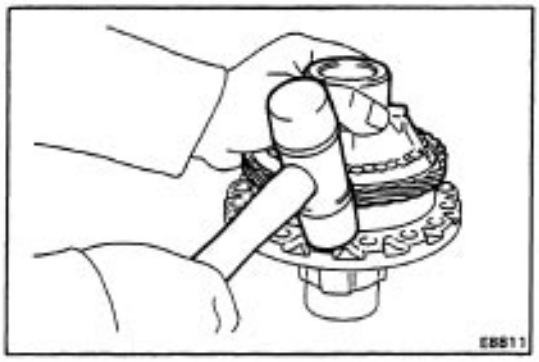


3. DISASSEMBLE OF DIFFERENTIAL CASE

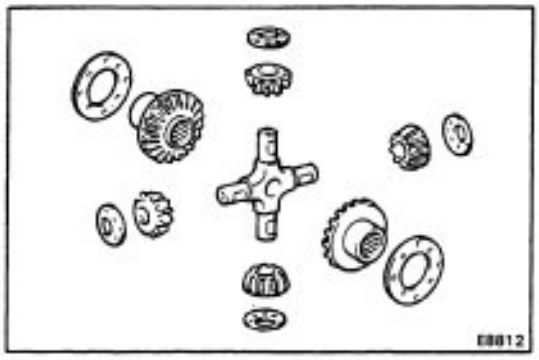
(a) Place the matchmarks on the differential right and left case.
(b) Using a torx socket wrench, remove the sixteen torx screws.



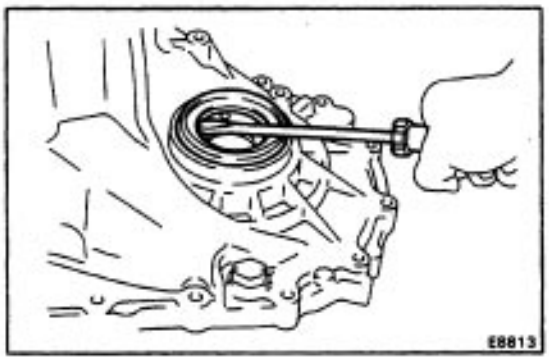
(b) Using a torx wrench, remove the sixteen torx screws.
Torx wrench T50 09042–00040



(c) Using a plastic hammer, tap out the differential left case.
(d) Remove the speedometer drive gear from the differential right case.



(e) Remove the two differential side gears, two side gear thrust washers, differential spider, four differential pinions and four pinion washers from the differential left case.



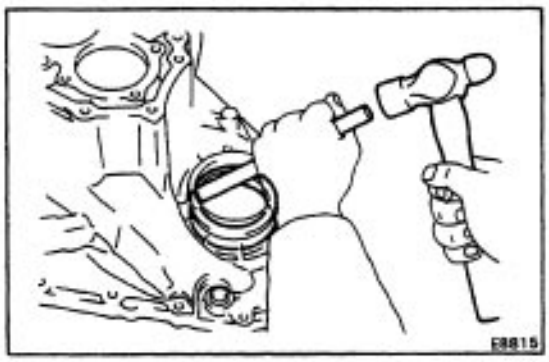
INSPECTION OF DIFFERENTIAL CASE

1 . (Transmission Case Side)

IF NECESSARY. REPLACE OIL SEAL AND TAPER ROLLER BEARING OUTER RACE

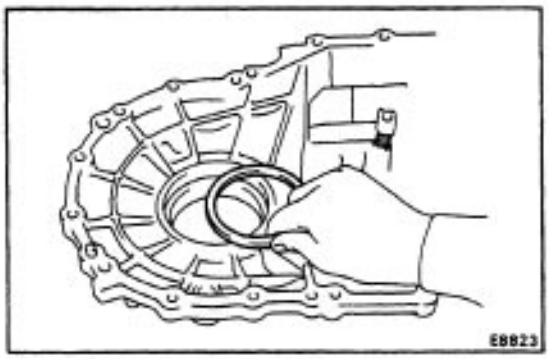
(a) Using screwdriver, remove the oil seal.

(b) Remove the transmission oil baffle.



(c) Using a brass bar and hammer, drive out the bearing outer race lightly and evenly.

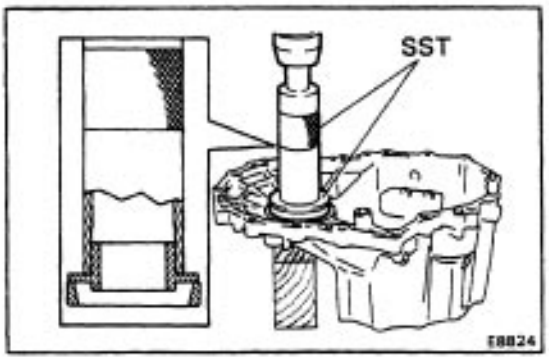
(d) Remove the shim.



(e) Install the shim.

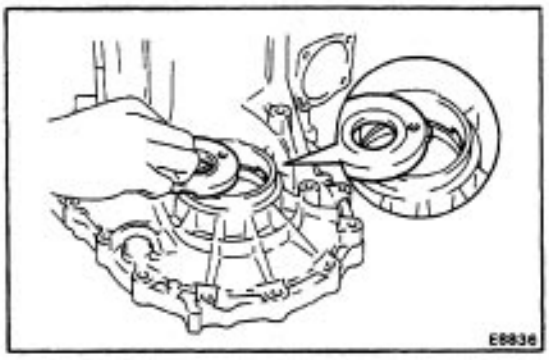
(See page MT–96, 97)

HINT: First select and install a shim of leaser thickness than before.



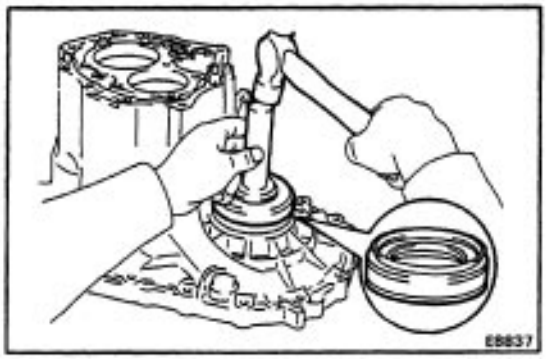
(f) Using SST and a press, install the taper roller bearing outer race.

SST 09316–60010 (09316–00010, 09316–00040)

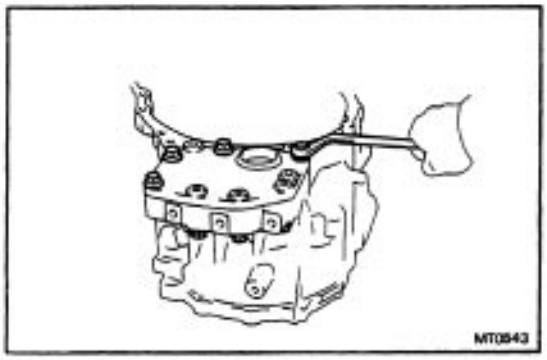


(g) Install the transmission oil baffle.

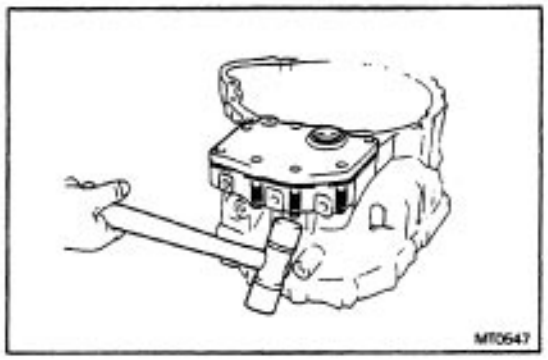
HINT: Install the transmission oil baffle projection into the case side cutout.



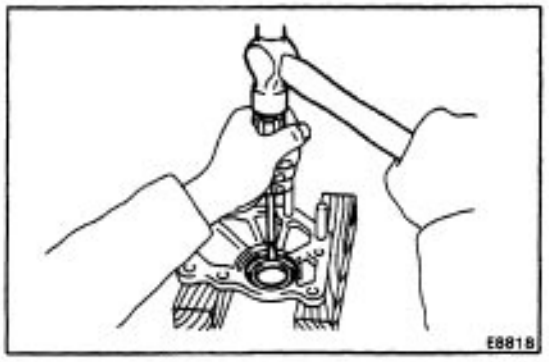
(h) Using SST and a hammer, drive in a new oil seal.
SST 09223–15010
(i) Coat the tip of oil seal with MP grease.



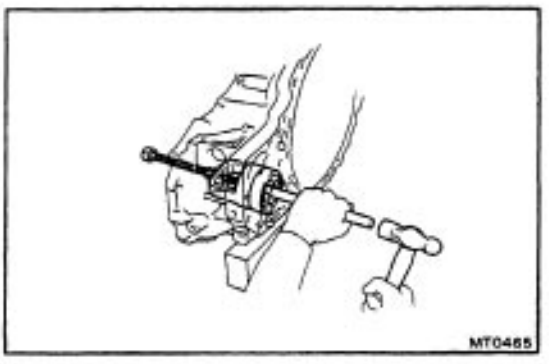
2. (Transaxle Case Side)
IF NECESSARY, REPLACE OIL SEAL AND TAPER
ROLLER BEARING OUTER RACE
(a) Remove the four bolts and three nuts.



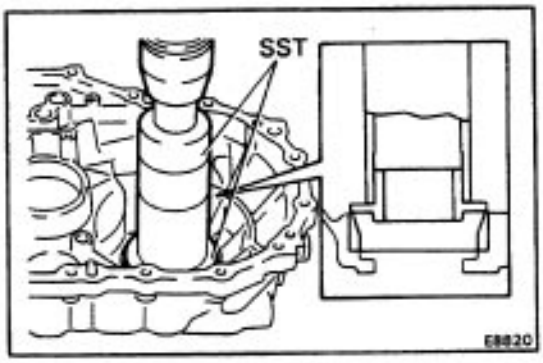
(b) Using a plastic hammer, tap the stud bolt and remove the transaxle case cover.



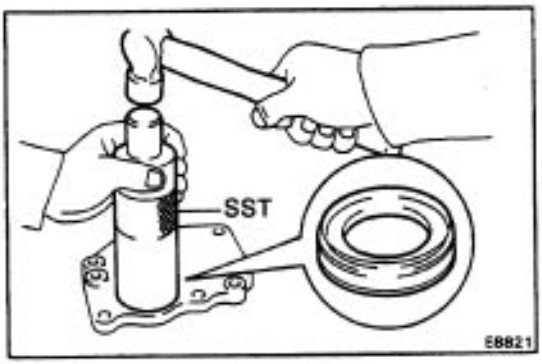
(c) Using a screwdriver and hammer, drive out the oil seal.



(d) Using SST, brass bar and hammer, remove the taper roller bearing outer race.
SST 09612–65014

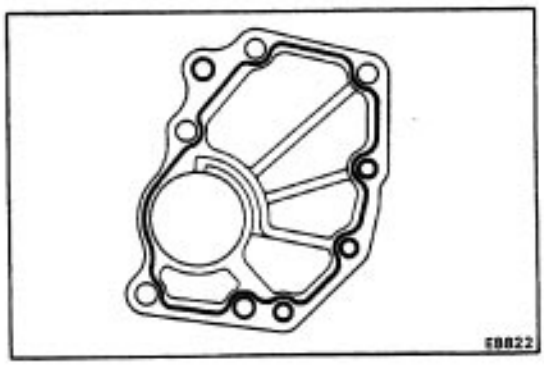


(e) Using SST and a press, install the taper roller bearing.
SST 09316–60010 (09316–00010, 09316–00040)



(f) Using SST and a hammer, drive in a new oil seal.
SST 09316–60010 (09316–00010)

(g) Coat the lip of oil seal with MP grease.

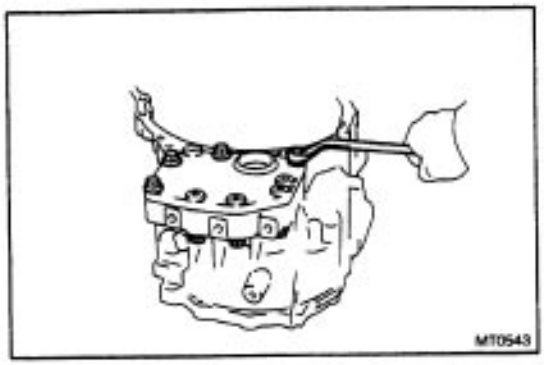


(h) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transaxle case or case cover.

Apply seal packing to the transaxle case cover as shown.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT: Install the transaxle case cover as soon as the seal packing is applied.

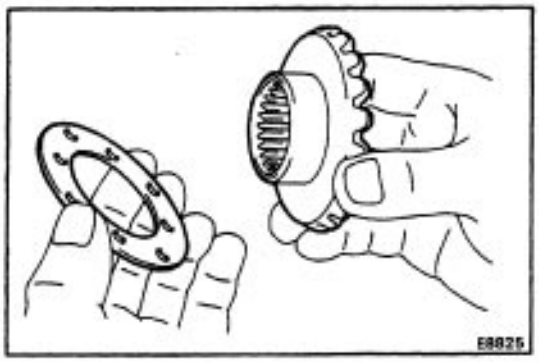


Q) Apply sealant to the bolt threads.

Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(k) Install and torque the four bolts and three nuts.

Torque: 550 kg–cm (40 ft–lb, 54 N–m)

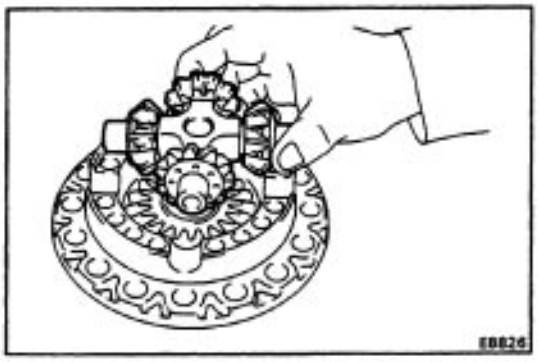


ASSEMBLY OF DIFFERENTIAL CASE

1. ASSEMBLE DIFFERENTIAL CASE

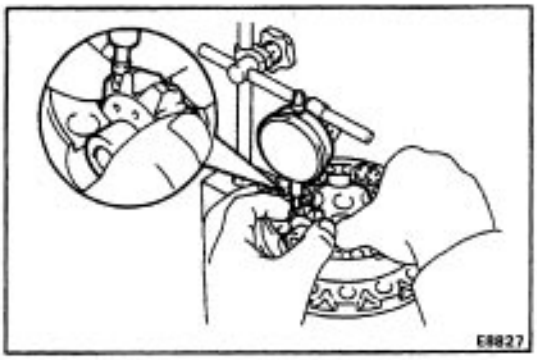
HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

(a) Install the thrust washer to the side gear.



(b) Install the four pinions and thrust washers to the spider.

(c) Install the side gear and spider with four pinions to the differential left case.



(d) Using a dial indicator, measure the backlash of one pinion gear while holding the No–2 differential case.

Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

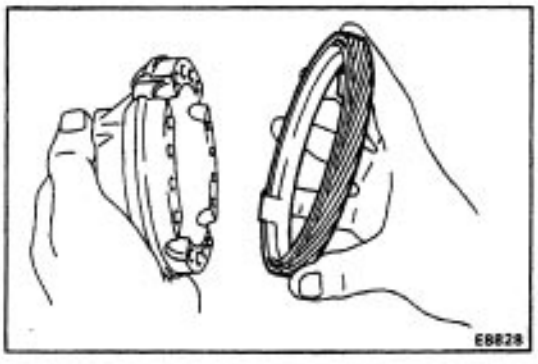
HINT: Push the pinion gear of the left side of the differential case.

(e) Install the side gear and spider with four pinions to the right side of the differential case.

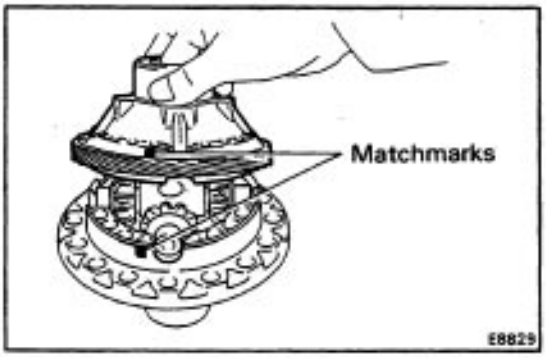
Check the side gear backlash.

(f) Referring to the table below, select the thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

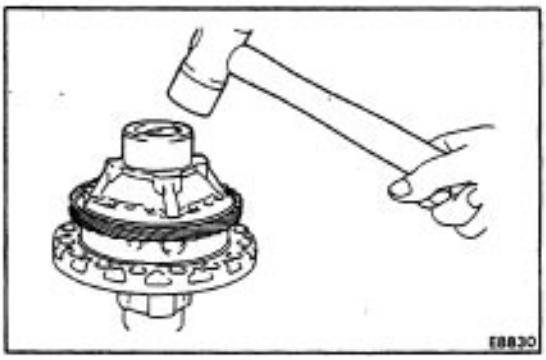
Thickness mm (in.)	Thickness mm (in.)
0.80 (0.0315)	1.20 (0.0472)
0.90 (0.0354)	1.30 (0.0512)
1.00 (0.0394)	1.40 (0.0551)
1.10 (0.0433)	



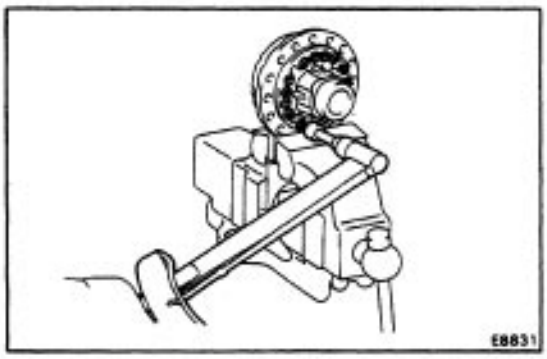
Install the speedometer driven gear.



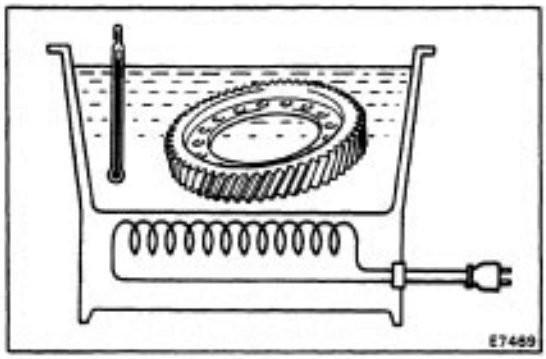
(h) Align the matchmarks on the differential cases.



Using a plastic hammer, carefully tap the differential case.

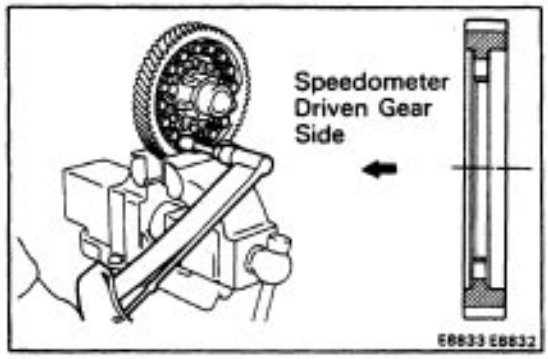


(j) Using a torx wrench, install and ,torque the sixteen torx screws.
Torx wrench T50 09042–00040
Torque: 640 k9–cm (46 ft–lb, 63 N–m)



2. INSTALL RING GEAR

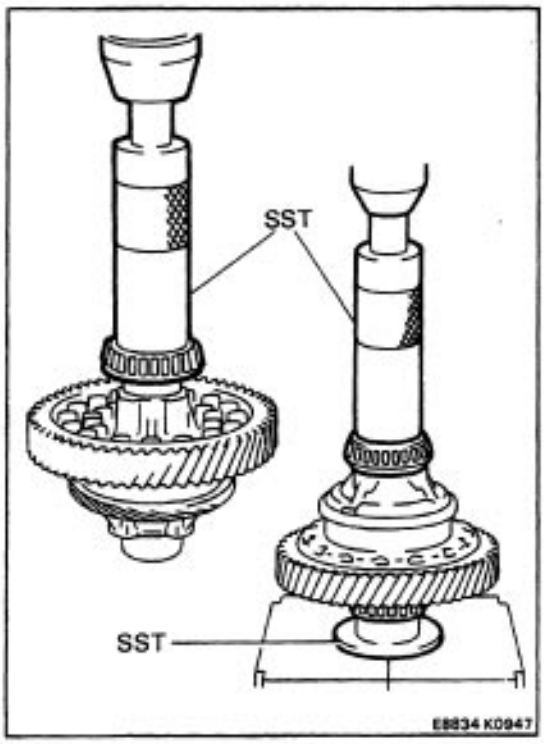
(a) Clean the contact surface of the differential case.
(b) Heat the ring gear to about 100˚C (212˚F) in an oil bath.
NOTICE: Do not heat the ring gear above 110˚C (230˚F).
(c) Clean the contact surface of the ring gear with cleaning solvent.



(d) Quickly install the ring gear on the differential case. Install the sixteen bolts.

HINT: Align the matchmarks on the differential left case and contact the ring gear.

(e) Tighten the set bolts uniformly and a little at a time. Torque the bolts.
Torque: 1,260 kg–cm (91 ft–lb, 124 N–m)



3. INSTALL SIDE BEARING '

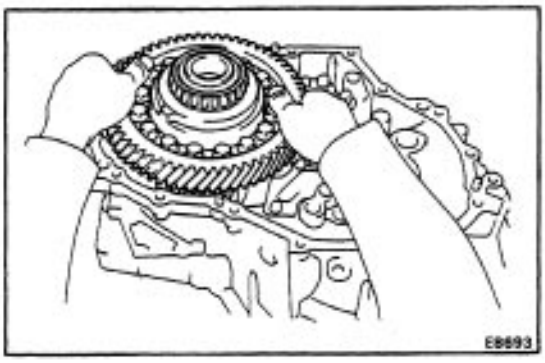
Using SST and a press, install the side bearings onto the differential case.

SST 09316–20011, 09506–35010

HINT: Press the bearing on the ring gear side first.

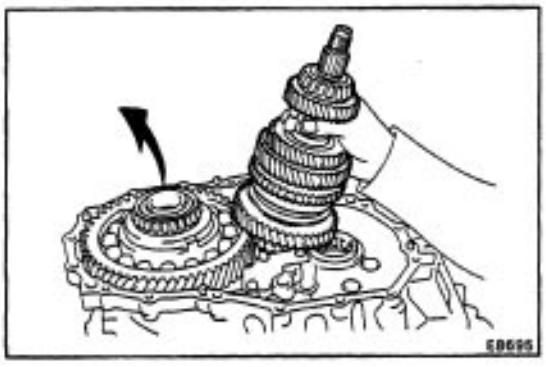
4. ADJUST OUTPUT SHAFT ASSEMBLY PRELOAD

(See pages MT–96 to 98)



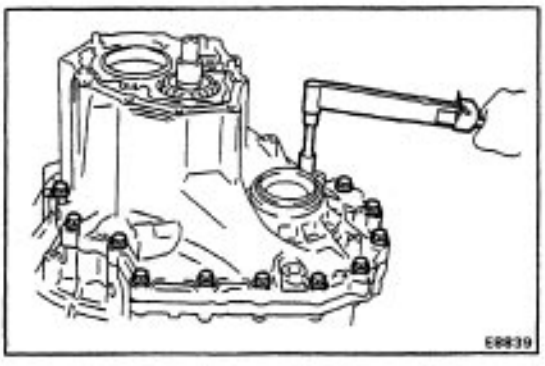
5. INSTALL DIFFERENTIAL CASE ASSEMBLY

Install the differential case assembly to the transaxle case.



6. INSTALL OUTPUT SHAFT ASSEMBLY

Lift up the differential case, install the output shaft assembly.



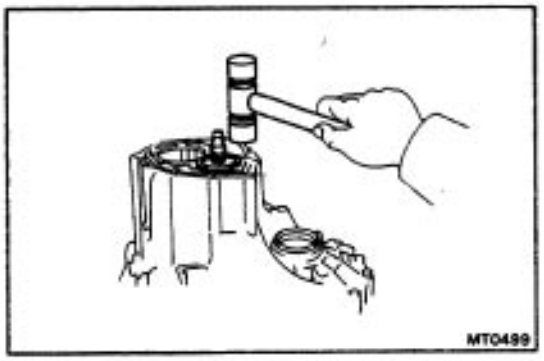
7. INSTALL TRANSMISSION CASE

(a) Install the transmission case.

HINT: If necessary, tap on the case with a plastic hammer.

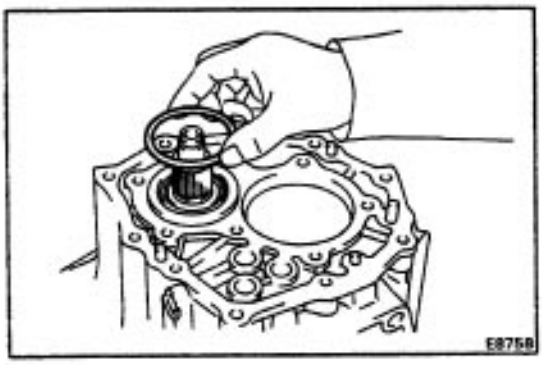
(b) Install and torque the seventeen bolts.

Torque: 300 kg–cm (22 ft–lb, 29 N–m)



8. INSTALL OUTPUT SHAFT REAR TAPER ROLLER BEARING OUTER RACE

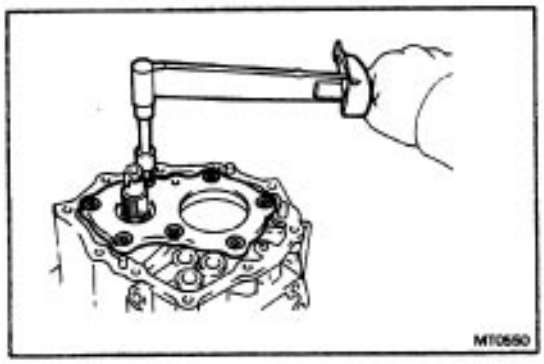
Using a plastic hammer, drive in the outer race.



9. INSTALL SHIM

(See pages MT–96, 97)

HINT: Install the previously selected shim.

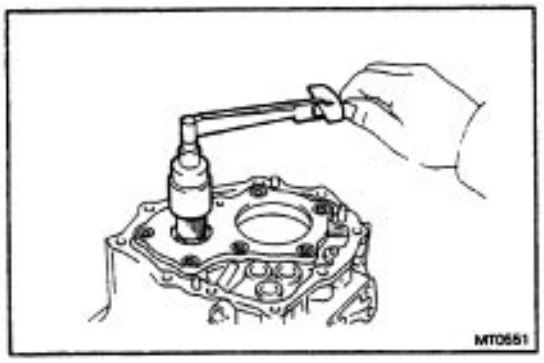


10. INSTALL REAR BEARING RETAINER

Using a torx wrench, install and torque the seven torx screws.

Torx wrench T45 09042–00050

Torque: 430 kg–cm (31 ft–lb, 42 N–m)



11. ADJUST DIFFERENTIAL CASE PRELOAD

(a) Install the new lock nut to the output shaft.

(b) Turn the output shaft right and left two or three times to allow the bearings to settle

(c) Using a torque wrench, measure the preload.

Preload (at starting):

New bearing (Add output shaft preload)

2.0 – 4.1 kg–cm

(1.7 – 3.6 in.–lb, 0.2 – 0.4 N–m)

Reused bearing (Add output shaft preload)

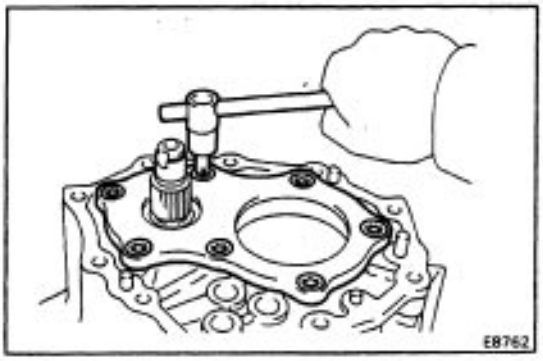
1.3 – 2.5 kg–cm

(1.1 – 2.2 in.–lb, 0.1 – 0.2 N–m)

If the preload is not within specification, select the thrust washers.

HINT: The total preload will change about 12 kg–cm (0.9 1.7 in.–lb, 0.1 – 0.2 N–m) with each shim thickness.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
0	2.00 (0.0787)	9	2.45 (0.0965)
1	2.05 (0.0807)	A	2.50 (0.0984)
2	2.10 (0.0827)	B	2.55 (0.1004)
3	2.15 (0.0746)	C	2.60 (0.1024)
4	2.20 (0.0866)	D	2.65 (0.1043)
5	2.25 (0.0886)	E	2.70 (0.1063)
6	2.30 (0.0906)	F	2.75 (0.1083)
7	2.35 (0.0925)	G	2.80 (0.1102)
8	2.40 (0.0945)	H	2.85 (0.1122)

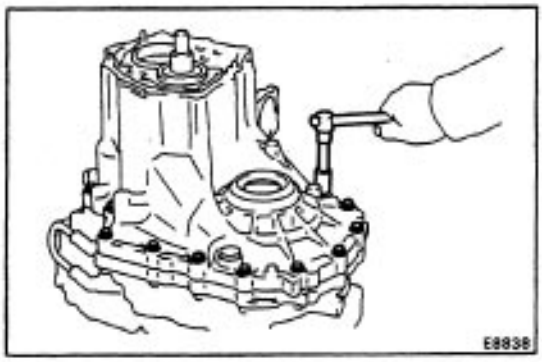


12. REMOVE REAR BEARING RETAINER

Using torx wrench, remove the seven torx screws and rear bearing retainer.

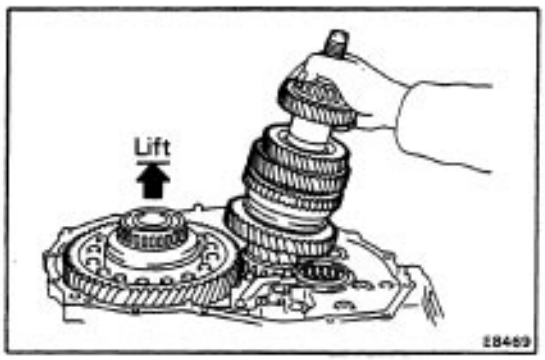
Torx wrench T45 09042–00050

13. REMOVE SHIM



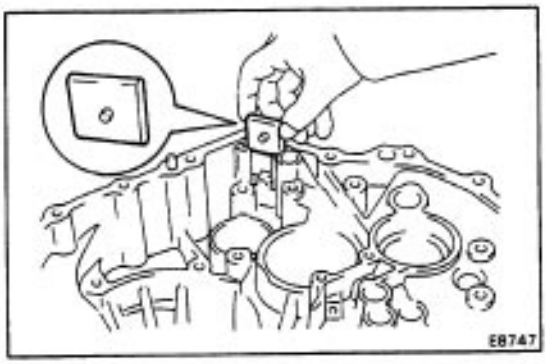
14. REMOVE TRANSMISSION CASE

Remove the seventeen bolts and tap off the case with a plastic hammer.



15. REMOVE OUTPUT SHAFT ASSEMBLY

16. REMOVE DIFFERENTIAL CASE ASSEMBLY

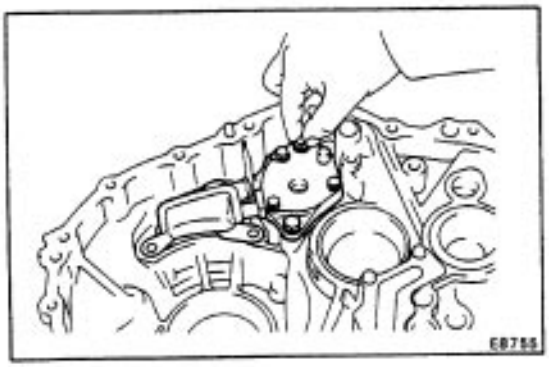


INSTALLATION OF COMPONENT PARTS

(See pages MT–47 to 49)

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

1. INSTALL MAGNET TO TRANSAXLE£ CASE

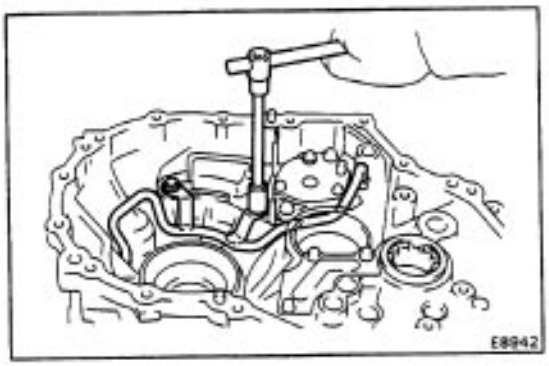


2. INSTALL OIL PUMP ASSEMBLY AND OIL PIPE

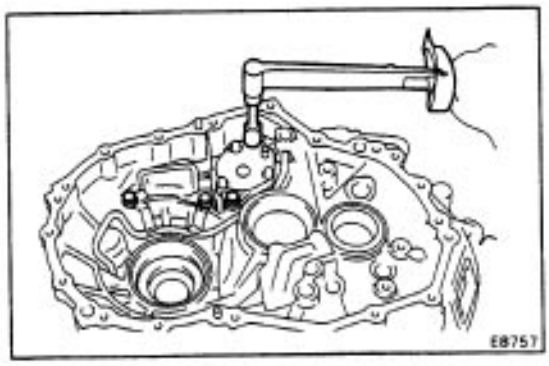
(a) Install the oil pump assembly.

(b) Install the two bolts.

HINT: Be careful not to drop the oil pump gasket.

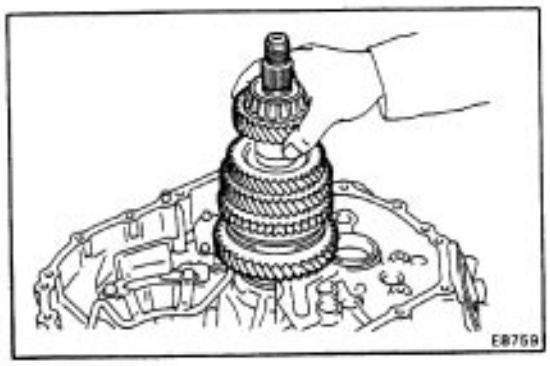


(c) Install the oil pipe and two bolts.



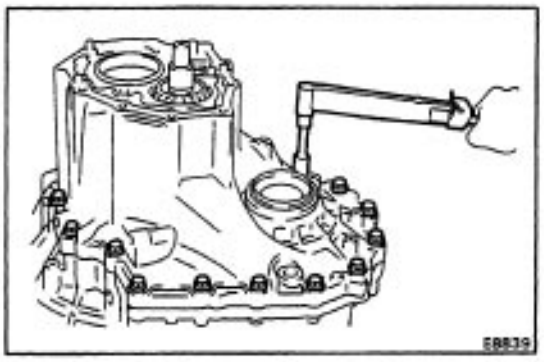
(d) Torque the four bolts.

Torque: 175 kg–cm (13 ft–lb, 17 N–m)

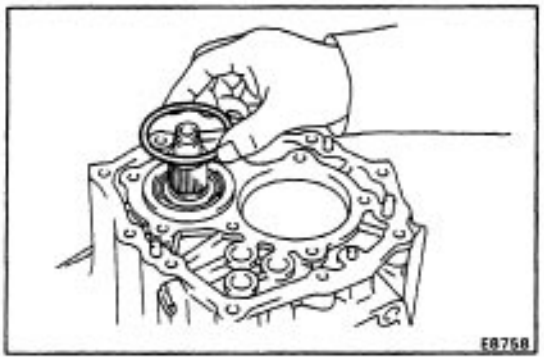


3. ADJUST OUTPUT SHAFT PRELOAD

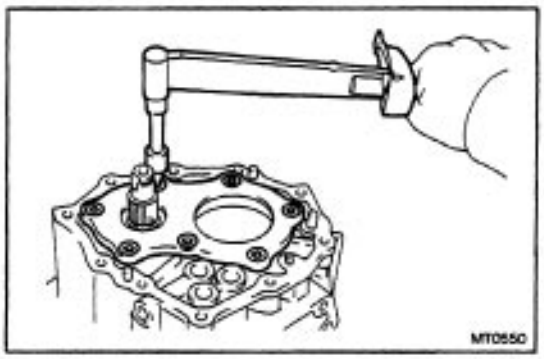
(a) Install the output shaft assembly.



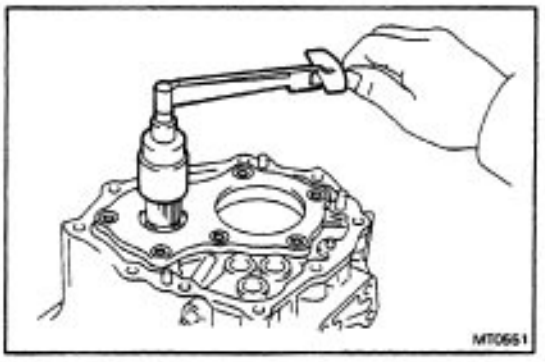
(b) Install the transmission case.
HINT: If necessary, tap on the case with a plastic hammer.
Install and torque the seventeen bolts.
Torque: 300 kg–cm (22 ft–lb, 29 N–m)
(d) Install the output shaft rear taper roller bearing outer race.



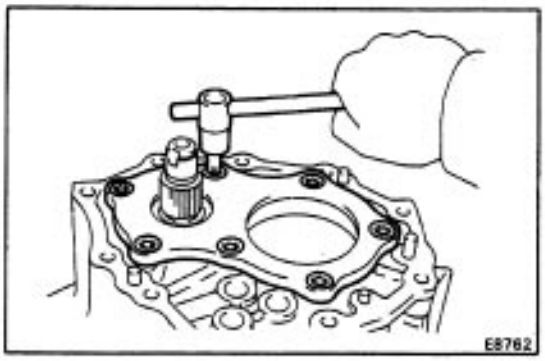
(e) Install the adjust shim.
HINT: When re–using the output shaft bearing, first install a shim of the same thickness as before. If installing a new tapered roller bearing, first select and install a shim of lesser thickness than before.



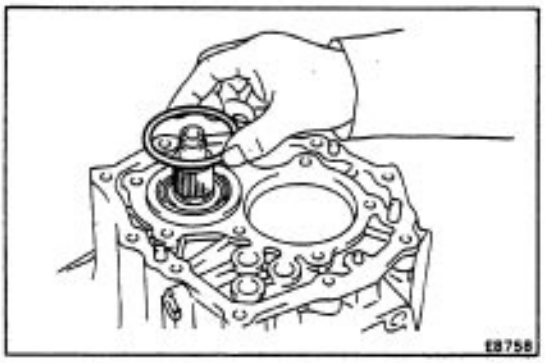
(f) Install the bearing retainer.
(g) Using a torx wrench, install and torque the seven bolts.
Torx wrench T45 09042–00050
Torque: 430 kg–cm (31 ft–lb, 42 N–m)
(h) Install the new lock nut to the output shaft.
(i) Turn the output shaft right and left 'two or three times to allow the bearings to settle.
(j) Using a torque meter, measure the preload.
Preload (at starting) :
New bearing 8 – 16 kg–cm
(6.9 – 13.9 in.–lb,
0.8 – 1.6 N–m)
Reused bearing 5 –, 10 kg–cm
(4.3 – 8.7 in.–lb, 0.5 – 1.0 N–m)
If the preload is not within specification, select the thrust washers.
HINT: The preload will change about 4 5 kg–cm (3.5 4.3 in.–lb, 0.4 0.5 N–m) with each shim thickness.



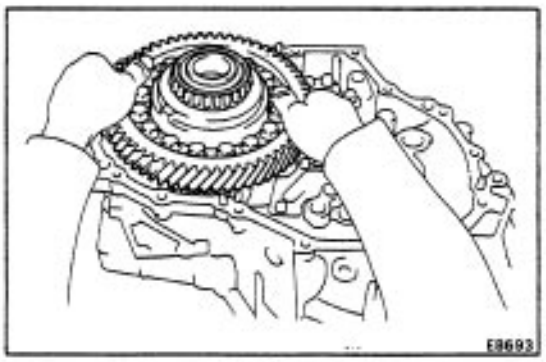
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)	Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
0	1.30 (0.0512)	7	1.65 (0.0650)	E	2.00 (0.0787)	M	2.35 (0.0925)
1	1.35 (0.0531)	8	1.70 (0.0669)	F	2.05 (0.0807)	N	2.40 (0.0945)
2	1.40 (0.0551)	9	1.75 (0.0689)	G	2.10 (0.0827)	P	2.45 (0.0965)
3	1.45 (0.0571)	A	1.80 (0.0709)	H	2.15 (0.0846)	Q	2.50 (0.0984)
4	1.50 (0.0591)	B	1.85 (0.0728)	J	2.20 (0.0866)		
5	1.55 (0.0610)	C	1.90 (0.0748)	K	2.25 (0.0886)		
6	1.60 (0.0630)	D	1.95 (0.0768)	L	2.30 (0.0906)		



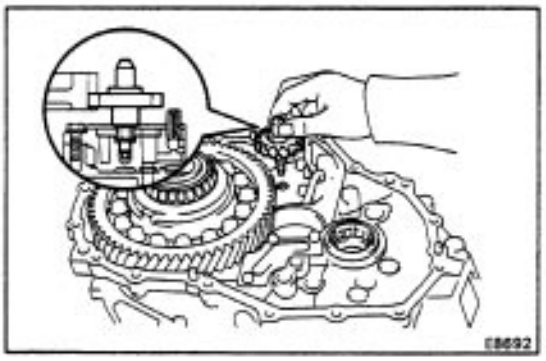
(k) Remove the lock nut.
(I) Using a torx wrench, remove the seven torx screws and rear bearing retainer.
Torx wrench T45 09042–00050



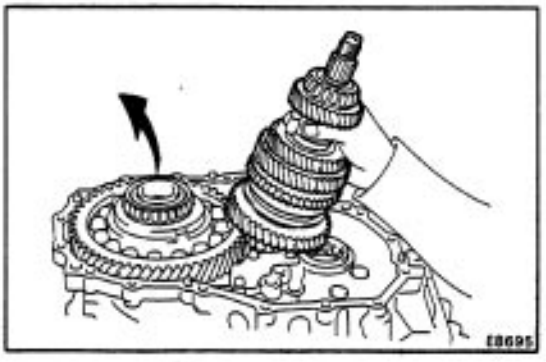
(m)) Remove the shim.
(n) Remove the seventeen bolts and transmission case.
(o) Remove the output shaft assembly.



4. INSTALL DIFFERENTIAL CASE ASSEMBLY

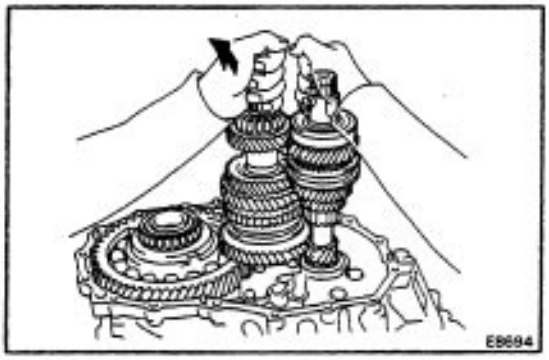


5. INSTALL OIL PUMP DRIVE GEAR

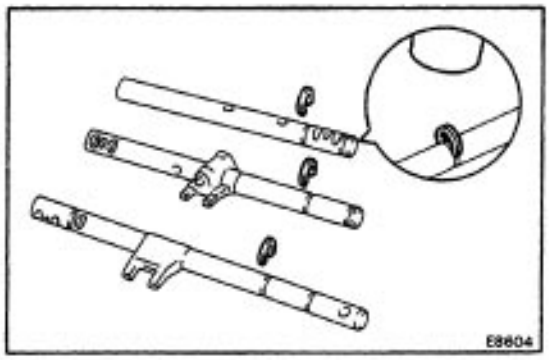


6. INSTALL OUTPUT SHAFT ASSEMBLY

(a) Lift up the differential case, install the output shaft assembly.

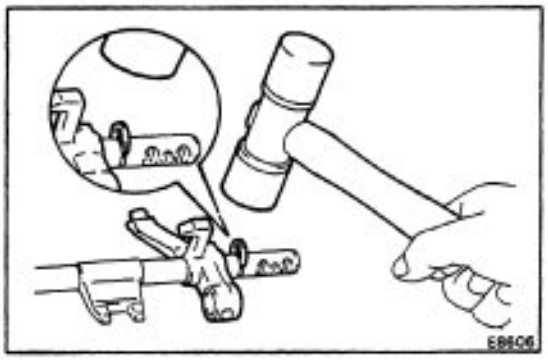


(b) Leaning the output shaft to the differential side, install the input shaft assembly.



7. INSTALL SNAP RINGS

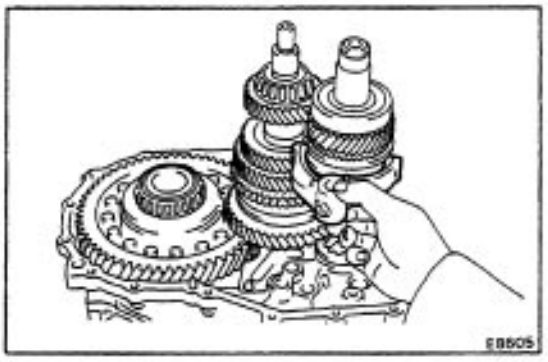
(a) Using a plastic hammer, install the snap rings to the No–1, No–2 and No–3 shift fork shafts.

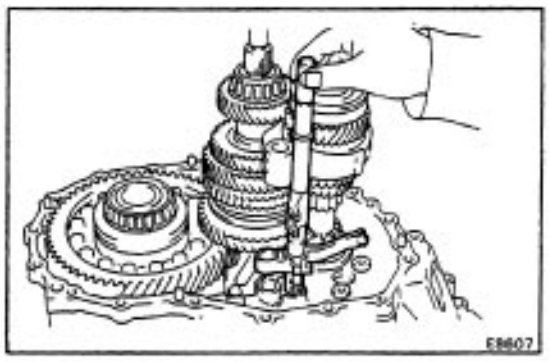


(b) Using a plastic hammer, install the reverse shift fork and snap ring to the No.3 shift fork shaft.

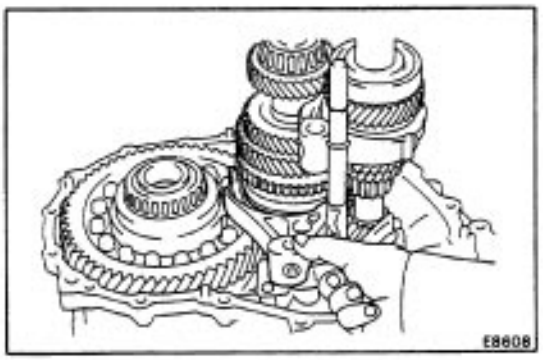
8. INSTALL NO.2 SHIFT FORK AND NO.3 SHIFT FORK SHAFT WITH REVERSE SHIFT FORK

(a) Install the No.2 shift fork to the No.2 hub sleeve.



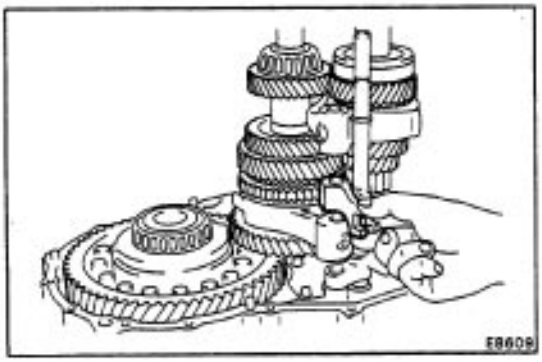


(b) Install the No.3 shift fork shaft with reverse shift fork.

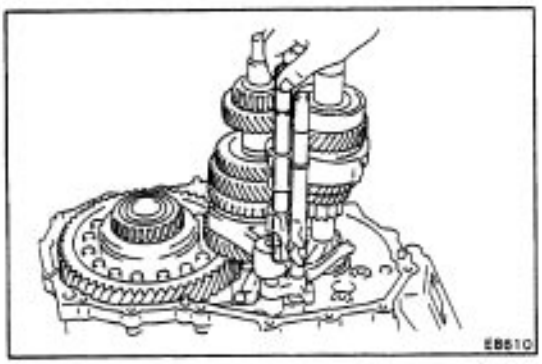


9. INSTALL NO.1 SHIFT FORK, SHIFT HEAD AND NO.2 SHIFT FORK SHAFT

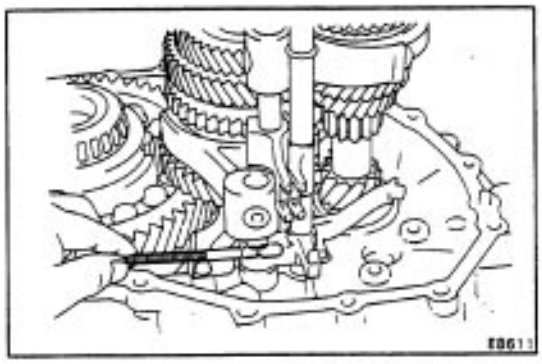
(a) Install the No.1 shift fork to the No.1 hub sleeve.



(b) Put shift head onto the NO–1 shift fork.

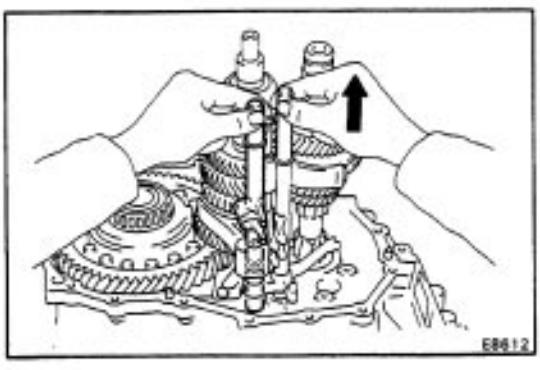


(c) Install the No.2 shift fork shaft to the transaxle case, through the shift head and No–1 shift fork.



10. INSTALL INTERLOCK ROLLER

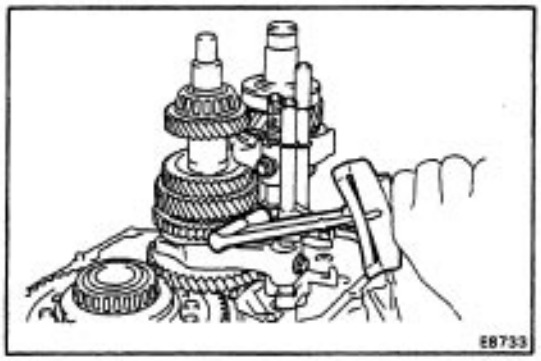
Using a magnetic finger, install the interlock roller to the reverse shift fork.



1 1. INSTALL NO.1 SHIFT FORK SHAFT

Install the No.1 shift fork shaft to the case, through the No.1 shift fork and reverse shift fork.

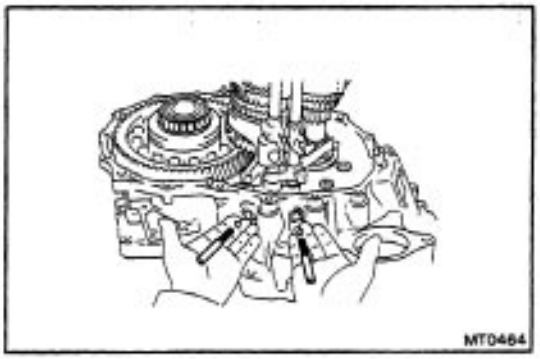
HINT: When it is difficult to install the fork shaft through the reverse shift fork, pull up the No.3 shift fork shaft.



12. INSTALL SET BOLTS

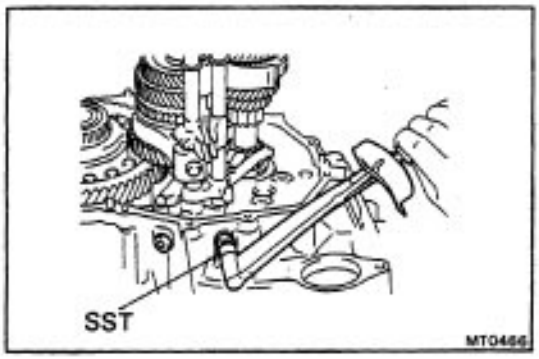
Install and torque the three set bolts.

Torque: 240 kg–cm I17 ft–lb, 24 N–m)



13. INSTALL LOCKING BALLS, SPRINGS, SEATS AND PLUGS

(a) Install the two locking balls, springs and seats.



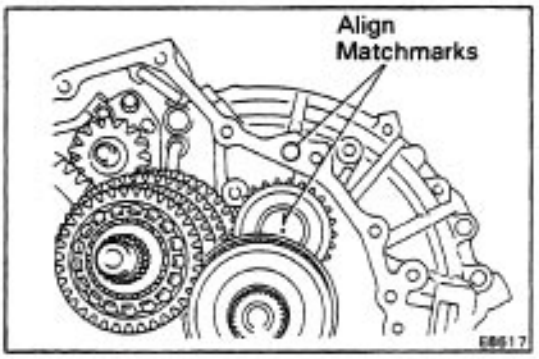
(b)Apply sealant to the two plugs.

Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Using SST, install and torque two plugs.

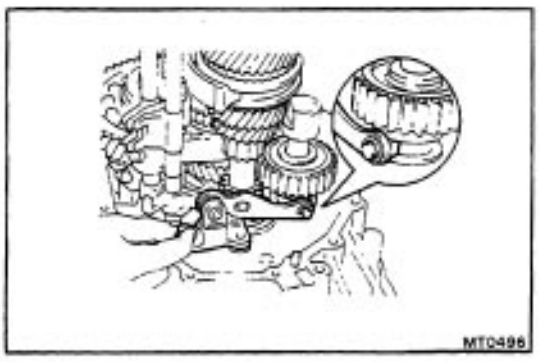
SST 09313–30021

Torque: 250 kg–cm (18 ft–lb, 25 N–m)



14. INSTALL REVERSE IDLER GEAR AND SHAFT

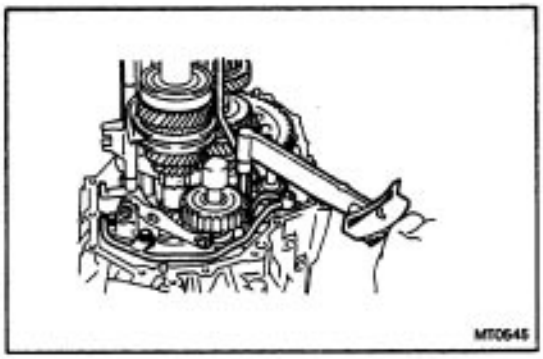
Install the reverse idler gear and shaft as shown.



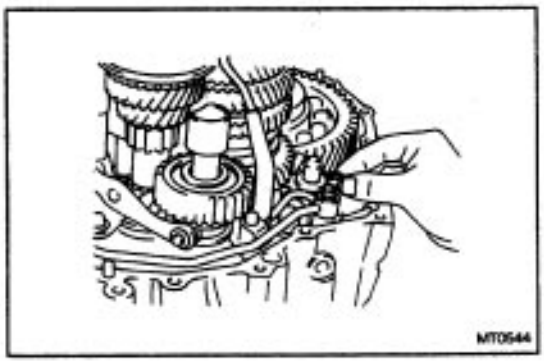
15. INSTALL REVERSE SHIFT ARM BRACKET AND NO.2 OIL PIPE

(a) Put the reverse shift fork pivot into the reverse shift arm and install the reverse shift arm bracket to the transaxle case.

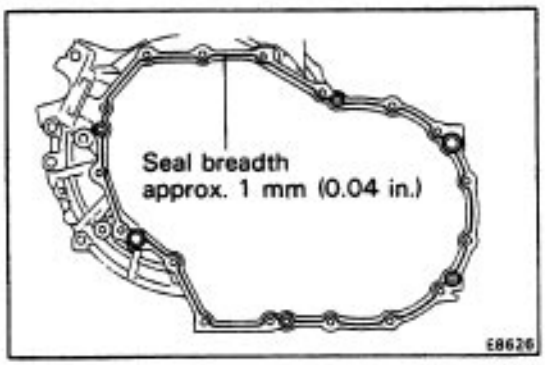
(b) Install the bolt.



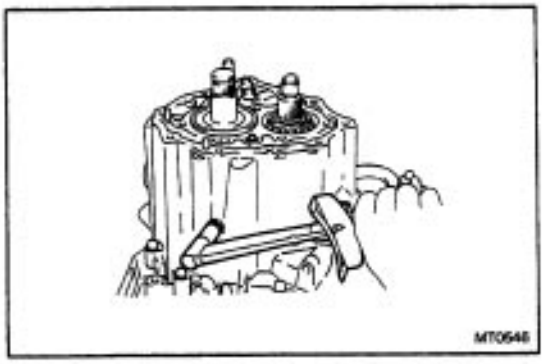
(c) Install the No.2 oil pipe and two bolts.
(d) Torque the reverse shift arm and oil pump bolts.
Torque: 175 kg–cm (13 ft–lb, 17 N–m)



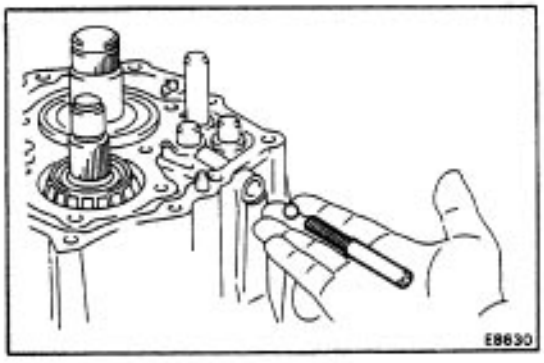
(e) Install the new gasket to the No.2 oil pipe.



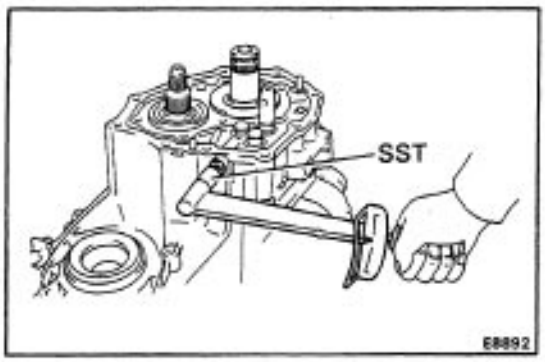
16. INSTALL TRANSMISSION CASE
(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transmission case or transaxle case.
(b) Apply seal packing to the transmission case as shown in the figure.
Seal packing: Part No.08826–00090, THREE BOND
1281 or equivalent
HINT: Install the transmission case as shown as the seal packing is applied.
(c) Install and torque the seventeen bolts.
Torque: 300 kg–cm (22 ft–lb, 29 N–m)



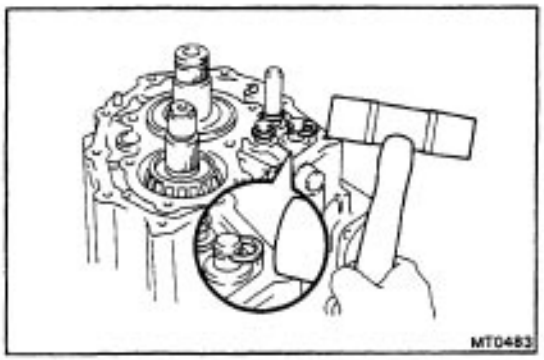
17. INSTALL AND TORQUE REVERSE IDLER GEAR SHAFT RETAINING BOLT
Torque: 300 kg–cm (22 ft–lb, 29 N–m)



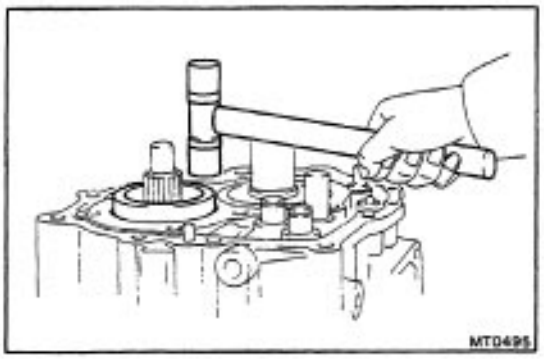
18. INSTALL LOCKING BALL, SPRING, SEAT AND PLUG
(a) Install the locking ball, spring and seat.



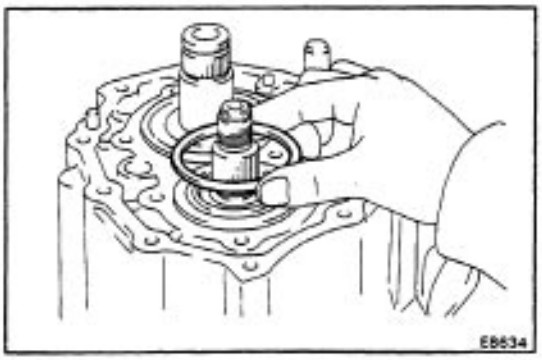
(b) Apply sealant to the plug.
Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(c) Using SST, install and torque the plug.
SST 09313–30021
Torque: 250 kg–cm (18 ft–lb, 25 N–m)



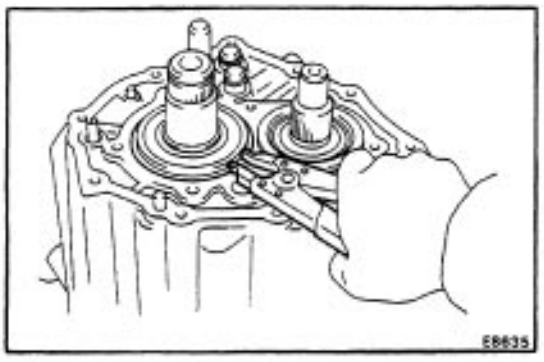
19. INSTALL SNAP .RINGS
Using a plastic hammer, install the three snap rings.



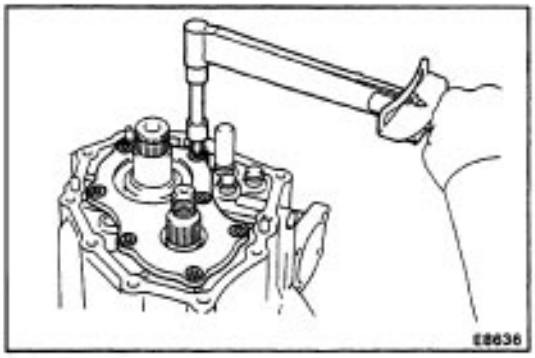
20. INSTALL OUTPUT SHAFT REAR TAPER ROLLER BEARING OUTER RACE
Using a plastic hammer, drive in the outer race.



21. INSTALL SHIM
HINT: Install the previously selected.



22. INSTALL SNAP RING
Using a snap ring pliers, install the snap ring to the input shaft rear bearing.



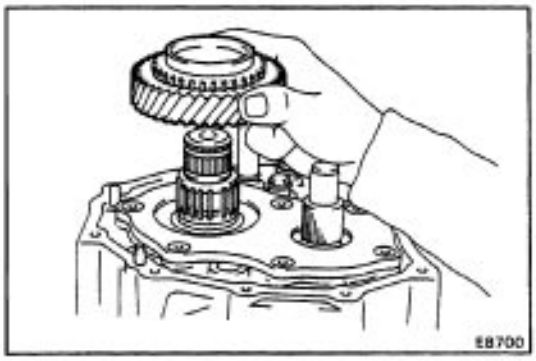
23. INSTALL REAR BEARING RETAINER

(a) Clean the threads of the torx screws.

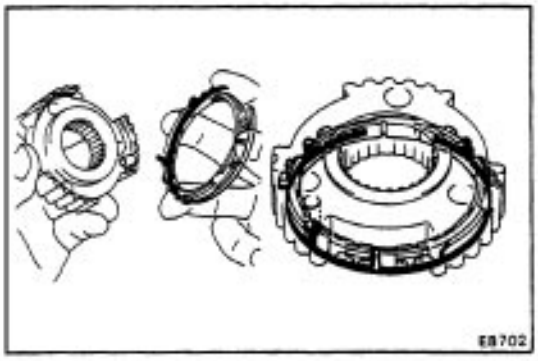
(b) Using a torx wrench, install and torque the seven torx screws.

Torx wrench T45 09042–00050

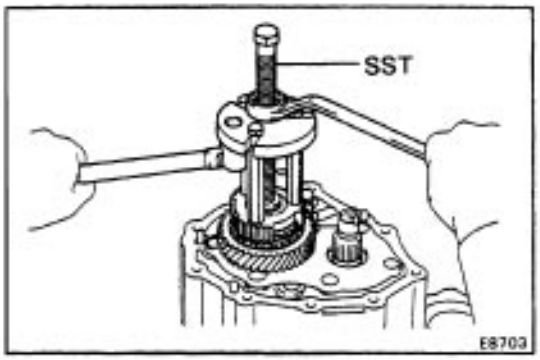
Torque: 430 kg–cm (31 ft–lb, 42 N–m)



24. INSTALL SPACER, NEEDLE ROLLER BEARING AND FIFTH GEAR



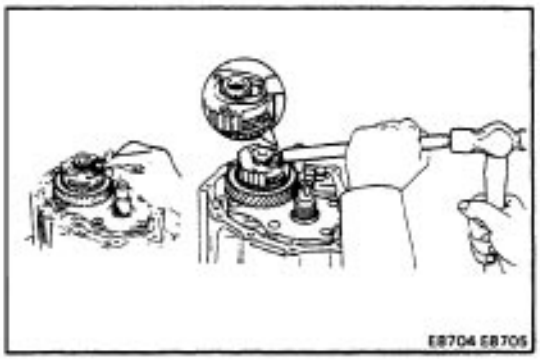
25. INSTALL SYNCHRONIZER RING WITH 1 KEY SPRING TO NO.3 CLUTCH HUB



26. INSTALL NO.3 CLUTCH HUB

Using SST, install the No.3 clutch hub with synchronizer ring and key spring.

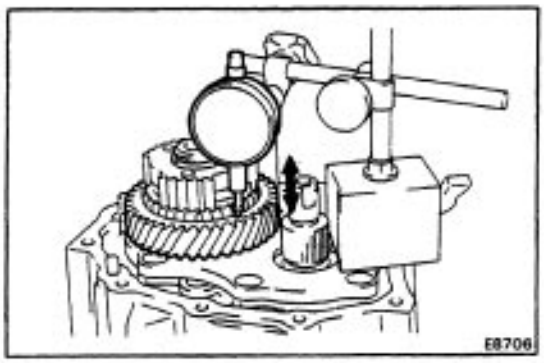
SST 09310–17010 (09310–07010, 09310–07020, 09310–07030)



27. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

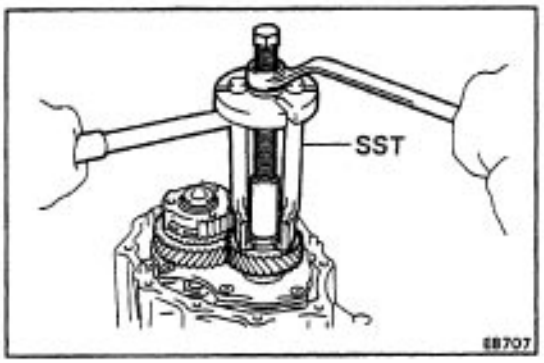
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
Q	2.25 (0.0886)	V	2.50 (0.0984)
R	2.30 (0.0906)	W	2.55 (0.1004)
S	2.35 (0.0925)	X	2.60 (0.1024)
T	2.40 (0.0945)	Y	2.65 (0.1043)
U	2.45 (0.0965)		



28. MEASURE FIFTH GEAR THRUST CLEARANCE

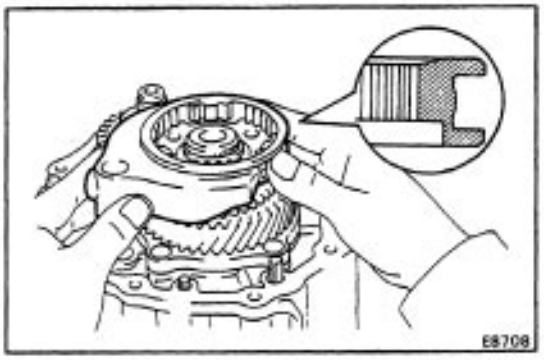
Using a dial indicator measure the 5th gear thrust clearance.

Standard clearance: 0.10 – 0.57 mm
(0.0039 – 0.0224 in.)

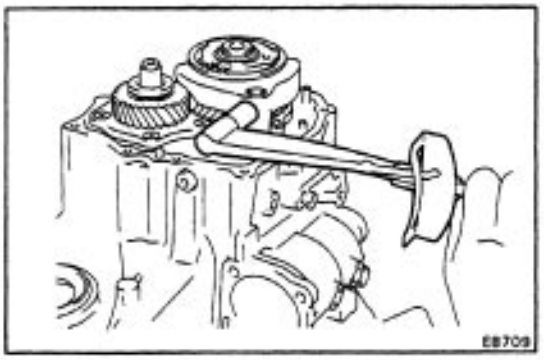


29. INSTALL FIFTH DRIVEN GEAR

Using SST, install the 5th driven gear.
SST 09310–17010 (09310–07010, 09310–07020, 09310–07040, 09310–07050)

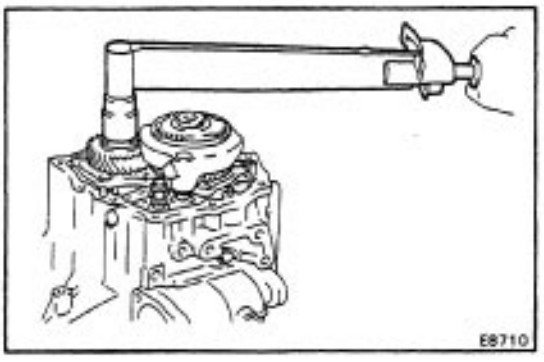


30. INSTALL NO.3 HUB SLEEVE WITH NO.3 SHIFT FORK



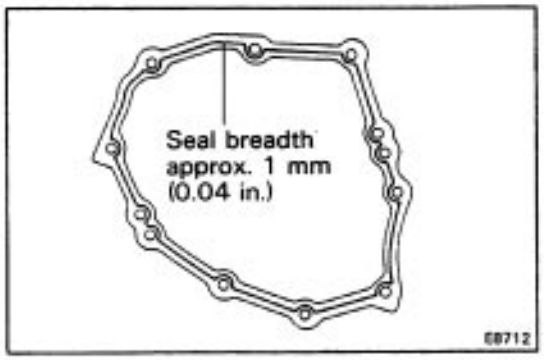
31. INSTALL SET BOLT

Install and torque the set bolt.
Torque: 240 kg–cm (17 ft–lb, 24 N–m)



32. INSTALL LOCK NUT

(a) Engage the gear double meshing.
(b) Install and torque the lock nut.
Torque: 1,250 kg–cm (90 ft–lb, 123 N–n)
(c) Disengage the gear double meshing.
(d) Stake the lock nut.



33. INSTALL TRANSMISSION CASE COVER

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transmission case cover.

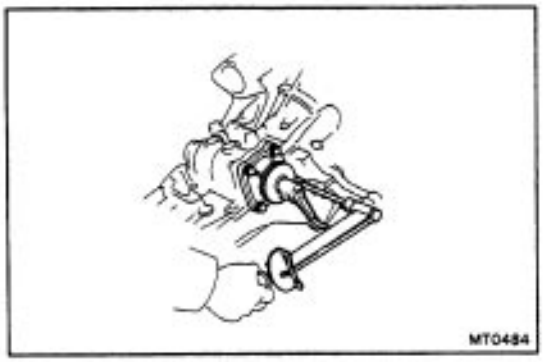
(b) Apply seal packing to the transmission case as shown in the figure. .

Seal packing: Part No.08826–00090, THREE BOND 1281 or equivalent

HINT: Install the transmission case cover as soon as the seal packing is applied.

(c) Install and torque the ten bolts.

Torque: 300 kg–cm (22 ft–lb, 29 N–m)



34. INSTALL SHIFT AND SELECT LEVER SHAFT ASSEMBLY

(a) Place a new gasket in position on the control shaft cover.

(b) Install the control shaft cover.

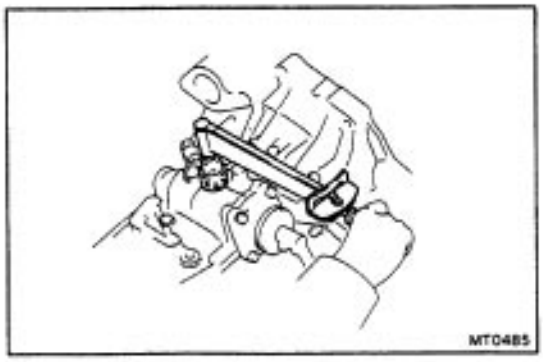
(c) Apply sealant to the bolt threads.

Sealant: Part

No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

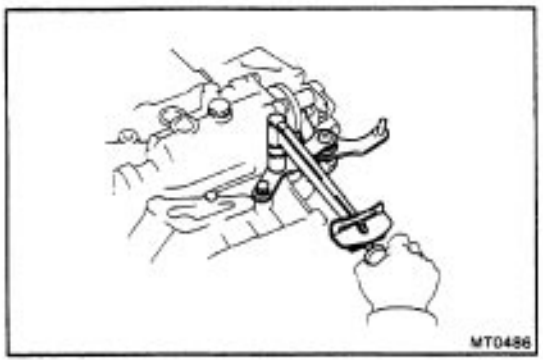
(d) install and torque the bolts.

Torque: 200 kg–cm (14 ft–lb, 20 N–m)



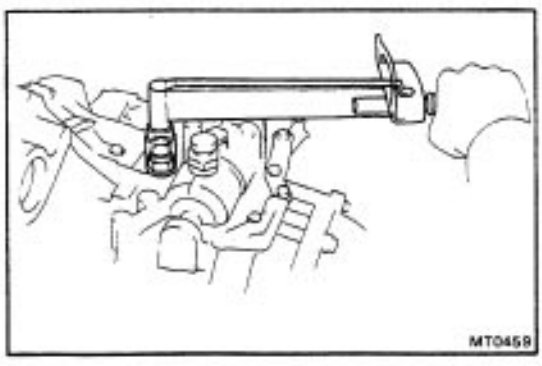
35. INSTALL AND TORQUE LOCK BOLT

Torque: 500 kg–cm (36 ft–lb, 49 N–m)



36. INSTALL AND. TORQUE SELECTING BELLCRANK ASSEMBLY

Torque: 200 kg–cm (14 ft–lb, 20 N–m)

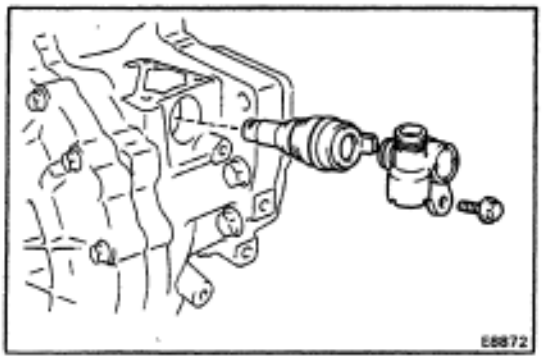


37. INSTALL BACK–UP LIGHT SWITCH

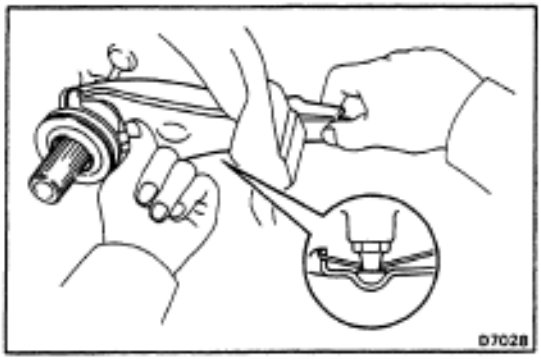
Using SST, install and torque the back–up light switch.

SST 09817–16011

Torque: 410 kg–cm (30 ft–lb, 40 N–m)



38. INSTALL SPEEDOMETER DRIVEN GEAR



39. INSTALL RELEASE FORK AND BEARING

Apply molybdenum disulphide lithium base grease to the following parts:

- Input shaft spline
- Release fork contact surface

PRECAUTIONS

When working with FIPG material, you must –be observe the following.

- **Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.**
- **Thoroughly clean all components to remove all the loose material.**
- **Clean both sealing surfaces with a non–residue solvent.**
  e Apply the seal packing in 1.2 mm (0.04) in.) bead along the sealing surface.
- **Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied. ,**

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Noise	Transmission, differential! or transfer faulty Wrong oil grade Oil lever low	Disassemble and inspect transmission, differential or transfer Replace oil Add oil	 MT–118 MT– 117
Oil leakage	Oil lever too high Oil seal, O–ring or gasket worn or damaged	Drain oil Replace oil seal, O–ring or gasket	 FA–5 MT–118
Hard to shift or will not shift	Control cable faulty Transmission faulty	Replace control cable Disassemble and inspect transmission	MT–205 MT– 118

PRECAUTIONS

When working with FIPG material, you must –be observe the following.

- **Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.**
- **Thoroughly clean all components to remove all the loose material.**
- **Clean both sealing surfaces with a non–residue solvent.**
- **Apply the seal packing in 1.2 mm (0.047 in.) bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied. ,**

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Noise	Transmission, differential! or transfer faulty Wrong oil grade Oil lever low	Disassemble and inspect transmission, differential or transfer Replace oil Add oil	 MT–118 MT–117
Oil leakage	Oil lever too high Oil seal, O–ring or gasket worn or damaged	Drain oil Replace oil seal, O–ring or gasket	 FA–5 MT–118
Hard to shift or will not shift	Control cable faulty Transmission faulty	Replace control cable Disassemble and inspect transmission	MT–205 MT– 118

ON–VEHICLE REPAIR

REPLACEMENT OF OUTPUT SHAFT OIL SEAL

1. DRAIN TRANSAXLE OIL

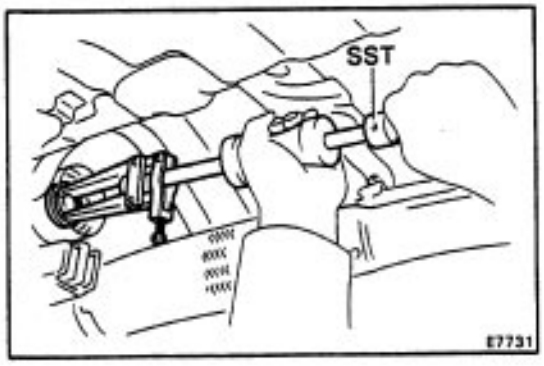
2. REMOVE PROPELLER SHAFT

(See page PR–4**)**

3. REMOVE OUTPUT SHAFT OIL SEAL

Using SST, drive out the oil seal.

SST 09308–00010

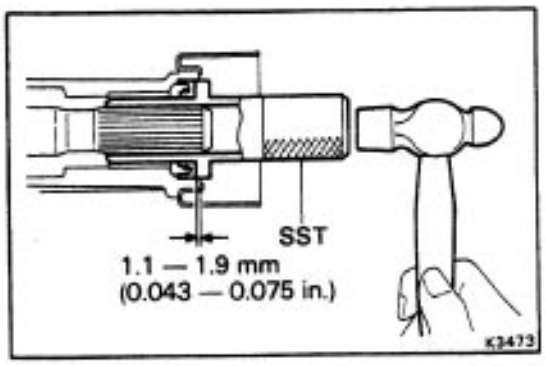


4. INSTALL OUTPUT SHAFT OIL SEAL

Using SST, drive in a new oil seal.

SST 09325–20010

Oil seal depth: 1.1 – 1.9 mm (0.043 – 0.075)



5. INSTALL PROPELLER SHAFT

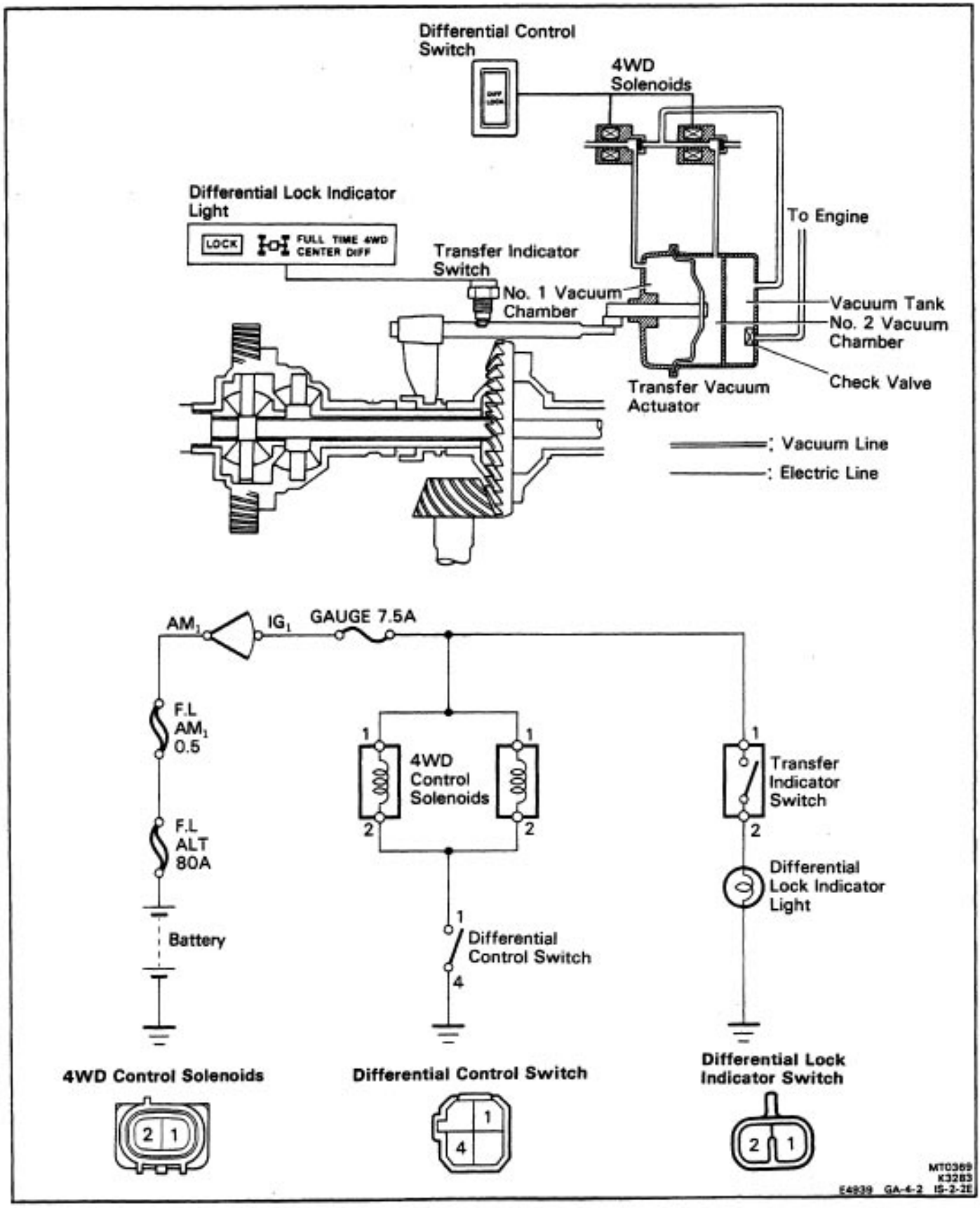
(See page PR–13)

6. FILL TRANSAXLE WITH GEAR OIL

(See page MT–117**)**

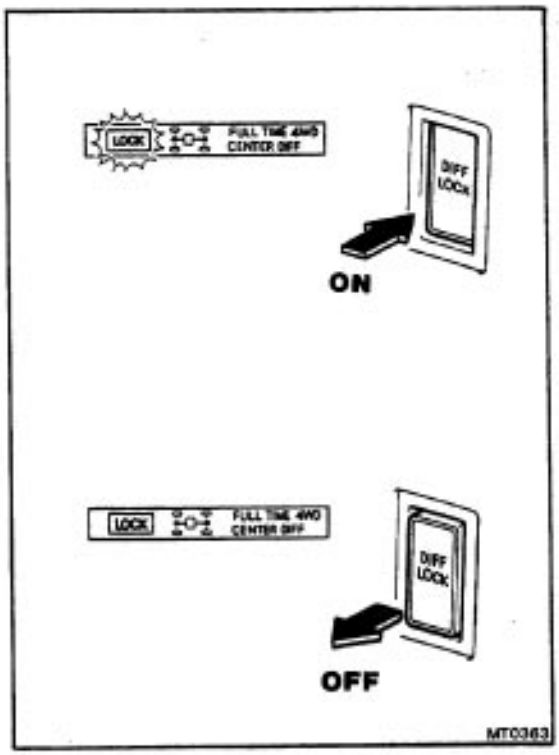
CENTER DIFFERENTIAL LOCK CONTROL (E56F5)

SYSTEM DIAGRAM AND WIRING DIAGRAM



Function Inspection

DIFFERENTIAL LOCK CONTROL



INSPECT DIFFERENTIAL LOCK OPERATION

Start the engine. Check that the differential lock indicator light comes on when the differential lock control switch is turned to ON. Check that the light goes off when the switch is turned to OFF.

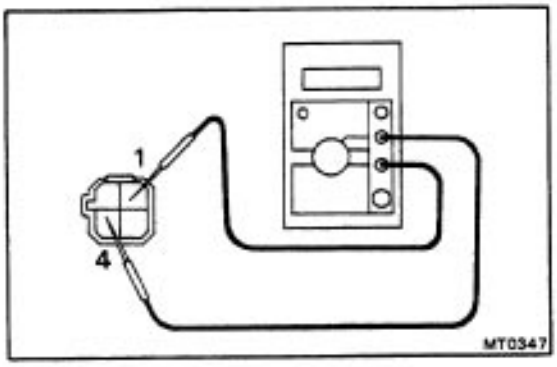
HINT: After checking the system, turn the control switch to OFF and check that the differential lock function is released.

Reference: If the indicator light does not come on and go out when the control switch is operated, move the vehicle

slightly forward. when the system is operated it should be normal.

Single Unit Inspection

DIFFERENTIAL LOCK SWITCH



1. INSPECT CONTINUITY OF DIFFERENTIAL LOCK SWITCH

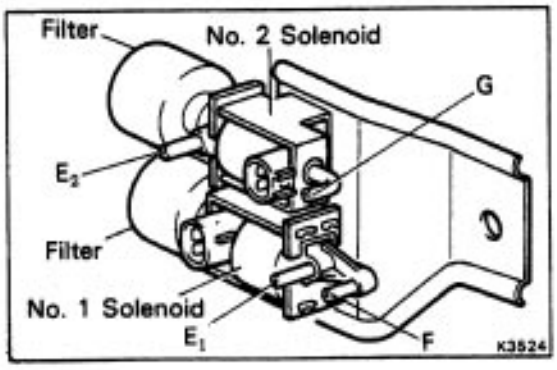
(a) Disconnect the differential lock switch connector.

(b) Check continuity between terminals 1 to 4.

Switch ON: Continuity

Switch OFF: No continuity

4WD CONTROL SOLENOID

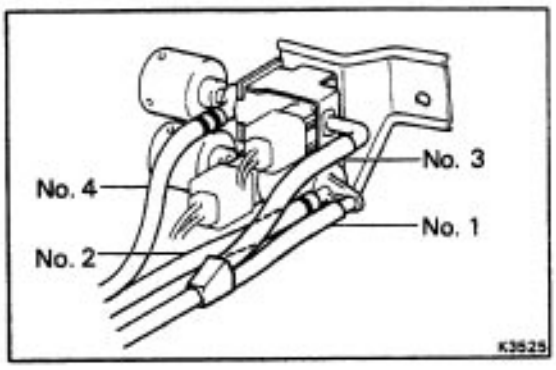


1. INSPECT OPERATION OF 4WD CONTROL SOLENOID

Check air flow of each port when the battery voltage is applied and is not applied to terminals No.1, No.2 of the solenoid.

○—○ : Aeration

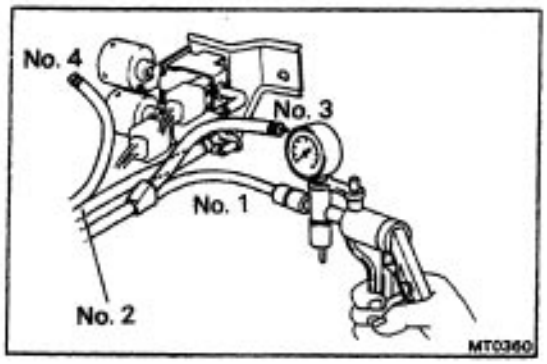
Port / Voltage	No. 1 Solenoid			No. 2 Solenoid		
	F	E_1	Filter	G	E_2	Filter
Apply battery voltage	○	○			○	○
Non voltage		○	○	○	○	



TRANSFER VACUUM ACTUATOR

1. INSPECT ACTUATOR HOSE CONNECTION

Check that the actuator hoses are connected to the solenoids and actuator tightly and properly.



2. INSPECT ACTUATOR AIRTIGHTNESS

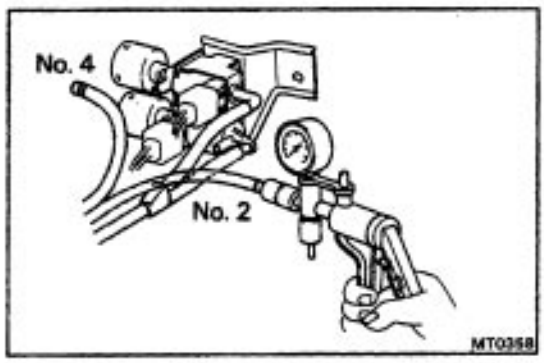
(Vacuum Tank)

(a) Disconnect the No. 1, No. 3 and No. 4 hoses from the solenoids.

(b) Plug the No. 3 hose.

W Connect the mighty vac to the No. 1 hose.

(d) Check the the indicator remains stable when a vacuum of 500 mmHg 0 9.69 in.Hg. 66.7 kPa) is applied.

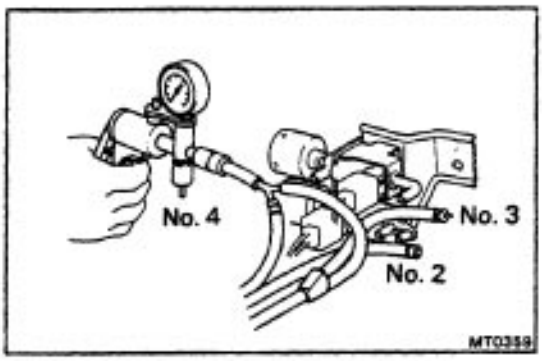


(No. 1 Vacuum Chamber Side)

(a) Disconnect the No. 2 and No. 4 hoses form the solenoids.

(b) Connect the mighty vac to the No. 2 hose.

(c) Check that the indicator remains stable when a vacuum of 504 mmHg (19.69 in.Hg, 66.7 kPa) is applied.



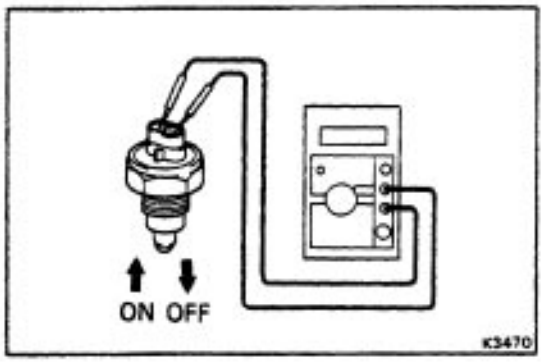
(No. 2 Vacuum Chamber Side

(a) Disconnect the all hoses from the solenoids.

(b) Plug the No. 3 hoses.

W Connect the mighty vac to the No. 1 and No. 4 hoses.

(d) Check that the indicator remains stable when a vacuum of 500 mmHg (19.69 in.Hg, 66.7 kPa) is applied.



TRANSFER INDICATOR SWITCH

INSPECT TRANSFER INDICATOR SWITCH FOR CONTINUITY

(a) Disconnect the indicator switch from the transfer.

(b) Check continuity between the terminals when the switch is turned ON and when turned OFF.

Switch *ON position: Continuity

Switch OFF position: No continuity

If not, replace the indicator switch.

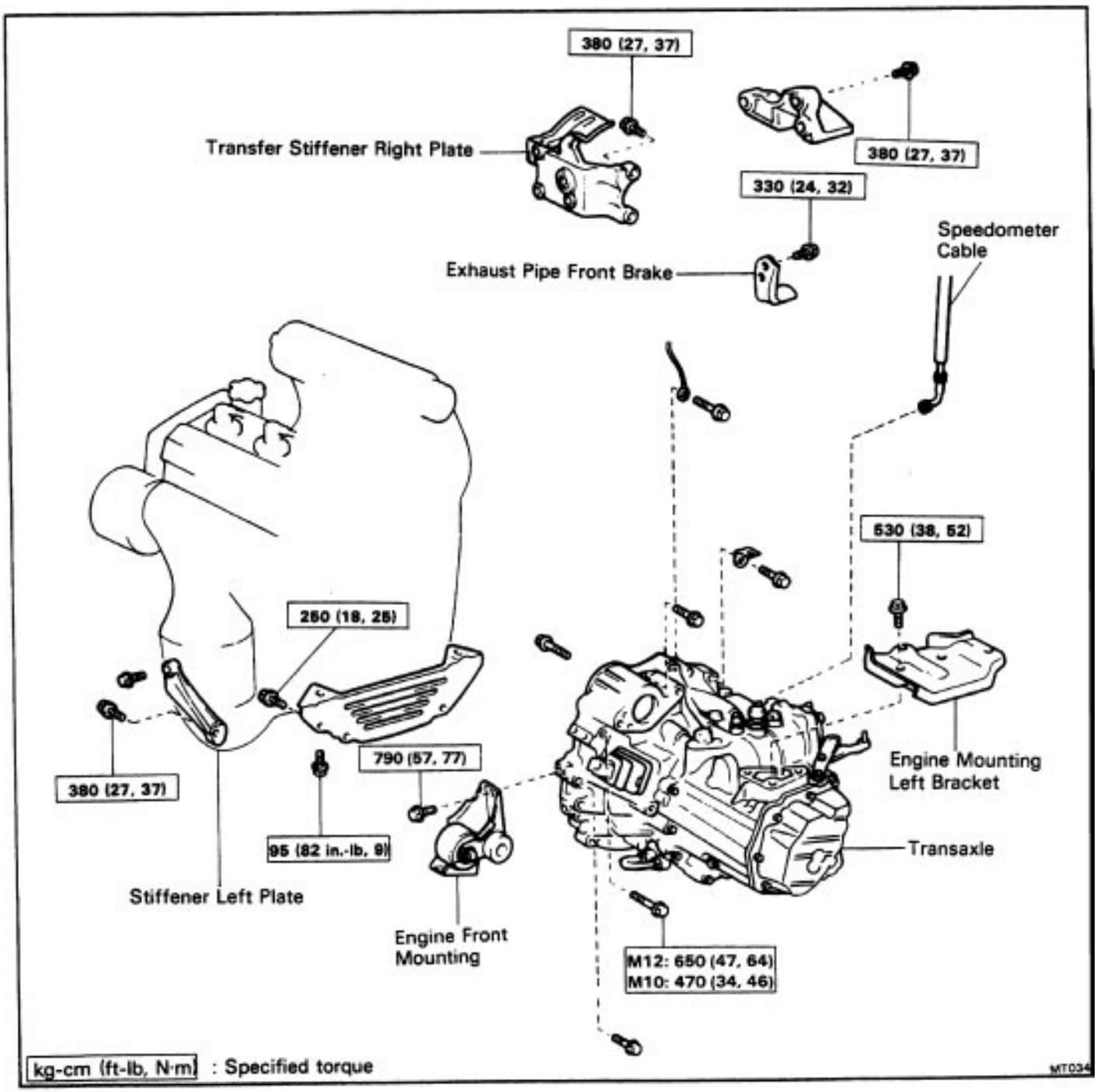
REMOVAL AND INSTALLATION OF TRANSAXLE

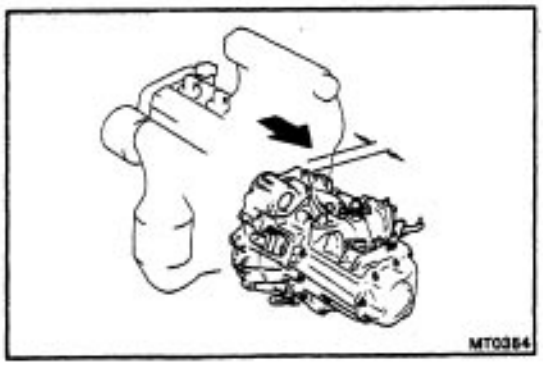
REMOVAL AND INSTALLATION OF ENGINE

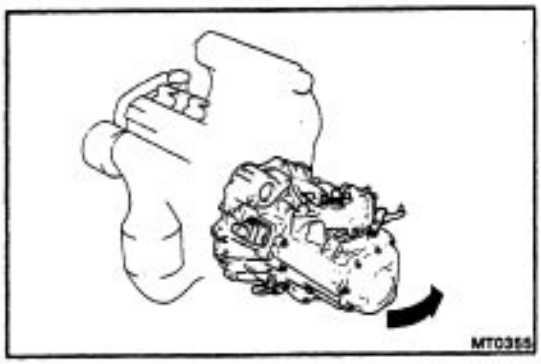
REMOVE ENGINE WITH TRANSAXLE
(See page EM–3)
INSTALL ENGINE WITH TRANSAXLE
(See page EM–7)

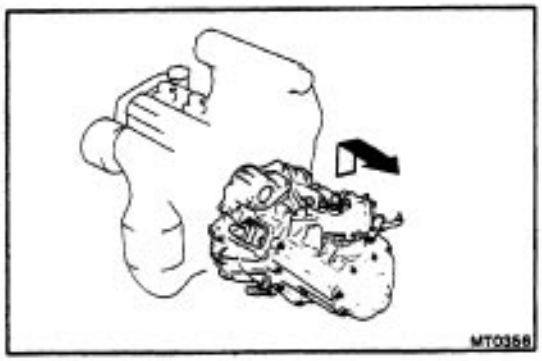
REMOVAL AND INSTALLATION OF TRANSAXLE

REMOVE AND INSTALL TRANSAXLE AS SHOWN









(MAIN POINT OF REMOVAL AND INSTALLATION)

1. REMOVE TRANSAXLE ASSEMBLY

HINT: When removing transaxle from engine, remove as the following procedure since cylinder block rib contacts transfer case.

(a) Pull straight until there are space of 60 – 80mm (2 –3 in.) between engine and transaxle case.

(b) Move the transmission case cover to the arrow in the illustration.

(e) While holding the transfer output slightly, pull out whole transaxle.

2. INSTALL TRANSAXLE ASSEMBLY FOLLOWING REMOVAL SEQUENCE IN REVERSE

REPLACEMENT OF TRANSAXLE GEAR OIL

1. DRAIN TRANSAXLE OIL

2. FILL TRANSAXLE OIL WITH GEAR OIL

Oil: Transaxle oil E50 (08885–80206) or equivalent

Recommended oil

Oil grade: API G!–5

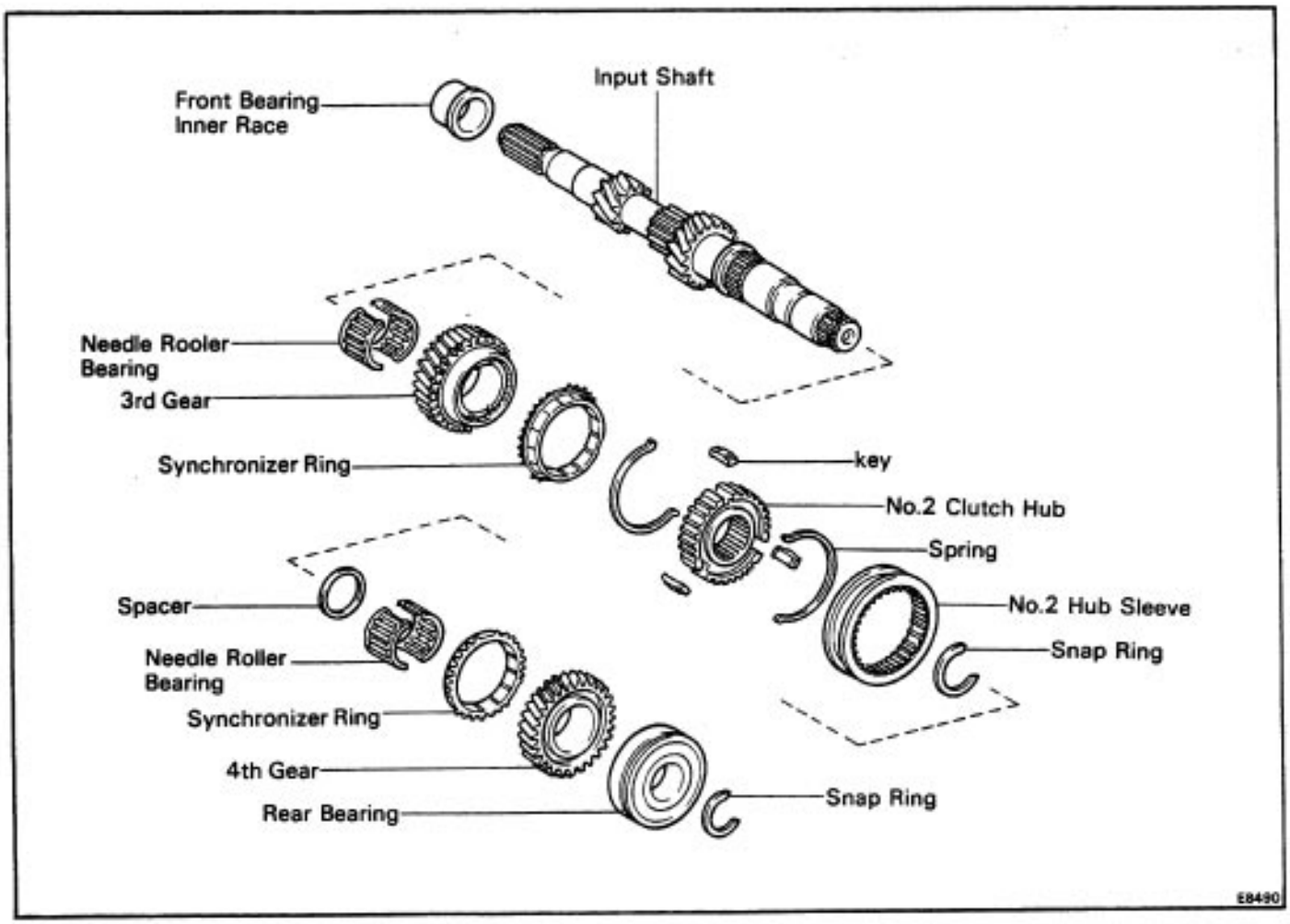
Viscosity: SAE 75W–90 or 80W–90

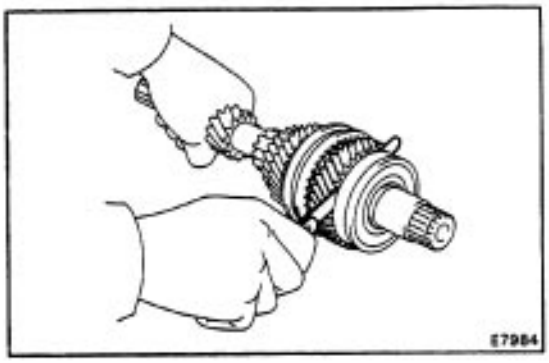
Above –18˚C (0˚F) SAE 90

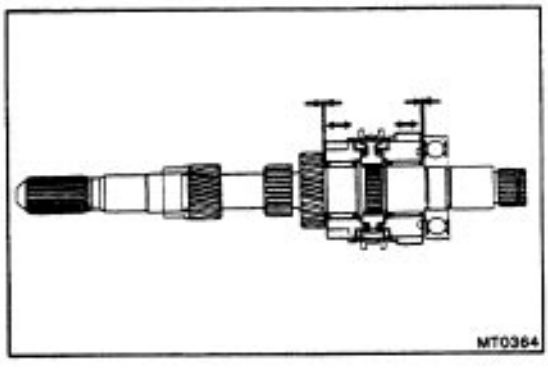
Below –18˚C (0˚F) SAE 80W

Capacity: 5.0 liters (5.3 US qts, 4.4 Imp qts)

COMPONENT PARTS
Input Shaft Assembly







DISASSEMBLY OF INPUT SHAFT ASSEMBLY

1. MEASURE THIRD AND FOURTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the thrust clearance.

Standard clearance:

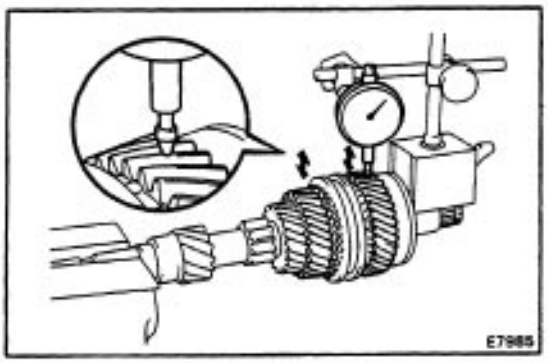
3rd gear 0.10 – 0.35 mm
(0.0039 – 0.0138 in.)

4th gear 0.10 – 0.55 mm
(0.0039 – 0.0217 in.)

Maximum clearance:

3rd gear 0.40 mm (0.0157 in.)

4th gear 0.60 mm (0.0236 in.)

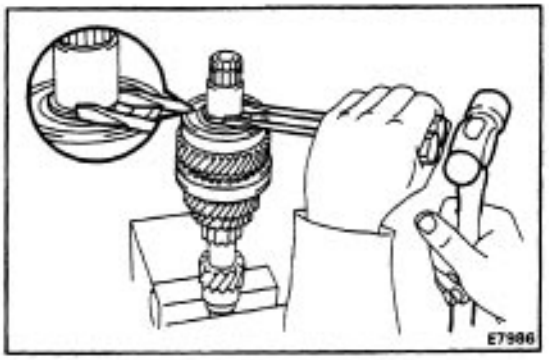


2. CHECK OIL CLEARANCE OF THIRD AND FOURTH GEAR

Using dial indicator, measure the oil clearance between the gear and shaft.

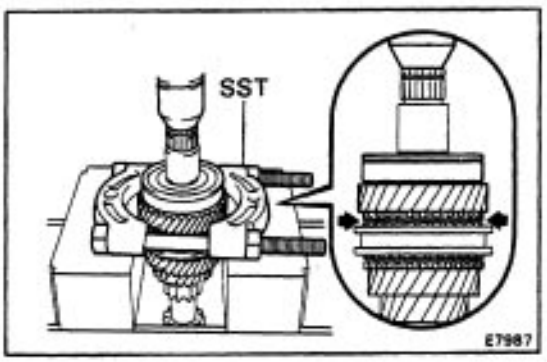
Standard clearance:
3rd gear 0.009 – 0.053 mm
(0.0004 – 0.0020 in.)
4th gear 0.009 – 0.051 mm(0.0004 – 0.0020 in.)
Maximum clearance: 0.080 mm (0–0031 in.)

If clearance exceeds the limit, replace the gear, needle roller bearing or shaft.



3. REMOVE SNAP RING

Using two screwdrivers and a hammer, tap out the snap ring.

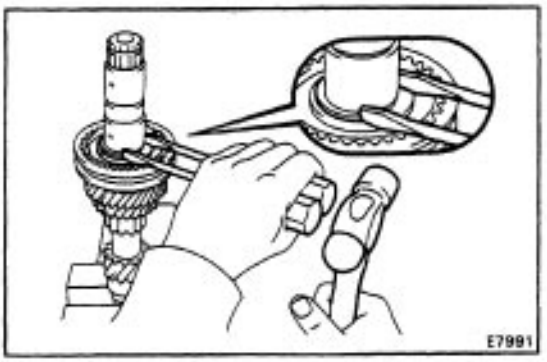


4. REMOVE INPUT SHAFT REAR BEARING AND FOURTH GEAR

Using SST and a press, remove the input shaft rear bearing.

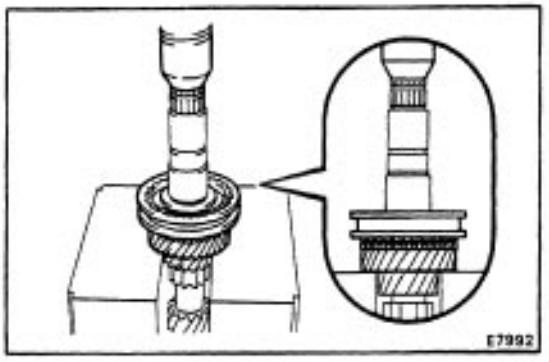
SST 09950–00020

5. REMOVE NEEDLE ROLLER BEARINGS, SPACER AND SYNCHRONIZER RING



6. REMOVE SNAP RING

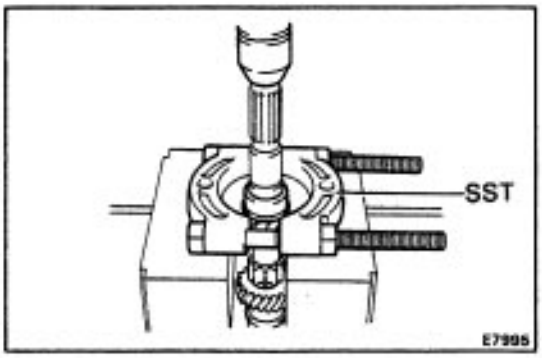
Using two screwdrivers and a hammer, tap out the snap ring.



7. REMOVE NO.2 CLUTCH HUB ASSEMBLY, SYNCHRONIZER RING AND THIRD GEAR

Using a press, remove No.2 hub sleeve, 3rd gear, synchronizer ring and needle roller bearings.

8. REMOVE NEEDLE ROLLER BEARING



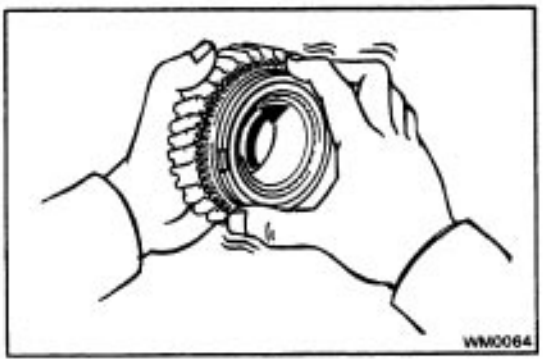
9. REMOVE INPUT SHAFT FRONT BEARING INNER RACE

Using SST and a press, remove the inner race.
SST 09950–00020

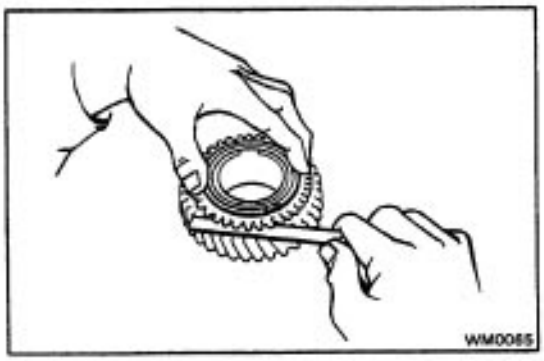
INSPECTION OF INPUT SHAFT COMPONENT PARTS

1. INSPECT SYNCHRONIZER RINGS

(a) Check for wear or damage.
(b) Turn the ring and push it in to check the bearing action.

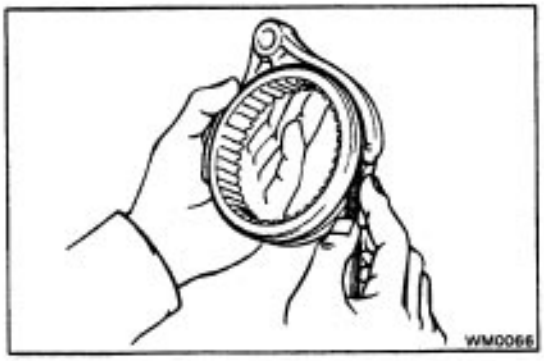


(c) Measure the clearance between the synchronizer ring back and gear spline end.
Minimum clearance: 0.6 mm (0.024 in.)
If the clearance is less than the limit, replace the synchronizer ring.



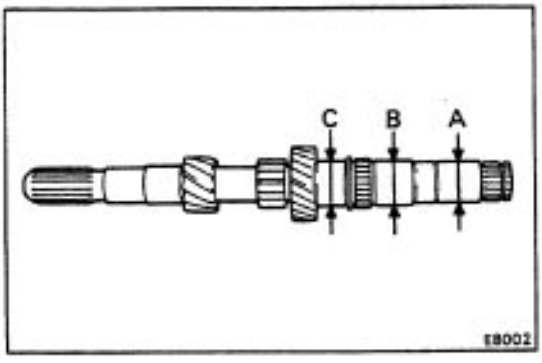
2. MEASURE CLEARANCE OF NO.2 SHIFT FORK AND HUB SLEEVE

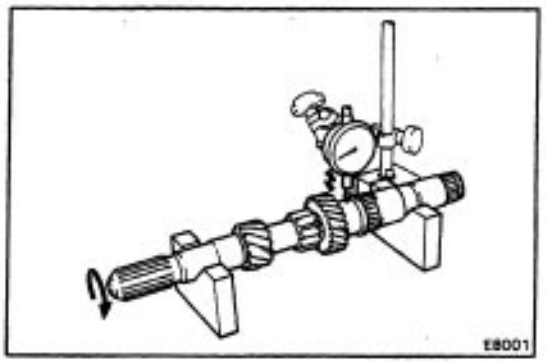
Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.
Maximum clearance: 1.0 mm (0.039 in.)
If the clearance exceeds the limit, replace the shift fork or hub sleeve.



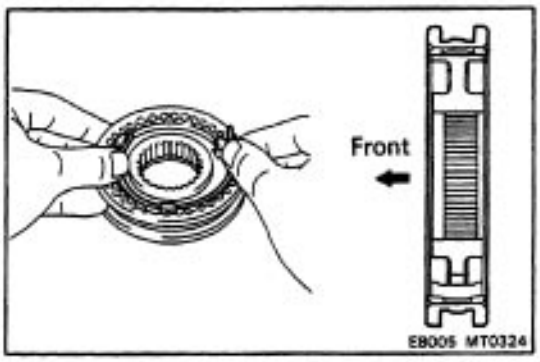
3. INSPECT INPUT SHAFT

(a) Check the input shaft for wear or damage.
(b) Using a micrometer, measure the outer diameter of the input shaft journal surface.
Minimum outer diameter:
Part A 32.930 mm (1.2964 in.)
B and C 35.950 mm (1.4154 in.)





(c) Using a dial indicator, check the shaft runout.
Maximum runout: 0.060 mm (0.0024 in.)



ASSEMBLY OF INPUT SHAFT ASSEMBLY

(See page MT–134)

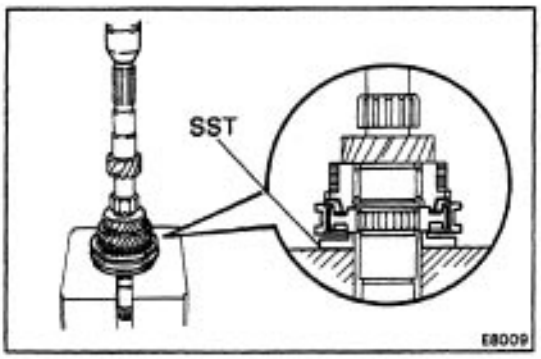
HINT: Coat all the sliding and rotating surface with gear oil b¿¿ore assembly.

1. INSERT NO.2 CLUTCH HUB SLEEVE

(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

NOTICE: install the key springs positioned so that their end gaps are not in line.



2. INSTALL NEEDLE ROLLER BEARING. THIRD GEAR, SYNCHRONIZER RING AND NO.2 HUB SLEEVE ASSEMBLY TO INPUT SHAFT

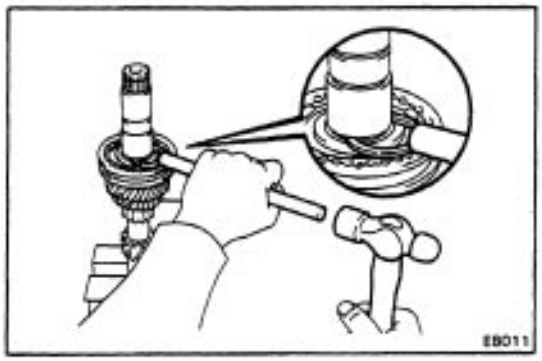
(a) Apply MP grease to the needle roller bearings.

(b) Install the 3rd gear.

(e) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(d) Using SST and a press, install the 3rd gear and No.2 hub sleeve.

SST 09506–35010

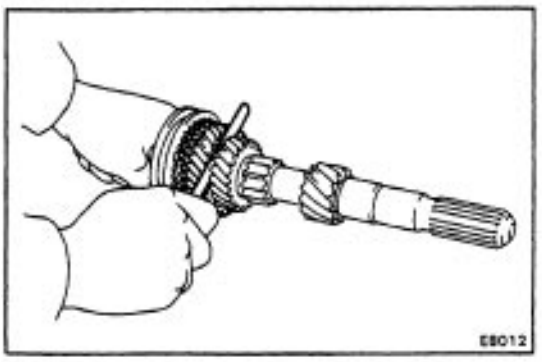


3. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

Snap ring thickness:

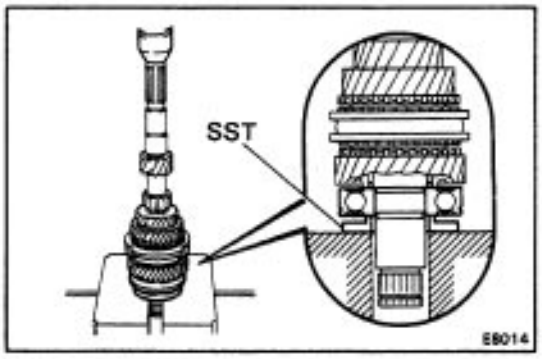
Mark	Thickness mm (in.)
H	2.30 – 2.35 (0.0906 – 0.0925)
J	2.35 – 2.40 (0.0925 – 0.0945)
K	2.40 – 2.45 (0.0945 – 0.0965)
L	2.45 – 2.50 (0.0965 – 0.0984)
M	2.50 – 2.55 (0.0984 – 0.1004)
N	2.55 – 2.60 (0.1004 – 0.1024)
P	2.60 – 2.65 (0.1024 – 0.1043)

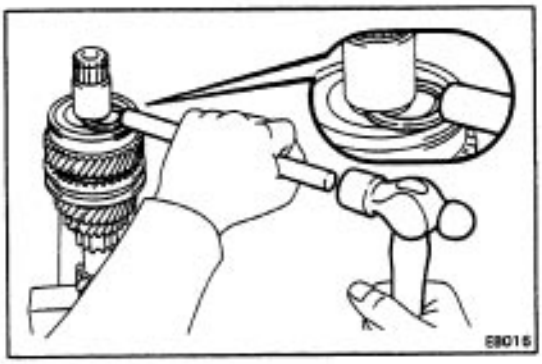


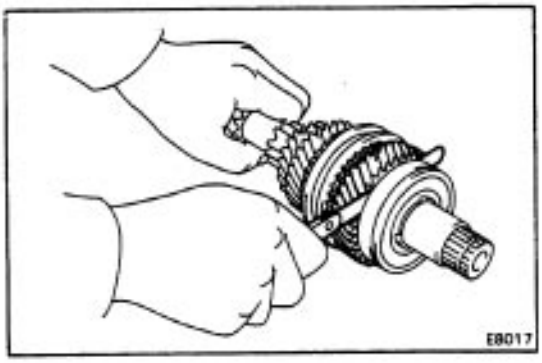
4. MEASURE THIRD GEAR THRUST CLEARANCE

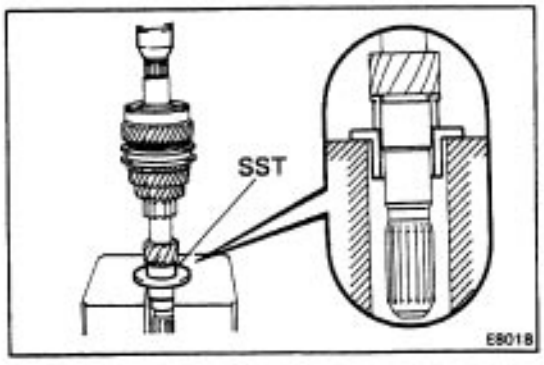
Using a feeler gauge, measure the 3rd gear thrust clearance.

Standard clearance: 0.10 – 0.35 mm (0.0039 – 0.0138 in.)









5. INSTALL SPACER, SYNCHRONIZER RING, NEEDLE ROLLER BEARINGS, FOURTH GEAR AND RADIAL BALL BEARING

(a) Install the spacer.
(b) Apply MP grease to the needle roller bearings.
(c) Place the synchronizer ring on the gear and align the the ring slots with the shifting keys.
(d) Install the 4th gear.
(e) Using SST and a press, install the radial ball bearing.
SST 09506–35010

6. INSTALL –SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.
Snap ring thickness:

Mark	Thickness mm (in.)
1	2.35 – 2.40 (0.0925 – 0.0945)
2	2.40 – 2.45 (0.0945 – 0.0965)
3	2.45 – 2.50 (0.0965 – 0.0984)
4	2.50 – 2.55 (0.0984 – 0.1004)
5	2.55 – 2.60 (0.1004 – 0.1024)
6	2.60 – 2.65 (0.1024 – 0.1043)
7	2.65 – 2.70 (0.1043 – 0.1063)
8	2.70 – 2.75 (0.1063 – 0.1083)

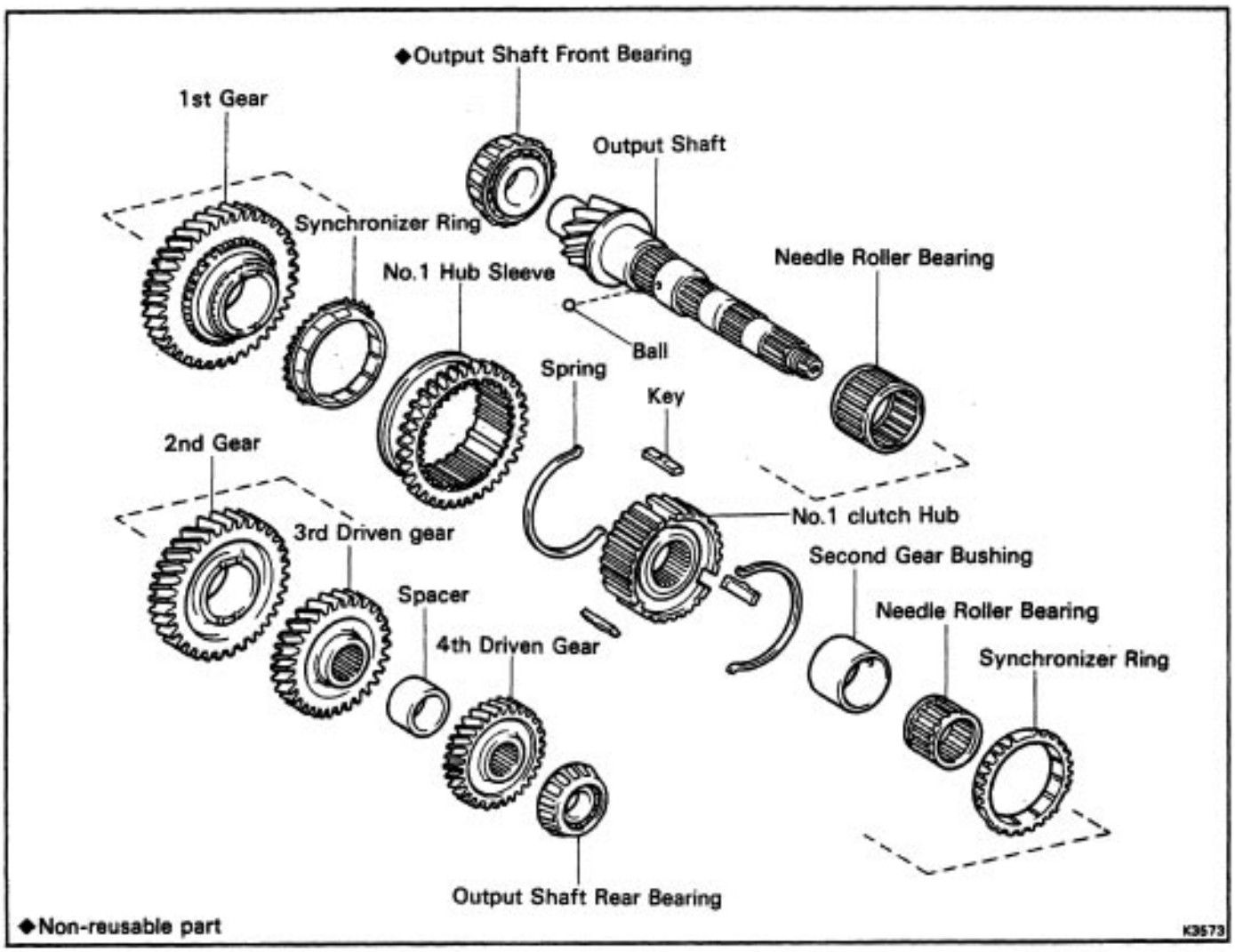
7. MEASURE FOURTH GEAR THRUST CLEARANCE

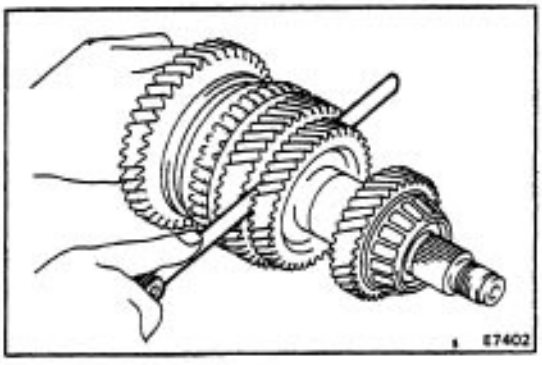
Using a feeler gauge, measure the 4th gear thrust clearance.
Standard clearance: 0.10 – 0.55 mm (0.0039 – 0.0217 in.)

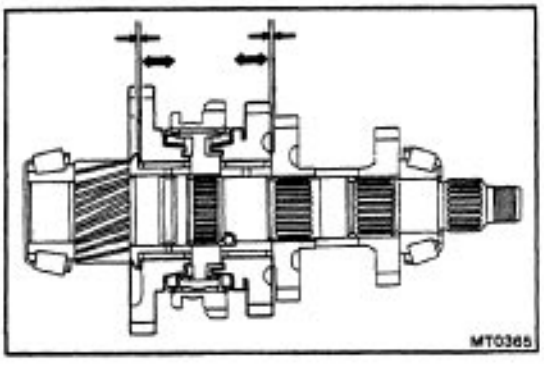
8. INSTALL INPUT SHAFT FRONT BEARING INNER RACE

Using SST and a press, install the input shaft front bearing inner race.
SST 09316–60010 (09316–00020)

Output Shaft Assembly







DISASSEMBLY OF OUTPUT SHAFT ASSEMBLY

1. MEASURE FIRST AND SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the thrust clearance.

Standard clearance:

1 st gear 0.10 – 0.35 mm

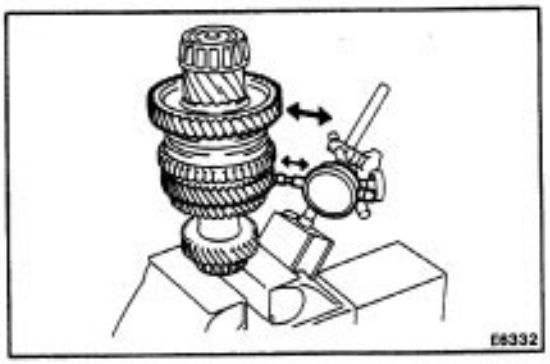
(0.0039 – 0.0138 in.)2nd gear 0.10 – 0.45 mm

(0.0038 – 0.0177 in.)

Maximum clearance:

1 st gear 0.40 mm (0.0157 in.)

2nd gear 0.50 mm (0.0197 in.)



2. CHECK OIL CLEARANCE OF FIRST AND SECOND GEAR

Using dial indicator, measure the oil clearance between the gear and shaft.

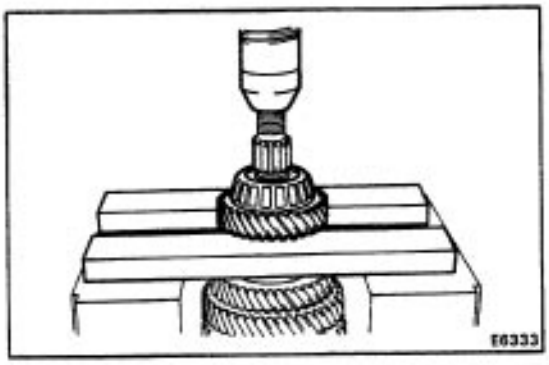
Standard clearance:

1st gear 0.009 – 0.051 mm
(0.0004 – 0.0020 in.)

2nd gear, 0.009 – 0.053 mm
(0.0004 – 0.0020 in.)

Maximum clearance: 0.080 mm (0.0031 in.)

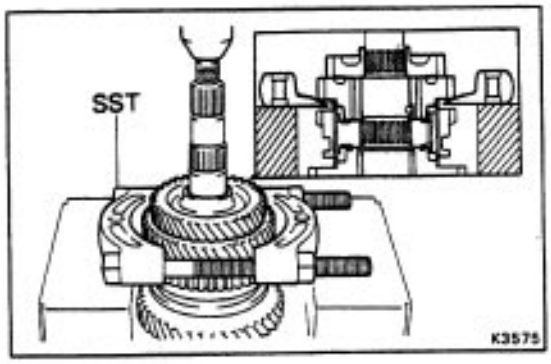
If the clearance exceeds the limit, replace the gear, needle roller bearing or shaft.



3. REMOVE OUTPUT SHAFT REAR BEARING, FOURTH DRIVEN GEAR AND SPACER

(a) Using a press, remove the bearing and 4th driven gear.

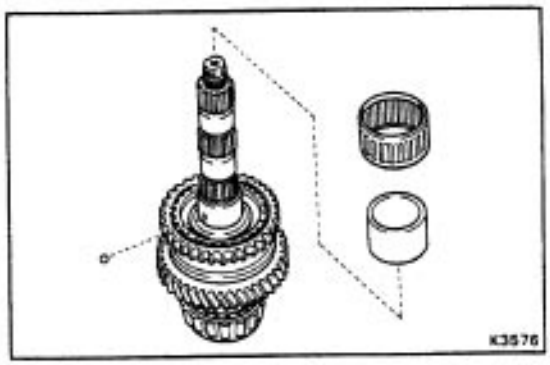
(b) Remove the spacer.



4. REMOVE THIRD DRIVEN GEAR AND SECOND GEAR

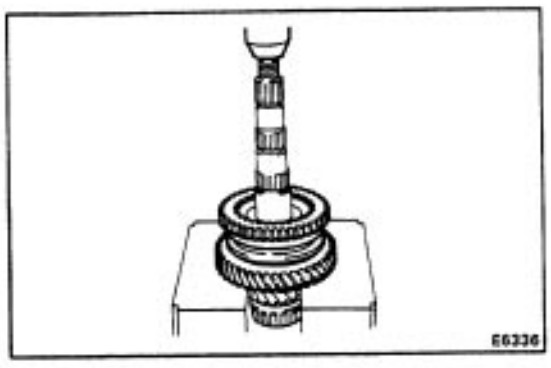
Using SST and a press, remove the 3rd driven gear and 2nd gear.

SST 09950–00020



5. REMOVE NEEDLE ROLLER BEARING. SECOND GEAR BUSHING AND BALL

6. REMOVE SYNCHRONIZER RING

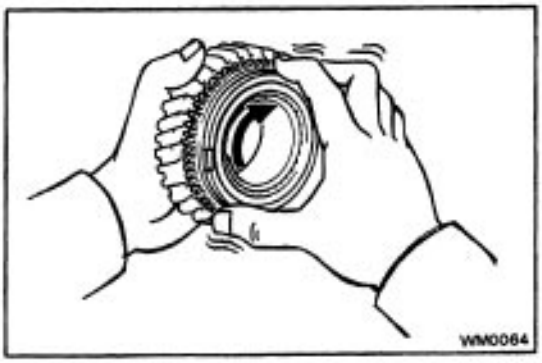


7. REMOVE NO.1 HUB SLEEVE ASSEMBLY AND FIRST GEAR

Using a press, remove No. 1 hub sleeve and 1st gear.

8. REMOVE SYNCHRONIZER RING AND NEEDLE ROLLER BEARING

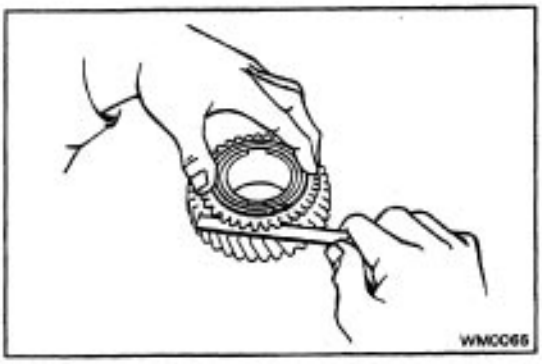
INSPECTION OF OUTPUT SHAFT COMPONENT PARTS



1. INSPECT SYNCHRONIZER RINGS

(a) Check for wear or damage.

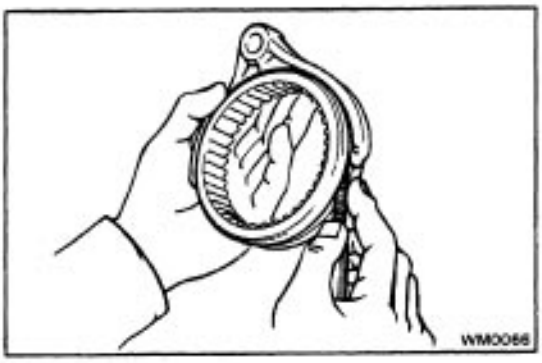
(b) Turn the ring and push it in to check the braking action.



(e) Measure the clearance between the synchronizer ring back and gear spline end.

Minimum clearance: 0.6 mm (0.024 in.)

If the clearance is less than the limit, replace the synchronizer ring.

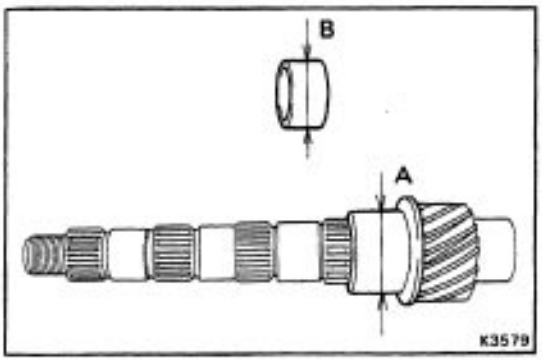


2. MEASURE CLEARANCE OF NO.1 SHIFT FORK AND HUB SLEEVE

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.



3. INSPECT OUTPUT SHAFT

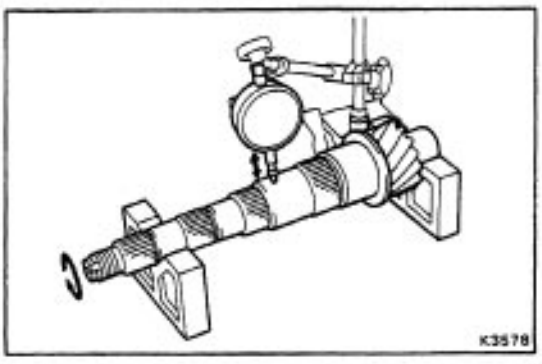
(a) Check the output shaft for wear or damage.

(b) Using a micrometer, measure the outer diameter of the second gear bushing and output shaft journal surface.

Minimum outer diameter:

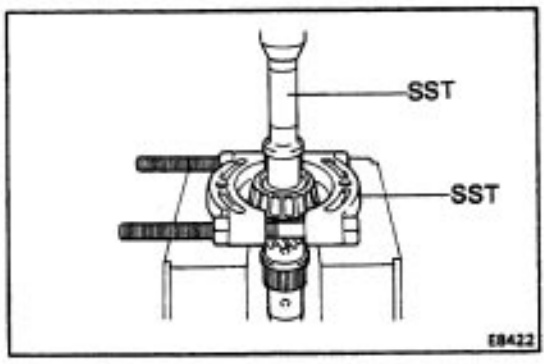
Part A: 44.950 mm (1.7697 in.)

Part B: 43.950 mm (1.7303 in.)



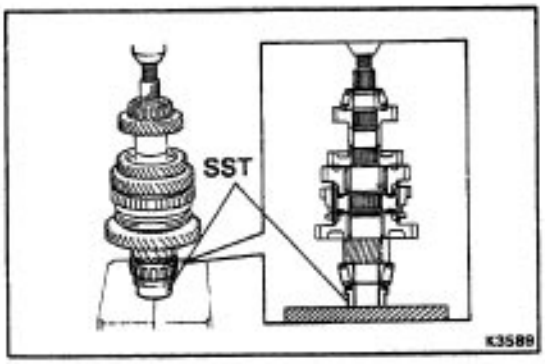
(c) Using a dial indicator, check the shaft runout.

Maximum runout: 0.060 mm (0.0024 in.)



4. IF NECESSARY, REPLACE OUTPUT SHAFT FRONT BEARING

(a) Using SST and a press, remove the bearing.
SST 09307–12010, 09950–00020

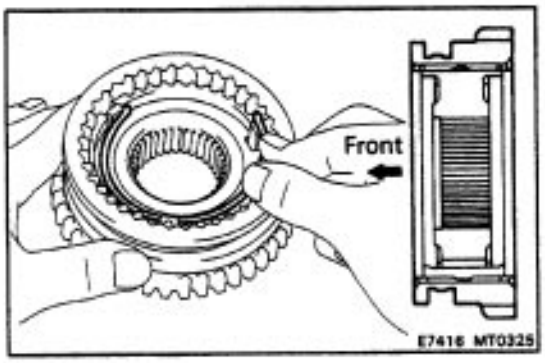


(b) Using SST and a press, install a new bearing.
SST 09316–60010 (09316–00070)

ASSEMBLY OF OUTPUT SHAFT ASSEMBLY

(See page MT–139)

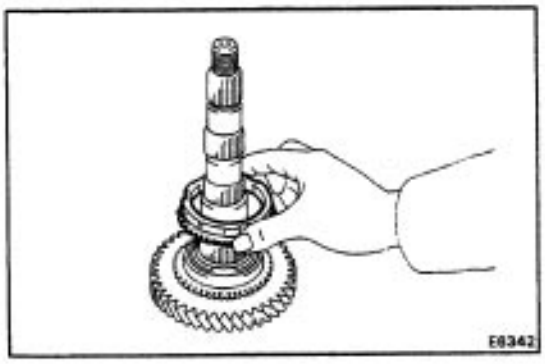
HINT: Coat all the sliding and rotating surface with gear oil before assembly.



1. INSERT NO.1 CLUTCH HUB INTO HUB SLEEVE

(a) Install the clutch hub and shifting keys to the hub sleeve.
(b) Install the shifting key springs under the shifting keys.

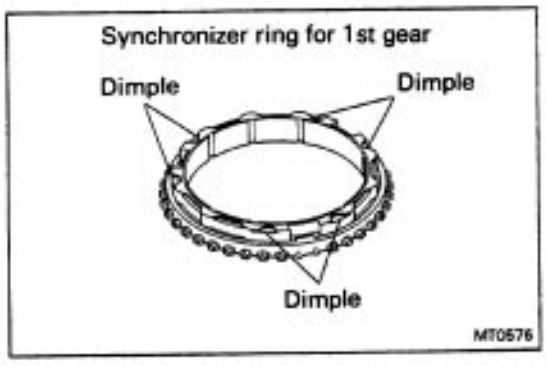
NOTICE: Install the key springs positioned so that their end gaps are not in line.



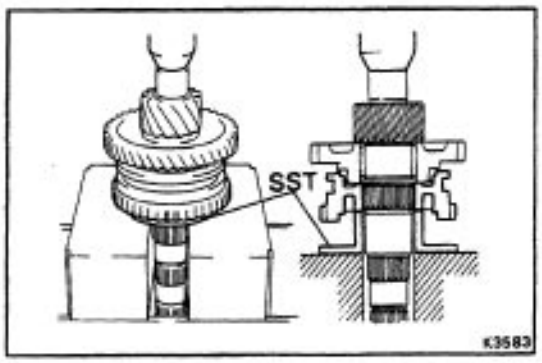
2. INSTALL NEEDLE ROLLER BEARINGS, FIRST GEAR, SYNCHRONIZER RING AND NO.1 HUB SLEEVE TO OUTPUT SHAFT

(a) Apply MP grease to the needle roller bearings.
(b) Install the 1st gear.
(c) Place the synchronizer ring (for 1st gear) on the gear and align the ring slots with the shifting keys.

NOTICE: Do not install the synchronizer ring for 2nd gear.

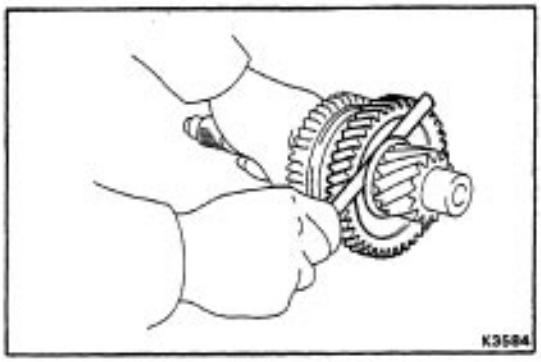


(d) Using SST and a press, install the 1 st gear and No. 1
hub sleeve.
SST 09316–60010¿09316–000401



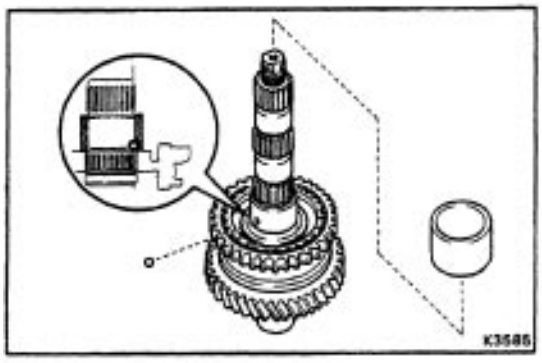
3. MEASURE FIRST GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 1st gear thrust clearance.
Standard clearance: 0.10 – 0.35 mm
(0.0039 – 0.0138 in.)



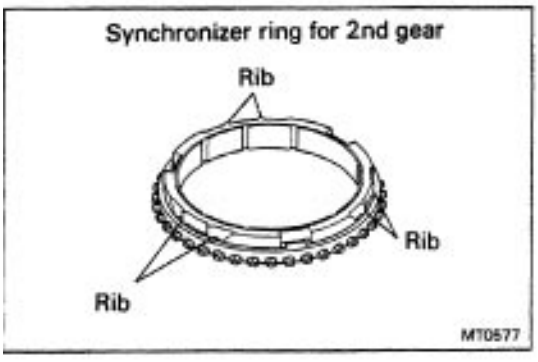
4. INSTALL BALL, SECOND GEAR BUSHING, NEEDLE ROLLER BEARING

(a) Install the ball and bushing.
(b) Apply MP grease to the needle roller bearing.
(e) Install the needle roller bearing.

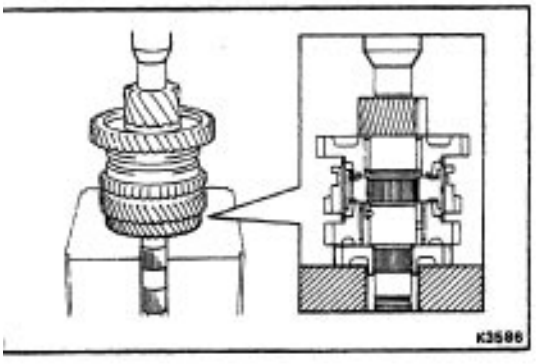


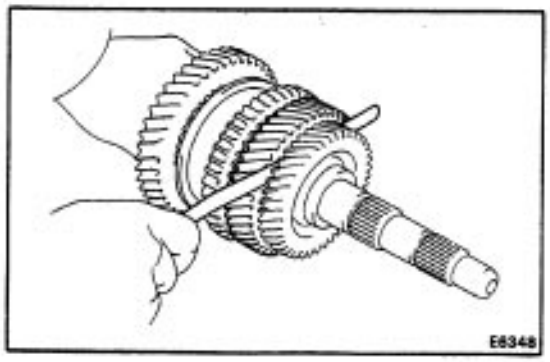
5. SYNCHRONIZER RING, SECOND GEAR AND THIRD DRIVEN GEAR

(a) Place the synchronizer ring (for 2nd gear) on the gear and align the ring slots with the shifting keys.
NOTICE: Do not install the synchronizer ring for 1 st gear.



(b) Install the 2nd gear.
(e) Using a press, install the 3rd driven gear.

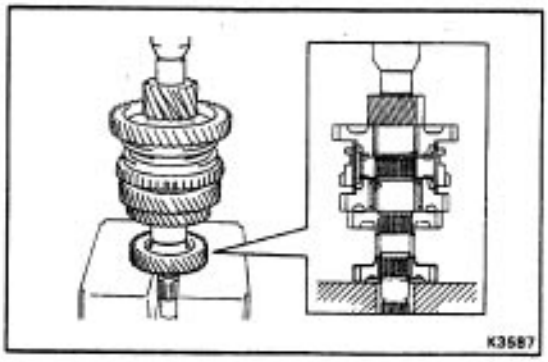




6. MEASURE SECOND GEAR THRUST CLEARANCE

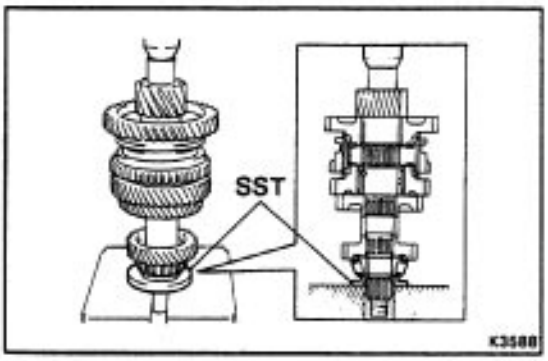
Using a feeler gauge, measure the 2nd gear thrust clearance.

Standard clearance: 0.10 – 0.45 mm
(0.0039 – 0.0177 in.)



7. INSTALL SPACER AND FOURTH DRIVEN GEAR

(a) Install the spacer.
(b) Using a press, install the 4th driven gear.

