NISSAN PULSAR NX

MODEL N13 SERIES

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FOREWORD

This manual contains maintenance and repair procedures for the 1989 NISSAN PULSAR NX.

In order to assure your safety and the efficient functioning of the vehicle, this manual should be read thoroughly. It is especially important that the PRECAUTIONS in the GI section be completely understood before starting any repair task.

All information in this manual is based on the latest product information at the time of publication. The right is reserved to make changes in specifications and methods at any time without notice.

IMPORTANT SAFETY NOTICE

The proper performance of service is essential for both the safety of the technician and the efficient functioning of the vehicle.
The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately.
Service varies with the procedures used, the skills of the technician and the tools and parts available. Accordingly, anyone using service procedures, tools or parts which are not specifically recommended by NISSAN must first completely satisfy himself that neither his safety nor the vehicle's safety will be jeopardized by the service method selected.

NISSAN MOTOR CO., LTD.
Overseas Service Department
Tokyo, Japan

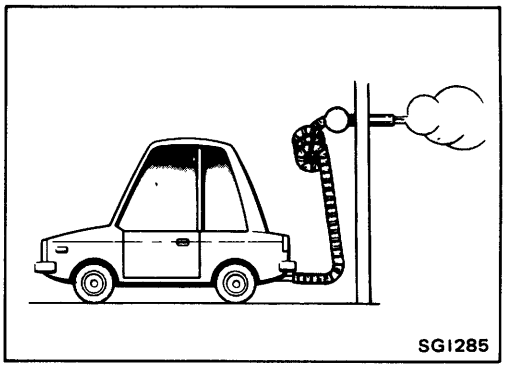
GENERAL INFORMATION

SECTION GI

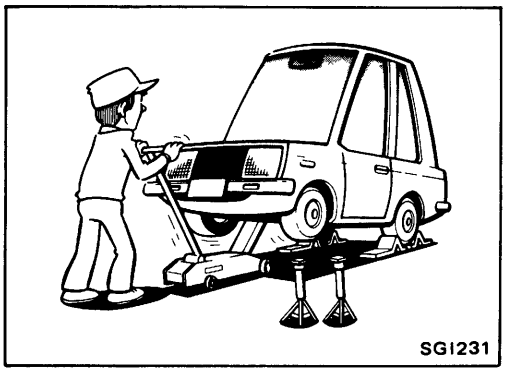
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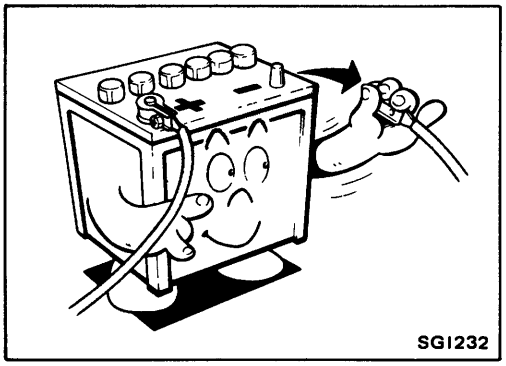
The following precautions should be observed to ensure safe and proper service operations. These precautions are not described in each individual section.


SGI285

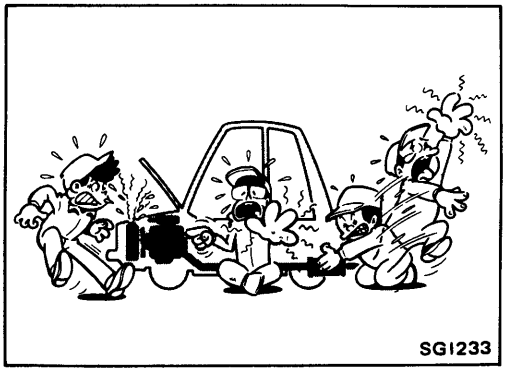
1. Do not operate the engine for an extended period of time without proper exhaust ventilation.
   Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When working in a pit or other enclosed area, be sure to properly ventilate the area before working with hazardous materials.
   Do not smoke while working on the vehicle.


SGI231

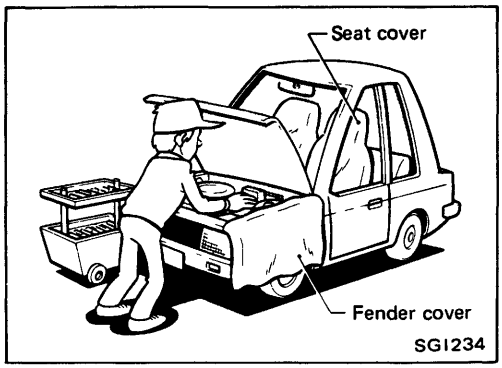
2. Before jacking up the vehicle, apply wheel chocks or other tire blocks to the wheels to prevent the vehicle from moving. After jacking up the vehicle, support the vehicle weight with safety stands at the points designated for proper lifting and towing before working on the vehicle.
   These operations should be done on a level surface.
3. When removing a heavy component such as the engine or transaxle/transmission, take care not to lose your balance and drop it. Also, do not allow it to hit against adjacent parts, especially brake tube and brake master cylinder.


SGI232

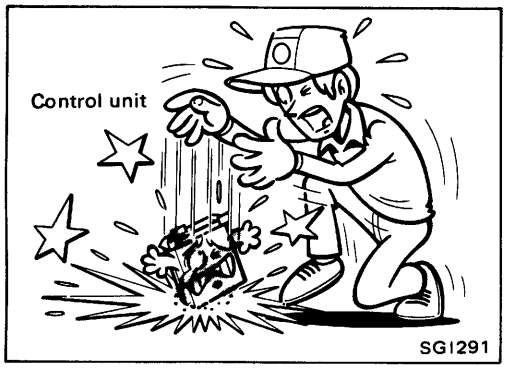
4. Before starting repairs which do not require battery power, always turn off the ignition switch, then disconnect the ground cable from the battery to prevent accidental short circuit.

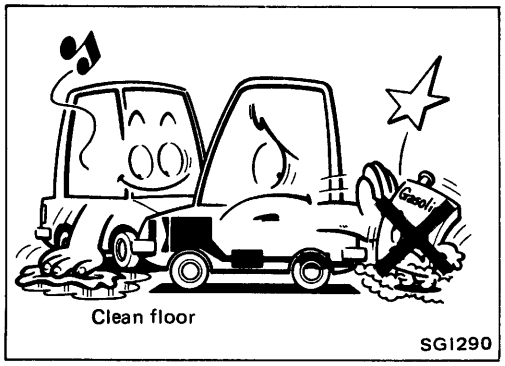

SGI233

5. To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe and muffler.
   Do not remove the radiator cap when the engine is hot.



6. To prevent scracthes and soiling, protect fenders, upholstery and carpeting with appropriate covers before starting servicing.
   Take caution that keys, buckles or buttons on your person do not scratch the paint.
7. Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.
8. Replace oil seals, gaskets, packings, O-rings, locking washers, cotter pins, self-locking nuts, etc. as instructed and discard used ones.
9. Tapered roller bearings and needle bearings should be replaced as a set of inner and outer races.
10. Arrange the disassembled parts in accordance with their assembled locations and sequence.
11. Do not touch the terminals of electrical components which utilize microcomputers such as electronic control units. Static electrical charges stored in your body may damage internal electronic components.
12. After disconnecting vacuum hose or air hose, attach tag which indicates the proper connection to prevent incorrect connection.
13. Use only the lubricants specified in the applicable section or those indicated under "Recommended Fuel and Lubricants".
14. Use approved bonding agent, sealants or their equivalents when required.
15. The use of the proper tools and recommended essential tools should be used where specified for proper, safe and efficient service repairs.
16. When effecting repairs on the fuel, oil, water, vacuum or exhaust systems, make certain to check all affected lines for leaks.
17. Dispose of drained oil or the solvent used for cleaning parts in an appropriate manner.





Precautions for E.C.C.S. Engine

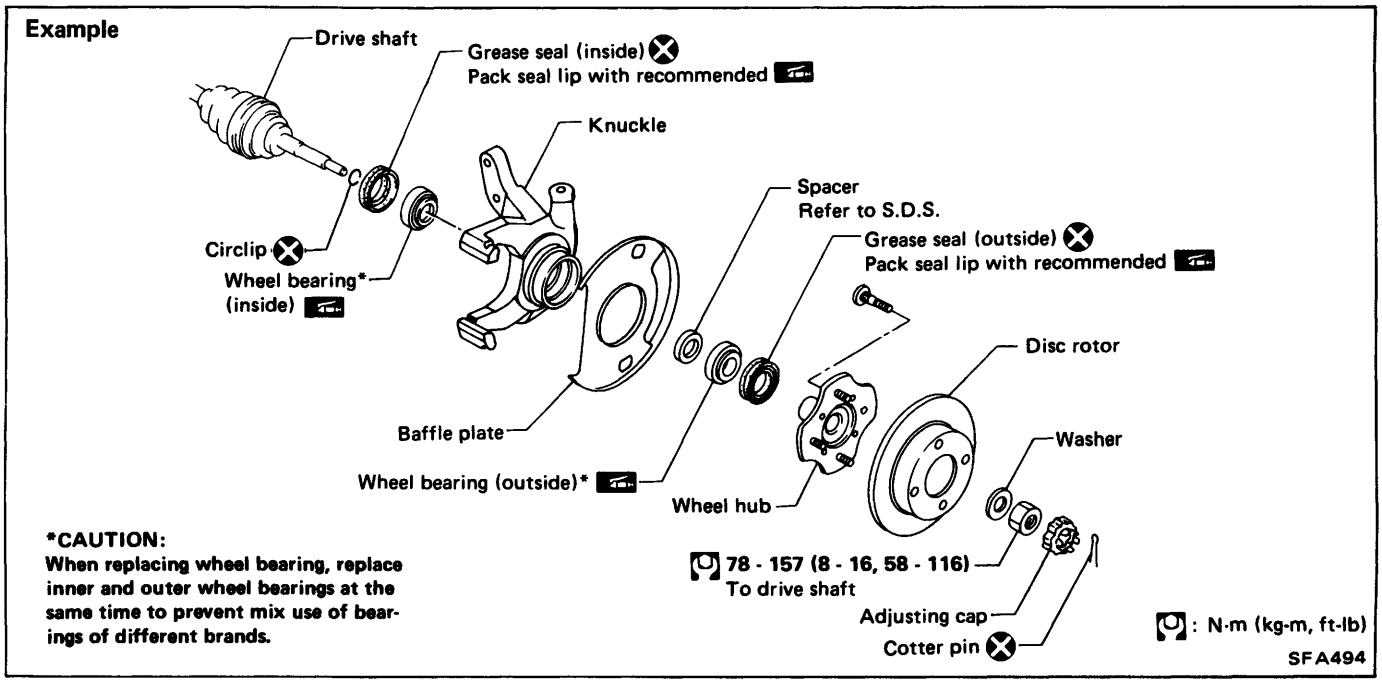
1. Before connecting or disconnecting E.C.C.S. harness connector to or from any E.C.C.S. control unit, be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal.
   Otherwise, there may be damage to control unit.
2. Before disconnecting pressurized fuel line from fuel pump to injectors, be sure to release fuel pressure to eliminate danger.
3. Be careful not to jar components such as control unit and air flow meter.

Precautions for a Catalyst

If a large amount of unburned fuel flows into the converter, the converter temperature will be excessively high. To prevent this, follow the procedure below.

1. Use unleaded gasoline only. Leaded gasoline will seriously damage the catalytic converter.
2. When checking for ignition spark or measuring engine compression, make tests quickly and only when necessary.
3. Do not run engine when the fuel tank level is low, otherwise the engine may misfire causing damage to the converter.
4. Do not place the vehicle on inflammable material. Keep inflammable material off the exhaust pipe.

1. **A QUICK REFERENCE INDEX**, a black tab (e.g. FA) is provided on the first page. You can quickly find the first page of each section by mating it to the section's black tab.
2. **THE CONTENTS** are listed on the first page of each section.
3. **THE TITLE** is indicated on the upper portion of each page and shows the part or system.
4. **THE PAGE NUMBER** of each section consists of two letters, which designate the particular section, and a number (e.g. "FA-5").
5. **THE LARGE ILLUSTRATION** is an exploded view (See below) and contains tightening torques, lubrication points and other information necessary to perform repairs.
   The illustration should be used in reference to the service matters only. When ordering parts, refer to the appropriate **PARTS CATALOG**.



6. **THE SMALL ILLUSTRATION** shows the important steps such as inspection, use of special tools, knacks of work and hidden or tricky steps which are not shown in the previous large illustration.
   Assembly, inspection and adjustment procedures for the complicated units such as the automatic transaxle or transmission, etc. are presented in a step-by-step format where necessary.
7. The followings **SYMBOLS AND ABBREVIATIONS** are used:

: Tightening Torque

: Should be lubricated with grease. Unless otherwise indicated, use recommended multi-purpose grease.

: Should be lubricated with oil.

: Sealing point

: Checking point

: Always replace when disassembled.

S.D.S.:	Service Data and Specifications
L.H., R.H.:	Left-Hand, Right-Hand
M/T:	Manual Transaxle/Transmission
A/T:	Automatic Transaxle/Transmission
Tool:	Special Service Tools

8. The **UNIT** given in this manual are primarily expressed with the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the yard/pound system.

   "Example"

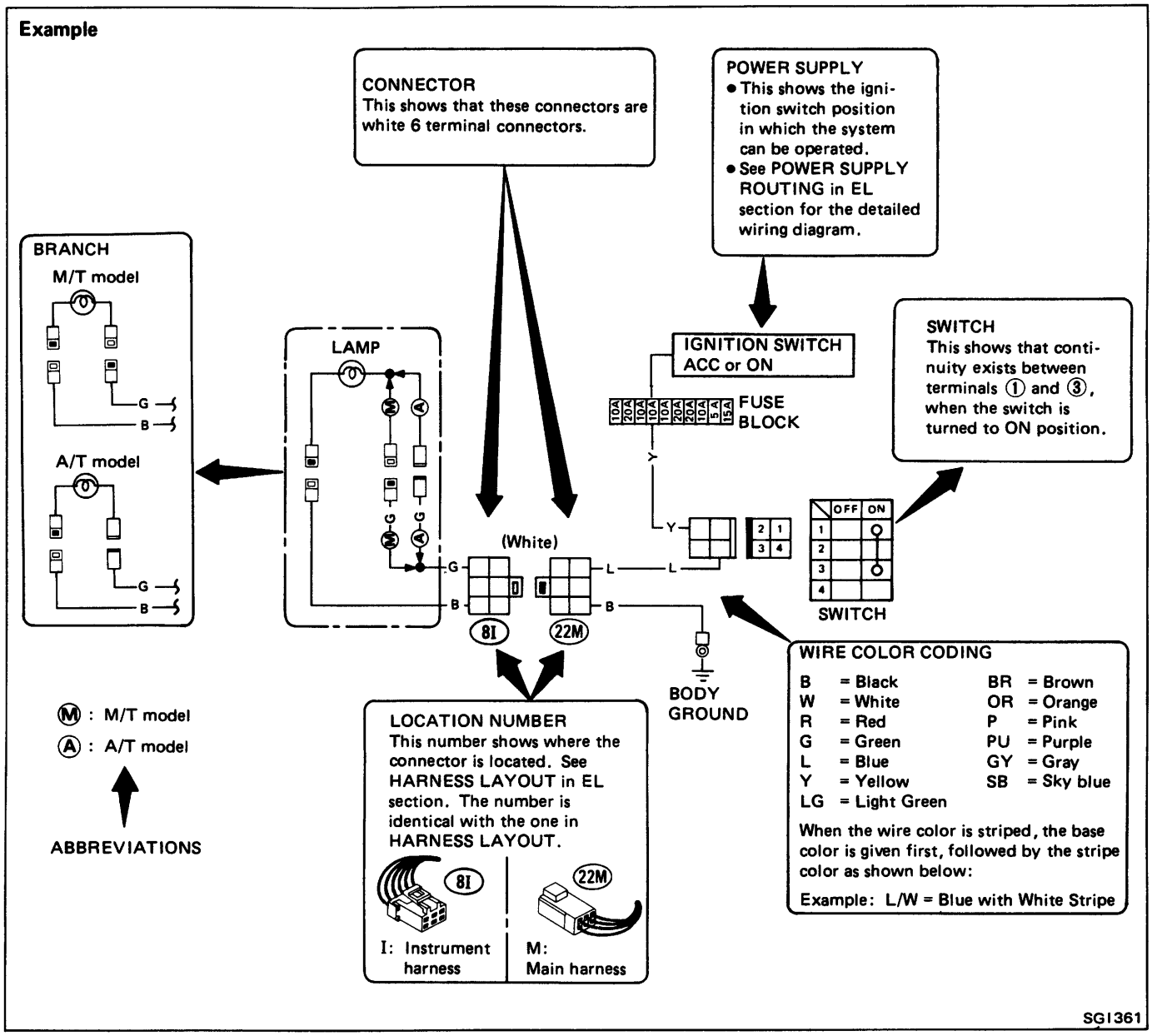
   Tightening torque:

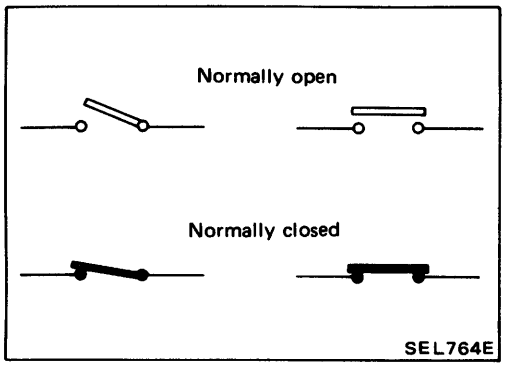
   59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)

9. **TROUBLE DIAGNOSES AND CORRECTIONS** are included in sections dealing with complicated components.
10. **SERVICE DATA AND SPECIFICATIONS** is contained at the end of each section for quick reference of data.
11. The captions **WARNING** and **CAUTION** warn you of steps that must be followed to prevent personal injury and/or damage to some part of the vehicle.

WIRING DIAGRAM

Symbols used in WIRING DIAGRAM are shown below.

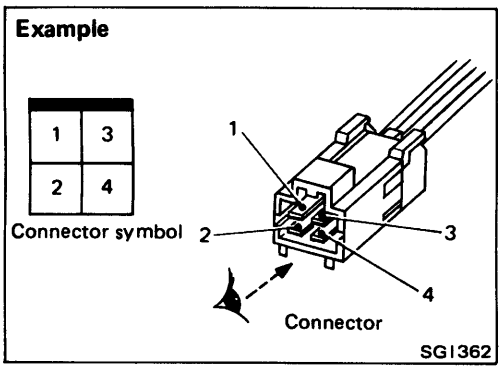




SWITCH POSITIONS

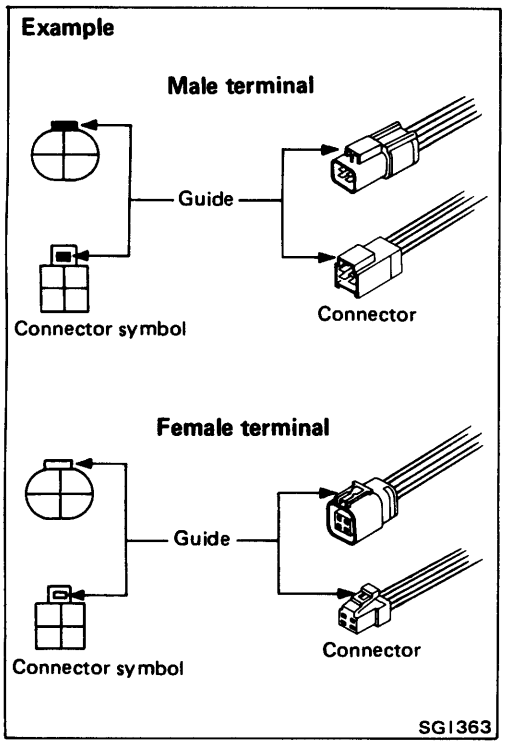
Wiring diagram switches are shown with the vehicle in the following condition:

- Ignition switch "OFF".
- Doors, hood and trunk lid/back door closed.
- Pedals are not depressed and parking brake is released.

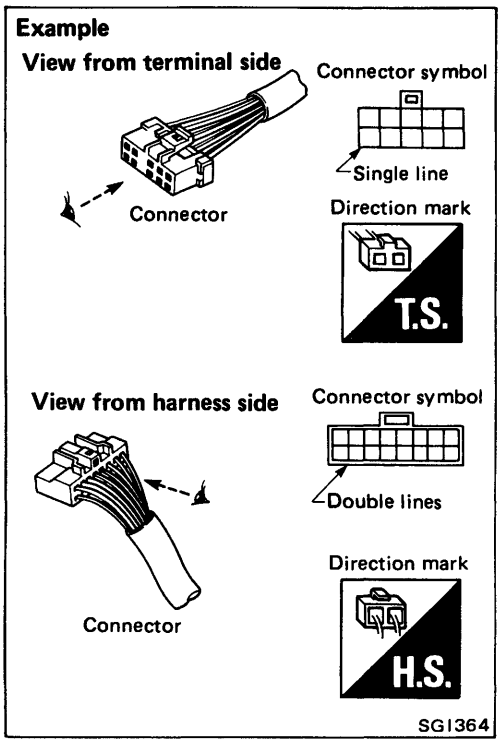


CONNECTOR SYMBOLS

- All connector symbols in wiring diagrams are shown from the terminal side.



- Male and female terminals
  Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.



DIRECTION MARK

A direction mark is shown to clarify the side of connector (terminal side or harness side).

Direction marks are mainly used in the illustrations indicating terminal inspection.



: **View from terminal side . . . T.S.**

- **All connector symbols shown from the terminal side are enclosed by a single line.**



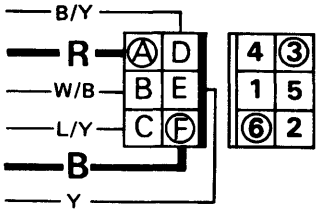
: **View from harness side . . . H.S.**

- **All connector symbols shown from the harness side are enclosed double lines.**

MULTIPLE SWITCH

The continuity of the multiple switch is identified in the switch chart in wiring diagrams.

Example



WIPER SWITCH

	OFF	INT	LO	HI	WASH
1					○
2				○	
3	○	○	●		
4	○	○			
5		○			
6		○	●	○	○

Continuity circuit of wiper switch

SWITCH POSITION	CONTINUITY CIRCUIT
OFF	3 - 4
INT	3 - 4, 5 - 6
LO	3 - 6
HI	2 - 6
WASH	1 - 6

Example: Wiper switch in LO position

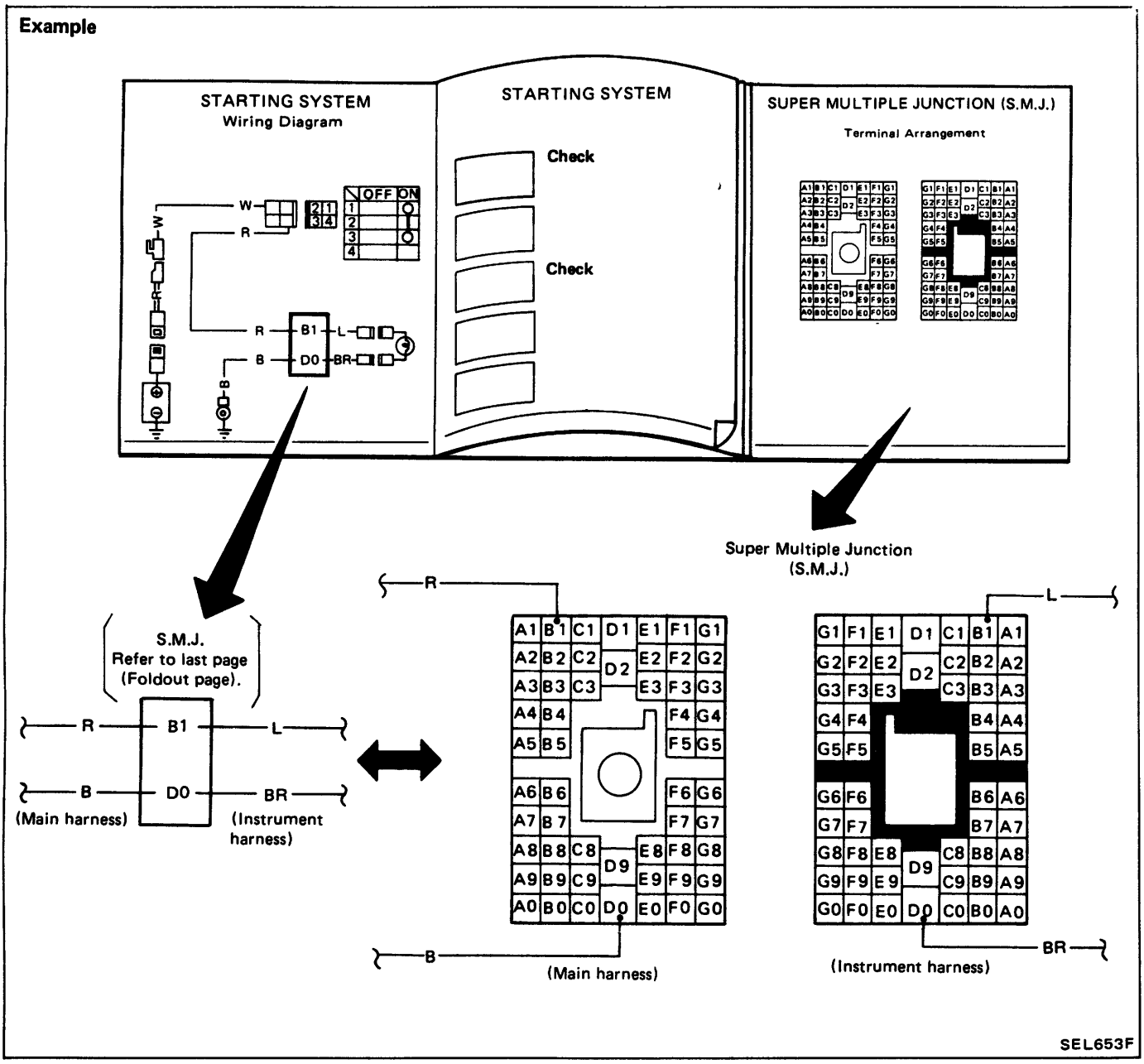
Continuity circuit: Red wire – Ⓐ terminal – ③ terminal – Wiper switch (● – ●: LO) – ⑥ terminal – Ⓕ terminal – Black wire

SGI365

SUPER MULTIPLE JUNCTION (S.M.J.)

- The "S.M.J." indicated in wiring diagrams is shown in a simplified form. The terminal arrangement should therefore be referred to in the foldout at the end of the Service Manual.
- The foldout should be spread to read the entire wiring diagram.

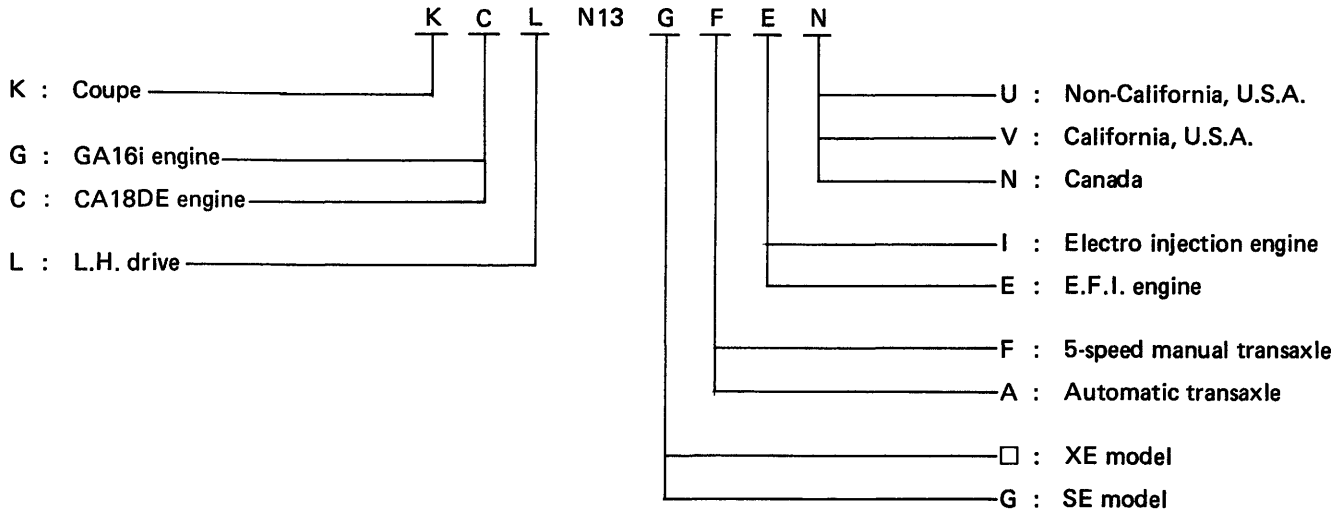
Example



Model Variation

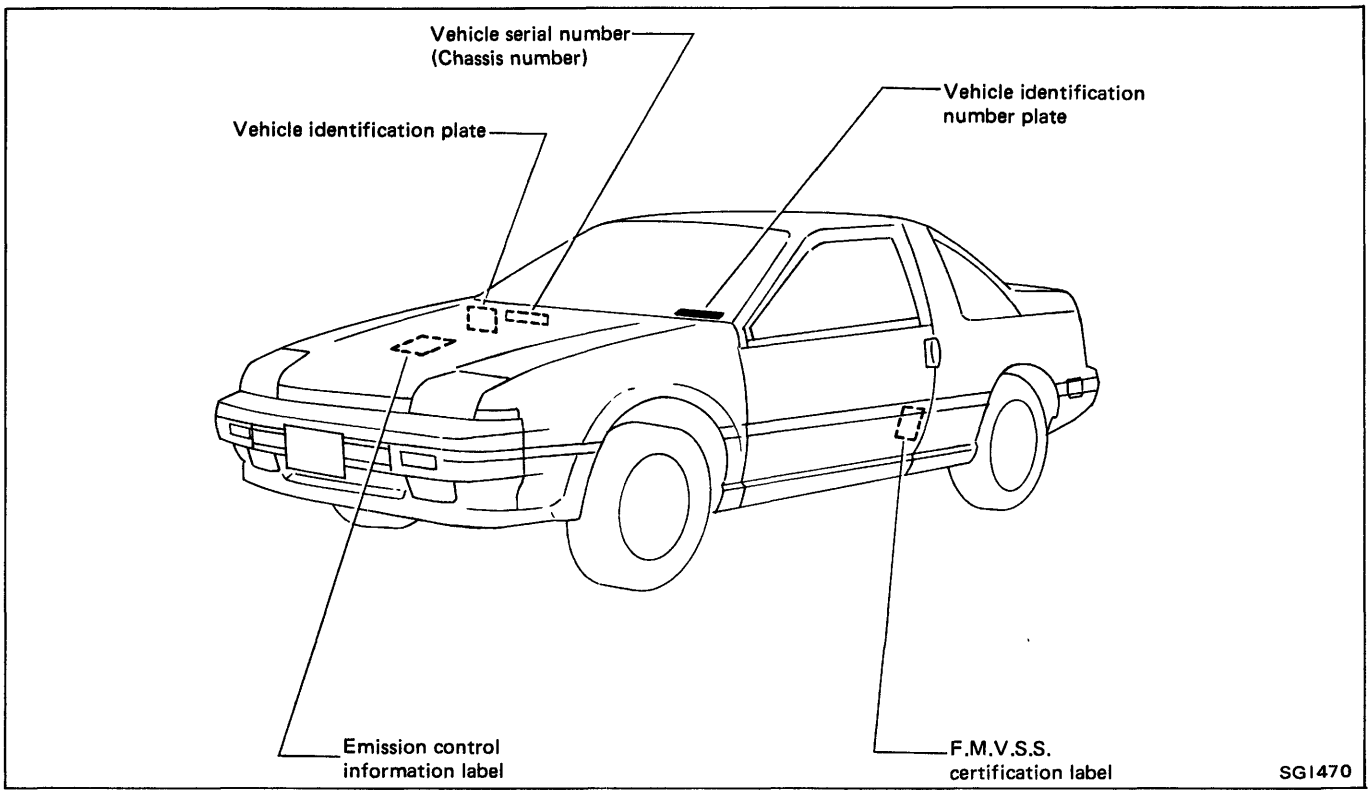
Destination	Body	Grade (Engine / Transaxle)	GA16i RS5F31A (M/T)	GA16i RL3F01A (A/T)	CA18DE RS5F50A (M/T)	CA18DE RL4F02A (A/T)
Non-California, U.S.A.	Coupe	XE	KGLN13FIU	KGLN13AIU	–	–
		SE	–	–	KCLN13GFEU	KCLN13GAEU
California, U.S.A.		XE	KGLN13FIV	KGLN13AIV	–	–
		SE	–	–	KCLN13GFEV	KCLN13GAEV
Canada		XE	KGLN13FIN	KGLN13AIN	–	–
		SE	–	–	KCLN13GFEN	KCLN13GAEN

Prefix and suffix designations



Note: □ means no indication.

Identification Number



VEHICLE IDENTIFICATION NUMBER ARRANGEMENT

JN1 G N 3 4 S X K W 000001

Manufacturer
JN1 : Nissan, Passenger vehicle

Engine type
G : GA16i
C : CA18DE

Vehicle line
N : Nissan Pulsar NX

Model change (0 to 9)

Body type
4 : Coupe

Vehicle serial number
(Chassis number)

Manufacture plant
M : Kyushu plant

Model year
K : 1989 year model

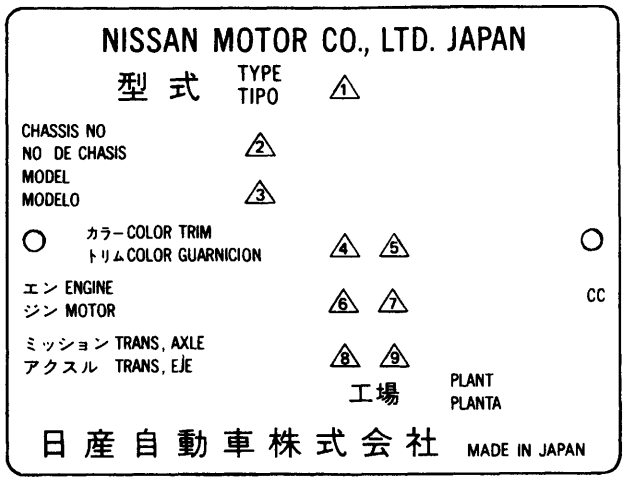
Check digit (0 to 9 or X)
The code for the check digit is determined by mathematical computation.

Restraint system
S : Standard

The 1989 models start production with the following vehicle identification numbers (Chassis number).
GA16i engine: JN1GN34SXKW400001
CA18DE engine: JN1CN34SXKW400001

Identification Number (Cont'd)

IDENTIFICATION PLATE

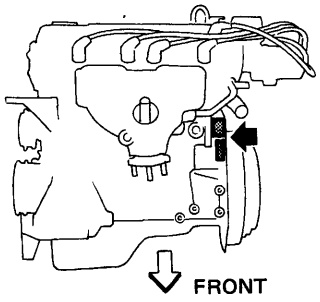


1 Type
2 Vehicle identification number (Chassis number)
3 Model
4 Body color code
5 Trim color code
6 Engine model
7 Engine displacement
8 Transaxle model
9 Axle model

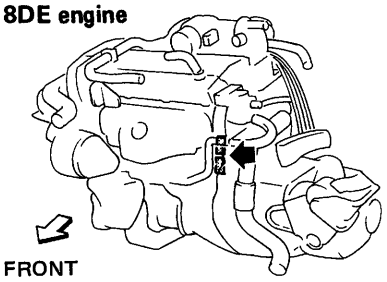
SGI315

ENGINE SERIAL NUMBER

GA16i engine



CA18DE engine

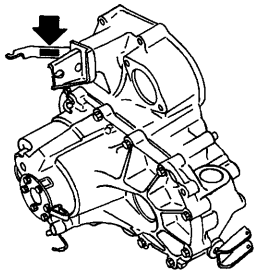


SGI546

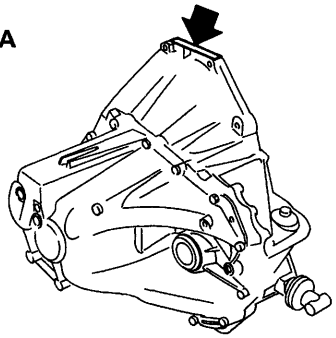
TRANSAXLE SERIAL NUMBER

Manual transaxle number

RS5F31A



RS5F50A

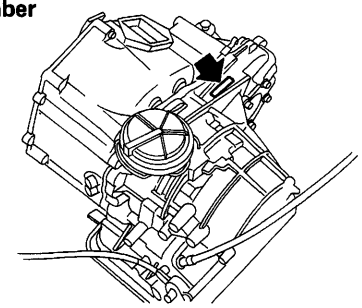


SGI507

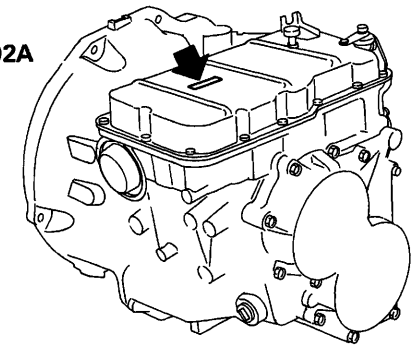
TRANSAXLE SERIAL NUMBER

Automatic transaxle number

RL3F01A



RL4F02A



SGI508

Dimensions

Item		
Overall length	mm (in)	4,230 (166.5)
Overall width	mm (in)	1,680 (66.1)
Overall height	mm (in)	1,295 (51.0)
Ground clearance	mm (in)	140 (5.5)
Front tread	mm (in)	1,435 (56.5)* 1,445 (56.9)
Rear tread	mm (in)	1,435 (56.5)* 1,445 (56.9)
Wheelbase	mm (in)	2,430 (95.7)

*SE model

Wheels & Tires

		Conventional tire		Spare tire
Road wheel	Type	Steel	Aluminum	Steel
	Size/offset mm (in)	5-J x 13/35 (1.38)	6-JJ x 14/40* (1.57)	4T x 14/40 (1.57)
Tire	Type	Tubeless, steel radial		Tubeless, bias
	Size	P185/70R13 195/60R14-85H*		T115/70D14

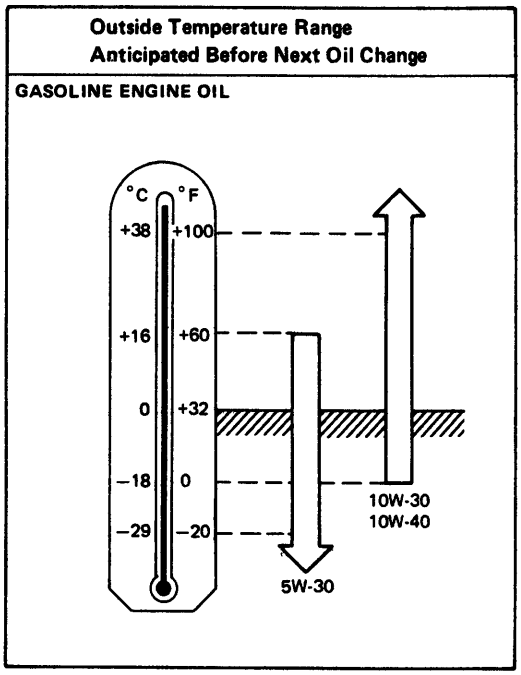
*SE model

Fuel and Lubricants

	Capacity (Approximate)			Recommended fuel and lubricants
	US measure	Imp measure	Liter	
Fuel	13-1/4 gal	11 gal	50	Unleaded gasoline with an octane rating of at least 87 AKI (RON91)
Engine oil (Refill)				Genuine Nissan Motor Oil*1 or equivalent Energy Conserving Oils*2 of API SF or SG*3
With oil filter				
GA16i	3-3/8 qt	2-7/8 qt	3.2	
CA18DE	4 qt	3-3/8 qt	3.8	
Without oil filter				
GA16i	3 qt	2-1/2 qt	2.8	
CA18DE	3-5/8 qt	3 qt	3.4	
Cooling system (Reservoir tank included)				Anti-freeze coolant (Ethylene glycol base)
GA16i				
M/T	5-3/4 qt	4-3/4 qt	5.4	
A/T	6-1/4 qt	5-1/4 qt	5.9	
CA18DE				
M/T	6-1/8 qt	5-1/8 qt	5.8	
A/T	6-1/2 qt	5-1/2 qt	6.2	
Manual transaxle gear oil				API GL-4*2
RS5F31A	5-7/8 pt	4-7/8 pt	2.8	
RS5F50A	10 pt	8-1/4 pt	4.7	
Automatic transaxle fluid				Genuine Nissan ATF*1 or equivalent Type DEXRON™
RL3F01A	6-5/8 qt	5-1/2 qt	6.3	
RL4F02A	7-1/4 qt	6 qt	6.8	
Power steering fluid	1 qt	3/4 qt	0.9	Type DEXRON™
Brake fluid	—	—	—	Genuine Nissan Brake Fluid*1 or equivalent DOT 3 (US FMVSS No. 116)
Multi-purpose grease	—	—	—	NLGI No. 2 (Lithium soap base)

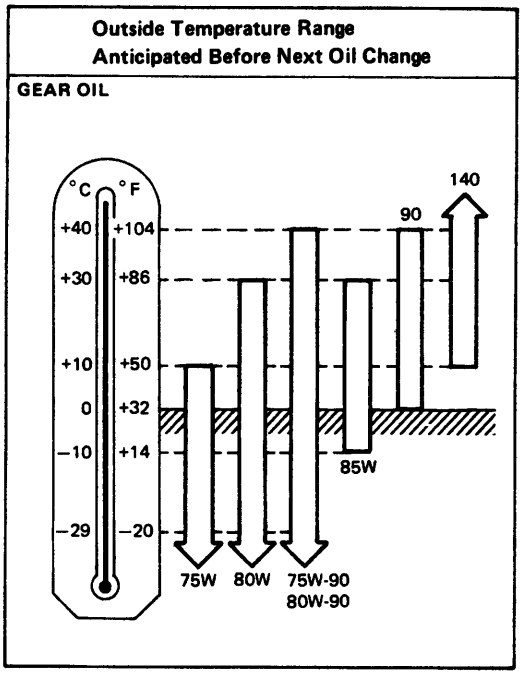
*1: Available in mainland U.S.A. through your Nissan dealer.
*2: For further details, see "Recommended SAE viscosity number".
*3: Energy conserving oils
These oils can be identified by such labels as energy conserving, energy saving, improved fuel economy, etc.

SAE Viscosity Number



TI0002

10W-30 is preferable if the ambient temperature is above −18°C (0°F). 20W-40 and 20W-50 are usable if the ambient temperature is above 10°C (50°F) for all seasons.



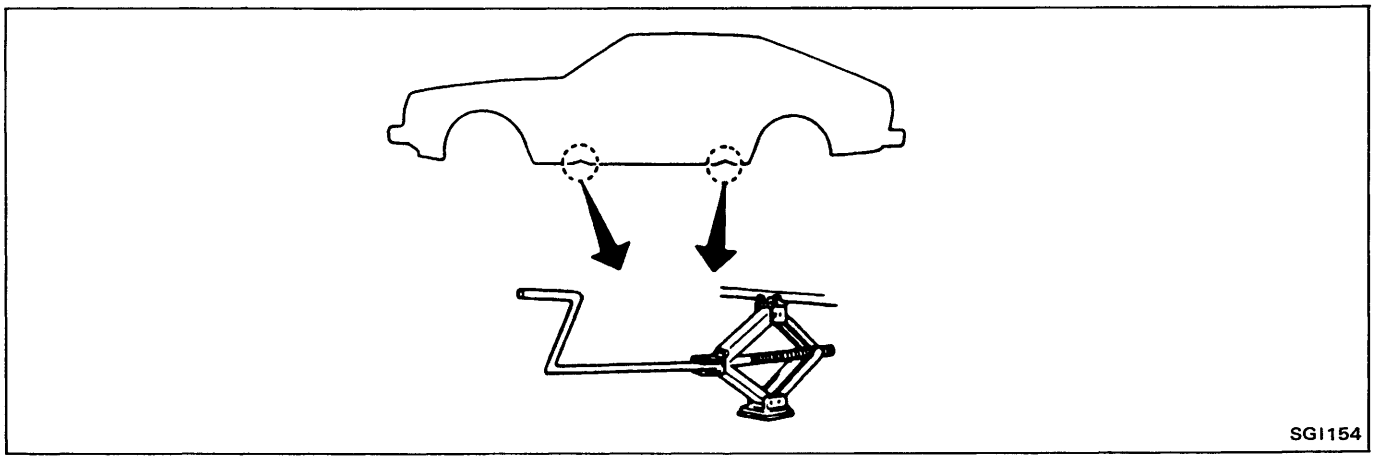
TI0003

80W-90 is preferable if the ambient temperature is below 40°C (104°F).

WARNING:

a. Never get under the vehicle while it is supported only by the jack. Always use safety stands to support the frame when you have to get under the vehicle.
b. Place wheel chocks at both front and back of the wheel which is diagonally opposite the jack position. Example: If the jack is positioned at the L.H. front wheel, place wheel chocks at R.H. rear wheel.

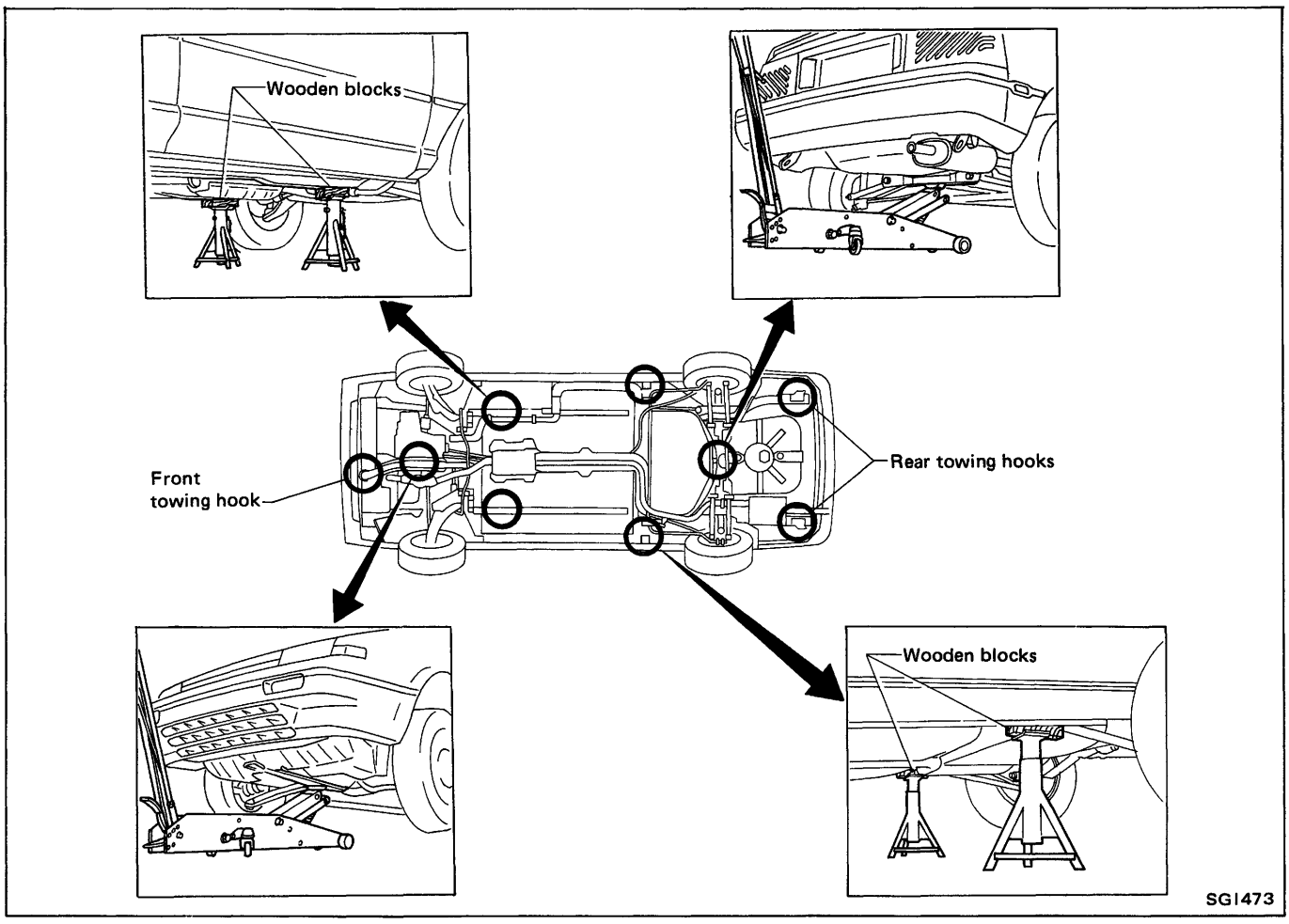
Pantograph Jack



Garage Jack and Safety Stand

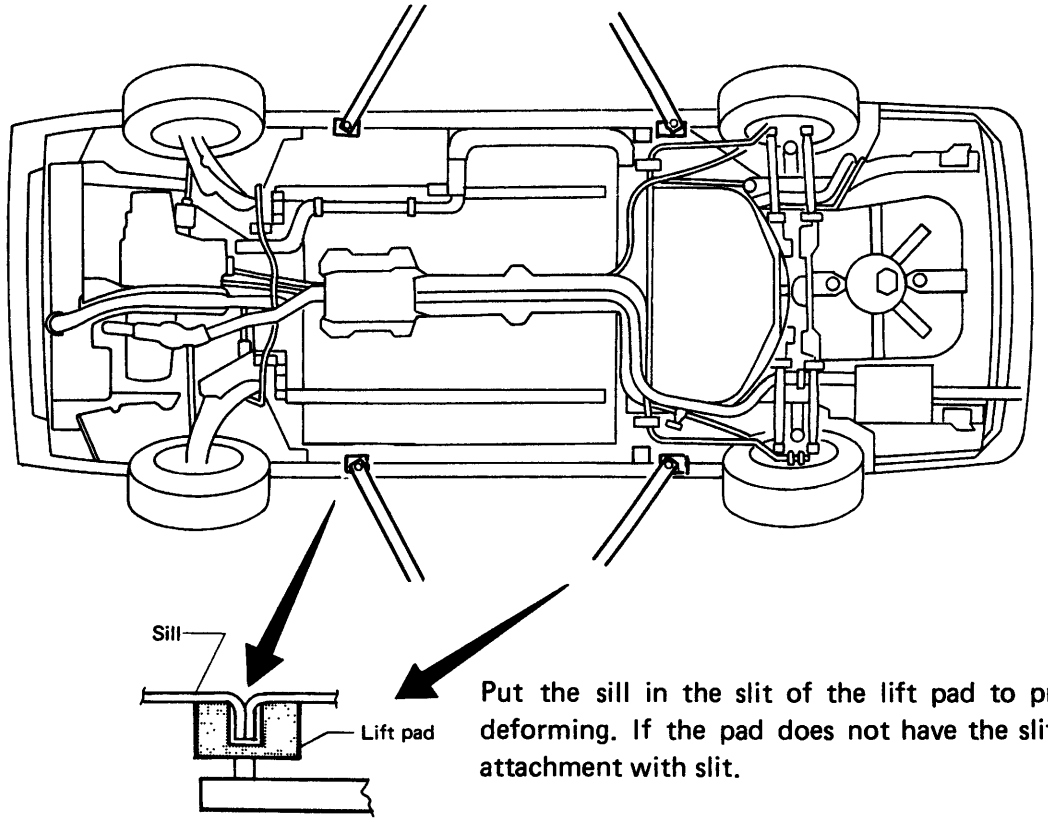
CAUTION:

- Place a wooden or rubber block between safety stand and vehicle body when the supporting body is flat.



2-pole Lift

WARNING:
When lifting the vehicle, open the lift arms as wide as possible and ensure that the front and rear of the vehicle are well balanced.
When setting the lift arm, do not allow the arm to contact the brake tubes and fuel lines.



Note: Lift-up points are the same as pantograph jack points.

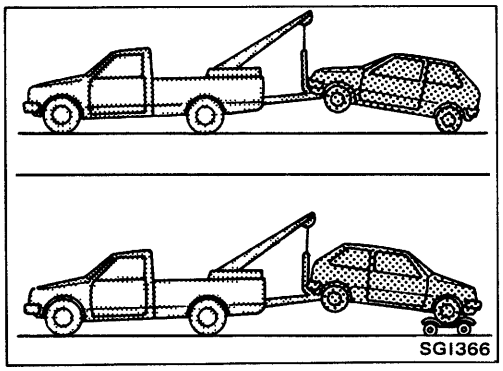
Put the sill in the slit of the lift pad to prevent the sill from deforming. If the pad does not have the slit, prepare a suitable attachment with slit.

SGI448

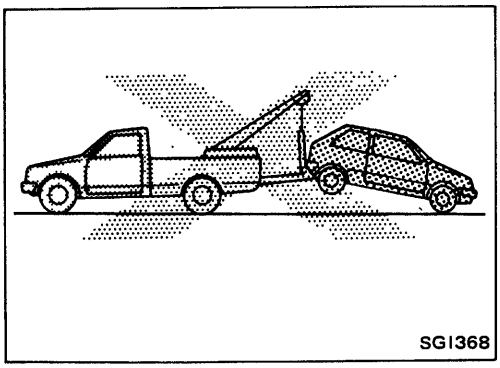
Tow Truck Towing

CAUTION:

- **All applicable state or Provincial (in Canada) laws and local laws regarding the towing operation must be obeyed.**
- **It is necessary to use proper towing equipment to avoid possible damage to the vehicle during towing operation. Towing should be done in accordance with Towing Procedure Manual.**
- **Attach safety chains for all towing.**
- **When towing, make sure that the transmission, steering system and power train are in good order. If any unit is damaged, a dolly must be used.**
- **When towing with the front wheels on the ground: Turn the ignition key to the "OFF" position and secure the steering wheel in a straightahead position with a rope or similar device. Never place the ignition key in the "LOCK" position. This will result in damage to the steering lock mechanism.**
- **Move the gearshift lever to the neutral ("N" position).**
- **When towing with the rear wheels on the ground, release the parking brake .**


SGI366

NISSAN recommends that vehicle be towed with the driving (front) wheels off the ground as illustrated.


SGI368

TOWING AN AUTOMATIC TRANSAXLE MODEL WITH REAR WHEELS RAISED (With front wheels on ground)

Never tow an automatic transaxle model with rear wheels raised (with front wheels on ground) as this may cause serious and expensive damage to the transaxle. If it is necessary to tow it with rear wheels raised, always use a towing dolly under the front wheels.

Tow Truck Towing (Cont'd)

TOWING AN AUTOMATIC TRANSAXLE MODEL WITH FOUR WHEELS ON GROUND

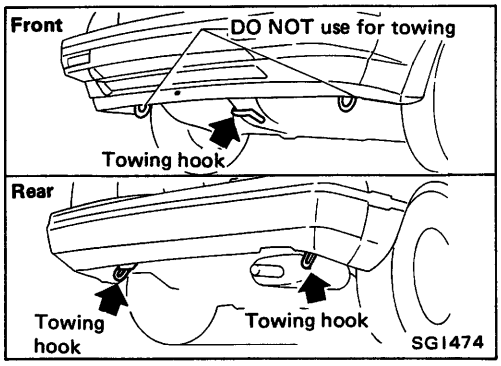
Observe the following restricted towing speeds and distances.

Speed:

Below 50 km/h (30 MPH)

Distance:

Less than 65 km (40 miles)



TOWING POINT

- **Never tow the vehicle using only the towing hooks. Use proper towing equipment when towing. Otherwise, the vehicle body will be damaged.**
- **Always pull the cable straight out from the vehicle. Never pull on the hook at a sideways angle.**

TIGHTENING TORQUE OF STANDARD BOLTS

Grade	Bolt size	Bolt diameter* mm	Pitch mm	Tightening torque (Without lubricant)					
				Hexagon head bolt			Hexagon flange bolt		
				N·m	kg-m	ft-lb	N·m	kg-m	ft-lb
4T	M6	6.0	1.0	5.1	0.52	3.8	6.1	0.62	4.5
	M8	8.0	1.25	13	1.3	9	15	1.5	11
			1.0	13	1.3	9	16	1.6	12
	M10	10.0	1.5	25	2.5	18	29	3.0	22
			1.25	25	2.6	19	30	3.1	22
	M12	12.0	1.75	42	4.3	31	51	5.2	38
			1.25	46	4.7	34	56	5.7	41
	M14	14.0	1.5	74	7.5	54	88	9.0	65
7T	M6	6.0	1.0	8.4	0.86	6.2	10	1.0	7
	M8	8.0	1.25	21	2.1	15	25	2.5	18
			1.0	22	2.2	16	26	2.7	20
	M10	10.0	1.5	41	4.2	30	48	4.9	35
			1.25	43	4.4	32	51	5.2	38
	M12	12.0	1.75	71	7.2	52	84	8.6	62
			1.25	77	7.9	57	92	9.4	68
	M14	14.0	1.5	127	13.0	94	147	15.0	108
9T	M6	6.0	1.0	12	1.2	9	15	1.5	11
	M8	8.0	1.25	29	3.0	22	35	3.6	26
			1.0	31	3.2	23	37	3.8	27
	M10	10.0	1.5	59	6.0	43	70	7.1	51
			1.25	62	6.3	46	74	7.5	54
	M12	12.0	1.75	98	10.0	72	118	12.0	87
			1.25	108	11.0	80	137	14.0	101
	M14	14.0	1.5	177	18.0	130	206	21.0	152

1. **Special parts are excluded.**
2. **This standard is applicable to bolts having the following marks embossed on the bolt head.**

Grade	Mark
4T	4
7T	7
9T	9

*: Nominal diameter

M 6
- 6: Nominal diameter of bolt threads (Unit: mm)
- M: Metric screw threads

MAINTENANCE

SECTION MA

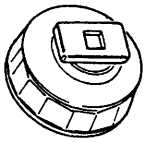
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PERIODIC MAINTENANCE ..... MA- 3
GENERAL MAINTENANCE ..... MA- 6
LUBRICATION CHART ..... MA- 9
ENGINE MAINTENANCE MA-10
CHASSIS AND BODY MAINTENANCE MA-22
SERVICE DATA AND SPECIFICATIONS (S.D.S.) MA-42

SPECIAL SERVICE TOOL

For engine maintenance

X: Available

Tool number (Kent-Moore No.) Tool name	Description	Engine Application	
		GA	CA
KV10105900 (J34274) Oil filter cap wrench	 Removing oil filter	X	X

The following charts show the normal maintenance schedule. Under severe driving conditions, additional or more frequent maintenance will be required. Refer to **"Maintenance under severe driving conditions"**.
The periodic maintenance schedule is repeated beyond the last mileage and period shown by returning to the first 15,000 miles (24,000 km) or 12 months.

GA16i ENGINE MODELS

Emission control system maintenance

MAINTENANCE OPERATION		MAINTENANCE INTERVAL					
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	7.5	15	30	45	60	Reference page
	(km x 1,000)	(12)	(24)	(48)	(72)	(96)	
	Months	6	12	24	36	48	
Drive belts	See NOTE (1).					I*	MA-10
Air cleaner filter			Replace every 30,000 miles (48,000 km).				MA-13
Positive crankcase ventilation (P.C.V.) filter	See NOTE (2)*.						MA-15
Vapor lines				I*		I*	MA-15
Fuel lines (hoses, piping, connections, etc.)				I*		I*	MA-12
Fuel filter	See NOTE (2)*.						MA-12
Engine coolant				R		R	MA-11
Engine oil		R	Then replace every 7,500 miles (12,000 km) or 6 months.				MA-13
Engine oil filter (Use Nissan PREMIUM type or equivalent.)		R	Then replace every second oil change.				MA-14
Spark plugs			Replace every 30,000 miles (48,000 km).				MA-14
Ignition wires			Inspect every 3 years*.				MA-15

Chassis and body maintenance

MAINTENANCE OPERATION		MAINTENANCE INTERVAL				
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	15	30	45	60	Reference page
	(km x 1,000)	(24)	(48)	(72)	(96)	
	Months	12	24	36	48	
Brake lines & hoses		I	I	I	I	MA-32
Brake pads, discs, drums & linings		I	I	I	I	MA-32, 33
Manual & automatic transaxle gear oil		I	I	I	I	MA-23, 24
Steering gear & linkage, axle & suspension parts			I		I	MA-26, 30, 40
Front drive shaft boots		I	I	I	I	MA-29
Exhaust system		I	I	I	I	MA-22

NOTE: (1) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months.
(2) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.
(3) Maintenance items and intervals with "*" are recommended by NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

Abbreviations: R = Replace
I = Inspect. Correct or replace if necessary.

The following charts show the normal maintenance schedule. Under severe driving conditions, additional or more frequent maintenance will be required. Refer to **"Maintenance under severe driving conditions".**

The periodic maintenance schedule is repeated beyond the last mileage and period shown by returning to the first 15,000 miles (24,000 km) or 12 months.

CA18DE ENGINE MODELS

Emission control system maintenance

MAINTENANCE OPERATION		MAINTENANCE INTERVAL					
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	7.5	15	30	45	60	Reference page
	(km x 1,000)	(12)	(24)	(48)	(72)	(96)	
	Months	6	12	24	36	48	
Drive belts	See NOTE (1).					I*	MA-16
Air cleaner filter			Replace every 30,000 miles (48,000 km).				MA-17
Vapor lines				I*		I*	MA-17
Fuel lines (hoses, piping, connections, etc.)				I*		I*	MA-17
Fuel filter	See NOTE (2)*.						MA-17
Engine coolant				R		R	MA-18
Engine oil		R	Then replace every 7,500 miles (12,000 km) or 6 months.				MA-19
Engine oil filter (Use Nissan PREMIUM type or equivalent.)		R	Then replace every second oil change.				MA-19
Spark plugs (PLATINUM-TIPPED type)	See NOTE (3).		Replace every 60,000 miles (96,000 km).				MA-20
Timing belt			Replace every 60,000 miles (96,000 km).				EM-58

Chassis and body maintenance

MAINTENANCE OPERATION		MAINTENANCE INTERVAL				
Perform at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	15	30	45	60	Reference page
	(km x 1,000)	(24)	(48)	(72)	(96)	
	Months	12	24	36	48	
Brake lines & hoses		I	I	I	I	MA-32
Brake pads, discs, drums & linings		I	I	I	I	MA-32, 33
Manual & automatic transaxle gear oil		I	I	I	I	MA-23, 24
Steering gear & linkage, axle & suspension parts			I		I	MA-26, 30, 40
Front drive shaft boots		I	I	I	I	MA-29
Exhaust system		I	I	I	I	MA-22

NOTE: (1) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months.

(2) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.

(3) Original equipment platinum-tipped plugs should be replaced at 60,000 miles (96,000 km). Conventional spark plugs can be used but should be replaced at 30,000 miles (48,000 km) intervals.

(4) Maintenance items and intervals with "*" are recommended by NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

Abbreviations: R = Replace
I = Inspect. Correct or replace if necessary.

MAINTENANCE UNDER SEVERE DRIVING CONDITIONS

The maintenance intervals shown on the preceding pages are for normal operating conditions. If the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance is required to be performed on the following items as shown in the table.

Severe driving conditions

A — Repeated short trips less than 5 miles (8 km) and outside temperatures remain below freezing
B — Extensive idling and/or low speed driving for a long distance such as police, taxi or door-to-door delivery use
C — Driving in dusty conditions
D — Driving on rough, muddy, or salt spread roads
E — Towing a trailer, using a camper or a car-top carrier

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page	
				GA16i	CA18DE
. . C . .	Air cleaner filter	R	More frequently	MA-13	MA-17
A B C D E	Engine oil & oil filter	R	Every 3,000 miles (5,000 km) or 3 months	MA-13, 14	MA-19
A . C D E	Brake pads, disc, drums & lining	I	Every 7,500 miles (12,000 km)	MA-32, 33	
. . . D E	Manual and automatic transaxle gear oil	R	Every 30,000 miles (48,000 km) or 24 months	MA-23, 25	
. . . D .	Steering gear & linkage, axle & suspension parts, and front drive shaft boots	I	Every 7,500 miles (12,000 km) or 6 months	MA-26, 29, 30, 40	
. . C D .	Steering linkage ball joints & front suspension ball joints	I		MA-26, 40	
A . . D E	Exhaust system	I		MA-22	

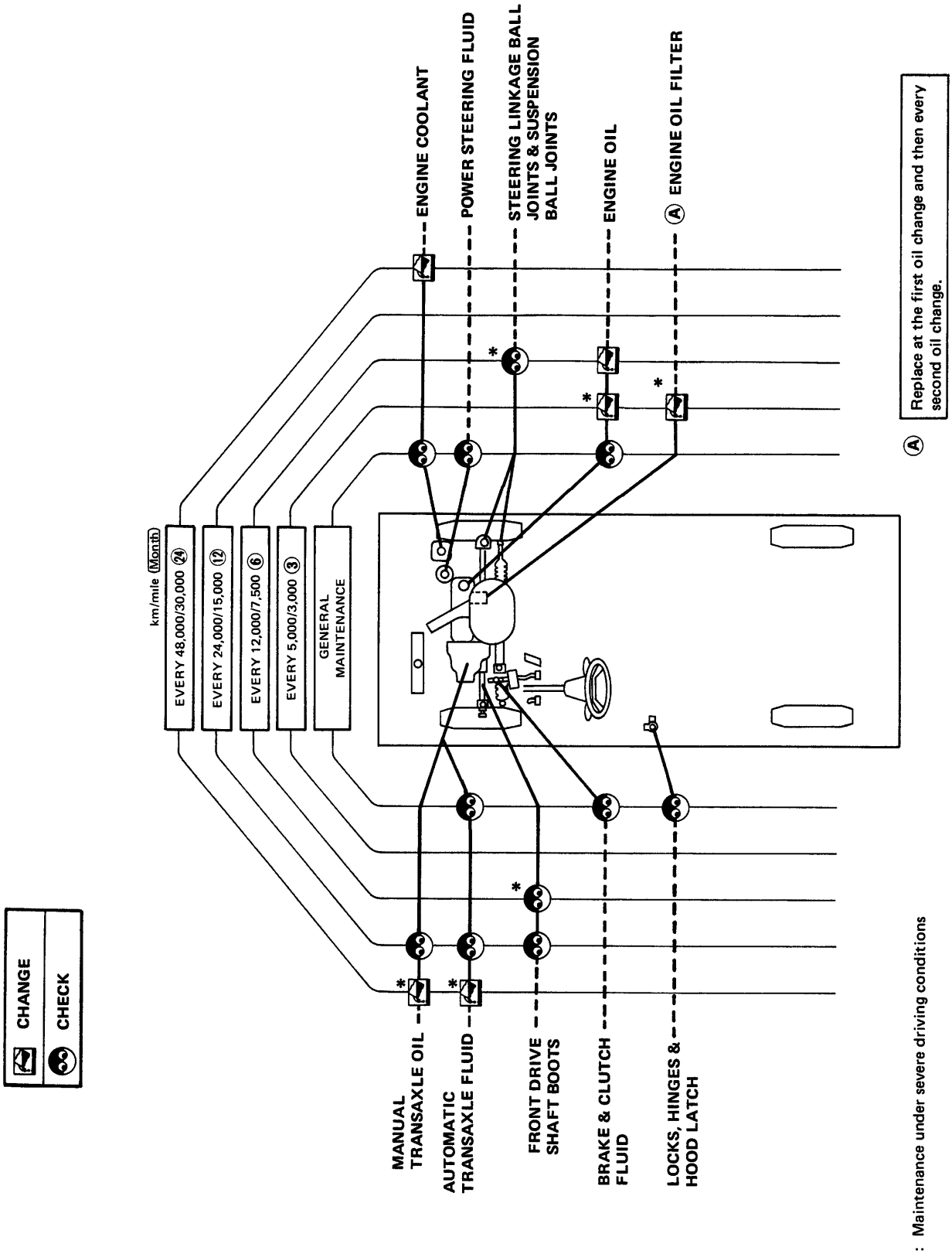
Maintenance operations: I = Inspect. Correct or replace if necessary. R = Replace

General maintenance includes those items which should be checked during the normal day-to-day operation of the vehicle. They are essential if the vehicle is to continue operating properly. The owners can perform the checks and inspections themselves or they can have their NISSAN dealers do them for a nominal charge.

Item	Reference item in MA section
OUTSIDE THE VEHICLE	
The maintenance items listed here should be performed from time to time, unless otherwise specified.	
Tires Check the pressure with a gauge periodically when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear.	• **CHECKING TIRE CONDITION**
Wheel nuts When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary.	• **TIRE REPLACEMENT**
Tire rotation Tires should be rotated every 12,000 km (7,500 miles).	• **TIRE ROTATION**
Wheel alignment and balance If the vehicle should pull to either side while driving on a straight and level road, or if you detect uneven or abnormal tire wear, there may be a need for wheel alignment. If the steering wheel or seat vibrates at normal highway speeds, wheel balancing may be needed.	• **CHECKING TIRE CONDITION** **Abnormal tire wear** • **CHECKING WHEEL ALIGNMENT** • **WHEEL INSPECTION**
Windshield glass Check for abrasions or scratches.	–
Windshield wiper blades Check for cracks or wear if they do not wipe properly.	–
Doors and engine hood Check that all doors and the engine hood operate properly. Also ensure, that all latches lock securely. Lubricate if necessary. Make sure that the secondary latch keeps the hood from opening when the primary latch is released. When driving in areas using road salt or other corrosive materials, check lubrication frequently.	• **LUBRICATING LOCKS, HINGES AND HOOD LATCH**
INSIDE THE VEHICLE	
The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle, etc.	
Lights Make sure that the headlights, stop lights, tail lights, turn signal lights, and other lights are all operating properly and installed securely. Also check headlight aim.	–
Warning lights and buzzers/chimes Make sure that all warning lights and buzzers/chimes are operating properly.	–
Horn Make sure it operates properly.	–
Windshield wiper and washer Check that the wipers and washer operate properly and that the wipers do not streak.	–

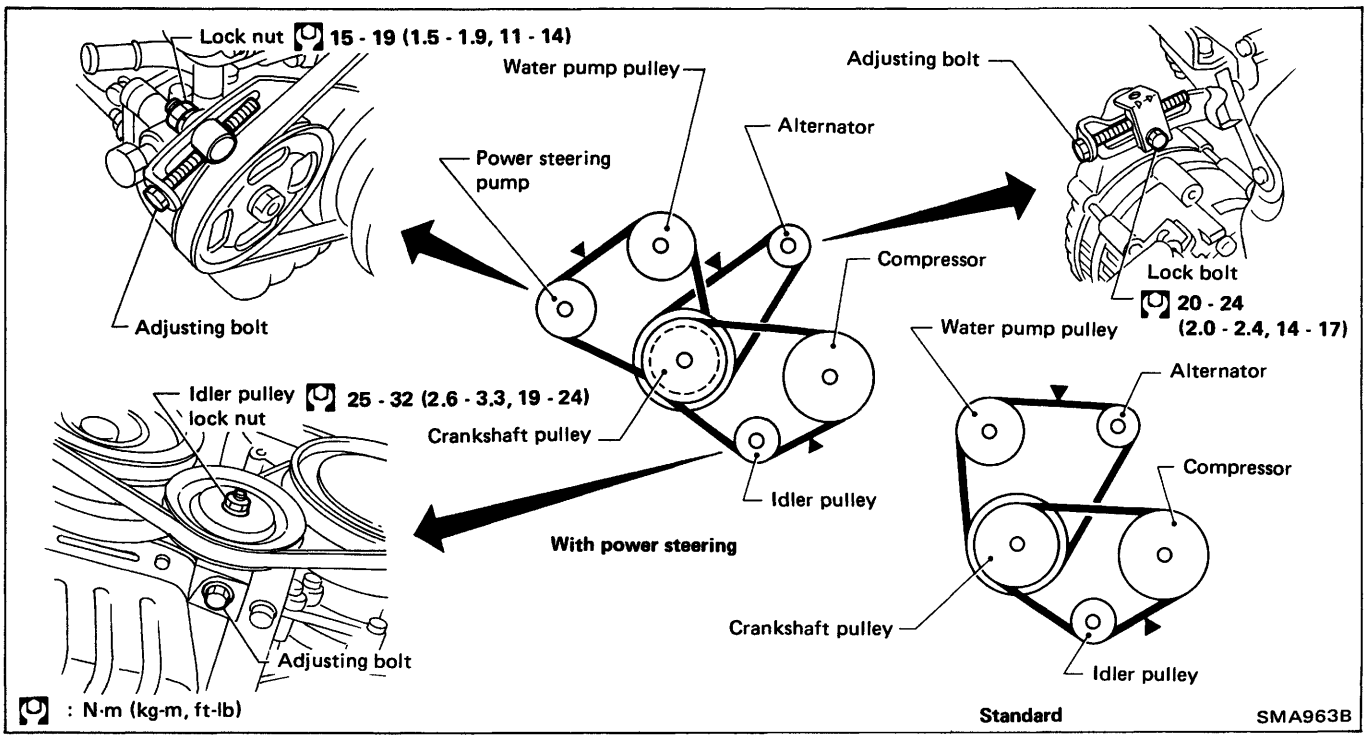
Item	Reference item in MA section
Windshield defroster Check that the air comes out of the defroster outlets properly and in sufficient quantity when operating the heater or air conditioner.	–
Rear view mirror Make sure that it is secure and clean.	–
Sun visors Make sure that they can be moved freely and are secure.	–
Steering wheel Check for changes in the steering condition, such as excessive free play, hard steering or strange noises.	**Specification** **Free play: Less than 35 mm (1.38 in)**
Seats Check seat position controls such as seat adjusters, seatback recliner, etc. to ensure they operate smoothly and that all latches lock securely in every position. Check that the head restraints move up and down smoothly and that the locks (if so equipped) hold securely in all latched positions.	–
Seat belts Check that all parts of the seat belt system (e.g. buckles, anchors, adjusters and retractors) operate properly and smoothly, and are installed securely. Check the belt webbing for cuts, fraying, wear or damage.	• **INSPECTING SEAT BELTS, BUCKLES ANCHORS, RETRACTORS AND ADJUSTER**
Accelerator pedal Check the pedal for smooth operation and make sure the pedal does not catch or require uneven effort. Keep the floor mats away from the pedal.	–
Clutch pedal Make sure the pedal operates smoothly and check that it has the proper free travel.	• **ADJUSTING CLUTCH PEDAL HEIGHT AND FREE PLAY**
Brakes Check that the brakes do not pull the vehicle to one side when applied.	–
Brake pedal Check the pedal for smooth operation and make sure it has the proper distance under it when depressed fully. Check the brake booster function.	• **CHECKING BRAKE PEDAL DEPRESSED HEIGHT** • **CHECKING BRAKE BOOSTER FUNCTION**
Parking brake Check that the lever has the proper travel and confirm that your vehicle is held securely on a fairly steep hill with only the parking brake applied.	• **CHECKING PARKING BRAKE**
Automatic transaxle "Park" mechanism Check that the lock release button on the selector lever operates properly and smoothly. On a fairly steep hill check that your vehicle is held securely with the selector lever in the "P" position without applying any brakes.	–

Item	Reference item in MA section
UNDER THE HOOD AND VEHICLE The maintenance items listed here should be checked periodically e.g. each time you check the engine oil or refuel.	
Windshield washer fluid Check that there is adequate fluid in the tank.	–
Engine coolant level Check the coolant level when the engine is cold.	–
Radiator and hoses Check the front of the radiator and clean off any dirt, insects, leaves, etc., that may have accumulated. Make sure the hoses have no cracks, deformation, rot or loose connections.	–
Brake and clutch fluid levels Make sure that the fluid levels are between the "MAX" and "MIN" lines on the reservoir.	• **CHECKING BRAKE FLUID LEVELS & LEAKS** • **CHECKING CLUTCH FLUID LEVELS & LEAKS**
Engine drive belts Make sure that no belt is frayed, worn, cracked or oily.	• **CHECKING DRIVE BELT**
Engine oil level Check the level after parking the vehicle on a level spot and turning off the engine.	–
Power steering fluid level and lines Check the level when the fluid is cold and the engine is turned off. Check the lines for proper attachment, leaks, cracks, etc.	• **CHECKING POWER STEERING FLUID LEVEL** • **CHECKING POWER STEERING LINES & HOSES**
Automatic transaxle fluid level Check the level after putting the selector lever in "P" with the engine idling.	• **CHECKING AUTOMATIC TRANSAXLE FLUID LEVEL**
Exhaust system Make sure there are no loose supports, cracks or holes. If the sound of the exhaust seems unusual or there is a smell of exhaust fumes, immediately locate the trouble and correct it.	• **INSPECTING EXHAUST SYSTEM**
Underbody The underbody is frequently exposed to corrosive substances such as those used on icy roads or to control dust. It is very important to remove these substances, otherwise rust will form on the floor pan, frame, fuel lines and around the exhaust system. At the end of winter, the underbody should be thoroughly flushed with plain water, being careful to clean those areas where mud and dirt may accumulate.	–
Fluid leaks Check under the vehicle for fuel, oil, water or other fluid leaks after the vehicle has been parked for a while. Water dripping from the air conditioner after use is normal. If you should notice any leaks or if gasoline fumes are evident, check for the cause and have it corrected immediately.	• **INSPECTING MANUAL TRANSAXLE OIL** • **INSPECTING AUTOMATIC TRANSAXLE FLUID** • **INSPECTING BRAKE LINES & HOSES** • **CHECKING POWER STEERING LINE & HOSES**


CHANGE
CHECK
km/mile (Month)
EVERY 48,000/30,000 (24)
EVERY 24,000/15,000 (12)
EVERY 12,000/7,500 (6)
EVERY 5,000/3,000 (3)
GENERAL MAINTENANCE
ENGINE COOLANT
POWER STEERING FLUID
STEERING LINKAGE BALL JOINTS & SUSPENSION BALL JOINTS
ENGINE OIL
Ⓐ ENGINE OIL FILTER
MANUAL TRANSAXLE OIL
AUTOMATIC TRANSAXLE FLUID
FRONT DRIVE SHAFT BOOTS
BRAKE & CLUTCH FLUID
LOCKS, HINGES & HOOD LATCH
Ⓐ Replace at the first oil change and then every second oil change.
* : Maintenance under severe driving conditions

SMA026C

Checking Drive Belts



1. Inspect for cracks, fraying, wear or oil adhesion. If necessary, replace with a new one.
2. Inspect drive belt deflections by pushing on the belt midway between pulleys.

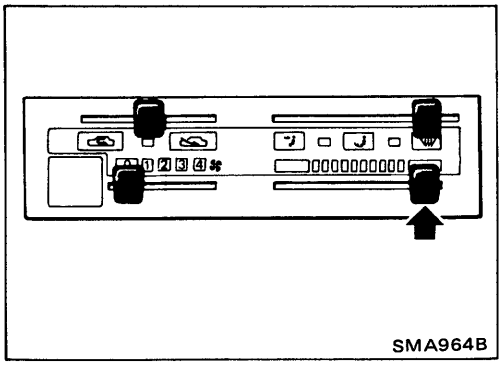
Adjust if belt deflections exceed the limit.

Belt deflection:

Unit: mm (in)

	Used belt deflection		Set deflection of new belt
	Limit	Adjusted deflection	
Alternator With power steering	11 (0.43)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)
Without power steering	10 (0.39)		
Air conditioner compressor	7.5 (0.295)	4 - 6 (0.16 - 0.24)	3 - 5 (0.12 - 0.20)
Power steering oil pump	7.5 (0.295)	4 - 6 (0.16 - 0.24)	3 - 5 (0.12 - 0.20)
Applied pushing force	98 N (10 kg, 22 lb)		

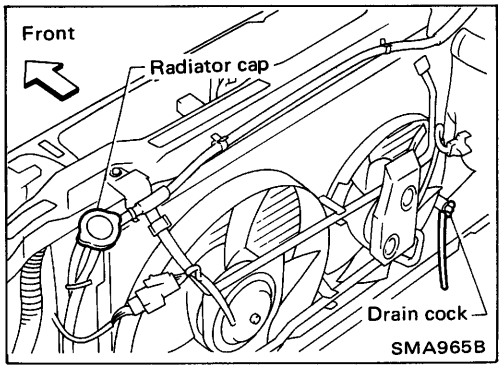
Inspect drive belt deflections when engine is cold.


SMA964B

Changing Engine Coolant

WARNING:
To avoid being scalded, never change the coolant when the engine is hot.

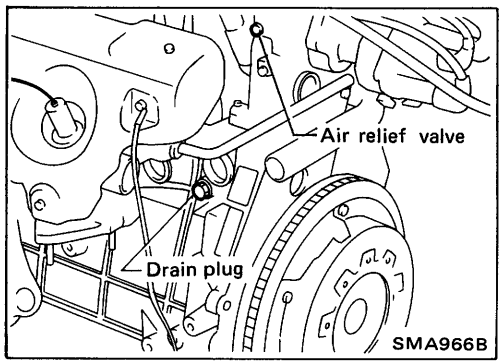
1. Move heater "TEMP" control lever all the way to "HOT" position.



SMA965B

2. Open drain cock at the bottom of radiator, and remove radiator cap.
3. Remove reservoir tank, drain coolant, then clean reservoir tank.
   Install it temporarily.

- **Be careful not to allow coolant to contact drive belts.**



SMA966B

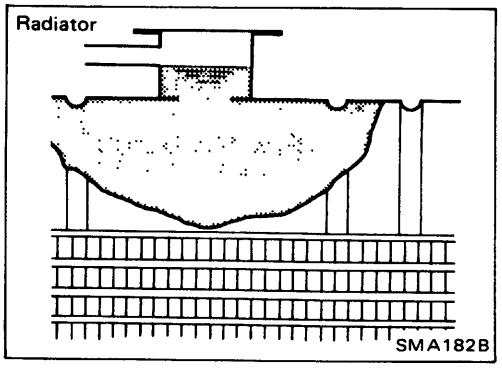
4. Remove cylinder block drain plug.
5. Close drain cock and tighten drain plug securely.
6. Fill radiator and reservoir tank with water.
   If necessary, remove air relief valve, and reinstall it when water spills from air relief hole.
   Then fill radiator and reservoir tank with water.
7. Reinstall radiator cap.
8. Warm up engine until radiator fan operates, then race engine 2 or 3 times under no-load.

- **Make sure that blower fan switch is "OFF".**

9. Stop engine and wait until it cools down.
10. Repeat step 2 through step 9 until clear water begins to drain from radiator.
11. Drain water.

- **Apply sealant to the thread of drain plug.**
  : 34 - 44 N·m (3.5 - 4.5 kg-m, 25 - 33 ft-lb)

12. Reinstall reservoir tank.



SMA182B

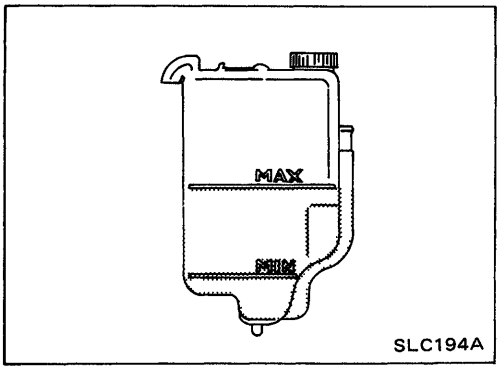
13. Fill radiator and reservoir tank with coolant up to specified level following step 6 through step 9.
    Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

Coolant capacity (With reservoir tank):

Unit: liter (US qt, Imp qt)

Model	M/T	A/T
2WD	5.4 (5-3/4, 4-3/4)	5.9 (6-1/4, 5-1/4)

Changing Engine Coolant (Cont'd)

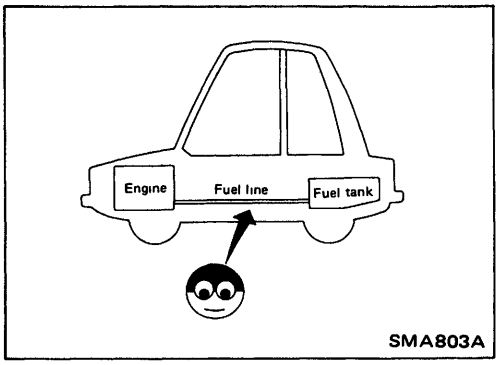


[Reservoir tank capacity for "H" level is 0.6 ℓ (5/8 US qt, 1/2 Imp qt).]

Pour coolant through coolant filler neck slowly to allow air in system to escape.

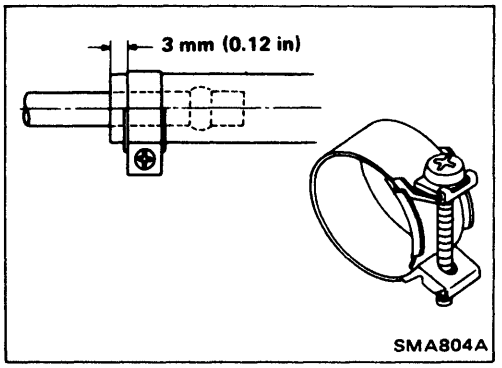
14. If necessary, add coolant.

Checking Fuel Lines



Inspect fuel lines and tank for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.

If necessary, repair or replace faulty parts.



CAUTION:

Tighten high-pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end.

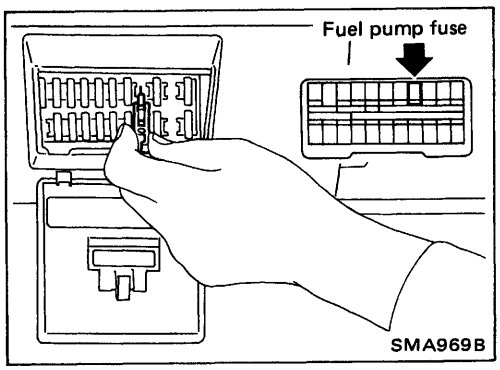
Tightening torque specifications are the same for all rubber hose clamps.

Ensure that screw does not contact adjacent parts.

Changing Fuel Filter

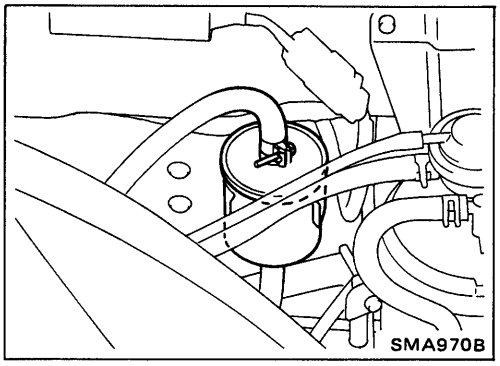
WARNING:

Before removing fuel filter, release fuel pressure from fuel line to eliminate danger.



1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank engine two or three times to make sure that fuel pressure is released.
4. Turn ignition switch off and install fuse for fuel pump.

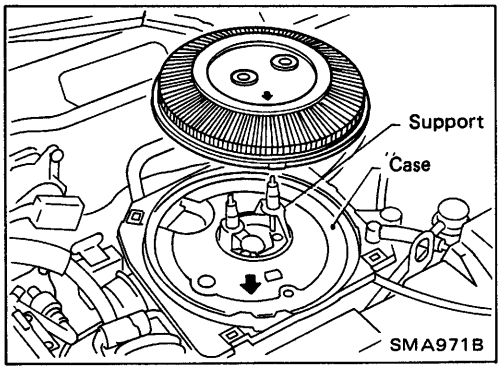
Changing Fuel Filter (Cont'd)



5. Loosen fuel hose clamps.
6. Replace fuel filter.

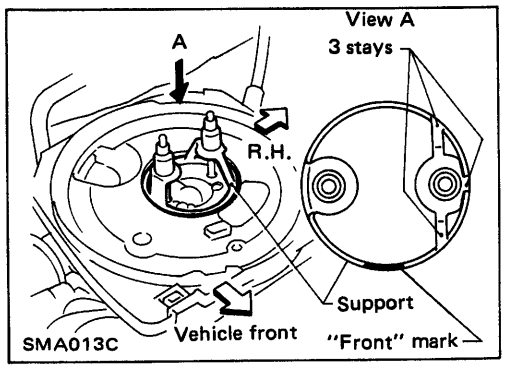
- **Be careful not to spill fuel over engine compartment. Place a shop towel to absorb fuel.**
- **Use a high-pressure type fuel filter. Do not use a synthetic resinous fuel filter.**
- **When tightening fuel hose clamps, refer to "Checking Fuel Lines".**

Changing Air Cleaner Filter



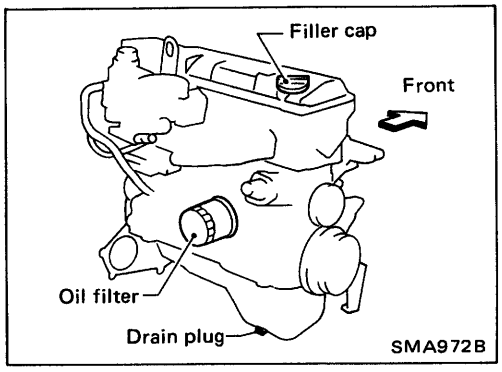
The viscous paper type filter does not need cleaning between renewals.

Align arrow mark on air cleaner filter with arrow mark on case.



When installing support to case, pay attention to the direction of support as shown in the figure.

Changing Engine Oil



WARNING:

Be careful not to burn yourself, as the engine oil is hot.

1. Warm up engine, and check for oil leakage from engine components.
2. Remove drain plug and oil filler cap.
3. Drain oil and refill with new engine oil.

Refill oil capacity (Approximate):

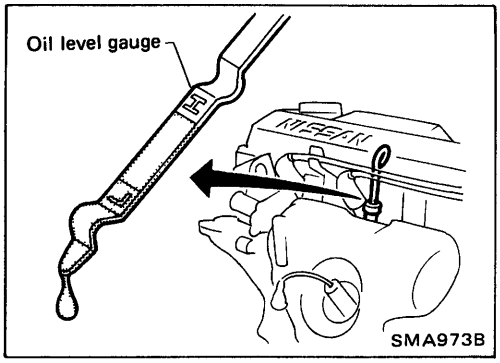
Unit: liter (US qt, Imp qt)

With oil filter change	3.2 (3-3/8, 2-7/8)
Without oil filter change	2.8 (3, 2-1/2)

CAUTION:

- **Be sure to clean drain plug and install with new washer.**
  Drain plug:
  : 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
- **Use recommended engine oil.**

Changing Engine Oil (Cont'd)

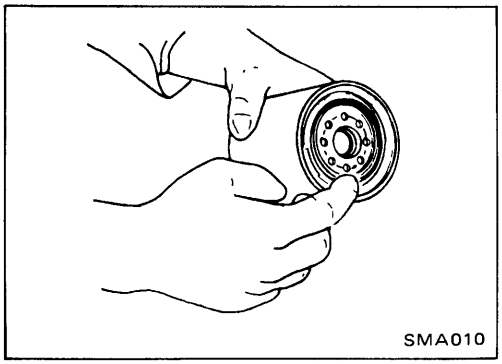


4. Check oil level.
5. Start engine and check area around drain plug and oil filter for oil leakage.
6. Run engine for a few minutes, then turn it off. After several minutes, check oil level.

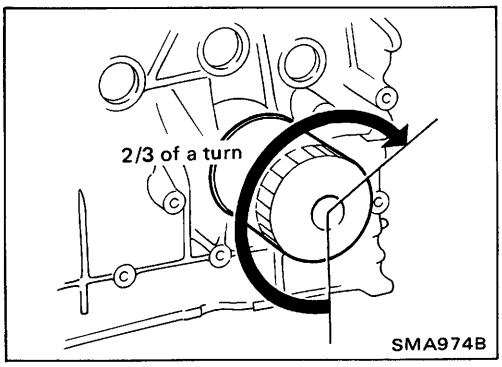
Changing Oil Filter

1. Remove oil filter with Tool.

WARNING:
Be careful not to burn yourself, as the engine and the engine oil are hot.

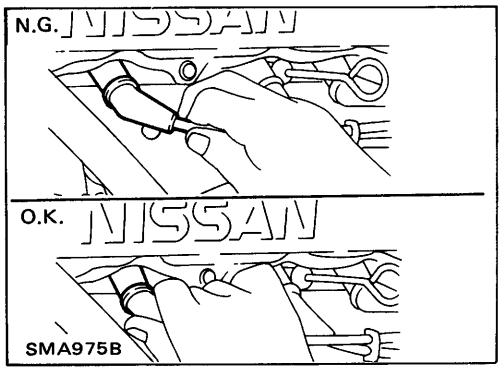


2. Before installing new oil filter, clean the oil filter mounting surface on cylinder block, and coat the rubber seal of oil filter with a little engine oil.



3. Screw in the oil filter until a slight resistance is felt, then tighten additionally more than 2/3 turn.
4. Add engine oil.

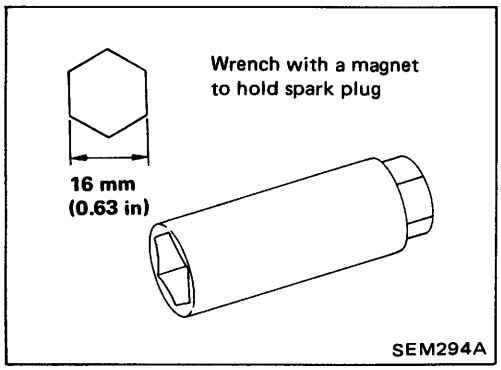
Refer to Changing Engine Oil.



Changing Spark Plugs

1. Disconnect ignition wires from spark plugs at boot. Do not pull on the wire.

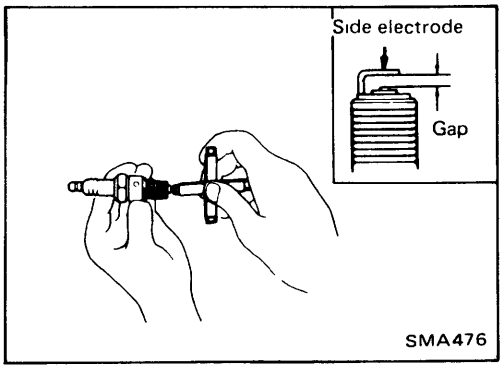
Changing Spark Plugs (Cont'd)



2. Remove spark plugs with spark plug wrench.

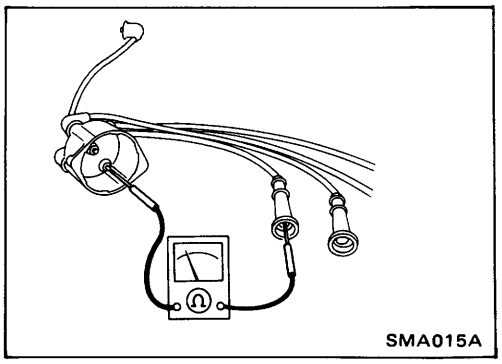
Spark plug:

Standard type	BCPR5ES-11
Hot type	BCPR4ES-11
Cold type	BCPR6ES-11



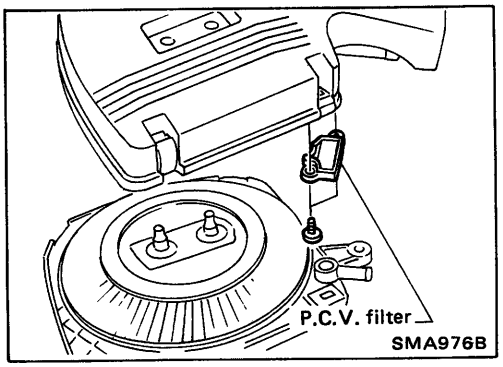
3. Check plug gap of each new spark plug.
   Gap:
   1.0 - 1.1 mm (0.039 - 0.043 in)
4. Install spark plugs. Reconnect ignition wires according to nos. indicated on them.
   Spark plug:
   [O]: 20 - 29 N·m (2.0 - 3.0 kg-m, 14 - 22 ft-lb)

Checking Ignition Wires



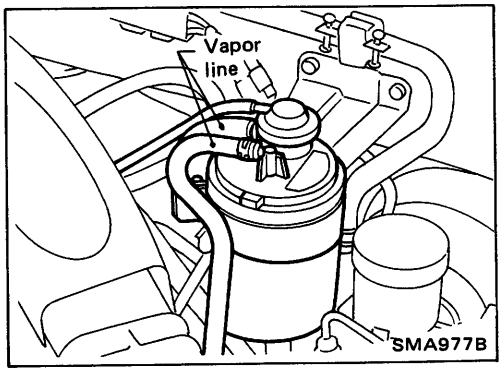
1. Inspect wires for cracks, damage, burned terminals and for improper fit.
2. Measure the resistance of wires and check for intermittent breaks by shaking them.
   Resistance: Less than 30 kΩ
   If it exceeds the limit, replace the ignition wire with a new one.

Changing Positive Crankcase Ventilation (P.C.V.) Filter



Remove air cleaner cover and replace P.C.V. filter.

Checking Vapor Lines



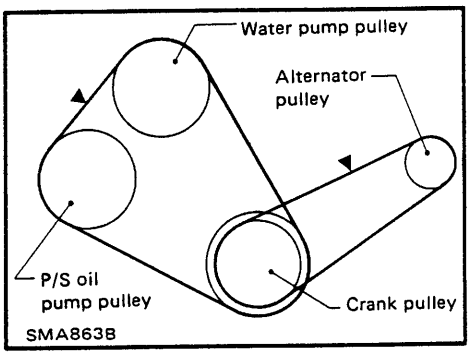
1. Visually inspect vapor lines for improper attachment and for cracks, damage, loose connections, chafing and deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc.

Refer to EVAPORATIVE EMISSION CONTROL SYSTEM INSPECTION in EF & EC section.

Drive Belts Inspection

1. Inspect for cracks, fraying, wear or oil adhesion. If necessary, replace with new one.
2. Inspect drive belt deflections by pushing on the belt midway between pulleys.

Inspect drive belt deflections when engine is cold. If engine is hot, check deflections in 30 minutes or more.
Adjust if belt deflections exceed the limit.



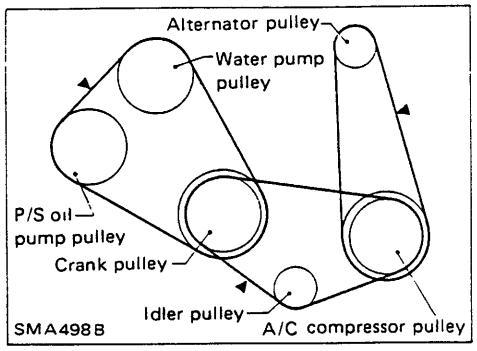
Belt deflection:

Power steering equipped model (Without air conditioner)

Unit: mm (in)

	Used belt deflection		Set deflection of new belt
	Limit	Adjust deflection	
Alternator	12 (0.47)	6 - 8 (0.24 - 0.31)	5 - 7 (0.20 - 0.28)
Power steering oil pump	12.5 (0.492)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)

Applied pushing force: 98 N (10 kg, 22 lb)



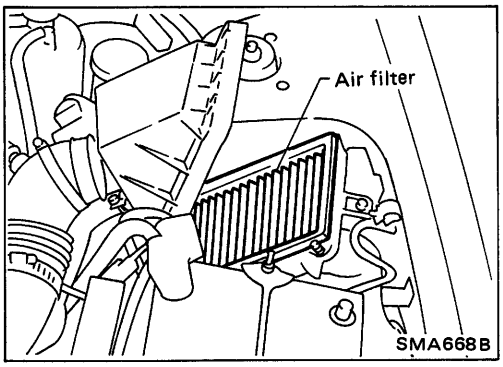
Air conditioner & power steering equipped model

Unit: mm (in)

	Used belt deflection		Set deflection of new belt
	Limit	Adjust deflection	
Alternator	10 (0.39)	5 - 7 (0.20 - 0.28)	5 - 7 (0.20 - 0.28)
Power steering oil pump	12.5 (0.492)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)
Air conditioner compressor	6 (0.24)	3 - 4 (0.12 - 0.16)	3 - 4 (0.12 - 0.16)

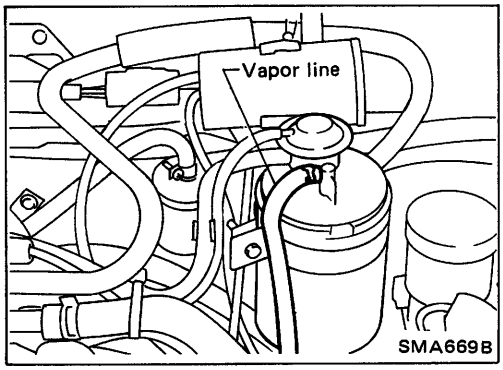
Applied pushing force: 98 N (10 kg, 22 lb)

1989 Pulsar NX Service Manual
GI88-020 (TS88-145)
Revised November 1988



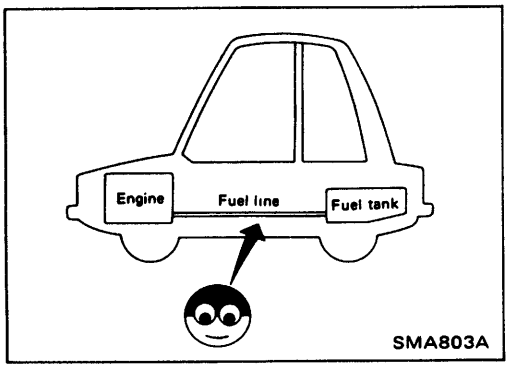
Replacing Air Cleaner Filter

The viscous paper type air cleaner filter does not require any cleaning operation between renewals.



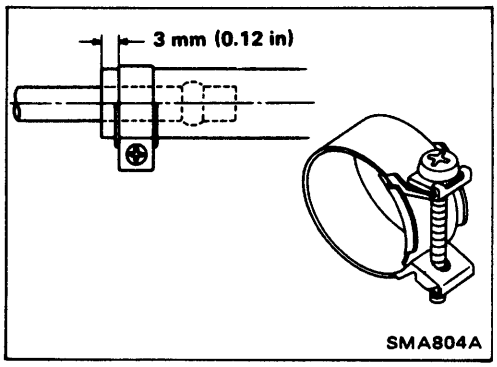
Vaper Line Inspection

1. Visually inspect vapor lines for proper attachment, cracks, damage, loose connections, chafing and deterioration.
2. Inspect vacuum relief valve of fuel tank filter cap for clogging, sticking, etc.



Fuel Line Inspection

Inspect fuel lines and tank for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.
If necessary, repair or replace faulty parts.



CAUTION:

Tighten high-pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end.

Tightening torque specifications are the same for all rubber hose clamps.

Fuel hose clamps:

: 1.0 - 1.5 N·m
(0.10 - 0.15 kg-m, 0.7 - 1.1 ft-lb)

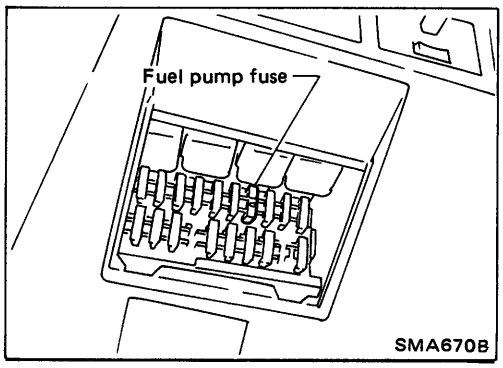
Ensure that screw does not contact adjacent parts.

Fuel Filter Replacement

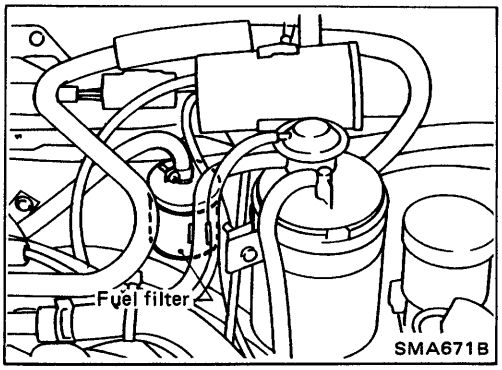
WARNING:

Before removing fuel filter, release fuel pressure from fuel line to eliminate danger.

Fuel Filter Replacement (Cont'd)



1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank engine two or three times to make sure that fuel pressure is released.
4. Turn ignition switch off and install fuse for fuel pump.



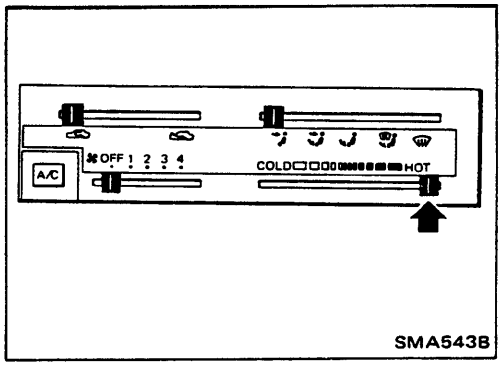
5. Loosen fuel hose clamps.
6. Replace fuel filter.

- **Be careful not to spill fuel in engine compartment. Place a rag to absorb fuel.**
- **Use high-pressure type fuel filter. Do not use a synthetic resinous fuel filter.**

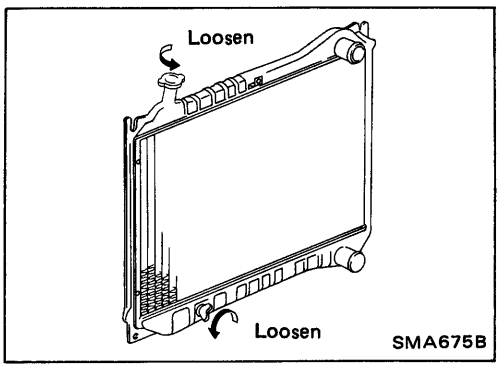
Changing Engine Coolant

WARNING:

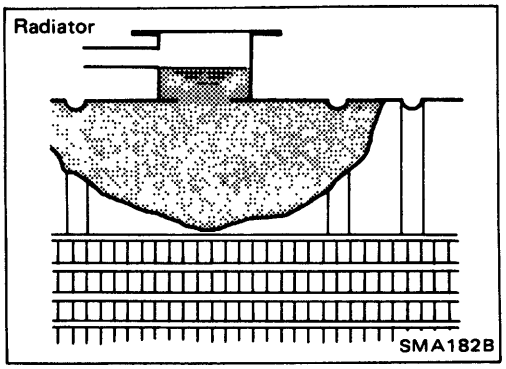
To avoid the danger of being scalded, never attempt to change the coolant when the engine is hot.



1. Move heater "TEMP" control lever all the way to "HOT" position.



2. Open drain cock at the bottom side of radiator, and remove radiator cap.
3. Close drain cock and fill radiator with water.
4. Warm up engine and repeat steps 2, 3 and 4 one or two times to drain old coolant.

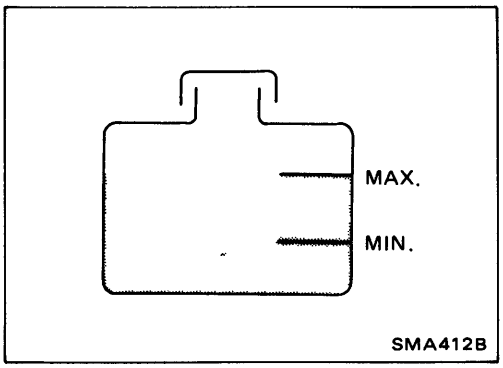


5. Fill radiator with coolant up to filler opening.
   Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

Coolant capacity (Reservoir tank included):
5.8 ℓ (6-1/8 US qt, 5-1/8 Imp qt)

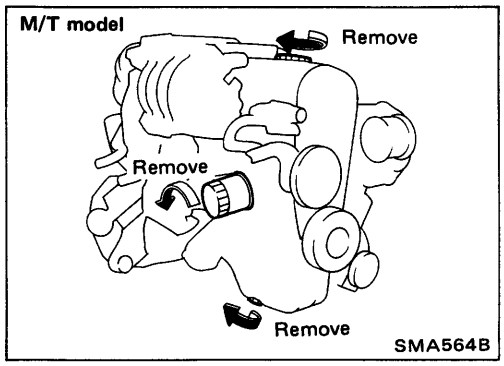
Pour coolant through coolant filler neck slowly to allow air in system to escape.

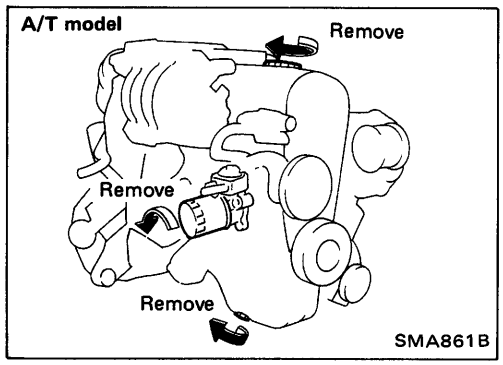
Changing Engine Coolant (Cont'd)



6. Fill reservoir tank up to "MAX" level.
   Reservoir tank capacity ("MAX" level):
   0.6ℓ (5/8 US qt, 1/2 Imp qt)
7. Run the engine at approximately 2,000 rpm for about one minute.
8. Stop engine and cool it down, then refill radiator and reservoir tank.

Changing Engine Oil





WARNING:

Be careful not to burn yourself, as engine oil is hot.

1. Warm up engine, and check for oil leakage from engine components.
2. Remove oil filter cap and drain plug.
3. Drain oil and refill with new engine oil.

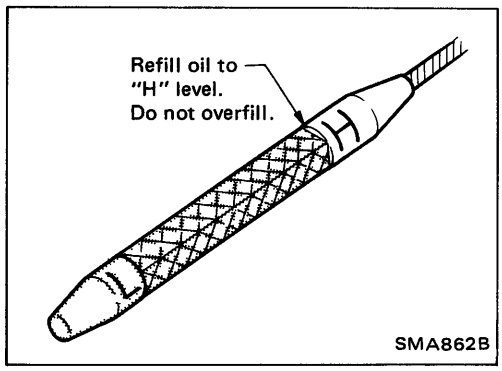
Oil capacity (Approximately):

Unit: ℓ (US qt, Imp qt)

With oil filter change	3.8 (4, 3-3/8)
Without oil filter change	3.4 (3-5/8, 3)

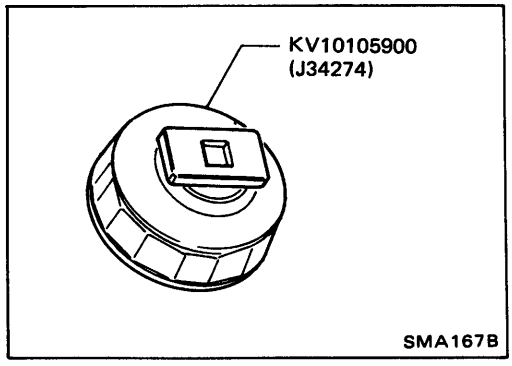
CAUTION:

a. **Be sure to clean drain plug and install with new washer.**
   Drain plug:
   : 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
b. **Use recommended engine oil.**
   Refer to GI section.



4. Check oil level.
5. Start engine. Check area around drain plug and oil filter for any sign of oil leakage.
6. Run engine for a few minutes, then turn it off. After several minutes, check oil level.

Oil Filter Replacement

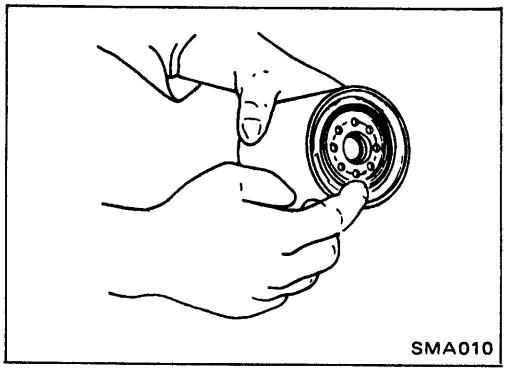


1. Remove oil filter with Tool.

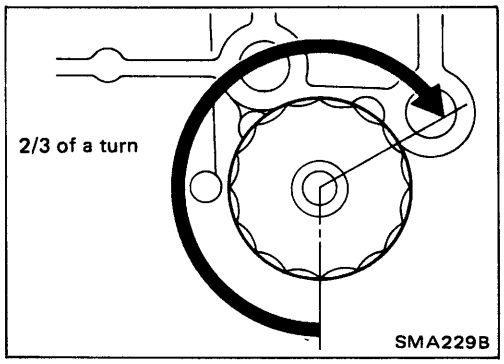
WARNING:

Be careful not to burn yourself, as engine and engine oil are hot.

Oil Filter Replacement (Cont'd)


SMA010

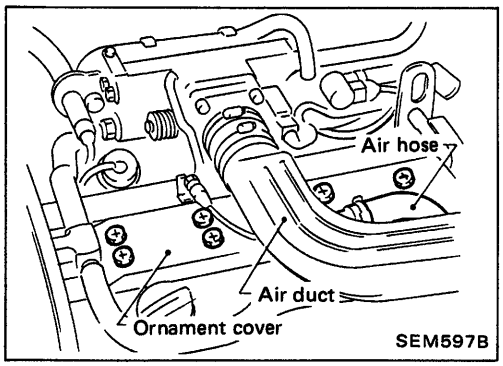
2. Before installing new oil filter, wipe clean oil filter mounting surface on cylinder block, and smear a little engine oil on rubber seal of oil filter.



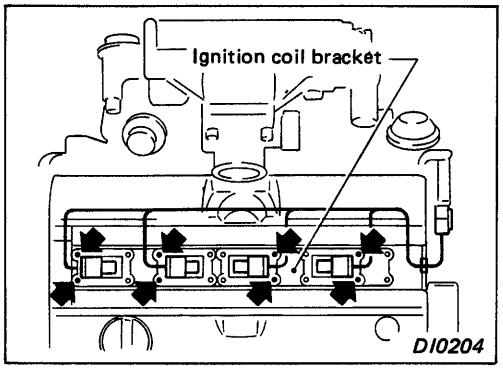
3. Screw oil filter on until a slight resistance is felt, then tighten an additional 2/3 turn, or more.

4. Add engine oil.
Refer to Changing Engine Oil.

Spark Plug Replacement

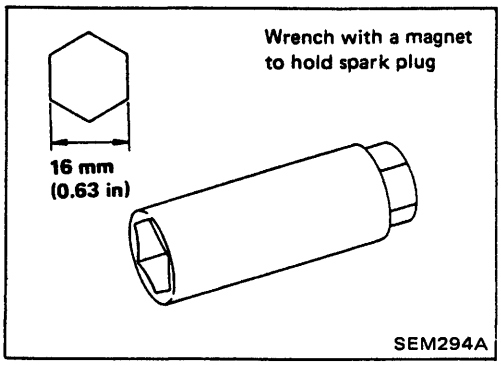


1. Disconnect air hose.
2. Remove air duct.
3. Remove ornament cover.



4. Disconnect harness connector between ignition coil and power transistor.
5. Remove ignition coil bracket fixing bolts and pull out this bracket with ignition coils.

Spark Plug Replacement (Cont'd)

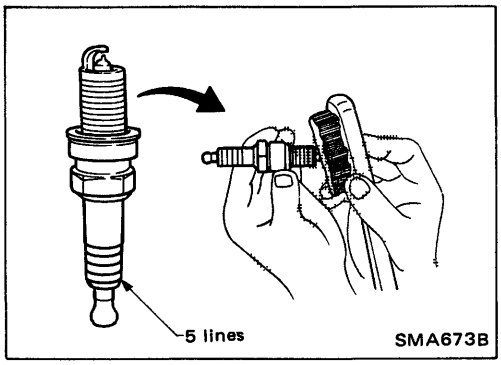


6. Remove spark plugs with suitable spark plug wrench.

Spark plug (Platinum-tipped type):

Standard type	**PFR6A-11**
Hot type	**PFR5A-11**
Cold type	**PFR7A-11**

[O] : 20 - 29 N·m (2 - 3 kg-m, 14 - 22 ft-lb)

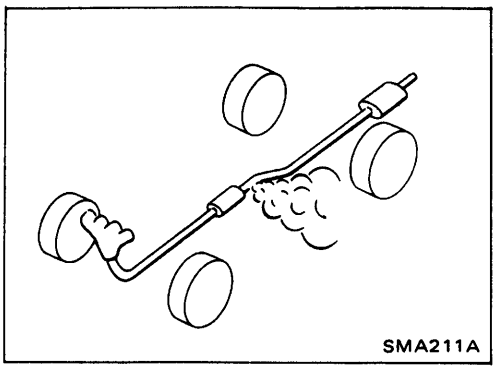


- **Checking and adjusting plug gap are not required between renewals.**
- **Do not use a wire brush for cleaning.**
- **If plug tip is covered with carbon, spark plug cleaner may be used.**

Cleaner air pressure:
Less than 588 kPa (6 kg/cm^2, 85 psi)
Cleaning time:
Less than 20 seconds

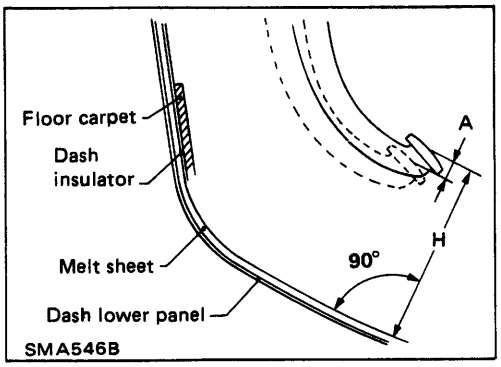
Original equipment platinum-tipped plugs should be replaced at 96,000 km (60,000 miles). Conventional spark plugs can be used but should be replaced at 48,000 km (30,000 miles) intervals.

Spark plug (Conventional type):
BCPR5ES-11
BCPR6ES-11
BCPR7ES-11
Gap: 1.1 mm (0.043 in)
[O] : 20 - 29 N·m (2 - 3 kg-m, 14 - 22 ft-lb)


SMA211A

Checking Exhaust System

Check exhaust pipes, muffler and mounting for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



SMA546B

Checking Clutch Pedal Operation (GA 16i engine)

Check clutch pedal height and free travel, and ensure it operates smoothly.

Pedal height "H":
162 - 172 mm (6.38 - 6.77 in)
Pedal free travel "A":
12.5 - 17.5 mm (0.492 - 0.689 in)

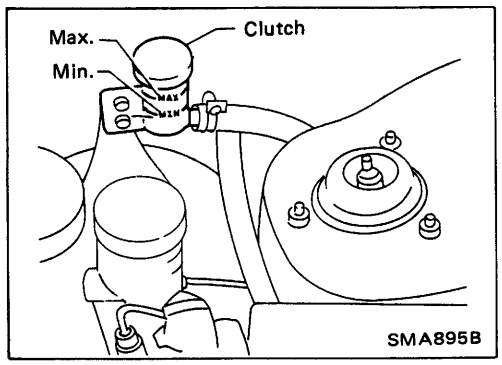
If necessary, adjust clutch pedal height and free travel.
Refer to section CL.

Checking Clutch Pedal Operation (CA18DE engine)

Check clutch pedal height, free play and for smooth operation.

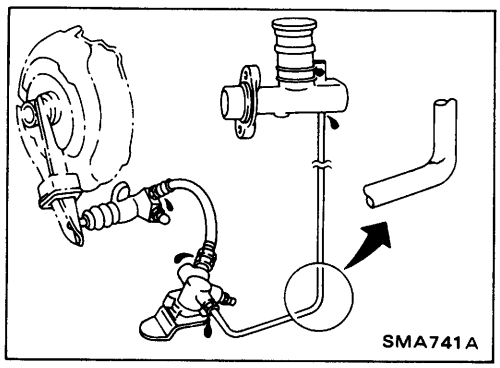
Pedal height "H":
162 - 172 mm (6.38 - 6.77 in)
Pedal free play "A":
1 - 3 mm (0.04 - 0.12 in)

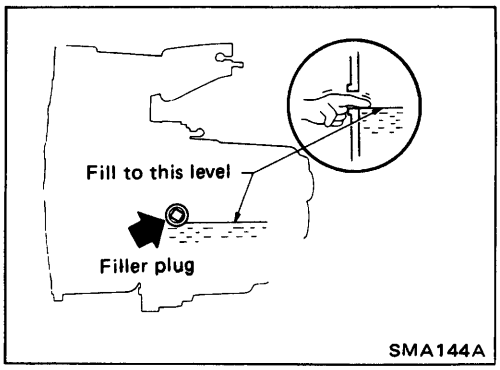
If necessary, adjust clutch pedal height and pedal free play.
Refer to section CL.



SMA895B

Checking Clutch Fluid Level and Leaks (CA18DE engine)

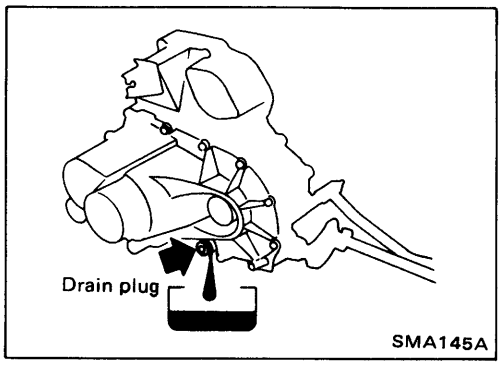

SMA741A



Checking M/T Oil Level (GA 16i engine)

Never start engine while checking oil level.

1. Check for oil leaks.
2. Check oil level.



Changing M/T Oil (GA 16i engine)

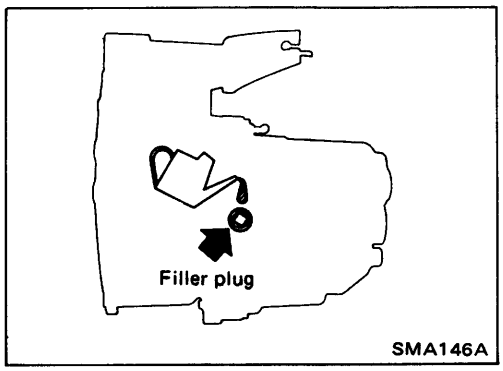
Oil capacity:

RS5F31A

2.8 liters (5-7/8 US pt, 4-7/8 Imp pt)

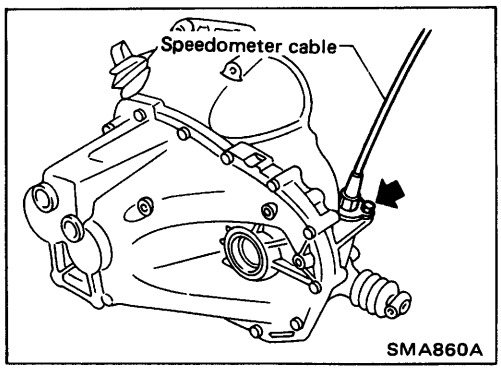
Drain plug:

: 25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)



Filler plug:

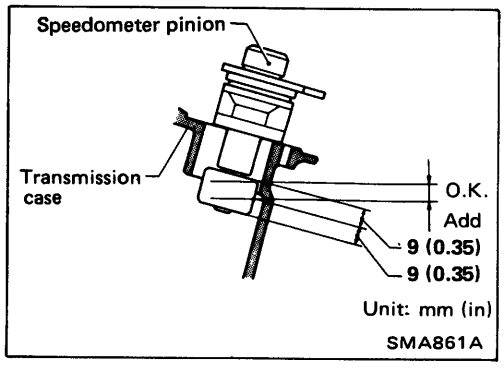
: 25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)

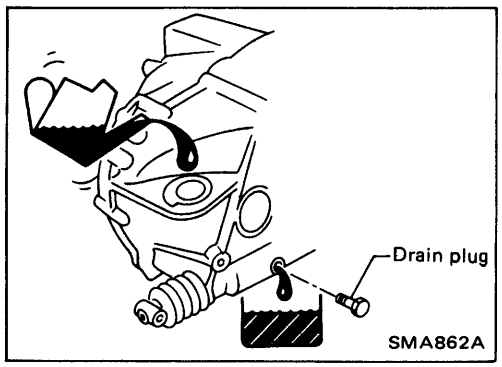


Checking M/T Oil Level (CA18DE engine)

Never start engine while checking oil level.

1. Check for oil leaks.
2. Check oil level.



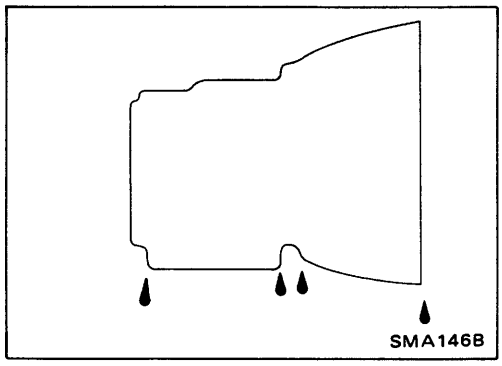


Changing M/T Oil (CA18DE engine)

Oil capacity:

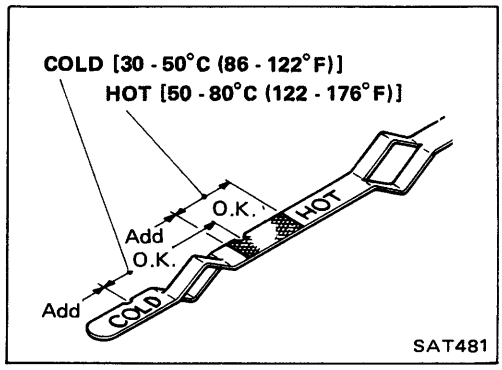
RS5F50A

4.7 liters (10 US pt, 8-1/4 Imp pt)



Checking A/T Fluid Level

Check automatic transaxle for leakage.



The dipstick can check fluid level at "HOT" fluid temperatures [50 to 80°C (122 to 176°F)] after vehicle has been driven approximately 10 minutes. It also can be used to check fluid level at "COLD" fluid temperatures [30 to 50°C (86 to 122°F)].

1. Park vehicle on a level surface and set parking brake.
2. Start engine and then move selector lever through each gear range, ending in "P".
3. Check fluid level with engine idling. (If vehicle has not been driven for some time and outside temperature is below 30°C (86°F), a "COLD" fluid temperature can be obtained by warming up engine completely.)
4. Remove dipstick and clean it with lint-free paper. Reinsert it into charging pipe as far as it will go.
5. Remove dipstick and note the reading. If fluid temperature is "HOT", the level should be in hot range.
   If it is "COLD", the level should be in cold range (within cutout portion).

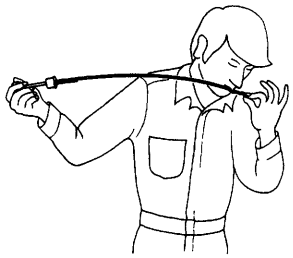
Keep fluid at the proper level.

- **Overfilling may blow off fluid, resulting in damage to transaxle.**
- **Underfilling may cause clutches to slip, resulting in damage to them.**

Checking A/T Fluid Level (Cont'd)



Check fluid for contamination.



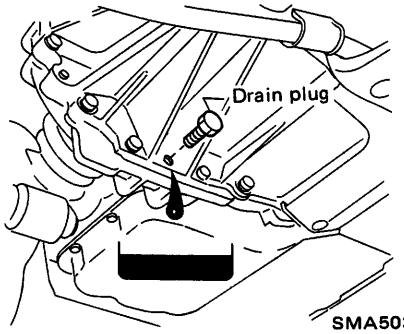
Check fluid for smell.

SMA107

Check automatic transmission fluid condition.

Check fluid for contamination. If fluid is very dark or smells burned, or contains frictional material (clutches, band, etc.), check operation of A/T.

Refer to section AT for checking operation of A/T.



SMA503B

Changing A/T Fluid

Oil capacity (With torque converter):

RL3F01A (GA16i engine)

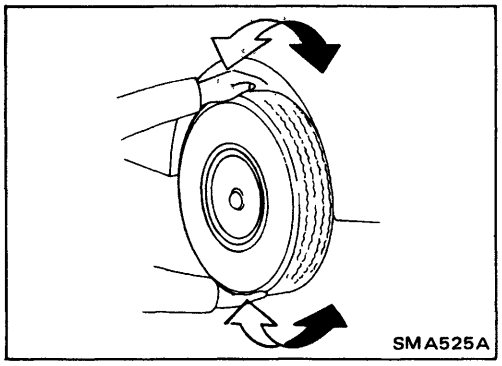
6.3 liters (6-5/8 US qt, 5-1/2 Imp qt)

RL4F02A (CA18DE engine)

6.8 liters (7-1/4 US qt, 6 Imp qt)

Drain plug:

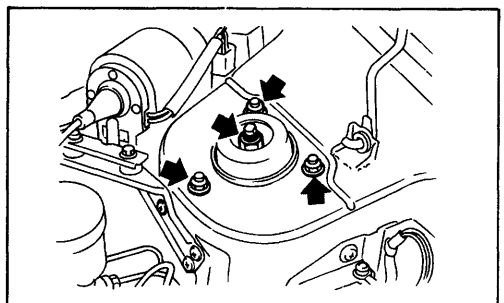
: 7 - 13 N·m (0.7 - 1.3 kg-m, 5.1 - 9.4 ft-lb)


SMA525A

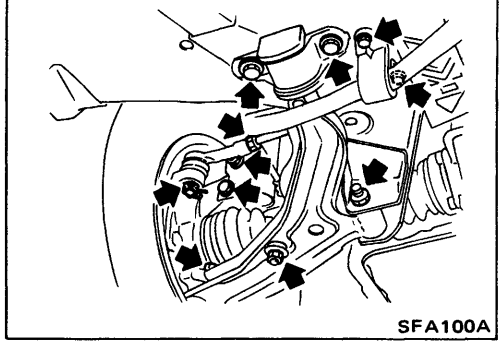
Checking Front Axle and Front Suspension Parts

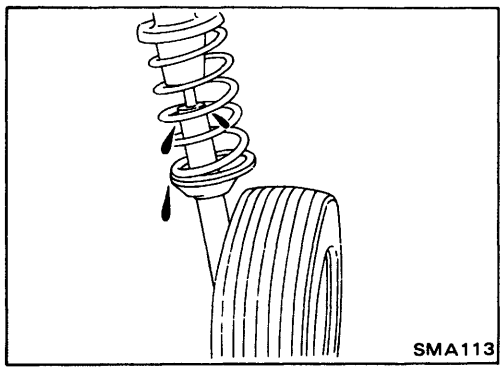
- Check front axle and front suspension parts for looseness, cracks, wear or other damage.

(1) Shake each front wheel.

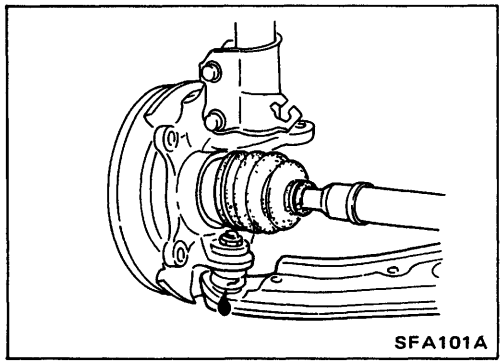

SFA099A

(2) Make sure that cotter pin is inserted.
(3) Retighten all nuts and bolts to the specified torque.
Tightening torque: Refer to section FA.
(4) Check front axle and front suspension parts for wear, cracks or other damage.

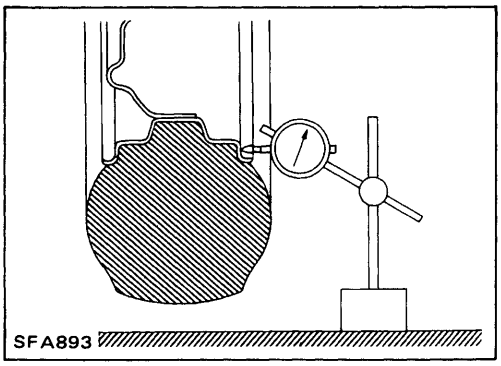

SFA100A


SMA113

- Check strut (shock absorber) for oil leakage or other damage.


SFA101A

- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.

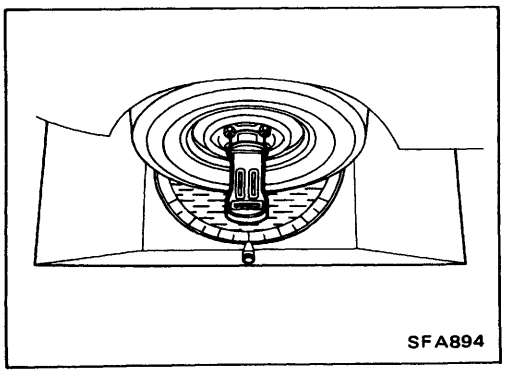

SFA893

Checking Front Wheel Alignment

Before checking front wheel alignment, be sure to make a preliminary inspection.

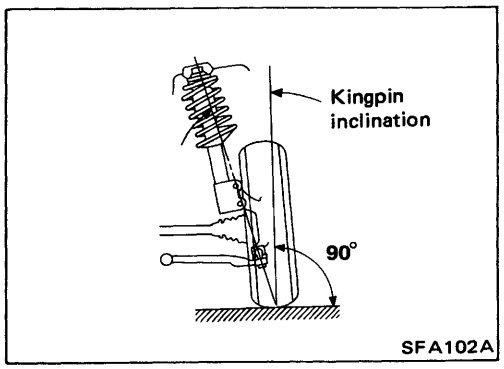
PRELIMINARY INSPECTION

- Check tires for wear and proper inflation.
- Check wheel runout.
  Lateral runout: 1.0 mm (0.039 in) or less
- Check front wheel bearings for looseness.
- Check front suspension for looseness.
- Check steering linkage for looseness.
- Check that front shock absorbers work properly.
- Check vehicle posture (Unladen):
  "Unladen"
  Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.


SFA894

CAMBER, CASTER AND KINGPIN INCLINATION

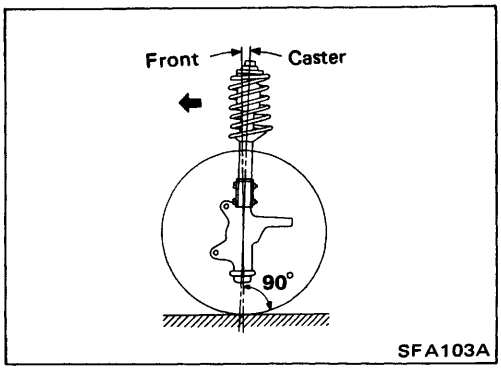
- **Caster and kingpin inclination are preset at factory and cannot be adjusted. If the caster and kingpin inclination are not within specification, inspect and replace any damaged or worn front suspension parts.**
- **Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge and adjust in accordance with the following procedures.**



SFA102A

Kingpin inclination (Unladen)

13°40′ - 15°10′

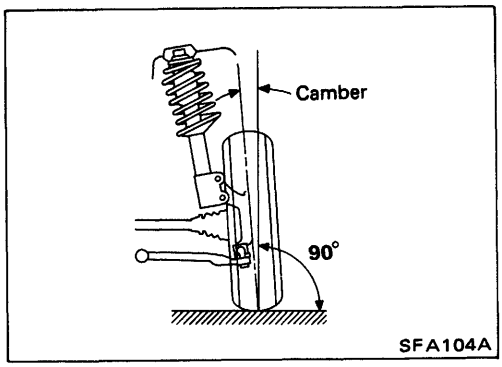


SFA103A

Caster (Unladen)

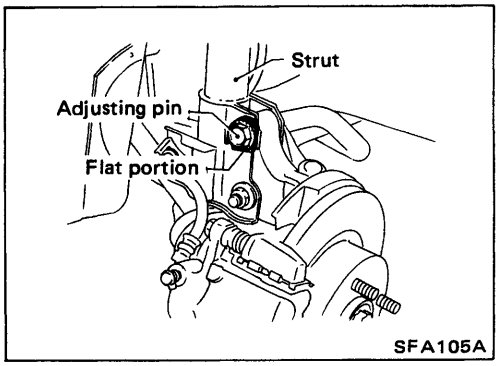
1°10′ - 2°40′

Checking Front Wheel Alignment (Cont'd)



Camber (Unladen)

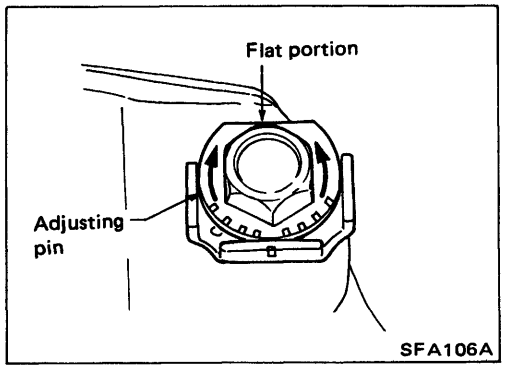
−1° 15′ to 0° 15′



If camber is not within specification, adjust by turning the adjusting pin.

(1) Remove the adjusting pin.

Adjustment pin is factory-installed with the flat side facing down.



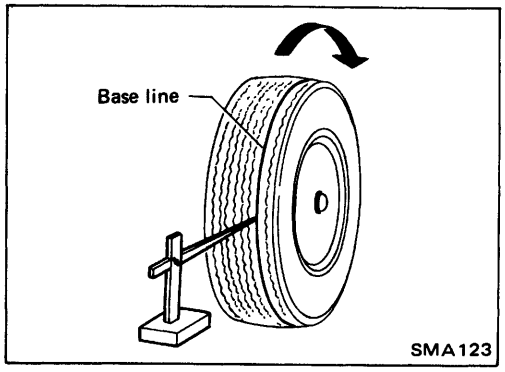
(2) Install adjusting pin with the flat side facing up.

(3) Turn the adjusting pin to adjust.

Camber changes about 15′ with each graduation of the adjusting pin.

(4) Tighten to the specified torque.

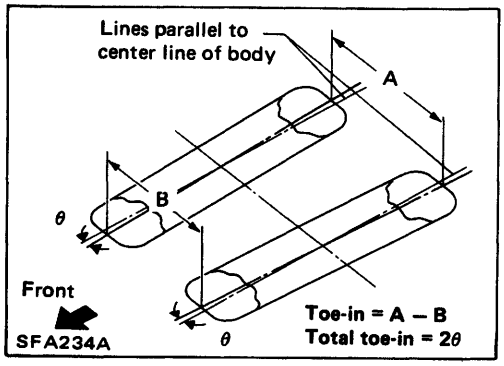
: 98 - 118 N·m (10.0 - 12.0 kg-m, 72 - 87 ft-lb)



TOE-IN

1. Mark a base line across tread.

After lowering front of vehicle, move it up and down to eliminate friction, and set steering wheel in straight ahead position.



2. Measure toe-in.

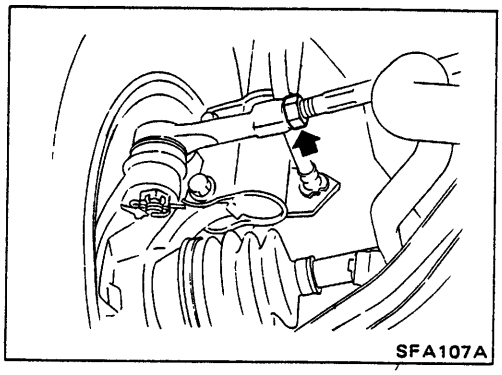
Measure distance "A" and "B" at the same height as hub center.

Toe-in (Unladen):

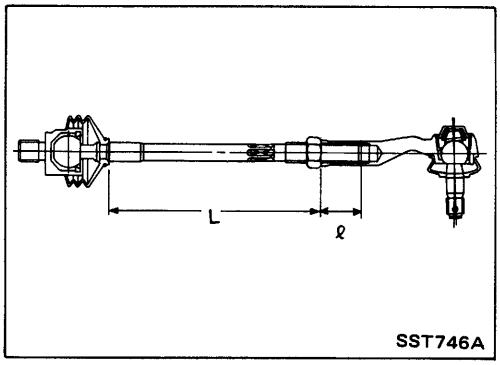
A − B −1 to 1 mm (−0.04 to 0.04 in)

2θ −6′ to 6′ (Total toe-in)

Checking Front Wheel Alignment (Cont'd)


SFA107A

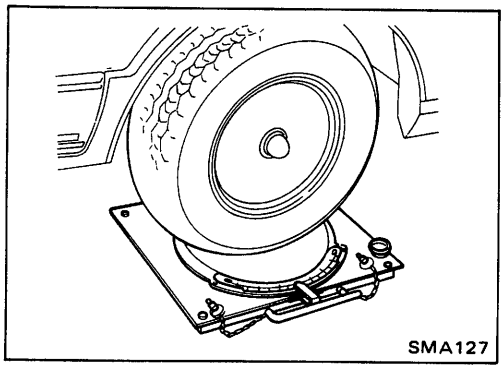
3. Adjust toe-in by varying length of steering tie-rods.



SST746A

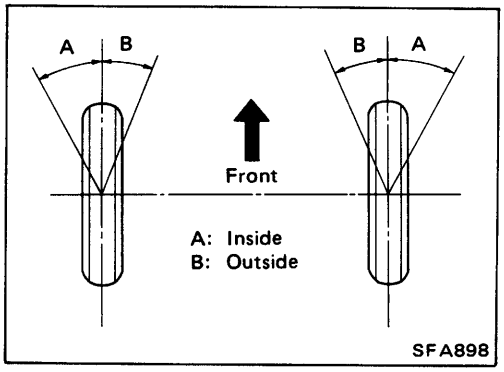
Length "ℓ" must be 25 mm (0.98 in) or more.
Make sure that tie-rods are the same length.
Tie-rod length "L"-reference data:
176 mm (6.93 in)

4. Tighten to the specified torque.
   : 37 - 46 N·m (3.8 - 4.7 kg-m, 27 - 34 ft-lb)


SMA127

FRONT WHEEL TURNING ANGLE

1. Set wheels in straight ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.

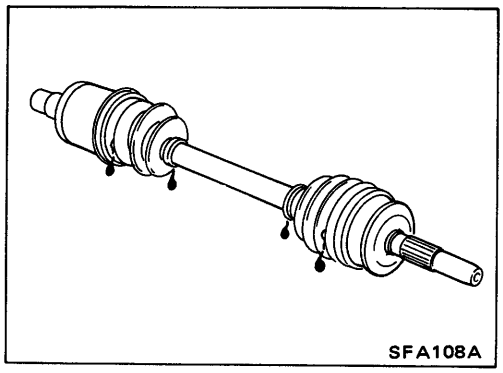


SFA898

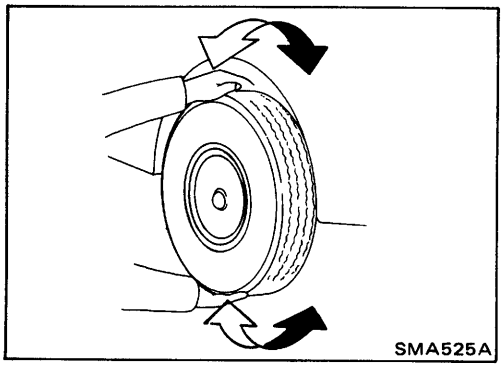
2. Rotate steering wheel all the way right and left; measure turning angle.

Wheel turning angle		GA16i engine models	CA18DE engine models
Full turns	Inside wheel: A	37° - 40°	36° - 39°
	Outside wheel: B	32°30′	30°
Toe-out turn (at 20°)	Inside wheel: A	21°36′	22°24′
	Outside wheel: B	20°	

Checking Drive Shafts Boots


SFA108A

- Check drive shaft boots for clamp looseness, damage or grease leakage.

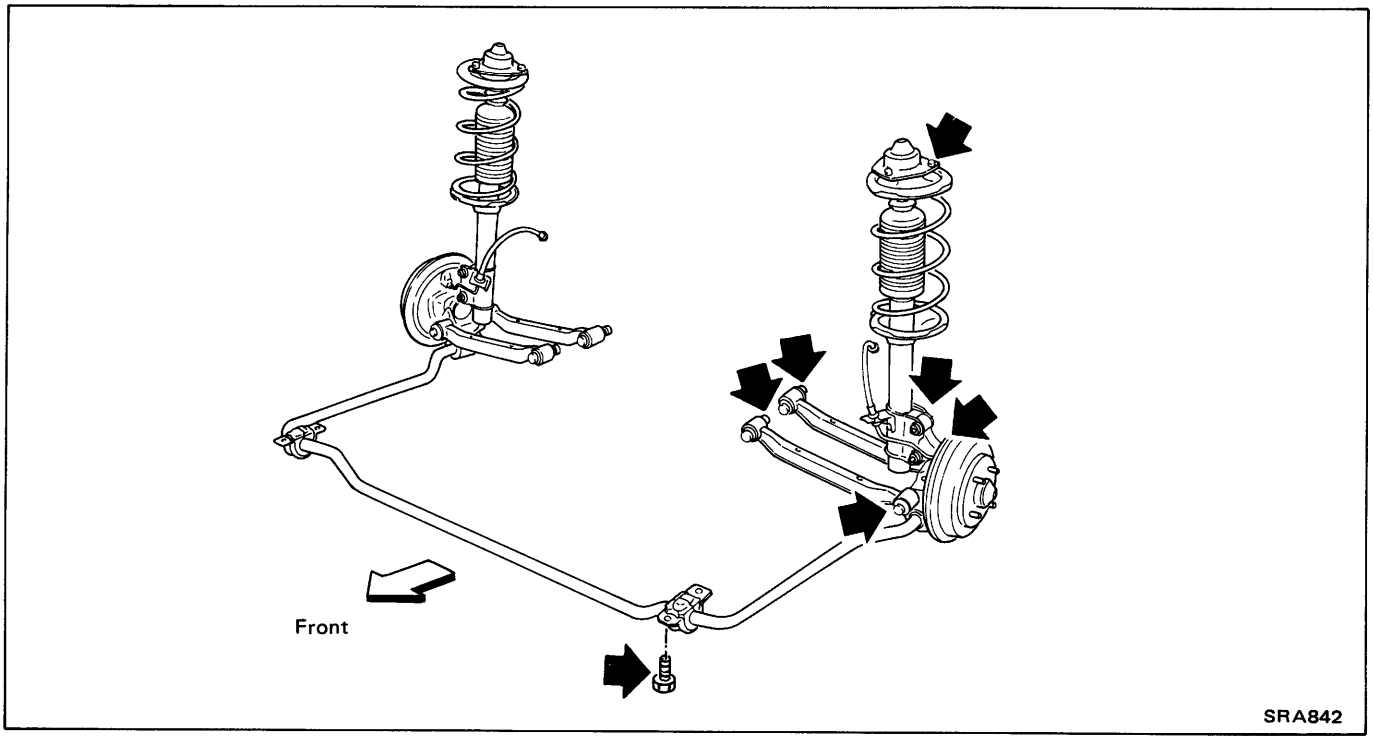

SMA525A

Checking Rear Axle and Rear Suspension Parts

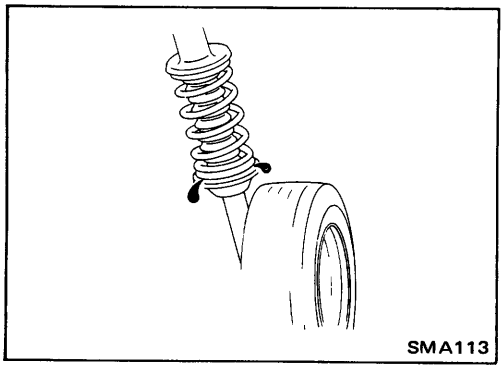
- Check axle and suspension parts for looseness, wear or damage.

(1) Shake each rear wheel.

(2) Retighten all nuts and bolts to the specified torque.
Tightening torque: Refer to section RA.



SRA842


SMA113

(3) Check strut (shock absorber) for oil leakage or other damage.

Checking Rear Wheel Alignment

PRELIMINARY INSPECTION

Make following checks. Adjust, repair or replace if necessary.

- Check tires for wear and proper inflation.
- Check rear wheel bearings for looseness.
- Check wheel runout.

Lateral runout: 1.0 mm (0.039 in) or less

- Check if rear strut (shock absorber) works properly.
- Check rear axle and rear suspension parts for looseness.

Checking Rear Wheel Alignment (Cont'd)

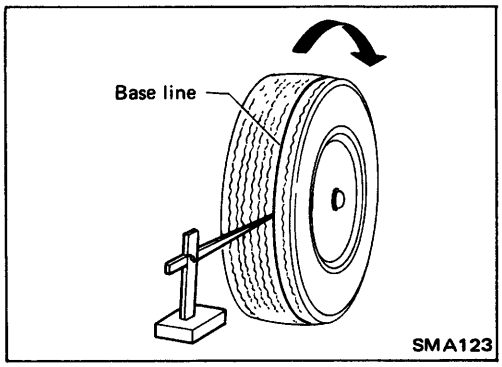
- Check vehicle posture (unladen).
  "Unladen":
  Fuel tank, radiator and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

CAMBER

Camber is preset at factory and cannot be adjusted.

Camber:

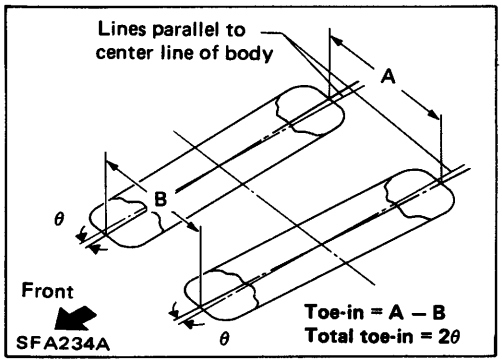
–2°00′ to –0°30′



TOE-IN

1. Mark a base line across tread.

After lowering rear of vehicle, move it up and down to eliminate friction.

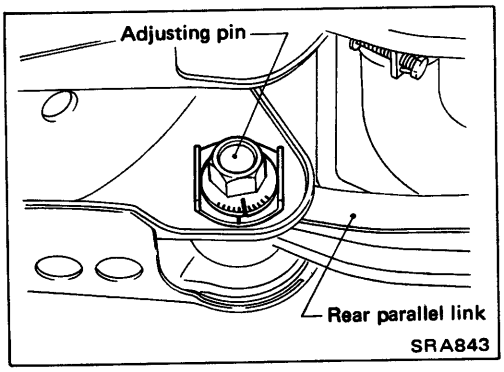


2. Measure toe-in.

Measure distance "A" and "B" at the same height as hub center.

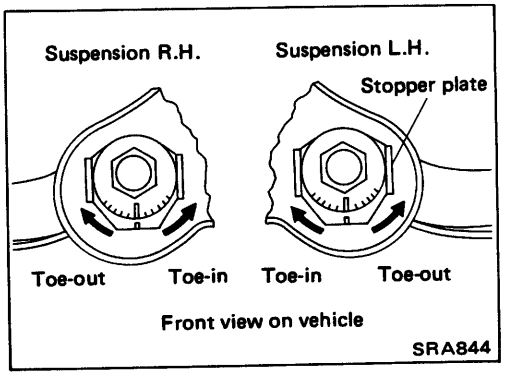
Toe-in:

A – B	–1.5 to 2.5 mm (–0.059 to 0.098 in)
2θ	–9′ to 15′



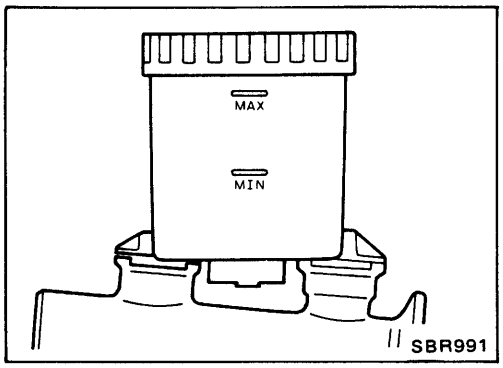
3. Adjust toe-in by turning toe adjusting pins.

One graduation on toe adjusting pin makes about 2 mm (0.08 in) variance (one wheel) at base line.



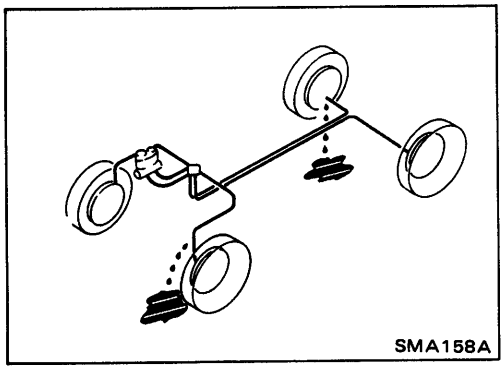
4. Tighten to the specified torque.

: 98 - 118 N·m (10.0 - 12.0 kg-m, 72 - 87 ft-lb)



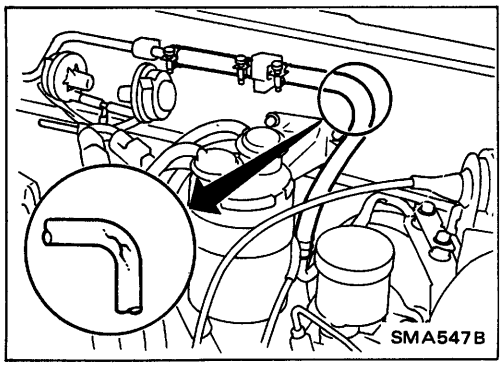
Checking Brake Fluid Level and Leaks

If fluid level is extremely low, check brake system for leaks.

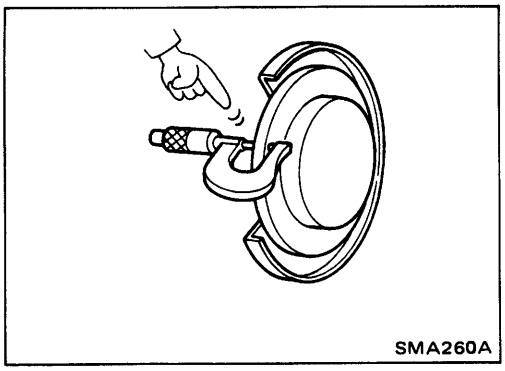


Checking Brake Lines & Hoses

- Check brake fluid lines and parking brake cables for proper attachment, leaks, chafing, abrasion, deterioration, etc.



- Check vacuum lines, connections and check valve for proper attachment, air tightness, chafing and deterioration.



Checking Disc Brake

Check condition of disc brake components.

ROTOR

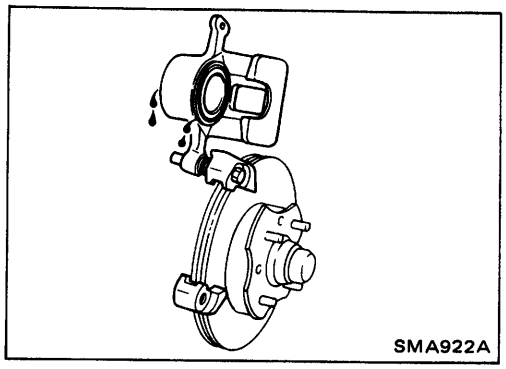
Check condition and thickness.

Minimum thickness:

Front disc brake

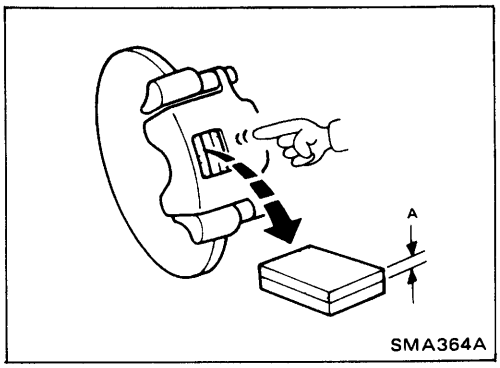
CL18B	**10.0 mm (0.394 in)**
AD18VB	**16.0 mm (0.630 in)**

Checking Disc Brake (Cont'd)


SMA922A

CALIPER

Check operation and leakage.



SMA364A

PAD

Check wear or damage.

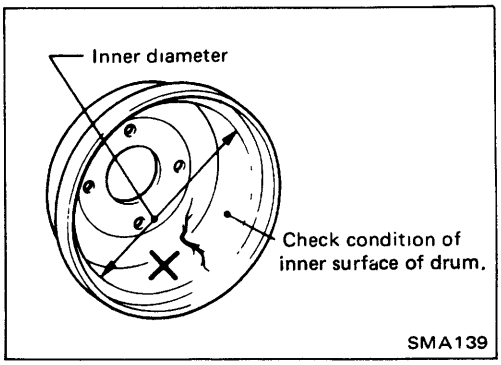
Minimum thickness "A": 2.0 mm (0.079 in)

Checking Drum Brake

Check condition of drum brake components.

WHEEL CYLINDER

Check operation and leakage.

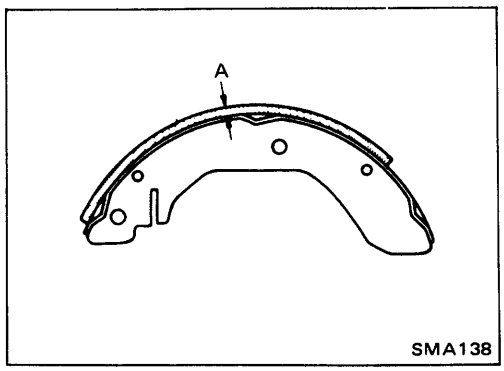


SMA139

DRUM

Check condition of inner surface.

Drum repair limit (Inner diameter): 204.5 mm (8.05 in)



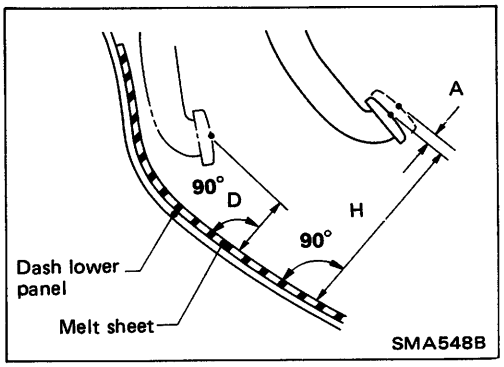
SMA138

LINING

Check wear or damage.

Minimum thickness "A": 1.5 mm (0.059 in)

Refer to section BR for shoe replacement.

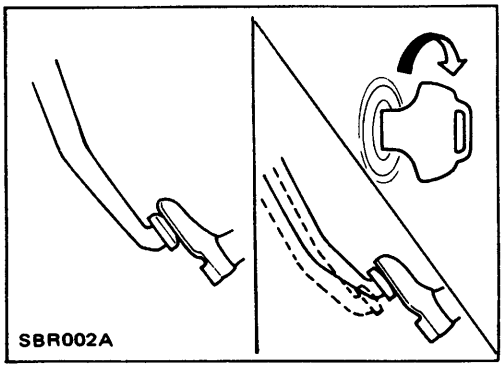


Checking Foot Brake Pedal Operation

H: Free height
Refer to S.D.S.

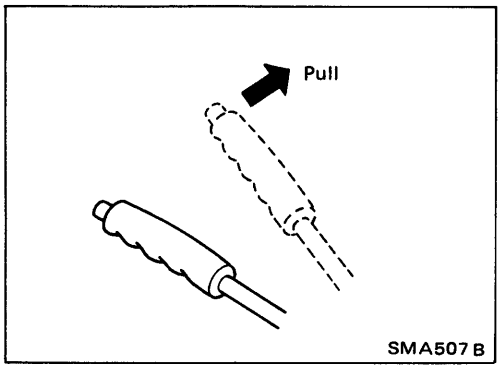
D: Depressed height
Under force of 490 N (50 kg, 110 lb) with engine running
Refer to S.D.S.

A: Pedal free play
1.0 - 3.0 mm (0.039 - 0.118 in)



Checking Brake Booster Function

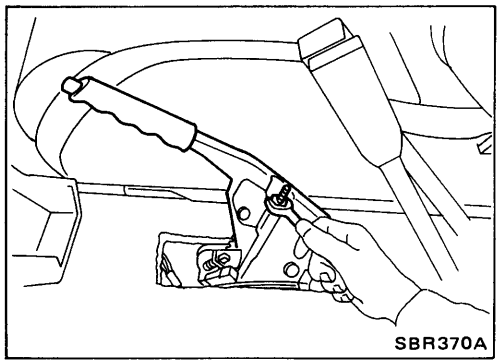
- Depress brake pedal several times with engine off, then check that there is no change in pedal stroke.
- Depress brake pedal, then start engine. If pedal goes down slightly, operation is normal.



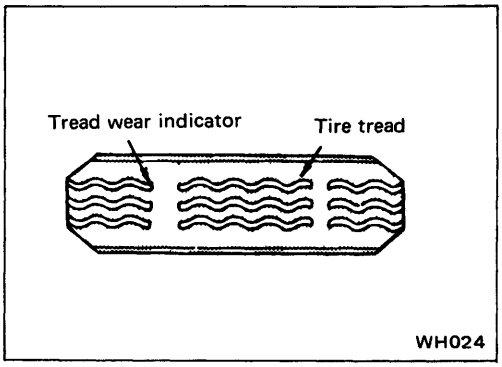
Checking Parking Brake

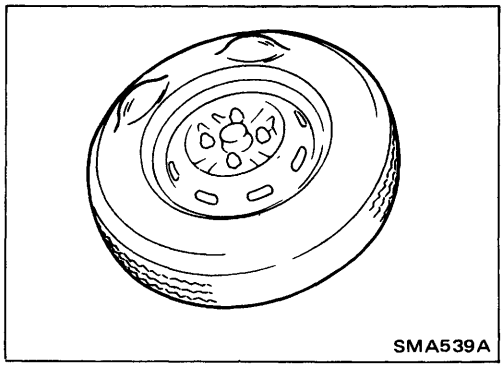
1. Pull lever with specified amount of force.
   Check lever stroke and ensure smooth operation.

   Number of notches [At pulling force of 196 N (20 kg, 44 lb)] :
   Refer to S.D.S.



2. Turn adjusting nut.





Checking Tire Condition

TIRE CONDITION

- When tread wear indicators appear, replace tire with new one.
- Check tread and side walls for cracks, holes, separation or damage.
- Check tire valves for air leakage.

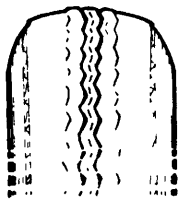
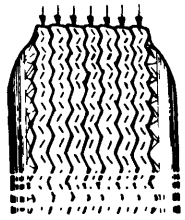
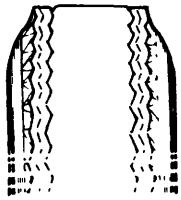
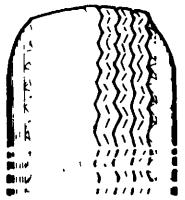
TIRE INFLATION

Tire pressure should be measured when tire is cold.

Tire pressure should be set to the specifications on tire placard affixed to the glove box door.

ABNORMAL TIRE WEAR

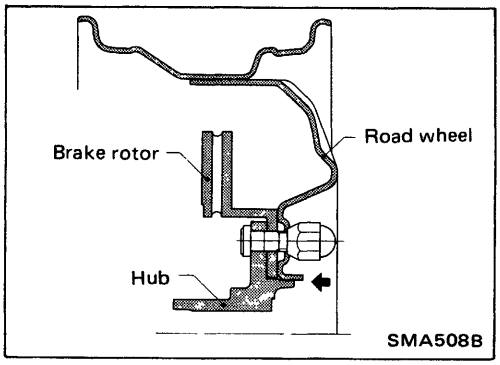
Correct abnormal tire wear according to chart shown below.

Condition	Probable cause	Corrective action	Condition	Probable cause	Corrective action
 Shoulder wear	• Underinflation (both sides wear) • Incorrect wheel camber (one side wear) • Hard cornering • Lack of rotation	• Measure and adjust pressure. • Repair, or replace axle and suspension parts. • Reduce speed. • Rotate tires.	Feathered edge  Toe-in or toe-out wear	• Incorrect toe	• Adjust toe-in.
 Center wear SMA197B	• Overinflation • Lack of rotation	• Measure and adjust pressure. • Rotate tires.	 Uneven wear	• Incorrect camber or caster • Malfunctioning suspension • Unbalanced wheel • Out-of-round brake drum • Other mechanical conditions • Lack of rotation	• Repair, or replace axle and suspension parts. • Repair, replace or, if necessary, reinstall. • Balance or replace. • Correct or replace. • Correct or replace. • Rotate tires.

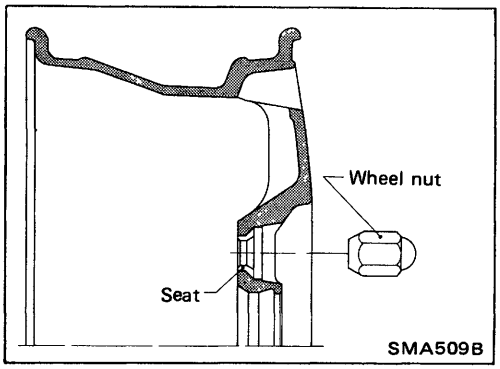
Tire Replacement

CAUTION:

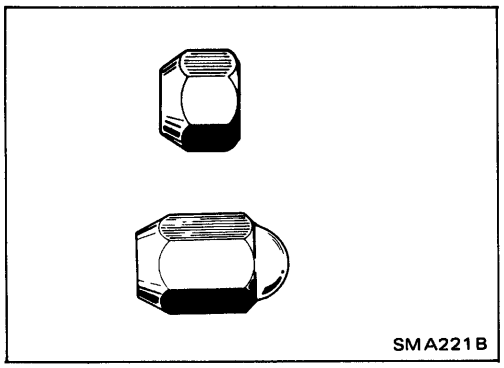
- **Do not mix different types of tires, such as bias, bias belted and radial tires under any circumstances.**
- **When replacing a tire, use a tire of the same size.**
- **Use recommended tires and wheels.**
- **Do not mix tires of different brands or tread patterns.**
- **When replacing standard tires with those tires of an optional recommended size and of different diameter, the speedometer must be recalibrated.**
- **Install road wheel using the wheel hub boss.**



- Use tapered wheel nuts for both steel and aluminum wheels.



- **Tighten wheel nuts in crisscross fashion.**


SMA221B

Wheel Nut

CAUTION:

- **Be careful not to smear threaded portion of bolt and nut as well as seat of nut with oil or grease.**

Tire Repair

CAUTION:

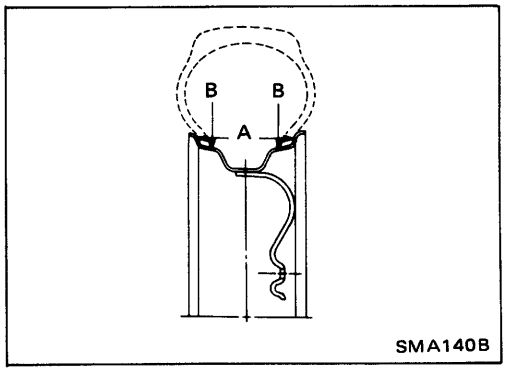
When replacing tire, take extra care not to damage tire bead, rim-flange and bead seat.

When installing tire, note the following items:

a. **Install valve core and inflate to proper pressure. Check locating rings of tire to be sure they show around rim flanges on both sides.**
b. **Check valves for leakage after inflating tires.**
c. **Be sure to tighten valve caps firmly by hand.**

WARNING:

To avoid serious personal injury, never stand over tire when inflating it. Never inflate to a pressure greater than 40 psi (275 kPa). If beads fail to seat at that pressure, deflate tire, lubricate it again, and then reinflate it. If tire is overinflated, the bead might break, possibly resulting in serious personal injury.



SMA140B

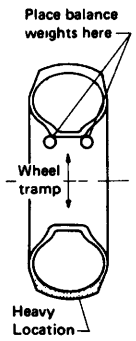
Wheel Inspection

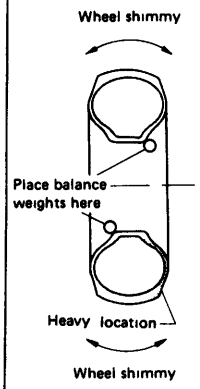
- Check wheel rim (especially rim flange and bead seat) for rust, distortion, cracks or other damage.
- Examine wheel rim for lateral and radial runout with dial gauge.

	Steel wheel	Aluminum wheel
Lateral runout (A) and radial runout (B)	–	0.3 mm (0.012 in) or less
Average (C) of right and left radial runout	0.5 mm (0.020 in) or less	–
Average (D) of right and left lateral runout	0.8 mm (0.031 in) or less	–
Difference between right and left radial runout	0.5 mm (0.020 in) or less	0.2 mm (0.008 in) or less

- Replace wheel when any of the following conditions occur.
  a. Bent, dented or heavily rusted
  b. Elongated bolt holes
  c. Excessive lateral or radial runout
  d. Air leaks through welds
  e. Wheel nuts will not stay tight

Cause	Wheel static unbalance	Wheel dynamic unbalance
Symptom of unbalance	Wheel tramp Wheel shimmy	Wheel shimmy
Corrective action	Balance statically	Balance dynamically





SMA075

Balancing Wheels

- Adjust wheel balance using road wheel center.

Wheel balance (Maximum allowable unbalance at rim flange):

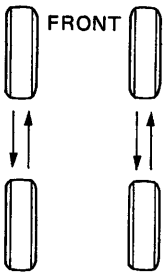
Refer to S.D.S.

Tire balancing weight: Refer to S.D.S.

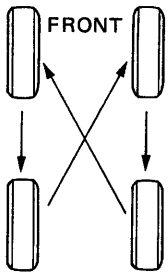
Tire Rotation

- **Do not include the T-type spare tire when rotating the tires.**

Models equipped with directional wheels



Other models



SFA297A

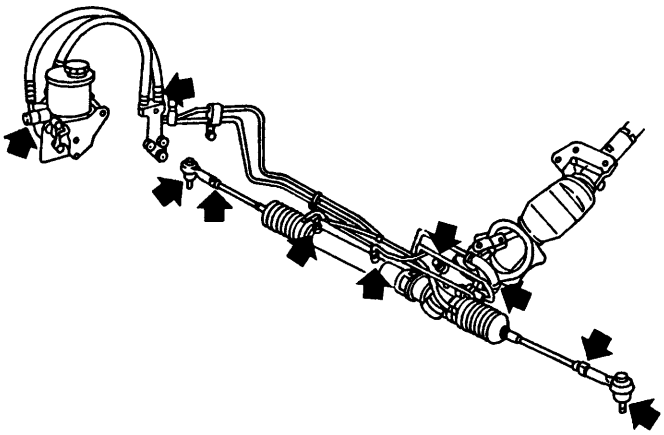
Spare Tire

T-TYPE SPARE TIRE

The T-type spare tire is designed for emergency use only.
The spare tire can be used repeatedly for emergency situations.
Precautions when using T-type spare tire

- **Periodically check tire inflation pressure, and always keep it at 60 psi (412 kPa).**
- **Do not drive vehicle at speeds faster than 80 km/h (50 MPH).**
- **T-type spare tire is designed only for temporary use as a spare. Dismount it and keep it as a spare as soon as standard tire repair has been completed.**
- **Do not attach a tire chain.**
- **Do not use T-type spare tire on other vehicles.**
- **Do not make a sharp turn, or apply brakes suddenly while driving.**
- **As soon as tread wear indicator becomes visible, replace tire with a new one.**
- **Mounting and dismounting to and from road wheel can be carried out in the same manner as any ordinary tire.**
- **Use of wheel balance is unnecessary.**

Checking Steering Gear and Linkage



- Steering gear:

(1) Check gear housing and boots for looseness, damage or grease leakage.

(2) Check connection with steering column for looseness.

- Steering linkage:

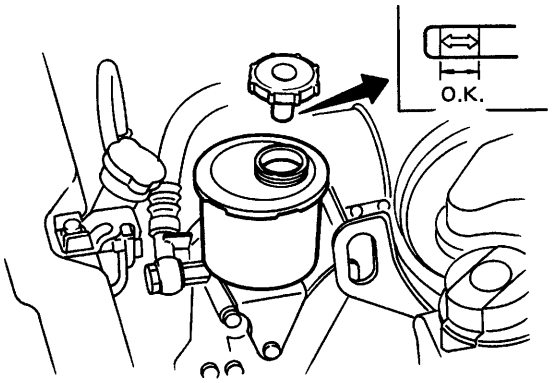
(1) Check ball joint, dust cover and other component parts for looseness, wear, damage or grease leakage.

(2) Check for missing parts (cotter pins, washer, etc.).

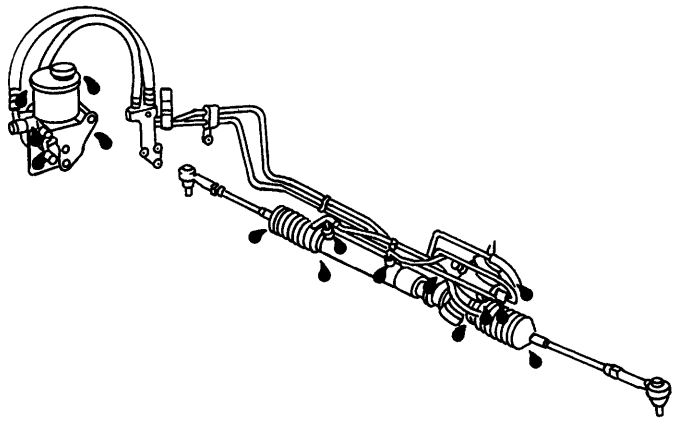
SMA549B

Checking Power Steering System Fluid and Lines

- Check fluid level, when the fluid is cold.

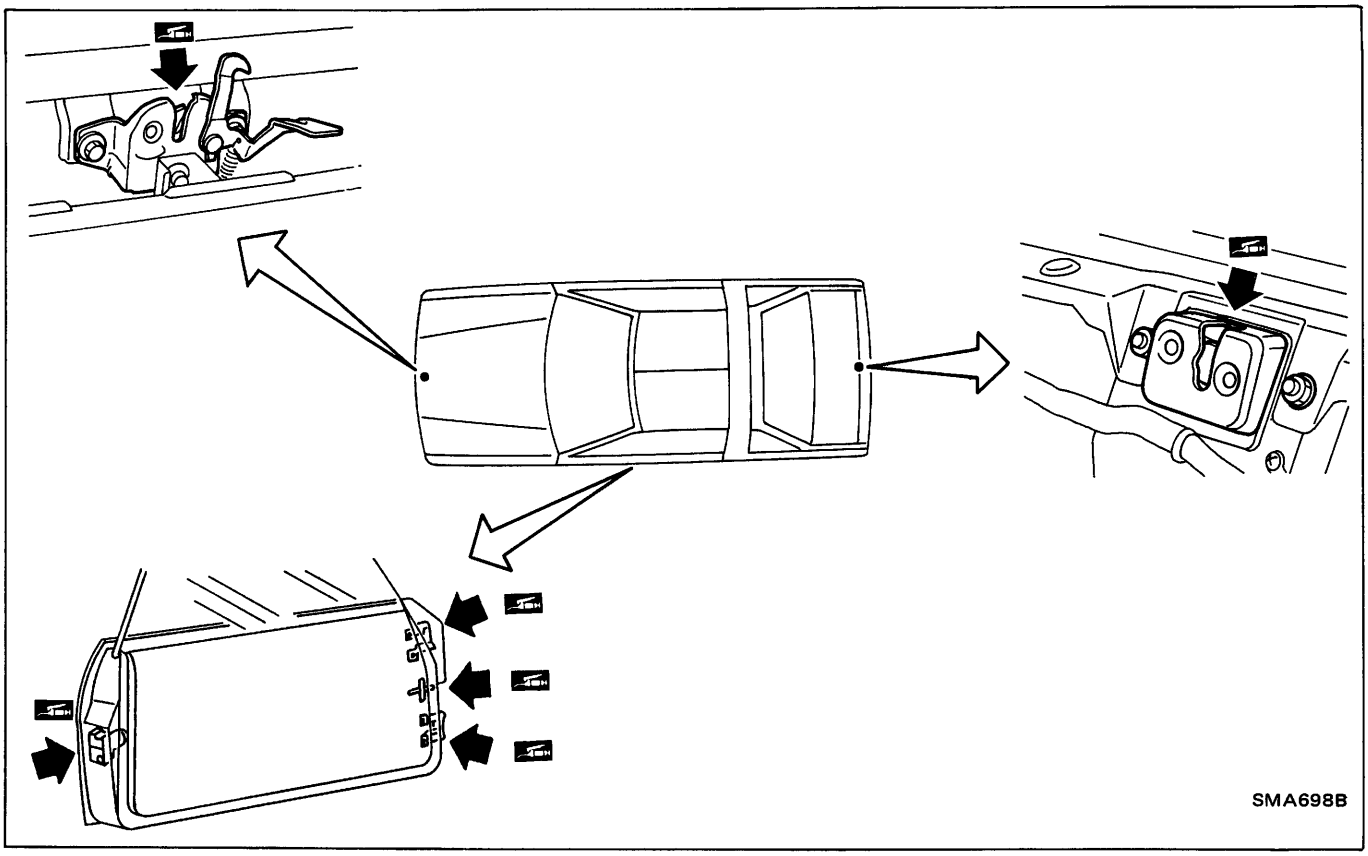


- Check lines for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



SMA550B

Lubricating Hood Latches, Locks and Hinges

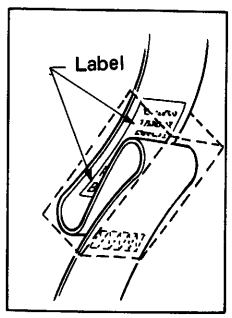


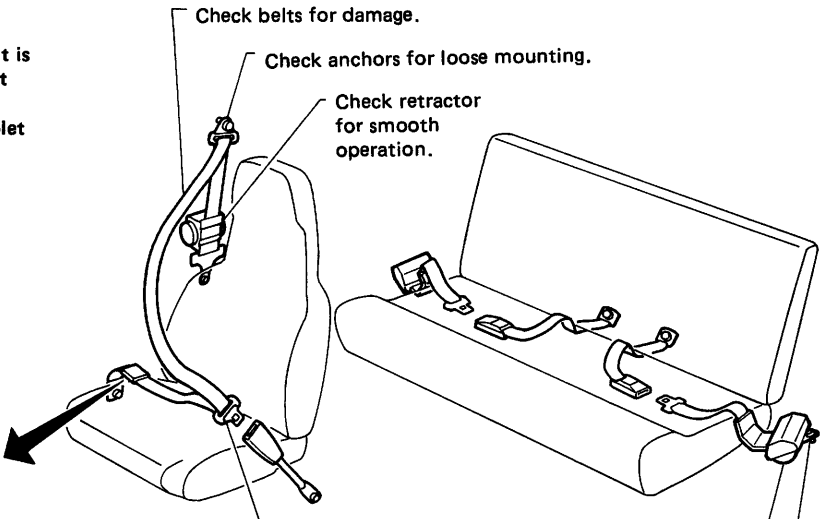
Checking Seat Belts, Buckles Retractors, Anchors and Adjusters

CAUTION:

1. **If the vehicle is collided or overturned, replace the entire belt assembly, regardless of nature of accident.**
2. **If the condition of any component of a seat belt is questionable, do not have seat belt repaired, but replaced as a belt assembly.**
3. **If webbing is cut, frayed, or damaged, replace blet assembly.**
4. **Do not spill drinks, oil, etc. on inner lap belt buckle. Never oil tongue and buckle.**
5. **Use a NISSAN genuine seat belt assembly.**

Anchor bolt
35.8 - 45.6 N·m
(3.65 - 4.65 kg-m, 26.4 - 33.6 ft-lb)





For front seat belt, shock absorber type belt has been used.
Replace the belt when loop has been pulled out and "REPLACE BELT" is visible because this seat belt has a loop of webbing under the sleeve.

SMA699B

Engine Maintenance — GA16i

INSPECTION AND ADJUSTMENT

Drive belt deflection

Unit: mm (in)

	Used belt deflection		Set deflection of new belt
	Limit	Adjusted deflection	
Alternator With power steering	11 (0.43)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)
Without power steering	10 (0.39)		
Air conditioner compressor	7.5 (0.295)	4 - 6 (0.16 - 0.24)	3 - 5 (0.12 - 0.20)
Power steering oil pump	7.5 (0.295)	4 - 6 (0.16 - 0.24)	3 - 5 (0.12 - 0.20)
Applied pushing force	98 N (10 kg, 22 lb)		

Oil capacity (Refill capacity)

Unit: ℓ (US qt, Imp qt)

With oil filter	3.2 (3-3/8, 2-7/8)
Without oil filter	2.8 (3, 2-1/2)

Coolant capacity (Refill capacity)

With reservoir tank

Unit: ℓ (US qt, Imp qt)

M/T	5.4 (5-3/4, 4-3/4)
A/T	5.9 (6-1/4, 5-1/4)

Spark plug

Standard type		BCPR5ES-11
Hot type		BCPR4ES-11
Cold type		BCPR6ES-11
Plug gap	mm (in)	1.0 - 1.1 (0.039 - 0.043)
Ignition wire resistance	kΩ	Less than 30

Engine Maintenance — CA18DE

INSPECTION AND ADJUSTMENT

Drive belt deflection

Unit: mm (in)

	Used belt deflection		Set deflection of new belt
	Limit	Adjust deflection	
Alternator			
Models without air conditioner	12 (0.47)	6 - 8 (0.24 - 0.31)	5 - 7 (0.20 - 0.28)
Models with air conditioner	10 (0.39)	5 - 7 (0.20 - 0.28)	
Power steering oil pump	12.5 (0.492)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)
Air conditioner compressor	6 (0.24)	3 - 4 (0.12 - 0.16)	3 - 4 (0.12 - 0.16)

Applied pushing force: 98 N (10 kg, 22 lb)

Coolant and oil capacity

Unit: ℓ (US qt, Imp qt)

Coolant (with reservoir tank)	Approx. 5.8 (6-1/8, 5-1/8)
Reservoir tank	0.6 (5/8, 1/2)
Engine oil	
With oil filter change	Approx. 3.8 (4, 3-3/8)
Without oil filter change	Approx. 3.4 (3-5/8, 3)

Spark plug

Platinum type

Standard type	PFR6A-11
Hot type	PFR5A-11
Cold type	PFR7A-11

Conventional type **(Refer to PERIODIC MAINTENANCE.)**

BCPR5ES-11, BCPR6ES-11, BCPR7ES-11
Gap: 1.1 mm (0.043 in)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Oil pan drain plug	29 - 39	3.0 - 4.0	22 - 29
Spark plug	20 - 29	2.0 - 3.0	14 - 22
Crank angle sensor	7 - 8	0.7 - 0.8	5.1 - 5.8
Crankshaft pulley	142 - 152	14.5 - 15.5	105 - 112
Timing belt tensioner pulley nut	22 - 29	2.2 - 3.0	16 - 22
Engine mount bracket bolt	39 - 54	4.0 - 5.5	29 - 40

Chassis and Body Maintenance

INSPECTION AND ADJUSTMENT

Clutch

GA16i engine model

Unit: mm (in)

Pedal free height "H"	162 - 172 (6.38 - 6.77)
Pedal free travel "A"	12.5 - 17.5 (0.492 - 0.689)

CA18DE engine model

Unit: mm (in)

Pedal free height "H"	162 - 172 (6.38 - 6.77)
Pedal free play "A"	1 - 3 (0.04 - 0.12)

Front axle and front suspension (Unladen)*

Item \ Model	GA16i engine	CA18DE engine
Camber degree	−1°15′ to 0°15′	
Caster degree	1°10′ - 2°40′	
Toe-in mm (in)	−1 to 1 (−0.04 to 0.04)	
(Total toe-in) degree	−6′ to 6′	
Kingpin inclination degree	13°40′ - 15°10′	
Front wheel turning angle Toe-out turn Inside/outside degree	21°36′/20°	22°24′/20°
Full turn Inside/outside degree	37° - 40°/32°30′	36° - 39°/30°

*: Tankful of fuel, radiator coolant and engine oil full
Spare tire, jack, hand tools, mats in designated positions

Rear axle and rear suspension (Unladen)*

Camber degree	−2°00′ to −0°30′
Toe-in mm (in)	−1.5 to 2.5 (−0.059 to 0.098)
(Total toe-in) degree	−9′ to 15′

*: Tankful of fuel, radiator coolant and engine oil full
Spare tire, jack, hand tools, mats in designated positions

Brake

Unit: mm (in)

Disc brake Pad minimum thickness	2.0 (0.079)
Rotor minimum thickness CL18B	10.0 (0.394)
AD18V	16.0 (0.630)
Drum brake Lining minimum thickness	1.5 (0.059)
Drum maximum inner dia. LT20A	204.5 (8.05)
Pedal Free height "H′" M/T	160 - 168 (6.30 - 6.61)
A/T	164 - 174 (6.46 - 6.85)
Free play "A"	1 - 3 (0.04 - 0.12)
Depressed height "D" [Under force of 490 N (50 kg, 110 lb) with engine running]	M/T: 80 (3.15) or more A/T: 85 (3.35) or more
Parking brake Number of notches [at pulling force 196 N (20 kg, 44 lb)]	7 - 11 notches

Chassis and Body Maintenance (Cont'd)

Wheel and tire

Tire inflation

Proper tire pressures are shown on the tire placard affixed to the glove box door.

Tire pressure should be checked when tires are COLD.

	Steel wheel	Aluminum wheel
Lateral runout (A) and radial runout (B)	—	0.3 mm (0.012 in) or less
Average (C) of right and left radial runout	0.5 mm (0.020 in) or less	—
Average (D) of right and left lateral runout	0.8 mm (0.031 in) or less	—
Difference between right and left radial runout	0.5 mm (0.020 in) or less	0.2 mm (0.008 in) or less
Wheel balance (Maximum allowable unbalance at rim flange) gr (oz)	10 (0.35)	
Tire balance weight gr (oz)	5 - 60 (0.18 - 2.12), Spacing 5 (0.18)	

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Clutch			
Pedal stopper lock nut	16 - 22	1.6 - 2.2	12 - 16
Manual transaxle			
Drain and filler plugs	25 - 34	2.5 - 3.5	18 - 25
Automatic transaxle			
Drain plug	7 - 13	0.7 - 1.3	5.1 - 9.4
Front axle and front suspension			
Tie-rod lock nut	37 - 46	3.8 - 4.7	27 - 34
Camber adjusting pin	98 - 118	10.0 - 12.0	72 - 87
Rear axle and rear suspension			
Toe adjusting pin	98 - 118	10.0 - 12.0	72 - 87
Brake system			
Air bleed valve	7 - 9	0.7 - 0.9	5.1 - 6.5
Brake lamp switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Brake booster input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
Wheel and tire			
Wheel nut	98 - 118	10.0 - 12.0	72 - 87

ENGINE MECHANICAL

SECTION EM

EM

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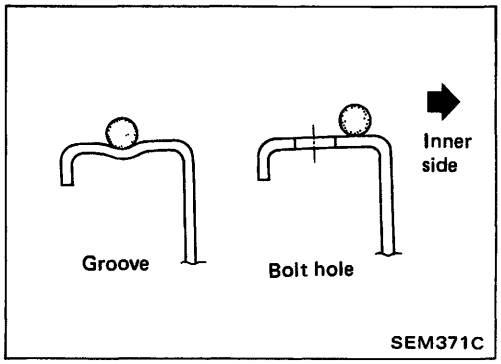
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GA16i

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CA18DE

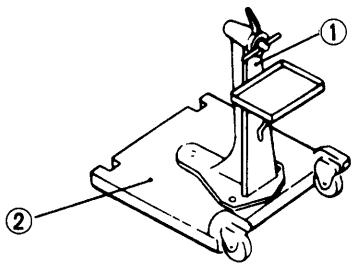
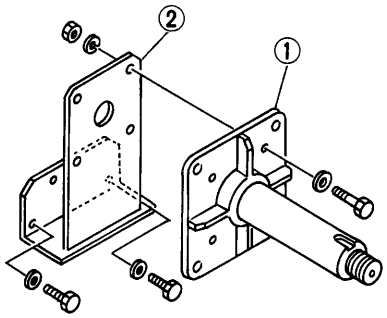
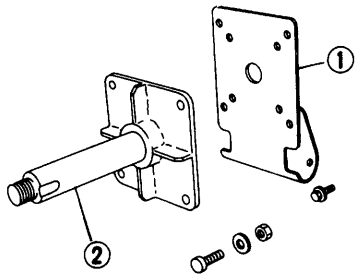
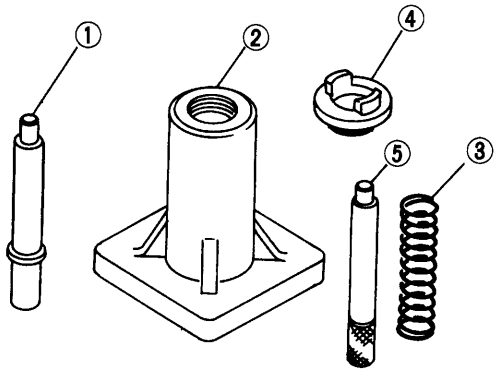
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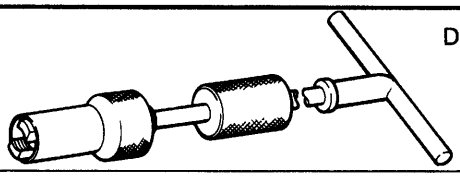
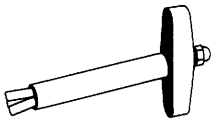
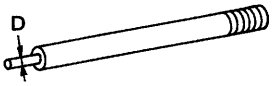
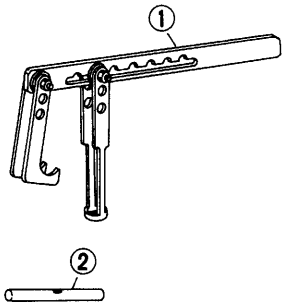
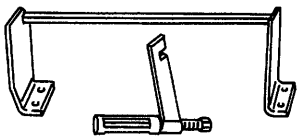
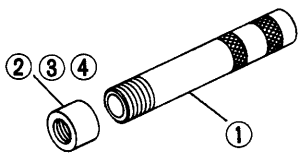


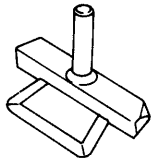
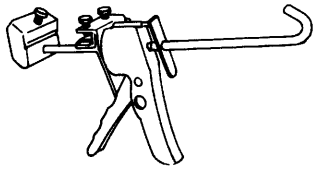
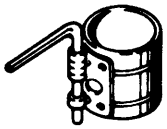
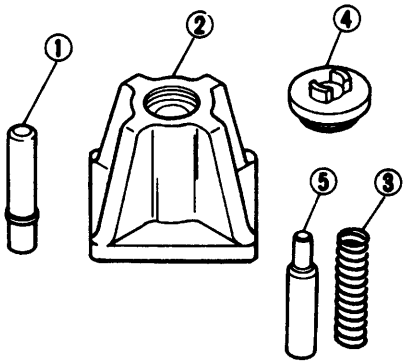
LIQUID GASKET APPLICATION PROCEDURE

a. Before applying liquid gasket, remove all traces of old liquid gasket from mating surface using a scraper.
b. Apply a continuous bead of liquid gasket to mating surface. (Use Genuine Liquid Gasket or equivalent.)
c. Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide (for oil pan).
   Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).
d. Apply liquid gasket to inner sealing surface around hole perimeter area.
   (Attaching should be done within 5 minutes after coating at least 30 minutes after installing.)

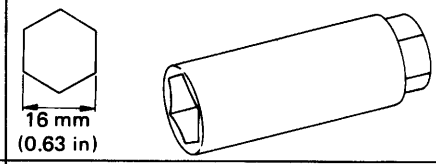
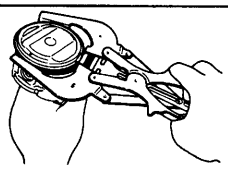
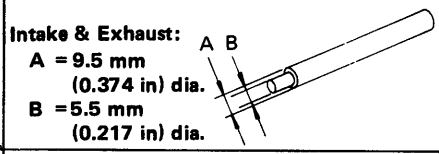
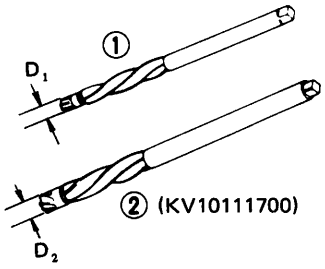
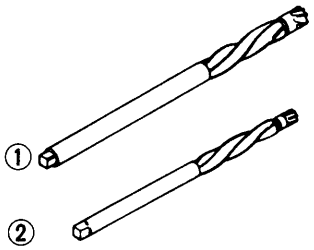
SPECIAL SERVICE TOOLS

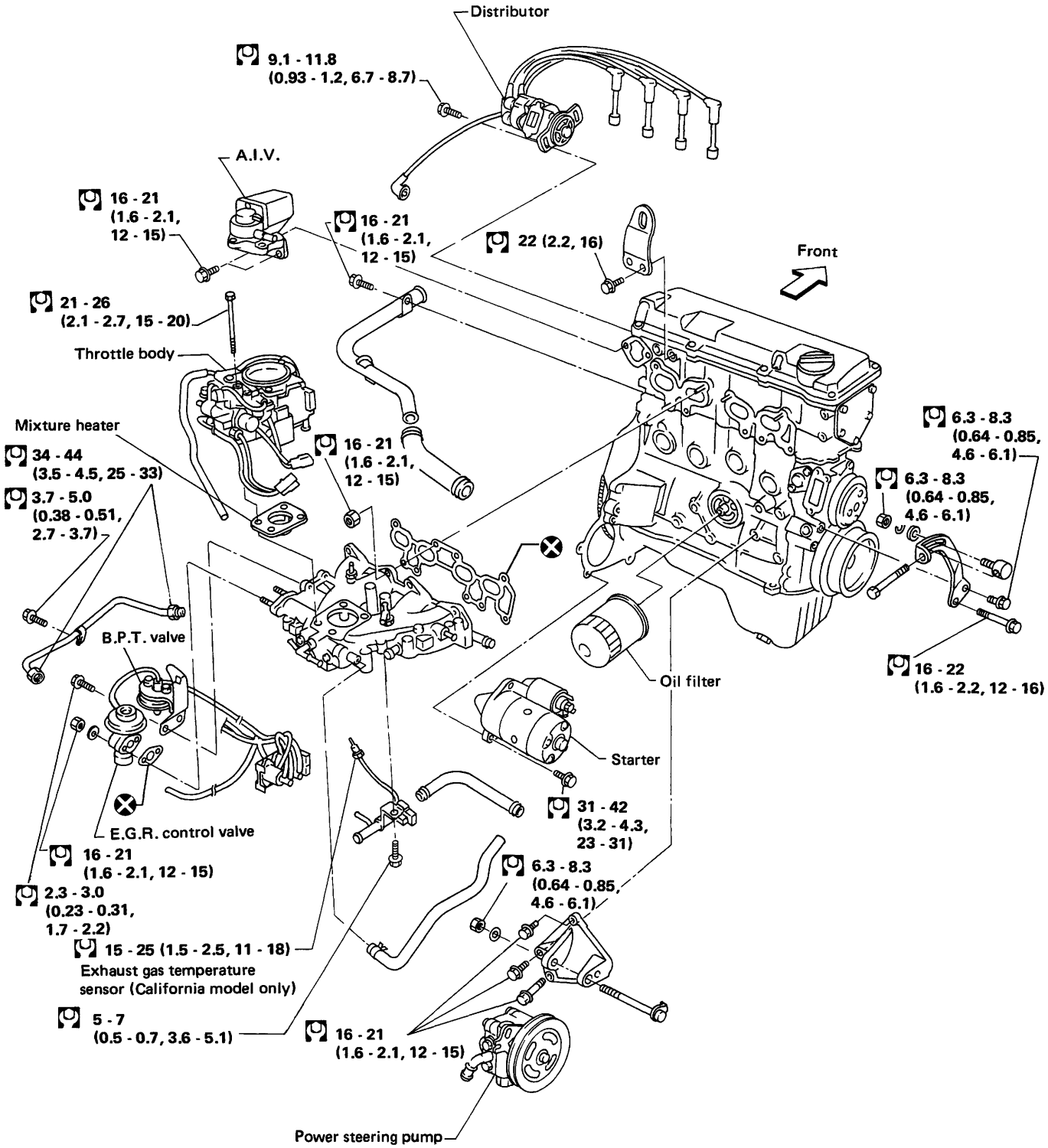
Tool number (Kent-Moore No.) Tool name	Description	Engine application GA	Engine application CA
ST0501S000 (–) Engine stand assembly ① ST05011000 (–) Engine stand ② ST05012000 (–) Base	When overhauling engine 	X	X
Engine attachment assembly ① KV10106500 (–) Engine attachment ② KV10113300 (–) Sub attachment	When overhauling engine 	X	–
Engine attachment assembly ① KV10108101 (–) Engine attachment ② KV10106500 (–) Sub-attachement		–	X
KV10107400 (J26365-12, J26365) Piston pin press stand ① KV10107310 (–) Center shaft ② ST13040020 (–) Stand ③ ST13040030 (–) Spring ④ KV10107320 (–) Cap ⑤ ST13040050 (–) Drift	Disassembling and assembling piston pin 	X	–

Tool number (Kent-Moore No.) Tool name	Description		Engine application	
			GA	CA
KV10107900 (–) Valve lip seal puller		Displacement valve lip seal	X	–
(J36467) Valve oil seal remover		Displacement valve oil seal	–	X
KV1011800 (–) KV10111000 (–) Valve guide drift	 **Intake (D): 6.0 mm (0.236 in) dia.** **Exhaust (D): 6.5 mm (0.256 in) dia.**	Removing and installing valve guide	X	–
KV101092S0 (–) Valve spring compressor ① KV10109210 (–) Compressor ② KV10109220 (–) Adapter		Disassembling valve mechanism	X	–
(J36420) Valve spring compressor		Disassembling and assembling valve components	–	X
① KV10107501 (–) Valve lip seal drift ② KV10113100 (–) Valve lip seal drift attachment ③ KV10113200 (–) Valve lip seal drift attachment ④ KV10111400 (–) Valve lip seal drift attachment		Installing valve lip seal	X X X –	X – – X

Tool number (Kent-Moore No.) Tool name	Description		Engine application	
			GA	CA
KV10111100 (–) Seal cutter		Removing oil pan	X	X
WS39930000 (–) Tube presser		Pressing the tube of liquid gasket	X	X
EM03470000 (J8037) Piston ring compressor		Installing piston assembly into cylinder bore	X	X
KV101070S0 (–) Piston pin press stand ① KV10107010 (–) Center shaft ② ST13030020 (–) Stand ③ ST13030030 (–) Spring ④ KV10107020 (–) Cap ⑤ ST13030051 (–) Drift		Disassembling and assembling piston with connecting rod	–	X

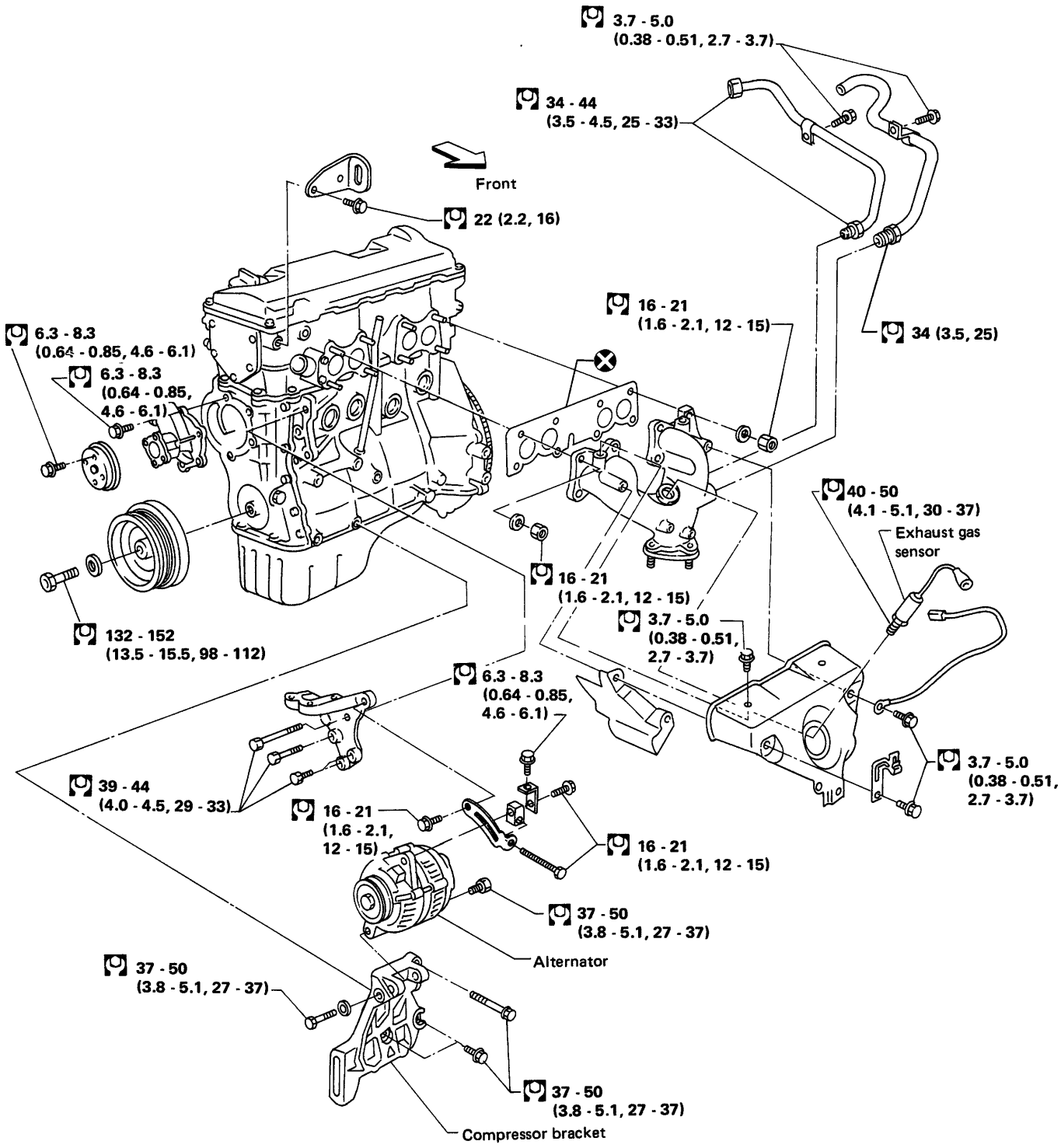
COMMERCIAL SERVICE TOOLS

Tool name	Description		Engine application	
			GA	CA
Spark plug wrench		Removing and installing spark plug	X	X
Pulley holder		Holding camshaft pulley while tightening or loosening camshaft bolt	X	X
Valve seat cutter set		Finishing valve seat dimensions	X	X
Piston ring expander		Removing and installing piston ring	X	X
Valve guide drift		Removing and installing valve guide	–	X
Valve guide reamer		Reaming cylinder head for oversize valve guide ① . Reaming valve guide inner ② . Intake & Exhaust: D_1 = 6.0 mm (0.236 in) dia. D_2 = 10.2 mm (0.402 in) dia.	–	X
Valve guide and hole reamer ① Intake ② Exhaust		Reaming valve guide and hole	X	–



: N·m (kg-m, ft-lb)

SEM346C

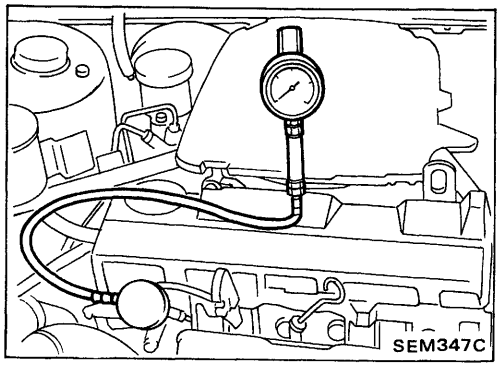


: N·m (kg-m, ft-lb)

SEM350C

Measurement of Compression Pressure

1. Warm up engine.
2. Turn ignition switch off.
3. Release fuel pressure.
   Refer to "Releasing Fuel Pressure" in section EF & EC.
4. Remove all spark plugs.
5. Disconnect distributor center cable.



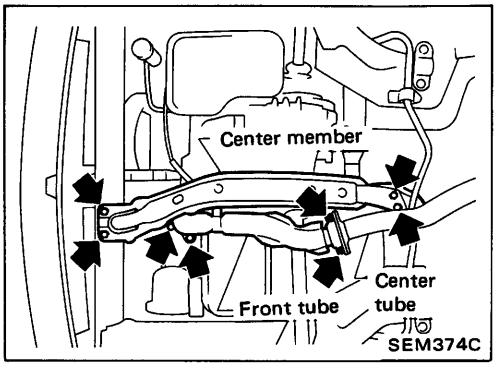
6. Attach a compression tester to No. 1 cylinder.
7. Depress accelerator pedal fully to keep throttle valve wide open.
8. Crank engine and record highest gauge indication.
9. Repeat the measurement on each cylinder as shown above.

- **Always use a fully-charged battery to obtain specified engine revolution.**

Compression pressure: kPa (kg/cm^2, psi)/350 rpm
Standard
1,245 (12.7, 181)
Minimum
981 (10.0, 142)
Difference limit between cylinders:
98 (1.0, 14)

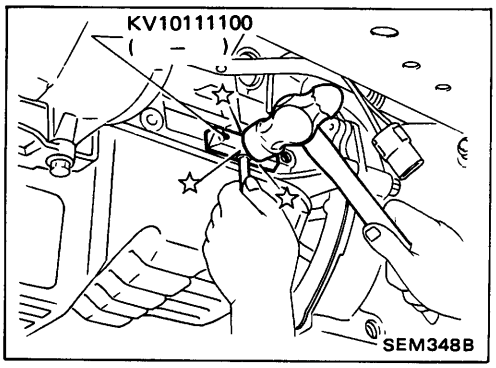
10. If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into cylinders through spark plug holes and retest compression.

- **If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.**
- **If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. (Refer to S.D.S.) If valve or valve seat is damaged excessively, replace them.**
- **If compression in any two adjacent cylinders is low and if adding oil does not help compression, there is leakage past the gasket surface. If so, replace cylinder head gasket.**

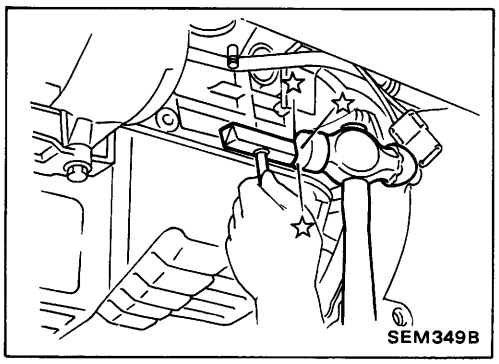


Removal

1. Drain engine oil.
2. Remove the following parts.
- Exhaust front tube
- Center member (2WD only)



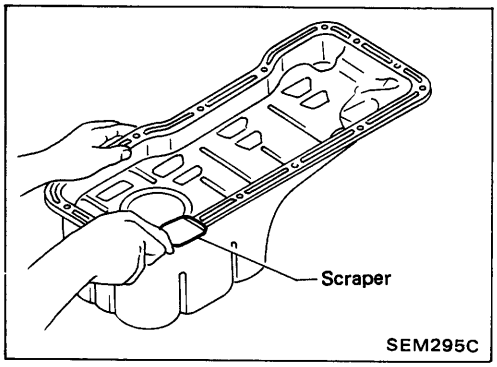
3. Remove oil pan.
(1) Insert Tool between cylinder block and oil pan.
- **Do not insert screwdriver, or oil pan flange will be deformed.**

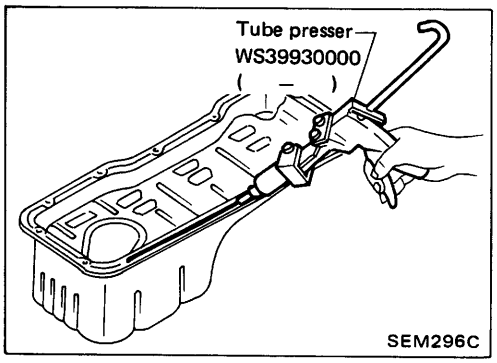


(2) Slide Tool by tapping its side with a hammer, and remove oil pan.

Installation

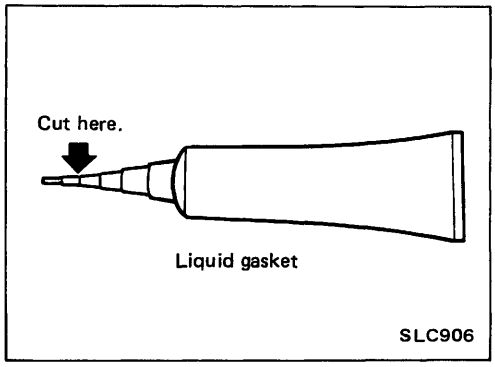
1. Before installing oil pan, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.



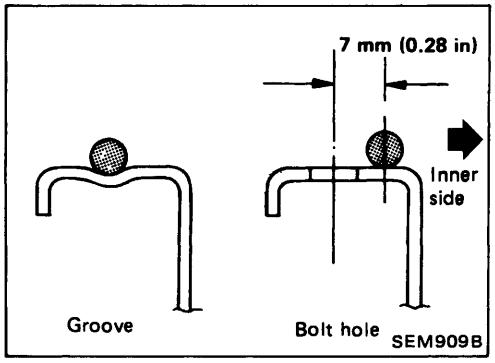


2. Apply a continuous bead of liquid gasket to mating surface of oil pan.
- **Use Genuine Liquid Gasket or equivalent.**

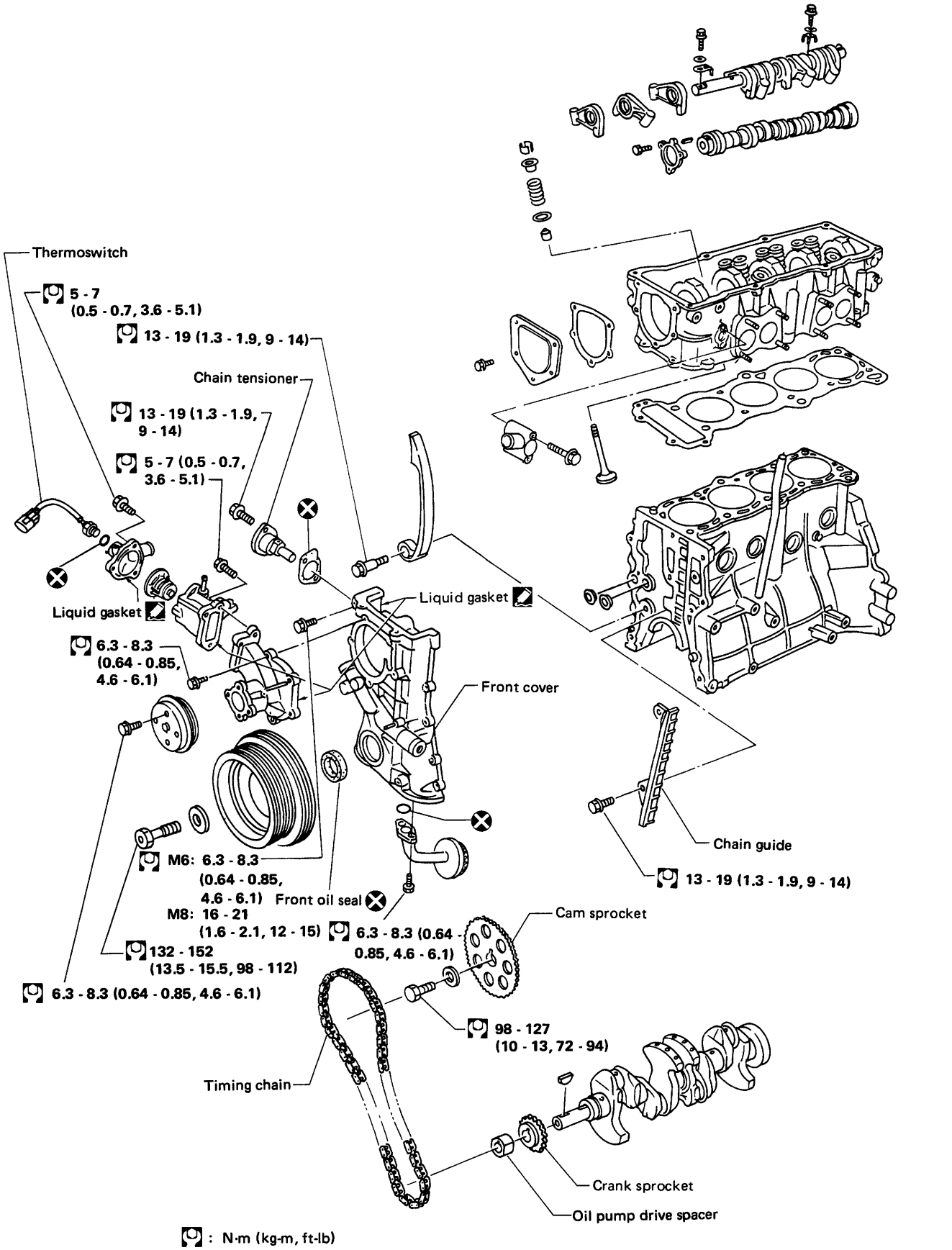
Installation (Cont'd)



- Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide.

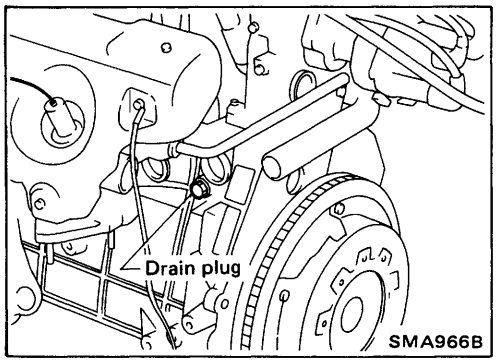


3. Apply liquid gasket to inner sealing surface as shown in figure.
- Attaching should be done within 5 minutes after coating.
4. Install oil pan.
- Wait at least 30 minutes before refilling engine oil.


Thermoswitch
5 - 7 (0.5 - 0.7, 3.6 - 5.1)
13 - 19 (1.3 - 1.9, 9 - 14)
Chain tensioner
13 - 19 (1.3 - 1.9, 9 - 14)
5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Liquid gasket
Liquid gasket
6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Front cover
Chain guide
13 - 19 (1.3 - 1.9, 9 - 14)
M6: 6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Front oil seal
M8: 16 - 21 (1.6 - 2.1, 12 - 15)
6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Cam sprocket
132 - 152 (13.5 - 15.5, 98 - 112)
6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
98 - 127 (10 - 13, 72 - 94)
Timing chain
Crank sprocket
Oil pump drive spacer
: N·m (kg-m, ft-lb)

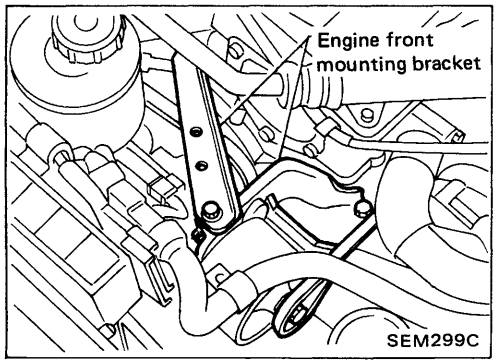
SEM424C

CAUTION:
- **After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.**

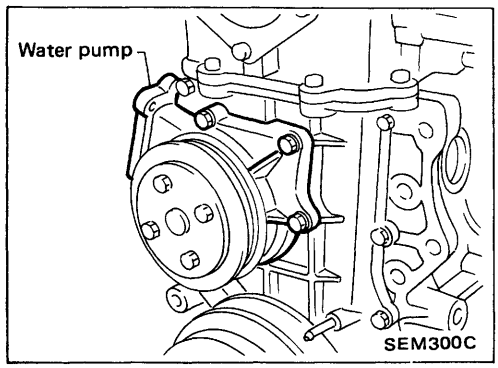


Removal

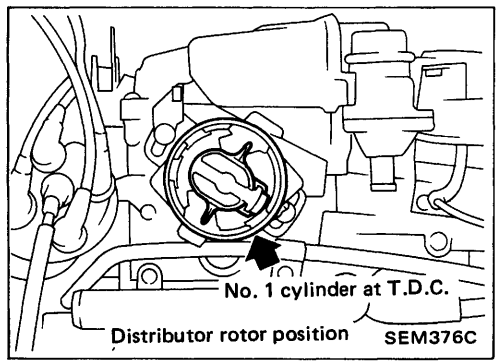
1. Drain engine coolant from radiator and cylinder block.
   Be careful not to spill coolant on drive belts.
2. Remove oil pan. (Refer to "Removal" of "OIL PAN".)
3. Remove the following belts.
- Power steering pump drive belt
- Compressor drive belt
- Alternator drive belt
4. Remove power steering pump bracket.
5. Remove air cleaner.



6. Hang engine front side using chain block.
7. Remove engine mounting bracket.

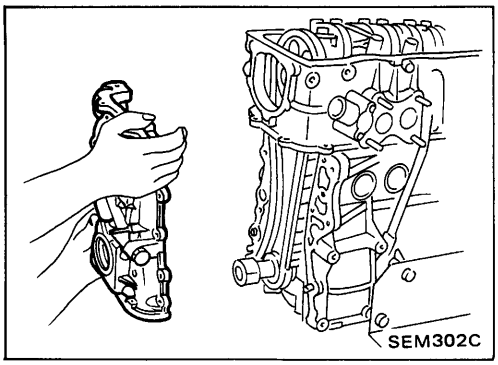


8. Remove water pump.
9. Remove chain tensioner from front cover.
10. Remove rocker cover.
11. Remove all spark plugs.

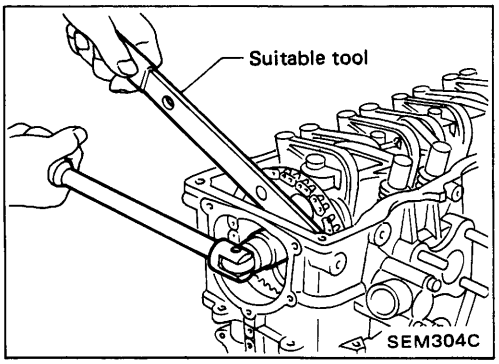


12. Set No. 1 cylinder at T.D.C. on its compression stroke.
13. Remove crankshaft pulley.

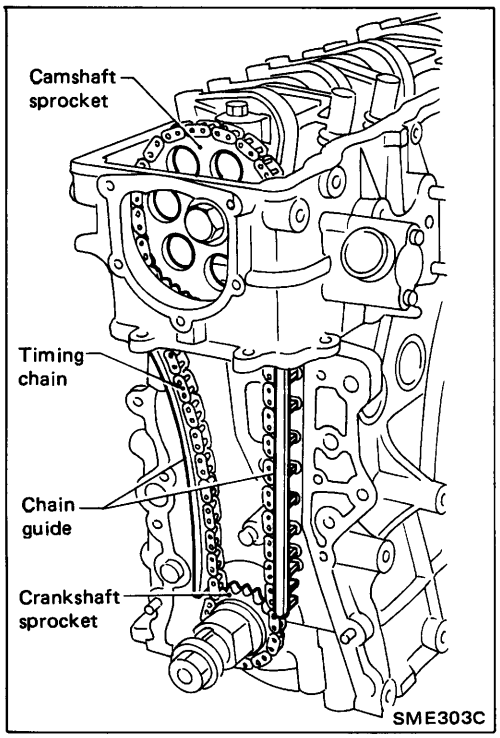
Removal (Cont'd)



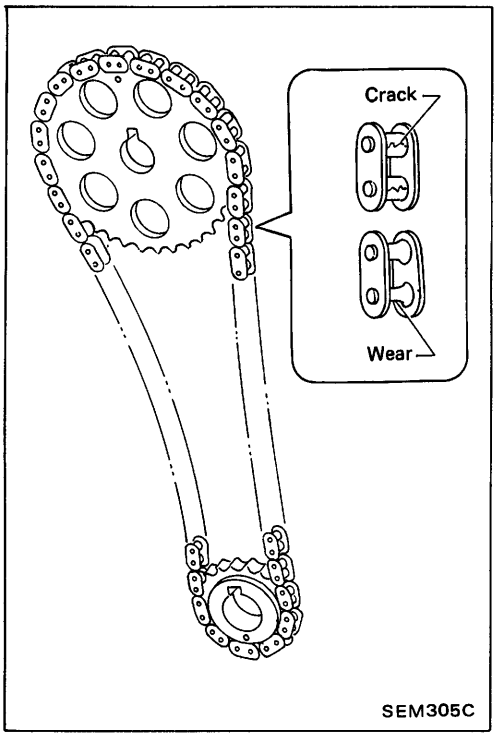
14. Remove front cover.



15. Remove camshaft sprocket bolt.

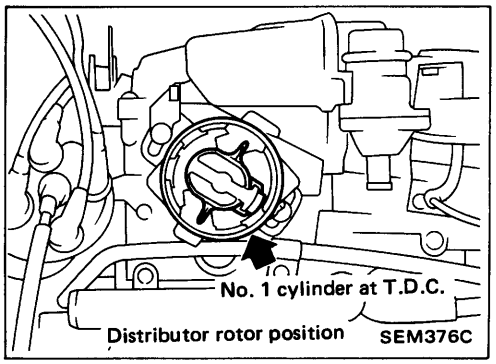


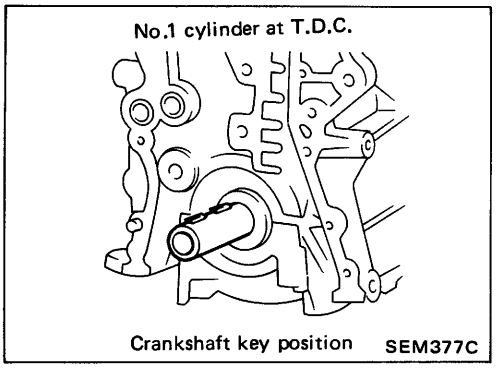
16. Remove the following parts.
- Chain guides
- Camshaft sprocket, crankshaft sprocket and timing chain



Inspection

Check for cracks and excessive wear at roller links. Replace if necessary.

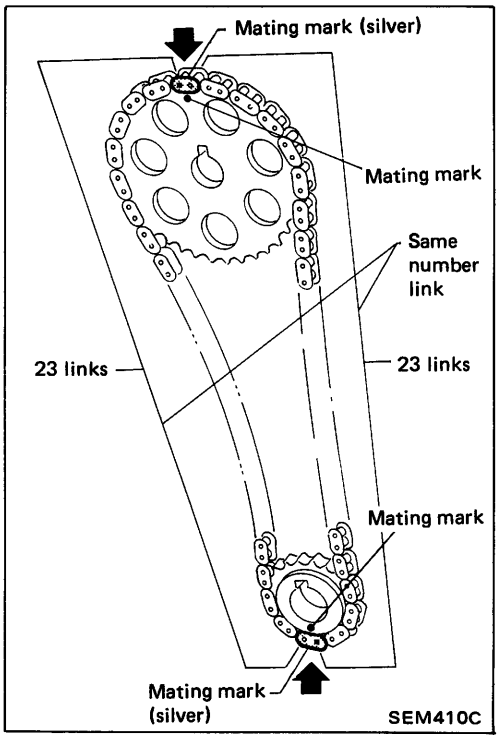




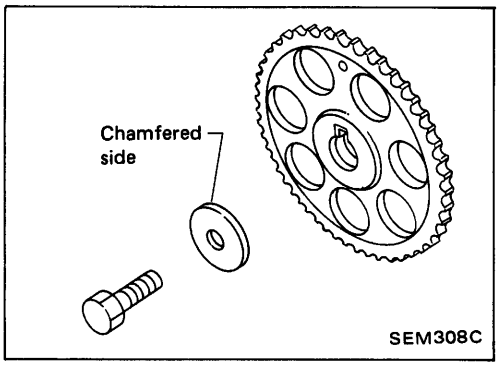
Installation

1. Confirm that No. 1 piston is set at T.D.C. of its compression stroke.

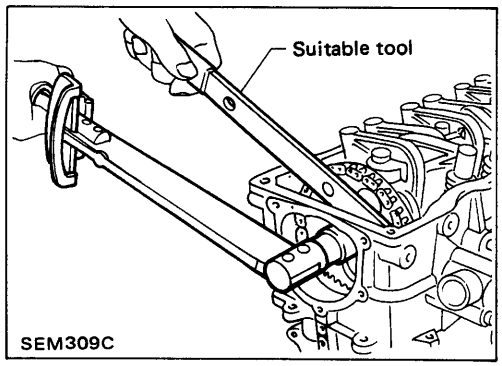
Installation (Cont'd)



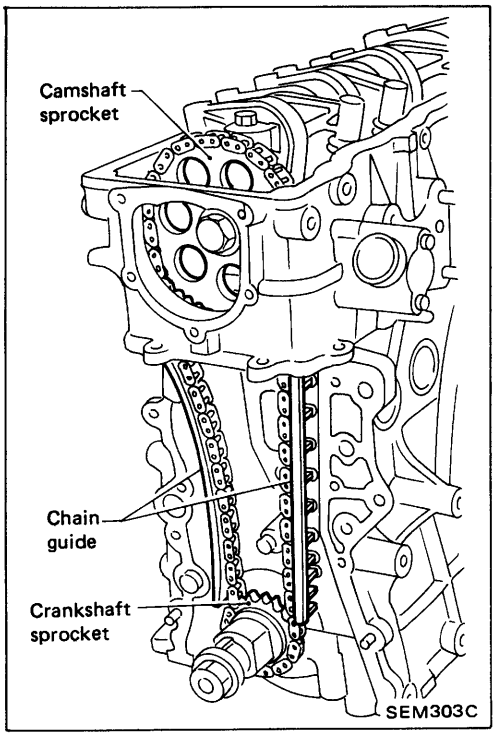
2. Install camshaft sprocket, crank shaft sprocket and timing chain.
- **Set timing chain by aligning its mating marks with those of crankshaft sprocket and camshaft sprocket.**
- **Make sure sprocket's mating mark faces engine front.**
- **The number of links between the alignment marks (silver) are the same for the left and right sides, so either side can be used during alignment with the sprocket.**



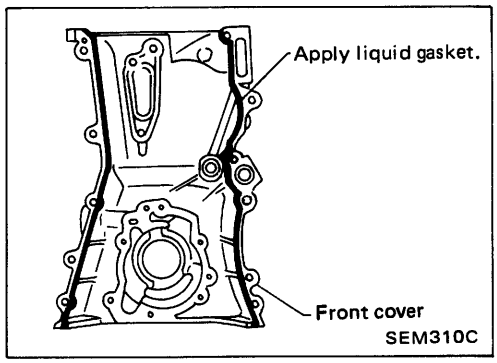
3. Tighten camshaft sprocket bolt.
- **When installing washer, face its non-chamfered side toward camshaft sprocket.**



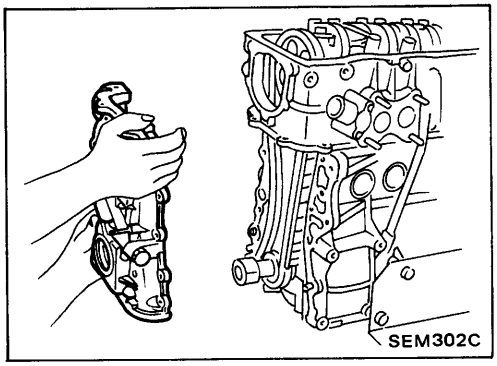
Installation (Cont'd)



4. Install chain guide.
- **When installing chain guide, move chain guide in direction that tensions chain.**



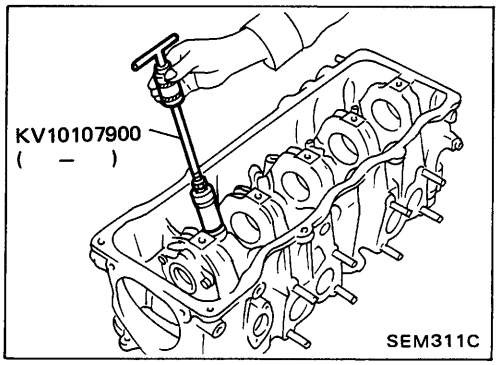
5. Apply liquid gasket to front cover.



6. Install front cover.

Be careful not to damage cylinder head gasket.

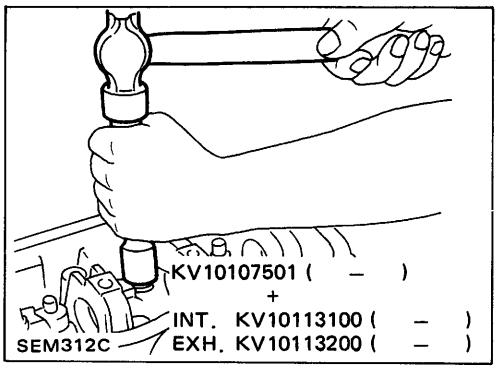
7. Install chain tensioner.
8. Install oil pan.
9. Install the following parts.
- Water pump
- Crank pulley
- Engine mounting bracket
- Power steering pump bracket



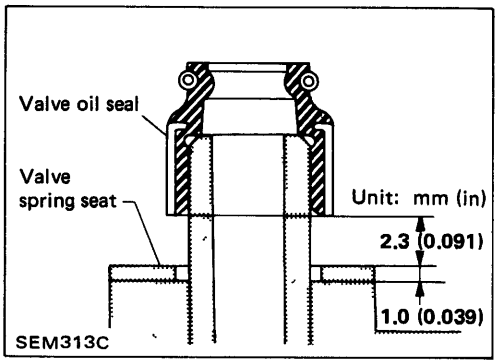
VALVE OIL SEAL

1. Remove rocker cover.
2. Remove rocker shaft assembly.
3. Remove valve spring and valve oil seal with Tool or suitable tool.

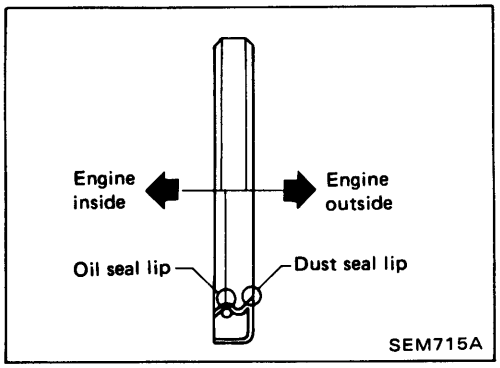
Piston concerned should be set at T.D.C. to prevent valve from falling.



4. Apply engine oil to new valve oil seal and install it with Tool.



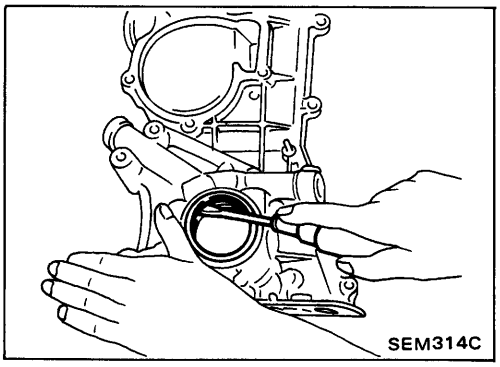
OIL SEAL INSTALLING DIRECTION

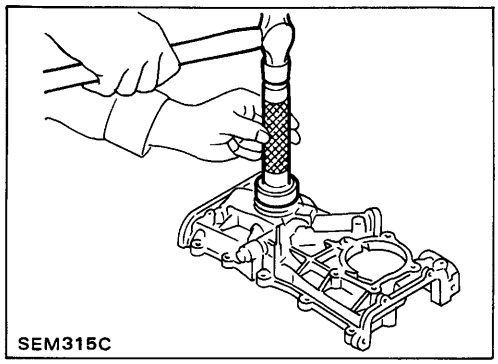


FRONT OIL SEAL

1. Remove front cover. Refer to "Removal" of "TIMING CHAIN".
2. Remove front oil seal from front cover.

Be careful not to damage oil seal retainer.

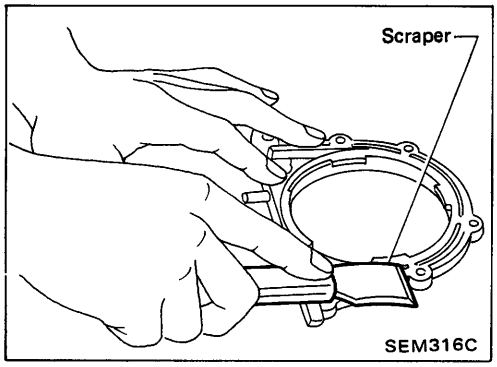



SEM315C

3. Apply engine oil to new oil seal and install it using suitable tool.

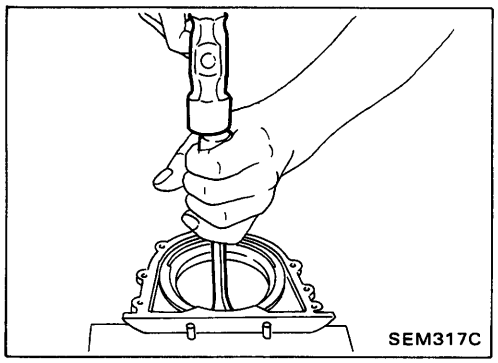
REAR OIL SEAL

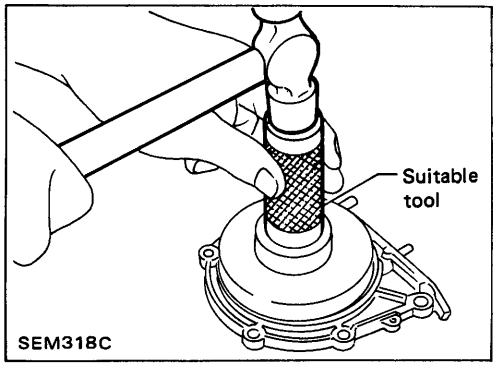
1. Remove flywheel or drive plate.
2. Remove rear oil seal retainer.
3. Remove traces of liquid gasket using scraper.



SEM316C

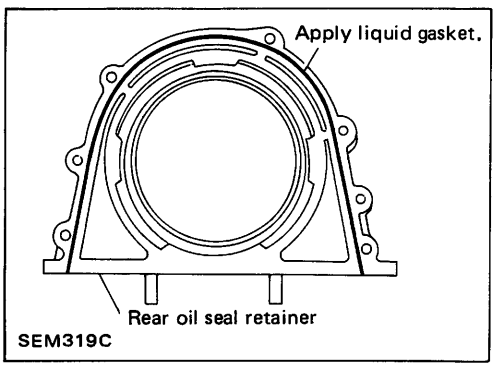
4. Remove seal from rear oil seal retainer.


SEM317C



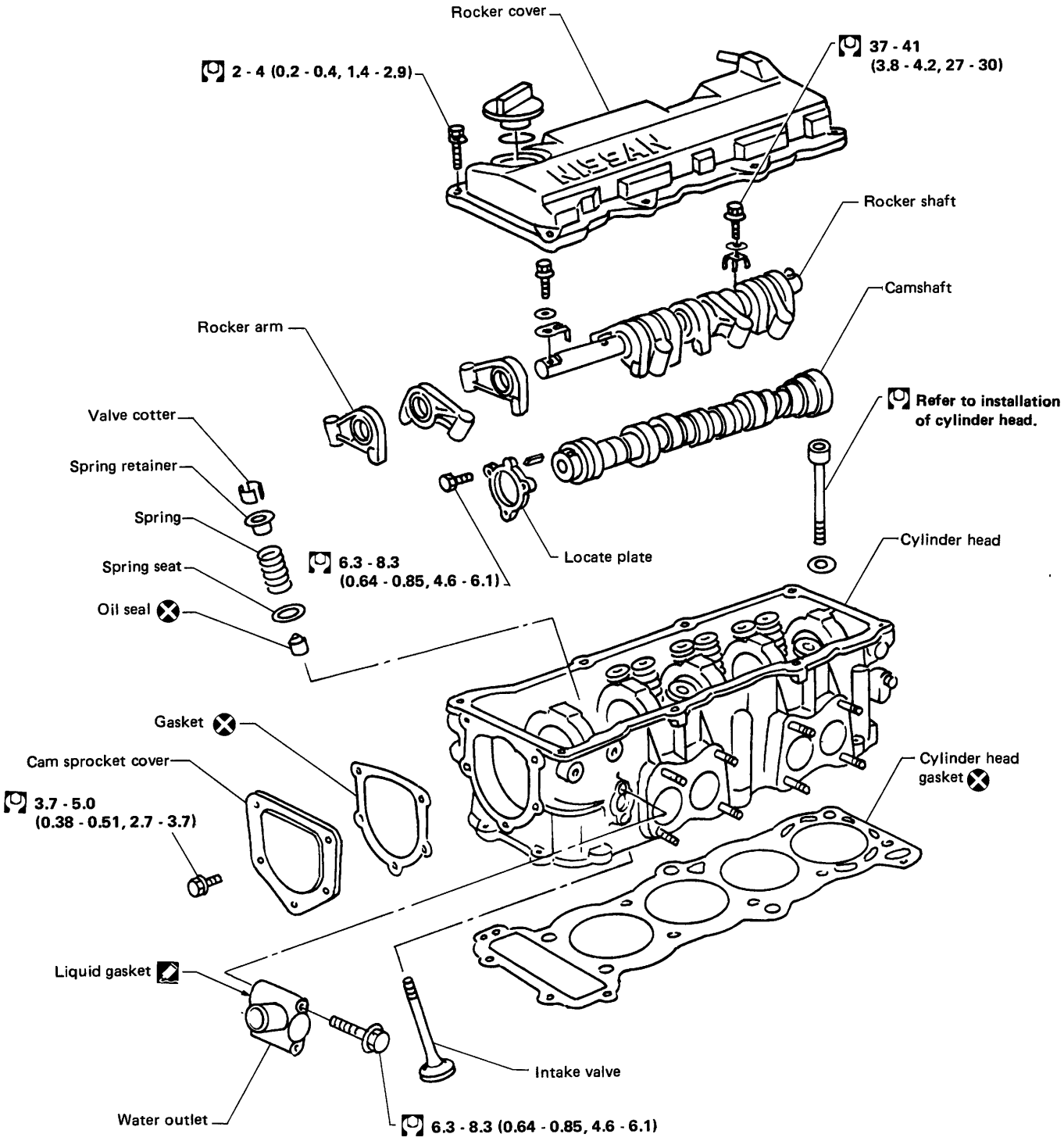
SEM318C

5. Apply engine oil to new oil seal and install it using suitable tool.



SEM319C

6. Apply liquid gasket to rear oil seal retainer.



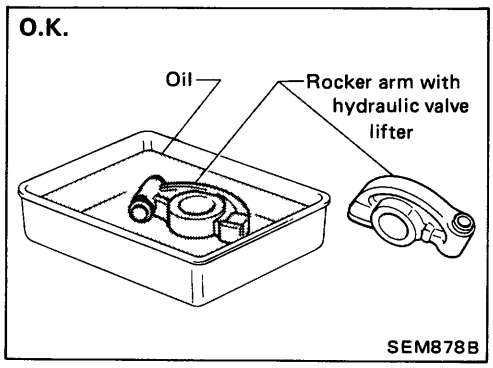
: N·m (kg-m, ft-lb)

SEM320C

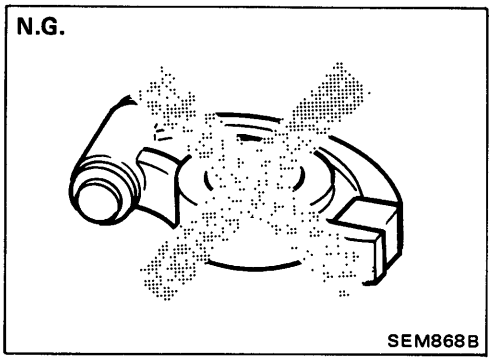
CYLINDER HEAD

CAUTION:

- **When installing sliding parts such as rocker arms, camshaft and oil seal, be sure to apply new engine oil on their sliding surfaces.**
- **When tightening cylinder head bolts and rocker shaft bolts, apply new engine oil to thread portions and bolts seat surfaces.**



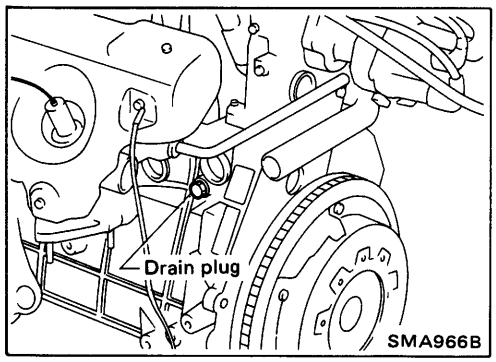
- **Hydraulic valve lifters are installed in each rocker arm. If hydraulic valve lifter is kept on its side, even when installed in rocker arm, there is a risk of air entering it. After removal, always set rocker arm straight up, or when laying it on its side, have it soak in new engine oil.**

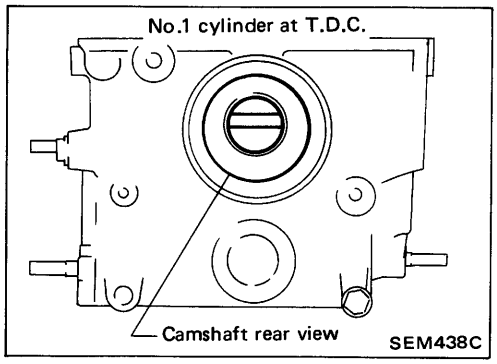


- **Do not disassemble hydraulic valve lifter.**
- **Attach tags to valve lifters so as not to mix them up.**

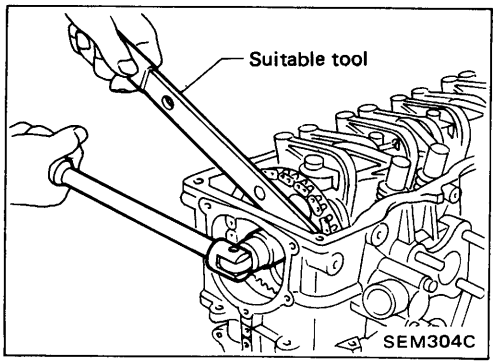
Removal

1. Drain coolant from radiator and cylinder block.
   Be careful not to spill coolant on drive belts.
2. Disconnect exhaust tube from exhaust manifold.
3. Remove intake manifold bracket.
4. Remove air cleaner.
5. Release fuel pressure.
   - **Refer to "Releasing Fuel Pressure" in section EF & EC.**
6. Disconnect distributor center cable.
7. Remove rocker cover.
8. Remove distributor from cylinder head.
9. Remove all spark plugs.
10. Set No. 1 piston at T.D.C. of its compression stroke.

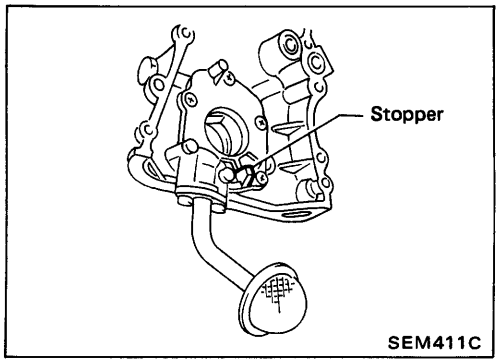




Removal (Cont'd)

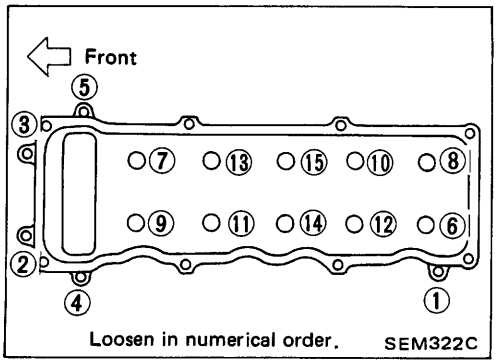


11. Remove camshaft sprocket.
12. Remove timing chain.
- Mark alignment marks on timing chain and sprocket.



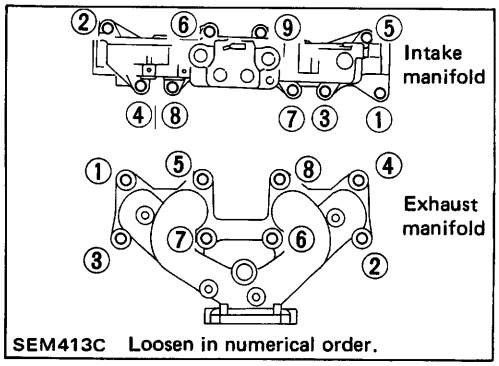
- Timing chain will not be disengaged or dislocated from crankshaft sprocket unless front cover is removed. For this reason, stopper need not be used.

Cast portion of front cover is located on lower side of crankshaft sprocket so timing chain is not disengaged from sprocket.

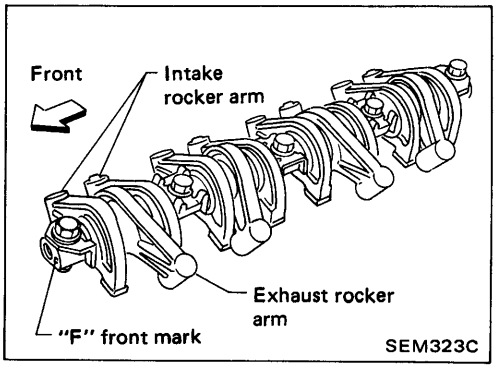


13. Remove cylinder head with manifolds.
- **Head warpage or cracking could result from removing in incorrect order.**
- **Cylinder head bolts should be loosened in two or three steps.**

Disassembly



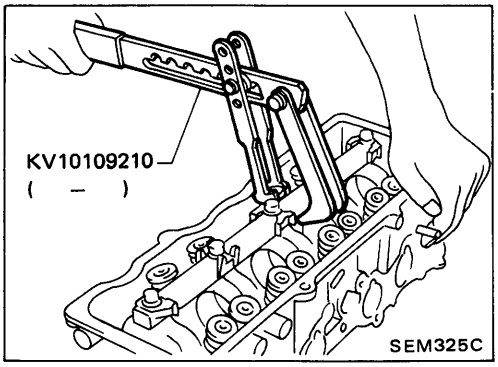
1. Remove manifolds from cylinder head.



2. Remove rocker shafts with rocker arms.

Bolts should be loosened in two or three steps.

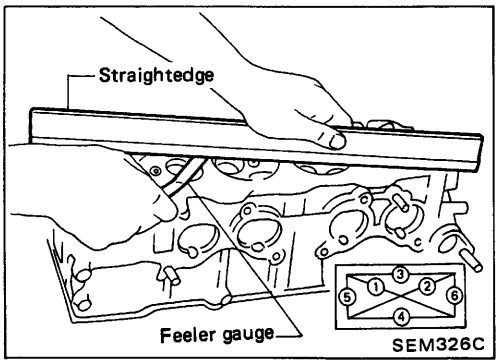
Disassembly (Cont'd)



3. Remove camshaft.
   - **Before removing camshaft, measure camshaft end play.**
4. Remove valve components with Tool.
5. Remove valve oil seal with Tool or suitable tool.

Inspection

CYLINDER HEAD DISTORTION



Head surface flatness:
Less than 0.1 mm (0.004 in)

If beyond the specified limit, replace it or resurface it.

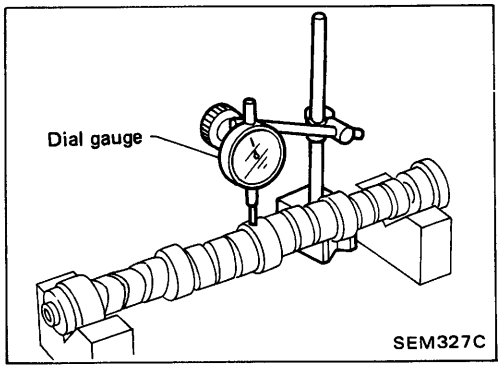
Resurfacing limit:
The cylinder head of resurfacing limit is determined by the cylinder block resurfacing in an engine.
Amount of cylinder head resurfacing is "A".
Amount of cylinder block resurfacing is "B".
The maximum limit is as follows:
A + B = 0.2 mm (0.008 in)

After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

Nominal cylinder head height:
120.60 - 120.80 mm (4.7480 - 4.7559 in)

CAMSHAFT VISUAL CHECK

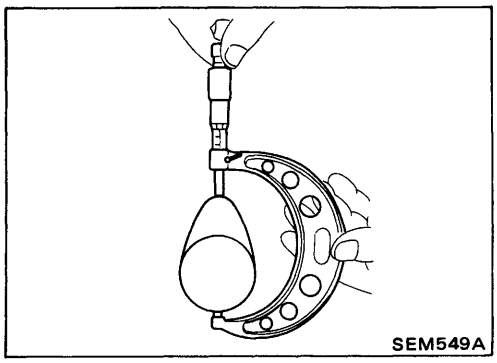
Check camshaft for scratches, seizure and wear.



CAMSHAFT RUNOUT

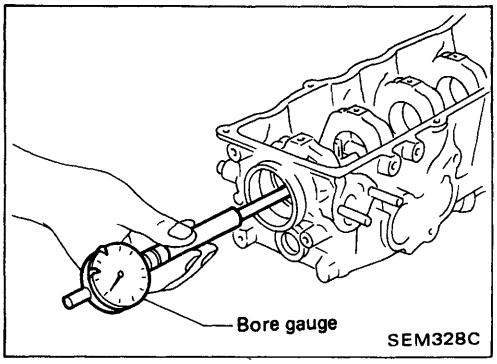
1. Measure camshaft runout at the center journal.
   Runout (Total indicator reading):
   Limit 0.1 mm (0.004 in)
2. If it exceeds the limit, replace camshaft.

Inspection (Cont'd)


SEM549A

CAMSHAFT CAM HEIGHT

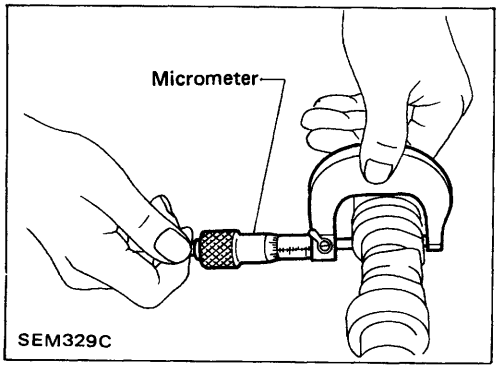
1. Measure camshaft cam height.
   Standard cam height:
   Intake
   35.933 - 36.123 mm (1.4147 - 1.4222 in)
   Exhaust
   35.746 - 35.936 mm (1.4073 - 1.4148 in)
   Cam wear limit:
   0.20 mm (0.0079 in)
2. If wear is beyond the limit, replace camshaft.



SEM328C

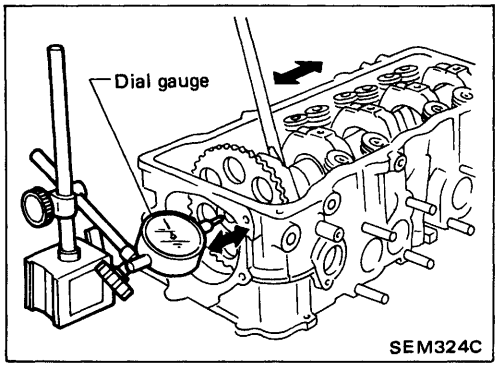
CAMSHAFT JOURNAL CLEARANCE

1. Install camshaft bracket and tighten bolts to the specified torque.
2. Measure inner diameter of camshaft bearing.
   Standard inner diameter:
   42.000 - 42.025 mm (1.6535 - 1.6545 in)



SEM329C

3. Measure outer diameter of camshaft journal.
   Standard outer diameter:
   41.935 - 41.955 mm (1.6510 - 1.6518 in)
4. If clearance exceeds the limit, replace camshaft and/or cylinder head.
   Camshaft journal clearance limit:
   0.15 mm (0.0059 in)

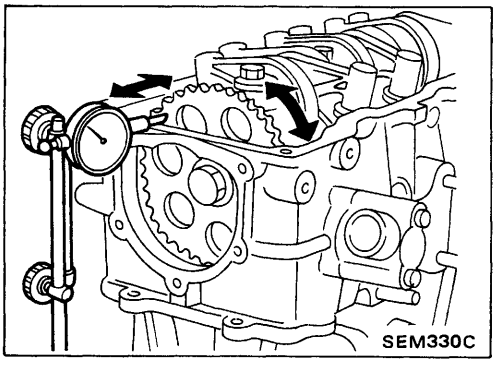


SEM324C

CAMSHAFT END PLAY

1. Install following parts in cylinder head.
- Camshaft
- Camshaft locate plate
- Camshaft sprocket
- Distributor

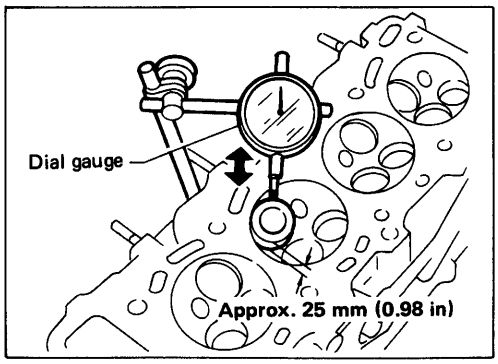
2. Measure camshaft end play.
   Camshaft end play:
   Standard
   0.030 - 0.130 mm (0.0012 - 0.0051 in)
   Limit 0.20 mm (0.0079 in)


SEM330C

CAMSHAFT SPROCKET RUNOUT

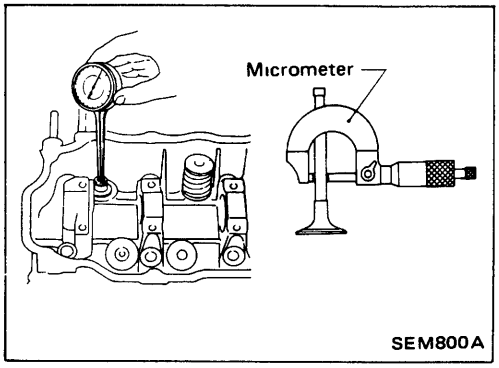
1. Install sprocket on camshaft.
2. Measure camshaft sprocket runout.
   Runout (Total indicator reading):
   Limit 0.25 mm (0.0098 in)
3. If it exceeds the limit, replace camshaft sprocket.

Inspection (Cont'd)

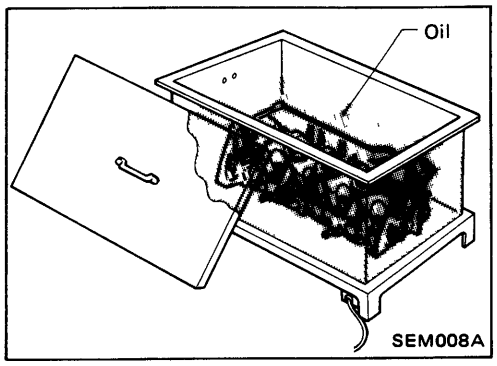


VALVE GUIDE CLEARANCE

1. Measure valve deflection in a right-angled direction with camshaft. (Valve and valve guide mostly wear in this direction.)
   Valve deflection limit (Dial gauge reading):
   0.2 mm (0.008 in)

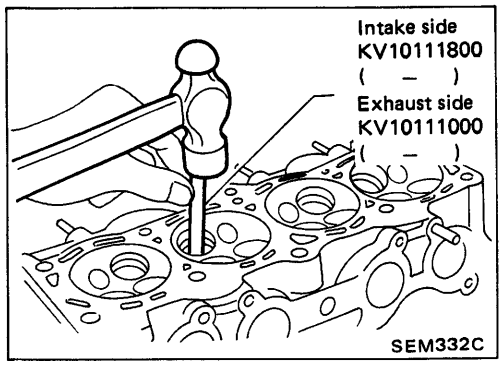


2. If it exceeds the limit, check valve to valve guide clearance.
a. Measure valve stem diameter and valve guide inner diameter.
b. Check that clearance is within specification.
   Valve to valve guide clearance limit:
   0.1 mm (0.004 in)
c. If it exceeds the limit, replace valve or valve guide.

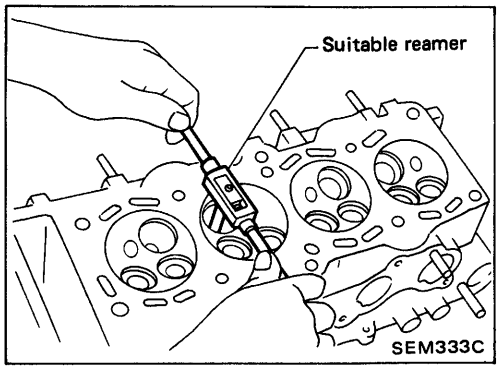


VALVE GUIDE REPLACEMENT

1. To remove valve guide, heat cylinder head to 150 to 160°C (302 to 320°F).

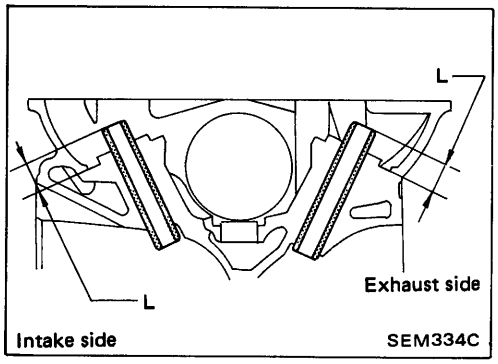


2. Drive out valve guide with a press [under a 20 kN (2 t, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and Tool or suitable tool.



3. Ream cylinder head valve guide hole.
   Valve guide hole diameter (for service parts):
   Intake
   10.185 - 10.196 mm (0.4010 - 0.4014 in)
   Exhaust
   10.785 - 10.796 mm (0.4246 - 0.4250 in)

Inspection (Cont'd)



4. Heat cylinder head to 150 to 160°C (302 to 320°F) and press service valve guide onto cylinder head.

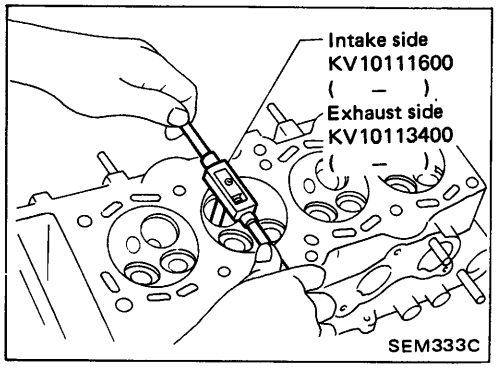
Projection "L":

Intake

13.2 - 13.4 mm (0.520 - 0.528 in)

Exhaust

14.7 - 14.9 mm (0.579 - 0.587 in)



5. Ream valve guide.

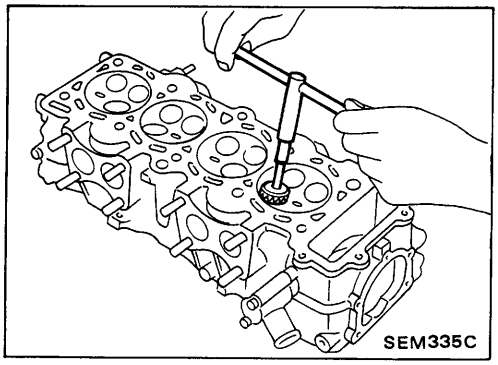
Finished size:

Intake

6.000 - 6.015 mm (0.2362 - 0.2368 in)

Exhaust

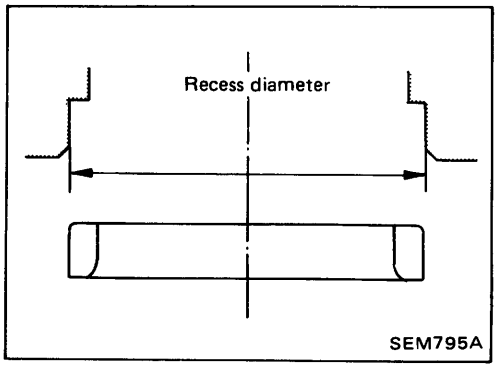
6.600 - 6.615 mm (0.2598 - 0.2604 in)



VALVE SEATS

Check valve seats for any evidence of pitting at valve contact surface, and reseat or replace if it has worn out excessively.

- **Before repairing valve seats, check valve and valve guide for wear. If they have worn, replace them. Then correct valve seat.**
- **Cut with both hands to uniform the cutting surface.**



REPLACING VALVE SEAT FOR SERVICE PARTS

1. Bore out old seat until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.
2. Ream cylinder head recess.

Reaming bore for service valve seat

Oversize [0.5 mm (0.020 in)]:

Intake

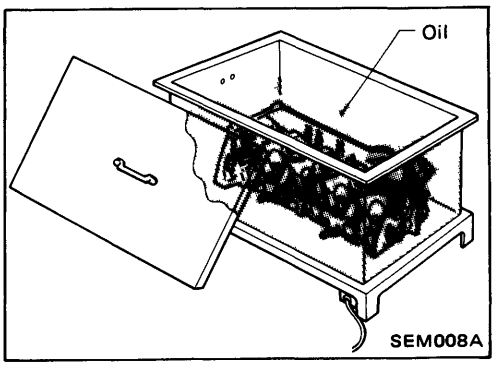
30.500 - 30.516 mm (1.2008 - 1.2014 in)

Exhaust

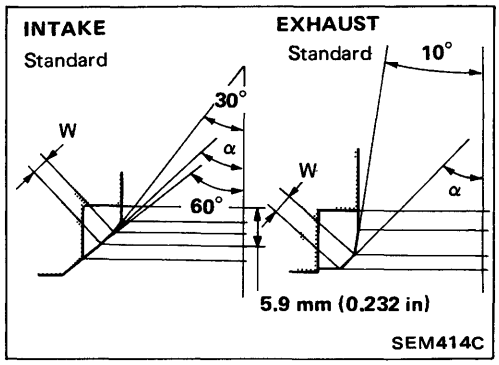
34.300 - 34.316 mm (1.3504 - 1.3510 in)

Reaming should be done to the concentric circles to valve guide center so that valve seat will have the correct fit.

Inspection (Cont'd)

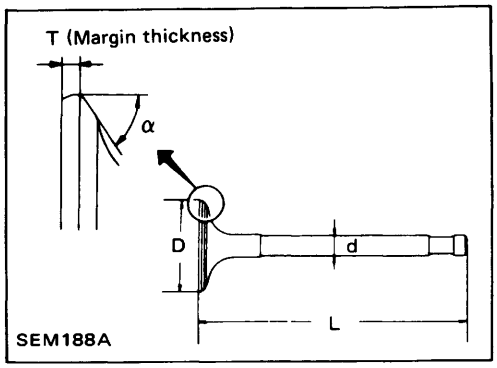


3. Heat cylinder head to 150 to 160°C (302 to 320°F).
4. Press fit valve seat until it seats on the bottom.



5. Cut or grind valve seat using suitable tool at the specified dimensions as shown in S.D.S.
6. After cutting, lap valve seat with abrasive compound.
7. Check valve seating condition.

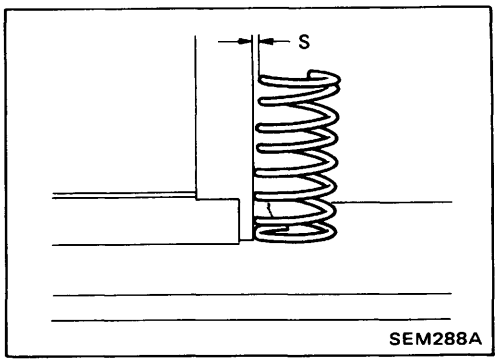
Seat face angle "α":
44°45' - 45°15' deg.
Contacting width "W":
Intake 1.5 mm (0.059 in)
Exhaust 1.8 mm (0.071 in)



VALVE DIMENSIONS

Check dimensions in each valve. For dimensions, refer to S.D.S. When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace valve.

Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.



VALVE SPRING

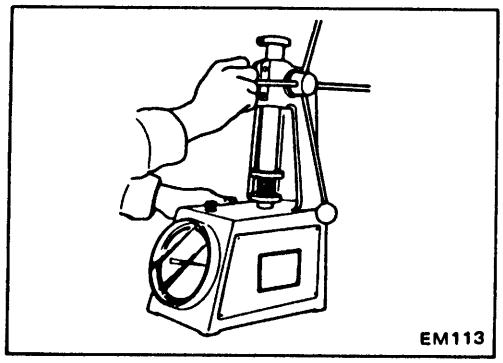
Squareness

1. Measure "S" dimension.

Out-of-square:
Intake
Less than 2.3 mm (0.091 in)
Exhaust
Less than 2.4 mm (0.094 in)

2. If it exceeds the limit, replace spring.

Inspection (Cont'd)



Pressure

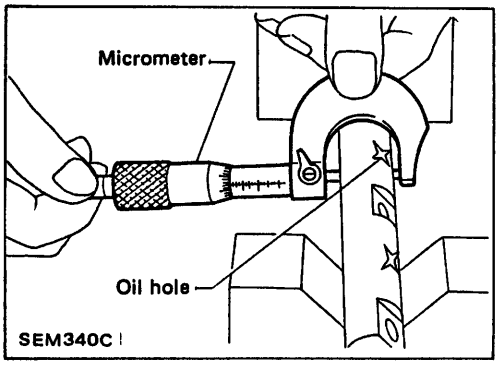
Check valve spring pressure.

Pressure: N (kg, lb) at height mm (in)

Modified

Standard:	
Intake	**489.4 (49.9, 110.0) at 33.8 (1.331)**
Exhaust	**545.3 (55.6, 122.6) at 34.2 (1.346)**
Limit:	
Intake	**More than 436.4 (44.5, 98.1) at 33.8 (1.331)**
Exhaust	**More than 486.4 (49.6, 109.4) at 34.2 (1.346)**

If it exceeds the limit, replace spring.

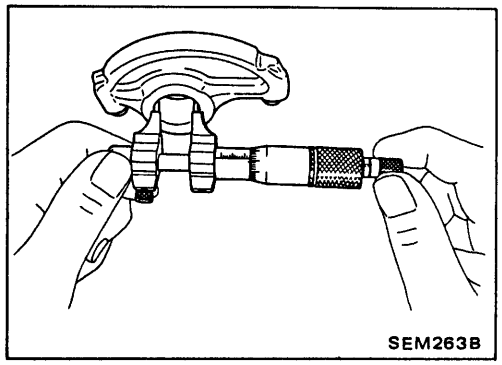


ROCKER SHAFT AND ROCKER ARM

1. Check rocker shafts for scratches, seizure and wear.
2. Check outer diameter of rocker shaft.

Diameter:

21.979 - 22.000 mm (0.8653 - 0.8661 in)



3. Check inner diameter of rocker arm.

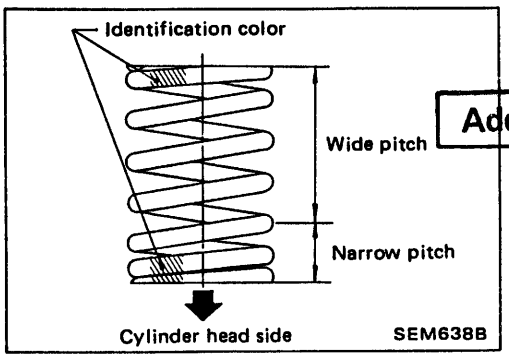
Diameter:

22.023 - 22.043 mm (0.8670 - 0.8678 in)

Rocker arm to shaft clearance:

0.023 - 0.064 mm (0.0009 - 0.0025 in)

- **Keep rocker arm with hydraulic valve lifter standing to prevent air from entering hydraulic valve lifter when checking.**



Assembly

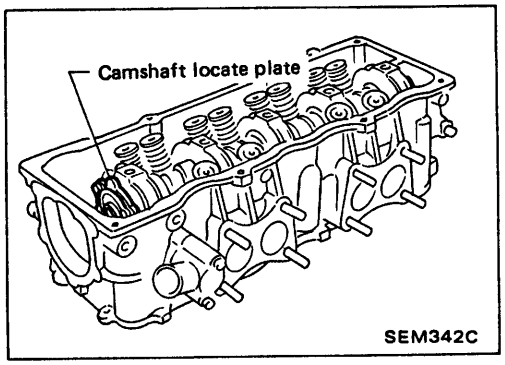
1. Install valve component parts.

- **Always use new valve oil seal. Refer to OIL SEAL REPLACEMENT.**

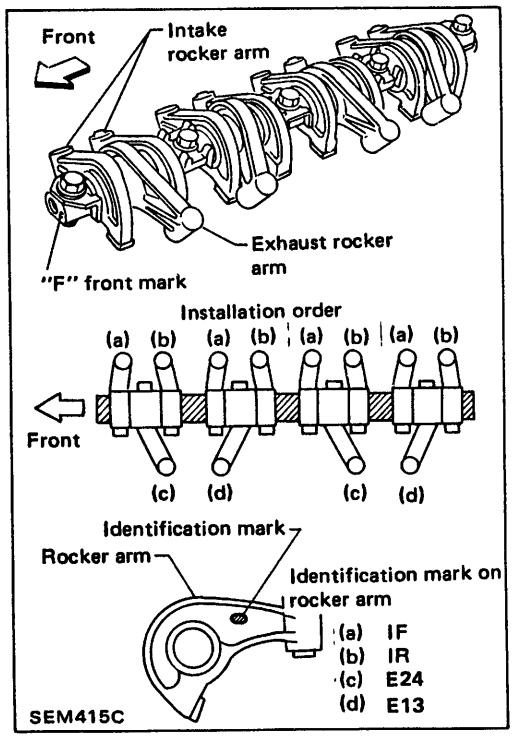
Added

- **Before installing valve oil seal, install valve spring seat.**
- **Install uneven pitch type spring with its narrow pitch side (painted side) toward cylinder head side.**
- **After installing valve component parts, use plastic hammer to lightly tap valve stem tip to assure a proper fit.**

Maker	A		B	
Valve	Intake	Exhaust	Intake	Exhaust
Identification color Wide pitch side	Gray	–	Blue	–
Narrow pitch side	White	Purple	White	Brown



2. Install camshaft and camshaft locate plate.

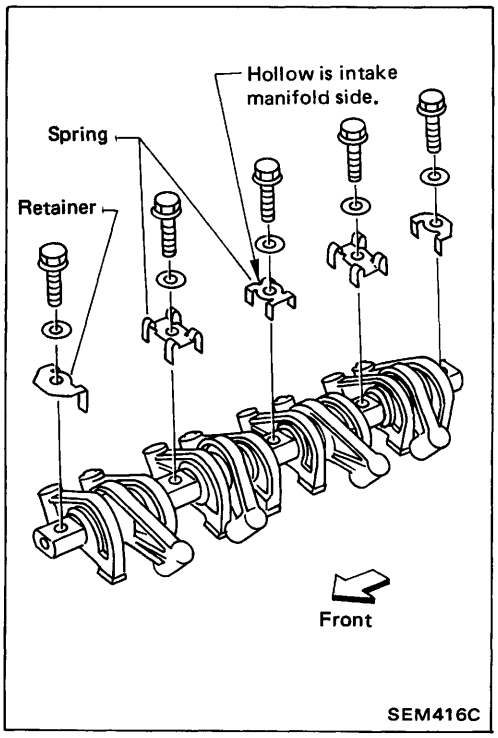


3. Install rocker shaft with rocker arms.

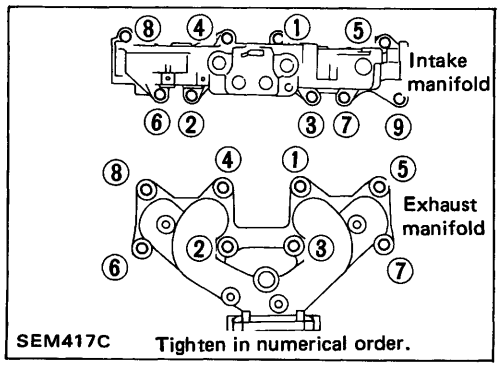
- Tighten bolts gradually in two or three stages outwardly from center position.
- Front mark is punched on front end face of rocker shaft.
- Tighten rocker shaft bolts after installing timing chain. Set No. 1 cylinder at T.D.C. on compression stroke and tighten bolts corresponding to No. 1 and No. 2 rocker shaft bolts; next, set No. 4 cylinder at T.D.C. on compression stroke and tighten bolts corresponding to No. 3 and No. 4 bolts. (If camshaft is lifted, rocker shaft bolts will not be equally tightened because of spring tension.)

1989 Pulsar Service Manual
AM89-009 (TS89-038)
Revised March 1989

Assembly (Cont'd)



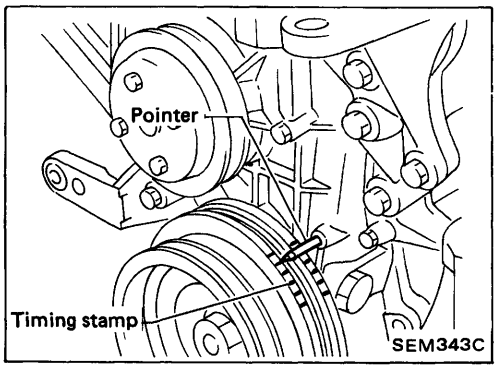
4. Install manifolds.



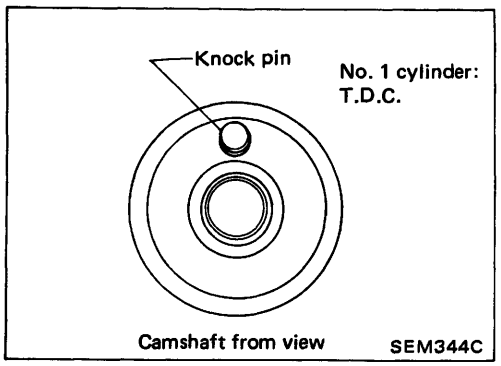
Installation

1. Set No. 1 piston at T.D.C. on its compression stroke as follows:

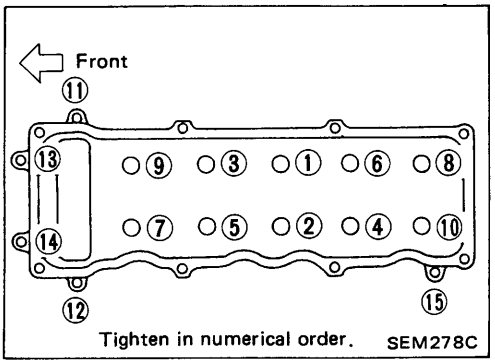
(1) Align mark on crankshaft pulley with pointer and confirm that distributor rotor head is set as shown in figure.



(2) Confirm that knock pin on camshaft is set at the top.



Installation (Cont'd)

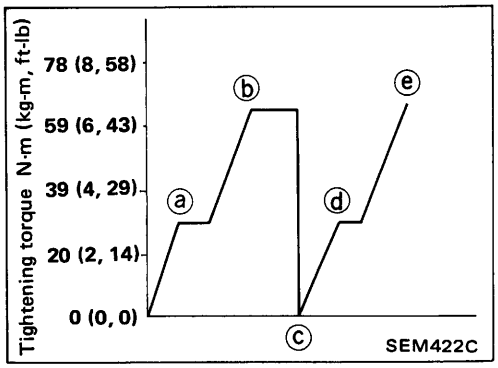


Tighten in numerical order. SEM278C

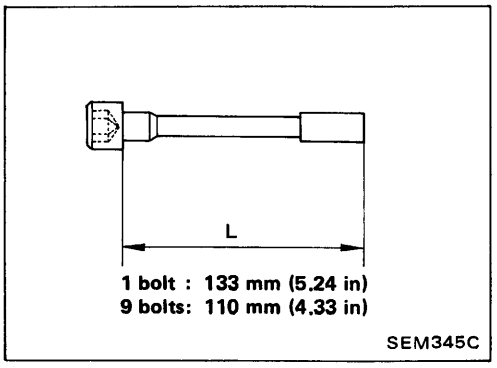
2. Install cylinder head with new gasket and tighten cylinder head bolts in numerical order.

- **Do not rotate crankshaft and camshaft separately, or valves will hit piston heads.**
- **Tightening procedure.**

a. **Tighten all bolts to 29 N•m (3.0 kg-m, 22 ft-lb).**
b. **Tighten all bolts to 64 N•m (6.5 kg-m, 47 ft-lb).**
c. **Loosen all bolts completely.**
d. **Tighten all bolts to 29 N•m (3.0 kg-m, 22 ft-lb).**
e. **Turn bolt ① 80 to 85 degrees clockwise and turn other bolts ② - ⑩ 60 to 65 degrees clockwise. If angle wrench is not available, tighten all bolts to 59 to 69 N•m (6.0 to 7.0 kg-m, 43 to 51 ft-lb).**
f. **Tighten bolts ⑪ - ⑮ 6.3 to 8.3 N•m (0.64 to 0.85 kg-m, 4.6 to 6.1 ft-lb).**



SEM422C

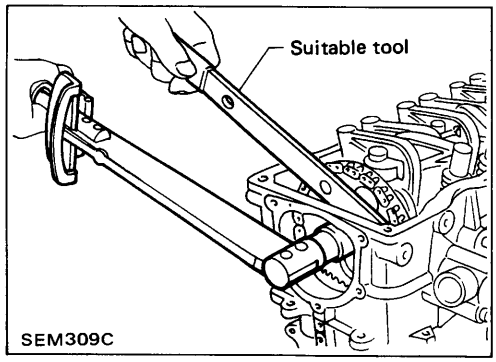


SEM345C

- **Two different lengths of cylinder head bolts are used. Do not confuse one length type with the other during installation.**

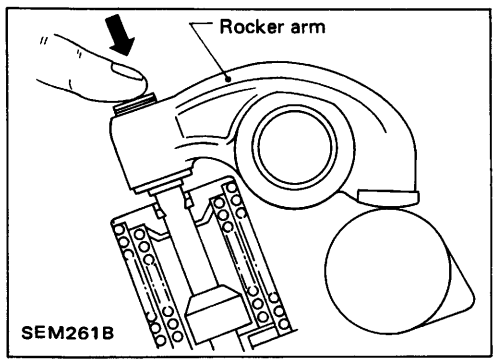
	Location
L = 133 mm (5.24 in)	①
L = 110 mm (4.33 in)	② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

For location of bolts, refer to figure "Tightening Sequence".



SEM309C

3. Set chain on camshaft sprocket by aligning each mating mark. Then install camshaft sprocket to camshaft.

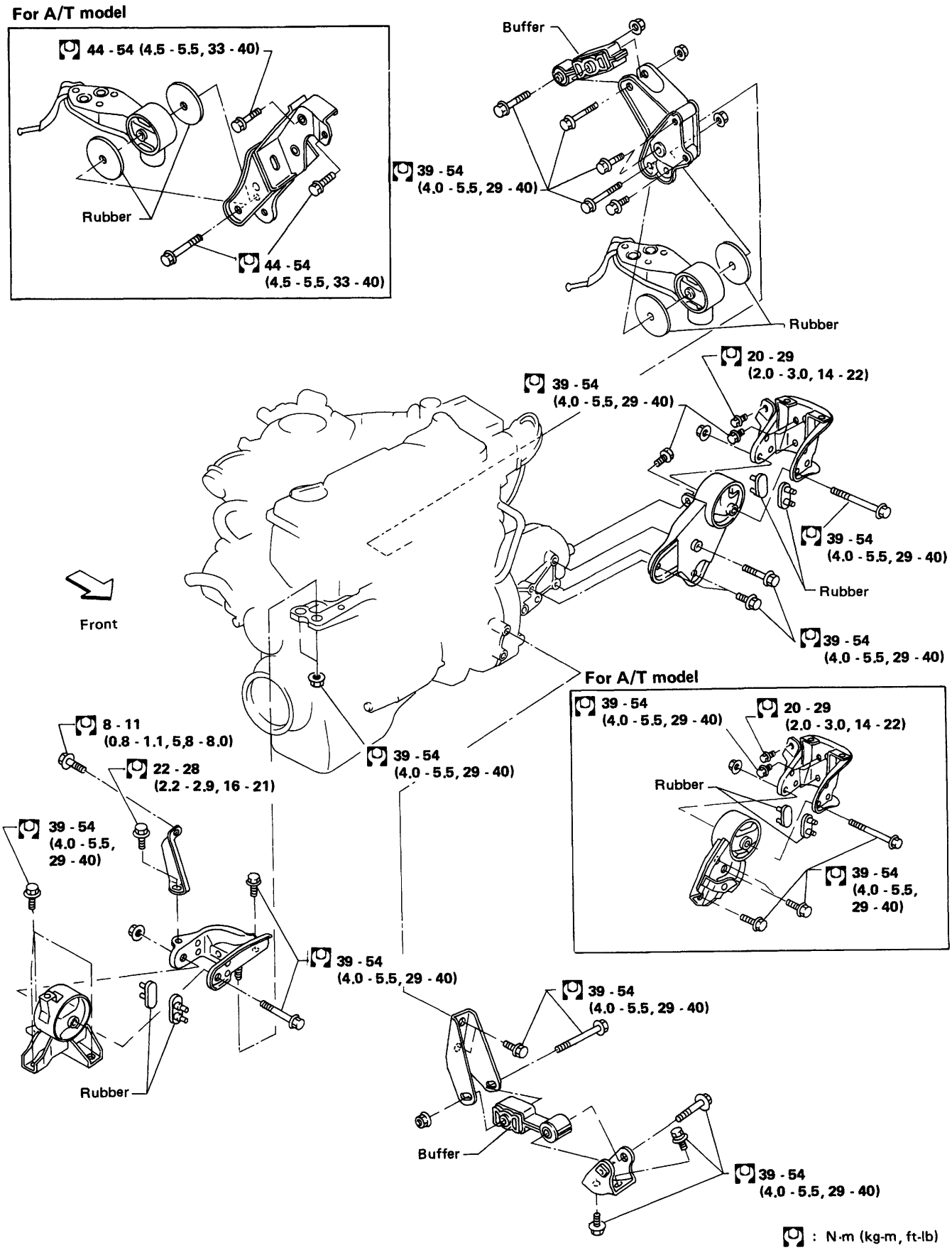


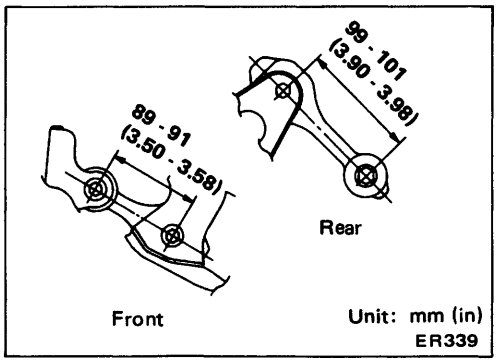
SEM261B

4. Check hydraulic valve lifter.
(1) Push hydraulic valve lifter forcefully with your finger.
- **Be sure to check it with rocker arm in its free position (not on the lobe).**

(2) If valve lifter moves more than 1 mm (0.04 in), air may be inside of it.
(3) Bleed air off by running engine at 1,000 rpm under no-load for about 10 minutes.
(4) If hydraulic valve lifters are still noisy, replace them and bleed air off again in the same manner as in step (3).

2WD model


For A/T model
44 - 54 (4.5 - 5.5, 33 - 40)
Rubber
44 - 54
(4.5 - 5.5, 33 - 40)
Buffer
39 - 54
(4.0 - 5.5, 29 - 40)
Rubber
20 - 29
(2.0 - 3.0, 14 - 22)
39 - 54
(4.0 - 5.5, 29 - 40)
39 - 54
(4.0 - 5.5, 29 - 40)
Rubber
39 - 54
(4.0 - 5.5, 29 - 40)
Front
For A/T model
39 - 54
(4.0 - 5.5, 29 - 40)
20 - 29
(2.0 - 3.0, 14 - 22)
Rubber
39 - 54
(4.0 - 5.5,
29 - 40)
8 - 11
(0.8 - 1.1, 5.8 - 8.0)
22 - 28
(2.2 - 2.9, 16 - 21)
39 - 54
(4.0 - 5.5, 29 - 40)
39 - 54
(4.0 - 5.5,
29 - 40)
39 - 54
(4.0 - 5.5, 29 - 40)
Rubber
39 - 54
(4.0 - 5.5, 29 - 40)
Buffer
39 - 54
(4.0 - 5.5, 29 - 40)
: N·m (kg-m, ft-lb)
SEM184C



When installing buffer rods, adjust the length between bolts of buffer rods as shown.

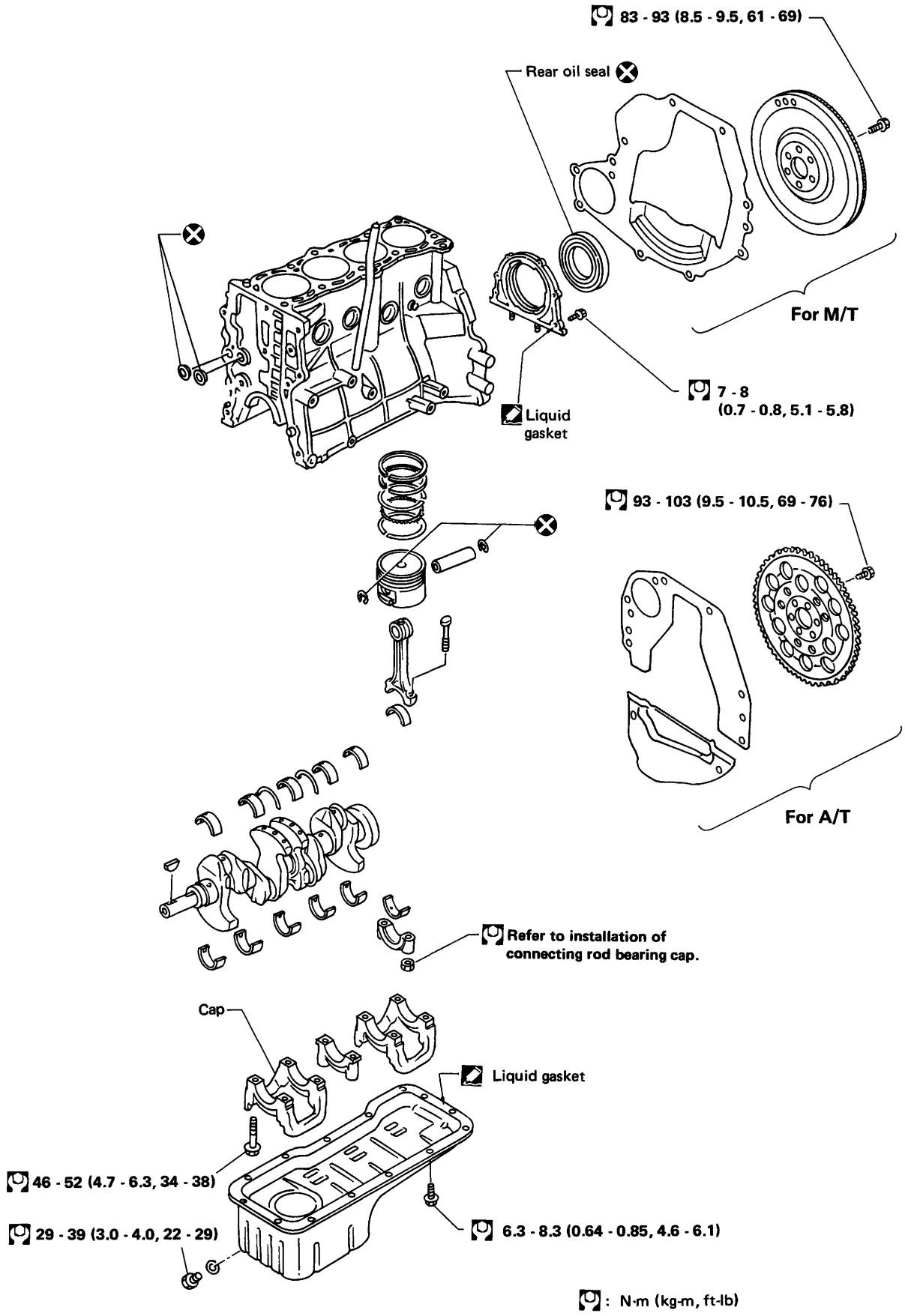
WARNING:

a. Situate vehicle on a flat and solid surface.
b. Place chocks at front and back of rear wheels.
c. Do not remove engine until exhaust system has completely cooled off.
Otherwise, you may burn yourself and/or fire may break out in fuel line.
d. For safety during subsequent steps, the tension of wires should be slackened against the engine.
e. Before disconnecting fuel hose, release fuel pressure from fuel line.
Refer to "Releasing Fuel Pressure" in section EF & EC.
f. For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.

CAUTION:

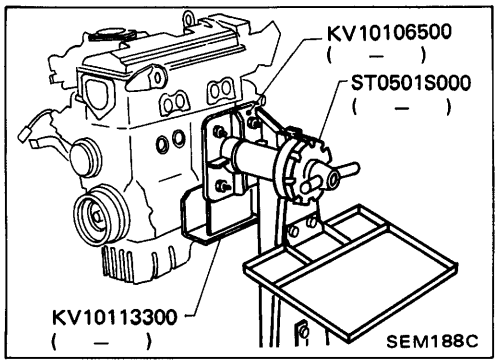
- **When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.**
- **In hoisting the engine, always use engine slingers in a safe manner.**
- **In removing drive shaft, be careful not to damage grease seal of transaxle.**

Engine cannot be removed separately from vehicle. Remove engine with transaxle.


83 - 93 (8.5 - 9.5, 61 - 69)
Rear oil seal
For M/T
7 - 8
(0.7 - 0.8, 5.1 - 5.8)
Liquid gasket
93 - 103 (9.5 - 10.5, 69 - 76)
For A/T
Refer to installation of connecting rod bearing cap.
Cap
Liquid gasket
46 - 52 (4.7 - 6.3, 34 - 38)
29 - 39 (3.0 - 4.0, 22 - 29)
6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
: N·m (kg-m, ft-lb)

SEM425C

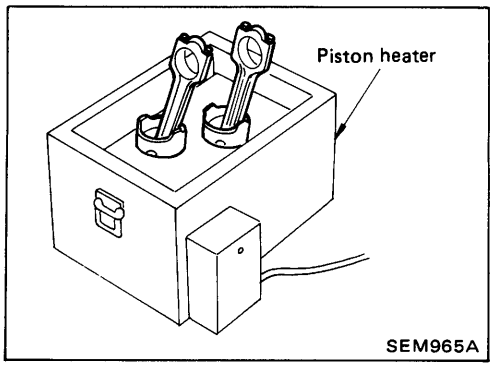
CAUTION:
- **When installing sliding parts such as bearings and pistons, be sure to apply engine oil on the sliding surfaces.**
- **Place removed parts such as bearings and bearing caps in their proper order and direction.**
- **When tightening connecting rod bolts and main bearing cap bolts, apply engine oil to thread portion of bolts and seating surface of nuts.**



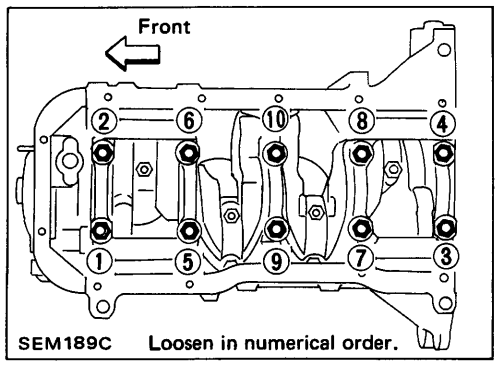
Disassembly

PISTON AND CRANKSHAFT

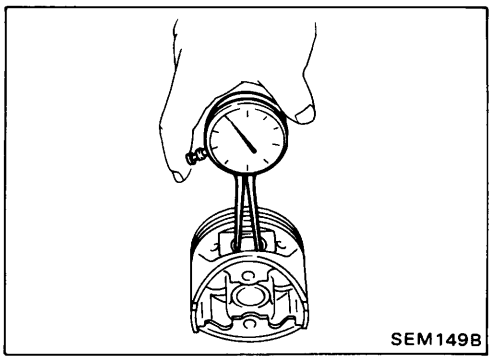
1. Place engine on a work stand.
2. Drain coolant and oil.
3. Remove timing chain.
4. Remove cylinder head.
5. Remove oil pan and oil pump.



6. Remove pistons.
- When disassembling piston and connecting rod, remove snap ring first, then heat piston to 60 to 70°C (140 to 158°F) or use piston pin press stand at room temperature.



7. Remove bearing cap and crankshaft.
- **Before removing bearing cap, measure crankshaft end play.**
- **Bolts should be loosened in two or three steps.**

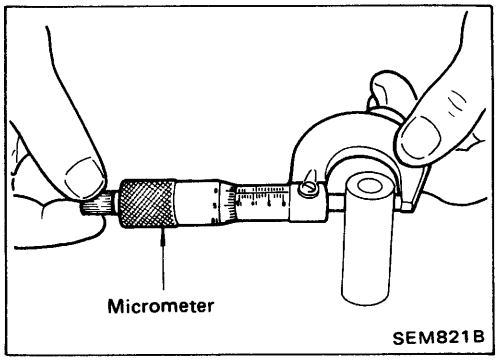


Inspection

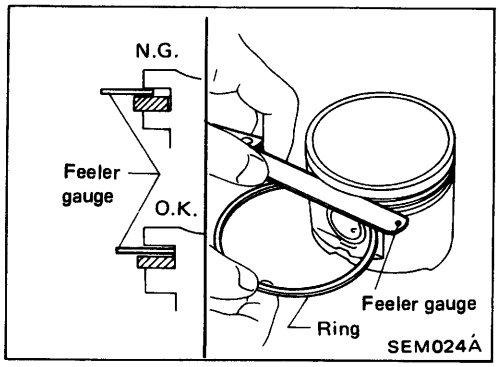
PISTON AND PISTON PIN CLEARANCE

1. Measure inner diameter of piston pin hole "dp".
   Standard diameter "dp":
   18.987 - 18.999 mm (0.7475 - 0.7480 in)

Inspection (Cont'd)



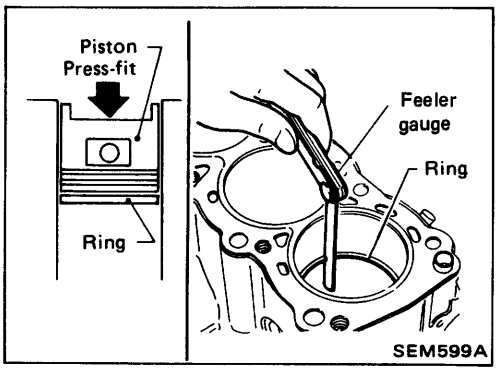
2. Measure outer diameter of piston pin "Dp".
   Standard diameter "Dp":
   18.989 - 19.001 mm (0.7476 - 0.7481 in)
3. Calculate piston pin clearance.
   dp – Dp = –0.004 to 0 mm (–0.0002 to 0 in)
   If it exceeds the above value, replace piston assembly with pin.



PISTON RING SIDE CLEARANCE

Side clearance:
Top ring
0.040 - 0.080 mm (0.0016 - 0.0031 in)
2nd ring
0.030 - 0.070 mm (0.0012 - 0.0028 in)
Max. limit of side clearance:
0.2 mm (0.008 in)
Oil ring
0.050 - 0.120 mm (0.0020 - 0.0047 in)

If out of specification, replace piston and/or piston ring assembly.

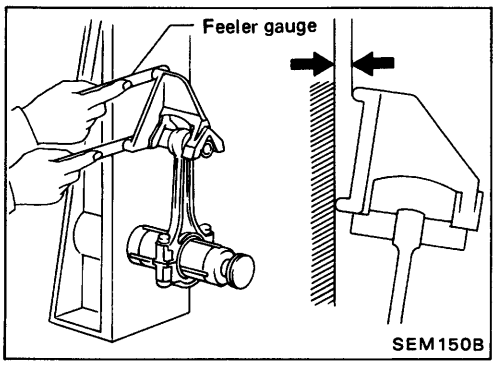


PISTON RING END GAP

End gap:
Top ring
0.20 - 0.35 mm (0.0079 - 0.0138 in)
2nd ring
0.37 - 0.52 mm (0.0146 - 0.0205 in)
Oil ring
0.20 - 0.60 mm (0.0079 - 0.0236 in)
Max. limit of ring gap:
1.0 mm (0.039 in)

If out of specification, replace piston ring. If gap still exceeds the limit even with a new ring, rebore cylinder and use oversized piston and piston rings.
Refer to S.D.S.

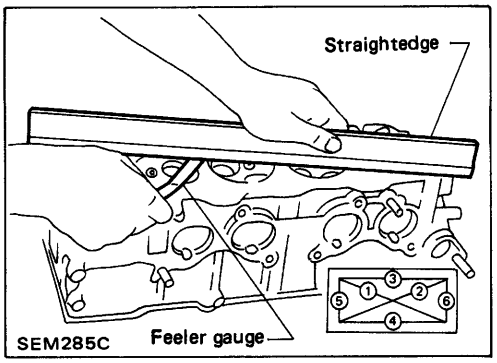
Inspection (Cont'd)



CONNECTING ROD BEND AND TORSION

Bend limit:
0.15 mm (0.0059 in)
per 100 mm (3.94 in) length
Torsion limit:
0.3 mm (0.012 in)
per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.

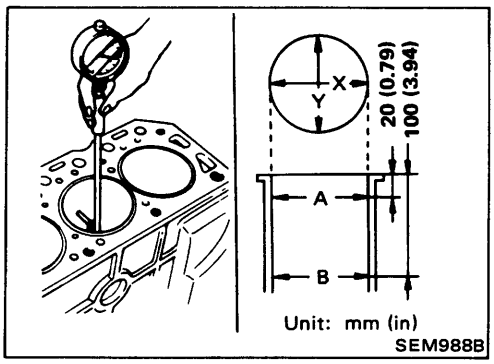


CYLINDER BLOCK DISTORTION AND WEAR

1. Clean upper face of cylinder block and measure the distortion.
   Limit:
   0.10 mm (0.0039 in)
2. If out of specification, resurface it.
   The resurfacing limit is determined by cylinder head resurfacing in engine.

Amount of cylinder head resurfacing is "A".
Amount of cylinder block resurfacing is "B".
The maximum limit is as follows:
A + B = 0.2 mm (0.008 in)
Nominal cylinder block height
from crankshaft center:
213.95 - 214.05 mm (8.4232 - 8.4271 in)

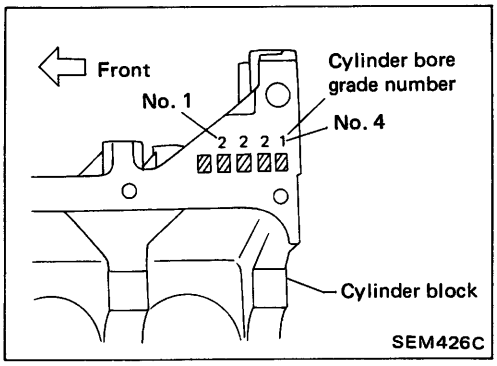
3. If necessary, replace cylinder block.



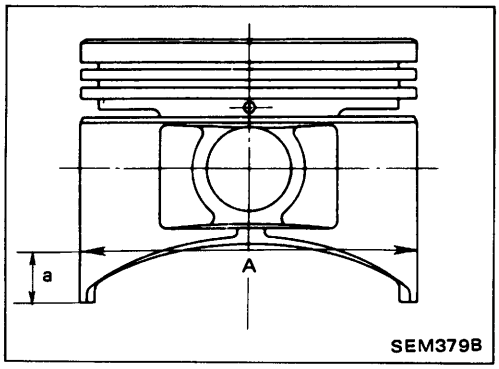
PISTON-TO-BORE CLEARANCE

1. Using a bore gauge, measure cylinder bore for wear, out-of-round and taper.
   Standard inner diameter:
   76.000 - 76.030 mm (2.9921 - 2.9933 in)
   Wear limit:
   0.2 mm (0.008 in)
   Out-of-round (X – Y) limit:
   0.015 mm (0.0006 in)
   Taper (A – B) limit:
   0.01 mm (0.0004 in)
   If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.
2. Check for scratches and seizure. If seizure is found, hone it.

Inspection (Cont'd)



- **If both cylinder block and piston are replaced with new ones, select piston of the same grade number punched on cylinder block lower surface.**



3. Measure piston skirt diameter.
   Piston diameter "A":
   Refer to S.D.S.
   Measuring point "a" (Distance from the bottom):
   7.5 mm (0.295 in)
4. Check that piston-to-bore clearance is within specification.
   Piston-to-bore clearance "B":
   0.015 - 0.035 mm (0.0006 - 0.0014 in)
5. Determine piston oversize according to amount of cylinder wear.

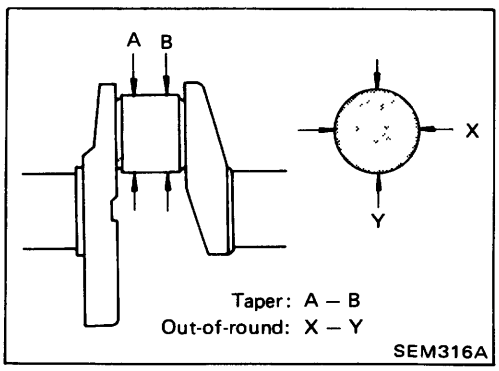
Oversize pistons are available for service. Refer to S.D.S.

6. Cylinder bore size is determined by adding piston-to-bore clearance to piston diameter "A".
   Rebored size calculation:
   D = A + B – C
   where,
   D: Bored diameter
   A: Piston diameter as measured
   B: Piston-to-bore clearance
   C: Honing allowance 0.02 mm (0.0008 in)
7. Install main bearing caps, and tighten to the specified torque to prevent distortion of cylinder bores in final assembly.
8. Cut cylinder bores.

- **When any cylinder needs boring, all other cylinders must also be bored.**
- **Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.**

9. Hone cylinders to obtain specified piston-to-bore clearance.
10. Measure finished cylinder bore for out-of-round and taper.

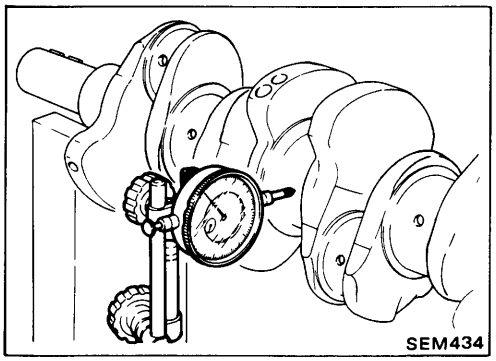
- **Measurement should be done after cylinder bore cools down.**



CRANKSHAFT

1. Check crankshaft main and pin journals for score, wear or cracks.
2. With a micrometer, measure journals for taper and out-of-round.
   Out-of-round (X – Y):
   Less than 0.005 mm (0.0002 in)
   Taper (A – B):
   Less than 0.002 mm (0.0001 in)

Inspection (Cont'd)



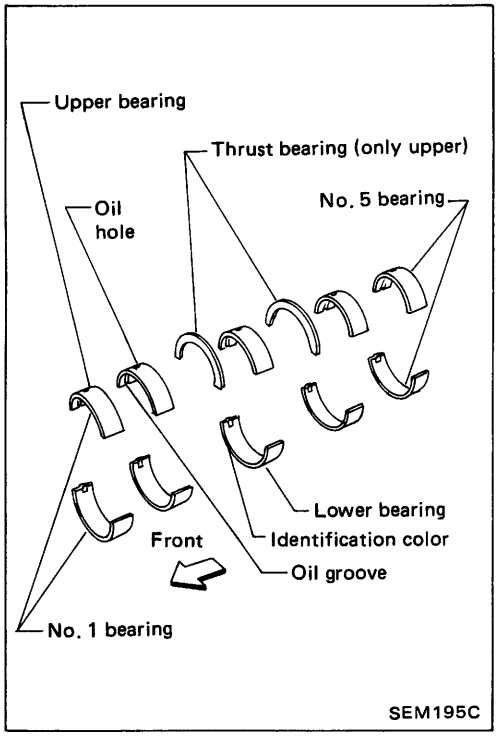
3. Measure crankshaft runout.
   Runout (Total indicator reading):
   Less than 0.05 mm (0.0020 in)

BEARING CLEARANCE

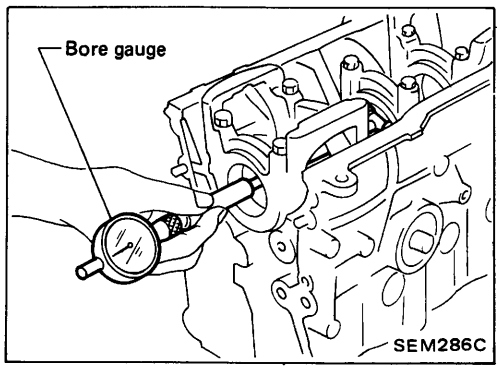
Method A (Using bore gauge & micrometer)

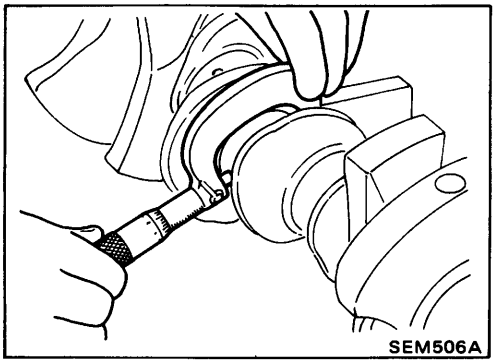
Main bearing

1. Set main bearings in their proper positions on cylinder block and main bearing cap.



2. Install main bearing cap to cylinder block.
   Tighten all bolts in correct order in two or three stages.
3. Measure inner diameter "A" of each main bearing.

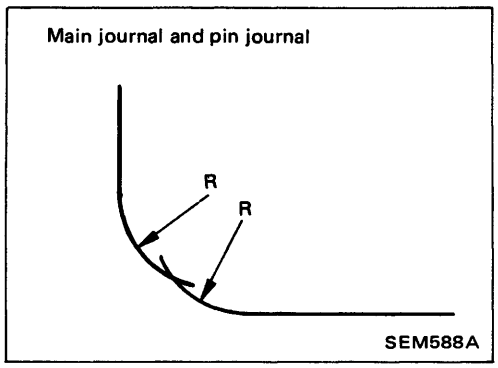




4. Measure outer diameter "Dm" of each main journal in crankshaft.
5. Calculate main bearing clearance.
   Main bearing clearance = A – Dm
   Standard:
   0.020 - 0.042 mm (0.0008 - 0.0017 in)
   Limit: 0.1 mm (0.004 in)
6. If it exceeds the limit, replace bearing.

Inspection (Cont'd)

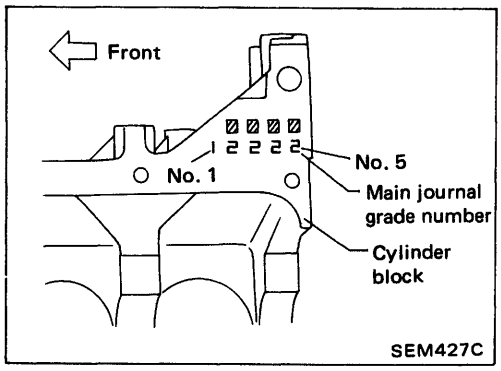
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing.



a. When grinding crank pin and crank journal, fillets should be finished as shown in the figure.
R: 2.3 - 2.5 mm (0.091 - 0.098 in)

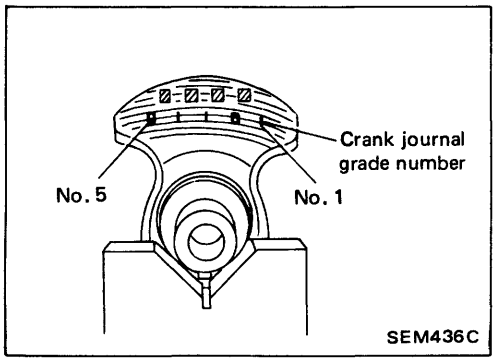
b. Refer to S.D.S. for grinding crankshaft and available service parts.

8. If crankshaft, cylinder block or main bearing is reused again, measure main bearing clearance.
If crankshaft, cylinder block and main bearings are replaced with new ones, it is necessary to select thickness of main bearings as follows:



a. Grade number of each cylinder block main journal is punched on the respective cylinder block.

Inspection (Cont'd)

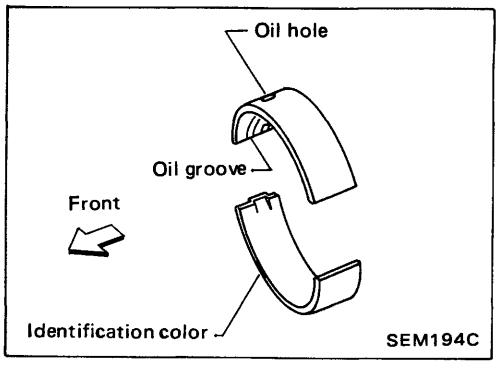


b. Grade number of each crankshaft main journal is punched on the respective crankshaft.

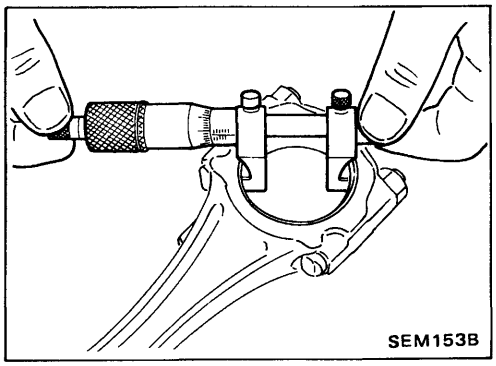
c. Select main bearing with suitable thickness according to the following table.

Main bearing grade color:

Crankshaft journal grade number \ Main journal grade number	0	1	2
0	Black	Brown	Green
1	Brown	Green	Yellow
2	Green	Yellow	Blue



For example:
Main journal grade number: 1
Crankshaft journal grade number: 2
Main bearing grade number = 1 + 2 = Yellow

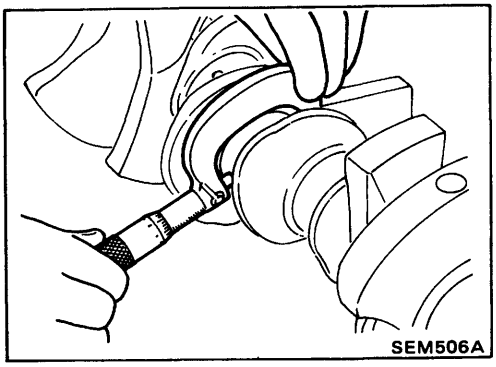


Connecting rod bearing (Big end)

1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.

Tighten bolts to the specified torque.

3. Measure inner diameter "C" of each bearing.



4. Measure outer diameter "Dp" of each crankshaft pin journal.
5. Calculate connecting rod bearing clearance.

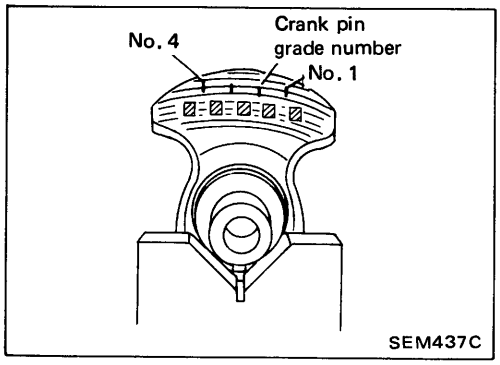
   Connecting rod bearing clearance = C – Dp

   Standard:

   0.010 - 0.035 mm (0.0004 - 0.0014 in)

   Limit: 0.1 mm (0.004 in)
6. If it exceeds the limit, replace bearing.
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing. Refer to step 7 of "BEARING CLEARANCE —Main bearing".

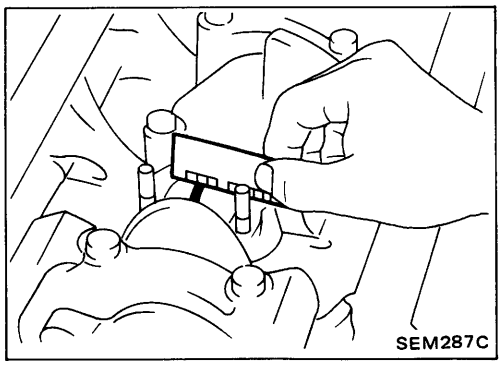
Inspection (Cont'd)



8. If bearing, crankshaft or connecting rod is replaced with a new one, select connecting rod bearing according to the following table.

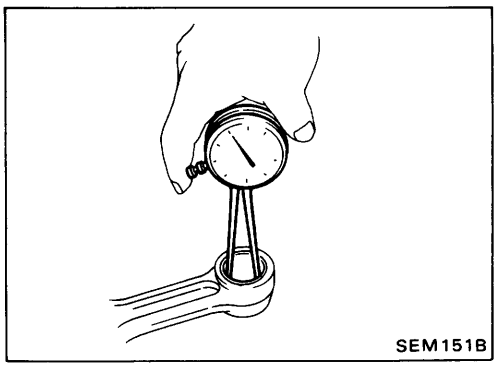
Connecting rod bearing grade number:

Crank pin grade number	Connecting rod bearing grade number
0	–
1	Brown
2	Green



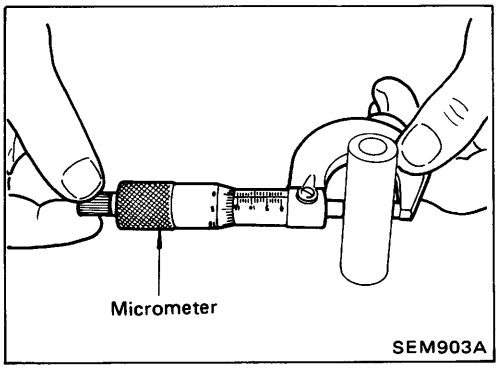
Method B (Using plastigage)
CAUTION:

- **Do not turn crankshaft or connecting rod while plastigage is being inserted.**
- **When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. Then if excessive bearing clearance exists, use a thicker main bearing or undersized bearing so that the specified bearing clearance is obtained.**



CONNECTING ROD BUSHING CLEARANCE (Small end)

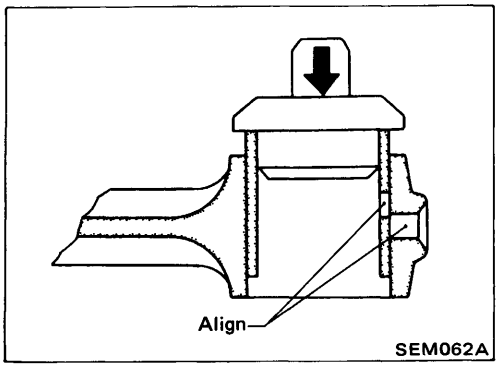
1. Measure inner diameter "C" of bushing.

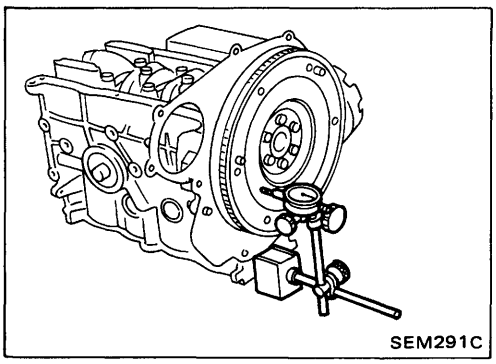


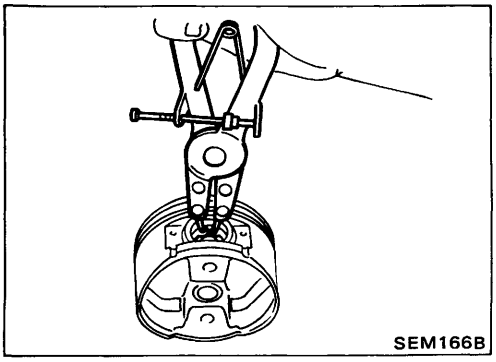
2. Measure outer diameter "Dp" of piston pin.
3. Calculate connecting rod bearing clearance.

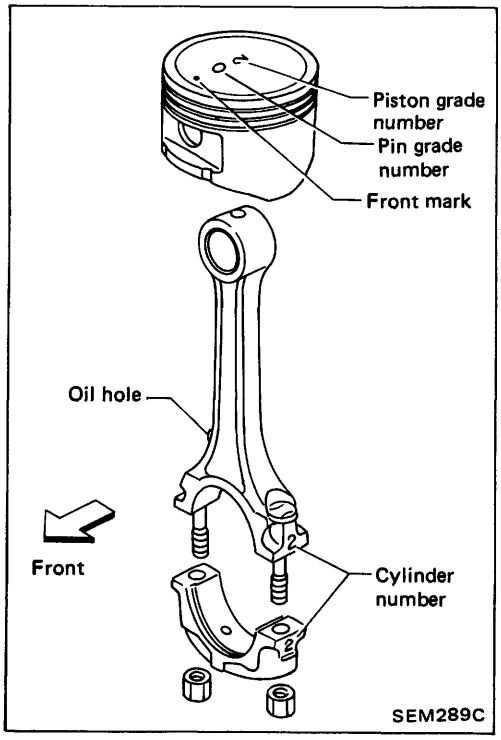
C – Dp =
0.005 - 0.017 mm (0.0002 - 0.0007 in); Standard
0.023 mm (0.0009 in); Limit

If it exceeds the limit, replace connecting rod assembly or connecting rod assembly or connecting rod bushing and/or piston pin.









Inspection (Cont'd)

REPLACEMENT OF CONNECTING ROD BUSHING (Small end)

1. Drive in small end bushing until it is flush with end surface of rod.

Be sure to align the oil holes.

2. After driving in small end bushing, ream the bushing so that clearance between connecting rod busing and piston pin achieves specified value.

Clearance between connecting rod bushing and piston pin:

0.005 - 0.017 mm (0.0002 - 0.0007 in)

FLYWHEEL/DRIVE PLATE RUNOUT

Runout (Total indicator reading):

Flywheel (M/T model)

Less than 0.15 mm (0.0059 in)

Drive plate (A/T model)

Less than 0.15 mm (0.0059 in)

Assembly

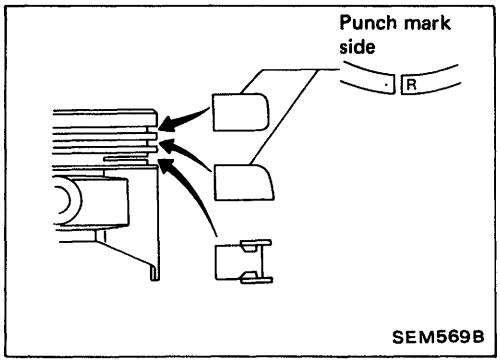
PISTON

1. Install new snap ring on one side of piston pin hole.

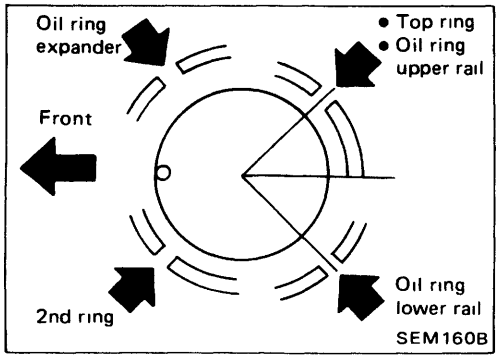
2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.

- **Align the direction of piston and connecting rod.**
- **Numbers stamped on connecting rod and cap correspond to each cylinder.**
- **After assembly, make sure connecting rod swings smoothly.**

Assembly (Cont'd)



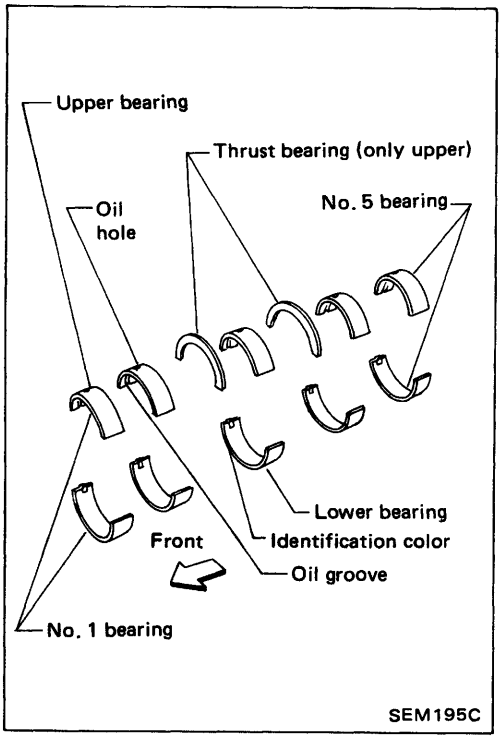
3. Set piston rings as shown.

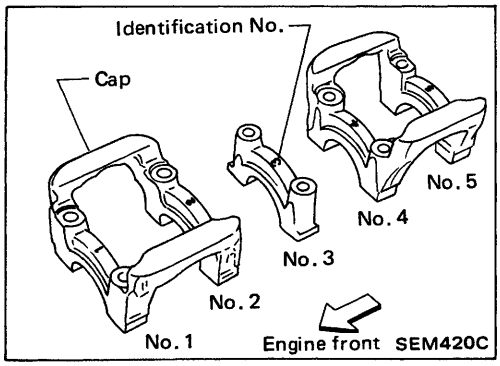


CRANKSHAFT

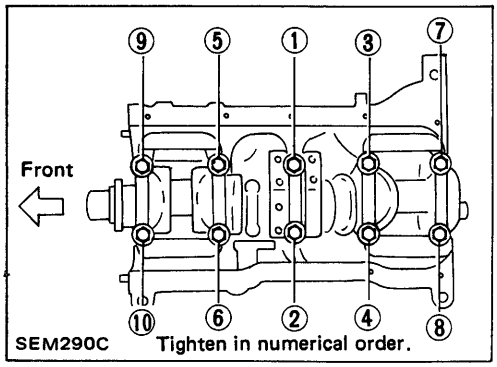
1. Set main bearings in their proper positions on cylinder block and main bearing cap.

- **Confirm that correct main bearings are used. Refer to "Inspection".**

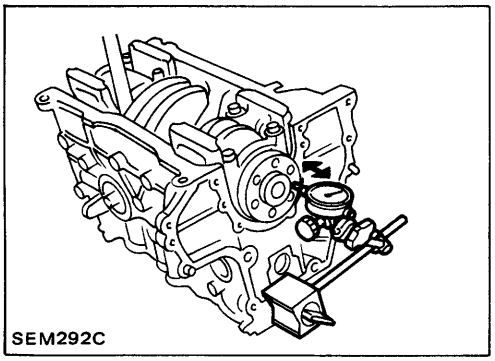




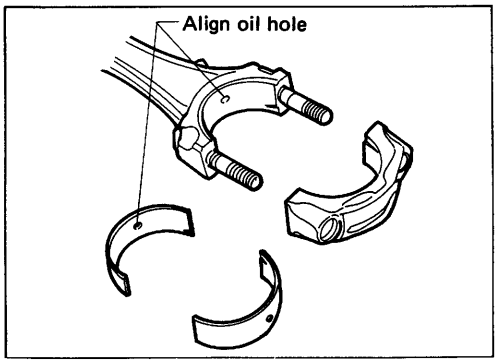
Assembly (Cont'd)



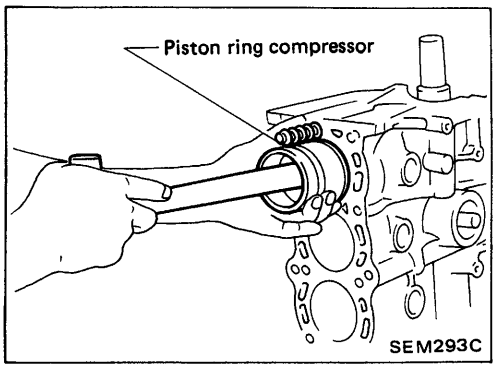
2. Install crankshaft and main bearing caps and tighten bolts to the specified torque.
- **Prior to tightening bearing cap bolts, place bearing cap in its proper position by shifting crankshaft in the axial direction.**
- **Tighten bearing cap bolts gradually in two or three stages. Start with center bearing and move outward sequentially.**
- **After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.**



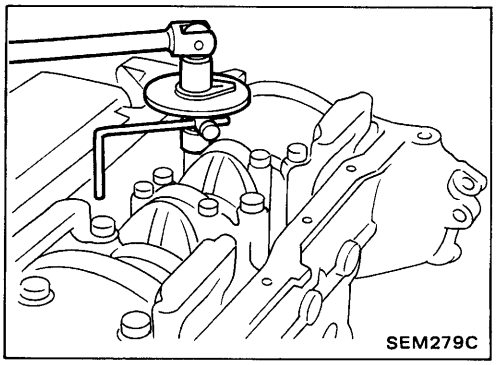
3. Measure crankshaft end play.
Crankshaft end play:
Standard
0.060 - 0.180 mm (0.0024 - 0.0071 in)
Limit
0.3 mm (0.012 in)
If beyond the limit, replace thrust bearing with a new one.



4. Install connecting rod bearings in connecting rods and connecting rod caps.
- Confirm that correct bearings are used. Refer to "Inspection".
- Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.

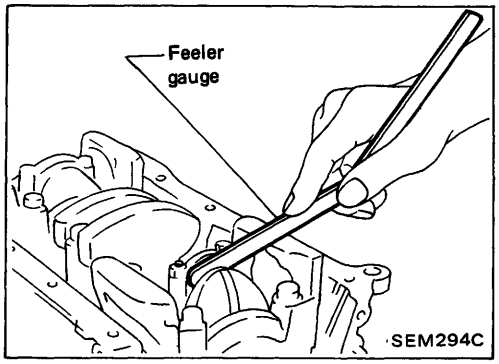


5. Install pistons with connecting rods.
a. Install them into corresponding cylinders with Tool.
- **Be careful not to scratch cylinder wall by connecting rod.**
- **Arrange so that front mark on piston head faces toward front of engine.**



b. Install connecting rod bearing caps.
Tighten connecting rod bearing cap nuts to the specified torque.
: Connecting rod bearing nut
(1) Tighten to 14 to 16 N·m (1.4 to 1.6 kg-m, 10 to 12 ft-lb).
(2) Turn nuts to 35° to 40° degrees clockwise with an angle wrench. If an angle wrench is not available tighten nuts to 23 to 28 N·m (2.3 to 2.9 kg-m, 17 to 21 ft-lb).

Assembly (Cont'd)



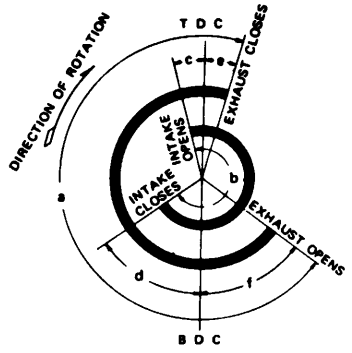
6. Measure connecting rod side clearance.
   Connecting rod side clearance:
   Standard
   0.200 - 0.470 mm (0.0079 - 0.0185 in)
   Limit
   0.52 mm (0.0205 in)
   If beyond the limit, replace connecting rod and/or crankshaft.

General Specifications

GENERAL SPECIFICATIONS

Engine model		GA16i
Classification		Gasoline
Cylinder arrangement		4, in-line
Displacement	cm^3 (cu in)	1,597 (97.45)
Bore x stroke	mm (in)	76.0 x 88.0 (2.992 x 3.465)
Valve arrangement		O.H.C.
Firing order		1-3-4-2
Number of piston rings		
Compression		2
Oil		1
Number of main bearings		5
Compression ratio		9.4

Valve timing



EM120

Unit: degree

a	b	c	d	e	f
236	221	5	36	10	18

Inspection and Adjustment

ENGINE COMPRESSION PRESSURE

Unit: kPa (kg/cm², psi)/350 rpm

Standard	1,245 (12.7, 181)
Minimum	981 (10.0, 142)
Difference limit between cylinders	98 (1.0, 14)

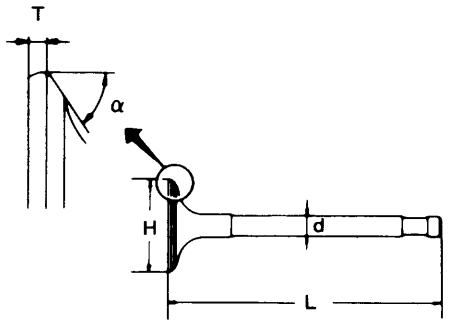
CYLINDER HEAD

Unit: mm (in)

	Standard	Limit
Head surface flatness	Less than 0.03 (0.0012)	0.1 (0.004)
Height	120.60 - 120.80 (4.7480 - 4.7559)	–

VALVE

Unit: mm (in)



SEM188

Valve head diameter "H"	Intake	29.0 - 29.2 (1.142 - 1.150)
	Exhaust	32.8 - 33.0 (1.291 - 1.299)
Valve length "L"	Intake	113.25 - 113.85 (4.4587 - 4.4823)
	Exhaust	115.97 - 116.57 (4.5657 - 4.5894)
Valve stem diameter "d"	Intake	5.965 - 5.980 (0.2348 - 0.2354)
	Exhaust	6.558 - 6.570 (0.2582 - 0.2587)
Valve face angle "α"		45° 15' - 45° 45'
Valve margin "T" limit		0.5 (0.020)
Valve stem end surface grinding limit		0.2 (0.008)

Valve spring

	Intake	Exhaust
Free height mm (in)	52.60 (2.0709)	54.72 (2.1543)
Assembled height/weight mm/N (mm/kg, in/lb)	41.5/221.05 (41.5/22.54, 1.634/49.70)	43.3/240.17 (43.3/24.49, 1.705/54.00)
Lifted height/weight mm/N (mm/kg, in/lb)	33.83/489.17 (33.83/49.88, 1.3319/109.99)	34.23/564.39 (34.23/57.55, 1.3476/126.90)
Out-of-square "S" mm (in)	2.3 (0.091)	2.4 (0.094)

Inspection and Adjustment (Cont'd)

Valve guide

Unit: mm (in)

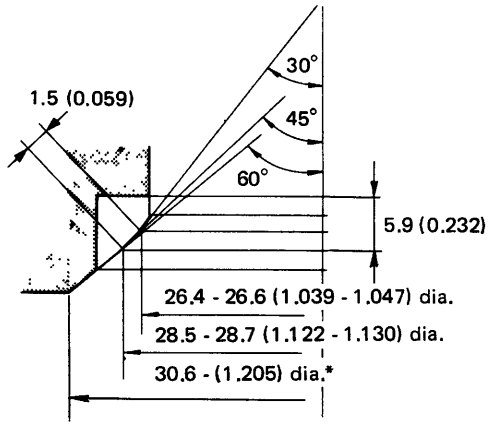
	Intake		Exhaust	
	Standard	Service	Standard	Service
Valve guide Outer diameter	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)	10.623 - 10.634 (0.4182 - 0.4187)	10.823 - 10.834 (0.4261 - 0.4265)
Valve guide Inner diameter [Finished size]	6.000 - 6.015 (0.2362 - 0.2368)	6.000 - 6.015 (0.2362 - 0.2368)	6.600 - 6.615 (0.2598 - 0.2604)	6.600 - 6.615 (0.2598 - 0.2604)
Cylinder head valve guide hole diameter	9.975 - 9.996 (0.3927 - 0.3935)	10.185 - 10.196 (0.4010 - 0.4014)	10.575 - 10.596 (0.4163 - 0.4172)	10.785 - 10.796 (0.4246 - 0.4250)
Interference fit of valve guide	0.027 - 0.059 (0.0011 - 0.0023)	0.027 - 0.049 (0.0011 - 0.0019)	0.027 - 0.059 (0.0011 - 0.0023)	0.027 - 0.049 (0.0011 - 0.0019)
Stem to guide clearance	0.020 - 0.050 (0.0008 - 0.0020)	0.020 - 0.050 (0.0008 - 0.0020)	0.030 - 0.057 (0.0012 - 0.0022)	0.030 - 0.057 (0.0012 - 0.0022)
Valve deflection limit (Dial gauge reading)	0.2 (0.008)	0.2 (0.008)	0.2 (0.008)	0.2 (0.008)

Inspection and Adjustment (Cont'd)

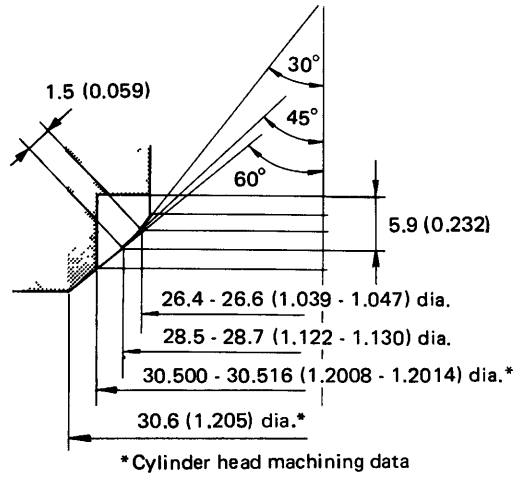
Valve seat

INTAKE

Standard



0.5 (0.020) oversize

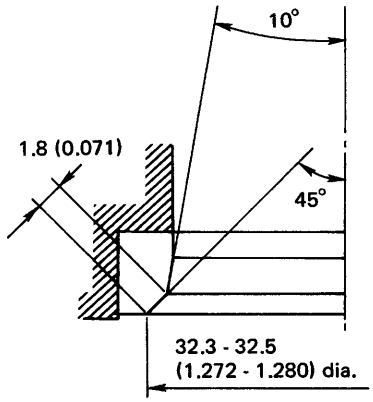


*Cylinder head machining data

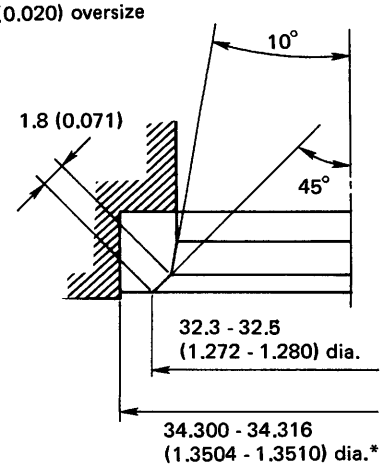
Unit: mm (in) SEM524A

EXHAUST

Standard



0.5 (0.020) oversize



* Cylinder head machining data

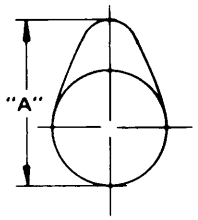
Unit: mm (in) SEM351C

Inspection and Adjustment (Cont'd)

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

	Standard	Limit
Camshaft journal to bearing clearance	0.045 - 0.090 (0.0018 - 0.0035)	0.15 (0.0059)
Inner diameter of camshaft bearing	42.000 - 42.025 (1.6535 - 1.6545)	–
Outer diameter of camshaft journal	41.935 - 41.955 (1.6510 - 1.6518)	–
Camshaft runout [T.I.R.*]	Less than 0.02 (0.0008)	0.1 (0.004)
Camshaft end play	0.030 - 0.130 (0.0012 - 0.0051)	0.20 (0.0079)



EM671

Cam height "A"	Intake	35.933 - 36.123 (1.4147 - 1.4222)
	Exhaust	35.746 - 35.936 (1.4073 - 1.4148)
Cam wear limit		0.20 (0.0079)

* Total indicator reading

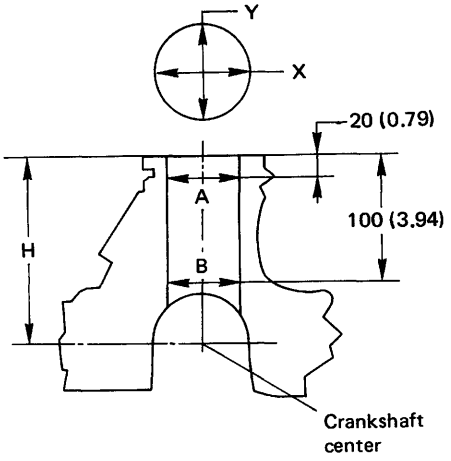
Rocker shaft

Unit: mm (in)

Rocker shaft outer diameter	21.979 - 22.000 (0.8653 - 0.8661)
Rocker arm inner diameter	22.023 - 22.043 (0.8670 - 0.8678)
Rocker arm to shaft clearance	0.023 - 0.064 (0.0009 - 0.0025)

CYLINDER BLOCK

Unit: mm (in)



SEM421C

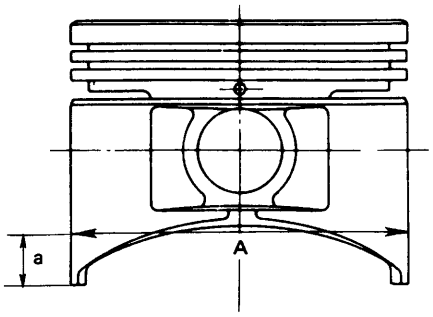
	Standard	Limit
Surface flatness	Less than 0.03 (0.0012)	0.1 (0.004)
Height H (nominal)	213.95 - 214.05 (8.4232 - 8.4271)	–
Cylinder bore Inner diameter	76.000 - 76.030 (2.9921 - 2.9933)	–
Out-of-round (X – Y)	Less than 0.015 (0.0006)	–
Taper (A – B)	Less than 0.010 (0.0004)	–
Difference in inner diameter between cylinders	Less than 0.10 (0.0039)	–

Inspection and Adjustment (Cont'd)

PISTON, PISTON RING AND PISTON PIN

Piston

Unit: mm (in)



SEM379B

Piston skirt diameter "A" Standard	
Grade No. 1	75.975 - 75.985 (2.9911 - 2.9915)
Grade No. 2	75.985 - 75.995 (2.9915 - 2.9919)
Grade No. 3	75.995 - 76.005 (2.9919 - 2.9923)
0.25 (0.0098) oversize (Service)	76.225 - 76.255 (3.0010 - 3.0022)
0.50 (0.0197) oversize (Service)	76.475 - 76.505 (3.0108 - 3.0120)
"a" dimension	7.5 (0.295)
Piston pin hole inner diameter	18.987 - 18.999 (0.7475 - 0.7480)
Piston pin outer diameter	18.989 - 19.001 (0.7476 - 0.7481)
Piston clearance to cylinder block	0.015 - 0.035 (0.0006 - 0.0014)

Piston ring

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.040 - 0.080 (0.0016 - 0.0031)	0.2 (0.008)
	2nd	0.030 - 0.070 (0.0012 - 0.0028)	
End gap	Top	0.20 - 0.35 (0.0079 - 0.0138)	1.0 (0.039)
	2nd	0.37 - 0.52 (0.0146 - 0.0205)	
	Oil	0.20 - 0.60 (0.0079 - 0.0236)	

Piston pin

Unit: mm (in)

Piston pin outer diameter	18.989 - 19.001 (0.7476 - 0.7481)
Piston pin to piston clearance	−0.004 to 0 (−0.0002 to 0)
Interference fit of piston pin to connecting rod bush	−0.005 to 0.017 (−0.0002 to 0.0007)

CONNECTING ROD

Unit: mm (in)

Center distance	140.45 - 140.55 (5.5295 - 5.5335)
Bend limit [per 100 (3.94)]	0.15 (0.0059)
Torsion limit	0.3 (0.012)
Connecting rod bushing inner diameter*	19.000 - 19.012 (0.7480 - 0.7485)
Connecting rod big end inner diameter* (small end)	43.000 - 43.013 (1.6929 - 1.6934)
Side clearance Standard	0.20 - 0.47 (0.0079 - 0.0185)
Limit	0.52 (0.0205)

*: After installing in connecting rod

Inspection and Adjustment (Cont'd)

CRANKSHAFT

Unit: mm (in)

Main journal dia. "Dm"	
Grade No. 0	49.956 - 49.964 (1.9668 - 1.9671)
Grade No. 1	49.948 - 49.956 (1.9665 - 1.9668)
Grade No. 2	49.940 - 49.948 (1.9661 - 1.9665)
Pin journal dia. "Dp"	39.956 - 39.974 (1.5731 - 1.5738)
Center distance "r"	43.95 - 44.05 (1.7303 - 1.7342)
Out-of-round (X – Y)	
Standard	Less than 0.005 (0.0002)
Taper (A – B)	
Standard	Less than 0.002 (0.0001)
Runout [T.I.R.]	
Standard	Less than 0.04 (0.0016)
Free end play	
Standard	0.060 - 0.180 (0.0024 - 0.0071)
Limit	0.3 (0.012)

BEARING

Main bearing

Grade No.	Thickness "T" mm (in)	Identification color
0	1.827 - 1.830 (0.0719 - 0.0720)	Black
1	1.831 - 1.834 (0.0721 - 0.0722)	Brown
2	1.835 - 1.838 (0.0722 - 0.0724)	Green
3	1.839 - 1.842 (0.0724 - 0.0725)	Yellow
4	1.843 - 1.846 (0.0726 - 0.0727)	Blue

Undersize

Unit: mm (in)

	Thickness "T"
0.25 (0.0098)	1.957 - 1.965 (0.0770 - 0.0774)
0.50 (0.0197)	2.082 - 2.090 (0.0820 - 0.0823)

AVAILABLE CONNECTING ROD BEARING

Connecting rod bearing undersize

Unit: mm (in)

		Crank pin journal diameter "Dp"
Standard		39.956 - 39.974 (1.5731 - 1.5738)
Undersize	0.08 (0.0031)	39.876 - 39.894 (1.5699 - 1.5706)
	0.12 (0.0047)	39.836 - 39.854 (1.5683 - 1.5691)
	0.25 (0.0098)	39.706 - 39.724 (1.5632 - 1.5639)

Bearing clearance

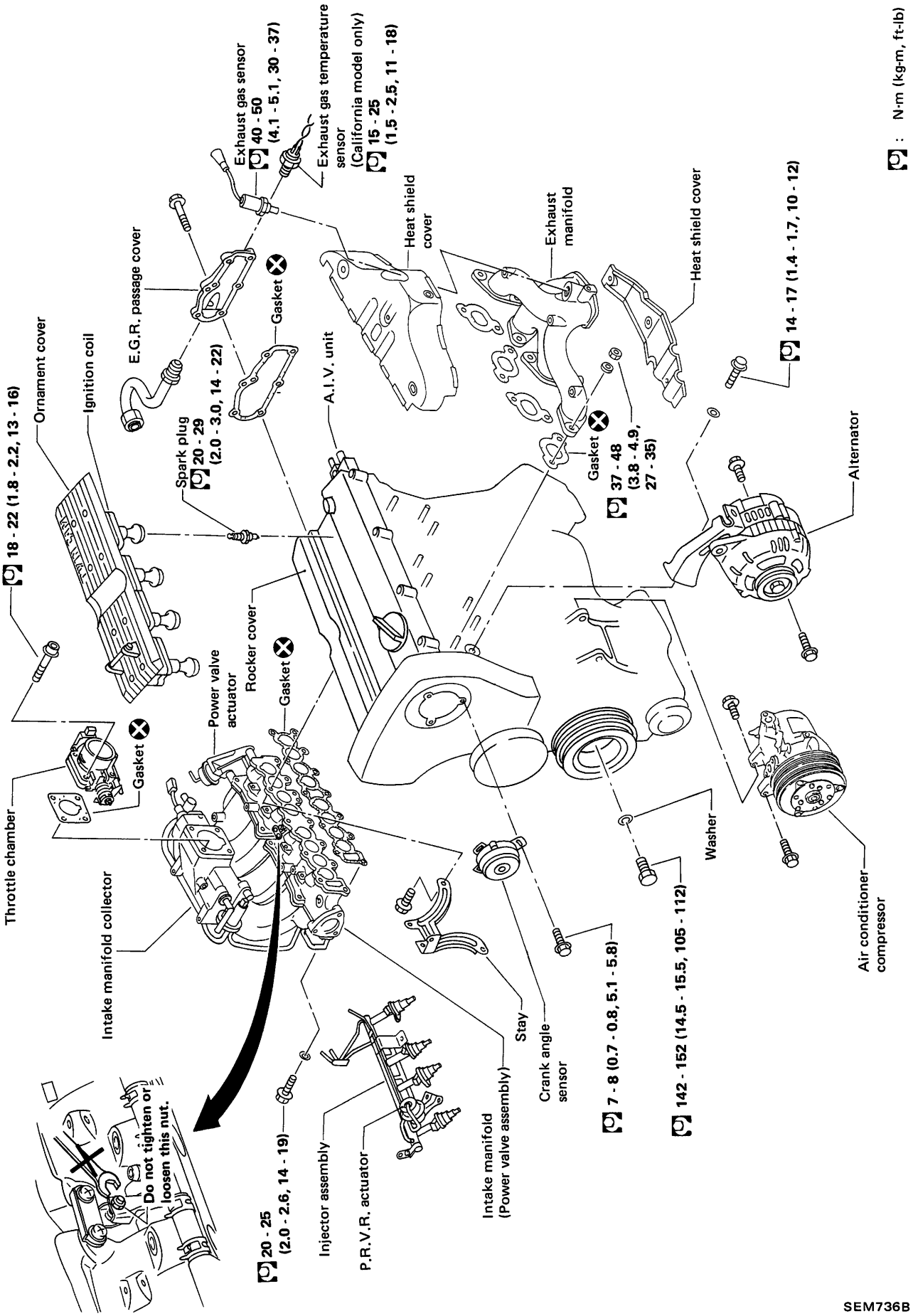
Unit: mm (in)

Main bearing clearance	
Standard bearing	0.020 - 0.042 (0.0008 - 0.0017)
Limit	0.1 (0.004)
Connecting rod bearing clearance	
Standard	0.010 - 0.035 (0.0004 - 0.0014)
Limit	0.1 (0.004)

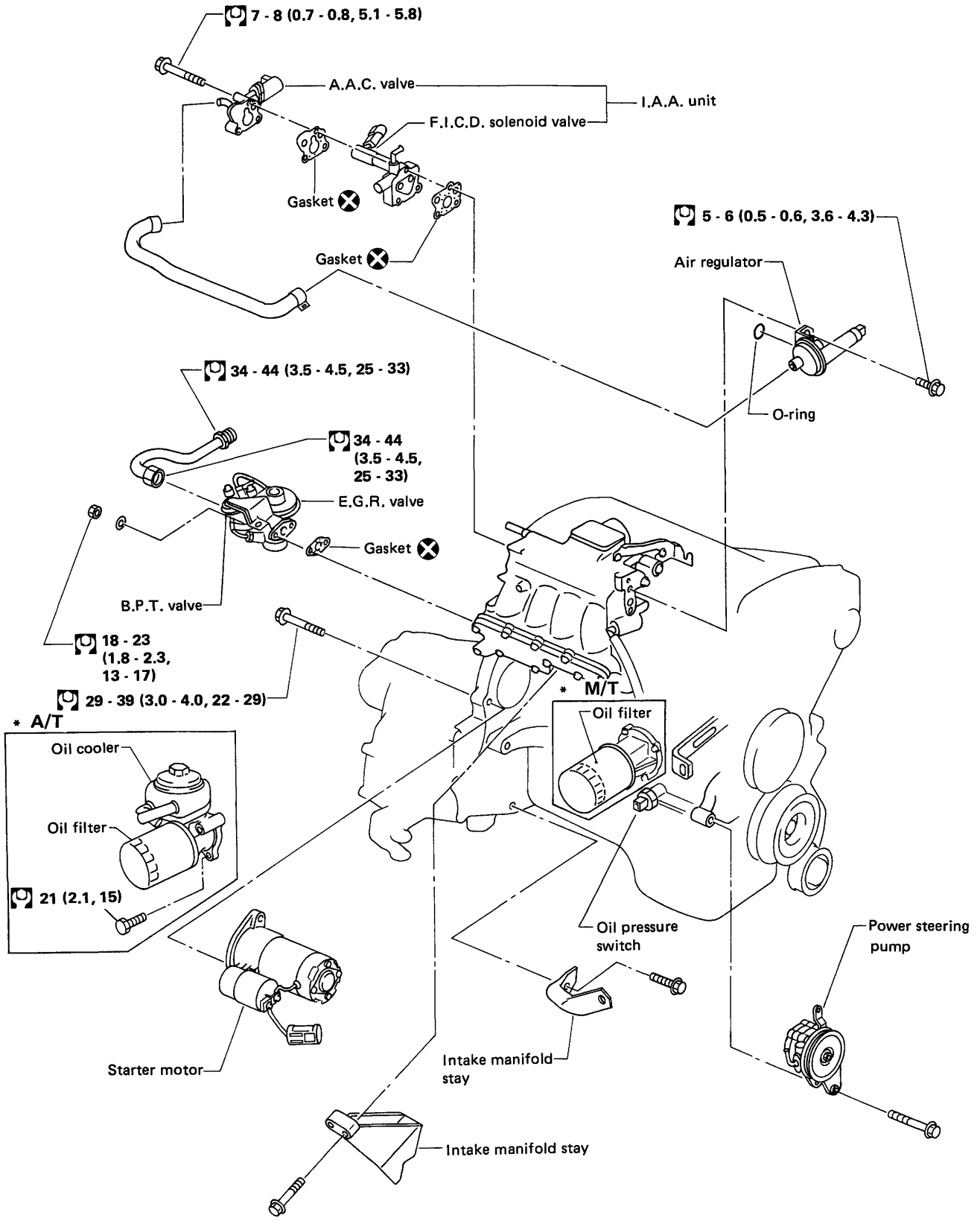
MISCELLANEOUS COMPONENTS

Unit: mm (in)

Flywheel	
Runout [T.I.R.]	Less than 0.15 (0.0059)

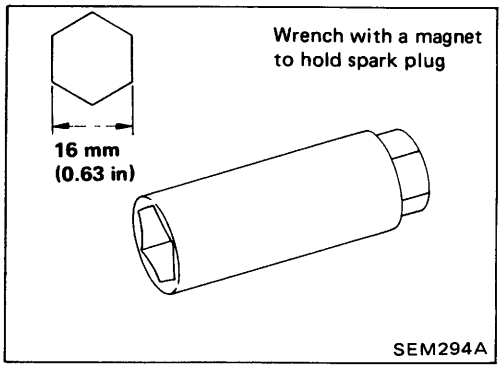

Exhaust gas sensor
40 - 50
(4.1 - 5.1, 30 - 37)
Exhaust gas temperature sensor (California model only)
15 - 25
(1.5 - 2.5, 11 - 18)
Heat shield cover
Exhaust manifold
Heat shield cover
14 - 17 (1.4 - 1.7, 10 - 12)
E.G.R. passage cover
Gasket
Ornament cover
Ignition coil
18 - 22 (1.8 - 2.2, 13 - 16)
Spark plug
20 - 29
(2.0 - 3.0, 14 - 22)
A.I.V. unit
Gasket
37 - 48
(3.8 - 4.9, 27 - 35)
Alternator
Rocker cover
Gasket
Power valve actuator
Throttle chamber
Gasket
Intake manifold collector
Stay
Crank angle sensor
7 - 8 (0.7 - 0.8, 5.1 - 5.8)
142 - 152 (14.5 - 15.5, 105 - 112)
Washer
Air conditioner compressor
Do not tighten or loosen this nut.
20 - 25
(2.0 - 2.6, 14 - 19)
Injector assembly
P.R.V.R. actuator
Intake manifold (Power valve assembly)
: N·m (kg-m, ft-lb)

SEM736B

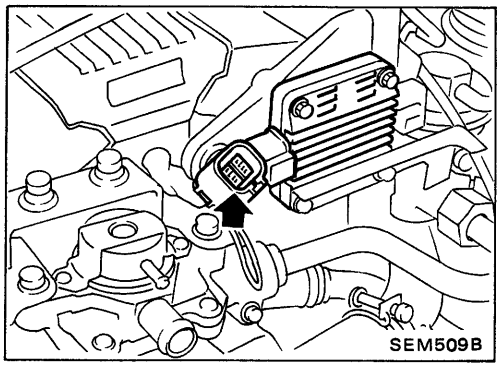


: N·m (kg-m, ft-lb)

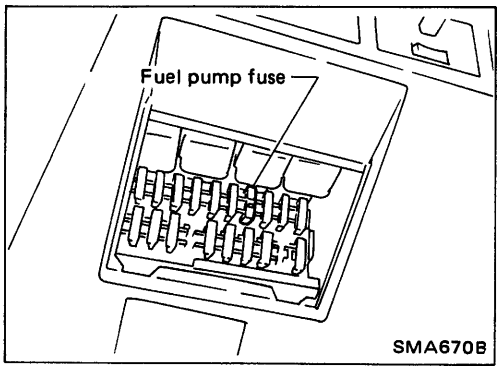
SEM737B



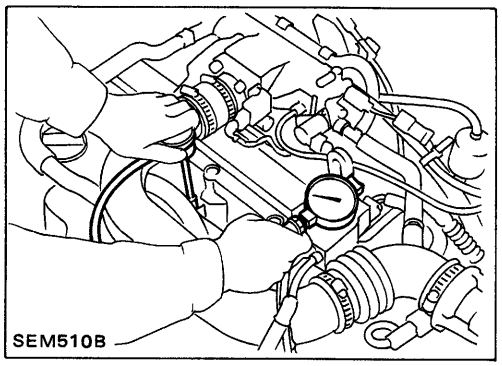
1. Warm up engine.
2. Remove ornament cover and all spark plugs.
- **Use a suitable plug wrench.**
- **Refer to Spark Plug Replacement in MA section.**



3. Disconnect power transistor harness connector.



4. Remove fuse for fuel pump.



5. Attach a suitable compression tester.

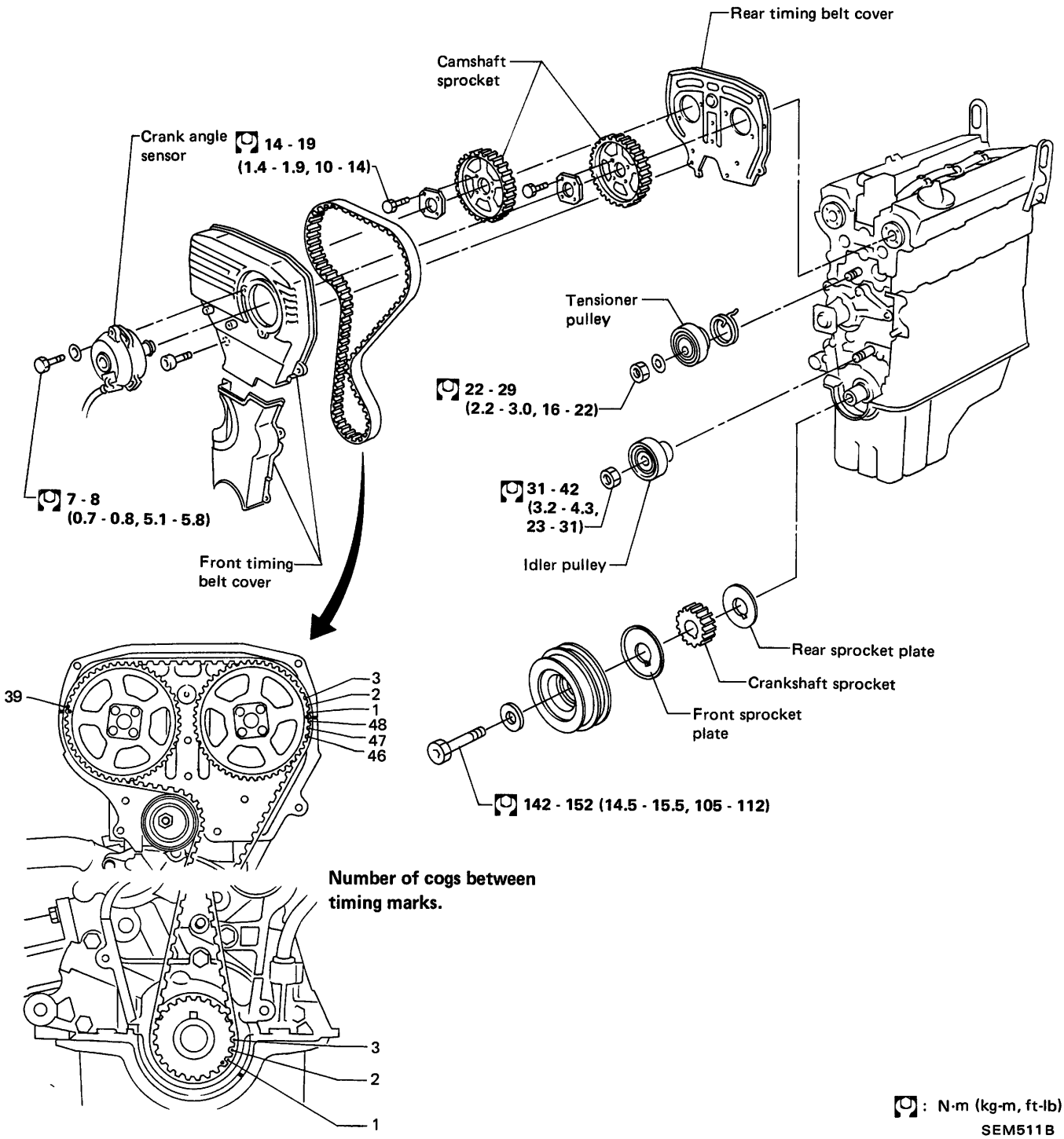
6. Depress accelerator pedal to fully open throttle.
7. Crank engine and read gauge indication.

Compression pressure:
kPa (kg/cm², psi) at 350 rpm
Standard
1,373 (14.0, 199)
Minimum
1,177 (12.0, 171)
Differential limit between cylinders:
98 (1.0, 14) at 350 rpm

8. If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into cylinders through the spark plug holes and retest compression.
- If adding oil helps the compression pressure, chances are that piston rings are worn or damaged.
- If pressure stays low, valve may be sticking or seating improperly.
- If cylinder compression in any two adjacent cylinders is low, and if adding oil does not help the compression, there is leakage past the gasket surface.

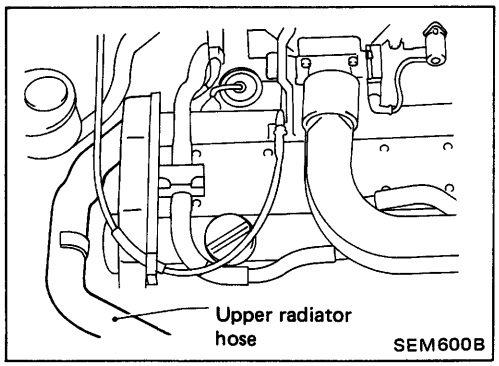
CAUTION:

a. Do not bend or twist timing belt too tightly.
b. After removing timing belt, do not rotate crankshaft and camshaft separately because valves will hit piston head.
c. Ensure timing belt, timing belt camshaft sprocket, crankshaft sprocket and belt tensioner are clean and free from oil or water.
d. Before installing timing belt, confirm that No. 1 cylinder is set at T.D.C. on compression stroke.
e. Align arrow on timing belt forward.
f. Align white lines on timing belt with punch mark on camshaft sprocket and crankshaft sprocket.
g. Adjust belt tension with all spark plugs removed.

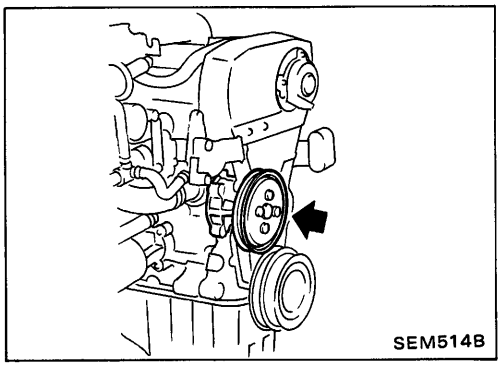


: N·m (kg-m, ft-lb)

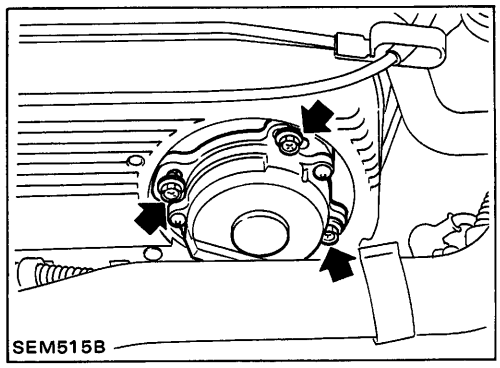
SEM511B



1. Drain coolant.
2. Remove upper radiator hose.

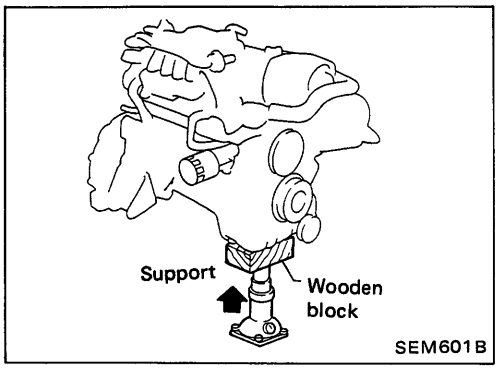


3. Remove right side under cover.
4. Remove drive belts for power steering pump and compressor.
5. Remove water pump pulley.

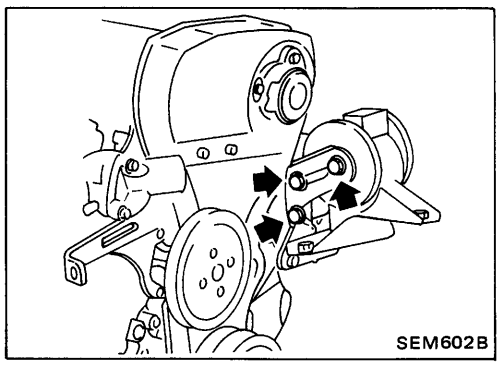


6. Remove crank angle sensor.

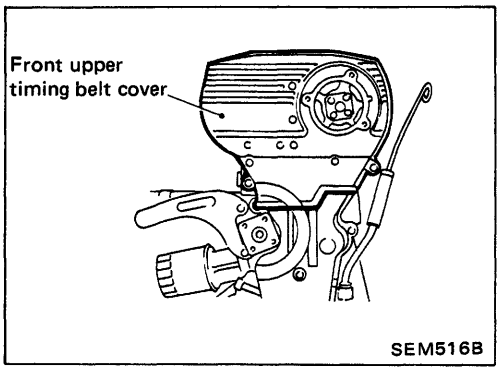
Put aligning mark on crank angle sensor and timing belt cover.



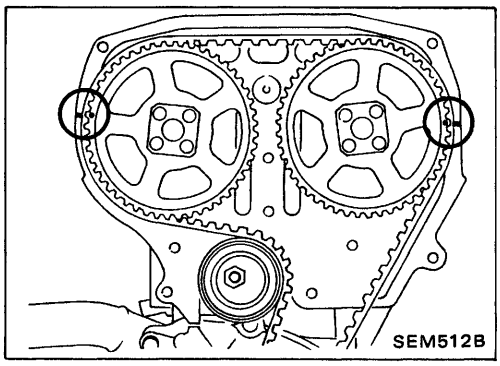
7. Support or hang the engine.



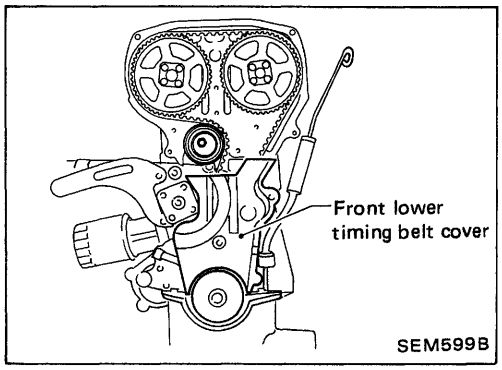
8. Remove engine mount bracket.



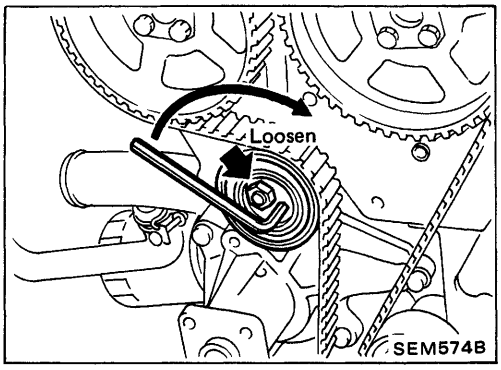
9. Remove front upper timing belt cover.



10. Align timing marks on crank pulley sprockets.

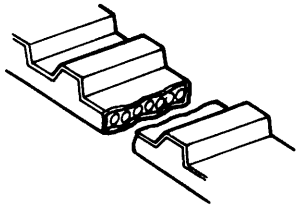
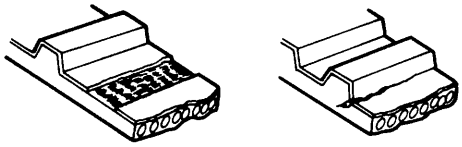
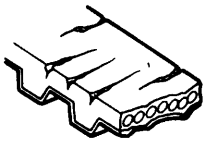


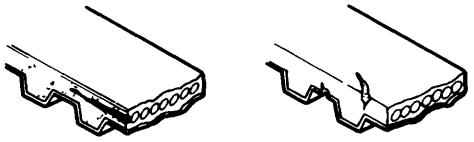
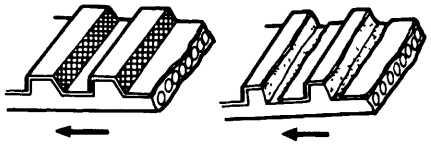
11. Remove crankshaft pulley.
Crankshaft pulley is accessible after removing side cover from inside R.H. wheel house.
12. Remove front lower timing belt cover.

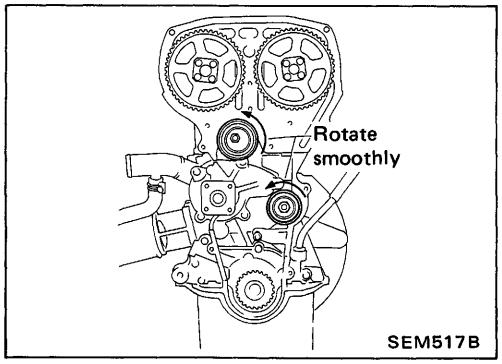


13. Loosen tensioner pulley nut to loosen timing belt.
14. Remove timing belt.

Visually check the condition of the timing belt.
Replace if any abnormality is found.

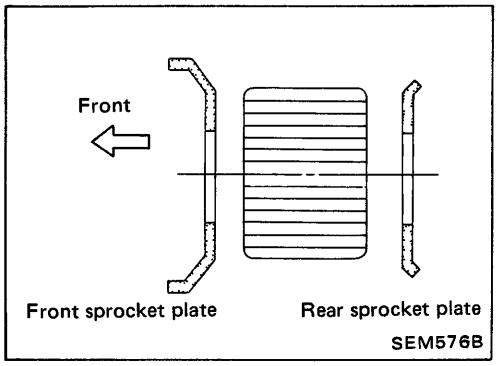
Item to check	Problem	Cause
Belt is broken.	 SEM393A	• Improper handling • Poor belt cover sealing • Coolant leakage at water pump
Tooth is broken/ tooth root is cracked.	 SEM394A	• Camshaft jamming • Distributor jamming • Oil leakage at camshaft/crankshaft oil seal
Back surface is cracked/worn.	 SEM395A	• Tensioner jamming • Overheated engine • Interference with belt cover

Item to check	Problem	Cause
Side surface is worn.	 • Side surface of belt is worn to such an extent that there is no trace of cutoff performed during manufacturing process. • Belt corners are worn and round. • Wicks are frayed and coming out. SEM396A	• Improper installation of belt • Malfunctioning crank pulley plate/timing belt plate
Teeth are worn.	 • Canvas on tooth face is worn down. • Canvas on tooth is fluffy, rubber layer is worn down and faded white, or canvas texture is unclear. SEM397A	• Poor belt cover sealing • Coolant leakage at water pump • Camshaft not functioning properly • Distributor not functioning properly • Excessive belt tension
Oil/Coolant or water is stuck to belt.		• Poor oil sealing of each oil seal • Coolant leakage at water pump • Poor belt cover sealing

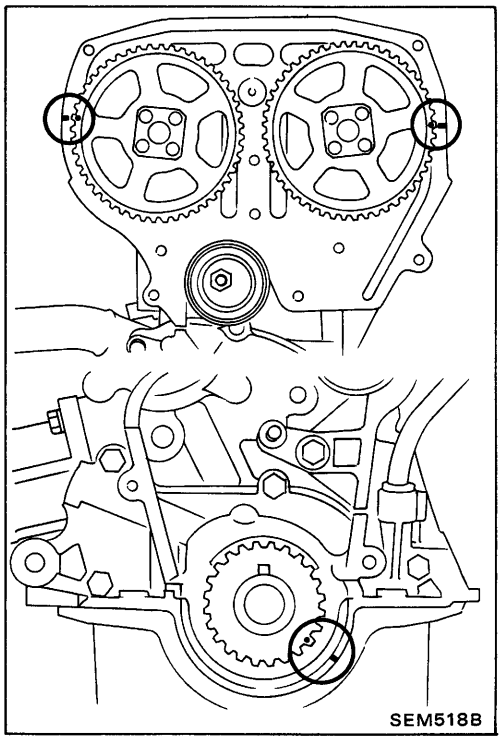


BELT TENSIONER AND IDLER PULLEY

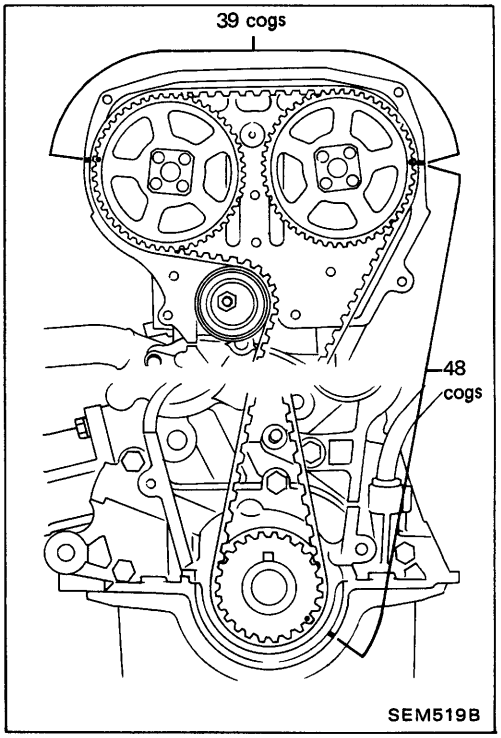
1. Visually check belt tensioner and idler pulley for seizure, rust and any evidence of breaks.
2. Confirm that tensioner and idler pulley can be rotated smoothly.
3. Visually check tensioner pulley return spring for corrosion, distortion and any abnormal signs.



1. Install crankshaft sprocket with sprocket plate.

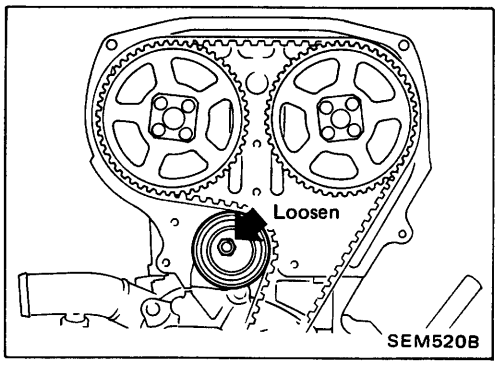


2. Confirm that No. 1 cylinder is set at T.D.C. on its compression stroke.

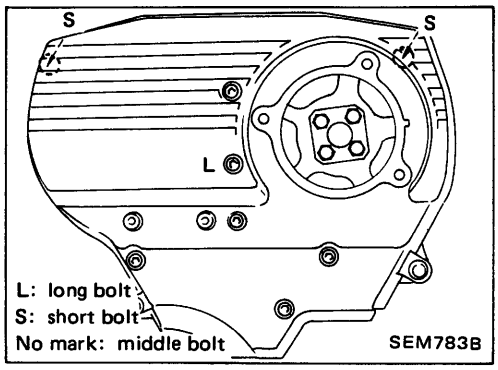


3. Install timing belt.

Align timing marks on timing belt and sprockets.



4. Loosen tensioner pulley nut.
5. Install lower timing belt.
6. Install crank pulley with washer.
   ⓞ : **142 - 152 N·m**
   (14.5 - 15.5 kg-m, 105 - 112 ft-lb)
7. Rotate crankshaft 2 turns completely.
8. Tighten tensioner pulley nut.
   ⓞ : **22 - 29 N·m (2.2 - 3.0 kg-m, 16 - 22 ft-lb)**



9. Install upper timing belt cover.

10. Install engine mount bracket.
11. Install crank angle sensor and water pump pulley.

Align marks on crank angle sensor and front cover that are marked when crank angle sensor is removed.

Crank angle sensor:

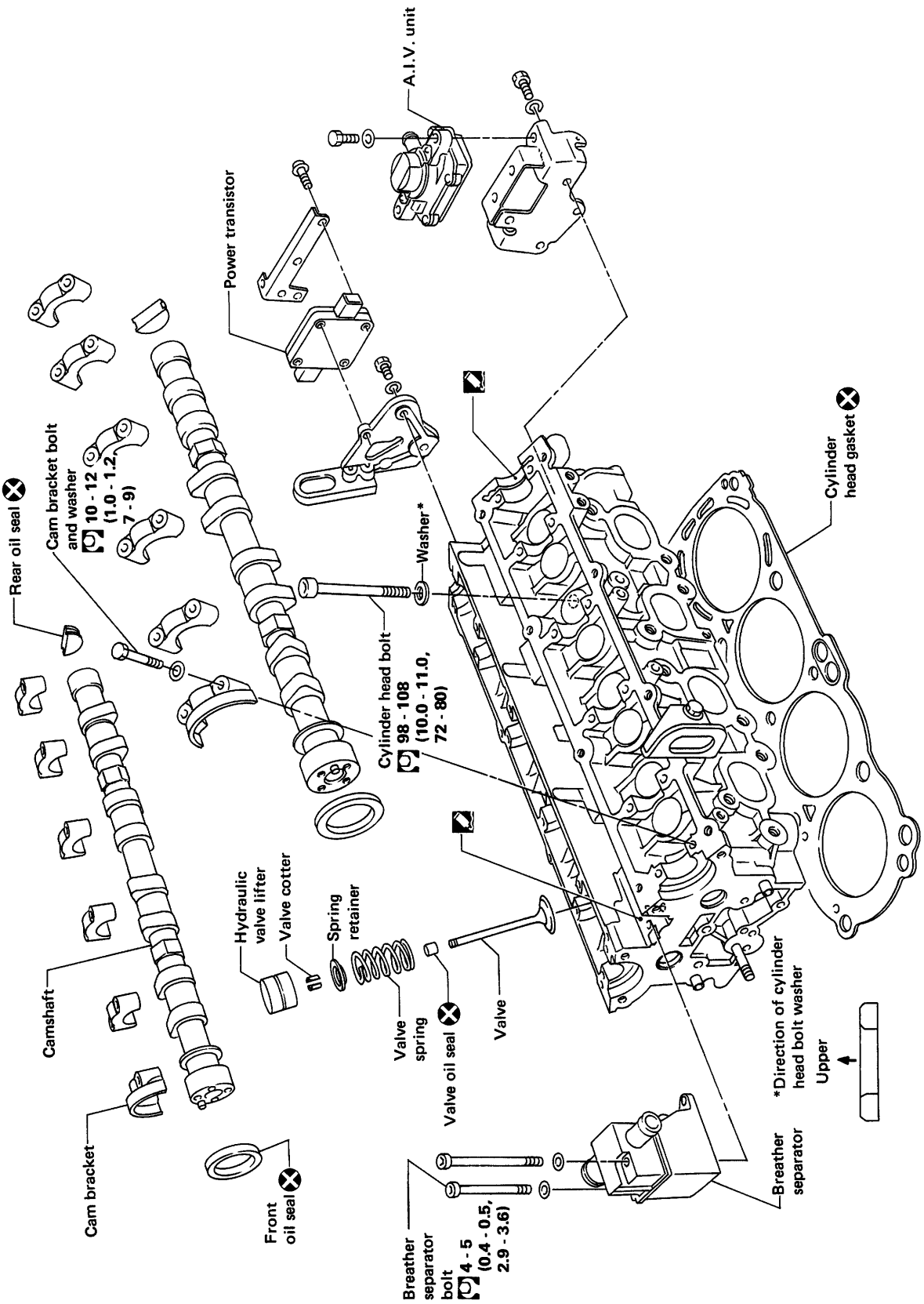
ⓞ : **7 - 8 N·m (0.7 - 0.8 kg-m, 5.1 - 5.8 ft-lb)**

12. Install drive belts.

Refer to Drive Belt Inspection in MA section.

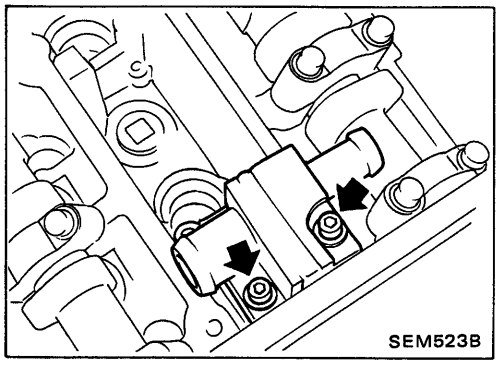
13. Install upper radiator hose and refill coolant.

Refer to Changing Engine Coolant in MA section.

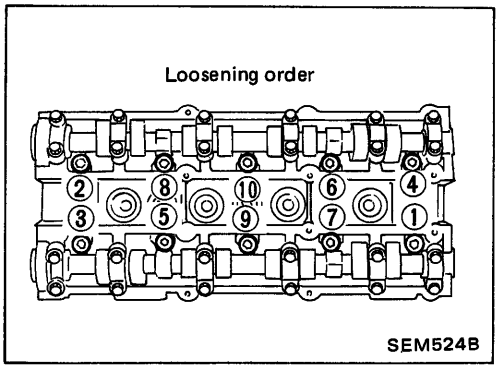

A.I.V. unit
Power transistor
Rear oil seal
Cam bracket bolt and washer
10 - 12 (1.0 - 1.2, 7 - 9)
Washer*
Cylinder head bolt
98 - 108 (10.0 - 11.0, 72 - 80)
Cylinder head gasket
Camshaft
Hydraulic valve lifter
Valve cotter
Spring retainer
Valve spring
Valve oil seal
Valve
*Direction of cylinder head bolt washer
Upper
Cam bracket
Front oil seal
Breather separator bolt
4 - 5 (0.4 - 0.5, 2.9 - 3.6)
Breather separator
: N·m (kg-m, ft-lb)

SEM522B

1. Remove timing belt.
Refer to TIMING BELT.


SEM523B

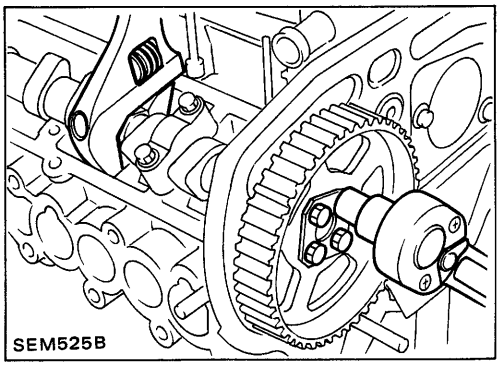
2. Remove breather separator.
To remove breather separator makes cylinder head bolts removal easy.



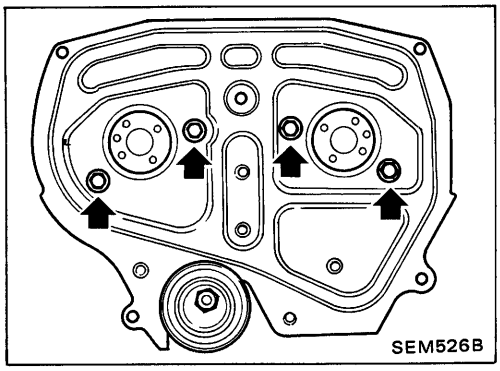
SEM524B

3. Loosen cylinder head bolts.

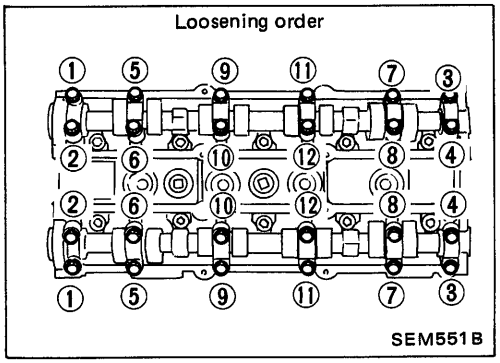
4. Remove cylinder head.


SEM525B

1. Remove camshaft sprockets.

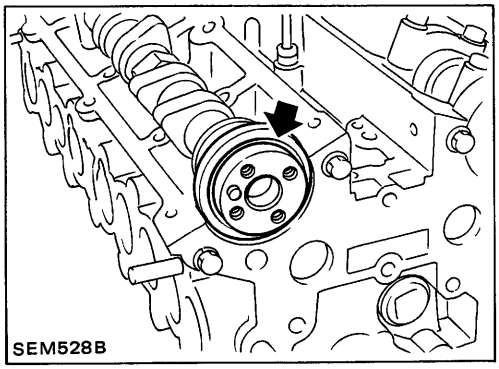

SEM526B

2. Remove tensioner pulley and rear cover.

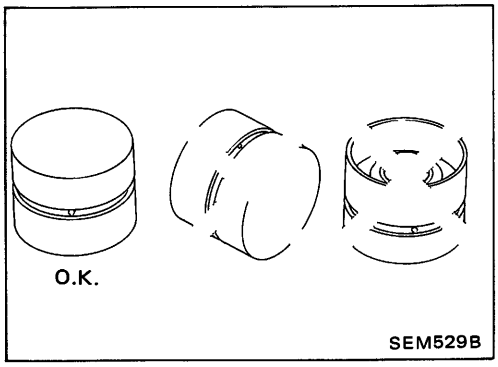


SEM551B

3. Remove camshaft bracket.
Loosen bolts gradually in two or three stages.

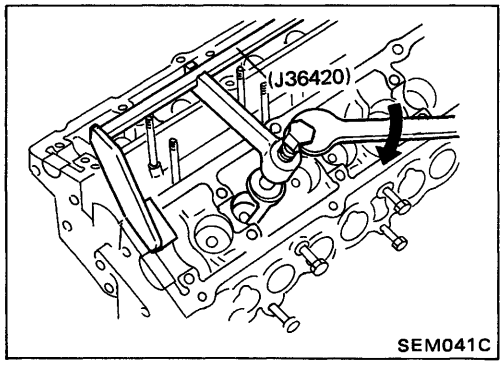

SEM528B

4. Remove front oil seals and then, remove camshafts.

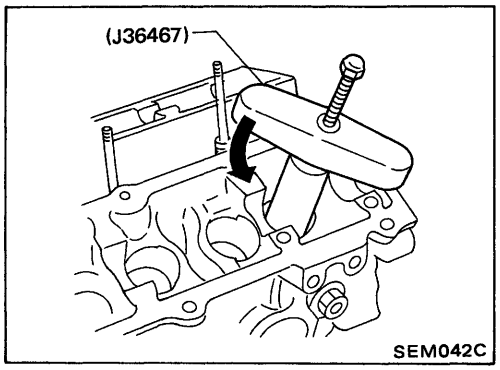


SEM529B

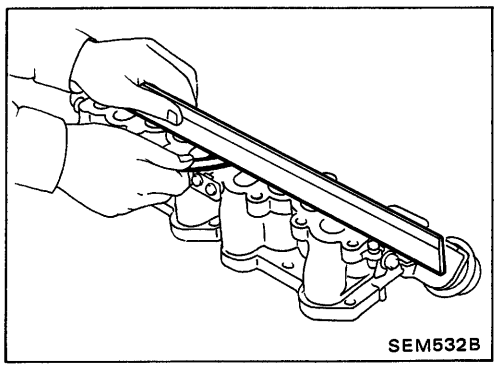
5. Remove hydraulic valve lifters.
a. **Do not put hydraulic valve lifters upside down, otherwise air will enter valve lifter, causing it to make a noise.**
b. **Do not disassemble hydraulic valve lifter.**
c. **Attach tags to valve lifters so as not to mix them up.**
d. **Valve lifters are required to put in engine oil.**



6. Disassemble valve mechanism.

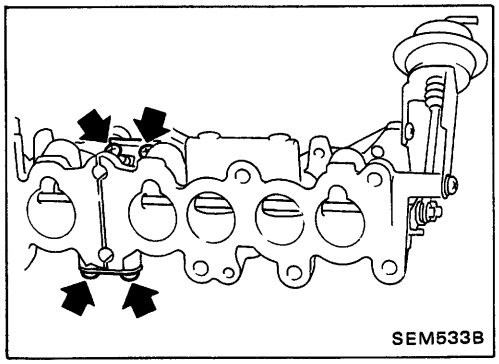


7. Remove valve oil seal.

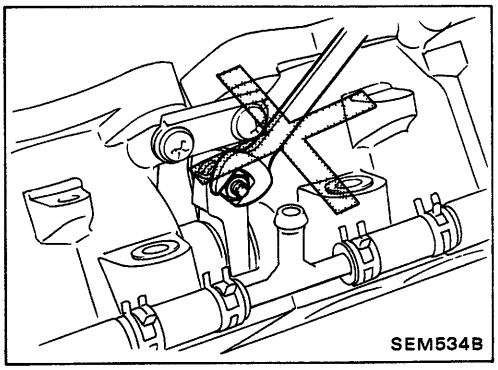

SEM532B

INTAKE MANIFOLD DISTORTION

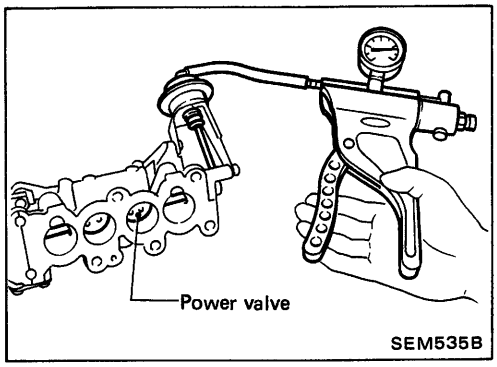
Intake manifold distortion:
Less than 0.1 mm (0.004 in)


SEM533B

If intake manifold distortion is not within the specified value, adjust distortion by loosening screws as shown.


SEM534B

Do not loosen power valve adjusting screw.
This screw is adjusted on product line.

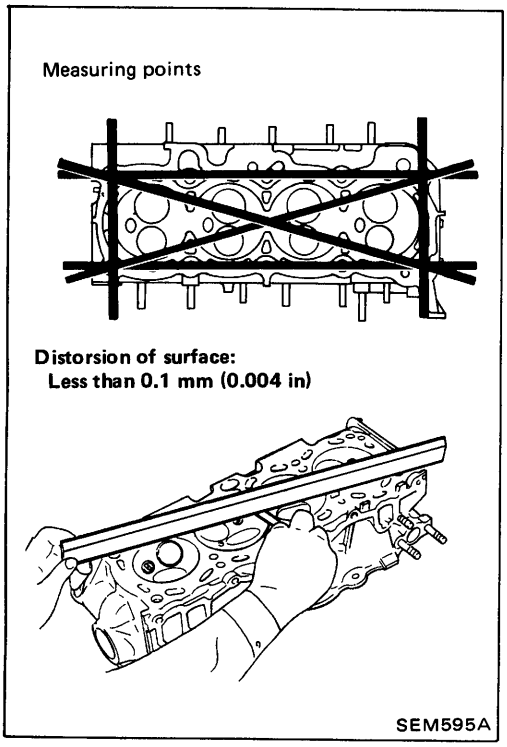


SEM535B

POWER VALVE ACTUATOR

Supply vacuum pressure and inspect actuator operation.

Vacuum pressure kPa (mmHg, inHg)	Operation
Approx. 6.7 (50, 1.97)	Begin to close
Approx. 40.0 (300, 11.81)	Fully closed



CYLINDER HEAD DISTORTION

Cylinder head distortion:

Less than 0.1 mm (0.004 in)

If beyond the specified limit, resurface it.

Nominal cylinder head height:

125.9 - 126.1 mm (4.957 - 4.965 in)

(From bottom to camshaft center)

Resurfacing limit:

The resurfacing limit of cylinder head is determined by the cylinder block resurfacing in an engine.

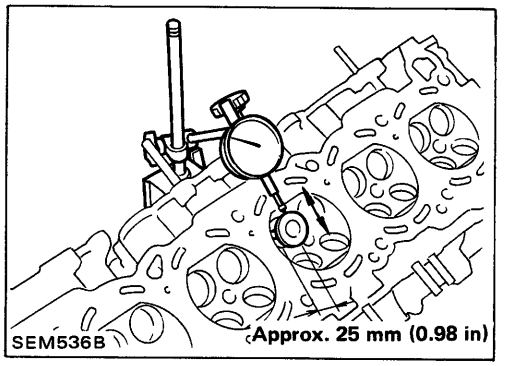
Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

After resurfacing the cylinder head, check that camshaft rotates freely by hand with cylinder block assembled.

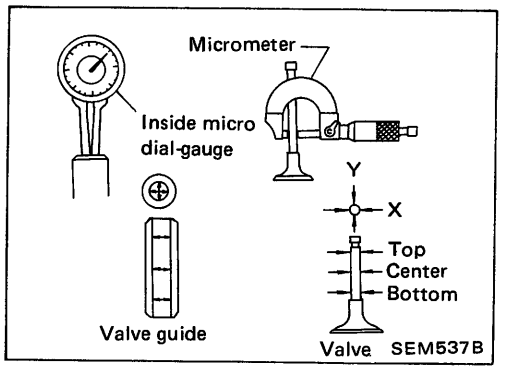


VALVE GUIDE CLEARANCE

Stem-to-guide clearance:

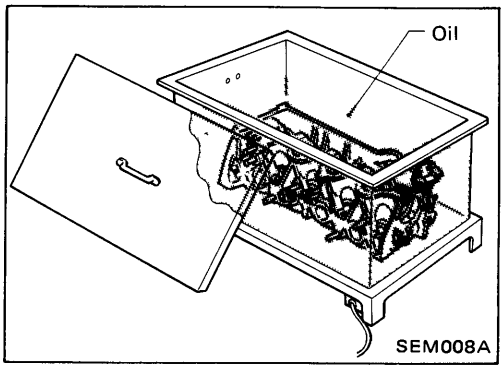
Maximum limit

0.10 mm (0.0039 in)



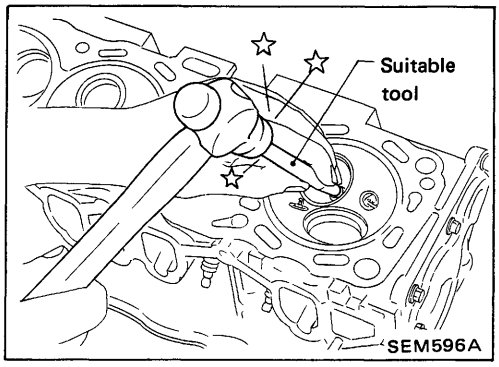
To determine the correct replacement part, measure valve stem diameter and valve guide bore.

For dimensions, refer to S.D.S.

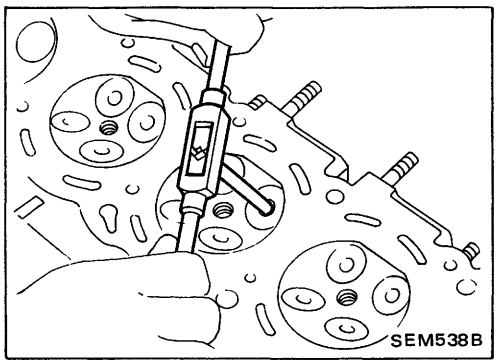


VALVE GUIDE REPLACEMENT

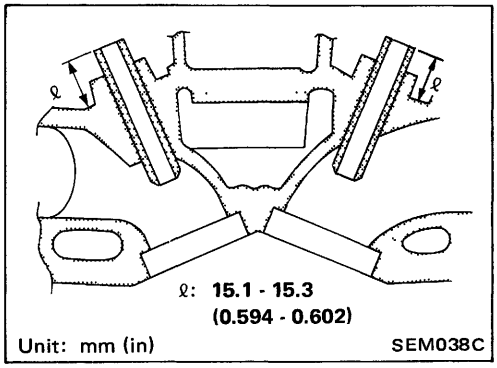
1. To remove valve guide, heat cylinder head to 150 to 160°C (302 to 320°F).



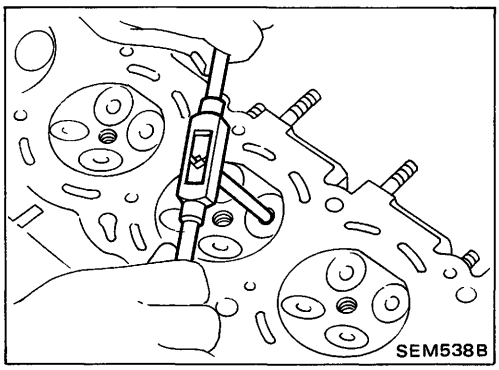
2. Drive out valve guide with a press [under a 20 kN (2t, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and suitable tool.



3. Ream cylinder head valve guide hole.
   Cylinder head valve guide hole diameter "a"
   [For 0.2 mm (0.008 in) oversize] :
   Intake and exhaust
   10.185 - 10.196 mm (0.4010 - 0.4014 in)



4. Heat cylinder head to 150 to 160°C (302 to 320°F) and press service valve guide onto cylinder head.

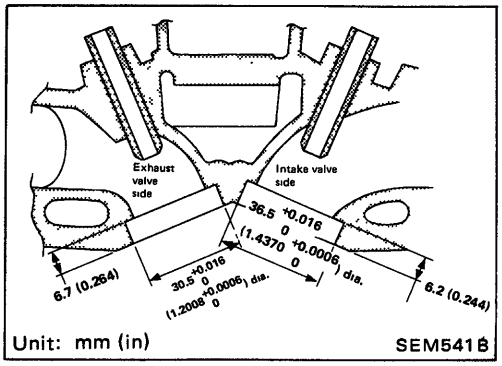


5. Ream valve guide.
   Finished size:
   Intake and exhaust
   6.000 - 6.018 mm (0.2362 - 0.2369 in)

VALVE SEATS

Check valve seats for any evidence of pitting at valve contact surface, and reseat or replace if worn out excessively.

- **When repairing valve seats, check valve and valve guide for wear beforehand. If worn, replace them. Then correct valve seat.**
- **The cutting should be done with both hands for uniform cutting.**



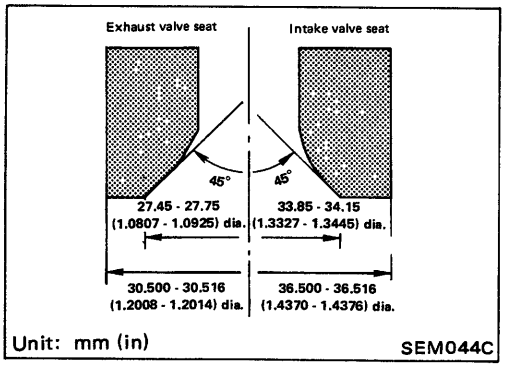
Unit: mm (in) SEM541B

REPLACING VALVE SEAT FOR SERVICE PARTS

1. Bore out old seat until it collapses.
   The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.
2. Ream the cylinder head recess.
   Reaming bore for service valve seat
   [Oversize 0.5 mm (0.020 in)]:
   Intake
   36.500 - 36.516 mm (1.4370 - 1.4376 in)
   Exhaust
   30.500 - 30.516 mm (1.2008 - 1.2014 in)

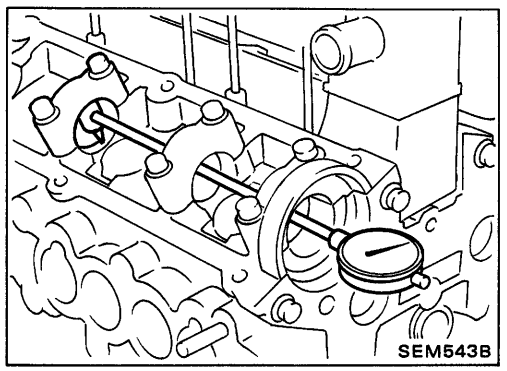
Reaming should be done to the concentric circles around the valve guide center so that valve seat will have the correct fit.

3. Heat cylinder head to a temperature of 150 to 160°C (302 to 320°F).
4. Press fit seat until it seats on the bottom.



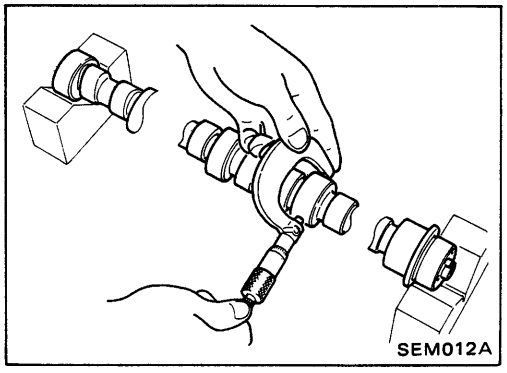
Unit: mm (in) SEM044C

5. Cut or grind valve seat using suitable tool at the specified dimensions as shown.
6. After cutting, lap valve seat with a lapping compound.
7. Check contact condition of valve seat.

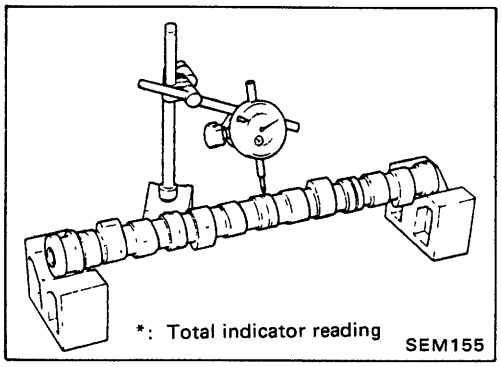

SEM543B

CAMSHAFT JOURNAL CLEARANCE

1. Measure the inner diameter of camshaft bearing.
   Camshaft bracket:
   (O) : 10 - 12 N·m
   (1.0 - 1.2 kg-m, 7 - 9 ft-lb)
   Standard inner diameter:
   28.000 - 28.025 mm (1.1024 - 1.1033 in)


SEM012A

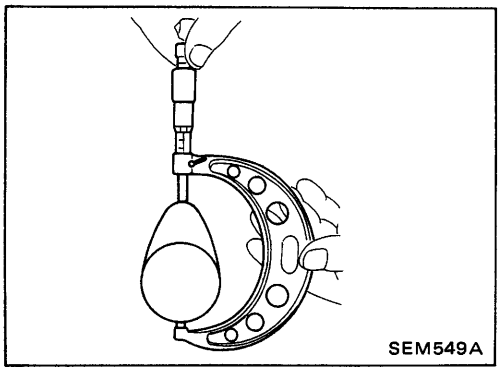
2. Measure the outer diameter of camshaft journal.
   Standard outer diameter:
   27.935 - 27.955 mm (1.0998 - 1.1006 in)
   If the clearance is greater than the maximum, replace camshaft and/or cylinder head.
   Maximum clearance:
   0.15 mm (0.0059 in)



CAMSHAFT RUNOUT

Camshaft runout (Total indicator reading):
Limit 0.05 mm (0.0020 in)

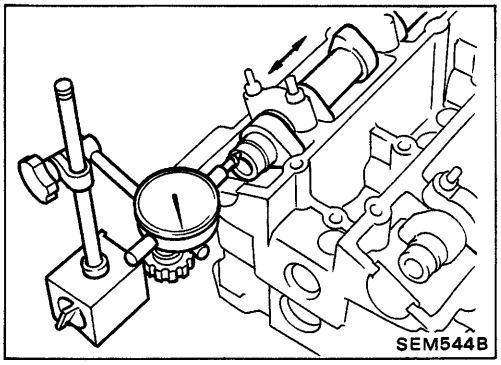
If beyond the limit, replace.



CAMSHAFT CAM HEIGHT

Standard cam height:
Intake and exhaust
40.485 - 40.515 mm
(1.5939 - 1.5951 in)
Cam wear:
Limit 0.2 mm (0.008 in)

If wear is beyond the limit, replace it.



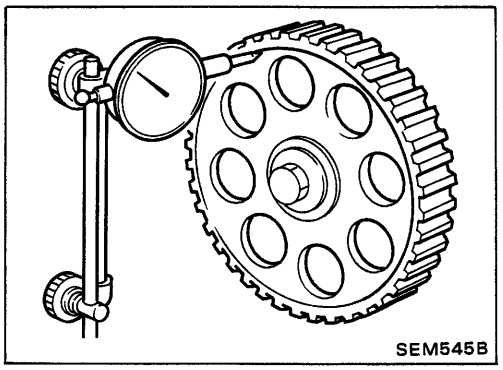
CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.

CAMSHAFT END PLAY

1. Install camshaft in cylinder head.
2. Measure camshaft end play.

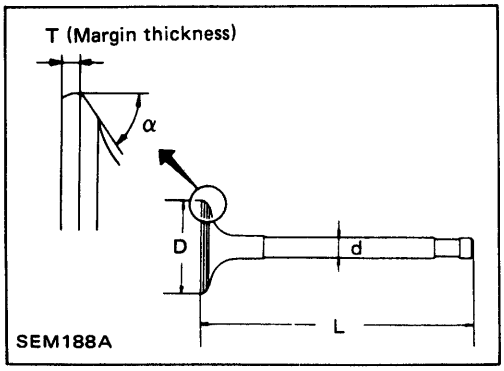
Camshaft end play:
Standard 0.07 - 0.15 mm (0.0028 - 0.0059 in)
Limit 0.2 mm (0.008 in)



CAMSHAFT SPROCKET RUNOUT

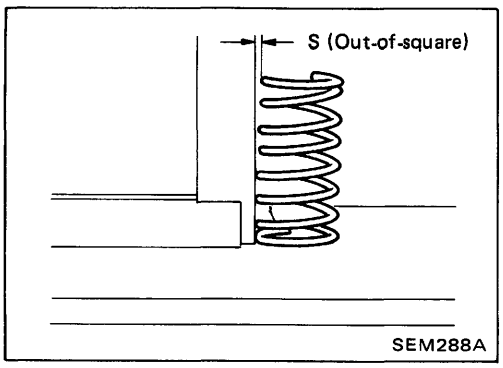
Install sprocket on camshaft and check for runout.
If runout exceeds the specified limit, replace camshaft sprocket.

Runout (Total indicator reading):
Limit 0.1 mm (0.004 in)



VALVE DIMENSIONS

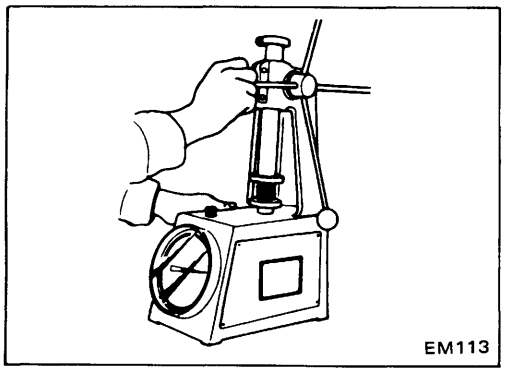
Check dimensions in each valve. For dimensions, refer to S.D.S.
When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace the valve.
Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.



VALVE SPRING SQUARENESS

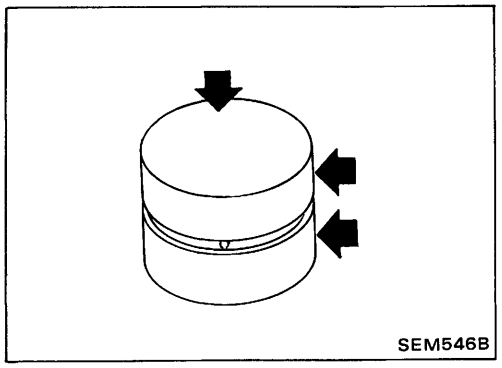
Out-of-square:

Less than 1.8 mm (0.071 in)



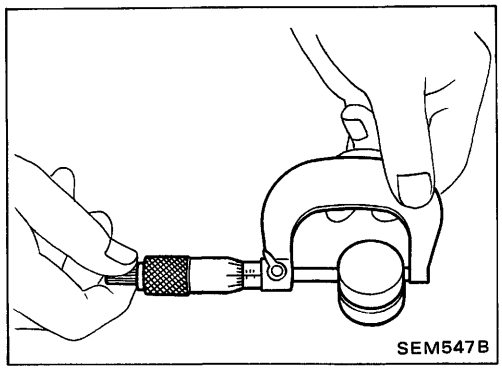
VALVE SPRING PRESSURE LOAD

Compression length mm (in)	Load N (kg, lb)
0 (0)	0 (0, 0)
8 (0.31)	Approx. 235 (24, 53)
16.5 (0.650)	Approx. 539 (55, 121)



HYDRAULIC VALVE LIFTER

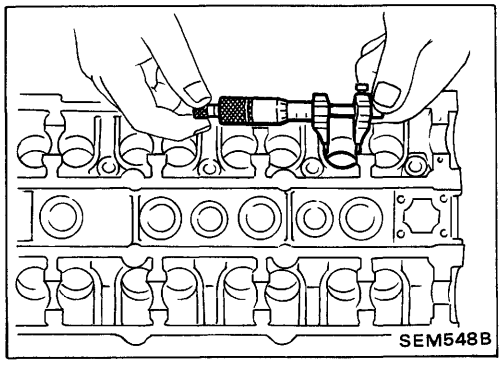
1. Check contact and sliding surfaces for wear or scratches.



2. Check diameter of a valve lifter and a valve lifter guide bore.

Valve lifter diameter:

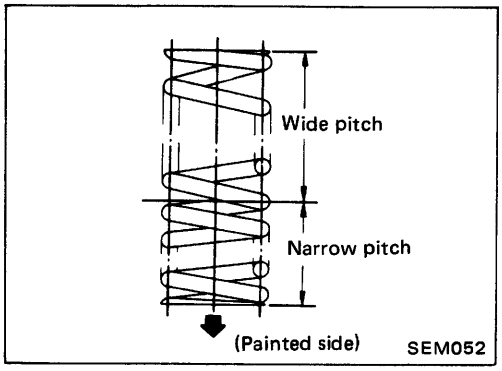
30.955 - 30.965 mm (1.2187 - 1.2191 in)



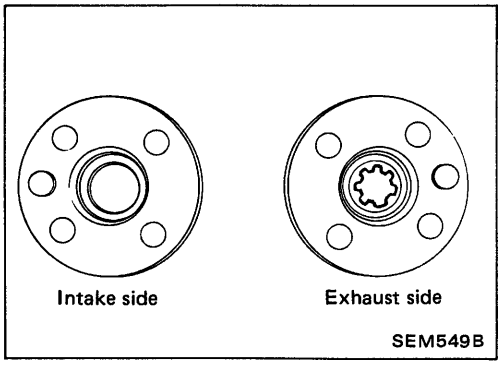
Lifter guide bore diameter:

31.000 - 31.013 mm (1.2205 - 1.2210 in)

If valve lifter can be depressed by finger more than 1 mm (0.04 in), air should be bled from it. At that time, run engine at approx. 1,000 rpm for 10 minutes.
If engine is still noisy, replace hydraulic valve lifters.

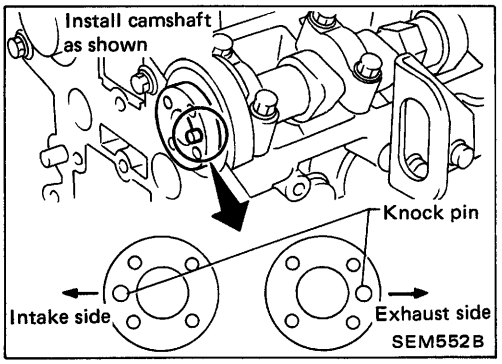


1. Install valve component parts.
- **Always use new valve oil seal. (Refer to OIL SEAL REPLACEMENT.)**
- **Install valve spring (uneven pitch type) with its narrow pitch side (painted side) toward cylinder head side.**

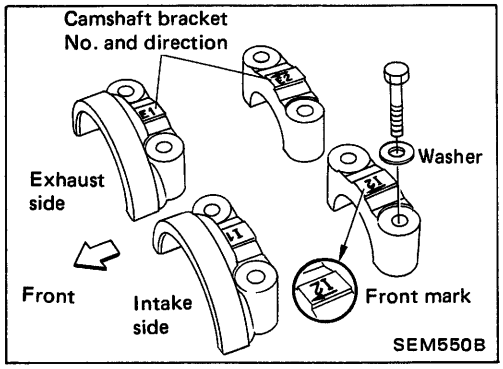


2. Install camshafts.

Exhaust side camshaft has spline for crank angle sensor.



Install camshaft as shown.



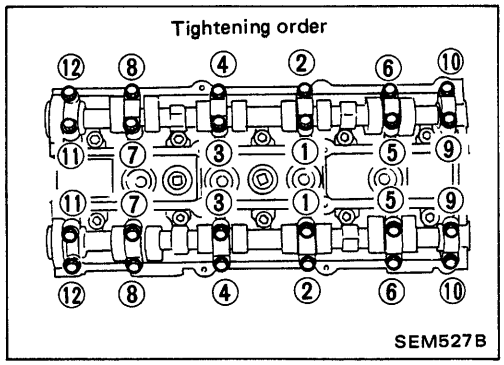
3. Install camshaft brackets.

Front mark is punched on the camshaft bracket.

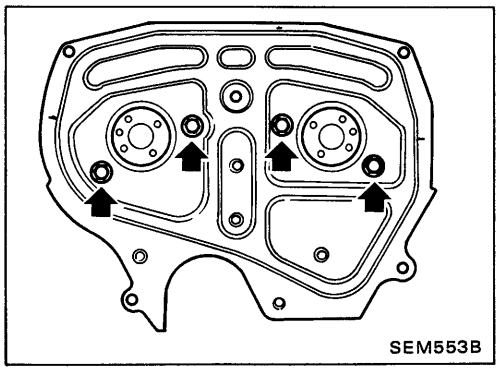
4. Apply engine oil to camshaft oil seal lip and install it in place.

Always use new camshaft oil seal.

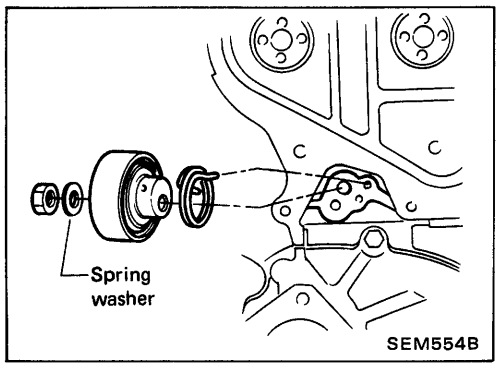
[O] : 9 - 12 N·m (0.9 - 1.2 kg-m, 6.5 - 8.7 ft-lb)



Tighten camshaft bracket bolts gradually in two or three stages.

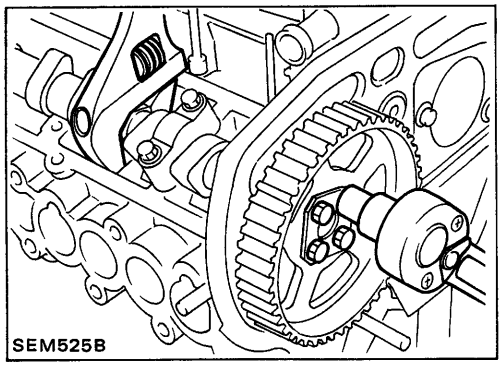

SEM553B

5. Install rear timing cover.
   : **7 - 8 N·m (0.7 - 0.8 kg-m, 5.1 - 5.8 ft-lb)**



SEM554B

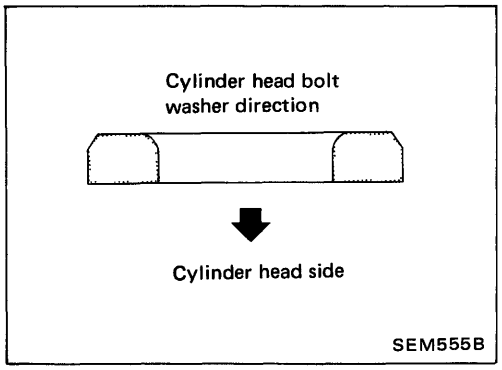
6. Install timing belt tensioner.
   Tensioner nut:
   : **22 - 29 N·m**
   (2.2 - 3.0 kg-m, 16 - 22 ft-lb)


SEM525B

7. Install camshaft sprockets.
   Sprocket bolt:
   : **14 - 19 N·m**
   (1.4 - 1.9 kg-m, 10 - 14 ft-lb)

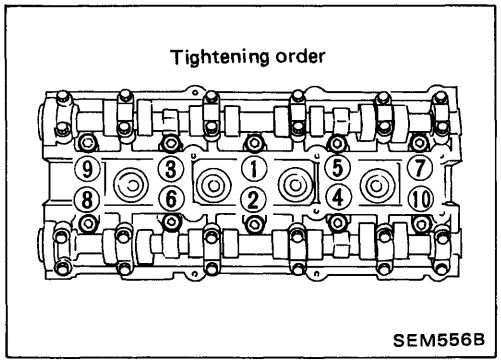
When tightening bolts, fix camshaft to prevent it from rotating.

8. Adjust timing belt tension.
   Refer to TIMING BELT.
9. Reinstall remaining parts.



1. Install cylinder head with new gasket.

Do not rotate crankshaft and camshaft separately, because valves will hit piston heads.

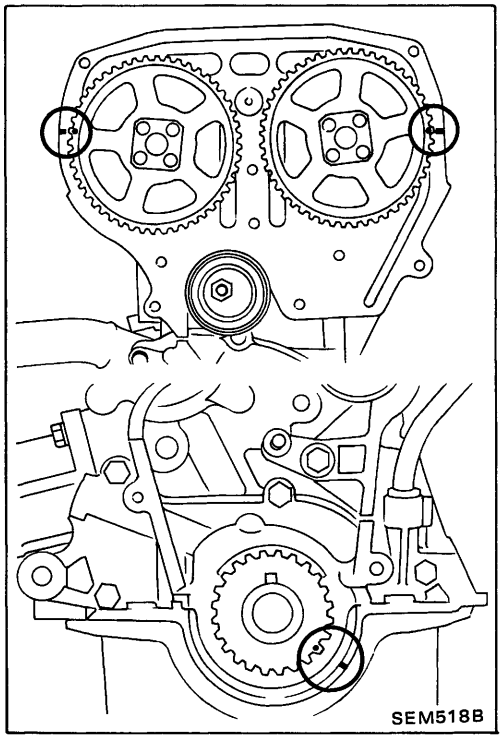


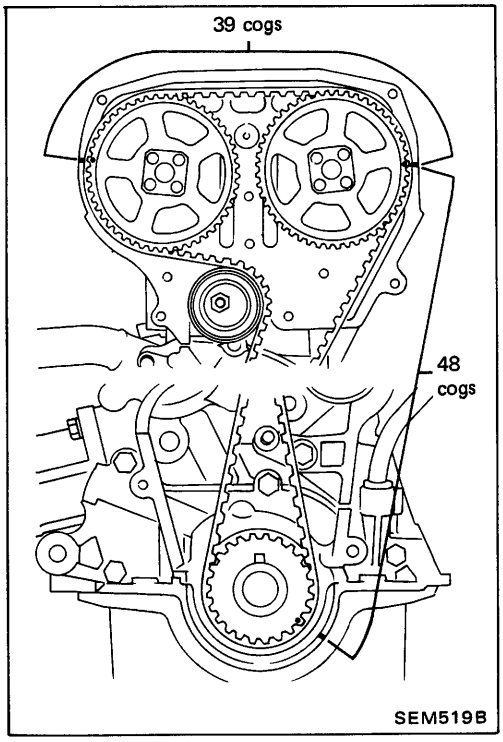
2. Apply oil to the thread portion and seat surface of bolts and tighten cylinder head bolts with washers.

- **Tightening procedure.**

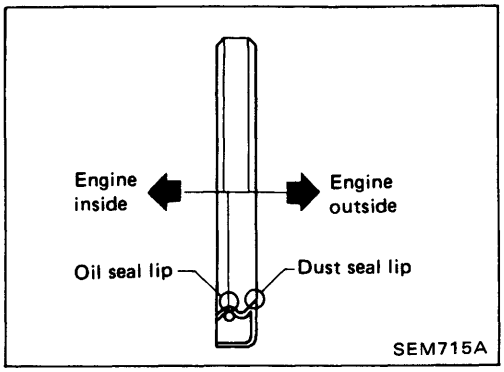
1st **Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).**
2nd **Tighten all bolts to 103 N·m (10.5 kg-m, 76 ft-lb).**
3rd **Loosen all bolts completely.**
4th **Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).**
5th **Tighten all bolts to 103 N·m (10.5 kg-m, 76 ft-lb) or if you have an angle wrench, tighten bolts 85 to 90 degrees clockwise.**

3. Confirm that No. 1 cylinder is set at T.D.C. on its compression stroke.

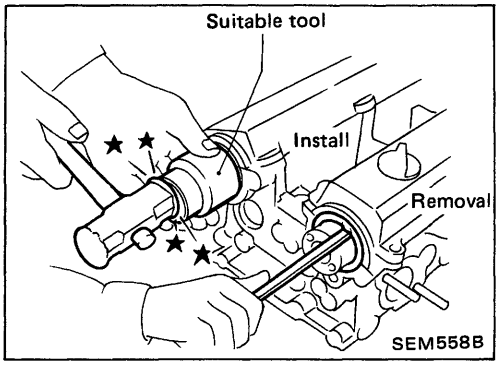




4. Install timing belt and adjust belt tension.
Refer to "TIMING BELT-Installation".
5. Install front timing belt covers and other remaining parts.



OIL SEAL INSTALLING DIRECTION

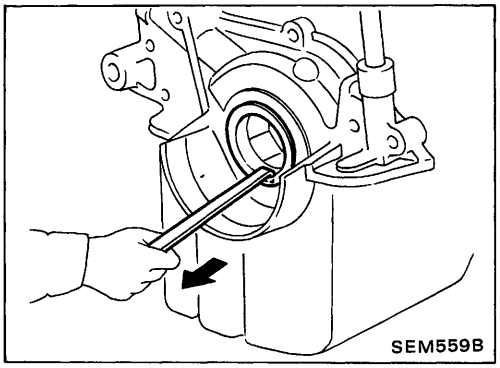


CAMSHAFT OIL SEAL

1. Set No. 1 piston at T.D.C. on its compression stroke.
2. Remove crank angle sensor, front cover, timing belt, camshaft sprockets and rear dust cover.
3. Remove camshaft oil seal.

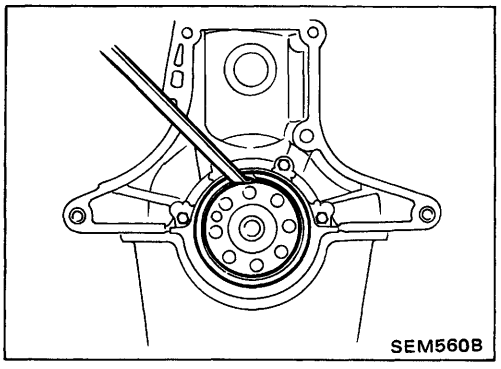
Be careful not to scratch camshaft.

4. Apply engine oil to camshaft oil seal lip and install it in place.



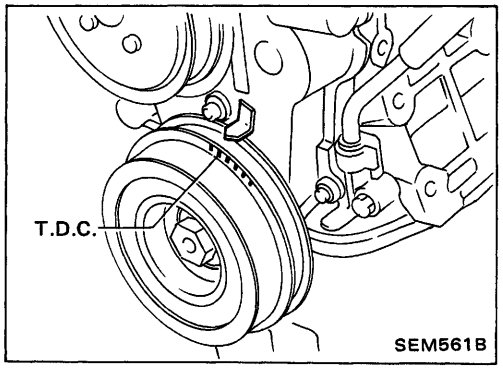
FRONT OIL SEAL

1. Set No. 1 piston at T.D.C. on its compression stroke.
2. Remove timing belt and crankshaft sprocket.
3. Remove front oil seal.
4. Apply engine oil to oil seal lip and install it in place using suitable tool.



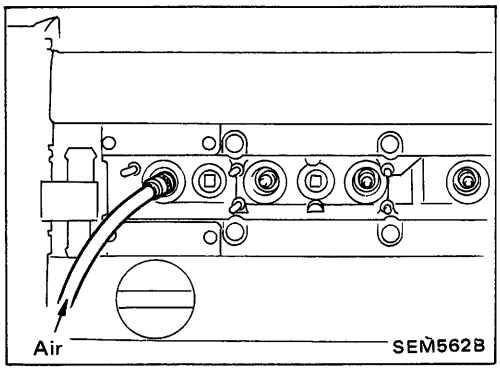
REAR OIL SEAL

1. Remove transaxle and flywheel.
2. Remove rear oil seal from the retainer.
3. Apply engine oil to oil seal lip and install it in place using suitable tool.

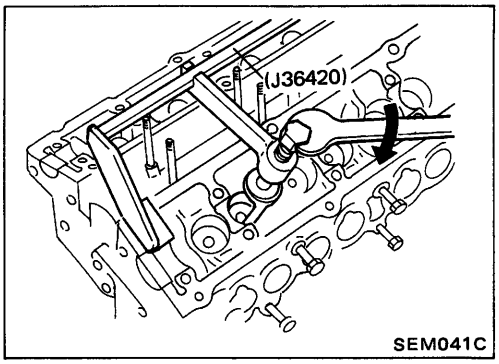


VALVE OIL SEAL

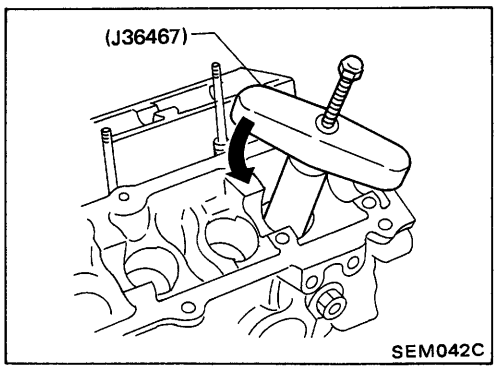
1. Set No. 1 piston at T.D.C. on its compression stroke.

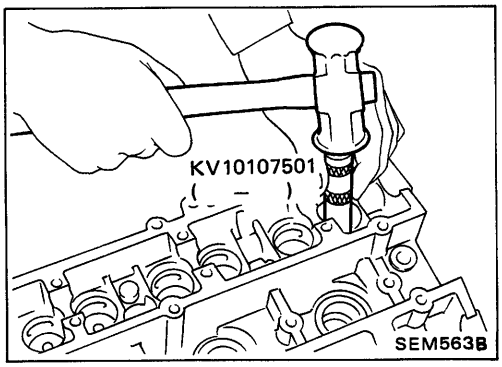


2. Remove throttle chamber and rocker covers.
3. Remove camshafts and valve lifters.
4. Remove spark plug.
5. Install air hose adapter into spark plug hole and apply air pressure to hold valves in place. [Apply pressure of 490 kPa (5 kg/cm², 71 psi)].

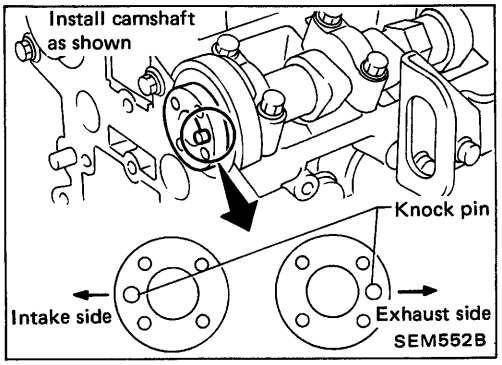


6. For No. 1 and No. 4 cylinders, remove valve springs and valve oil seals.

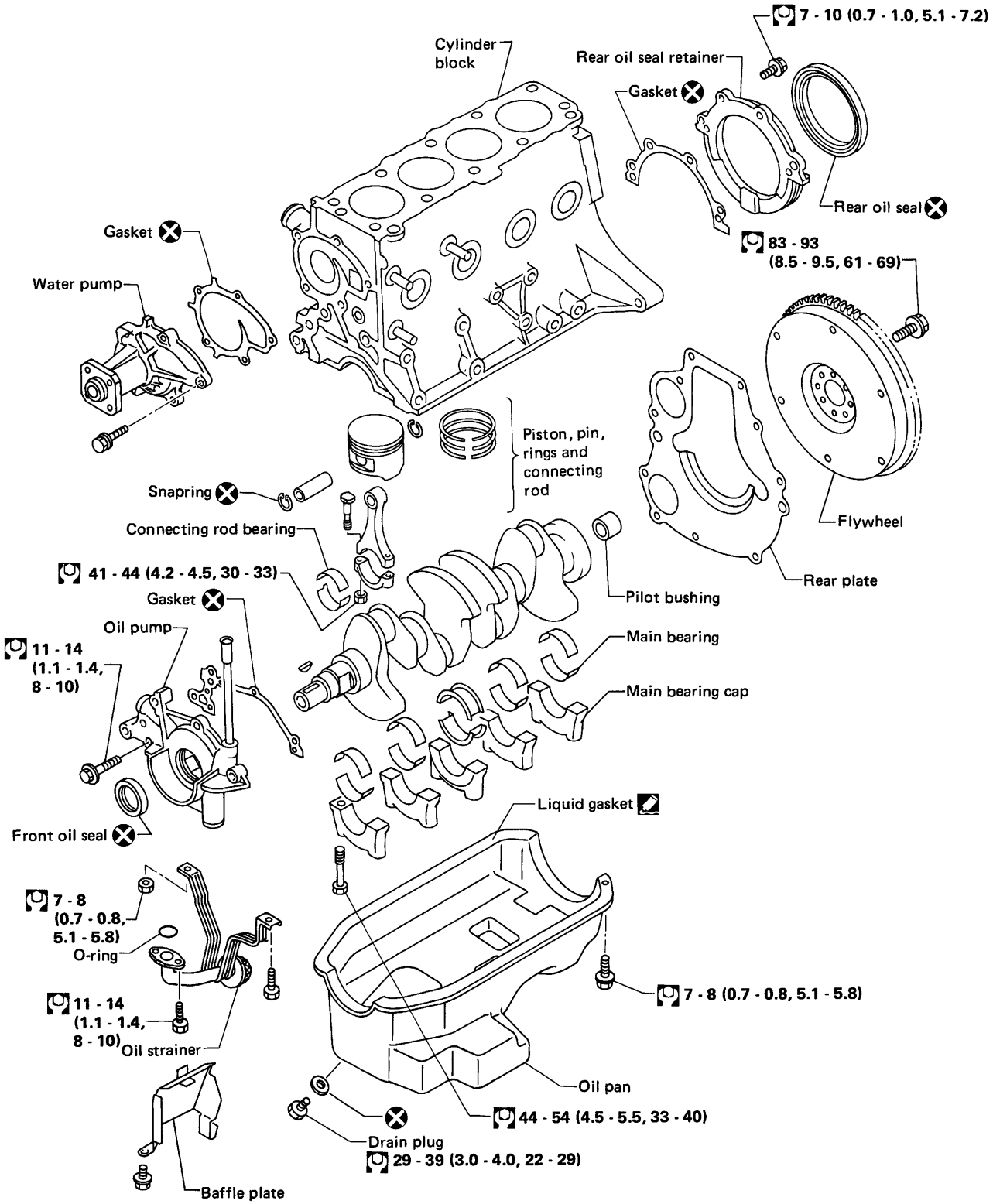




7. Apply engine oil to valve oil seal and install it in place.



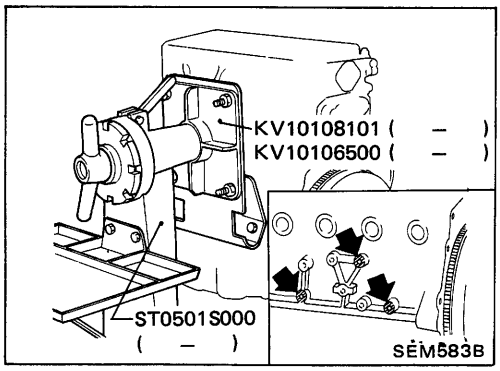
8. Assemble valve mechanism, camshafts and timing belt.
9. Reinstall remaining parts.



When installing sliding parts such as bearings, be sure to apply engine oil on the sliding surfaces.

: N·m (kg-m, ft-lb)

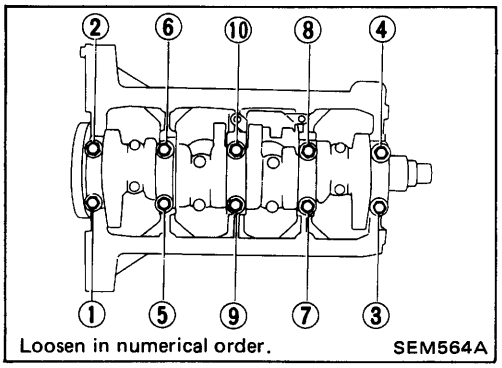
SEM564B



PISTON AND CRANKSHAFT

1. Place engine on work stand.
2. Drain coolant and oil.
3. Remove timing belt.
4. Remove water pump.
5. Remove oil pan and oil pump.
6. Remove cylinder head.
7. Remove pistons.

When disassembling piston and connecting rod, heat piston to 60 to 70°C (140 to 158°F) or use piston pin press stand at room temperature.



8. Remove bearing caps and crankshaft.

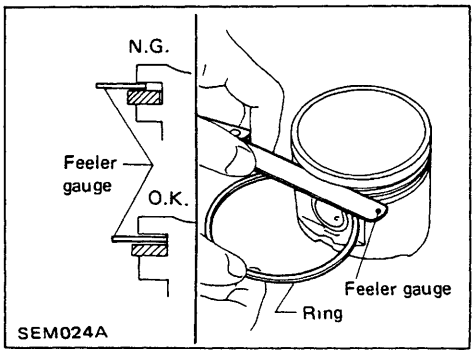
Place the bearings and caps in their proper order.

Upper bearings (cylinder block side) have oil groove.

PISTON AND PISTON PIN CLEARANCE

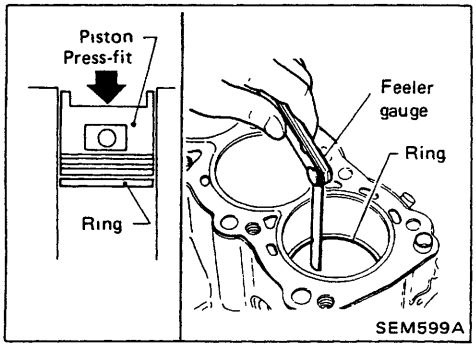
1. Measure outer diameter of piston pin and inner diameter of piston pin hole.
2. Calculate piston to piston pin clearance.

Pin diameter:
19.989 - 20.001 mm (0.7870 - 0.7874 in)
Pin hole diameter:
19.987 - 19.999 mm (0.7869 - 0.7874 in)
Clearance:
—0.004 to 0 mm (—0.0002 to 0 in)
(Interference fit)



PISTON RING SIDE CLEARANCE

Side clearance:
Top ring
0.040 - 0.073 mm (0.0016 - 0.0029 in)
2nd ring
0.030 - 0.063 mm (0.0012 - 0.0025 in)
Oil ring
0.015 - 0.185 mm (0.0006 - 0.0073 in)
Max. limit of side clearance (Top and 2nd rings):
0.2 mm (0.008 in)



PISTON RING GAP

Standard ring gap:
Top ring
0.25 - 0.48 mm (0.0098 - 0.0189 in)
2nd ring
0.38 - 0.64 mm (0.0150 - 0.0252 in)
Oil ring
0.20 - 0.76 mm (0.0079 - 0.0299 in)
Max. limit of ring gap:
1.0 mm (0.039 in)

If out of specification, replace piston ring. If gap still exceeds the limit even with a new ring, rebore the cylinder and use oversize piston/piston ring assembly.

Refer to S.D.S.

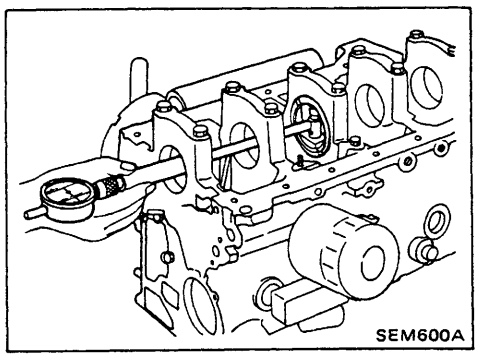
MAIN BEARING CLEARANCE

1. Install main bearings to cylinder block and main bearing cap.
2. Install main bearing cap to cylinder block.

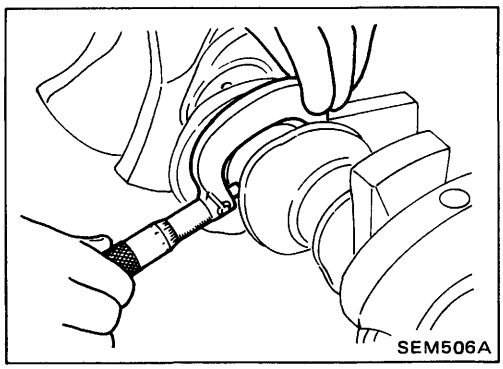
Tighten all bolts in two or three stages.

: 44 - 54 N·m (4.5 - 5.5 kg-m, 33 - 40 ft-lb)

3. Measure inside diameter "A" of main journal.



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GI88-020 (TS88-145)
Revised November 1988


SEM506A

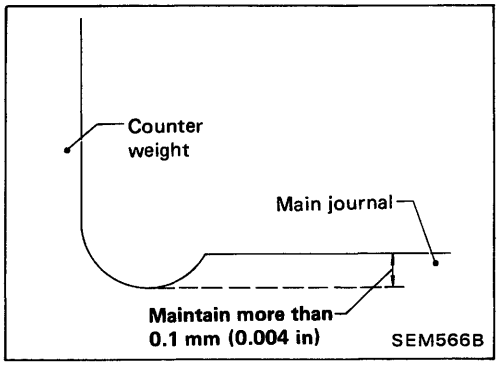
4. Measure outside diameter "Dm" of main journal of crankshaft.

Journal diameter:
52.951 - 52.975 mm (2.0847 - 2.0856 in)

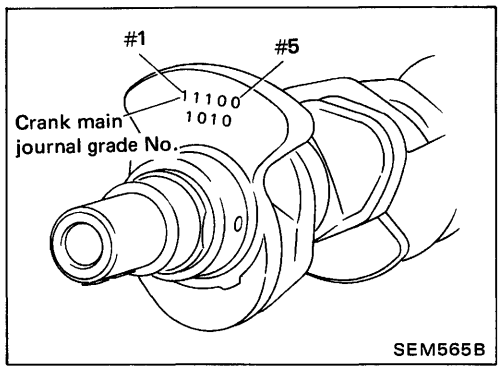
5. Calculate main bearing clearance.
Main bearing clearance = A — Dm

Standard: 0.021 - 0.048 mm (0.0008 - 0.0019 in)
Limit: 0.1 mm (0.004 in)

- If it exceeds the limit, replace the bearing.

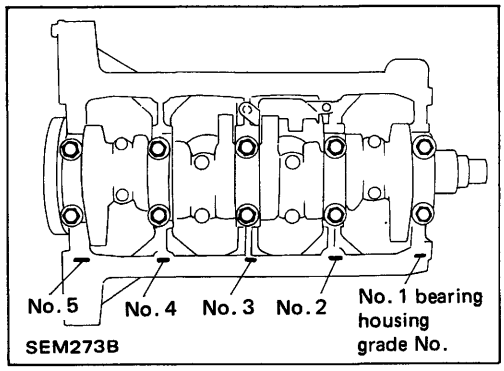


- If it still exceeds the limit even with a new bearing, regrind crank journal and use undersized bearings to maintain the specified oil clearance.
- **Refer to S.D.S. for regrinding crankshaft diameter and available service parts.**
- **When regrinding crank journal, do not grind fillet-roll.**



- **If either bearing, crankshaft or cylinder block is replaced with new one, select main bearing according to the following table.**

		Main bearing housing grade number		
		0	1	2
		Main bearing grade number		
Crankshaft main journal grade number	0	0	1	2
	1	1	2	3
	2	2	3	4



Identification color:
Grade 0: Black
Grade 1: Brown
Grade 2: Green
Grade 3: Yellow
Grade 4: Blue

For example:

Main journal grade number: 1
Crankshaft journal grade number: 2
Main bearing grade number = 1 + 2 = 3

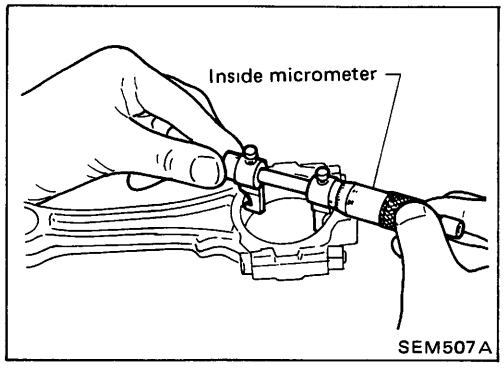
Main bearing thickness:
Refer to S.D.S.

CONNECTING ROD BEARING CLEARANCE (Big end)

1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.

Apply oil to the thread portion of bolts and seating surface of nuts.

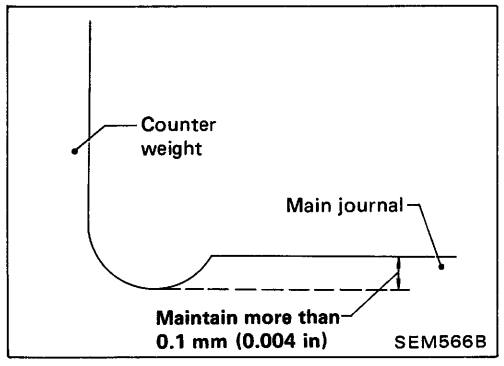
: **1st**
Tighten to 14 to 16 N·m (1.4 to 1.6 kg-m, 10 to 12 ft-lb).
2nd
Tighten to 41 to 44 N·m (4.2 to 4.5 kg-m, 30 to 33 ft-lb) or if you have an angle wrench, tighten bolts 60 to 65 degrees clockwise.

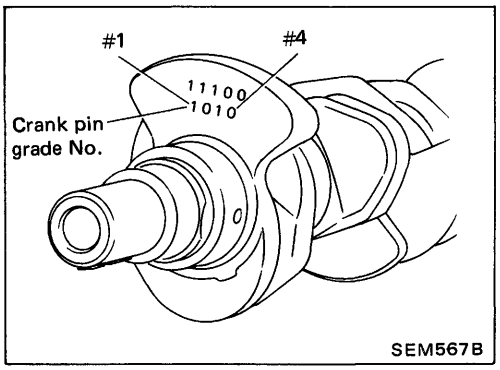


3. Measure inside diameter "C" of bearing.
4. Measure outside diameter "Dp" of crankshaft pin journal.
5. Calculate connecting rod bearing clearance.

Connecting rod bearing clearance = C — Dp
Standard: 0.018 - 0.045 mm (0.0007 - 0.0018 in)
Limit: 0.1 mm (0.004 in)

- If it exceeds the limit, replace the bearing.
- If it still exceeds the limit even with a new bearing, regrind crank pin and use undersized bearings to maintain the specified oil clearance.
- **Refer to S.D.S. for regrinding crankshaft pin and available service parts.**
- **When regrinding crank pin, do not grind fillet-roll.**

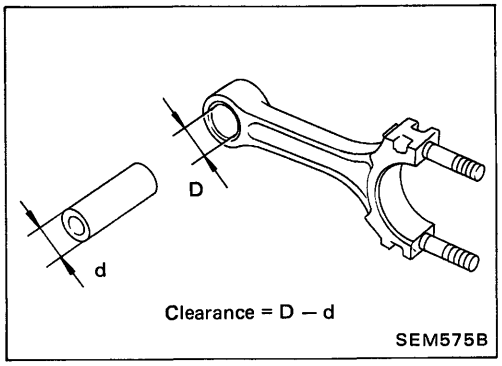




- **If either bearing, crankshaft or cylinder block is replaced with new one, select connecting rod bearing according to the following table.**

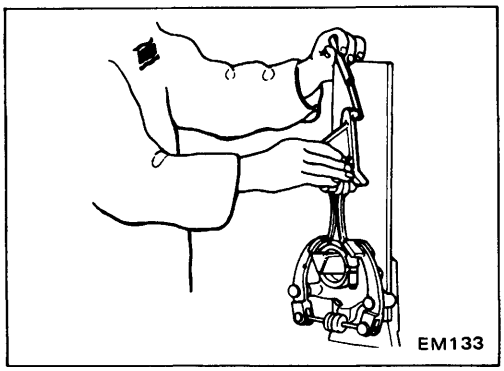
Crank pin grade number	Connecting rod bearing grade number
0	0
1	1
2	2

Identification color:
Grade 0: Black
Grade 1: Brown
Grade 2: Green



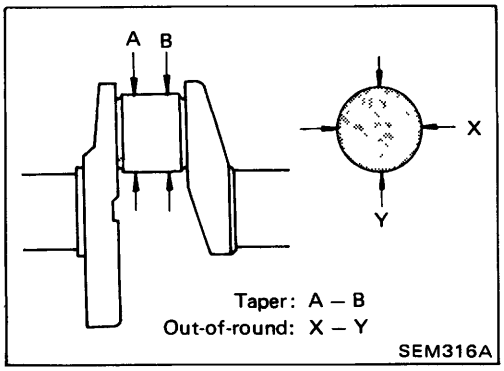
CONNECTING ROD BEARING CLEARANCE (Small end)

Clearance:
0.005 - 0.017 mm (0.0002 - 0.0007 in)



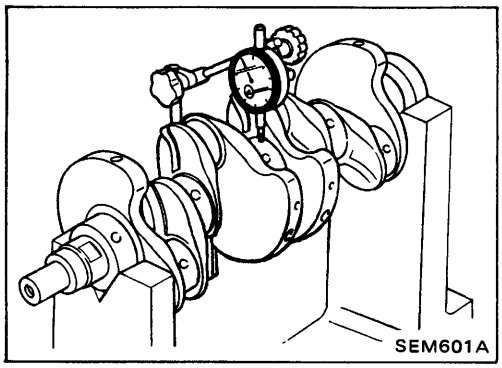
CONNECTING ROD BEND AND TORSION

Bend and torsion:
Limit 0.1 mm (0.004 in) per 100 mm (3.94 in) length

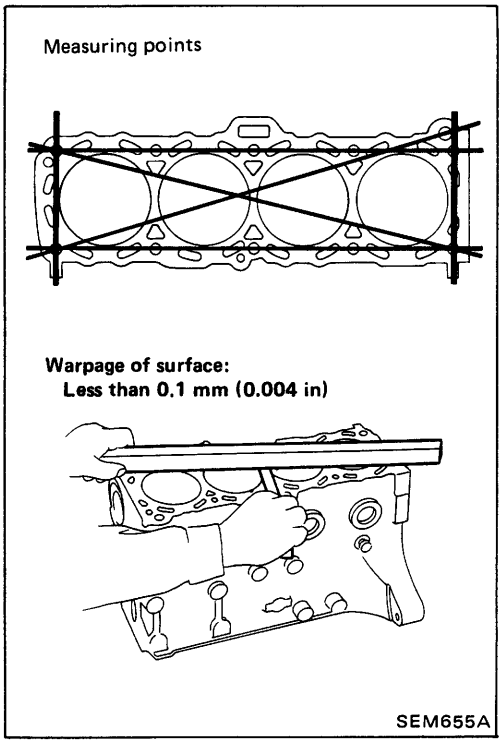


CRANKSHAFT

1. Check crankshaft journals for score, bias, wear or cracks. If faults are minor, correct with fine crocus cloth.
2. Check journals with a micrometer for taper and out-of-round.
   Out-of-round (X — Y):
   Less than 0.005 mm (0.0002 in)
   Taper (A — B):
   Less than 0.005 mm (0.0002 in)


SEM601A

3. Check crankshaft runout.
   Runout (Total indicator reading):
   Less than 0.025 mm (0.0010 in)



SEM655A

CYLINDER BLOCK DISTORTION

Clean upper face of cylinder block and measure the distortion.

Limit:
0.10 mm (0.0039 in)

If out of specification, resurface it.

The resurfacing limit of cylinder block is determined by the cylinder head resurfacing in an engine.

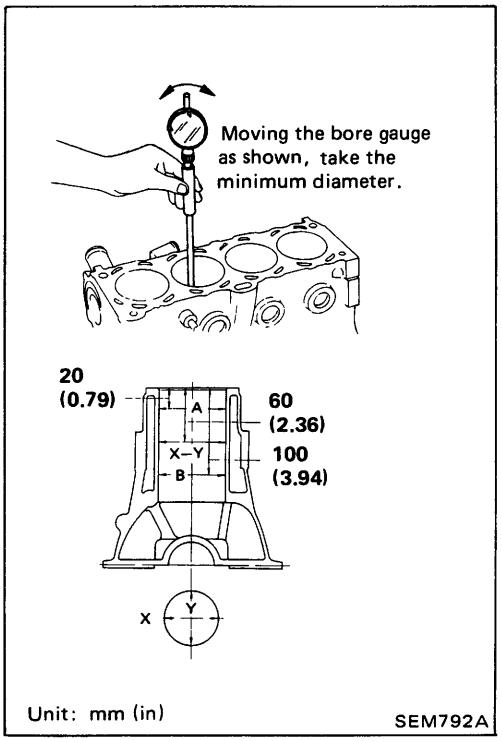
Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:
A + B = 0.2 mm (0.008 in)

If necessary, replace cylinder block.

Cylinder block height (Nominal):
204.75 - 204.85 mm (8.0610 - 8.0649 in)



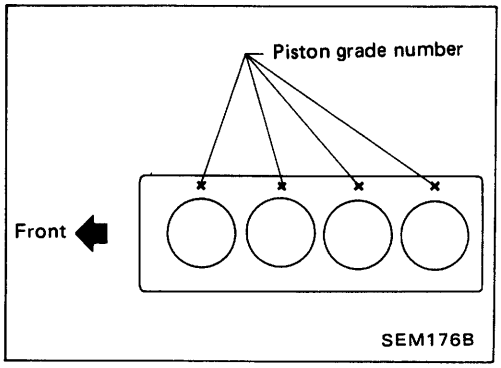
SEM792A

CYLINDER BORE

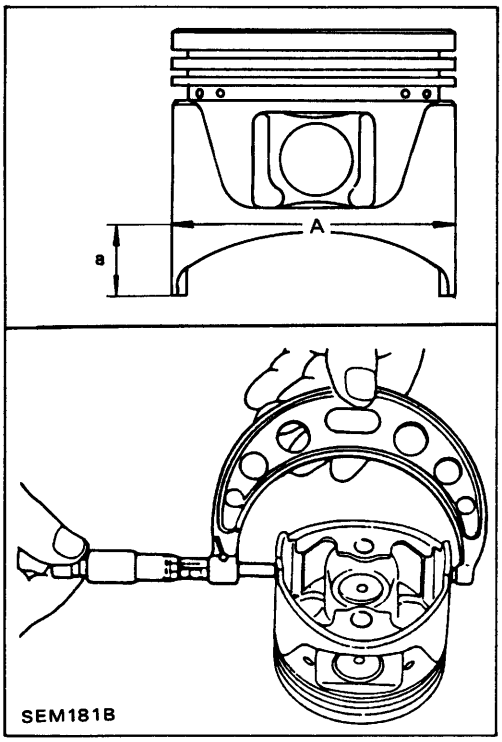
1. Using a bore gauge, measure cylinder bore for wear, out-of-round or taper.
   Standard inside diameter:
   83.00 - 83.05 mm (3.2677 - 3.2697 in)
   Wear limit:
   0.20 mm (0.0079 in)
   Out-of-round (X – Y) limit:
   0.015 mm (0.0006 in)
   Taper (A – B) limit:
   0.010 mm (0.0004 in)

If it exceeds the limit, rebore all four cylinders. Replace cylinder block if necessary.

- Check for scratches or seizure. If seizure is found, hone it.



- **If either cylinder block or piston is replaced with new one, select the same piston as piston grade number punched on cylinder block upper surfaces.**



2. The size to which cylinders must be honed, is determined by adding piston-to-cylinder clearance to the piston skirt diameter "A".

   Dimension "a":

   Approximately 14 mm (0.55 in)

   Rebored size calculation

   D = A + B − C = A + [0.005 to 0.025 mm (0.0002 to 0.0010 in)]

   where,

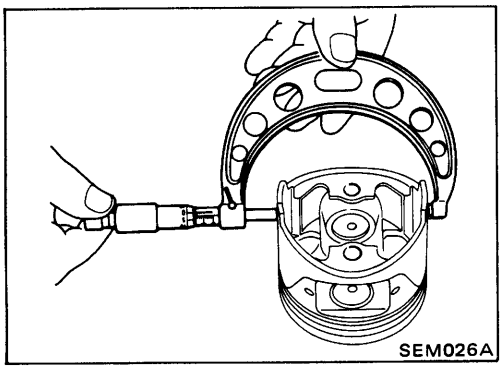
   D : Honed diameter
   A : Skirt diameter as measured
   B : Piston-to-wall clearance
   C : Machining allowance 0.02 mm (0.0008 in)

3. Install main bearing caps in place, and tighten to the specified torque to prevent distortion of the cylinder bores in final assembly.
4. Cut cylinder bores in the order of 2-4-1-3.

- **Do not cut too much out of the cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.**

5. Hone the cylinders to the required size referring to S.D.S.
6. Measure the finished cylinder bore for out-of-round and taper.

- **Measurement of a just machined cylinder bore requires utmost care since it is expanded by cutting heat.**



PISTON TO CYLINDER WALL CLEARANCE

Using micrometer

1. Measure piston and cylinder bore diameter.

   Piston diameter "A":

   Refer to S.D.S.

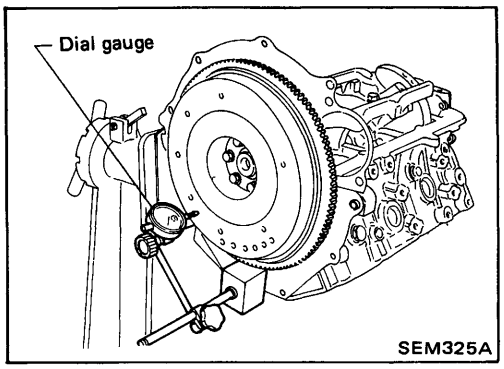
   Measuring point "a" (Distance from the bottom):

   Approximately 14 mm (0.55 in)

2. Check that piston clearance is within the specification.

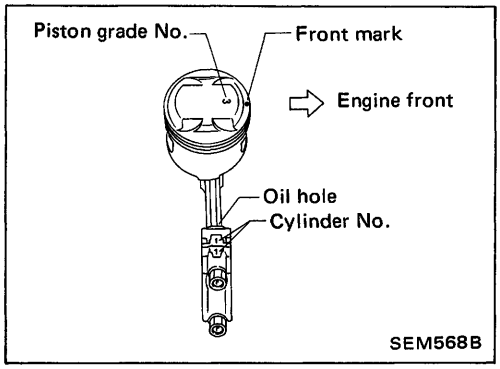
   Piston clearance:

   0.015 - 0.035 mm (0.0006 - 0.0014 in)



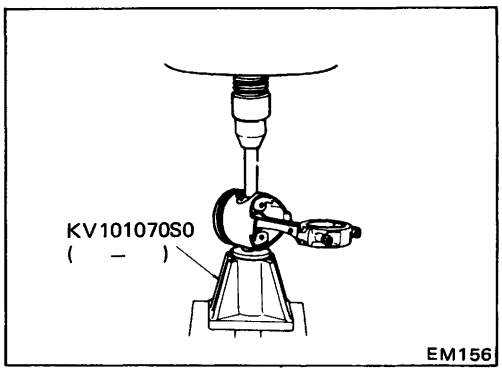
FLYWHEEL RUNOUT

Runout (Total indicator reading):
Less than 0.15 mm (0.0059 in)

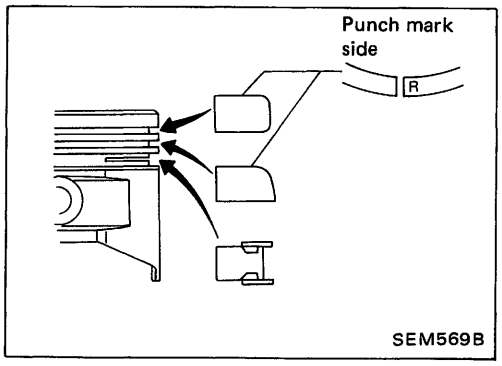


PISTON

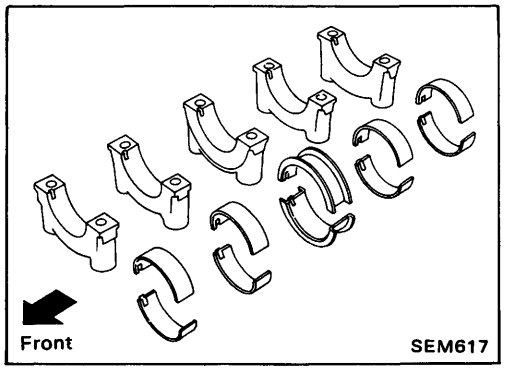
a. **Numbers stamped on the connecting rod and cap correspond to each cylinder. Care should be taken to avoid a wrong combination including bearing and connecting rod direction.**



b. **When pressing piston pin in connecting rod, apply engine oil to pin and small end of connecting rod.**
c. **After assembling, ascertain that piston swings smoothly.**



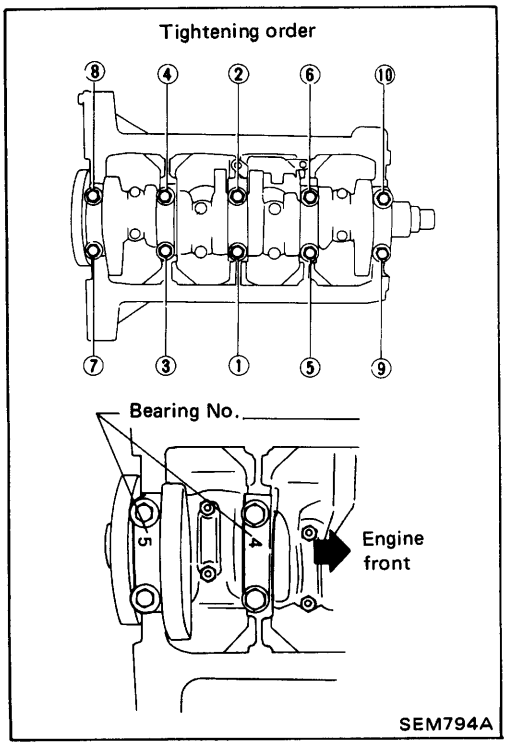
- Install piston rings.



CRANKSHAFT

1. Set main bearings in the proper position on cylinder block.

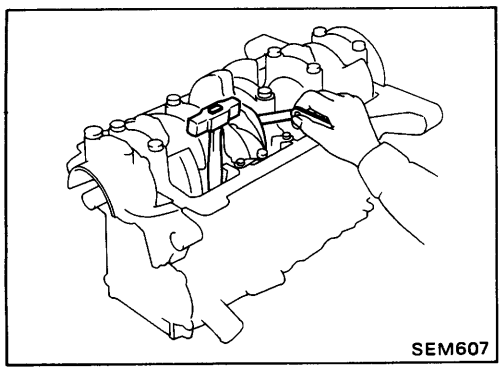
- **If either crankshaft, cylinder block or main bearing is reused again, it is necessary to measure main bearing clearance.**
- **Upper bearings (cylinder block side) have oil groove.**



2. Apply engine oil to main bearing surfaces on both sides of cylinder block and cap.
3. Install crankshaft and main bearing caps and tighten bolts to specified torque.

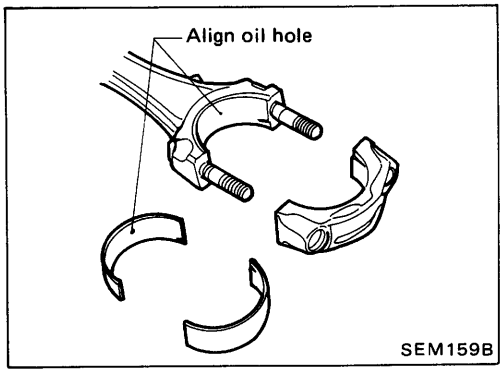
Main bearing cap bolt:
: 44 - 54 N·m
(4.5 - 5.5 kg-m, 33 - 40 ft-lb)

- **Arrange the parts so that the indicated number on bearing cap is in a row from the front of engine.**
- **Prior to tightening bearing cap bolts, place bearing cap in proper position by shifting crankshaft in the axial direction.**
- **Tighten bearing cap bolts gradually in separating two or three stages and outwardly from center bearing in sequence.**
- **After securing bearing cap bolts, ascertain that crankshaft turns smoothly.**



4. Measure crankshaft free end play at center bearing.

Crankshaft free end play:
Standard
0.05 - 0.18 mm (0.0020 - 0.0071 in)
Limit
0.30 mm (0.0118 in)



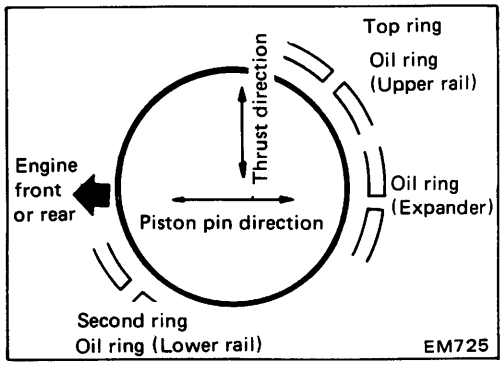
PISTON WITH CONNECTIONS ROD

1. Install connecting rod bearings in the connecting rods and connecting rod caps.

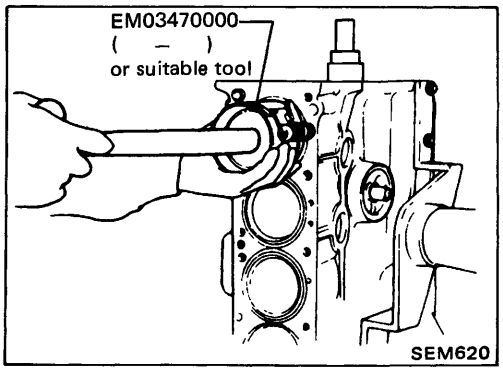
- Confirm that correct size of bearings are used.

Refer to "Inspection" of this section.

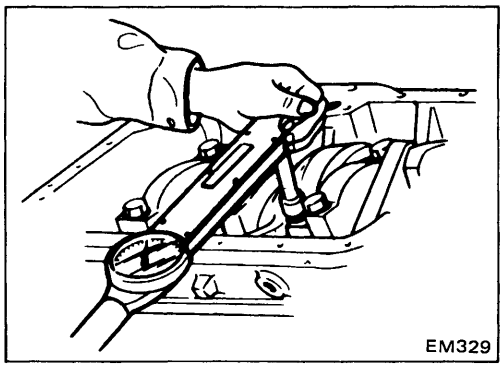
- Install the bearings so that the oil hole in the connecting rod aligns with the oil hole of the bearing.



- **Set piston ring as shown.**



2. Install pistons with connecting rods.
(1) Install them into corresponding cylinder using Tool.
- **Be careful not to scratch cylinder wall by connecting rod.**
- **Apply engine oil to cylinder wall, piston and bearing.**
- **Arrange so that the front mark on piston head faces to the front of engine.**



(2) Install connecting rod bearing caps.
- **Tighten in two stages.**

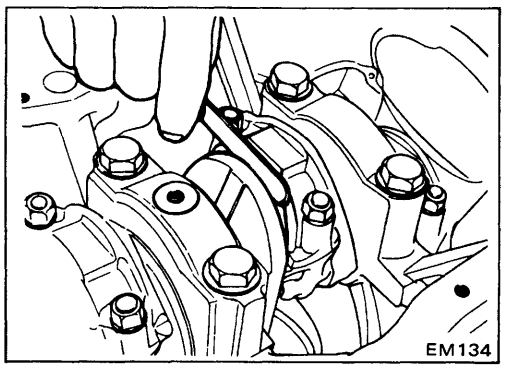
: Connecting rod bearing nut

1st

Tighten to 14 to 16 N·m (1.4 to 1.6 kg-m, 10 to 12 ft-lb).

2nd

Tighten to 41 to 44 N·m (4.2 to 4.5 kg-m, 30 to 33 ft-lb) or if you have an angle wrench, tighten bolts 60 to 65 degrees clockwise.



3. Measure connecting rod side clearance.

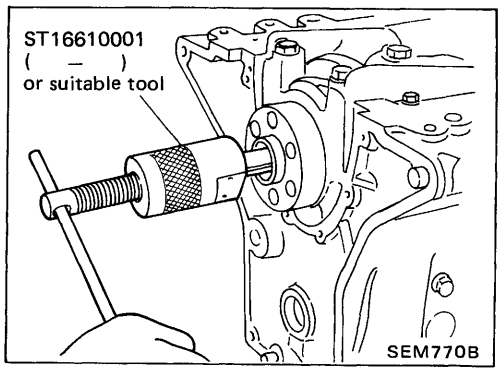
Connecting rod side clearance (Big end play):

Standard

0.20 - 0.35 mm (0.0079 - 0.0138 in)

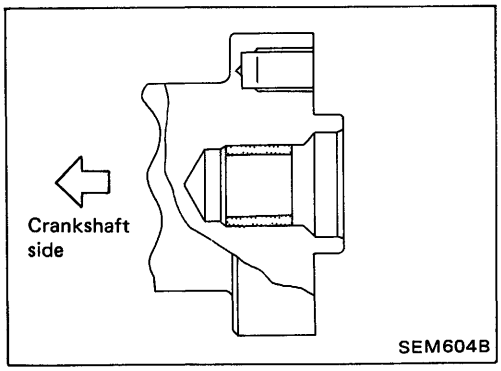
Limit

0.4 mm (0.016 in)



REPLACING PILOT BUSHING

1. Remove pilot bushing.



2. Install pilot bushing.

General Specifications

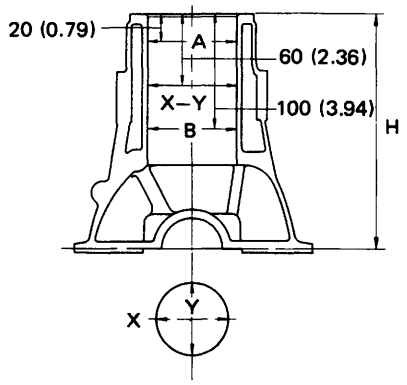
Engine model	CA18DE
Cylinder arrangement	4, in-line
Displacement cm^3 (cu in)	1,809 (110.39)
Bore x stroke mm (in)	83.0 x 83.6 (3.268 x 3.291)
Valve arrangement	D.O.H.C.
Firing order	1-3-4-2
Number of piston rings	
Compression	2
Oil	1
Number of main bearings	5
Compression ratio	10.0

Unit: kPa (kg/cm^2, psi)/rpm

Compression pressure	
Standard	1,373 (14.0, 199)/350
Minimum	1,177 (12.0, 171)/350
Differential limit between cylinders	98 (1.0, 14)/350

Inspection and Adjustment

CYLINDER BLOCK



SEM528A

Unit: mm (in)

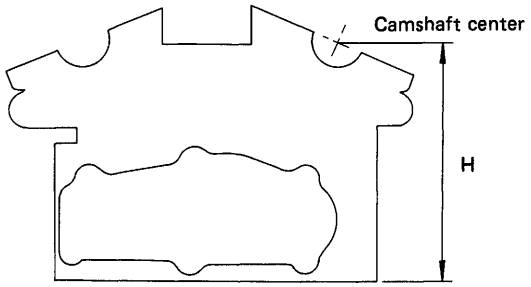
			Standard	Limit
			CA18DE	
Distortion			0.03 (0.0012)	0.1 (0.004)
Cylinder bore	Inner diameter	Grade 1	83.000 - 83.010 (3.2677 - 3.2681)	0.2 (0.008)*
		Grade 2	83.010 - 83.020 (3.2681 - 3.2685)	
		Grade 3	83.020 - 83.030 (3.2685 - 3.2689)	
		Grade 4	83.030 - 83.040 (3.2689 - 3.2693)	
		Grade 5	83.040 - 83.050 (3.2693 - 3.2697)	
	Out-of-round (X – Y)		Less than 0.015 (0.0006)	–
	Taper (A – B)		Less than 0.010 (0.0004)	–
Difference in inner diameter between cylinders			Less than 0.05 (0.0020)	0.2 (0.008)
Piston-to-cylinder clearance			0.015 - 0.035 (0.0006 - 0.0014)	–
Feeler gauge extracting force [With gauge thickness 0.04 mm (0.0016 in)]		N (kg, lb)	2.0 - 14.7 (0.2 - 1.5, 0.4 - 3.3)	–
Cylinder block height (From crankshaft center)		CA18DE	204.75 - 204.85 (8.0610 - 8.0649)	0.2 (0.008)**

* Wear limit

** Total amount of cylinder head resurfacing and cylinder block resurfacing

Inspection and Adjustment (Cont'd)

CYLINDER HEAD



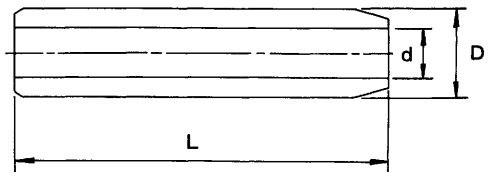
SEM570B

Unit: mm (in)

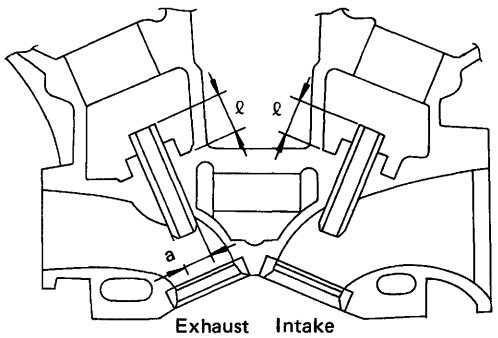
	Standard	Limit
Height (H)	125.9 - 126.1 (4.957 - 4.965)	0.2 (0.008)*
Surface distorsion	0.03 (0.0012)	0.1 (0.004)

*: Total amount of cylinder head resurfacing and cylinder block resurfacing

VALVE GUIDE



SEM571B

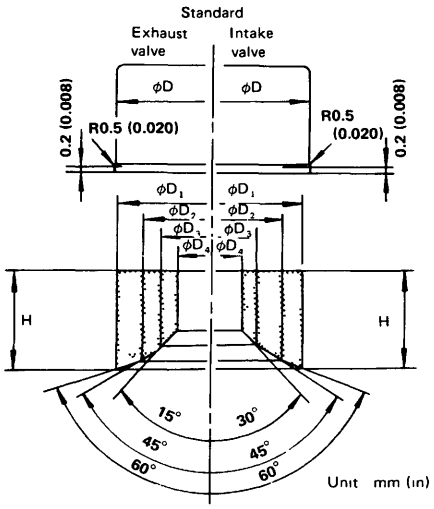


SEM572B

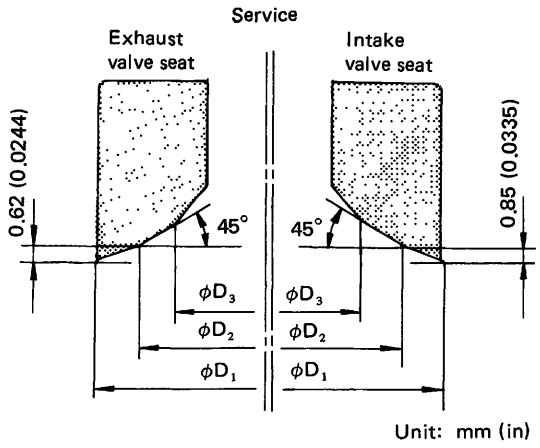
Unit: mm (in)

	Standard		Service		Limit
	Intake	Exhaust	Intake	Exhaust	–
Length (L)	40.1 (1.579)	43.1 (1.697)	40.1 (1.579)	43.1 (1.697)	–
Outer diameter (D)	10.023 - 10.034 (0.3946 - 0.3950)		10.223 - 10.234 (0.4025 - 0.4029)		–
Inner diameter (d) (Finished size)	6.000 - 6.018 (0.2362 - 0.2369)				–
Cylinder head hole diameter (a)	9.960 - 9.978 (0.3921 - 0.3928)	9.975 - 9.996 (0.3927 - 0.3935)	10.185 - 10.196 (0.4010 - 0.4014)		–
Interference fit	0.045 - 0.074 (0.0018 - 0.0029)	0.027 - 0.059 (0.0011 - 0.0023)	0.027 - 0.049 (0.0011 - 0.0019)		–
Stem to guide clearance	0.020 - 0.053 (0.0008 - 0.0021)	0.040 - 0.073 (0.0016 - 0.0029)	0.020 - 0.053 (0.0008 - 0.0209)	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)
Tapping length (ℓ)	15.1 - 15.3 (0.594 - 0.602)				–

Inspection and Adjustment (Cont'd)



SEM573B



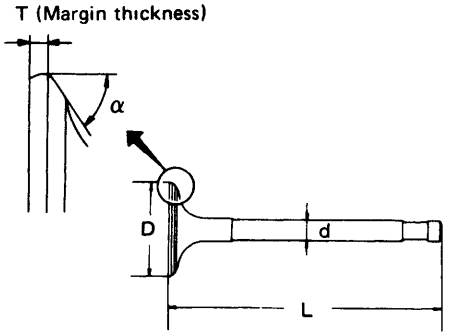
SEM542B

Unit: mm (in)

	Standard		Service	
	Intake	Exhaust	Intake	Exhaust
Cylinder head seat recess diameter (D)	36.000 - 36.016 (1.4173 - 1.4179)	30.000 - 30.016 (1.1811 - 1.1817)	36.500 - 36.516 (1.4370 - 1.4376)	30.500 - 30.516 (1.2008 - 1.2014)
Valve seat outer diameter (D_1)	36.9 (1.453)	31.0 (1.220)	36.9 (1.453)	31.0 (1.220)
Face outer diameter (D_2)	33.6 - 33.8 (1.323 - 1.331)	27.4 - 27.6 (1.079 - 1.087)	33.6 - 33.8 (1.323 - 1.331)	27.4 - 27.6 (1.079 - 1.087)
Face inner diameter (D_3)	31.5 (1.240)	24.9 (0.980)	31.5 (1.240)	24.9 (0.980)
Valve seat inner diameter (D_4)	27.85 - 28.15 (1.0965 - 1.1083)	22.85 - 23.15 (0.8996 - 0.9114)	27.85 - 28.15 (1.0965 - 1.1083)	22.85 - 23.15 (0.8996 - 0.9114)
Height (H)	5.9 - 6.0 (0.232 - 0.236)			

Inspection and Adjustment (Cont'd)

VALVE



SEM188A

Unit: mm (in)

Engine model		CA18DE	Limit
Valve head diameter (D)	In.	34.0 - 34.2 (1.339 - 1.346)	–
	Ex.	28.0 - 28.2 (1.102 - 1.110)	–
Valve length (L)	In.	88.8 - 89.0 (3.496 - 3.504)	–
	Ex.	89.2 - 89.4 (3.512 - 3.520)	–
Valve stem diameter (d)	In.	5.965 - 5.980 (0.2348 - 0.2354)	–
	Ex.	5.945 - 5.960 (0.2341 - 0.2346)	–
Valve face angle (α)	In.	45°30'	–
	Ex.	45°30'	–
Valve head margin (T)	In.	1.3 (0.051)	0.5 (0.020)
	Ex.	1.5 (0.059)	

VALVE SPRING

Unit: mm (in)

	Standard	Limit
Free height (H)	43.1 (1.697)	–
Spring constant N/mm (kg/mm, lb/in)	28.4 (2.9, 162)	–
Out-of-square (S)	–	1.8 (0.071)

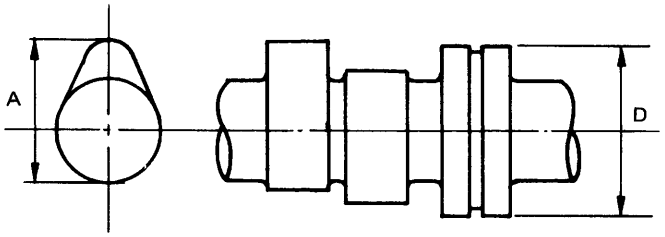
HYDRAULIC VALVE LIFTER

Unit: mm (in)

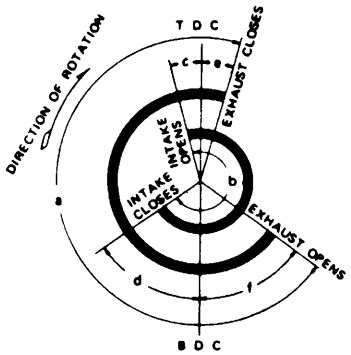
Valve lifter diameter	30.955 - 30.965 (1.2187 - 1.2191)
Lifter guide bore diameter	31.000 - 31.013 (1.2205 - 1.2210)

Inspection and Adjustment (Cont'd)

CAMSHAFT AND CAMSHAFT BEARING



SEM568A



EM120

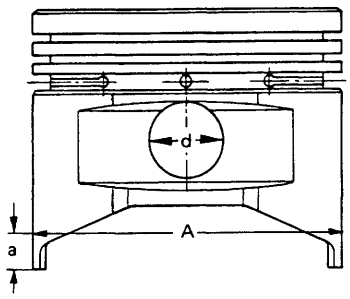
Unit: mm (in)

Engine model		CA18DE	
		Standard	Limit
Cam height (A)	In.	40.485 - 40.515 (1.5939 - 1.5951)	–
	Ex.	40.485 - 40.515 (1.5939 - 1.5951)	–
Valve lift (h)	In.	8.5 (0.335)	–
	Ex.	8.5 (0.335)	–
Wear limit of cam height		–	0.2 (0.008)
Camshaft journal to bearing clearance		0.045 - 0.090 (0.0018 - 0.0035)	0.15 (0.0059)
Inner diameter of camshaft bearing		28.000 - 28.025 (1.1024 - 1.1033)	–
Outer diameter of camshaft journal (D)		27.935 - 27.955 (1.0998 - 1.1006)	–
Camshaft runout		–	0.05 (0.0020)
Camshaft end play		0.07 - 0.15 (0.0028 - 0.0059)	0.2 (0.008)
Valve timing (Degree on crankshaft)	a	248	–
	b	248	–
	c	15	–
	d	53	–
	e	9	–
	f	59	–

Inspection and Adjustment (Cont'd)

PISTON, PISTON RING AND PISTON PIN

Piston



SEM569A

Unit: mm (in)

Engine model			CA18DE
Piston skirt diameter (A)	Standard	Grade No. 1	82.975 - 82.985 (3.2667 - 3.2671)
		Grade No. 2	82.985 - 82.995 (3.2671 - 3.2675)
		Grade No. 3	82.995 - 83.005 (3.2675 - 3.2679)
		Grade No. 4	83.005 - 83.015 (3.2679 - 3.2683)
		Grade No. 5	83.015 - 83.025 (3.2683 - 3.2687)
	Service (Oversize)	0.5 (0.020)	83.475 - 83.525 (3.2864 - 3.2884)
		1.0 (0.039)	83.975 - 84.025 (3.3061 - 3.3081)
Dimension (a)			Approximately 14 (0.55)
Piston pin hole diameter (d)			19.987 - 19.999 (0.7869 - 0.7874)
Piston-to-cylinder bore clearance			0.015 - 0.035 (0.0006 - 0.0014)

Piston pin

Unit: mm (in)

	CA18DE
Piston pin outer diameter	19.989 - 20.001 (0.7870 - 0.7874)
Interference fit of piston pin to piston pin hole clearance	0 - 0.004 (0 - 0.0002)
Piston pin to connecting rod bearing clearance	0.005 - 0.017 (0.0002 - 0.0007)

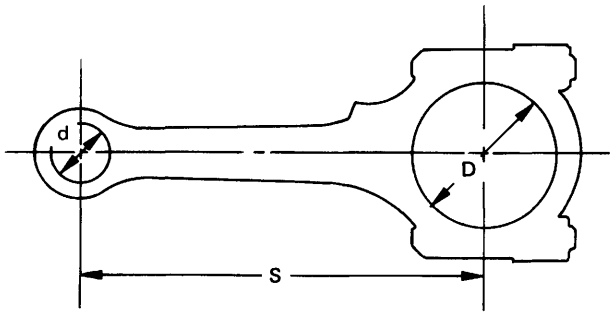
Piston ring

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)
	2nd	0.030 - 0.063 (0.0012 - 0.0025)	0.1 (0.004)
	Oil	0.015 - 0.185 (0.0006 - 0.0073)	0.2 (0.008)
Ring gap	Top	0.25 - 0.48 (0.0098 - 0.0189)	1.0 (0.039)
	2nd	0.38 - 0.64 (0.0150 - 0.0252)	1.0 (0.039)
	Oil (rail ring)	0.20 - 0.76 (0.0079 - 0.0299)	1.0 (0.039)

Inspection and Adjustment (Cont'd)

CONNECTING ROD



SEM570A

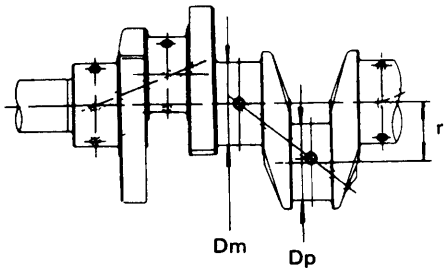
Unit: mm (in)

Engine model	CA18DE	
	Standard	Limit
Center distance (S)	132.95 - 133.05 (5.2342 - 5.2382)	–
Bend [per 100 mm (3.94 in)]	–	0.1 (0.004)
Torsion [per 100 mm (3.94 in)]	–	0.1 (0.004)
Piston pin bore diameter (d)*	22.987 - 23.000 (0.9050 - 0.9055)	–
Clearance between piston pin and bearing	0.005 - 0.017 (0.0002 - 0.0007)	–
Crank pin bore diameter (D)*	48.000 - 48.013 (1.8898 - 1.8903)	–
Clearance between crank pin and bearing	0.018 - 0.045 (0.0007 - 0.0018)	–
Big end play	–	0.4 (0.016)

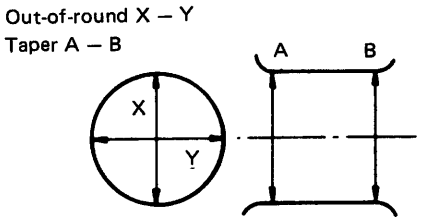
* Without bearing

Inspection and Adjustment (Cont'd)

CRANKSHAFT



EM737



EM715

Unit: mm (in)

Engine model	CA18DE	
Main journal diameter (Dm)	52.951 - 52.975 (2.0847 - 2.0856)	
Pin journal diameter (Dp)	44.954 - 44.974 (1.7698 - 1.7706)	
Center distance (r)	41.77 - 41.83 (1.6445 - 1.6468)	
	Standard	Limit
Taper of journal and pin (A – B)	–	0.005 (0.0002)
Out-of-round of journal and pin (X – Y)	–	0.005 (0.0002)
Runout [T.I.R.] *	–	0.025 (0.0010)
Free end play	0.05 - 0.18 (0.0020 - 0.0071)	0.3 (0.012)

* Total indicator reading

Inspection and Adjustment (Cont'd)

BEARING CLEARANCE

Unit: mm (in)

	Standard	Limit
Main bearing clearance	0.021 - 0.048 (0.0008 - 0.0019)	0.1 (0.004)
Connecting rod bearing clearance	0.018 - 0.045 (0.0007 - 0.0018)	0.1 (0.004)

AVAILABLE MAIN BEARING

Standard

Grade number	Thickness mm (in)	Identification color
0	1.825 - 1.829 (0.0719 - 0.0720)	Black
1	1.829 - 1.833 (0.0720 - 0.0722)	Brown
2	1.833 - 1.837 (0.0722 - 0.0723)	Green
3	1.837 - 1.841 (0.0723 - 0.0725)	Yellow
4	1.841 - 1.845 (0.0725 - 0.0726)	Blue

Undersize (service)

Unit: mm (in)

	Thickness	Main journal diameter "Dm"
0.25 (0.0098)	1.947 - 1.960 (0.0767 - 0.0772)	Grind so that bearing clearance is the specified value.

AVAILABLE CONNECTING ROD BEARING

Standard

Grade number	Thickness mm (in)	Identification color
0	1.501 - 1.504 (0.0591 - 0.0592)	–
1	1.504 - 1.507 (0.0592 - 0.0593)	Brown
2	1.507 - 1.510 (0.0593 - 0.0594)	Green

Undersize (service)

Unit: mm (in)

	Thickness	Crank pin journal diameter "Dp"
0.08 (0.0031)	1.540 - 1.548 (0.0606 - 0.0609)	Grind so that bearing clearance is the specified value.
0.12 (0.0047)	1.560 - 1.568 (0.0614 - 0.0617)	
0.25 (0.0098)	1.625 - 1.633 (0.0640 - 0.0643)	

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Camshaft sprocket runout [T.I.R.] *	Less than 0.1 (0.004)
Flywheel runout [T.I.R.] *	Less than 0.15 (0.0059)

* Total indicator reading

Tightening Torque

Unit	N·m	kg-m	ft-lb
ENGINE FRONT SIDE			
Timing belt tensioner nut	22 - 29	2.2 - 3.0	16 - 22
Timing belt idler pulley nut	31 - 42	3.2 - 4.3	23 - 31
Crank angle sensor	7 - 8	0.7 - 0.8	5.1 - 5.8
Crank pulley bolt	142 - 152	14.5 - 15.5	105 - 112
INTAKE SIDE			
Intake manifold to cylinder head	20 - 25	2.0 - 2.6	14 - 19
Intake manifold collector to manifold	20 - 25	2.0 - 2.6	14 - 19
E.G.R. tube nut	34 - 44	3.5 - 4.5	25 - 33
Exhaust gas temperature sensor	15 - 25	1.5 - 2.5	11 - 18
Throttle chamber	18 - 22	1.8 - 2.2	13 - 16
E.G.R. valve	18 - 23	1.8 - 2.3	13 - 17
Air regulator valve	5 - 6	0.5 - 0.6	3.6 - 4.3
EXHAUST SIDE			
Exhaust manifold to cylinder head	37 - 48	3.8 - 4.9	27 - 35
Exhaust manifold to exhaust front tube	42 - 48	4.3 - 4.9	31 - 35
Exhaust gas sensor	40 - 50	4.1 - 5.1	30 - 37

Unit	N·m	kg-m	ft-lb
ENGINE TOP SIDE			
Cylinder head bolt (Refer to CYLINDER HEAD Installation.)	103	10.5	76
Camshaft pulley bolt	14 - 19	1.4 - 1.9	10 - 14
Camshaft bracket bolt	10 - 12	1.0 - 1.2	7 - 9
Spark plug	20 - 29	2.0 - 3.0	14 - 22
Water temperature sensor	20 - 29	2.0 - 3.0	14 - 22
ENGINE BOTTOM SIDE			
Main bearing cap bolt	44 - 54	4.5 - 5.5	33 - 40
Connecting rod cap bolt (Refer to ENGINE OVERHAUL.)	41 - 44	4.2 - 4.5	30 - 33
Water drain plug on cylinder block	54 - 74	5.5 - 7.5	40 - 54
Oil pan	7 - 8	0.7 - 0.8	5.1 - 5.8
Oil pan drain plug	29 - 39	3.0 - 4.0	22 - 29
ENGINE REAR SIDE			
Flywheel bolt	83 - 93	8.5 - 9.5	61 - 69

ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

CONTENTS

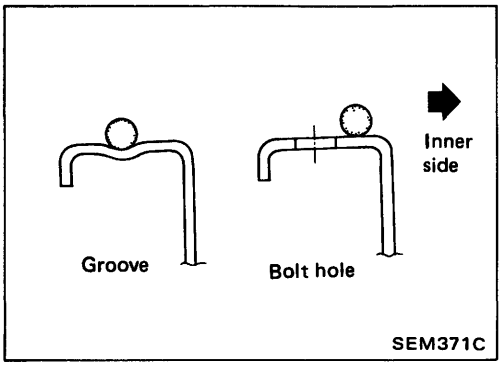
PRECAUTION ..... LC- 2
PREPARATION ..... LC- 3

GA16i

ENGINE LUBRICATION SYSTEM ..... LC- 4
ENGINE COOLING SYSTEM ..... LC- 8
RADIATOR AND CONDENSER FAN MOTOR ELECTRICAL CIRCUIT LC-15
SERVICE DATA AND SPECIFICATIONS (S.D.S.) LC-20

CA18DE

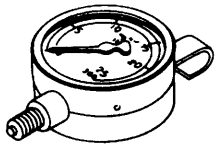
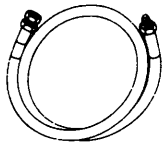
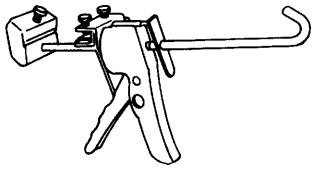
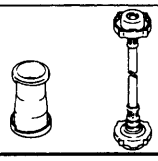
ENGINE LUBRICATION SYSTEM LC-21
ENGINE COOLING SYSTEM LC-25
SERVICE DATA AND SPECIFICATIONS (S.D.S.) LC-30



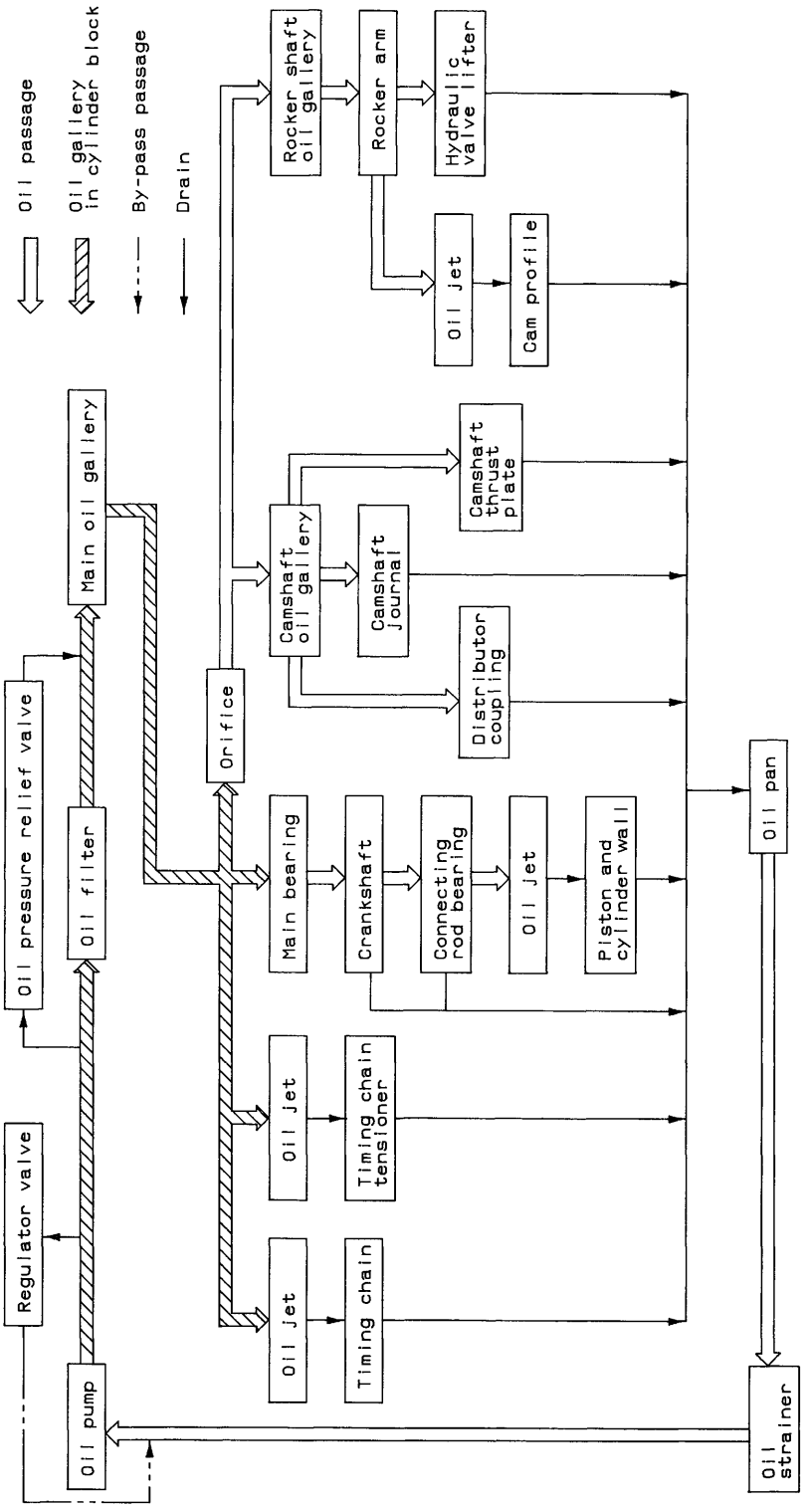
LIQUID GASKET APPLICATION PROCEDURE

a. Before applying liquid gasket, remove all traces of old liquid gasket from mating surface using a scraper.
b. Apply a continuous bead of liquid gasket to mating surface. (Use Genuine Liquid Gasket or equivalent.)
c. Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide (for oil pan).
   Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).
d. Apply liquid gasket to inner sealing surface around hole perimeter area.
   (Attaching should be done within 5 minutes after coating at least 30 minutes after installing.)

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
ST25051001 (J25695-1) Oil pressure gauge		
ST25052000 (J25695-2) Hose		Adapting oil pressure gauge to cylinder block
WS39930000 (—) Tube presser		Pressing the tube of liquid gasket
EG17650301 (—) Radiator cap tester adapter		Adapting radiator cap tester to radiator filler neck

Lubrication Circuit

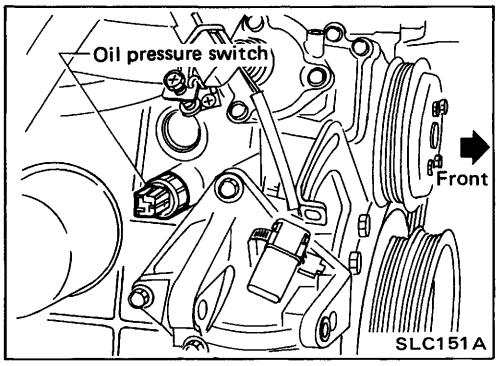


SLC150A

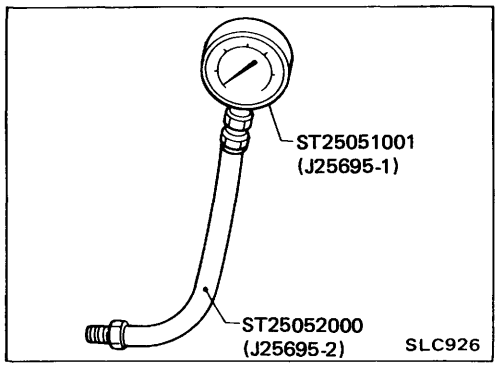
Oil Pressure Check

WARNING:

- **Be careful not to burn yourself, as the engine and oil may hot.**
- **Oil pressure check should be done in "Neutral" gear position.**



1. Check oil level.
2. Remove oil pressure switch.



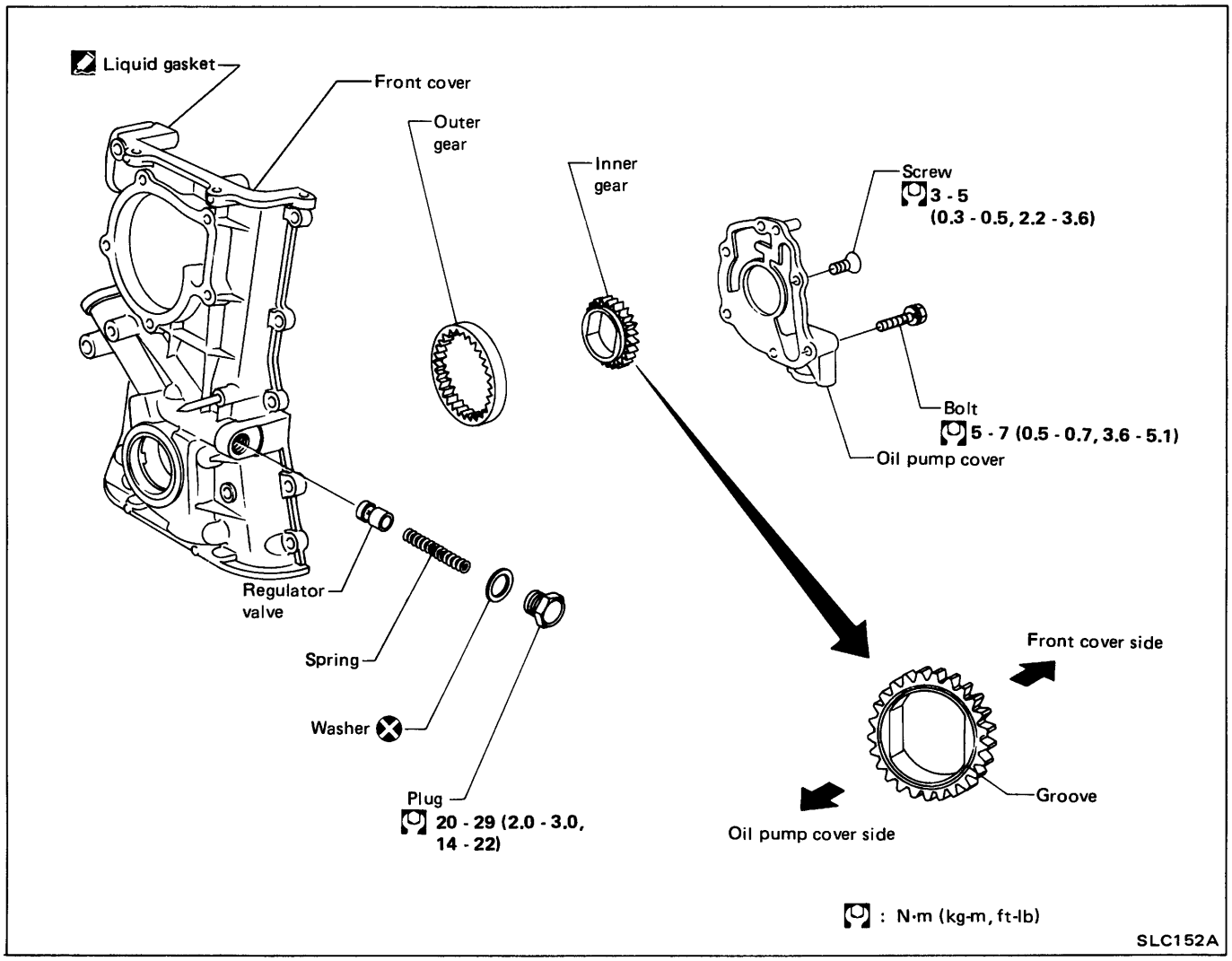
Engine speed rpm	Approximate discharge pressure kPa (kg/cm^2, psi)
Idle speed (800)	49 - 186 (0.5 - 1.9, 7 - 27)
3,000	392 - 490 (4.0 - 5.0, 57 - 71)

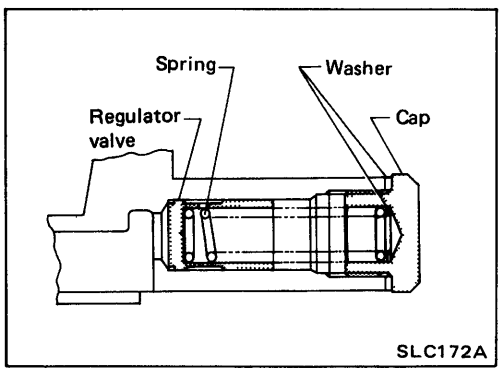
3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

If difference is extreme, check oil passage and oil pump for oil leaks.

6. Install oil pressure switch with sealant.

Oil Pump





REGULATOR VALVE INSPECTION

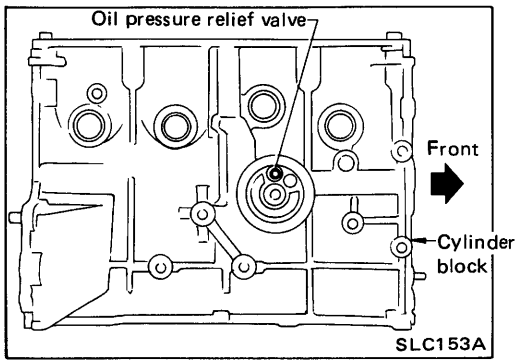
1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Apply regulator valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump assembly.

Oil Pump (Cont'd)

OIL PRESSURE RELIEF VALVE INSPECTION

Inspect oil pressure relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with suitable tool.
Install a new valve in place by tapping it.

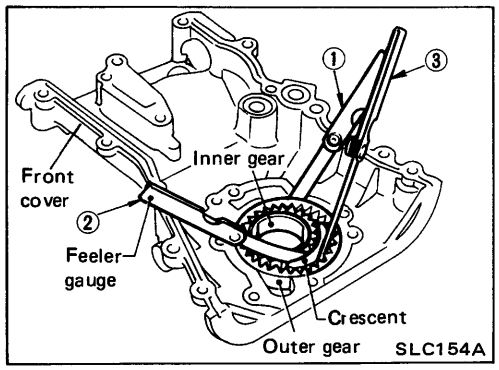


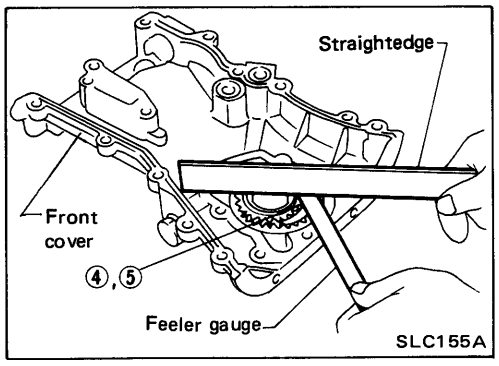
OIL PUMP INSPECTION

Using a feeler gauge, check the following clearance.

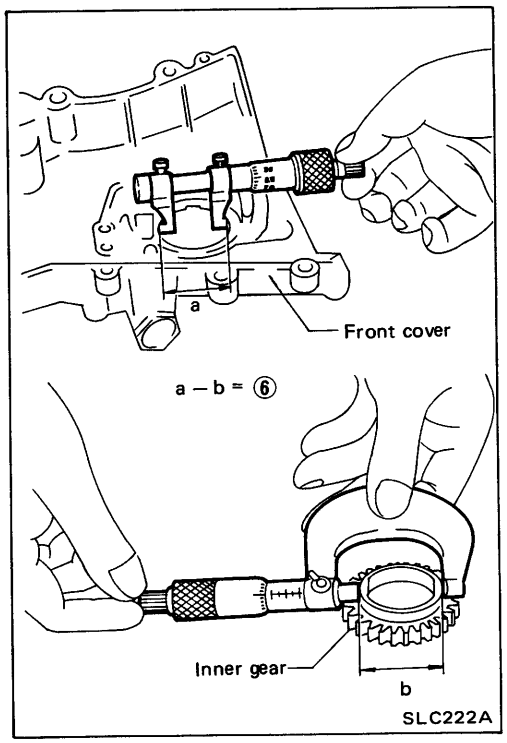
Unit: mm (in)

Body to outer gear clearance ①	0.114 - 0.200 (0.0045 - 0.0079)
Inner gear to crescent clearance ②	0.217 - 0.327 (0.0085 - 0.0129)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Body to inner gear clearance ④	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear clearance ⑤	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to brazed portion of housing clearance ⑥	0.045 - 0.091 (0.0018 - 0.0036)

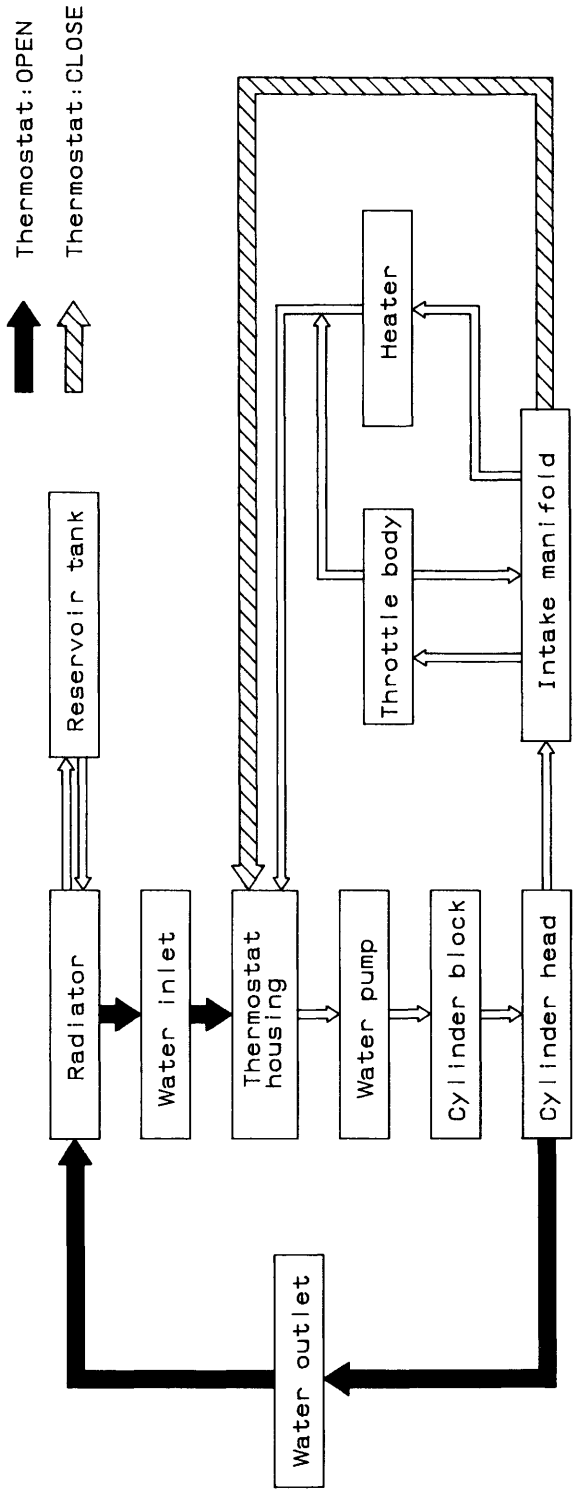




If it exceeds the limit, replace gear set or entire oil pump assembly.



Cooling Circuit



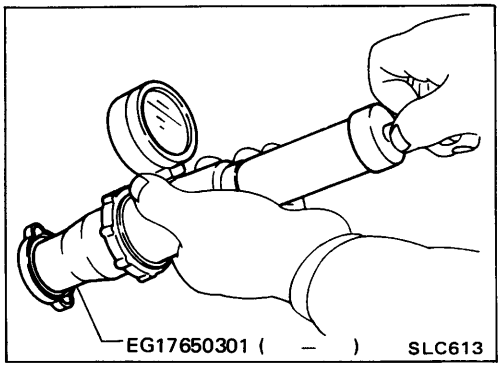
SLC159A

System Check

WARNING:
Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap and carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape and then turn the cap all the way off.

CHECKING COOLING SYSTEM HOSES

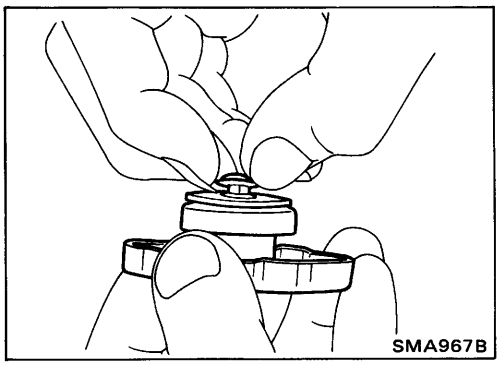
Check hoses for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



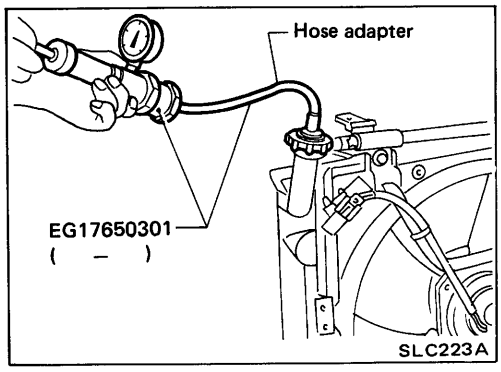
CHECKING RADIATOR CAP

To check radiator cap, apply pressure to cap with a tester.

Radiator cap relief pressure:
78 - 98 kPa (0.8 - 1.0 kg/cm^2, 11 - 14 psi)



Pull the negative pressure valve to open it. Check that it closes completely when released.



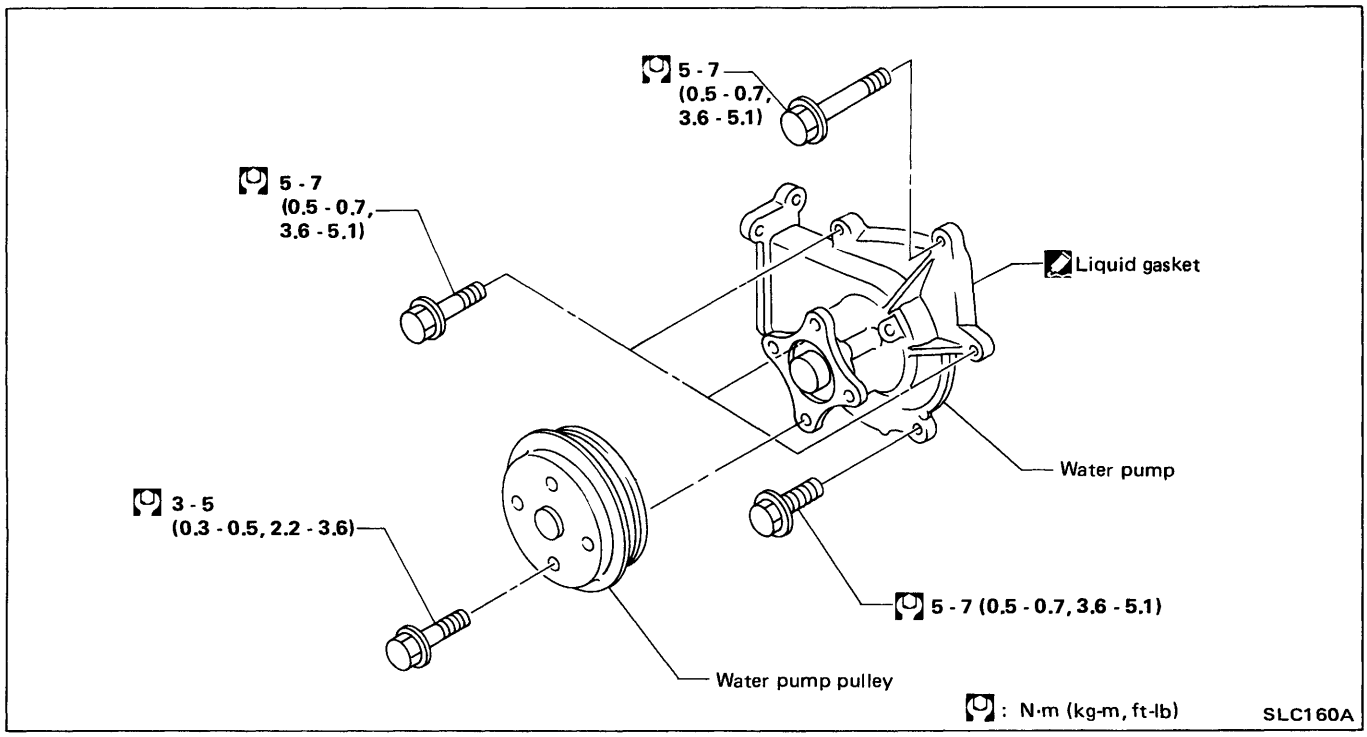
CHECKING COOLING SYSTEM FOR LEAKS

To check for leakage, apply pressure to the cooling system with a tester.

Testing pressure:
98 kPa (1.0 kg/cm^2, 14 psi)

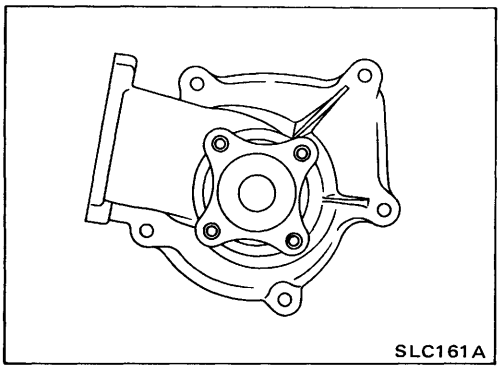
CAUTION:
Higher than the specified pressure may cause radiator damage.

Water Pump



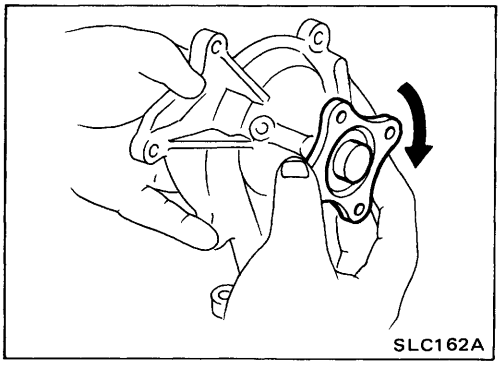
CAUTION:

- **When removing water pump assembly, be careful not to get coolant on timing chain.**
- **Water pump cannot be disassembled and should be replaced as a unit.**
- **After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.**



REMOVAL

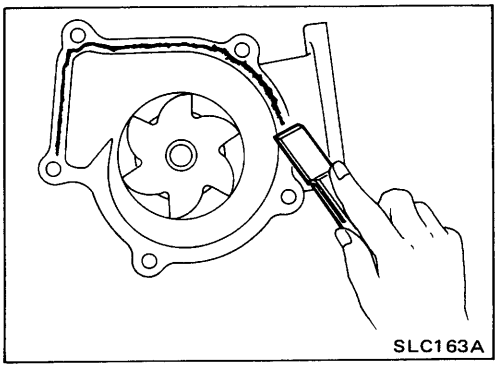
1. Drain coolant from radiator and cylinder block.
2. Remove drive belts for compressor, power steering pump and alternator.
3. Remove water pump pulley.
4. Remove water pump.