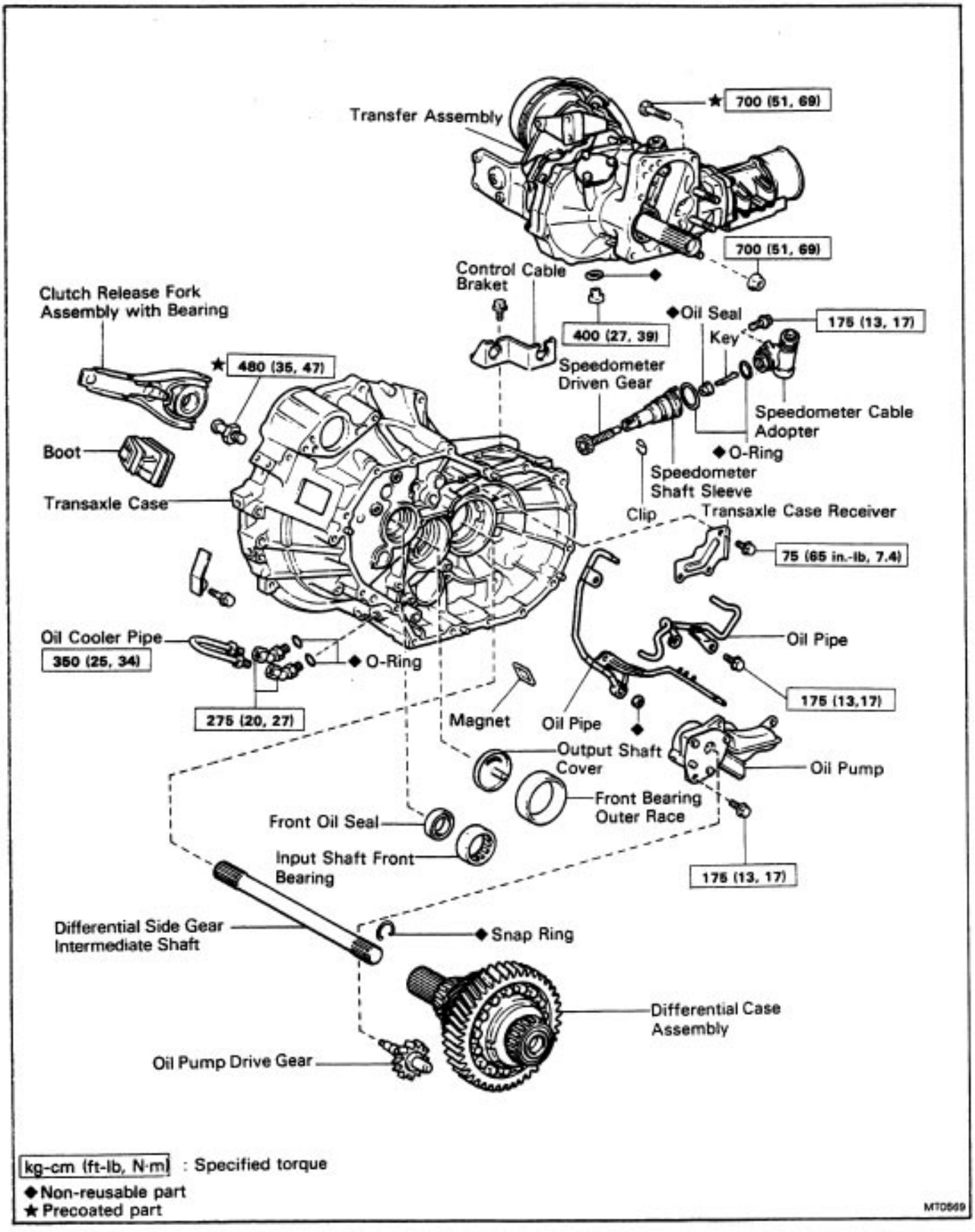


8. INSTALL OUTPUT SHAFT REAR BEARING

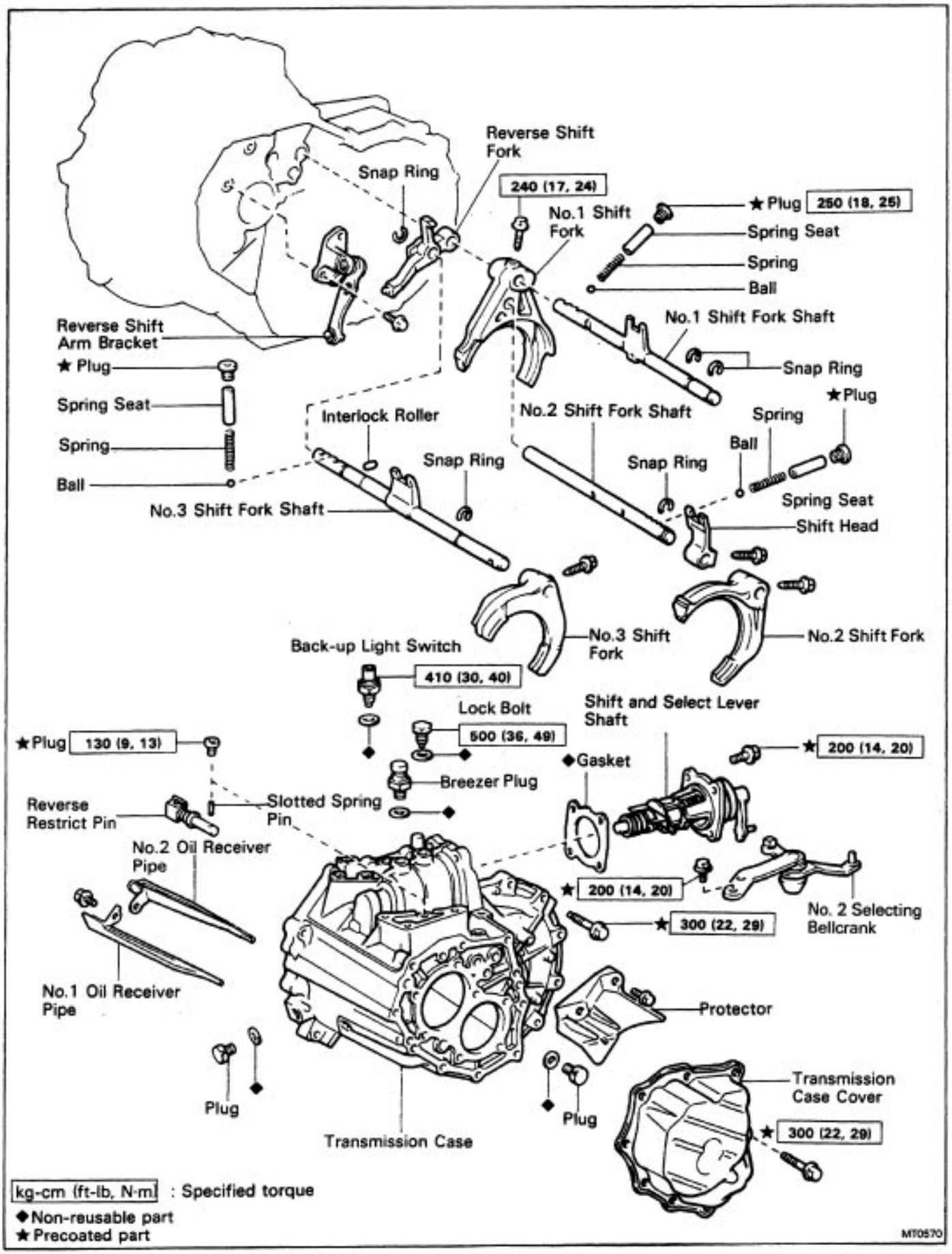
Using SST and a press, install the output shaft rear taper roller bearing.
SST 09506–30012

REMOVAL OF COMPONENT PARTS

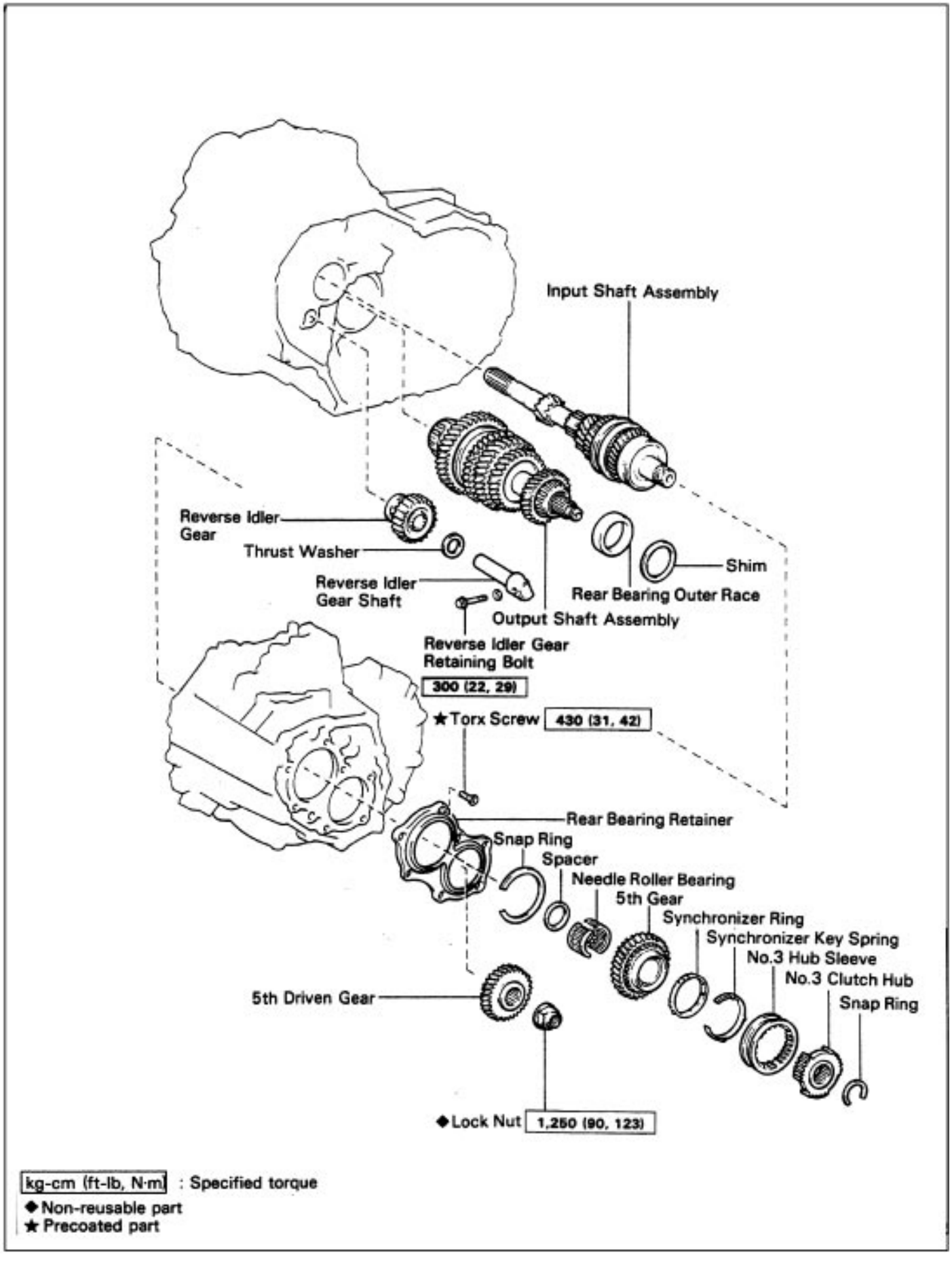
COMPONENTS

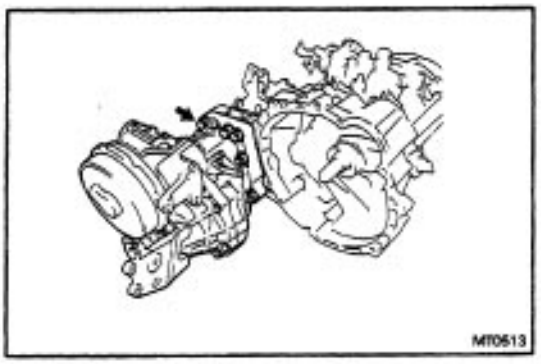


COMPONENTS (Cont'd)



COMPONENTS (Cont'd)





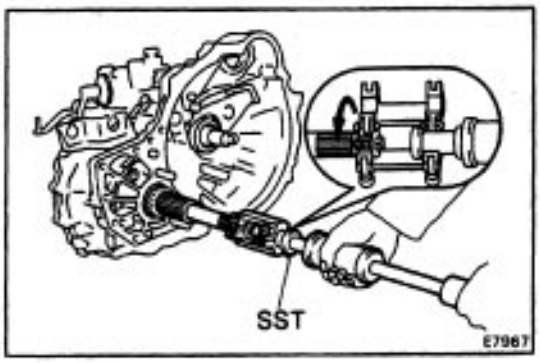
REMOVAL OF COMPONENT PARTS

(See pages MT– 118 to MT– 120)

1. REMOVE TRANSFER ASSEMBLY

(a) Remove the three bolts and five nuts.

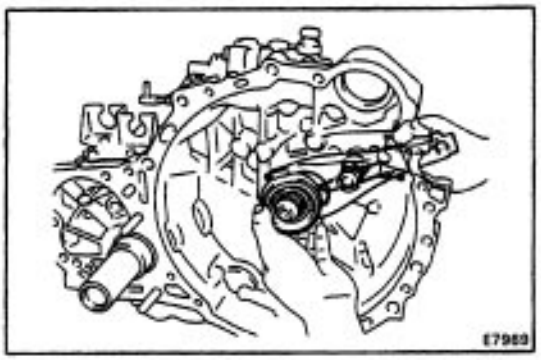
(b) Using a plastic hammer, remove the transfer assembly from the transaxle.



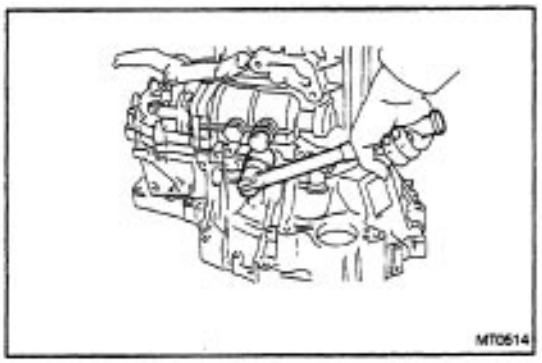
2. REMOVE DIFFERENTIAL SIDE GEAR INTERMEDIATE SHAFT

(a) Screw in a suitable bolt with washer into the side gear intermediate shaft.

(b) Using SST, remove the side gear intermediate shaft.
SST 09910–00015



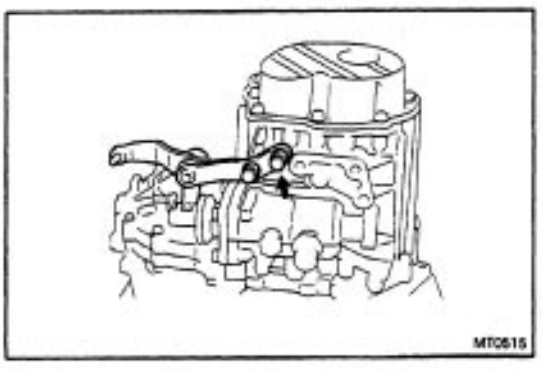
3. REMOVE RELEASE FORK, BEARING AND BOOT



4. REMOVE BACK–UP LIGHT SWITCH

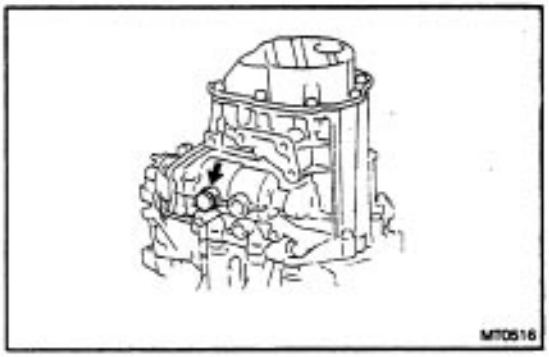
(a) Remove the back–up light switch.

(b) Remove the gasket from the back–up light switch.



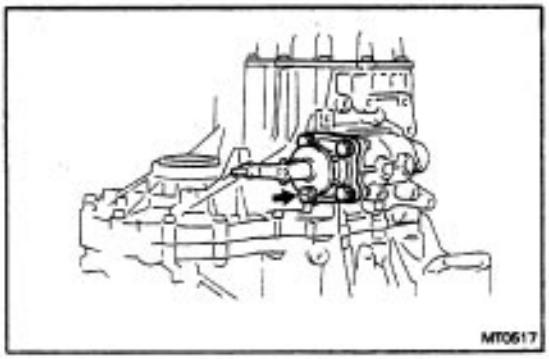
B. REMOVE SPEEDOMETER DRIVEN GEAR

6. REMOVE NO.2 SELECTING BELLCRANK WITH SELECTING BELLCRANK SUPPORT



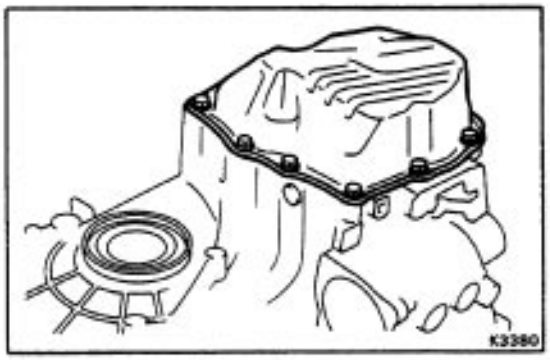
7. REMOVE SHIFT AND SELECT LEVER SHAFT LOCK BOLT

(a) Remove the shift and select lever shaft lock bolt.
(b) Remove the gasket from the bolt.



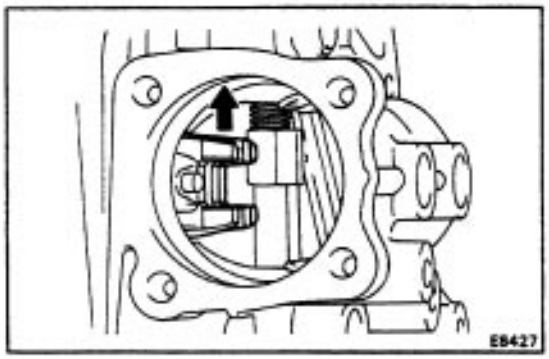
8. REMOVE SHIFT AND SELECT LEVER SHAFT ASSEMBLY

(a) Remove the four bolts and the shift and select lever . shaft assembly.
(b) Remove the gasket from the shift and select lever shaft assembly.



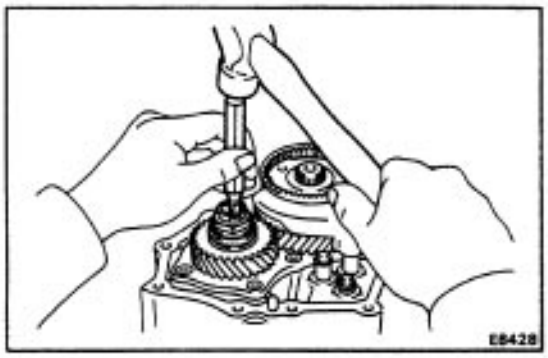
9. REMOVE TRANSMISSION CASE COVER

(a) Remove the ten bolts.
(b) Using a plastic hammer, remove the case cover.

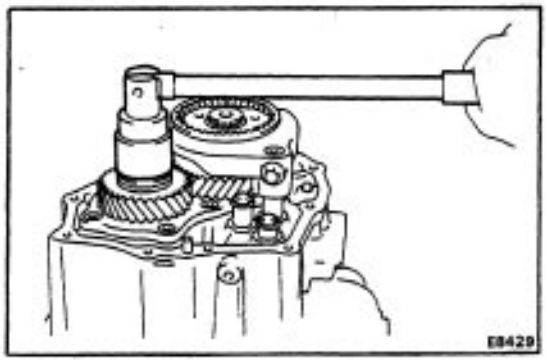


10. REMOVE OUTPUT SHAFT LOCK NUT

(a) Engage the gear double meshing.

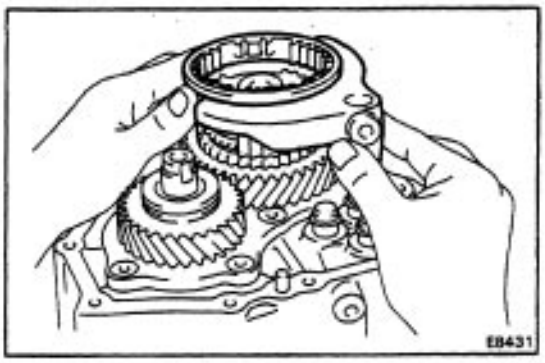


(b) Using a chisel and hammer, unstake the lock nut.



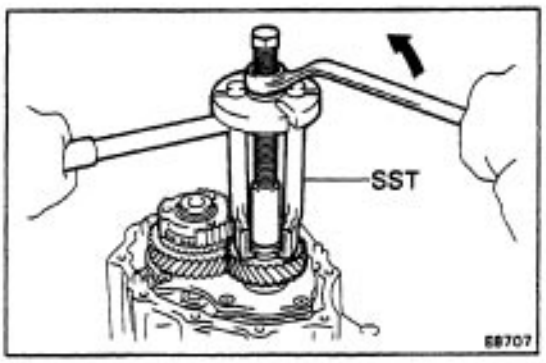
(e) Remove the lock nut.
(d) Disengage the gear double meshing.

11. REMOVE NO.3 HUB SLEEVE AND NO. 3 SHIFT FORK



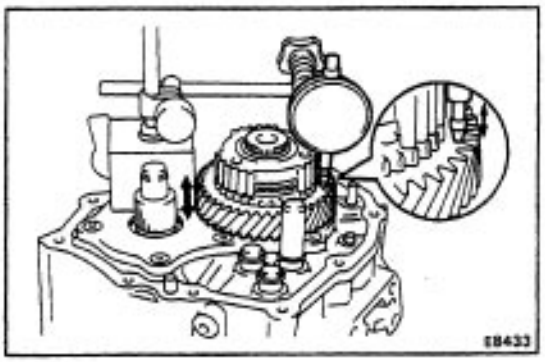
(a) Remove the No.3 shift fork set bolt.
(b) Remove the No.3 hub sleeve and No.3 shift fork.

12. REMOVE FIFTH DRIVEN GEAR

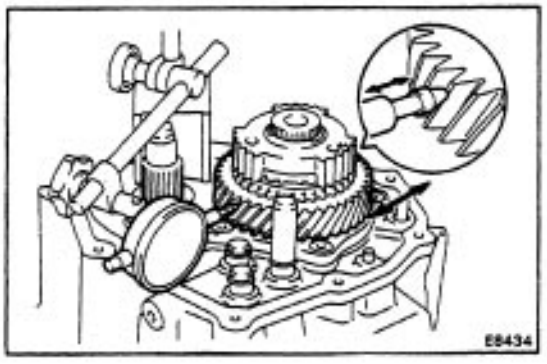


Using SST, remove the 5th driven gear.
SST 09310–17010 (09310–07010, 09310–07020 09310–07040, 09310–07050)

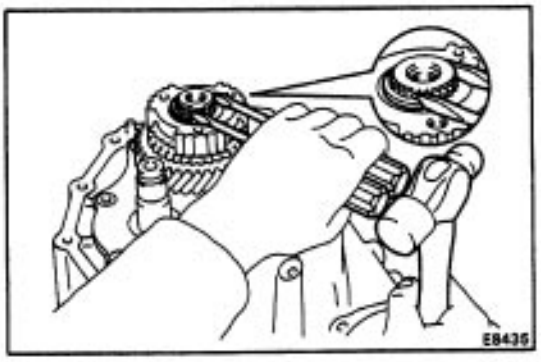
13. MEASURE FIFTH GEAR THRUST CLEARANCE



(a) Using a dial indicator, measure the thrust clearance.
Standard clearance: 0.10 – 0.57 mm (0.0039 – 0.0224 in.)
Maximum clearance: 0.65 mm (0.0256. in.)

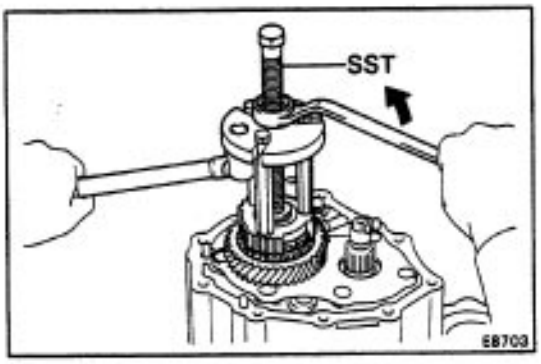


(b) Using a dial indicator, measure the oil clearance.
Standard clearance: 0.009 – 0.050 mm (0.0004 – 0.0020 in.)
Maximum clearance: 0.070 mm (0.0028 in.)

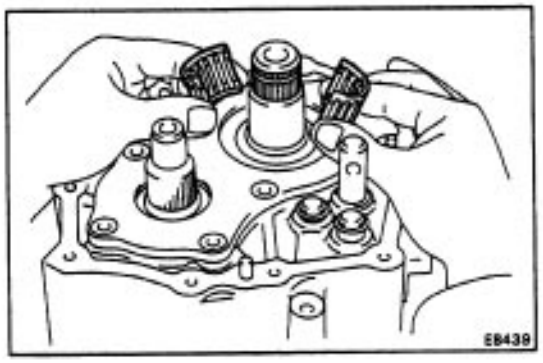


14. REMOVE NO.3 CLUTCH HUB AND FIFTH GEAR

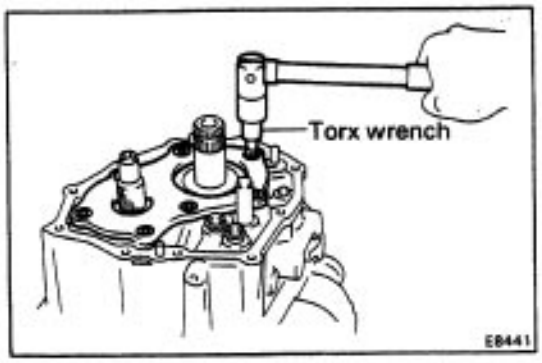
(a) Using two screwdrivers and a hammer, tap out the snap ring.



(b) Using SST, remove the No.3 clutch hub with synchronizer ring and 5th gear.
SST 09310–17010
(09310–07010, 09310–07020, 09310–07030)

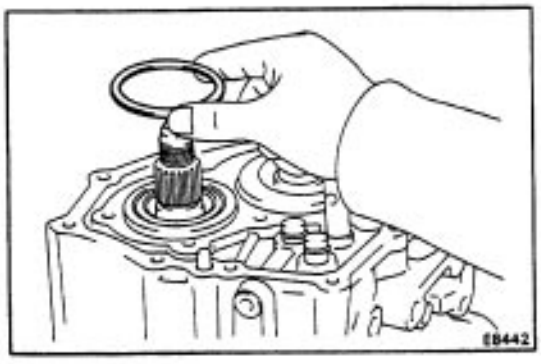


15. REMOVE NEEDLE ROLLER BEARING AND SPACER

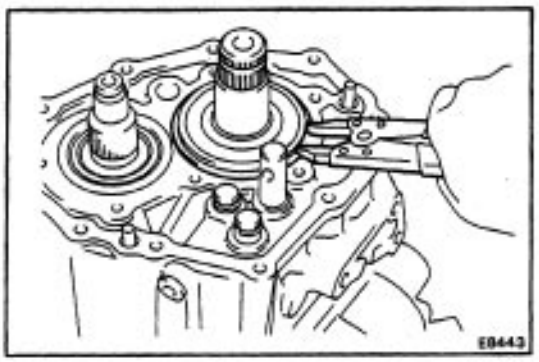


16. REMOVE REAR BEARING RETAINER

(a) Using a torx wrench, remove the seven torx screws and bearing retainer.
Torx wrench T45 09042–00050

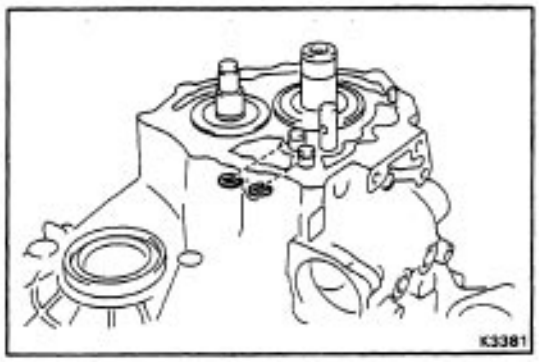


(b) Remove the adjusting shim.



17. REMOVE SNAP RING

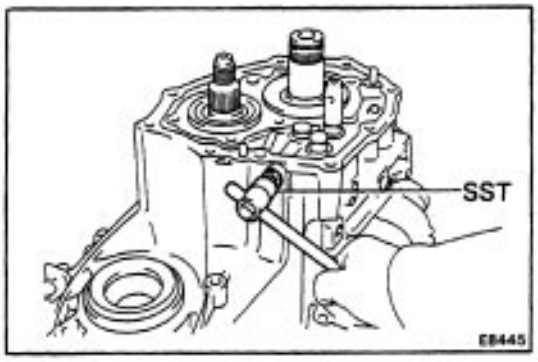
(a) Using snap ring pliers, remove the snap ring of the input shaft rear bearing.



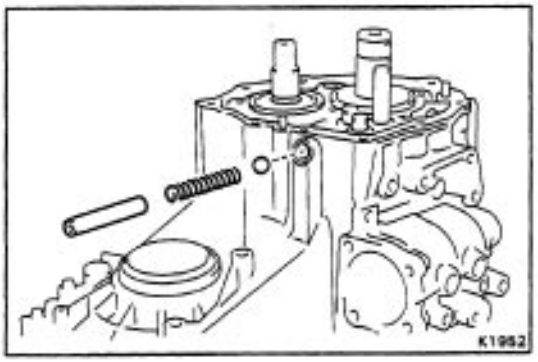
(b) Using two screwdrivers and a hammer, remove the two snap rings of the shift fork shafts.

18. REMOVE PLUG, SEAT, SPRING AND LOCKING BALL

(a) Using SST, remove the plug.
SST 09313–30021

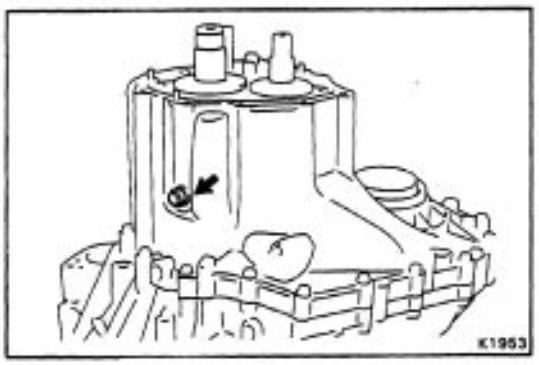


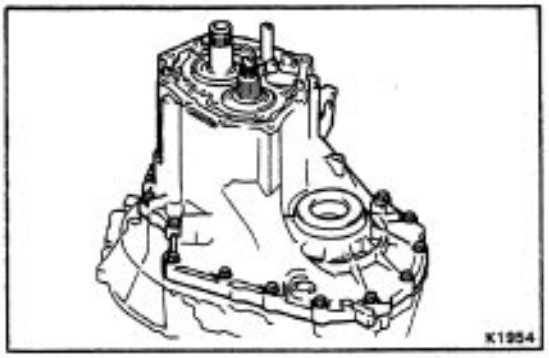
(b) Using a magnetic finger, remove the seat, spring and ball.



19. REMOVE REVERSE IDLER GEAR SHAFT RETAINING BOLT

(a) Remove the reverse idler gear shaft retaining bolt.
(b) Remove the gasket from the bolt.

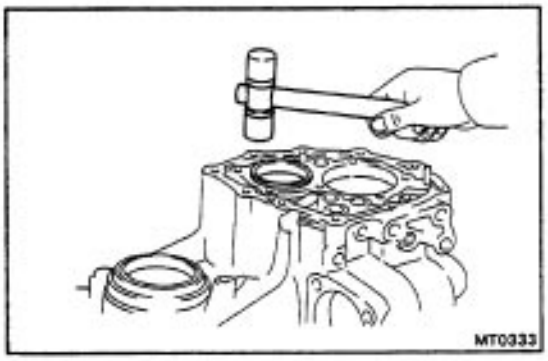




24. REMOVE TRANSMISSION CASE

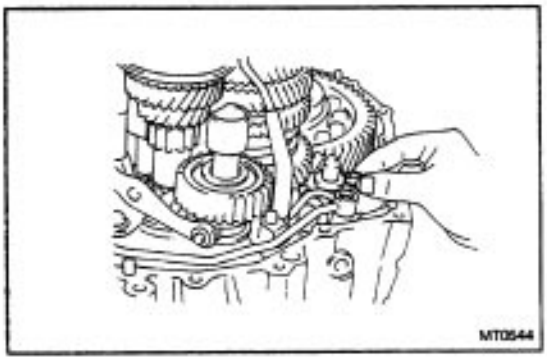
Remove the seventeen bolts and tap off the case with a plastic hammer.

- Transmission case side: Fourteen bolts
- Transaxle case side: Three bolts



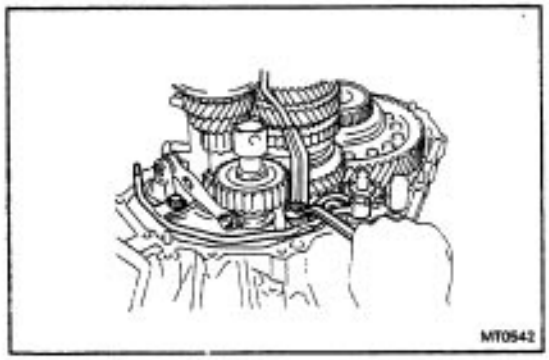
21. REMOVE OUTPUT SHAFT REAR BEARING OUTER RACE

Using a plastic hammer, remove the output shaft rear bearing outer race.

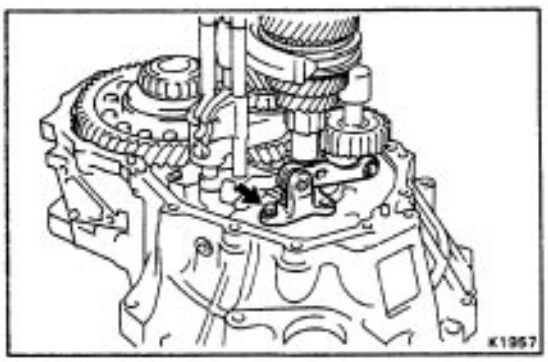


22. REMOVE NO.2 OIL PIPE

(a) Remove the gasket.

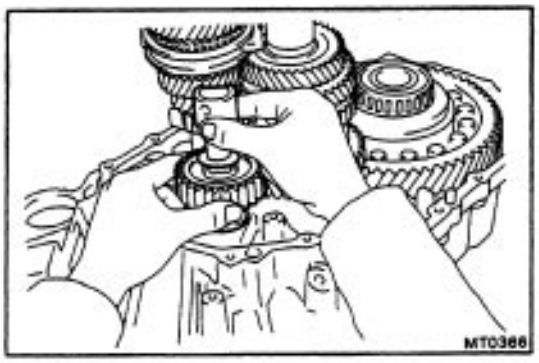


(b) Remove the two bolts and oil pipe.



23. REMOVE REVERSE SHIFT ARM BRACKET

Remove the bolt and pull off the bracket.



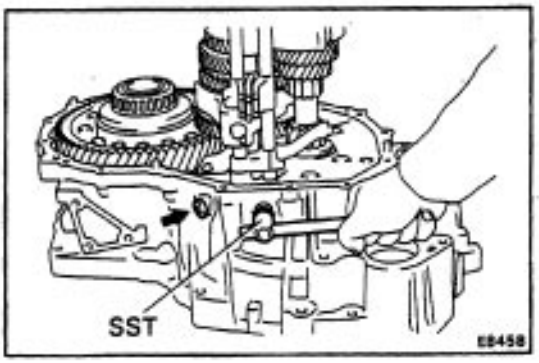
24. REMOVE REVERSE IDLER GEAR, THRUST WASHER AND SHAFT

Pull out the shaft, remove the reverse idler gear and thrust washer.

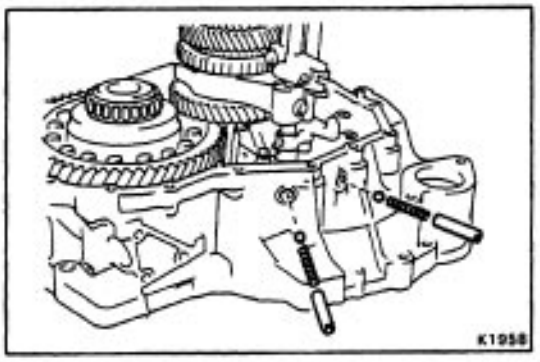
25. REMOVE PLUGS, SEATS, SPRINGS AND BALLS

(a) Using SST, remove the two plugs.

SST 09313–30021

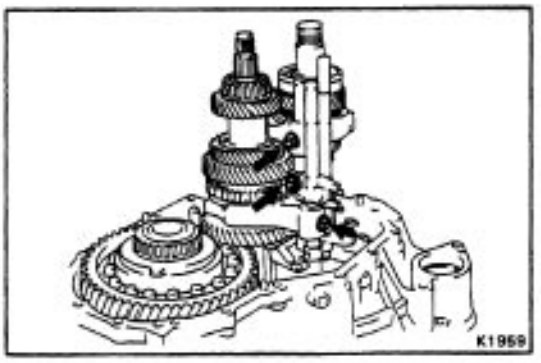


(b) Using a magnetic finger, remove the two seats, springs and balls.



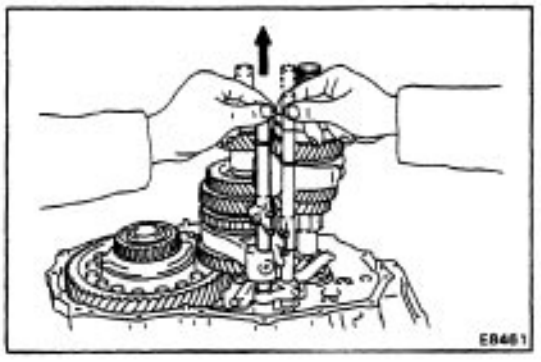
26. REMOVE SET BOLTS

Remove the three set bolts.



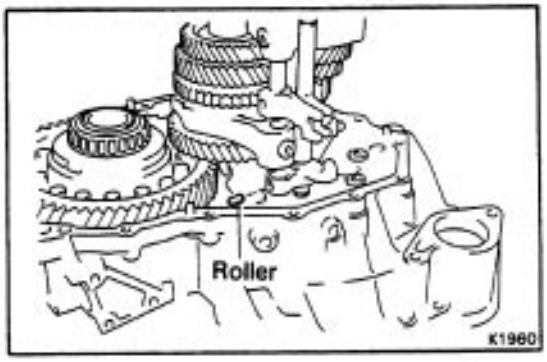
27. REMOVE NO–1 SHIFT FORK SHAFT

Pull up No.3 shift fork shaft, remove the No.1 shift fork shaft.



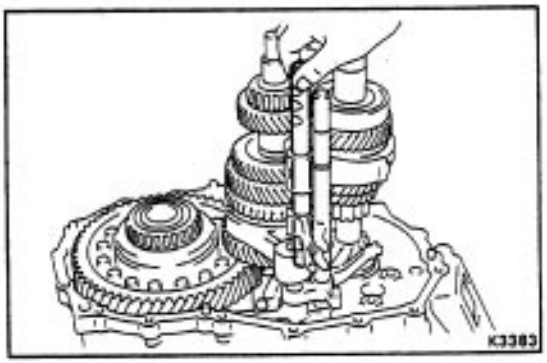
28. REMOVE INTERLOCK ROLLER

Using a magnetic finger, remove the interlock roller from the reverse shift fork.

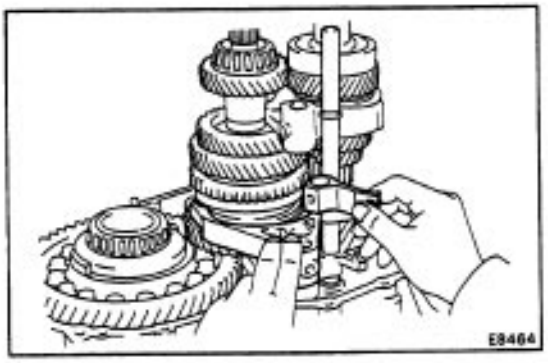


29. REMOVE NO.2 SHIFT FORK SHAFT, SHIFT HEAD AND NO.1 SHIFT FORK

(a) Full out the No.2 shift fork shaft.



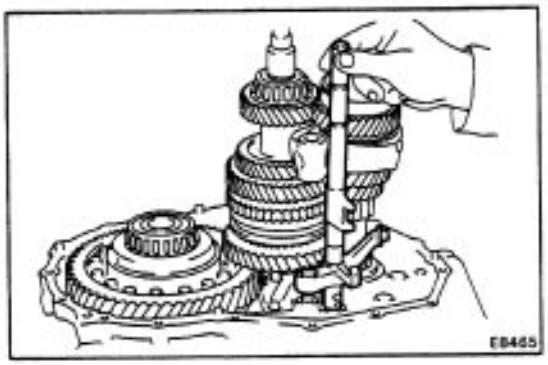
(b) Remove the shift head and No. 1 shift fork.



30. REMOVE N0.3 SHIFT FORK SHAFT WITH REVERSE SHIFT FORK AND NO.2 SHIFT FORK

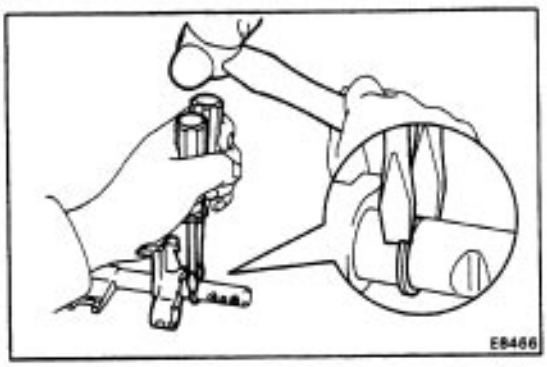
(a) Pull out the No.3 shift fork shaft with reverse shift fork.

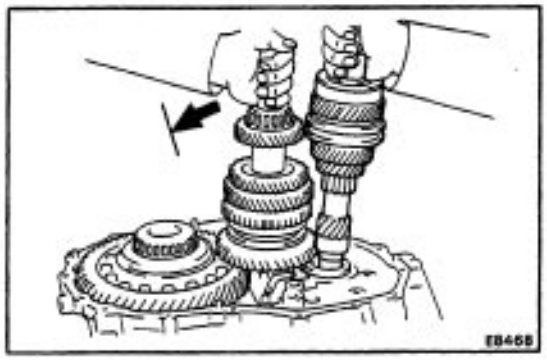
(b) Remove the No.2 shift fork.



31. REMOVE SNAP RING

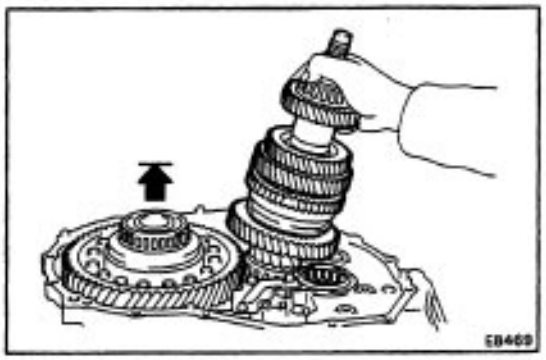
Using two screwdrivers and a hammer, remove the snap ring and reverse shift fork from the No.3 shift fork shaft



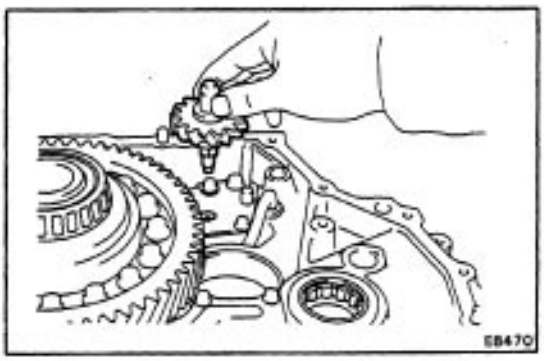


32. REMOVE INPUT AND OUTPUT SHAFT ASSEMBLY

(a) Leaning the output shaft to the differential side, remove the input shaft assembly.

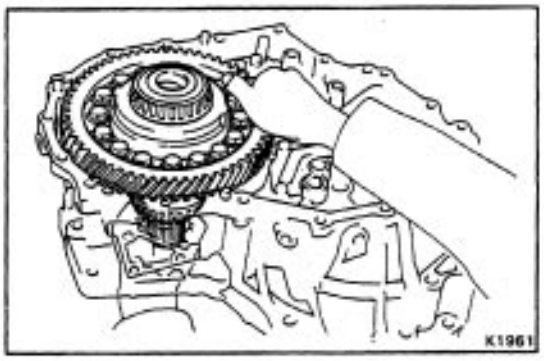


(b) Lift up the differential case assembly, remove the output shaft assembly.

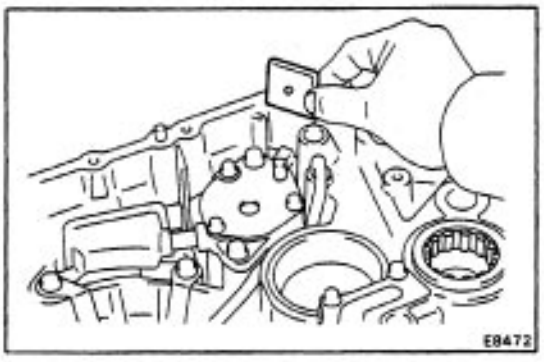


33. REMOVE DIFFERENTIAL CASE ASSEMBLY

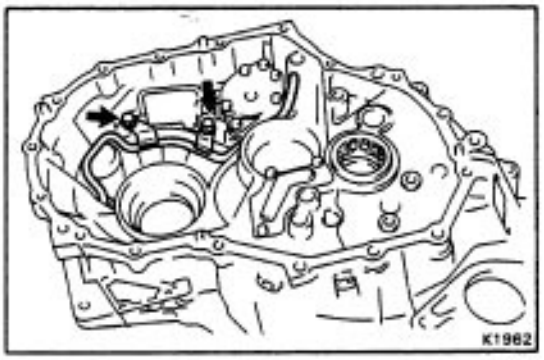
(a) Remove the oil pump drive gear.



(b) Remove the differential case assembly.

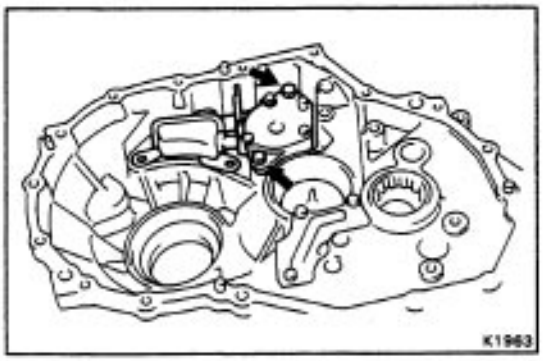


34. REMOVE MAGNET FROM TRANSAXLE CASE



35. REMOVE OIL PUMP ASSEMBLY

(a) Remove the two bolts and oil pipe.



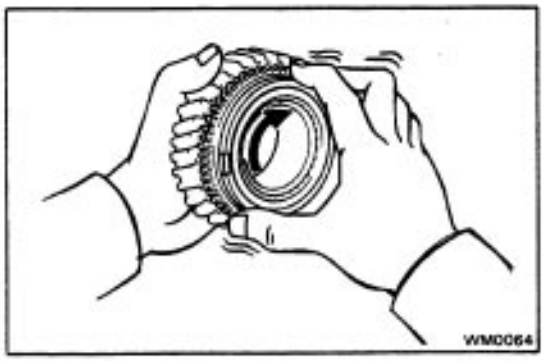
(b) Remove the two bolts and oil pump.

INSPECTION OF COMPONENT PARTS

1. INSPECT SYNCHRONIZER RING OF FIFTH GEAR

(a) Check for wear or damage.

(b) Turn the ring and push it in to check the braking action.



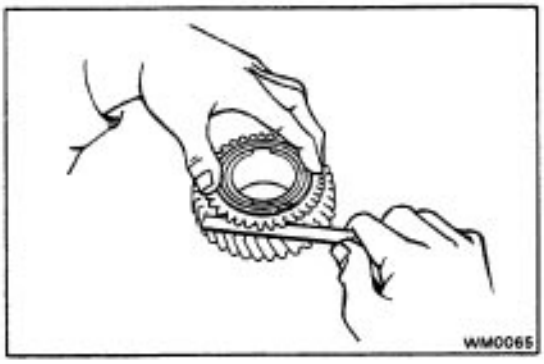
(e) Measure the clearance between the synchronizer ring back and the gear spline end.

Standard clearance: 0.75 – 1.65 mm (0.0295 – 0.0650 in.)

Minimum clearance: 0.6 mm (0.024 in.)

NOTE: Inspect the clearance of the gear's whole circumference.

If the clearance is less than the limit, replace the synchronizer ring.

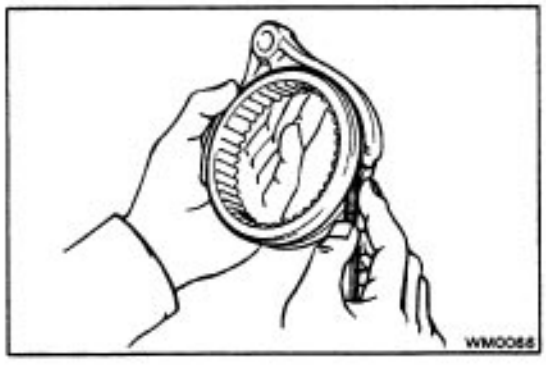


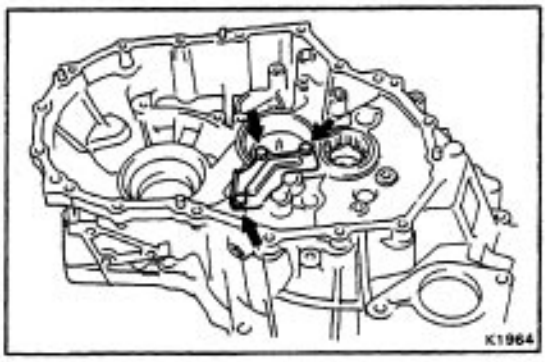
2. MEASURE CLEARANCE OF SHIFT FORK AND HUB SLEEVE

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1.0 mm (a.039 in.)

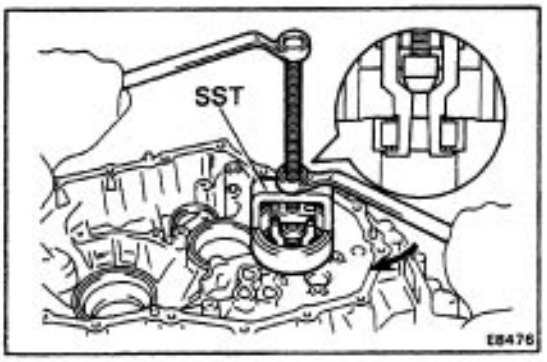
If the clearance exceeds the limit, replace the shift fork or hub sleeve.





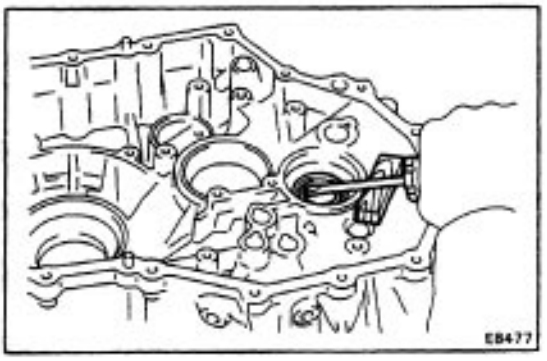
3. REMOVE TRANSAXLE CASE RECEIVER

Remove the three bolts and the transaxle case receiver.

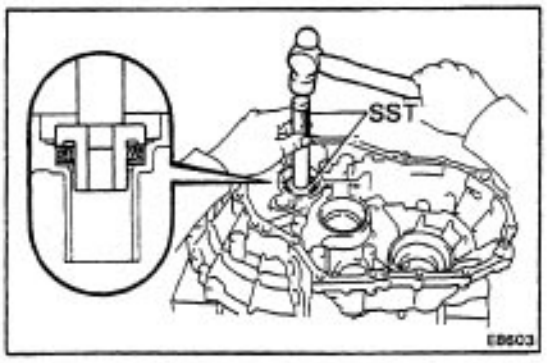


4. IF NECESSARY, REPLACE INPUT SHAFT FRONT BEARING AND OIL SEAL

(a) Using SST, pull out the bearing from the transaxle case.
SST 09612–65014

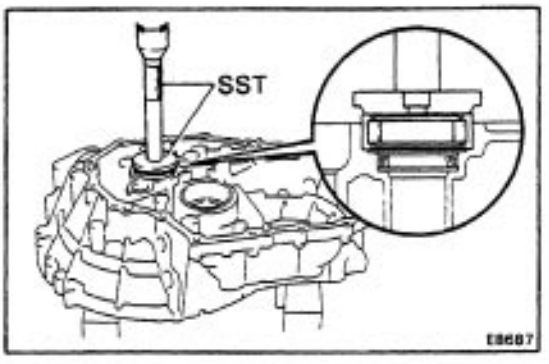


(b) Using a screwdriver, remove the oil seal.



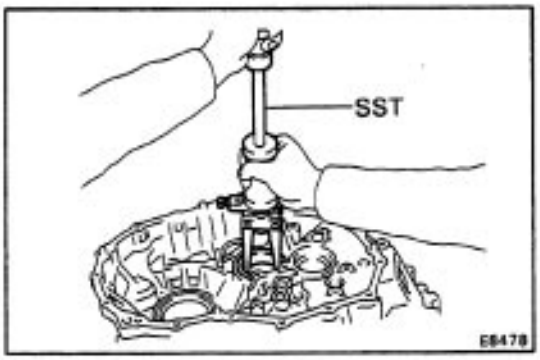
(c) Using SST, drive in a new oil seal.
SST 09608–12010 (09608–00020, 09608–00080)

(d) Coat the lip of oil seal with MP grease.



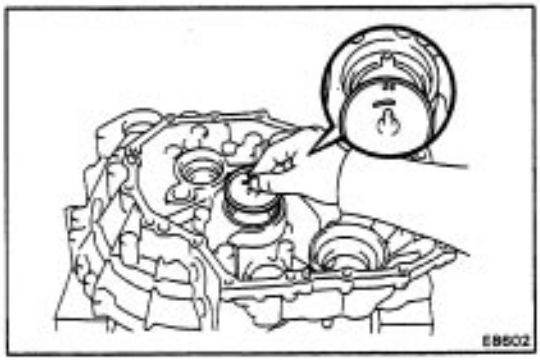
(e) Using SST, drive in a new bearing.
SST 09608–12010 (09608–00020, 09608–00060)

5. IF NECESSARY, REPLACE OUTPUT SHAFT FRONT BEARING OUTER RACE AND OUTPUT SHAFT COVER



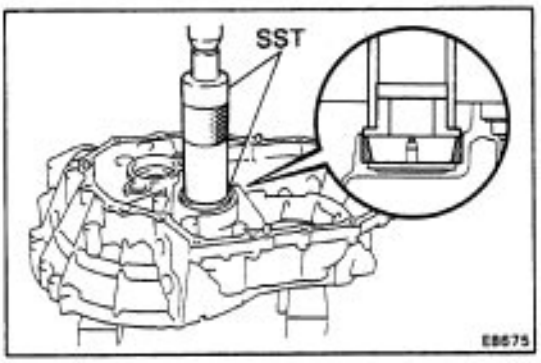
(a) Using SST, pull out the outer race.
SST 09308–00010 .

(b) Remove the output shaft cover.



(c) Install the output shaft cover.

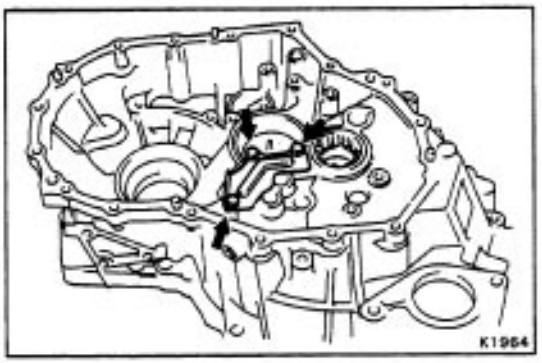
NOTE: Install the output shaft cover projection into the case side groove.



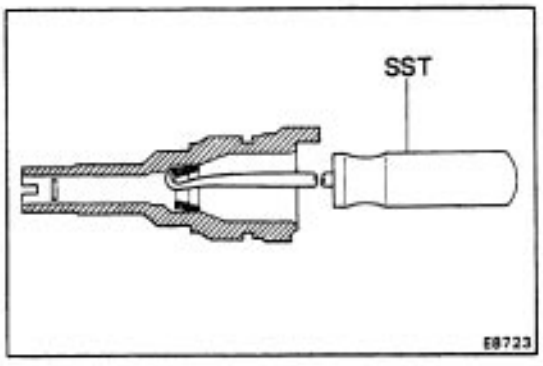
(d) Using SST, press in a new outer race.
SST 09316–60010 (09316–00010, 09316–00020)

6. INSTALL AND TORQUE TRANSAXLE CASE RECEIVER

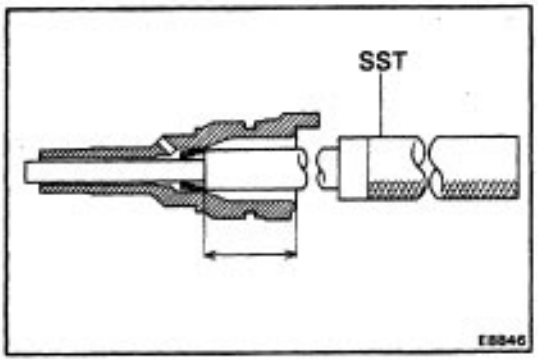
Torque: 75 kg–cm (65 in.–lb, 7.4 N–m)



7. IF NECESSARY, REPLACE SPEEDOMETER DRIVEN GEAR OIL SEAL

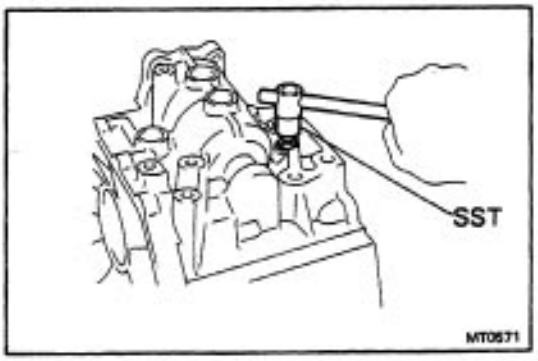


(a) Using SST, pull out the oil seal.
SST 09921–00010

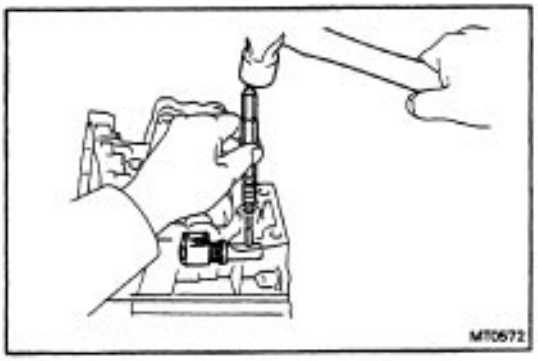


(b) Using SST, drive in a new oil seal.
SST 09201–60011
Drive in depth: 33 mm 0 .30 in.)
(c) Coat the lip of oil seal with MP grease.

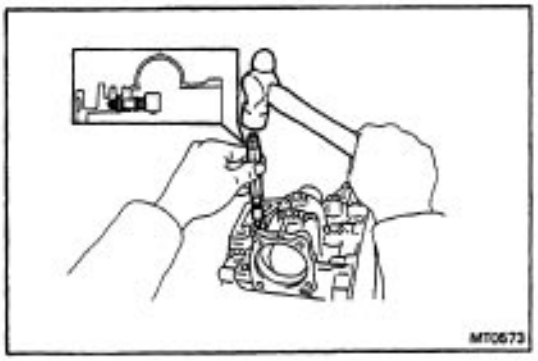
8. IF NECESSARY, REPLACE REVERSE RESTRICT PIN



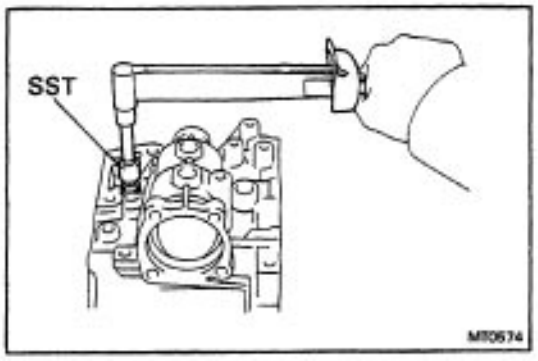
(a) Using SST, remove the screw plug.
SST 09313–30021



(b) Using a pin punch and hammer, drive out the slotted spring pin.

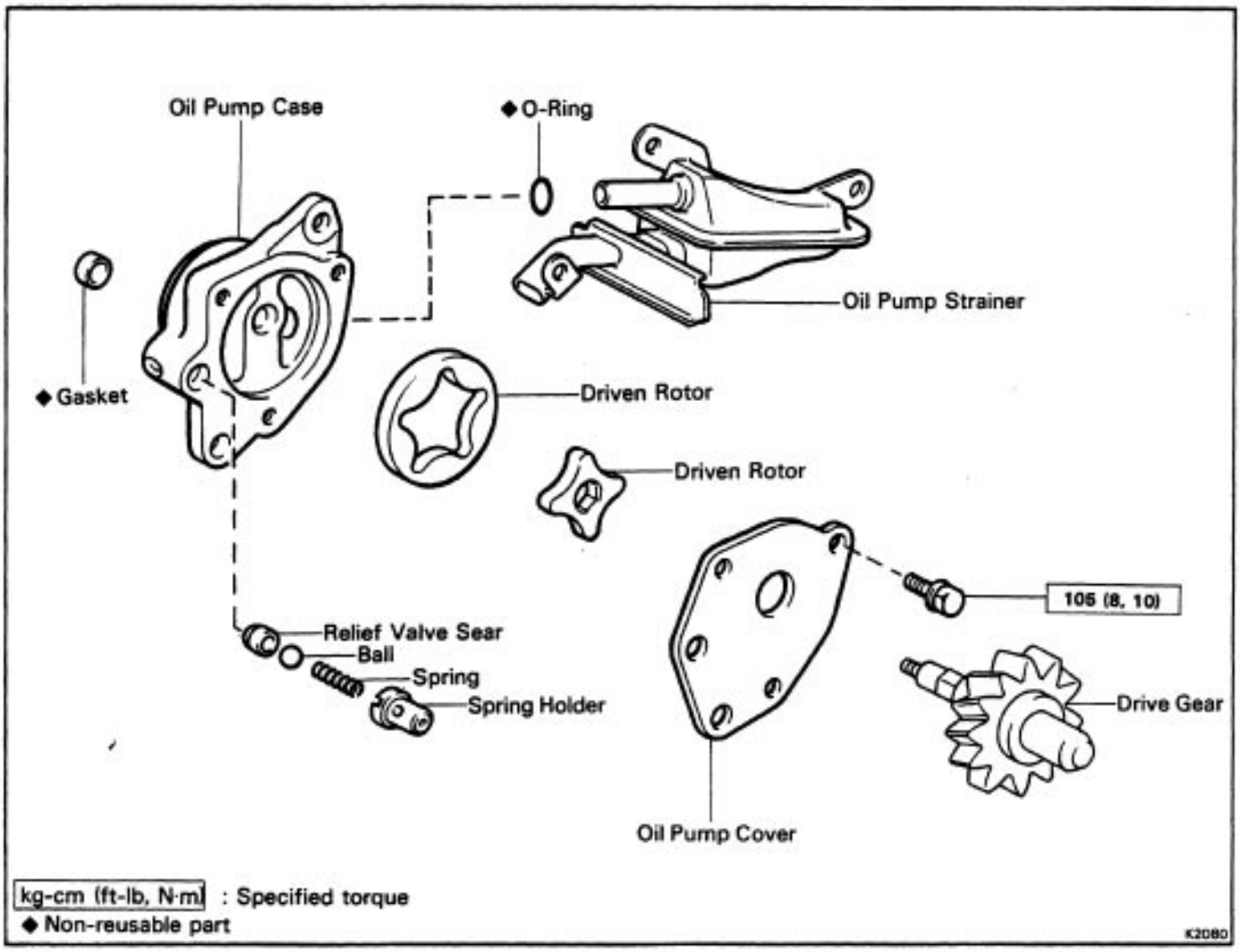


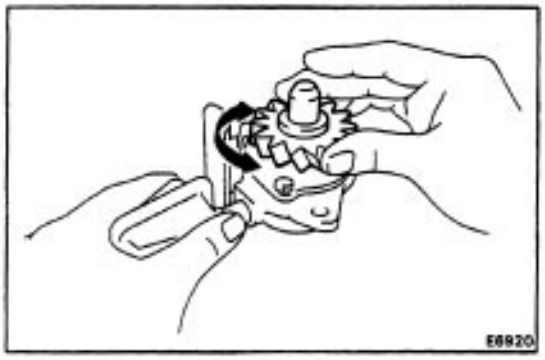
(e) Replace the reverse restrict pin.
(d) Using a pin punch, drive in the slotted spring pin.



(f) Apply liquid sealant to the plug threads.
Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(f) Using SST, install the screw plug.
SST 09313–30021

OIL PUMP

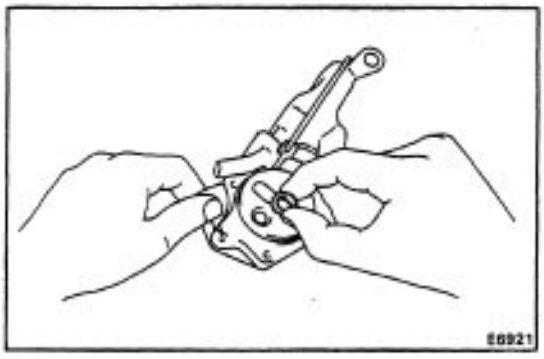




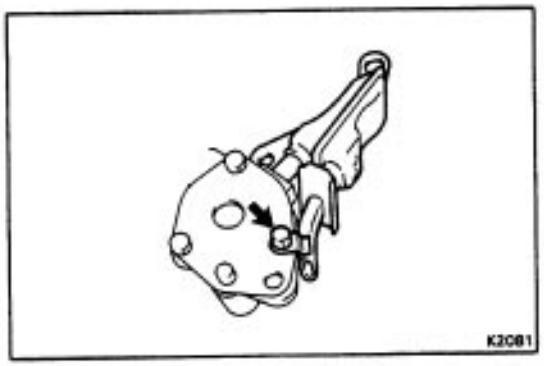
DISASSEMBLY OF OIL PUMP

1. CHECK OPERATION OF OIL PUMP

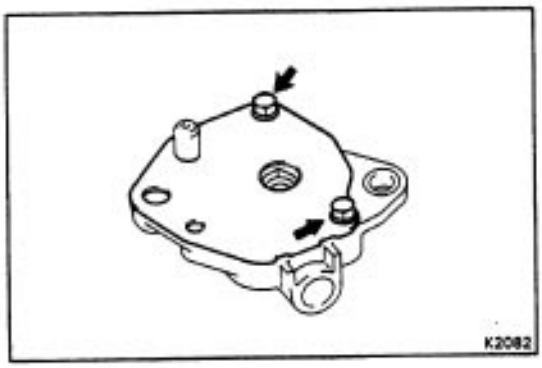
Install the oil pump drive gear to the drive rotor, check that the drive rotor turns smoothly.



2. REMOVE GASKET FROM OIL PUMP CASE

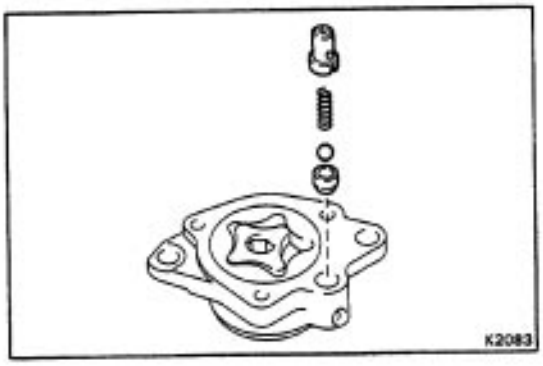


3. REMOVE BOLT AND OIL STRAINER

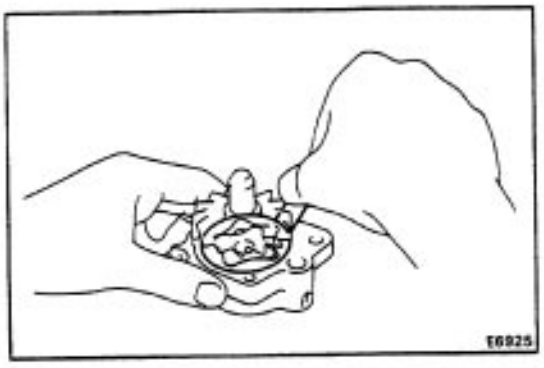


4. REMOVE OIL PUMP COVER

(a) Hold the oil pump cover, remove the two bolts and the cover.



(b) Remove the spring holder, spring, ball and relief valve seat.



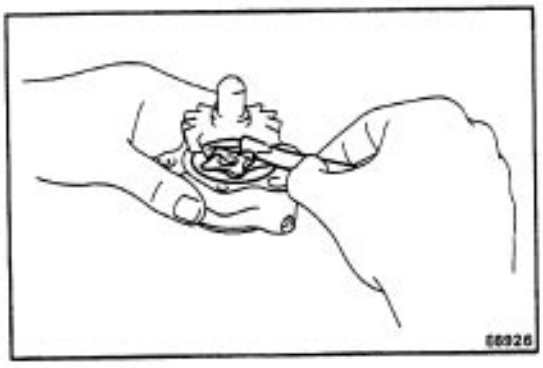
5. CHECK ROTOR BODY CLEARANCE

(a) Install the oil pump drive gear to the drive rotor.

(b) Using a feeler gauge, measure the body clearance between the drive rotor and oil pump case.

Standard clearance: 0.10 – 0.16 mm (0.0039 – 0.0063 in.)

Maximum clearance: 0.30 mm (0.0118 in.)



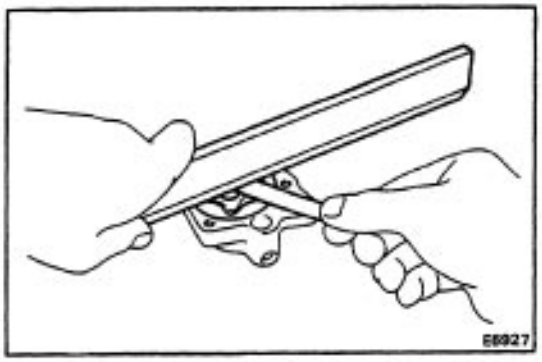
6. CHECK ROTOR TIP CLEARANCE

(a) Install the oil pump drive gear to the drive rotor.

(b) Using a feeler gauge, measure the tip clearance between the drive and driven rotors.

Standard clearance: 0.08 – 0.15 mm (0.0031 – 0.0059 in.)

Maximum clearance: 0.30 mm (0.0118 in.)

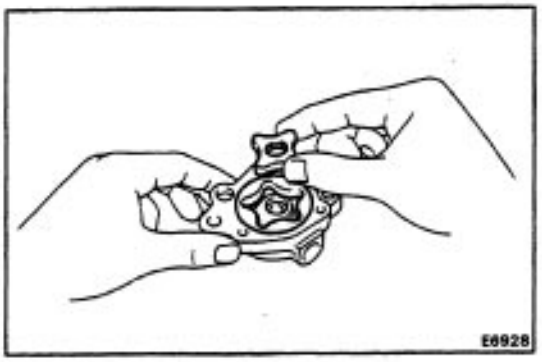


7. CHECK. SIDE CLEARANCE

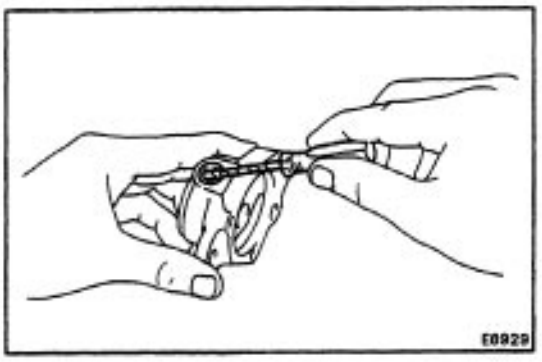
Using a precision straight edge and feeler gauge, measure the side clearance of both rotors.

Standard clearance: 0.03 – 0.08 mm (0.0012 – 0.0031 in.)

Maximum clearance: 0.15 mm (0.0059 in.)

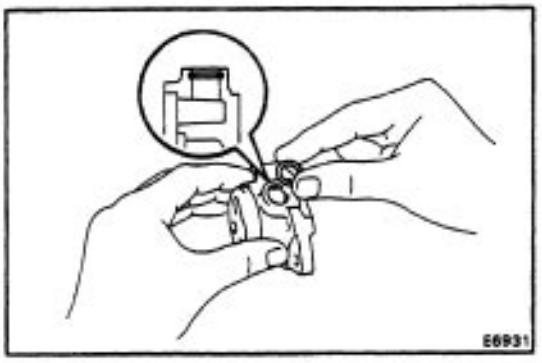


8. REMOVE OIL PUMP DRIVE ROTOR AND DRIVEN ROTOR



9. IF NECESSARY, REPLACE O–RING

(a) Using a screwdriver, remove the O–ring.

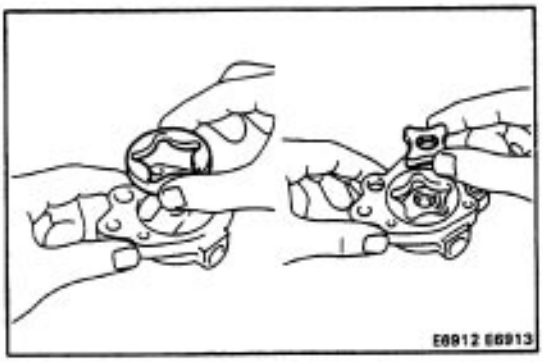


(b) Apply the gear oil to a new O–ring.

(c) Install a new O–ring.

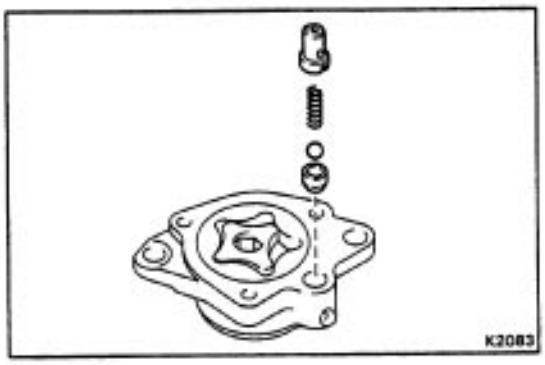
ASSEMBLY OF OIL PUMP

1. INSTALL DRIVEN ROTOR AND DRIVE ROTOR

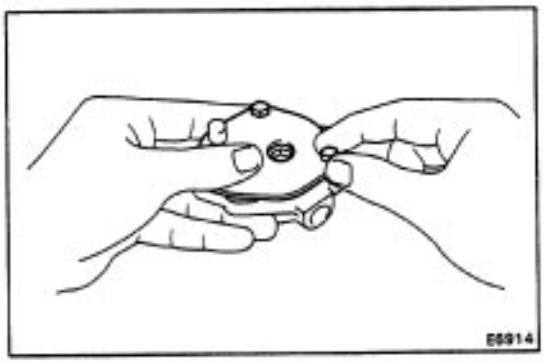


2. INSTALL OIL PUMP COVER

(a) Install the relief valve seat, ball, spring and spring holder to the oil pump case.

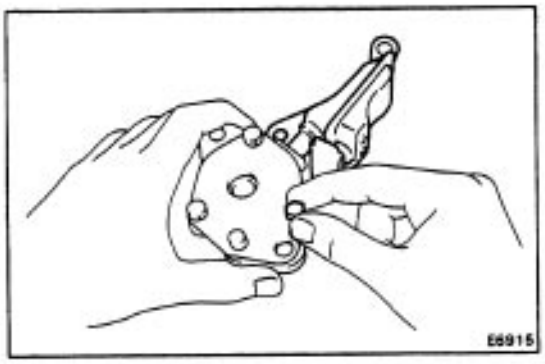


(b) Hold the oil pump cover, temporarily install the two bolts.



3. INSTALL OIL STRAINER

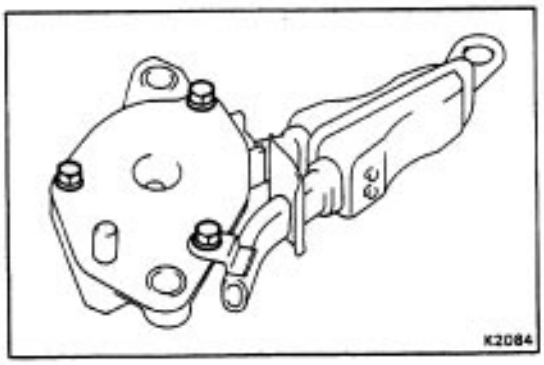
Install the oil strainer to the oil pump case, temporarily install the bolt.

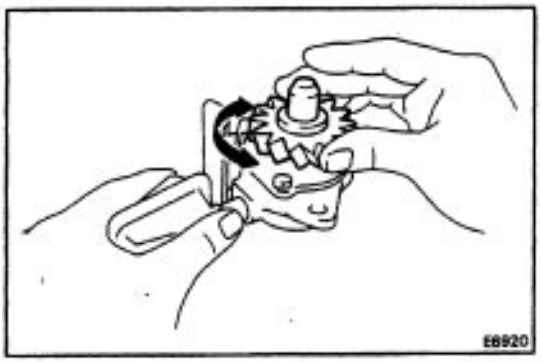


4. TORQUE OIL PUMP COVER BOLTS

Torque the three bolts evenly.

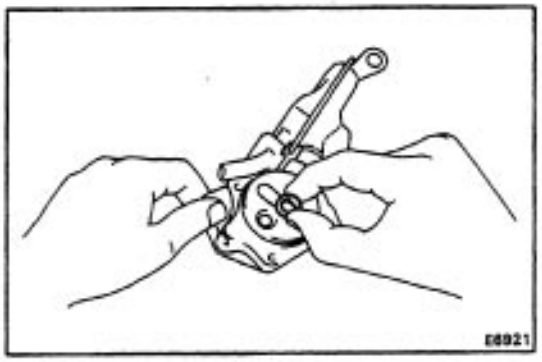
Torque: 105 kg–cm (8 ft–lb, 10 N–m)





5. CHECK OPERATION OF OIL PUMP

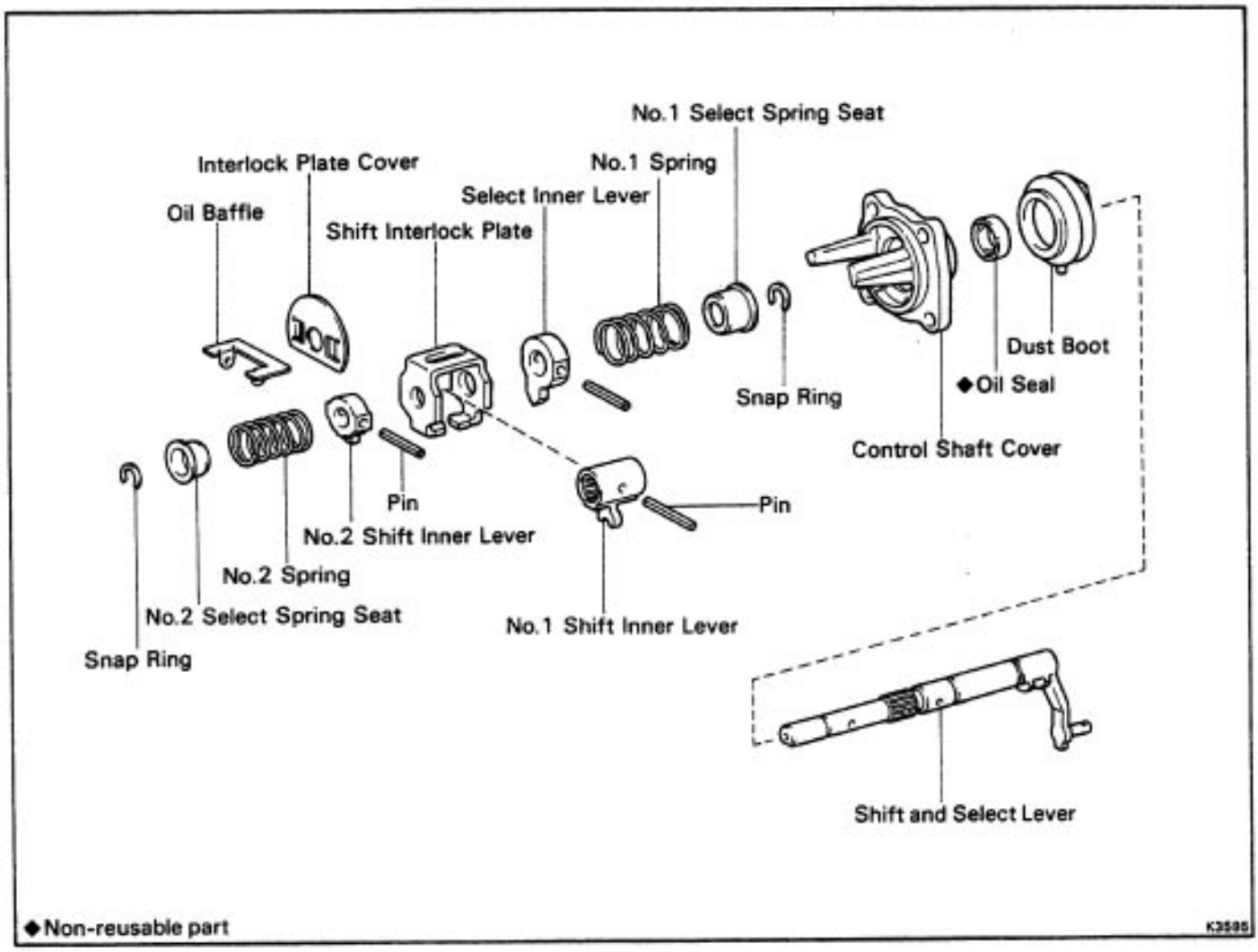
Insert the oil pump drive gear to the drive rotor, check that the drive rotor turns smoothly.

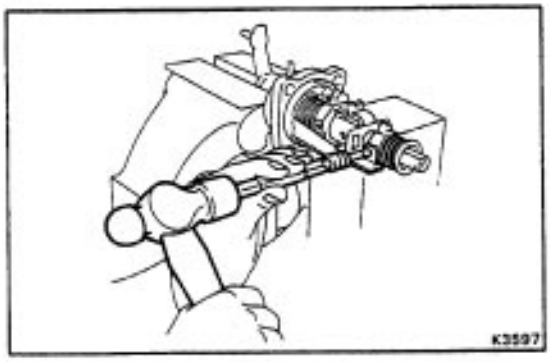


6. INSTALL GASKET

Install a new gasket to the oil pump case.

Shift and Select Lever Shaft

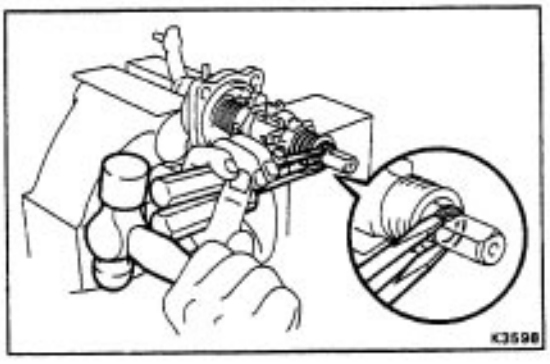




DISASSEMBLY OF SHIFT AND SELECT LEVER SHAFT ASSEMBLY

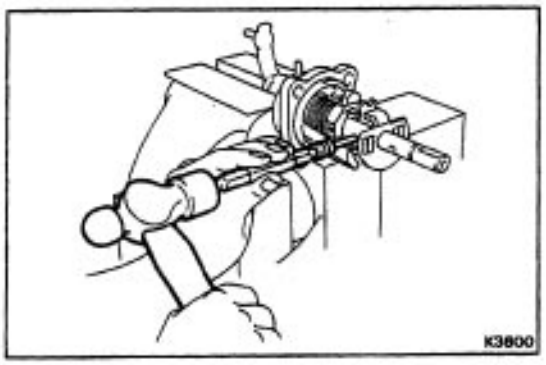
1. REMOVE N0.2 SHIFT INNER LEVER

(a) Using a pin punch and a hammer, drive out the slatted spring pin and remove the transmission oil baffle.



(b) Using two screwdrivers and a hammer, remove the snap ring.

(c) Remove No.2 select spring seat, No.2 compressor spring and No.2 shift inner lever.

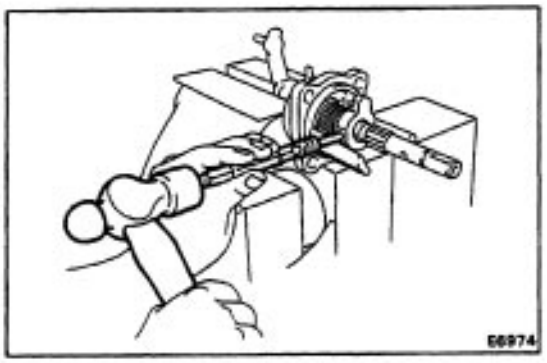


2. REMOVE SHIFT INTERLOCK PLATE AND NO.1 SHIFT INNER LEVER

(a) Using a pin punch and hammer, drive out the slotted spring pin.

(b) Remove the shift inter plate and No. 1 shift inner lever from the shaft.

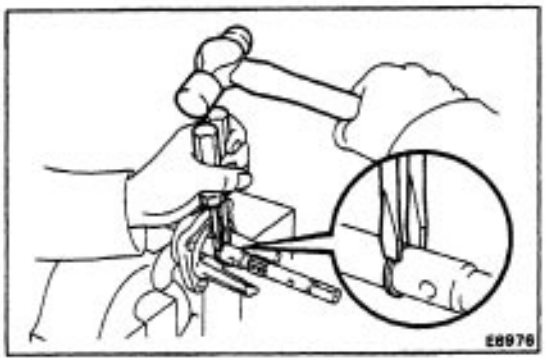
(e) Remove the shift interlock plate cover and No. 1 shift inner lever from the shift interlock plate.



3. REMOVE SELECT INNER LEVER

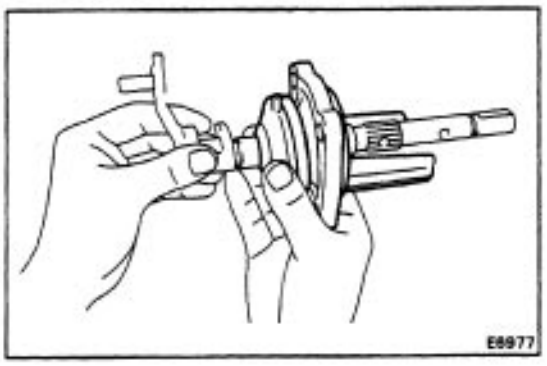
(a) Using a pin punch and hammer, drive out the slotted spring pin.

(b) Remove the select inner lever, No.1 compression spring and No.1 select spring seat.

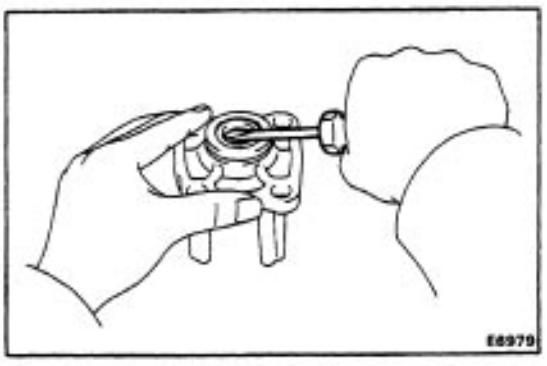


4. REMOVE SNAP RING

Using two screwdrivers and a hammer, remove the snap ring.

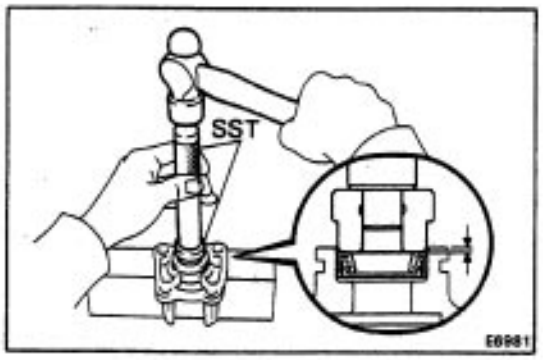


5. REMOVE CONTROL SHAFT COVER AND DUST BOOT



6. 1F NECESSARY, REPLACE CONTROL SHAFT COVER OIL SEAL

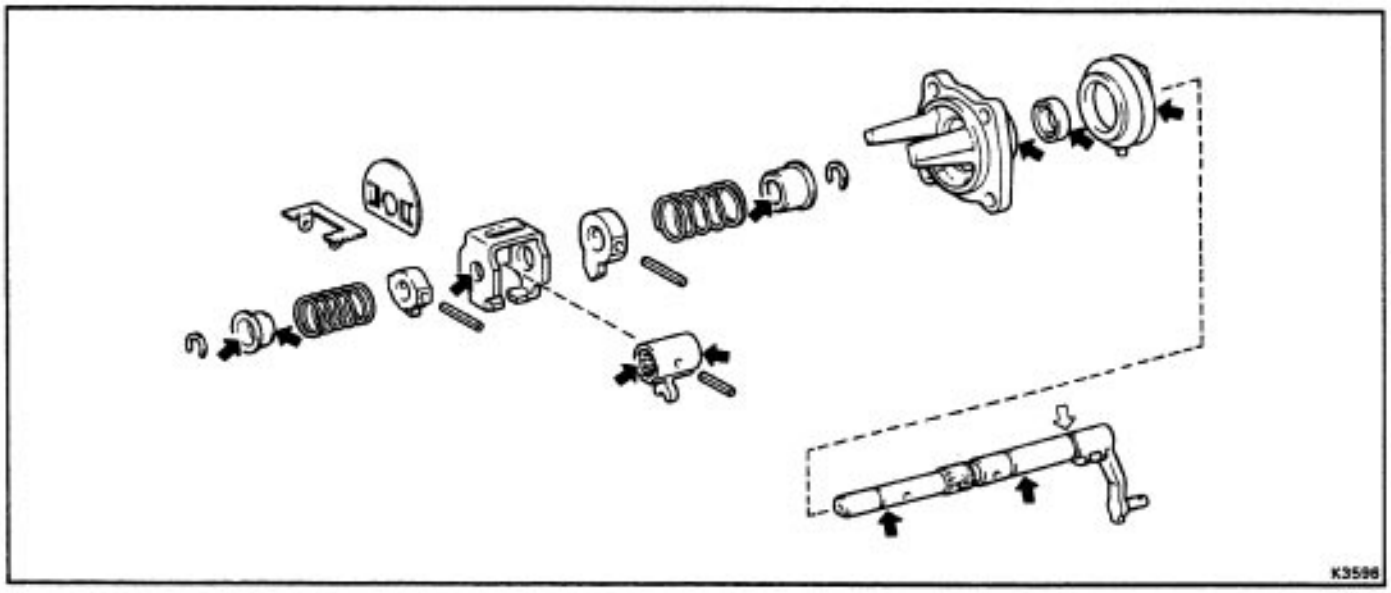
(a) Using a screwdriver, remove oil seal.

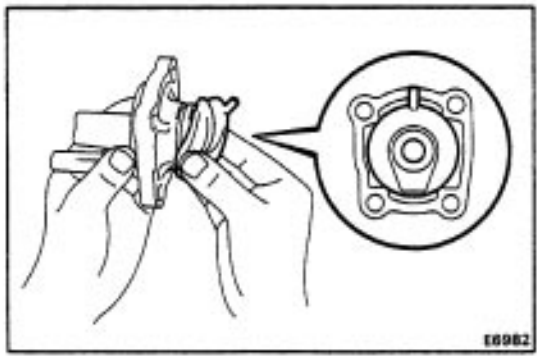


(b) Using SST and a hammer, drive in the new oil seal.
SST 09620–30010 (09631–00020, 09627–30010)
Oil seal depth: 0 – 1.0 mm (0 – 0.039 in.)
(c) Apply MP grease to the oil seal.

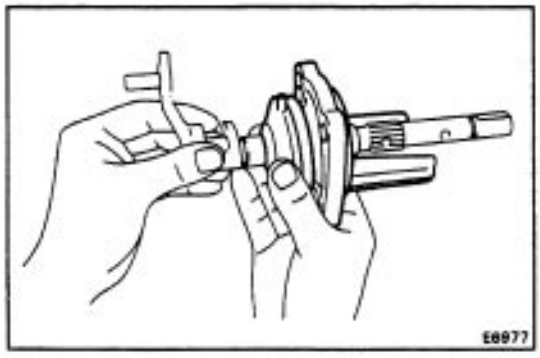
ASSEMBLY OF SHIFT AND SELECT LEVER SHAFT ASSEMBLY

7. APPLY SHAFT WITH MP GREASE. AS SHOWN

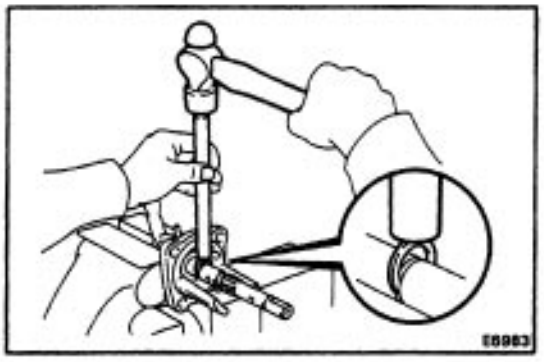




2. INSTALL SHIFT AND SELECT LEVER SHAFT
(a) Install the boot to the control shaft cover, as shown.

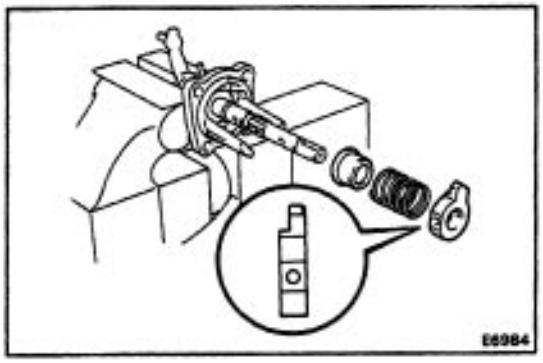


(b) Install the shift and select lever shaft to the control shaft cover.



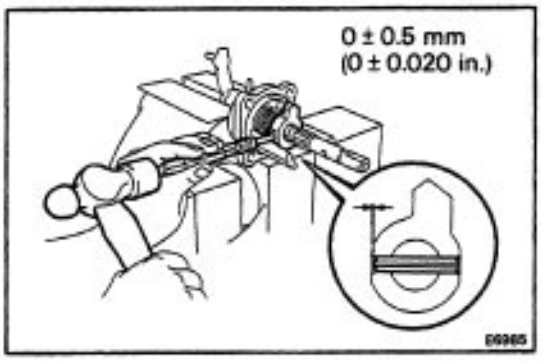
3. INSTALL SNAP RING

Using a brass bar and hammer, install the snap ring and spring seat.

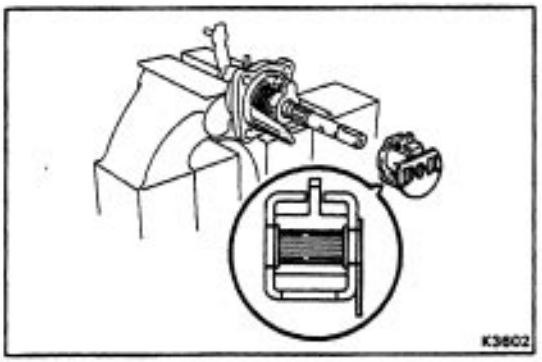


4. INSTALL SELECT INNER LEVER

(a) Install the No.1 spring seat, No–1 select spring and select inner lever, as shown.



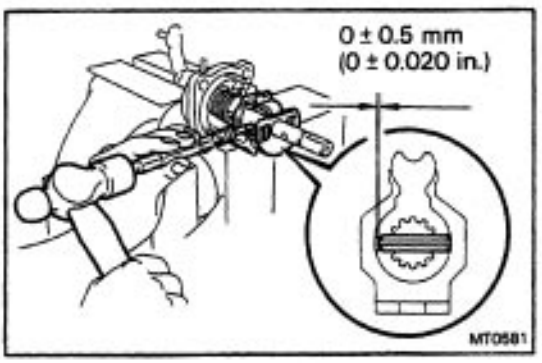
(b) Using a pin punch and hammer, drive in the slotted spring pin.



5. INSTALL SHIFT INTERLOCK PLATE AND NO.1 SHIFT INNER LEVER

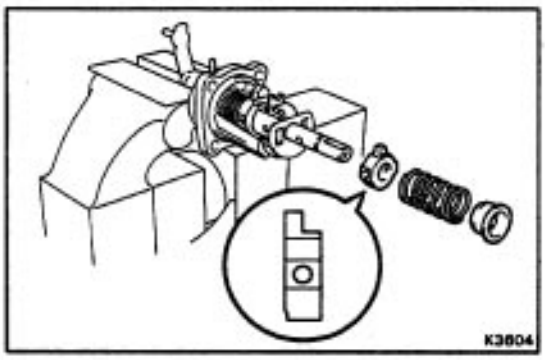
(a) Place the No–1 shift inner lever into the interlock plate.

(b) Install the shift interlock plate cover to the interlock plate.



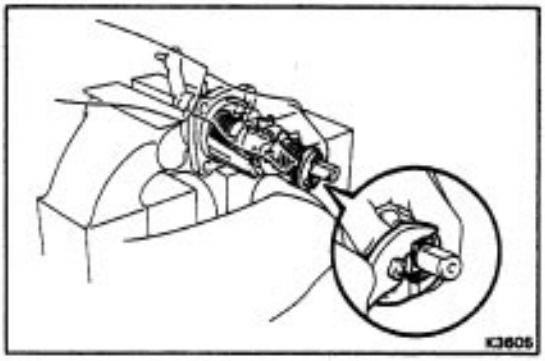
(c) Using a pin punch and hammer, drive in the slotted spring pin.

(d) Check that the shift interlock plate turns smoothly.

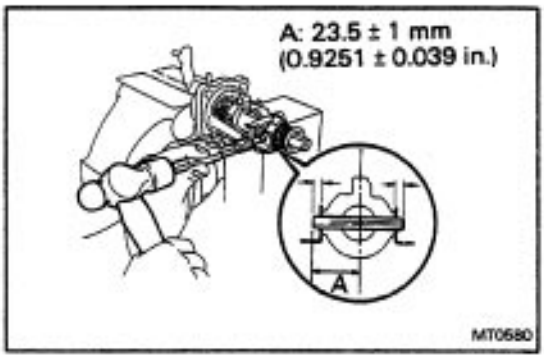


6. INSTALL NO.2 SHIFT INNER LEVER

(a) Install the No.2 shift inner lever, No.2 compression spring, transmission oil baffle and No.2 select spring seat, as shown.

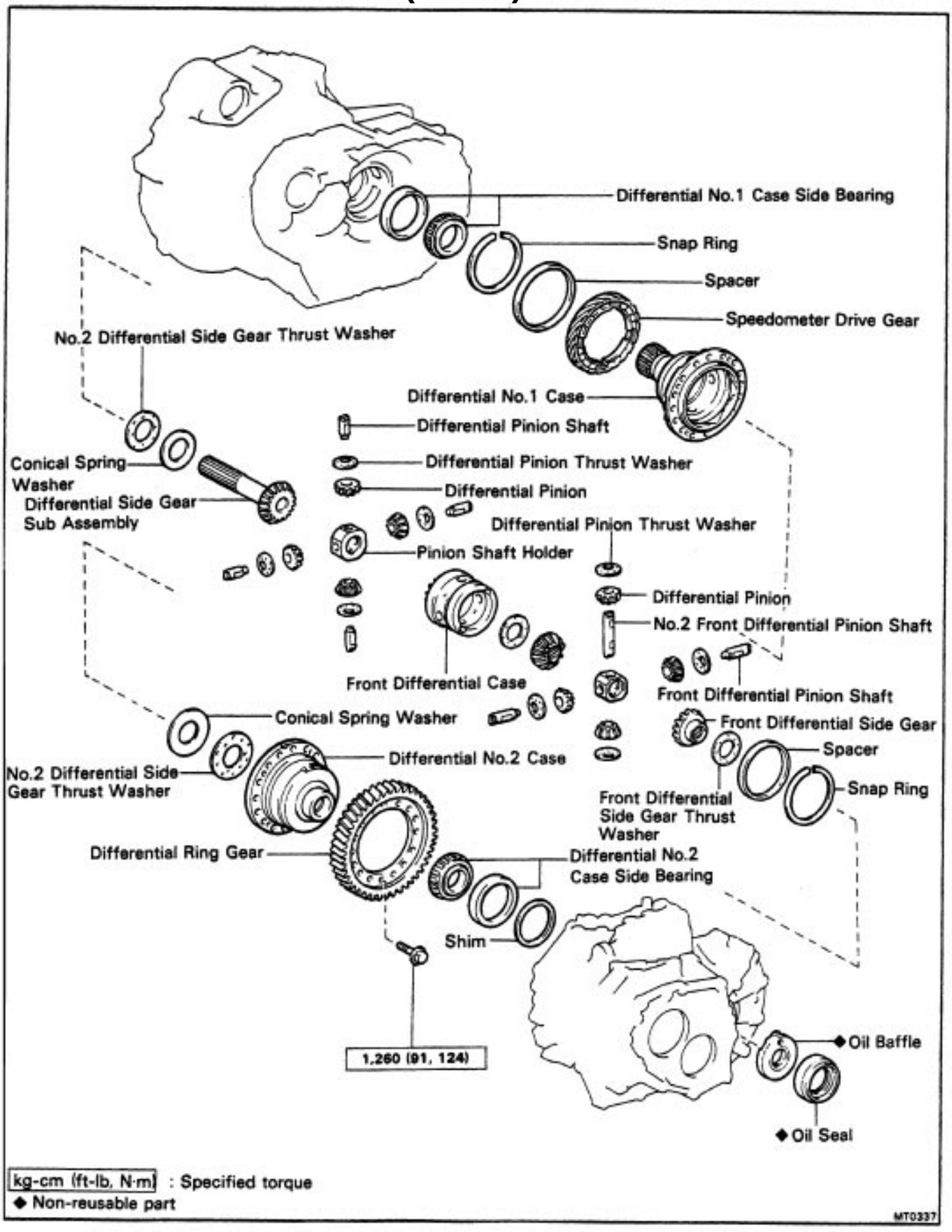


(b) Install the snap ring.

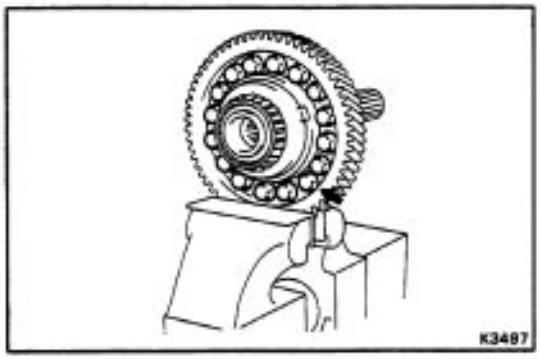


(c) Using a pin punch and hammer, drive in the slotted spring pin.

Differential Case Assembly (E56F5)

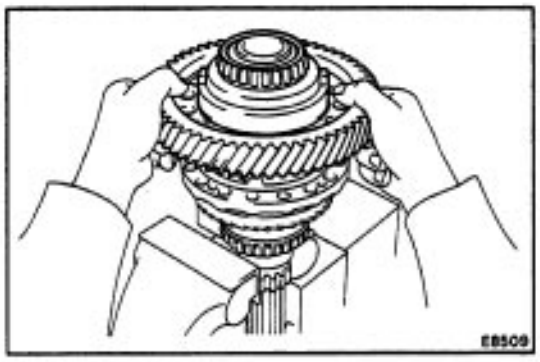


DISASSEMBLY OF DIFFERENTIAL CASE



1. REMOVE DIFFERENTIAL CASE

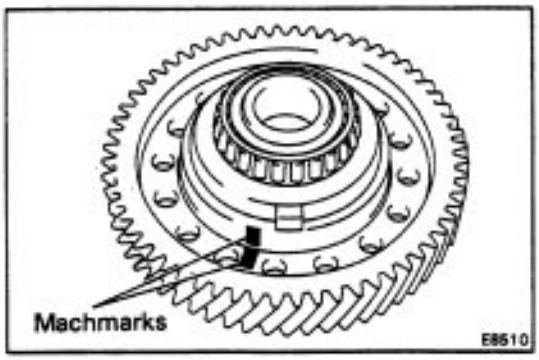
(a) Remove the sixteen bolts.



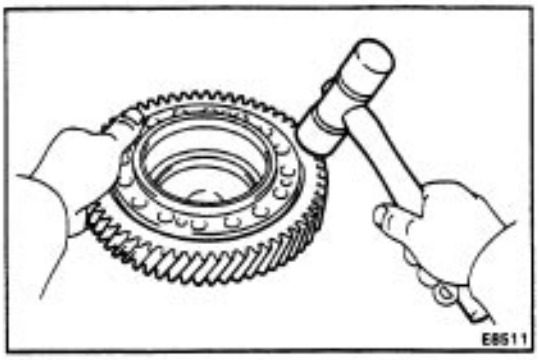
(b) Remove the differential No.2 case upward.

2. REMOVE RING GEAR

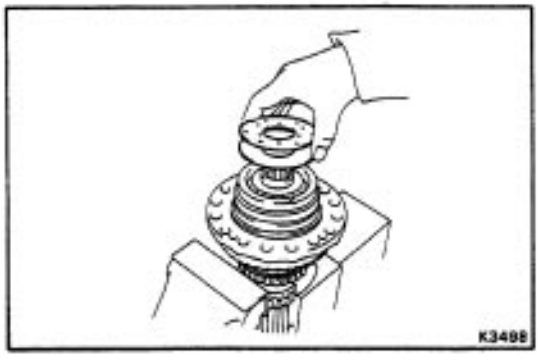
(a) Place the matchmarks on both the differential No.2 case and ring gear.

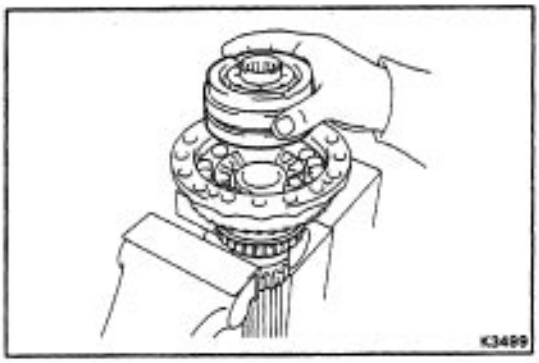


(b) Using a plastic hammer, tap out the ring gear.

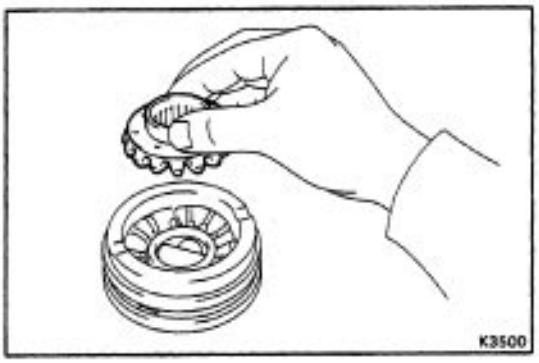


3. REMOVE NO.2 DIFFERENTIAL SIDE GEAR THRUST WASHER AND CONICAL SPRING WASHER





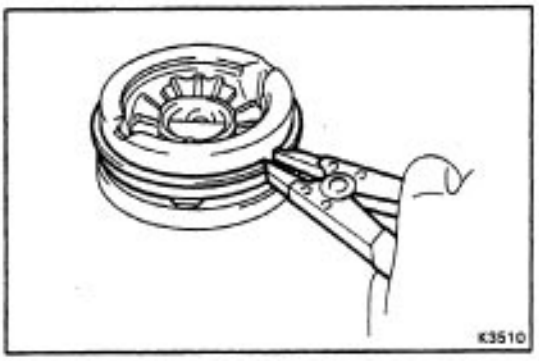
4. REMOVE FRONT DIFFERENTIAL CASE ASSEMBLY



5. DISASSEMBLE FRONT DIFFERENTIAL CASE ASSEMBLY

(a) Remove the front differential side gear together with thrust washer.

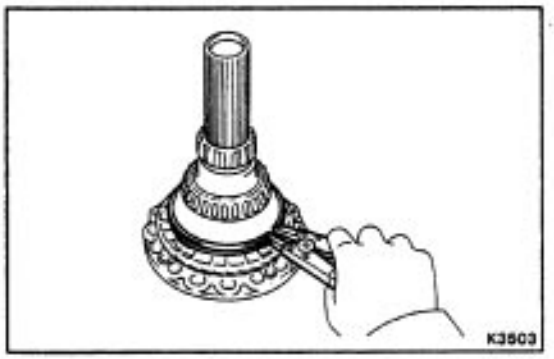
(b) Remove the front differential side gear thrust washer from the side gear.



(c) Using snap ring pliers, remove the snap ring.
HINT: Before removing the shaft snap ring, wrap vinyl tape around the case prevent the it from damage.

(d) Remove the spacer.

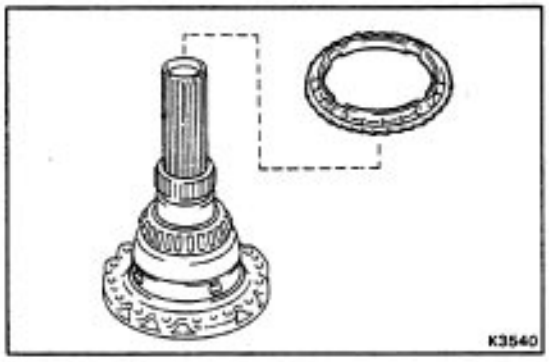
(e) Remove the No.2 pinion shaft, two pinion shafts, pinion holder, four differential pinions, four thrust washers, front differential side gear and thrust washer from the front differential case.



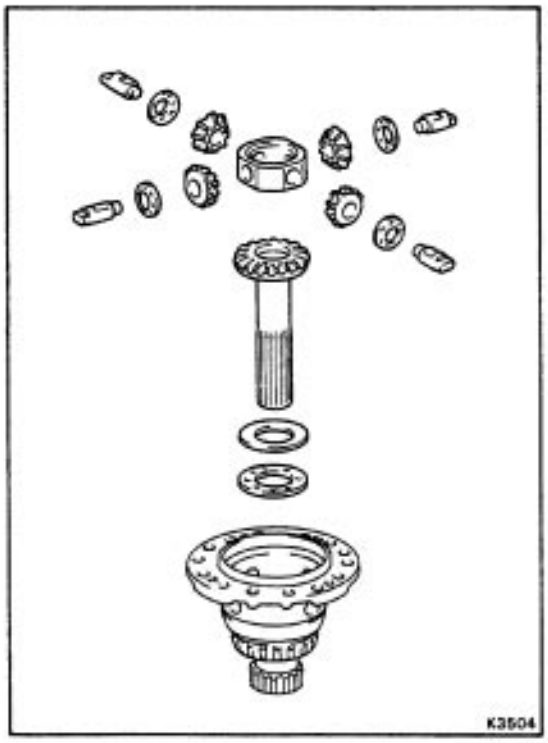
6. REMOVE SPEEDOMETER DRIVE GEAR AND SPACER

(a) Using snap ring pliers, remove the snap ring.

(b) Remove the spacer.

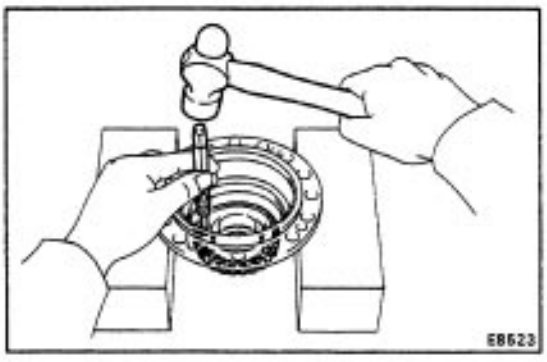


(c) Remove the speedometer drive gear.



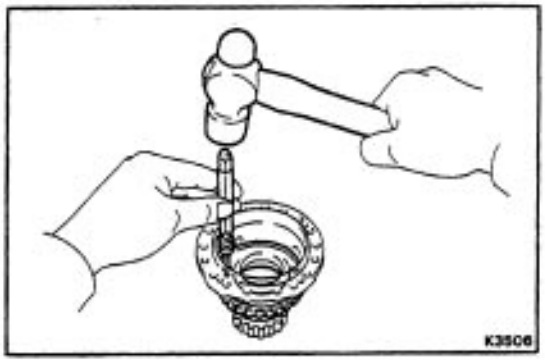
7. DISASSEMBLE DIFFERENTIAL NO.1 CASE

Remove the four pinion shafts, pinion holder, four differential pinions, four thrust washers, side gear sub assembly, conical spring washer and No.2 thrust washer.

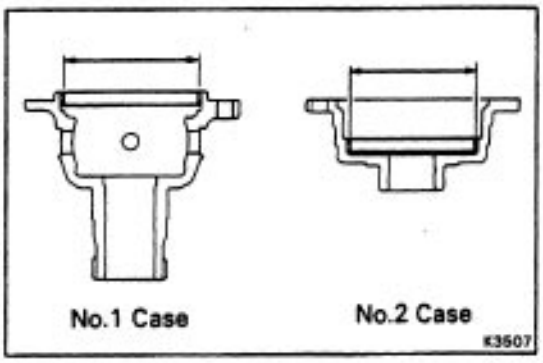


8. REMOVE SIDE BEARING

(a) Using a pin punch and hammer, drive out the side bearing evenly through two holes in the differential No. 1 case.



(b) Using a pin punch and hammer, drive out the side bearing evenly through two holes in the differential No–2 case.



INSPECTION OF DIFFERENTIAL CASE

1. MEASURE DIFFERENTIAL NO.1 AND NO.2 CASE

Using a cylinder gauge, measure the inner diameter of the differential No.1 and No.2 case.

Standard diameter:

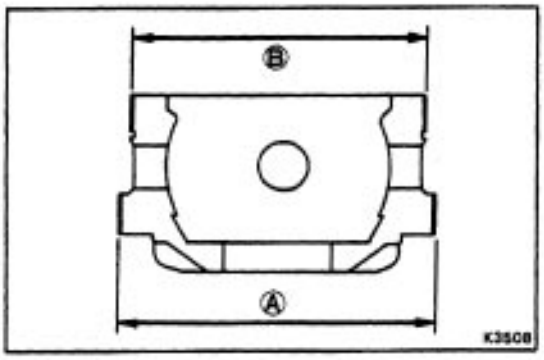
No–1 case 104.000 – 104.035 mm
(4.0945 – 4.0959 in.)

No.2 case 97.000 – 97.035 mm
(3.8189 – 3.8203 in.)

Maximum diameter:

No.1 case 104.060 mm (4.0968 in.)

No.2 case 97.060 mm (3.8213 in.)

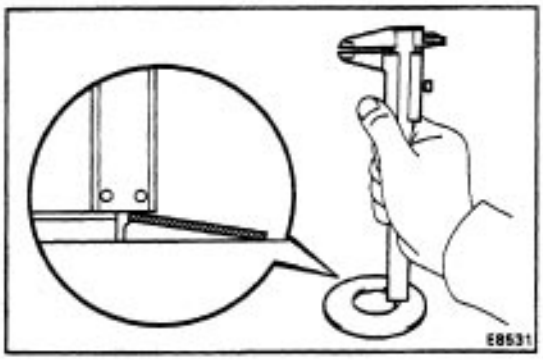


2. MEASURE FRONT DIFFERENTIAL CASE

Using a micrometer, measure the outer diameter of front differential case.

Standard diameter: A 103.929 – 103.964 mm
(4.0917 – 4.0931 in.)
B 96.929 – 96.964 mm
(3.8161 – 3.8175 in.)

Minimum diameter: A 103.850 mm (4.0886 in.)
B 96.850 mm (3.8130 in.)



3. MEASURE CONICAL SPRING WASHER

Using a caliper, measure the height of the conical spring washer.

Standard height:

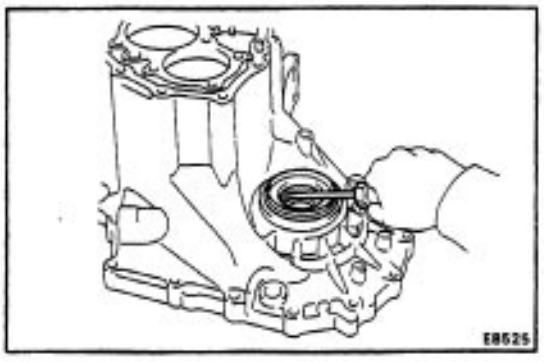
No.1 case conical spring washer
1.85 – 2.05 mm (0.073 – 0.081 in.)

No.2 case conical spring washer
2.60 – 2.80 mm (0.102 – 0.110 in.)

Minimum height:

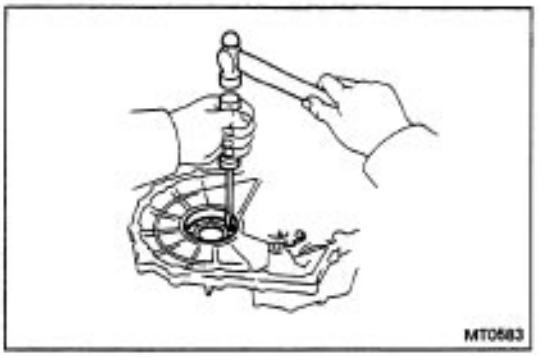
No–1 case conical spring washer
1.75 mm (0.069 in.)

No.2 case conical spring washer
2.50 mm (0.098 in.)

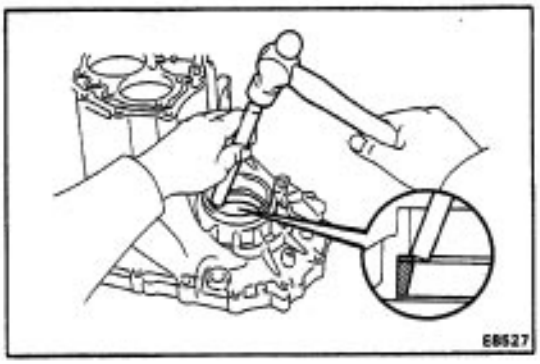


4. (TRANSMISSION CASE SIDE)
IF NECESSARY, REPLACE OIL SEAL AND TAPERED ROLLER BEARING OUTER RACE

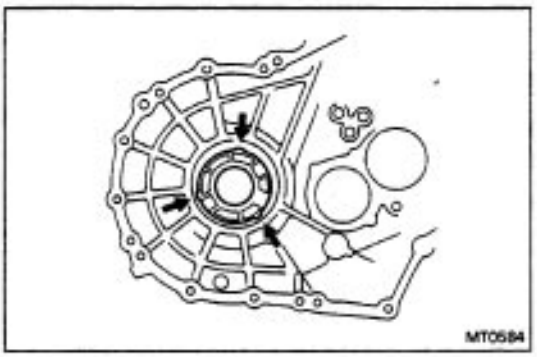
(a) Using a screwdriver, remove the oil seal.



(b) Using a screw driver and hammer, drive out the transmission oil baffle.

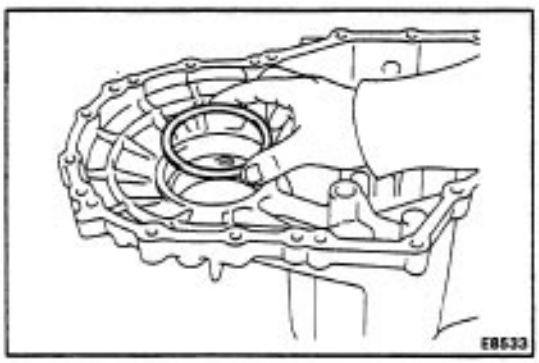


(c) Using a brass bar and hammer, drive out the bearing outer race lightly and evenly.
(d) Remove the adjusting shim.

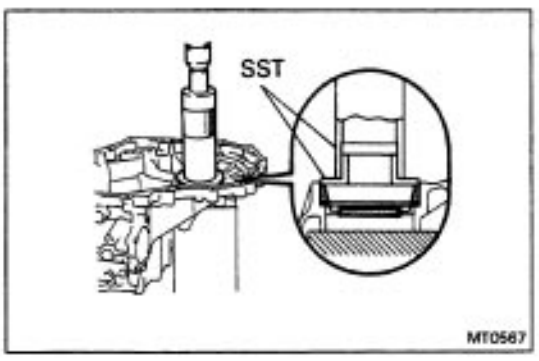


(e) Install the new transmission oil baffle.
HINT:

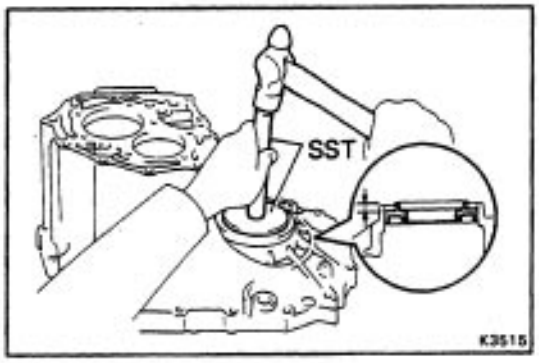
- Install the transmission oil baffle projection into the case side cutout.
- Do not install the oil baffle when adjusting the differential side bearing preload.



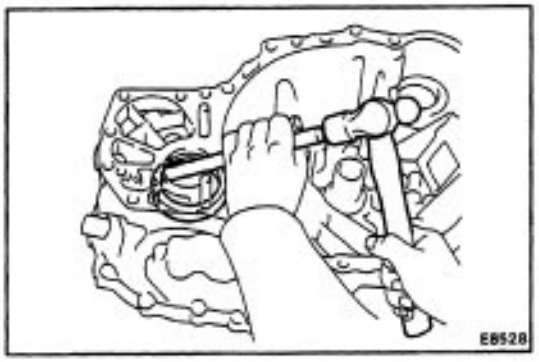
(f) Install the adjusting shim.
(See page MT– 168)
HINT: First select and install a shirr of lesser thickness than before.



Using SST and a press, install the taper roller bearing outer race.
SST 09316–60010 (09316–00010,09316–00040)

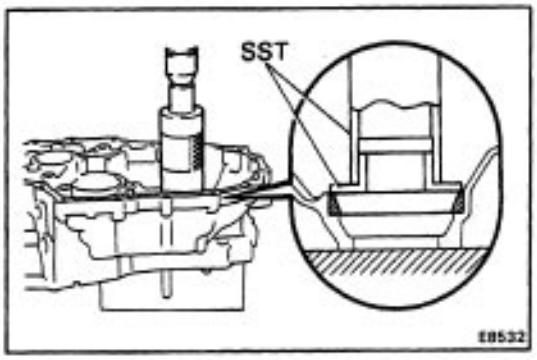


(h) Using SST, drive in a new oil seal.
SST 09223–15010
Drive in depth: 6.0 – 7.0 mm
(0.4–0.5ft–lb,0.6–0.7N–m)
(I) Coat the lip of the oil seal with MP grease.



5. (TRANSAXLE CASE SIDE)
IF NECESSARY, REPLACE TAPERED ROLLER BEARING OUTER RACE
(a) Using a brass bar and hammer, drive out the bearing outer race lightly and evenly through the cut–out position on the transaxle case.

(b) Using SST and a press, install the tapered roller bearing outer race.
SST 09316–60010 (09316–00010, 09316–00040)

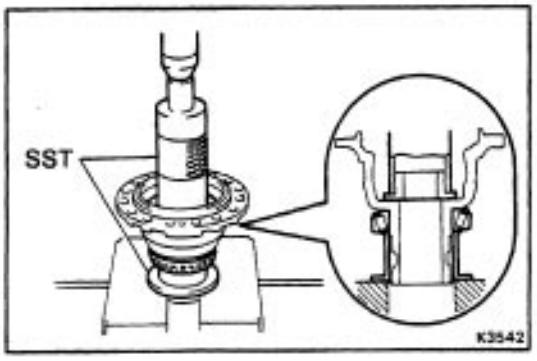


ASSEMBLY OF DIFFERENTIAL CASE

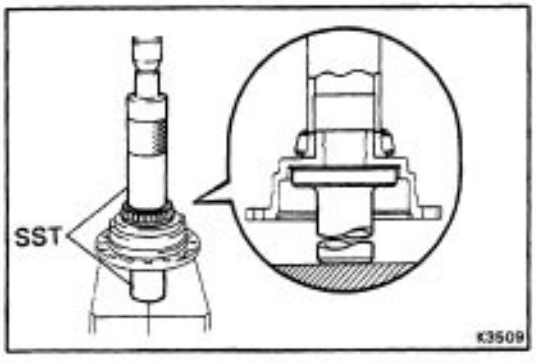
HINT: Coat all of the sliding surface with gear oil before assembly.

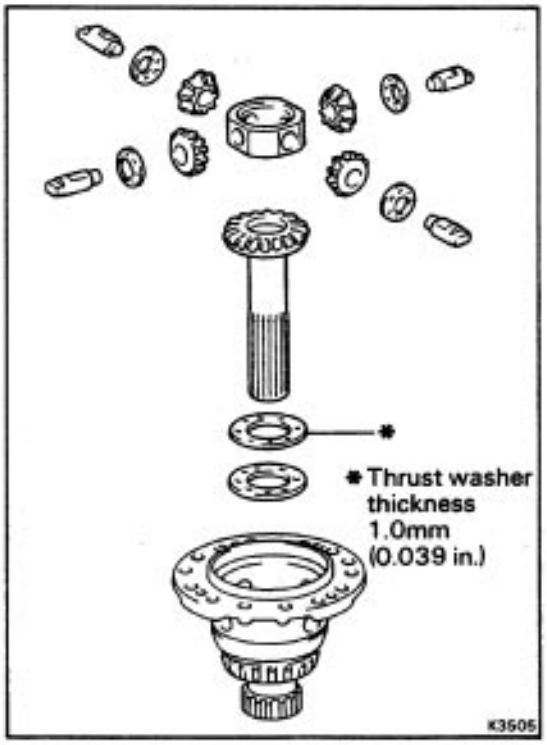
1. INSTALL SIDE BEARING

(a) Using SST and a press, install the side bearing to the differential No.1 case.
SST 09316–60010 (06316–00010, 09316–00020), 09316–20011



(b) Using SST and a press, install the side bearing to the differential No.2 case.
SST 09309–36010, 09316–60010 (09316–00010)

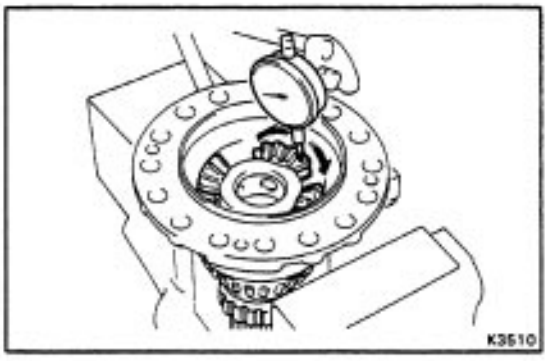




2. CHECK AND ADJUST CENTER DIFFERENTIAL SIDE GEAR BACKLASH
(Differential Side Gear Sub Assembly)

(a) Install the No.2 side gear thrust washer, (temporarily install) 1.0 mm (0.039 in.) size thrust washer, differential side gear sub assembly, four pinions, four thrust washers, pinion shaft holder and four shafts to the differential No. 1 case.

HINT: Trust washer 1.0 mm (0.039 in.) size is for check of backlash.



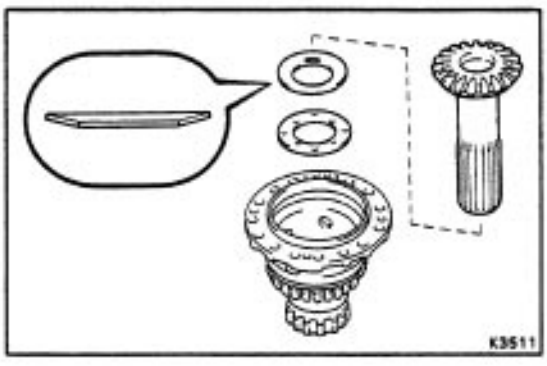
(b) Using a dial indicator, measure the backlash of one pinion gear while holding the differential side gear sub assembly toward the case.

Standard clearance: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

HINT: Referring to the table below, select the No.2 thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

Thickness mm(in.)	Thickness mm (in.)
0.80 (0.0315)	1.15 (0.0453)
0.85 (0.0335)	1.20 (0.0472)
0.90 (0.0354)	1.25 (0.0492)
0.95 (0.0374)	1.30 (0.0512)
1.00 (0.0394)	1.35 (0.0531)
1.05 (0.0413)	1.40 (0.0551)
1.10 (0.0433)	

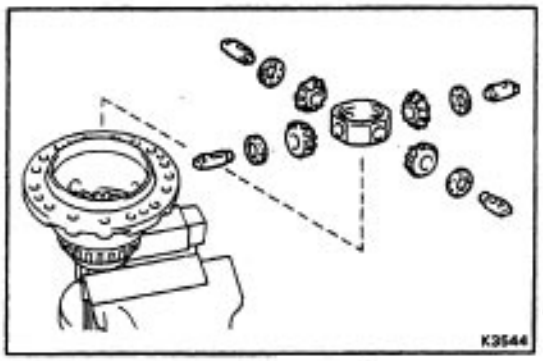
(e) Remove the differential No. 1 case.



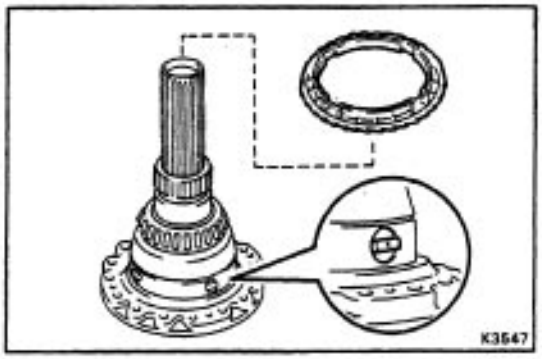
3. ASSEMBLE DIFFERENTIAL NO–1 CASE

(a) Install the No.2 side gear thrust washer (Previously selected), conical spring washer and differential side gear sub assembly to the No–1 case.

HINT: Be carful not to mistake the direction of conical spring washer.

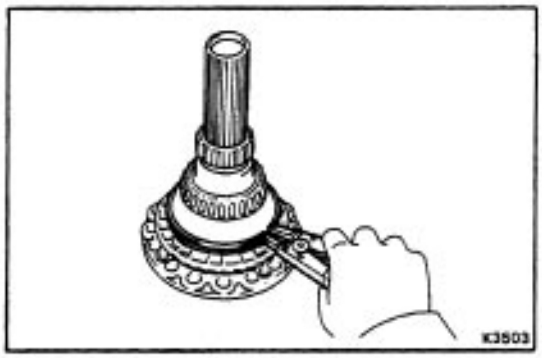


(b) Install the four pinion thrust washers, four differential pinions, shaft holder and four shafts to the No. 1 case.



4. INSTALL SPEEDOMETER DRIVE GEAR

(a) Install the speedometer drive gear as shown in the figure.

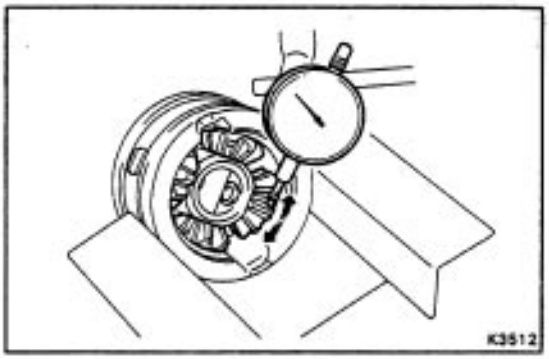


(b) Install the spacer.

(c) Using snap ring pliers, install the snap ring.

5. CHECK AND ADJUST FRONT DIFFERENTIAL SIDE GEAR BACKLASH

(a) Install the front differential side gear thrust washer, side gear, shaft holder, four pinions, four thrust washers, No–2 shaft and two shafts to the front differential case.

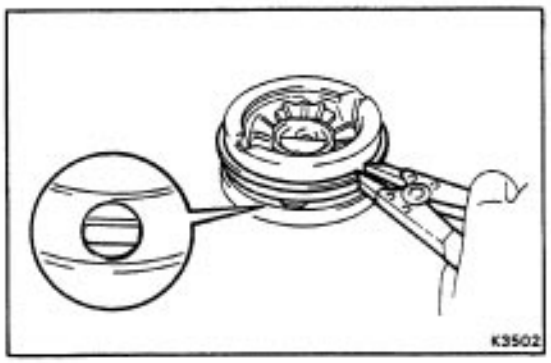


(d) Using a dial indicator, measure the backlash of one pinion gear while holding the front differential side.
gear toward the case.

Standard backlash: 0.05 – 0.20 mm
I0.0020 – 0.0079 in.)

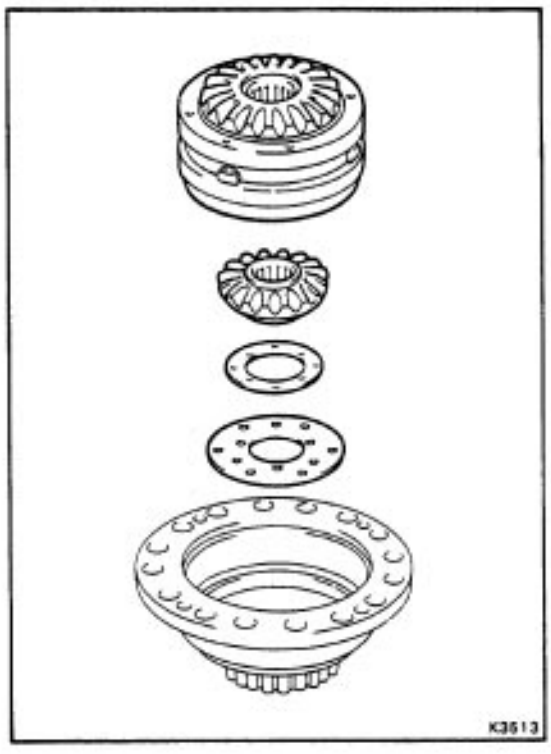
HINT: Do not mount the surface of No.2 differential case which contacts with bushing in a vise.
Referring to the table below, select the thrust washer which will ensure that the backlash is within specification.
Try to select a washer of the same size.

Mark	Thickness	mm (in.)
B	1.00	(0.0394)
C	1.05	(0.0413)
D	1.10	(0.0433)
E	1.15	(0.0453)
F	1.20	(0.0472)
G	1.25	(0.0492)



6. INSTALL SNAP RING

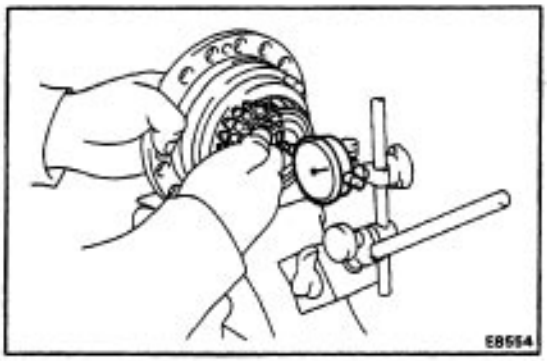
Using snap ring pliers, install the shaft snap ring toward to as shown.
HINT: Before installing the shaft snap ring, wrap vinyl tape around the case prevent the it from damage.



7. CHECK AND ADJUST FRONT DIFFERENTIAL SIDE GEAR THRUST CLEARANCE
(Differential No.2 Case)

(a) Install the No.2 side gear thrust washer, front differential side gear thrust washer, side gear and front differential case assembly to the differential No–2 case.

HINT: Engage the front differential side gear and pinion gear of No.2 case.



(b) Using a dial indicator, measure the thrust clearance of front differential side gear while holding the No.2 case on the left side.

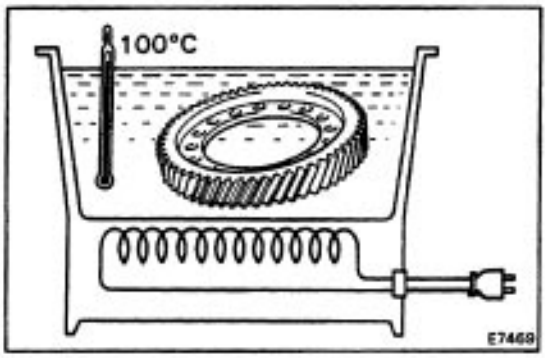
Standard clearance: 0.14 – 0.21 mm (0.006 – 0.008 in.)

HINT: Turning the side gear a bit, check the maximum value of thrust clearance.

Referring to the table below, select the thrust washer which. will ensure that the thrust clearance within specification. Try to select a washer of the same size. . .

Mark	Thickness mm (in.)	Mark	Thickness mm(in.)
A	0.95 (0.0374)	F	1.20 (0.0472)
B	1.00 (0.0394)	G	1.25 (0.0492)
C	1.05 (0.0413)	H	1.30 (0.0512)
D	1.10 (0.0433)	J	1.35 (0.0531)
E	1.15 (0.0453)	K	1.40 (0.0551)

(c) Remove the differential No.2 case.



8. INSTALL RING GEAR

(a) Clean the contact surface of the differential No.2 case.

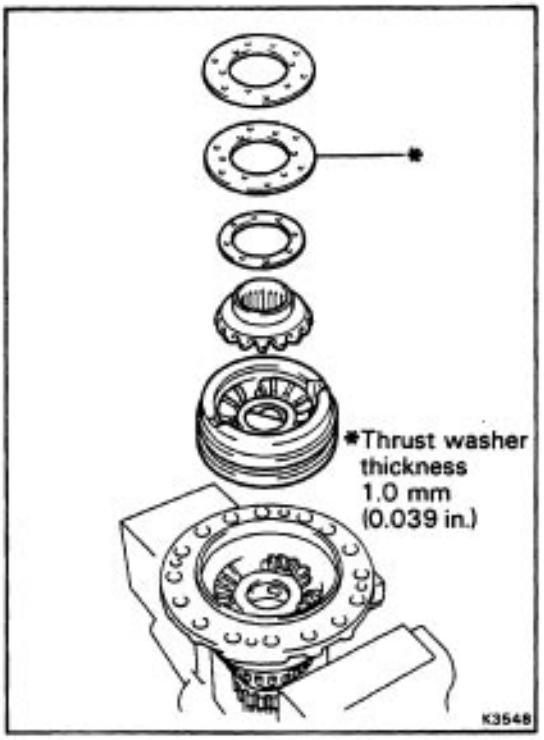
(b) Heat the ring gear to about 100˚C (212˚F) in an oil bath.

NOTICE: Do not heat the ring gear above 110˚C (230˚F).

(c) Clean the contact surface of the ring gear with cleaning solvent.

(d) Then quickly install the ring gear on the differential No.2 case. .

HINT: Align the matchmarks on the differential No.2 case and connect the ring gear.

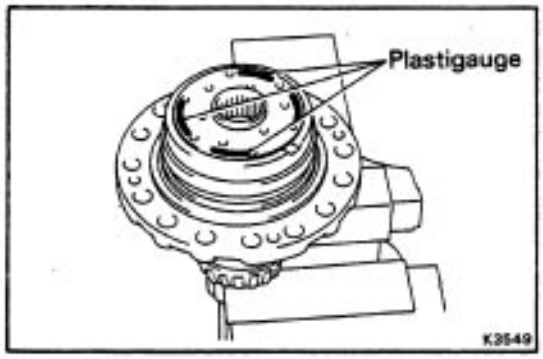


9. SELECT CENTER DIFFERENTIAL SIDE GEAR THRUST WASHER

(a) Install the front differential case assembly, side gear, thrust washer, (Temporarily install) 1.0 mm (0.039 in.) size No.2 thrust washer and No.2 thrust washer to the differential No. 1 case assembly.

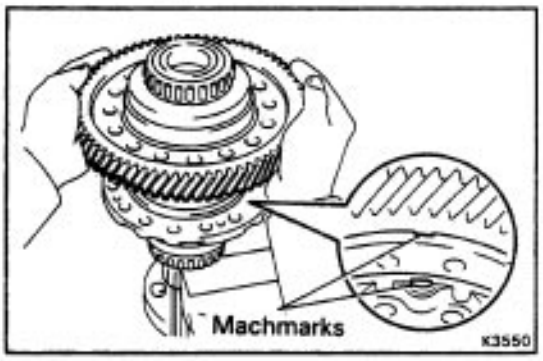
HINT: Thrust washer 1.0 mm (0.039 in.) size is for check of backlash.

Engage the front differential side gear and pinion gear of No. 1 case.



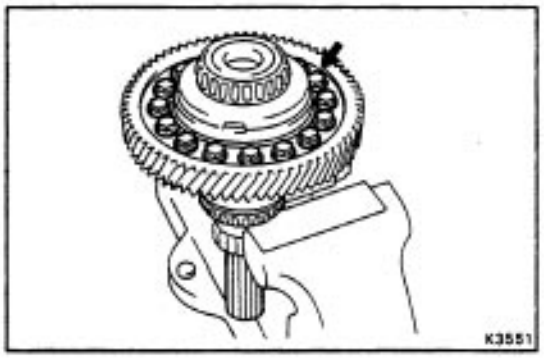
(b) Clean the No.2 side gear thrust washer and No.2case.
(c) Place the Plastigauge onto the No.2 thrust washer as shown in the figure.

HINT: Place the Platigauge in four positions on top of the side gear thrust washer so that they are above the axes of the three pinion shafts inside the differential No–1 case.

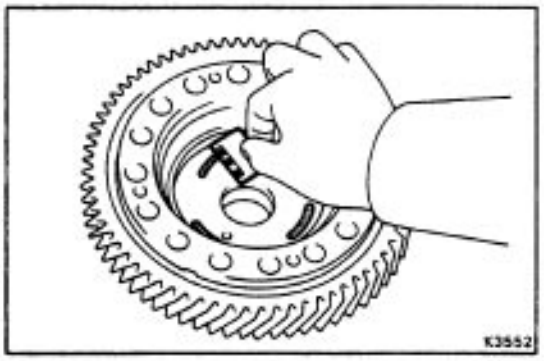


Place the Plastigauge so that is as close as possible to the outer side of the No.2 thrust washer.
(d) Install the No.2 case.

HINT: Align the matchmarks on the differential No. 1 case and connect the No.2 case.
Do not turn the No.2 case.



(e) Install and torque the sixteen bolts.
Torque: 1,260 kg–cm (91 ft–lb, 124 N–m)

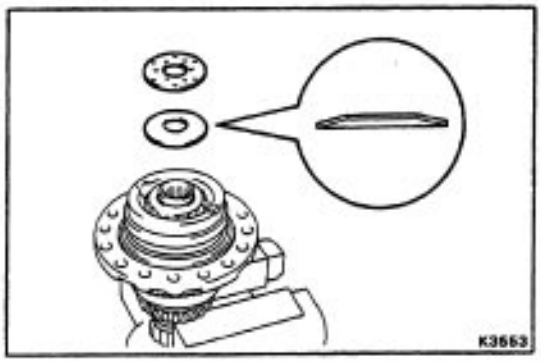


(f) Remove the sixteen bolts and differential No.2 case up ward.
(g) Measure the Plastigauge at its widest point.
Standard clearance: 0.155 – 0.250 mm (0.0061 – 0.0098 in.)

HINT: Referring to the table below, select the thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

Thickness mm(in.)	Thickness mm(in.)
0.80 (0.0315)	1.15 (0.0453)
0.85 (0.0335)	1.20 (0.0472)
0.90 (0.0354)	1.25 (0.0492)
0.95 (0.0374)	1.30 (0.0512)
1.00 (0.0394)	1.35 (0.0531)
1.05 (0.0413)	1.40 (0.0551)
1.10 (0.0433)	

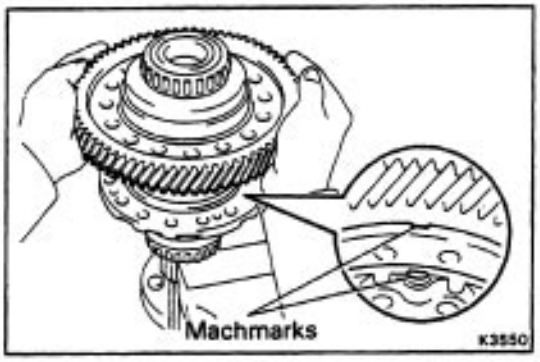
(h) Remove the differential No.2 case, No.2 thrust washer and (Temporarily install) 1.0 mm (0.039 in.) thrust washer.



10. INSTALL DIFFERENTIAL NO.2 CASE

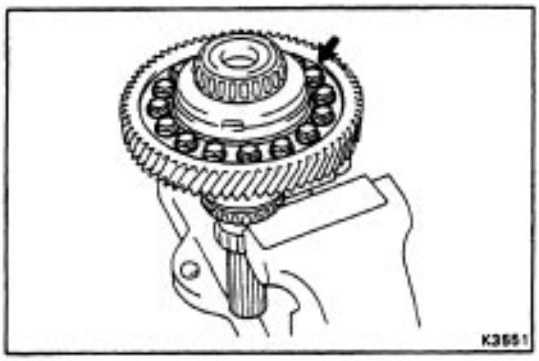
(a) Install the conical spring washer and No.2 side gear thrust washer (Previously selected).

HINT: Be careful not to mistake the direction of conical spring washer.



(a) Install the differential No.2 case to the No. 1 case.

HINT: Align the matchmarks on the differential No.1 case and connect the N.2 case.

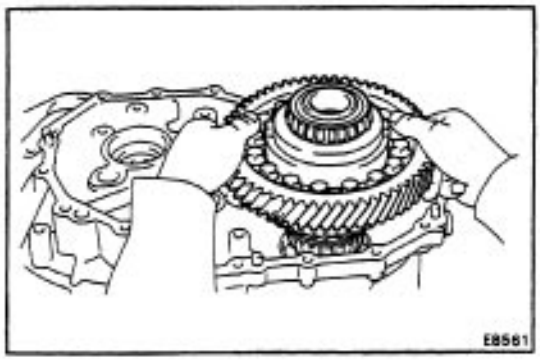


(c) Install and torque the sixteen bolts.

Torque: 1,260 kg–cm (91 ft–ib, 124 N–m)

11. INSTALL DIFFERENTIAL CASE ASSEMBLY

Install the differential case assembly –to the transaxle case.



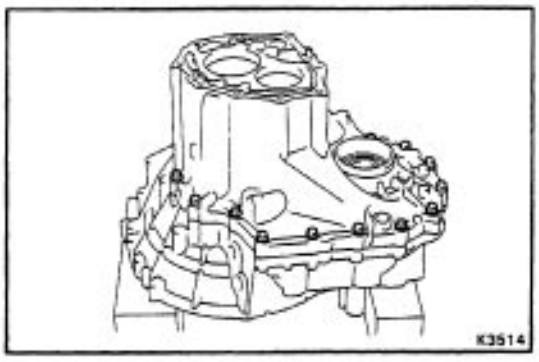
12. INSTALL TRANSMISSION CASE

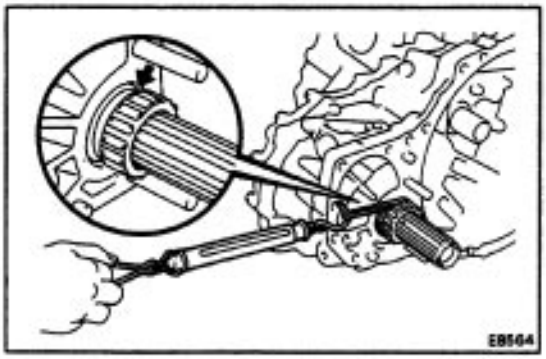
(a) Install the transmission case.

HINT: If necessary, tap on the case with a plastic hammer.

(b) Install and torque the seventeen bolts.

Torque: 300 kg–cm (22 ft–lb, 29 N–m)





13. ADJUST DIFFERENTIAL SIDE BEARING PRELOAD

(a) Turn the differential case assembly counterclockwise and clockwise several time.

(b) Using a spring tension gauge, measure the differential case assembly preload.

Preload (at starting)

New bearing

3.2 – 6.3 kg

(7.1 –13.9 lb,31.4–61.8N)

Reused bearing

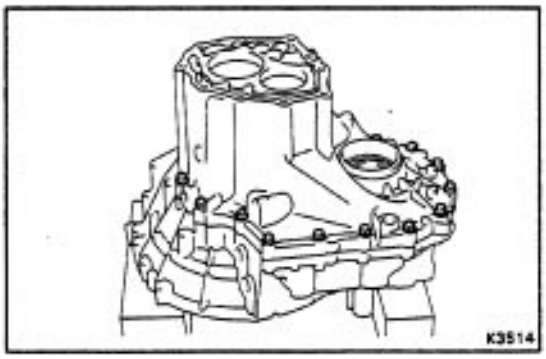
2.0 – 4.0 kg

(4.4–8.81b,19.6–39.2N)

If the preload is not within specification, select the thrust washers.

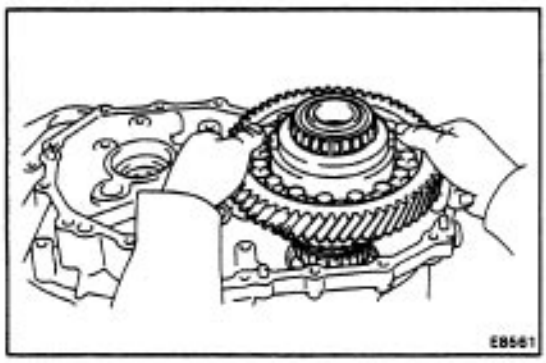
HINT: The preload will change about 2.4 kg (5.3 lb, 23.5 N) with each shim thinness.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
0	2.00 (0.0787)	9	2.45 (0.0965)
1	2.05 (0.0807)	A	2.50 (0.0984)
2	2.10 (0.0827)	B	2.55 (0.1004)
3	2.15 (0.0846)	C	2.60 (0.1024)
4	2.20 (0.0866)	D	2.65 (0.1043)
5	2.25 (0.0886)	E	2.70 (0.1063)
6	2.30 (0.0906)	F	2.75 (0.1083)
7	2.35 (0.0925)	G	2.80 (0.1102)
8	2.40 (0.0945)	H	2.85 (0.1122)



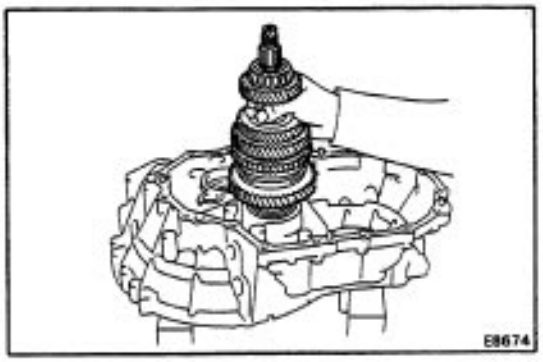
14. REMOVE TRANSMISSION CASE

Remove the seventeen bolts and tap off the case with a plastic hammer.



15. REMOVE DIFFERENTIAL CASE ASSEMBLY

INSTALLATION OF COMPONENT PARTS



(See pages MT–118 to MT–120)

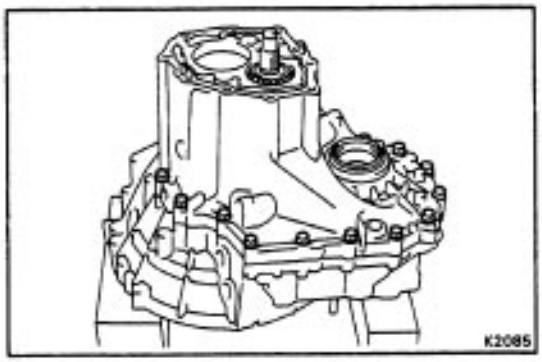
HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

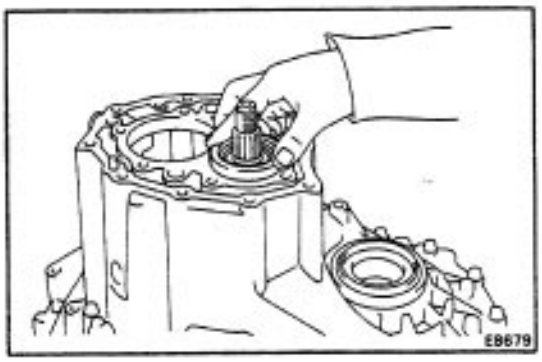
1. ADJUST OUTPUT SHAFT PRELOAD

(a) Install the output shaft assembly to the transaxle case.

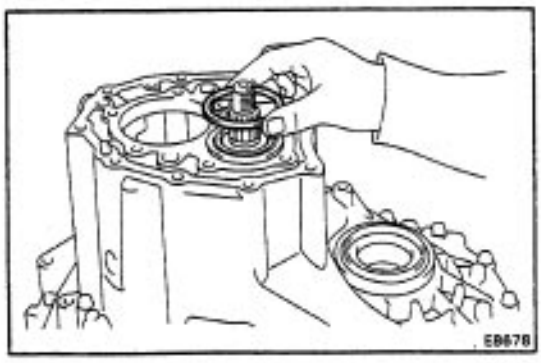
(b) Install the transmission case to the transaxle case.
If necessary, tap on the case with a plastic hammer.

(e) Install and torque the seventeen bolts.
Torque: 300 kg–cm (22 ft–lb, 29 N–m)

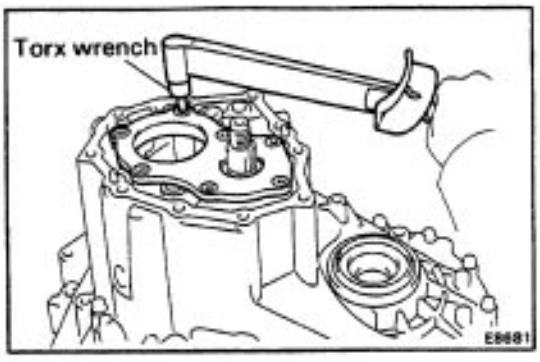




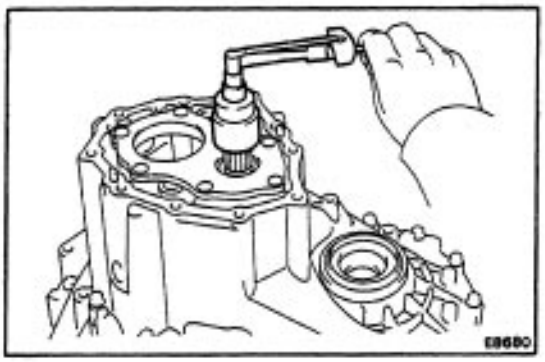
(d) Install the output shaft rear bearing outer race.



(e) Install the adjusting shim.
HINT: When re–using the output shaft rear bearing, first install a shim of the same thickness as before. If installing a new bearing, first select and install a shim of lesser thickness than before.



(f) Using a torx wrench, install and torque the seven torx screws.
Torx wrench T45 09042–00050
Torque: 430 kg–cm (31 ft–lb, 42 N–m)



(g) Install the new lock nut to the output shaft.

(h) Turn the output shaft counterclockwise and clockwise several times.

(i) Using a torque meter, measure the preload of the output shaft.

Preload (at starting)

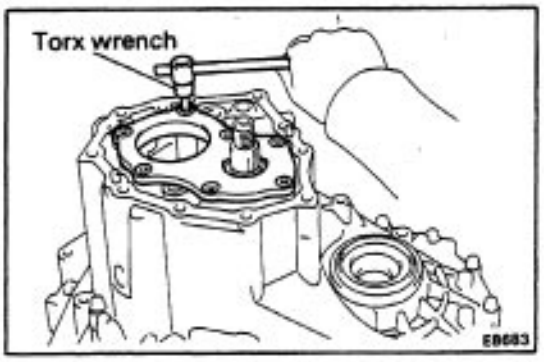
Now bearing 8.0 – 16.0 kg–cm
(6.9 – 13.9 in.–lb, 0.8 – 1.6 N–m)

Reused bearing 5.0 – 10.0 kg–cm
(4.3 – 8.7 in.–lb, 0.5 – 1.0 N–m)

If the preload is not within specification, select the thrust washers.

HINT: The preload will change about 4 5 kg–cm (3.5 4.3 in.–lb, 0.4 – 0.5 N–m) with each shim thickness.

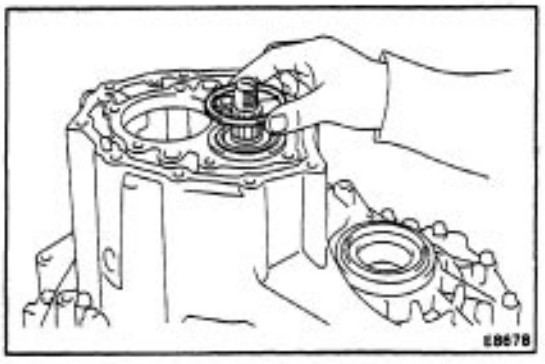
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
0	1.30 (0.0512)	D	1.95 (0.0768)
1	1.35 (0.0531)	E	2.00 (0.0787)
2	1.40 (0.0551)	F	2.05 (0.0807)
3	1.45 (0.0571)	G	2.10 (0.0827)
4	1.50 (0.0591)	H	2.15 (0.0846)
5	1.55 (0.0610)	J	2.20 (0.0866)
6	1.60 (0.0630)	K	2.25 (0.0886)
7	1.65 (0.0650)	L	2.30 (0.0906)
8	1.70 (0.0669)	M	2.35 (0.0925)
9	1.75 (0.0689)	N	2.40 (0.0945)
A	1.80 (0.0709)	P	2.45 (0.0965)
B	1.85 (0.0728)	Q	2.50 (0.0984)
C	1.90 (0.0748)		

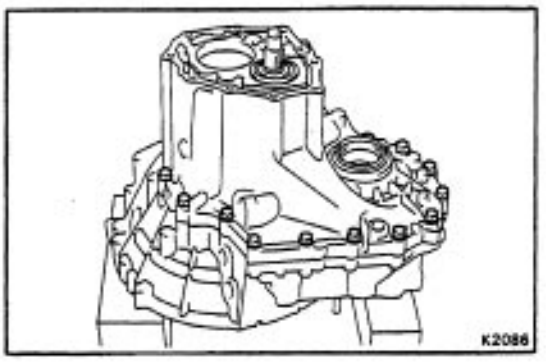


(j) Remove the lock nut.

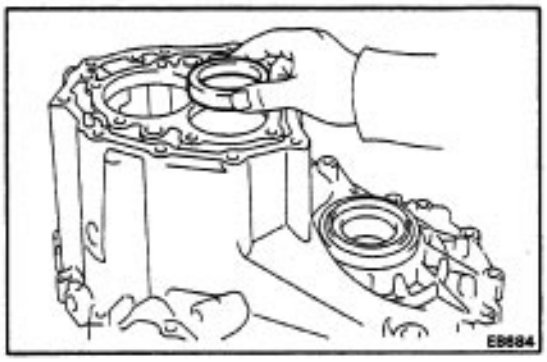
(k) Using a torx wrench, remove the seven torx screws.
Torx wrench T45 09042–00050

(l) Remove the adjust shim.

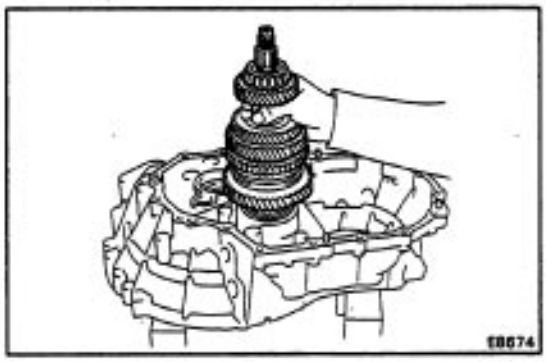




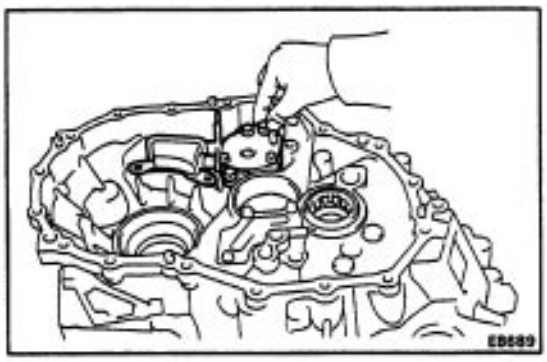
(m) Remove the seventeen bolts and tap off the case with a plastic hammer.



(n) Remove the output shaft rear bearing outer race.



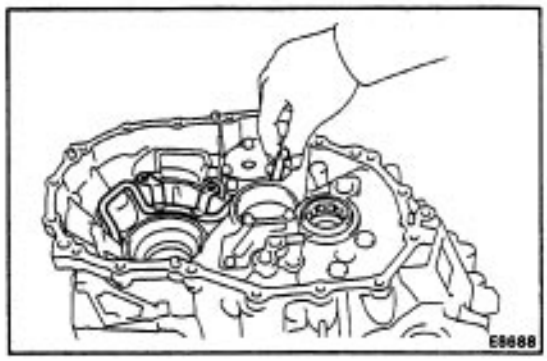
(o) Remove the output shaft assembly.



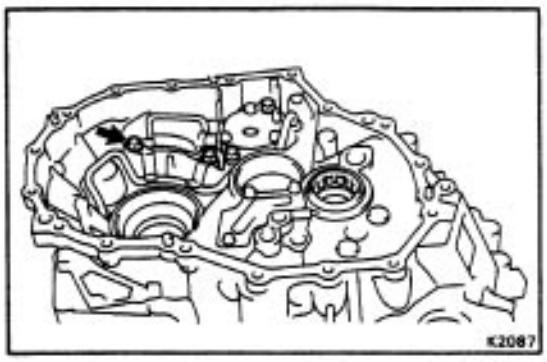
2. INSTALL OIL PUMP ASSEMBLY AND OIL PIPE

(a) Install the oil pump assembly and temporarily tighten the two bolts.

HINT: Do not drop the oil pump gasket.

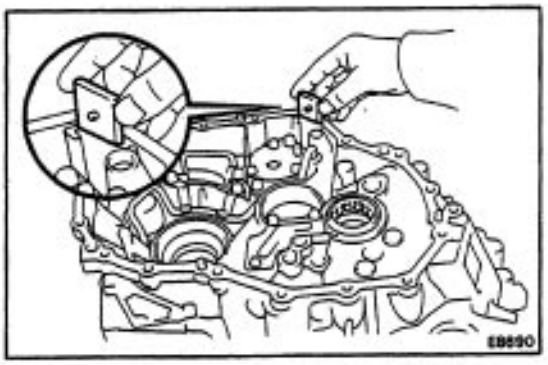


(b) Install the oil pipe.

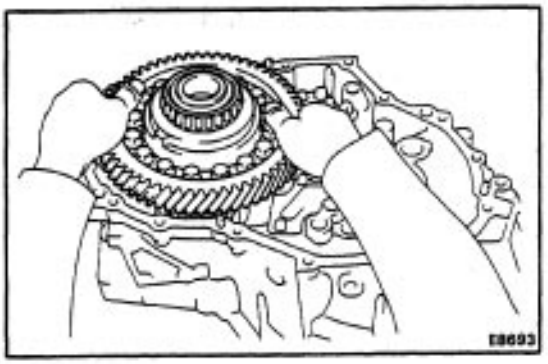


(c)Torque the four bolts.

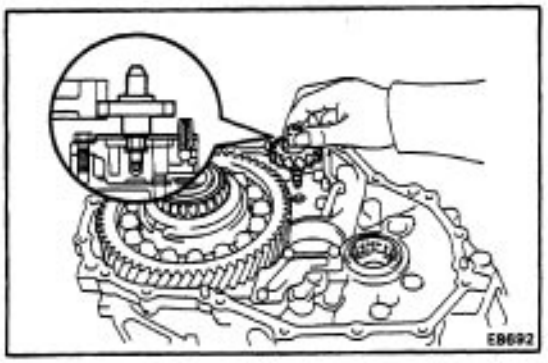
Torque: 175 kg–cm(13 ft–lb, 17 N–m)



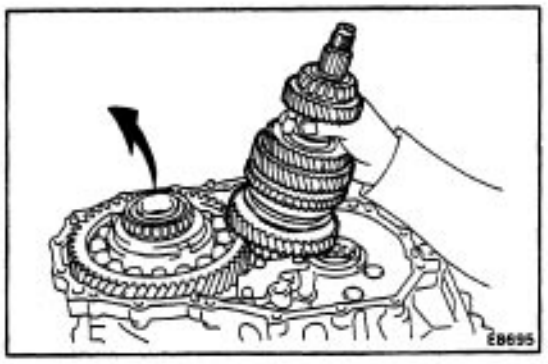
3. INSTALL MAGNET TO TRANSAXLE CASE



4. INSTALL DIFFERENTIAL CASE ASSEMBLY

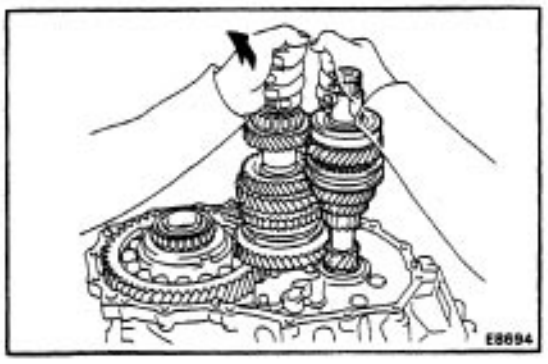


S. INSTALL OIL PUMP DRIVE GEAR



B. INSTALL OUTPUT SHAFT ASSEMBLY

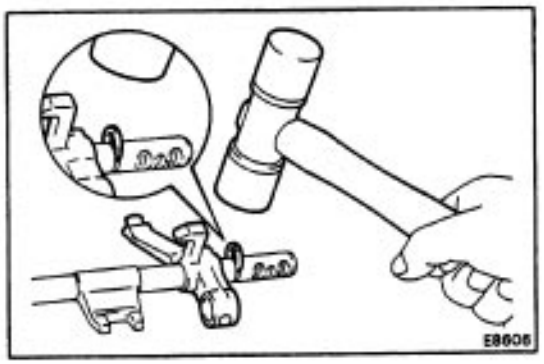
Lifting the differential case assembly, install the output shaft assembly.



7. INSTALL INPUT SHAFT ASSEMBLY

Leaning the output shaft assembly to the differential case side, install the input shaft assembly.

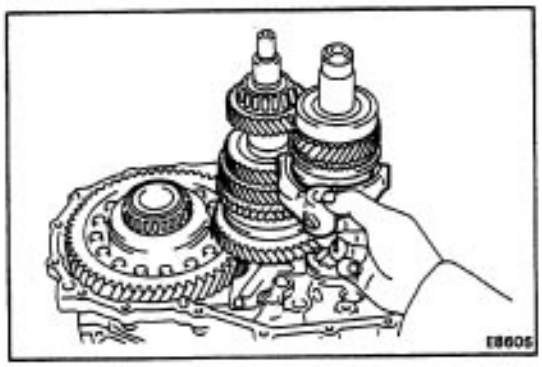
HINT: When you install the input shaft assy, be careful not to scratch the oil seal.



8. INSTALL SNAP RING

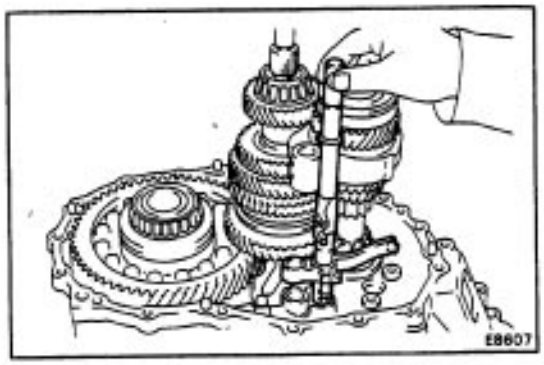
(a) Install the reverse shift fork to the No.3 shift fork.

(b) Using a plastic hammer, install the snap ring.

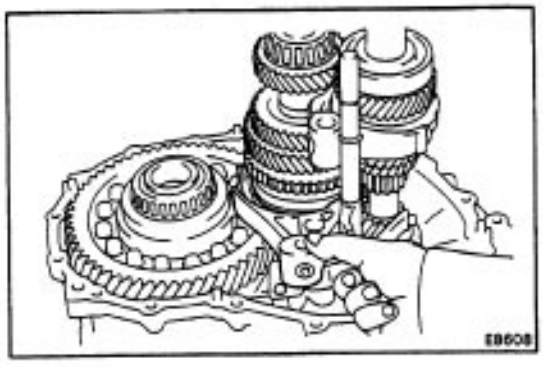


9. INSTALL NO.2 SHIFT FORK AND NO–3 SHIFT FORK SHAFT WITH REVERSE SHIFT FORK

(a) Place No.2 shift fork into the groove of No.2 hub sleeve.

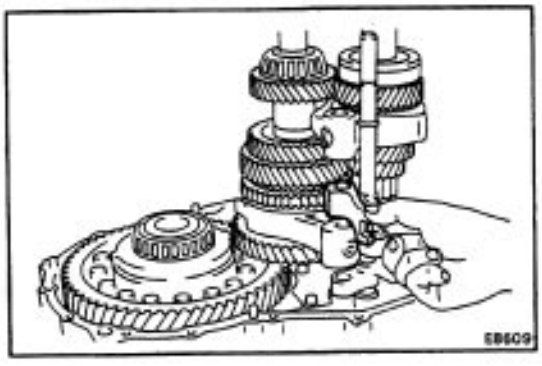


(b) Install the No.3 shift fork shaft with reverse shift fork to the case.

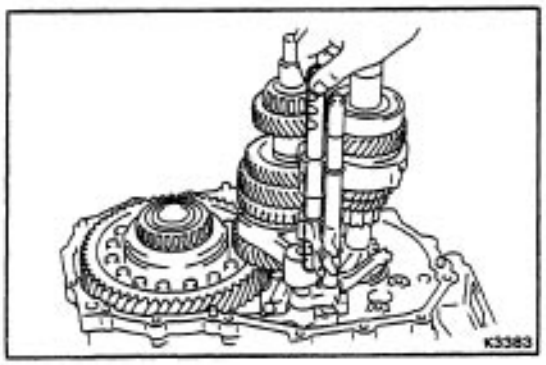


10. INSTALL NO.1 SHIFT FORK, SHIFT HEAD AND N0.2 SHIFT FORK SHAFT.

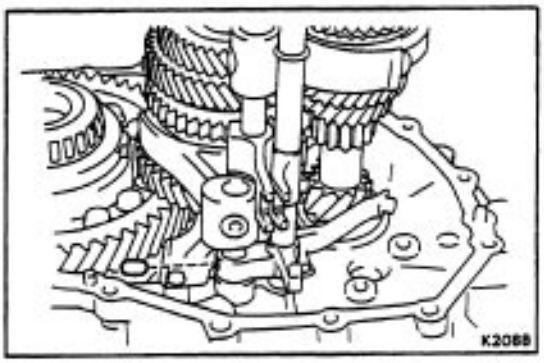
(a) Place No–1 shift fork into the groove of No.1 hub sleeve.



(b) Put shift head onto the No–1 shift fork.



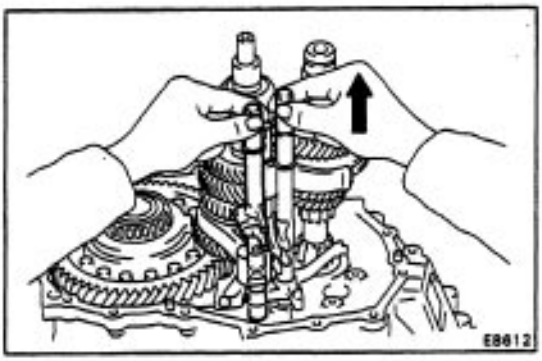
(c) Install the No.2 shift fork shaft to the case, through the No.2 shift fork, the shift head and the No. t shift fork.



11. INSTALL NO.1 SHIFT FORK SHAFT

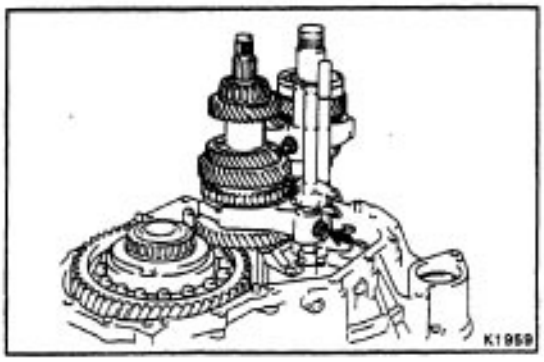
(a) Using a magnetic finger, install the interlock roller into the reverse shift fork.

HINT: Align the groove of No.1 fork shaft with the interlock roller hole of reverse shift fork.



(b) Install the No–1 shift fork shaft to the case, through the No. 1 shift fork and reverse shift fork.

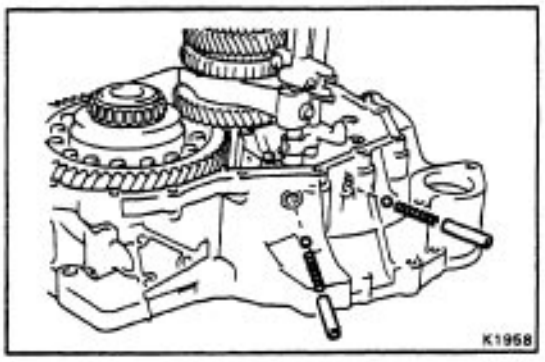
HINT: If it is difficult to put the No.1 shift fork shaft through the reverse shift fork, pull up the No.3 shift fork shaft.



12. INSTALL SET BOLTS

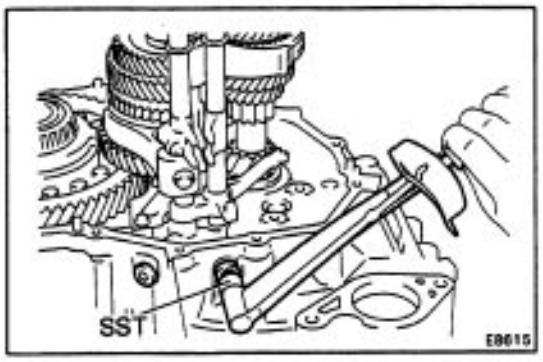
Install and torque the three bolts.

Torque: 240 kg–cm (17 ft–lb, 24 N–m)

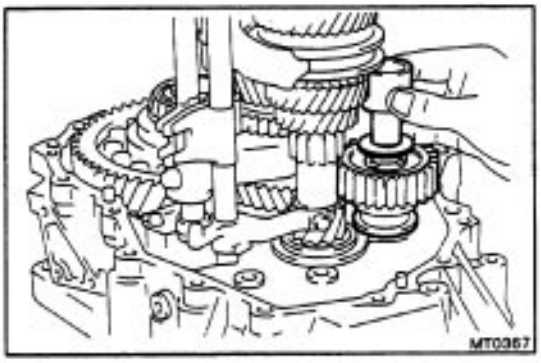


13. INSTALL LOCKING BALLS, SPRINGS, SPRING SEATS AND SCREW PLUGS

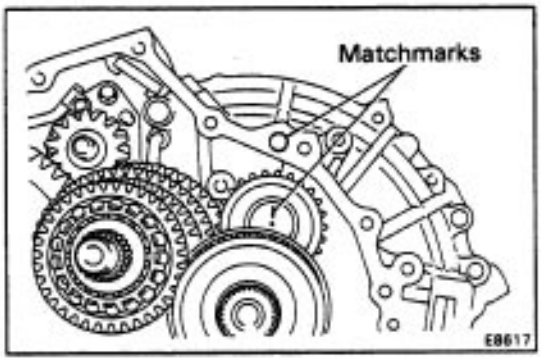
(a) Install the two locking balls, springs and spring seats.



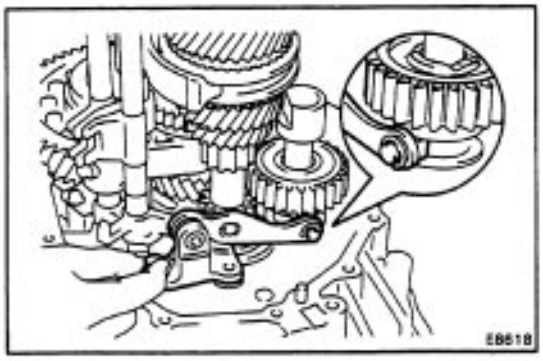
(b) Apply sealant to the two screw plugs.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(c) Using SST, torque the two screw plugs.
SST 09313–30021
Torque: 250 kg–cm (18 ft–lb, 25 N–m)



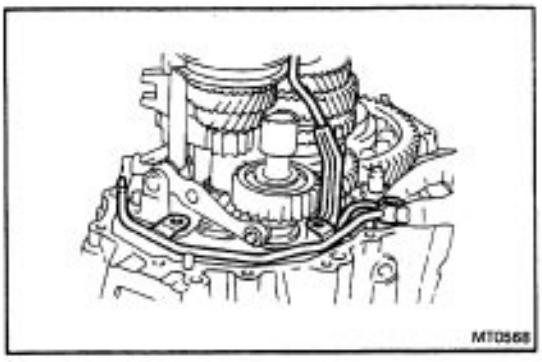
14. INSTALL REVERSE IDLER GEAR SHAFT, THRUST WASHER AND GEAR
(a) Install the reverse idler gear shaft with gear and thrust washer to the case.



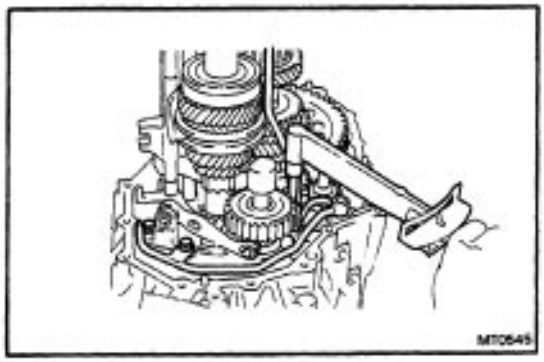
(b) Align the matchmarks, as shown in the illustration.



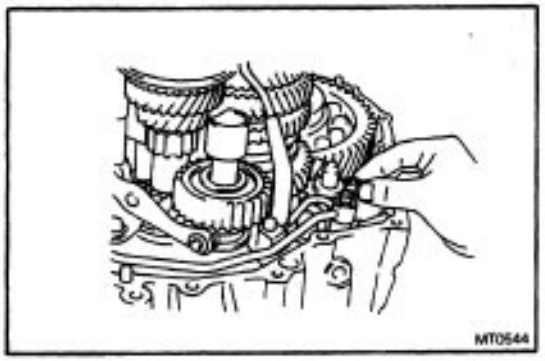
15. INSTALL REVERSE SHIFT ARM BRACKET ASSEMBLY AND NO.2 OIL PIPE
(a) Put the–reverse shift fork pivot into the reverse shift arm and install the reverse shift arm bracket to the transaxle case.
(b) Temporarily install the bolt.



(c) Install the No.2 oil pipe.



(d) Torque the two oil pipe bolts and reverse shift arm bracket bolt.
Torque: 175 kg–cm (13 ft–lb, 17 N–m)

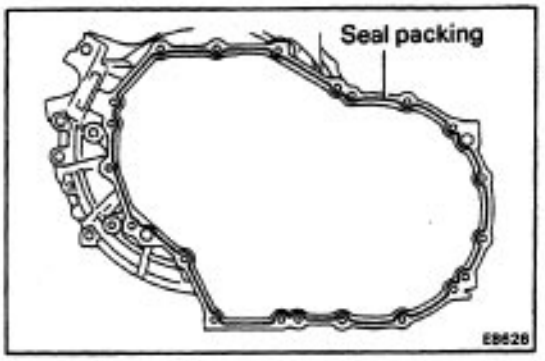


(e) Install a new gasket to the oil pipe.

16. INSTALL TRANSMISSION CASE

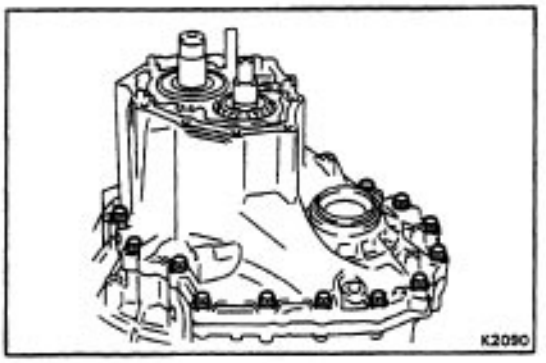
(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transaxle case.

(b) Apply seal packing to the transmission case as shown in the figure.
Seal packing: Part No.08826–00080, THREE BOND 1281 or equivalent

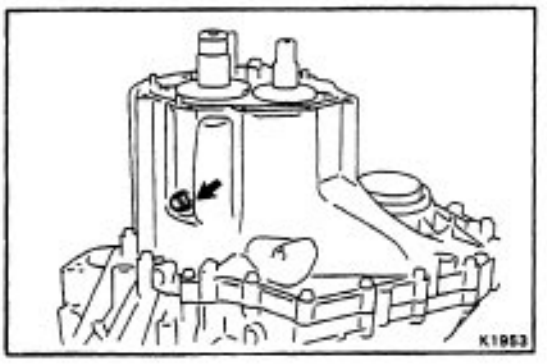


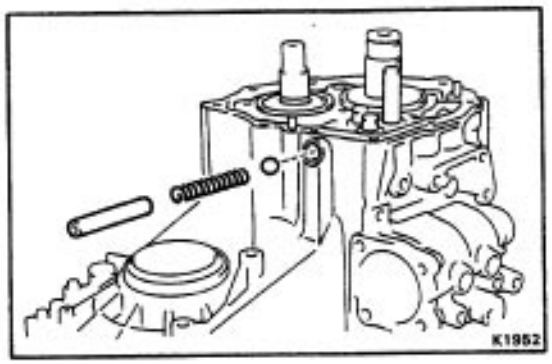
HINT: Install the transmission case as soon as the seal packing is applied.

(c) Install and torque the seventeen bolts.
Transmission case side: Fourteen bolts
Transaxle case side: Three bolts
Torque: 300 kg–cm (22 ft–lb, 29 N–m)



17. INSTALL AND TORQUE REVERSE IDLER GEAR RETAINING BOLT WITH GASKET
Torque: 300 kg–cm (22 ft–lb, 29 N–m)



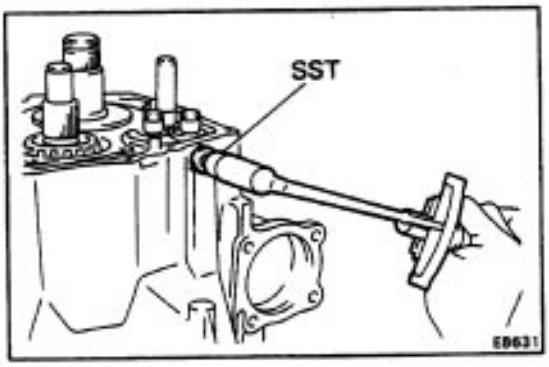


18. INSTALL LOCKING BALL, SPRING, SPRING SEAT AND SCREW PLUG

(a) Install the locking ball, spring and spring seat.

(b) Apply sealant to the screw plug.

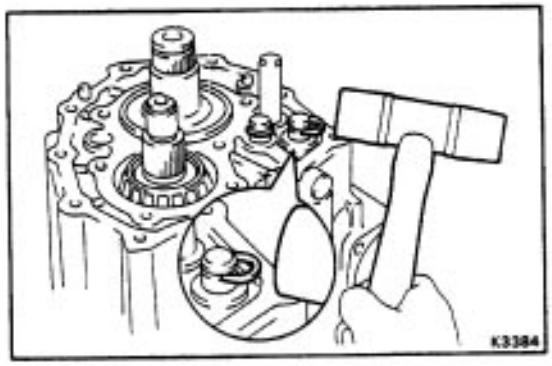
Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent



(c) Using SST, torque the screw, plug.

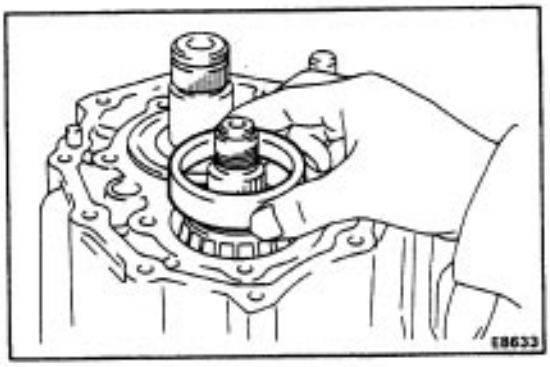
SST 09313–30021

Torque: 250 kg–cm (18 ft–lb, 25 N–m)



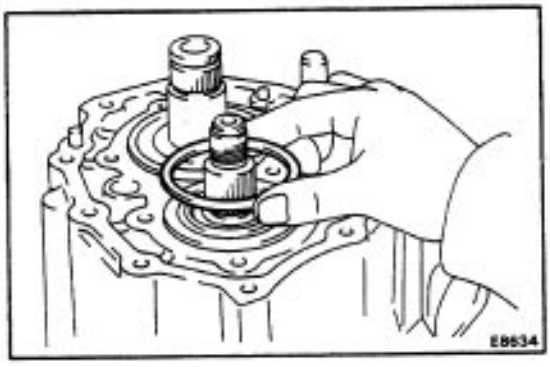
18. INSTALL SNAP RINGS

Using a plastic hammer, install the two snap rings to the shift fork shafts.

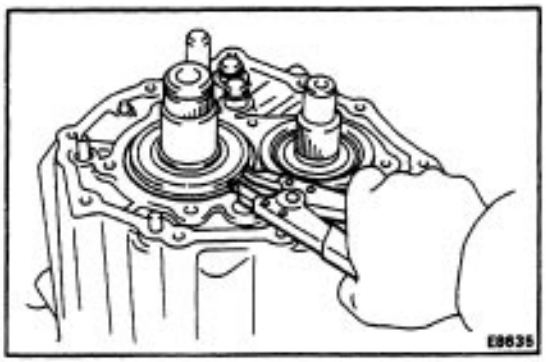


20. INSTALL REAR BEARING RETAINER

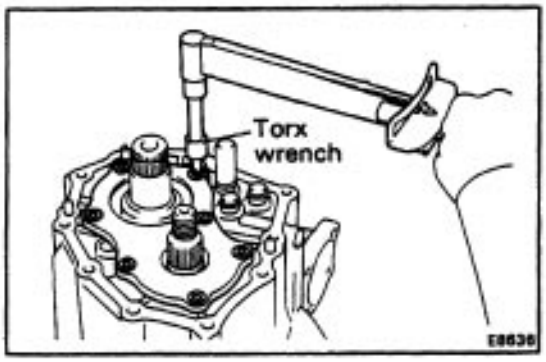
(a) Install the output shaft rear bearing outer race.



(b) Install the adjust shim which is already finished out put shaft preload.

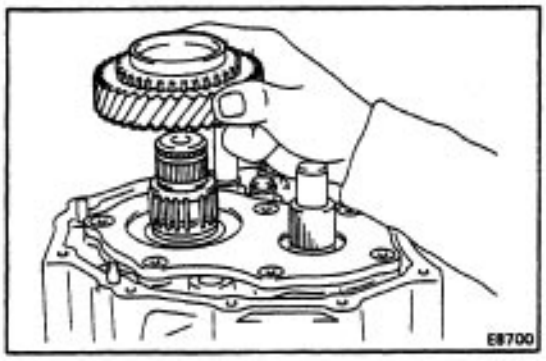


(c) Using snap ring pliers, install the snap ring to the input shaft rear bearing.



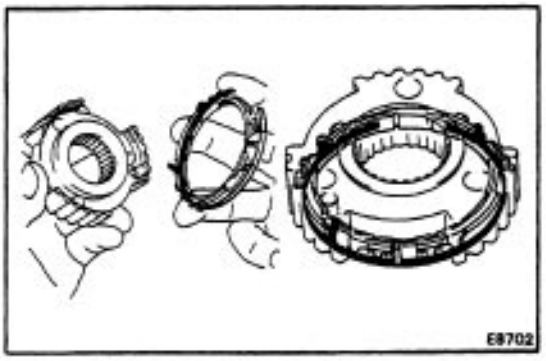
(d) Apply sealant to the, seven screws.
Sealant: Part No.08833–00070, THREE BOND 1324, LOCTITE 242 or equivalent

(e) Using a torx wrench, torque the seven screws.
Tom wrench T45 09042–00050
Torque: 430 kg–cm (31 ft–lb, 42 N–m)

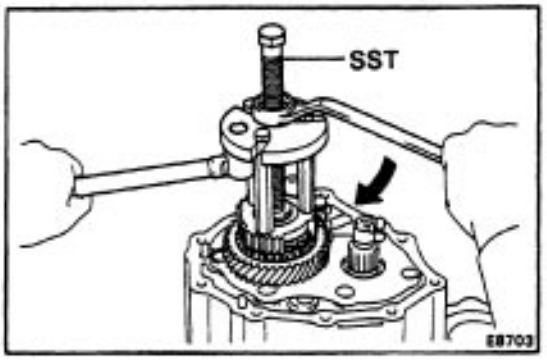


21. INSTALL FIFTH GEAR AND NO–3 CLUTCH HUB

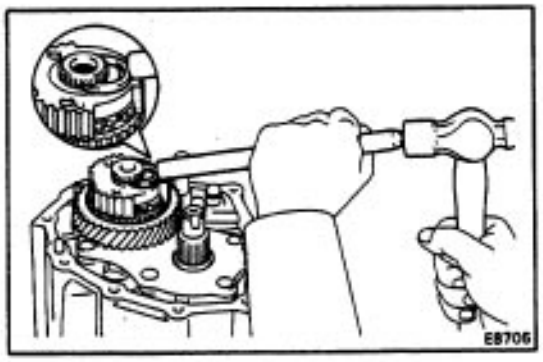
(a) Install the spacer, needle roller bearings and 5th gear.



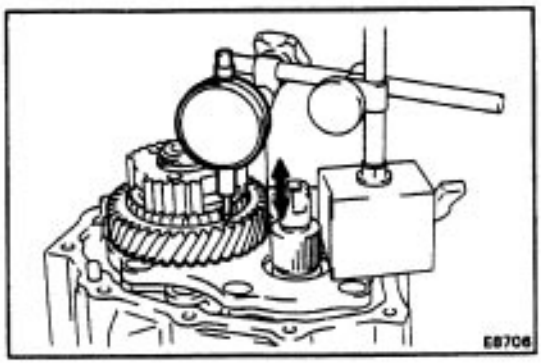
(b) Install the synchronizer ring and key spring to the No–3 clutch hub.



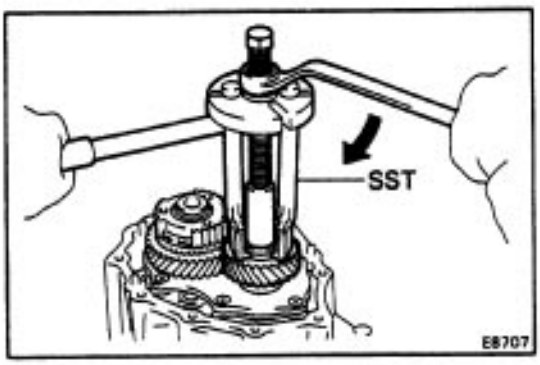
(c) Using SST, install the No.3 clutch hub with synchronizer ring and key spring.
SST 09310–17010 I09310–07010, 09310–07020, 09310–070301



(d) Select a snap ring that will allow minimum axial play and install it on the shaft.

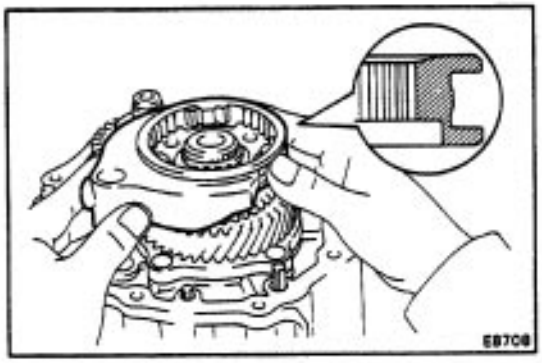


(e) Using a dial indicator, measure the 5th gear thrust clearance.
Standard clearance: 0.10 – 0.57 mm (0.004 – 0.022 in.)



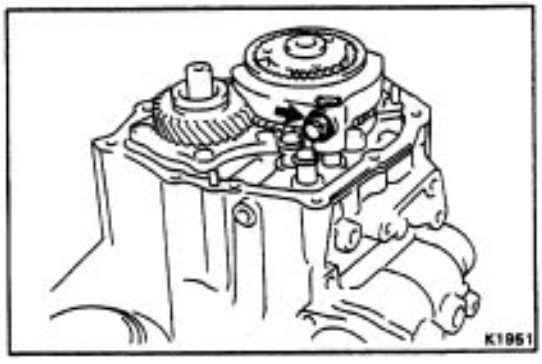
22. INSTALL FIFTH DRIVEN GEAR

Using SST, install the 5th driven gear.
SST 09310–17010 (09310–07010, 09310–07020 09310–07040, 09310–07050)



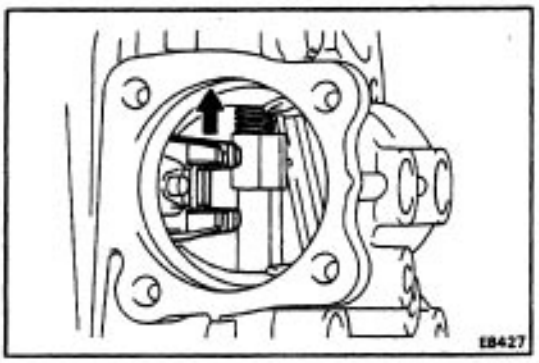
23. INSTALL NO.3 HUB SLEEVE AND NO.3 SHIFT FORK

(a) Install the No.3 hub sleeve and No.3 shift fork.

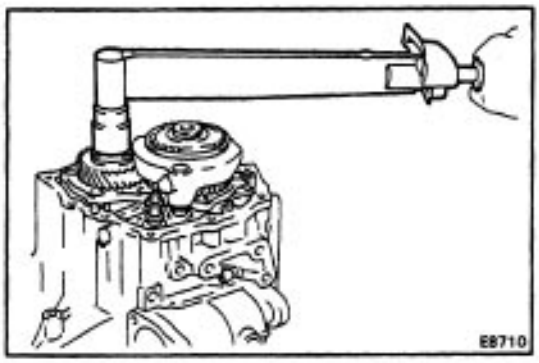


(b) install and torque the set bolt.
Torque: 240 kg–cm (17 ft–lb, 24 N–m)

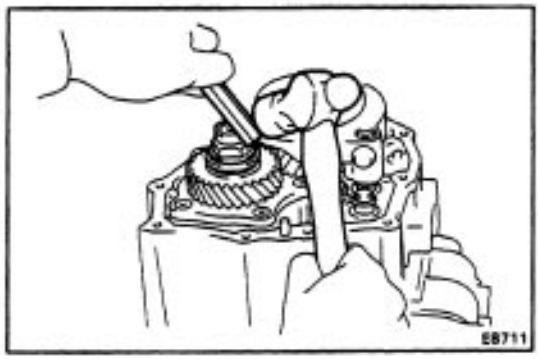
24. INSTALL LOCK NUT



(a) Engage the gear double meshing.

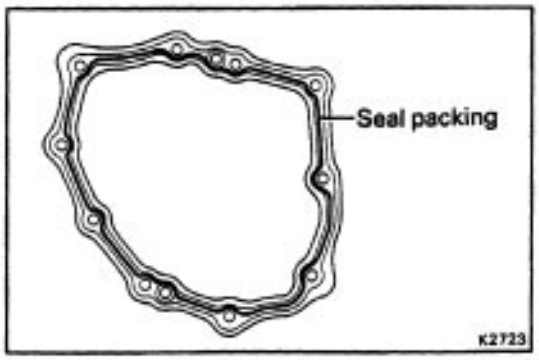


(b) install and torque a new lock nut.
Torque: 1,250 kg–cm (90 ft–lb, 123 N–m)



(e) Stake the lock nut.
(d) Disengage the gear double meshing.

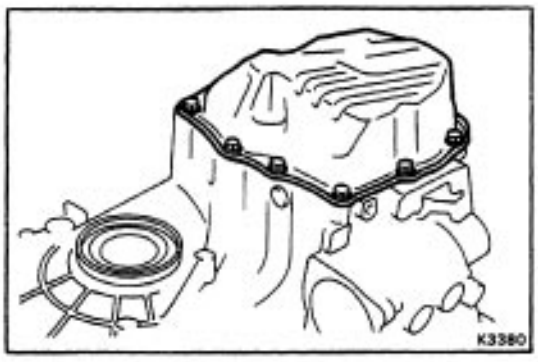
25. INSTALL TRANSMISSION CASE COVER

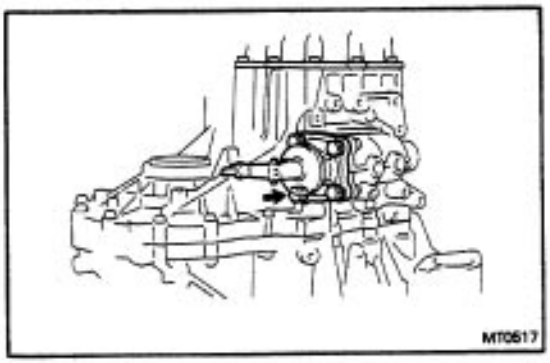


(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transmission case cover.
(b) Apply seal packing to the transmission case as shown in the figure.
Seal packing: Part No.08826–00090, THREE BOND
1281 or equivalent

HINT: Install the transmission case cover as soon as the seal packing is applied.

Install and torque the ten bolts.
Torque: 300 kg–cm (22 ft–lb, 29 N–m)





26. INSTALL SHIFT AND SELECT LEVER SHAFT ASSEMBLY

(a) Install the shift and select lever shaft assembly and new gasket.

(b) Apply sealant to the bolt threads.

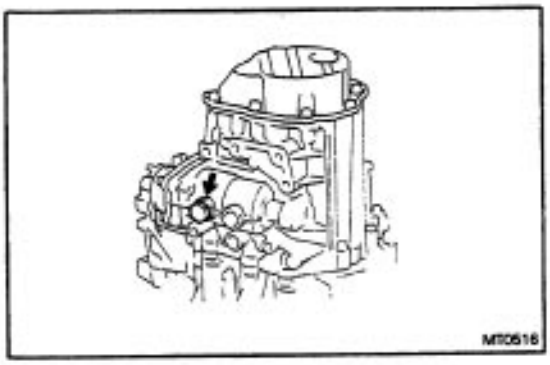
Sealant: Part No.08833–00O80, THREE BOND 1344, LOCTITE 242 or equivalent

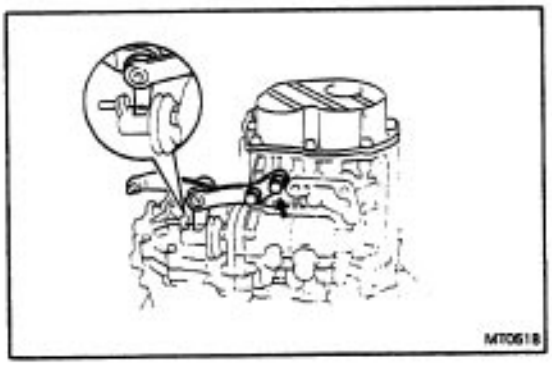
(e) Install and torque the four bolts.

Torque: 200 kg–cm (14 ft–lb, 20 N–m)

(d) Install and torque the lock bolt with the new gasket.

Torque: 500 kg–cm (36 ft–lb, 49 N–m)





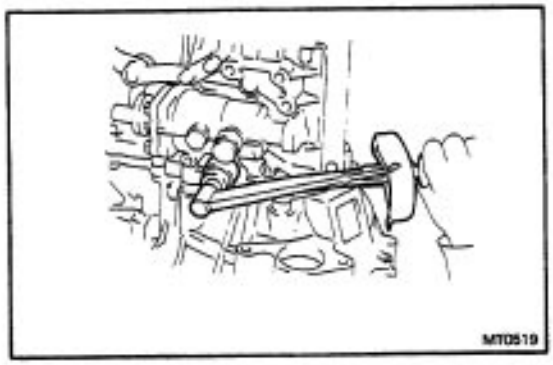
27. INSTALL NO.2 SELECTING BELLCRANK WITH SELECTING BELLCRANK SUPPORT

(a) Apply sealant to the bolt threads.

Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Install and torque the two bolts.

Torque: 200 kg–cm (14 ft–lb, 20 N–m)

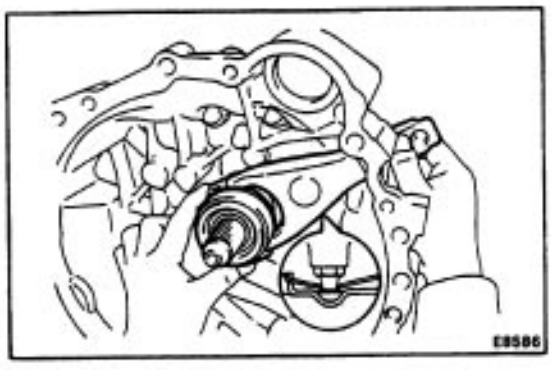


28. INSTALL BACK–UP LIGHT SWITCH

Instal! and torque the back–up light switch with the new gasket.

Torque: 410 kg–cm (30 ft–lb, 40 N–m)

29. INSTALL SPEEDOMETER DRIVEN GEAR



30. INSTALL RELEASE FORK AND BEARING

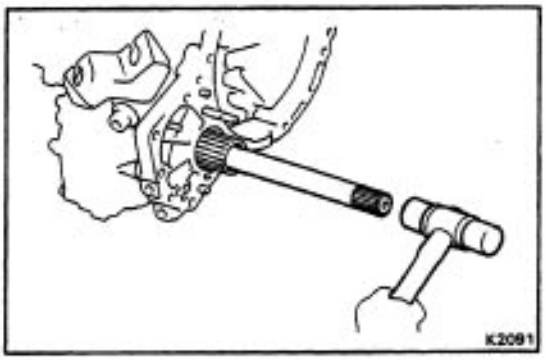
Apply molybdenum disulphide lithium base grease to the following part:

- Input shaft spline
- Release fork contact surface

31. INSTALL DIFFERENTIAL SIDE GEAR INTERMEDIATE SHAFT

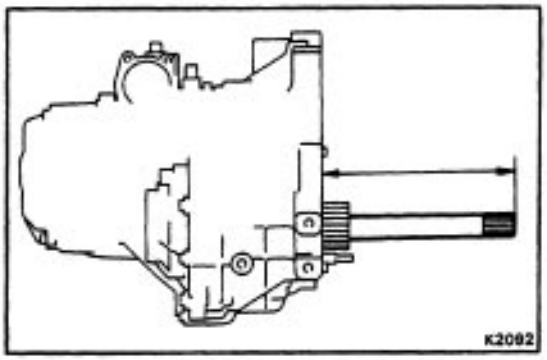
(a) Apply MP grease to the intermediate shaft.

(b) Using a plastic hammer, correctly drive the intermediate shaft straight until the top of it touches the differential pinion shaft.



HINT: Keeping the intermediate shaft on the pinion shaft of differential, measure the point in the illustration.

Protrusion length: 255.5 mm (10.059 in.)

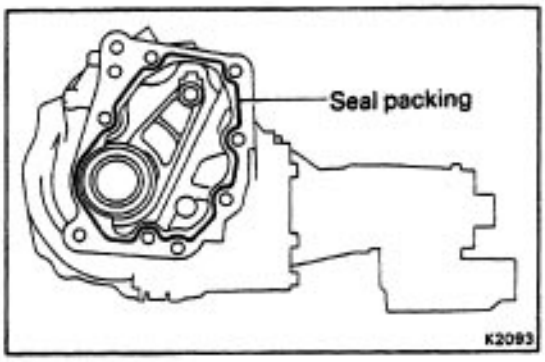


32. INSTALL TRANSFER ASSEMBLY

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transfer or transaxle.

(b) Apply seal packing to the transfer as shown in the figure.

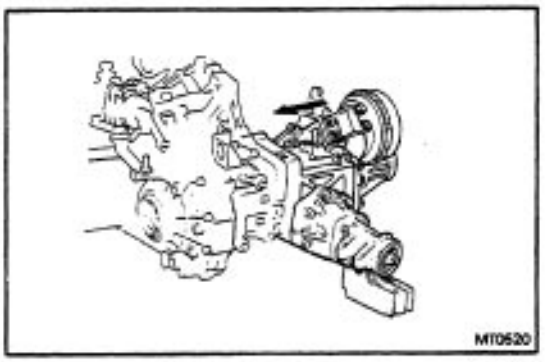
Seal packing: Part No.08826–00090, THREE BOND 1281 or equivalent



HINT: Install the transfer as soon as the seal packing is applied.

(c) Install the transfer assembly to the transaxle assembly

HINT: Shift into 4th gear, install the transfer assembly while turning the input shaft of the transaxle.

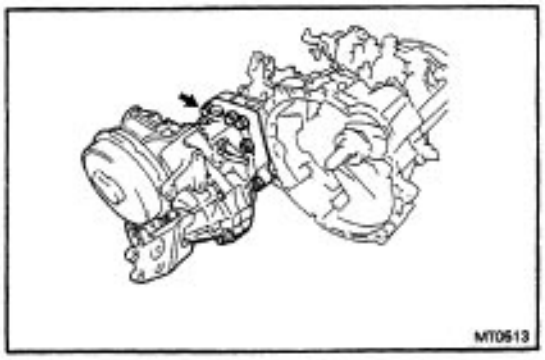


(d) Apply sealant to the bolt threads.

Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

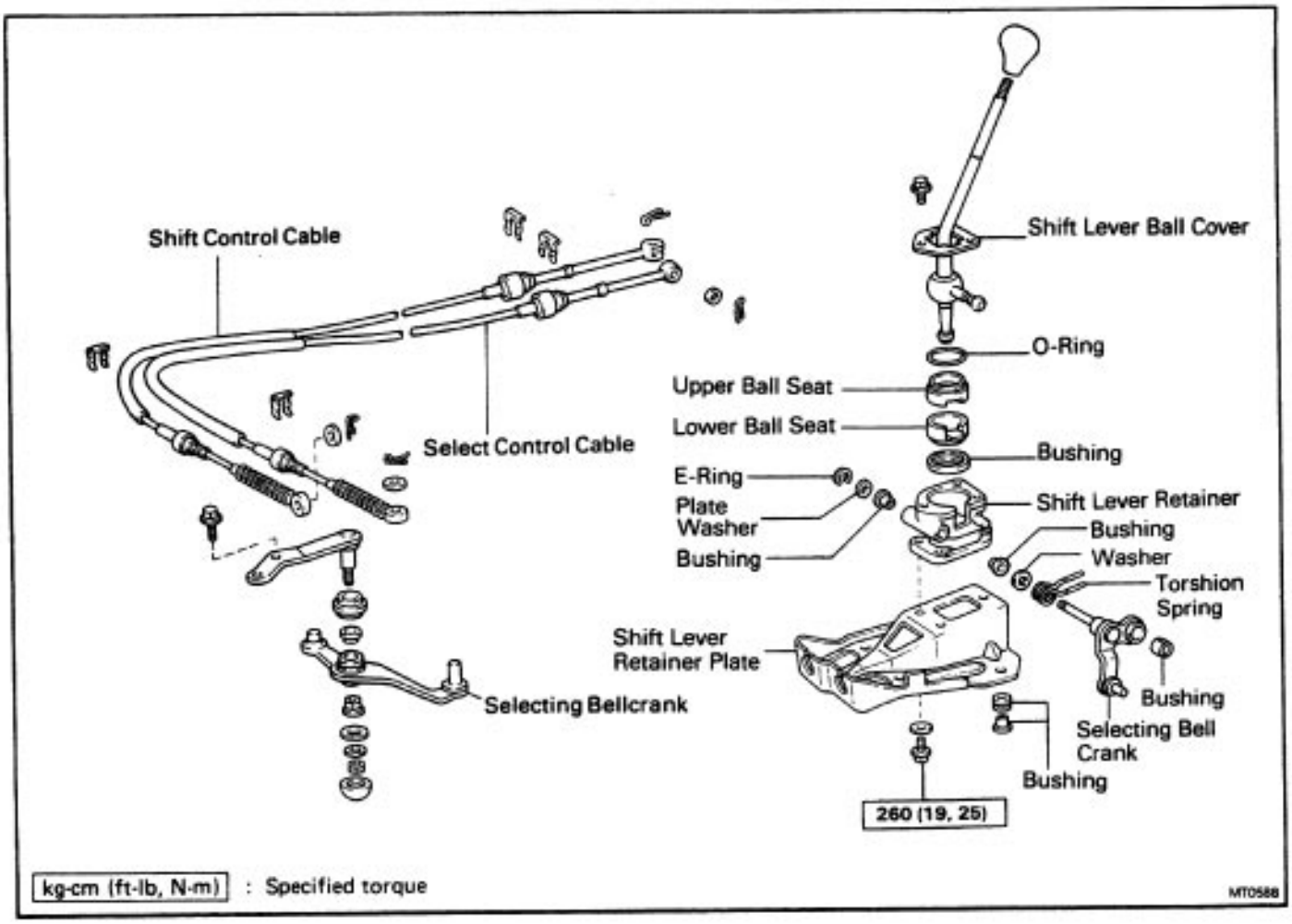
(e) Install and torque the three bolts and five nuts.

Torque: 700 kg–cm (51 ft–lb, 69 N–m)



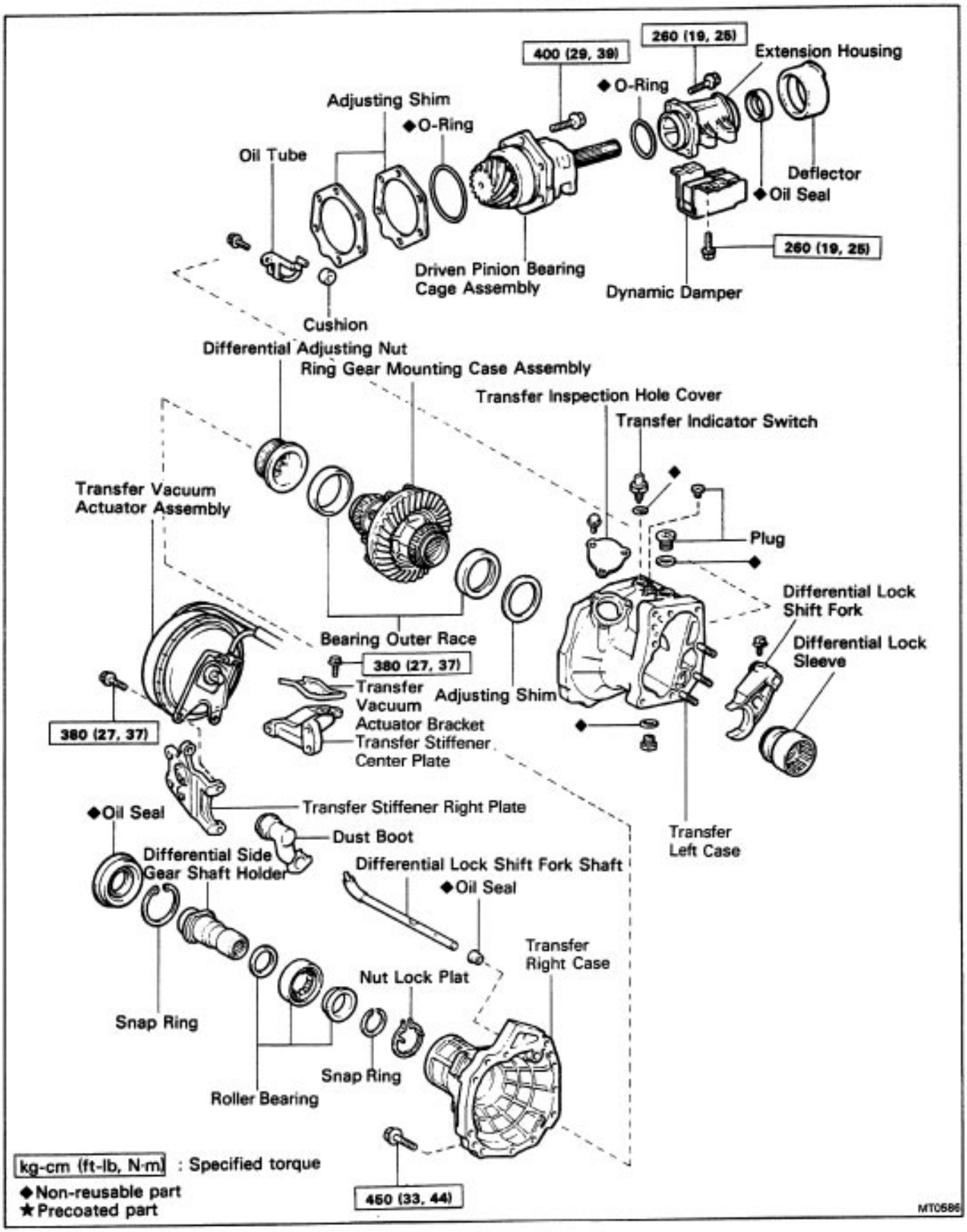
SHIFT LEVER AND CONTROL CABLE

COMPONENTS

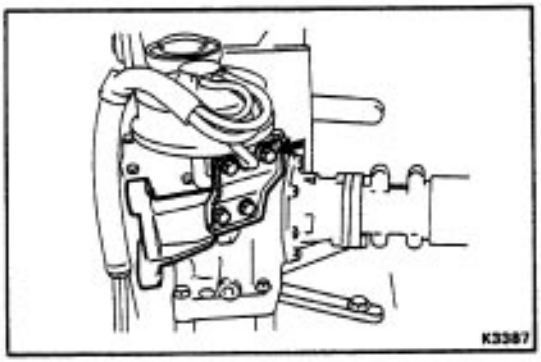


Transfer Assembly (E56F5)

COMPONENT



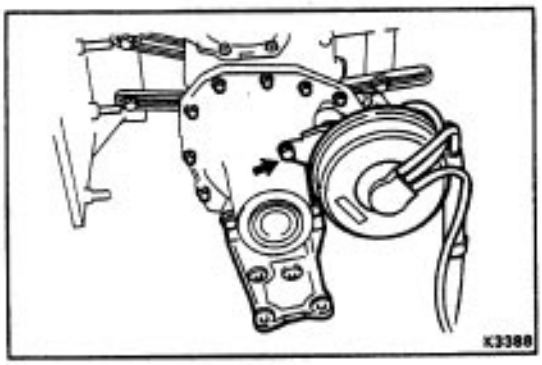
DISASSEMBLY OF TRANSFER COMPONENT PARTS



1. REMOVE TRANSFER VACUUM ACTUATOR

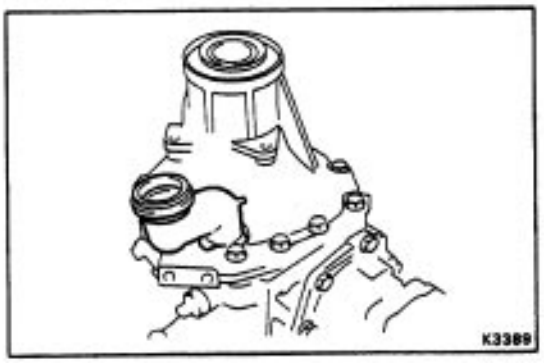
(a) Remove the four bolts.

(b) Remove the actuator bracket and stiffener center plate.

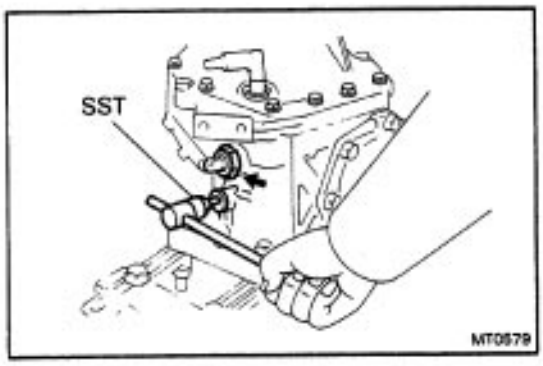


(c) Remove the three bolts.

(d) Remove the vacuum actuator.



2. REMOVE DUST BOOT

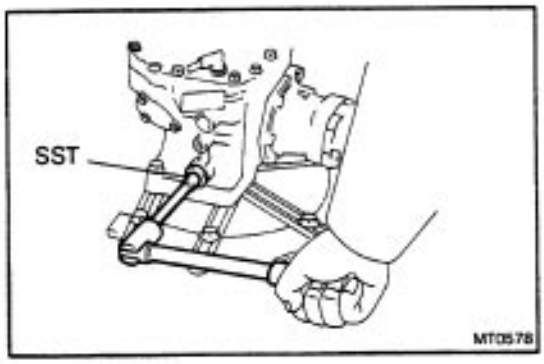


3. REMOVE DIFFERENTIAL LOCK SHIFT FORK SHAFT

(a) Remove transfer indicator switch.

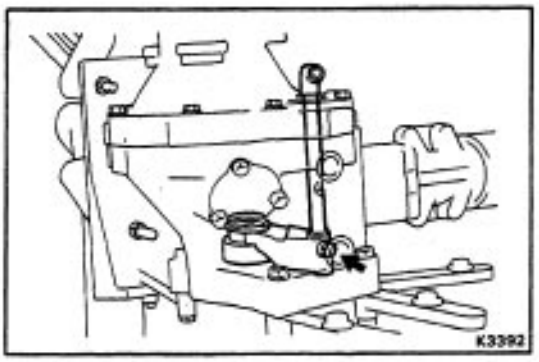
(b) Using SST, remove the plug.

SST 09313–30021



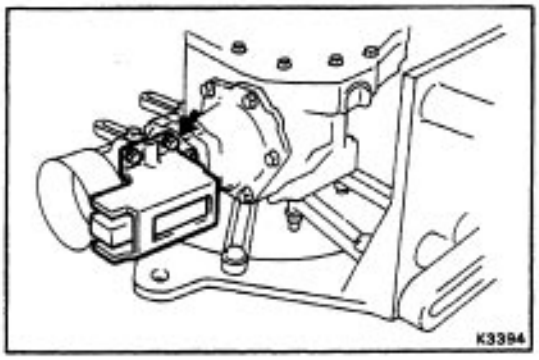
(c) Using SST, remove the plug.

SST 09043–38100



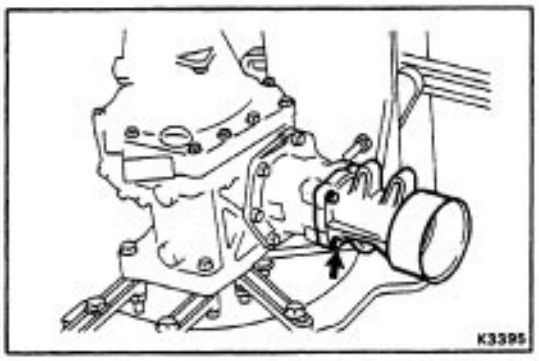
(d) Remove the set bolt.

(e) Remove the shift fork shaft, shift fork and sleeve.



4. REMOVE DYNAMIC DAMPER

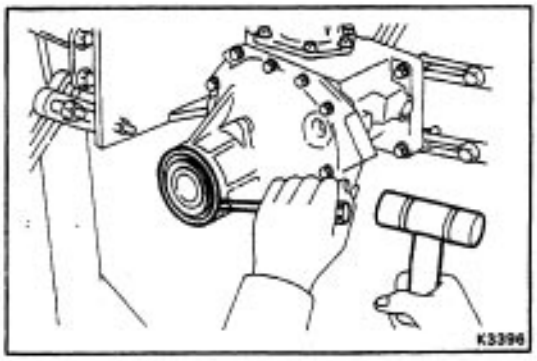
Remove the four bolts and dynamic damper.



5. REMOVE EXTENSION HOUSING

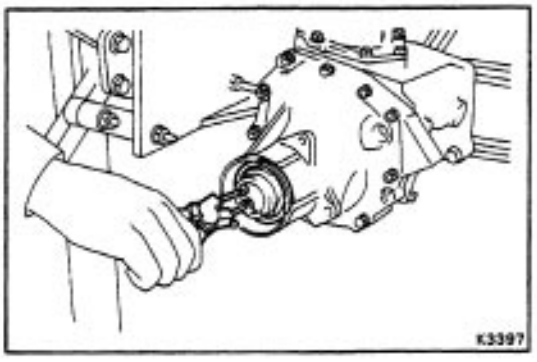
(a) Remove the four bolts and tap off the housing with a plastic hammer.

(b) Remove the O–ring and the dust deflector from the extension housing.

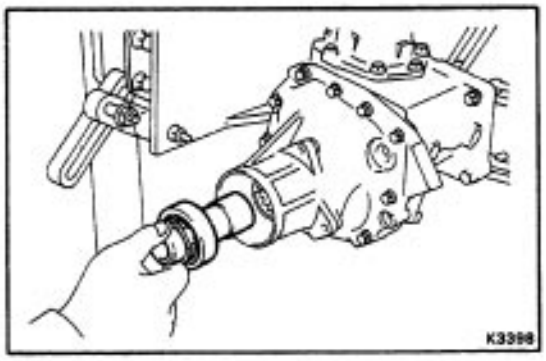


6. REMOVE SIDE GEAR SHAFT HOLDER

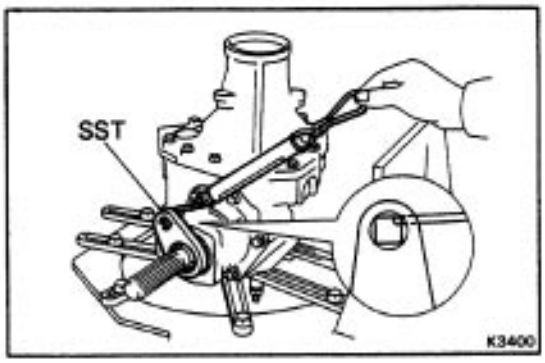
(a) Using a screwdriver and hammer, remove the oil seal.



(b) Using snap ring pliers, remove the snap ring.



(c) Remove the shaft holder.



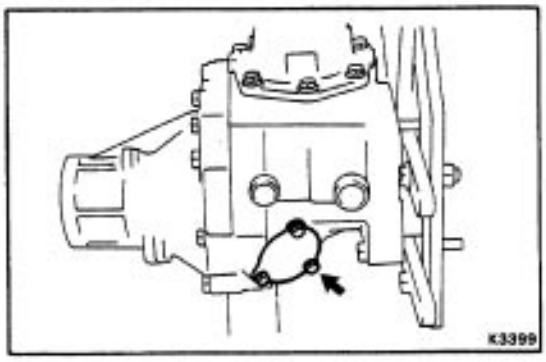
7. CHECK PRELOAD

(a) Using SST and a spring tension gauge, measure the driven pinion preload of the backlash between the driven pinion and ring gear.
SST 09326–20011

Preload (at starting): 0.9 – 1.4 kg (2–3 lb, 9– 14 N)

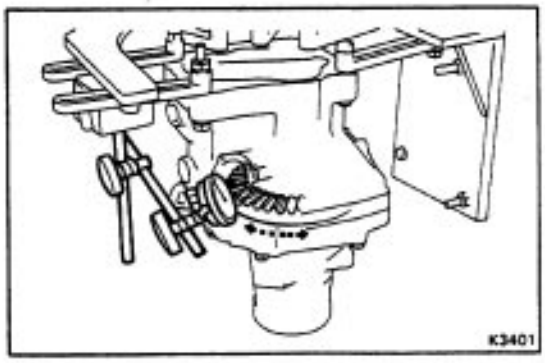
(a) Using SST and a spring tension gauge, measure the total preload.
SST 09326–20011

Preload (at starting):
Add driven pinion preload
0.5–0.90 (1–2 lb,5–9 N)



8. REMOVE TRANSFER INSPECTION HOLE COVER

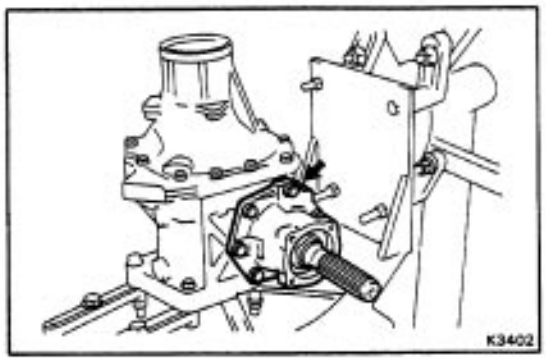
Remove the three bolts and a cover.



9. CHECK RING GEAR BACKLASH

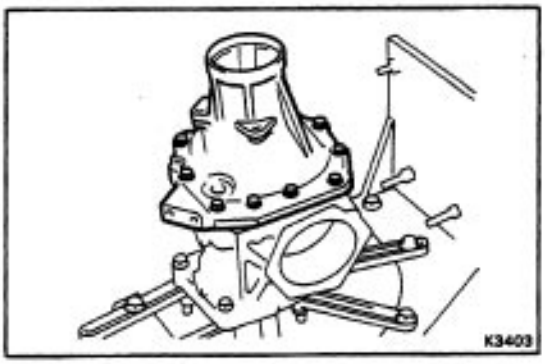
Using a dial indicator, measure the ring gear backlash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

10. CHECK TOOTH CONTACT (Seepage MT–183)



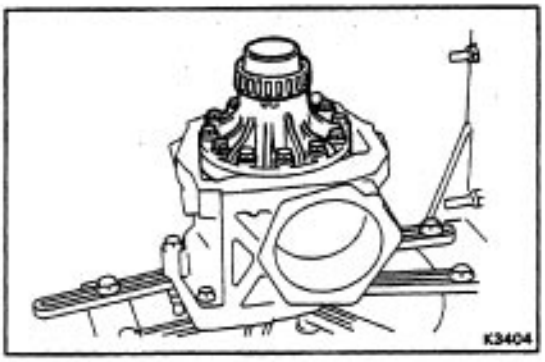
11. REMOVE DRIVEN PINION BEARING CAGE ASSEMBLY

(a) Remove the six bolts and tap off a plastic hammer.
(b) Remove the 4–ring and shim from the driven pinion bearing cage.

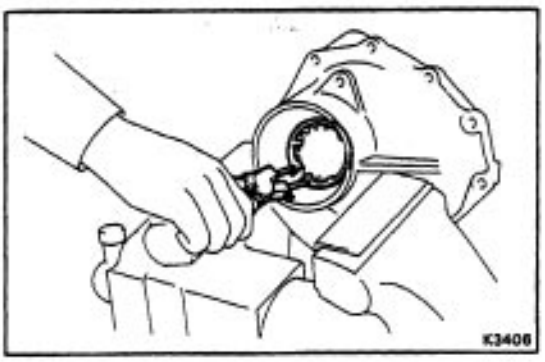


12. REMOVE TRANSFER RIGHT CASE

Remove the ten bolts and tap off the case with a plastic hammer.

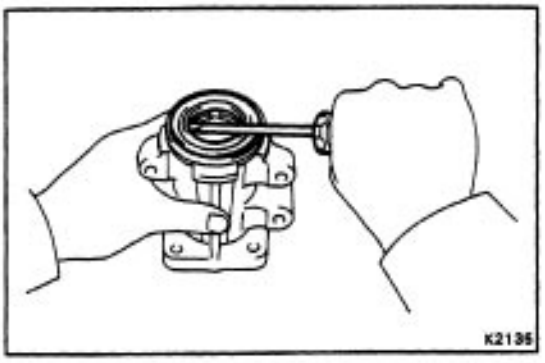


13. REMOVE RING GEAR MOUNTING CASE ASSEMBLY



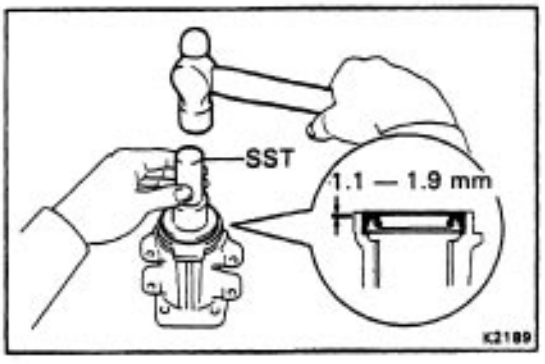
14. REMOVE ADJUSTING NUT LOCK PLATE

Using snap ring pliers, remove the lock plate from the transfer right case.



15. IF NECESSARY, REPLACE EXTENSION HOUSING OIL SEAL

(a) Using a screwdriver, remove the oil seal.

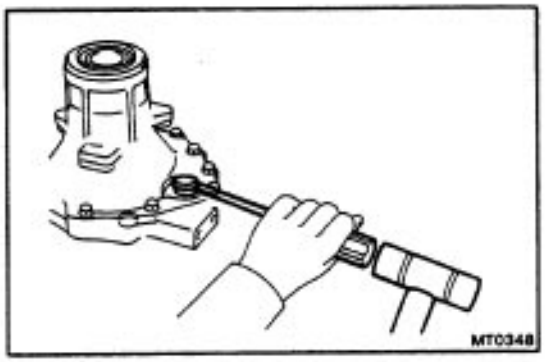


(b) Using SST and a hammer, drive in a new oil seal.

SST 09325–20010

Oil seal depth: 1.1 – 1.9 mm (0.043 – 0.075 in.)

(c) Coat the lip of oil seal with MP grease.

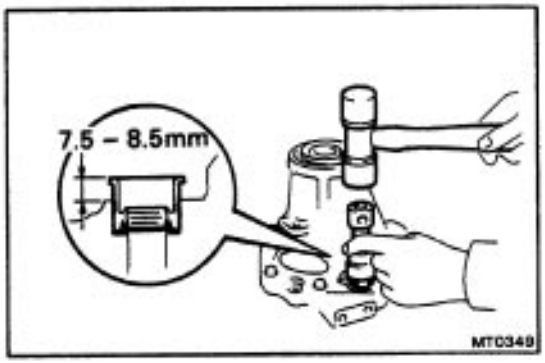


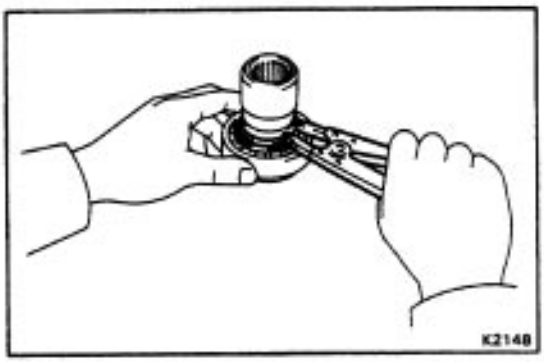
16. IF NECESSARY, REPLACE SHIFT FORK SHAFT OIL SEAL

(a) Using a screwdriver and hammer, remove the oil seal.

(b) Coat the lip of oil seal with MP grease.

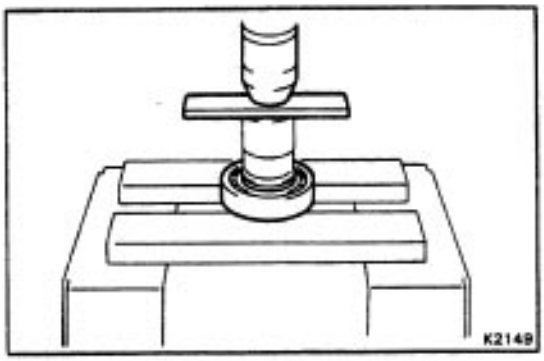
(c) Using a socket wrench and hammer, drive in a new oil seal as shown.
Oil seal height: 7.5 – 8.5 mm (0.295 – 0.335 in.)



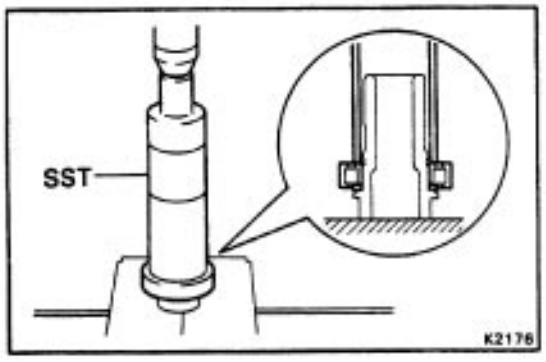


17. IF NECESSARY, REPLACE SIDE GEAR SHAFT HOLDER BEARING

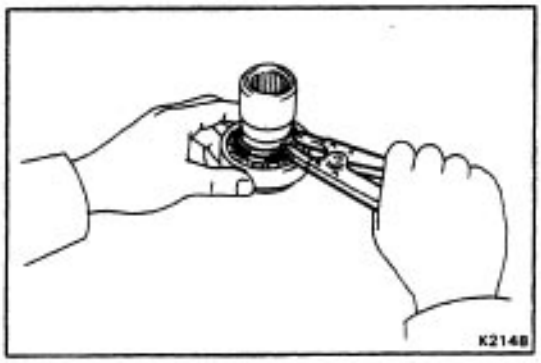
(a) Using snap ring pliers, remove the snap ring.



(b) Using a press, remove the bearing from the side gear shaft holder.



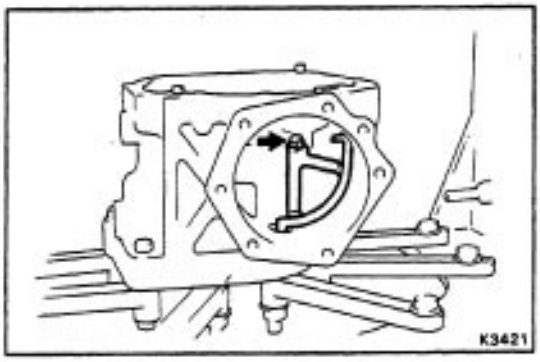
(c) Using SST and a press, install a new bearing as shown.
SST 09316–60010 (09316–00010)

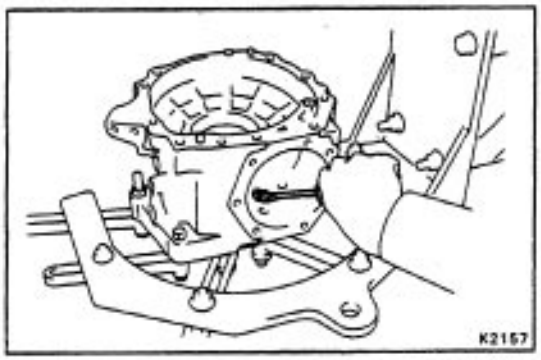


(d) Using snap ring pliers, install the snap ring.

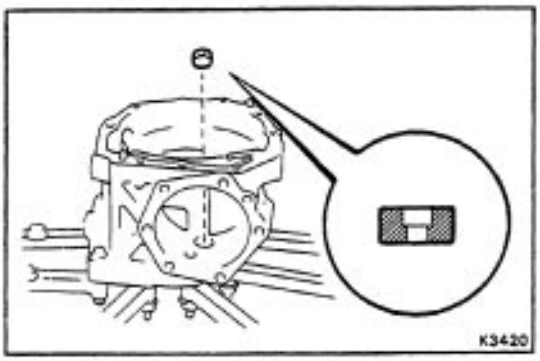
18. IF NECESSARY, REPLACE TRANSFER OIL TUBE

(a) Remove the bolt and oil tube.

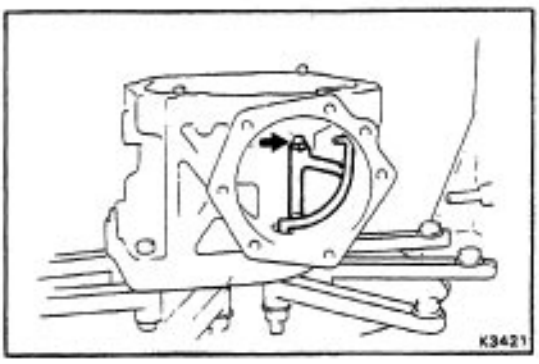




(b) Using a screwdriver, remove the cushion.



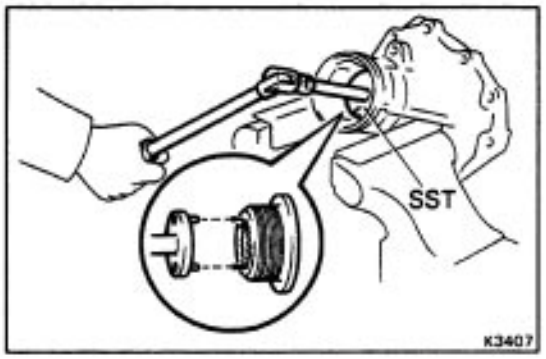
(c) Install anew cushion.



(d) Install the oil tube.

(e) Install and torque the bolt.

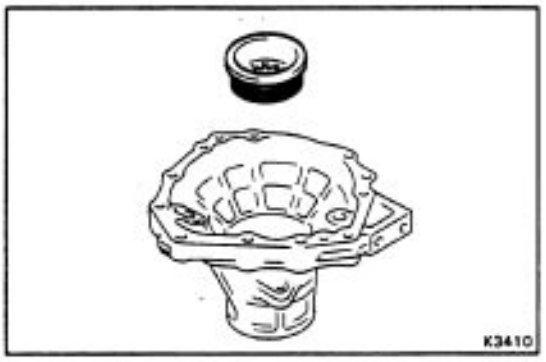
Torque: 130 kg–cm (9 ft–lb, 13 N–m)



19. IF NECESSARY, REPLACE RING GEAR MOUNTING CASE SIDE BEARING OUTER RACE

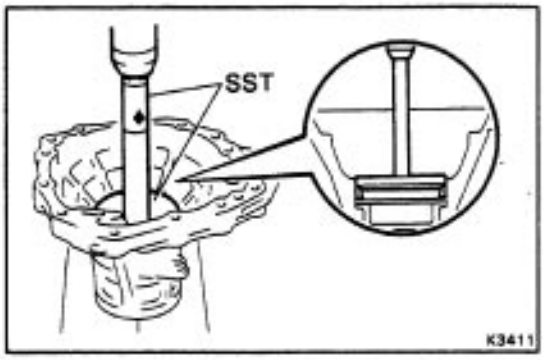
(Transfer Right Case)

(a) Using SST, turn the bearing adjusting nut, remove the outer race and bearing adjusting nut.
SST 09318–20010

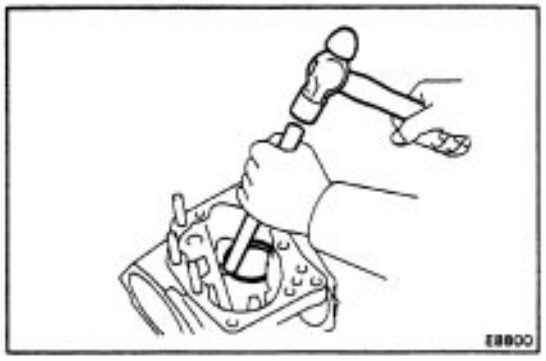


(b) Install the bearing adjusting nut until it touches the lip of the case.

HINT: If the nut is difficult to turn, use SST (09318–20010).

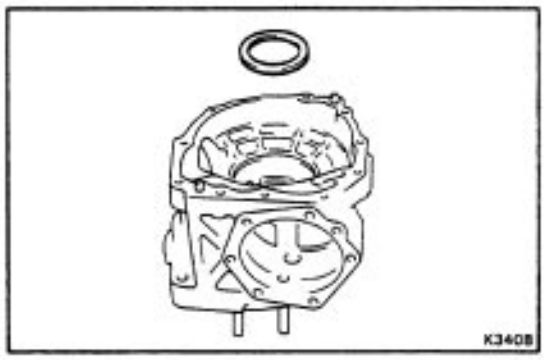


(c) Using SST and a press, install the press until it is almost touching the bearing adjusting nut.
SST 09608–35014 (09608–06020, 09608–06160)



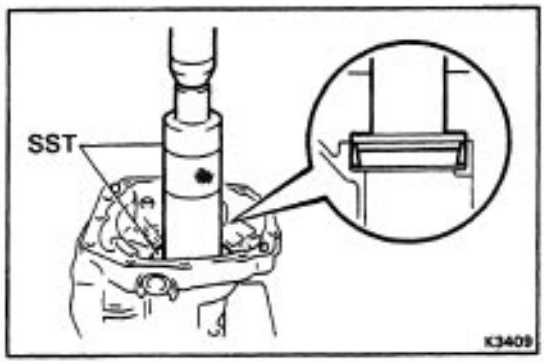
(Transfer Left Case)

(a) Using a brass bar and hammer, drive out the bearing outer race lightly and evenly.
Remove the plate washer.

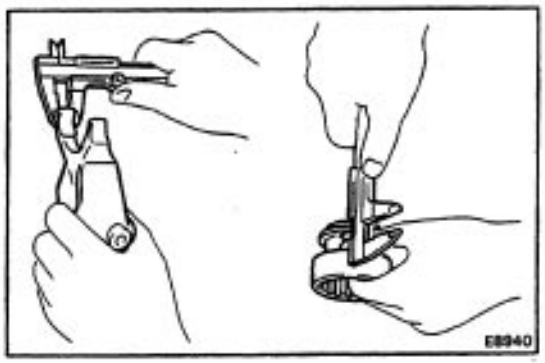


(c) Install the plate washer.

HINT: First install a washer of the same thickness as before.



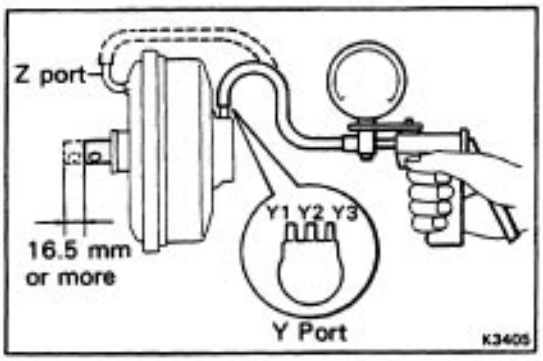
(d) Using. SST and a press, install the outer race.
SST 09316–60010 (09316–00010, 09316–00060)



20. MEASURE CLEARANCE OF DIFFERENTIAL LOCK SHIFT FORK AND SLEEVE

Measure the clearance between the shift fork and sleeve.

Maximum clearance: 1.0 mm (0.039 in.)



21. INSPECT TRANSFER VACUUM ACTUATOR

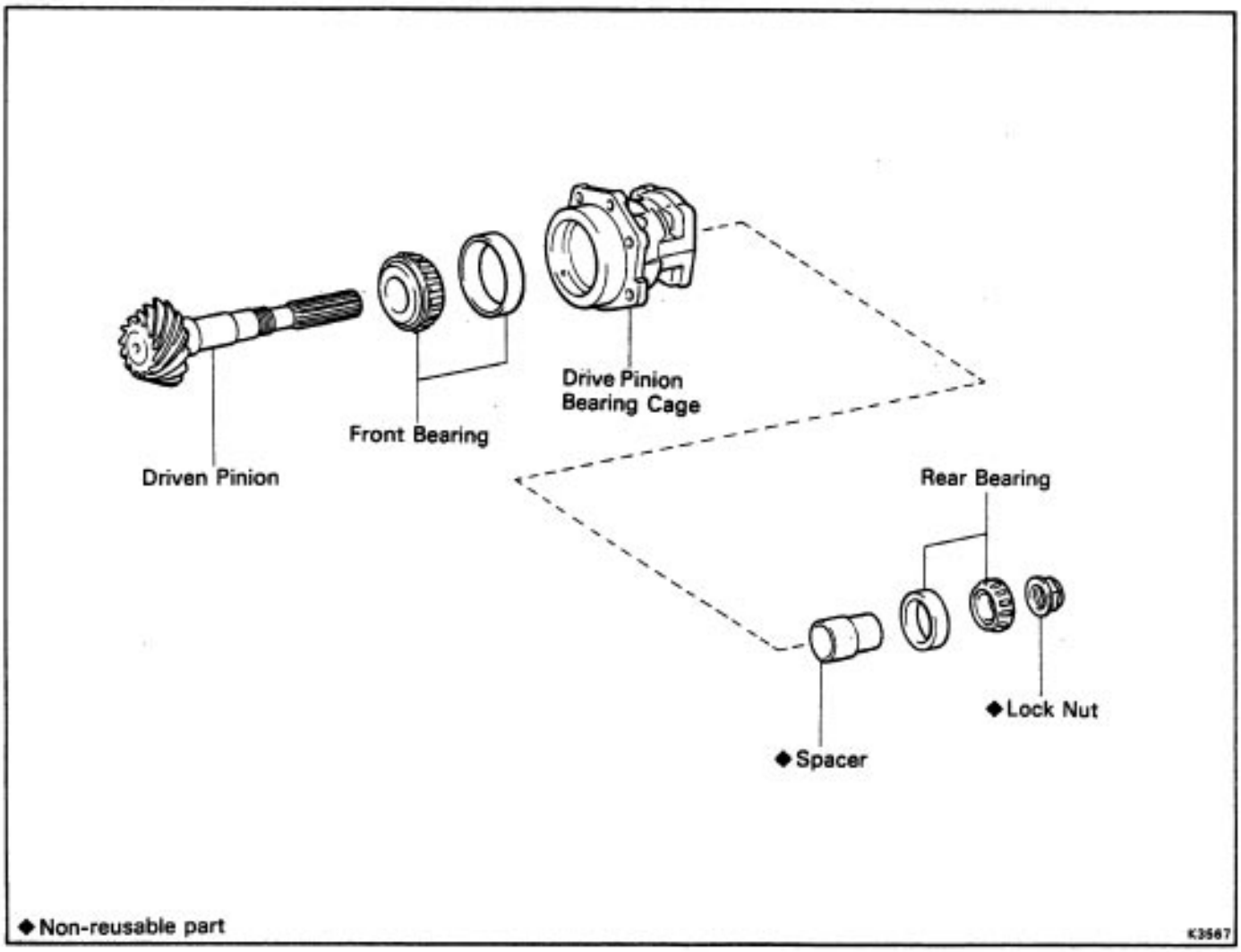
(a) the push rod.

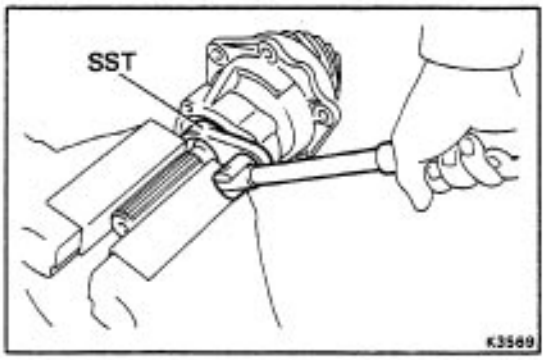
(b) Apply a vacuum of 500 mmHg to port Y1 and Y2.
Move in the push rod and measure the push rod strake.
Push rod strake: 16.5 mm (0.650 in.) or more

(c) Apply a vacuum of 500 mmHg to port Y3. Check that no remain the vacuum in actuator.
If not, replace the actuator.

(d) After the check, apply a vacuum of 500 mmHg to port Y of the actuator (Put the differential lock on the free side).

DRIVEN PINION. BEARING CAGE ASSEMBLY





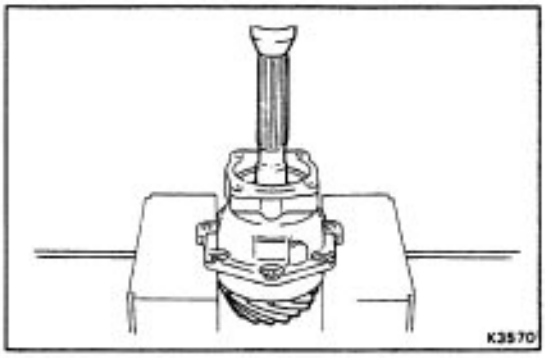
DISASSEMBLY OF DRIVEN PINION BEARING CAGE

1. REMOVE LOCK NUT

(a) Unstake the lock nut.

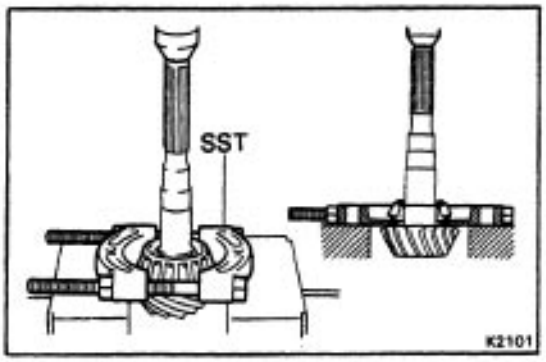
(b) Using SST, remove the luck nut.

SST 09326–20011



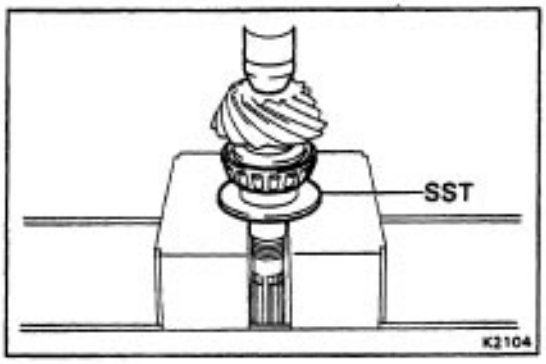
2. REMOVE DRIVEN PINION

Using a press, remove the driven pinion, rear bearing and spacer.

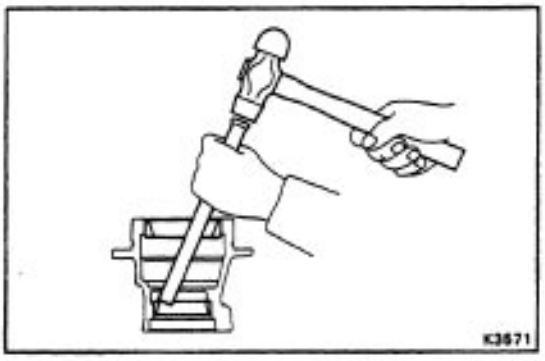


3. IF NECESSARY, REPLACE DRIVEN PINION FRONT BEARING

(a) Using SST and a press, remove the front bearing.
SST 09950–00020



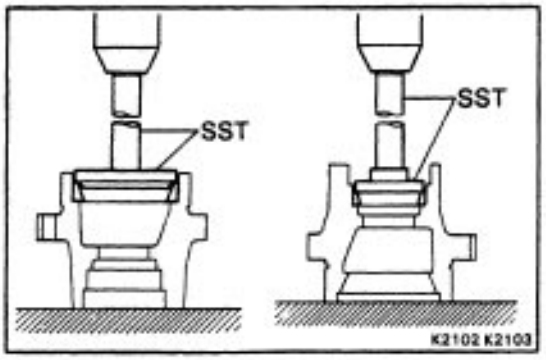
(b) Using SST and a press, install the front bearing.
SST 09506–35010



4. IF NECESSARY, REPLACE FRONT AND REAR BEARING OUTER RACE

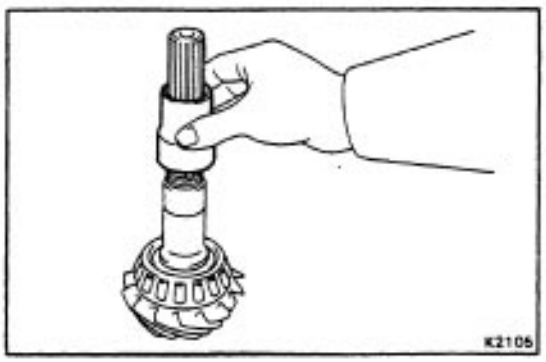
(a) Using a brass bar and hammer, drive out the bearing outer race race lightly and evenly.

HINT: Be careful not to damage the drive pinion bearing cage and earing outer race.



(b) Using SST and a press, install the front bearing outer race.
SST 09608–35014 (09608–06020, 09608–06210)

(c) Using SST and a press, install the rear bearing outer race.
SST 09550–10012 (09252–10010, 09555–10010)



ASSEMBLY OF DRIVEN PINION BEARING CAGE

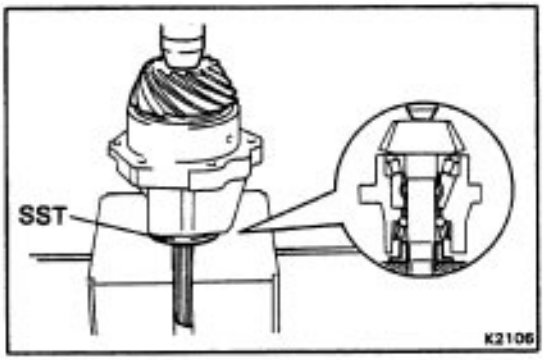
(See page MT– 178)

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

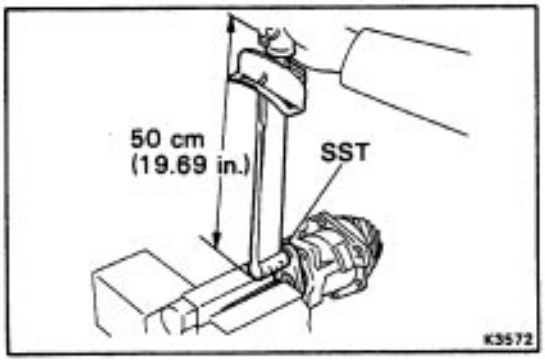
1. INSTALL DRIVEN PINION BEARING CAGE

(a) Install a new bearing spacer.

HINT: Insert the spacer with the smaller facing upwards.

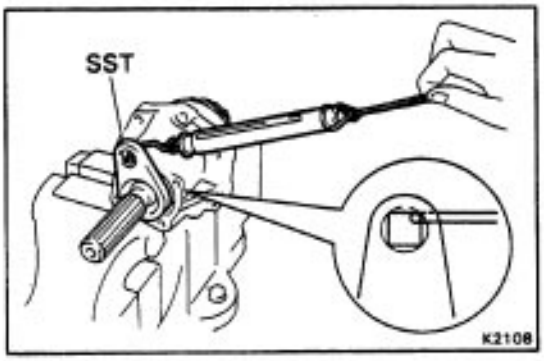


(b) Using SST and a press, install the rear bearing.
HINT: Press down until the pinion can just move slightly up and down.
SST 09316–60010 (09316–00020)



2. ADJUST DRIVEN PINION PRELOAD

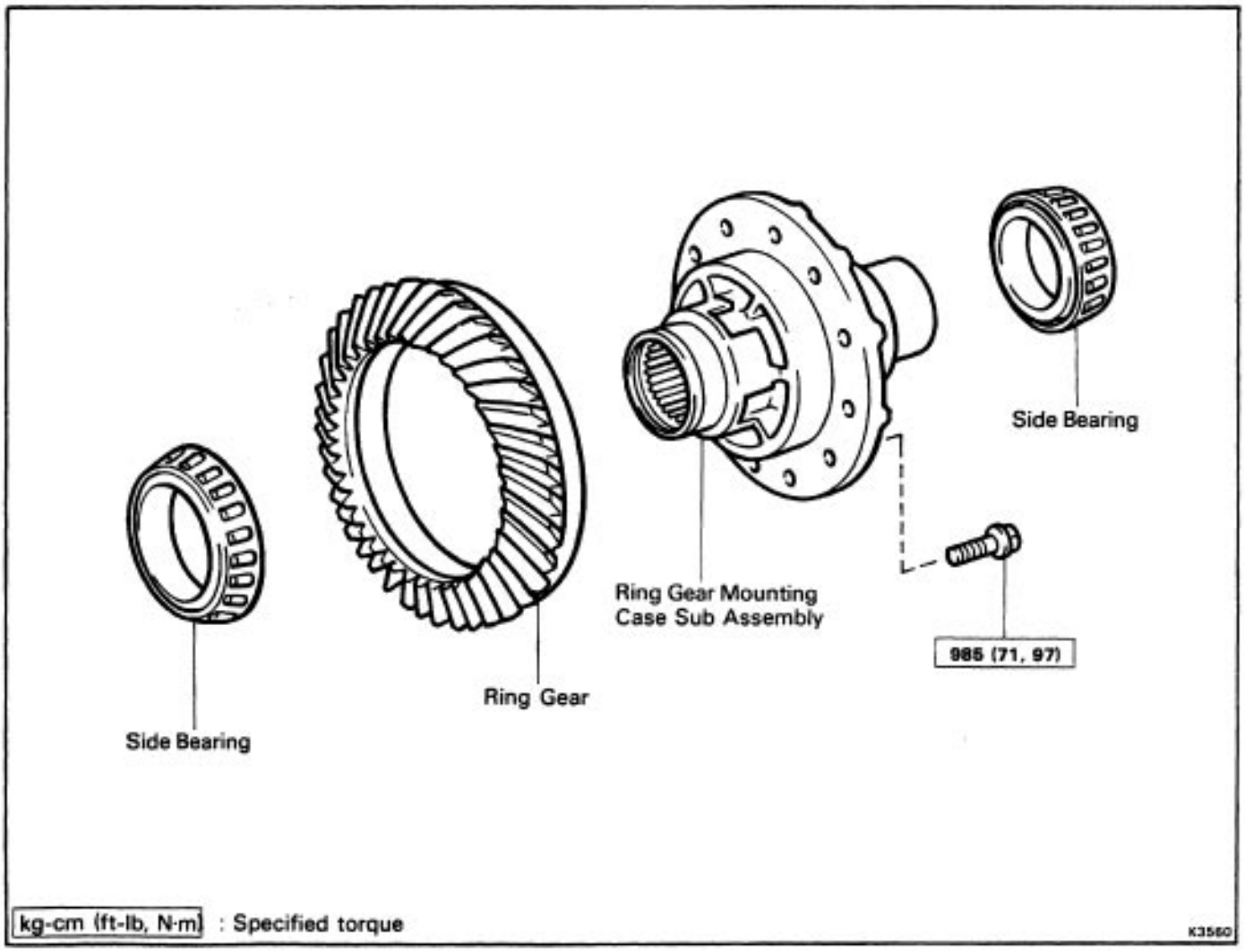
(a) Using SST, install and torque the new lock nut.
SST 09326–20011
Torque: 1,000 kg–cm (72 ft–lb, 90 N–m)
HINT: Use a torque wrench with a fulcrum length of 50 cm (19.69 in.).

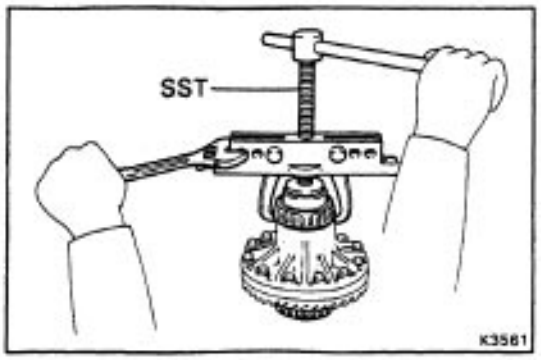


(b) Using SST and a spring tension gauge, measure the driven pinion preload.
HINT: Turn the driven pinion right and left two or three times to allow the bearings to settle.
Preload (at starting) :
Now bearing
1.8–2.9kg(4.0–6.41b,17.6–28.4N)
Reused bearing
0.9–1.4kg(2.0–3.11b,8.8–13.7N)
*** If preload is greater than specification, replace the bearing spacer.**
*** If preload is less than specification, retighten the nut 5 – 10° at a time until the specified preload is reached.**
If the maximum torque is exceed while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.
Maximum torque: 2,200 kg–cm (159 ft–lb, 216 N–m)

3. STAKE LOCK NUT

RING GEAR MOUNTING CASE ASSEMBLY

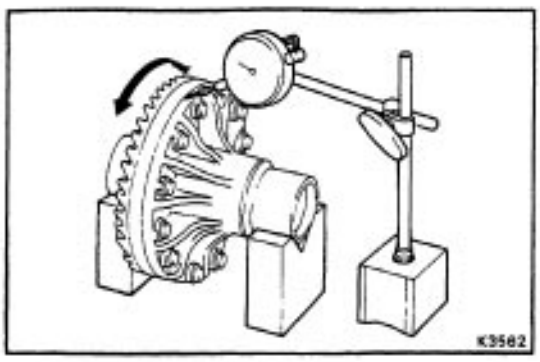




DISASSEMBLY OF RING GEAR MOUNTING CASE

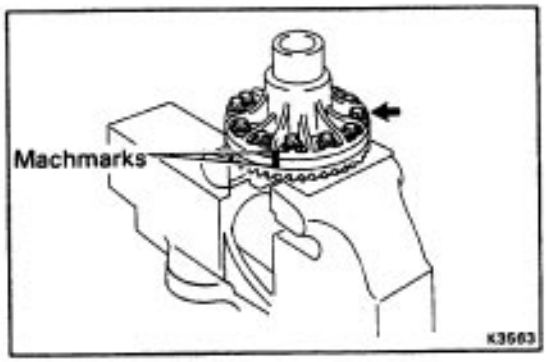
1. REMOVE MOUNTING CASE SIDE BEARING

Using SST, remove the side bearing.
SST 09950–20017



2. CHECK RING GEAR RUNOUT

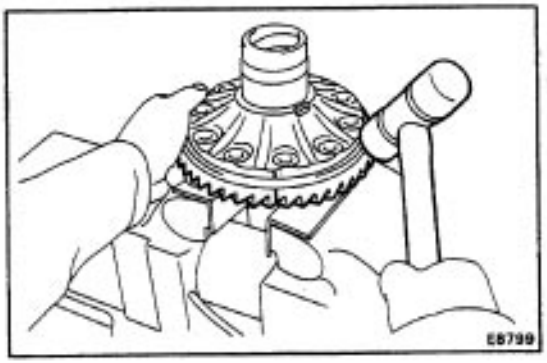
Using a dial indicator, check the ring gear runout.
Maximum runout: 0.1 mm (0.004 in.)



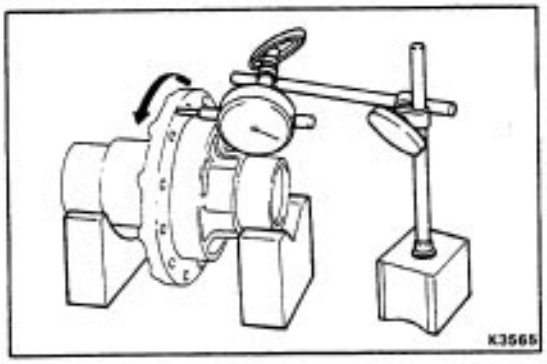
3. REMOVE RING GEAR

(a) Place the matchrmarks on both the mounting case and ring gear.

(b) Remove the twelve bolts.



(c) Using a plastic hammer, tap out the ring gear.



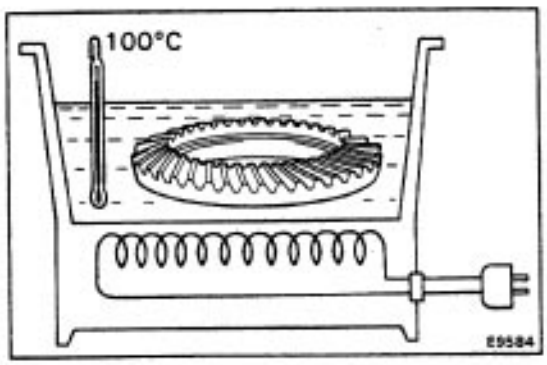
INSPECTION OF RING GEAR MOUNTING CASE

1. CHECK RING GEAR MOUNTING CASE RUNOUT

HINT: Perform only when the limit is exceeded in the ring gear runout inspection.

(a) Using a dial indicator, check the mounting case

Maximum runout: 0.1 mm (0.004 in.)



ASSEMBLY OF RING GEAR MOUNTING CASE

1. INSTALL RING GEAR

(a) Clean the contact surface of the differential case.

(b) Heat the ring gear to about 100˚C (21 20F) in an oil bath.

(e) Clean the contact surface of the ring gear with cleaning solvent.

(d) Then quickly install the ring gear on the differential case.

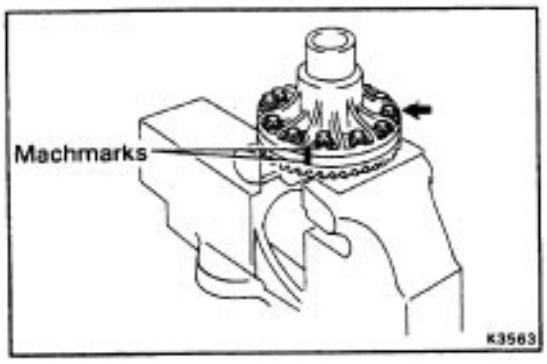
(e) Align the marks on the ring gear and differential case

NOTICE: Do not heat the ring gear more than 11O˚C (230˚F).

(f) Coat the ring gear set bolts with gear oil.

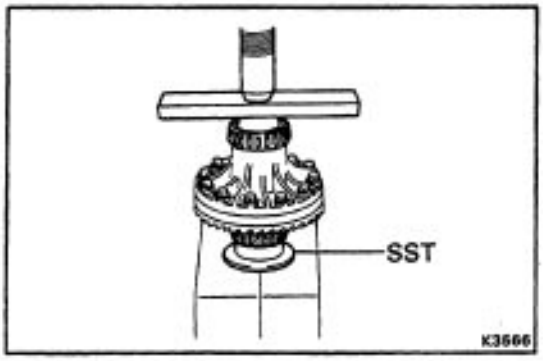
(g) Install and torque the set bolts uniformly, a little at a time.

Torque: 985 kg–cm (71 ft–lb, 97 N–m)



2. CHECK RING GEAR RUNOUT

(See page MT– 181)



3. INSTALL MOUNTING CASE SIDE BEARING

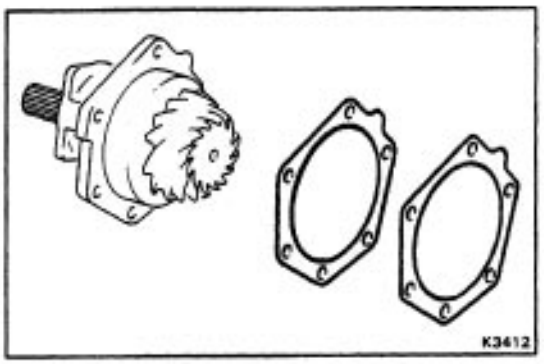
Using SST and a press, install the two side bearing.

SST 09316–20011

NOTE: Bearing inner diameter

Ring gear tooth side 55 mm (2.2 in.)

Ring gear back side 54 mm (2.1 in.)



ASSEMBLY OF TRANSFER COMPONENT PARTS

(See page MT–169**)**

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

1. ADJUST RING GEAR BACKLASH

(a) Install the adjust shim to the driven pinion bearing cage assembly.

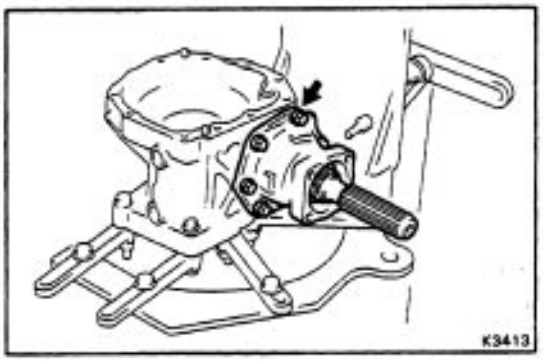
HINT: First install a shim of the same thickness as before.

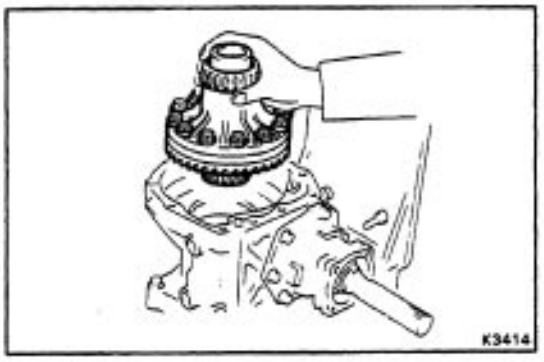
(b) Install the driven pinion bearing cage assembly to the transfer left case.

(e) Install and torque the six bolts.

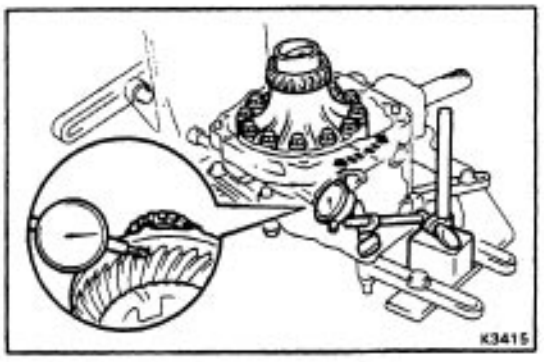
Torque: 400 kg–cm (29 ft–lb, 39 N–m)

HINT: Do not install the O–ring.





(d) Install the ring gear mounting case assembly to the transfer left case.



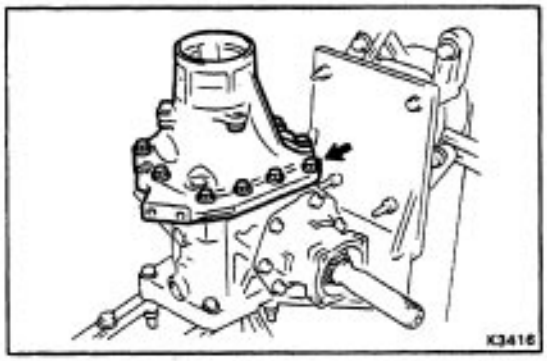
(e) Using a dial indicator, measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

(f) Referring to the table below, select the plate washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

HINT: The backlash will change about 0.02 mm (0.0008 in.) with each shim thickness.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
1	2.13 (0.0839)	13	2.49 (0.0980)
2	2.16 (0.0850)	14	2.52 (0.0980)
3	2.19 (0.0862)	15	2.55 (0.1004)
4	2.22 (0.0874)	16	2.58 (0.1016)
5	2.25 (0.0886)	17	2.61 (0.1028)
6	2.28 (0.0898)	18	2.64 (0.1039)
7	2.31 (0.0909)	19	2.67 (0.1051)
8	2.34 (0.0921)	20	2.70 (0.1063)
9	2.37 (0.0933)	21	2.73 (0.1075)
10	2.40 (0.0945)	22	2.76 (0.1087)
11	2.43 (0.0957)	23	2.79 (0.1098)
12	2.46 (0.0968)	24	2.82 (0.1110)

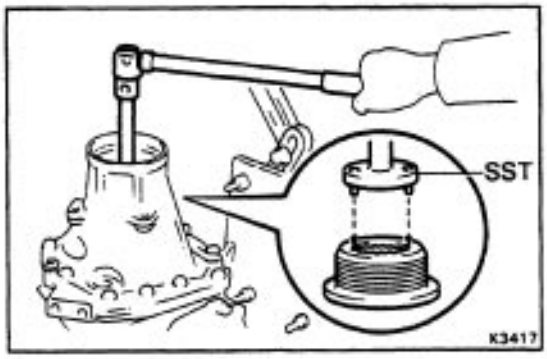


2. ADJUST TOTAL PRELOAD

(a) Install the transfer right case.

(b) Install and torque the twelve bolts.

Torque: 450 kg–cm (33 ft–lb, 44 N–m)



(c) Adjust the total preload by tightening the bearing adjusting nut.

Using SST, tightening the adjusting nut.

SST 09318–20010

HINT: Measure the preload while tightening the adjusting nut a little at a time.

(d) Using SST and a spring tension gauge, measure the total preload.

SST 09326–20011

(Preload at starting):

New bearing

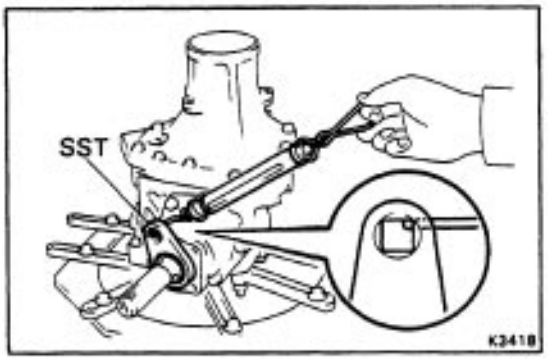
Add driven pinion preload

1.3– 1.4 kg (2.9–3.1 lb, 12.7– 13.7 N)

Reused bearing

Add driven pinion preload

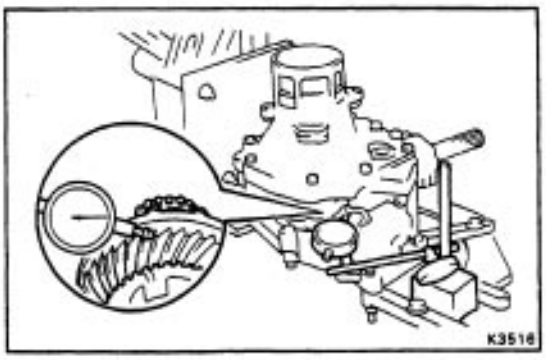
0.5–0.9kg (1.1 –2.0lb,4.9–8.8 N)



HINT: Turn the output shaft counterclockwise and clockwise several times.

(e) When the standard value for total preload is exceeded, remove the transfer right case, push in the adjusting nut and outer race.

Again adjust the total preload.

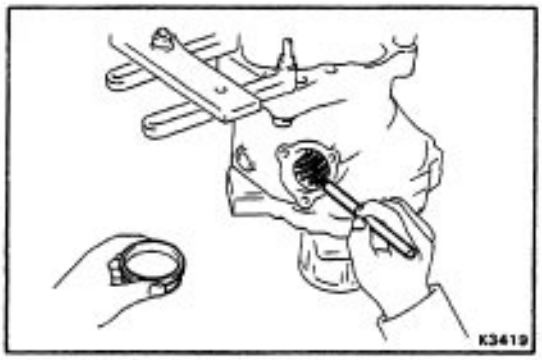


3. CHECK RING GEAR BACKLASH

(a) Using a dial indicator, measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

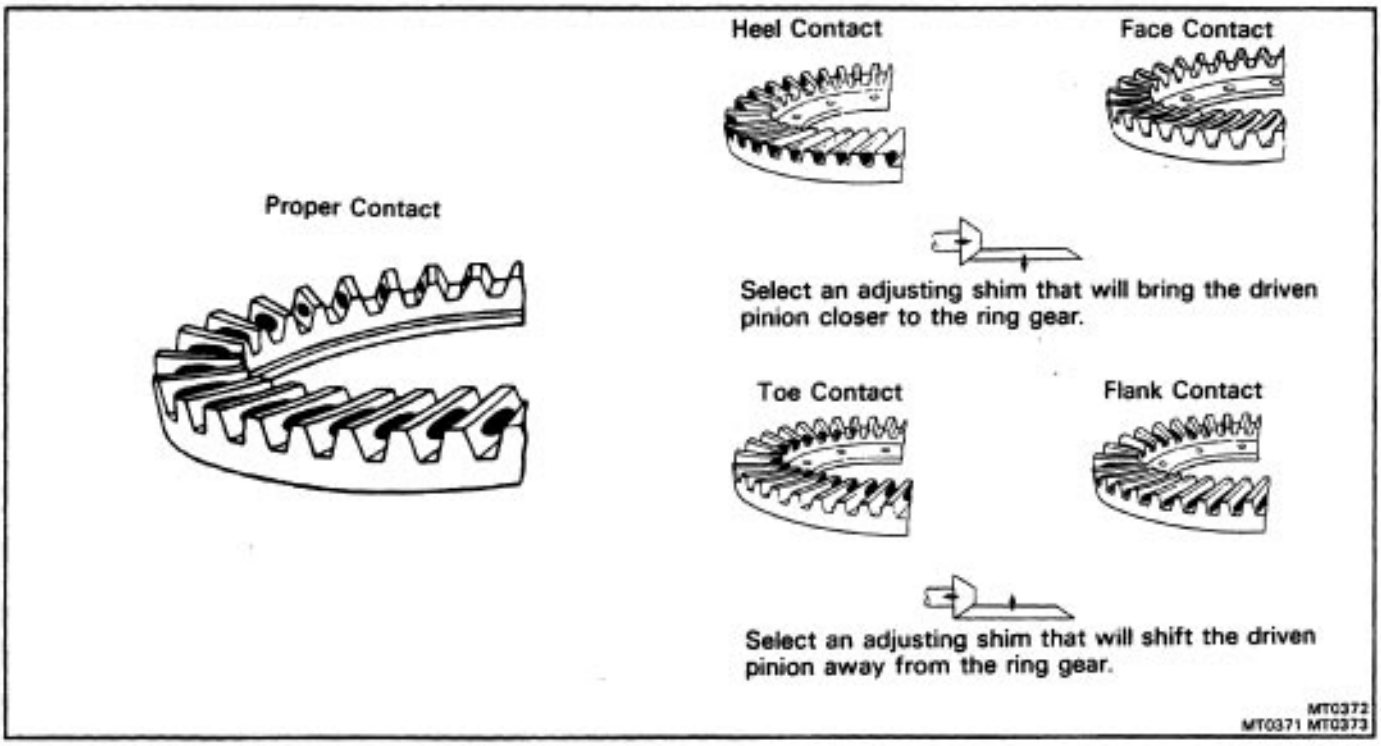
(b) When the backlash is outside the standard value, select a different plate washer to the one selected step 2. Again adjust the backlash and total preload.



4. CHECK TOOTH CONTACT

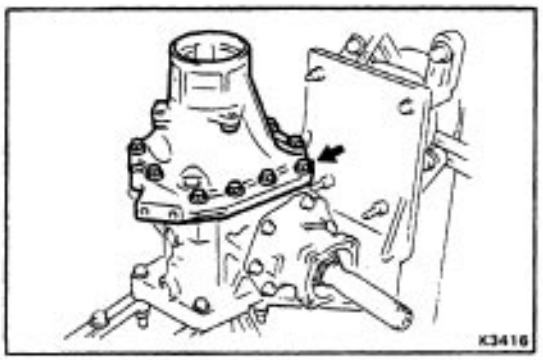
(a) Coat 3 or 4 teeth at four different position on the ring gear with red lead.

(b) Rotate the ring gear, inspect the teeth pattern.



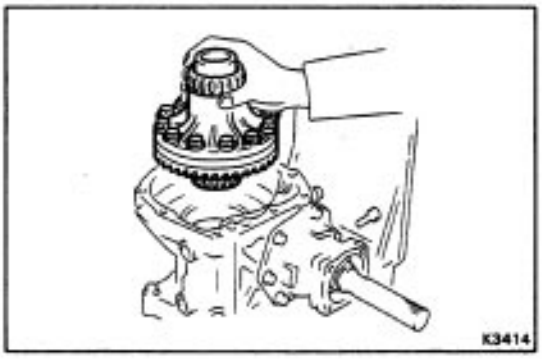
(e) If the teeth are not contacting properly, again select the proper shim and plate.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	0.30 (0.0118)	F	0.45 (0.0177)
B	0.33 (0.0130)	G	0.48 (0.0189)
C	0.36 (0.0142)	H	0.51 (0.0201)
D	0.39 (0.0154)	J	0.54 (0.0213)
E	0.42 (0.0165)	K	0.57 (0.0224)

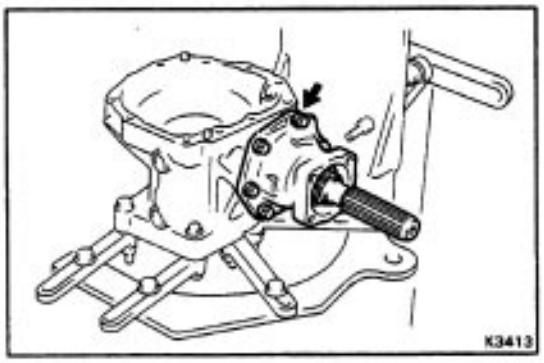


5. REMOVE RING GEAR MOUNTING CASE ASSEMBLY

(a) Remove the twelve bolts and transfer right case.

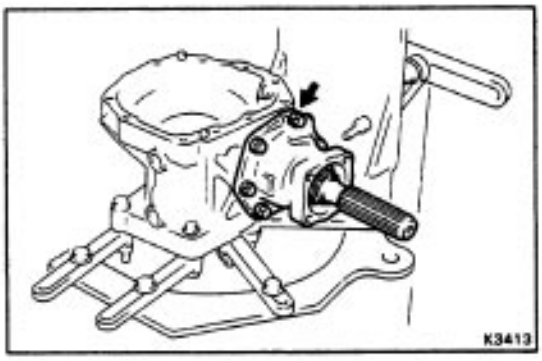


(b) Remove the ring gear mounting case assembly.



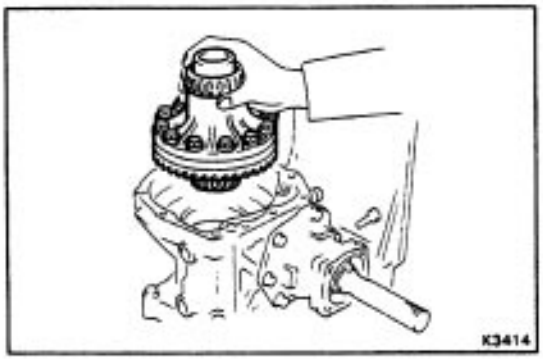
6. REMOVE DRIVEN PINION BEARING CAGE ASSEMBLY

(a) Remove the six bolts and bearing cage assembly.

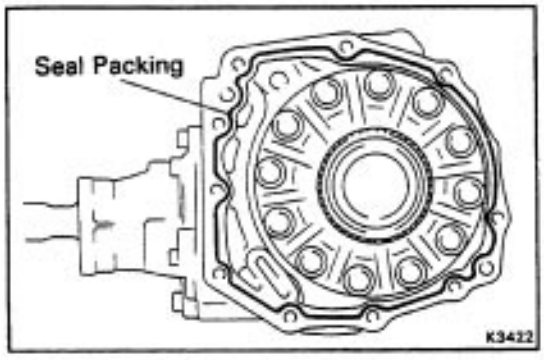


7. INSTALL DRIVEN PINION BEARING CAGE ASSEMBLY

(a) Coat the O–ring with gear oil.
(b) Install the O–ring to the driven pinion bearing cage.
(c) Install the driven pinion bearing cage with adjust shim (Previously selected) to the transfer left case.
(d) Install and torque the six bolts.
Torque: 400 kg–cm (29 ft–lb. 39 N–m)



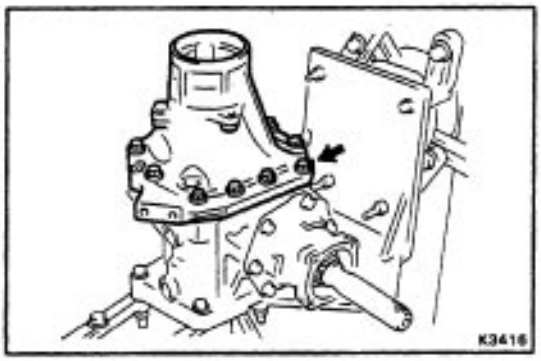
8. INSTALL RING GEAR MOUNTING CASE ASSEMBLY



9. INSTALL TRANSFER RIGHT CASE

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transfer left case or right case.
(b) Apply seal packing to the transfer left case as shown in the figure.
Seal packing: Part No.08826–00090, THREE BOND 1281 or equivalent

HINT: Install the transfer right case as soon as the seal packing is applied.



(c) Apply sealant to the bolt threads.

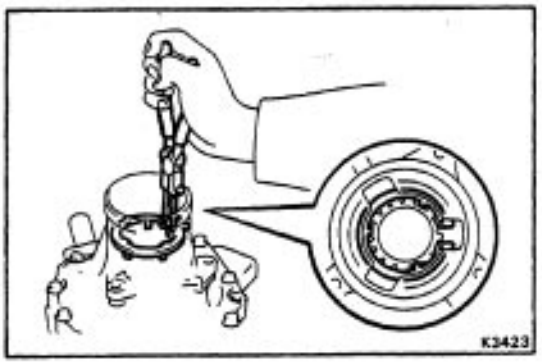
Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 OR EQUIVALENT

(d) Install and torque the twelve bolts.

Torque: 450 kg–cm (33 ft–lb, 44 N–m)

10. CHECK TOTAL PRELOAD

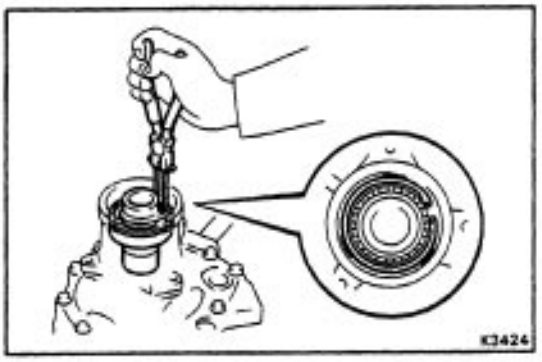
(See page MT– 184)



11. INSTALL ADJUSTING NUT LOCK PLATE

Using snap ring pliers, install the lock plate so that the projection from the lock plate fits properly into the groove of the adjusting nut.

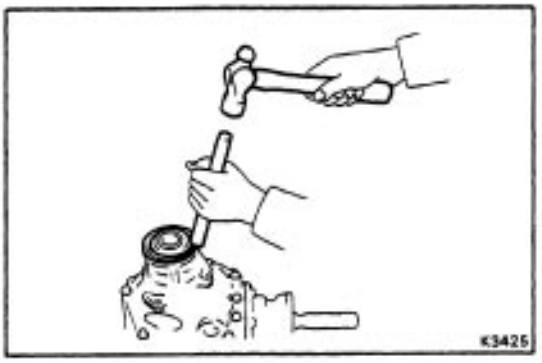
HINT: Choose one of the two types of lock plate can be installed, tighten the adjusting nut to the minimum limit.



12. INSTALL SIDE GEAR SHAFT SIDE GEAR SHAFT HOLDER

(a) Install the side gear shaft holder to the transfer right case.

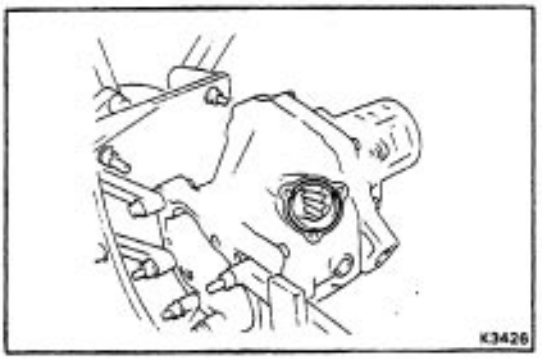
(b) Using snap ring pliers, install the snap ring.



13. INSTALL OIL SEAL

(a) Coat the lip of the oil seal with MP grease.

(b) Using a brass bar and hammer, drive in a new oil seal.



14. INSTALL TRANSFER INSPECTION HOLE COVER

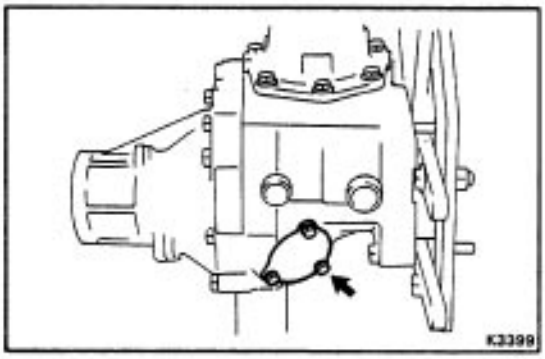
(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of transfer left case or transfer inspection hole cover.

(b) Apply seal packing to the transfer left case as shown in the figure.

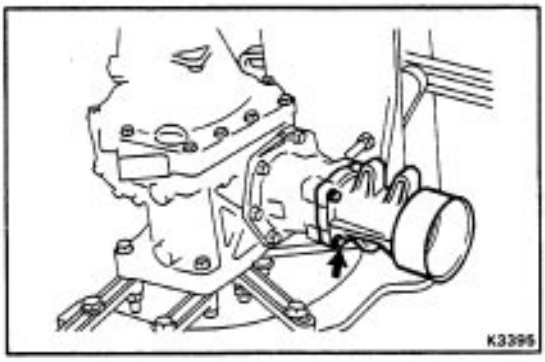
Seal packing: Part No.08826–00090, THREE BOND

1281 or equivalent

HINT: Install the transfer inspection hole cover as soon as the seal packing is applied.

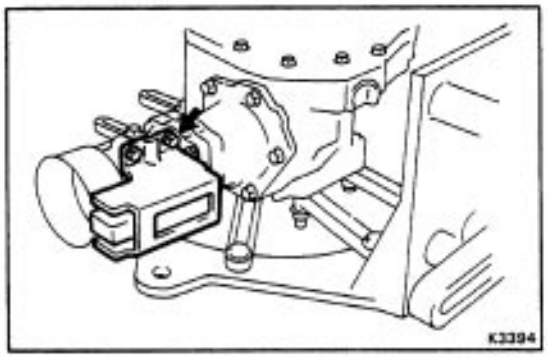


(c) Install and torque the three bolts.
Torque: 160 kg–cm (12 ft–lb, 16 N–M)



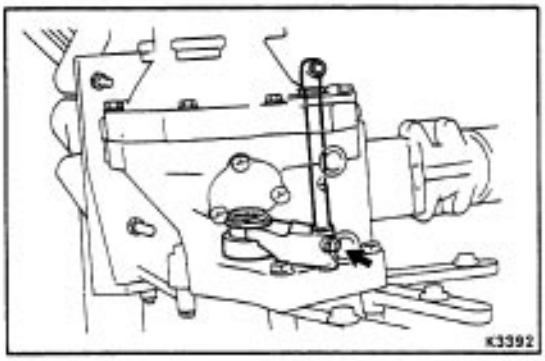
15. INSTALL EXTENSION HOUSING

(a) Coat the O–ring with gear oil.
(b) Install the O–ring to the extension housing.
(c) Install the extension housing to the driven pinion bearing cage.
(e) Install and torque the four bolts.
Torque: 260kg–cm (19 ft–lb, 25 N–m)



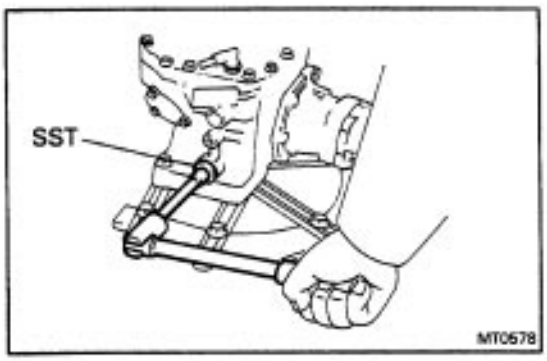
16. INSTALL DYNAMIC DANPER

Install and torque the four bolts.
Torque: 260 kg–cm (19 ft–lb, 25 N–m)

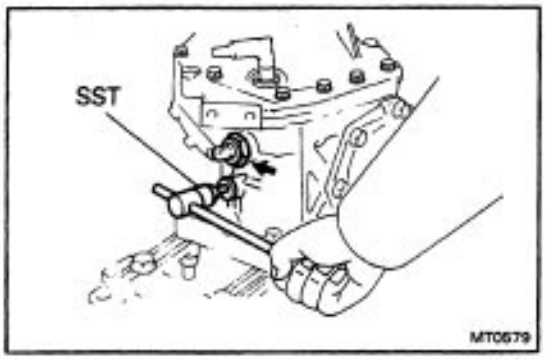


17. INSTALL DIFFERENTIAL LOCK SHIFT FORK SHAFT

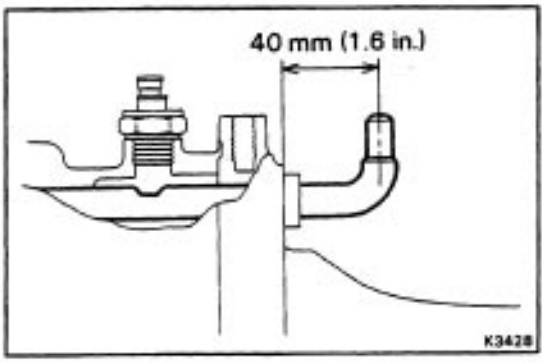
(a) Install the differential lock sleeve with shift fork.
(b) Install and torque the set bolt.
Torque: 160 kg–cm (12 ft–lb, 16 N–m)



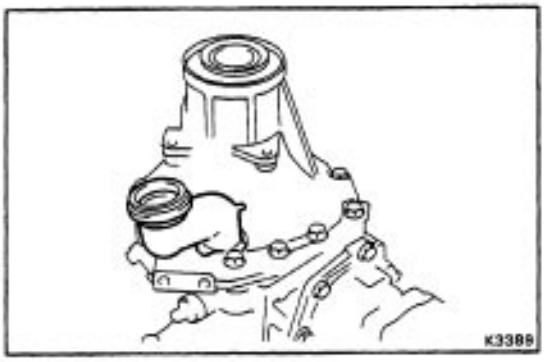
(c) Using SST, install and torque the plug.
SST 09043–36100
Torque: 400 kg–cm (29 ft–lb, 39 N–m)



(d) Install and torque the indicator switch.
Torque: 400 kg–cm (29 ft–lb, 39 N–m)
(e) Using SST, install and torque the plug.
SST 09313–30021
Torque: 250 kg–cm (18 ft–lb, 25 N–m)

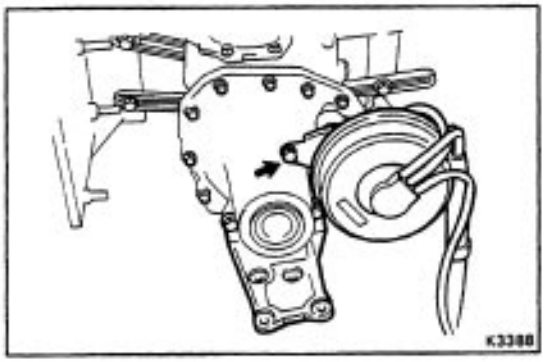


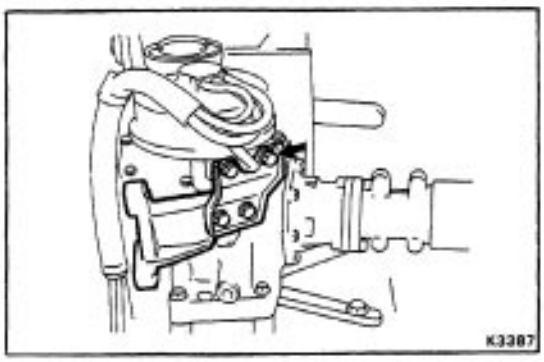
(e) Set the shift fork shaft at the as shown in the figure.