INSPECTION

1. Check for badly rusted or corroded body assembly and vane.
2. Check for rough operation due to excessive end play.

Water Pump (Cont'd)

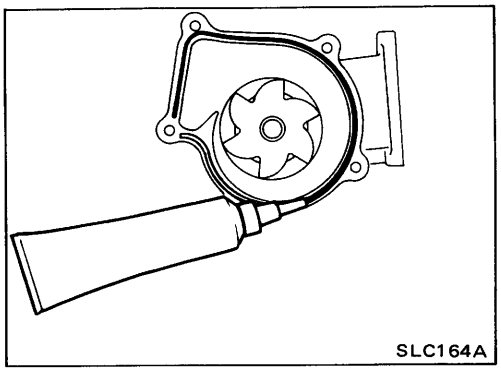

SLC163A

INSTALLATION

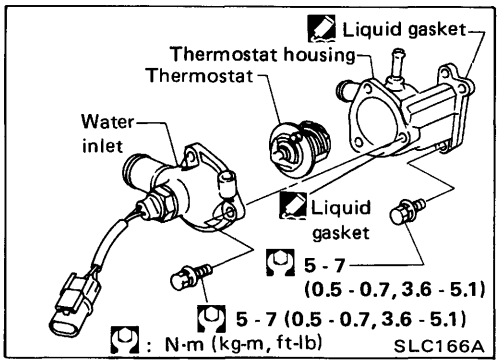
- Before installing water pump, remove liquid gasket from mating surface of water pump using a scraper.

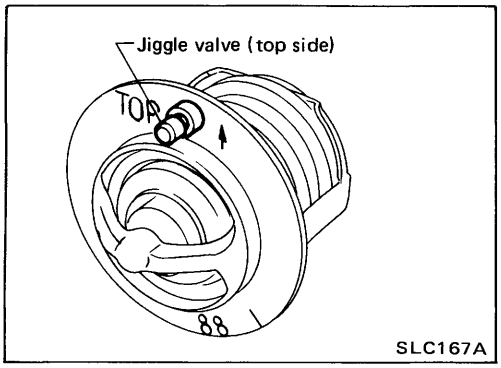
Be sure liquid gasket in grooves is also removed.

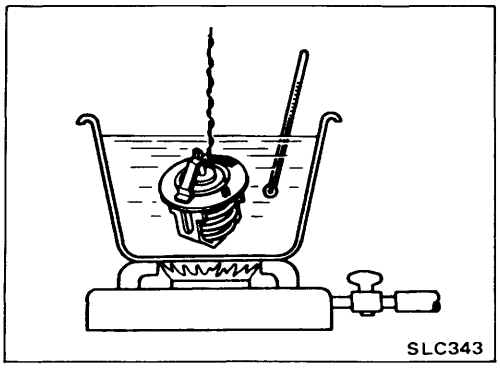
- Remove liquid gasket from mating surface of front cover.
- Remove all traces of liquid gasket using white gasoline.

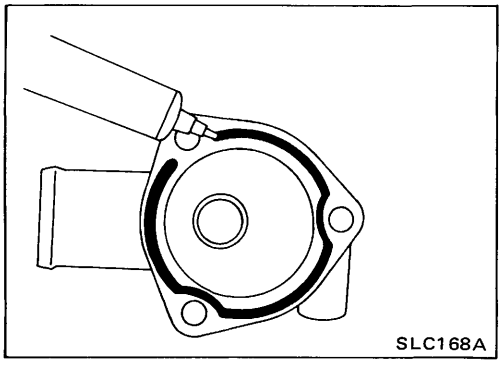

SLC164A

- Apply liquid gasket to mating surface of pump housing as shown.









Thermostat

INSPECTION

1. Check for valve seating condition at ordinary temperatures. It should seat tightly.

2. Check valve opening temperature and maximum valve lift.

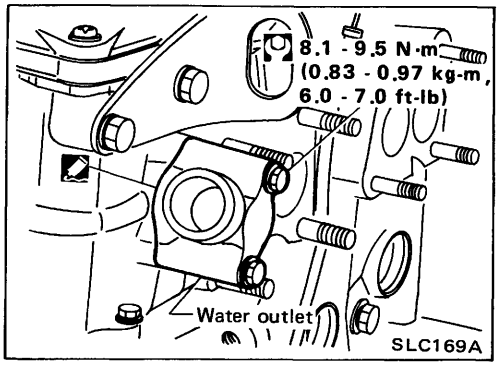
Valve opening temperature	°C (°F)	76.5 (170)
Max. valve lift	mm/°C (in/°F)	8/90 (0.31/194)

3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

- **After installation, run engine for a few minutes, and check for leaks.**

INSTALLATION

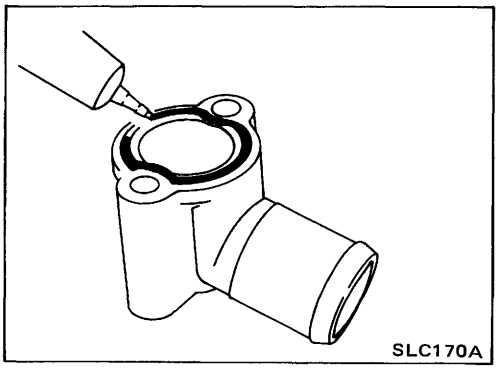
- When installing water inlet apply liquid gasket as shown.



Water Outlet

INSPECTION

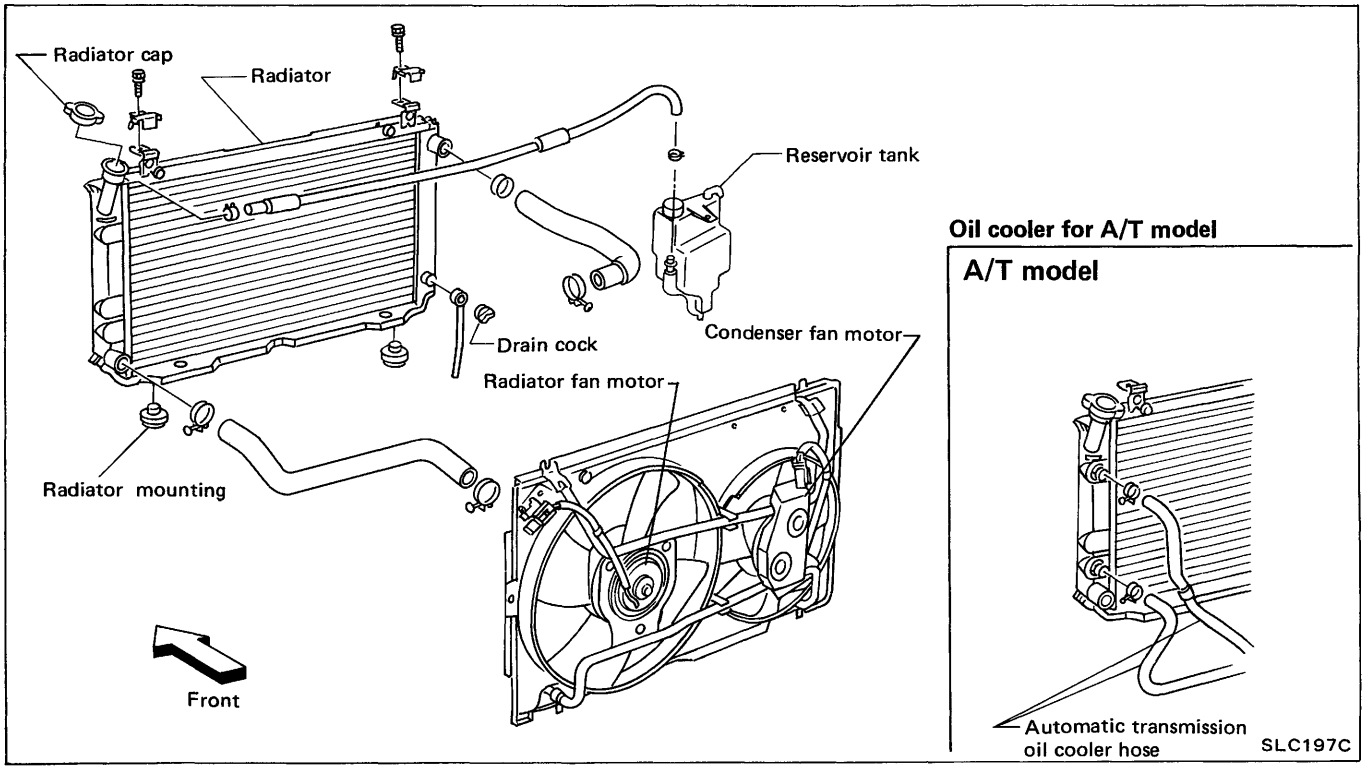
Visual inspection for water leaks. If there is leakage, apply liquid gasket.



INSTALLATION

- When installing water outlet, apply liquid gasket as shown.

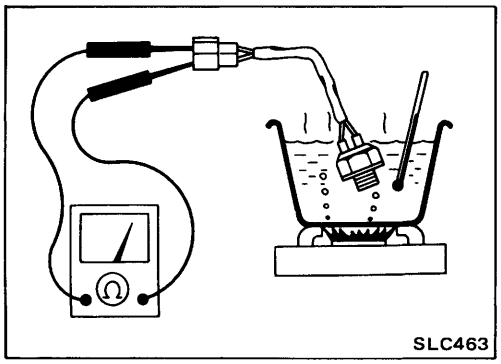
Radiator



CAUTION:
When filling radiator with coolant, refer to MA section.

Electrical Cooling Fan

For schematic and wiring diagram of electrical cooling fan, refer to LC-14 and 15.



Thermoswitch

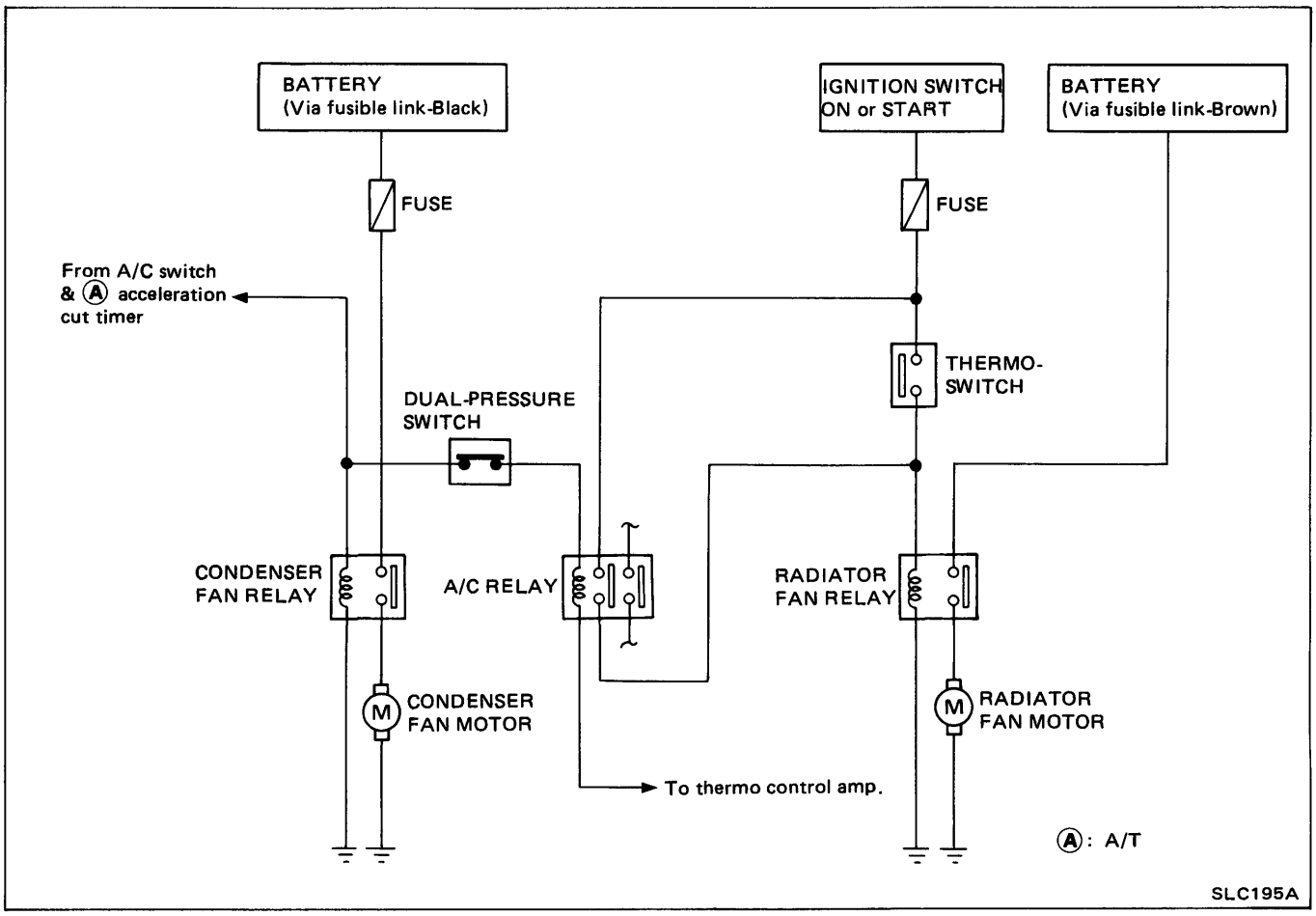
INSPECTION

1. Drain about one liter of coolant.
2. Remove thermoswitch.
3. Check thermoswitch for proper operation.

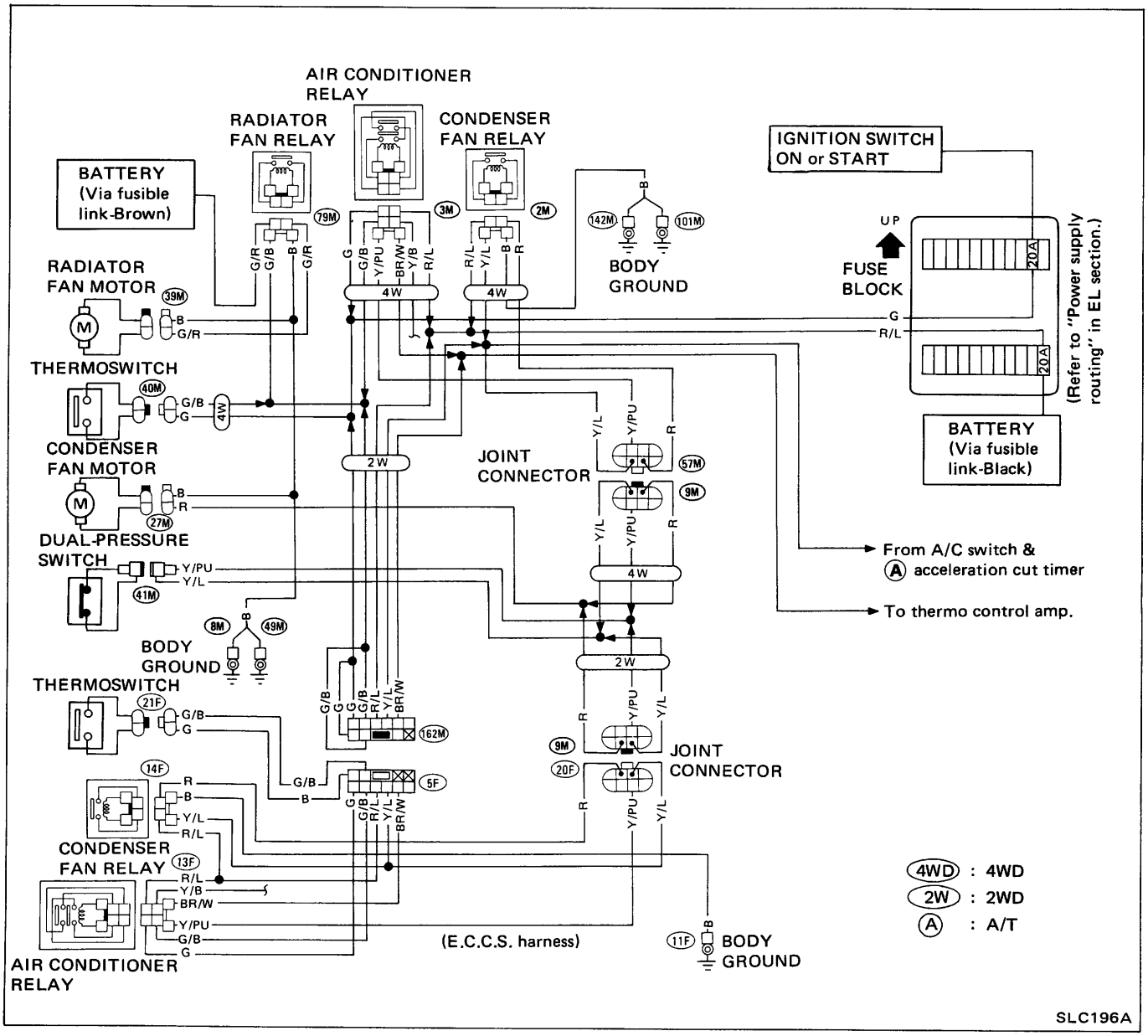
Operating temperature:

OFF → ON 82 - 88°C (180 - 190°F)

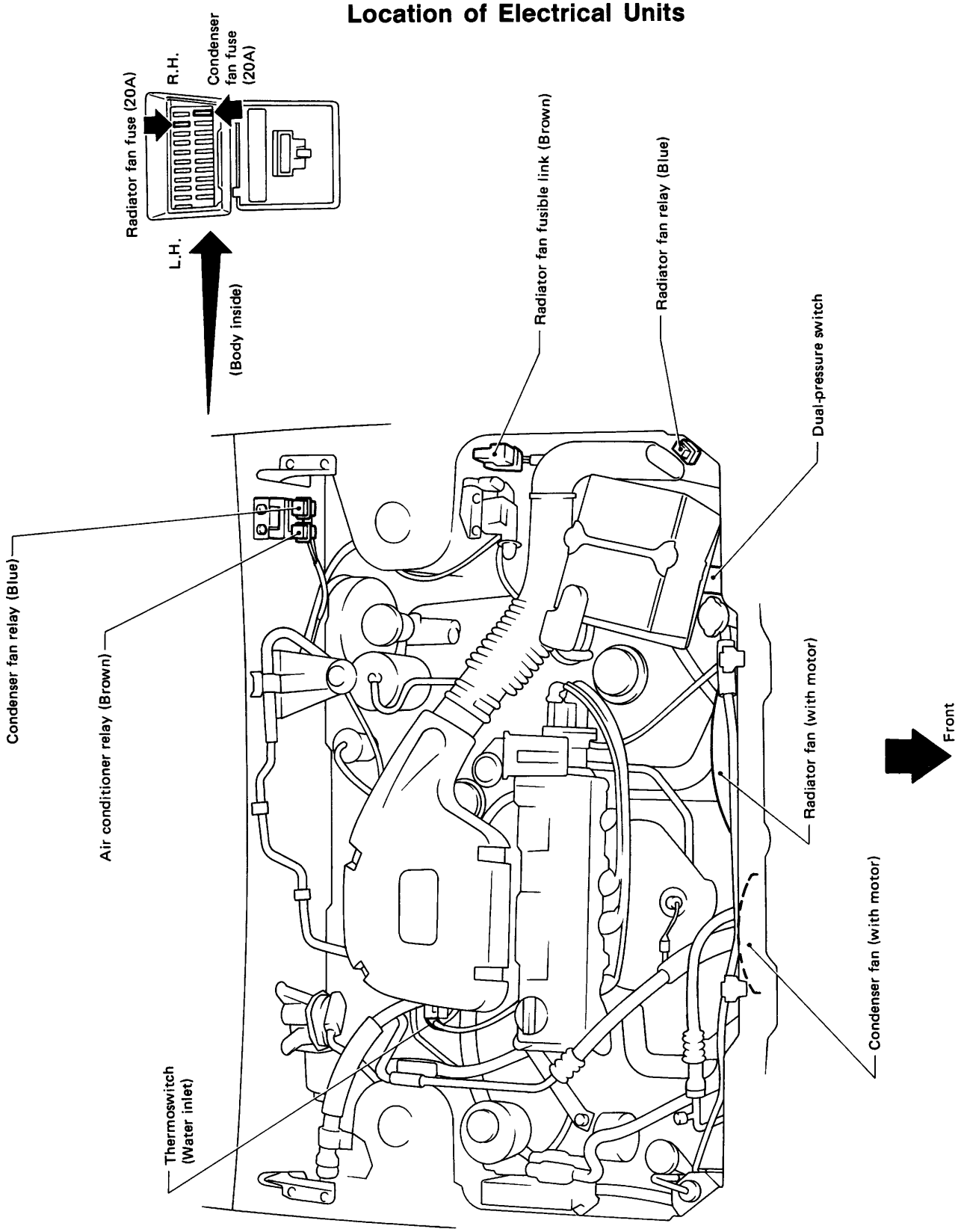
Schematic


BATTERY
(Via fusible link-Black)
IGNITION SWITCH
ON or START
BATTERY
(Via fusible link-Brown)
FUSE
FUSE
From A/C switch
& Ⓐ acceleration
cut timer
THERMO-
SWITCH
DUAL-PRESSURE
SWITCH
CONDENSER
FAN RELAY
A/C RELAY
RADIATOR
FAN RELAY
M
CONDENSER
FAN MOTOR
M
RADIATOR
FAN MOTOR
To thermo control amp.
Ⓐ: A/T
SLC195A

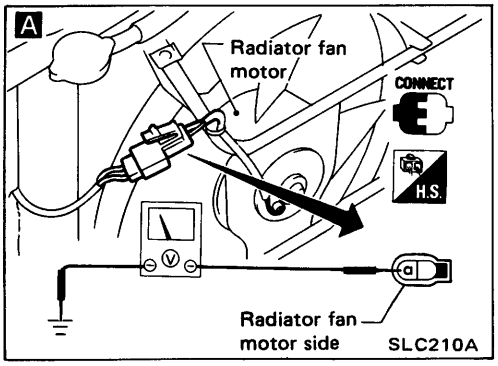
Wiring Diagram

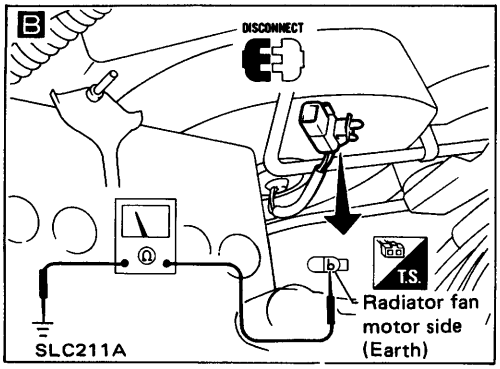


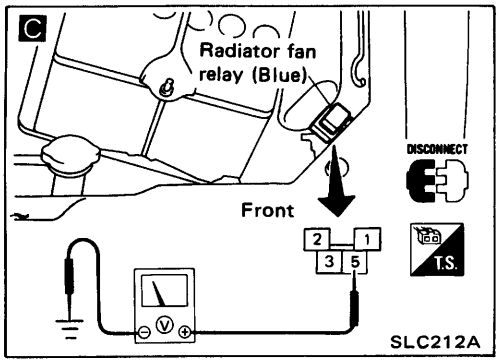
Location of Electrical Units

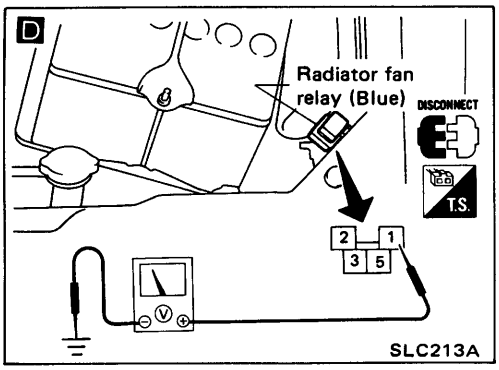


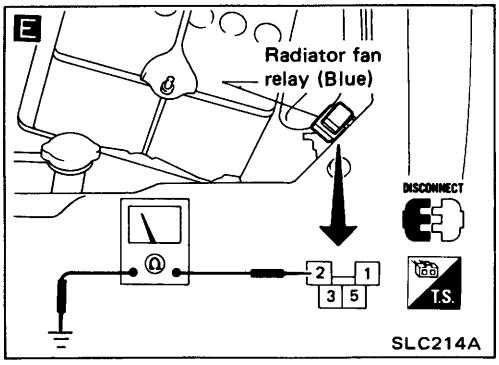
SLC209A











Trouble-shooting & Diagnosis (Radiator fan motor)

Even though the engine coolant is hot, the radiator fan motor does not rotate.

NOTICE:
This check should be performed after engine is warmed up sufficiently.

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON". Check voltage between (a) and ground.
Battery voltage should exist.

N.G. → **C**

1) Turn ignition switch "OFF".
2) Disconnect radiator fan relay.
3) Check voltage between terminal ⑤ and ground.
Battery voltage should exist.
If N.G, check harness continuity between battery ⊕ pole and terminal ⑤.

O.K. → **D**

1) Turn ignition switch "ON".
2) Check voltage between terminal ① and ground.
Battery voltage should exist.
If N.G., check following parts:
- Termoswitch (See page LC-13.)
- Harness continuity between fuse and terminal ①.

O.K. → **E**

1) Turn ignition switch "OFF".
2) Check continuity between terminal ② and ground.
Continuity should exist.
If N.G., repair harness.

O.K.

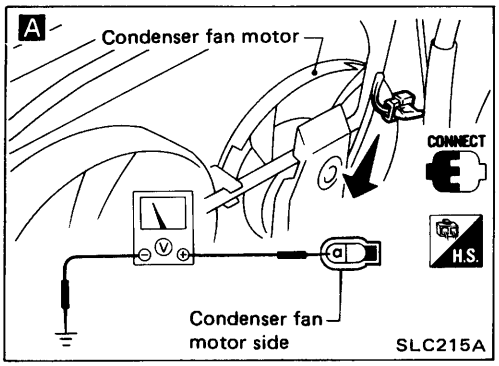
Check radiator fan relay.
If N.G., replace with new one.

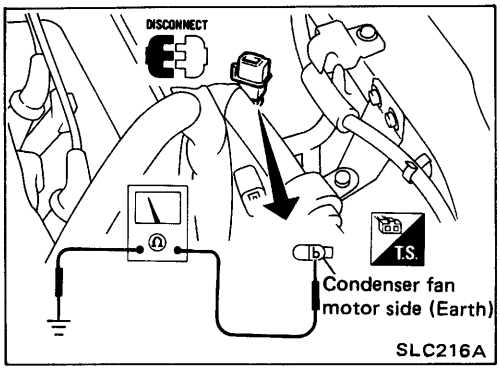
O.K. → **B**

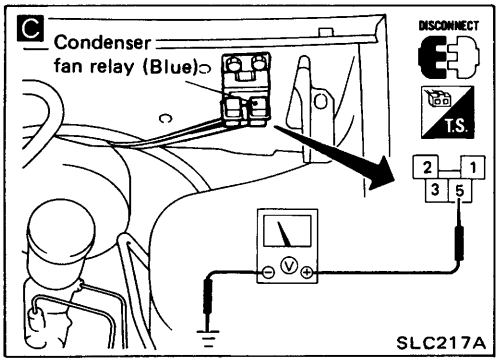
CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect radiator fan motor harness connector.
3) Check harness continuity between (b) and ground.
Continuity should exist.
If N.G., repair harness.

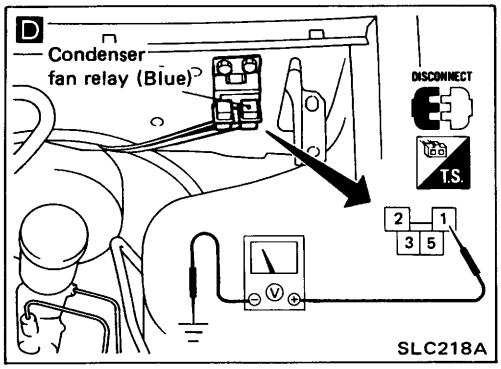
O.K.

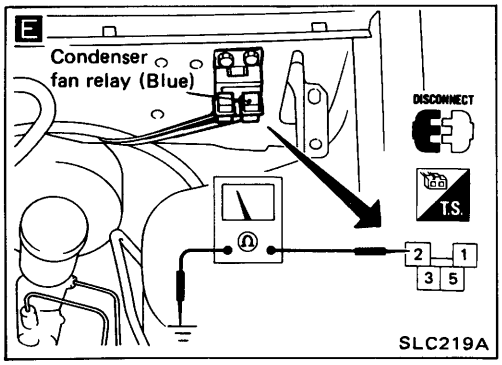
Replace radiator fan motor with new one.











Trouble-shooting & Diagnosis (Condenser fan motor)

Even though the air conditioner operates normally, the condenser fan motor does not rotate.

A

CHECK POWER SUPPLY.
1) Turn ignition and air conditioner switch "ON".
2) Check voltage between ⓐ and ground.

Battery voltage should exist.

N.G. →

C

1) Turn ignition and air conditioner switch "OFF".
2) Disconnect condenser fan relay.
3) Check voltage between terminal ⑤ and ground.

Battery voltage should exist

If N.G., check harness continuity between battery ⊕ pole and terminal ⑤.

O.K. ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition and air conditioner switch "OFF".
2) Disconnect condenser fan motor harness connector.
3) Check harness continuity between ⓑ and ground.

Continuity should exist.

If N.G., repair harness.

O.K. ↓

Replace condenser fan motor with new one.

D

1) Turn ignition and air conditioner switch "ON".
2) Check voltage between terminal ① and ground.

Battery voltage should exist.

If N.G., check following parts:
- Air conditioner switch & acceleration cut timer (Refer to HA section.)

O.K. ↓

E

1) Turn ignition and air conditioner switch "OFF".
2) Check continuity between terminal ② and ground.

Continuity should exist.

If N.G., repair harness.

O.K. ↓

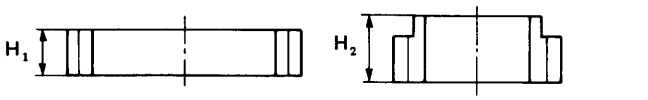
Check condenser fan relay.
If N.G., replace with new one.

Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (kg/cm², psi)
Idle speed (800)	49 - 186 (0.5 - 1.9, 7 - 27)
3,000	392 - 490 (4.0 - 5.0, 57 - 71)

Oil pump



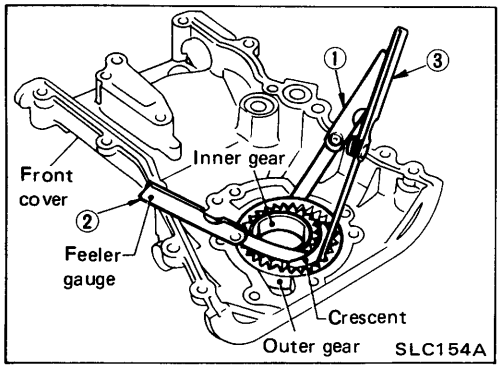
Unit: mm (in)

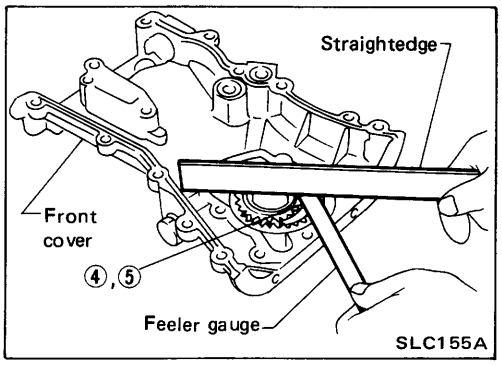
	H_1	H_2
Height	10.5 (0.413)	15.0 (0.591)

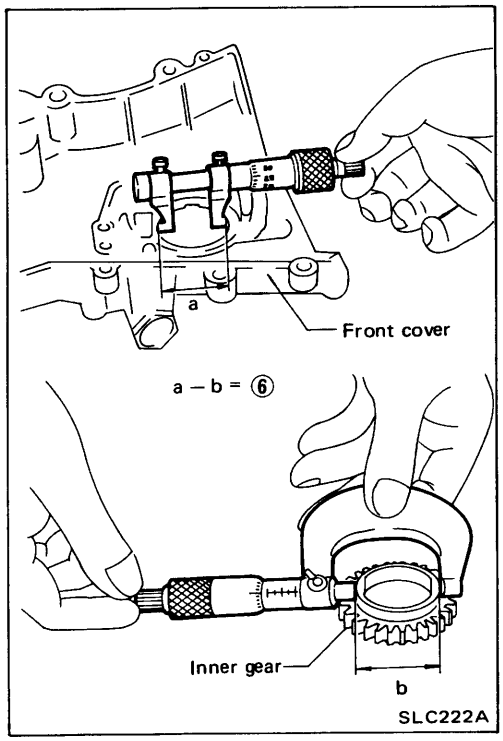
Oil pump inspection

Unit: mm (in)

Body to outer gear clearance ①	0.114 - 0.200 (0.0045 - 0.0079)
Inner gear to crescent clearance ②	0.217 - 0.327 (0.0085 - 0.0129)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Body to inner gear clearance ④	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear clearance ⑤	0.05 - 0.11 (0.0020 - 0.0043)
Inner gear to brazed portion of housing clearance ⑥	0.045 - 0.091 (0.0018 - 0.0036)







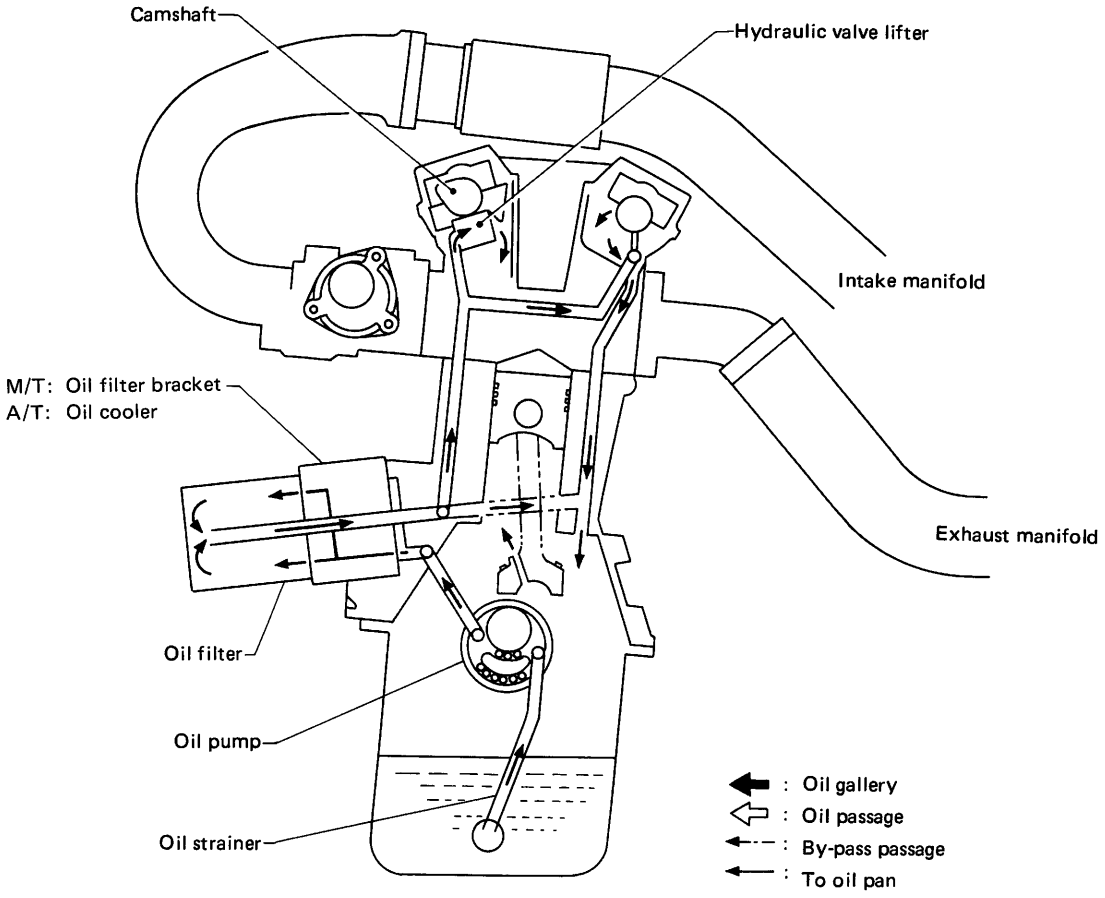
Thermostat

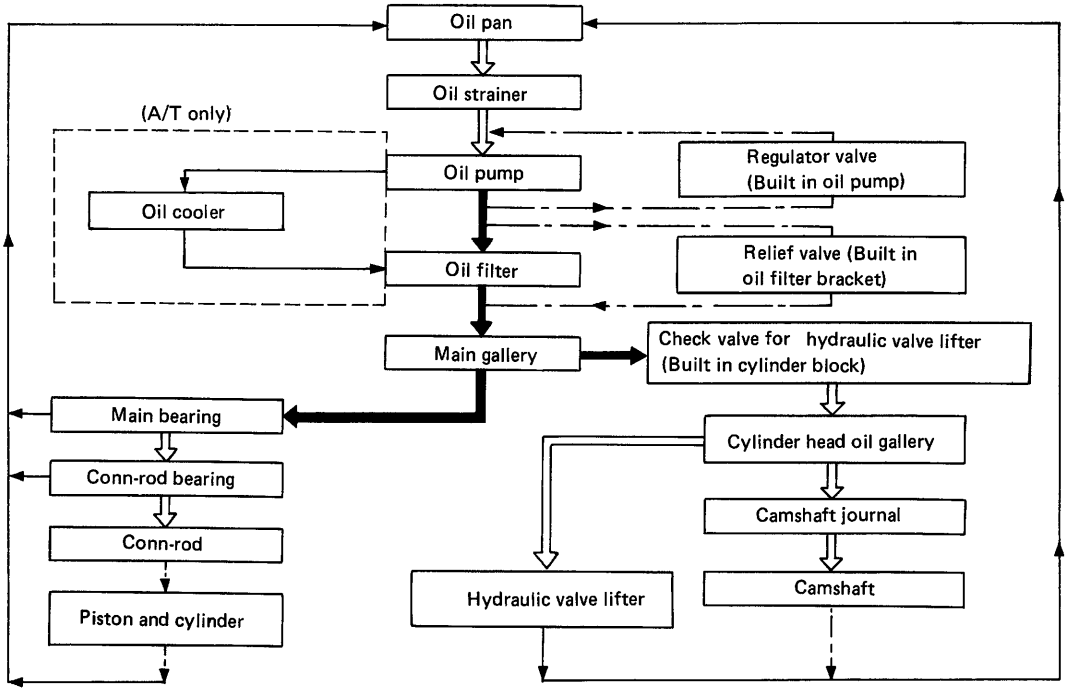
		Standard
Valve opening temperature	°C (°F)	76.5 (170)
Maximum valve lift	mm/°C (in/°F)	8/90 (0.31/194)

Thermoswitch (Electrical cooling fan)

Operating temperature (OFF → ON)	°C (°F)	82 - 88 (180 - 190)

Lubrication Circuit



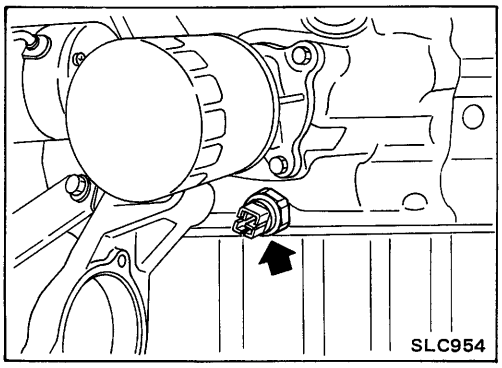


SLC065A

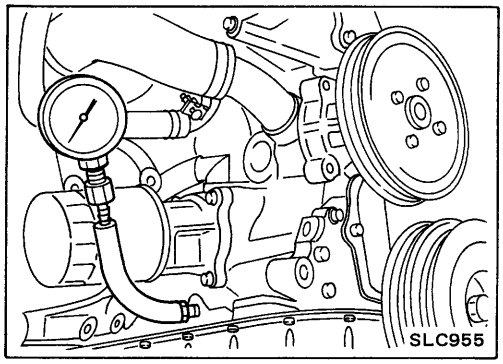
Oil Pressure Check

WARNING:

- **Be careful not to burn yourself, as the engine and oil may be hot.**
- **Oil pressure check should be done in "Neutral" gear position.**



1. Check oil level.
2. Remove oil pressure switch.



3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

Engine rpm	Approximate discharge pressure kPa (kg/cm^2, psi)
Idle speed	More than 78 (0.8, 11)
2,000	461 (4.7, 67)

If difference is extreme, check oil passage and oil pump for oil leaks.

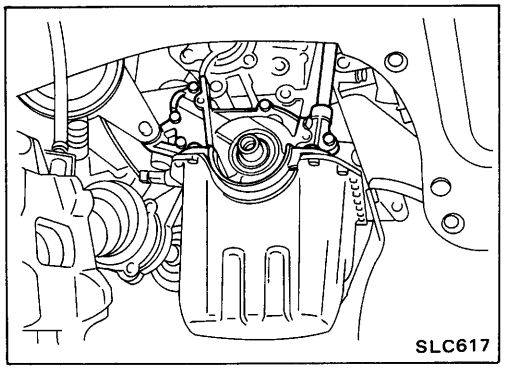
6. Install oil pressure switch.

Use proper liquid sealant.

Oil pressure switch:

: 10 - 16 N·m

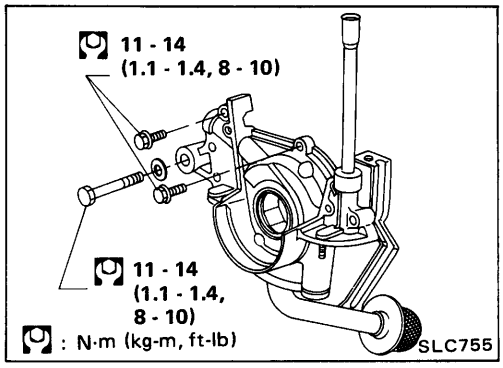
(1.0 - 1.6 kg-m, 7 - 12 ft-lb)



Oil Pump

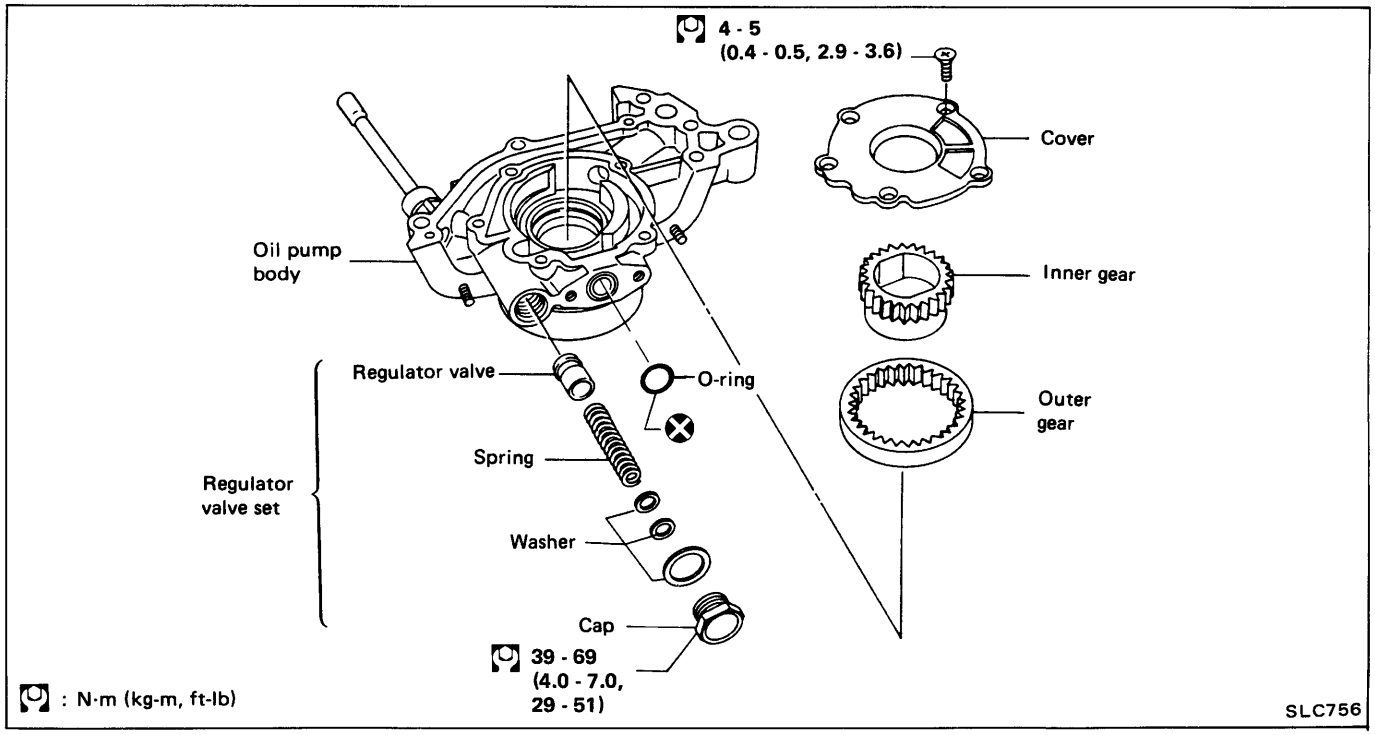
REMOVAL AND INSTALLATION

1. Remove drive belts.
2. Remove timing belt covers and timing belt.
3. Remove center member from body.
4. Remove oil pan.



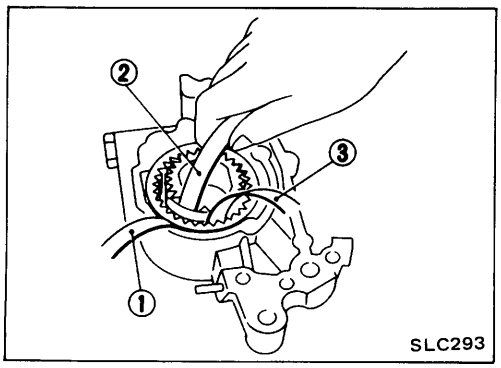
5. Remove oil pump assembly with oil strainer.
6. Installation is in reverse order of removal.

DISASSEMBLY AND ASSEMBLY

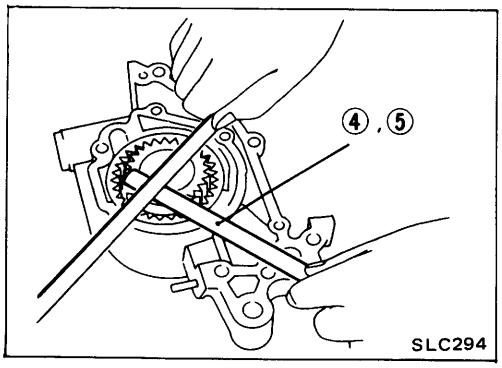


- When installing oil pump, apply engine oil to inner and outer gear.
- Be sure that O-ring is properly fitted.

Oil Pump (Cont'd)



SLC293



SLC294

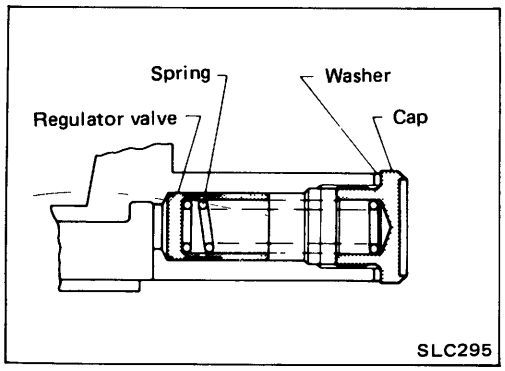
INSPECTION

Using a feeler gauge, check the following clearances.

Unit: mm (in)

Body to outer gear clearance ①	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.15 - 0.26 (0.0059 - 0.0102)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Body to inner gear clearance ④	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear clearance ⑤	0.05 - 0.11 (0.0020 - 0.0043)

If it exceeds the limit, replace gear set or entire oil pump assembly.

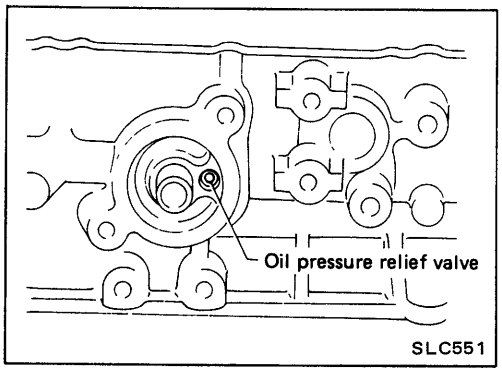


SLC295

REGULATOR VALVE INSPECTION

1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump assembly.

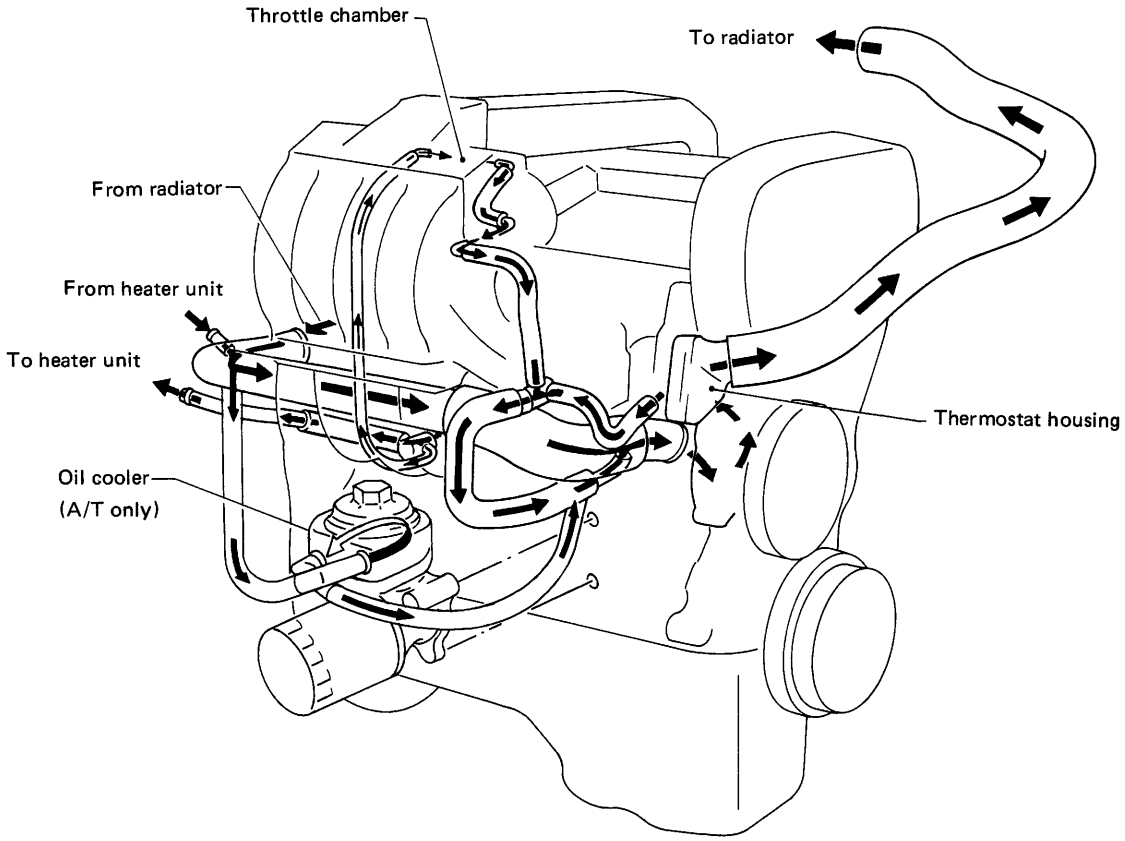


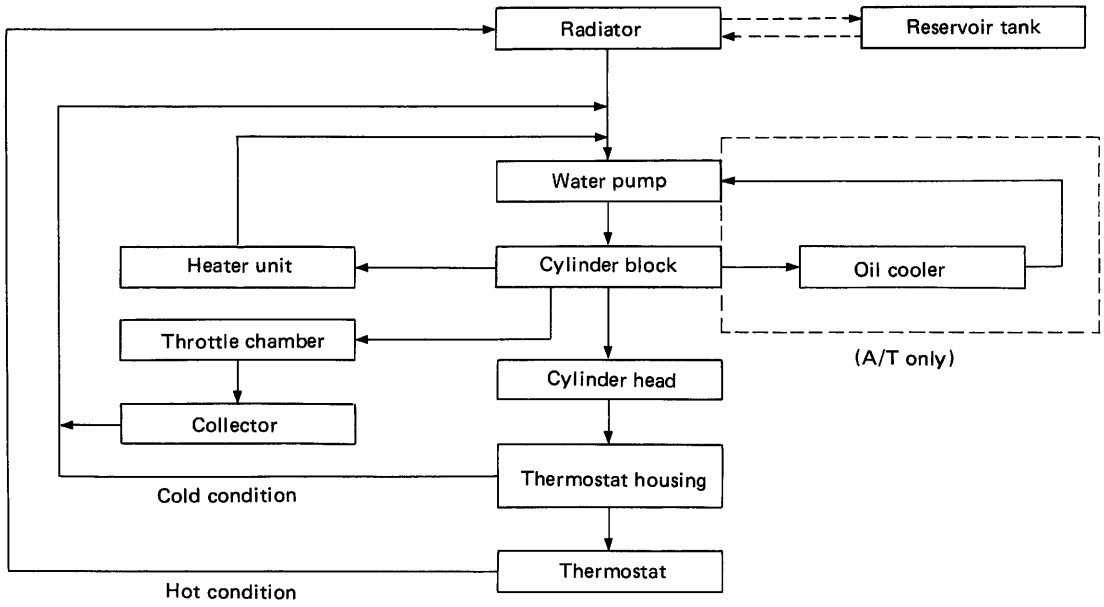
SLC551

OIL PRESSURE RELIEF VALVE INSPECTION

Inspect oil pressure relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with a screwdriver. Install a new valve in place by tapping it.

Cooling Circuit





SLC060A

WARNING:

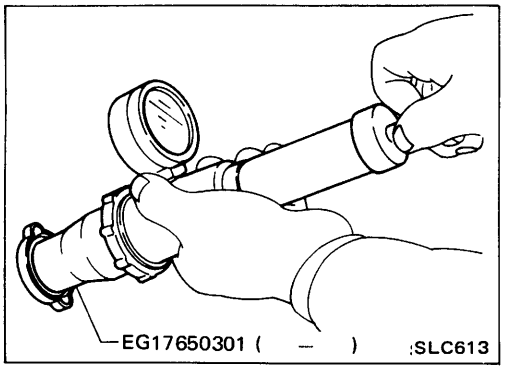
To avoid serious personal injury, never remove radiator cap quickly when engine is hot.

If it is necessary to remove radiator cap when radiator is hot, turn cap slowly counterclockwise to the first stop. After all pressure in the cooling system is released, turn cap past the stop and remove it.

Cooling System Inspection

CHECKING HOSES

Check water hoses for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



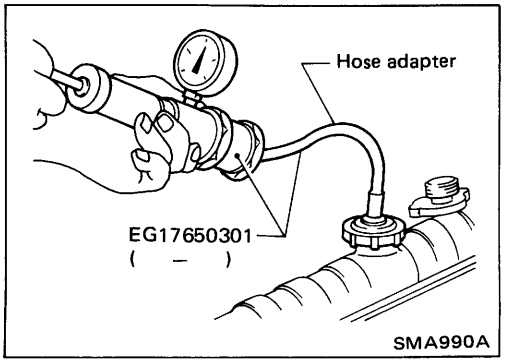
CHECKING RADIATOR CAP

Apply pressure to radiator cap by means of a cap tester to see if it is satisfactory.

Radiator cap relief pressure:

78 - 98 kPa

(0.8 - 1.0 kg/cm^2, 11 - 14 psi)



CHECKING COOLING SYSTEM FOR LEAKS

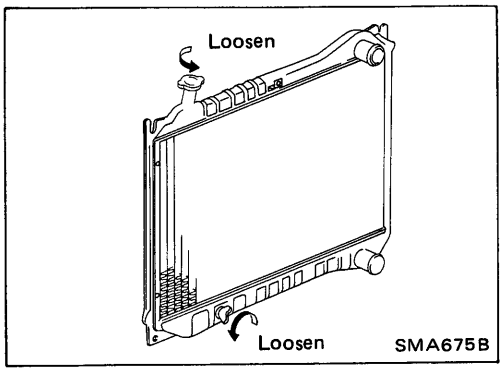
Apply pressure to the cooling system by means of a tester to check for leakage.

Testing pressure:

98 kPa (1.0 kg/cm^2, 14 psi)

CAUTION:

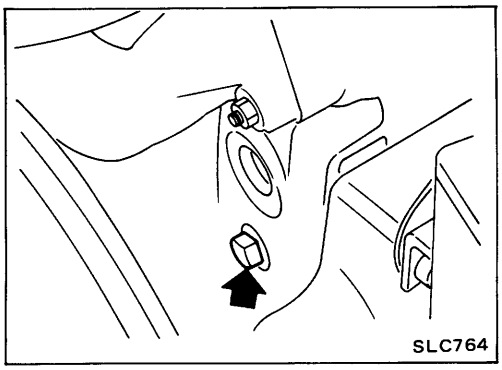
Overpressure may cause radiator damage.



Water Pump

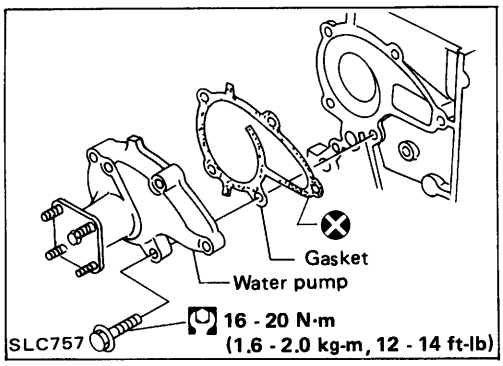
REMOVAL AND INSTALLATION

1. Drain coolant from radiator.



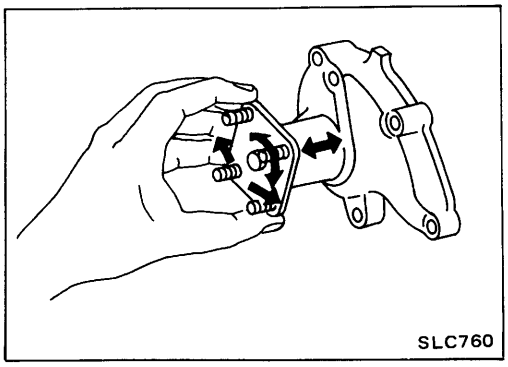
2. Remove cylinder block drain plug located at left rear of cylinder block and drain coolant.

   : **54 - 74 N·m (5.5 - 7.5 kg-m, 40 - 54 ft-lb)**



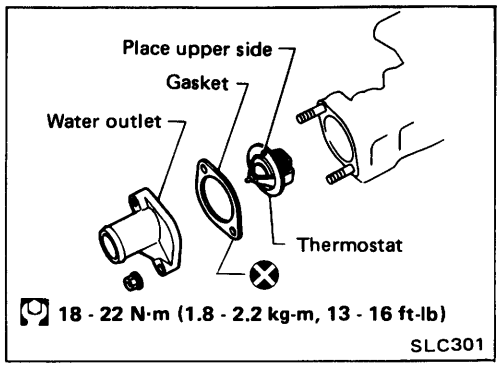
CAUTION:

- **When removing water pump assembly, be careful not to get coolant on timing belt.**
- **Water pump cannot be disassembled and should be replaced as a unit.**
- **After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.**



INSPECTION

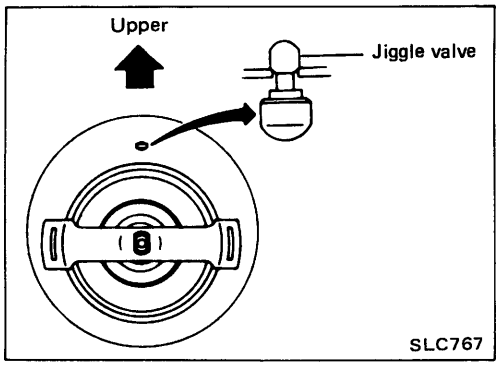
1. Check for badly rusted or corroded body assembly and vane.
2. Check for rough operation due to excessive end play.



Thermostat

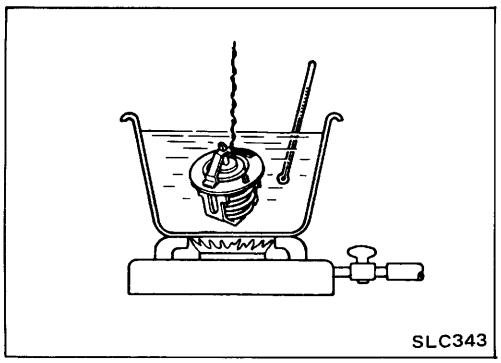
REMOVAL AND INSTALLATION

1. Drain engine coolant.
2. Remove water outlet, then take out thermostat.



3. Install thermostat with jiggle valve or air bleeder facing upward.

- **After installation, run engine for a few minutes, and check for leaks.**



INSPECTION

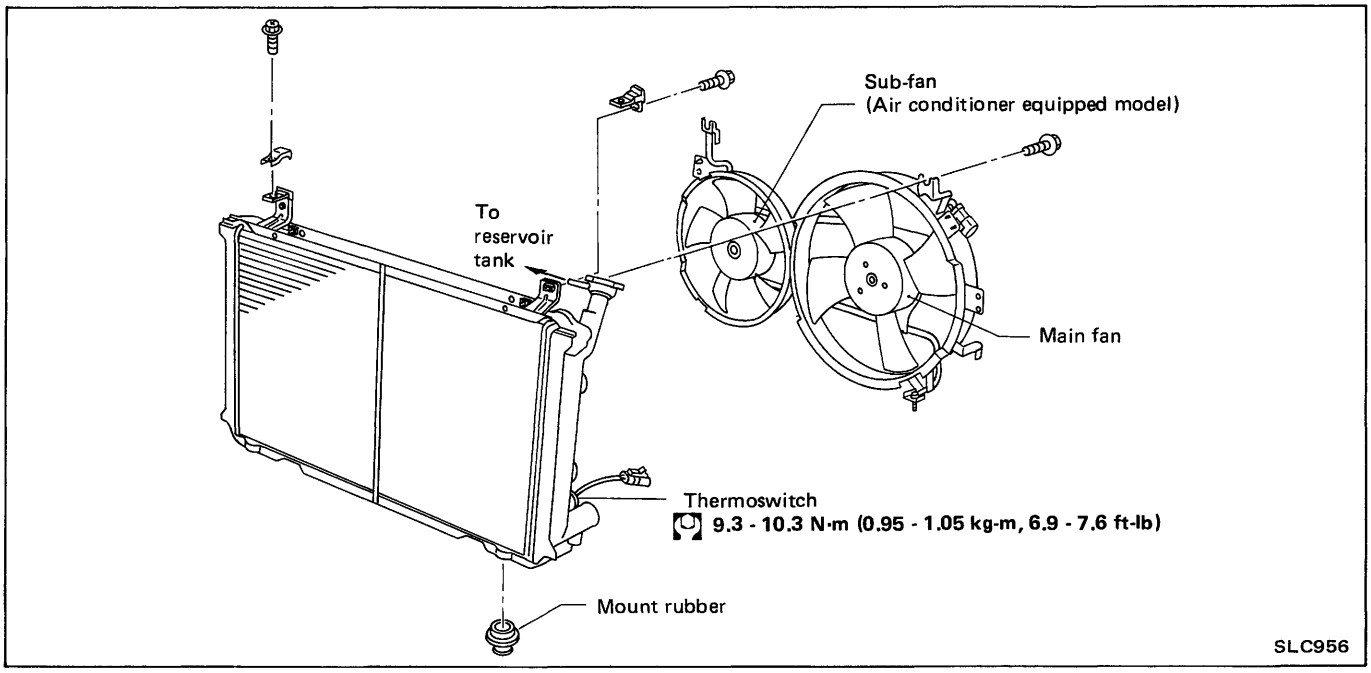
1. Check for valve seating condition at ordinary temperatures. It should seat tightly.
2. Check valve opening temperature and maximum valve lift.

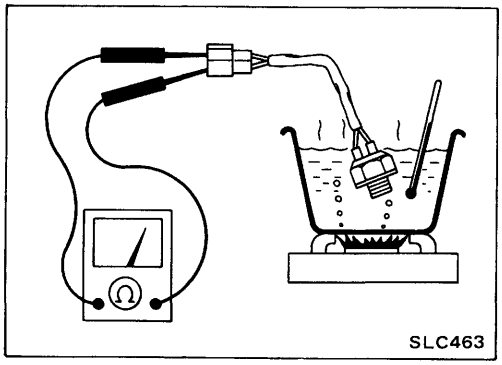
	Standard	Cold type
Valve opening temperature °C (°F)	82 (180)	88 (190)
Max. valve lift mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)

3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

Radiator

DISASSEMBLY AND ASSEMBLY





Water Temperature Switch

INSPECTION

1. Drain coolant.
2. Remove thermoswitches.
3. Check thermoswitches for proper operation.

Operating temperature

OFF → ON 85°C (185°F)

Water temperature switch:

: 9.3 - 10.3 N·m

(0.95 - 1.05 kg-m, 6.9 - 7.6 ft-lb)

For cooling system wiring diagram, refer to HA section.

Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (kg/cm², psi)
Idle speed	More than 78 (0.8, 11)
2,000	461 (4.7, 67)

Oil pump inspection

Unit: mm (in)

Body to outer gear clearance	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance	0.15 - 0.26 (0.0059 - 0.0102)
Outer gear to crescent clearance	0.21 - 0.32 (0.0083 - 0.0126)
Body to inner gear clearance	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear clearance	0.05 - 0.11 (0.0020 - 0.0043)

Oil pressure regulator valve

kPa (kg/cm², psi)/rpm

Regulator valve opening pressure	471 - 510 (4.8 - 5.2, 68 - 74)/2,000

Tightening torque

Unit	N·m	kg-m	ft-lb
Oil pump securing bolt	11 - 14	1.1 - 1.4	8 - 10
Oil pump cover screw	4 - 5	0.4 - 0.5	2.9 - 3.6
Oil pressure regulator valve cap	39 - 69	4.0 - 7.0	29 - 51
Oil pressure switch	10 - 16	1.0 - 1.6	7 - 12
Oil cooler	21	2.1	15

Engine Cooling System

Thermostat

	Standard	Cold type
Valve opening temperature °C (°F)	82 (180)	88 (190)
Max. valve lift mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)

Thermo switch

Operating temperature (OFF → ON)	85°C (185°F)

Tightening torque

Unit	N·m	kg-m	ft-lb
Water pump securing bolt	16 - 20	1.6 - 2.0	12 - 14
Water outlet securing nut	18 - 22	1.8 - 2.2	13 - 16
Water temperature switch	9.3 - 10.3	0.95 - 1.05	6.9 - 7.6

ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

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PRECAUTIONS ..... EF & EC- 5

GA16i

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E.C.C.S. CHART ..... EF & EC- 8
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AIR FLOW SYSTEM DESCRIPTION ..... EF & EC- 10
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E.C.C.S. WIRING DIAGRAM ..... EF & EC- 12
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- VEHICLE SPEED SENSOR ..... EF & EC- 88
- IGNITION SIGNAL ..... EF & EC- 90
- IDLE SWITCH ..... EF & EC- 94
- AUXILIARY AIR CONTROL (A.A.C.) VALVE ..... EF & EC- 98
- ENGINE CONTROL UNIT ..... EF & EC-100
- E.G.R. FUNCTION ..... EF & EC-102
- EXHAUST GAS SENSOR ..... EF & EC-106
- EXHAUST GAS TEMPERATURE SENSOR ..... EF & EC-108
- THROTTLE SENSOR ..... EF & EC-112
- INJECTOR LEAK ..... EF & EC-116
- FUEL PUMP ..... EF & EC-118

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MIXTURE HEATER RELAY ..... EF & EC-124
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CA18DE

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EXHAUST GAS TEMPERATURE SENSOR ..... EF & EC-260
THROTTLE SENSOR ..... EF & EC-264
INJECTOR LEAK ..... EF & EC-268

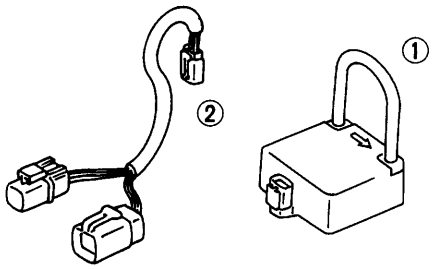
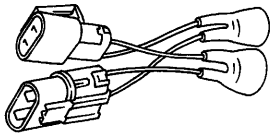
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A.I.V. (Air Induction Valve) SYSTEM INSPECTION ..... EF & EC-305
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... EF & EC-306

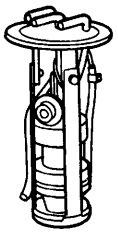
When you read wiring diagrams:

- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

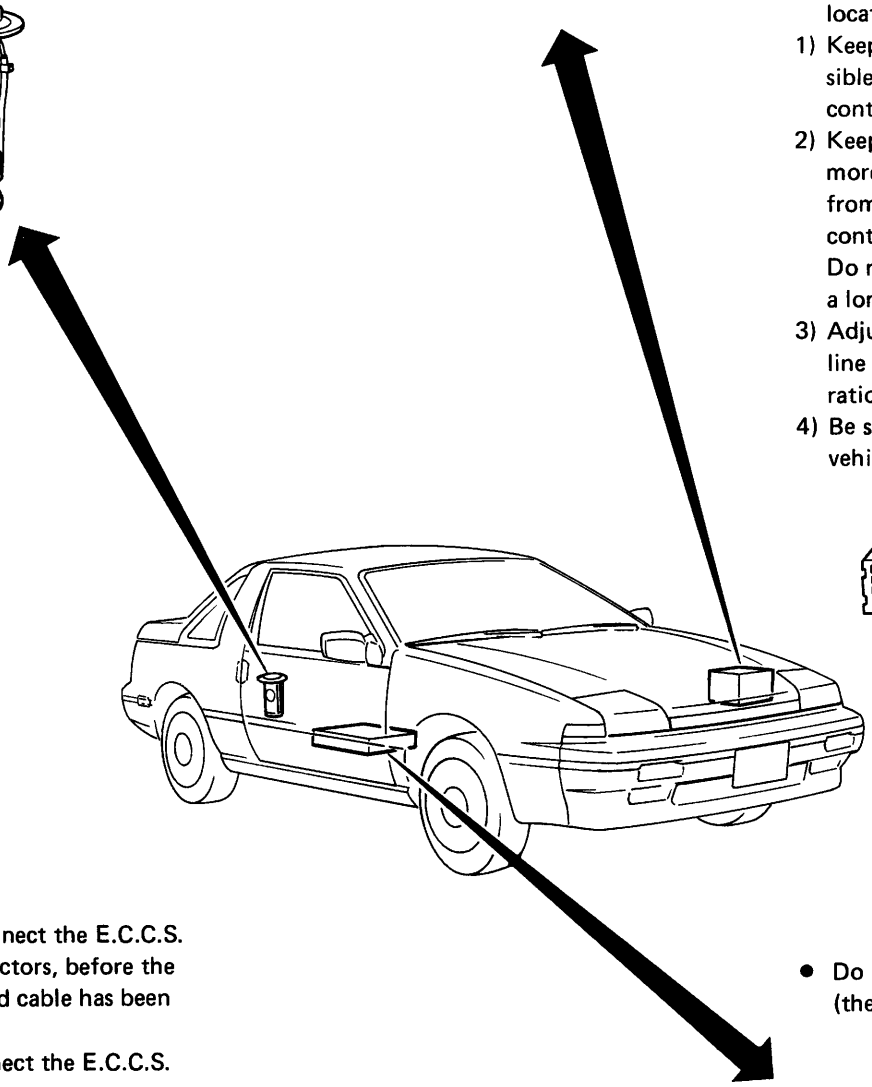
SPECIAL SERVICE TOOL

Tool number (Kent-Moore No.) Tool name	Description		Engine Application	
			GA	CA
KV109D10S0 (J-36777) Ignition timing adapter coil set ① KV109D0010 (J-36777-1) Ignition timing adapter coil ② KV109D0015 (J-36777-2) Adapter harness		Measuring ignition timing	–	X
EG11160000 (–) Adapter harness		Measuring engine speed	X	–

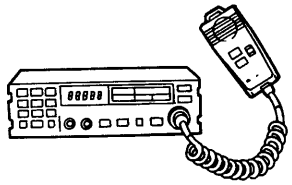
- Do not operate the fuel pump when the fuel lines are empty.
- Tighten fuel hose clamps to the specified torque.



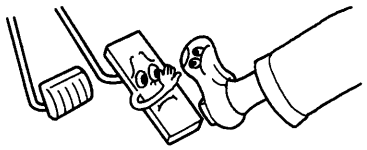
- Always use a 12-volt battery as power source.
- Do not attempt to disconnect the battery cables while the engine is running.



- When installing a C.B. ham radio or a mobile phone, be sure to observe the following notes as it may adversely affect the electronic control systems depending on its installation location.
  1) Keep the antenna as far as possible away from the electronic control unit.
  2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls.
     Do not let them run parallel for a long distance.
  3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
  4) Be sure to ground the radio to vehicle body.

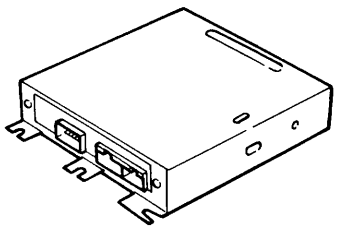


- Do not disconnect the E.C.C.S. harness connectors, before the battery ground cable has been disconnected.
- Securely connect the E.C.C.S. harness connectors.
  A poor connection can cause an extremely high (surge) voltage developed in coil and condenser, thus resulting in damage to ICs.
- Keep the E.C.C.S. harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an E.C.C.S. system malfunction due to receiving an external noise, degraded operation of ICs, etc.
- Keep E.I. parts and harnesses dry.
- Before removing parts, turn off the ignition switch and disconnect the battery ground cable.



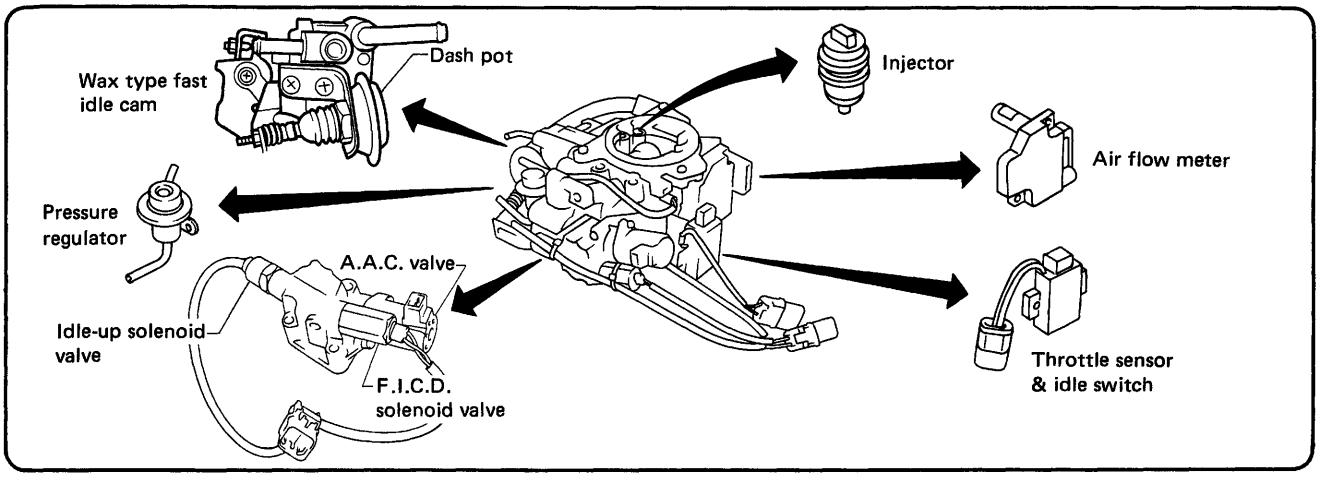
- Do not depress the accelerator pedal when starting.
- Immediately after starting, do not rev up the engine unnecessarily.
- Do not rev up the engine just prior to shutdown.

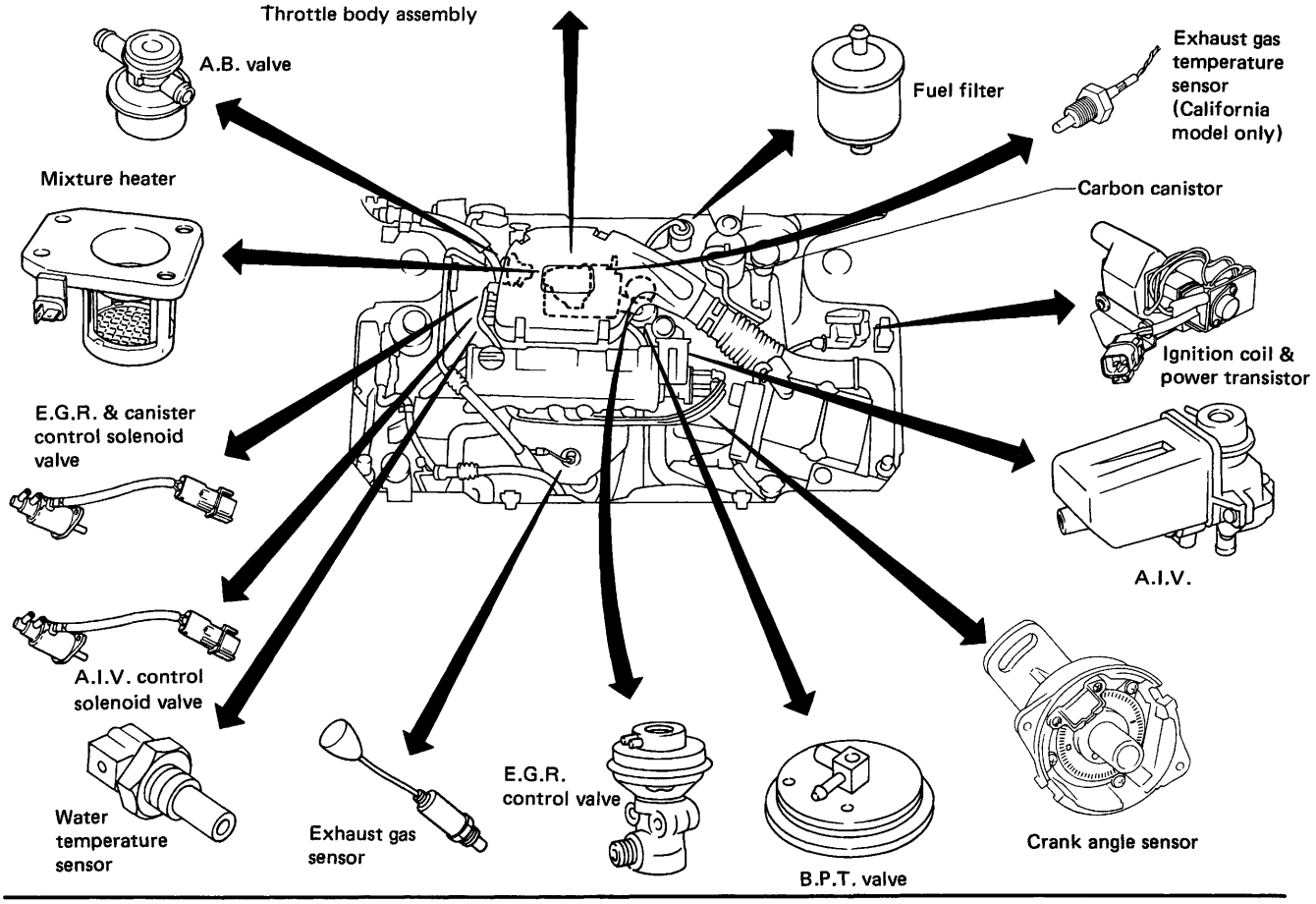
- Do not disassemble the E.C.U. (the E.C.C.S. control unit).

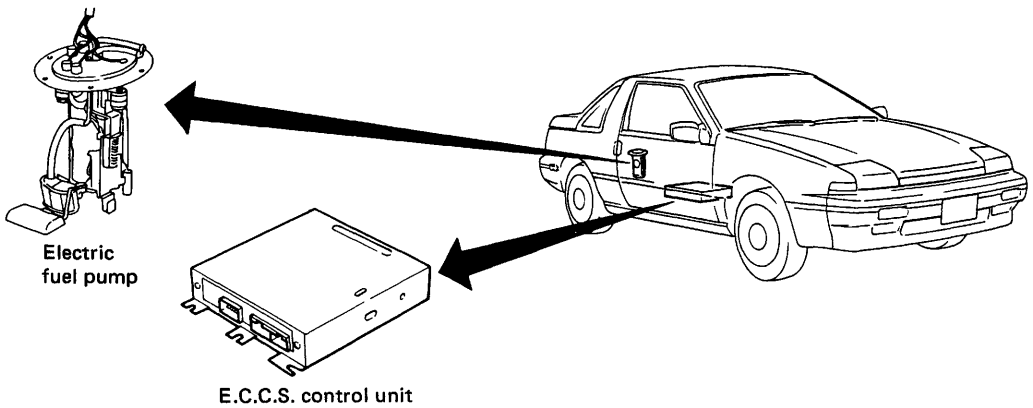


- If a battery terminal is disconnected, the memory will return to the ROM value. The E.C.C.S. will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.

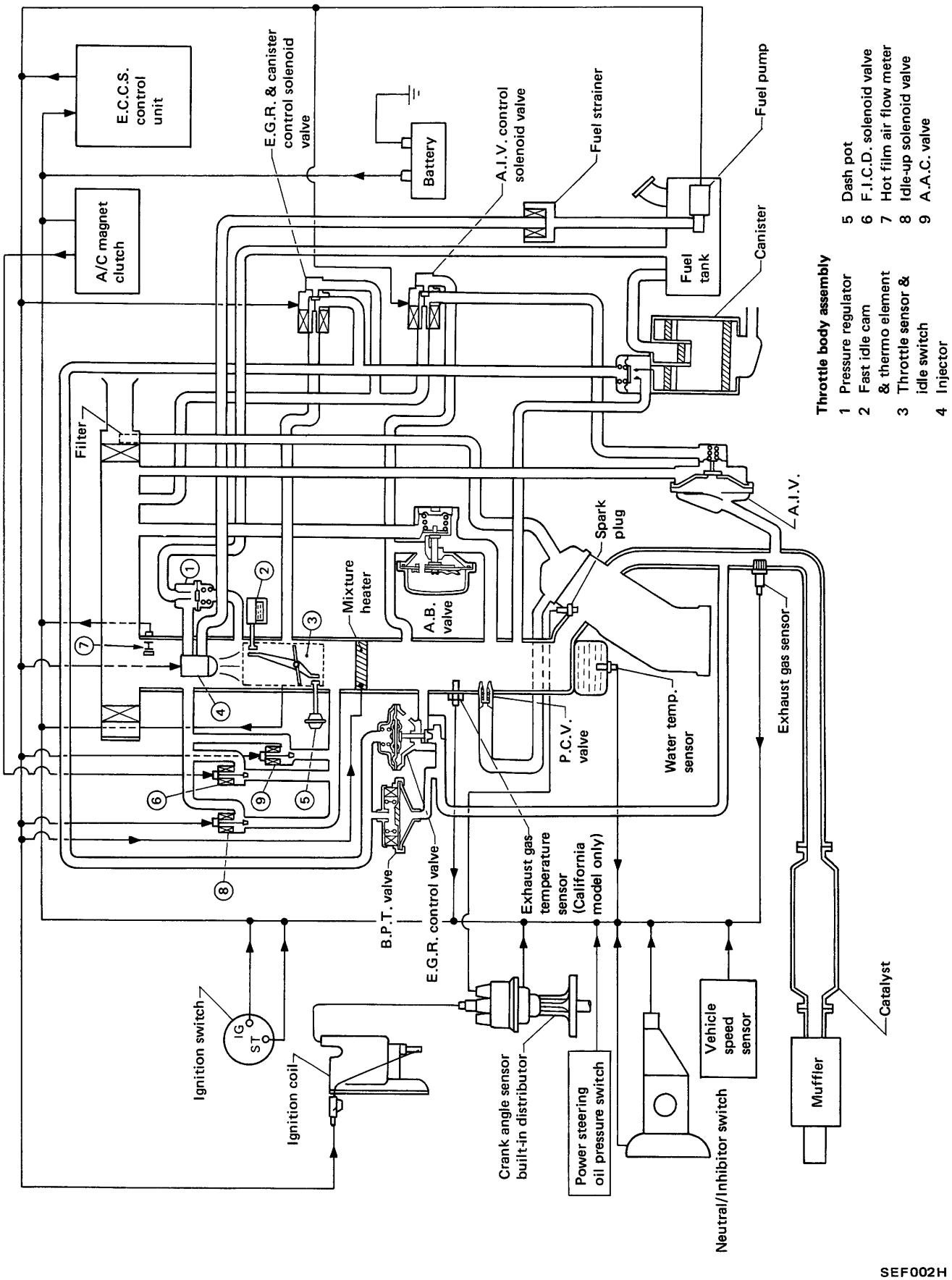
SEF814E


Wax type fast idle cam
Dash pot
Injector
Air flow meter
Pressure regulator
A.A.C. valve
Idle-up solenoid valve
F.I.C.D. solenoid valve
Throttle sensor & idle switch
Throttle body assembly


A.B. valve
Fuel filter
Exhaust gas temperature sensor (California model only)
Mixture heater
Carbon canistor
Ignition coil & power transistor
E.G.R. & canister control solenoid valve
A.I.V.
A.I.V. control solenoid valve
Water temperature sensor
Exhaust gas sensor
E.G.R. control valve
B.P.T. valve
Crank angle sensor

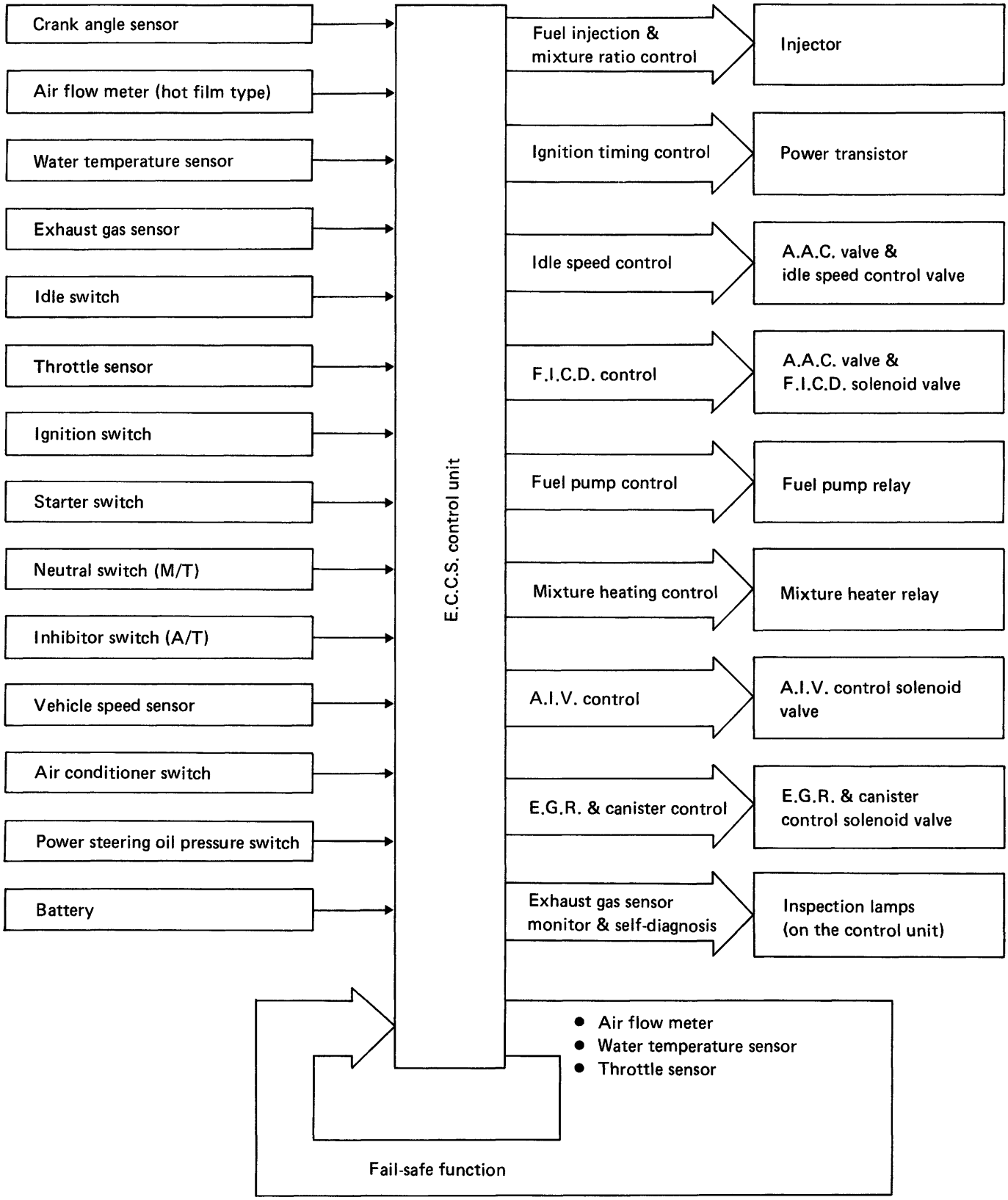

Electric fuel pump
E.C.C.S. control unit

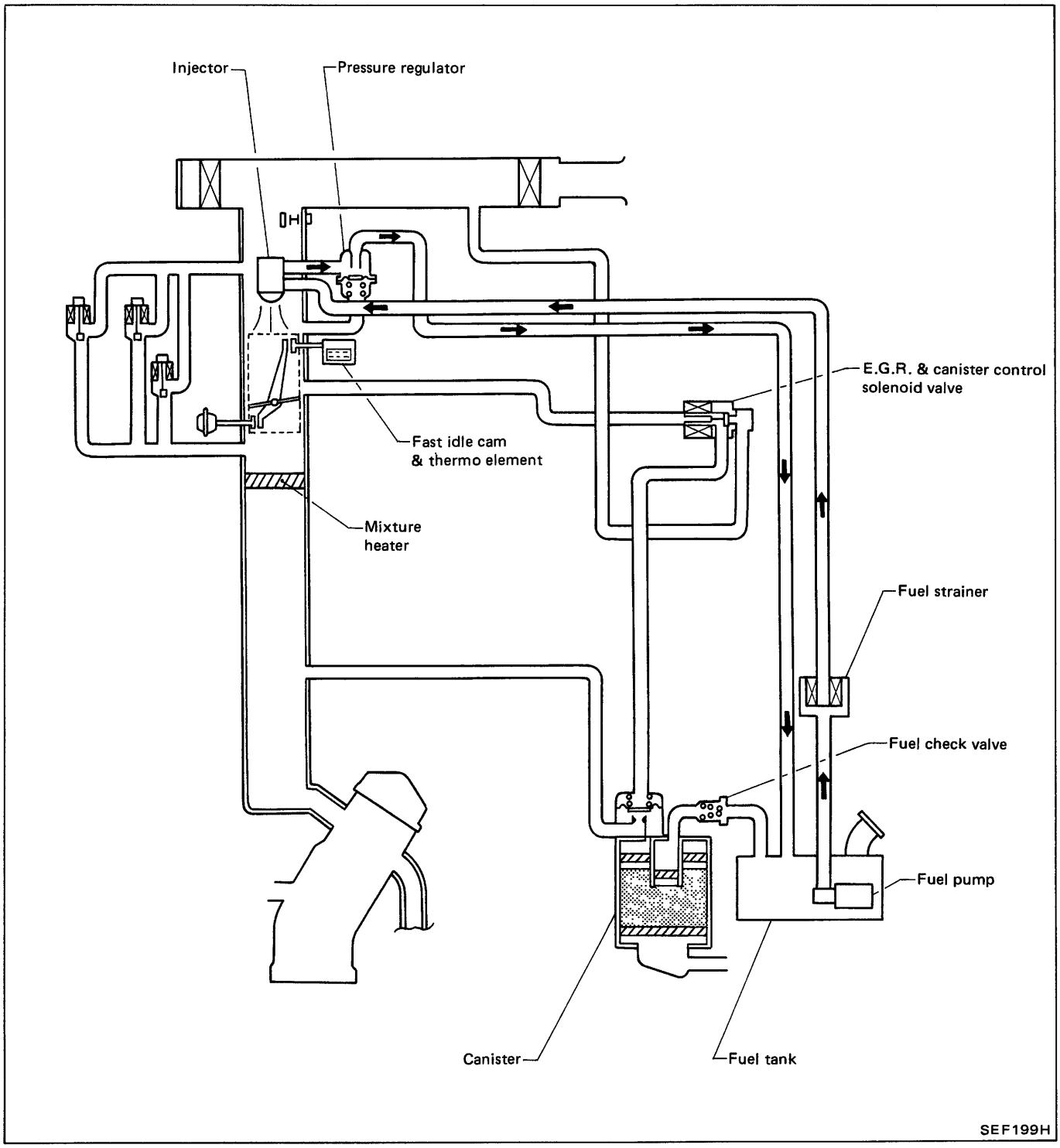
SEF271H

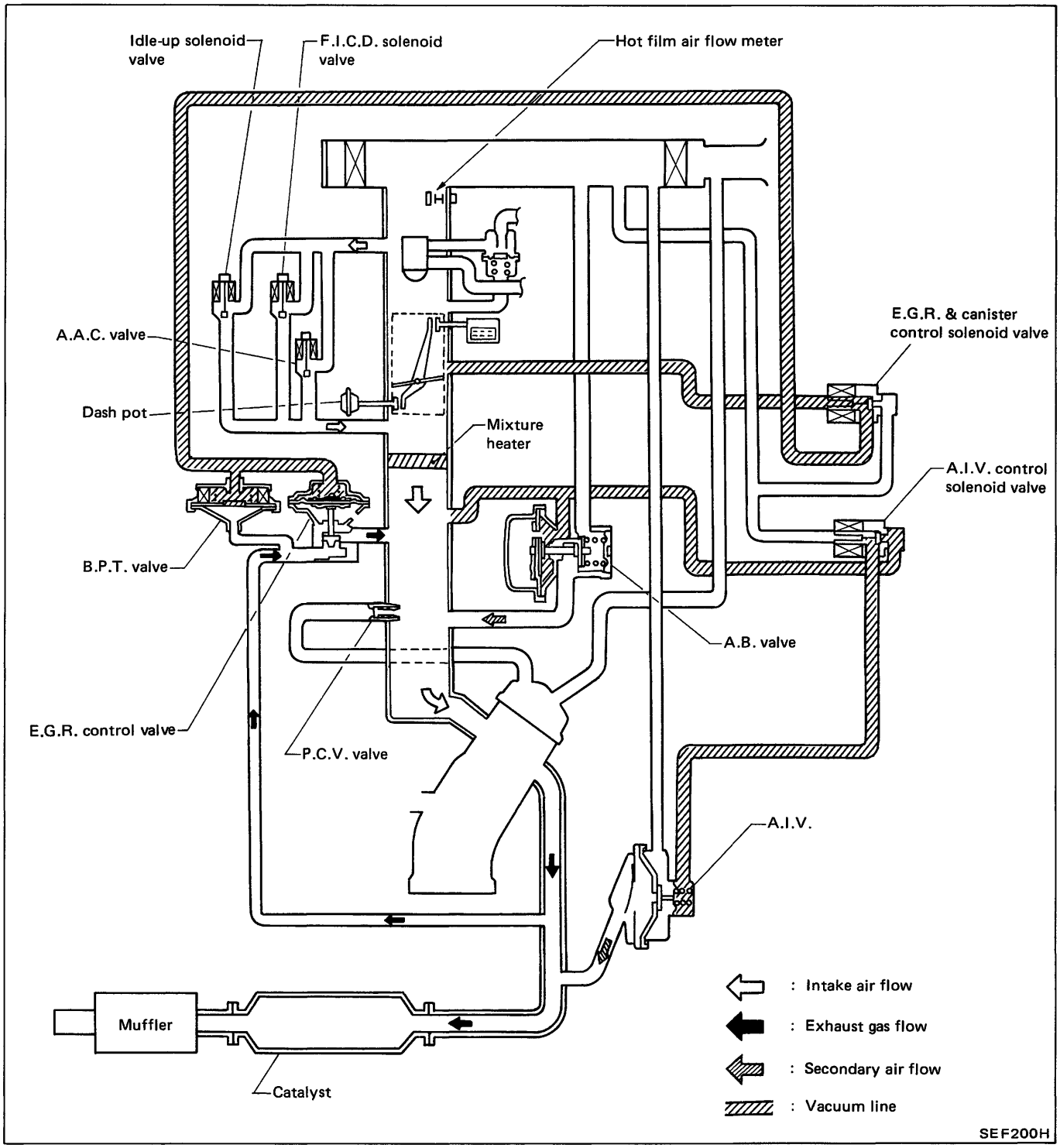

E.C.C.S. control unit
A/C magnet clutch
E.G.R. & canister control solenoid valve
Battery
A.I.V. control solenoid valve
Fuel strainer
Fuel pump
Fuel tank
Canister
Filter
Mixture heater
A.B. valve
Spark plug
A.I.V.
P.C.V. valve
Water temp. sensor
Exhaust gas sensor
B.P.T. valve
E.G.R. control valve
Exhaust gas temperature sensor (California model only)
Ignition switch
IG
ST
Ignition coil
Crank angle sensor built-in distributor
Power steering oil pressure switch
Neutral/Inhibitor switch
Vehicle speed sensor
Muffler
Catalyst
Throttle body assembly
1 Pressure regulator
2 Fast idle cam & thermo element
3 Throttle sensor & idle switch
4 Injector
5 Dash pot
6 F.I.C.D. solenoid valve
7 Hot film air flow meter
8 Idle-up solenoid valve
9 A.A.C. valve

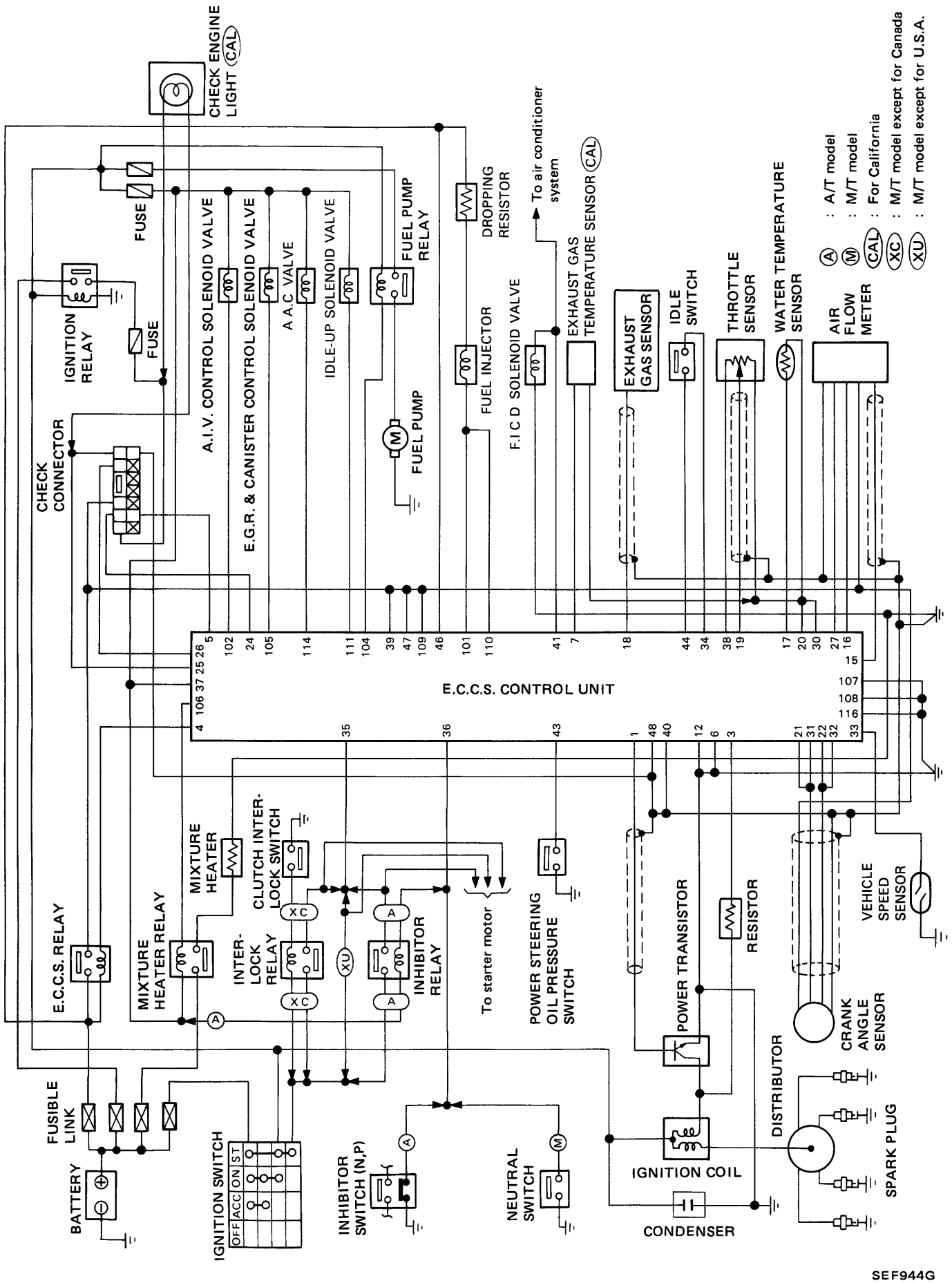
SEF002H

E.C.C.S. CONTROL



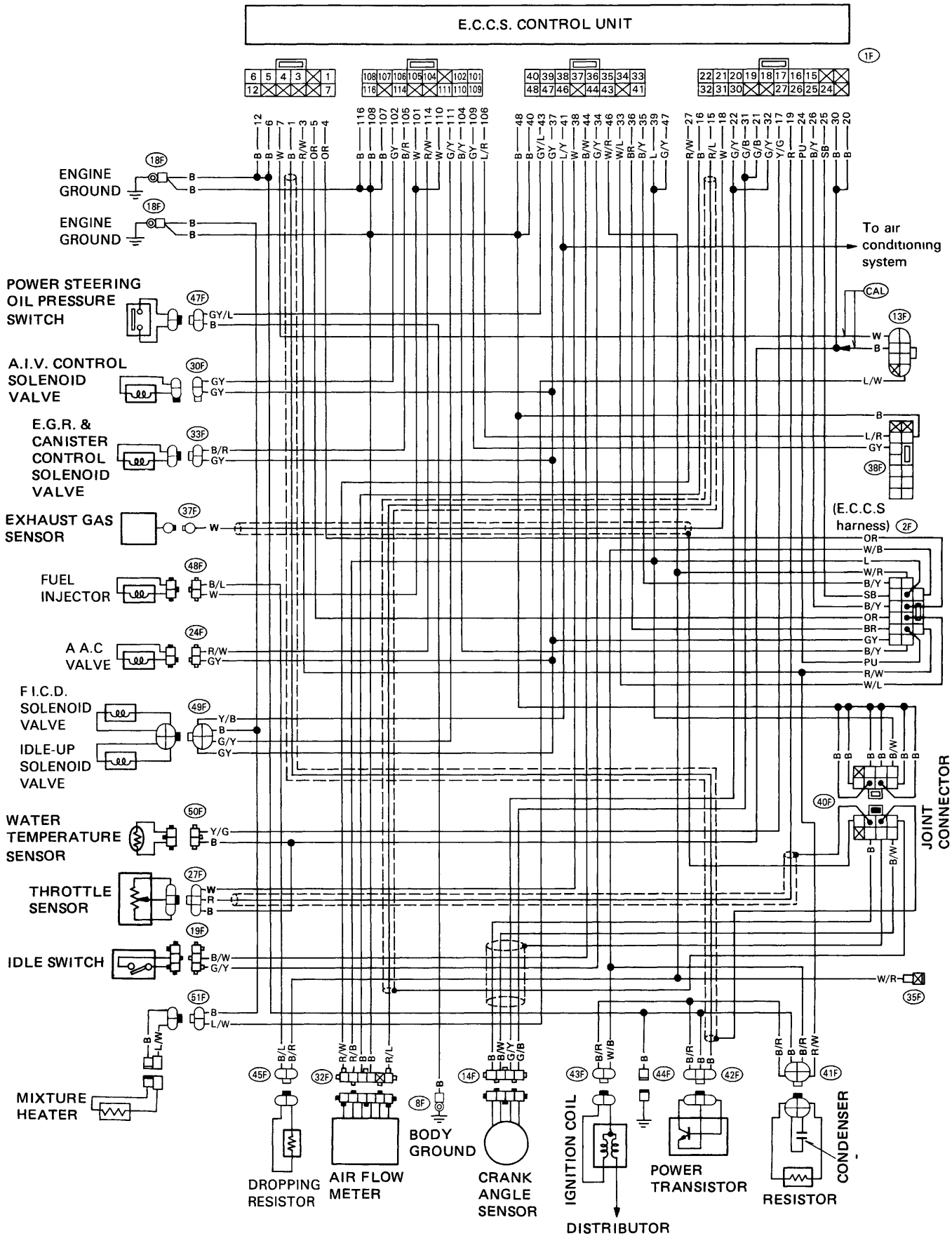

Injector
Pressure regulator
OH
E.G.R. & canister control solenoid valve
Fast idle cam & thermo element
Mixture heater
Fuel strainer
Fuel check valve
Fuel pump
Canister
Fuel tank
SEF199H

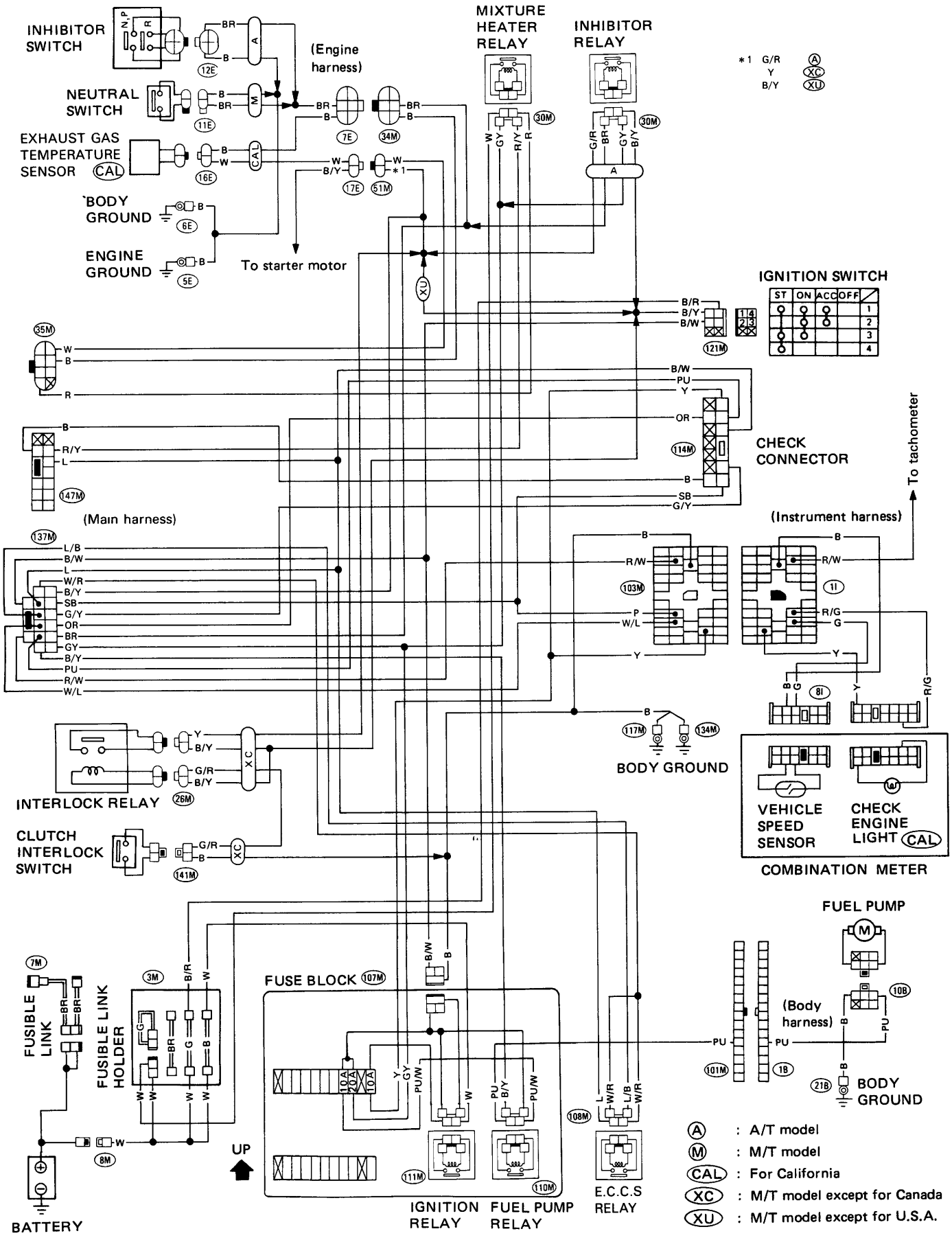

Idle-up solenoid valve
F.I.C.D. solenoid valve
Hot film air flow meter
A.A.C. valve
Dash pot
Mixture heater
E.G.R. & canister control solenoid valve
A.I.V. control solenoid valve
B.P.T. valve
A.B. valve
E.G.R. control valve
P.C.V. valve
A.I.V.
Muffler
Catalyst
: Intake air flow
: Exhaust gas flow
: Secondary air flow
: Vacuum line
SEF200H


CHECK ENGINE LIGHT (CAL)
FUSE
IGNITION RELAY
FUSE
CHECK CONNECTOR
A.I.V. CONTROL SOLENOID VALVE
E.G.R. & CANISTER CONTROL SOLENOID VALVE
A A.C VALVE
IDLE-UP SOLENOID VALVE
FUEL PUMP RELAY
FUEL PUMP
FUEL INJECTOR
F.I.C.D SOLENOID VALVE
DROPPING RESISTOR
To air conditioner system
EXHAUST GAS TEMPERATURE SENSOR (CAL)
EXHAUST GAS SENSOR
IDLE SWITCH
THROTTLE SENSOR
WATER TEMPERATURE SENSOR
AIR FLOW METER
Ⓐ : A/T model
Ⓜ : M/T model
CAL : For California
XC : M/T model except for Canada
XU : M/T model except for U.S.A.
E.C.C.S. CONTROL UNIT
E.C.C.S. RELAY
MIXTURE HEATER RELAY
MIXTURE HEATER
CLUTCH INTER-LOCK SWITCH
INTER-LOCK RELAY
INHIBITOR RELAY
To starter motor
POWER STEERING OIL PRESSURE SWITCH
POWER TRANSISTOR
RESISTOR
VEHICLE SPEED SENSOR
CRANK ANGLE SENSOR
DISTRIBUTOR
SPARK PLUG
IGNITION COIL
CONDENSER
FUSIBLE LINK
BATTERY
IGNITION SWITCH
OFF ACC ON ST
INHIBITOR SWITCH (N,P)
NEUTRAL SWITCH

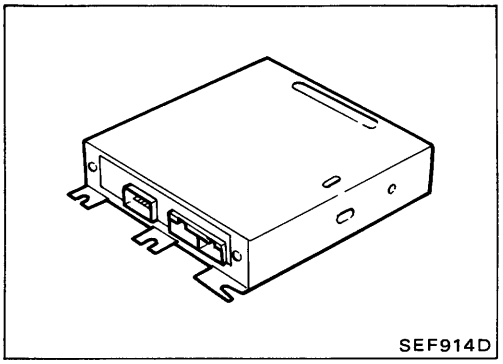
SEF944G

E.C.C.S. WIRING DIAGRAM




INHIBITOR SWITCH
NEUTRAL SWITCH
EXHAUST GAS TEMPERATURE SENSOR CAL
BODY GROUND
ENGINE GROUND
(Engine harness)
To starter motor
MIXTURE HEATER RELAY
INHIBITOR RELAY
*1 G/R A
Y XC
B/Y XU
IGNITION SWITCH
ST ON ACC OFF
CHECK CONNECTOR
To tachometer
(Main harness)
(Instrument harness)
INTERLOCK RELAY
CLUTCH INTERLOCK SWITCH
BODY GROUND
VEHICLE SPEED SENSOR
CHECK ENGINE LIGHT CAL
COMBINATION METER
FUEL PUMP
(Body harness)
BODY GROUND
FUSIBLE LINK
FUSIBLE LINK HOLDER
FUSE BLOCK 107M
BATTERY
UP
IGNITION RELAY
FUEL PUMP RELAY
E.C.C.S RELAY
A : A/T model
M : M/T model
CAL : For California
XC : M/T model except for Canada
XU : M/T model except for U.S.A.

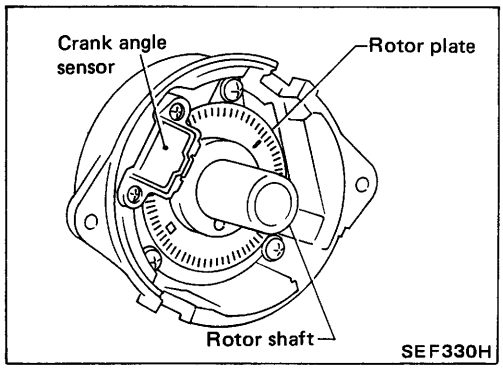
SEF945G


SEF914D

E.C.U. (E.C.C.S. control unit)

The E.C.U. consists of a microcomputer, inspection lamps, a diagnostic mode selector and connectors for signal input and output, and for power supply. The unit has control of the following functions.

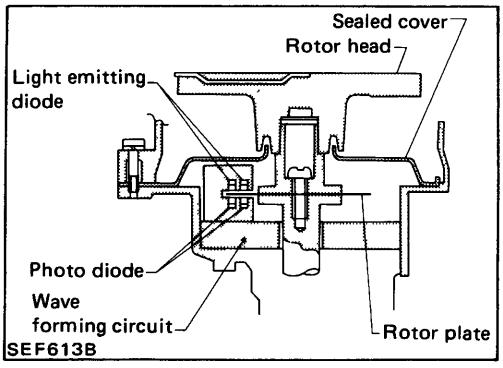
- Injected fuel amount
- Ignition timing
- Mixture ratio feedback
- Idle speed
- Fuel pump operation
- Mixture heating
- A.I.V. operation
- E.G.R. and canister purge operation



SEF330H

CRANK ANGLE SENSOR

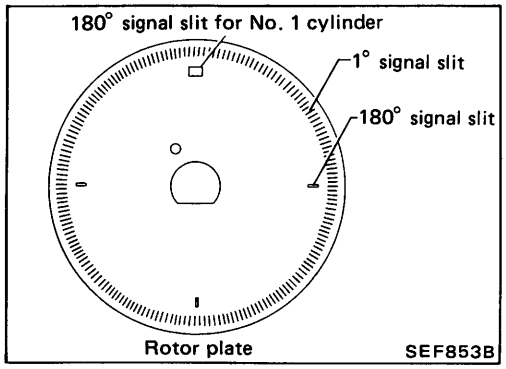
The crank angle sensor is a basic component of the entire E.C.C.S. It monitors engine speed and piston position, and sends to the E.C.U. some signals on which the controls of fuel injection, ignition timing and other functions are based.



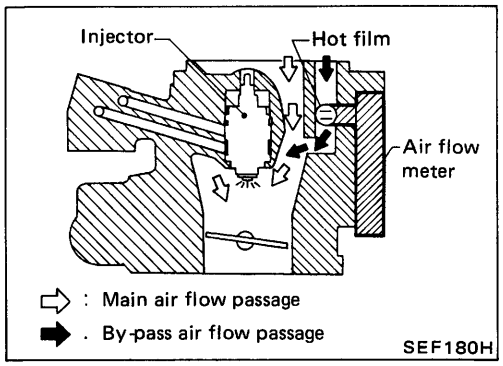
SEF613B

The crank angle sensor has a rotor plate and a wave forming circuit. The rotor plate has 360 slits for 1° signal and 4 slits for 180° signal. Light Emitting Diodes (L.E.D.) and Photo Diodes are built in the wave forming circuit.

When the rotor plate passes the space between the L.E.D. and the photo diode, the slits of the rotor plate continually cut the light which is sent to the photo diode from the L.E.D. This causes generating rough-shaped pulses. They are then converted into on-off pulses by the wave forming circuit, which are sent to the E.C.U.



SEF853B

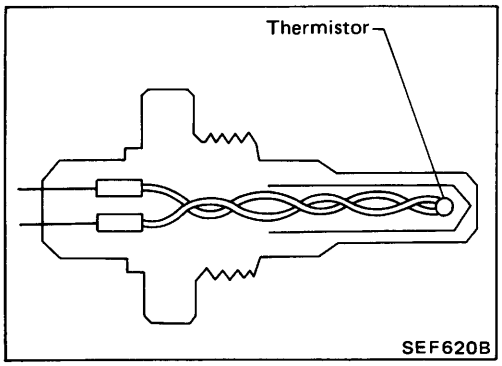


AIR FLOW METER

The air flow meter measures the intake air flow rate by taking a part of the entire flow. Measurements are made in such a manner that the E.C.U. receives electrical output signals varied by the amount of heat emitting from the hot film placed in the stream of the intake air.

When intake air flows into the intake manifold through a route around the hot film, the heat generated from the hot film is taken away by the air. The amount of heat depends on the air flow. On the other hand, the temperature of the hot film is automatically controlled to a certain number of degrees.

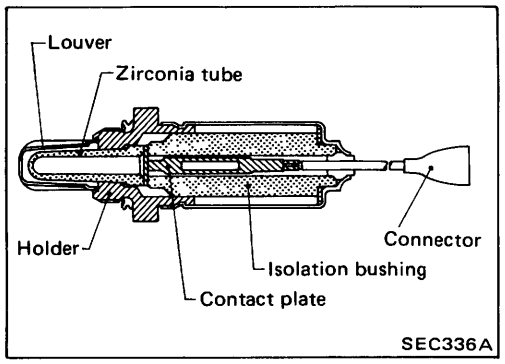
Therefore, it is necessary to supply the hot film with more electric current in order to maintain the temperature of the hot film. The E.C.U. knows the air flow by means of the electric change.



WATER TEMPERATURE SENSOR

The water temperature sensor, located on the front side of the intake manifold, detects engine coolant temperature and emits signals to the E.C.U.

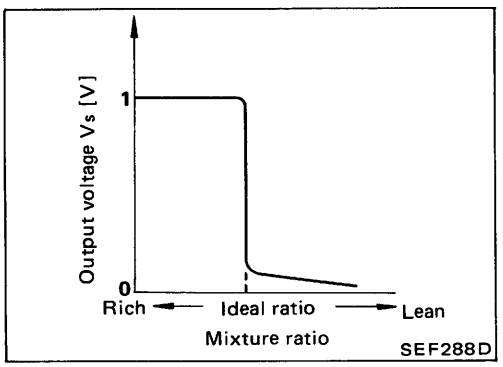
This part employs a thermistor which is sensitive to changes in temperature. The electric resistance of a thermistor decreases in response to a temperature rise.

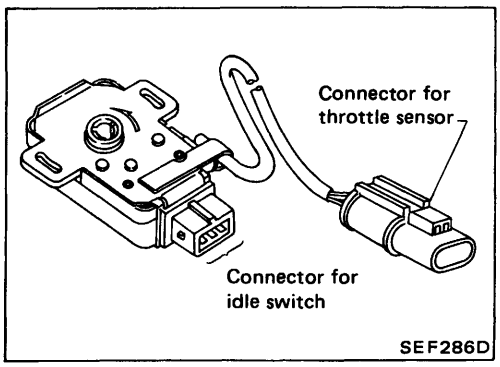


EXHAUST GAS SENSOR (Zirconia type)

The exhaust gas sensor, which is placed into the exhaust manifold, monitors the amount of oxygen in the exhaust gas.

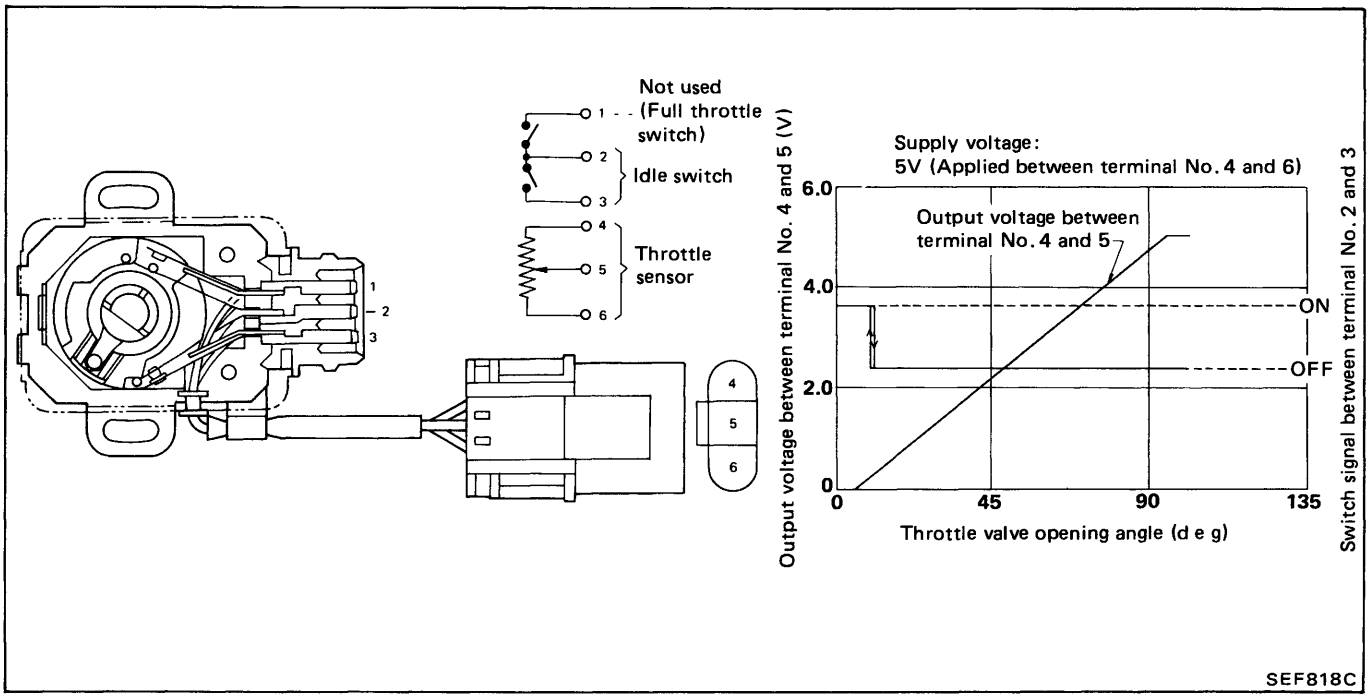
The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares the oxygen density of exhaust gas with that of atmosphere, and generates electricity. In order to improve generating power of the zirconia, its tube is coated with platinum. The voltage is approximately 1V in a richer condition of the mixture ratio than the ideal air fuel ratio, while approximately 0V in leaner conditions. The radical change from 1V to 0V occurs at around the ideal mixture ratio. In this way, the exhaust gas sensor detects the amount of oxygen in the exhaust gas and sends the signal of approximately 1V or 0V to the E.C.U.

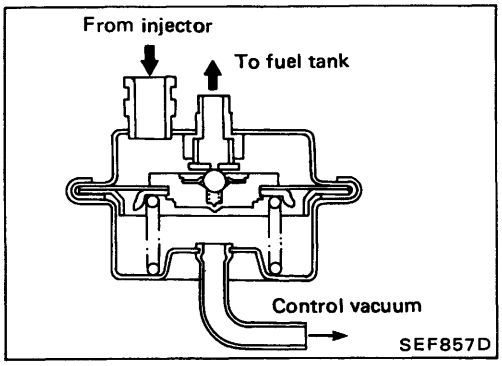




THROTTLE SENSOR & IDLE SWITCH

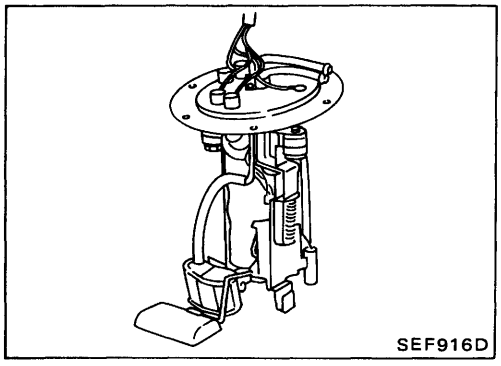
The throttle sensor is attached to the throttle body and actuates in response to accelerator pedal movement. This sensor has two functions. It contains an idle switch and throttle sensor. The idle switch closes when the throttle valve is positioned at idle and opens when it is at any other position. The throttle sensor is a potentiometer which transforms the throttle valve position into output voltage, and feeds the voltage signal to E.C.C.S. control unit. In addition, the throttle sensor detects the opening or closing speed of the throttle valve, and feeds the rate of voltage change to the E.C.C.S. control unit.





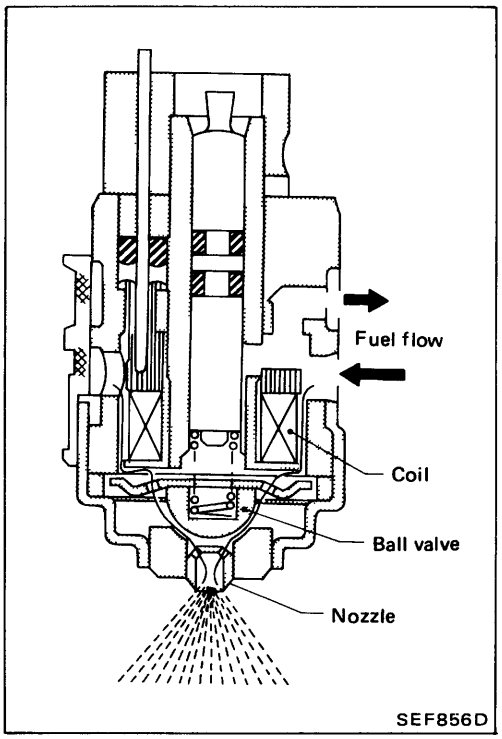
PRESSURE REGULATOR

The pressure regulator, built into the side of the throttle body, maintains the fuel pressure at 299.1 kPa (3.05 kg/cm^2, 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to keep pressure constant.



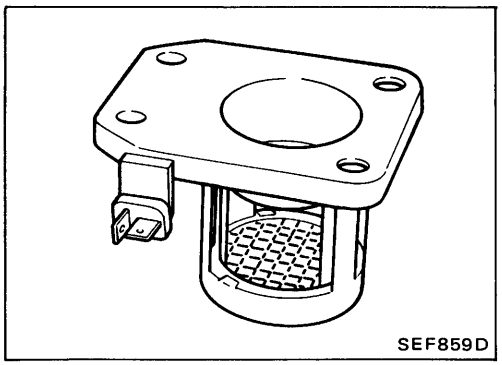
FUEL PUMP

The fuel pump with a fuel damper is an in-tank type, that is the pump and damper are located in the fuel tank. The vane rollers are directly coupled to a motor which is filled with fuel.



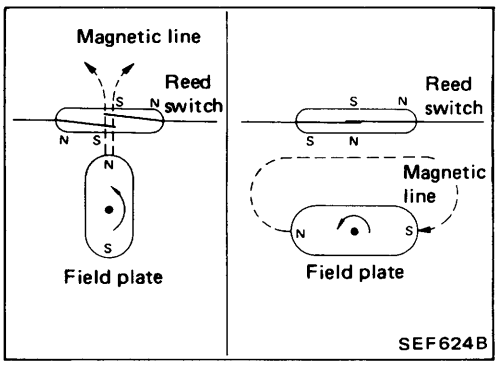
FUEL INJECTOR

The fuel injector is a kind of small, elaborate solenoid valve. As the E.C.U. sends injection signals to the injector, high-pressure fuel, which is supplied to the coil built in the injector, pulls the ball valve back, and then fuel is injected onto the throttle valve through the nozzle. The amount of injected fuel is controlled by the E.C.U. in terms of injection pulse duration.



MIXTURE HEATER

The mixture heater is located between the throttle valve and the intake manifold. This is designed and operated for atomizing fuel in the cold engine start condition.
The E.C.U. has control of the heater.

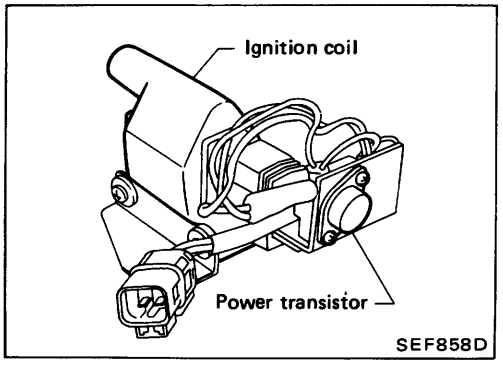


VEHICLE SPEED SENSOR

The vehicle speed sensor provides a vehicle speed signal to the E.C.U. for fuel cut, recovery and idle speed control.

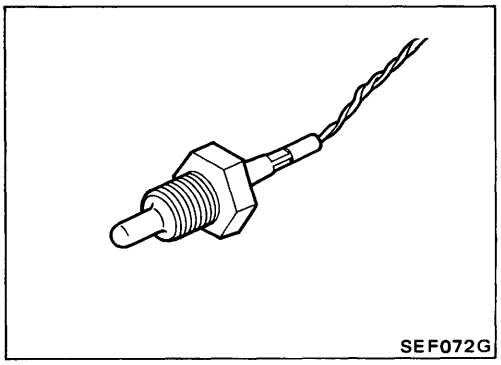
- **Needle type speedometer models**

The speed sensor consists of a reed switch, which is installed in the speed meter unit and transforms vehicle speed into a pulse signal.



POWER TRANSISTOR & IGNITION COIL

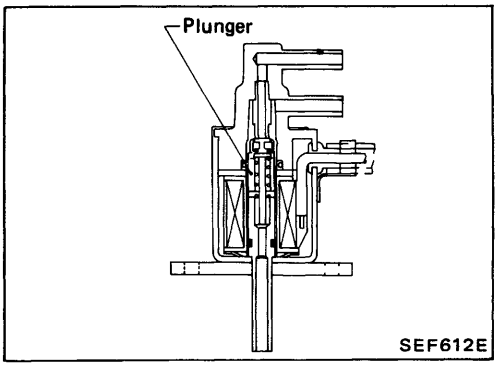
The ignition signal from the E.C.U. is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit.
The ignition coil is a small, molded type.


SEF072G

EXHAUST GAS TEMPERATURE SENSOR

[Carifornia model]

The exhaust gas temperature sensor is located near E.G.R. valve, detects exhaust gas temperature and emits signals to the E.C.U. This part employs a thermistor which is sensitive to changes in temperature. The electric resistance of a thermistor decreases in response to a temperature rise.



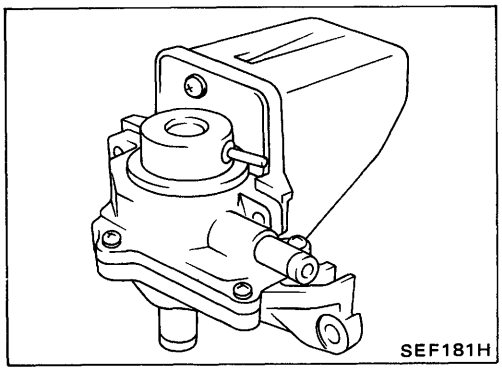
SEF612E

A.I.V. CONTROL SOLENOID VALVE

The A.I.V. control solenoid valve cuts intake manifold vacuum signal for A.I.V. control. The solenoid valve actuates in response to the ON/OFF signal from the E.C.U. When the solenoid is off, the vacuum signal from the intake manifold is cut. As the control unit outputs an ON signal, the coil pulls the plunger downward, and feeds the vacuum signal to the A.I.V. control valve.

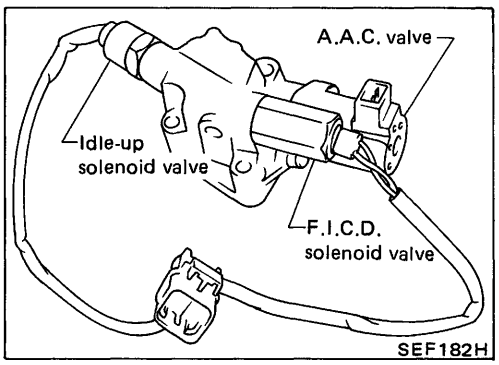
E.G.R. & CANISTER CONTROL SOLENOID VALVE

The E.G.R. and canister systems are controlled only by the E.C.U. At both low and high speed revolution of engine, the solenoid valve turns ON and accordingly the E.G.R. control valve and canister cut exhaust gas and fuel vapor leading to the intake manifold.


SEF181H

A.I.V. (AIR INDUCTION VALVE)

The air induction valve sends secondary air to the exhaust manifold, utilizing a vacuum caused by exhaust pulsation in the exhaust manifold. When the exhaust pressure is below atmospheric pressure (negative pressure), secondary air is sent to the exhaust manifold. When the exhaust pressure is above atmospheric pressure, the reed valves prevent secondary air from being sent back to the air cleaner.



A.A.C. (AUXILIARY AIR CONTROL) VALVE

The A.A.C. valve is attached to the throttle body. The E.C.U. actuates the A.A.C. valve by an ON/OFF pulse of approximately 160 Hz. The longer that ON duty is left on, the larger the amount of air that will flow through the A.A.C. valve.

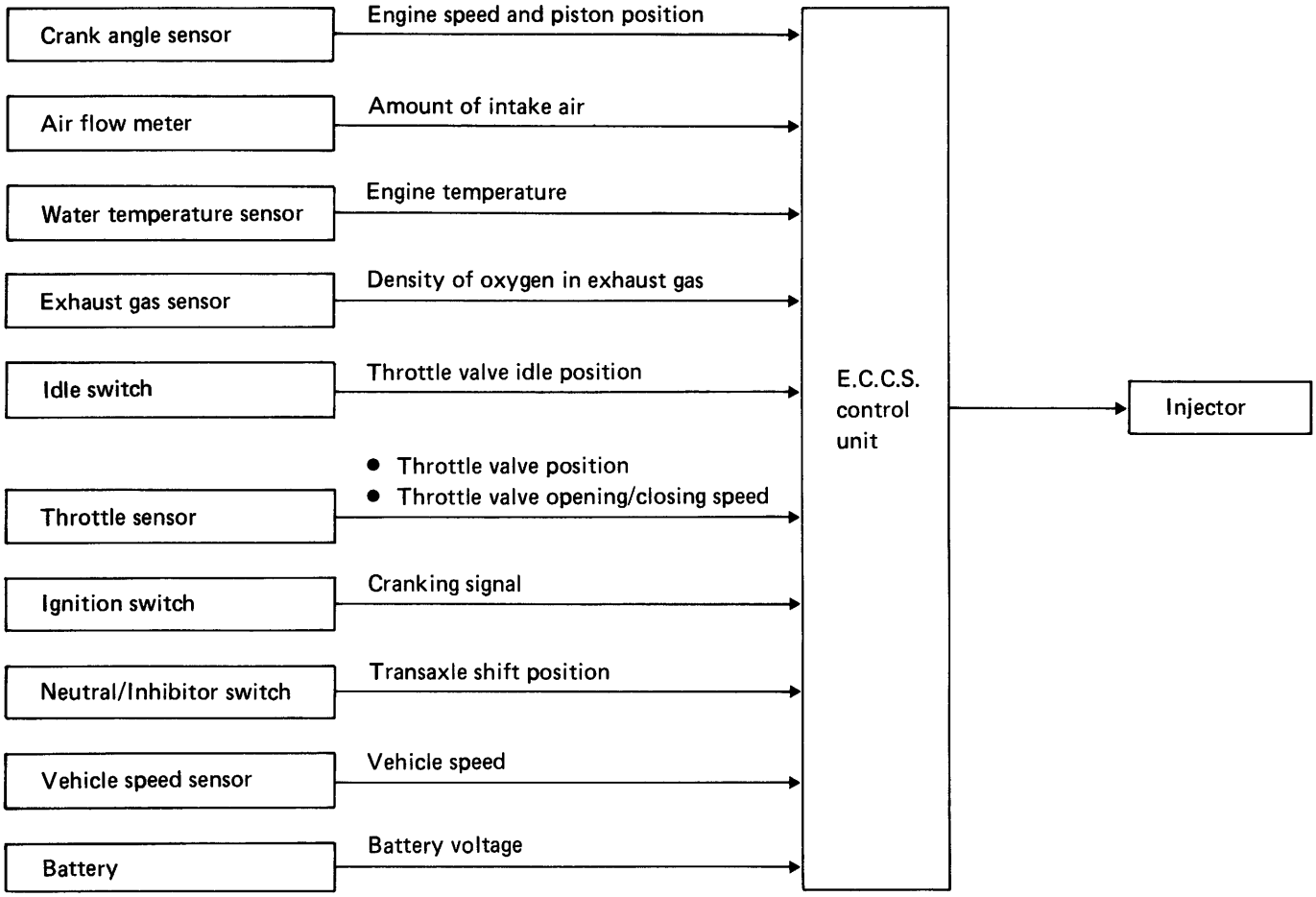
The A.A.C. valve adjusts idle speed to the specified value.

When the amount of air through the A.A.C. valve is insufficient (power steering oil pressure switch ON, air conditioner switch ON etc.), additional air is supplyed by the idle-up solenoid valve, F.I.C.D. solenoid valve and F.I.C. system.

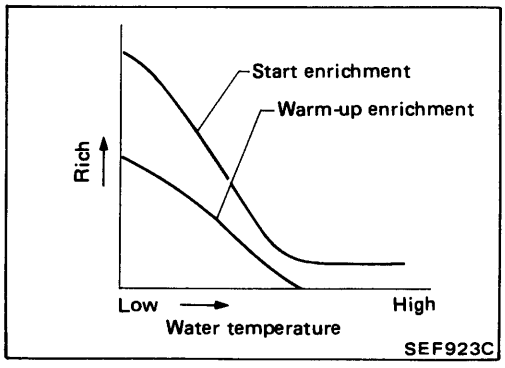
IDLE-UP SOLENOID VALVE

The idle-up solenoid valve is attached to the throttle body. The solenoid valve actuates to stabilize idle speed when engine load is heavy because of electric load, power steering oil pump.

Fuel Injection Control



The E.C.U. calculates the basic injection pulse width by processing signals from the crank angle sensor and air flow meter. Receiving signals from each sensor which detects various engine conditions, the E.C.U. adds various enrichments, which are pre-programmed in the E.C.U., to the basic injection amount. Thus, the optimum amount of fuel is injected through the injectors.



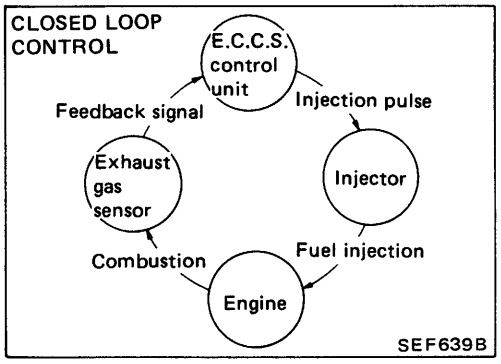
1) Fuel enrichment:
In each of the following conditions, fuel is enriched.

- During warm-up
- When starting
- When accelerating (in response to opening speed of throttle valve)
- With heavy load
- Water temperature is high.

Enrichment rates for "when accelerating" and "with heavy load" are pre-programmed.

Fuel Injection Control (Cont'd)

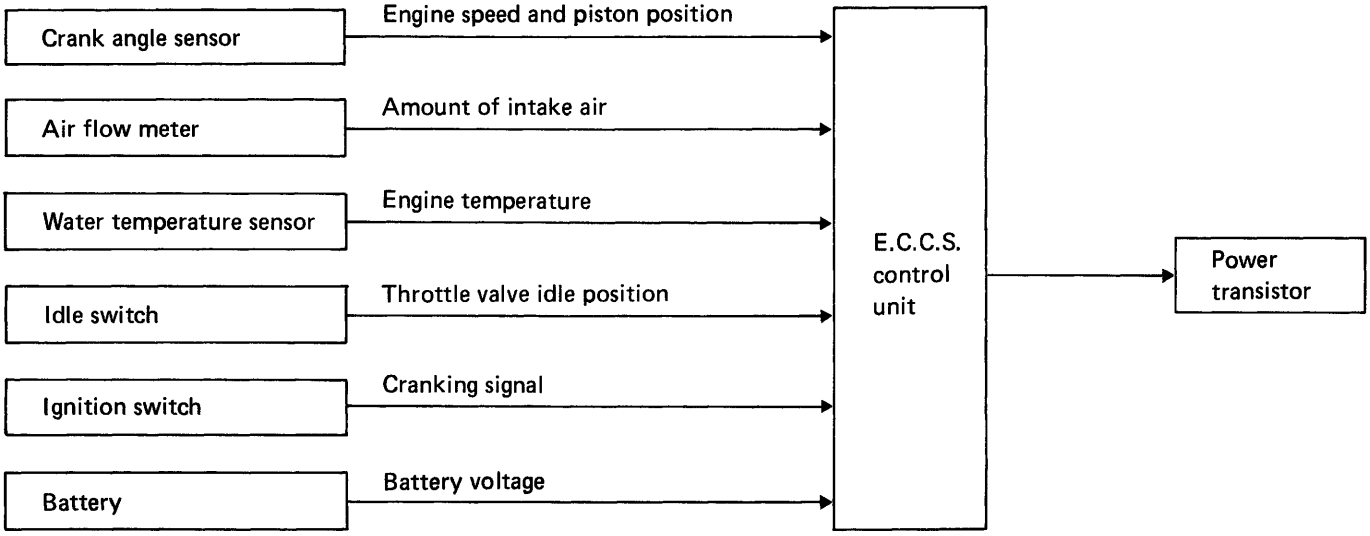
2) Fuel lean during deceleration:
Lean rates for "during deceleration" are programmed for closing speed of throttle valve.



3) Mixture ratio feedback control (Closed loop control)
Mixture ratio feedback system is designed to control the mixture ratio precisely to the stoichiometric point so that the three-way catalyst can minimize CO, HC and NOx emissions simultaneously. This system uses an exhaust gas sensor located in the exhaust manifold to give an indication of whether the air-fuel ratio richer or leaner than the stoichiometric point. The control unit adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the narrow window around the stoichiometric air fuel ratio.
However, this system will operate under open loop under the following conditions:

- **When starting engine.**
- **When engine temperature is cold.**
- **When exhaust gas sensor temperature is cold.**
- **When driving at high speeds or under heavy load.**
- **At idle.**
- **When the exhaust gas sensor monitors a rich condition for more than 10 seconds.**
- **During deceleration.**

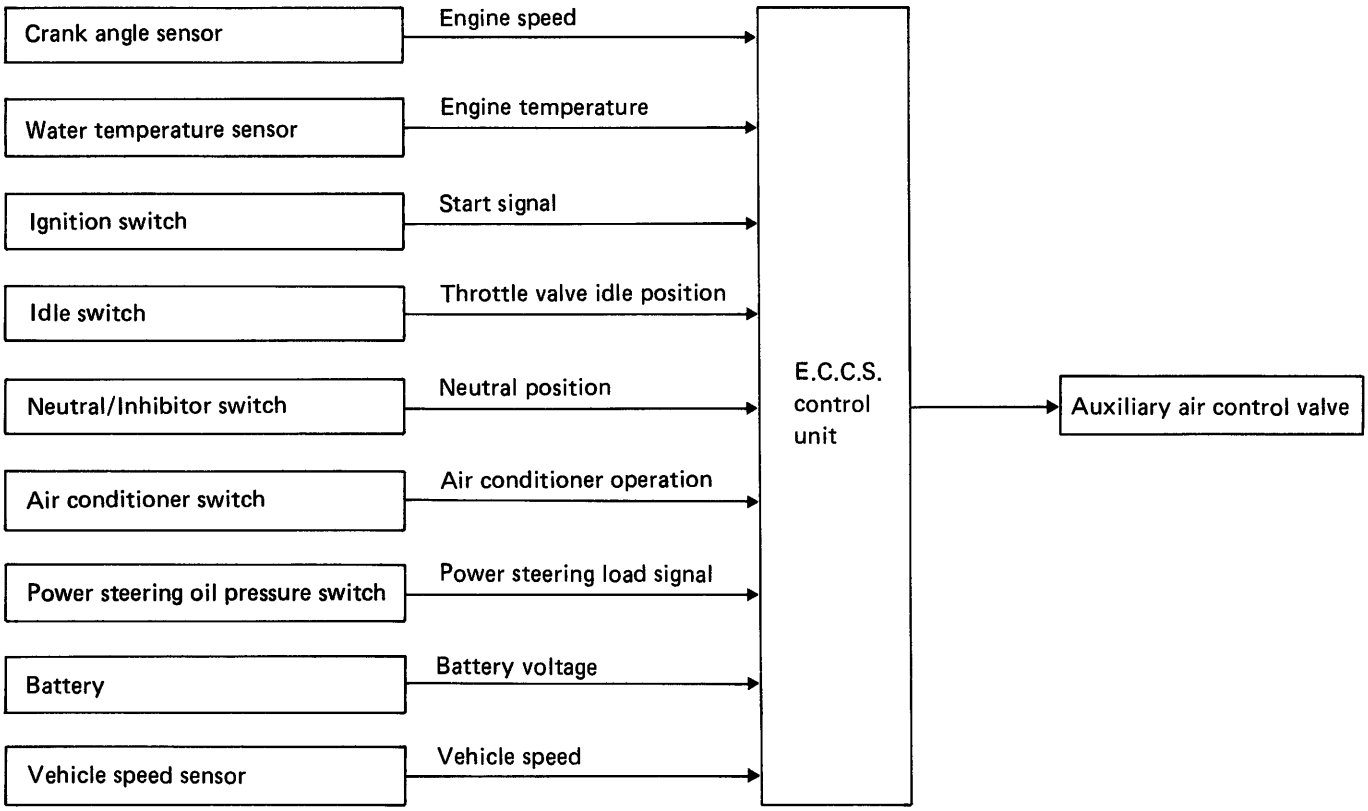
Ignition Timing Control



Ignition timing is controlled corresponding to the engine operating conditions.

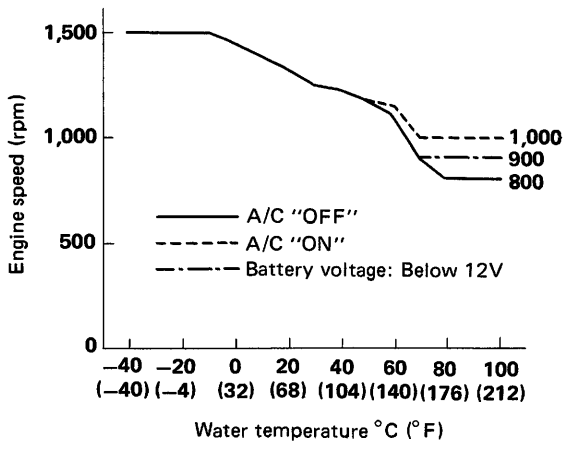
The optimum ignition timing in each driving condition is preprogrammed in the E.C.U. The signal from the E.C.U. is transmitted to the power transistor and controls ignition timing.

Idle Speed Control

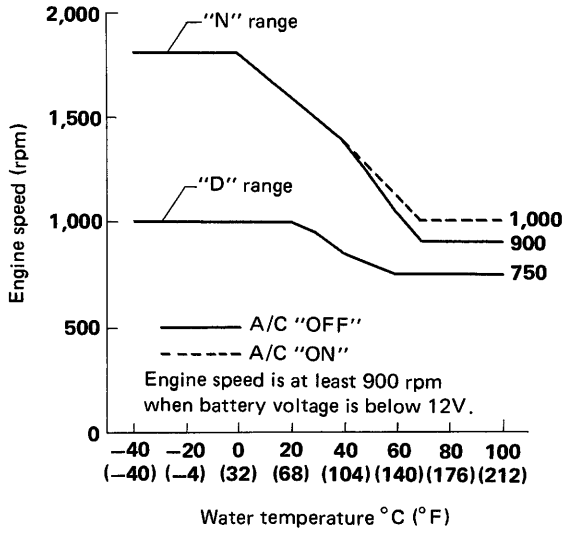


The idle speed is controlled by the E.C.U., corresponding to the engine operating conditions. The E.C.U. senses the engine condition and determines the best idle speed at each cylinder head temperature and gear position. The control unit then sends an electronic signal corresponding to the difference between the best idle speed and the actual idle speed to the A.A.C. valve.

M/T models

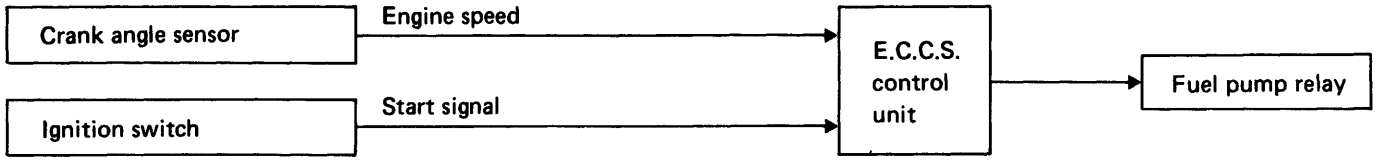


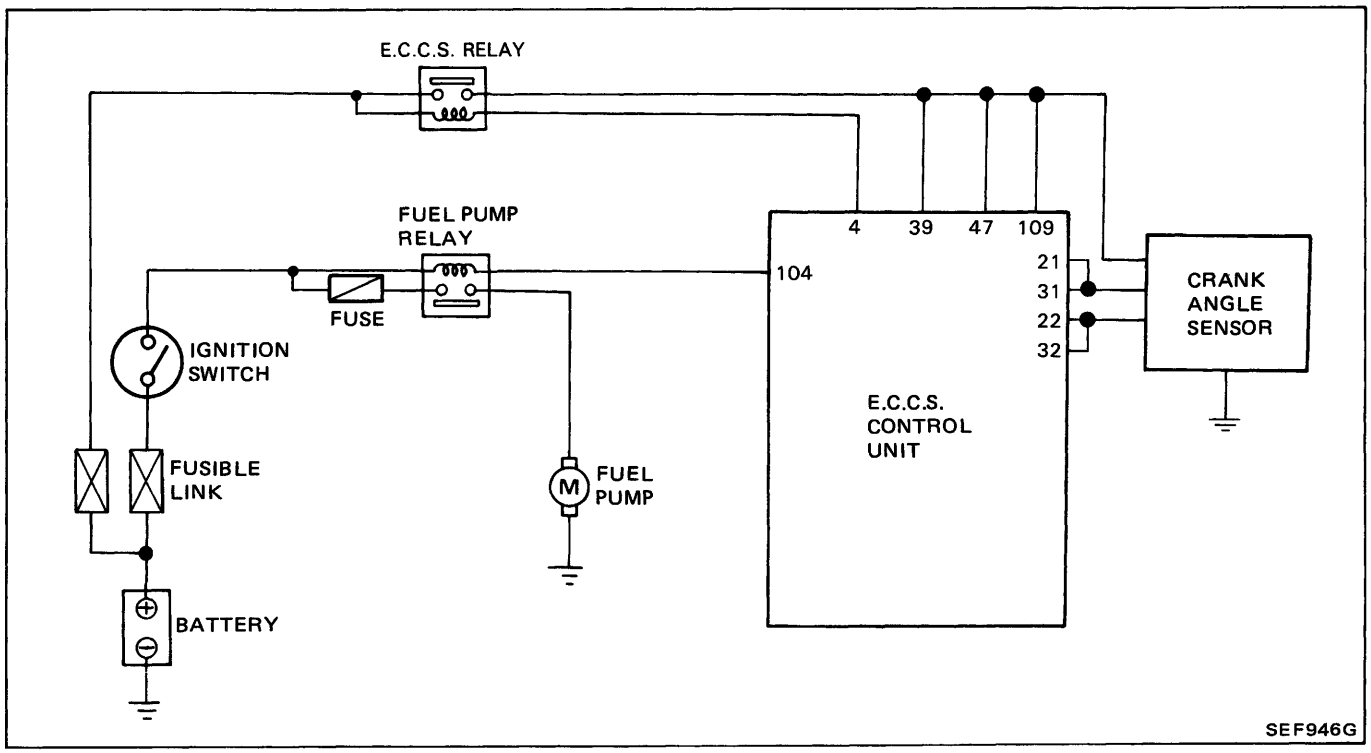
A/T models



SEF198H

Fuel Pump Control

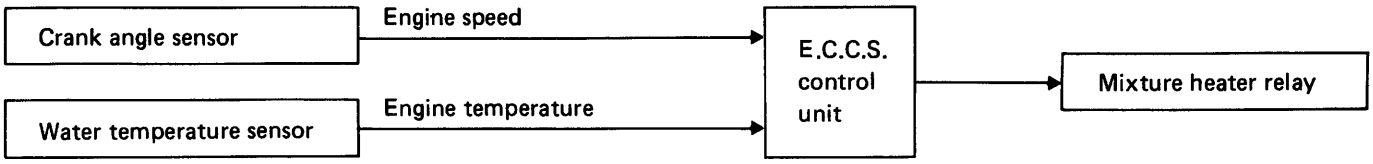


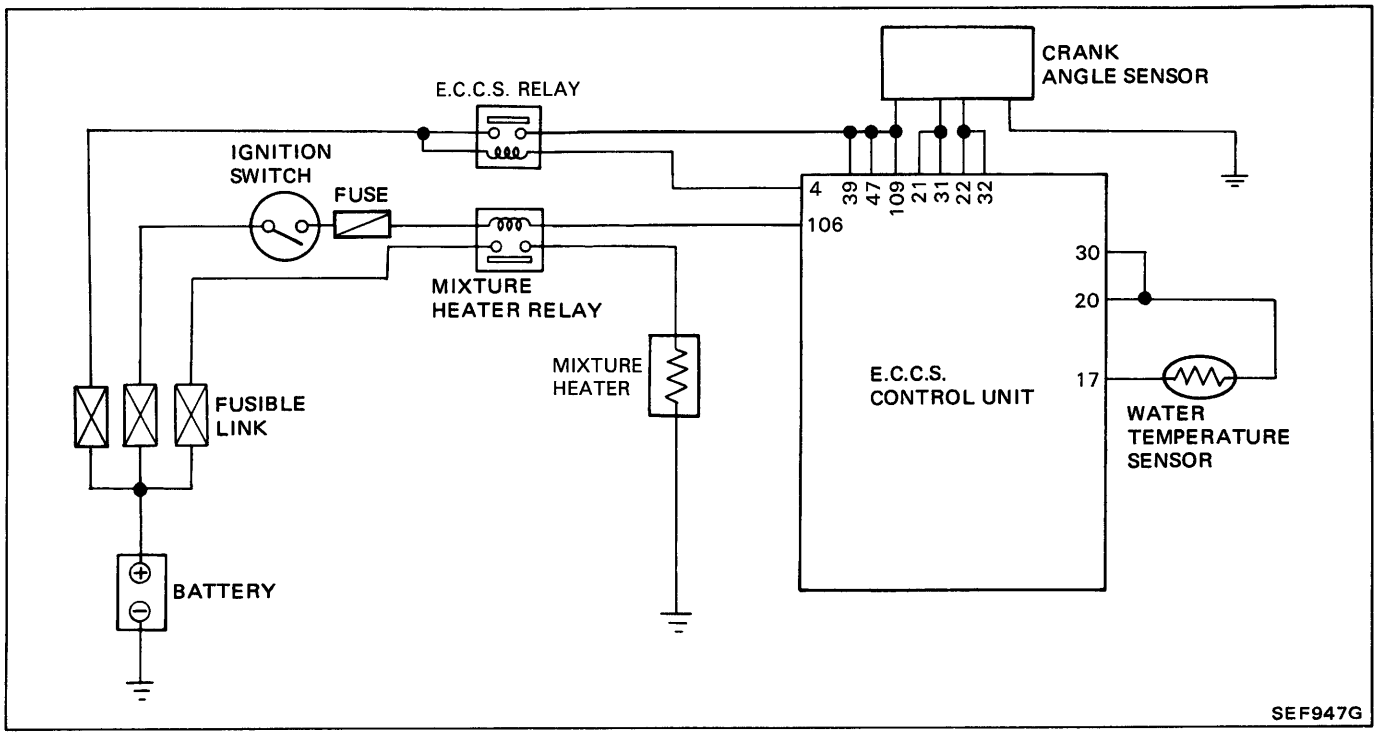


Fuel pump ON-OFF control

Ignition switch position	Engine condition	Fuel pump relay	Fuel pump operation
ON	Stopped	ON → OFF	Operates for 5 seconds after ignition switch turns to "ON"
	Starting	ON	Operates
	Running	ON	Operates
	After stall	ON → OFF	Stops in 1 second

Mixture Heating Control



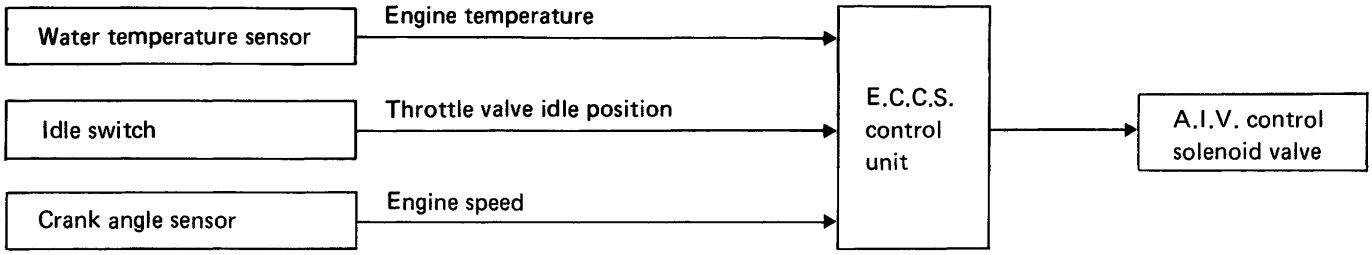


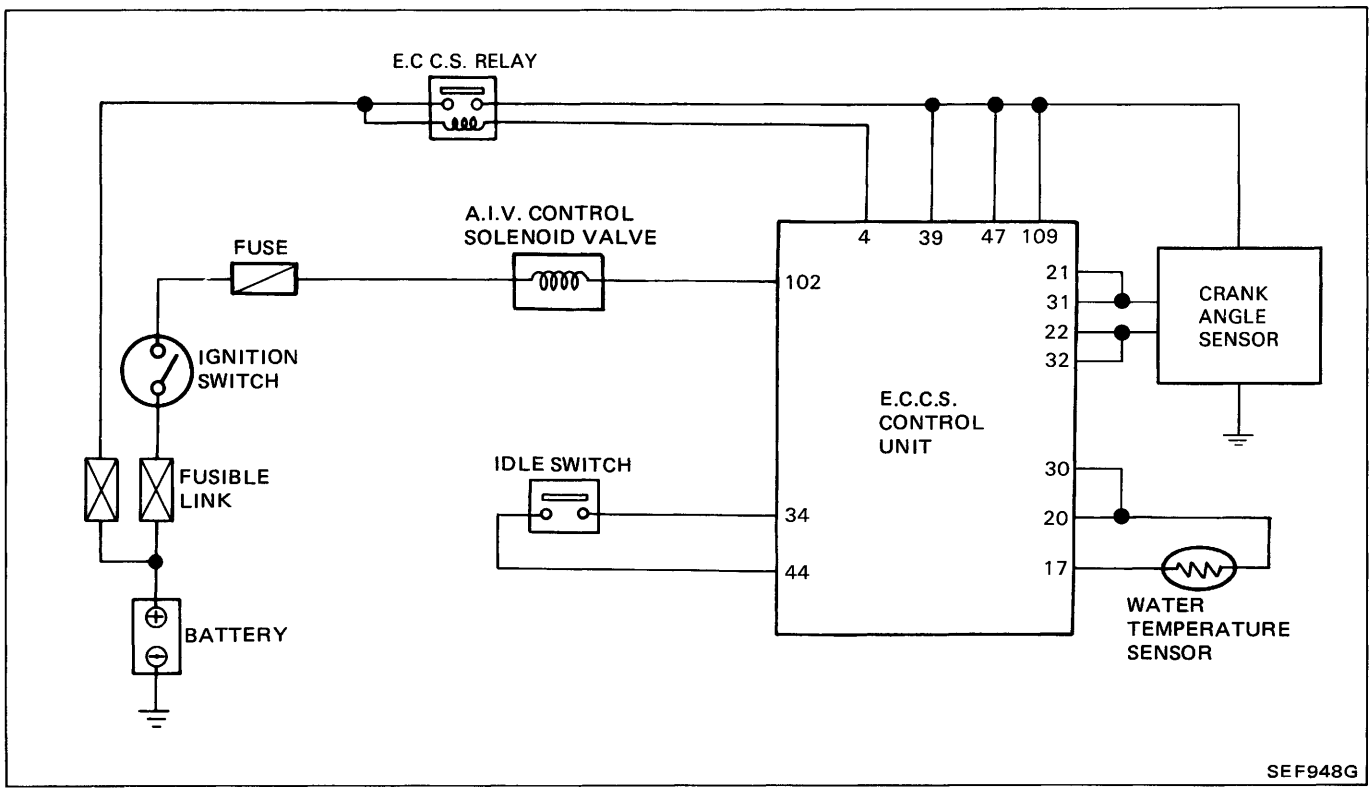
Mixture heater relay will be ON when all the following conditions are met:

- Engine is running
- Water temperature is below 50°C (122°F) when starting the engine.

And turns OFF when several minutes have passed after water temperature exceeds 50°C (122°F).

Air Induction Valve (A.I.V.) Control





The air induction system is designed to send secondary air to the exhaust manifold, utilizing a vacuum caused by exhaust pulsation in the exhaust manifold.

The exhaust pressure in the exhaust manifold usually pulsates in response to the opening and closing of the exhaust valve and it decreases below atmospheric pressure periodically.

If a secondary air intake pipe is opened to the atmosphere under vacuum conditions, secondary air can be drawn into the exhaust manifold in proportion to the vacuum.

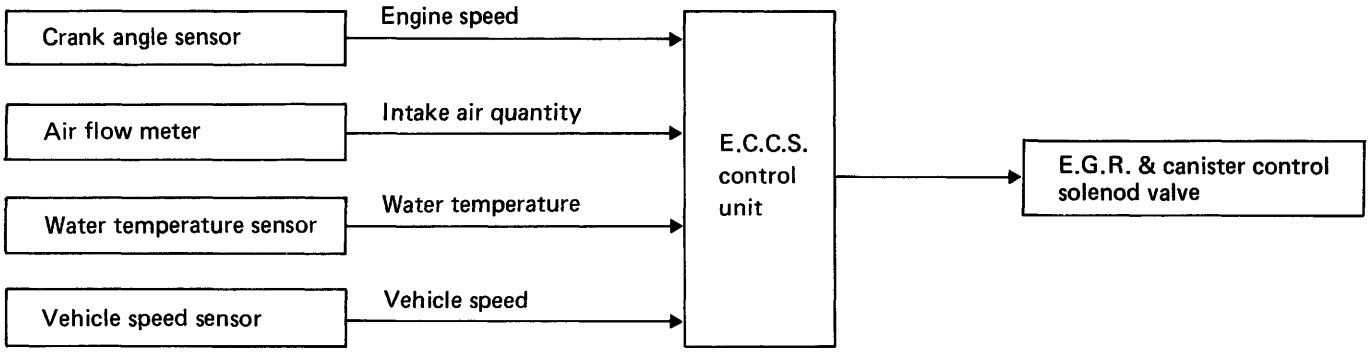
The air induction valve is controlled by the E.C.C.S. control unit, corresponding to the engine temperature. When the engine is cold, the A.I.V. control system operates to reduce HC and CO.

In extremely cold condition, A.I.V. control system does not operate to reduce after burning.

OPERATION

Engine condition	Water temperature °C (°F)	A.I.V. control solenoid valve	A.I.V. control system
Running or idle	Between 15 (59) and 60 (140)	ON	Operates
Idle	Above 70 (158)		
During deceleration	–		

E.G.R. (Exhaust Gas Recirculation) & Canister Control



The signal from the E.C.U. is sent to the E.G.R. & canister control solenoid valve, which cuts the vacuum line for the E.G.R. and canister control valve. E.G.R. and canister activates when all the following conditions are met.

Condition	E.G.R. & canister control solenoid	E.G.R. & canister system
Engine speed between 800 and 5,200 rpm Vehicle speed above 14 km/h (9 MPH) Water temperature above 60°C (140°F)	OFF	Operates
Except above	ON	Does not operate

Fail-safe System Description

AIR FLOW METER MALFUNCTIONING

If the air flow meter output voltage is lower or higher than the specified value, E.C.U. senses an air flow meter malfunctioning. In case air flow meter malfunctions, the throttle sensor substitutes for the air flow meter.

Though air flow meter is malfunctioning, it is possible to drive the vehicle and start the engine. But engine speed will not rise more than 2,400 rpm in order to inform the driver of fail-safe system operation while driving.

Operation

Engine condition	Starter switch	Fail-safe system	Fail-safe functioning
Stopped	ANY	Does not operate	–
Cranking	ON	Operates	Engine will be started by a pre-determined injection pulse on E.C.U.
Running	OFF		Engine speed will not rise above 2,400 rpm.

WATER TEMPERATURE SENSOR

Description

When the output signal of water temperature sensor is abnormal the E.C.U. judges it as a malfunctioning of water temperature sensor.
The E.C.U. decides the water temperature according to the ignition switch signal.

Operation

Condition	Water temperature decided
Just as ignition switch is turned ON.	80°C (176°F)
Just as ignition switch is turned Start.	20°C (68°F)

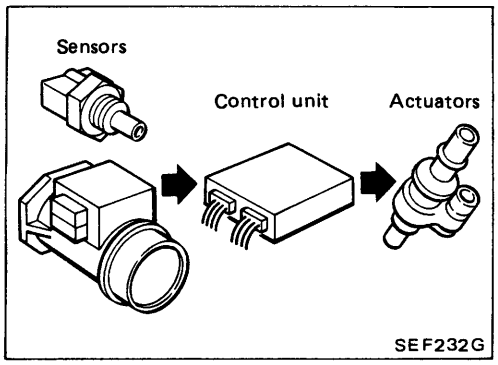
THROTTLE SENSOR

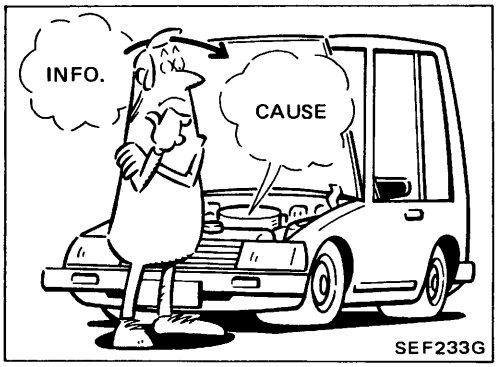
Description

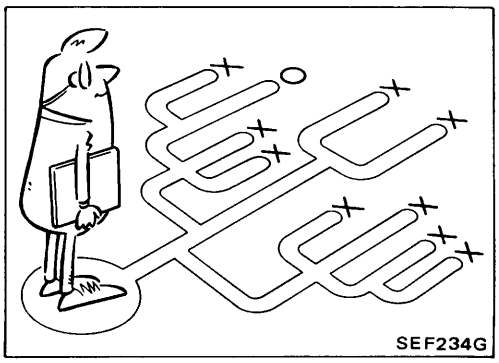
When the output signal of throttle sensor is abnormal the E.C.U. judges it as a malfunctioning of throttle sensor.
The E.C.U. decides the throttle valve opening according to the idle switch signal.

Operation

Condition	Throttle valve opening decided
Just as idle switch is turned ON.	0°
Just as idle switch is turned OFF.	5°







Introduction

The engine has an electronic control unit to control major systems such as fuel control, ignition control, idle speed control, etc. The control unit accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it is important that there are no conventional problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.

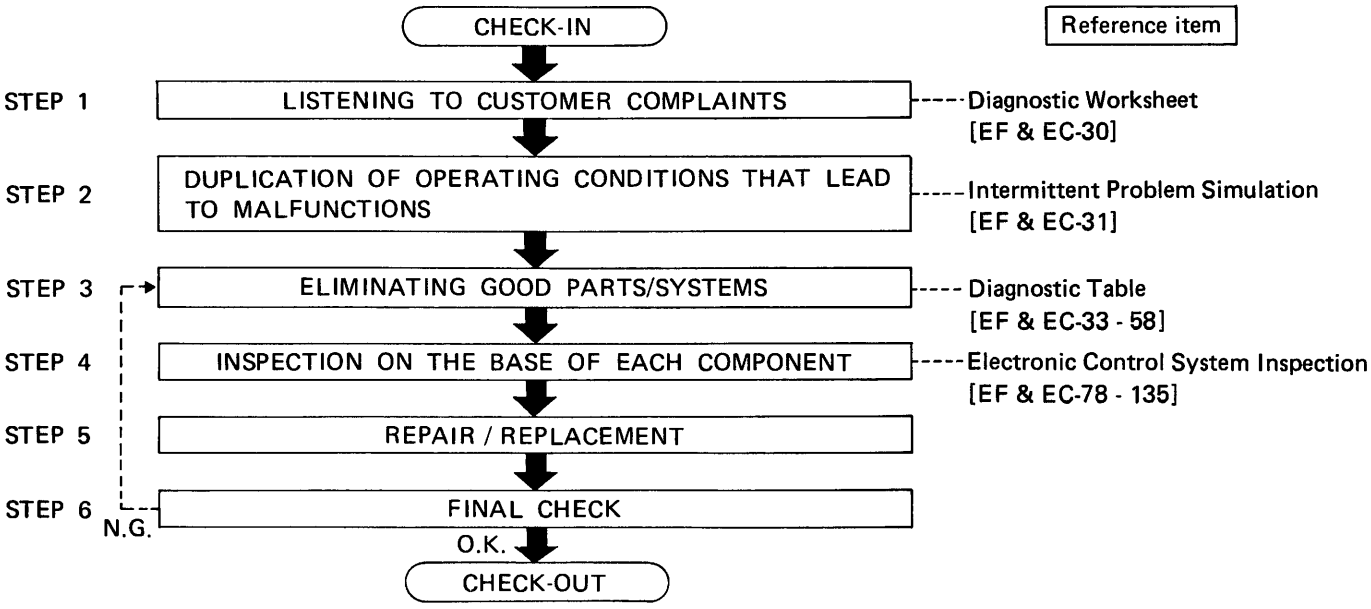
It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or faulty wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

A visual check only may not find the cause of the problems. A road test with a circuit tester connected to a suspected circuit should be performed.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through the talks with the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot driveability problems on an electronically controlled engine vehicle.

Work Flow



KEY POINTS

WHAT ..... Vehicle & engine model
WHEN ..... Date, Frequencies
WHERE ..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

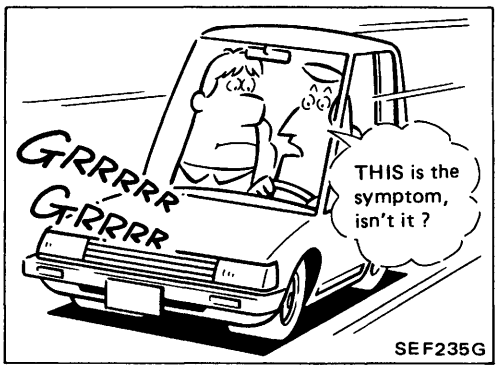
Diagnostic Worksheet

There are many kinds of operating conditions that lead to malfunctions on engine components.
A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions a customer complains..
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for troubleshooting.

WORKSHEET SAMPLE

Customer name MR/MS	Model & Year	VIN
Engine #	Trans.	Mileage
Incident Date	Manuf. Date	In Service Date

Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]
	☐ Driveability	☐ Stumble ☐ Surge ☐ Detonation ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes
Weather conditions		☐ Not effected
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH
Check engine light		☐ Turned on ☐ Not turned on

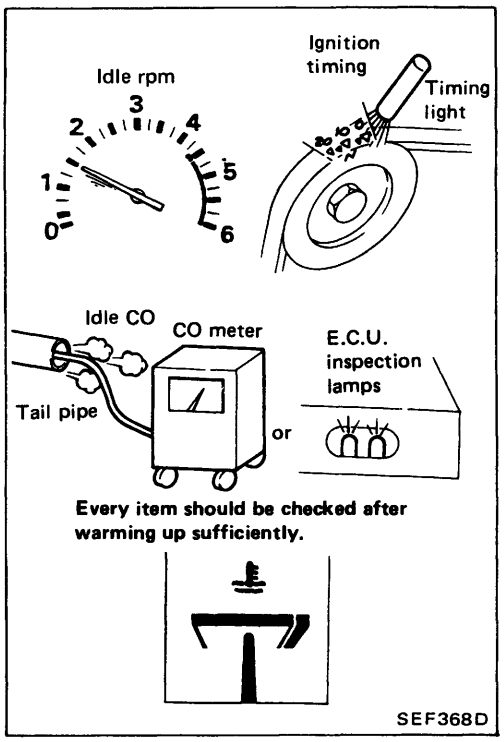


Intermittent Problem Simulation

In order to duplicate an intermittent problem, it is effective to create similar conditions for component parts, under which the problem might occur.

Perform the activity listed under Service procedure and note the result.

	Variable factor	Influential part	Target condition	Service procedure
1	Mixture ratio	Pressure regulator	Made lean	Remove vacuum hose and apply vacuum.
			Made rich	Remove vacuum hose and apply pressure.
2	Ignition timing	Distributor	Advanced	Rotate distributor clockwise.
			Retarded	Rotate distributor counterclockwise.
3	Mixture ratio feedback control	Exhaust gas sensor	Suspended	Disconnect exhaust gas sensor harness connector.
		Control unit	Operation check	Perform self-diagnosis (Mode I/II) at 2,000 rpm.
4	Idle speed	Throttle body	Raised	Turn idle adjust screw counterclockwise.
			Lowered	Turn idle adjust screw clockwise.
5	Electric connection (Electric continuity)	Harness connectors and wires	Poor electric connection or faulty wiring	Tap or wiggle.
				Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks.
6	Temperature	Control unit	Cooled	Cool with an icing spray or similar device.
			Warmed	Heat with a hair drier. **[WARNING: Do not overheat the unit.]**
7	Moisture	Electric parts	Damp	Wet **[WARNING: Do not directly pour water on components. Use a mist sprayer.]**
8	Electric loads	Load switches	Loaded	Turn on head lights, air conditioner, rear defogger, etc.
9	Idle switch condition	Control unit	ON-OFF switching	Perform self-diagnosis (Mode IV).
10	Ignition spark	Timing light	Spark power check	Try to flash timing light for each cylinder.



Specifications

1) Idle speed
   M/T: 800±100 rpm
   A/T: 750±100 rpm (in "D" position)
2) Ignition timing
   7°±5° B.T.D.C.
3) Idle CO
   ○ 3.0 - 10.0% (in tail pipe)
   - Throttle valve switch harness connector disconnected (No A.I.V. controlled condition).
   - Water temperature sensor harness connector disconnected and then 2.5 kΩ resistor connected.
   - Exhaust gas sensor harness connector disconnected.

   ○ Flashes of E.C.U. red inspection lamp in Mode II (If flashes, O.K.)
4) Mixture ratio at approximately 2,000 rpm of engine speed.
   Number of flashes of E.C.U. inspection green lamp in Mode I:
   5 times or more/10 seconds
5) Engine speed of idle switch OFF → ON
   M/T: 1,050±150 rpm
   A/T: 1,150±150 rpm (in "N" position)

Diagnostic Table

To assist with your troubleshooting, some typical diagnostic procedures for the following symptoms are described.

CONTENTS

1. Impossible to start – no combustion ..... EF & EC-34
2. Impossible to start – partial combustion ..... EF & EC-35
3. Impossible to start – partial combustion (not affected by throttle position) ..... EF & EC-36
4. Impossible to start – partial combustion (throttle position changes combustion quality) ..... EF & EC-37
5. Hard to start – before warm-up ..... EF & EC-38
6. Hard to start – after warm-up ..... EF & EC-39
7. Hard to start – every time ..... EF & EC-40
8. Hard to start – morning after a rainy day ..... EF & EC-41
9. Abnormal idling – no fast idle ..... EF & EC-42
10. Abnormal idling – low idle (after warm-up) ..... EF & EC-43
11. Abnormal idling – high idle (after warm-up) ..... EF & EC-44
12. Unstable idling – before warm-up ..... EF & EC-45
13. Unstable idling – after warm-up ..... EF & EC-46
14. Poor driveability – stumble (while accelerating) ..... EF & EC-47
15. Poor driveability – surge (while cruising) ..... EF & EC-48
16. Poor driveability – lack of power ..... EF & EC-49
17. Poor driveability – detonation ..... EF & EC-50
18. Engine stall – during start-up ..... EF & EC-51
19. Engine stall – while idling ..... EF & EC-52
20. Engine stall – while accelerating ..... EF & EC-53
21. Engine stall – while cruising ..... EF & EC-54
22. Engine stall – while decelerating/just after stopping ..... EF & EC-55
23. Engine stall – while loading (power steering, air conditioner, headlamps, etc.) ..... EF & EC-56
24. Backfire – through the intake ..... EF & EC-57
25. Backfire – through the exhaust ..... EF & EC-58

REMARKS

In the following pages, the numbers such as ❶, ❷ in the above chart correspond to those in the service procedure described below.
Possible causes can be checked through the service procedure shown by the mark "○".

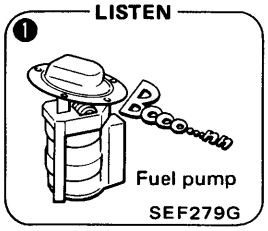
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 1 **Impossible to start – no combustion**

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽
SPECIFICATIONS	Mixture ratio (too lean)	○	○						
	Ignition sparks (weak, missing)				○	○	○		
	Ignition timing							○	
FUEL SYSTEM	Fuel pump (no operation)	○							
	Fuel pump relay (open circuited)	○							
	Injector (no operation, clogged)		○						
IGNITION SYSTEM	Ignition switch	○	○	○	○			○	
	Main relay	○	○	○	○			○	
	Power transistor			○	○			○	
	Ignition coil				○			○	
	Center cable (ignition leaks)				○			○	
	Ignition wires (ignition leaks)				○	○			
	Spark plugs						○		
CONTROL SYSTEM	Crank angle sensor	○	○		○			○	○

SERVICE PROCEDURE

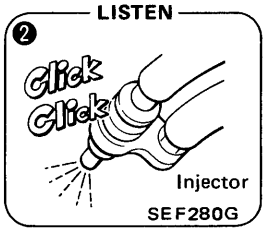
❶ **LISTEN**



Listen for fuel pump operating sound.

N.G. → Check fuel pump and/or related circuits. [See page EF & EC-118.]

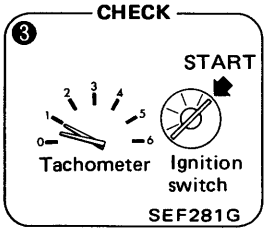
❷ **LISTEN**



Listen for injector operating sound.

N.G. → Check injector circuit. [See page EF & EC-116/120.]

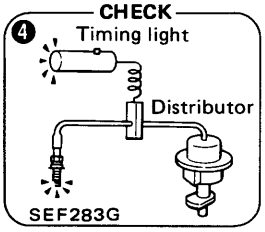
❸ **CHECK**



Make sure tachometer needle moves when cranking.

N.G. →

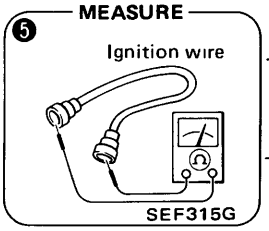
❹ **CHECK**



Check flashes of timing light for weakness.

N.G. →

❺ **MEASURE**

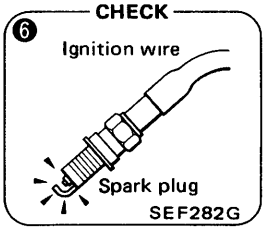


Measure resistance of suspect wires.

N.G. → Replace the wire.

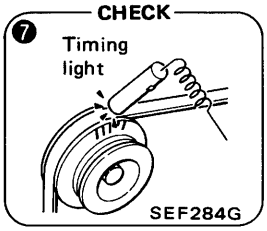
O.K. →

❻ **CHECK**



Remove spark plugs and check their ignition sparks.

❼ **CHECK**

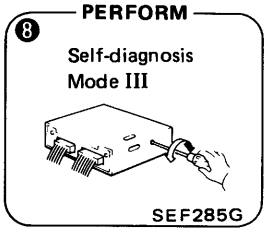


Check ignition timing.

N.G. → Adjust ignition timing. [See page EF & EC-141.]

❽ **PERFORM**

Self-diagnosis Mode III



Perform self-diagnosis Mode III (for crank angle sensor).

N.G. → Check crank angle sensor and/or related circuits. [See page EF & EC-82.]

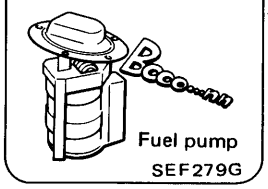
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 2 **Impossible to start — partial combustion**

POSSIBLE CAUSES		❶	❷	❸	❹	❺
SPECIFICATIONS	Mixture ratio	○	○	○		
	Fuel pressure (too low)				○	
	Ignition timing					○
FUEL SYSTEM	Fuel pump	○				
	Fuel pump relay (open circuited)	○				
	Injector (clogged)		○			

SERVICE PROCEDURE

❶ **LISTEN**

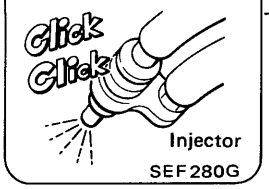


Listen for fuel pump operating sound.

N.G. → Check fuel pump and/or related circuits. [See page EF & EC-118.]

O.K. →

❷ **LISTEN**

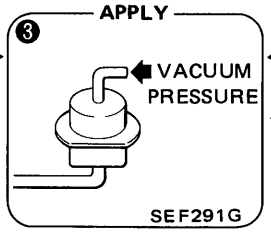


Listen for injector operating sound.

N.G. → Check injector circuit. [See page EF & EC-116/120.]

O.K. →

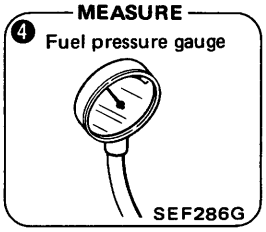
❸ **APPLY**



Remove vacuum hose from pressure regulator, and apply vacuum and/or pressure, and try to start.

Improved →

❹ **MEASURE** Fuel pressure gauge

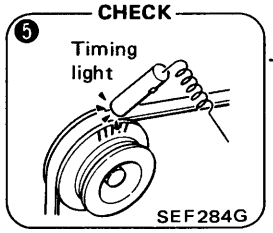


Connect vacuum hose to pressure regulator and measure fuel pressure.

↓

Check Mixture ratio feedback system. [See page EF & EC-141.]

❺ **CHECK**



Check ignition timing.

→ Adjust ignition timing. [See page EF & EC-141.]

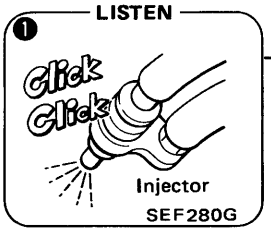
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 3 Impossible to start – partial combustion (not affected by throttle position

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫	⓬
SPECIFICATIONS	Mixture ratio	○		○	○								
	Fuel pressure (too low)			○	○	○							
	Ignition timing						○						
FUEL SYSTEM	Fuel filter (clogged)					○							
	Fuel line (clogged)					○							
	Injector (clogged)	○											
	Pressure regulator				○								
	Pressure regulator vacuum hose (clogged)			○									
IGNITION SYSTEM	Ignition wires (ignition leaks)							○	○				
	Spark plugs (wet with fuel)									○			
	Ignition switch	○						○			○		
INTAKE SYSTEM	Throttle body (with ports clogged)		○										
	Throttle valve (clogged)		○										
CONTROL SYSTEM	Water temparature sensor											○	○
	Crank angle sensor	○						○				○	

SERVICE PROCEDURE

❶ LISTEN

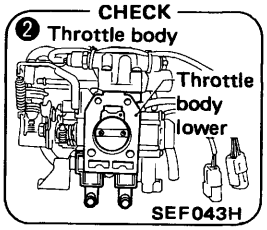


N.G. → Check injector circuit. [See page EF & EC-116/120.]

Listen for injector operating sound.

O.K. ↓

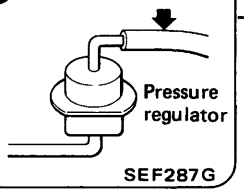
❷ CHECK Throttle body



N.G. → Clean the ports and/or throttle valve.

Check throttle body ports and valve for clogging.

❸ CHECK



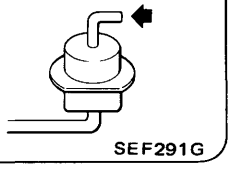
O.K. →

Check vacuum hose of pressure regulator for clogging.

N.G. ↓

Repair or replace the hose.

❹ REMOVE Pressure regulator



Improved →

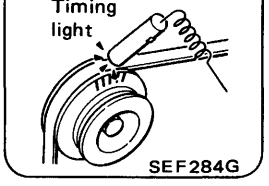
Remove vacuum hose from pressure regulator, and try to start.

❺ MEASURE Fuel pressure

Connect vacuum hose to pressure regulator and measure fuel pressure.

→ Check Mixture ratio feedback system. [See page EF & EC-141.]

❻ CHECK Timing light

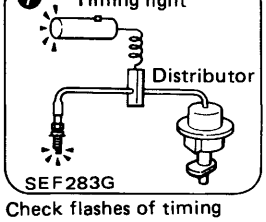


Check ignition timing.

N.G. ↓

Adjust ignition timing. [See page EF & EC-141.]

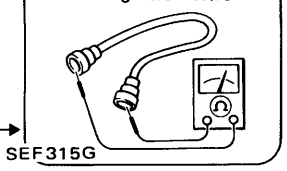
❼ CHECK Timing light



Check flashes of timing light for weakness.

N.G. →

❽ MEASURE Ignition wire



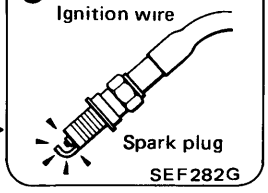
Measure resistance of suspect ignition wires.

N.G. ↓

Replace the wires.

O.K. →

❾ CHECK Ignition wire



Remove spark plugs and check their ignition sparks by cranking.

❿ PERFORM Self-diagnosis Mode IV

N.G. → Check starter circuit. [See page EF & EC-132.]

Perform self-diagnosis Mode IV (for start signal).

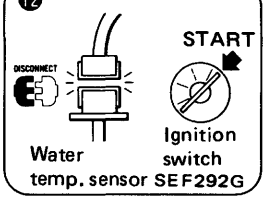
⓫ PERFORM Self-diagnosis Mode III

for C.A.S. → Check the sensor circuits. [See page EF & EC-86 (water temp. sensor), page EF & EC-82 (crank angle sensor).]

for C.H.T.S. →

Perform self-diagnosis Mode III (for water temp. sensor and crank angle sensor).

⓬ CRANK



N.G. →

Start with water temp. sensor connector disconnected.

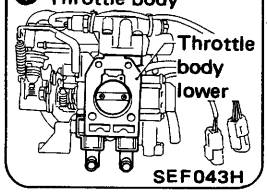
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION **4** **Impossible to start – partial combustion (throttle position changes combustion quality)**

POSSIBLE CAUSES		❶	❷	❸	❹
INTAKE SYSTEM	Throttle body (with ports clogged)	○			
	Throttle valve (clogged)		○		
	Fast idle cam			○	
	Idle speed control valve				○
CONTROL SYSTEM	Water temperature sensor				○
	Idle switch				○
	Neutral switch				○

SERVICE PROCEDURE

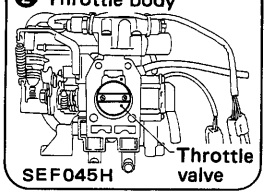
CHECK ❶ Throttle body



N.G. → Clean the ports.

Check throttle body ports for clogging.

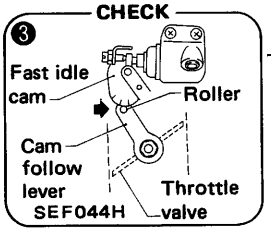
CHECK ❷ Throttle body



N.G. → Clean the valve.

Check throttle valve for clogging.

CHECK ❸

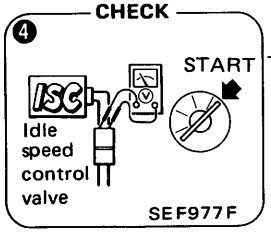


N.G. → Check fast idle cam. [See page EF & EC-149.]

Fast idle

Make sure throttle valve stays open by fast idle cam before warm-up.

CHECK ❹



N.G. → Check idle speed control circuit. [See page EF & EC-98/126/128.]

Check terminal voltage of idle speed control valve while cranking.

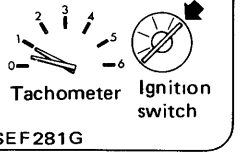
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 5 **Hard to start — before warm-up**

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio			○			○
IGNITION SYSTEM	Ignition switch (no start signal)	○			○		
INTAKE SYSTEM	Fast idle cam			○			
CONTROL SYSTEM	Water temperature sensor					○	○
	Idle switch				○		
	Neutral switch	○					
OTHERS	Starter (operation too slow)	○					
	Battery (voltage too low)	○	○				

SERVICE PROCEDURE

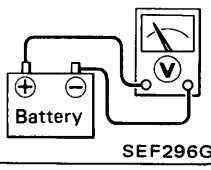
❶ CHECK



Make sure tachometer indicates about 300 rpm while cranking.

N.G. →

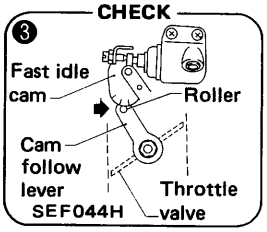
❷ MEASURE



Measure battery voltage.

N.G. (less than 12V) → Charge the battery.

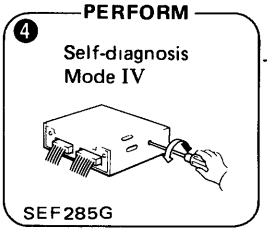
❸ CHECK



Make sure throttle valve stays open by fast idle cam before warm-up.

N.G. → Check fast idle cam. [See page EF & EC-149.]

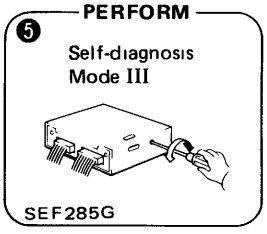
❹ PERFORM



Perform self-diagnosis Mode IV (for start signal and idle switch).

N.G. → Check the malfunctioning switches and/or circuits. [See page EF & EC-132 (start signal), page EF & EC-94 (idle switch).]

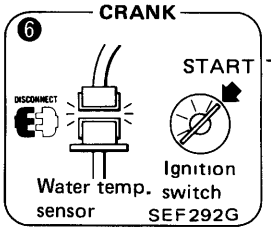
❺ PERFORM



Perform self-diagnosis Mode III (for water temp. sensor).

N.G. →

❻ CRANK



Start with water temp. sensor connector disconnected.

N.G. → Check sensor circuit. [See page EF & EC-86.]

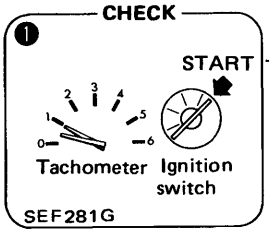
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 6 **Hard to start – after warm-up**

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio			○			○
	Fuel pressure			○			○
FUEL SYSTEM	Fuel line (hot fuel)			○			
	Pressure regulator (low fuel pressure)						○
	Pressure regulator vacuum hose (clogged)						○
IGNITION SYSTEM	Ignition switch (no start signal)	○				○	
CONTROL SYSTEM	Water temperature sensor				○		
	Air flow meter				○		
OTHERS	Starter (operation too slow)	○					
	Battery (voltage too low)	○	○				

SERVICE PROCEDURE

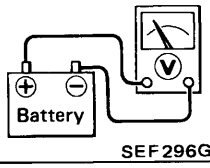
❶ CHECK



Make sure tachometer indicates about 300 rpm while cranking.

N.G. →

❷ MEASURE

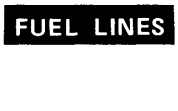


Measure battery voltage.

N.G. (less than 12V) ↓

Charge the battery.

❸ CRANK



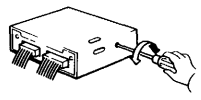
Cool fuel lines with wet rags, etc. and try to start.

No change → Proceed to other steps.

Improved → Proceed to other steps. If everything is O.K., check fuel vapor pressure.

❹ PERFORM

Self-diagnosis Mode III

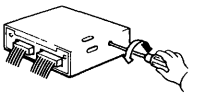


Perform self-diagnosis Mode III (for water temp. sensor and air flow meter).

N.G. → Check sensor circuits. [See page EF & EC-86 (water temp. sensor), page EF & EC-84 (air flow meter).]

❺ PERFORM

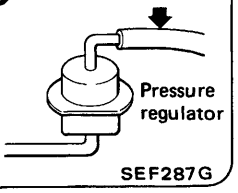
Self-diagnosis Mode IV



Perform self-diagnosis Mode IV (for start signal).

N.G. → Check starter circuit. [See page EF & EC-132.]

❻ CHECK



Check vacuum hose of pressure regulator for clogging.

N.G. ↓

Repair or replace the hose.

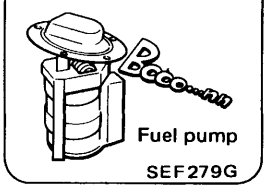
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 7 Hard to start – every time

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫	⓬
SPECIFICATIONS	Mixture ratio	○				○	○						
	Fuel pressure						○	○					
	Ignition sparks (missing)								○	○		○	
	Ignition timing				○								
FUEL SYSTEM	Fuel pump (improper operation)	○											
	Fuel line (clogged)							○					
	Canister (air leaks)					○							
	Pressure regulator (low fuel pressure)						○						
IGNITION SYSTEM	Ignition wires (ignition leaks)								○	○			
	Spark plugs (improper gap)										○		
CONTROL SYSTEM	Crank angle sensor	○							○				○
	Water temperature sensor												○
	Idle switch												○
	Neutral switch		○										
OTHERS	Starter (operation too slow)		○										
	Battery (voltage too low)		○	○									

SERVICE PROCEDURE

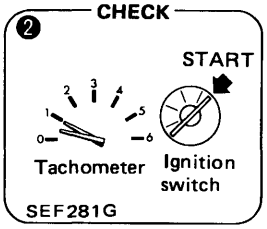
❶ **LISTEN**



Listen for fuel pump operating sound.

N.G. → Check fuel pump and/or related circuits. [See page EF & EC-118.]

❷ **CHECK**



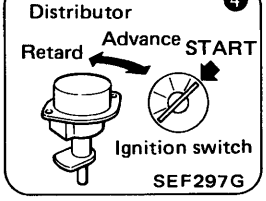
Make sure tachometer indicates about 300 rpm while cranking.

N.G. → ❸ **MEASURE** Battery

Measure battery voltage.

N.G. → Charge the battery.

❹ **CRANK**

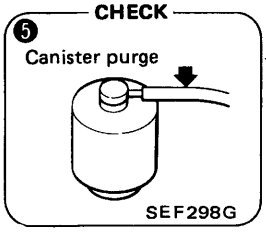


Advance/retard ignition timing and try to start.

No change → [Proceed to other steps.]

Improved → Check Mixture ratio feedback system. [See page EF & EC-141.]

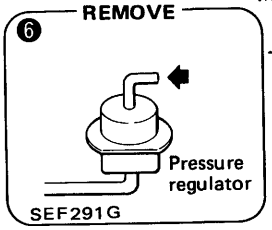
❺ **CHECK**



Check vacuum hose of canister for air leaks.

N.G. → Repair or replace the hose.

❻ **REMOVE**



Remove vacuum hose from pressure regulator, and try to start.

❼ **MEASURE** Fuel pressure

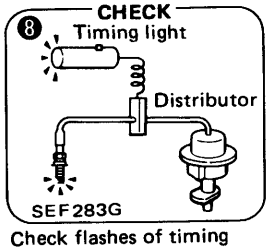
Connect vacuum hose to pressure regulator and measure fuel pressure.

❿ **PERFORM** Self-diagnosis Mode III/IV

Perform self-diagnosis Mode III (for water temp. sensor and crank angle sensor), Mode IV (for idle switch).

N.G. → Check the malfunctioning circuits. [See page EF & EC-86.] (water temp. sensor), page EF & EC-82 (crank angle sensor), page EF & EC-94 (idle switch).]

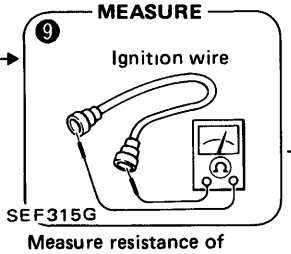
❽ **CHECK**



Check flashes of timing light for weakness.

N.G. → Replace the wires.

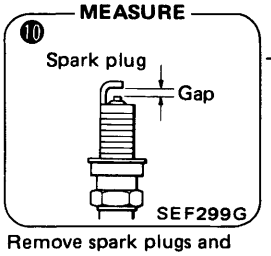
❾ **MEASURE**



Measure resistance of suspect ignition wires.

O.K. →

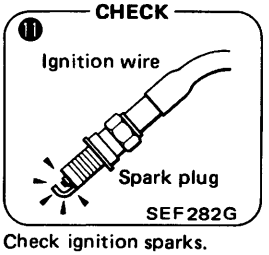
❿ **MEASURE**



Remove spark plugs and measure their gaps.

O.K. →

⓫ **CHECK**



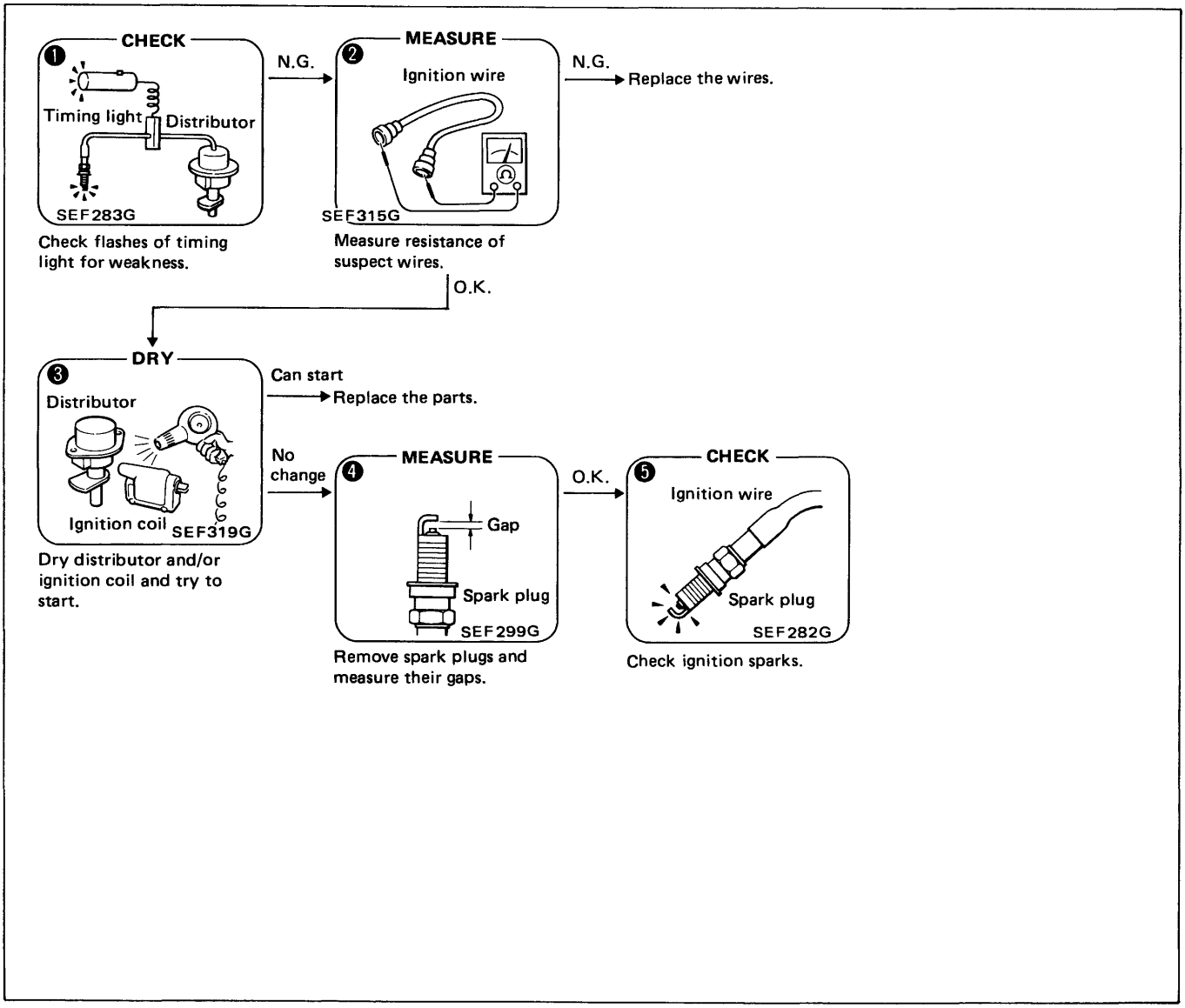
Check ignition sparks.

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 8 **Hard to start — morning after a rainy day**

POSSIBLE CAUSES		❶	❷	❸	❹	❺
SPECIFICATIONS	Ignition sparks (weak)	○	○			○
IGNITION SYSTEM	Power transistor	○				○
	Ignition coil	○		○		○
	Center cable (ignition leaks)	○				○
	Ignition wires (ignition leaks)	○	○			○
	Distributor cap (ignition leaks)	○		○		○
	Spark plugs (improper gap)				○	○

SERVICE PROCEDURE



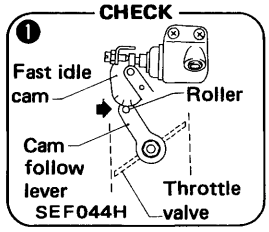
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 9 **Abnormal idling – no fast idle**

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio	○	○		○		
	Ignition timing			○			
INTAKE SYSTEM	Blow-by hose (clogged)		○				
	Fast idle cam	○					
CONTROL SYSTEM	Water temperature sensor					○	○

SERVICE PROCEDURE

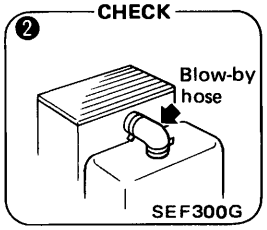
❶ CHECK



N.G. → Check fast idle cam. [See page EF & EC-149.]

Make sure throttle valve stays open by fast idle cam before warm-up.

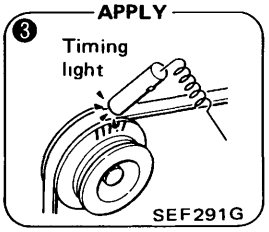
❷ CHECK



N.G. → Clean or replace the hose.

Check blow-by hose for clogging.

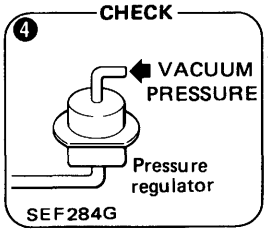
❸ APPLY



Improved → Adjust ignition timing. [See page EF & EC-141.]

Check ignition timing.

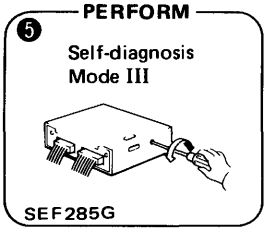
❹ CHECK



N.G. → Check Mixture ratio feedback system. [See page EF & EC-141.]

Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and check idling.

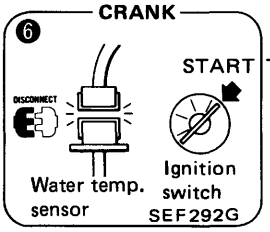
❺ PERFORM



N.G. →

Perform self-diagnosis Mode III (for water temp. sensor).

❻ CRANK



N.G. → Check sensor circuit. [See page EF & EC-86.]

Start with water temp. sensor connector disconnected.

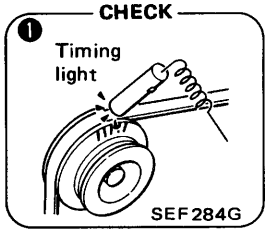
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 10 Abnormal idling – low idle (after warm-up)

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio		○			○		
	Ignition timing (too retarded)	○						
INTAKE SYSTEM	Throttle body (with ports clogged)			○				
	Throttle valve (clogged)				○			
CONTROL SYSTEM	Crank angle sensor						○	
	Air flow meter						○	
	Water temperature sensor						○	○
	Load switches (remaining OFF)							

SERVICE PROCEDURE

❶ CHECK

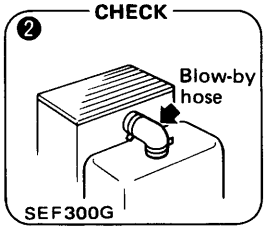


Check ignition timing.

N.G.

Adjust ignition timing. [See page EF & EC-141.]

❷ CHECK

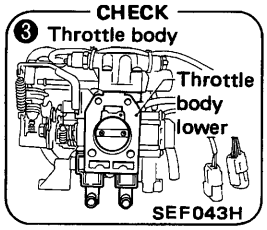


Check blow-by hose for clogging.

N.G.

Clean or replace the hose.

❸ CHECK

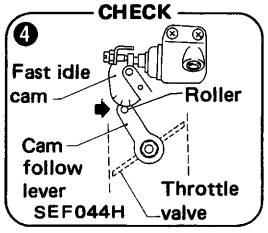


Check throttle chamber ports for clogging.

N.G.

Clean the ports.

❹ CHECK

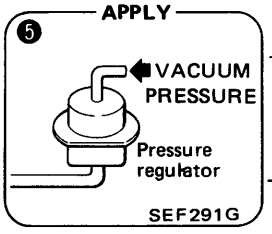


Check throttle valve for clogging.

N.G.

Clean the valve.

❺ APPLY

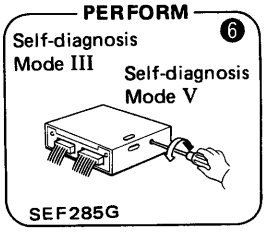


Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and check idling.

Improved → Check Mixture ratio feedback system. [See page EF & EC-141.]

No change → Check load signal circuit. [See EL section.]

❻ PERFORM

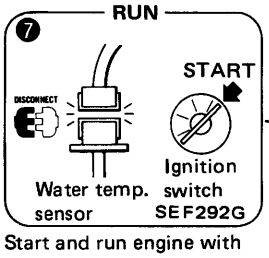


Perform self-diagnosis Modes III and V (for air flow meter, and water temp. sensor).

N.G.

Check the malfunctioning parts and/or circuits. [See page EF & EC-84 (air flow meter), page EF & EC-86 (water temp. sensor).]

❼ RUN



N.G. →

Start and run engine with water temp. sensor connector disconnedted.

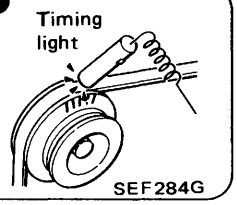
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 11 — Abnormal idling – high idle (after warm-up)

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫
SPECIFICATIONS	Mixture ratio		○	○		○	○			○		
	Ignition timing (too advanced)	○										
INTAKE SYSTEM	Air duct (leaks)		○									
	Throttle chamber (air leaks)				○							
	Throttle valve (stuck control wire)				○							
	Intake manifold (gasket) (air leaks)		○									
	Fast idle cam			○								
	Idle speed control valve (remaining ON)							○				
	F.I.C.D. solenoid (remaining ON)								○			
CONTROL SYSTEM	Crank angle sensor										○	
	Air flow meter										○	
	Water temperature sensor										○	○
	Idle switch (remaining OFF)							○		○		
	Load switches (remaining ON)							○	○			
OTHERS	Battery (voltage too low)											

SERVICE PROCEDURE

❶ CHECK

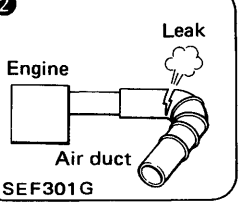


Check ignition timing.

N.G. ↓

Adjust ignition timing.
[See page EF & EC-141.]

❷ CHECK



Check intake system for air leaks.

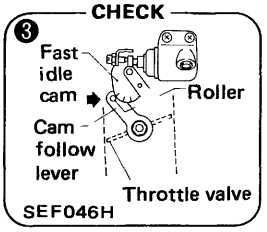
O.K. ↓

N.G. ↓

Check throttle wire for rough sliding.

Repair/replace the part.

❸ CHECK

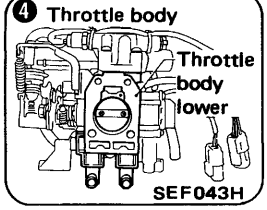


Make sure throttle valve stays closed by fast idle cam after warm-up.

N.G. ↓

Check fast idle cam.
[See page EF & EC-149.]

❹ CHECK

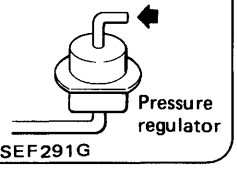


Check throttle body ports and valve for clogging.

N.G. ↓

Clean the ports and/or throttle valve.

❺ REMOVE



Remove vacuum hose from pressure regulator, and try to start.

Improved →

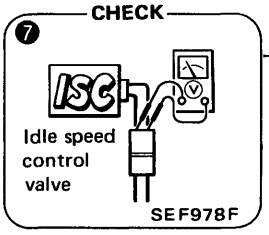
❻ MEASURE

Fuel pressure

Connect vacuum hose to pressure regulator and measure fuel pressure.

Check Mixture ratio feedback system.
[See page EF & EC-141.]

❼ CHECK



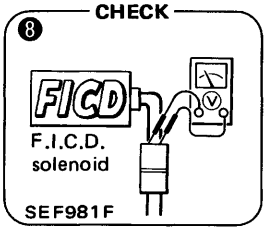
Check terminal voltage of idle speed control valve while idling.

N.G. →

Check the part and/or circuit.
[See page EF & EC-98/126/128.]

Check sensor circuit.
[See page EF & EC-86 (water temp. sensor), page EF & EC-82 (crank angle sensor), page EF & EC-84 (air flow meter).]

❽ CHECK



Check terminal voltage of F.I.C.D. solenoid while idling.

Check the part and/or circuit.
[See HA section.]

❾ PERFORM

Self-diagnosis Mode IV

Perform self-diagnosis Mode IV (for idle switch).

N.G. ↓

Check the idle switch circuit.
[See page EF & EC-94.]

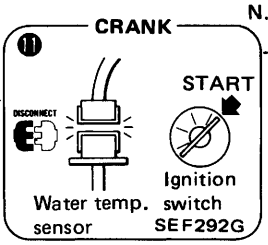
❿ PERFORM

Self-diagnosis Mode III

Perform self-diagnosis Mode III (for water temp. sensor, crank angle sensor and air flow meter).

N.G. →

⓫ CRANK



Start with water temp. sensor connector disconnected.

N.G. →

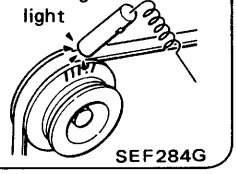
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 12 **Unstable idling – before warm-up**

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽
SPECIFICATIONS	Mixture ratio		○	○					
	Ignition timing	○							
INTAKE SYSTEM	Fast idle cam		○						
	Idle speed control valve (remaining OFF)				○				
CONTROL SYSTEM	Water temperature sensor							○	○
E.G.R. SYSTEM	E.G.R. control valve (stuck open)					○			
	E.G.R. solenoid (remaining OFF)					○	○		

SERVICE PROCEDURE

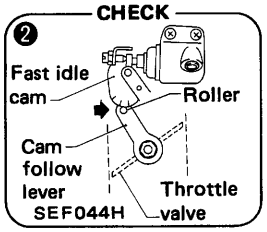
❶ CHECK



N.G. → Adjust ignition timing. [See page EF & EC-141.]

Check ignition timing.

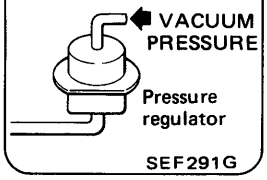
❷ CHECK



N.G. → Check fast idle cam. [See page EF & EC-149.]

Make sure throttle valve stays open by fast idle cam before warm-up.

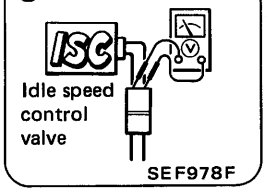
❸ APPLY



Improved → Check Mixture ratio feedback system. [See page EF & EC-141.]

Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and check idling.

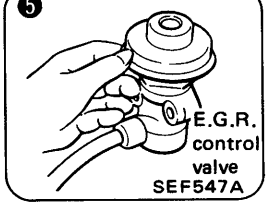
❹ CHECK



Does not turn ON → Check its circuit. [See page EF & EC-98/126/128.]

Check terminal voltage of idle speed control valve while idling.

❺ CHECK



Stays lifted →

❻ CHECK



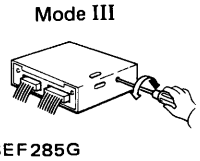
Check terminal voltage of E.G.R. solenoid while idling.

N.G. ↓

Check the solenoid circuit. [See page EF & EC-102.]

Check E.G.R. control valve for operation.

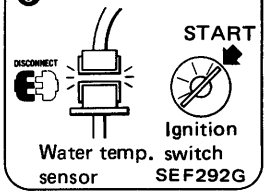
❼ PERFORM



N.G. → Check sensor circuit. [See page EF & EC-82.]

Perfrom self-diagnosis Mode III (for water temp. sensor).

❽ RUN



N.G. →

Start and run engine with water temp. sensor connector disconnected.

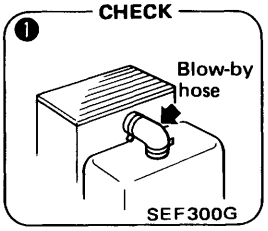
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 13 Unstable idling – after warm-up

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫
SPECIFICATIONS	Mixture ratio	○	○	○								
	Ignition sparks				○	○	○					
	Ignition timing							○				
	Compression pressure								○			
FUEL SYSTEM	Fuel line (clogged)											
	Canister (air leaks)			○								
IGNITION SYSTEM	Power transistor				○		○					
	Ignition coil				○		○					
	Ignition wires				○	○	○					
INTAKE SYSTEM	Blow-by hose (leaks)	○										
	Air duct (leaks)		○									
CONTROL SYSTEM	Idle switch											○
	Load switches											
E.G.R. SYSTEM	E.G.R. control valve									○		
	E.G.R. solenoid									○	○	

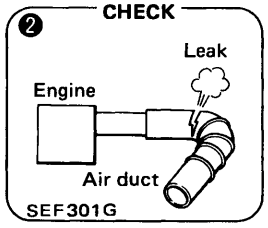
SERVICE PROCEDURE

❶ CHECK



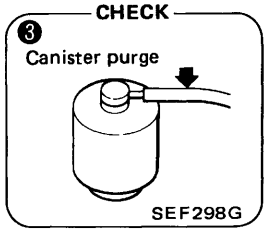
Check blow-by hose for leaks.
N.G. ↓
Repair/replace the hose.

❷ CHECK



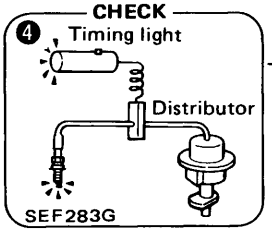
Check intake system for air leaks.
N.G. ↓
Repair/replace the part.

❸ CHECK



Check purge line for leaks.
N.G. ↓
Repair/replace the hose.

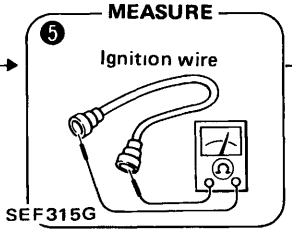
❹ CHECK



Check flashes of timing light for weakness.

N.G. →

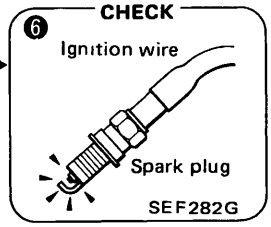
❺ MEASURE



Measure resistance of suspect wires.
N.G. ↓
Replace the wire.

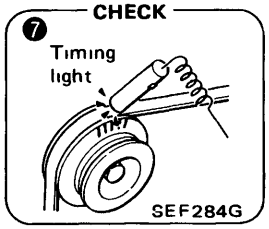
O.K. →

❻ CHECK



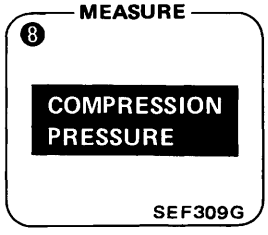
Remove spark plugs and check their ignition sparks.

❼ CHECK



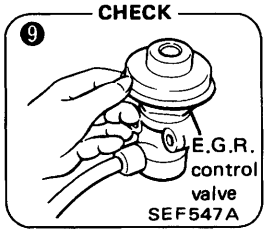
Check ignition timing.
N.G. ↓
Adjust ignition timing.
[See page EF & EC-141.]

❽ MEASURE



Measure compression pressure.
N.G. ↓
Check cylinder head and gasket.
[See EM section.]

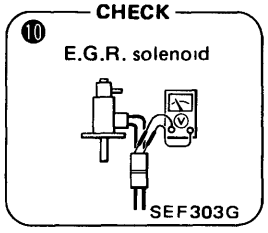
❾ CHECK



Cehck E.G.R. control valve for operation.

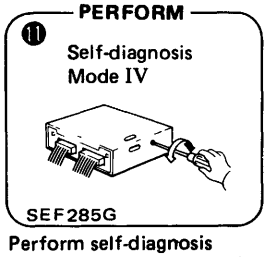
Stays lifted →

❿ CHECK



Check terminal voltage of E.G.R. solenoid while idling.
N.G. ↓
Check the solenoid circuit.
[See page EF & EC-102.]

⓫ PERFORM



Perform self-diagnosis Mode IV (for idle switch).
N.G. ↓
Check the idle switch circuit.
[See page EF & EC-94.]

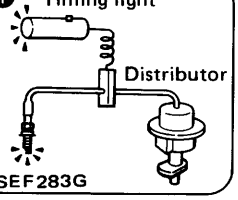
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 14 Poor driveability – stumble (while accelerating)

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio				○		○	○		○
	Fuel pressure						○	○		
FUEL SYSTEM	Fuel filter (clogged)							○		
	Fuel line (clogged)							○		
	Injector (clogged)							○		
IGNITION SYSTEM	Power transistor	○		○						
	Ignition coil	○		○						
	Ignition wires (ignition leaks)	○	○	○						
	Spark plugs (ignition leaks, improper gap)			○						
INTAKE SYSTEM	Air duct (leaks)				○					
CONTROL SYSTEM	Crank angle sensor	○							○	
	Air flow meter								○	
	Water temperature sensor	○							○	
	Exhaust gas sensor								○	○
	Idle switch (remaining OFF)					○				
OTHERS	Fuel (poor quality)									

SERVICE PROCEDURE

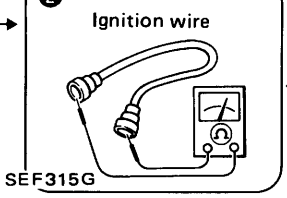
❶ **CHECK** Timing light



Check flashes of timing light for weakness.

N.G. →

❷ **MEASURE** Ignition wire

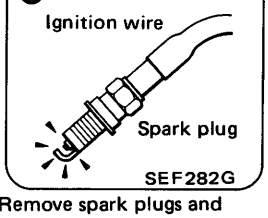


Measure resistance of suspect wires.

N.G. → Replace the wires.

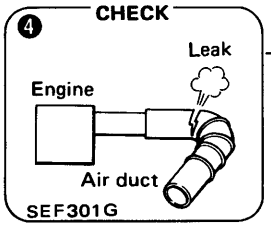
O.K. →

❸ **CHECK** Ignition wire



Remove spark plugs and check their ignition sparks.

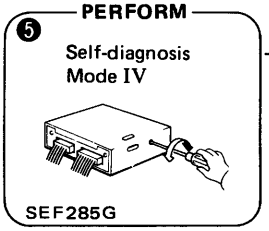
❹ **CHECK**



Check intake system for air leaks.

N.G. → Repair/replace the part.

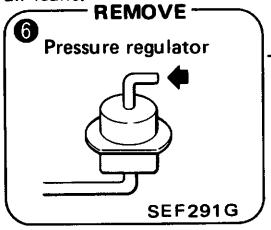
❺ **PERFORM** Self-diagnosis Mode IV



Perform self-diagnosis Mode IV (for idle switch).

N.G. → Check the idle switch circuit. [See page EF & EC-94.]

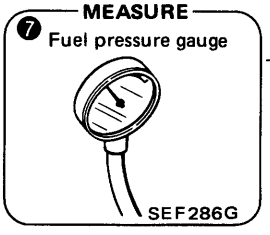
❻ **REMOVE** Pressure regulator



Remove vacuum hose from pressure regulator, and try to drive.

Improved →

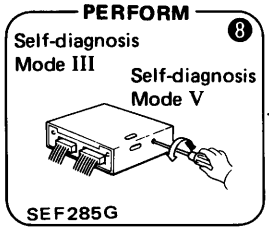
❼ **MEASURE** Fuel pressure gauge



Connect vacuum hose to pressure regulator and measure fuel pressure while driving.

→ Check Mixture ratio feedback system. [See page EF & EC-141.]

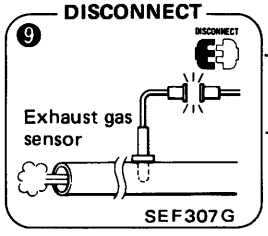
❽ **PERFORM** Self-diagnosis Mode III, Self-diagnosis Mode V



Perform self-diagnosis Mode III and V (for air flow meter and exhaust gas sensor).

N.G. → Check the malfunctioning parts and/or circuits. [See page EF & EC-84 (air flow meter), page EF & EC-106 (exhaust gas sensor).]

❾ **DISCONNECT**



Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check Mixture ratio feedback system. [See page EF & EC-141.]

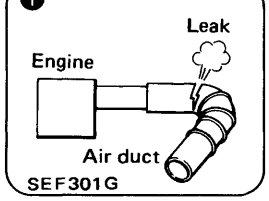
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 15 Poor driveability – surge (while cruising)

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio (too lean)	○				○	○			○
	Fuel pressure (low)					○	○			
	Ignition timing		○							
IGNITION SYSTEM	(missing)								○	
INTAKE SYSTEM	Air duct (leaks)	○								
	Throttle chamber (air leaks)	○								
	Intake manifold (gasket) (air leaks)	○								
CONTROL SYSTEM	Crank angle sensor								○	
	Air flow meter								○	
	Exhaust gas sensor								○	○
	Idle switch							○		
E.G.R. SYSTEM	E.G.R. control valve (stuck open)			○						
	E.G.R. solenoid (remaining OFF)			○	○					
	E.G.R. vacuum hose (removed)			○						

SERVICE PROCEDURE

❶ CHECK

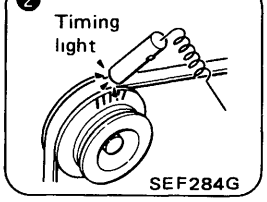


Check intake system for air leaks.

↓ N.G.

Repair/replace the part.

❷ CHECK

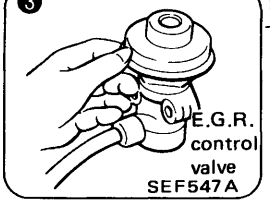


Check ignition timing.

↓ N.G.

Adjust ignition timing. [See page EF & EC-141.]

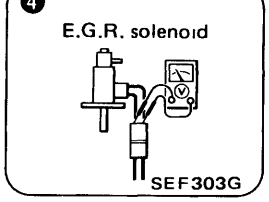
❸ CHECK



Stays lifted →

Check E.G.R. control valve for operation.

❹ CHECK

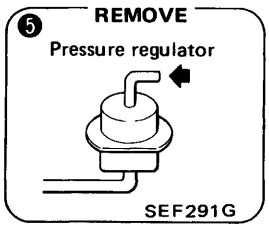


Check terminal voltage of E.G.R. solenoid.

↓ N.G.

Check the solenoid circuit. [See page EF & EC-102.]

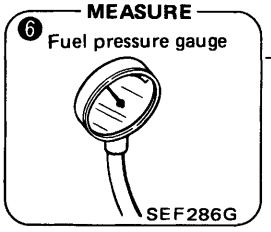
❺ REMOVE



Remove vacuum hose from pressure regulator, and try to drive.

Improved →

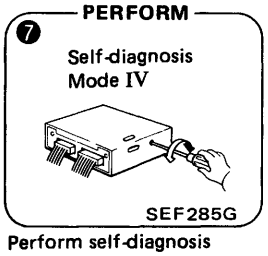
❻ MEASURE



Connect vacuum hose to pressure regulator and measure fuel pressure while driving.

→ Check Mixture ratio feedback system. [See page EF & EC-141.]

❼ PERFORM

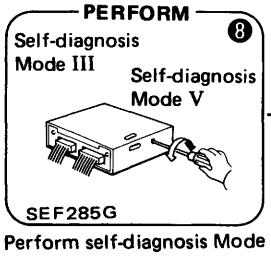


Perform self-diagnosis Mode IV (for idle switch).

↓ N.G.

Check the idle switch circuit. [See page EF & EC-94.]

❽ PERFORM

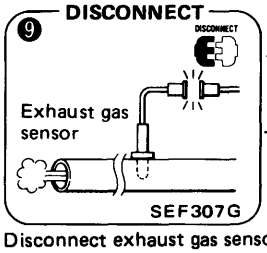


Perform self-diagnosis Mode III and V (for crank angle sensor, air flow meter, ignition signal and exhaust gas sensor).

N.G. →

Check the malfunctioning parts and/or circuits. [See page EF & EC-82 (crank angle sensor), page EF & EC-84 (air flow meter), page EF & EC-90 (ignition signal), page EF & EC-106 (exhaust gas sensor).]

❾ DISCONNECT



Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check mixture ratio feedback system. [See page EF & EC-141.]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 16 Poor driveability – lack of power

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫
SPECIFICATIONS	Fuel pressure								○	○		
	Ignition timing		○									
	Compression pressure (too low)							○				
FUEL SYSTEM	Fuel pump (low fuel output)									○		
	Fuel filter (clogged)									○		
	Fuel line (clogged)									○		
	Injector (clogged)									○		
IGNITION SYSTEM	Ignition wires (ignition leaks)				○	○	○					
	Spark plugs (improper gap)						○					
INTAKE SYSTEM	Air cleaner element (clogged)	○										
	Throttle chamber (clogged)			○								
	Throttle valve (not open enough)			○								
CONTROL SYSTEM	Air flow meter										○	
	Exhaust gas sensor											○

SERVICE PROCEDURE

❶ CHECK
AIR CLEANER ELEMENT
SEF320G
Check air cleaner element for clogging.
↓ N.G.
Replace the part.

❷ CHECK
Timing light
SEF284G
Check ignition timing with a timing light.
↓ N.G.
Adjust ignition timing.
[See pege EF & EC-141.]

❸ CHECK
Throttle body
Throttle valve
SEF045H
Check throttle valve for rough movement.
↓ N.G.
Repair/replace the part.

❹ CHECK
Timing light
Distributor
SEF283G
Check flashes of timing light for weakness.
↓ N.G.

❺ MEASURE
Ignition wire
SEF315G
Measure resistance of suspect wires.
↓ N.G.
Replace the wires.

O.K. ←

❻ CHECK
Ignition wire
Spark plug
SEF282G
Remove spark plugs and check their ignition sparks.

❼ MEASURE
COMPRESSION PRESSURE
SEF309G
Measure compression pressure.
→ Check cylinder head and gasket.
[See EM section.]

❽ REMOVE
Pressure regulator
SEF291G
Remove vacuum hose from pressure regulator, and try to drive.
Improved →

❾ MEASURE
Fuel pressure gauge
SEF286G
Connect vacuum hose to pressure regulator and measure fuel pressure while driving.
↓
Check Mixture ratio feedback system.
[See page EF & EC-141.]

❿ PERFORM
Self-diagnosis Mode III
Self-diagnosis Mode V
SEF285G
Perform self-diagnosis Mode III and V (for air flow meter).
↓ N.G.
Check the malfunctioning parts and/or circuit.
[See page EF & EC-84 (air flow meter).]

⓫ DISCONNECT
Exhaust gas sensor
SEF307G
Disconnect exhaust gas sensor connector, and try to drive.
No change ↓ / Improved ↓
Replace the sensor.
Check Mixture ratio feedback system.
[See page EF & EC-141.]

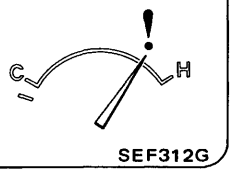
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 17 Poor driveability – detonation

POSSIBLE CAUSES		❶	❷	❸	❹	❺
SPECIFICATIONS	Mixture ratio (too lean)			○	○	
	Fuel pressure (low)			○		
	Ignition timing (too advanced)		○			
FUEL SYSTEM	Fuel filter (clogged)				○	
	Fuel line (clogged)				○	
	Injector (clogged)				○	
CONTROL SYSTEM	Crank angle sensor (improper 1°-signals)					○
	Air flow meter					○
	Water temperature sensor					○
OTHERS	Water temperature (too high)	○				
	Fuel (low octane rating, poor quality)					

SERVICE PROCEDURE

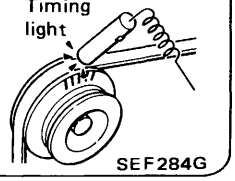
❶ **CHECK** Water temperature



Too high → Check cooling system. [See LC section.]

Check water temperature.

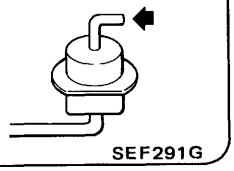
❷ **CHECK** Timing light



N.G. → Adjust ignition timing. [See pege EF & EC-141.]

Check ignition timing.

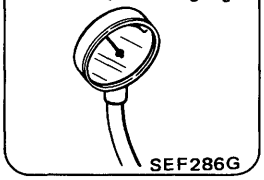
❸ **REMOVE** Pressure regulator



Improved →

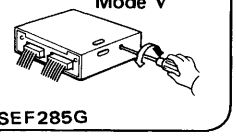
Remove vacuum hose from pressure regulator, and try to drive.

❹ **MEASURE** Fuel pressure gauge



Connect vacuum hose to pressure regulator, and measure fuel pressure while driving.

PERFORM ❺ Self-diagnosis Mode III, Self-diagnosis Mode V



N.G. → Check the malfunctioning parts. [See page EF & EC-82 (crank angle sensor), page EF & EC-84 (air flow meter).]

Perform self-diagnosis Mode III and V (for crank angle sensor and air flow meter).

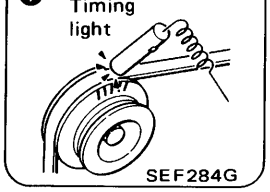
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 18 Engine stall — during start-up

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio (too rich/too lean)							○	○	○
	Ignition sparks (weak)			○	○					
	Ignition timing	○								
	Compression pressure (too low)						○			
FUEL SYSTEM	Canister (too much evaporation to intake)							○		
IGNITION SYSTEM	Ignition wires (ignition leaks)			○	○	○				
	Spark plugs (wet with fuel, improper gap)					○				
INTAKE SYSTEM	Throttle valve (not open enough)		○							

SERVICE PROCEDURE

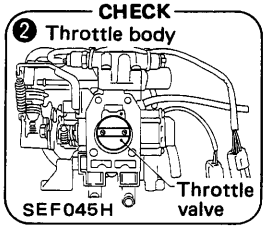
❶ CHECK Timing light



Check ignition timing.

N.G. → Adjust ignition timing. [See page EF & EC-141.]

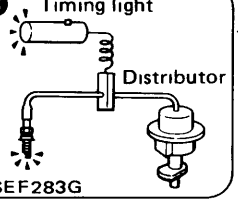
❷ CHECK Throttle body



Check throttle valve for rough movement.

N.G. → Repair/replace the part.

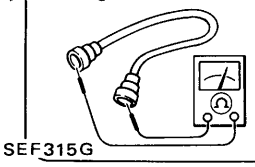
❸ CHECK Timing light



Check flashes of timing light for weakness.

N.G. →

❹ MEASURE Ignition wire

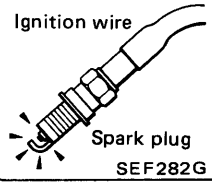


Measure resistance of ignition wires.

N.G. → Replace the wires.

O.K. →

❺ CHECK Ignition wire



Remove spark plugs and check their ignition sparks.

❻ MEASURE

COMPRESSION PRESSURE

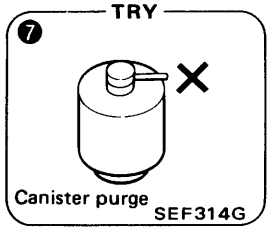


Measure compression pressure.

↓

Check cylinder head and gasket. [See EM section.]

❼ TRY

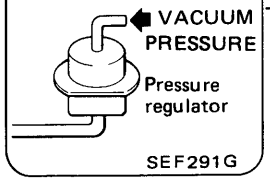


Shut evaporated fuel to intake valve and try to drive.

Improved → Replace the canister and/or the hoses.

No change →

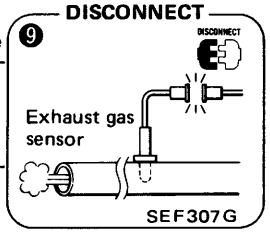
❽ APPLY



Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and try to drive.

Improved → Check Mixture ratio feedback system. [See page EF & EC-141.]

❾ DISCONNECT



Disconnect exhaust gas sensor connector and try to drive.

No change → Replace the sensor.

Improved →

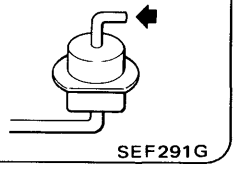
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 19 Engine stall – while idling

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio (too rich/too lean)	○	○							
	Fuel pressure (low)	○	○							
	Ignition sparks (weak, missing)				○					
	Idle speed (low)			○						
FUEL SYSTEM	Fuel line (clogged)		○							
IGNITION SYSTEM	Spark plugs (wet with fuel, improper gap)					○	○			
INTAKE SYSTEM	Idle speed control valve (improper operation)			○				○		
	F.I.C.D. solenoid (improper operation)			○					○	
CONTROL SYSTEM	Idle switch (remaining OFF)									○
	Neutral switch (remaining OFF)			○						
	Load switches (remaining OFF)							○	○	

SERVICE PROCEDURE

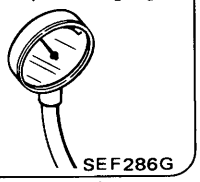
❶ REMOVE
Pressure regulator



Remove vacuum hose from pressure regulator, and check idling.

Improved →

❷ MEASURE
Fuel pressure gauge



Connect vacuum hose to pressure regulator and measure fuel pressure.

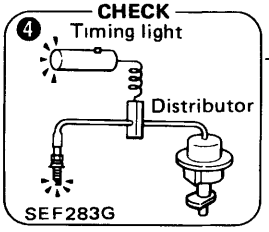
→ Check Mixture ratio feedback system.
[See page EF & EC-141.]

❸ MEASURE
Tachometer



Measure idle speed.
↓ N.G.
Adjust idle speed.
[See page EF & EC-141.]

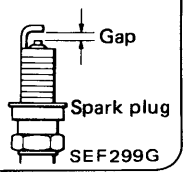
❹ CHECK
Timing light



Check flashes of timing light for weakness.

N.G. →

❺ CHECK



Remove spark plugs and check their gaps and tips.

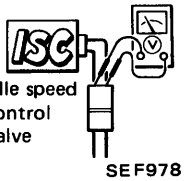
and/or

❻ CHECK
Spark plug



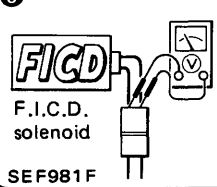
Check spark plugs for being foul or wet with fuel.

❼ CHECK



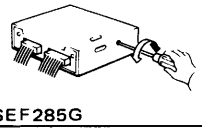
Check terminal voltages of idle speed control valve.
↓ N.G.
Check the part and/or circuit.
[See page EF & EC-98/126/128]

❽ CHECK



Check terminal voltage of F.I.C.D. solenoid.
↓ N.G.
Check the part and/or circuit.
[See HA section.]

❾ PERFORM
Self-diagnosis Mode IV



Perform self-diagnosis Mode IV (for idle switch).

N.G. → Check the idle switch circuit.
[See page EF & EC-94.]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 20 Engine stall – while accelerating

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio					○	○	
	Ignition sparks (weak, missing)	○	○	○				
	Compression pressure (low)				○			
CONTROL SYSTEM	Crank angle sensor	○						○
	Air flow meter							○
	Exhaust gas sensor					○	○	

SERVICE PROCEDURE

❶ CHECK
Timing light
Distributor
SEF283G
Check flashes of timing light for weakness during acceleration.

N.G. →

❷ MEASURE
Ignition wire
SEF315G
Measure resistance of suspect wires.

N.G. → Replace the wires.

O.K. →

❸ CHECK
Ignition wire
Spark plug
SEF282G
Remove spark plugs and check their ignition sparks.

❹ MEASURE
COMPRESSION PRESSURE
SEF309G
Measure compression pressure.

N.G. → Check cylinder head and gasket.
[See EM section.]

❺ CHECK
Self-diagnosis Mode II
5 times or more/10 sec.
SEF373G
Check mixture ratio by flashes of inspection lamps.

N.G. →

❻ DISCONNECT
Exhaust gas sensor
SEF307G
Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check Mixture ratio feedback system.
[See page EF & EC-141.]

❼ PERFORM
Self-diagnosis Mode III
Self-diagnosis Mode V
SEF285G
Perform self-diagnosis Mode III and V (for crank angle sensor and air flow meter).

N.G. → Check the malfunctioning parts and/or circuits.
[See page EF & EC-82 (crank angle sensor), page EF & EC-84 (air flow meter).]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 21 Engine stall – while cruising

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio				○	○	
	Ignition sparks (weak, missing)	○	○	○			
CONTROL SYSTEM	Crank angle sensor						○
	Air flow meter						○

SERVICE PROCEDURE

❶ CHECK — Timing light, Distributor — SEF283G

Check flashes of timing light for weakness at constant engine rev. (1,000 to 2,000 rpm).

N.G. →

❷ MEASURE — Ignition wire — SEF315G

Measure resistance of suspect wires.

N.G. → Replace the wires.

O.K. →

❸ CHECK — Ignition wire, Spark plug — SEF282G

Remove spark plugs and check their ignition sparks.

❹ CHECK — Self-diagnosis Mode II, 5 times or more/10 sec. — SEF373G

Check mixture ratio by flashes of inspection lamps.

N.G. →

❺ DISCONNECT — Exhaust gas sensor — SEF307G

Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check Mixture ratio feedback system. [See page EF & EC-141.]

❻ PERFORM — Self-diagnosis Mode III, Self-diagnosis Move V — SEF285G

Perform self-diagnosis Mode III and V (for air flow meter and crank angle sensor).

N.G. → Check the circuits. [See page EF & EC-82 (crank angle sensor), page EF & EC-84 (air flow meter).]

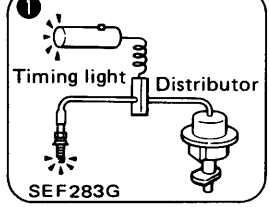
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 22 Engine stall – while decelerating/just after stopping

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio					○	○
	Ignition sparks (missing)	○					
	Idle speed (too low)			○			
IGNITION SYSTEM	(missing)	○	○				
INTAKE SYSTEM	Idle speed control valve (remaining OFF)			○	○		
CONTROL SYSTEM	Exhaust gas sensor (malfunctioning feedback control)					○	○
	Crank angle sensor		○				
	Idle switch (remaining OFF)			○			
	Load switches (remaining OFF)			○	○		

SERVICE PROCEDURE

❶ CHECK

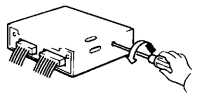


Check flashes of timing light while decreasing engine speed.

N.G. →

❷ PERFORM

Self-diagnosis Mode V



Perform self-diagnosis Mode V (for ignition signal and crank angle sensor).

N.G. → Check the malfunctioning parts and/or circuits. [See page EF & EC-90 (ignition siglal), page EF & EC-82 (crank angle sensor).]

❸ MEASURE

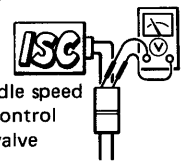
Tachometer



Measure idle speed.

N.G. → Adjust idle speed. [See page EF & EC-141.]

❹ CHECK

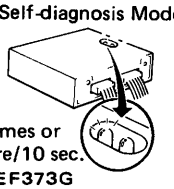


Check terminal voltage of idle speed control valve.

Left OFF → Check the circuit. [See page EF & EC-98/126/128.]

❺ CHECK

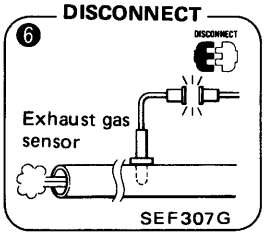
Self-diagnosis Mode II



Check mixture ratio by flashes of inspection lamps.

N.G. →

❻ DISCONNECT



Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check Mixture ratio feedback system. [See page EF & EC-141.]

Diagnostic Table (Cont'd)

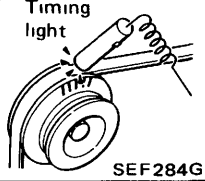
SYMPTOM & CONDITION 23 Engine stall – while loading

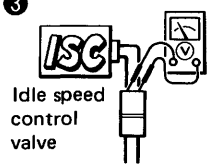
POSSIBLE CAUSES		❶	❷	❸	❹	❺
SPECIFICATIONS	Ignition timing		○			
	Idle speed (too low)	○				
INTAKE SYSTEM	Idle speed control valve (remaining OFF)	○		○		
	F.I.C.D. solenoid (remaining OFF)	○			○	
CONTROL SYSTEM	Idle switch (remaining OFF)	○				○
	Load switches (remaining OFF)	○		○	○	

SERVICE PROCEDURE

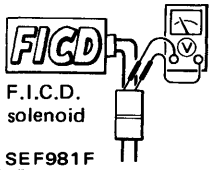
❶ MEASURE
Tachometer

SEF316G
Measure idle speed.
N.G. → Adjust idle speed. [See page EF & EC-141.]

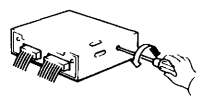
❷ CHECK
Timing light

SEF284G
Check ignition timing.
N.G. → Adjust ignition timing. [See page EF & EC-141.]

❸ CHECK


SEF978F
Check terminal voltage of idle speed control valve.
N.G. → Check the part and/or circuit. [See page EF & EC-98/126/128.]

❹ CHECK


SEF981F
Check terminal voltage of F.I.C.D. solenoid.
→ Check the part and/or circuit. [See HA section.]

❺ PERFORM
Self-diagnosis Mode IV

SEF285G
Perform self-diagnosis Mode IV (for idle switch).
N.G. → Check the idle switch circuit. [See page EF & EC-94.]

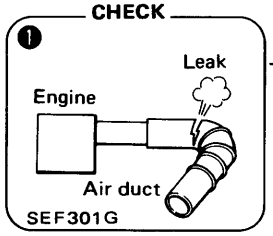
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 24 Backfire – through the intake

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio (too lean)	○		○		○	○	
	Ignition timing (too retarded)		○					
FUEL SYSTEM	Injector (clogged)				○			
INTAKE SYSTEM	Air duct (air leaks)	○						
	Intake manifold (gaskets) (air leaks)	○						
CONTROL SYSTEM	Air flow meter							○
	Exhaust gas sensor					○	○	

SERVICE PROCEDURE

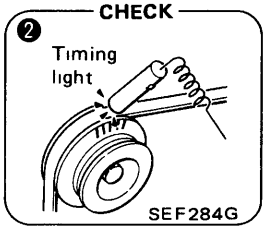
❶ CHECK



N.G. → Repair/replace the part.

Check intake system for air leaks.

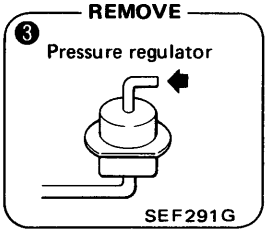
❷ CHECK



N.G. → Adjust ignition timing. [See page EF & EC-141.]

Check ignition timing.

❸ REMOVE



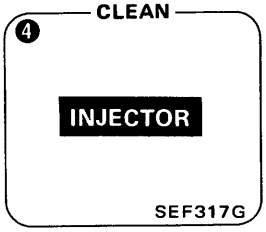
Improved → Check Mixture ratio feedback system. [See page EF & EC-141.]

Remove vacuum hose from pressure regulator, and try to drive.

No change ↓

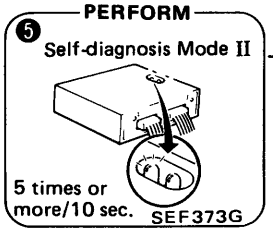
or

❹ CLEAN



Clean the injector.

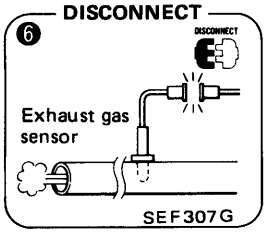
❺ PERFORM



N.G. →

Check mixture ratio by flashes of inspection lamps.

❻ DISCONNECT

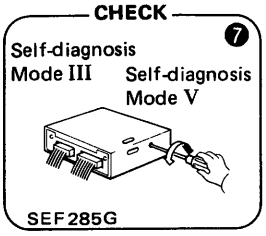


Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check Mixture ratio feedback system. [See page EF & EC-141.]

❼ CHECK



Perform self-diagnosis Mode III and V (for air flow meter).

N.G. ↓

Check the circuits. [See page EF & EC-84 (air flow meter).]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 25 Backfire – through the exhaust

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio (too rich)	○	○				
FUEL SYSTEM	Injectors (fuel leaks)		○				
IGNITION SYSTEM	(missing)				○		
INTAKE SYSTEM	Air cleaner element (clogged)	○					
	A.I.V. (always operating)					○	
	A.I.V. solenoid (remaining ON)					○	○
CONTROL SYSTEM	Idle switch (remaining OFF)			○			

SERVICE PROCEDURE

❶ CHECK
AIR CLEANER ELEMENT
SEF320G
N.G. → Replace the element.
Check air cleaner element for clogging.

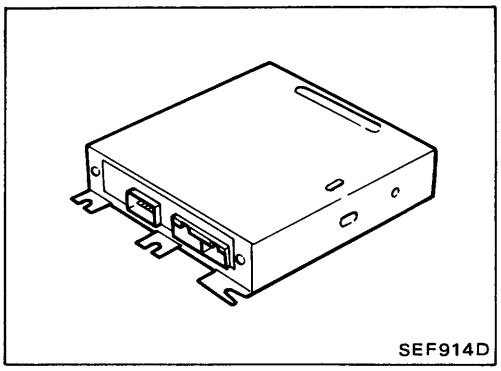
❷ APPLY
PRESSURE
Pressure regulator
SEF291G
Improved → Check Mixture ratio feedback system. [See page EF & EC-141.]
Apply pressure to pressure regulator after disconnecting vacuum hose, and try to drive.

❸ PERFORM
Self-diagnosis Mode IV
SEF285G
N.G. → Check idle switch and/or its circuit. [See page EF & EC-94.]
Perform self-diagnosis Mode IV (for idle switch).

❹ PERFORM
Self-diagnosis Mode V
SEF285G
N.G. → Check the malfunctioning part and/or circuit. [See page EF & EC-90 (ignition signal).]
Perform self-diagnosis Mode V (for ignition signal).

❺ CHECK
A.I.V.
SEF375G
Keeps flowing →
Check secondary air to exhaust system.

❻ CHECK
A.I.V. solenoid
SEF372G
Left ON → Check the solenoid circuit. [See page EF & EC-130.]
Check terminal voltage of A.I.V. solenoid.


SEF914D

Description

The self-diagnosis is useful to diagnose malfunctions in major sensors and actuators of the E.C.C.S. system. There are 5 modes in the self-diagnosis system.

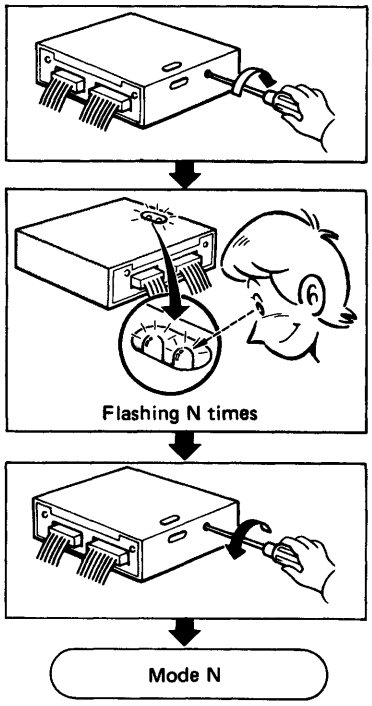
1. **Mode I – Mixture ratio feedback control monitor A**
- During closed loop condition:
  The green inspection lamp turns ON when lean condition is detected and goes OFF by rich condition.
- During open loop condition:
  The green inspection lamp remains ON or OFF.

2. **Mode II – Mixture ratio feedback control monitor B**
   The green inspection lamp function is the same as Mode I.
- During closed loop condition:
  The red inspection lamp turns ON and OFF simultaneously with the green inspection lamp when the mixture ratio is controlled within the specified value.
- During open loop condition:
  The red inspection lamp remains ON or OFF.

3. **Mode III – Self-diagnosis**
   This mode is the same as the former self-diagnosis in self-diagnosis mode.

4. **Mode IV – Switches ON/OFF diagnosis**
   During this mode, the inspection lamps monitor the switch ON-OFF condition.
- Idle switch
- Starter switch
- Vehicle speed sensor

5. **Mode V – Real time diagnosis**
   The moment the malfunction is detected, the display will be presented immediately. That is, the condition at which the malfunction occurs can be found by observing the inspection lamps during driving test.

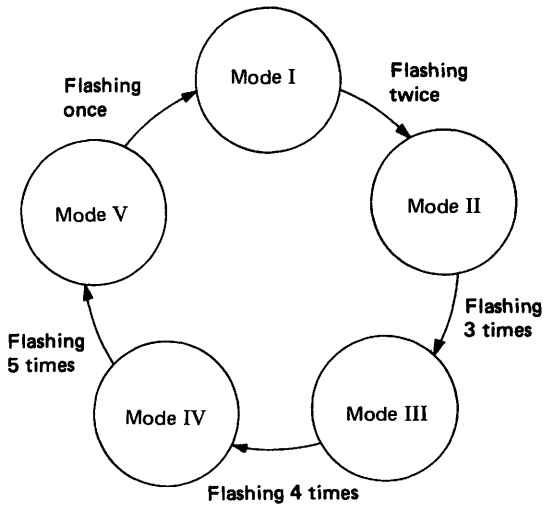


SEF872D

Description (Cont'd)

SWITCHING THE MODES

1. Turn ignition switch "ON".
2. Turn diagnostic mode selector on E.C.U. fully clockwise and wait the inspection lamps flash.
3. Count the number of the flashing time, and after the inspection lamps have flashed the number of the required mode, turn diagnostic mode selector fully counterclockwise immediately.



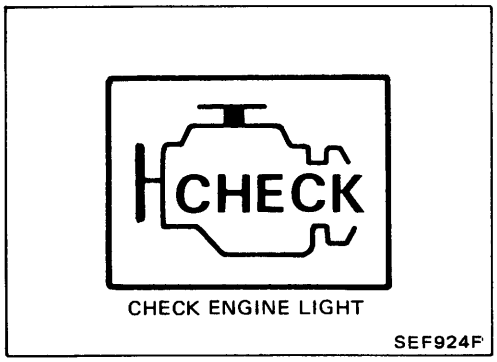
SEF989D

NOTE:

When the ignition switch is turned off during diagnosis, in each mode, and then turned back on again after the power to the E.C.U. has dropped off completely, the diagnosis will automatically return to Mode I.

The stored memory would be lost if:

1. Battery terminal is disconnected.
2. After selecting Mode III, Mode IV is selected.
   However, if the diagnostic mode selector is kept turned fully clockwise, it will continue to change in the order of Mode I → II → III → IV → V → I ... etc., and in this state the stored memory will not be erased.



CHECK ENGINE LIGHT
SEF924P

Description (Cont'd)

CHECK ENGINE LIGHT (For California only)

This vehicle has a check engine light on instrument panel. This light comes ON under the following conditions:

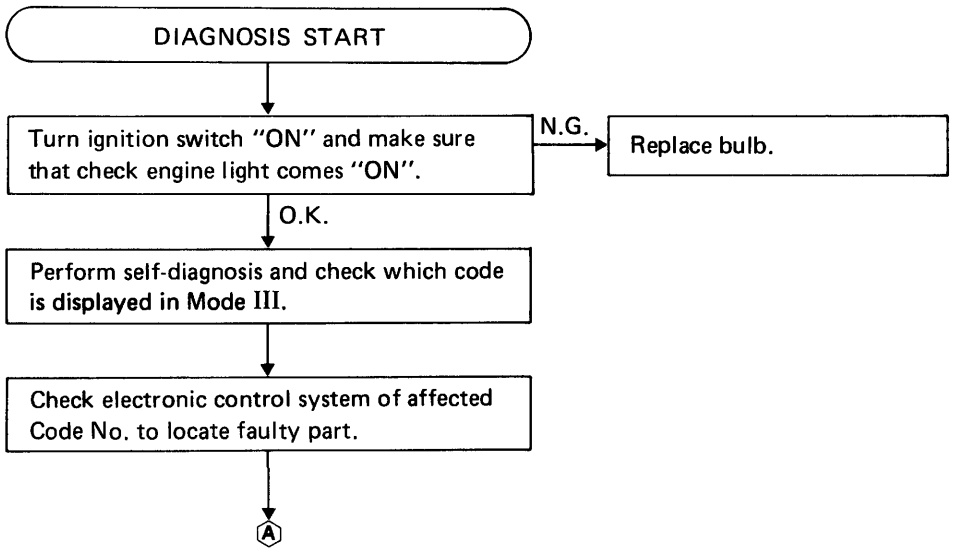
1) When ignition switch is turned "ON" (for bulb check).
2) When systems related to emission performance malfunction in Mode I (with engine running).

- **This check engine light always illuminates and is synchronous with red L.E.D.**
- **Malfunction systems related to emission performance can be detected by self-diagnosis, and they are clarified as self-diagnostic codes in Mode III.**

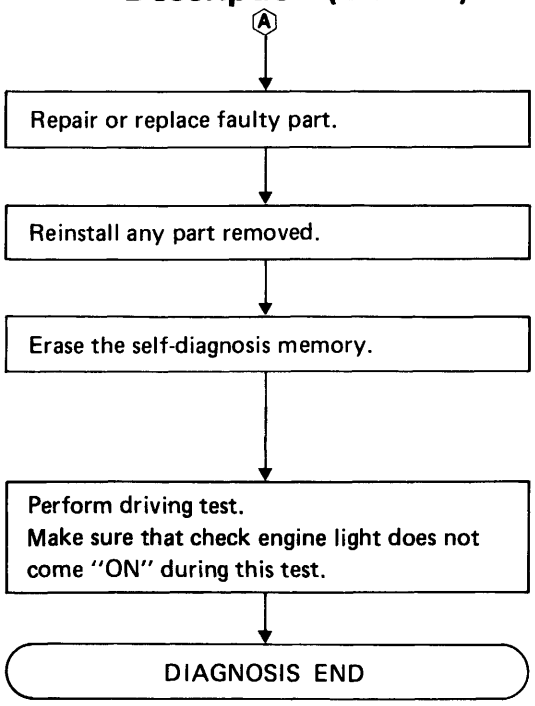
3) Check engine light will come "ON" only when malfunction is sensed.
   The check engine light will turn off when normal operation is resumed. Mode III memory must be cleared as the contents remain stored.

Code No.	Malfunction
12	Air flow meter circuit
13	Water temperature sensor circuit
14	Vehicle speed sensor circuit
23	Idle switch circuit
31	E.C.U. (E.C.C.S. control unit)
32	E.G.R. function
33	Exhaust gas sensor circuit
35	Exhaust gas temperature sensor circuit
43	Throttle sensor circuit
45	Injector leak

Use the following diagnostic flowchart to check and repair a malfunctioning system.



Description (Cont'd)



- **Methods of erasing memories differ with systems. Read the manual before diagnosing systems.**
- **After repairs, test drive to check that check engine light does not come on.**
- **Test driving modes differ with systems. Read the manual before test driving.**

Modes I & II —Mixture Ratio Feedback Control Monitors A & B

In these modes, the control unit provides the Air-fuel ratio monitor presentation and the Air-fuel ratio feedback coefficient monitor presentation.

<table>
<tr><th rowspan="2">Mode</th><th rowspan="2">LED</th><th rowspan="2">Engine stopped (Ignition switch "ON")</th><th colspan="4">Engine running</th></tr>
<tr><th>Open loop condition</th><th colspan="3">Closed loop condition</th></tr>
<tr><td rowspan="2">Mode I (Monitor A)</td><td>Green</td><td>ON</td><td>*Remains ON or OFF</td><td colspan="3">Blinks</td></tr>
<tr><td>Red</td><td>ON</td><td>Except for California model
• OFF</td><td colspan="3">For California model
• ON: when CHECK ENGINE LIGHT ITEMS are stored in the E.C.U.
• OFF: except for the above condition</td></tr>
<tr><td rowspan="3">Mode II (Monitor B)</td><td>Green</td><td>ON</td><td>*Remains ON or OFF</td><td colspan="3">Blinks</td></tr>
<tr><td rowspan="2">Red</td><td rowspan="2">OFF</td><td rowspan="2">*Remains ON or OFF (synchronous with green LED)</td><td colspan="3">Compensating mixture ratio</td></tr>
<tr><td>More than 5% rich</td><td>Between 5% lean and 5% rich</td><td>More</td></tr>
<tr><td></td><td></td><td></td><td>OFF</td><td>Synchronized with green LED</td><td>Remains ON</td></tr>
</table>

*: Maintains conditions just before switching to open loop

Mode III — Self-diagnostic System

The E.C.U. constantly monitors the function of these sensors and actuators, regardless of ignition key position. If a malfunction occurs, the information is stored in the E.C.U. and can be retrieved from the memory by turning on the diagnostic mode selector, located on the side of the E.C.U. When activated, the malfunction is indicated by flashing a red and a green L.E.D. (Light Emitting Diode), also located on the E.C.U. Since all the self-diagnostic results are stored in the E.C.U.'s memory even intermittent malfunctions can be diagnosed.

A malfunctioning part's group is indicated by the number of both the red and the green L.E.D.s flashing. First, the red L.E.D. flashes and the green flashes follow. The red L.E.D. refers to the number of tens while the green one refers to the number of units. For example, when the red L.E.D. flashes once and then the green one flashes twice, this means the number "12" showing the air flow meter signal is malfunctioning. In this way, all the problems are classified by the code numbers.

- **When engine fails to start, crank engine more than two seconds before starting self-diagnosis.**
- **Before starting self-diagnosis, do not erase stored memory. If doing so, self-diagnosis function for intermittent malfunctions would be lost.**

The stored memory would be lost if:

1. **Battery terminal is disconnected.**
2. **After selecting Mode III, Mode IV is selected.**

DISPLAY CODE TABLE

Code No.	Detected items	California	Non-California
11	Crank angle sensor circuit	X	X
12	Air flow meter circuit	X*	X
13	Water temperature sensor circuit	X*	X
14	Vehicle speed sensor circuit	X*	X
21	Ignition signal missing in primary coil	X	X
23	Idle switch circuit	X*	X
25	A.A.C. valve circuit	X	X
31	E.C.U. (E.C.C.S. control unit)	X*	X
32	E.G.R. function	X*	–
33	Exhaust gas sensor circuit	X*	X
35	Exhaust gas temperature sensor circuit	X*	–
43	Throttle sensor circuit	X*	X
45	Injector leak	X*	–
55	No malfunctioning in the above circuit	X	X

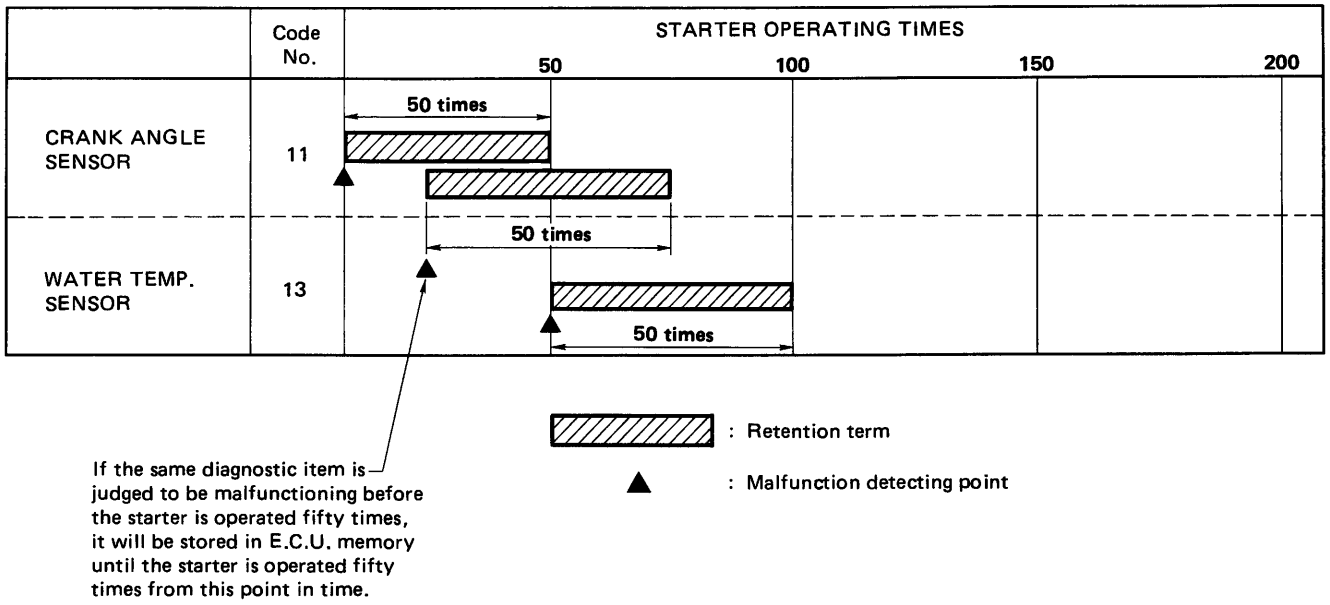
X: Available
–: Not available
*: Check engine light item

Mode III — Self-diagnostic System (Cont'd)

RETENTION OF DIAGNOSTIC RESULTS

The diagnostic result is retained in E.C.U. memory until the starter is operated fifty times after a diagnostic item is judged to be malfunctioning. The diagnostic result will then be cancelled automatically. If a diagnostic item which has been judged to be malfunctioning and stored in memory is again judged to be malfunctioning before the starter is operated fifty times, the second result will replace the previous one. It will be stored in E.C.U. memory until the starter is operated fifty times more.

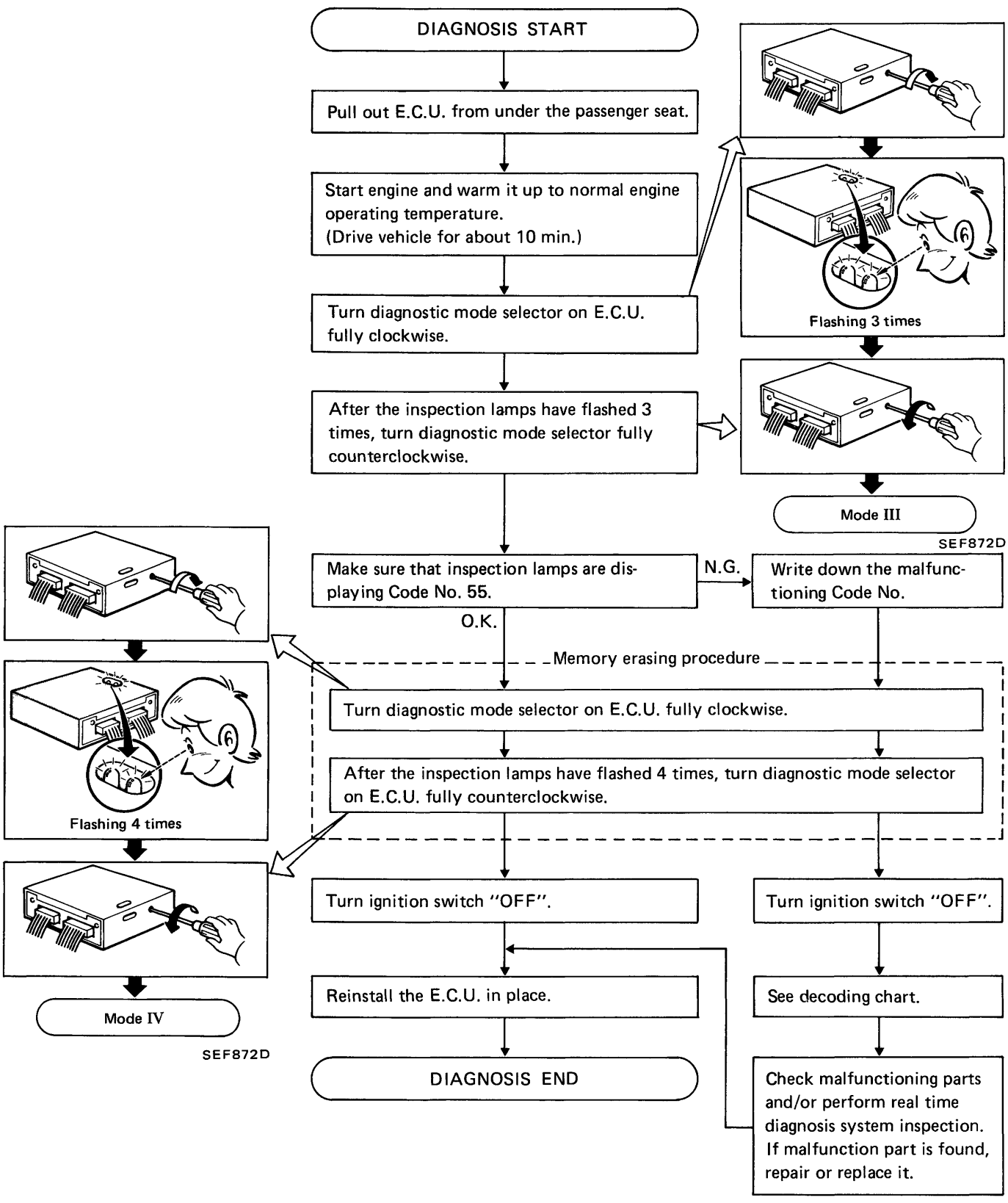
RETENTION TERM CHART (Example)



SEF793D

Mode III — Self-diagnostic System (Cont'd)

SELF-DIAGNOSTIC PROCEDURE

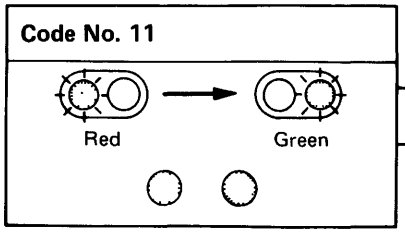
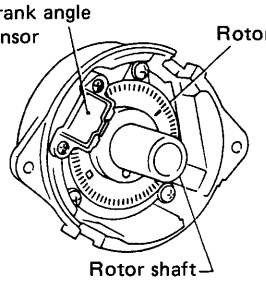
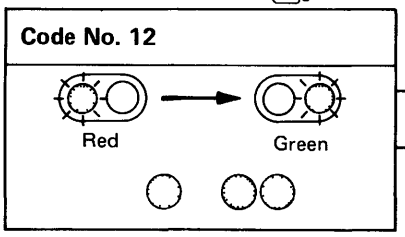
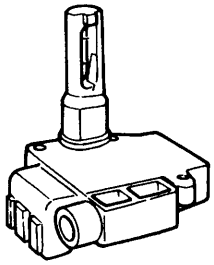
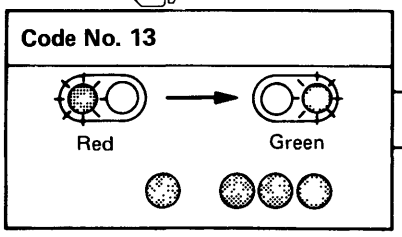
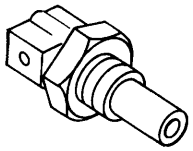
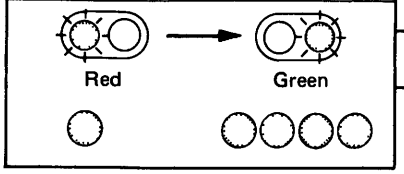
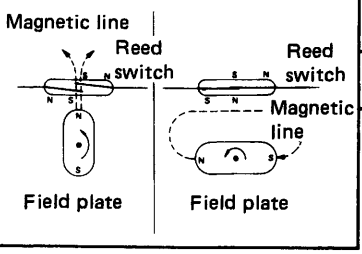


CAUTION:

During displaying Code No. in self-diagnosis mode (Mode III), if the other diagnostic mode should be done, make sure to write down the malfunctioning Code No. before turning diagnostic mode selector on E.C.U. fully clockwise, or select the diagnostic mode after turning switch "OFF". Otherwise self-diagnosis information stored in E.C.U. memory until now would be lost.

Mode III — Self-diagnostic System (Cont'd)

DECODING CHART

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.
CRANK ANGLE SENSOR **Code No. 11** 	Crank angle sensor circuit 	• Either 1° or 180° signal is not entered for the first few seconds during engine cranking. • Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm. SYSTEM INSPECTION See page EF & EC-82.
SEF331H		
AIR FLOW METER CHECK **Code No. 12** 	Air flow meter circuit 	• The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.) SYSTEM INSPECTION See page EF & EC-84.
SEF920D		
WATER TEMPERATURE SENSOR CHECK **Code No. 13** 	Water temperature sensor circuit 	• The water temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.) SYSTEM INSPECTION See page EF & EC-86.
SEF833C		
VEHICLE SPEED SENSOR CHECK **Code No. 14** 	Vehicle speed sensor circuit 	• Signal circuit is open. SYSTEM INSPECTION See page EF & EC-88.
SEF981F		

Mode III — Self-diagnostic System (Cont'd)

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.
IGNITION SIGNAL **Code No. 21** Red → Green	Ignition signal circuit	• The ignition signal in primary circuit is not entered during engine cranking or running. SYSTEM INSPECTION See page EF & EC-90.
IDLE SWITCH CHECK **Code No. 23** Red → Green	Idle switch circuit	• Signal circuit is open. SYSTEM INSPECTION See page EF & EC-94.
A.A.C. VALVE **Code No. 25**	Idle speed control slips out	• A.A.C. valve circuit is open or short. (Idle speed is different from target idle speed in spite of feedback control.) SYSTEM INSPECTION See page EF & EC-98.
E.C.U. (E.C.C.S. control unit) CHECK **Code No. 31** Red → Green	E.C.U. calculation function	• Signal is beyond "normal" range. SYSTEM INSPECTION See page EF & EC-100.

SEF921D

SEF982F

SEF327H

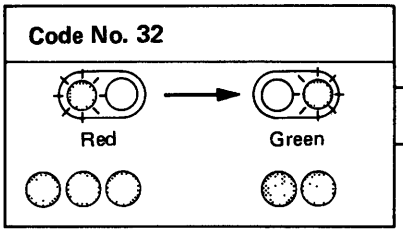
SEF983F

Mode III — Self-diagnostic System (Cont'd)

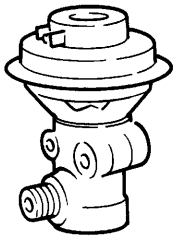
Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.

E.G.R. FUNCTION (California model only)

Code No. 32



E.G.R. function



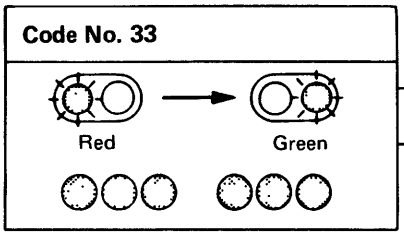
- E.G.R. control valve does not operate. (E.G.R. control valve spring does not lift.)

SYSTEM INSPECTION
See page EF & EC-102.

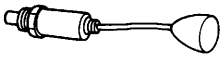
SEF238G

EXHAUST GAS SENSOR

Code No. 33



Exhaust gas sensor circuit



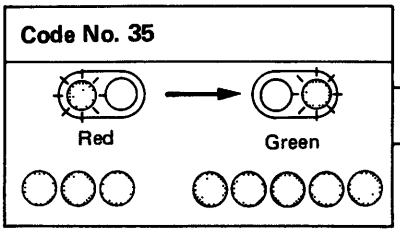
- Output voltage is too high.

SYSTEM INSPECTION
See page EF & EC-106.

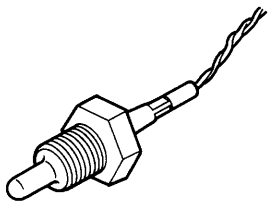
SEF979F

EXHAUST GAS TEMPERATURE SENSOR CIRCUIT (California model only)

Code No. 35



Exhaust gas temperature sensor circuit



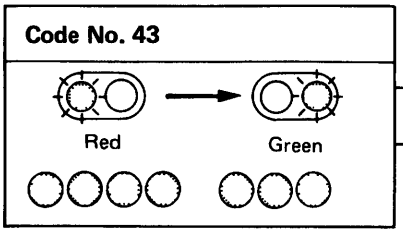
- Signal circuit is open.

SYSTEM INSPECTION
See page EF & EC-108.

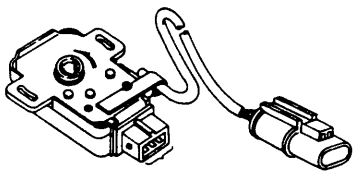
SEF239G

THROTTLE SENSOR

Code No. 43



Throttle sensor circuit



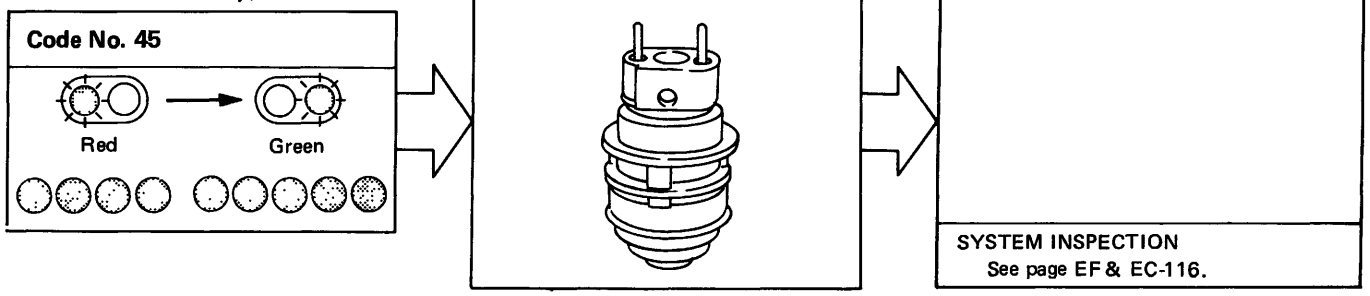
- Throttle sensor circuit is open or short. (Output voltage is too high or too low.)

SYSTEM INSPECTION
See page EF & EC-112.

SEF980F

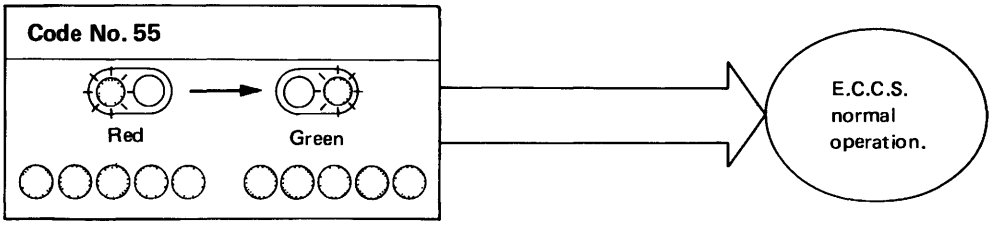
Mode III — Self-diagnostic System (Cont'd)

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.
INJECTOR LEAK (CHECK) (California model only) Code No. 45 Red → Green	Injector circuit	• Leak from the injector. SYSTEM INSPECTION See page EF & EC-116.



SEF321H

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.
Code No. 55 Red → Green		E.C.C.S. normal operation.



SEF984F

Mode IV — Switches ON/OFF Diagnostic System

In switches ON/OFF diagnosis system, ON/OFF operation of the following switches can be detected continuously.

- Idle switch
- Starter switch
- Vehicle speed sensor

(1) Idle switch & Starter switch

The switches ON/OFF status at the point when Mode IV is selected is stored in E.C.U. memory. When either switch is turned from "ON" to "OFF" or "OFF" to "ON", the red L.E.D. on E.C.U. alternately comes on and goes off each time switching is detected.

(2) Vehicle Speed Sensor

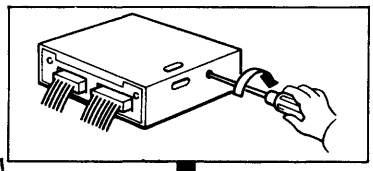
The switches ON/OFF status at the point when Mode IV is selected is stored in E.C.U. memory. When vehicle speed is 20 km/h (12 MPH) or slower, the green L.E.D. on E.C.U. is off. When vehicle speed exceeds 20 km/h (12 MPH), the green L.E.D. on E.C.U. comes "ON".

Mode IV — Switches ON/OFF Diagnostic System (Cont'd)

SELF-DIAGNOSTIC PROCEDURE

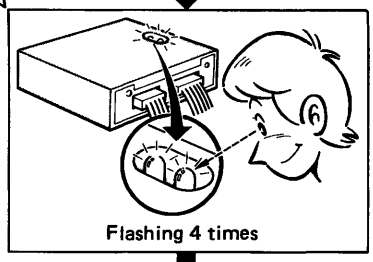
DIAGNOSIS START

Pull out E.C.U. from under the assist seat.

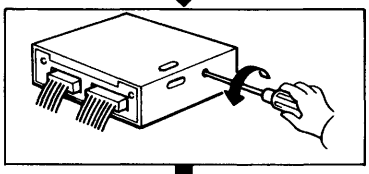


Turn ignition switch "ON".

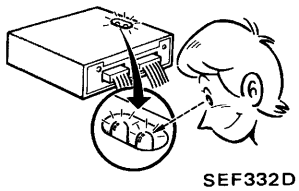
Turn diagnostic mode selector on E.C.U. fully clockwise.



After the inspection lamps have flashed 4 times, turn diagnostic mode selector fully counterclockwise.



Make sure that a red inspection lamp goes "OFF".

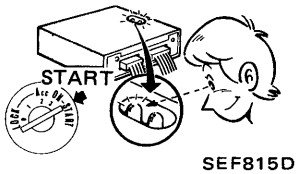


SEF332D

Mode IV

SEF872D

Start engine. Make sure that a red inspection lamp goes "ON" during turning ignition switch "START".



SEF815D

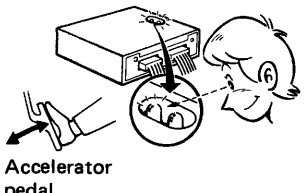
N.G. → Check starter signal circuit.

O.K.

Warm up engine sufficiently.

Turn ignition switch "OFF".

Make sure that a red inspection lamp goes "ON" when depressing accelerator pedal.



SEF816D

N.G. → Check idle switch circuit.

O.K.

Lift up front wheels.

Drive vehicle. Make sure that a green inspection lamp goes "ON" when vehicle speed is 20 km/h (12 MPH) or faster.

N.G. → Check vehicle speed sensor circuit.

O.K.

Turn ignition switch "OFF".

Reinstall the E.C.U. in place.

DIAGNOSIS END

CAUTION:

For safety, do not turn front wheel at higher speed than required.

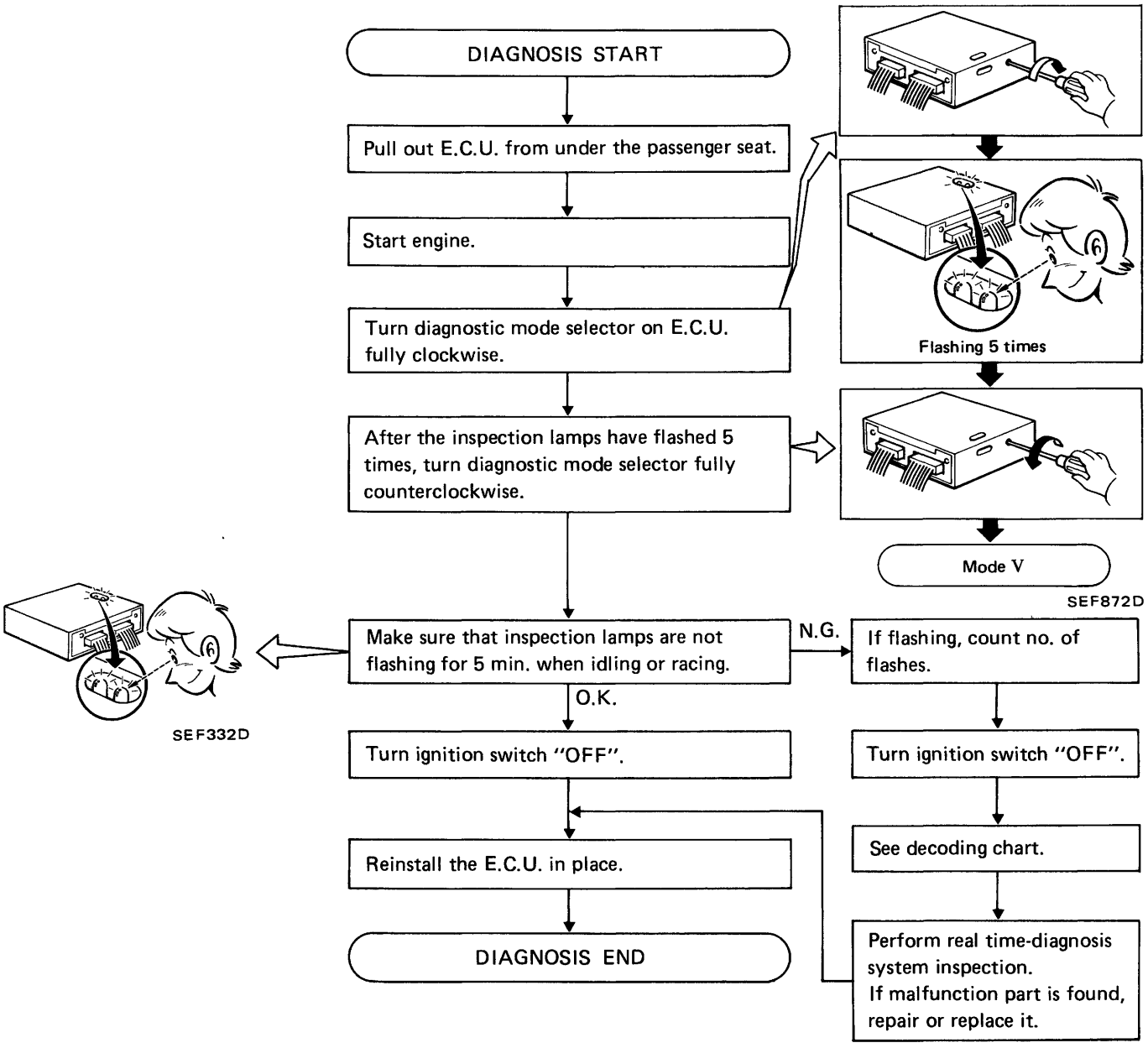
Mode V — Real Time Diagnostic System

In real time diagnosis, if any of the following items are judged to be faulty, a malfunction is indicated immediately.

- Crank angle sensor (180° signal & 1° signal)
- Ignition signal
- Air flow meter output signal

Consequently, this diagnosis is a very effective measure to diagnose whether the above systems cause the malfunction or not, during driving test. Compared with self-diagnosis, real time diagnosis is very sensitive, and can detect malfunctioning conditions in a moment. Further, items regarded to be malfunctions in this diagnosis are not stored in E.C.U. memory.

SELF-DIAGNOSTIC PROCEDURE

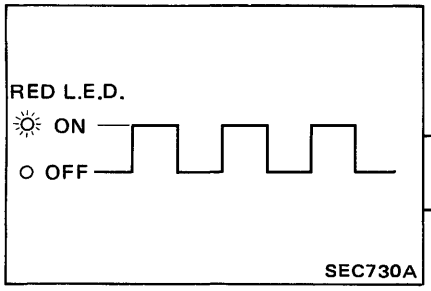
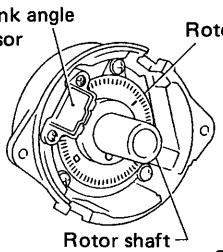
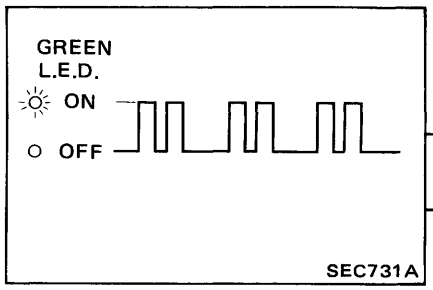
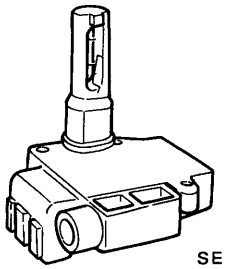
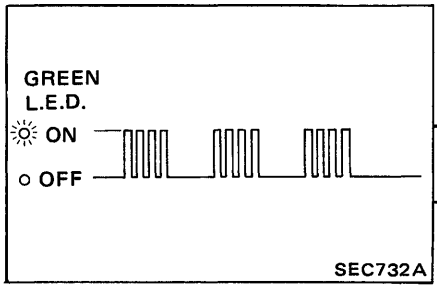
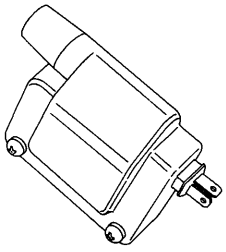
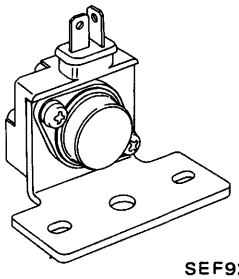


CAUTION:

In real time diagnosis, pay attention to inspection lamp flashing. E.C.U. displays the malfunction code only once, and does not memorize the inspection.

Mode V — Real Time Diagnostic System (Cont'd)

DECODING CHART

Display presentation	Malfunction circuit or parts	Control unit shows a malfunction signal when the following conditions are detected. (Compare with Self-diagnosis — Mode III.)
CRANK ANGLE SENSOR		
	Crank angle sensor circuit is malfunctioning. 	The 1° or 180° signal is momentarily missing, or, multiple, momentary noise signals enter. REAL TIME DIAGNOSTIC INSPECTION See page EF & EC-75.
AIR FLOW METER		
	Air flow meter circuit is malfunctioning. 	Abnormal, momentary increase in air flow meter output signal. REAL TIME DIAGNOSTIC INSPECTION See page EF & EC-76.
IGNITION SIGNAL		
	Ignition signal is malfunctioning.  	Signal from the primary ignition coil momentarily drops off. REAL TIME DIAGNOSTIC INSPECTION See page EF & EC-77.

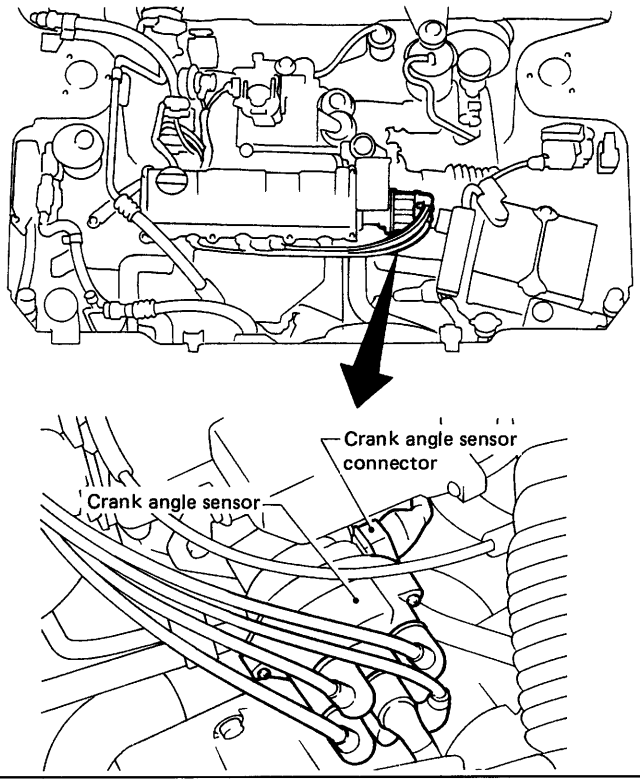
Mode V — Real Time Diagnostic System (Cont'd)

REAL TIME DIAGNOSTIC INSPECTION

Crank Angle Sensor

X: Available
—: Not available

Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Middle connector	Sensor & actuator	E.C.U. connectors	
1	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	X	—	—	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	X	—	X	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	—	—	X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	X	—	—	Replace terminal.
6	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	If malfunction codes are displayed during real time diagnosis, replace terminal.



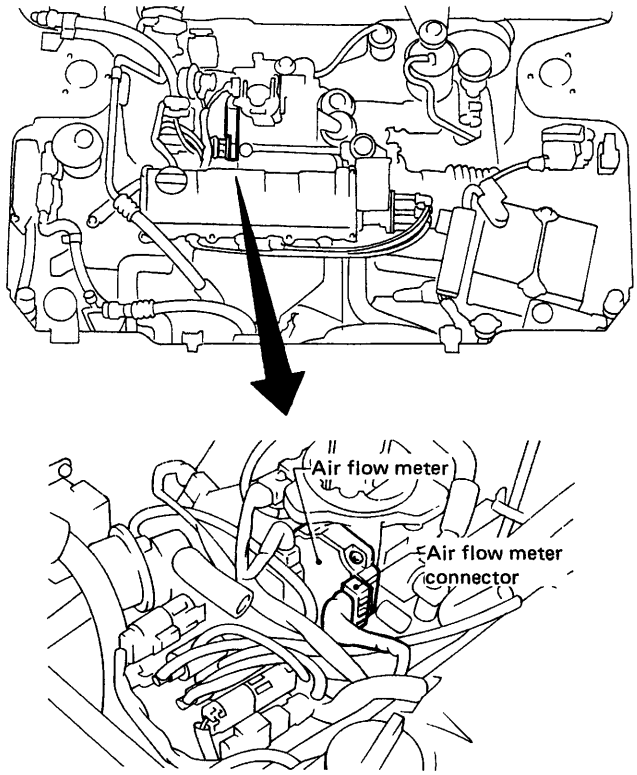
SEF096H

Mode V — Real Time Diagnostic System (Cont'd)

Air Flow Meter

X: Available
—: Not available

Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Middle connector	Sensor & actuator	E.C.U. connectors	
1	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	X	—	—	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	X	—	X	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	—	—	X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	X	—	—	Replace terminal.
6	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	If malfunction codes are displayed during real time diagnosis, replace terminal.



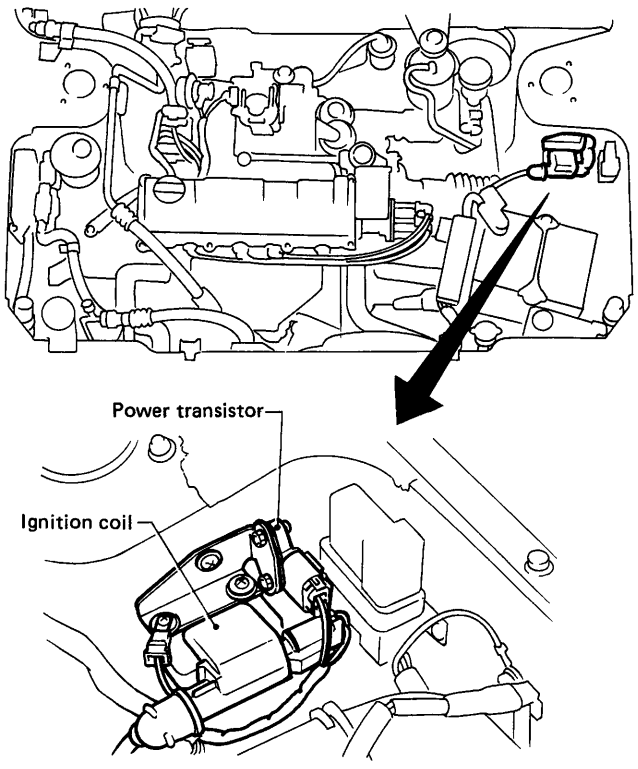
SEF097H

Mode V — Real Time Diagnostic System (Cont'd)

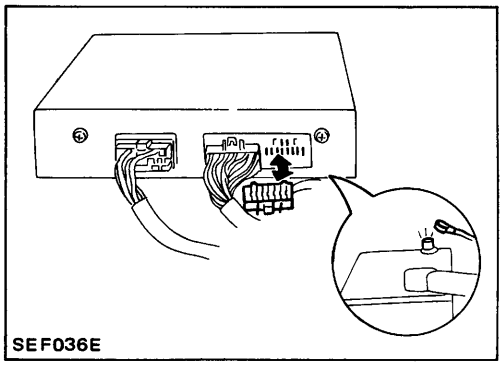
Ignition Signal

X: Available
—: Not available

Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Middle connector	Sensor & actuator	E.C.U. connectors	
1	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	X	—	—	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	X	—	X	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	—	—	X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	X	—	—	Replace terminal.
6	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	If malfunction codes are displayed during real time diagnosis, replace terminal.

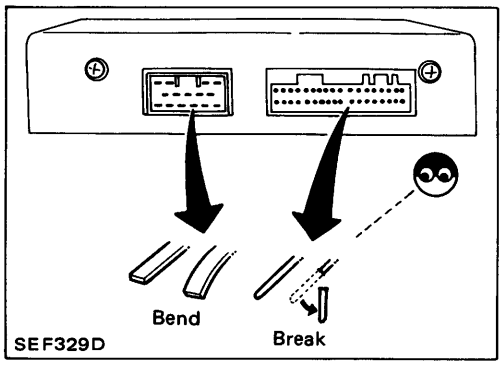


SEF098H


SEF036E

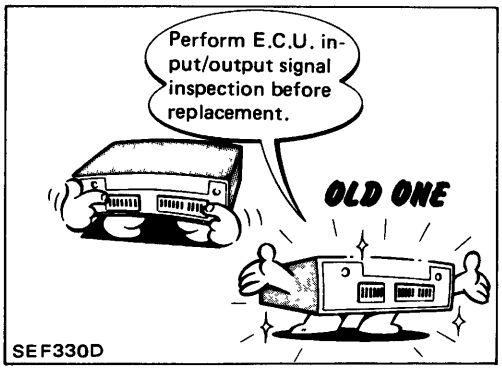
CAUTION:

1. Before connecting or disconnecting E.C.U. harness connector to or from any E.C.U., be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage E.C.U. as battery voltage is applied to E.C.U. even if ignition switch is turned off. Otherwise, there may be damage to the E.C.U.



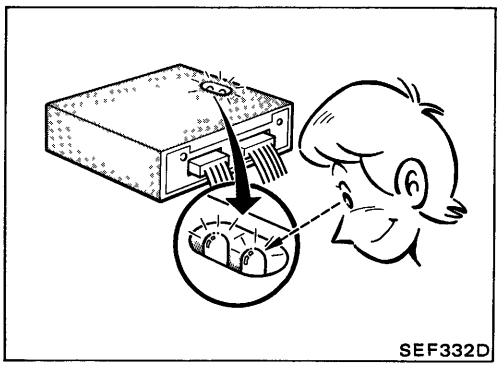
SEF329D

2. When connecting pin connectors into E.C.U. or disconnecting them from E.C.U., take care not to damage pin terminal of E.C.U. (Bend or break).
3. Make sure that there are not any bends or breaks on E.C.U. pin terminal, when connecting pin connectors into E.C.U.

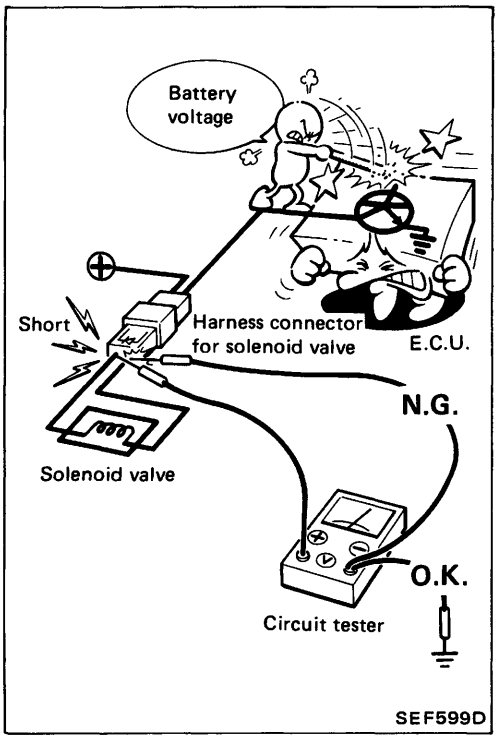


SEF330D

4. Before replacing E.C.U., perform E.C.U. input/output signal inspection and make sure whether E.C.U. functions properly or not. (See page EF & EC-136.)


SEF332D

5. After performing this "ELECTRONIC CONTROL SYSTEM INSPECTION", perform E.C.C.S. self-diagnosis and driving test.



6. When measuring supply voltage of E.C.U. controlled components with a circuit tester, separate one tester probe from the other.
   If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the power transistor of the control unit.

7. When measuring voltage or resistance at connector with tester probes, there are two methods of measurement; one is done from terminal side and the other from harness side. Before measuring, confirm symbol mark again.

   H.S. : Inspection should be done from harness side.

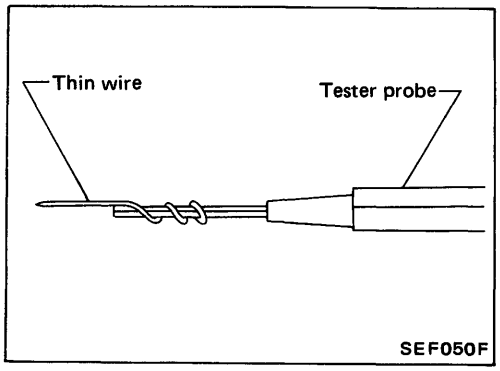
   T.S. : Inspection should be done from terminal side.

   Refer to GI section.

8. As for continuity check of joint connector, refer to EL section.
9. Key to symbols

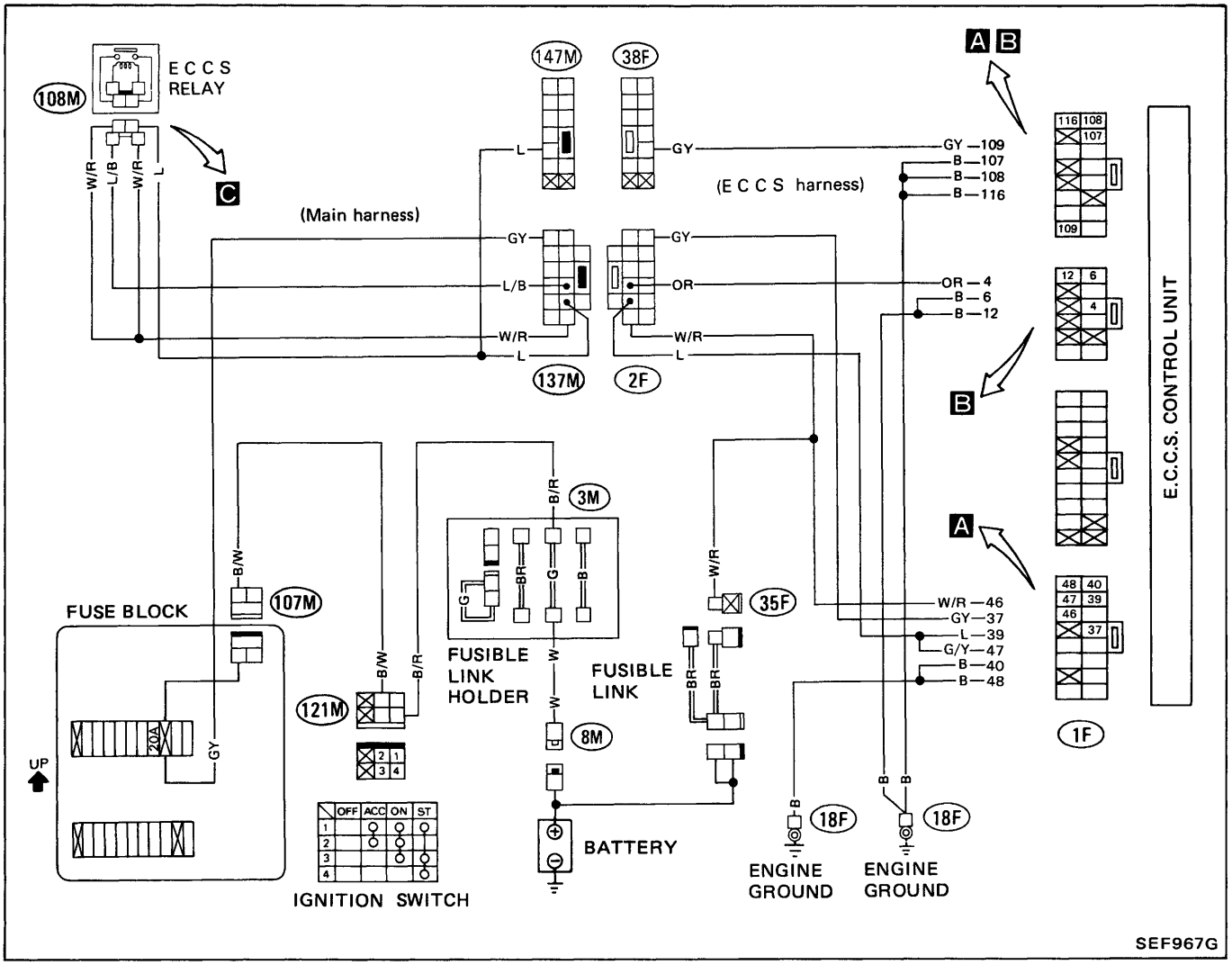
   DISCONNECT : Check after disconnecting the connector to be measured.

   CONNECT : Check after connecting the connector to be measured.



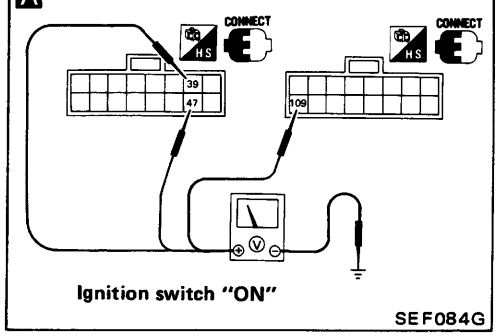
10. Improve tester probe as shown to perform test easily.
11. For the first trouble-shooting procedure, perform POWER SOURCE & GROUND CIRCUIT FOR E.C.U. check.

POWER SOURCE & GROUND CIRCUIT FOR E.C.U. (Not self-diagnosis item)



POWER SOURCE & GROUND CIRCUIT FOR E.C.U. (Not self-diagnosis item)

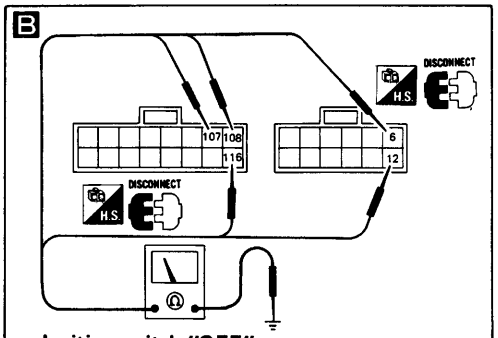
A



Ignition switch "ON"

SEF084G

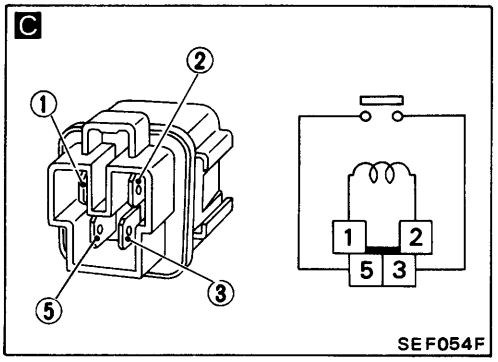
B



Ignition switch "OFF"

SEF085G

C



SEF054F

INSPECTION START

A

CHECK POWER SOURCE
1) Turn ignition switch "ON".
2) Check voltage between terminals (39), (47), (109) and ground.
Voltage: Battery voltage

N.G. →

Check the following items.
C 1) E.C.C.S. relay.

Condition	Continuity between terminals (3) and (5)
Supply 12V direct current between terminals (1) and (2)	Yes
Not supply	No

If N.G., replace E.C.C.S. relay.
2) Harness continuity between E.C.U. terminal and E.C.C.S. relay.
3) Fusible link

O.K. ↓

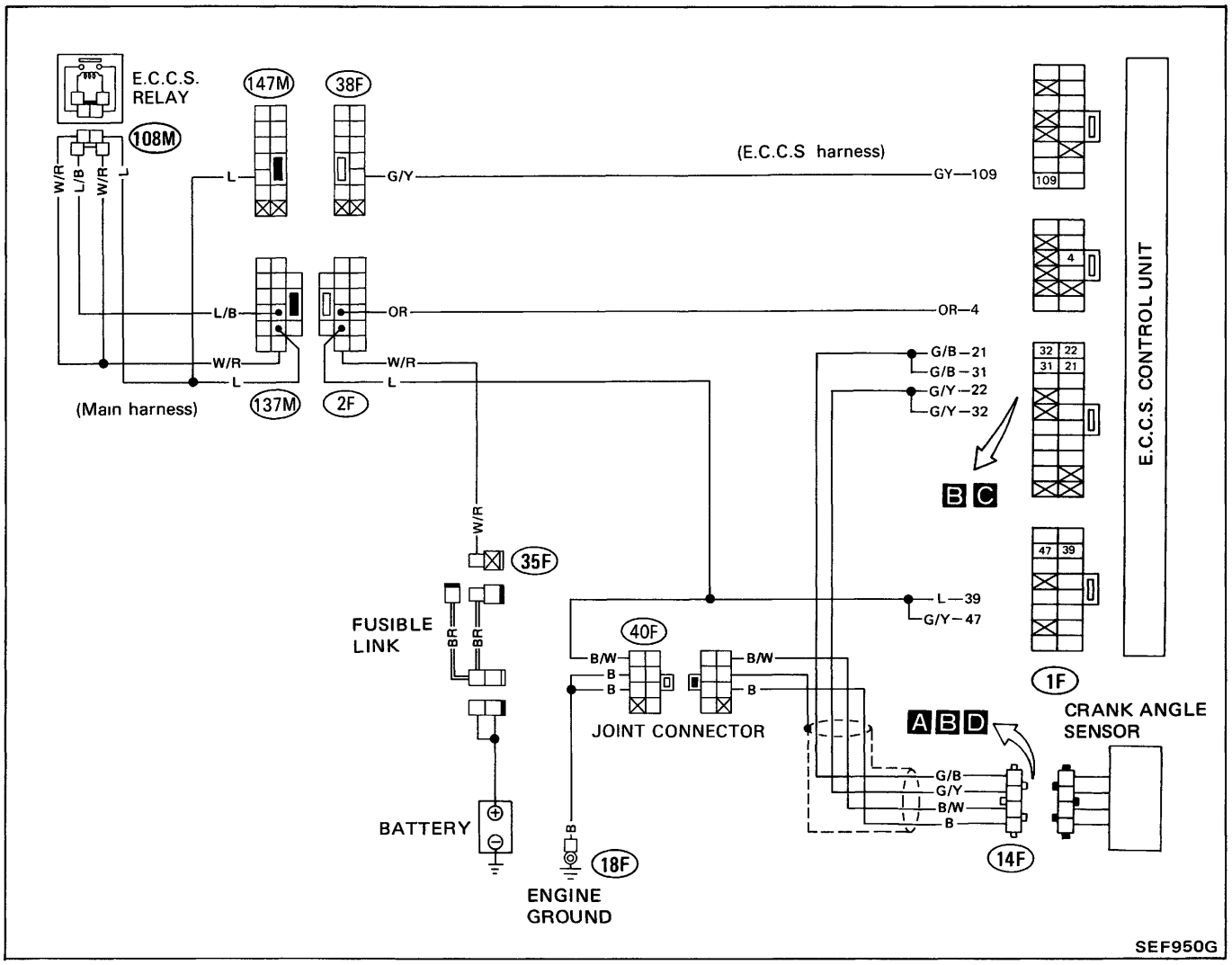
B

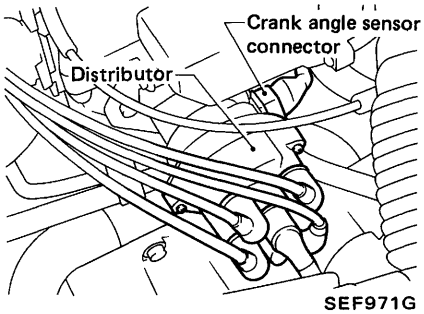
CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF".
2) Disconnect 16-pin and 12-pin terminal connectors from E.C.U.
3) Check resistance between terminals (6), (12), (107), (108), (116) and ground.
Resistance:
Approximately 0Ω
If N.G., repair harness or connectors.

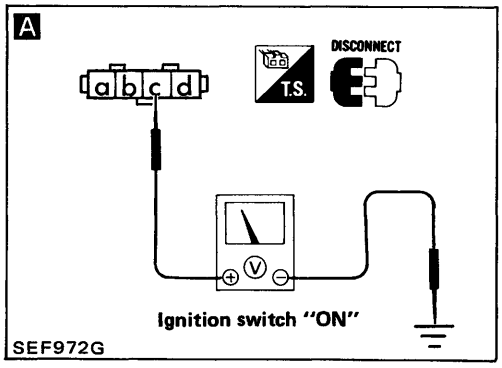
O.K. ↓

INSPECTION END

CRANK ANGLE SENSOR (Code No. 11)







INSPECTION START

Perform self-diagnosis (Mode III).
Is Code No. 11 indicated?

No → INSPECTION END

Yes

A

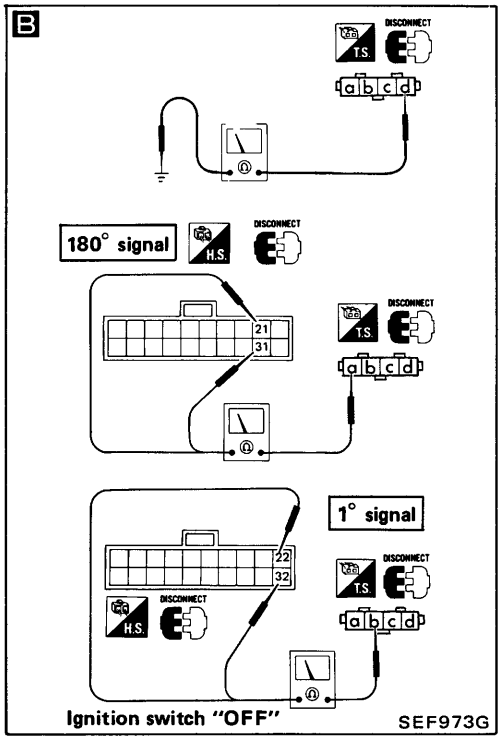
CHECK POWER SOURCE
1) Disconnect crank angle sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal Ⓒ and ground.
Voltage: Battery voltage

N.G. → Repair harness or connectors.

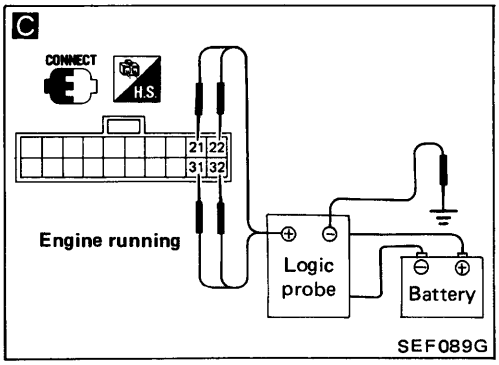
O.K.

CRANK ANGLE SENSOR (Code No. 11)

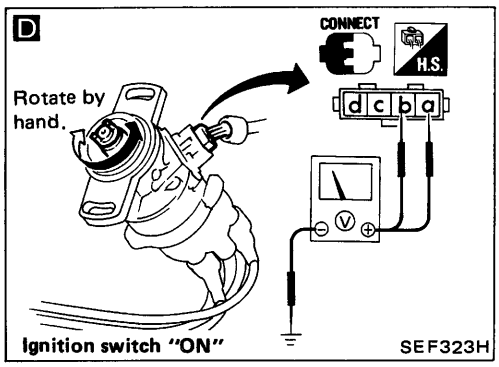
B



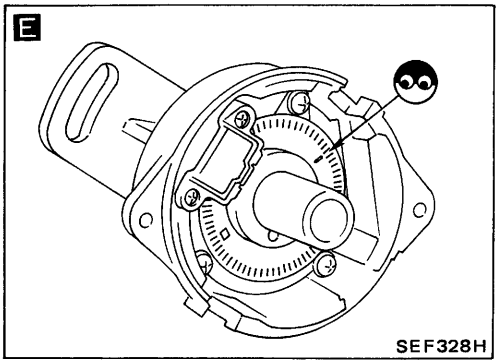
C



D



E



C

CHECK INPUT SIGNAL
1) Reconnect crank angle sensor harness connector.
2) Start engine.
3) Check that pulse signals exist in E.C.U. terminals ㉒, ㉜ and ㉑, ㉛ with logic probe.
Pulse signals should exist.
㉒, ㉜: 1° signal
㉑, ㉛: 180° signal

N.G. →

B CHECK CONTINUITY BETWEEN E.C.U. AND CRANK ANGLE SENSOR
1) Turn ignition switch "OFF".
2) Disconnect 20-pin terminal connector from E.C.U.
3) Disconnect crank angle sensor harness connector
4) Check continuity between terminal ⓓ and ground, terminal ⓑ and ㉒, ㉜ and terminals ⓐ and ㉑, ㉛.
Resistance:
Approximately 0Ω
If NG, check crank angle sensor.

D CHECK COMPONENT
1) Remove distributor.
2) Disconnect ignition wire.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground and terminal ⓑ and ground by rotating crank angle sensor shaft.
Voltage:
Approximately 5V

O.K. ↓

Stop engine and check interference between crank angle sensor harness and high-tension cable.

N.G. → Separate them.

O.K. ↓

E

Visually check rotor plate for damage or dust.

N.G. → Clean or replace crank angle sensor.

O.K. ↓

Reinstall and part removed. ↓

Erase the self-diagnosis memory. ↓

Perform driving test and then perform self-diagnosis (Mode III) again.

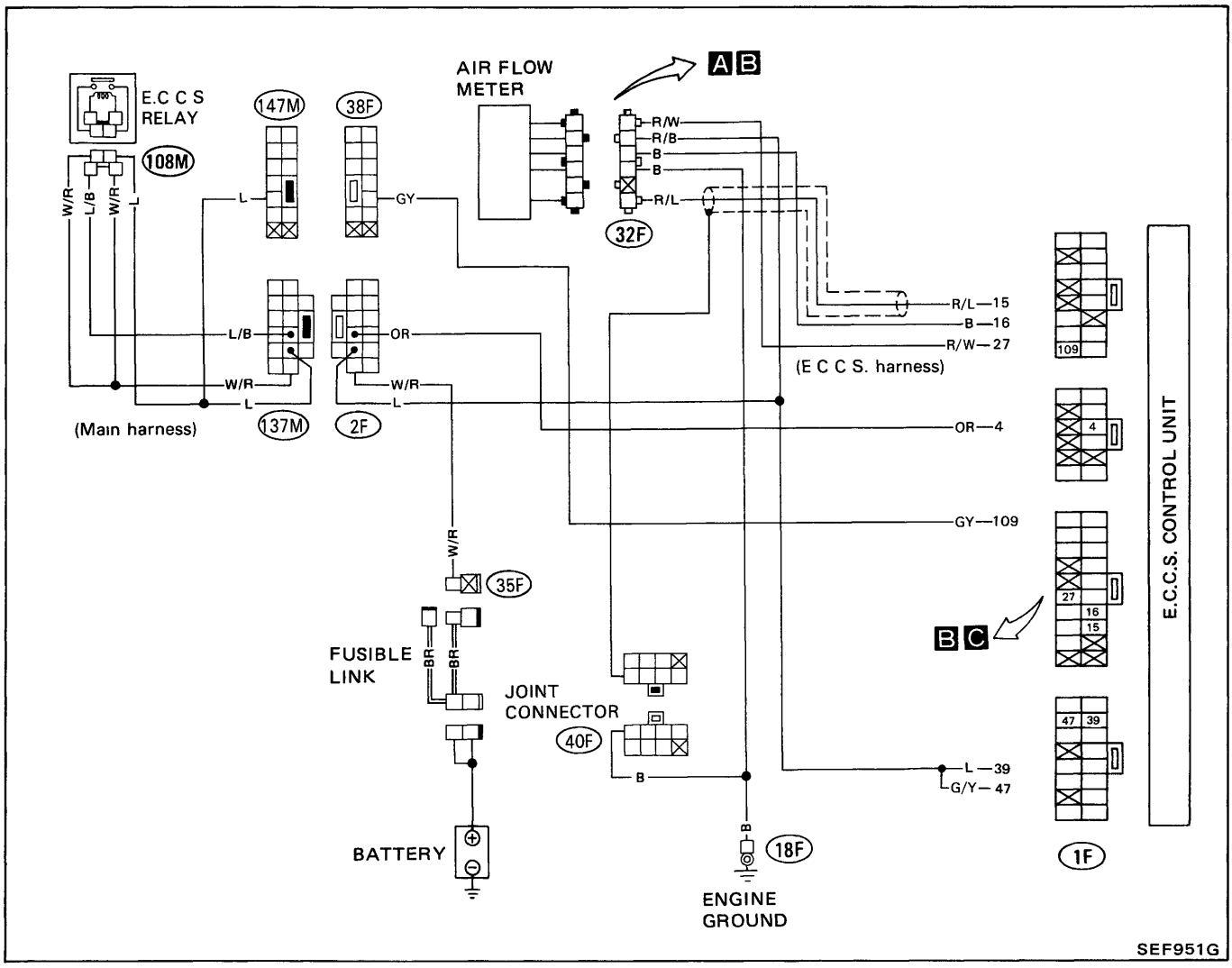
N.G. →

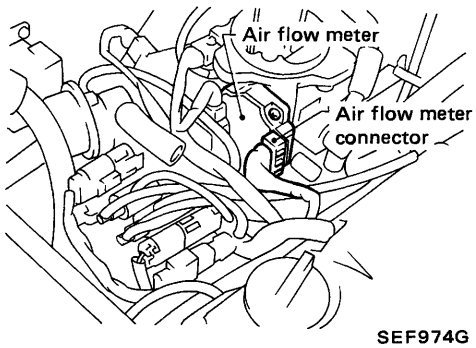
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

O.K. ↓

INSPECTION END

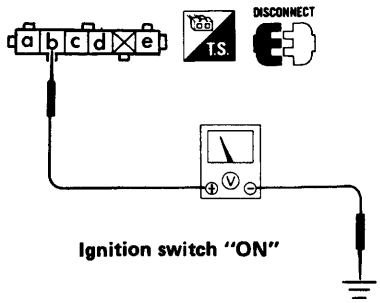
AIR FLOW METER (Code No. 12) CHECK (CHECK ENGINE LIGHT ITEM)



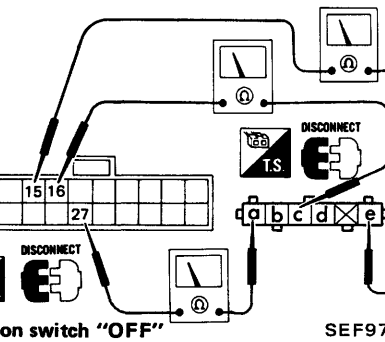


AIR FLOW METER (Code No. 12) (CHECK ENGINE LIGHT ITEM)

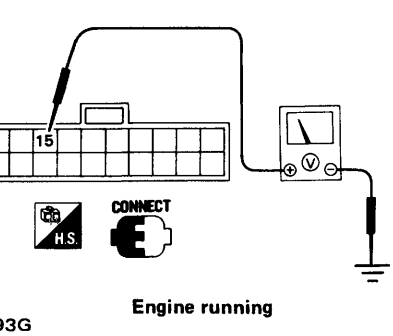
A



B



C



INSPECTION START

Perform self-diagnosis (Mode III).
Is Code No. 12 indicated?
No → INSPECTION END
Yes

A
CHECK POWER SOURCE
1) Disconnect air flow meter harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Battery voltage should exist.
N.G. → Repair harness or connectors.
O.K.

C
CHECK INPUT SIGNAL
1) Reconnect air flow meter harness connector.
2) Start engine.
3) Make sure that voltage exists between E.C.U. terminal ⑮ and ground.
Voltage:
Approximately 1.0V (at idle)
N.G. → B

B
CHECK CONTINUITY BETWEEN E.C.U. AND AIR FLOW METER
1) Turn ignition switch "OFF".
2) Disconnect 20-pin terminal connector.
3) Disconnect air flow meter harness connector.
4) Check continuity between terminals ⓐ and ㉗, ⓒ and ⑯ and ⓔ and ⑮.
Resistance:
Approximately 0Ω

O.K.

Reinstall any part removed.

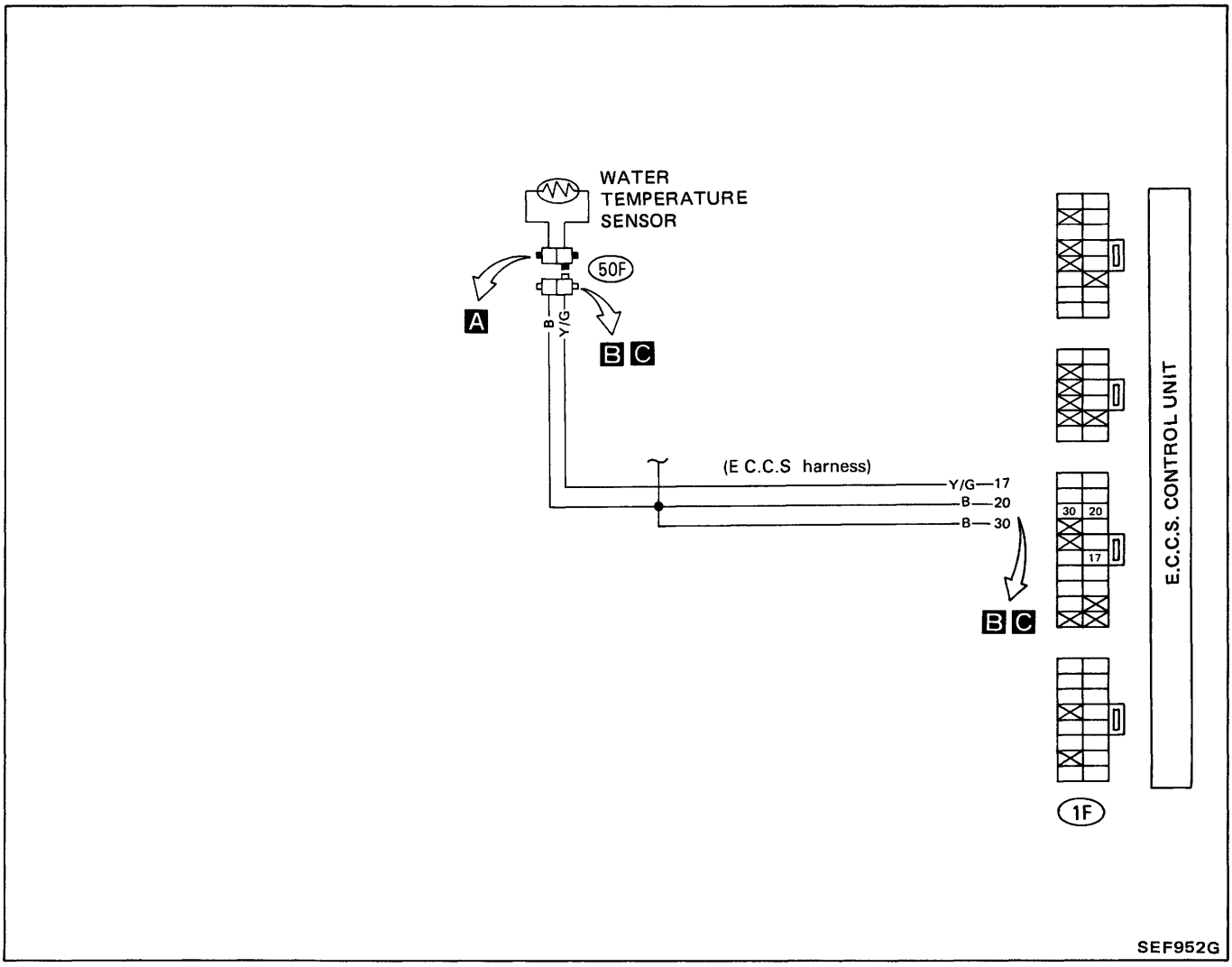
Erase the self-diagnosis memory.

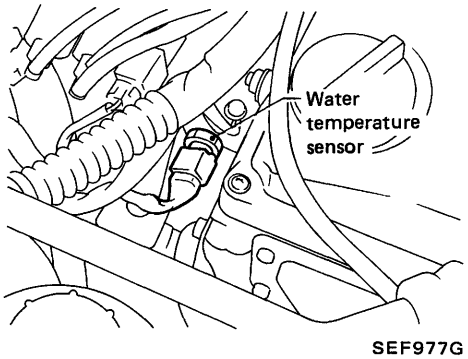
Perform driving test and then perform self-diagnosis (Mode III) again.
N.G. →
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

O.K.

INSPECTION END

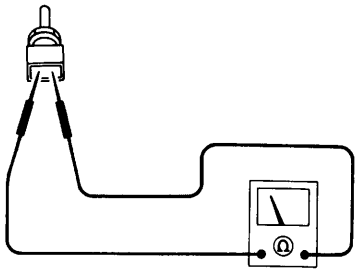
WATER TEMPERATURE SENSOR (Code No. 13) CHECK (CHECK ENGINE LIGHT ITEM)





WATER TEMPERATURE SENSOR (Code No. 13) (CHECK ENGINE LIGHT ITEM)

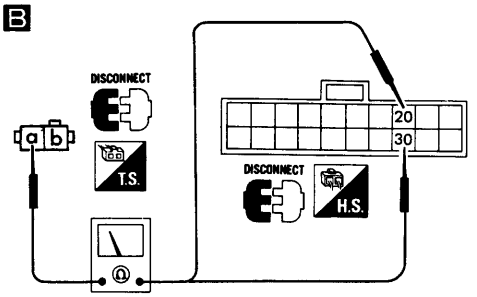
A



Temperature °C (°F)	Resistance (kΩ)
20 (68)	Approx. 2.5
80 (176)	Approx. 0.33

SEF062F

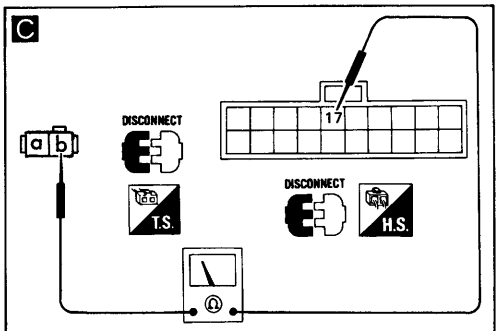
B



Ignition switch "OFF"

SEF978G

C



Ignition switch "OFF"

SEF979G

INSPECTION START

Perform self-diagnosis (Mode III).
Is Code No. 13 indicated?
- No → INSPECTION END
- Yes ↓

A

CHECK COMPONENTS
1) Disconnect water temperature sensor harness connector.
2) Check resistance of water temperature sensor.
Resistance is shown in illustration A.
- N.G. → Replace water temperature sensor.
- O.K. ↓

B

CHECK GROUND CIRCUIT
1) Disconnect 20-pin terminal connector from E.C.U.
2) Check continuity between terminals ⓐ and ⑳, ㉚.
Continuity should exist.
- N.G. → 1) Repair harness or connectors. 2) Check middle harness connector for proper connection.
- O.K. ↓

C

CHECK INPUT SIGNAL CIRCUIT
Check continuity between terminals ⓑ and ⑰.
Continuity should exist.
- N.G. → 1) Repair harness or connectors. 2) Check middle harness connector for proper connection.
- O.K. ↓

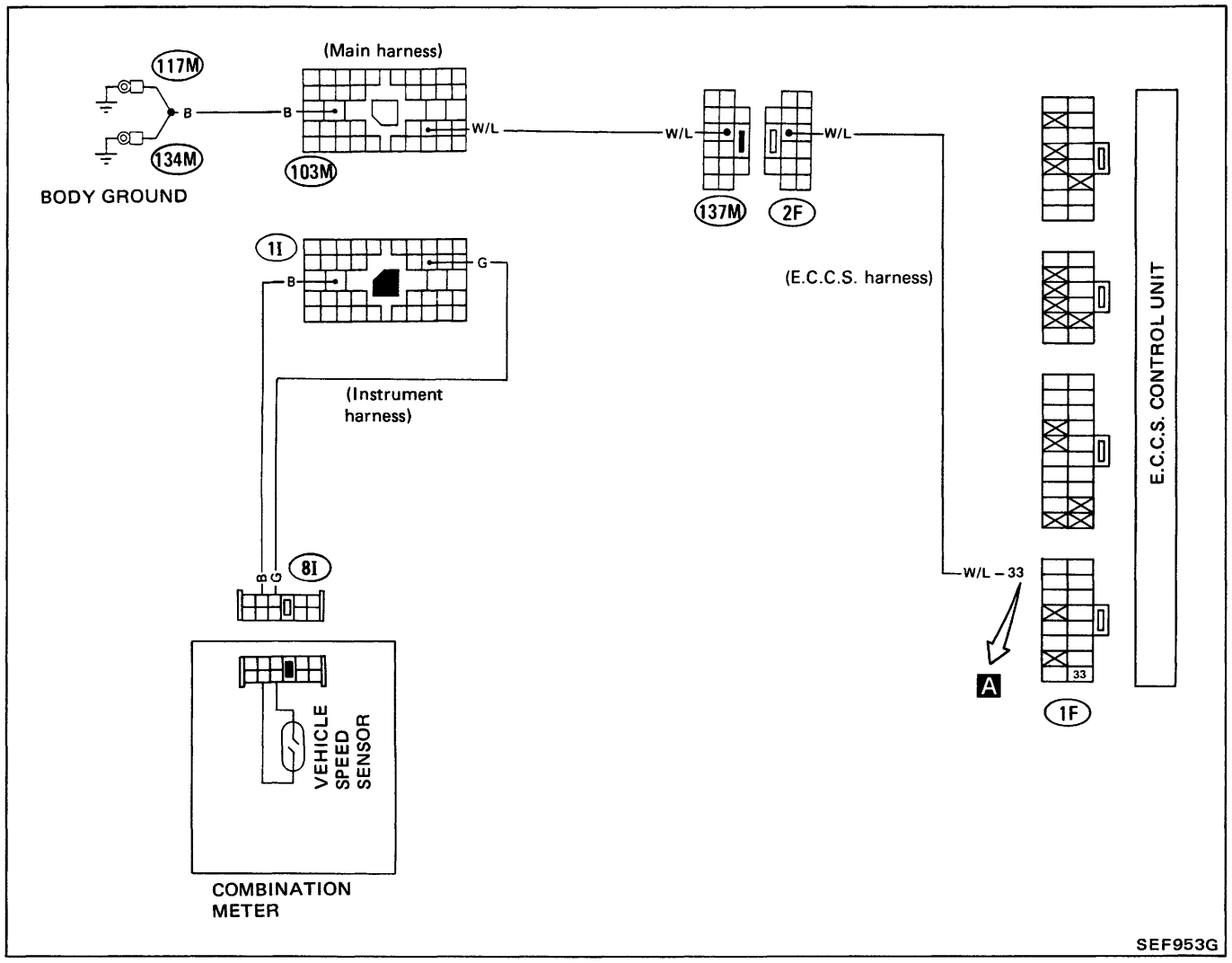
Reinstall any part removed. ↓

Erase the self-diagnosis memory. ↓

Perform driving test and then perform self-diagnosis (Mode III) again.
- N.G. → 1) Perform E.C.U. input/output signal inspection test. 2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.
- O.K. ↓

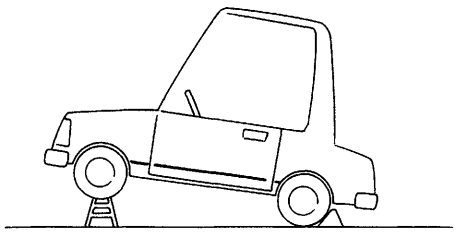
INSPECTION END

VEHICLE SPEED SENSOR (Code No. 14) CHECK (CHECK ENGINE LIGHT ITEM)



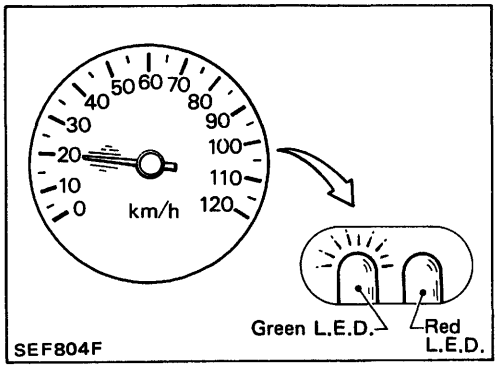
The following is necessary to perform this inspection.

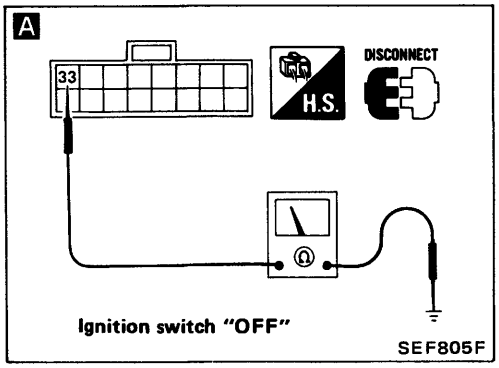
1. Jack up front wheels.



SEF803F

VEHICLE SPEED SENSOR (Code No. 14) (CHECK ENGINE LIGHT ITEM)





INSPECTION START

CHECK INPUT SIGNAL
1) Perform switch ON/OFF diagnosis (in Mode IV).
2) Make sure green L.E.D. on E.C.U. comes "ON" when vehicle speed reaches 20 km/h (12 MPH).

O.K. → INSPECTION END

N.G. ↓

A CHECK CONTINUITY BETWEEN E.C.U. AND VEHICLE SPEED SENSOR
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. 16-pin harness connector.
3) Check resistance between E.C.U. terminal (33) and ground by rotating front wheel by hand.

Continuity should come and go.

N.G. → 1) Repair or replace harness.
2) Check middle harness connector for proper connection.

O.K. ↓

CHECK VEHICLE SPEED SENSOR
See EL section.

↓

Reinstall any part removed.

↓

Perform self-diagnosis Mode IV.

N.G. → 1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck E.C.U. pin terminal damage or the connection of E.C.U. harness connector.

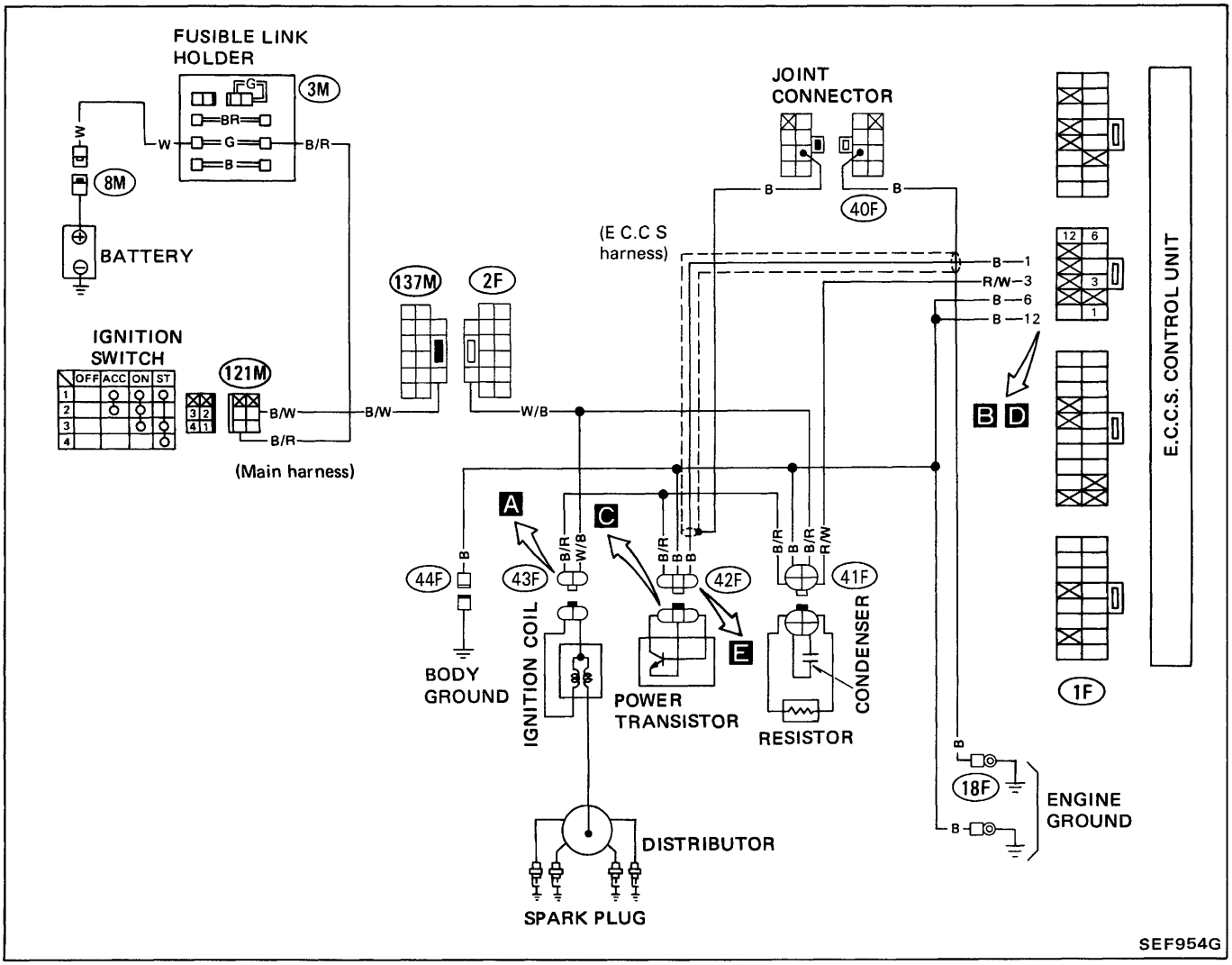
O.K. ↓

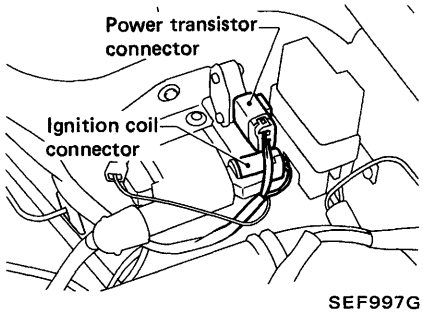
Erase the self-diagnosis memory.

↓

INSPECTION END

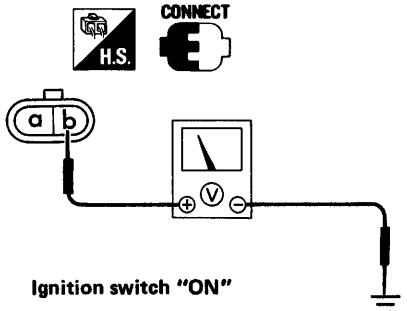
IGNITION SIGNAL (Code No. 21)



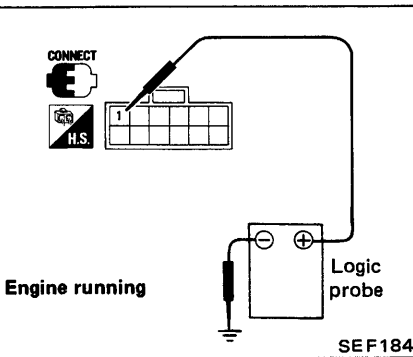


IGNITION SIGNAL (Code No. 21)

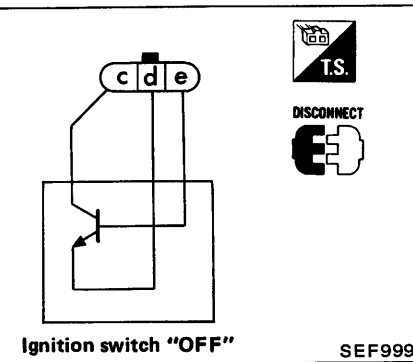
A



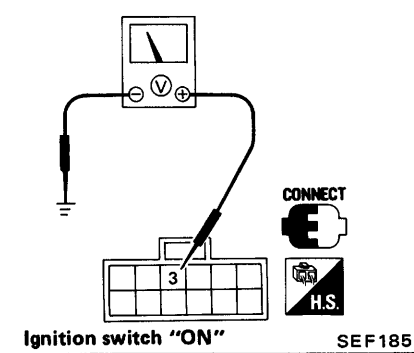
B



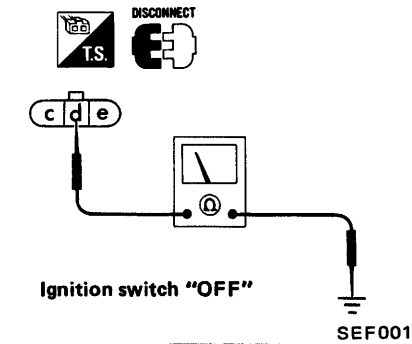
C



D



E



INSPECTION START

A

CHECK POWER SOURCE
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → Check the following items.
1) Harness continuity between battery and power transistor
2) "G" fusible link
3) Ignition switch

O.K.

B

CHECK OUTPUT SIGNAL
1) Turn ignition switch "OFF".
2) Start engine.
3) Make sure that pulse signals exist between E.C.U. terminal ① and ground with logic probe.
Pulse signal should exist.

N.G. →
1) Stop engine and check harness continuity between power transistor and E.C.U.

C 2) Check power transistor with circuit tester.
- Disconnect harness connector for power transistor.
  - ⓒ : To ignition coil (+) side
  - ⓔ : To E.C.U.
  - ⓓ : To engine ground

Terminal No.	Tester polarity	Continuity
ⓒ	+	No continuity
ⓓ	−	
ⓒ	−	Continuity should exist.
ⓓ	+	
ⓒ	+	No continuity
ⓔ	−	
ⓒ	−	Continuity should exist.
ⓔ	+	

If N.G., replace power transistor.

O.K.

D

CHECK INPUT SIGNAL
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between E.C.U. terminal ③ and ground.
Voltage: Battery voltage

N.G. → Check harness continuity between E.C.U. and battery.

O.K.

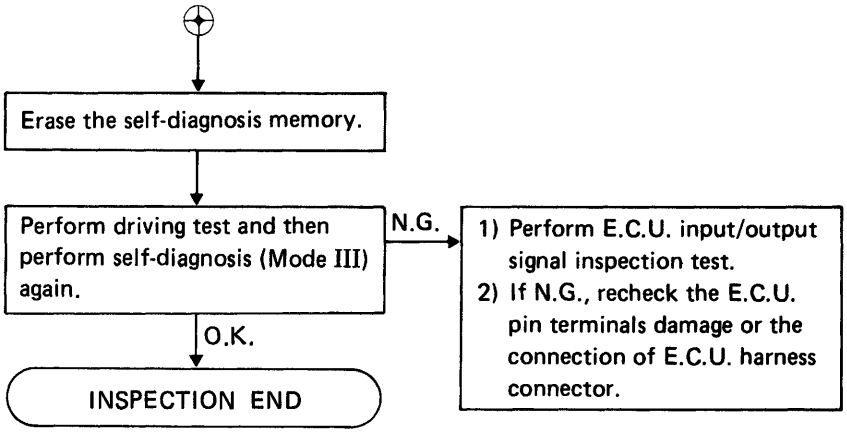
E

CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF".
2) Disconnect power transistor harness connector.
3) Check resistance between terminal ⓓ and ground.
Resistance:
Approximately 0Ω

N.G. → Repair harness.

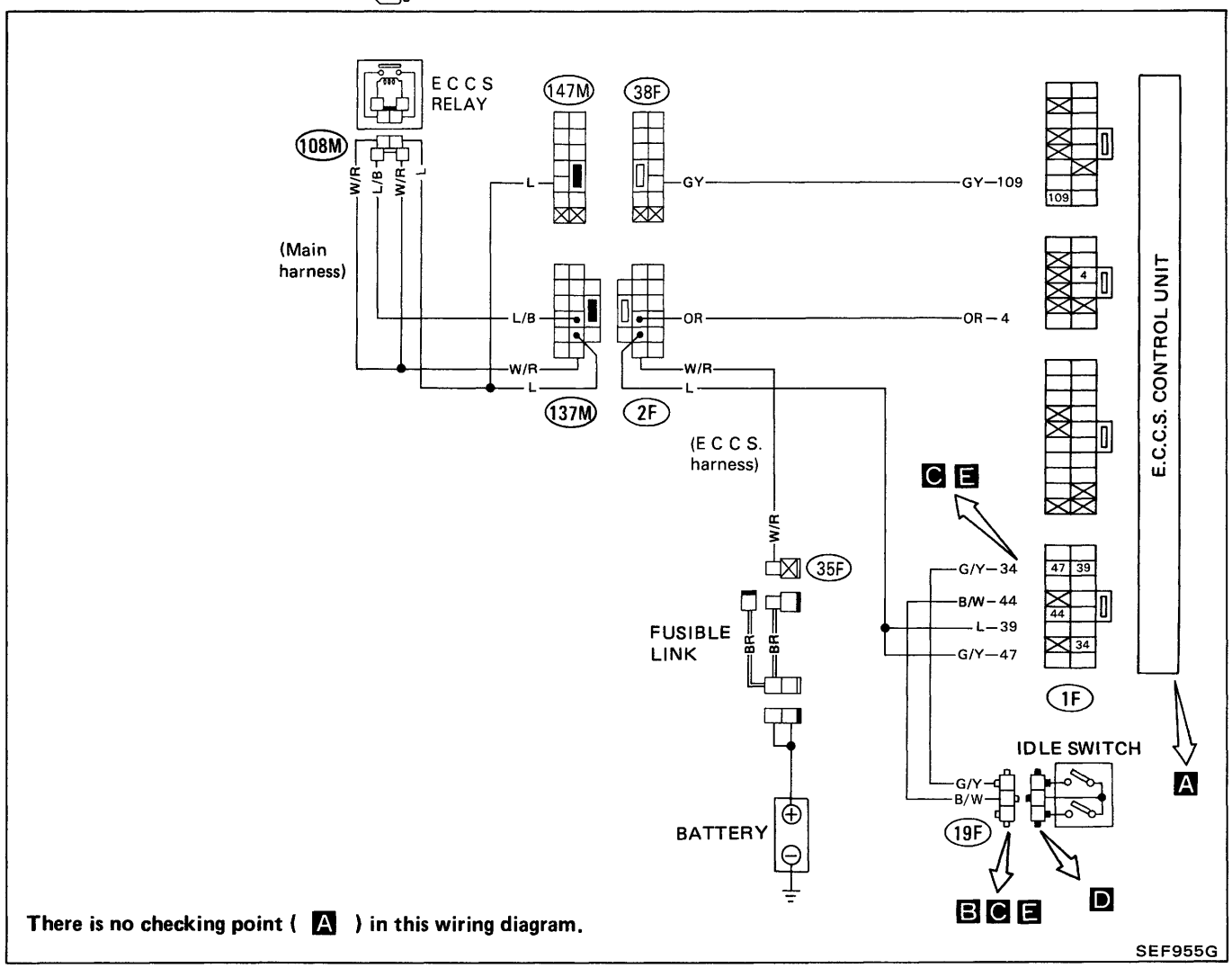
O.K.

IGNITION SIGNAL (Code No. 21)

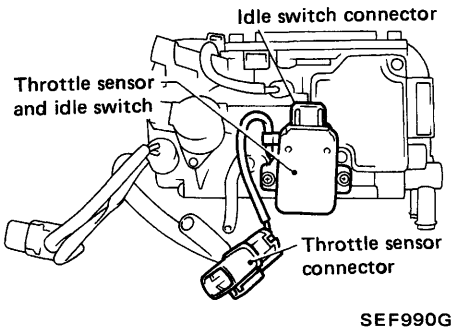


NOTE

IDLE SWITCH (Code No. 23) (CHECK ENGINE LIGHT ITEM)

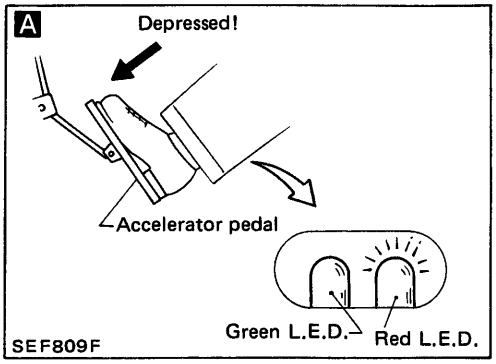


The following is necessary to perform this inspection.



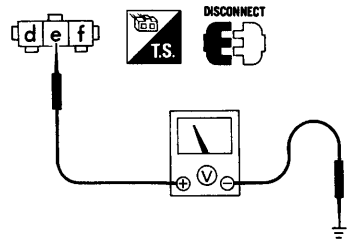
IDLE SWITCH (Code No. 23) (CHECK ENGINE LIGHT ITEM)

A



SEF809F

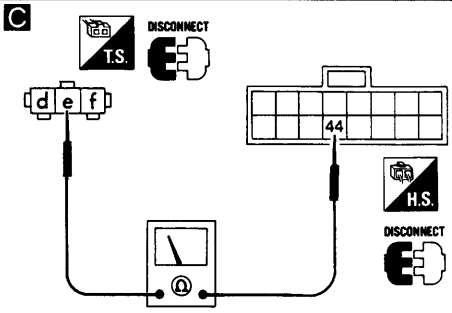
B



Ignition switch "ON"

SEF810F

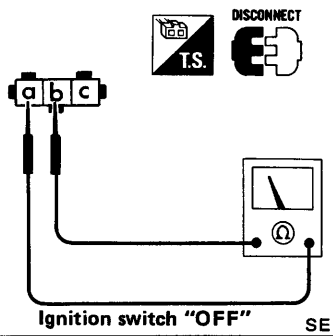
C



Ignition switch "OFF"

SEF811F

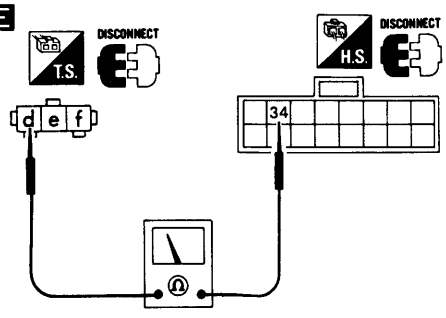
D



Ignition switch "OFF"

SEF981G

E



Ignition switch "OFF"

SEF836F

INSPECTION START

A CHECK INPUT SIGNAL
1) Start engine and warm it up sufficiently.
2) Perform switch ON/OFF diagnosis (in Mode IV).
3) Make sure red L.E.D. comes "ON" or goes "OFF" when accelerator pedal is depressed.

O.K. → INSPECTION END

N.G.

B CHECK POWER SOURCE
1) Disconnect idle switch harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓔ and ground.
Voltage:
Approximately 9 - 11V

N.G. → **C** CHECK CONTINUITY BETWEEN E.C.U. AND IDLE SWITCH
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. 16-pin connector.
3) Disconnect idle switch harness connector.
4) Check resistance between E.C.U. terminal ㊹ and terminal ⓔ.
Resistance:
Approximately 0Ω
If N.G., repair or replace harness.

O.K.

D CHECK COMPONENTS
1) Turn ignition switch "OFF".
2) Disconnect idle switch harness connector.
3) Check continuity between terminals ⓐ and ⓑ.

Accelerator pedal	Continuity
Completely released	ⓐ - ⓑ
Depressed	No

N.G. → Check if idle switch is installed in proper position.
If N.G., adjust it by turning idle switch.
If O.K., replace idle switch.

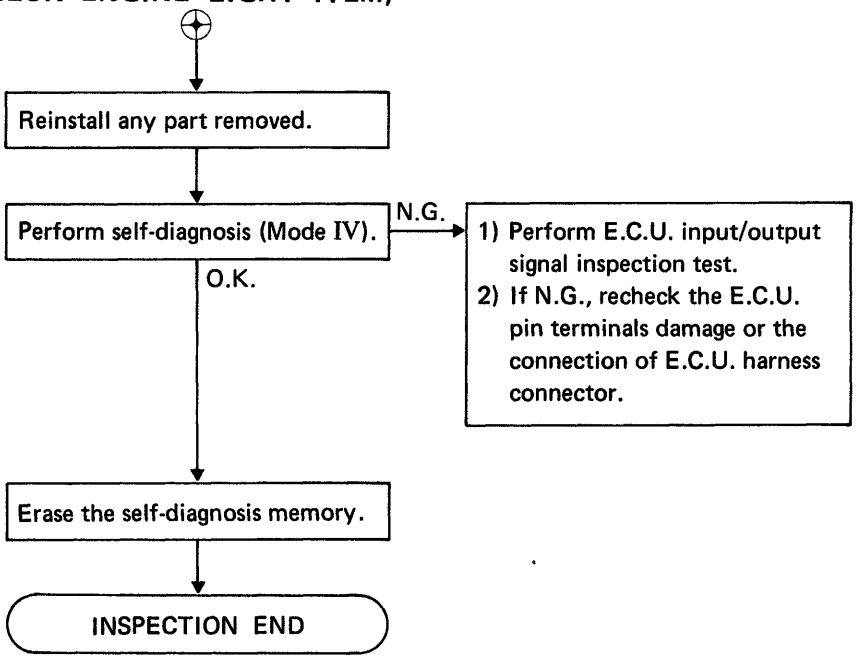
O.K.

E CHECK GROUND CIRCUIT
1) Check resistance between E.C.U. terminal ㉞ and terminal ⓓ.
Resistance:
Approximately 0Ω

N.G. → Repair or replace harness.

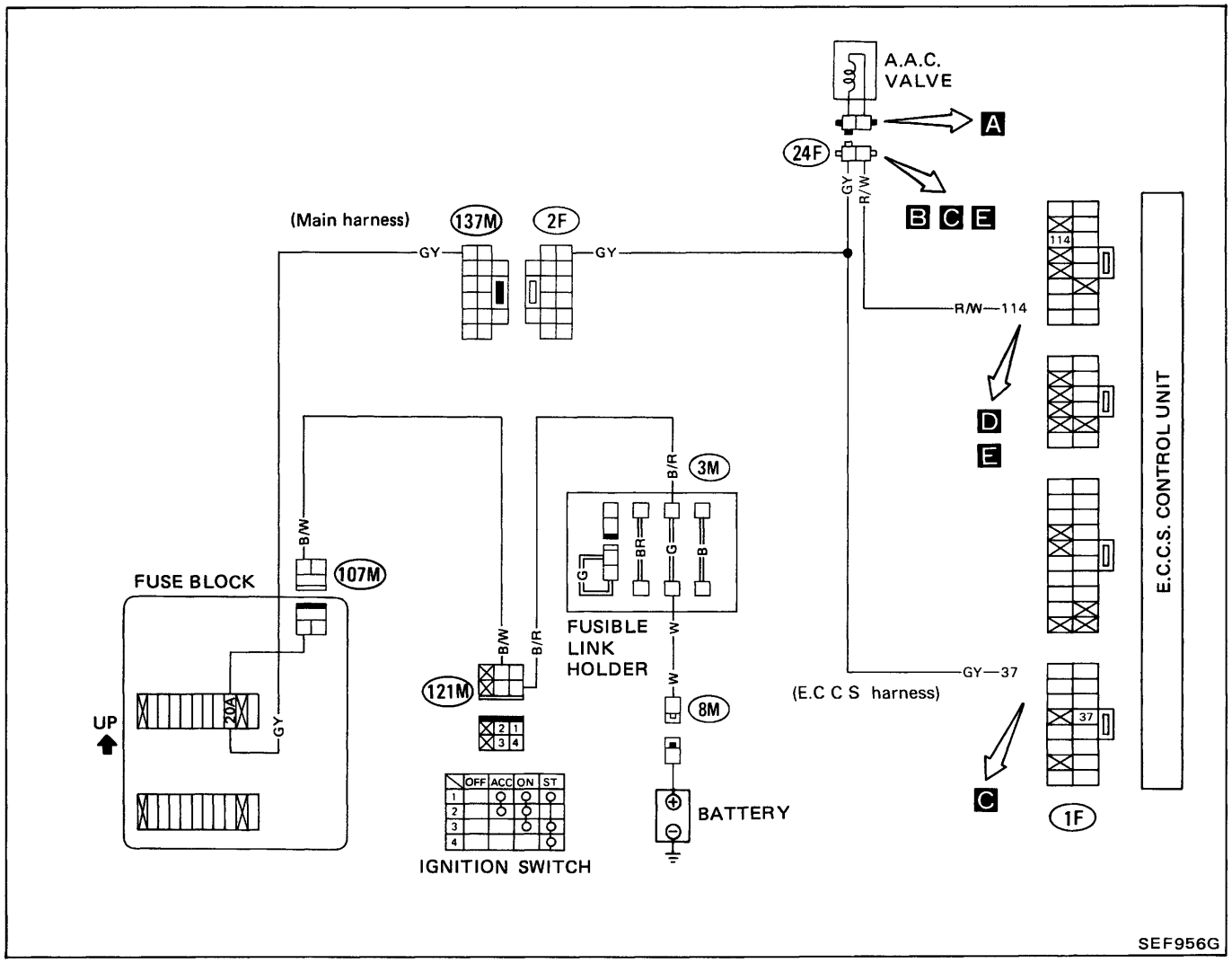
O.K.

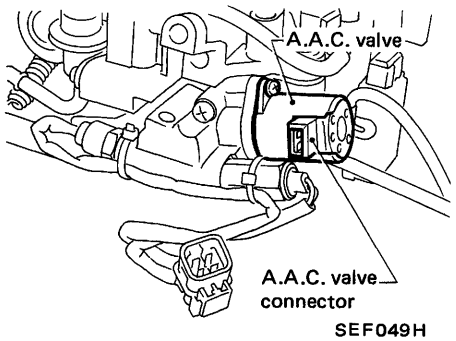
IDLE SWITCH (Code No. 23) (CHECK ENGINE LIGHT ITEM)



NOTE

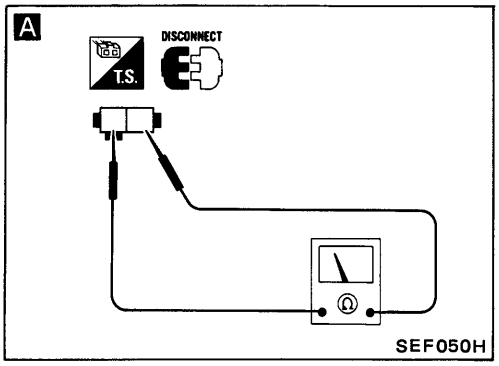
AUXILIARY AIR CONTROL (A.A.C.) VALVE (Code No. 25)



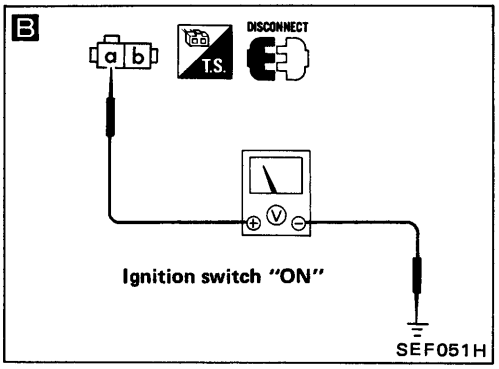


AUXILIARY AIR CONTROL (A.A.C.) VALVE (Code No. 25)

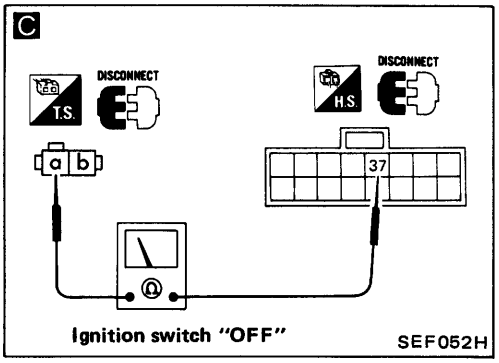
A



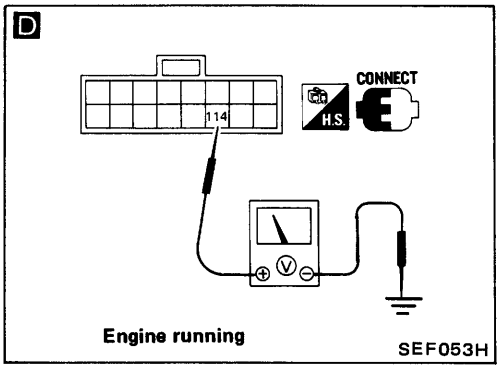
B



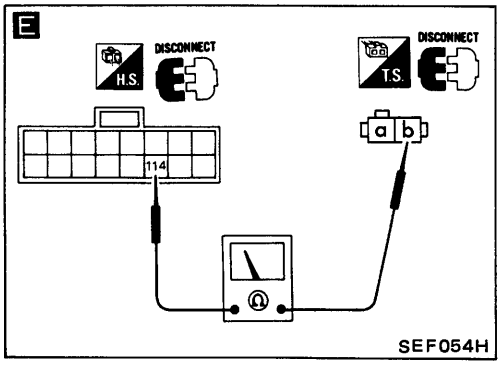
C



D



E



INSPECTION START

A

CHECK COMPONENTS
Check resistance of A.A.C. valve.
Resistance:
Approximately 10Ω
If N.G., replace A.A.C. valve.

B

CHECK POWER SOURCE
1) Disconnect A.A.C. valve harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage
If N.G., repair harness or connectors.

N.G. → **C**

CHECK CONTINUITY BETWEEN E.C.U. AND A.A.C. VALVE
1) Turn ignition switch "OFF".
2) Disconnect 16-pin terminal connector.
3) Check resistance between terminals ⓐ and ㊲.
Resistance:
Approximately 0Ω
If N.G., check the following items:
1) Fusible link "G"
2) Fuse

O.K.

D

CHECK INPUT SIGNAL
1) Reconnect A.A.C. valve harness connector.
2) Start engine and warm it up sufficiently.
3) Check voltage between E.C.U. terminal ㊱ and ground.
Voltage:
Approximately 4 - 8V
(at idle speed)

N.G. → **E**

CHECK CONTINUITY BETWEEN E.C.U. AND A.A.C. VALVE
1) Stop engine.
2) Disconnect 16-pin terminal connector.
3) Disconnect A.A.C. valve harness connector.
4) Check resistance between terminals ㊱ and ⓑ.
Resistence:
Approximately 0Ω

O.K.

Reinstall and part removed.

Erase the self-diagnosis memory.

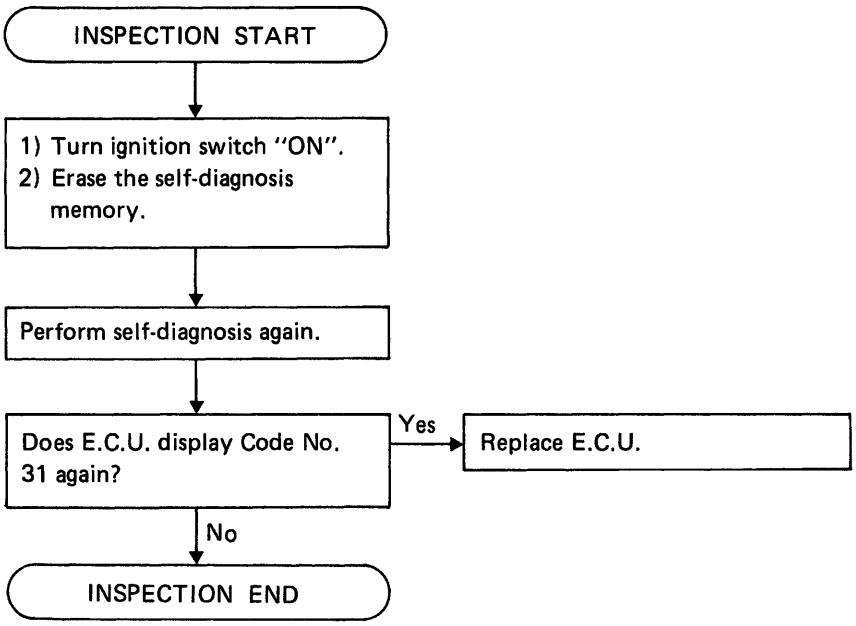
Perform driving test and then perform self-diagnosis (Mode III) again.

N.G. →
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

O.K.

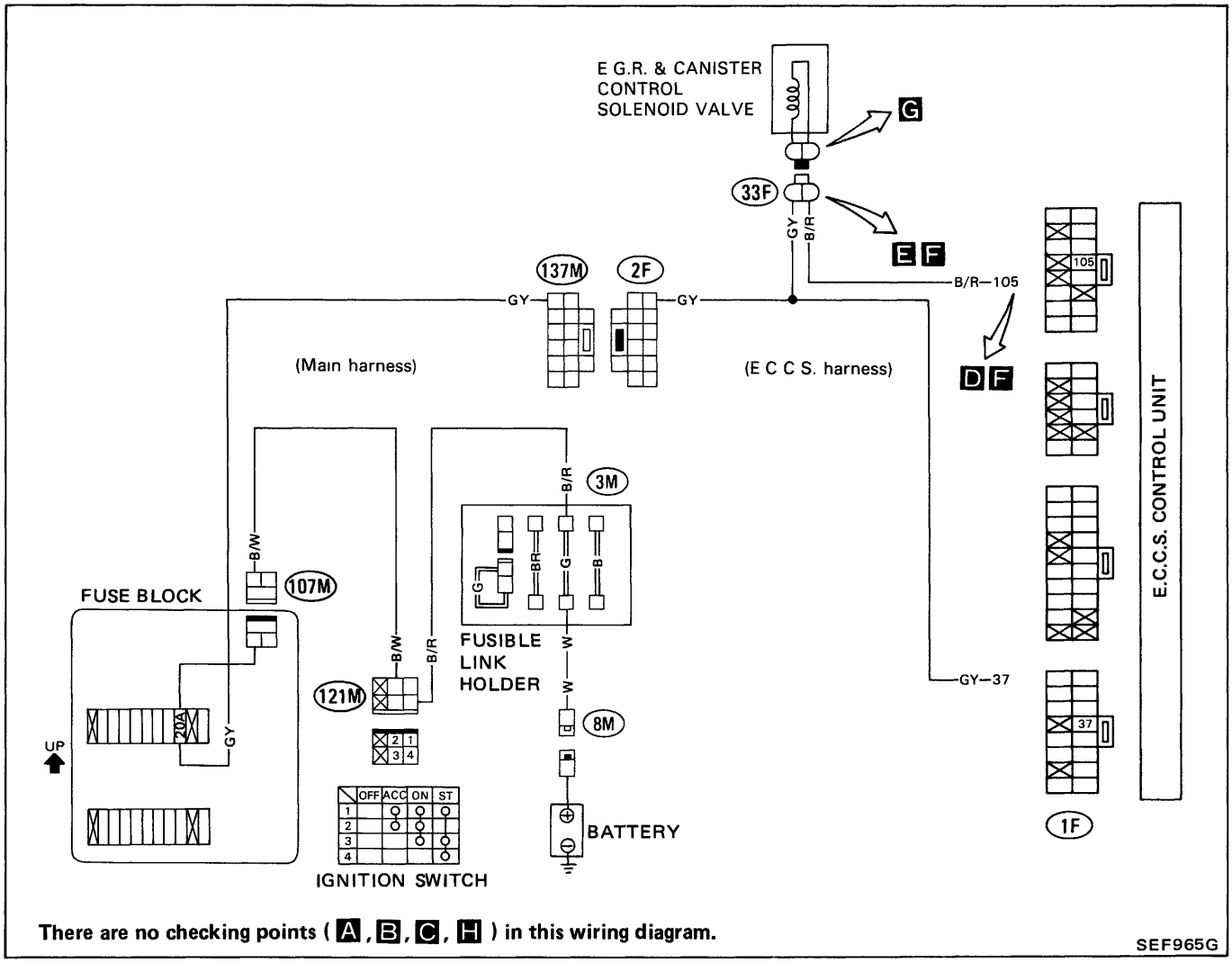
INSPECTION END

ENGINE CONTROL UNIT (Code No. 31) CHECK (CHECK ENGINE LIGHT ITEM)



NOTE

E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM): For California
(Not self-diagnosis item): For Non-California

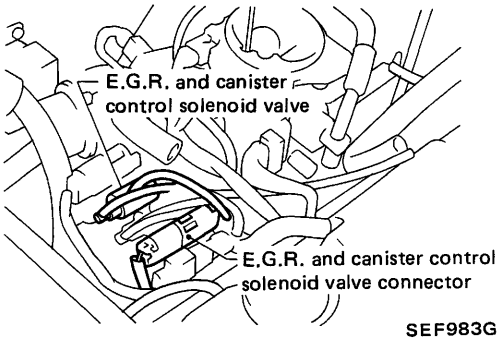


CAUTION:

When directly applying battery voltage to E.G.R. & canister control solenoid valve, pay attention to the polarity. The solenoid valve will be broken if the polarity is reversed.

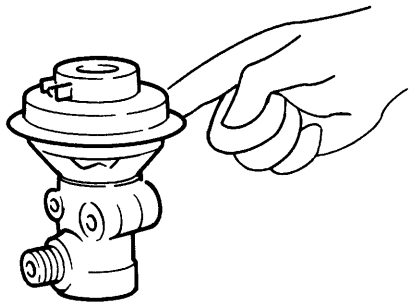
The following is necessary to perform this inspection.

1. Warm up engine sufficiently.



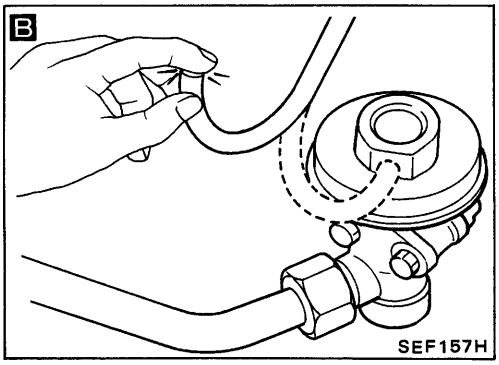
E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM): For California
(Not self-diagnosis item): For Non-California

A



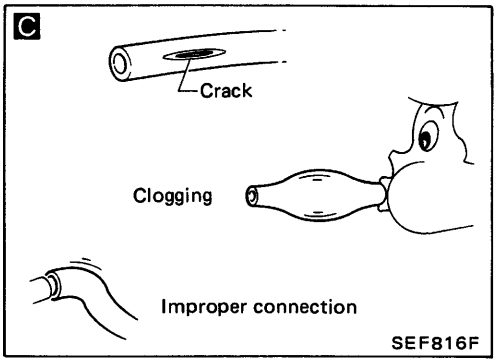
SEF242G

B



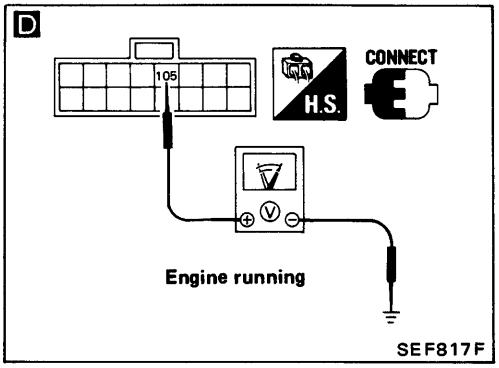
SEF157H

C



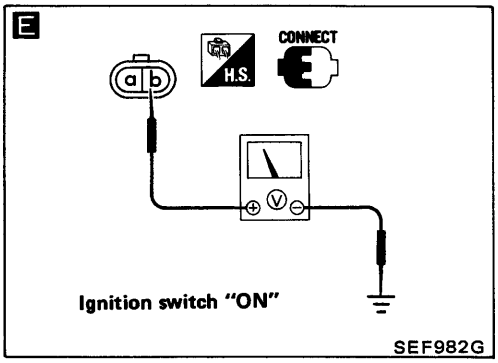
SEF816F

D



SEF817F

E



SEF982G

INSPECTION START

A CHECK E.G.R. CONTROL VALVE OPERATION
1) Start engine.
2) Make sure engine is warmed up sufficiently.
3) Make sure E.G.R. control valve spring responds to your touch (use your fingers) and also when engine is raced.

Responds → INSPECTION END

Does not respond ↓

B CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE
1) Disconnect vacuum hose connected to E.G.R. control valve and B.P.T. valve.
2) Make sure vacuum exists when racing engine.

O.K. → Perform CHECK **H**. (See page EF & EC-104.)

N.G. ↓

C CHECK VACUUM HOSE
Check vacuum hose for clogging, cracks and proper connections.

N.G. → If necessary, replace vacuum hose or reconnect vacuum hose firmly.

O.K. ↓

D CHECK E.C.U. OUTPUT SIGNAL
1) Check voltage between E.C.U. terminal (105) and ground under the following conditions:

Engine condition	Voltage
Idle	0.6 - 0.9V
Racing	Battery voltage

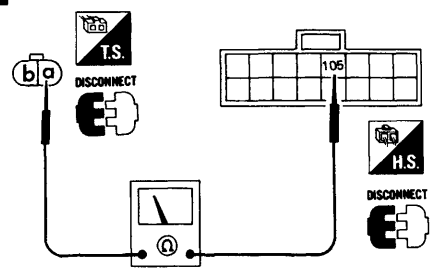
N.G. → **E** CHECK POWER SOURCE TO E.G.R. & CANISTER CONTROL SOLENOID VALVE
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between terminal (b) and ground.
Battery voltage should exist.

F CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. 16-pin terminal connector.
3) Disconnect E.G.R. & canister control solenoid valve harness connector.
4) Check resistance between E.C.U. terminal (105) and terminal (a).
Resistance:
Approximately 0Ω
If N.G., repair or replace harness.

O.K. ↓

E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM): For California
(Not self-diagnosis item): For Non-California

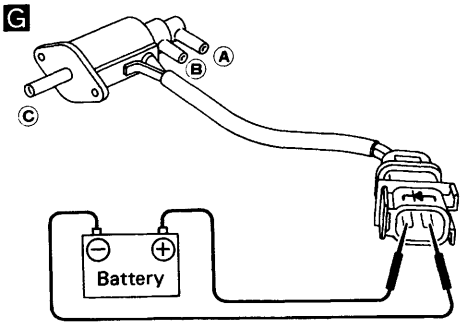
F



Ignition switch "OFF"

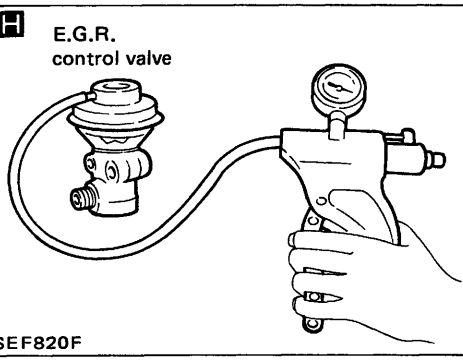
SEF984G

G



SEF762F

H



SEF820F

G CHECK E.G.R. & CANISTER CONTROL SOLENOID VALVE
1) Stop engine.
2) Remove E.G.R. control solenoid valve from vehicle.
3) Check the port continuity.

Solenoid valve	Continuity
When current flows	Ⓐ - Ⓑ
When current does not flow	Ⓑ - Ⓒ

N.G. → Replace E.G.R. & canister control solenoid valve.

O.K. ↓

H CHECK E.G.R. CONTROL VALVE
1) Remove E.G.R. control valve from vehicle.
2) Apply vacuum to E.G.R. vacuum port with a hand vacuum pump.
E.G.R. control valve spring should lift.

N.G. → Valve spring may be stuck. Clean if necessary. If this does not correct trouble, replace E.G.R. control valve.

O.K. For Non-California → INSPECTION END

For California ↓ O.K.

Check resistance of exhaust gas temperature sensor. (See page EF & EC-110.)

↓

Reinstall any part removed.

↓

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

↓

I Perform driving test under the following conditions:
1) Warm up engine sufficiently.
2) Use test driving modes indicated in figure I.

↓

J Make sure check engine light does not come "ON" during driving test.

Comes "ON" → Perform self-diagnosis and find malfunction code. According to displayed Code No., perform electronic control system inspection.

Does not come "ON" ↓

INSPECTION END

E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM): For California (Not self-diagnosis item): For Non-California

I ROAD TEST

Test condition

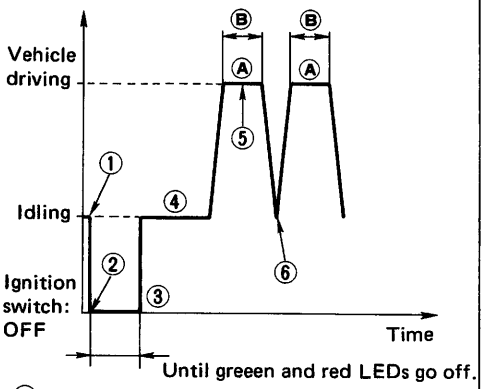
Drive vehicle under the following conditions with a suitable shift position.

① **Engine speed:**
2,700±500 rpm

② **Intake manifold vacuum:**
−36.7±10.0 kPa
(−275±75 mmHg, −10.83±2.95 inHg)

Driving mode

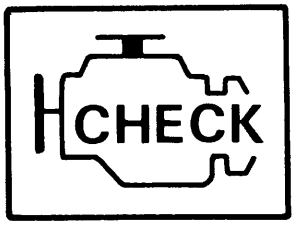
Ⓐ : Test condition
Ⓑ : 19 seconds or more



① Start engine and warm it up sufficiently.
② Turn off ignition switch and keep it off until green and red LEDs go off.
③ Start engine and make sure that air conditioner switch and rear defogger are turned "OFF" during driving test.
④ Keep engine running for at least 3 minutes.
⑤ Shift to suitable gear position and drive in "Test condition" for at least 19 seconds.
⑥ Decrease engine revolution to less than 2,000 rpm.
⑦ Repeat steps ⑤ through ⑥ at least 1 time.

SEF302H

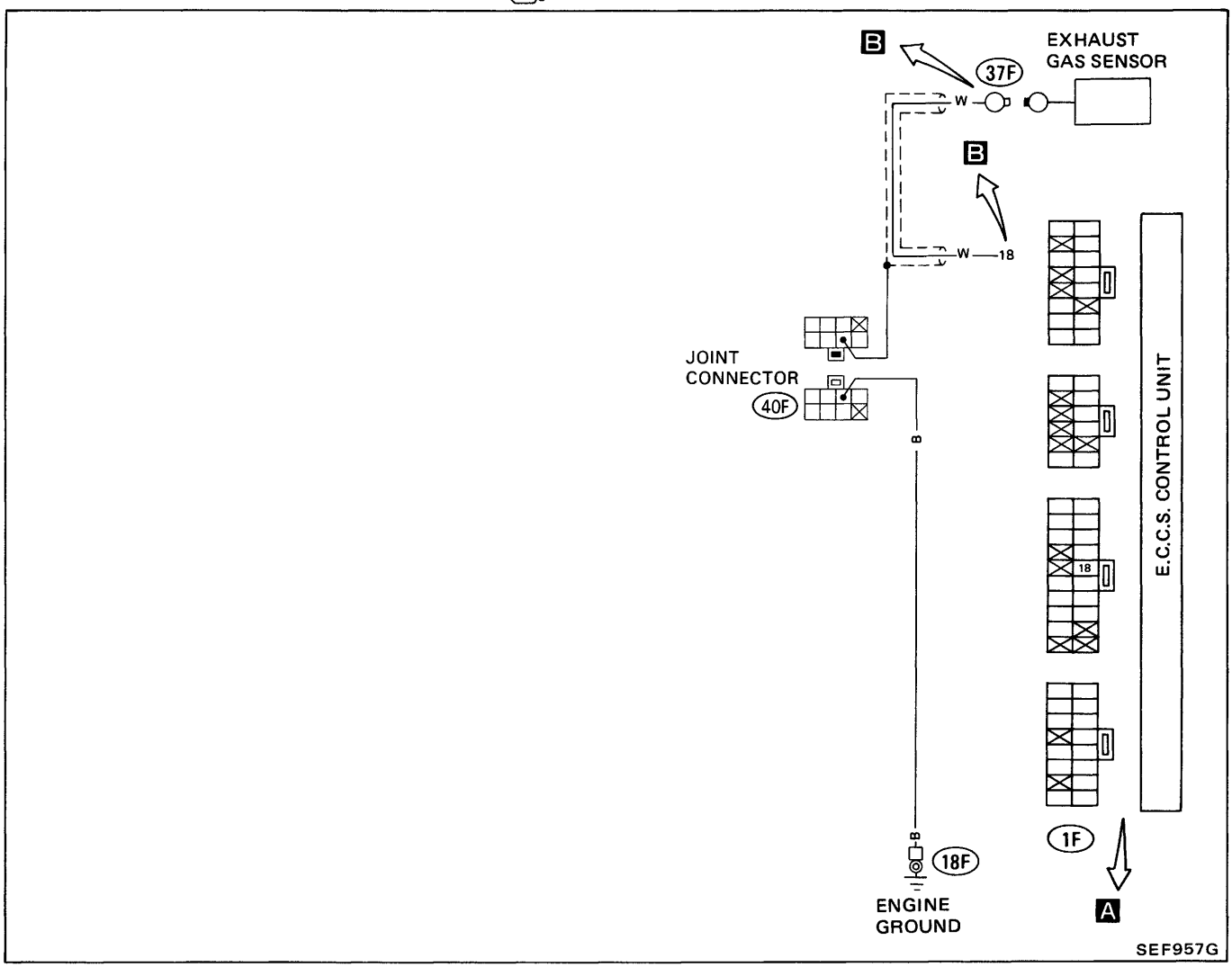
J



CHECK ENGINE LIGHT

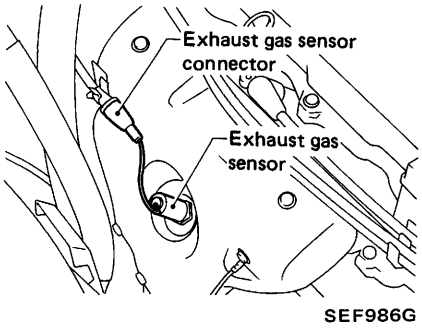
SEF924F

EXHAUST GAS SENSOR (Code No. 33) (CHECK ENGINE LIGHT ITEM)

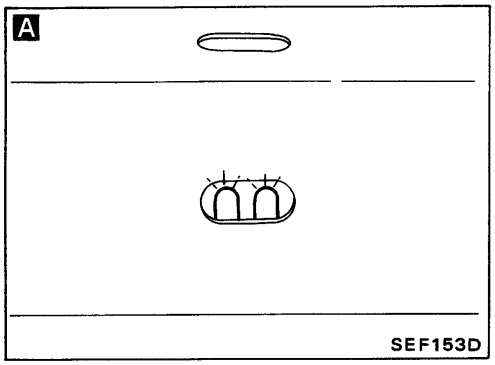


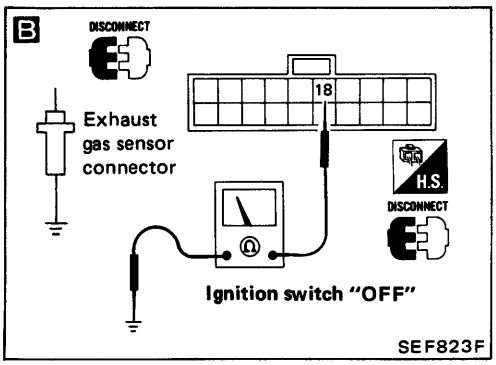
The following is necessary to perform this inspection.

1. Warm up engine sufficiently.



EXHAUST GAS SENSOR (Code No. 33) (CHECK ENGINE LIGHT ITEM)





INSPECTION START

A CHECK INPUT SIGNAL
1) Start engine and warm it up sufficiently.
2) Make sure green L.E.D. on E.C.U. blinks at 2,000 rpm.

O.K. → INSPECTION END

N.G.

B CHECK EXHAUST GAS SENSOR CIRCUIT
1) Turn off engine.
2) Disconnect E.C.U. 20-pin connector.
3) Disconnect exhaust gas sensor harness connector.
4) Connect a jumper wire from exhaust gas sensor harness connector to ground.
5) Check resistance between E.C.U. terminal ⑱ and ground.
Resistance:
Approximately 0Ω

N.G. → Repair or replace harness.

O.K.

Replace exhaust gas sensor.

Reinstall any part removed.

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

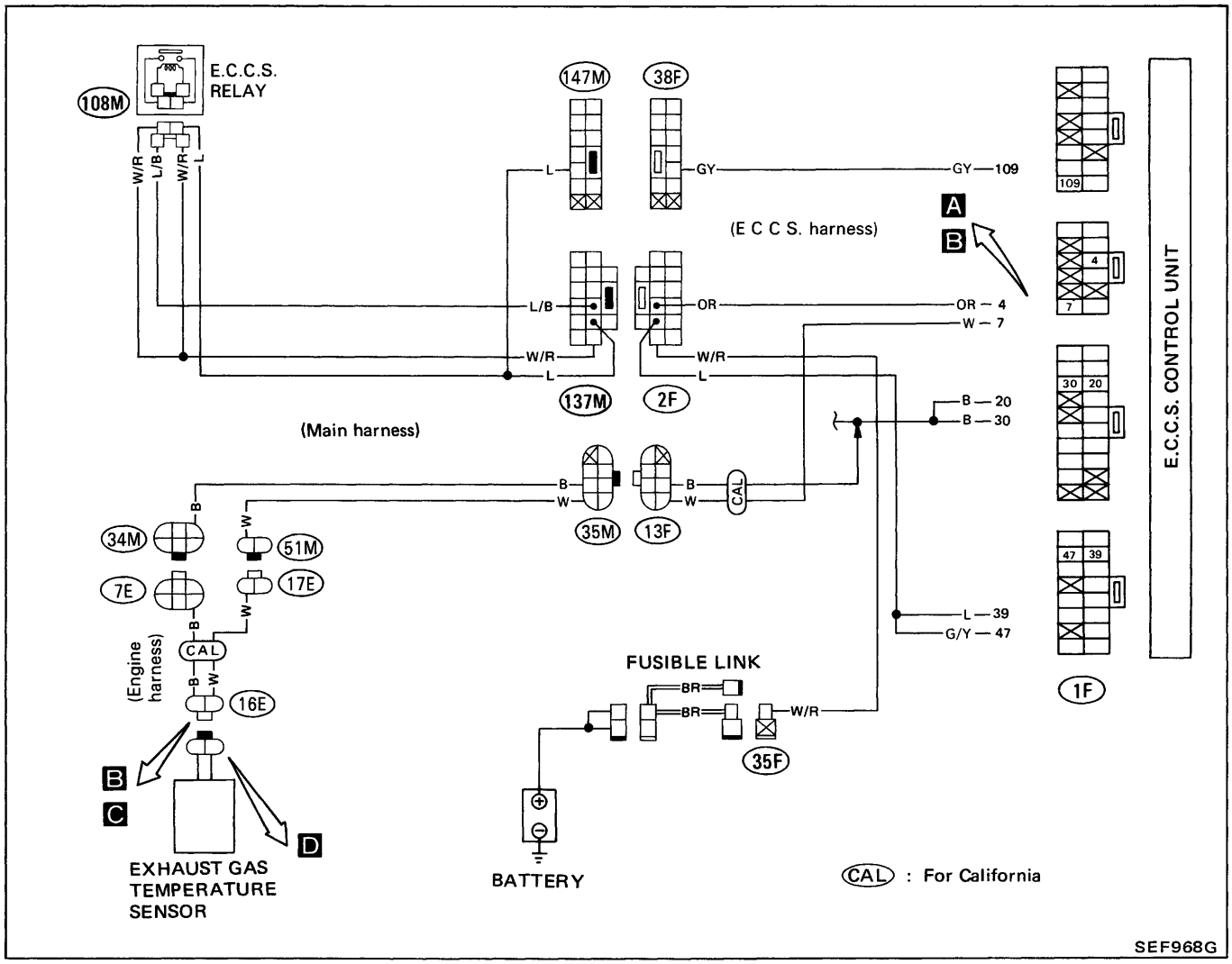
1) Warm up engine sufficiently.
2) Set diagnosis mode to Mode I.
3) Make sure that inspection lamp (Green) on E.C.U. goes on and off periodically more than 5 times during 10 seconds at 2,000 rpm.

N.G. → Perform MIXTURE RATIO FEEDBACK SYSTEM INSPECTION. (See page EF & EC-141.)

O.K.

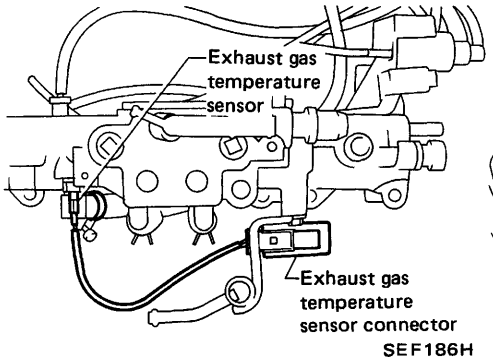
INSPECTION END

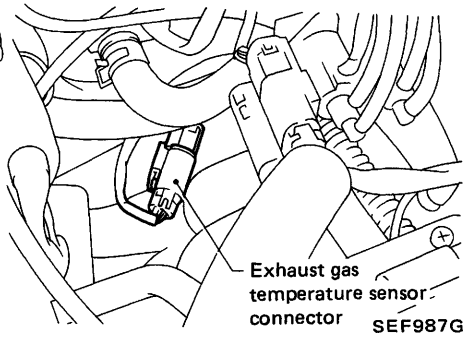
EXHAUST GAS TEMPERATURE SENSOR (Code No. 35) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY



The following is necessary to perform this inspection.

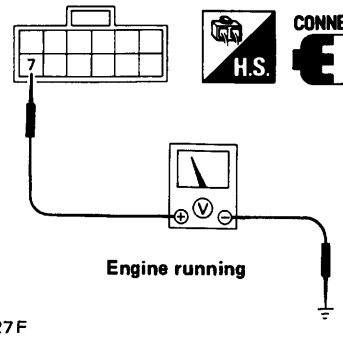
1. • Disconnect vacuum hose connected to E.G.R. control valve.
   • Connect a hand vacuum pump to E.G.R. control valve.
2. Warm up engine sufficiently.





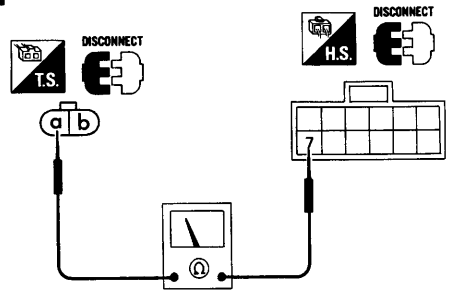
EXHAUST GAS TEMPERATURE SENSOR (Code No. 35) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY

A



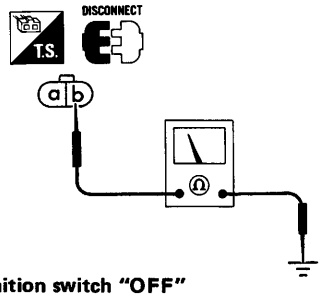
SEF827F

B



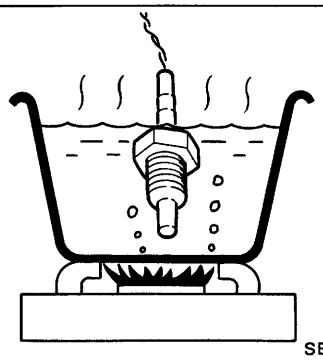
SEF988G

C



SEF989G

D



SEF830F

INSPECTION START

A CHECK INPUT SIGNAL
1) Start engine and warm it up sufficiently.
2) Keep engine speed at approximately 2,000 rpm.
3) Check voltage between E.C.U. terminal ⑦ and ground under the following conditions:

Condition	Voltage
When vacuum is not applied to E.G.R. control valve	1.0V or more
When vacuum is applied to E.G.R. control valve	0 - 1.0V

A sufficient vacuum applied with a hand vacuum pump may cause the engine to stall.

O.K. → INSPECTION END

N.G.

B CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND EXHAUST GAS TEMPERATURE SENSOR
1) Stop engine.
2) Disconnect E.C.U. 12-pin terminal connector.
3) Disconnect exhaust gas temperature sensor harness connector.
4) Check continuity between E.C.U. terminal ⑦ and ⓐ.

N.G. →
1) Check middle harness connector connection.
2) If necessary, repair or replace harness.

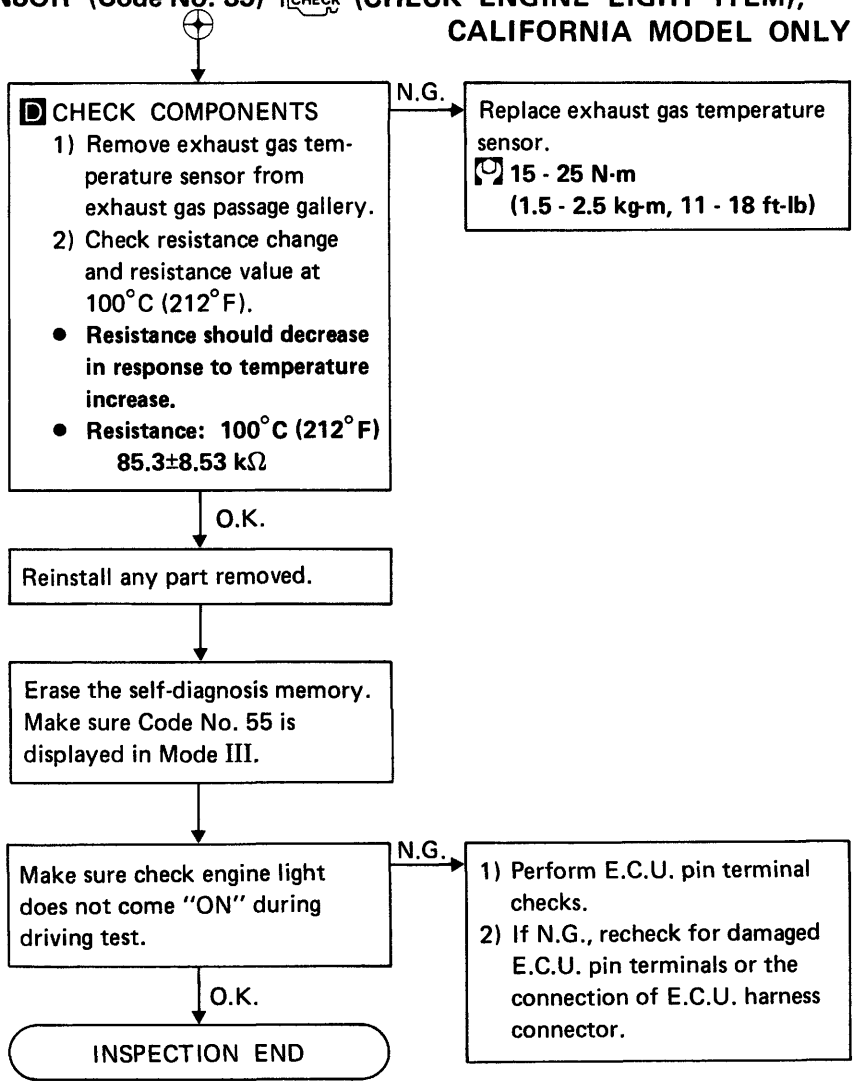
O.K.

C CHECK GROUND CIRCUIT
Check continuity between ⓑ and ground.
Resistance:
Approximately 0Ω

N.G. →
1) Check middle harness connector connection.
2) If necessary, repair or replace harness.

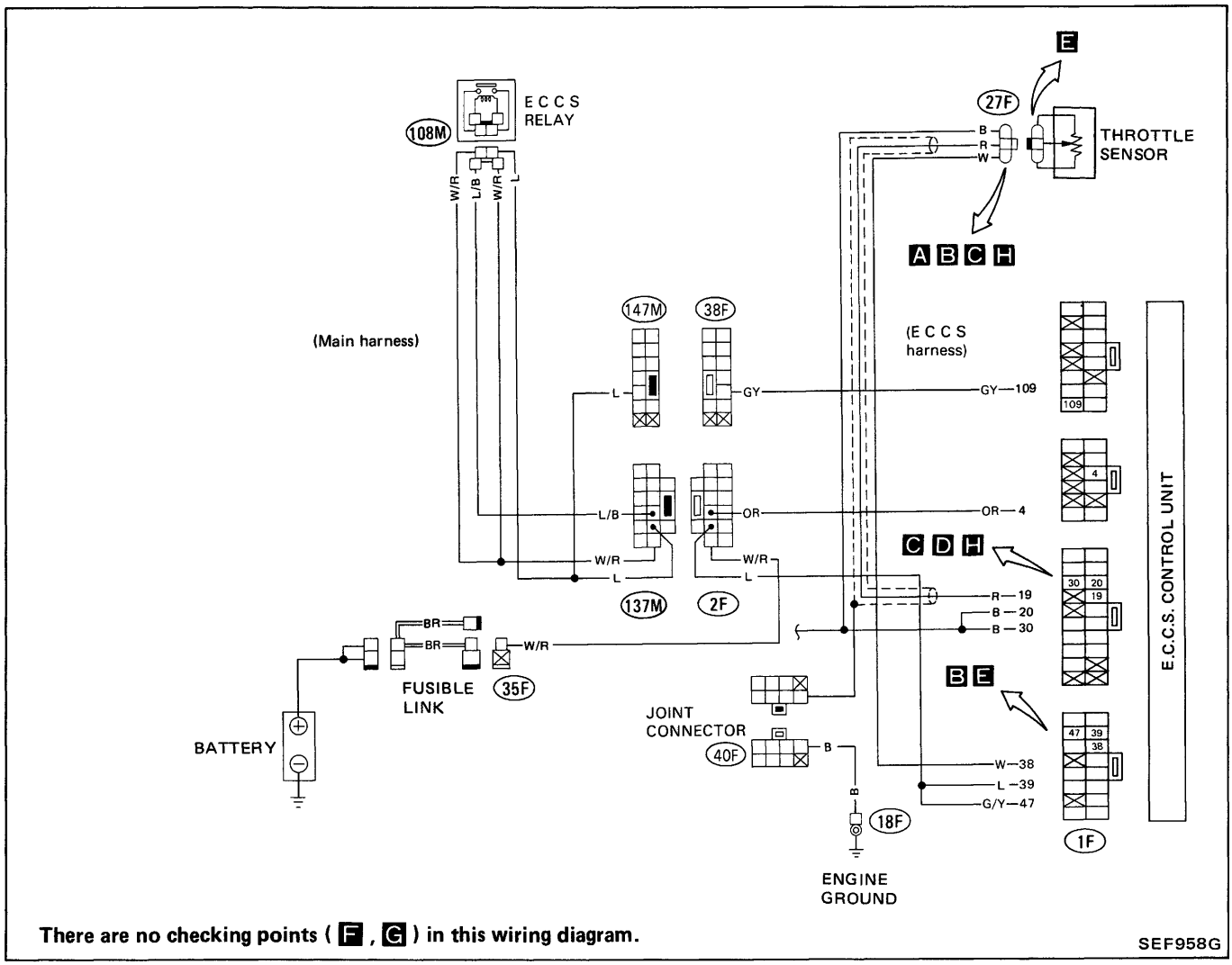
O.K.

EXHAUST GAS TEMPERATURE SENSOR (Code No. 35) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY



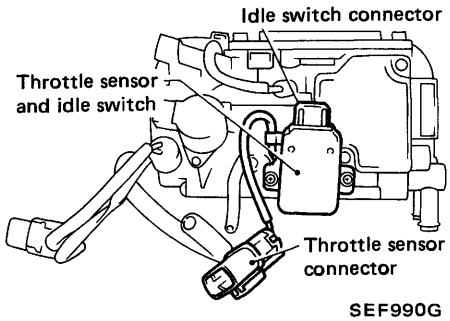
NOTE

THROTTLE SENSOR (Code No. 43) CHECK (CHECK ENGINE LIGHT ITEM)



There are no checking points (F , G) in this wiring diagram.

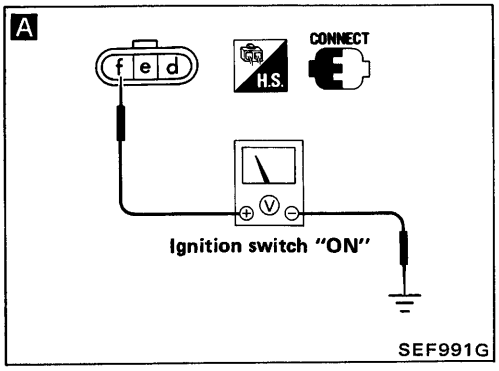
SEF958G



SEF990G

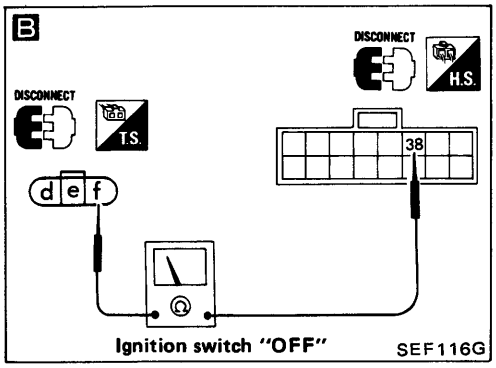
THROTTLE SENSOR (Code No. 43) (CHECK ENGINE LIGHT ITEM)

A



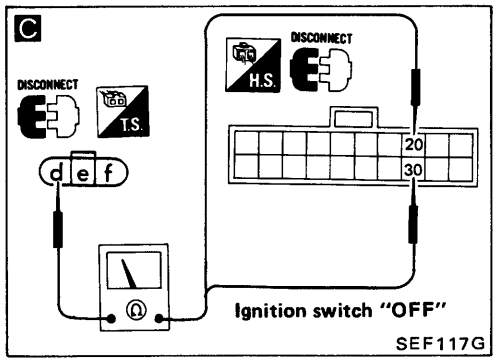
SEF991G

B



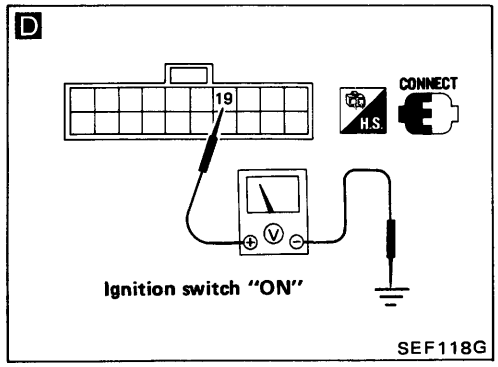
SEF116G

C



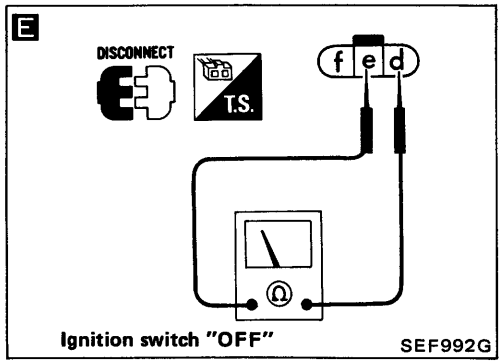
SEF117G

D



SEF118G

E



SEF992G

INSPECTION START

Perform self-diagnosis (Mode III).
Is Code No. 43 indicated?

No → INSPECTION END

Yes

A

CHECK POWER SOURCE
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓕ and ground.
Voltage:
Approximately 5.0V

N.G. →
Check the following items.
B 1) Harness continuity between throttle sensor harness connector and E.C.U.
- Turn ignition switch "OFF".
- Disconnect throttle sensor harness connector.
- Disconnect 16-pin connector from E.C.U.
- Check resistance between ⓕ and ㊳.
Resistance:
Approximately 0Ω

2) Middle harness connector
3) E.C.C.S. relay
(Refer to page EF & EC-81.)

O.K.

C

CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF" and disconnect 20-pin connector from E.C.U.
2) Disconnect throttle sensor harness connector.
3) Check resistance between terminal ⓓ and E.C.U. terminals ⑳ and ㉚.
Resistance:
Approximately 0Ω

N.G. →
1) Check harness continuity between throttle sensor and ground.
2) E.C.U. ground circuit.

O.K.

D

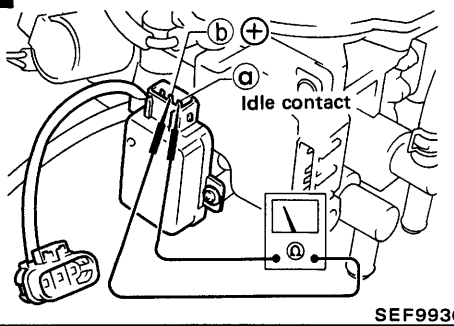
CHECK INPUT SIGNAL
1) Reconnect E.C.U. 20-pin terminal and throttle sensor harness connector.
2) Turn ignition switch "ON".
3) Make sure that voltage between terminal ⑲ and ground changes when accelerator pedal is depressed.
Voltage:
Approximately 0.4 - 4.0V

O.K. → INSPECTION END

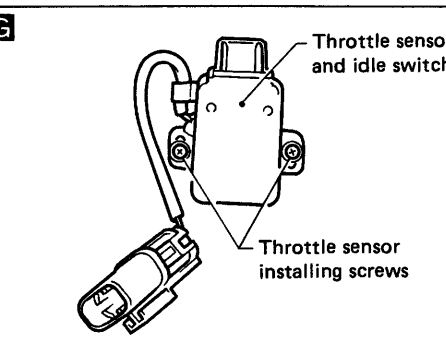
N.G.

THROTTLE SENSOR (Code No. 43) (CHECK ENGINE LIGHT ITEM)

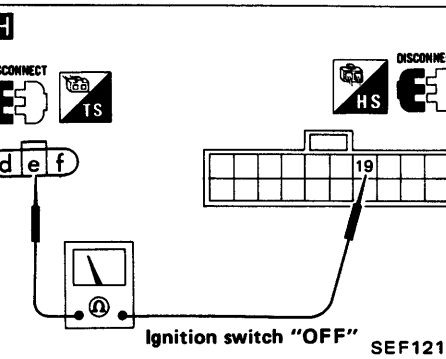
F



G



H



1) Disconnect throttle sensor harness connector.

E 2) Make sure that resistance between ⓓ and ⓔ changes when opening throttle valve manually.
Resistance should change.
If not, replace throttle sensor.

3) Check idle switch OFF → ON speed.
- Reconnect throttle sensor harness connector.

F
- Disconnect idle switch harness connector.
- Start and warm up engine sufficiently.
- Check idle switch OFF → ON speed with circuit tester, closing throttle valve manually.

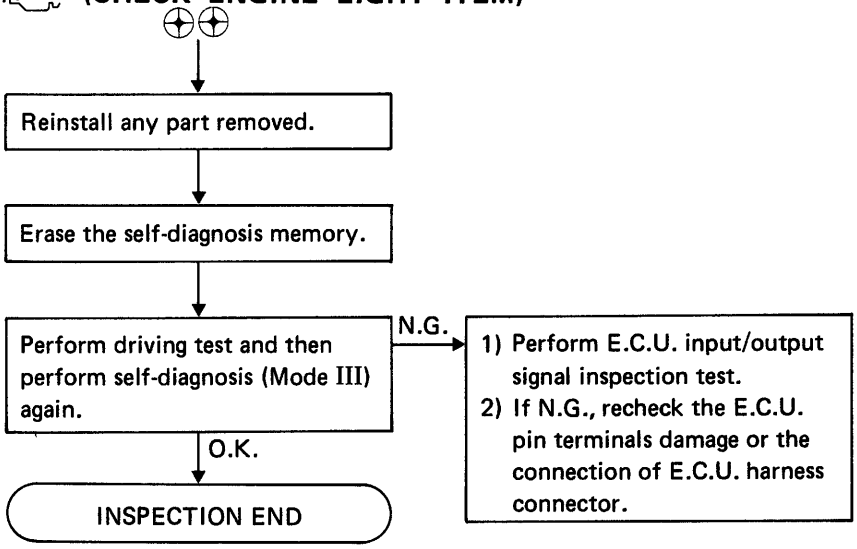
Idle switch OFF → ON speed:
M/T: 1,050±150 rpm
A/T: Engine speed in "N" position 1,150±150 rpm

F
G
- If N.G., loosen throttle sensor installing screws, then set idle switch OFF → ON speed to the specified value by turning throttle sensor body. (Connect circuit tester with terminals ⓐ and ⓑ on idle switch side and find out OFF → ON point.)
- Tighten throttle sensor installing screws after setting.

H 4) Check harness continuity between throttle sensor and E.C.U.
- Disconnect harness connector for thrttle sensor.
- Disconnect 20-pin connector from E.C.U.
- Check resistance between terminal ⓔ and E.C.U. terminal ⑲.

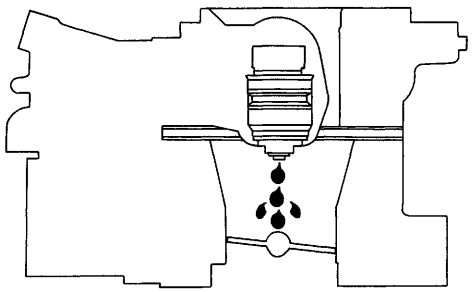
Resistance:
Approximately 0Ω

THROTTLE SENSOR (Code No. 43) (CHECK ENGINE LIGHT ITEM)



INJECTOR LEAK (Code No. 45) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY

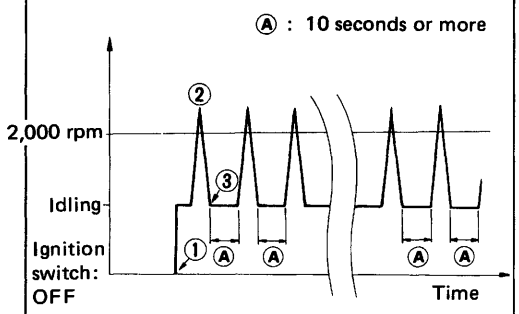
A



SEF995G

B

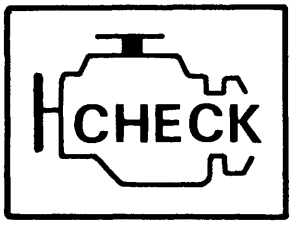
Engine racing mode



① Start engine and warm it up sufficiently.
② Race engine revolution higher than 2,000 rpm under no-load.
③ Keep engine at idle speed for at least 10 seconds.
④ Repeat steps ② through ③ at least 10 times.

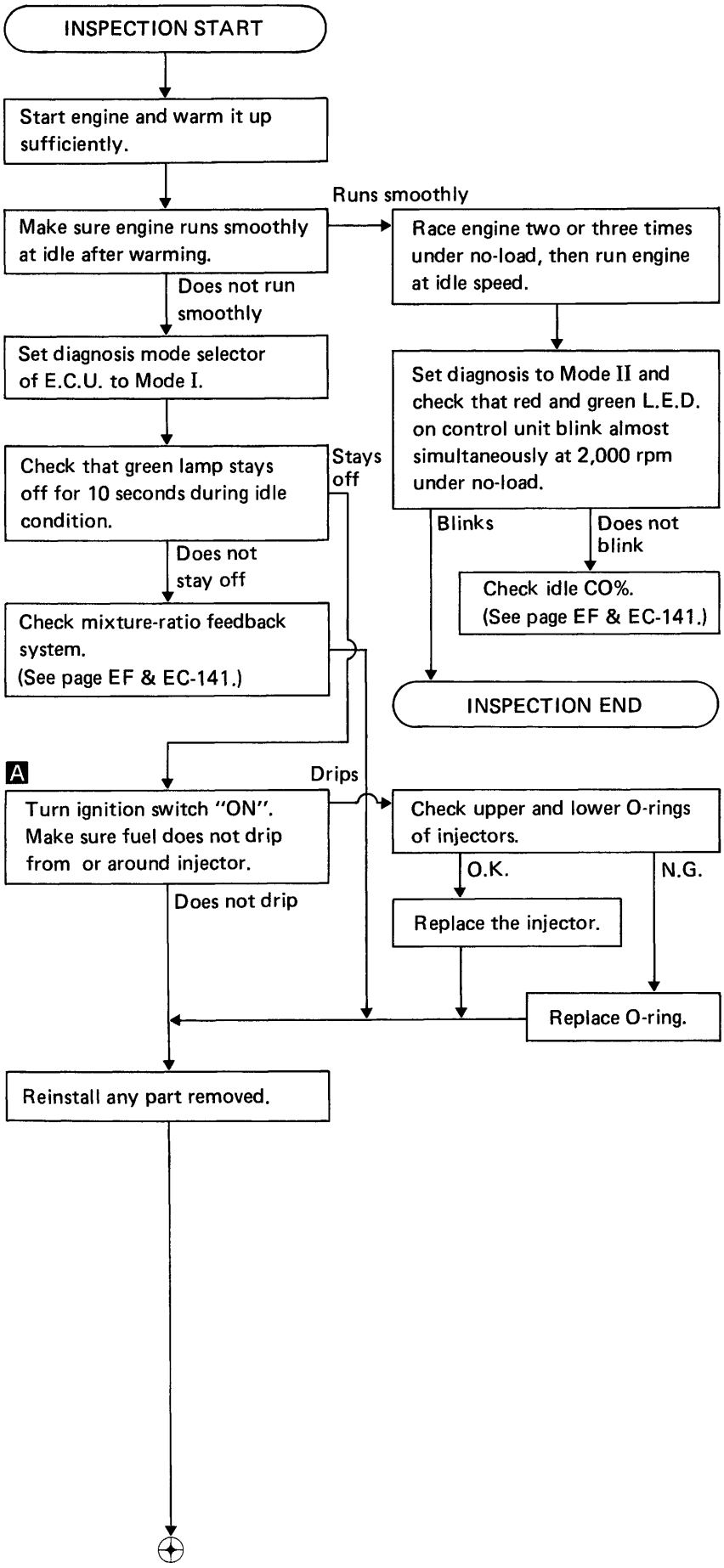
SEF329G

C

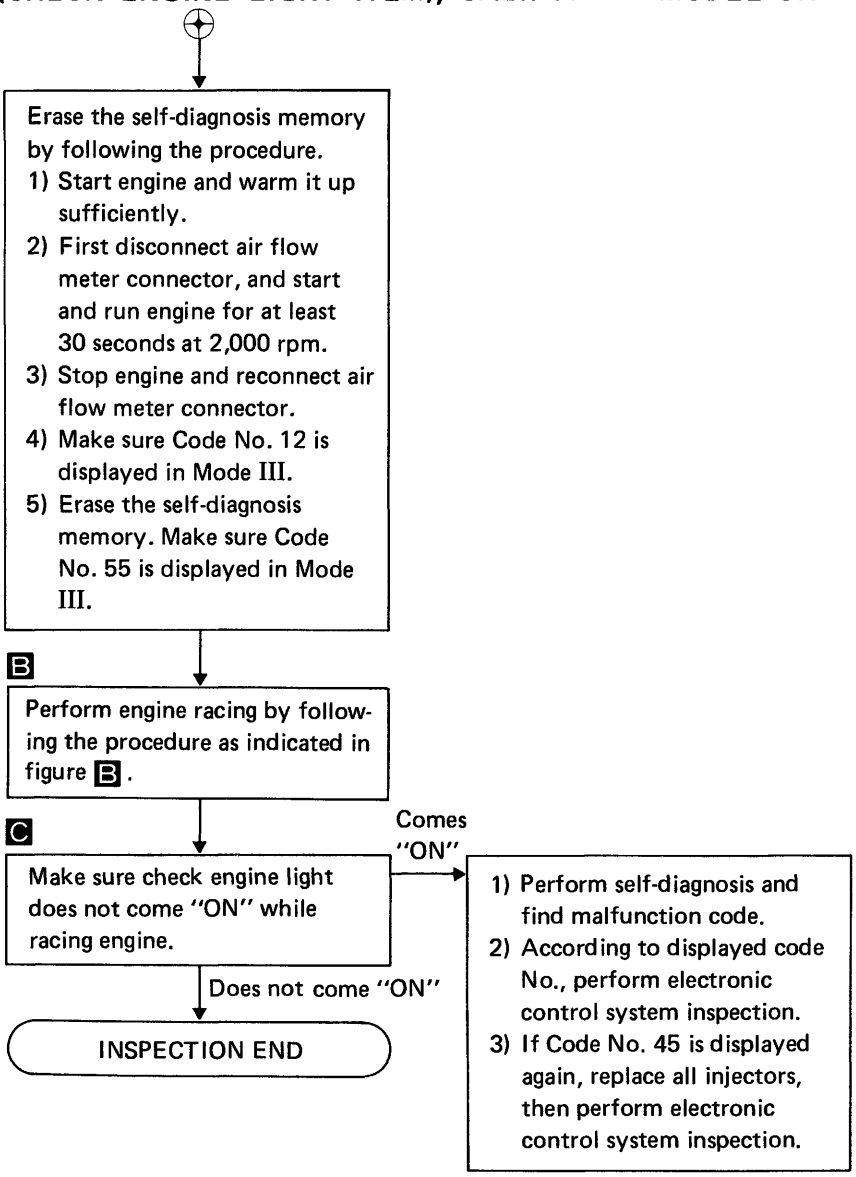


CHECK ENGINE LIGHT

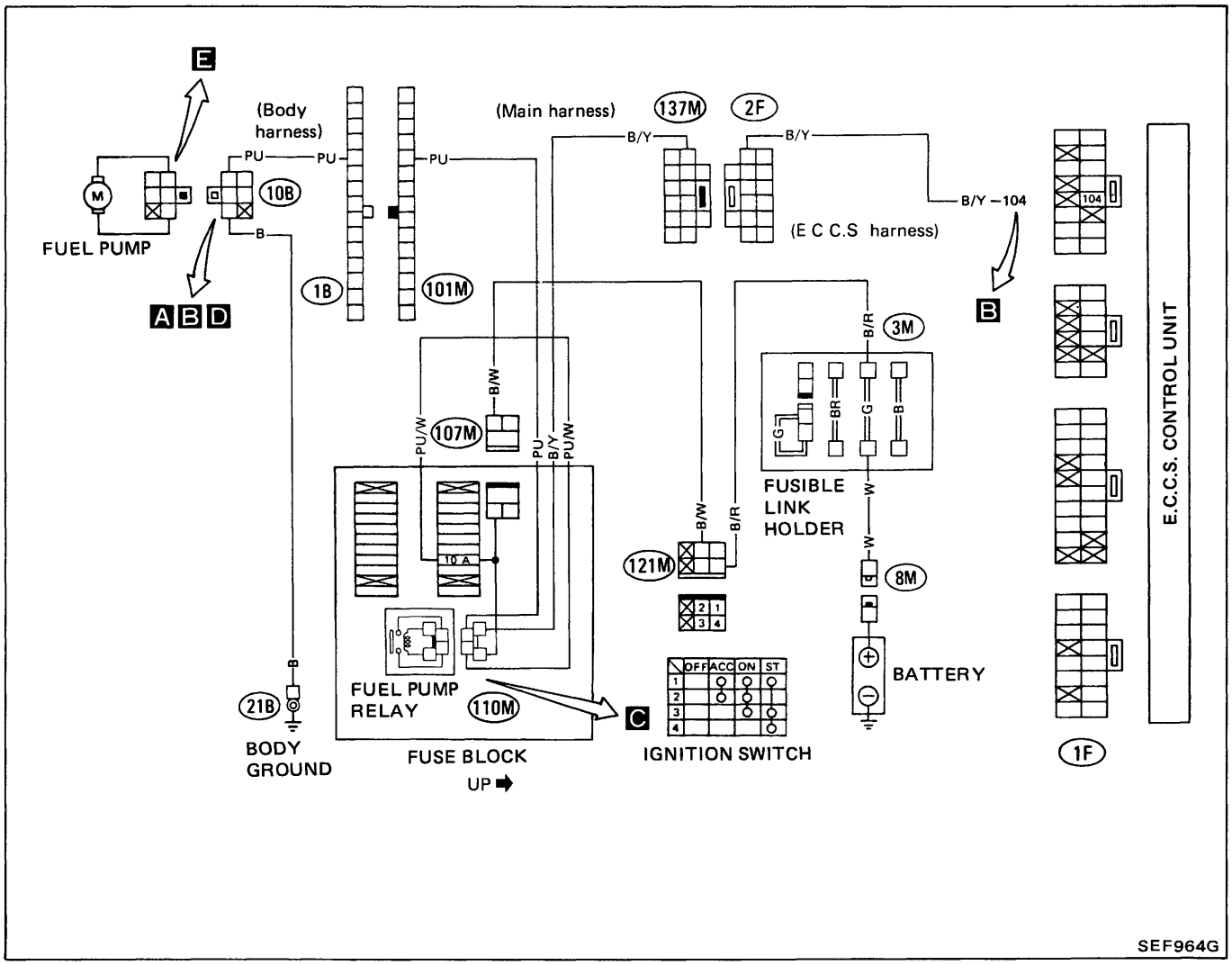
SEF924F

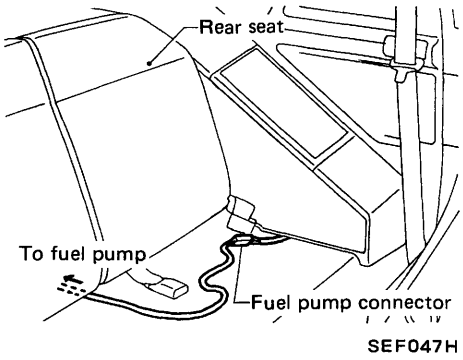


INJECTOR LEAK (Code No. 45) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY



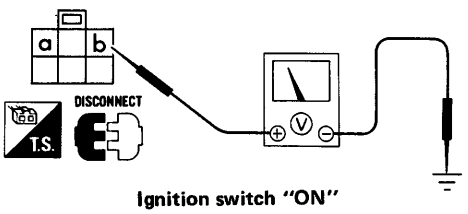
FUEL PUMP (Not self-diagnosis item)





FUEL PUMP (Not self-diagnosis item)

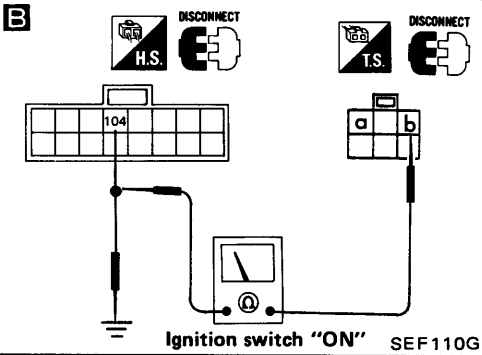
A



Ignition switch "ON"

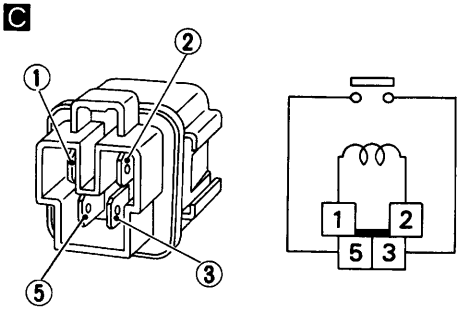
SEF048H

B



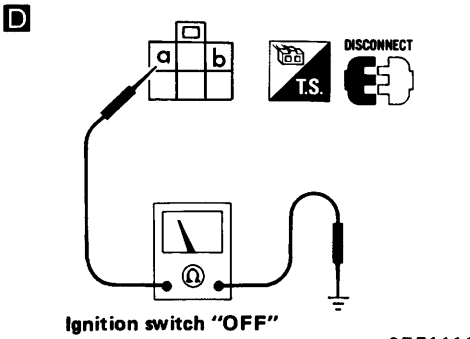
Ignition switch "ON" SEF110G

C



SEF054F

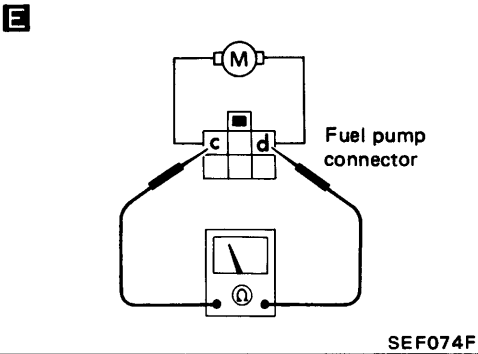
D



Ignition switch "OFF"

SEF111G

E



SEF074F

INSPECTION START

A

CHECK POWER SOURCE
1) Disconnect fuel pump harness connector.
2) Turn ignition switch "ON".
3) Make sure there is battery voltage between terminal ⓑ and ground for 5 seconds after turning ignition switch "ON".

N.G. → **B**

CHECK HARNESS CONTINUITY BETWEEN FUEL PUMP AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect 16-pin terminal connector from E.C.U.
3) Connect a suitable jumper wire to terminal (104) and ground.
4) Disconnect fuel pump harness connector.
5) Turn ignition switch "ON".
6) Check continuity between terminals (104) and ⓑ.

N.G. ↓

1) Check middle harness connector for proper connection.
C 2) Check fuel pump relay.

Condition	Continuity between terminals ③ and ⑤
Supply of 12V direct current between terminals ① and ②	Yes
No supply	No

If N.G., replace relay.
3) Repair harness or connector, if necessary.

O.K. ↓

D

CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF".
2) Disconnect fuel pump harness connector.
3) Check continuity between terminal ⓐ and ground.
Continuity:
Approximately 0Ω

N.G. → Repair harness or connectors, if necessary.

O.K. ↓

E

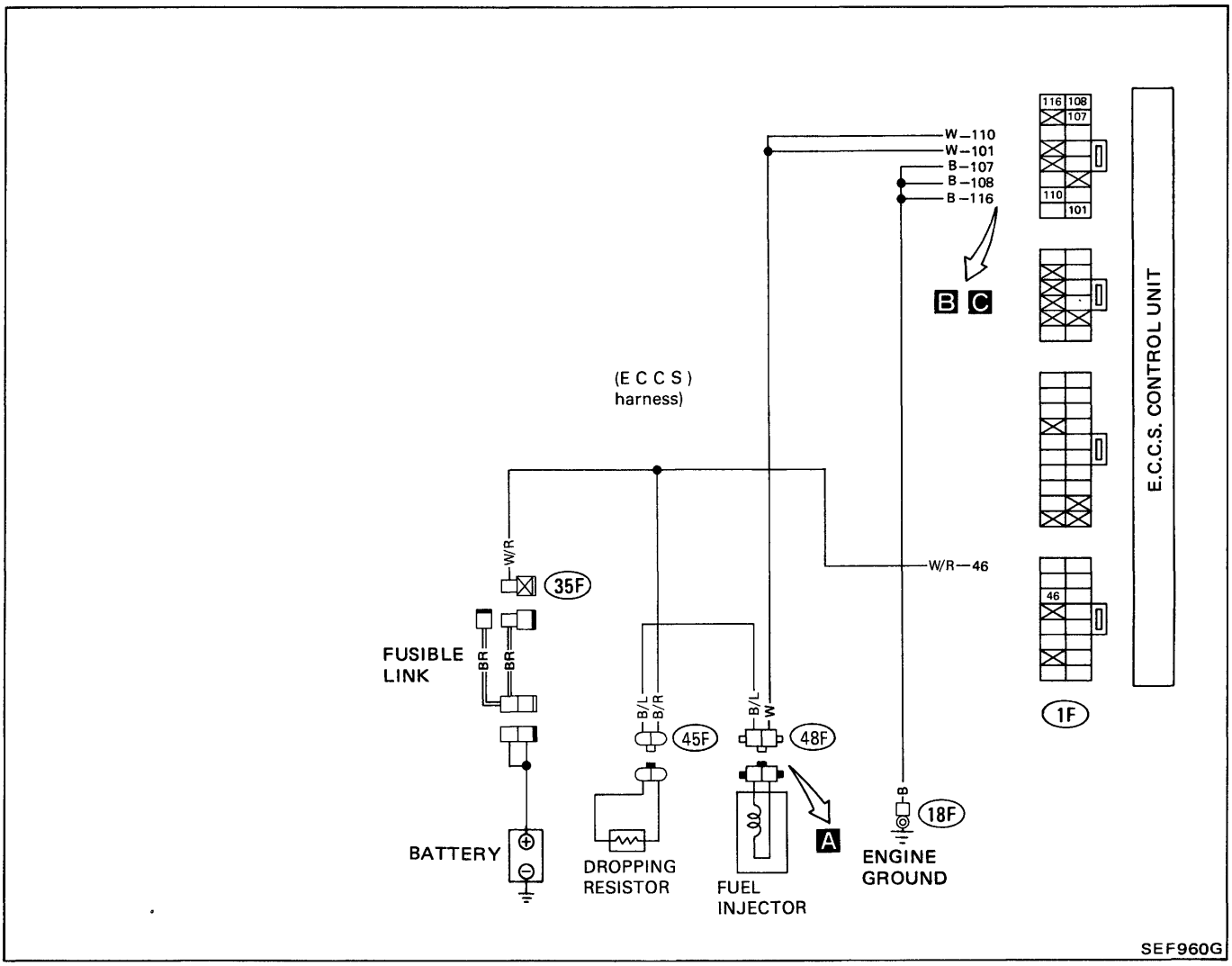
CHECK COMPONENT
Check continuity between terminals ⓒ and ⓓ.
Continuity should exist.

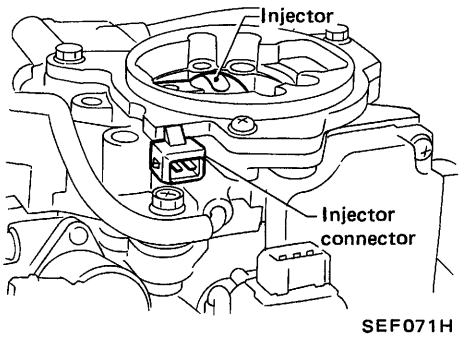
N.G. → Replace fuel pump.

O.K. ↓

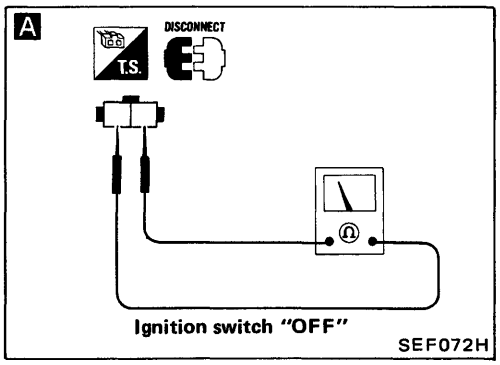
INSPECTION END

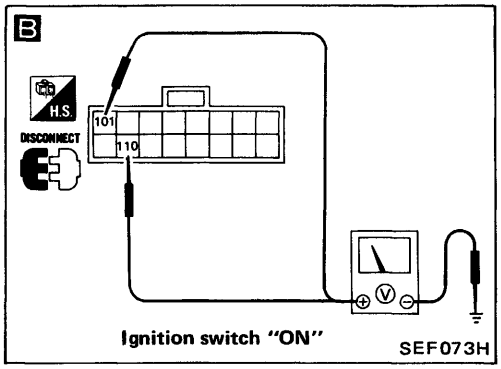
INJECTOR (Not self-diagnosis item)

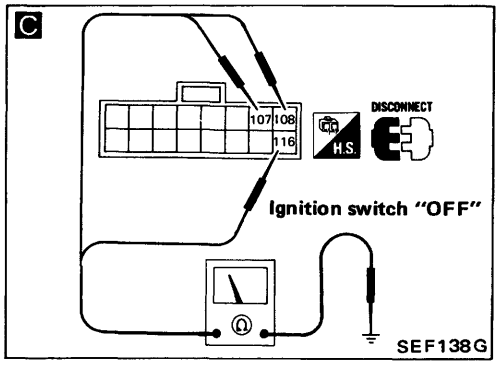




INJECTOR (Not self-diagnosis item)







INSPECTION START

A

CHECK INJECTORS
1) Disconnect injector harness connector.
2) Check resistance of injector.
Resistance:
Approximately 1 - 2Ω
If N.G., replace injector.

N.G. → Replace injector.

O.K.

B

CHECK POWER SOURCE
1) Disconnect 16-pin terminal connector.
2) Turn ignition switch "ON".
3) Check voltage between terminals (101), (110) and ground.
Voltage: Battery voltage

N.G. → Check continuity between battery and injectors.

O.K.

C

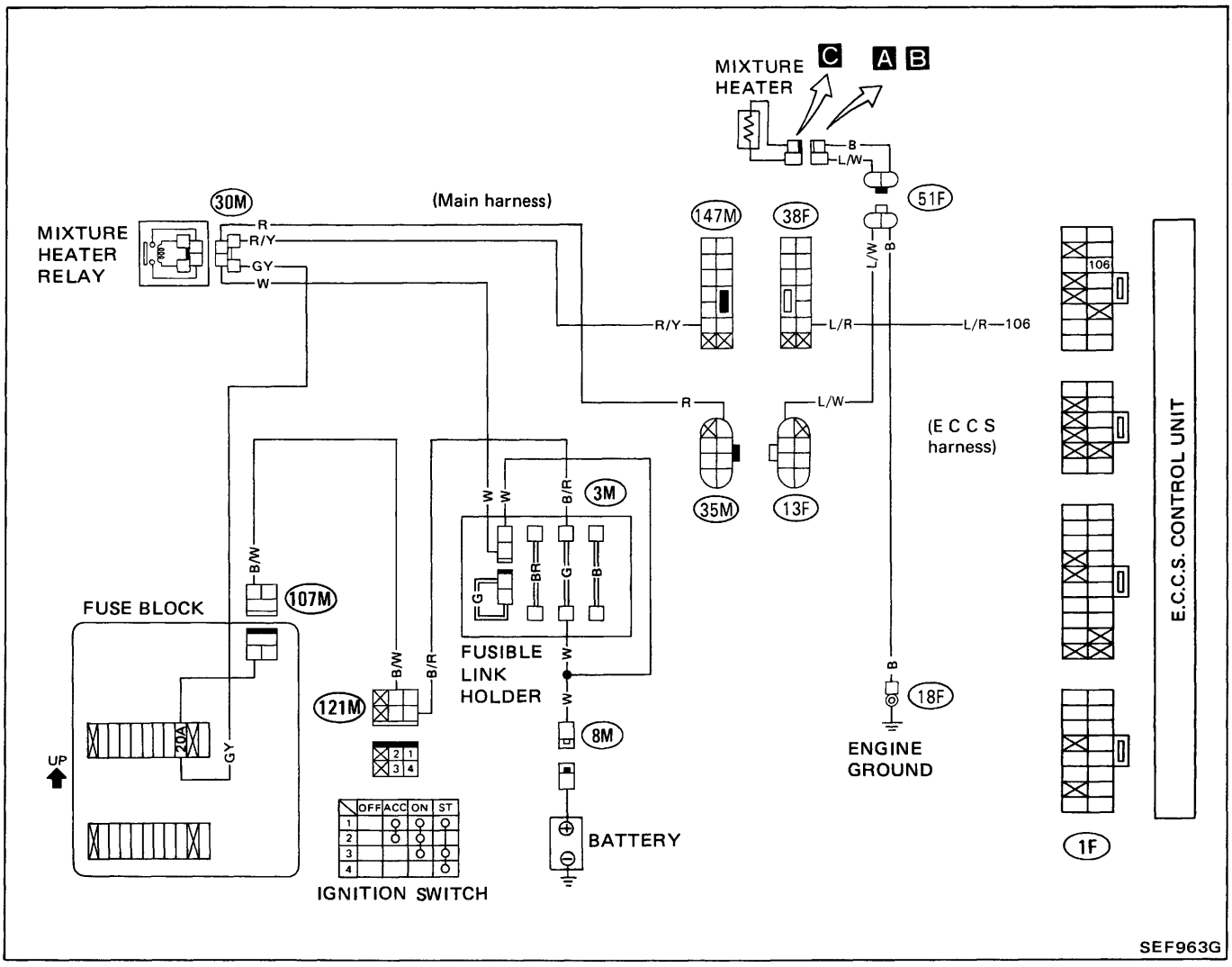
CHECK GROUND CIRCUIT
1) Check resistance between terminals (107), (108), (116) and ground.
Resistance:
Approximately 0Ω

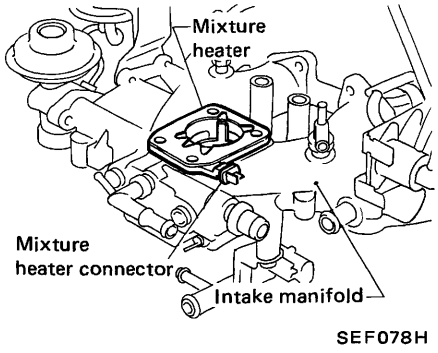
N.G. → Repair harness.

O.K.

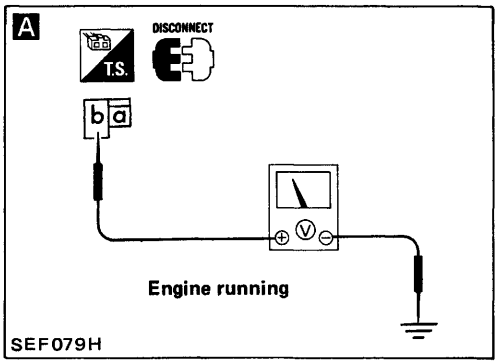
INSPECTION END

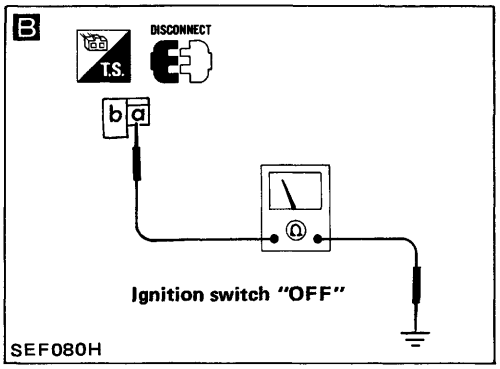
MIXTURE HEATER (Not self-diagnosis item)

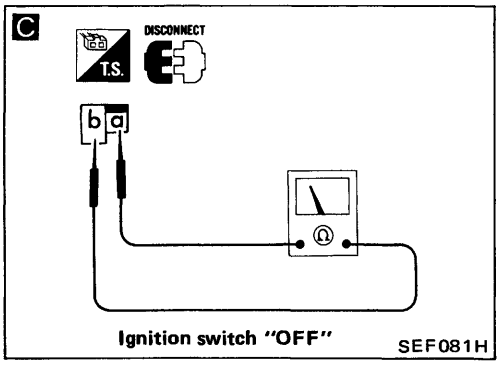




MIXTURE HEATER (Not self-diagnosis item)







INSPECTION START

A

CHECK POWER SOURCE
1) Make sure that engine is cold.
2) Disconnect mixture heater harness connector.
3) Start engine.
4) Check voltage between terminal ⓑ and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Harness continuity between:
- Fusible link and mixture heater relay
- Mixture heater relay and fuse block

2) Mixture heater relay (See page EF & EC-124.)
3) Fusible link "G"

O.K.

B

CHECK GROUND CIRCUIT
1) Stop engine.
2) Disconnect mixture heater harness connector.
3) Check resistance between terminal ⓐ and ground.
Resistance:
Approximately 0Ω

N.G. → Check harness continuity between mixture heater harness connector and ground.

O.K.

C

CHECK COMPONENT
1) Disconnect mixture heater harness connector.
2) Check resistance between terminals ⓐ and ⓑ.
Continuity should exist.

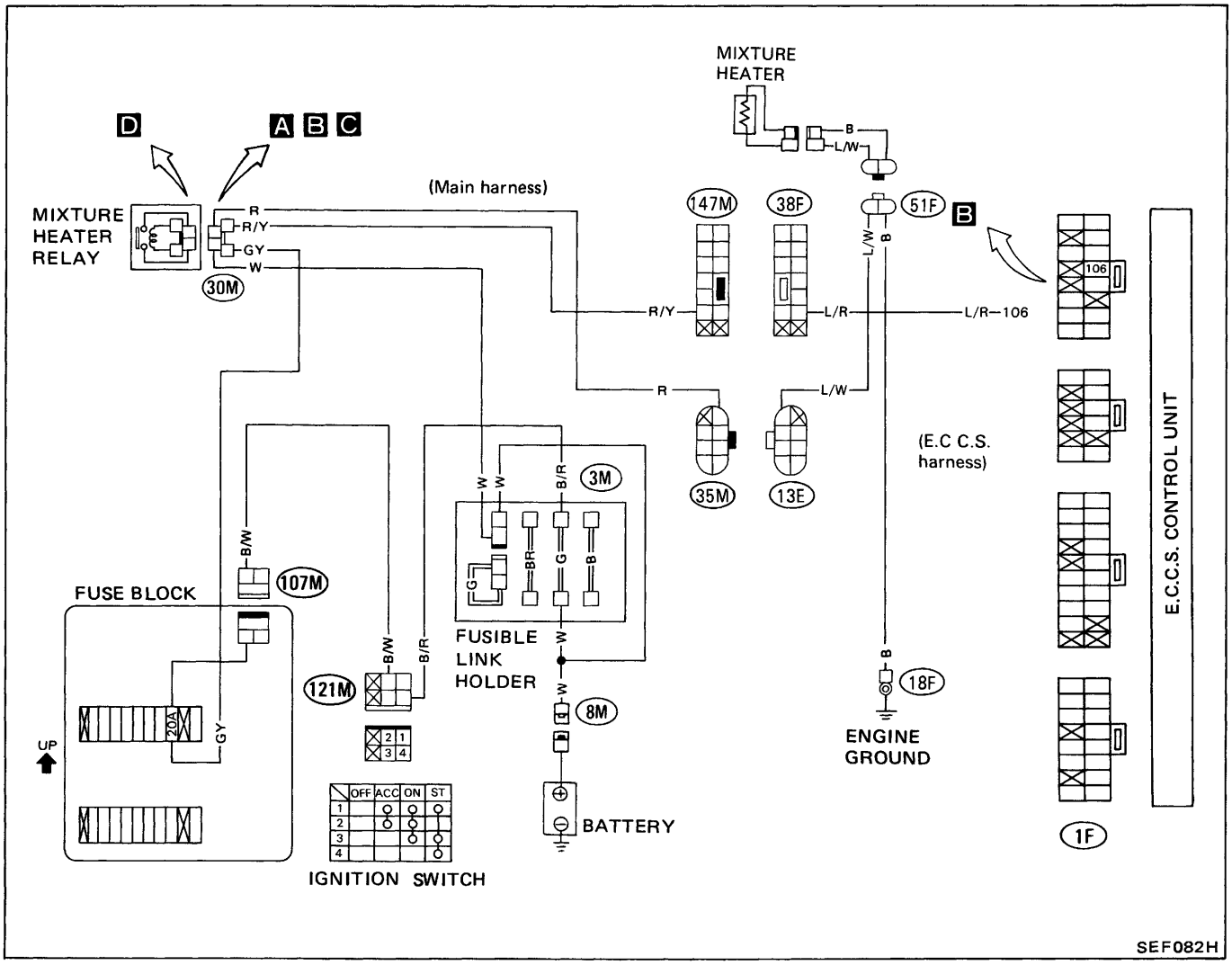
N.G. → Replace mixture heater.

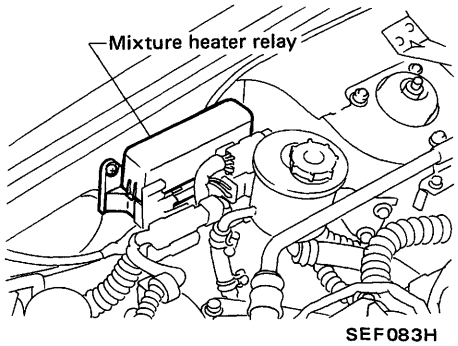
O.K.

Reinstall any part removed.

INSPECTION END

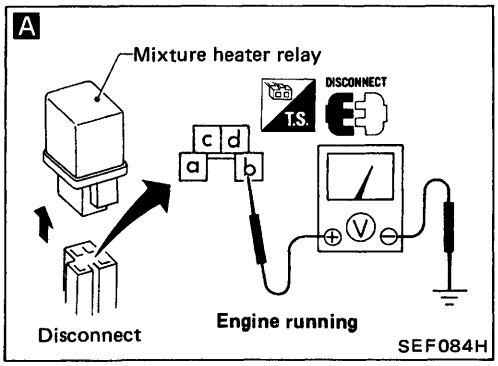
MIXTURE HEATER RELAY (Not self-diagnosis item)



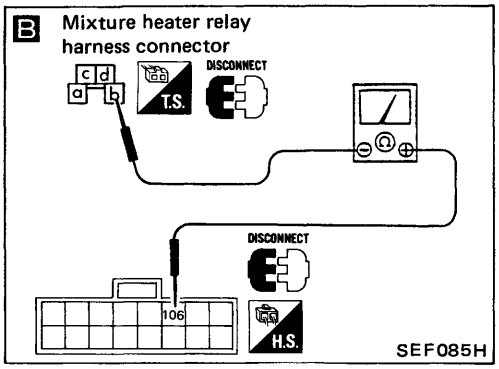


MIXTURE HEATER RELAY (Not self-diagnosis item)

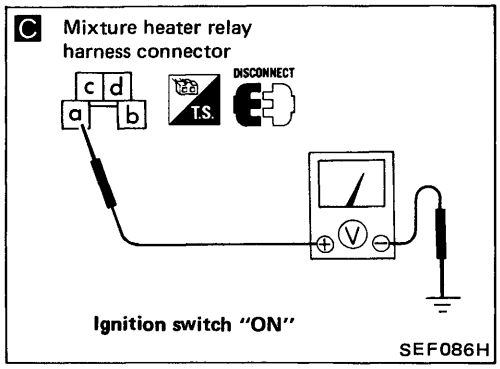
A



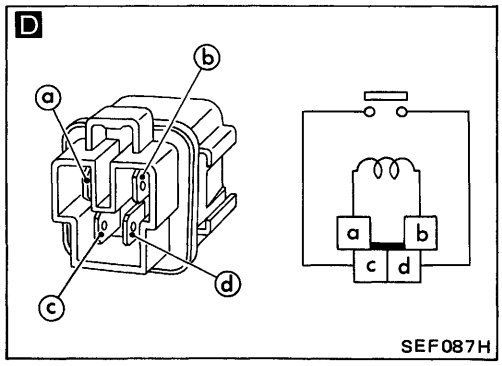
B



C



D



A

CHECK E.C.U. OUTPUT SIGNAL
1) Make sure that engine is cold.
2) Disconnect mixture heater relay.
3) Start engine and check voltage between terminal ⓑ of mixture heater relay harness connector and engine ground.
Voltage: Approximately 0.7V

N.G. →
1) Turn ignition switch "OFF".
B 2) Disconnect E.C.U. 16-pin harness connector and check continuity between terminal (106) of E.C.U. and terminal ⓑ of mixture heater relay harness connector.
3) Check signal from water temperature sensor. (See page EF & EC-86.)
4) Check joint connector A.
5) Ground circuit for E.C.U. (See page EF & EC-80.)

O.K. ↓

C

CHECK POWER SOURCE
1) Stop engine and turn ignition switch "ON".
2) Check voltage between terminal ⓐ of mixture heater relay harness connector and ground.
Battery voltage should exist.

N.G. →
Check the following:
- Fusible link "G" and fuse
- Ignition switch
- Fuse block
- Harness between mixture heater relay and fusible link

O.K. ↓

D

Check mixture heater relay

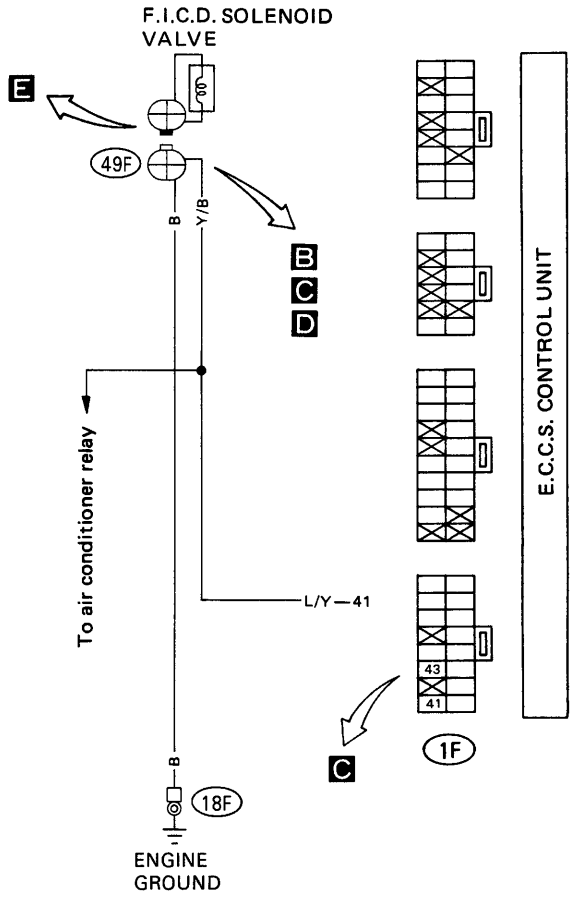
Condition	Continuity between terminals ⓒ and ⓓ
Supply of 12V direct current between terminals ⓐ and ⓑ	Yes
No supply	No

N.G. → Replace mixture heater relay.

O.K. ↓

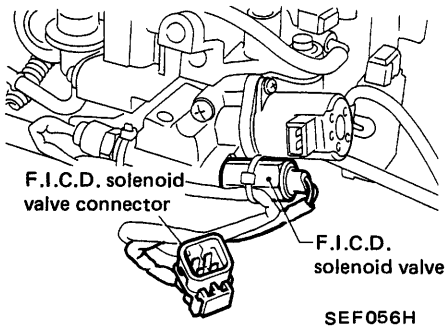
INSPECTION END

F.I.C.D. CONTROL (Not self-diagnosis item)



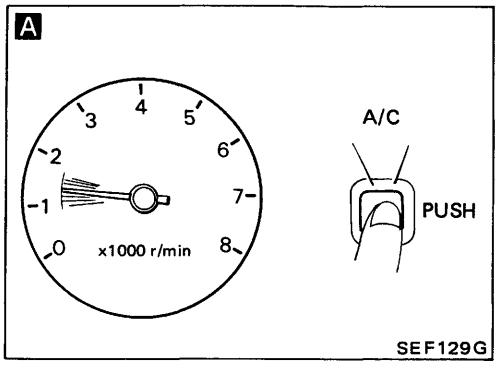
There is no checking point (A) in this wiring diagram.

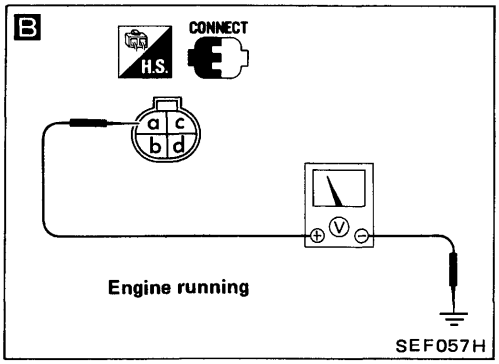
SEF055H

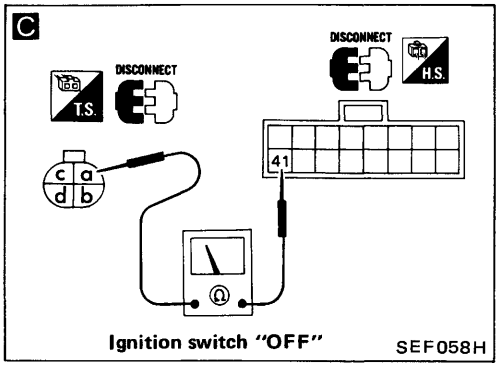


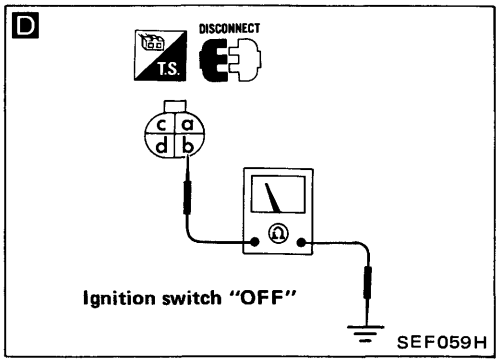
SEF056H

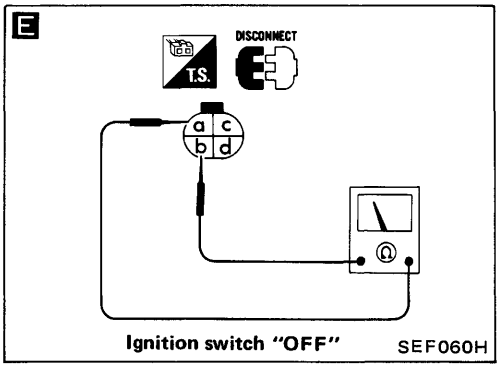
F.I.C.D. CONTROL (Not self-diagnosis item)











INSPECTION START

A

CHECK INPUT SIGNAL
1) Start and warm up engine sufficiently.
2) Does engine revolution rise when air conditioner switch is turned "ON"?

Yes → CHECK IDLE SPEED WHEN AIR CONDITIONER SWITCH IS "ON"
M/T: 1,000±100 rpm
A/T: 1,000±100 rpm (in "N" position)
If out of specification, adjust idle speed.
(See page EF & EC-141.)
O.K. → INSPECTION END

No

B

CHECK POWER SOURCE
1) Check voltage between terminal ⓐ and ground when air conditioner switch is turned "ON".

Air conditioner	Voltage between terminal ⓐ and ground
ON	Battery voltage
OFF	0V

N.G. → **C**

CHECK CONTINUITY BETWEEN E.C.U. AND F.I.C.D. SOLENOID VALVE
1) Stop engine.
2) Disconnect F.I.C.D. solenoid valve harness connector.
3) Disconnect 16-pin terminal connector.
4) Check resistance between terminals ⓐ and ㊶.
Resistance:
Approximately 0Ω
If N.G., repair harness or connectors.

O.K.

D

CHECK GROUND CIRCUIT
1) Stop engine.
2) Disconnect F.I.C.D. solenoid valve harness connector.
3) Check resistance between terminal ⓑ and ground.
Resistance:
Approximately 0Ω

N.G. → Repair harness or connectors.

O.K.

E

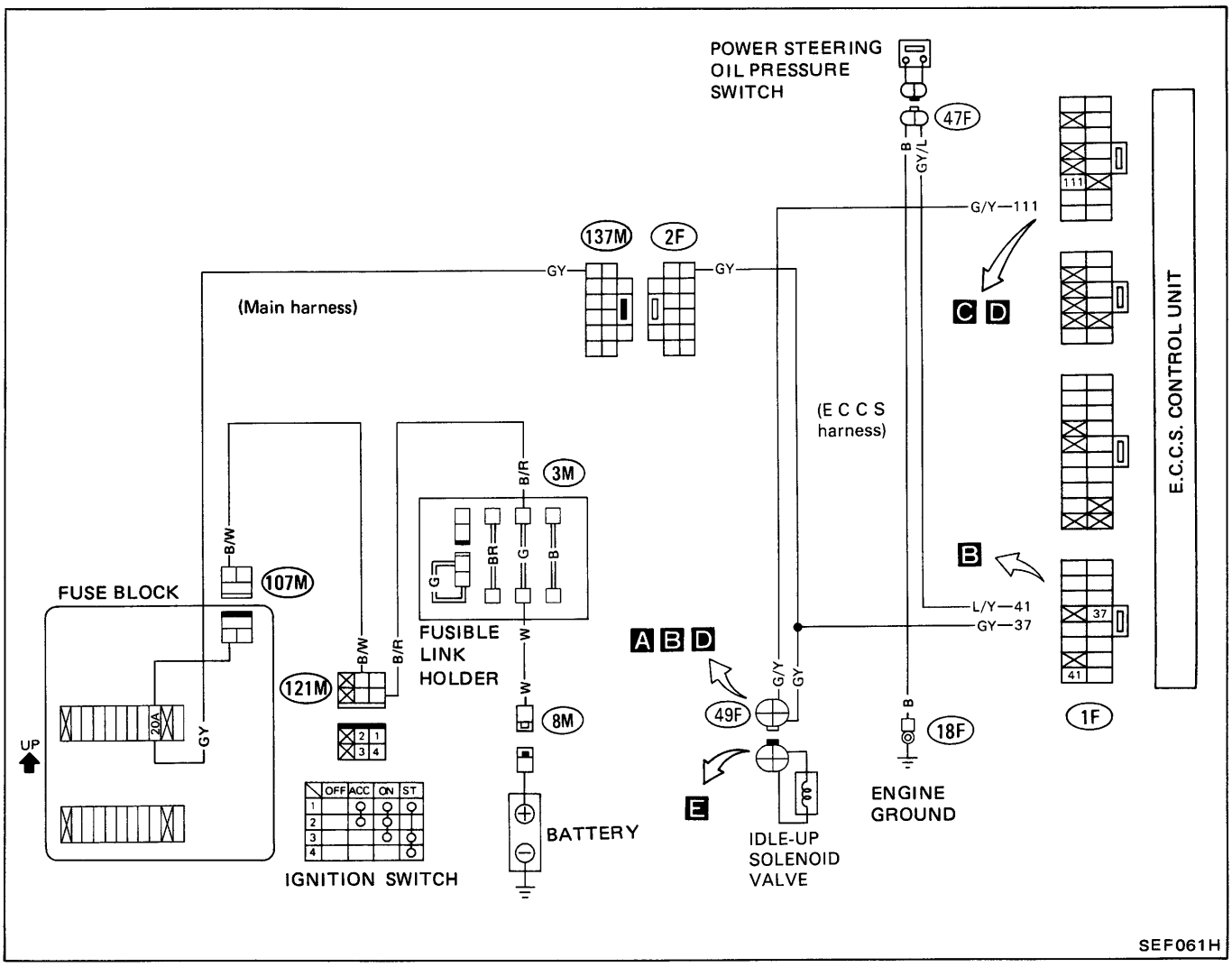
CHECK COMPONENTS
Check resistance between terminals ⓐ and ⓑ.
Continuity should exist.

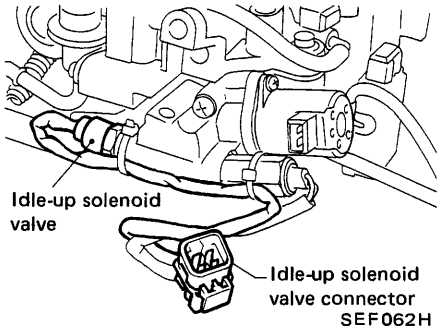
N.G. → Replace F.I.C.D. solenoid valve.

O.K.

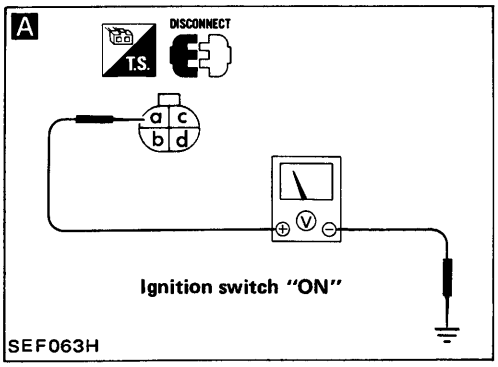
INSPECTION END

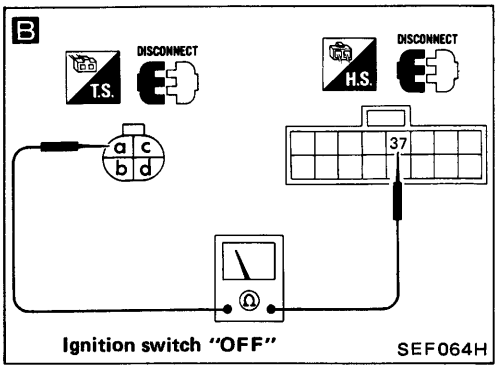
IDLE-UP CONTROL (Not self-diagnosis item)

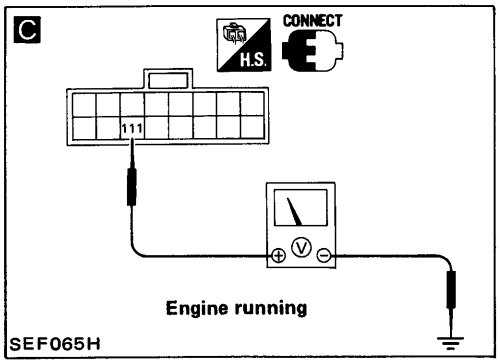


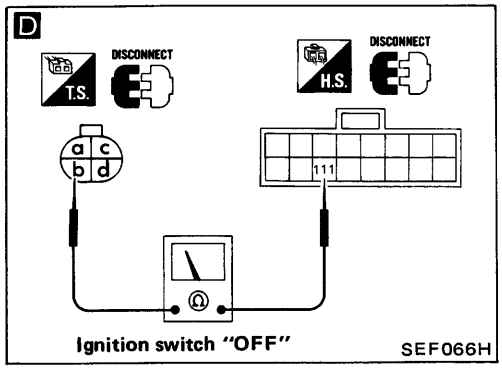


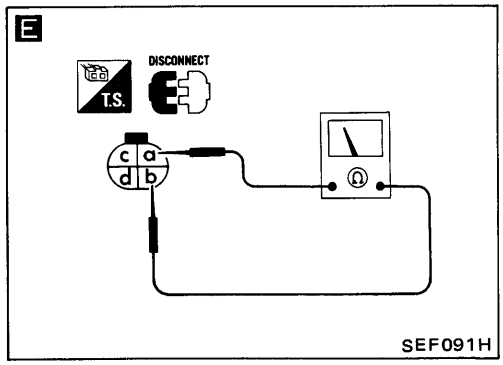
IDLE-UP CONTROL (Not self-diagnosis item)











INSPECTION START

A

CHECK POWER SOURCE
1) Disconnect idle-up solenoid valve harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. →

B

CHECK HARNESS CONTINUITY BETWEEN IDLE-UP SOLENOID VALVE AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect 16-pin terminal connector.
3) Check resistance between terminal ⓐ and ㊲.
Resistance:
Approximately 0Ω
If N.G., repair harness or connector.

O.K. ↓

C

CHECK INPUT SIGNAL
1) Reconnect idle-up solenoid valve harness connector.
2) Start and warm up engine sufficiently.
3) Check voltage between E.C.U. terminal ⑪① and ground when power steering oil pressure switch is turned "ON".

Power steering oil pressure switch	Voltage between ⑪① and ground
ON	Approximately 0.9V
OFF	Battery voltage

N.G. →

D

CHECK HARNESS CONTINUITY BETWEEN IDLE-UP SOLENOID VALVE AND E.C.U.
1) Stop engine.
2) Disconnect idle-up solenoid valve harness connector.
3) Disconnect 16-pin terminal connector.
4) Check resistance between terminal ⓑ and ⑪①.
Resistance:
Approximately 0Ω
If N.G. repair harness or connector.

O.K. ↓

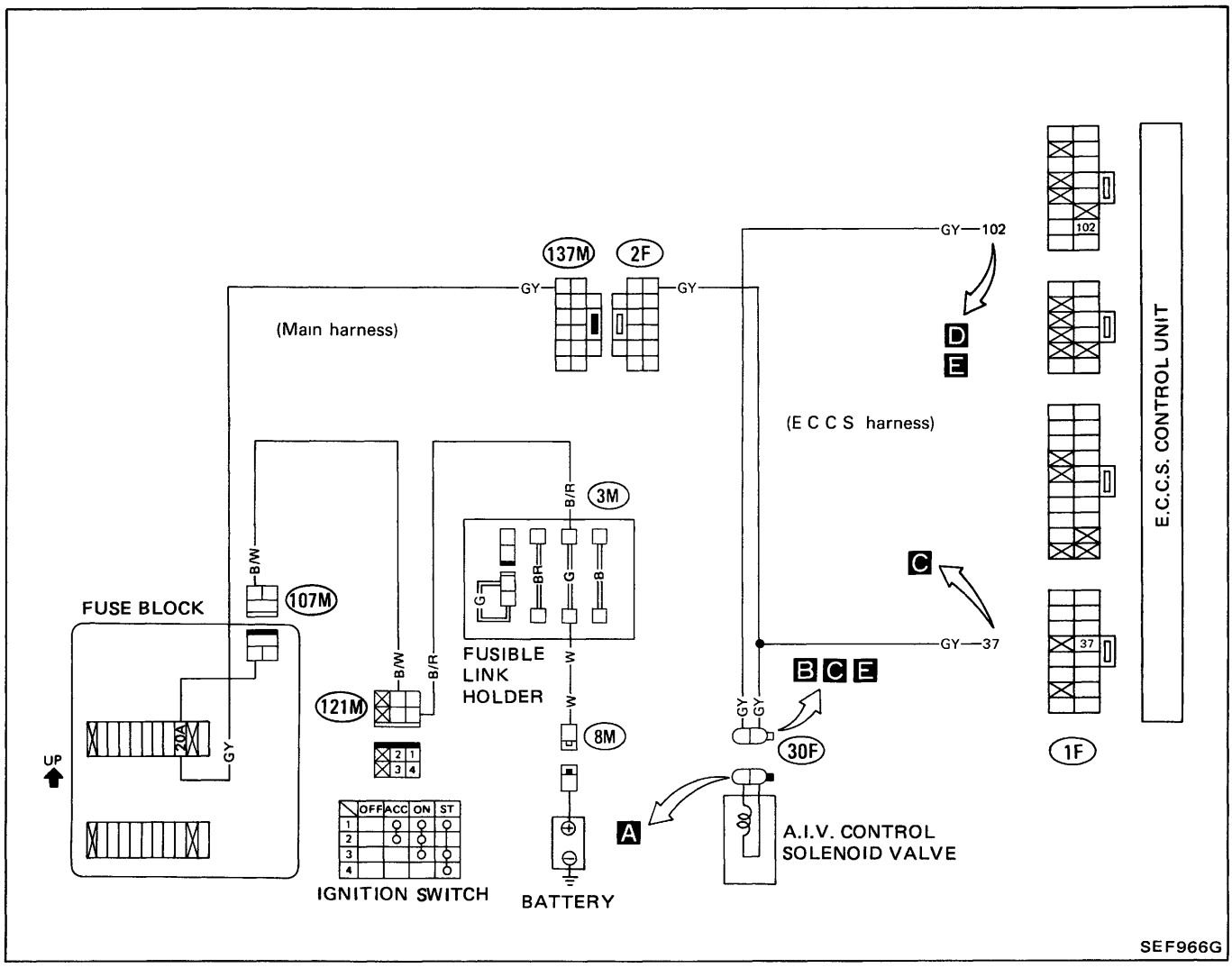
E

CHECK COMPONENTS
1) Stop engine.
2) Disconnect idle-up solenoid valve harness connector.
3) Check resistance between terminals ⓐ and ⓑ.
Continuity should exist.

N.G. → Replace idle-up solenoid valve.

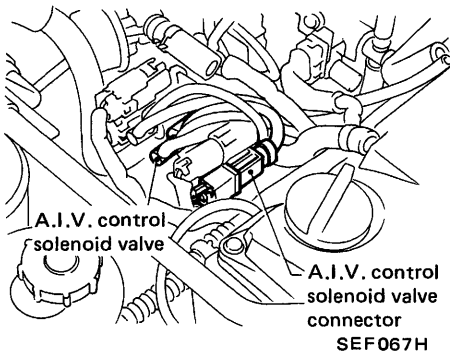
INSPECTION END

AIR INDUCTION VALVE (A.I.V.) CONTROL (Not self-diagnosis item)



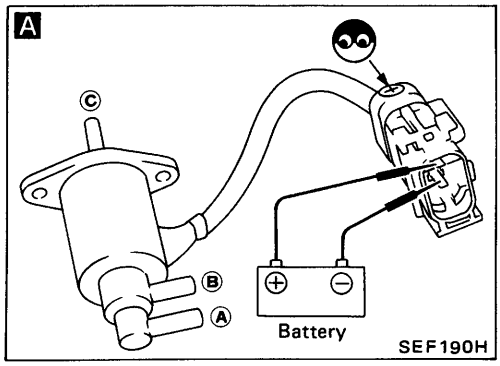
CAUTION:

When directly applying battery voltage to A.I.V. control solenoid valve, pay attention to the polarity. The solenoid valve will be broken if the polarity is reversed.



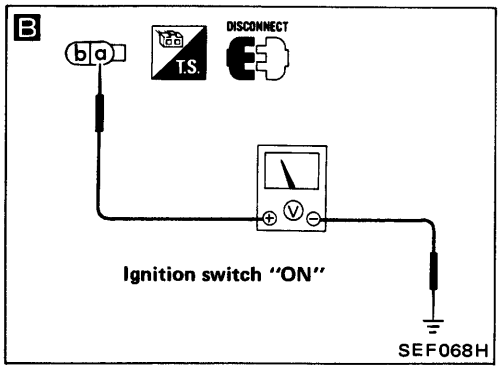
AIR INDUCTION VALVE (A.I.V.) CONTROL (Not self-diagnosis item)

A



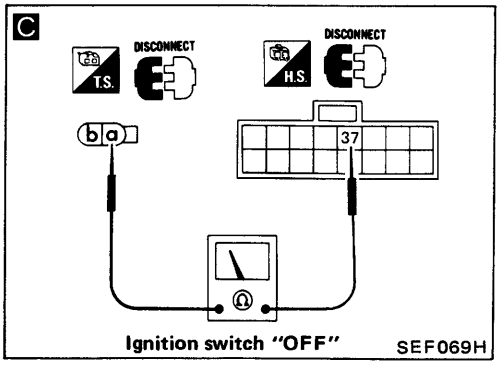
SEF190H

B



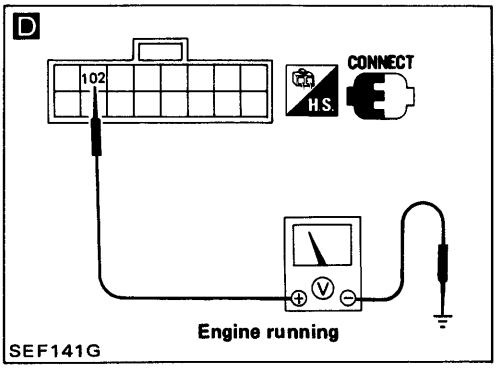
SEF068H

C



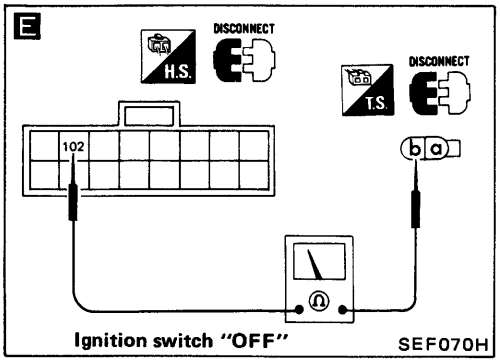
SEF069H

D



SEF141G

E



SEF070H

INSPECTION START

A

CHECK COMPONENTS
1) Remove A.I.V. control solenoid valve from vehicle.
2) Check A.I.V. control solenoid valve.

Condition	Continuity
Supply 12V direct current to A.I.V. control solenoid valve	Only Ⓐ - Ⓑ
Not supply	Only Ⓑ - Ⓒ

N.G. → Replace A.I.V. control solenoid valve.

O.K.

B

CHECK POWER SOURCE
1) Disconnect A.I.V. control solenoid valve harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → **C**

CHECK HARNESS CONTINUITY BETWEEN A.I.V. CONTROL SOLENOID VALVE AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect 16-pin terminal connector.
3) Check resistance between terminals ⓐ and ㊲.
Resistance:
Approximately 0Ω
If N.G., repair harness or connector.

O.K.

D

CHECK OUTPUT SIGNAL
1) Reconnect A.I.V. control solenoid valve harness connector.
2) Start engine and warm it up sufficiently.
3) Check voltage between E.C.U. terminal ⑩② and ground.

Accelerator pedal position	Voltage
Released	Approximately 0.8V
Depressed	Battery voltage

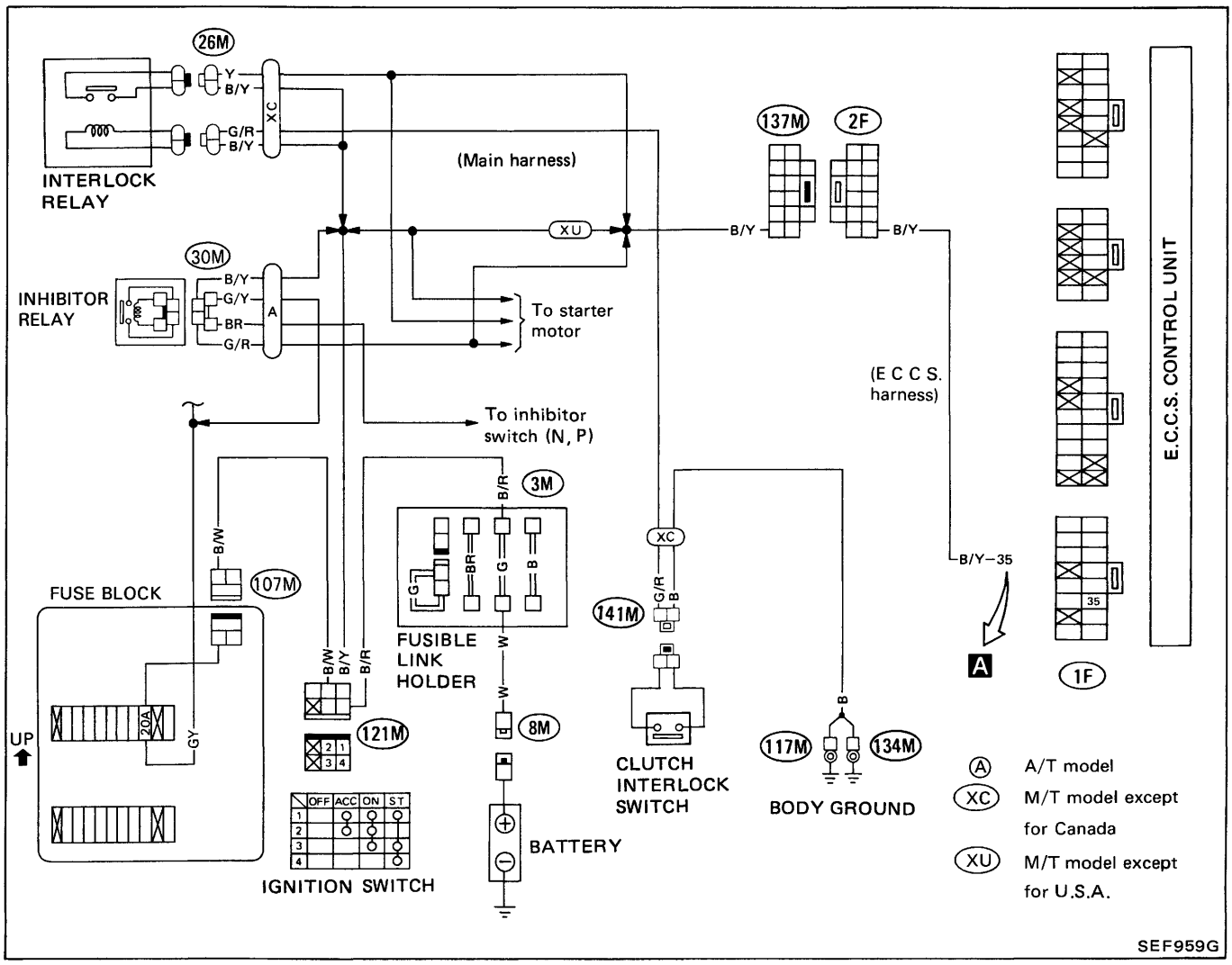
N.G. → **E**

CHECK HARNESS CONTINUITY BETWEEN A.I.V. CONTROL SOLENOID VALVE AND E.C.U.
1) Stop engine.
2) Disconnect A.I.V. control solenoid valve harness connector.
3) Disconnect 16-pin terminal connector.
4) Check resistance between terminals ⓑ and ⑩②.
Resistance:
Approximately 0Ω
If N.G., repair harness or connector.

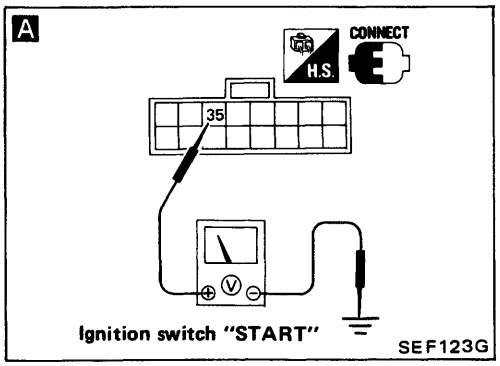
O.K.

INSPECTION END

START SIGNAL (Switch ON/OFF diagnosis)



START SIGNAL (Switch ON/OFF diagnosis)



INSPECTION START

Perform switch ON/OFF diagnosis (in Mode IV).
- O.K. → INSPECTION END
- N.G. → A

A

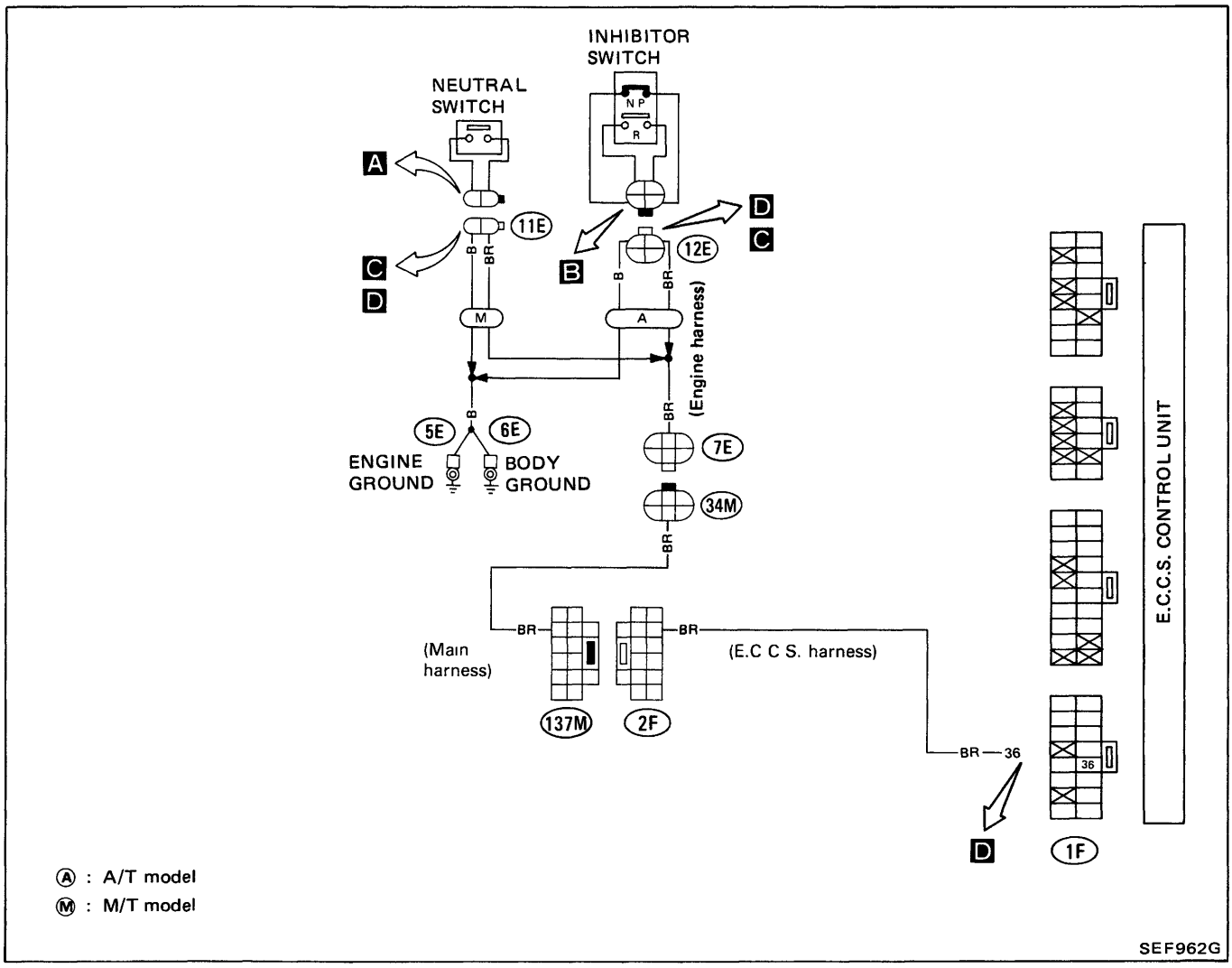
CHECK INPUT SIGNAL
1) Turn ignition switch "START".
2) Check voltage between terminal ㉟ and ground.
Voltage: 8 - 12V
If N.G., repair harness and connectors.
- N.G. → Check the following items:
  1) Fusible link "G"
  2) Ignition switch
  3) Middle harness connector
- O.K. →

Reinstall any part removed.

Preform driving test and then perform self-diagnosis Mode IV again.
- N.G. → 1) Perform E.C.U. input/output signal inspection test.
  2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.
- O.K. →

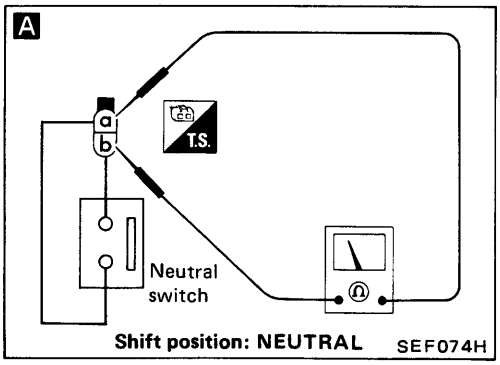
INSPECTION END

NEUTRAL AND INHIBITOR SWITCH (Not self-diagnosis item)



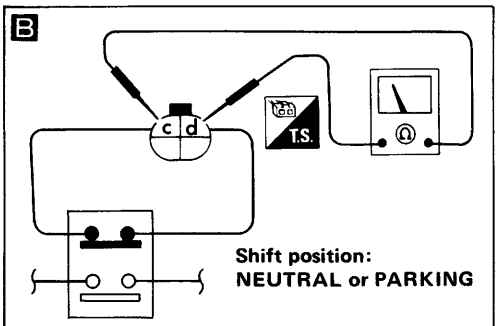
NEUTRAL AND INHIBITOR SWITCH (Not self-diagnosis item)

A



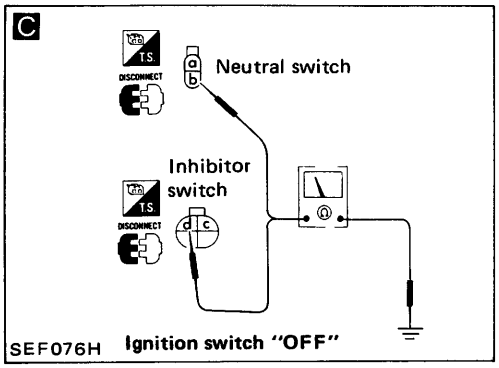
Shift position: NEUTRAL SEF074H

B



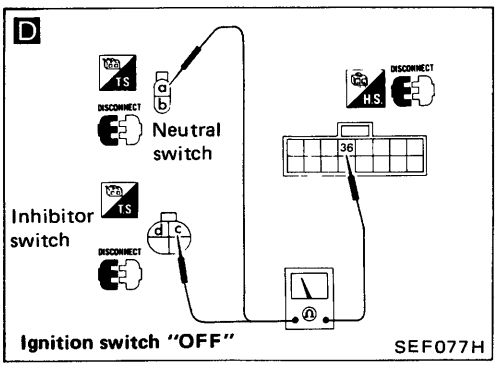
SEF075H

C



SEF076H Ignition switch "OFF"

D



Ignition switch "OFF" SEF077H

INSPECTION START

A B

Check neutral switch and inhibitor switch.

Neutral switch

Conditions	Continuity between terminals ⓐ and ⓑ
Shift to "Neutral"	Yes
Shift to other positions	No

Inhibitor switch

Conditions	Continuity between terminals ⓒ and ⓓ
Shift to "Neutral" or "Park"	Yes
Except above	No

If N.G., replace faulty switches.

O.K.

C

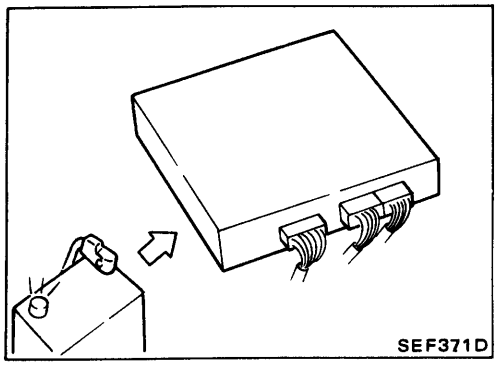
Check continuity between terminal ⓑ and ground (for neutral switch) and terminal ⓓ and ground (for inhibitor switch).
Continuity should exist.
If N.G., repair harness or connectors.

O.K.

D

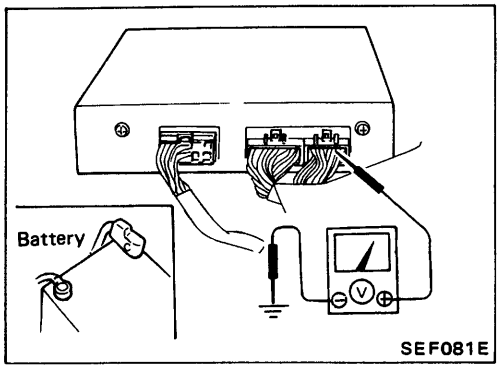
Check continuity between terminal ⓐ and ㊱ (for neutral switch), and terminals ⓒ and ㊱ (for inhibitor switch).
Continuity should exist.
If N.G., repair harness or connectors.

INSPECTION END


SEF371D

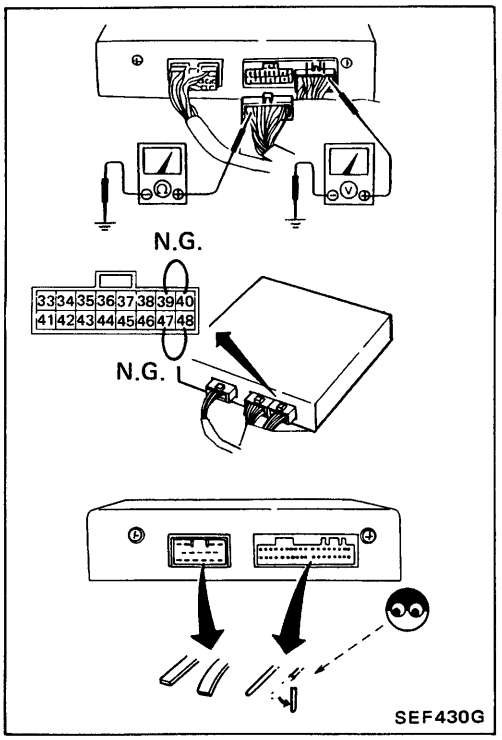
MEASUREMENT VOLTAGE OR RESISTANCE OF E.C.U.

1. Disconnect battery ground cable.
2. Remove assist side seat from vehicle.
3. Disconnect connectors from E.C.U.



SEF081E

4. Connect connectors to E.C.U. carefully.
5. Connect battery ground cable.
6. Measure the voltage at each terminal by following "E.C.U. inspection table".



SEF430G

CAUTION:

a. **Perform all voltage measurements with the connectors connected.**
b. **Perform all resistance measurements with the connectors disconnected.**
c. **Make sure that there are not any bends or breaks on E.C.U. pin terminal before measurements.**
d. **Do not touch tester probes between terminals ㊴ and ㊵, ㊼ and ㊽.**

E.C.U. inspection table

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
1	Ignition signal	Engine is running.	0 - 1.0V
7	Exhaust gas temperature sensor	Engine is running. └Idle speed	1.0V or more
		Engine is running. └E.G.R. system is operating.	0 - 1.0V
15	Air flow meter	Engine is running. **Do not run engine at high speed under no-load.**	0.5 - 4.0V Output voltage varies with engine revolution.
17	Water temperature sensor	Engine is running.	0.5 - 5.0V Output voltage varies with engine water temperature.
18	Exhaust gas sensor	Engine is running. └After warming up sufficiently	0 - Approximately 1.0V
19	Throttle sensor	Ignition switch "ON"	0.4 - 4.0V Output voltage varies with the throttle valve opening angle.
21 31	Crank angle sensor (Reference signal)	Engine is running. **Do not run engine at high speed under no-load.**	0.3 - 0.5V
22 32	Crank angle sensor (Position signal)	Engine is running. **Do not run engine at high speed under no-load.**	2.0 - 2.7V
34	Idle switch (⊖ side)	Ignition switch "ON" └Throttle valve: Idle position	Approximately 10V
		Ignition switch "ON" └Throttle valve: Any position except idle position	Approximately 0V
35	Start signal	Cranking	8 - 12V

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
36	Neutral switch & Inhibitor switch	Ignition switch "ON" └Neutral/Parking	0V
		Ignition switch "ON" └Except the above gear position	Approximately 6.5V
37	Ignition switch	Ignition switch "OFF"	0V
		Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
41	Air conditioner	Engine is running. └Both air conditioner switch and blower switch are "ON".	BATTERY VOLTAGE (11 - 14V)
43	Power steering switch	Engine is running. └Steering wheel is turned.	Approximately 0V
		Engine is running. └Except above operation	Approximately 7.0 - 9.0V
44	Idle switch (⊕ side)	Ignition switch "ON" └Throttle valve: Idle position	Approximately 9 - 11V
		Ignition switch "ON" └Throttle valve: Except idle position	BATTERY VOLTAGE (11 - 14V)
46	Power source	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
39 47	Power source for E.C.U.	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
101 110	Injector	Engine is running.	BATTERY VOLTAGE (11 - 14V)

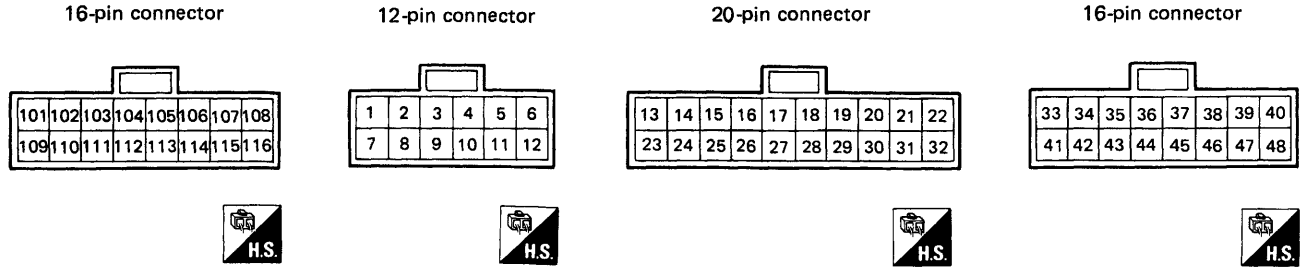
*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
102	A.I.V. control solenoid valve	Engine is running. — Idle speed	Approximately 0.8V
		Engine is running. — Accelerator pedal is depressed. — After warming up	BATTERY VOLTAGE (11 - 14V)
104	Fuel pump relay	Ignition switch "ON" — For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
		Ignition switch "ON" — In 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
105	E.G.R. & canister control solenoid valve	Engine is running. — Engine is cold. [Water temperature is below 60°C (140°F).]	0.6 - 0.9V
		Engine is running. — After warming up [Water temperature is above 60°C (140°F).]	BATTERY VOLTAGE (11 - 14V)
106	Mixture heater relay	Engine is running. — Engine is cold. [Water temperature is below 50°C (122°F).]	Approximately 0.7V
		Engine is running. — After warming up [Water temperature is above 50° (122°F).]	BATTERY VOLTAGE (11 - 14V)

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
111	Idle-up solenoid valve	Engine is running. — After warming up — Idle speed	BATTERY VOLTAGE (11 - 14V)
		Engine is running. — After warming up — Idle speed — Power steering switch is "ON"	Approximately 0.9V
114	A.A.C. valve	Engine is running. — Idle speed	7 - 8V
		Engine is running. — Power steering switch is "ON" — Air conditioner is operating. — Rear defogger is "ON". — Headlights are in high position.	4 - 7V

E.C.U. PIN CONNECTOR TERMINAL LAYOUT



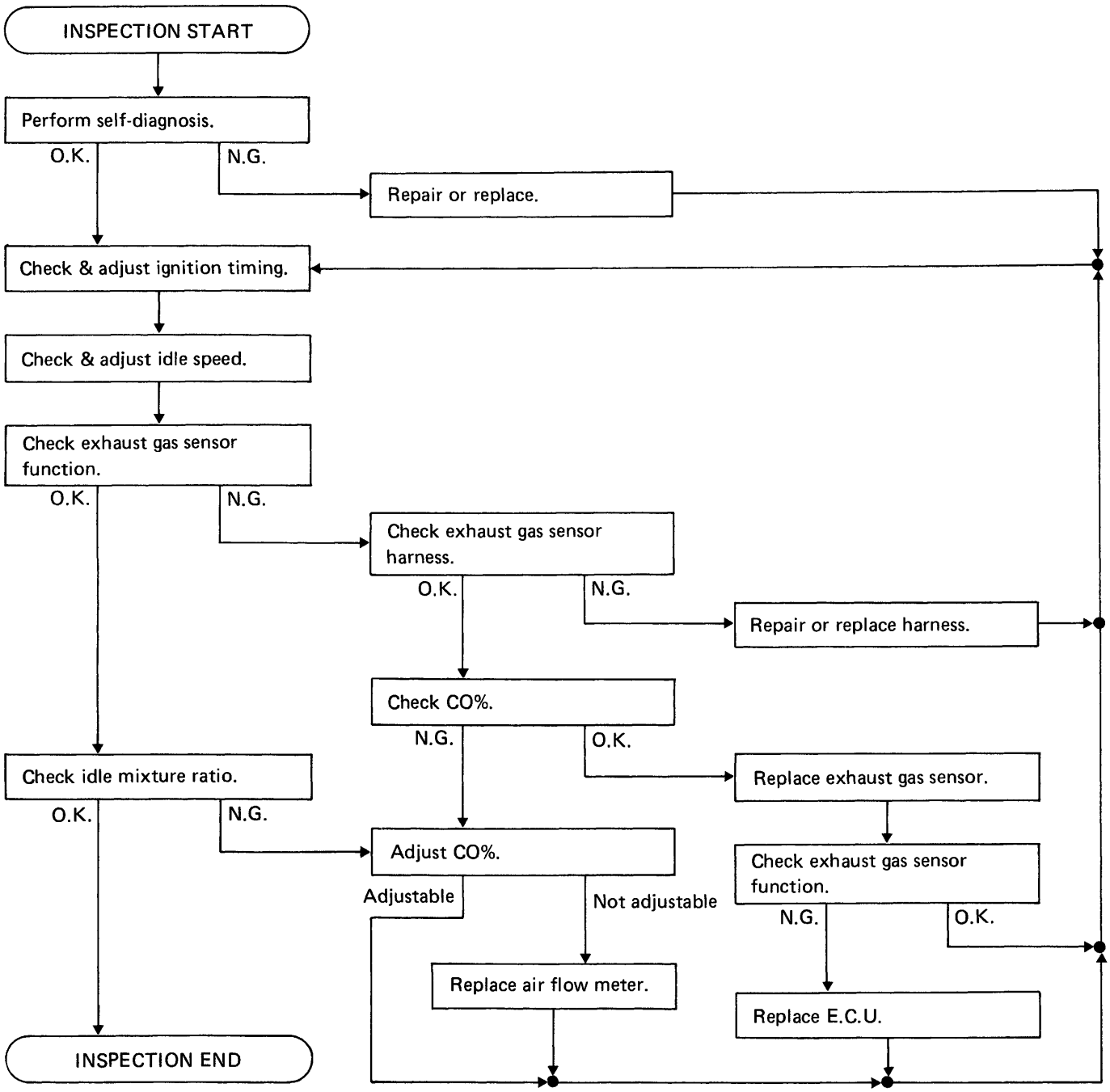
SEF324H

PREPARATION

1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.C.S. harness connectors
- Vacuum hoses
- Air intake system
  (oil filler cap, oil level gauge, etc.)
- Fuel pressure
- A.I.V. hose
- Engine compression
- E.G.R. valve operation
- Throttle valve

2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
4. This inspection should be performed under the condition that air cleaner is installed correctly. Air cleaner removal may cause improper idling.

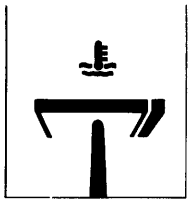
Overall inspection sequence



Idle Check and Set Procedure

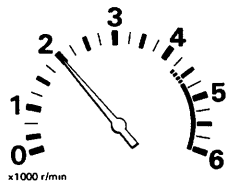
INSPECTION START

Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- E.G.R. valve operation
- Electrical connectors
- Gaskets
- Throttle valve and throttle sensor operation
- A.I.V. hose



SEF355D

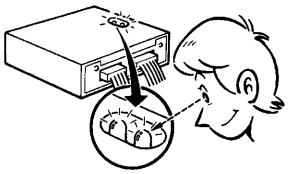
Start engine and warm up until water temperature indicator points to the middle of gauge.



SMA406B

Run engine at about 2,000 rpm for about 2 minutes under no-load.

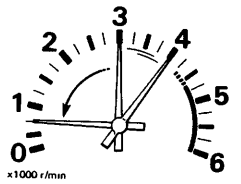
Perform E.C.C.S. self-diagnosis.



SEF332D

O.K. N.G.

Repair or replace components as necessary.



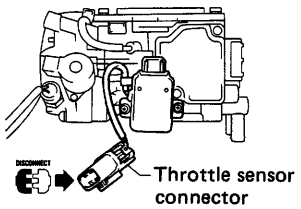
SMA407B

Race engine two or three times under no-load and run engine for about one minute at idle speed.

Check ignition timing.

7°±5° B.T.D.C.

O.K. N.G.



Throttle sensor connector

SEF276H

Turn off engine and disconnect throttle sensor harness connector.

Start engine, race engine two or three times under no-load and run engine at idle speed.

Adjust ignition timing to the specified value by turning distributor after loosening distributor securing bolt.

7° B.T.D.C.

Re-connect throttle sensor harness connector.

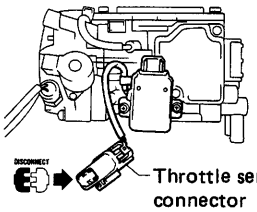
Ⓐ Ⓑ

Ⓐ

Check idle speed.

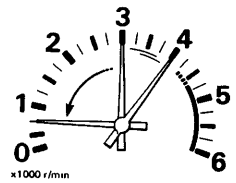
Idle speed:
M/T 800±100 rpm
A/T 750±100 rpm (in "D" position)

O.K. | N.G.



SEF276H

Turn off engine and disconnect throttle sensor harness connector.

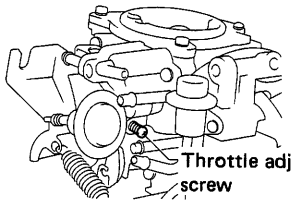


SMA407B

Start engine, race engine two or three times under no-load and run engine at idle speed.

Adjust idle speed by turning throttle adjust screw.

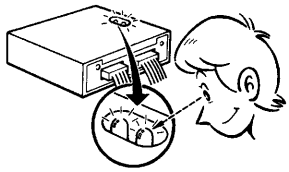
Idle speed:
M/T 725±50 rpm
A/T 675±50 rpm (in "D" position)



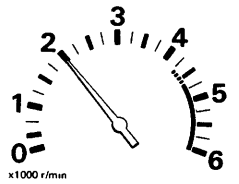
SEF277H

Turn off engine and re-connect throttle sensor harness connector.

Start engine.


SEF332D

Run engine at about 2,000 rpm for about 2 minutes under no-load.

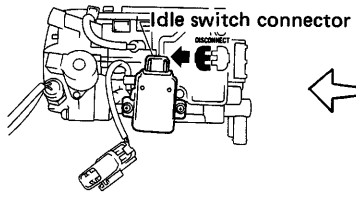


SMA406B

Keep engine speed at 2,000 rpm and make sure that green inspection lamp on E.C.U. goes ON and OFF more than 5 times during 10 seconds.

N.G.

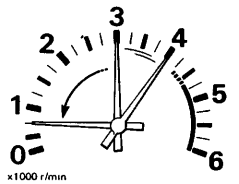
O.K.



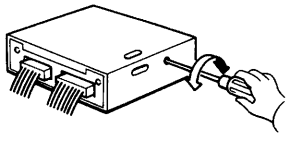
SEF278H

Disconnect idle switch harness connector.

Race engine two or three times under no-load, then run engine at idle speed.

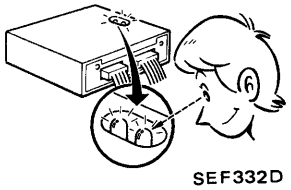


SMA407B


SEF957D

Set the diagnosis mode selector of E.C.U. to Mode II.

Check if green and red inspection lamps on E.C.U. flash simultaneously.

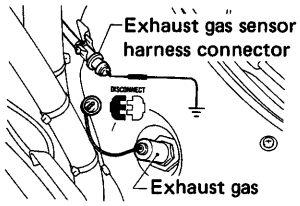

SEF332D

Yes | No

Connect throttle valve switch harness connector.

INSPECTION END

Ⓓ Ⓒ

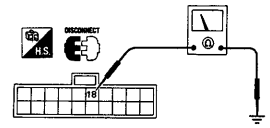


SEF279H

Check exhaust gas sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect 20-pin connector from E.C.U.
3) Disconnect exhaust gas sensor harness connector and connect main harness side terminal to ground with a jumper wire.
4) Check for continuity between terminal No. 18 of 20-pin connector and body ground.

Continuity exists ..... O.K.
Continuity does not exist ..... N.G.

After checking remove the jumper wire.

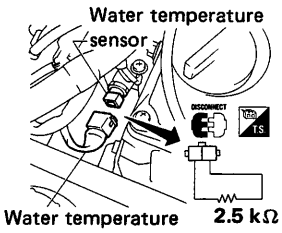

E.C.U. 20-pin connector
SEF280H

O.K.

N.G.

Repair or replace harness.

Connect 20-pin connector to E.C.U.

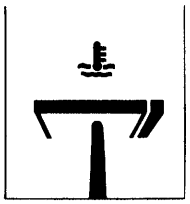


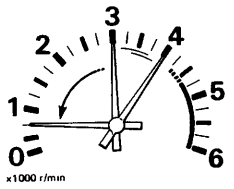
SEF281H

- Disconnect water temperature sensor harness connector.
- Connect a resistor (2.5 kΩ) between terminals of water temperature sensor harness connector.

- Disconnect A.I.V. hose and apply blind plug to the hose.
- Disconnect A.I.V. control solenoid valve harness connector.

Connect battery ground cable. Start engine and warm it up until water temperature sensor indicator points to the middle of gauge.


SEF355D



SMA407B

Race engine two or three times under no-load, then run engine at idle.

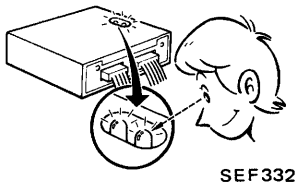
Check CO%.

Idle CO: 3.0 - 10.0%

After checking CO%,
1) Disconnect the resistor from terminals of water temperature sensor harness connector.
2) Connect water temperature sensor harness connector to water temperature sensor.
3) Reconnect A.I.V. hose.
4) Reconnect A.I.V. control solenoid valve harness connector.

N.G.

O.K.


SEF332D

Replace exhaust gas sensor.

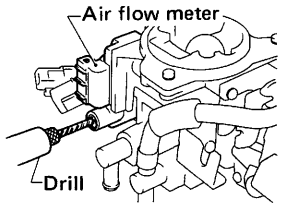
Run engine at 2,000 rpm and make sure that green inspection lamp on E.C.U. goes ON and OFF more than 5 times during 10 seconds.

O.K. / N.G.

Replace E.C.U.

Connect exhaust gas sensor harness connector to exhaust gas sensor.

Turn off engine and remove throttle body from vehicle.

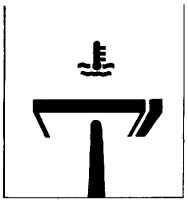


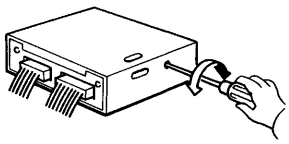
SEF282H

Drill a hole in seal plug which seals variable resistor of air flow meter and remove seal plug.

Install throttle body on vehicle.

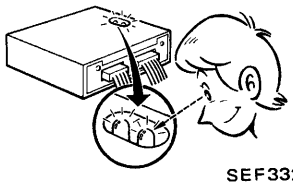
Start engine and warm it up until water temperature sensor indicator points to the middle of gauge.


SEF355D


SEF957D

Set the diagnosis mode selector of E.C.U. to Mode II.

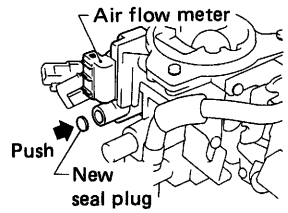
Adjust idle mixture ratio by turning variable resistor of air flow meter so that green and red inspection lamps on E.C.U. flash simultaneously at 2,000 rpm under no-load.


SEF332D

Adjustable / Not adjustable

Replace air flow meter.

Turn off engine and remove throttle body from vehicle.