1s. INSTALL DUST BOOT

19. INSTALL TRANSFER VACUUM ACTUATOR
(a) Install the vacuum actuator.
(b) Install and torque the three bolts.





(c) Install the stiffener center plate and actuator bracket.
(d) Install and torque the four bolts.
Torque: 380 kg–cm (27 ft–lb, 37 N–m)

PROPELLER SHAFT

PRECAUTION

Be careful not to grip the propeller shaft tube too tightly in the vise as this will cause deformation.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Noise	Sleeve yoke spline worn	Replace sleeve yoke	PR–4
	Center support bearing worn	Replace center support bearing	PR–4
	Spider bearing worn or stuck	Replace propeller shafts	PR–4
Vibration	Propeller and intermediate shafts runout	Replace shafts	PR–4
	Propeller shafts imbalance	Balance propeller shafts	
	Front flange runout	Replace front flange	PR–7
	Rear flange runout	Replace rear flange	PR–6
	Cross groove joint stuck or damaged	Replace cross groove joint	PR–8
	Transfer extension housing rear bushing worn		
	Sleeve yoke spline stuck	Replace sleeve yoke	PR–4

PRECAUTION

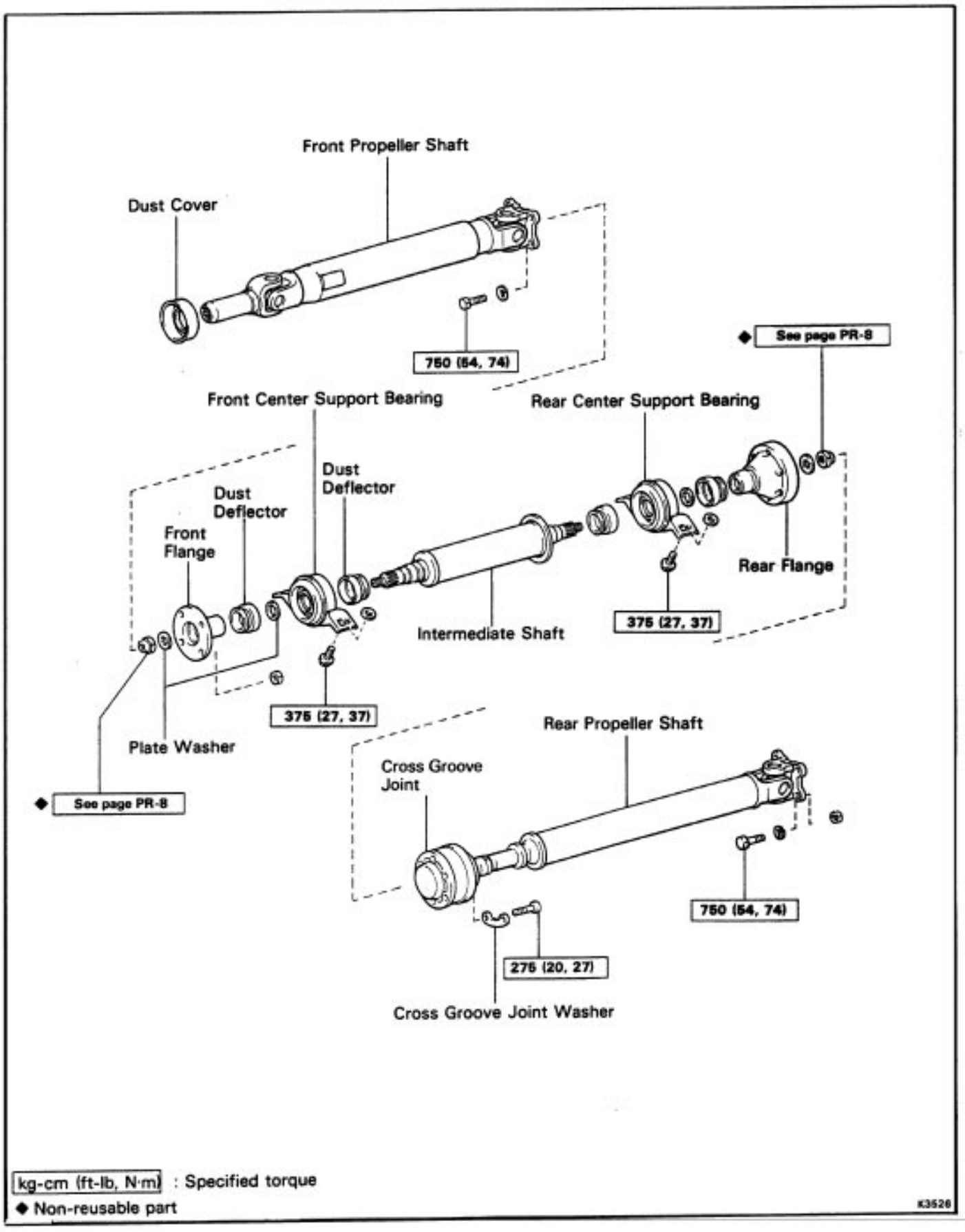
Be careful not to grip the propeller shaft tube too tightly in the vise as this will cause deformation.

TROUBLESHOOTING

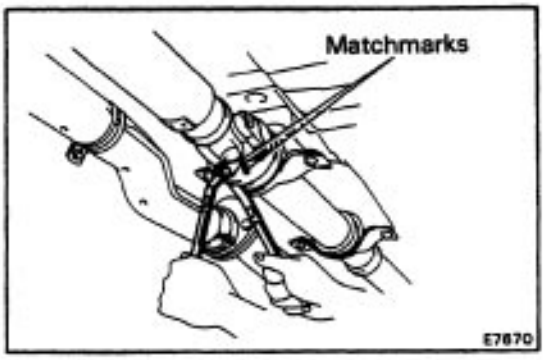
Problem	Possible cause	Remedy	Page
Noise	Sleeve yoke spline worn	Replace sleeve yoke	PR–4
	Center support bearing worn	Replace center support bearing	PR–4
	Spider bearing worn or stuck	Replace propeller shafts	PR–4
Vibration	Propeller and intermediate shafts runout	Replace shafts	PR–4
	Propeller shafts imbalance	Balance propeller shafts	
	Front flange runout	Replace front flange	PR–7
	Rear flange runout	Replace rear flange	PR–6
	Cross groove joint stuck or damaged	Replace cross groove joint	PR–8
	Transfer extension housing rear bushing worn		
	Sleeve yoke spline stuck	Replace sleeve yoke	PR–4

PROPELLER SHAFT

COMPONENTS



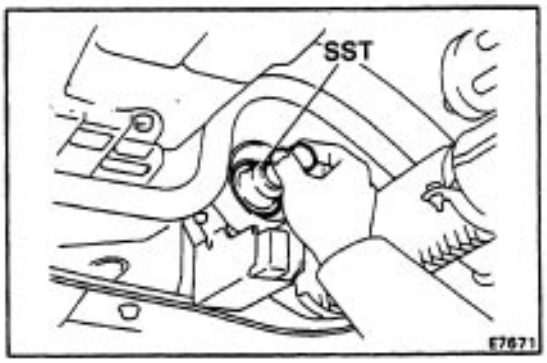
REMOVAL OF PROPELLER SHAFT



1. DISCONNECT FRONT PROPELLER SHAFT

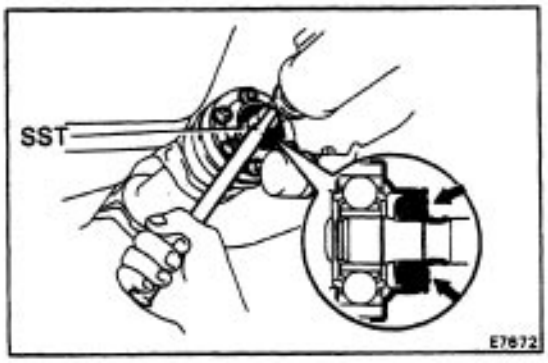
(a) Place the matchmarks on the both flanges.

(b) Remove the four bolts, washers and nuts.



(c) Pull the yoke from the transfer.

(d) Insert SST in the transfer to prevent oil leakage.
SST 09325–20010

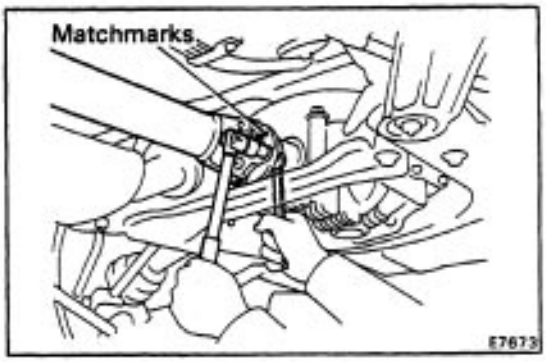


2. LOOSEN CROSS GROOVE JOINT SET BOLTS

(a) Depress the brake pedal and hold it.

(b) Using a SST, loosen the cross groove joint set bolts 1 /2 turn.
SST 09313–30021

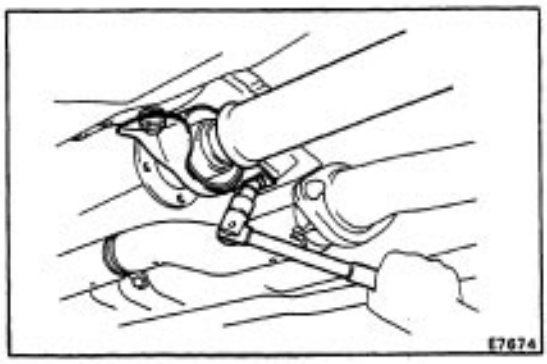
HINT: Put a piece of cloth or an equivalent into the inside of the universal joint cover.



3. REMOVE INTERMEDIATE SHAFT AND REAR PROPELLER SHAFT

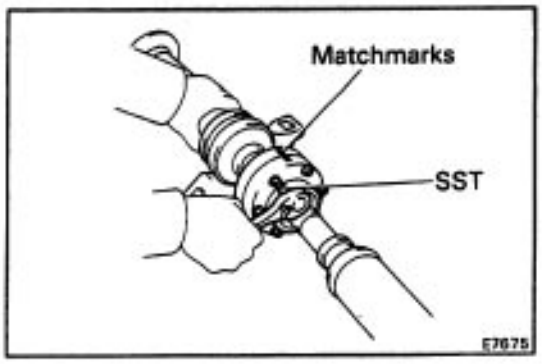
(a) Place the matchmarks on the both flanges.

(b) Remove the bolts, nuts and washers.



(e) Remove the two bolts, front center support bearing and washers.

(d) Remove rear center support bearing and washers.



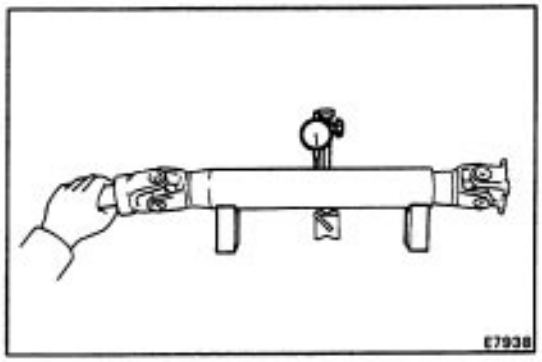
4. SEPARATE INTERMEDIATE SHAFT AND REAR PROPELLER SHAFT

(a) Place the matchmarks on the joint and flange.

HINT: Do not place the matchmarks with a punch.

(b) Using SST, remove the six bolts and three washers. Then separate intermediate shaft and rear propeller shaft.
SST 09313–30021

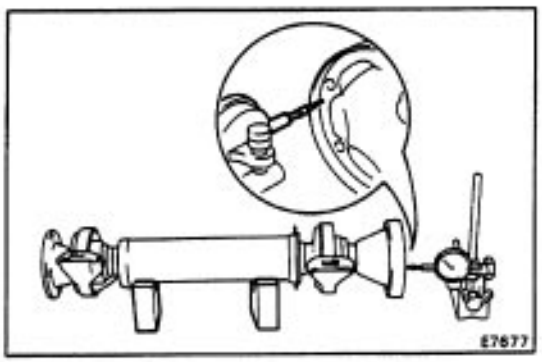
INSPECTION OF PROPELLER SHAFT



1. INSPECT PROPELLER AND INTERMEDIATE SHAFTS RUNOUT

If shaft runout is greater than maximum, replace the shaft.

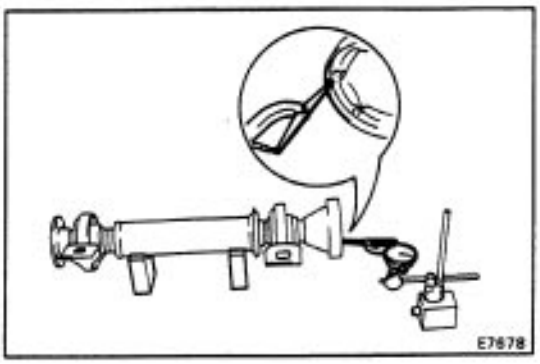
Maximum runout: 0.8 mm (0.031 in.)



2. INSPECT INTERMEDIATE SHAFT FLANGE RUNOUT

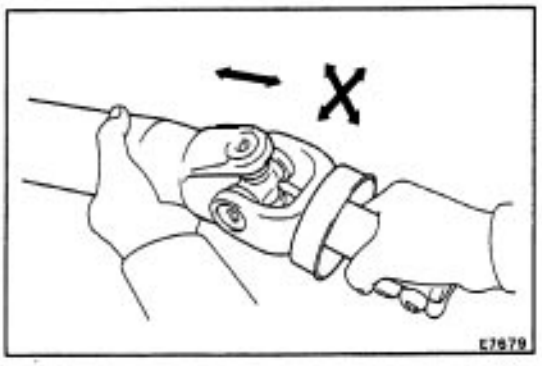
(a) Inspect the front side of intermediate shaft flange runout.

Maximum runout: 0.1 mm (0.004 in.)



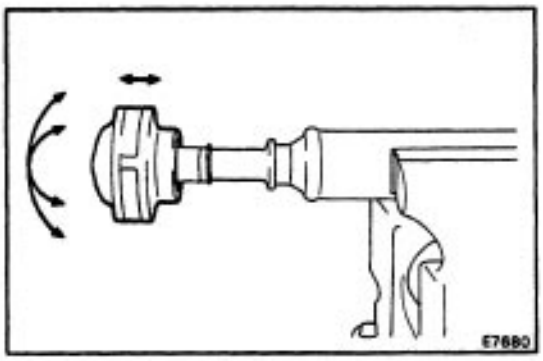
(b) Inspect the rear side of intermediate shaft flange runout in vertical direction.

Maximum runout: 0.1 mm (0.004 in.)



3. INSPECT SPIDER BEARINGS

Check the spider bearing axial play by turning the flange while holding the shaft tightly.



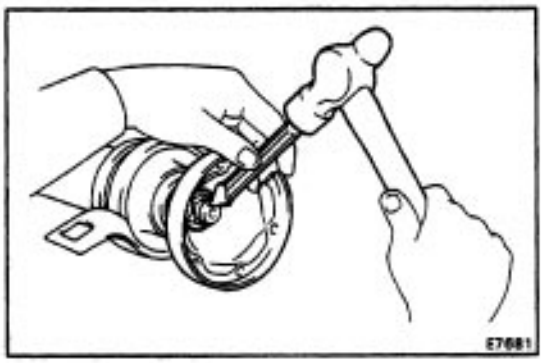
4. INSPECT CROSS GROOVE JOINT

Check the joint smooth play by turning the joint in directions as shown. And check the crack or damage or grease leakage of boot. If problem is found, replace the joint.

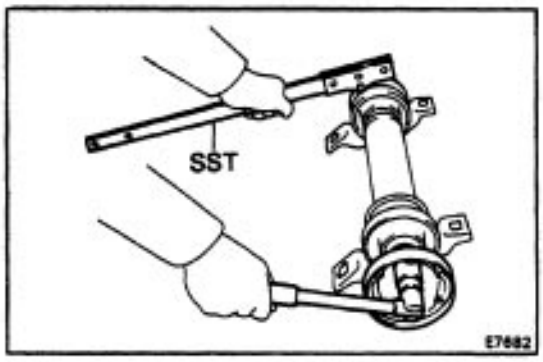
DISASSEMBLY OF PROPELLER SHAFT

1. REMOVE REAR CENTER SUPPORT BEARING

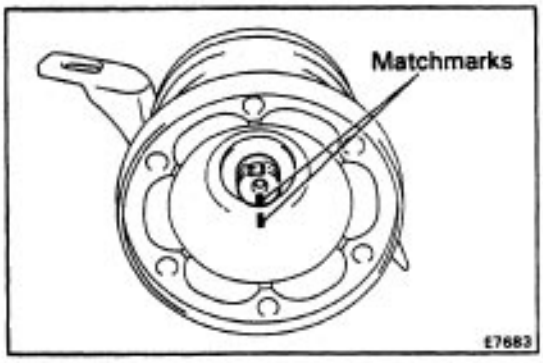
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the front flange, remove the nut and plate washer.
SST 09330–00021

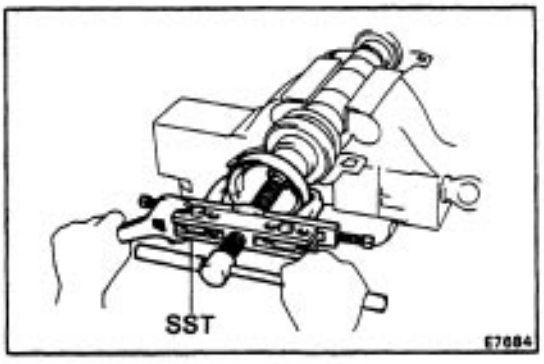


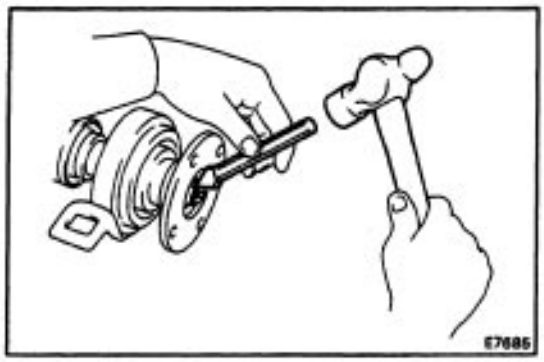
(c) Place the matchmarks on the rear flange and shaft.



(d) Using SST, remove the rear flange.
SST 09950–20017

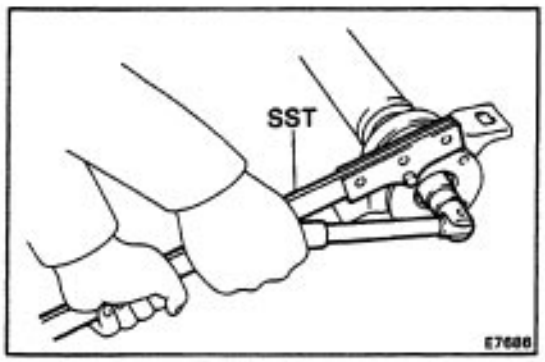
(e) Remove the rear center support bearing and plate washer.



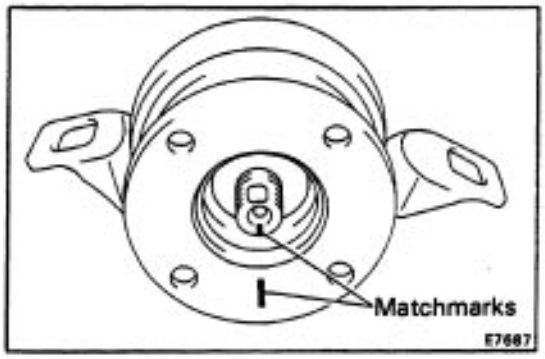


2. REMOVE FRONT CENTER SUPPORT BEARING

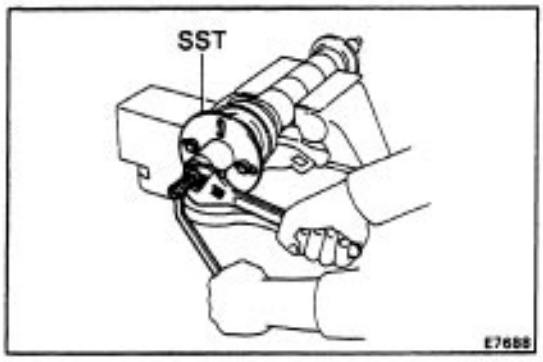
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut and plate washer.
SST 09330–00021

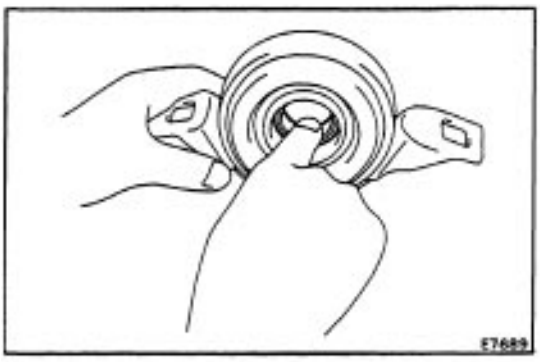


(c) Place the matchmarks on the flange and the shaft.



(d) Using SST, remove the flange.
SST 09557–22022

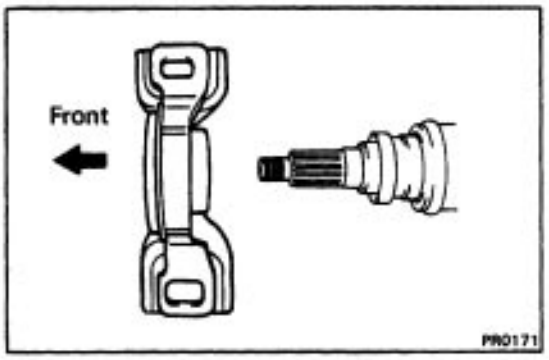
(e) Remove the front center support bearing and plate washer.



3. INSPECT CENTER SUPPORT BEARING

(a) Turning the bearing by hand while applying force in the rotation direction. Check the bearing smooth play.

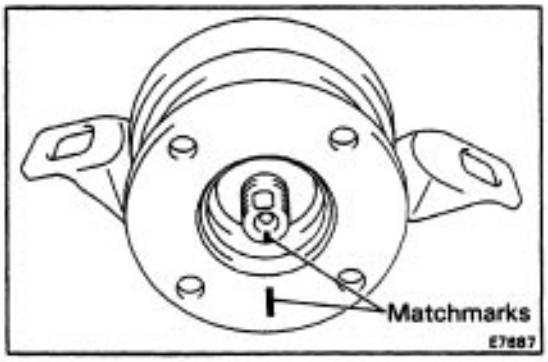
(b) Check that there are no cracks and no damages about both seals.



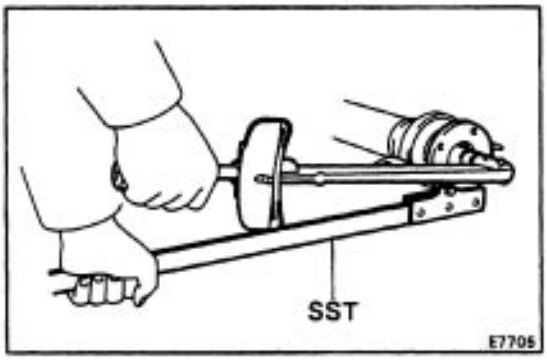
ASSEMBLY OF PROPELLER SHAFT

1. INSTALL FRONT CENTER SUPPORT BEARING

(a) Set the front center support bearing on the intermediate shaft as shown.



(b) Install the plate washer to the intermediate shaft.
(c) Align the matchmarks on the flange and shaft and install the flange on the shaft.



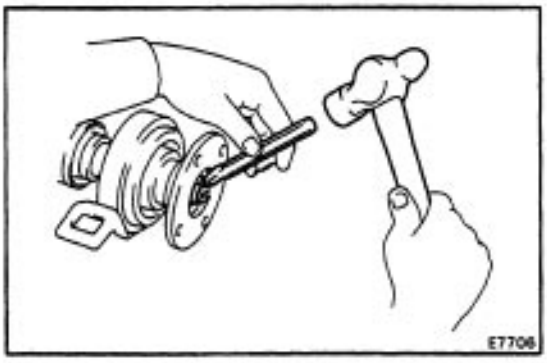
(d) Using SST to hold the flange, press the bearing into position by tightening down a new nut and washer.

SST 09330–0002

Torque: 1,850 kg–cm (134 ft–lb, 181 N–m)

(e) Loosen the nut.
(f) Torque the nut again.

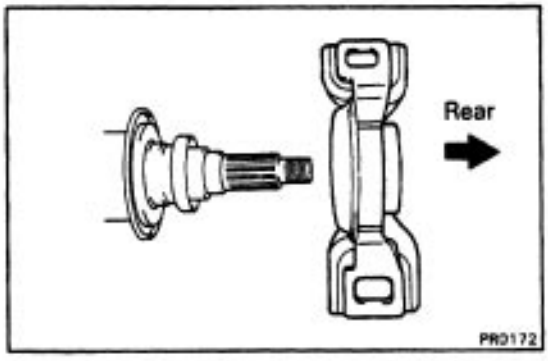
Torque: 700 kg–cm (51 ft–lb, 69 N–m)

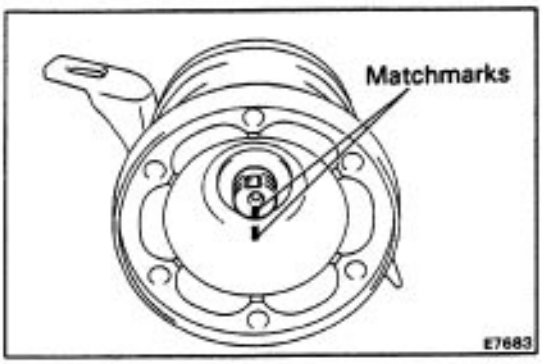


(g) Using a hammer and chisel, stake the nut.

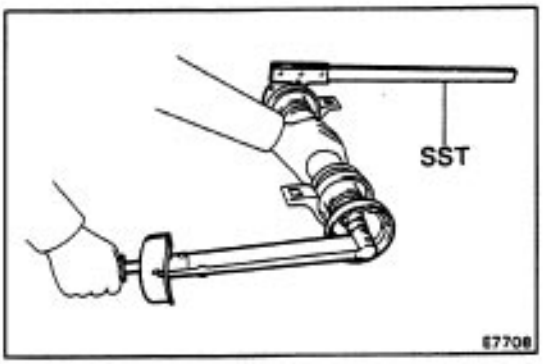
2. INSTALL REAR CENTER SUPPORT BEARING

(a) Set the rear center support bearing on the intermediate shaft as shown.

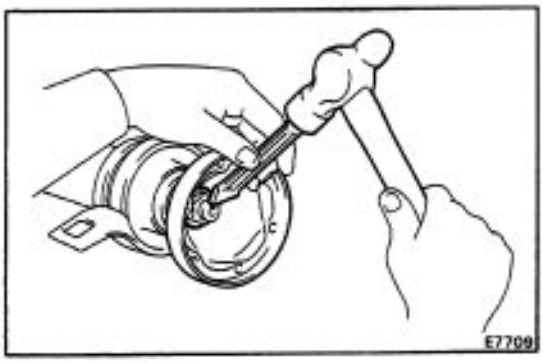




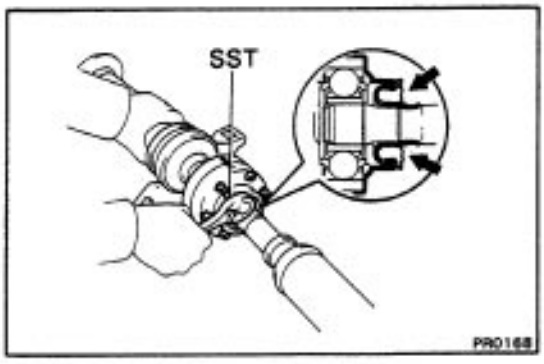
(b) Install the plate washer to the intermediate shaft.
(c) Align the matchmarks on the flange and shaft and place the flange on the shaft.



(d) Using SST to hold the flange, press the bearing into position by tightening down a new nut and washer.
SST 09330–00021
Torque: 1,850 kg–cm (134 ft–lb, 181 N–m)
(e) Loosen the nut.
(f) Torque the nut again.
Torque: 700 kg–cm (51 ft–lb, 69 N–m)

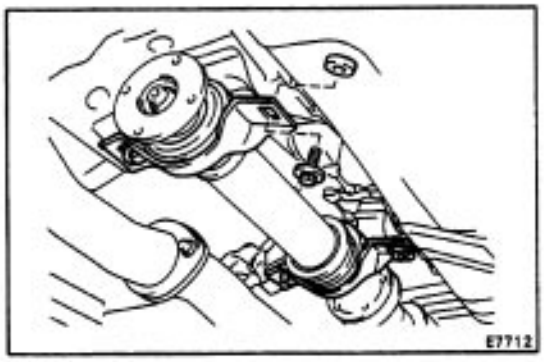


(g) Using a hammer and chisel, stake the nut.

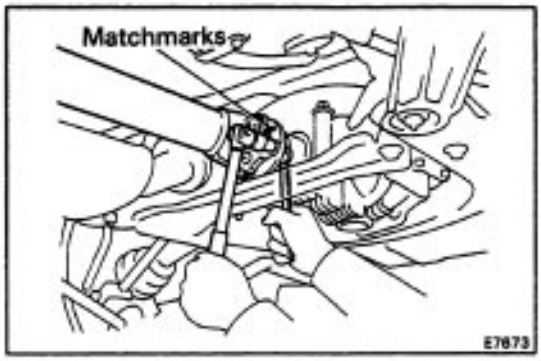


3. INSPECT CROSS GROOVE JOINT
(See step 4 on page PR–6)
4. CONNECT INTERMEDIATE SHAFT WITH REAR PROPELLER SHAFT
Using SST, tighten the six bolts and three washers temporarily.
SST 09313–30021
HINT: Put a piece of cloth or an equivalent into the inside of the universal joint cover.

INSTALLATION OF PROPELLER SHAFT



1. INSTALL CENTER SUPPORT BEARING TEMPORARILY

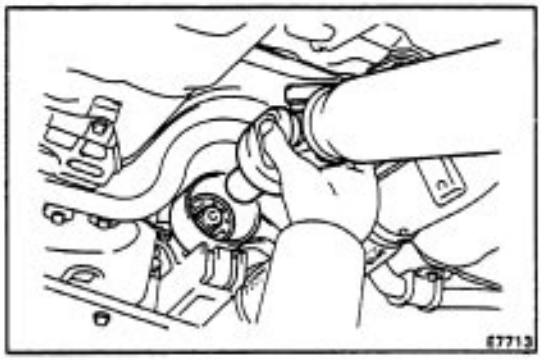


2. INSTALL REAR PROPELLER SHAFT

(a) Align the matchrmarks on the flanges and connect the shaft with the four bolts, washers and nuts.

(b)Torque the bolts and nuts.

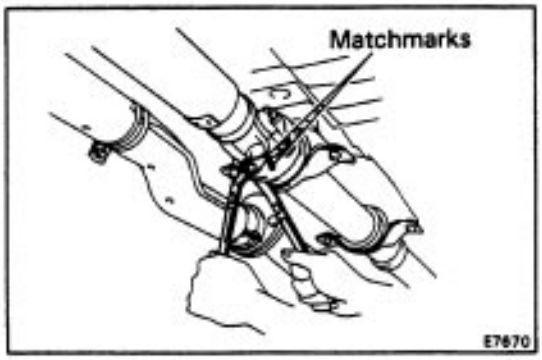
Torque: 750 kg–cm (54 ft–lb, 74 N–m)



3. INSTALL FRONT PROPELLER SHAFT

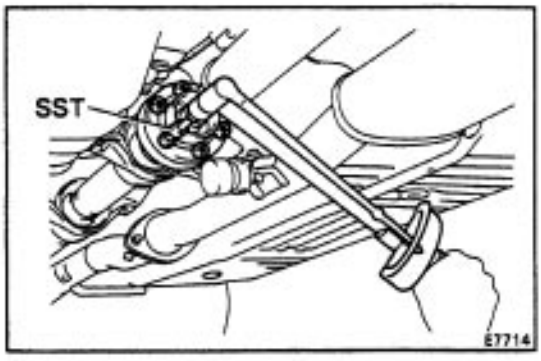
(a) Remove SST from the transfer.
SST 09325–20010

(b) Insert the yoke into the transfer.



(c) Align the matchmarks on the both flanges, then install the bolts, washers and nuts.

Torque: 750 kg–cm (54 ft–lb, 74 N–m)

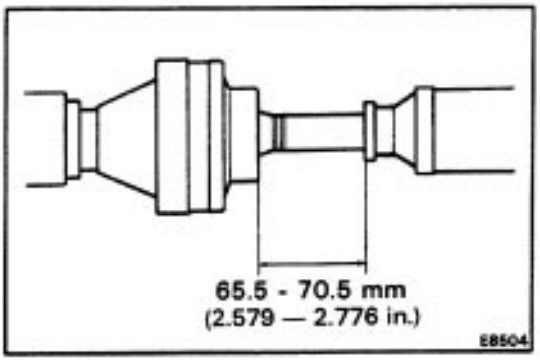


4. TIGHTEN CROSS GROOVE JOINT SET BOLTS

(a) Depress the brake pedal and hold it.

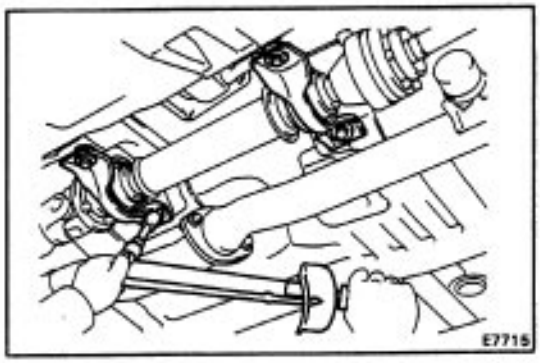
(b) Using SST, tighten the cross groove joint set bolts.
SST 09313–30021

Torque: 275 kg–cm (20 ft–lb. 27 N–m)



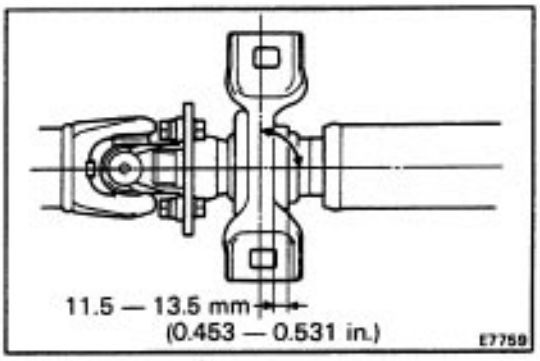
5. INSTALL CENTER SUPPORT BEARING

(a) With a vehicle unladen condition, adjust the intervals between the rear side of boot cover and the shaft as shown in the illustration.



(b) With the same condition, adjust the intervals between the rear side of center bearing housing and the rear side of cushion at 11.5 – 13.5 mm (0.453 in. – 0.531 in.) as shown in the illustration below, then torque the bolts.

Torque: 375 kg–cm (27 ft–lb, 37 N–m)



(c) Check that the center line of the bracket is at right angles at the shaft axial direction.

REAR AXLE AND SUSPENSION

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Wanders/pulls	Tires worn or improperly inflated	Replace tires or inflate to proper pressure	RA–3
	Alignment incorrect	Check alignment	RA–3
	Hub bearing worn	Replace hub bearing	RA–5,12
	Rear suspension parts loose or broken	Tighten or replace suspension parts	
Bottoming	Vehicle overloaded	Check loading	
	Shock absorbers worn out	Replace shock absorbers	RA–50
	Springs weak	Replace springs	RA–50
Sways/pitches	Tires improperly inflated	Inflate tires to proper pressure	RA–3
	Stabilizer bar bent or broken	Inspect stabilizer bar	RA–60, 63
	Shock absorber worn out	Replace shock absorber	RA–50
Abnormal tire wear	Tire improperly inflated	Inflate tires to proper pressure	RA–3
	Shock absorber worn out	Replace shock absorbers	RA–50
	Alignment incorrect	Check camber and toe–in	RA–3
	Suspension parts worn	Replace suspension parts	RA–5,12, 50,62

REAR WHEEL ALIGNMENT

1. MAKE FOLLOWING CHECKS AND CORRECT ANY PROBLEMS

(a) Check the tires for wear, size and proper inflation pressure.

Cold tire inflation pressure:
FWD/SV21 and 4WD 2.1 kg/cm2 (30 psi, 206 kPa)
FWD/VZV21 1.9 kg/cm2 (27 psi, 186 kPa)

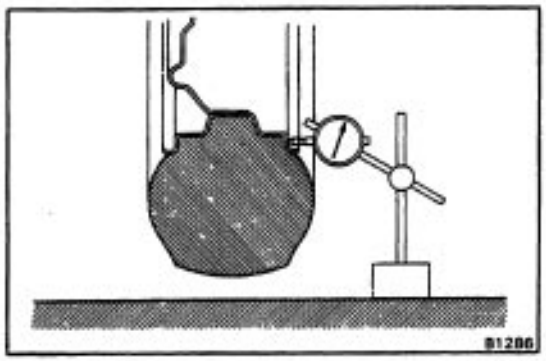
(b) Check the front wheel bearings for looseness.

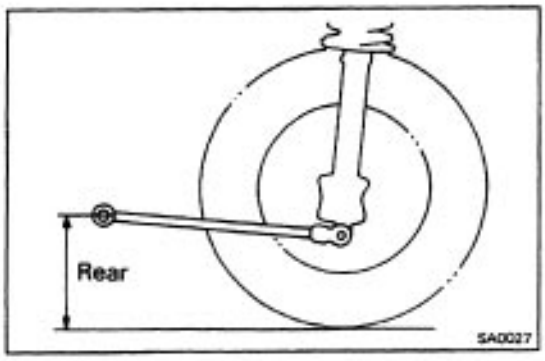
(e) Check the wheel runout.

Lateral runout: Less than 1.0 mm (0.039 in.)

(d) Check the front suspension for looseness.

(e) Check that the front shock absorber function properly by using the standard bounce test.





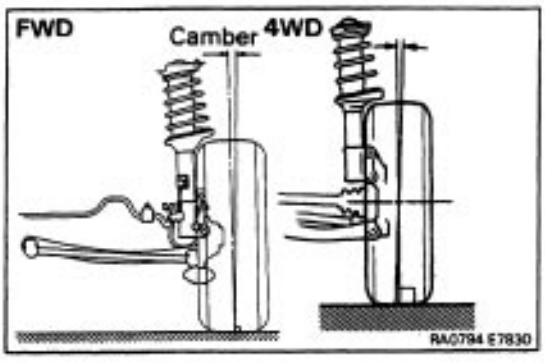
2. MEASURE CHASSIS GROUND CLEARANCE

Chassis ground clearance: m m (in.)

	Sedan	Wagon
FWD/SV21	260 (10.24)	290 (11.42)
4WD	256 (10.08)	—
FWD/VZV21	254 (10.00)	284 (11.18)

If the clearance of the vehicle is not standard try to level by locking it down. If still not correct, check for bad springs or suspension parts.

HINT: Before inspecting wheel alignment, adjust chassis ground clearance to specification.



3. INSPECT CAMBER

Camber: Inspection standard

FWD	(Sedan)	−35' ± 30'
	(Wagon)	−5' ± 30'
4WD		−30' ± 30'

Left–right error
30'

4. INSPECT TOE–IN

(See page FA–5)

Toe–in: Inspection standard

mm (in.)

FWD/SV21	4 ± 2 (0.16 ± 0.08)
4WD	3 ± 2 (0.12 ± 0.08)
FWD/VZV21	4 ± 2 (0.16 ± 0.08)

5. ADJUST TOE–IN

(a) Measure the distance between each wheel disc and corner of the cam bracket and confirm that both are the same.

Left–right error: Less than 3 mm (0.12 in.)

If the left–right error is greater than 3 mm (0.12 in.) adjust following the procedures below.

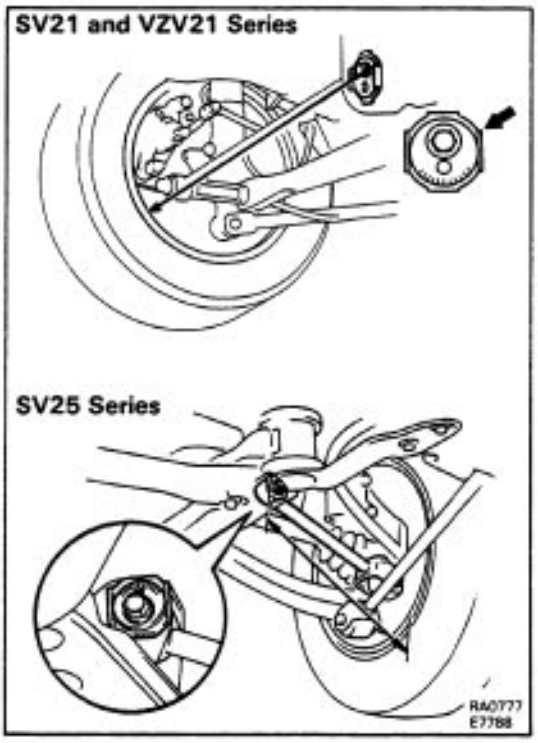
- If the toe–in is out of the standard toward toe–out side, lengthen the shorter arm by the cam.
- If the toe–in is out of the standard toward toe–in side, shorten the longer arm by the cam.

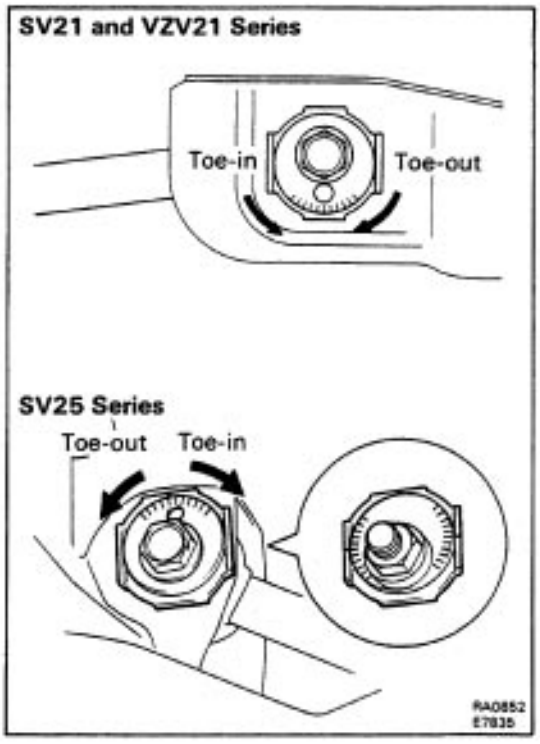
(b) Measure the toe–in.

Toe–in: Inspection standard mm (in.)

mm (in.)

FWD/SV21	4 ± 1 (0.16 ± 0.04)
4WD	3 ± 1 (0.12 ± 0.04)
FWD/VZV21	4 ± 1 (0.16 ± 0.04)



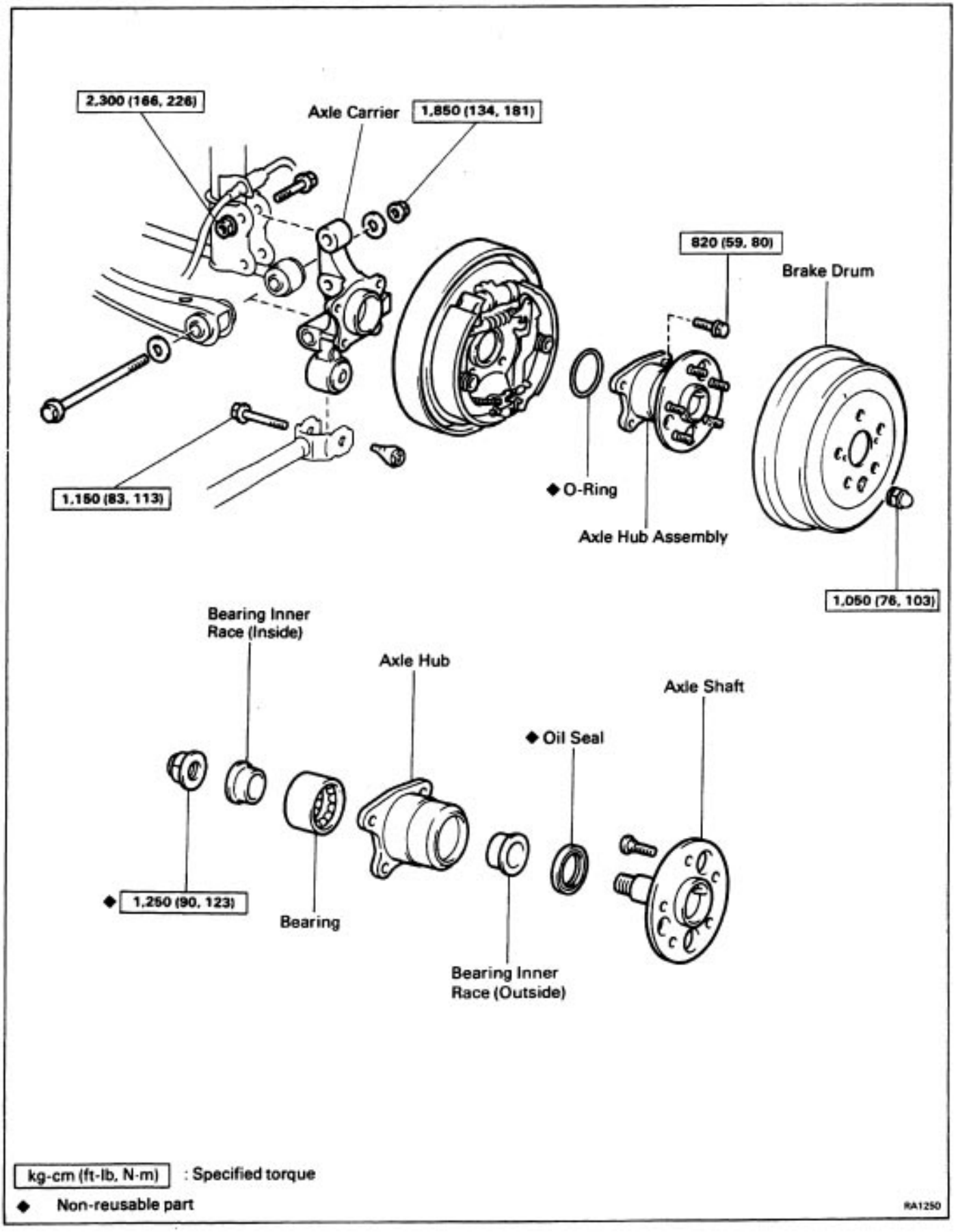


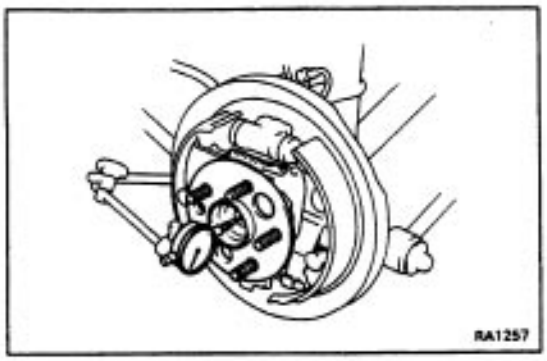
If the left–right error is within specifications but the overall toe–in is not, lengthen or shorten both arms an equal amount by turning the two cams in the opposite direction, until the adjustment standard is obtained.

HINT: The toe–in will change about
1.5 mm (0.059 in.) for FWD
4.5 mm (0.177 in.) for 4WD
with each graduation of the cam (one side).

REAR AXLE HUB AND CARRIER FWD

COMPONENTS





INSPECTION OF AXLE HUB BEARING

1. ROTATE BRAKE DRUM

Rotate the drum by hand, if the movement is not smooth and free, replace the axle hub bearing.

2. REMOVE BRAKE DRUM

3. CHECK BEARING PLAY AXIAL DIRECTION

Limit: 0.05 mm (0.0020 in.)

If not within specification, disassembly and inspection the axle hub assembly.

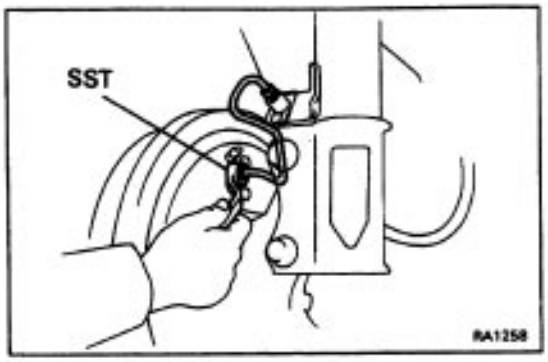
REMOVAL OF REAR AXLE HUB AND CARRIER

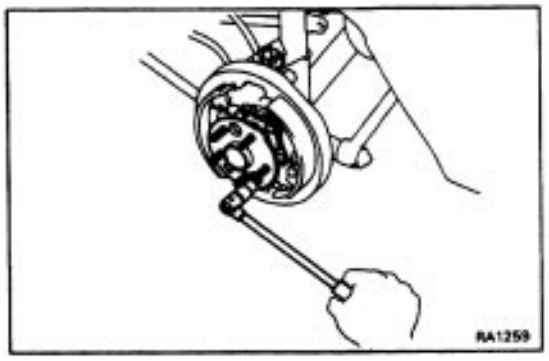
1. REMOVE BRAKE DRUM

2. DISCONNECT BRAKE TUBE FROM BACKING PLATE

Using SST, disconnect the brake tube from the backing plate.

SST 09751–36011



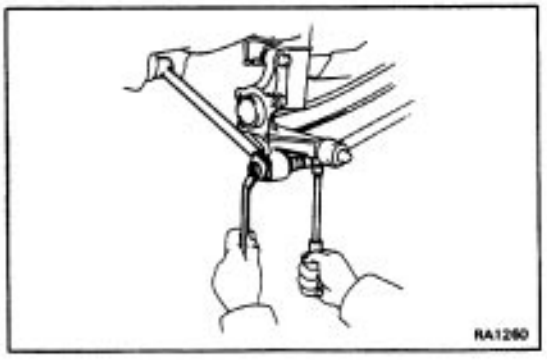


3. REMOVE REAR AXLE HUB

(a) Remove the four axle hub and carrier mounting bolts.

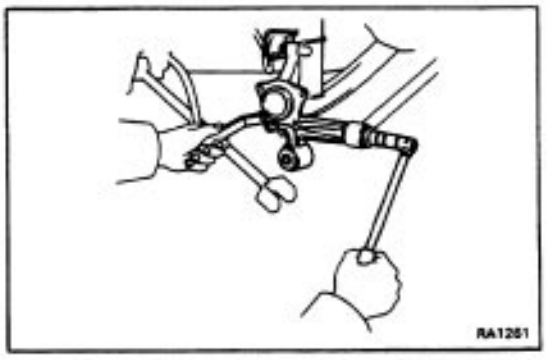
(b) Remove the axle hub and brake assembly.

(c) Remove the O–ring from the backing plate.

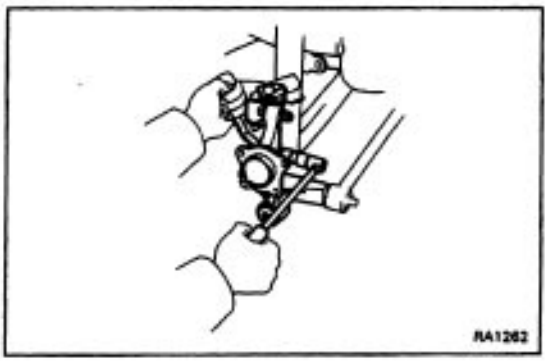


4. REMOVE REAR AXLE CARRIER

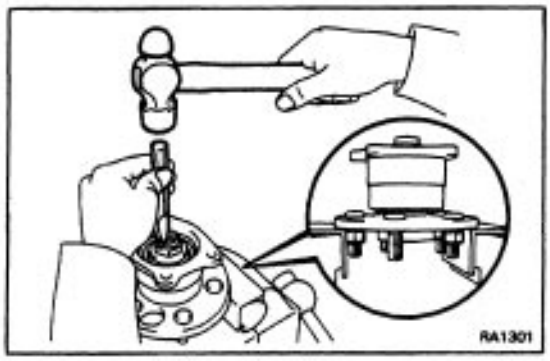
(a) Disconnect the strut rod from the axle carrier.



(b) Disconnect the No. 1 and No.2 suspension arm from the axle carrier.



(e) Remove the axle carrier from the rear shock absorber.

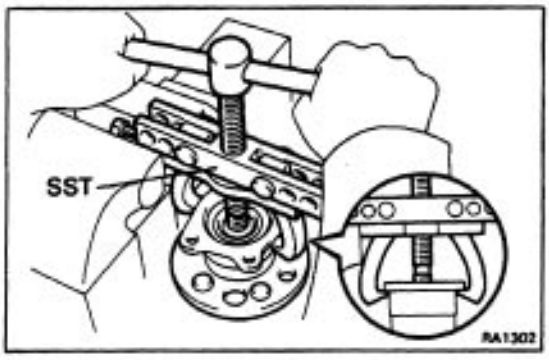


REPLACEMENT OF REAR AXLE HUB AND BEARING

1. REMOVE LOCK NUT

(a) Using a hammer and chisel, unstake the nut.

(b) Remove the lock nut

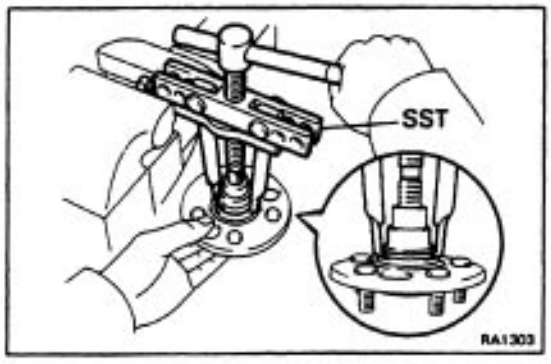


2. REMOVE AXLE SHAFT FROM AXLE HUB

Using SST, push the rear axle shaft, off the rear axle hub.

SST 09950–20017

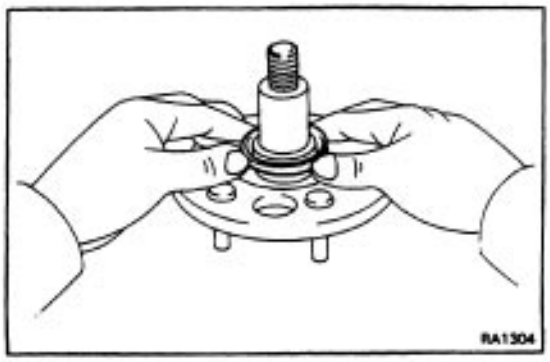
3. REMOVE BEARING INNER RACE (INSIDE)



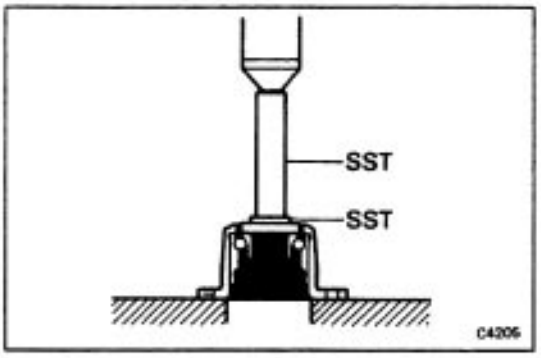
4. REMOVE BEARING INNER RACE (OUTSIDE)

Using SST, pull off the bearing inner race (outside) from the axle shaft.

SST 09950–20017



5. REMOVE OIL SEAL



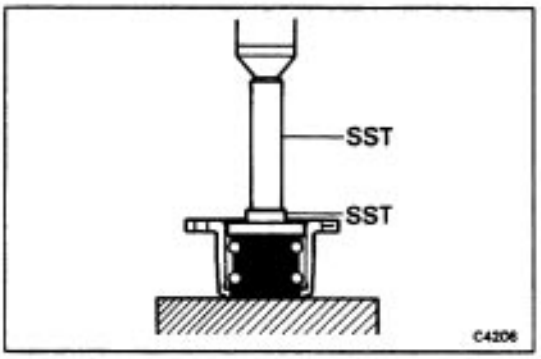
6. REMOVE BEARING

(a) First, install the inner race (outside) of the bearing to be removed.

(b) Using SST, press out the bearing.

SST 09550–10012 (09552–10010,09558–10010)

NOTICE: Always replace the bearing as an assembly.

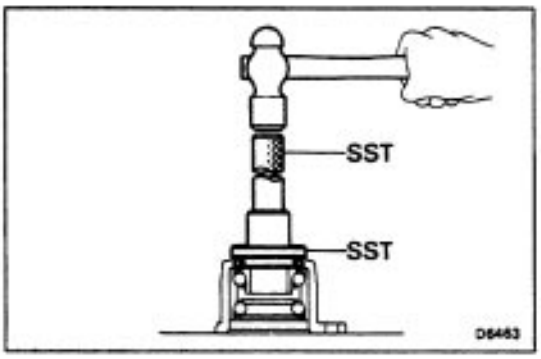


7. INSTALL BEARING

(a) Apply MP grease around the outer race of a new bearing.

(b) Using SST, press the bearing into the axle hub.

SST 09550–10012 (09552–10010, 09554–10010)



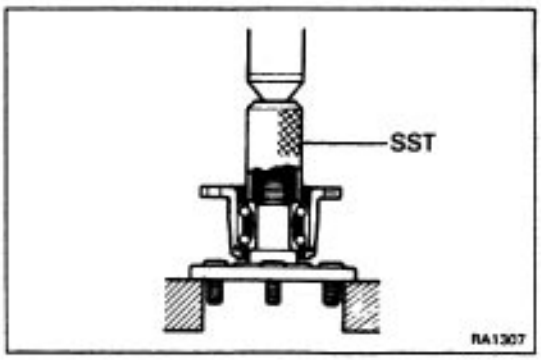
8. INSTALL NEW OIL SEAL

(a) Install a new bearing inner race (outside.

(b) Using SST, drive a new oil seal into the axle hub.

SST 09550–10012 (09552–10010, 09554–10010)

(c) Coat the oil seal lip with MP grease.

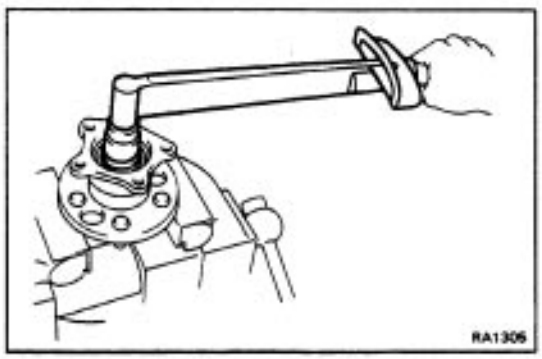


9. INSTALL AXLE SHAFT

(a) Install a new bearing inner race (inside).

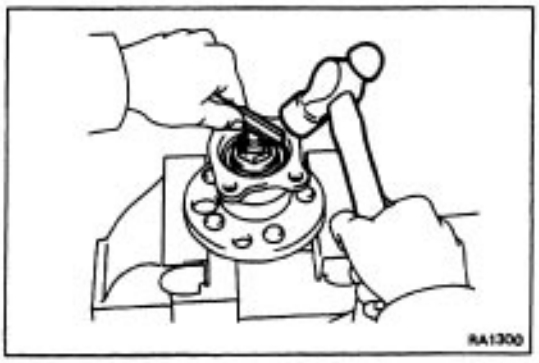
(b) Using SST, press the inner races onto the axle shaft.

SST 09636–20010



(c) Install and torque a new lock nut.

Torque: 1,250 kg–cm (90 ft–lb, 123 N–m)



(d) Using a hammer and a chisel, stake the nut.

INSTALLATION OF REAR AXLE HUB AND CARRIER

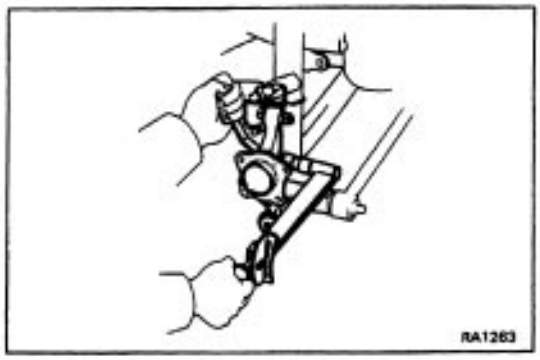
(see page RA–5)

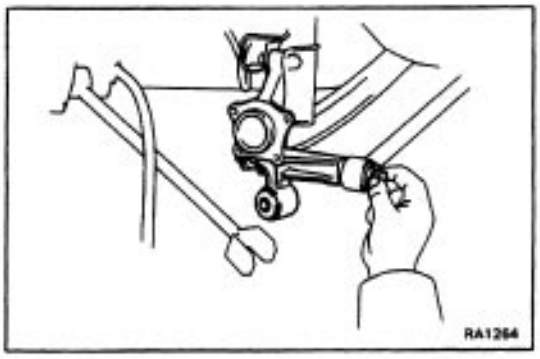
1. INSTALL REAR AXLE CARRIER

(a) Place the axle carrier position.

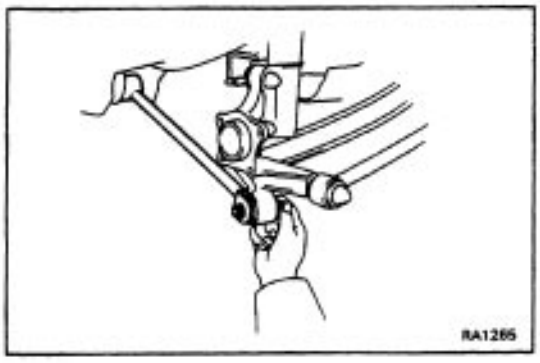
(b) Install and torque the axle carrier mounting bolts and nuts to the shock absorber.

Toque: 2,300 kg–cm (166 ft–lb, 226 N–m)





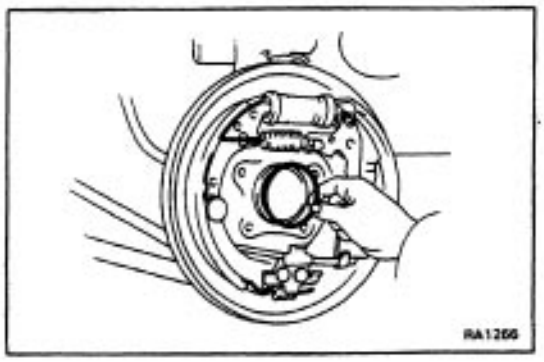
(c) Connect the No. 1 and No.2 suspension arm to the axle carrier with the bolt, and temporarily install the retainer and nut.

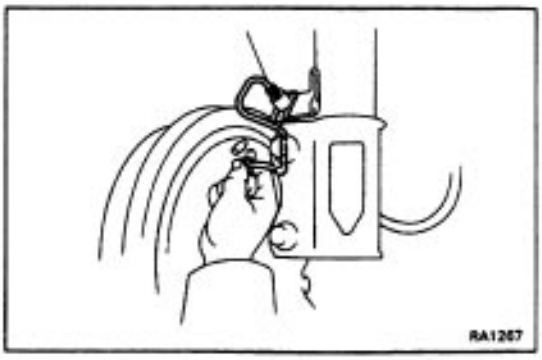


(d) Temporarily connect the strut rod to the axle carrier with the bolt and the nut as shown in the figure.

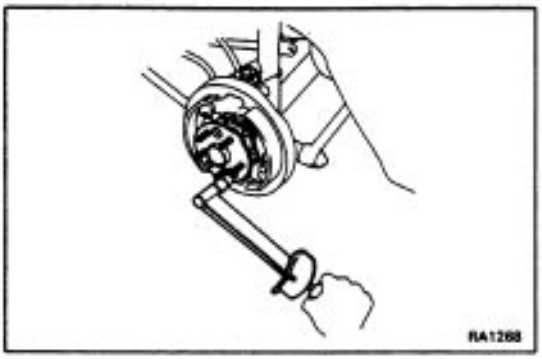
2. INSTALL REAR AXLE HUB

(a) Install the brake assembly and anew oil seal to the axle carrier.

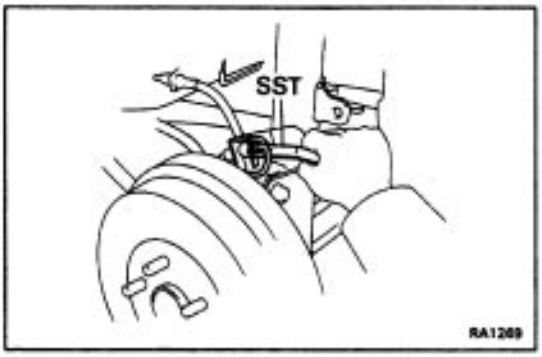




(b) Temporarily connect the brake tube to the backing plate.

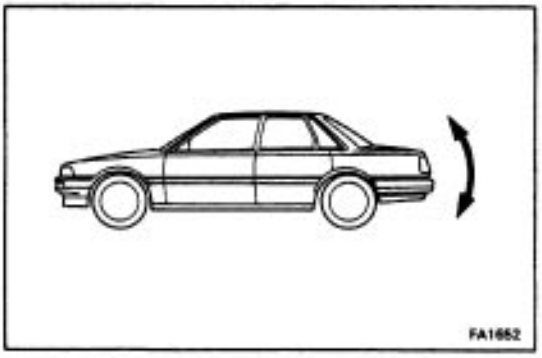


(c) Install the axle hub and torque the four bolts.
Torque: 820 kg–cm (59 ft–lb, 80 N – m)



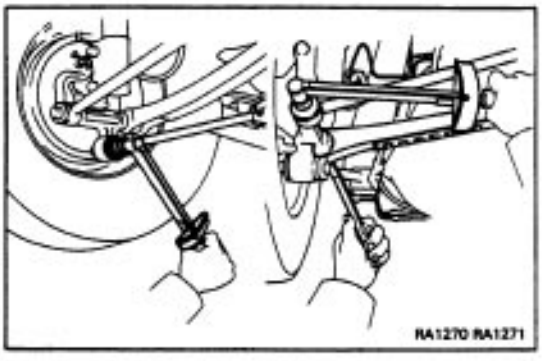
3. TORQUE BRAKE TUBE
Using SST, torque the brake tube union.
SST 09751–36011

4. INSTALL BRAKE DRUM



5. INSTALL WHEELS AND LOWER VEHICLE
(a) Install the wheels.
(b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.

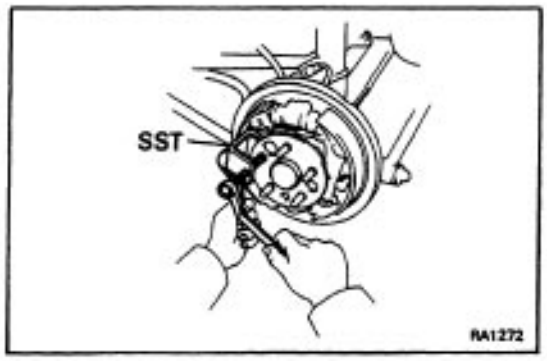
6. TORQUE AXLE CARRIER MOUNTING BOLTS
Torque the axle carrier mounting blots with the vehicle weight on the suspension.
Torque:
Strut rod x Axle carrier
1,150 kg–cm (83 ft–lb, 113 N–m)
No. 1 and No. 2 suspension arm x Axle carrier
1,850 kg–cm (134 ft–lb, 181 N–m)



7. BLEED BRAKE SYSTEM
(See page BR–7)

8. CHECK REAR WHEEL ALIGNMENT
(See page RA–3)

REPLACEMENT OF REAR AXLE HUB BOLT

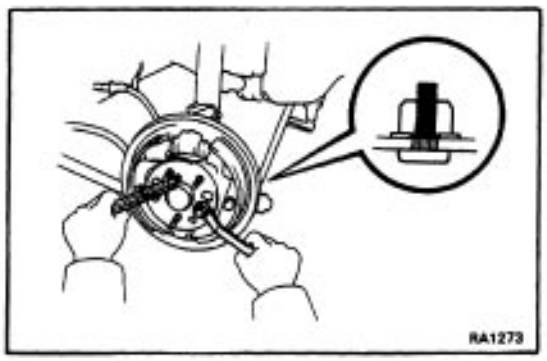


1. REMOVE BRAKE DRUM

2. REMOVE HUB BOLT

Using SST, remove the hub bolt.

SST 09650–17011



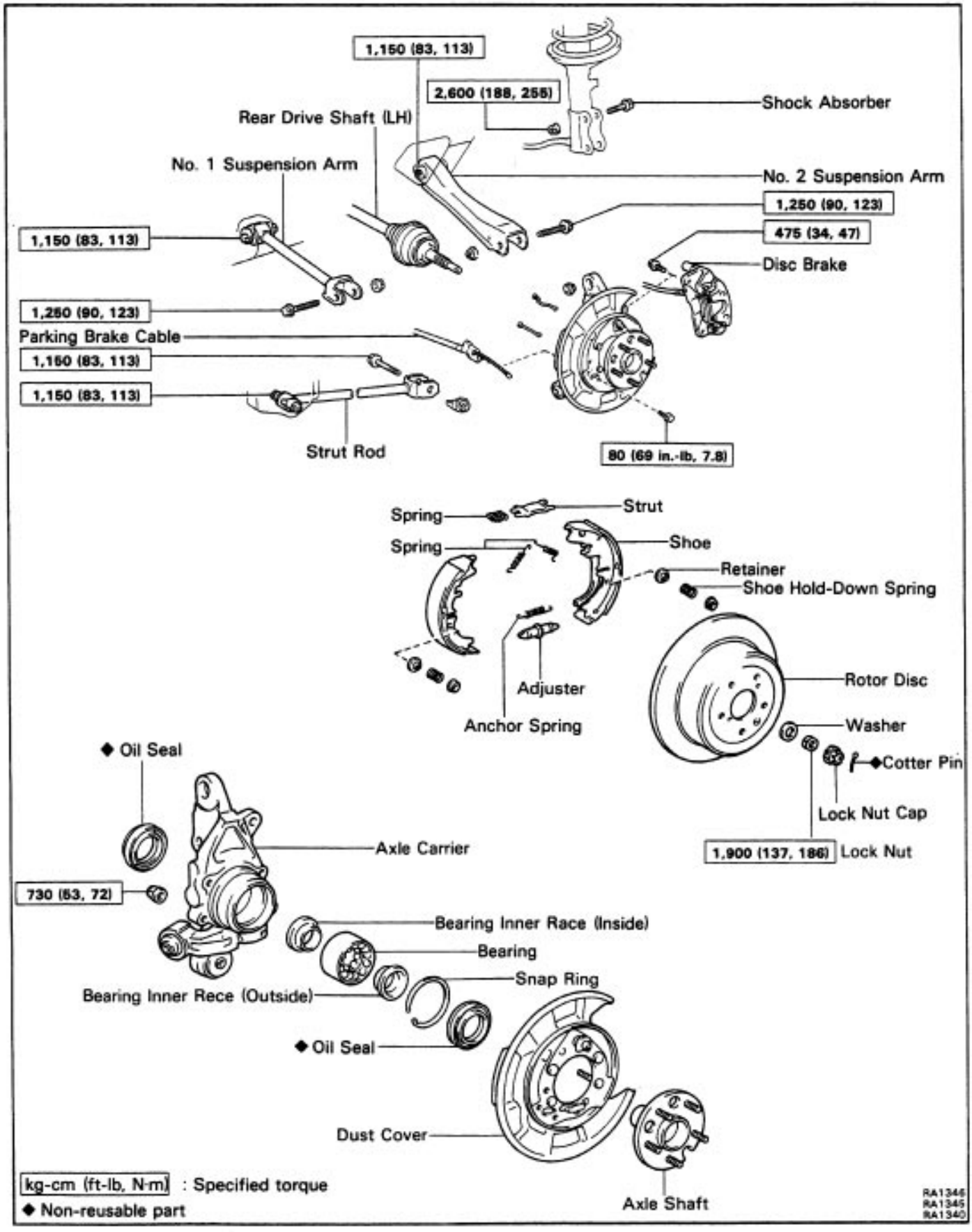
3. INSTALL HUB BOLT

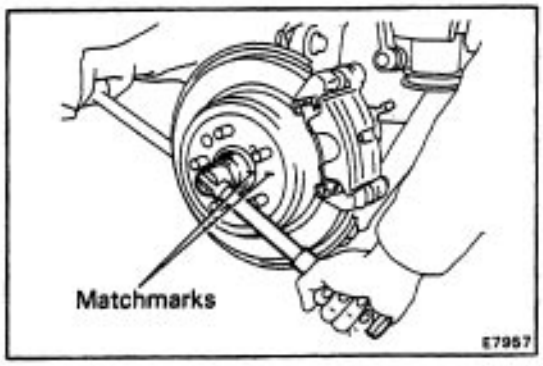
Install a new hub bolt.

4. INSTALL BRAKE DRUM

REAR AXLE HUB AND CARRIER 4WD

COMPONENTS





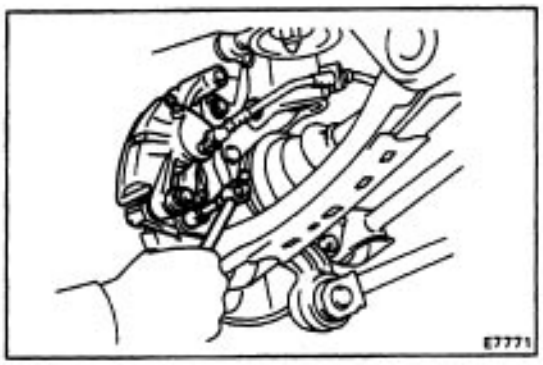
REMOVAL OF REAR AXLE HUB AND CARRIER

(See page RA–12)

1. REMOVE COTTER PIN, BEARING LOCK NUT CAP AND BEARING LOCK NUT

(a) Remove the cotter pin and bearing lock nut cap.

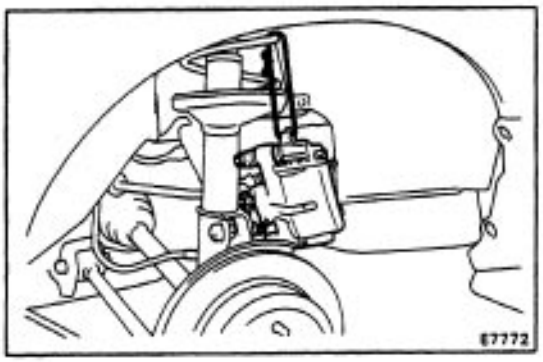
(b) With the parking brake engaged, remove the bearing lock nut.



2. DISCONNECT PARKING BRAKE CABLE

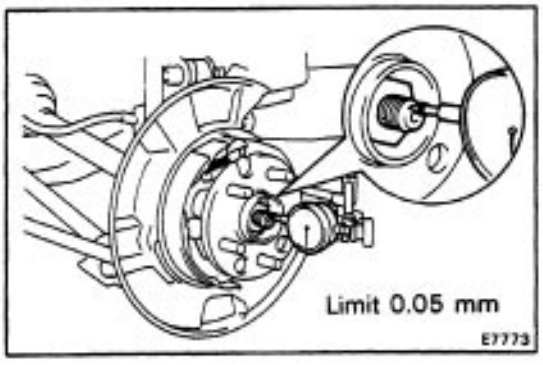
3. REMOVE BRAKE CALIPER

Remove the brake caliper from. the rear axle carrier and suspend it with wire.



4. REMOVE ROTOR DISC

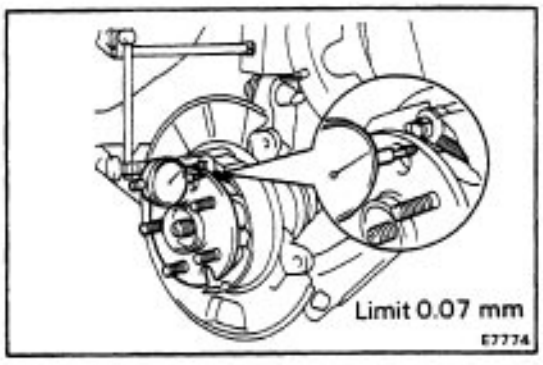
HINT: Before removing the rotor disc, plate the matchmarks on the axle hub and rotor disc.



5. CHECK BEARING PLAY 1N AXIAL DIRECTION

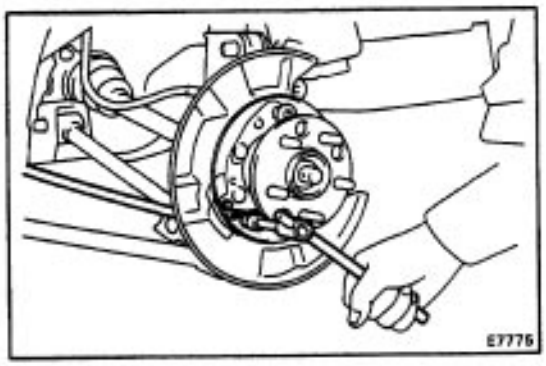
Bearing play: 0.05 mm (0.0020 in.) or less

If the bearing play is greater than the maximum, replace the bearing.

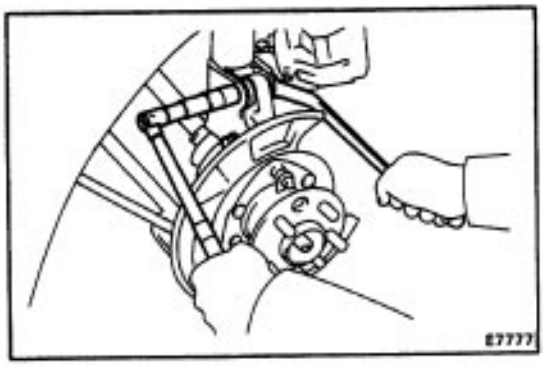


6. CHECK AXLE SHAFT FLANGE RUNOUT

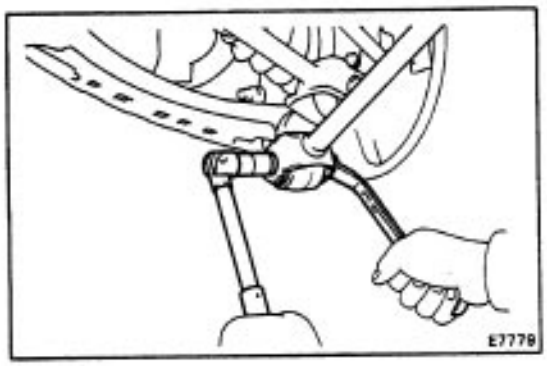
Maximum flange runout: 0.07 mm (0.0028 in.) or less



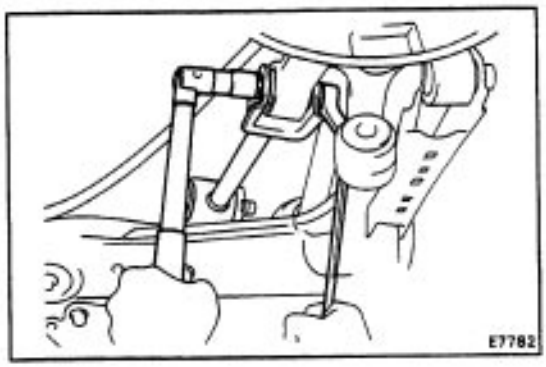
7. REMOVE PARKING BRAKE ASSEMBLY
(See page RA–12)
B. REMOVE PARKING BRAKE CABLE



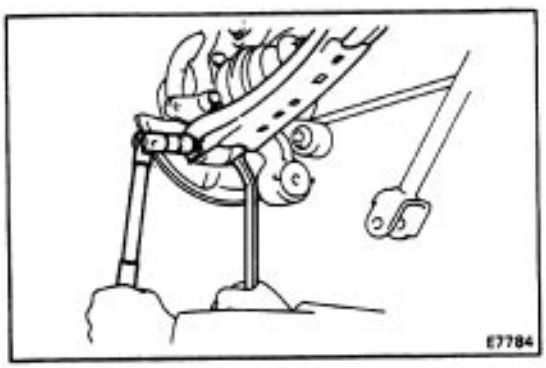
9. REMOVE AXLE CARRIER WITH AXLE HUB
(a) Remove the two axle carrier set nuts and two bolts with the camber adjusting cam.



(b) Disconnect the strut rod from the axle carrier.



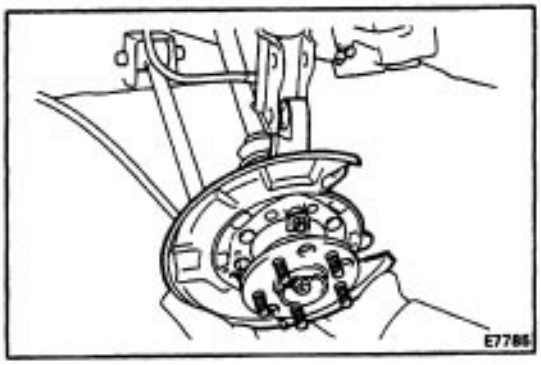
(c) Disconnect the No. 1 suspension arm from the axle carrier.



(d) Disconnect the No. 2 suspension arm from the axle carrier.

(e) Remove the axle carrier with axle hub.

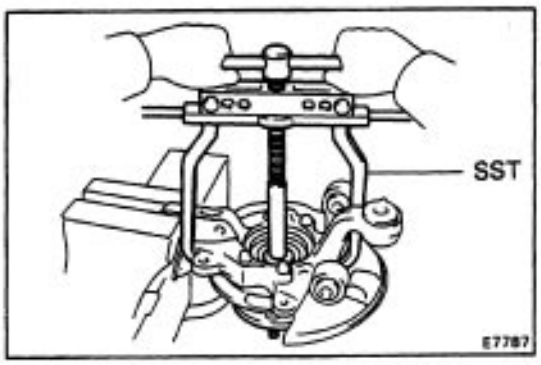
NOTICE: Cover the drive shaft boot with cloth to protect it from damage.



REPLACEMENT OF AXLE HUB AND BEARING

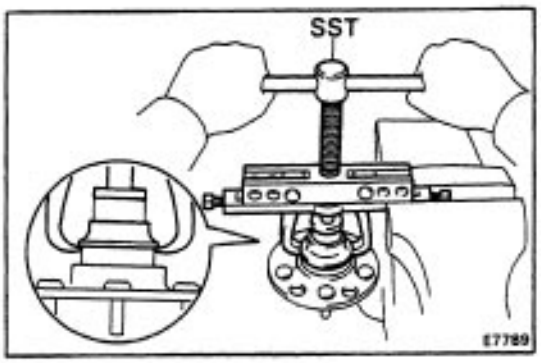
1. REMOVE AXLE SHAFT FROM AXLE HUB

Using SST, push the axle shaft off the axle hub.
SST 09950–20017

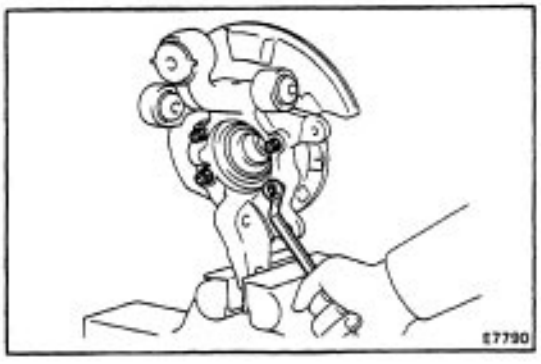


2. REMOVE BEARING INNER RACE (OUTSIDE) FROM AXLE SHAFT

Using SST, pull off the bearing inner race (outside) from the axle shaft.

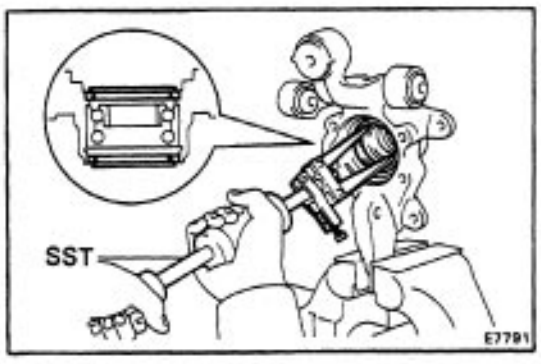


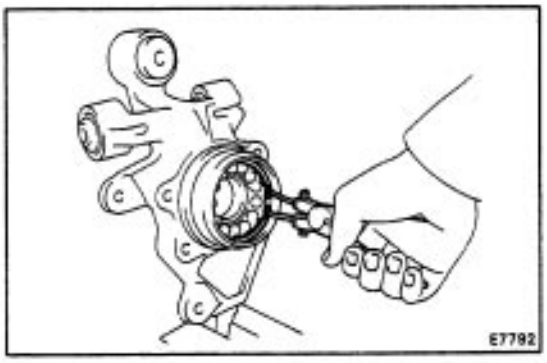
3.REMOVE DUST COVER



4. REMOVE INNER AND OUTER OIL SEAL

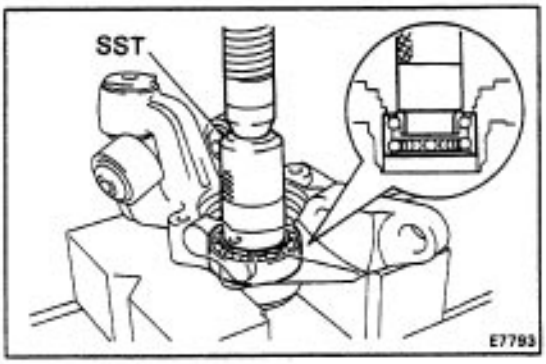
Using SST, remove the oil seal from the axle carrier.
SST 09308–00010





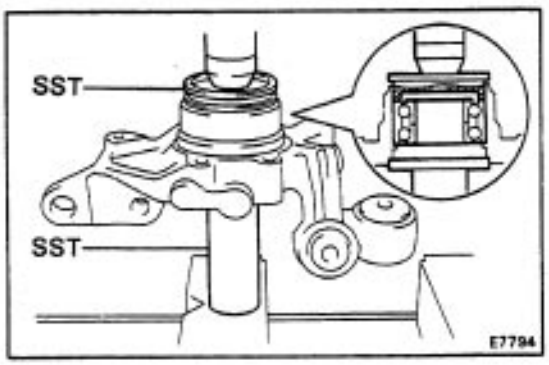
5. REMOVE HOLE SNAP RING

Using snap ring pliers, remove the hole snap ring from the axle carrier.



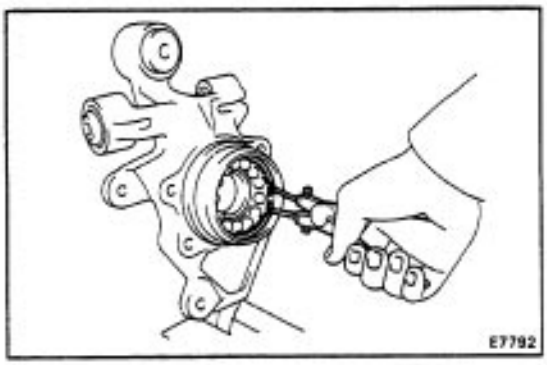
6. REMOVE BEARING

Using SST, press out the bearing from the axle carrier.
SST 09636–20010



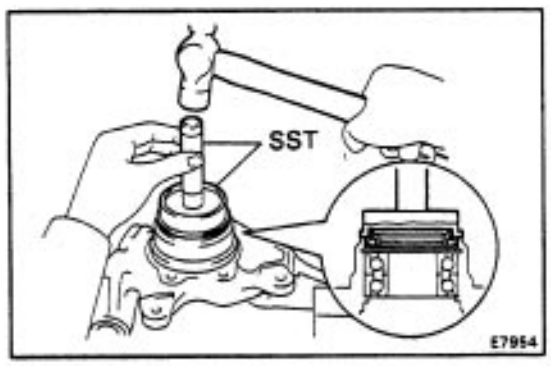
7. INSTALL BEARING

Using SST, press the bearing into the axle hub.
SST 09309–36010, 09608–32010



8. INSTALL HOLE SNAP RING

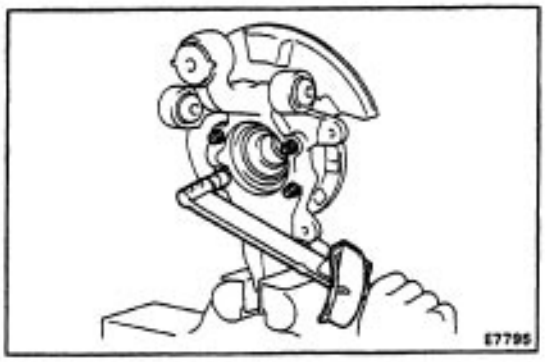
Using pliers, install a hole snap ring into the rear axle carrier.



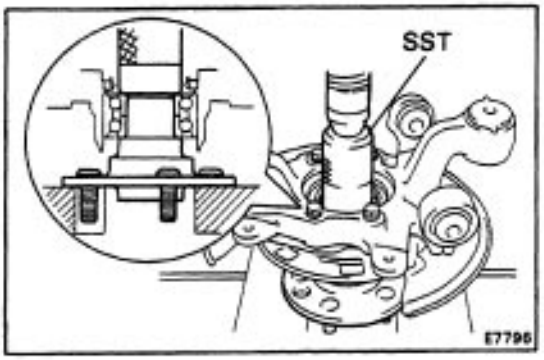
9. INSTALL OUTER OIL SEAL

(a) Using SST, drive in a new oil seal to the axle carrier.
SST 09608–30012 (09608–04020), 09608–32010

(b) Apply MP grease to the oil seal lip.

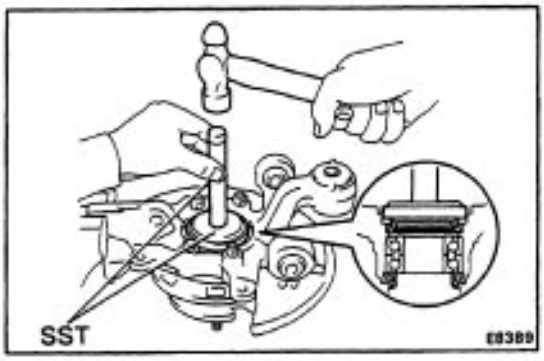


10. INSTALL DUST COVER



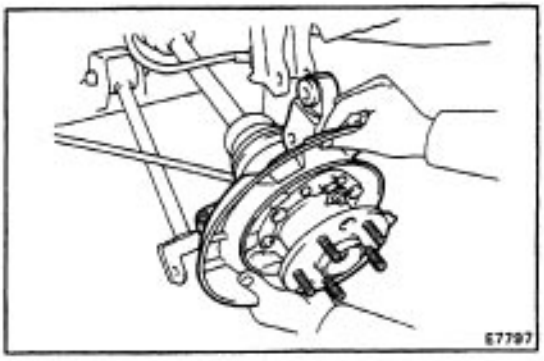
11. INSTALL AXLE SHAFT

Using SST, install the axle shaft to the axle carrier.
SST 09636–20010



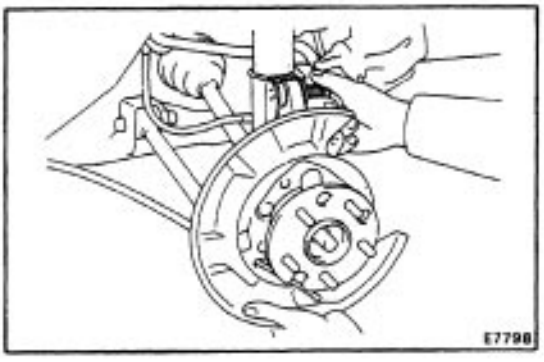
12. INSTALL INNER OIL SEAT.

(a) Using SST, drive in a new oil sea! to the axle carrier.
SST 09608–30012 (09608–04020, 09608–04110)
(b) Apply MP grease to the oil seal lip.

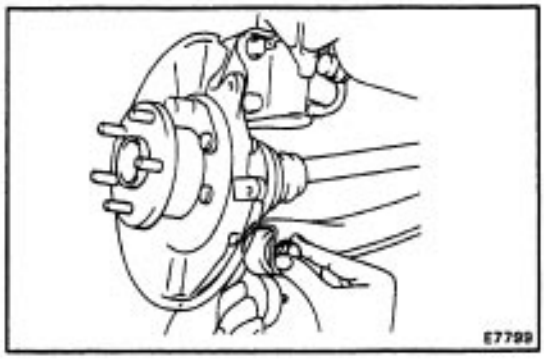


13. INSTALL AXLE CARRIER WITH AXLE HUB

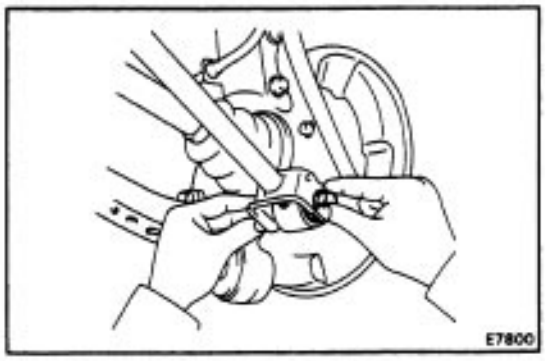
(a) Install the axle carrier with axle hub.



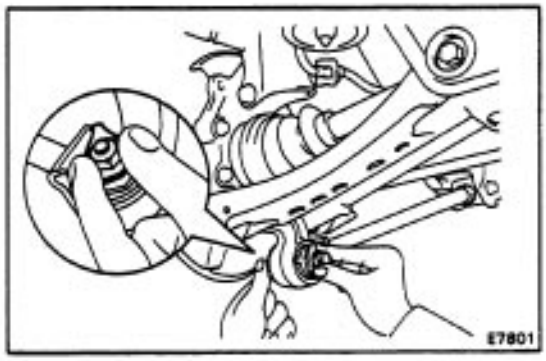
(b) Install the axle carrier with axle hub.
(1) Place the rear axle carrier to the shock absorber's lower bracket.
(2) Install the two set bolts and two nuts.
(3) Torque the nuts.
Torque: 2,600 kg–cm (188 ft–lb, 255 N–m)



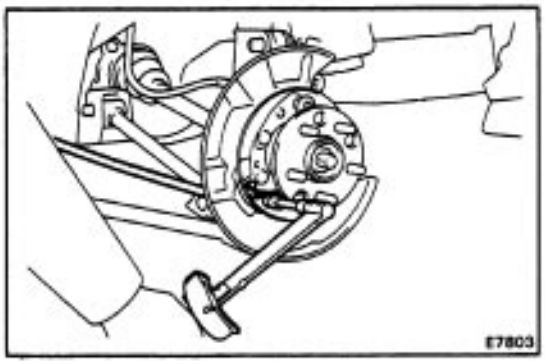
(c) Temporarily connect the No. 2 suspension arm to the axle carrier.



(d) Temporarily connect the No. 1 suspension arm to the axle carrier.



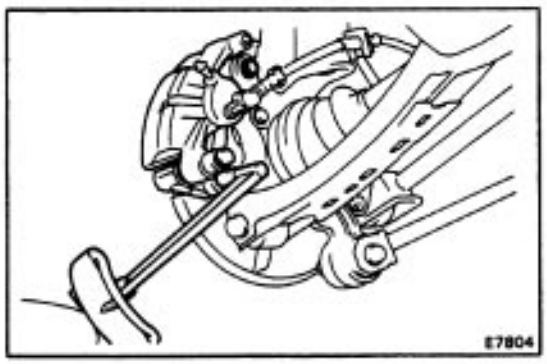
(e) Temporarily connect the strut rod to the axle carrier.



14. INSTALL PARKING BRAKE CABLE

15. INSTALL PARKING BRAKE ASSEMBLY

(See page RA–12**)**

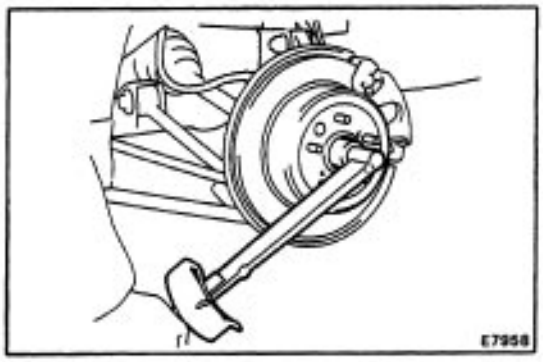


16. INSTALL ROTOR DISC

HINT: Align the matchmarks on the axle hub and rotor disc.

17. INSTALL BRAKE CALIPER

Torque: 475 kg–cm (34 ft–lb, 47 N–m)



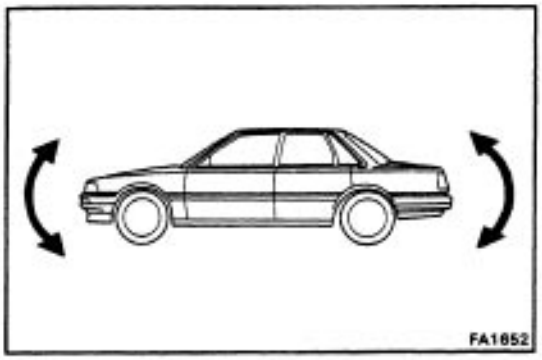
18. INSTALL PLATE WASHER, BEARING LOCK NUT, BEARING LOCK NUT CAP AND NEW COTTER PIN

(a) Install the plate washer and lock nut.

(b) With the parking brake engaged, and tighten the nut.

Torque: 1,900 kg–cm (137 ft–lb, 186 N–m)

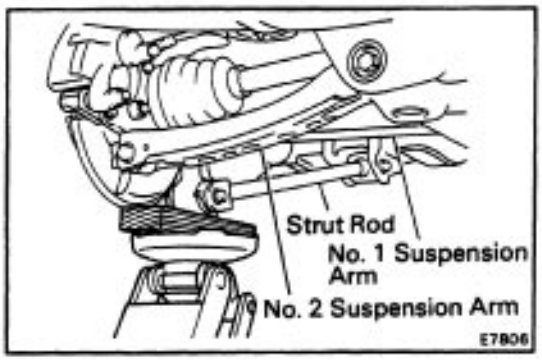
(c) Install the lock nut cap and a new cotter pin.



19. INSTALL WHEELS AND LOWER VEHICLE

(a) Install the wheel.

(b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.



20. TORQUE AXLE CARRIER MOUNTING BOLTS

Torque the axle carrier mounting bolts with the vehicle weight on the suspension.

Torque: Strut rod x Axle carrier

1,150 kg–cm (83 ft–lb, 113 N–m)

No. 1 and No. 2 suspension arm x Axle carrier

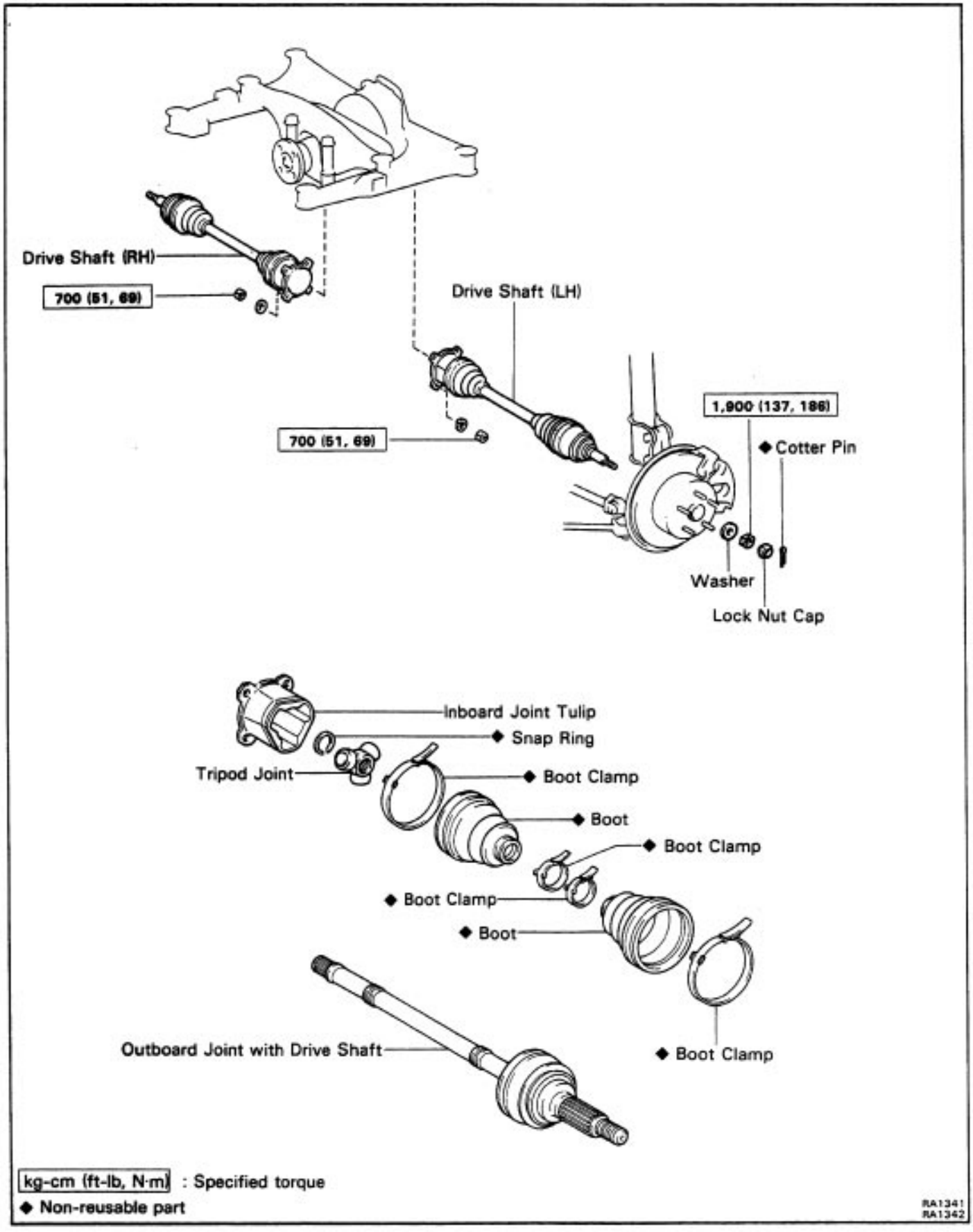
1,250 kg–cm (90 ft–lb, 123 N–m)

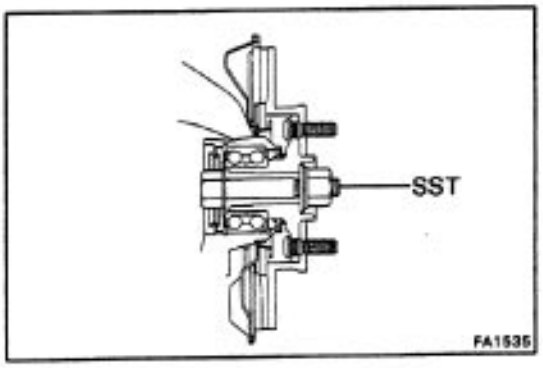
21. CHECK REAR WHEEL ALIGNMENT

(See page RA–31)

REAR DRIVE SHAFT (4WD)

COMPONENTS



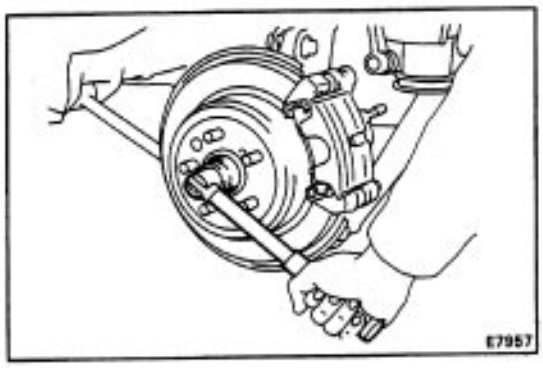


REMOVAL OF REAR DRIVE SHAFT

(See page RA–20)

NOTICE: The hub bearing could be damaged if it is subjected to the vehicle weight, such as when moving the vehicle with the drive shaft removed. Therefore, if it is bearing first support it with SST.

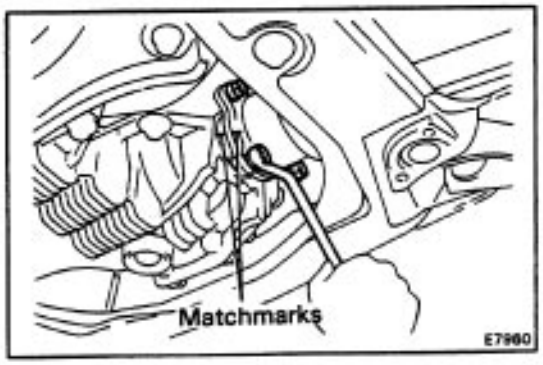
SST 09608–16041 (09608–02020, 09608–02040)



1. REMOVE COTTER PIN, LOCK NUT CAP AND LOCK NUT

(a) Remove the cotter pin and lock nut cap.

(b) Loosen the bearing lock nut while depressing the brake pedal.



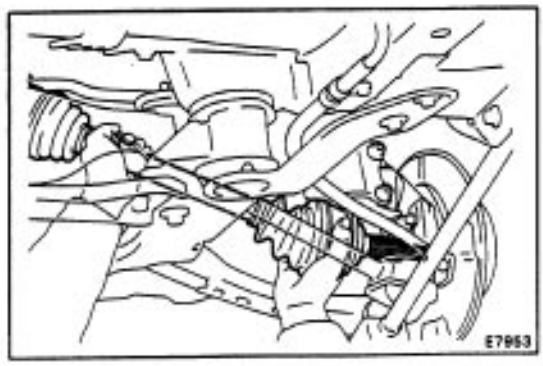
2. REMOVE DRIVE SHAFT

HINT: Be careful not to damage the boots.

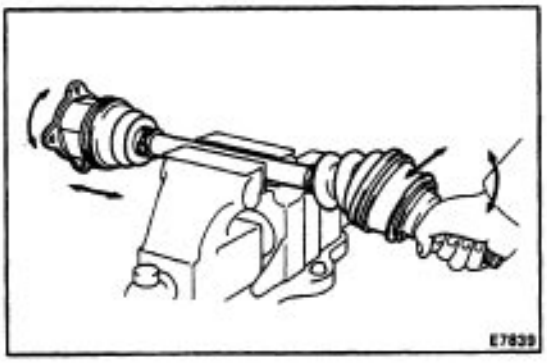
(a) Place rnatchmarks on the inboard joint tulip and the side gear shaft flange.

(b) Loosen four nuts holding the drive shaft to the side gear shaft.

(c) Disconnect the drive shaft from the side gear shaft.



(d) Remove the drive shaft from the axle carrier.



DISASSEMBLY OF REAR DRIVE SHAFT

(See page RA–20)

1. CHECK DRIVE SHAFT

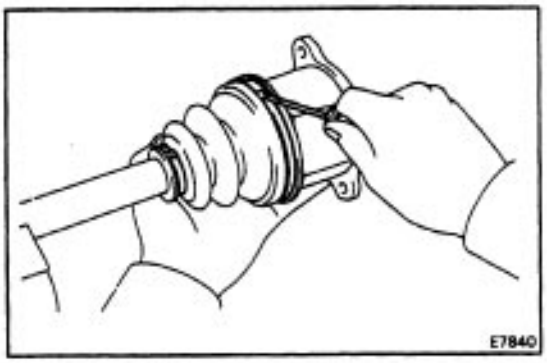
(a) Check to see that there is no play in the inboard and outboard joints.

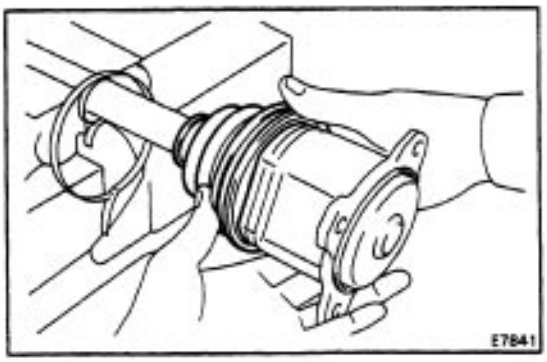
(b) Check to see that the inboard joint slide smoothly in the thrust direction.

(c) Check to see that the¿e is no remarkable play in the redial direction of the inboard joint.

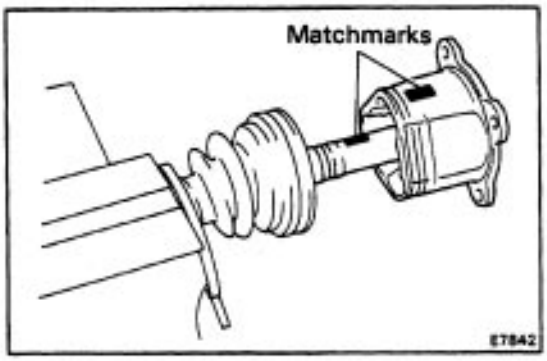
(d) Check the damage of boot.

2. REMOVE INBOARD JOINT BOOT CLAMPS





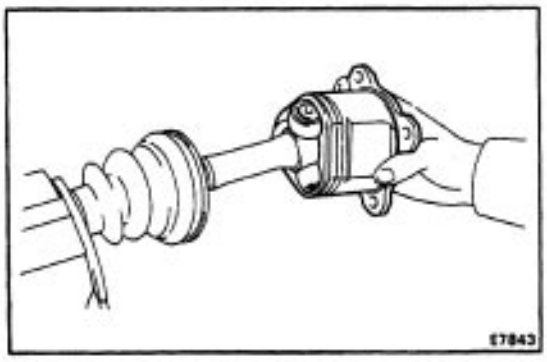
3. REMOVE INBOARD JOINT BOOT FROM INBOARD JOINT TULIP



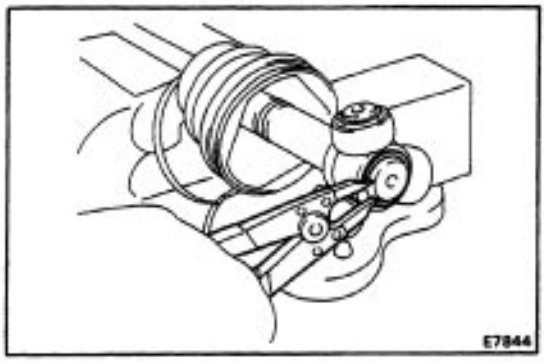
4. REMOVE INBOARD JOINT TULIP FROM DRIVE SHAFT

(a) Place matchmarks on the inboard joint tulip and drive shaft.

NOTICE: Do not punch the marks.

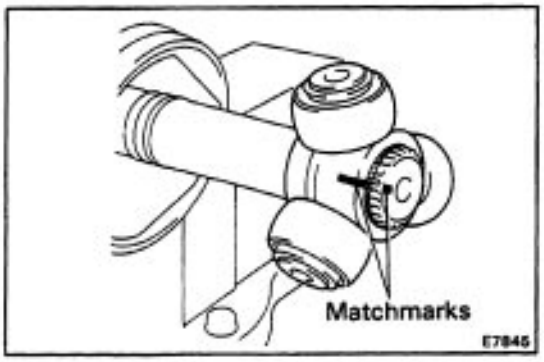


(b) Remove the inboard joint tulip from the drive shaft.

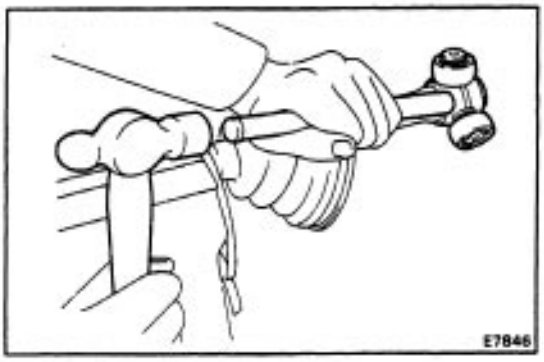


5. REMOVE TRIPOD JOINT

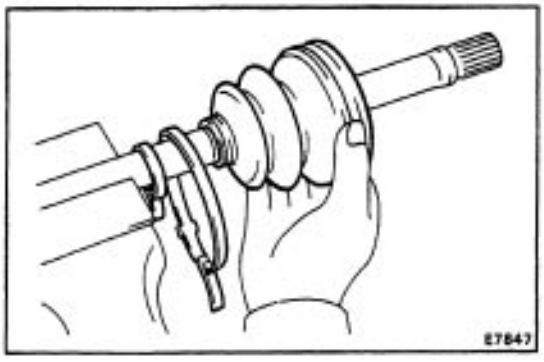
(a) Using snap ring pliers, remove the snap ring.



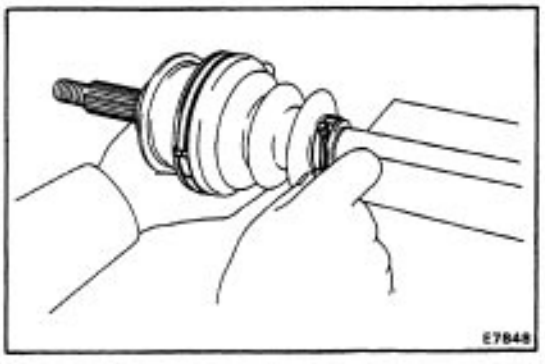
(b) Place matchmarks on the shaft and the tripod.



(c) Using a hammer and brass bar, drive out the tripod joint from the drive shaft.



6. REMOVE INBOARD JOINT BOOT AND CLAMP

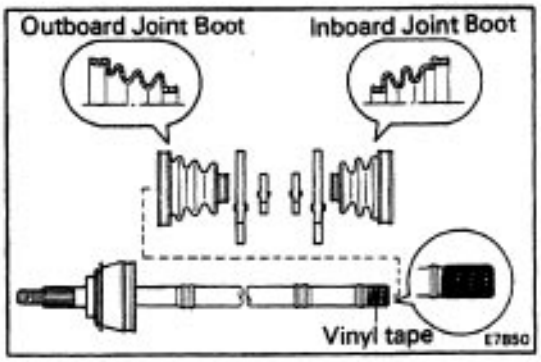


7. REMOVE OUTBOARD JOINT BOOT

(a) Using a screwdriver, remove the two boot clamps of the outboard joint boot.

(b) Remove the boot from the outboard joint.

NOTICE: Do not disassemble the outboard joint.



ASSEMBLY OF REAR DRIVE SHAFT

(See page RA–20)

1. TEMPORARILY INSTALL BOOTS AND NEW BOOT CLAMPS

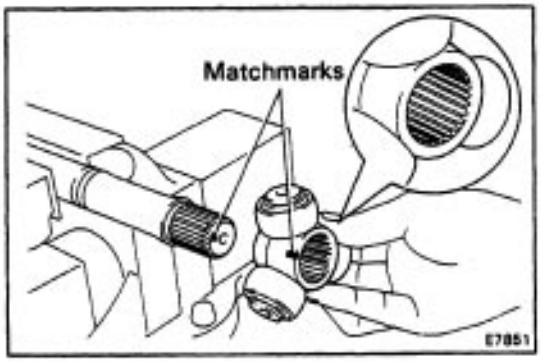
CAUTION: The boot and clamp of the outboard joint are smaller than those of the inboard joint.

HINT: Before installing the boot, wrap vinyl tape around the spline of the shaft to prevent damaging the boot.

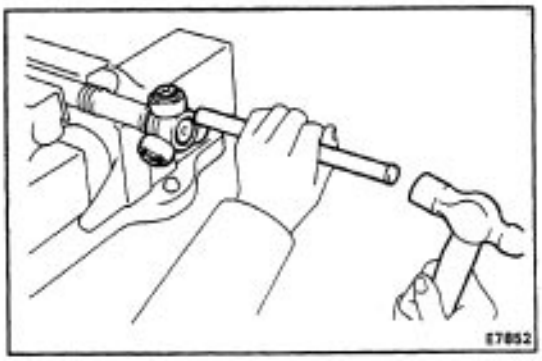
Temporarily install the boots and a new clamps to the drive shaft.

2. INSTALL TRIPOD JOINT

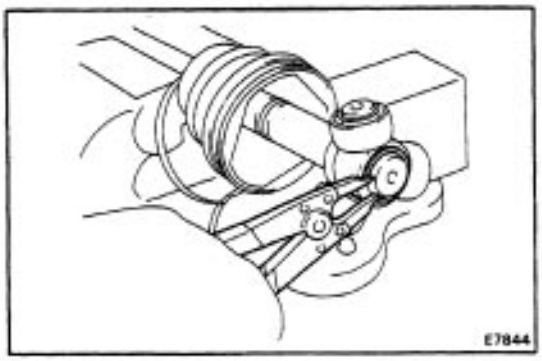
(a) Align the matchmarks placed before remove.



(b) Using a brass bar and hammer, tap in the tripod joint to the drive shaft.



(c) Using snap ring pliers, install a new snap ring.

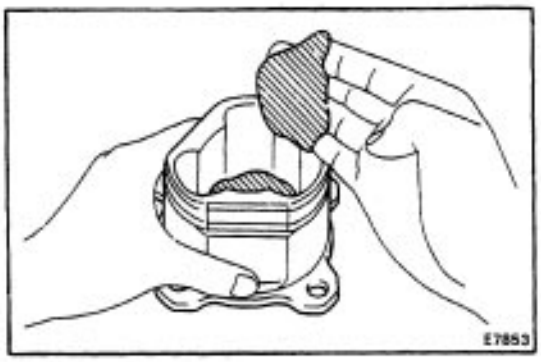


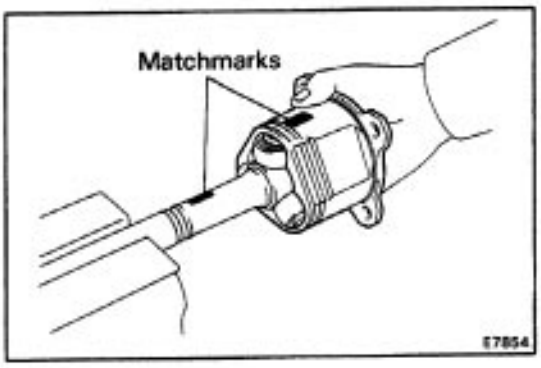
3. INSTALL INBOARD JOINT TULIP TO DRIVE SHAFT

(a) Pack in the grease to the inboard tulip.

HINT: Use the grease supplied in the boot kit.

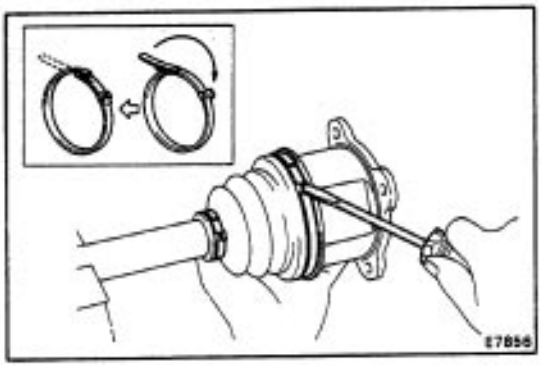
Grease capacity: 180g (0.40 lb)





(b) Align the matchmarks placed before remove, and install the inboard joint tulip to the drive shaft.

5. INSTALL INBOARD JOINT BOOT TO INBOARD JOINT TULIP .

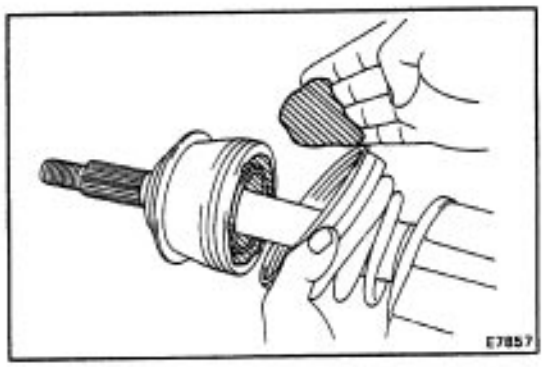


6. INSTALL INBOARD JOINT BOOT CLAMPS

NOTICE: The clamps of the outboard joint are smaller than those of the inboard joint.

(a) Be sure the boot is on the shaft groove.

(b) Using a screwdriver, bend the band and lock it as shown in the illustration.



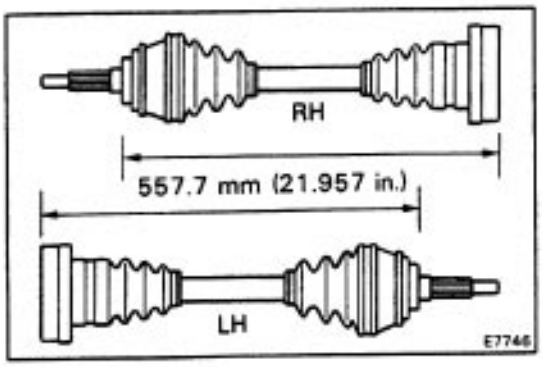
7. INSTALL OUTBOARD JOINT BOOT

(a) Before install the boot, back in grease.

HINT: Use the grease supplied in the boot kit.

Grease capacity: 124 g (0.26 lb)

(b) Install the boot to the outboard joint.

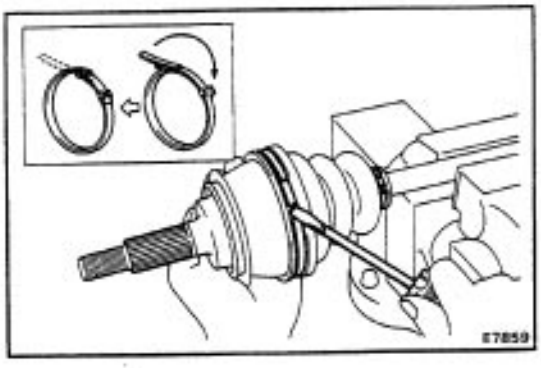


8. INSTALL OUTBOARD JOINT BOOT CLAMPS

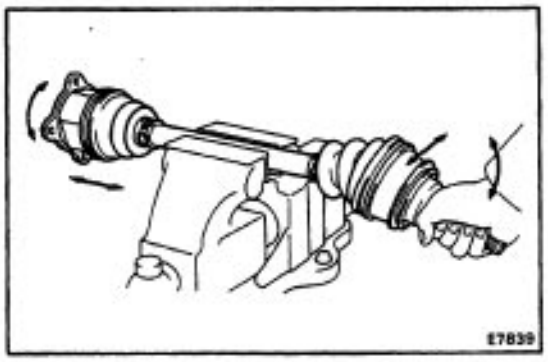
(a) Be sure the boot is on the shaft groove.

(b) In sure that the boot is not stretched or contracted when drive shaft is at standard length.

Drive shaft length: 557.7 mm (21.957 In.)



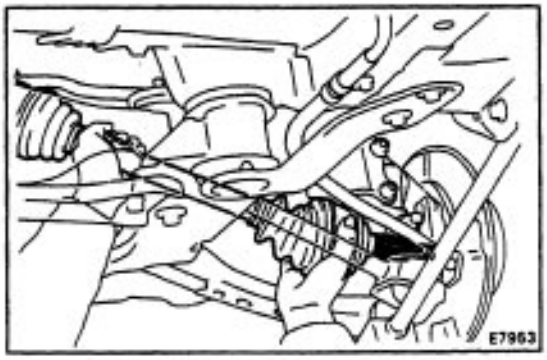
(c) Using a screwdriver, bend the band and lock it as shown in the illustration.



9. CHECK DRIVE SHAFT

(a) Check to see that there is no play in the inboard joint and outboard joint.

(b) Check to see that the inboard joint side smoothly in the thrust direction.



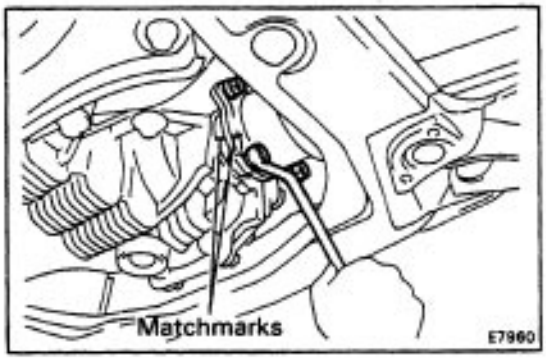
INSTALLATION OF REAR DRIVE SHAFT

(See page RA–20**)**

1. INSTALL DRIVE SHAFT

HINT: Be careful not to damage the boots.

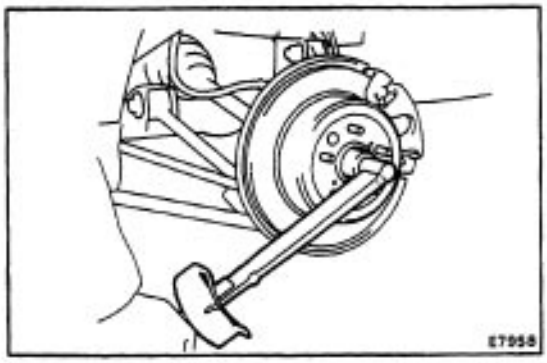
(a) Install the drive shaft to the axle carrier.



(b) Align the matchmarks on the inboard joint tulip and the side gear shaft flange.

(e) Connect the drive shaft to the side gear shaft.

Torque: 700 kg–cm (51 ft–tb, 69 N–m)



2. INSTALL BEARING LOCK NUT, LOCK NUT CAP AND COTTER PIN

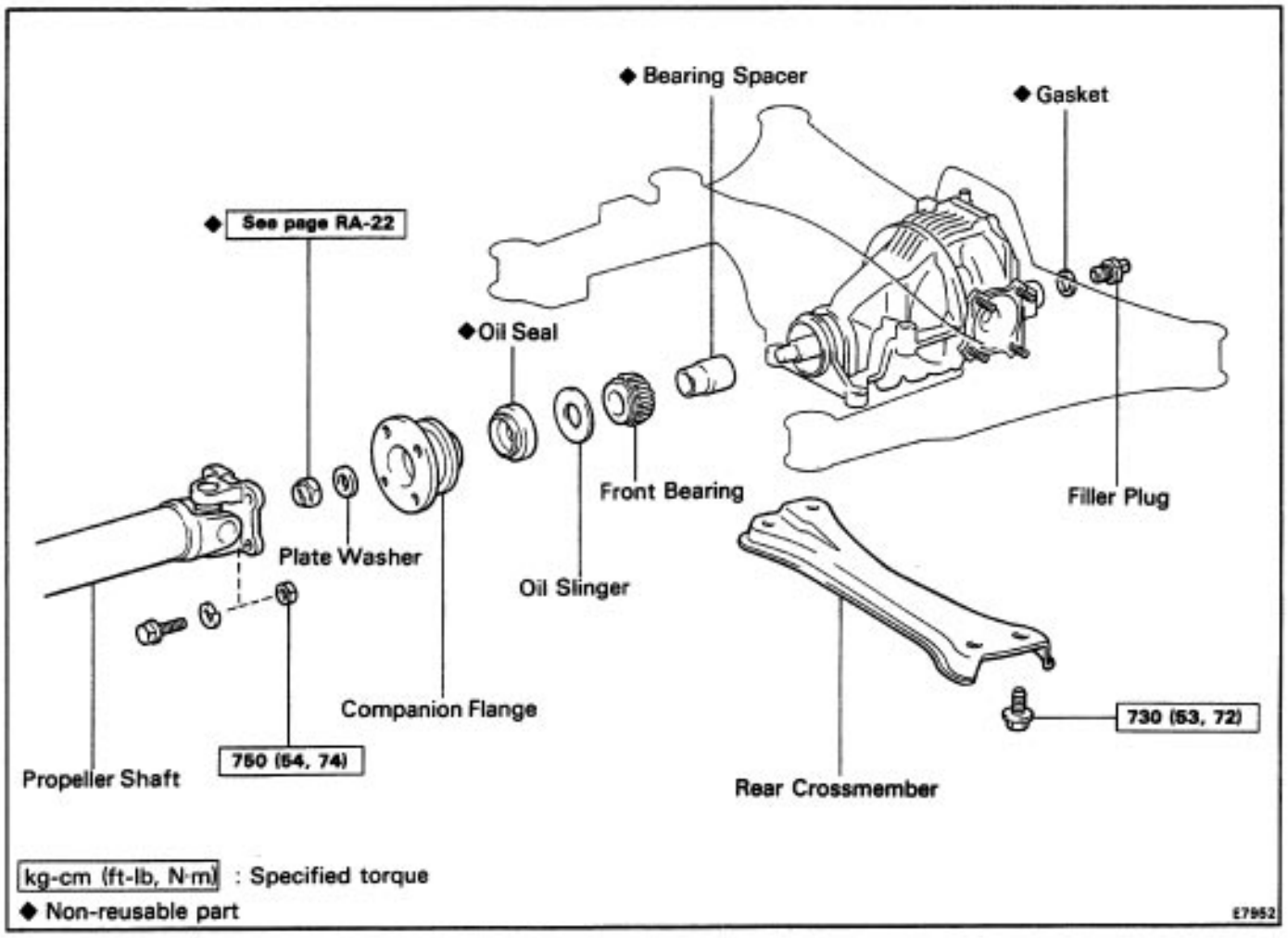
(a) Torque the bearing lock nut while depressing the brake pedal.

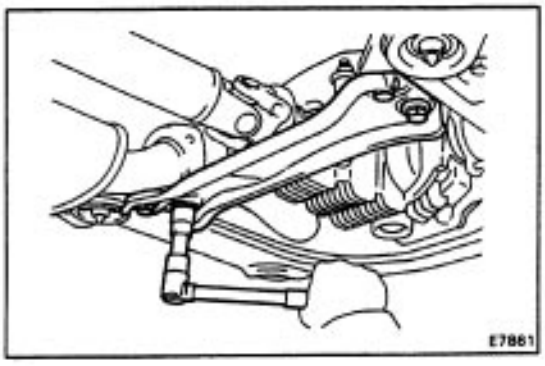
Torque: 1,900 kg–cm (137 ft–lb, 186 N–m)

(b) Install the lock nut cap and, using pliers, install a new cotter pin.

DIFFERENTIAL

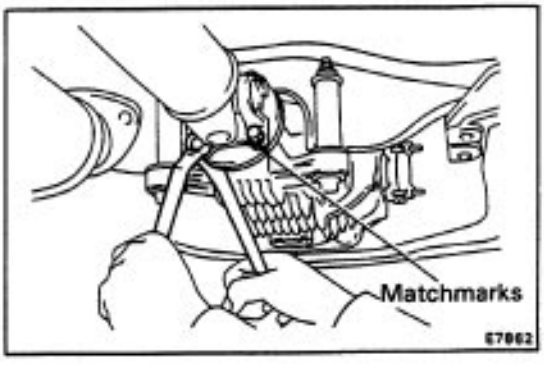
On–Vehicle Repair





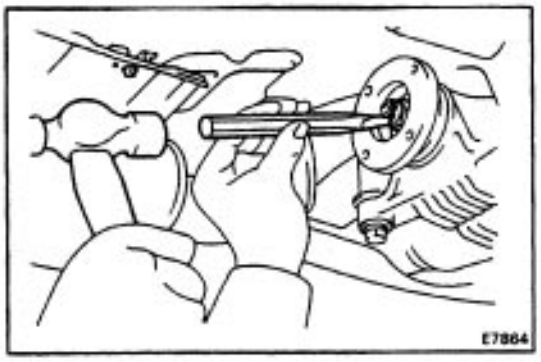
REPLACEMENT OF FRONT OIL SEAL

1. REMOVE REAR CROSSMEMBER



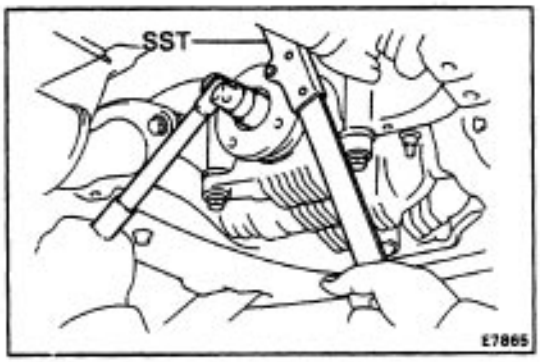
2. DISCONNECT PROPELLER SHAFT

(a) Place the matchmarks on the both flanges.
(b) Remove the four bolts, washers and nuts.
(c) Disconnect the propeller shaft from the differential.



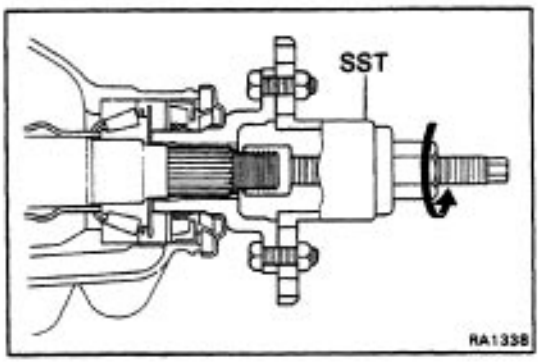
3. REMOVE COMPANION FLANGE

(a) Using a hammer and chisel, loosen the staked part of the nut.

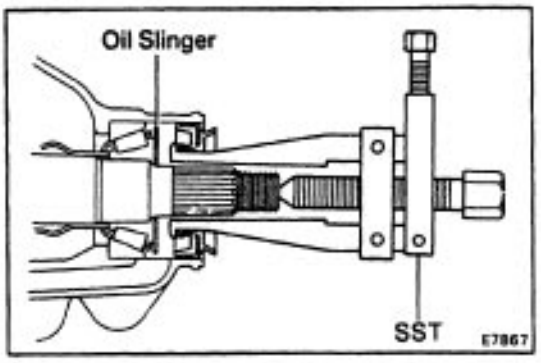


(b) Using SST to hold the flange, remove the nut.
SST 09330–00021

(c) Remove the plate washer.



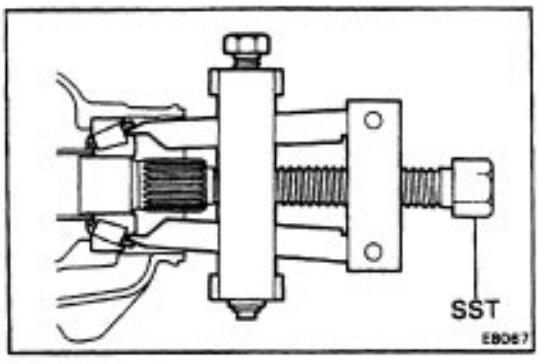
(d) Using SST, remove the companion flange.
SST 09557–22022



4. REMOVE FRONT OIL SEAL AND OIL SLINGER

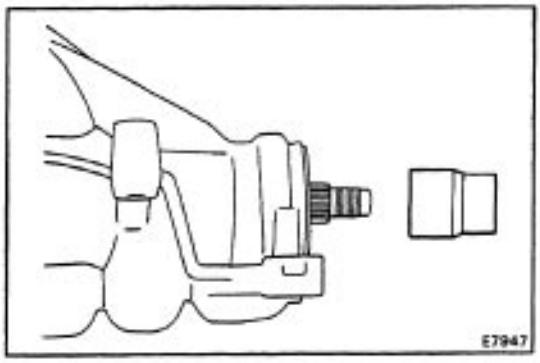
(a) Using SST, remove the front oil seal.
SST 09308–10010

(b) Remove the oil slinger.



5. REMOVE FRONT BEARING AND BEARING SPACER

(a) Using SST, remove the front bearing.
SST 09556–22010

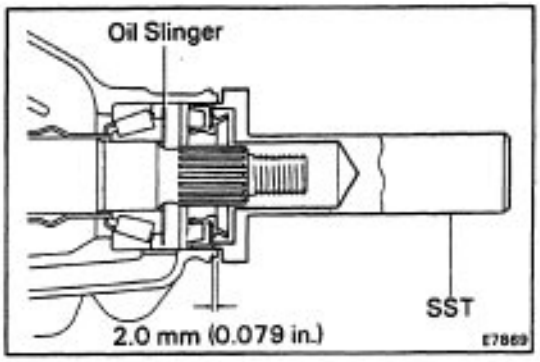


(b) Remove the bearing spacer.

6. INSTALL NEW BEARING SPACER AND FRONT BEARING

(a) Install a new bearing spacer on the shaft.

(b) Install the front bearing on the shaft.



7. INSTALL OIL SLINGER AND NEW OIL SEAL

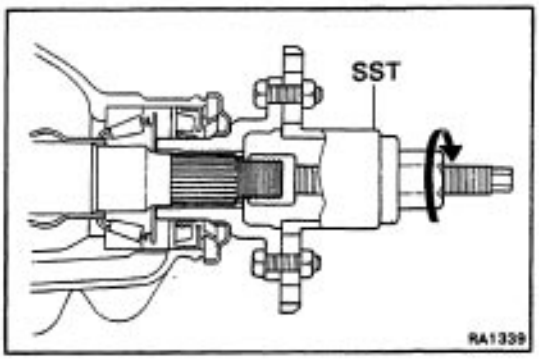
(a) Install the oil slinger on the shaft.

(b) Using SST, drive in a new oil seal.

SST 09554–22010

Oil seat drive in depth: 2.0 mm (0.079 in)

(c) Apply MP grease to the oil seal lip.



8. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange.

SST 09557–22022

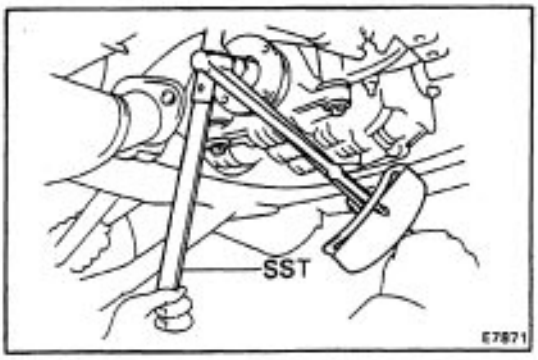
(b) Install the plate washer.

W Coat the threads of a new nut with gear oil.

(d) Using SST to hold the flange, tighten the nut.

SST 09330–0002 1

Torque: 1,100 kg–cm (80 ft–lb, 108 N–m)



9. CHECK DRIVE PINION BEARING PRELOAD

Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear.

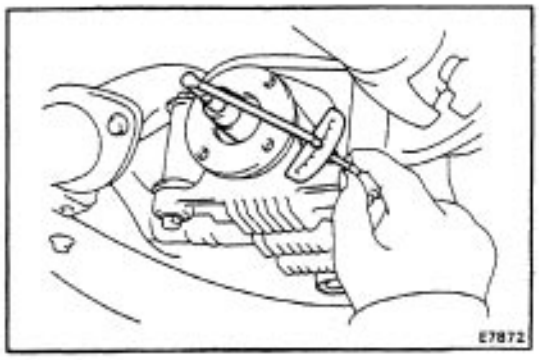
Preload (at starting) :

New bearing 10 – 16 kg–cm

(8.7 – 13.9 in.–lb, 1.0 – 1.6 N–m)

Reused bearing 5 – 8 kg–cm

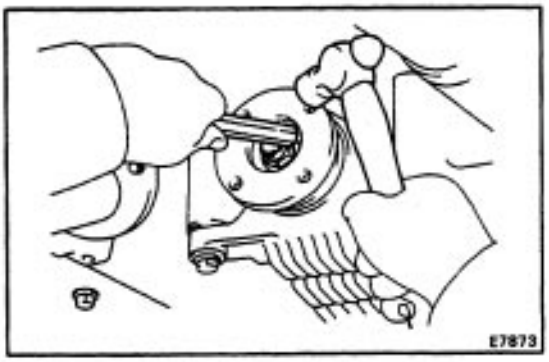
(4.3 – 6.9 in.–lb, 0.5 – 0.8 N–m)



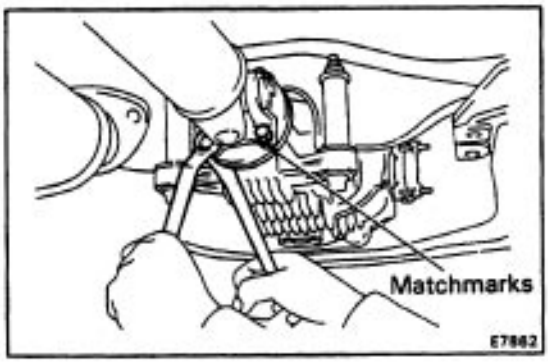
- If preload is greater than specification, replace the bearing spacer.
- If preload is less than specification, retighten the nut 130 kg–cm (9 ft–lb, 13 N–m) at a time until the specified preload is reached.

1f the maximum torque is exceed while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

Maximum torque: 2,400 kg–cm (174 ft–lb, 235 N–m)



10. STAKE DRIVE PINION NUT

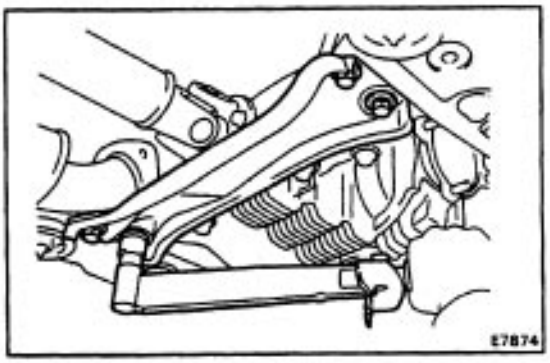


11. CONNECT PROPELLER SHAFT

(a) Align the matchmarks on the flanges and connect the propeller shaft with the four bolts, washers and nuts.

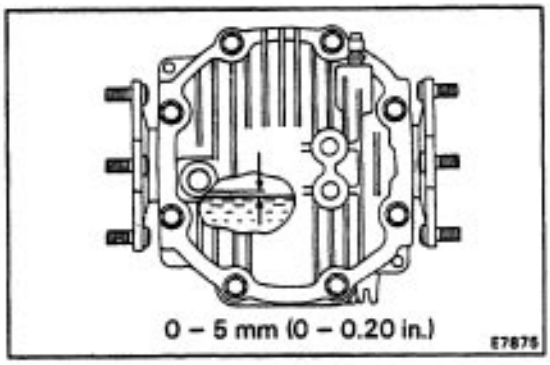
(b) Torque the bolts and nuts.

Torque: 760 kg–cm (54 ft–lb, 74 N–m)



12. INSTALL REAR CROSSMEMBER

Torque: 730 kg–cm (53 ft–lb, 72 N–m)



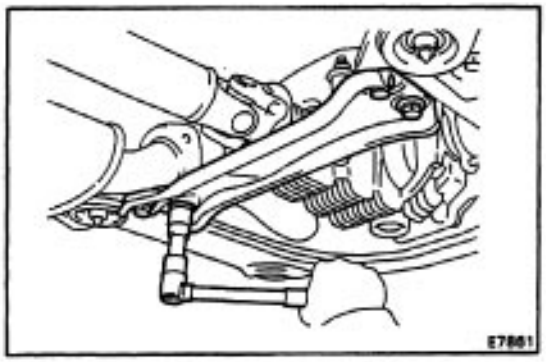
13. CHECK OIL LEVEL

Oil grade: AN GL–5 hypoid gear oil

Viscosity: Above – 18˚C (0˚F) SAE 90

Below – 18˚C (0˚F) SAE 80 W – 90

Capacity: 1.1 liters (1.2 US qts, 1.0 Imp.qts)



Removal of Differential

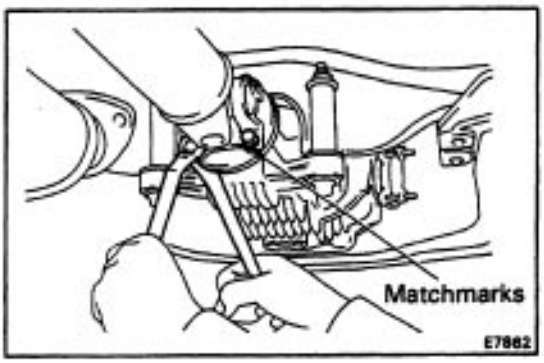
(See page RA–27)

1. DRAIN DIFFERENTIAL OIL

2. REMOVE DRIVE SHAFTS

(See page RA–20)

3. REMOVE REAR CROSSMEMBER

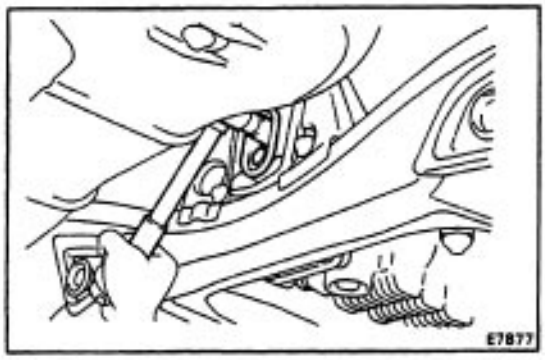


4. DISCONNECT PROPELLER SHAFT

(a) Place the matchmarks on the both flanges.

(b) Remove the four bolts, washers and nuts.

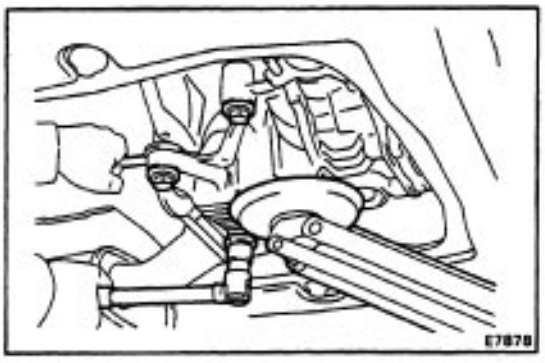
(c) Disconnect the propeller shaft from the differential.



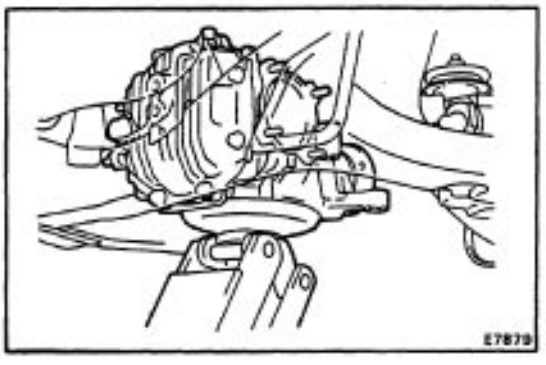
S. REMOVE DIFFERENTIAL

(a) Jack up the differential slightly.

(b) Remove the two bolts.

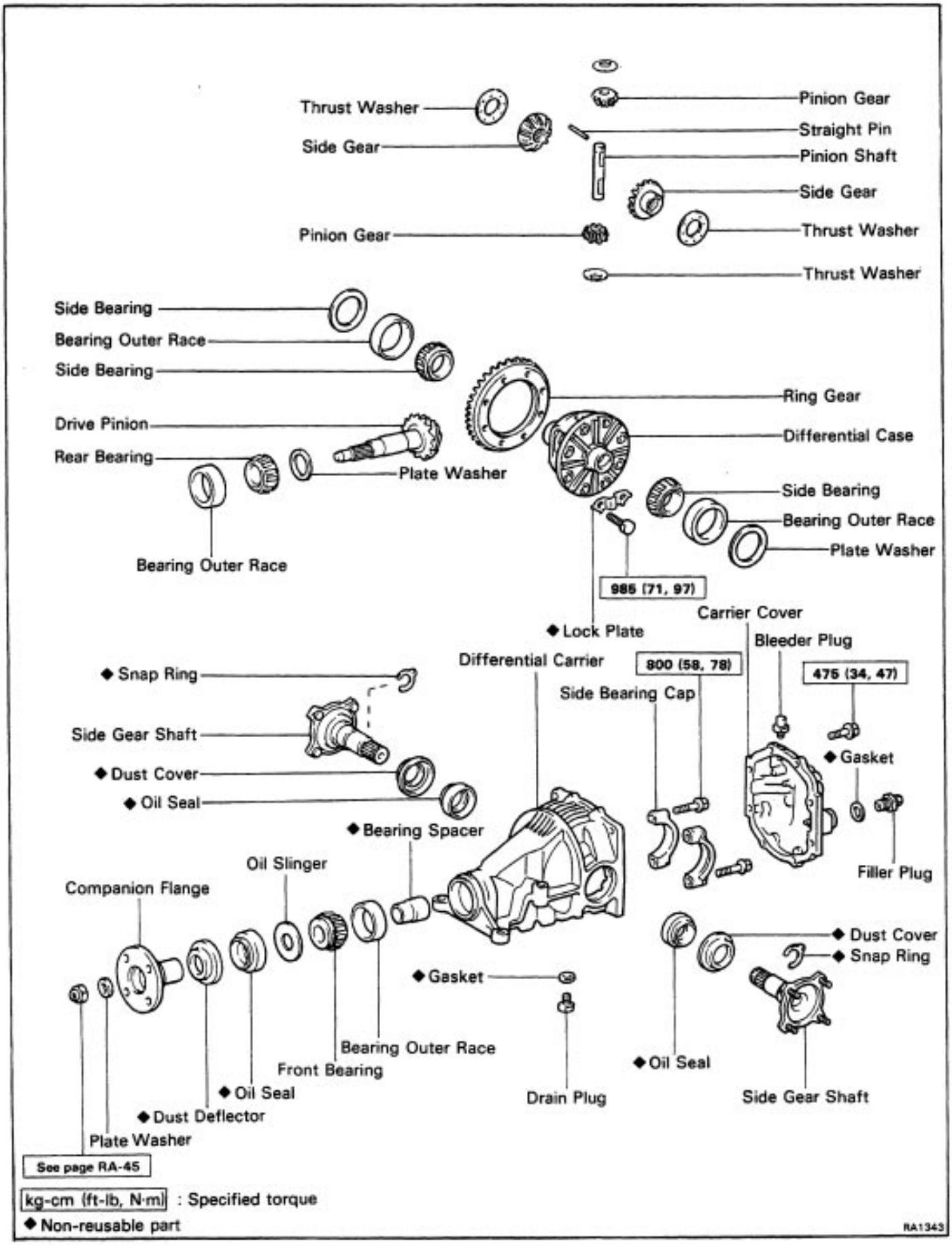


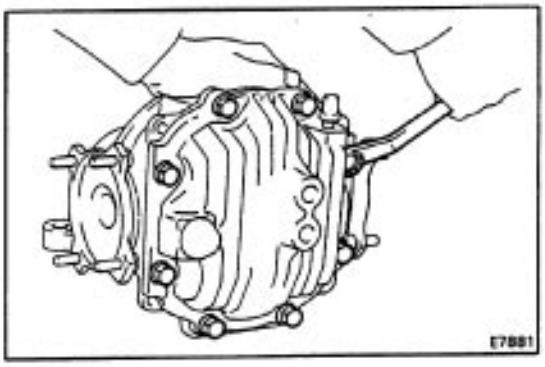
(c) Remove the four nuts and bolts.