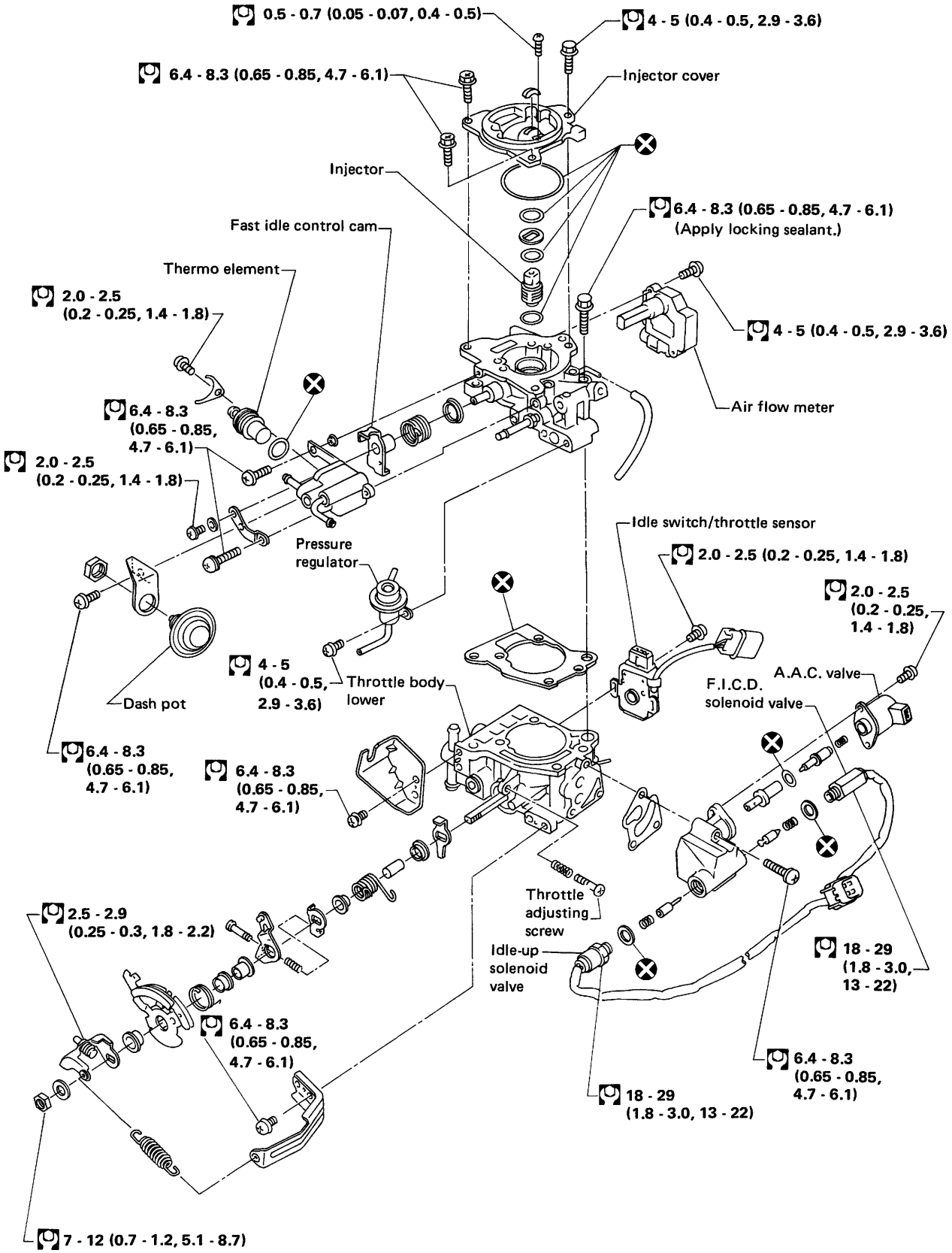


SEF283H

Install new seal plug into variable resistor hole of air flow meter.

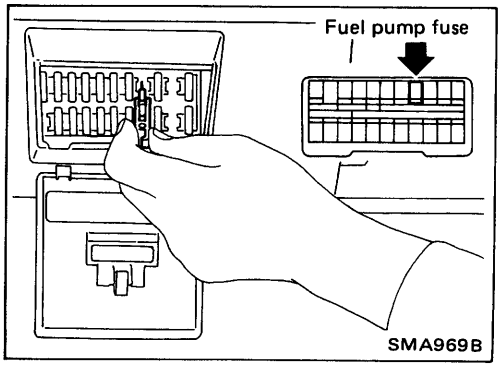
Install throttle body on vehicle.

Throttle Body Component Parts



: N·m (kg-m, ft-lb)

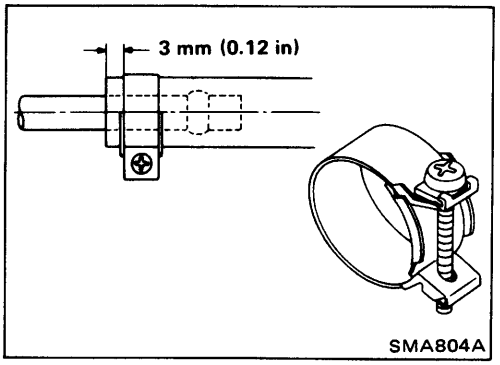
SEF088H



Releasing Fuel Pressure

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

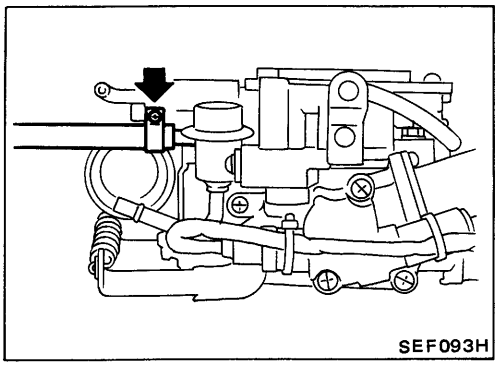
(1) Disconnect the fuse for the fuel pump.
(2) Start the engine.
(3) After the engine stalls, crank the engine twice or three times.
(4) Turn the ignition switch "OFF".



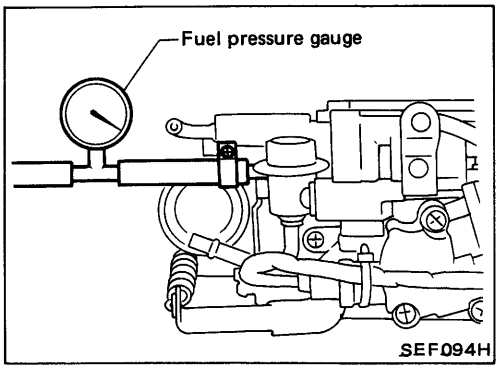
Fuel Pressure Check

a. Tighten the clamp so its end is 3 mm (0.12 in) from the hose end.
b. Make sure that the screw of the clamp does not contact with any adjacent parts.
c. Use Pressure Gauge to check fuel pressure.

Fuel hose clamps:
: 1.0 - 1.5 N·m
(0.10 - 0.15 kg-m, 0.7 - 1.1 ft-lb)



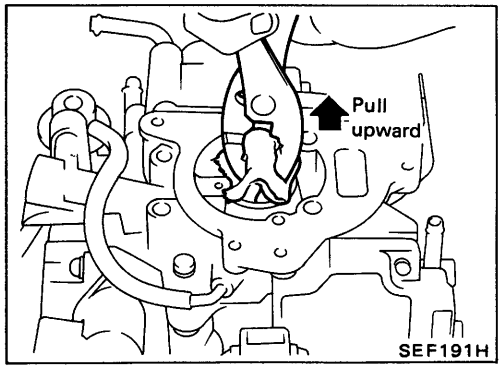
1. Release fuel pressure.
2. Disconnect the fuel inlet hose at the electro injection unit.



3. Install a pressure gauge.
4. Start the engine and check the fuel line for fuel leakage.
5. Read fuel pressure gauge.

At idling speed:
Approximately 299.1 kPa
(3.05 kg/cm², 43.4 psi)

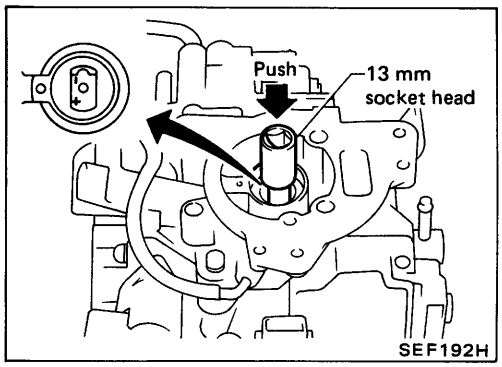
6. Release fuel pressure again.
7. Remove the pressure gauge from the fuel line.
8. Reconnect the fuel inlet hose.



Injector Removal

1. Release fuel pressure.
2. Remove injector cover and pull out injector straight upward.

- **Take care not to break or bend injector terminal.**

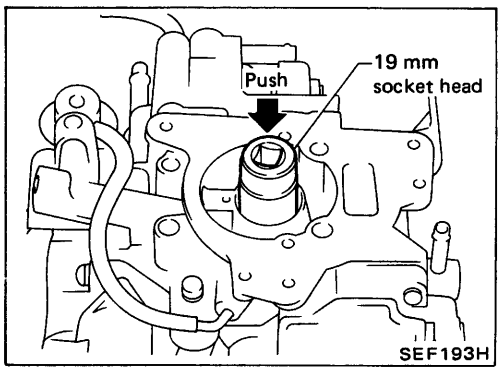


Injector Installation

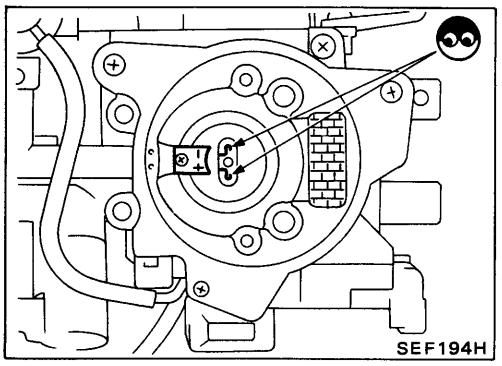
- **Always replace O-rings with new ones.**
- **When installing, smear a little of engine oil to O-rings.**

1. Install lower O-ring.
2. Install fuel injector and push it using suitable tool (or a socket head of 13 mm).

- **Align the direction of the injector terminals.**
- **Take care not to bend injector terminal.**



3. Install upper O-ring and push it using suitable tool (or a socket head of 19 mm).
4. Install upper plate (white one).



5. Install injector cover with rubber plug removed.

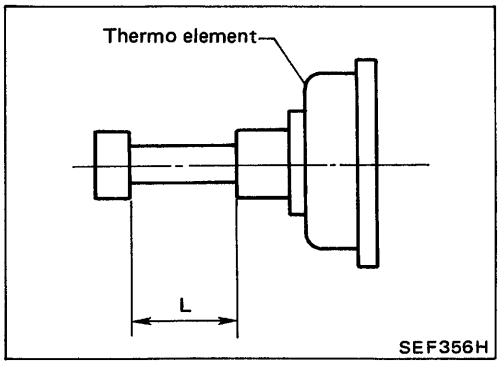
- Make sure that two O-rings (small one and big one) are installed in the injector cover.

6. Check the proper connection between injector terminal and injector cover terminal, then install rubber plug.

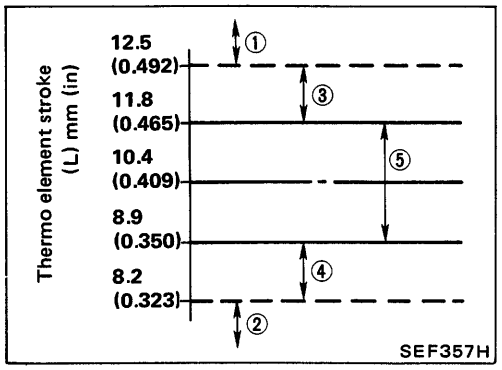
- After installation, check that there is no fuel leakage and engine idling condition is stable and proper.

Fast Idle Inspection and Adjustment

1. Warm up engine until radiator fan operates.
   Then measure thermo element stroke (L).

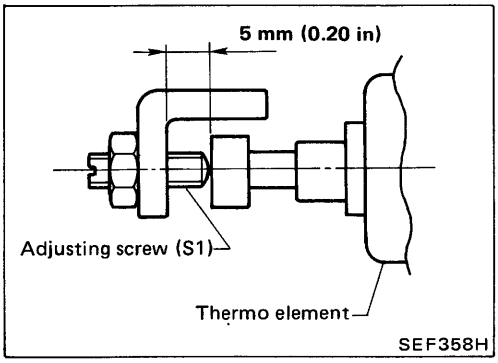


2. Check thermo element stroke (L) as shown in the figure.

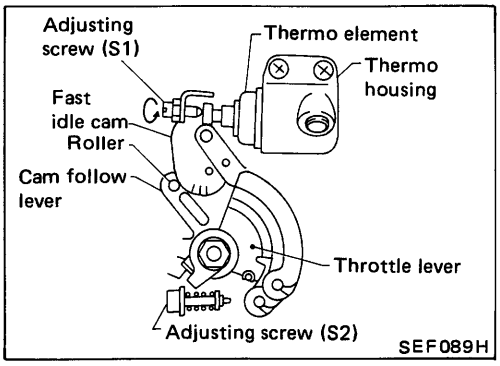


L: Thermo element stroke	① or ②	③ or ④	⑤
Go to step	3	4	5

Fast Idle Inspection and Adjustment (Cont'd)



3. Replace thermo element.
- After replacing thermo element, set the adjusting screw (S1) as shown in the figure.
  Then return to step 1.



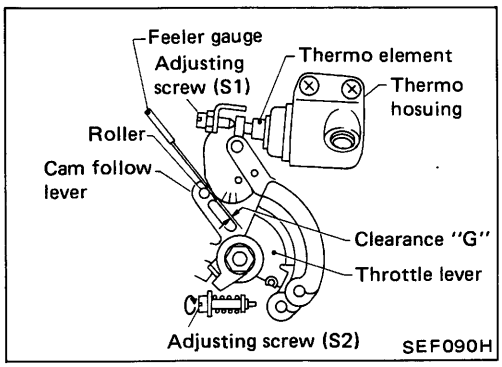
4. Adjust fast idle cam position.

$$\frac{L\ (mm) - 10.40\ (mm)}{0.50\ (mm)} = Z \Big/ \frac{L\ (in) - 0.4094\ (in)}{0.0197\ (in)} = Z$$

Turn the adjusting screw (S1) Z revolution counterclockwise or clockwise.

For example:

	③	④
Thermo element stroke (L) mm (in)	12.40 (0.4882)	8.60 (0.3386)
Revolution of adjusting screw (Z) mm/in	$\frac{12.40 - 10.40}{0.50} = 4.0 \Big/ \frac{0.4882 - 0.4094}{0.0197} = 4.0$	$\frac{8.60 - 10.40}{0.50} = -3.6 \Big/ \frac{0.3386 - 0.4094}{0.0197} = -3.6$
Direction of revolution	Counterclockwise	Clockwise



5. Warm up engine until radiator fan operates.
6. Check the clearance "G" between the roller and the fast idle cam.

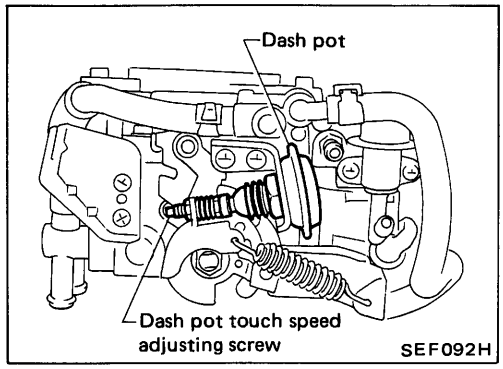
Clearance "G":
M/T 1.8 - 4.9 mm (0.071 - 0.193 in)
A/T 1.9 - 5.4 mm (0.075 - 0.213 in)

If not within specification, correct the clearance "G" by turning the adjusting screw (S2).

Adjust clearance "G":
M/T 2.1 - 4.1 mm (0.083 - 0.161 in)
A/T 2.4 - 4.9 mm (0.094 - 0.193 in)

Verify clearance "G" measurement when radiator fan start operating.

Dash Pot Inspection and Adjustment



1. The idle speed of the engine must be well tuned, and the engine warmed up to normal operation.
2. Turn the throttle valve by hand, and read the engine speed when the dash pot just touches the adjusting screw.

Dash pot touch speed:
M/T 1,800 - 2,200 rpm
A/T 2,000 - 2,800 rpm (in "N" position)

3. If out of the specification, adjust it by turning the adjusting screw.

Description

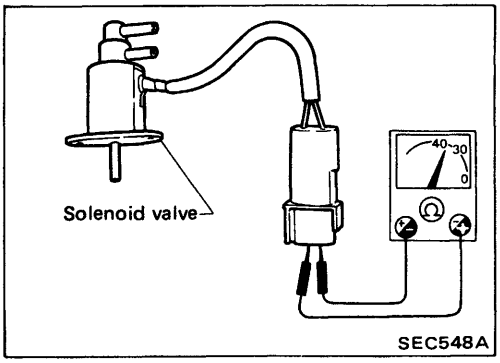
In the exhaust gas recirculation system, some of the exhaust gas is returned to the combustion chamber to lower the flame temperature during combustion. This results in a reduction of the nitrogen oxide density in the exhaust gas.

When the E.G.R. & canister control solenoid valve is open, some of the exhaust gas is led from the exhaust manifold to the E.G.R. tube. The exhaust gas is then regulated by E.G.R. valve, and is introduced into the intake manifold.

The E.G.R. & canister control solenoid valve is controlled by the E.C.U. Refer to "E.G.R. & Canister Purge Control" of E.C.C.S. SYSTEM DESCRIPTION.

Inspection

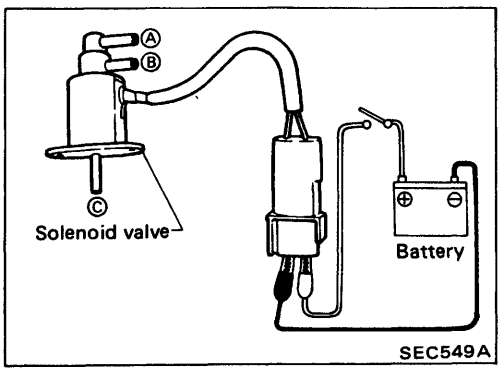
- **Perform E.G.R. circuit test. (See page EF & EC-102.)**
- **Perform E.C.U. input/output test. (See page EF & EC-136.)**



E.G.R. & CANISTER CONTROL SOLENOID VALVE

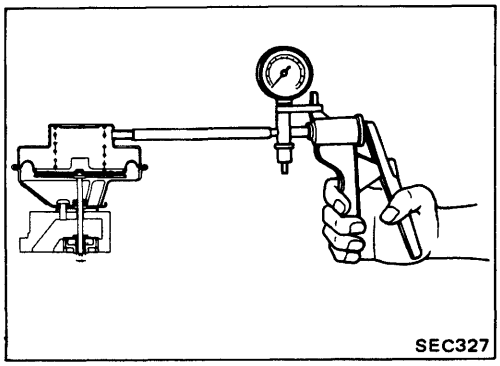
1. Check the solenoid valve for electric continuity, after disconnecting the harness connector.

Continuity should exist.



2. Check the solenoid valve for normal operation, after disconnecting the harness connector and all the vacuum hoses. Supply the solenoid valve with battery voltage, and check whether there is continuity between ports A, B and C.

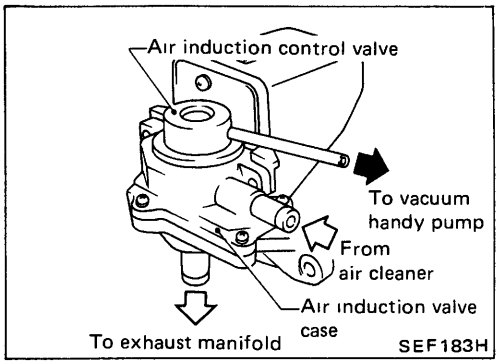
Item \ Solenoid valve	OFF	ON
Continuity	B-C	A-B



E.G.R. CONTROL VALVE

1. Supply the E.G.R. control valve with vacuum using a handy vacuum pump.
2. Place a finger on the diaphragm of the valve, and make sure that the diaphragm lifts up and down in response to the vacuum leading to the valve.

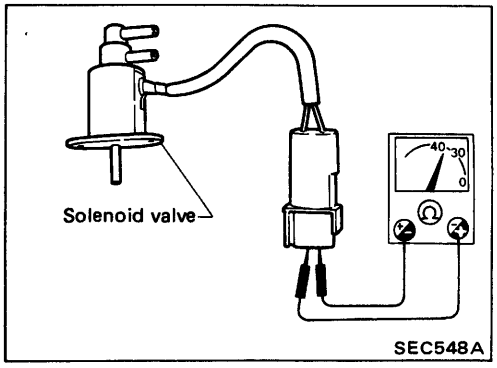
Full open of E.G.R. valve:
Over –9.3 kPa
(–70 mmHg, –2.76 inHg)



- **Perform A.I.V. circuit test. (See page EF & EC-130.)**
- **Perform E.C.U. input/output test. (See gage EF & EC-136.)**

AIR INDUCTION VALVE AND AIR INDUCTION CONTROL VALVE

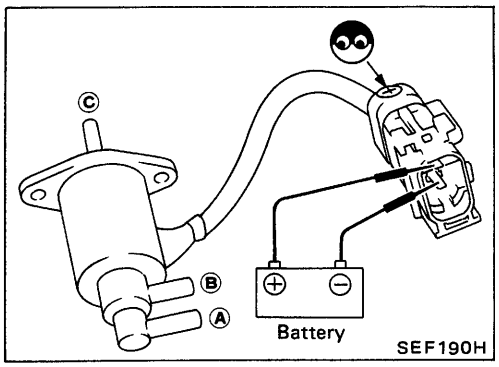
1. Disconnect air induction hose at air induction pipe side. Suck or blow hose to make sure that air flow does not exist.
2. Connect a vacuum handy pump to the air induction control valve.
3. Suck or blow air induction hose to make sure that air flows only on the air induction pipe side while control valve is operated.
4. Check air induction valve and air induction control valve for binding or damage. If necessary, replace.



AIR INDUCTION CONTROL SOLENOID VALVE

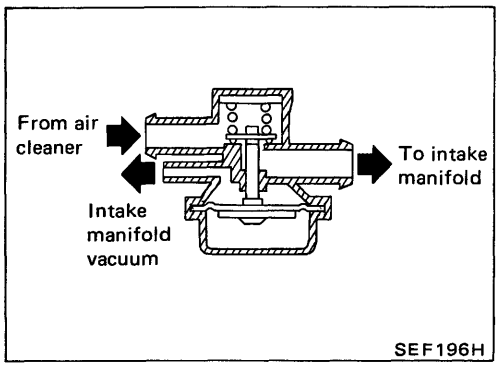
1. Check it for electric continuity.

Continuity should exist.



2. Check the solenoid valve for normal operation. Supply it with battery voltage, and check whether there is continuity between ports A, B and C.

Item \ Solenoid valve	OFF	ON
Continuity	B - C	A - B

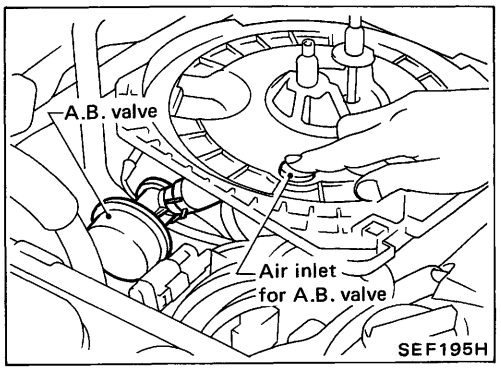


A.B. VALVE

Description

During deceleration the fuel mixture becomes excessively rich due to the high manifold vacuum which occurs when the throttle closes. This excess fuel is passed through to the exhaust where it combines with the air supplied by the air induction valve, causing afterburn or backfire. In addition to afterburn, the excessively rich mixture creates unnecessary hydrocarbon emissions.

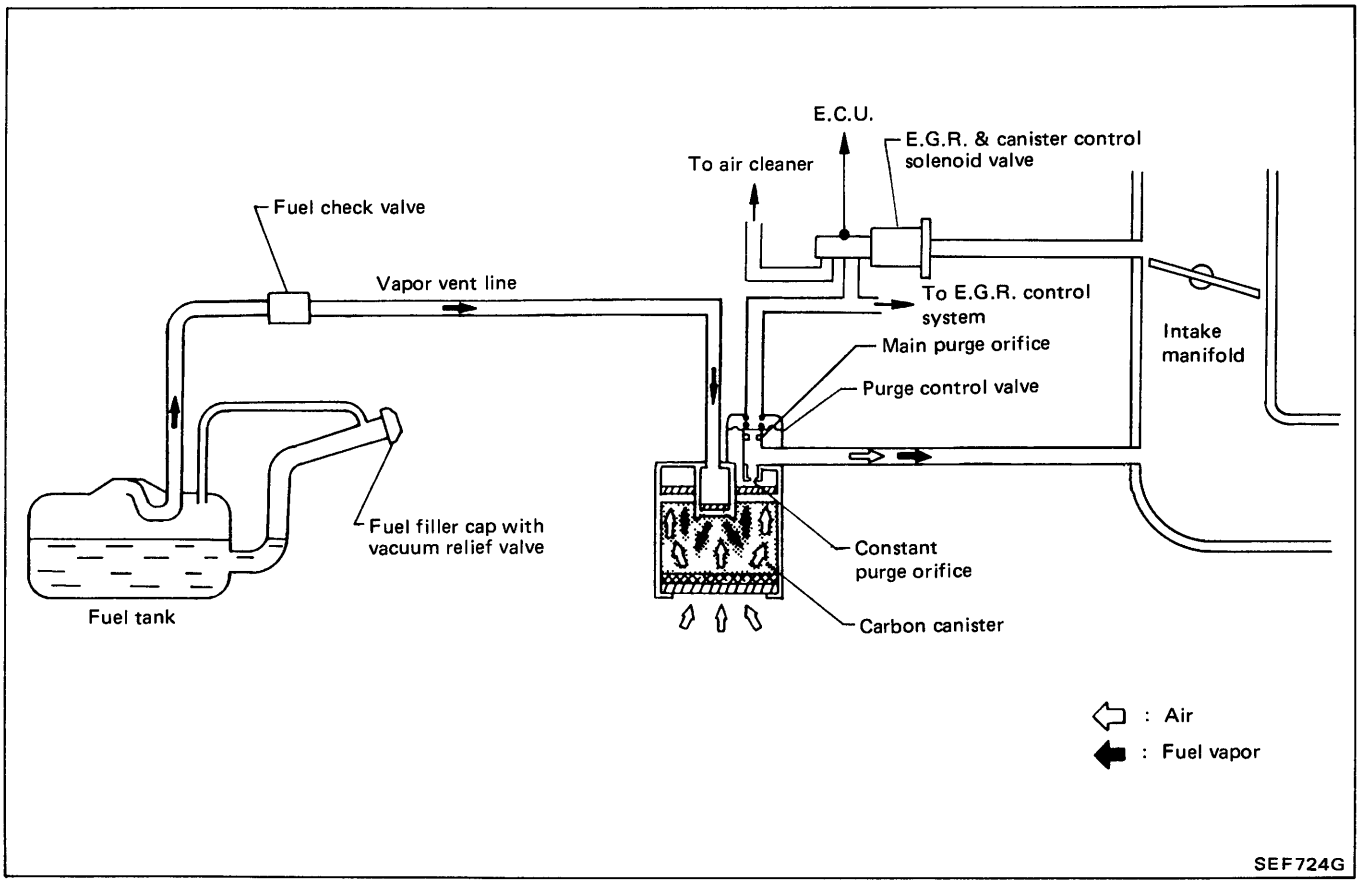
To prevent this condition, the A.B. valve is designed to sense high manifold vacuum and open an air passage into the intake manifold. This extra air introduced into the intake manifold leans out the fuel mixture before it can pass into the exhaust manifold, preventing both backfire and excessive HC emissions.



Inspection

1. Warm up the engine.
2. Remove the air cleaner cover and the air cleaner filter.
3. Run the engine at approximate 3,000 rpm under no load, then quickly return it to idling. If you feel pull or suction force on your finger, the A.B. valve is functioning normally. If no suction is felt, replace the A.B. valve with new one.

Description



The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

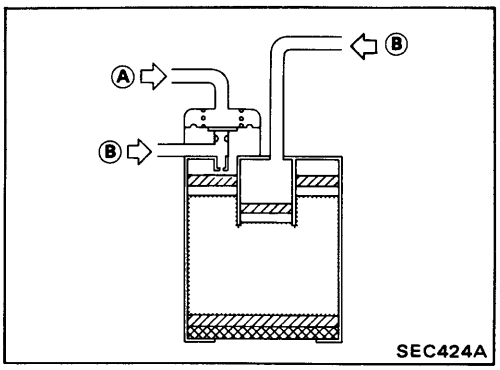
The fuel vapor from the sealed fuel tank is led into the canister which contains activated carbon and the vapor is stored there when the engine is not running.

The canister retains the fuel vapor until the canister is purged by the air drawn through the bottom of the canister to the intake manifold when the engine is running. When the engine runs at idle, the purge control valve is closed.

Only a small amount of stored vapor flows into the intake manifold through the constant purge orifice. As the engine speed increases, and the throttle vacuum rises higher, the purge control valve opens and the vapor is sucked into the intake manifold through both the main purge orifice and the constant purge orifice.

The canister purge is also controlled by the E.C.U. and vacuum cut solenoid valve, according to warm-up conditions or driving conditions.

Refer to "E.G.R. & Canister Purge Control" of E.C.C.S. SYSTEM DESCRIPTION.

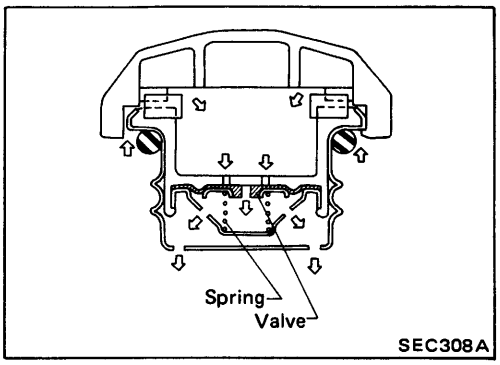


Inspection

CARBON CANISTER

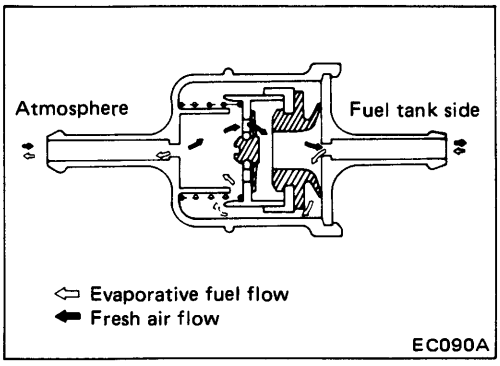
Check carbon canister as follows.

Ⓐ : Blow air and ensure that there is no leakage.
Ⓑ : Blow air and ensure that there is leakage.



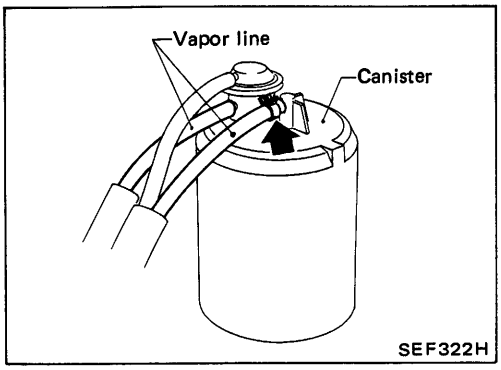
FUEL TANK VACUUM RELIEF VALVE

1. Wipe clean valve housing.
2. Inhale air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should be disappeared with valve clicks.
3. If valve is clogged, or if no resistance is felt, replace cap as an assembly.



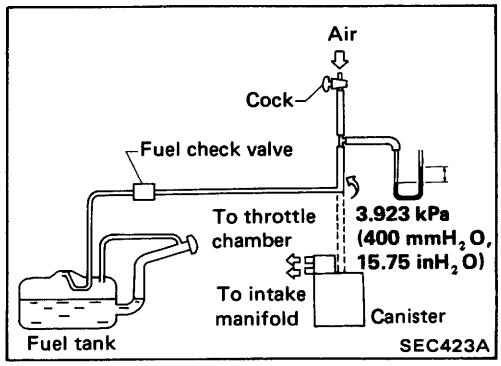
FUEL CHECK VALVE

1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow be directed toward the canister.
2. Blow air through connector on the canister side.
   Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected of not being properly functioning in steps 1 and 2 above, replace it.



VAPOR VENT LINE

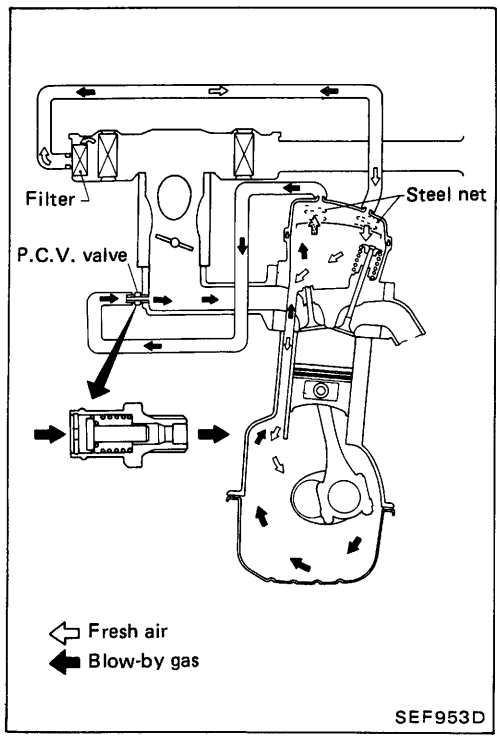
1. Check hoses and fuel tank filler cap.
2. Disconnect the vapor vent line connecting carbon canister to fuel tank.
3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line.
4. Supply fresh air into the vapor vent line through the cock little by little until pressure becomes 3.923 kPa (400 mmH_2O, 15.75 inH_2O).
5. Shut the cock completely and leave it unattended.
6. After 2.5 minutes, measure the height of the liquid in the manometer.
7. Variation in height should remain at 0.245 kPa (25 mmH_2O, 0.98 inH_2O).
8. When filler cap does not close completely, the height should drop to zero in a short time.



Inspection (Cont'd)

9. If the height does not drop to zero in a short time when filler cap is removed, the cause is a blocked hose or a clogged fuel check valve.

In case the vent line is blocked, the fuel tank is not vented properly causing insufficient delivery of fuel to engine, or vapor lock. It must, therefore, be repaired.



Description

This system returns blow-by gas to both the intake manifold and air cleaner.

The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.

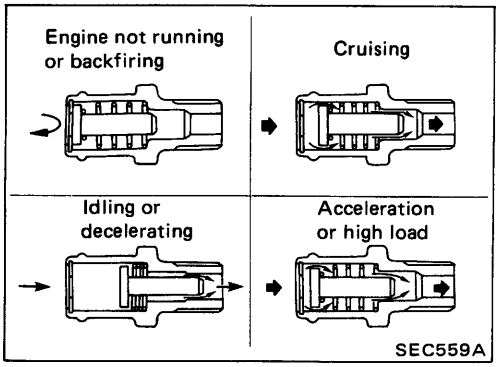
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.

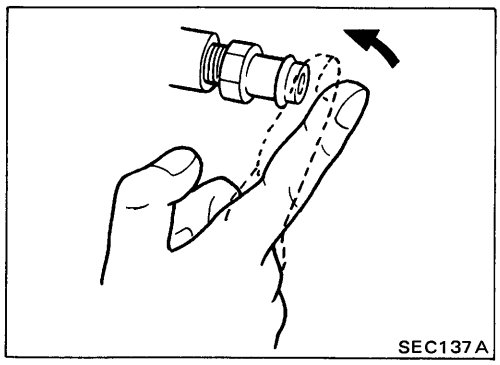
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is then drawn from the air cleaner, through the hose connecting air cleaner to rocker cover, into the crankcase.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air cleaner under all conditions.

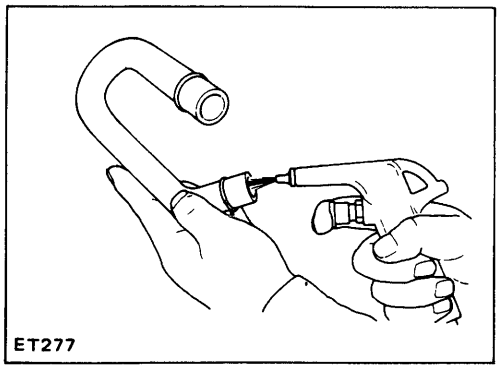




Inspection

P.C.V. VALVE

With engine running at idle, remove ventilation hose from P.C.V. valve; if valve is working properly a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

General Specifications

THROTTLE BODY ASSEMBLY		
Throttle chamber bore	mm (in)	46 (1.81)
PRESSURE REGULATOR		
Regulated pressure	kPa (kg/cm^2, psi)	299.1 (3.05, 43.4)

Inspection and Adjustment

Idle speed [1]	rpm	
No load [2]		
M/T		800±100
A/T (in "D" range)		750±100
Air conditioner: ON		
M/T		1,000±100
A/T (in "N" range)		1,000±100
Ignition timing	deg.	
With throttle sensor harness connected		7±5 B.T.D.C.
With throttle sensor harness disconnected		7 B.T.D.C.
Dash pot touch speed (A/T: in "N" range)	rpm	M/T: 2,000±200 A/T: 2,400±400
Throttle valve switch touch speed (OFF → ON)	rpm	
M/T		1,050±150
A/T (in "N" range)		1,150±150

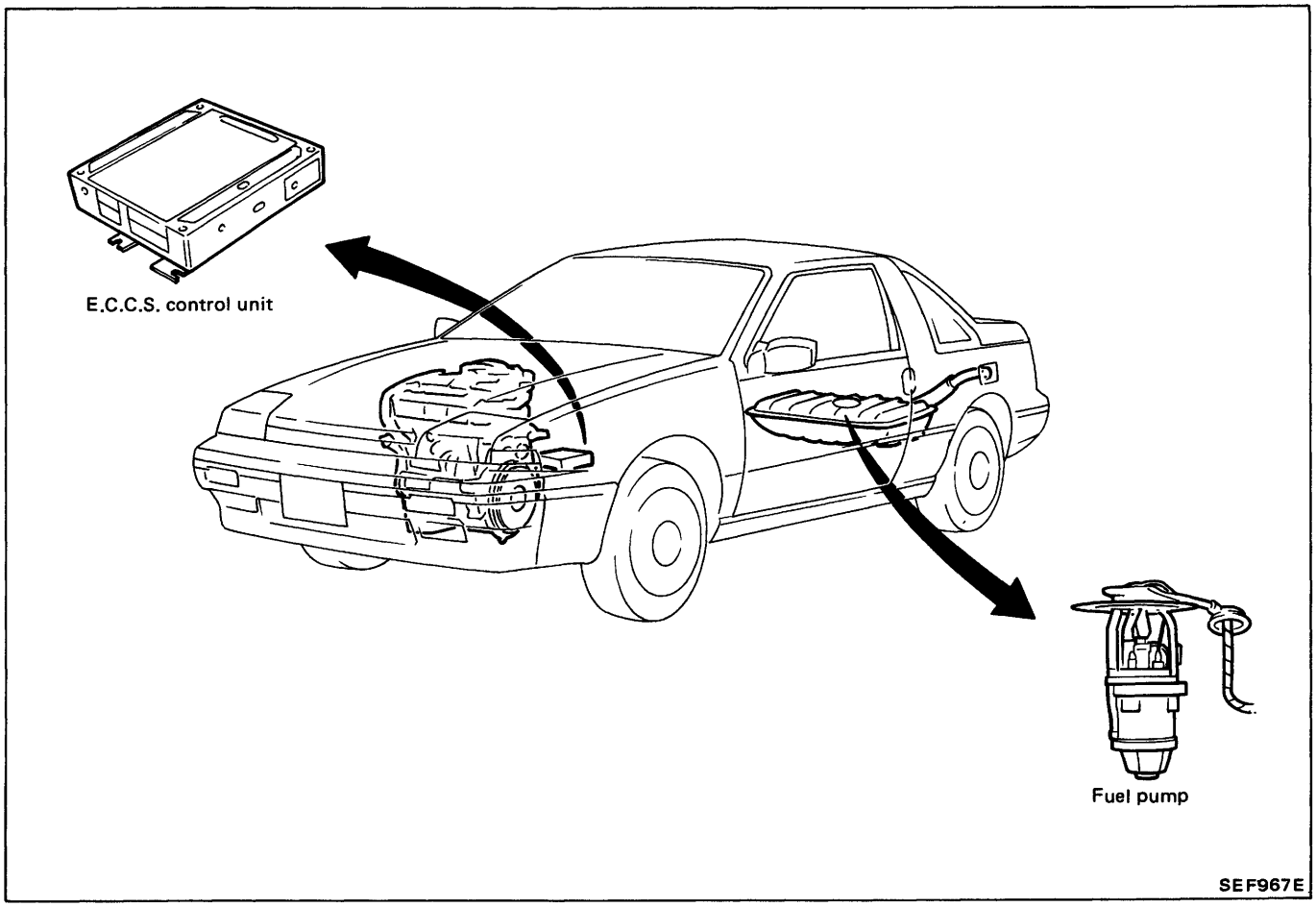
1) Feedback controlled and need no adjustments.
2) Under following conditions:
   - Air conditioner: OFF
   - Steering wheel: Kept straight
   - Electrical load: OFF (lights, heater fan & rear defogger)

CRANK ANGLE SENSOR

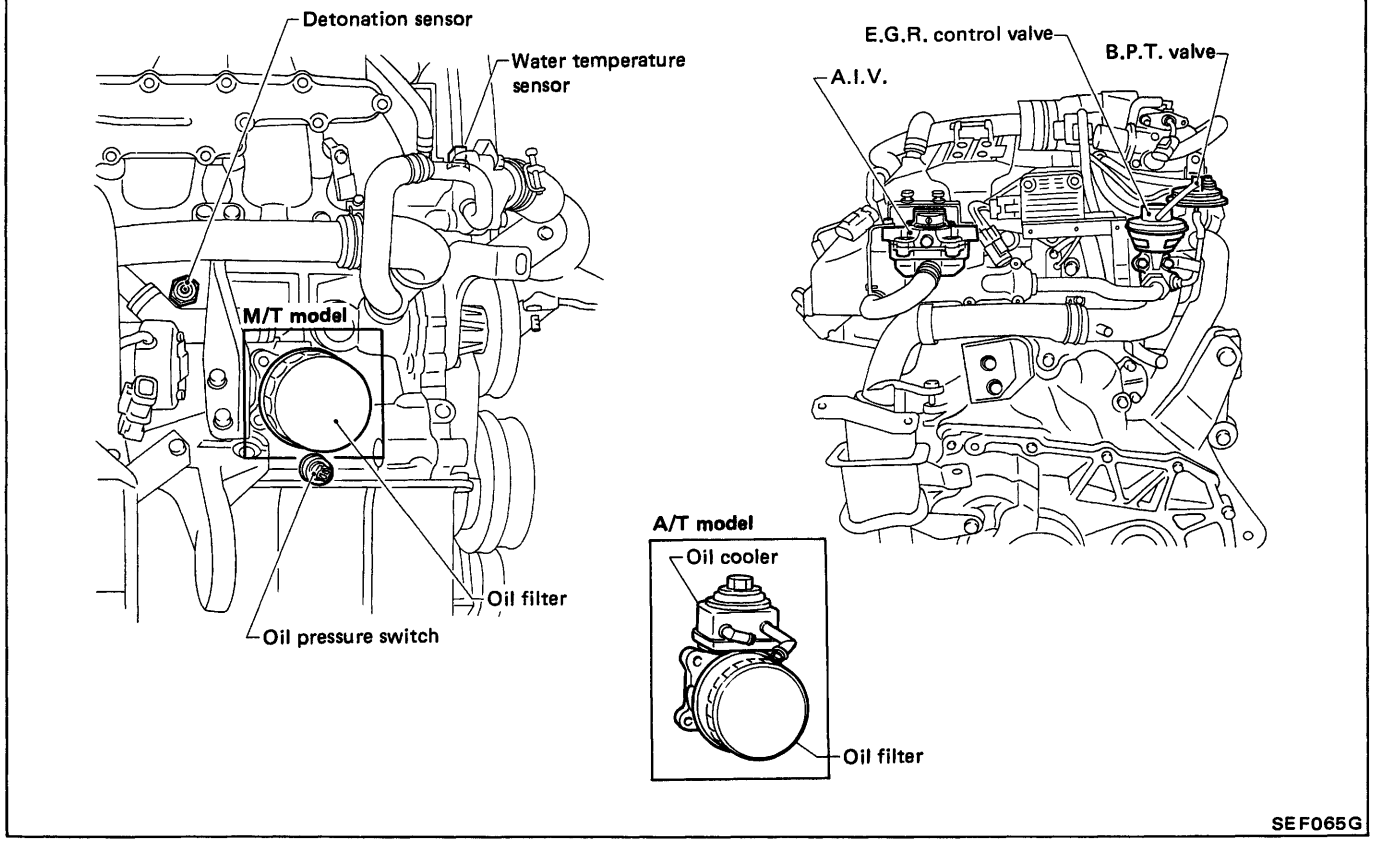
Applied engine		GA16i
Firing order		1-3-4-2
Rotating direction		Counterclockwise
Cap insulation resistance	MΩ	More than 50
Rotor head insulation resistance	MΩ	More than 50
Cap carbon point length	mm (in)	10 (0.39)

IGNITION COIL

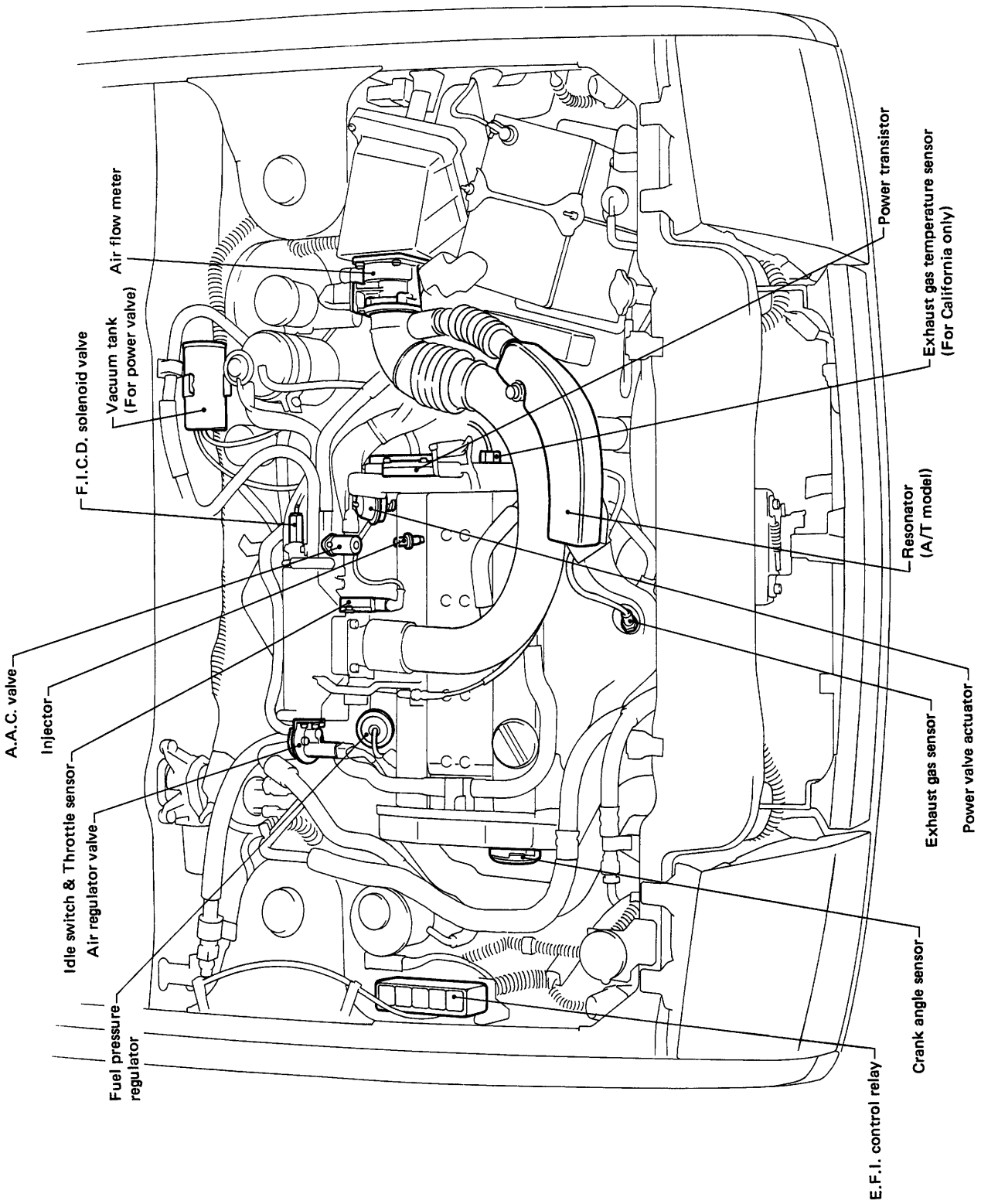
Applied engine		GA16i
Primary voltage	V	12
Primary resistance [at 20°C (68°F)]	Ω	0.81 - 0.99
Secondary resistance [at 20°C (68°F)]	kΩ	8.2 - 12.4



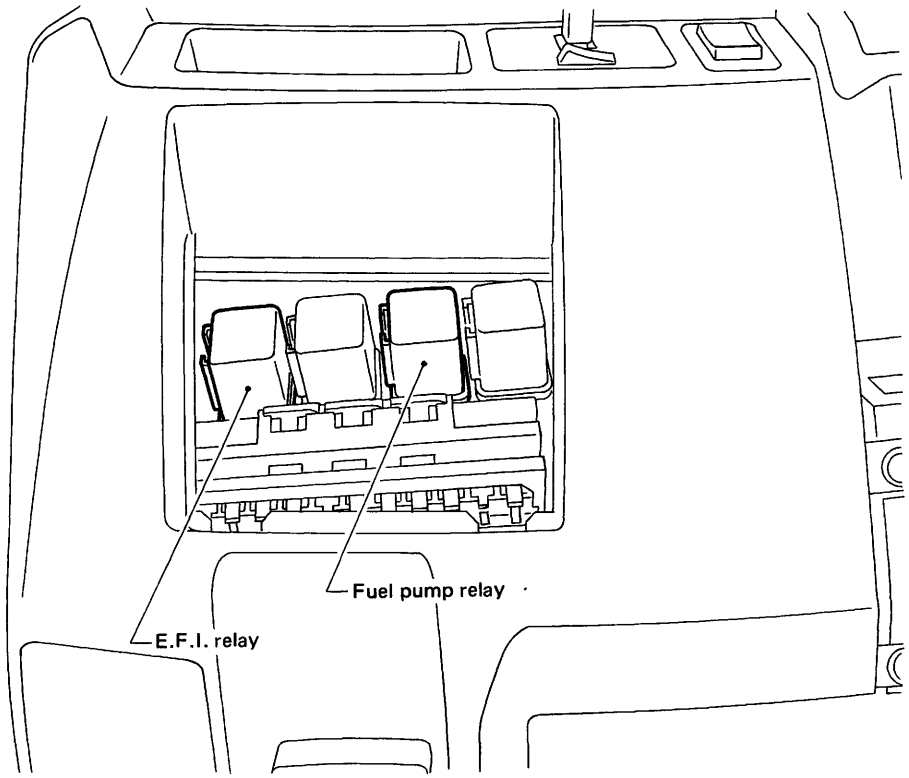
SEF967E



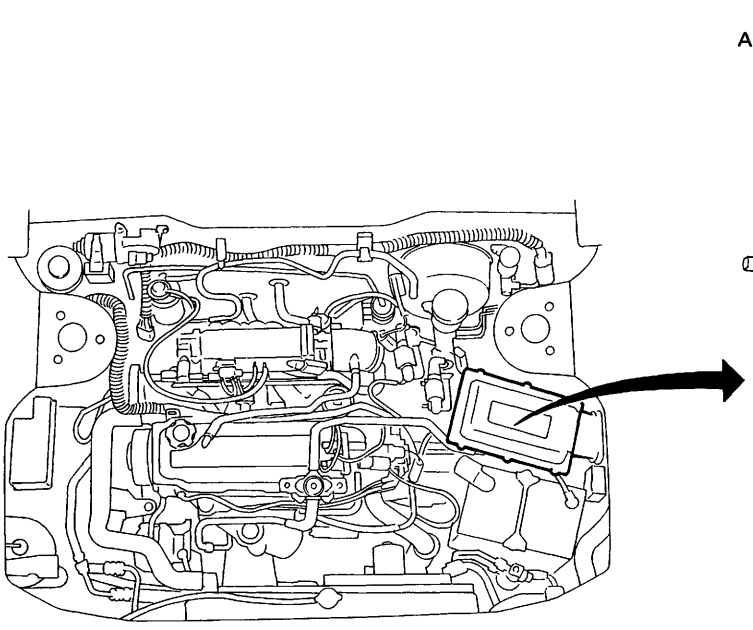
SEF065G

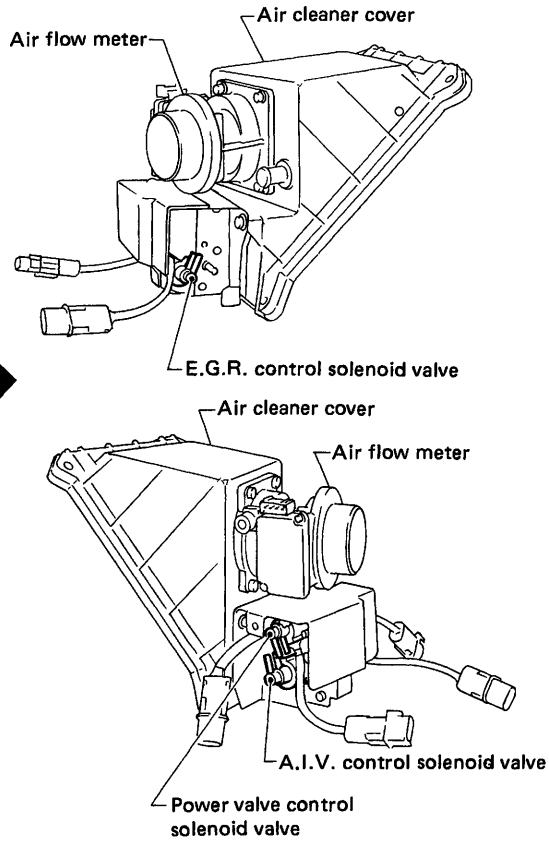

A.A.C. valve
Injector
Idle switch & Throttle sensor
Air regulator valve
Fuel pressure regulator
F.I.C.D. solenoid valve
Vacuum tank (For power valve)
Air flow meter
Power transistor
Exhaust gas temperature sensor (For California only)
Resonator (A/T model)
Exhaust gas sensor
Power valve actuator
Crank angle sensor
E.F.I. control relay
C-C

SEF066G

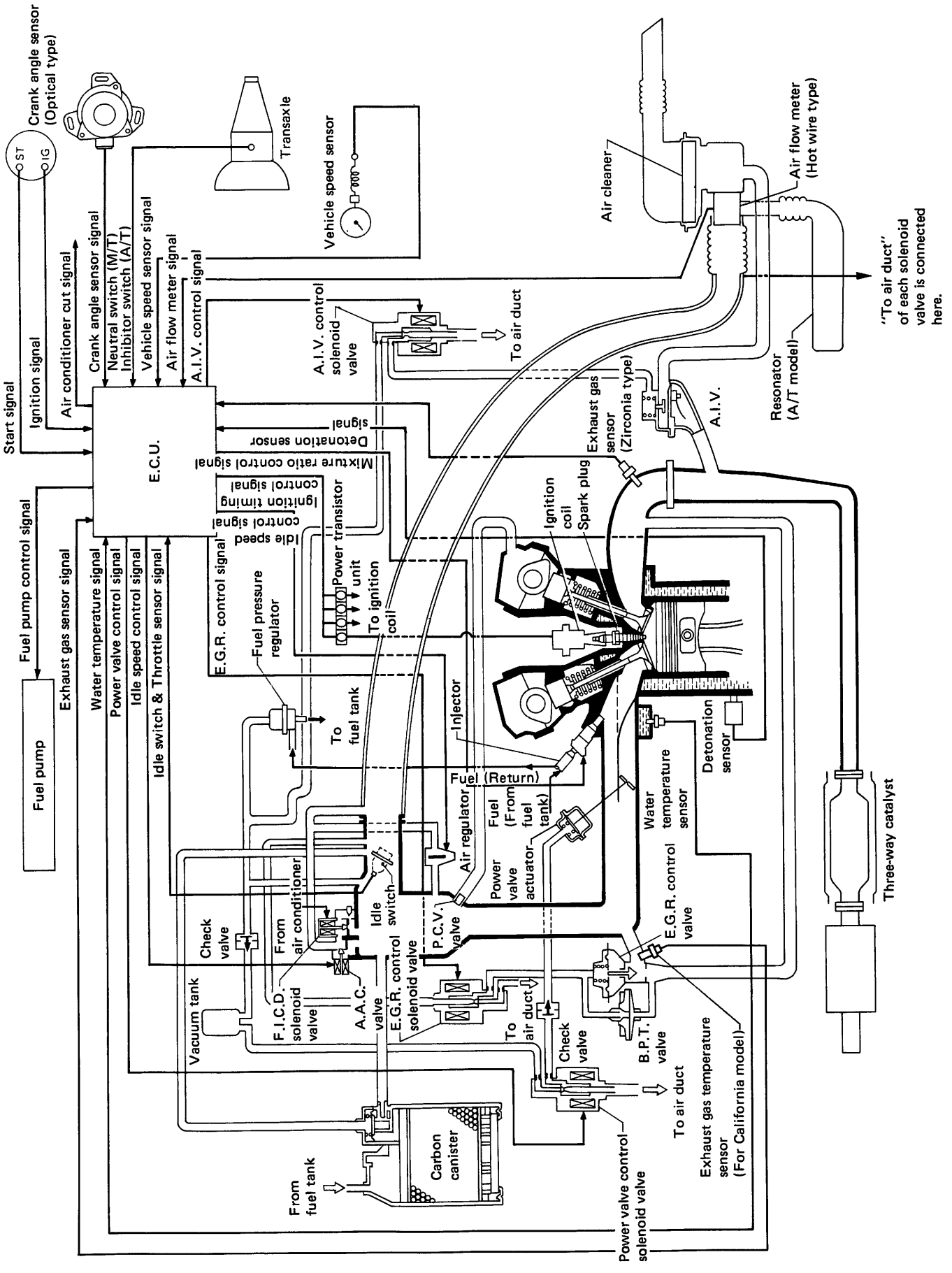


SEF129F

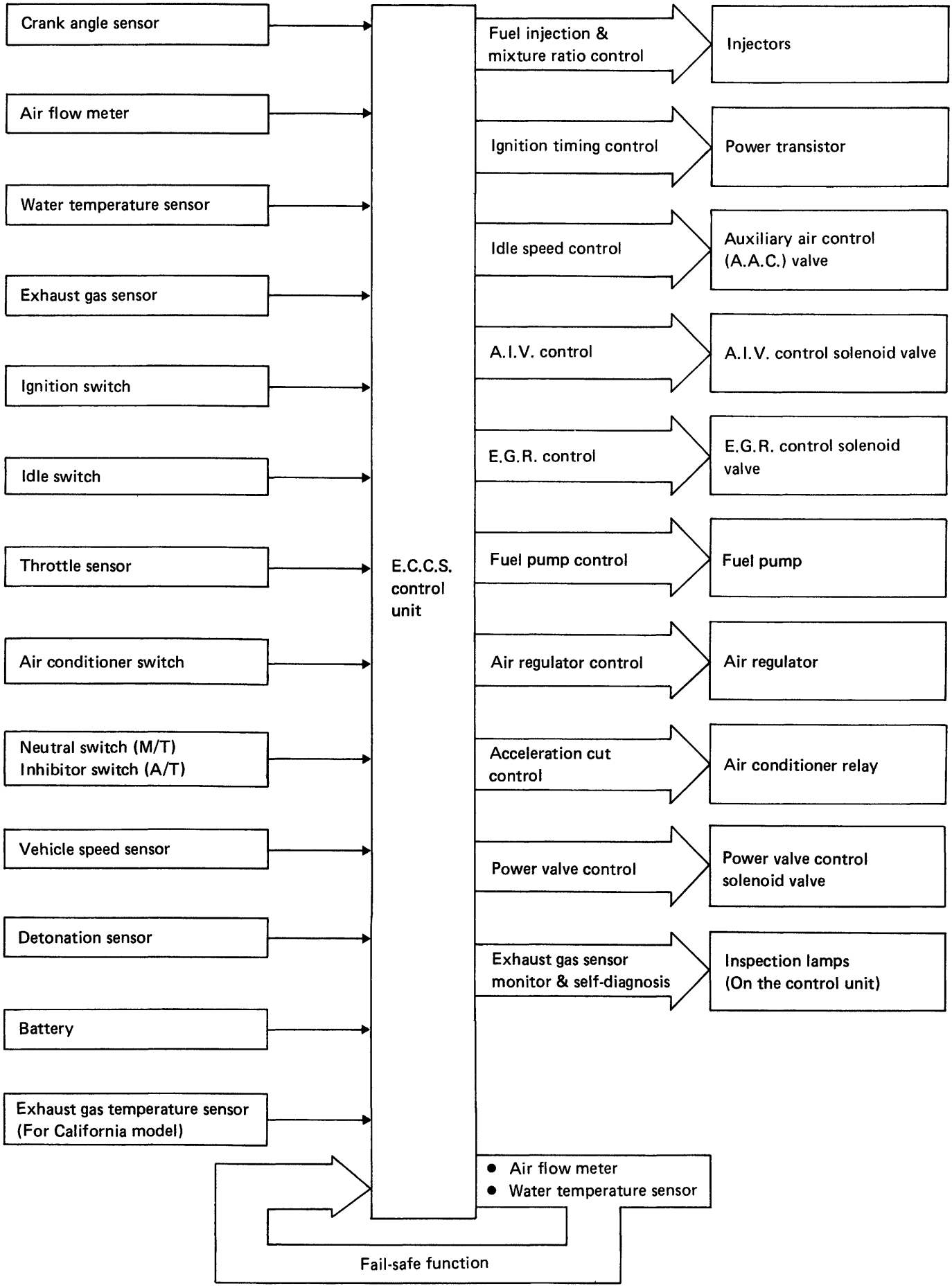


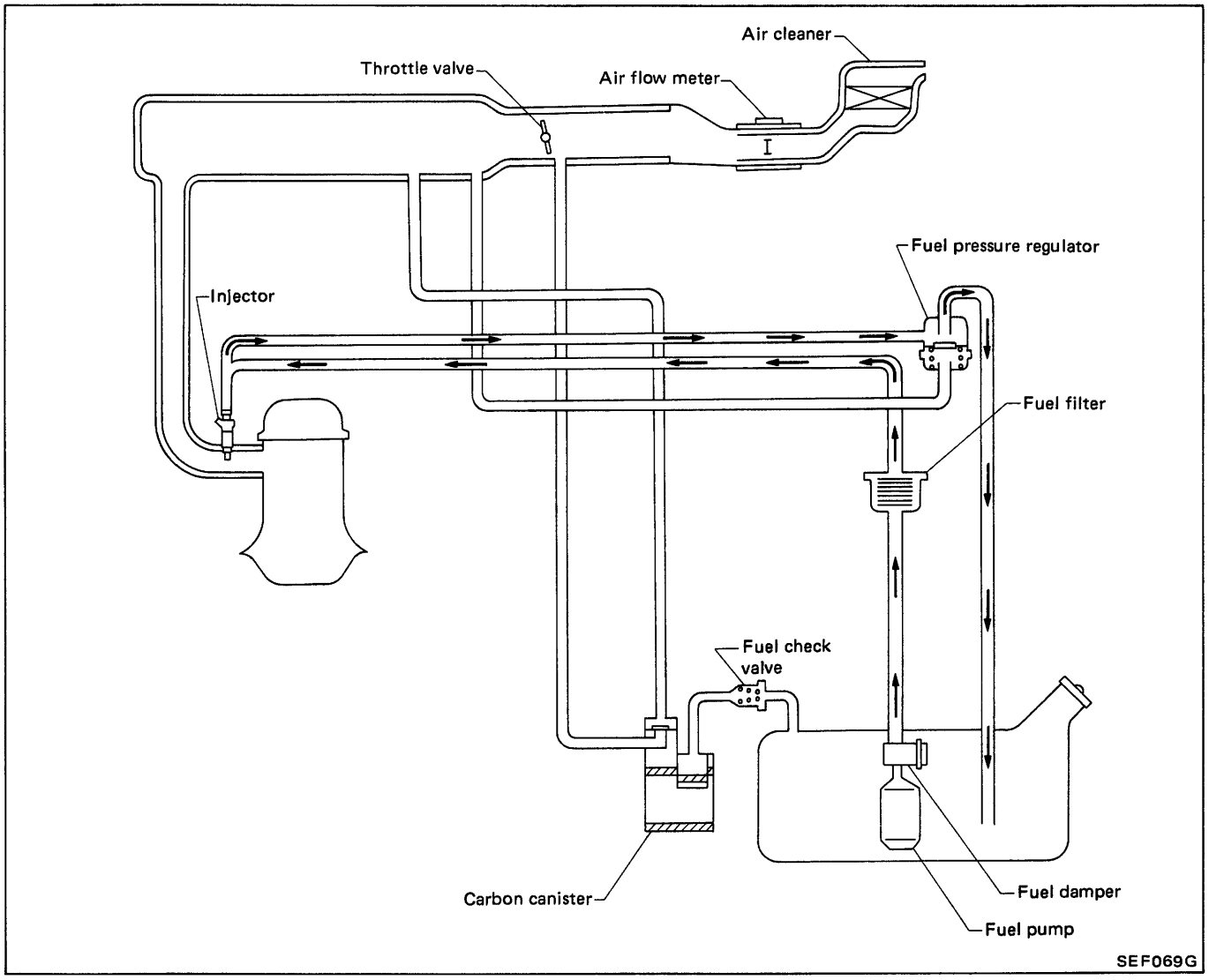


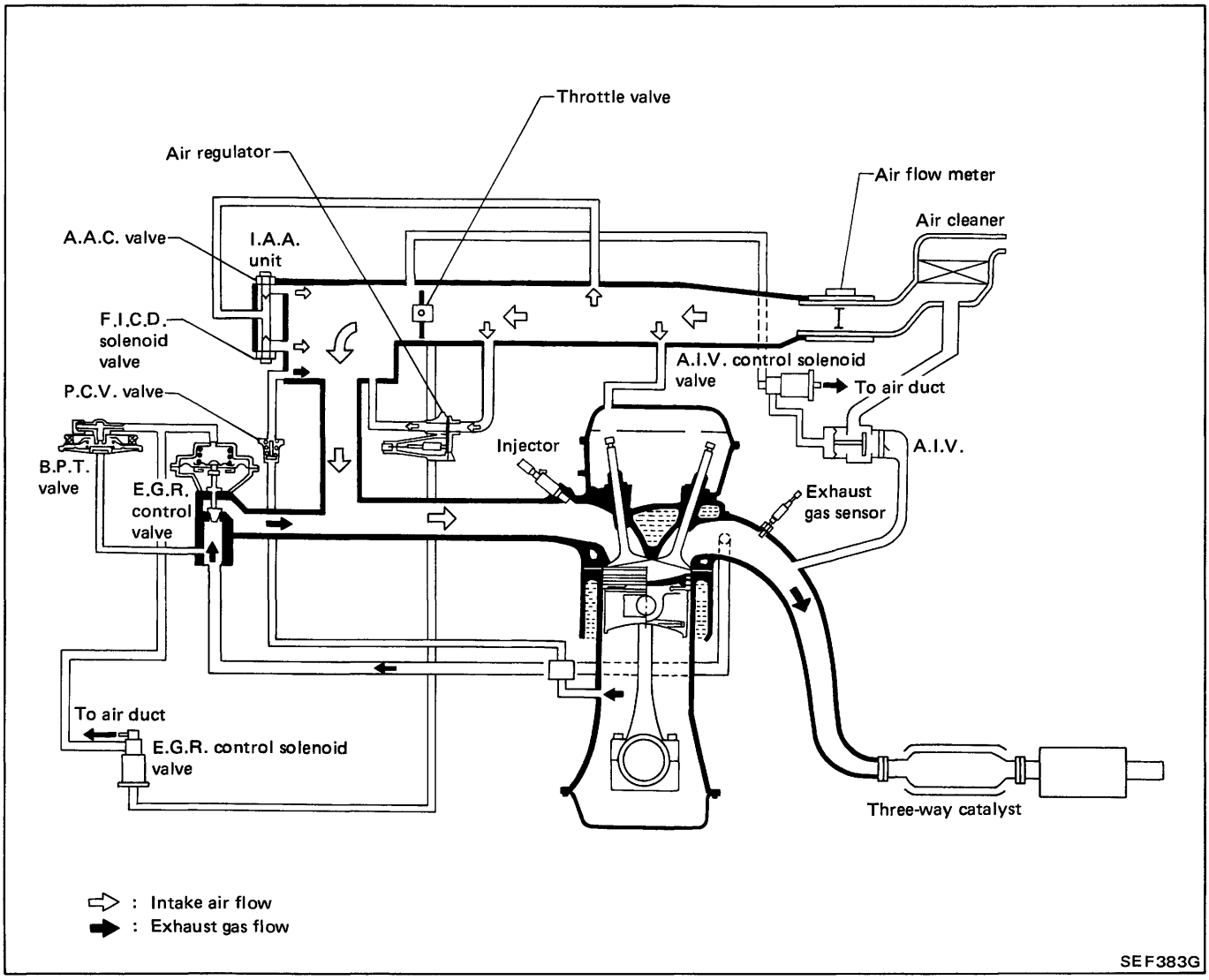
SEF067G

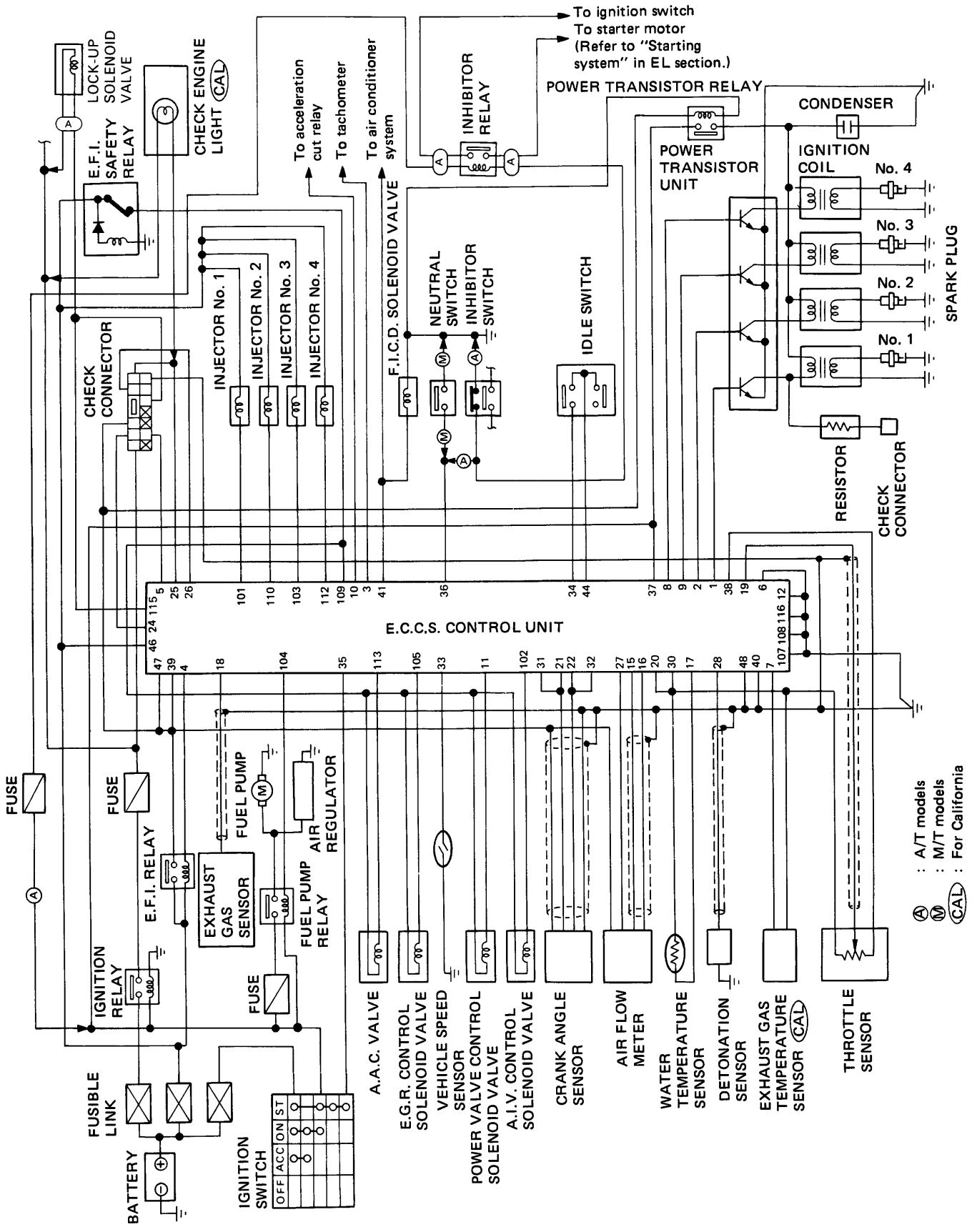

Crank angle sensor (Optical type)
ST
IG
Transaxle
Vehicle speed sensor
Air cleaner
Air flow meter (Hot wire type)
"To air duct" of each solenoid valve is connected here.
Start signal
Ignition signal
Air conditioner cut signal
Crank angle sensor signal
Neutral switch (M/T)
Inhibitor switch (A/T)
Vehicle speed sensor signal
Air flow meter signal
A.I.V. control signal
A.I.V. control solenoid valve
To air duct
E.C.U.
Detonation sensor signal
Mixture ratio control signal
Ignition timing control signal
Idle speed control signal
Power transistor unit
To ignition coil
Ignition coil
Spark plug
Exhaust gas sensor (Zirconia type)
A.I.V.
Resonator (A/T model)
Fuel pump control signal
Exhaust gas sensor signal
Water temperature signal
Power valve control signal
Idle speed control signal
Idle switch & Throttle sensor signal
E.G.R. control signal
Fuel pressure regulator
Fuel pump
To fuel tank
Injector
Fuel (Return)
Air regulator
Fuel (From fuel tank)
Power valve actuator
Water temperature sensor
Detonation sensor
Three-way catalyst
Check valve
From air conditioner
Idle switch
P.C.V. valve
E.G.R. control valve
Vacuum tank
F.I.C.D. solenoid valve
A.A.C. valve
E.G.R. control solenoid valve
To air duct
Check valve
B.P.T. valve
To air duct
Exhaust gas temperature sensor (For California model)
Carbon canister
From fuel tank
Power valve control solenoid valve

SEF068G

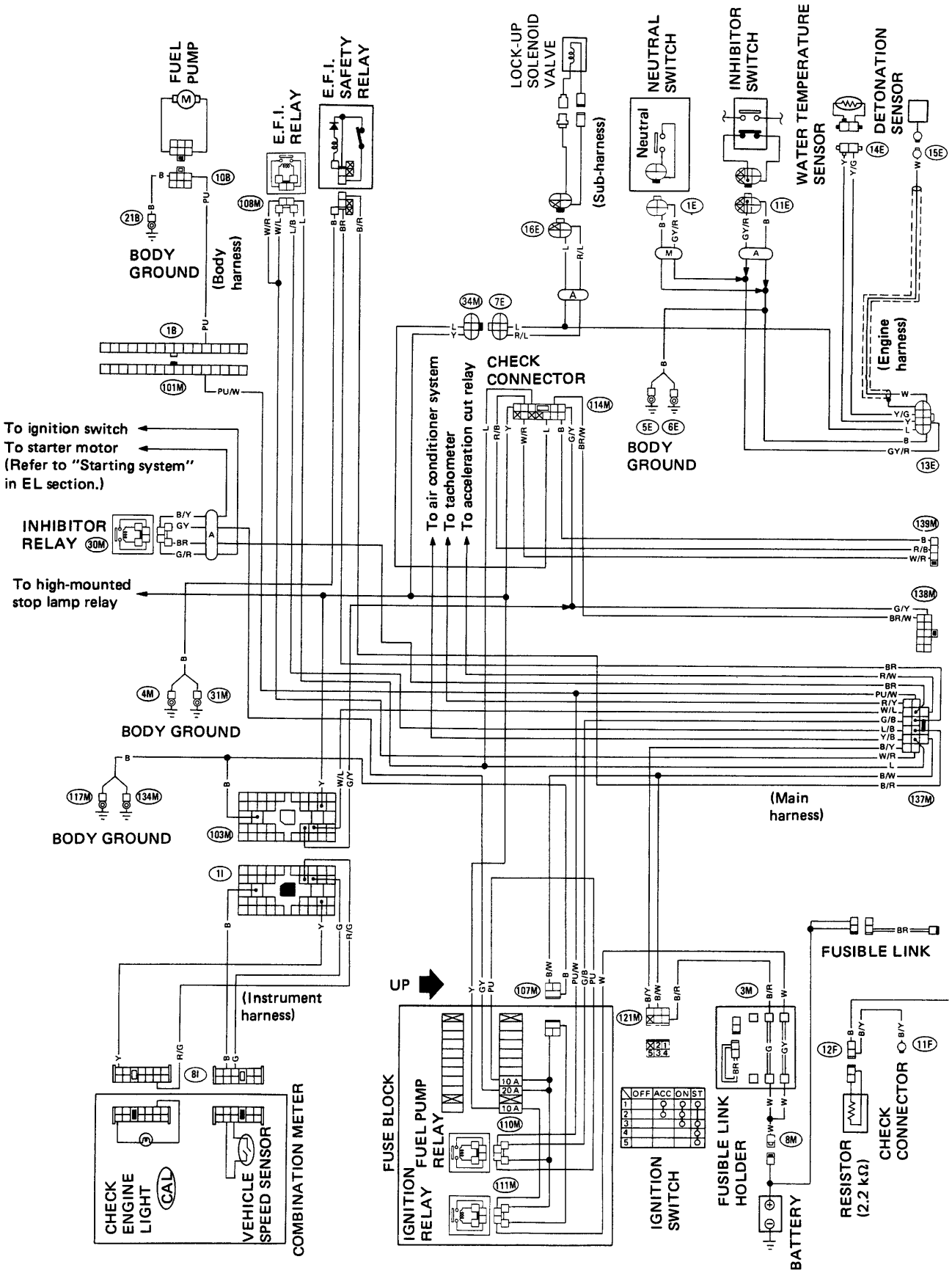

Crank angle sensor
Air flow meter
Water temperature sensor
Exhaust gas sensor
Ignition switch
Idle switch
Throttle sensor
Air conditioner switch
Neutral switch (M/T)
Inhibitor switch (A/T)
Vehicle speed sensor
Detonation sensor
Battery
Exhaust gas temperature sensor
(For California model)
E.C.C.S.
control
unit
Fuel injection &
mixture ratio control
Injectors
Ignition timing control
Power transistor
Idle speed control
Auxiliary air control
(A.A.C.) valve
A.I.V. control
A.I.V. control solenoid valve
E.G.R. control
E.G.R. control solenoid
valve
Fuel pump control
Fuel pump
Air regulator control
Air regulator
Acceleration cut
control
Air conditioner relay
Power valve control
Power valve control
solenoid valve
Exhaust gas sensor
monitor & self-diagnosis
Inspection lamps
(On the control unit)
● Air flow meter
● Water temperature sensor
Fail-safe function

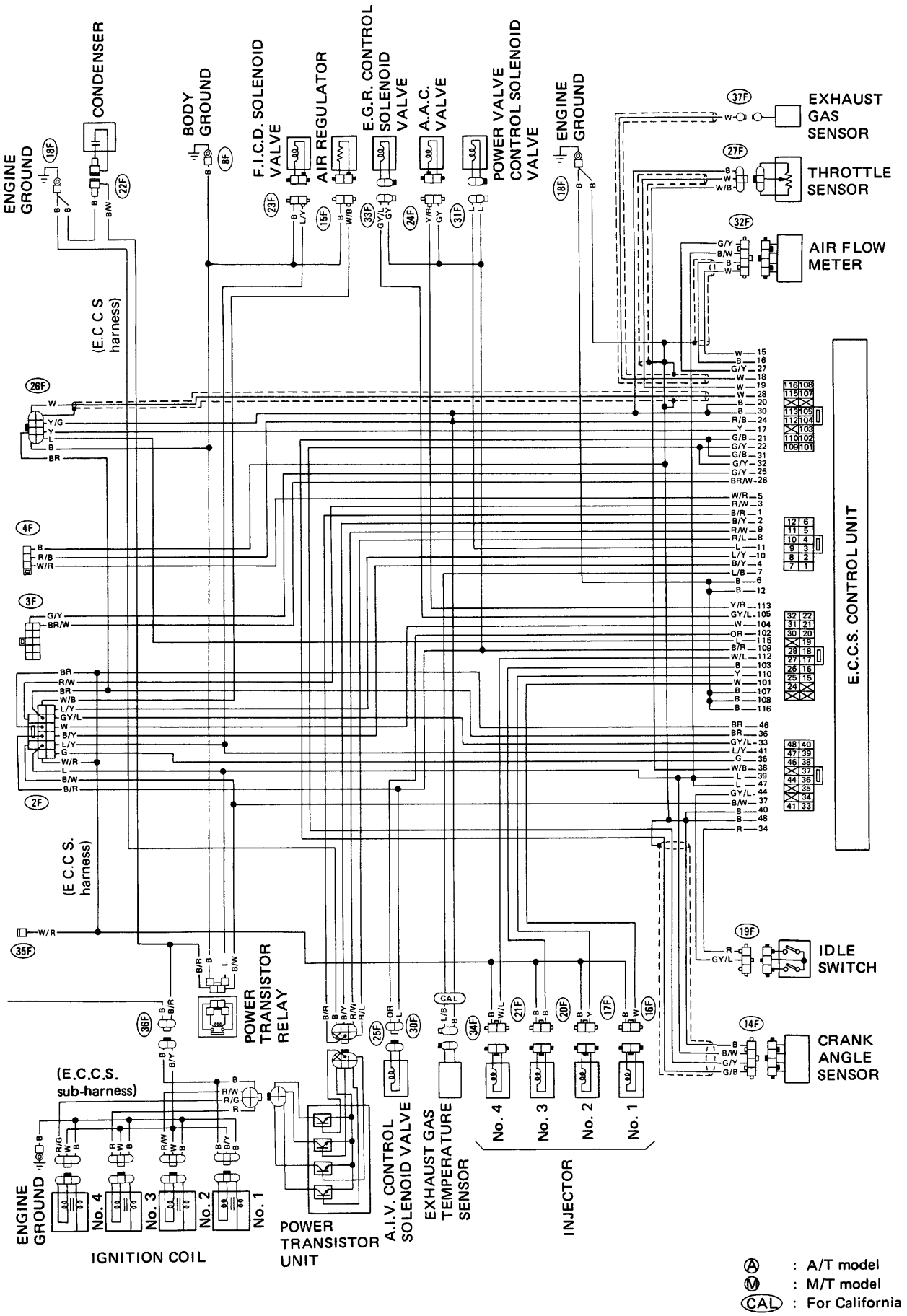

Air cleaner
Throttle valve
Air flow meter
Fuel pressure regulator
Injector
Fuel filter
Fuel check valve
Carbon canister
Fuel damper
Fuel pump
SEF069G


Throttle valve
Air regulator
Air flow meter
Air cleaner
A.A.C. valve
I.A.A. unit
F.I.C.D. solenoid valve
P.C.V. valve
A.I.V. control solenoid valve
To air duct
A.I.V.
Injector
B.P.T. valve
E.G.R. control valve
Exhaust gas sensor
To air duct
E.G.R. control solenoid valve
Three-way catalyst
: Intake air flow
: Exhaust gas flow
SEF383G

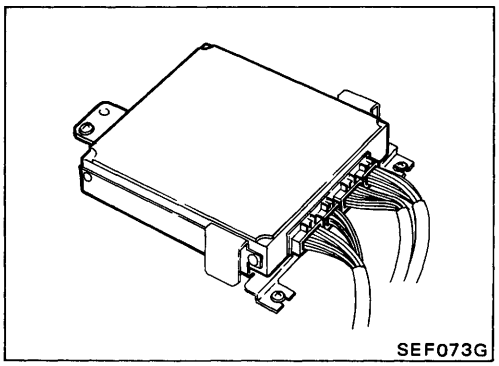

To ignition switch
To starter motor
(Refer to "Starting system" in EL section.)
POWER TRANSISTOR RELAY
CONDENSER
IGNITION COIL
No. 4
No. 3
No. 2
No. 1
SPARK PLUG
POWER TRANSISTOR UNIT
INHIBITOR RELAY
To acceleration cut relay
To tachometer
To air conditioner system
LOCK-UP SOLENOID VALVE
E.F.I. SAFETY RELAY
CHECK ENGINE LIGHT (CAL)
CHECK CONNECTOR
INJECTOR No. 1
INJECTOR No. 2
INJECTOR No. 3
INJECTOR No. 4
F.I.C.D. SOLENOID VALVE
NEUTRAL SWITCH
INHIBITOR SWITCH
IDLE SWITCH
RESISTOR
CHECK CONNECTOR
E.C.C.S. CONTROL UNIT
FUSE
FUSE
E.F.I. RELAY
FUEL PUMP
AIR REGULATOR
EXHAUST GAS SENSOR
FUEL PUMP RELAY
IGNITION RELAY
FUSE
FUSIBLE LINK
BATTERY
IGNITION SWITCH
OFF ACC ON ST
A.A.C. VALVE
E.G.R. CONTROL SOLENOID VALVE
VEHICLE SPEED SENSOR
POWER VALVE CONTROL SOLENOID VALVE
A.I.V. CONTROL SOLENOID VALVE
CRANK ANGLE SENSOR
AIR FLOW METER
WATER TEMPERATURE SENSOR
DETONATION SENSOR
EXHAUST GAS TEMPERATURE SENSOR (CAL)
THROTTLE SENSOR
Ⓐ : A/T models
Ⓜ : M/T models
(CAL) : For California

SEF035H


FUEL PUMP
E.F.I. RELAY
E.F.I. SAFETY RELAY
LOCK-UP SOLENOID VALVE
(Sub-harness)
NEUTRAL SWITCH
INHIBITOR SWITCH
WATER TEMPERATURE SENSOR
DETONATION SENSOR
BODY GROUND
(Body harness)
(Engine harness)
CHECK CONNECTOR
To ignition switch
To starter motor
(Refer to "Starting system" in EL section.)
To air conditioner system
To tachometer
To acceleration cut relay
INHIBITOR RELAY
To high-mounted stop lamp relay
(Main harness)
FUSIBLE LINK
(Instrument harness)
UP
FUSE BLOCK
IGNITION RELAY
FUEL PUMP RELAY
IGNITION SWITCH
FUSIBLE LINK HOLDER
BATTERY
RESISTOR (2.2 kΩ)
CHECK ENGINE LIGHT
VEHICLE SPEED SENSOR
COMBINATION METER


ENGINE GROUND
CONDENSER
BODY GROUND
F.I.C.D. SOLENOID VALVE
AIR REGULATOR
E.G.R. CONTROL SOLENOID VALVE
A.A.C. VALVE
POWER VALVE CONTROL SOLENOID VALVE
ENGINE GROUND
EXHAUST GAS SENSOR
THROTTLE SENSOR
AIR FLOW METER
(E.C.C.S. harness)
E.C.C.S. CONTROL UNIT
IDLE SWITCH
CRANK ANGLE SENSOR
POWER TRANSISTOR RELAY
(E.C.C.S. sub-harness)
ENGINE GROUND
IGNITION COIL
No. 4
No. 3
No. 2
No. 1
POWER TRANSISTOR UNIT
A.I.V. CONTROL SOLENOID VALVE
EXHAUST GAS TEMPERATURE SENSOR
INJECTOR
Ⓐ : A/T model
Ⓜ : M/T model
CAL : For California

SEF036H

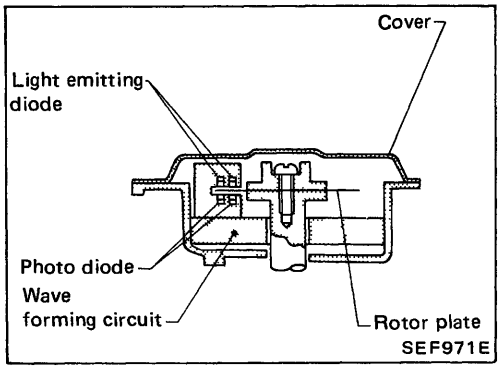

SEF073G

Components

E.C.U. (E.C.C.S. control unit)

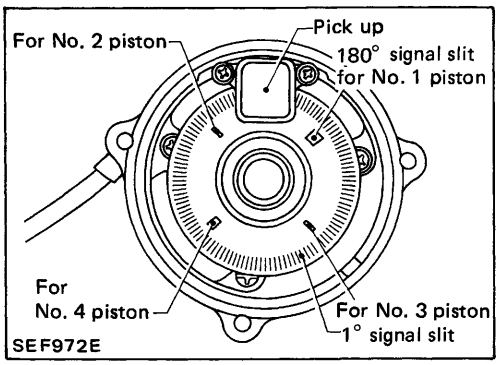
The E.C.U. consists of a microcomputer, inspection lamps and a diagnostic mode selector for signal input and output, and for power supply. The unit has control of the following functions.

- Injected fuel amount
- Mixture ratio feedback
- Ignition timing
- Idle speed
- E.G.R. operation
- A.I.V. operation
- Fuel pump operation
- Air regulator operation
- Power valve control
- Acceleration cut control
- Self-diagnosis



CRANK ANGLE SENSOR

The crank angle sensor is a basic component of the entire E.C.C.S. It monitors engine speed and piston position, and sends to the E.C.U. signals on which the controls of fuel injection, ignition timing and other functions are based.

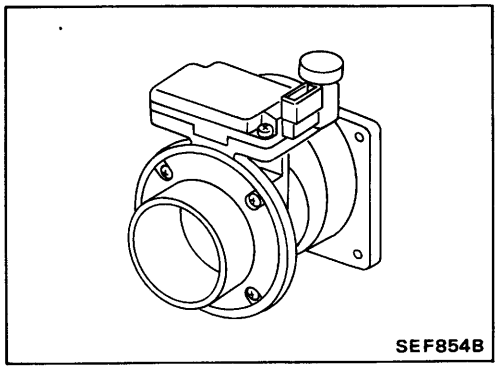


The crank angle sensor has a rotor plate and a wave forming circuit. The rotor plate has 360 slits for 1° signal and 4 slits for 180° signal. Light Emitting Diodes (L.E.D.) and Photo Diodes are built in the wave forming circuit.

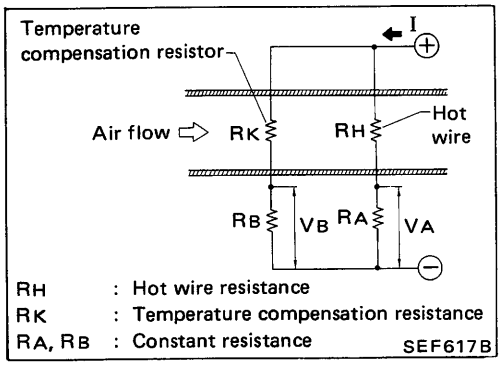
When the rotor plate passes the space between the L.E.D. and the Photo Diode, the slits of the rotor plate continually cut the light which is sent to the photo diode from the L.E.D. This causes generating rough-shaped pulses. They are then converted into on-off pulses by the wave forming circuit, which are sent to the E.C.U.

Components (Cont'd)

AIR FLOW METER

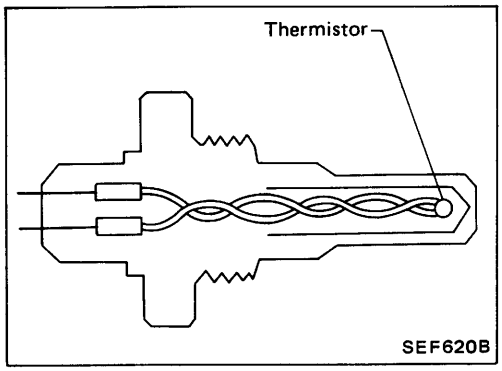

SEF854B

The air flow meter measures the mass flowrate of intake air. Measurements are made in such a manner that the control circuit emits an electrical output signal in relation to the amount of heat dissipated from the hot wire placed in the stream of intake air.



The air flowing around the hot wire removes the heat from the hot wire. The temperature of the hot wire is very sensitive to the mass flowrate of the air. The higher the temperature of the hot wire, the higher its resistance value. This change in the temperature (or: resistance) is determined by the mass flowrate of the air. The control circuit accurately regulates current (I) in relation to the varying resistance value (R_H) so that V_A always equals V_B. The air flow meter transmits an output for voltage V_A to the control unit where the output is converted into an intake air signal.

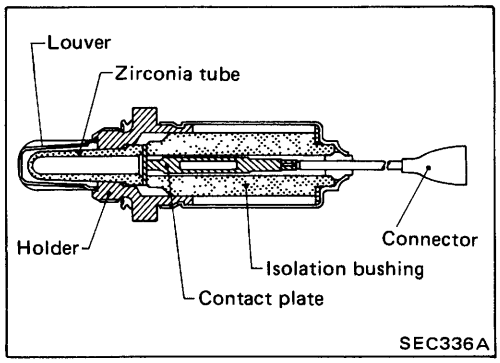
WATER TEMPERATURE SENSOR



The water temperature sensor, built into the thermostat housing, monitors changes in coolant temperature and transmits a signal to the E.C.U.

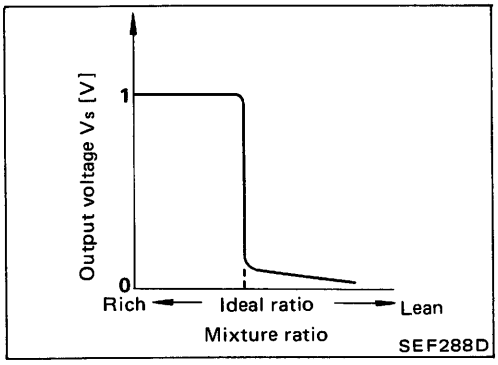
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

EXHAUST GAS SENSOR (Zirconia type)



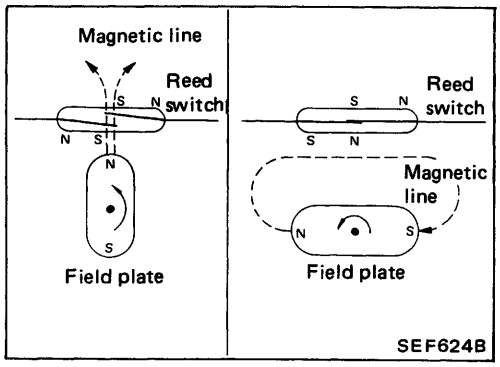
The exhaust gas sensor, which is placed into the exhaust manifold, monitors the amount of oxygen in the exhaust gas.

The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares the oxygen density of exhaust gas with that of atmosphere, and generates electricity. In order to improve generating power of the zirconia, its tube is coated with platinum. The voltage is approximately 1V in a richer condition of the mixture ratio than the ideal air-fuel ratio, while approximately 0V in leaner conditions. The radical change from 1V to 0V occurs at around the ideal mixture ratio. In this way, the exhaust gas sensor detects the amount of oxygen in the exhaust gas and sends the signal of approximately 1V or 0V to the E.C.U.



Components (Cont'd)

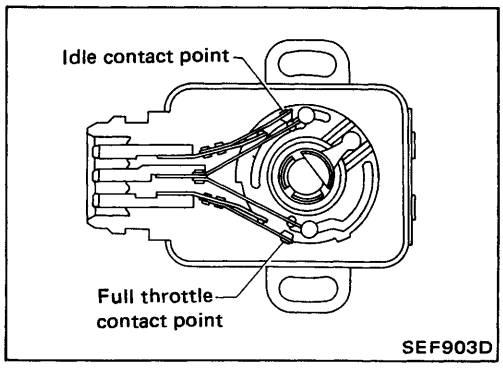
VEHICLE SPEED SENSOR



The vehicle speed sensor provides a vehicle speed signal to the E.C.U.

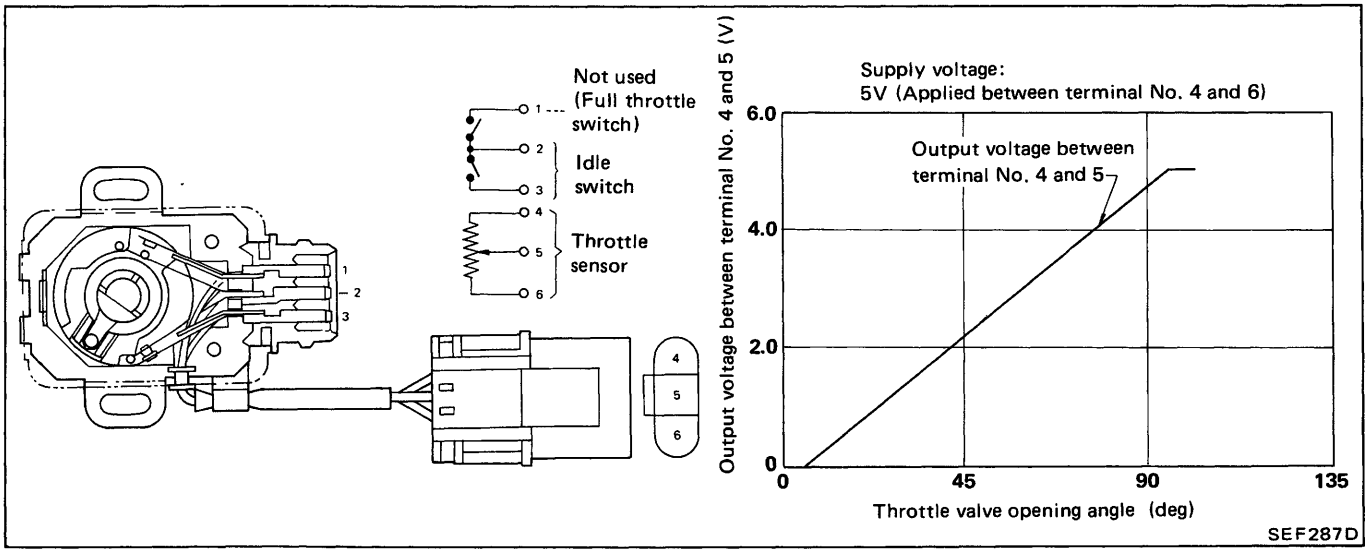
The speed sensor consists of a reed switch, which is installed in the speed meter unit and transforms vehicle speed into a pulse signal.

IDLE SWITCH & THROTTLE SENSOR

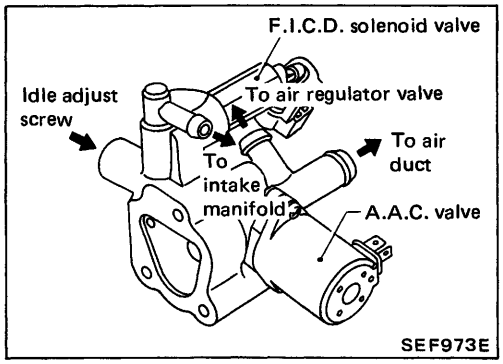


The idle switch and throttle sensor are attached to the throttle chamber and actuates in response to accelerator pedal movement. This switch has idle contact and full throttle contact. The idle contact closes when the throttle valve is positioned at idle and opens when it is at any other position. The full throttle contact closes when the throttle valve is positioned at full throttle and opens when it is at any other position.

The throttle sensor actuates in response to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle valve position into output voltage, and emits the voltage signal to the E.C.U. In addition the sensor detects the opening and closing speed of the throttle valve, and sends the voltage change rate to the E.C.U.

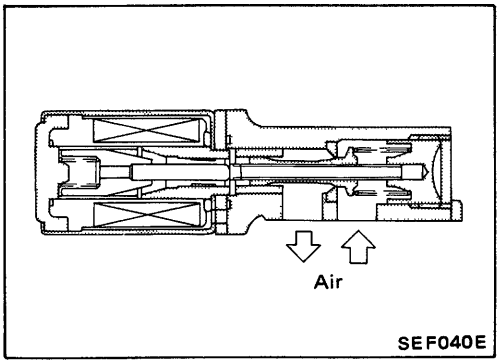


IDLE AIR ADJUSTING (I.A.A.) UNIT



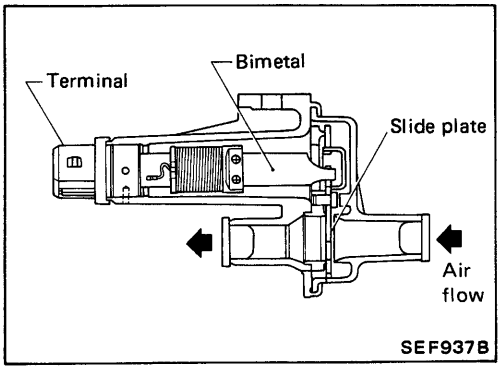
The I.A.A. unit is made up of the A.A.C. valve, F.I.C.D. solenoid valve and idle adjust screw. It receives the signal from the E.C.U. and controls the idle speed at the preset value.

Components (Cont'd)



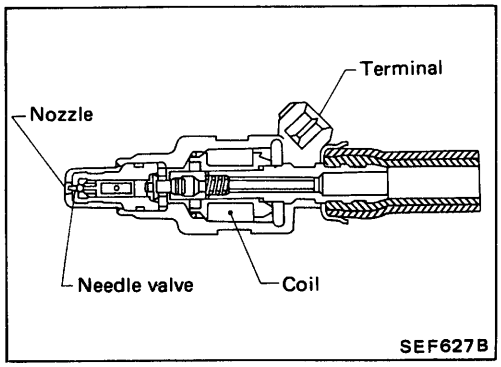
AUXILIARY AIR CONTROL (A.A.C.) VALVE

The E.C.U. actuates the A.A.C. valve by an ON/OFF pulse. The longer that ON duty is left on, the larger the amount of air that will flow through the A.A.C. valve.



AIR REGULATOR

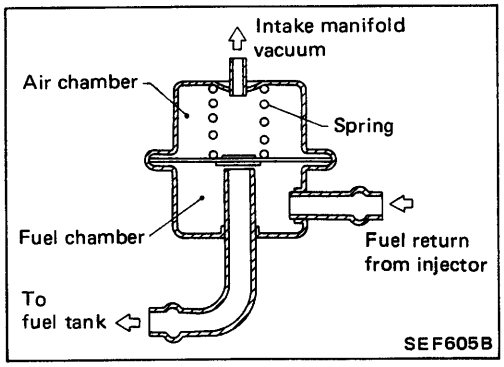
Air regulator provides an air by-pass when the engine is cold to create a fast idle during warm-up. A bimetal, heater and rotary shutter are built into the air regulator. When the bimetal temperature is low, the air by-pass port is open. As the engine starts and electric current flows through a heater, the bimetal begins to rotate the shutter to close off the by-pass port. The air passage remains closed until the engine is stopped and the bimetal temperature drops.



FUEL INJECTOR

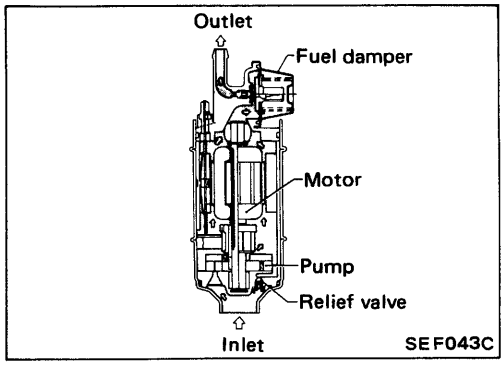
The fuel injector is a small, precision solenoid valve. As the E.C.U. outputs an injection signal to each fuel injector, the coil built into the injector pulls the needls valve back, and fuel is injected through the nozzle to intake manifold. The amount of fuel injected is controlled by the E.C.U. as an injection pulse duration.

Brass wire is used in injector coil and thus the resistance gets higher the conventional injector.



PRESSURE REGULATOR

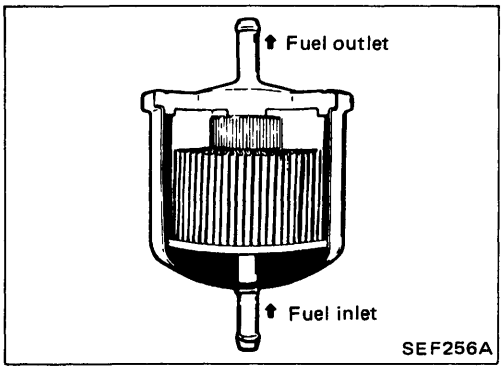
The pressure regulator maintains the fuel pressure at 299.1 kPa (3.05 kg/cm^2, 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.



FUEL PUMP

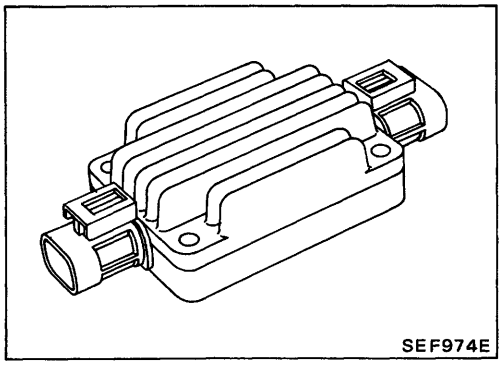
The fuel pump with a fuel damper is an in-take type, that is the pump and damper are located in the fuel tank. The vane rollers are directly coupled to a motor which is cooled by fuel.

Components (Cont'd)



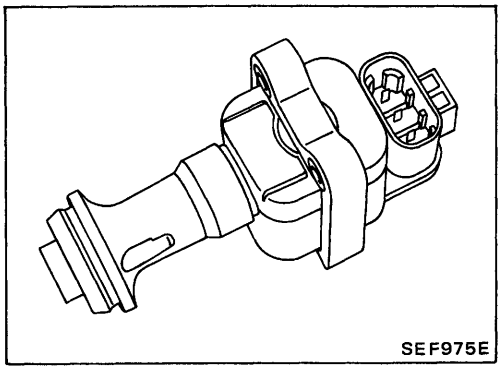
FUEL FILTER

The fuel filter is designed for the fuel injection system, and has a metal case in order to endure the high pressure of fuel.



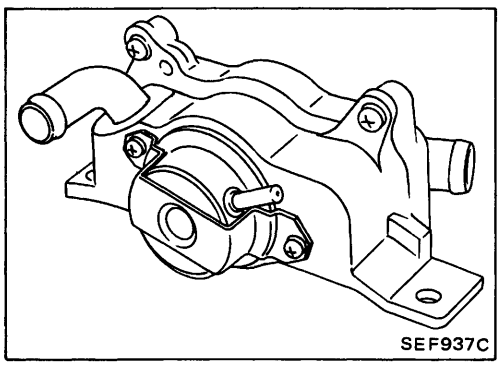
POWER TRANSISTOR

The ignition signal from the E.C.U. is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit.



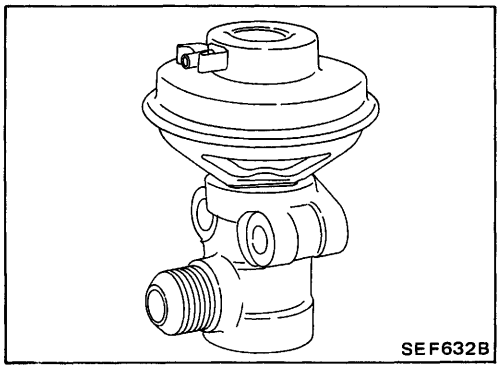
IGNITION COIL

The ignition coil is a small, molded type.



AIR INDUCTION VALVE (A.I.V.)

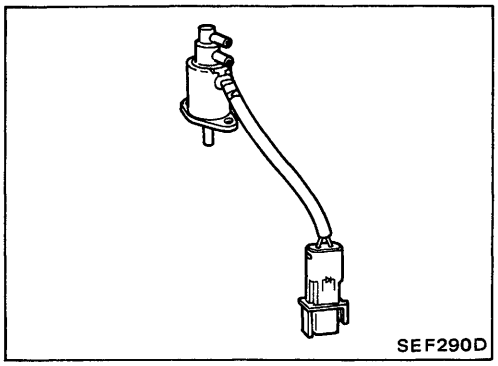
The air induction valve sends secondary air to the exhaust manifold, utilizing a vacuum caused by exhaust pulsation in the exhaust manifold. When the exhaust pressure is below atmospheric pressure (negative pressure), secondary air is sent to the exhaust manifold. When the exhaust pressure is above atmospheric pressure, the reed valves prevent secondary air from being sent back to the air cleaner.



E.G.R. CONTROL VALVE

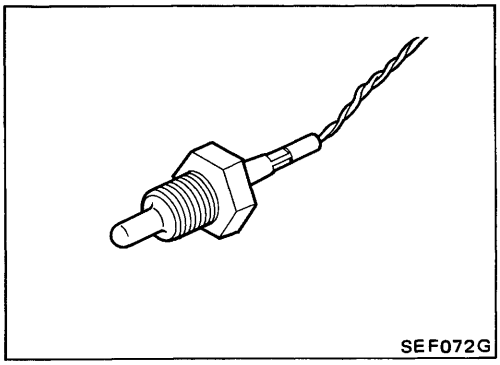
The E.G.R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.

Component (Cont'd)


SEF290D

E.G.R. CONTROL SOLENOID VALVE, A.I.V. CONTROL SOLENOID VALVE AND POWER VALVE CONTROL SOLENOID VALVE

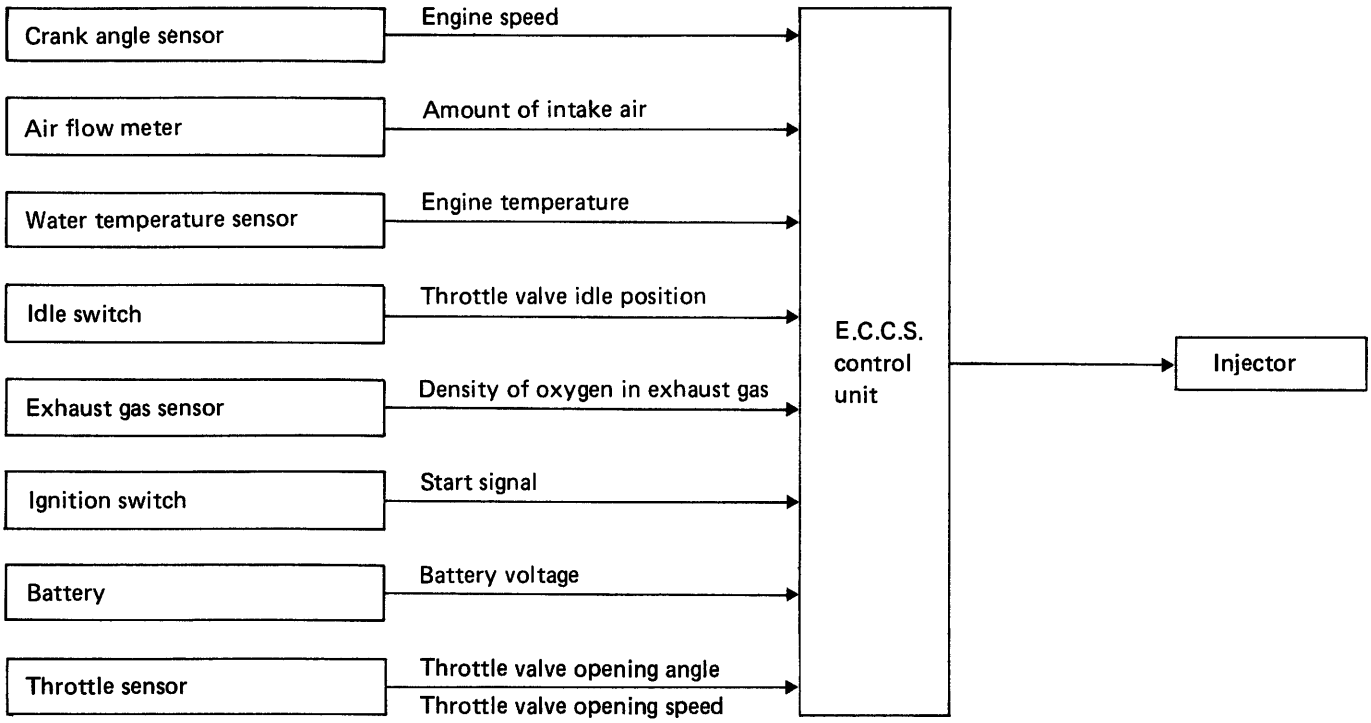
The three-port solenoid valve controls above systems based on signals supplied by the E.C.U.

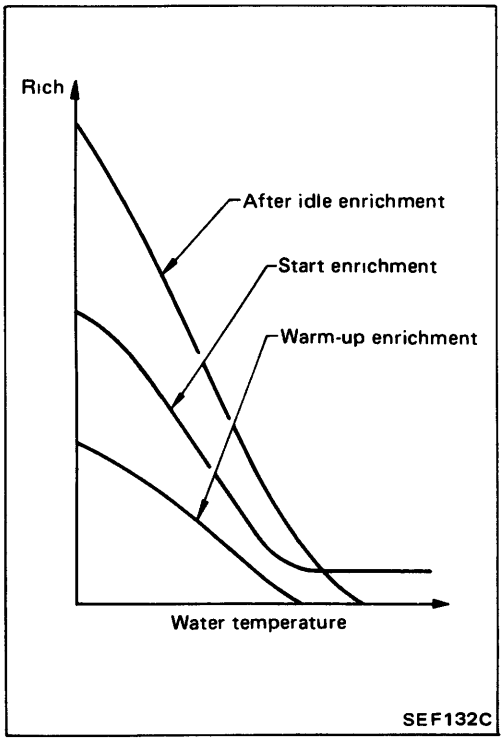

SEF072G

EXHAUST GAS TEMPERATURE SENSOR

The exhaust gas temperature sensor monitors in exhaust gas temperature and transmits a signal to the E.C.U. The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electric resistance of the thermistor decreases in response to the temperature rise.

Fuel Injection Control





The E.C.U. calculates the basic injection pulse width by processing signals from the crank angle sensor and air flow meter. Receiving signals from each sensor which detects various engine conditions, the E.C.U. adds various enrichments, which are pre-programmed in the E.C.U. to the basic injection amount. Thus, the optimum amount of fuel is injected through the injectors.

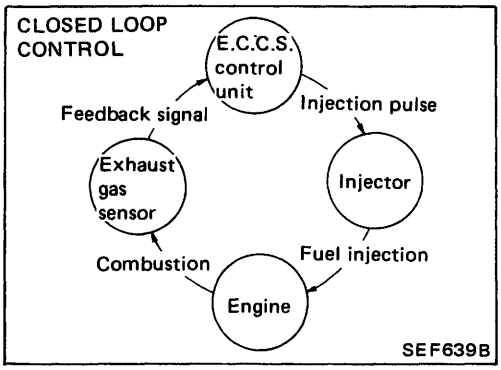
1) Fuel enrichment:
   In each of the following conditions, fuel is enriched.

- When starting
- After idle
- During warm-up
- When accelerating during warm-up period
- Full throttle (with heavy load condition)

For these enrichment conditions, signals from water temperature sensor, crank angle sensor, air flow meter, throttle sensor and idle switch are used.

Fuel Injection Control (Cont'd)

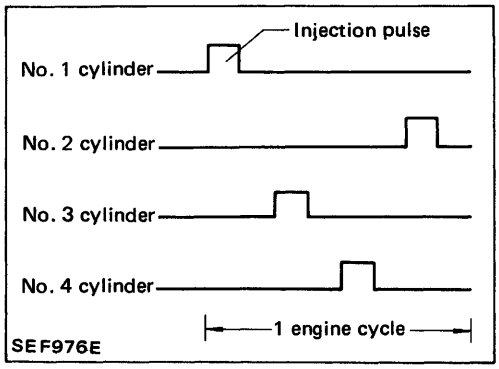
2) Fuel shut-off
The fuel shut-off is operated when the engine runs at higher than pre-set rpm and the throttle valve is closed (idle switch "ON"). As the engine speed goes down to the "recovery rpm", which is somewhat lower than the shut-off rpm, the fuel shut-off ceases even if the throttle valve is kept closed. Both "shut-off and recovery rpm" vary with the coolant temperature.



3) Mixture ratio feedback control (Closed loop control)
Mixture ratio feedback system is designed to control the mixture ratio precisely to the stoichiometric point so that the three way catalyst can minimize CO, HC and NOx emissions simultaneously. This system uses an exhaust gas sensor located in the exhaust manifold to give an indication of whether the air-fuel ratio is richer or leaner than the stoichiometric point. The E.C.U. adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the narrow window around the stoichiometric air fuel ratio.

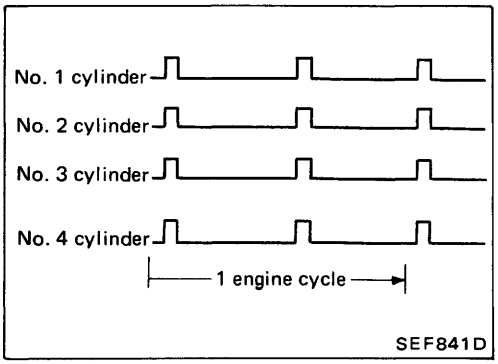
However, this system will operate under open loop under the following conditions:

- **When starting engine.**
- **When engine temperature is cold.**
- **When exhaust gas sensor temperature is cold.**
- **When driving at high speeds or under heavy load.**
- **At idle.**
- **When the exhaust gas sensor monitors a rich condition for more than a few seconds.**
- **When A.I.V. control system is operated.**



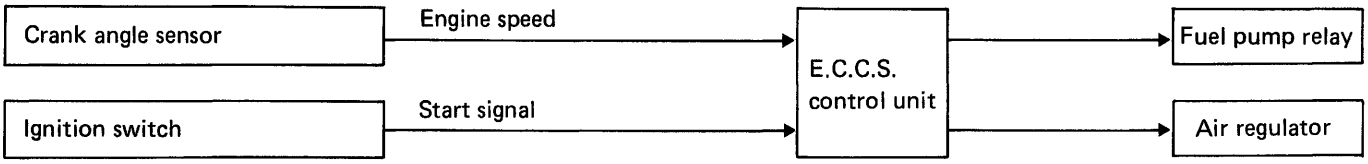
4) Fuel injection pattern.
Fuel is injected once a cycle for each cylinder.

Fuel Injection Control (Cont'd)



When engine temperature is low, engine starts, and engine load is heavy, fuel is injected into all four cylinders simultaneously twice a cycle.

Fuel Pump and Air Regulator Control



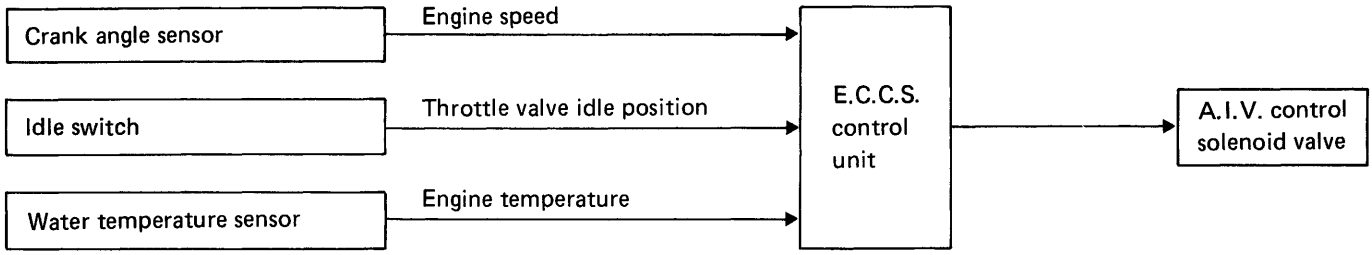
Fuel pump and air regulator control

The fuel pump and air regulator ON-OFF are simultaneously controlled by the E.C.U.

Fuel pump and air regulator ON-OFF control

Ignition switch position	Engine condition	Fuel pump/ Air regulator operation
ON	Stopped	Operates for 5 seconds
	Running	Operates
	After stopped	Stops after 1 second
START	Starting	Operates

A.I.V. (Air Induction Valve) Control

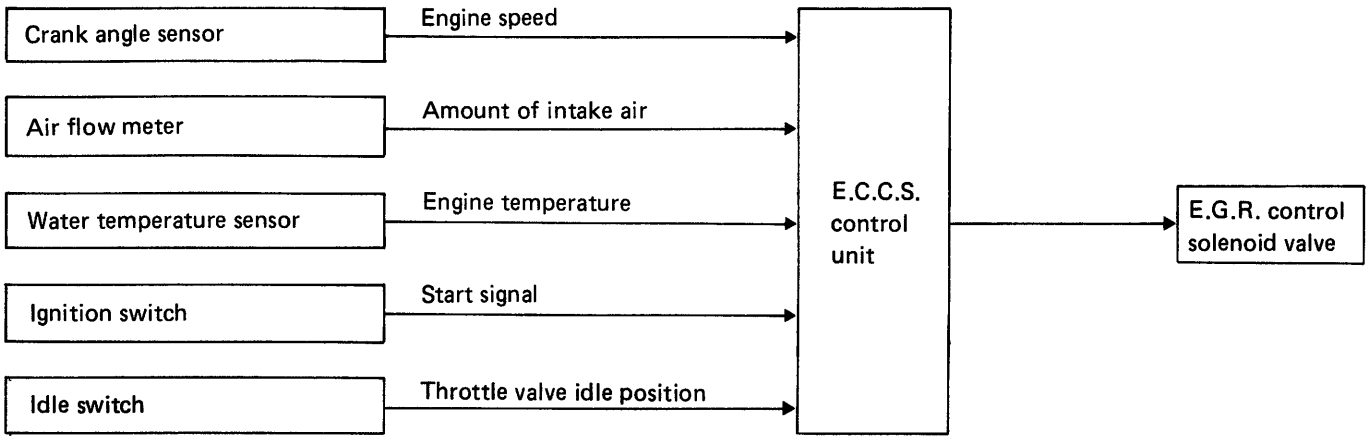


The air induction valve (A.I.V.) system is utilized to reduce HC and CO emissions by supplying air through the air induction valve. This system is composed of the air induction valve, the A.I.V. control valve and the A.I.V. solenoid valve.
The air induction valve is designed for one-way operation and consists of one-way reed valves. It inducts the secondary air into the exhaust manifold via the exhaust pressure pulsations.
The A.I.V. control valve is controlled by the A.I.V. solenoid valve which is controlled by the electrical signal from the E.C.U.

OPERATION

Water temperature	Idle switch	Engine speed (rpm)	Solenoid valve	A.I.V. system
Cool (Engine warm-up condition)	Any	Any	OFF	OFF
Hot [Above approximately 70°C (158°F)]	OFF	Any	OFF	OFF
	ON (Idle contact)	High (Above approximately 1,700)	OFF	OFF
		Low	ON	ON

Exhaust Gas Recirculation (E.G.R.) Control



In the exhaust gas recirculation system, some of the exhaust gas is returned to the combustion chamber to lower the flame temperature during combustion. This results in a reduction of the nitrogen oxide density in the exhaust gas.
When the E.G.R. control valve is open, some of the exhaust gas is led from the exhaust manifold to the E.G.R. tube. The exhaust gas is then regulated by E.G.R. valve, and is introduced into the intake manifold.
The signal from the E.C.U. is sent to the E.G.R. control solenoid valve, which cuts the vacuum line for the B.P.T. valve when any of the following conditions are met.

E.G.R. control solenoid valve operation

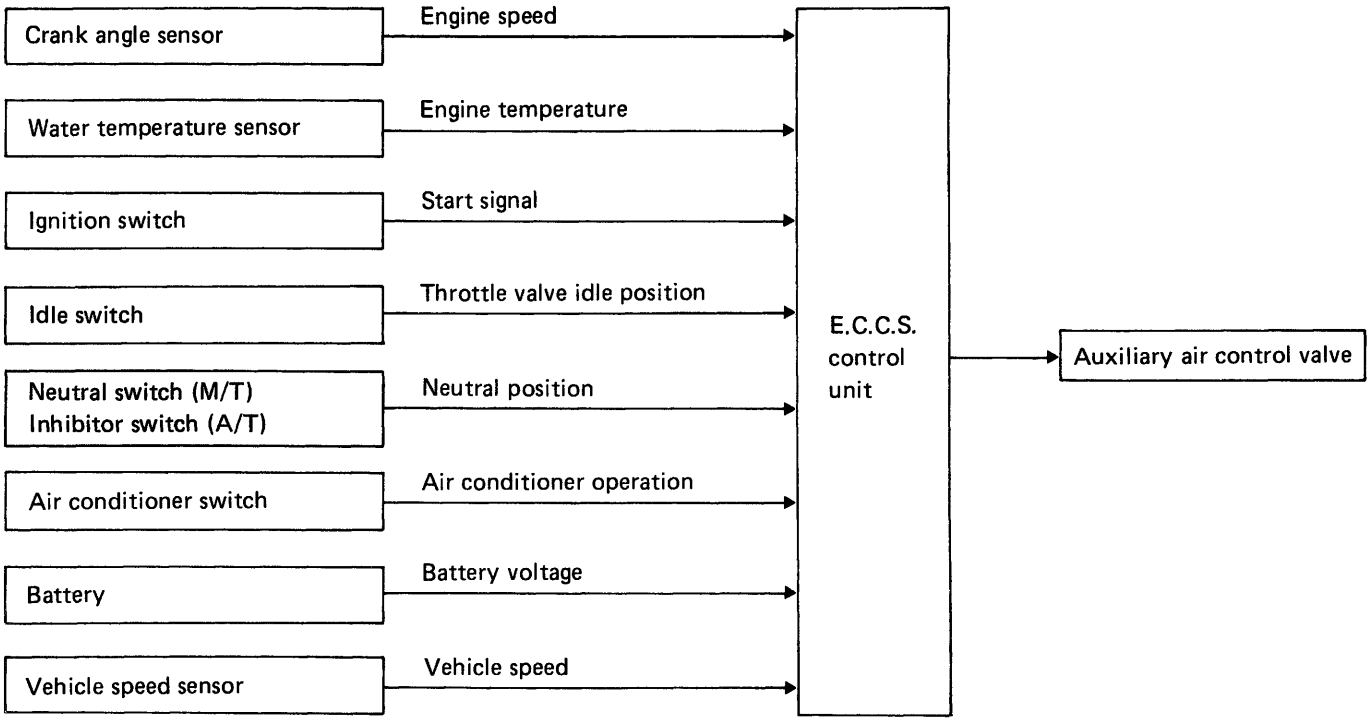
Condition			E.G.R. control solenoid valve
Water temperature	°C (°F)	Below 65 (149)	ON
		Above 105 (221)	
Idle & heavy load conditions			
Other conditions			OFF

E.G.R. system operation

E.G.R. system operates under only the following conditions.

Water temperature °C (°F)	B.P.T. valve		Throttle position	E.G.R. control solenoid valve	E.G.R. system
	Exhaust gas pressure	Operation			
Above 65 (149) Below 105 (221)	High	Closed	Partially open	OFF	Operates

Idle Speed Control

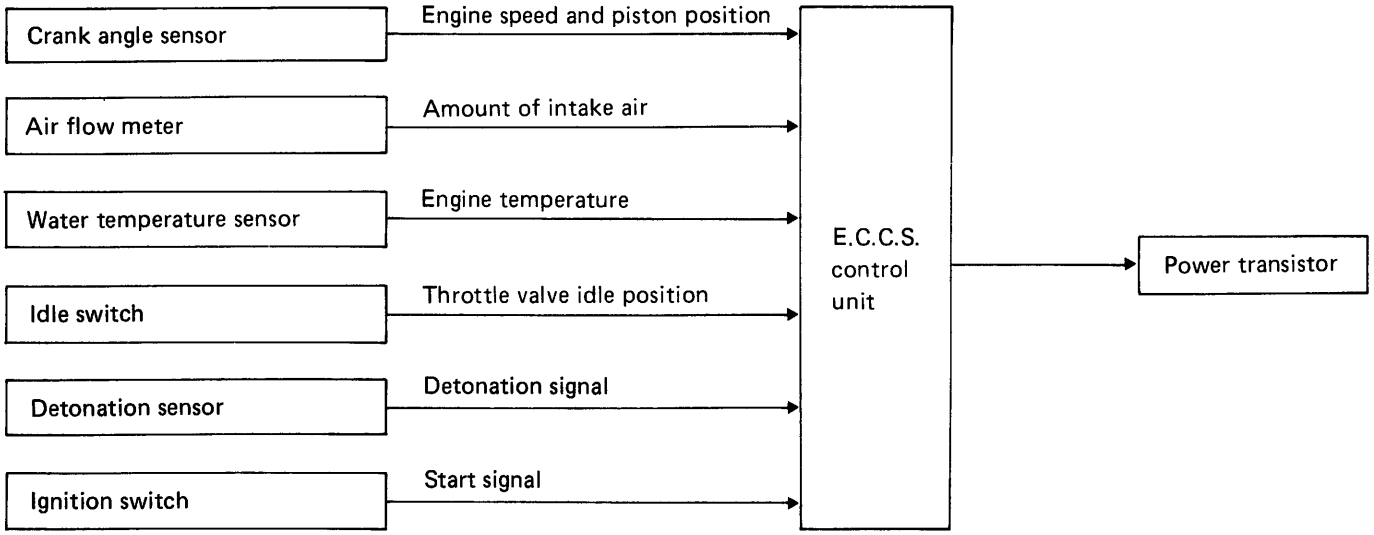


The idle speed is controlled by the E.C.U., corresponding to the engine operating conditions. The E.C.U. senses the engine condition and determines the best idle speed at water temperature and gear position. The control unit then sends an electronic signal corresponding to the difference between the best idle speed and the actual idle speed to the A.A.C. valve.

The E.C.U. controlled idle speed feedback is carried out when the following conditions are satisfied.

1) When starting engine.
2) Idle switch is turned "ON" during acceleration or deceleration. (When shifting up or down transaxle position.)

Ignition Timing Control



Ignition timing is controlled, corresponding to the engine operating conditions, by the E.C.U. That is, as the optimum ignition timing in any driving condition has been pre-programmed in the E.C.U., the ignition timing is determined by electrical signals processed in the E.C.U.

The signal from the E.C.U. is transmitted to the power transistor, and controls ignition timing.

Fail-safe System

Air flow meter malfunctioning

When air flow meter output voltage is lower or higher than the preset value while the engine is running, the fuel injection pulse duration is fixed at the preset value (when engine speed is less than approx. 2,000 rpm) or the fuel is not injected (when engine speed is more than approx. 2,000 rpm).

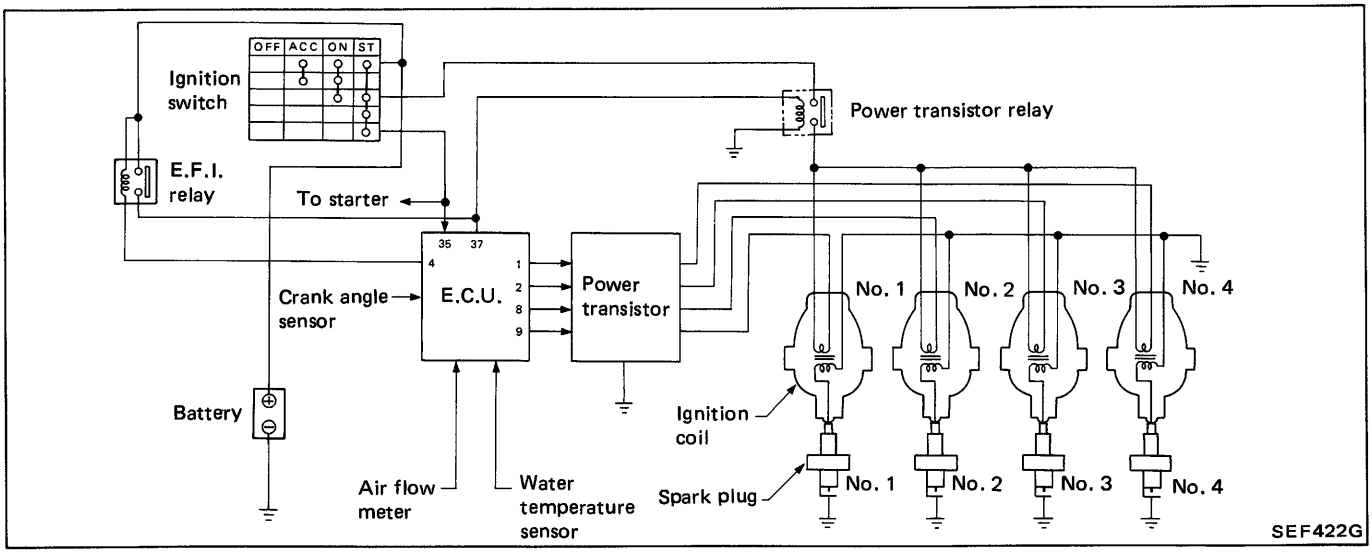
Water temperature sensor malfunctioning

When water temperature sensor output voltage is lower or higher than the specified value, water temperature is fixed at the preset value as follows:

Engine condition	Water temperature preset value °C (°F)
Start	20 (68)
Running	80 (176)

Direct Ignition System

This system has no conventional distributor and high-tension wires. Small, very efficient ignition coils are fitted directly to each spark plug.



Direct Ignition System (Cont'd)

CHECKING IGNITION TIMING AND IDLE SPEED

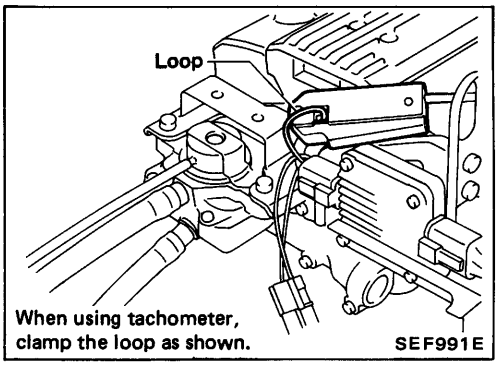
Checking idle speed

Idle speed:

M/T 800±50 rpm

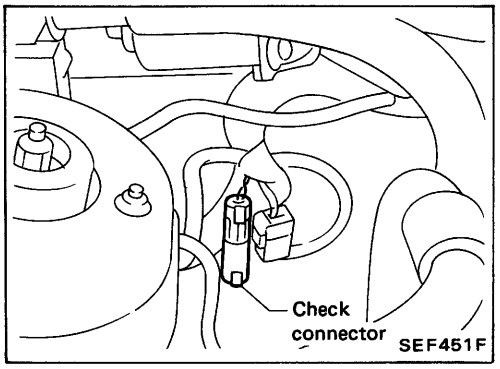
A/T 700±50 rpm (in "D" position)

If idle speed is not within specific value, refer to MIXTURE RATIO FEEDBACK SYSTEM INSPECTION.



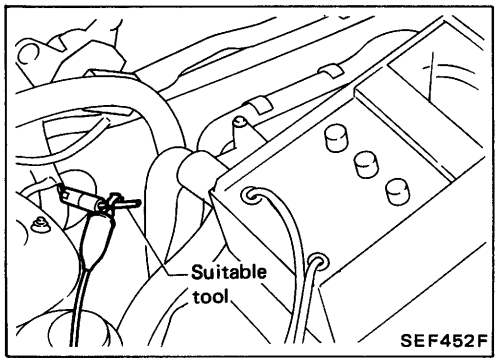
- METHOD A (With pulse type tachometer)

1. Clamp loop wire as shown.



- METHOD B (With voltage type tachometer)

1. Disconnect check connector for tachometer.

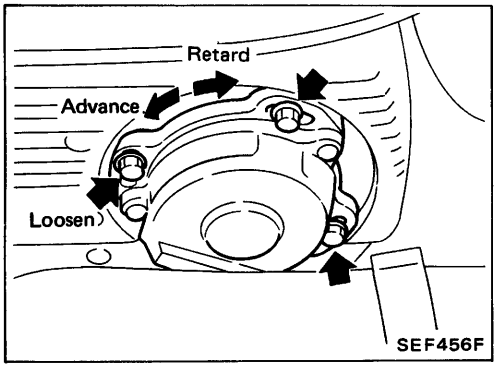


2. Connect tachometer using suitable tool.

Checking ignition timing

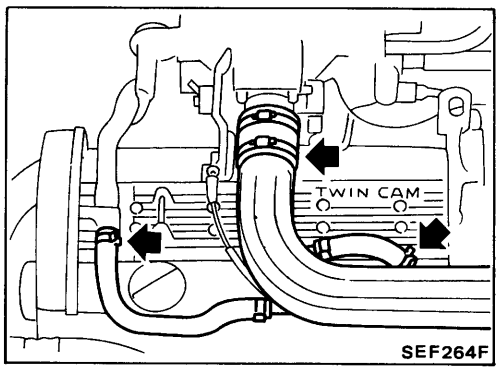
Ignition timing: 15°±2° B.T.D.C.

If ignition timing is not within specific value, adjust ignition timing as shown.

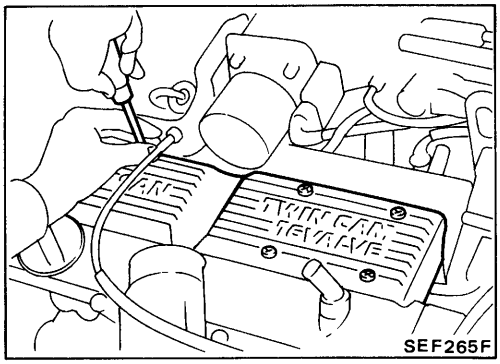


- METHOD A (Without S.S.T.)

1. Disconnect air duct and air hoses.

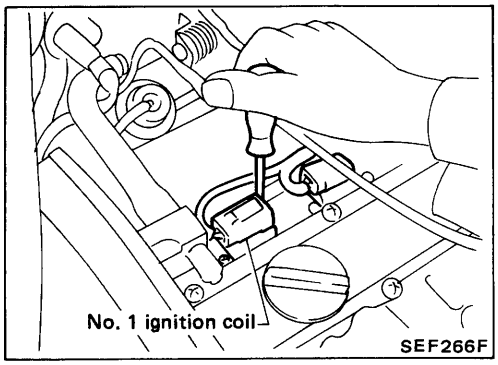


Direct Ignition System (Cont'd)



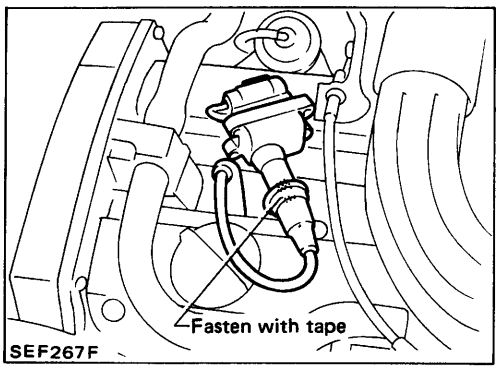
SEF265F

2. Remove ornament cover.
   Acceleration wire does not need removing.



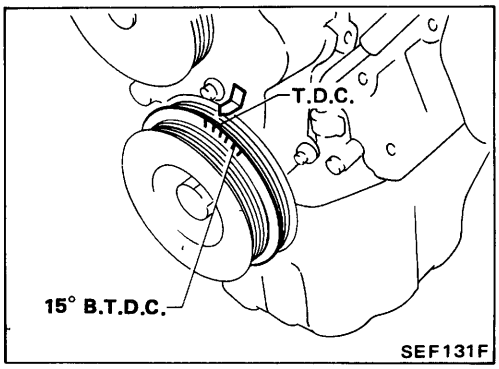
SEF266F

3. Remove No. 1 ignition coil.



SEF267F

4. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and clamp this wire with timing light clamp.

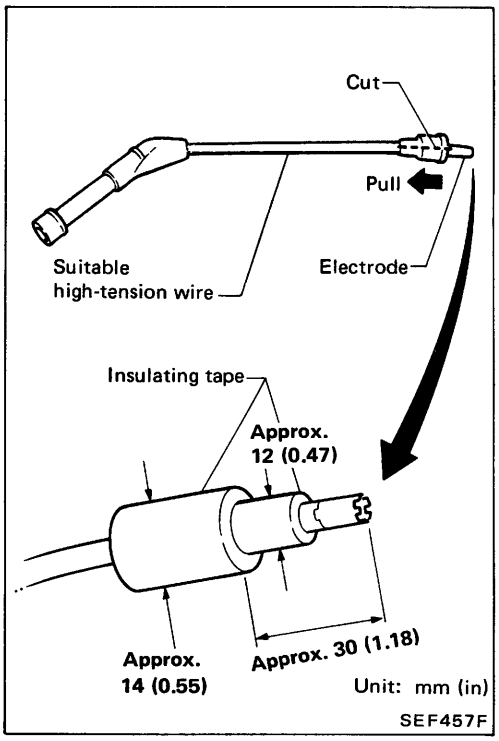


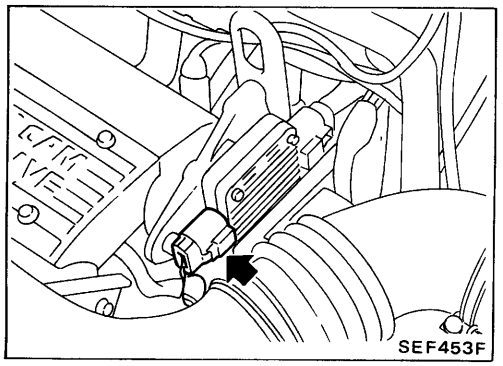
SEF131F

5. Connect air duct and air hoses, then start engine.
   Check ignition timing.
6. Install No. 1 ignition coil and ornament cover, and connect air duct and air hoses.

Direct Ignition System (Cont'd)

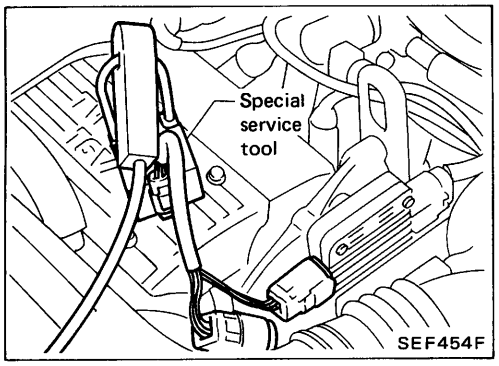
For above procedures, enlarge suitable high-tension wire end with insulating tape as shown.



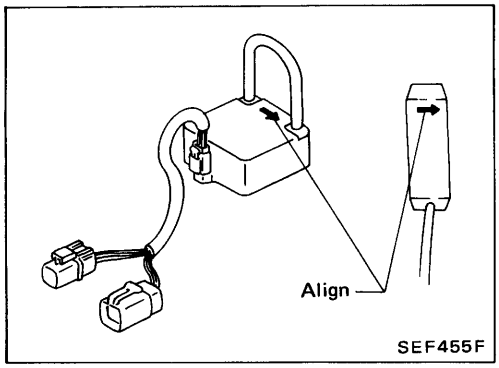


- METHOD B [With S.S.T. KV109D10S0 (J36777)]

1. Disconnect connector of power transistor unit.

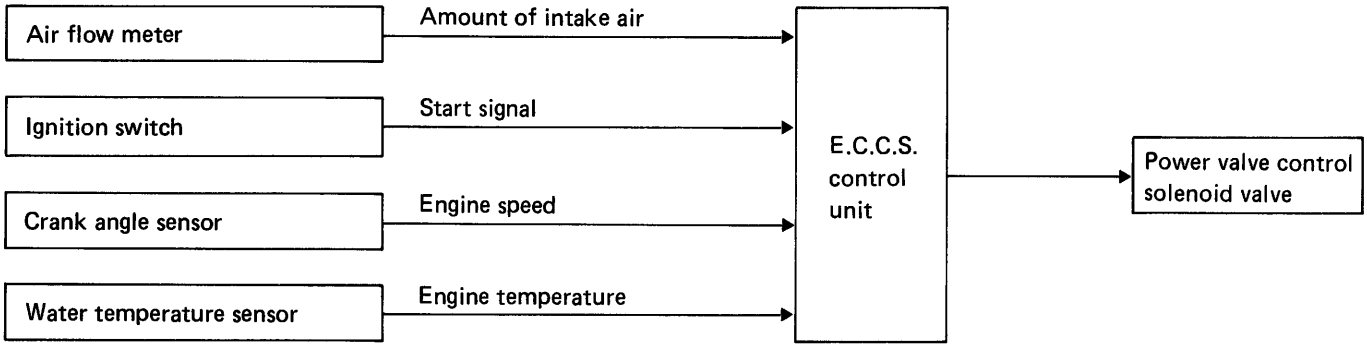


2. Connect S.S.T. and clamp wire as shown.



Align direction marks on S.S.T. and timing light clamp if aligning mark is punched.

NICS Control



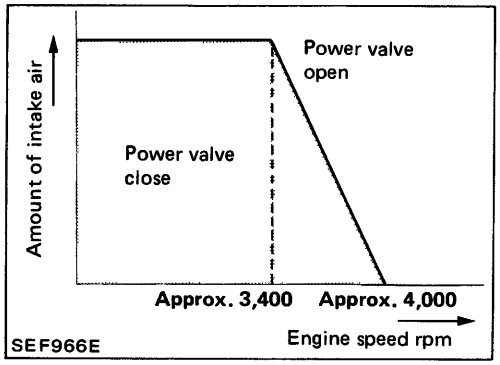
This system has an intake manifold port shut valve (power valve) to the one side of the intake passage for each cylinder.

At low engine speed or low engine load condition, the power valve is closed. Thus the velocity of the air in the intake passage increases, promoting the vapourization of the fuel and producing a swirl in the combustion chamber.

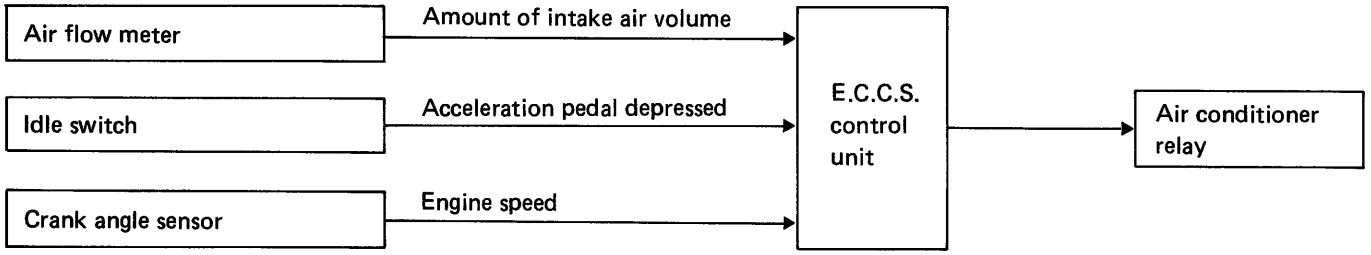
Because of this operation, this system tends to increase the burning speed of mixture gas, improve the fuel consumption, and increase the stability in running condition.

Also, at high speed or heavy engine load condition, this system opens both sides of dual intake passage (power valve is opened). In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance, intake flow.

The solenoid valve controls power valve's shut/open condition. This solenoid valve is operated by the E.C.U.

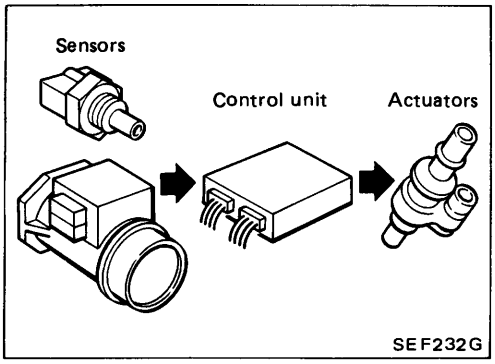


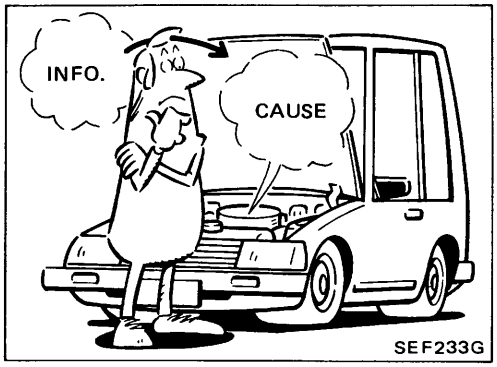
Acceleration Cut Control

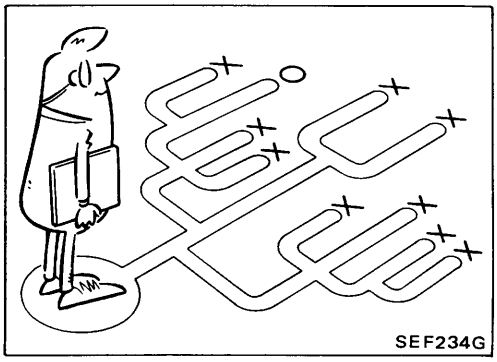


When E.C.U. detects heavy load conditions, air conditioner is turned off for a few seconds.

This system improves acceleration when air conditioner is used.







Introduction

The engine has an electronic control unit to control major systems such as fuel control, ignition control, idle speed control, etc. The control unit accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it is important that there are no conventional problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.

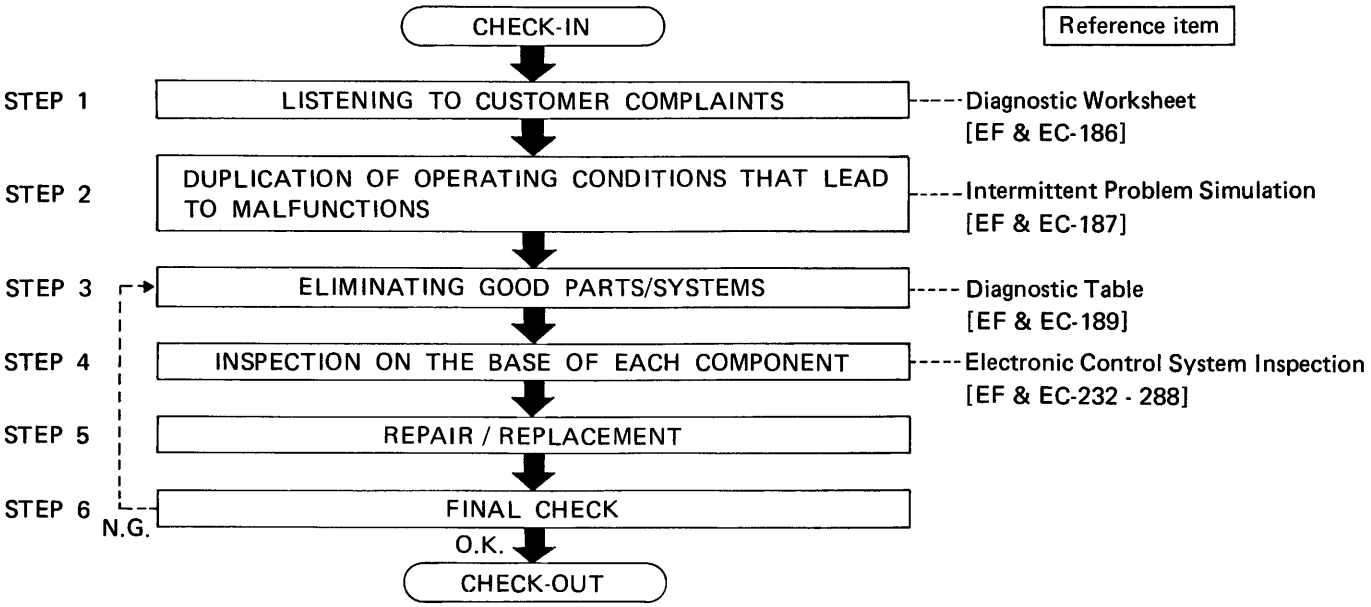
It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or faulty wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

A visual check only may not find the cause of the problems. A road test with a circuit tester connected to a suspected circuit should be performed.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through the talks with the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot driveability problems on an electronically controlled engine vehicle.

Work Flow



KEY POINTS

WHAT ..... Vehicle & engine model
WHEN ..... Date, Frequencies
WHERE ..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

Diagnostic Worksheet

There are many kinds of operating conditions that lead to malfunctions on engine components.

A good grasp of such conditions can make troubleshooting faster and more accurate.

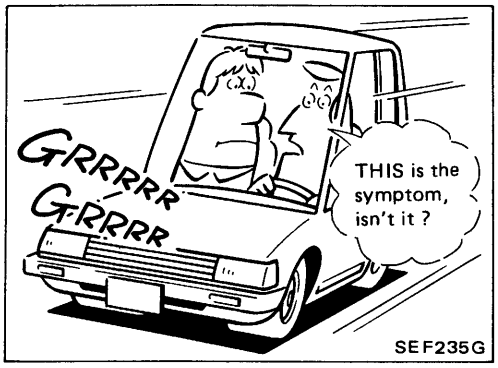
In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions a customer complains..

Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for troubleshooting.

WORKSHEET SAMPLE

Customer name MR/MS	Model & Year	VIN
Engine #	Trans.	Mileage
Incident Date	Manuf. Date	In Service Date

Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]
	☐ Driveability	☐ Stumble ☐ Surge ☐ Detonation ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes
Weather conditions		☐ Not effected
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH
Check engine light		☐ Turned on ☐ Not turned on

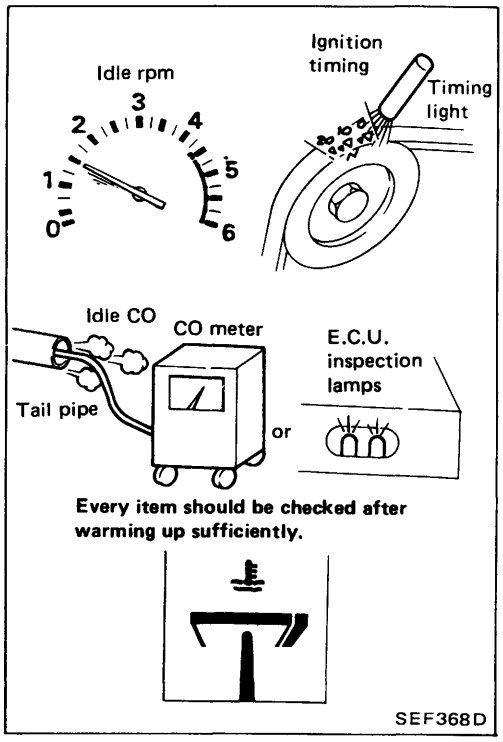


Intermittent Problem Simulation

In order to duplicate an intermittent problem, it is effective to create similar conditions for component parts, under which the problem might occur.

Perform the activity listed under Service procedure and note the result.

	Variable factor	Influential part	Target condition	Service procedure
1	Mixture ratio	Pressure regulator	Made lean	Remove vacuum hose and apply vacuum.
			Made rich	Remove vacuum hose and apply pressure.
2	Ignition timing	Distributor	Advanced	Rotate distributor clockwise.
			Retarded	Rotate distributor counterclockwise.
3	Mixture ratio feedback control	Exhaust gas sensor	Suspended	Disconnect exhaust gas sensor harness connector.
		Control unit	Operation check	Perform self-diagnosis (Mode I/II) at 2,000 rpm.
4	Idle speed	I.A.A. unit	Raised	Turn idle adjust screw counterclockwise.
			Lowered	Turn idle adjust screw clockwise.
5	Electric connection (Electric continuity)	Harness connectors and wires	Poor electric connection or faulty wiring	Tap or wiggle.
				Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks.
6	Temperature	Control unit	Cooled	Cool with an icing spray or similar device.
			Warmed	Heat with a hair drier. **[WARNING: Do not overheat the unit.]**
7	Moisture	Electric parts	Damp	Wet **[WARNING: Do not directly pour water on components. Use a mist sprayer.]**
8	Electric loads	Load switches	Loaded	Turn on head lights, air conditioner, rear defogger, etc.
9	Idle switch condition	Control unit	ON-OFF switching	Perform self-diagnosis (Mode IV).
10	Ignition spark	Timing light	Spark power check	Try to flash timing light for each cylinder.



Specifications

1) Idle speed
   - M/T: 800±50 rpm
   - A/T: 700±50 rpm (in "D" position)
2) Ignition timing
   - 15°±2° B.T.D.C.
3) Idle CO

○ 0.2 - 8.0% (in tail pipe)
- Idle switch harness connector disconnected (No A.I.V. controlled condition)
- Water temperature sensor harness connector disconnected and then 2.5 kΩ resistor connected.
- Exhaust gas sensor harness connector disconnected.

○ Flashes of E.C.U. red inspection lamp in Mode II (If flashes, O.K.)

4) Mixture ratio at approximately 2,000 rpm of engine speed.
   - Number of flashes of E.C.U. inspection green lamp in Mode I:
     - 9 times or more/10 seconds
5) Engine speed of idle switch OFF → ON
   - M/T: Idle speed + 250±150 rpm
   - A/T: Engine speed (in "N" position) + 250±150 rpm

Diagnostic Table

To assist with your troubleshooting, some typical diagnostic procedures for the following symptoms are described.

CONTENTS

1. Impossible to start — no combustion ..... EF & EC-190
2. Impossible to start — partial combustion ..... EF & EC-191
3. Impossible to start — partial combustion (not affected by throttle position) ..... EF & EC-192
4. Impossible to start — partial combustion (throttle position changes combustion quality) ..... EF & EC-193
5. Hard to start — before warm-up ..... EF & EC-194
6. Hard to start — after warm-up ..... EF & EC-195
7. Hard to start — every time ..... EF & EC-196
8. Hard to start — morning after a rainy day ..... EF & EC-197
9. Abnormal idling — no fast idle ..... EF & EC-198
10. Abnormal idling — low idle (after warm-up) ..... EF & EC-199
11. Abnormal idling — high idle (after warm-up) ..... EF & EC-200
12. Unstable idling — before warm-up ..... EF & EC-201
13. Unstable idling — after warm-up ..... EF & EC-202
14. Poor driveability — stumble (while accelerating) ..... EF & EC-203
15. Poor driveability — surge (while cruising) ..... EF & EC-204
16. Poor driveability — lack of power ..... EF & EC-205
17. Poor driveability — detonation ..... EF & EC-206
18. Engine stall — during start-up ..... EF & EC-207
19. Engine stall — while idling ..... EF & EC-208
20. Engine stall — while accelerating ..... EF & EC-209
21. Engine stall — while cruising ..... EF & EC-210
22. Engine stall — while decelerating/just after stopping ..... EF & EC-211
23. Engine stall — while loading (power steering, air conditioner, headlamps, etc.) ..... EF & EC-212
24. Backfire — through the intake ..... EF & EC-213
25. Backfire — through the exhaust ..... EF & EC-214

REMARKS

In the following pages, the numbers such as ❶, ❷ in the above chart correspond to those in the service procedure described below.
Possible causes can be checked through the service procedure shown by the mark "○".

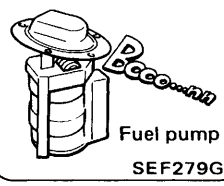
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 1 Impossible to start — no combustion

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽
SPECIFICATIONS	Mixture ratio (too lean)	○	○						
	Ignition sparks (weak, missing)				○	○	○		
	Ignition timing							○	
FUEL SYSTEM	Fuel pump (no operation)	○							
	Fuel pump relay (open circuited)	○							
	Injectors (no operation, clogged)		○						
IGNITION SYSTEM	Ignition switch	○	○	○	○			○	
	Main relay	○	○	○	○			○	
	Power transistor			○	○			○	
	Ignition coil				○			○	
	Center cable (ignition leaks)				○			○	
	Ignition wires (ignition leaks)				○	○			
	Spark plugs						○		
CONTROL SYSTEM	Crank angle sensor	○	○		○			○	○

SERVICE PROCEDURE

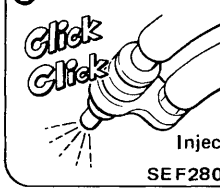
❶ **LISTEN**



Listen for fuel pump operating sound.

N.G. → Check fuel pump and/or related circuits. [See page EF & EC-270.]

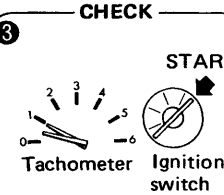
❷ **LISTEN**



Listen for injector operating sound.

N.G. → Check injector circuit. [See page EF & EC-280.]

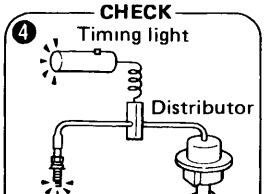
❸ **CHECK**



Make sure tachometer needle moves when cranking.

N.G. →

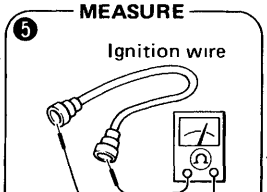
❹ **CHECK** Timing light



Check flashes of timing light for weakness.

N.G. →

❺ **MEASURE**

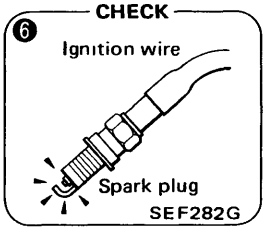


Measure resistance of suspect wires.

N.G. → Replace the wire.

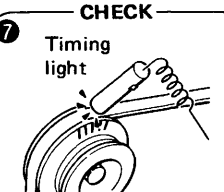
O.K. →

❻ **CHECK**



Remove spark plugs and check their ignition sparks.

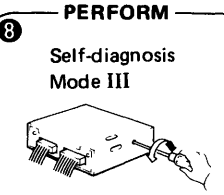
❼ **CHECK**



Check ignition timing.

N.G. → Adjust ignition timing. [See page EF & EC-188.]

❽ **PERFORM**



Perform self-diagnosis Mode III (for crank angle sensor).

N.G. → Check crank angle sensor and/or related circuits. [See page EF & EC-236.]

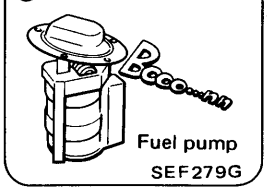
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 2 **Impossible to start — partial combustion**

POSSIBLE CAUSES		❶	❷	❸	❹	❺
SPECIFICATIONS	Mixture ratio	○	○	○		
	Fuel pressure (too low)				○	
	Ignition timing					○
FUEL SYSTEM	Fuel pump	○				
	Fuel pump relay (open circuited)	○				
	Injectors (clogged)		○			

SERVICE PROCEDURE

❶ **LISTEN**



Listen for fuel pump operating sound.

N.G. → Check fuel pump and/or related circuits. [See page EF & EC-270.]

O.K. →

❷ **LISTEN**

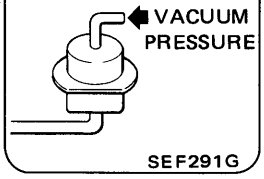


Listen for injector operating sound.

N.G. → Check injector circuit. [See page EF & EC-280.]

O.K. →

❸ **APPLY**

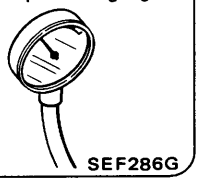


Remove vacuum hose from pressure regulator, and apply vacuum and/or pressure, and try to start.

Improved →

❹ **MEASURE**

Fuel pressure gauge

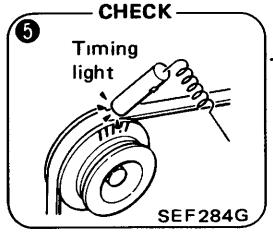


Connect vacuum hose to pressure regulator and measure fuel pressure.

↓

Check Mixture ratio feedback system. [See page EF & EC-294.]

❺ **CHECK**



Check ignition timing.

→ Adjust ignition timing. [See page EF & EC-188.]

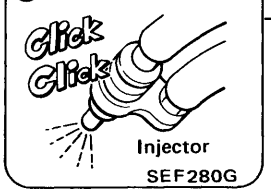
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 3 Impossible to start – partial combustion (not affected by throttle position

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫	⓬
SPECIFICATIONS	Mixture ratio	○		○	○								
	Fuel pressure (too low)			○	○	○							
	Ignition timing						○						
FUEL SYSTEM	Fuel filter (clogged)					○							
	Fuel line (clogged)					○							
	Injectors (clogged)	○											
	Pressure regulator				○								
	Pressure regulator vacuum hose (clogged)			○									
IGNITION SYSTEM	Ignition wires (ignition leaks)							○	○				
	Spark plugs (wet with fuel)									○			
	Ignition switch	○						○			○		
INTAKE SYSTEM	Throttle chamber (with ports clogged)		○										
	Throttle valve (clogged)		○										
CONTROL SYSTEM	Water temperature sensor											○	○
	Crank angle sensor	○						○				○	

SERVICE PROCEDURE

❶ **LISTEN**

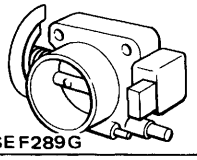


N.G. → Check injector circuit. [See page EF & EC-280.]

Listen for injector operating sound.

O.K. ↓

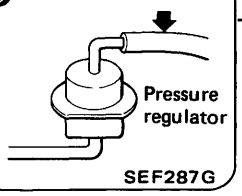
❷ **CHECK** Throttle chamber



N.G. → Clean the ports and/or throttle valve.

Check throttle chamber ports and valve for clogging.

❸ **CHECK**



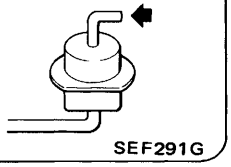
O.K. →

Check vacuum hose of pressure regulator for clogging.

N.G. ↓

Repair or replace the hose.

❹ **REMOVE** Pressure regulator



Improved →

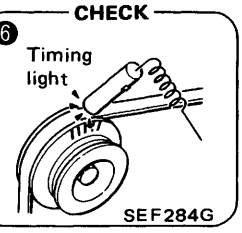
Remove vacuum hose from pressure regulator, and try to start.

❺ **MEASURE** Fuel pressure

Connect vacuum hose to pressure regulator and measure fuel pressure.

→ Check Mixture ratio feedback system. [See page EF & EC-294.]

❻ **CHECK** Timing light

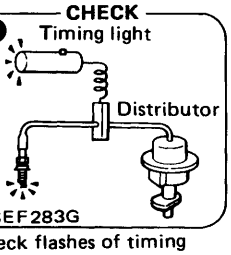


Check ignition timing.

N.G. ↓

Adjust ignition timing. [See page EF & EC-188.]

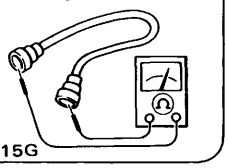
❼ **CHECK** Timing light



Check flashes of timing light for weakness.

N.G. →

❽ **MEASURE** Ignition wire



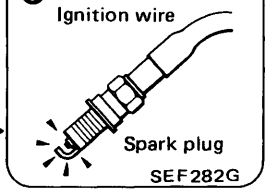
Measure resistance of suspect ignition wires.

N.G. ↓

Replace the wires.

O.K. →

❾ **CHECK** Ignition wire



Remove spark plugs and check their ignition sparks by cranking.

❿ **PERFORM** Self-diagnosis Mode IV

N.G. → Check starter circuit. [See page EF & EC-272.]

Perform self-diagnosis Mode IV (for start signal).

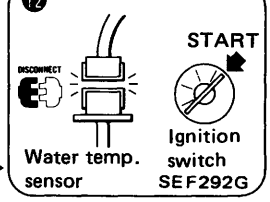
⓫ **PERFORM** Self-diagnosis Mode III

for C.A.S. → Check the sensor circuits. [See page EF & EC-240 (water temp. sensor), page EF & EC-236 (crank angle sensor).]

for C.H.T.S. →

Perform self-diagnosis Mode III (for water temp. sensor and crank angle sensor).

⓬ **CRANK**



N.G. →

Start with water temp. sensor connector disconnected.

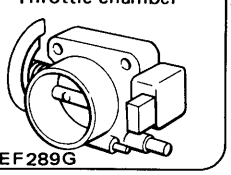
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 4 **Impossible to start – partial combustion (throttle position changes combustion quality)**

POSSIBLE CAUSES		❶	❷	❸	❹
INTAKE SYSTEM	Throttle chamber (with ports clogged)	○			
	Throttle valve (clogged)		○		
	Air regulator (stuck closed)			○	
	A.A.C. valve				○
CONTROL SYSTEM	Water temperature sensor				○
	Idle switch				○
	Neutral switch				○

SERVICE PROCEDURE

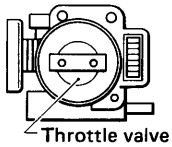
CHECK ❶ Throttle chamber



N.G. → Clean the ports.

Check throttle chamber ports for clogging.

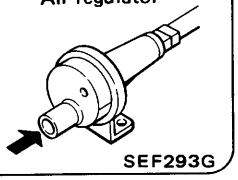
CHECK ❷ Throttle chamber



N.G. → Clean the valve.

Check throttle valve for clogging.

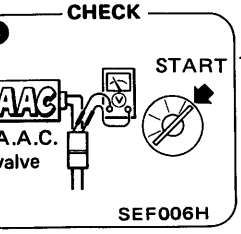
CHECK ❸ Air regulator



N.G. → Check air regulator and/or its circuit. [See page EF & EC-278.]

Make sure air regulator stays open before warm-up

CHECK ❹



N.G. → Check A.A.C. control circuit. [See page EF & EC-274.]

Check terminal voltage of A.A.C. valve while cranking.

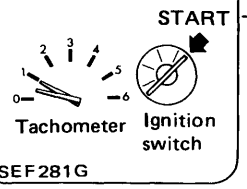
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 5 Hard to start – before warm-up

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio			○			○
IGNITION SYSTEM	Ignition switch (no start signal)	○			○		
INTAKE SYSTEM	Air regulator			○			
CONTROL SYSTEM	Water temperature sensor					○	○
	Idle switch				○		
	Neutral switch	○					
OTHERS	Starter (operation too slow)	○					
	Battery (voltage too low)	○	○				

SERVICE PROCEDURE

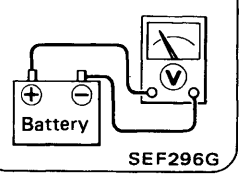
❶ CHECK



Make sure tachometer indicates about 300 rpm while cranking.

N.G. →

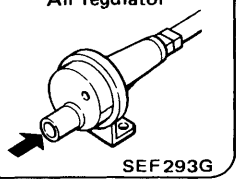
❷ MEASURE



Measure battery voltage.

N.G. (less than 12V) → Charge the battery.

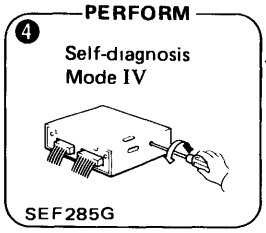
❸ CHECK



Make sure air regulator stays open before warm-up.

N.G. → Check air regulator and/or its circuit. [See page EF & EC-278.]

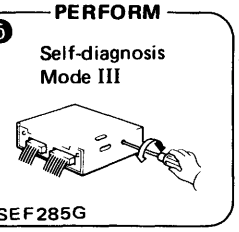
❹ PERFORM



Perform self-diagnosis Mode IV (for start signal and idle switch).

N.G. → Check the malfunctioning switches and/or circuits. [See page EF & EC-272 (start signal), page EF & EC-248 (idle switch).]

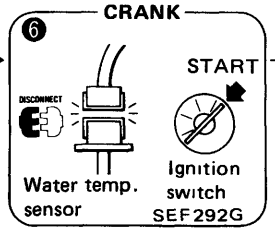
❺ PERFORM



Perform self-diagnosis Mode III (for water temp. sensor).

N.G. →

❻ CRANK



Start with water temp. sensor connector disconnected.

N.G. → Check sensor circuit. [See page EF & EC-240.]

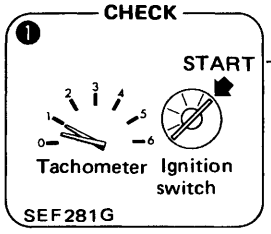
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 6 Hard to start – after warm-up

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio			○			○
	Fuel pressure			○			○
FUEL SYSTEM	Fuel line (hot fuel)			○			
	Pressure regulator (low fuel pressure)						○
	Pressure regulator vacuum hose (clogged)						○
	Pressure regulator control solenoid vacuum hose						○
IGNITION SYSTEM	Ignition switch (no start signal)	○				○	
CONTROL SYSTEM	Water temperature sensor				○		
	Air flow meter				○		
OTHERS	Starter (operation too slow)	○					
	Battery (voltage too low)	○	○				

SERVICE PROCEDURE

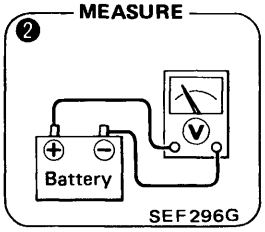
❶ CHECK



Make sure tachometer indicates about 300 rpm while cranking.

N.G. →

❷ MEASURE

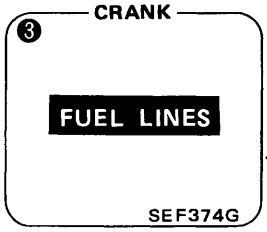


Measure battery voltage.

N.G. (less than 12V) ↓

Charge the battery.

❸ CRANK



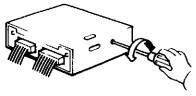
Cool fuel lines with wet rags, etc. and try to start.

No change → Proceed to other steps.

Improved → Proceed to other steps. If everything is O.K., check fuel vapor pressure.

❹ PERFORM

Self-diagnosis Mode III

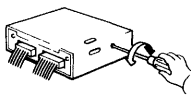


Perform self-diagnosis Mode III (for water temp. sensor and air flow meter).

N.G. → Check sensor circuits. [See page EF & EC-240 (water temp. sensor), page EF & EC-238 (air flow meter).]

❺ PERFORM

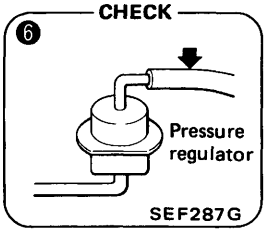
Self-diagnosis Mode IV



Perform self-diagnosis Mode IV (for start signal).

N.G. → Check starter circuit. [See page EF & EC-272.]

❻ CHECK



Check vacuum hose of pressure regulator for clogging.

N.G. ↓

Repair or replace the hose.

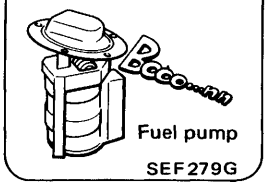
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 7 Hard to start – every time

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫	⓬
SPECIFICATIONS	Mixture ratio	○				○	○						
	Fuel pressure						○	○					
	Ignition sparks (missing)								○	○		○	
	Ignition timing				○								
FUEL SYSTEM	Fuel pump (improper operation)	○											
	Fuel line (clogged)							○					
	Canister (air leaks)					○							
	Pressure regulator (low fuel pressure)						○						
IGNITION SYSTEM	Ignition wires (ignition leaks)								○	○			
	Spark plugs (improper gap)										○		
CONTROL SYSTEM	Crank angle sensor	○							○				○
	Water temperature sensor												○
	Idle switch												○
	Neutral switch		○										
OTHERS	Starter (operation too slow)		○										
	Battery (voltage too low)		○	○									

SERVICE PROCEDURE

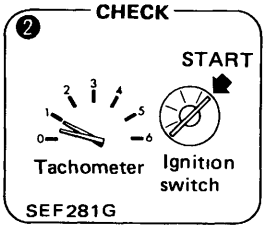
❶ **LISTEN**



Listen for fuel pump operating sound.

N.G. → Check fuel pump and/or related circuits. [See page EF & EC-270.]

❷ **CHECK**



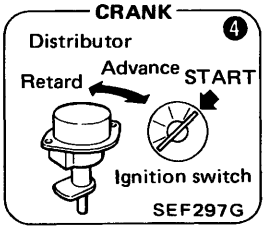
Make sure tachometer indicates about 300 rpm while cranking.

N.G. → ❸ **MEASURE** Battery

Measure battery voltage.

N.G. → Charge the battery.

❹ **CRANK**

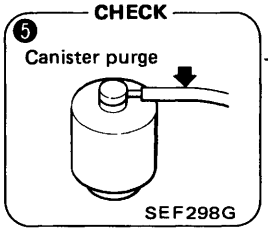


Advance/retard ignition timing and try to start.

No change → [Proceed to other steps.]

Improved → Check Mixture ratio feedback system. [See page EF & EC-294.]

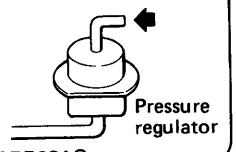
❺ **CHECK**



Check vacuum hose of canister for air leaks.

N.G. → Repair or replace the hose.

❻ **REMOVE**



Remove vacuum hose from pressure regulator, and try to start.

❼ **MEASURE** Fuel pressure

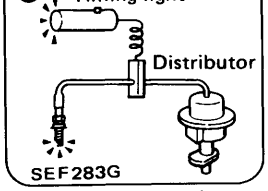
Connect vacuum hose to pressure regulator and measure fuel pressure.

❿ **PERFORM** Self-diagnosis Mode III/IV

Perform self-diagnosis Mode III (for water temp. sensor and crank angle sensor), Mode IV (for idle switch).

N.G. → Check the malfunctioning circuits. [See page EF & EC-240 (water temp. sensor), page EF & EC-237 (crank angle sensor), page EF & EC-248 (idle switch).]

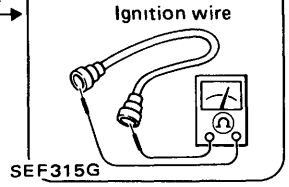
❽ **CHECK** Timing light



Check flashes of timing light for weakness.

N.G. → Replace the wires.

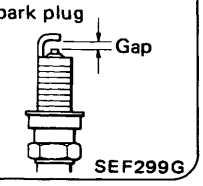
❾ **MEASURE** Ignition wire



Measure resistance of suspect ignition wires.

O.K. →

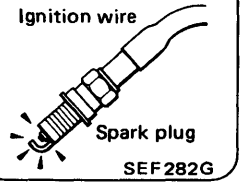
❿ **MEASURE** Spark plug



Remove spark plugs and measure their gaps.

O.K. →

⓫ **CHECK** Ignition wire



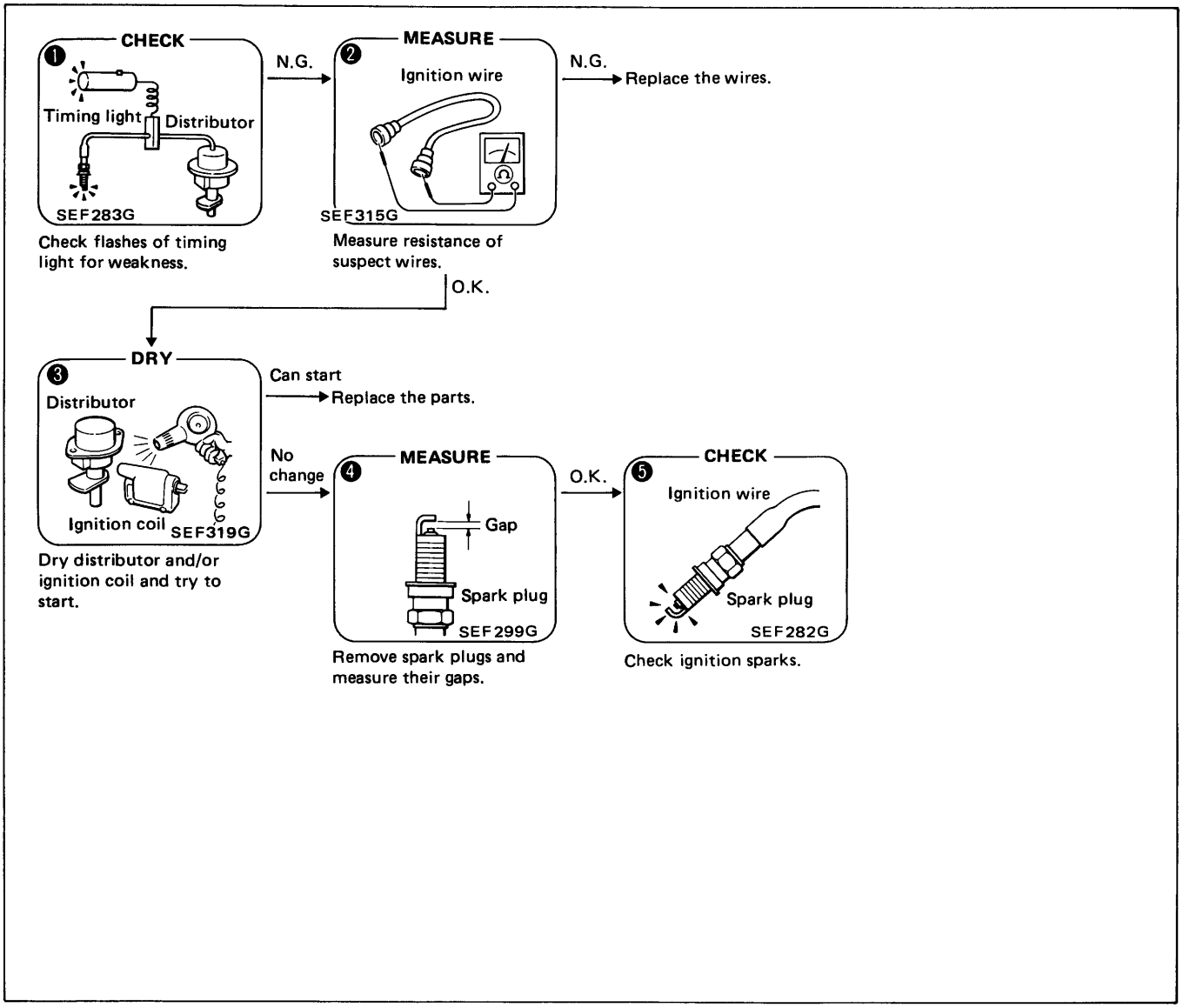
Check ignition sparks.

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 8 Hard to start — morning after a rainy day

	POSSIBLE CAUSES	❶	❷	❸	❹	❺
SPECIFICATIONS	Ignition sparks (weak)	○	○			○
IGNITION SYSTEM	Power transistor	○				○
	Ignition coil	○		○		○
	Center cable (ignition leaks)	○				○
	Ignition wires (ignition leaks)	○	○			○
	Distributor cap (ignition leaks)	○		○		○
	Spark plugs (improper gap)				○	○

SERVICE PROCEDURE



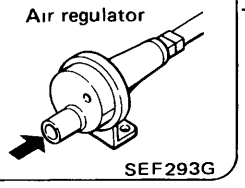
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 9 **Abnormal idling – no fast idle**

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio	○	○		○		
	Ignition timing			○			
INTAKE SYSTEM	Blow-by hose (clogged)		○				
	Air regulator (stuck closed)	○					
CONTROL SYSTEM	Water temperature sensor					○	○

SERVICE PROCEDURE

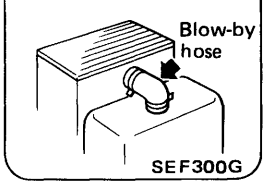
❶ **CHECK**



N.G. → Check air regulator and/or its circuit. [See page EF & EC-278.]

Make sure air regulator stays open before warm-up.

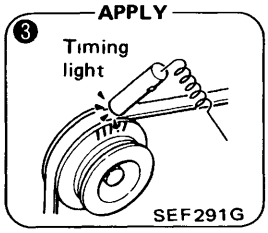
❷ **CHECK**



N.G. → Clean or replace the hose.

Check blow-by hose for clogging.

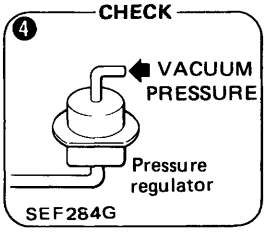
❸ **APPLY**



Improved → Adjust ignition timing. [See page EF & EC-188.]

Check ignition timing.

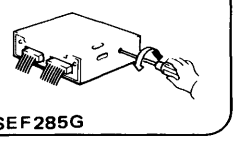
❹ **CHECK**



N.G. → Check Mixture ratio feedback system. [See page EF & EC-294.]

Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and check idling.

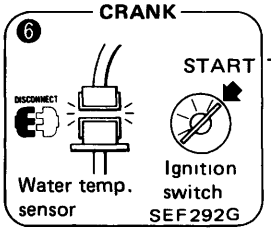
❺ **PERFORM**



N.G. →

Perform self-diagnosis Mode III (for water temp. sensor).

❻ **CRANK**



N.G. → Check sensor circuit. [See page EF & EC-240.]

Start with water temp. sensor connector disconnected.

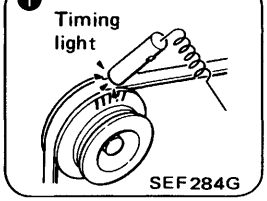
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 10 Abnormal idling – low idle (after warm-up)

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio		○			○		
	Ignition timing (too retarded)	○						
INTAKE SYSTEM	Throttle chamber (with ports clogged)			○				
	Throttle valve (clogged)				○			
	A.A.C. valve							○
CONTROL SYSTEM	Crank angle sensor						○	
	Air flow meter						○	
	Water temperature sensor						○	○

SERVICE PROCEDURE

❶ CHECK

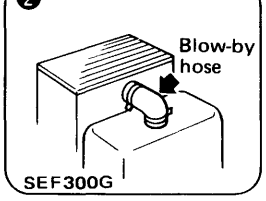


Check ignition timing.

N.G.

Adjust ignition timing. [See page EF & EC-188.]

❷ CHECK

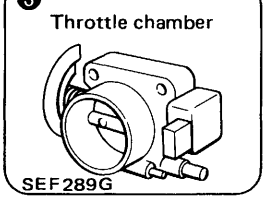


Check blow-by hose for clogging.

N.G.

Clean or replace the hose.

❸ CHECK

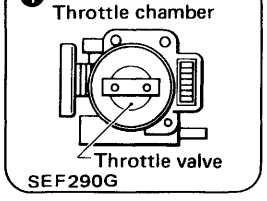


Check throttle chamber ports for clogging.

N.G.

Clean the ports.

❹ CHECK

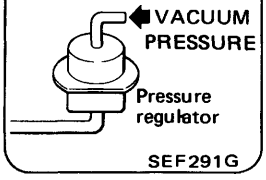


Check throttle valve for clogging.

N.G.

Clean the valve.

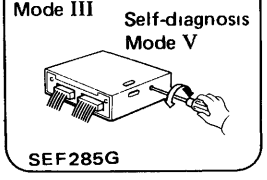
❺ APPLY



Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and check idling.

Improved → Check Mixture ratio feedback system. [See page EF & EC-294.]

❻ PERFORM

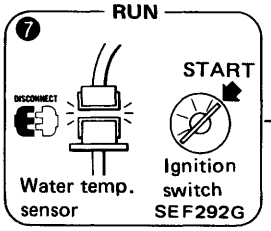


Perform self-diagnosis Modes III and V (for air flow meter, and water temp. sensor).

N.G.

Check the malfunctining parts and/or circuits. [See page EF & EC-238 (air flow meter), page EF & EC-240 (water temp. sensor).]

❼ RUN



N.G. →

Start and run engine with water temp. sensor connector disconnected.

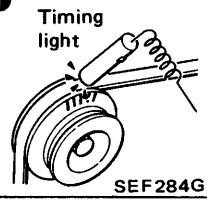
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 11 Abnormal idling – high idle (after warm-up)

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫
SPECIFICATIONS	Mixture ratio		○	○		○	○			○		
	Ignition timing (too advanced)	○										
INTAKE SYSTEM	Air duct (leaks)		○									
	Throttle chamber (air leaks)				○							
	Throttle valve (stuck control wire)				○							
	Intake manifold (gasket) (air leaks)		○									
	Air regulator (stuck open)			○								
	A.A.C. valve (remaining ON)							○				
	F.I.C.D. solenoid (remaining ON)								○			
CONTROL SYSTEM	Crank angle sensor										○	
	Air flow meter										○	
	Water temperature sensor										○	○
	Idle switch (remaining OFF)							○		○		
OTHERS	Battery (voltage too low)											

SERVICE PROCEDURE

❶ CHECK

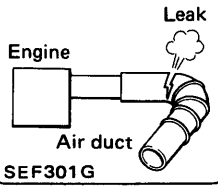


Check ignition timing.

N.G. ↓

Adjust ignition timing.
[See page EF & EC-188.]

❷ CHECK

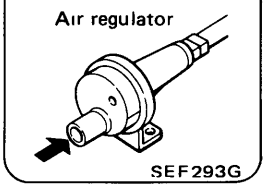


Check intake system for air leaks.

O.K. ↓ Check throttle wire for rough sliding.

N.G. ↓ Repair/replace the part.

❸ CHECK

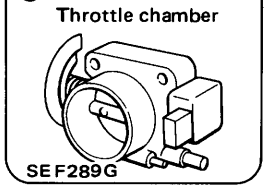


Make sure air regulator stays closed after warm-up.

N.G. ↓

Check air regulator and/or its circuit.
[See page EF & EC-278.]

❹ CHECK

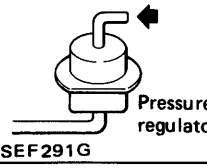


Check throttle chamber ports and valve for clogging.

N.G. ↓

Clean the ports and/or throttle valve.

❺ REMOVE



Remove vacuum hose from pressure regulator, and try to start.

Improved →

❻ MEASURE

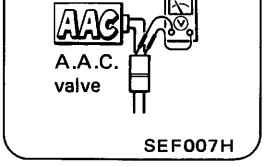
Fuel pressure

Connect vacuum hose to pressure regulator and measure fuel pressure.

↓

Check Mixture ratio feedback system.
[See page EF & EC-294.]

❼ CHECK

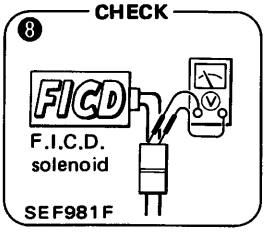


Check terminal voltage of A.A.C. valve while idling.

N.G. → Check the part and/or circuit.
[See page EF & EC-274.]

Check sensor circuit.
[See page EF & EC-240 (water temp. sensor), page EF & EC-236 (crank angle sensor), page EF & EC-238 (air flow meter).]

❽ CHECK



Check terminal voltage of F.I.C.D. solenoid while idling.

↓

Check the part and/or circuit.
[See HA section.]

❾ PERFORM

Self-diagnosis Mode IV

Perform self-diagnosis Mode IV (for idle switch).

N.G. ↓

Check the idle switch circuit.
[See page EF & EC-248.]

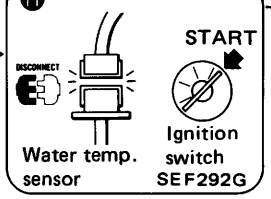
❿ PERFORM

Self-diagnosis Mode III

N.G.

Perform self-diagnosis Mode III (for water temp. sensor, crank angle sensor and air flow meter).

⓫ CRANK



N.G.

Start with water temp. sensor connector disconnected.

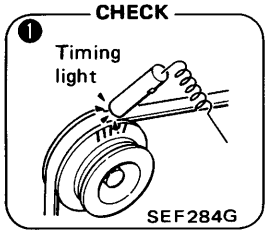
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 12 Unstable idling – before warm-up

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽
SPECIFICATIONS	Mixture ratio		○	○					
	Ignition timing	○							
INTAKE SYSTEM	Air regulator (not open enough)		○						
	A.A.C. valve (remaining OFF)				○				
CONTROL SYSTEM	Water temperature sensor							○	○
E.G.R. SYSTEM	E.G.R. control valve (stuck open)					○			
	E.G.R. solenoid (remaining OFF)					○	○		

SERVICE PROCEDURE

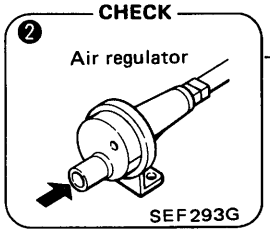
❶ CHECK



Check ignition timing.

N.G. → Adjust ignition timing. [See page EF & EC-188.]

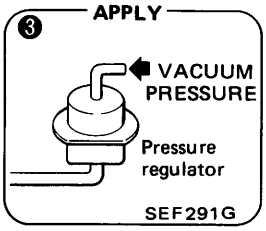
❷ CHECK



Make sure air regulator stays open before warm-up.

N.G. → Check air regulator and/or its circuit. [See page EF & EC-278.]

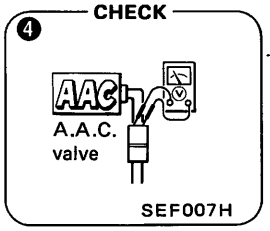
❸ APPLY



Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and check idling.

Improved → Check Mixture ratio feedback system. [See page EF & EC-294.]

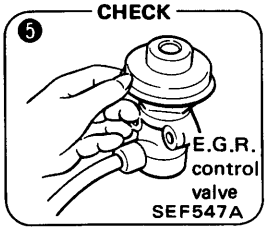
❹ CHECK



Check terminal voltage of A.A.C. valve while idling.

Does not turn ON → Check its circuit. [See page EF & EC-274.]

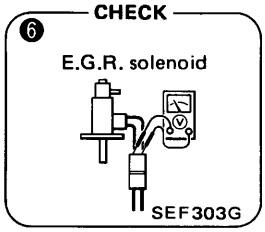
❺ CHECK



Check E.G.R. control valve for operation.

Stays lifted →

❻ CHECK

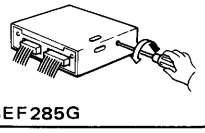


Check terminal voltage of E.G.R. solenoid while idling.

N.G. ↓

Check the solenoid circuit. [See page EF & EC-254.]

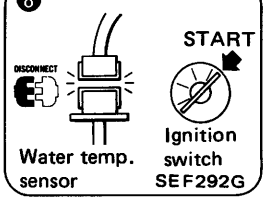
❼ PERFORM



Perform self-diagnosis Mode III (for water temp. sensor).

N.G. → Check sensor circuit. [See page EF & EC-240.]

❽ RUN



Start and run engine with water temp. sensor connector disconnected.

N.G. → Check sensor circuit. [See page EF & EC-240.]

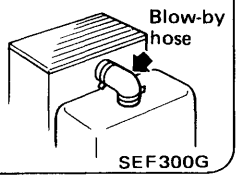
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 13 **Unstable idling – after warm-up**

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫
SPECIFICATIONS	Mixture ratio	○	○	○								
	Ignition sparks				○	○	○					
	Ignition timing							○				
	Compression pressure								○			
FUEL SYSTEM	Fuel line (clogged)											
	Canister (air leaks)			○								
IGNITION SYSTEM	Power transistor				○		○					
	Ignition coil				○		○					
	Ignition wires				○	○	○					
INTAKE SYSTEM	Blow-by hose (leaks)	○										
	Air duct (leaks)		○									
CONTROL SYSTEM	Idle switch											○
E.G.R. SYSTEM	E.G.R. control valve									○		
	E.G.R. solenoid									○	○	

SERVICE PROCEDURE

❶ CHECK

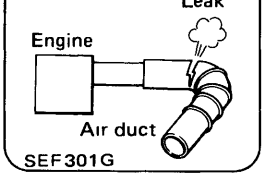


Check blow-by hose for leaks.

N.G. ↓

Repair/replace the hose.

❷ CHECK

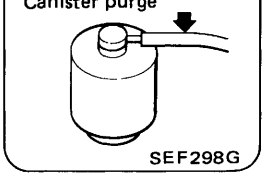


Check intake system for air leaks.

N.G. ↓

Repair/replace the part.

❸ CHECK

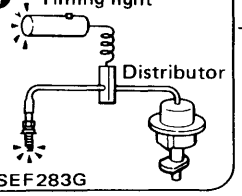


Check purge line for leaks.

N.G. ↓

Repair/replace the hose.

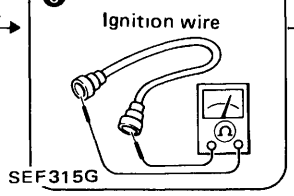
❹ CHECK



Check flashes of timing light for weakness.

N.G. →

❺ MEASURE



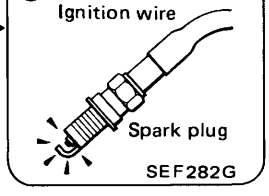
Measure resistance of suspect wires.

N.G. ↓

Replace the wire.

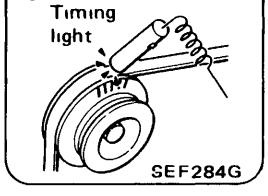
O.K. →

❻ CHECK



Remove spark plugs and check their ignition sparks.

❼ CHECK

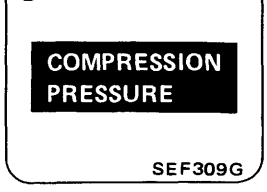


Check ignition timing.

N.G. ↓

Adjust ignition timing.
[See page EF & EC-188.]

❽ MEASURE

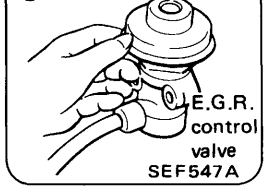


Measure compression pressure.

N.G. ↓

Check cylinder head and gasket.
[See EM section.]

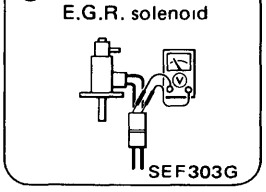
❾ CHECK



Check E.G.R. control valve for operation.

Stays lifted →

❿ CHECK

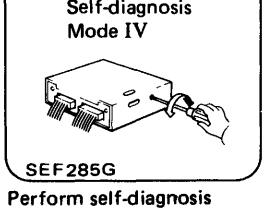


Check terminal voltage of E.G.R. solenoid while idling.

N.G. ↓

Check the solenoid circuit.
[See page EF & EC-254.]

⓫ PERFORM



Perform self-diagnosis Mode IV (for idle switch).

N.G. ↓

Check the idle switch circuit.
[See page EF & EC-248.]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 14 Poor driveability — stumble (while accelerating)

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio				○		○	○		○
	Fuel pressure						○	○		
FUEL SYSTEM	Fuel filter (clogged)							○		
	Fuel line (clogged)							○		
	Injectors (clogged)							○		
IGNITION SYSTEM	Power transistor	○		○						
	Ignition coil	○		○						
	Ignition wires (ignition leaks)	○	○	○						
	Spark plugs (ignition leaks, improper gap)			○						
INTAKE SYSTEM	Air duct (leaks)				○					
CONTROL SYSTEM	Crank angle sensor	○							○	
	Air flow meter								○	
	Water temperature sensor	○							○	
	Exhaust gas sensor								○	○
	Idle switch (remaining OFF)					○				
OTHERS	Fuel (poor quality)									

SERVICE PROCEDURE

❶ CHECK — Timing light, Distributor — SEF283G
Check flashes of timing light for weakness.

N.G. → ❷ MEASURE — Ignition wire — SEF315G
Measure resistance of suspect wires.

N.G. → Replace the wires.

O.K. → ❸ CHECK — Ignition wire, Spark plug — SEF282G
Remove spark plugs and check their ignition sparks.

❹ CHECK — Leak, Engine, Air duct — SEF301G
Check intake system for air leaks.

N.G. → Repair/replace the part.

❺ PERFORM — Self-diagnosis Mode IV — SEF285G
Perform self-diagnosis Mode IV (for idle switch).

N.G. → Check the idle switch circuit.
[See page EF & EC-248.]

❻ REMOVE — Pressure regulator — SEF291G
Remove vacuum hose from pressure regulator, and try to drive.

Improved → ❼ MEASURE — Fuel pressure gauge — SEF286G
Connect vacuum hose to pressure regulator and measure fuel pressure while driving.

→ Check Mixture ratio feedback system.
[See page EF & EC-294.]

❽ PERFORM — Self-diagnosis Mode III, Self-diagnosis Mode V — SEF285G
Perform self-diagnosis Mode III and V (for air flow meter and exhaust gas sensor).

N.G. → Check the malfunctioning parts and/or circuits.
[See page EF & EC-238 (air flow meter), page EF & EC-258 (exhaust gas sensor).]

❾ DISCONNECT — Exhaust gas sensor — SEF307G
Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check Mixture ratio feedback system.
[See page EF & EC-294.]

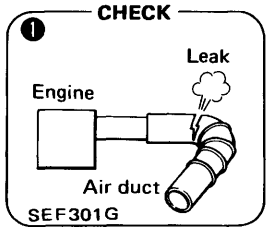
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 15 Poor driveability – surge (while cruising)

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio (too lean)	○				○	○			○
	Fuel pressure (low)					○	○			
	Ignition timing		○							
IGNITION SYSTEM	(missing)								○	
INTAKE SYSTEM	Air duct (leaks)	○								
	Throttle chamber (air leaks)	○								
	Intake manifold (gasket) (air leaks)	○								
CONTROL SYSTEM	Crank angle sensor								○	
	Air flow meter								○	
	Exhaust gas sensor								○	○
	Idle switch							○		
E.G.R. SYSTEM	E.G.R. control valve (stuck open)			○						
	E.G.R. solenoid (remaining OFF)			○	○					
	E.G.R. vacuum hose (removed)			○						

SERVICE PROCEDURE

❶ **CHECK**

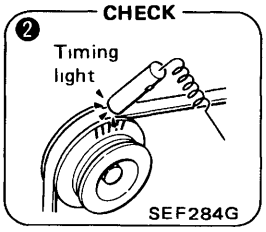


Check intake system for air leaks.

↓ N.G.

Repair/replace the part.

❷ **CHECK**

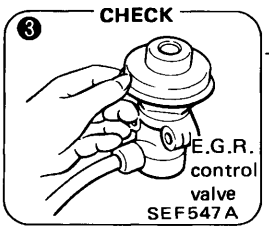


Check ignition timing.

↓ N.G.

Adjust ignition timing. [See page EF & EC-188.]

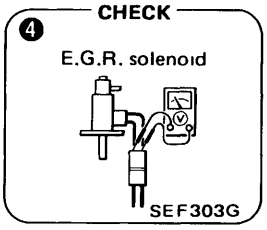
❸ **CHECK**



Check E.G.R. control valve for operation.

Stays lifted →

❹ **CHECK**

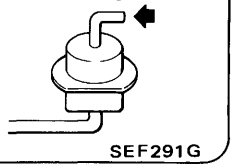


Check terminal voltage of E.G.R. solenoid.

↓ N.G.

Check the solenoid circuit. [See page EF & EC-254.]

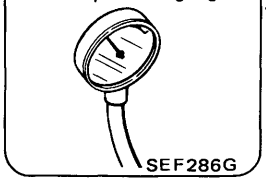
❺ **REMOVE**



Remove vacuum hose from pressure regulator, and try to drive.

Improved →

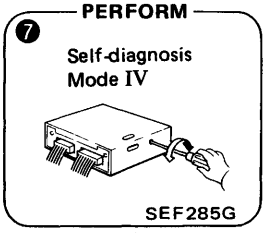
❻ **MEASURE**



Connect vacuum hose to pressure regulator and measure fuel pressure while driving.

→ Check Mixture ratio feedback system. [See page EF & EC-294.]

❼ **PERFORM**

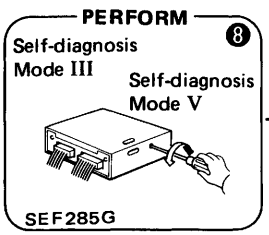


Perform self-diagnosis Mode IV (for idle switch).

↓ N.G.

Check the idle switch circuit. [See page EF & EC-248.]

❽ **PERFORM**

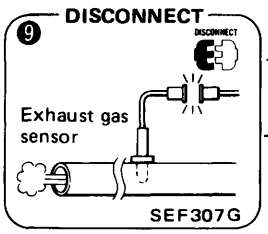


Perform self-diagnosis Mode III and V (for crank angle sensor, air flow meter, ignition signal and exhaust gas sensor).

N.G. →

Check the malfunctioning parts and/or circuits. [See page EF & EC-236 (crank angle sensor), page EF & EC-238 (air flow meter), page EF & EC-244 (ignition signal), page EF & EC-258 (exhaust gas sensor).]

❾ **DISCONNECT**



Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check mixture ratio feedback system. [See page EF & EC-294.]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 16 Poor driveability – lack of power

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫	⓬
SPECIFICATIONS	Fuel pressure								○	○			
	Ignition timing		○										
	Compression pressure (too low)							○					
FUEL SYSTEM	Fuel pump (low fuel output)									○			
	Fuel filter (clogged)									○			
	Fuel line (clogged)									○			
	Injectors (clogged)									○			
IGNITION SYSTEM	Ignition wires (ignition leaks)				○	○	○						
	Spark plugs (improper gap)						○						
INTAKE SYSTEM	Air cleaner element (clogged)	○											
	Throttle chamber (clogged)			○									
	Power valve control solenoid												○
	Throttle valve (not open enough)			○									
CONTROL SYSTEM	Air flow meter										○		
	Exhaust gas sensor											○	

SERVICE PROCEDURE

❶ CHECK

AIR CLEANER ELEMENT

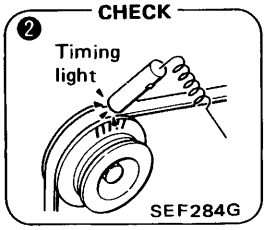
SEF320G

Check air cleaner element for clogging.

↓N.G.

Replace the part.

❷ CHECK



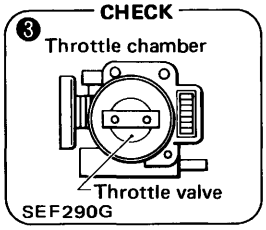
Check ignition timing with a timing light.

↓N.G.

Adjust ignition timing.

[See page EF & EC-188.]

❸ CHECK

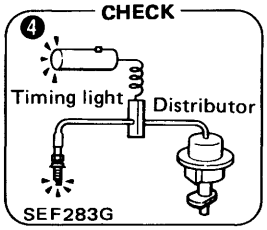


Check throttle valve for rough movement.

↓N.G.

Repair/replace the part.

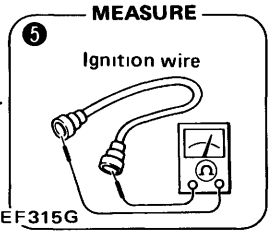
❹ CHECK



Check flashes of timing light for weakness.

↓N.G.

❺ MEASURE



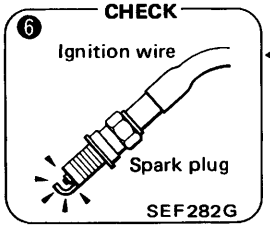
Measure resistance of suspect wires.

↓N.G.

Replace the wires.

O.K. ←

❻ CHECK



Remove spark plugs and check their ignition sparks.

❼ MEASURE

COMPRESSION PRESSURE

SEF309G

Measure compression pressure.

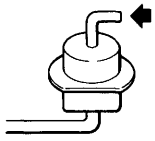
↓

Check cylinder head and gasket.

[See EM section.]

❽ REMOVE

Pressure regulator



Remove vacuum hose from pressure regulator, and try to drive.

↓ Improved

❾ MEASURE

Fuel pressure gauge



Connect vacuum hose to pressure regulator and measure fuel pressure while driving.

↓

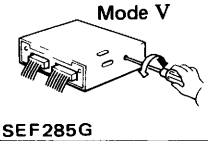
Check Mixture ratio feedback system.

[See page EF & EC-294.]

❿ PERFORM

Self-diagnosis Mode III

Self-diagnosis Mode V



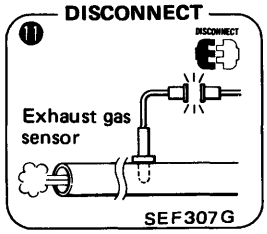
Perform self-diagnosis Mode III and V (for air flow meter).

↓N.G.

Check the malfunctioning parts and/or circuit.

[See page EF & EC-238.]

⓫ DISCONNECT



Disconnect exhaust gas sensor connector, and try to drive.

No change ↓ / Improved ↓

Replace the sensor.

Check Mixture ratio feedback system.

[See page EF & EC-294.]

⓬ CHECK

Power valve control solenoid



Check terminal voltage of power valve control solenoid.

↓N.G.

Replace solenoid valve.

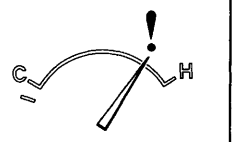
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 17 Poor driveability – detonation

POSSIBLE CAUSES		❶	❷	❸	❹	❺
SPECIFICATIONS	Mixture ratio (too lean)			○	○	
	Fuel pressure (low)			○		
	Ignition timing (too advanced)		○			
FUEL SYSTEM	Fuel filter (clogged)				○	
	Fuel line (clogged)				○	
	Injectors (clogged)				○	
CONTROL SYSTEM	Crank angle sensor (improper 1°-signals)					○
	Air flow meter					○
	Water temperature sensor					○
OTHERS	Water temperature (too high)	○				
	Fuel (low octane rating, poor quality)					

SERVICE PROCEDURE

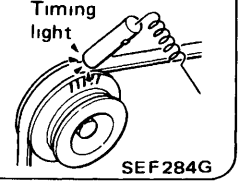
❶ **CHECK** Water temperature



Too high → Check cooling system. [See LC section.]

Check water temperature.

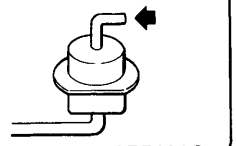
❷ **CHECK** Timing light



N.G. → Adjust ignition timing. [See page EF & EC-188.]

Check ignition timing.

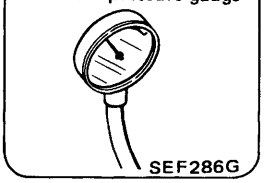
❸ **REMOVE** Pressure regulator



Remove vacuum hose from pressure regulator, and try to drive.

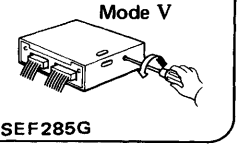
Improved →

❹ **MEASURE** Fuel pressure gauge



Connect vacuum hose to pressure regulator, and measure fuel pressure while driving.

❺ **PERFORM** Self-diagnosis Mode III, Self-diagnosis Mode V



Perform self-diagnosis Mode III and V (for crank angle sensor and air flow meter).

N.G. → Check the malfunctioning parts. [See page EF & EC-236 (crank angle sensor), page EF & EC-238 (air flow meter).]

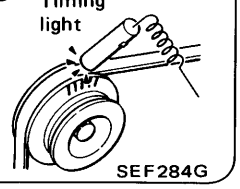
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 18 Engine stall — during start-up

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio (too rich/too lean)							○	○	○
	Ignition sparks (weak)			○	○					
	Ignition timing	○								
	Compression pressure (too low)						○			
FUEL SYSTEM	Canister (too much evaporation to intake)							○		
IGNITION SYSTEM	Ignition wires (ignition leaks)			○	○	○				
	Spark plugs (wet with fuel, improper gap)					○				
INTAKE SYSTEM	Throttle valve (not open enough)		○							

SERVICE PROCEDURE

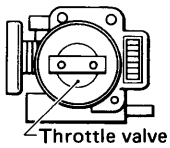
❶ CHECK — Timing light



Check ignition timing.

N.G. → Adjust ignition timing. [See page EF & EC-188.]

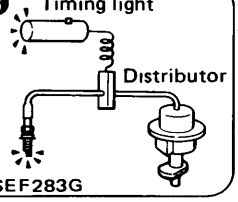
❷ CHECK — Throttle chamber



Check throttle valve for rough movement.

N.G. → Repair/replace the part.

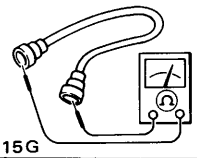
❸ CHECK — Timing light



Check flashes of timing light for weakness.

N.G.

❹ MEASURE — Ignition wire

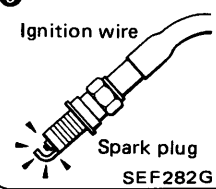


Measure resistance of ignition wires.

N.G. → Replace the wires.

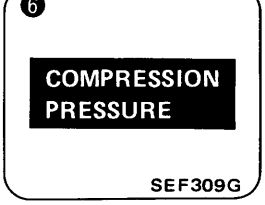
O.K.

❺ CHECK — Ignition wire



Remove spark plugs and check their ignition sparks.

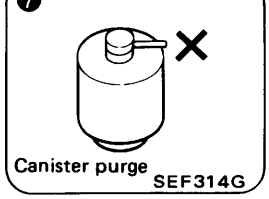
❻ MEASURE



Measure compression pressure.

Check cylinder head and gasket. [See EM section.]

❼ TRY

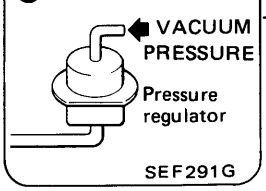


Shut evaporated fuel to intake valve and try to drive.

Improved → Replace the canister and/or the hoses.

No change

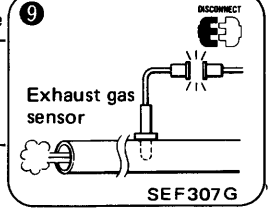
❽ APPLY



Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and try to drive.

Improved → Check Mixture ratio feedback system. [See page EF & EC-294.]

❾ DISCONNECT



Disconnect exhaust gas sensor connector and try to drive.

No change / Improved → Replace the sensor.

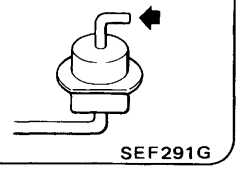
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 19 Engine stall – while idling

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽	❾
SPECIFICATIONS	Mixture ratio (too rich/too lean)	○	○							
	Fuel pressure (low)	○	○							
	Ignition sparks (weak, missing)				○					
	Idle speed (low)			○						
FUEL SYSTEM	Fuel line (clogged)		○							
IGNITION SYSTEM	Spark plugs (wet with fuel, improper gap)					○	○			
INTAKE SYSTEM	A.A.C. valve (improper operation)			○				○		
	F.I.C.D. solenoid (improper operation)			○					○	
CONTROL SYSTEM	Idle switch (remaining OFF)									○
	Neutral switch (remaining OFF)			○						

SERVICE PROCEDURE

❶ REMOVE Pressure regulator



Remove vacuum hose from pressure regulator, and check idling.

Improved →

❷ MEASURE Fuel pressure gauge



Connect vacuum hose to pressure regulator and measure fuel pressure.

→ Check Mixture ratio feedback system. [See page EF & EC-294.]

❸ MEASURE Tachometer

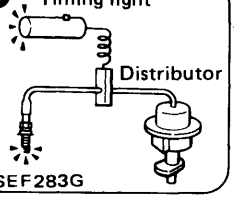


Measure idle speed.

↓ N.G.

Adjust idle speed. [See page EF & EC-188.]

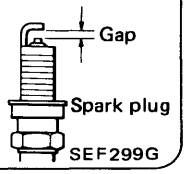
❹ CHECK Timing light



Check flashes of timing light for weakness.

N.G. →

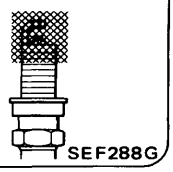
❺ CHECK



Remove spark plugs and check their gaps and tips.

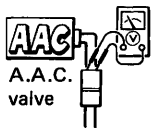
and/or

❻ CHECK Spark plug



Check spark plugs for being foul or wet with fuel.

❼ CHECK

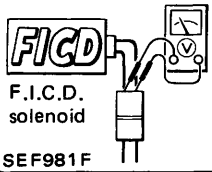


Check terminal voltages of A.A.C. valve.

↓ N.G.

Check the part and/or circuit. [See page EF & EC-274.]

❽ CHECK

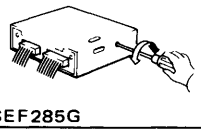


Check terminal voltage of F.I.C.D. solenoid.

↓ N.G.

Check the part and/or circuit. [See HA section.]

❾ PERFORM Self-diagnosis Mode IV



Perform self-diagnosis Mode IV (for idle switch).

N.G. → Check the idle switch circuit. [See page EF & EC-248.]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 20 Engine stall – while accelerating

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio					○	○	
	Ignition sparks (weak, missing)	○	○	○				
	Compression pressure (low)				○			
CONTROL SYSTEM	Crank angle sensor	○						○
	Air flow meter							○
	Exhaust gas sensor					○	○	

SERVICE PROCEDURE

❶ CHECK
Timing light
Distributor
SEF283G
N.G. →
Check flashes of timing light for weakness during acceleration.

❷ MEASURE
Ignition wire
SEF315G
N.G. → Replace the wires.
O.K. →
Measure resistance of suspect wires.

❸ CHECK
Ignition wire
Spark plug
SEF282G
Remove spark plugs and check their ignition sparks.

❹ MEASURE
COMPRESSION PRESSURE
SEF309G
N.G. → Check cylinder head and gasket.
[See EM section.]
Measure compression pressure.

❺ CHECK
Self-diagnosis Mode II
9 times or more/10 sec.
SEF373G
N.G. →
Check mixture ratio by flashes of inspection lamps.

❻ DISCONNECT
Exhaust gas sensor
SEF307G
Disconnect exhaust gas sensor connector, and try to drive.
Improved → Replace the sensor.
No change →
Check Mixture ratio feedback system.
[See page EF & EC-294.]

❼ PERFORM
Self-diagnosis Mode III
Self-diagnosis Mode V
SEF285G
N.G. → Check the malfunctioning parts and/or circuits.
[See page EF & EC-236 (crank angle sensor), page EF & EC-238 (air flow meter).]
Perform self-diagnosis Mode III and V (for crank angle sensor and air flow meter).

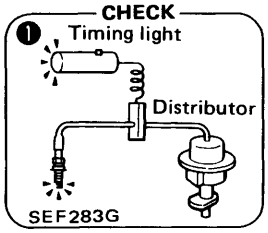
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 21 Engine stall – while cruising

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio				○	○	
	Ignition sparks (weak, missing)	○	○	○			
CONTROL SYSTEM	Crank angle sensor						○
	Air flow meter						○

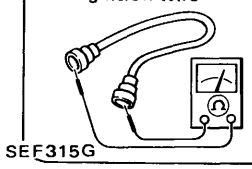
SERVICE PROCEDURE

❶ CHECK — Timing light



Check flashes of timing light for weakness at constant engine rev. (1,000 to 2,000 rpm)

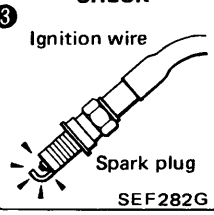
N.G. → ❷ MEASURE — Ignition wire



Measure resistance of suspect wires.

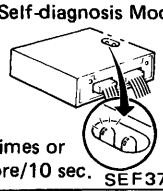
N.G. → Replace the wires.

O.K. → ❸ CHECK — Ignition wire



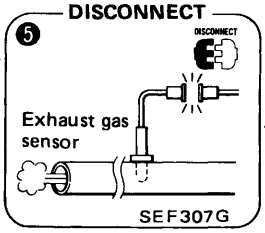
Remove spark plugs and check their ignition sparks.

❹ CHECK — Self-diagnosis Mode II



Check mixture ratio by flashes of inspection lamps.

N.G. → ❺ DISCONNECT

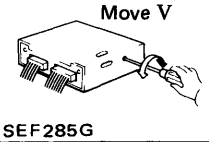


Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check Mixture ratio feedback system. [See page EF & EC-294.]

❻ PERFORM — Self-diagnosis Mode III, Self-diagnosis Move V



Perform self-diagnosis Mode III and V (for air flow meter and crank angle sensor).

N.G. → Check the circuits. [See page EF & EC-236 (crank angle sensor), page EF & EC-238 (air flow meter).]

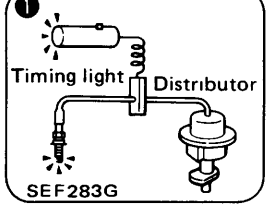
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 22 Engine stall – while decelerating/just after stopping

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio					○	○
	Ignition sparks (missing)	○					
	Idle speed (too low)			○			
IGNITION SYSTEM	(missing)	○	○				
INTAKE SYSTEM	A.A.C. valve (remaining OFF)			○	○		
CONTROL SYSTEM	Exhaust gas sensor (malfunctioning feedback control)					○	○
	Crank angle sensor		○				
	Idle switch (remaining OFF)			○			

SERVICE PROCEDURE

❶ CHECK

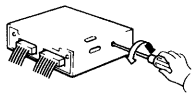


Check flashes of timing light while decreasing engine speed.

N.G. →

❷ PERFORM

Self-diagnosis Mode V



Perform self-diagnosis Mode V (for ignition signal and crank angle sensor).

N.G. → Check the malfunctioning parts and/or circuits. [See page EF & EC-244 (ignition signal), page EF & EC-236 (crank angle sensor).]

❸ MEASURE

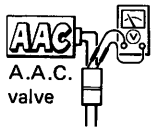
Tachometer



Measure idle speed.

N.G. → Adjust idle speed. [See page EF & EC-188.]

❹ CHECK

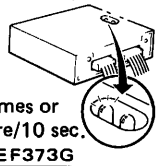


Check terminal voltage of A.A.C. valve.

Left OFF → Check the circuit. [See page EF & EC-274.]

❺ CHECK

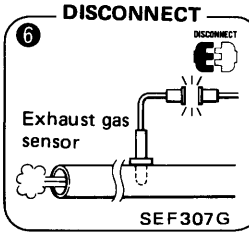
Self-diagnosis Mode II



Check mixture ratio by flashes of inspection lamps.

N.G. →

❻ DISCONNECT



Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check Mixture ratio feedback system. [See page EF & EC-294.]

Diagnostic Table (Cont'd)

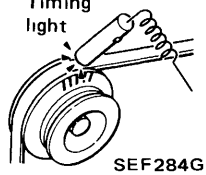
SYMPTOM & CONDITION 23 Engine stall – while loading

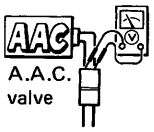
POSSIBLE CAUSES		❶	❷	❸	❹	❺
SPECIFICATIONS	Ignition timing		○			
	Idle speed (too low)	○				
INTAKE SYSTEM	A.A.C. valve (remaining OFF)	○		○		
	F.I.C.D. solenoid (remaining OFF)	○			○	
CONTROL SYSTEM	Idle switch (remaining OFF)	○				○

SERVICE PROCEDURE

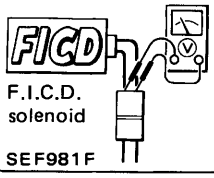
❶ MEASURE
Tachometer

SEF316G
N.G. → Adjust idle speed. [See page EF & EC-188.]
Measure idle speed.

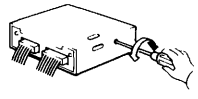
❷ CHECK
Timing light

SEF284G
N.G. → Adjust ignition timing. [See page EF & EC-188.]
Check ignition timing.

❸ CHECK


SEF007H
N.G. → Check the part and/or circuit. [See page EF & EC-274.]
Check terminal voltage of A.A.C. valve.

❹ CHECK


SEF981F
→ Check the part and/or circuit. [See HA section.]
Check terminal voltage of F.I.C.D. solenoid.

❺ PERFORM
Self-diagnosis Mode IV

SEF285G
N.G. → Check the idle switch circuit. [See page EF & EC-248.]
Perform self-diagnosis Mode IV (for idle switch).

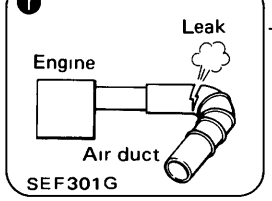
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 24 Backfire – through the intake

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio (too lean)	○		○		○	○	
	Ignition timing (too retarded)		○					
FUEL SYSTEM	Injectors (clogged)				○			
INTAKE SYSTEM	Air duct (air leaks)	○						
	Intake manifold (gaskets) (air leaks)	○						
CONTROL SYSTEM	Air flow meter							○
	Exhaust gas sensor					○	○	

SERVICE PROCEDURE

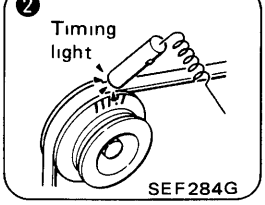
❶ **CHECK**



N.G. → Repair/replace the part.

Check intake system for air leaks.

❷ **CHECK**

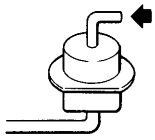


N.G. → Adjust ignition timing. [See page EF & EC-188.]

Check ignition timing.

❸ **REMOVE**

Pressure regulator



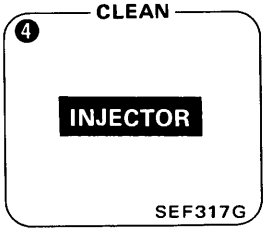
Improved → Check Mixture ratio feedback system. [See page EF & EC-294.]

Remove vacuum hose from pressure regulator, and try to drive.

No change ↓

or

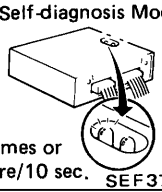
❹ **CLEAN**



Clean the injector.

❺ **PERFORM**

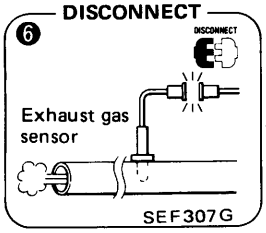
Self-diagnosis Mode II



N.G. →

Check mixture ratio by flashes of inspection lamps.

❻ **DISCONNECT**



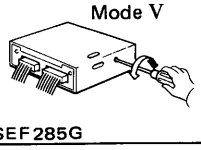
Improved → Replace the sensor.

No change → Check Mixture ratio feedback system. [See page EF & EC-294.]

Disconnect exhaust gas sensor connector, and try to drive.

❼ **CHECK**

Self-diagnosis Mode III Self-diagnosis Mode V



Perform self-diagnosis Mode III and V (for air flow meter).

N.G. ↓

Check the circuits. [See page EF & EC-238 (air flow meter).]

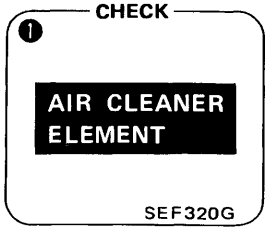
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 25 Backfire – through the exhaust

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio (too rich)	○	○				
FUEL SYSTEM	Injectors (fuel leaks)		○				
IGNITION SYSTEM	(missing)				○		
INTAKE SYSTEM	Air cleaner element (clogged)	○					
	A.I.V. (always operating)					○	
	A.I.V. solenoid (remaining ON)					○	○
CONTROL SYSTEM	Idle switch (remaining OFF)			○			

SERVICE PROCEDURE

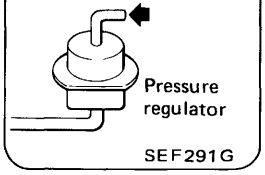
❶ CHECK



N.G. → Replace the element.

Check air cleaner element for clogging.

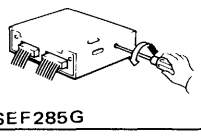
❷ APPLY PRESSURE



Improved → Check Mixture ratio feedback system. [See page EF & EC-294.]

Apply pressure to pressure regulator after disconnecting vacuum hose, and try to drive.

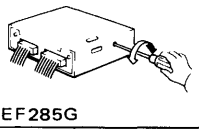
❸ PERFORM Self-diagnosis Mode IV



N.G. → Check idle switch and/or its circuit. [See page EF & EC-248.]

Perform self-diagnosis Mode IV (for idle switch).

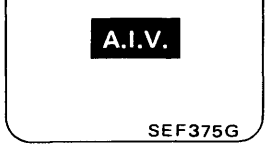
❹ PERFORM Self-diagnosis Mode V



N.G. → Check the malfunctioning part and/or circuit. [See page EF & EC-244 (ignition signal).]

Perform self-diagnosis Mode V (for ignition signal).

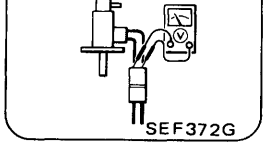
❺ CHECK



Keeps flowing →

Check secondary air to exhaust system.

❻ CHECK A.I.V. solenoid



Left ON → Check the solenoid circuit. [See page EF & EC-282.]

Check terminal voltage of A.I.V. solenoid.

Description

The self-diagnosis is useful to diagnose malfunctions in major sensors and actuators of the E.C.C.S. system. There are 5 modes in the self-diagnosis system.

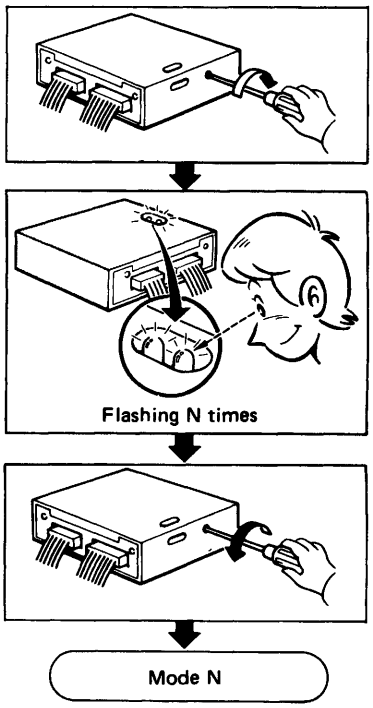
1. **Mode I — Mixture ratio feedback control monitor A**
- During closed loop condition:
  The green inspection lamp turns ON when lean condition is detected and goes OFF by rich condition.
- During open loop condition:
  The green inspection lamp remains ON or OFF.

2. **Mode II — Mixture ratio feedback control monitor B**
   The green inspection lamp function is the same as Mode I.
- During closed loop condition:
  The red inspection lamp turns ON and OFF simultaneously with the green inspection lamp when the mixture ratio is controlled within the specified value.
- During open loop condition:
  The red inspection lamp remains ON or OFF.

3. **Mode III — Self-diagnosis**
   This mode is the same as the former self-diagnosis in self-diagnosis mode.

4. **Mode IV — Switches ON/OFF diagnosis**
   During this mode, the inspection lamps monitor the switch ON-OFF condition.
- Idle switch
- Ignition switch "START"
- Vehicle speed sensor

5. **Mode V — Real time diagnosis**
   The moment the malfunction is detected, the display will be presented immediately. That is, the condition at which the malfunction occurs can be found by observing the inspection lamps during driving test.

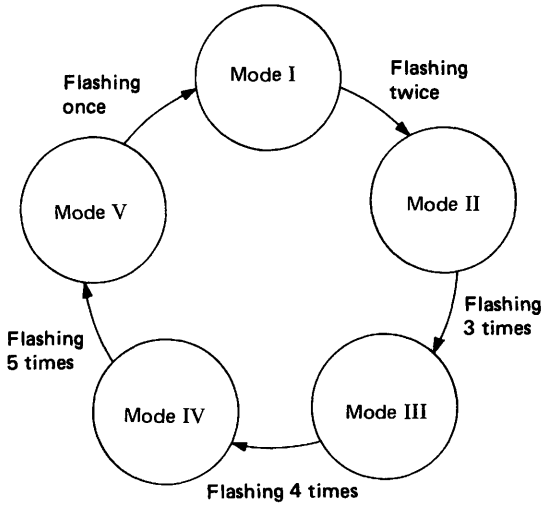


SEF872D

Description (Cont'd)

SWITCHING THE MODES

1. Turn ignition switch "ON".
2. Turn diagnostic mode selector on E.C.U. fully clockwise and wait the inspection lamps flash.
3. Count the number of the flashing time, and after the inspection lamps have flashed the number of the required mode, turn diagnostic mode selector fully counterclockwise immediately.



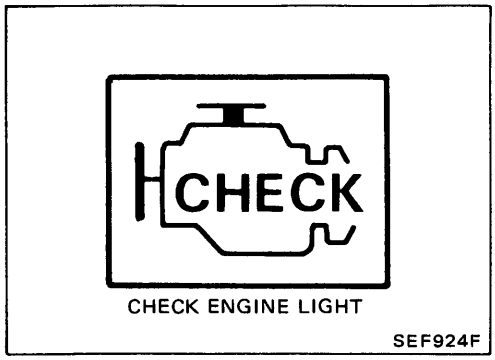
SEF989D

NOTE:

When the ignition switch is turned off during diagnosis, in each mode, and then turned back on again after the power to the E.C.U. has dropped off completely, the diagnosis will automatically return to Mode I.

The stored memory would be lost if:

1. Battery terminal is disconnected.
2. After selecting Mode III, Mode IV is selected.
   However, if the diagnostic mode selector is kept turned fully clockwise, it will continue to change in the order of Mode I → II → III → IV → V → I ... etc., and in this state the stored memory will not be erased.



CHECK ENGINE LIGHT
SEF924F

Description (Cont'd)

CHECK ENGINE LIGHT (For California only)

This vehicle has a check engine light on the instrument panel. This light comes ON under the following conditions:

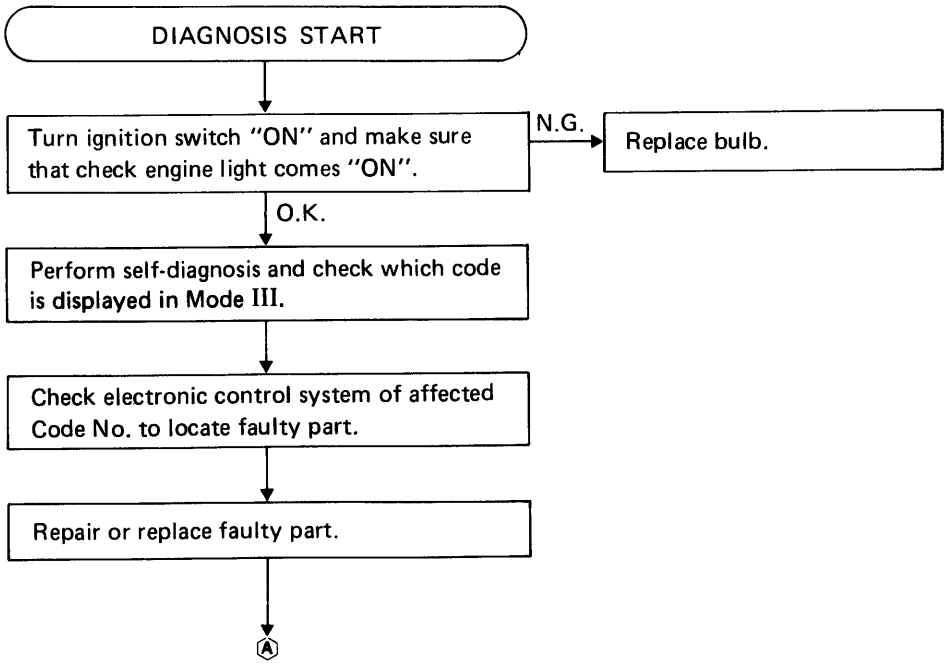
1) When ignition switch is turned "ON" (for bulb check).
2) When systems related to emission performance malfunction in Mode I (with engine running).

- **This check engine light always illuminates and is synchronous with the red L.E.D.**
- **Malfunction systems related to emission performance can be detected by self-diagnosis, and they are clarified as self-diagnostic codes in Mode III.**

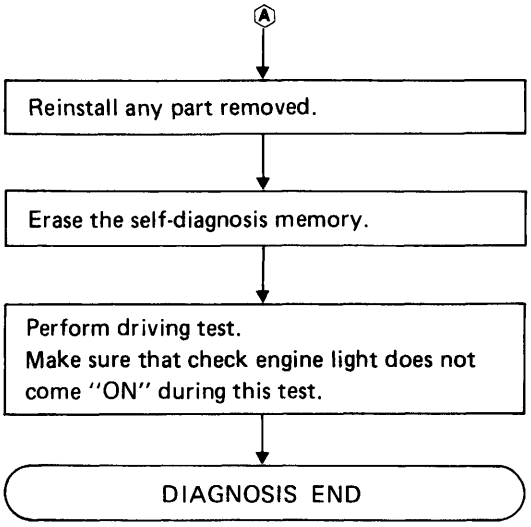
3) Check engine light will be "ON" only when malfunction is sensed.
   The check engine light will turn off when normal operation is resumed. Mode III memory must be cleared as the contents remain stored.

Code No.	Malfunction
12	Air flow meter circuit
13	Water temperature sensor circuit
14	Vehicle speed sensor circuit
23	Idle switch circuit
31	E.C.U. (E.C.C.S. control unit)
32	E.G.R. function
33	Exhaust gas sensor circuit
35	Exhaust gas temperature sensor circuit
43	Throttle sensor circuit
45	Injector leak

Use the following diagnostic flowchart to check and repair a malfunctioning system.



Description (Cont'd)



- **After repairs, test drive to check that check engine light does not come on.**
- **Test driving modes differ with systems. Read the manual before test driving.**

Modes I & II —Mixture Ratio Feedback Control Monitors A & B

In these modes, the control unit provides the mixture ratio monitor presentation and the mixture ratio feedback coefficient monitor presentation.

<table>
<tr><th rowspan="2">Mode</th><th rowspan="2">LED</th><th rowspan="2">Engine stopped (Ignition switch "ON")</th><th colspan="4">Engine running</th></tr>
<tr><th>Open loop condition</th><th colspan="3">Closed loop condition</th></tr>
<tr><td rowspan="2">Mode I (Monitor A)</td><td>Green</td><td>ON</td><td>*Remains ON or OFF</td><td colspan="3">Blinks</td></tr>
<tr><td>Red</td><td>ON</td><td>Except for California model
• OFF</td><td colspan="3">For California model
• ON: when the following malfunctions are stored in the E.C.U.:
Air flow meter, water temperature sensor, vehicle speed sensor, idle switch, E.C.U., E.G.R. function, exhaust gas sensor, exhaust gas temperature sensor, throttle sensor, injector leak
• OFF: except for the above condition</td></tr>
<tr><td rowspan="3">Mode II (Monitor B)</td><td>Green</td><td>ON</td><td>*Remains ON or OFF</td><td colspan="3">Blinks</td></tr>
<tr><td rowspan="2">Red</td><td rowspan="2">OFF</td><td rowspan="2">*Remains ON or OFF (synchronous with green LED)</td><td colspan="3">Compensating mixture ratio</td></tr>
<tr><td>More than 5% rich</td><td>Between 5% lean and 5% rich</td><td>More</td></tr>
<tr><td></td><td></td><td></td><td>OFF</td><td>Synchronized with green LED</td><td>Remains ON</td></tr>
</table>

*: Maintains conditions just before switching to open loop

Mode III — Self-diagnostic System

The E.C.U. constantly monitors the function of these sensors and actuators, regardless of ignition key position. If a malfunction occurs, the information is stored in the E.C.U. and can be retrieved from the memory by turning on the diagnostic mode selector, located on the side of the E.C.U. When activated, the malfunction is indicated by flashing a red and a green L.E.D. (Light Emitting Diode), also located on the E.C.U. Since all the self-diagnostic results are stored in the E.C.U.'s memory even intermittent malfunctions can be diagnosed.

A malfunctioning part's group is indicated by the number of both the red and the green L.E.D.s flashing. First, the red L.E.D. flashes and the green flashes follow. The red L.E.D. refers to the number of tens while the green one refers to the number of units. For example, when the red L.E.D. flashes once and then the green one flashes twice, this means the number "12" showing the air flow meter signal is malfunctioning. In this way, all the problems are classified by the code numbers.

- **When engine fails to start, crank engine more than two seconds before starting self-diagnosis.**
- **Before starting self-diagnosis, do not erase stored memory. If doing so, self-diagnosis function for intermittent malfunctions would be lost.**

The stored memory would be lost if:

1. **Battery terminal is disconnected.**
2. **After selecting Mode III, Mode IV is selected.**

DISPLAY CODE TABLE

X: Available
—: Not available

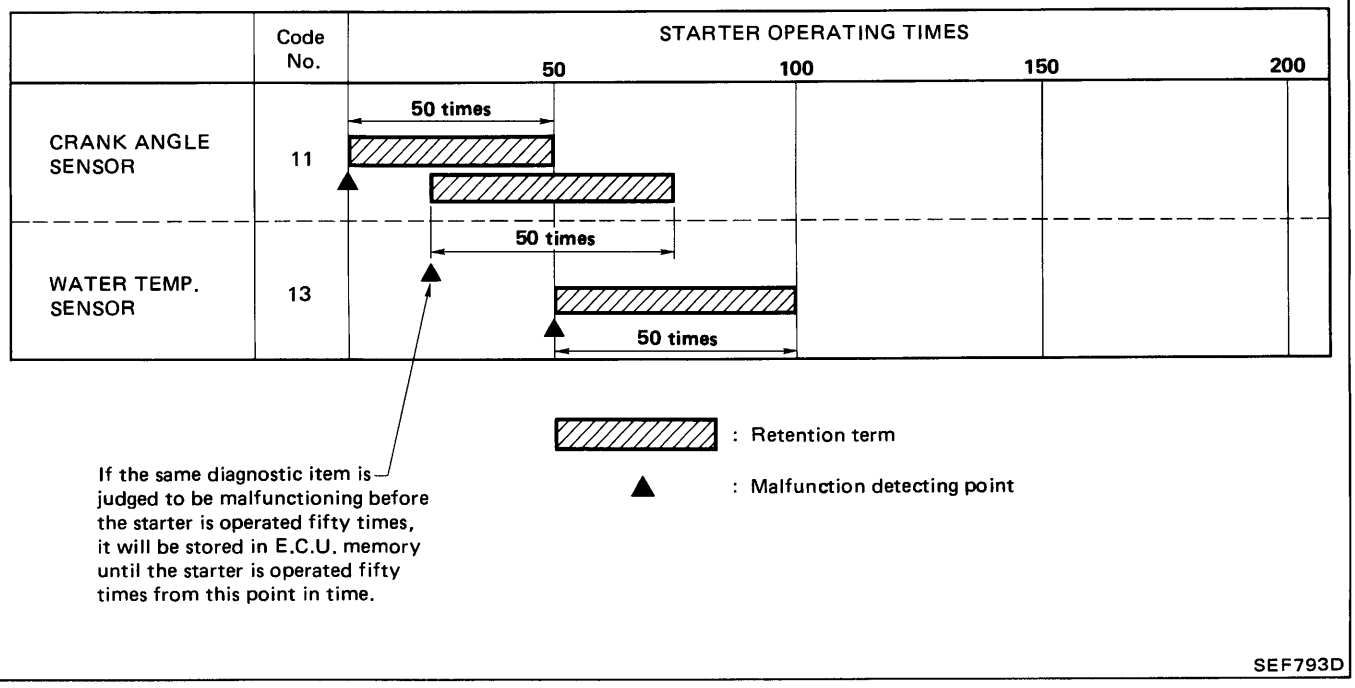
Code No.	Detected items	California	Non-California
11	Crank angle sensor circuit	X	X
12	Air flow meter circuit	X	X
13	Water temperature sensor circuit	X	X
14	Vehicle speed sensor circuit	X	X
21	Ignition signal circuit	X	X
23	Idle switch circuit	X	X
31	E.C.U. (E.C.C.S. control unit)	X	X
32	E.G.R. function	X	—
33	Exhaust gas sensor	X	X
34	Detonation sensor circuit	X	X
35	Exhaust gas temperature sensor circuit	X	—
43	Throttle sensor	X	X
45	Injector leak	X	—
55	No malfunctioning in the above circuit	X	X

Mode III — Self-diagnostic System (Cont'd)

RETENTION OF DIAGNOSTIC RESULTS

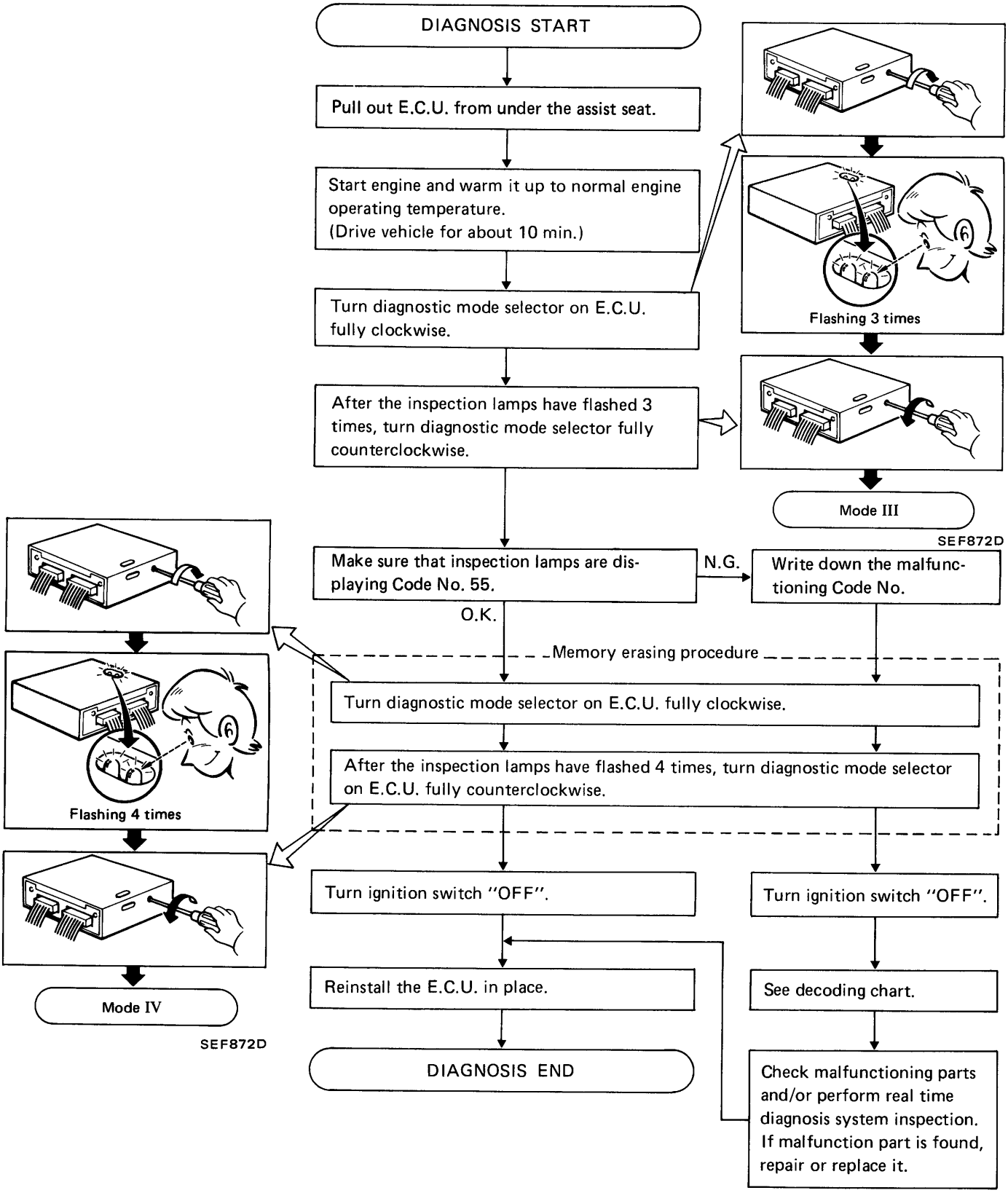
The diagnostic result is retained in E.C.U. memory until the starter is operated fifty times after a diagnostic item is judged to be malfunctioning. The diagnostic result will then be cancelled automatically. If a diagnostic item which has been judged to be malfunctioning and stored in memory is again judged to be malfunctioning before the starter is operated fifty times, the second result will replace the previous one. It will be stored in E.C.U. memory until the starter is operated fifty times more.

RETENTION TERM CHART (Example)



Mode III — Self-diagnostic System (Cont'd)

SELF-DIAGNOSTIC PROCEDURE



CAUTION:

During displaying Code No. in self-diagnosis mode (Mode III), if the other diagnostic mode should be done, make sure to write down the malfunctioning Code No. before turning diagnostic mode selector on E.C.U. fully clockwise, or select the diagnostic mode after turning switch "OFF". Otherwise self-diagnosis information stored in E.C.U. memory until now would be lost.

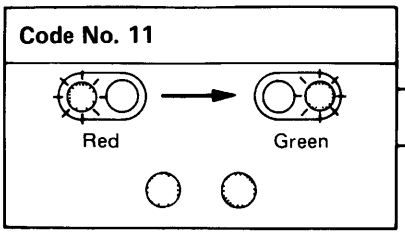
Mode III — Self-diagnostic System (Cont'd)

DECODING CHART

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.

CRANK ANGLE SENSOR

Code No. 11



Crank angle sensor circuit

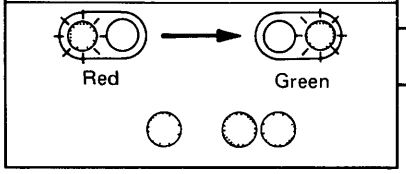
- Either 1° or 180° signal is not entered for the first few seconds during engine cranking.
- Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm.

SYSTEM INSPECTION
See page EF & EC-236.

SEF042F

AIR FLOW METER CHECK

Code No. 12



Air flow meter circuit

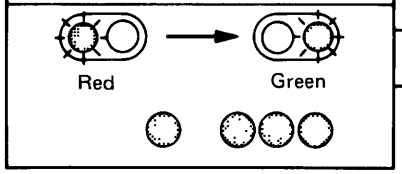
- The air flow meter circuit is open or shorted.
  (An abnormally high or low voltage is entered.)

SYSTEM INSPECTION
See page EF & EC-238.

SEF043F

WATER TEMPERATURE SENSOR CHECK

Code No. 13



Water temperature sensor circuit

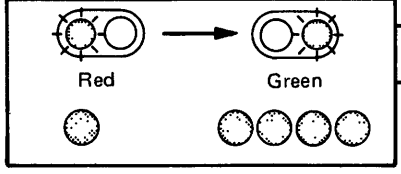
- The water temperature sensor circuit is open or shorted.
  (An abnormally high or low output voltage is entered.)

SYSTEM INSPECTION
See page EF & EC-240.

SEF044F

VEHICLE SPEED SENSOR CHECK

Code No. 14



Vehicle speed sensor circuit

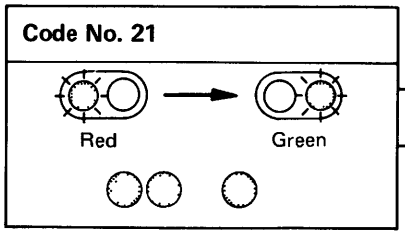
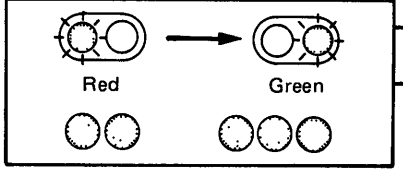
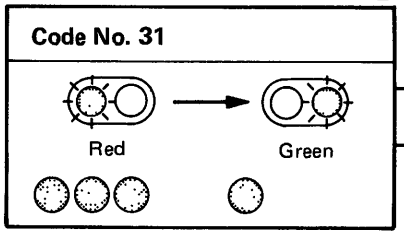
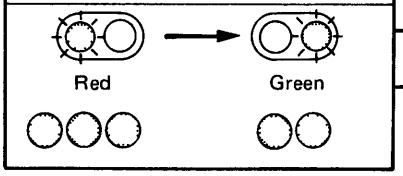
- Signal circuit is open.

SYSTEM INSPECTION
See page EF & EC-242.

SEF074G

Mode III — Self-diagnostic System (Cont'd)

DECODING CHART

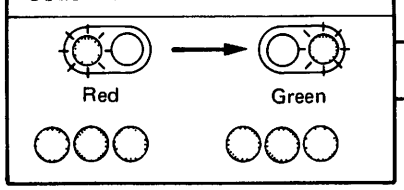
Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.
IGNITION SIGNAL **Code No. 21** 	Ignition signal circuit	• The circuit between power transistor unit and E.C.U. is opened. SYSTEM INSPECTION See page EF & EC-244.
SEF045F		
IDLE SWITCH CHECK **Code No. 23** 	Idle switch circuit	• Signal circuit is open. SYSTEM INSPECTION See page EF & EC-248.
SEF075G		
E.C.U. (E.C.C.S. control unit) CHECK **Code No. 31** 	E.C.U. calculation function	• Signal is beyond "normal" range. SYSTEM INSPECTION See page EF & EC-252.
SEF076G		
E.G.R. function CHECK **Code No. 32** 	E.G.R. function	• E.G.R. control valve does not operate. (E.G.R. control valve spring does not lift.) SYSTEM INSPECTION See page EF & EC-254.
SEF077G		

Mode III — Self-diagnostic System (Cont'd)

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.

EXHAUST GAS SENSOR CHECK

Code No. 33



Exhaust gas sensor circuit

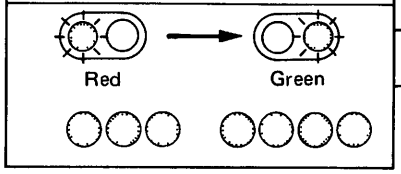
- Output voltage is too high.

SYSTEM INSPECTION
See page EF & EC-258.

SEF078G

DETONATION SENSOR

Code No. 34



Detonation sensor circuit

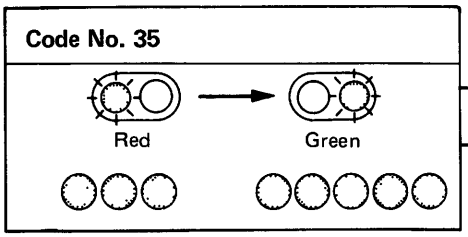
- The detonation sensor circuit is open or shorted.

SYSTEM INSPECTION
See page EF & EC-244.

SEF132F

EXHAUST GAS TEMPERATURE SENSOR CHECK

Code No. 35



Exhaust gas temperature sensor circuit

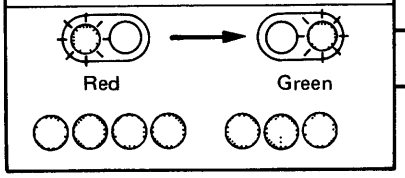
- Signal circuit is open.

SYSTEM INSPECTION
See page EF & EC-260.

SEF393G

THROTTLE SENSOR CHECK

Code No. 43



Throttle sensor circuit

- Throttle sensor circuit is open or short.
  (Output voltage is too high or too low.)

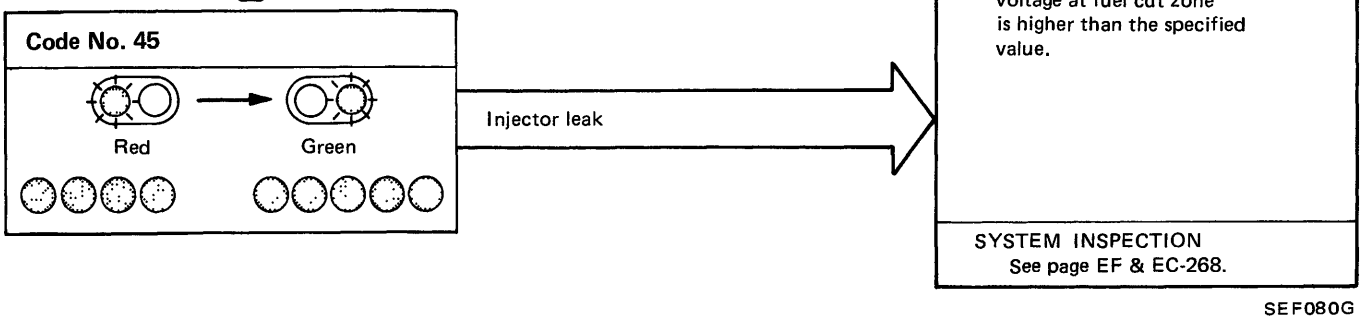
SYSTEM INSPECTION
See page EF & EC-264.

SEF079G

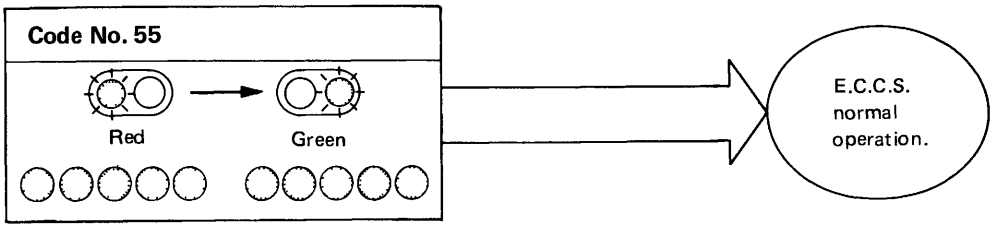
Mode III — Self-diagnostic System (Cont'd)

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.