(d) Remove the differential from the body.

Differential Carrier

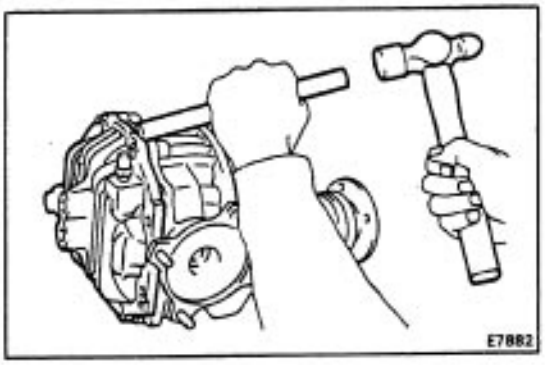




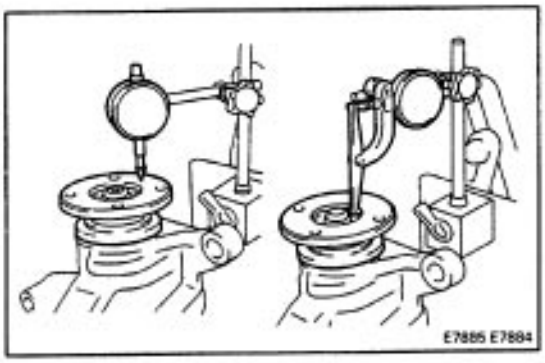
PRE–INSPECTION OF DIFFERENTIAL CARRIER

1. REMOVE DIFFERENTIAL CARRIER COVER

(a) Remove the eight bolts.



(b) Using a brass bar and hammer, separate the cover and carrier. .



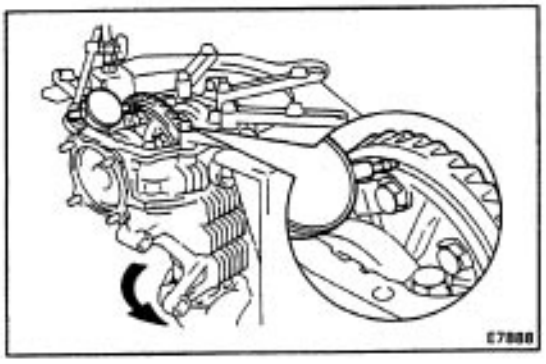
2. CHECK COMPANION FLANGE RUNOUT

Using a dial indicator, measure the lateral and radial runout of the companion flange.

Maximum lateral runout: 0.10 mm (0.0039 in.)

Maximum radial runout: 0.10 mm (0.0039 in.)

If the runout is greater than the maximum, replace the companion flange.

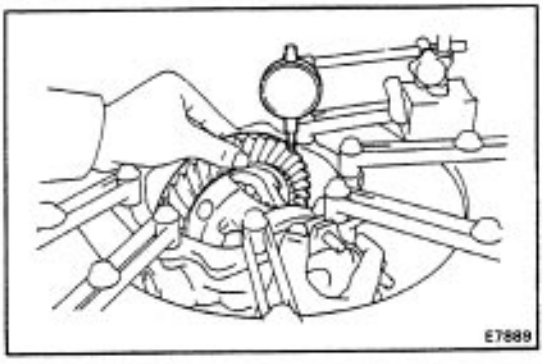


3. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the runout of the ring gear.

Maximum runout: 0.07 mm (0.0028 in.)

If the runout is greater than the maximum, replace the ring gear.



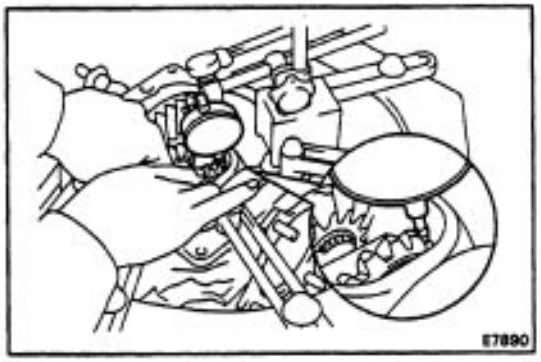
4. CHECK RING GEAR BACKLASH

Using a dial indicator, check the backlash of the ring gear.

Backlash: 0.13 mm – 0.18 mm (0.0051 – 0.0071 in.)

If the backlash is not within specification, adjust the side bearing preload.

5. CHECK TOOTH CONTACT (See page RA–45)

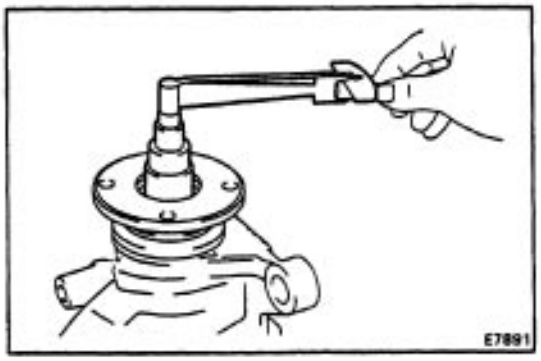


6. CHECK SIDE GEAR BACKLASH

Using a dial indicator, check the backlash of the side gear while holding one pinion gear toward the differential case.

Backlash: 0.05 – 0.20 n nm (0.0020 – 0.0079 in.)

If the backlash is not within specification, install the side gear thrust washers of different thickness.



7. MEASURE DRIVE PINION PRELOAD

Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear.

Preload (at staring):

5–8kg–cm (4.3–6.9in.–lb,0.5–0.8N–n)

8. CHECK TOTAL PRELOAD

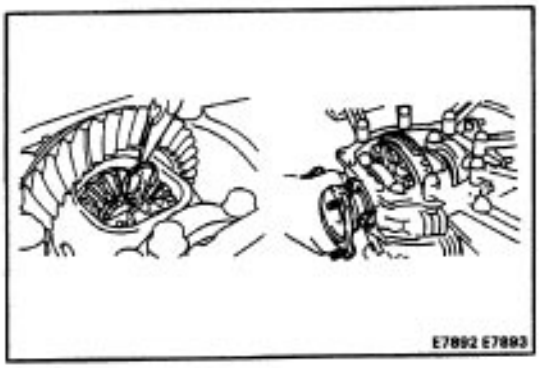
Using a torque wrench, measure the total preload.

Total preload (at starting):

In addition to drive pinion preload

3 – 5 kg–cm (2.6 – 4.3 in.–lb, 0.3 – 0.5 N–m)

If necessary disassembly and inspect a differential.

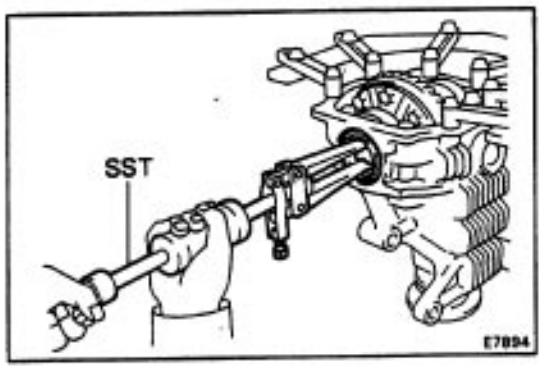


DISASSEMBLY OF DIFFERENTIAL CARRIER

1. REMOVE SIDE GEAR SHAFTS

(a) Remove the two shaft snap rings.

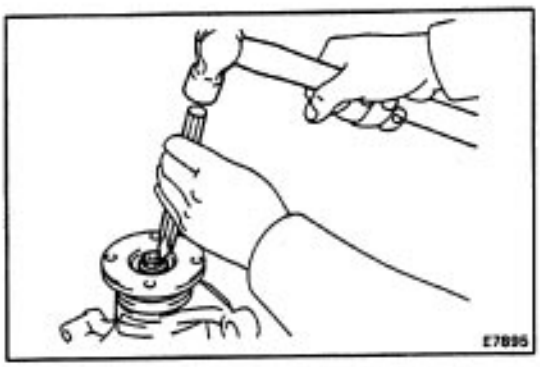
(b) Remove the two side gear shafts.



2. REMOVE SIDE GEAR SHAFT OIL SEALS

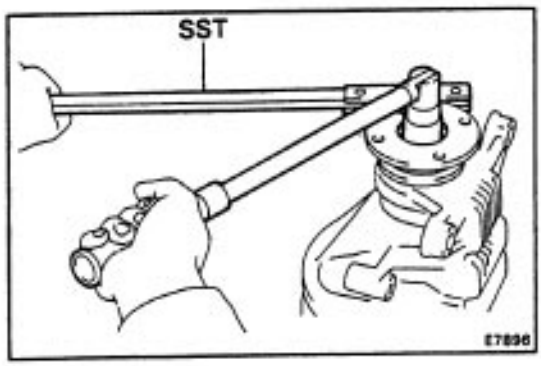
Using SST, remove the two oil seals from the housing.

SST 09308–00010



3. REMOVE COMPANION FLANGE

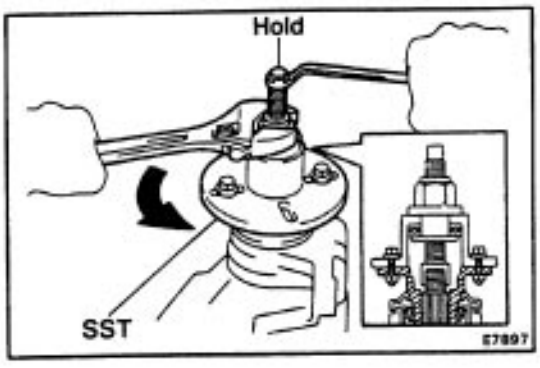
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut.

SST 09330–00021

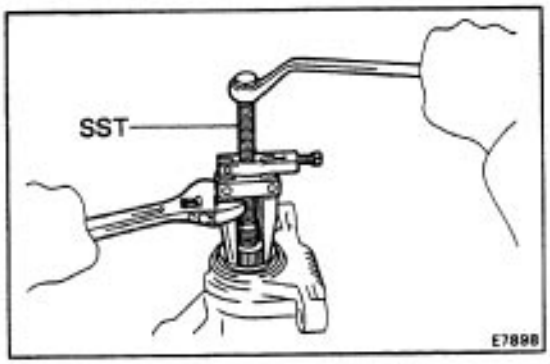
(c) Remove the plate washer.



(d) Using SST, remove the companion flange.

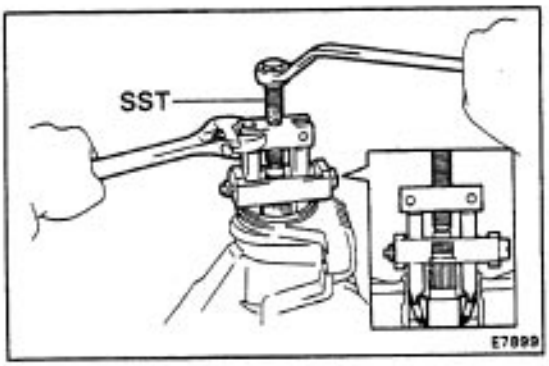
SST 09557–22022

4. REMOVE FRONT OIL SEAL AND OIL SLINGER



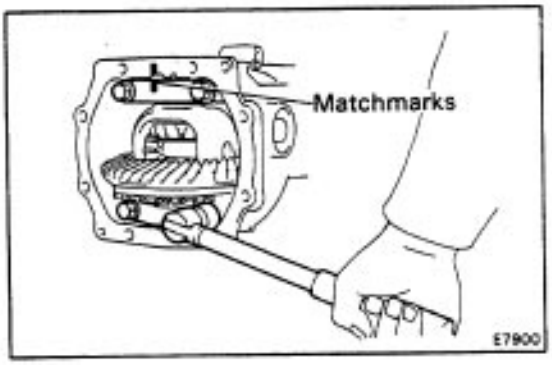
(a) Using SST, remove the oil seal from the housing.
SST 09308–10010
(b) Remove the oil slinger.

5. REMOVE FRONT BEARING AND BEARING SPACER

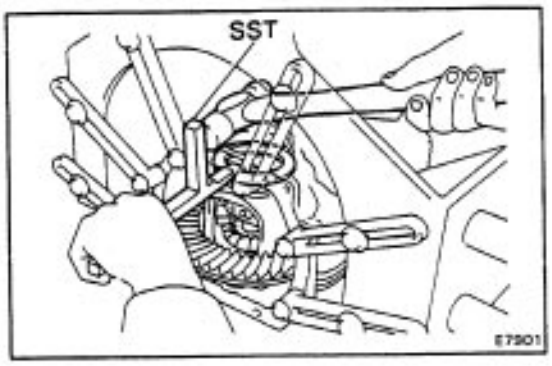


(a) Using SST, remove the bearing from the housing.
SST 09556–22010
(b) Remove the bearing spacer.

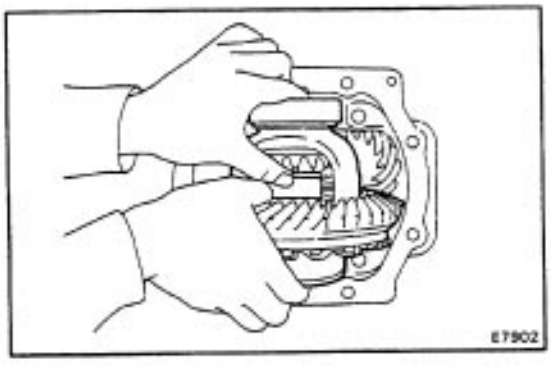
6. REMOVE DIFFERENTIAL CASE



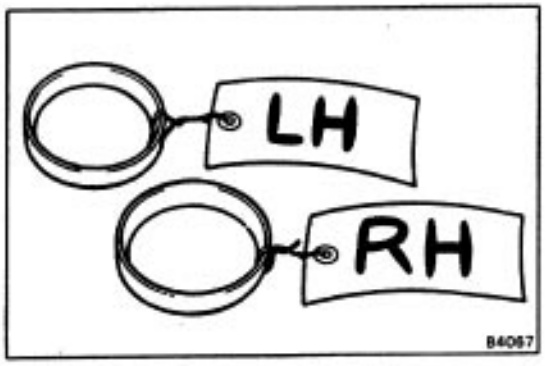
(a) Place matchmarks on the bearing cap and differential carrier.
(b)Remove the two bearing caps.



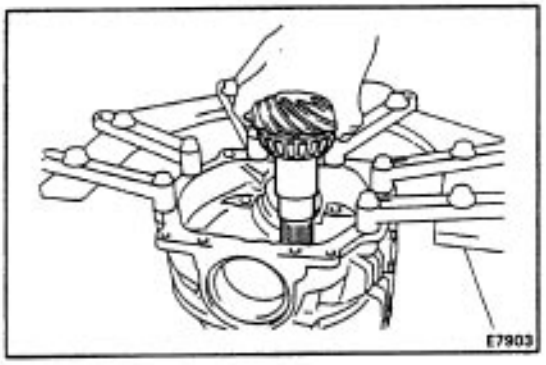
(c) Using SST, remove the two side bearing preload adjusting plate.
SST 09504–22011
HINT: Measure the adjusting plate washer and note the thickness.



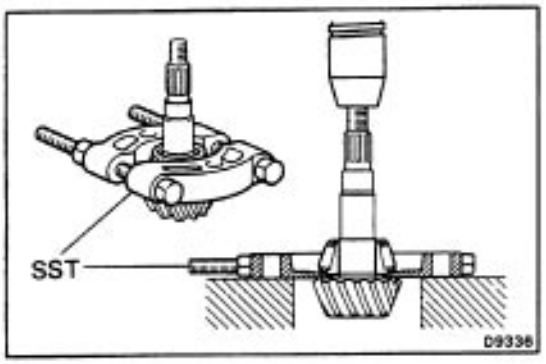
(d) Remove the differential case and bearing outer race from the carrier.



HINT: Tag the bearing outer races to show the location for reassembly.



7. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER

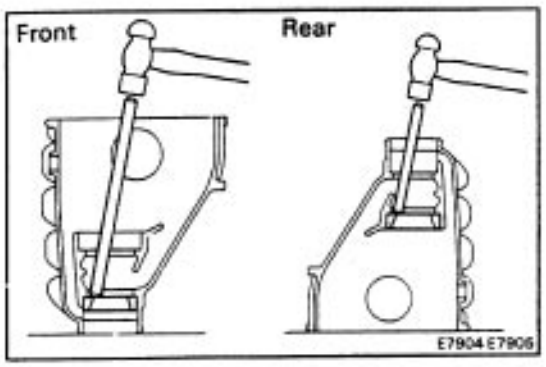


8. REMOVE DRIVE PINION REAR BEARING

(a) Using SST and a press, remove the bearing from the drive pinion.
SST 09950–00020

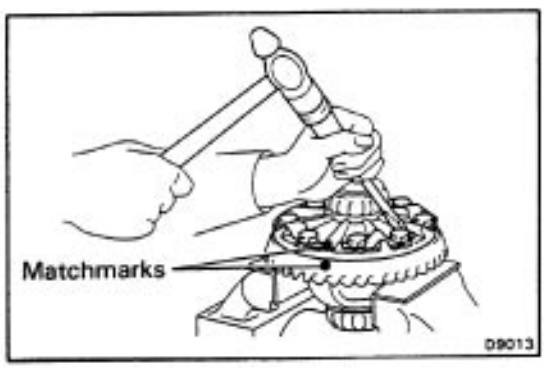
HINT: If the drive pinion or ring gear are damaged replace them a set.

(b) Remove the plate washer.



9. REMOVE FRONT AND REAR BEARING OUTER RACES

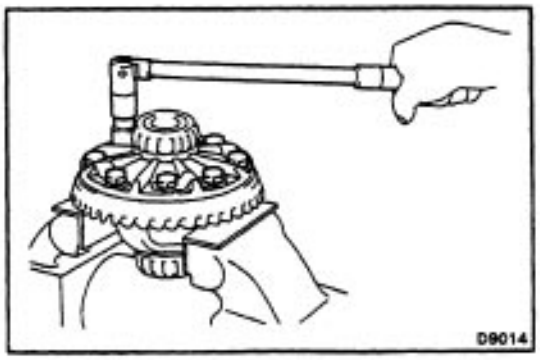
Using a hammer and brass bar, drive out the outer races from the carrier.



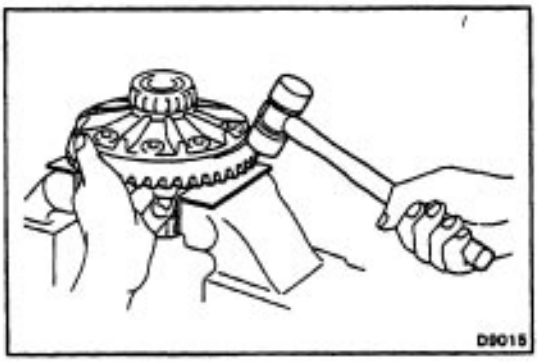
10. REMOVE RING GEAR

(a) Place the matchmarks on the ring gear and differential case.

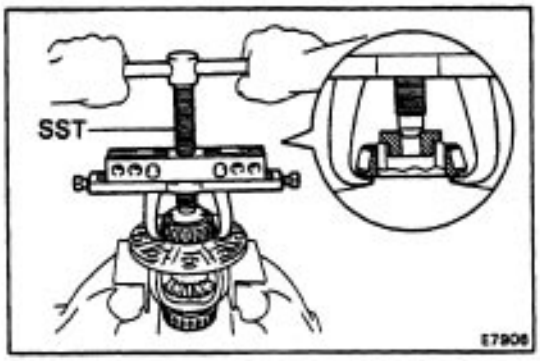
(b) Unstake the lock plates.



(c) Remove the eight bolts and lock plates.



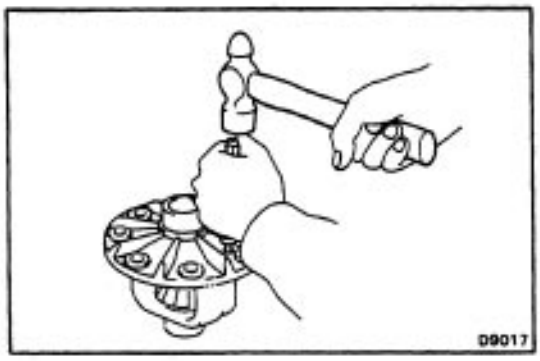
(d) Using a plastic hammer, tap on the ring gear to separate it from differential case.



11. REMOVE SIDE BEARINGS

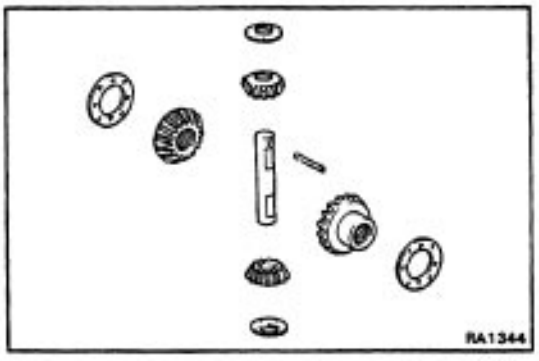
Using SST, remove the two side bearings from differential case.

SST 09950–24017



12. DISASSEMBLE DIFFERENTIAL CASE

(a) Using a hammer and punch, drive out the straight pin.



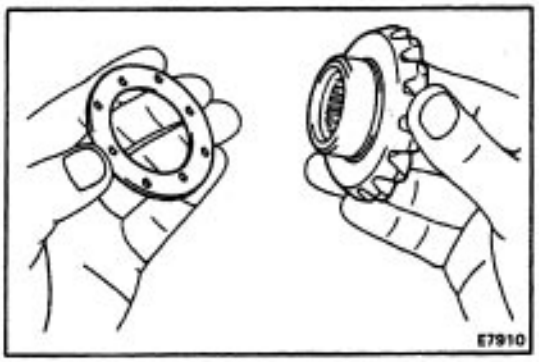
(b) Remove the following parts from differential case:

- **Pinion shaft**
- **Two pinion gears**
- **Two side gears**
- **Four thrust washers**

ASSEMBLY OF DIFFERENTIAL CARRIER

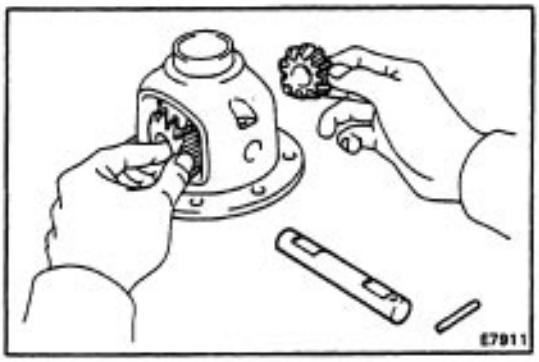
1. ASSEMBLE DIFFERENTIAL CASE

(a) Install the thrust washers to the side gears.



(b) Install the side gears with thrust washers and pinion gears with thrust washers.

(c) Install the pinion shaft.

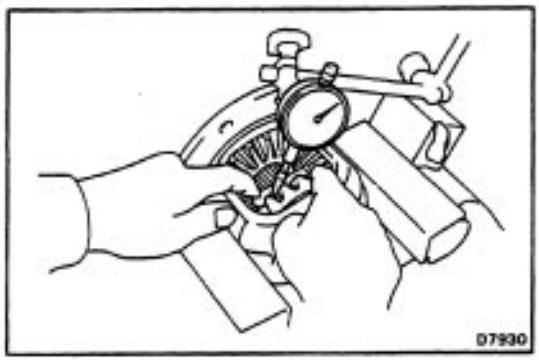


(d) Check the side gear backlash.

Measure the side gear backlash while holding one pinion gear toward the case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.079 in.)

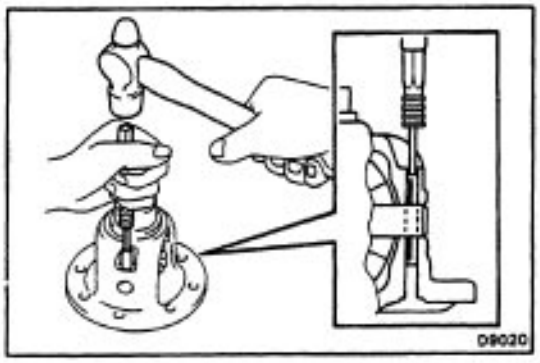
If the backlash is not within specification, install the side gear thrust washers of different thickness.



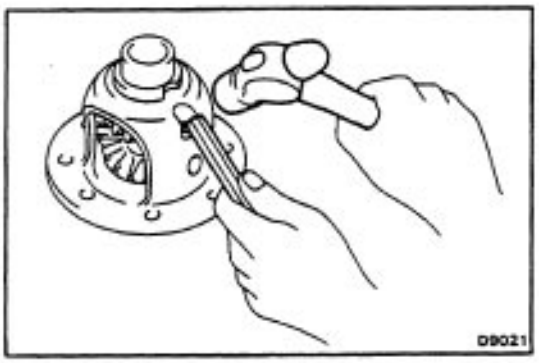
Thrust washer thickness mm (in.)	
0.95 (0.0374)	1.10 (0.0433)
1.00 (0.0394)	1.15 (0.0453)
1.05 (0.0413)	1.20 (0.0472)

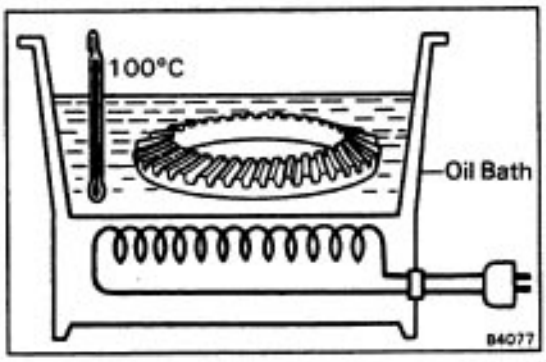
HINT: Use washers of same thickness on both the right and left sides.

(e) Using a hammer and punch, drive in the straight pin through the case and hole in the pinion shaft.



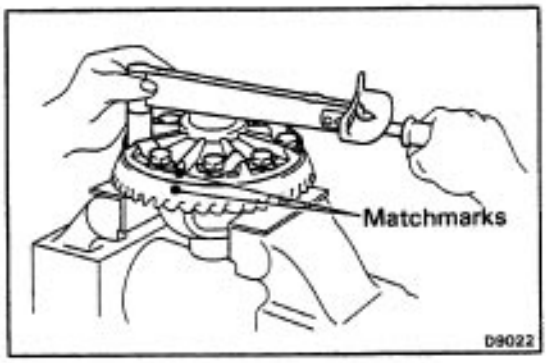
(f) Stake the case.

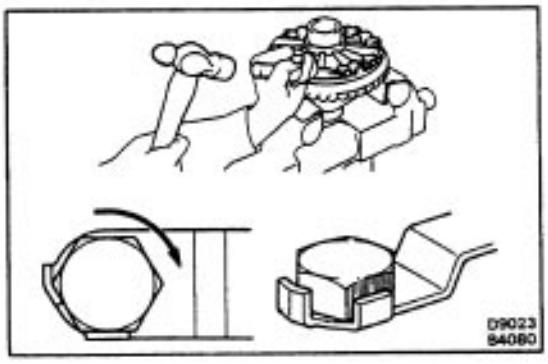




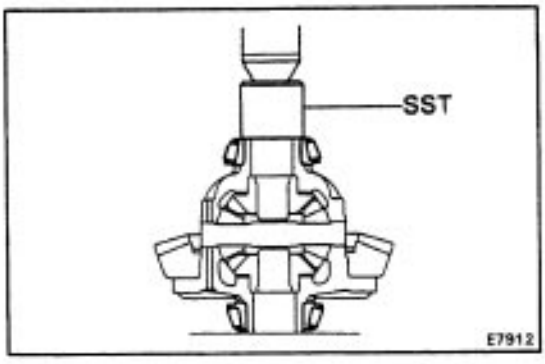
2. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surface of the differential case.
(b) Heat the ring gear to about 100˚C (212˚F) in an oil bath.
NOTICE: Do not heat the ring gear above 110˚C (230˚F).
(c) Clean the contact surface of the ring gear with cleaning solvent.
(d) Then quickly install the ring gear on the differential case.
(e) Align the matchmarks on the ring gear and differential case.
(f) Coat the ring gear set bolts with gear oil.
(g) Temporarily install the lock plates and set bolts.
(h) After the ring gear cools down enough, tighten the set bolts uniformly and a little at a time.
Torque: 985 kg–cm (71 ft–lb, 97 N–m)



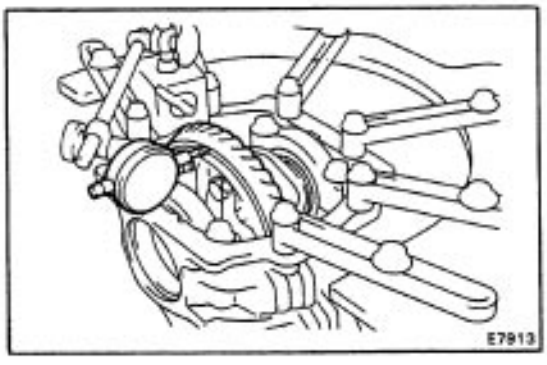


Using a hammer and drift punch, stake the lock plates.
HINT: Stake one claw flush with the flat surface of the nut. For the claw contacting the protruding portion of the nut, stake only the half on the tightening side.



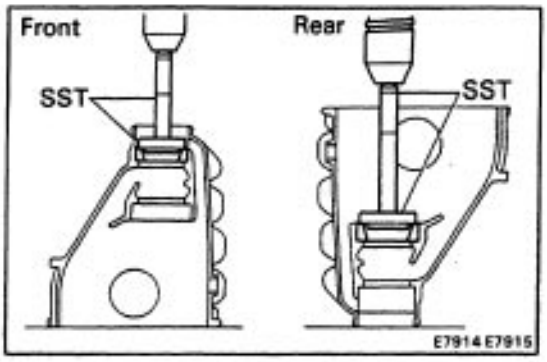
3. INSTALL SIDE BEARINGS

Using a press and SST, drive in the side bearings into the differential case.
SST 09710–22020 (09710–01030)



4. CHECK RING GEAR RUNOUT

(a) Install the differential case onto the carrier and install the plate washers to where there is no play in the bearing (See page RA–42)
(b) Install bearing caps. (See page RA–44)
(c) Using a dial indicator, measure the runout of ring gear.
Maximum runout: 0.07 mm (0.0028 in.)



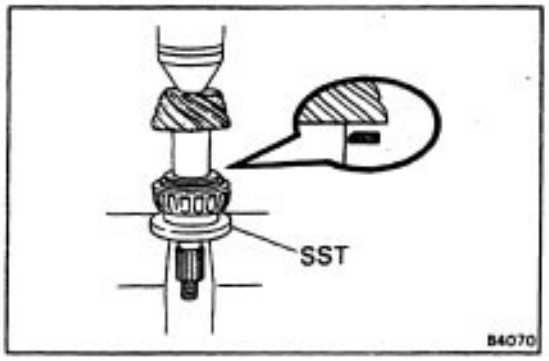
5. INSTALL FRONT AND REAR BEARING OUTER RACES

Using a press and SST, drive in the front and rear bearing outer races.

SST 09608–30012

Front (09608–04020 and 09608–00060)

Rear (09608–04020 and 09608–04100)

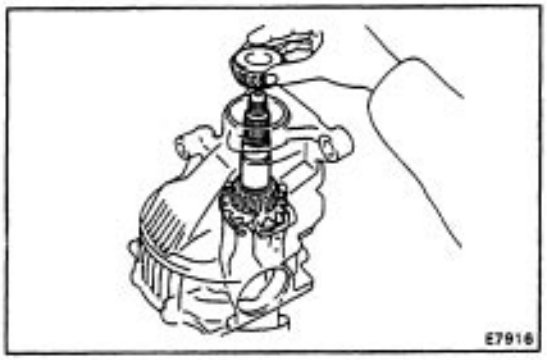


6. INSTALL REAR BEARING TO DRIVE PINION

(a) install the plate washer on the drive pinion with the chamfered end facing toward the pinion gear.

(b) Using a press and SST, install the rear bearing onto the drive pinion.

SST 09506–30012

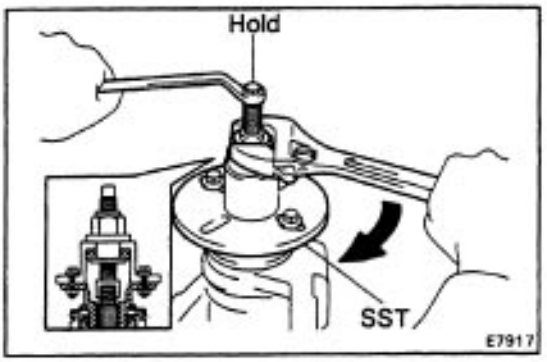


7. TEMPORARILY ADJUST DRIVE PINION PRELOAD

(a) Install the following parts:

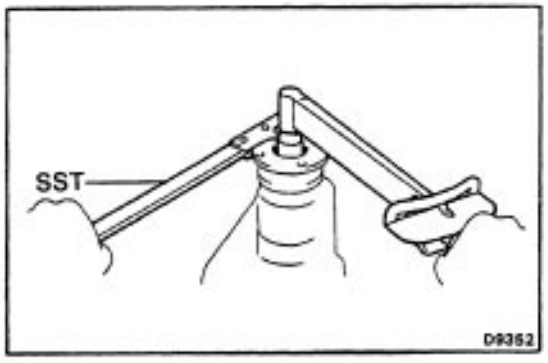
- Drive pinion
- Front bearing

HINT: Assemble the spacer, oil slinger and oil seal after adjusting the gear contact pattern.



(b) Install the companion flange with SST.

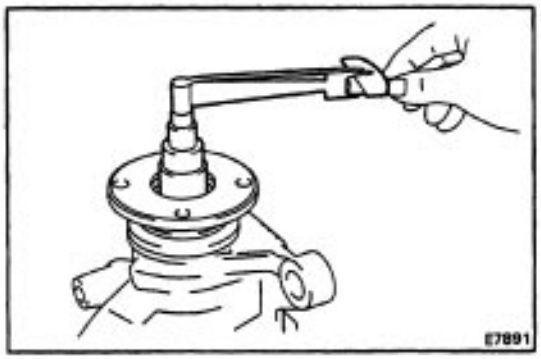
SST 09557–22022



(c) Adjusting the drive pinion preload by tightening the companion flange nut.

Using SST to hold the flange, tighten the nut.

SST 09330–00021



(d) Using a torque meter, measure the preload.

Preload (at staring):

New bearing

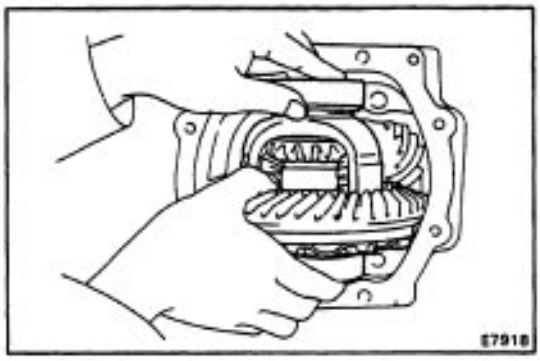
10 – 16 kg–cm

(8.7 – 13.9 in.–lb, 1.0 – 1.6 N–m)

Reused bearing

5 – 8 kg–cm

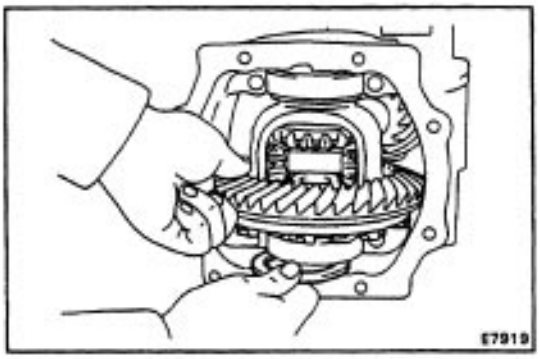
(4.3 – 6.9 in.–lb, 0.5 – 0.8 N–m)



8. INSTALL DIFFERENTIAL CASE IN CARRIER

(a)Place the bearing outer races on their respective bearings. Make sure the left and right outer races are not interchanged.

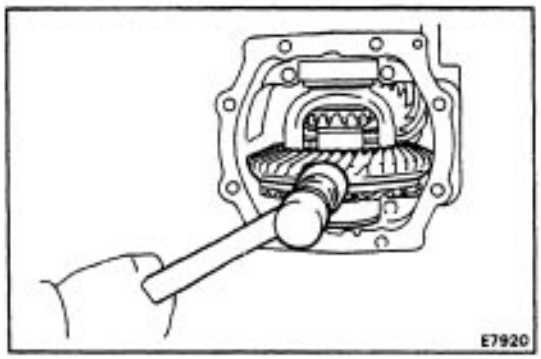
(b) Install the differential case in the carrier.



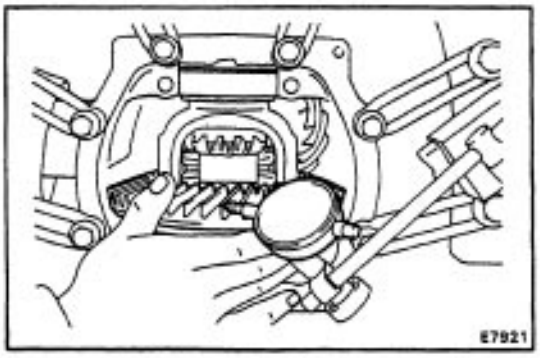
9. ADJUST RING GEAR BACKLASH

(a) Install only the plate washer on the ring gear back side.

HINT: Insure that the ring gear has backlash.



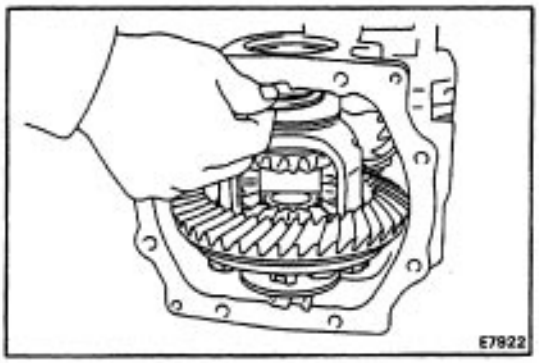
(b) Snug down the washer and bearing by tapping on the ring gear with a plastic hammer.



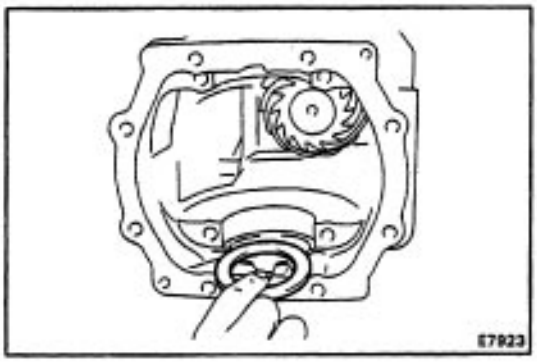
(c) Using a dial indicator, measure the backlash.

(d) Select a ring gear back side plate washer so that the backlash is 0.13 mm (0.0051 in.).

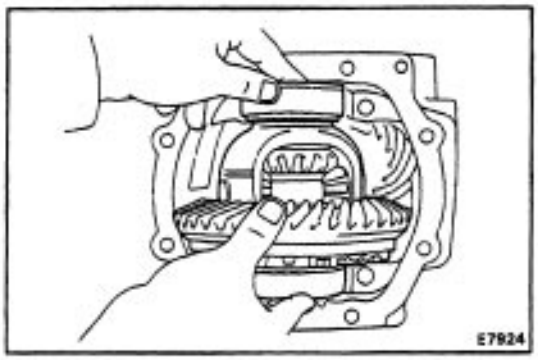
(See table on page RA–44)



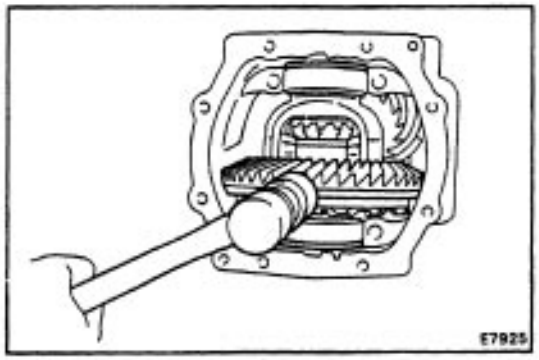
(e) Select a ring gear teeth side washer with a thickness which eliminates any clearance between the outer race and case.



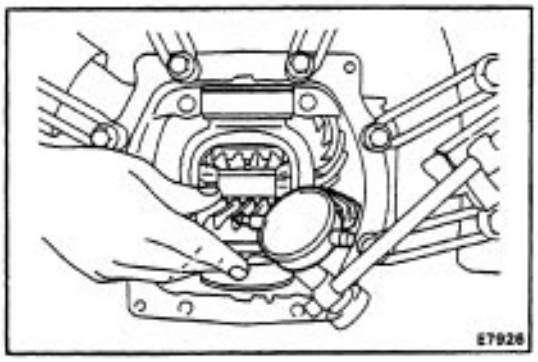
(f) Remove the plate washer and differential case. Install the plate washer into the ring gear back side.



(g) Place the other plate washer onto the differential case together with the outer race, and install the differential case with the outer race into the carrier.



(h)Using a plastic hammer, snug down the washer and bearing by tapping the ring gear.



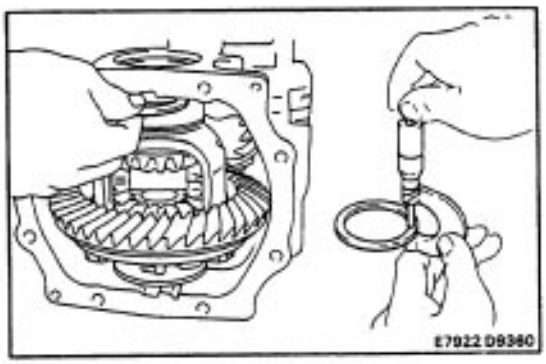
(j) Using a dial indicator, measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

(k) If not within the specification, adjust by either increasing or decreasing the number of washers on both sides by an equal amount.

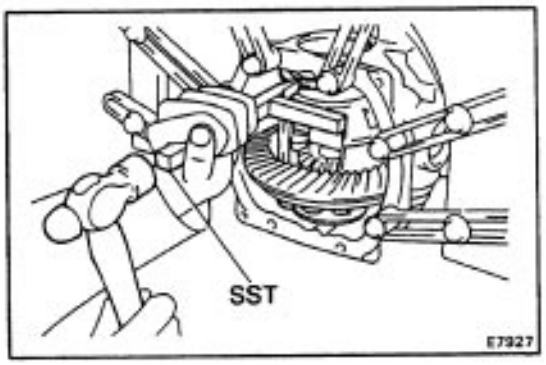
HINT: There should be no clearance between the plate washer and case.

Insure that there is ring gear backlash.



10. ADJUST SIDE BEARING PRELOAD

(a) Remove the ring gear teeth side plate washer and measure the thickness.

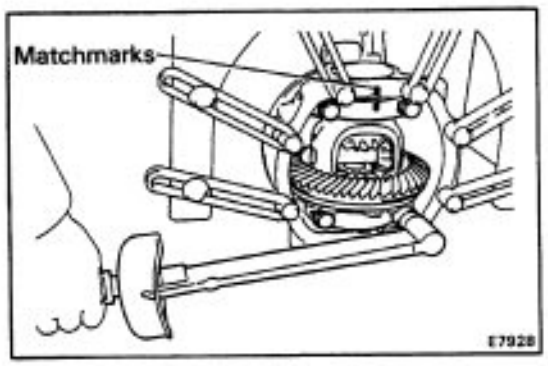


(b) Install a new plate washer of 0.06 – 0.09 mm (0.0024 – 0.0035 in.) thicker than the removed washer.

HINT: Select a washer which can be pressed in 2/3 of the way by finger.

(c) Using a hammer and SST, tap in the side washer.

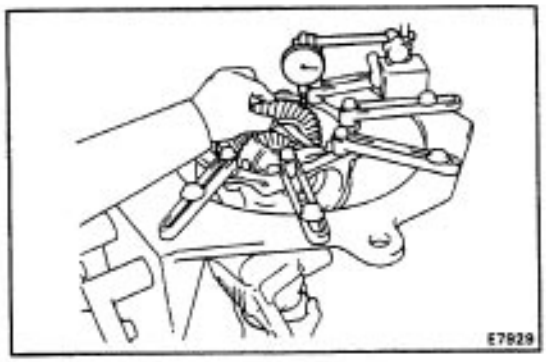
SST 09504–22011



(d) Install the side bearing caps.

HINT: Align the matchmarks on the cap and carrier.

Torque: 800 kg–cm (58 ft–lb, 78 N–m)



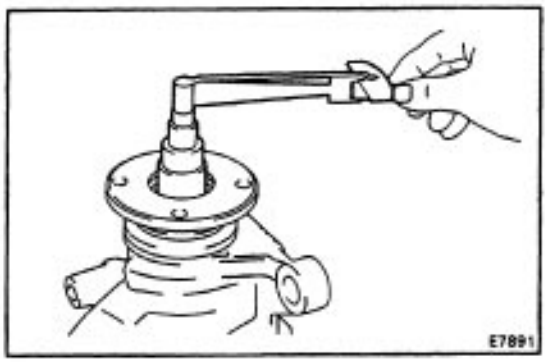
(e) Recheck the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

(f) If not within the standard, adjust by either increasing or decreasing the washers on both sides by equal amount.

HINT: The backlash will change about 0.02 mm (0.0008 in.) with 0.03 mm (0.0012 in.) alteration of the side washer.

Washer thickness	mm (in.)
2.21–2.23 (0.0870–0.0878)	2.72–2.74 (0.1071–0.1079)
2.24–2.26 (0.0882–0.0890)	2.75–2.77 (0.1083–0.1091)
2.27–2.29 (0.0894–0.0902)	2.78–2.80 (0.1094–0.1102)
2.30–2.32 (0.0906–0.0913)	2.81–2.83 (0.1106–0.1114)
2.33–2.35 (0.0917–0.0925)	2.84–2.86 (0.1118–0.1126)
2.36–2.38 (0.0929–0.0937)	2.87–2.89 (0.1130–0.1138)
2.39–2.41 (0.0941–0.0949)	2.90–2.92 (0.1142–0.1150)
2.42–2.44 (0.0953–0.0961)	2.93–2.95 (0.1154–0.1161)
2.45–2.47 (0.0965–0.0972)	2.96–2.98 (0.1165–0.1173)
2.48–2.50 (0.0976–0.0984)	2.99–3.01 (0.1177–0.1185)
2.51–2.53 (0.0988–0.0996)	3.02–3.04 (0.1189–0.1197)
2.54–2.56 (0.1000–0.1008)	3.05–3.07 (0.1201–0.1209)
2.57–2.59 (0.1012–0.1020)	3.08–3.10 (0.1213–0.1220)
2.60–2.62 (0.1024–0.1031)	3.11–3.13 (0.1224–0.1232)
2.63–2.65 (0.1035–0.1043)	3.14–3.16 (0.1236–0.1244)
2.66–2.68 (0.1047–0.1055)	3.17–3.19 (0.1248–0.1256)
2.69–2.71 (0.1059–0.1067)	3.20–3.22 (0.1260–0.1268)



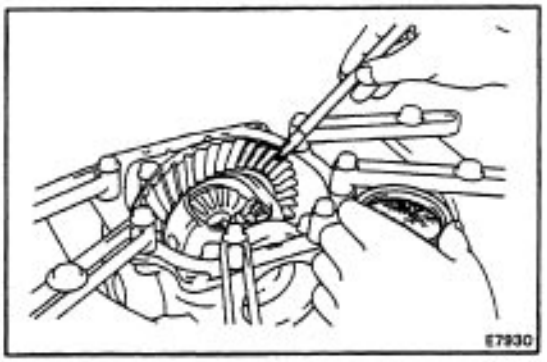
11. MEASURE TOTAL PRELOAD

Using a torque wrench, measure the total preload.

Total preload (at starting):

Add drive pinion preload

3 – 5 kg–cm (2.6 – 4.3 in.–lb, 0.3 – 0.5 N–m)

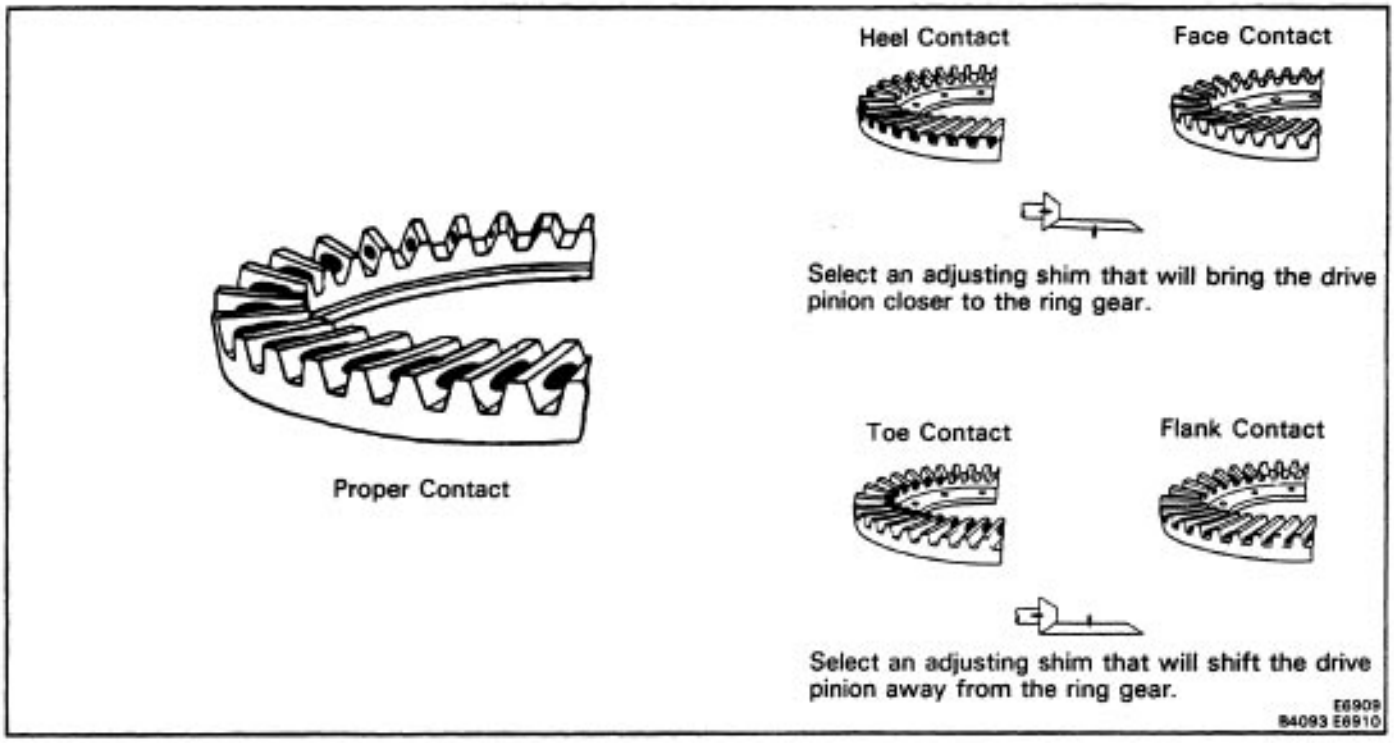


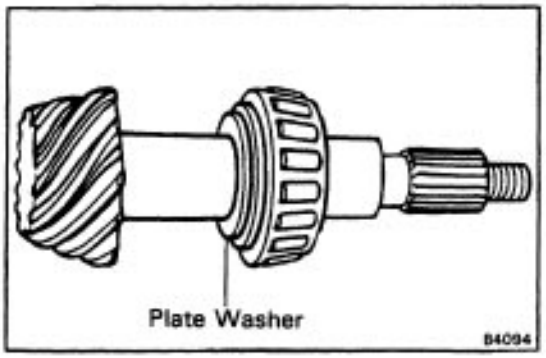
12. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead.

(b) Hold the companion flange firmly and rotate the ring gear in both directions.

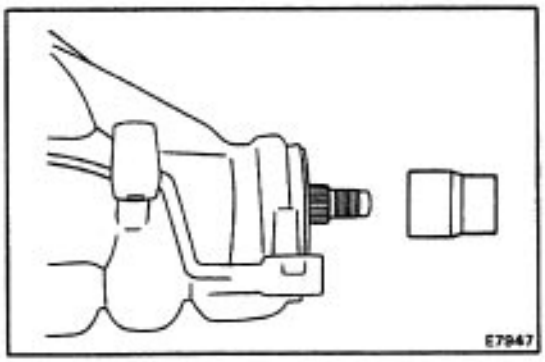
(c) Inspect the tooth contact.





If the teeth are not contacting properly, use the following chart to select a proper washer for correction.

Thickness	mm (in.)
2.27 (0.0894) 2.30 (0.0906) 2.33 (0.0917) 2.36 (0.0929) 2.39 (0.0941) 2.42 (0.0953) 2.45 (0.0965) 2.48 (0.0976) 2.51 (0.0988)	2.54 (0.1000) 2.57 (0.1012) 2.60 (0.1024) 2.63 (0.1035) 2.66 (0.1047) 2.69 (0.1059)



13. REMOVE COMPANION FLANGE

(See step 3 on page RA–35)

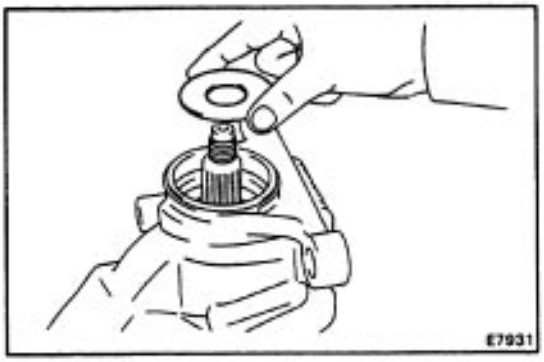
14. REMOVE FRONT BEARING

(See step 5 on page RA–36)

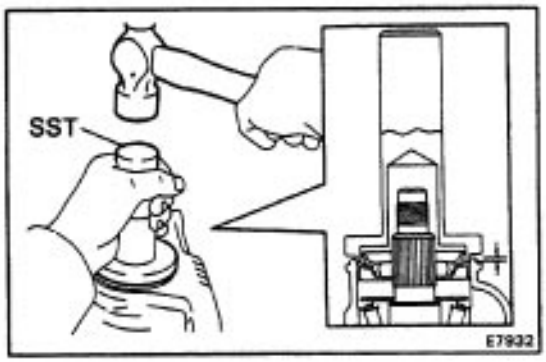
15. INSTALL NEW BEARING SPACER AND FRONT BEARING

(a) Install a new bearing spacer on the drive pinion.

(b) Install the front bearing on the drive pinion.



16. INSTALL OIL SLINGER



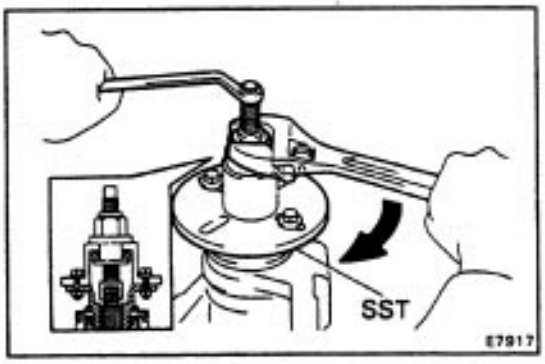
17. INSTALL NEW OIL SEAL

(a) Using SST, drive in a new oil seal.

SST 09554–22010

Oil seal drive in depth: 2.0 mm (0.079 in.)

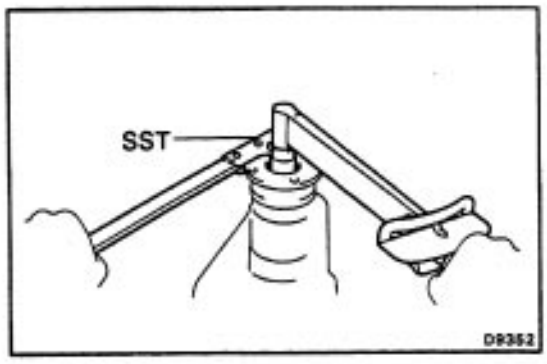
(b) Apply MP grease to oil seal lip.



18. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange on the shaft.

SST 09557–22022



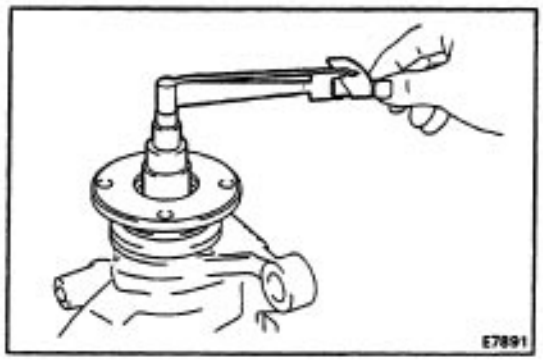
(b) Install the plate washer.

(c) Coat the threads of a new nut with gear oil.

(d) Using SST to hold the flange, tighten the nut.

SST 09330–00021

Torque: 1,100 kg–cm (80 ft–lb, 108 N–m)



19. CHECK DRIVE PINION BEARING PRELOAD

Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear.

Preload (at starting):

New bearing

10 – 16 kg–cm

(8.7 – 13.9 in.–lb, 1.0 – 1.6 N–m)

Reused bearing

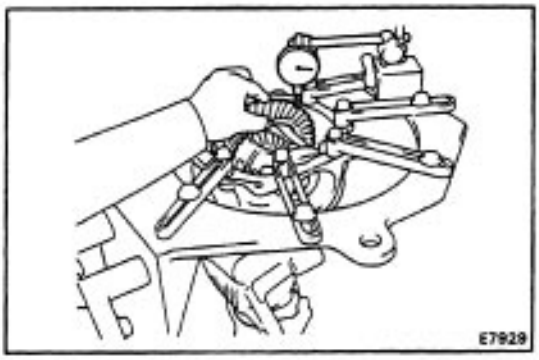
5–8kg–cm

(4.3 – 6.9 in.–lb, 0.5 – 0.8 N–m)

- If preload is greater than specification, replace the bearing spacer.
- If preload is less than specification, re–tighten the nut 130 kg–cm (9 ft–lb, 13 N–m) at a time until the specified preload is reached. .

  If the maximum torque is exceed while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

Maximum torque: 2,400 kg–cm (174 ft–lb, 235 N–m)



20. CHECK TOTAL PRELOAD

Total preload (at starting):

Add drive pinion preload

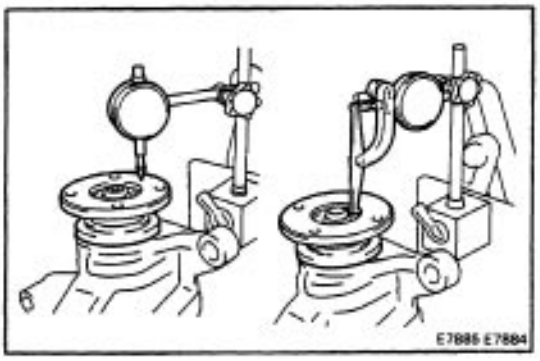
3 – 5 kg–cm (2.6 – 4.3 in.–lb, 0.3 – 0.5 N–m)

21. CHECK RING GEAR BACKLASH

Using a dial indicator, check the backlash of the ring gear.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

If the backlash is not within specification, adjust the side bearing pt–eload.



22. INSPECT TOOTH CONTACT BETWEEN RING GEAR

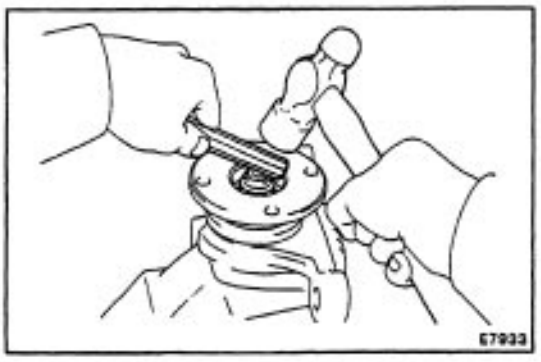
AND DRIVE PINION (See page RA–39)

23. CHECK COMPANION FLANGE RUNOUT

Using a dial indicator, measure the lateral and radial runout of the companion flange.

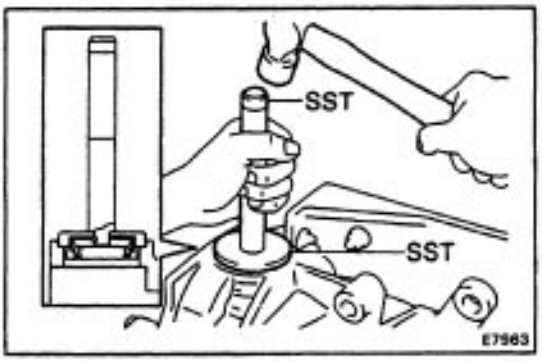
Maximum lateral runout: 0.10 mm (0.0039 in.)

Maximum radial runout: 0.10 mm (0.0039 in.)



24. STAKE DRIVE PINION NUT

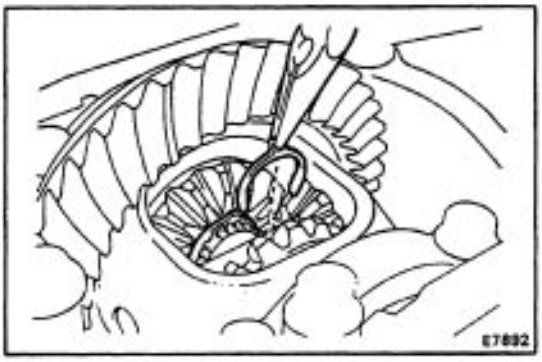
25. INSTALL NEW SIDE GEAR SHAFT OIL SEALS



(a) Using SST, drive in two new oil seals until they are flush with the carrier end surface.
SST 09550–22011 (09550–00020 and 09550–00031)

(b) Coat the oil seal lips with MP grease.

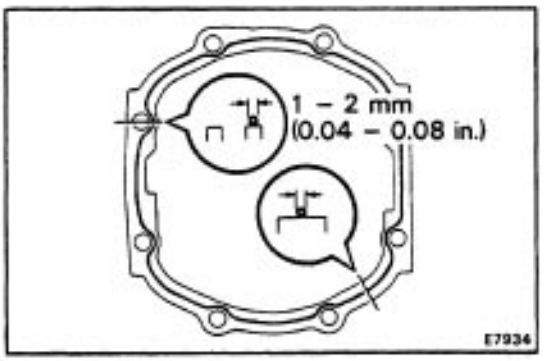
26. INSTALL SIDE GEAR SHAFTS



(a) Install the two side gear shafts to the differential case.

(b) Install two new shaft snap rings to the side gear shafts.

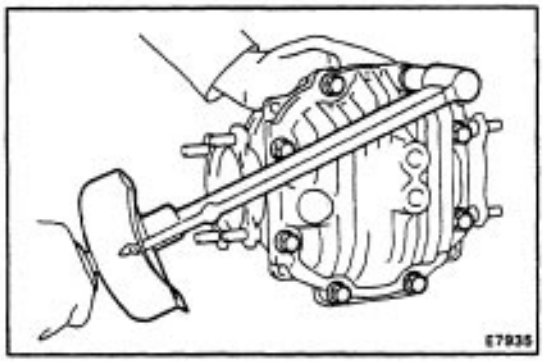
27. INSTALL DIFFERENTIAL CARRIER COVER



(a) Clean contacting surfaces of any residual packing material using gasoline or alcohol.

(b) Apply seal packing to the carrier.
Seal packing: Par No. 08826–00090, THREE BOND 1281 or equivalent

HINT: Install the carrier cover within 3 minutes after applying seal packing.



(c) Install and tighten the eight set bolts.
Torque: 475 kg–cm (34 ft–lb, 47 N–m)

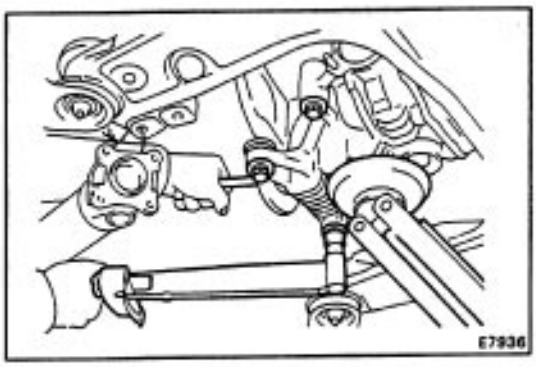
INSTALLATION OF DIFFERENTIAL

(See page RA–27)

1. INSTALL DIFFERENTIAL

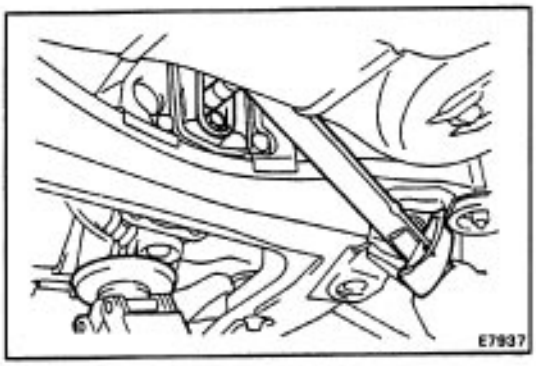
(a) Position the differential and torque the four bolts and nuts.

Torque: 970 kg–cm (70 ft–lb. 95 N–m)



(b) Install and torque the two bolts.

Torque: 1,500 kg–cm 108 ft–lb, 147 N–m)

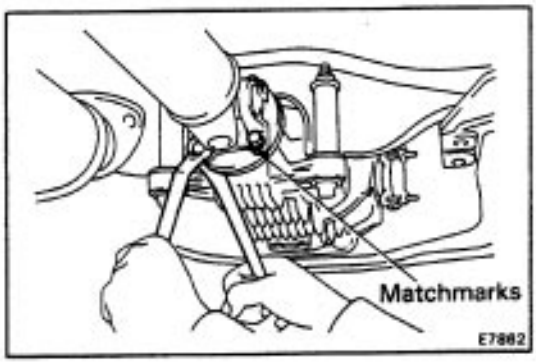


2. CONNECT PROPELLER SHAFT

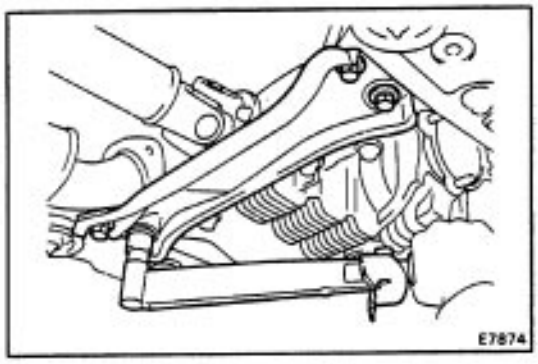
(a) Align the matchmarks on the flanges and connect the flanges with four bolts, nuts and washers.

(b) Torque the four bolts and nuts.

Torque: 750 kg–cm (54 ft–lb, 74 N–m)



4. CONNECT DRIVE SHAFTS (See page RA–131)



5. FILL DIFFERENTIAL WITH GEAR OIL

(a) Install the drain plug with new gasket.

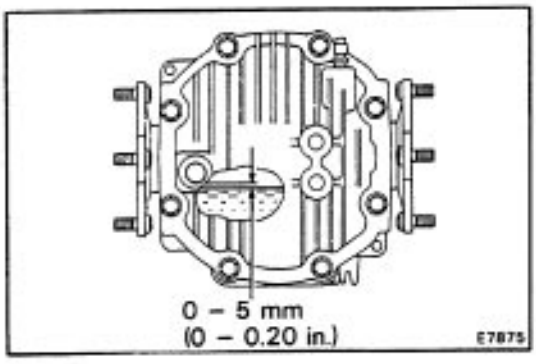
Torque: 500 kg–cm (36 ft–lb, 49 N–m)

(b) Fill the differential with gear oil.

Oil grade: API GL–5 hypoid gear oil
Viscosity: Above –18˚C (0˚F) SAE 90
Below –18˚C
(0˚F) SAE 80W–90
Capacity: 1.1 liters (1.2 US qts, 1.0 Imp.qts)

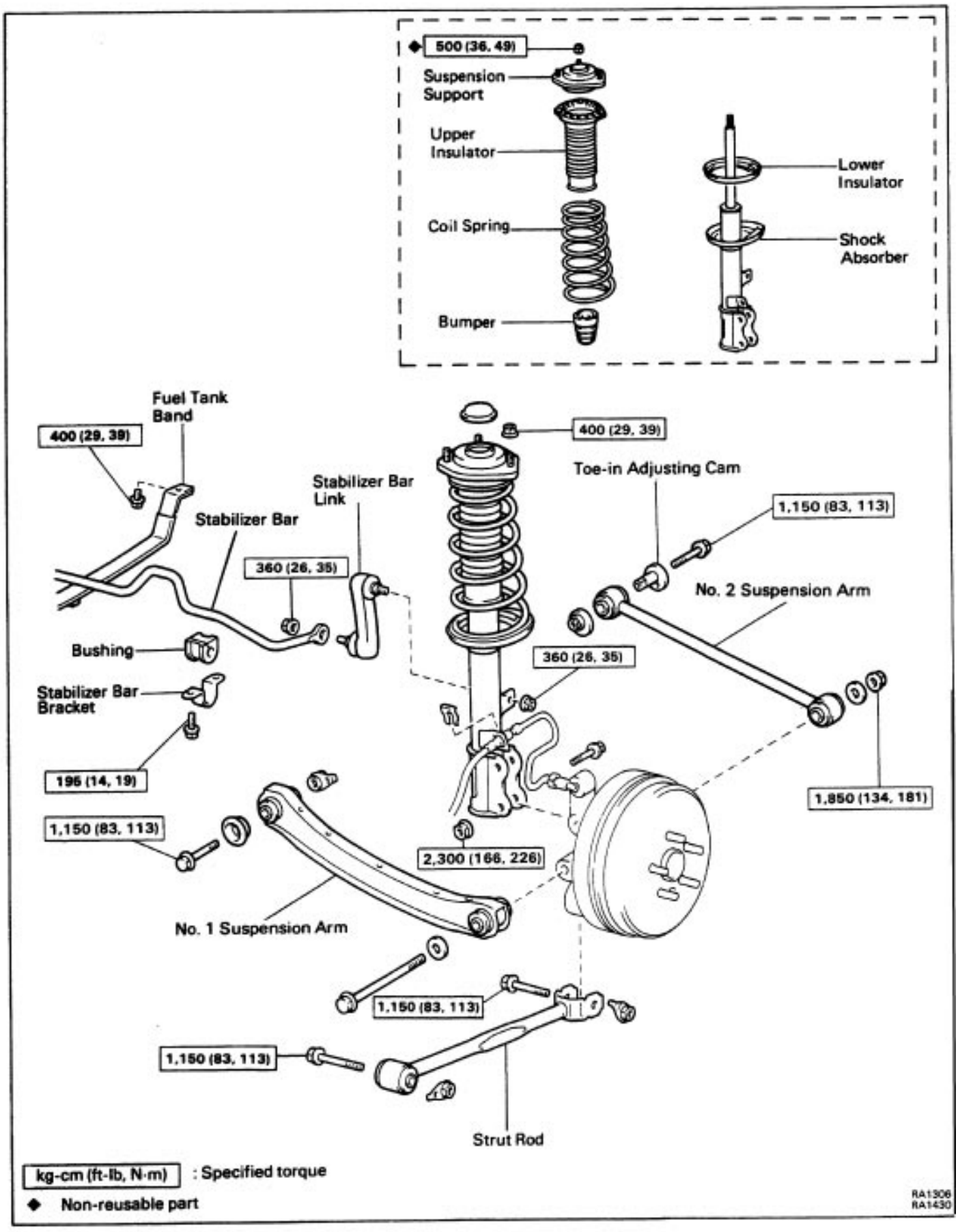
(c) Install the filler plug with new gasket.

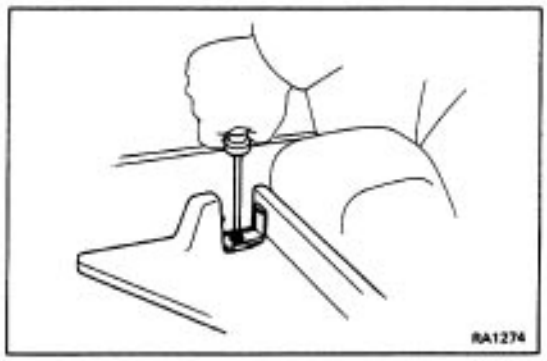
Torque: 400 kg–cm (29 ft–lb, 39 N–m)



REAR SUSPENSION (FWD)

COMPONENTS

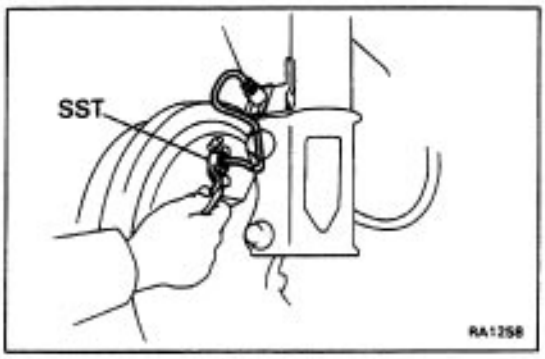




Rear Shock Absorber

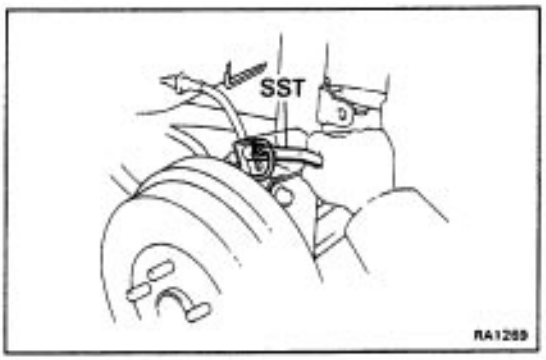
REMOVAL OF REAR SHOCK ABSORBER

1. REMOVE TONNEAU COVER HOLDER (Wagon)



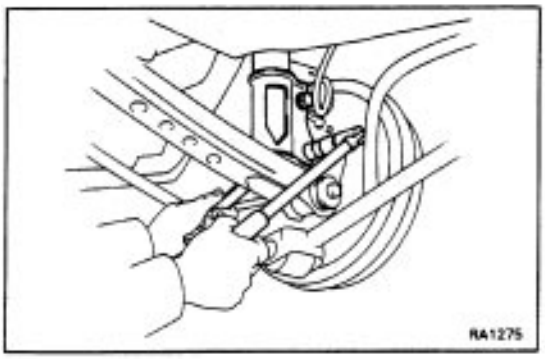
2. REMOVE BRAKE HOSE FROM SHOCK ABSORBER

(a) Using SST, disconnect the backing plate.
SST 09751–36011



(b) Using SST, remove the brake tube from the brake hose.
SST 09751–36011

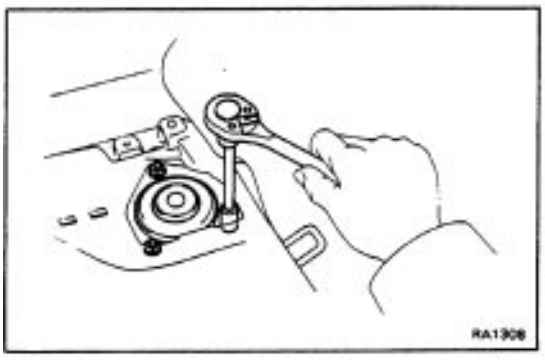
(c) Remove the clip and remove the brake hose from the shock absorber.



3. DISCONNECT SHOCK ABSORBER FROM AXLE CARRIER

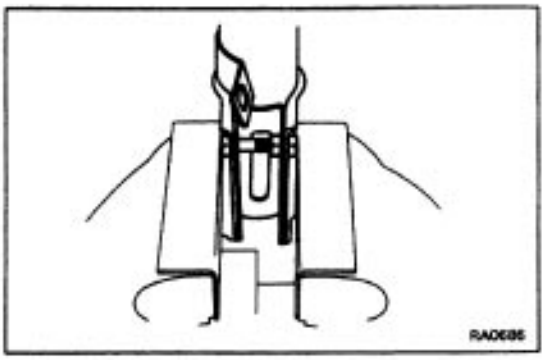
Remove the axle carrier mounting bolts and the nut and disconnect the shock absorber.

NOTE: Before removing the axle carrier mounting bolt, support the axle carrier with a jack.



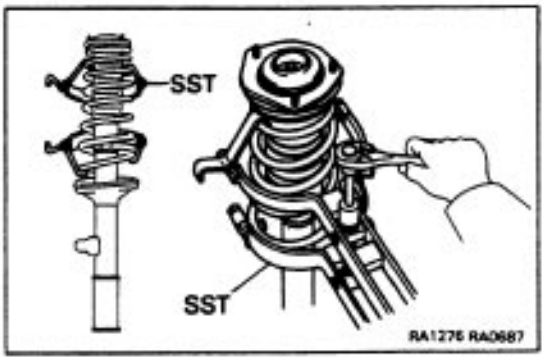
4. REMOVE SHOCK ABSORBER

With holding the shock absorber, remove the three mounting nuts, and shock absorber from the body.

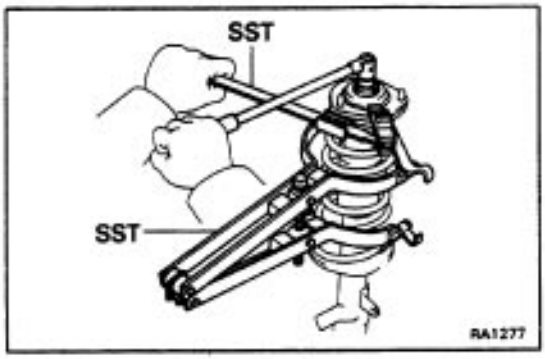


5. REMOVE COIL SPRING

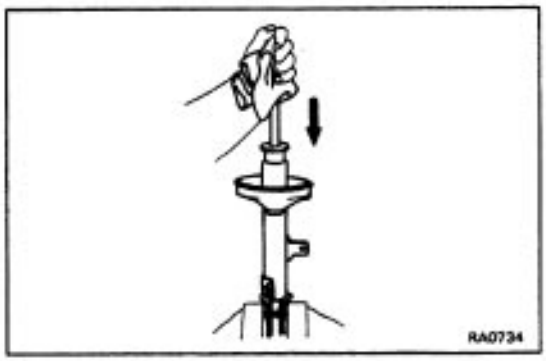
(a) Mount the shock absorber with a bolt and two nuts as shown in the figure in a vise.



(b) Using SST, compress the coil spring.
SST 09727–22032 or 09727–30020

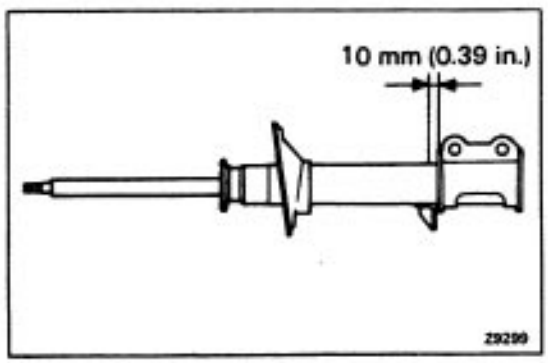


(c) Remove the cover from the suspension support.
(d) Using SST, hold the suspension support and remove the lock nut.
SST 09729–22031
(e) Remove the suspension support, coil spring, upper insulator, bumper and lower insulator.



6. INSPECT OPERATION OF SHOCK ABSORBER

(a) While pushing the piston rod, check that the pull throughout the stroke is even, and there is no abnormal resistance or noise.
(b) Push the piston rod in fully and release it. Check that it returns at a constant speed throughout.



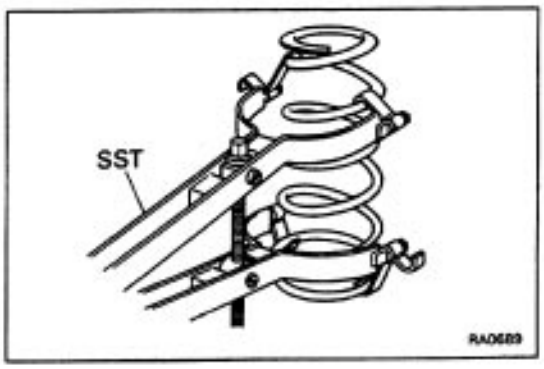
7. DISCARD SHOCK ABSORBER

Before discarding the absorber, drill a hole 2 – 3 mm (0.079 – 0.118 in.) in diameter at the location shown in the figure to release the gas inside.

NOTICE:

- When drilling, chips may fly out, so work carefully.
- The gas is colorless, odorless, and non–poisonous.

INSTALLATION OF REAR SHOCK ABSORBER



1. INSTALL SPRING BUMPER, INSULATOR, COIL SPRING, AND SUSPENSION SUPPORT

(a) Mount the shock absorber in a vise.

(b) Using SST, compress the coil spring.
SST 09727–22032 or 09727–30020

(e) Install the lower insulator to the shock absorber.

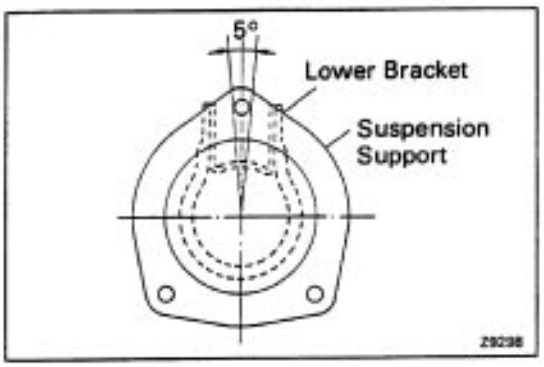
(d) Align the coil spring end with the lower seat hollow and install the coil spring.

(e) Install the spring bumper to the shock absorber piston rod.

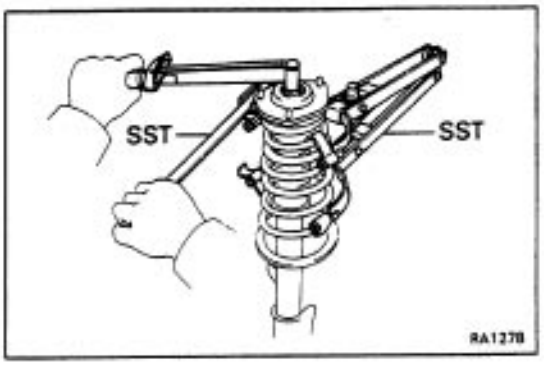
(f) Install the upper insulator.

(g) Align the suspension support with the piston rod and install it.

(h) Align the suspension support.

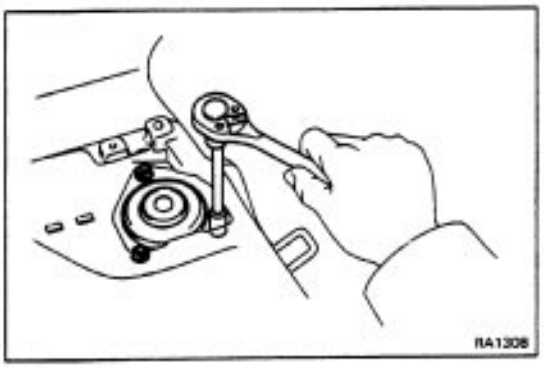


(i) Using SST, hold the suspension support and install and torque a new lock nut.
Torque: 500 kg–cm (36 ft–lb, 49N–m)



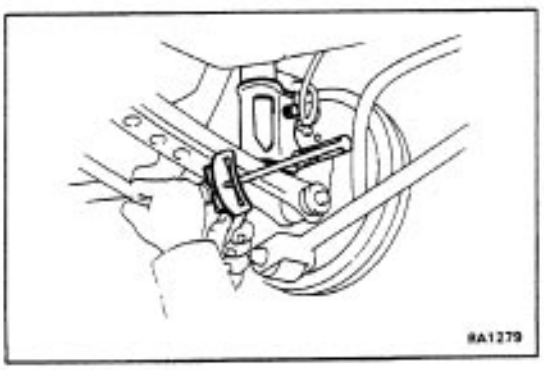
2. INSTALL SHOCK ABSORBER TO BODY

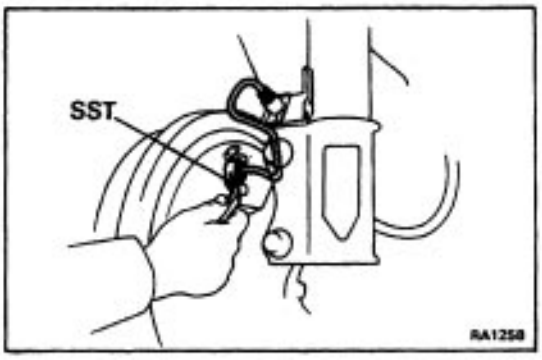
Install the shock absorber to the body and torque the three n uts.
Torque: 400 kg–cm (29 ft–lb, 39 N– m)

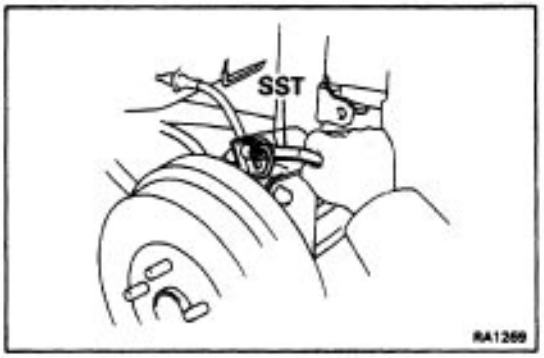


3. CONNECT AXLE CARRIER TO SHOCK ABSORBER

Connect the axle carrier to the shock absorber with the two bolts and torque the two nuts.
Torque: 2,300 kg–cm (166 ft–lb, 226 N–m)







4. INSTALL BRAKE HOSE AND TUBE

(a) Temporarily connect the brake tube to the backing plate.

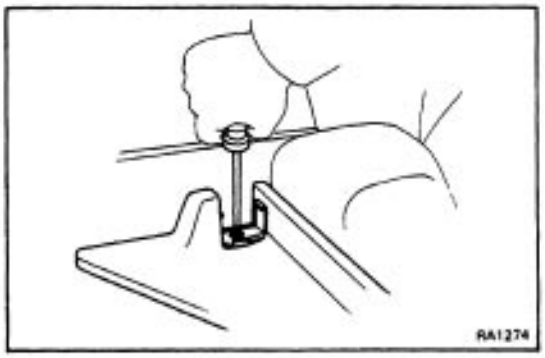
(b) Temporarily connect the brake tube to the brake hose.

(c) Install the clip.

(d) Using SST, torque the two brake tube union nuts.

SST 09751–36011

Torque: 155 kg–cm (11 ft–lb, 15 N–m)



5. INSTALL TONNEAU COVER HOLDER (Wagon)

6. BLEED BRAKE LINE

(See page BR–7)

7. CHECK WHEEL ALIGNMENT

(See page RA–3)

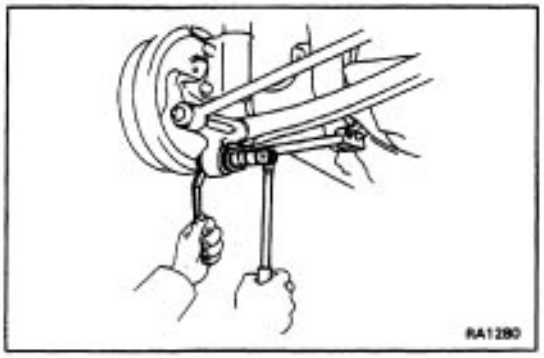
Suspension Arm

(See page RA–50)

REMOVAL OF SUSPENSION ARMS

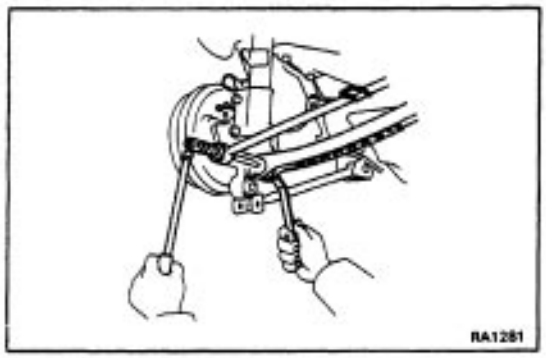
1. JACK UP VEHICLE

Jack up the vehicle and support the body with stands.



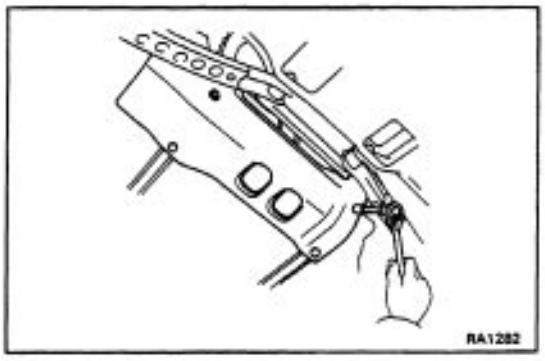
2. DISCONNECT STRUT ROD FROM AXLE CARRIER

Remove the bolt and nut and disconnect the strut rod from the axle carrier.



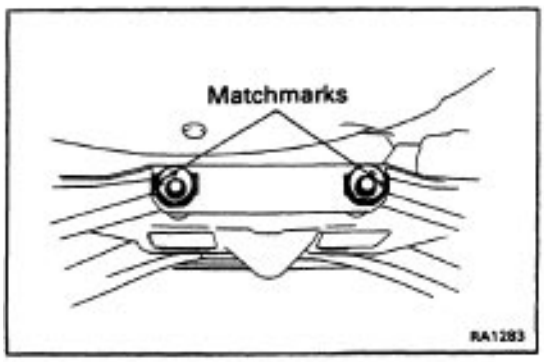
3. DISCONNECT NO. 1 AND NO. 2 SUSPENSION ARMS FROM AXLE CARRIER

Remove the suspension holding bolt and nut from the No. 1 and No.2 suspension arms.



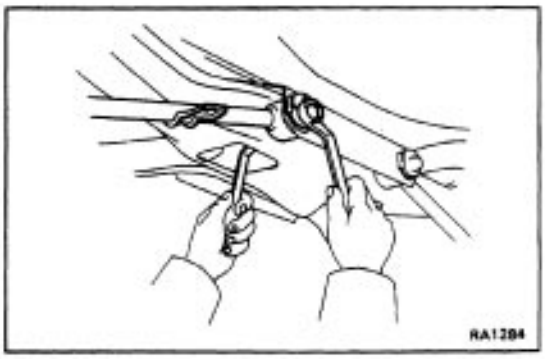
4. REMOVE FUEL TANK PROTECTOR

Remove the two bolts, two clips, and the protector.

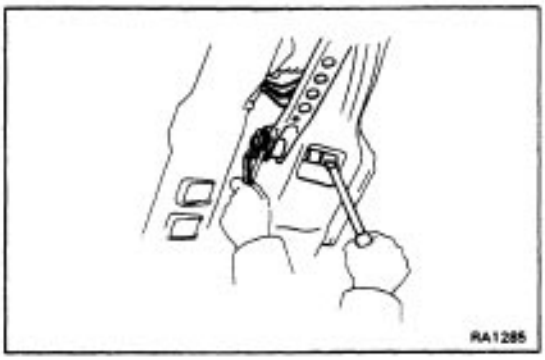


5. REMOVE N0.2 SUSPENSION ARM

(a) Place matchmarks on the adjusting cam and body.



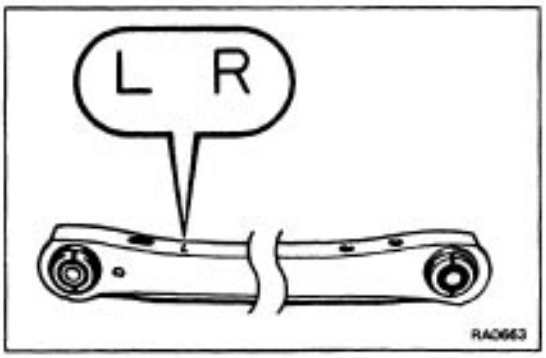
(b) Remove the cam and the cam bolt from the body and remove the No.2 suspension arm.



6. REMOVE NO.1 SUSPENSION ARM

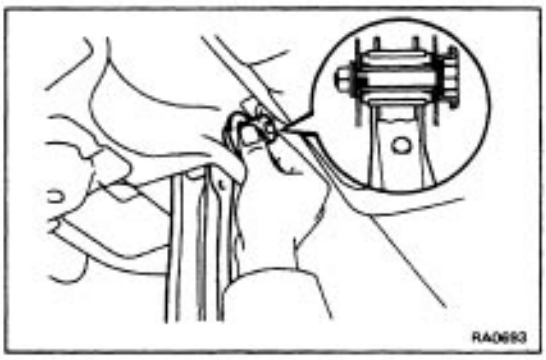
Remove the nut, retainer from the body and remove the No. 1 suspension arm.

INSTALLATION OF NO.1 AND NO.2 SUSPENSION ARMS

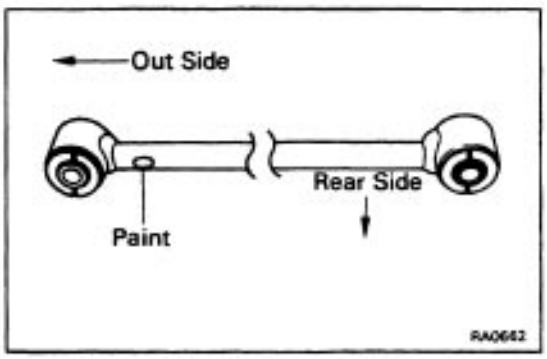


1. INSTALL NO.1 SUSPENSION ARM

HINT: Install the bushing with the slit side towards the rear. The right and left suspension arms have been stamped with a ”R” and ”L” respectively for identification.

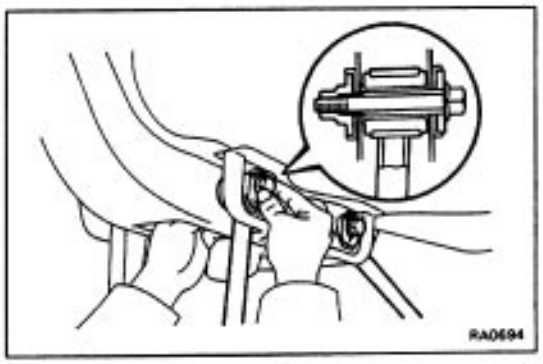


Temporarily install the No. 1 suspension arm to the body with the bolt, plate and nut.

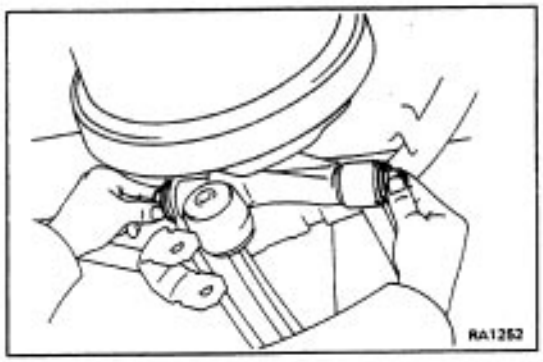


2. INSTALL NO.2 SUSPENSION ARM TO BODY

HINT: Install the bushing with the slit side towards the rear. Then instal! the suspension arm with the small paint spot towards the outside of the vehicle.

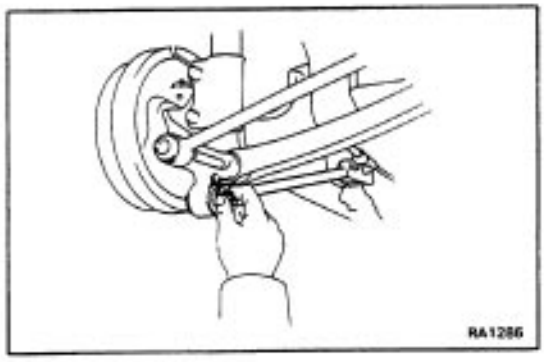


(a) Place the No.2 suspension arm in position.
(b) Temporarily install the cam bolt and cam to the body.



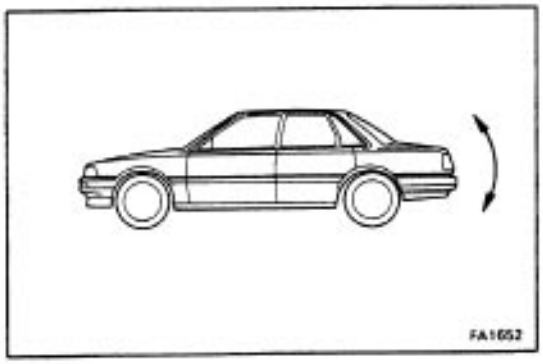
3. CONNECT NO.1 AND NO.2 SUSPENSION ARM TO AXLE CARRIER

Connect the No. 1 and No.2 suspension arms with the bolt and the two retainers to the axle carrier and temporarily install the nut.



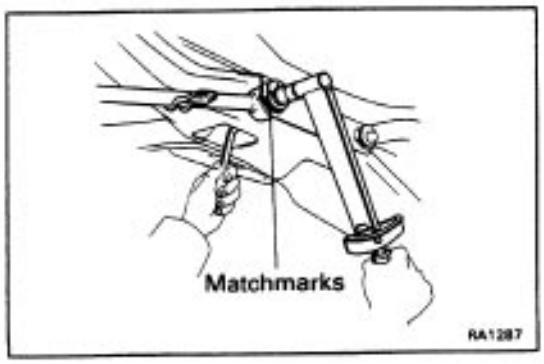
4. CONNECT STRUT BAR TO AXLE CARRIER

Connect the strut rod to the axle carrier and temporarily install the bolt and nut.



5. INSTALL WHEELS AND LOWER VEHICLE

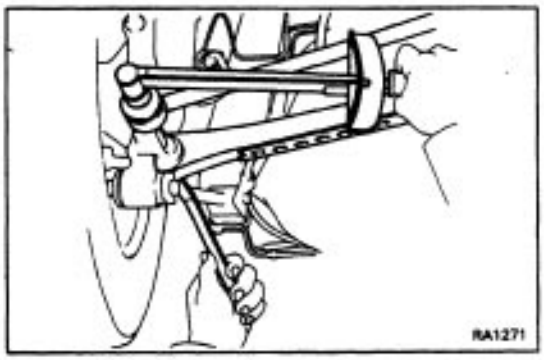
(a) Install the wheels.
(b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.



6. TORQUE NO.1 AND NO.2 SUSPENSION ARM INSTALLATION BOLTS

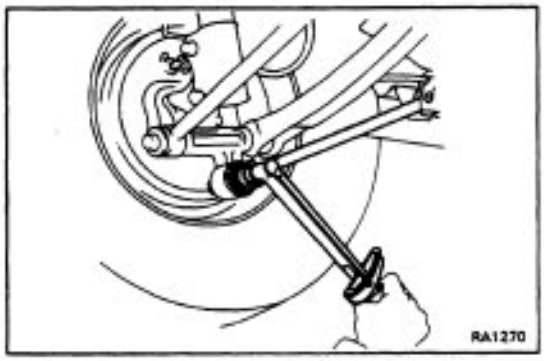
(a) Align the matchmarks on the cam and the body torque the installation bolt with the vehicle weight on the suspension.

Torque: 1,150 kg–cm (83 ft–lb, 113 N–m)



(b) Torque the suspension arm installation bolt to the axle carrier with the vehicle weight on the suspension.

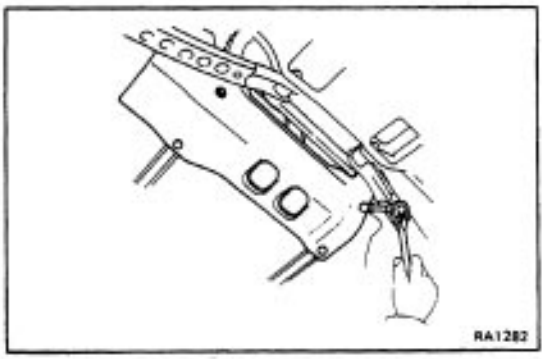
Torque: 1,850 kg–cm (134 ft–lb, 181 N – m)



7. TORQUE STRUT ROD INSTALLATION BOLT TO AXLE CARRIER

Torque the strut rod installation bolt to the axle carrier with the vehicle weight on the suspension.

Torque: 1,150 kg–cm (83 ft–lb, 113 N – m)



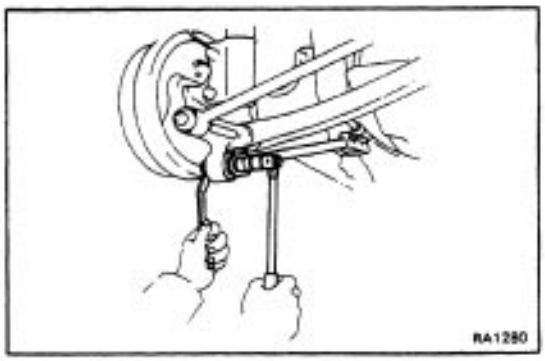
8. INSTALL FUEL TANK PROTECTOR

Install the fuel tank protector with the two bolts and the two clips.

9. CHECK REAR WHEEL ALIGNMENT

Strut Rod

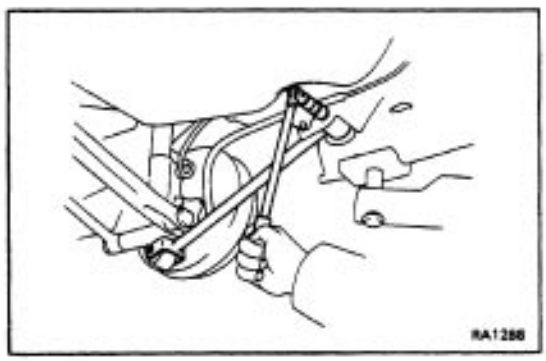
(See page RA–50)



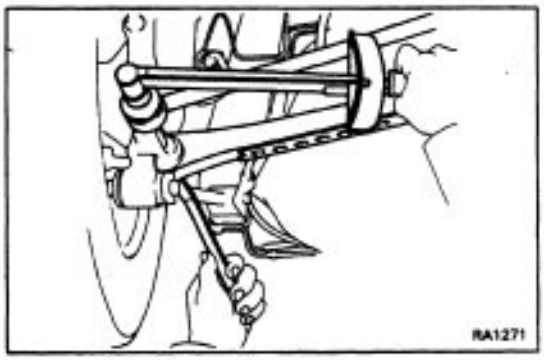
REMOVAL OF STRUT ROD

REMOVE STRUT ROD

(a) Remove the strut rod installation bolt and nut from the axle carrier.

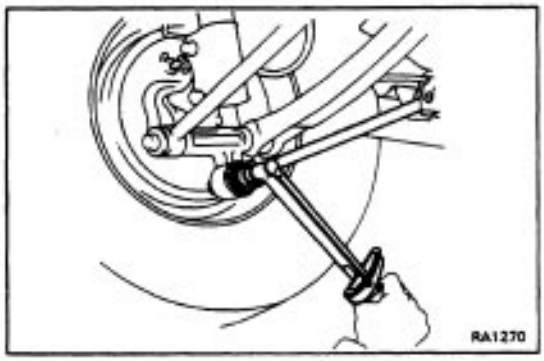


(b) Remove the strut rod installation bolt and nut from the body.



(b) Torque the suspension arm installation bolt to the axle carrier with the vehicle weight on the suspension.

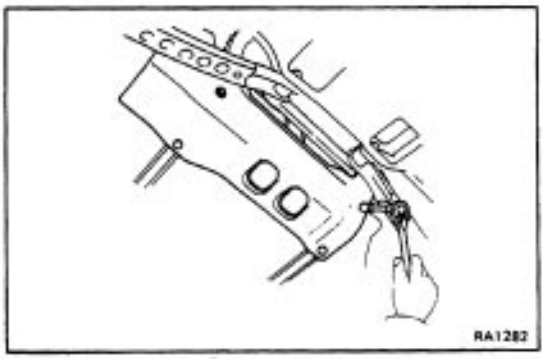
Torque: 1,850 kg–cm (134 ft–lb, 181 N – m)



7. TORQUE STRUT ROD INSTALLATION BOLT TO AXLE CARRIER

Torque the strut rod installation bolt to the axle carrier with the vehicle weight on the suspension.

Torque: 1,150 kg–cm (83 ft–lb, 113 N – m)



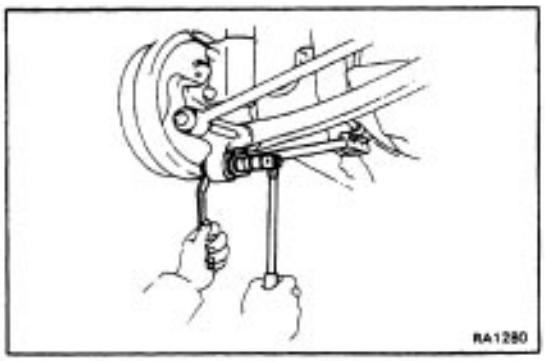
8. INSTALL FUEL TANK PROTECTOR

Install the fuel tank protector with the two bolts and the two clips.

9. CHECK REAR WHEEL ALIGNMENT

Strut Rod

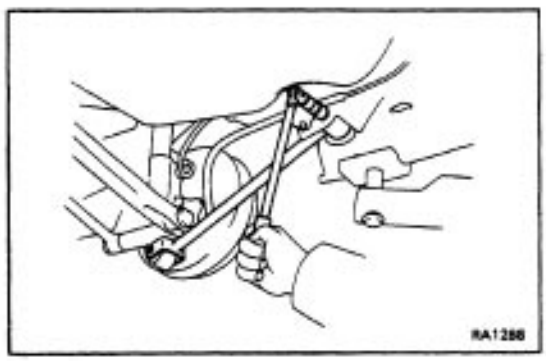
(See page RA–50)



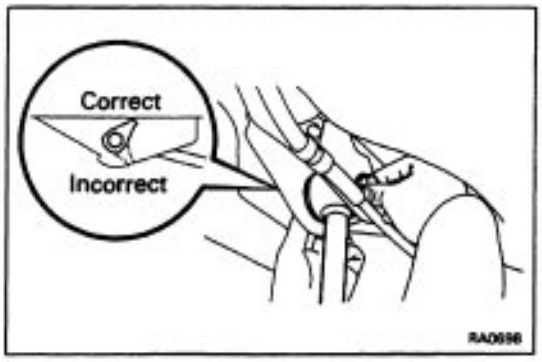
REMOVAL OF STRUT ROD

REMOVE STRUT ROD

(a) Remove the strut rod installation bolt and nut from the axle carrier.



(b) Remove the strut rod installation bolt and nut from the body.

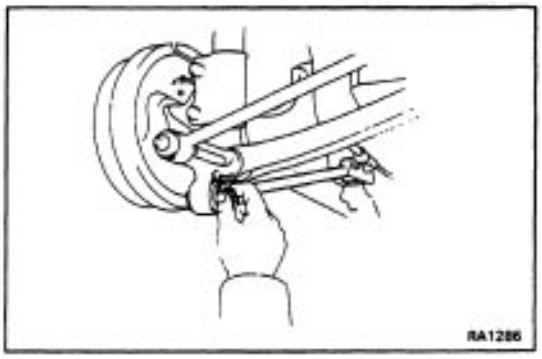


INSTALLATION OF STRUT ROD

1. INSTALL STRUT ROD

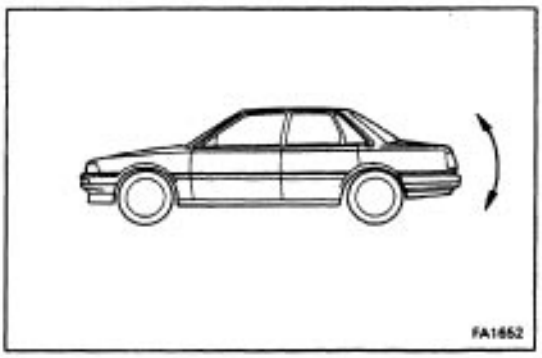
(a) Position the strut rod to the body and temporarily install the bolt and nut.

HINT: Be sure the lip of the nut is resting on the flange of the bracket as shown in the figure.



(b) Temporarily connect the strut rod with the bolt and nut.

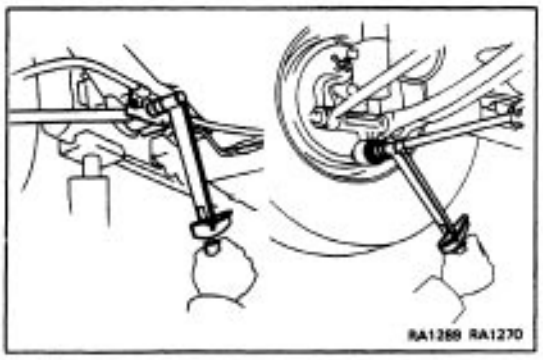
HINT: Be sure the lip of the nut is resting on the flange of the bracket as shown in the figure. .



2. INSTALL WHEELS AND LOWER VEHICLE

(a) install the wheels.

(b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.



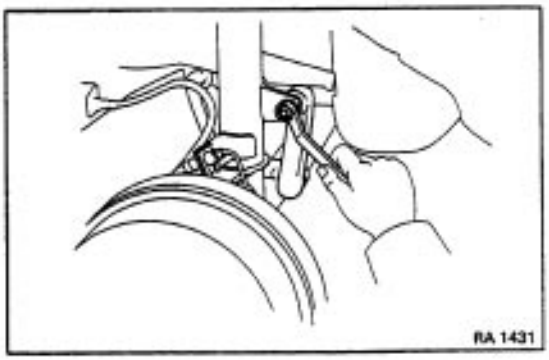
3. TORQUE STRUT ROD INSTALLATION BOLTS AND NUTS

Torque the mounting bolt with the vehicle weight on the suspension.

Torque: 1,150 kg–cm (83 ft–lb, 113 N– m)

4. CHECK WHEEL ALIGNMENT

(See page RA–3**)**

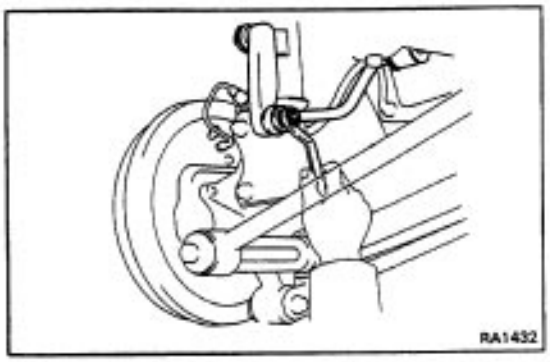


Stabilizer Bar

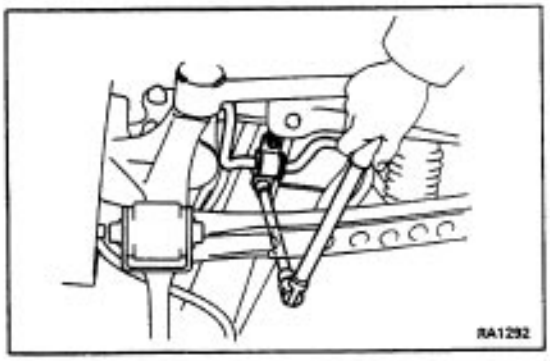
(See page RA–50)

REMOVAL OF STABILIZER BAR

1. DISCONNECT STABILIZER LINK FROM SHOCK ABSORBER



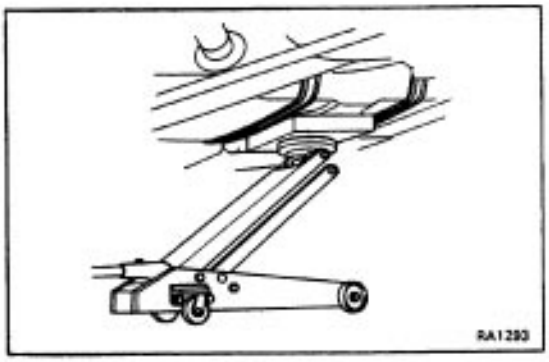
2. REMOVE STABILIZER BAR LINK FROM STABILIZER BAR



3. REMOVE STABILIZER BAR BRACKET

(a) Remove the four bolts.

(b) Remove the stabilizer bar brackets and cushions from the stabilizer bar.



4. DISCONNECT TANK BAND FROM BODY

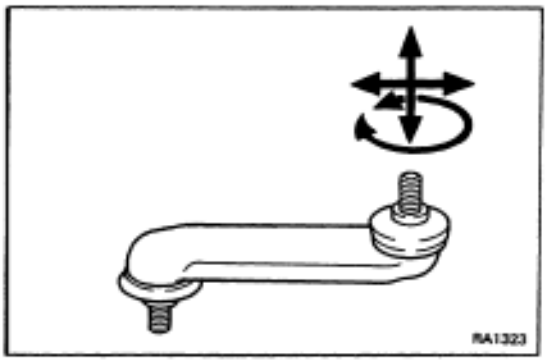
(a) Using a jack and wooden block, support the fuel tank.

(b) Remove the two tank and installation bolts.

5. REMOVE STABILIZER BAR

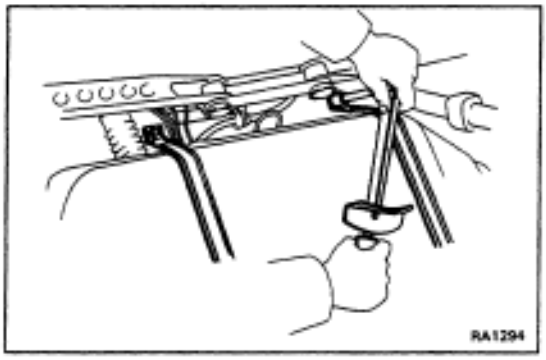
Lower the fuel tank about 40 mm (1.57 in.) and then remove the stabilizer bar from the body.

INSTALLATION OF STABILIZER BAR



1. INSPECT STABILIZER LINK

Move the ball joint stud in all directions, if the movement is not smooth and free, replace the stabilizer link.

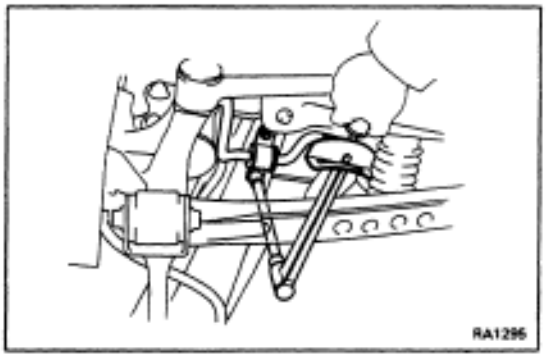


2. PLACE STABILIZER BAR

3. CONNECT TANK BAND TO BODY

Position the fuel tank in position, connect the tank bands to the body and torque the installation bolts.

Torque: 400 kg–cm (29 ft–lb, 39 N–m)

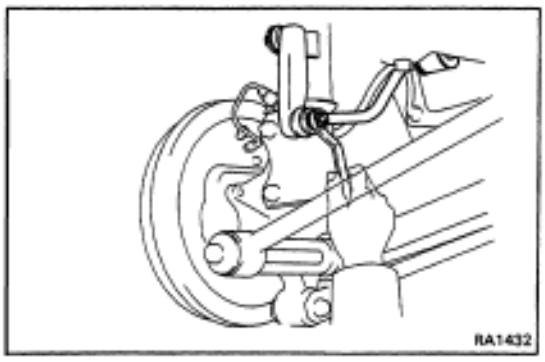


4. INSTALL STABILIZER BAR TO BODY

(a) Install the cushion and brackets to the stabilizer bar.

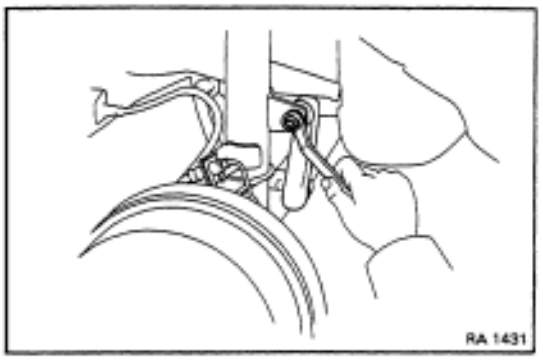
(b) Torque the four bolts.

Torque: 195 kg–cm (14 ft–lb, 19 N–m)



5. INSTALL STABILIZER LINK TO STABILIZER BAR

Torque: 650 kg–cm (47 ft–lb, 64 N– m)



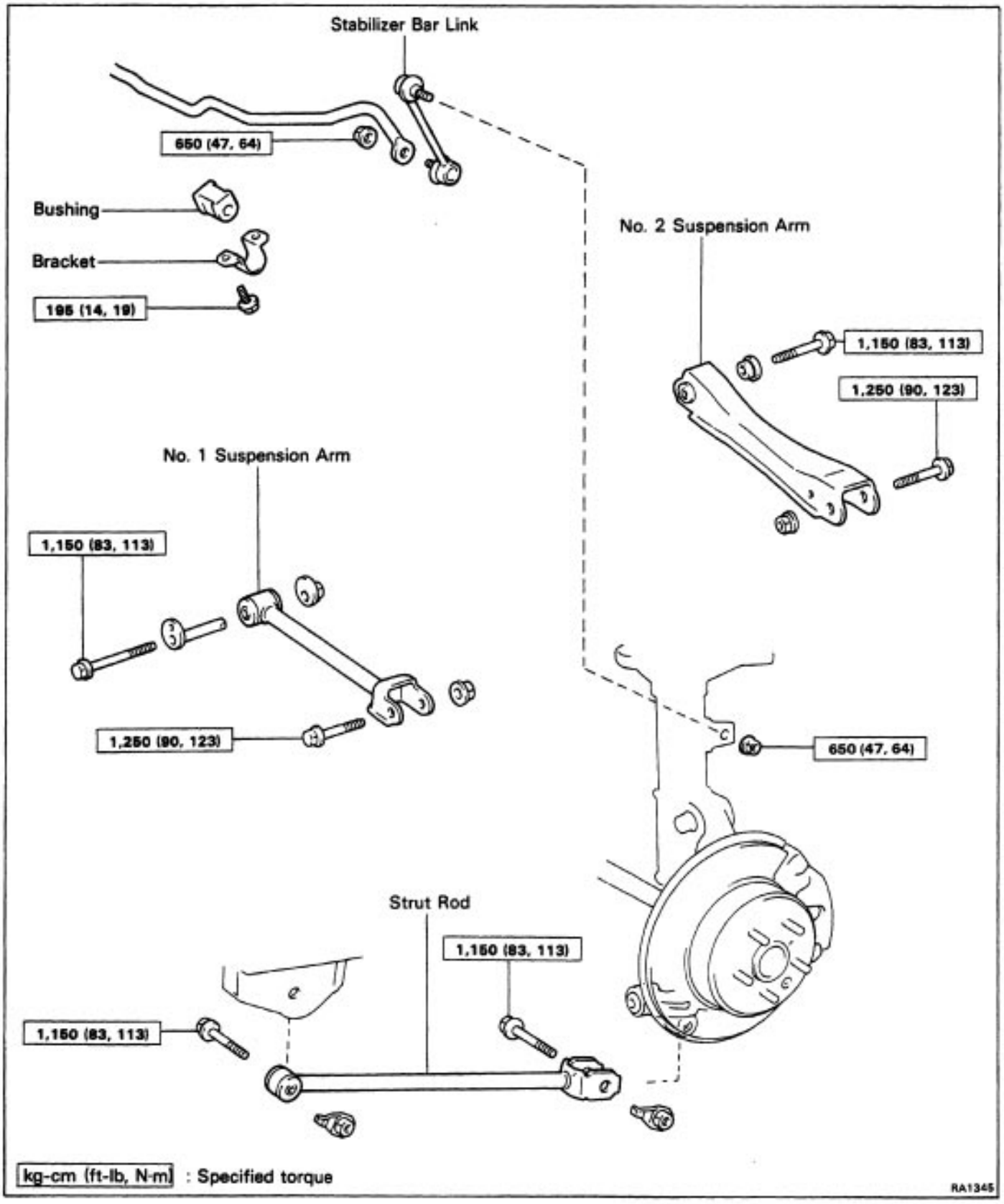
6. CONNECT STABILIZER LINK TO SHOCK ABSORBER

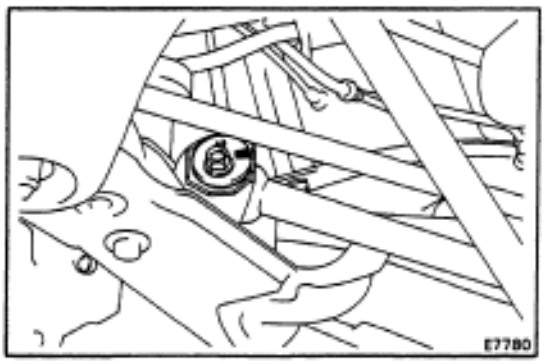
Torque: 650 kg–cm (47 ft–lb, 64 N–m)

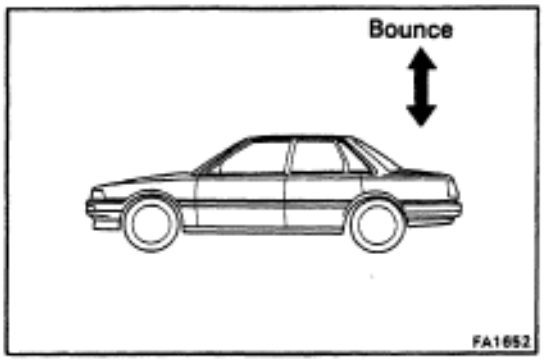
REAR SUSPENSION (4WD)

HINT: Refer to RA–50 except following points about 4WD.

COMPONENTS







Suspension Arm and Strut Rod

REMOVAL AND INSTALLATION OF SUSPENSION ARM AND STRUT ROD

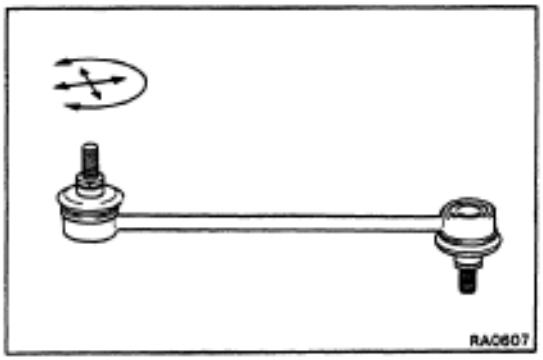
Remove and install the parts as shown components on page RA–62.

(MAIN POINT OF REMOVAL SUSPENSION ARM AND STRUT ROD)

- Place matchmarks on the adjusting cam and body. (No.2 suspension arm only)

(MAIN POINT OF INSTALLATION SUSPENSION ARM AND STRUT ROD)

- Place suspension arm or the strut rod in position.
- Temporarily install the bolt to the body and the axle carrier.
- Bounce the vehicle up and down to stabilize the suspension arm on strut rod.
- Align the matchmarks on the cam and body (No. 2 suspension arm only)
- Torque the installation bolt with the vehicle weight on the suspension. (See page RA–62)
- Check rear wheel alignment. (See page RA–3)



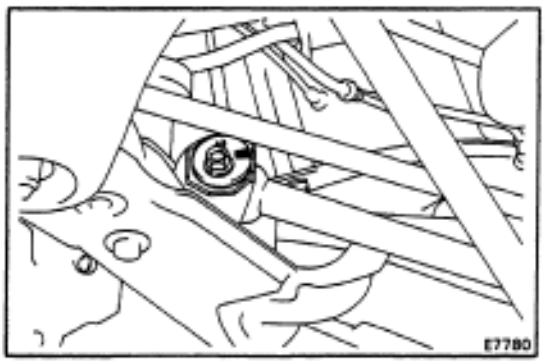
Stabilizer Bar

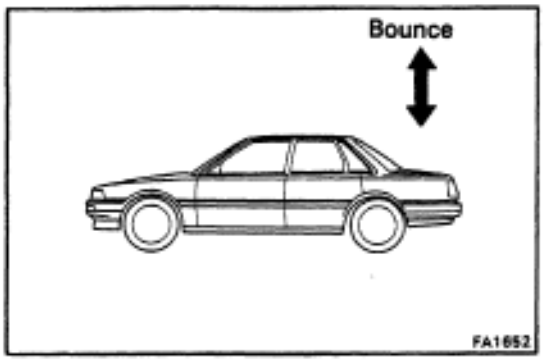
REMOVAL AND INSTALLATION OF STABILIZER BAR

Remove and install the stabilizer bar as shown components on page RA–44.

INSPECT STABILIZER BAR LINK

Move the ball joint stud in all directions, if the movement is not smooth and free, replace the stabilizer link.





Suspension Arm and Strut Rod

REMOVAL AND INSTALLATION OF SUSPENSION ARM AND STRUT ROD

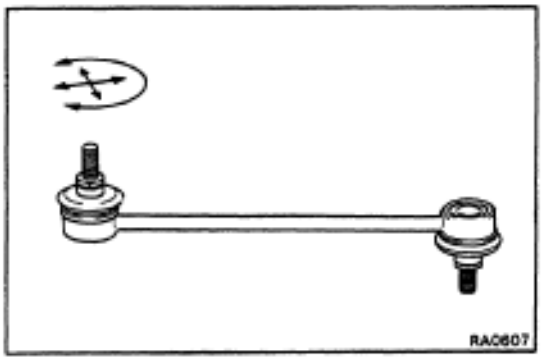
Remove and install the parts as shown components on page RA–62.

(MAIN POINT OF REMOVAL SUSPENSION ARM AND STRUT ROD)

- Place matchmarks on the adjusting cam and body. (No.2 suspension arm only)

(MAIN POINT OF INSTALLATION SUSPENSION ARM AND STRUT ROD)

- Place suspension arm or the strut rod in position.
- Temporarily install the bolt to the body and the axle carrier.
- Bounce the vehicle up and down to stabilize the suspension arm on strut rod.
- Align the matchmarks on the cam and body (No. 2 suspension arm only)
- Torque the installation bolt with the vehicle weight on the suspension. (See page RA–62)
- Check rear wheel alignment. (See page RA–3)



Stabilizer Bar

REMOVAL AND INSTALLATION OF STABILIZER BAR

Remove and install the stabilizer bar as shown components on page RA–44.

INSPECT STABILIZER BAR LINK

Move the ball joint stud in all directions, if the movement is not smooth and free, replace the stabilizer link.

SERVICE SPECIFICATIONS

MAINTENANCE

Engine

Drive belt tension					
Alternator	3S-FE	w/ A/C	New belt	175 ± 5 lb	
			Used belt	130 ± 10 lb	
		w/o A/C	New blet	125 ± 25 lb	
			Used belt	95 ± 20 lb	
	2VZ-FE		New belt	175 ± 5 lb	
			Used belt	115 ± 20 lb	
PS pump			New belt	125 ± 10 lb	
			Used belt	80 ± 20 lb	
Coolant capacity 1w/ Heater)					
	3S-FE		M/T	6.4 liters	6.8 US qts 5.6 Imp. qts
			A/T (2WD)	6.3 liters	6.7 US qts 5.5 Imp. qts
			A/T (4WD)	6.8 liters	7.2 US qts 6.0 Imp. qts
	2VZ-FE		M/T	9.5 liters	10.0 US qts 8.4 Imp. qts
			A/T	9.4 liters	9.9 US qts 8.3 Imp. qts
Engine oil capacity (Drain and refill with oil fitter change)				3.9 liters	4.1 US qts 3.4 Imp. qts
Spark plug					
Type	3S-FE		ND	Q16R-U11	
			NGK	BCPR5EY11	
	2VZ-FE		ND	PQ20R	
			NGK	BCPR6E11	
Gap				1.1 mm	0.43 in.
Firing order	3S-FE			1 — 3 — 4 — 2	
Valve clearance	2VZ-FE			1 — 2 — 3 — 4 — 5 — 6	
	3S-FE		Intake	0.19 — 0.29 mm	0.007 — 0.011 in.
			Exhaust	0.28 — 0.38 mm	0.011 — 0.015 in.
	2VZ-FE		Intake	0.13 — 0.23 mm	0.005 — 0.009 in.
			Exhaust	0.27 — 0.37 mm	0.011 — 0.015 in.

Chassis

Front and rear brake					
Pad thickness			Limit	1.0 mm	0.039 in.
Disc thickness		Front	Limit	24.0 mm	0.945 in.
Disc runout		Rear	Limit	9.0 mm	0.354 in.
Parking brake		Front	Limit	0.07 mm	0.0028 in.
Lining thickness		Rear	Limit	0.15 mm	0.0059 in.
Drum inside diameter					
Front axle and suspension					
Ball joint vertical play			Limit	1.0 mm	0.039 in.
Steering wheel freeplay		Drum brake	Limit	230.9 mm	9.079 in.
Torque specifications		Disc brake	Limit	171.0 mm	6.732 in.
Front seat mount bolts					
Strut/stabilizer bar bracket x Body					
Engine mounting center member x Body			Limit	0 mm	0 in.
Front suspension lower crossmember x Body				30 mm (1.18 in.) or less	
Rear suspension lower crossmember x Body					
				375 kg-cm	27 ft-lb 37 N·m
				620 kg-cm	45 ft-lb 61 N·m
				400 kg-cm	29 ft-lb 39 N·m
				2,110 kg-cm	153 ft-lb 207 N·m
			2WD	710 kg-cm	51 ft-lb 70 N·m
			4WD	1,620 kg-cm	117 ft-lb 159 N·m

ENGINE MECHANICAL (3S–FE)

Specifications

Idle speed				700 ± 50 rpm	
Intake manifold vacuum	at idle speed			450 mmHg (17.72 in. Hg, 60.0 kPa) or more	
Compression pressure	at 250 rpm		STD	12.5 kg/cm² (178 psi, 1,226 kPa) or more	
			Limit	10.0 kg/cm²	142 psi 981 kPa
	Difference of pressure between each cylinder			1.0 kg/cm² (14 psi, 98 kPa) or less	
Cylinder head	Cylinder block side warpage		Limit	0.05 mm	0.0020 in.
	Manifold side warpage		Limit	0.08 mm	0.0031 in.
	Valve seat	Refacing angle		30°, 45°, 75°	
		Contacting angle		45°	
		Contacting width		1.0 — 1.4 mm	0.039 — 0.055 in.
Valve guide bushing	Inside diameter			6.010 — 6.030 mm	0.2366 — 0.2374 in.
	Outside diameter		STD	11.048 — 11.059 mm	0.4350 — 0.4354 in.
			O/S 0.05	11.098 — 11.109 mm	0.4369 — 0.4374 in.
Valve	Valve overall length	STD	Intake	100.60 mm	3.9606 in.
			Exhaust	100.45 mm	3.9547 in.
		Limit	Intake	100.1 mm	3.941 in.
			Exhaust	100.0 mm	3.937 in.
	Valve face angle			44.5°	
	Stem diameter		Intake	5.970 — 5.985 mm	0.2350 — 0.2356 in.
			Exhaust	5.965 — 5.980 mm	0.2348 — 0.2354 in.
	Stem oil clearance	STD	Intake	0.025 — 0.060 mm	0.0010— 0.0024 in.
			Exhaust	0.030 — 0.065 mm	0.0012 — 0.0026 in.
		Limit	Intake	0.08 mm	0.0031 in.
			Exhaust	0.10 mm	0.0039 in.
	Margin thickness		STD	0.8 — 1.2 mm	0.031 — 0.047 in.
			Limit	0.5 mm	0.020 in.
Valve spring	Free length			45.0 mm	1.772 in.
	Installed load	at 34.7 mm (1.366 in.)		16.7 — 19.3 kg (36.8 — 42.5 lb, 164 — 189 N)	
	Squareness		Limit	2.0 mm	0.075 in.
Valve lifter	Lifter diameter			27.975 — 27.985 mm	1.1014 — 1.1018 in.
	Cylinder head lifter bore diameter			28.000 — 28.021 mm	1.1024 — 1.1032 in.
	Oil clearance		STD	0.015 — 0.046 mm	0.0005 — 0.0018 in.
			Limit	0.07 mm	0.0028 in.
Manifold	Manifold surface warpage		Limit	0.30 mm	0.0118 in.
Camshaft and gear	Thrust clearance	STD	Intake	0.045 — 0.100 mm	0.0018 — 0.0039 in.
			Exhaust	0.030 — 0.085 mm	0.0012 — 0.0033 in.
		Limit	Intake	0.12 mm	0.0047 in.
			Exhaust	0.10 mm	0.0039 in.
	Journal oil clearance		STD	0.025 — 0.062 mm	0.0010 — 0.0024 in.
			Limit	0.10 mm	0.0039 in.
	Journal diameter			26.959 — 26.975 mm	1.0614 — 1.0620 in.
	Circle runout		Limit	0.04 mm	0.0016 in.

Specifications (Cont'd)

Camshaft and gear (cont'd)	Cam lobe height	STD	Intake	34.910 — 35.010 mm	1.3744 — 1.3783 in.
			Exhaust	35.560 — 35.660 mm	1.4000 — 1.4039 in.
		Limit	Intake	34.80 mm	1.3701 in.
			Exhaust	35.45 mm	1.3957 in.
	Camshaft gear backlash		STD	0.020 — 0.200 mm	0.0008 — 0.0079 in.
			Limit	0.30 mm	0.0188 in.
	Camshaft gear spring end free distance			22.5 — 22.9 mm	0.886 — 0.902 in.
Idler pulley tension spring	Free length			46.1 mm	1.815 in.
	Installed load at 51.9 mm (2.043 in.)			6.0 — 7.0 kg (13.2 — 15.4 lb, 59 — 69 N)	
Cylinder block	Cylinder head surface warpage		Limit	0.05 mm	0.0020 in.
	Cylinder bore diameter		Mark 1	86.000 — 86.010 mm	3.3858 — 3.3862 in.
			Mark 2	86.010 — 86.020 mm	3.3862 — 3.3866 in.
			Mark 3	86.020 — 86.030 mm	3.3866 — 3.3870 in.
			Limit	86.23 mm	3.3949 in.
Piston and piston ring	Piston diameter		Mark 1	85.945 — 85.955 mm	3.3836 — 3.3840 in.
			Mark 2	85.955 — 85.965 mm	3.3840 — 3.3844 in.
			Mark 3	85.965 — 85.975 mm	3.3844 — 3.3848 in.
	Piston oil clearance		STD	0.045 — 0.065 mm	0.0018 — 0.0026 in.
			Limit	0.085 mm	0.0033 in.
	Ring to ring groove clearance			0.030 — 0.070 mm	0.0012 — 0.0028 in.
	Piston ring end gap	STD	No.1	0.270 — 0.500 mm	0.0106 — 0.0197 in.
			No.2	0.270 — 0.510 mm	0.0106 — 0.0201 in.
			Oil	0.200 — 0.550 mm	0.0079 — 0.0217 in.
		Limit	No.1	1.10 mm	0.0433 in.
			No.2	1.11 mm	0.0437 in.
			Oil	1.15 mm	0.0453 in.
Connecting rod	Thrust clearance		STD	0.160 — 0.312 mm	0.0063 — 0.0123 in.
			Limit	0.35 mm	0.0138 in.
	Connecting rod bearing center wall thickness				
			Mark 1	1.484 — 1.488 mm	0.0584 — 0.0586 in.
			Mark 2	1.488 — 1.492 mm	0.0586 — 0.0587 in.
			Mark 3	1.492 — 1.496 mm	0.0587 — 0.0589 in.
	Connecting rod oil clearance				
		STD	STD	0.024 — 0.055 mm	0.0009 — 0.0022 in.
			U/S 0.25	0.023 — 0.069 mm	0.0009 — 0.0027 in.
		Limit		0.08 mm	0.0031 in.
	Rod bending per 100 mm (3.94 in.)		Limit	0.05 mm	0.0020 in.
	Rod twist per 100 mm (3.94 in.)		Limit	0.15 mm	0.0059 in.
Crankshaft	Thrust clearance		STD	0.020 — 0.220 mm	0.0008 — 0.0087 in.
			Limit	0.30 mm	0.0118 in.
	Thrust washer thickness			2.440 — 2.490 mm	0.0961 — 0.0980 in.

Specifications (Cont'd)

Crankshaft (cont'd)	Main journal oil clearance				
	STD	No.3	STD	0.025 — 0.044 mm	0.0010 — 0.0017 in.
			U/S 0.25	0.027 — 0.067 mm	0.0011 — 0.0026 in.
		Others	STD	0.015 — 0.034 mm	0.0006 — 0.0013 in.
			U/S 0.25	0.019 — 0.059 mm	0.0007 — 0.0023 in.
	Limit			0.08 mm	0.0031 in.
	Main journal diameter		STD	54.988 — 55.003 mm	2.1649 — 2.1655 in.
			U/S 0.25	54.745 — 54.755 mm	2.1553 — 2.1557 in.
	Main bearing center wall thickness				
		No.3	Mark 1	1.992 — 1.995 mm	0.0784 — 0.0785 in.
			Mark 2	1.995 — 1.998 mm	0.0785 — 0.0787 in.
			Mark 3	1.998 — 2.001 mm	0.0787 — 0.0788 in.
			Mark 4	2.001 — 2.004 mm	0.0788 — 0.0789 in.
			Mark 5	2.004 — 2.007 mm	0.0789 — 0.0790 in.
		Others	Mark 1	1.997 — 2.000 mm	0.0786 — 0.0787 in.
			Mark 2	2.000 — 2.003 mm	0.0787 — 0.0789 in.
			Mark 3	2.003 — 2.006 mm	0.0789 — 0.0790 in.
			Mark 4	2.006 — 2.009 mm	0.0790 — 0.0791 in.
			Mark 5	2.009 — 2.012 mm	0.0791 — 0.0792 in.
	Crank pin diameter		STD	47.985 — 48.000 mm	1.8892 — 1.8898 in.
			U/S 0.25	47.745 — 47.755 mm	1.8797 — 1.8801 in.
	Circle runout		Limit	0.06 mm	0.0024 in.
	Main journal taper and out-of-round		Limit	0.02 mm	0.0008 in.
	Crank pin journal taper and out-of-round		Limit	0.02 mm	0.0008 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N-m
Oil pump pulley x Oil pump drive shaft		290	21	28
No. 1 idler pulley x Cylinder head		425	31	42
No. 2 idler pulley x Cylinder block		425	31	42
Camshaft timing pulley x Camshaft		550	40	54
Crankshaft pulley x Crankshaft		1,100	80	108
Cylinder head x Cylinder block	1st	500	36	49
	2nd	90° turns		
Spark plug tube x Cylinder head		400	29	39
Camshaft bearing cap x Cylinder head		190	14	19
Cylinder head cover x Cylinder head		230	17	23
Intake manifold x Cylinder head		195	14	19
Intake manifold stay x Cylinder head		195	14	19
Intake manifold stay x Cylinder block		425	31	42
EGR valve x Intake manifold		130	9	13
EGR pipe x Cylinder head		600	43	59
Water outlet x Cylinder head		150	11	15
Exhaust manifold x Catalytic converter		300	21	29
Exhaust manifold x Cylinder head		500	36	49
Engine hanger x Cylinder head		425	31	42
Alternator bracket x Cylinder head		425	31	42

Torque Specifications (Cont'd)

Part tightened	kg-cm	ft-lb	N·m
Main bearing cap X Cylinder block	600	43	59
Connecting rod cap x Connecting rod	500	36	49
Rear oil seal retainer x Cylinder block	95	82 in.-lb	9.3
Rear end plate X Cylinder block	95	82 in.-lb	9.3
Flywheel x Crankshaft (M/T)	900	65	88
Drive plate x Crankshaft (A/T)	850	61	83
Suspension lower crossmember x Body	2,125	154	208
Suspension lower crossmember x Engine mounting center member	400	29	39
Engine mounting center member x Body	400	29	39
Engine mounting center member x Engine mounting insulator			
Nuts	490	35	48
Bolts	740	54	73
Engine RH mounting bracket x Cylinder block	530	38	52
Engine RH mounting insulator x Engine mounting bracket	530	38	52
Engine RH mounting insulator x Body (2WD) Bolt	650	47	64
Engine RH mounting insulator x Body (4WD) Nut	900	65	88
Engine RH mounting stay x Engine mounting insulator	890	64	87
Engine RH mounting stay x Alternator bracket	740	54	73
Engine LH mounting bracket x Transaxle	740	54	73
Engine LH mounting insulator x Engine mounting insulator	530	38	52
Engine LH mounting insulator x Body	530	38	52
Engine LH mounting stay x Engine mounting insulator (4/T)	890	64	87
Engine LH mounting stay x Transaxle (A/T)	210	15	21
Engine front mounting bracket x Transaxle	210	15	21
Engine front mounting insulator x Engine mounting bracket	790	57	77
Engine center mounting bracket x Cylinder block (2WD)	890	64	87
Engine rear mounting x Transaxle	490	35	48
Engine rear mounting insulator x Engine mounting bracket	790	57	77
Engine front pipe x Catalytic converter	890	64	87
Exhaust front pipe x Exhaust center pipe	630	46	62
	440	32	43

ENGINE MECHANICAL (2VZ–FE)

Specifications

Idle speed				700 ± 50 rpm	
Intake manifold vacuum	at idle speed			440 mmHg (17.32 in. Hg, 58.6 kPa) or more	
Compression pressure	at 250 rpm		STD	12.5 kg/cm² (178 psi, 1,226 kPa) or more	
			Limit	10.0 kg/cm²	142 psi 981 kPa
	Difference of pressure between each cylinder			1.0 kg/cm² (14 psi, 98 kPa) or less	
Cylinder head	Cylinder block side warpage		Limit	0.10 mm	0.0039 in.
	Valve seat	Refacing angle		30°, 45°, 60°	
		Contacting angle		45°	
		Contacting width		1.0 — 1.4 mm	0.039 — 0.055 in.
Valve guide bushing	Inside diameter			6.010 — 6.030 mm	0.2366 — 0.2374 in.
	Outside diameter		STD	11.048 — 11.059 mm	0.4350 — 0.4354 in.
			O/S 0.05	11.098 — 11.109 mm	0.4369 — 0.4374 in.
Valve	Valve overall length	STD	Intake	96.1 mm	3.783 in.
			Exhaust	96.2 mm	3.787 in.
		Limit	Intake	95.6 mm	3.764 in.
			Exhaust	95.7 mm	3.768 in.
	Valve face angle			44.5°	
	Stem diameter		Intake	5.970 — 5.985 mm	0.2350 — 0.2356 in.
			Exhaust	5.965 — 5.980 mm	0.2348 — 0.2354 in.
	Stem oil clearance	STD	Intake	0.025 — 0.060 mm	0.0010 — 0.0024 in.
			Exhaust	0.030 — 0.065 mm	0.0012 — 0.0026 in.
		Limit	Intake	0.08 mm	0.0031 in.
			Exhaust	0.10 mm	0.0039 in.
	Margin thickness	STD		1.0 mm	0.039 in.
		Limit		0.5 mm	0.020 in.
Valve spring	Free length			42.6 mm	1.677 in.
	Installed tension	at 33.8 mm (1.331 in.)		18.6 — 21.4 kg (41.0 — 47.2 lb, 182 — 210 N)	
	Squareness	Limit		2.0 mm	0.075 in.
Valve lifter	Lifter diameter			27.975 — 27.985 mm	1.1014 — 1.1018 in.
	Cylinder head lifter bore diameter			28.000 — 28.021 mm	1.1024 — 1.1032 in.
	Oil clearance	STD		0.015 — 0.046 mm	0.0005 — 0.0018 in.
		Limit		0.07 mm	0.0028 in.
Manifold	Warpage	Limit	Intake	0.10 mm	0.0039 in.
			Exhaust	1.00 mm	0.0394 in.
Air intake chamber	Warpage	Limit		0.10 mm	0.0039 in.
Camshaft	Thrust clearance	STD		0.030 — 0.080 mm	0.0012 — 0.0031 in.
		Limit		0.12 mm	0.0047 in.
	Journal oil clearance	STD		0.035 — 0.072 mm	0.0014 — 0.0028 in.
		Limit		0.10 mm	0.0039 in.
	Journal diameter			26.949 — 26.965 mm	1.0610 — 1.0616 in.
	Circle runout	Limit		0.06 mm	0.0024 in.

Specifications (Cont'd)

Camshaft (cont'd)	Cam lobe height	STD	Intake	39.510 — 39.610 mm	1.5555 — 1.5594 in.
			Exhaust	38.960 — 35.060 mm	1.5339 — 1.5378 in.
		Limit	Intake	39.36 mm	1.5496 in.
			Exhaust	38.81 mm	1.5279 in.
	Camshaft gear backlash	STD		0.020 — 0.200 mm	0.0008 — 0.0079 in.
		Limit		0.30 mm	0.0188 in.
	Camshaft gear spring end free distance			18.2 — 18.8 mm	0.712 — 0.740 in.
Timing belt tensioner	Protrusion (from housing end)			10.5 — 11.5 mm	0.413 — 0.453 in.
Cylinder block	Cylinder head surface warpage		Limit	0.05 mm	0.0020 in.
	Cylinder bore diameter	STD	Mark 1	87.500 — 87.510 mm	3.4449 — 3.4453 in.
			Mark 2	87.510 — 87.520 mm	3.4453 — 3.4457 in.
			Mark 3	87.520 — 87.530 mm	3.4457 — 3.4461 in.
		Limit	STD	87.73 mm	2.4539 in.
			O/S 0.50	88.23 mm	3.4736 in.
Piston and piston ring	Piston diameter	STD	Mark 1	87.445 — 87.455 mm	3.4427 — 3.4431 in.
			Mark 2	87.455 — 87.465 mm	3.4431 — 3.4435 in.
			Mark 3	87.465 — 87.475 mm	3.4435 — 3.4439 in.
		O/S 0.50		87.945 — 87.975 mm	3.4624 — 3.4636 in.
	Piston oil clearance		STD	0.045 — 0.065 mm	0.0018 — 0.0026 in.
			Limit	0.085 mm	0.0033 in.
	Piston ring groove clearance		No.1	0.010 — 0.080 mm	0.0004 — 0.0031 in.
			No.2	0.030 — 0.070 mm	0.0012 — 0.0028 in.
	Piston ring end gap	STD	No.1	0.300 — 0.520 mm	0.0118 — 0.0205 in.
			No.2	0.350 — 0.600 mm	0.0138 — 0.0236 in.
			Oil	0.200 — 0.550 mm	0.0079 — 0.0217 in.
		Limit	No.1	1.12 mm	0.0441 in.
			No.2	1.20 mm	0.0472 in.
			Oil	1.15 mm	0.0453 in.
Connecting rod	Thrust clearance		STD	0.150 — 0.330 mm	0.0059 — 0.0130 in.
			Limit	0.38 mm	0.0150 in.
	Connecting rod oil clearance				
		STD	STD	0.028 — 0.065 mm	0.0011 — 0.0026 in.
			U/S 0.25	0.027 — 0.080 mm	0.0011 — 0.0031 in.
		Limit		0.08 mm	0.0031 in.
	Connecting rod bearing center wall thickness				
			Mark 1	1.484 — 1.488 mm	0.0584 — 0.0586 in.
			Mark 2	1.488 — 1.492 mm	0.0586 — 0.0587 in.
			Mark 3	1.492 — 1.496 mm	0.0587 — 0.0589 in.
	Rod bending per 100 mm (3.94 in.)		Limit	0.05 mm	0.0020 in.
	Rod twist per 100 mm (3.94 in.)		Limit	0.15 mm	0.0059 in.
	Connecting rod bolt outer diameter		STD	7.860 — 8.000 mm	0.3094 — 0.3150 in.
			Limit	7.60 mm	0.2992 in.
Crankshaft	Thrust clearance		STD	0.020 — 0.220 mm	0.0008 — 0.0087 in.
			Limit	0.30 mm	0.0118 in.
	Thrust washer thickness			2.440 — 2.490 mm	0.0961 — 0.0980 in.