INJECTOR LEAK CHECK



SEF080G



SEF984F

Mode IV — Switches ON/OFF Diagnostic System

In switches ON/OFF diagnosis system, ON/OFF operation of the following switches can be detected continuously.

- Idle switch
- Ignition switch "START"
- Vehicle speed sensor

(1) Idle switch & Ignition switch "START"

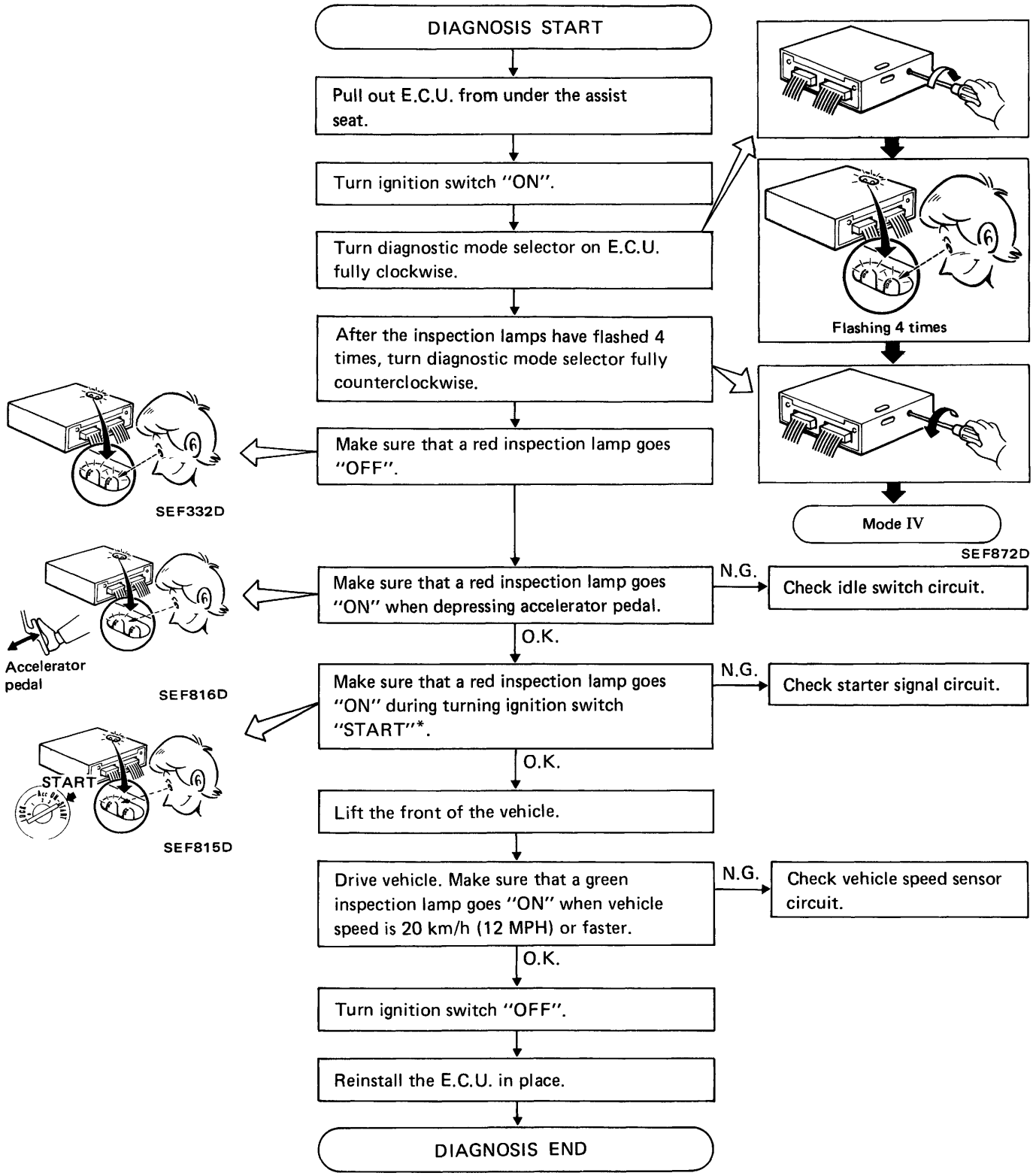
The switches ON/OFF status at the point when Mode IV is selected is stored in E.C.U. memory. When either switch is turned from "ON" to "OFF" or "OFF" to "ON", the red L.E.D. on E.C.U. alternately comes on and goes off each time switching is detected.

(2) Vehicle Speed Sensor

The switches ON/OFF status at the point when Mode IV is selected is stored in E.C.U. memory. When vehicle speed is 20 km/h (12 MPH) or slower, the green L.E.D. on E.C.U. is off. When vehicle speed exceeds 20 km/h (12 MPH), the green L.E.D. on E.C.U. comes "ON".

Mode IV — Switches ON/OFF Diagnostic System (Cont'd)

SELF-DIAGNOSTIC PROCEDURE



CAUTION:

- ***If ignition switch is turned to "START" an even number of times, a red inspection lamp goes "OFF" when depressing accelerator pedal.**
- **For safety, do not turn front wheel at higher speed than required.**

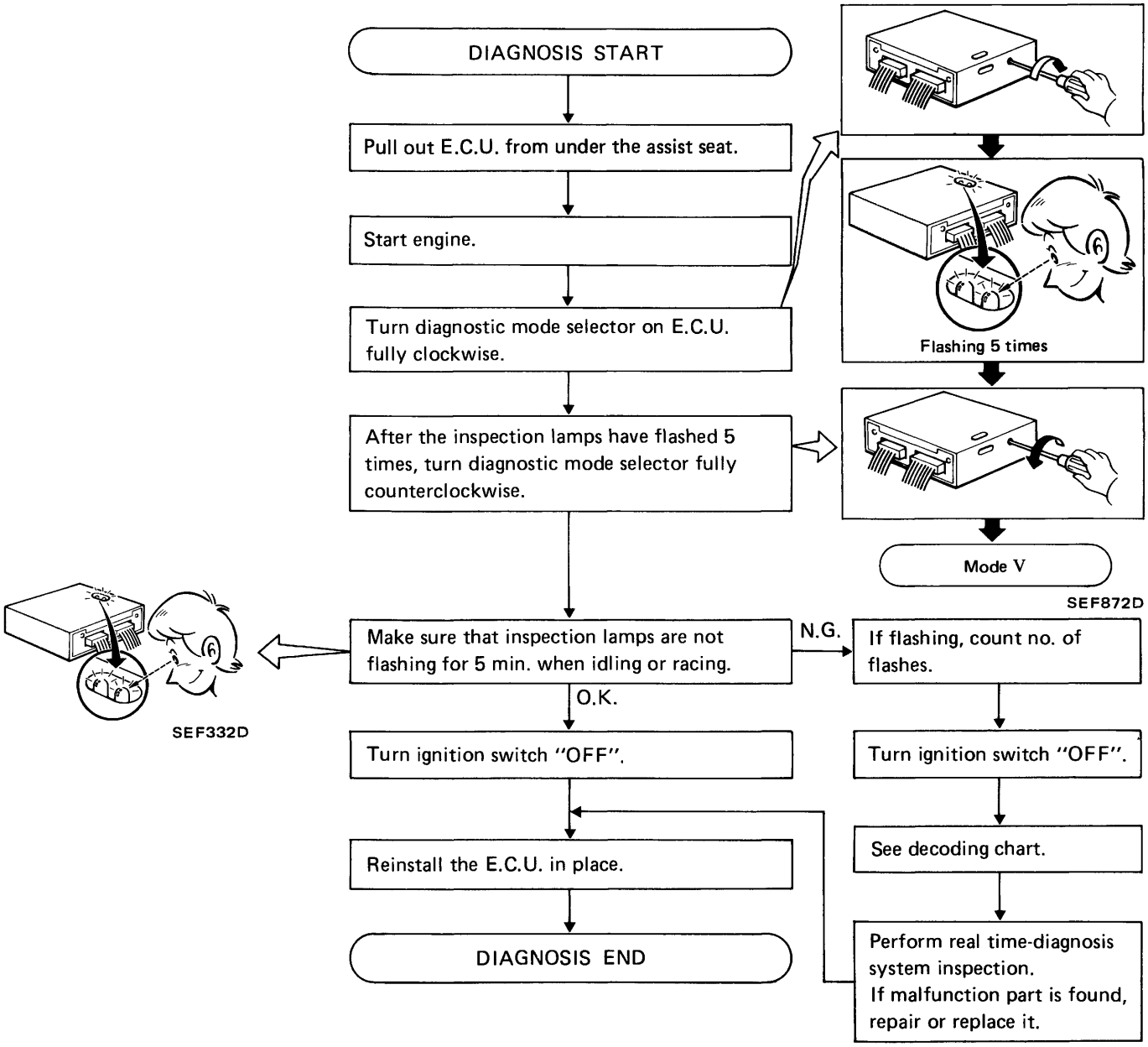
Mode V — Real Time Diagnostic System

In real time diagnosis, if any of the following items are judged to be faulty, a malfunction is indicated immediately.

- Crank angle sensor (180° signal & 1° signal)
- Ignition signal
- Air flow meter output signal

Consequently, this diagnosis is a very effective measure to diagnose whether the above systems cause the malfunction or not, during driving test. Compared with self-diagnosis, real time diagnosis is very sensitive, and can detect malfunctioning conditions in a moment. Further, items regarded to be malfunctions in this diagnosis are not stored in E.C.U. memory.

SELF-DIAGNOSITC PROCEDURE

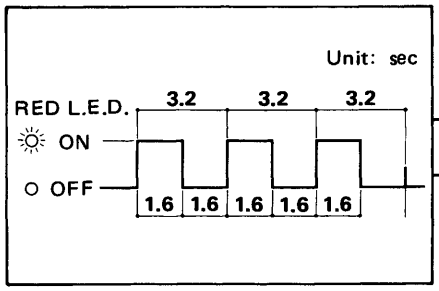
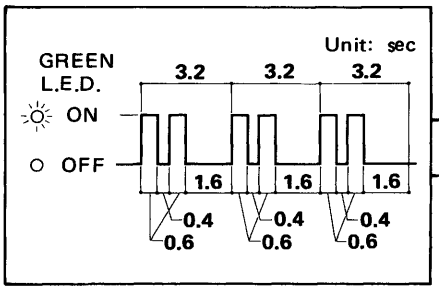
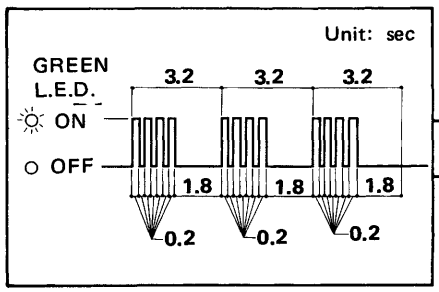


CAUTION:

In real time diagnosis, pay attention to inspection lamp flashing. E.C.U. displays the malfunction code only once, and does not memorize the inspection.

Mode V — Real Time Diagnostic System (Cont'd)

DECODING CHART

Display presentation	Malfunction circuit or parts	Control unit shows a malfunction signal when the following conditions are detected. (Compare with Self-diagnosis — Mode III.)
CRANK ANGLE SENSOR 	Malfunction of crank angle sensor circuit	The 1° or 180° signal is momentarily missing, or, multiple, momentary noise signals enter. REAL TIME DIAGNOSITC INSPECTION See page EF & EC-231.
SEF047F		
AIR FLOW METER 	Malfunction of air flow meter circuit	Abnormal, momentary increase in air flow meter output signal REAL TIME DIAGNOSITC INSPECTION See page EF & EC-231.
SEF048F		
IGNITION SIGNAL 	Malfunction of ignition signal	Signal from the primary ignition coil momentarily drops off. REAL TIME DIAGNOSITC INSPECTION See page EF & EC-231.
SEF049F		

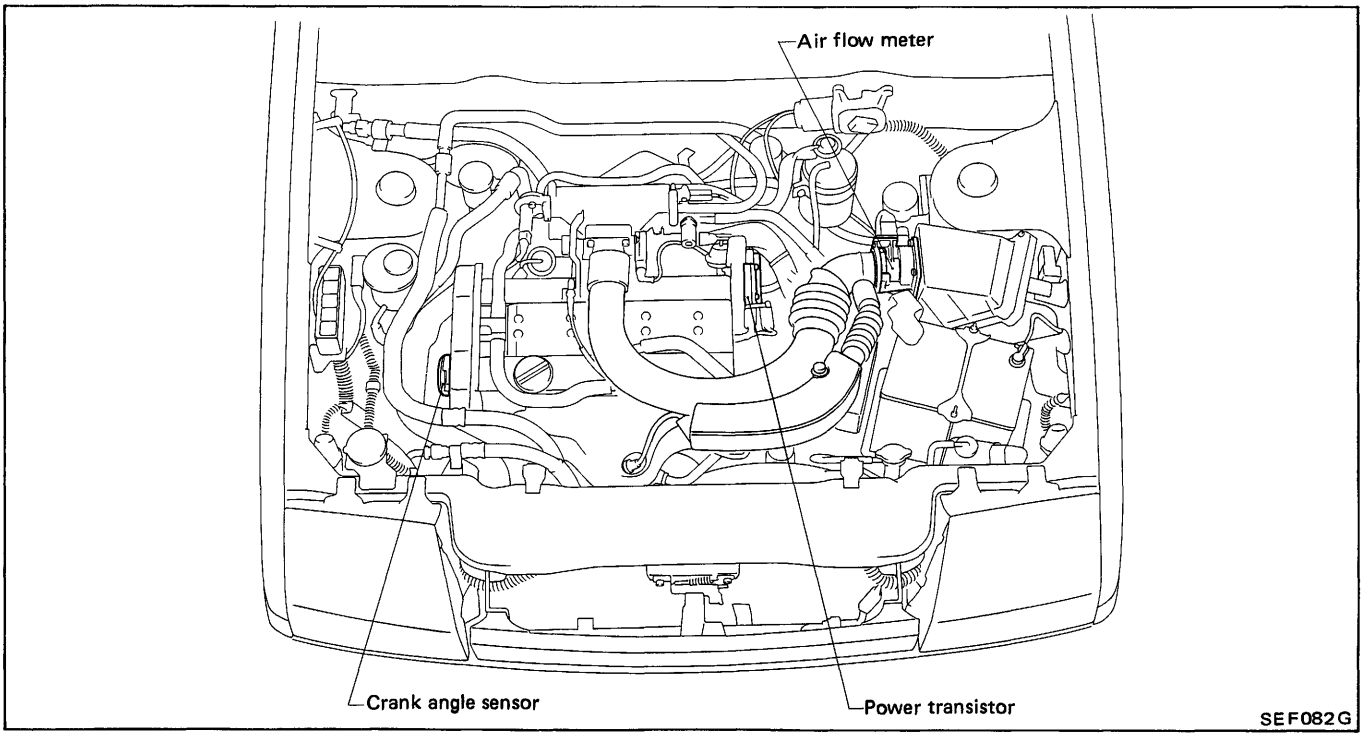
Mode V — Real Time Diagnostic System (Cont'd)

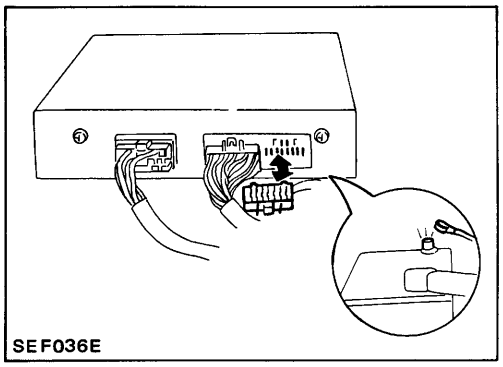
REAL TIME DIAGNOSTIC INSPECTION

Crank Angle Sensor, Air Flow Meter and Ignition Signal

X: Available
—: Not available

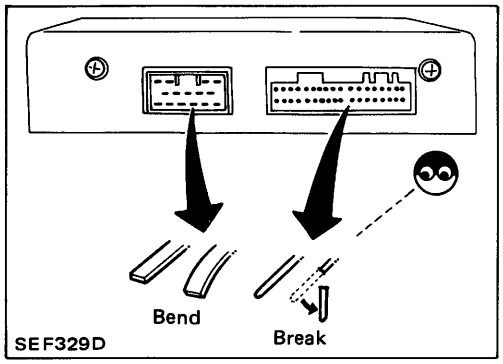
Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Harness connectors	Sensor & actuator	E.C.U. connectors	
1	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	X	—	—	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	X	—	X	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	—	—	X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	X	—	—	Replace terminal.
6	Tap harness connector or component during real time diagnosis.	During real time diagnosis	X	X	X	If malfunction codes are displayed during real time diagnosis, replace terminal.




SEF036E

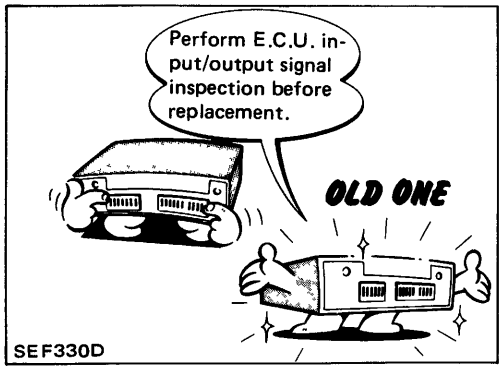
CAUTION:

1. Before connecting or disconnecting E.C.U. harness connector to or from any E.C.U., be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage E.C.U. as battery voltage is applied to E.C.U. even if ignition switch is turned off. Otherwise, there may be damage to the E.C.U.



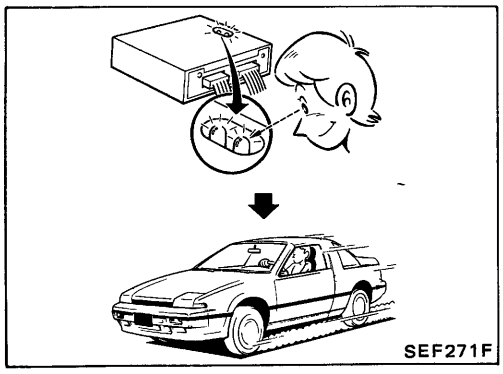
SEF329D

2. When connecting pin connectors into E.C.U. or disconnecting them from E.C.U., take care not to damage pin terminal of E.C.U. (Bend or break).
3. Make sure that there are not any bends or breaks on E.C.U. pin terminal, when connecting pin connectors into E.C.U.

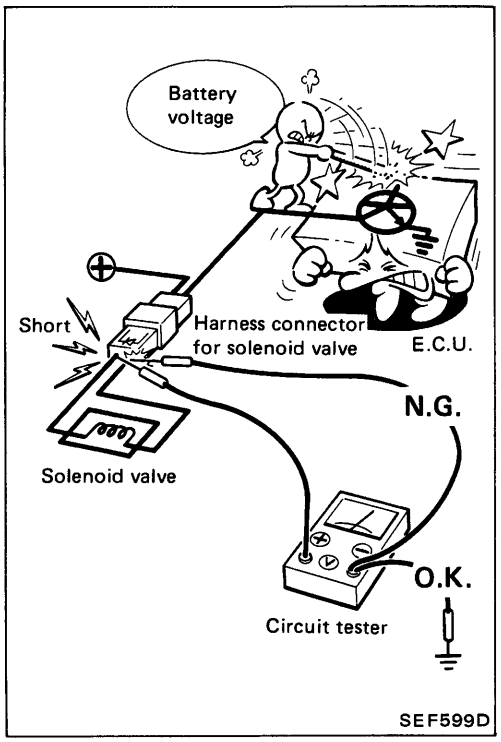


SEF330D

4. Before replacing E.C.U., perform E.C.U. input/output signal inspection and make sure whether E.C.U. functions properly or not. (See page EF & EC-289.)


SEF271F

5. After performing this "ELECTRONIC CONTROL SYSTEM INSPECTION", perform E.C.C.S. self-diagnosis and driving test.



6. When measuring supply voltage of E.C.U. controlled components with a circuit tester, separate one tester probe from the other.
   If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the power transistor of the control unit.

7. When measuring voltage or resistance at connector with tester probes, there are two methods of measurement; one is done from terminal side and the other from harness side. Before measuring, confirm symbol mark again.

   H.S. : Inspection should be done from harness side.

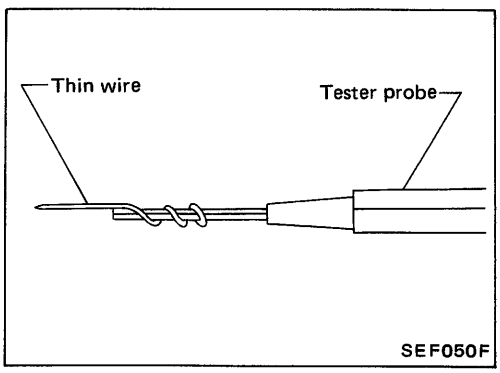
   T.S. : Inspection should be done from terminal side.

   Refer to GI section.

8. As for continuity check of joint connector, refer to EL section.
9. Key to symbols

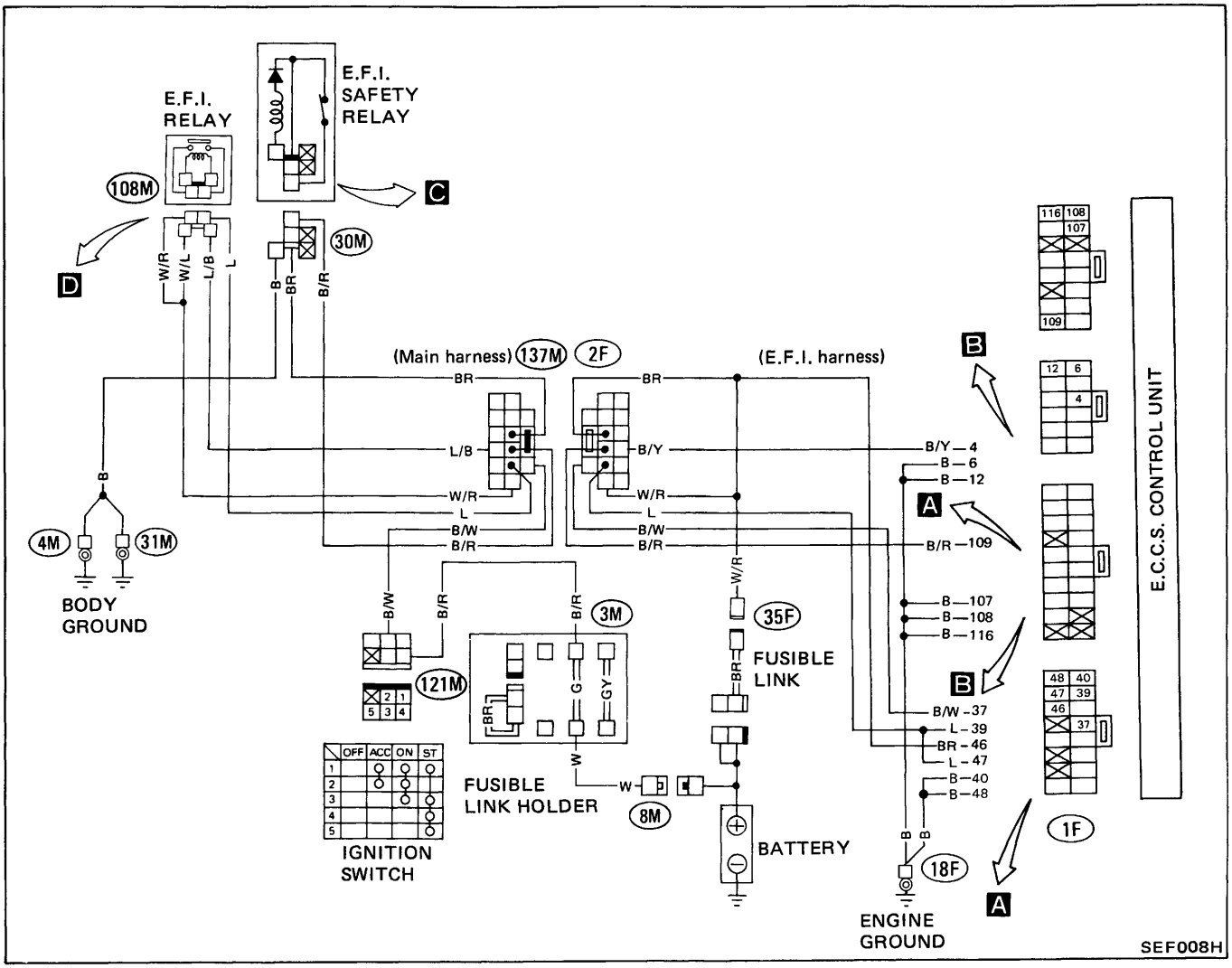
   DISCONNECT : Check after disconnecting the connector to be measured.

   CONNECT : Check after connecting the connector to be measured.



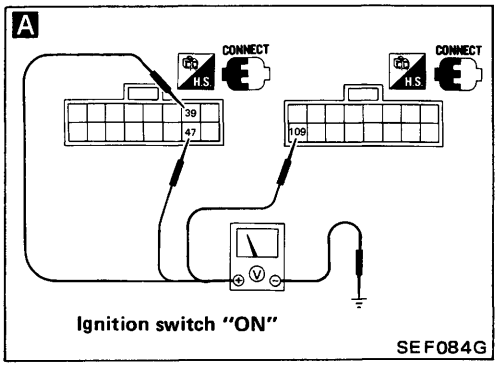
10. Improve tester probe as shown to perform test easily.
11. For the first trouble-shooting procedure, perform POWER SOURCE & GROUND CIRCUIT FOR E.C.U. check.

POWER SOURCE & GROUND CIRCUIT FOR E.C.U. (Not self-diagnosis item)

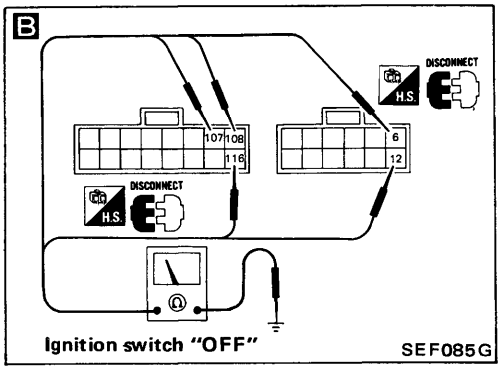


POWER SOURCE & GROUND CIRCUIT FOR E.C.U. (Not self-diagnosis item)

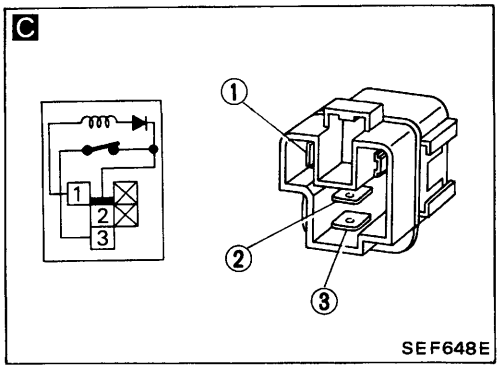
A



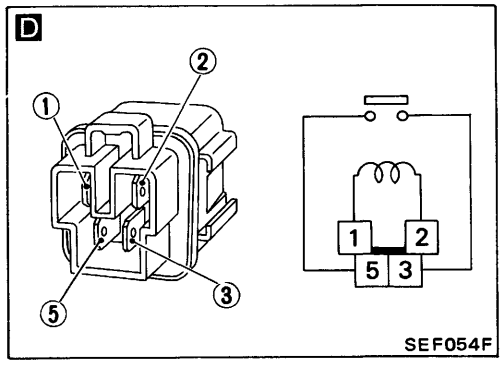
B



C



D



INSPECTION START

A

Check power source for E.C.U.
1) Turn ignition switch "ON".
2) Check voltage between terminals (39), (47), (109) and ground.
Voltage: Battery voltage

N.G. (109) → **C**

C

Check E.F.I. safety relay.

12V direct current is applied between terminals ① and ②		Continuity between terminals ② and ③
①	②	
–	+	Yes
+	–	No

If N.G., replace E.F.I. safety relay.

O.K. ↓

Repair harness or connectors.

O.K. ↑

D

Check E.F.I. relay.

Condition	Continuity between terminals ③ and ⑤
Supply 12V direct current between terminals ① and ②	Yes
Not supply	No

If N.G., replace E.F.I. relay.

O.K. ↓

B

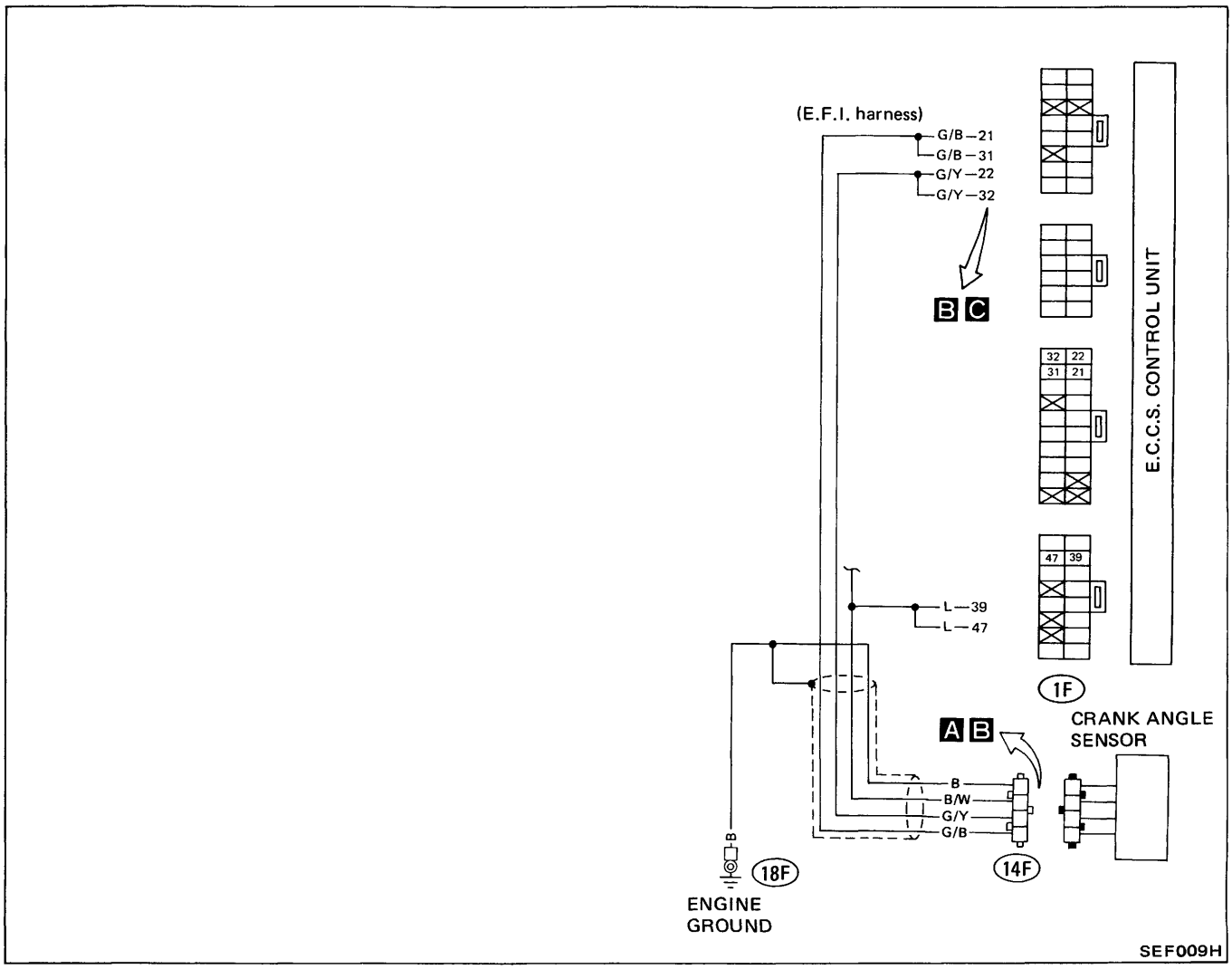
1) Turn ignition switch "OFF".
2) Disconnect 16-pin and 12-pin terminal connectors from E.C.U.
3) Check resistance between terminals (6), (12), (107), (108), (116) and ground.
Resistance:
Approximately 0Ω
If N.G., repair harness or connectors.

N.G. (39), (47) → **C**

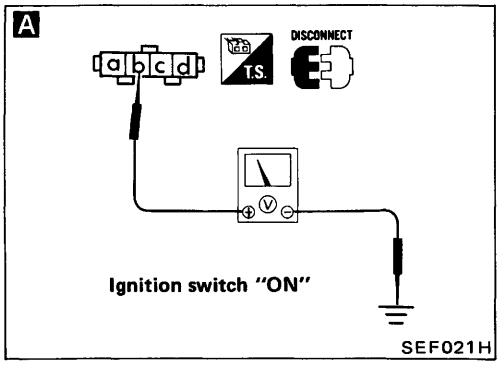
O.K. ↓

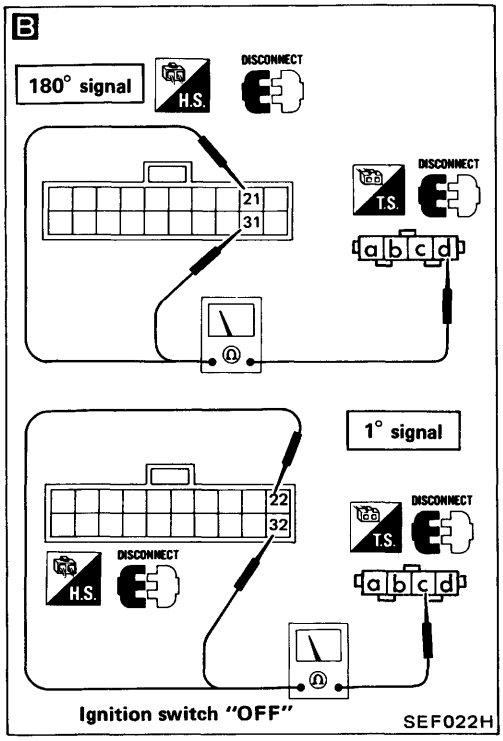
INSPECTION END

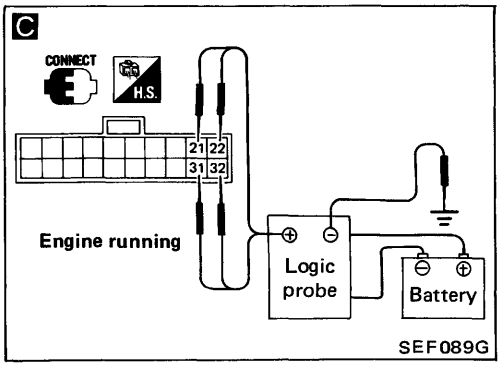
CRANK ANGLE SENSOR (Code No. 11)



CRANK ANGLE SENSOR (Code No. 11)







INSPECTION START

Perform self-diagnosis (Mode III).
Is Code No. 11 indicated?
No → INSPECTION END
Yes

A

CHECK POWER SOURCE
1) Disconnect crank angle sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → Repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL
1) Reconnect crank angle sensor harness connector.
2) Start engine.
3) Check that pulse signals exist in E.C.U. terminals ㉒, ㉜ and ㉑, ㉛ with logic probe.
Pulse signals should exist.
㉒, ㉜: 1° signal
㉑, ㉛: 180° signal

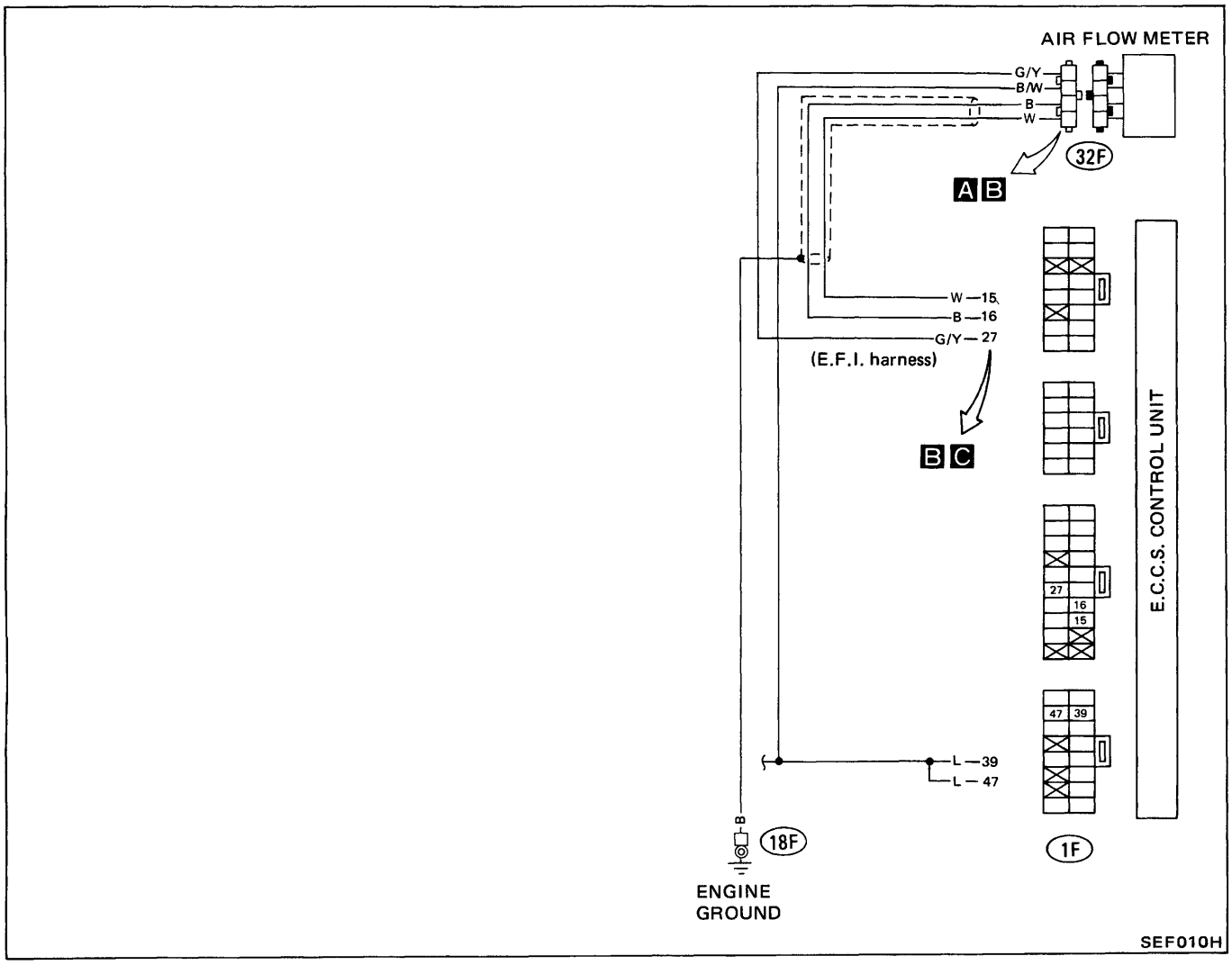
N.G. → **B**

CHECK CONTINUITY BETWEEN E.C.U. AND CRANK ANGLE SENSOR
1) Turn ignition switch "OFF".
2) Disconnect 20-pin terminal connector from E.C.U.
3) Disconnect crank angle sensor harness connector
4) Check continuity between terminal ⓐ and ground, terminals ⓒ and ㉒, ㉜ and terminals ⓓ and ㉑, ㉛.
Resistance:
Approximately 0Ω

O.K.

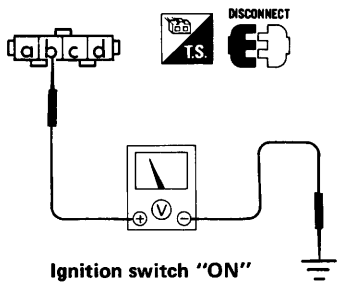
INSPECTION END

AIR FLOW METER (Code No. 12) (CHECK ENGINE LIGHT ITEM)



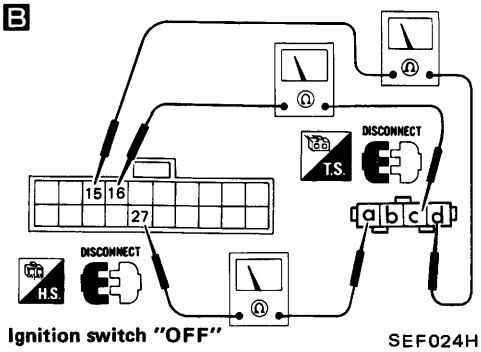
AIR FLOW METER (Code No. 12) (CHECK ENGINE LIGHT ITEM)

A



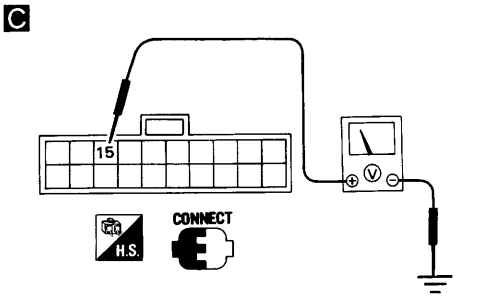
SEF023H

B



SEF024H

C



SEF093G

INSPECTION START

Perform self-diagnosis (Mode III).
Is Code No. 12 indicated?

No → INSPECTION END

Yes

A

CHECK POWER SOURCE
1) Disconnect air flow meter harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Battery voltage should exist.

N.G. → Repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL
1) Reconnect air flow meter harness connector.
2) Start engine.
3) Make sure that voltage exists between E.C.U. terminal ⑮ and ground.
Voltage:
Approximately 1.5V
(at idle)

N.G. → B

B

CHECK CONTINUITY BETWEEN E.C.U. AND AIR FLOW METER
1) Turn ignition switch "OFF".
2) Disconnect 20-pin terminal connector.
3) Disconnect air flow meter harness connector.
4) Check continuity between terminals ⓐ and ㉗, ⓒ and ⑯ and ⓓ and ⑮.
Resistance:
Approximately 0Ω

O.K.

Reinstall any part removed.

Erase the self-diagnosis memory.

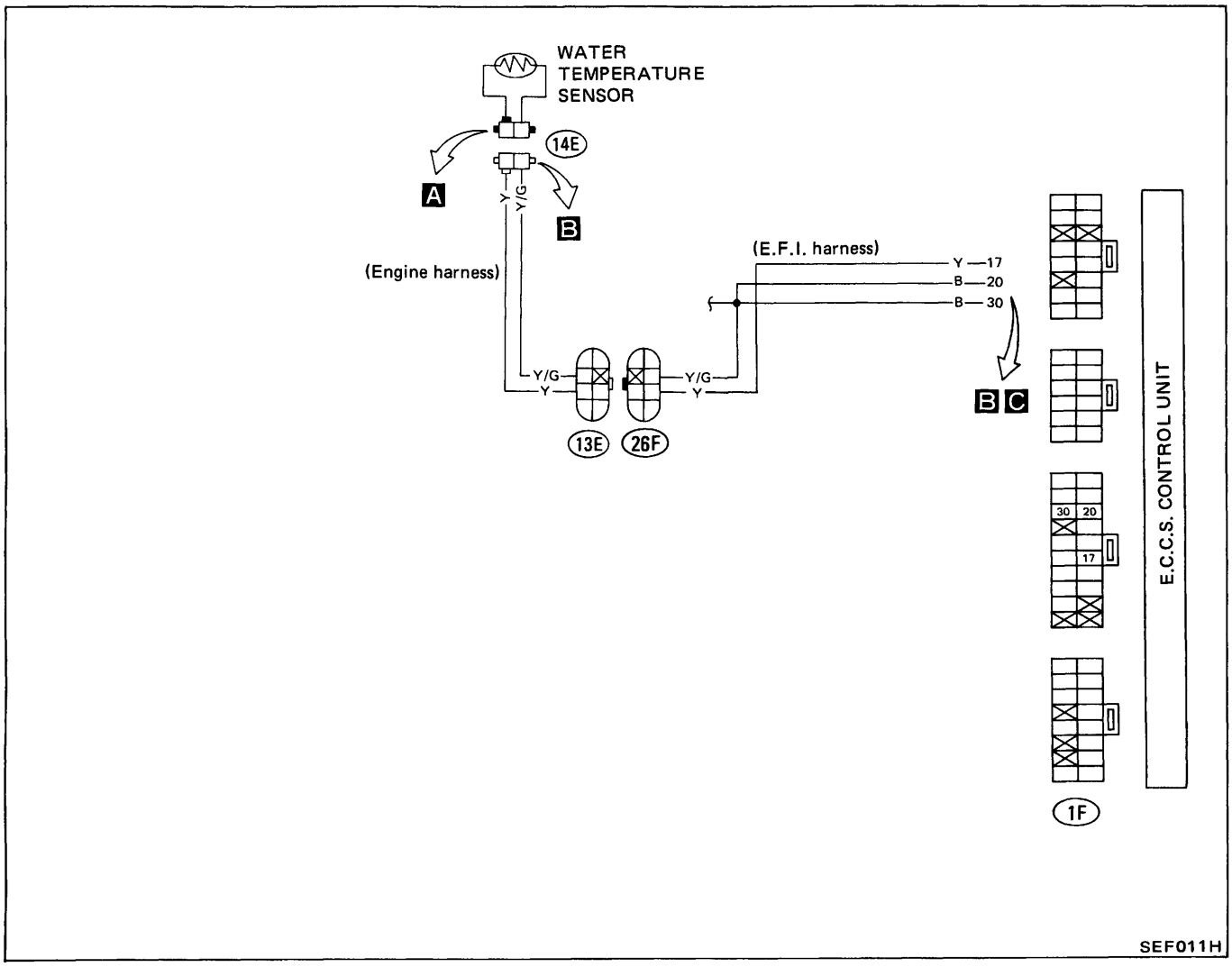
Perform driving test and then perform self-diagnosis (Mode III) again.

N.G. →
1) Perform E.C.U. input/output signal inspection test.
2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

O.K.

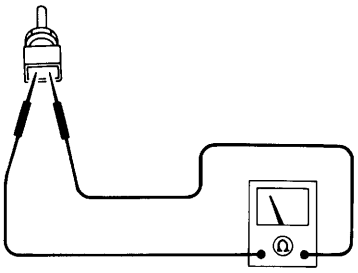
INSPECTION END

WATER TEMPERATURE SENSOR (Code No. 13) (CHECK ENGINE LIGHT ITEM)



WATER TEMPERATURE SENSOR (Code No. 13) (CHECK ENGINE LIGHT ITEM)

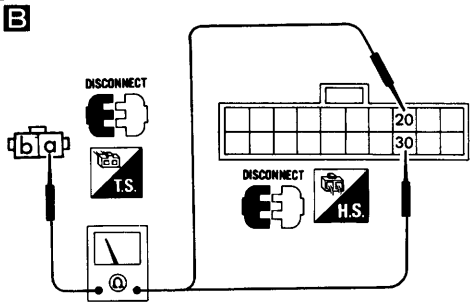
A



Temperature °C (°F)	Resistance (kΩ)
20 (68)	Approx. 2.5
80 (176)	Approx. 0.33

SEF062F

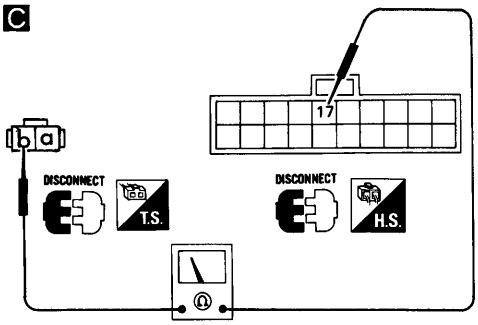
B



Ignition switch "OFF"

SEF095G

C



Ignition switch "OFF"

SEF096G

INSPECTION START

Perform self-diagnosis (Mode III).
Is Code No. 13 indicated?

No → INSPECTION END

Yes

A

CHECK COMPONENTS
1) Disconnect water temperature sensor harness connector.
2) Check resistance of water temperature sensor.
Resistance is shown in illustration A.

N.G. → Replace water temperature sensor.

O.K.

B

CHECK GROUND CIRCUIT
1) Disconnect 20-pin terminal connector from E.C.U.
2) Check continuity between terminals ⓐ and ⑳, ㉚.
Continuity should exist.

N.G. → 1) Repair harness or connectors. 2) Check middle harness connector for proper connection.

O.K.

C

CHECK INPUT SIGNAL CIRCUIT
Check continuity between terminals ⓑ and ⑰.
Continuity should exist.

N.G. →

O.K.

Reinstall any part removed.

Erase the self-diagnosis memory.

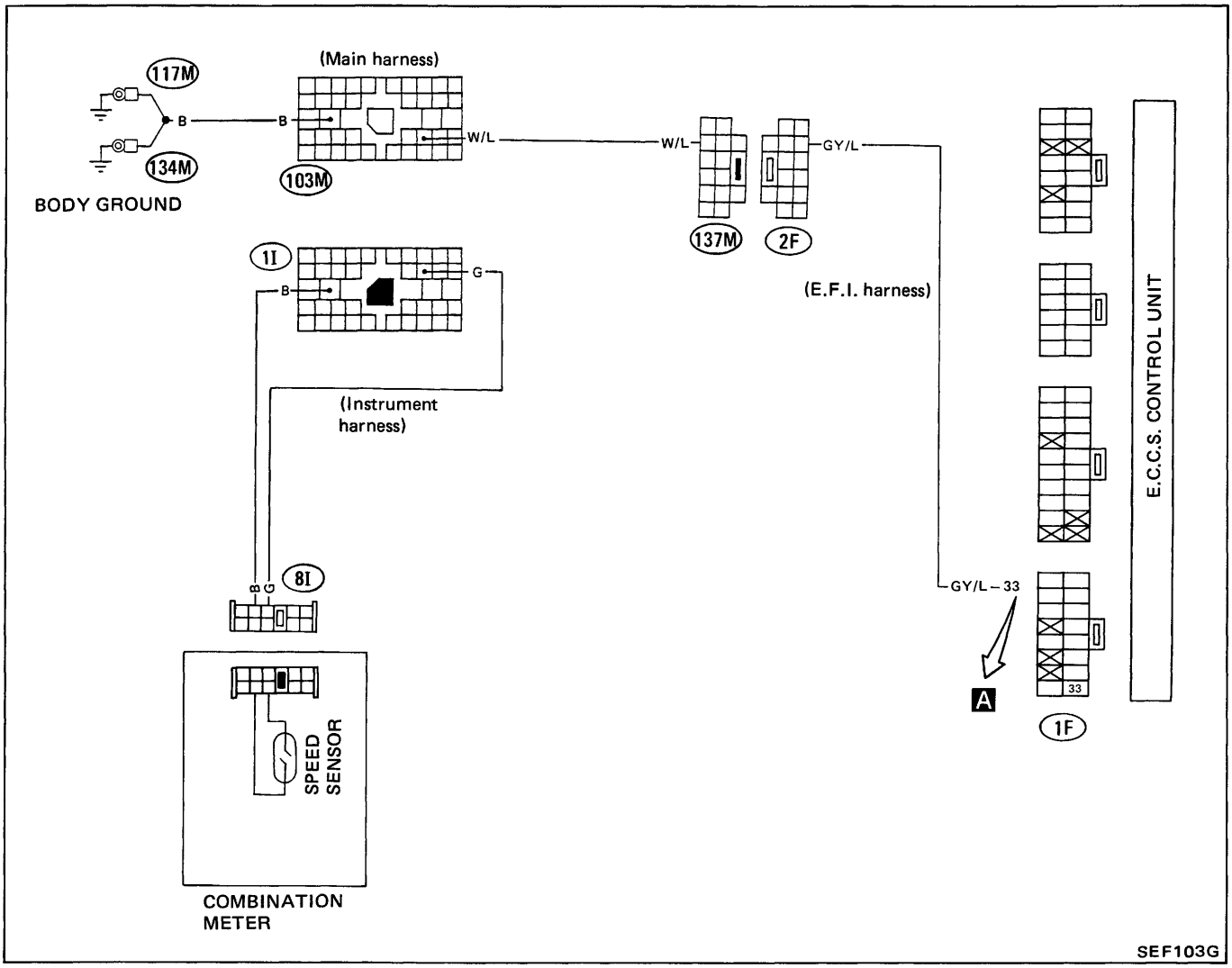
Perform driving test and then perform self-diagnosis (Mode III) again.

N.G. → 1) Perform E.C.U. input/output signal inspection test. 2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

O.K.

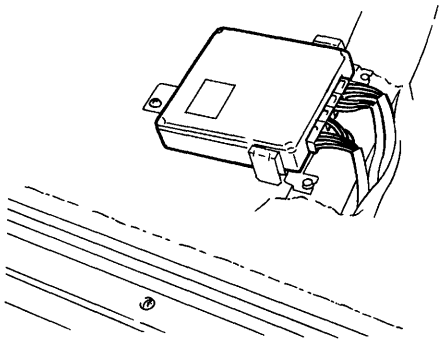
INSPECTION END

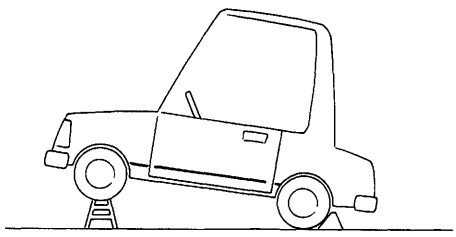
VEHICLE SPEED SENSOR (Code No. 14) (CHECK ENGINE LIGHT ITEM)



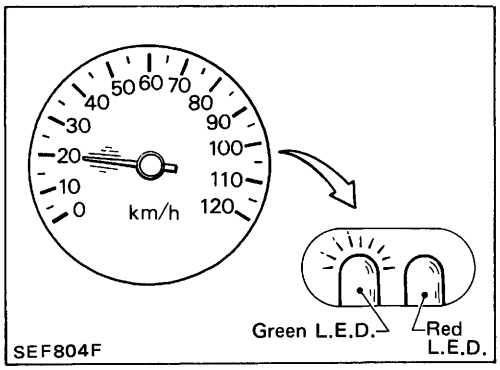
The following is necessary to perform this inspection.

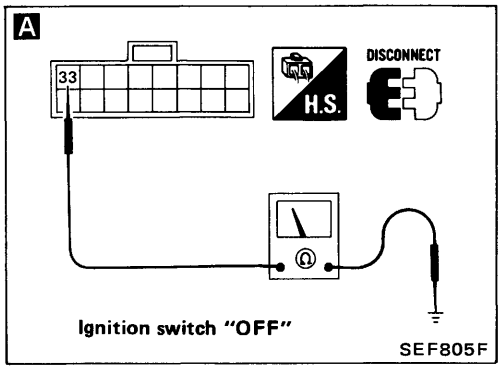
1. Pull out E.C.U. installed under the assist seat.
2. Jack up front wheels.


SEF808F


SEF803F

VEHICLE SPEED SENSOR (Code No. 14) (CHECK ENGINE LIGHT ITEM)





INSPECTION START

CHECK INPUT SIGNAL
1) Perform switch ON/OFF diagnosis (in Mode IV).
2) Make sure green L.E.D. on E.C.U. comes "ON" when vehicle speed reaches 20 km/h (12 MPH).

O.K. → INSPECTION END

N.G.

A CHECK CONTINUITY BETWEEN E.C.U. AND VEHICLE SPEED SENSOR
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. 16-pin harness connector.
3) Check resistance between E.C.U. terminal ㉝ and ground by rotating front wheel by hand.
Continuity should come and go.

N.G. →
1) Repair or replace harness.
2) Check middle harness connector for proper connection.
3) Check S.M.J.

O.K.

CHECK VEHICLE SPEED SENSOR
See EL section.

Reinstall any part removed.

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

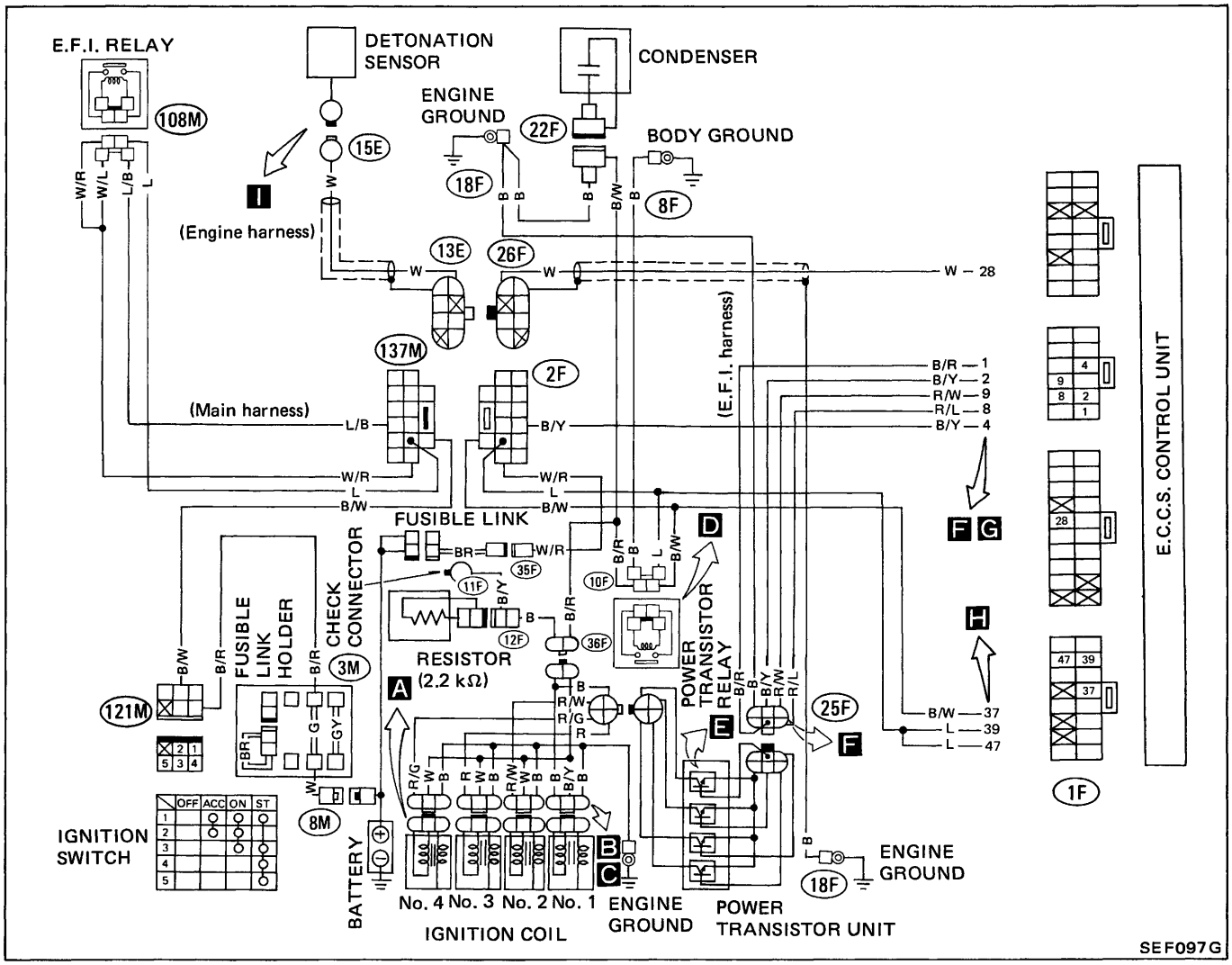
1) Perform switch ON/OFF diagnosis (in Mode IV) again.
2) Make sure green L.E.D. on E.C.U. comes "ON" when vehicle speed reaches 20 km/h (12 MPH).

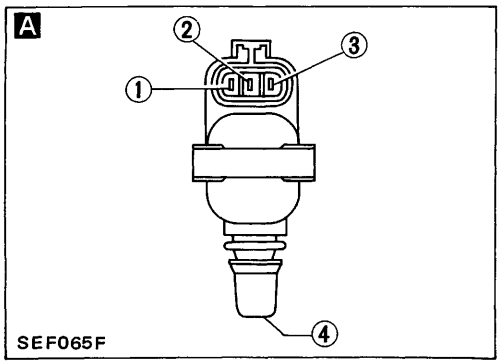
N.G. →
1) Perform self-diagnosis and find malfunction code.
2) According to displayed Code No., perform electronic control system inspection.

O.K.

INSPECTION END

IGNITION SIGNAL (Code No. 21) & DETONATION SENSOR (Code No. 34)

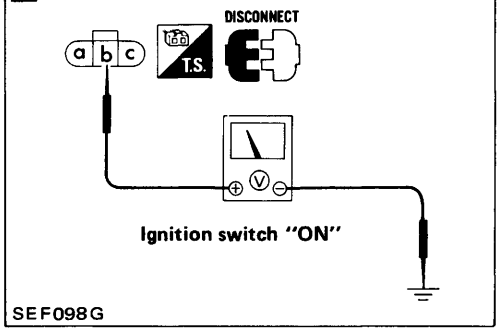




Continuity between terminals ③ and ④ cannot be inspected with an ordinal ohmmeter.

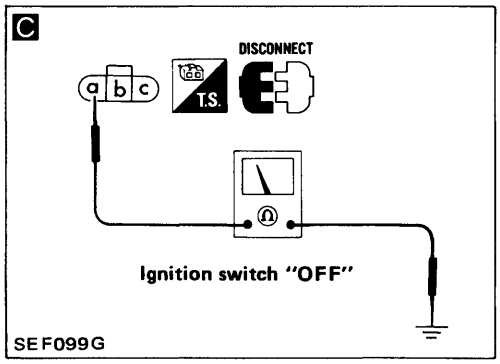
IGNITION SIGNAL (Code No. 21) & DETONATION SENSOR (Code No. 34)

B



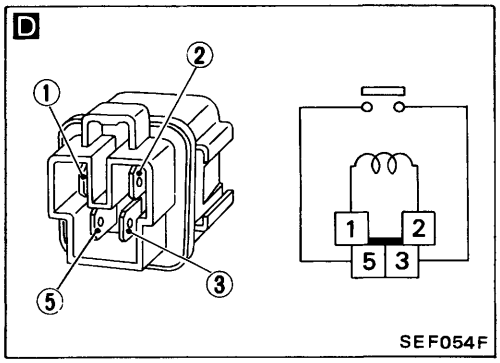
SEF098G

C



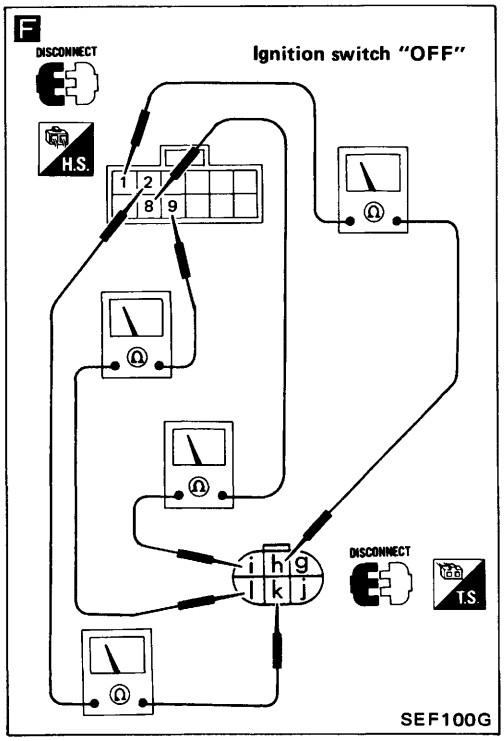
SEF099G

D



SEF054F

F



SEF100G

INSPECTION START

Perform self-diagnosis (Mode III). Is Code No. 21 or 34 indicated?

O.K. → INSPECTION END

Yes
Code No. 21

Yes
Code No. 34 → CHECK COMPONENT
Resistance: 500 - 600 kΩ
If N.G., replace detonation sensor.

A

CHECK COMPONENT
1) Remove ornament cover.
2) Remove ignition coil.
3) Check resistance of ignition coil.
4) Disconnect ignition coil harness connector.

Terminal	Resistance
① - ②	Approximately 0.7Ω

N.G. → Replace ignition coil.

O.K.

B

CHECK POWER SOURCE
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → D

O.K.

C

CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF".
2) Check continuity between terminal ⓐ and ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

F

CHECK HARNESS CONTINUITY BETWEEN POWER TRANSISTOR AND E.C.U.
1) Disconnect 12-pin terminal harness connector from E.C.U.
2) Disconnect (25F) harness connector.
3) Check continuity between terminals ⓗ and ①, ⓘ and ⑧, ⓚ and ②, ⓛ and ⑨.
Resistance:
Approximately 0Ω

N.G. → Repair harness or connectors.

O.K.

D

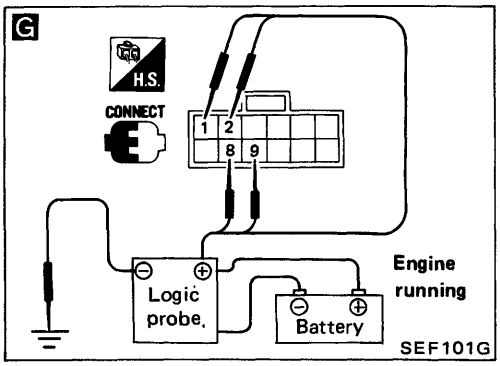
Check power transistor relay.

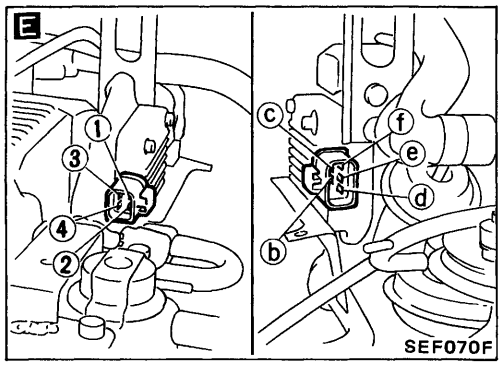
Condition	Continuity between terminals ③ and ⑤
Supply 12V direct current between terminals ① and ②	Yes
Not supply	No

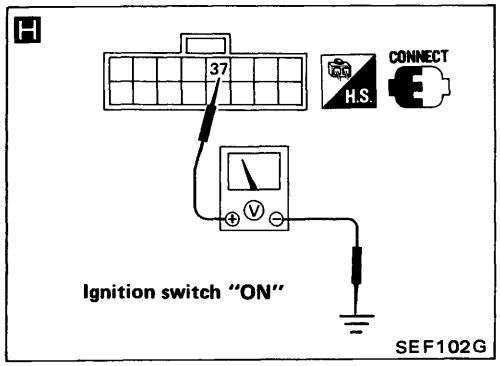
If N.G., replace relay.

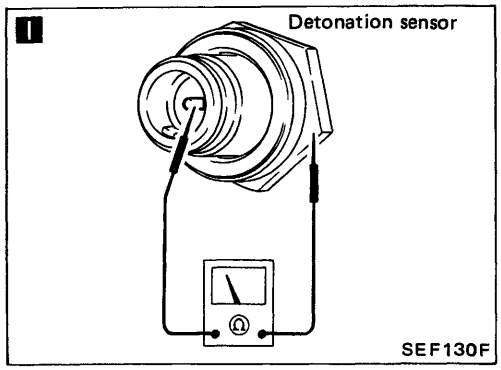
O.K. → Repair harness or connectors.

IGNITION SIGNAL (Code No. 21) & DETONATION SENSOR (Code No. 34)









G

CHECK OUTPUT SIGNAL

1) Reconnect (25F) harness connector.
2) Reconnect 12-pin terminal harness connector.
3) Reconnect ignition coil harness connector.
4) Start engine.
5) Make sure that pulse signals exist between E.C.U. terminals ①, ②, ⑧, ⑨ and ground with logic probe.
   Pulse signal should exist.

E

Check power transistor unit.

Terminal combination				Measuring current of tester	Continuity	Measuring current of tester	Continuity
1 d	2 d	3 d	4 d	↑	Yes	↓	No
1 c	2 b	3 f	4 e	↑	Yes	↓	No
d c	d b	d f	d e	↑	Yes	↓	Yes

If N.G., replace power transistor unit.

H

CHECK INPUT SIGNAL

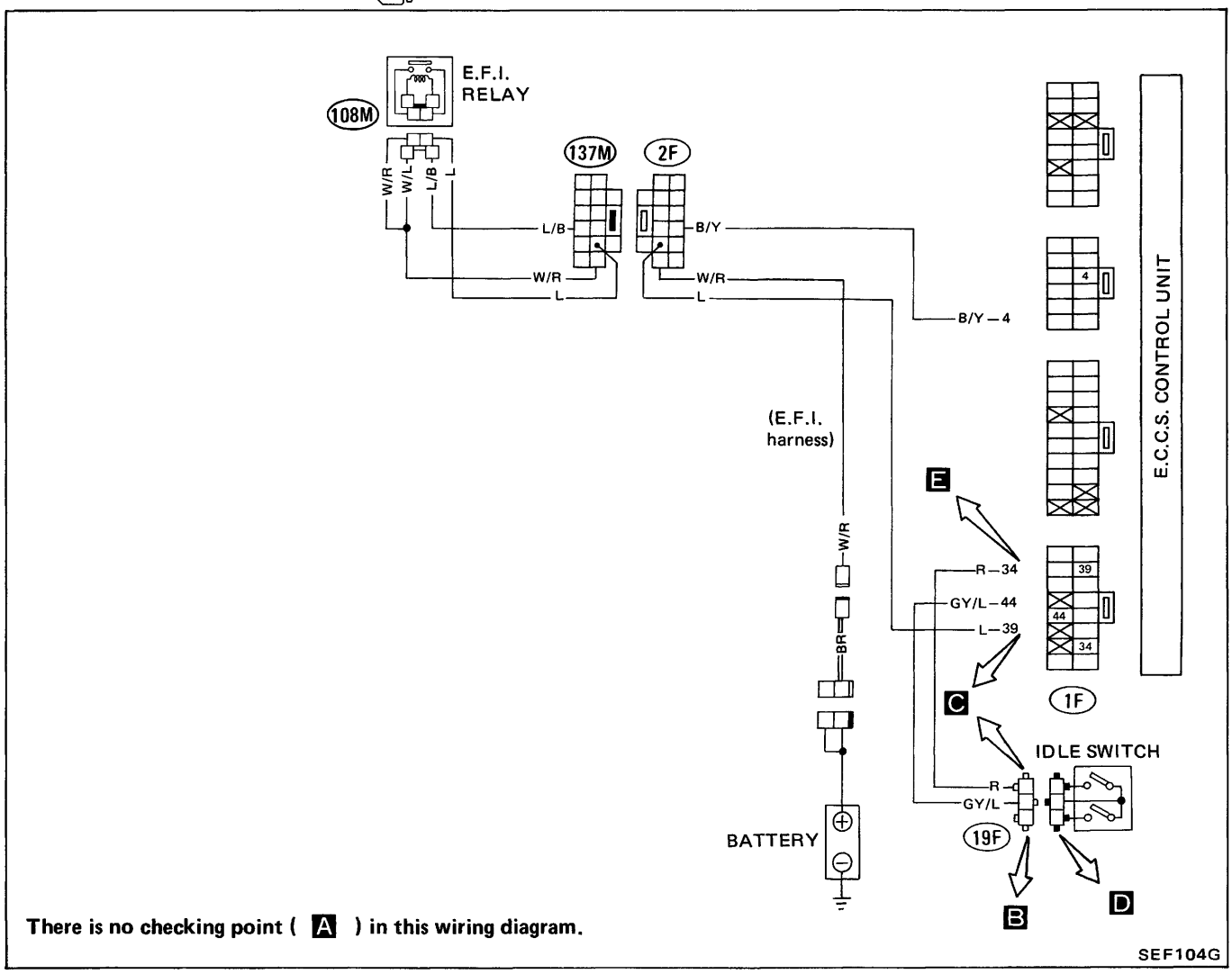
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between E.C.U. terminal (37) and ground.
   Voltage: Battery voltage

1) Check middle harness connector.
2) Repair harness or connectors.

INSPECTION END

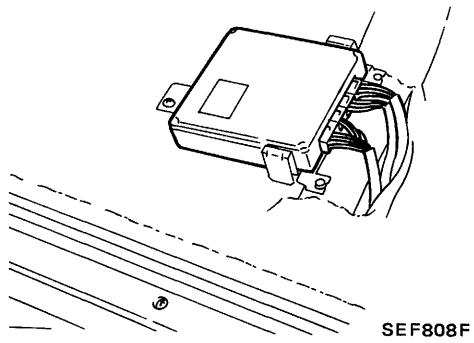
NOTE

IDLE SWITCH (Code No. 23) (CHECK ENGINE LIGHT ITEM)

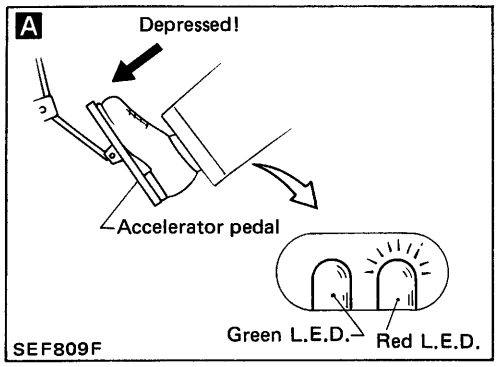


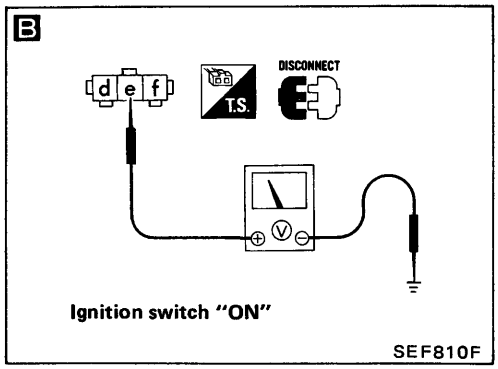
The following is necessary to perform this inspection.

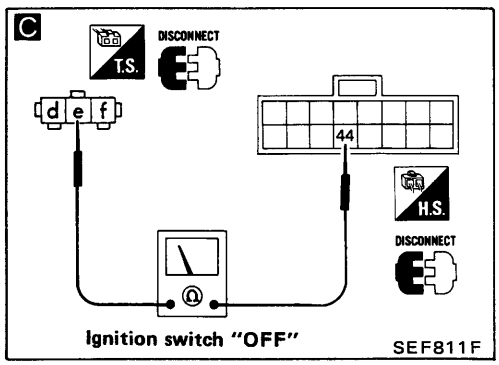
Pull out E.C.U. installed under the assist seat.

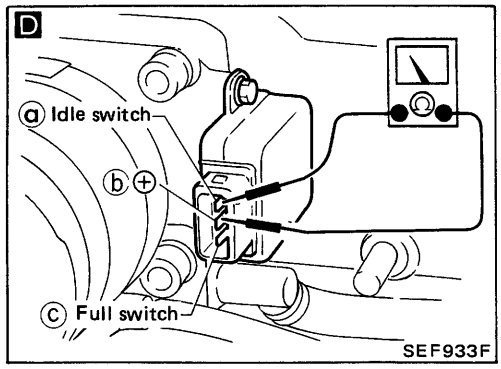


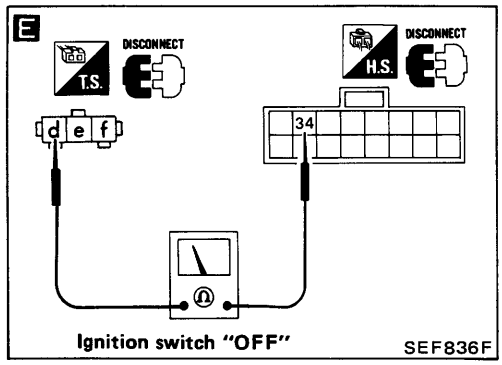
IDLE SWITCH (Code No. 23) (CHECK ENGINE LIGHT ITEM)











INSPECTION START

A CHECK INPUT SIGNAL
1) Perform switch ON/OFF diagnosis (in Mode IV).
2) Make sure red L.E.D. comes "ON" or goes "OFF" when accelerator pedal is depressed.

O.K. → INSPECTION END

N.G.

B CHECK POWER SOURCE
1) Disconnect idle switch harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓔ and ground.
Voltage:
Approximately 5.0V

N.G. → **C** CHECK CONTINUITY BETWEEN E.C.U. AND IDLE SWITCH
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. 16-pin connector.
3) Disconnect idle switch harness connector.
4) Check resistance between E.C.U. terminal ㊹ and terminal ⓔ.
Resistance:
Approximately 0Ω
If N.G., repair or replace harness.

O.K.

D CHECK COMPONENTS
1) Turn ignition switch "OFF".
2) Check continuity between terminals ⓐ and ⓑ.

Accelerator pedal	Continuity
Completely released	ⓐ - ⓑ
Depressed	No

N.G. → Check if idle switch is installed in proper position.
If N.G., adjust it by turning idle switch.
If O.K., replace idle switch.

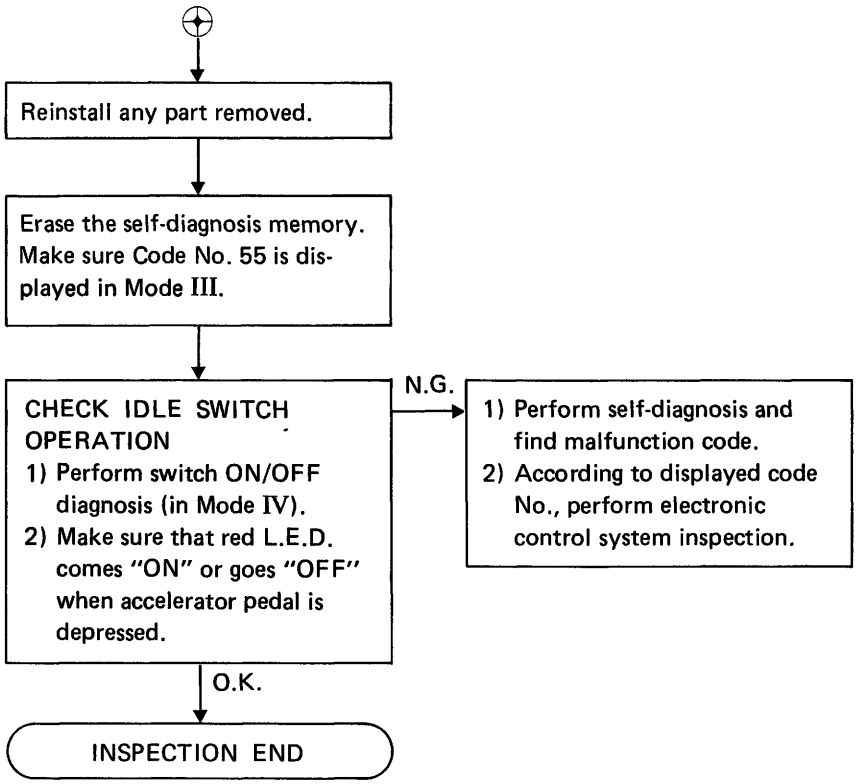
O.K.

E CHECK GROUND CIRCUIT
1) Disconnect E.C.U. 16-pin connector.
2) Check resistance between E.C.U. terminal ㉞ and terminal ⓓ.
Resistance:
Approximately 0Ω

N.G. → Repair or replace harness.

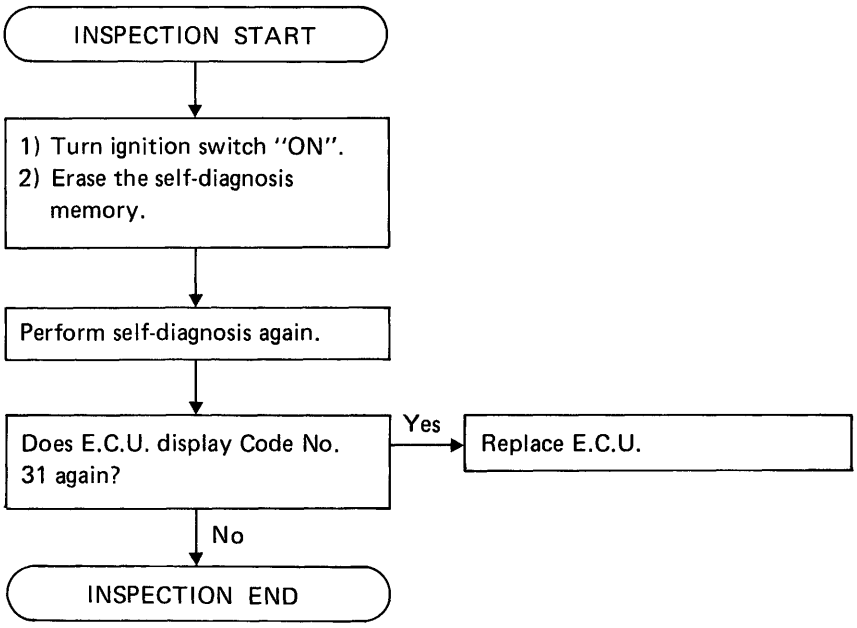
O.K.

IDLE SWITCH (Code No. 23) (CHECK ENGINE LIGHT ITEM)



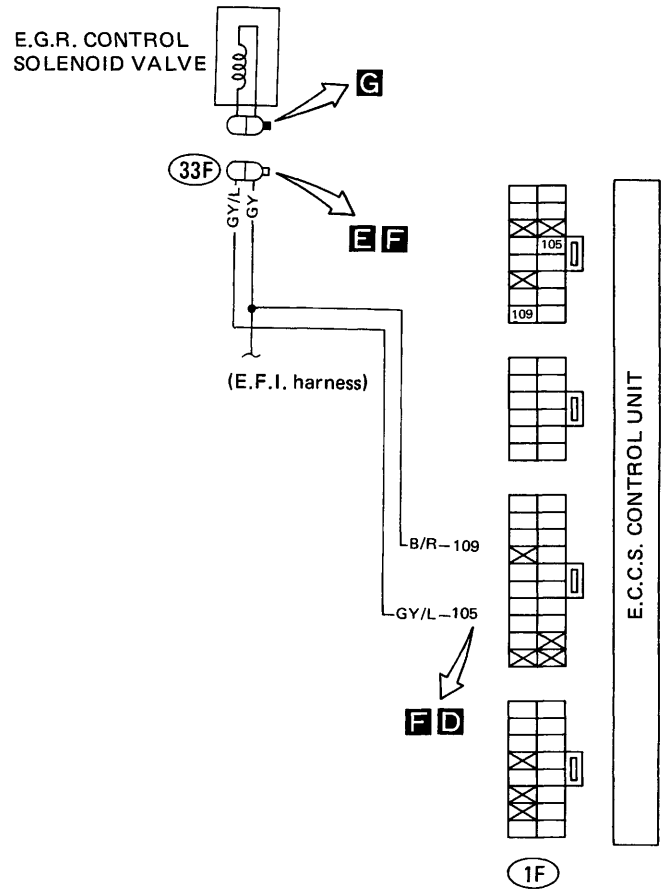
NOTE

ENGINE CONTROL UNIT (Code No. 31) (CHECK ENGINE LIGHT ITEM)



NOTE

E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM): For California
(Not self-diagnosis item): For Non-California



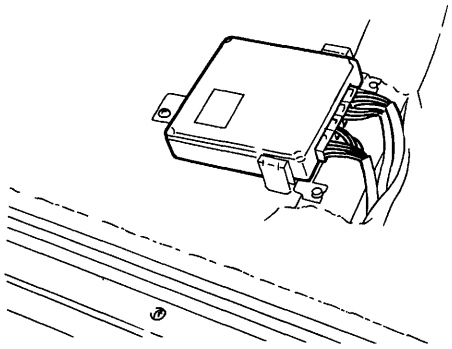
There are no checking points
(A , B , C , H) in this wiring diagram.

SEF105G

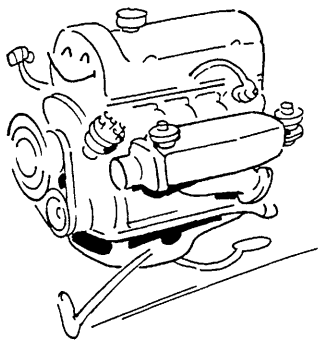
CAUTION:
When directly applying battery voltage to E.G.R. control solenoid valve, pay attention to the polarity. The solenoid valve will be broken if the polarity is reversed.

The following is necessary to perform this inspection.

1. Pull out E.C.U. installed under the assist seat.
2. Warm up engine sufficiently.



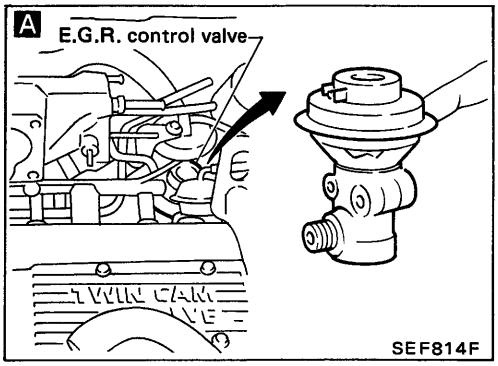
SEF808F



SEF802F

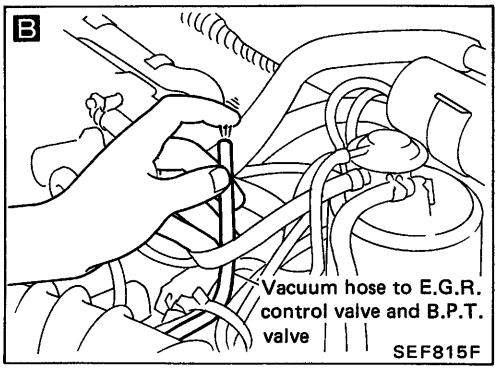
E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM): For California (Not self-diagnosis item): For Non-California

A E.G.R. control valve



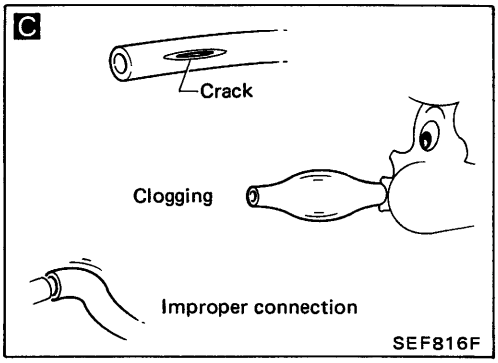
SEF814F

B



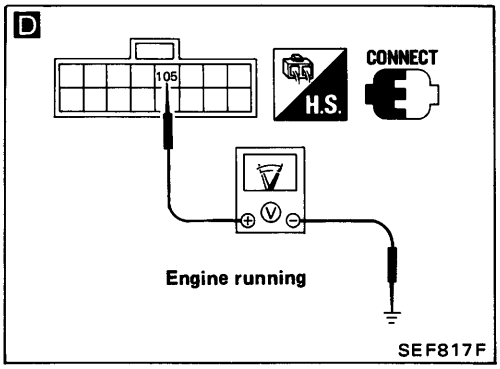
SEF815F

C



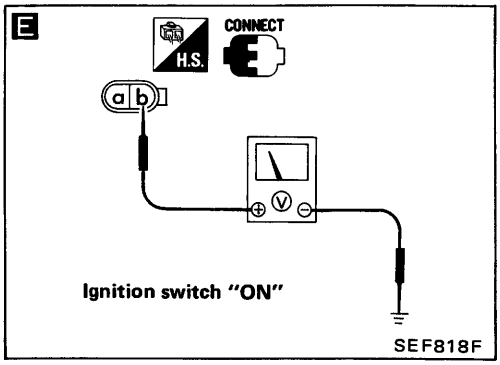
SEF816F

D



SEF817F

E



SEF818F

INSPECTION START

A CHECK E.G.R. CONTROL VALVE OPERATION
1) Start engine.
2) Make sure engine is warmed up sufficiently.
3) Make sure E.G.R. control valve spring responds to your touch (use your fingers) and also when engine is raced.

Responds → INSPECTION END

Does not respond

B CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE
1) Disconnect vacuum hose connected to E.G.R. control valve and B.P.T. valve.
2) Make sure vacuum exists when racing engine.

O.K. → Perform CHECK **H**. (See page EF & EC-256.)

N.G.

C CHECK VACUUM HOSE
Check vacuum hose for clogging, cracks and proper connections.

N.G. → If necessary, replace vacuum hose or reconnect vacuum hose firmly.

O.K.

D CHECK E.C.U. OUTPUT SIGNAL
1) Check voltage between E.C.U. terminal (105) and ground under the following conditions:

Engine condition	Voltage
Idle	0.7 - 0.9V
Racing	Battery voltage (11 - 14V)

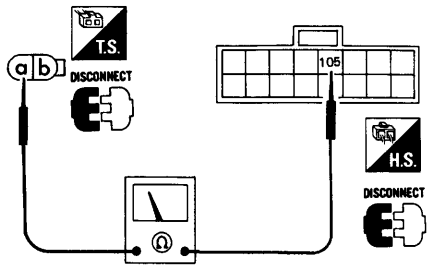
N.G. → **E** CHECK POWER SOURCE TO E.G.R. CONTROL SOLENOID VALVE
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Battery voltage should exist.

F CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. 16-pin terminal connector.
3) Disconnect E.G.R. control solenoid valve harness connector.
4) Check resistance between E.C.U. terminal (105) and terminal ⓐ.
Resistance:
Approximately 0Ω
If N.G., repair or replace harness.

O.K. ⊕

E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM): For California (Not self-diagnosis item): For Non-California

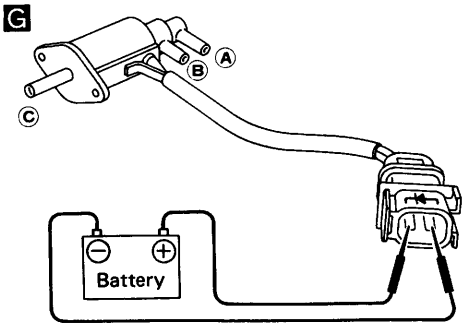
F



Ignition switch "OFF"

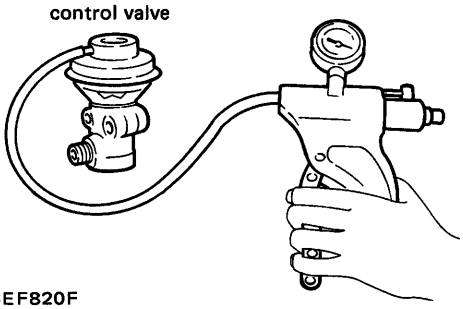
SEF819F

G



SEF762F

H



SEF820F

G CHECK E.G.R. CONTROL SOLENOID VALVE
1) Stop engine.
2) Remove E.G.R. control solenoid valve from vehicle.
3) Check the port continuity.

Solenoid valve	Continuity
When current flows	Ⓐ - Ⓑ
When current does not flow	Ⓑ - Ⓒ

N.G. → Replace E.G.R. control solenoid valve.

O.K. ↓

H CHECK E.G.R. CONTROL VALVE
1) Remove E.G.R. control valve from vehicle.
2) Apply vacuum to E.G.R. vacuum port with a hand vacuum pump.
E.G.R. control valve spring should lift.

N.G. → Valve spring may be stuck. Clean if necessary. If this does not correct trouble, replace E.G.R. control valve.

O.K. For Non-California → INSPECTION END

For California O.K. ↓

Check resistance of exhaust gas temperature sensor. (See page EF & EC-258.)

↓

Reinstall any part removed.

↓

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

↓

I Perform driving test under the following conditions:
1) Warm up engine sufficiently.
2) Use test driving modes indicated in figure I.

↓

J Make sure check engine light does not come "ON" during driving test.

Comes "ON" → Perform self-diagnosis and find malfunction code. According to displayed Code No., perform electronic control system inspection.

Does not come "ON" ↓

INSPECTION END

E.G.R. FUNCTION (Code No. 32) (CHECK ENGINE LIGHT ITEM): For California
(Not self-diagnosis item): For Non-California

I

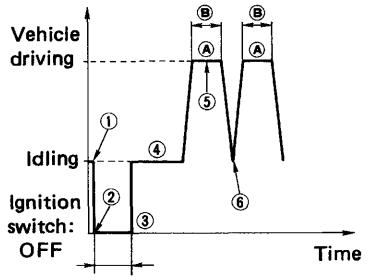
Test condition

Drive vehicle under the following conditions with a suitable shift position.

- **Engine speed:**
  2,500±300 rpm (A/T)
  2,900±300 rpm (M/T)
- **Intake manifold vacuum:**
  −32.0±9.3 kPa
  (−240±70 mmHg, −9.45±2.76 inHg)

Driving mode

Ⓐ : Test condition
Ⓑ : 16 seconds or more

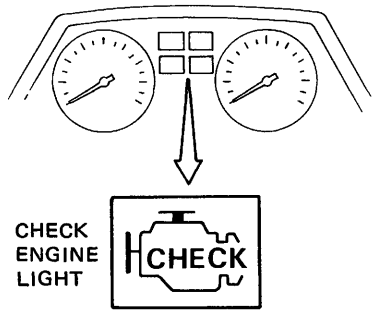


Until green and red LEDs go off.

① Start engine and warm it up sufficiently.
② Turn off ignition switch and keep it off until green and red LEDs go off.
③ Start engine and make sure that air conditioner switch and rear defogger are turned "OFF" during driving test.
④ Keep engine running for at least 4 minutes.
⑤ Shift to suitable gear position and drive in "Test condition" for at least 16 seconds.
⑥ Decrease engine revolution to less than 2,000 rpm.
⑦ Repeat steps ⑤ through ⑥ at least 1 time.

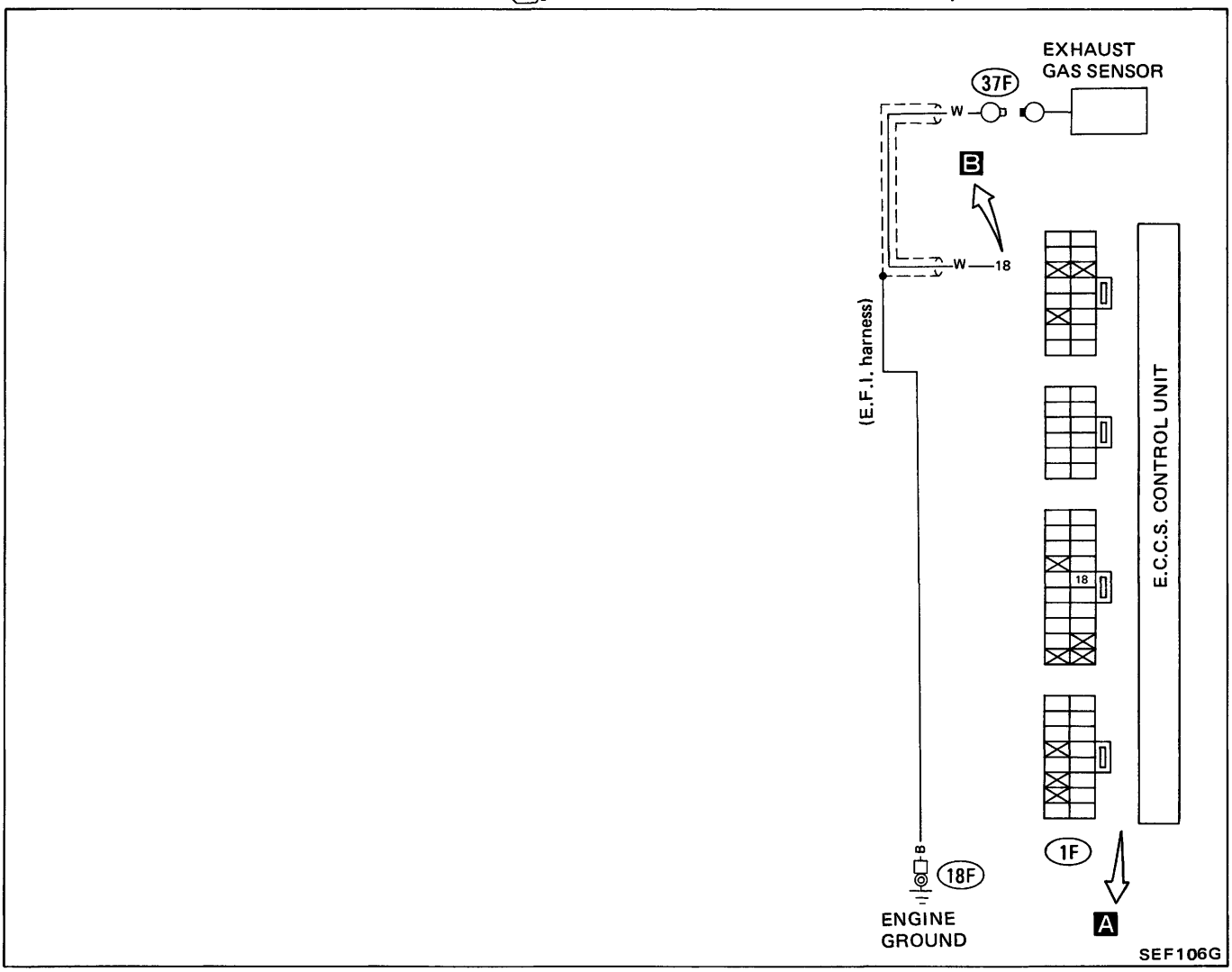
SEF326H

J



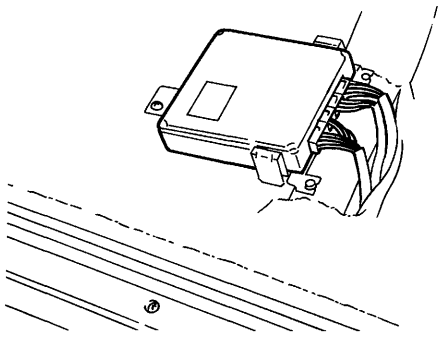
SEF807F

EXHAUST GAS SENSOR (Code No. 33) (CHECK ENGINE LIGHT ITEM)



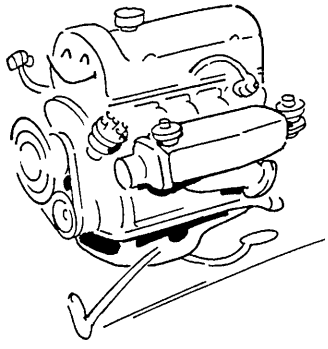
The following is necessary to perform this inspection.

1. Pull out E.C.U. installed under the assist seat.



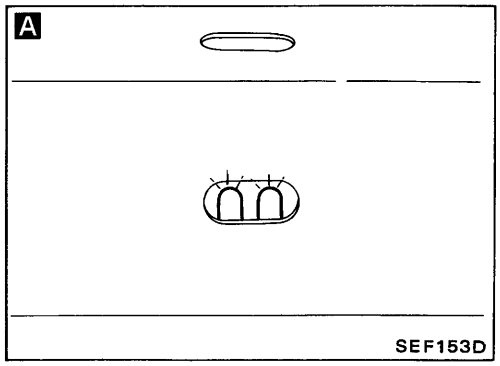
SEF808F

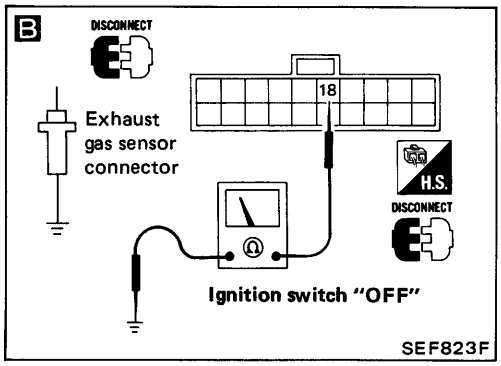
2. Warm up engine sufficiently.



SEF802F

EXHAUST GAS SENSOR (Code No. 33) (CHECK ENGINE LIGHT ITEM)





INSPECTION START

A CHECK INPUT SIGNAL
1) Start engine and warm it up sufficiently.
2) Make sure green L.E.D. on E.C.U. blinks at 2,000 rpm.

O.K. → INSPECTION END

N.G.

B CHECK EXHAUST GAS SENSOR CIRCUIT
1) Turn off engine.
2) Disconnect E.C.U. 20-pin connector.
3) Disconnect exhaust gas sensor harness connector.
4) Connect a jumper wire from exhaust gas sensor harness connector to ground.
5) Check resistance between E.C.U. terminal ⑱ and ground.
Resistance:
Approximately 0Ω

N.G. → Repair or replace harness.

O.K.

Replace exhaust gas sensor.

Reinstall any part removed.

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

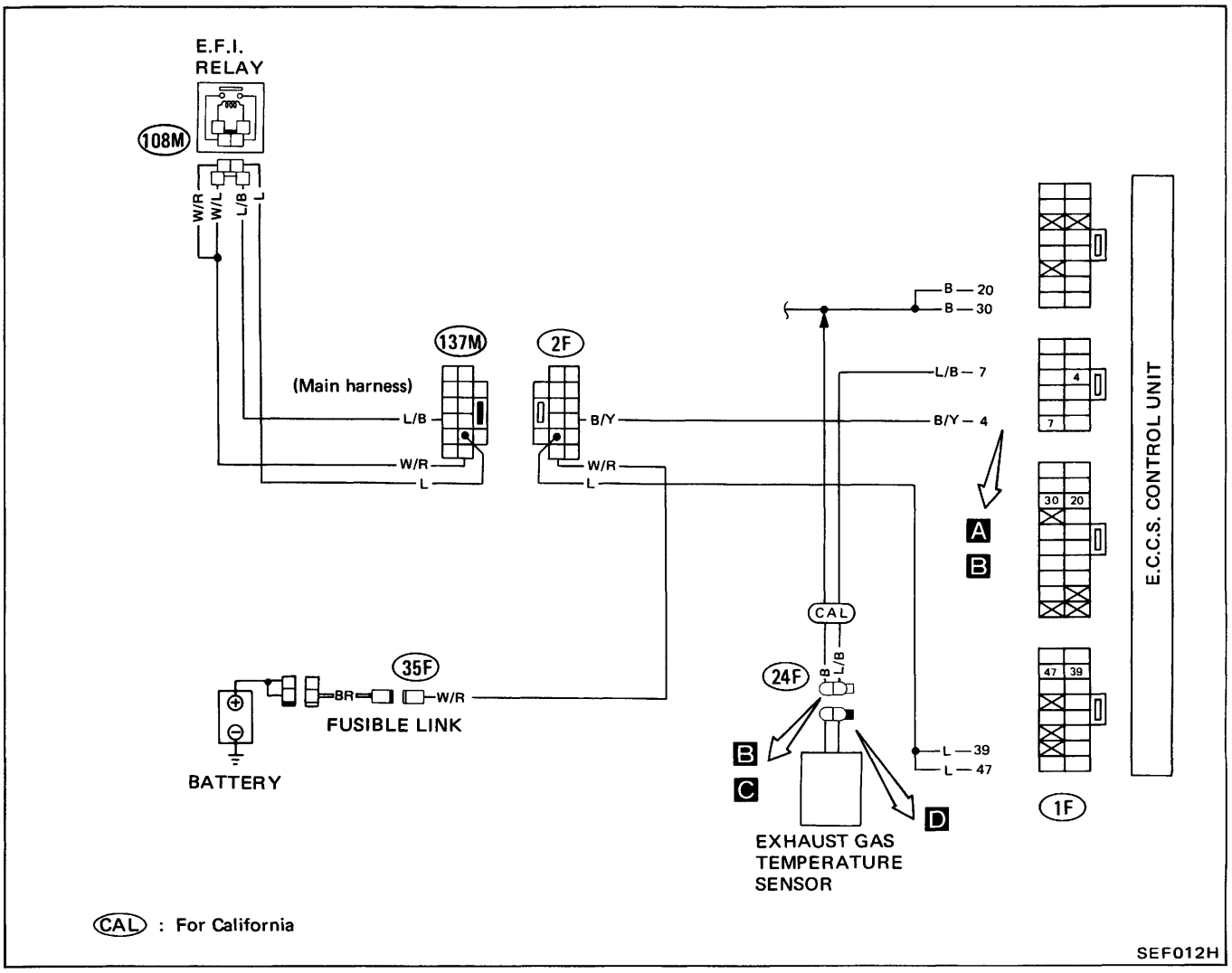
1) Warm up engine sufficiently.
2) Set diagnosis mode to Mode I.
3) Make sure that inspection lamp (Green) on E.C.U. goes on and off periodically more than 9 times during 10 seconds at 2,000 rpm.

N.G. → Perform MIXTURE RATIO FEEDBACK SYSTEM INSPECTION. (See page EF & EC-294.)

O.K.

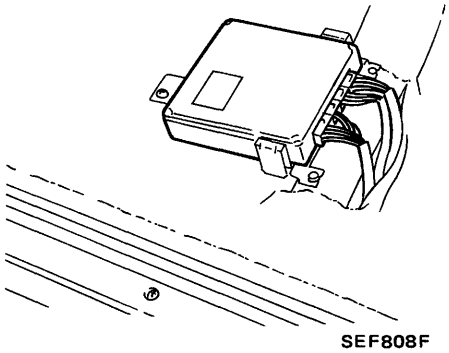
INSPECTION END

EXHAUST GAS TEMPERATURE SENSOR (Code No. 35) (CHECK ENGINE LIGHT ITEM)

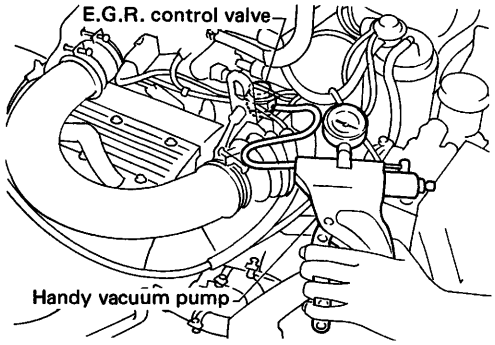


The following is necessary to perform this inspection.

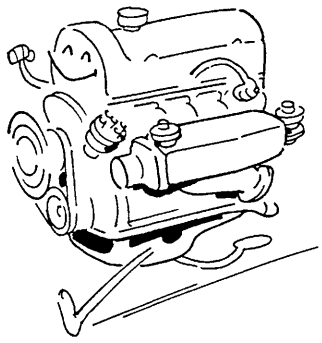
1. Pull out E.C.U. installed under the assist seat.



2. • Disconnect vacuum hose connected to E.G.R. control valve.
   • Connect a hand vacuum pump to E.G.R. control valve.

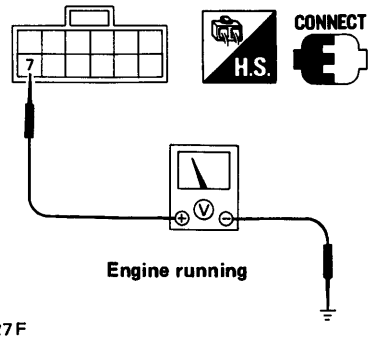


3. Warm up engine sufficiently.



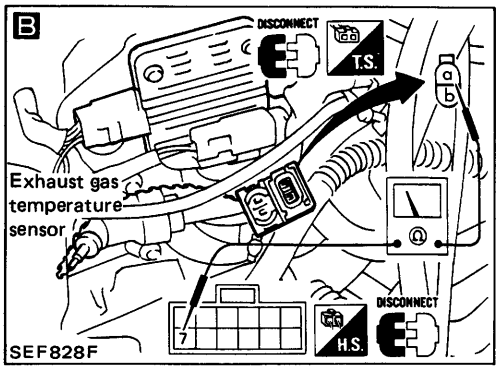
EXHAUST GAS TEMPERATURE SENSOR (Code No. 35) (CHECK ENGINE LIGHT ITEM)

A



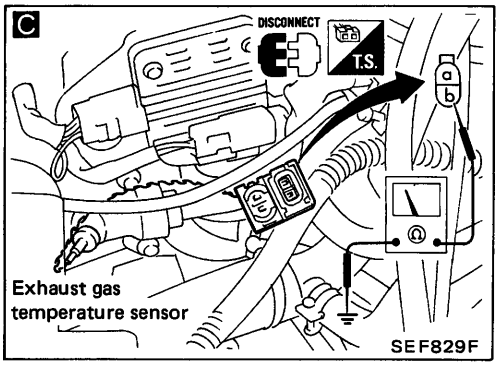
SEF827F

B



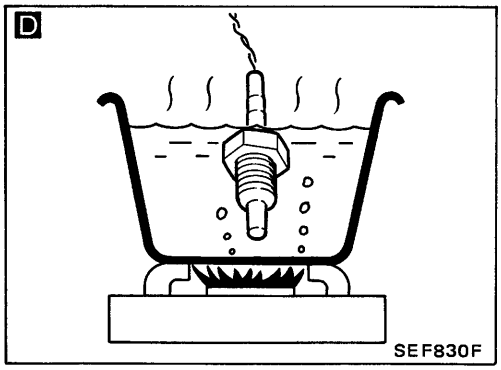
SEF828F

C



SEF829F

D



SEF830F

INSPECTION START

A CHECK INPUT SIGNAL

1) Start engine and warm it up sufficiently.
2) Keep engine speed at approximately 2,000 rpm.
3) Check voltage between E.C.U. terminal ⑦ and ground under the following conditions:

Condition	Voltage
When vacuum is not applied to E.G.R. control valve	1.0 - 2.0V
When vacuum is applied to E.G.R. control valve	0 - 1.0V

A sufficient vacuum applied with a hand vacuum pump may cause the engine to stall.

O.K. → INSPECTION END

N.G.

B CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND EXHAUST GAS TEMPERATURE SENSOR

1) Stop engine.
2) Disconnect E.C.U. 12-pin terminal connector.
3) Disconnect exhaust gas temperature sensor harness connector.
4) Check continuity between E.C.U. terminal ⑦ and ⓐ.

Continuity should exist.

N.G. →
1) Check middle harness connector connection.
2) If necessary, repair or replace harness.

O.K.

C CHECK GROUND CIRCUIT

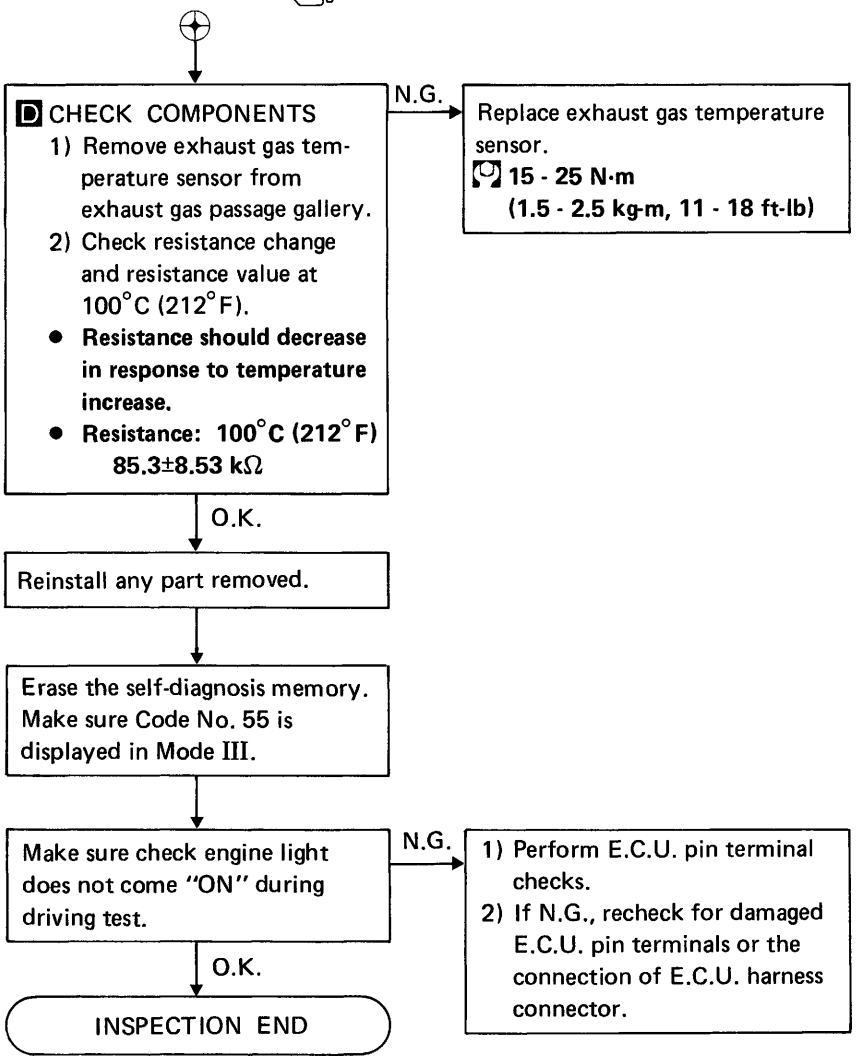
Check continuity between ⓑ and ground.

Resistance:
Approximately 0Ω

N.G. →
1) Check middle harness connector connection.
2) If necessary, repair or replace harness.

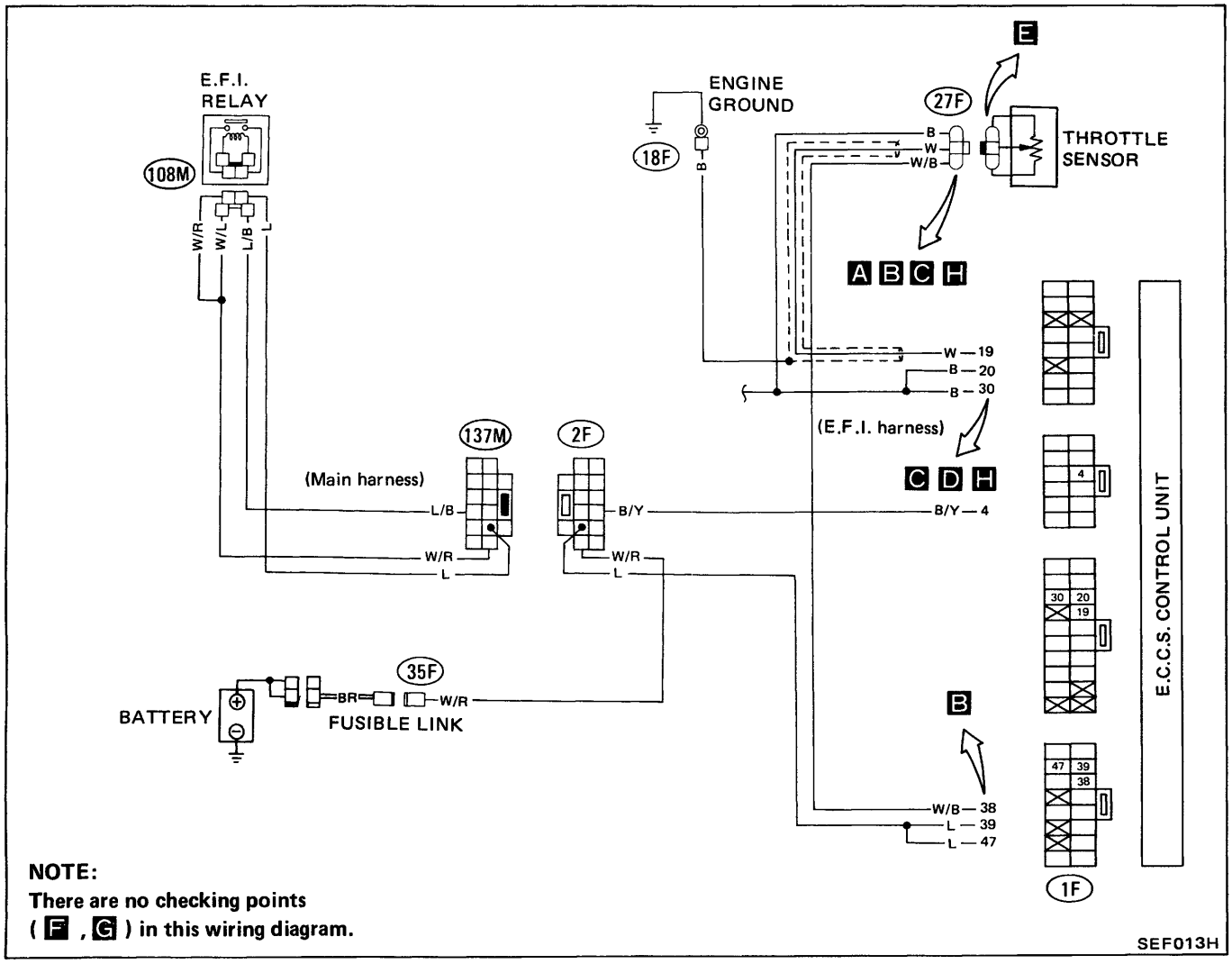
O.K.

EXHAUST GAS TEMPERATURE SENSOR (Code No. 35) (CHECK ENGINE LIGHT ITEM)



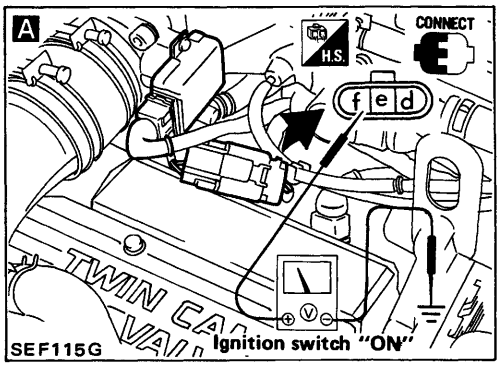
NOTE

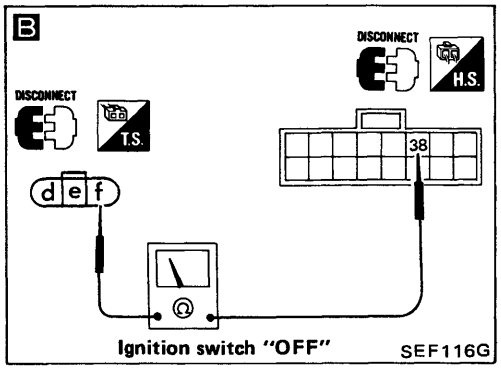
THROTTLE SENSOR (Code No. 43) (CHECK ENGINE LIGHT ITEM)

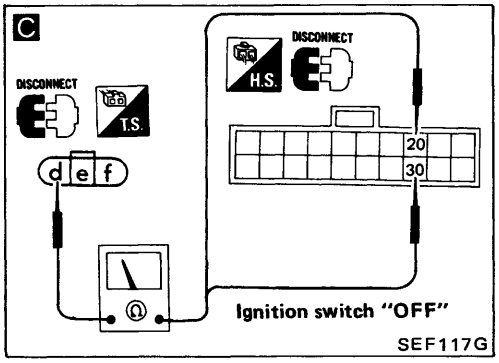


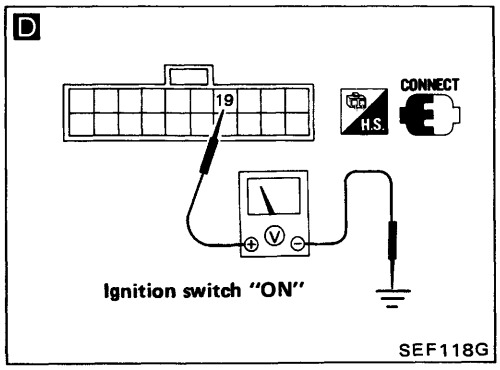
NOTE:
There are no checking points (F , G) in this wiring diagram.

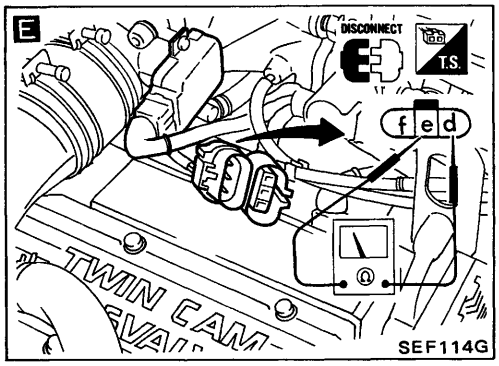
THROTTLE SENSOR (Code No. 43) (CHECK ENGINE LIGHT ITEM)











INSPECTION START

Perform self-diagnosis (Mode III).
Is Code No. 43 indicated?

No → INSPECTION END

Yes

A

CHECK POWER SOURCE
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓕ and ground.
Voltage:
Approximately 5.0V

N.G. →
Check the following items.
B 1) Harness continuity between throttle sensor harness connector and E.C.U.
- Turn ignition switch "OFF".
- Disconnect throttle sensor harness connector.
- Disconnect 16-pin connector from E.C.U.
- Check resistance between ⓕ and ㊳.
Resistance:
Approximately 0Ω

2) Middle harness connector
3) E.F.I. relay
(Refer to page EF & EC-235.)

O.K.

C

CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF" and disconnect 20-pin connector from E.C.U.
2) Disconnect throttle sensor harness connector.
3) Check resistance between terminal ⓓ and E.C.U. terminals ⑳ and ㉚.
Resistance:
Approximately 0Ω

N.G. →
1) Check harness continuity between throttle sensor and ground.
2) E.C.U. ground circuit.

O.K.

D

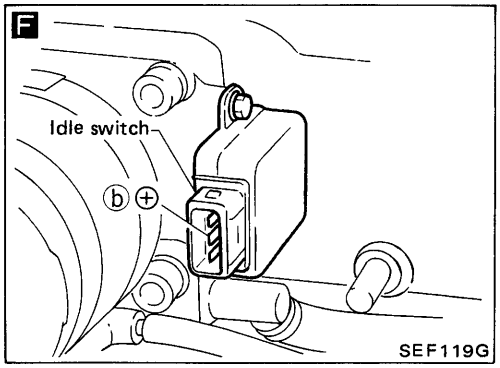
CHECK INPUT SIGNAL
1) Reconnect E.C.U. 20-pin terminal and throttle sensor harness connector.
2) Turn ignition switch "ON".
3) Make sure that voltage between terminal ⑲ and ground changes when accelerator pedal is depressed.
Voltage:
Approximately 0.5 - 4.0V

O.K. → INSPECTION END

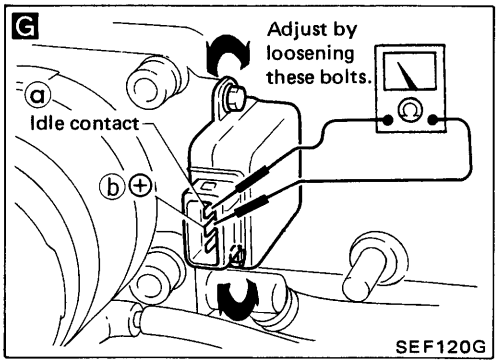
N.G. → ⊕

THROTTLE SENSOR (Code No. 43) (CHECK ENGINE LIGHT ITEM)

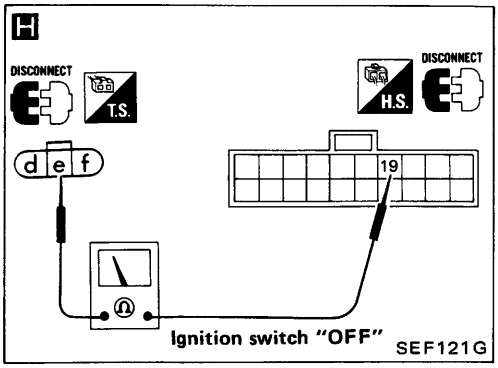
F



G



H



1) Disconnect throttle sensor harness connector.

E 2) Make sure that resistance between ⓓ and ⓔ changes when opening throttle valve manually.
Resistance should change.
If not, replace throttle sensor.

3) Check idle switch OFF → ON speed.

- Reconnect throttle sensor harness connector.

F
- Disconnect idle switch harness connector.
- Start and warm up engine sufficiently.
- Check idle switch OFF → ON speed with circuit tester, closing throttle valve manually.

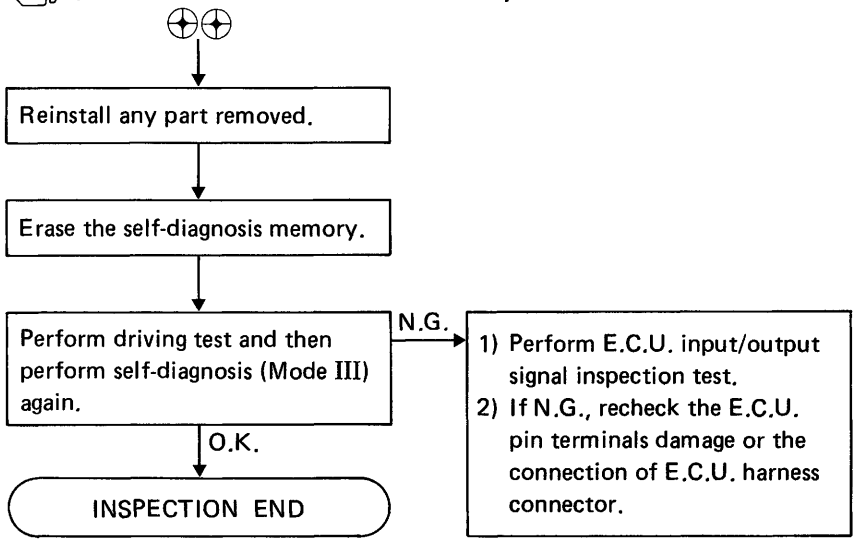
Idle switch OFF → ON speed:
M/T: Idle speed + 250±150 rpm
A/T: Engine speed (Idle speed in "N" position) + 250±150 rpm

G
- If N.G., loosen throttle sensor installing screws, then set idle switch OFF → ON speed to the specified value by turning throttle sensor body. (Connect circuit tester with terminals ⓐ and ⓑ on idle switch side and find out OFF → ON point.)
- Tighten throttle sensor installing screws after setting.

H 4) Check harness continuity between throttle sensor and E.C.U.
- Disconnect harness connector for thrttle sensor.
- Disconnect 20-pin connector from E.C.U.
- Check resistance between terminal ⓔ and E.C.U. terminal ⑲.

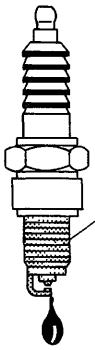
Resistance:
Approximately 0Ω

THROTTLE SENSOR (Code No. 43) (CHECK ENGINE LIGHT ITEM)



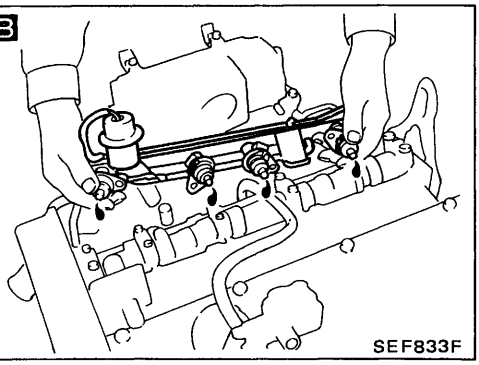
INJECTOR LEAK (Code No. 45) (CHECK ENGINE LIGHT ITEM)

A



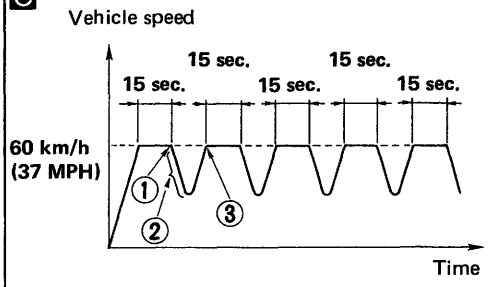
SEF832F

B



SEF833F

C



① Shift to "4th" position* and drive on a smooth road at constant speed of approximately 60 km/h (37 MPH) for 15 seconds.
② While holding at "4th" position*, release accelerator pedal (fully closed throttle) until speed is reduced to 40 km/h (25 MPH).
③ Accelerate engine and drive at the same constant speed in step ① above for 15 seconds.
④ Repeat steps ① through ③ above at least five times.
*: Refers to "D" range for automatic transaxle model.

SEF834F

INSPECTION START

Start engine and warm it up sufficiently.

Perform self-diagnosis (Mode III). Is Code No. 14 or 23 indicated? — Yes → Check vehicle speed sensor or idle switch. (See page EF & EC-242/248.)

No

Make sure engine runs smoothly at idle after warming. — Does not run smoothly → Ⓐ

Runs smoothly

Race engine two or three times under no-load, then run engine at idle speed.

Set diagnosis to Mode II and check that red and green L.E.D. on control unit blink almost simultaneously at 2,000 rpm under no-load. — Does not blink → Check idle CO% (See page EF & EC-294.)

Blinks

INSPECTION END

Ⓐ

A Remove all spark plugs from intake manifold. Are plugs wet with fuel? — Yes → Replace the injector in which cylinder spark plug is wet with fuel.

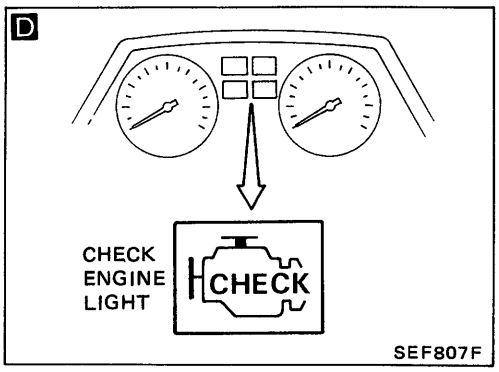
No

Remove injector assembly. (See page EF & EC-300.) **Keep fuel hose and all injectors connected to injector gallery.**

B Turn ignition switch "ON". Make sure fuel does not drip from injector. — Drips → Replace the injectors where fuel is dripping from.

Does not drip

INJECTOR LEAK (Code No. 45) (CHECK ENGINE LIGHT ITEM)



Reinstall any part removed.

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Mode III.

C Perform driving test under the following conditions:
1) Warm up engine sufficiently.
2) Use test driving modes indicated in figure C.

D Make sure check engine light does not come "ON" during driving test.

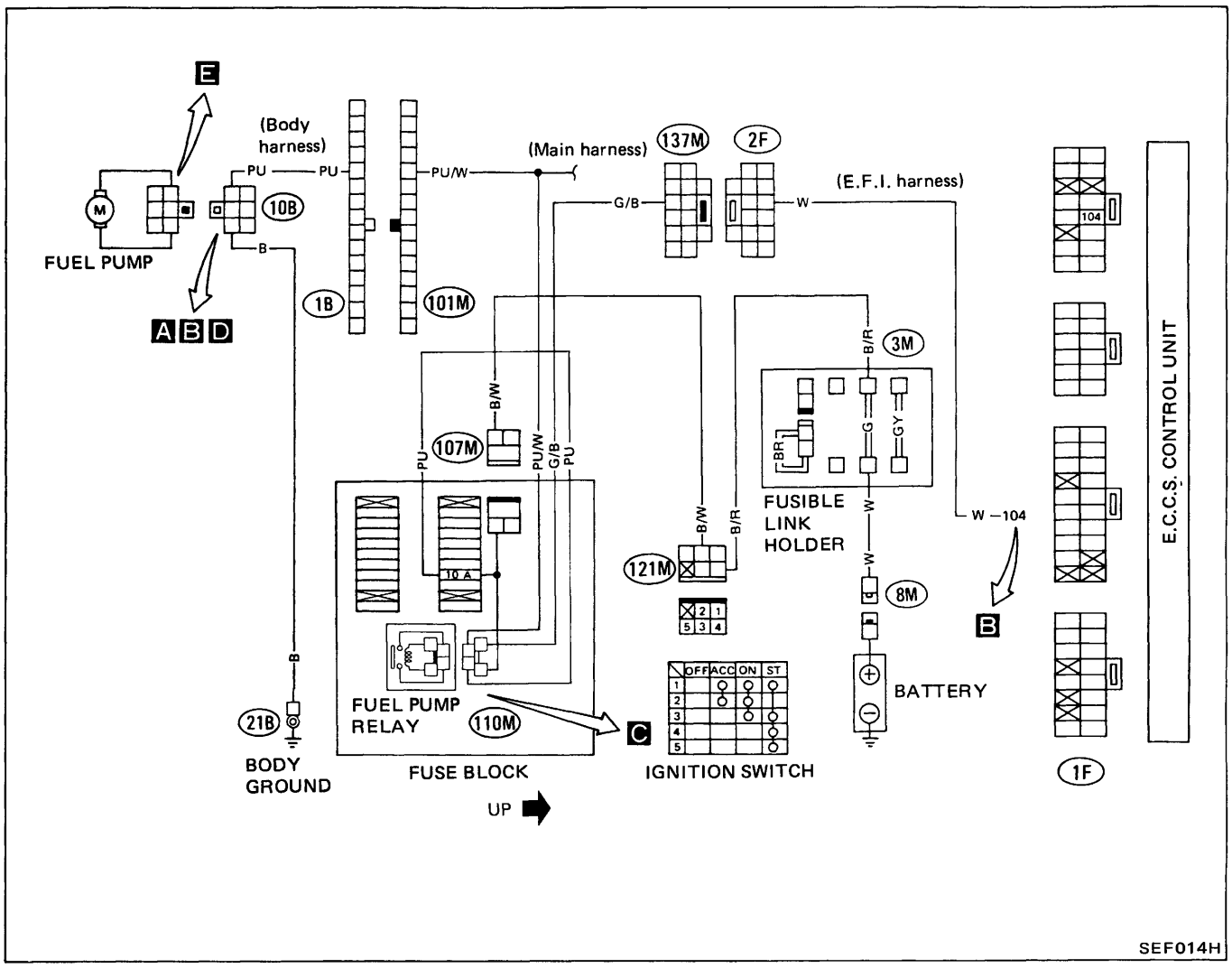
Comes "ON"

1) Perform self-diagnosis and find malfunction code.
2) According to displayed code No., perform electronic control system inspection.
3) If Code No. 45 is displayed again, replace all injectors, then perform electronic control system inspection.

Does not come "ON"

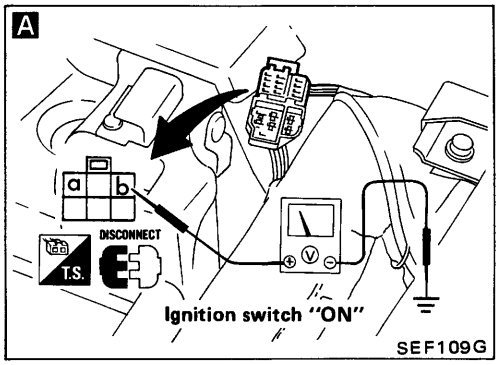
INSPECTION END

FUEL PUMP (Not self-diagnosis item)

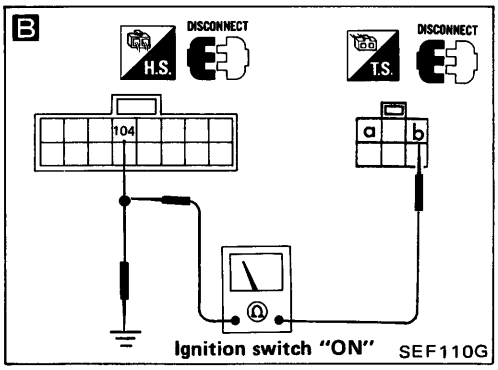


FUEL PUMP (Not self-diagnosis item)

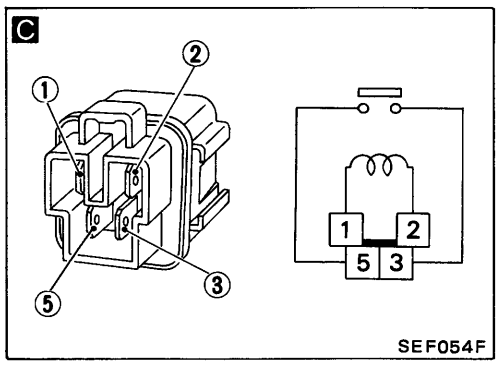
A



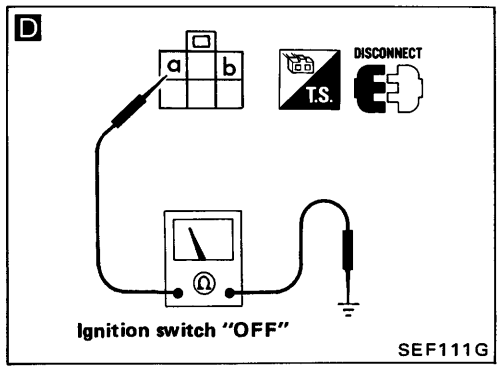
B



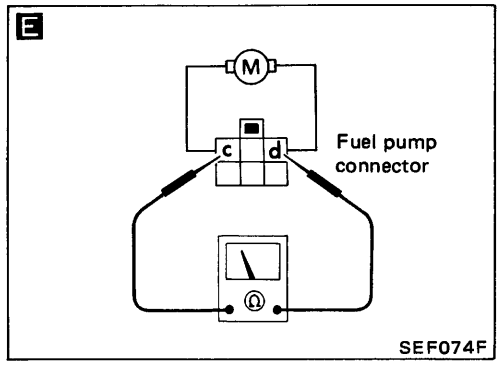
C



D



E



INSPECTION START

A

CHECK POWER SOURCE
1) Disconnect fuel pump harness connector.
2) Turn ignition switch "ON".
3) Make sure there is battery voltage between terminal ⓑ and ground for 5 seconds after turning ignition switch "ON".

N.G. → **B**

CHECK HARNESS CONTINUITY BETWEEN FUEL PUMP AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect 16-pin terminal connector from E.C.U.
3) Connect a suitable jumper wire to terminal (104) and ground.
4) Disconnect fuel pump harness connector.
5) Turn ignition switch "ON".
6) Check continuity between terminals (104) and ⓑ.
Continuity should exist.

N.G. →

1) Check middle harness connector for proper connection.
C 2) Check fuel pump relay.

Condition	Continuity between terminals ③ and ⑤
Supply of 12V direct current between terminals ① and ②	Yes
No supply	No

If N.G., replace relay.
3) Repair harness or connector, if necessary.

O.K. ↓

D

CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF".
2) Disconnect fuel pump harness connector.
3) Check continuity between terminal ⓐ and ground.
Resistance:
Approximately 0Ω

N.G. → Repair harness or connectors, if necessary.

O.K. ↓

E

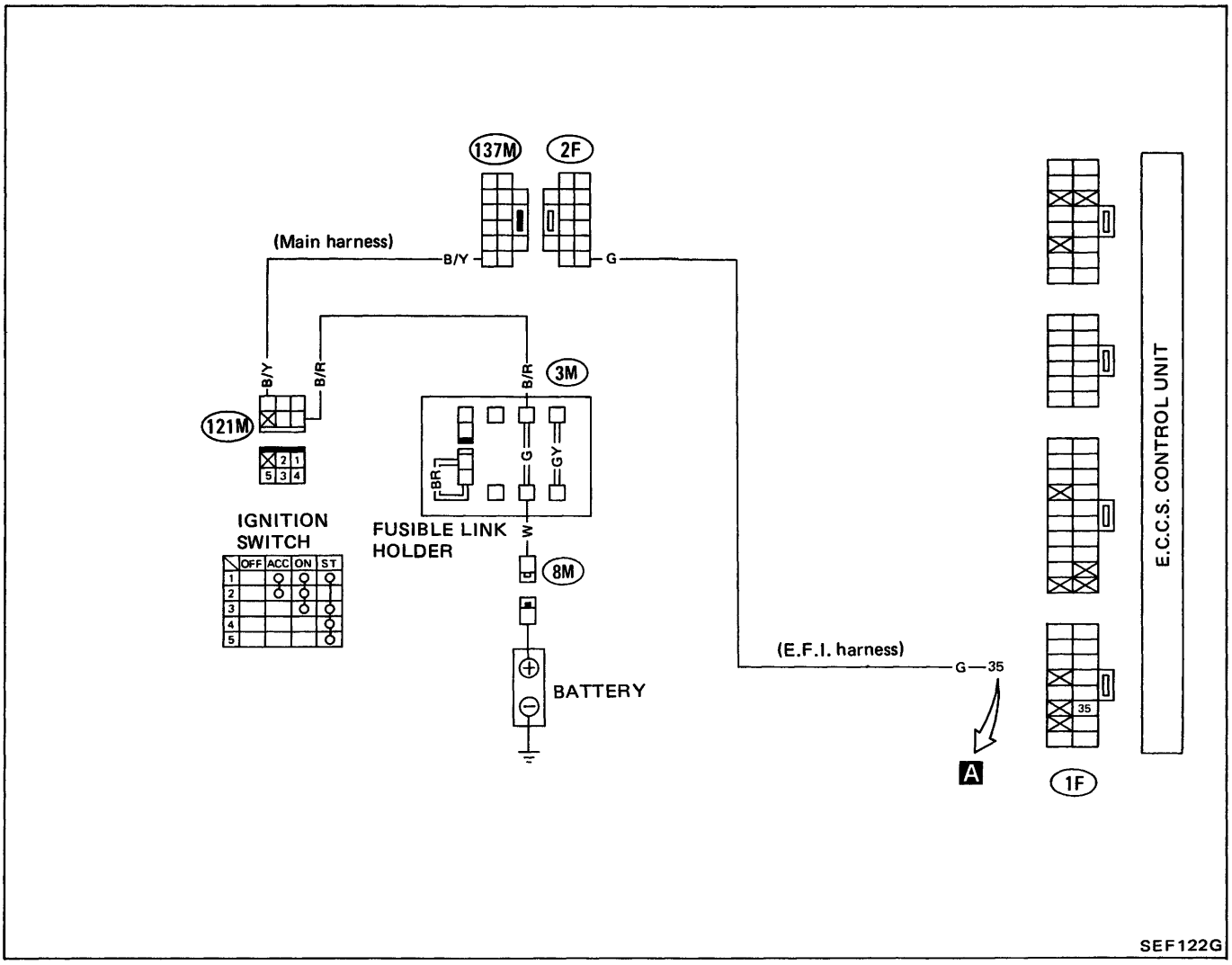
CHECK COMPONENT
Check continuity between terminals ⓒ and ⓓ.
Continuity should exist.

N.G. → Replace fuel pump.

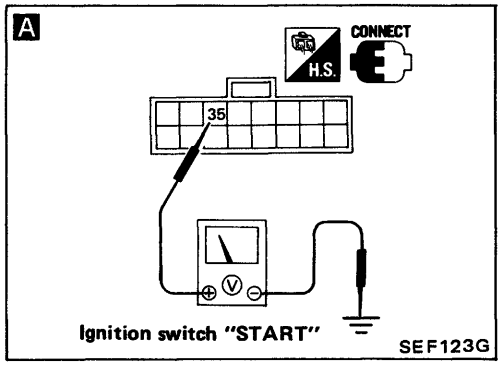
O.K. ↓

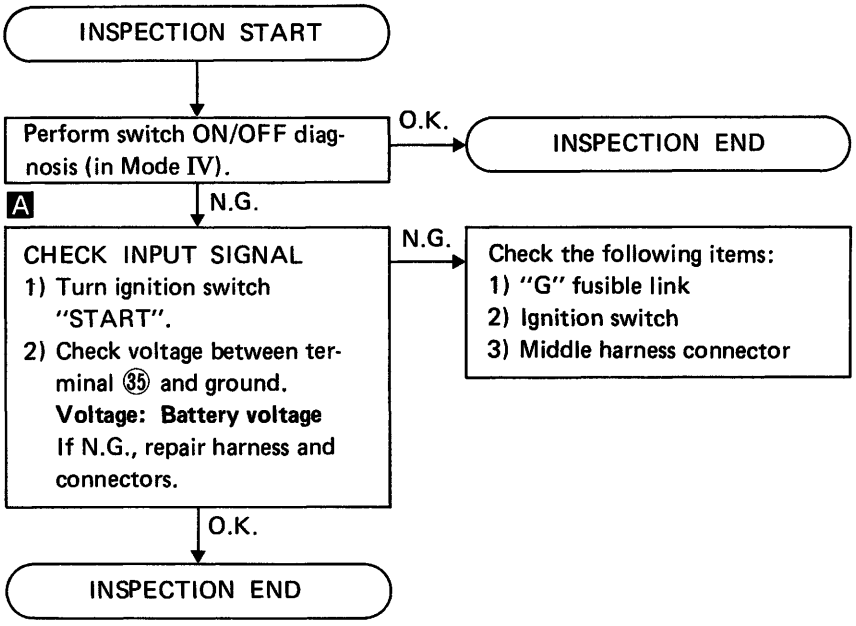
INSPECTION END

START SIGNAL (Switch ON/OFF diagnosis)

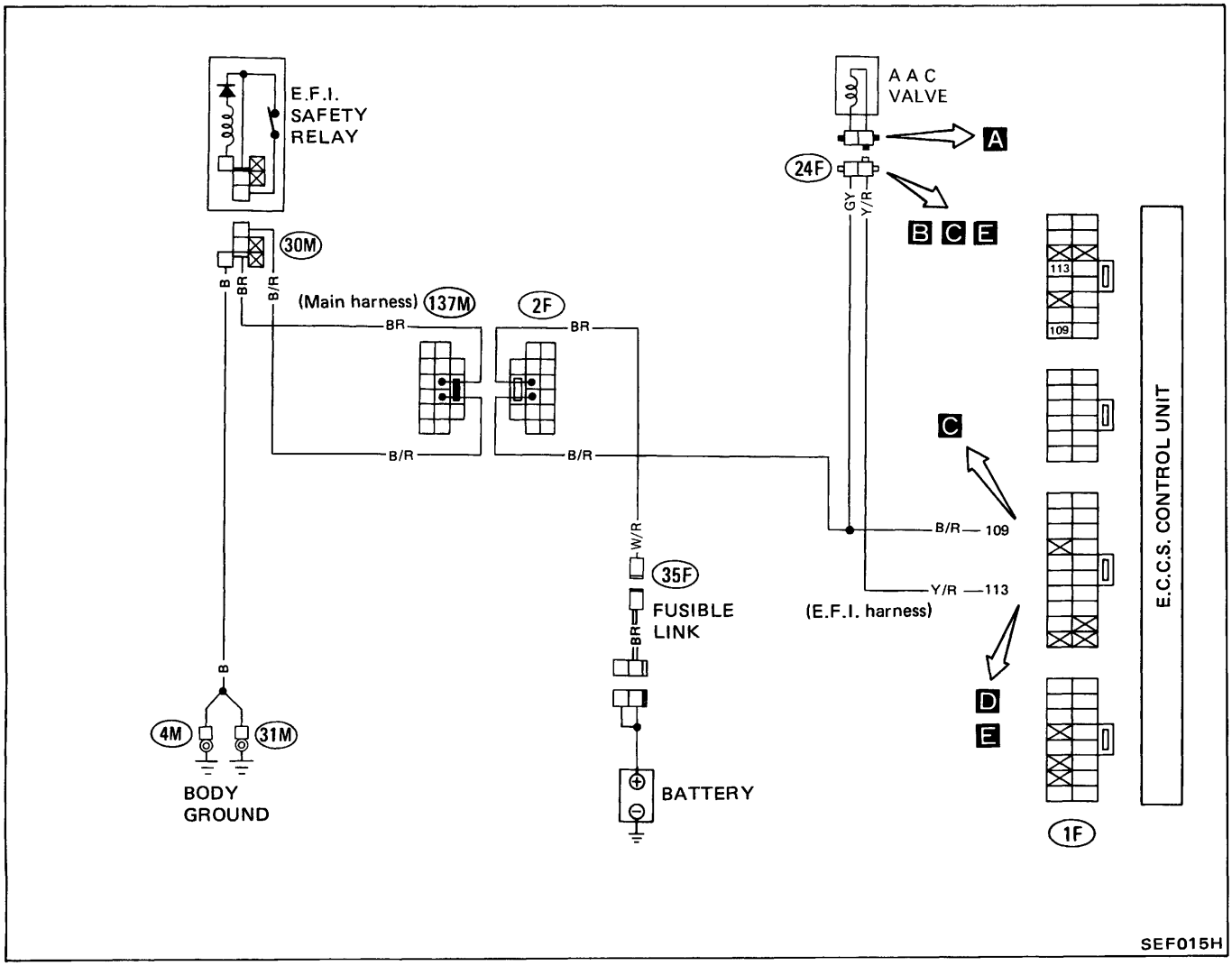


START SIGNAL (Switch ON/OFF diagnosis)

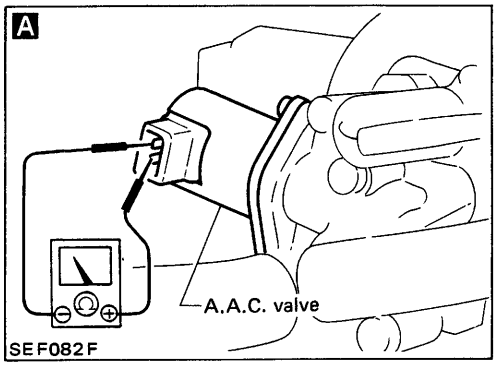


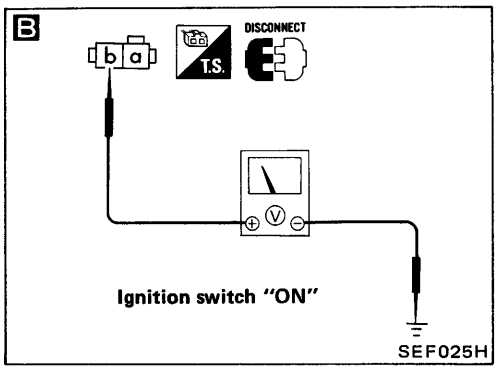


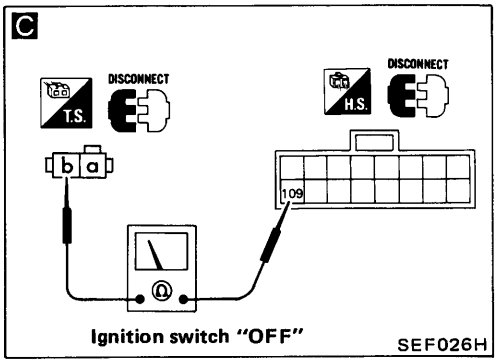
AUXILIARY AIR CONTROL (A.A.C.) VALVE (Not self-diagnosis item)

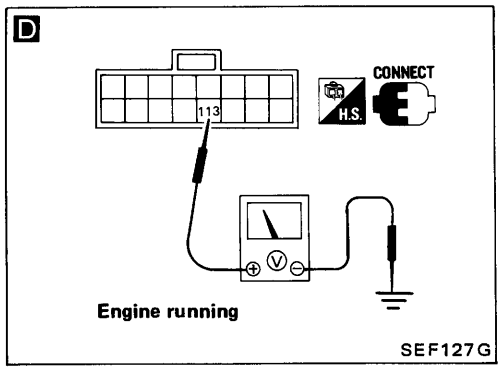


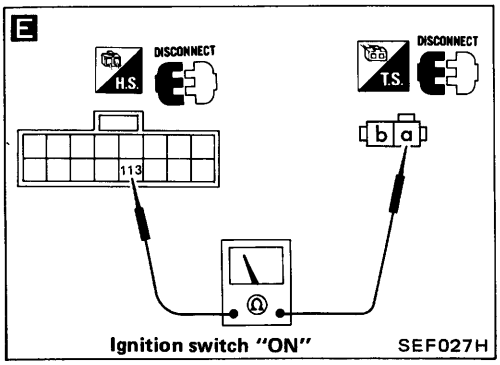
AUXILIARY AIR CONTROL (A.A.C.) VALVE (Not self-diagnosis item)











INSPECTION START

A

CHECK COMPONENTS
Check resistance of A.A.C. valve.
Resistance:
Approximately 10Ω
If N.G., replace A.A.C. valve.

B

CHECK POWER SOURCE
1) Disconnect A.A.C. valve harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage
If N.G., repair harness or connectors.

N.G. →

C

CHECK CONTINUITY BETWEEN E.C.U. AND A.A.C. VALVE
1) Turn ignition switch "OFF".
2) Disconnect 16-pin terminal connector.
3) Check resistance between terminals ⓑ and (109).
Resistance:
Approximately 0Ω
If N.G., check the following items:
1) E.F.I. control relay
2) "BR" fusible link

O.K. ↓

D

CHECK INPUT SIGNAL
1) Reconnect A.A.C. valve harness connector.
2) Start engine and warm it up sufficiently.
3) Check voltage between E.C.U. terminal (113) and ground.
Voltage:
Approximately 7 - 11V

N.G. →

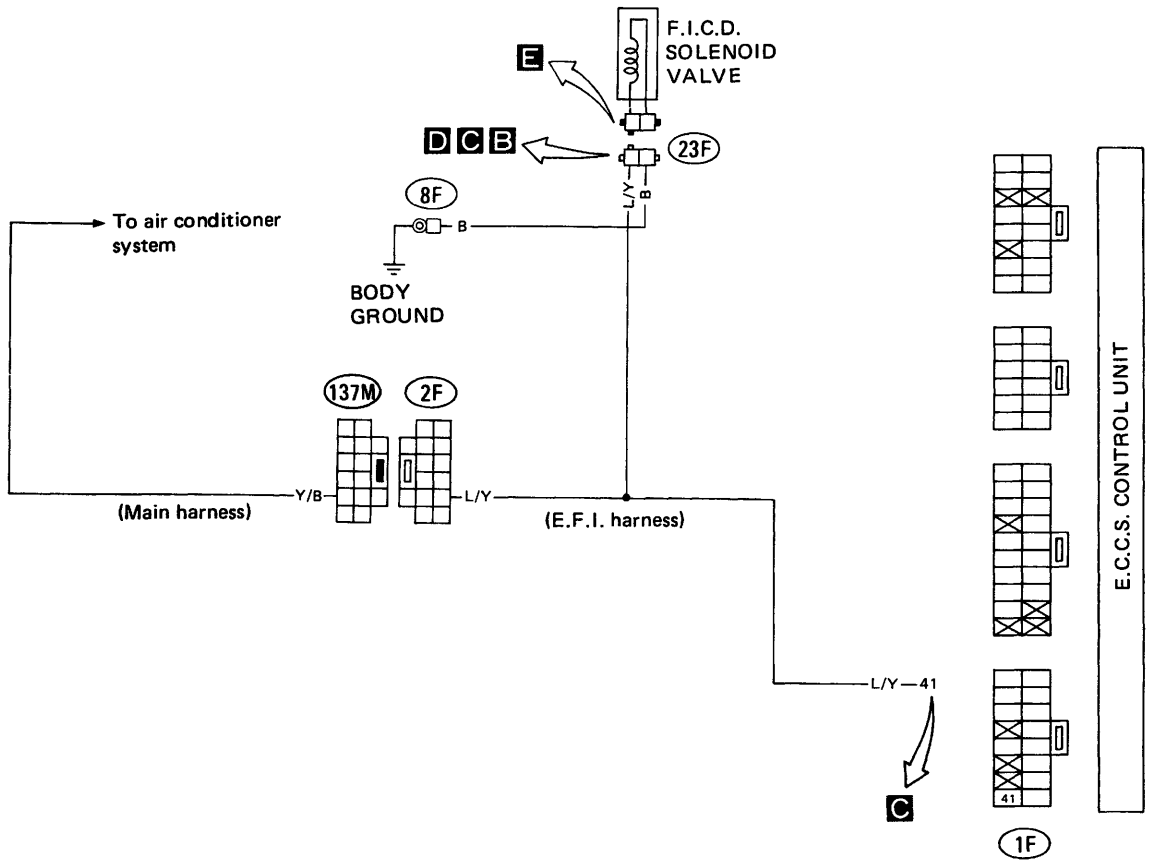
E

CHECK CONTINUITY BETWEEN E.C.U. AND A.A.C. VALVE
1) Stop engine.
2) Disconnect 16-pin terminal connector.
3) Disconnect A.A.C. valve harness connector.
4) Check resistance between terminals (113) and ⓐ.
Resistance:
Approximately 0Ω

O.K. ↓

INSPECTION END

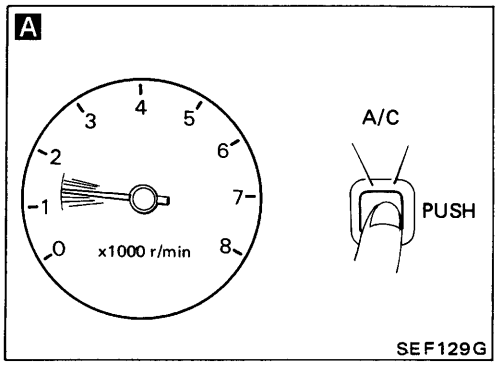
I.A.A. CONTROL (F.I.C.D. CONTROL) (Not self-diagnosis item)

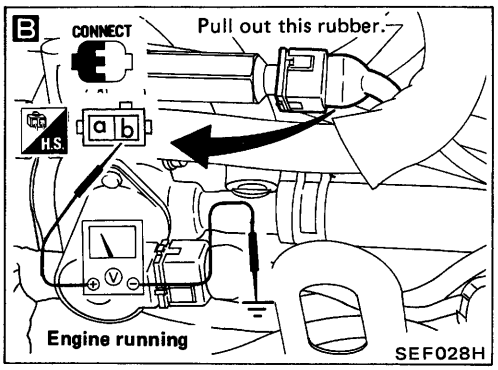


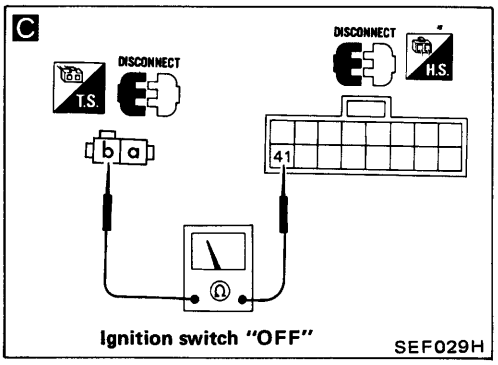
NOTE:
There is no checking point (A) in this wiring diagram.

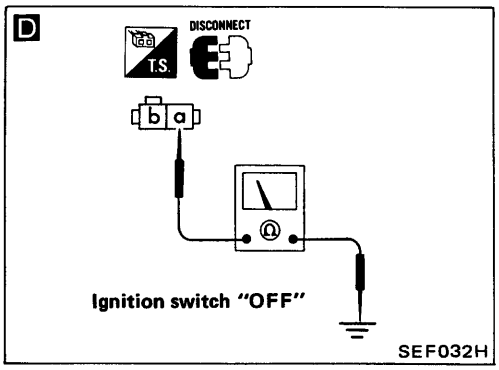
SEF016H

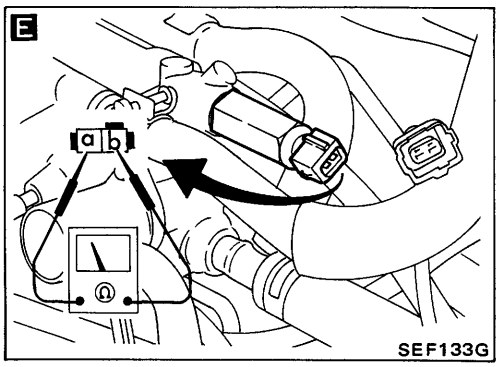
I.A.A. CONTROL (F.I.C.D. CONTROL) (Not self-diagnosis item)











INSPECTION START

A

CHECK INPUT SIGNAL
1) Start and warm up engine sufficiently.
2) Does engine revolution rise when air conditioner switch is turned "ON"?

Yes → CHECK IDLE SPEED WHEN AIR CONDITIONER SWITCH IS "ON"
M/T: 1,000±50 rpm
A/T: 1,000±50 rpm (at "N" range)
If out of specification, adjust idle speed.
(See page EF & EC-294.)
→ INSPECTION END

No ↓

B

CHECK POWER SOURCE
1) Check voltage between terminal ⓑ and ground when air conditioner switch is turned "ON".

Air conditioner	Voltage between terminal ⓑ and ground
ON	Battery voltage
OFF	0V

N.G. → **C**

CHECK CONTINUITY BETWEEN E.C.U. AND F.I.C.D. SOLENOID VALVE
1) Stop engine.
2) Disconnect F.I.C.D. solenoid valve harness connector.
3) Disconnect 16-pin terminal connector.
4) Check resistance between terminals ⓑ and ㊶.
Resistance:
Approximately 0Ω
If N.G., repair harness or connectors.

O.K. ↓

D

CHECK GROUND CIRCUIT
1) Stop engine.
2) Disconnect F.I.C.D. solenoid valve harness connector.
3) Check resistance between terminal ⓐ and ground.
Resistance:
Approximately 0Ω

N.G. → Repair harness or connectors.

O.K. ↓

E

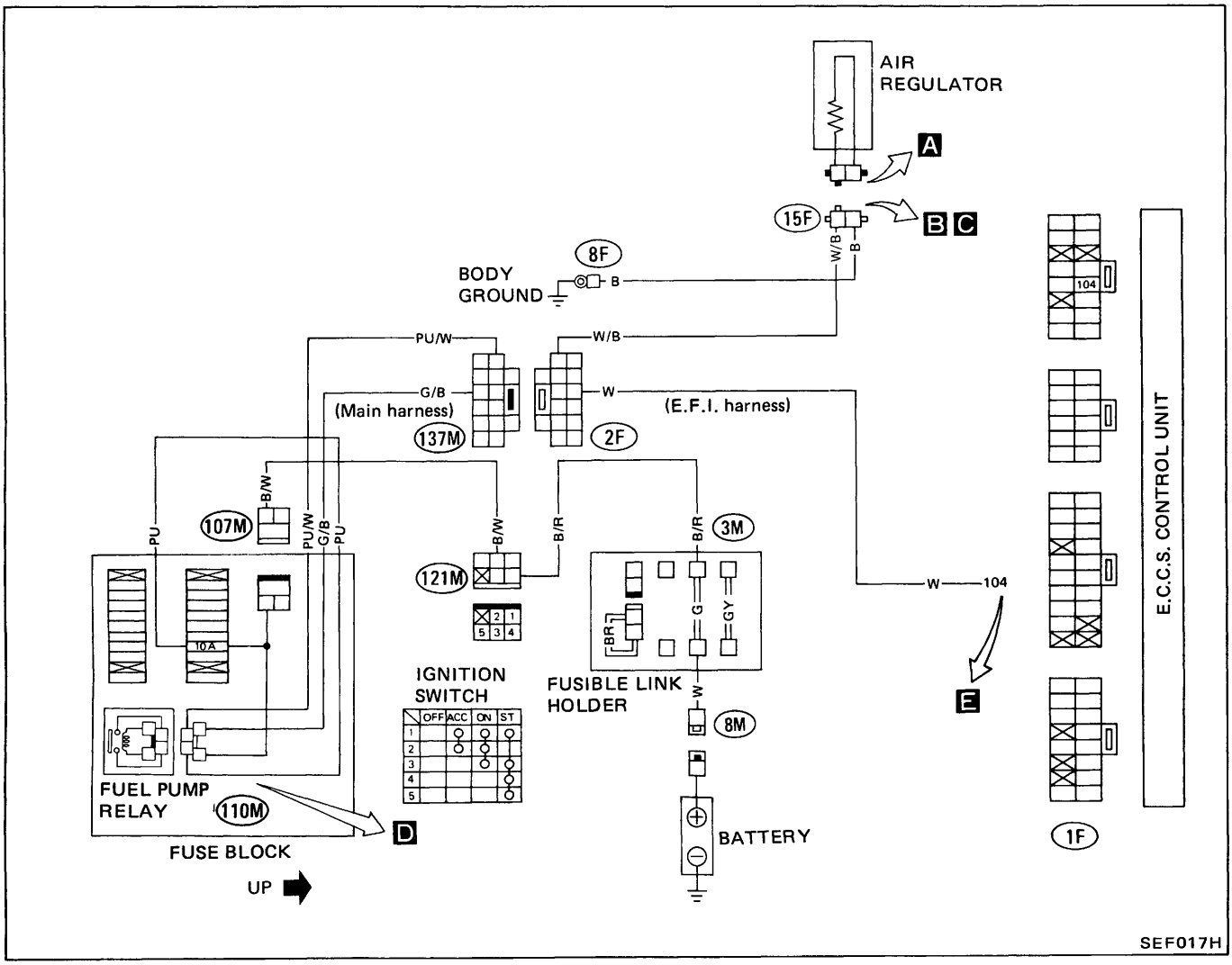
CHECK COMPONENTS
Check resistance between terminals ⓐ and ⓑ.
Continuity should exist.

N.G. → Replace F.I.C.D. solenoid valve.

O.K. ↓

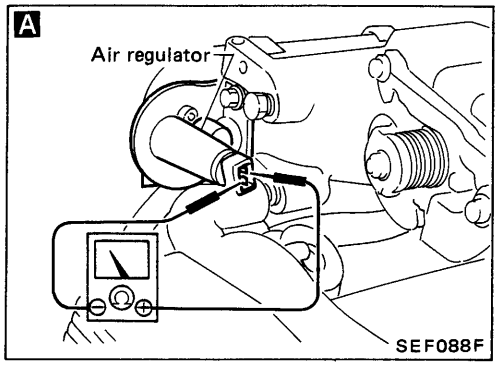
INSPECTION END

AIR REGULATOR (Not self-diagnosis item)



AIR REGULATOR (Not self-diagnosis item)

A



INSPECTION START

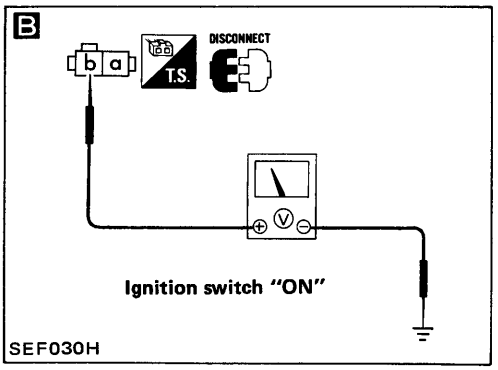
A

CHECK COMPONENTS
1) Disconnect air regulator valve harness connector.
2) Check resistance of air regulator.
Resistance:
Approximately 70Ω

N.G. → Replace air regulator valve.

O.K.

B



B

CHECK POWER SOURCE
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Battery voltage should exist.

N.G. → D

D

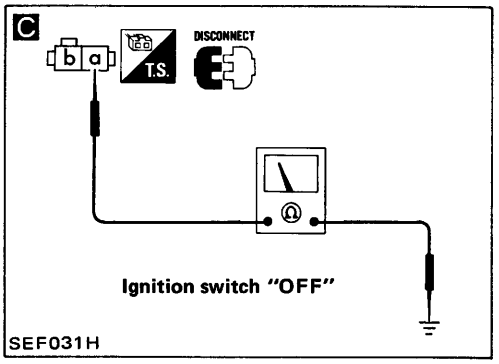
Check the following items:
1) Continuity between E.C.U. and battery
2) "G" fusible link
3) Ignition switch
4) Fuel pump relay

Condition	Continuity between terminals ③ and ⑤
Supply 12V direct current between terminals ① and ②	Yes
Not supply	No

If N.G., replace relay.

O.K.

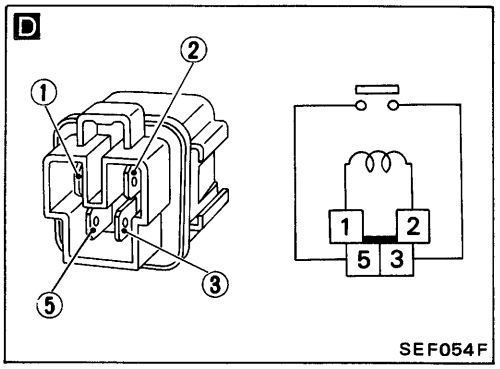
C



C

CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF".
2) Check continuity between terminal ⓐ and ground.
Continuity should exist.
If N.G., repair harness or connectors.

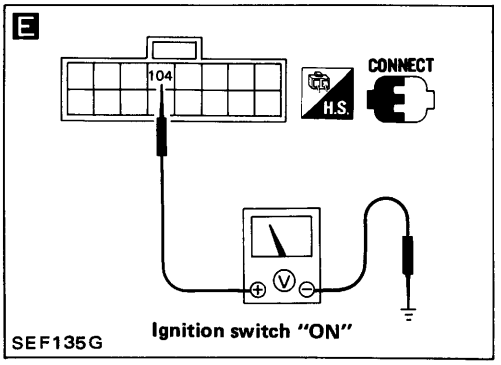
D



E

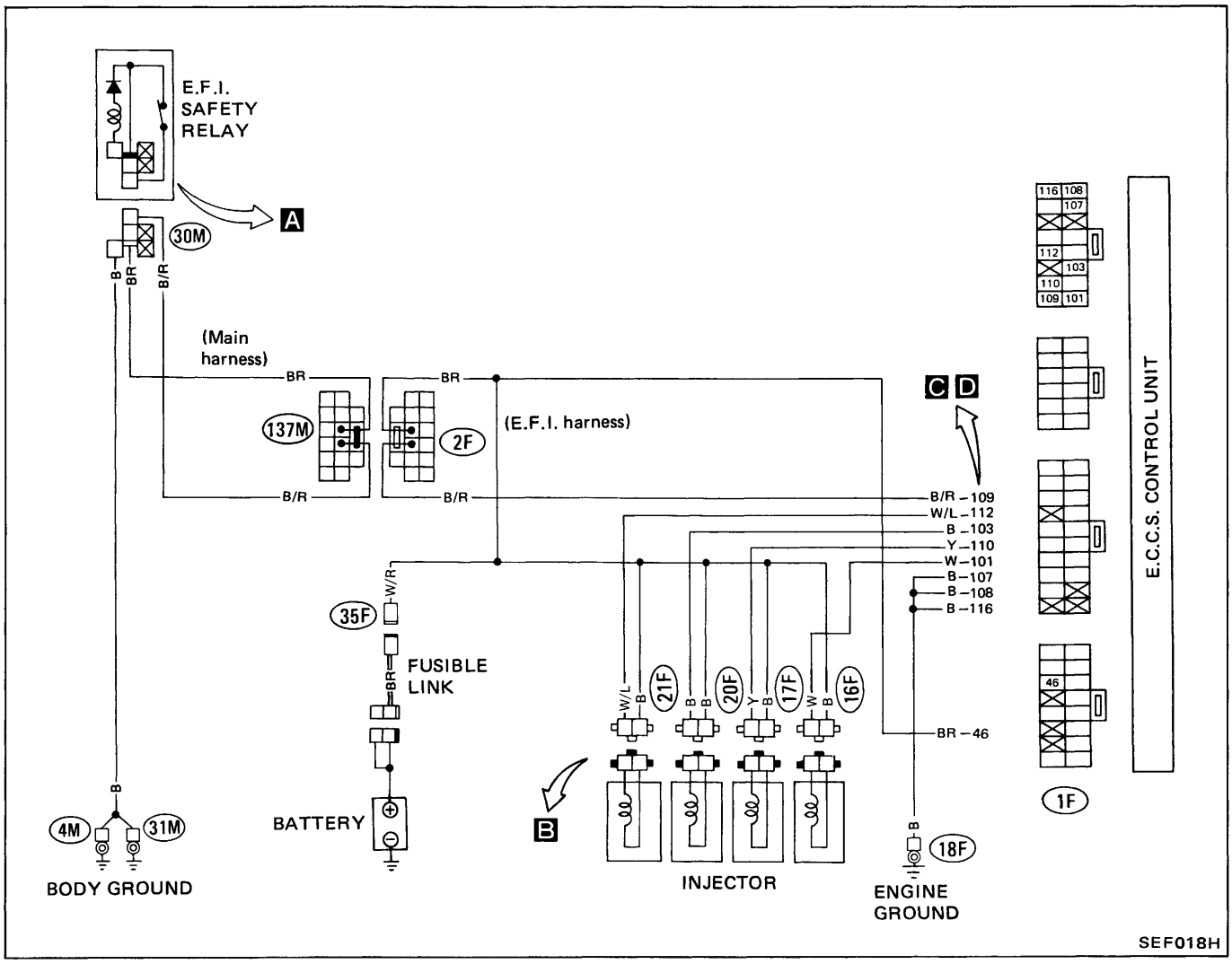
CHECK OUTPUT SIGNAL
1) Reconnect air regulator valve harness connector.
2) Turn ignition switch "ON".
3) Check voltage between E.C.U. terminal (104) and ground.
Battery voltage should appear after 5 seconds.

E



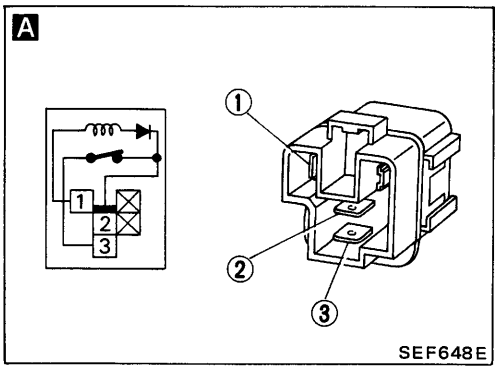
INSPECTION END

INJECTOR (Not self-diagnosis item)



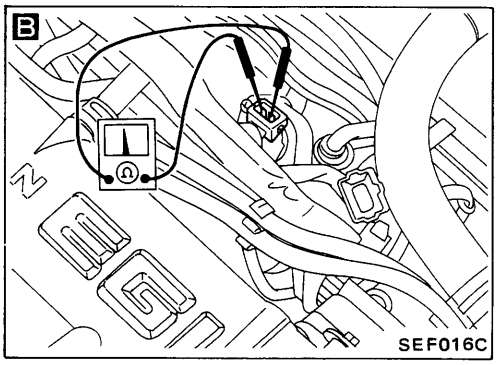
INJECTOR (Not self-diagnosis item)

A

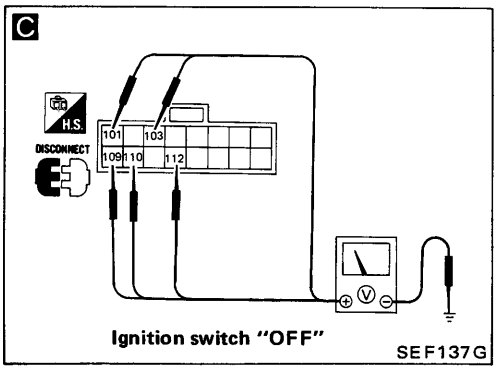


SEF648E

B

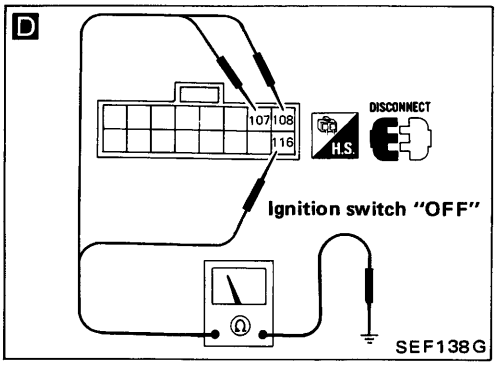

SEF016C

C



Ignition switch "OFF"
SEF137G

D



Ignition switch "OFF"
SEF138G

INSPECTION START

A CHECK E.F.I. CONTROL RELAY

12V direct current is applied between terminals ① and ②		Continuity between terminals ② and ③
①	②	
–	+	Yes
+	–	No

N.G. → Replace E.F.I. control relay.

O.K.

B CHECK INJECTORS
1) Disconnect injector harness connector.
2) Check resistance of each injector.
Resistance:
Approximately 10 - 15Ω
If N.G., replace injector.

N.G. → Replace injector.

O.K.

C CHECK POWER SOURCE
1) Disconnect 16-pin terminal connector.
2) Check voltage between terminals (101), (103), (110), (112), (109) and ground.
Voltage: Battery voltage

N.G. → Check continuity between battery and injectors.

O.K.

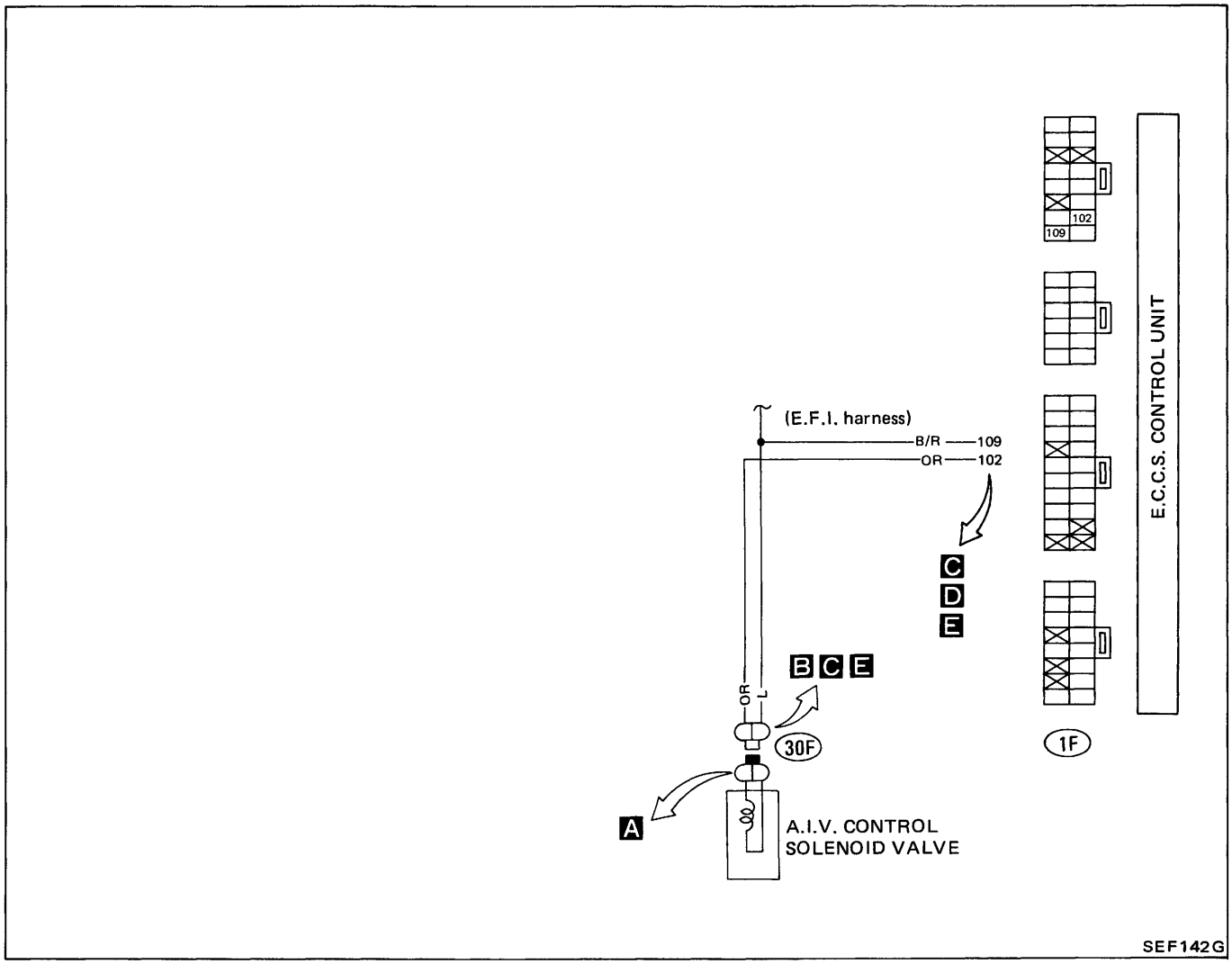
D CHECK GROUND CIRCUIT
1) Check resistance between terminals (107), (108), (116) and ground.
Resistance:
Approximately 0Ω

N.G. → Repair harness.

O.K.

INSPECTION END

AIR INDUCTION VALVE (A.I.V.) CONTROL (Not self-diagnosis item)

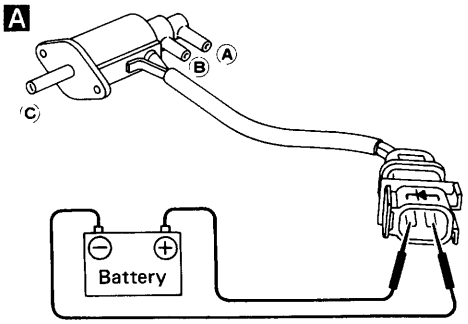


CAUTION:

When directly applying battery voltage to A.I.V. control solenoid valve, pay attention to the polarity. The solenoid valve will be broken if the polarity is reversed.

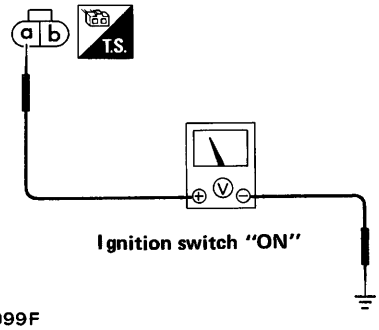
AIR INDUCTION VALVE (A.I.V.) CONTROL (Not self-diagnosis item)

A



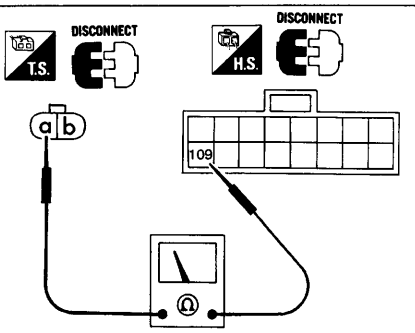
SEF762F

B



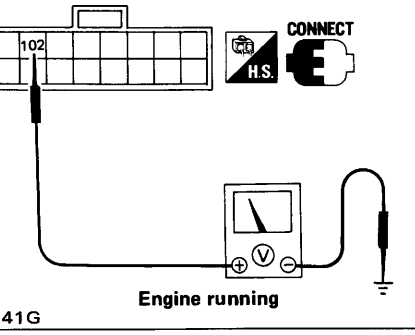
SEF099F

C



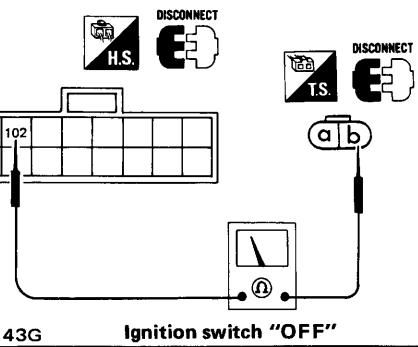
SEF140G

D



SEF141G

E



SEF143G

INSPECTION START

A

CHECK COMPONENTS
1) Remove A.I.V. control solenoid valve from vehicle.
2) Check A.I.V. control solenoid valve.

Condition	Continuity
Supply 12V direct current to A.I.V. control solenoid valve	Only Ⓐ - Ⓑ
Not supply	Only Ⓑ - Ⓒ

N.G. → Replace A.I.V. control solenoid valve.

O.K. ↓

B

CHECK POWER SOURCE
1) Disconnect A.I.V. control solenoid valve harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → **C**

CHECK HARNESS CONTINUITY BETWEEN A.I.V. CONTROL SOLENOID VALVE AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect 16-pin terminal connector.
3) Check resistance between terminals ⓐ and (109).
Resistance:
Approximately 0Ω
If N.G., repair harness or connector.

O.K. ↓

D

CHECK OUTPUT SIGNAL
1) Reconnect A.I.V. control solenoid valve harness connector.
2) Start engine and warm it up sufficiently.
3) Check voltage between E.C.U. terminal (102) and ground.

Accelerator pedal position	Voltage
Released	Approximately 0.8V
Depressed	Battery voltage

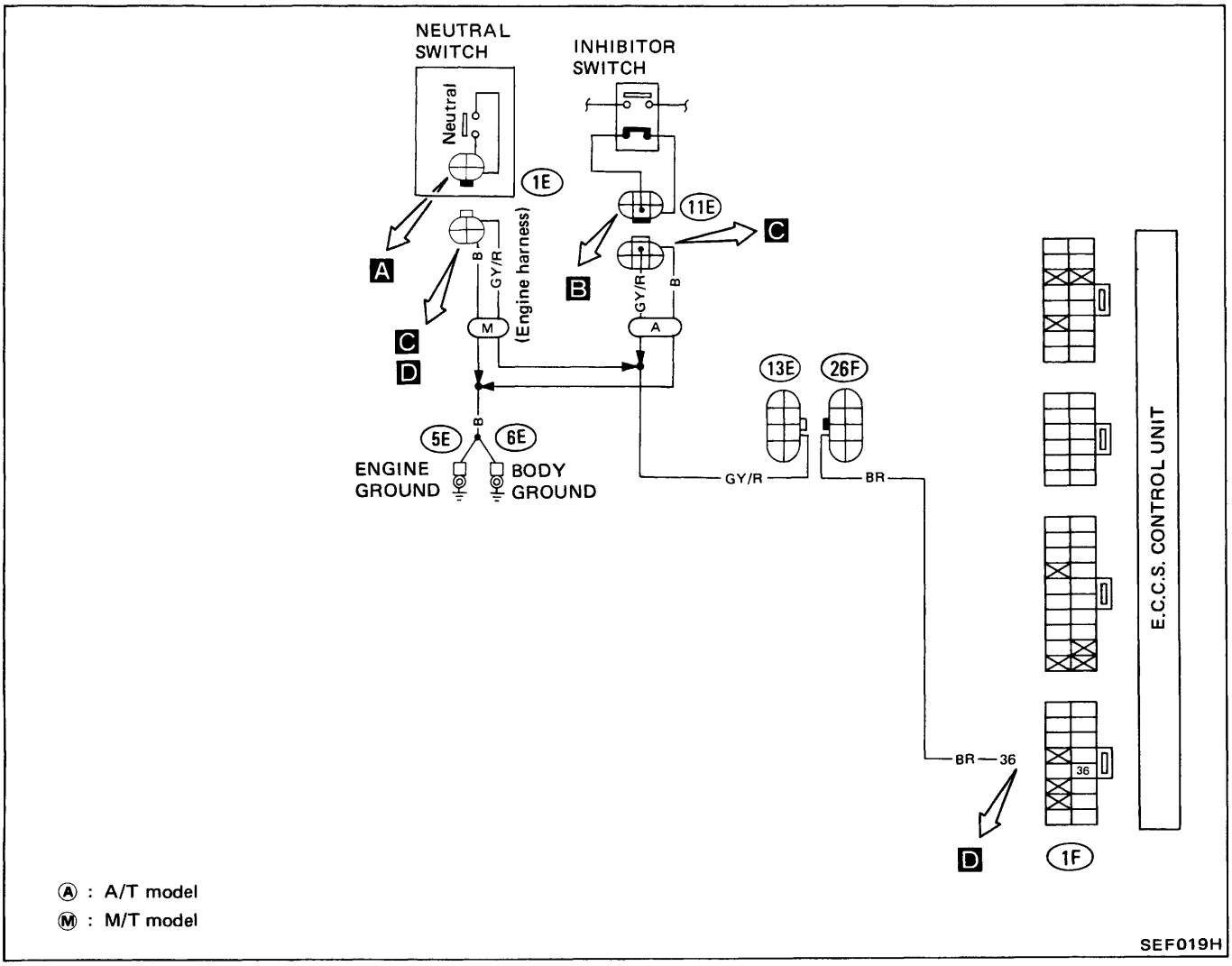
N.G. → **E**

CHECK HARNESS CONTINUITY BETWEEN A.I.V. CONTROL SOLENOID VALVE AND E.C.U.
1) Stop engine.
2) Disconnect A.I.V. control solenoid harness connector.
3) Disconnect 16-pin terminal connector.
4) Check resistance between terminals ⓑ and (102).
Resistance:
Approximately 0Ω
If N.G., repair harness or connector.

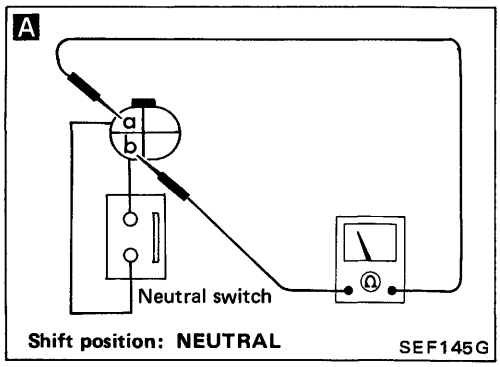
O.K. ↓

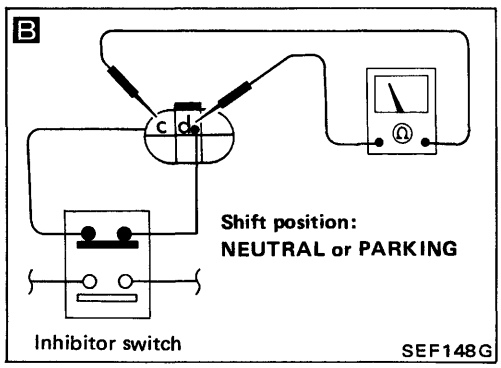
INSPECTION END

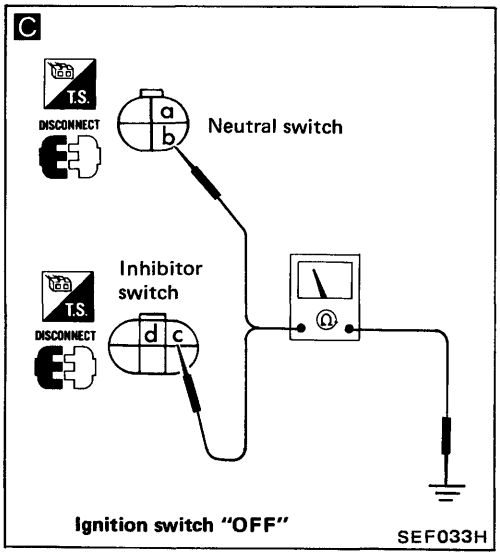
NEUTRAL AND INHIBITOR SWITCH (Not self-diagnosis item)

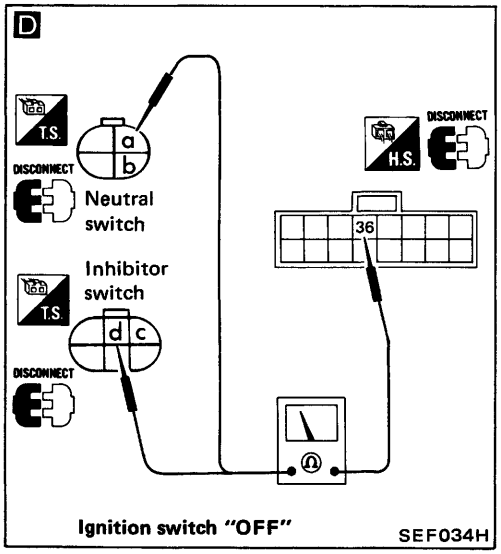


NEUTRAL AND INHIBITOR SWITCH (Not self-diagnosis item)









INSPECTION START

A B

Check neutral switch.

Neutral switch

Conditions	Continuity between terminals ⓐ and ⓑ
Shift to "Neutral"	Yes
Shift to other positions	No

Inhibitor switch

Conditions	Continuity between terminals ⓒ and ⓓ
Shift to "Neutral" or "Park"	Yes
Except above	No

If N.G., replace faulty switches.

O.K.

C

Check continuity between terminal ⓑ and ground (for neutral switch), and terminal ⓒ and ground (for inhibitor switch).
Continuity should exist.
If N.G., repair harness or connectors.

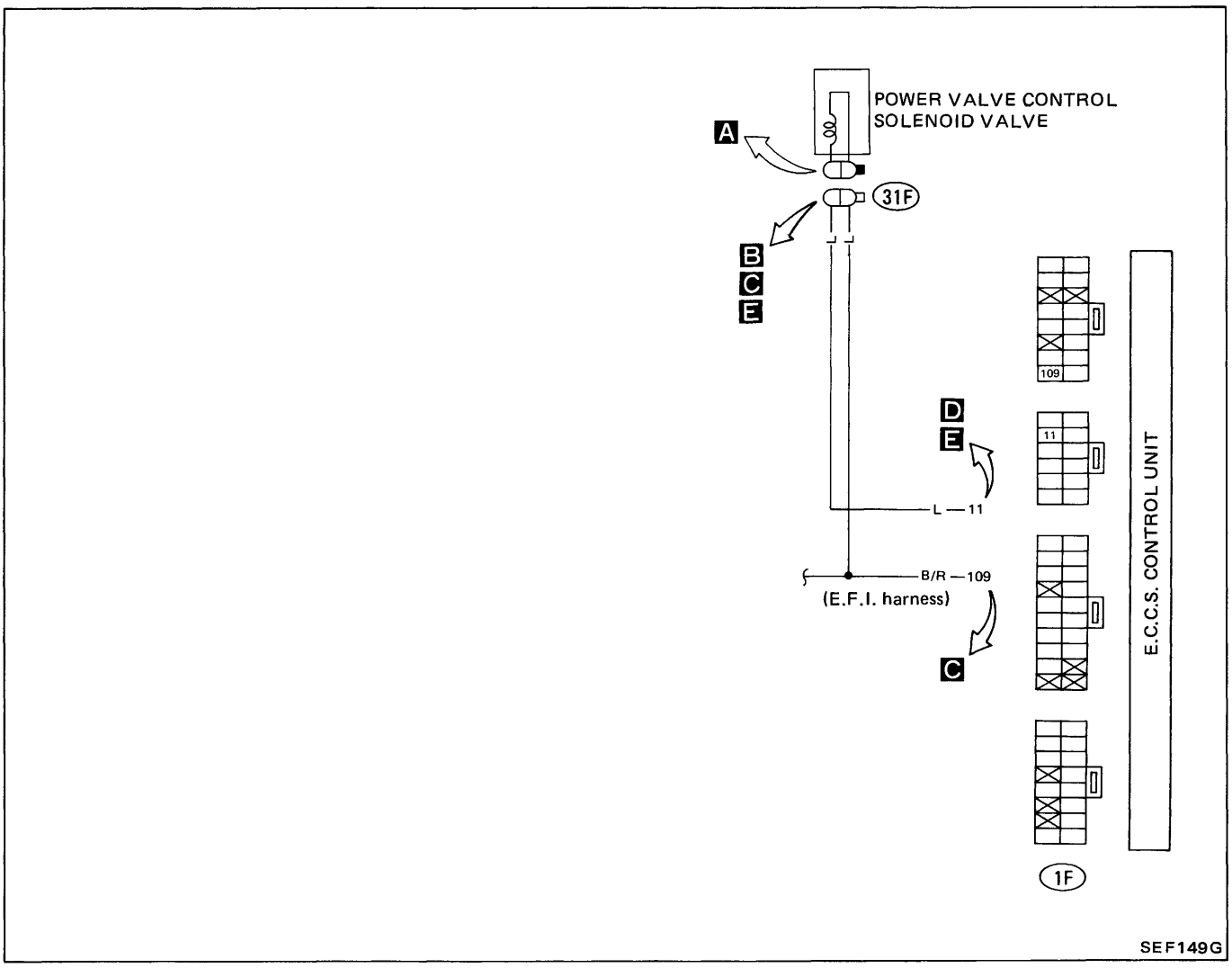
O.K.

D

Check continuity between terminals ⓐ and ㊱ (for neutral switch), and terminals ⓓ and ㊱ (for inhibitor switch).
Continuity should exist.
If N.G., repair harness or connectors.

INSPECTION END

POWER VALVE CONTROL (Not self-diagnosis item)

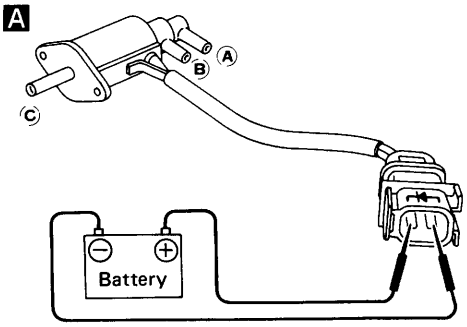


CAUTION:

When directly applying battery voltage to power control valve solenoid valve, pay attention to the polarity. The solenoid valve will be broken if the polarity is reversed.

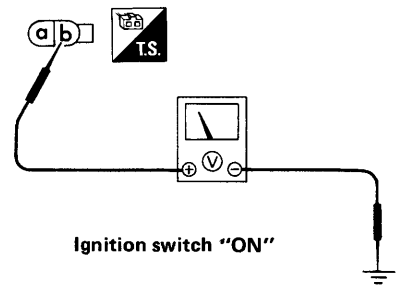
POWER VALVE CONTROL (Not self-diagnosis item)

A



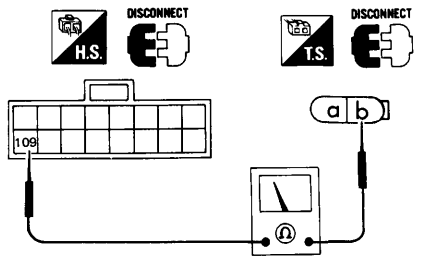
SEF762F

B



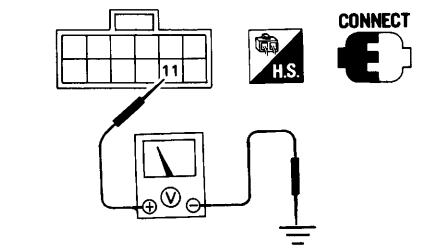
SEF113F

C



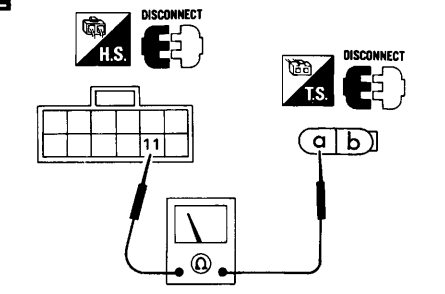
SEF152G

D



SEF150G

E



SEF151G

INSPECTION START

A

CHECK COMPONENTS
1) Remove power control valve solenoid valve.
2) Check power control valve solenoid valve.

Condition	Continuity
Supply 12V direct current to power control valve solenoid valve	Only Ⓐ - Ⓑ
Not supply	Only Ⓑ - Ⓒ

N.G. → Replace power control valve solenoid valve.

O.K.

B

CHECK POWER SOURCE
1) Disconnect power control valve solenoid valve.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

N.G. → **C**

CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND POWER CONTROL VALVE SOLENOID VALVE
1) Turn ignition switch "OFF".
2) Disconnect power control valve solenoid valve harness connector.
3) Disconnect 16-pin terminal harness connector.
4) Check resistance between terminals ⓑ and ⑩⑨.
Resistance:
Approximately 0Ω
If N.G., repair harness or connectors.

O.K.

D

CHECK OUTPUT SIGNAL
1) Reconnect power control valve solenoid valve.
2) Start engine.
3) Check voltage between terminal ⑪ and ground.

Engine speed	Voltage between terminal ⑪ and ground
Less than approx. 4,000 rpm	Approx. 1V
More than approx. 4,000 rpm	Battery voltage

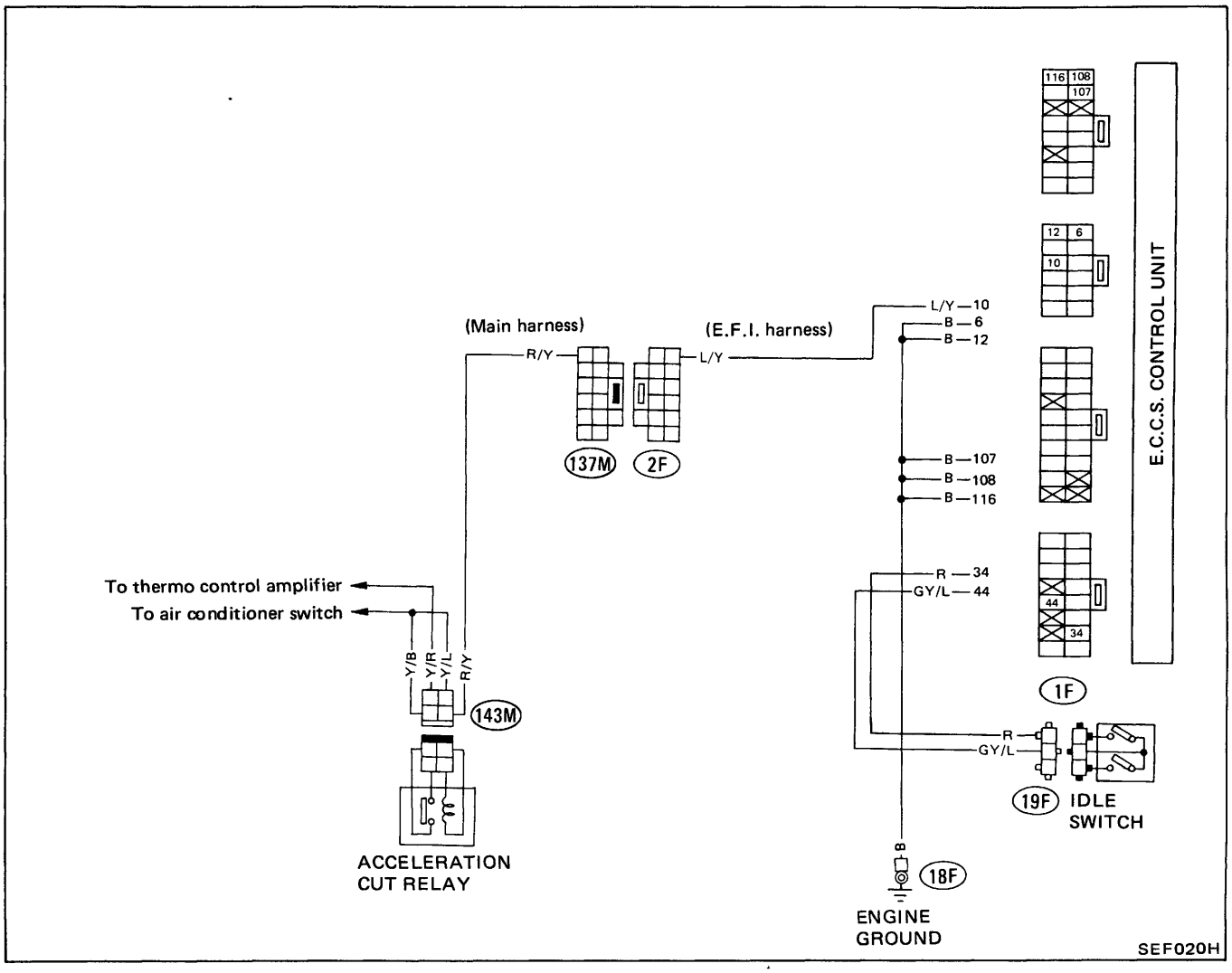
N.G. → **E**

CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND POWER CONTROL VALVE SOLENOID VALVE
1) Stop engine.
2) Disconnect power control valve solenoid valve harness connector.
3) Disconnect 12-pin terminal harness connector.
4) Check resistance between terminals ⓐ and ⑪.
Resistance:
Approximately 0Ω
If N.G., repair harness or connectors.

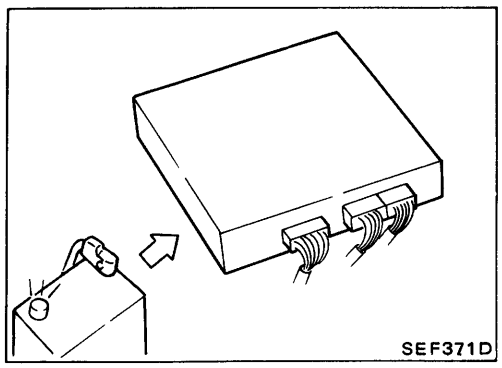
O.K.

INSPECTION END

ACCELERATION CUT CONTROL (Not self-diagnosis item)

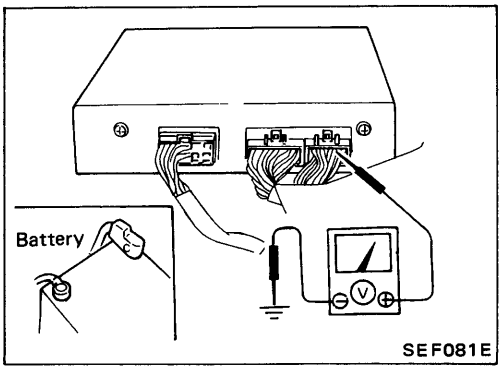


For inspection of this system, refer to HA section.


SEF371D

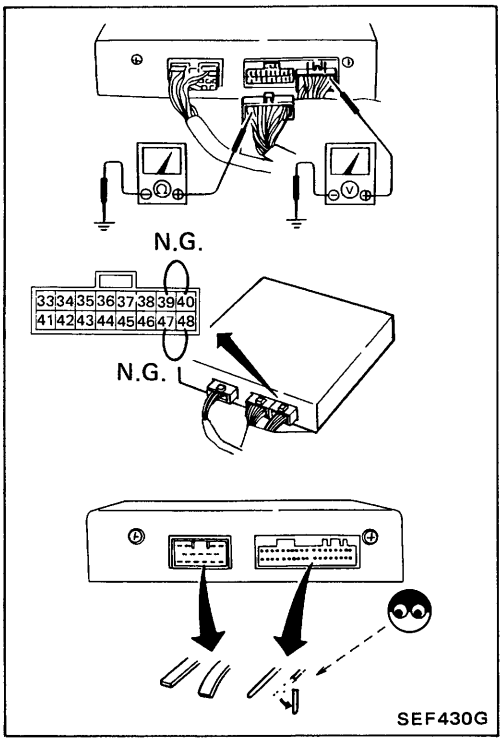
MEASUREMENT VOLTAGE OR RESISTANCE OF E.C.U.

1. Disconnect battery ground cable.
2. Remove assist side seat from vehicle.
3. Disconnect connectors from E.C.U.



SEF081E

4. Connect connectors to E.C.U. carefully.
5. Connect battery ground cable.
6. Measure the voltage at each terminal by following "E.C.U. inspection table".



SEF430G

CAUTION:

a. **Perform all voltage measurements with the connectors connected.**
b. **Perform all resistance measurements with the connectors disconnected.**
c. **Make sure that there are not any bends or breaks on E.C.U. pin terminal before measurements.**
d. **Do not touch tester probes between terminals ㊴ and ㊵, ㊼ and ㊽.**

E.C.U. inspection table

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
1	Ignition signal for No. 1 cylinder	Engine is running.	0 - 1.0V
2	Ignition signal for No. 2 cylinder		
8	Ignition signal for No. 3 cylinder		
9	Ignition signal for No. 4 cylinder		
7	Exhaust gas temperature sensor	Engine is running. └ Idle speed	1.0 - 2.0V
		Engine is running. └ E.G.R. system is operating.	0 - 1.0V
10	Air conditioner cut signal	Engine is running. └ Idle speed	0 - 1.0V
		Engine is running. └ Sudden racing	BATTERY VOLTAGE (11 - 14V)
11	Power valve control solenoid valve	Engine is running. └ Engine speed is less than approximately 4,000 rpm.	Approximately 1V
		Engine is running. └ Engine speed is more than approximately 4,000 rpm.	BATTERY VOLTAGE (11 - 14V)
15	Air flow meter	Engine is running. **Do not run engine at high speed under no-load.**	1.0 - 3.0V Output voltage varies with engine revolution.
17	Water temperature sensor	Engine is running.	1.0 - 5.0V Output voltage varies with engine water temperature.

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
18	Exhaust gas sensor	Engine is running. └After warming up sufficiently	0 - Approximately 1.0V
19	Throttle sensor	Ignition switch "ON"	0.4 - 4.0V Output voltage varies with the throttle valve opening angle.
21 31	Crank angle sensor (Reference signal)	Engine is running. **Do not run engine at high speed under no-load.**	0.6 - 0.7V
22 32	Crank angle sensor (Position signal)	Engine is running. **Do not run engine at high speed under no-load.**	2.0 - 2.5V
34	Idle switch (⊖ side)	Ignition switch "ON" └Throttle valve: Idle position	Approximately 9 - 10V
		Ignition switch "ON" └Throttle valve: Any position except idle position	0V
35	Start signal	Cranking	8 - 12V
36	Neutral switch & Inhibitor switch	Ignition switch "ON" └Neutral/Parking	0V
		Ignition switch "ON" └Except the above gear position	BATTERY VOLTAGE (11 - 14V)
37	Ignition switch	Ignition switch "OFF"	0V
		Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
41	Air conditioner	Engine is running. └Both air conditioner switch and blower switch are "ON".	BATTERY VOLTAGE (11 - 14V)

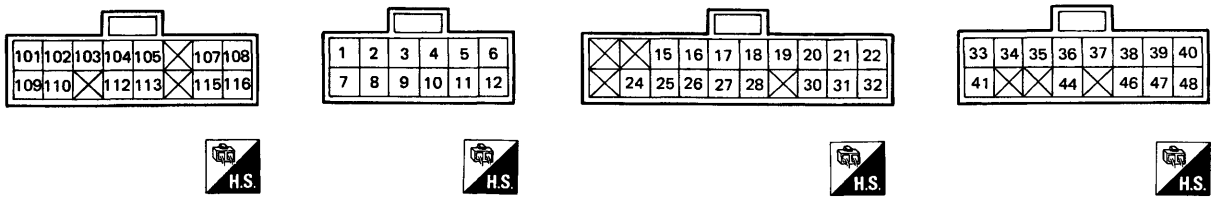
*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
44	Idle switch (⊕ side)	Ignition switch "ON" └ Throttle valve: Idle position	Approximately 9 - 11V
		Ignition switch "ON" └ Throttle valve: Except idle position	BATTERY VOLTAGE (11 - 14V)
46	Power source (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
39 47	Power source for E.C.U.	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
101	Injector No. 1	Engine is running.	BATTERY VOLTAGE (11 - 14V)
103	Injector No. 3		
110	Injector No. 2		
112	Injector No. 4		
102	A.I.V. control solenoid valve	Engine is running. └ Idle speed	0 - 1.0V
		Engine is running. └ Accelerator pedal is depressed. └ After warming up	BATTERY VOLTAGE (11 - 14V)
104	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
		Ignition switch "ON" └ In 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

*Data are reference values

TERMINAL NO.	ITEM	CONDITION	*DATA
105	E.G.R. control solenoid valve	Engine is running. — Engine is cold. [Water temperature is below 60°C (140°F).]	0.7 - 0.9V
		Engine is running. — After warming up [Water temperature is between 65°C (149°F) and 105°C (221°F).]	BATTERY VOLTAGE (11 - 14V)
113	A.A.C. valve	Engine is running. — Idle speed	8 - 10V
		Engine is running. — Steering wheel is turned. — Air conditioner is operating. — Rear defogger is "ON". — Head lights are in high position.	7 - 8V

E.C.U. PIN CONNECTOR TERMINAL LAYOUT



SEF154G

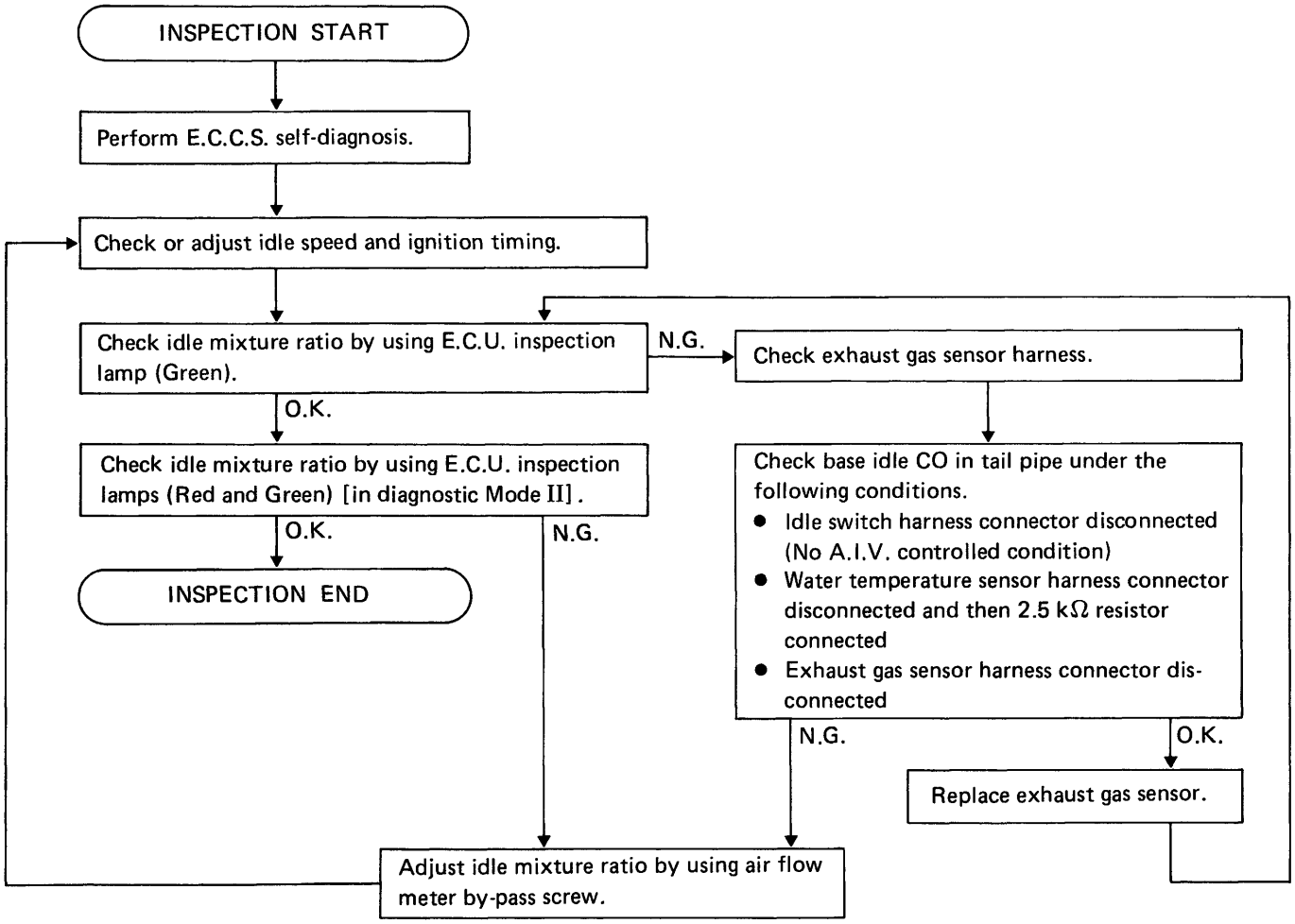
MIXTURE RATIO FEEDBACK SYSTEM INSPECTION

Preparation

1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.C.S. harness connectors
- Vacuum hoses
- Air intake system
  (oil filler cap, oil level gauge, etc.)
- Engine compression
- E.G.R. valve operation
- Idle switch operation

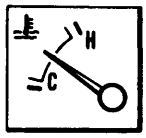
2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
4. Checking and adjusting should be done while the radiator cooling fan is stopped.

Overall inspection sequence



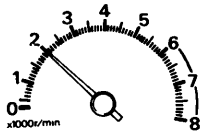
INSPECTION START

Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- E.G.R. valve operation
- Electrical connectors
- Gaskets
- Idle switch operation



SEF457C

Start engine and warm up until water temperature indicator points to the middle of gauge.



SEF477B

Open engine food and run engine at about 2,000 rpm for about 2 minutes under no-load.

Perform E.C.C.S. self-diagnosis.

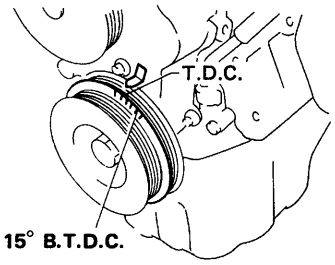
O.K. / N.G.

Check, correct or replace malfunctioning parts.

Does engine run smoothly?

O.K. / N.G.

Check and clean injectors, and replace injectors if necessary.



SEF131F

Race engine two or three times under no-load, then run engine at idle speed.

Check idle speed.

M/T: 800±50 rpm
A/T: 700±50 rpm (in "D" position)

O.K. / N.G.

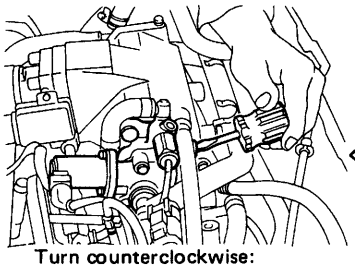
Check ignition timing with a timing light.

15±2° B.T.D.C.

N.G.

Adjust ignition timing by turning crank angle sensor after loosing crank angle sensor fixing bolts.

O.K.


Turn counterclockwise:
Idle speed becomes lower

SEF119F

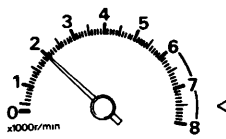
Disconnect A.A.C. valve harness connector.

Adjust idle speed by turning idle speed adjusting screw.

M/T: 750 rpm
A/T: 650 rpm

Connect A.A.C. valve harness connector.

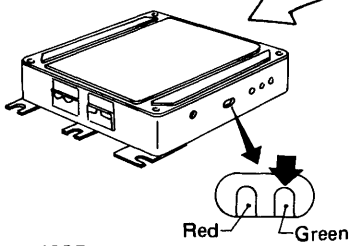
Ⓐ Ⓑ



SEF477B

Run engine at about 2,000 rpm for about 2 minutes under no-load.

Make sure that inspection lamp (Green) on control unit goes on and off periodically more than 9 times during 10 seconds at 2,000 rpm under no-load.



SEF433D

O.K. / N.G.

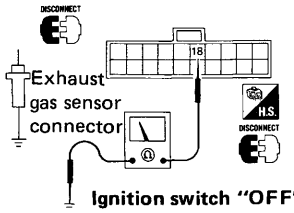
Race engine two or three times under no-load, then run engine at idle speed.

Set the diagnosis mode of E.C.U. to Mode II and check inspection lamps (Red and Green) on control unit blink at 2,000 rpm under no-load. They should blink simultaneously.

No → Ⓒ

Yes

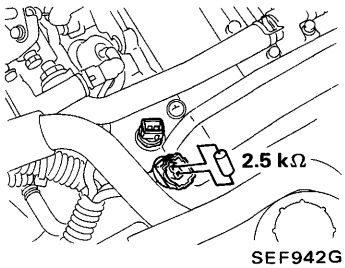
INSPECTION END



SEF823F

Check exhaust gas sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect 20-pin terminal harness connector from E.C.U.
3) Disconnect exhaust gas sensor harness connector and connect terminal for exhaust gas sensor harness connector to ground with a jumping wire.
4) Check for continuity between terminal No. 18 and ground metal on vehicle body.

Continuity exists ..... O.K.
Continuity does not exist ..... N.G.

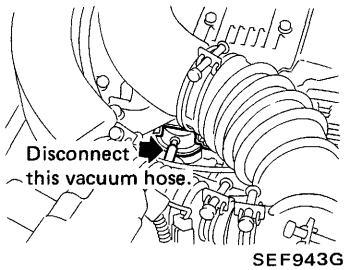


SEF942G

O.K. / N.G.

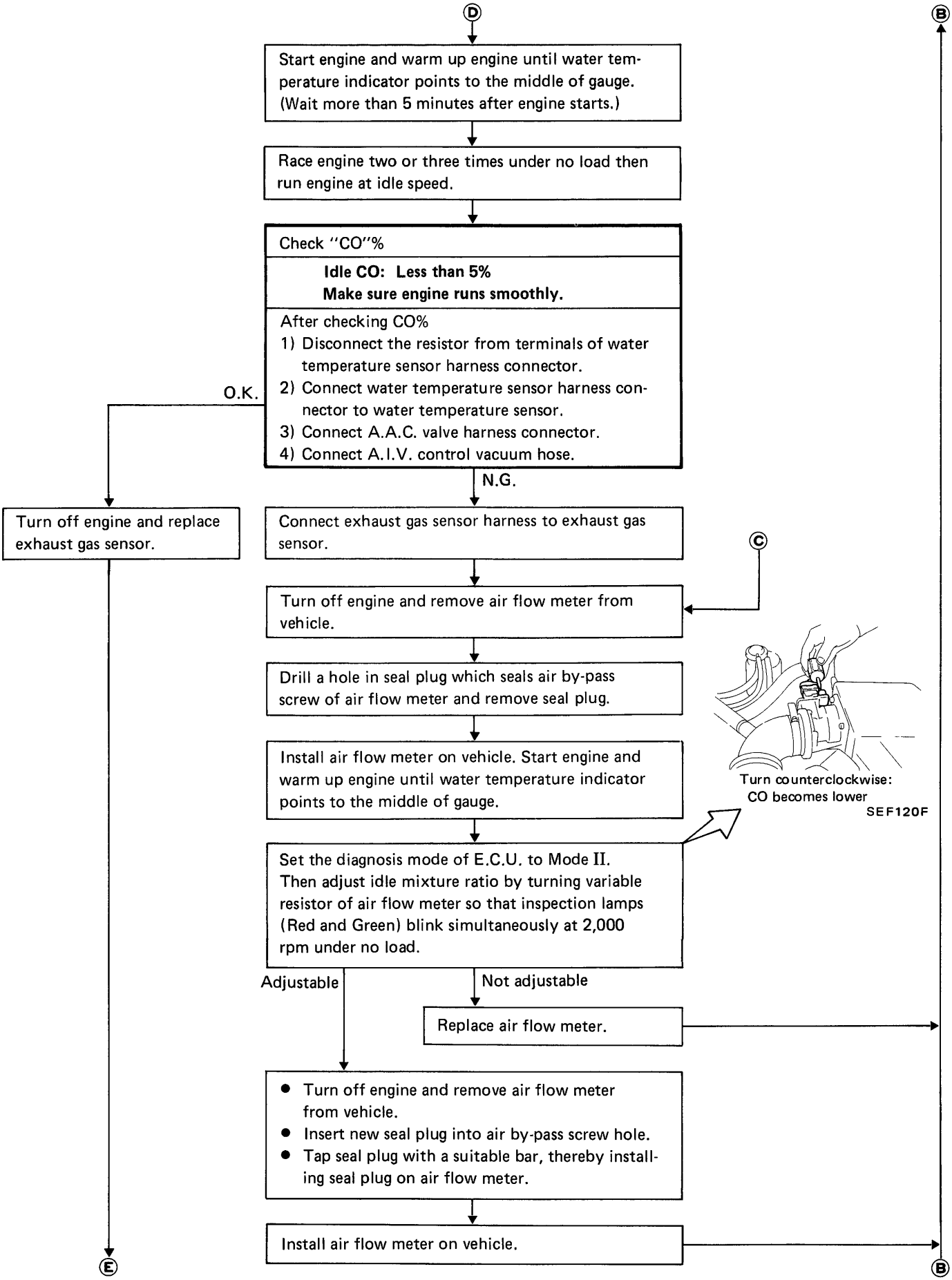
Repair or replace E.C.C.S. harness. → Ⓑ

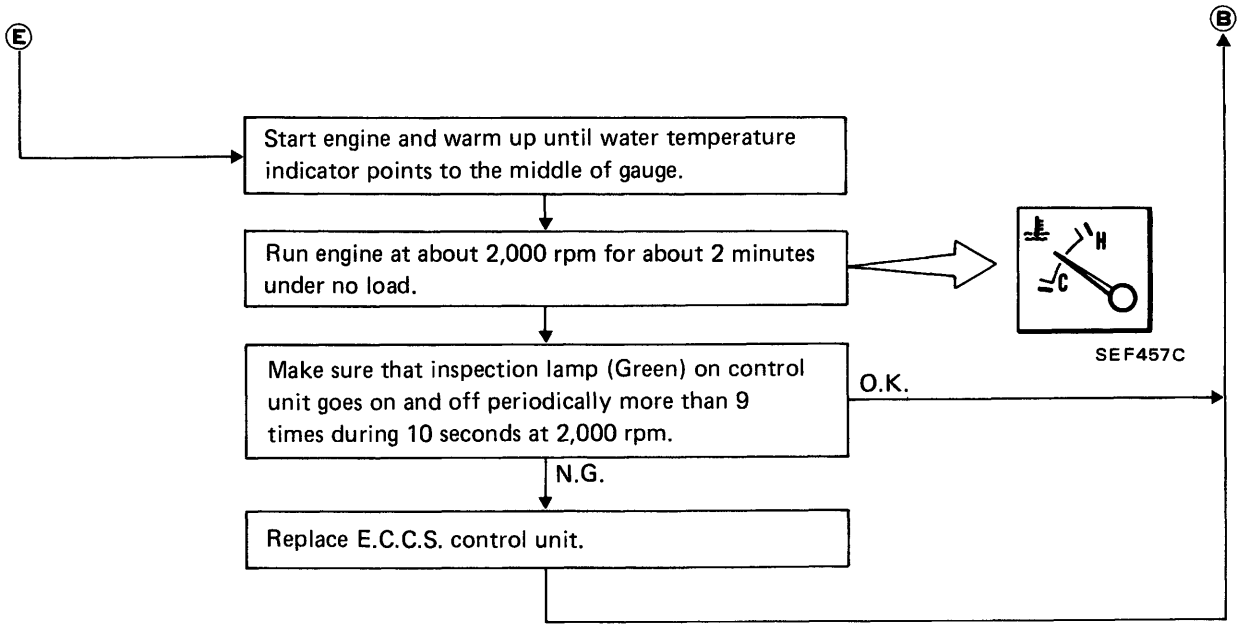
- Disconnect water temperature sensor harness connector.
- Connect a resistor (2.5 kΩ) between terminals of water temperature sensor harness connector.
- Reconnect 20-pin terminal harness connector to E.C.U.
- Disconnect A.A.C. valve harness connector.
- Disconnect A.I.V. control vacuum hose.

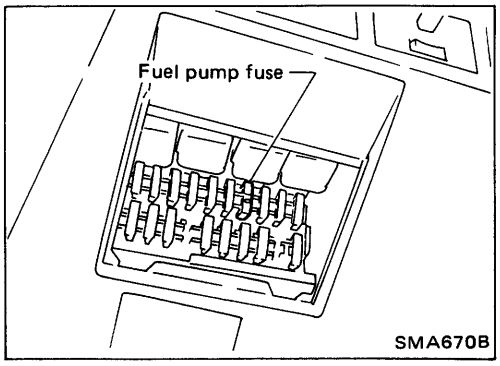


SEF943G

Ⓓ → Ⓑ


Ⓓ
Start engine and warm up engine until water temperature indicator points to the middle of gauge. (Wait more than 5 minutes after engine starts.)
Race engine two or three times under no load then run engine at idle speed.
Check "CO"%
Idle CO: Less than 5%
Make sure engine runs smoothly.
After checking CO%
1) Disconnect the resistor from terminals of water temperature sensor harness connector.
2) Connect water temperature sensor harness connector to water temperature sensor.
3) Connect A.A.C. valve harness connector.
4) Connect A.I.V. control vacuum hose.
O.K.
N.G.
Turn off engine and replace exhaust gas sensor.
Connect exhaust gas sensor harness to exhaust gas sensor.
Ⓒ
Turn off engine and remove air flow meter from vehicle.
Drill a hole in seal plug which seals air by-pass screw of air flow meter and remove seal plug.
Install air flow meter on vehicle. Start engine and warm up engine until water temperature indicator points to the middle of gauge.
Turn counterclockwise: CO becomes lower
SEF120F
Set the diagnosis mode of E.C.U. to Mode II. Then adjust idle mixture ratio by turning variable resistor of air flow meter so that inspection lamps (Red and Green) blink simultaneously at 2,000 rpm under no load.
Adjustable
Not adjustable
Replace air flow meter.
• Turn off engine and remove air flow meter from vehicle.
• Insert new seal plug into air by-pass screw hole.
• Tap seal plug with a suitable bar, thereby installing seal plug on air flow meter.
Install air flow meter on vehicle.
Ⓔ
Ⓑ
Ⓑ

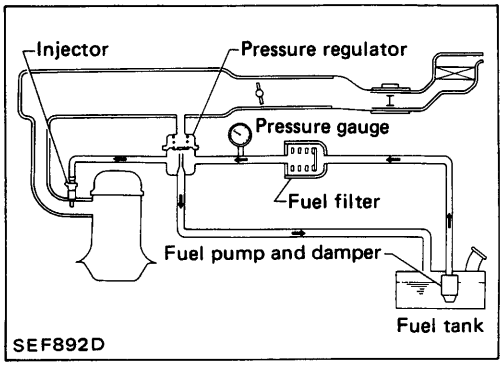

E
Start engine and warm up until water temperature indicator points to the middle of gauge.
Run engine at about 2,000 rpm for about 2 minutes under no load.
H
C
SEF457C
Make sure that inspection lamp (Green) on control unit goes on and off periodically more than 9 times during 10 seconds at 2,000 rpm.
O.K.
N.G.
Replace E.C.C.S. control unit.
B



Releasing Fuel Pressure

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

1. Remove fuel pump fuse.
2. Start engine.
3. After engine stalls, crank engine two or three times to make sure that pressure is released.
4. Turn ignition switch off and connect fuel pump fuse.

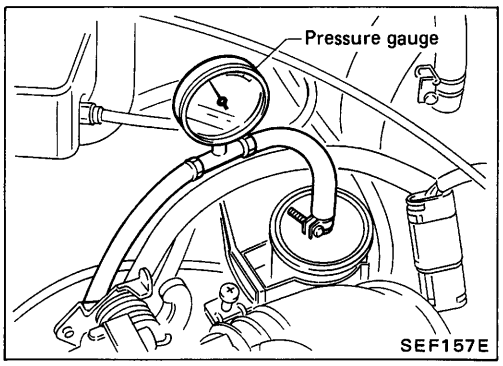


Fuel Pressure Check

a. Use a torque driver to tighten clamps.

b. Use Pressure Gauge to check fuel pressure.

1. Release fuel pressure to zero.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.



5. Read the indication of fuel pressure gauge.

   At idling:

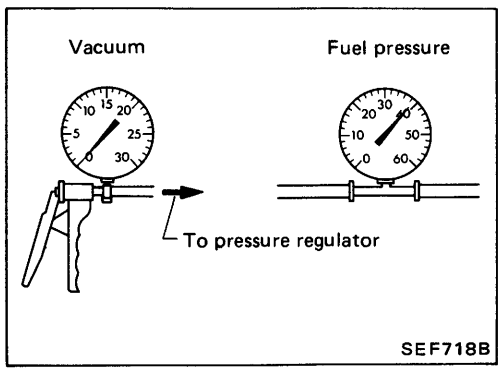
   When fuel pressure regulator valve vacuum hose is connected.

   Approximately 245 kPa (2.5 kg/cm², 36 psi)

   When fuel pressure regulator valve vacuum is disconnected.

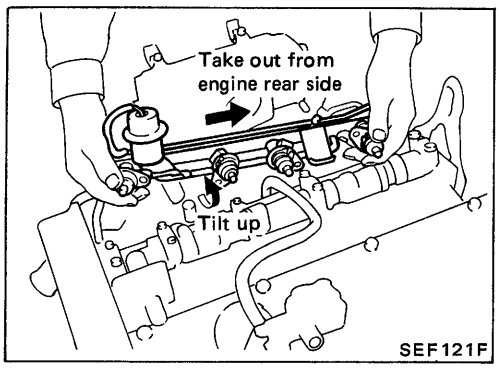
   Approximately 294 kPa (3.0 kg/cm², 43 psi)

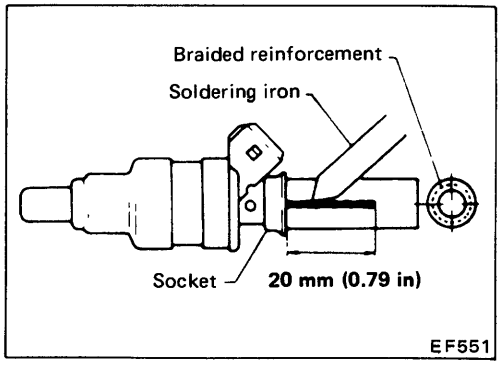
6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.



9. Start engine and read the indication of fuel pressure gauge as vacuum is changed.

Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.





Injector Removal and Installation

1. Release fuel pressure to zero.
2. Remove throttle chamber, throttle chamber stay, I.A.A. unit, intake side rocker cover and P.C.U.
3. Disconnect fuel hoses and pressure regulator vacuum hose.
4. Remove injector assembly fixing bolts.
5. Take out injector assembly.

Be careful not to damage the injector, nor to deform the fuel tube.

6. Remove injectors from fuel tube.
7. Remove fuel hose.

1) Heat soldering iron (150 watt). Cut hose into braided reinforcement from mark to socket end.

Do not feed soldering iron until it touches injector tail piece.

2) Then pull rubber hose out with hand.

a. Be careful not to damage socket plastic connector, etc. with soldering iron.

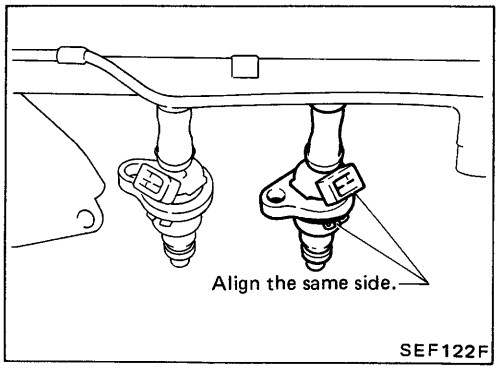
b. Never place injector in a vise when disconnecting rubber hose.

8. Install fuel hose as follows:

1) Clean exterior of injector tail piece.
2) Wet inside of new rubber hose with fuel.
3) Push end of rubber hose with hose sockets onto injector tail piece by hand as far as they will go.

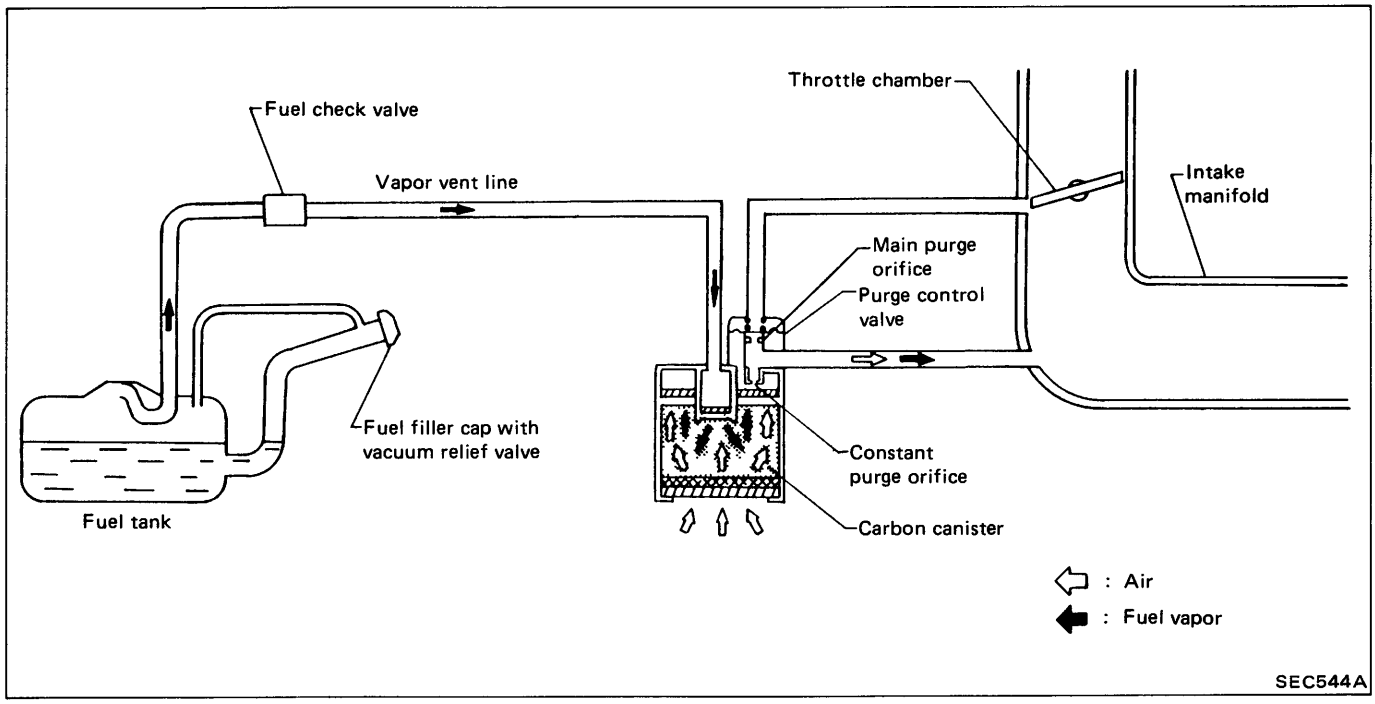
CAUTION:

After properly connecting fuel hose to injector and fuel tube, check connection for fuel leakage.



9. Assemble injectors with fuel pipe.
10. Install injectors.

Description

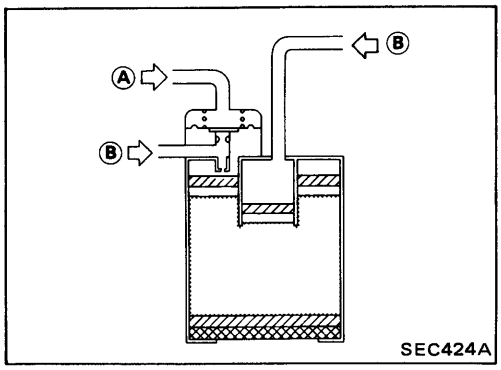


The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

The fuel vapor from the sealed fuel tank is led into the canister which contains activated carbon and the vapor is stored there when the engine is not running.

The canister retains the fuel vapor until the canister is purged by the air drawn through the bottom of the canister to the intake manifold when the engine is running. When the engine runs at idle, the purge control valve is closed.

Only a small amount of stored vapor flows into the intake manifold through the constant purge orifice. As the engine speed increases, and the throttle vacuum rises higher, the purge control valve opens and the vapor is sucked into the intake manifold through both the main purge orifice and the constant purge orifice.



Inspection

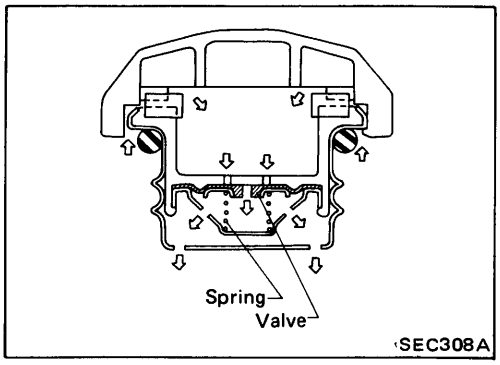
CARBON CANISTER

Check carbon canister as follows.

Ⓐ : Blow air and ensure that there is no leakage.

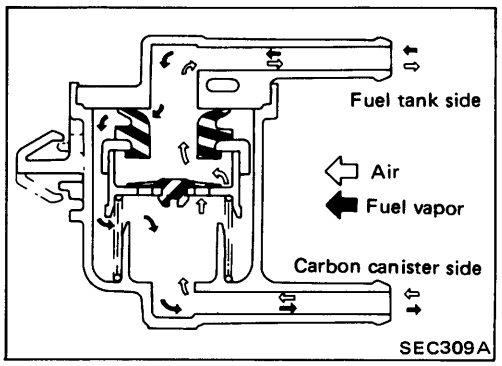
Ⓑ : Blow air and ensure that there is leakage.

Inspection (Cont'd)



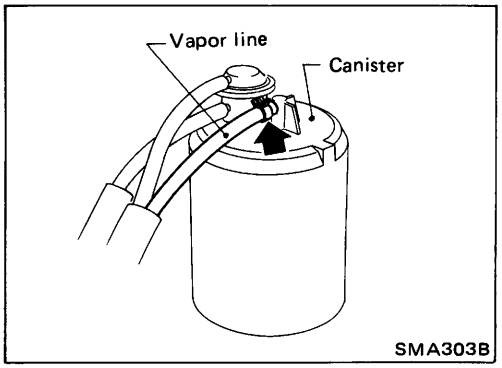
FUEL TANK VACUUM RELIEF VALVE

1. Wipe clean valve housing.
2. Inhale air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should be disappeared with valve clicks.
3. If valve is clogged, or if no resistance is felt, replace cap as an assembly.



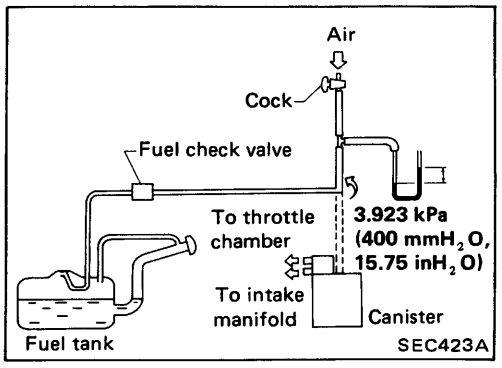
FUEL CHECK VALVE

1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow be directed toward the canister.
2. Blow air through connector on the canister side.
   Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected of not being properly functioning in steps 1 and 2 above, replace it.



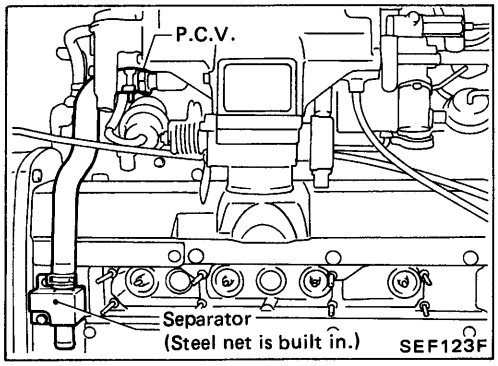
VAPOR VENT LINE

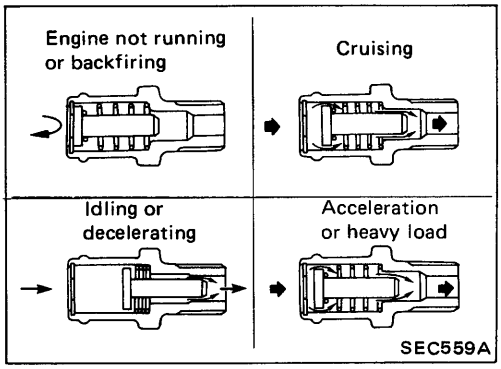
1. Check hoses and fuel tank filler cap.
2. Disconnect the vapor vent line connecting carbon canister to fuel tank.



3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line.
4. Supply fresh air into the vapor vent line through the cock little by little until pressure becomes 3.923 kPa (400 mmH_2O, 15.75 inH_2O).
5. Shut the cock completely and leave it unattended.
6. After 2.5 minutes, measure the height of the liquid in the manometer.
7. Variation in height should remain at 0.245 kPa (25 mmH_2O, 0.98 inH_2O).
8. When filler cap does not close completely, the height should drop to zero in a short time.
9. If the height does not drop to zero in a short time when filler cap is removed, the cause is a blocked hose or a clogged fuel check valve.

In case the vent line is blocked, the fuel tank is not vented properly causing insufficient delivery of fuel to engine, or vapor lock. It must, therefore, be repaired.





Description

This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.

During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is then drawn from the air duct, through the hose connecting air cleaner to rocker cover, into the crankcase.

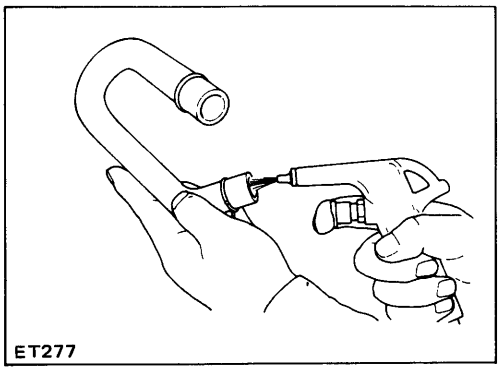
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air duct under all conditions.

Inspection

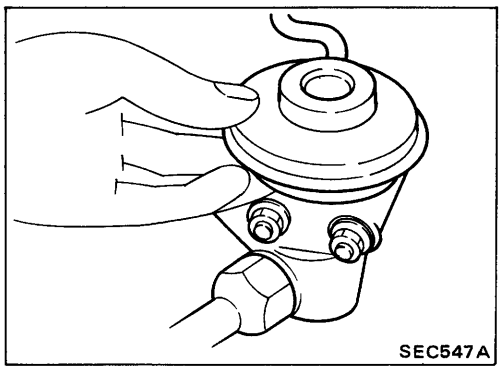
P.C.V. VALVE

With engine running at idle, remove ventilation hose from P.C.V. valve; if valve is working properly a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

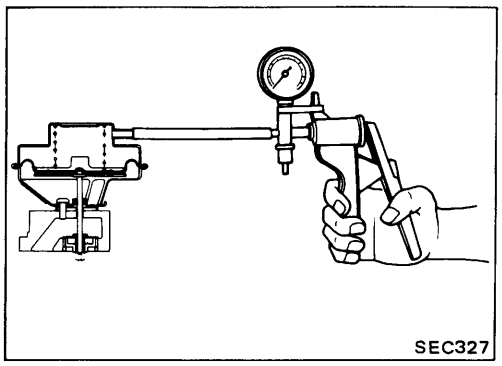

SEC547A

ENTIRE SYSTEM

Ensure that E.G.R. system is functioning properly by placing your finger on E.G.R. control valve diaphragm.

Make sure that E.G.R. control valve operates as follows when engine is revved up to 3,000 to 3,500 rpm.

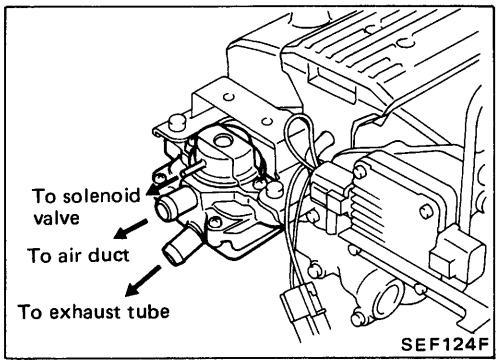
Water temperature °C (°F)	E.G.R. diaphragm
Below 65 (149)	Not moved
Above 65 (149)	Moved


SEC327

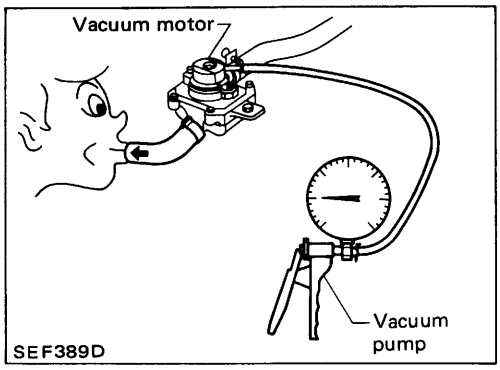
E.G.R. CONTROL VALVE

1. Supply the E.G.R. control valve with vacuum using a handy vacuum pump.
2. Place a finger on the diaphragm of the valve, and make sure that the diaphragm lifts up and down in response to the vacuum leading to the valve.

Full open of E.G.R. valve:
Over −16.0 kPa
(−120 mmHg, −4.72 inHg)



Check hoses for looseness, collapsing, damage or faulty connections, and each part for proper installation.



Air induction valve

Disconnect air induction hose on air induction pipe side. Apply vacuum to vacuum motor. Suck or blow hose to make sure that air flows only to the air induction pipe side.

General Specifications

IGNITION TIMING	°B.T.D.C.	15±2
IDLE SPEED	rpm	M/T 800±50 A/T 700±50 (in "D" position)

Inspection and Adjustment

WATER TEMPERATURE SENSOR		
Thermistor resistance	kΩ	20°C (68°F): Approx. 2.5 80°C (176°F): Approx. 0.33
IDLE SWITCH		
Engine speed when idle switch is changed from "OFF" to "ON"	rpm	Idle speed + 250±150 (M/T) Engine speed (in "N" position) + 250±150 (A/T)
FUEL PRESSURE at idling (Measuring point: between fuel filter and fuel pipe)		
Vacuum hose is connected	kPa (kg/cm², psi)	Approximately 245 (2.5, 36)
Vacuum hose is disconnected	kPa (kg/cm², psi)	Approximately 294 (3.0, 43)
FUEL INJECTOR		
Coil resistance	Ω	Approximately 10 - 15
AIR REGULATOR		
Resistance	Ω	Approximately 70
EXHAUST GAS TEMPERATURE SENSOR		
Thermistor resistance	kΩ	100°C (212°F): 85.3±8.53

ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

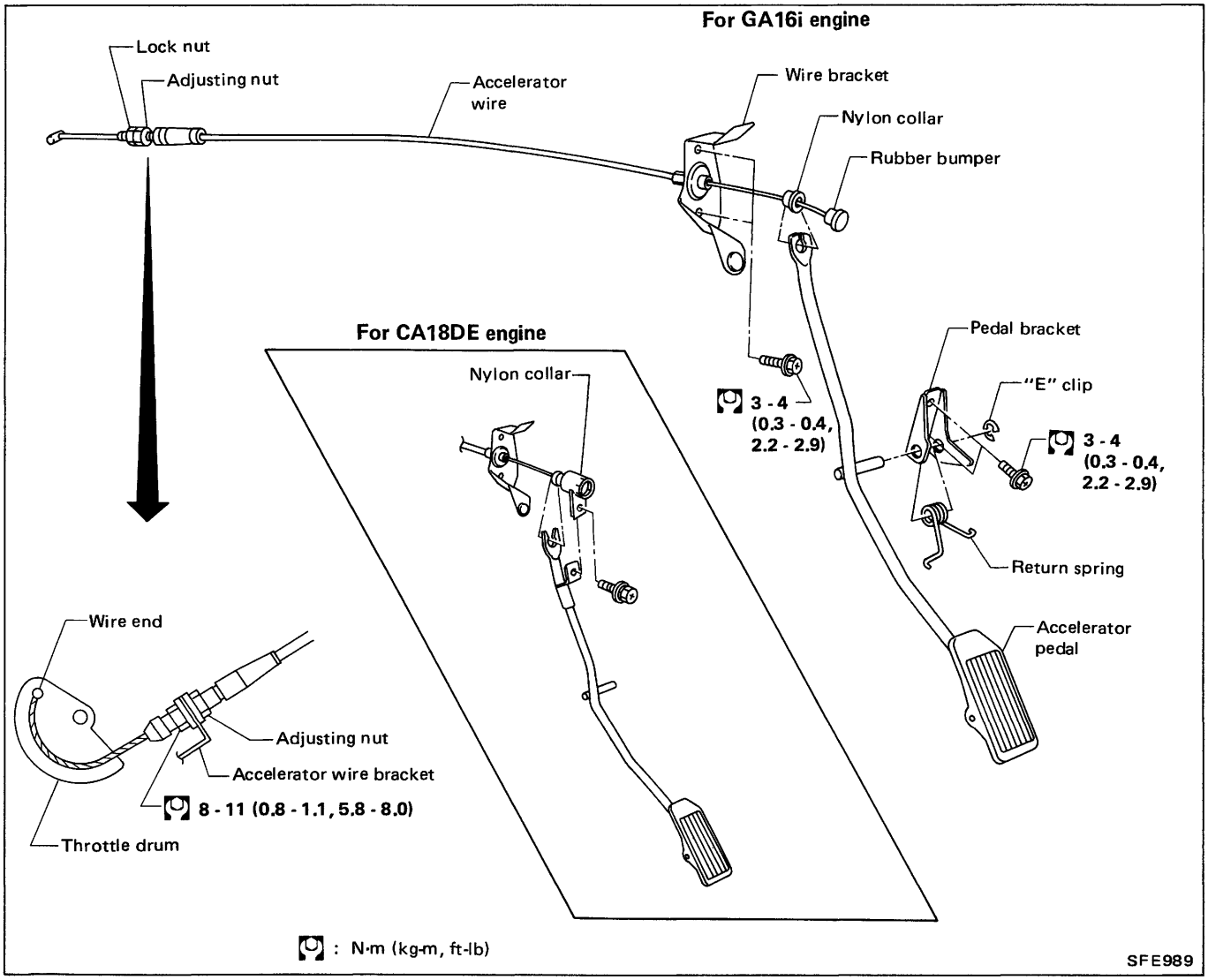
SECTION FE

CONTENTS

ENGINE CONTROL SYSTEM FE-2
FUEL SYSTEM FE-3
EXHAUST SYSTEM FE-4

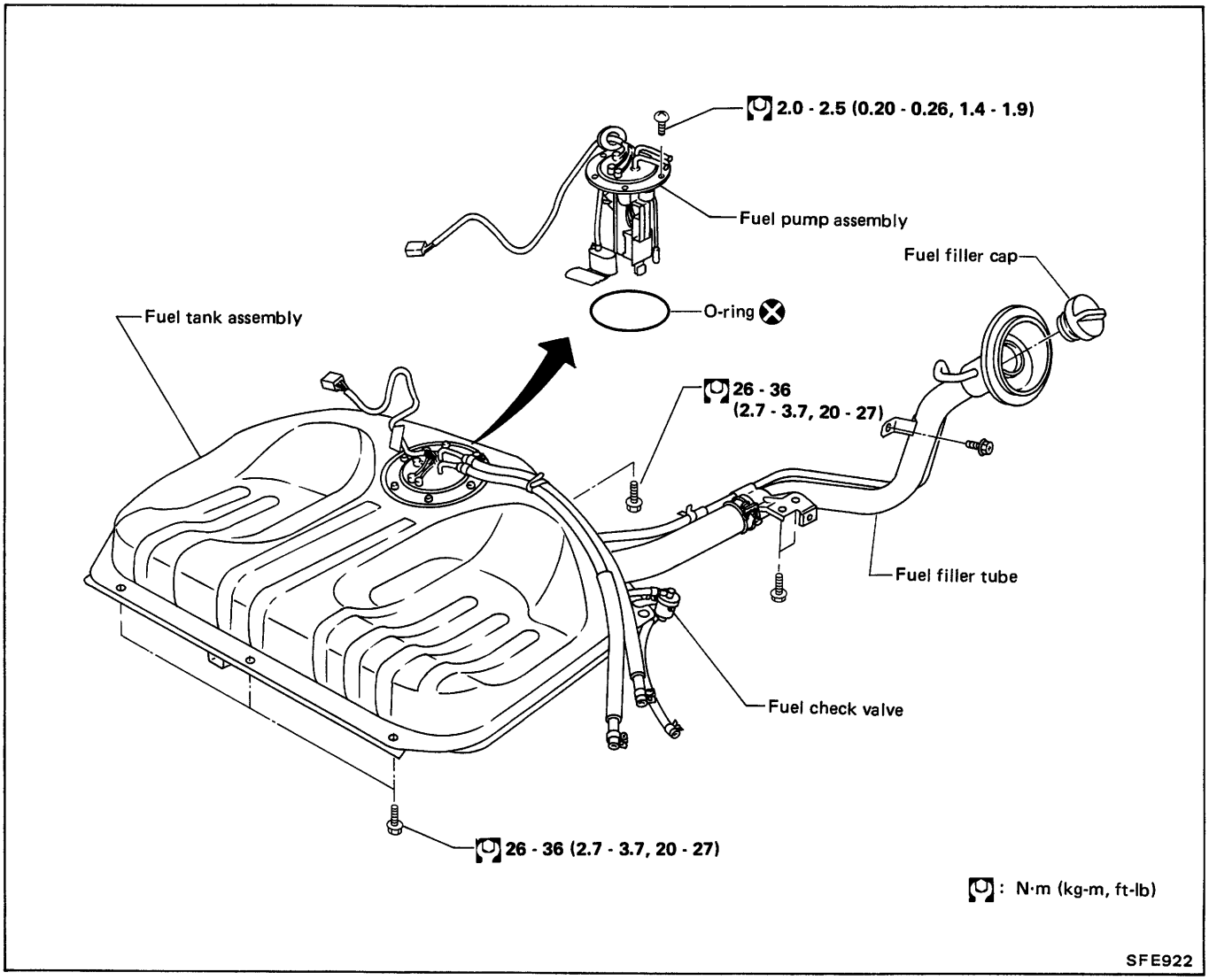
Accelerator Control System

- When removing accelerator wire, make a mark to indicate lock nut's initial position.
- Check that throttle valve fully opens when accelerator pedal is fully depressed and that it returns to idle position when pedal is released.
- Adjust accelerator wire according to the following procedure.
  Tighten "adjusting nut" until "throttle drum" starts to move.
  From that position turn back "adjusting nut" 1.5 to 2 turns, and fasten it with a lock nut.
- Check accelerator control parts for improper contact with any adjacent parts.
- When connecting accelerator wire, be careful not to twist or scratch its inner wire.
- On automatic transaxle models, adjust A/T throttle wire. Refer to "ON-VEHICLE SERVICE" in section AT.



WARNING:
When replacing fuel line parts, be sure to observe the following:
- **Put a "CAUTION: INFLAMMABLE" sign in workshop.**
- **Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.**
- **Be sure to disconnect battery ground cable before conducting operations.**
- **Put drained fuel in an explosion-proof container and put lid on securely.**

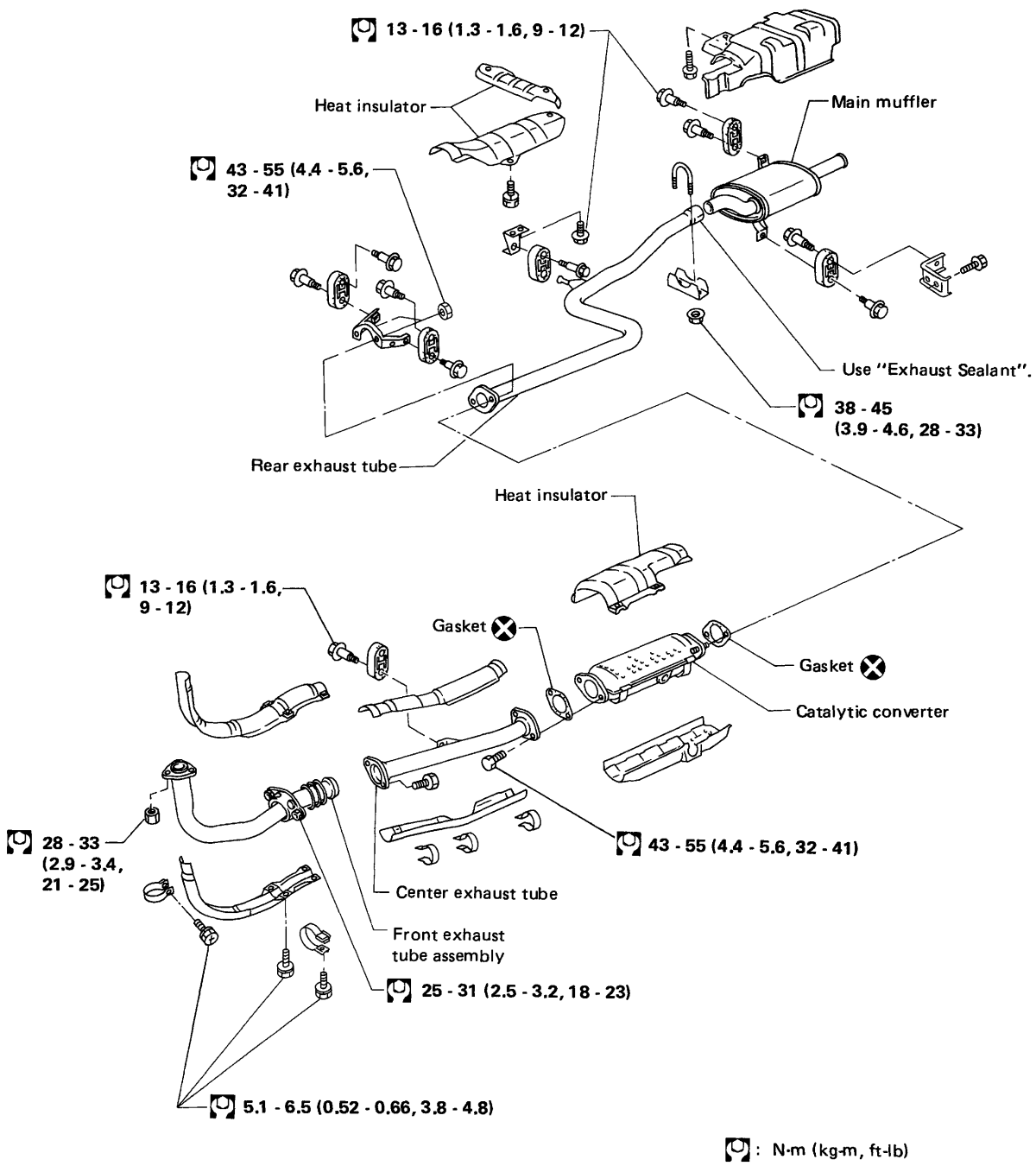
CAUTION:
- **Before disconnecting fuel hose, release fuel pressure from fuel line. Refer to "Fuel Filter Replacement" in MA section.**
- **Do not disconnect any fuel line unless absolutely necessary.**
- **Plug hose and pipe openings to prevent entry of dust or dirt.**
- **Always replace O-ring and clamps with new ones.**
- **Do not kink or twist hose and tube when they are installed.**
- **Do not tighten hose clamps excessively to avoid damaging hoses.**
- **When installing fuel check valve, be careful of its designated direction. (Refer to section EF & EC.)**
- **Run engine and check for leaks at connections.**



CAUTION:

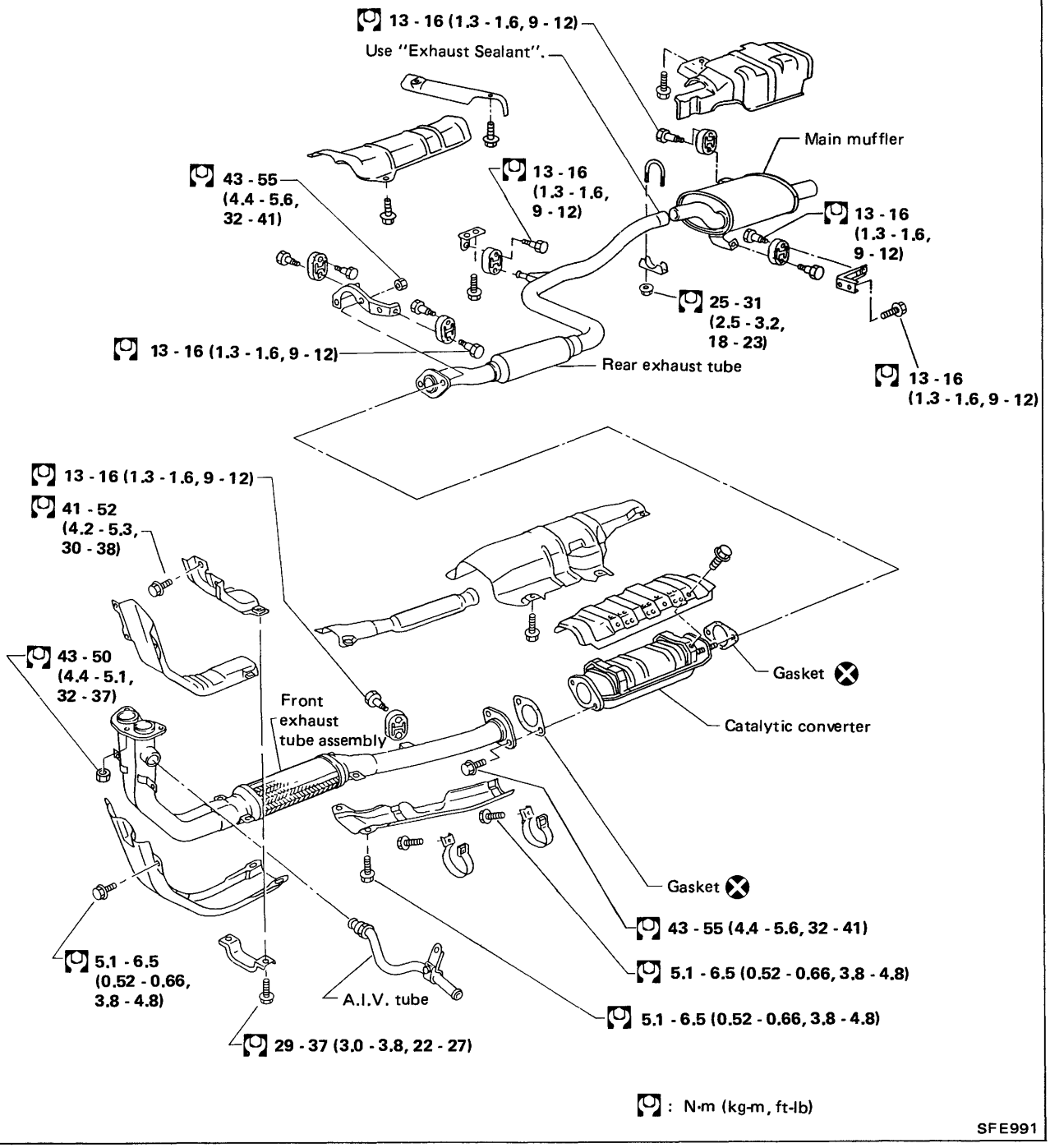
- **Always replace exhaust gaskets with new ones when disassembling.**
- **When connecting slit joint, use Genuine Nissan Sealant "Exhaust Sealant Kit" or an equivalent to eliminate gas leakage at the joint.**
- **Check all tube connections for exhaust gas leaks, and entire system for unusual noises, with engine running.**
- **After installation, check that mounting brackets and mounting insulator are free from undue stress. If any of above parts are not installed properly, excessive noise or vibration may be transmitted to vehicle body.**

GA16i engine model



SFE990

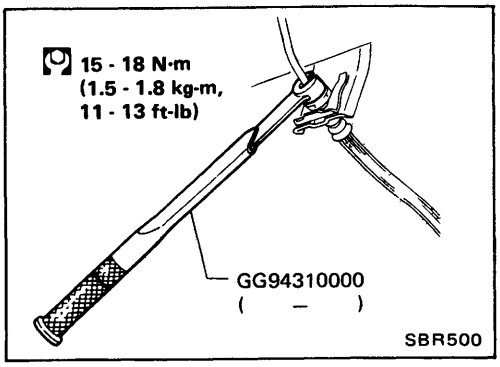
CA18DE engine model



SECTION CL

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CLUTCH SYSTEM (GA16i engine) ..... CL- 3
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HYDRAULIC CLUTCH CONTROL ..... CL- 8
CLUTCH RELEASE MECHANISM (GA16i engine) CL-10
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SERVICE DATA AND SPECIFICATIONS (S.D.S.) CL-15



Precautions

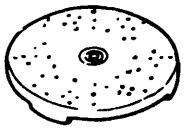
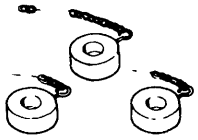
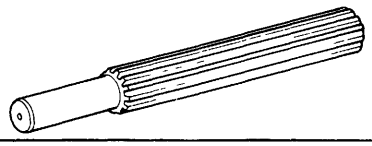
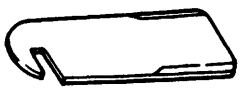
- Recommended fluid is brake fluid "DOT 3".
- Do not reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- When removing and installing clutch piping, use Tool.
- To clean or wash all parts of master cylinder, operating cylinder, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene.
  It will ruin the rubber parts of the hydraulic system.

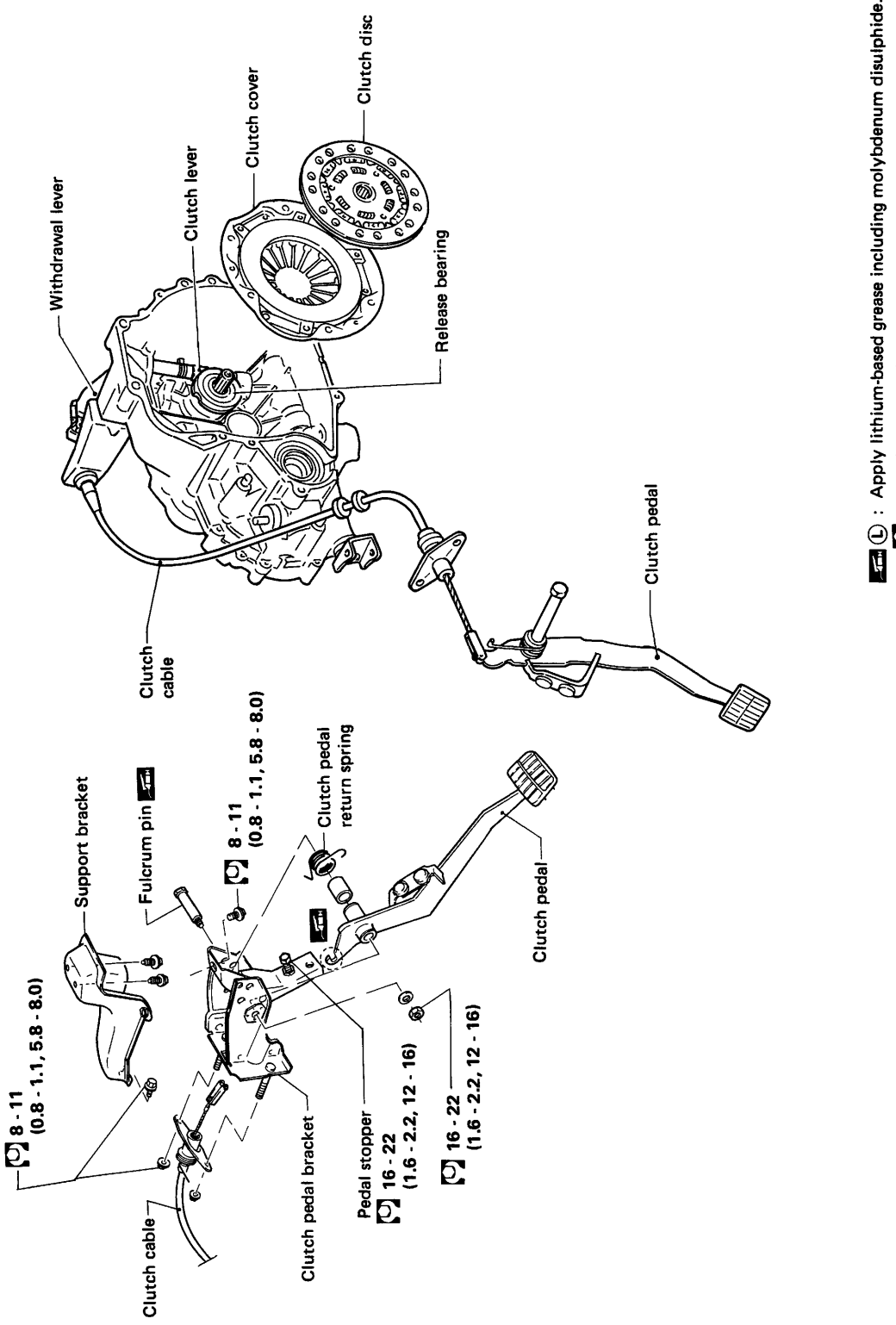
WARNING:

Remove all dust from clutch disc with a dust collector after cleaning with waste cloth.

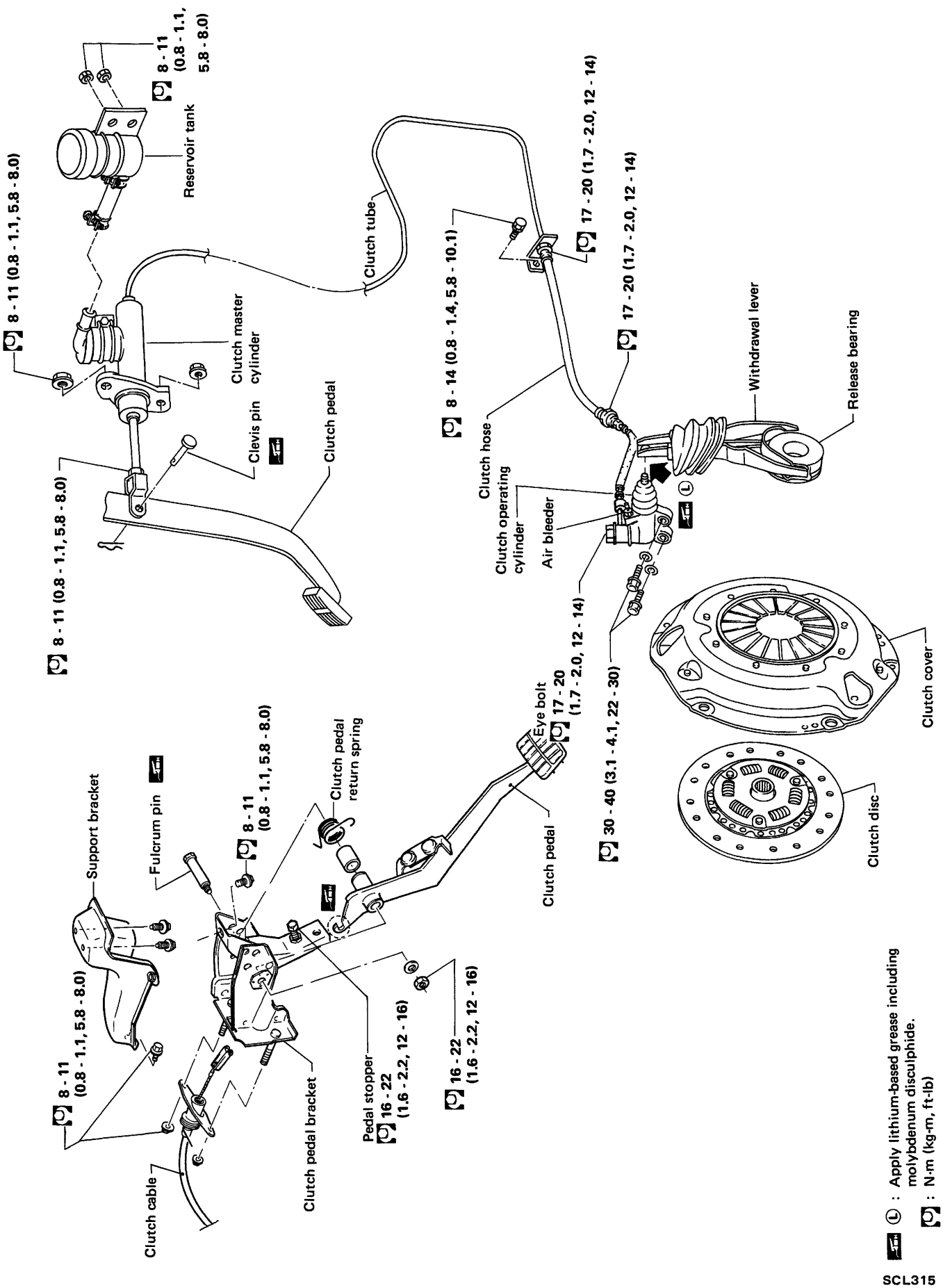
Preparation

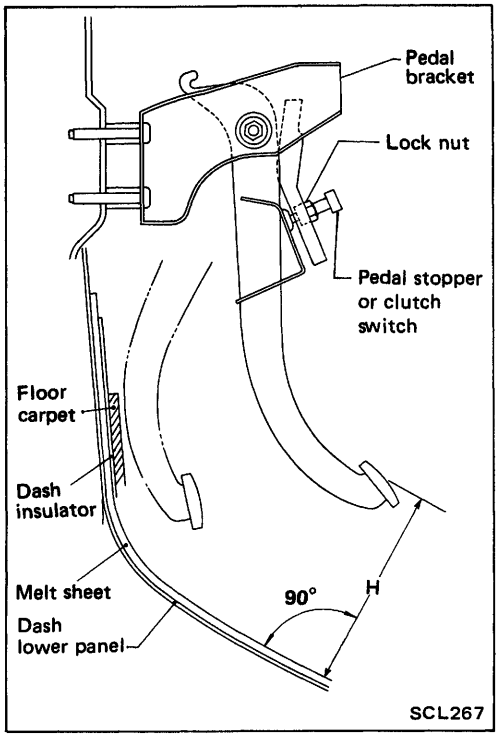
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description		Applied model	
			GA16i engine	CA18DE engine
ST20050010 (–) Base plate		Inspecting diaphragm spring of clutch cover	X	X
ST20050100 (–) Distance piece				
GG94310000 (–) Flare nut torque wrench		Removing and installing each clutch piping	–	X
KV30101000 (J33213) Clutch aligning bar		Installing clutch cover and clutch disc	X	X
ST20050240 (–) Diaphragm spring adjusting wrench		Adjusting unevenness of diaphragm spring of clutch cover	X	X



: Apply lithium-based grease including molybdenum disulphide.
: N·m (kg-m, ft-lb)

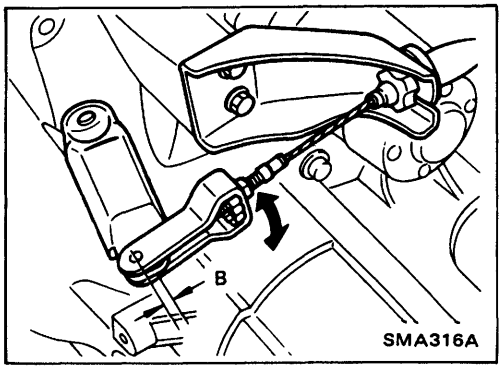

8 - 11 (0.8 - 1.1, 5.8 - 8.0)
Reservoir tank
Clutch tube
8 - 14 (0.8 - 1.4, 5.8 - 10.1)
17 - 20 (1.7 - 2.0, 12 - 14)
Clutch master cylinder
Clevis pin
Clutch pedal
Clutch hose
Withdrawal lever
Release bearing
Clutch operating cylinder
Air bleeder
Support bracket
Fulcrum pin
Clutch pedal return spring
Eye bolt
30 - 40 (3.1 - 4.1, 22 - 30)
Clutch cover
Clutch disc
Clutch cable
Clutch pedal bracket
Pedal stopper
16 - 22 (1.6 - 2.2, 12 - 16)
Clutch pedal
: Apply lithium-based grease including molybdenum disculphide.
: N·m (kg-m, ft-lb)
SCL315



Adjusting Clutch Pedal

1. Adjust pedal height with pedal stopper or clutch switch.

Pedal height "H":
162 - 172 mm (6.38 - 6.77 in)



2. Adjust withdrawal lever play "B" according to the following procedure.

(1) Push withdrawal lever by hand until resistance is felt, and then tighten adjusting nut.

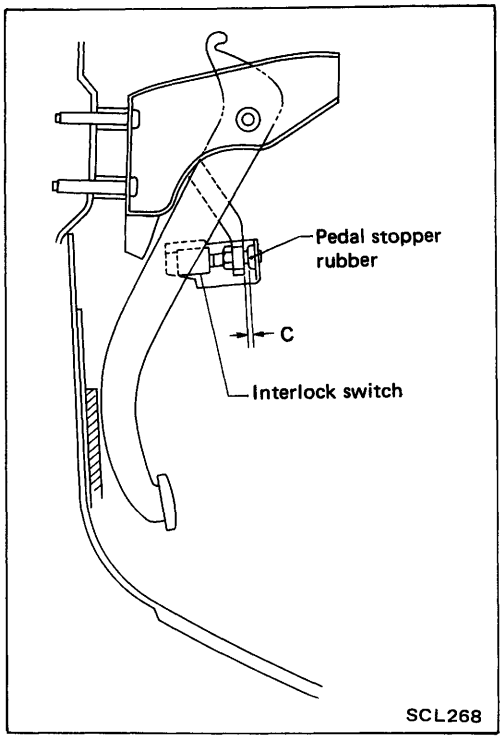
(2) Turn back adjusting nut 2.5 - 3.5 turns, and then tighten lock nut.

Withdrawal lever play "B":
2.5 - 3.5 mm (0.098 - 0.138 in)
Lock nut :
: 3 - 4 N·m (0.3 - 0.4 kg-m, 2.2 - 2.9 ft-lb)

3. As a final check, measure pedal free travel "A" at center of pedal pad.

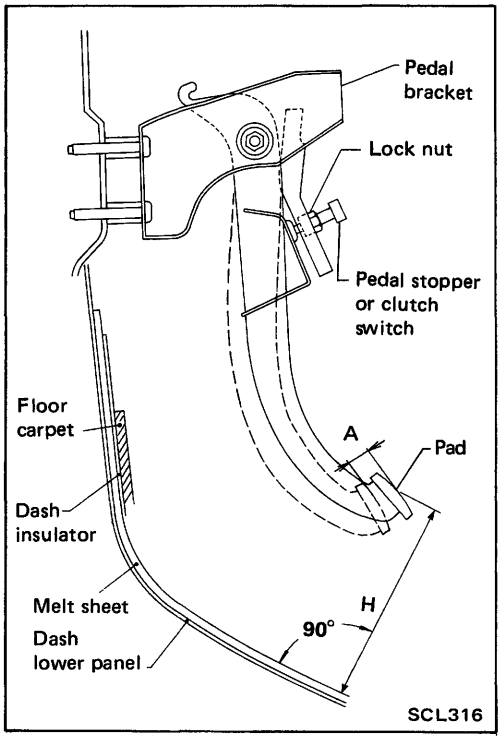
Pedal free travel "A":
12.5 - 17.5 mm (0.492 - 0.689 in)

Adjusting Clutch Pedal (Cont'd)



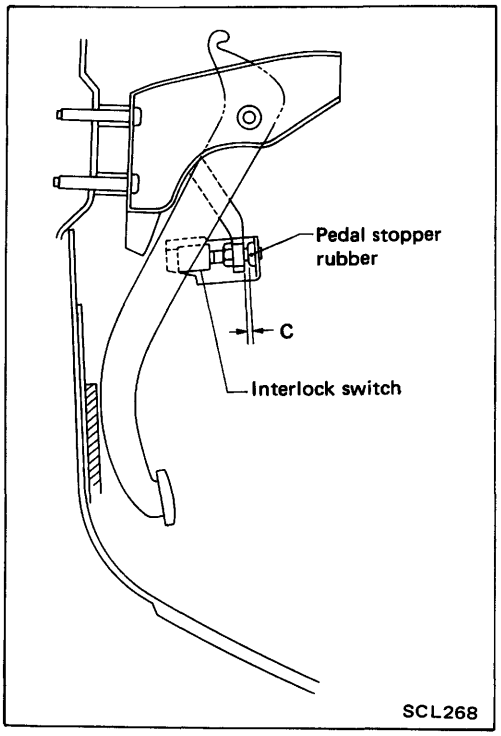
4. **U.S.A. model only**
   Adjust clearance "C" between pedal stopper rubber and threaded end of clutch interlock switch while depressing clutch pedal fully.

   Clearance C: 0.1 - 1.0 mm (0.004 - 0.039 in)

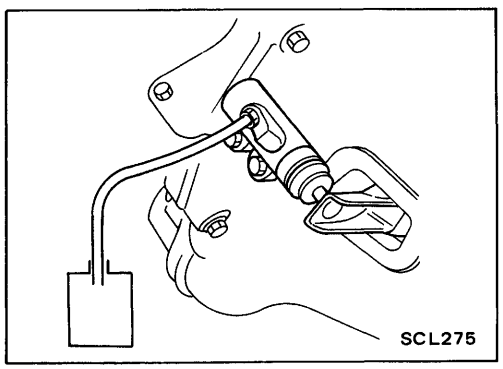


Adjusting Clutch Pedal

1. Adjust pedal height with pedal stopper or clutch switch.
   Pedal height "H":
   162 - 172 mm (6.38 - 6.77 in)
2. Adjust pedal free play "A" with push rod.
   Pedal free play "A":
   1 - 3 mm (0.04 - 0.12 in)



3. Adjust clearance "C" between pedal stopper rubber and threaded end of clutch interlock switch while depressing clutch pedal fully.
   Clearance C:
   0.1 - 1.0 mm (0.004 - 0.039 in)

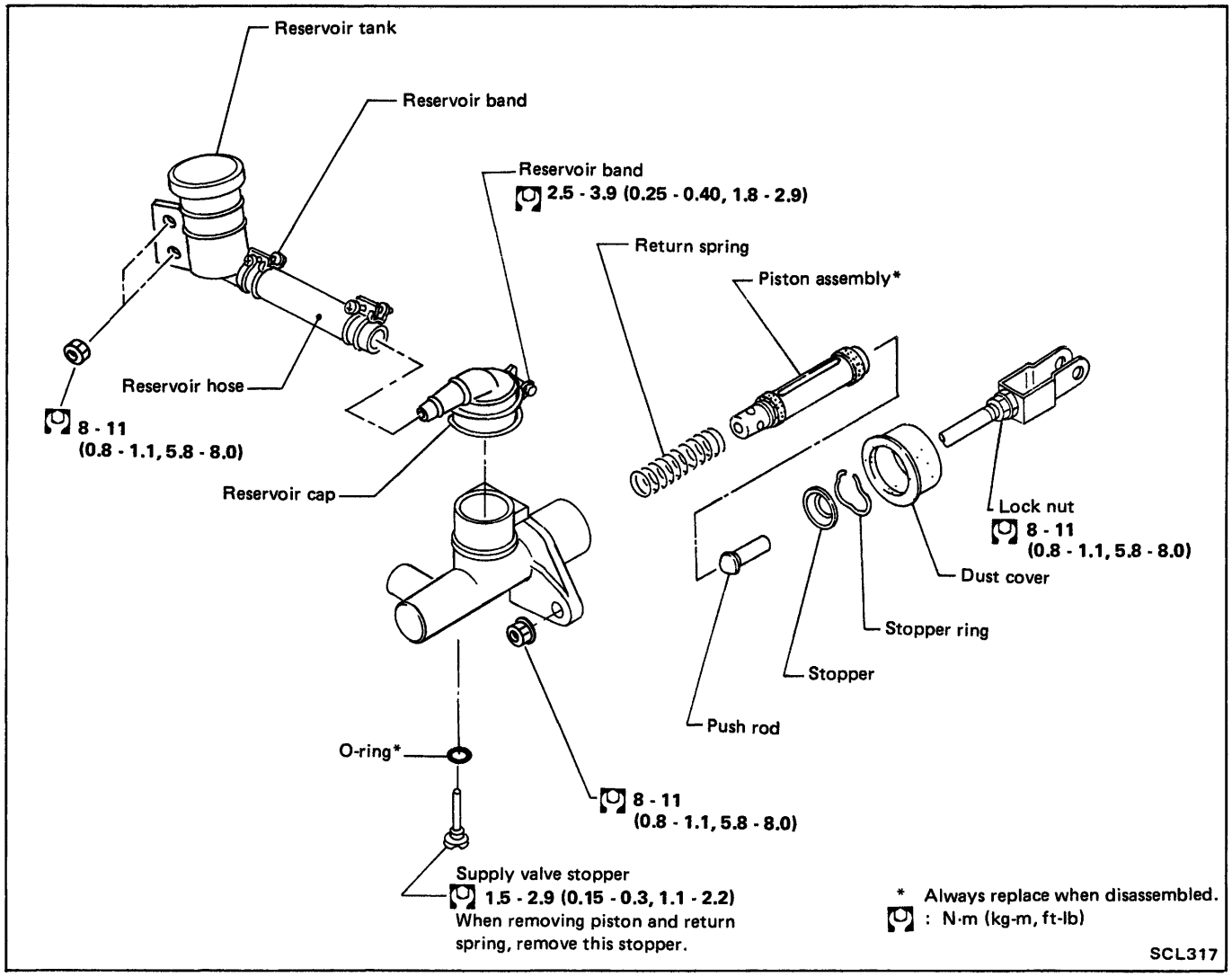


Bleeding Procedure

- **Carefully monitor fluid level at master cylinder during bleeding operation.**

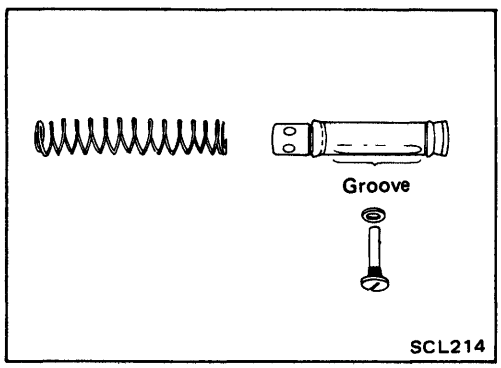
1. Top up reservoir with recommended brake fluid.
2. Connect a transparent vinyl tube to air bleeder valve.
3. Fully depress clutch pedal several times.
4. With clutch pedal depressed, open bleeder valve to release air.
5. Close bleeder valve.
6. Repeat steps 4 through 6 above until clear brake fluid comes out of air bleeder valve.

Clutch Master Cylinder



DISASSEMBLY AND ASSEMBLY

- Push piston in cylinder body with screwdriver when removing and installing valve stopper.



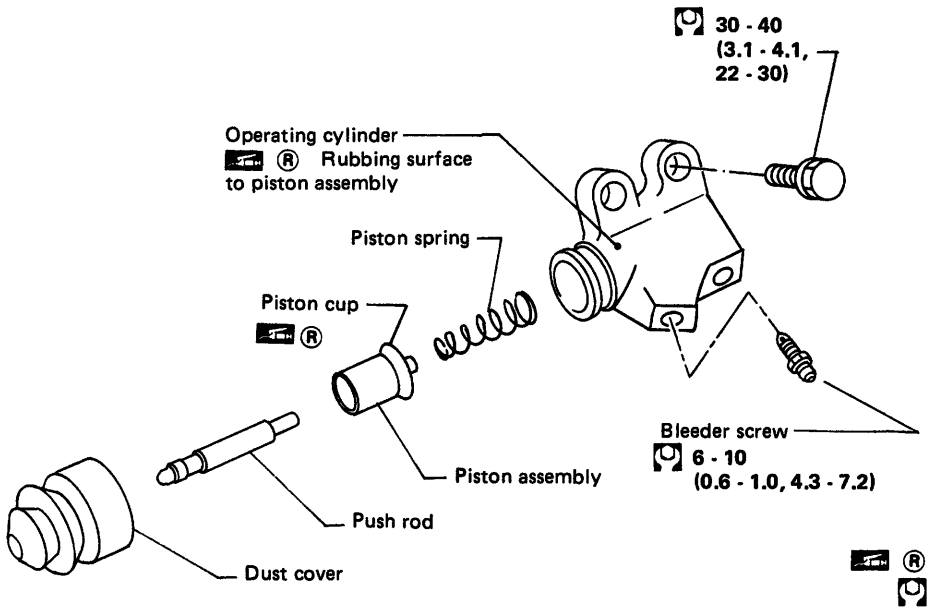
- Align groove of piston assembly and valve stopper portion when installing valve stopper.
- Check direction of piston caps.

Clutch Master Cylinder (Cont'd)

INSPECTION

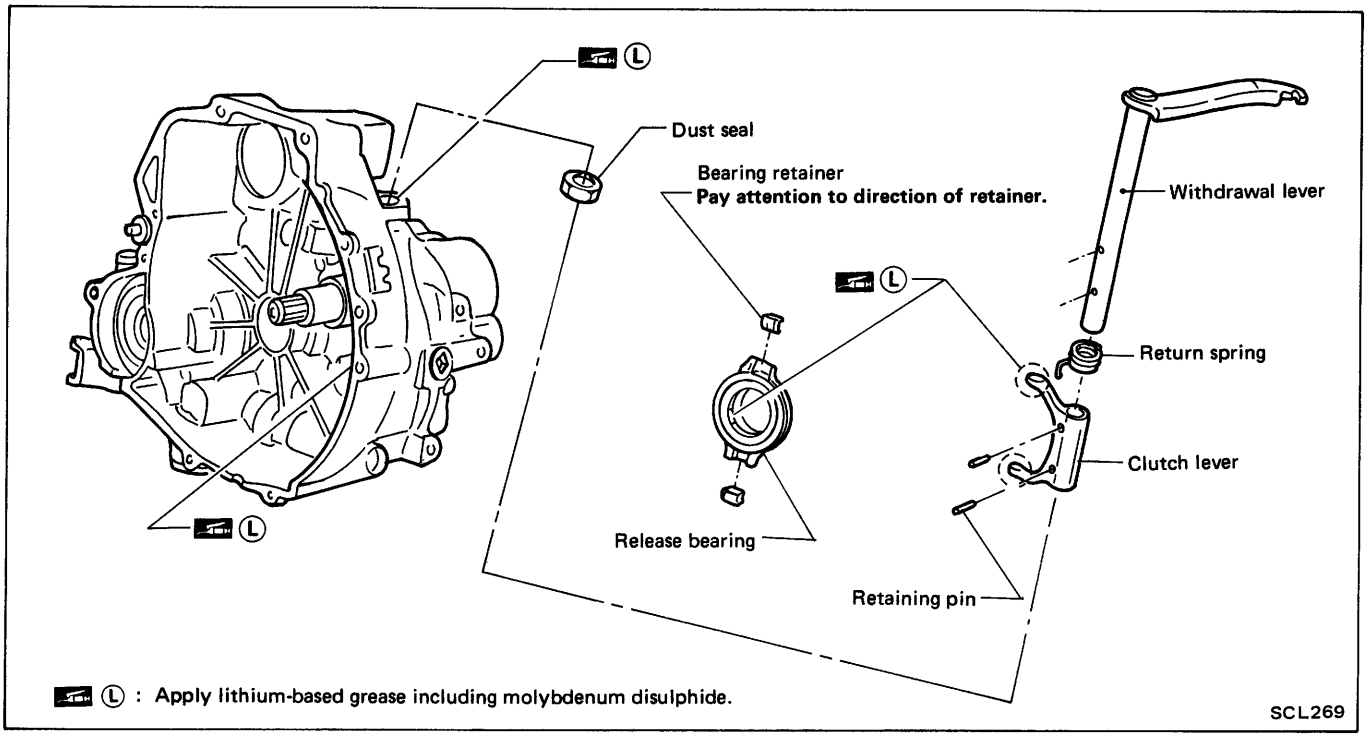
- Check cylinder and piston rubbing surface for uneven wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check return spring for wear or damage. Replace if necessary.
- Check reservoir for deformation or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.

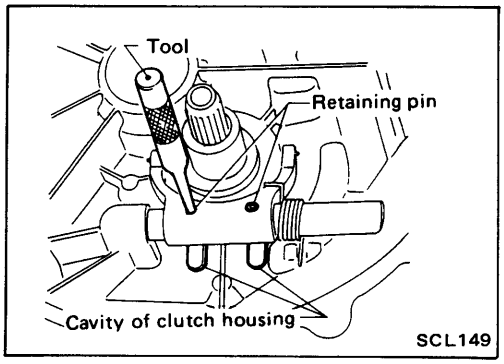
Operating Cylinder



INSPECTION

- Check rubbing surface of cylinder for wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check piston spring for wear or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.



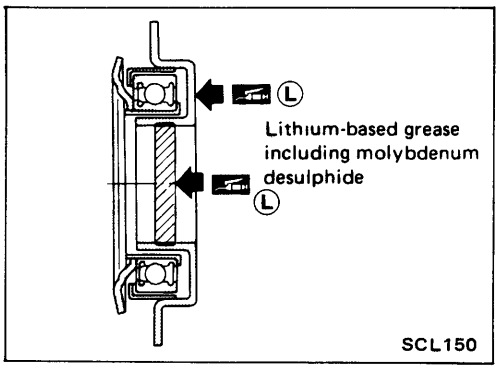


REMOVAL AND INSTALLATION

- Align retaining pin with cavity of clutch housing and tap out retaining pin.

INSPECTION

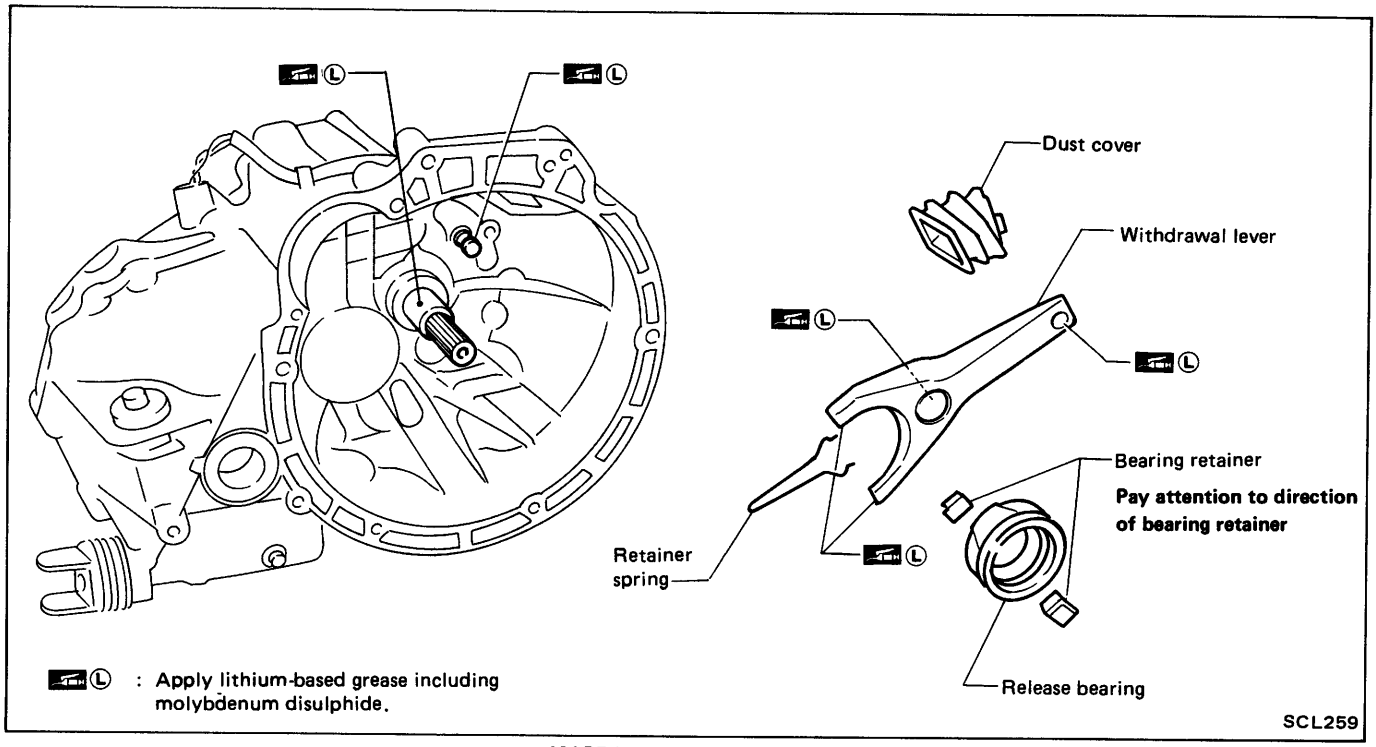
- Check release bearing to see that it rolls freely and is free from noise, cracks, pitting or wear. Replace if necessary.
- Check withdrawal lever rubbing surface for wear, rust or damage. Replace if necessary.



LUBRICATION

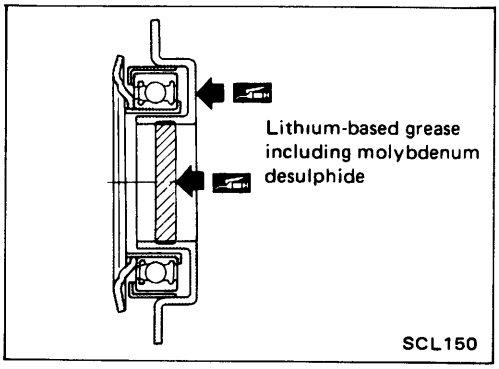
- Apply recommended grease to contact surface and rubbing surface.

Too much lubricant might cause clutch disc facing damage.



INSPECTION

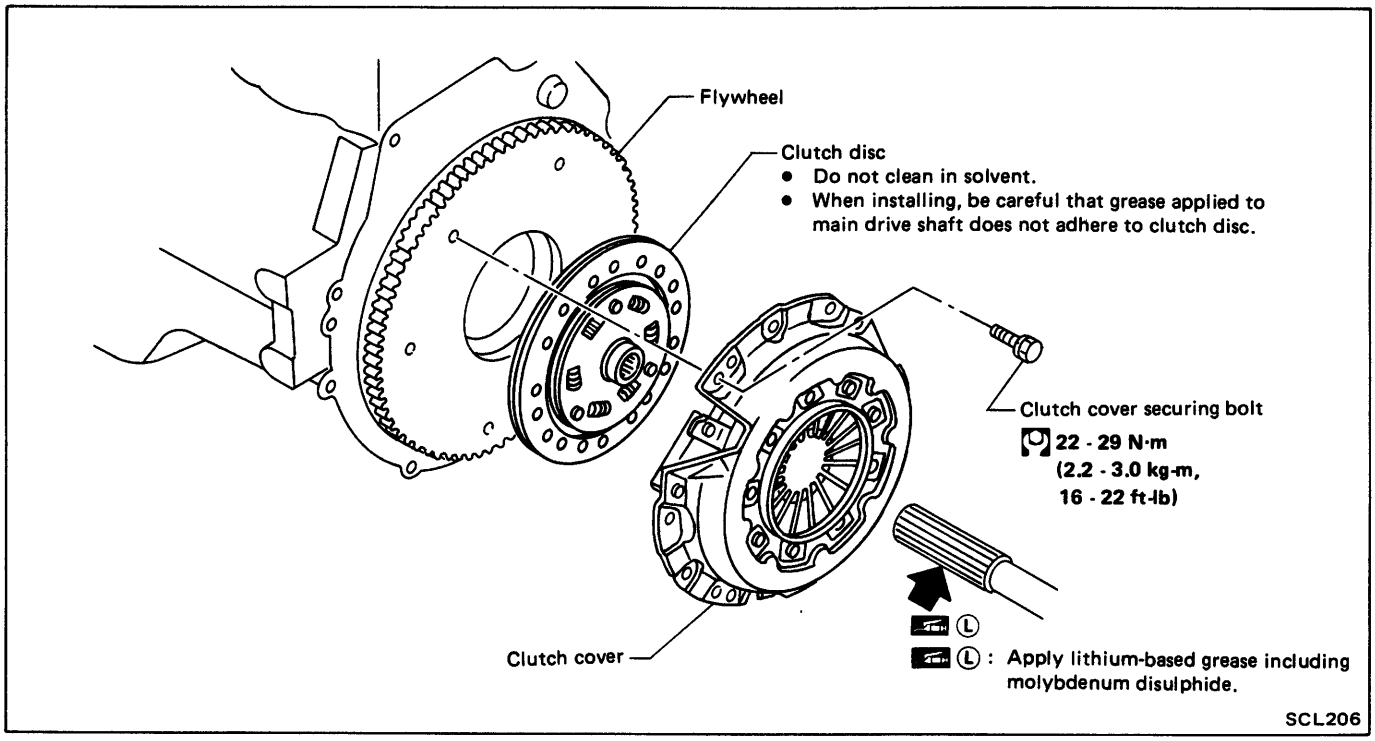
- Check release bearing to see that it rolls freely and is free from noise, cracks, pitting or wear. Replace if necessary.
- Check release sleeve and withdrawal lever rubbing surface for wear, rust or damage. Replace if necessary.

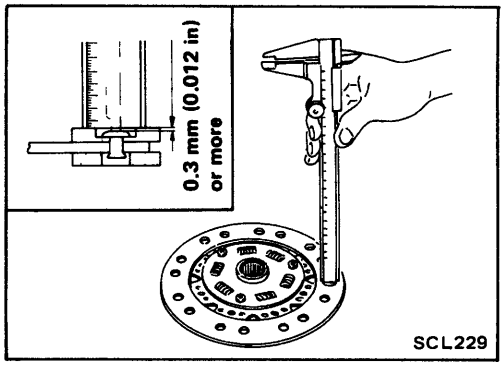


LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.

Too much lubricant might cause clutch disc facing damage.



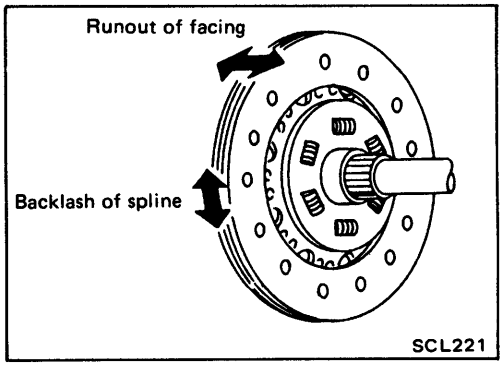


Clutch Disc

INSPECTION

Check clutch disc for wear of facing.

Wear limit of facing surface to rivet head:
0.3 mm (0.012 in)



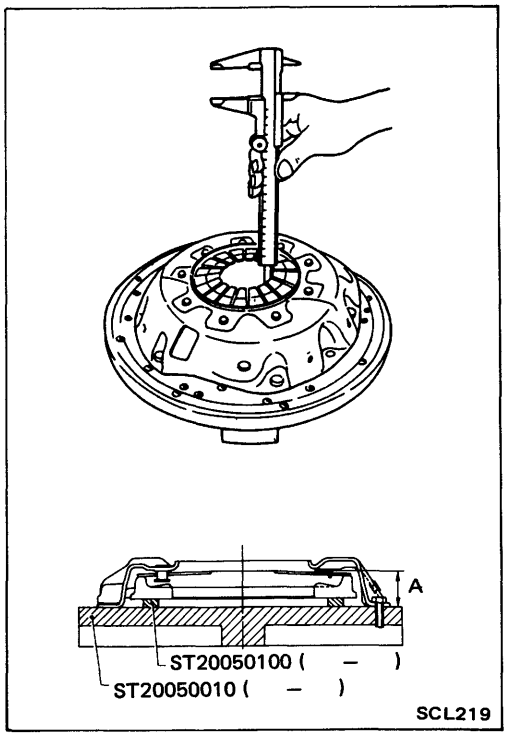
- Check clutch disc for backlash of spline and runout of facing.
  Maximum backlash of spline (at outer edge of disc):
  0.8 mm (0.031 in)
  Runout limit:
  1.0 mm (0.039 in)
  Distance of runout check point (from hub center)
  190TBL 90 mm (3.54 in) ... GA16i engine
  215TBL 102.5 mm (4.04 in) ... CA18DE engine
- Check clutch disc for burns, discoloration or oil or grease leakage. Replace if necessary.

Clutch Disc (Cont'd)

INSTALLATION

- Apply recommended grease to contact surface of spline portion.

Too much lubricant might cause clutch disc facing damage.



Clutch Cover and Flywheel

INSPECTION AND ADJUSTMENT

- Set Tool and check height and unevenness of diaphragm spring.
- Set 0.4 mm (0.016 in) feeler gauges on distance pieces when checking C190S.
- Set 0.2 mm (0.008 in) feeler gauges on distance pieces when checking C215S.

Diaphragm spring height "A":

C190S

29 - 31 mm (1.14 - 1.22 in) ... GA16i engine

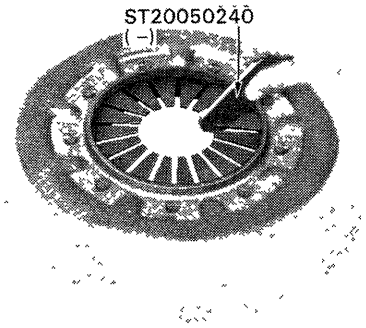
C215S

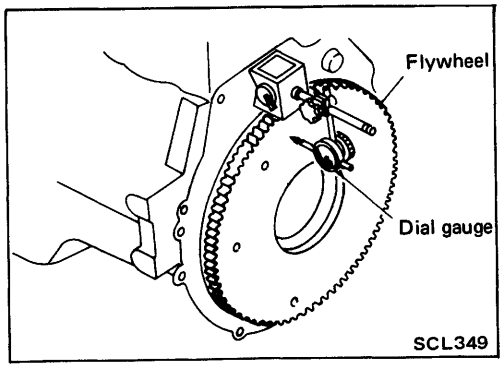
30.5 - 32.5 mm (1.201 - 1.280 in) ... CA18DE engine

- Check thrust rings for wear or damage by shaking cover assembly up and down to listen for chattering noise, or lightly hammering on rivets for a slightly cracked noise. Replace clutch cover assembly if necessary.
- Check contact surface of plassure plate and flywheel. Repair them with emery paper if slight burns or discoloration is found. Replace them if serious deformation or damage is found.
- Adjust unevenness of diaphragm spring with Tool.

Uneven limit:

0.5 mm (0.020 in)



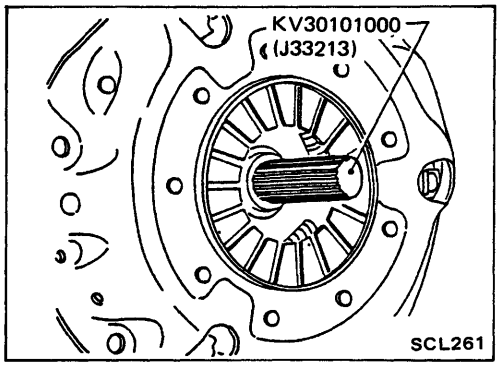


Flywheel inspection

- Check contact surface of flywheel for slight burns or discoloration. Repair flywheel with emery paper.
- Check flywheel runout.

Runout (Total indicator reading):

Less than 0.15 mm (0.0059 in)



Clutch Cover and Flywheel (Cont'd)

INSTALLATION

- Insert Tool into clutch disc hub when installing clutch cover and disc.

General Specifications

CLUTCH DISC

Model	190TBL	215TBL
Engine	GA16i	CA18DE
Facing size mm (in) (outer dia. x inner dia. x thickness)	190 x 132 x 3.5 (7.48 x 5.20 x 0.138)	215 x 140 x 3.5 (8.46 x 5.51 x 0.138)
Thickness of disc assembly with load mm (in)	8.0 - 8.4 (0.315 - 0.331) with 3,923 N (400 kg, 882 lb)	7.8 - 8.2 (0.307 - 0.323) with 3,922 N (400 kg, 882 lb)

CLUTCH COVER

Model	C190S	C215S
Engine	GA16i	CA18DE
Full load N (kg, lb)	3,236 (330, 728)	3,923 (400, 882)

CLUTCH MASTER CYLINDER

Inner diameter	mm (in)	15.87 (5/8)

CLUTCH OPERATION CYLINDER

Inner diameter	mm (in)	19.05 (3/4)

Inspection and Adjustment

CLUTCH PEDAL (GA16i engine)

Unit: mm (in)

Pedal height "H"	162 - 172 (6.38 - 6.77)
Pedal free travel "A"	12.5 - 17.5 (0.492 - 0.689)
Withdrawal lever play "B"	2.5 - 3.5 (0.098 - 0.138)
Clearance between pedal stopper rubber and threaded end of clutch interlock switch	0.1 - 1.0 (0.004 - 0.039)

CLUTCH PEDAL (CA18DE engine)

Unit: mm (in)

Pedal height "H*"	162 - 172 (6.38 - 6.77)
Pedal free play	1 - 3 (0.04 - 0.12)
Clearance between pedal stopper rubber and threaded end of clutch interlock switch	0.1 - 1.0 (0.004 - 0.039)

*: Measured from surface of melt sheet to pedal pad

CLUTCH DISC

Unit: mm (in)

Model	190TBL	215TBL
Wear limit of facing surface to rivet head	0.3 (0.012)	
Runout limit of facing	1.0 (0.039)	
Distance of runout check point (from the hub center)	90 (3.54)	102.5 (4.04)
Maximum backlash of spline (at outer edge of disc)	0.8 (0.031)	

CLUTCH COVER

Unit: mm (in)

Model	C190S	C215S
Diaphragm spring height	29 - 31 (1.14 - 1.22)	30.5 - 32.5 (1.201 - 1.280)
Uneven limit of diaphragm spring toe height	0.5 (0.020)	

Tightening Torque

E16i engine

Unit	N·m	kg-m	ft-lb
Pedal stopper lock nut	16 - 22	1.6 - 2.2	12 - 16
Clutch switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Fulcrum pin securing nut	16 - 22	1.6 - 2.2	12 - 16
Clutch pedal bracket securing nut	8 - 11	0.8 - 1.1	5.8 - 8.0
Clutch cover securing nut	22 - 29	2.2 - 3.0	16 - 22
Clutch cable lock nut	3 - 4	0.3 - 0.4	2.2 - 2.9
Interlock switch lock nut	12 - 15	1.2 - 1.5	9 - 11

CA18DE engine

Unit	N·m	kg-m	ft-lb
Clutch switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Clutch interlock switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Clutch pedal bracket securing nut	8 - 11	0.8 - 1.1	5.8 - 8.0
Master cylinder push rod lock nut	8 - 11	0.8 - 1.1	5.8 - 8.0
Master cylinder securing nut	8 - 11	0.8 - 1.1	5.8 - 8.0
Valve stopper	1.5 - 2.9	0.15 - 0.3	1.1 - 2.2
Reservoir band	2.5 - 3.9	0.25 - 0.4	1.8 - 2.9
Operating cylinder securing nut	30 - 40	3.1 - 4.1	22 - 30
Clutch tube flare nut	15 - 18	1.5 - 1.8	11 - 13
Bleeder screw	6 - 10	0.6 - 1.0	4.3 - 7.2
Clutch hose to operating cylinder or clutch tube	17 - 20	1.7 - 2.0	12 - 14
Clutch hose clamp to body	8 - 14	0.8 - 1.4	5.8 - 10.1
Clutch cover securing bolt	22 - 29	2.2 - 3.0	16 - 22

MANUAL TRANSAXLE

SECTION MT

CONTENTS

Model RS5F31A & RS5F50A

PREPARATION ..... MT- 2
ON-VEHICLE SERVICE ..... MT- 7
REMOVAL AND INSTALLATION ..... MT- 9
TRANSAXLE GEAR CONTROL MT-10

Model RS5F31A

MAJOR OVERHAUL MT-11
DISASSEMBLY MT-14
REPAIR FOR COMPONENT PARTS MT-17
ADJUSTMENT MT-30
ASSEMBLY MT-32

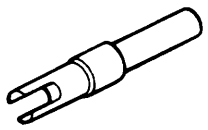
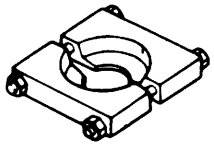
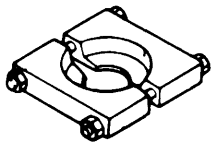
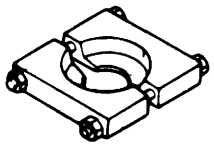
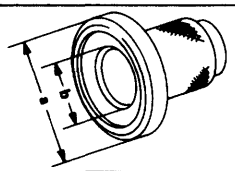
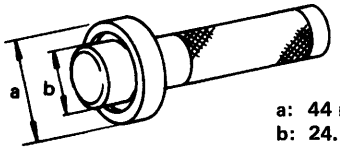
Model RS5F50A

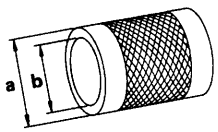
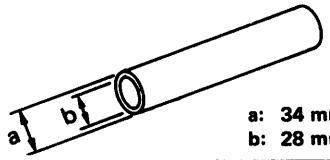
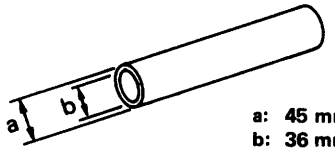
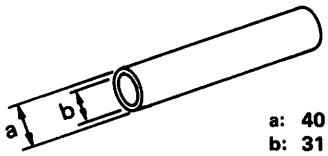
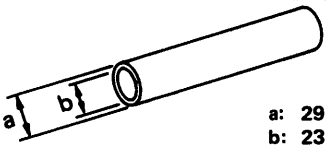
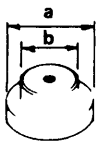
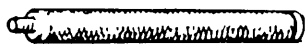
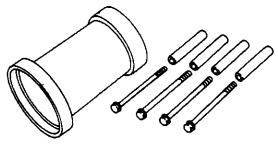
MAJOR OVERHAUL MT-35
DISASSEMBLY MT-38
REPAIR FOR COMPONENT PARTS MT-41
ADJUSTMENT MT-54
ASSEMBLY MT-58

Model RS5F31A & RS5F50A

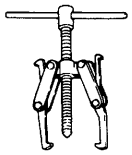
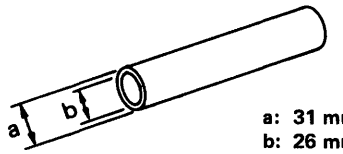
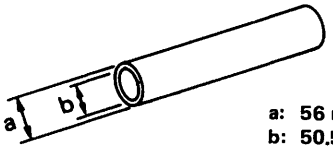
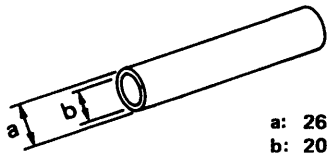
SERVICE DATA AND SPECIFICATIONS (S.D.S.) MT-62

SPECIAL SERVICE TOOLS – for RS5F31A

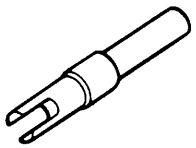
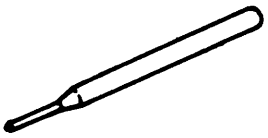
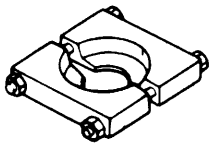
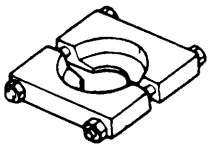
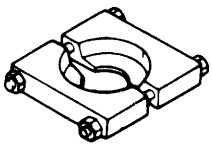
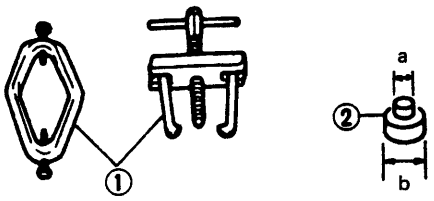
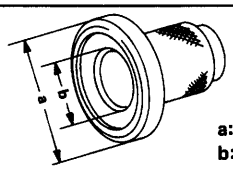
Tool number (Kent-Moore No.) Tool name	Description	
KV38105900 (J33201) Preload adapter		Measuring turning torque of final drive assembly Measuring total turning torque Measuring clearance between side gear and differential case with washer
KV32101000 (J25689-A) Pin punch		Removing and installing retaining pin
ST22730000 (J25681) Puller		Removing mainshaft front and rear bearing inner race Removing 5th main gear
ST30031000 (J22912-01) Puller		Removing differential side bearing inner race
ST30021000 (J22912-01) Puller		Removing 5th synchronizer hub
ST33290001 (J34286) Puller		Removing differential oil seal Removing mainshaft front bearing outer race Removing differential side bearing outer race
ST33400001 (J26082) Drift	 **a: 60 mm (2.36 in) dia.** **b: 47 mm (1.85 in) dia.**	Installing differential oil seal
KV38102100 (J25803-01) Drift	 **a: 44 mm (1.73 in) dia.** **b: 24.5 mm (0.965 in) dia.**	Installing input shaft oil seal Installing input shaft rear bearing

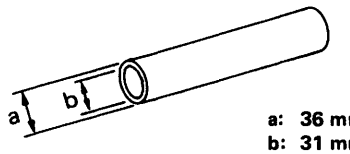
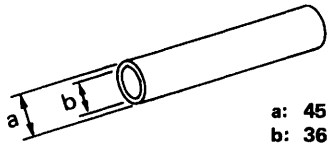
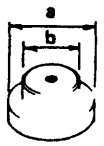
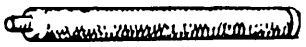
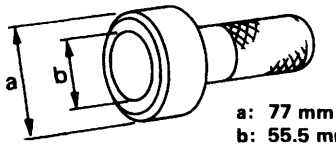
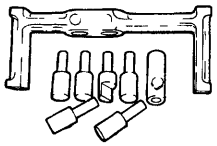
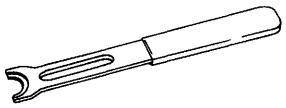
Tool number (Kent-Moore No.) Tool name	Description	
ST33200000 (J26082) Drift	 **a: 60 mm (2.36 in) dia.** **b: 44.5 mm (1.752 in) dia.**	Installing mainshaft front bearing outer race
ST22350000 (J25678-01) Drift	 **a: 34 mm (1.34 in) dia.** **b: 28 mm (1.10 in) dia.**	Installing input shaft front bearing
ST22452000 (—) Drift	 **a: 45 mm (1.77 in) dia.** **b: 36 mm (1.42 in) dia.**	Installing 1st & 2nd synchronizer
ST37750000 (J25863-01) Drift	 **a: 40 mm (1.57 in) dia.** **b: 31 mm (1.22 in) dia.**	Installing 5th main gear
ST22360002 (J25679-01) Drift	 **a: 29 mm (1.14 in) dia.** **b: 23 mm (0.91 in) dia.**	Installing mainshaft rear bearing inner race
ST30621000 (J25742-5) Drift	 **a: 79 mm (3.11 in) dia.** **b: 59 mm (2.32 in) dia.**	Installing differential side bearing outer race (Use with ST30611000.)
ST30611000 (J25742-1) Drift		Installing differential side bearing outer race (Use with ST30621000).
(J33200) Differential preload shim selector		Selecting differential side bearing adjusting shim

COMMERCIAL SERVICE TOOLS – for RS5F31A

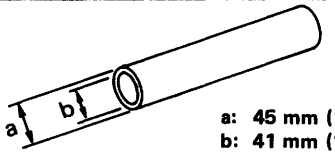
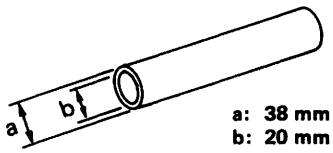
Tool name	Description	
Puller		Removing input shaft front bearing
Drift	 **a: 31 mm (1.22 in) dia.** **b: 26 mm (1.02 in) dia.**	Installing mainshaft front bearing inner race
Drift	 **a: 56 mm (2.20 in) dia.** **b: 50.5 mm (1.988 in) dia.**	Installing differential side bearing inner race
Drift	 **a: 26 mm (1.02 in) dia.** **b: 20 mm (0.79 in) dia.**	Installing striking rod oil seal

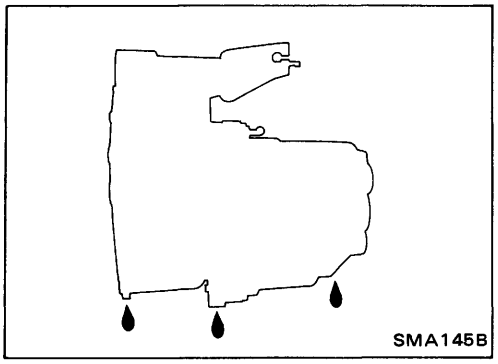
SPECIAL SERVICE TOOLS – for RS5F50A

Tool number (Kent-Moore No.) Tool name	Description	
KV38106500 (J34284) Preload adapter		Measuring turning torque of final drive assembly Measuring total turning torque Measuring clearance between side gear and differential case with washer Selecting differential side bearing adjusting shim
KV32101000 (J25689-A) Pin punch		Removing and installing retaining pin
ST22730000 (J25681) Puller		Removing mainshaft front and rear bearing inner race
ST30031000 (J22912-01) Puller		Removing input shaft front and rear bearing Removing 4th & 5th main gear
ST30021000 (J22912-01) Puller		Removing 5th synchronizer Removing 3rd & 4th synchronizer Removing 2nd & 3rd main gear
ST3306S001 (–) Differential side bearing puller set ① ST33051001 (–) Puller ② ST33061000 (J8107-2) Adapter		Removing differential side bearing inner race **a: 28.5 mm (1.122 in) dia.** **b: 38 mm (1.50 in) dia.**
ST33290001 (J34286) Puller		Removing differential oil seal Removing mainshaft rear bearing outer race Removing differential side bearing outer race
ST33400001 (J26082) Drift		Installing differential oil seal **a: 60 mm (2.36 in) dia.** **b: 47 mm (1.85 in) dia.**

Tool number (Kent-Moore No.) Tool name	Description	
ST30600000 (J25863-01) Drift	 a: 36 mm (1.42 in) dia. b: 31 mm (1.22 in) dia.	Installing input shaft front bearing
ST22452000 (—) Drift	 a: 45 mm (1.77 in) dia. b: 36 mm (1.42 in) dia.	Installing 3rd, 4th and 5th main gear
ST30621000 (J25742-5) Drift	 a: 79 mm (3.11 in) dia. b: 59 mm (2.32 in) dia.	Installing mainshaft rear bearing outer race (Use with ST30611000.)
ST30611000 (J25742-1) Drift		Installing mainshaft rear bearing outer race (Use with ST30621000.)
ST30720000 (—) Drift	 a: 77 mm (3.03 in) dia. b: 55.5 mm (2.185 in) dia.	Installing differential side bearing outer race
(J34290) Shim selecting tool set		Selecting differential side bearing adjusting shim
(J34305) Snap ring remover and installer		Removing and installing stopper ring of shift fork

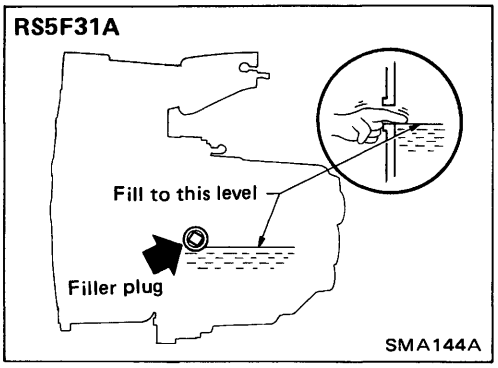
COMMERCIAL SERVICE TOOLS — for RS5F50A

Tool name	Description	
Drift	 a: 45 mm (1.77 in) dia. b: 41 mm (1.61 in) dia.	Installing differential side bearing inner race
Drift	 a: 38 mm (1.50 in) dia. b: 20 mm (0.79 in) dia.	Installing striking rod oil seal

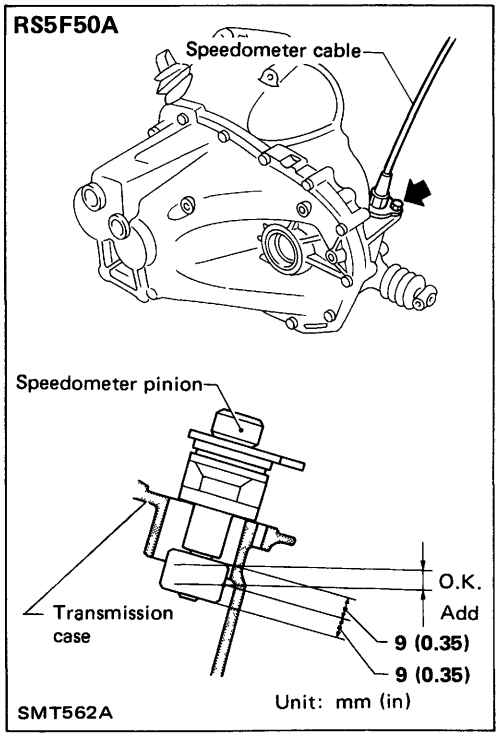

SMA145B

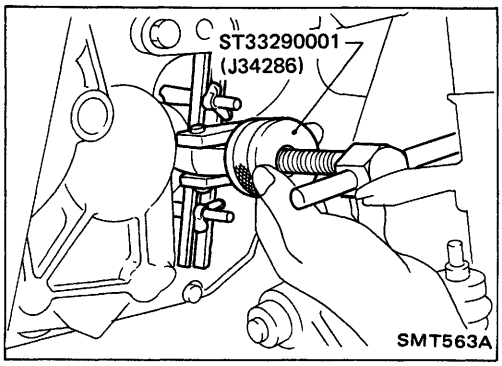
Checking M/T Oil

- Check manual transaxle for leakage.



- Check oil level.

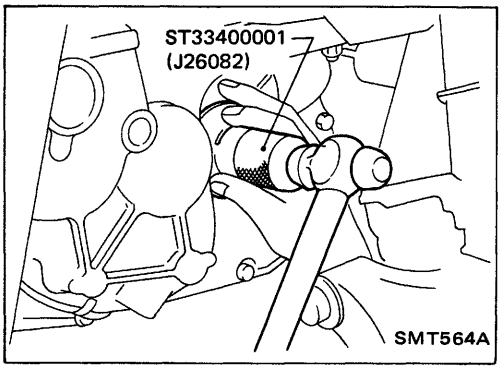




Replacing Oil Seal

DIFFERENTIAL OIL SEAL

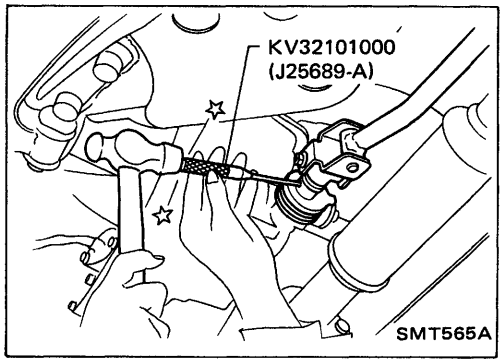
1. Drain gear oil from transaxle.
2. Remove drive shafts – Refer to section FA.
3. Remove differential oil seal.



4. Install differential oil seal.

Apply multi-purpose grease to seal lip of oil seal before installing.

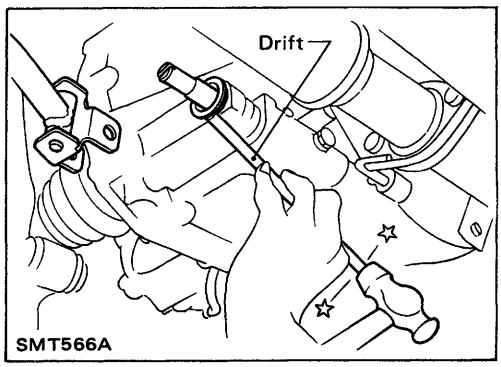
5. Install drive shafts – Refer to section FA.



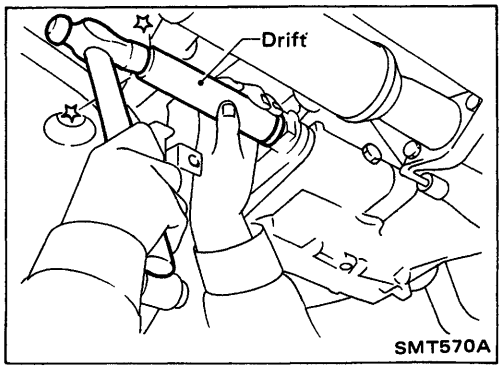
STRIKING ROD OIL SEAL

1. Remove transaxle control rod from yoke.
2. Remove retaining pin of yoke.

Be careful not to damage boot.



3. Remove striking rod oil seal.

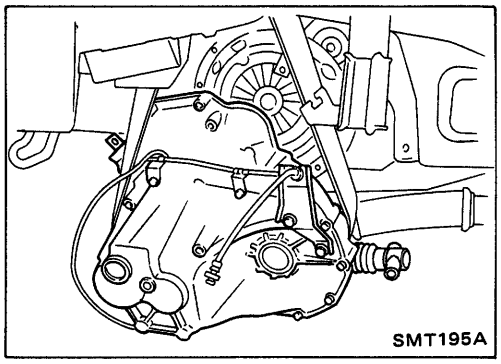


4. Install striking rod oil seal.

Apply multi-purpose grease to seal lip of oil seal before installing.

Removal

- Remove battery and its bracket.
- Remove air cleaner and air flow meter.
- Draw out drive shaft – Refer to section FA.


SMT195A

- Support engine by placing a jack under oil pan.

CAUTION:

Do not place jack under the oil pan drain plug.

- Lower transaxle.

WARNING:

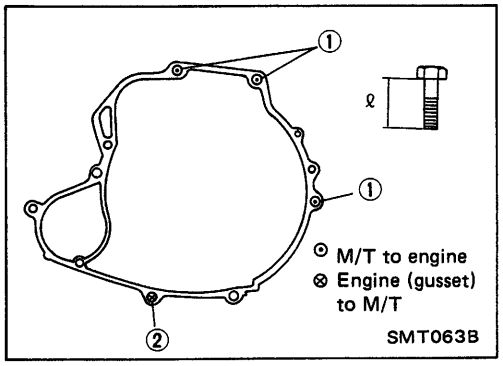
Support Manual Transaxle while removing it.

Installation

Tighten bolts securing transaxle.

- **GA16i engine model**

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
1	16 - 21 (1.6 - 2.1, 12 - 15)	70 (2.76)
2	16 - 21 (1.6 - 2.1, 12 - 15)	25 (0.98)

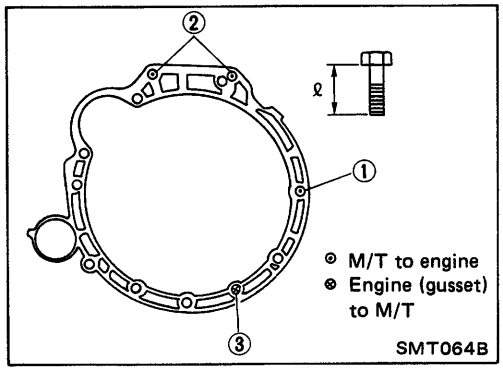


SMT063B

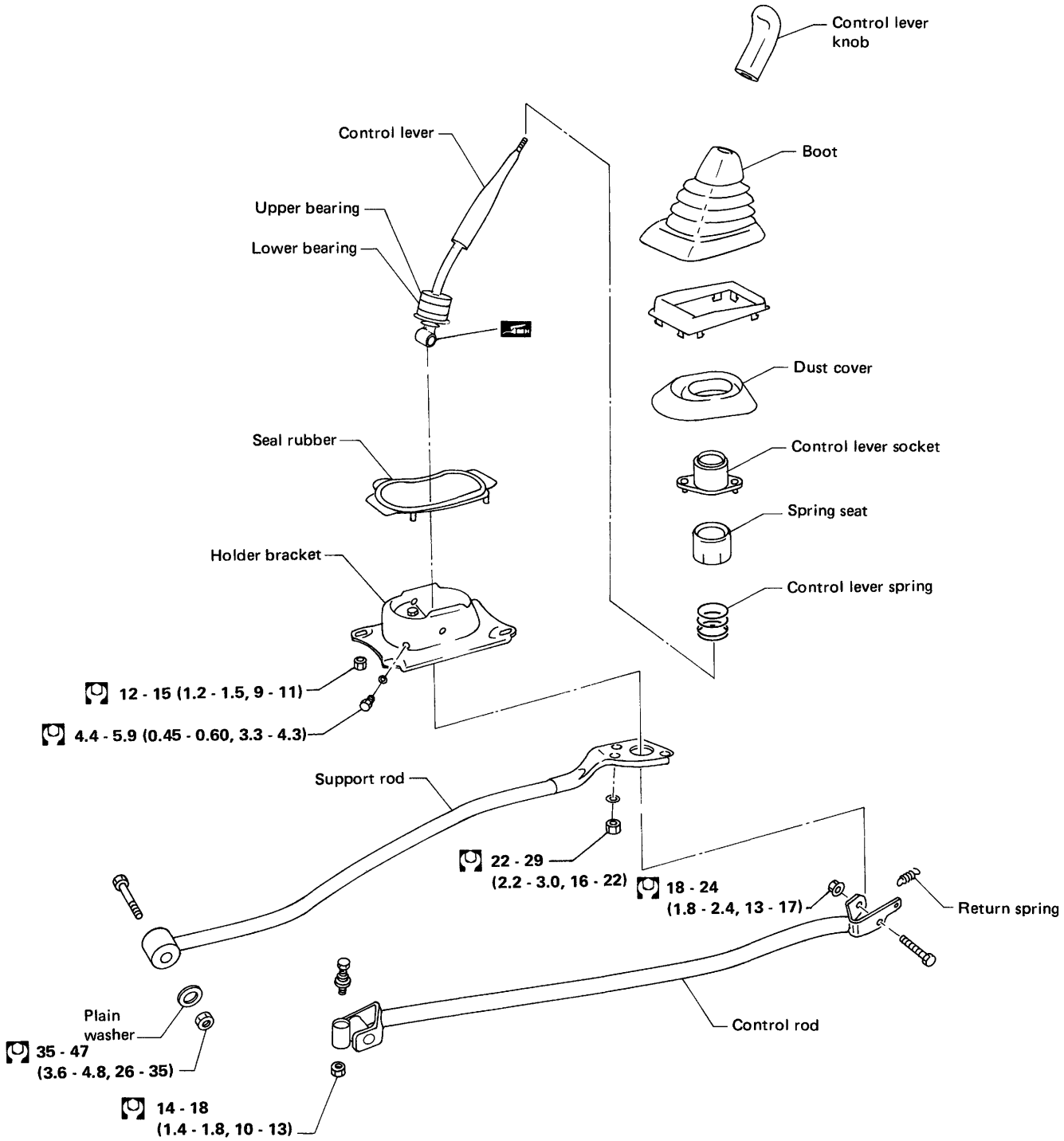
- **CA18DE engine model**

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
1*	43 - 58 (4.4 - 5.9, 32 - 43)	125 (4.92)
2	43 - 58 (4.4 - 5.9, 32 - 43)	65 (2.56)
3	30 - 40 (3.1 - 4.1, 22 - 30)	45 (1.77)

*: With nut



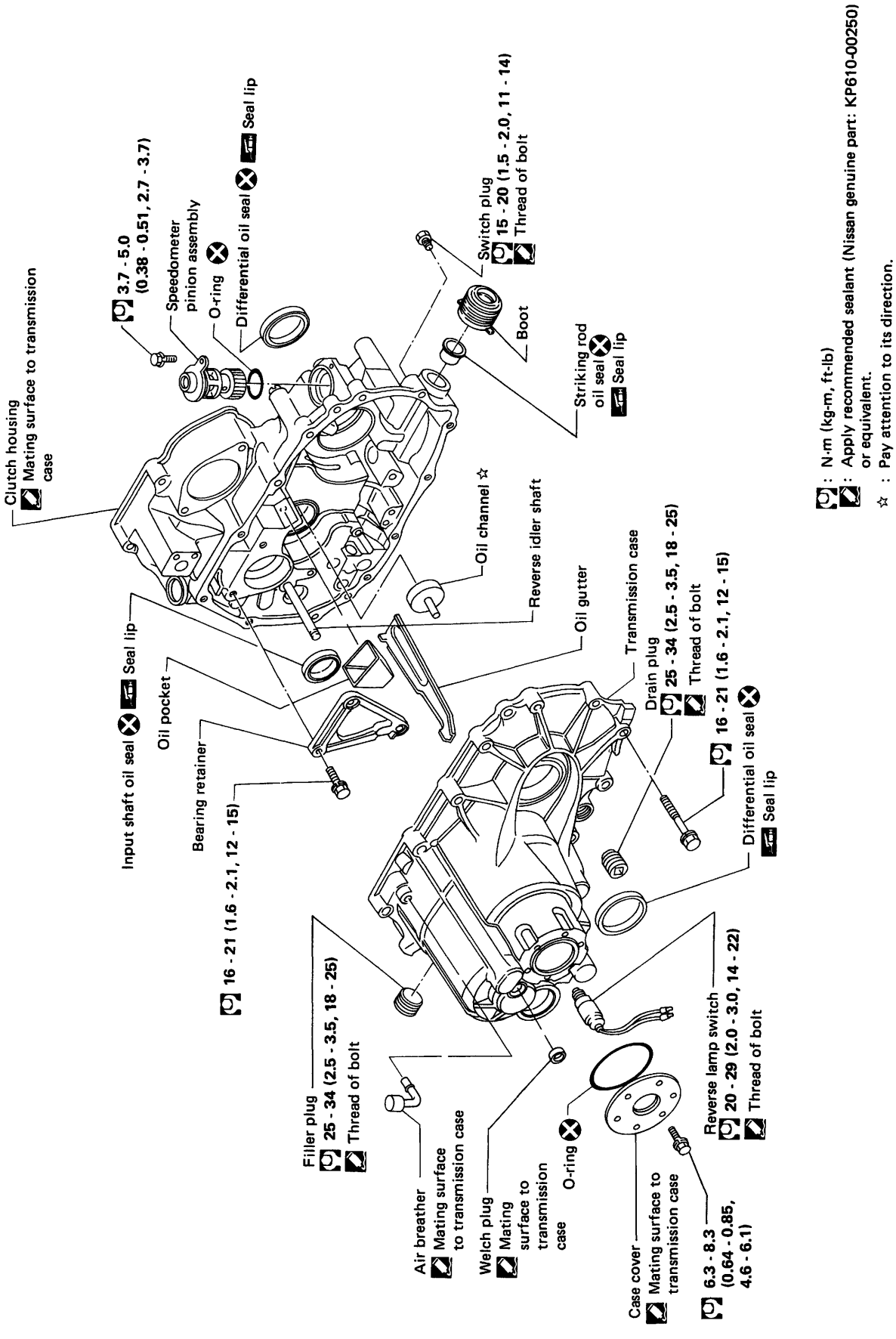
SMT064B



: N·m (kg-m, ft-lb)

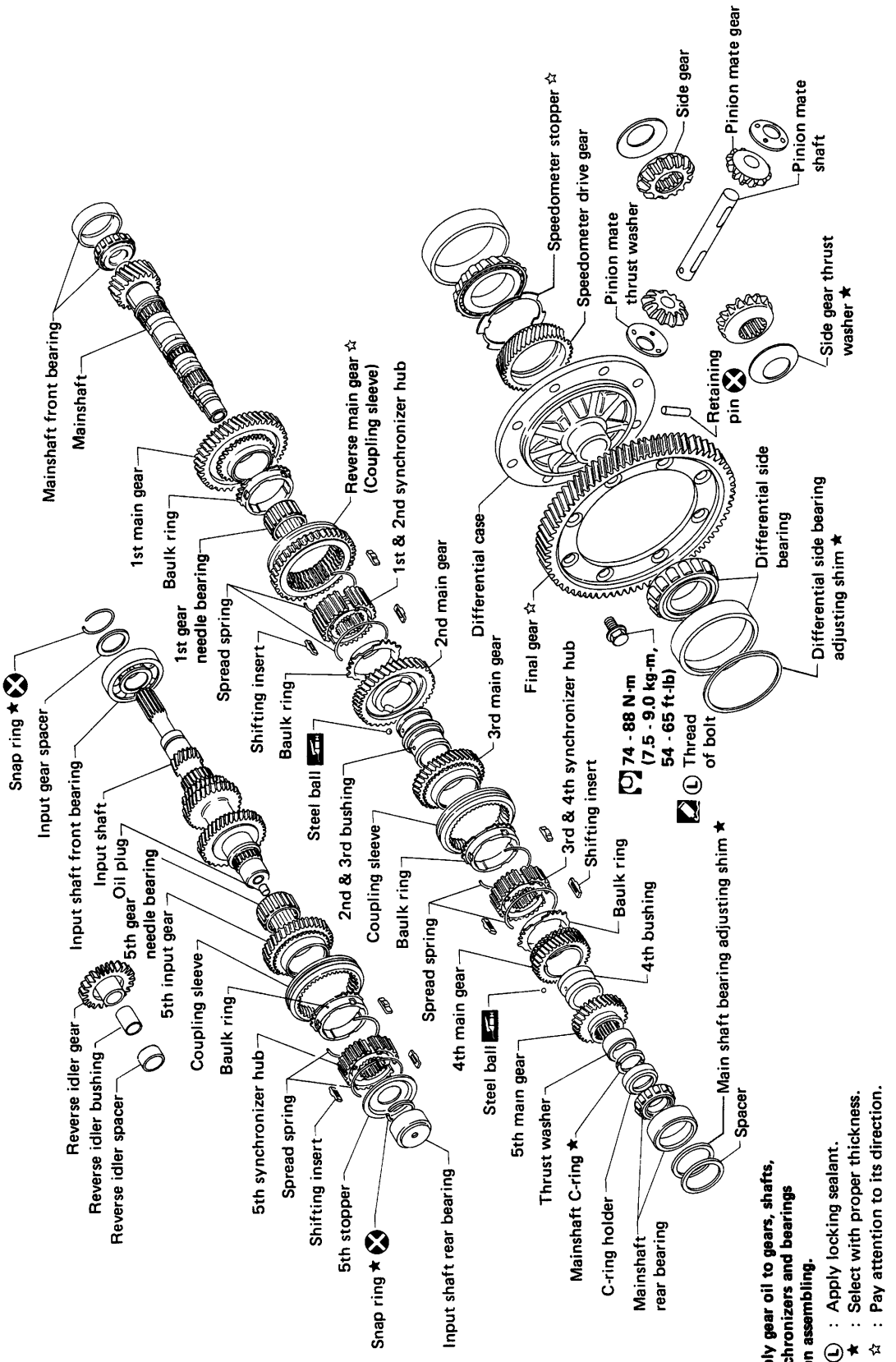
SMT447B

Case Components



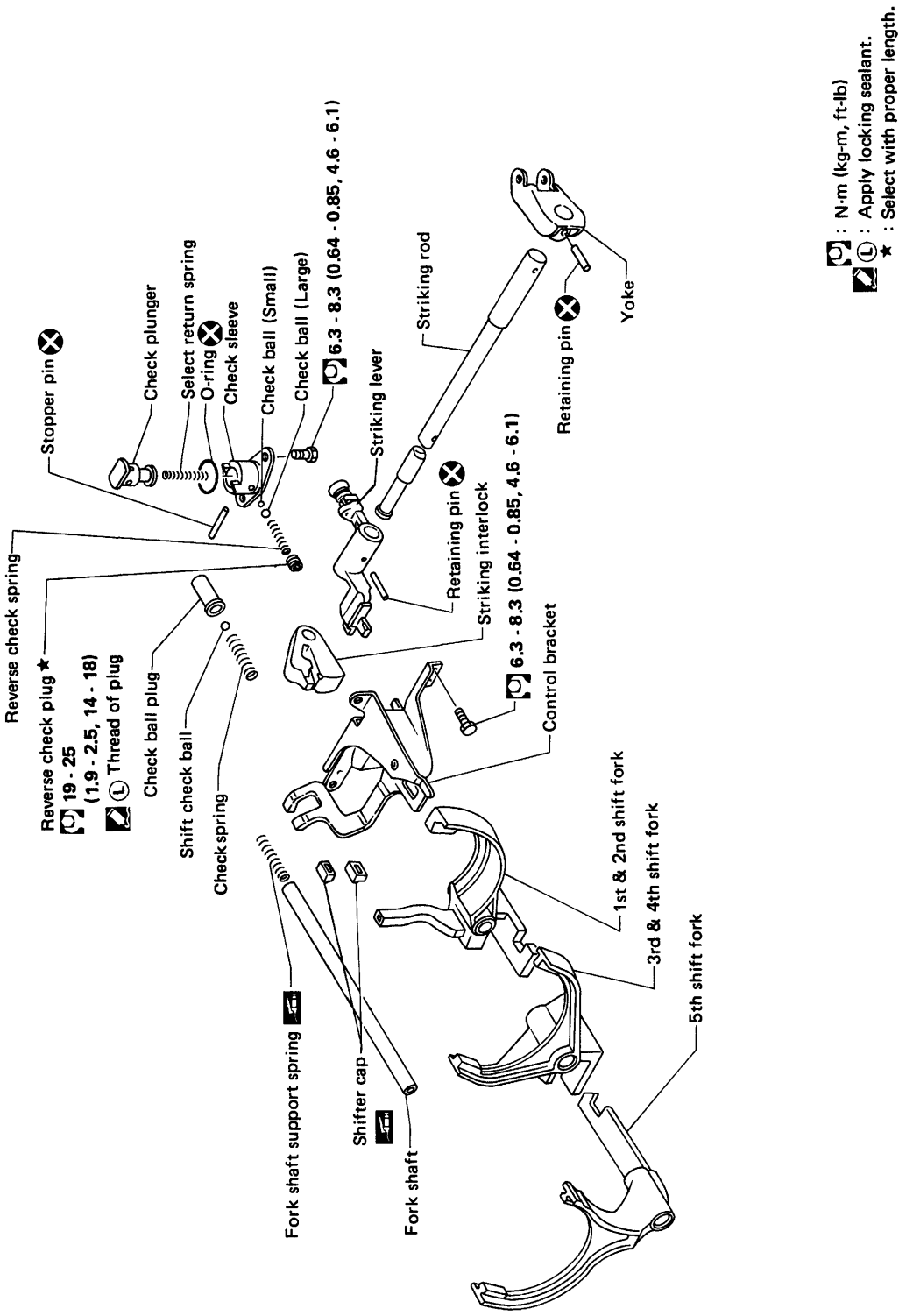
SMT051B

Gear Components

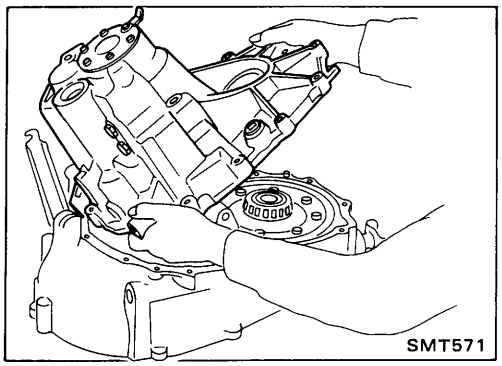


SMT743A

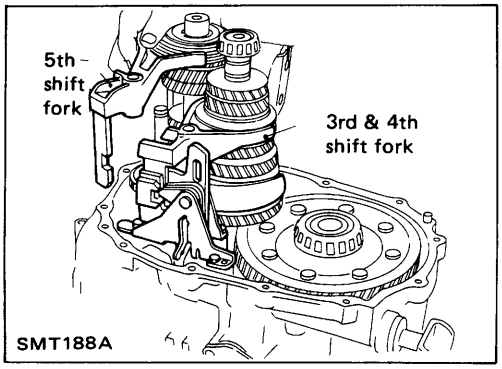
Shift Control Components



SMT598A


SMT571

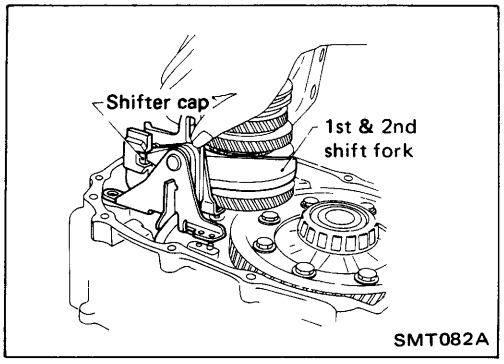
1. Remove transmission case while slightly tilting it to prevent 5th shift fork from interfering with the case.



SMT188A

2. Draw out reverse idler spacer and fork shaft, then remove 5th and 3rd & 4th shift forks.

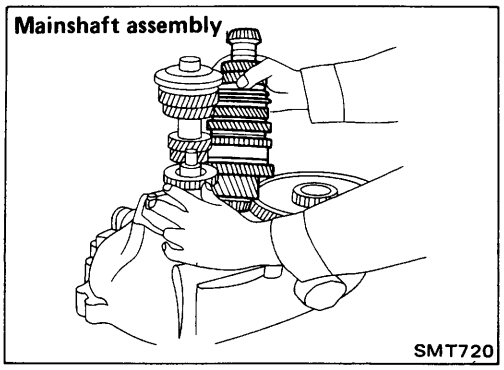
Be careful not to lose shifter cap.



SMT082A

3. Remove control bracket with 1st & 2nd shift fork.

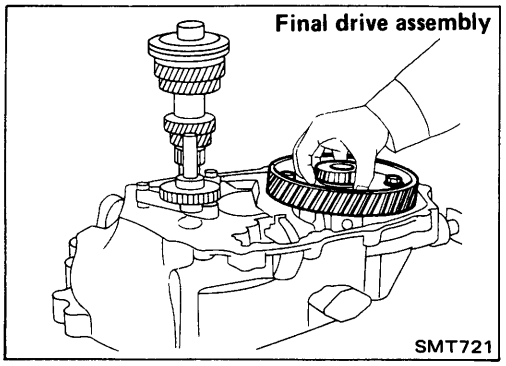
Be careful not to lose shifter cap.



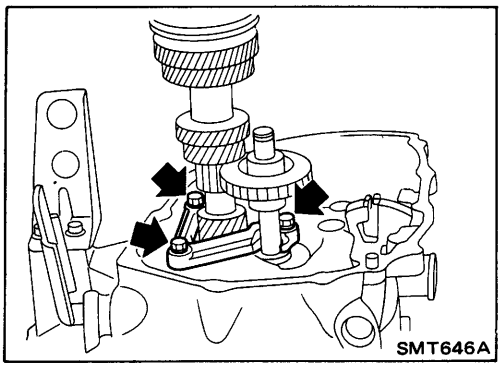
SMT720

4. Remove gear components from clutch housing.
a. Remove mainshaft and final drive assembly.

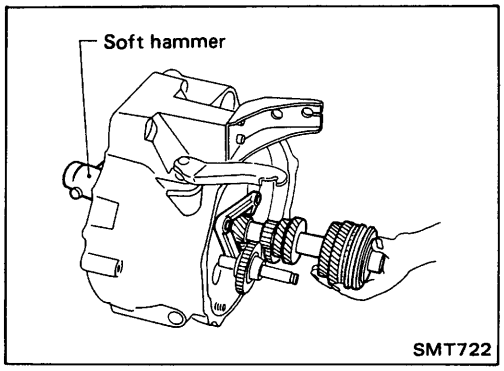
Always withdraw mainshaft straight out. Failure to do so can damage resin oil channel on clutch housing side.



SMT721


SMT646A

b. Remove bearing retainer securing bolts.

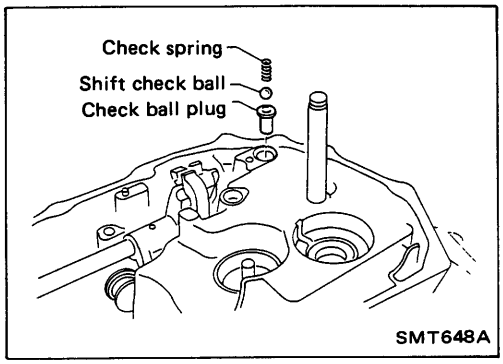


SMT722

c. Remove input shaft together with bearing retainer and reverse idler gear by tapping lightly.

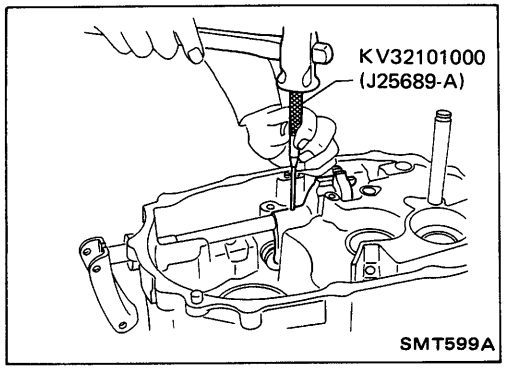
Do not draw out reverse idler shaft from clutch housing because these fittings will be loose.

When removing input shaft, be careful not to scratch oil seal lip with shaft spline.



SMT648A

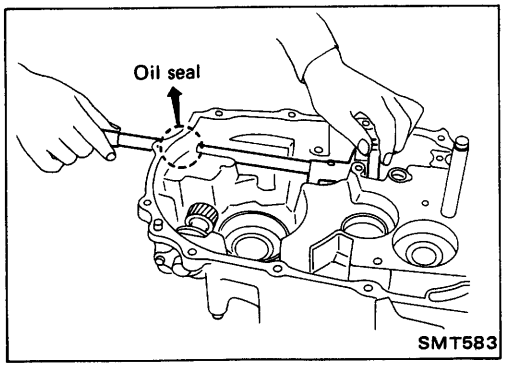
5. Remove oil pocket, shift check ball, check spring and check ball plug.



SMT599A

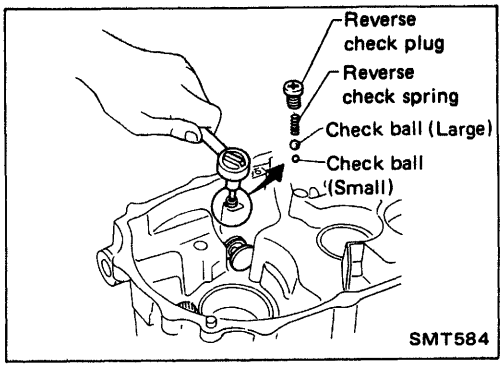
6. Drive retaining pin out of striking lever, then remove striking rod striking lever and striking interlock.

Select a position where retaining pin does not interfere with clutch housing when removing retaining pin.

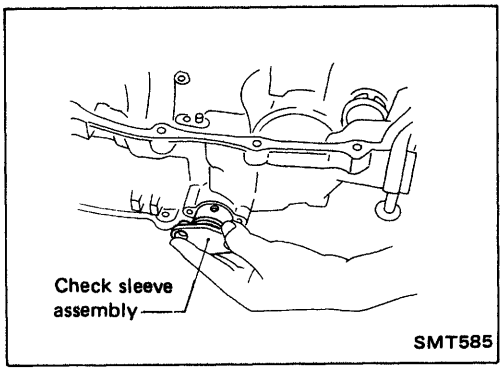


SMT583

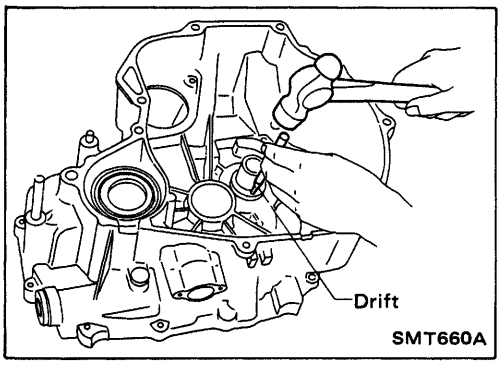
Be careful not to damage oil seal lip, when removing striking rod. If necessary, tape edges of striking rod.



7. Remove reverse check plug, then detach reverse check spring and check balls.



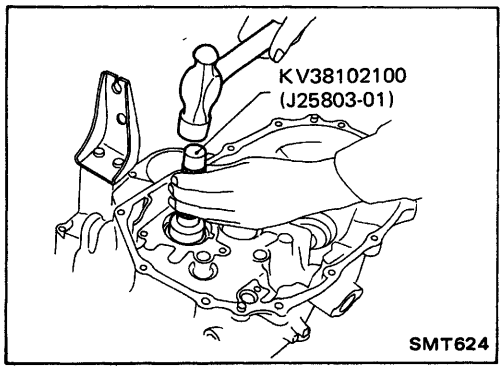
8. Remove check sleeve assembly.



Clutch Housing and Transmission Case

REMOVAL AND INSTALLATION

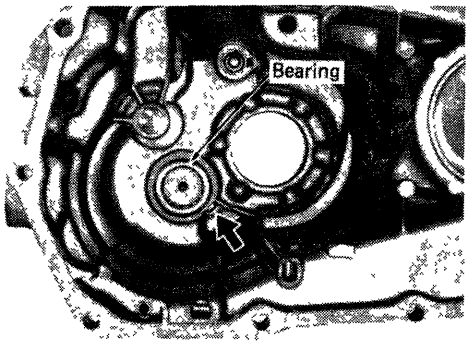
Input shaft oil seal

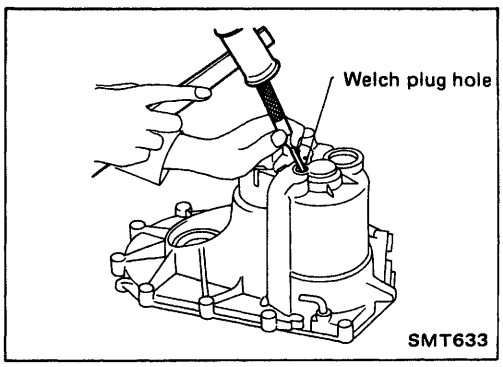


Apply multi-purpose grease to seal lip of oil seal before installing.

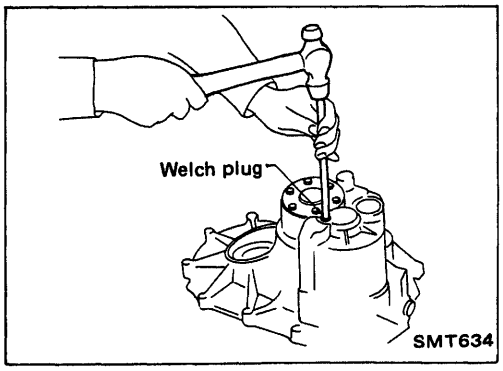
Input shaft rear bearing

1. Remove welch plug from transmission case.





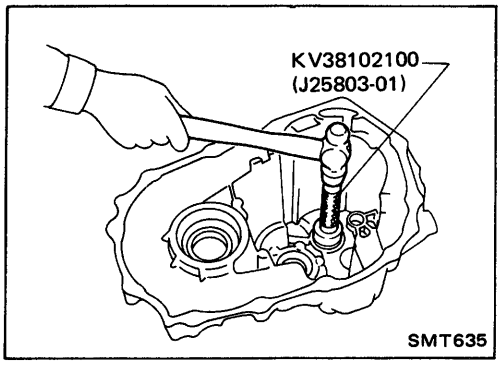
2. Remove input shaft rear bearing by tapping it from welch plug hole.



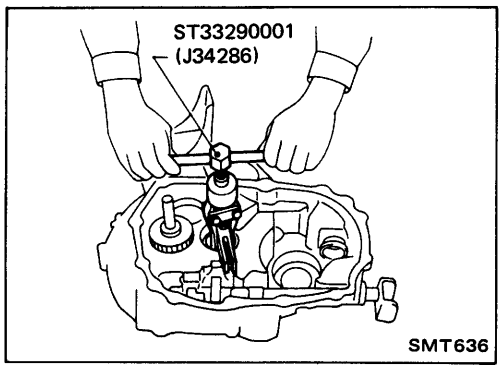
3. Install welch plug.

Apply recommended sealant to mating surface of transmission case.

Clutch Housing and Transmission Case (Cont'd)

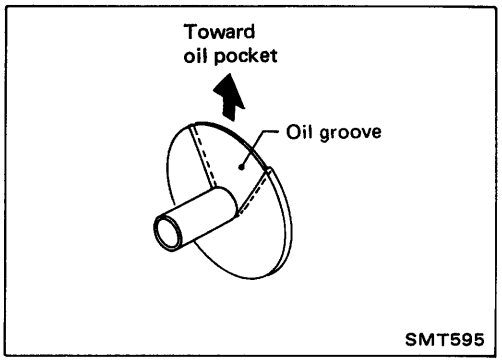


4. Install input shaft rear bearing.



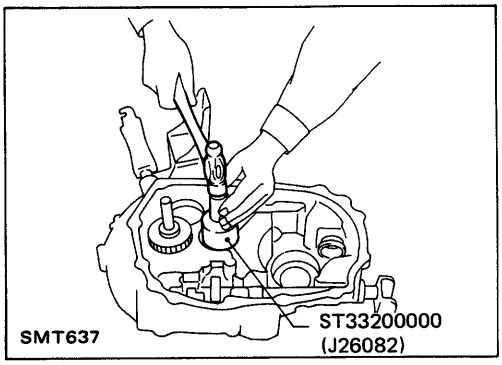
Mainshaft front bearing outer race and oil channel

1. Remove mainshaft front bearing outer race.
2. Remove oil channel.



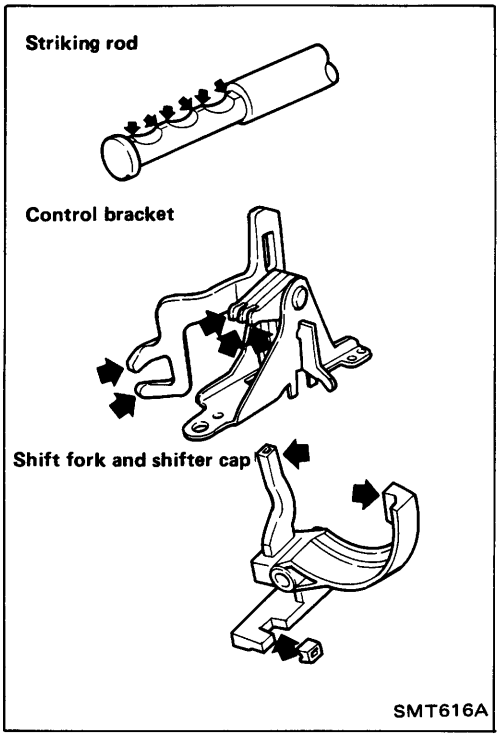
3. Install oil channel.

Ensure that oil groove in oil channel always faces toward oil pocket when installing it on clutch housing.



4. Install mainshaft front bearing outer race.

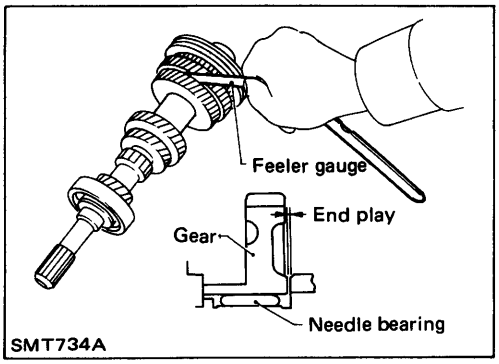
Mainshaft rear bearing outer race – Refer to "ADJUSTMENT".
Differential side bearing outer race – Refer to "ADJUSTMENT".



Shift Control Components

INSPECTION

- Check contact surface and sliding surface for wear, scratches, projections or other damage.



Input Shaft and Gears

DISASSEMBLY

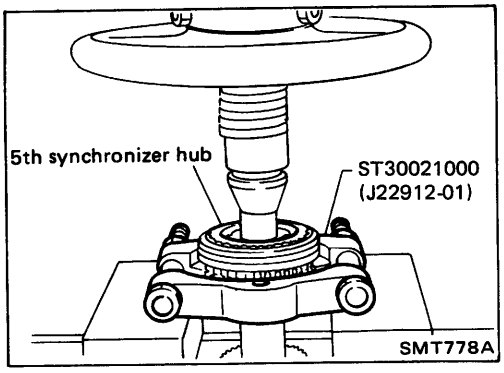
1. Before disassembly, check 5th input gear end play.

Gear end play

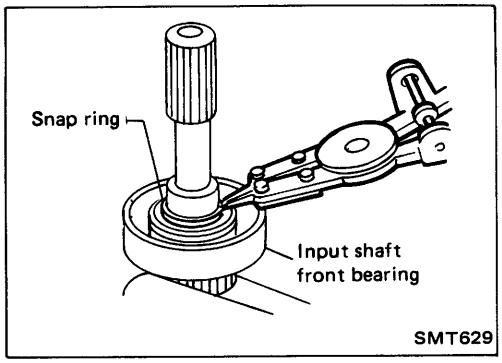
Gears	End play mm (in)
5th input gear	0.18 - 0.41 (0.0071 - 0.0161)

If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring groove. (Refer to Assembly.)

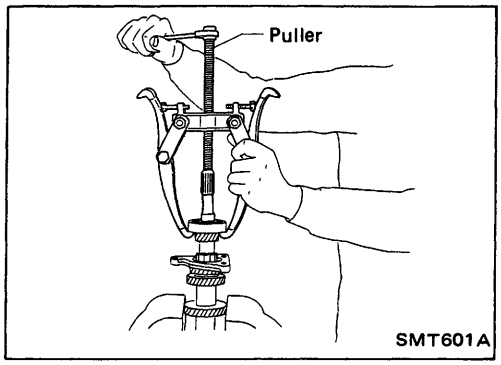
2. Remove snap ring and 5th stopper.
3. Remove 5th synchronizer, 5th input gear and 5th gear needle bearing.



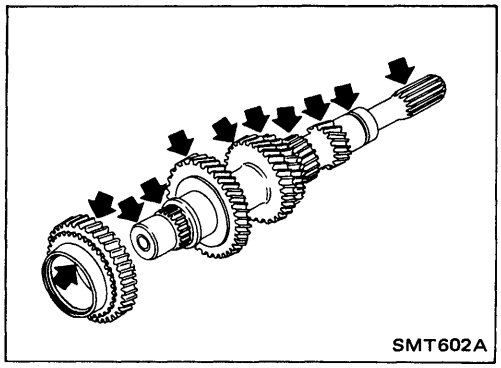
4. Remove snap ring of input shaft front bearing and input gear spacer.



Input Shaft and Gears (Cont'd)



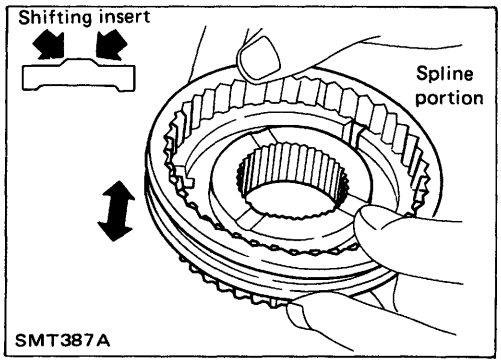
5. Pull out input shaft front bearing.
6. Remove bearing retainer.



INSPECTION

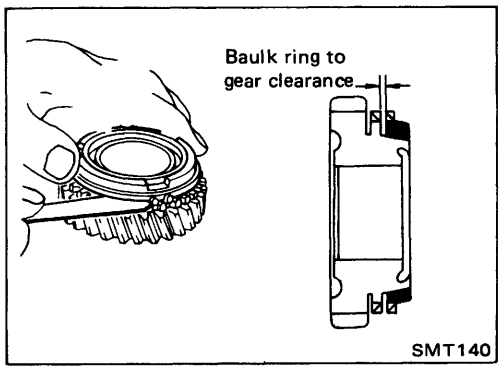
Gear and shaft

- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



Synchronizer

- Check spline portion of coupling sleeve, hub and gear for wear or cracks.
- Check baulk ring for cracks or deformation.
- Check shifting inserts for wear or deformation.



- Measure clearance between baulk ring and gear.

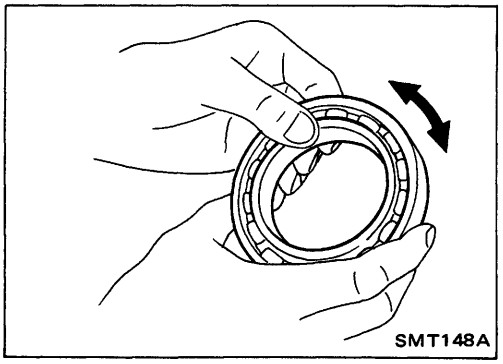
Clearance between baulk ring and 5th input gear:

Standard

1.0 - 1.3 mm (0.039 - 0.051 in)

Wear limit

0.7 mm (0.028 in)



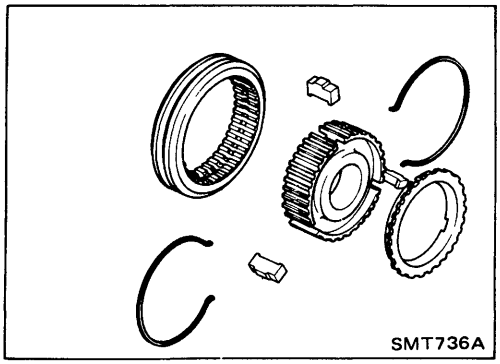
Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

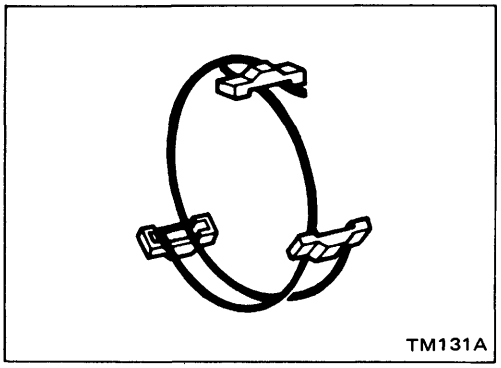
Input Shaft and Gears (Cont'd)

ASSEMBLY

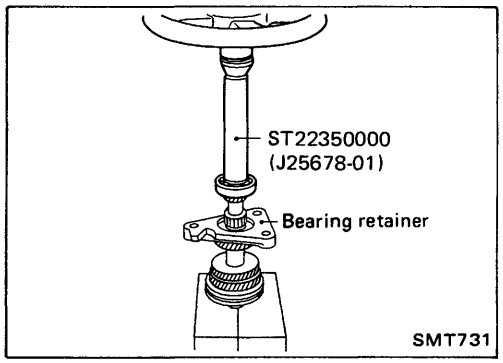
1. Assemble 5th synchronizer.


SMT736A

Be careful not to hook front and rear ends of spread spring to the same insert.


TM131A

2. Install bearing retainer.
3. Press on input shaft front bearing.
4. Install input gear spacer.



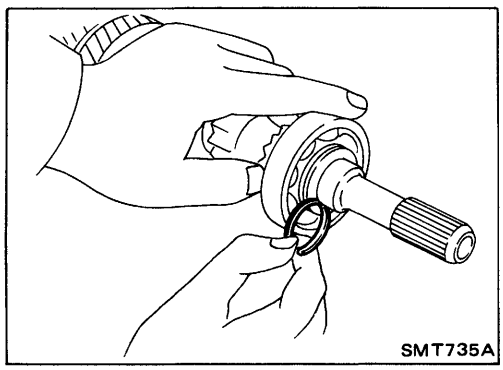
SMT731

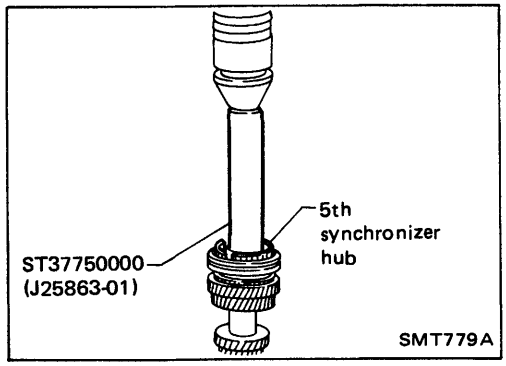
5. Select proper snap ring of input shaft front bearing to minimize clearance of groove in input shaft and then install it.

Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)

Snap ring of input shaft front bearing

Thickness mm (in)	Part number
1.27 (0.0500)	32204-M8004
1.33 (0.0524)	32204-M8005
1.39 (0.0547)	32204-M8006
1.45 (0.0571)	32204-M8007

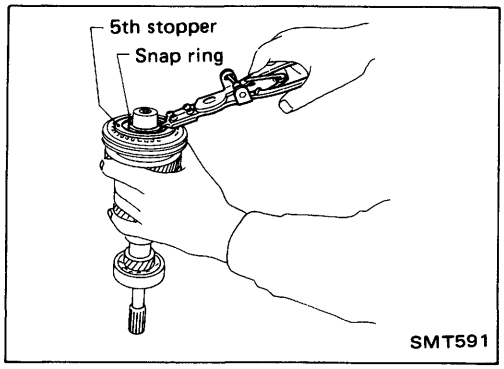

SMT735A



SMT779A

6. Install 5th gear needle bearing, 5th input gear, 5th synchronizer and 5th stopper.
7. Measure gear end play as the final check — Refer to Disassembly.

Input Shaft and Gears (Cont'd)



8. Select proper snap ring of 5th synchronizer hub to minimize clearance of groove in input shaft and install it.

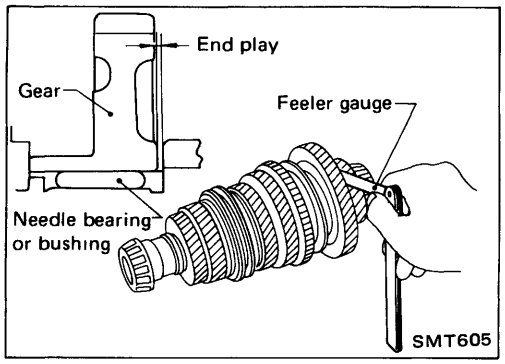
Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)

Snap ring of 5th synchronizer

Thickness mm (in)	Part number
2.00 (0.0787)	32311-M8812
2.05 (0.0807)	32311-M8813
2.10 (0.0827)	32311-M8814
2.15 (0.0846)	32311-M8815
2.20 (0.0866)	32311-M8816
2.25 (0.0886)	32311-M8817
2.30 (0.0906)	32311-M8818

Mainshaft and Gears

DISASSEMBLY

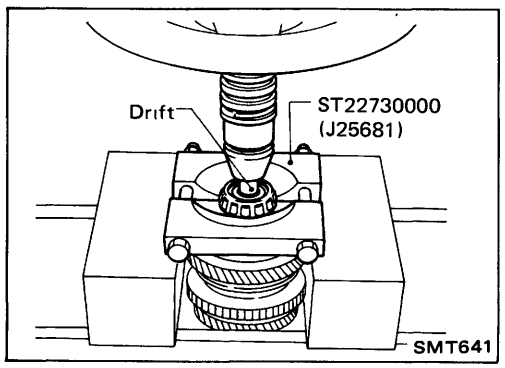


1. Before disassembly, check 1st, 2nd, 3rd and 4th main gear end plays.

Gear end play

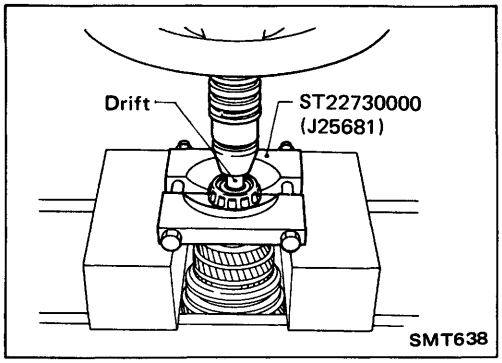
Gears	End play mm (in)
1st main gear	0.18 - 0.31 (0.0071 - 0.0122)
2nd-4th main gear	0.20 - 0.40 (0.0079 - 0.0157)

If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of C-ring groove. (Refer to Assembly.)

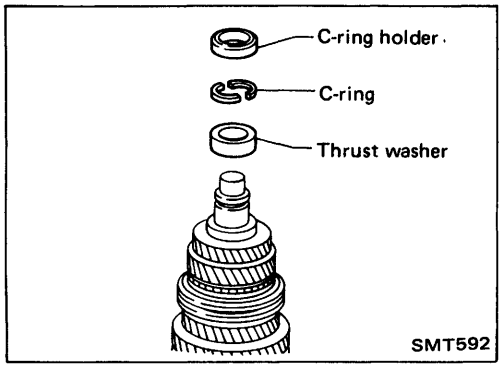


2. Press out mainshaft front bearing.

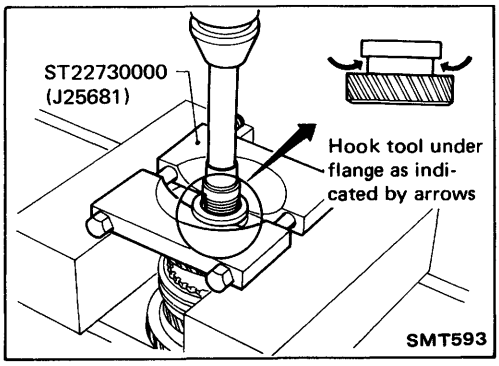
Mainshaft and Gears (Cont'd)



3. Press out mainshaft rear bearing.

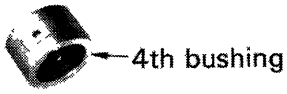


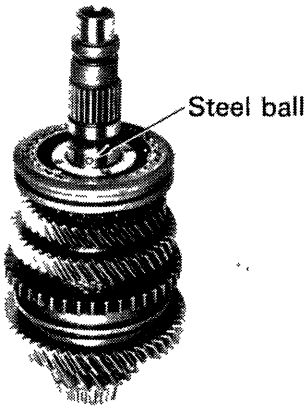
4. Remove C-rings, C-ring holder and thrust washer.



5. Press out 5th main gear.

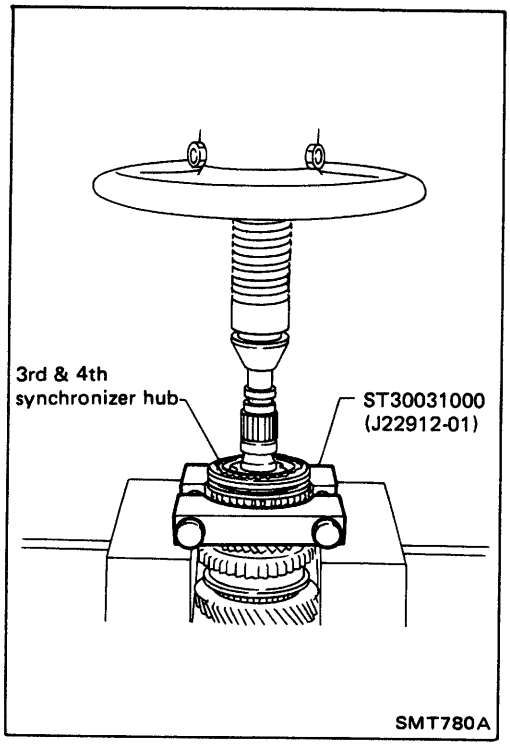






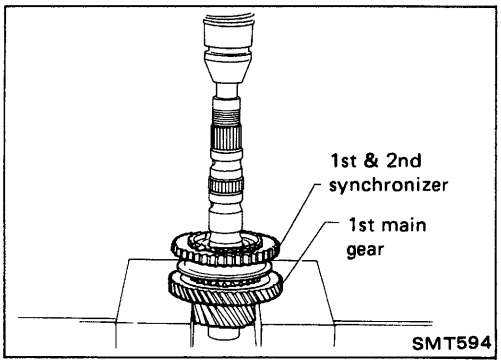
6. Remove 4th main gear, 4th bushing and steel ball.
Be careful not to lose steel ball.

Mainshaft and Gears (Cont'd)

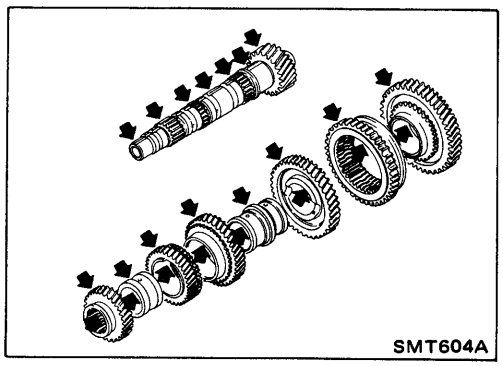


7. Remove 3rd & 4th synchronizer, 3rd main gear, 2nd & 3rd bushing, steel ball and 2nd main gear.

Be careful not to lose steel ball.



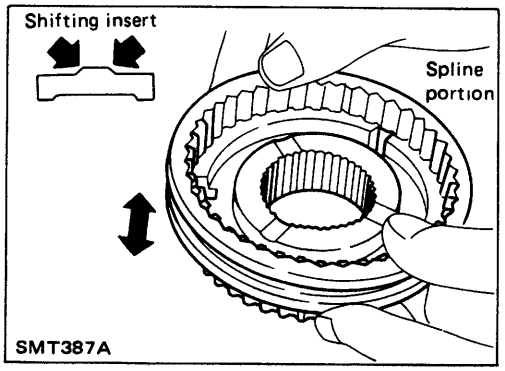
8. Remove 1st & 2nd synchronizer and 1st main gear, then remove 1st gear needle bearing.



INSPECTION

Gear and shaft

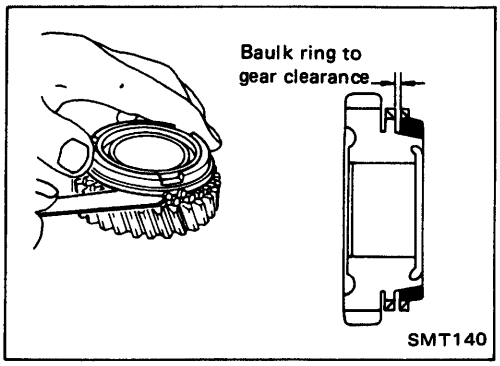
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



Synchronizer

- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check shifting inserts for wear or deformation.

Mainshaft and Gears (Cont'd)



- Measure clearance between baulk ring and gear.

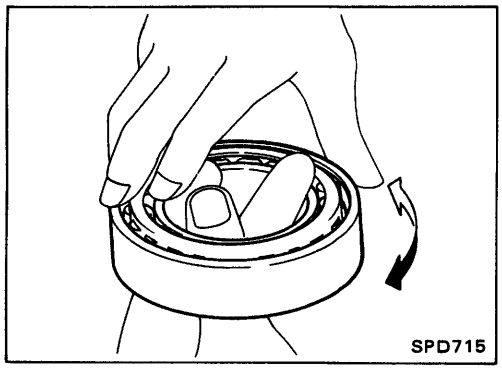
Clearance between baulk rings and 1st-4th main gears:

Standard

1.0 - 1.3 mm (0.039 - 0.051 in)

Wear limit

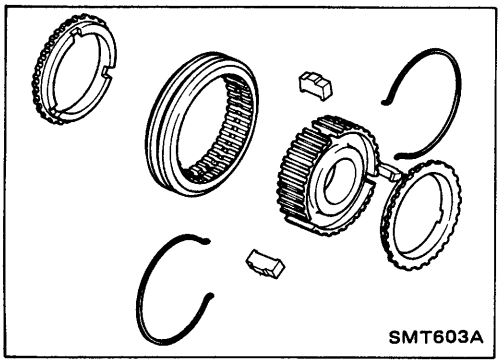
0.7 mm (0.028 in)



Bearing

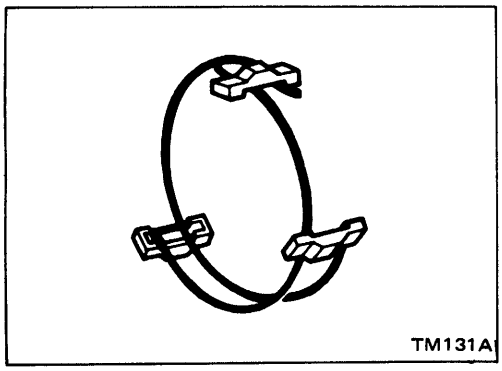
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

When replacing tapered roller bearing, replace outer and inner race as a set.

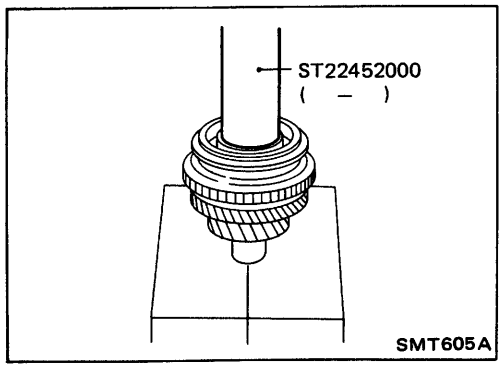


ASSEMBLY

1. Assemble 1st & 2nd and 3rd & 4th synchronizers.

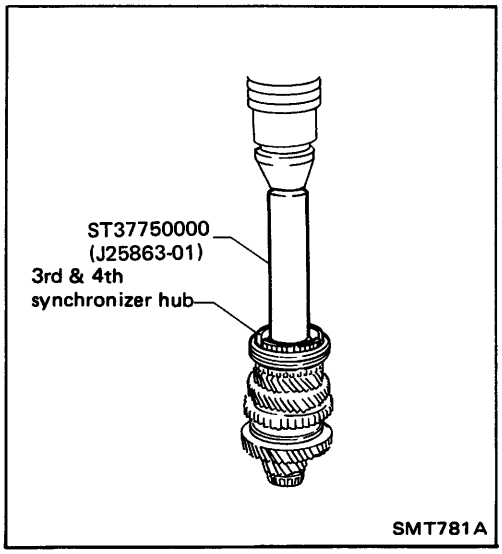


Be careful not to hook front and rear ends of spread spring to the same insert.



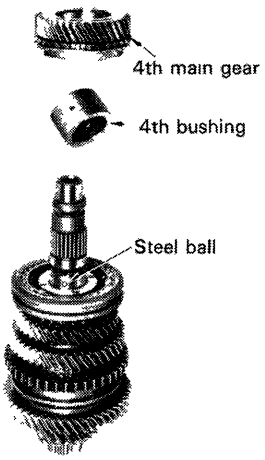
2. Install 1st gear needle bearing and 1st main gear.
3. Press on 1st & 2nd synchronizer.

Mainshaft and Gears (Cont'd)



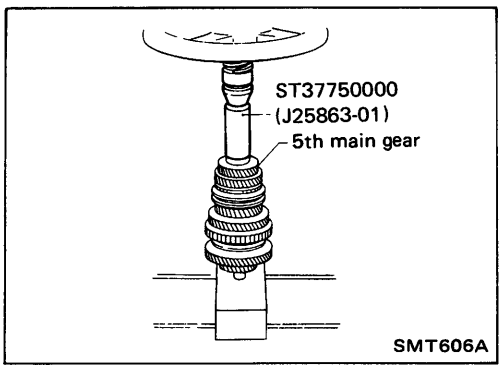
4. Install steel ball, 2nd main gear, 2nd & 3rd bushing, 3rd main gear and 3rd & 4th synchronizer.

Apply multi-purpose grease to steel ball before installing it.
2nd & 3rd bushing has a groove in which steel ball fits.



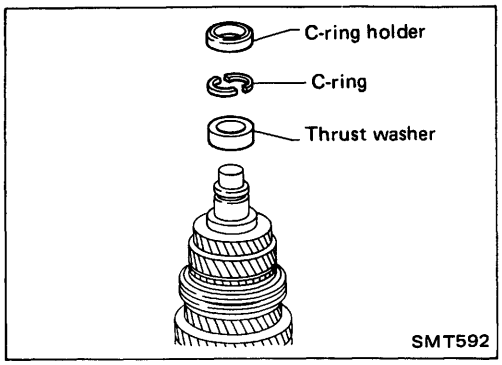
5. Install steel ball, 4th bushing and 4th main gear.

Apply multi-purpose grease to steel ball before installing it.
4th bushing has a groove in which steel ball fits.



6. Press on 5th main gear.

Mainshaft and Gears (Cont'd)



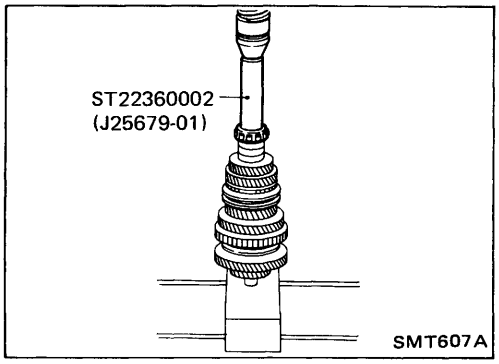
7. Install thrust washer.
8. Select proper C-ring to minimize clearance of groove in mainshaft and install it.

Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)

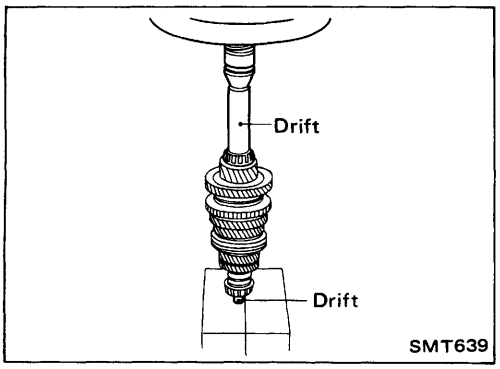
Mainshaft C-ring

Thickness mm (in)	Part number	Thickness mm (in)	Part number
3.63 (0.1429)	32348-M8800	4.12 (0.1622)	32348-M8807
3.70 (0.1457)	32348-M8801	4.19 (0.1650)	32348-M8808
3.77 (0.1484)	32348-M8802	4.26 (0.1677)	32348-M8809
3.84 (0.1512)	32348-M8803	4.33 (0.1705)	32348-M8810
3.91 (0.1539)	32348-M8804	4.40 (0.1732)	32348-M8811
3.98 (0.1567)	32348-M8805	4.47 (0.1760)	32348-M8812
4.05 (0.1594)	32348-M8806	4.54 (0.1787)	32348-M8813

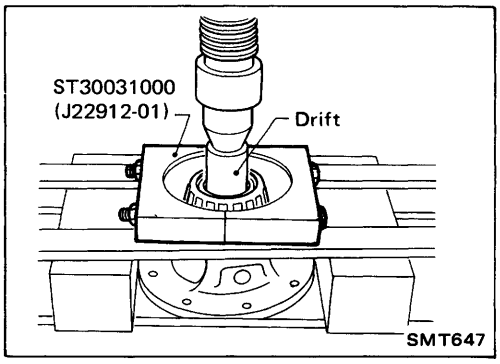
9. Install C-ring holder.



10. Press on mainshaft rear bearing.



11. Press on mainshaft front bearing.
12. Measure gear end play as the final check — Refer to "Disassembly".



Final Drive

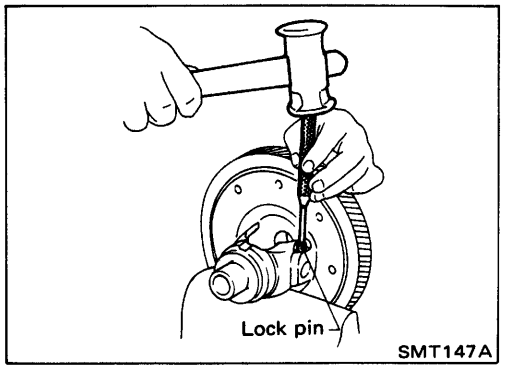
DISASSEMBLY

1. Remove final gear.
2. Remove speedometer drive gear by cutting it.
3. Press out differential side bearings.

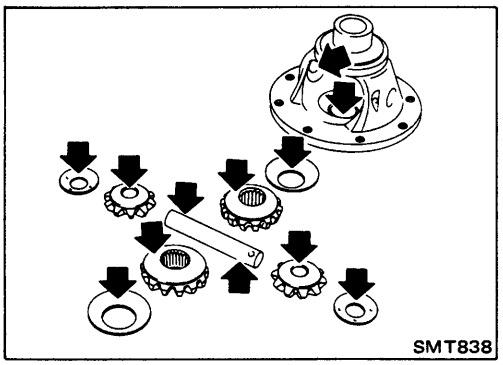
Be careful not to mix up the right and left bearings.

4. Remove speedometer stopper.

Final Drive (Cont'd)



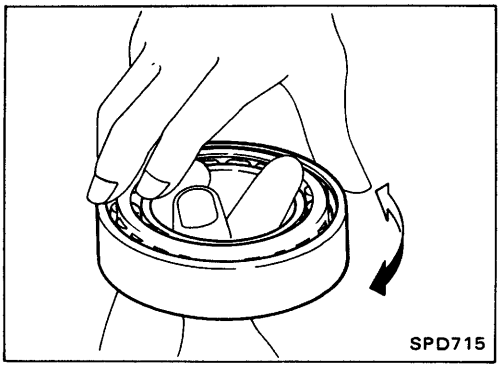
5. Drive out retaining pin and draw out pinion mate shaft.
6. Remove pinion mate gears and side gears.



INSPECTION

Gear, washer, shaft and case

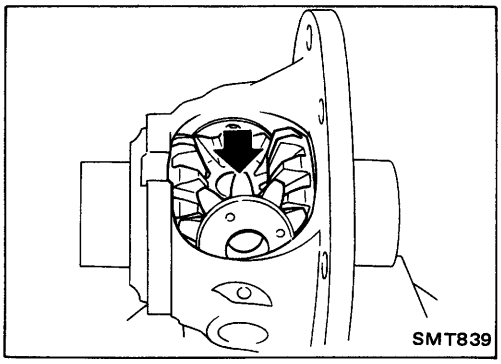
- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.



Bearing

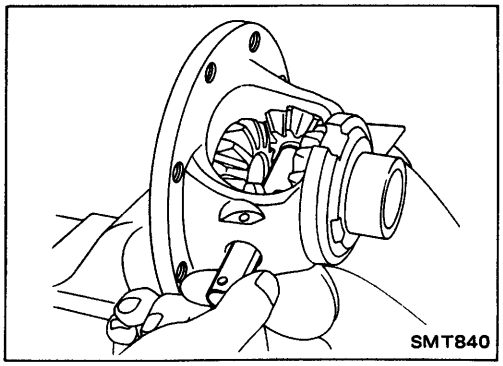
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

When replacing tapered roller bearing, replace outer and inner race as a set.



ASSEMBLY

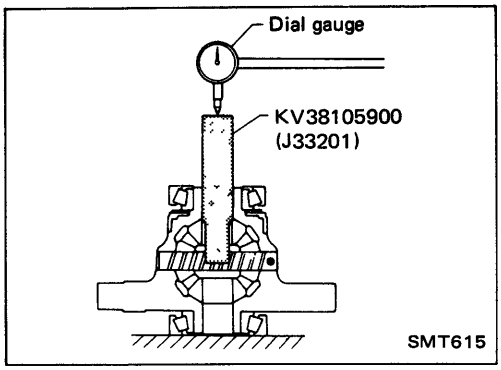
1. Fit side gear thrust washers and side gears, then install pinion mate washers and pinion mate gears in place.



2. Insert pinion mate shaft.

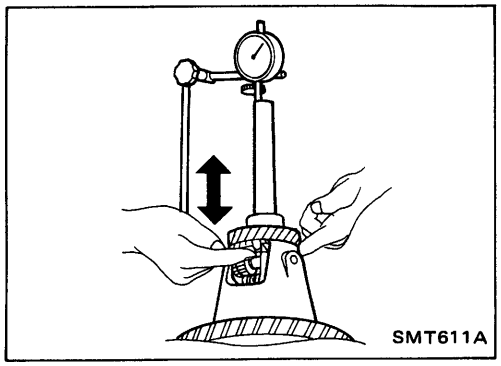
When inserting, be careful not to damage pinion mate thrust washers.

Final Drive (Cont'd)



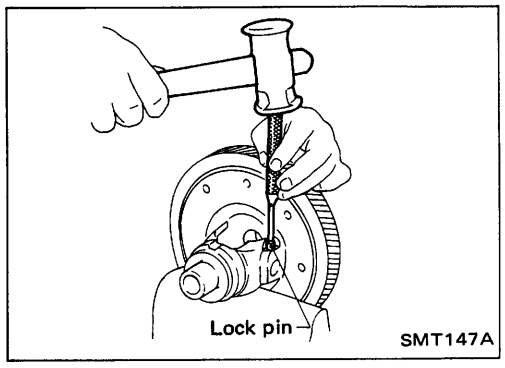
3. Measure clearance between side gear and differential case with washers following the procedure below.
a. Set Tool and dial indicator on side gear.
b. Move side gear up and down to measure dial indicator deflection. Always measure indicator deflection on both side gears.

Clearance between side gear and differential case with washers:
0.3 mm (0.012 in) or less



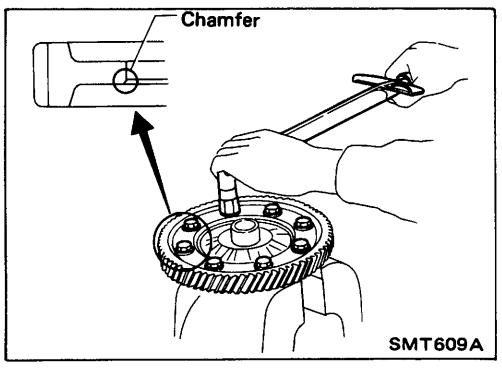
c. If not within specification, adjust clearance by changing thickness of side gear thrust washers.

Side gear thrust washer:
Refer to S.D.S.



4. Install retaining pin.

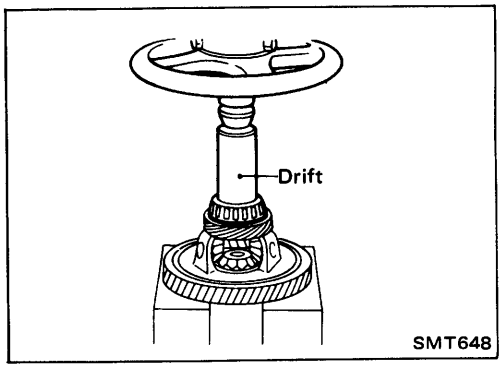
Make sure that retaining pin is flush with case.



5. Install final gear.

Apply locking sealant to final gear fixing bolts before installing them.

6. Install speedometer drive gear and stopper.

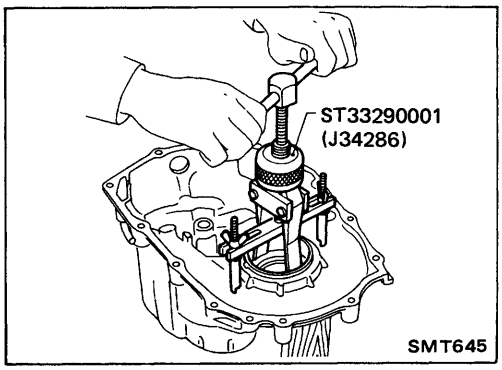


7. Press on differential side bearings.

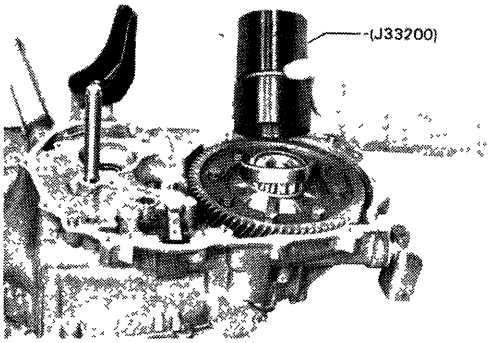
Differential Side Bearing Preload

If any of the following parts are replaced, adjust differential side bearing preload.

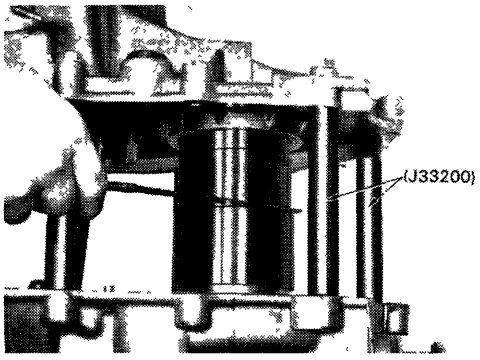
- **Differential case**
- **Differential side bearing**
- **Clutch housing**
- **Transmission case**



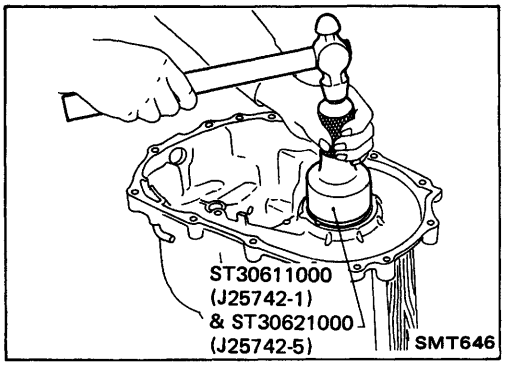
1. Remove differential side bearing outer race (transmission case side) and shim.
2. Install final drive assembly on clutch housing.



3. Place differential side bearing outer race (transmission case side) and Tool on final drive assembly.
4. Position four spacers evenly spaced apart around clutch housing and install transmission case. Then tighten bolts alternately to specified torque.
5. Rotate final drive assembly a few times to ensure proper seating.



6. Measure widest gap around Tool with feeler gauge.
7. Select shim with S.D.S. table as a guide.

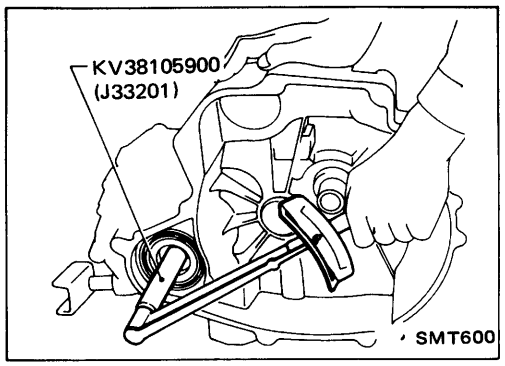


8. Install selected shim and differential side bearing outer race.
9. Check differential side bearing turning torque.

a. Install final drive assembly on clutch housing.
b. Install transmission case on clutch housing.

Tighten transmission case fixing bolts to the specified torque.

Differential Side Bearing Preload (Cont'd)



c. Measure turning torque of final drive assembly.

Turning torque of final drive assembly
(New bearing):
3.9 - 7.8 N·m
(40 - 80 kg-cm, 35 - 69 in-lb)

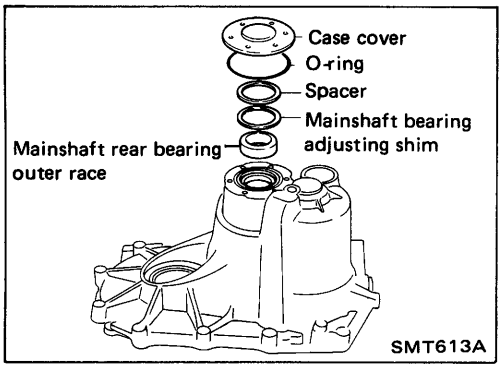
When old bearing is used again, turning torque will be slightly lower than that indicated above. Check turning torque to see if it is not far from specified range.

Changes in turning torque of final drive assembly per revolution should be within 1.0 N·m (10 kg-cm, 8.7 in-lb) without binding.

Mainshaft Bearing Preload

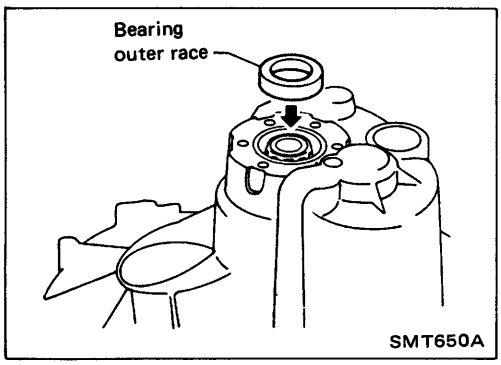
If any of the following parts are replaced, adjust mainshaft bearing preload.

- **Mainshaft**
- **Mainshaft bearings**
- **Clutch housing**
- **Transmission case**

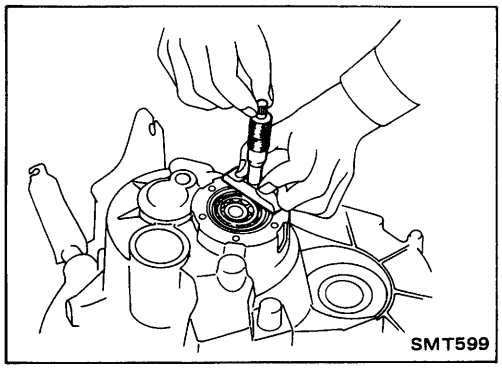


1. Remove case cover, O-ring, spacer, mainshaft bearing adjusting shim and mainshaft rear bearing outer race from transmission case.
2. Install mainshaft assembly on clutch housing.
3. Install transmission case on clutch housing.

Tighten transmission case fixing bolts to the specified torque.



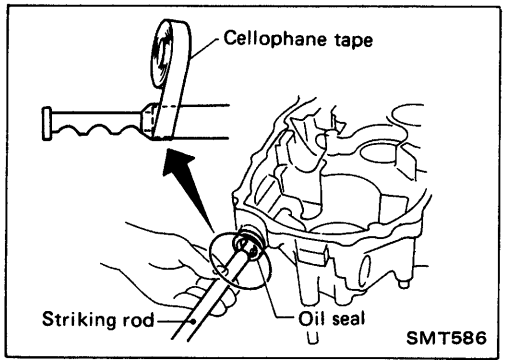
4. Re-install mainshaft rear bearing outer race on inner race.



5. Measure distance from transmission case to bearing outer race.

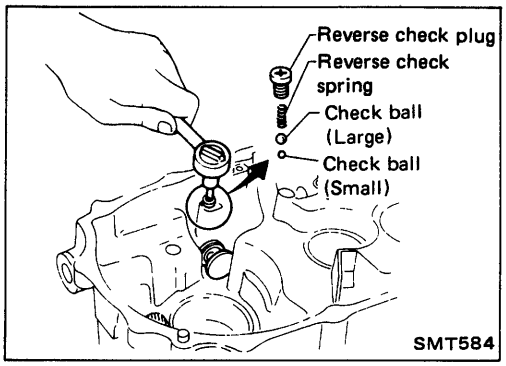
Make sure that bearing is properly seated.

6. Select shim with S.D.S. table as a guide.
7. Check total turning torque after assembling – Refer to "ASSEMBLY".

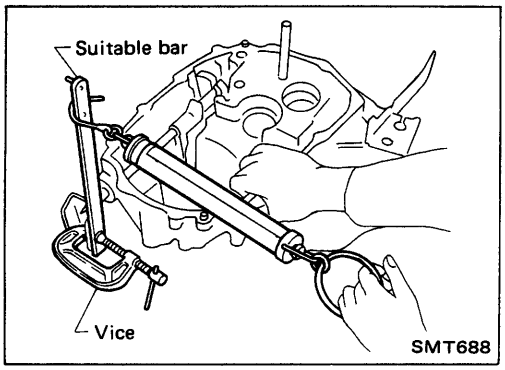


1. Install striking rod, lever and interlock.

When inserting striking rod into clutch housing, tape edges of striking rod to avoid damaging oil seal's lip if it hits against oil seal.



2. Install reverse check sleeve assembly.
3. Install check balls, reverse check spring and check plug.



4. Check reverse check force.

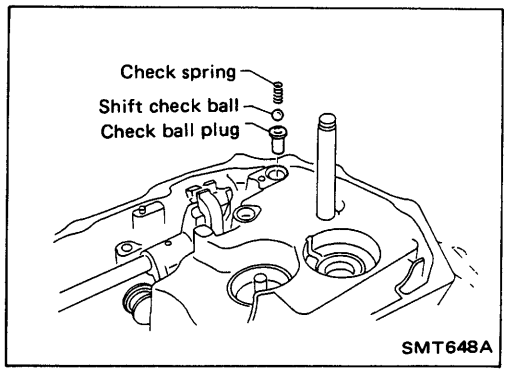
Reverse check force:
4.9 - 7.4 N·m
(50 - 75 kg-cm, 43 - 65 in-lb)

If not within specification, select another check plug having a different length and reinstall it.

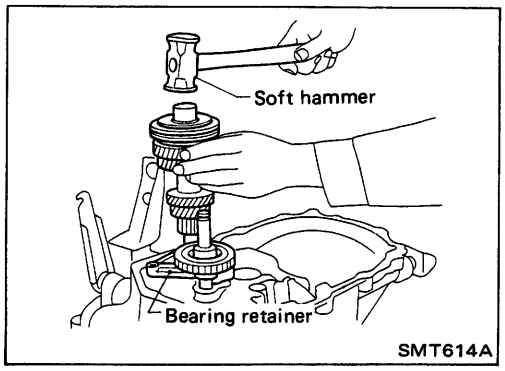
Reverse check plug: Refer to S.D.S.

5. Install selected reverse check plug.

Apply locking sealant to thread of plug before installing it.



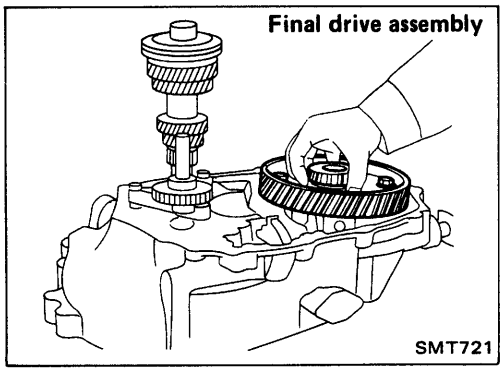
6. Install check ball plug, shift check ball and check spring.
7. Install oil pocket.



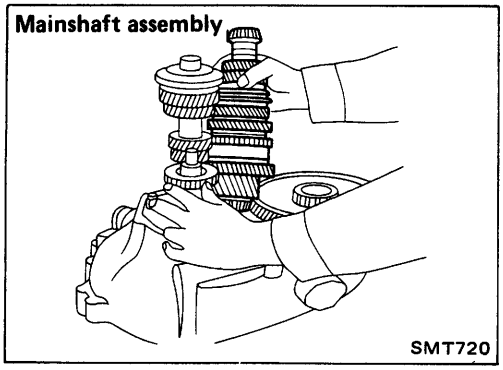
8. Install gear components onto clutch housing.

a. Install input shaft assembly and reverse idler gear.

Use care not to damage oil seal's lip by splines of input shaft while shaft is being inserted into clutch housing.

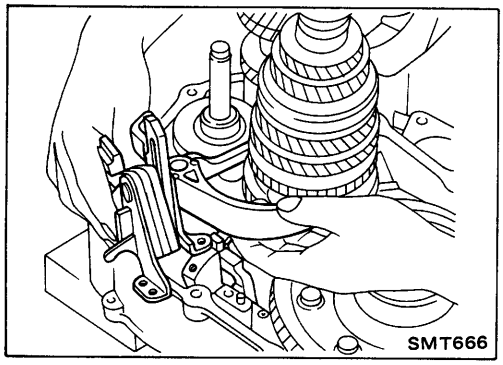


b. Install final drive assembly.

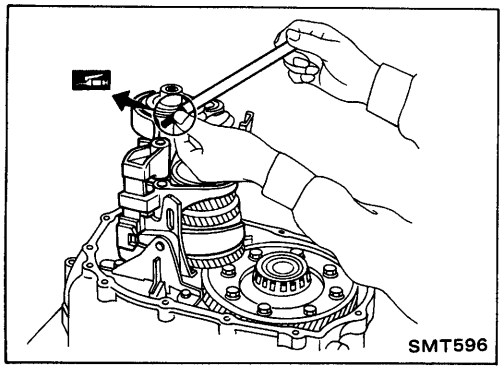


c. Install mainshaft assembly.

Use care not to damage oil channel when inserting mainshaft into clutch housing.



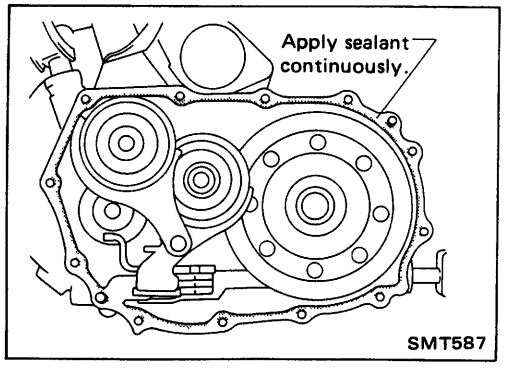
9. Apply grease to shifter caps, then install it to control bracket. Install control bracket with 1st & 2nd shift fork.
10. Install 3rd & 4th and 5th shift forks.



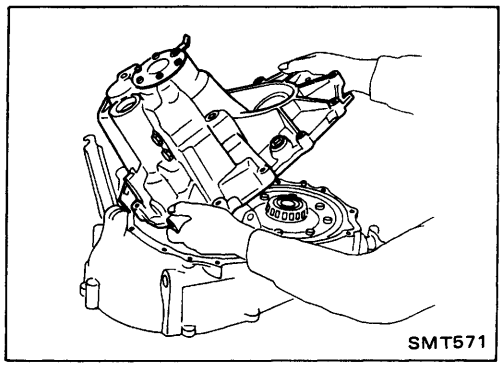
11. Insert fork shaft.

Apply multi-purpose grease to support spring before installing.

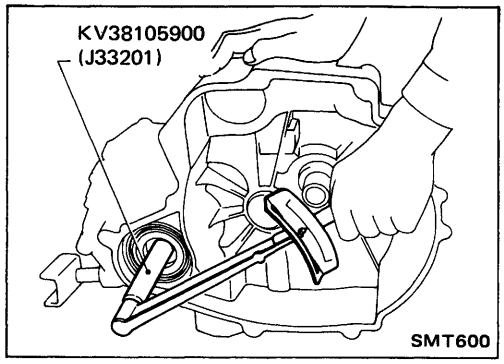
12. Install reverse idler spacer.



13. Apply recommended sealant to mating surface of clutch housing.


SMT571

14. Install transmission case on clutch housing.



SMT600

15. Measure total turning torque.

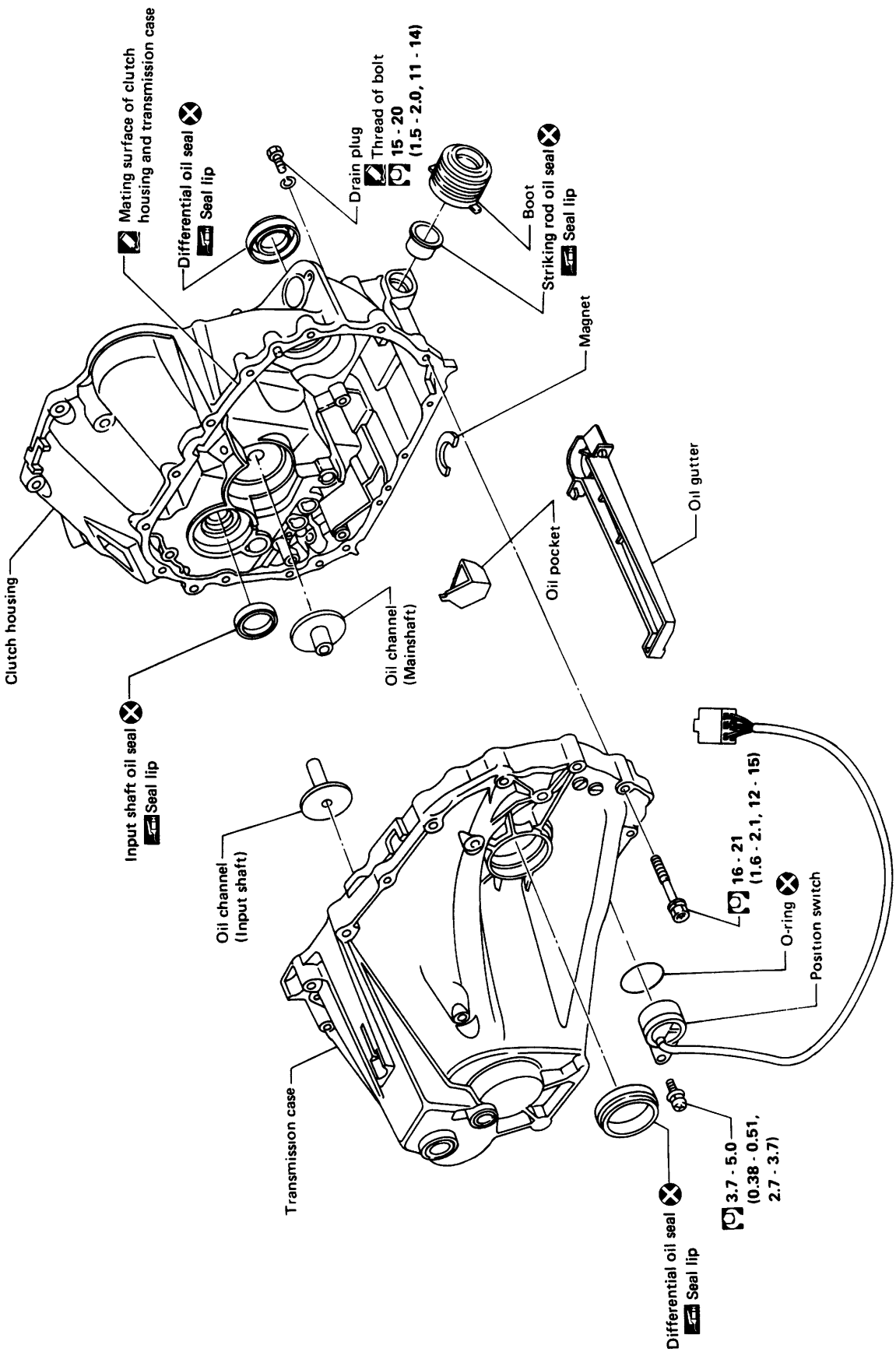
Total turning torque (New bearing):

5.9 - 13.7 N·m

(60 - 140 kg-cm, 52 - 122 in-lb)

When old bearing is used again, turning torque will be slightly lower than that indicated above. Check turning torque to see if it is not far from specified range.

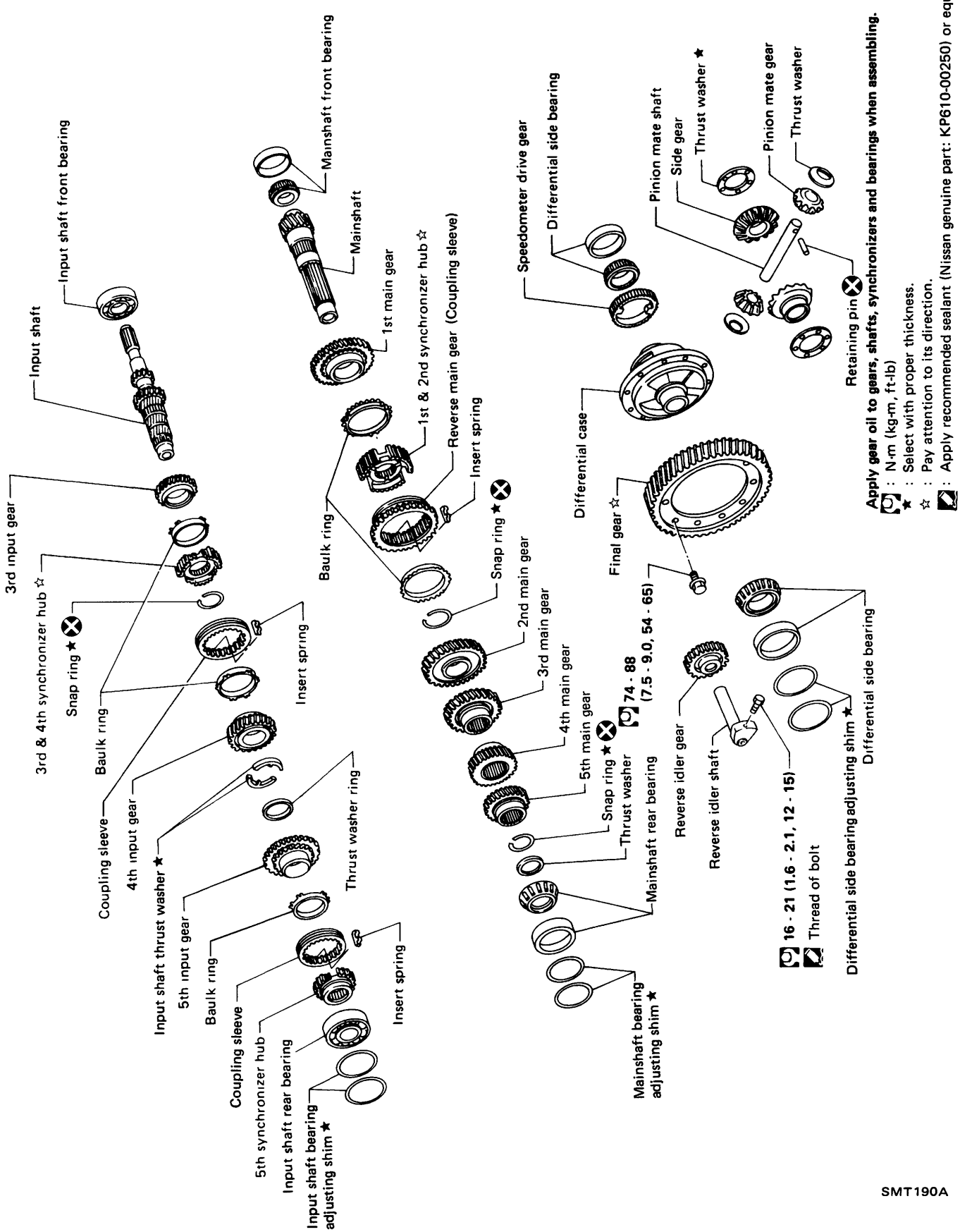
Case Component



: N·m (kg-m, ft-lb)
: Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.

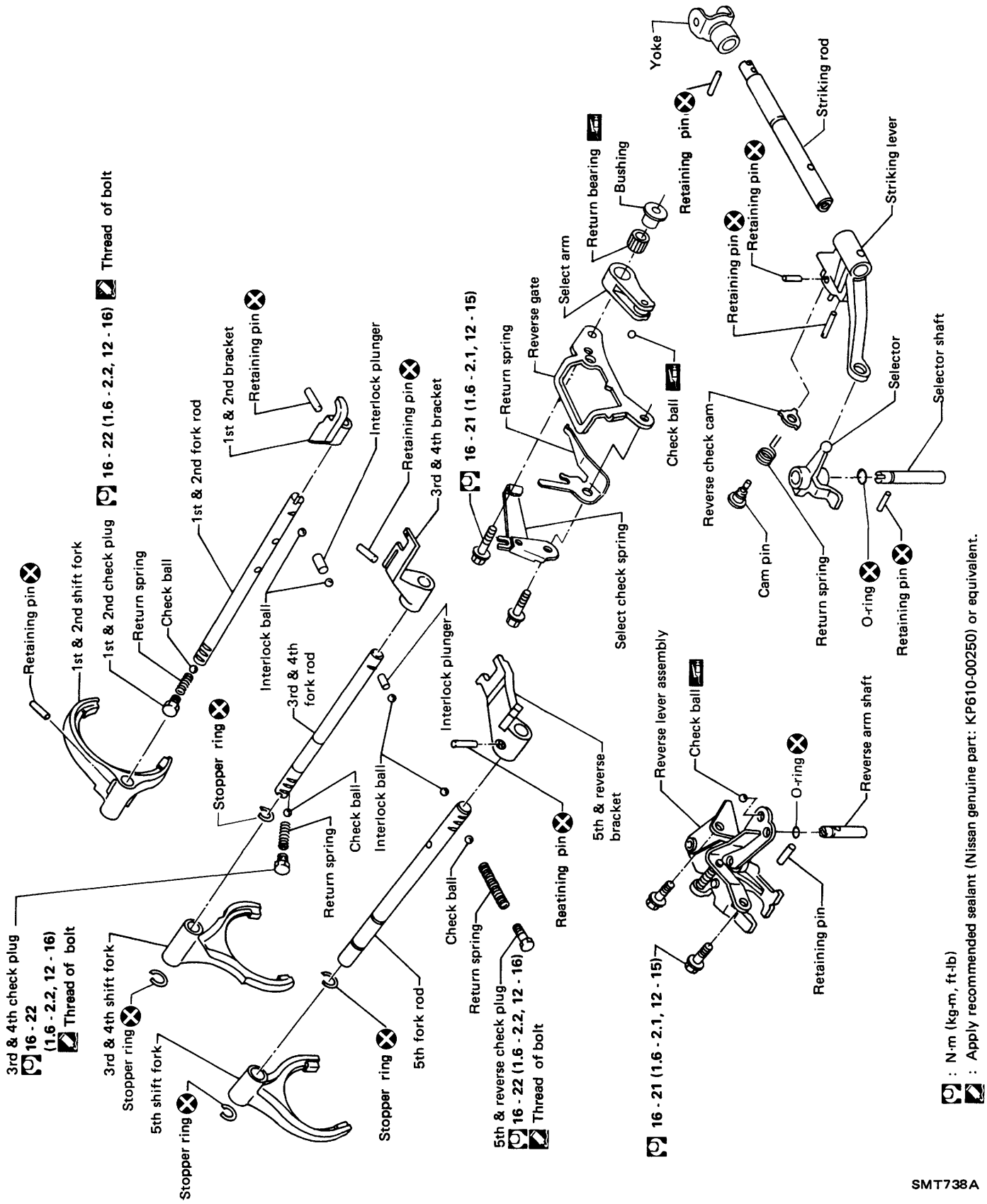
SMT013A

Gear Component

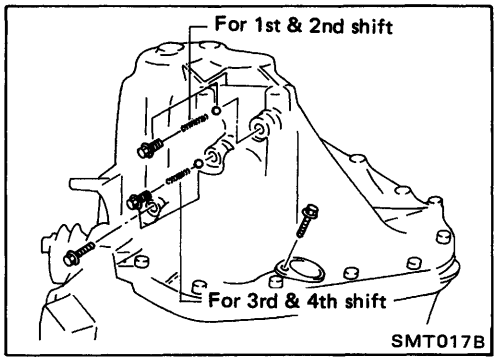


SMT190A

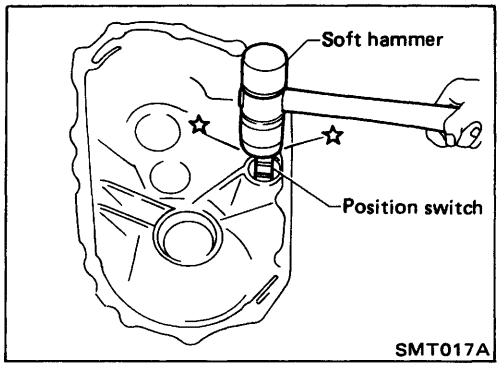
Shift Component



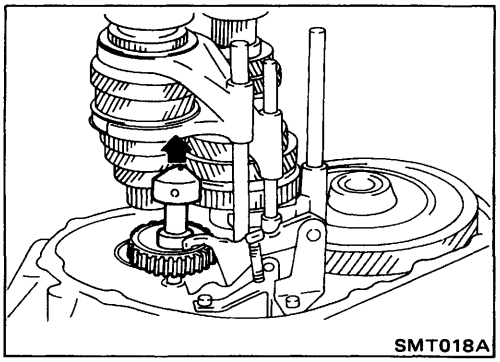
SMT738A



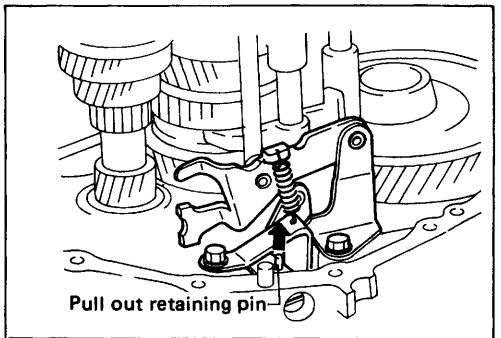
1. Before removing transaxle case, remove bolts and plugs shown left.
2. Take off transmission case.

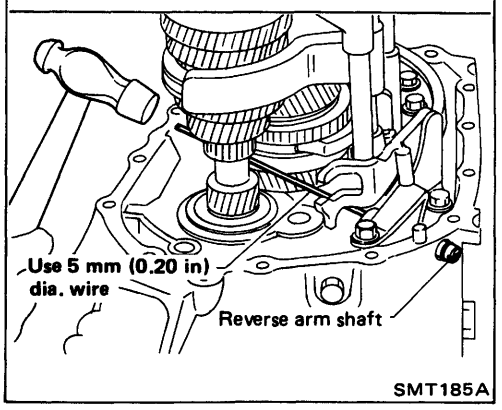


3 Remove position switch.

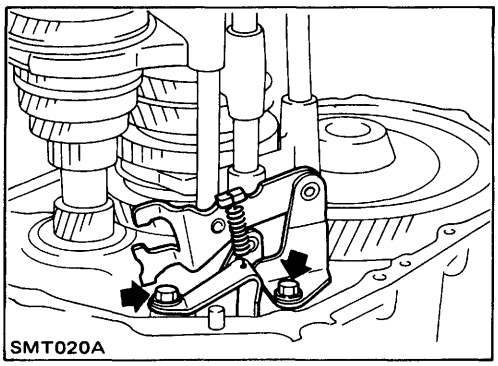


4. Mesh 4th gear, and then remove reverse idler shaft and reverse idler gear.

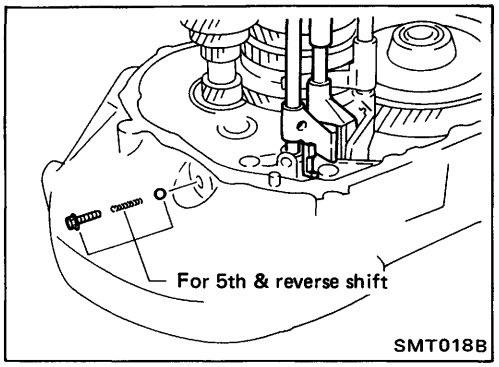




5. Remove reverse arm shaft.

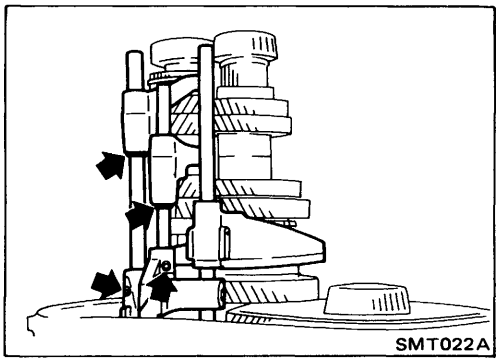

SMT020A

6. Remove reverse lever assembly.

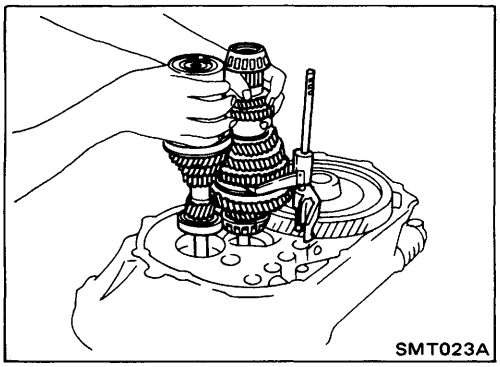


SMT018B

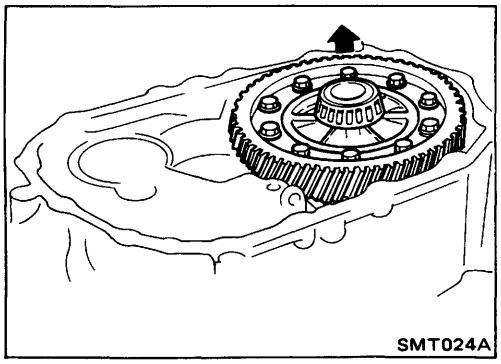
7. Remove 5th & Reverse check plug, spring and ball.


SMT022A

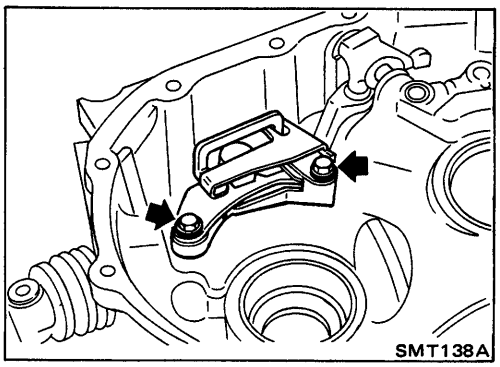
8. Remove stopper rings and retaining pins from 5th & Reverse and 3rd & 4th fork rods.
   When removing stopper rings, use snap ring remover and installer (J34305).
9. Remove 5th & Reverse and 3rd & 4th fork rods. Then remove forks and brackets.


SMT023A

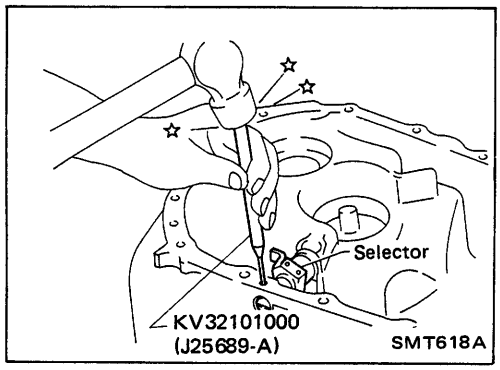
10. Remove both input and mainshafts with 1st & 2nd fork and fork rod as a set.


SMT024A

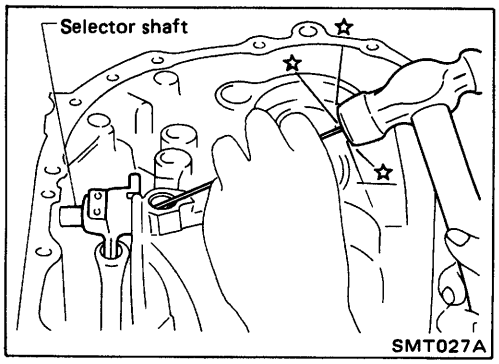
11. Remove final drive assembly.

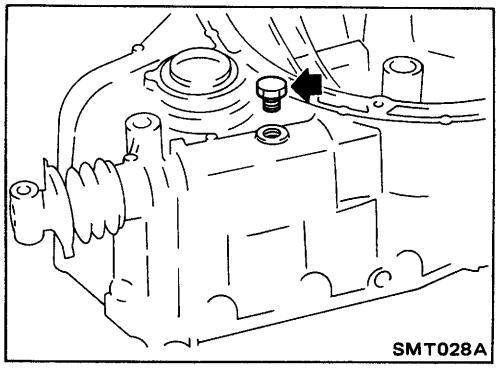

SMT138A

12. Remove reverse check assembly.

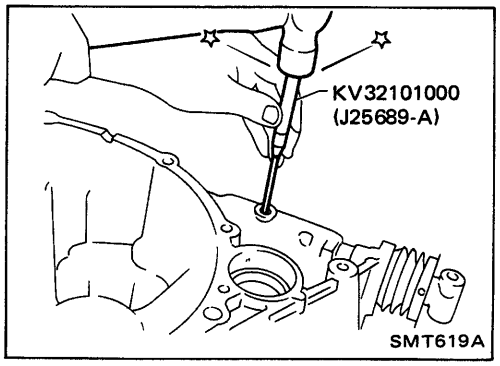


13. Remove retaining pin and detach the selector.

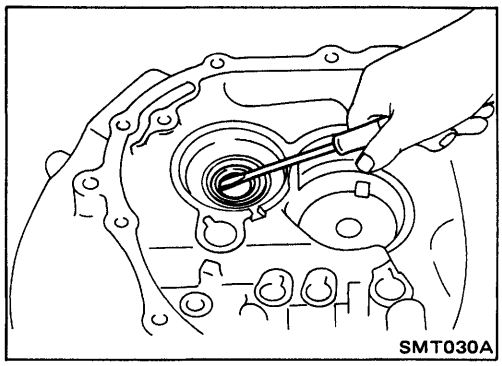



SMT028A

14. Remove drain plug for convenience in removing retaining pin which holds striking lever to striking rod.



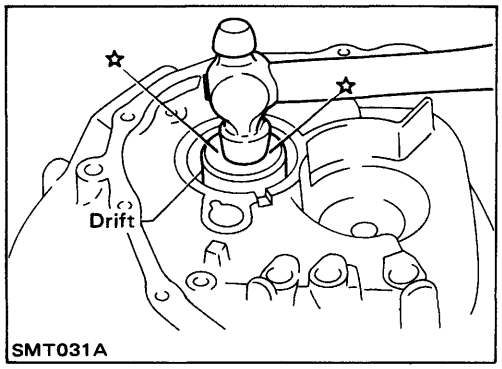
15. Remove retaining pin and then withdraw striking lever and striking rod.


SMT030A

Clutch Housing and Transmission Case

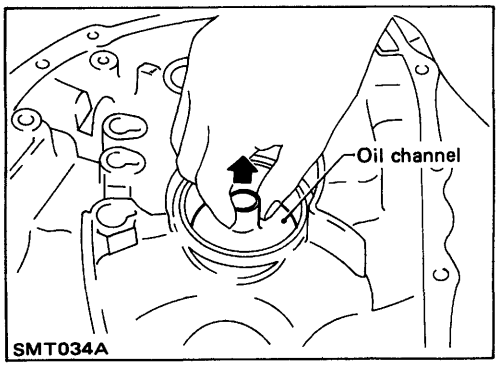
REMOVAL AND INSTALLATION

Input shaft oil seal



SMT031A

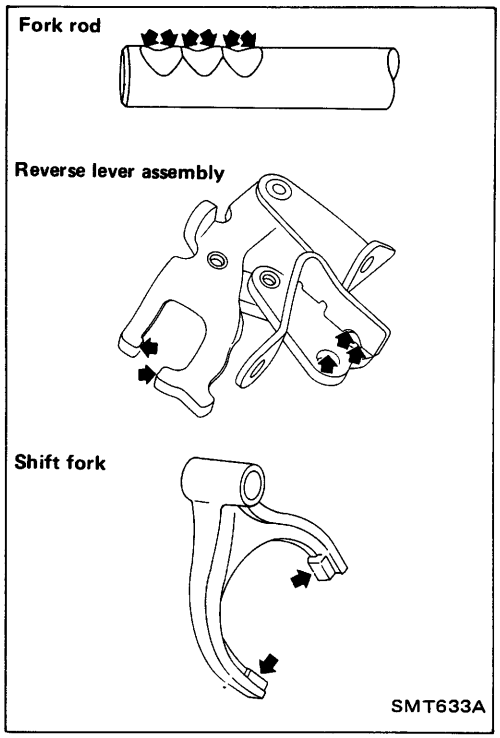
Mainshaft front bearing outer race



SMT034A

Mainshaft rear bearing outer race – Refer to "ADJUSTMENT".

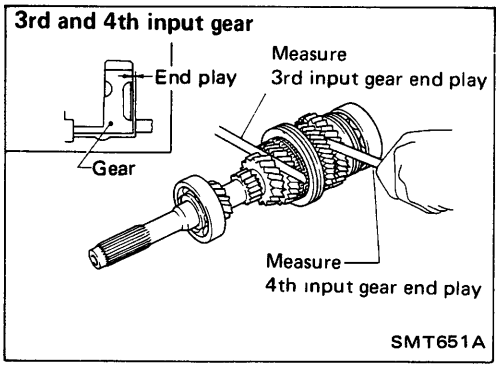
Differential side bearing outer race – Refer to "ADJUSTMENT".



Shift Control Components

INSPECTION

- Check contact surface and sliding surface for wear, scratches, projections or other damage.



Input Shaft and Gears

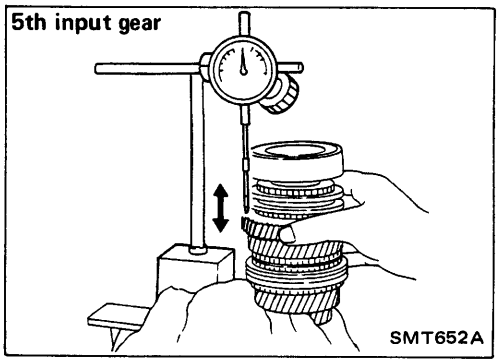
DISASSEMBLY

1. Before disassembly, check 3rd, 4th and 5th input gear end plays.

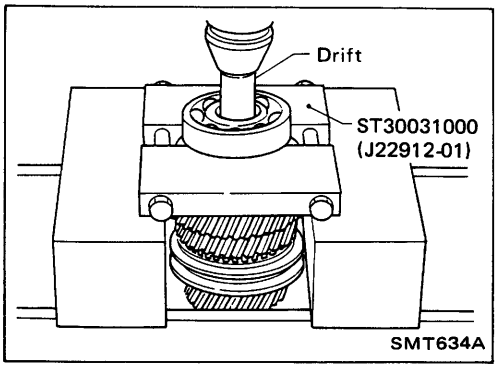
Gear end play

Gears	End play mm (in)
3rd input gear	0.23 - 0.43 (0.0091 - 0.0169)
4th input gear	0.25 - 0.55 (0.0098 - 0.0217)
5th input gear	0.23 - 0.48 (0.0091 - 0.0189)

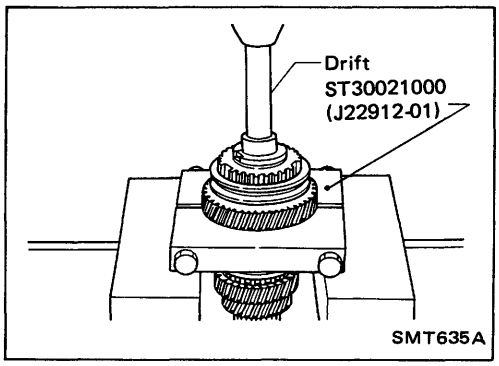
If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring and thrust washer — Refer to Assembly.



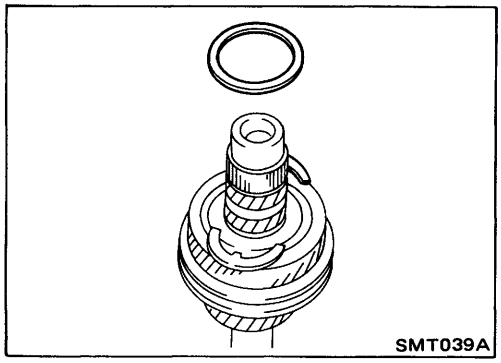
2. Remove input shaft rear bearing.



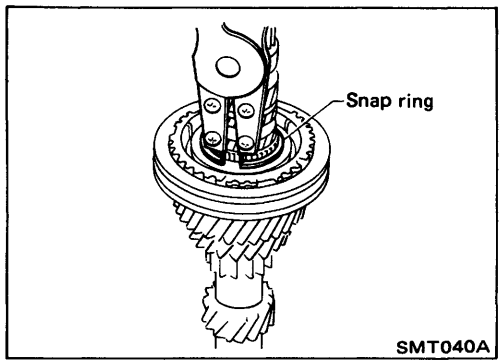
Input Shaft and Gears (Cont'd)



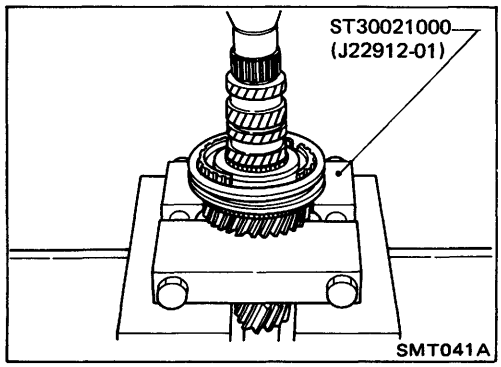
3. Remove 5th synchronizer and 5th input gear.



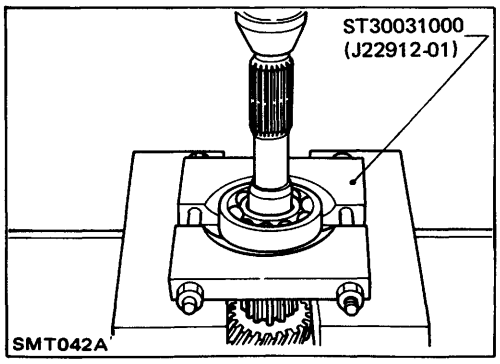
4. Remove thrust washer ring, thrust washers and 4th input gear.



5. Remove snap ring.

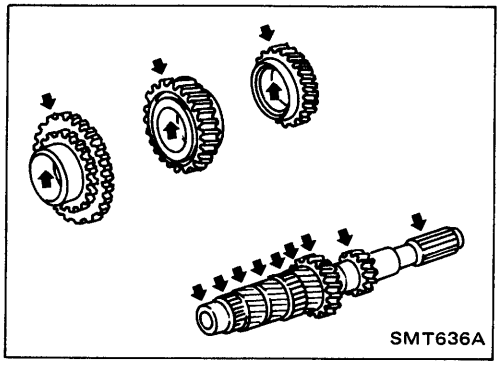


6. Remove 3rd & 4th synchronizer and 3rd input gear.



7. Remove input shaft front bearing.

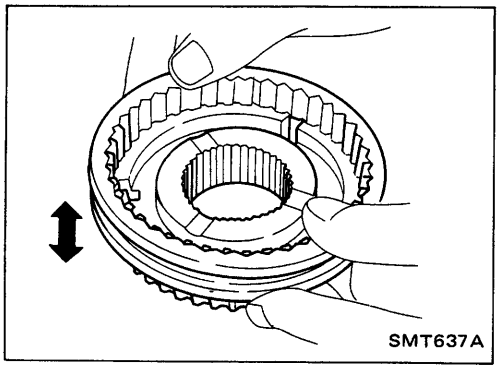
Input Shaft and Gears (Cont'd)


SMT636A

INSPECTION

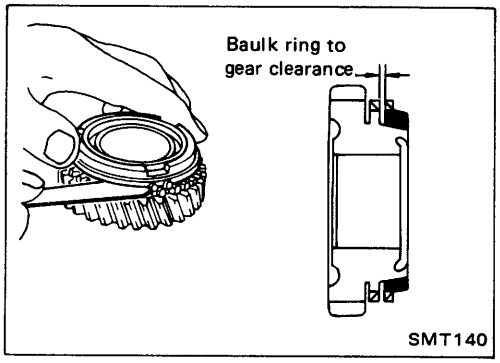
Gear and shaft

- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.


SMT637A

Synchronizer

- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check insert springs for deformation.



SMT140

- Measure clearance between baulk ring and gear.

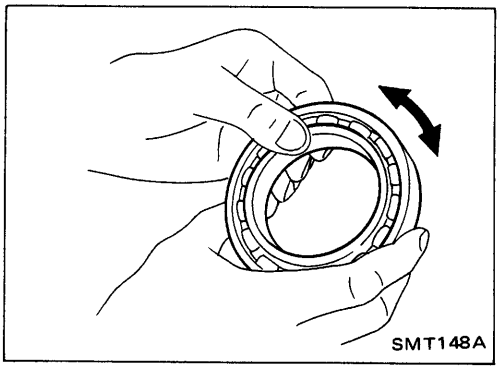
Clearance between baulk rings and 3rd-5th input gears:

Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

Wear limit

0.7 mm (0.028 in)

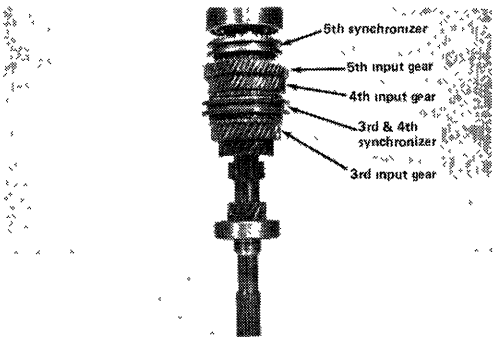

SMT148A

Bearing

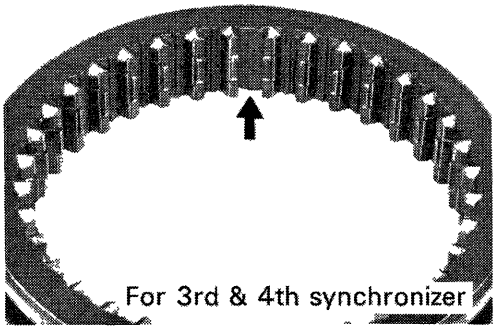
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

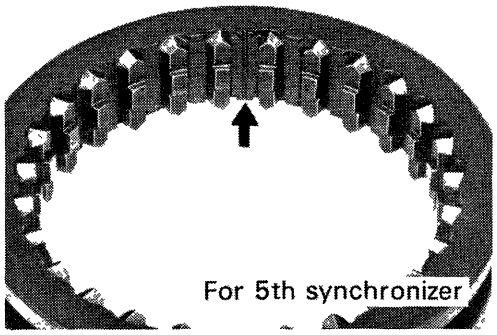
Input Shaft and Gears (Cont'd)

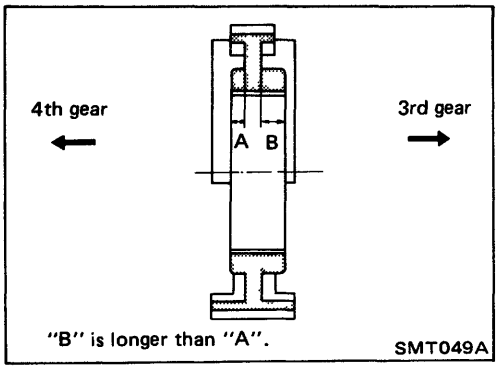
ASSEMBLY



1. Place inserts in the three grooves on the coupling sleeve (3rd & 4th synchronizer, 5th synchronizer).







2. Install 3rd input gear and 3rd baulk ring.
3. Press on 3rd & 4th synchronizer hub.

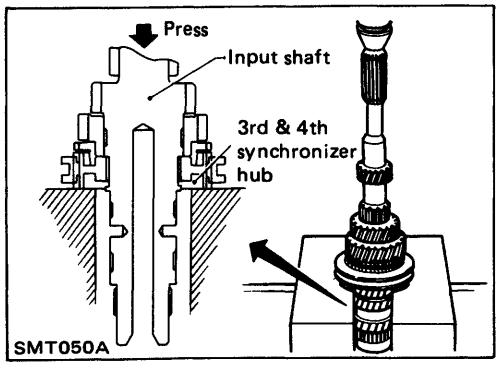
Pay attention to its direction.

4. Select proper snap ring of 3rd & 4th synchronizer hub to minimize clearance of groove, and then install it.

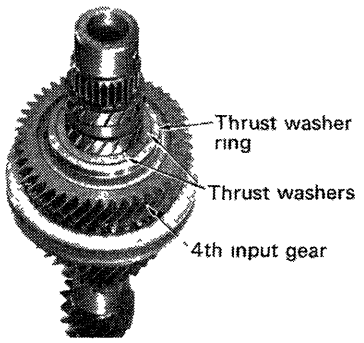
Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)

Snap ring of 3rd & 4th synchronizer hub:

Thickness mm (in)	Part number
1.95 (0.0768)	32269-03E03
2.00 (0.0787)	32269-03E00
2.05 (0.0807)	32269-03E01
2.10 (0.0827)	32269-03E02



Input Shaft and Gears (Cont'd)

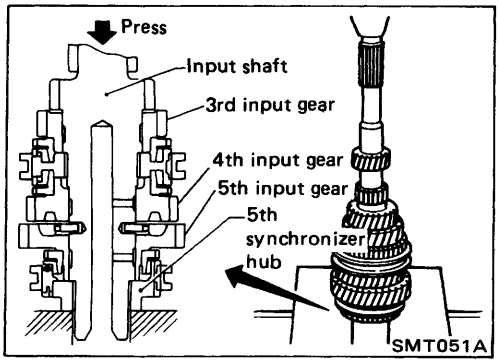


5. Install 4th input gear.
6. Select proper thrust washers to minimize clearance of groove. Then install them and thrust washer ring.

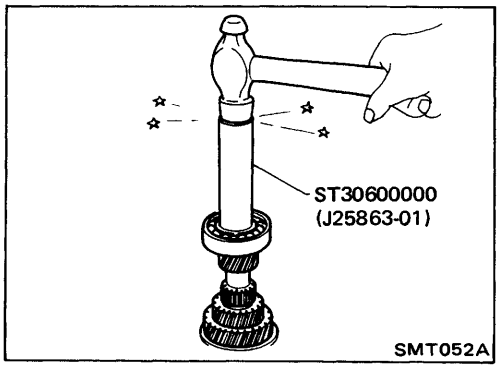
Allowable clearance of groove:
0 - 0.06 mm (0 - 0.0024 in)

Input shaft thrust washer

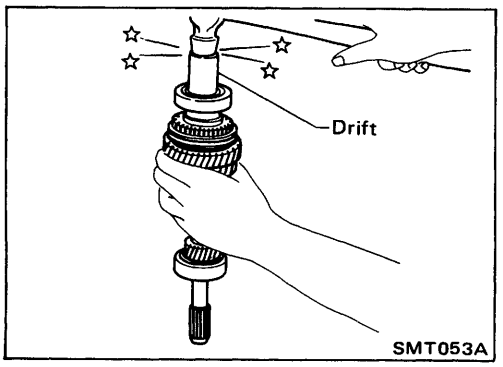
Thickness mm (in)	Part number
4.500 (0.1772)	32278-03E01
4.525 (0.1781)	32278-03E02
4.550 (0.1791)	32278-03E03
4.575 (0.1801)	32278-03E04

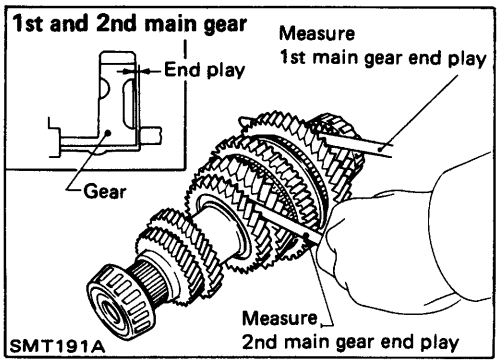


7. Install 5th input gear.
8. Press on 5th synchronizer.



9. Install input shaft front and rear bearings.
10. Measure gear end play as the final check — Refer to "Disassembly".





Mainshaft and Gears

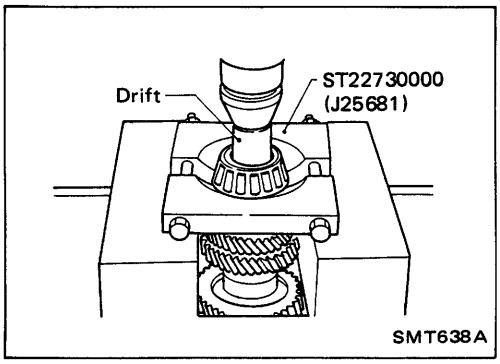
1. Before disassembly, check 1st and 2nd main gear end plays.

Gear end play

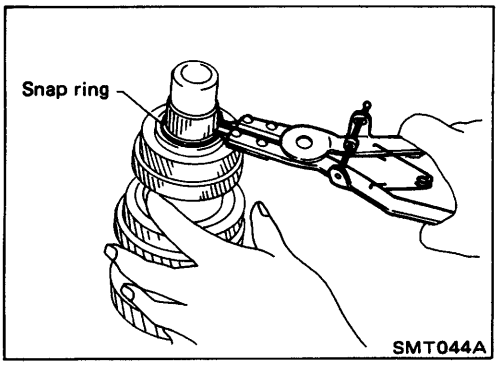
Gears	End play mm (in)
1st main gear	0.23 - 0.43 (0.0091 - 0.0169)
2nd main gear	0.23 - 0.58 (0.0091 - 0.0228)

If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring – Refer to "Assembly".

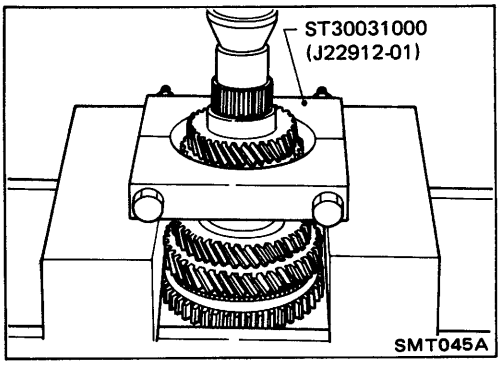
2. Press out mainshaft rear bearing.



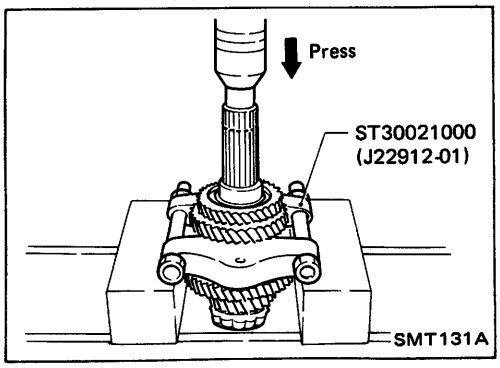
3. Remove thrust washer and snap ring.



4. Press out 5th main gear and 4th main gear.

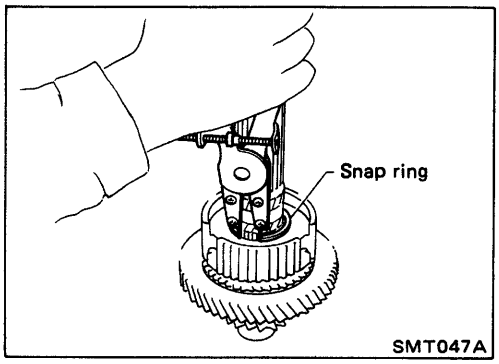


5. Press out 3rd main gear and 2nd main gear.

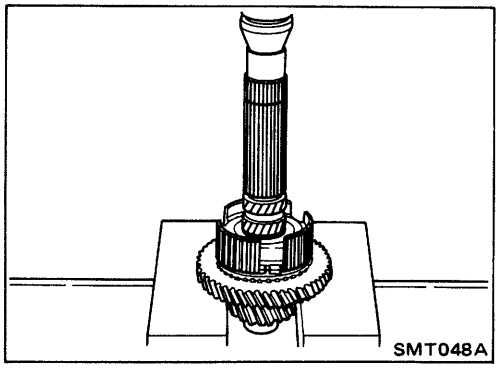


Mainshaft and Gears (Cont'd)

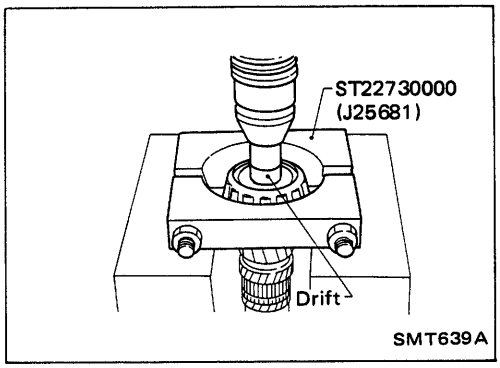
6. Remove snap ring.



7. Remove 1st & 2nd synchronizer and 1st main gear.



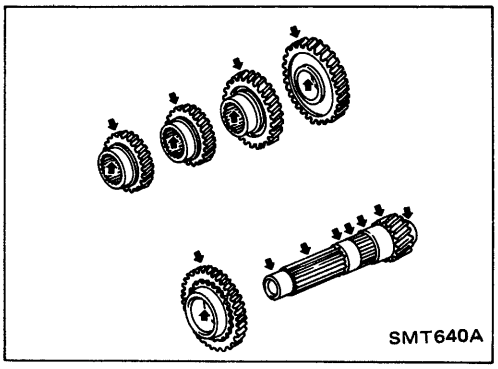
8. Remove mainshaft front bearing.



INSPECTION

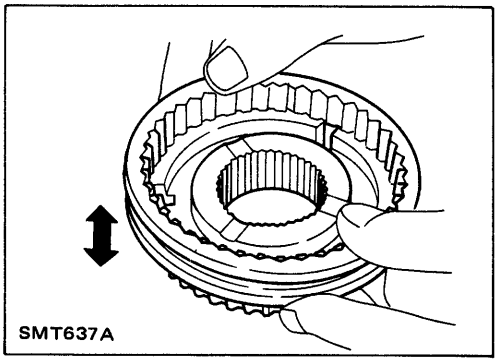
Gear and shaft

- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

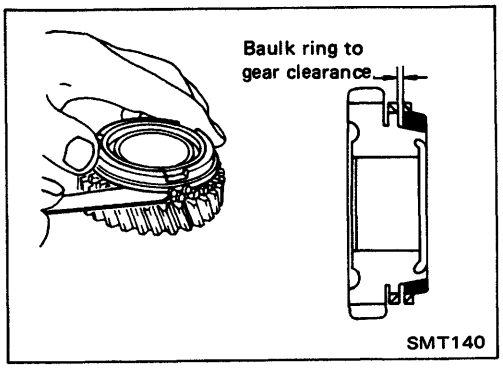


Synchronizer

- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check insert springs for deformation.



Mainshaft and Gears (Cont'd)



- Measure clearance between baulk ring and gear.

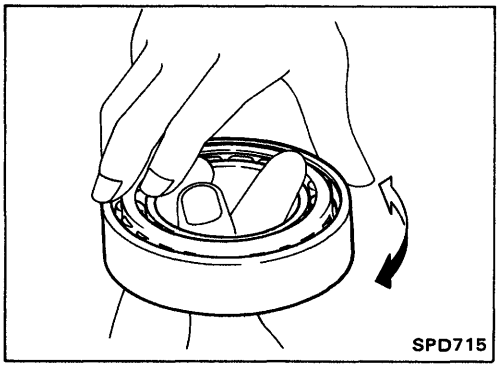
Clearance between baulk ring and gear:

Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

Wear limit

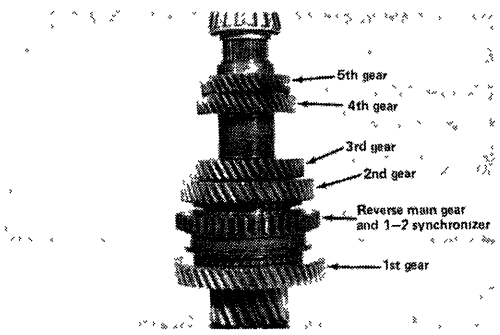
0.7 mm (0.028 in)



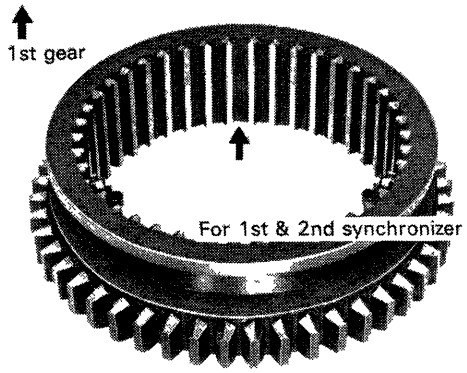
Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

When replacing tapered roller bearing, replace outer and inner race as a set.

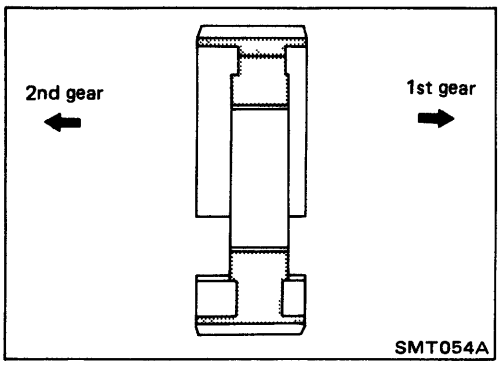


ASSEMBLY



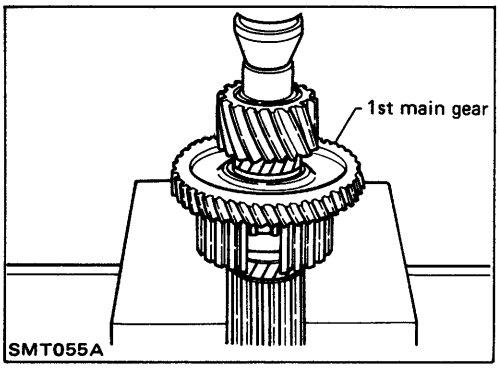
1. Place inserts in three grooves on the coupling sleeve (1st & 2nd synchronizer).

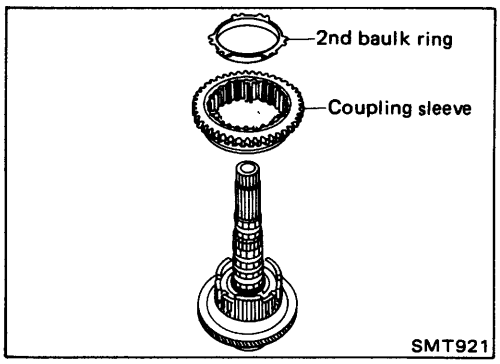
Mainshaft and Gears (Cont'd)



2. Install 1st main gear and 1st baulk ring.
3. Press on 1st & 2nd synchronizer hub.

Pay attention to its direction.





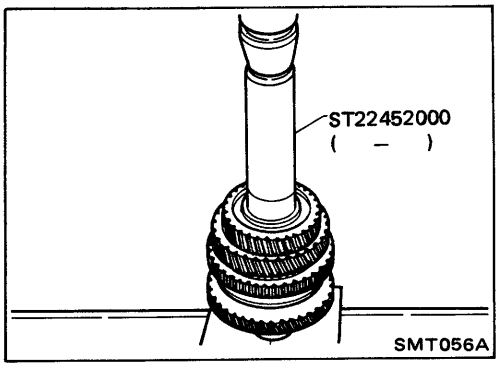
4. Install coupling sleeve with three inserts and 2nd baulk ring.
5. Select proper snap ring of 1st & 2nd synchronizer hub to minimize clearance of groove and then install it.

Allowable clearance of groove:

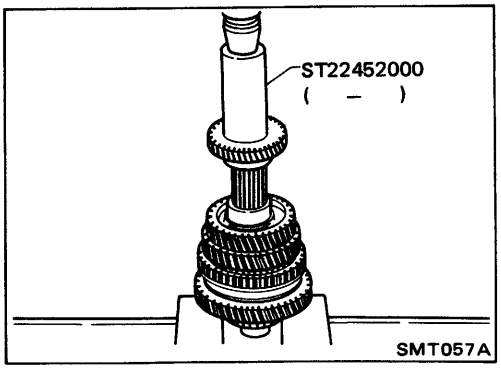
0 - 0.1 mm (0 - 0.004 in)

Snap ring of 1st & 2nd synchronizer hub:

Thickness mm (in)	Part number
1.95 (0.0768)	32269-03E03
2.00 (0.0787)	32269-03E00
2.05 (0.0807)	32269-03E01
2.10 (0.0827)	32269-03E02

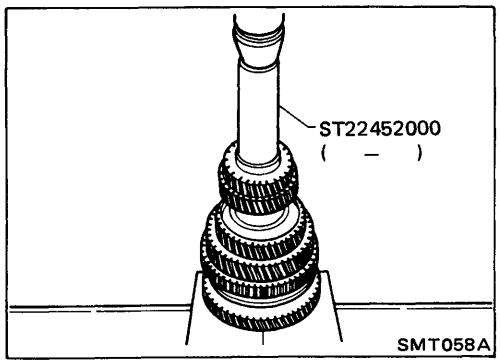


6. Install 2nd main gear.
7. Press on 3rd main gear.



8 Press on 4th main gear.

Mainshaft and Gears (Cont'd)

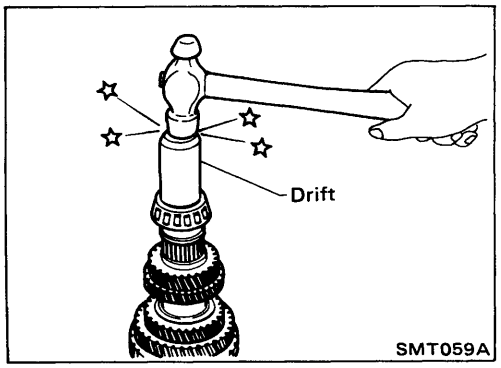


9. Press on 5th main gear.
10. Select proper snap ring of 5th main gear to minimize clearance of groove and then install it.

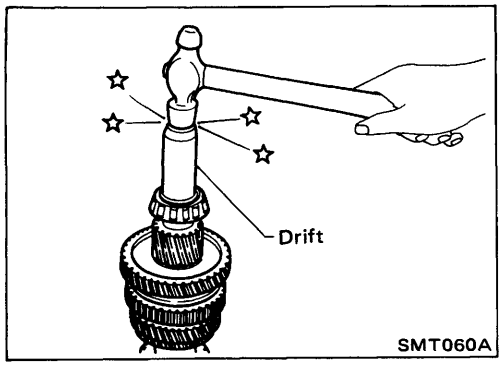
Allowable clearance of groove:
0 - 0.15 mm (0 - 0.0059 in)

Snap ring of 5th main gear:

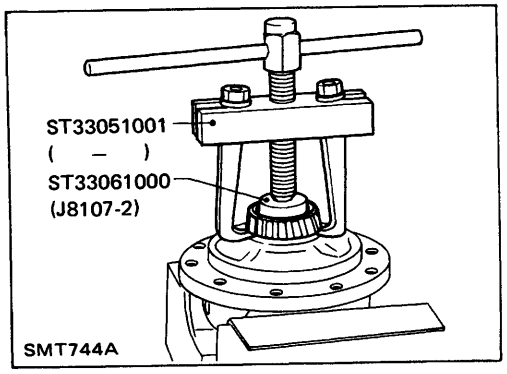
Thickness mm (in)	Part number
1.95 (0.0768)	32348-05E00
2.05 (0.0807)	32348-05E01
2.15 (0.0846)	32348-05E02
2.25 (0.0886)	32348-05E03



11. Press on thrust washer and press on mainshaft rear bearing.



12. Press on mainshaft front bearing.
13. Measure gear end play as the final check — Refer to "Disassembly".



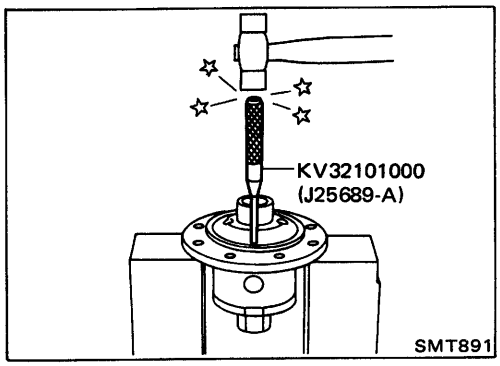
Final Drive

DISASSEMBLY

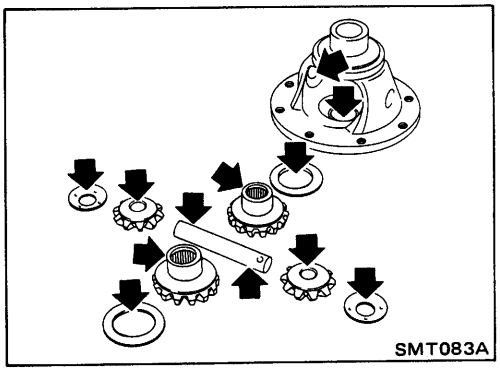
1. Remove final gear.
2. Remove speedometer drive gear by cutting it.
3. Press out differential side bearing inner races.

Be careful not to mix up the right and left bearings.

Final Drive (Cont'd)



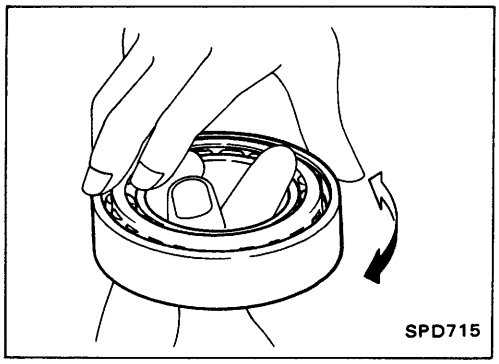
4. Drive out pinion mate shaft lock pin and draw out pinion mate shaft.



INSPECTION

Gear, washer, shaft and case

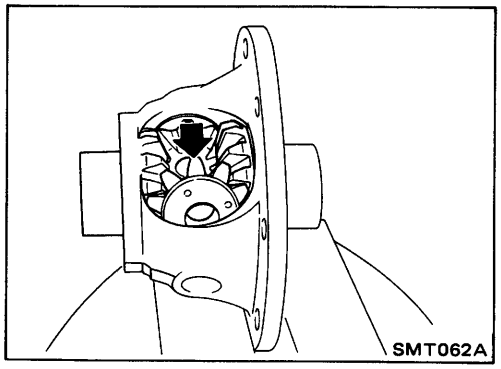
- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.



Bearing

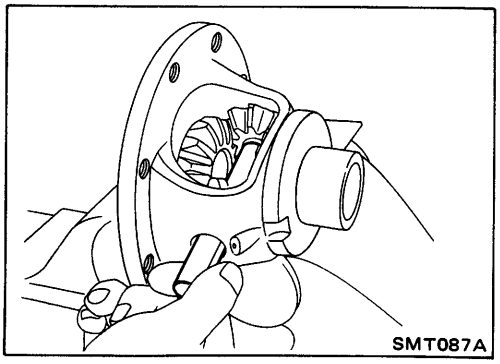
- Make sure bearings roll freely and are free from noise, crack, pitting or wear.

When replacing tapered roller bearing, replace outer and inner race as a set.



ASSEMBLY

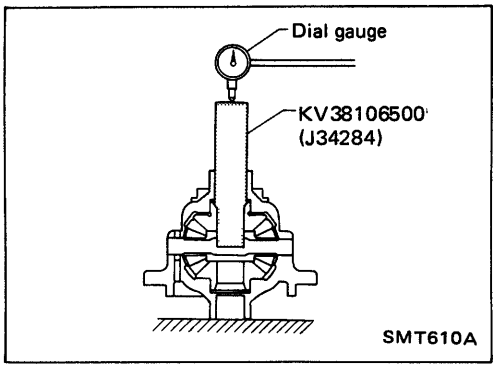
1. Fit side gear thrust washers and side gears, then install pinion mate washers and pinion mate gears in place.



2. Insert pinion mate shaft.

When inserting, be careful not to damage pinion mate washers.

Final Drive (Cont'd)



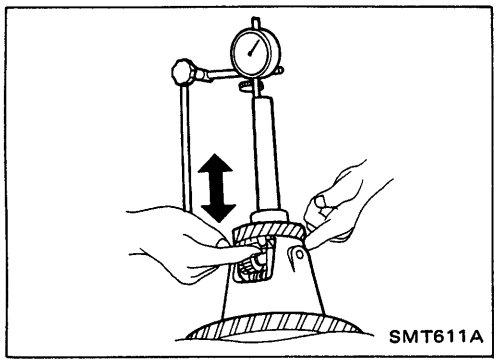
3. Measure clearance between side gear and differential case with washer, following the procedure below.

a. Set Tool and dial indicator on side gear.

b. Move side gear up and down to measure dial indicator deflection. Always measure indicator deflection on both side gears.

Clearance between side gear and differential case with washers:

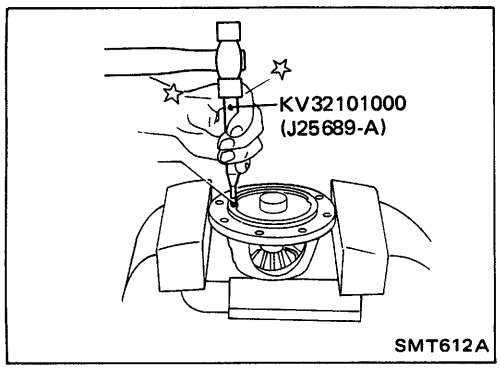
0.1 - 0.2 mm (0.004 - 0.008 in)



c. If not within specification, adjust clearance by changing thickness of side gear thrust washers.

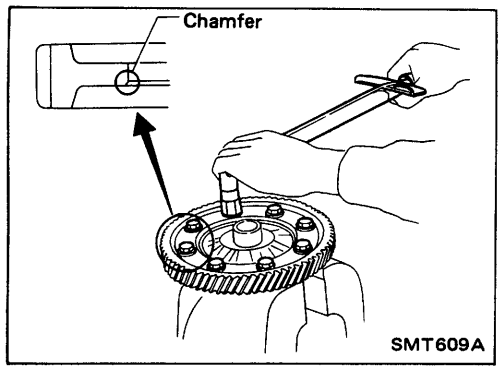
Side gear thrust washer

Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-E3000
0.80 - 0.85 (0.0315 - 0.0335)	38424-E3001
0.85 - 0.90 (0.0335 - 0.0354)	38424-E3002
0.90 - 0.95 (0.0354 - 0.0374)	38424-E3003

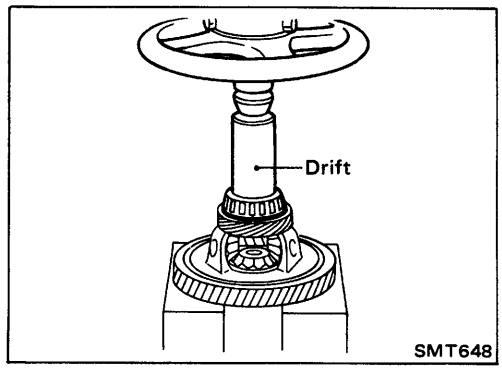


4. Install retaining pin using a punch.

Make sure that lock pin is flush with case.



5. Install final gear.
6. Install speedometer drive gear.



7. Install differential side bearings.

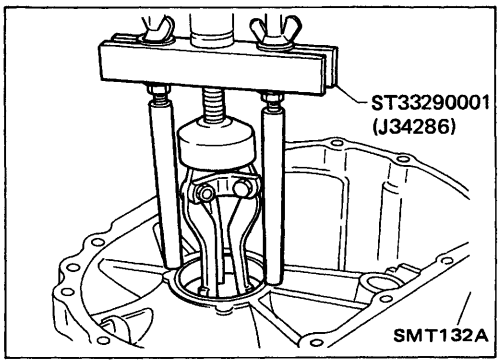
Input Shaft End Play and Differential Side Bearing Preload

If any of the following parts are replaced, adjust input shaft end play.

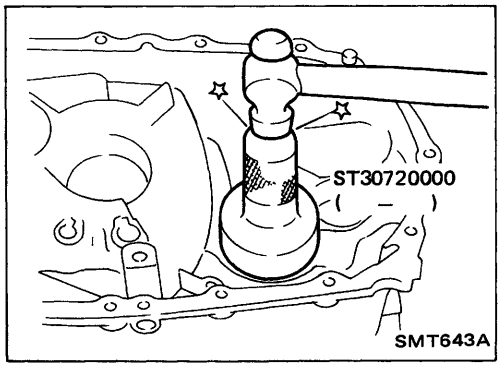
- **Input shaft**
- **Input shaft bearing**
- **Clutch housing**
- **Transmission case**

If any of the following parts is replaced, adjust differential side bearing preload.

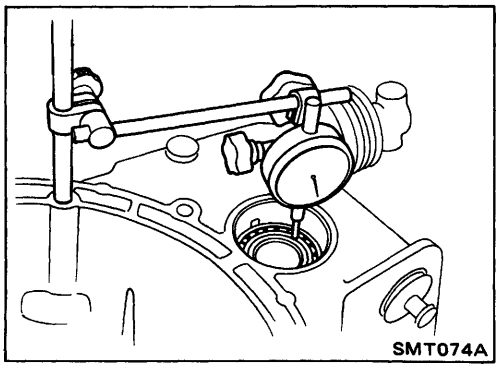
- **Differential case**
- **Differential side bearing**
- **Clutch housing**
- **Transmission case**



1. Remove differential side bearing outer race (transmission case side) and shim(s).



2. Re-install differential side bearing outer race without shim(s).
3. Install input shaft and final drive assembly on clutch housing.
4. Install transmission case without input shaft bearing shim(s). Then tighten it to the specified torque.

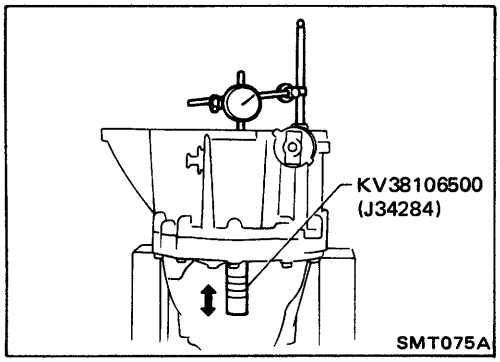


5. Using the following procedures, measure clearance between bearings and transmission case.

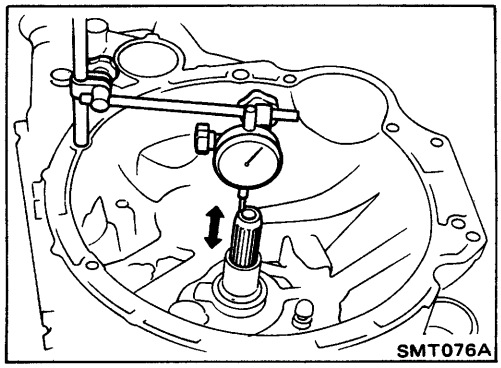
- **Differential side**

a. Attach dial indicator. If cramp diameter of dial indicator is too small or too large, attach dial indicator using a magnetic stand.

Input Shaft End Play and Differential Side Bearing Preload (Cont'd)

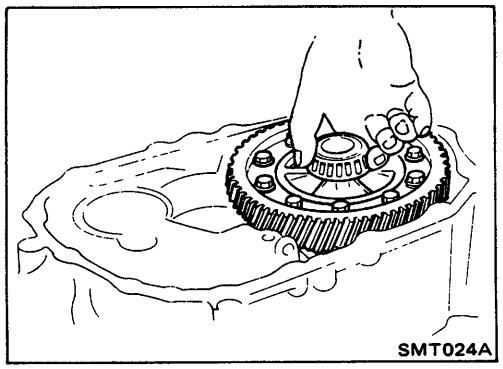


b. Insert preload adapter tool all the way into differential side gear. Move tool up and down and measure dial indicator deflection.



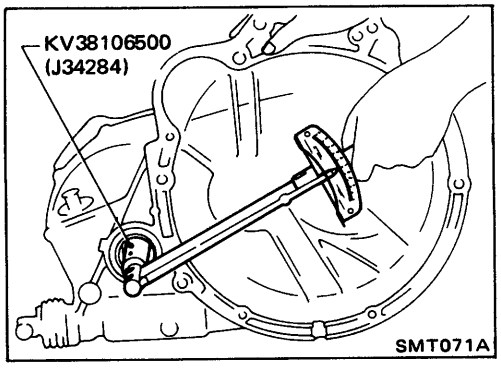
- **Input shaft side**

a. Set dial indicator on rear end of input shaft.
b. Move input shaft up and down and measure dial indicator deflection.
6. Select shims with proper thickness with S.D.S. table as a guide.
7. Install selected differential side bearing adjusting shim and differential side bearing outer race.



8. Check differential side bearing turning torque.
a. Install final drive assembly on clutch housing.
b. Install transmission case on clutch housing.

Tighten transmission case fixing bolts to the specified torque.



c. Measure turning torque of final drive assembly.

Turning torque of final drive assembly
(New bearing):
4.9 - 7.8 N·m
(50 - 80 kg-cm, 43 - 69 in-lb)

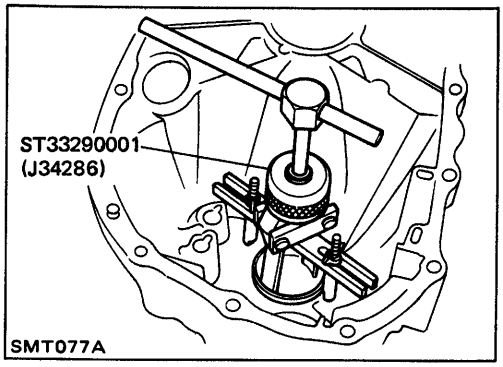
When old bearing is used again, turning torque will be slightly lower than that indicated above. Check turning torque to see if it is not far from specified range.

Mainshaft Bearing Preload

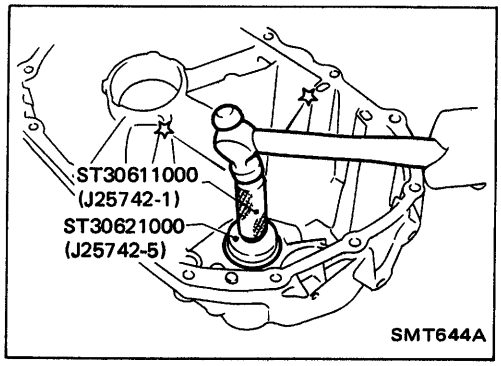
If any of the following parts is replaced, adjust mainshaft bearing preload.

- **Mainshaft**
- **Mainshaft bearing**
- **Clutch housing**
- **Transmission case**

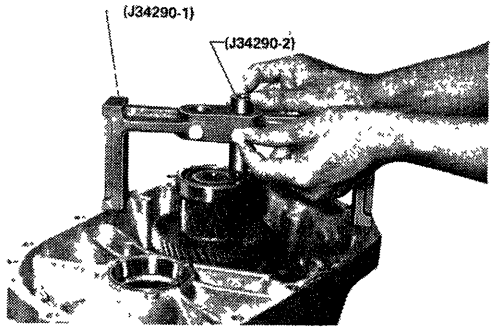
Mainshaft Bearing Preload (Cont'd)



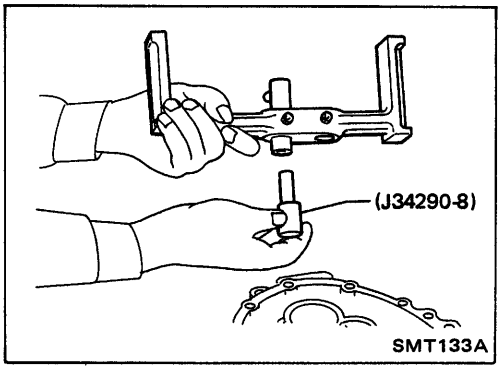
1. Remove mainshaft rear bearing outer race and shim(s).



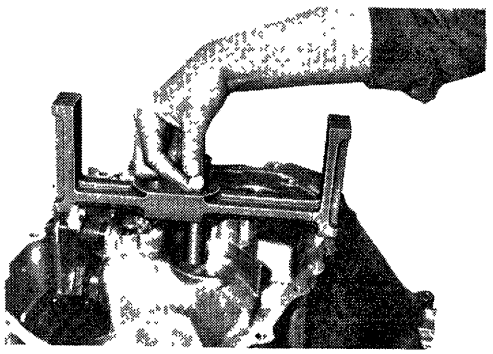
2. Re-install mainshaft rear bearing outer race without shims.
3. Clean mating surfaces of clutch housing and transmission case with solvent.
4. Install mainshaft and mainshaft front bearing outer race into transmission case. Turn mainshaft while holding bearing outer race so that bearings are properly seated.



5. Place Tools (bridge and gauging cylinder) onto machined surface of transmission case, allowing gauging cylinder to rest on surface of mainshaft front bearing outer race. Use proper screw in bridge to lock gauging cylinder in place.

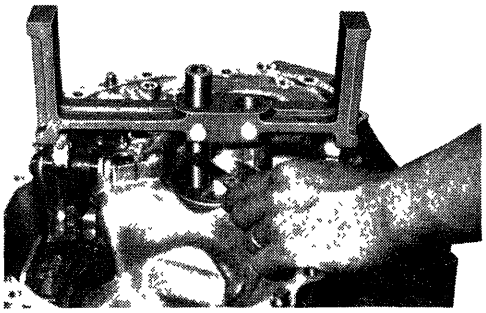


6. Turn bridge over and place Tool (gauging plunger) into gauging cylinder.



7. Place bridge, legs up, onto machined surface of clutch housing and allow gauging plunger to rest upon mating surface where mainshaft front bearing outer race fits.

Mainshaft Bearing Preload (Cont'd)

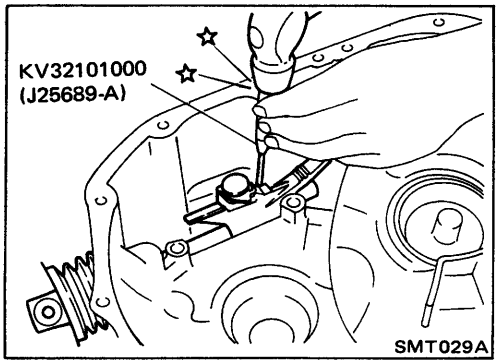


8. Measure with feeler gauge distance between gauging cylinder and shoulder of gauging plunger.
9. Use feeler gauge reading to select correct mainshaft preload shim(s) from following chart.

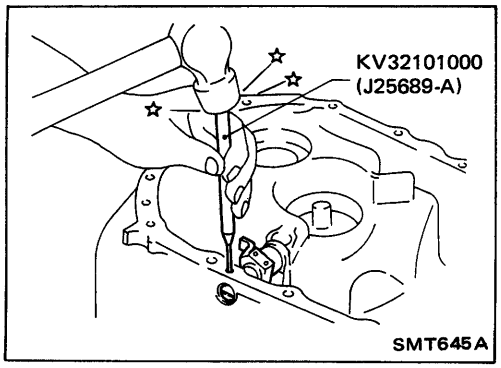
Mainshaft bearing adjusting shim

Thickness mm (in)	Part number
0.40 (0.0157)	32139-03E11
0.44 (0.0173)	32139-03E00
0.48 (0.0189)	32139-03E01
0.52 (0.0205)	32139-03E12
0.56 (0.0220)	32139-03E02
0.60 (0.0236)	32139-03E03
0.64 (0.0252)	32139-03E04
0.68 (0.0268)	32139-03E05
0.72 (0.0283)	32139-03E06
0.76 (0.0299)	32139-03E07
0.80 (0.0315)	32139-03E08
1.20 (0.0472)	32139-03E13

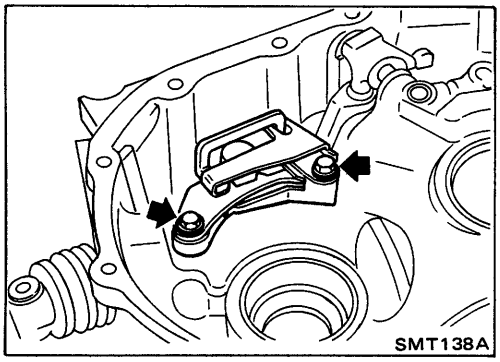
10. Install selected mainshaft bearing adjusting shim and mainshaft rear bearing outer race.
11. Check total turning torque after assembly — Refer to "ASSEMBLY".



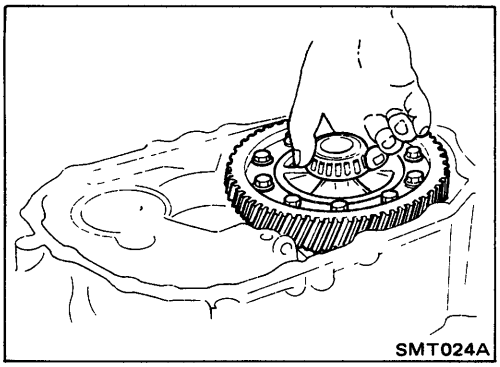
1. Install striking lever and striking rod.



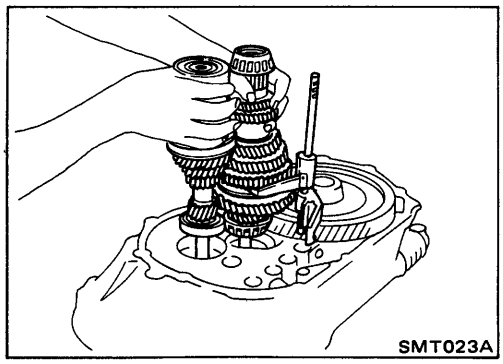
2. Install selector and retaining pin.



3. Install reverse gate assembly.

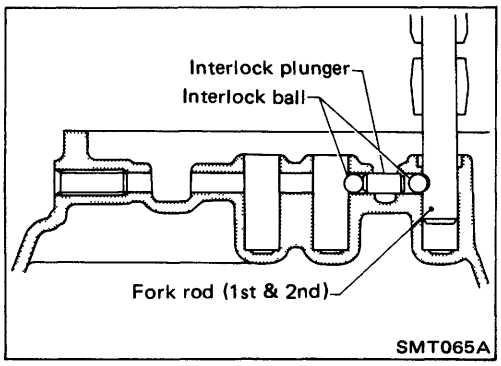


4. Install final drive assembly.

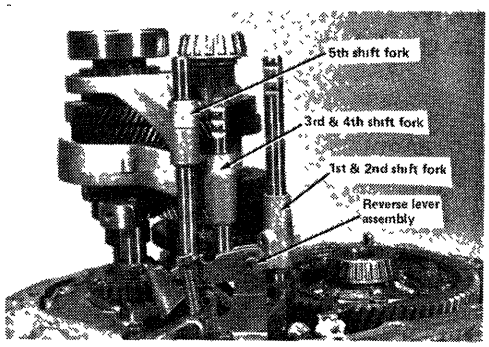


5. Install input shaft and mainshaft with 1st & 2nd shift fork assembly.

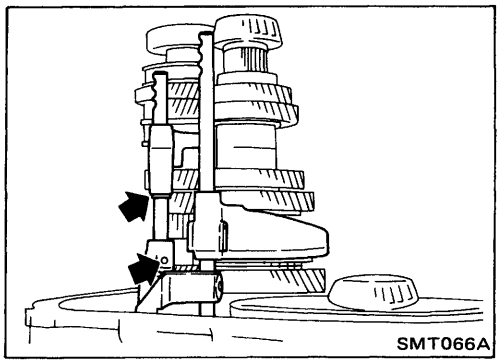
Be careful not to damage input shaft oil seal.

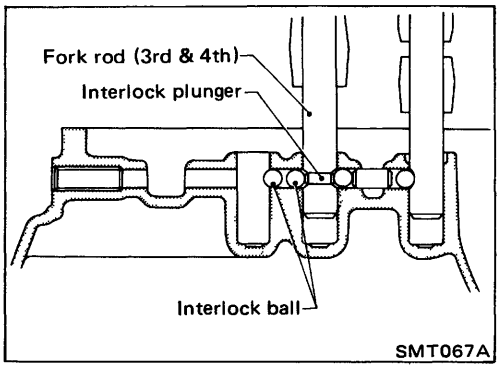


6. Install interlock balls and plunger.

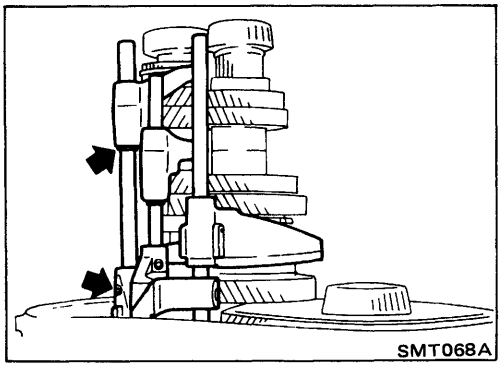


7. Install 3rd & 4th shift fork and bracket, then install 3rd & 4th shift rod, stopper ring and retaining pin.
When installing stopper ring, use snap ring remover and installer (J34305).

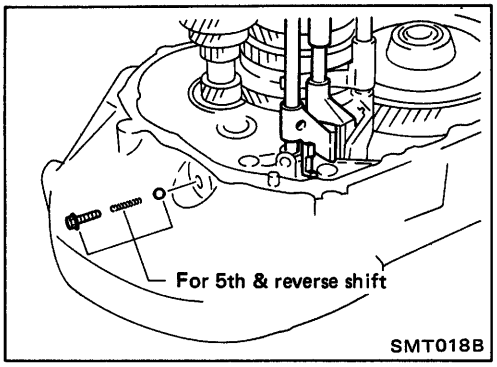




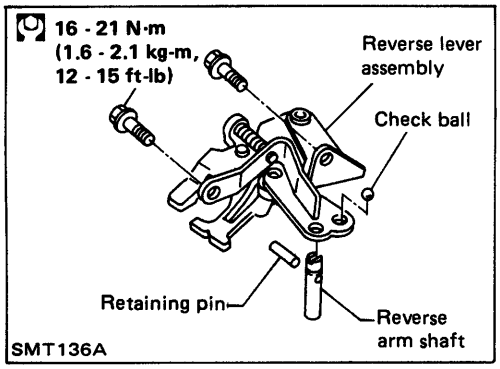
8. Install interlock balls.



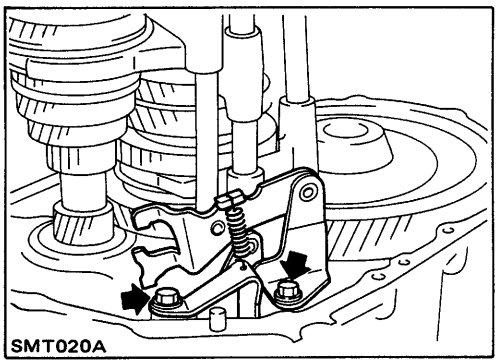
9. Install 5th shift fork and bracket, then install shift rod, stopper ring and retaining pin.
When installing stopper ring, use snap ring remover and installer (J34305).

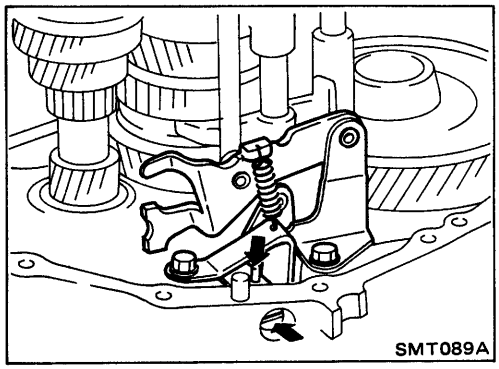


10. Install 5th & reverse check plug, spring and ball.

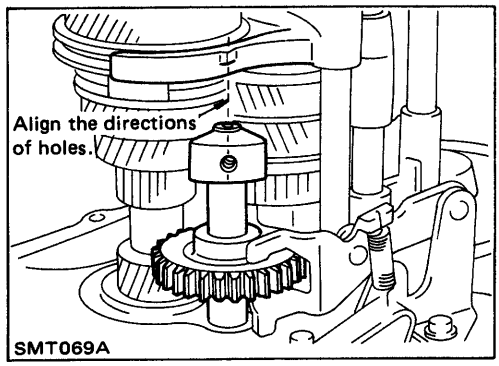


11. Install reverse lever assembly.
Apply multi-purpose grease to check ball.

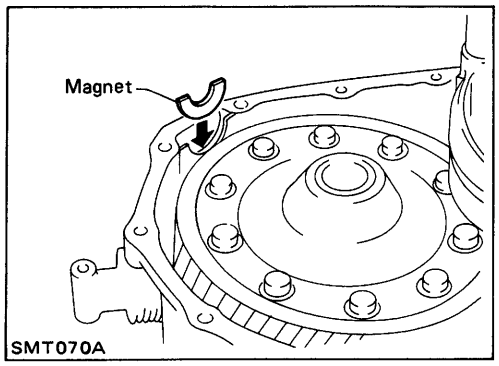




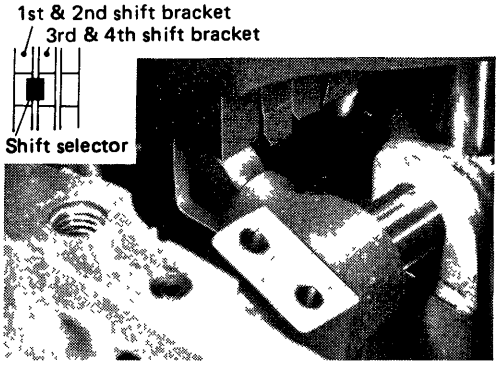
12. Install reverse arm shaft and retaining pin.



13. Mesh 4th gear. Then install reverse idler gear and shaft, paying attention to the direction of the tapped hole.



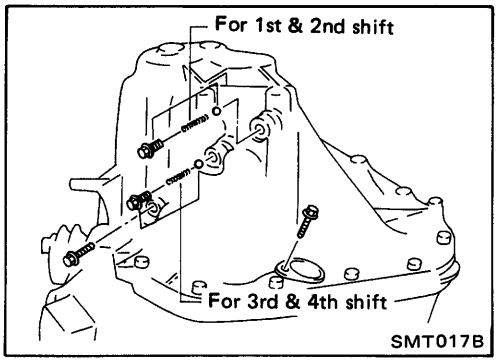
14. Place magnet on clutch housing.



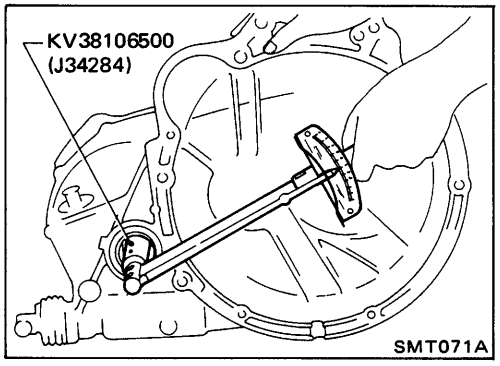
15. If bearing preload was adjusted, install selected shim(s) into transmission case.

To aid in installation of the transmission case, place the shift selector in the 1st and 2nd shift bracket or between the 1st and 2nd bracket and the 3rd and 4th bracket.

16. Apply sealant to mating surface of transmission case and install it.
17. Install position switch.



18. Apply sealant to threads of check plugs. Install balls, springs and plugs.
19. After assembly, check that you can shift into each gear smoothly.



20. Measure total turning torque.

Total turning torque (New bearing):
8.8 - 21.6 N·m
(90 - 220 kg-cm, 78 - 191 in-lb)

When old bearing is used again, preload will be slightly lower than that indicated above. Check preload to see if it is not far from specified range.

General Specifications—RS5F31A and RS5F50A

TRANSAXLE

Engine			GA16i	CA18DE
Transaxle model			RS5F31A	RS5F50A
Number of speed			5	5
Synchromesh type			Warner	Warner
Shift pattern				
Gear ratio		1st	3.063	3.285
		2nd	1.826	1.850
		3rd	1.207	1.272
		4th	0.902	0.954
		5th	0.756	0.795
		Rev.	3.417	3.428
Number of teeth	Input gear	1st	16	14
		2nd	23	20
		3rd	29	33
		4th	41	44
		5th	45	49
		Rev.	12	14
	Main gear	1st	49	46
		2nd	42	37
		3rd	35	42
		4th	37	42
		5th	34	39
		Rev.	41	48
	Reverse idler gear		30	29
Oil capacity	liter (US pt, Imp pt)		2.8 (5-7/8, 4-7/8)	4.7 (10, 8-1/4)

FINAL GEAR

Engine	GA16i	CA18DE
Final gear ratio	4.471	4.471
Number of teeth Final gear/Pinion	76/17	76/17
Side gear/Pinion mate gear	14/10	16/10

Inspection and Adjustment—RS5F31A

GEAR END PLAY

Gear	End play mm (in)
1st main gear	0.18 - 0.31 (0.0071 - 0.0122)
2nd main gear	0.20 - 0.40 (0.0079 - 0.0157)
3rd main gear	0.20 - 0.40 (0.0079 - 0.0157)
4th main gear	0.20 - 0.40 (0.0079 - 0.0157)
5th input gear	0.18 - 0.41 (0.0071 - 0.0161)

CLEARANCE BETWEEN BAULK RING AND GEAR

Unit: mm (in)

	Standard	Wear limit
1st & 2nd	1.0 - 1.3 (0.039 - 0.051)	0.7 (0.028)
3rd & 4th	1.0 - 1.3 (0.039 - 0.051)	0.7 (0.028)
5th	1.0 - 1.3 (0.039 - 0.051)	0.7 (0.028)

AVAILABLE CHECK PLUG

Reverse check plug

Reverse check turning torque (At striking rod)	4.9 - 7.4 N·m (50 - 75 kg-cm, 43 - 65 in-lb)

Thickness mm (in)	Part number
8.3 (0.327)	32188-M8001*
7.1 (0.280)	32188-M8002
7.7 (0.303)	32188-M8003
8.9 (0.350)	32188-M8004

* Standard check plug

AVAILABLE SNAP RING

Input shaft front bearing

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)

Thickness mm (in)	Part number
1.27 (0.0500)	32204-M8004
1.33 (0.0524)	32204-M8005
1.39 (0.0547)	32204-M8006
1.45 (0.0571)	32204-M8007

Input shaft 5th synchronizer hub

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)

Thickness mm (in)	Part number
2.00 (0.0787)	32311-M8812
2.05 (0.0807)	32311-M8813
2.10 (0.0827)	32311-M8814
2.15 (0.0846)	32311-M8815
2.20 (0.0866)	32311-M8816
2.25 (0.0886)	32311-M8817
2.30 (0.0906)	32311-M8818

AVAILABLE C-RING

Mainshaft C-ring

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)

Thickness mm (in)	Part number	Thickness mm (in)	Part number
3.63 (0.1429)	32348-M8800	4.12 (0.1622)	32348-M8807
3.70 (0.1457)	32348-M8801	4.19 (0.1650)	32348-M8808
3.77 (0.1484)	32348-M8802	4.26 (0.1677)	32348-M8809
3.84 (0.1512)	32348-M8803	4.33 (0.1705)	32348-M8810
3.91 (0.1539)	32348-M8804	4.40 (0.1732)	32348-M8811
3.98 (0.1567)	32348-M8805	4.47 (0.1760)	32348-M8812
4.05 (0.1594)	32348-M8806	4.54 (0.1787)	32348-M8813

Inspection and Adjustment— RS5F31A (Cont'd)

AVAILABLE WASHER

Differential side gear thrust washer

Allowable clearance between side gear and differential case with washer	0.3 mm (0.012 in) or less

Thickness mm (in)	Part number
0.745 - 0.775 (0.0293 - 0.0305)	38424-02M00
0.775 - 0.805 (0.0305 - 0.0317)	38424-02M01
0.805 - 0.835 (0.0317 - 0.0329)	38424-02M02
0.835 - 0.865 (0.0329 - 0.0341)	38424-02M03
0.865 - 0.895 (0.0341 - 0.0352)	38424-02M04
0.895 - 0.925 (0.0352 - 0.0364)	38424-02M05
0.925 - 0.955 (0.0364 - 0.0376)	38424-02M06
0.955 - 0.985 (0.0376 - 0.0388)	38424-02M07

AVAILABLE SHIM

– MAINSHAFT AND DIFFERENTIAL SIDE BEARING PRELOAD AND ADJUSTING SHIM

Bearing preload

Unit: mm (in)

Mainshaft bearing	0.18 - 0.27 (0.0071 - 0.0106)
Differential side bearing	0.29 - 0.35 (0.0114 - 0.0138)

Turning torque (New bearing)

Unit: N·m (kg-cm, in-lb)

Final drive only	3.9 - 7.8 (40 - 80, 35 - 69)
Total	5.9 - 13.7 (60 - 140, 52 - 122)

Mainshaft bearing adjusting shim

Thickness mm (in)	Part number
0.10 (0.0039)	32137-M8000
0.15 (0.0059)	32137-M8001
0.20 (0.0079)	32137-M8002
0.25 (0.0098)	32137-M8003
0.30 (0.0118)	32137-M8004
0.35 (0.0138)	32137-M8005
0.40 (0.0157)	32137-M8006
0.45 (0.0177)	32137-M8007
0.50 (0.0197)	32137-M8008
0.55 (0.0217)	32137-M8009
0.60 (0.0236)	32137-M8010
0.65 (0.0256)	32137-M8011
0.70 (0.0276)	32137-M8012
0.75 (0.0295)	32137-M8013
0.80 (0.0315)	32137-M8014
0.85 (0.0335)	32137-M8015
0.90 (0.0354)	32137-M8016
0.95 (0.0374)	32137-M8017
1.00 (0.0394)	32137-M8018
2.50 (0.0984)	32138-M8010

Table for selecting mainshaft bearing adjusting shim

Unit: mm (in)

Measured distance	Suitable shim thickness
2.35 - 2.40 (0.0925 - 0.0945)	0.10 (0.0039)
2.40 - 2.45 (0.0945 - 0.0965)	0.15 (0.0059)
2.45 - 2.50 (0.0965 - 0.0984)	0.20 (0.0079)
2.50 - 2.55 (0.0984 - 0.1004)	0.25 (0.0098)
2.55 - 2.60 (0.1004 - 0.1024)	0.30 (0.0118)
2.60 - 2.65 (0.1024 - 0.1043)	0.35 (0.0138)
2.65 - 2.70 (0.1043 - 0.1063)	0.40 (0.0157)
2.70 - 2.75 (0.1063 - 0.1083)	0.45 (0.0177)
2.75 - 2.80 (0.1083 - 0.1102)	0.50 (0.0197)
2.80 - 2.85 (0.1102 - 0.1122)	0.55 (0.0217)
2.85 - 2.90 (0.1122 - 0.1142)	0.60 (0.0236)
2.90 - 2.95 (0.1142 - 0.1161)	0.65 (0.0256)
2.95 - 3.00 (0.1161 - 0.1181)	0.70 (0.0276)
3.00 - 3.05 (0.1181 - 0.1201)	0.75 (0.0295)
3.05 - 3.10 (0.1201 - 0.1220)	0.80 (0.0315)
3.10 - 3.15 (0.1220 - 0.1240)	0.85 (0.0335)
3.15 - 3.20 (0.1240 - 0.1260)	0.90 (0.0354)
3.20 - 3.25 (0.1260 - 0.1280)	0.95 (0.0374)
3.25 - 3.30 (0.1280 - 0.1299)	1.00 (0.0394)

Inspection and Adjustment— RS5F31A (Cont'd)

Differential side bearing adjusting shim

Thickness mm (in)	Part number
0.44 (0.0173)	38454-M8000
0.48 (0.0189)	38454-M8001
0.56 (0.0220)	38454-M8003
0.60 (0.0236)	38454-M8004
0.64 (0.0252)	38454-M8005
0.68 (0.0268)	38454-M8006
0.72 (0.0283)	38454-M8007
0.76 (0.0299)	38454-M8008
0.80 (0.0315)	38454-M8009
0.84 (0.0331)	38454-M8010
0.88 (0.0346)	38454-M8011

Table for selecting differential side bearing adjusting shim

Unit: mm (in)

Measured clearance	Suitable shim thickness	Appropriate shim(s)
0.58 - 0.62 (0.0228 - 0.0244)	0.64 (0.0252)	0.64 (0.0252)
0.62 - 0.66 (0.0244 - 0.0260)	0.68 (0.0268)	0.68 (0.0268)
0.66 - 0.70 (0.0260 - 0.0276)	0.72 (0.0283)	0.72 (0.0283)
0.70 - 0.74 (0.0276 - 0.0291)	0.76 (0.0299)	0.76 (0.0299)
0.74 - 0.78 (0.0291 - 0.0307)	0.80 (0.0315)	0.80 (0.0315)
0.78 - 0.82 (0.0307 - 0.0323)	0.84 (0.0331)	0.84 (0.0331)
0.82 - 0.86 (0.0323 - 0.0339)	0.88 (0.0346)	0.88 (0.0346)
0.86 - 0.90 (0.0339 - 0.0354)	0.92 (0.0362)	0.44 (0.0173) + 0.48 (0.0189)
0.90 - 0.94 (0.0354 - 0.0370)	0.96 (0.0378)	0.48 (0.0189) + 0.48 (0.0189)
0.94 - 0.98 (0.0370 - 0.0386)	1.00 (0.0394)	0.44 (0.0173) + 0.56 (0.0220)
0.98 - 1.02 (0.0386 - 0.0402)	1.04 (0.0409)	0.44 (0.0173) + 0.60 (0.0236)
1.02 - 1.06 (0.0402 - 0.0417)	1.08 (0.0425)	0.44 (0.0173) + 0.64 (0.0252)
1.06 - 1.10 (0.0417 - 0.0433)	1.12 (0.0441)	0.44 (0.0173) + 0.68 (0.0268)
1.10 - 1.14 (0.0433 - 0.0449)	1.16 (0.0457)	0.44 (0.0173) + 0.72 (0.0283)
1.14 - 1.18 (0.0449 - 0.0465)	1.20 (0.0472)	0.44 (0.0173) + 0.76 (0.0299)
1.18 - 1.22 (0.0465 - 0.0480)	1.24 (0.0488)	0.44 (0.0173) + 0.80 (0.0315)
1.22 - 1.26 (0.0480 - 0.0496)	1.28 (0.0504)	0.44 (0.0173) + 0.84 (0.0331)
1.26 - 1.30 (0.0496 - 0.0512)	1.32 (0.0520)	0.44 (0.0173) + 0.88 (0.0346)
1.30 - 1.34 (0.0512 - 0.0528)	1.36 (0.0535)	0.88 (0.0346) + 0.48 (0.0189)
1.34 - 1.38 (0.0528 - 0.0543)	1.40 (0.0551)	0.68 (0.0268) + 0.72 (0.0283)
1.38 - 1.42 (0.0543 - 0.0559)	1.44 (0.0567)	0.88 (0.0346) + 0.56 (0.0220)
1.42 - 1.46 (0.0559 - 0.0575)	1.48 (0.0583)	0.88 (0.0346) + 0.60 (0.0236)
1.46 - 1.50 (0.0575 - 0.0591)	1.52 (0.0598)	0.88 (0.0346) + 0.64 (0.0252)
1.50 - 1.54 (0.0591 - 0.0606)	1.56 (0.0614)	0.88 (0.0346) + 0.68 (0.0268)
1.54 - 1.58 (0.0606 - 0.0622)	1.60 (0.0630)	0.88 (0.0346) + 0.72 (0.0283)
1.58 - 1.62 (0.0622 - 0.0638)	1.64 (0.0646)	0.88 (0.0346) + 0.76 (0.0299)
1.62 - 1.66 (0.0638 - 0.0654)	1.68 (0.0661)	0.88 (0.0346) + 0.80 (0.0315)
1.66 - 1.70 (0.0654 - 0.0669)	1.72 (0.0677)	0.88 (0.0346) + 0.84 (0.0331)
1.70 - 1.74 (0.0669 - 0.0685)	1.76 (0.0693)	0.88 (0.0346) + 0.88 (0.0346)

Tightening Torque—RS5F31A

TRANSMISSION INSTALLATION

Unit	N·m	kg-m	ft-lb
Transmission securing bolt	Refer to Removal and Installation.		
Engine gusset to engine			
Front gusset	Refer to section EM.		
Rear gusset	16 - 21	1.6 - 2.1	12 - 15
Engine mounting bracket fixing bolt	Refer to section EM.		
Starter motor fixing bolt	Refer to section EM.		