Specifications (Cont'd)

Crankshaft (cont'd)	Main journal oil clearance	STD	STD	0.029 — 0.056 mm	0.0011 — 0.0022 in.
			U/S 0.25	0.028 — 0.080 mm	0.0011 — 0.0031 in.
		Limit		0.08 mm	0.0031 in.
	Main journal diameter		STD	63.985 — 64.000 mm	2.5191 — 2.5197 in.
			U/S 0.25	63.745 — 63.755 mm	2.5096 — 2.5100 in.
	Main bearing center wall thickness		Mark 1	1.989 — 1.992 mm	0.0783 — 0.0784 in.
			Mark 2	1.992 — 1.995 mm	0.0784 — 0.0785 in.
			Mark 3	1.995 — 1.998 mm	0.0785 — 0.0787 in.
			Mark 4	1.998 — 2.001 mm	0.0787 — 0.0788 in.
			Mark 5	2.001 — 2.004 mm	0.0788 — 0.0789 in.
	Crank pin diameter		STD	47.987 — 48.000 mm	1.8892 — 1.8898 in.
			U/S 0.25	47.745 — 47.755 mm	1.8797 — 1.8801 in.
	Circle runout		Limit	0.06 mm	0.0024 in.
	Main journal taper and out–of–round		Limit	0.02 mm	0.0008 in.
	Crank pin taper and out–of–round		Limit	0.02 mm	0.0008 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
No. 1 idler pulley x Cylinder block		350	25	34
No. 2 idler pulley x No. 2 idler pulley bracket .		400	29	39
Camshaft tinning pulley x Camshaft		1,100	80	108
Crankshaft pulley x Crankshaft		2,500	181	245
Tinning belt tensioner x Oil pump		270	20	26
Engine RH mounting bracket x Cylinder block		410	30	39
Cylinder head x Cylinder block 12–sided bolt	1st	350	25	34
	2nd	90° turns		
	3rd	90° turns		
Recessed head bolt		185	13	18
LH engine hanger x LH Cylinder head		380	27	37
Camshaft bearing cap x Cylinder head		160	12	16
Cylinder head cover x Cylinder head		60	52 in.-lb	5.9
No. 3 timing belt cover x Cylinder head		75	65 in.-lb	7.4
No. 3 timing belt cover x Cylinder block		75	65 in.-lb	7.4
Exhaust manifold x Cylinder head		400	29	39
Intake manifold x Cylinder head		180	13	18
No. 2 idler pulley bracket stay x Cylinder head		185	13	18
No. 2 idler pulley bracket stay x No. 2 idler pulley bracket		185	13	18
Water by–pass outlet x Cylinder head		200	14	20
Water outlet x Cylinder head		85	73 in.-lb	8.3
Air intake chamber x Intake manifold		440	32	43
Air intake chamber stay x Air intake chamber		380	27	37
Air intake chamber stay x Cylinder head		380	27	37
Crossover pipe x Exhaust manifold		400	29	39
Crossover pipe x Cylinder head		350	25	34
Crossover pipe x Cylinder block		350	25	34
EGR valve x Air intake chamber		185	13	18

Torque Specifications (Cont'd)

Part tightened		kg-cm	ft-lb	N·m
EGR pipe x EGR valve		185	13	18
EGR pipe x RH exhaust manifold		800	58	78
Main bearing cap x Cylinder block	1st	625	45	61
	2nd	90° turns		
Connecting rod cap x Connecting rod	1st	250	18	25
Rear oil seal retainer x Cylinder block	2nd	90° turns		
No. 2 idler pulley bracket x Cylinder block		80	69 in.-lb	7.8
Water by–pass pipe x Cylinder block		380	27	37
Rear end plate x Cylinder block		85	74 in.-lb	8.3
Flywheel x Crankshaft		75	65 in.-lb	7.4
Drive plate x Crankshaft		850	61	83
Engine RH mounting insulator x Engine mounting bracket		850	61	83
Engine RH mounting insulator x Body Bolt		530	38	52
Nut		650	47	64
Engine LH mounting insulator x Engine mounting bracket		900	65	88
Engine LH mounting insulator x Body		530	38	52
No. 1 engine RH mounting stay x Air intake chamber		890	64	87
No. 1 engine RH mounting stay x Engine RH mounting insulator		530	38	52
No. 2 engine RH mounting stay x Alternator		530	38	52
No. 2 engine RH mounting stay x Engine RH mounting insulator		530	38	52
Engine LH mounting stay x Transaxle M/T		530	38	52
		670	48	66
	Bolt	195	14	19
	Nut	530	38	52
A/T	12 mm nut	210	15	21
	14 mm nut	530	38	52
Engine LH mounting stay x Engine mounting insulator		530	38	52
Engine front mounting insulator x Cylinder block		530	38	52
Engine front mounting insulator x Transaxle		790	57	77
Engine front mounting insulator x Engine mounting bracket		890	64	87
Engine center mounting bracket x Cylinder block		530	38	52
Engine rear mounting insulator x Transaxle		790	57	77
Engine rear mounting insulator x Engine mounting bracket		890	64	87
Engine mounting center member x Body		400	29	39
Engine mounting center member x Engine front mounting insulator		740	54	73
Engine mounting center member x Engine center mounting insulator		740	54	73
Engine mounting center member x Engine rear mounting insulator		630	46	62
Exhaust front pipe x Exhaust manifold		440	32	43
Exhaust front pipe x Catalytic converter		2,110	153	207
Suspension lower crossmember x Body		400	29	39
Suspension lower crossmember x Engine mounting center member				

EFI SYSTEM (3S–FE)

Specifications

Fuel pressure regulator	Fuel pressure	at No vacuum	2.7 — 3.1 kg/cm² (38 — 44 psi, 265 — 304 kPa)	
Cold start injector	Resistance		2 — 4 Ω	
	Fuel leakage		One drop or less per minute	
Injector	Resistance		Approx. 13.8 Ω	
	Injection volume		45 — 55 cc (2.7 — 3.4 cu in.)/1.5 sec.	
	Difference between each injector		5 cc (0.31 cu in.) or less	
	Fuel leakage		One drop or less per minute	
Throttle body	Throttle body fully closed angle		6°	
Throttle position sensor (w/o ECT)	Throttle opening angle (from Vertical)	Clearance between stop screw and fever	IDL – E1	PS1N – E 1
	—	0.50 mm 0.020 in.	Continuity	No continuity
	—	0.90 mm 0.035 in.	No continuity	No continuity
	Throttle valve fully opened	—	No continuity	Continuity
	71°	—	No continuity	No continuity
	81°	—	No continuity	Continuity
	7.5° or less	—	Continuity	No continuity
Throttle position sensor (W/ECT)	Clearance between stop screw and lever		Between terminals	Resistance
	0 mm 0 in.		VTA — E2	0.2 — 0.8 kΩ
	0.50 mm 0.020 in.		IDL — E2	2.3 kΩ or less
	0.70 mm 0.028 in.		IDL — E2	Infinity
	Throttle valve fully opened position		VTA — E2	3.3 — 10 kΩ
	—		VC — E2	3 — 7 kΩ
ISC valve	Resistance	+B — ISC1 or ISC2	16.0 — 17.0 Ω	
Cold start injector time switch	Resistance	STA — E1 below 30°C (86°F)	20 — 40 Ω	
		above 40°C (104°F)	40 — 60 Ω	
		STA — Ground	20 — 80 Ω	
Air flow meter	Resistance	VS — E2	200 — 600 Ω (Measuring plate fully closed)	
			20 — 1,200 Ω (Measuring plate fully open)	
		VC — E2	3,000 — 7,000 Ω	
		FC — E1	Infinity (Measuring plate fully closed)	
			Zero (Others)	
		THA — E2 at −20° C (−4° F)	10 — 20 kΩ	
		at 0° C (32° F)	4 — 7 kΩ	
		at 20° C (68° F)	2 — 3 kΩ	
		at 40° C (104° F)	0.9 — 1.3 kΩ	
		at 60° C (140° F)	0.4 — 0.7 kΩ	
Water temp. sensor	Resistance	at −20° C (−4° F)	10 — 20 kΩ	
		at 0° C (32° F)	4 — 7 kΩ	
		at 20° C (68° F)	2 — 3 kΩ	
		at 40° C (104° F)	0.9 — 1.3 kΩ	
		at 60° C (140° F)	0.4 — 0.7 kΩ	
		at 80° C (176° F)	0.2 — 0.4 kΩ	

Specifications (Cont'd)

EGR gas temp. sensor (CALIF.. only)	Resistance	at 50°C (122°F) at 100°C (212°F) at 150°C (302°F)		69.40 — 88.50 kΩ 11.89 — 14.37 kΩ 2.79 — 3.59 kΩ
ECU	HINT • Perform all voltage and resistance measurements with the ECU connected. • Verify that the battery voltage is 11 V or above with the ignition switch is ON.			
	Voltage			
	Terminals	Condition		STD voltage (V)
	+B +B1 — E1	EG SW ON		10 — 14
	BATT — E1			10 — 14
	*1IDL — E1	IG SW ON	Throttle valve open	8 — 14
	*1PSW — E1		Throttle valve fully closed	4 — 6
	*2IDL — E2		Throttle valve open	8 — 14
	*2VTA — E2		Throttle valve fully closed	0.1 — 1.0
			Throttle valve open	4 — 6
	VC — E2		—	4 — 6
	VS — E2		Measuring plate fully closed	4.0 — 5.5
			Measuring plate fully open	0 — 1
		Idling		2.0 — 4.0
		3,000 rpm		1.0 — 2.0
	No. 10 — E01 No. 20 — E02	IG SW ON		10 — 14
	THA — E2	IG SW ON	Intake air temp. 20°C (68°F)	1 — 3
	THW — E2		Coolant temp. 80°C (176°F)	0.1 — 1.0
	STA — E1	Cranking		6 — 14
	IGT — E1	Cranking or idling		0.7 — 1.0
	ISC1 ISC2 — E1	IG SW ON		9 — 14
	W — E1	No trouble ("CHECK" engine warning light off) and engine running		10 — 14
	*3A/C — E1	IG SW ON	Air conditioning ON	8 — 14
	*3ACT — E1		Heater blower SW ON	4 — 6
	T — E1		Check connector TE 1 – E 1 not connected	10 — 14
			Check connector TE1 – E1 connected	0.5 or less
	NSW — E1		Shift position P or N range	0 — 2
			Ex. shift position P or N range	6 — 14
	STP — E1	Stop light SW ON (Brake pedal depressed) or defogger SW ON		10 — 14

*1 W/O ECT *2 W/ EGT *3 A/C

Specifications (Cont'd)

ECU (cont'd)	Resistance		
	Terminals	Condition	STD resistance (Ω)
	*1IDL — E1	Throttle valve open	Infinity
		Throttle valve fully closed	0
	*1PSW — E1	Throttle valve fully open	0
		Throttle valve fully closed	Infinity
	*2IDL — E2	Throttle valve open	Infinity
		Throttle valve fully closed	2,300 or less
	*2VTA — E2	Throttle valve fully open	3,300 — 10,000
		Throttle valve fully closed	200 — 800
	VC — E2	—	3,000 — 7,000
	VS — E2	Measuring plate fully closed	200 — 600
		Measuring plate fully open	20 — 1,200
	THA — E2	Intake air temp. 20°C (68°F)	2,000 — 3,000
	THW — E2	Coolant temp. 80°C (176°F)	200 — 400
	G, NE — G⊖	—	140 — 180
	ISC1, ISC2 — +B, +B1		16.0 — 17.0

* 1 w/o ECT *2 w/ ECT

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Fuel line	Union bolt type	300	22	29
	Flare nut type	310	22	30
Fuel sender gauge	2WD	20	17 in.-lb	2.0
Fuel pump X Fuel tank	4WD	15	13 in.-lb	1.5
	2WD	35	30 in.-lb	3.4
	4WD	30	26 in.-lb	2.9
Fuel evaporation vent tube x Fuel tank 4WD		15	13 in.-lb	1.5
Fuel inlet pipe x Fuel tank	2WD	20	17 in.-lb	2.0
	4WD	30	26 in.-lb	2.9
Fuel tank band x Body	2WD	400	29	39
Cold start injector x Air intake chamber	4WD	220	16	22
Cold start injector pipe x Cold start injector		95	82 in.-lb	9.3
Cold start injector pipe x Delivery pipe		180	13	18
Fuel pressure regulator X Delivery pipe		180	13	18
Fuel return pipe x Fuel pressure regulator		55	48 in.-lb	5.4
Delivery pipe x Cylinder head		180	13	18
Throttle body x Air intake chamber		130	9	13
		195	14	19

COOLING SYSTEM

Specifications

Engine coolant capacity			See page A–2
Radiator	Relief valve opening pressure	STD	0.75 — 1.05 kg/cm² (10.7 — 14.9 psi, 74 — 103 kPa)
		Limit	0.6 kg/cm² 8.5 psi 59 kPa
Thermostat	Valve opening temperature		80 — 84°C 176 — 183°F
	Valve lift at 95°C (203°F)	3S–FE	8 mm (0.31 in.) or more
		2VZ–FE	8.5 mm (0.35 in.) or more

Torque Specifications (3S–FE)

Part tightened	kg-cm	ft-lb	N·m
Engine coolant x Drain plug	130	9	13
Water pump x Water pump cover	90	78 in.-lb	8.8
Water pump x Cylinder head	95	82 in.-lb	9.3
Water by–pass pipe X Water pump	95	82 in.-lb	9.3
Water inlet housing x Water pump	90	78 in.-lb	8.8
Oil cooler x Radiator tower tank	220	16	22

Torque Specifications (2VZ–FE)

Part tightened	kg-cm	ft-lb	N·m
Cylinder block x Drain plug	300	22	29
Water pump x Cylinder block	200	14	20
Water inlet x Water pump	200	14	20
Water inlet pipe x Alternator belt adjusting bar	200	14	20

LUBRICATION SYSTEM (3S–FE)

Specifications

Engine coolant capacity			See page A–20
Oil pressure		at Idling	0.3 kg/cm² (4.3 psi, 29 kPa) or more
		at 3,040 rpm	2.5 — 5.0 kg/cm² (36 — 71 psi, 245 — 490 kPa)
Oil pump	Body clearance .	STD	0.10 — 0.16 mm 0.0039 — 0.0063 in.
		Limit	0.20 mm 0.0079 in.
	Tip clearance	STD	0.04 — 0.16 mm 0.0016 — 0.0063 in.
		Limit	0.20 mm 0.0079 in.

EFI SYSTEM (2VZ–FE)

Specifications

Fuel pressure regulator	Fuel pressure	at No vacuum	2.7 – 3.1 kg/cm² (38 – 44 psi, 265 – 304 kPa)
Cold start injector	Resistance		2 – 4 Ω
	Fuel leakage		One drop or less per minute
Injector	Resistance		Approx. 13.8 Ω
	Injection volume		45 – 55 cc (2.7 – 3.4 cu in.)/15 sec
	Difference volume between each injector		5 cc (0.31 cu in.) or less
	Fuel leakage		One drop or less per minute
Air flow meter	Resistance VS — E2		200 – 600 Ω (Measuring plate fully closed)
			20 – 1,200 Ω (Measuring plate fully open)
	VC — E2		200 – 400 Ω
	FC — E1		Infinity (Measuring plate fully closed)
			Zero (Others)
	THA — E2	at –20°C (–4°F)	10 – 20 kΩ
		at 0°C (32°F)	4 – 7 kΩ
		at 20°C (68°F)	2 – 3 kΩ
		at 40°C (104°F)	0.9 – 1.3 kΩ
		at 60°C (140°F)	0.4 – 0.7 kΩ

Throttle position sensor	Clearance between stop screw and lover		Between terminals	Resistance
	0 mm	0 in.	VTA – E2	0.3 – 6.3 kΩ
	0.30 mm	0.0118 in.	IDL – E2	2.3 kΩ or less
	0.70 mm	0.0276 in.	IDL – E2	Infinity
	Throttle valve fully opened position		VTA – E2	3.5 – 10.3 kΩ
	–		VC – E2	4.25 – 8.25 kΩ

ISC valve	Resistance	B1 – S1 or S3	10 – 30 Ω
		B2 – S2 or S4	10 – 30 Ω
Cold start Injector time switch	Resistance STA – STJ	below 15°C (59°F)	25 – 45 Ω
		above 30°C (86°F)	65 – 85 Ω
	STA – Ground		25 – 85 Ω
Water temp. sensor	Resistance	at –20°C (–4°F)	10 – 20 kΩ
		at 0°C (32°F)	4 – 7 kΩ
		at 20°C (68°F)	2 – 3 kΩ
		at 40°C (104°F)	0.9 – 1.3 kΩ
		at 60°C (140°F)	0.4 – 0.7 kΩ
		at 80°C (176°F)	0.2 – 0.4 kΩ
EGR gas temp. sensor (CALIF. only)	Resistance	at 50°C (122°F)	69.40 – 88.50 kΩ
		at 100°C (212°F)	11.89 – 14.37 kΩ
		at 150°C (302°F)	2.79 – 3.59 kΩ
Fuel pressure VSV	Resistance		33 — 39 Ω

Specifications (Cont'd)

Oxygen sensor	Heater resistance			5.1 – 6.3 Ω
ECU	HINT: • Perform all voltage and resistance measurements with the ECU connected. • Verify that the battery voltage is 11 V or above with the ignition switch is ON.			
	Voltage			
	Terminals	Condition		STD voltage (V)
	BATT — E1			10 — 14
	IG SW — E1	IG SW ON		
	M-REL — E1			
	+B, +B1 — E1			
	IDL — E2	IG SW ON	Throttle valve open	4 — 6
	VTA — E2		Throttle valve fully closed	0.1 — 1.0
			Throttle valve open	3.2 — 4.2
	VC — E2			4 — 6
	VS — E2		Measuring plate fully closed	3.7 — 4.3
			Measuring plate fully open	0.2 — 0.5
		Idling		1.6 — 4.1
		3,000 rpm		1.0 — 2.0
	No. 10, No. 20, No. 30 — E01, E02	IG SW ON		10 — 14
	THA — E2	IG SW ON	Intake air temp. 20°C (68°F)	1 — 3
	THW — E2		Coolant temp. 60°C (176°F)	0.1 — 1.0
	STA — E1	Cranking		6 — 14
	IGT — E1	Cranking or idling		0.7 — 1.0
	ISC1, ISC2, ISC3, ISC4 — E1	IG SW ON		9 — 14
	W — E1	No trouble ("CHECK"' engine warning light off) and engine running		10 — 14
	*1A/C — E1	IG SW ON	Air conditioning ON	10 — 14
	*1ACT — E1		Heater blower SW ON	4 — 6
	T — E1		Check connector TE1 – E1 not connected	4 — 6
			Check connector TE1 – Et connected	0.5 or less
	*2NSW — E1		Shift position P or N range	0 — 2
			Ex shift position P or N range	10 — 14
	*2BK — E1	Stop light SW ON (Brake pedal depressed)		10 — 14

*1 w/o ECT *2 w/ ECT

Specifications (Cont'd)

ECU (cont'd)	Resistance		
	Terminals	Condition	STD resistance (fl)
	IDL — E2	Throttle valve open	Infinity
		Throttle valve fully dosed	2,300 or less
	VTA — E2	Throttle valve fully open	3,500 — 10,300
		Throttle valve fully closed	300 — 6,300
	VC — E2		200 — 400
	VS — E2	Measuring plate fully closed	200 — 600
		Measuring plate fully open	20 — 1,200
	THA — E2	Intake air temp. 20˚C (68˚F)	2,000 — 3,000
	THW — E2	Coolant temp. 60˚C (176˚F)	200 — 400
	G1 G2 — G⊖ NE	—	140 — 180
	ISC1 ISC2 — +B ISC3 — +B1 ISC4	—	10 — 30

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Fuel line	Union bolt type	300	22	29
	Flare nut type	310	22	30
Fuel pump x Fuel tank		40	35 in.-lb	3.9
Fuel inlet pipe x Fuel tank		20	17 in.-lb	2.0
Fuel tank band x Body		400	29	39
Cold start injector x Air intake chamber		55	48 in.-lb	5.4
Cold start injector tube x Cold start injector		200	14	20
Cold start injector tube x Delivery pipe		200	14	20
Fuel pressure regulator x Delivery pipe		250	18	25
Delivery pipe x Intake manifold		130	9	13
No. 2 fuel pipe x Delivery pipe		300	21	29
Air intake chamber x Intake manifold		400	29	39
EGR pipe nut		800	58	78
No. 1 engine hanger		380	27	37
Air intake chamber stay		380	27	37
No. 1 RH engine mounting stay x Air intake chamber		530	38	52
No. 1 RH engine mounting stay x RH engine mounting insulator		530	38	52
Throttle body x Air intake chamber		130	9	13
ISC valve x Air intake chamber		130	9	13

COOLING SYSTEM

Specifications

Engine coolant capacity			See page A–2
Radiator	Relief valve opening pressure	STD	0.75 — 1.05 kg/cm² (10.7 — 14.9 psi, 74 — 103 kPa)
		Limit	0.6 kg/cm² 8.5 psi 59 kPa
Thermostat	Valve opening temperature		80 — 84°C 176 — 183°F
	Valve lift at 95°C (203°F)	3S–FE	8 mm (0.31 in.) or more
		2VZ–FE	8.5 mm (0.35 in.) or more

Torque Specifications (3S–FE)

Part tightened	kg-cm	ft-lb	N·m
Engine coolant x Drain plug	130	9	13
Water pump x Water pump cover	90	78 in.-lb	8.8
Water pump x Cylinder head	95	82 in.-lb	9.3
Water by–pass pipe X Water pump	95	82 in.-lb	9.3
Water inlet housing x Water pump	90	78 in.-lb	8.8
Oil cooler x Radiator tower tank	220	16	22

Torque Specifications (2VZ–FE)

Part tightened	kg-cm	ft-lb	N·m
Cylinder block x Drain plug	300	22	29
Water pump x Cylinder block	200	14	20
Water inlet x Water pump	200	14	20
Water inlet pipe x Alternator belt adjusting bar	200	14	20

LUBRICATION SYSTEM (3S–FE)

Specifications

Engine coolant capacity			See page A–20
Oil pressure		at Idling	0.3 kg/cm² (4.3 psi, 29 kPa) or more
		at 3,040 rpm	2.5 — 5.0 kg/cm² (36 — 71 psi, 245 — 490 kPa)
Oil pump	Body clearance .	STD	0.10 — 0.16 mm 0.0039 — 0.0063 in.
		Limit	0.20 mm 0.0079 in.
	Tip clearance	STD	0.04 — 0.16 mm 0.0016 — 0.0063 in.
		Limit	0.20 mm 0.0079 in.

Torque Specifications

Part tightened	kg-cm	ft-lb	N-m
Engine oil drain plug	400	29	39
Oil pump body cover x Oil pump body	95	82 in.-lb	9.3
Oil pump x Cylinder block	95	82 in.-lb	9.3
Oil strainer x Cylinder block	55	48 in.-lb	5.4
Oil strainer x Oil pump	55	48 in.-lb	5.4
Oil pan x Cylinder block	55	48 in.-lb	5.4
Oil pan x Oil pump	55	48 in.-lb	5.4
Stiffener plate x Cylinder block	380	27	37
Stiffener plate x Transaxle case	380	27	37

LUBRICATION SYSTEM (2VZ–FE)

Specifications

Engine coolant capacity			See page A–20	
Oil pressure		at idling	0.3 kg/cm² (4.3 psi, 29 kPa) or more	
		at 3,000 rpm	3.0 — 5.5 kg/cm² (43 — 78 psi, 294 — 539 kPa)	
Oil pump	Body clearance	STD	0.100 — 0.175 mm	0.0039 — 0.0069 in.
		Limit	0.30 mm	0.0118 in.
	Side clearance	STD	0.030 — 0.090 mm	0.0012 — 0.0035 in.
		Limit	0.15 mm	0.0059 in.
	Tip clearance	STD	0.110 — 0.240 mm	0.0043 — 0.0094 in.
		Limit	0.35 mm	0.0138 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N-m
Oil pan x Drain plug		250	18	25
Oil pump. x Cylinder block	12 mm bolt head	200	14	20
Oil strainer x Main bearing cap	14 mm bolt head	420	30	41
Oil strainer x Oil pump		70	61 in.-lb	6.9
Oil pan x Cylinder block		70	61 in.-lb	6.9
Oil pan x Oil pump		60	52 in.-lb	5.9
Oil pan X Rear oil seal retainer		60	52 in.-lb	5.9
Stiffener plate x Cylinder block		60	52 in.-lb	5.9
Stiffener plate x Transaxle case		530	38	52
		380	27	37

Torque Specifications

Part tightened	kg-cm	ft-lb	N-m
Engine oil drain plug	400	29	39
Oil pump body cover x Oil pump body	95	82 in.-lb	9.3
Oil pump x Cylinder block	95	82 in.-lb	9.3
Oil strainer x Cylinder block	55	48 in.-lb	5.4
Oil strainer x Oil pump	55	48 in.-lb	5.4
Oil pan x Cylinder block	55	48 in.-lb	5.4
Oil pan x Oil pump	55	48 in.-lb	5.4
Stiffener plate x Cylinder block	380	27	37
Stiffener plate x Transaxle case	380	27	37

LUBRICATION SYSTEM (2VZ–FE)

Specifications

Engine coolant capacity			See page A–20	
Oil pressure		at idling	0.3 kg/cm² (4.3 psi, 29 kPa) or more	
		at 3,000 rpm	3.0 — 5.5 kg/cm² (43 — 78 psi, 294 — 539 kPa)	
Oil pump	Body clearance	STD	0.100 — 0.175 mm	0.0039 — 0.0069 in.
		Limit	0.30 mm	0.0118 in.
	Side clearance	STD	0.030 — 0.090 mm	0.0012 — 0.0035 in.
		Limit	0.15 mm	0.0059 in.
	Tip clearance	STD	0.110 — 0.240 mm	0.0043 — 0.0094 in.
		Limit	0.35 mm	0.0138 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N-m
Oil pan x Drain plug		250	18	25
Oil pump. x Cylinder block	12 mm bolt head	200	14	20
Oil strainer x Main bearing cap	14 mm bolt head	420	30	41
Oil strainer x Oil pump		70	61 in.-lb	6.9
Oil pan x Cylinder block		70	61 in.-lb	6.9
Oil pan x Oil pump		60	52 in.-lb	5.9
Oil pan X Rear oil seal retainer		60	52 in.-lb	5.9
Stiffener plate x Cylinder block		60	52 in.-lb	5.9
Stiffener plate x Transaxle case		530	38	52
		380	27	37

IGNITION SYSTEM

Ignition timing			10° BTDC @ Idle (w/ Terminals TE1 and E1 connected)
Firing order		3S-FE	1 — 3 — 4 — 2
		2VZ-FE	1 — 2 — 3 — 4 — 5 — 6
Spark plug			See page A-2
High–tension cord	Resistance		25 kΩ per cord
Ignition coil	Primary coil resistance	3S-FE	0.38 — 0.46 Ω
		2VZ-FE	0.41 — 0.50 Ω
	Secondary coil resistance	3S-FE	7.7 — 10.4 kΩ
		2VZ-FE	10.2 — 13.8 kΩ
Distributor	Air gap		0.2 mm (0.008 in.) or more
	Signal generator (pickup coil) resistance		140 — 180 Ω

STARTING SYSTEM

Starter	Rated voltage and output power		12 V 1.0 kW		12 V 1.4 kW
	No–toad characteristic	Current	90 A or less at 11.5 V		←
		rpm	3,000 rpm or more		3,500 rpm or more
	Bruch length	STD	13.5 mm	0.531 in.	15.5 mm 0.610 in.
		Limit	8.5 mm	0.335 in.	10.0 mm 0.394 in.
	Commutator				
	Outer diameter	STD	30 mm	1.18 in.	←
		Limit	29 mm	1.14 in.	←
	Undercut depth	STD	0.6 mm	0.024 in.	←
		Limit	0.2 mm	0.008 in.	←
	Circle runout	Limit	0.05 mm	0.0020 in.	←
	Spring installed load	STD	1.79 — 2.41 kg (3.9 — 5.3 lb, 17 — 24 N)		←

CHARGING SYSTEM

Drive belt tension			See page A–2	
Battery specific gravity	When fully charged at 20°C (68°F)		1.25 — 1.27	
Alternator	Rated output		12 V — 70 A	
	Rotor coil resistance		2.8 — 3.0 Ω	
	Slip ring diameter	STD	14.2 — 14.4 mm	0.559 — 0.567 in.
		Limit	12.8 mm	0.504 in.
	Brush exposed length	STD	10.5 mm	0.413 in.
		Limit	1.5 mm	0.059 in.
Alternator regulator (ICS	Regulating voltage	at 25°C (77°F)	13.9 — 15.1 V	
		at 115°C (239°F)	13.5 — 14.3 V	

IGNITION SYSTEM

Ignition timing			10° BTDC @ Idle (w/ Terminals TE1 and E1 connected)
Firing order		3S-FE	1 — 3 — 4 — 2
		2VZ-FE	1 — 2 — 3 — 4 — 5 — 6
Spark plug			See page A-2
High–tension cord	Resistance		25 kΩ per cord
Ignition coil	Primary coil resistance	3S-FE	0.38 — 0.46 Ω
		2VZ-FE	0.41 — 0.50 Ω
	Secondary coil resistance	3S-FE	7.7 — 10.4 kΩ
		2VZ-FE	10.2 — 13.8 kΩ
Distributor	Air gap		0.2 mm (0.008 in.) or more
	Signal generator (pickup coil) resistance		140 — 180 Ω

STARTING SYSTEM

Starter	Rated voltage and output power		12 V 1.0 kW		12 V 1.4 kW	
	No–toad characteristic	Current	90 A or less at 11.5 V		←	
		rpm	3,000 rpm or more		3,500 rpm or more	
	Bruch length	STD	13.5 mm	0.531 in.	15.5 mm	0.610 in.
		Limit	8.5 mm	0.335 in.	10.0 mm	0.394 in.
	Commutator					
	Outer diameter	STD	30 mm	1.18 in.	←	
		Limit	29 mm	1.14 in.	←	
	Undercut depth	STD	0.6 mm	0.024 in.	←	
		Limit	0.2 mm	0.008 in.	←	
	Circle runout	Limit	0.05 mm	0.0020 in.	←	
	Spring installed load	STD	1.79 — 2.41 kg (3.9 — 5.3 lb, 17 — 24 N)		←	

CHARGING SYSTEM

Drive belt tension			See page A–2	
Battery specific gravity	When fully charged at 20°C (68°F)		1.25 — 1.27	
Alternator	Rated output		12 V — 70 A	
	Rotor coil resistance		2.8 — 3.0 Ω	
	Slip ring diameter	STD	14.2 — 14.4 mm	0.559 — 0.567 in.
		Limit	12.8 mm	0.504 in.
	Brush exposed length	STD	10.5 mm	0.413 in.
		Limit	1.5 mm	0.059 in.
Alternator regulator (ICS	Regulating voltage	at 25°C (77°F)	13.9 — 15.1 V	
		at 115°C (239°F)	13.5 — 14.3 V	

IGNITION SYSTEM

Ignition timing			10° BTDC @ Idle (w/ Terminals TE1 and E1 connected)
Firing order		3S-FE	1 — 3 — 4 — 2
		2VZ-FE	1 — 2 — 3 — 4 — 5 — 6
Spark plug			See page A-2
High–tension cord	Resistance		25 kΩ per cord
Ignition coil	Primary coil resistance	3S-FE	0.38 — 0.46 Ω
		2VZ-FE	0.41 — 0.50 Ω
	Secondary coil resistance	3S-FE	7.7 — 10.4 kΩ
		2VZ-FE	10.2 — 13.8 kΩ
Distributor	Air gap		0.2 mm (0.008 in.) or more
	Signal generator (pickup coil) resistance		140 — 180 Ω

STARTING SYSTEM

Starter	Rated voltage and output power		12 V 1.0 kW		12 V 1.4 kW
	No–toad characteristic	Current	90 A or less at 11.5 V		←
		rpm	3,000 rpm or more		3,500 rpm or more
	Bruch length	STD	13.5 mm	0.531 in.	15.5 mm 0.610 in.
		Limit	8.5 mm	0.335 in.	10.0 mm 0.394 in.
	Commutator				
	Outer diameter	STD	30 mm	1.18 in.	←
		Limit	29 mm	1.14 in.	←
	Undercut depth	STD	0.6 mm	0.024 in.	←
		Limit	0.2 mm	0.008 in.	←
	Circle runout	Limit	0.05 mm	0.0020 in.	←
	Spring installed load	STD	1.79 — 2.41 kg (3.9 — 5.3 lb, 17 — 24 N)		←

CHARGING SYSTEM

Drive belt tension			See page A–2	
Battery specific gravity	When fully charged at 20°C (68°F)		1.25 — 1.27	
Alternator	Rated output		12 V — 70 A	
	Rotor coil resistance		2.8 — 3.0 Ω	
	Slip ring diameter	STD	14.2 — 14.4 mm	0.559 — 0.567 in.
		Limit	12.8 mm	0.504 in.
	Brush exposed length	STD	10.5 mm	0.413 in.
		Limit	1.5 mm	0.059 in.
Alternator regulator (ICS	Regulating voltage	at 25°C (77°F)	13.9 — 15.1 V	
		at 115°C (239°F)	13.5 — 14.3 V	

LUBRICANT

Item			Capacity			Classification
			Liters	US qts	Imp. qts	
Engine oil						API grade SG, multigrade, recommended viscosity and fuel–efficient oil
Dry fill	3S–FE		4.5	4.8	4.0	
	2VZ– FE		4.6	4.8	4.0	
Drain and refill						
w/ Oil filter change		3S-FE	4.1	4.3	3.6	
		2VZ-FE	3.9	4.1	3.4	
w/o Oil filter change			3.7	3.9	3.3	

SERVICE SPECIFICATIONS

CLUTCH

Specifications

Pedal height (from asphalt sheet)		181 — 191 mm	7.13 — 7.52 in.
Push rod play at pedal top		1.0 — 5.0 mm	0.039 — 0.197 in.
Pedal freepiay		5 — 15 mm	0.20 — 0.59 in.
Clutch release point (from pedal stroke end)		25 mm (0.98 in.) or more	
Disc rivet head depth	Limit	0.3 mm	0.012 in.
Disc runout	Limit	0.8 mm	0.031 in.
Diaphragm spring out of alignment	Limit	0.5 mm	0.020 in.
Diaphragm spring finger wear Depth Width	Limit	0.6 mm	0.024 in.
Flywheel runout	Limit	5.0 mm	0.197 in.
	Limit	0.1 mm	0.004 in.

Torque Specifications

Part tightened	kg-cm	ft-lb	N-m
Clutch cover x Flywheel	195	14	19
Master cylinder set nut	130	9	13
Release cylinder set bolt	120	8	12
Reservoir tank x Master cylinder	250	18	25
Clutch line union	155	11	15
Bleeder plug	110	8	11
Release fork support	480	35	47

MANUAL TRANSAXLE (S51)

Specifications

Input shaft				
Roller bearing journal diameter		Limit	29.970 mm	1.1799 in.
3rd gear journal diameter		Limit	33.090 mm	1.3028 in.
4th gear journal diameter		Limit	32.470 mm	1.2783 in.
5th gear journal diameter		Limit	26.970 mm	1.0618 in.
Runout		Limit	0.05 mm	0.0020 in.
Output shaft				
Roller bearing journal diameter				
1 st gear journal diameter		Limit	31.970 mm	1.2587 in.
2nd gear journal diameter		Limit	37.970 mm	1.4949 in.
Runout		Limit	31.970 mm	1.2587 in.
Gear thrust clearance		Limit	0.05 mm	0.0020 in.
	1st	STD	0.10 — 0.29 mm	0.0039 — 0.0114 in.
		Limit	0.35 mm	0.0138 in.
	2nd	STD	0.20 — 0.44 mm	0.0079 — 0.0173 in.
		Limit	0.50 mm	0.0197 in.
	3rd	STD	0.10 — 0.25 mm	0.0039 — 0.0098 in.
		Limit	0.30 mm	0.0118 in.
	4th	STD	0.20 — 0.45 mm	0.0079 — 0.0177 in.
		Limit	0.50 mm	0.0197 in.
	5th	STD	0.20 — 0.40 mm	0.0079 — 0.0157 in.
		Limit	0.45 mm	0.0177 in.

CLUTCH

Specifications

Pedal height (from asphalt sheet)		181 — 191 mm	7.13 — 7.52 in.
Push rod play at pedal top		1.0 — 5.0 mm	0.039 — 0.197 in.
Pedal freepiay		5 — 15 mm	0.20 — 0.59 in.
Clutch release point (from pedal stroke end)		25 mm (0.98 in.) or more	
Disc rivet head depth	Limit	0.3 mm	0.012 in.
Disc runout	Limit	0.8 mm	0.031 in.
Diaphragm spring out of alignment	Limit	0.5 mm	0.020 in.
Diaphragm spring finger wear Depth Width	Limit	0.6 mm	0.024 in.
Flywheel runout	Limit	5.0 mm	0.197 in.
	Limit	0.1 mm	0.004 in.

Torque Specifications

Part tightened	kg-cm	ft-lb	N-m
Clutch cover x Flywheel	195	14	19
Master cylinder set nut	130	9	13
Release cylinder set bolt	120	8	12
Reservoir tank x Master cylinder	250	18	25
Clutch line union	155	11	15
Bleeder plug	110	8	11
Release fork support	480	35	47

MANUAL TRANSAXLE (S51)

Specifications

Input shaft				
Roller bearing journal diameter		Limit	29.970 mm	1.1799 in.
3rd gear journal diameter		Limit	33.090 mm	1.3028 in.
4th gear journal diameter		Limit	32.470 mm	1.2783 in.
5th gear journal diameter		Limit	26.970 mm	1.0618 in.
Runout		Limit	0.05 mm	0.0020 in.
Output shaft				
Roller bearing journal diameter				
1 st gear journal diameter		Limit	31.970 mm	1.2587 in.
2nd gear journal diameter		Limit	37.970 mm	1.4949 in.
Runout		Limit	31.970 mm	1.2587 in.
Gear thrust clearance		Limit	0.05 mm	0.0020 in.
	1st	STD	0.10 — 0.29 mm	0.0039 — 0.0114 in.
		Limit	0.35 mm	0.0138 in.
	2nd	STD	0.20 — 0.44 mm	0.0079 — 0.0173 in.
		Limit	0.50 mm	0.0197 in.
	3rd	STD	0.10 — 0.25 mm	0.0039 — 0.0098 in.
		Limit	0.30 mm	0.0118 in.
	4th	STD	0.20 — 0.45 mm	0.0079 — 0.0177 in.
		Limit	0.50 mm	0.0197 in.
	5th	STD	0.20 — 0.40 mm	0.0079 — 0.0157 in.
		Limit	0.45 mm	0.0177 in.

Specifications (Cont'd)

Gear oil clearance			
1 st, 2nd, 3rd & 4th	STD	0.009 — 0.053 mm	0.0004 — 0.0021 in.
	Limit	0.070 mm	0.0028 in.
5th	STD	0.009 — 0.050 mm	0.0004 — 0.0020 in.
	Limit	0.070 mm	0.0028 in.
Shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
Synchronizer ring to gear clearance	Limit	0.6 mm	0.024 in.
Input shaft snap ring thickness			
No.2 clutch hub	Mark		
	1	1.95 — 2.00 mm	0.0768 — 0.0787 in.
	2	2.00 — 2.05 mm	0.0787 — 0.0807 in.
	3	2.05 — 2.10 mm	0.0807 — 0.0827 in.
	4	2.10 — 2.15 mm	0.0827 — 0.0846 in.
	5	2.15 — 2.20 mm	0.0846 — 0.0866 in.
	6	2.20 — 2.25 mm	0.0866 — 0.0886 in.
No.3 clutch hub	Mark		
	1	1.60 — 1.65 mm	0.0630 — 0.0650 in.
	2	1.65 — 1.70 mm	0.0650 — 0.0699 in.
	3	1.70 — 1.75 mm	0.0669 — 0.0689 in.
	4	1.75 — 1.80 mm	0.0689 — 0.0709 in.
	5	1.80 — 1.85 mm	0.0709 — 0.0728 in.
	6	1.85 — 1.90 mm	0.0728 — 0.0748 in.
	7	1.90 — 1.95 mm	0.0748 — 0.0768 in.
	8	1.95 — 2.00 mm	0.0768 — 0.0787 in.
	9	2.00 — 2.05 mm	0.0787 — 0.0807 in.
	10	2.05 — 2.10 mm	0.0807 — 0.0827 in.
	11	2.10 — 2.15 mm	0.0827 — 0.0846 in.
	12	2.15 — 2.20 mm	0.0846 — 0.0866 in.
	13	2.20 — 2.25 mm	0.0866 — 0.0886 in.
	14	2.25 — 2.30 mm	0.0886 — 0.0906 in.
	15	2.30 — 2.35 mm	0.0906 — 0.0925 in.
Rear bearing	Mark		
	A	2.15 — 2.20 mm	0.0846 — 0.0866 in.
	B	2.20 — 2.25 mm	0.0866 — 0.0886 in.
	C	2.25 — 2.30 mm	0.0886 — 0.0906 in.
	D	2.30 — 2.35 mm	0.0906 — 0.0925 in.
	E	2.35 — 2.40 mm	0.0925 — 0.0945 in.
Output shaft snap ring thickness			
No.1 clutch hub	Mark		
	1	2.50 — 2.55 mm	0.0984 — 0.1004 in.
	2	2.55 — 2.60 mm	0.1004 — 0.1024 in.
	3	2.60 — 2.65 mm	0.1024 — 0.1043 in.
	4	2.65 — 2.70 mm	0.1043 — 0.1063 in.
	5	2.70 — 2.75 mm	0.1063 — 0.1083 in.
	6	2.75 — 2.80 mm	0.1083 — 0.1102 in.

Specifications (Cont'd)

Side bearing preload (at starting)		10 — 16 kg-cm	8.7 — 13.9 in.-lb	1.0 — 1.6 N·m
Side bearing adjusting shim thickness	Mark			
	1	1.90 mm	0.0748 in.	
	2	1.95 mm	0.0768 in.	
	3	2.00 mm	0.0787 in.	
	4	2.05 mm	0.0807 in.	
	5	2.10 mm	0.0827 in.	
	6	2.15 mm	0.0846 in.	
	7	2.20 mm	0.0866 in.	
	8	2.25 mm	0.0886 in.	
	9	2.30 mm	0.0906 in.	
	10	2.35 mm	0.0925 in.	
	11	2.40 mm	0.0945 in.	
	12	2.45 mm	0.0965 in.	
	13	2.50 mm	0.0984 in.	
	14	2.55 mm	0.1004 in.	
	15	2.60 mm	0.1024 in.	
	16	2.65 mm	0.1043 in.	
	17	2.70 mm	0.1063 in.	
	18	2.75 mm	0.1083 in.	
	19	2.80 mm	0.1102 in.	
Shift lever preload		50 — 100 g	0.1 — 0.2 lb	0.5 — 1.0 N
Shift lever seat shim thickness	Mark			
	A or 3	0.3 mm	0.012 in.	
	B or 4	0.4 mm	0.016 in.	
	C or 5	0.5 mm	0.020 in.	
	D or 6	0.6 mm	0.024 in.	
	E or 7	0.7 mm	0.028 in.	
	F or 8	0.8 mm	0.031 in.	
	G or 9	0.9 mm	0.035 in.	
	H or 10	1.0 mm	0.039 in.	
	K or 11	1.1 mm	0.043 in.	
	L or 12	1.2 mm	0.047 in.	

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Transmission case x Transaxle case	300	22	29
Transmission case x Case cover	300	22	29
Transmission case protector	185	13	18
Rear bearing retainer	210	15	21
Output shaft front bearing lock plate	185	13	18
Input shaft oil receiver	75	65 in.-lb	7.4
5th driven gear lock nut	1,250	90	123
Reverse idler shaft lock bolt	300	22	29
Control shaft cover	375	27	37
Reverse shift arm bracket	185	13	18
No.3 shift fork x Shift fork shaft	185	13	18

Torque Specifications (Cont'd)

Part tightened	kg-cm	ft-lb	N·m
No. 1 lock ball assembly lock nut	375	27	37
No. 2 lock ball assembly	230	17	23
Filler plug	500	36	49
Drain plug	500	36	49
Back–up light switch	450	33	44
Side bearing retainer	185	13	18
Clutch release bearing retainer	75	65 in.-lb	7.4
Straight screw plug (Shit fork shaft)	130	9	13
(Reverse restrict piny	130	9	13
Transaxle x Engine (10 mm bolt)	650	47	64
(12 mm bolt)	470	34	46
Left engine mounting	530	38	52
Drive shaft center bearing bracket	330	24	32
Drive shaft X Side gear shaft	370	27	36
Steering knuckle x Lower arm	1,150	83	113
Engine mounting center member x Body	400	23	39
Engine mounting center member x Engine Mounting	440	32	43
Engine mounting center member x Lower crossmember	400	29	39
Lower cross member x Body	2,110	153	207

MANUAL TRANSAXLE (E56F5)

Specifications

TRANSMISSION ASSEMBLY				
Input shaft				
Roller bearing journal diameter		Limit	32.930 mm	1.2964 in.
3rd gear journal diameter		Limit	35.950 mm	1.4154 in.
4th gear journal diameter		Limit	35.950 mm	1.4154 in.
Runout		Limit	0.060 mm	0.0024 in.
Output shaft				
1 st gear journal diameter				
2nd gear bushing diameter		Limit	44.950 mm	1.7697 in.
Runout		Limit	43.950 mm	1.7303 in.
Gear thrust clearance		Limit	0.060 mm	0.0024 in.
	1st	STD	0.10 – 0.35 mm	0.0039 – 0.0138 in.
		Limit	0.40 mm	0.0157 in.
	2nd	STD	0.10 – 0.45 mm	0.0039 – 0.0177 in.
		Limit	0.50 mm	0.0197 in.
	3rd	STD	0.10 – 0.35 mm	0.0039 – 0.0138 in.
		Limit	0.40 mm	0.0157 in.
	4th	STD	0.10 – 0.55 mm	0.0039 – 0.0217 in.
		Limit	0.60 mm	0.0236 in.
	5th	STD	0.10 – 0.57 mm	0.0039 – 0.0224 in.
		Limit	0.65 mm	0.0256 in.
Gear oil clearance				
1 st and 4th gear		STD	0.009 – 0.051 mm	0.0004 – 0.0020 in.
		Limit	0.080 mm	0.0031 in.
2nd and 3rd gear		STD	0.009 – 0.053 mm	0.0004 – 0.0021 in.
		Limit	0.080 mm	0.0031 in.
5th gear		STD	0.009 – 0.050 mm	0.0004 – 0.0020 in.
		Limit	0.070 mm	0.0028 in.
Shift fork to hub sleeve clearance		Limit	1.0 mm	0.039 in.
Synchronizer ring to gear clearance		Limit	0.6 mm	0.024 in.
Oil pump assembly				
Rotor body clearance		STD	0.10 – 0.16 mm	0.0039 – 0.0063 in.
		Limit	0.30 mm	0.0118 in.
Rotor tip clearance		STD	0.08 – 0.15 mm	0.0031 – 0.0059 in.
		Limit	0.30 mm	0.0118 in.
Side clearance		STD	0.03 – 0.08 mm	0.0012 – 0.0031 in.
		Limit	0.15 mm	0.0059 in.
Input shaft snap ring thickness				
No.2 clutch hub		Mark		
		H	2.30 – 2.35 mm	0.0906 – 0.0925 in.
		J	2.35 – 2.40 mm	0.0925 – 0.0945 in.
		K	2.40 – 2.45 mm	0.0945 – 0.0965 in.
		L	2.45 – 2.50 mm	0.0965 – 0.0984 in.
		M	2.50 – 2.55 mm	0.0984 – 0.1004 in.
		N	2.55 – 2.60 mm	0.1004 – 0.1024 in.
		P	2.60 – 2.65 mm	0.1024 – 0.1043 in.

Specifications (Cont'd)

Input shaft snap ring thickness (cont'd)				
4th gear and rear bearing	Mark			
	1	2.35 – 2.40 mm		0.0925 – 0.0945 in.
	2	2.40 – 2.45 mm		0.0945 – 0.0965 in.
	3	2.45 – 2.50 mm		0.0965 – 0.0984 in.
	4	2.50 – 2.55 mm		0.0984 – 0.1004 in.
	5	2.55 – 2.60 mm		0.1004 – 0.1024 in.
	6	2.60 – 2.65 mm		0.1024 – 0.1043 in.
	7	2.65 – 2.70 mm		0.1043 – 0.1063 in.
	8	2.70 – 2.75 mm		0.1063 – 0.1083 in.
DIFFERENTIAL ASSEMBLY				
Differential side bearing preload (at starting)				
New bearing		3.2 – 6.3 kg	7.1 – 13.9 lb	31.4 – 61.8 N
Reused bearing		2.0 – 4.0 kg	4.4 – 8.8 lb	19.6 – 39.2 N
No. 1 case bushing inner diameter	STD	104.000 – 104.035 mm		4.0945 – 4.0959 in.
	Limit	104.060 mm		4.0968 in.
No–2 case bushing inner diameter	STD	97.000 – 97.035 mm		3.8189 – 3.8203 in.
	Limit	97.060 mm		3.8213 in.
Front case outer diameter				
No. 1 case side	STD	103.929 – 103.964 mm		4.0917 – 4.0931 in.
	Limit	103.850 mm		4.0886 in.
No.2 case side	STD	96.929 – 96.964 mm		3.8161 – 3.8175 in.
	Limit	96.850 mm		3.8130 in.
Conical spring washer height				
For No. 1 case	STD	1.85 – 2.05 mm		0.073 – 0.081 in.
	Limit	1.75 mm		0.069 in.
For No.2 case	STD	2.60 – 2.80 mm		0.102 – 0.110 in.
	Limit	2.50 mm		0.098 in.
Differential No. 1 case backlash		0.05 – 0.20 mm		0.0020 – 0.0079 in.
Front differential case backlash		0.05 – 0.20 mm		0.0020 – 0.0079 in.
Differential No.2 case thrust clearance		0.14 – 0.21 mm		0.006 – 0.008 in.
Front differential case thrust clearance		0.155 – 0.250 mm		0.0061 – 0.0098 in.
Thrust washer thickness				
For No. 1 case side gear		0.80 mm		0.0315 in.
		0.85 mm		0.0335 in.
		0.90 mm		0.0354 in.
		0.95 mm		0.0374 in.
		1.00 mm		0.0394 in.
		1.05 mm		0.0413 in.
		1.10 mm		0.0433 in.
		1.15 mm		0.0453 in.
		1.20 mm		0.0472 in.
		1.25 mm		0.0492 in.
		1.30 mm		0.0512 in.
		1.35 mm		0.0531 in.
		1.40 mm		0.0551 in.

Specifications (Cont'd)

Thrust washer thickness (cont'd)			
For front case side gear	Mark		
	B	1.00 mm	0.0394 in.
	C	1.05 mm	0.0413 in.
	D	1.10 mm	0.0433 in.
	E	1.15 mm	0.0453 in.
	F	1.20 mm	0.0472 in.
	G	1.25 mm	0.0492 in.
For No–2 case side gear	Mark		
	A	0.95 mm	0.0374 in.
	B	1.00 mm	0.0394 in.
	C	1.05 mm	0.0413 in.
	D	1.10 mm	0.0433 in.
	E	1.15 mm	0.0453 in.
	F	1.20 mm	0.0472 in.
	G	1.25 mm	0.0492 in.
	H	1.30 mm	0.0512 in.
	J	1.35 mm	0.0531 in.
	K	1.40 mm	0.0551 in.
For No. 2 case and front case		0.80 mm	0.0315 in.
		0.85 mm	0.0335 in.
		0.90 mm	0.0354 in.
		0.95 mm	0.0374 in.
		1.00 mm	0.0394 in.
		1.05 mm	0.0413 in.
		1.10 mm	0.0433 in.
		1.15 mm	0.0453 in.
		1.20 mm	0.0472 in.
		1.25 mm	0.0492 in.
		1.30 mm	0.0512 in.
		1.35 mm	0.0531 in.
		1.40 mm	0.0551 in.
Shim thickness			
For differential side bearing preload	Mark		
	0	2.00 mm	0.0787 in.
	1	2.05 mm	0.0807 in.
	2	2.10 mm	0.0827 in.
	3	2.15 mm	0.0846 in.
	4	2.20 mm	0.0866 in.
	5	2.25 mm	0.0886 in.
	6	2.30 mm	0.0906 in.
	7	2.35 mm	0.0925 in.
	8	2.40 mm	0.0945 in.
	9	2.45 mm	0.0965 in.
	A	2.50 mm	0.0984 in.
	B	2.55 mm	0.1004 in.
	C	2.60 mm	0.1024 in.

Specifications (Cont'd)

Shim thickness (cont'd)				
For differential side bearing preload (cont'd)	Mark			
	D	2.65 mm		0.1043 in.
	E	2.70 mm		0.1063 in.
	F	2.75 mm		0.1083 in.
	G	2.80 mm		0.1102 in.
	H	2.85 mm		0.1122 in.
TRANSFER ASSEMBLY				
Ring gear runout	Limit	0.1 mm		0.004 in.
Ring gear mounting case runout	Limit	0.1 mm		0.004 in.
Ring gear backlash		0.13 – 0.18 mm		0.0051 – 0.0071 in.
Driven pinion preload (at starting)				
	New bearing	1.8 – 2.9 kg	4.0 – 6.4 lb	17.6 – 28.4 N
	Reused bearing	0.9 – 1.4 kg	2.0 – 3.1 lb	8.8 – 13.7 N
Transfer total prreload (at starting) (Add driven pinion preload)				
	New bearing	1.3 – 1.4 kg	2.9 – 3.1 lb	12.7 – 13.7 N
	Reused bearing	0.5 – 0.9 kg	1.1 – 2.0 lb	4.9 – 8.8 N
Adjusting shim thickness				
For ring gear backlash	Mark			
	1	2.13 mm		0.0839 in.
	2	2.16 mm		0.0850 in.
	3	2.19 mm		0.0862 in.
	4	2.22 mm		0.0874 in.
	5	2.25 mm		0.0886 in.
	6	2.28 mm		0.0898 in.
	7	2.31 mm		0.0909 in.
	8	2.34 mm		0.0921 in.
	9	2.37 mm		0.0933 in.
	10	2.40 mm		0.0945 in.
	11	2.43 mm		0.0957 in.
	12	2.46 mm		0.0968 in.
	13	2.49 mm		0.0980 in.
	14	2.52 mm		0.0992 in.
	15	2.55 mm		0.1004 in.
	16	2.58 mm		0.1016 in.
	17	2.61 mm		0.1028 in.
	18	2.64 mm		0.1039 in.
	19	2.67 mm		0.1051 in.
	20	2.70 mm		0.1063 in.
	21	2.73 mm		0.1075 in.
	22	2.76 mm		0.1087 in.
	23	2.79 mm		0.1098 in.
	24	2.82 mm		0.1110 in.

Specifications (Cont'd)

Adjusting shim thickness (cont'd)			
For tooth contact	Mark		
	A	0.30 mm	0.0118 in.
	B	0.33 mm	0.0130 in.
	C	0.36 mm	0.0142 in.
	D	0.39 mm	0.0154 in.
	E	0.42 mm	0.0165 in.
	F	0.45 mm	0.0177 in.
	G	0.48 mm	0.0189 in.
	H	0.51 mm	0.0201 in.
	J	0.54 mm	0.0213 in.
	K	0.57 mm	0.0224 in.

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Oil pump x Cover	105	8	10
Ring gear x Differential case	985	71	97
Ring bearing retainer x Transmission case	430	31	42
Transmission case x Transaxfe case	300	22	29
Oil pump assembly x Transaxle case	175	13	17
Shift fork x Shaft	240	17	24
Oil pipe X Housing	175	13	17
Transmission case x Transmission case cover	300	22	29
Shift and select lever shaft assembly x Transmission case			
Belicrank x Transmission case	200	14	20
Back–up light switch X Transmission case	200	14	20
Driven pinion x Bearing cage	410	30	40
Ring gear x Ring gear mounting case	See page MT-180		
Driven pinion cage x Transfer case	985	71	97
Transfer left case x Transfer right case	400	29	39
Transfer left case x Inspection hole cover	450	33	44
Differential lock sleeve x Shift fork	160	12	16
Transfer right case x Transfer case cover	160	12	16
Driven pinion cage x Extension housing	175	13	17
Extension housing x Dynamic damper	260	19	25
Transaxle assembly x Transfer assembly	260	19	25
Differential lock indicator switch X Transfer left case	700	51	69
Output shaft assembly x Lock nut	400	29	39
Transfer left case x Plug (Large)	1,250	90	123
Transfer left case x Plug (Small)	400	29	39
Transmission case x Plug	250	18	25
Transfer left case X Drain plug	250	18	25
Reverse idler gear retaining bolt	400	29	39
Oil cooler pipe elbow X Transaxle	300	22	29
Oil cooler pipe x Elbow	275	20	27
	350	25	34

Torque Specifications (Cont'd)

Part tightened	kg-cm	ft-lb	N-m
Shift and select lever X Transmission case	200	14	20
Lock bolt x Transmission case	500	36	49
Engine front mounting X Transaxle	790	57	77
Stiffener plate	380	27	37
Engine rear end plate	250	18	25
Engine mounting left bracket x Transaxle	95	82 in.-lb	9.3
Transfer right case x Actuator bracket	380	27	37
Transaxle assembly x Engine	380	27	37
M12 bolt	650	47	64
M10 bolt	470	34	46

MANUAL TRANSAXLE (E52)

Specifications

Input shaft _				
3rd and 4th gear journal diameter		Limit	35.950 mm	1.4154 in.
5th gear journal diameter		Limit	32.930 mm	1.2965 in.
Runout		Limit	0.05 mm	0.0020 in.
Output shaft				
Roller bearing journal diameter		Limit	32.070 mm	1,2626 in.
1 st and 2nd gear journal diameter		Limit	38.950 mm	1.5335 in.
Runout		Limit	0.06 mm	0.0024 in.
Gear thrust clearance	1st	STD	0.10 — 0.35 mm	0.0039 — 0.0138 in.
		Limit	0.40 mm	0.0157 in.
	2nd	STD	0.10 — 0.45 mm	0.0039 — 0.0177 in.
		Limit	0.50 mm	0.197 in.
	3rd	STD	0.10 — 0.35 mm	0.0039 — 0.0138 in.
		Limit	0.40 mm	0.0157 in.
	4th	STD	0.10 — 0.55 mm	0.0039 — 0.0217 in.
		Limit	0.60 mm	0.0236 in.
	5th	STD	0.10 — 0.57 mm	0.0039 — 0.0224 in.
		Limit	0.65 mm	0.0256 in.
Gear oil clearance				
1 st and 4th		STD	0.009 — 0.051 mm	0.0004 — 0.0020 in.
		Limit	0.070 mm	0.0028 in.
2nd and 3rd		STD	0.0090 — 0.053 mm	0.0004 — 0.0021 in.
		Limit	0.070 mm	0.0028 in.
5th		STD	0.009 — 0.050 mm	0.0004 — 0.0020 in.
		Limit	0.070 mm	0.0028 in.
Reverse idler		STD	0.056 — 0.090 mm	0.0022 — 0.0035 in.
		Limit	0.120 mm	0.0047 in.
Shift fork to hub sleeve clearance		Limit	1.0 mm	0.039 in.
Synchronizer ring to gear clearane		Limit	0.6 mm	0.024 in.
Output shaft bearing preload (at starting)	New bearing		8 — 16 kg-cm (6.9 — 13.9 in.-lb, 0.8 — 1.6 N·m)	
	Reused bearing		5 — 10 kg-cm (4.3 — 8.7 in.-lb, 0.5 — 1.0 N·m)	

Torque Specifications (Cont'd)

Part tightened		kg-cm	ft-lb	N·m
Shift and select lever X Transmission case		200	14	20
Lock bolt x Transmission case		500	36	49
Engine front mounting X Transaxle		790	57	77
Stiffener plate		380	27	37
Engine rear end plate		250	18	25
Engine mounting left bracket x Transaxle		95	82 in.-lb	9.3
Transfer right case x Actuator bracket		380	27	37
Transaxle assembly x Engine		380	27	37
	M12 bolt	650	47	64
	M10 bolt	470	34	46

MANUAL TRANSAXLE (E52)

Specifications

Input shaft _				
3rd and 4th gear journal diameter		Limit	35.950 mm	1.4154 in.
5th gear journal diameter		Limit	32.930 mm	1.2965 in.
Runout		Limit	0.05 mm	0.0020 in.
Output shaft				
Roller bearing journal diameter		Limit	32.070 mm	1.2626 in.
1 st and 2nd gear journal diameter		Limit	38.950 mm	1.5335 in.
Runout		Limit	0.06 mm	0.0024 in.
Gear thrust clearance	1st	STD	0.10 — 0.35 mm	0.0039 — 0.0138 in.
		Limit	0.40 mm	0.0157 in.
	2nd	STD	0.10 — 0.45 mm	0.0039 — 0.0177 in.
		Limit	0.50 mm	0.197 in.
	3rd	STD	0.10 — 0.35 mm	0.0039 — 0.0138 in.
		Limit	0.40 mm	0.0157 in.
	4th	STD	0.10 — 0.55 mm	0.0039 — 0.0217 in.
		Limit	0.60 mm	0.0236 in.
	5th	STD	0.10 — 0.57 mm	0.0039 — 0.0224 in.
		Limit	0.65 mm	0.0256 in.
Gear oil clearance				
1 st and 4th		STD	0.009 — 0.051 mm	0.0004 — 0.0020 in.
		Limit	0.070 mm	0.0028 in.
2nd and 3rd		STD	0.0090 — 0.053 mm	0.0004 — 0.0021 in.
		Limit	0.070 mm	0.0028 in.
5th		STD	0.009 — 0.050 mm	0.0004 — 0.0020 in.
		Limit	0.070 mm	0.0028 in.
Reverse idler		STD	0.056 — 0.090 mm	0.0022 — 0.0035 in.
		Limit	0.120 mm	0.0047 in.
Shift fork to hub sleeve clearance		Limit	1.0 mm	0.039 in.
Synchronizer ring to gear clearane		Limit	0.6 mm	0.024 in.
Output shaft bearing preload (at starting)	New bearing		8 — 16 kg-cm (6.9 — 13.9 in.-lb, 0.8 — 1.6 N·m)	
	Reused bearing		5 — 10 kg-cm (4.3 — 8.7 in.-lb, 0.5 — 1.0 N·m)	

Specifications (Cont'd)

Side bearing preload (at starting)	New bearing	Output shaft bearing preload +1.9 — 3.7 kg-cm (1.6 — 3.2 in.-lb, 0.2 — 0.4 N·m)	
	Reused bearing	Output shaft bearing preload +1.2 — 2.3 kg-cm (1.0 — 2.0 in.-lb, 0.1 — 0.2 N·m)	
Speedometer driven gear oil seal drive in depth		33 mm	1.30 in.
Oil pump			
Body clearance	STD	0.10 — 0.16 mm	0.004 — 0.006 in.
	Limit	0.30 mm	0.012 in.
Tip clearance	STD	0.08 — 0.15 mm	0.003 — 0.006 in.
	Limit	0.30 mm	0.012 in.
Side clearance	STD	0.03 — 0.08 mm	0.001 — 0.003 in.
	Limit	0.15 mm	0.006 in.
Tight plug drive in depth		0.20 — 0.90 mm	0.008 — 0.035 in.
Control shaft cover oil seal drive on depth		0.5 ± 0.5 mm	0.020 ± 0.020 in.
Input shaft snap ring thickness			
No. 2 clutch hub	Mark		
	H	2.30 mm	0.0906 in.
	J	2.35 mm	0.0925 in.
	K	2.40 mm	0.0945 in.
	L	2.45 mm	0.0965 in.
	M	2.50 mm	0.0984 in.
	N	2.55 mm	0.1004 in.
	P	2.60 mm	0.1024 in.
Input rear bearing	Mark		
	1	2.35 mm	0.0925 in.
	2	2.40 mm	0.0945 in.
	3	2.45 mm	0.0965 in.
	4	2.50 mm	0.0984 in.
	5	2.55 mm	0.1004 in.
	6	2.60 mm	0.1024 in.
	7	2.65 mm	0.1043 in.
	8	2.70 mm	0.1063 in.
Output shaft snap ring thickness			
No. 1 clutch hub	Mark		
	A	2.80 mm	0.1102 in.
	B	2.85 mm	0.1122 in.
	C	2.90 mm	0.1142 in.
	D	2.95 mm	0.1161 in.
	E	3.00 mm	0.1181 in.
	F	3.05 mm	0.1201 in.
	G	3.10 mm	0.1220 in.

Specifications (Cont'd)

Output shaft snap ring thickness (cont'd)			
No. 3 clutch hub	Mark		
	Q	2.25 mm	0.0886 in.
	R	2.30 mm	0.0906 in.
	S	2.35 mm	0.0925 in.
	T	2.40 mm	0.0945 in.
	U	2.45 mm	0.0965 in.
	V	2.50 mm	0.0984 in.
	W	2.55 mm	0.1004 in.
	X	2.60 mm	0.1024 in.
	Y	2.65 mm	0.1043 in.
Output shaft rear bearing adjusting shim thickness			
	Mark		
	0	1.30 mm	0.0512 in.
	1	1.35 mm	0.0531 in.
	2	1.40 mm	0.0551 in.
	3	1.45 mm	0.0571 in.
	4	1.50 mm	0.0591 in.
	5	1.55 mm	0.0610 in.
	6	1.60 mm	0.0630 in.
	7	1.65 mm	0.0650 in.
	8	1.70 mm	0.0669 in.
	9	1.75 mm	0.0689 in.
	A	1.80 mm	0.0709 in.
	B	1.85 mm	0.0728 in.
	C	1.90 mm	0.0748 in.
	D	1.95 mm	0.0768 in.
	E	2.00 mm	0.0787 in.
	F	2.05 mm	0.0807 in.
	G	2.10 mm	0.0827 in.
	H	2.15 mm	0.0846 in.
	J	2.20 mm	0.0866 in.
	K	2.25 mm	0.0886 in.
	L	2.30 mm	0.0906 in.
	M	2.35 mm	0.0925 in.
	N	2.40 mm	0.0945 in.
	P	2.45 mm	0.0965 in.
	Q	2.50 mm	0.0984 in.
Differential pinion to side gear backlash		0.05 — 0.20 mm	0.0020 — 0.0079 in.
Differential runout	Limit	0.07 mm	0.0028 in.
Differential side gear thrust washer thickness		0.80 mm	0.0315 in.
		0.90 mm	0.0354 in.
		1.00 mm	0.0394 in.
		1.10 mm	0.0433 in.
		1.20 mm	0.0472 in.
		1.30 mm	0.0512 in.
		1.40 mm	0.0551 in.

Specifications (Cont'd)

Differential side bearing adjusting shim thickness		
Mark		
0	2.00 mm	0.0787 in.
1	2.05 mm	0.0807 in.
2	2.10 mm	0.0827 in.
3	2.15 mm	0.0846 in.
4	2.20 mm	0.0866 in.
5	2.25 mm	0.0886 in.
6	2.30 mm	0.0906 in.
7	2.35 mm	0.0925 in.
8	2.40 mm	0.0945 in.
9	2.45 mm	0.0965 in.
A	2.50 mm	0.0984 in.
B	2.55 mm	0.1004 in.
C	2.60 mm	0.1024 in.
D	2.65 mm	0.1043 in.
E	2.70 mm	0.1063 in.
F	2.75 mm	0.1083 in.
G	2.80 mm	0.1102 in.
H	2.85 mm	0.1122 in.

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Transaxle case X Transaxle case receiver	75	65 in.-lb	7.4
Transaxle case x Transmission case	300	22	29
Transaxle case x Case cover	550	40	54
Transaxle case x Oil pump	175	13	17
Transmission case x Case cover	300	22	29
Transmission case x Rear bearing retainer	430	31	42
Oil pump x Cover	105	8	10
Shift and select lever lock bolt	500	36	49
Reverse shift arm bracket	175	13	17
Straight screw plug	250	18	25
Reverse restrict pin holder	130	9	13
Ring gear X Differential case	1,260	91	124
Differential case No. 1 X No. 2	640	46	63
5th driven gear lock nut	1,250	90	123
Reserse idler shaft lock bolt	300	22	29
Control shaft x Lock bolt	200	14	20
Shift fork X Lock bolt	240	17	24
Back–up light switch	410	30	40
Filler plug	500	36	49
Drain plug	500	36	49
Elbow X Transaxie	275	20	27

Specifications (Cont'd)

Part tightened	kg-cm	ft-lb	N·m
oil cooler tube x Elbow	350	25	34
Selecting bellcrank set bolt	200	14	20
Transaxle X Engine	650	47	64
Transaxle X Engine 12 mm bolt	470	34	46
10 mm bolt	530	38	52
Transaxle X Engine front mounting	800	58	78
Insulator x Engine front mounting	380	27	37
Transaxle X Stiffener plate	530	38	52
Transaxle X Engine mounting left stay	530	38	52
Engine left mounting x Left stay	530	38	52
Engine mounting bracket X Body bracket	250	18	25
Transaxle x Rear end plate	250	18	25
Transaxle x Case protector	2,110	153	207
Lower arm x Body	1,300	94	127
Stabilizer bar x Body	660	48	65
Drive shaft X Side gear shaft	1,150	83	113
Ball joint X Steering knuckle	500	36	49
Tie rod end x Steering knuckle	1,900	137	186
Drive shaft x Axle hub	400	29	39
Center member x Body	440	32	43
Center member X Engine mounting	2,110	153	207
Lower crossmember X Body	120	9	12
Clutch release cylinder x Transaxle			

AUTOMATIC TRANSAXLE (A140E)

Specifications

Line pressure (wheel locked)					
Engine idling		D range	3.7 — 4.3 kg/cm²	53 — 61 psi	363 — 422 kPa
		R range	5.4 — 7.2 kg/cm²	77 — 102 psi	530 — 706 kPa
		D range	9.2 — 10.7 kg/cm²	131 — 152 psi	902 — 1,049 kPa
At stall (Throttle valve fully opened)		R range	14.4 — 16.8 kg/cm²	205 — 239 psi	1,412 — 1,648 kPa
Engine stall revolution			2,200 ± 150 rpm		
	N range →	D range	Less than 1.2 seconds		
Time lag	N range →	R range	Less than 1.5 seconds		
Engine idle speed (A/C OFF)		N range	700 rpm		
Throttle cable adjustment (Throttle valve fully opened)			Between boot end face and inner cable stopper		
			0 — 1 mm	0 — 0.04 in.	

Shift schedule — Throttle valve fully open [ ] Fully closed — km/h (mph)

		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	51-56 (32-35)	97-107 (60-66)	145-155 (90-96)	[31-36 (19-22)]	[22-26 (14-16)]	135-145 (84-90)	90-100 (56-62)	41-46 (25-29)
	PWR	60-65 (37-40)	112-122 (70-76)	148-158 (92-98)	[34-39 (21-24)]	[22-26 (14-16)]	138-148 (86-92)	105-115 (65-71)	41-46 (25-29)
2 range	NORM PWR	51-56 (32-35)	—	—	—	—	—	—	41-46 (25-29)
L range	NORM P'WR	—	—	—	—	—	—	—	41-46 (25-29)

Lock–up point — Throttle valve opening 5 % — km/h (mph)

		Lock–up ON			Lock–up OFF		
		2nd	3rd	O/D	2nd	3rd	O/D
D range	NORM	—	*61-66 (38-41)	67-72 (42-45)	—	*46-51 (29-32)	64-69 (40-43)
	PWR	—	*64-69 (40-43)	73-78 (45-48)	—	*58-63 (36-39)	70-75 (43-47)

* O/D main switch OFF

NOTE:

(1) In the 2 and L ranges, all stages lock–up is OFF.

(2) In the following cases, the lock–up will be released regardless of the lock–up pattern.

- When the throttle is completely closed.
- When the brake light switch is ON.

Second coast brake	Piston stroke		1.5 — 3.0 mm	0.059 — 0.118 in.
	Piston rod length		72.9 mm	2.870 in.
			71.4 mm	2.811 in.
Oil pump	Body clearance	STD	0.07 — 0.15 mm	0.0028 — 0.0059 in.
	Tip clearance	Maximum	0.3 mm	0.012 in.
	Side clearance	STD	0.11 — 0.14 mm	0.0043 — 0.0055 in.
	Pump body bushing inside diameter	Maximum	0.3 mm	0.012 in.
	Stator shaft bushing inside diameter	STD	0.02 — 0.05 mm	0.0008 — 0.0020 in.
		Maximum	0.1 mm	0.004 in.
		Maximum	38.18 mm	1.5031 in.
		Maximum	21.57 mm	0.8492 in.

Specifications (Cont'd)

Direct clutch	Piston stroke		1.11 — 1.44 mm	0.0473 — 0.0567 in.
	Drum bushing inside diamater	Maximum	47.07 mm	1.8531 in.
	Flange thickness		2.60 mm	0.1024 in.
			3.00 mm	0.1181 in.
Forward clutch	Piston stroke		1.41 — 1.82 mm	0.0555 — 0.0717 in.
	Flange thickness		3.00 mm	0.1181 in.
			3.37 mm	0.1327 in.
Front planetary gear	Planetary pinion gear thrust clearance			
		Standard clearance	0.20 — 0.50 mm	0.0079 — 0.0197 in.
	Ring gear flange bushing inside diameter			
		STD	19.025 — 19.050 mm	0.7490 — 0.7500 in.
Rear planetary gear	Planetary pinion gear thrust clearance			
		Standard clearance	0.20 — 0.50 mm	0.0079 — 0.0197 in.
Overdrive unit	Direct clutch piston stroke		1.21 — 1.91 mm	0.0476 — 0.0752 in.
	Direct clutch bushing inside diameter			
		Maximum	22.09 mm	0.8697 in.
	Counter drive gear preload			
		at Starting	920 — 1,530 g	2.0 — 3.4 lb 9 — 15 N
	Planetary pinion gear thrust clearance			
		STD	0.20 — 0.50 mm	0.0079 — 0.0197 in.

Valve body spring

Spring	Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coifs	Color
(Upper valve body)				
Throttle modulator valve	21.70 (0.8543)	9.50 (0.3740)	9.5	None
Accumulator control valve	28.06 (1.1047)	10.60 (0.4173)	13.0	Yellow
Low coast modulator valve	21.60 (0.8504)	7.90 (0.3110)	11.5	None
Down shift plug	29.76 (1.1717)	8.73 (0.3437)	13.5	Yellow
2nd coast modulator valve	20.93 (0.8240)	8.50 (0.3346)	10.0	Light Green
Throttle valve	30.70 (1.2087)	9.20 (0.3622)	9.5	None
Cut–back valve	21.80 (0.8583)	6.00 (0.2362)	13.5	None
Lock–up relay valve	26.56 (1.0457)	10.20 (0.4016)	11.5	Green
(Lower valve body)				
Primary regulator valve	66.65 (2.6240)	18.60 (0.7323)	12.5	None
1–2 shift valve	29.27 (1.1524)	9.70 (0.3819)	10.5	None
2–3 shift valve	29.27 (1.1524)	9.70 (0.3819)	10.5	None
3–4 shift valve	29.27 (1.1524)	9.70 (0.3819)	10.5	None
Lock–up signal valve	30.00 (1.1811)	8.20 (0.3228)	11.5	None
Secondary regulator valve	43.60 (1.7165)	10.90 (0.4291)	11.5	None
Pressure relief valve	11.20 (0.4409)	6.40 (0.2520)	7.5	None
Cooler by–pass valve	19.90 (0.7835)	11.00 (0.4331)	8.5	None

Specifications (Cont'd)

Valve body Retainer	Retainer	Height mm (in.)	Width mm (in.)	Thickness (mm (in.)
	(Upper valve body)			
	Throttle modulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	Accumulator control valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
	Cut–back valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	Lock–up relay valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)
	2nd coast modulator valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)
	(Lower valve body)			
	Primary regualtor valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	2–3 shift valve	8.0 (0.315)	6.0 (0.236)	3.2 (0.126)
	1–2 shift valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	3–4 shift valve	8.0 (0.315)	6.0 (0.236)	3.2 (0.126)
	Secondary regulator valve	13.0 (0.512)	6.0 (0.236)	3.2 (0.126)
	Lock–up signal valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)

Accumulator spring	Spring	Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coils	Color
	C_1 Inner	48.00 (1.8898)	13.58 (0.5346)	10.5	None
	C_1 Outer	81.09 (3.1925)	18.63 (0.7335)	17.0	Yellow Green
	C_2	72.18 (2.8417)	17.58 (0.6921)	16.5	Yellow
	B_2	66.68 (2.6252)	16.36 (0.6441)	14.5	Orange

Differential	Drive pinion preload (at starting)			
	New bearing	10 — 16 kg-cm	8.7 — 13.9 in.-lb	1.0 — 1.6 N·m
	Reused bearing	5 — 8 kg-cm	4.3 — 6.9 in.-lb	0.5 — 0.8 N·m
	Total preload (at starting)	Add drive pinion preload		
	New bearing	2.9 — 4.0 kg-cm	2.5 — 3.5 in.-lb	0.3 — 0.4 N·m
	Reused bearing	1.5 — 2.0 kg-cm	1.3 — 1.7 in.-lb	0.1 — 0.2 N·m
	Pinion to side gear backlash	0.05 — 0.20 mm	0.0020 — 0.0079 in.	
	Side gear thrust washer thickness	0.95 mm	0.0374 in.	
		1.00 mm	0.0394 in.	
		1.05 mm	0.0413 in.	
		1.10 mm	0.0433 in.	
		1.15 mm	0.0453 in.	
		1.20 mm	0.0472 in.	
	Side bearing adjusting shim thickness	1.90 mm	0.0748 in.	
		1.95 mm	0.0768 in.	
		2.00 mm	0.0787 in.	
		2.05 mm	0.0807 in.	
		2.10 mm	0.0827 in.	
		2.15 mm	0.0846 in.	
		2.20 mm	0.0866 in.	
		2.25 mm	0.0886 in.	
		2.30 mm	0.0906 in.	
		2.35 mm	0.0925 in.	
		2.40 mm	0.0945 in.	
		2.45 mm	0.0965 in.	
		2.50 mm	0.0984 in.	
		2.55 mm	0.1004 in.	

Specifications (Cont'd)

Differential (cont'd)	Side bearing adjusting shim thickness (cont'd)	2.60 mm	0.1024 in.
		2.65 mm	0.1043 in.
		2.70 mm	0.1063 in.
		2.75 mm	0.1083 in.
		2.80 mm	0.1103 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N-m
Transaxle case x Engine	12 mm	650	47	64
	10 mm	470	34	46
Drive plate x Crank shaft		850	61	83
Torque converter X Drive plate		280	20	27
Oil pump x Transaxle case		225	16	22
Oil pump body X Stator shaft		100	7	10
Second coast brake band guide		55	48 in.-lb	5.4
Upper valve body x Lower valve body		55	48 in.-lb	5.4
Valve body		100	7	10
Accumulator cover		100	7	10
Oil strainer		100	7	10
Oil pan		50	43 in.-lb	4.9
Oil pan drain plug		500	36	49
Cooler pipe union nut		350	25	34
Testing plug		75	65 in.-lb	7.4
Parking lock pawl bracket		75	65 in.-lb	7.4
Overdrive case x Transaxle case		250	18	25
Neutral start switch bolt		55	48 in.-lb	5.4
Neutral start switch nut		70	61 in.-lb	6.9

AUTOMATIC TRANSAXLE (A140L)

Specifications

Governor pressure				
Drive pinion rpm	(Vehicle speed reference)			
1,000	(approx. 30 km/h 19 mph)	0.6 — 1.4 kg/cm²	9 — 20 psi	59 — 137 kPa
1,800	(approx. 55 km/h 34 mph)	1.5 — 2.3 kg/cm²	21 — 31 psi	147 — 216 kPa
3,500	(approx. 106 km/h 66 mph)	4.2 — 5.0 kg/cm²	60 — 71 psi	412 — 490 kPa
Line pressure (wheel locked)				
Engine idling	D range	3.7 — 4.3 kg/cm²	53 — 61 psi	363 — 422 kPa
	R range	5.4 — 7.2 kg/cm²	77 — 102 psi	530 — 706 kPa
At stall	D range	9.2 — 107 kg/cm²	131 — 152 psi	902 — 1,049 kPa
(Throttle valve fully opened)	R range	14,4 — 16.8 kg/cm²	205 — 239 psi	1,412 — 1,648 kPa
Engine stall revolution		2,200 ± 150 rpm		
Time lag N range –	D range	Less than 1.2 seconds		
N range –	R range	Less than 1.5 seconds		
Engine idling speed (A/C OFF)	N range	700 rpm		
Throttle cable adjustment (Throttle valve fully opened)		Between boot end face and inner cable stopper		
		0 — 1 mm	0 — 0.04 in.	

Shift schedule	Differential gear ratio	D range (throttle valve fully open) km/h (mph)								L range
		1 → 2	2 → 3	3 → O/D	Lock-up ON	Lock-up OFF	O/D → 3	3 → 2	2 → 1	2 → 1
	3.736	51-67 (32-42)	99-114 (62-71)	—*1	—*2	—*3	—*4	94-113 (58-70)	39-49 (24-30)	38-50 (24-31)

*1 3 – O/D up–shift point with closed accelerator pedal is at 32 – 45 km/h (20 – 28 mph).
*2 Lock–up ”ON” point with closed accelerator pedal is at 64 – 73 km/h (40 – 45 mph).
*3 Lock–up ”OFF” point with closed accelerator pedal is at 60 – 68 km/h (37 – 42 mph).
*4 O/D – 3 down–shift is possible up to maximum speed.

Second coast brake	Same the A140E automatic transaxle specifications (seepage A–16)
Oil pump	↑
Direct clutch	Same the A140E automatic trransaxle specifications (see page A– 17)
Forward clutch	↑
Front planetary gear	↑
Rear plane-tary gear	↑
Overdrive unit	↑

Specifications (Cont'd)

Valve body spring	Spring	Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coils	Color
	(Upper valve body)				
	Throttle modulator valve	21.70 (0.8543)	9.50 (0.3740)	9.5	None
	Accumulator control valve	28.06 (1.1047)	10.60 (0.4173)	13.0	Yellow
	Low coast modulator valve	23.40 (0.9213)	7.90 (0.3110)	11.5	Red
	Down shift plug	29.76 (1.1717)	8.73 (0.3437)	13.5	Yellow
	2nd coast modulator valve	20.93 (0.8240)	8.50 (0.3346)	10.0	Light Green
	Throttle valve	30.70 (1.2087)	9.20 (0.3622)	9.5	None
	Lock–up relay valve	26.56 (1.0457)	10.20 (0.4016)	11.5	Green
	(Lower valve body)				
	Primary regulator valve	66.65 (2.6240)	18.60 (0.7323)	12.5	None
	1–2 shift valve	27.17 (1.0697)	6.39 (0.2516)	15.5	Yellow
	Detent regulator valve	30.64 (1.2063)	7.90 (0.3110)	12.5	Blue
	2–3 shift valve	27.74 (1.0921)	8.30 (0.3268)	11.0	None
	3–4 coast shift valve	21.10 (0.8307)	10.90 (0.4291)	8.5	White
	Lock–up signal valve	38.65 (1.5217)	8.15 (0.3209)	12.25	Pink
	O/D sequence valve	30.90 (1.2165)	7.00 (0.2756)	18.5	None
	Secondary regulator valve	43.60 (1.7165)	10.90 (0.4291)	11.5	None
	Pressure relief valve	11.20 (0.4409)	6.40 (0.2520)	7.5	None
	Cooler by–pass valve	19.90 (0.7835)	11.00 (0.4331)	8.5	None

Valve body retainer	Retainer	Height mm (in.)	Width mm (in.)	Thickness mm (in.)
	(Upper valve body)			
	Throttle modulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	Accumulator control valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
	Cut–back valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	Lock–back relay valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)
	2nd coast modulator valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)
	(Lower valve body)			
	Secondary regulator valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
	Low coast shift valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	O/D sequence valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	Intermediate shift valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
	3–4 coast shift valve	6.0 (0.236)	8.0 (0.315)	3.2 (0.126)
	3–4 shift valve	6.0 (0.236)	8.0 (0.315)	3.2 (0.126)
	2–3 shift valve.	6.0 (0.236)	8.0 (0.315)	3.2 (0.126)
	Detent regulator valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
	1–2 shift lower valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	Primary regulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
Accumulator spring	Same the A140E automatic transaxle (See page A–18)			
Differential	†			

Torque Specifications

Same the A140E automatic transaxle. (See page A–19)

AUTOMATIC TRANSAXLE (A540E)

Specifications

Line pressure (wheel locked)				
Engine idling	D range	3.6 — 4.2 kg/cm²	53 — 61 psi	363 — 412 kPa
	R range	5.7 — 6.6 kg/cm²	81 — 94 psi	559 — 647 kPa
At stall	D range	7.5 — 8.7 kg/cm²	107 — 124 psi	735 — 853 kPa
	R range	11.8 — 13.8 kg/cm²	168 — 196 psi	1,157 — 1,353 kPa
Engine stall revolution	2VZ-FE	2,450 ± 150 rpm		
Time lag N range –	D range	Less than 1.2 seconds		
	R range	Less than 1.5 seconds		
N range –	N range	700 rpm		
Engine idle speed (A/C OFF)		Between boot end face and inner cable stopper		
Throttle cable adjustment (Throttle valve fully opened)		0 — 1 mm	0 — 0.04 in.	

Shift schedule

		Throttle valve fully open [Fu lly closed] km/h (mph)							
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	55-60 (34-37)	100-109 (62-68)	154-164 (96-102)	[35-39 (22-24)]	[19-24 (12-15)]	148-157 (92-98)	88-97 (55-60)	48-53 (30-33)
	PWR	61-66 (38-41)	116-125 (72-78)	181-191 (112-119)	[35-39 (22-24)]	[19-24 (12-15)]	172-182 (107-113)	107-115 (66-71)	48-53 (30-33)
2 range	NORM PWR	61-66 (38-41)	—	—	—	—	—	—	48-53 (30-33)
L range	NORM PWR	—	—	—	—	—	—	—	51-56 (32-35)

Lock–up point

		Throttle valve opening 5% km/h (mph)					
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	—	77-82 (48-51)	64-69 (40-43)	—	68-73 (42-45)	61-66 (38-41)
	PW R	—	77-82 (48-51)	64-69 (40-43)	—	68-73 (42-45)	61-66 (38-41)

* O/D switch OFF

Second coast brake	Piston stroke		2.0 — 3.5 mm	0.079 — 0.138 in.
	Piston rod length		95.2 mm	3.748 in.
			96.3 mm	3.791 in.
Oil pump	Body clearance	STD	0.07 — 0.15 mm	0.0028 — 0.0059 in.
	Tip clearance	Maximum	0.3 mm	0.012 in.
	Side clearance	STD	0.11 — 0.14 mm	0.0043 — 0.0055 in.
	Pump body bushing inside diameter	Maximum	0.3 mm	0.012 in.
	Stator shaft bushing inside diameter	STD	0.02 — 0.05 mm	0.0008 — 0.0020 in.
	Front side	Maximum	0.1 mm	0.004 in.
	Rear side	Maximum	38.18 mm	1.5031 in.
		Maximum	21.57 mm	0.8492 in.
		Maximum	27.07 mm	1.0657 in.

Specifications (Cont'd)

Direct clutch	Piston stroke		0.91 — 1.35 mm	0.0358 — 0.0531 in.
	Drum bushing inside diamaterr	Maximum	48.27 mm	1.9004 in.
	Flange thickness		2.70 mm	0.1063 in.
			3.00 mm	0.1181 in.
Forward clutch	Piston stroke		1.41 — 1.82 mm	0.0555 — 0.0717 in.
	Flange thickness		3.00 mm	0.1181 in.
			3.37 mm	0.1327 in.
Front planetary gear	Sun gear bushing inside diameter	Maximum	22.59 mm	0.8894 in.
	Ring gear flange bushing inside diameter	Maximum	30.08 mm	1.1842 in.
	Planetary pinion gear thrust clearance	STD	0.16 — 0.56 mm	0.0063 — 0.0220 in.
		Maximum	0.61 mm	0.024 in.
Rear planetary gear	Planetary pinion gear thrust clearance	STD	0.16 — 0.56 mm	0.0063 — 0.0220 in.
		Maximum	0.61 mm	0.024 in.
First and reverse brake	Pack clearance		0.85 — 2.05 mm	0.033 — 0.081 in.
Overdrive unit	Direct clutch piston stroke		1.75 — 2.49 mm	0.0689 — 0.0980 in.
	Direct clutch bushing inside diameter	Maximum	22.13 mm	0.8713 in.
	Counter drive gear preload	at Starting	940 — 1,560 g	2.1 — 3.4 lb 9.2 — 15.3 N
	Planetary pinion gear thrust clearance	STD	0.16 — 0.56 mm	0.0063 — 0.0220 in.
		Maximum	0.61 mm	0.024 in.

Valve body spring

Spring	Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coils	Color
(Upper valve body)				
Second coast modulator valve	27.5 (1.083)	8.9 (0.350)	14.6	Brown
B, orifice control valve	24.8 (0.976)	8.0 (0.315)	12.0	White
Down–shift plug	29.8 (1.173)	8.7 (0.343)	13.5	Yellow
Throttle valve	30.7 (1.209)	9.2 (0.362)	9.5	Purple
Throttle modulator valve	21.7 (0.854)	9.5 (0.374)	9.5	Orange
Cut–back valve	21.8 (0.858)	6.0 (0.236)	13.5	Red
No. 1 accumulator control valve	28.1 (1.106)	10.6 (0.417)	13.0	Yellow
Lock–up relay valve	26.6 (1.047)	10.2 (0.402)	11.5	Green
(Lower valve body)				
Pressure relief valve	11.2 (0.441)	6.4 (0.252)	7.5	None
Check valve	19.9 (0.783)	11.0 (0.433)	8.5	None
Secondary regulator valve	38.5 (1.516)	8.4 (0.331)	17.0	Purple
No. 2 accumulator control valve	23.0 (0.906)	6.3 (0.248)	12.0	Gray
Second lock valve	20.7 (0.815)	6.1 (0.240)	12.0	Orange
3–4 shift valve	29.2 (1.150)	8.9 (0.350)	12.0	Light green
Low coast modulator valve	20.2 (0.795)	7.9 (0.311)	11.9	Purple
1–2 shift valve	29.2 (1.150)	8.9 (0.350)	12.0	Light green
2–3 shift valve	28.0 (1.102)	9.4 (0.370)	10.3	None
Primary regulator valve	64.2 (2.528)	18.6 (0.732)	12.5	None

Specifications (Cont'd)

Valve body retainer	Retainer	Height mm (in.)	Width mm (in.)	Thickness (mm (in.)
	(Upper valve body)			
	Lock–up relay valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
	Throttle modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
	Second coast modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
	Cut–back valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	No. 1 accumulator control valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
	B, orifice contron valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
	(Lower valve body)			
	Primary regulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	Secondary regulator valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)
	No. 2 accumulator control valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	Second lock valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
	Low coast modulator valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
	1–2 shift valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
	2–3 shift valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
	3–4 shift valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)

Accumulator spring	Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coils	Color
	C_1	Inner	43.4 (1.709)	17.8 (0.701)	9.0	Light Green
		Outer	71.2 (2.803)	24.4 (0.961)	11.5	Blue
	C_2		51.0 (2.008)	18.0 (0.709)	10.2	Red
	C_0 (O/D case)	Inner	47.5 (1.870)	18.9 (0.744)	9.5	White
		Outer	59.3 (2.335)	25.5 (1.004)	9.5	Gray
	B_2		58.5 (2.303)	15.2 (0.598)	15.9	Orange
	B_0 (Valve body)		62.2 (2.449)	14.8 (0.583)	17.0	None

Differential	Drive pinion preload (at starting)			
	New bearing	10 — 16 kg-cm	8.7 — 13.9 in.-lb	1.0 — 1.6 N·m
	Reused bearing	5 — 8 kg-cm	4.3 — 6.9 in.-lb	0.5 — 0.8 N·m
	Total preload (at starting)	Add drive pinion preload		
	New bearing	2.8 — 4.4 kg-cm	2.4 — 3.8 in.-lb	0.3 — 0.4 N·m
	Reused bearing	1.4 — 2.2 kg-cm	1.2 — 1.9 in.-lb	0.1 — 0.2 N·m
	Pinion to side gear backlash	0.05 — 0.20 mm	0.0020 — 0.0079 in.	
	Side gear thrust washer thickness	0.80 mm	0.0315 in.	
		0.90 mm	0.0354 in.	
		1.00 mm	0.0394 in	
		1.10 mm	0.0433 in.	
		1.20 mm	0.0472 in.	
		1.30 mm	0.0512 in.	
		1.40 mm	0.0551 in.	
	Side bearing adjusting shim thickness			
	Mark			
	0	2.00 mm	0.0787 in.	
	1	2.05 mm	0.0807 in.	
	2	2.10 mm	0.0827 in.	
	3	2.15 mm	0.0846 in.	
	4	2.20 mm	0.0866 in.	
	5	2.25 mm	0.0886 in.	

Specifications (Cont'd)

Differential (cont'd)	Side bearing adjusting shim thickness (cont'd)	Mark		
		6	2.30 mm	0.0906 in.
		7	2.35 mm	0.0925 in.
		8	2.40 mm	0.0945 in.
		9	2.45 mm	0.0965 in.
		A	2.50 mm	0.0984 in.
		B	2.55 mm	0.1004 in.
		C	2.60 mm	0.1024 in.
		D	2.65 mm	0.1043 in.
		E	2.70 mm	0.1063 in.
		F	2.75 mm	0.1083 in.
		G	2.80 mm	0.1103 in.
		H	2.85 mm	0.1122 in.

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Oil cooler pipe union	275	20	27
Oil pan	50	43 in.-lb	4.9
Valve body x Transaxte case	110	8	11
Accumulator x Cover	100	7	10
Oil pump x Transaxle case	225	16	22
O/D case X Transaxle case	250	18	25
Differential LH side bearing retainer	195	14	19
Differential RH retainer	195	14	19
Differential carrier cover	400	29	39
Oil pump body x Stator shaft	100	7	10
Upper valve body x Lower valve body	67	58 in.-lb	6.6
Differential left case x Right case	640	46	63
Ring gear x Differential case	1,260	91	124

AUTOMATIC TRANSAXLE (A540H)

Specifications

Line pressure (wheel locked)				
Engine idling	D range	3.6 — 4.2 kg/cm²	53 — 61 psi	353 — 412 kPa
	R range	6.6 — 7.7 kg/cm²	94 — 110 psi	647 — 755 kPa
At stall	D range	7.5 — 8.7 kg/cm²	107 — 124 psi	735 — 853 kPa
	R range	13.5 — 15.8 kg/cm²	192 — 225 psi	1,324 — 1,549 kPa
Engine stall revolution	3S-FE	2,320 ± 150 rpm		
Time lag	N range → D range	Less than 1.2 seconds		
	N range → R range	Less than 1.5 seconds		
Engine idle speed (A/C OFF)	N range	700 rpm		
Throttle cable adjustment (Throttle valve fully opened)		Between boot end face and inner cable stopper 0 — 1 mm	0 — 0.04 in.	

Center differential control pressure (D range)

Solenoid valve No. 1	Solenoid valve No. 2	Engine R.P.M.	Pressure		
ON	ON	Idling	3.6 — 4.2 kg/cm²	53 — 60 psi	353 — 412 kPa
		Stall	7.4 — 8.8 kg/cm²	107 — 125 psi	726 — 863 kPa
OFF	ON	Idling	1.7 — 2.4 kg/cm²	24 — 34 psi	167 — 235 kPa
		Stall	4.3 — 5.1 kg/cm²	61 — 73 psi	422 — 500 kPa
ON	OFF	Idling	0.7 — 1.4 kg/cm²	10 — 20 psi	69 — 137 kPa
		Stall	2.5 — 3.2 kg/cm²	36 — 46 psi	245 — 314 kPa
OFF	OFF	Idling	Under 0.1 kg/cm²	Under 1 psi	Under 10 kPa
		Stall			

Shift schedule

Throttle valve fully open [Fully closed] km/h (mph)

		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	41-45 (25-28)	79-85 (49-53)	117-123 (73-76)	[25-29 (16-18)]	[15-19 (9-12)]	109-116 (68-72)	75-79 (47-49)	35-39 (22-24)
	PWR	48-52 (30-32)	90-97 (56-60)	126-133 (78-83)	[27-31 (17-19)]	[15-19 (9-12)]	112-118 (70-73)	85-91 (53-57)	41-44 (25-27)
2 range	NORM PWR	41-45 (25-28)	—	—	—	—	—	—	35-39 (22-24)
L range	NORM PWR	—	—	—	—	—	—	—	37-41 (23-25)

Lock–up point

Throttle valve opening 5% km/h (mph)

		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	—	49-53 (30-33)	57-61 (35-38)	—	37-41 (23-25)	47-51 (29-32)
	PWR	—	59-63 (37-39)	66-70 (41-43)	—	47-15 (29-32)	57-61 (35-38)

* O/D switch OFF

Specifications (Cont'd)

Second coast brake	Same the A540E automatic transaxle (See page A–22)		
Oil pump	↑		
Direct clutch	Piston stroke	1.11 — 1.47 mm	0.0437 — 0.0579 in.
	Drum bushing inside diameter Maximum	48.27 mm	1.9004 in.
	Flange thinkness	2.70 mm	0.1063 in.
		3.00 mm	0.1181 in.
Forward clutch	Same the A540E automatic transaxle (See page A–23)		
Front planetary gear	↑		
Rear planetary gear	↑		
First and reverse brake	Pack clearance	1.04 — 2.16 mm	0.0409 — 0.0850 in.
Over drive unit	Same the A540E automatic transaxle (See page A–23)		
Valve body spring	↑		
Valve body retainer	Same the A540E automatic transaxie (See page A–24)		
Accumulator spring	↑		
Differential	Drive pinion preload (at staring)		
	New bearing	10 — 16 kg-cm	8.7 — 13.9 in.-lb 1.0 — 1.6 N·m
	Reused bearing	5 — 8 kg-cm	4.3 — 6.9 in.-lb 0.5 — 0.8 N·
	Total preload (at starting)		
	New bearing	2.3 — 3.7 kg-cm	2.0 — 3.2 in.-lb 0.2 — 0.4 N·m
	Reused bearing	1.2 — 1.9 kg-cm	1.0 — 1.6 in.-lb 0.1 — 0.2 N·m
	Pinion to side gear backlash	0.05 — 0.20 mm	0.0020 — 0.0079 in.
	Side gear thrust washer thickness		
	Mark		
	A	1.00 mm	0.0394 in.
	B	1.05 mm	0.0413 in.
	C	1.10 mm	0.0433 in.
	D	1.15 mm	0.0453 in.
	E	1.20 mm	0.0472 in.
	F	1.25 mm	0.0492 in.
	G	1.30 mm	0.0512 in.
	Side bearing adjusting shim thickness		
	Mark		
	0	2.00 mm	0.0787 in.
	1	2.05 mm	0.0807 in.
	2	2.10 mm	0.0827 in.
	3	2.15 mm	0.0846 in.
	4	2.20 mm	0.0866 in.
	5	2.25 mm	0.0886 in.
	6	2.30 mm	0.0906 in.
	7	2.35 mm	0.0925 in.
	8	2.40 mm	0.0945 in.
	9	2.45 mm	0.0965 in.

Specifications (Cont'd)

Differential (cont'd)	Side bearing adjusting shim thickness leont'dy	Mark			
		A	2.50 mm		0.0984 in.
		B	2.55 mm		0.1004 in.
		C	2.60 mm		0.1024 in.
		D	2.65 mm		0.1043 in.
		E	2.70 mm		0.1063 in.
		F	2.75 mm		0.1083 in.
		G	2.80 mm		0.1103 in.
		H	2.85 mm		0.1122 in.
	Differential end play		0.18 — 0.82 mm		0.0071 — 0.0323 in.
Transfer	Driven pinion preload (at starting)		0.9 — 1.4 kg	2.0 — 3.1 lb	8.8 — 13.7 N
	Total preload (at starting)		0.5 — 0.9 kg	1.1 — 2.0 lb	4.9 — 8.8 N
	Ring gear backlash		0.13 — 0.18 mm		0.0051 — 0.0071 in.
	Driven pinion bearing cage				
	Driven pinion preload (at starting)				
	New bearing		1.8 — 2.9 kg	4.0 — 6.4 lb	18 — 28 N
	Reused bearing		0.9 — 1.4 kg	2.0 — 3.1 lb	9 — 13 lb
	Center differential side gear backlash		0.05 — 0.20 mm		0.0020 — 0.0079 in.
	Center differential left side gear thrust washer thickness	Mark			
		A	1.00 mm		0.0394 in.
		B	1.05 mm		0.0413 in.
		C	1.10 mm		0.0433 in.
		D	1.15 mm		0.0453 in.
		E	1.20 mm		0.0472 in.
		F	1.25 mm		0.0492 in.
		G	1.30 mm		0.0512 in.
		H	1.35 mm		0.0531 in.
		J	1.40 mm		0.0551 in.
	Center differential side gear thrust clearance		0.18 — 0.63 mm		0.0071 — 0.0248 in.
	Center differential right side gear thrust washer thickness	Mark			
		A	1.00 mm		0.0394 in.
		B	1.05 mm		0.0413 in.
		C	1.10 mm		0.0433 in.
		D	1.15 mm		0.0453 in.
		E	1.20 mm		0.0472 in.
		F	1.25 mm		0.0492 in.
		G	1.30 mm		0.0512 in.
		H	1.35 mm		0.0531 in.
		J	1.40 mm		0.0551 in.
		K	1.45 mm		0.0571 in.
		L	1.50 mm		0.0591 in.

Transfer lower valve body spring	Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coils	Color
Transfer clutch modulator valve	32.3 (1.272)	7.6 (0.299)	16	None
No. 2 low–high shift valve	28.9 (1.138)	7.0 (0.276)	14	None
No. 1 low–high shift valve	28.9 (1.138)	7.0 (0.276)	14	None

Specifications (Cont'd)

Transfer (cont'd)	Transfer lower valve body retainer	Height mm (in.)	Width mm (in.)	Thickness mm (in.)
	Transfer clutch modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
	No. 2 low–high shift valve	†	†	†
	No. 1 low–high shift valve	†	†	†

Center differential plate washer	Mark		
	71	2.13 mm	0.0839 in.
	72	2.16 mm	0.0850 in.
	73	2.19 mm	0.0862 in.
	74	2.22 mm	0.0874 in.
	75	2.25 mm	0.0886 in.
	76	2.28 mm	0.0898 in.
	77	2.31 mm	0.0909 in.
	78	2.34 mm	0.0921 in.
	79	2.37 mm	0.0933 in.
	80	2.40 mm	0.0945 in.
	81	2.43 mm	0.0957 in.
	82	2.46 mm	0.0969 in.
	83	2.49 mm	0.0980 in.
	84	2.52 mm	0.0992 in.
	85	2.55 mm	0.1004 in.
	86	2.58 mm	0.1016 in.
	87	2.61 mm	0.1028 in.
	88	2.64 mm	0.1039 in.
	89	2.67 mm	0.1051 in.
	90	2.70 mm	0.1063 in.
	91	2.73 mm	0.1075 in.
	92	2.76 mm	0.1087 in.
	93	2.79 mm	0.1098 in.
	94	2.82 mm	0.1110 in.
Ring gear adjusting shim	Mark		
	A	0.30 mm	0.0118 in.
	B	0.33 mm	0.0130 in.
	C	0.36 mm	0.0142 in.
	D	0.39 mm	0.0154 in.
	E	0.42 mm	0.0165 in.
	F	0.45 mm	0.0177 in.
	G	0.48 mm	0.0189 in.
	H	0.51 mm	0.0201 in.
	J	0.54 mm	0.0213 in.
	K	0.57 mm	0.0224 in.

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Oil cooler pipe union and elbow	275	20	27
Oil pan	50	43 in.-lb	4.9
Valve body x Transaxle case	110	8	11
Accumulator x Cover	100	7	10

Torque Specifications (Cont'd)

Part tightened		kg-cm	ft-lb	N·m
Oil pump X Transaxle case		225	16	22
O/D case x Transaxle case		250	18	25
Differential LH side bearing retainer		195	14	19
Differential carrier cover		400	29	39
Oil pump body x Stator shaft		100	7	10
Upper valve body x Lower valve body		67	58 in.-lb	6.6
Front differential right case x Front differential left case		340	25	33
Ring gear X Ring gear mounting case		1,260	91	124
Transfer right case retainer x Transfer right case		300	22	29
Transfer right case X Adjusting nut lock plate lock bolt		73	63 in.-lb	7.2
Transfer right case x Transfer left case		450	33	44
Transfer right case x Mode select lever and rod		55	48 in.-lb	5.4
Transfer right case x Oil strainer	Ⓐ	115	8	11
Transfer left case X Rear wheel speed sensor	Ⓑ	55	48 in.-lb	5.4
Transfer left case X Transfer inspection hole cover		55	48 in.-lb	5.4
Transfer left case x Drain plug		160	12	16
Transfer left case x Driven pinion bearing cage		400	29	39
Driven pinion bearing cage x Transfer extension housing		400	29	39
Transfer extension housing X Dynamic damper		260	19	25
Transfer right case x Oil pump cover		260	19	25
Transfer ring gear X Ring gear mounting case		80	69 in.-lb	7.8
Center differential control solenoid x Transfer valve body		985	71	97
Transfer valve body x Transfer left case		145	10	14
Neutral start switch bolt		110	8	11
Neutral start switch nut		55	48 in.-lb	5.4
Transfer assembly X Transaxle case		70	61 in.-lb	6.9
		700	51	69

PROPELLER SHAFT

Specifications

Bearing axial play		0.05 mm	0.0020 in.
Front propeller shaft runout	Limit	0.8 mm	0.0315 in.
Intermediate shaft runout	Limit	0.8 mm	0.0315 in.
Rear propeller shaft runout	Limit	0.8 mm	0.0315 in.
Intermediate shaft flange runout	Limit	0.1 mm	0.0039 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Propeller shaft x Differential		750	54	74
Intermediate shaft x Propeller shaft		750	54	74
Center support bearing x Body		375	27	37
Intermediate shaft x Center bearing x Joint flange				
	1st	1,850	134	181
	2nd	Lossen nut		
	3rd	700	51	69
Cross groove joint set bolt		275	20	27

Torque Specifications (Cont'd)

Part tightened		kg-cm	ft-lb	N·m
Oil pump X Transaxle case		225	16	22
O/D case x Transaxle case		250	18	25
Differential LH side bearing retainer		195	14	19
Differential carrier cover		400	29	39
Oil pump body x Stator shaft		100	7	10
Upper valve body x Lower valve body		67	58 in.-lb	6.6
Front differential right case x Front differential left case		340	25	33
Ring gear X Ring gear mounting case		1,260	91	124
Transfer right case retainer x Transfer right case		300	22	29
Transfer right case X Adjusting nut lock plate lock bolt		73	63 in.-lb	7.2
Transfer right case x Transfer left case		450	33	44
Transfer right case x Mode select lever and rod		55	48 in.-lb	5.4
Transfer right case x Oil strainer	Ⓐ	115	8	11
Transfer left case X Rear wheel speed sensor	Ⓑ	55	48 in.-lb	5.4
Transfer left case X Transfer inspection hole cover		55	48 in.-lb	5.4
Transfer left case x Drain plug		160	12	16
Transfer left case x Driven pinion bearing cage		400	29	39
Driven pinion bearing cage x Transfer extension housing		400	29	39
Transfer extension housing X Dynamic damper		260	19	25
Transfer right case x Oil pump cover		260	19	25
Transfer ring gear X Ring gear mounting case		80	69 in.-lb	7.8
Center differential control solenoid x Transfer valve body		985	71	97
Transfer valve body x Transfer left case		145	10	14
Neutral start switch bolt		110	8	11
Neutral start switch nut		55	48 in.-lb	5.4
Transfer assembly X Transaxle case		70	61 in.-lb	6.9
		700	51	69

PROPELLER SHAFT

Specifications

Bearing axial play		0.05 mm	0.0020 in.
Front propeller shaft runout	Limit	0.8 mm	0.0315 in.
Intermediate shaft runout	Limit	0.8 mm	0.0315 in.
Rear propeller shaft runout	Limit	0.8 mm	0.0315 in.
Intermediate shaft flange runout	Limit	0.1 mm	0.0039 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Propeller shaft x Differential		750	54	74
Intermediate shaft x Propeller shaft		750	54	74
Center support bearing x Body		375	27	37
Intermediate shaft x Center bearing x Joint flange				
	1st	1,850	134	181
	2nd	Lossen nut		
	3rd	700	51	69
Cross groove joint set bolt		275	20	27

FRONT AXLE AND SUSPENSION

Specifications

Cold tire inflation pressure	(FWD/SV21 and 4WD) (FWD/VZV21)	2.1 kg/cm² 30 psi 206 kPa 2.2 kg/cm² 31 psi 216 kPa		
Chassis groung clearance		Sedan	Wagon	
	(FWD/SV21) (4WD) (F1ND/VZV21)	233 mm (9.17 in.) 233 mm (9.17 in.) 227 mm (8.94 in.)	231 mm (9.09 in.) — 255 mm (8.86 in.)	
Front wheel alignment		Inspection STD	Adjustment STD	
	Toe–in	1 ± 2 mm (0.04 ± 0.08 in.)	1 ± 1 mm (0.04 ± 0.04 in.)	
	Camber Sedan Wagon Left-right error	0°35′ ± 45′ 0°30′ ± 45′ 30′	—	
	Steering axis inclination Sedan Wagon Left-right error	 12°45′ ± 45′ 12°50′ ± 45′ 30′	—	
	Caster Sedan Wagon Left-right error	1°40′ ± 45′ 1°00′ ± 45′ 30′	1°40′ ± 30′ 1°00′ ± 30′ 30′	
	Side slip	Less than 3.0 mm/m (0.118 in./3.3 ft)		
	Wheel angle (FWD/SV21 and 4WD) (FWD/VZV21)	Inside wheel (Max.)	Outside wheel (Max.)	
		37°30′ ± 1°00′ 35°45′	30°45′ 29°45′	
		Inside wheel at 20° outside wheel		
		22°00′		
Front axle and suspension	Wheel lateral runout	Limit	Less than 1.0 mm (0.039 in.)	
	Tie rod end left–right error		Less than 1.5 mm (0.059 in.)	
	Hub bearing axial direction play	Limit	0.05 mm	0.0020 in.
	Ball joint vertial play		0 mm	0 in.
	Ball joint rotation condition		10 — 33 kg-cm	9 — 29 in.-lb 1.0 — 3.2 N·m
	Drive shaft standard length (FWD/SV21 /TOYOTA type/LH) (FWD/SV21 /TOYOTA type/RH) (FWD/SV21 /GKN type/LH) (FWD/SV21 /GKN type/RH) (FVIJD/VZV21) (4WD/M/T/LH) (4WD/A/T/LH) (4WD/M/T/RH)		 558.7 ± 5.0 mm 845.2 ± 5.0 mm 652.0 ± 6.0 mm 937.0 ± 6.0 mm 406.0 ± 5.0 mm 512.5 ± 5.0 mm 512.5 ± 5.0 mm 515.7 ± 5.0 mm	 21.996 ± 0.197 in. 33.276 ± 0.197 in. 25.669 ± 0.236 in. 36.890 ± 0.236 in. 15.984 ± 0.197 in. 20.177 ± 0.197 in. 20.177 ± 0.197 in. 20.303 ± 0.197 in.

Torque Specifications

Part tightened	kg-cm	ft-lb	N-m
Tie rod end lock nut	570	41	56
Shock absorber X Steering knuckle Tie rod end x Steering knuckle	3,100	224	304
Ball joint x Lower suspension arm	500	36	49
Disc brake caliper X Steering knuckle	1,250	90	123
Hub bearing lock nut	1,190	86	117
Center drive shaft bearing lock nut	1,900	137	186
Ball joint x Steering knuckle	330	24	32
Drive shaft x Side gear shaft (FWD/VZV21 and 4WD)	1,150	83	113
Drive shaft x Center drive shaft (FWD/VZV21) ,	660	48	65
Center drive shaft bearing bracket installation bolt	660	48	65
(FWD 1)			
Drive shaft bearing bracket bolt (GKN)			
(TOYOTA) /VZV2	650	47	64
Drive shaft bearing bracket x Bracket stay	330	24	32
Piston rod x Suspension support	650	47	64
Suspension support x Body	650	47	64
Disc brake hose union bolt	475	34	47
Suspension lower crossmember x Body	650	47	64
Stabilizer bar x Lower suspension arm	310	22	30
Lower arm shaft x Lower suspension arm	2,110	153	207
Lower arm shaft x Body	2,160	156	212
Stabilizer bar bracket x Body	2,160	156	212
Engine center mounting member X Body	2,110	153	207
Engine center mounting member x Engine mountings	1,300	94	127
	400	29	39
	440	32	43

REAR AXLE AND SUSPENSION

Specifications

Cold tire inflation pressure	(FWD/SV21 and 4WD)	2.1 kg/cm²	30 psi	206 kPa
	(FWD/VZV21)	1.9 kg/cm²	27 psi	186 kPa
Chassis ground clearance		Sedan		Wagon
	(FWD SV21)	260 mm (10.24 in.)		290 mm (11.42 in.)
	(4WD)	256 mm (10.08 in.)		—
	(FIND/¿¿V21)	254 mm (10.00 in.)		284 mm (11.18 in.)
Rear wheel alignment		Inspection STD		Adjustment STD
	Toe–in (FWD/SV21)	4 ± 2 mm (0.16 ± 0.08 in.)		4 ± 1 mm (0.16 ± 0.04 in.)
	(FWD/VZV21)	4 ± 2 mm (0.16 ± 0.08 in.)		4 ± 1 mm (0.16 ± 0.04 in.)
	(4WD)	3 ± 2 mm (0.12 ± 0.08 in.)		3 ± 1 mm (0.12 ± 0.04 in.)
	Camber (FWD /Sedan)	–35′ ± 30′		—
	(FWD/Wagon)	– 5′ ± 30′		
	(4WD)	–30′ ± 30′		
	Left–right error	30′		
Rear axle and suspension	Wheel lateral runout	Less than 1.0 mm (0.039 in.)		
	Hub bearing axial direction Limit	0.05 mm		0.0020 in.
Differential	Drive pinion bearing preload at Starting			
	New bearing	10 — 16 kg-cm (8.7 — 13.9 in.-lb, 1.0 — 1.6 N·m)		
	Reused bearing	5 — 8 kg-cm (4.3 — 6.9 in.-lb, 0.5 — 0.8 N·m)		
	Total preloacf at Starting	Add drive pinion bearing preload 3 — 5 kg-cm (2.6 — 4.3 in.-lb, 0.3 — 0.5 N·m)		
	Drive pinion to ring gear backlash	0.13 — 0.18 mm		0.0051 — 0.0071 in.
	Pinion gear to side gear backlash	0.05 — 0.20 mm		0.0020 — 0.0079 in.
	Ring gear runout Limit	0.07 mm		0.0028 in.
	Companion flange runout			
	Limit Lateral runout	0.1 mm		0.004 in.
	Radial runout	0.1 mm		0.004 in.
	Ring gear installing temperature	90 — 110°C		194 — 230°F
	Drive pinion oil seal drive in depth	2.0 mm		0.079 in.
	Side gear oil seal drive in depth	Flash the carrier end surface		
	Side gear thrust washer thickness	0.95 mm		0.0374 in.
		1.00 mm		0.0394 in.
		1.05 mm		0.0413 in.
		1.10 mm		0.0433 in.
		1.15 mm		0.0453 in.
		1.20 mm		0.0472 in.

Specifications (Cont'd)

Differential (cont'd)	Drive pinion adjusting plate washer thickness	2.27 mm	0.0894 in.
		2.30 mm	0.0906 in.
		2.33 mm	0.0917 in.
		2.36 mm	0.0929 in.
		2.39 mm	0.0941 in.
		2.42 mm	0.0953 in.
		2.45 mm	0.0965 in.
		2.48 mm	0.0976 in.
		2.51 mm	0.0988 in.
		2.54 mm	0.1000 in.
		2.57 mm	0.1012 in.
		2.60 mm	0.1024 in.
		2.63 mm	0.1035 in.
		2.66 mm	0.1047 in.
		2.69 mm	0.1059 in.
	Side bearing adjusting plate. thickness	2.21 — 2.23 mm	0.0870 — 0.0878 in.
		2.24 — 2.26 mm	0.0882 — 0.0890 in.
		2.27 — 2.29 mm	0.0894 — 0.0902 in.
		2.30 — 2.32 mm	0.0906 — 0.0913 in.
		2.33 — 2.35 mm	0.0917 — 0.0925 in.
		2.36 — 2.38 mm	0.0929 — 0.0937 in.
		2.39 — 2.41 mm	0.0941 — 0.0949 in.
		2.42 — 2.44 mm	0.0953 — 0.0961 in.
		2.45 — 2.47 mm	0.0965 — 0.0972 in.
		2.48 — 2.50 mm	0.0976 — 0.0984 in.
		2.51 — 2.53 mm	0.0988 — 0.0996 in.
		2.54 — 2.56 mm	0.1000 — 0.1008 in.
		2.57 — 2.59 mm	0.1012 — 0.1020 in.
		2.60 — 2.62 mm	0.1024 — 0.1031 in.
		2.63 — 2.65 mm	0.1035 — 0.1043 in.
		2.66 — 2.68 mm	0.1047 — 0.1055 in.
		2.69 — 2.71 mm	0.1059 — 0.1067 in.
		2.72 — 2.74 mm	0.1071 — 0.1079 in.
		2.75 — 2.77 mm	0.1083 — 0.1091 in.
		2.78 — 2.80 mm	0.1094 — 0.1102 in.
		2.81 — 2.83 mm	0.1106 — 0.1114 in.
		2.84 — 2.86 mm	0.1118 — 0.1126 in.
		2.87 — 2.89 mm	0.1130 — 0.1138 in.
		2.90 — 2.92 mm	0.1142 — 0.1150 in.
		2.93 — 2.95 mm	0.1154 — 0.1161 in.
		2.96 — 2.98 mm	0.1165 — 0.1173 in.
		2.99 — 3.01 mm	0.1177 — 0.1185 in.
		3.02 — 3.04 mm	0.1189 — 0.1197 in.
		3.05 — 3.07 mm	0.1201 — 0.1209 in.
		3.08 — 3.10 mm	0.1213 — 0.1220 in.
		3.11 — 3.13 mm	0.1224 — 0.1232 in.
		3.14 — 3.16 mm	0.1236 — 0.1244 in.
		3.17 — 3.19 mm	0.1248 — 0.1256 in.
		3.20 — 3.22 mm	0.1260 — 0.1268 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N-m
Axle bearing lock nut		1,250	90	123
Axle carrier x Shock Absorber		2,300	166	226
Axle hub x Axle carrier		820	59	80
Strut rod X Axle carrier		1,150	83	113
No. 1 and No. 2 suspension arm x Axle carrier	(2WD)	1,850	134	181
Drive shaft x 'Side gear shaft	(4WD)	1,250	90	123
Piston rod X Suspension support	(4WD)	700	51	69
Suspension support x Body		500	36	49
No. 1 suspension Arm x Body		400	29	39
No. 2 suspension arm x Body		1,150	83	113
Strut rod X Body		1,150	83	113
Stabilizer bar X Stabilizer bar link		1,150	83	113
Shock absorber X Stabilizer bar link		650	47	64
Stabilizer bar bracket x Body		650	47	64
Fuel tank band X Body		195	14	19
Hub nut		400	29	39
		1,050	76	103
(4WD)				
Differential x Support member	(Under side)	970	70	95
	(Rear side)	1,500	108	147
Carrier x Carrier cover		475	34	47
Carrier X Drain plug		500	36	49
Carrier x Filler plug		400	29	39
Carrier x Side bearing cap		800	58	78
Ring gear x Differential case		985	71	97
Drive pinion x Companion flage		See page RA-39		
Companion flange x Propeller shaft		750	54	74

BRAKE SYSTEM

Specifications

Brake pedal	Pedal height (from asphalt sheet)		177.5 — 187.5 mm	6.988 — 7.382 in.
	Pedal freeplay		3 — 6 mm	0.12 — 0.24 in.
	Pedal reserve distance at 50 kg (110.2 lb, 490 N)		More than 85 mm (3.35 in.)	
Brake booster	Booster push rod to piston clearance w/ SST		0 mm	0 in.
Front brake	Disc thickness	STD	25.0 mm	0.984 in.
		Limit	24.0 mm	0.945 in.
	Disc runout	Limit	0.07 mm	0.0028 in.
	Pad thickness	STD	10.0 mm	0.394 in.
		Limit	1.0 mm	0.039 in.
Rear brake (Drum)	Drum inside diameter	STD	200.0 mm	7.874 in.
		Limit	201.0 mm	7.913 in.
	Lining thickness	STD	4.0 mm	0.157 in.
		Limit	1.0 mm	0.039 in.
Rear brake (Disc)	Pad thickness	STD	10.0 mm	0.394 in.
		Limit	1.0 mm	0.039 in.
	Disc thickness	STD	10.0 mm	0.394 in.
		Limit	9.0 mm	0.354 in.
	Discrrunout	Limit	0.15 mm	0.0059 in.
Parking brake (Drum)	Lever travel at 20 kg (44.1 lb, 196 N)		5 — 8 clicks	
	Shoe to parking brake shoe lever clearance		0 — 0.35 mm	0 — 0.138 in.
	Parking brake shoe lever shim thickness		0.2 mm	0.008 in.
			0.3 mm	0.012 in.
			0.4 mm	0.016 in.
			0.5 mm	0.020 in.
			0.6 mm	0.024 in.
			0.9 mm	0.035 in.
	Drum to shoe clearance		0.6 mm	0.024 in.
Parking brake (Disc)	Rear disc inner diameter	STD	170 mm	6.69 in.
		Limit	171 mm	6.73 in.
	Limit thickness	STD	2.0 mm	0.079 in.
		Limit	1.0 mm	0.039 in.
	Lever travel at 20 kg 144.1 lb, 196 N)		5 — 8 clicks	
	Clearance between rear shoe and lever		0 — 0.35 mm	0 — 0.0138 in.
	Parking brake shoe lever shim thickness		0.3 mm	0.012 in.
			0.6 mm	0.024 in.
			0.9 mm	0.035 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Master cylinder X Piston stopper bolt		100	7	10
Master cylinder x Reservoir		17.5	15.2 in.-lb	1.7
Master cylinder x Brake booster		130	9	13
Brake tube union nut		155	11	15
Brake booster clevis lock nut		260	19	25
Brake booster x Pedal bracket		130	18	25
Front disc brake cylinder installation bolt		400	29	39
Front disc brake torque plate X Steering knuckle		1,090	79	107
Front disc brake cylinder x Flexible hose		310	22	30
Rear drum brake wheel cylinder x Backing plate		100	7	10
Parking brake cable bracket x Backing plate		80	69 in.-lb	7.8
Bleeder plug		85	74 in.-lb	8.3
Rear disc brake cylinder installation bolt		200	14	20
Rear disc brake torque plate X Dust cover		475	34	47
Rear disc brake cylinder X Flexible hose		310	22	30
Rear disc brake main pin x Torque plate		270	20	26
Rear disc brake torque plate x Rear axle carrier		475	34	47
A.B.S. actuator x Proportioning valve bracket (w/o LSPV)		90	78 in.-lb	8.8
A.B.S. actuator x 3–way union (w/ LSPV)		90	78 in.-lb	8.8
Proportioning valve installation bolt (w/o LSPV)		90	78 in.-lb	8.8
A.B.S. actuator x 3–way unmion		160	12	16
A.B.S. actuator bracket x Body	(Front LH bolt)	530	38	52
	(Others)	195	14	19
Front speed sensor installation bolt		80	69 in.-lb	7.8
Front sensor rotor x Axle hub		140	10	14
Rear speed sensor installation bolt	(2WD)	80	69 in.-lb	7.8
	(4WD)	195	14	19
Rear axle hub installation bolt		820	59	80
Deceleration sensor x Computer bracket	(For 4WD)	32.5	28 in.-lb	3.2
A.B.S. computer x Computer bracket		32.5	28 in.-lb	3.2
A.B.S. computer bracket x Body		55	48 in.-lb	5.4

STEERING

Specifications

Steering column	Steering wheel freeplay		30 mm (1.18 in.) or less	
	Collar No. 1 outer diameter		17.989 — 17.996 mm	0.7082 — 0.7085 in.
			17.996 — 18.003 mm	0.7085 — 0.7088 in.
			18.003 — 18.010 mm	0.7088 — 0.7091 in.
			18.010 — 18.017 mm	0.7091 — 0.7093 in.
			18.017 — 18.024 mm	0.7093 — 0.7096 in.
	Collar No. 2 outer diameter		17.982 — 18.000 mm	0.7080 — 0.7087 in.
			18.000 — 18.018 mm	0.7087 — 0.7094 in.
	Support shim thickness	Mark		
		None	0.17 — 0.23 mm	0.0067 — 0.0091 in.
		5	0.45 — 0.55 mm	0.0177 — 0.0217 in.
		8	0.75 — 0.85 mm	0.0295 — 0.0335 in.
		14	1.35 — 1.45 mm	0.0531 — 0.0571 in.
		18	1.75 — 1.85 mm	0.0689 — 0.0728 in.
Power steering	Drive belt tension	New belt	125 ± 25 lb	
		Used belt	80 ± 20 lb	
	Maximum rise of oil level		Below 5 mm (0.20 in.)	
	Oil pressure at idle speed	(SV series)	65 kg/cm² (924 psi, 6,374 kPa) or more	
		(VZV series)	75 kg/cm² (1,067 psi, 7,355 kPa) or more	
	Steering effort	Maximum	70 kg-cm (61 in.-lb, 6.9 N·m)	
	Rotor shaft bushing oil clearance			
		STD	0.01 — 0.03 mm	0.0004 — 0.0012 in.
		Maximum	0.07 mm	0.0028 in.
	Vane plate to rotor groove clearance			
		Maximum	0.03 mm	0.0012 in.
	Vane plate	Minimum height	8.0 mm	0.315 in.
		Minimum thickness	1.77 mm	0.0697 in.
		Minimum length	14.97 mm	0.5894 in.
	Vane plate length Rotor and cam ring mark			
		None	14.996 — 14.998 mm	0.5904 — 0.5905 in.
		1	14.994 — 14.996 mm	0.5903 — 0.5904 in.
		2	14.992 — 14.994 mm	0.5902 — 0.5903 in.
		3	14.990 — 14.992 mm	0.59016 — 0.59024 in.
		4	14.988 — 14.990 mm	0.5901 — 0.5902 in.
	Flow control valve spring length	STD	38 mm	1.49 in.
		Minimum	36 mm	1.42 in.
	PS pump rotating torque		2.8 kg-cm (2.4 in.-lb, 0.3 N·m) or less	
	Steering rack runout	Maximum	0.3 mm	0.012 in.
	Control valve bearing preload	at Turning	4.5 — 6.5 kg-cm (3.9 — 5.6 in.-lb, 0.4 — 0.6 N·m)	
	Total preload	at Turning	9 — 12 kg-cm (7.8 — 10.4 in.-lb, 0.9 — 1.2 N·m)	

Torque Specifications

	Part tightened	kg-cm	ft-lb	N-m
Steering column	Upper tube x Upper bracket	185	13	18
	Tilt lever retainer x Breakaway bracket	195	14	19
	Serration bolt	195	14	19
	Upper bracket x Column cover support	110	8	11
	Column tube x Breakaway bracket	185	13	18
	Main shaft X Intermediate shaft	260	19	25
	Column tube X Thrust stopper	130	9	13
	Breakaway bracket x Body	260	19	25
	Column tube x Body	260	19	25
	Column support bolt .	120	9	12
	Universal joint	360	26	35
	Steering wheel x Main shaft	350	25	34
Power steering (2WD/SV21)	Pressure port union X Front housing	700	51	69
	Suction port union x Front housing	130	9	13
	Air control valve x Front housing	370	27	36
	PS pump shaft x Drive pulley	440	32	43
	PS pump x Pump bracket (Adjusting bolt)	400	29	39
	(Through bolt)	440	32	43
	PS pump x Pressure tube	525	38	51
	Control valve housing X Cylinder housing	315	23	31
	Bearing guide lock nut	570	41	56
	Rack guide spring cap lock nut	570	41	56
	Rack x Rack end	730	53	72
	Turn pressure tube x Gear housing	200	14	20
	Gear housing x Body	600	43	59
	Pressure tube x Gear housing	450	33	44
	Return tube x Gear housing	450	33	44
	Tie rod end X Knuckle arm	500	36	49
	Tie rod end lock nut	570	41	56
Power steering (2WD/VZV21)	PS pump x Pressure hose	525	38	51
	Pressure hose x Flexible nut	370	27	36
	PS pump x Bracket Upper	410	30	40
	Lower	400	29	39
	Tie rod end x Knuckle arm	500	36	49
	Lower crossmember	2,110	153	207
	Pressure port union X Front housing	700	51	69
	Suction port union X Front housing	130	9	13
	PS pump shaft x Drive pulley	440	32	43
	Control valve housing X Cylinder housing	315	23	31
	Bearing guide lock nut	570	41	56
	Rack guide spring cap lock nut	570	41	56
	Rack x Rack end	730	53	72
	Turn pressure tube x Gear housing	200	14	20
	Gear housing X Pressure and return line	450	33	44
	Universal joint	360	26	35
	Gear housing X Body	600	43	59
	Engine rear mount bracket	530	38	52

Torque Specifications (Cont'd)

	Part tightened		kg-cm	ft-lb	N·m
Power steering (2WD/VZV21) (cont'd)	Center member	Center	490	35	48
		Others	400	29	39
	Front exhaust pipe	Front nut	630	46	62
		Front bolt	210	15	21
		Rear	440	32	43
Power steering (4WD)	Pressure port union x Front housing		700	51	69
	Suction port union x Front housing		130	9	13
	PS pump shaft X Drive pulley		440	32	43
	PS pump x Pressure hose		525	38	51
	PS pump x Bracket	Upper	440	32	43
		Lower	400	29	39
	Rear pump stay X Pump bracket		400	29	39
	Lower crossmember		2,110	153	207
	Pressure hose X Pressure tube		370	27	36
	Control valve housing X Cylinder housing		315	23	31
	Bearing guide lock nut		570	41	56
	Rack –guide spring cap lock nut		570	41	56
	Rack X Rack end		730	53	72
	Turn pressure tube x Gear housing		200	14	20
	Gear housing X Body		600	43	59
	Engine rear mount bracket		530	38	52
	Gear housing X Return line		450	33	44
	Gear housing X Pressure line		450	33	44
	Center member x Body		400	29	39
	Universal joint		360	26	35
	Tie rod end lock nut		500	36	49
	Propeller shaft x Intermediate shaft		750	54	74
	Front exhaust pipe	Front	630	46	62
		Rear	440	32	43

BODY

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Front Seat			
Seat back x Seat adjuster	185	13	18
Seat cushion x Seat– adjuster	185	13	18
Seat adjuster x Body	375	27	37
Rear Seat (Sedan Fixed Type)			
Seat back x Body .	150	11	15
Rear Seat (Sedan Separate Type)			
Seat back side hinge x Seat back	185	13	18
Seat back side hinge x Body	185	13	18
Seat back center hinge x Seat back	80	69 in.-lb	7.8
Seat back center hinge x Body	80	69 in.-lb	7.8
Side seat back x Body Rear Seat (Station Wagon)	150	11	13
Seat back side hinge x Seat back			
Seat back side hinge x Body	185	13	18
Seat back center hinge x Seat back	185	13	18
Seat back center hinge x Body	80	69 in.-lb	7.8
Side seat back x Body	80	69 in.-lb	7.8
Seat cushion x Body	150	11	15
Front Seat Belt (w/Automatic Shoulder Belt)	185	13	18
Guide rail x Body			
Shoulder belt x Guide rail	80	69 in.-lb	7.8
ELR x Parking brake bracket	200	14	20
Inner lap belt x Bracket	195	14	19
Outer lap belt x Body	440	32	43
Bracket x Seat	440	32	43
Slide anchor plate x Belt anchor base	195	14	19
Belt anchor base x Body	440	32	43
Front Seat Belt (w/o Automatic Shoulder Belt)	440	32	43
Shoulder belt anchor x Body			
Shoulder belt lower side x Body	440	32	43
ELR upper side x Body	440	32	43
Inner belt x Bracket			
Bracket x Seat	440	32	43
Slide anchor plate x Belt anchor base	440	32	43
Belt anchor base x Body	80	69 in.-lb	7.8
Rear Seat Belt	440	32	43
Shoulder belt anchor x Body	195	14	19
Shoulder belt lower side x Body	440	32	43
ELR x Body (Sedan)	440	32	43
ELR upper side x Body (Station Wagon)			
ELR lower side x Body jStation Wagon)			
Inner seat belt x Body	440	32	43
CRS tether anchor x Body	440	32	43
	440	32	43
	80	69 in.-lb	7.8
	440	32	43
	440	32	43
	210	15	21

LUBRICANT

Item		Capacity			Classification
		Liters	US qts	Imp. qts	
Manual transaxle oil	S51 (w/ Differential oil)	2.6	2.7	2.3	ATF DEXRON□ 11
	E56F5 (w/ Differential and transfer)	5.0	5.3	4.4	Transaxle oil E50 (08885–80206) or equivalent Recommended oil Oil grade: AN GL–5 Viscosity : SAE 75W–90 or 80W–90 SA E 90W [above –18˚C (0˚F)] SAE 80W [below –18˚C (0˚F)]
	E52	4.2	4.4	3.7	API GL–4 or GL–5 SAE 75W–90 or 80W–90
Automatic transaxle fluid (w/o Differential oil)	Al 40L Dry fill Drain and refill	 5.7 2.5	 6.0 2.6	 5.0 2.2	ATF DEXRON II
	Al 40E Dry fill Drain and refill	 5.3 2.5	 5.6 2.6	 4.7 2.2	
	A540E Dry fill Drain and refill	 5.9 2.5	 6.2 2.6	 5.2 2.2	
	A540H Dry fill Drain and refill	 7.0 3.3	 7.4 3.5	 6.2 2.9	ATF type T (08886–00405) or equivalent
Differential oil (w/ Automatic transaxle) SV21 series VZV21 series		 1.6 1.0	 1.7 1.1	 1.4 0.9	ATF DEXRON II
Transfer oil (A540H)		0.7	0.74	0.62	Transaxle oil E50 (08885–80206) or equivalent Recommended oil Oil grade: API GL–5 Viscosity : SAE 75W–90 or 80W–90 SAE 90W [above –18˚C (0˚F)] SAE 80W [below –18˚C (0˚F)]
Rear differential oil		1.1	1.2	1.0	API grade GL–5 Hypoid gear oil Viscosity: Above –18˚C (0˚F) SAE 90 Below –18˚C (0˚F) SAE 80W–90
Power steering fluid		800cc 48.8 cu in.			ATF DEXRON II
Steering gear housing grease		—			Molybdenum disulphide lithium base, NLGI No. 2
Wheel bearing grease		—			Lithium base multipurpose, NLGI No. 2
Brake fluid					SAE J 1703 or FMVSS No. 116, DQT3

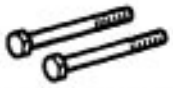
SST AND SSM

SST (SPECIAL SERVICE TOOLS)

Section / Part Name / Part No. / Illustration			EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	09011-38121	12 mm Socket Wrench for 12 Pointed Head	*1 ●															
	09032-00100	Oil Pan Seal Cutter				●												
	09043-38100	Hexagon 10 mm Wrench									*2 ●	●						
	09043-88010	Hexagon 8 mm Wrench	*3 ●											*4 ●				
	09201-41020	Valve Stem Oil Seal Replacer	*1 ●					*5 ●										
	09201-60011	Valve Guide Bushing Remover & Replacer									*6 ●	●						
	09201-70010	Valve Guide Bushing Remover & Replacer	●															
	09202-70010	Valve Spring Compressor	●															
	09213-54015	Crankshaft Pulley Holding Tool	●															
	(09214-00030)	(Bolt)	*3 ●															
	09213-60017	Crankshaft Pulley & Gear Puller Set	●															
	(09213-00020)	(Body with Bolt)	●															

Remarks:
* 1 2VZ–FE only
* 2 E56F5 only
* 3 3S–FE only
* 4 FWD/VZV21 and 4WD
* 5 Armature front bearing for 1.4 kW type
* 6 Speedometer driven gear oil seal

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Illustration	Part No.	Part Name	EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	(09213-00030)	(Handle)	●															
	(09213-00050)	(Bolt Set)	*1 ●															
	(09213-00060)	(Bolt Set)	*2 ●															
	09213-70010	Crankshaft Pulley Holding Tool	*2 ●															
	09221-25024	Piston Pin Remover & Replacer	●															
	(09221-00020)	(Body)	●															
	(09221-00030)	(Spring)	●															
	(09221-00060)	(Bushing "C")	*1 ●															
	(09221-00160)	(Guide "I")	*1 ●															
	(09221-00170)	(Guide "J")	*1 ●															
	(09221-00181)	(Bushing	*2 ●															
	(09221-00190)	(Guide "K")	*2 ●															

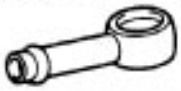
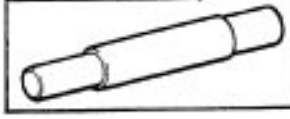
Remarks:
* 1 3S–FE only
* 2 2VZ–FE only

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	(09221-00200)	(Guide "L")	*1 ●															
	09223-15010	Crankshaft Rear Oil Seal Replacer									*2 ●	●		*3 ●				
	09223-46011	Crankshaft Front Oil Seal Replacer	*4 ●															
	09223-56010	Crankshaft Rear Oil Seal Replacer	*1 ●															
	09223-63010	Crankshaft Rear Oil Seal Replacer	*5 ●															
	09226-10010	Crankshaft Front & Rear Bearing Replacer	*6 ●									●						
	09228-06500	Oil Filter Wrench				*5 ●												
	09228-07500	Oil Filter Wrench				*1 ●												
	09230-00010	Radiator Service Tool Set			●													
	09236-00101	Water Pump Overhaul Tool Set															●	
	(09237-00010)	Water Pump Bearing Remover & Replacer															*7 ●	
	09240-00020	Wire Gauge Set										●						

Remarks:
*1 2VZ–FE only
* 2 Transmission case oil seal (E52 and E56F5)
* 3 Transaxle side gear shaft oil seal (4WD only)
* 4 Crankshaft oil sea!
* 5 3S–FE only
* 6 Crankshaft front oil seal for 3S–FE
* 7 Steering main shaft bearing

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part NO. / Illustration			EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	09248-55010	Valve Clearance Adjust Tool Set	●															
	09249-63010	Torque Wrench Adaptor	*1 ●															
	09268-41045	Injection Measuring Tool Set		●														
	(09268-41060)	(No. 3 Union)		*1 ●														
	(09268-41080)	(No. 6 Union)		●														
	(09268-41090)	(No. 7 Union)		*2 ●														
	(90405-09015)	(No. 1 Union)		●														
	09268-45012	ER Fuel Pressure Gauge		●														
	09278-54012	Drive Shaft Holding Toot	*3 ●															
	09285-76010	Injection Pump Camshaft Bearing Cone Replacer						*4 ●	*5 ●									
	09286-46011	Injection Pump Spline Shaft Puller						*6 ●	*7 ●									
	09301-17010	Clutch Guide Tool								*8 ●								

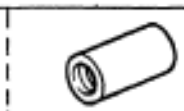
Remarks:
* 1 2VZ–FE only
* 2 3S–FE only
* 3 Camshaft timing pulley
* 4 Armature front bearing for 1.0 kW type
* 5 Rotor rear bearing
* fi Armature rear bearing
* 7 Rectifier end frame
* 8 E52 and E56F5

SST (SPECIAL SERVICE TOOLS.) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	09301-32010	Clutch Guide Tool								●								
	09307-12010	Extension Housing Bushing Replacer									*1 ●							
	09308-00010	Oil Seal Puller									●	●		●	*2 ●			
	09308-10010	Oil Sea! Puller													*2 ●			
	09309-32050	5th Driven Gear Replacer									●							
	09309-36010	Transmission Rear Bearing Replacer									*3 ●				*4 ●			
	09309-37010	Transmission Bearing Replacer	*5 ●															
	09310-17010	Transaxle Gear Remover & Replacer									●							
	(09310-07010)	(Plate)									*6 ●							
	(09310-07020)	(Center Bolt)									*7 ●							
	(09310-07030)	(Set Bolt)									*8 ●							
	(09310-07040)	(Claw)									*8 ●							

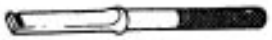
Remarks:
*1 Output shaft front bearing (E52 and E56F5)
* 2 4WD only
* 3 Differential side bearing
* 4 Rear axis hub'(4WD only)
* 5 Crankshaft front oil seal for 2VZ–FE
* 6 E52 and E56F5
* 7 5th driven gear and No. 3 clutch hub (E52 and E56F5)
* 8 5th driven gear (E52 and E56F5)

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	(09310-07050)	(Adaptor)									*1 ●							
	09310-35010	Countershaft Bearing Replacer									*2 ●			●				
	09313-30021	Detent Bail Plug Socket									●		*3 ●					
	09316-12010	Transfer Bearing Replacer										●						
	09316-20011	Transfer Bearing Replacer									*4 ●	●						
	09316-60010	Transmission & Transfer Bearing Replacer									●	●		●				
	(09316-00010)	(Replacer Pipe)									*5 ●	●		*6 ●				
	(09316-00020)	(Replacer "A")									*7 ●							
	(09316-00030)	(Replacer "B")										●						
	(09316-00040)	(Replacer "C")									*8 ●	●						
	(09316-00060)	(Replacer "E")									*9 ●	●						
	(09316-00070)	(Replacer "F")									*7 ●							

Remarks:
* 1 5th driven gear (E52 and E56F5)
* 2 S51 only
* 3 Universal joint cover set bolts
* 4 Input shaft rear bearing and outer race and No. 1 hub differential side bearing sleeve (E52 and E56F5) (E52 and E56F5)
* 5 Transaxle case oil seal and differential side bearing outer race
* 6 Side gear shaft oil seal
* 7 E52 and E56F5
* 8 Differential side bearing
* 9 E56F5 only

SST (SPECIAL SERVICE TOOLS) (Cont”d)

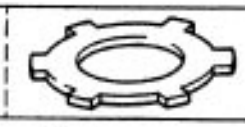
Section / Part Name / Part No. / Illustration		EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	09318-12010	Transfer Bearing Adjusting Nut Wrench									●						
	09318-20010	Transfer Side Bearing Adjusting Nut Wrench								*1 ●							
	09325-20010	Transmission Oil Plug								*2 ●	●	●				*3 ●	
	09326-20011	Output Shaft Bearing Lock Nut Wrench								*1 ●	●						
	09330-00021	Companion Flange Holding Tool	*4 ●								●	●		*3 ●			
	09333-00013	Clutch Diaphragm Spring Aligner							●								
	09350-32014	TOYOTA Automatic Transmission Tool Set									●		●				
	(09308-10010)	(Oil Seal Pullerl									●						
	(09351-32010)	One–way Clutch Test Tool									●						
	(09351-32020)	(Stator Stopper)									●						
	(09351-32032)	Counter Driven Gear Holding Tool									●						
	(09351-32040)	No. 7 Piston Spring Compressor									●						

Remarks:
* 1 E56F5 only
* 2 Extension housing oil seal (E56F5)
* 3 4WD only
* 4 Crankshaft pulley

SST (SPECIAL SERVICE TOOLS) (Cont'd)

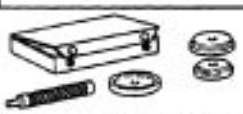
Section / Part Name / Part No. / Illustration			EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	(09351-32050)	(Snap Ring .Expanded										●						
	(09351-32061)	(Oil Pump Pulled										●						
	(09351-32070)	No. 2 Piston Spring Compressor										●						
	(09351-32080)	(Lock Nut Wrench)										●						
	(09351-32090)	Oil Seal Remover & Replacer										●						
	(09351-32100)											●						
	(09351-32111)	Drive Pinion Bearing Reptacer Side Searing Race Replacer –_._–_–_–										●						
	(09351-32120)	Overdrive Bearing Replacer										●						
	(09351-32130)	(Handle)										●						
	(09351-32140)	(Oil Seal Replacer)										●						
	(09351-32150)	(Oil Seal Replacer)										●		●				
	(09351-32190)	(Measure Terminal)										●						

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration		EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	(09351-32200) No. 2 Piston Spring Compressor										●						
	09502-10012 Differential Side Bearing Puller										●						
	09502-12010 Differential Bearing Replacer										●						
	09504-22011 Differential Side Washer Remover & Replacer													*1 ●			
	09506-30012 Differential Drive Pinion Bearing Cone Replacer									*2 ●				*1 ●			
	09506-35010 Differential Drive Pinion Rear Bearing Replacer									*3 ●	●		●				
	09520-32012 Differential Side Gear Shaft Puller										●		●				
	09527-20011 Rear Axle Shaft Bearing Remover															*4 ●	
	09527-21011 Rear Axle Shaft Bearing Remover											*5 ●					
	09550-10012 Replacer Set "B"													●			
	(09552-10010) (No. 2 Replacer Handle)													*6 ●			
	(09554-10010) Differential Drive Pinion Oil Seal Replacer													*6 ●			

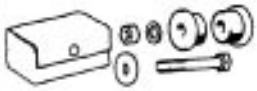
Remarks:
* 1 4WD only
* 2 Output shaft rear bearing (E52 and E56F5)
* 3 No. 2 hub sleeve, input shaft rear bearing and differential side bearing (E52 and E56F5)
* 4 Steering main shaft bearing
* 5 Cross groove joint
* 6 Rear hub bearing and rear axle hub oil seal (2WD only)

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	(09558-10010)	Rear Axle Shaft Oil Seal Replacer													*1 ●			
	09550-22011	Rear Axle Bearing & Differential Tool Set												●	●			
	(09550-00020)	(Handle)												●	*2 ●			
	(09550-00031)	(Replacer)												●	*2 ●			
	09554-22010	Differential Oil Seal Replacer													*2 ●			
	09556-22010	Drive Pinion Front Bearing Remover													*2 ●			
	09557-22022	Companion Flange Remover & Replacer											●		*2 ●			
	09564-32011	Differential Preload Adaptor									*3 ●	●						
	09608-12010	Front Hub & Drive Pinion Bearing Replacer Set									●							
	(09608-00020)	Remover & Replacer Handle									*4 ●							
	(09608-00060)	(Drive Pinion Front Bearing Cup Replacer									*5 ●							
	(09608-00070)	Drive Pinion Rear Bearing Cone Replacer									*6 ●							

Remarks:
* 1 Rear hub bearing and rear axle hub oil seal (2WD only)
* 2 4WD only
* 3 S51 only
* 4 Input shaft bearing front oil seal and input shaft bearing (E52 and E56F5)
* 5 Input shaft bearing (E52 and E56F5)
* 6 Output shaft rear bearing (S51 only)

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	(09608-00080)	Differential Side Bearing Cone Replaoer									*1 ●							
	09608-16041	Front Hub Bearing Adjusting Tool												●	●			
	(09608-02020)	(Bolt & Nut)												●	*2 ●			
	(09608-02040)	(Retainer)												●	*2 ●			
	09608-20012	Front Hub & Drive Pinion Bearing Tool Set							●		●							
	(09608-00030)	(Replacer)							*3 ●		*4 ●							
	(09608-00060)	(Replacer)									*4 ●							
	(09608-00080)	(Replacer)									*4 ●							
	(09608-03020)	(Handle)									*4 ●							
	(09608-03060)	(Replacer)									*4 ●							
	(09608-03070)	(Replacer)									*4 ●							
	09608-30012	Front Hub & Drive Pinion Bearing Tool Set													●			

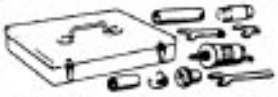
Remarks:
* 1 Input shaft bearing front oil seal (E52 and E56F5)
* 2 Hub bearing (4WD only)
* 3 Rotor front bearing
*4 Input shaft front oil seal, LH¿side oil seal, LH side bearing outer race, RH side bearing outer race, control shaft cover oil seal and input shaft rear bearing

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Illustration	Part No.	Part Name	EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	(09608-00060)	Drive Pinion Front Bearing Cup Replacer													●*1			
	(09608-04020)	(Handle) (Drive Pinion Front Bearing Cup Repiacer													●*1			
	(09608-04100)	Drive Pinion Rearing Bearing Cup Replacer													●*1			
	(09608-04110)	Front Hub Bearing Replacer Set													●*2			
	09608-30022	(Replacer)										●						
	(09550-00050)	(Handle)										●						
	(09608-05010)	Steering Knuckle oil Seal Replacer										●						
	09608-32010	Steering Knuckle Oil Seal Replacer										●		●	●*3			
	09608-35014	Axle Hub & Drive Pinion Bearing Tool Set									●	●		●				
	(09608-06020)	(Handle)									●*4	●		●*5				
	(09608-06120)	Front Hub Outer Bearing Cup Replacer										●						
	(09608-06160)	Rear Hub Inner Bearing Cup Replacer									●*4							

Remarks:
* 1 4WD only
* 2 Rear axle hub inner oil seal (4W0 only)
* 3 Rear axle hub (4WD only)
* 4 E56F5 only
* 5 Dust deflector

SST (SPECIAL SERVICE TOOLS) (Cont”d)

Section / Part Name / Part No. / Illustration			EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	(09608-06180)	Drive Pinion Rear Bearing Cup Replacer												●*1				
	(09608-06210)	Rear Axle Bearing Replacer									●*2							
	09609-20011	Steering Wheel Puiler															●	
	09610-55012	Pitman Arm Puller.												●*3			●*3	
	09612-00012	Rack & Pinion Steering Rack Housing Stand															●	
	09612-10093	Steering Gear Housing Overhaul Tool Set															●	
	(09628-10020)	Ball Joint Lock Nut Wrench															●	
	09612-22011	Tilt Handle Bearing Replacer									●*4						●*5	
	09612-24014	Steering Gear Housing Overhaul Tool Set															●	
	(09612-10022)	(Hexagon Wrench)															●	
	(09612-10061)	Steering Pinion Bearing Replacer															●*5	
	(09617-24011)	(Steering Rack Wrench)															●	

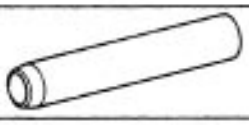
Remarks:
* 1 Dust deflector
* 2 E56F5 only
* 3 Tie rod end (FWDlSV21 and 4WD)
* 4 No. 3 hub sleeve assembly (S51 only)
* 5 Cylinder end stopper

SST (SPECIAL SERVICE TOOLS) (Cont”d)

Section / Part Name / Part No. / Illustration			EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	(09617-24020)	Steering Pinion Bearing Adjusting Screw Lock Nut Wrench															*1 ●	
	09612-65014	Steering Worm Bearing Puller									*2 ●							
	09616-00010	Steering Worm Bearing Adjusting Socket															●	
	09616-22010	Steering Worm Bearing Adjusting Screw Wrench															*3 ●	
	09616-30011	Steering Worm Bearing Adjusting Screw Wrench	*4 ●															
	09616-30020	Steering Worm Bearing Adjusting Screw Wrench															*5 ●	
	09620-30010	Steering Gear Box Repiacer Set				●					●						●	
	(09624-30010)	Steering Sector Shaft Oil Seal Replacer															*6 ●	
	(09625-30010)	Steering Main Shaft Bearing Replacer									*7 ●							
	(09627-30010)	(Steering Sector Shaft Bushing Replacer				*8 ●					*9 ●							
	(09631-00020)	(Handle)				*8 ●					*9 ●							
	09628-62011	Ball Joint Puller												*10 ●			*10 ●	

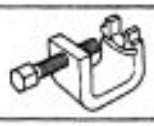
Remarks:
* 1 Rack guide spring cap lock nut and bearing guide lock nut pulley (SV series)
* 2 Input shaft front bearing (E52 and E56F5) and differential side bearing outer race
* 3 Power steering drive pulley seal (E52 and E56F5) (VZV series)
* 4 Oil pump pulley for 2VZ–FE (FWD/VZV21)
* 5 Power steering drive
* 6 Rack housing oil seal
* 7 E56FS only
* 8 3S–FE only
* 9 Control shaft cover oil
*10 Tie rod end

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	09630-24013	Steering Rack Oil Seal Tool Set															●	
	(09620-24010)	Valve Cup Oil Seal Remover															●	
	(09620-24020)	Valve Cup Oil Seal Reptacer															●	
	(09620-24030)	Valve Cup Bearing Replacer															●	
	09631-12020	Handle												●			●	
	09631-12070	Steering Rack Oil Seal Test Tool															●	
	09631-20031	Oil Seal "B" Remover															●	
	09631-20051	Steering Rack Cover "C"															●	
	09631-20070	Seal Ring Guide															●	
	09631-20081	Seal Ring Tool															●	
	09631-22020	Power Steering Hose Nut 14 x 17 mm Wrench Set		*1 ●													●	
	09631-32010	Oil Seal Replacer															●	

Remark:
* 1 Fuel line

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration		EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	09633-00020 Power Steering Hose Nut Wrench															●	
	09636-20010 Upper Ball Joint Dust Cover Replacer													*1 ●			
	09650-17011 Hub Bolt Remover												●	●			
	09703-30010 Brake Shoe Return Spring Tool														●		
	09709-29017 LSPV Gauge Set														●		
	09710-14012 Rear Suspension Bushing Tool Set												●				
	(09710-00050) (Handle)												*2 ●				
	09710-22020 Front Suspension Bushing Tool Set													●			
	(09710-01030) Upper Arm Bushing Replacer													*3 ●			
	09710-28020 Front Suspension Bushing Tool Set										●						
	(09710-08040) (Bushing Replacer)										*4 ●						
	09717-20010 Brake Shoe Return Spring Remover														●		

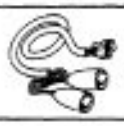
Remarks:
* 1 Rear axle shaft
* 2 Dust deflector
* 3 Differential (4WD only)
* 4 Differential case LH side bearing

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	09718-00010	Shoe Hold Down Spring Driver														●		
	09718-20010	Brake Shoe Return Spring Reptarcer														●		
	09720-00012	Shock Absorber Overhaul Tool Set												●				
	(09721-00071)	Front Shock Absorber Ring Nut Wrench												●				
	09726-10010	Lower Suspension Arm Bushing Remover & Replacer												●				
	(09726-00030)	(Spacer)												●*1				
	09727-22032	Coil Spring Compressor												●	●			
	09727-30020	Coil Spring Compressor												●	●			
	09729-22031	Front Spring Upper Seat Holder												●	●			
	09737-00010	Brake Booster Push Rod Gauge														●		
	09751-36011	Brake Tube Union Nut 10x12mm Wrench								●					●	●		
	09804-24010	Luggage Compart–ment Door Torsion Bar Tool																●

Remark:
* 1 Drive shaft

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	09806-30010	Windshield Moulding Remover																●
	09812-00010	Door Hinge Set Bolt Wrench																●
	09816-30010	Oil Pressure Switch Socket	*1 ●															
	09817-16011	Back–up Light Switch Tool									*2 ●							
	09820-00021	Alternator Rear Bearing Puller							●									
	09820-63010	Altemator Pulley Set Nut Wrench Set							●									
	09842-30050	Wiring "'A" EFI Inspection		●														
	09842-30070	Wiring "F" EFI Inspection		●														
	09843-18020	Diagnosis Check Wiring		●			●					●						
	09910-00015	Puller Set									*3 ●							
	09921-00010	Spring Tension Tool									*4 ●	●						
	09923-00020	Hexagon 8 mm Wrench												*5 ●				

Remarks:
* 1 2VZ–FE only
* 2 E52 and E56F5
* 3 E56F5 only
* 4 Speedometer driven gear oil seal
* 5 FWD/VZV21 and 4WD

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	FI	CO	LU	IG	ST	CH	CL	MT	AT	PR	FA	RA	BR	SR	BO
	09950-00020	Bearing Remover									●*1	●		●*2	●*3			
	09950-00030	Bearing Remover Attachment										●						
	09950-20017	Universal Puller									●		●	●	●			
	09990-00150	A.B.S. Actuator Checker and Sub–harness														●		
	09990-00163	A.B.S. Actuator Checker Sheet "A"														●		
	09992-00094	Oil Pressure Gauge Set										●						

Remarks:
* 1 E52 and E56F5
* 2 Drive shaft dust cover
* 3 4WD only

NOTE: For reference to SSTs for the Air Conditioning System see page AC–15.

SSM (SPECIAL SERVICE MATERIALS)

Part Name	Part No.	Sec.	Use etc.
Seal packing or equivalent	08826-00080	EM	Camshaft bearing cap Cylinder head Rear oil seal retainer for 2VZ–FE
		LU	Oil pan Oil pump oil pan baffle plate for 2VZ–FE
Seal packing 1281, Three bond 1281 or equivalent	08826-00090	MT	(S51) Transmission case Transmission case cover Control shaft cover flange (E56F5) Transmission case Control shaft cover Transfer case Transfer inspection hole cover Transfer right case (E52) Transaxle case cover Transmission case Transmission case cover
		AT	Transfer right case x Transfer left case (A540H) Transfer inspection hole cover (A540H) Transaxie case x Differential carrier cover Differential LH bearing retainer (A540E, A540H) Differential RH retainer (A540E)
		RA	Differential carrier (for 4WD)
Seal packing 1282B, Three bond 1282B or equivalent	08826-00100	EM	Water by–pass pipe (for 2VZ–FE)
		CO	Water pump (for 2VZ–FE)
Seal packing 1121, Three bond 1121 or equivalent	08826-00801	PR	Universal joint cover
		FA	The contact surface of the outer race and cover of the drive shaft (for 4WD) Drive shaft inboard joint cover (for VZV series)
Adhesive 1324, Three bond 1324 or equivalent	08833-00070	EM	Flywheel or drive plate mount bolt
		EC	EVAP BVSV EG R BVSV
		CL	Release fork support
		MT	Rear bearing retainer set bolt (S51 and E56E5) – Differential intermediate No. 1 case mounting screw (E56F5)
		AT	Differential LH bearing retainer set bolt Differential carrier cover set bolt Torque converter mounting bolt Differential RH retainer set bolt (A540E) Transfer set bolt (A544H)
		BO	Sun roof guide rail cover set bolt Sun roof drive motor set bolt

SSM (SPECIAL SERVICE MATERIALS) (Cont'd)

Part Name	Part No.	Sec.	Use etc.
Adhesive 1344, Three bond 1344, Loctite 242 or equivalent	08833-00080	EM	No. 1 idler pulley mount bolt
		LU	Oil pressure switch
		MT	(S51) Straight screw plug for reverse restrict pin Straight screw plug for shift fork shaft locking ball Side bearing retainer set bolt No. 2 lock ball assembly Transmission case cover set bolt (E56F5) Straight screw plug Transmission case cover set bolt Transmission case set bolt Transaxle case set bolt Transfer case set bolt Transfer right case set bolt Shift and select lever shaft assembly set bolt (E52) Straight screw plug Transaxle case cover bolt Control shaft cover bolt
		SR	Bearing guide nut Bearing guide lock nut Rack guide spring cap Rack guide spring cap lock nut
Adhesive 1131, Three bond 1131, Loctite 518 or equivalent	08833-00090	AT	Transaxle case x Transfer assembly (A540H)
Dupont paste No. 4817	–	BE	Rear window defogger wire
Side body moulding adhesive	08850-00051	BO	Side body moulding
Windshield glass adhesive set No. 15	08850-00070	BO	Windshield glass (0 – 15˚C or 32 – 59˚F) Rear window glass Back door glass
Windshield glass adhesive set No. 35	08850-00080	BO	Windshield glass 05 – 35˚C or 59 – 95˚F) Rear window glass Back door glass
Windshield glass adhesive set No. 45	08850-00090	BO	Windshield glass (35 – 45˚C or 95 – 113˚F) Rear window glass Back door glass
Dam kit	04562-30040	BO	Windshield glass Rear window glass Back door glass
Butyl tape set	08850-00065	BO	Quarter window glass

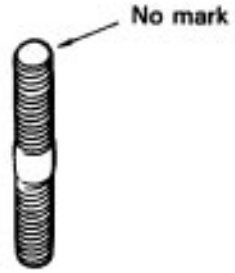
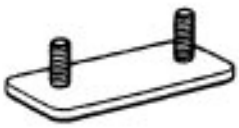
NOTE: For reference to SSMs for the Air Conditioning System see page **AC–15**.

STANDARD BOLT TORQUE SPECIFICATIONS

STANDARD BOLT TORQUE SPECIFICATIONS

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class
Hexagon head bolt	Bolt head No. 4– 5– 6– 7– 8– 9– 10– 11–	4T 5T 6T 7T 8T 9T 10T 11T
	No mark	4T
Hexagon flange bolt wl washer hexagon bolt	No mark	4T
Hexagon head bolt	Two protruding lines	5T
Hexagon flange bolt w/ washer hexagon bolt	Two protruding lines	6T
Hexagon head bolt	Three protruding lines	7T
Hexagon head bolt	Four protruding lines	8T

	Mark	Class
Stud bolt	 No mark	4T
	Grooved	6T
Welded bolt		4T

SPECIFIED TORQUE FOR STANDARD BOLTS

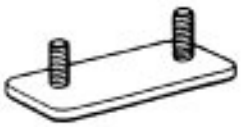
Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			kg-cm	ft-lb	N·m	kg-cm	ft-lb	N·m
4T	6	1	55	48 in.-lb	5	60	52 in.-lb	6
	8	1.25	130	9	12.5	145	10	14
	10	1.25	260	19	26	290	21	29
	12	1.25	480	35	47	540	39	53
	14	1.5	760	55	74	850	61	84
	16	1.5	1,150	83	115	–	–	–
5T	6	1	65	56 in.-lb	6.5	75	65 in.-lb	7.5
	8	1.25	160	12	15.5	175	13	17.5
	10	1.25	330	24	32	360	26	36
	12	1.25	600	43	59	670	48	65
	14	1.5	930	67	91	1,050	76	100
	16	1.5	1,400	101	140	–	–	–
6T	6	1	80	69 in.-lb	8	90	78 in.-lb	9
	8	1.25	195	14	19	210	15	21
	10	1.25	400	29	39	440	32	44
	12	1.25	730	53	71	810	59	80
	14	1.5	1,100	80	110	1,250	90	125
	16	1.5	1,750	127	170	–	–	–
7T	6	1	110	8	10.5	120	9	12
	8	1.25	260	19	25	290	21	28
	10	1.25	530	38	52	590	43	58
	12	1.25	970	70	95	1,050	76	105
	14	1.5	1,500	108	145	1,700	123	165
	16	1.5	2,300	166	230	–	–	–
8T	8	1.25	300	22	29	330	24	33
	10	1.25	620	45	61	690	50	68
	12	1.25	1,100	80	110	1,250	90	120
9T	8	1.25	340	25	34	380	27	37
	10	1.25	710	51	70	790	57	78
	12	1.25	1,300	94	125	1,450	105	140
10T	8	1.25	390	28	38	430	31	42
	10	1.25	800	58	78	890	64	88
	12	1.25	1,450	105	140	1,600	116	155
11T	8	1.25	430	31	42	480	35	47
	10	1.25	890	64	87	990	72	97
	12	1.25	1,600	116	155	1,800	130	175

STANDARD BOLT TORQUE SPECIFICATIONS

STANDARD BOLT TORQUE SPECIFICATIONS

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class
Hexagon head bolt		4T 5T 6T 7T 8T 9T 10T 11T
	No mark	4T
Hexagon flange bolt w/ washer hexagon bolt	No mark	4T
Hexagon head bolt	Two protruding lines	5T
Hexagon flange bolt w/ washer hexagon bolt	Two protruding lines	6T
Hexagon head bolt	Three protruding lines	7T
Hexagon head bolt	Four protruding lines	8T

	Mark	Class
Stud bolt		4T
		6T
Welded bolt		4T

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch . mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			kg-cm	ft-lb	N·m	kg-cm	ft-lb	N·m
4T	6	1	55	48 in.-lb	5	60	52 in.-lb	6
	8	1.25	130	9	12.5	145	10	14
	10	1.25	260	19	26	290	21	29
	12	1.25	480	35	47	540	39	53
	14	1.5	760	55	74	850	61	84
	16	1.5	1,150	83	115	—	—	—
5T	6	1	65	56 in.-lb	6.5	75	65 in.-lb	7.5
	8	1.25	160	12	15.5	175	13	17.5
	10	1.25	330	24	32	360	26	36
	12	1.25	600	43	59	670	48	65
	14	1.5	930	67	91	1,050	76	100
	16	1.5	1,400	101	140	—	—	—
6T	6	1	80	69 in.-lb	8	90	78 in.-lb	9
	8	1.25	195	14	19	210	15	21
	10	1.25	400	29	39	440	32	44
	12	1.25	730	53	71	810	59	80
	14	1.5	1,100	80	110	1,250	90	125
	16	1.5	1,750	127	170	—	—	—
7T	6	1	110	8	10.5	120	9	12
	8	1.25	260	19	25	290	21	28
	10	1.25	530	38	52	590	43	58
	12	1.25	970	70	95	1,050	76	105
	14	1.5	1,500	108	145	1,700	123	165
	16	1.5	2,300	166	230	—	—	—
8T	8	1.25	300	22	29	330	24	33
	10	1.25	620	45	61	690	50	68
	12	1.25	1,100	80	110	1,250	90	120
9T	8	1.25	340	25	34	380	27	37
	10	1.25	710	51	70	790	57	78
	12	1.25	1,300	94	125	1,450	105	140
10T	8	1.25	390	28	38	430	31	42
	10	1.25	800	58	78	890	64	88
	12	1.25	1,450	105	140	1,600	116	155
11T	8	1.25	430	31	42	480	35	47
	10	1.25	890	64	87	990	72	97
	12	1.25	1,600	116	155	1,800	130	175

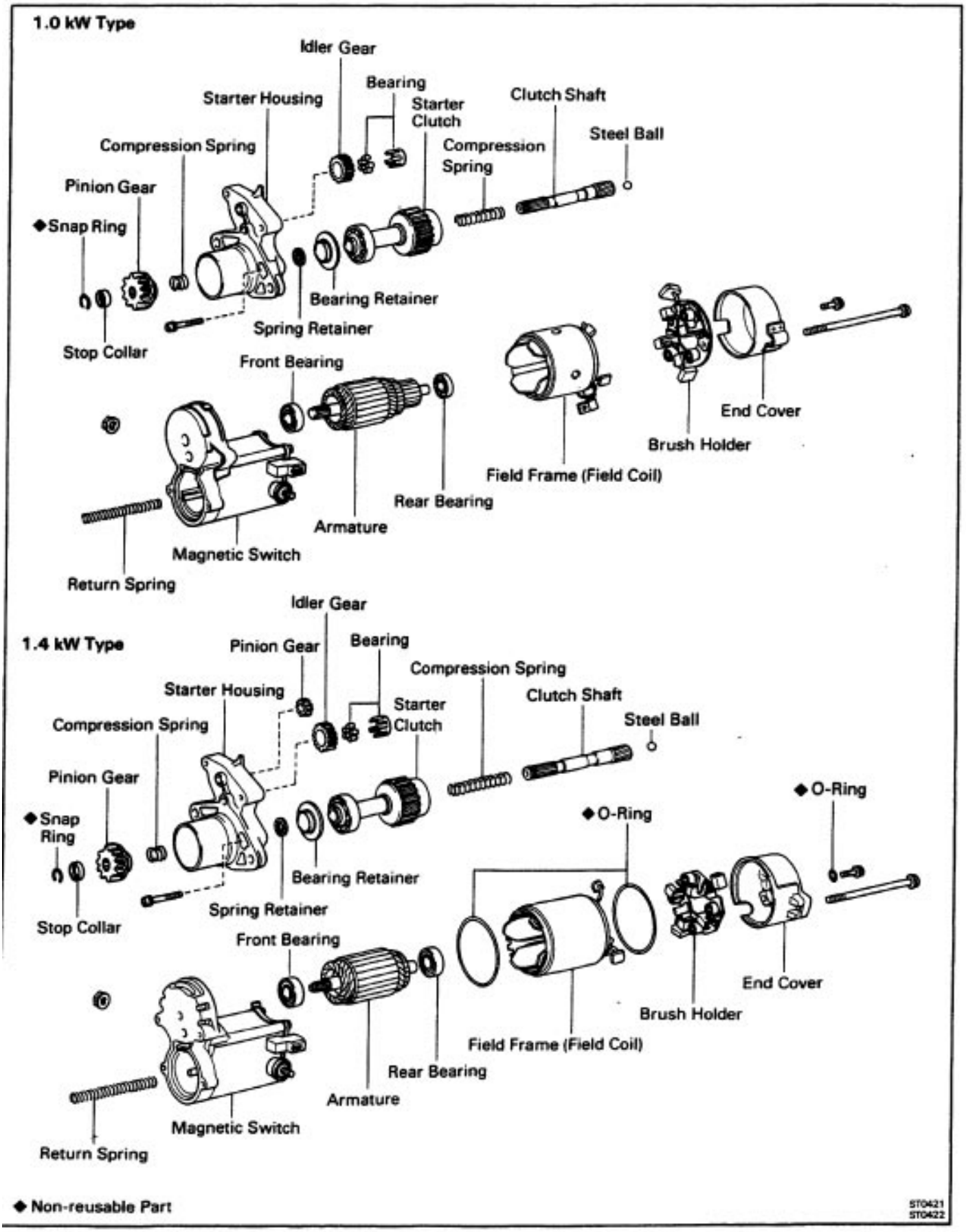
STARTING SYSTEM

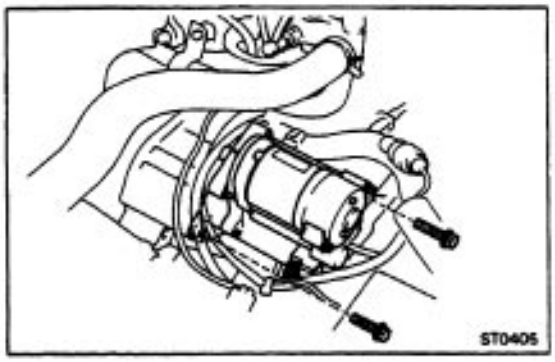
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not crank	Battery charge low	Check battery specific gravity Check or replace battery	CH–2
	Battery cables loose, corroded or worn	Repair or replace cables	
	Clutch start switch faulty (M/T only)	Adjust or replace clutch start switch	CL–4
	Neutral start switch faulty (A/T only)	Adjust or repair switch	
	Starter relay faulty (M/T only)	Replace starter relay	
	Fusible link blown	Replace fusible link	
	Starter faulty	Repair starter	
	Ignition switch faulty	Replace ignition switch	ST–3
Engine cranks slowly	Battery charge low	Check battery specific gravity Charge or replace battery	CH–2
	Battery cables loose, corroded or worn	Repair or replace cables	
	Starter faulty	Repair starter	ST–3
Starter keeps running	Starter faulty	Repair starter	ST–3
	Ignition switch faulty	Replace ignition switch	
	Short in wiring	Repair wiring	
Starter spins – engine will not crank	Pinion gear teeth broken or starter faulty	Repair starter	ST–3
	Flywheel teeth broken	Replace flywheel	

STARTER

COMPONENTS





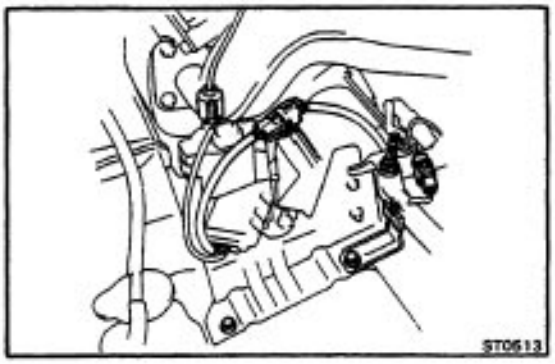
REMOVAL OF STARTER (3S–FE)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DISCONNECT CONNECTOR AND WIRE FROM STARTER

3. REMOVE STARTER

Remove the two bolts and starter.



REMOVAL OF STARTER (2VZ–FE)

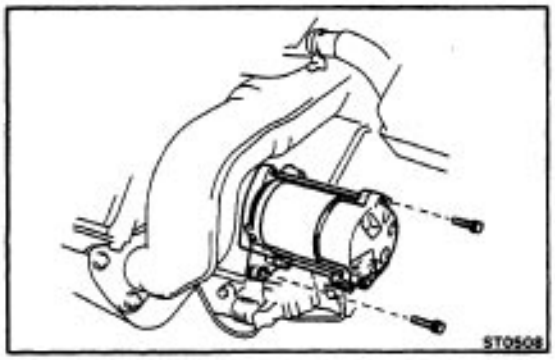
1. REMOVE BATTERY AND BATTERY TRAY

2. REMOVE IGNITER BRACKET

(a) Disconnect the following connectors and wire:

- Noise filter connector
- Igniter connector
- High–tension cord for ignition coil
- Ground strap

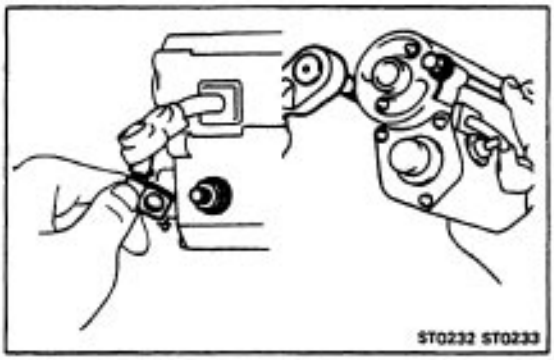
(b) Disconnect the harness clamp, and remove the two bolts and igniter bracket.



3. DISCONNECT CONNECTOR AND WIRE FROM STARTER

4. REMOVE STARTER

Remove the two bolts and starter.



DISASSEMBLY OF STARTER

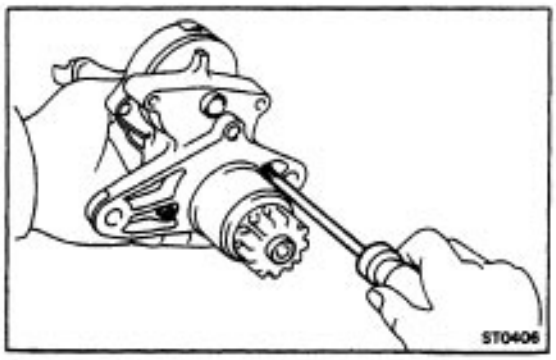
(See page ST–3)

1. REMOVE FIELD FRAME AND ARMATURE

(a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.

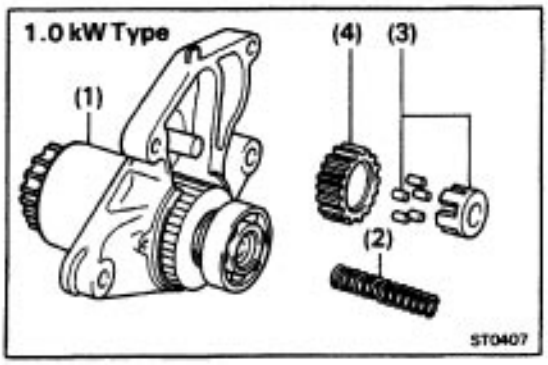
(b) Remove the two through bolts, and pull out the field frame together with the armature.

(c) (1.4 kW Type)
Remove the 0–ring.

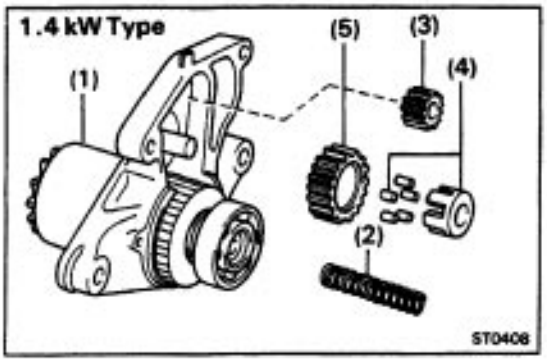


2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEARS

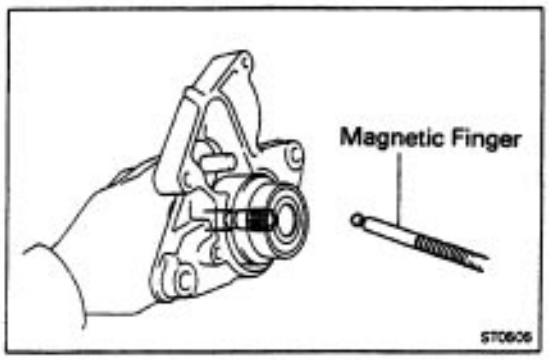
(a) Remove the two screws.



(b) Remove the following parts from the magnetic switch:
(1.0 kW Type)
(1) Starter housing and clutch assembly
(2) Return spring
(3) Bearing
(4) Idler gear

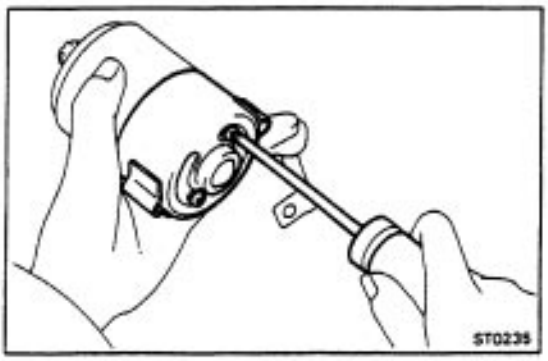


(1.4 kW Type)
(1) Starter housing and clutch assembly
(2) Return spring
(3) Pinion gear
(4) Bearing
(5) Idler gear



3. REMOVE STEEL BALL

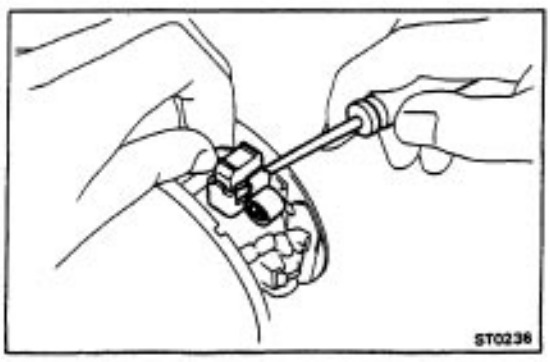
Using a magnetic finger, remove the steel ball from the clutch shaft hole.



4. REMOVE BRUSH HOLDER

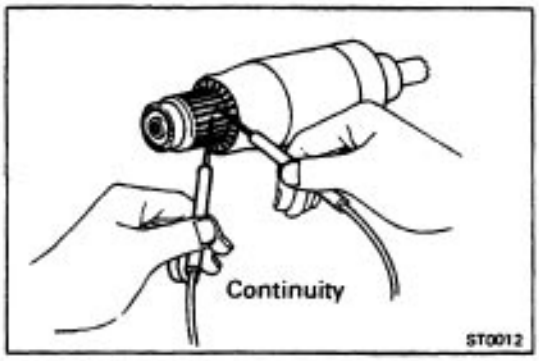
(a) (1.0 kW Type)
Remove the two screws and end cover from the field frame.
(1.4 kW Type)
Remove the two screws, 0–rings and end cover from the field frame.

(b) (1.4 kW Type)
Remove the 0–ring.



(c) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder. Disconnect the four brushes, and remove the brush holder.

5. REMOVE ARMATURE FROM FIELD FRAME



INSPECTION AND REPAIR OF STARTER

Armature Coil

1. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the commutator

If there is no continuity, replace the armature.

2. INSPECT COMMUTATOR FOR GROUND

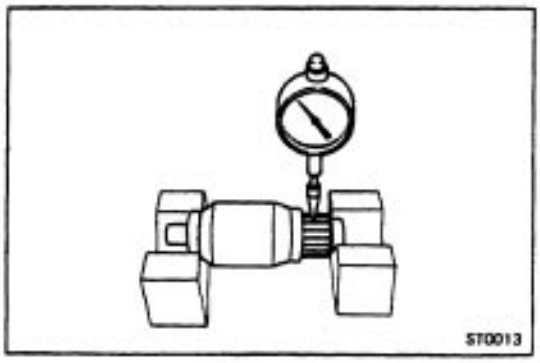
Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is continuity, replace the armature.

Commutator

1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACE

If the surface is dirty or burnt, correct with sandpaper (No.400) or on a lathe.



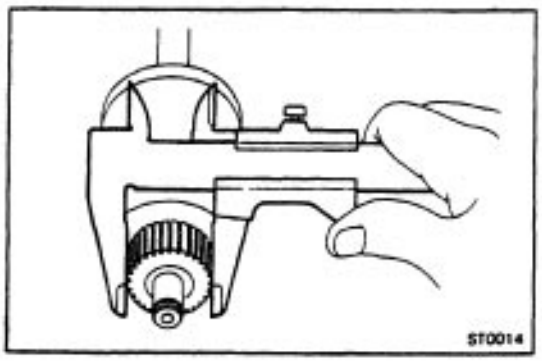
2. INSPECT COMMUTATOR FOR RUNOUT

(a) Place the communicator on V–blocks.

(b) Using a dial indicator, measure the circle runout.

Maximum circle runout: 0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it with on a lathe.

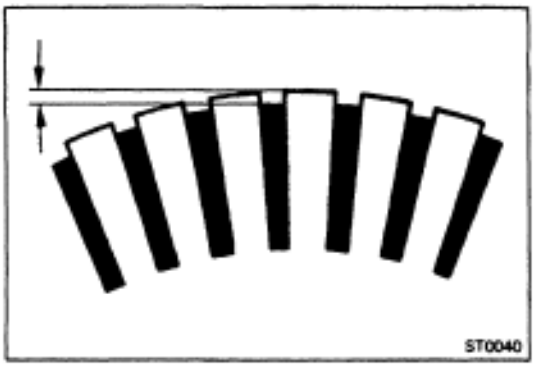


3. INSPECT COMMUTATOR DIAMETER

Using calipers, measure the diameter.

Standard diameter: 30.0 mm (1.181 in.)

Minimum diameter 29.0 mm (1.142 in.)



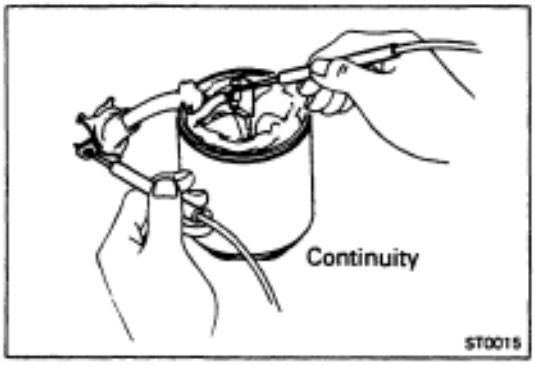
4. INSPECT UNDERCUT DEPTH

Check that the undercut depth is clean and free of foreign material. Smooth out the edge.

Standard undercut depth: 0.6 mm 10.024 in.)

Minimum undercut depth: 0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with hacksaw blade.

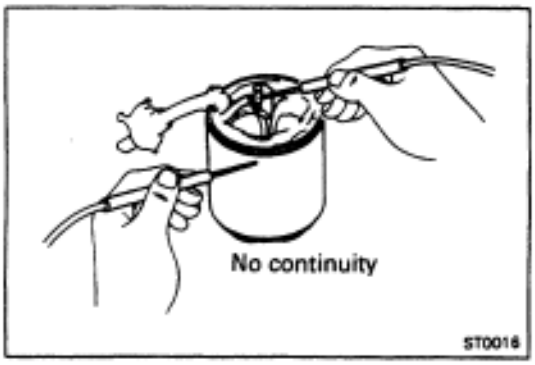


Field Coil (Field Frame)

1. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.

If there is no continuity, replace the field frame.



2. INSPECT FIELD COIL FOR GROUND

Using an ohmmeter, check that there is no continuity) between the field coil end and field frame.

If there is continuity, replace the field frame.

Brushes

INSPECT BRUSH LENGTH

Using calipers, measure the brush length.

Standard length:

1.0 kW type 13.5 mm (0.531 in.)

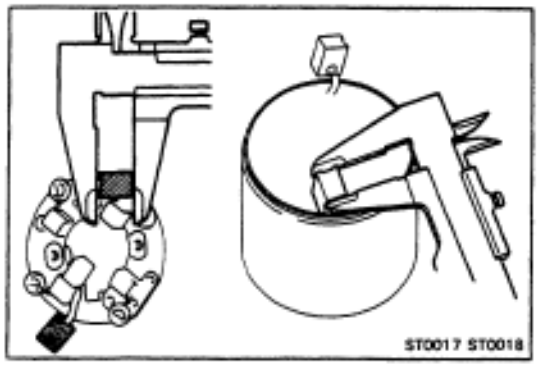
1. 4 kW type 15.5 mm (0–610in.)

Minimum length:

1.0 kW type 8.5 mm (0.335 in.)

1.4 kW type 10.0 mm (0.394 in.)

If the length is less than minimum, replace the brush holder and field frame.



Brush Springs

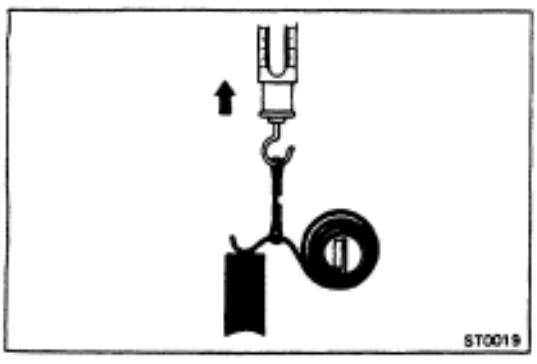
INSPECT BRUSH SPRING LOAD

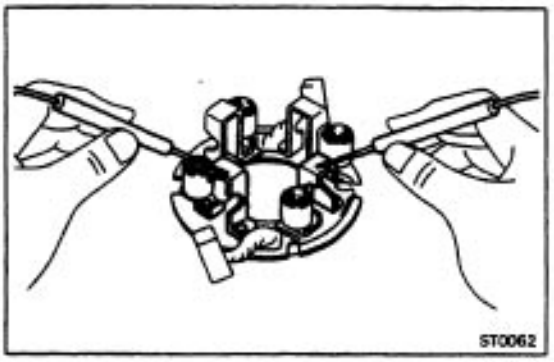
Take the pull scale reading the instant the brush spring separates from the brush.

Standard installed load:

1.79–2.41.kg (3.9–5.31b, 18–24N)

If the installed load is not as specified, replace the brush springs.





Brush Holder

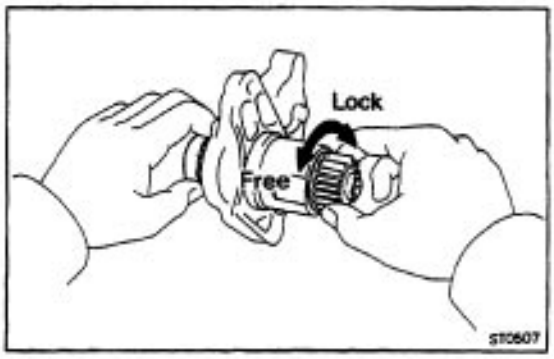
INSPECT BRUSH HOLDER INSULATION

Using an ohmmeter, check that there is no continuity between the positive (+) and negative (–) brush holders.
If there is continuity, repair or replace the brush holder.

Clutch and Gears

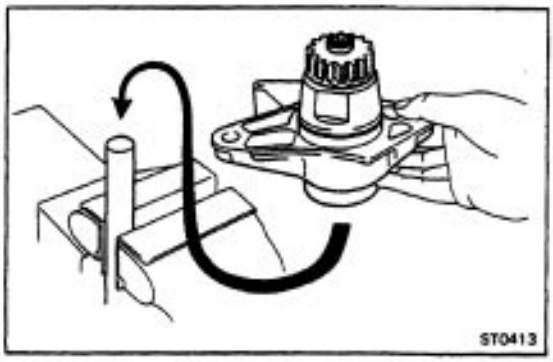
1. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idler gear and the clutch assembly for wear or damage.
If damaged, replace the gear or clutch assembly.
If damaged, also check the flywheel ring gear for wear or damage.



2. INSPECT CLUTCH PINION GEAR

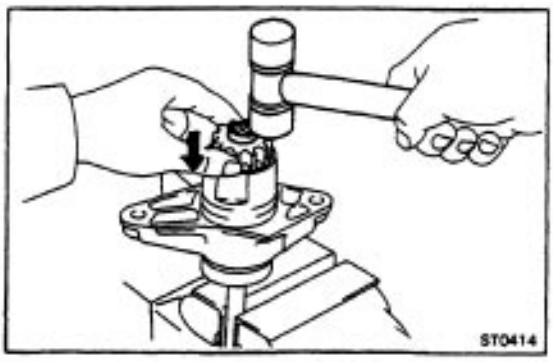
Rotate the pinion gear counterclockwise and check that it turns freely. Try to rotate the pinion gear clockwise and check that it locks.
If necessary, replace the clutch assembly.



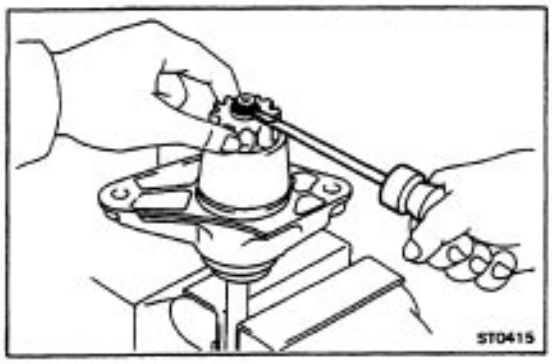
3. IF NECESSARY, REPLACE CLUTCH ASSEMBLY

A. Disassembly starter housing and clutch assembly

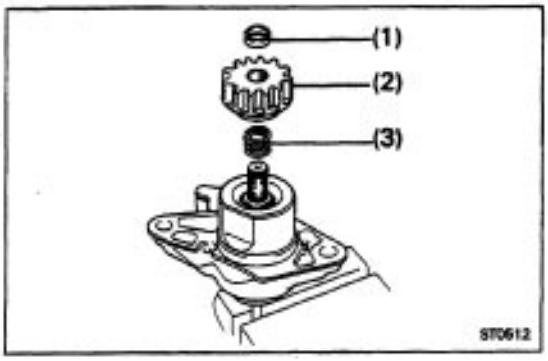
(a) Mount a brass bar in a vise, and install the starter housing and clutch assembly to the brass bar.



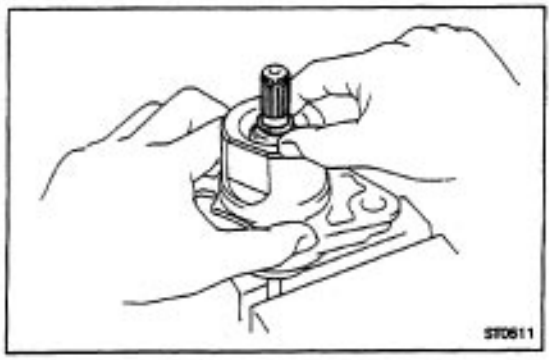
(b) Push down the–pinion gear.
(c) Using a plastic–faced hammer, tap in the stop collar.



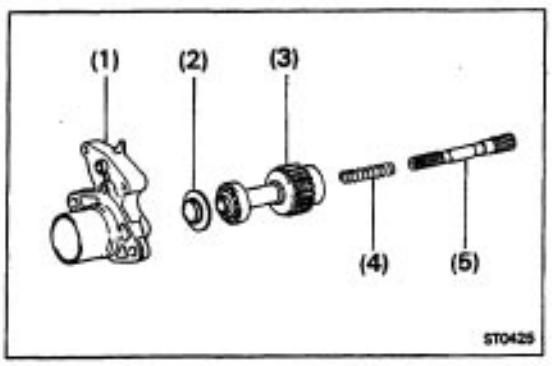
(d) Using a screwdriver, pry out the snap ring.



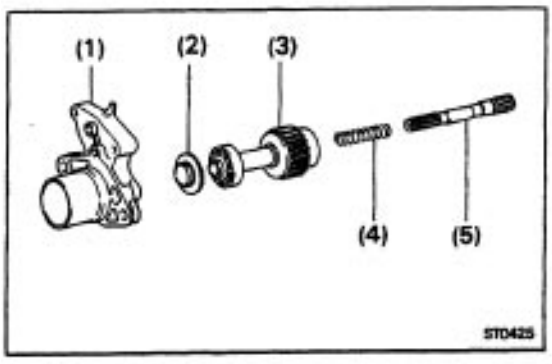
(e) Remove the following parts:
(1) Stop collar
(2) Pinion gear
(3) Compression spring



(f) Push down the starter housing, remove the spring retainer.

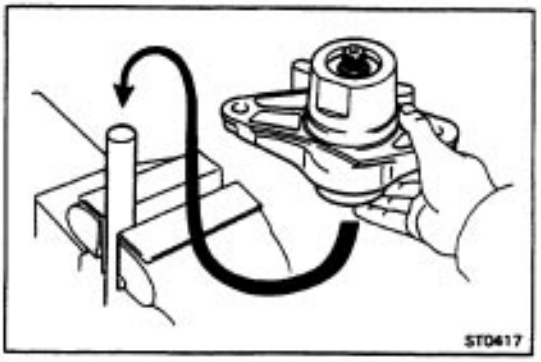


(g) Disassemble the following parts:
(1) Starter housing
(2) Bearing retainer.
(3) Starter clutch
(4) Compression spring
(5) Clutch shaft

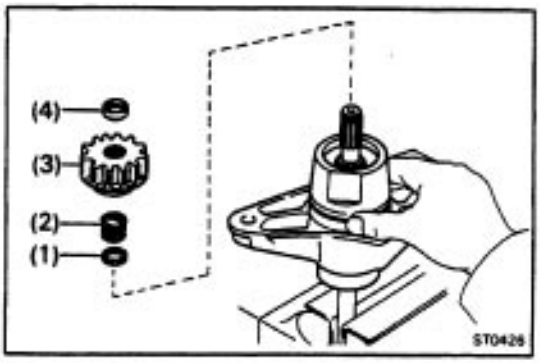


B. Assemble starter housing and clutch assembly

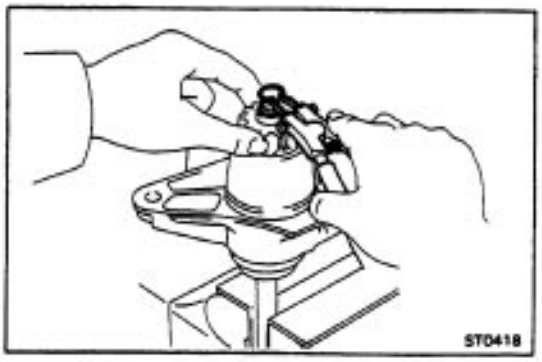
(a) Assembly the following parts:
(1) Starter housing
(2) Bearing retainer
(3) Starter clutch
(4) Compression spring
(5) Clutch shaft



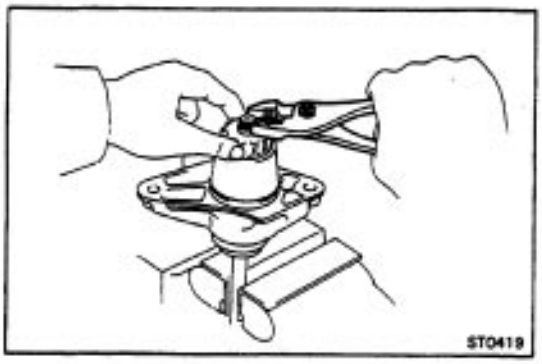
(b) Mount a brass bar in a vise, install the starter housing and clutch assembly to the brass bar.



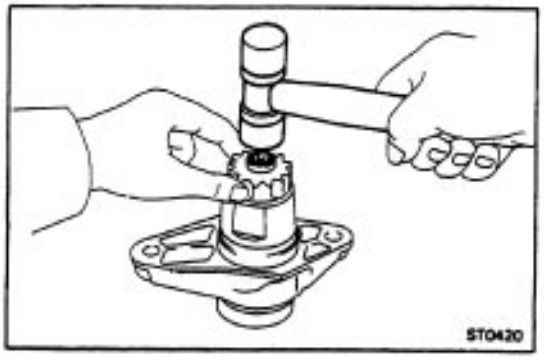
(c) Push down the starter housing, and install the following parts:
(1) Spring retainer
(2) Compression spring
(3) Pinion gear
(4) Stop collar



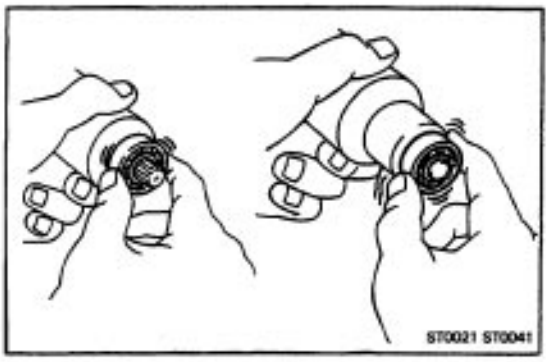
(d) Push down the pinion gear.
(e) Using snap ring pliers, install a new snap ring.



(f) Using pliers, compress the snap ring.
(g) Check that the snap ring fits correctly.



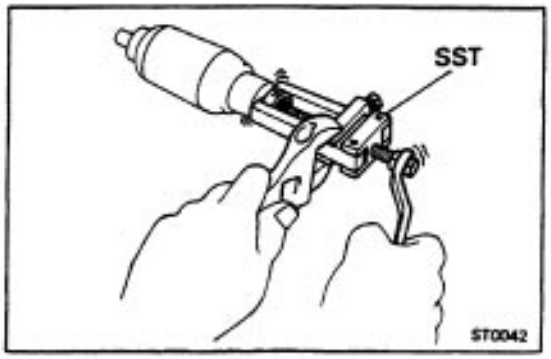
(h) Remove the starter housing and clutch assembly from the brass bar.
(i) Using a plastic–faced hammer, tap the clutch shaft and install the stop collar onto the snap ring.



Bearings

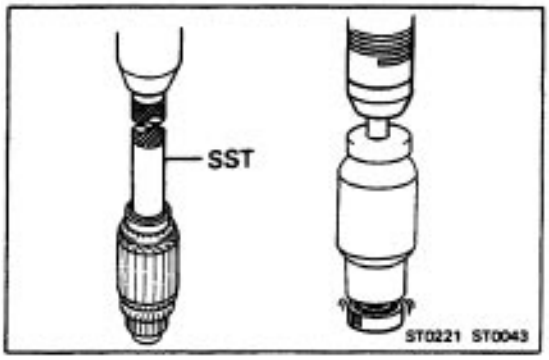
1. INSPECT BEARINGS

Turn each bearing by hand while applying inward force.
If resistance is felt or if the bearing sticks, replace the bearing.



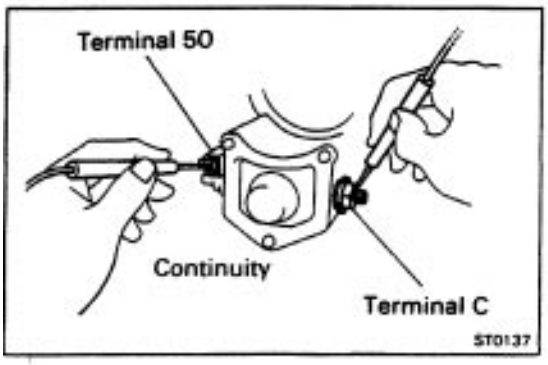
2. IF NECESSARY, REPLACE BEARINGS

(a) Using SST, remove the bearing.
SST 09286–46011



(b) Using SST and a press, press in a new front bearing.
SST 1.0 kW Type 09285–76010
1.4 kW Type 09201–41020

(c) Using a press, press in a new rear bearing.



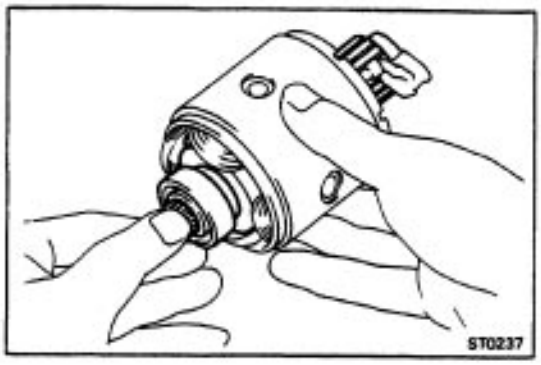
Magnetic Switch

1. PERFORM PULL–11V COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminals 50 and C.
If there is no continuity, replace the magnetic switch.

2. PERFORM HOLD–IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.
If there is no continuity, replace the magnetic switch.



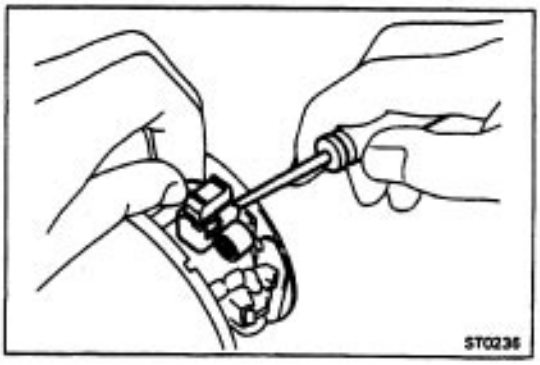
ASSEMBLY OF STARTER

(See page ST–3)

HINT: Use high–temperature grease to lubricate the bearings and gears when assembling the starter.

1. PLACE ARMATURE INTO FIELD FRAME

Apply grease to the armature bearings, and insert the armature into the field frame.

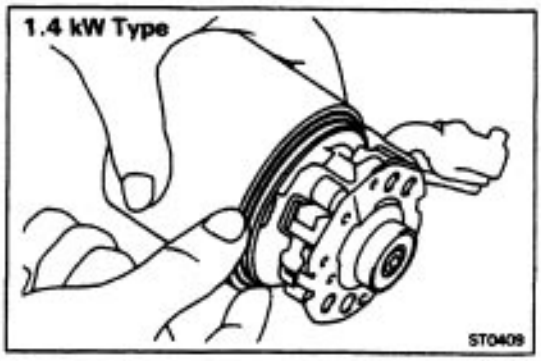


2. INSTALL BRUSH HOLDER

(a) Place the brush holder in position on the armature.

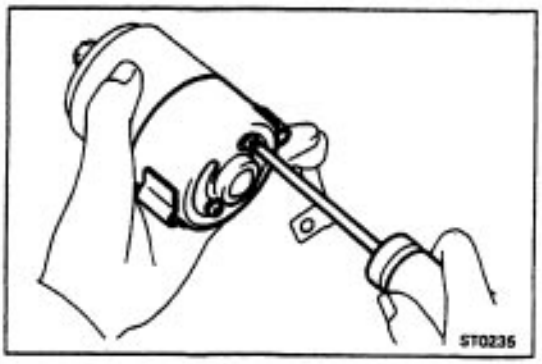
(b) Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder. Connect the four brushes.

HINT: Check that positive H lead wires are not grounded.



(c) (1.4 kW Type)

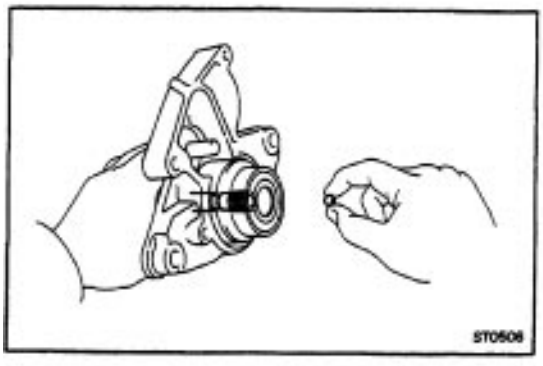
Place a new O–ring in position on the field frame.



(d) 0 .4 kW Type)

Install a new O–ring to the end cover screw.

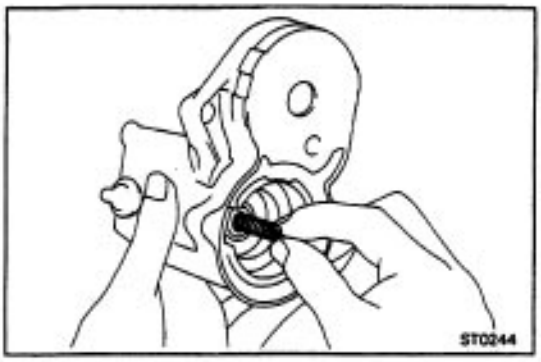
(e) Install the end cover with the two screws.



3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

(a) Apply grease to the steel ball.

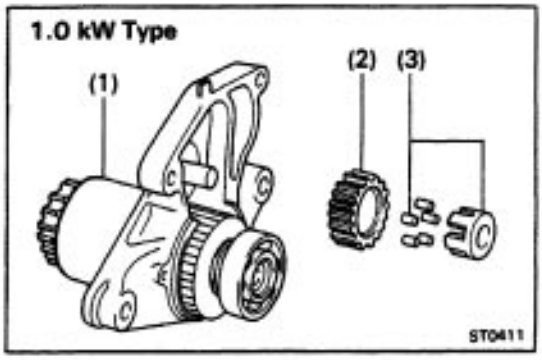
(b) Insert the steel ball into the clutch shaft hole.



4. INSTALL CLUTCH ASSEMBLY AND GEARS

(a) Apply grease to the return spring.

(b) Insert the return spring into the magnetic switch hole.



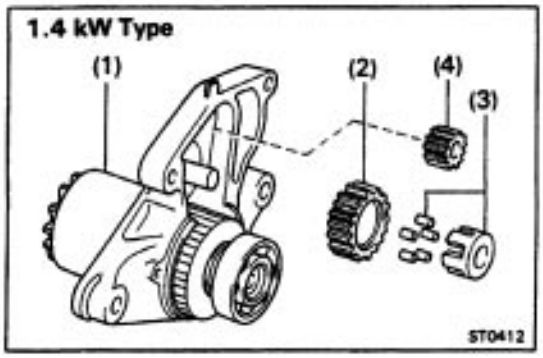
(c) Place the following parts in position on the starter housing:

(1.0 kW Type)

(1) Starter housing and clutch assembly

(2) Idler gear

(3) Bearing



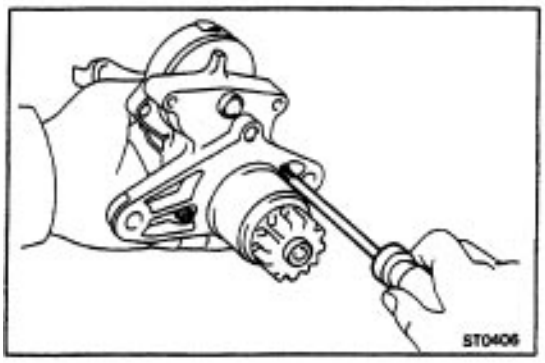
(1.4 kW Type)

(1) Starter housing and clutch assembly

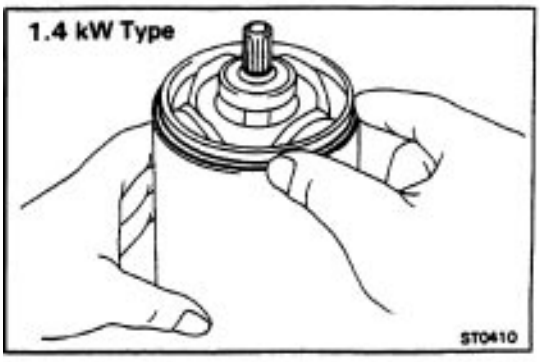
(2) Idler gear

(3) Bearing

(4) Pinion gear



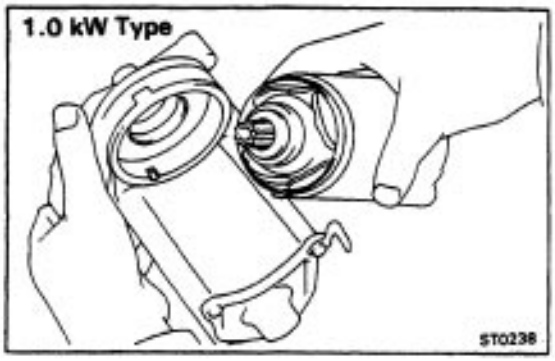
(d) Assemble the starter housing and magnetic switch with the two screws.



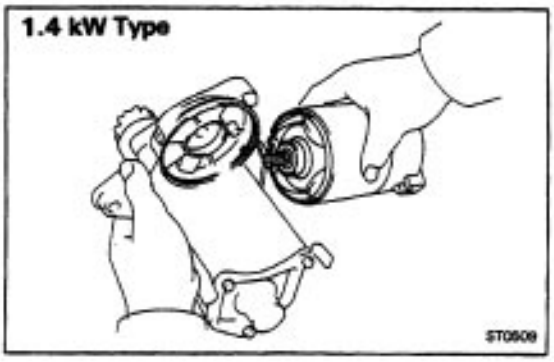
5. INSTALL FIELD FRAME AND ARMATURE ASSEMBLY

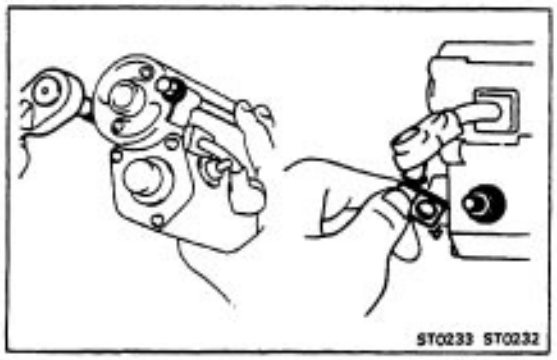
(a) (1.4 kW Type)

Place a new O–ring in position on the field frame.

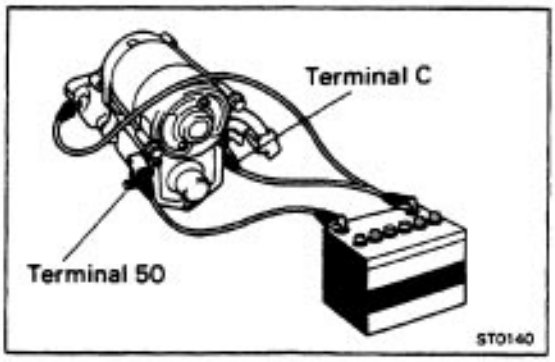


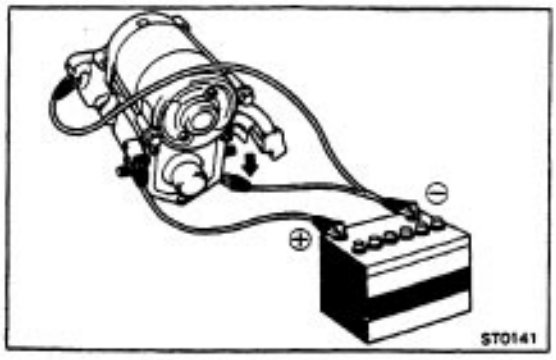
(b) Align the protrusion of the field frame with the cutout of the magnetic switch.





(c) Install the field frame and armature assembly with the two through bolts.
(d) Connect the lead wire to terminal C, and install the nut.





PERFORMANCE TEST OF STARTER

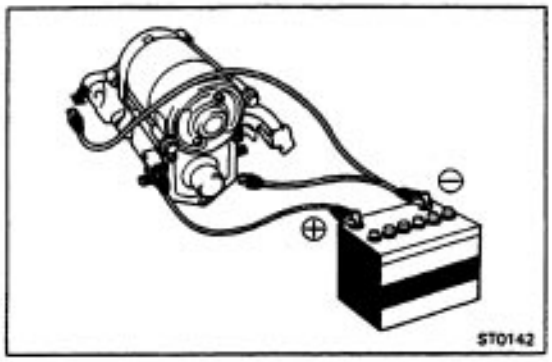
NOTICE: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

1. PERFORM PULL–IN TEST

(a) Disconnect the field coil lead wire from terminal C.
(b) Connect battery to the magnetic switch as shown.
Check that the pinion gear moves outward.
If the pinion gear does not move, replace the magnetic switch.

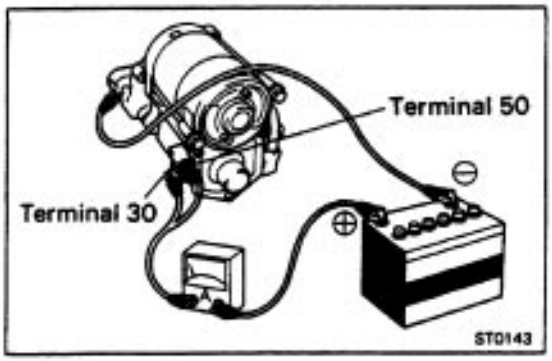
2. PERFORM HOLD–IN TEST

While connected as above with the pinion gear out, disconnect the negative (–) lead from terminal C.
Check that the pinion gear remains out.
If the pinion gear returns inward, replace the magnetic switch.



3. INSPECT PLUNGER RETURN

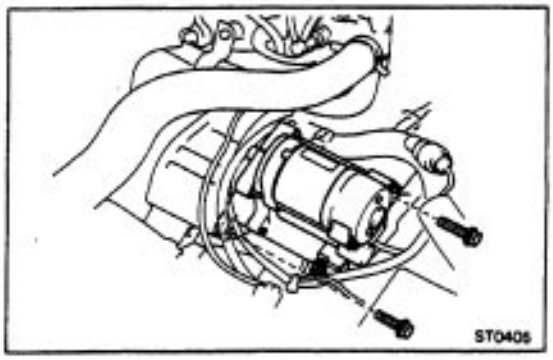
Disconnect the negative (+) lead from the switch body.
Check that the pinion gear returns inward.
If the pinion gear does not return, replace the magnetic switch.



4. PERFORM NO–LOAD PERFORMANCE TEST

(a) Connect the battery and ammeter to the starter as shown.
(b) Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check the reading on the ammeter.

Standard amperage: 90 A or less at 11.5 V



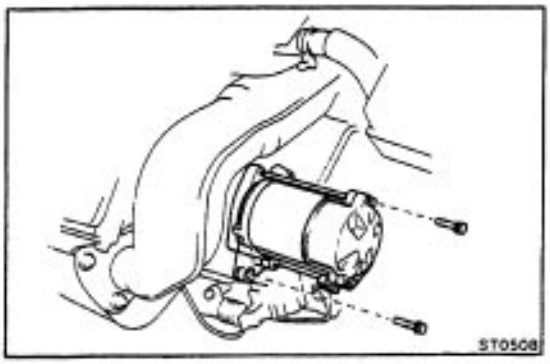
INSTALLATION OF STARTER (3S–FE)

1. INSTALL STARTER

Install the starter with the two bolts.

Torque: 400 kg–cm (29 ft–lb, 39 N)

2. CONNECT CONNECTOR AND WIRE TO STARTER
3. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
4. CHECK THAT ENGINE STARTS



INSTALLATION OF STARTER (2VZ–FE)

1. INSTALL STARTER

install the starter with the two bolts.

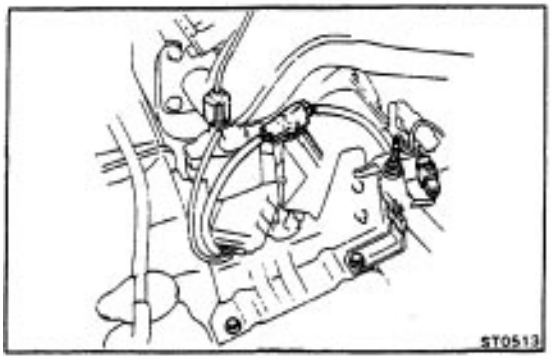
Torque: 400 kg–cm (29 ft–lb, 39 N–m)

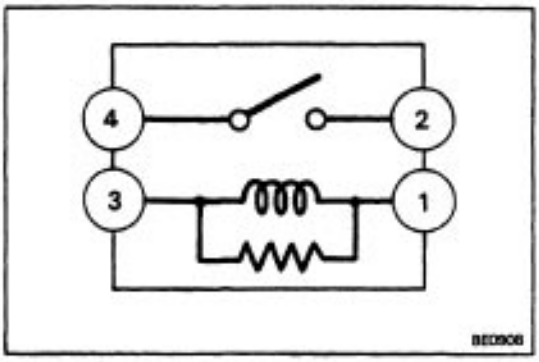
2. CONNECT CONNECTOR AND WIRE TO STARTER
3. INSTALL IGNITER BRACKET

(a) Install the igniter bracket with the two bolts, and connect the harness clamp.
(b) Connect the following connectors and wire:

- Noise filter connector
- Igniter connector
- High–tension cord for ignition coil
- Ground strap

4. INSTALL BATTERY TRAY AND BATTERY
5. CHECK THAT ENGINE STARTS

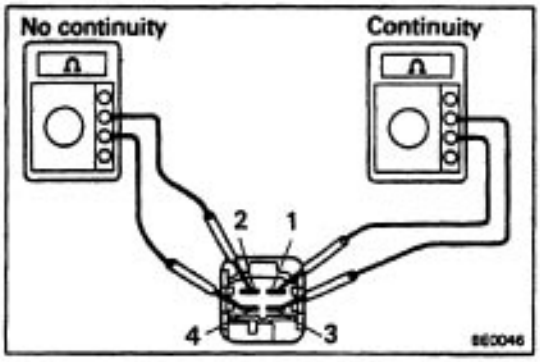




STARTER RELAY (MT only)

INSPECTION OF STARTER RELAY

LOCATION: In the left cowl side.

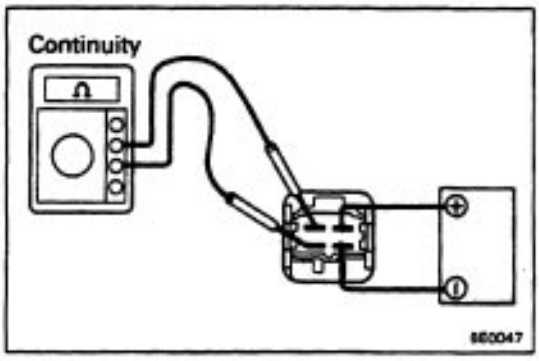


1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.

(b) Check that there is no continuity between terminals 2 and 4.

If continuity is not as specified, replace the relay.



2. INSPECT RELAY OPERATION

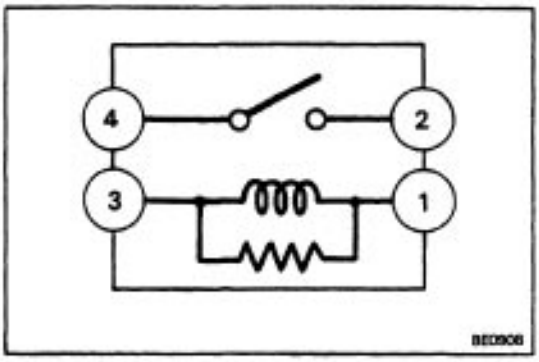
(a) Apply battery voltage across terminals 1 and 3.

(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.

CLUTCH START SWITCH (MT only)

(See page CL–4**)**



STARTER RELAY (MT only)

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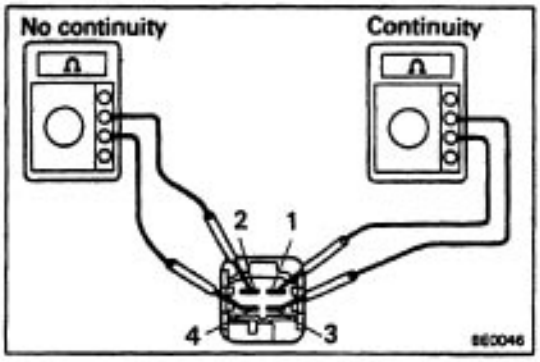

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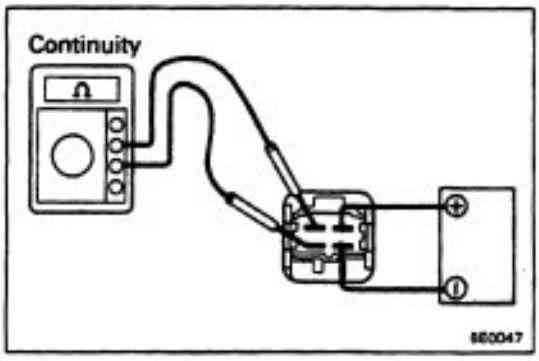

2. INSPECT RELAY OPERATION

(a) Apply battery voltage across terminals 1 and 3.

(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.

CLUTCH START SWITCH (MT only)

(See page CL–4**)**

STEERING

PRECAUTIONS

Care must be taken to replace parts properly because they could affect the performance of the steering system and result in a driving hazard.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Hard steering	Tires improperly inflated	Inflate tires to proper pressure	FA–3
	Insufficient lubricant	lubricate suspension and steering linkage	
	Excessive caster	Check front wheel alignment	FA–3
	Steering system joint worn	Replace steering system joints	SR–43,45, 48
	Lower arm ball joints worn	Replace lower arm ball joints	
	Steering column binding	Inspect steering column	FA–57
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–4
		Adjust belt	SR–43,45, 48
		Check reservoir	
		Check power steering unit	SR–22
	Power steering beh loose		SR–22
	Fluid level i n reversoi r low		SR–22
	Power steering unit faulty		
Poor return	Tires improperly inflated	Inflate tires to proper pressure	FA–3
	Insufficient lubricant	Lubricate suspension and steering linkage	
	Wheel alignment incorrect	Check front wheel alignment	FA–3
	Steering column binding	Inspect steering column	SR–4
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–43,45, 48
Excessive play	Hub bearing worn	Replace hub bearing	FA–7
	Main shaft yoke or intermediate shaft yoke worn	Replace main shaft or intermediate shaft	
	Lower arm ball joints wo¿n	Replace lower arm ball joints	FA–57
	Steering system joints worn	Replace steering system joints	SR–43,45, 48
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–43,45 48
Abnormal noise	Steering linkage loose	Tighten steering linkage	
	Steering system joints worn	Replace steering system joints	SR–43,45, 48
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–43,45 48

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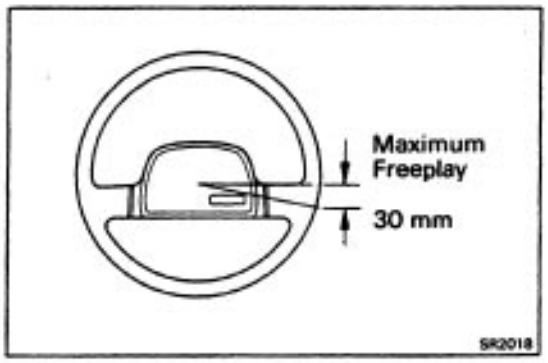


ON–VEHICLE INSPECTION

1. CHECK THAT STEERING WHEEL FREEPLAY IS CORRECT

With the vehicle stopped and tires pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure.

Freeplay should not exceed the maximum limit.

Maximum freeplay: 30 mm (1.18 in.)

If incorrect, repair.

2. CHECK STEERING LINKAGE AND GEAR HOUSING

(a) Check the steering linkage for looseness or damage.

Check that:

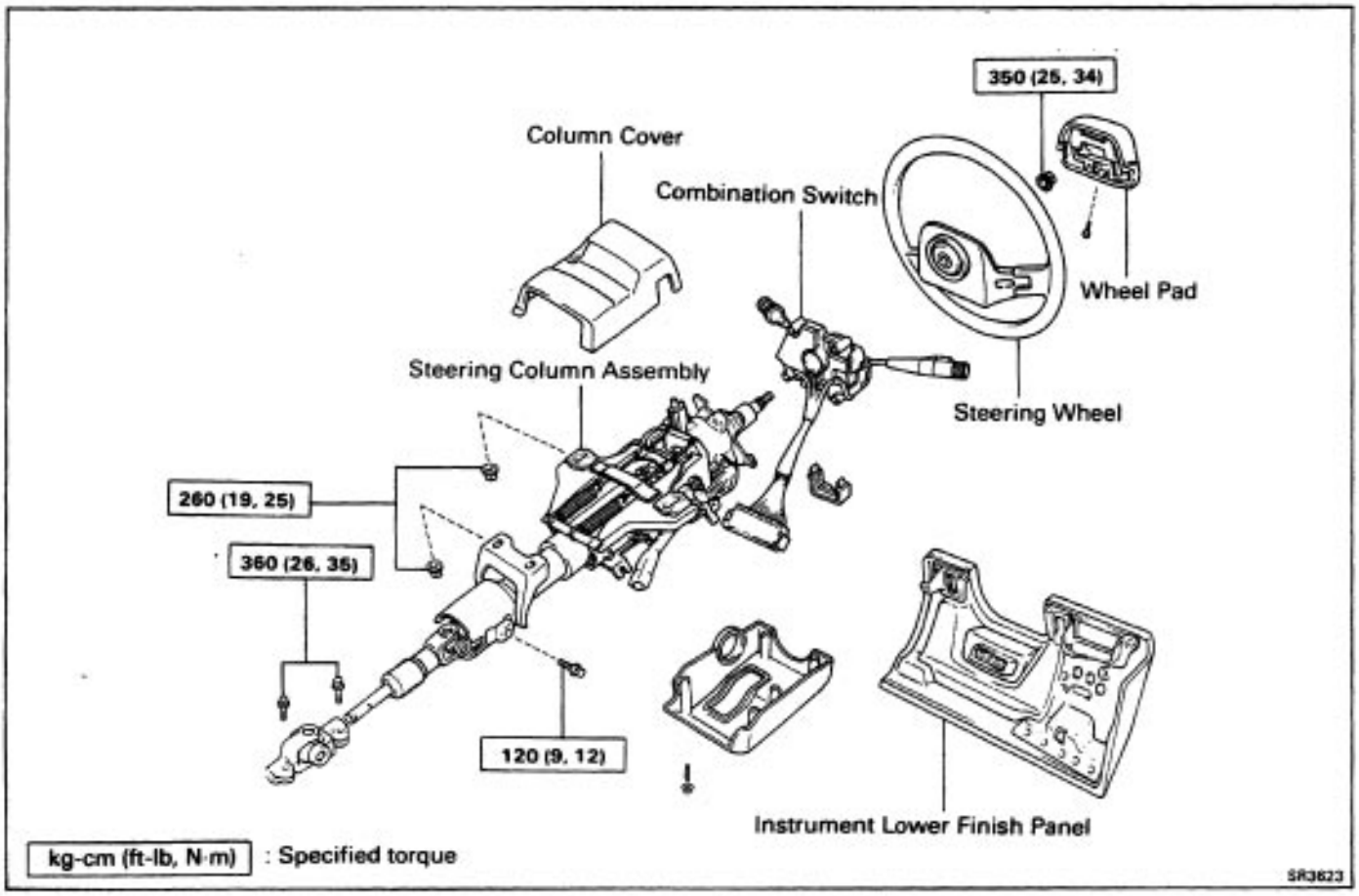
- Tie rod ends do not have excessive play.
- Boots are not damaged.
- Boot clamps are not loose.

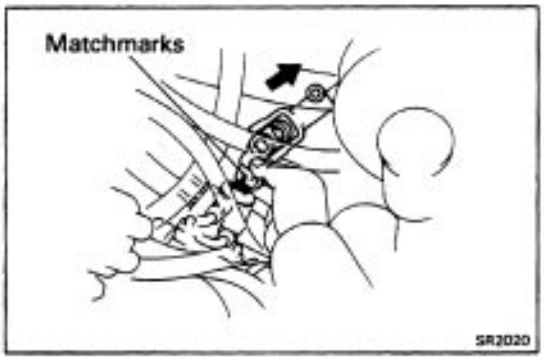
(b) Check gear housing for grease leakage or oozing.

STEERING COLUMN

REMOVAL AND INSTALLATION OF STEERING COLUMN

Remove and install the parts as shown.





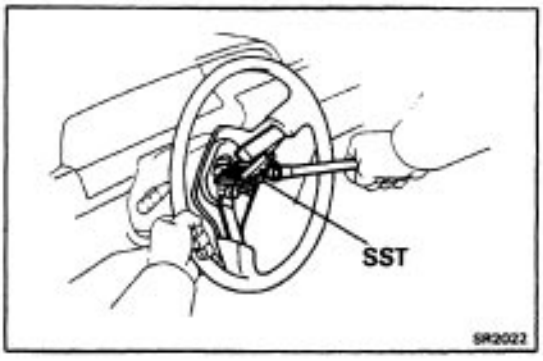
(MAIN POINTS OF REMOVAL AND INSTALLATION)

1. REMOVE UNIVERSAL JOINT

(a) Remove the two set bolts.

(b) Place matchmarks on the universal joint and control valve shaft.

(e) First pull the universal joint from the gear housing, and then pull it out from the main shaft.



2. REMOVE STEERING WHEEL

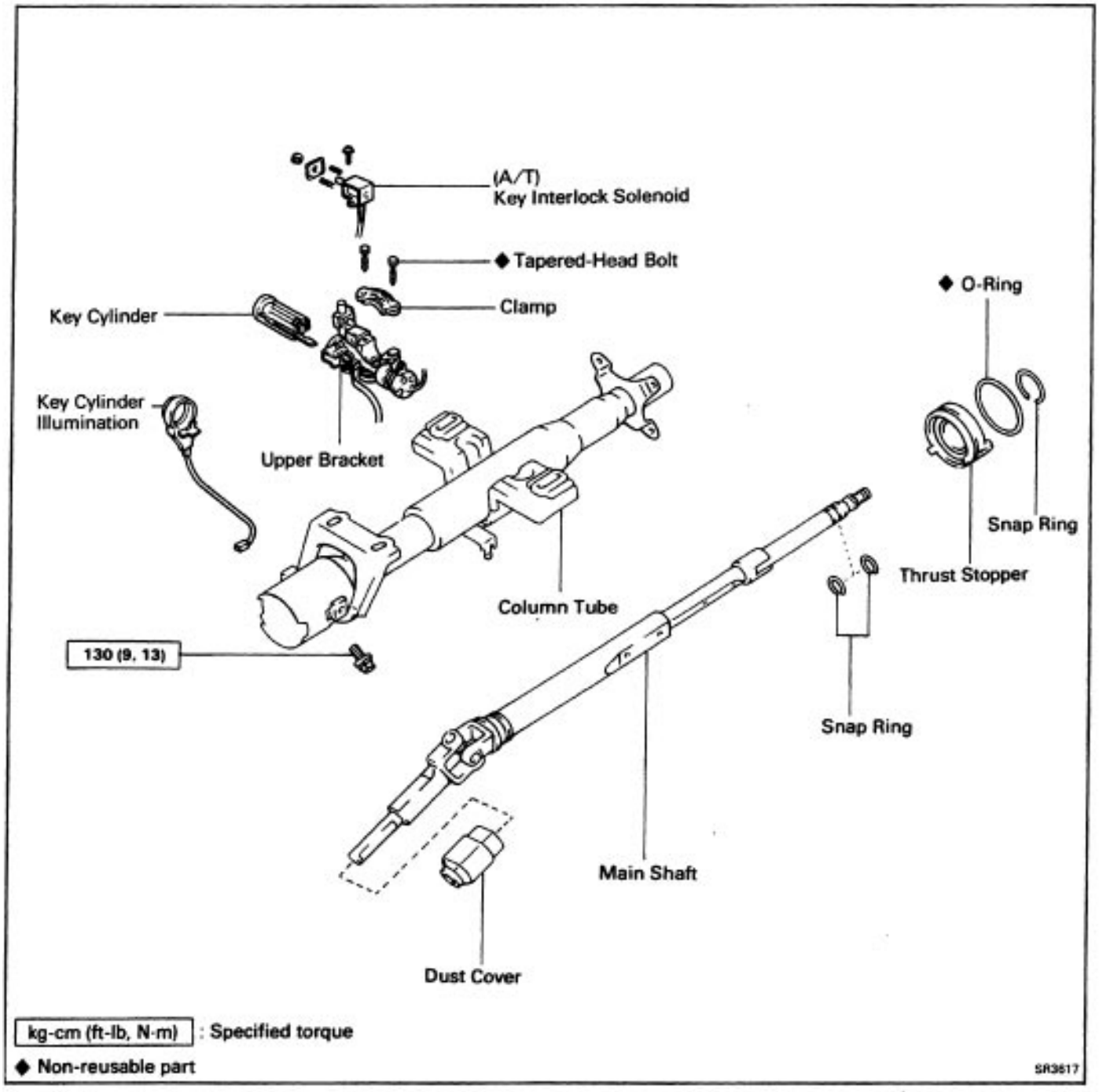
Using SST, remove the steering wheel.

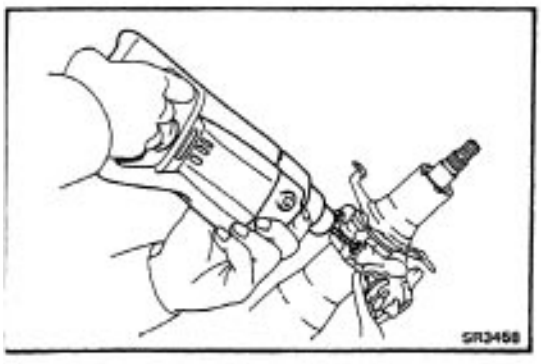
SST 09609–20011

3. CHECK STEERING WHEEL CENTER POINT AFTER INSTALLING STEERING COLUMN

Non–Tilt Steering Column

COMPONENTS



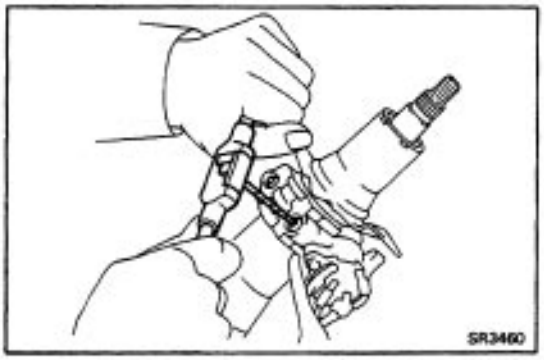


DISASSEMBLY OF STEERING COLUMN

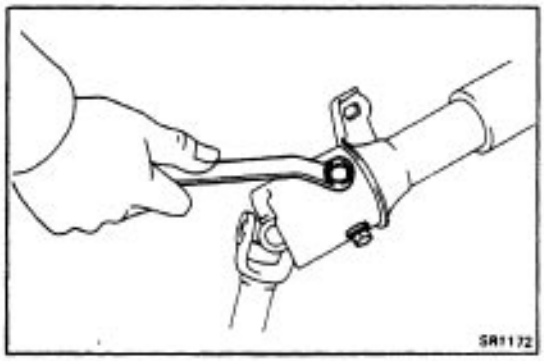
1. REMOVE UPPER BRACKET

(a) Using a centering punch, mark the center of the tapered–head bolt.

(b) Using a 3 – 4 mm (0.12 –0.16 in.) drill, drill into the tapered–head bolt.

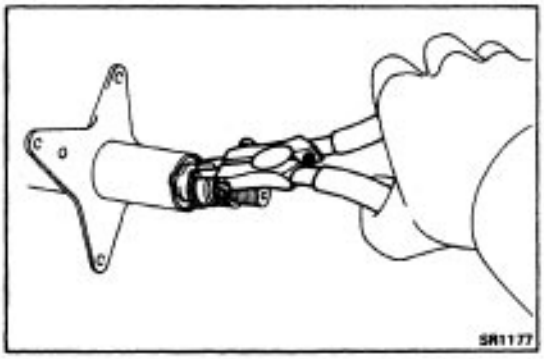


(c) Using a screw extractor, remove the tapered–head bolt.
(d) Remove the two bolts, and separate the upper bracket and the column tube.

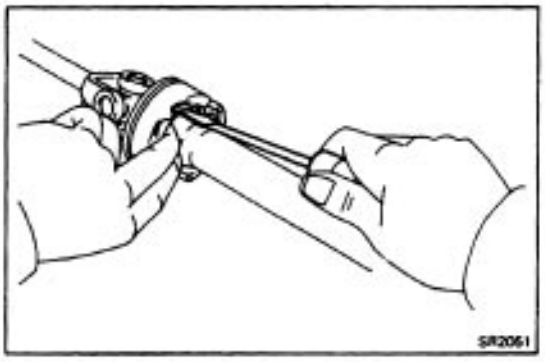


2. REMOVE MAIN SHAFT

(a) Remove the two thrust stopper set bolts. ,

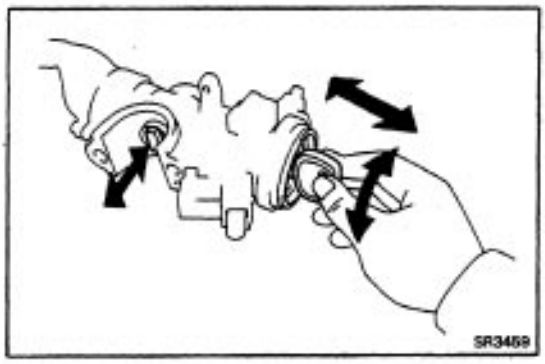


(b) Using snap ring pliers, remove the snap ring.
(c) Remove the main shaft.
(d) Using snap ring pliers, remove the snap ring from the main shaft.



3. REMOVE THRUST STOPPER

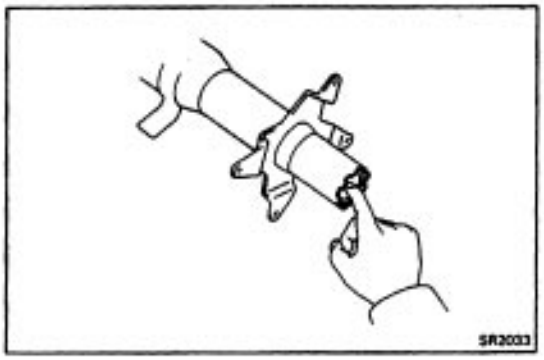
(a) Using a screwdriver, remove the snap ring and thrust stopper.
(b) Remove the 0–ring from the thrust stopper.



INSPECTION AND REPLACEMENT OF STEERING COLUMN

1. INSPECT UPPER BRACKET

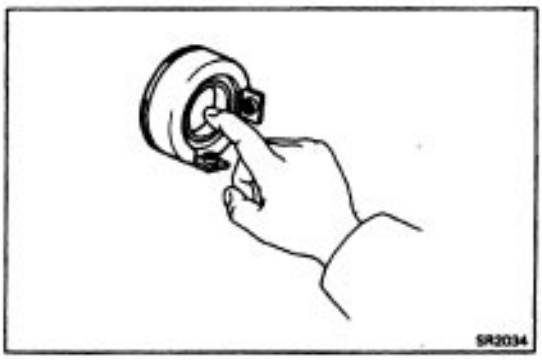
Check that the steering lock mechanism operates properly.



2. INSPECT UPPER BEARING

Check the upper bearing rotation condition and check for abnormal noise.

If the bearing is worn or damaged, replace the column tube.



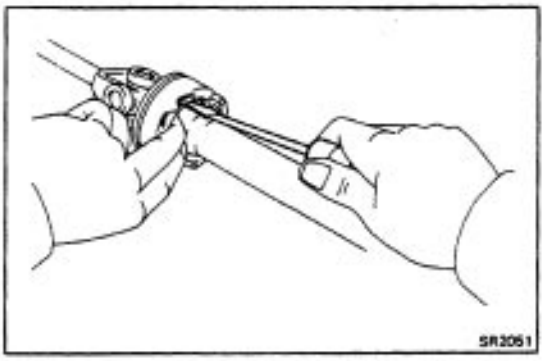
3. INSPECT LOWER BEARING

Check the lower bearing rotation condition and check for abnormal noise.

If bearing is worn or damaged, replace the thrust stopper.

4. (A /T)
INSPECT KEY INTERLOCK SOLENOID
(See page AT–411)

5. (A/T)
IF NECESSARY, REPLACE KEY INTERLOCK SOLENOID
(See page SR–1 3)



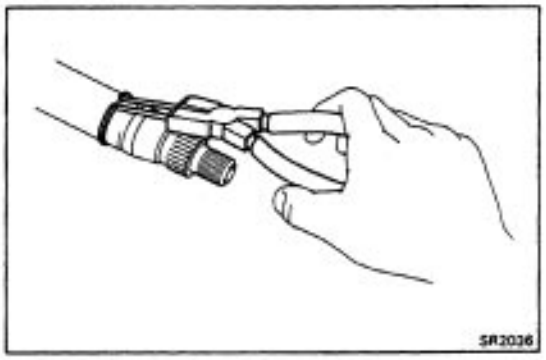
ASSEMBLY OF STEERING COLUMN

(See page SR–5)

1. INSTALL THRUST STOPPER

(a) Install a new O–ring to the thrust stopper.

(b) Install the thrust stopper and snap ring.

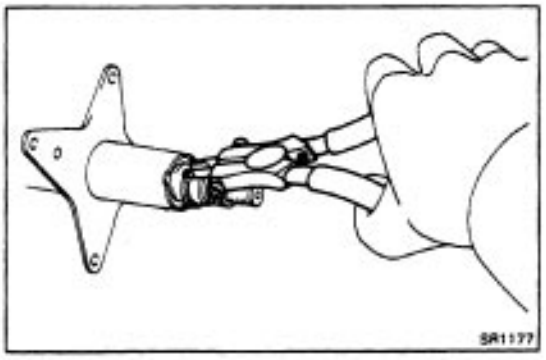


2. INSTALL MAIN SHAFT TO COLUMN TUBE

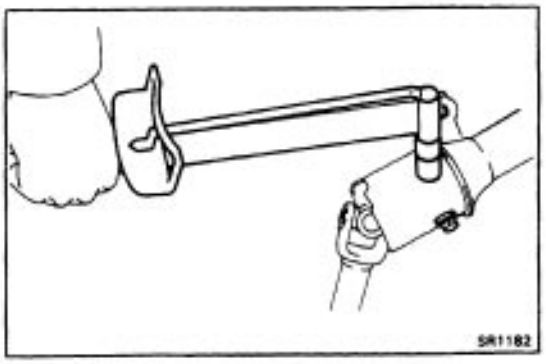
(a) Using snap ring pliers, install the snap ring in the lower groove of the main shaft.

(b) Apply molybdenum disulphide lithium base grease to the thrust stopper.

(c) Insert the main shaft into the column tube.

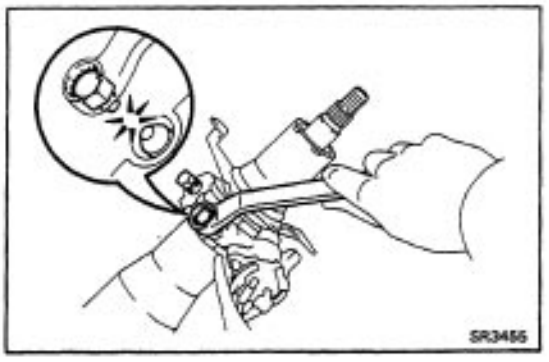


(d) Using snap ring pliers, install the snap ring.



(e) Install the two thrust stopper set bolts.

Torque: 130 kg–cm (9 ft–11b, 13 N–m)



3. INSTALL UPPER BRACKET TO COLUMN TUBE

(a) Install the upper bracket with the two tapered–head bolts.

(b) Tighten the tapered–head bolts until the bolt heads break off.

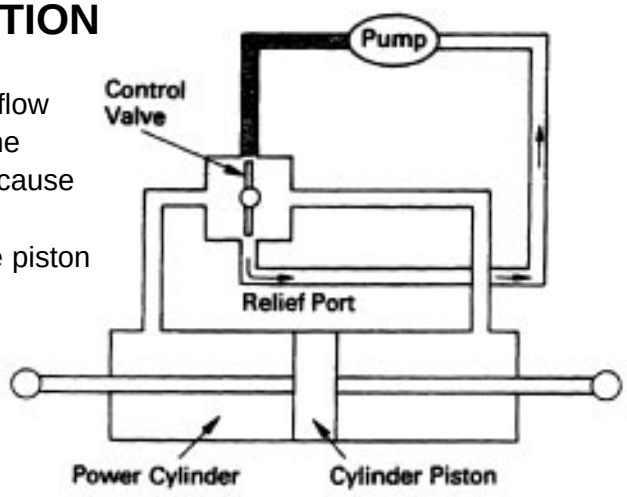
POWER STEERING
Description

PRINCIPLES OF POWER STEERING

Power steering is one type of hydraulic device for utilizing engine power to reduce steering effort. Consequently, the engine is used to drive a pump to develop fluid pressure, and this pressure acts on a piston within the power cylinder so that the piston assists the rack effort. The amount of this assistance depends on the extent of pressure acting on the piston. Therefore, if more steering force is required, the pressure must be raised. The variation in the fluid pressure is accomplished by a control valve which is linked to the steering main shaft.

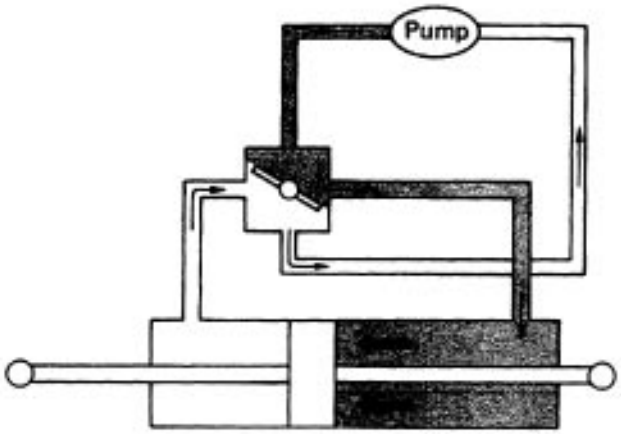
NEUTRAL (STRAIGHT–AHEAD) POSITION

Fluid from the pump is sent to the control valve. If the control valve is in the neutral position, all the fluid will flow through the control valve into the relief port and back to the pump. At this time, hardly any pressure is created and because the pressure on the cylinder piston is equal on both sides, the piston will not move in either direction.



WHEN TURNING

When the steering main shaft is turned in either direction, the control valve also moves, closing one of the fluid passages. The other passage then opens wider, causing a change in fluid flow volume and, at the same time, pressure is created. Consequently, a pressure difference occurs between both sides of the piston and the piston moves in the direction of the lower pressure so that the fluid in the cylinder is forced back to the pump through the control valve.



SERVICE HINT

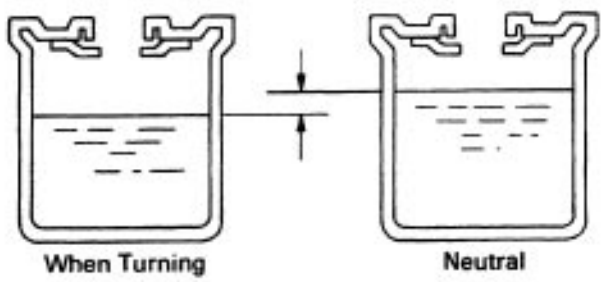
Troubles with the power steering system are usually concerned with hard steering due to the fact that there is no assist. In such cases, before attempting to make repairs, it is necessary to determine whether the trouble lies with the pump or with the gear housing. To do this, an on–vehicle inspection can be made by using a pressure gauge.

ON–VEHICLE INSPECTION

Power steering is a hydraulic device and problems are normally due to insufficient fluid pressure acting on the piston. This could be caused by either the pump not producing the specified fluid pressure or the control valve in the gear housing not functioning properly so that the proper fluid pressure can not be obtained.

If the fault lies with the pump, the same symptoms will generally occur whether the steering wheel is turned fully to the right or left. On the other hand, if the fault lies with the control valve, there will generally be difference between the amount of assist when the steering wheel is turned to the left and right, causing harder steering. However, if the piston seal of the power cylinder is worn, there will be a loss of fluid pressure whether the steering wheel is turned to the right or left and the symptoms will be the same for both.

Before performing an on–vehicle inspection, a check must first be made to confirm that the power steering system is completely free of any air. If there is any air in the system, the volume of this air wilt change when the fluid pressure raised, causing a fluctuation in the fluid pressure so that the power steering will not function properly. To determine if there is any air in the system, check to see if there is a change of fluid level in the reservoir tank when the steering wheel is turned fully to the right or left. For example, if there is air in the system, it will be compressed to a smaller volume when the steering wheel is turned, causing a considerable drop in the fluid level. If the system is free of air, there will be very little change in the level even when the fluid pressure is raised. This is because the fluid, being a liquid, does not change volume when compressed. The little change in the fluid level is due to expansion of the hoses between the pump and gear housing when pressure rises.



Also, air in the system will sometimes result in an abnormal noise occurring from the pump or gear housing when the steering wheel is fully turned in either direction.

This on–vehicle inspection must be performed every time to ensure that the power steering system is working properly after overhauling or repairing the pump or gear housing.

VANE PUMP

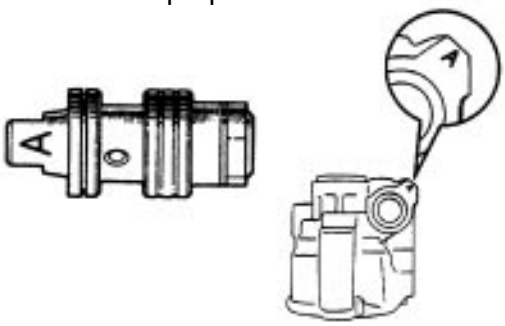
The main component parts of the vane pump, such as the cam ring, rotor, vanes and flow control valve are high precision parts and must be handled carefully. Also, because this pump produces a very high fluid pressure, O–rings are used for sealing each part. When reassembling the pump, always use new 0–rings.

In the flow control valve, there is a relief valve which controls the maximum pressure of the pump.

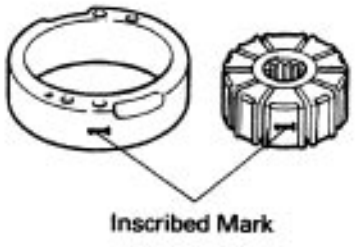
The amount of this maximum pressure is very important; if it is too low, there will be insufficient power steering assist and if too high, it will have an adverse effect on the pressure hoses, oil seals, etc.

If the maximum pressure is either too high or too low due to a faulty relief valve, do not disassemble or adjust the relief valve, but replace the flow control valve as an assembly.

The clearance between the flow control valve and pump body installation hole is very important. After manufacture, the factory measures the size of the installation hole and outer circumference of the flow control valve, and punches a mark accordingly. Therefore, when replacing the flow control valve, be sure to do so with one having the same mark in order to insure the proper clearance.

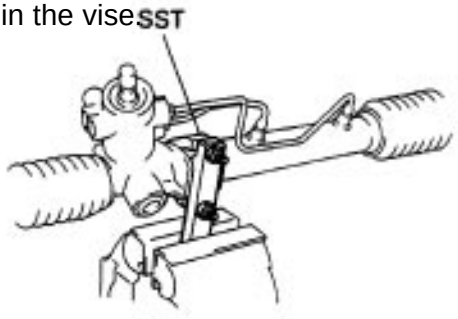


The functional parts of the pump which produce fluid pressure are the cam ring, rotor and vanes, and these should be checked for wear. If the clearance between each is not within standard when reassembling, any worn parts should be replaced. In this case, the replaced cam ring and rotor should be of the same length (have the same mark), and the vanes should be replaced with those having a length corresponding to that mark, otherwise the proper thrust clearance cannot be obtained. If there is too much thrust clearance, there will be insufficient fluid pressure at low speeds. If there is too little thrust clearance, it may result in seizure of the vanes.

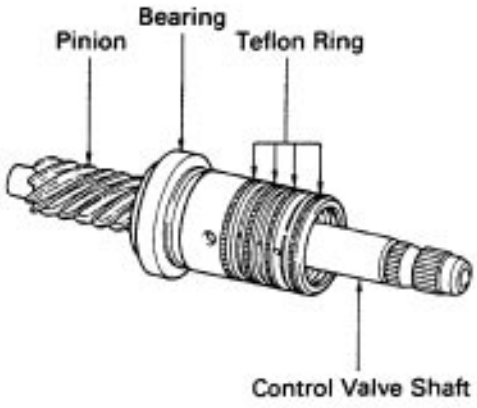


GEAR HOUSING

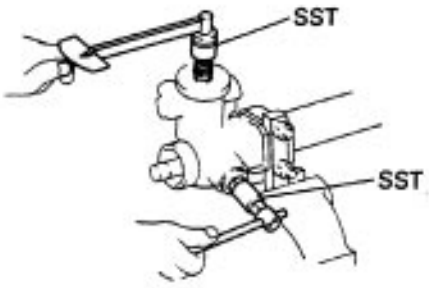
If the gear housing is secured directly in a vise during overhaul, there is danger of deforming it, so always first secure it in the SST provided (rack &
pinion steering rack housing stand) before placing it in the vise.



The oil seals on both sides of the power cylinder are for the prevention of leakage of the high pressure fluid which acts on the piston. Always use new oil seals when reassembling and be very careful not to scratch or damage them. Because of the high pressure, even the slightest scratch will cause fluid leakage, resulting in an inoperative power steering system.
Also, be very careful not to scratch the sliding portion of the rack which makes contact with the oil seals. When removing the rack ends from the rack, it is very easy to cause a burr when holding the tip of the rack with a wrench. Therefore, before assembling the rack, first check the tip for burrs and remove any with an oil stone.
Teflon rings are used for the piston and control valve. These teflon rings are highly durable against wear, but if it is necessary to replace them, be careful not to stretch the new ones. After installing a teflon ring into its groove, snug it down into the groove before assembly of the cylinder or housing to prevent possible damage.



As with the rack and pinion type steering, preload is very important. If the preload is not correct, it could result in such trouble as steering wheel play or shimmy or lack of durability, so always make sure that it is correct.

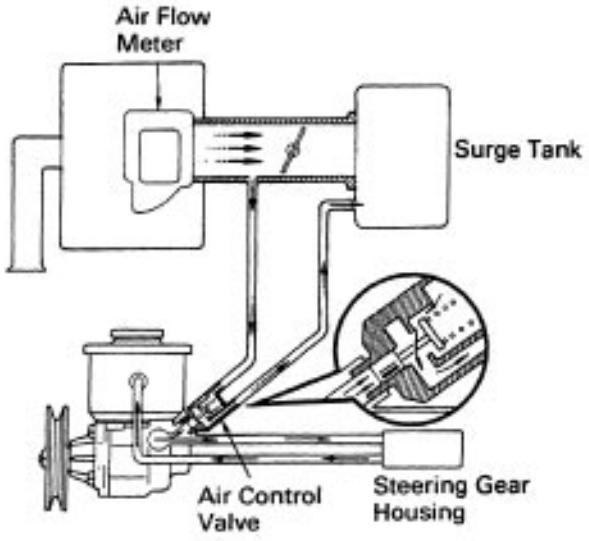


IDLE–UP DEVICE

The pump produces the maximum fluid pressure when the steering wheel is turned fully to the right or left and, at this time, there is a maximum load on
the pump which causes a decrease in engine idle rpm. To solve this problem, vehicles are equipped with an idle–up device which acts to raise the engine idle rpm whenever there is a heavy load on
the pump.

On ER engines, when the piston of the air control valve is pushed by fluid pressure, the air valve opens and the volume of air by–passing the throttle valve is increased to regulate engine rpm.

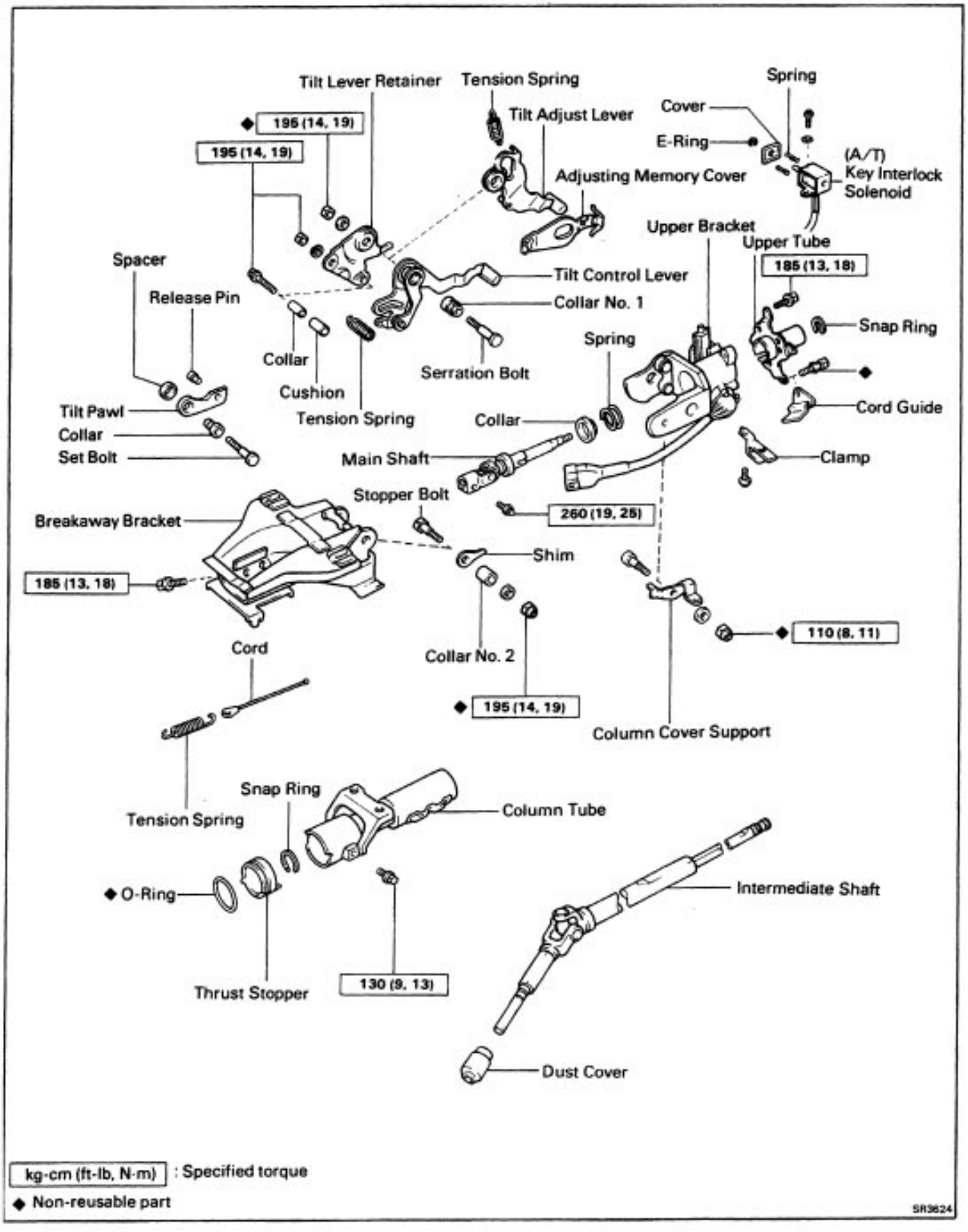
(SV Series)



The idle–up device functions to raise engine idle rpm when pump fluid pressure acts on the air control valve, installed to the pump body or pressure tube, to control the flow of air.

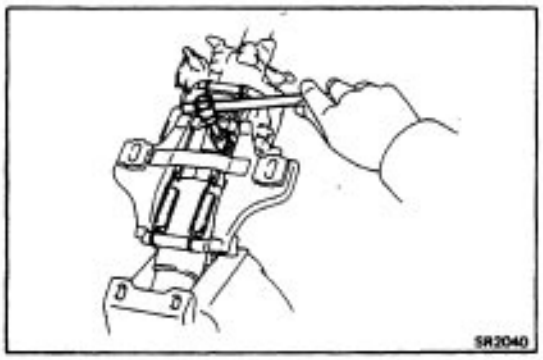
Tilt Steering Column

COMPONENTS



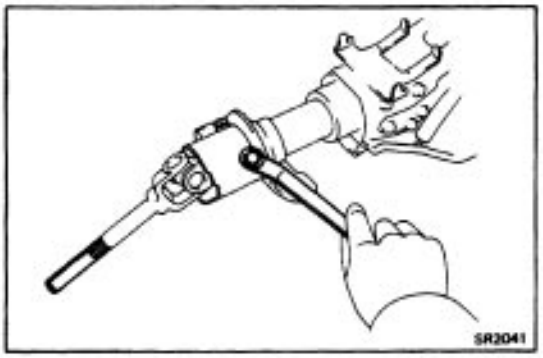
DISASSEMBLY OF STEERING COLUMN

(See page SR–9)



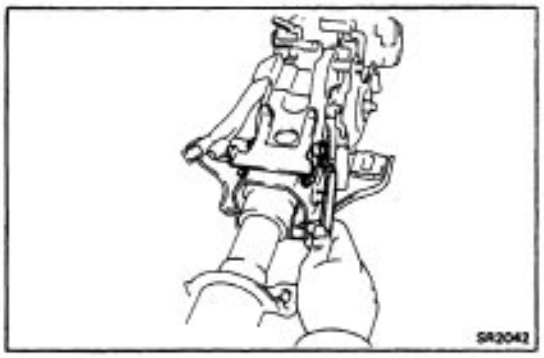
1. REMOVE INTERMEDIATE SHAFT

(a) Remove the bolt from the main shaft.



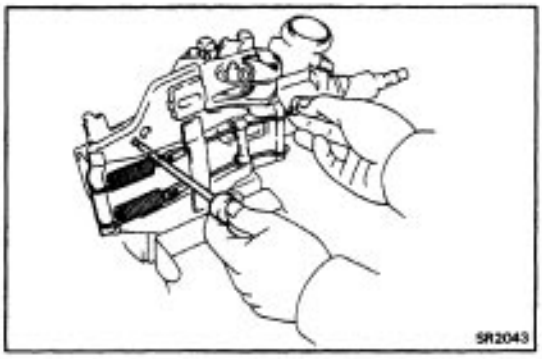
(b) Remove the two thrust stopper set bolts.

(e) Pull out the intermediate shaft from the column tube.



2. REMOVE COLUMN TUBE

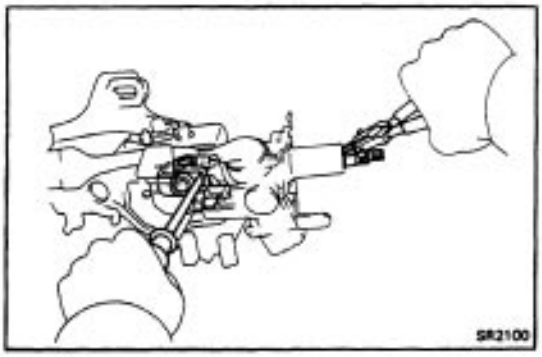
Remove the four bolts and column tube.



3. REMOVE TENSION SPRINGS AND CORDS

(a) Fully tilt the main shaft upward.

(b) Using a screwdriver, pry out the cord tip and remove the spring and cord.



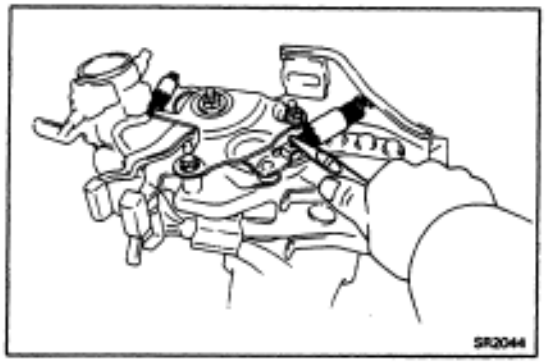
4. REMOVE MAIN SHAFT

(a) Using a screwdriver, push the main shaft.

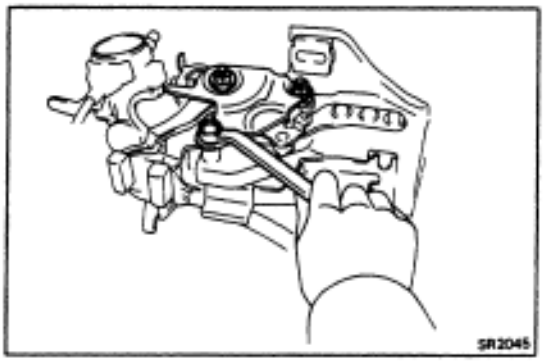
(b) Using snap ring pliers, remove the snap ring.

(e) Pull out the main shaft.

(d) Remove the spring and collar from the main shaft.

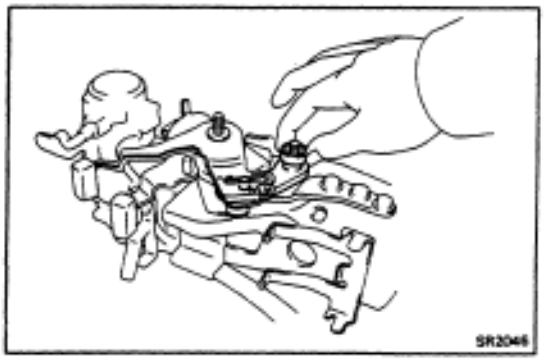


5. REMOVE TWO TENSION SPRINGS



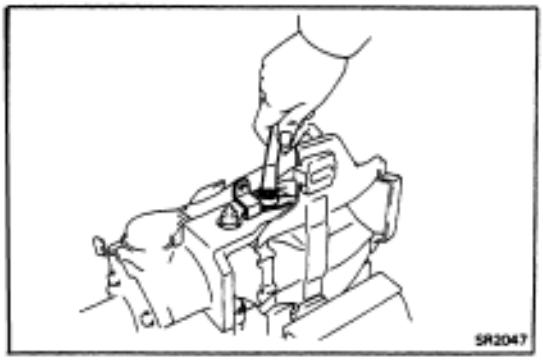
6. REMOVE TILT LEVER RETAINER

(a) Remove the bolt, collar and cushion.
(b) Remove the two nuts and tilt lever retainer.



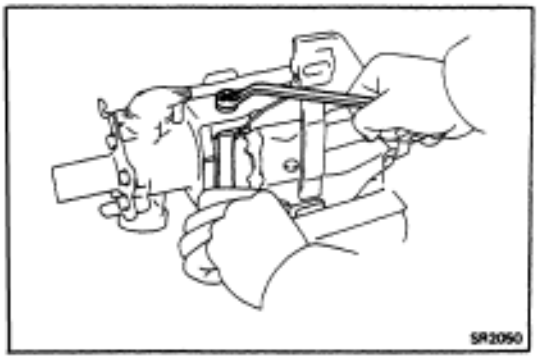
7. REMOVE TILT PAWL

(a) Remove the spacer and pin.
(b) Remove the tilt pawl and collar.



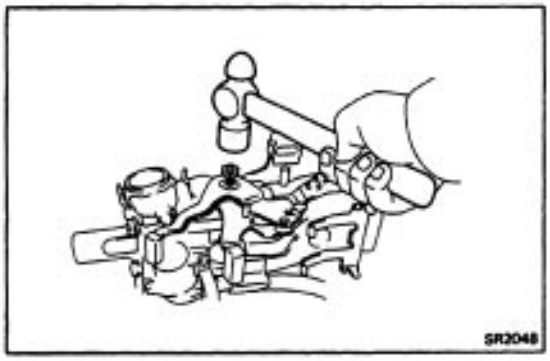
8. REMOVE STOPPER BOLT

(a) Remove the nut and column cover support.
(b) Tap out the stopper bolt and cushion.

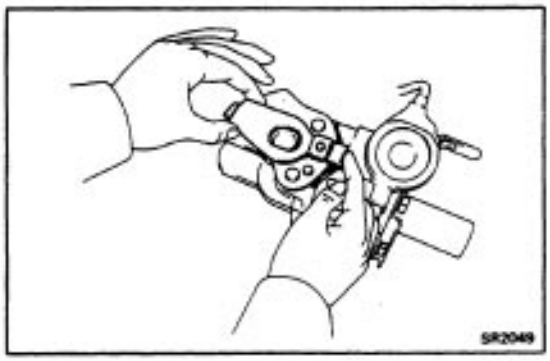


9. REMOVE COLUMN UPPER BRACKET

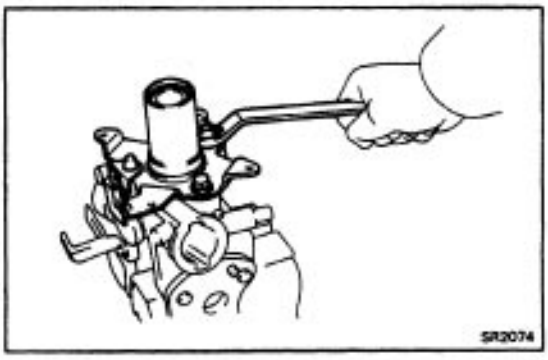
(a) Remove the nut and set bolt.



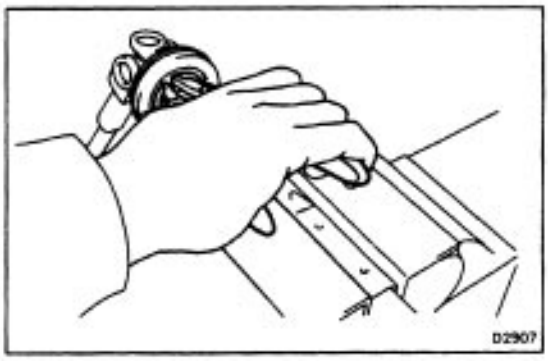
(b) Temporarily install the nut to the serration bolt end for protection, and tap out the serration bolt from the breakaway bracket.
(e) Remove the upper bracket.
(d) Remove the two collars, shim and tilt levers from the upper bracket.



10. REMOVE ADJUSTING MEMORY COVER

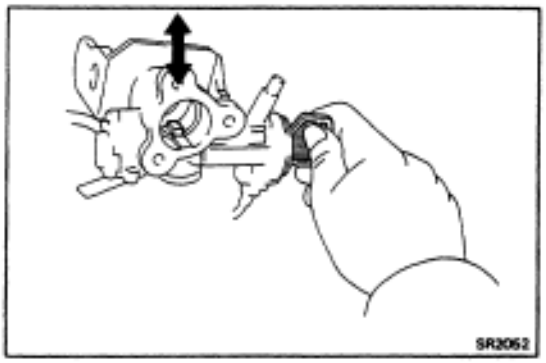


11. REMOVE UPPER TUBE
(a) Loosen the tapered–head bolt by tapping the chisel.
(b) Remove the three bolts and upper tube.



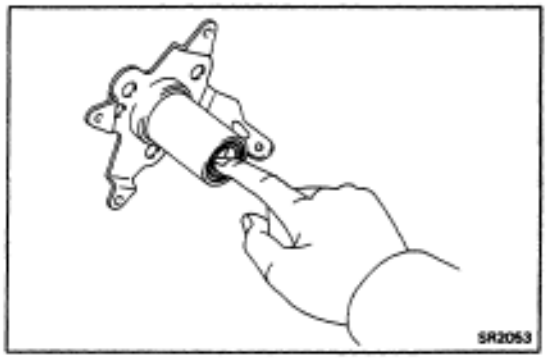
12. REMOVE THRUST STOPPER
(a) Using snap ring pliers, remove the snap ring and thrust stopper.
(b) Remove the O–ring from the thrust stopper.

INSPECTION AND REPLACEMENT OF STEERING COLUMN



1. INSPECT STEERING LOCK OPERATION

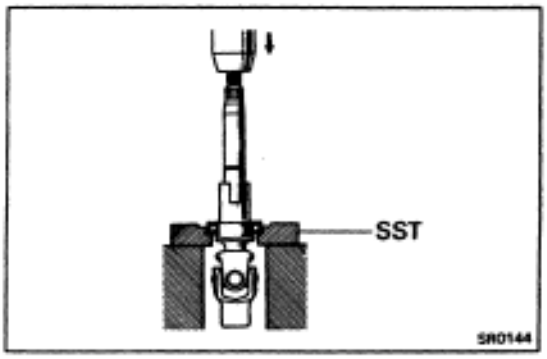
Check that the steering lock mechanism operates properly.



2. INSPECT MAIN SHAFT UPPER BEARING

Check the upper bearing rotation condition and check for abnormal noise.

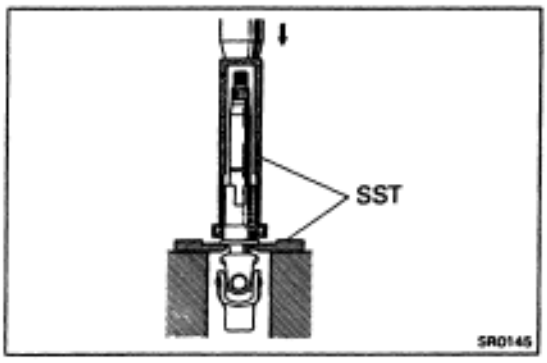
If the bearing is worn or damaged, replace the upper tube.



3. IF NECESSARY, REPLACE MAIN SHAFT BEARING

(a) Using SST, press out the bearing.

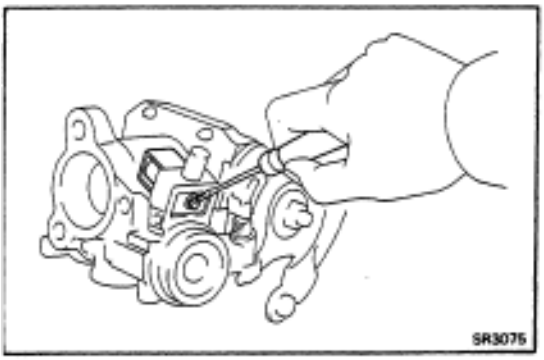
SST 09527–20011



(b) Pack MP grease into a new bearing.

(c) Using SST, press in the bearing to the main shaft.

SST 09236–00101 (09237–00010),09612–22011



4. INSPECT KEY INTERLOCK SOLENOID

(See page AT–41 1)

5. IF NECESSARY, REPLACE KEY INTERLOCK SOLENOID

(a) Using a screwdriver, remove E–ring and the cover.

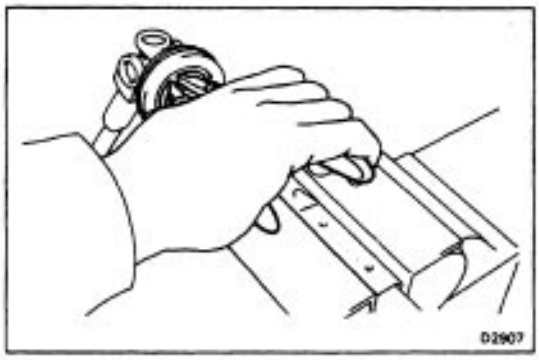
(b) Remove two screws and the solenoid.

(c) Install a new solenoid with two screws.

(d) Install the cover and E–ring over the two springs.

ASSEMBLY OF STEERING COLUMN

(See page SR–9)

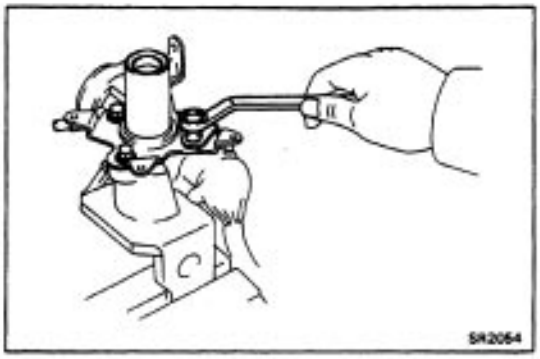


1. COAT ALL RUBBING PARTS WITH MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE

2. INSTALL THRUST STOPPER

(a) Install a new O–ring to the thrust stopper.

(b) Install the thrust stopper and snap ring with snap ring pliers.



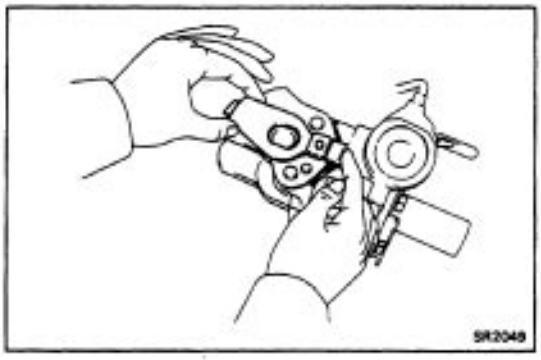
3. INSTALL UPPER TUBE

(a) Install the upper tube with the three bolts and cord guide.

(b) Torque the two bolts.

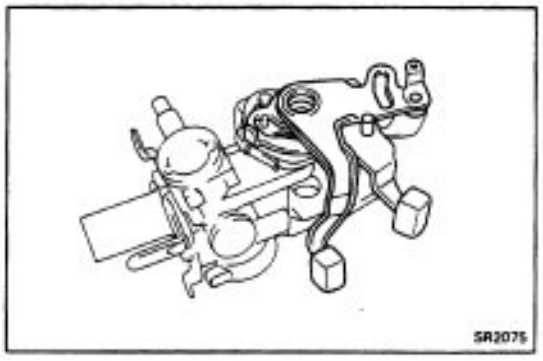
Torque: 185 k9–cm (13 ft–lb, 18 N–m)

(c) Tighten the tapered–head bolt until the bolt head breaks off.

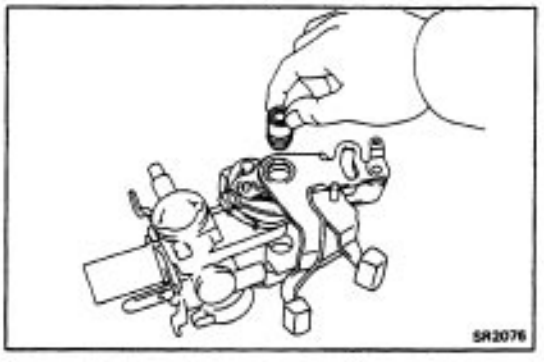


4. INSTALL ADJUSTING MEMORY COVER

Install the adjusting memory cover to the ratchet of the column upper bracket.



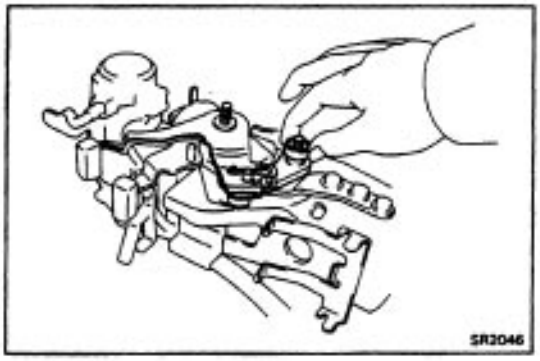
5. INSTALL TILT ADJUST LEVER AND CONTROL LEVER



6. SELECT COLLAR NO.1

Select a collar No. 1 which will eliminate all play.

Outer diameter mm(in.)
17.989 — 17.996 (0.7082 — 0.7085)
17.996 — 18.003 (0.7085 — 0.7088)
18.003 — 18.010 (0.7088 — 0.7091)
18.010 — 18.017 (0.7091 — 0.7093)
18.017 — 18.024 (0.7093 — 0.7096)



7. INSTALL COLLAR NO. 1

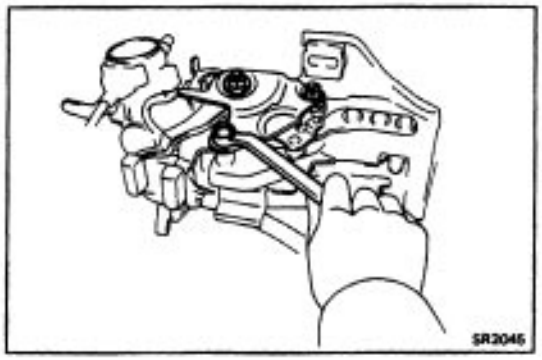
8. INSTALL UPPER BRACKET TO BREAKAWAY BRACKET

9. INSTALL TILT PAWL

(a) Pull up the control lever.

(b) Install the collar and tilt pawl to the set bolt.

(c) Install the spacer and release pin.



10. INSTALL TILT LEVER RETAINER

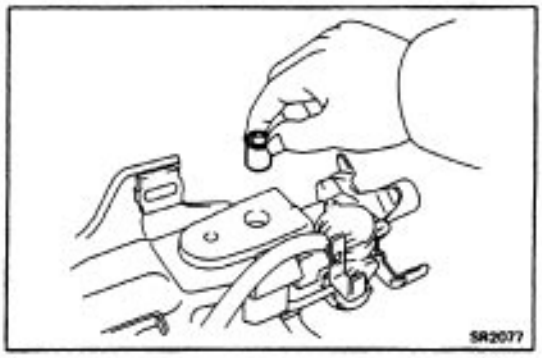
(a) Insert the serration bolt.

(b) Install the tilt lever retainer with the collar, cushion and bolt.

Torque: 195 kg–cm (14 ft–lb, 19 N–m)

(c) Install the two washers and two nuts.

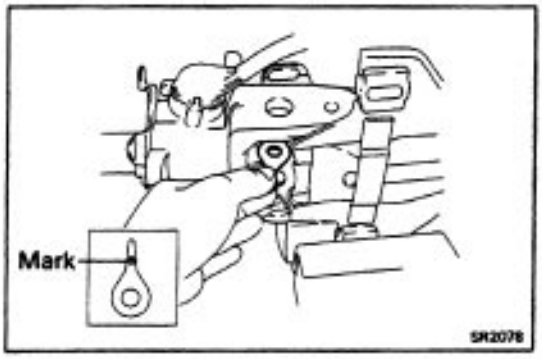
Torque: 195 kg–cm (14 ft–lb, 19 N–m)



11. SELECT COLLAR NO.2

Select a collar No–2 which will eliminate all play.

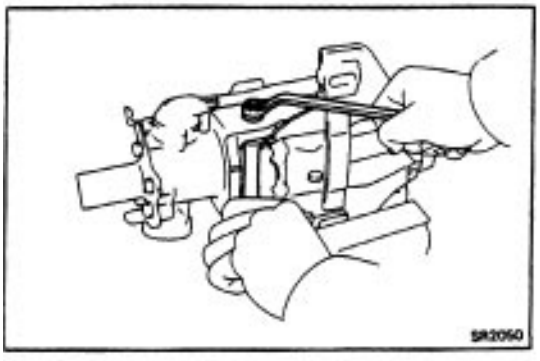
Outer diameter mm(in.)
17.982 — 18.000 (0.7080 — 0.7087)
18.000 — 18.018 (0.7087 — 0.7094)



12. SELECT SHIM

Select one or two shims which fit snugly when pressed in by hand.

Mark	Thickness mm (in.)
None	0.17—0.23 (0.0067—0.0091)
5	0.45—0.55 (0.0177—0.0217)
8	0.75—0.85 (0.0295—0.0335)
14	1.35—1.45 (0.0531—0.0571)
18	1.75—1.85 (0.0689—0.0728)

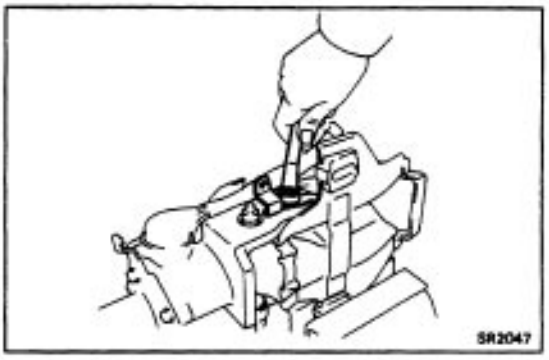


13. INSTALL COLLAR NO.2 AND SHIM

(a) Install the collar No.2 and shim.

(b) Install the bolt, washer and nut.

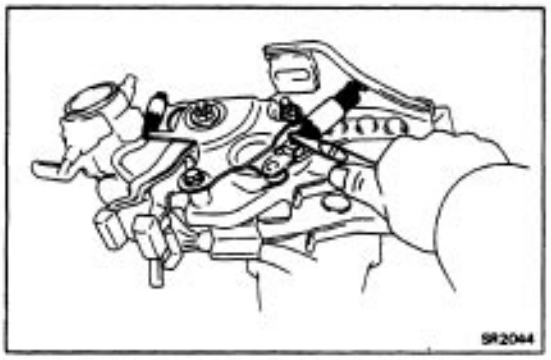
Torque: 195 kg–cm 114 ft–lb, 19 N–m)



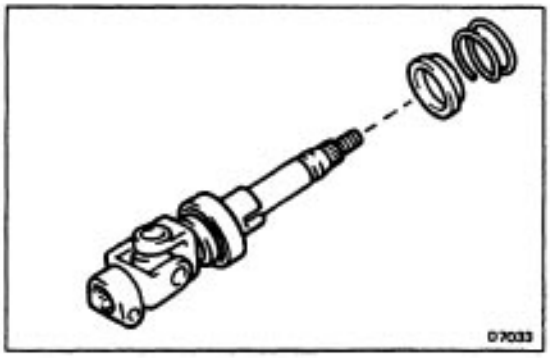
14. INSTALL STOPPER6OLT

(a) Install the cushion to the stopper bolt.
(b) Install the stopper bolt, column cover support and nut.

Torque: 110 kg–cm (8 ft–lb, 11 N–m)

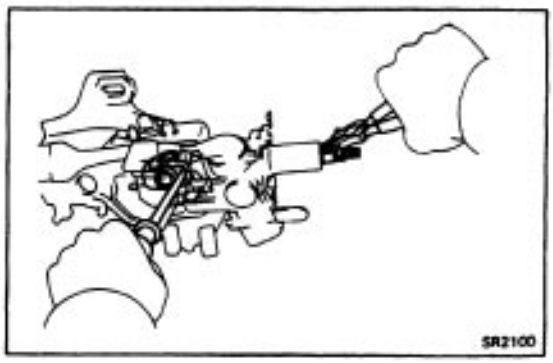


15. INSTALL TWO TENSION SPRINGS

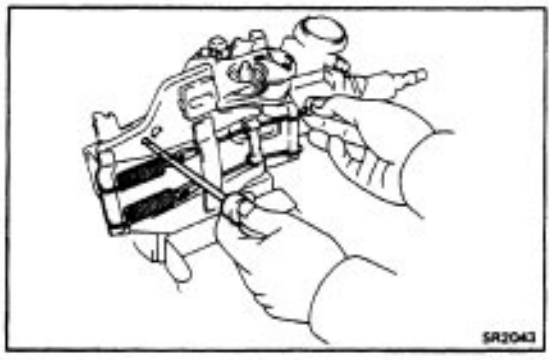


16. INSTALL MAIN SHAFT

(a) Place the ignition key at the ACC position.
(b) Install the collar and spring to the main shaft and insert the main shaft into the upper bracket.

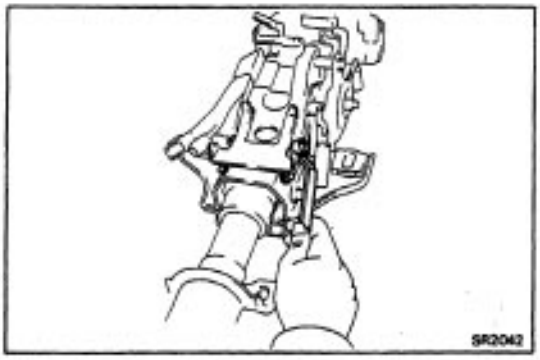


(c) Using a screwdriver, push the main shaft to the main shaft end.
(d) Using snap ring pliers, install the snap ring.



17. INSTALL TENSION SPRINGS AND CORDS

(a) Fully tilt the main shaft upward.
(b) Connect the spring and cord, and hook the spring to the hanger.
(c) Using a screwdriver, hook the cord end to the column upper bracket.

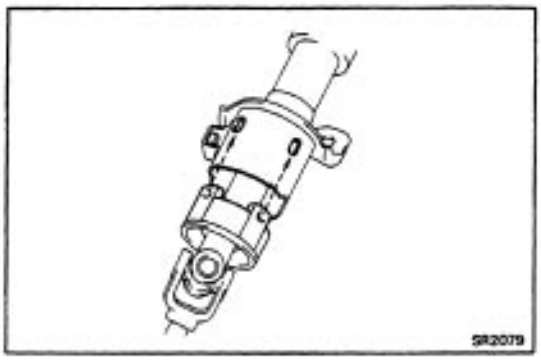


18. INSTALL COLUMN TUBE TO BREAKAWAY BRACKET

(a) Install the column tube to the breakaway bracket.

(b) Install and torque the four bolts.

Torque: 185 kg–cm (13 ft–lb, 18 N–m)

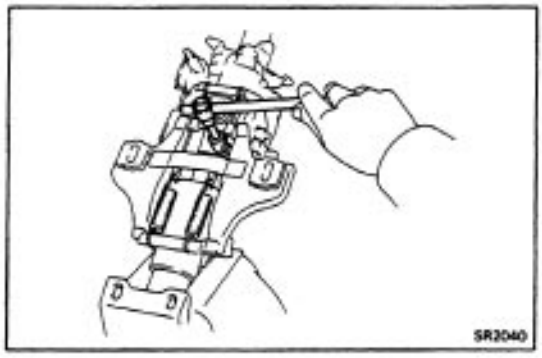


19. INSTALL INTERMEDIATE SHAFT TO COLUMN TUBE

(a) Coat the thrust stopper with molybdenum disulphide lithium base grease.

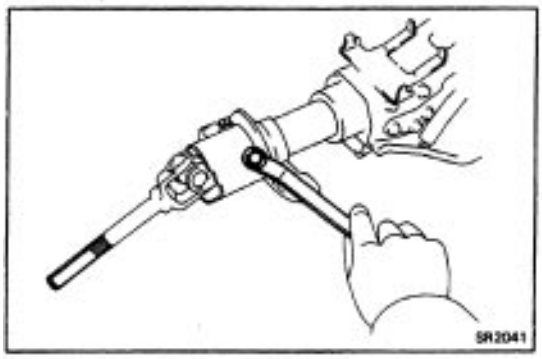
(b) Install the intermediate shaft to the column tube.

(c) Install the dust cover.



(d) Connect the universal joint of the main shaft and intermediate shaft.

Torque: 260 kg–cnn (19 ft–lb, 25 N–m)



(e) Install and torque the two bolts with the plate washers.

Torque: 130 kg–cm (9 ft–lb, 13 N–m)

20. CHECK OPERATION OF TILT STEERING LEVER AND SUPPORT

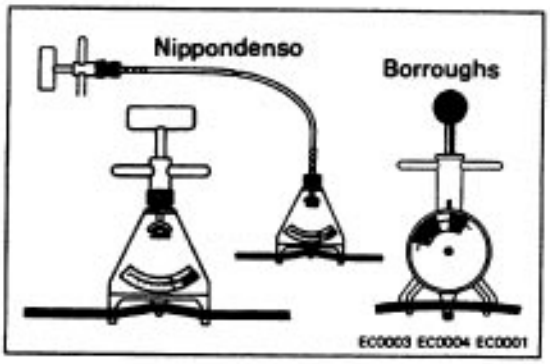
(a) Check that there is no axial or horizontal play at the end of the main shaft.

(b) Using the tilt adjust lever, check that the main shaft locks securely in all positions.

(c) With the main shaft in the neutral position, pull the tilt control lever and check that the main shaft rises to the uppermost position.

(d)

- Pull the tilt adjust lever, and set the main shaft to the lowermost position.
- Pull the tilt control lever, and raise the main shaft to the uppermost position.
- Lower the main shaft, and check that it locks in the lowermost position.



On–Vehicle Inspection

CHECK DRIVE BELT TENSION

Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

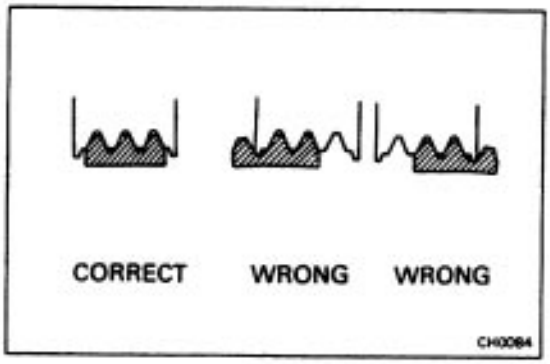
Nippondenso BTG–20 (95506–00020) or
Borroughs No.BT–33–73F

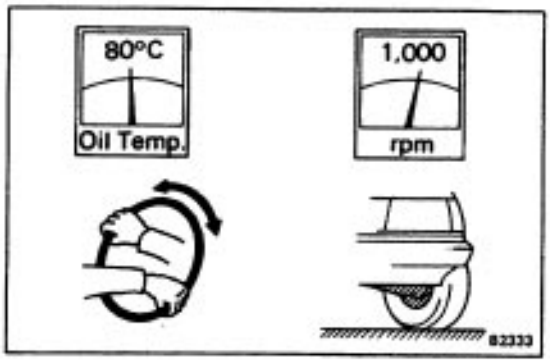
Drive belt tension:

New belt 125 ± 25 lb
Used belt 80 ± 20 lb

HINT:

- ”New belt” refers to a belt which has been less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves.



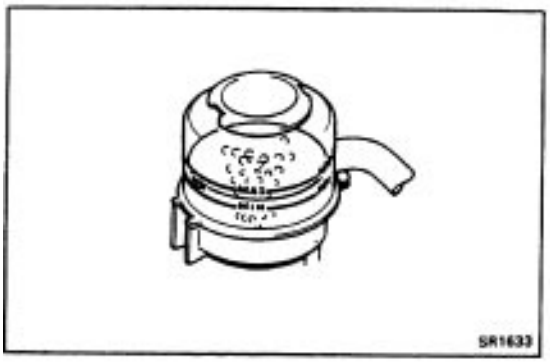


FLUID LEVEL CHECK

1. **KEEP VEHICLE LEVEL**
2. **BOOST FLUID TEMPERATURE**

   With the engine idling at 1,000 rpm or less, turn the steering wheel from lock to lock several times to boost fluid temperature.

   Fluid temperature: 80˚C (176˚F)



3. **CHECK FOR FOAMING OR EMULSIFICATION**

   HINT: Foaming and emulsification indicate either the existence of air in the system or that the fluid level is too low.

4. **CHECK FLUID LEVEL IN RESERVOIR**

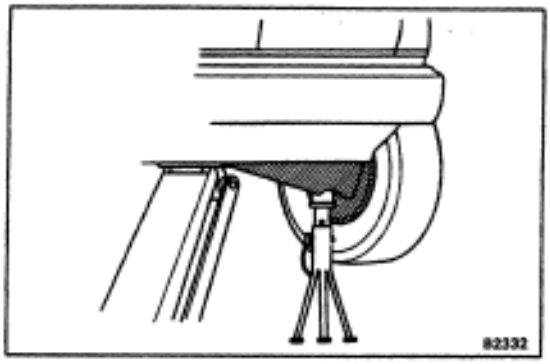
   Check the fluid level and add fluid if necessary.

   Fluid: ATF DEXRON II

   HINT: Check that the fluid level is within the HOT LEVEL of the tank. If the fluid is cold, check that it is within the COLD LEVEL of the tank.

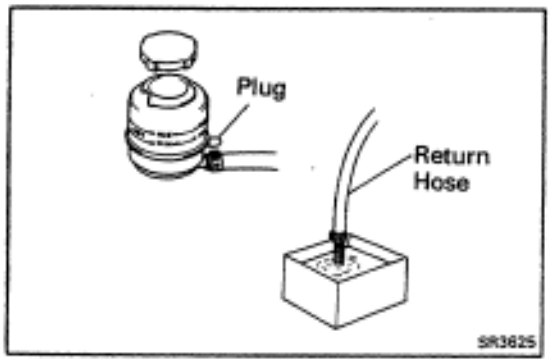
CHECK IDLE–UP

1. **WARM UP ENGINE**
2. **TURN AIR CONDITIONER SWITCH OFF**
3. **CHECK IDLE–UP**
   (a) Fully turn the steering wheel.
   (b) Check that the engine rpm decreases when the air control valve hose is pinched.
   (c) Check that the engine rpm increases when the air control valve hose is released.

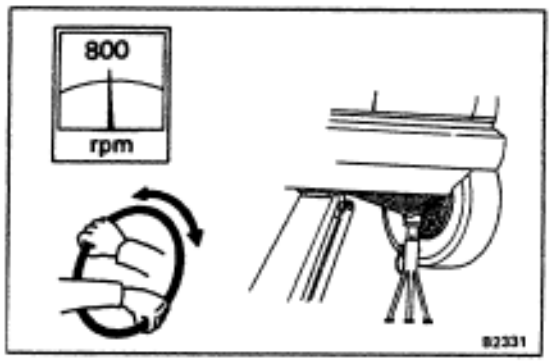


REPLACEMENT OF POWER STEERING FLUID

1. JACK UP FRONT OF VEHICLE AND SUPPORT IT WITH STANDS

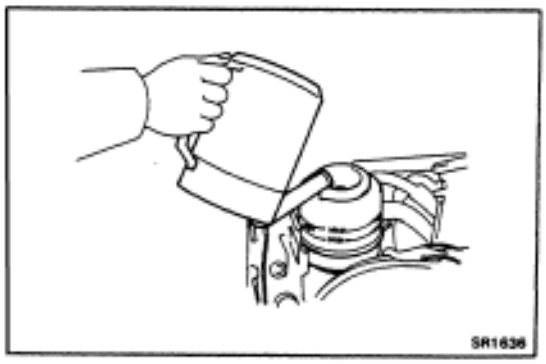


2. REMOVE FLUID RETURN HOSE FROM RESERVOIR TANK AND DRAIN FLUID INTO CONTAINER

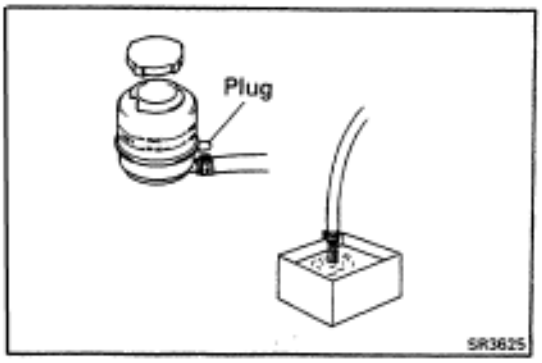


3. WITH ENGINE IDLING, TURN STEERING WHEEL FROM LOCK TO LOCK WHILE DRAINING FLUID

4. STOP ENGINE



5. FILL RESERVOIR TANK WITH FRESH FLUID
Fluid type: ATF DEXRON II

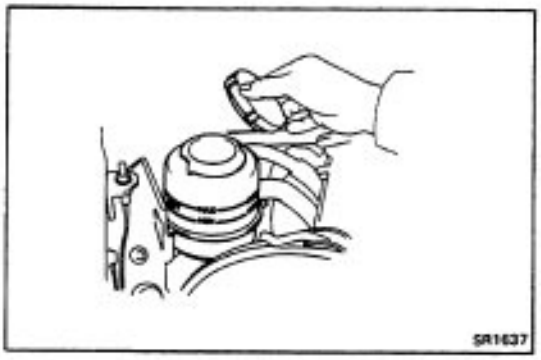


6. START ENGINE AND RUN IT AT 1,000 RPM
After 1 or 2 seconds, fluid will begin to discharge from the return hose. Stop the engine immediately at this time.
NOTICE: Take care that some fluid remains left in the reservoir tank.

7. REPEAT STEPS 5 AND 6 FOUR OR FIVE TIMES UNTIL THERE IS NO MORE AIR IN FLUID

8. CONNECT RETURN HOSE TO RESERVOIR TANK

9. BLEED POWER STEERING SYSTEM



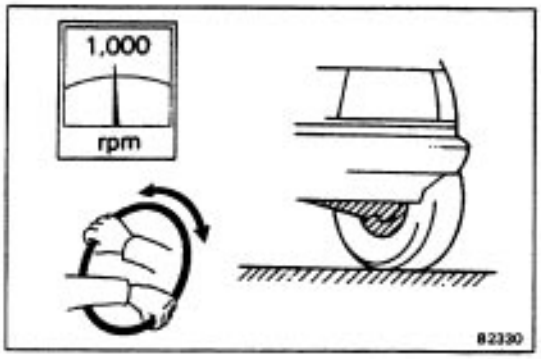
BLEEDING OF POWER STEERING SYSTEM

1. CHECK FLUID LEVEL IN RESERVOIR TANK

Check the fluid level and add fluid if necessary.

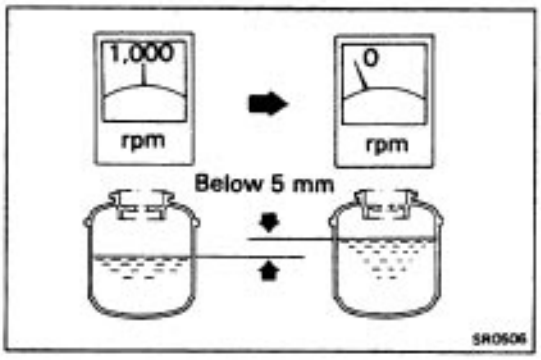
Fluid: ATF DEXRON II

HINT: Check that the fluid level is within the HOT LEVEL of the tank If the fluid is cold, check that it is within the COLD LEVEL of the tank.



2. START ENGINE AND TURN STEERING WHEEL FROM LOCK TO LOCK THREE OR FOUR TIMES

With the engine speed below 1,000 rpm, turn the steering wheel to left or right full lock and keep it there for 2 – 3 seconds, then turn the wheel to the reverse full lock and keep it there for 2 3 seconds.

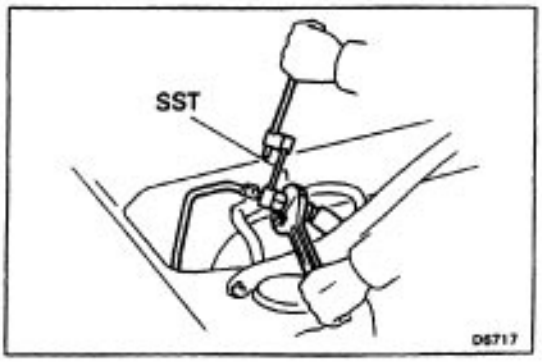


3. CHECK THAT FLUID IN RESERVOIR IS NOT FOAMY OR CLOUDY AND DOES NOT RISE OVER MAXIMUM WHEN ENGINE IS STOPPED

Measure the fluid level with the engine running. Stop the engine and measure the fluid level.

Maximum rise: 5 mm (0.20 in.)

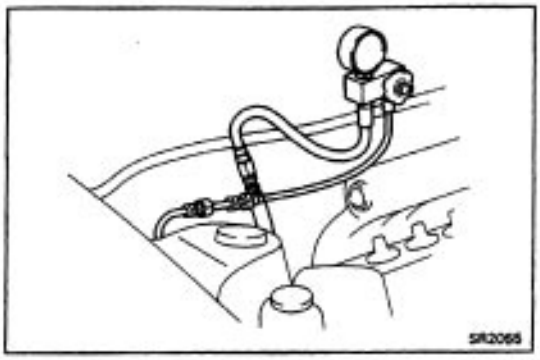
If a problem is found, repeat steps 5 to 8 on page SR–23– Repair the PS if the problem persists.



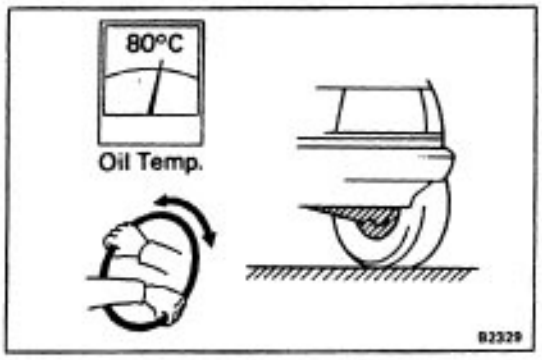
OIL PRESSURE CHECK

1. CONNECT PRESSURE GAUGE

(a) Using SST, disconnect the pressure line joint.
SST 09631–22020

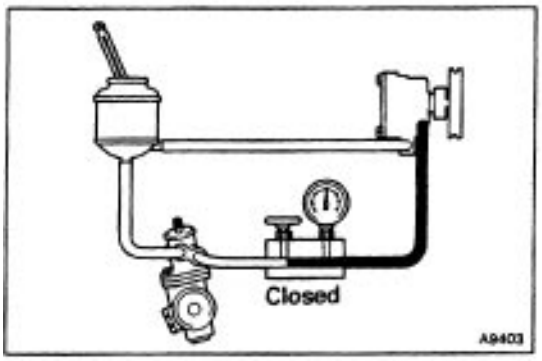


(b) Connect the gauge side of the pressure gauge to the PS pump, and the valve side to the pressure line.
(c) Bleed the system. Start the engine and turn the steering wheel from lock to lock two or three times.
(d) Check that the fluid level is correct.



2. CHECK THAT FLUID TEMPERATURE IS AT LEAST 80˚C (176˚F)

3. START ENGINE AND RUN IT AT IDLE



4. CHECK FLUID PRESSURE READING WITH VALVE CLOSED

Close the pressure gauge valve and observe the reading on the gauge.

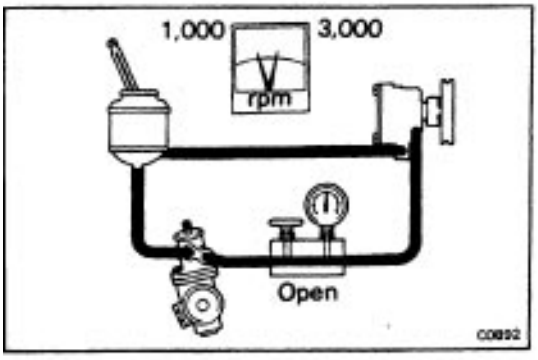
Minimum pressure:

(VZV series) 75 kg/crn^2 (1,067 psi, 7,355 kPa)
(Others) 65 kg /crm^2 (924 psi, 6,374 kPa)

NOTICE:

- **Do not keep the valve closed for more than 10 seconds.**
- **Do not let the fluid temperature become too high. If pressure is low, repair or replace the PS pump.**

5. OPEN VALVE FULLY .

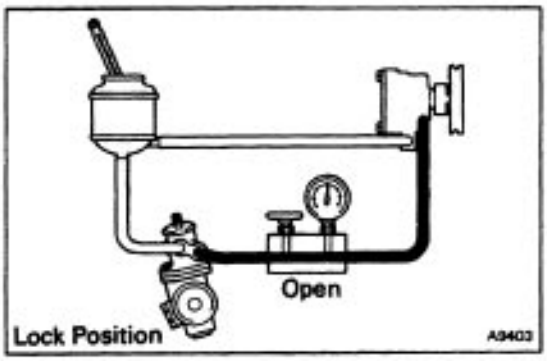


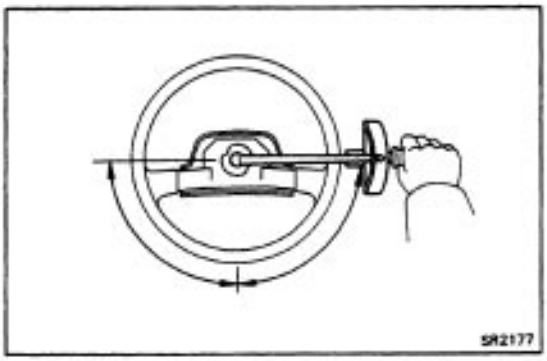
6. CHECK AND RECORD PRESSURE READING AT 1,000 RPM

7. CHECK AND RECORD PRESSURE READING AT 3,000 RPM

Check that there is 5 kg /cm^2 (71 psi, 490 kPa) or less difference in pressure between the 1,000 rpm and 3, rpm checks.

If the difference is excessive, repair or replace the flow control valve of the PS pump.





8. CHECK PRESSURE READING WITH STEERING WHEEL TURNED TO FULL LOCK

Be sure the pressure gauge valve is fully opened and the engine idling.

Minimum pressure:

(VZV series) 75 kg/cm^2 (1,067 psi, 7,355 kPa)
(Others) 65 kg/cm^2 (924 psi, 6,374 kPa)

NOTICE:

- **Do not maintain lock position for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**

If pressure is tow, the gear housing has an internal leak and must be repaired or replaced.

9. MEASURE STEERING EFFORT

Center the steering wheel and run the engine at idle.
Using a torque meter, measure the steering effort in both directions.

Maximum steering effort: 70 kg–cm (61 in.–lb, 6.9 N–m)

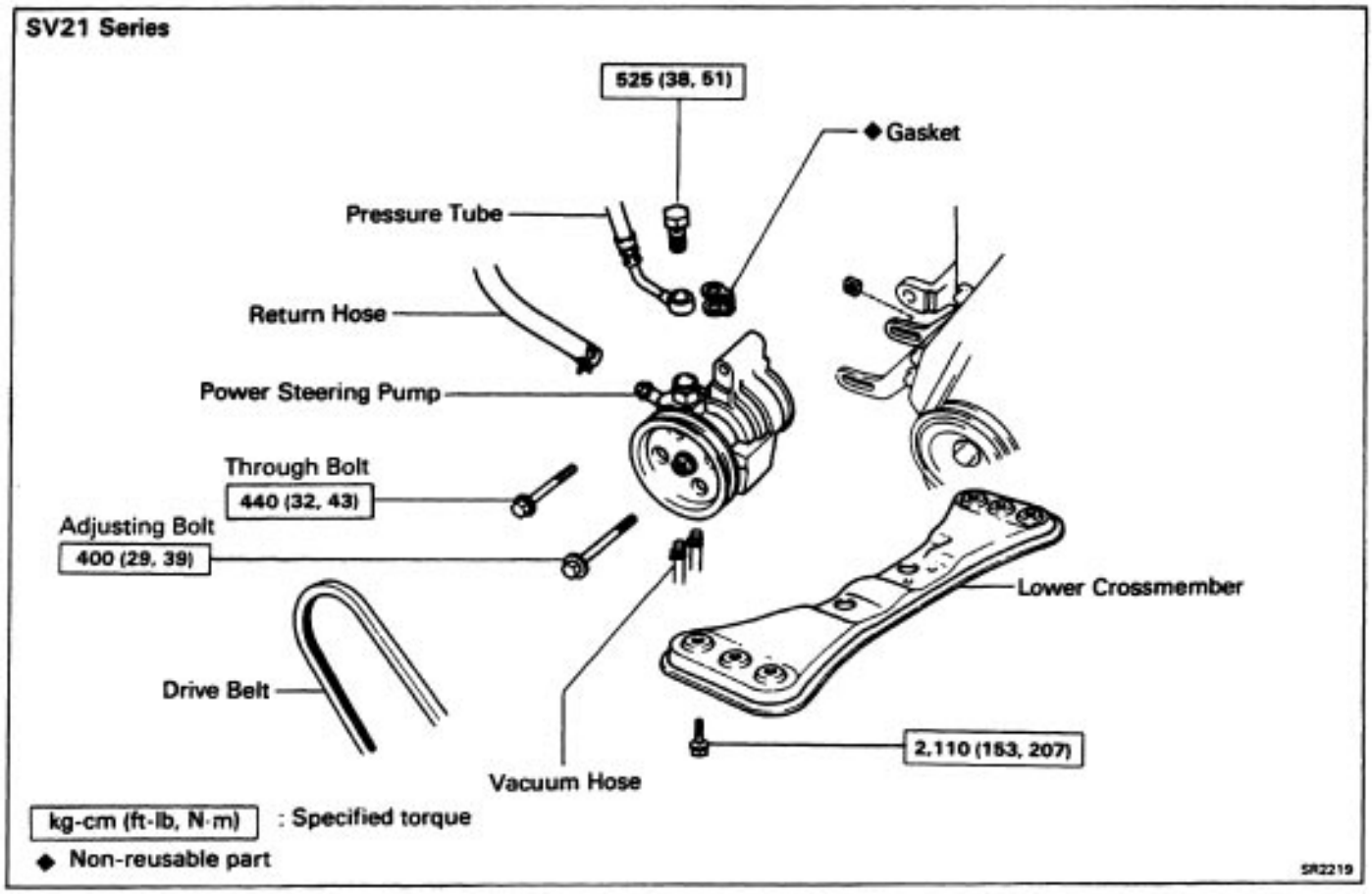
If steering effort is excessive, repair the power steering unit.

HINT: Be sure to consider the tire type, pressure and contact surface before making your diagnosis.

Power Steering Pump

REMOVAL AND INSTALLATION OF POWER STEERING PUMP (SV21 Series)

Remove and install the parts as shown.



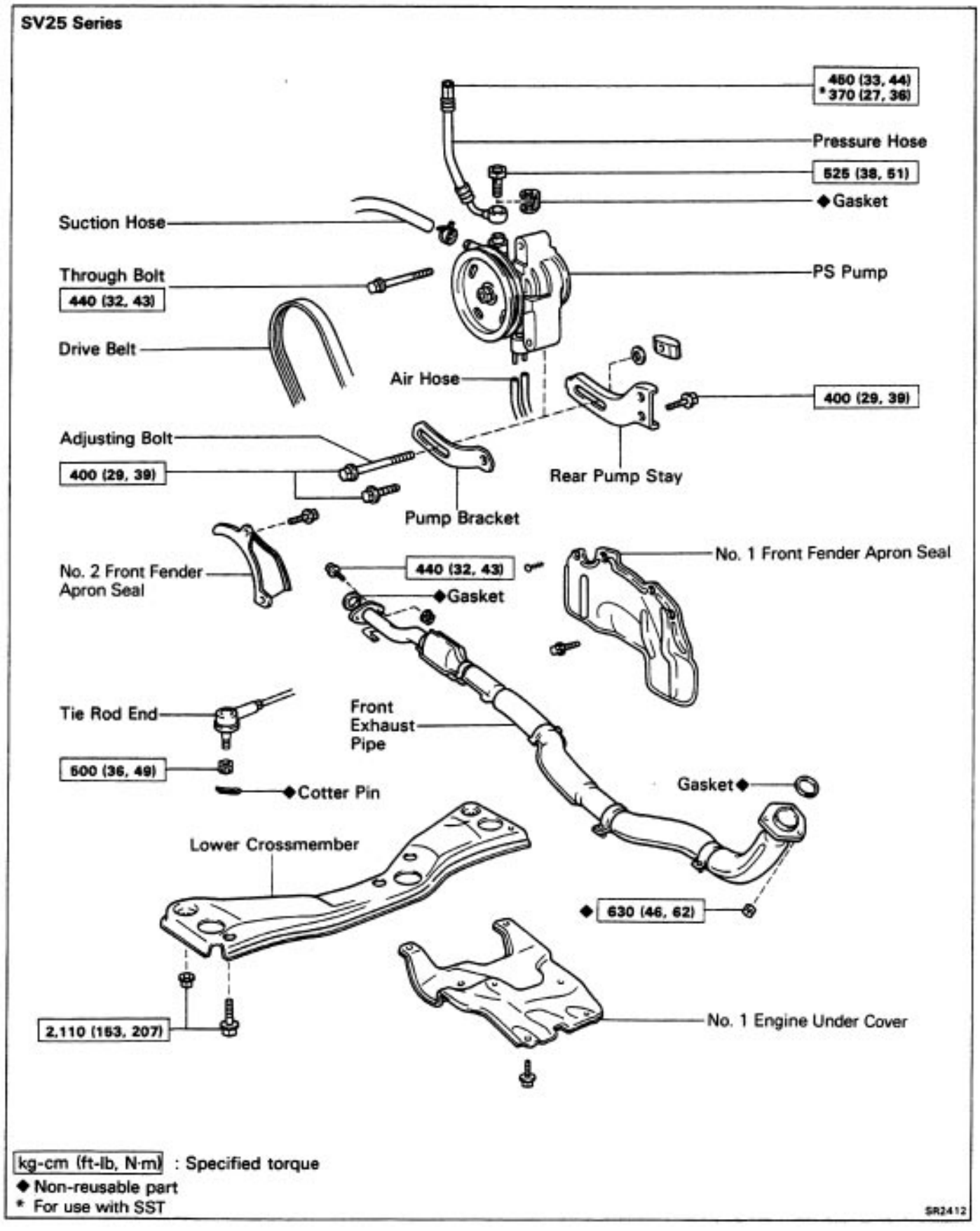
(MAIN POINT OF INSTALLATION)

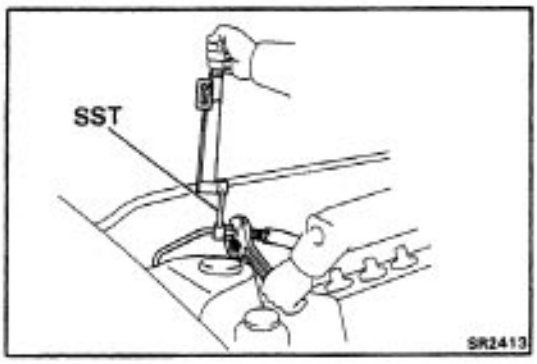
ADJUST DRIVE BELT TENSION AFTER INSTALLING PS PUMP

(See page SR–22)

REMOVAL AND INSTALLATION OF POWER STEERING PUMP (SV25 Series)

Remove and install the parts as shown.

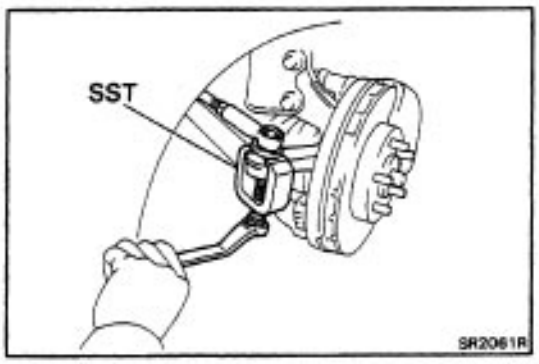




(MAIN POINTS OF REMOVAL AND INSTALLATION)

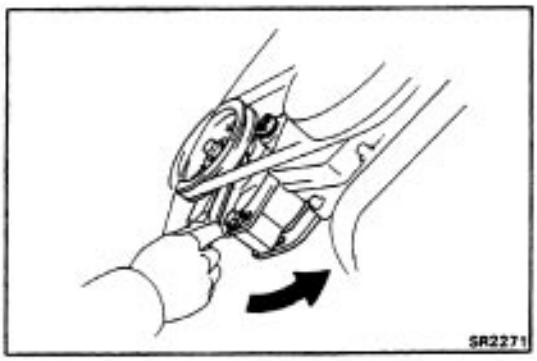
1. DISCONNECT AND CONNECT PRESSURE LINE

Using SST, disconnect and connect the pressure line.
SST 09631–22020
HINT: When connecting, use a torque wrench with a fulcrum length of 340 mm (13.39 in.).



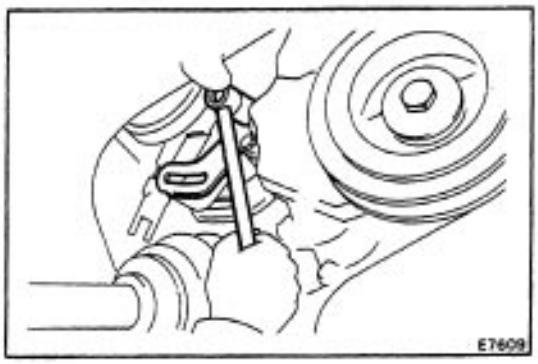
2. DISCONNECT TIE ROD END RH

(a) Remove the cotter pin and nut.
(b) Using SST, disconnect the tie rod end RH.
SST 09610–55012



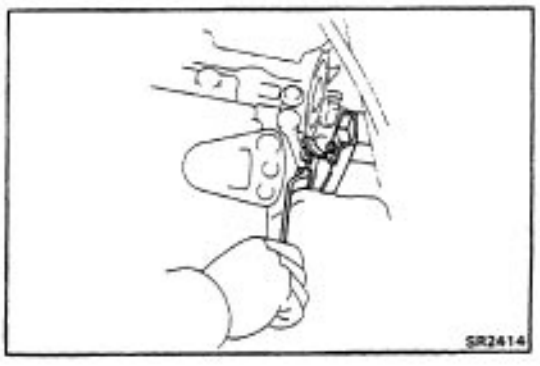
3. REMOVE DRIVE BELT

(a) Loosen the adjusting bolt and the through bolt and push the PS pump forward.
(b) Remove the drive belt.



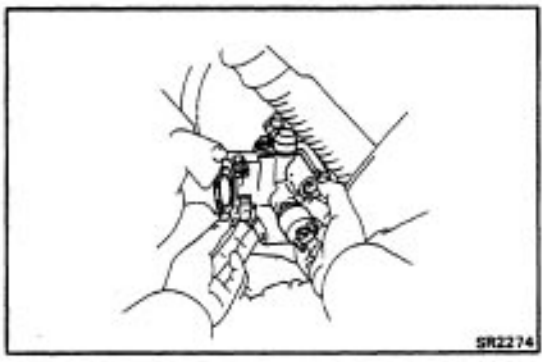
4. REMOVE PUMP BRACKET

(a) Remove the adjusting bolt.
(b) Remove the bolt and bracket.



5. REMOVE REAR PUMP STAY

Remove the two bolts and stay.



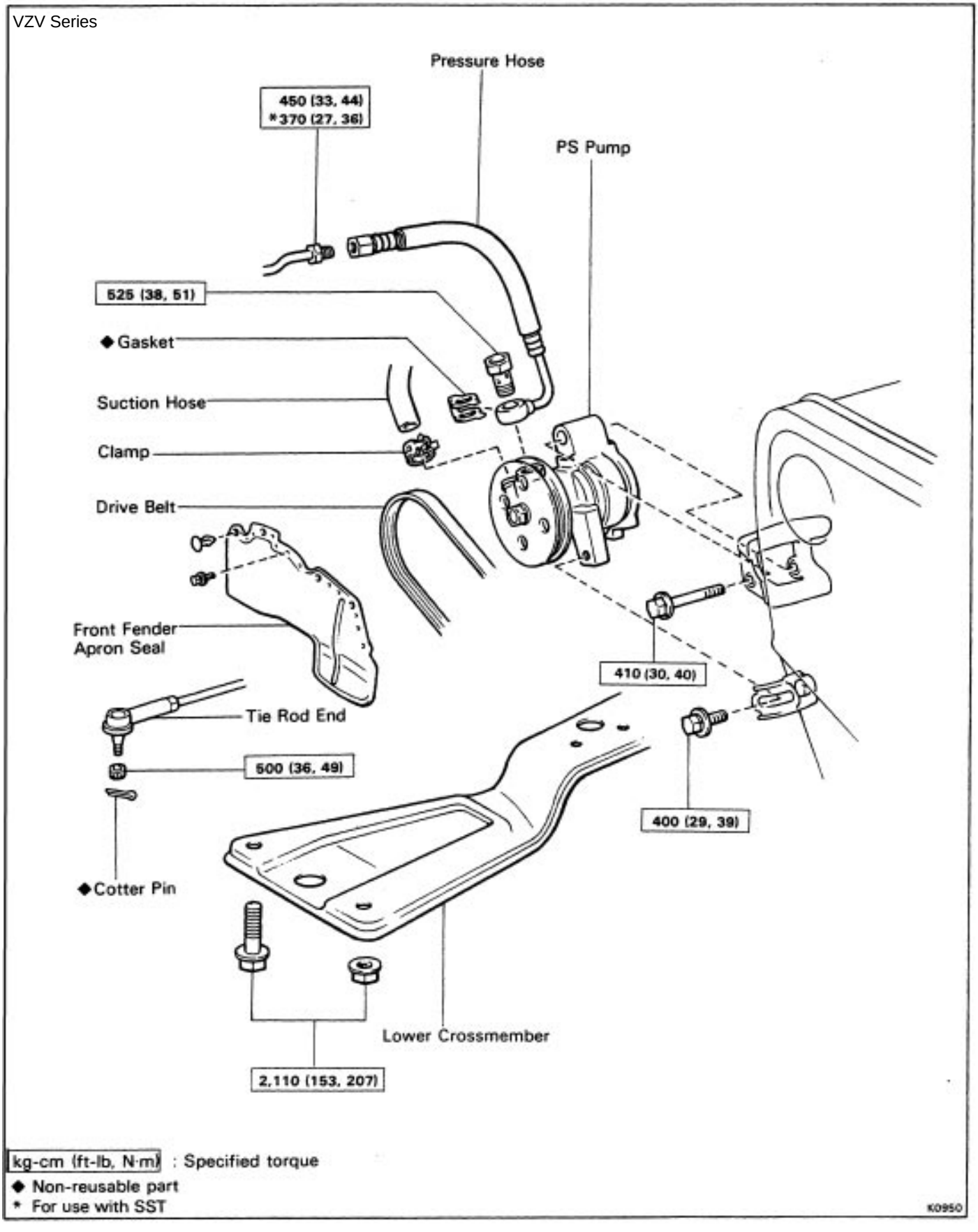
6. REMOVE PS PUMP WITH PRESSURE TUBE

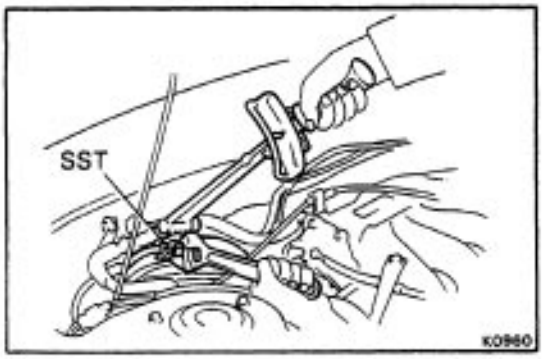
(a) Remove the through bolt.

(b) Remove the PS pump from the lower side of body.

REMOVAL AND INSTALLATION OF POWER STEERING PUMP (VZV Series)

Remove and install the parts as shown.

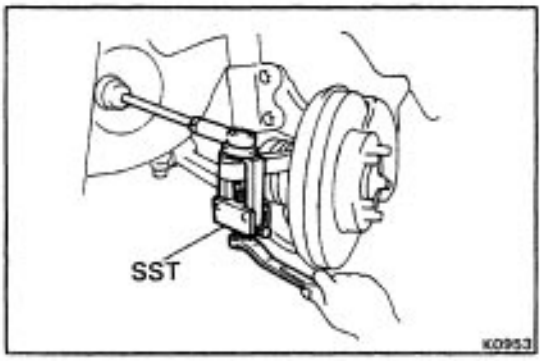




(MAIN POINTS OF REMOVAL AND INSTALLATION)

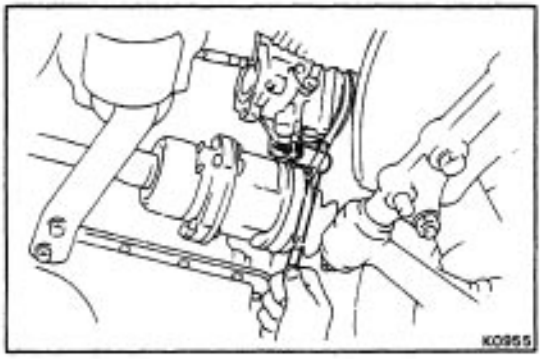
1. DISCONNECT AND CONNECT PRESSURE LINE

Using SST, disconnect and connect the pressure line.
SST 09631–22020
HINT: When connecting, use a torque wrench with a fulcrum length of 340 mm (13.39 in.).



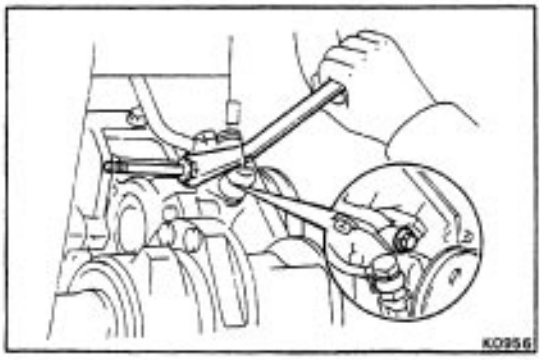
2. DISCONNECT TIE ROD END RH

(a) Remove the cotter pin and nut.
(b) Using SST, disconnect the tie rod end RH.
SST 09628–62011



3. REMOVE DRIVE BELT

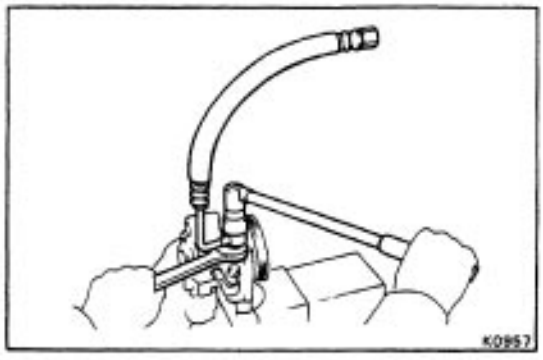
(a) Loosen the adjusting bolt.



(b) Loosen the through bolt and push the PS pump forward.
(c) Remove the drive belt.

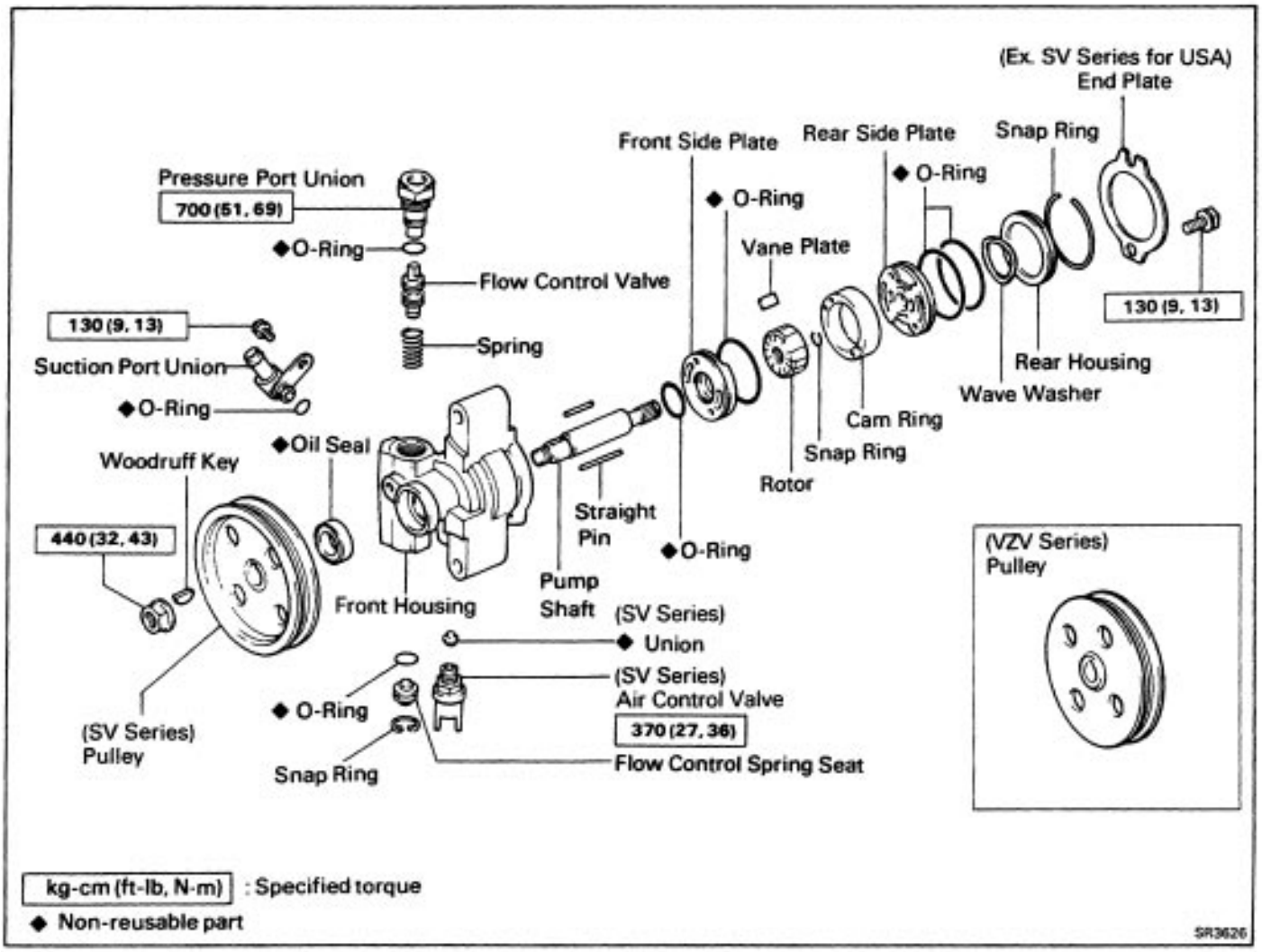
4. REMOVE PS PUMP WITH PRESSURE TUBE

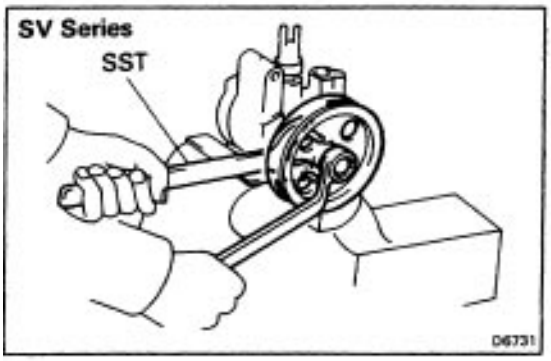
Remove the adjusting bolt and through bolt, then remove PS pump from the lower side of vehicle body.

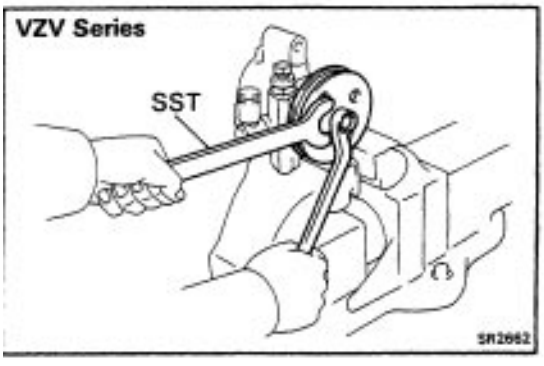


5. REMOVE PRESSURE TUBE

COMPONENTS

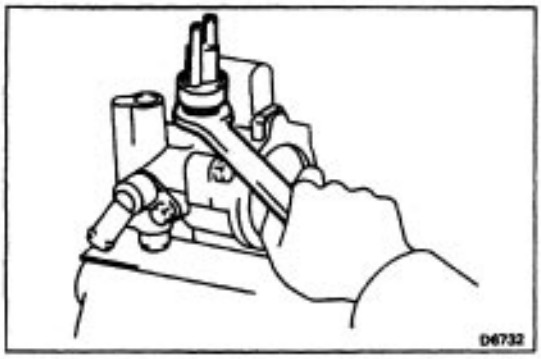




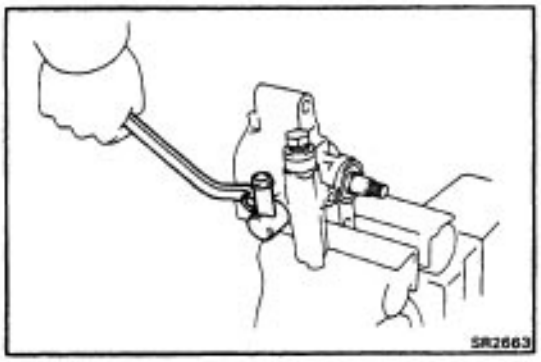


DISASSEMBLY OF POWER STEERING PUMP

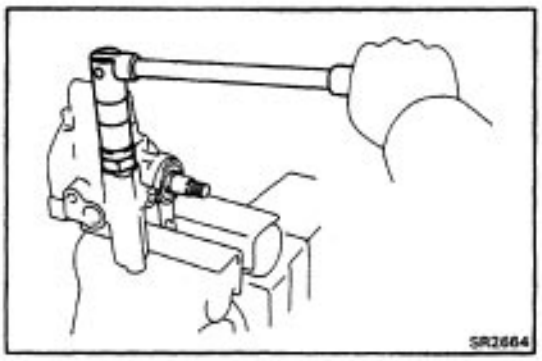
1. **MOUNT POWER STEERING PUMP !N VISE**
   NOTICE: Do not tighten the vise too tight.
2. **REMOVE PS PUMP PULLEY**
   (a) Using SST, remove the pulley set nut.
   SST 09616–30020 (For SV Series)
   SST 09616–22010 (For VZV Series)
   (b) Remove the pulley and woodruff key.
3. **(Ex. SV Series for USA)**
   REMOVE END PLATE



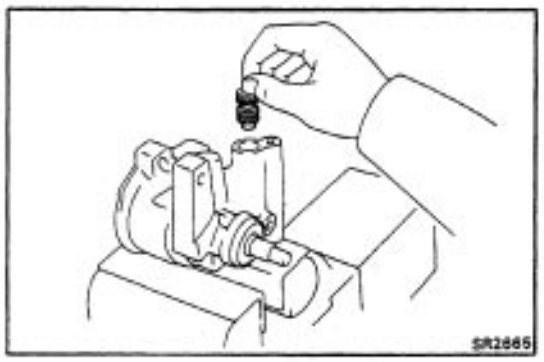
4. (SV Series)
REMOVE AIR CONTROL VALVE
(a) Remove the air control valve.
(b) Remove the union seat.



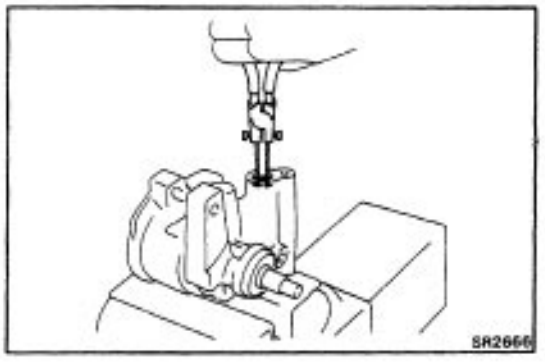
5. REMOVE SUCTION PORT UNION
(a) Remove the bolt and union.
(b) Remove the O–ring from the union.



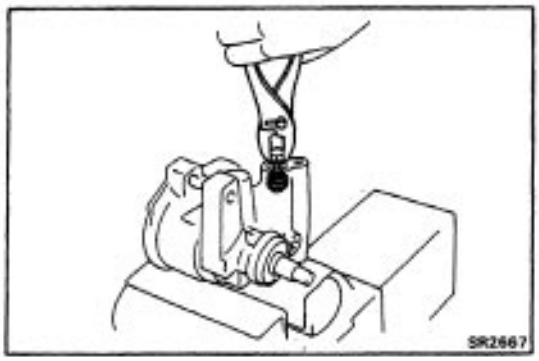
6. REMOVE FLOW CONTROL VALVE
(a) Remove the pressure port union.
(b) Remove the 0–ring from the union.



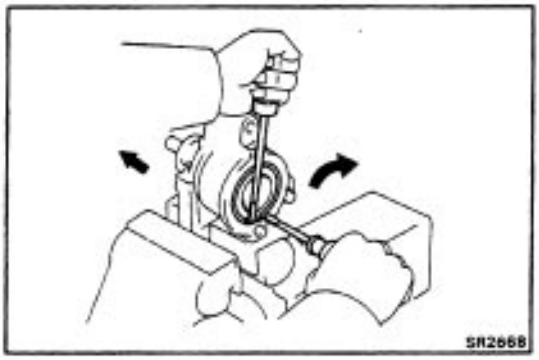
(e) Remove the flow control valve and spring.



7. REMOVE FLOW CONTROL SPRING SEAT
(a) Using snap ring pliers, remove the snap ring.

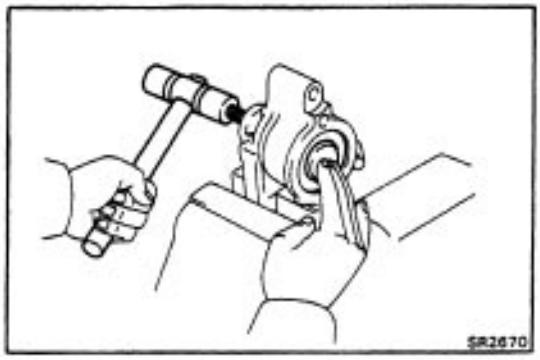


(b) Temporarily install a bolt to the seat and pull out the seat.
(c) Remove the O–ring from the seat.

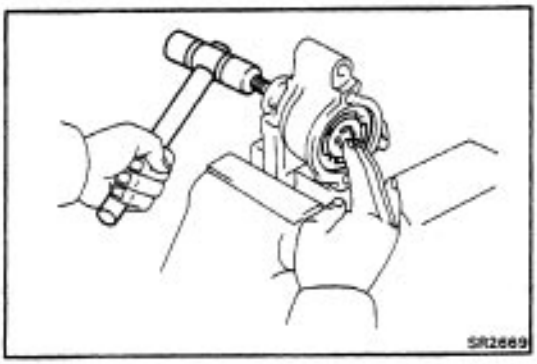


8. REMOVE REAR HOUSING

(a) Using two screwdrivers, remove the snap ring.

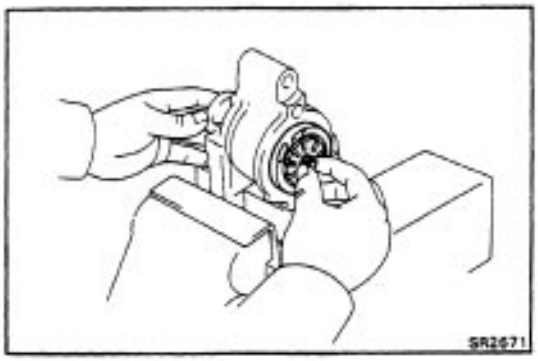


(b) Using a plastic hammer, tap out the rear housing and wave washer.
(c) Remove the O–ring from the rear housing.



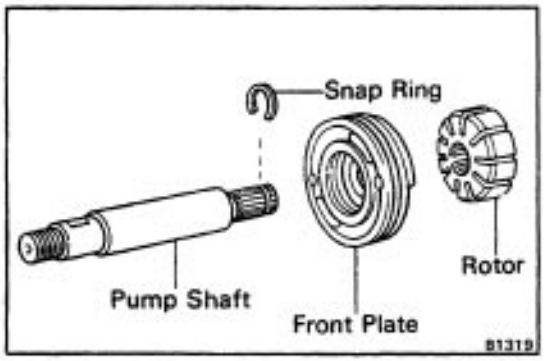
9. REMOVE REAR SIDE PLATE

(a) Using a plastic hammer, tap the shaft end and remove the rear plate.
(b) Remove the O–ring from the rear plate.



10. REMOVE PUMP SHAFT, CAM RING AND VANE PLATES

(a) Remove the pump shaft with cam ring, vane plates from the front housing.
(b) Remove the cam ring and ten vane plates from the pump shaft.
(c) Remove the long straight pin from the front housing.

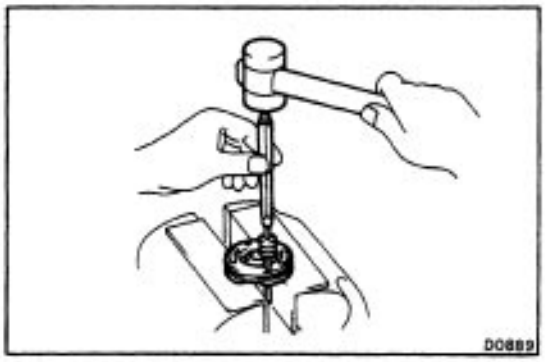


11. REMOVE ROTOR AND FRONT PLATE

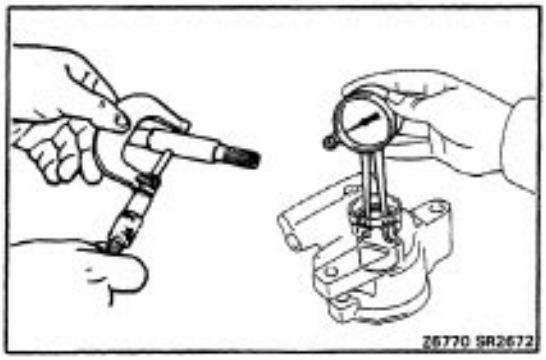
(a) Using a screwdriver, remove the snap ring.

(b) Remove the rotor and front plate from the pump shaft.

(c) Remove the two O–rings from the front plate.



(d) Using a pin punch and hammer, drive out the straight pin.



INSPECTION OF POWER STEERING PUMP

1. MEASURE OIL CLEARANCE OF SHAFT AND BUSHING

Using a micrometer and calipers, measure the oil clearance.

Standard clearance: 0.01 = 0.03 mm
(0.0004 – 0.0012 in.)

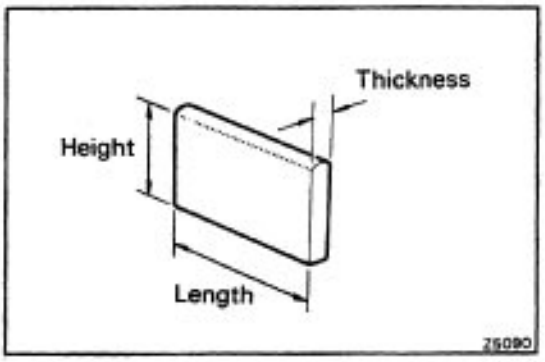
Maximum clearance: 0.07 mm (0.O028 in.)

If more than maximum, replace the entire power steering pump.

2. INSPECT ROTOR AND VANE PLATES

(a) Using a micrometer, measure the height, thickness and length of the vane plates.

Minimum height: 8.0 mm (0.315 in.)
Minimum thickness: 1.77 mm (0.0697 in.)
Minimum length: 14.97 mm (0.5894 in.)



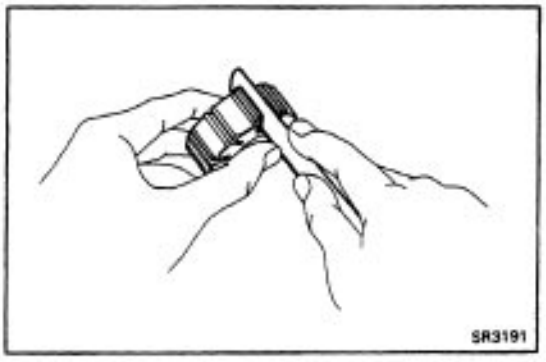
(b) Using a feeler gauge, measure the clearance between the rotor groove and vane plate.

Maximum clearance: 0.03 mm (0.0012 in.)

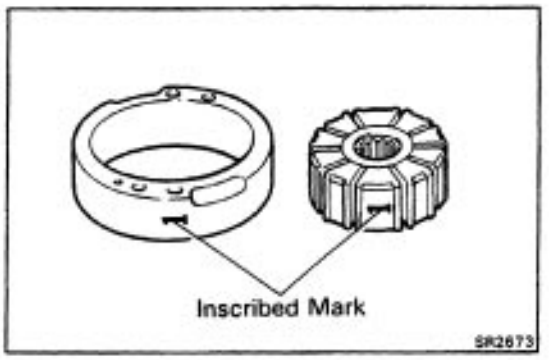
If more than maximum, replace the vane plate and/or rotor with one having the same mark stamped on the cam ring.

Inscribed mark: 1,2,3,4 or None

HINT: There are five vane lengths with the following rotor and cam ring marks:

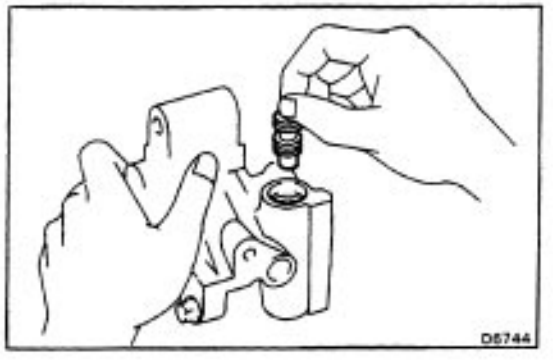


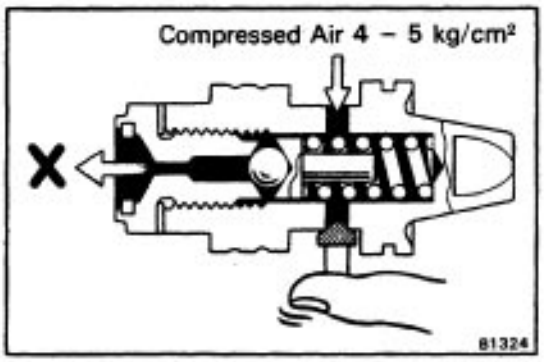
Rotor and cam ring mark	Vane length mm (in.)	
None	14.996 – 14.998	(0.5904 – 0.5905)
1	14.994 – 14.996	(0.5903 – 0.5904)
2	14.992 – 14.994	(0.5902 – 0.5903)
3	14.990 – 14.992	(0.59016 – 0.59024)
4	14.988 – 14.990	(0.5901 – 0.5902)



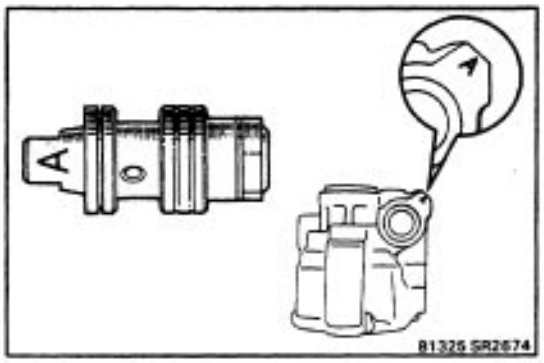
3. INSPECT FLOW CONTROL VALVE

(a) Coat the valve with power steering fluid and check that it falls smoothly into the valve hole by its own weight.

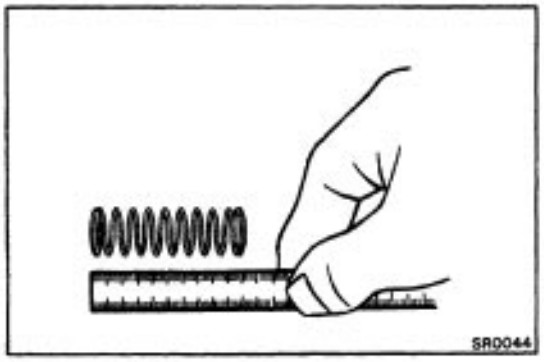




(b) Check the flow control valve for leakage.
Close.one of the holes and apply compressed air [4 –5 kg/crn^2 (57 – 71 psi, 392 – 490 kPa)] into the opposite side, and confirm that air does not come out from the end hole.

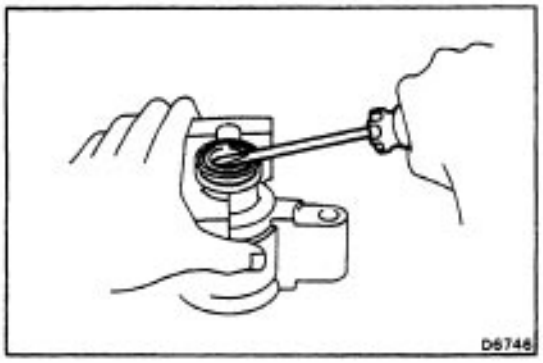


If necessary, replace the valve with one having the same letter as inscribed on the front housing.
Inscribed mark: A,6,C,6, E or F



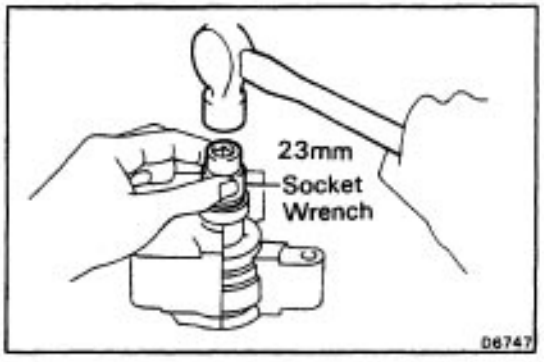
4. INSPECT FLOW CONTROL SPRING

Using a scale, measure the free length of the spring.
Spring length: 36 – 38 mm (1.42 – 1.49 in.)
If not within specification, replace the spring.

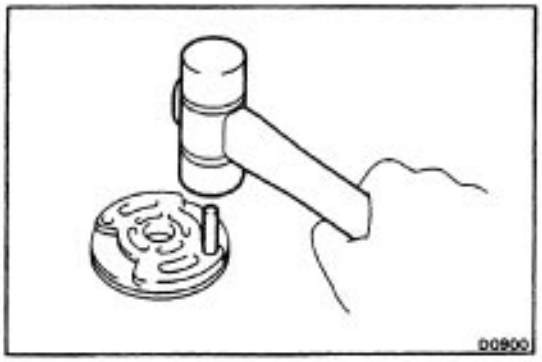


5. IF NECESSARY, REPLACE OIL SEAL

(a) Using a screwdriver, pry out the oil seal.



(b) Using a socket wrench and hammer, drive in a new oil seal.



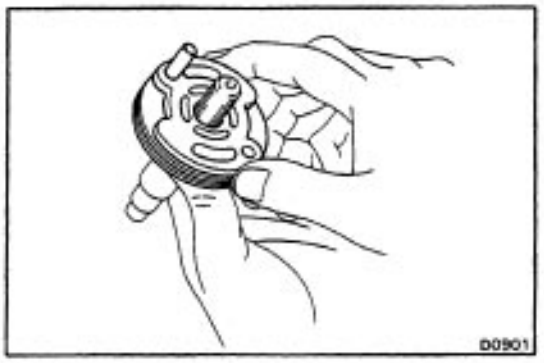
ASSEMBLY OF POWER STEERING PUMP

(See page SR–33)

1. COAT ALL SLIDING SURFACES WITH POWER STEERING FLUID BEFORE ASSEMBLY

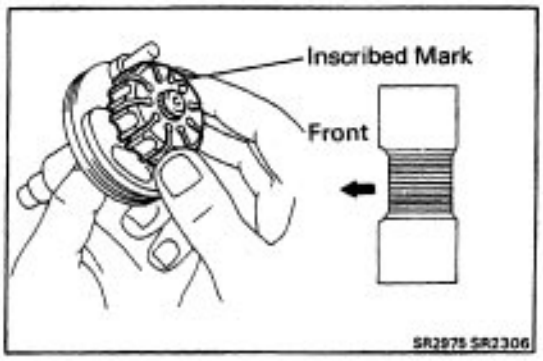
2. INSTALL FRONT PLATE AND ROTOR TO PUMP SHAFT

(a) Using a plastic hammer, drive the short straight pin to the front plate.



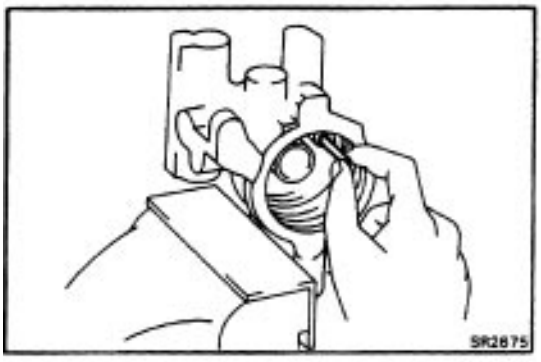
(b) Install two new O–rings to the front plate.

(c) Install the front plate to the pump shaft.



(d) Install the rotor to the pump shaft.

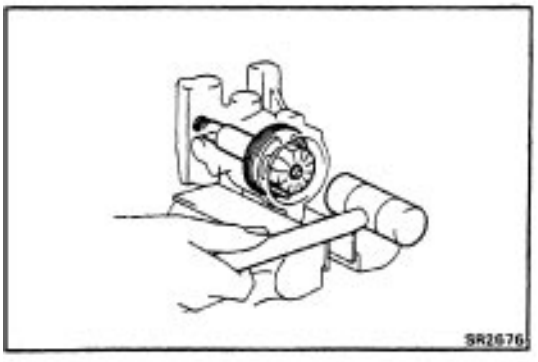
(e) Install the snap ring.



3. INSTALL PS PUMP SHAFT TO FRONT HOUSING

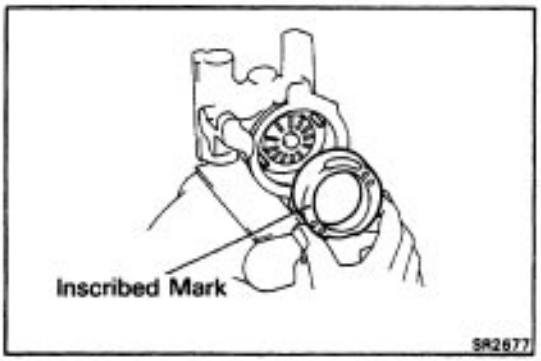
(a) Coat. the oil seal lip with MP grease.

(b) Install the long straight pin to the front housing.



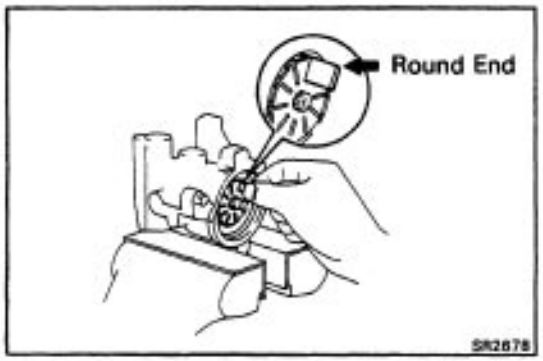
(c) Align the hole of the front plate and straight pin and tap in the pump shaft with a plastic hammer.

NOTICE: Be careful not to damage the oil seal and O–rings.



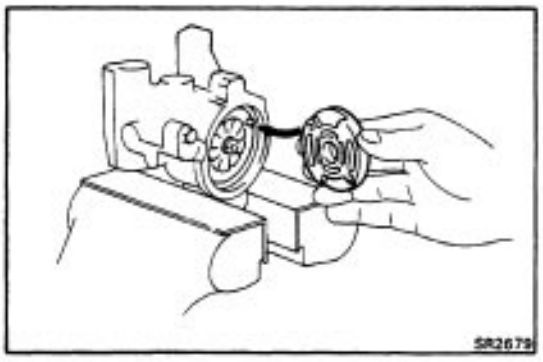
4. INSTALL CAM RING

Align the holes of the cam ring and straight pins, and insert the cam ring with the inscribed mark facing outward.



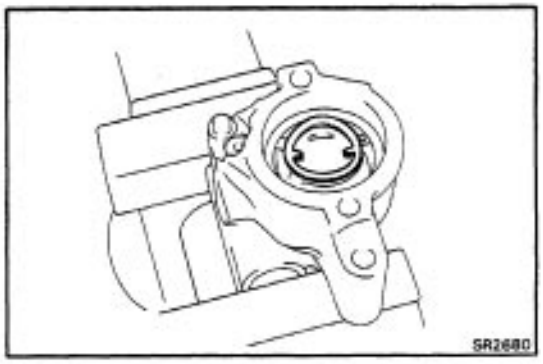
5. INSTALL VANE PLATES

Install the vane plates with the round end facing outward.



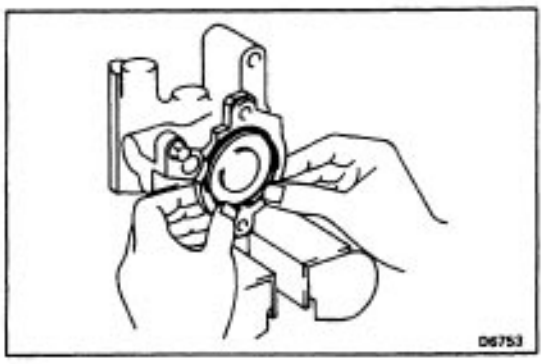
6. INSTALL REAR SIDE PLATE AND O–RING

(a) Install a new O–ring to the side plate.
(b) Align the holes of the side plate with the pins, and install the plate.

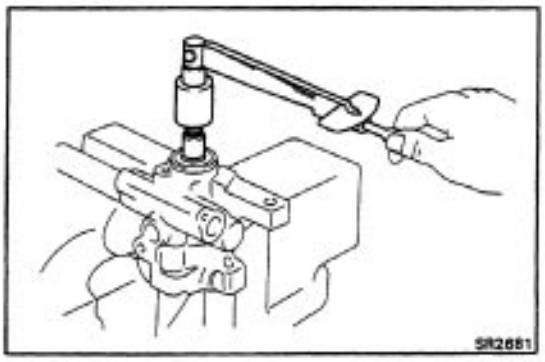


7. INSTALL REAR HOUSING

(a) Install the wave washer.



(b) Install a new O–ring to the rear housing.
(c) Using a plastic hammer, tap in the rear housing.
(d) Install the snap ring.

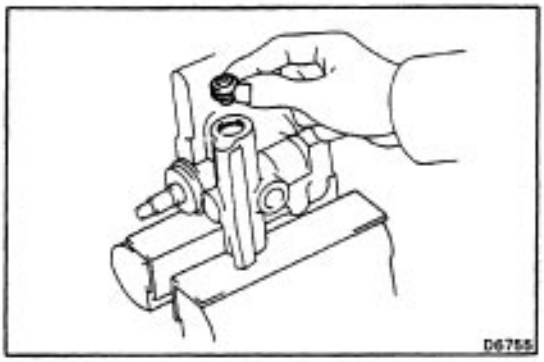


8. MEASURE PUMP SHAFT PREL4AD

(a) Check that the shaft rotates smoothly without abnormal noise.

(b) Temporarily install the pulley nut and check the rotating torque.

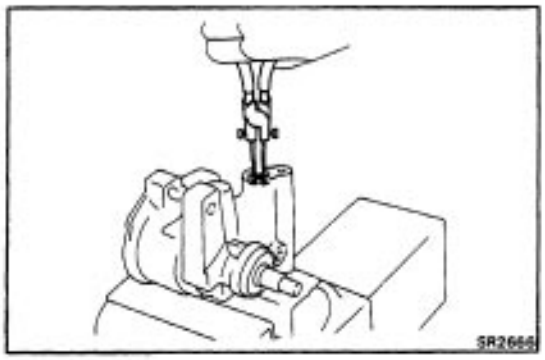
Rotating torque: 2.8 kg–cm (2.4 in.–lb,0.3 N–m) or less



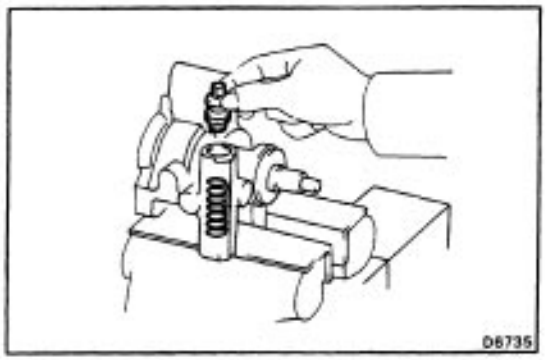
9. INSTALL FLOW CONTROL SPRING SEAT

(a) Install a new O–ring in the spring seat.

(b) Insert the spring seat with the bolt hole facing outward to the housing.



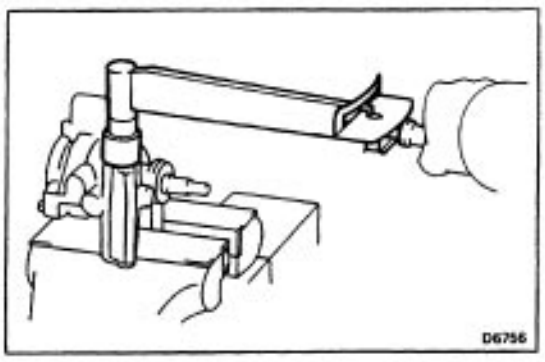
(e) Using snap ring pliers, install the snap ring.



10. INSTALL SPRING, FLOW CONTROL VALVE, O–RING AND PRESSURE PORT UNION

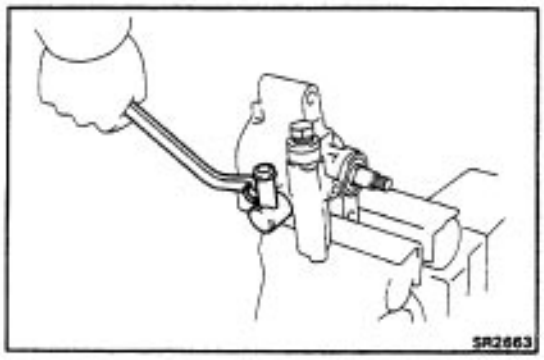
(a) Install the spring and the valve into the housing.

(b) Install a new O–ring in the groove of the pressure port union.



(c) Install and torque the pressure port union.

Torque: 700 kg–cm (51 ft–lb, 69 N–m)

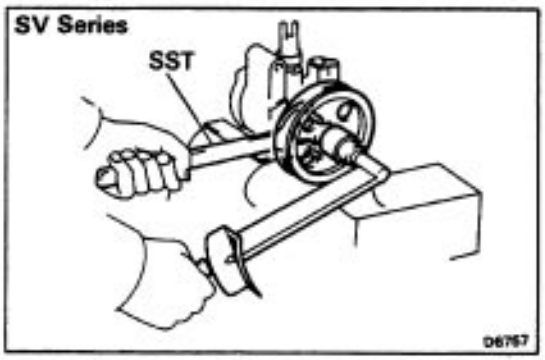


11. INSTALL SUCTION PORT UNION

(a) Install a new O–ring to the suction port union.
(b) Install the suction port union into the housing.
(c) Install and torque the bolt.

Torque: 130 kg–cm (9 ft–lb, 13 N–m)

12. (SV Series)
INSTALL AIR CONTROL VALVE

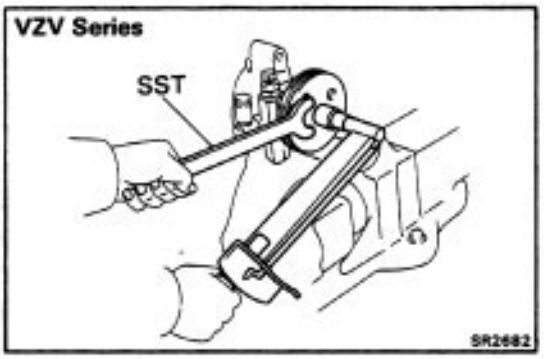


13. INSTALL PS PUMP PULLEY

(a) Install the woodruff key to the shaft.
(b) Install the pulley and nut to the shaft.
(c) Using SST, torque the nut.

SST 09616–30020 (For SV Series)
SST 09616–22010 (For VZV Series)

Torque: 440 kg–cm (32 ft–lb, 43 N–m)



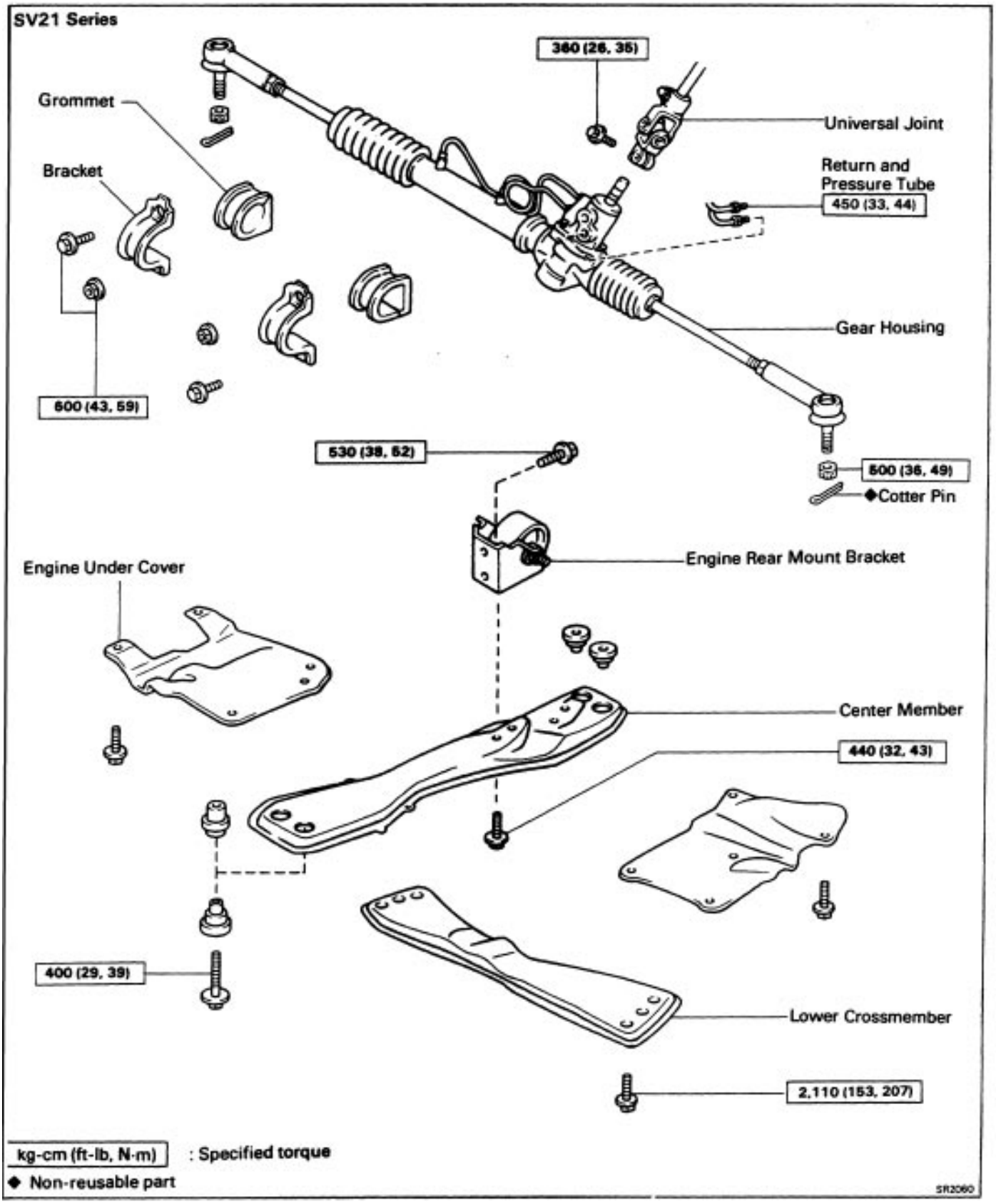
14. (Ex. SV Series for USA)
INSTALL END PLATE

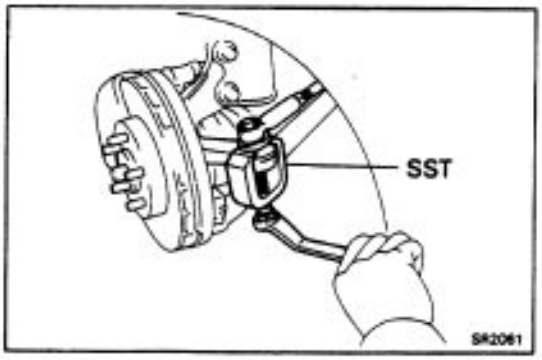
Torque: 130 kg–cm (9 ft–lb, 13 N–m)

Gear Housing

REMOVAL AND INSTALLATION OF STEERING GEAR HOUSING (SV21 Series)

Remove and install the parts as shown.





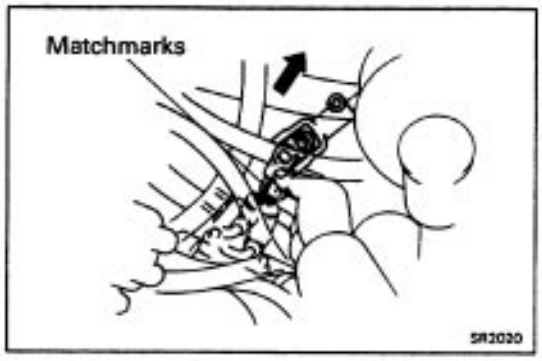
(MAIN POINTS OF REMOVAL AND INSTALLATION)

1. DISCONNECT TIE ROD ENDS

(a) Remove the cotter pins and nuts.

(b) Using SST, disconnect the tie rod ends from the knuckle arm.

SST 09610–55012



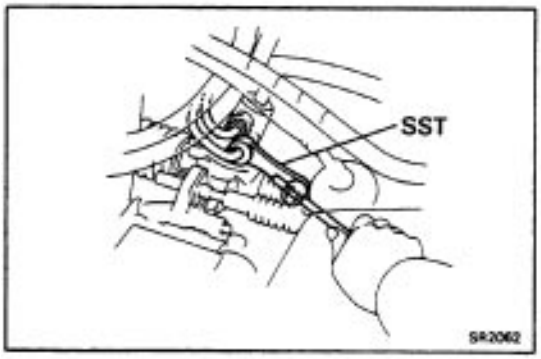
2. REMOVE UNIVERSAL JOINT

(a) Remove the two bolts.

(b) Place matchmarks on the universal joint and control valve shaft.

(c) Slide the joint to the column side and disconnect the joint from the gear housing.

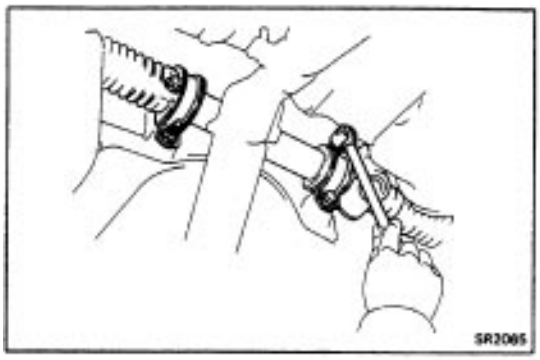
(d) Remove the universal joint.



3. DISCONNECT PRESSURE AND RETURN TUBES

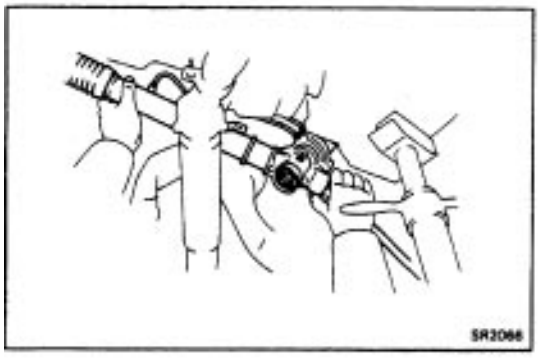
Using SST, disconnect the pressure and return tubes from the gear housing.

SST 09631–22020



4. REMOVE GEAR HOUSING

(a) Remove the two bolts, two nuts and two brackets.

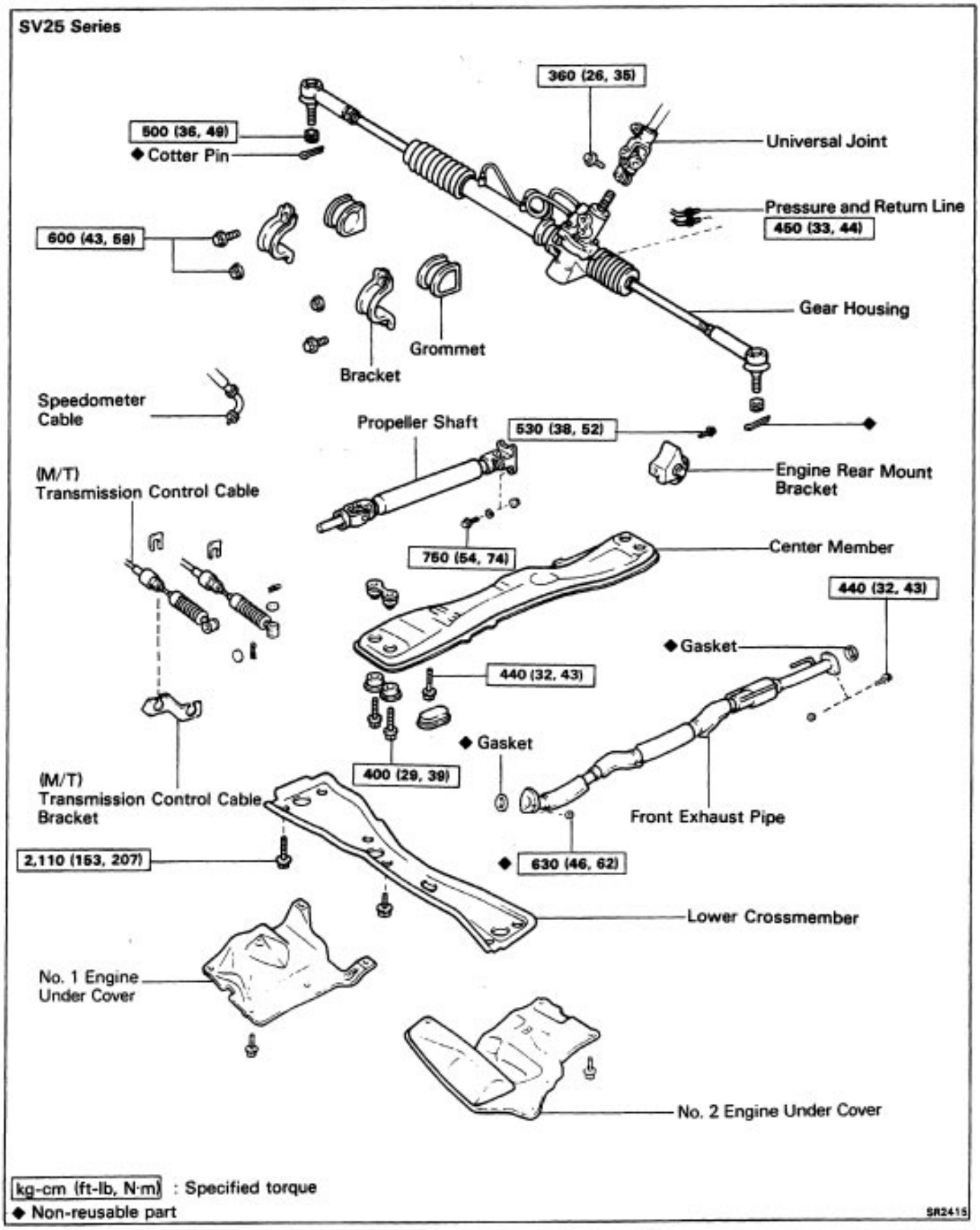


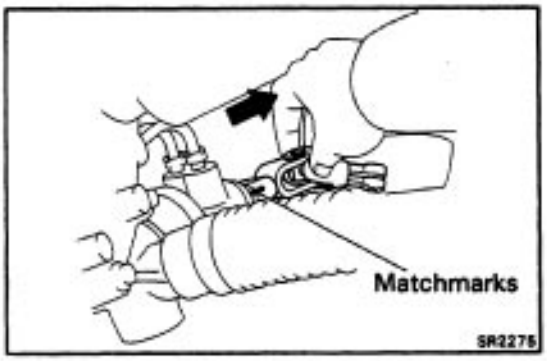
(b) Slide the gear housing to the RH side.

(c) Slide the gear housing to the LH side and pull it out.

REMOVAL AND INSTALLATION OF STEERING GEAR HOUSING (SV25 Series)

Remove and instal! the parts as shown.





(MAIN POINTS OF REMOVAL AND INSTALLATION)

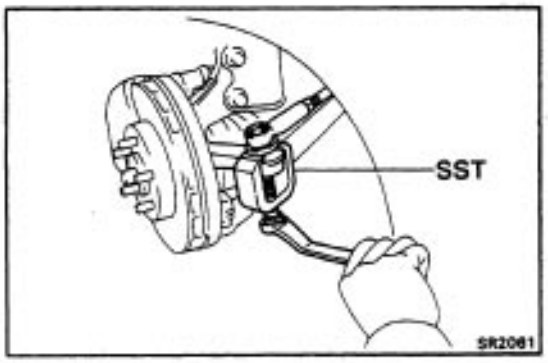
1. REMOVE UNIVERSAL JOINT

(a) Place matchmarks on the universal joint and control valve shaft.

(b) Loosen the upper side of universal joint set bolt.

(c) Remove the lower side of universal joint set bolt.

(d) Pull the universal joint upward from the control valve shaft.

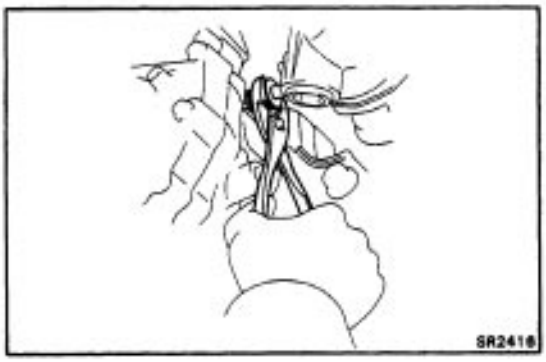


2. DISCONNECT TIE ROD ENDS

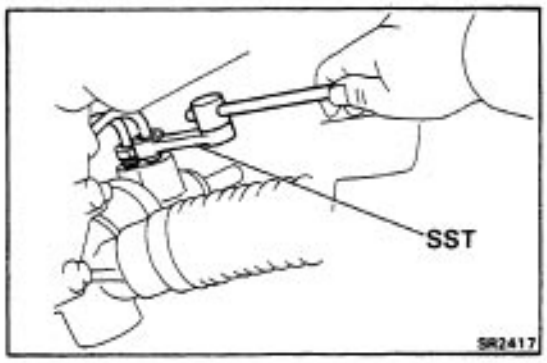
(a) Remove the cotter pins and nuts.

(b) Using SST, disconnect the tie rod ends.

SST 09610–55012



3. DISCONNECT SPEEDOMETER CABLE

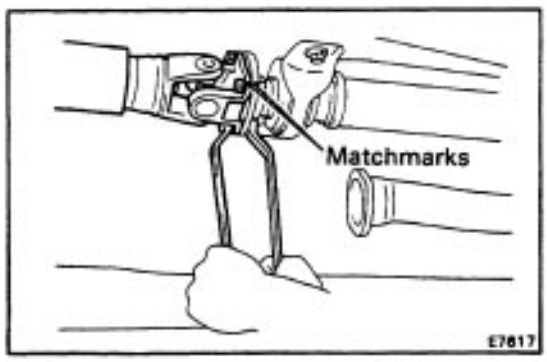


4. DISCONNECT AND CONNECT PRESSURE AND RETURN LINE

Using SST, disconnect and connect the pressure and return line.

SST 09631–22020

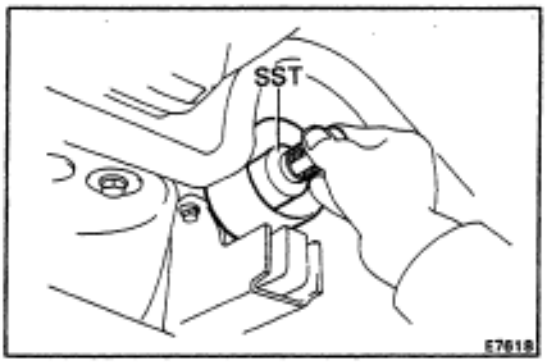
Torque: 450 k9–cm (33 ft–lb, 44 N–m)



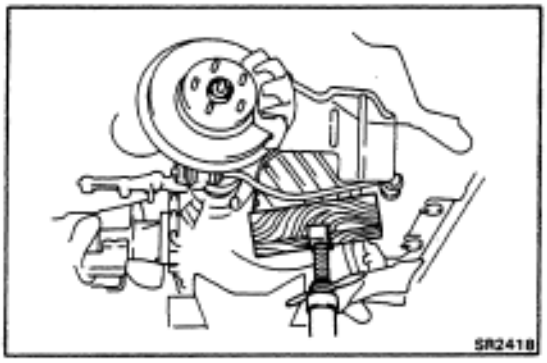
6. REMOVE PROPELLER SHAFT

(a) Place matchmarks to the propeller shaft flange and intermediate shaft flange.

(b) Remove the four bolts and nuts.

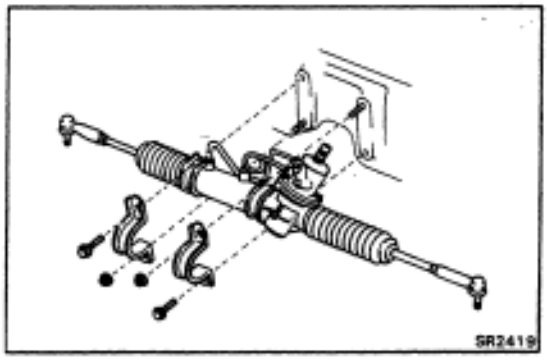


(e) Pull out the propeller shaft and insert SST.
SST .09325–20010

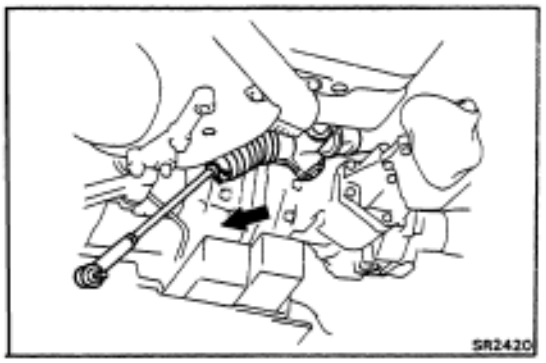


6. REMOVE GEAR HOUSING

(a) Jack up the front of the engine.
NOTICE: Do not overtilt the engine.



(b) Remove the two bolts, two nuts and two brackets.

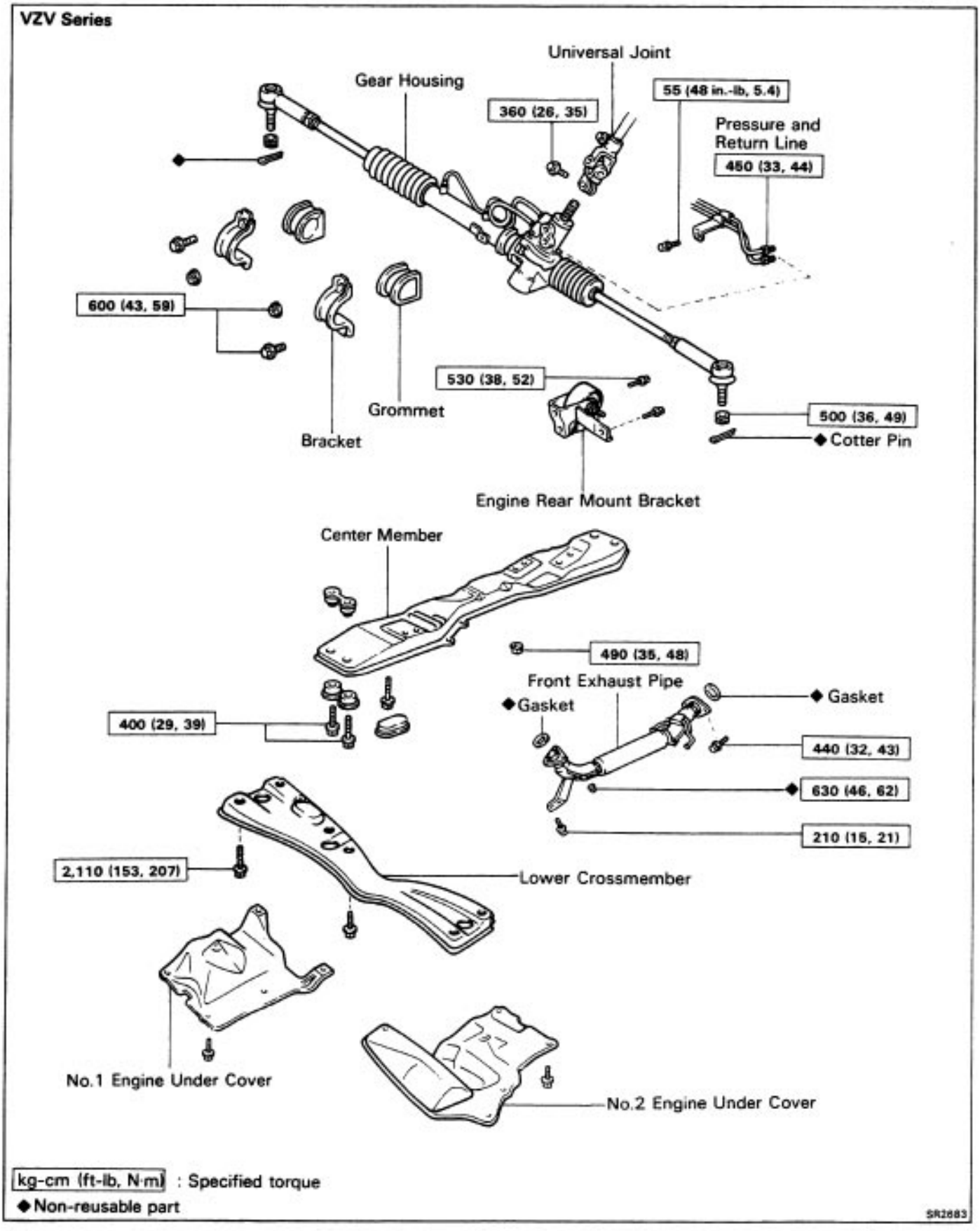


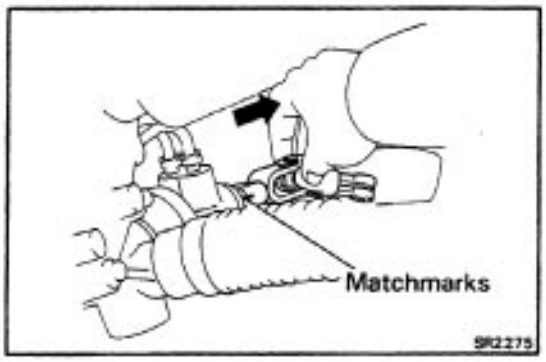
(c) Slide the gear housing to the RH side to put the LH tie rod end in the body panel, then pull it out through the opening in the LH lower side of vehicle body.
HINT: Do not damage the turn pressure tube and the transmission control cables.

(d) Remove two grommets from the gear housing.

REMOVAL AND INSTALLATION OF STEERING GEAR HOUSING (VZV Series)

Remove and install the parts as shown.

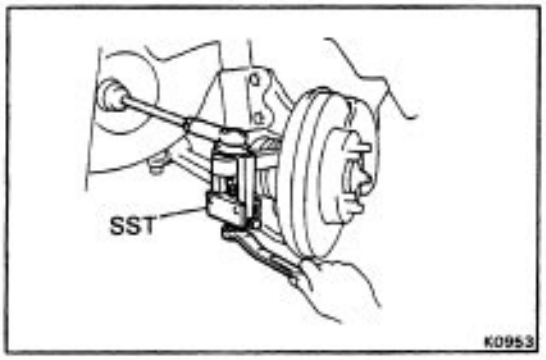




(MAIN POINTS OF REMOVAL AND INSTALLATION)

7. REMOVE UNIVERSAL JOINT

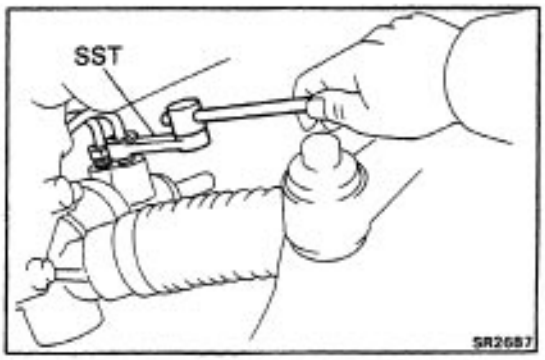
(a) Place matchmarks on the universal joint and control valve shaft.
(b) Loosen the upper side of universal joint set bolt.
(c) Remove the lower side of universal joint .set bolt.
(d) Pull the universal joint upward from the control valve shaft.



2. DISCONNECT TIE ROD ENDS

(a) Remove the cotter pins and nuts.
(b) Using SST, disconnect the tie rod ends.

SST 09628–62011

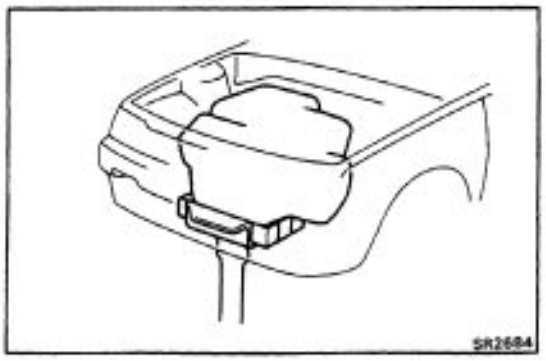


3. DISCONNECT AND CONNECT PRESSURE AND RETURN LINE

Using SST, disconnect and connect the pressure and return line.

SST 09631–22020

Torque: 450 kg–cm (33 ft–!b, 44 N–m)

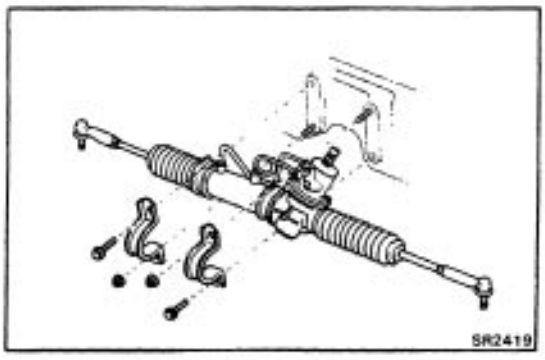


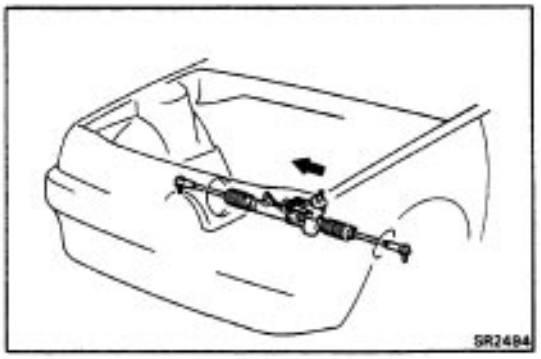
4. REMOVE GEAR HOUSING

(a) Jack up the front of the engine.

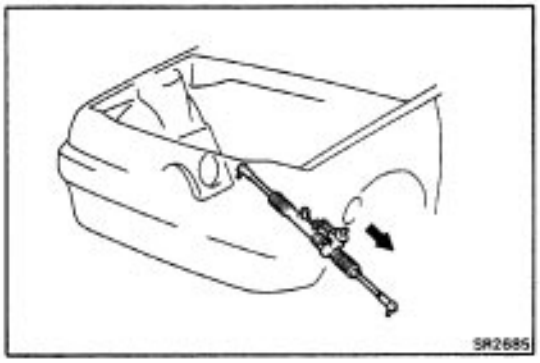
NOTICE: Do not overtilt the engine.

(b) Remove the two bolts, two nuts and brackets.





(c) Slide the gear housing to the RH side to put the LH tie rod end in the body panel.

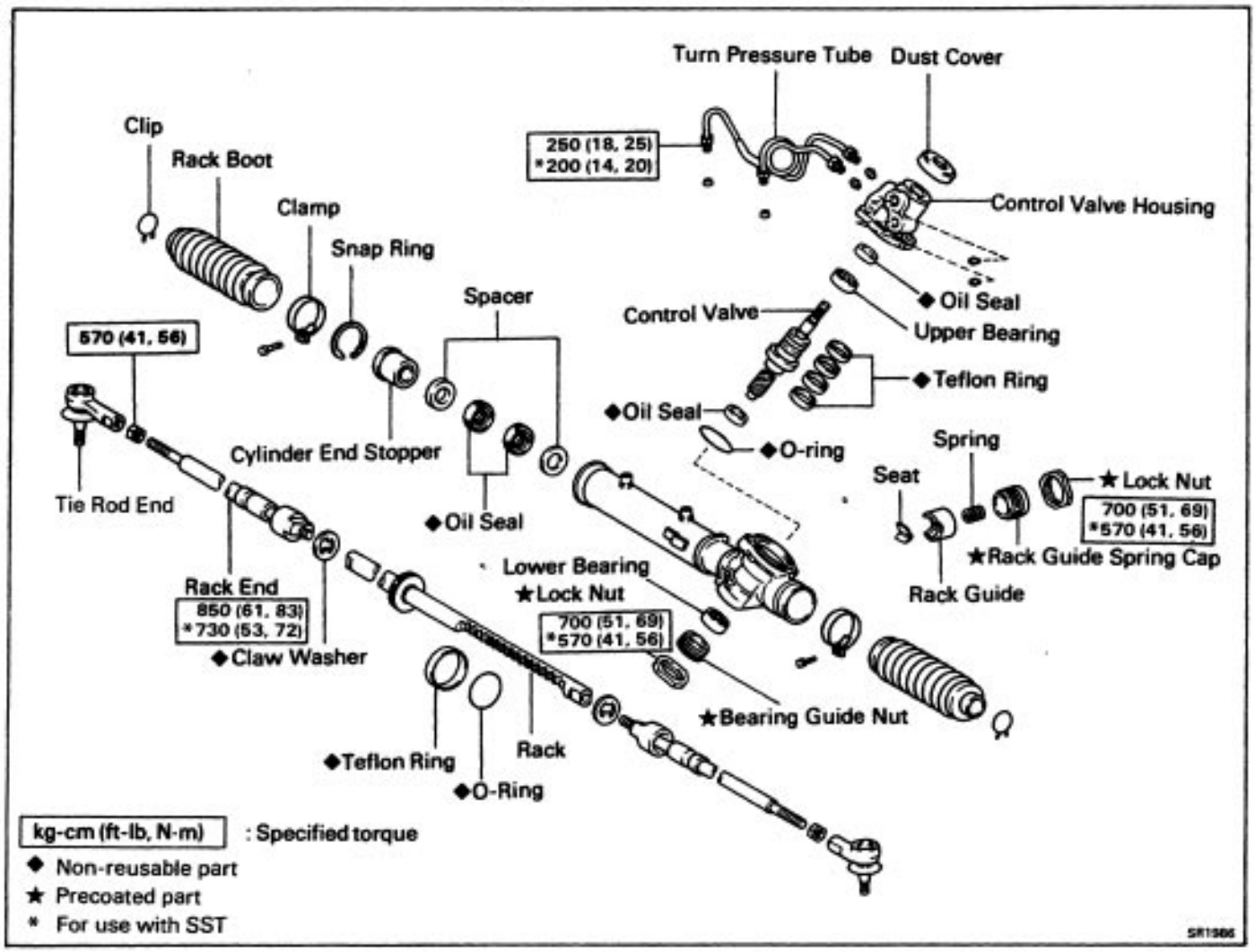


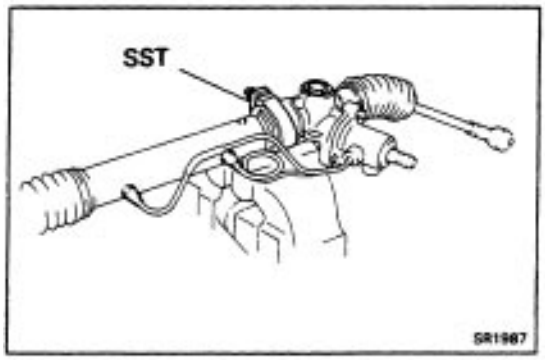
(d) Pull the gear housing out through the opening in the LH lower side of vehicle body.

HINT: Do not damage the turn pressure tube and the transmission control cables.

(e) Remove two grommets from the gear housing.

COMPONENTS

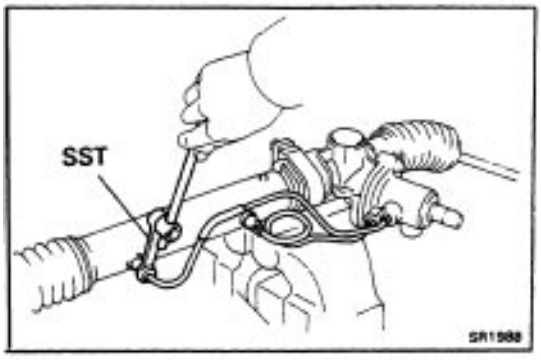




DISASSEMBLY OF STEERING GEAR HOUSING

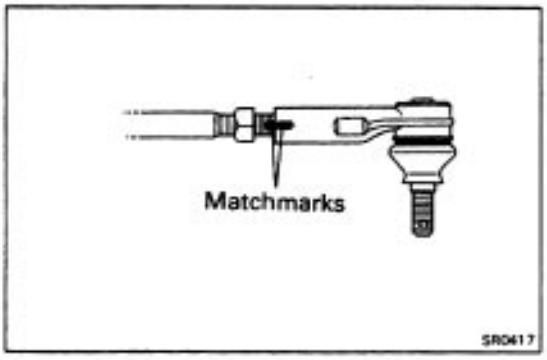
1. CLAMP GEAR HOUSING IN VISE

Using SST secure the steering gear in a vise.
SST 09612–00012



2. REMOVE RIGHT AND LEFT TURN PRESSURE TUBES

Using SST, remove the pressure tubes.
SST 09633–20



3. REMOVE TIE ROD ENDS

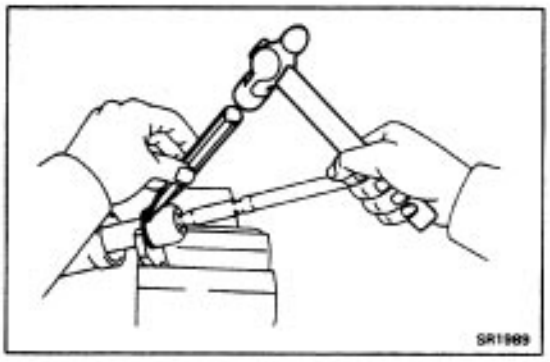
(a) Loosen the lock nuts and place rnatchmarks on the tie rod ends and rack ends.

(b) Remove the tie rod ends and lock nuts.

4. REMOVE RACK BOOTS

(a) Remove the clips and clamps.

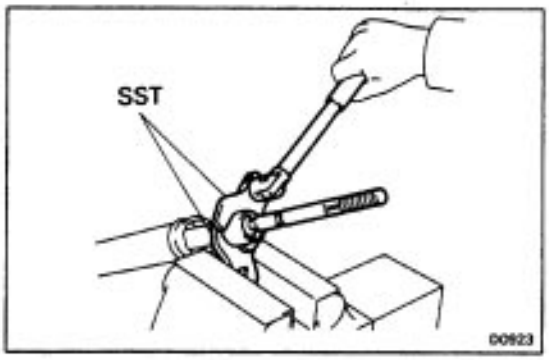
(b) Remove the rack boots.



5. REMOVE RACK ENDS AND CLAW WASHERS

(a) Unstake the claw washer.

NOTICE: Avoid any impact to the rack.

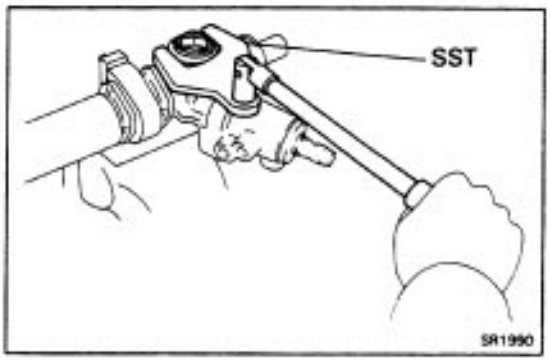


(b) Using SST, remove the rack ends.

SST 09612–10093 (09628–10020)
09612–24014 (09617–24011)

(c) Mark the left and right rack ends accordingly.

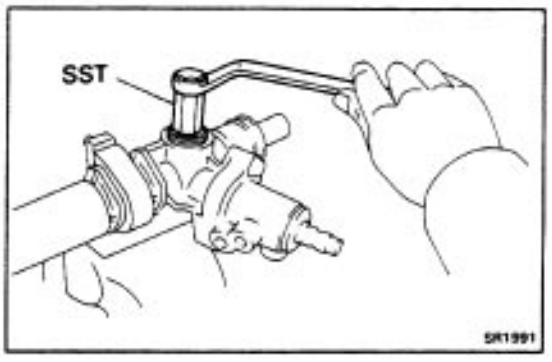
(d) Remove the claw washer.



6. REMOVE RACK GUIDE SPRING CAP LOCK NUT

Using SST, remove the rack guide spring cap lock nut.

SST 09612–24014 (09617–24020)

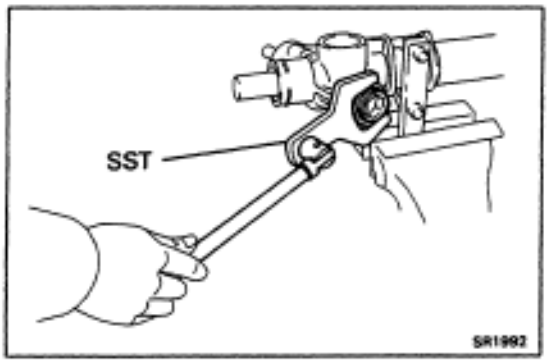


7. REMOVE RACK GUIDE SPRING CAP

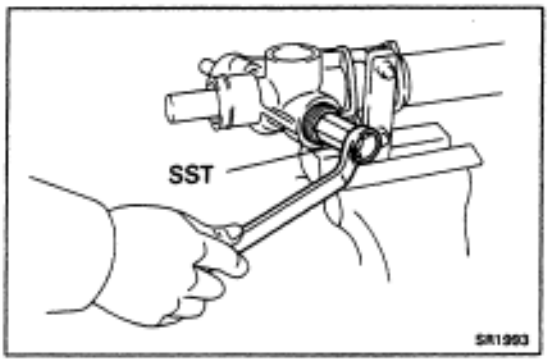
Using SST, remove the rack guide spring cap.

SST 09612–24014 (49612–10022)

8. REMOVE RACK GUIDE SPRING, RACK GUIDE AND SEAT

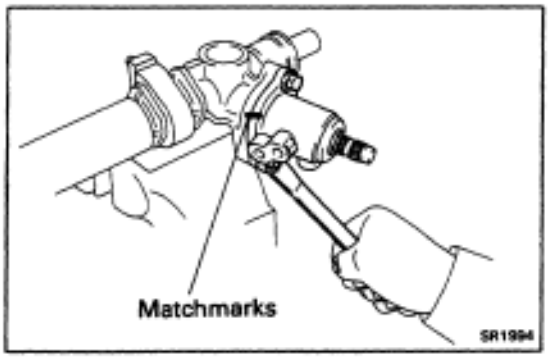


9. REMOVE BEARING GUIDE LOCK NUT
Using SST, remove the lock nut.
SST 09612–24014 (09617–24020)



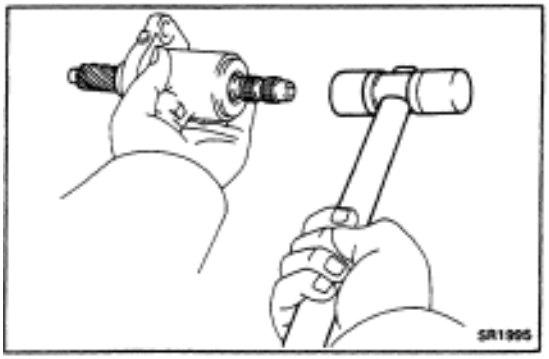
10. REMOVE BEARING GUIDE NUT
Using SST, remove the bearing guide nut.
SST 09612–24014 (09612–10022)

11. REMOVE DUST COVER

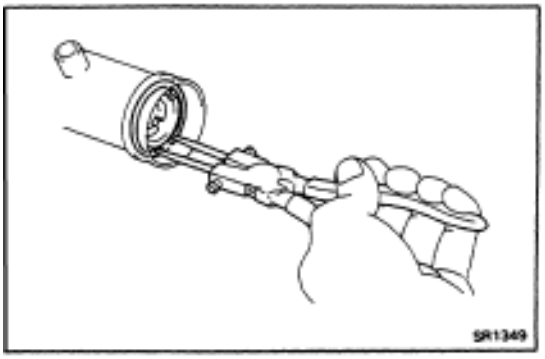


12. REMOVE CONTROL VALVE HOUSING
(a) Place matchmarks on the valve housing and rack housing.
(b) Remove the two bolts.
(e) Pull out the valve with the valve housing.
(d) Remove the O–ring from the rack housing.

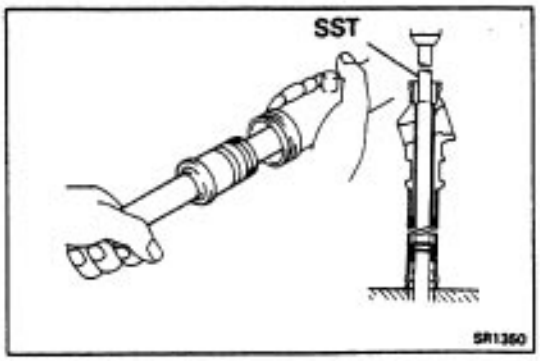
13. REMOVE LOWER BEARING



14. REMOVE CONTROL VALVE FROM HOUSING
Tap out the control valve.



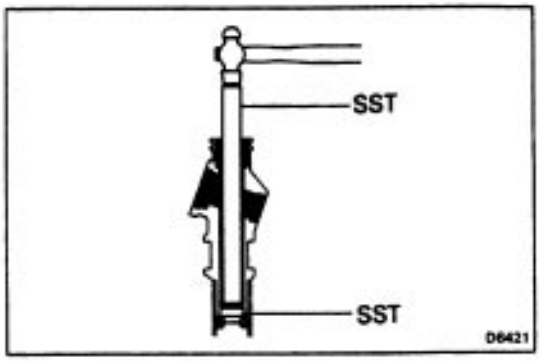
15. REMOVE CYLINDER END STOPPER, SPACER, OIL SEAL AND RACK
(a) Using snap ring pliers, remove the snap ring.



(b) Using SST, press the rack until the end stopper slightly touches the press block.

SST 09612–24014 (09612–10061)Pull out the rack with the cylinder end stopper, spacer and oil seal.

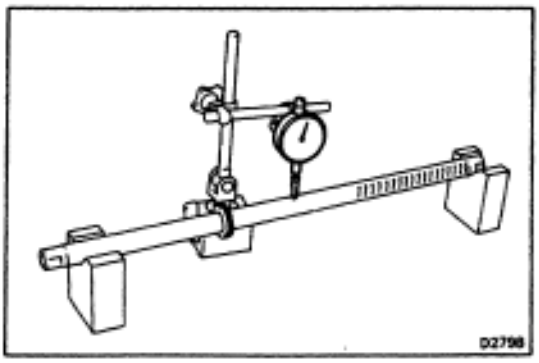
HINT: If necessary, slightly tap the rack end with a brass bar and hammer.



16. REMOVE CYLINDER HOUSING OIL SEAL AND SPACER

Using SST, drive out the spacer and oil seal.

SST 09631–12020,09631–20031



INSPECTION AND REPAIR OF GEAR HOUSING COMPONENTS

1. INSPECT RACK

(a) Check the rack for runout and for tooth wear or damage.

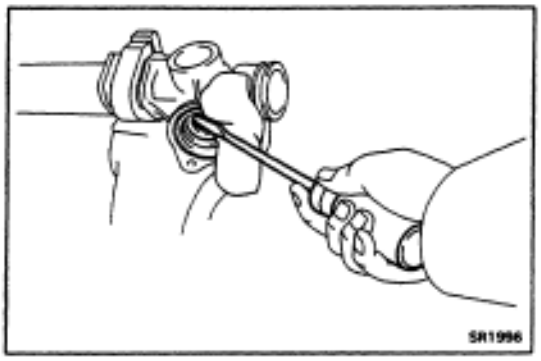
(b) Check the back surface for wear or damage.

If faulty, replace it.

Maximum runout: 0.3 mm (0.012 in.)

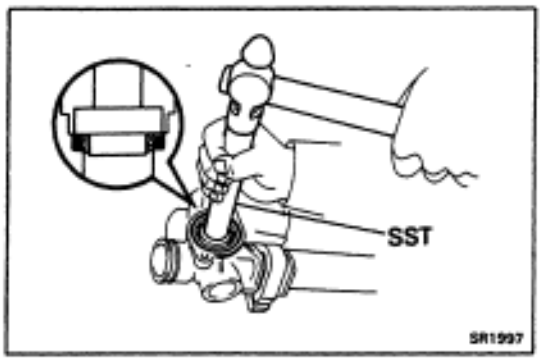
2. IF –NECESSARY, REPLACE RACK HOUSING OIL SEAL

(a) Using a screwdriver, pry out the oil seai.



(b) Using SST, drive in a new oil seal.

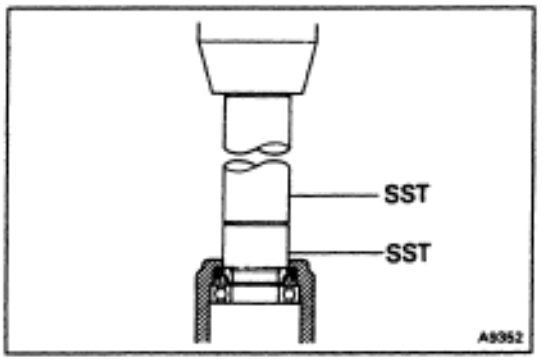
SST 09620–30010 (09624–30010,09631–00020)



3. IF NECESSARY, REPLACE CONTROL VALVE HOUSING OIL SEAL AND BEARING

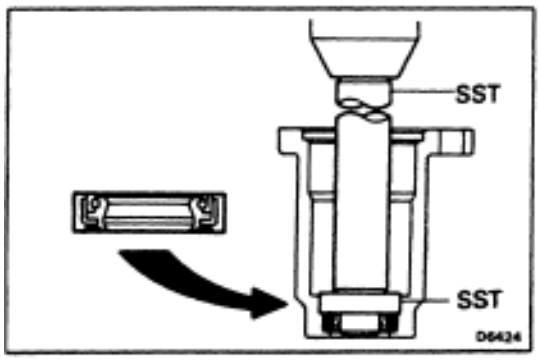
(a) Using SST, press out the oil seat with bearing.

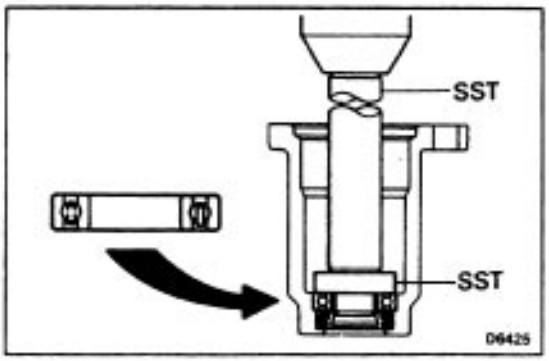
SST 09630–24013 (09620–24010),09631–12020



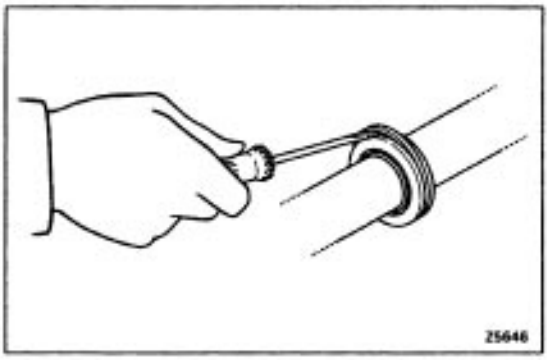
(b) Using SST, press in a new oil seal.

SST 09630–24013 (09620–24020),09631–12020





(e) Using SST, press in a new bearing.
SST 09630–24013 (09620–24030),09631–12020

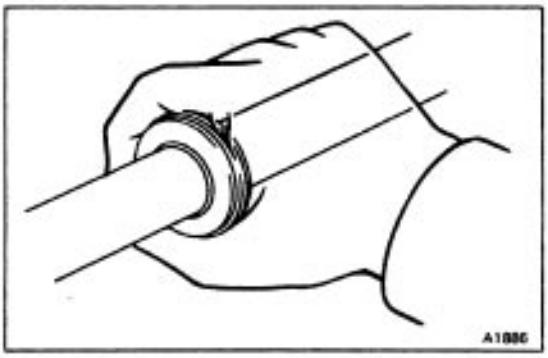


4. IF NECESSARY, REPLACE TEFLON RING AND O–RING

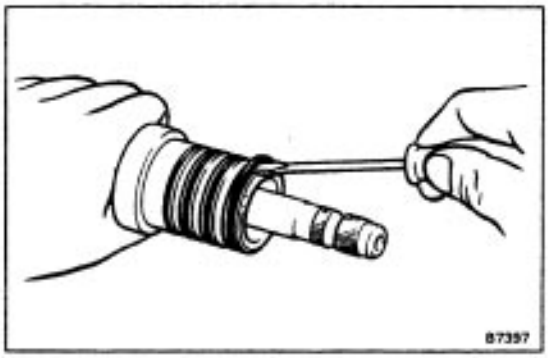
(a) Using a screwdriver, remove the tetton ring and O–ring.

NOTICE: Be careful not to damage the rack.

(b) Install a new O–ring and teflon ring.



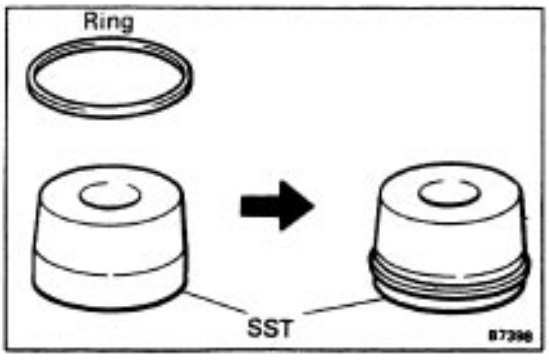
(c) Coat the teflon ring with power steering fluid and snug it down with your fingers.



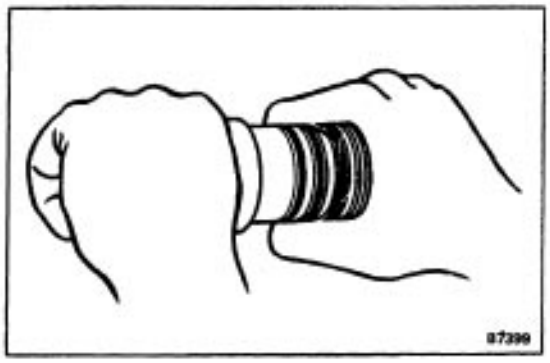
5. IF NECESSARY, REPLACE CONTROL VALVE TEFLON RINGS

(a) Using a screwdriver, remove the tefton rings.

NOTICE: Be careful not to damage the control valve.

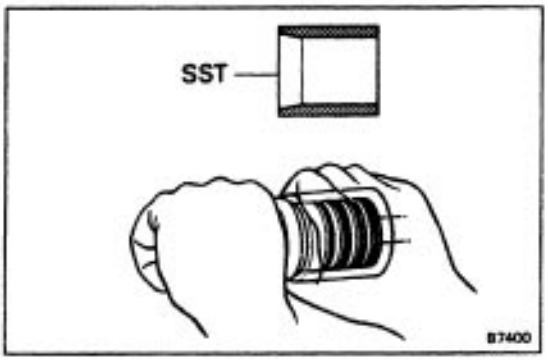


(b) Install new teflon rings to SST and expand them.
SST 09631–20070



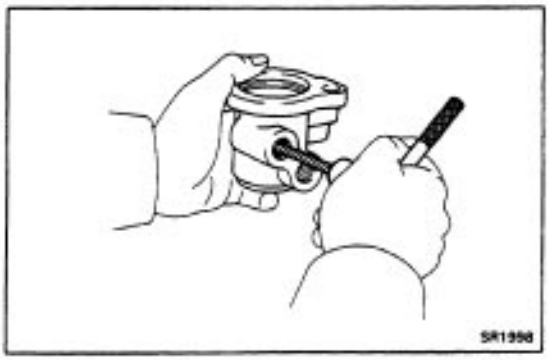
(c) Install the expanded teflon rings to the control valve and snug them down with your fingers.

NOTICE: Be careful not to damage the rings.



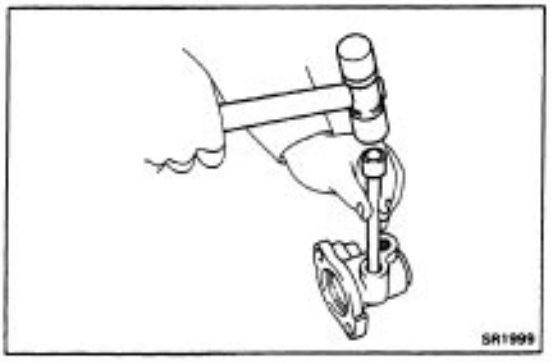
(d) Coat the teflon rings with power steering fluid, and carefully slide the tapered end of SST over the teflon rings to seat the rings.

SST 09631–20081



6. IF NECESSARY, REPLACE UNION SEAT

(a) Using a screw extractor, remove the union seat.

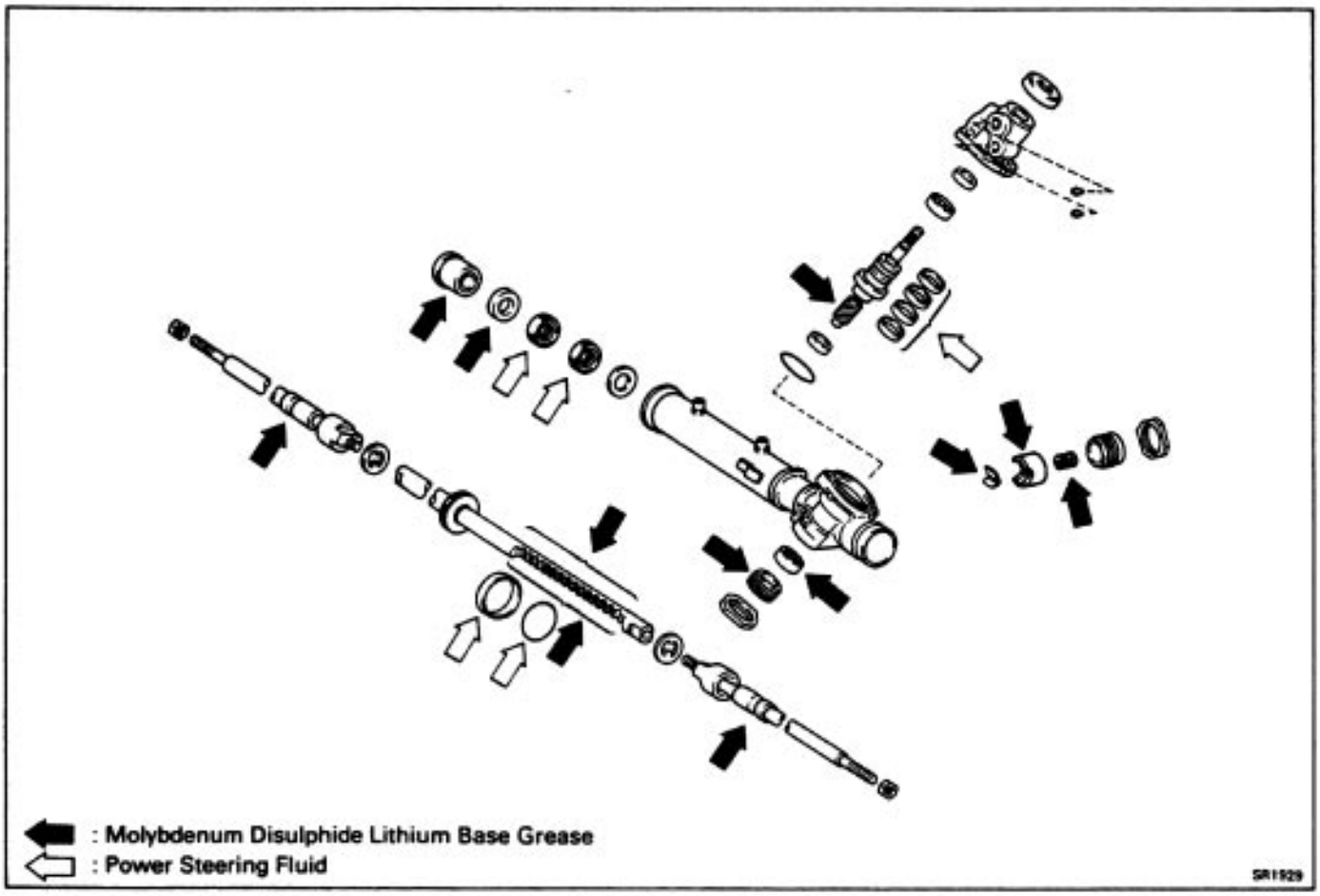


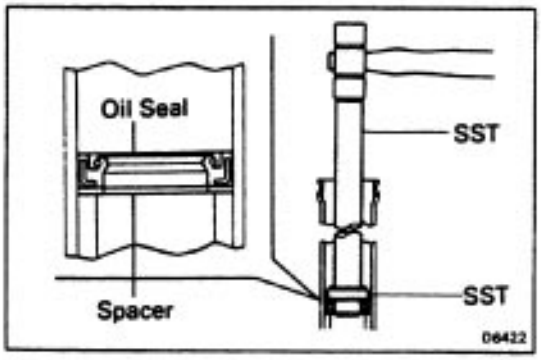
(b) Using a plastic hammer and extension bar, tap in a new union seat.

ASSEMBLY OF GEAR HOUSING

(See page SR–51)

1. COAT POWER STEERING FLUID OR GREASE ON FOLLOWING PARTS:

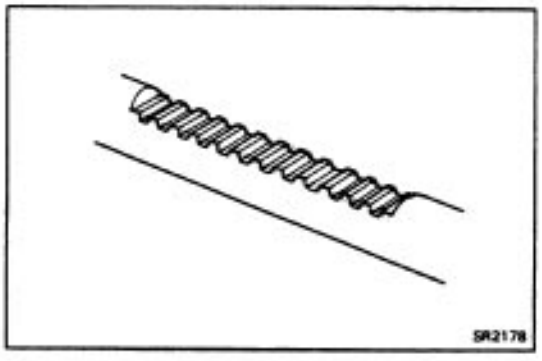




2. INSTALL CYLINDER HOUSING OIL SEAL AND SPACER

Install a new oil seal and spacer to SST, and drive them in with a plastic hammer.

SST 09631–12020, 09631–32010

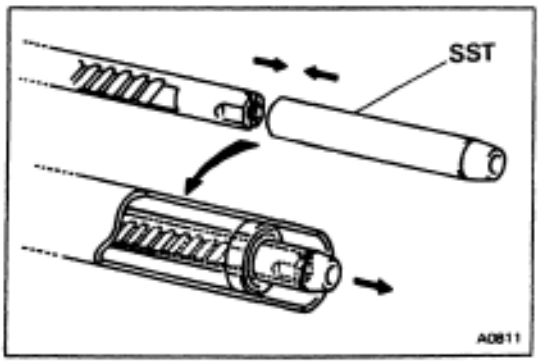


3. INSTALL RACK

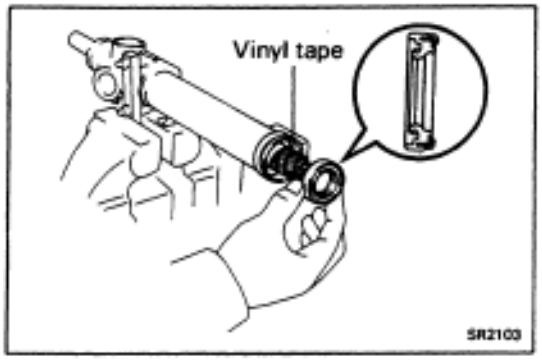
(a) Install SST to the rack.

HINT: if necessary, scrape the burrs off the rack teeth end and burnish.

SST 09631–20051

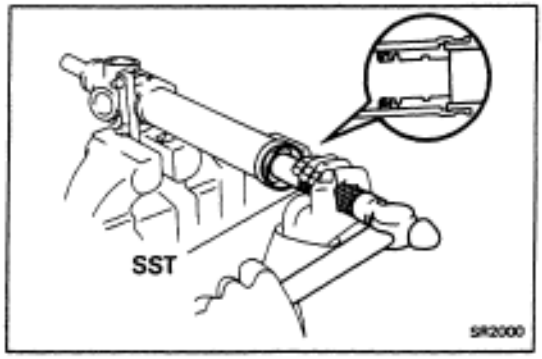


(b) Coat SST with power steering fluid.
(c) Insert the rack into the cylinder.
(d) Remove SST.

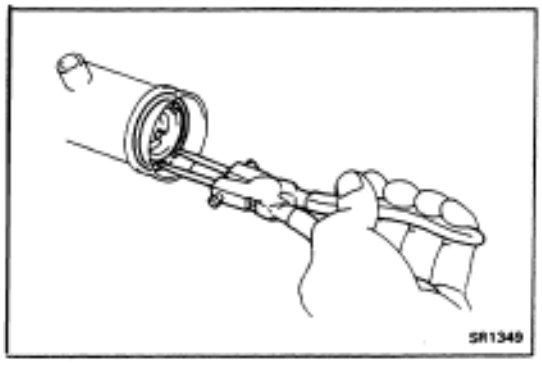


4. INSTALL CYLINDER END STOPPER, OIL SEAL AND SPACER

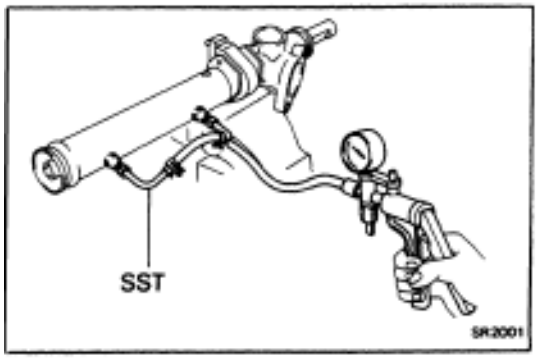
(a) To prevent oil seal lip damage, wind vinyl tape on the steering rack end, and apply power steering fluid.
(b) Install the oil seal by pushing it into the cylinder in the direction shown in drawing, without tilting.



(c) Install the spacer and cylinder end stopper.
(d) Using SST, drive in the cylinder end stopper.
SST 09612–22011

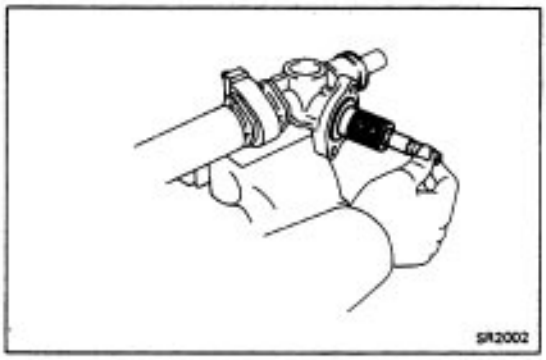


(e) Using snap ring pliers, install the snap ring.



5. AIR TIGHTNESS TEST

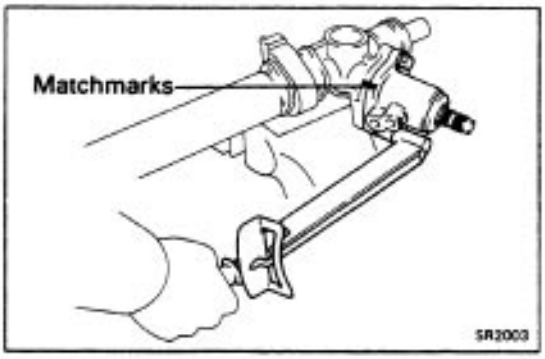
(a) Install SST to the union of the cylinder housing.
SST 09631–12070
(b) Apply 400 mm Hg (15.75 in. Hg, 53.3 kPa) of vacuum for about 30 seconds.
(c) Check that there is no change in the vacuum.



6. INSTALL CONTROL VALVE

(a) Coat the teflon ring with power steering fluid.

(b) Push the control valve into the housing.

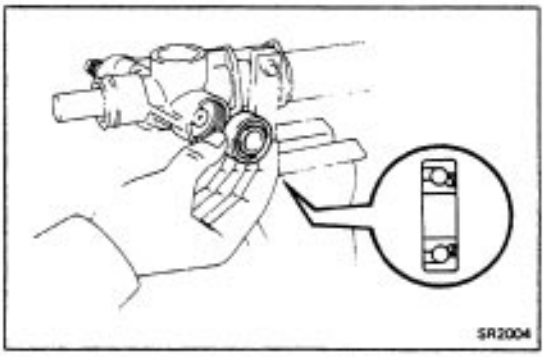


7. INSTALL CONTROL VALVE HOUSING

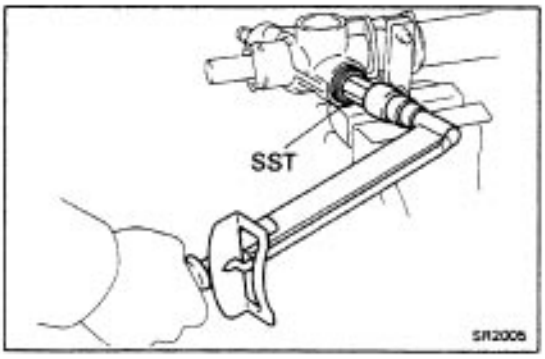
(a) Align the matchmarks on the valve housing and rack housing.

(b) Torque the two bolts.

Torque: 315 kg–cm (23 ft–lb, 31 N–m)



8. INSTALL CONTROL VALVE LOWER BEARING



9. INSTALL BEARING GUIDE NUT

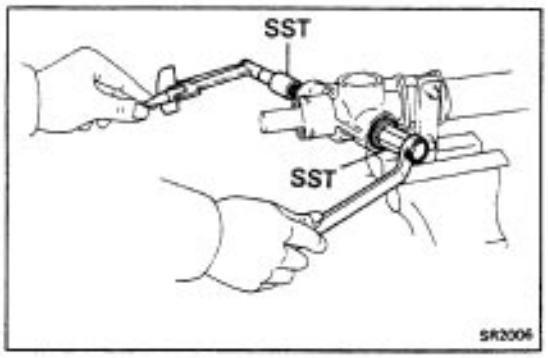
(a) Apply sealant to 2 or 3 threads of the guide nut.

Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Using SST, torque the bearing guide nut.

SST 09612–24014 (09612–10022)

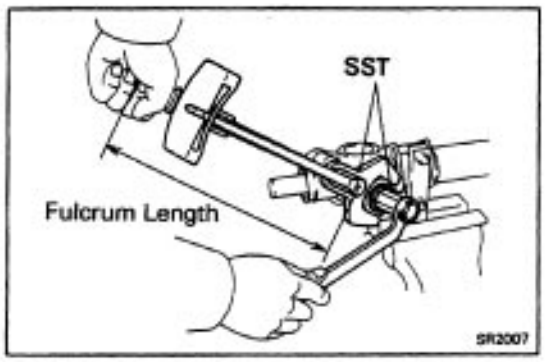
Torque: 150 kg–crn (11 ft–lb, 15 N–m)



(c) Using SST and torque meter, loosen the bearing guide nut until the preload is within specification.

SST 09612–24014 (09612–10022), 09616–00014

Preload (tuming): 4.5 – 6.5 kg–cm (3.9 – 5.6 in.–lb, 0.4 – 0.6 N–m)



10. INSTALL BEARING GUIDE LOCK NUT

(a) Apply sealant to 2 or 3 threads of the lock nut.

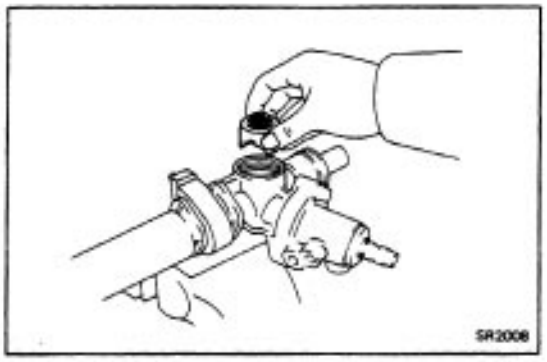
Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Using SST, install and torque the lock nut.

SST 09612–24014 (09612–10022,09617–24020)

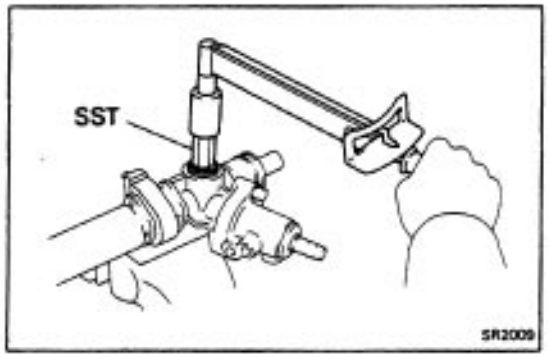
Torque: 570 kg–cm (41 ft–lb, 56 N–m)

HINT: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.).



11. INSTALL RACK GUIDE SEAT, RACK GUIDE AND RACK GUIDE SPRING

Install the rack guide with the seat and spring.



12. ADJUST TOTAL PRELOAD

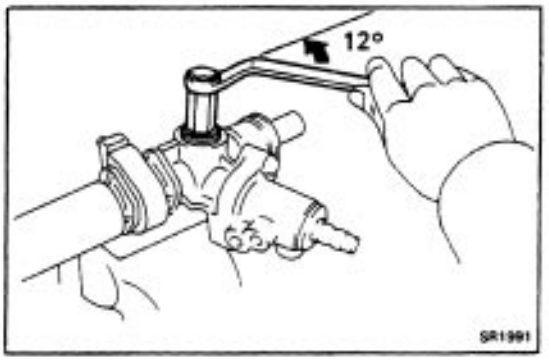
(a) Apply sealant to 2 or 3 threads of the spring cap.

Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Using SST, install and torque the spring cap.

SST 09612–24014 (09612–10022)

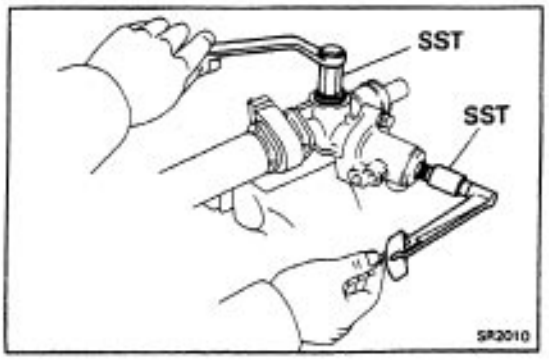
Torque: 250 kg–crrn (18 ft–lb, 25 N–m)



(e) Using SST, return the rack guide spring cap 12˚.

(d) Turn the control valve shaft right and left one or two times.

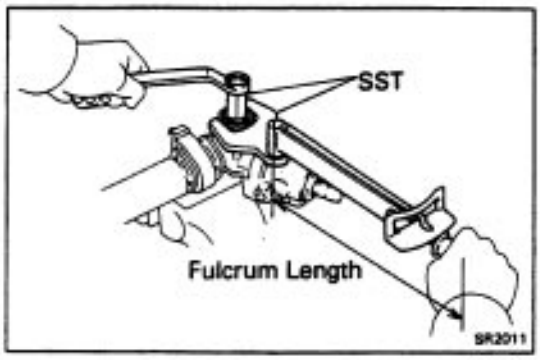
(e) Loosen the spring cap until the rack guide co¿¿pression spring is not functioning.



(f) Using SST and a torque meter, tighten the rack guide spring cap until the preload is within specification.

SST 09612–24014 (09612–10022), 09616–00010

Preload (turning): 9 –12 kg–cm (7.8 – 10.4 in.–lb, 0.9 –1.2 N–m)



13. INSTALL RACK GUIDE SPRING CAP LOCK NUT

(a) Apply sealant to 2 or 3 threads of the lock nut.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

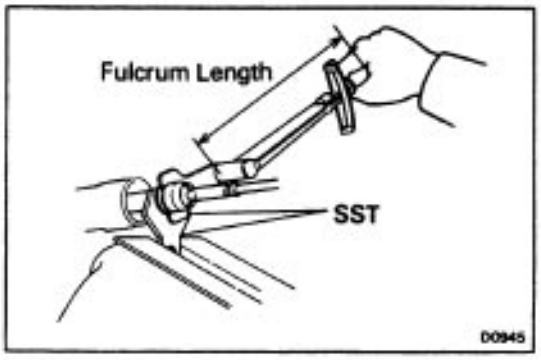
(b) Using SST, install and torque the lock nut.

SST 09612–24014 (09612–10022,09617–24020)

Torque: 570 kg–cm (41 ft–lb, 56 N–m)

HINT: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.).

(c) Recheck the total preload.



14. INSTALL DUST COVER

15. INSTALL CLAW WASHERS AND RACK ENDS

(a) Install a new claw washer.

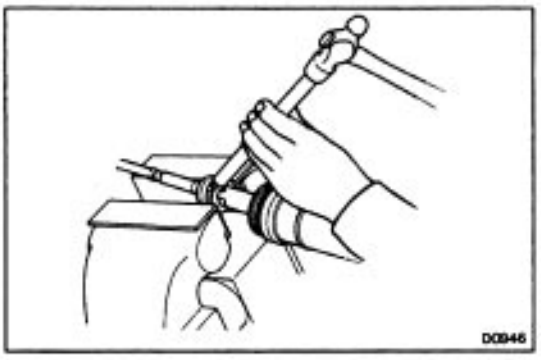
(b) Using SST, install and torque the rack ends.

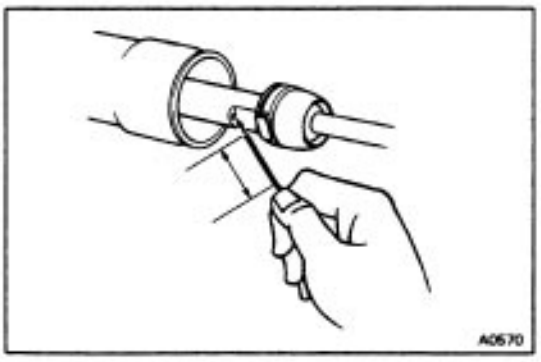
SST 09612–10093 (09628–10020)
09612–24014 (09617–24011)

Torque: 730 kg–cm (53 ft–11b, 72 N–m)

HINT: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.).

(c) Using a brass bar and hammer, stake the claw washer.

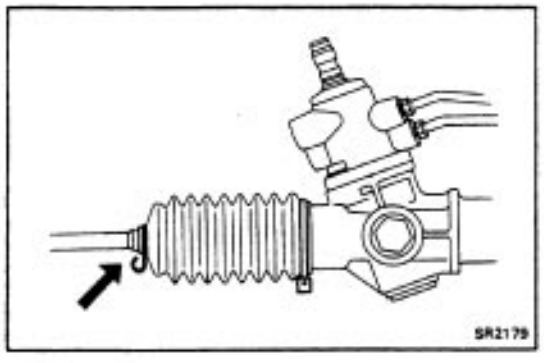




16. INSTALL RACK BOOTS, CLAMPS AND CLIPS

(a) Insure that the tube hole is not clogged with grease.

HINT: If the tube hole is clogged, the pressure inside the boot will change after it is assembled and the steering wheel turned.

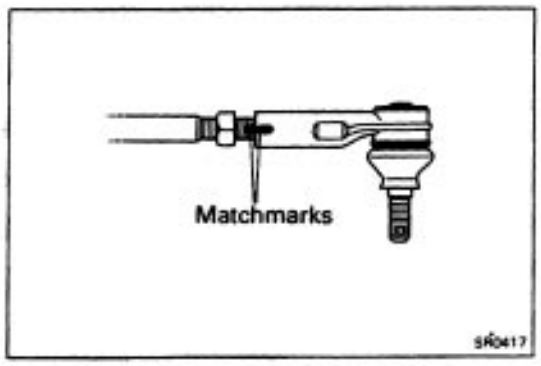


(b) Install the boots.

HINT: be careful not to damage or twist the boots.

(e) Install the clamps.

(d) Install the clips with the ends facing outward.

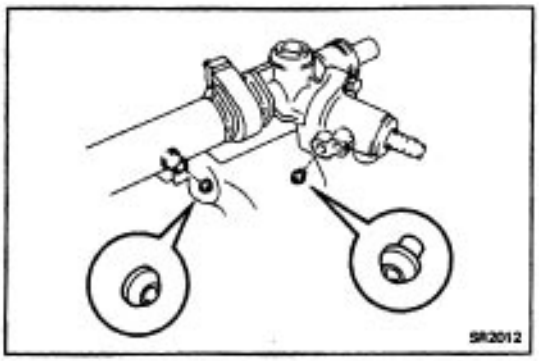


17. INSTALL TIE ROD ENDS

(a) Screw the lock nuts and tie rod ends onto the rack ends until the matchmarks are aligned.

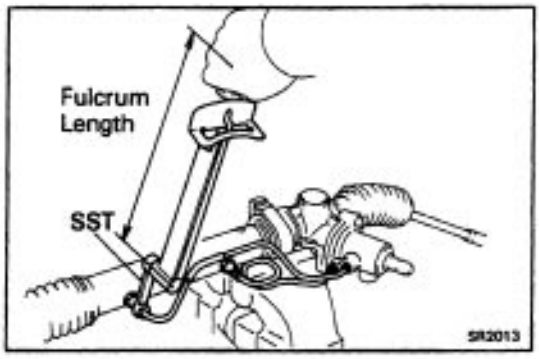
(b) After adjusting toe–in, torque the lock nuts.

Torque: 570 kg–cm (41 ft–lb, 56 N–m)



18. INSTALL RIGHT AND LEFT TURN PRESSURE TUBES

(a) Install new union seats as shown.



(b) Using SST, install and torque the tubes.

SST 09633–00020

Torque: 200 kg–cm (14 ft–lb, 20 N–m)

HINT: Use a torque wrench with a fulcrum length of 300 mm (11.81 in.).