Gear control

Unit	N·m	kg-m	ft-lb
Control rod to transaxle	14 - 18	1.4 - 1.8	10 - 13
Support rod to engine mount bracket	35 - 47	3.6 - 4.8	26 - 35
Holder bracket fixing bolt	12 - 15	1.2 - 1.5	9 - 11
Holder bracket to support rod	22 - 29	2.2 - 3.0	16 - 22
Control lever socket to support rod	8 - 11	0.8 - 1.1	5.8 - 8.0
Control lever to control rod	18 - 24	1.8 - 2.4	13 - 17

Gear assembly

Unit	N·m	kg-m	ft-lb
Clutch housing to transmission case	16 - 21	1.6 - 2.1	12 - 15
Case cover to transmission case	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Bearing retainer to clutch housing	16 - 21	1.6 - 2.1	12 - 15
Control bracket to clutch housing	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Reverse check plug	19 - 25	1.9 - 2.5	14 - 18
Check sleeve assembly to clutch housing	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Final gear to differential case	74 - 88	7.5 - 9.0	54 - 65
Filler plug	25 - 34	2.5 - 3.5	18 - 25
Drain plug	25 - 34	2.5 - 3.5	18 - 25
Reverse lamp switch	20 - 29	2.0 - 3.0	14 - 22
Neutral switch	20 - 29	2.0 - 3.0	14 - 22
Switch plug	15 - 20	1.5 - 2.0	11 - 14

Inspection and Adjustment—RS5F50A

GEAR END PLAY

Gear	End play mm (in)
1st main gear	0.23 - 0.43 (0.0091 - 0.0169)
2nd main gear	0.23 - 0.58 (0.0091 - 0.0228)
3rd input gear	0.23 - 0.43 (0.0091 - 0.0169)
4th input gear	0.25 - 0.55 (0.0098 - 0.0217)
5th input gear	0.23 - 0.48 (0.0091 - 0.0189)

CLEARANCE BETWEEN BAULK RING AND GEAR

Unit: mm (in)

	Standard	Wear limit
1st & 2nd	1.0 - 1.35 (0.0394 - 0.0531)	0.7 (0.028)
3rd & 4th	1.0 - 1.35 (0.0394 - 0.0531)	0.7 (0.028)
5th	1.0 - 1.35 (0.0394 - 0.0531)	0.7 (0.028)

AVAILABLE SNAP RING

3rd & 4th synchronizer hub (At input shaft)

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
1.95 (0.0768)	32269-03E03
2.00 (0.0787)	32269-03E00
2.05 (0.0807)	32269-03E01
2.10 (0.0827)	32269-03E02

1st & 2nd synchronizer hub

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
1.95 (0.0768)	32269-03E03
2.00 (0.0787)	32269-03E00
2.05 (0.0807)	32269-03E01
2.10 (0.0827)	32269-03E02

5th main gear

Allowable clearance	0 - 0.15 mm (0 - 0.0059 in)
Thickness mm (in)	Part number
1.95 (0.0768)	32348-05E00
2.05 (0.0807)	32348-05E01
2.15 (0.0846)	32348-05E02
2.25 (0.0886)	32348-05E03

AVAILABLE WASHER

Input shaft thrust washer

Allowable clearance	0 - 0.06 mm (0 - 0.0024 in)
Thickness mm (in)	Part number
4.500 (0.1772)	32278-03E01
4.525 (0.1781)	32278-03E02
4.550 (0.1791)	32278-03E03
4.575 (0.1801)	32278-03E04

Differential side gear thrust washer

Allowable clearance between side gear and differential case with washer	0.1 - 0.2 mm (0.004 - 0.008 in)
Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-E3000
0.80 - 0.85 (0.0315 - 0.0335)	38424-E3001
0.85 - 0.90 (0.0335 - 0.0354)	38424-E3002
0.90 - 0.95 (0.0354 - 0.0374)	38424-E3003

AVAILABLE SHIM

– INPUT SHAFT END PLAY AND MAINSHAFT AND DIFFERENTIAL SIDE BEARING PRELOAD AND ADJUSTING SHIM

Bearing preload and end play

Unit: mm (in)

Mainshaft bearing preload	0.25 - 0.31 (0.0098 - 0.0122)
Input shaft end play	–0.06 - 0 (–0.0024 - 0)
Differential side bearing preload	0.40 - 0.46 (0.0157 - 0.0181)

Turning torque (New bearing)

Unit: N·m (kg-cm, in-lb)

Final drive only	4.9 - 7.8 (50 - 80, 43 - 69)
Total	8.8 - 21.6 (90 - 220, 78 - 191)

Inspection and Adjustment—RS5F50A (Cont'd)

Mainshaft bearing adjusting shim

Thickness mm (in)	Part number
0.40 (0.0157)	32139-03E11
0.44 (0.0173)	32139-03E00
0.48 (0.0189)	32139-03E01
0.52 (0.0205)	32139-03E12
0.56 (0.0220)	32139-03E02
0.60 (0.0236)	32139-03E03
0.64 (0.0252)	32139-03E04
0.68 (0.0268)	32139-03E05
0.72 (0.0283)	32139-03E06
0.76 (0.0299)	32139-03E07
0.80 (0.0315)	32139-03E08
1.20 (0.0472)	32139-03E13

Input shaft bearing adjusting shim

Thickness mm (in)	Part number
0.40 (0.0157)	32225-08E00
0.44 (0.0173)	32225-08E01
0.48 (0.0189)	32225-08E02
0.52 (0.0205)	32225-08E03
0.56 (0.0220)	32225-08E04
0.60 (0.0236)	32225-08E05
0.64 (0.0252)	32225-08E06
0.68 (0.0268)	32225-08E07
0.72 (0.0283)	32225-08E08
0.76 (0.0299)	32225-08E09
0.80 (0.0315)	32225-08E10
1.20 (0.0472)	32225-08E11

Table for selecting input shaft bearing adjusting shim

Unit: mm (in)

Dial indicator deflection	Suitable shim(s)
0.65 - 0.69 (0.0256 - 0.0272)	0.64 (0.0252)
0.69 - 0.73 (0.0272 - 0.0287)	0.68 (0.0268)
0.73 - 0.77 (0.0287 - 0.0303)	0.72 (0.0283)
0.77 - 0.81 (0.0303 - 0.0319)	0.76 (0.0299)
0.81 - 0.85 (0.0319 - 0.0335)	0.80 (0.0315)
0.85 - 0.89 (0.0335 - 0.0350)	0.40 + 0.44 (0.0157 + 0.0173)
0.89 - 0.93 (0.0350 - 0.0366)	0.44 + 0.44 (0.0173 + 0.0173)
0.93 - 0.97 (0.0366 - 0.0382)	0.44 + 0.48 (0.0173 + 0.0189)
0.97 - 1.01 (0.0382 - 0.0398)	0.48 + 0.48 (0.0189 + 0.0189)
1.01 - 1.05 (0.0398 - 0.0413)	0.48 + 0.52 (0.0189 + 0.0205)
1.05 - 1.09 (0.0413 - 0.0429)	0.52 + 0.52 (0.0205 + 0.0205)
1.09 - 1.13 (0.0429 - 0.0445)	0.52 + 0.56 (0.0205 + 0.0220)
1.13 - 1.17 (0.0445 - 0.0461)	0.56 + 0.56 (0.0220 + 0.0220)
1.17 - 1.21 (0.0461 - 0.0476)	0.56 + 0.60 (0.0220 + 0.0236)
1.21 - 1.25 (0.0476 - 0.0492)	0.60 + 0.60 (0.0236 + 0.0236)
1.25 - 1.29 (0.0492 - 0.0508)	0.60 + 0.64 (0.0236 + 0.0252)
1.29 - 1.33 (0.0508 - 0.0524)	0.64 + 0.64 (0.0252 + 0.0252)
1.33 - 1.37 (0.0524 - 0.0539)	0.64 + 0.68 (0.0252 + 0.0268)
1.37 - 1.41 (0.0539 - 0.0555)	0.68 + 0.68 (0.0268 + 0.0268)
1.41 - 1.45 (0.0555 - 0.0571)	0.68 + 0.72 (0.0268 + 0.0283)
1.45 - 1.49 (0.0571 - 0.0587)	0.72 + 0.72 (0.0283 + 0.0283)
1.49 - 1.53 (0.0587 - 0.0602)	0.72 + 0.76 (0.0283 + 0.0299)
1.53 - 1.57 (0.0602 - 0.0618)	0.76 + 0.76 (0.0299 + 0.0299)
1.57 - 1.61 (0.0618 - 0.0634)	0.76 + 0.80 (0.0299 + 0.0315)
1.61 - 1.65 (0.0634 - 0.0650)	0.80 + 0.80 (0.0315 + 0.0315)
1.65 - 1.69 (0.0650 - 0.0665)	0.44 + 1.20 (0.0173 + 0.0472)

Differential side bearing adjusting shim

Thickness mm (in)	Part number
0.40 (0.0157)	38453-03E11
0.44 (0.0173)	38453-03E00
0.48 (0.0189)	38453-03E01
0.52 (0.0205)	38453-03E12
0.56 (0.0220)	38453-03E02
0.60 (0.0236)	38453-03E03
0.64 (0.0252)	38453-03E04
0.68 (0.0268)	38453-03E05
0.72 (0.0283)	38453-03E06
0.76 (0.0299)	38453-03E07
0.80 (0.0315)	38453-03E08
1.20 (0.0472)	38453-03E13

Table for selecting differential side bearing adjusting shim(s)

Unit: mm (in)

Dial indicator deflection	Suitable shim(s)
0.47 - 0.51 (0.0185 - 0.0201)	0.44 + 0.48 (0.0173 + 0.0189)
0.51 - 0.55 (0.0201 - 0.0217)	0.48 + 0.48 (0.0189 + 0.0189)
0.55 - 0.59 (0.0217 - 0.0232)	0.48 + 0.52 (0.0189 + 0.0205)
0.59 - 0.63 (0.0232 - 0.0248)	0.52 + 0.52 (0.0205 + 0.0205)
0.63 - 0.67 (0.0248 - 0.0264)	0.52 + 0.56 (0.0205 + 0.0220)
0.67 - 0.71 (0.0264 - 0.0280)	0.56 + 0.56 (0.0220 + 0.0220)
0.71 - 0.75 (0.0280 - 0.0295)	0.56 + 0.60 (0.0220 + 0.0236)
0.75 - 0.79 (0.0295 - 0.0311)	0.60 + 0.60 (0.0236 + 0.0236)
0.79 - 0.83 (0.0311 - 0.0327)	0.60 + 0.64 (0.0236 + 0.0252)
0.83 - 0.87 (0.0327 - 0.0343)	0.64 + 0.64 (0.0252 + 0.0252)
0.87 - 0.91 (0.0343 - 0.0358)	0.64 + 0.68 (0.0252 + 0.0268)
0.91 - 0.95 (0.0358 - 0.0374)	0.68 + 0.68 (0.0268 + 0.0268)
0.95 - 0.99 (0.0374 - 0.0390)	0.68 + 0.72 (0.0268 + 0.0283)
0.99 - 1.03 (0.0390 - 0.0406)	0.72 + 0.72 (0.0283 + 0.0283)
1.03 - 1.07 (0.0406 - 0.0421)	0.72 + 0.76 (0.0283 + 0.0299)
1.07 - 1.11 (0.0421 - 0.0437)	0.76 + 0.76 (0.0299 + 0.0299)
1.11 - 1.15 (0.0437 - 0.0453)	0.76 + 0.80 (0.0299 + 0.0315)
1.15 - 1.19 (0.0453 - 0.0469)	0.80 + 0.80 (0.0315 + 0.0315)
1.19 - 1.23 (0.0469 - 0.0484)	0.44 + 1.20 (0.0173 + 0.0472)
1.23 - 1.27 (0.0484 - 0.0500)	0.48 + 1.20 (0.0189 + 0.0472)
1.27 - 1.31 (0.0500 - 0.0516)	0.52 + 1.20 (0.0205 + 0.0472)

Tightening Torque— RS5F50A

TRANSMISSION INSTALLATION

Unit	N·m	kg-m	ft-lb
Clutch operating cylinder	30 - 40	3.1 - 4.1	22 - 30
Transmission securing bolt	Refer to Removal and Installation.		
Engine gusset to engine	30 - 40	3.1 - 4.1	22 - 30
Engine mounting bracket fixing bolt	Refer to section EM.		
Starter motor fixing bolt	Refer to section EM.		

Gear control

Unit	N·m	kg-m	ft-lb
Control rod to transaxle	14 - 18	1.4 - 1.8	10 - 13
Support rod to bracket	35 - 47	3.6 - 4.8	26 - 35
Support rod bracket to transaxle	27 - 36	2.8 - 3.7	20 - 27
Holder bracket fixing bolt	12 - 15	1.2 - 1.5	9 - 11
Holder bracket to support rod	22 - 29	2.2 - 3.0	16 - 22
Control lever socket to support rod	8 - 11	0.8 - 1.1	5.8 - 8.0
Control lever to control rod	18 - 24	1.8 - 2.4	13 - 17

Gear assembly — RS5F50A

Unit	N·m	kg-m	ft-lb
Clutch housing to transmission case	16 - 21	1.6 - 2.1	12 - 15
Reverse lever assembly securing bolt	16 - 21	1.6 - 2.1	12 - 15
5th & Rev check plug	16 - 22	1.6 - 2.2	12 - 16
1st & 2nd check plug	16 - 22	1.6 - 2.2	12 - 16
3rd & 4th check plug	16 - 22	1.6 - 2.2	12 - 16
Reverse gate securing bolt	16 - 21	1.6 - 2.1	12 - 15
Reverse idler shaft fixing bolt	16 - 21	1.6 - 2.1	12 - 15
Final gear to differential case	74 - 88	7.5 - 9.0	54 - 65
Drain plug	15 - 20	1.5 - 2.0	11 - 14
Position switch securing bolt	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7

AUTOMATIC TRANSAXLE

SECTION AT

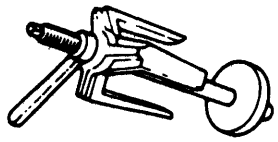
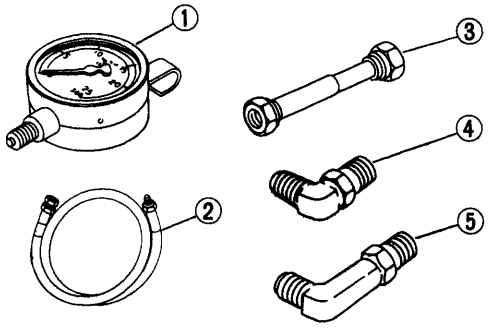
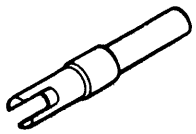
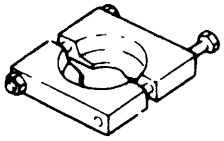
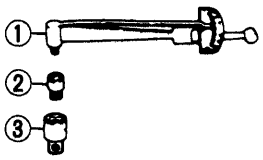
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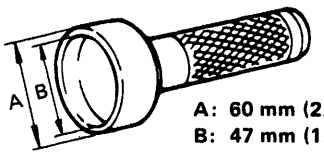
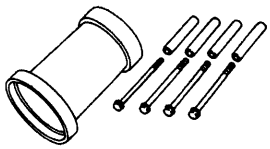
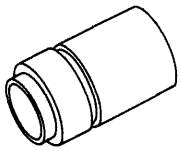
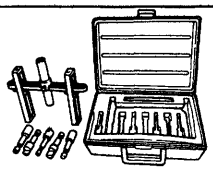
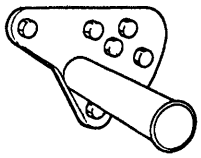
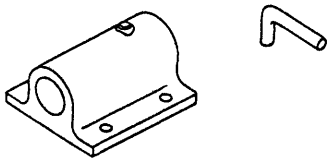
PREPARATION (RL3F01A & RL4F02A) ..... AT- 2
ON-VEHICLE SERVICE (RL3F01A & RL4F02A) ..... AT- 7
TROUBLE-SHOOTING AND DIAGNOSES (RL3F01A) ..... AT- 12
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ASSEMBLY (RL4F02A) AT-123
SERVICE DATA AND SPECIFICATIONS (S.D.S.) (RL3F01A & RL4F02A) AT-141

When you read wiring diagrams:

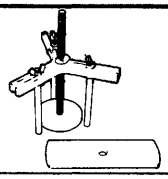
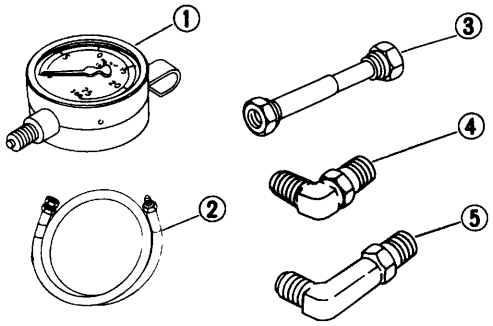
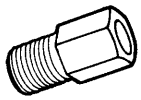
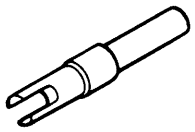
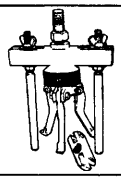
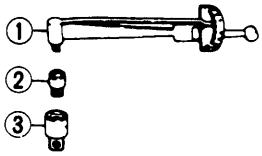
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

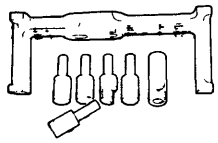
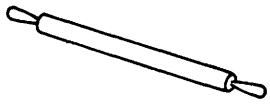
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
ST25420001 (J26063-A) Clutch spring compressor		Removing and installing clutch springs
ST2505S001 (J25695-A) Oil pressure gauge set ① ST25051001 (J25695-1) Oil pressure gauge ② ST25052000 (J25695-2) Hose ③ ST25053000 (J25695-3) Joint pipe ④ ST25054000 (J25695-4) Adapter ⑤ ST25055000 (J25695-5) Adapter		Measuring oil pressure
KV38105900 (J33201) Preload adapter		Checking differential side bearing preload
ST22730000 (J25681) Bearing puller		Removing output shaft bearing inner cones
ST33290001 (J25810-A) Side bearing outer race puller		Removing differential side bearing outer race
ST3127S000 (See J25765-A) Preload gauge ① GG91030000 (J25765-A) Torque wrench ② HT62940000 (–) Socket adapter ③ HT62900000 (–) Socket adapter		Checking differential side bearing preload

Tool number (Kent-Moore No.) Tool name	Description	
ST33400001 (J26082) Oil seal drift	 A: 60 mm (2.36 in) dia. B: 47 mm (1.85 in) dia.	Installing differential side oil seal
(J33200) Differential preload shim selector		Selecting differential side bearing adjusting shim
(J33200-83) Transaxle shim selector adapter		Selecting differential side bearing adjusting shim
(J34291) Shim setting gauge set		Selecting output shaft end play adjusting shim
(J34279) Automatic transaxle holding fixture		Holding automatic transaxle assembly (Use with T3289-20.)
(J3289-20) Bench mount fixture		Holding automatic transaxle assembly (Use with J34279.)

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description
ST25420001 (J34285) Clutch spring compressor	 Removing and installing clutch springs
ST2505S001 (J25695-A) Oil pressure gauge set ① ST25051001 (J25695-1) Oil pressure gauge ② ST25052000 (J25695-2) Hose ③ ST25053000 (J25695-3) Joint pipe ④ ST25054000 (J25695-4) Adapter ⑤ ST25055000 (J25695-5) Adapter	 Measuring oil pressure
KV31101200 (J34282) Oil pressure gauge adapter	 Measuring oil pressure
KV38106500 (J34284) Preload adapter	 Checking differential side bearing preload
ST33290001 (J34286) Side bearing outer race puller	 Removing differential side bearing outer race
ST3127S000 (See J25765-A) Preload gauge ① GG91030000 (J25765-A) Torque wrench ② HT62940000 (–) Socket adapter ③ HT62900000 (–) Socket adapter	 Checking differential side bearing preload

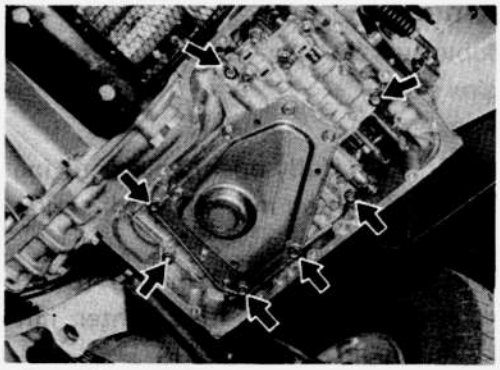
Tool number (Kent-Moore No.) Tool name	Description	
(J34290) Shim selecting tool		Selecting oil pump housing bearing race Selecting clutch pack thrust washer Selecting differential side bearing adjusting shim Selecting output shaft bearing adjusting shim Selecting idler gear bearing adjusting shim
(J26774-A) Seal installation tool		Installing piston

Service Notice

- Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts of the transmission from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use a nylon cloth or paper towel for wiping parts clean. Common shop rags can leave lint that might interfere with the transaxle's operation.
- When disassembling parts, be sure to place them in order in parts rack so they can be put back in the unit in their proper positions.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals, and O-rings should be replaced. It is also very important to perform functional tests whenever it is designated.
- The valve body contains many precision parts and requires extreme care when parts are removed and serviced. Place removed parts on a parts rack so they can be put back in the valve body in the same positions and sequences. Care will also prevent springs and small parts from becoming scattered or lost.
- Before assembly, apply a coat of recommended A.T.F. to all parts. Vaseline may be applied to O-rings and seals. Do not use any grease.
- Care should be taken to avoid damaging O-rings, seals and gaskets when assembling.

Abbreviations used throughout this section stand for the following:

- A.T.F. ..... Automatic Transmission Fluid
- D_1 ..... Drive range 1st gear
- D_2 ..... Drive range 2nd gear
- D_3 ..... Drive range 3rd gear
- D_4 ..... Drive range 4th gear
- O.D. ..... Overdrive
- 1_2 ..... 1 range 2nd gear
- 1_1 ..... 1 range 1st gear

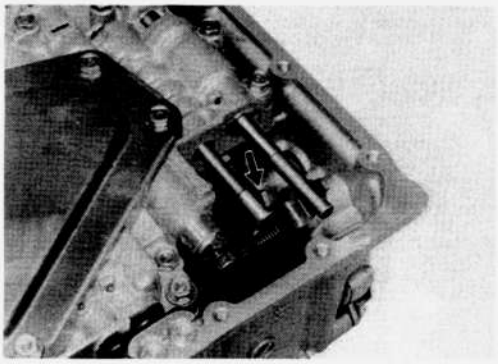


Control Valve (RL3F01A)

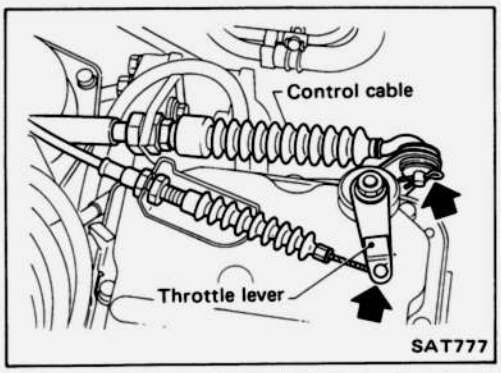
1. Remove control valve assembly.

Be careful not to drop manual valve out of valve body.

2. Disassemble, inspect and assemble control valve assembly. Refer to Control Valve Body.

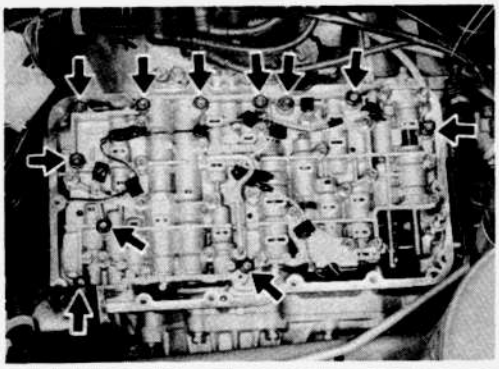


- **Set manual shaft at Neutral, then align manual plate with groove in manual valve of control valve assembly.**
- **Install detent valve with its groove facing forward.**
- **After installing control valve to transmission case, make sure that selector lever can be moved to all positions.**



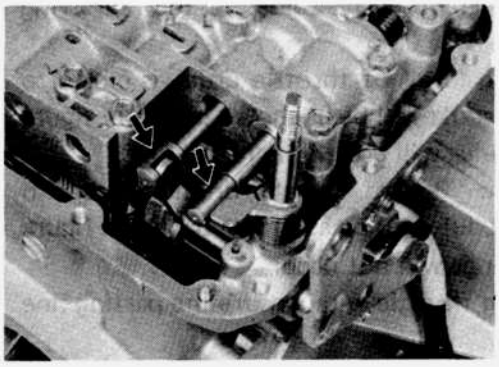
Control Valve (RL4F02A)

1. Remove battery and its bracket.
2. Disconnect control cable and throttle wire and remove throttle lever.



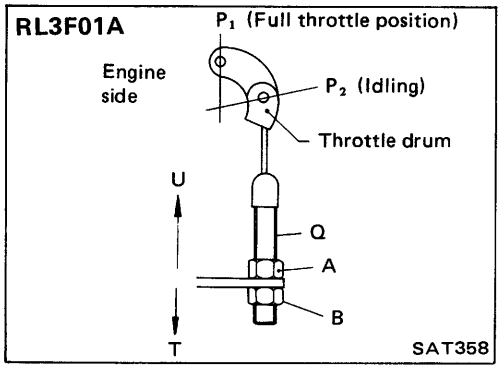
3. Disconnect harness connector on control valve and remove control valve assembly.

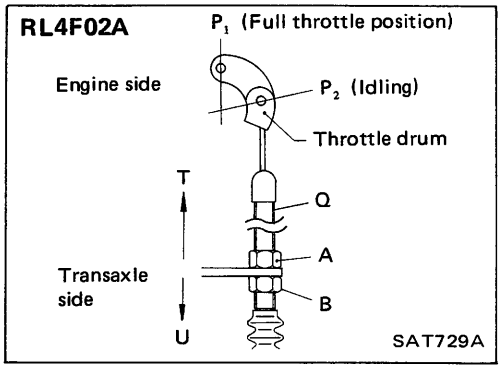
Be careful not to drop manual valve out of valve body.

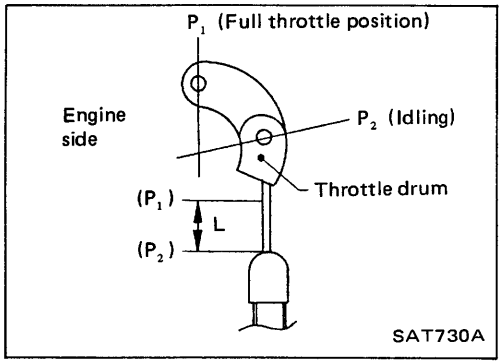


4. Disassemble, inspect and assemble control valve assembly. Refer to Control Valve Body.

- **Set manual shaft at Neutral, then align manual plate with groove in manual valve of control valve assembly.**
- **After installing control valve to transmission case, make sure that selector lever can be moved to all positions.**



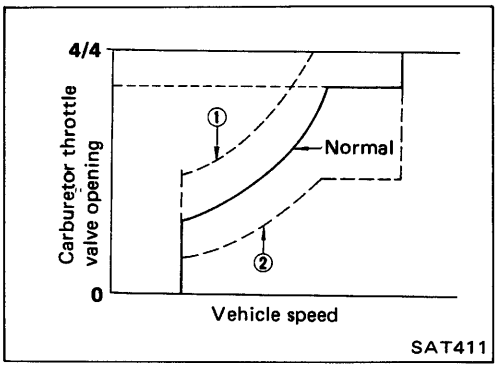




Throttle Wire Adjustment

1. Loosen throttle wire double nuts "A" and "B".
   RL3F01A: Engine side
   RL4F02A: Transaxle side
2. With throttle drum set at "P_1" (fully-open), move fitting "Q" fully in direction "T" and tighten nut "B" in direction "U".
3. Reverse nut "B" 2.75 to 3.25 (RL4F02A) or 1.0 to 1.5 (RL3F01A) revolutions in direction "T", then tighten nut "A" securely. Throttle drum should be held at "P_1".
4. Ensure that throttle wire stroke "L" is within specified range between full throttle and idle.
   Throttle wire stroke "L":
   RL4F02A
   39 - 43 mm (1.54 - 1.69 in)
   RL3F01A
   27.4 - 31.4 mm (1.079 - 1.236 in)

- **Adjust throttle wire stroke when throttle wire/accelerator wire is installed or after carburetor has been adjusted.**
- **Put marks on throttle wire to facilitate measuring wire stroke.**



If throttle wire stroke is improperly adjusted, the following problems may arise.

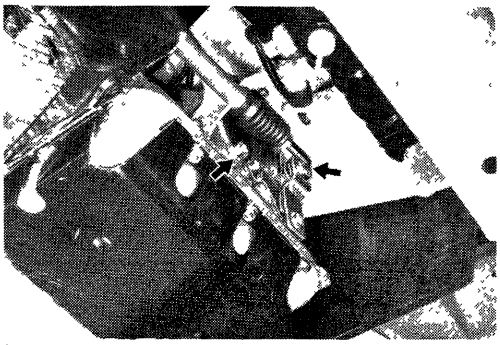
- When full-open position "P_1" of throttle drum is closer to direction "T", shift schedule will be as shown by ② in figure below, and kickdown range will greatly increase.
- When full-open position "P_1" of throttle drum is closer to direction "U", shift schedule will be as shown by ① in figure above, and kickdown range will not occur.

5. After properly adjusting throttle wire, ensure the parting line is as straight as possible.

Control Cable Adjustment

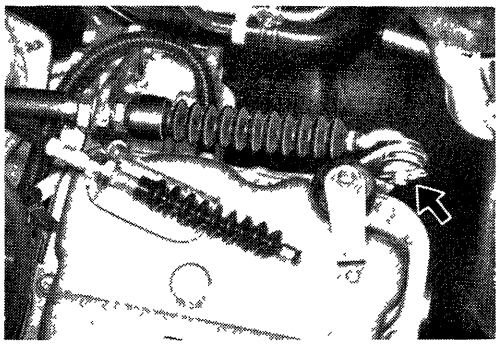
Move selector lever from the "P" range to "1" range. You should be able to feel the detents in each range.
If the detents cannot be felt or the pointer indicating the range is improperly aligned, the control cable needs adjustment.

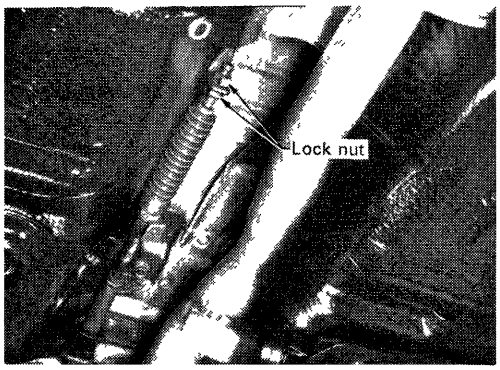
RL3F01A



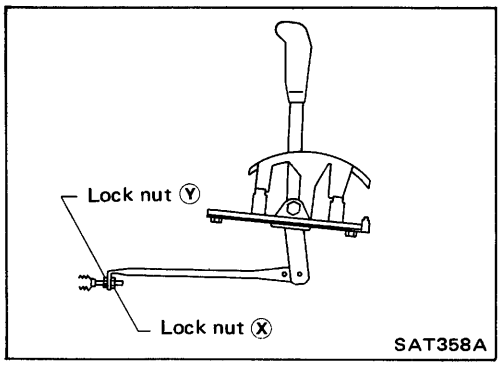
1. Place selector lever at "P" range.
2. Connect control cable end to manual lever in transaxle unit, and tighten control cable securing bolts.

RL4F02A





3. Move selector lever from "P" range to "1" range. Make sure that selector lever can move smoothly and without any sliding noise.
4. Place selector lever at "P" range again.
5. Make sure that control lever locks at "P" range.
6. Loosen lock nuts.



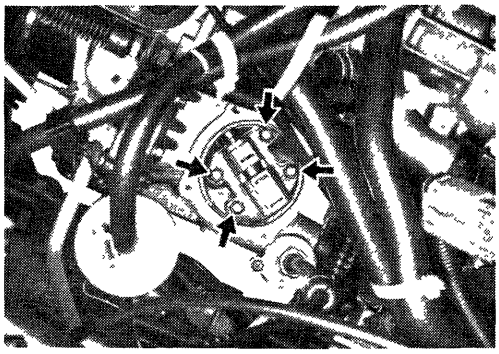
7. Screw lock nut Ⓧ until it touches select rod end while holding select rod horizontal, and tighten lock nut Ⓨ.

Control Cable Adjustment (Cont'd)

8. Move selector lever from "P" range to "1" range again. Make sure that selector lever can move smoothly and without any sliding noise.
9. Apply grease to contacting areas of selector lever and select rod.

Governor Valve

1. Remove governor cap.

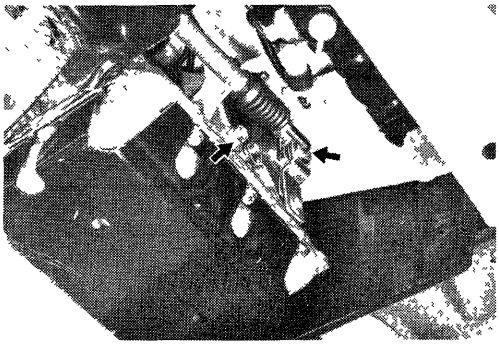


RL3F01A

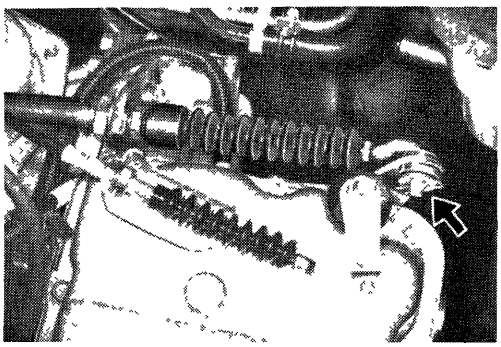
2. Remove governor valve assembly.
3. Disassemble, check and reassemble governor shaft assembly. Refer to Repair for Component Parts.

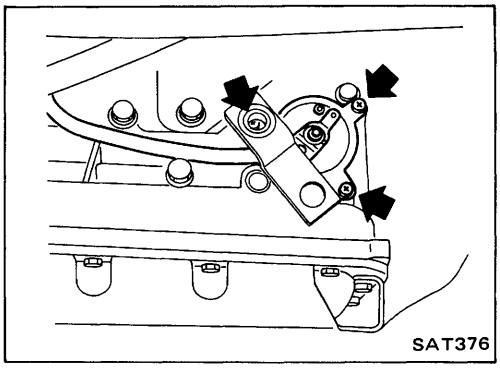
Inhibitor Switch Adjustment

1. Remove control cable end from unit.



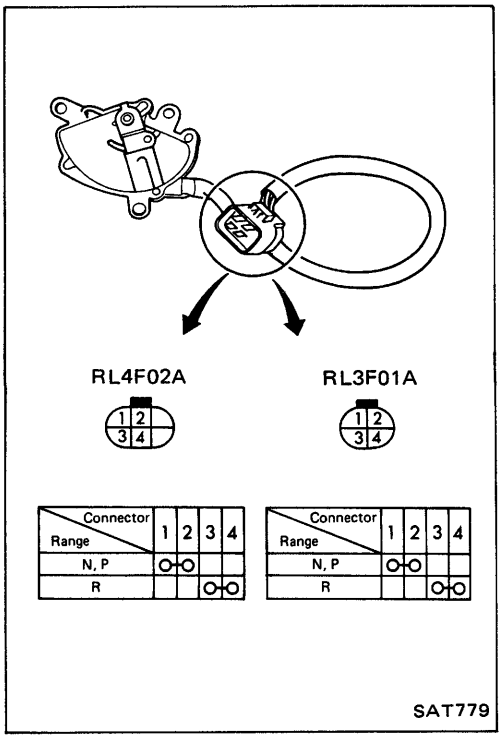
RL4F02A





2. Disconnect harness at connector, then remove inhibitor switch.

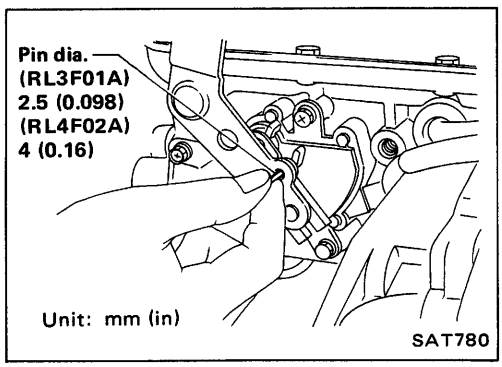
Inhibitor Switch Adjustment (Cont'd)



- Check continuity at "N", "P" and "R" ranges.
- With control lever held in "Neutral", turn manual lever an equal amount in both directions to see if current flow ranges are nearly the same. (Current normally begins to flow before manual lever reaches an angle of 1.5° in either direction.)
  If current flows outside normal range, or if normal flow range is out of specifications, properly adjust inhibitor switch.

Adjust inhibitor switch as follows:
This adjustment can be done on the vehicle.

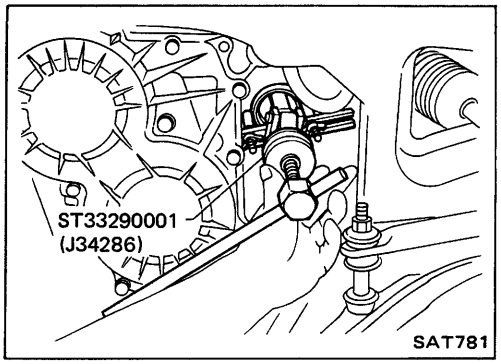
1. Loosen attaching screws.
2. Set select lever (manual shaft) at "N" position.



3. Insert a pin into adjustment holes in both inhibitor switch and switch lever as near vertical as possible.
4. Tighten screws.
5. Recheck for continuity. If faulty, replace the switch.

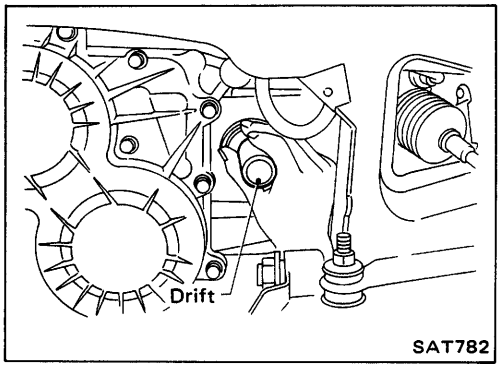
Differential Side Oil Seal Replacement

1. Remove drive shaft assembly. Refer to Drive Shaft in section FA.
2. Remove oil seal.



3. Apply coat of A.T.F. to oil seal surface, then drive new oil seal into place.
4. Install drive shaft assembly. Refer to Drive Shaft in section FA.

Be extremely careful not to scratch oil seal when inserting drive shaft.



Preliminary Checks (Prior to Road Testing)

FLUID LEAKAGE

If the governor cap is suspected:

1) Open hood.
2) Remove snap retainer, governor cap and seal ring, then reinstall them. Refer to ON-VEHICLE SERVICE.
3) Clean the area around the governor cap.
4) Run the vehicle at highway speeds.
5) Check the governor cap for fresh leakage.

To detect a fluid leak:

1) Raise vehicle.
2) Clean areas suspected of leaking.
3) Start engine, apply foot brake, place selector lever in drive, and wait a few minutes.
4) Stop engine.
5) Check for fresh leakage.

FLUID CONDITION

Examine the A.T.F. and note its color, texture, and odor.

1) Dark of Black Fluid:
   With a burned odor
   - Worn friction material.
2) Milky Pink Fluid: Water Contamination
   - Road water entering through filler tube or breather.
3) Varnished Fluid, light to dark brown and tacky: Oxidation
   - Over or Underfilling.
   - Overheating.

Road Testing

Perform road tests using "Symptom" chart. Refer to page AT-16.

"P" RANGE

1. Place selector lever in "P" range and start the engine. Stop the engine and repeat the procedure in all other ranges including neutral.
2. Stop vehicle on a slight upgrade and place selector lever in "P" range. Release parking brake to make sure vehicle remains locked.

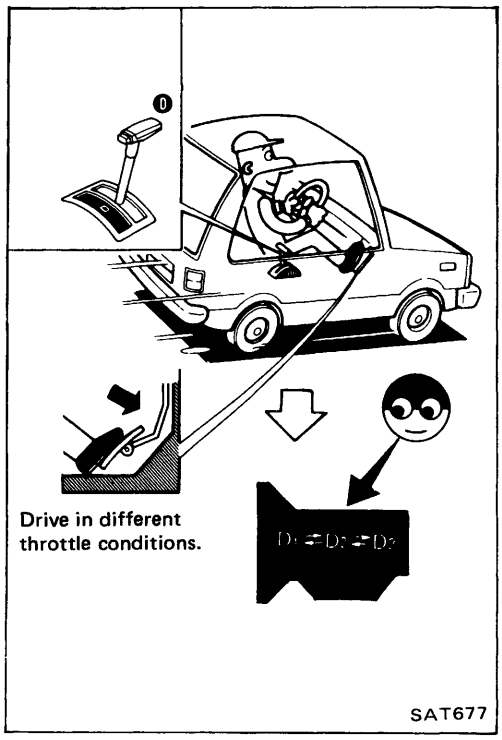
"R" RANGE

1. Manually move selector lever from "P" to "R", and note shift quality.
2. Drive the vehicle in reverse long enough to detect slippage or other abnormalities.

Road Testing (Cont'd)

"N" RANGE

1. Manually move selector lever from "R" and "D" to "N" and note quality.
2. Release parking brake with selector lever in "N" range. Lightly depress accelerator pedal to make sure vehicle does not move. (When vehicle is new or soon after clutches have been replaced, vehicle may move slightly. This is not a problem.)



"D" RANGE

1. Manually shift selector lever from "N" to "D" range, and note shift quality.
2. Using the shift schedule as a reference, drive vehicle in "D" range. Record, on symptom chart, respective vehicle speeds at which upshifting (1st → 2nd and 2nd → 3rd) and downshifting (3rd → 2nd and 2nd → 1st) occur. These speeds are to be read at three different throttle positions (light, half and full), respectively. Also determine the timing at which shocks are encountered during shifting and which clutches are engaged.
3. When vehicle is being driven in the 65 to 85 km/h (40 to 53 MPH) range in "D_3" range at half to light throttle position, fully depress accelerator pedal to make sure it downshifts from 3rd to 2nd gear.
4. When vehicle is being driven in the 25 to 35 km/h (16 to 22 MPH) ("D_2" range) at half to light throttle position, fully depress accelerator pedal to make sure it downshifts from 2nd to 1st gear.

"2" RANGE

1. Shift to "2" range and check to make sure that vehicle starts to move in 1st gear.
2. Increase vehicle speed to make sure it upshifts from 1st to 2nd gear.
3. Further increase vehicle speed. Make sure it does not upshift to 3rd gear.
4. While driving vehicle at the 25 to 35 km/h (16 to 22 MPH) with throttle at half to light position ("2_2" range), fully depress accelerator pedal to make sure it downshifts from 2nd to 1st gear.

Road Testing (Cont'd)

5. Allow vehicle to run idle while in 2nd gear to make sure that it downshifts to 1st gear.
6. Move selector lever to "D" range and allow vehicle to operate at 40 to 50 km/h (25 to 31 MPH). Then, shift to "2" range to make sure it downshifts to 2nd gear.

"1" RANGE

1. Place selector lever in "1" range and accelerate vehicle. Ensure that it does not upshift from 1st to 2nd gear although vehicle speed increases.
2. While vehicle is being driven in "1" range, release accelerator pedal to make sure that engine compression acts as a brake.
3. Place selector lever in "D" or "2" range and allow vehicle to run at 20 to 30 km/h (12 to 19 MPH). Then, move selector lever to "1" range to make sure the downshift to 1st gear is made.

VEHICLE SPEED AND LINE PRESSURE WHEN SHIFTING GEARS

This check should be carried out when oil temperature is between 43 to 57°C (109 to 135°F) after the vehicle has been driven approx. 10 minutes.

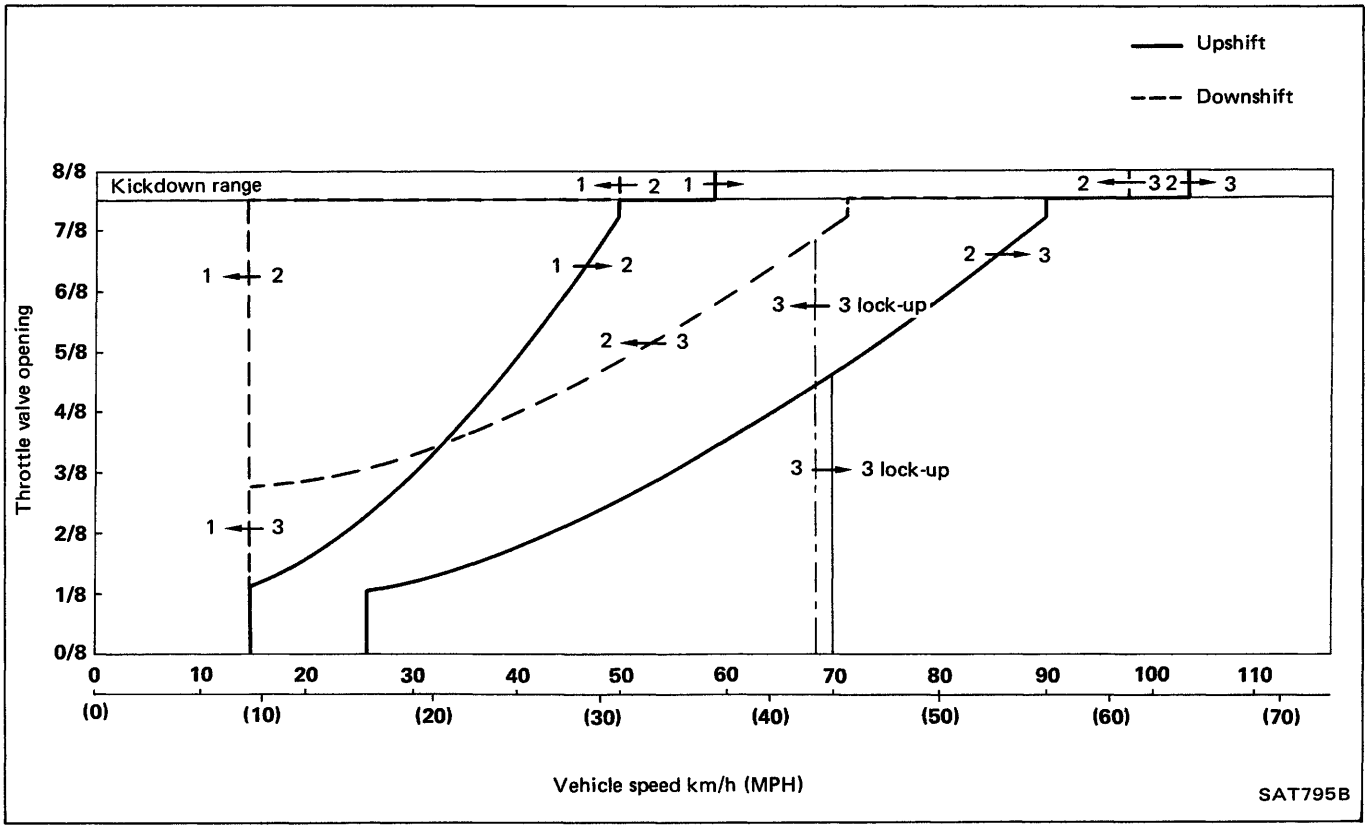
GA16i engine models

Throttle position	Gearshift	Vehicle speed km/h (MPH)
Full throttle	$D_1 \rightarrow D_2, 2_1 \rightarrow 2_2$	57 - 64 (35 - 40)
	$D_2 \rightarrow D_3$	101 - 111 (63 - 69)
	$D_3 \rightarrow D_2$	95 - 105 (59 - 65)
	$D_2 \rightarrow D_1, 2_2 \rightarrow 2_1$	47 - 54 (29 - 34)
	$D_3 \rightarrow 2_2, D_3 \rightarrow 1_2$	–
	$1_2 \rightarrow 1_1$	–

Road Testing (Cont'd)

SHIFT SCHEDULE

GA16i engine model



Road Testing (Cont'd)

ROAD TEST SYMPTOM CHART

Numbers in chart below correspond with those indicated in Trouble-shooting chart.

			SHIFT QUALITY											
			ROUGH	SHIFT TIMING [Mark km/h (MPH)]	NO SHIFT	SHIFT SLIPPAGE	VEHICLE WON'T MOVE	CRUISE SLIPPAGE	POOR POWER/ ACCELERATION	NOISY	ENGINE WON'T START	VEHICLE WON'T STAND STILL	NO ENGINE BRAKING	COMMENTS
PARK RANGE	ENG. START										Ⓐ			
	HOLDING									Ⓑ		Ⓒ		
"R" RANGE	Man. shift (Vehicle at halt)	P-R					Ⓤ			Ⓥ				
	REVERSE						Ⓔ·Ⓤ	Ⓔ	Ⓔ	Ⓥ				
"N" RANGE	Man. shift (Vehicle at halt)	R-N								Ⓥ				
	ENG. START										Ⓐ			
	N									Ⓑ		Ⓓ		
"D" RANGE	Man. shift	N-D	Ⓕ				Ⓖ·Ⓤ			Ⓥ				
	1st						Ⓖ·Ⓤ		Ⓘ	Ⓥ				
	Auto shift	1-2	Ⓛ		Ⓙ	Ⓝ				Ⓥ				
	2nd								Ⓟ	Ⓥ				
	Auto shift	2-3	Ⓜ		Ⓚ	Ⓞ				Ⓥ				
	3rd in lock-up "OFF"								Ⓟ	Ⓥ				
	Auto shift Lock-up "OFF" (3) → Lock-up "ON" (3)				A2	A3				Ⓥ				
	3rd in Lock-up "ON"								Ⓟ	Ⓥ				
	Auto shift Lock-up "ON" (3) → Lock-up "OFF" (3)									Ⓥ				
	Decel.	3-2			Ⓠ	Ⓣ				Ⓥ				
	Kickdown	3-2			Ⓠ·Ⓢ	Ⓣ				Ⓥ				
	Decel.	2-1			Ⓡ					Ⓥ				
	Kickdown	2-1			Ⓡ					Ⓥ				
"2" RANGE	Man. shift (Vehicle in operation)	D-2			Ⓦ		Ⓗ·Ⓤ			Ⓥ				
	1st						Ⓗ·Ⓤ		Ⓘ	Ⓥ				
	Auto shift	1-2	Ⓛ		Ⓙ	Ⓝ				Ⓥ				
	2nd								Ⓟ	Ⓥ				
	Decel.	2-1			Ⓡ					Ⓥ				
	Kickdown	2-1			Ⓡ					Ⓥ				
"1" RANGE	Man. shift (Vehicle in operation)	2-1	A1		Ⓡ·Ⓩ					Ⓥ				
	Man. shift (Vehicle in operation)	D-1			Ⓡ·Ⓧ					Ⓥ				
	Acceleration						Ⓗ·Ⓤ		Ⓘ	Ⓥ				
	"1"	Engine Braking								Ⓥ			Ⓨ	

Road Testing (Cont'd)

TROUBLE-SHOOTING CHART

Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transaxle must be removed from the vehicle.

Reference		ON VEHICLE											OFF VEHICLE					
		Oil level	Control cable	Inhibitor switch and wiring	Throttle wire	Detent valve	Engine idling rpm	Line pressure	Manual valve	Governor	Band servo	Transaxle air check	Oil quality	Ignition switch and starter motor	Engine adjustment, brake inspection	Forward clutch (Rear)	High-reverse clutch (Front)	Band brake	Low and reverse brake	Oil pump	Oil passage leak	Transaxle one-way clutch	High-reverse clutch (Front) check ball	Park linkage
Ⓐ	Engine does not start in "N", "P" ranges.	.	2	3	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
	Engine starts in range other than "N" and "P".	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ⓑ	Transaxle noise in "P" and "N" ranges.	1	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	③	.	.	.	.
Ⓒ	Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	②	
Ⓓ	Vehicle runs in "N" range.	.	1	.	.	.	.	.	3	.	.	.	2	.	.	④	.	.	.	.	.	.	.	.
Ⓔ	Vehicle will not run in "R" range (but runs in "D", "2" and "1" ranges). Clutch slips. Very poor acceleration.	1	2	.	.	.	.	3	5	.	.	6	4	.	.	⑨	⑧	.	⑦	.	⑩	.	⑪	.
	Vehicle braked when shifting into "R" range.	.	.	.	.	.	.	.	.	.	3	2	1	.	.	④	.	⑤	.	.	.	.	.	⑥
Ⓕ	Sharp shock in shifting from "N" to "D" range.	.	.	.	2	.	1	3	4	.	.	.	.	.	.	⑤	.	.	.	.	.	.	.	.
Ⓖ	Vehicle will not run in "D" range (but runs in "2", "1" and "R" ranges).	.	1	.	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	.	.	④	.	.
Ⓗ	Vehicle will not run in "D", "1", "2" ranges (but runs in "R" range). Clutch slips. Very poor acceleration.	1	2	.	.	.	.	4	5	.	.	6	3	.	7	⑧	⑩	.	.	.	⑨	.	.	.
Ⓘ	Clutches or brakes slip somewhat in starting.	1	2	.	6	.	.	3	5	.	.	7	4	.	.	.	.	.	.	⑧	⑨	.	.	.
	Excessive creep.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	No creep at all.	1	2	.	.	.	3	.	5	.	.	.	4	.	.	⑧	⑨	.	.	⑥	⑦	.	.	.
Ⓙ	Failure to change gear from "1st" to "2nd".	.	1	.	2	3	.	.	5	6	8	7	4	.	.	.	⑨	.	.	.	⑩	.	.	.
Ⓚ	Failure to change gear from "2nd" to "3rd".	.	1	.	2	3	.	.	5	6	8	7	4	.	.	.	⑨	.	.	.	⑩	.	⑪	.
	Too high a gear change point from "1st" to "2nd", from "2nd" to "3rd".	.	.	.	1	2	.	3	5	6	.	.	4	.	.	.	.	.	.	.	⑦	.	.	
	Gear change directly from "1st" to "3rd" occurs.	.	.	.	.	.	.	.	2	4	.	3	1	.	.	.	.	⑤	.	.	⑥	.	.	.
	Engine stops when shifting lever into "D" range.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
		ON VEHICLE														OFF VEHICLE								

Road Testing (Cont'd)

Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transaxle must be removed from the vehicle.

Reference		ON VEHICLE										OFF VEHICLE				
		Oil level	Control cable	Throttle wire	Detent valve	Line pressure	Engine stall rpm	Manual valve	Governor	Band servo	Transaxle air check	Oil quality	Engine adjustment, brake inspection	Forward clutch (Rear)	High-reverse clutch (Front)	Band brake	Low and reverse brake	Oil pump	Oil passage leak	Transaxle one-way clutch	High-reverse clutch (Front) check ball
Ⓛ	Too sharp a shock in change from "1st" to "2nd".			1			2	4		5		3				⑥					
Ⓜ	Too sharp a shock in change from "2nd" to "3rd".			1		2		3		5	4				⑥						
Ⓝ	Almost no shock or clutches slipping in change from "1st to "2nd".	1	2	3		4		6		8	7	5				⑨			⑩		
Ⓞ	Almost no shock or slipping in change from "2nd" to "3rd". Engine races extremely fast.	1	2	3		4		6		8	7	5			⑨				⑩		⑪
	Vehicle braked by gear change from "1st" to "2nd".							2				1			④		③			⑤	
	Vehicle braked by gear change from "2nd" to "3rd".							3		2		1				④					
Ⓟ	Maximum speed not attained. Acceleration poor.	1	2			4	5	7		6		3	8	⑪	⑫	⑨	⑩	⑬			
Ⓠ	Failure to change gear from "3rd" to "2nd".			1				3	4	6	5	2			⑦	⑧			⑨		
Ⓡ	Failure to change gear from "2nd" to "1st" or from "3rd to "1st".			1				3	4	6	5	2			⑦					⑧	
	Gear change shock felt during deceleration by releasing accelerator pedal.		1	2	3	4		5	6										⑦		
	Too high a change point from "3rd" to "2nd", from "2nd" to "1st".		1	2	3	4		5	6										⑦		
Ⓢ	Kickdown does not operate when depressing pedal in "3rd" within kickdown vehicle speed.			2	1			4	5			3				⑥			⑦		
	Kickdown operates or engine overruns when depressing pedal in "3rd" beyond kickdown vehicle speed limit.		1	2		3		5	6		7	4			⑧				⑨		
Ⓣ	Races extremely fast or slips in changing from "3rd" to "2nd" when depressing pedal.			1		2		4		6	5	3			⑦	⑧			⑨		⑩
		ON VEHICLE												OFF VEHICLE							

Road Testing (Cont'd)

Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transaxle must be removed from the vehicle.

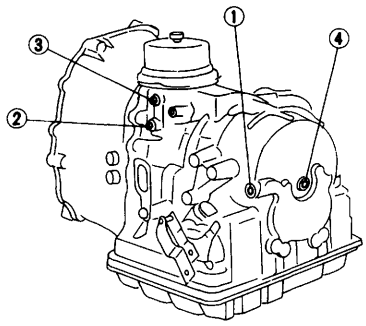
Reference		ON VEHICLE										OFF VEHICLE											
		Oil level	Control cable	Throttle wire	Engine idling rpm	Line pressure	Engine stall rpm	Lubrication	Manual valve	Governor	Band servo	Transaxle air check	Oil quality	Forward clutch (Rear)	High-reverse clutch (Front)	Band brake	Low and reverse brake	Oil pump	Oil passage leak	Torque converter, one-way clutch	Transaxle one-way clutch	Park linkage	Planetary gear
Ⓤ	Vehicle will not run in any range.	1	2	.	.	3	.	.	5	.	.	6	4	.	.	.	.	⑦	⑧	.	.	⑨	.
Ⓥ	Transmission noise in "D", "2", "1" and "R" ranges.	1	.	.	.	2	.	.	.	.	.	.	.	③	.	.	.	④	.	.	⑤	.	⑥
Ⓦ	Failure to change from "3rd" to "2nd" when changing lever into "2" range.	.	1	.	.	2	.	.	4	.	5	.	3	.	.	⑥	.	.	⑦	.	.	.	.
	Gear change from "2nd" to "3rd" in "2" range.	.	1	.	.	2	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	No shock at change from "1" to "2" range or engine races extremely fast.	1	2	3	4	.	5	.	7	.	.	8	6	.	.	⑨	.	⑩	.	.	.	.	.
Ⓧ	Failure to change from "3rd" to "2nd" when shifting lever into "1" range.	.	1	.	.	2	.	.	4	5	7	6	3	.	⑧	⑨	.	.	⑩	.	.	.	.
Ⓨ	Engine brake does not operate in "1" range.	.	1	.	.	2	.	.	4	.	.	5	3	.	.	.	⑥	.	⑦	.	.	.	.
	Gear change from "1st" to "2nd" or from "2nd" to "3rd" in "1" range.	.	1	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	③	.	.	.	.
Ⓩ	Does not change from "2nd" to "1st" in "1" range.	1	2	.	.	.	.	.	4	5	6	7	3	.	.	.	⑧	.	⑨	.	.	.	.
Ⓐ1	Large shock changing from "2nd" to "1st" in "1" range.	.	.	1	.	.	2	.	4	.	.	.	3	.	.	.	⑤	.	.	.	.	.	.
	Transaxle overheats.	1	.	.	.	3	4	2	6	.	8	7	5	.	⑨	⑩	⑪	⑫	⑬	⑭	.	.	⑮
	Oil shoots out during operation. White smoke emitted from exhaust pipe during operation.	1	.	3	.	5	6	2	7	.	.	8	4	.	⑨	⑩	⑪	⑫	⑬	⑭	.	.	⑮
	Offensive smell at oil charging pipe.	1	.	.	.	.	.	.	.	.	.	.	2	③	④	⑤	⑥	⑦	⑧	⑨	.	.	⑩
		ON VEHICLE										OFF VEHICLE											

Road Testing (Cont'd)

Exclusively for RL3F01A

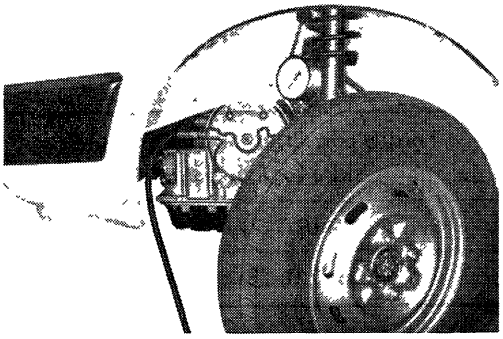
Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transaxle must be removed from the vehicle.

Reference		ON VEHICLE: Governor	ON VEHICLE: Line pressure	OFF VEHICLE: Torque converter	OFF VEHICLE: O-ring in input shaft	OFF VEHICLE: Speed cut valve	OFF VEHICLE: Lock-up control valve	OFF VEHICLE: Oil pump
(A2)	Torque converter is not locked up.	1	2	③	⑦	⑤	⑥	④
(A3)	Lock-up piston slip.		1	②	④			③
	Lock-up point is extremely high or low.	1				②	③	
	Engine is stopped at R.D. 2 and 1 ranges.				②		①	
	Transmission overheats.		1	②	④			③
(A4)	Torque converter lock-up pressure is not normal.		1	②	⑥	④	⑤	③



1 Line pressure
[To high-reverse clutch (Front)]
2 Line pressure
[To forward clutch (Rear)]
3 Governor pressure
4 Torque converter lock-up pressure

SAT476



Pressure Testing

LINE PRESSURE

1. Install pressure gauge to line pressure port. (When selector lever is in "D", "2" or "1" range, install pressure gauge to port ② and when in "R" range, install pressure gauge to port ① shown at left.) Locate the gauge so it can be seen by driver. Measure line pressure in both "R" and "D" ranges at idling and at stall test.
2. Warm up engine until engine oil and A.T.F. reach operating temperatures after the vehicle has been driven approx. 10 minutes.

   A.T.F. temperature:
   43 - 57°C (109 - 135°F)
3. Measure line pressure at idle and at stall point while depressing brake pedal fully.

At idling

Range	Line pressure kPa (kg/cm^2, psi)
R	628 - 775 (6.4 - 7.9, 91 - 112)
D	245 - 343 (2.5 - 3.5, 36 - 50)
2	245 - 343 (2.5 - 3.5, 36 - 50)
1	245 - 343 (2.5 - 3.5, 36 - 50)

At stall test

- Do not perform tests for more than five seconds at any shift range.
- Do not proceed to next "range" test immediately after one "range" test is done. Wait until oil temperature decreases.

Range	Line pressure kPa (kg/cm^2, psi)
R	1,275 - 1,471 (13.0 - 15.0, 185 - 213)
D	549 - 696 (5.6 - 7.1, 80 - 101)
2	549 - 696 (5.6 - 7.1, 80 - 101)
1	549 - 696 (5.6 - 7.1, 80 - 101)

Pressure Testing (Cont'd)

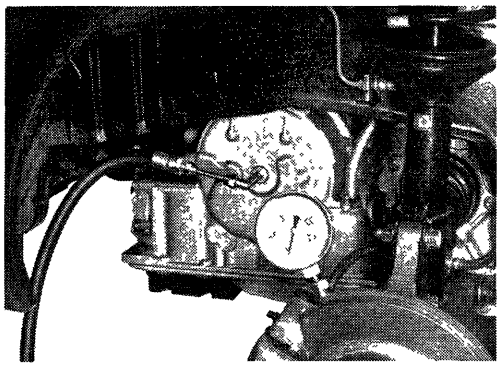
Judgment by measuring line pressure

1) When line pressure while idling is low at all positions, the problem may be due to:
- Wear on interior of oil pump
- Oil leakage at or around oil pump, control valve body, transmission case or governor
- Sticking pressure regulator valve
- Sticking pressure modifier valve

2) When line pressure while idling is low at a particular position, the problem may be due to the following:
- If oil leaks at or around forward clutch (rear) or governor, line pressure is low in "D", "2" or "1" range but is normal in "R" range.
- If oil leaks at or around low and reverse brake circuit, line pressure becomes low in "R" or "P" range but is normal in "D", "2" or "1" range.

3) When line pressure is high while idling, pressure regulator valve may have stuck.

If line pressure does not rise, first check to make sure that throttle wire is connected properly.



LOCK-UP TEST

Install pressure gauge to lock-up pressure port. Shift selector lever in "D" range.

Condition	Torque converter lock-up pressure kPa (kg/cm^2, psi)
Lock-up "ON"	49 (0.5, 7) or less
Lock-up "OFF"	196 (2.0, 28) or more

If lock-up pressure is not within specifications, refer to Trouble-shooting chart ((A4)).

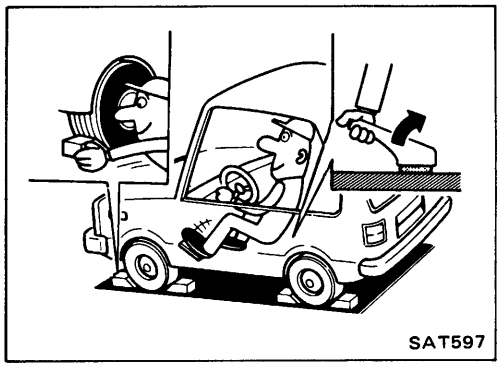
Stall Testing

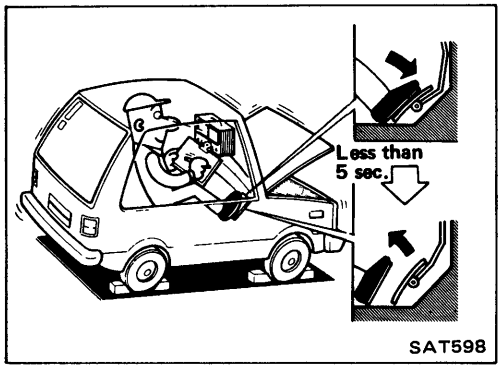
The stall test is an effective method of testing clutch and band holding ability, torque converter one-way clutch operation, and engine performance. A stall test should only be performed as a last resort because of the high fluid temperature it generates and the excessive load it places on the engine and transaxle.

CAUTION:

a. **Transaxle and engine fluid levels should always be checked and fluid added as needed.**
b. **Run engine at 1,200 rpm to attain proper warm-up.**
c. **During test, never hold throttle wide-open for more than 5 seconds.**
d. **Do not test more than two gear ranges without driving vehicle to cool off engine and transaxle.**

Stall Testing (Cont'd)


SAT597



SAT598

STALL TEST PROCEDURE

1. Set parking brake and block wheels.
2. Install a tachometer where it can be seen by driver during test.
3. Start engine and place selector lever in "D" range.
4. Apply foot brake and accelerate to wide-open throttle.
5. Quickly note the engine stall speed and immediately release throttle.

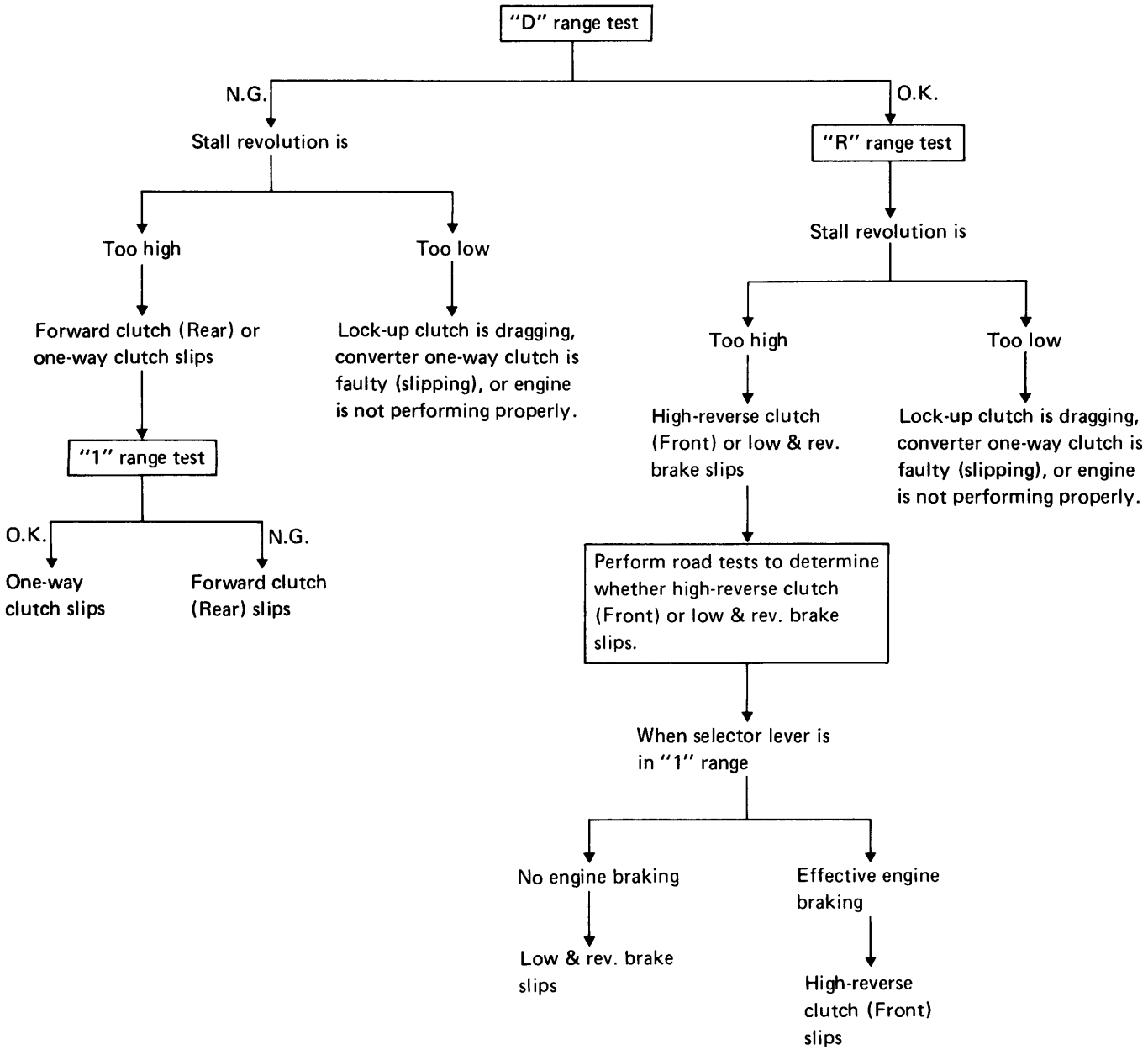
   Stall revolution:

   GA16i engine models

   2,350 - 2,650 rpm
6. Shift selector lever to "N".
7. Cool off A.T.F.
8. Perform stall tests in the same manner as in steps 3 through 7 with selector lever in "1" and "R", respectively.
9. If stall revolution is out of specified value, perform trouble-shotting following Stall Test Analysis on the next page.

Stall Testing (Cont'd)

STALL TEST ANALYSIS



If converter one-way clutch is frozen, vehicle will have poor high speed performance and low engine rpm when it is raced in "N" range. If converter one-way clutch is slipping, vehicle will be sluggish up to 50 or 60 km/h (30 or 40 MPH).

Preliminary Checks (Prior to Road Testing)

FLUID LEAKAGE

If the governor cap and valve cover are suspected:

1) Open hood.
2) Clean the area around the governor cap and valve cover.
3) Run the vehicle at highway speeds.
4) Check the governor cap and valve cover for fresh leakage.

To detect a fluid leak:

1) Raise vehicle.
2) Clean areas suspected of leaking.
3) Start engine, apply foot brake, place selector lever in drive, and wait a few minutes.
4) Stop engine.
5) Check for fresh leakage.

FLUID CONDITION

Examine the A.T.F. and note its color, texture, and odor.

1) Dark or Black Fluid:
   With a burned odor
   - Worn friction material.
2) Milky Pink Fluid: Water Contamination
   - Road water entering through filler tube or breather.
3) Varnished Fluid, light to dark brown and tacky: Oxidation
   - Over or Underfilling.
   - Overheating.

Road Testing

Perform road tests using "Symptom" chart. Refer to page AT-29.

"P" RANGE

1. Place selector lever in "P" range and start the engine. Stop the engine and repeat the procedure in all other ranges including neutral.
2. Stop vehicle on a slight upgrade and place selector lever in "P" range. Release parking brake to make sure vehicle remains locked.

"R" RANGE

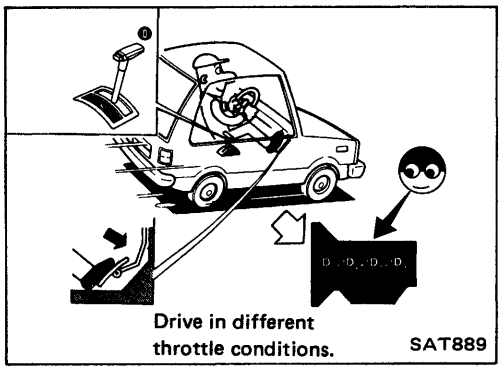
1. Manually move selector lever from "P" to "R", and note shift quality.
2. Drive the vehicle in reverse long enough to detect slippage or other abnormalities.

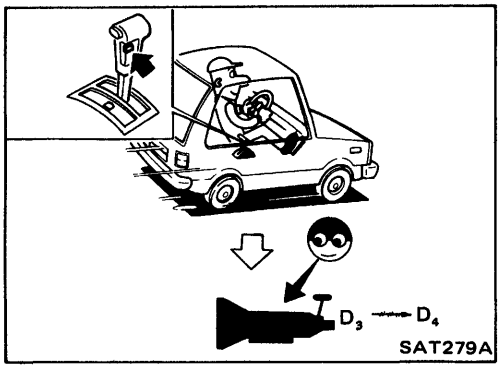
"N" RANGE

1. Manually move selector lever from "R" and "D" to "N" and note quality.

Road Testing (Cont'd)

2. Release parking brake with selector lever in "N" range. Lightly depress accelerator pedal to make sure vehicle does not move. (When vehicle is new or soon after clutches have been replaced, vehicle may move slightly. This is not a problem.)


Drive in different throttle conditions. SAT889



SAT279A

"D" RANGE

1. Manually shift selector lever from "N" to "D" range, and note shift quality.
2. Using the shift schedule as a reference, drive vehicle in "D" range. Record, on symptom chart, respective vehicle speeds at which up-shifting and down-shifting occur. These speeds are to be read at three different throttle positions (light, half and full), respectively. Also determine the timing at which shocks are encountered during shifting and which clutches are engaged.
3. Determine, by observing lock-up pressure, whether lock-up properly occurs while driving vehicle in "D4" range. (Refer to Pressure Testing.)
4. Check to determine if shifting to overdrive gear cannot be made while O.D. control switch is "OFF".
5. When vehicle is being driven in the 65 to 80 km/h (40 to 50 MPH) range in "D_3" range at half to light throttle position, fully depress accelerator pedal to make sure it downshifts from 3rd to 2nd gear.
6. When vehicle is being driven in the 25 to 35 km/h (16 to 22 MPH) ("D_2" range) at half to light throttle position, fully depress accelerator pedal to make sure it downshifts from 2nd to 1st gear.

"2" RANGE

1. Shift to "2" range and check to make sure that vehicle starts to move in 1st gear.
2. Increase vehicle speed to make sure it upshifts from 1st to 2nd gear.
3. Further increase vehicle speed. Make sure it does not upshift to 3rd gear.
4. While driving vehicle at the 25 to 35 km/h (16 to 22 MPH) with throttle at half to light position ("2_2" range), fully depress accelerator pedal to make sure it downshifts from 2nd to 1st gear.

Road Testing (Cont'd)

5. Allow vehicle to run idle while in 2nd gear to make sure that it downshifts to 1st gear.
6. Move selector lever to "D" range and allow vehicle to operate at 40 to 50 km/h (25 to 31 MPH). Then, shift to "2" range to make sure it downshifts to 2nd gear.

"1" RANGE

1. Shift control lever to "1" range and accelerate vehicle. Ensure that it does not upshift from 1st to 2nd gear although vehicle speed increases.
2. While vehicle is being driven in "1" range, release accelerator pedal to make sure that engine compression acts as a brake.
3. Place selector lever in "D" or "2" range and allow vehicle to run at 20 to 30 km/h (12 to 19 MPH). Then, move selector lever to "1" range to make sure the downshift to 1st gear is made.

VEHICLE SPEED AND LINE PRESSURE WHEN SHIFTING GEARS

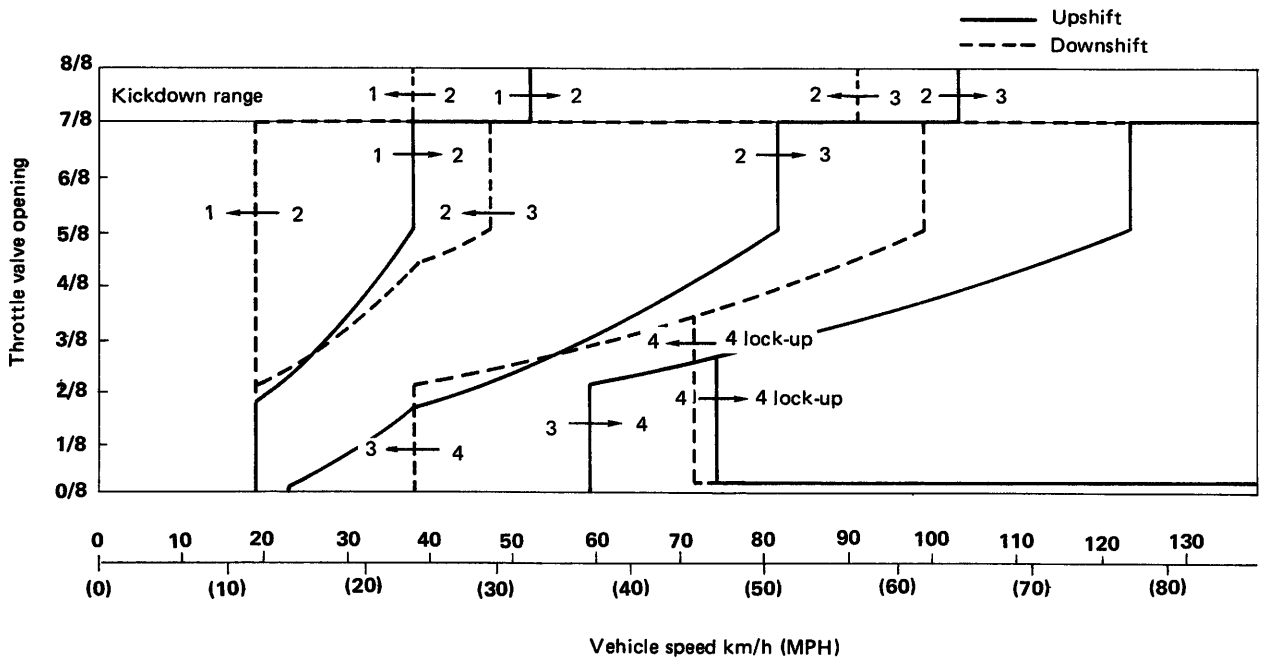
This check should be carried out when oil temperature is between 43 to 57°C (109 to 135°F) after the vehicle has been driven approx. 10 minutes.

Throttle position	Gearshift	Vehicle speed km/h (MPH)
Full throttle	$D_1 \rightarrow D_2$, $2_1 \rightarrow 2_2$	52 (32)
	$D_2 \rightarrow D_3$	103 (64)
	$D_3 \rightarrow D_4$	–
	$D_4 \rightarrow D_3$	–
	$D_3 \rightarrow D_2$	91 (57)
	$D_2 \rightarrow D_1$, $2_2 \rightarrow 2_1$	37 (23)

Road Testing (Cont'd)

SHIFT SCHEDULE

CA18DE engine models



Road Testing (Cont'd)

ROAD TEST SYMPTOM CHART

Numbers in chart below correspond with those indicated in Trouble-shooting chart.

			SHIFT QUALITY												
			ROUGH	SHIFT TIMING [Mark km/h (MPH)]	NO SHIFT	SHIFT SLIPPAGE	VEHICLE WON'T MOVE	CRUISE SLIPPAGE	POOR POWER/ ACCELERATION	NOISY	ENGINE WON'T START	VEHICLE WON'T STAND STILL	NO ENGINE BRAKING	NO LOCK-UP	COMMENTS
PARK RANGE	ENG. START										Ⓐ				
	HOLDING									Ⓑ		Ⓒ			
"R" RANGE	Man. shift (Vehicle at halt)	P-R					Ⓩ			A1					
	REVERSE						Ⓔ · Ⓩ	Ⓔ	Ⓔ	A1					
"N" RANGE	Man. shift (Vehicle at halt)	R-N								A1					
	ENG. START										Ⓐ				
	N									Ⓑ		Ⓓ			
"D" RANGE	Man. shift	N-D	Ⓕ				Ⓖ · Ⓩ			A1					
	1st						Ⓖ · Ⓩ		Ⓘ	A1					
	Auto shift	1-2	Ⓜ		Ⓙ	Ⓟ				A1					
	2nd									A1					
	Auto shift	2-3	Ⓝ		Ⓚ	Ⓠ				A1					
	3rd (Top)									A1					
	Auto shift	3-4	Ⓞ		Ⓛ	Ⓡ				A1					
	4th (O.D.)								Ⓢ	A1					
	Lock-up "OFF" → "ON"					A7				A1				A6	
	Lock-up "ON" → "OFF"									A1					
	Decel.	4-3			Ⓣ					A1					
	Kickdown	4-3			Ⓣ · Ⓦ	Ⓧ				A1					
	Decel.	3-2			Ⓤ					A1					
	Kickdown	3-2			Ⓤ	Ⓨ				A1					
	Decel.	2-1			Ⓥ					A1					
	Kickdown	2-1			Ⓥ					A1					
"2" RANGE	Man. shift (Vehicle in operation)	D-2			Ⓤ · A2		Ⓗ · Ⓩ			A1					
	1st						Ⓗ · Ⓩ		Ⓘ	A1					
	Auto shift	1-2	Ⓜ		Ⓙ	Ⓟ				A1					
	2nd									A1					
	Decel.	2-1			Ⓥ					A1					
	Kickdown	2-1			Ⓥ					A1					
"1" RANGE	Man. shift (Vehicle in operation)	2-1	A5		Ⓥ · A4					A1					
	Man. shift (Vehicle in operation)	D-1	A5		Ⓥ · A4					A1					
	Acceleration						Ⓗ · Ⓩ		Ⓘ	A1					
	"1"	Engine Braking								A1		A3			

Road Testing (Cont'd)

TROUBLE-SHOOTING CHART

Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transaxle must be removed from the vehicle.

		ON VEHICLE									OFF VEHICLE										
Reference		Oil level	Control cable	Inhibitor switch and wiring	Throttle wire	Engine idling rpm	Line pressure	Control valve	Governor valve	Oil quality	Ignition switch and starter motor	Engine adjustment, brake inspection	Oil pump	High clutch	Low clutch	Reverse clutch	Low & reverse brake	Band brake	Transaxle one-way clutch	Final drive	Solenoids	Oil passage leak	Park linkage	Torque converter
Ⓐ	Engine does not start in "N", "P" ranges.	.	2	3	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Engine starts in range other than "N" and "P".	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ⓑ	Transaxle noise in "P" and "N" ranges.	1	.	.	.	.	2	.	.	.	.	.	③	.	.	.	.	.	.	.	.	.	.	.	.
Ⓒ	Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	②	.
Ⓓ	Vehicle runs in "N" range.	.	1	.	.	.	.	3	.	2	.	.	.	.	④	.	.	.	.	.	.	.	.	.	.
Ⓔ	Vehicle will not run in "R" range (but runs in "D", "2" and "1" ranges). Clutch slips. Very poor acceleration.	1	2	.	.	.	3	5	.	4	.	.	.	.	⑧	⑥	⑦	.	.	.	.	.	⑨	.	.
	Vehicle braked when shifting into "R" range.	.	.	.	.	.	.	.	.	1	.	.	.	.	④	②	③	⑤	.	.	.	.	.	⑥	.
Ⓕ	Sharp shock in shifting from "N" to "D" range.	.	.	.	2	1	3	4	.	.	.	.	.	.	⑤	.	.	.	.	.	.	.	.	.	.
Ⓖ	Vehicle will not run in "D" range (but runs in "2", "1" and "R" ranges).	.	1	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	④	.	.	.	.	.	.
Ⓗ	Vehicle will not run in "D", "1", "2" ranges (but runs in "R" range). Clutch slips. Very poor acceleration.	1	2	.	.	.	4	5	.	3	.	6	.	⑧	⑦	.	.	.	.	.	.	.	⑨	.	.
Ⓘ	Clutches or brakes slip somewhat in starting.	1	2	.	6	.	3	5	.	4	.	.	⑦	.	.	.	.	.	.	.	.	.	⑧	.	.
	Excessive creep.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	No creep at all.	1	2	.	.	3	.	5	.	4	.	.	⑥	.	⑧	.	.	.	.	.	.	.	⑦	.	⑨
Ⓙ	Failure to change gear from "1st" to "2nd".	.	1	.	2	.	.	4	5	3	.	.	.	.	.	.	.	⑥	.	.	.	.	⑦	.	.
Ⓚ	Failure to change gear from "2nd" to "3rd".	.	1	.	2	.	.	4	5	3	.	.	.	⑥	.	.	.	.	.	.	.	.	⑦	.	.
Ⓛ	Failure to change gear from "3rd" to "4th".	.	1	.	2	.	.	4	5	3	.	.	.	⑥	.	.	.	⑦	.	.	.	.	.	.	.
	Too high a gear change point from "1st" to "2nd", from "2nd" to "3rd", from "3rd" to "4th".	.	.	.	1	.	2	4	5	3	.	.	.	.	.	.	.	.	.	.	.	.	⑥	.	.
	Gear change directly from "1st" to "3rd" occurs.	.	.	.	.	.	.	2	3	1	.	.	.	.	.	.	.	④	.	.	.	.	⑤	.	.
	Engine stops when shifting lever into "D" range.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Ⓜ	Too sharp a shock in change from "1st" to "2nd".	.	.	.	1	.	3	4	.	2	.	.	.	.	.	.	.	⑤	.	.	.	.	.	.	.
Ⓝ	Too sharp a shock in change from "2nd" to "3rd".	.	.	.	1	.	3	4	.	2	.	.	.	⑤	.	.	.	.	.	.	.	.	.	.	.

Road Testing (Cont'd)

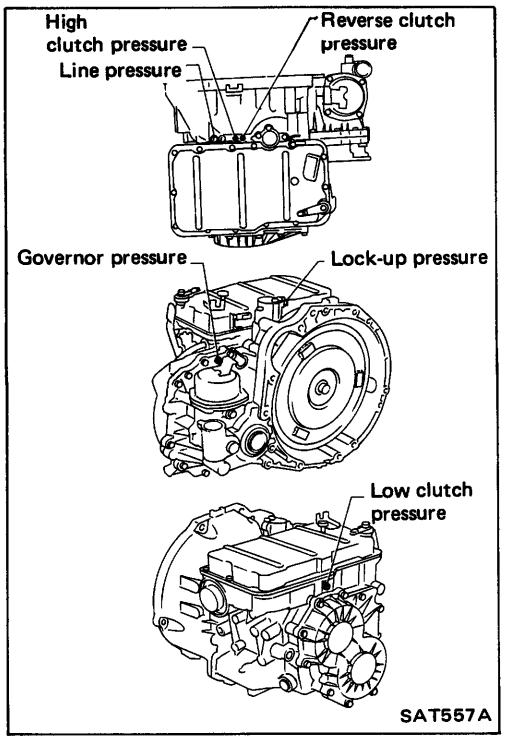
Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transaxle must be removed from the vehicle.

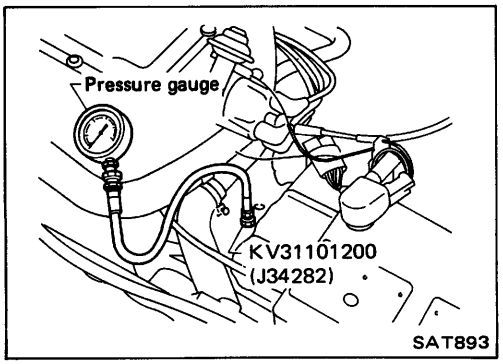
Reference		ON VEHICLE										OFF VEHICLE														
		Oil level	Control cable	Inhibitor switch and wiring	Throttle wire	Engine idling rpm	Line pressure	Control valve	Governor valve	Oil quality	Ignition switch and starter motor	Engine adjustment, brake inspection	Oil pump	High clutch	Low clutch	Reverse clutch	Low & reverse brake	Band brake	Transaxle one-way clutch	Final drive	Solenoids	Oil passage leak	Park linkage	Torque converter
ⓞ	Too sharp a shock in change from "3rd" to "4th".	.	.	.	1	.	3	4	.	2	.	.	.	.	.	.	.	⑤	.	.	.	.	.	.	.
Ⓟ	Almost no shock or clutches slipping in change from "1st" to "2nd".	1	2	.	3	.	4	6	.	5	.	.	.	.	.	.	.	⑦	.	.	.	.	⑧	.	.
Ⓠ	Almost no shock or slipping in change from "2nd" to "3rd". Engine races extremely fast.	1	2	.	3	.	4	6	.	5	.	.	.	⑦	.	.	.	.	.	.	.	.	⑧	.	.
Ⓡ	Almost no shock or slipping in change from "3rd" to "4th".	1	2	.	3	.	4	6	.	5	.	.	.	.	.	.	.	⑦	.	.	.	.	⑧	.	.
	Vehicle braked by gear change from "1st" to "2nd".	.	.	.	.	.	.	2	.	1	.	.	.	③	.	④	⑤	.	⑥	.	.	.	.	.	.
	Vehicle braked by gear change from "2nd" to "3rd".	.	.	.	.	.	.	2	.	1	.	.	.	.	.	.	.	③	.	.	.	.	.	.	.
	Vehicle braked by gear change from "3rd" to "4th".	.	.	.	.	.	.	2	.	1	.	.	.	.	③	.	.	.	.	.	.	.	.	.	.
Ⓢ	Maximum speed not attained. Acceleration poor.	1	2	.	.	.	4	5	6	3	.	7	⑧	⑨	.	.	.	⑩	.	.	.	.	.	.	⑪
Ⓣ	Failure to change gear from "4th" to "3rd".	.	.	.	1	.	.	3	4	2	.	.	.	.	⑤	.	.	⑥	.	.	.	.	⑦	.	.
Ⓤ	Failure to change gear from "3rd" to "2nd" or from "4th" to "2nd".	.	.	.	1	.	.	3	4	2	.	.	.	.	.	.	.	⑤	.	.	.	.	⑥	.	.
Ⓥ	Failure to change gear from "2nd" to "1st" or from "3rd" to "1st".	.	.	.	1	.	.	3	4	2	.	.	.	.	.	.	.	⑥	⑤	.	.	.	.	.	.
	Gear change shock felt during deceleration by releasing accelerator pedal.	.	1	.	2	.	3	4	5	.	.	.	.	.	.	.	.	.	.	.	.	⑥	⑦	.	.
	Too high a change point from "4th" to "3rd", from "3rd" to "2nd", from "2nd" to "1st".	.	1	.	2	.	3	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	⑥	.	.
Ⓦ	Kickdown does not operate when depressing pedal in "4th" within kickdown car speed.	.	.	.	1	.	.	3	4	2	.	.	.	.	⑥	.	.	⑤	.	.	.	.	⑦	.	.
	Kickdown operates or engine overruns when depressing pedal in "4th" beyond kickdown vehicle speed limit.	.	1	.	2	.	3	5	6	4	.	.	.	⑦	.	.	.	⑧	.	.	.	.	⑨	.	.
Ⓧ	Races extremely fast or slips in changing from "4th" to "3rd" when depressing pedal.	.	.	.	1	.	2	4	.	3	.	.	.	.	⑤	.	.	⑥	.	.	.	.	.	.	⑦
Ⓨ	Races extremely fast or slips in changing from "3rd" to "2nd" when depressing pedal.	.	.	.	1	.	2	4	.	3	.	.	.	⑤	.	.	.	⑥	.	.	.	.	.	.	.

Road Testing (Cont'd)

Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transaxle must be removed from the vehicle.

Reference		ON VEHICLE												OFF VEHICLE											
		Oil level	Control cable	Inhibitor switch and wiring	Throttle wire	Engine idling rpm	Line pressure	Control valve	Governor valve	Oil quality	Ignition switch and starter motor	Engine adjustment, brake inspection	O.D. control switch and wiring	O.D. indicator switch	Oil pump	High clutch	Low clutch	Reverse clutch	Low & reverse brake	Band brake	Transaxle one-way clutch	Final drive	Solenoids	Oil passage leak	Park linkage	Torque converter	Planetary gear	Lubrication
Ⓩ	Vehicle will not run in any range.	1	2	.	.	.	3	5	.	4	.	.	.	.	⑥	.	.	.	.	.	.	.	.	⑧	⑩	⑨	.	.
A1	Transmission noise in "D", "2", "1" and "R" ranges.	1	.	.	.	.	2	.	.	.	.	.	.	.	③	.	.	.	.	.	.	④	.	.	.	.	⑤	⑥	.
A2	Failure to change from "3rd" to "2nd" when changing lever into "2" range.	.	1	.	.	.	2	4	.	3	.	.	.	.	.	.	.	.	.	⑤	.	.	.	.	⑥	.	.	.	.
	Gear change from "2nd" to "3rd" in "2" range.	.	1	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	④	.	.	.	.
A3	Engine brake does not operate in "1" range.	.	1	.	.	.	2	4	.	3	.	.	.	.	.	.	.	.	⑤	.	.	.	.	.	⑥	.	.	.	.
	Gear change from "1st" to "2nd" in "1" range.	.	1	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	④	.	.	.	.
A4	Does not change from "2nd" to "1st" in "1" range.	1	2	.	.	.	.	4	5	3	.	.	.	.	.	.	.	.	⑦	⑥	.	.	.	.	⑧	.	.	.	.
A5	Large shock changing from "2nd" to "1st" in "1" range.	.	.	.	1	.	.	4	.	3	.	2	.	.	.	.	.	.	⑤	.	.	.	.	.	.	.	.	.	.
	Transaxle overheats.	1	.	.	.	.	2	5	.	4	.	3	.	.	⑥	⑨	⑪	⑫	⑬	⑩	.	⑯	.	.	⑭	.	⑦	⑮	⑧
	Oil shoots out during operation. White smoke emitted from exhaust pipe during operation.	1	.	.	2	.	4	6	.	3	.	5	.	.	⑥	⑨	⑪	⑫	⑬	⑩	.	⑯	.	.	⑭	.	⑦	⑮	⑧
	Offensive smell at oil charging pipe.	1	.	.	.	.	.	.	.	2	.	.	.	.	③	⑥	⑧	⑨	⑩	⑦	.	⑬	.	.	⑪	.	④	⑫	⑤
A6	Torque converter is not locked up.	.	.	.	.	.	3	1	2	.	.	.	.	.	⑤	.	.	.	.	.	.	.	.	⑥	.	.	④	.	.
A7	Lock-up piston slip.	.	.	.	.	.	1	.	.	.	.	.	.	.	②	.	.	.	.	.	.	.	.	④	.	.	③	.	.
	Lock-up point is extremely high or low.	.	.	.	.	.	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	③	.	.	.	.	.
	Engine is stopped at R.D. 2 and 1 ranges.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	②	.	.	③	.	.
A8	Torque converter lock-up pressure is not normal.	.	.	.	1	.	2	3	.	.	.	.	.	.	④	.	.	.	.	.	.	.	.	.	.	.	⑤	.	.
	Transaxle shifts to overdrive even if O.D. control switch is turned to "OFF".	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	②	.	.	.	.	.
	Lamp inside O.D. control switch glows even if transaxle is shifted out of O.D.	.	.	.	.	.	.	.	.	.	.	.	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.





Pressure Testing

LINE PRESSURE

1. Install pressure gauge to line pressure port. Locate the gauge so it can be seen by driver.
2. Warm up engine until engine oil and A.T.F. reach operating temperatures after the vehicle has been driven approx. 10 minutes.

   A.T.F. temperature:
   43 - 57°C (109 - 135°F)
3. Measure line pressure at idle and at stall point while depressing brake pedal fully.

At idling

Range	Line pressure kPa (kg/cm^2, psi)
R D 2 1	373 - 441 (3.8 - 4.5, 54 - 64)

At stall test

- Do not perform tests for more than five seconds at any shift range.
- Do not proceed to next "range" test immediately after one "range" test is done. Wait until oil temperature decreases.

Pressure Testing (Cont'd)

Range	Line pressure kPa (kg/cm^2, psi)
R D 2 1	1,245 - 1,402 (12.7 - 14.3, 181 - 203)

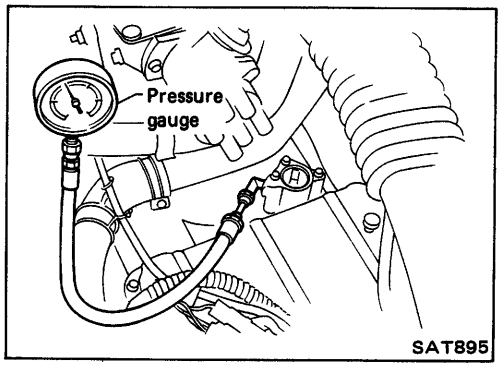
Judgment by line pressure

1) When line pressure while idling is low at all positions ("D", "2", "1", "R" and "P"), the problem may be due to:
- Wear on interior of oil pump
- Oil leakage at or around oil pump, control valve body, transmission case or governor
- Sticking pressure regulator valve
- Sticking pressure modifier valve

2) When line pressure while idling is low at a particular position, the problem may be due to the following:
- If oil leaks at or around forward clutch (rear) or governor, line pressure is low in "D", "2" or "1" range but is normal in "R" range.
- If oil leaks at or around low and reverse brake circuit, line pressure becomes low in "R" or "P" range but is normal in "D", "2" or "1" range.

3) When line pressure is high while idling, pressure regulator valve may have stuck.

If line pressure does not rise, first check to make sure that throttle wire is connected properly.



LOCK-UP TEST

Install pressure gauge to lock-up pressure port. Shift selector lever in "D" range.

Condition	Torque converter lock-up pressure kPa (kg/cm^2, psi)
Lock-up "ON"	Less than 49 (0.5, 7)
Lock-up "OFF"	More than 196 (2, 28)

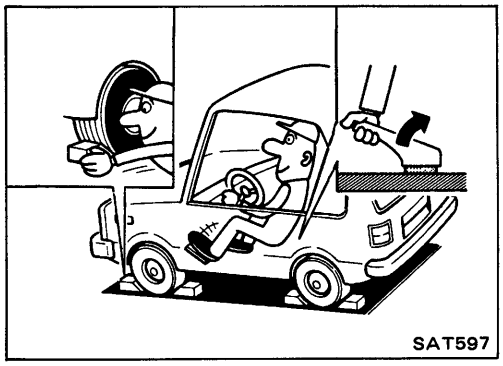
If lock-up pressure is not within specifications, refer to Trouble-shooting chart (A6).

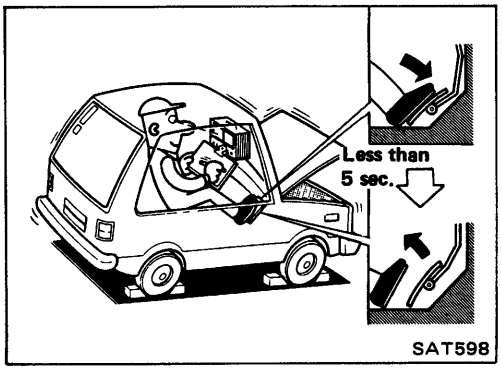
Stall Testing

The stall test is an effective method of testing clutch and band holding ability, torque converter one-way clutch operation, and engine performance. A stall test should only be performed as a last resort because of the high fluid temperature it generates and the excessive load it places on the engine and transaxle.

CAUTION:

a. **Transaxle and engine fluid levels should always be checked and fluid added as needed.**
b. **Run engine at 1,200 rpm to attain proper warm-up.**
c. **During test, never hold throttle wide-open for more than 5 seconds.**
d. **Do not test more than two gear ranges without driving vehicle to cool off engine and transaxle.**


SAT597



SAT598

STALL TEST PROCEDURE

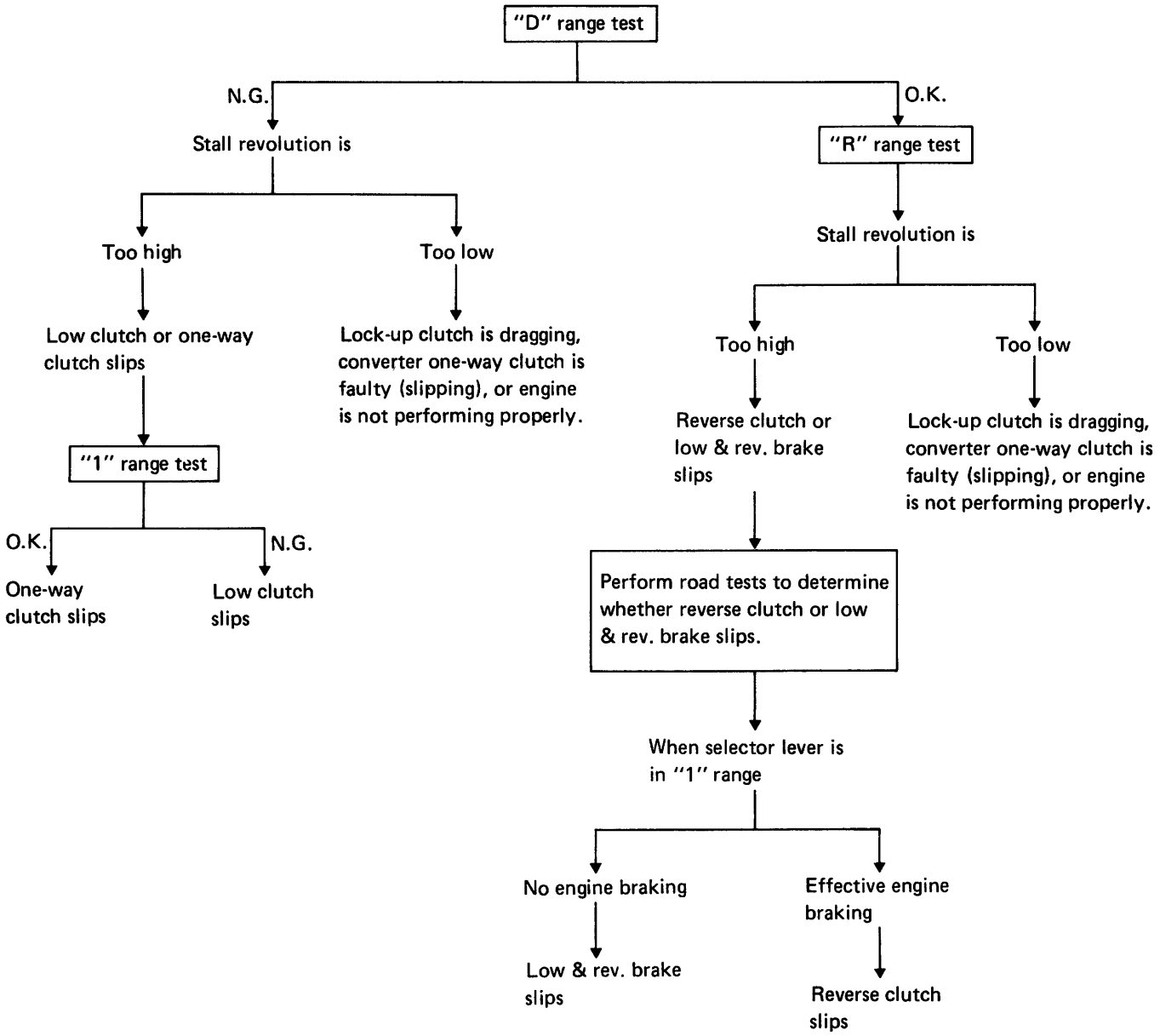
1. Set parking brake and block wheels.
2. Install a tachometer where it can be seen by driver during test.
3. Start engine and place selector lever in "D" range.
4. Apply foot brake and accelerate to wide-open throttle.
5. Quickly note the engine stall speed and immediately release throttle.

   Stall revolution:
   CA18DE engine models
   2,550 - 2,850 rpm

6. Shift selector lever to "N".
7. Cool off A.T.F.
8. Perform stall tests in the same manner as in steps 3 through 7 with selector lever in "1" and "R", respectively.
9. If stall revolution is not within specified values, perform trouble-shooting using Stall Test Analysis chart on the next page.

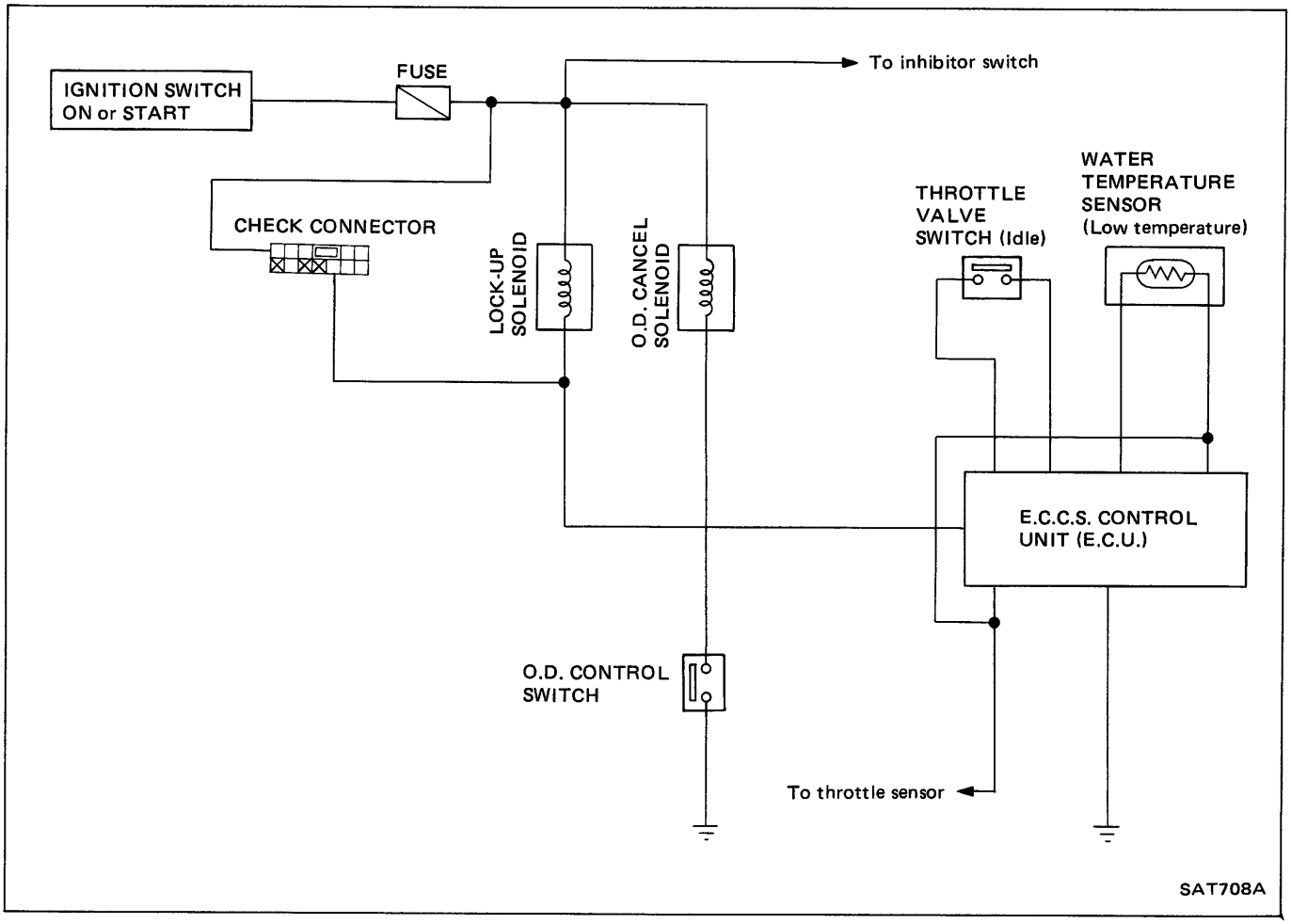
Stall Testing (Cont'd)

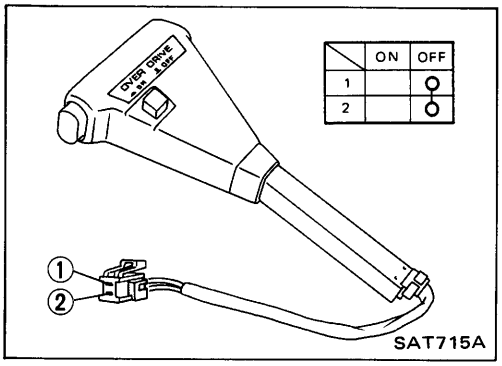
STALL TEST ANALYSIS



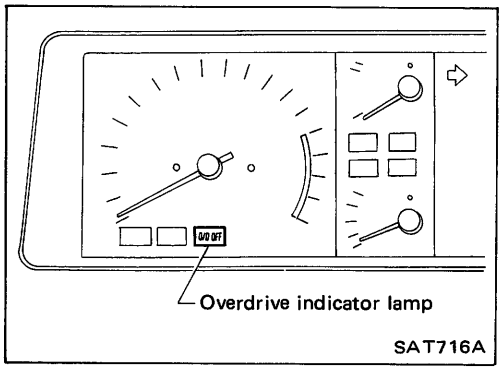
If converter one-way clutch is frozen, vehicle will have poor high-speed performance and low engine rpm when it is raced in "N" range. If converter one-way clutch is slipping, vehicle will be sluggish up to 50 or 60 km/h (30 or 40 MPH).

Electrical System/Schematic



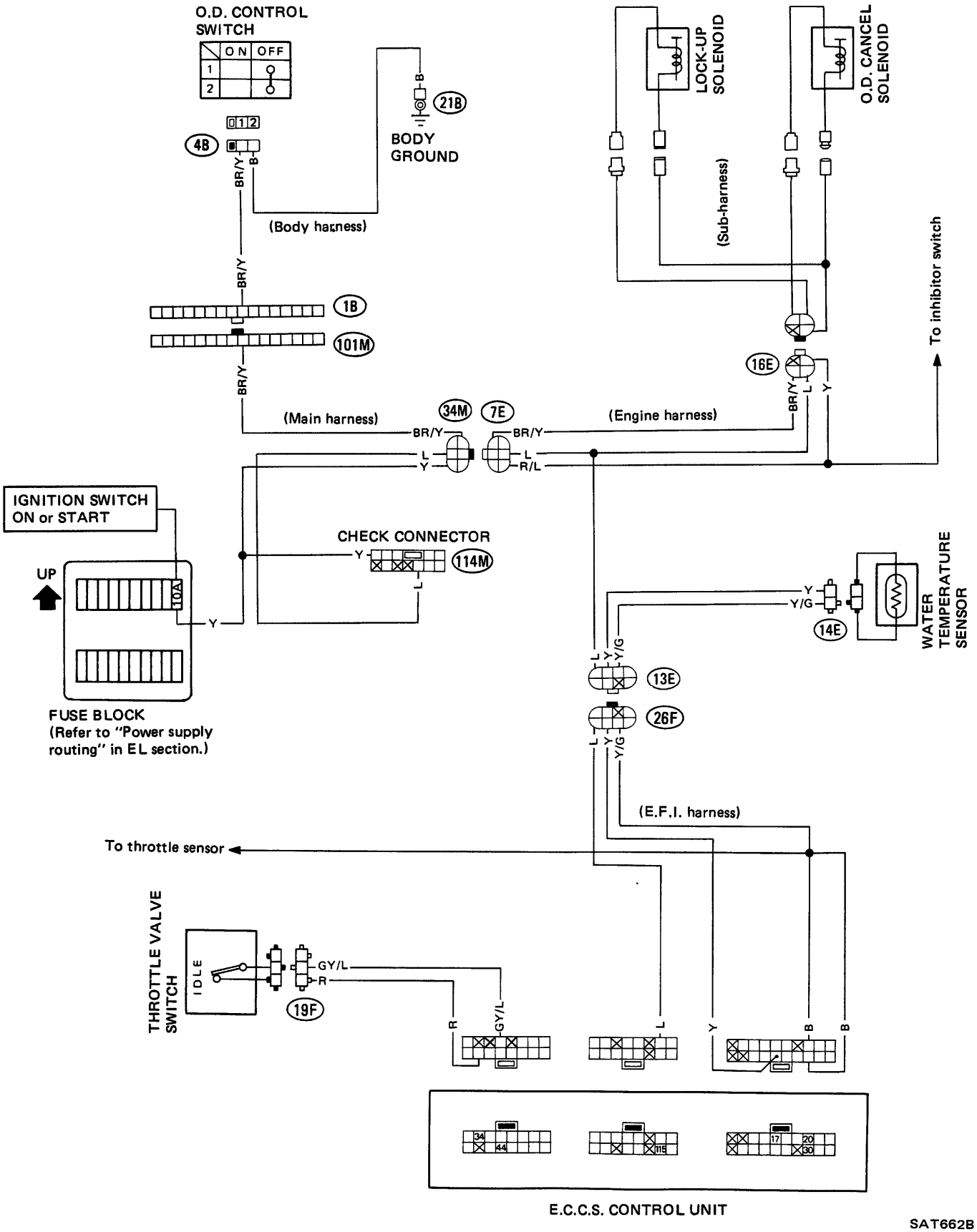


OVERDRIVE CONTROL SWITCH

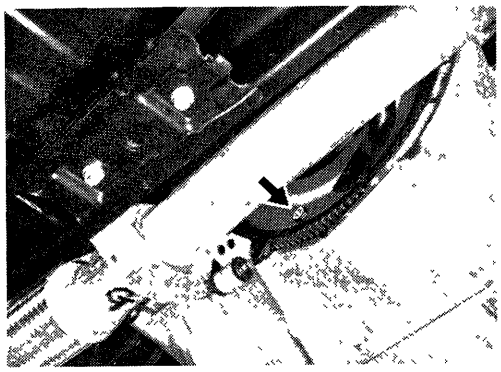


O.D. control switch "ON" → O.D. indicator lamp "OFF"
O.D. control switch "OFF" → O.D. indicator lamp "ON"

Electrical System/Wiring Diagram



SAT662B



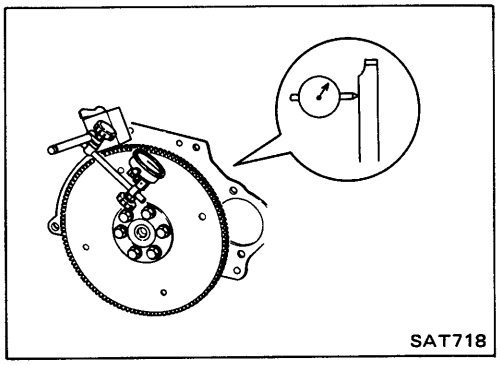
Removal

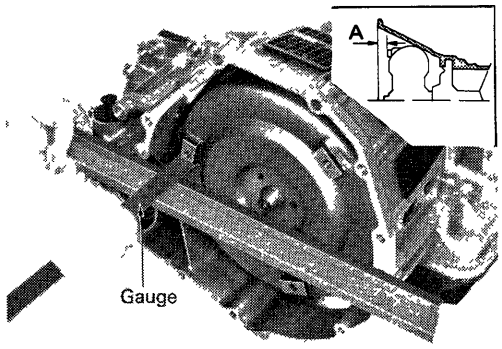
- Disconnect drive shafts. Refer to Drive Shaft (section FA) for removal.
- Remove bolts securing torque converter to drive plate.

a. **Remove those bolts turning crankshaft.**
b. **Before removing torque converter, inscribe matching marks on two parts so that they may be replaced in their original positions during assembly.**

- Plug up openings such as oil charging pipe, etc.

CAUTION:
Take care when dismounting transaxle not to strike any adjacent parts.





Installation

- Drive plate runout

  Maximum allowable runout:
  0.5 mm (0.020 in)

  If this runout is out of allowance, replace drive plate and ring gear.

- When connecting torque converter to transaxle, measure distance "A" to be certain that they are correctly assembled.

  Distance "A":
  RL3F01A 21.1 mm (0.831 in) or more
  RL4F02A 19.0 mm (0.748 in) or more

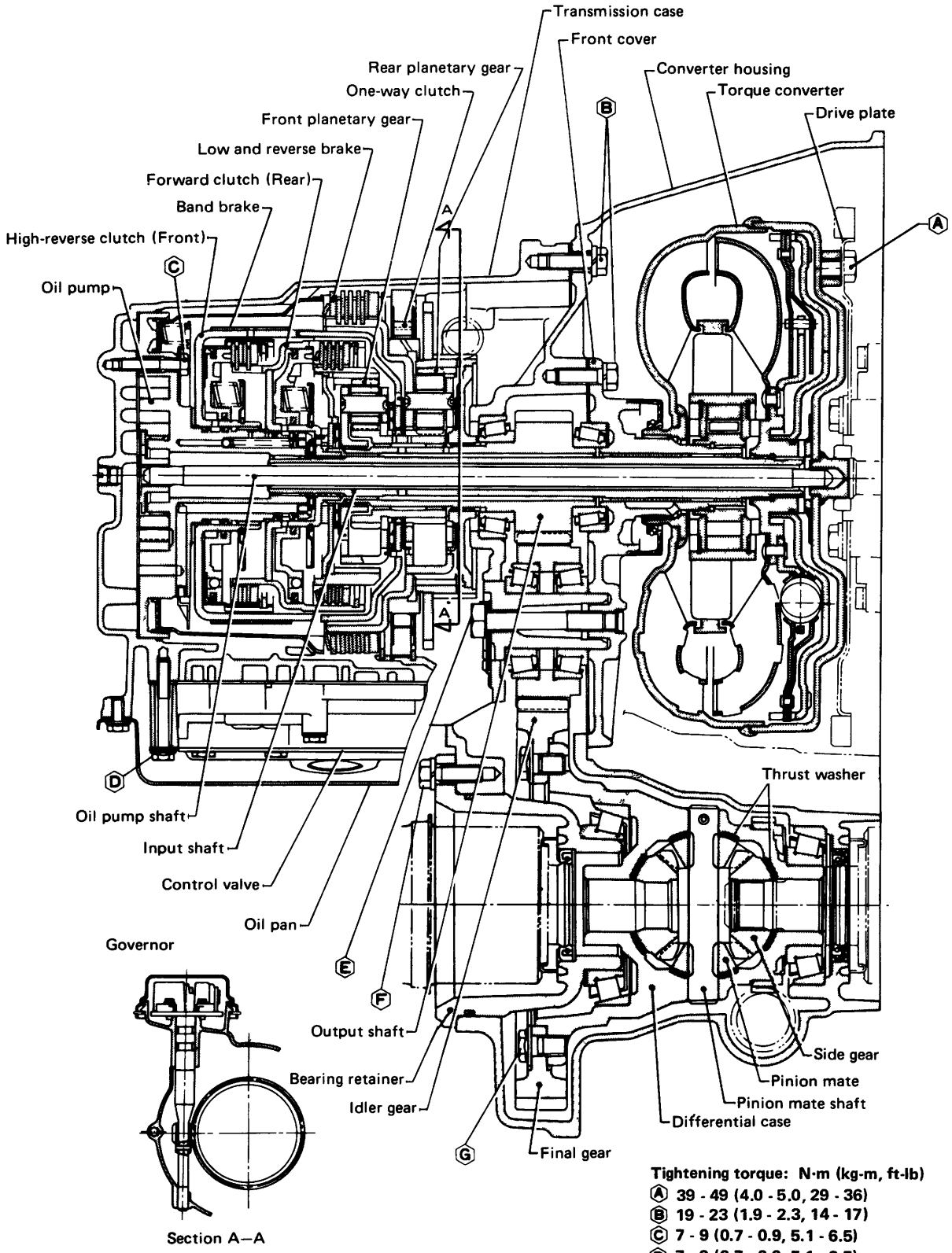
- Install converter to drive plate. Refer to photograph in Removal.

Align matching marks painted across both parts during disassembly.

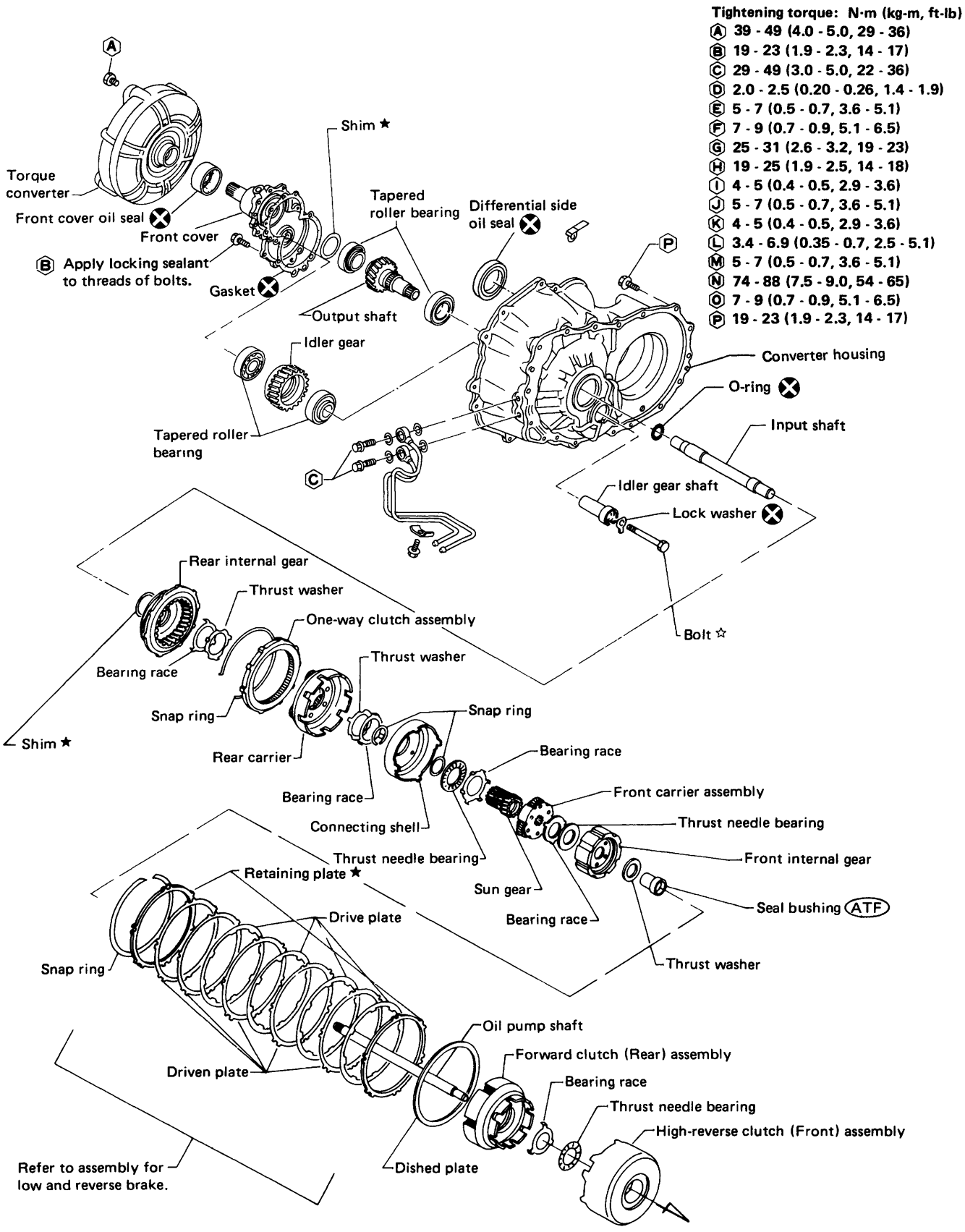
- After converter is installed, rotate crankshaft several turns and check to be sure that transaxle rotates freely without binding.
- Adjust control cable and throttle wire. Refer to On-vehicle Service.
- Check inhibitor switch for operation.
- Check fluid level in transaxle.

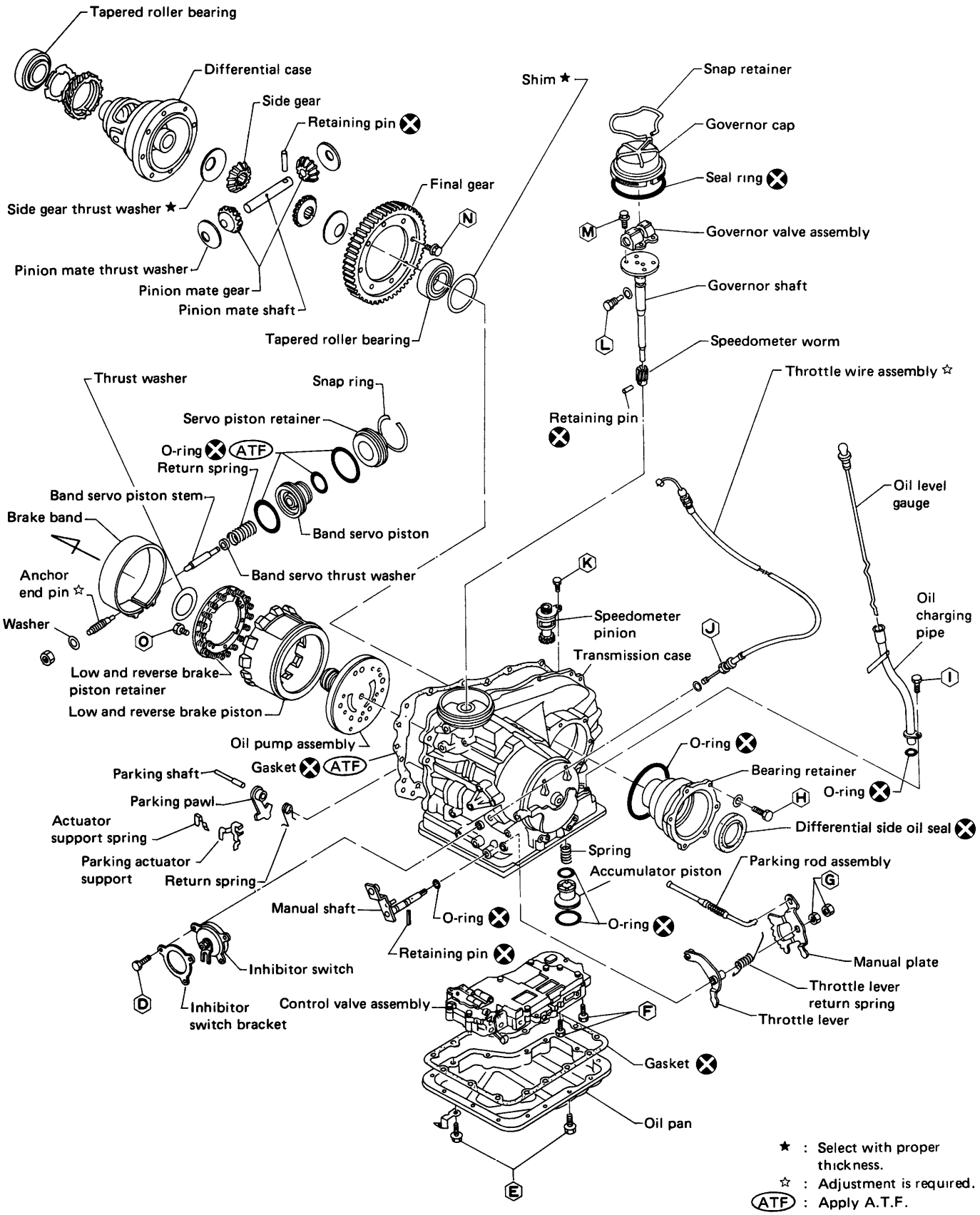
Installation (Cont'd)

- Move selector lever through all positions to be sure that transaxle operates correctly.
  With hand brake applied, rotate engine at idling. Without disturbing the above setting, move selector lever through "N" to "D", to "2", to "1" and to "R". A slight shock should be felt by hand gripping hand lever each time transaxle is shifted.
- Check to be sure that line pressure is correct. To do this, refer to Pressure Testing.
- Perform stall test.


Transmission case
Front cover
Converter housing
Torque converter
Drive plate
Rear planetary gear
One-way clutch
Front planetary gear
Low and reverse brake
Forward clutch (Rear)
Band brake
High-reverse clutch (Front)
Oil pump
Oil pump shaft
Input shaft
Control valve
Oil pan
Governor
Output shaft
Bearing retainer
Idler gear
Final gear
Thrust washer
Side gear
Pinion mate
Pinion mate shaft
Differential case
Section A–A
Tightening torque: N·m (kg-m, ft-lb)
Ⓐ 39 - 49 (4.0 - 5.0, 29 - 36)
Ⓑ 19 - 23 (1.9 - 2.3, 14 - 17)
Ⓒ 7 - 9 (0.7 - 0.9, 5.1 - 6.5)
Ⓓ 7 - 9 (0.7 - 0.9, 5.1 - 6.5)
Ⓔ 3 - 4 (0.3 - 0.4, 2.2 - 2.9)
Ⓕ 19 - 25 (1.9 - 2.5, 14 - 18)
Ⓖ 74 - 88 (7.5 - 9.0, 54 - 65)

SAT612


Tightening torque: N·m (kg-m, ft-lb)
A 39 - 49 (4.0 - 5.0, 29 - 36)
B 19 - 23 (1.9 - 2.3, 14 - 17)
C 29 - 49 (3.0 - 5.0, 22 - 36)
D 2.0 - 2.5 (0.20 - 0.26, 1.4 - 1.9)
E 5 - 7 (0.5 - 0.7, 3.6 - 5.1)
F 7 - 9 (0.7 - 0.9, 5.1 - 6.5)
G 25 - 31 (2.6 - 3.2, 19 - 23)
H 19 - 25 (1.9 - 2.5, 14 - 18)
I 4 - 5 (0.4 - 0.5, 2.9 - 3.6)
J 5 - 7 (0.5 - 0.7, 3.6 - 5.1)
K 4 - 5 (0.4 - 0.5, 2.9 - 3.6)
L 3.4 - 6.9 (0.35 - 0.7, 2.5 - 5.1)
M 5 - 7 (0.5 - 0.7, 3.6 - 5.1)
N 74 - 88 (7.5 - 9.0, 54 - 65)
O 7 - 9 (0.7 - 0.9, 5.1 - 6.5)
P 19 - 23 (1.9 - 2.3, 14 - 17)
Torque converter
Front cover oil seal
Front cover
B Apply locking sealant to threads of bolts.
Gasket
Shim ★
Tapered roller bearing
Output shaft
Idler gear
Tapered roller bearing
Differential side oil seal
Converter housing
O-ring
Input shaft
Idler gear shaft
Lock washer
Bolt ☆
Rear internal gear
Thrust washer
One-way clutch assembly
Bearing race
Thrust washer
Snap ring
Shim ★
Rear carrier
Snap ring
Bearing race
Bearing race
Front carrier assembly
Connecting shell
Thrust needle bearing
Thrust needle bearing
Front internal gear
Retaining plate ★
Sun gear
Seal bushing ATF
Drive plate
Bearing race
Snap ring
Thrust washer
Oil pump shaft
Forward clutch (Rear) assembly
Driven plate
Bearing race
Thrust needle bearing
High-reverse clutch (Front) assembly
Dished plate
Refer to assembly for low and reverse brake.

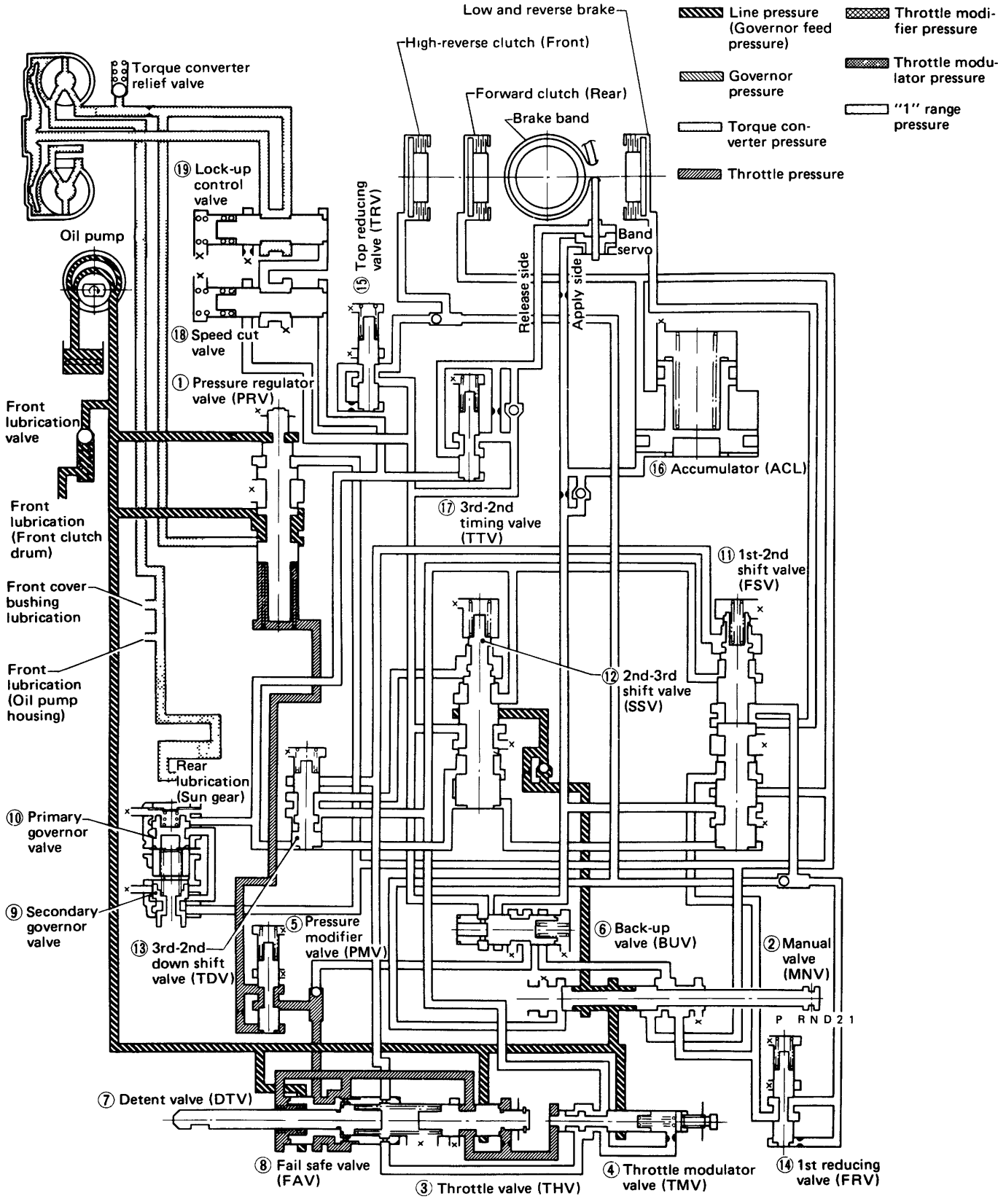

Tapered roller bearing
Differential case
Side gear
Retaining pin
Side gear thrust washer ★
Pinion mate thrust washer
Pinion mate gear
Pinion mate shaft
Final gear
N
Tapered roller bearing
Shim ★
Snap retainer
Governor cap
Seal ring
M
Governor valve assembly
Governor shaft
L
Speedometer worm
Retaining pin
Throttle wire assembly ☆
Thrust washer
Snap ring
Servo piston retainer
O-ring ATF
Return spring
Band servo piston stem
Brake band
Band servo piston
Band servo thrust washer
Anchor end pin ☆
Washer
O
Low and reverse brake piston retainer
Low and reverse brake piston
Oil pump assembly
Gasket ATF
Parking shaft
Parking pawl
Actuator support spring
Parking actuator support
Return spring
K
Speedometer pinion
Transmission case
J
Oil level gauge
Oil charging pipe
I
O-ring
Bearing retainer
H
O-ring
Differential side oil seal
Spring
Accumulator piston
O-ring
Parking rod assembly
G
Manual shaft
O-ring
Retaining pin
Inhibitor switch
D
Inhibitor switch bracket
Control valve assembly
F
Manual plate
Throttle lever return spring
Throttle lever
Gasket
Oil pan
E
★ : Select with proper thickness.
☆ : Adjustment is required.
ATF : Apply A.T.F.

SAT624A

Hydraulic Control Circuits (RL3F01A)

Oil pressure circuit diagram "N" range

Note: Marked X are drain.



SAT653

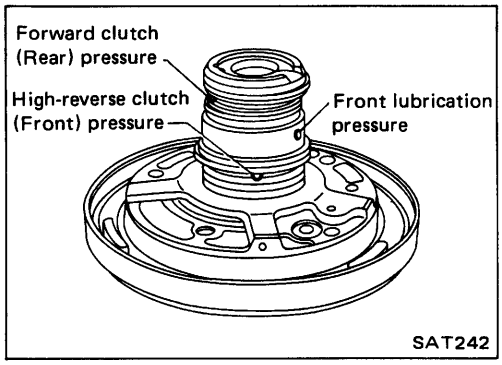
Mechanical Operation

Range		Gear ratio	Clutch		Low & reverse brake	Lock-up	Band servo		One-way clutch	Parking pawl
			High-reverse clutch (Front)	Forward clutch (Rear)			Operation	Release		
Park		–								on
Reverse		2.364	on		on					
Neutral		–								
Drive	D_1 Low	2.826		on					on	
	D_2 Second	1.543		on			on			
	D_3 Top (3rd)	1.000	on	on		on	(on)	on		
2	2_1 Low	2.826		on					on	
	2_2 Second	1.543		on			on			
1	1_1 Low	2.826		on	on				on	
	1_2 Second	1.543		on			on			

The low & reverse brake is applied in "1_1" range to prevent free wheeling when coasting and allows engine braking.

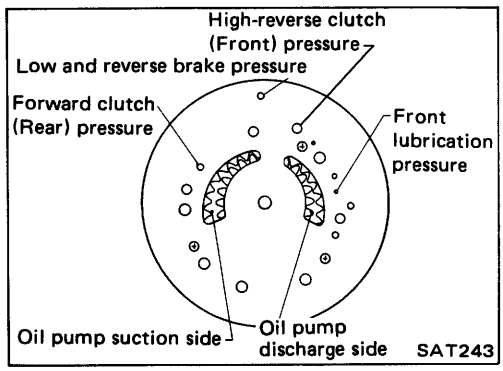
Oil Channel (RL3F01A)

Oil channels which connect components are located in areas shown below.



OIL CHANNELS IN OIL PUMP HOUSING

Oil pump housing side

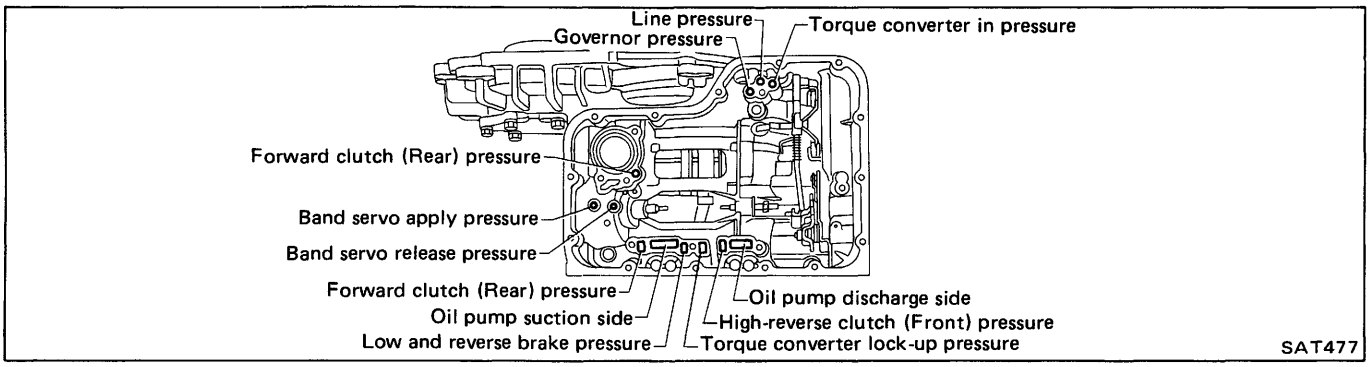


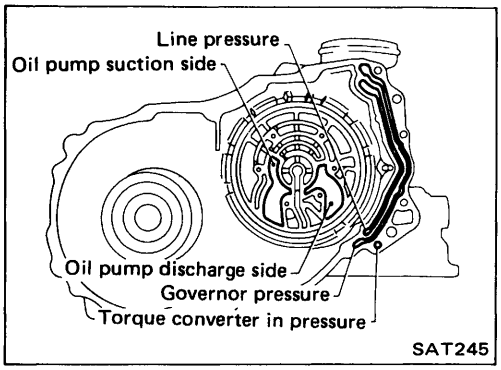
Oil pump plate side

Oil Channel (RL3F01A) (Cont'd)

OIL CHANNELS IN TRANSMISSION CASE

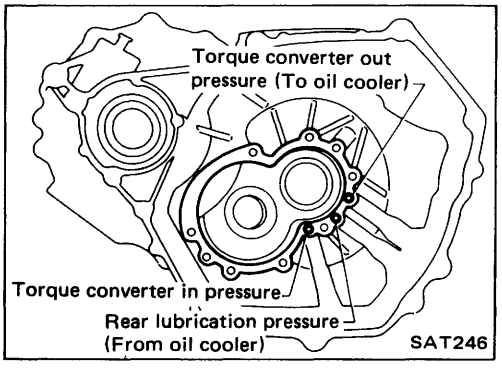
Lower face side



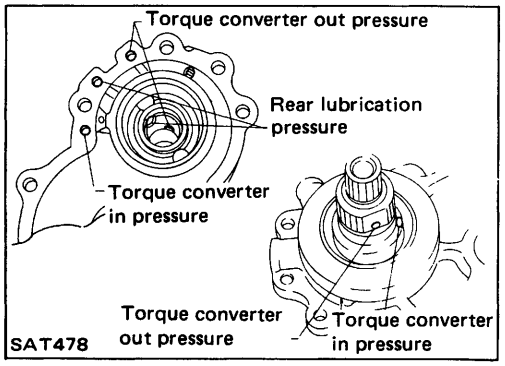


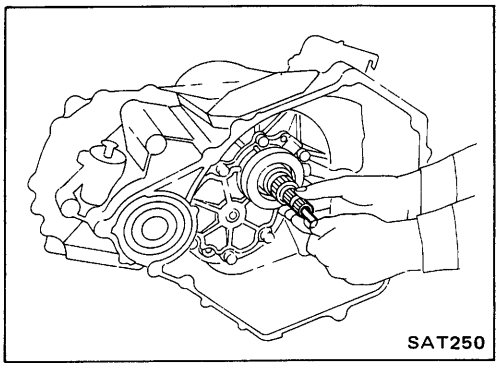
Converter housing attaching side

OIL CHANNELS IN CONVERTER HOUSING

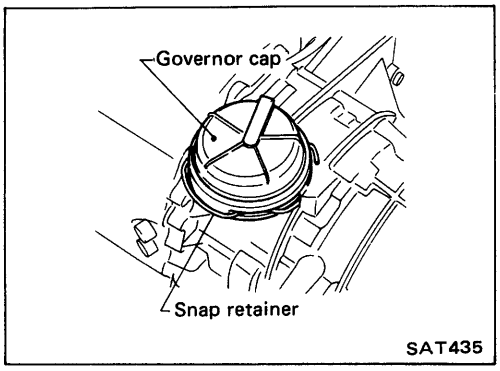


OIL CHANNELS IN FRONT COVER



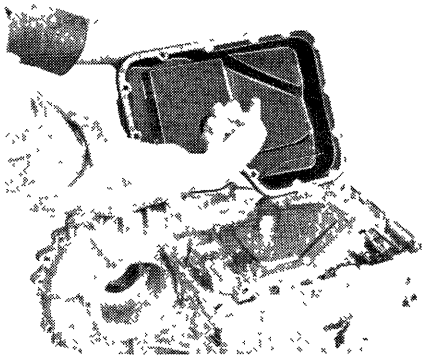

SAT250

1. Drain A.T.F.
2. Remove torque converter.
3. Remove oil pump shaft and input shaft.

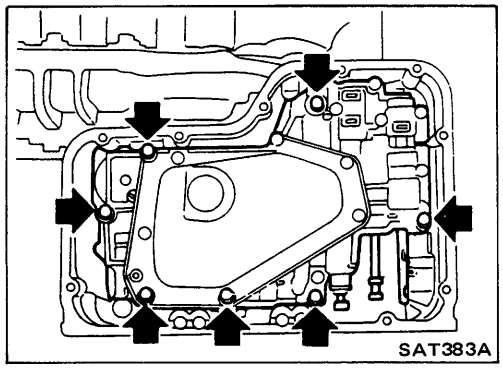


SAT435

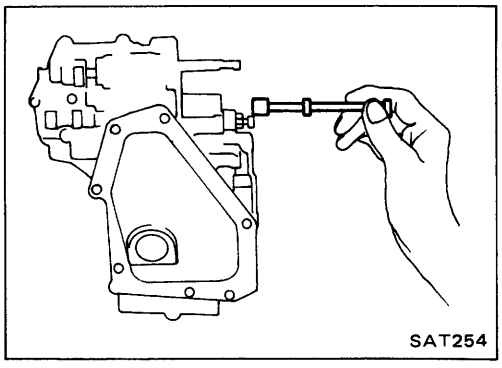
4. Remove snap retainer, governor cap with breather hose and O-ring.



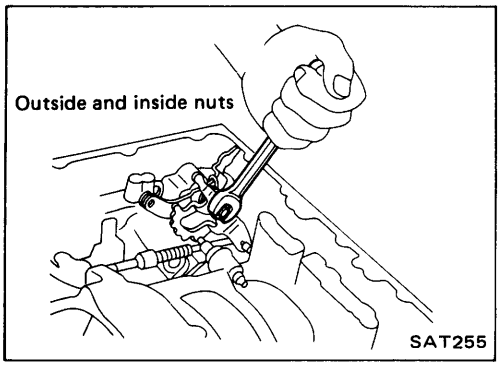
5. Remove oil pan guard and oil pan and inspect its contents. An analysis of any foreign matter can indicate the types of problems to look for. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band) may need replacement. A tacky film that will not wipe clean indicates varnish build up which can cause valves, servo, and clutches to stick and may inhibit pump pressure.


SAT383A

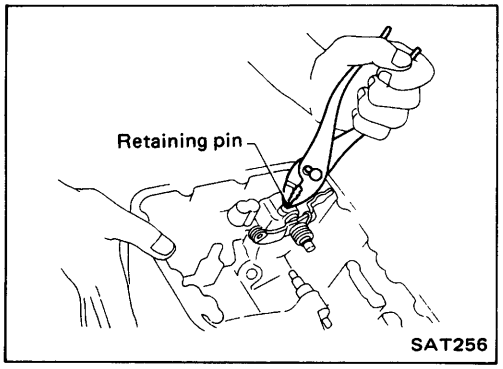
6. Remove control valve body.


SAT254

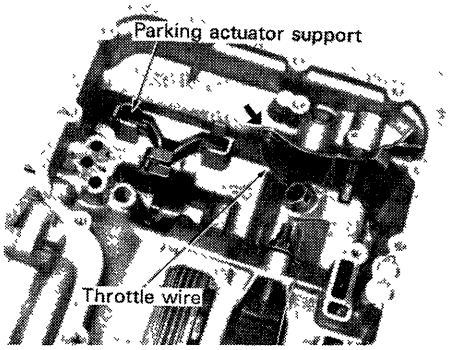
Remove manual valve from valve body as a precaution, to prevent valve from dropping out accidentally.



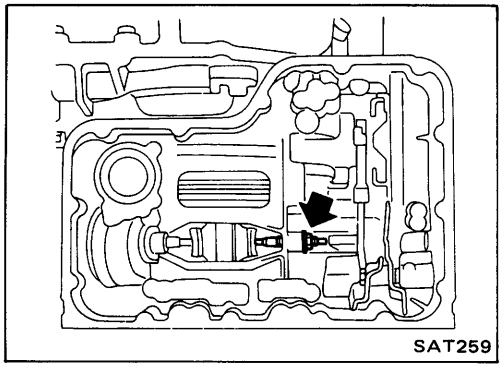
7. Remove manual shaft securing nuts.



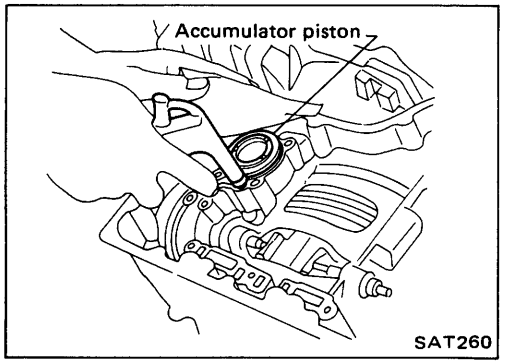
8. Pull out retaining pin, then remove throttle lever, manual plate, manual shaft, selector range lever and parking rod assembly.



9. Disconnect throttle wire from throttle lever, then remove throttle wire. Remove parking actuator support from transmission case.



10. Loosen band brake piston stem lock nut, then back off piston stem.



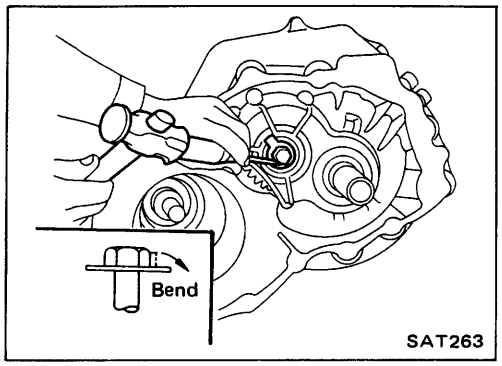
11. Remove accumulator piston with compressed air.

Be careful that accumulator piston does not jump out.

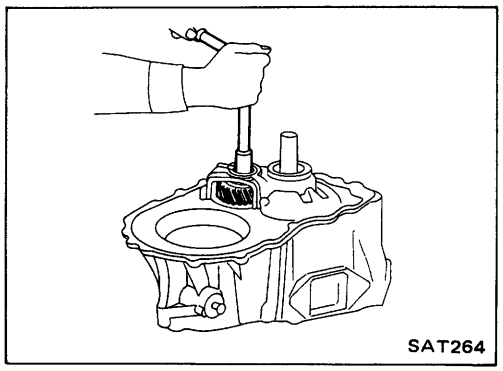
12. Remove converter housing securing bolts.
13. Separate converter housing from transmission case by tapping it.

Be careful not to drop final drive assembly.

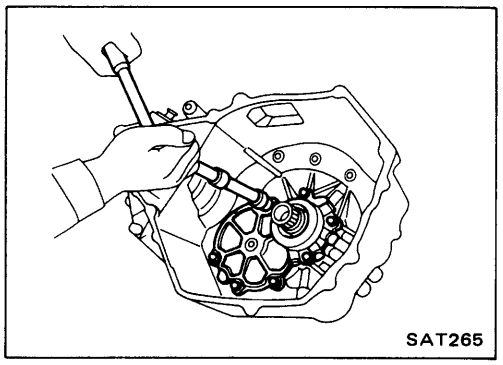
14. Remove final drive assembly.



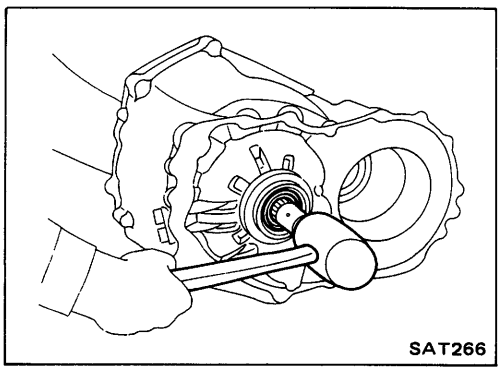
15. Straighten lock washer.



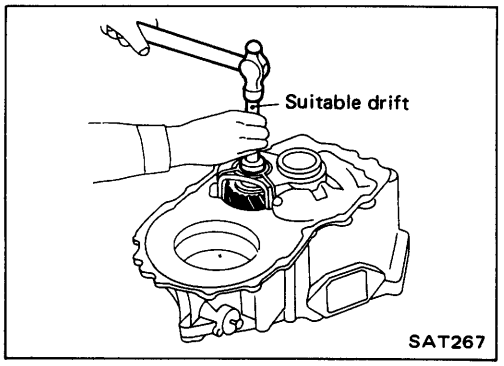
16. Remove idler gear bolt and lock washer.



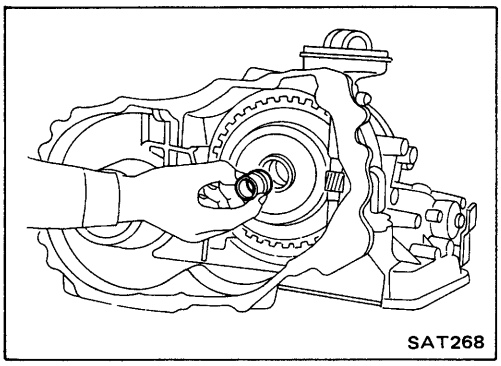
17. Remove front cover retaining bolts.



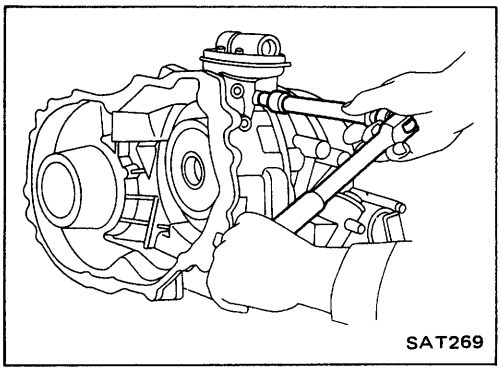
18. Tap output shaft, then remove it together with front cover.
a. **When tapping output shaft, be sure to hold front cover so that it does not fall.**
b. **Adjusting shim is attached to rear internal gear side of output shaft so be careful not to lose it.**



19. Remove front cover gasket.
20. Remove idler gear, idler gear shaft and taper roller bearings by tapping idler gear shaft.

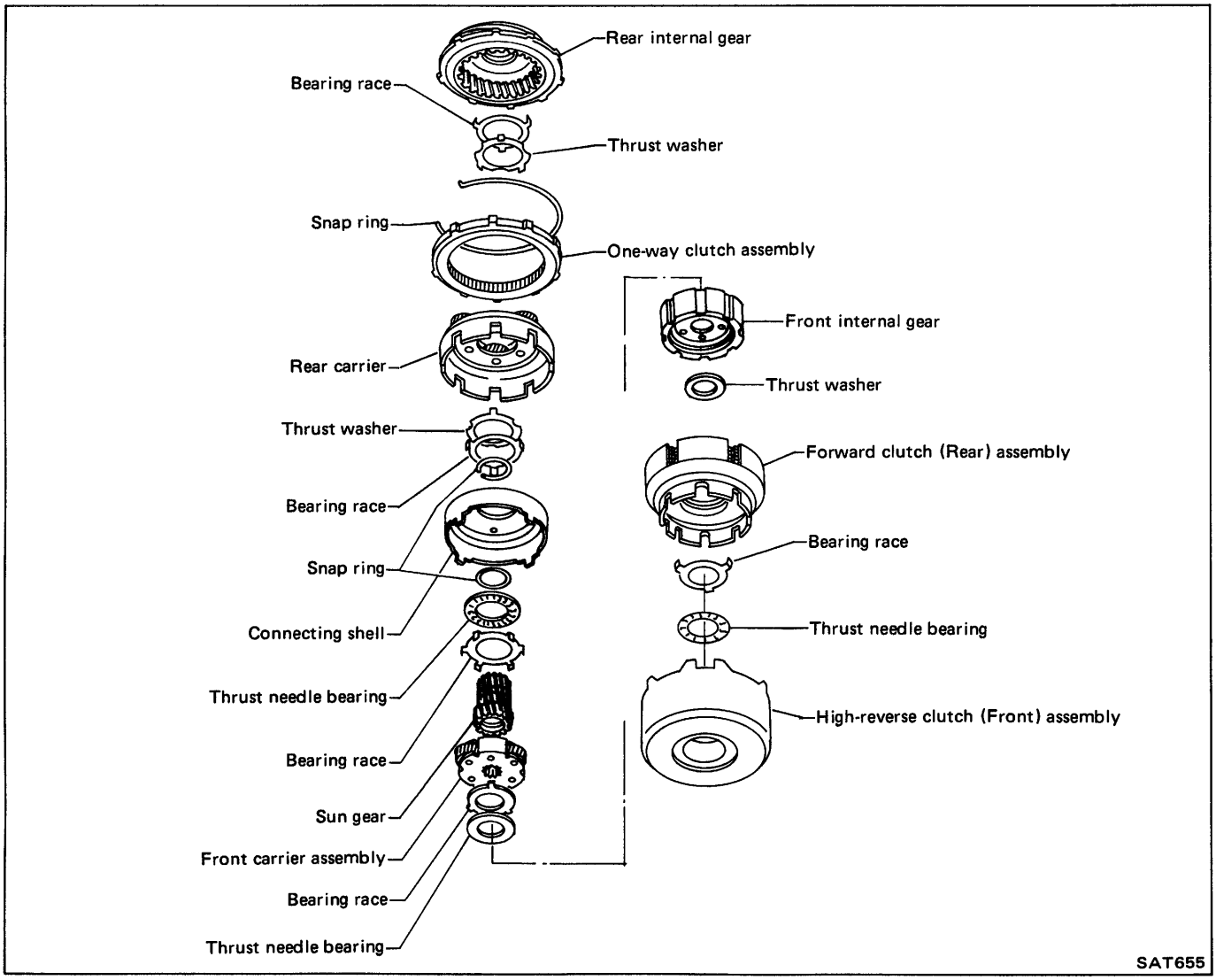

SAT268

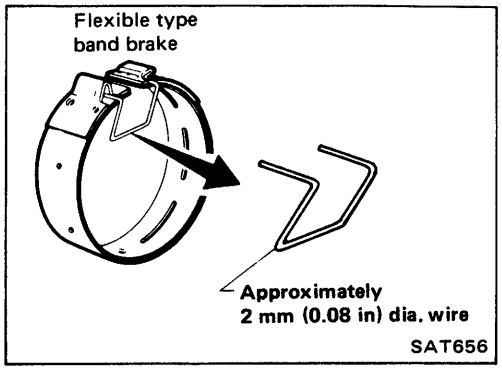
21. Remove seal bushing.


SAT269

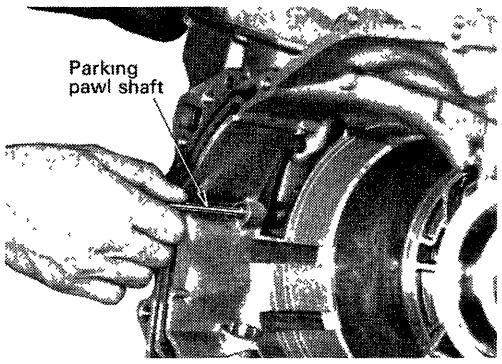
22. Remove governor shaft retaining bolt.
23. Pull out governor shaft.

24. Remove the following parts.

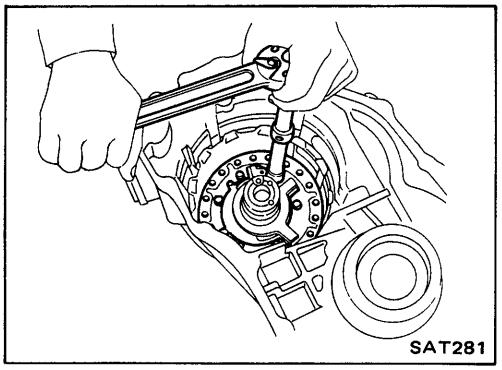




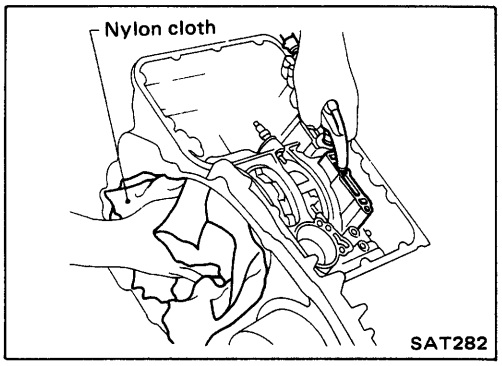
To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. Before removing the brake band, always secure it with a clip as shown in the figure at left.
Leave the clip in position after removing the brake band.



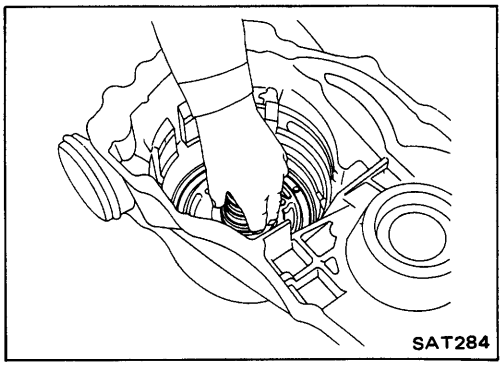
25. Pull out parking pawl shaft, then remove parking pawl and return spring.



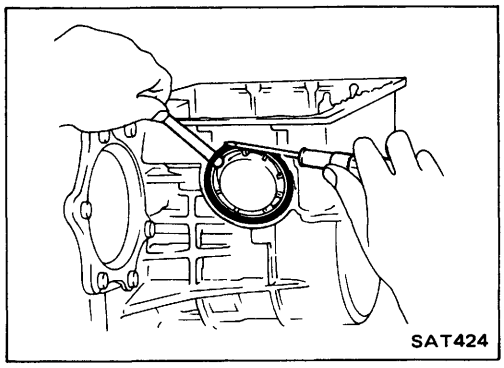
26. Remove low and reverse brake retainer.



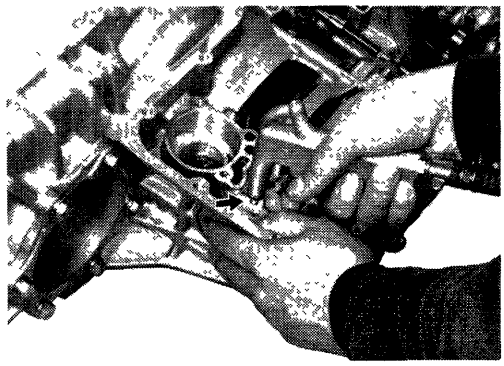
27. Remove low and reverse brake piston with compressed air.
Be sure to hold low and reverse brake piston with nylon cloth so that they do not jump out.



28. Remove oil pump assembly, thrust washer and thrust needle bearing.
The oil pump and transmission case fit loosely, but the clearance is very small. So always lift it straight out of transmission case.

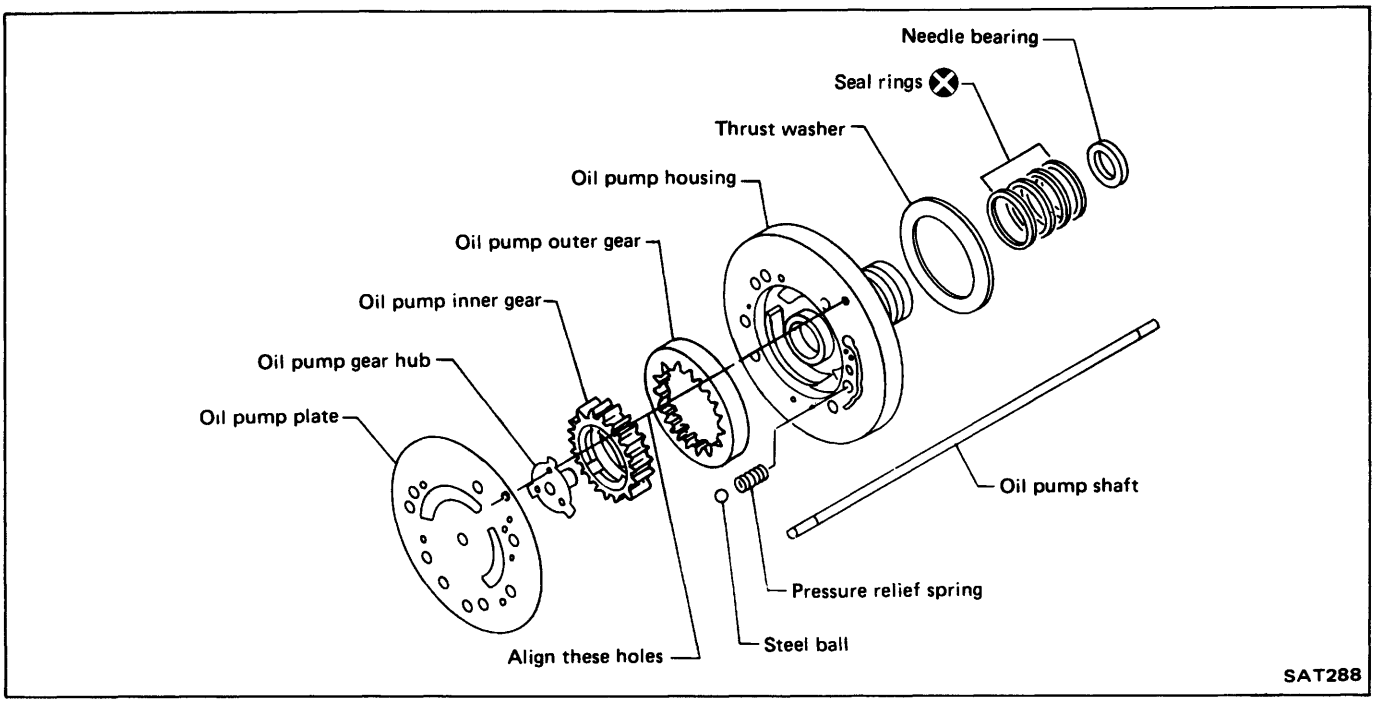

SAT424

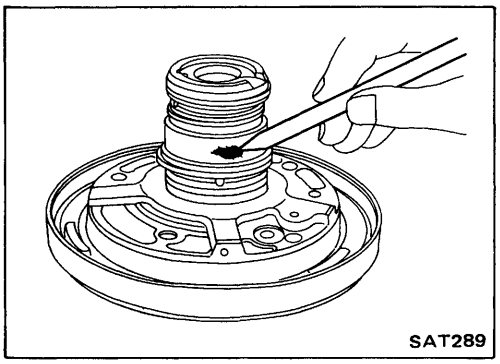
29. Remove inhibitor switch.
30. Remove band servo piston and return spring.



31. Remove band brake servo, retainer and return spring.

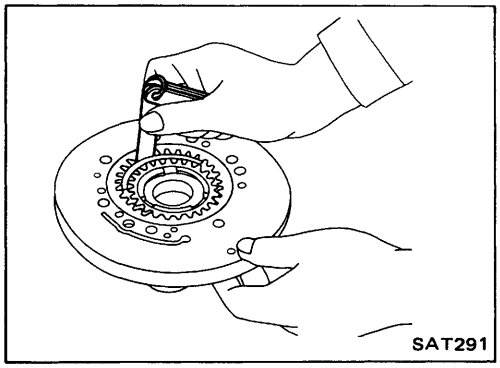
Oil Pump





INSPECTION

1. Inspect oil pump body, oil pump shaft and ring groove areas for wear.

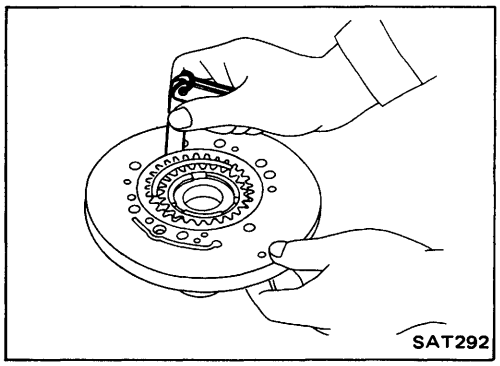


2. Remove oil pump plate.
3. Inspect gears and all internal surfaces for faults and visible wear.
4. Measure clearance between outer gear and crescent.

   Standard clearance:

   0.20 - 0.30 mm (0.0079 - 0.0118 in)

   Replace oil pump inner & outer gear and oil pump housing if the clearance exceeds 0.35 mm (0.0138 in).



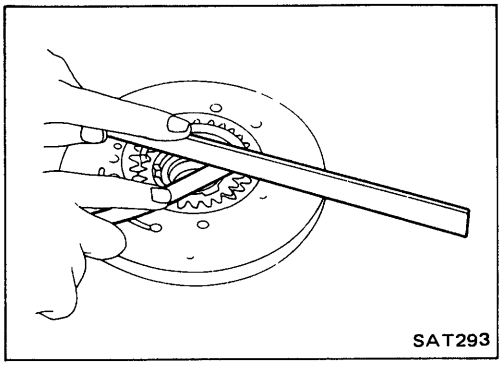
5. Measure clearance between outer gear and pump housing.

   Standard clearance:

   0.20 - 0.30 mm (0.0079 - 0.0118 in)

   Replace oil pump inner & outer gear and oil pump housing if the clearance exceeds 0.35 mm (0.0138 in).

Oil Pump (Cont'd)


SAT293

6. Measure clearance between gears and oil pump housing.

Standard clearance:

0.02 - 0.04 mm (0.0008 - 0.0016 in)

Replace oil pump inner & outer gear and oil pump housing if the clearance exceeds 0.08 mm (0.0031 in).

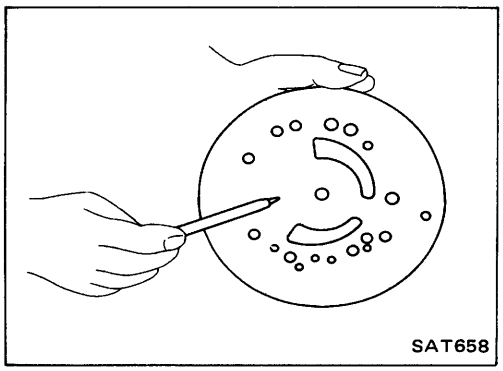
Select oil pump inner and outer gears of the proper thickness from among those in the following table before installation.

Oil pump outer gear

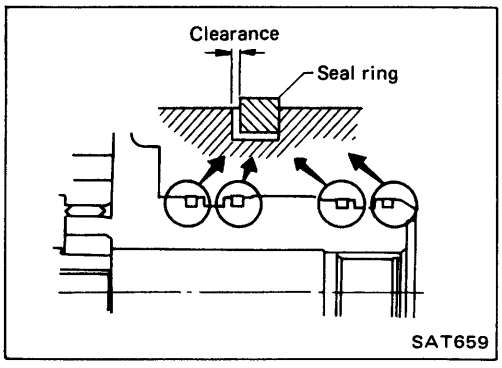
Thickness mm (in)	Part number
14.99 - 15.00 (0.5902 - 0.5906)	31347-01X00
14.98 - 14.99 (0.5898 - 0.5902)	31347-01X01
14.97 - 14.98 (0.5894 - 0.5898)	31347-01X02
14.96 - 14.97 (0.5890 - 0.5894)	31347-01X03

Oil pump inner gear

Thickness mm (in)	Part number
14.99 - 15.00 (0.5902 - 0.5906)	31346-01X00
14.98 - 14.99 (0.5898 - 0.5902)	31346-01X01
14.97 - 14.98 (0.5894 - 0.5898)	31346-01X02
14.96 - 14.97 (0.5890 - 0.5894)	31346-01X03


SAT658

7. Check oil pump plate for scratches or bending.



SAT659

8. Measure clearance between seal ring and ring groove.

Standard clearance:

0.10 - 0.25 mm (0.0039 - 0.0098 in)

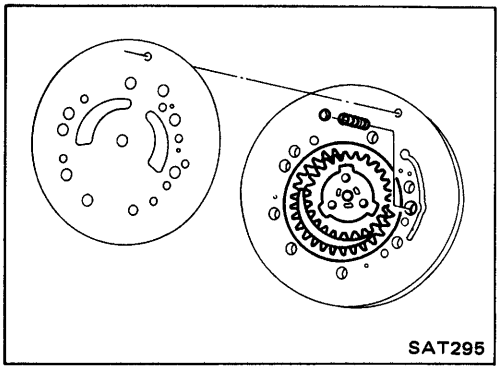
Wear limit:

0.25 mm (0.0098 in)

Oil Pump (Cont'd)

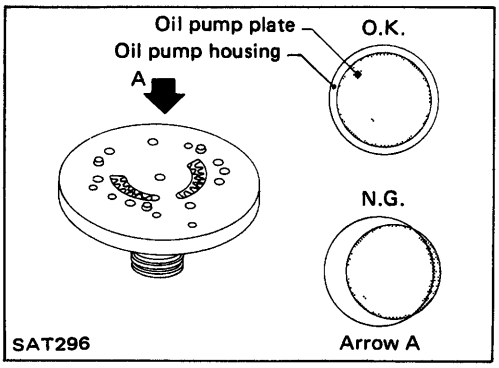
ASSEMBLY

1. Install oil pump gear hub, pressure relief spring and steel ball onto oil pump housing.


SAT295

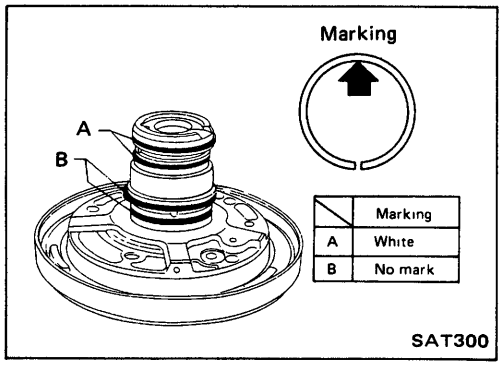
2. Install oil pump plate.

Do not allow periphery of oil pump plate to protrude beyond periphery of oil pump housing.

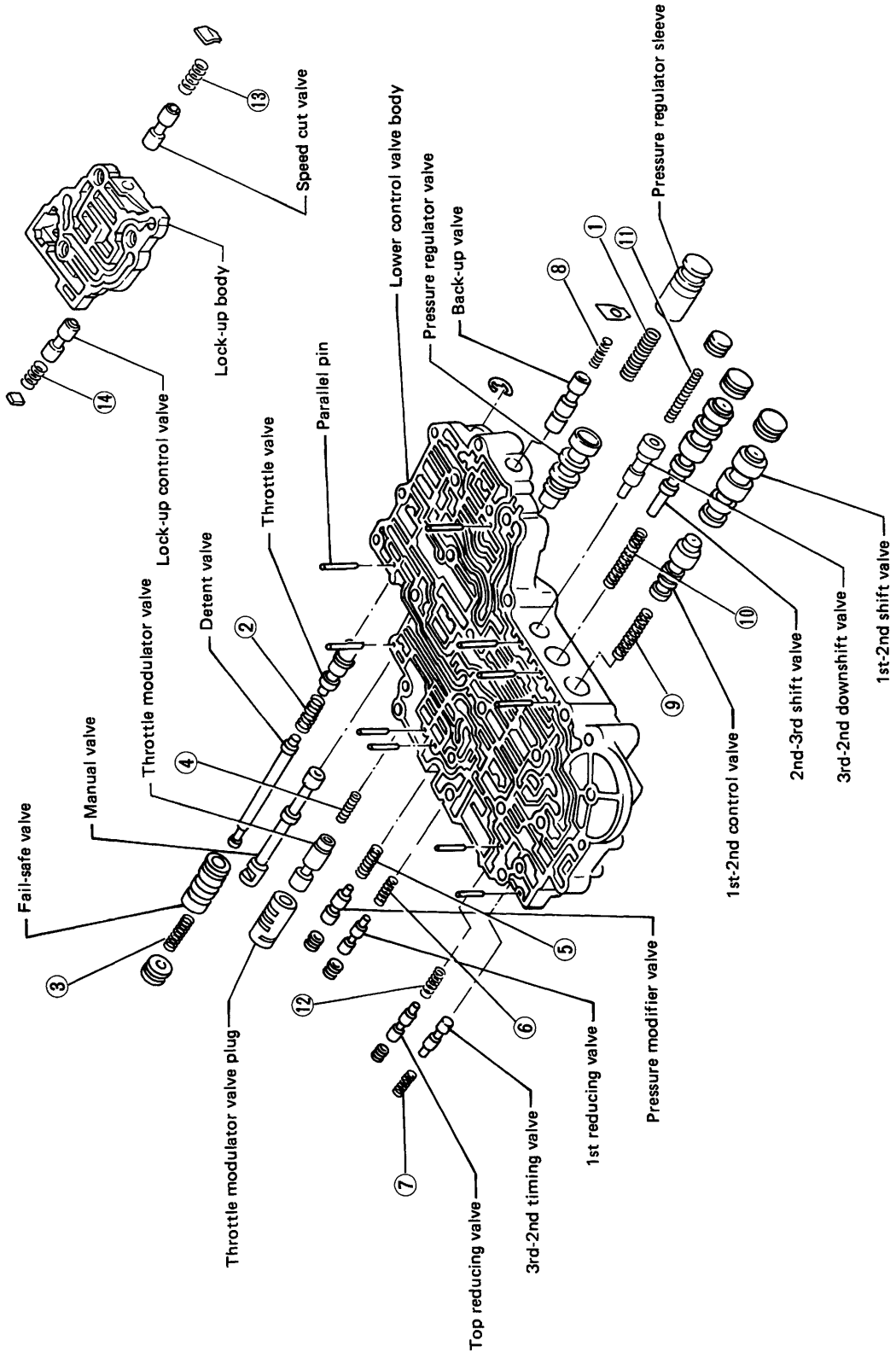


3. Install seal rings.

Refer to the following figure for proper locations of the two different types of seal rings.

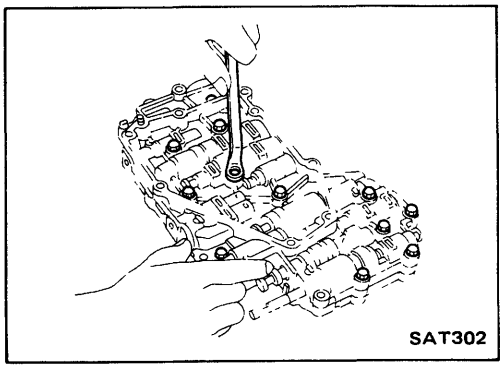


Control Valve Body



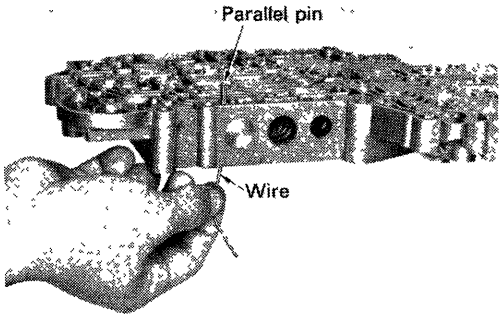
SAT689A

Control Valve Body (Cont'd)


SAT302

DISASSEMBLY

1. Remove oil strainer and magnet.
2. Disassemble valve body and its remaining attaching bolts and nuts to carefully separate lower body, separator plate and upper body.



3. During valve body separation, do not lose the 6 steel balls on valve upper body.

Manual valve was removed when valve body was removed from transaxle. Include valve in subsequent inspection and service sequence.

INSPECTION

A newly manufactured valve body represents precision manufactured valves assembled with close tolerances into precision bores of the valve body. If inspection reveals excessive clearances, 0.03 mm (0.0012 in) or more, between the valves and the valve body bores, replace the entire valve body rather than attempt rework.

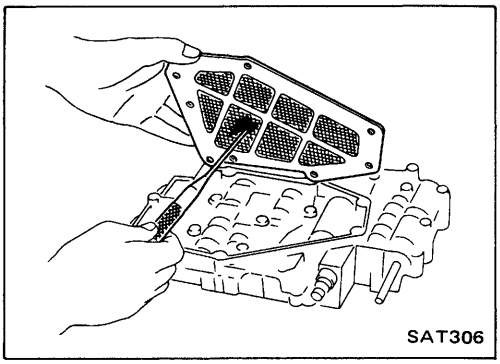
If one or more valves are sticking from varnish deposits or burns resulting from deteriorated oil or overheating, you may be able to clean the valves and valve bodies. Always use crocus cloth, which is a very fine type of cutting material. Never use emery cloth, as it is too coarse and can scratch the valves or valve bores. Scratches can lead to future deposits of varnish or foreign matter. During cleaning, do not remove the sharp edges of the valve. When edges are rounded or scratched, entry is provided for dirt or foreign matter to work into the sides of the valves and hinder valve movement.

The valves may be cleaned using alcohol or lacquer thinner. The valve bodies can be dip cleaned with a good carburetor cleaner or lacquer thinner. Do not leave valve bodies submerged in carburetor cleaner longer than five minutes. Rinse parts thoroughly and dry.

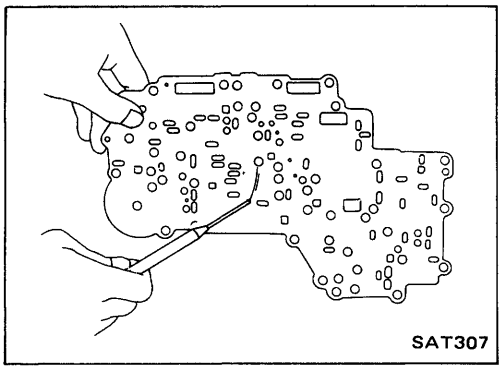
Lubricate all parts in clean A.T.F. before reassembly.

1. Check valves for signs of burning. Replace if beyond clean-up.

Control Valve Body (Cont'd)


SAT306

2. Check oil strainer for general condition. Replace if necessary.


SAT307

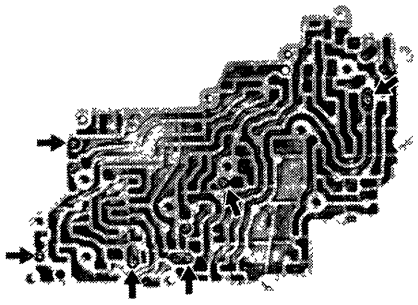
3. Check separator plate for scratches or damage. Replace if necessary. Scratches or score marks can cause oil to by-pass correct oil passages and result in system malfunction.

4. Check oil passages in upper and lower valve bodies for varnish deposits, scratches or other damage that would impair valve movement. Check threaded holes and related bolts and screws for stripped threads; replace as needed.
5. Check valve springs for damage. Measure free length of valve springs. If the free length is out of specification, replace it. Numbers of each valve spring listed in table below are the same as those in the figure on page AT-56.

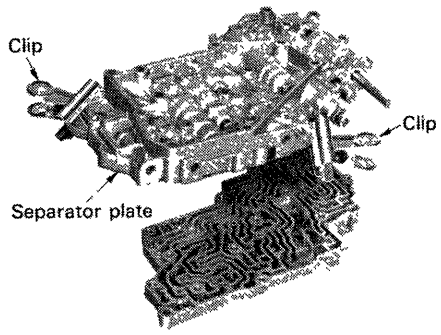
Valve spring	Free length mm (in)
① Pressure regulator valve	46.4 (1.827)
② Throttle valve	33.4 (1.315)
③ Fail-safe valve	23.1 (0.909)
④ Throttle modulator valve	28.0 (1.102)
⑤ Pressure modifier valve	25.3 (0.996)
⑥ 1st reducing valve	22.3 (0.878)
⑦ 3rd-2nd timing valve	20.6 (0.811)
⑧ Back up valve	18.8 (0.740)
⑨ 1st-2nd shift valve	38.9 (1.531)
⑩ 2nd-3rd shift valve	40.5 (1.594)
⑪ 3rd-2nd downshift valve	37.39 (1.4720)
⑫ Top reducing valve	22.5 (0.886)
⑬ Speed cut valve	19.7 (0.776)
⑭ Lock-up control valve	20.62 (0.8118)

Control Valve Body (Cont'd)

ASSEMBLY

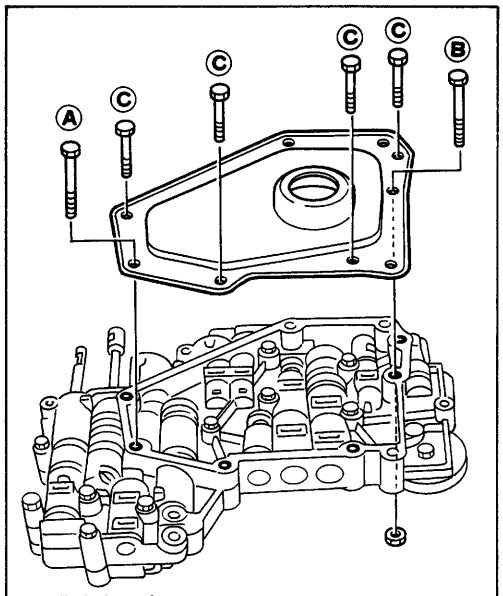


1. Reinstall the six steel balls in upper valve body.



2. Assemble separator plate and lower valve body on upper valve body, then tighten bolts.

When installing these bolts, first be sure to install reamer bolt to its original position.



Bolt length:
A: 60 mm (2.36 in)
B: 55 mm (2.17 in)
C: 45 mm (1.77 in)

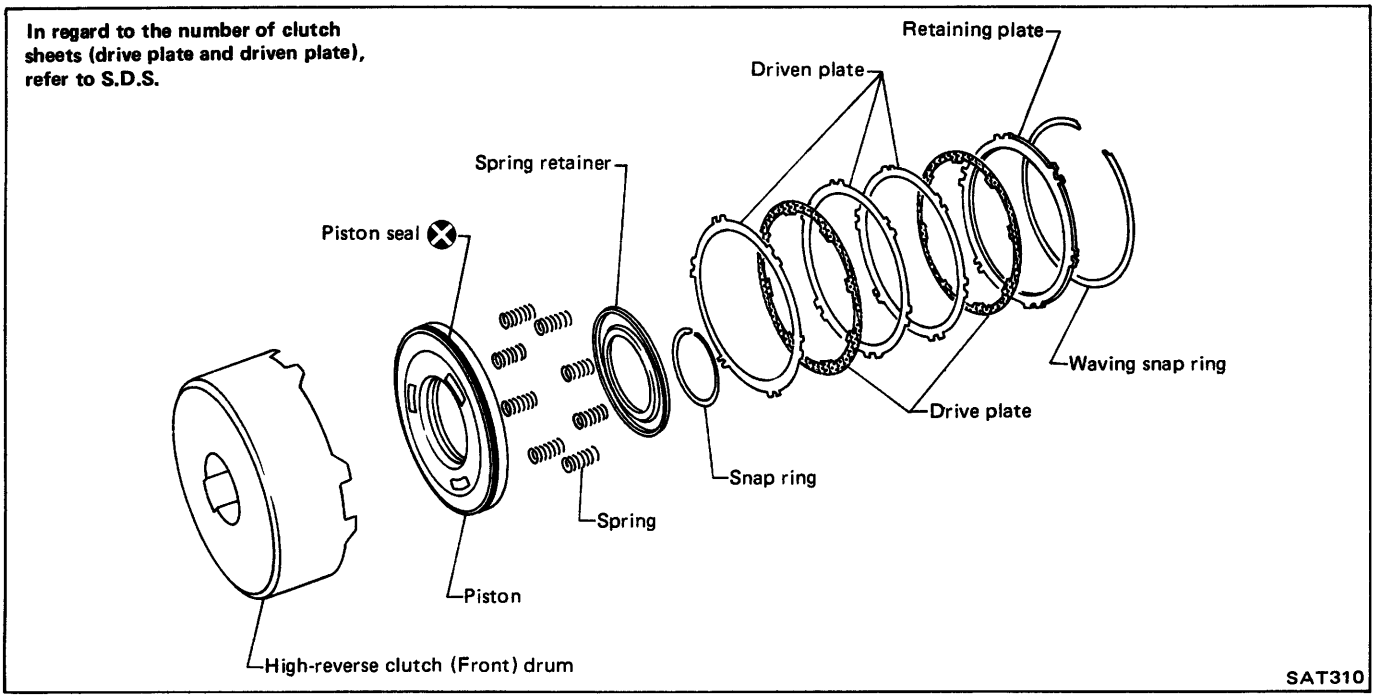
SAT690A

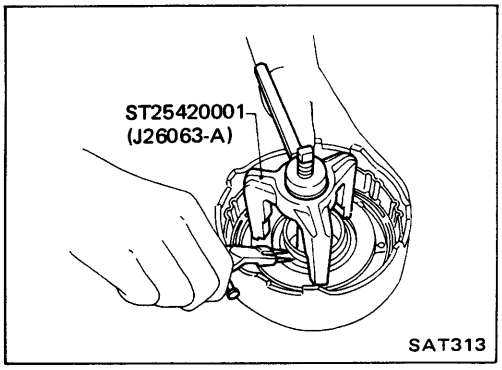
3. Install oil strainer, oil strainer gasket and reinforce plate.

Do not reuse conical bolts that secure oil strainer.

The manual valve is inserted into the valve body when the latter is installed in the transaxle.

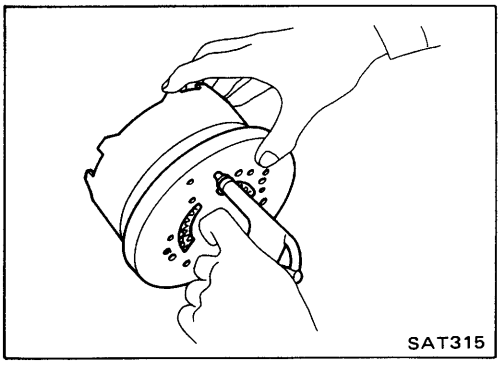
High-reverse Clutch (Front)





DISASSEMBLY

- Compress clutch springs and remove snap ring from spring retainer.



- For easy removal of piston from drum, use an air gun with a tapered rubber tip to carefully apply air pressure to loosen piston from drum.

High-reverse Clutch (Front) (Cont'd)

INSPECTION AND ASSEMBLY

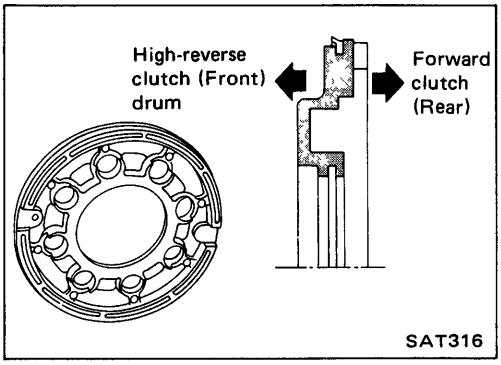
1. Check clutch drive plate facing for wear or damage. Drive plate thickness must not be less than 1.4 mm (0.055 in).

   Standard drive plate thickness:

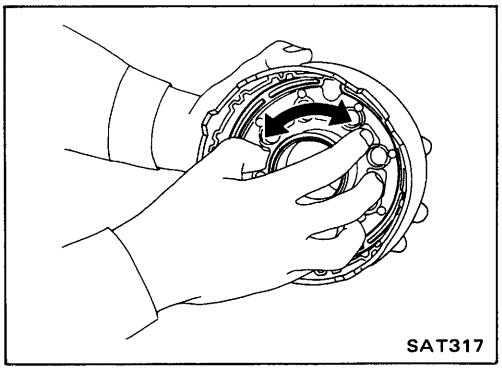
   1.50 - 1.65 mm (0.0591 - 0.0650 in)

2. Check for wear on snap ring, weak or broken coil springs, and warped spring retainer.
3. Lubricate clutch drum bushing, and install inner seal and piston seal as illustrated. Be careful not to stretch seals during installation.

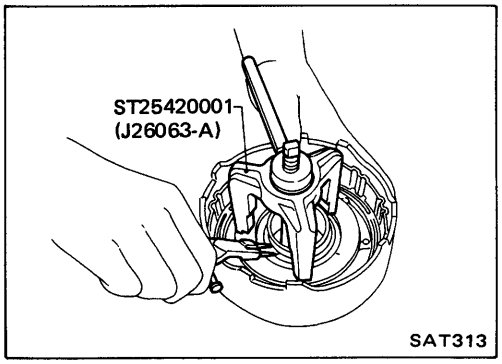
- Never assemble clutch dry; always lubricate its components thoroughly.



- Always install piston seal in direction shown in figure at left.

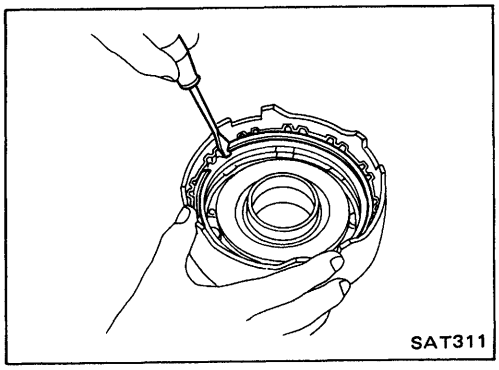


4. Assemble piston, being careful not to allow seal to kink or become damaged during installation. After installing, turn piston by hand to ensure that there is no binding.

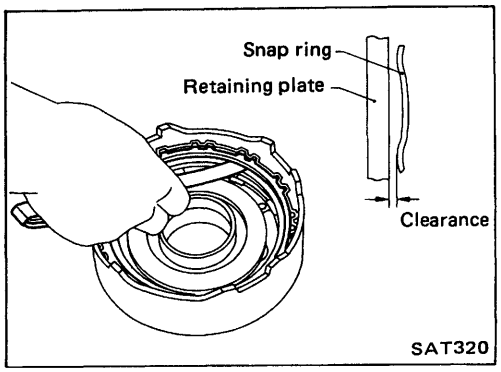


5. Reassemble springs and retainer. Reinstall snap ring. Be sure snap ring is properly seated.

High-reverse Clutch (Front) (Cont'd)



6. Install driven plates, drive plates, and secure with snap ring.



7. Measure clearance between retaining plate and snap ring. Always measure the existing minimum clearance, since snap ring is a wave type.

Specified clearance:

Standard

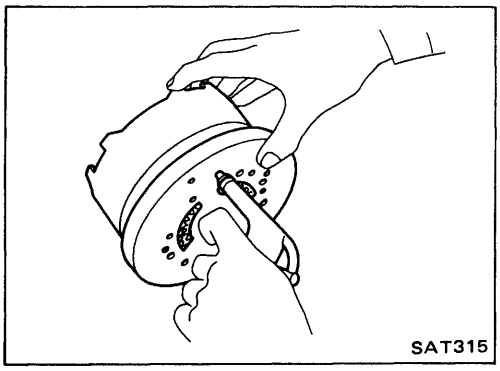
1.0 - 1.4 mm (0.039 - 0.055 in)

Allowable limit

2.0 mm (0.079 in)

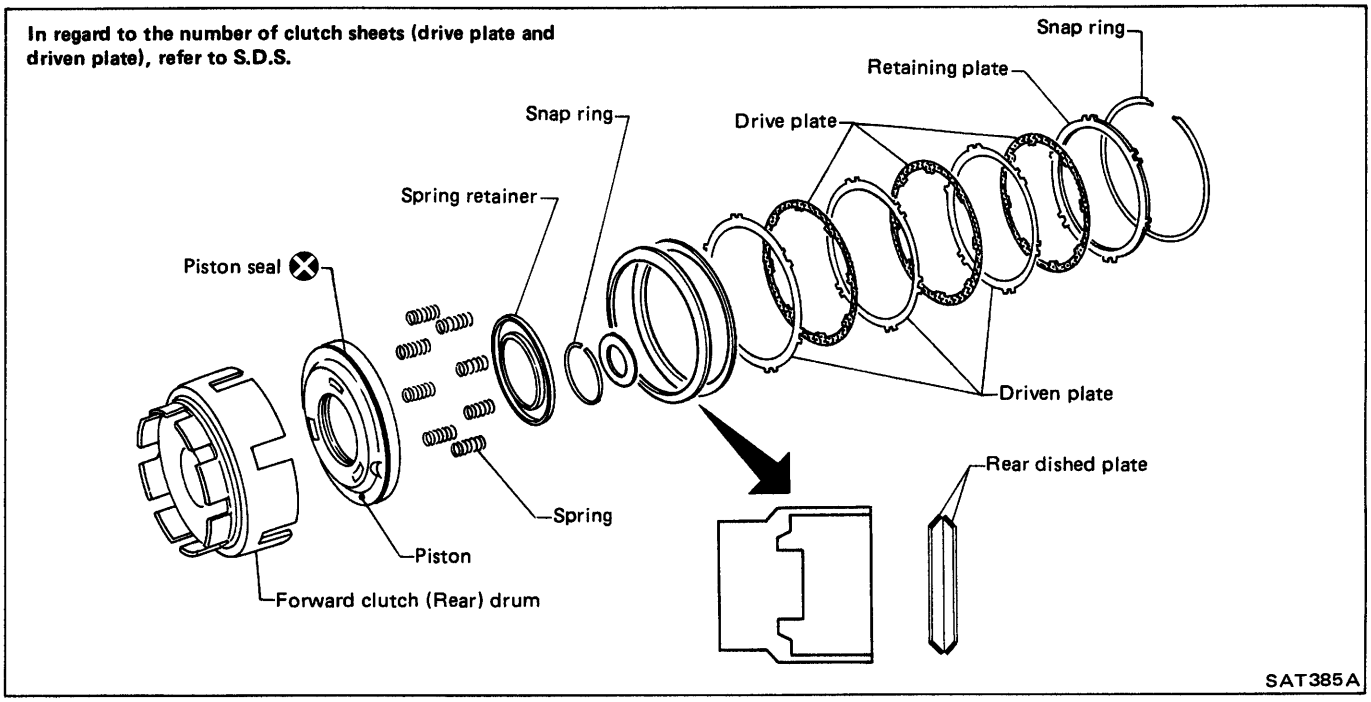
Available retaining plate

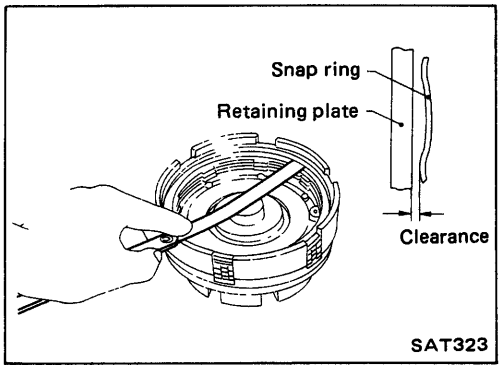
Thickness mm (in)	Part number
3.4 (0.134)	31537-01X05
3.6 (0.142)	31537-01X00
3.8 (0.150)	31537-01X01
4.0 (0.157)	31537-01X02
4.2 (0.165)	31537-01X03
4.4 (0.173)	31537-01X04



8. Testing high-reverse clutch (Front) using compressed air.

Forward Clutch (Rear)

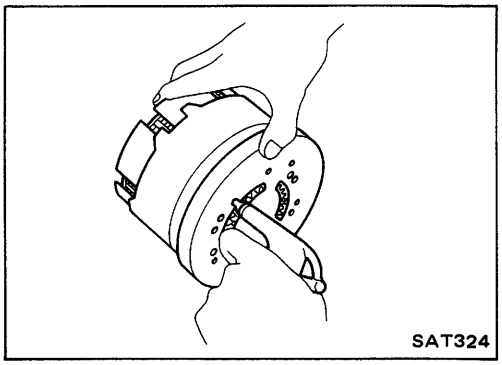




Service procedures for forward clutch (Rear) are essentially the same as those for high-reverse clutch (Front), with the following exception:

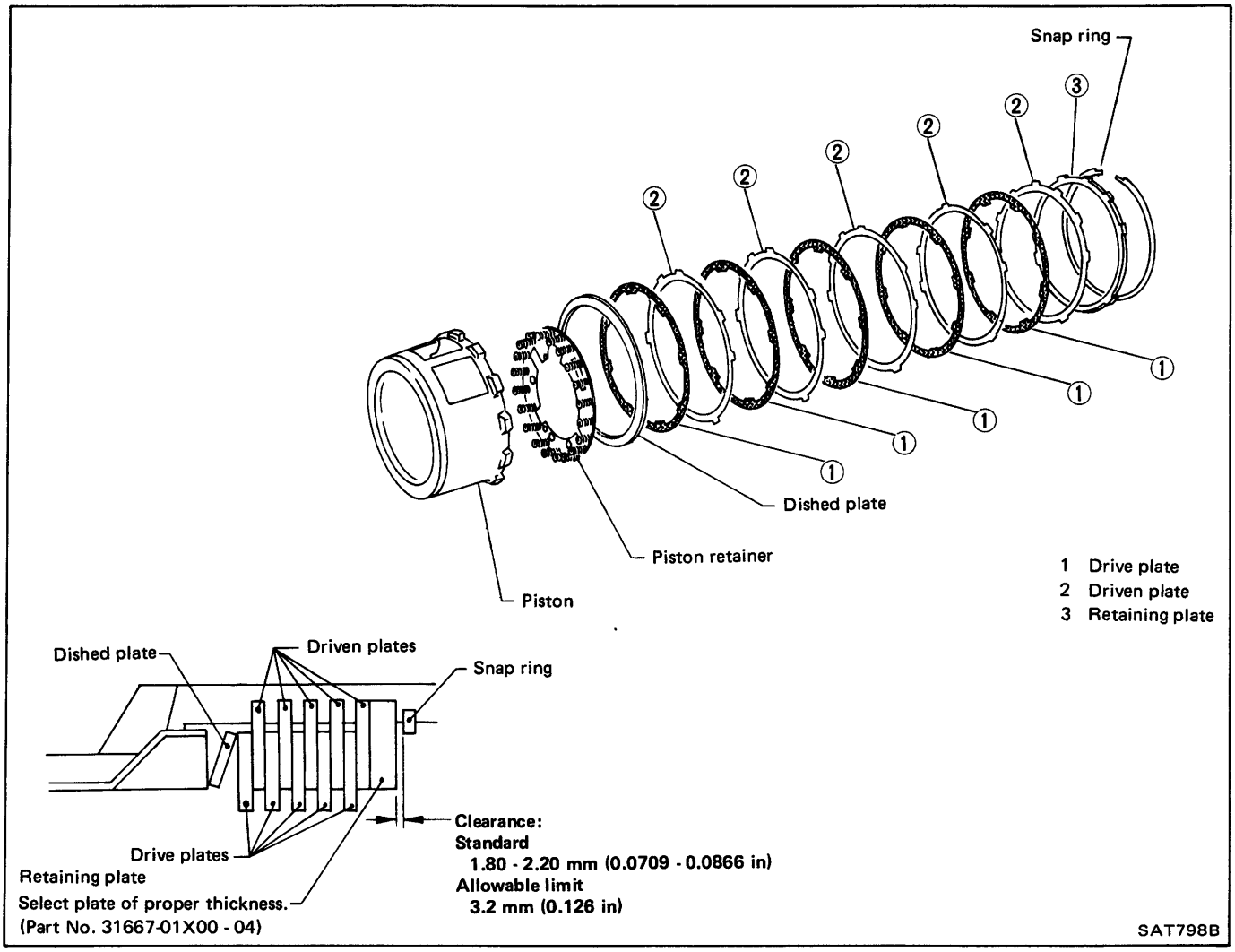
Drive plate thickness:
Standard
1.50 - 1.65 mm (0.0591 - 0.0650 in)
Allowable limit
1.4 mm (0.055 in)

Specified clearance between retaining plate and snap ring:
Standard
0.5 - 0.8 mm (0.020 - 0.031 in)
Allowable limit
1.55 mm (0.0610 in)



After assembly, check the operation of clutch.

Low & Reverse Brake



INSPECTION

- Examine low and reverse brake for damaged clutch drive plate facing and worn snap ring.
- Check drive plate facing for wear or damage; if necessary, replace.

Drive plate thickness:

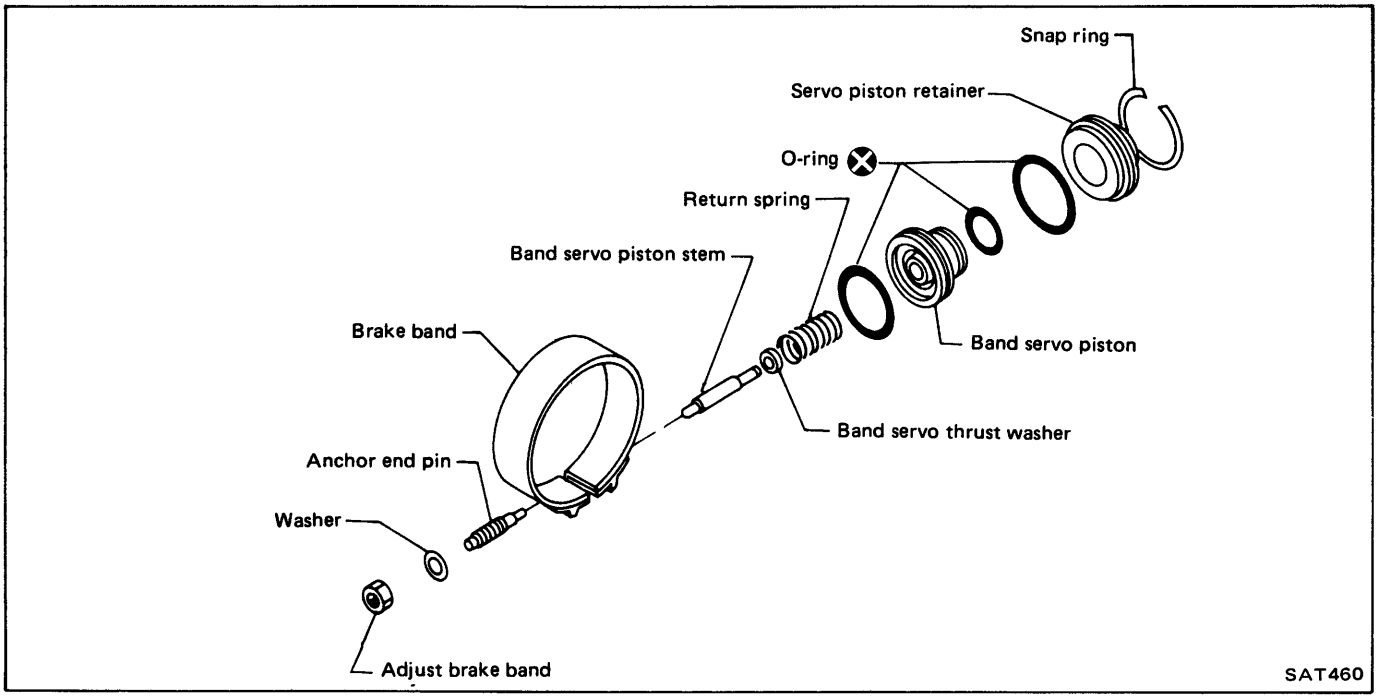
Standard

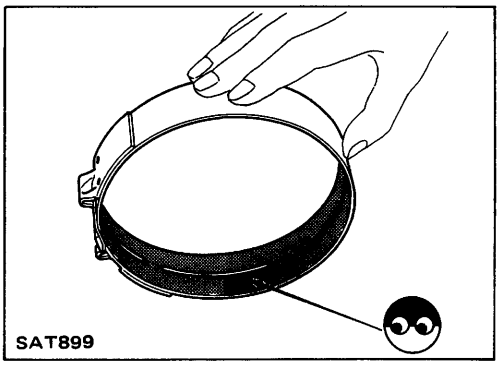
1.90 - 2.05 mm (0.0748 - 0.0807 in)

Allowable limit

1.8 mm (0.071 in)

Brake Band and Band Servo

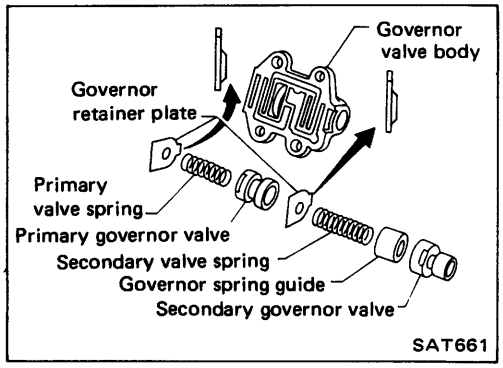




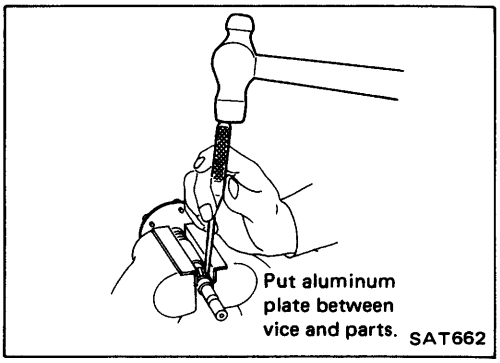
INSPECTION

- Inspect band friction material for wear. If cracked, chipped or burnt spots are apparent, replace the band.
- Check band servo components for wear and scoring.

Governor



- Remove governor worm.

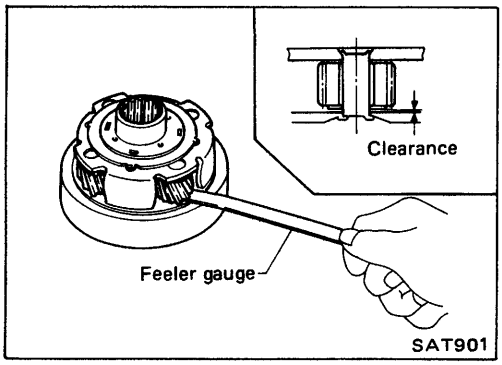


Governor (Cont'd)

- Disassemble governor and check governor valves and valve body for indication of burning or scratches.
- Check valve springs for damage.
  Measure free length of valve springs.

Valve spring	Free length mm (in)
Primary governor	31.7 (1.248)
Secondary governor	38.2 (1.504)

If any abnormalities are found, replace governor body, valves and springs as an assembly.



Planetary Carrier

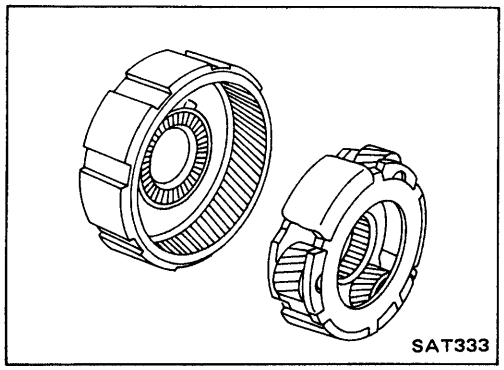
INSPECTION

- Check clearance between pinion washer and planetary carrier with a feeler gauge.

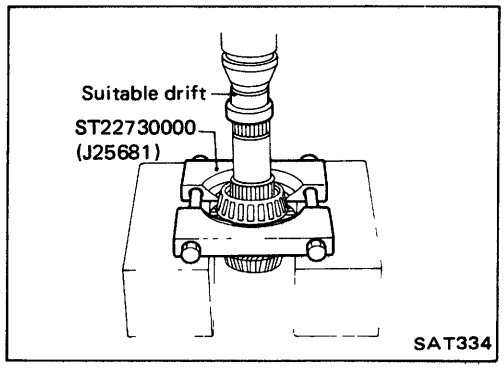
  Standard clearance:

  0.20 - 0.70 mm (0.0079 - 0.0276 in)

  Replace if the clearance exceeds 0.80 mm (0.0315 in).



- Check planetary gear sets and bearings for damaged or worn gears.

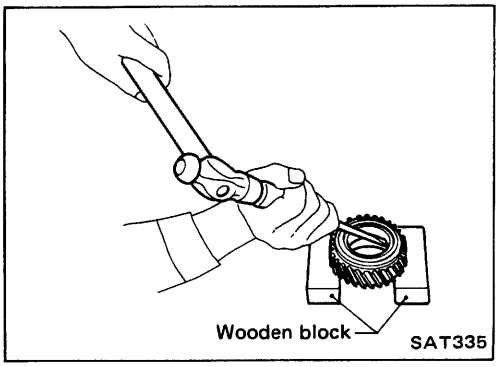


Output Shaft and Idler Shaft

DISASSEMBLY

1. Remove inner cones from output shaft.

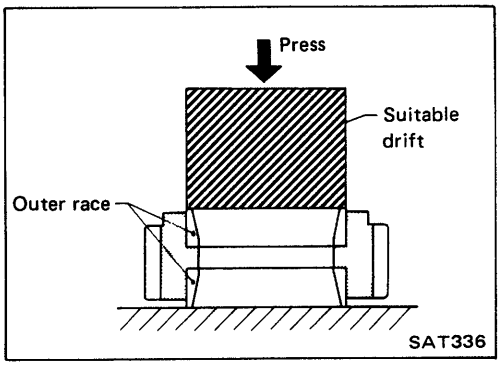
Output Shaft and Idler Shaft (Cont'd)



2. Remove outer races from idler gear.

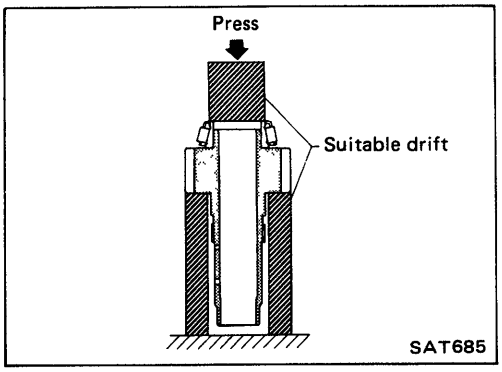
INSPECTION

- Check all gears for excessive wear, chips or cracks; replace as required.
- Check shaft for bending, crack, wear, and worn spline; if necessary, replace.
- Check bearing to see that it rolls freely and is free from noise, crack, pitting, or wear.

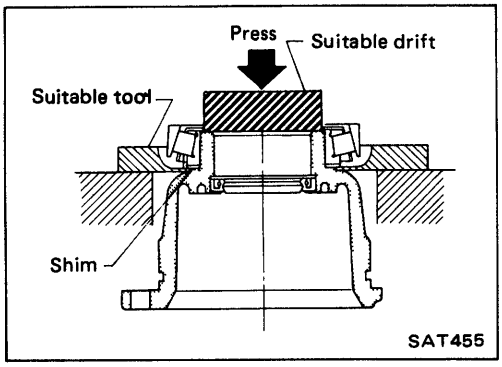


ASSEMBLY

1. Install outer races on idler gear.



2. Install inner cones on output shaft.

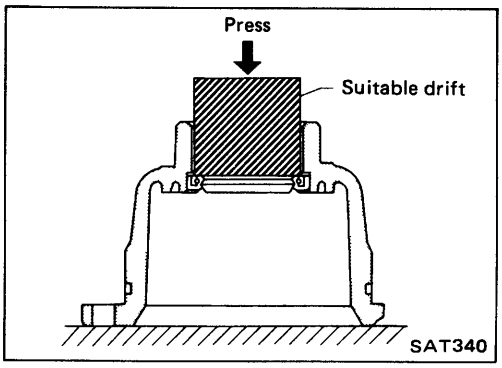


Bearing Retainer

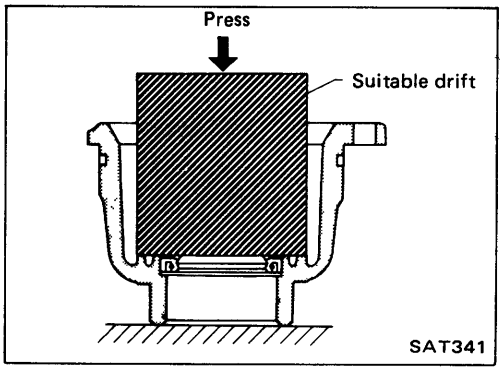
DISASSEMBLY

1. Remove bearing retainer from transmission case.
2. Remove inner cone.

Bearing Retainer (Cont'd)

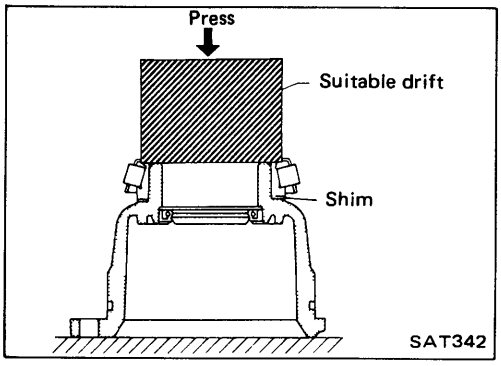


3. Remove oil seal and O-ring.



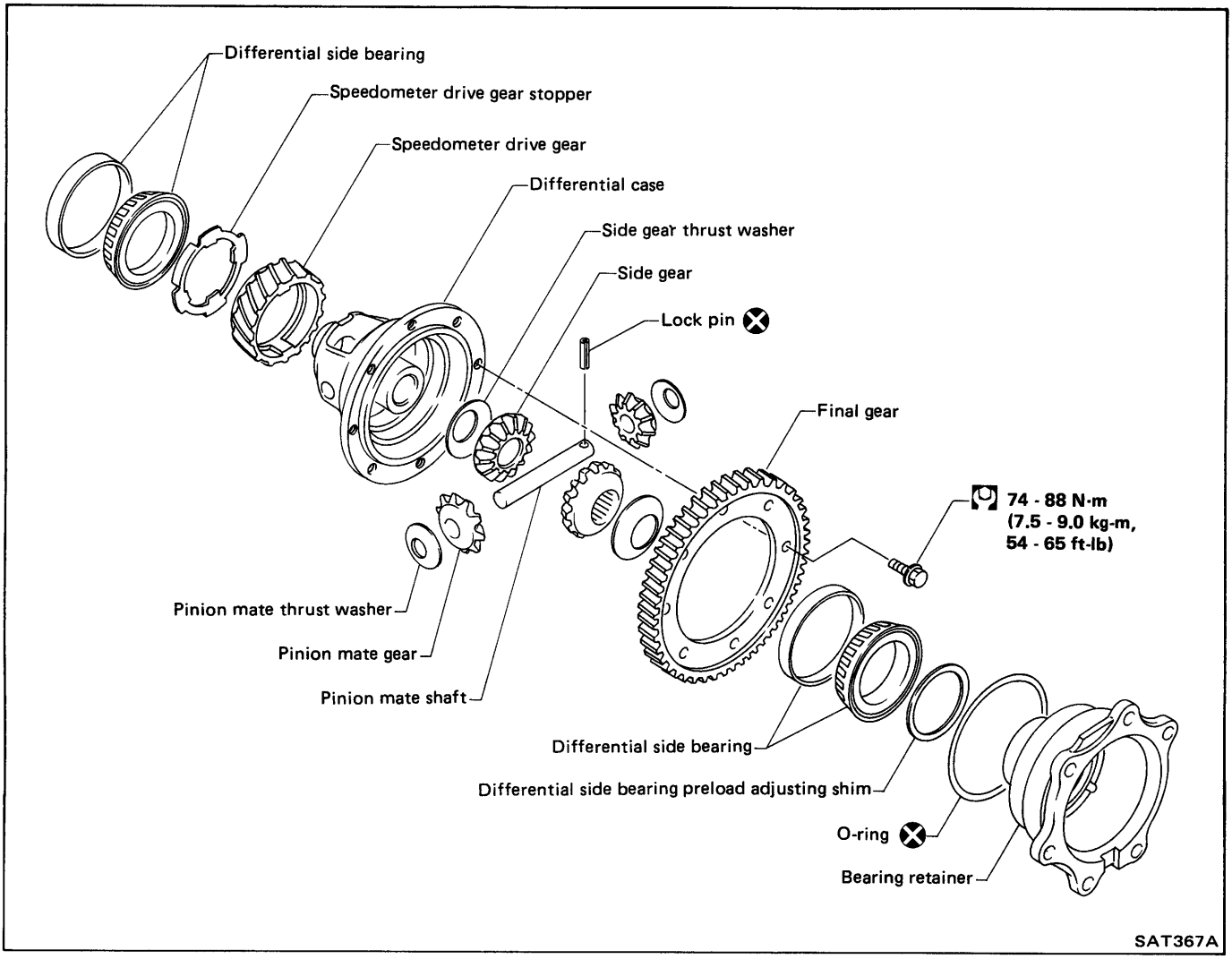
ASSEMBLY

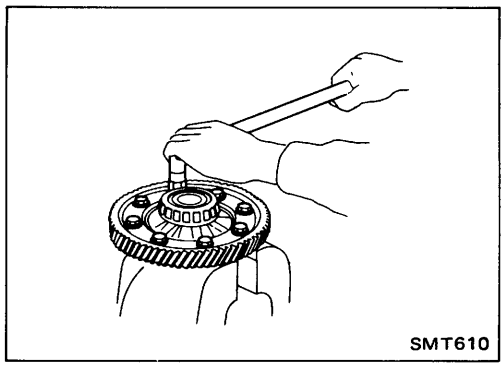
1. Apply A.T.F. to seal surface and O-ring, then drive new seal and O-ring into place.



2. Install inner cone with shim.

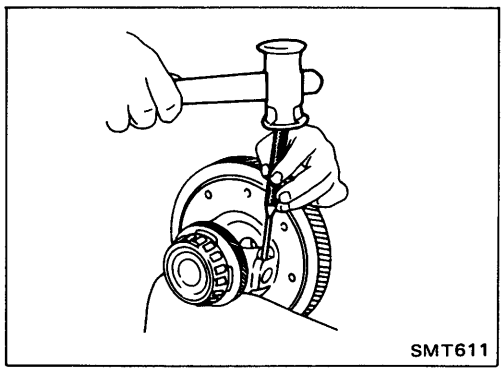
Final Drive




SMT610

DISASSEMBLY

1. Remove final gear.

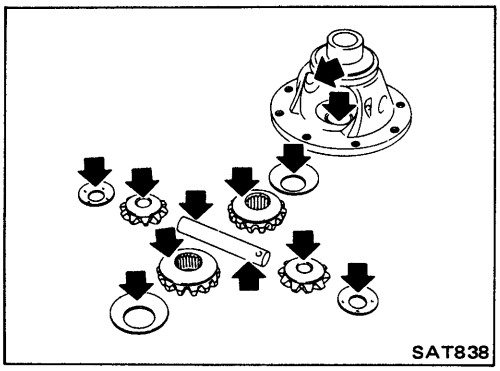

SMT611

2. Drive out pinion mate shaft lock pin and draw out pinion mate shaft.

Final Drive (Cont'd)

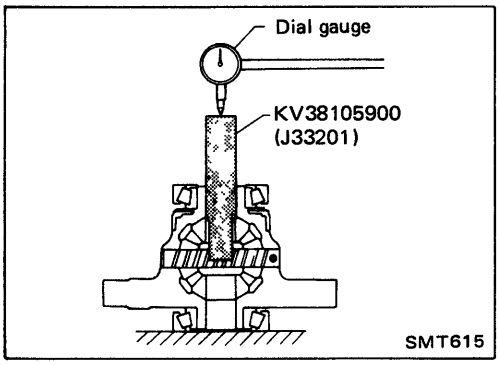
3. Drive out differential side bearing outer race and inner cone.

Be careful not to confuse the right- and left-hand bearings.


SAT838

INSPECTION

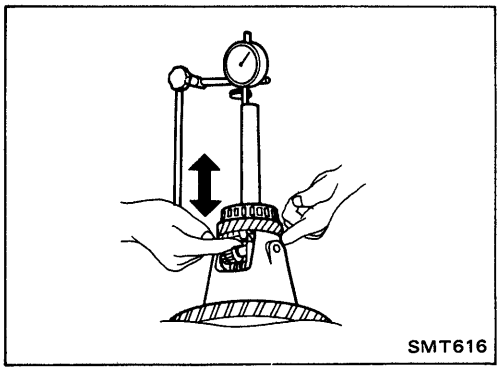
1. Check mating surfaces of differential case, side gears and pinion mate gears.
   Replace as required.



SMT615

2. Check clearance between side gear and differential case with washer following the procedure below.

a. Set Tool and dial gauge on side gear.


SMT616

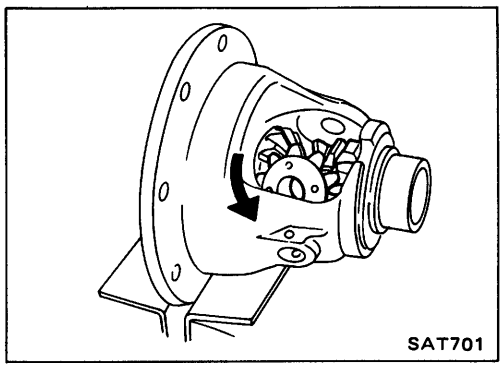
b. Move side gear up and down to measure dial gauge deflection. Always measure gauge deflection on both side gears.

Clearance between side gear and differential case with washer:

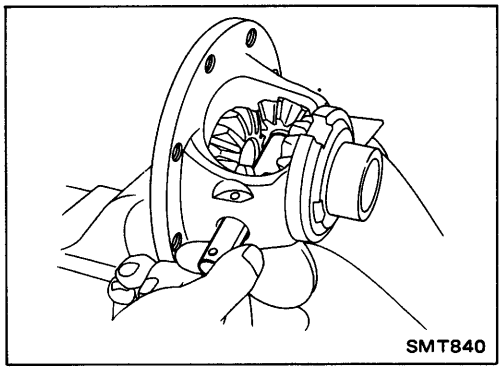
0.3 mm (0.012 in) or less

Final Drive (Cont'd)

ASSEMBLY


SAT701

1. Install the side gear and thrust washer in the differential case.
2. Install the pinion mate gear and thrust washer in the differential case while rotating them.

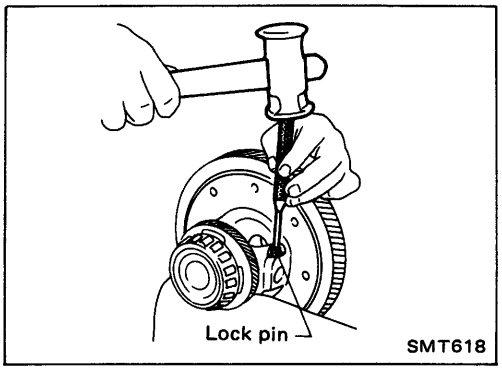

SMT840

3. Insert pinion mate shaft.

When inserting, be careful not to damage pinion mate washers.

4. Measure clearance between side gear and pinion mate gear, referring to "Inspection". If necessary, adjust.

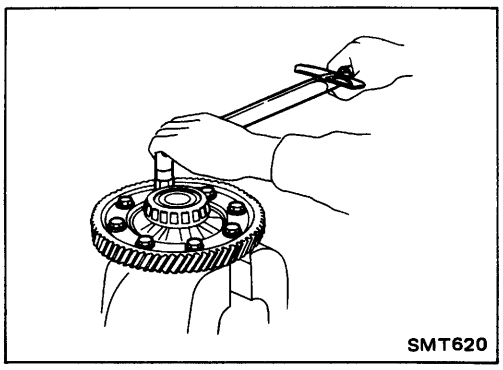
Side gear to pinion mate clearance:
0.3 mm (0.012 in) or less
Side gear thrust washer:
Refer to S.D.S.



SMT618

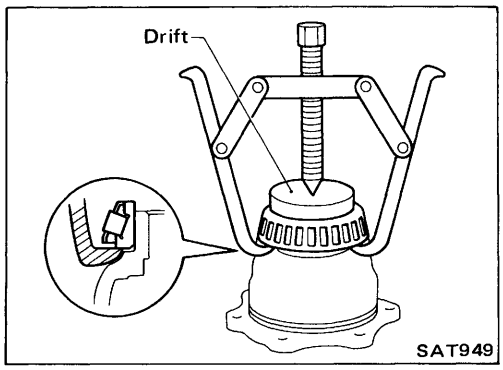
5. Install pinion mate shaft lock pin using a punch.

Make sure that lock pin is flush with case.

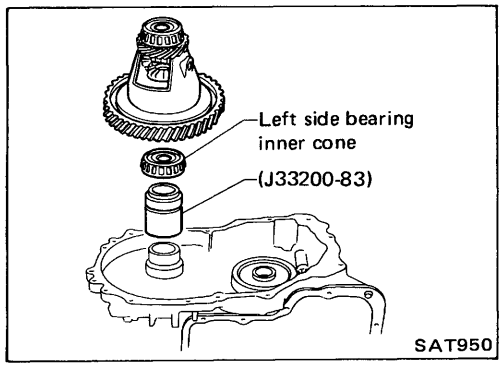

SMT620

6. Install speedometer worm and stopper.
7. Press on differential side bearing outer race and inner cone.
8. Apply locking sealant to final gear bolts, then install final gear.

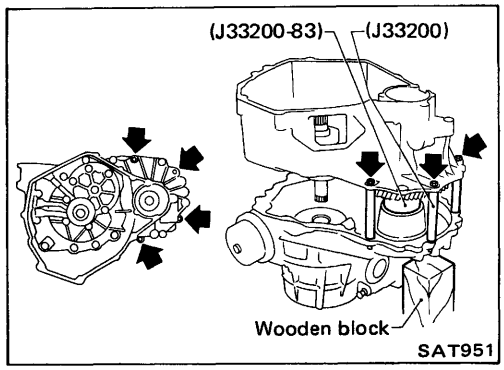
If transmission case, bearing retainer, side bearing, differential case or converter housing is replaced, final drive should be adjusted. Preload is adjusted by selecting shims of appropriate thickness.



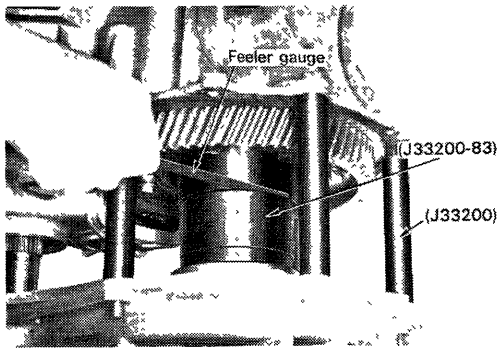
1. Remove left side bearing inner cone and shim(s) from bearing retainer.



2. Place Tool and the following parts in transmission case.
Gasket must be installed on transmission case.

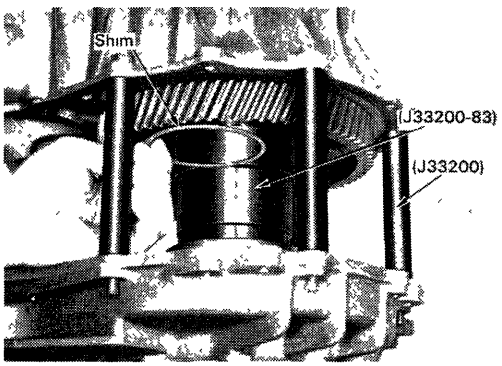


3. Position four spacers so they are evenly spaced around transmission case and install converter housing. Then tighten bolts alternately to the specified torque.
[O] : 14 N·m (1.4 kg-m, 10 ft-lb)



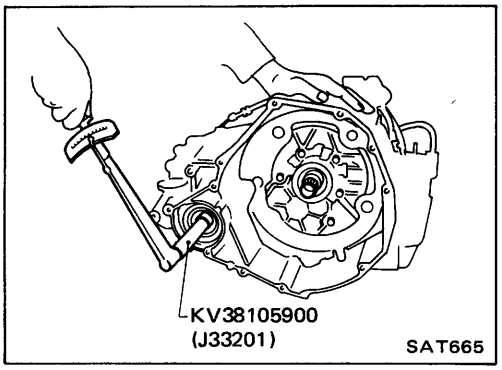
4. Rotate final drive assembly a few times to ensure proper seating.
5. To find the correct shim size, use method (1) or (2) described below.

a. Using a feeler gauge, measure the widest gap around Tool for the proper shim size to be installed.



b. If shims are available, find the largest shim that can be placed into the gap at any point around Tool.
This will be the correct shim size to use.

6. When the proper size shim(s) has been determined, remove converter housing, final drive assembly, side bearing inner cone and Tools (J33200).
7. Install the proper size shim(s) and left side bearing inner cone into bearing retainer.
8. Proceed with final assembly.



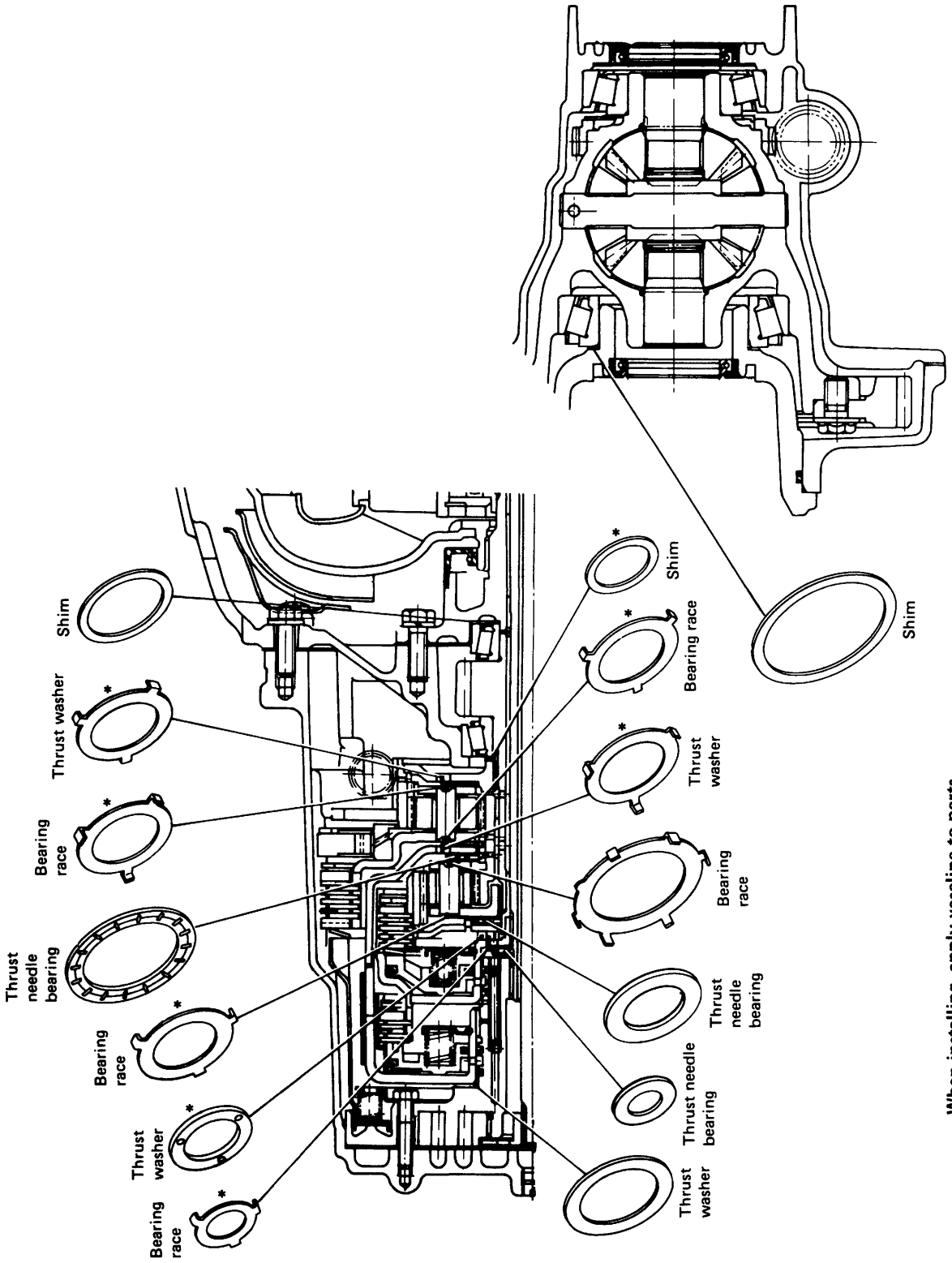
9. Measure differential side bearing preload with KV38105900.

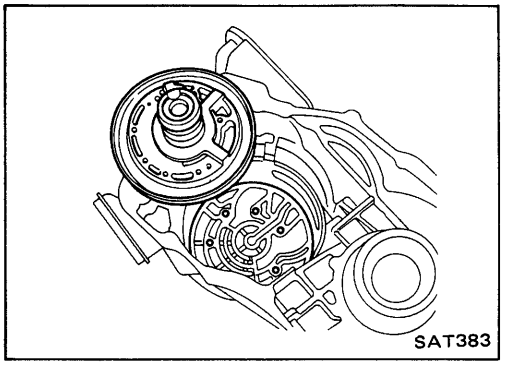
Specified differential side bearing preload:
5.9 - 7.4 N·m
(60 - 75 kg-cm, 52 - 65 in-lb)

- **Turn final drive assembly at least 10 times before measuring differential side bearing preload.**
- **Changes in differential side bearing preload per revolution should be within 1.0 N·m (10 kg-cm, 8.7 in-lb) without binding.**
- **If any abnormalities are noted above, or differential side bearing preload is outside specified range, disassemble and reassemble again.**

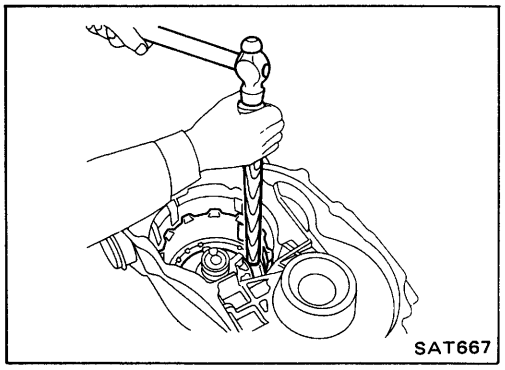
10. Disassemble transmission case and remove final drive assembly.

When installing/assembling needle bearing and bearing race, use the following illustration as a guide to installation procedures and locations.

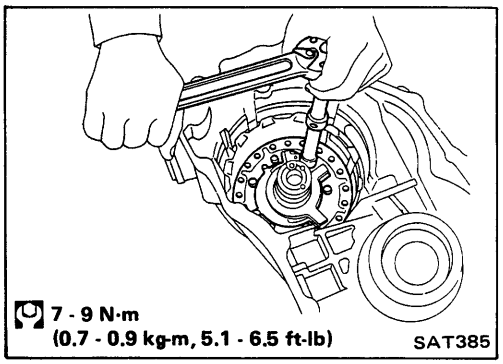



SAT383

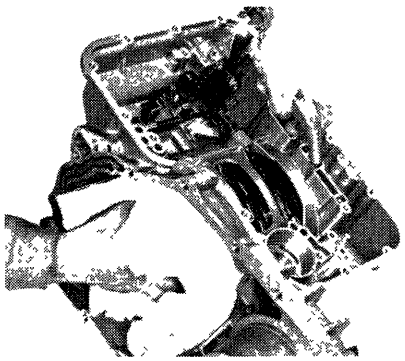
1. Lubricate outer diameter part of oil pump assembly. Install oil pump assembly and thrust bearing.


SAT667

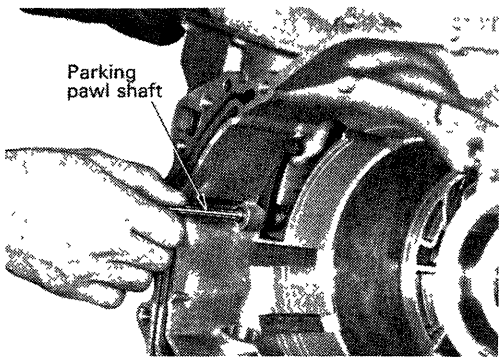
2. Lubricate low and reverse brake piston seal then install piston by tapping it evenly using a wooden block.



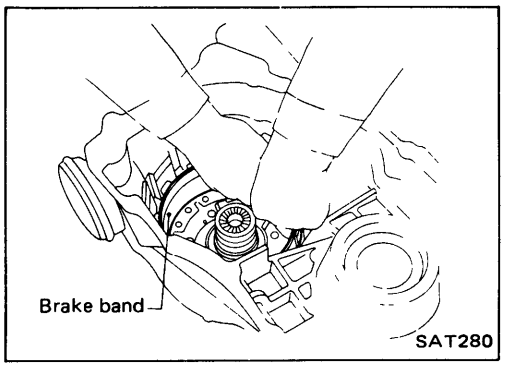
3. Install low and reverse brake piston retainer.



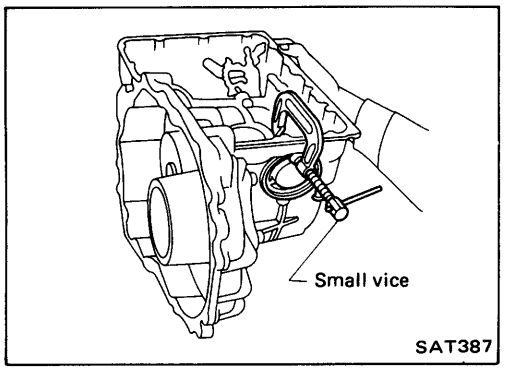
After installing piston retainer, make sure that its piston seal is not turned over by the application of air pressure to low and reverse brake circuit.



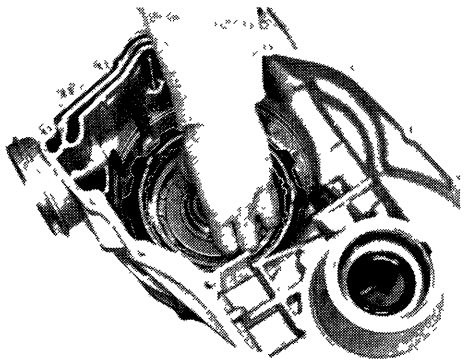
4. Install parking pawl, return spring and parking pawl shaft.



5. Install brake band.

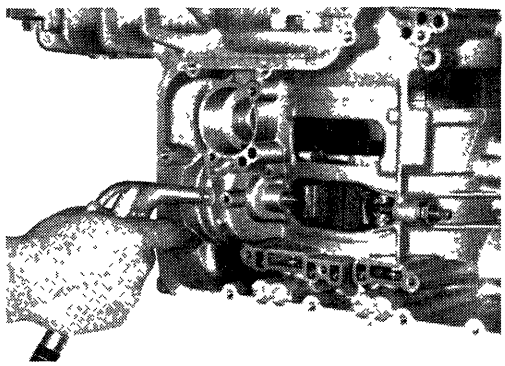


6. Lubricate band servo piston O-ring and install band servo piston O-ring, return spring and snap ring holding piston with a small vice.

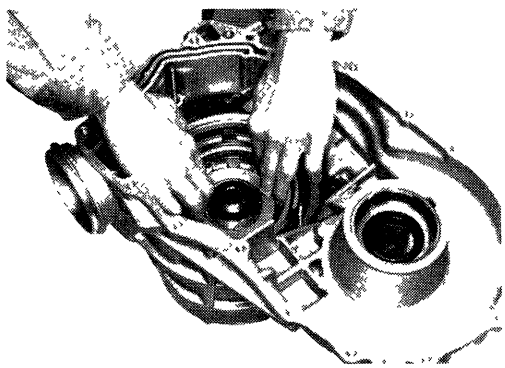


7. Lubricate seals in oil pump housing, then install plastic thrust washer and high-reverse clutch (Front) assembly.

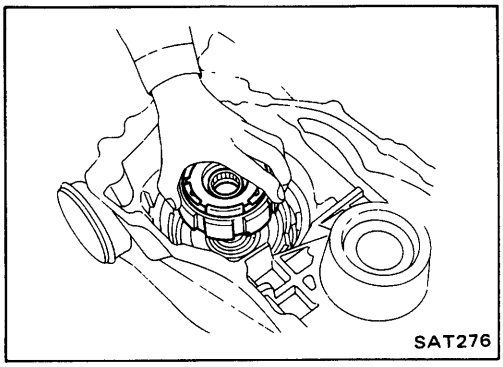
Check seal rings to ensure that they have not expanded. If they have, high-reverse clutch (Front) assembly will be hard to install.



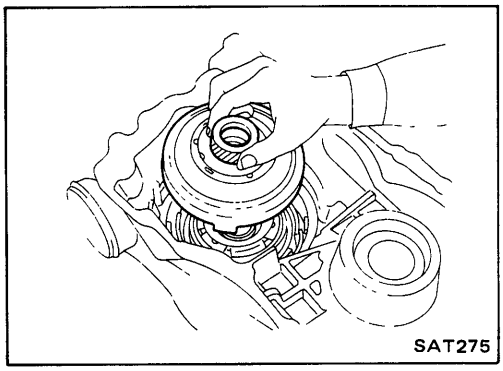
Check band servo operation using air.



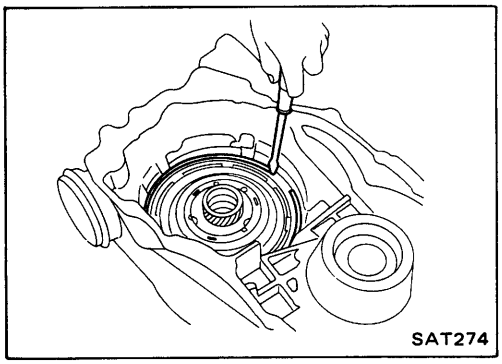
8. Install thrust needle bearing & race and forward clutch (Rear) assembly.


SAT276

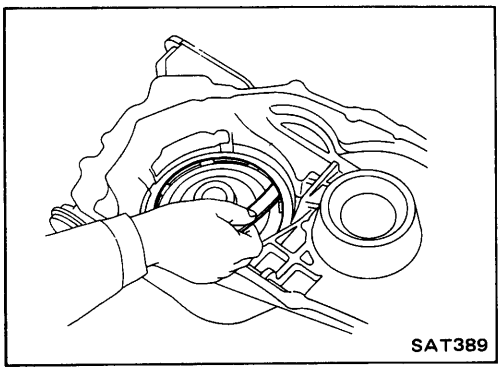
9. Install thrust washer and front carrier assembly together with front internal gear.


SAT275

10. Install shell & sun gear assembly, thrust needle bearing and bearing race.


SAT274

11. Install low and reverse brake driven & drive plates and retaining plate, then secure with snap ring.


SAT389

12. After low and reverse brake has been completely assembled, measure clearance between snap ring and retaining plate. If measurement exceeds specifications, it can be adjusted by replacing retaining plate with one of a different thickness.

Low and reverse brake clearance:

Standard

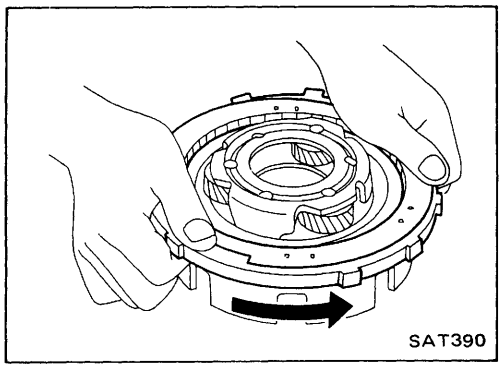
1.80 - 2.20 mm (0.0709 - 0.0866 in)

Allowable limit

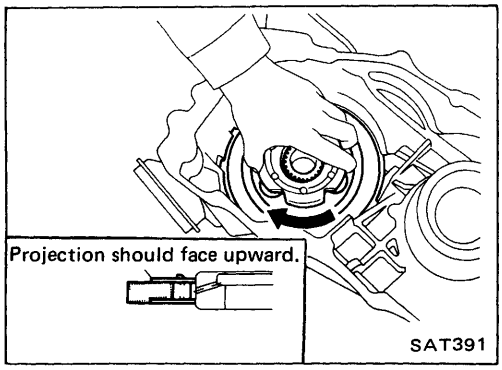
3.2 mm (0.126 in)

Available retaining plate

Thickness mm (in)	Part number
3.6 (0.142)	31667-01X00
3.8 (0.150)	31667-01X01
4.0 (0.157)	31667-01X02
4.2 (0.165)	31667-01X03
4.4 (0.173)	31667-01X04

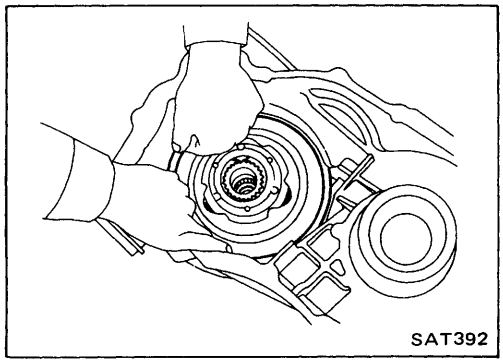

SAT390

13. Install bearing race on connecting shell.
14. Install one-way clutch assembly to rear carrier.
15. Install thrust washer on rear carrier.

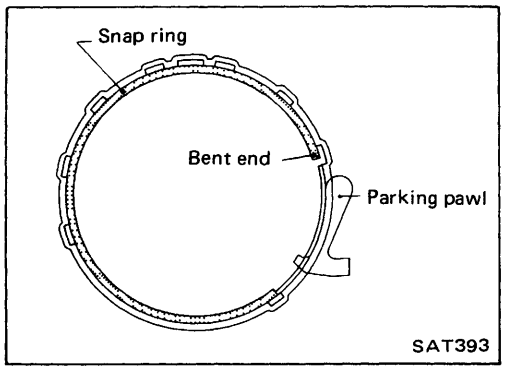


SAT391

16. Install one-way clutch together with rear carrier by turning rear carrier clockwise.

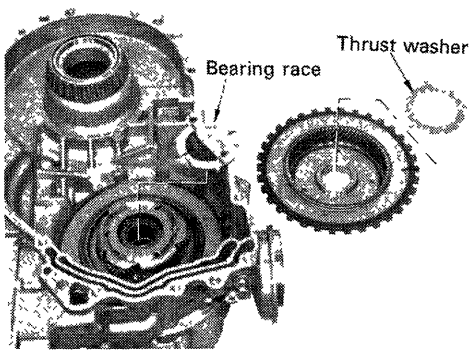

SAT392

17. Install snap ring.

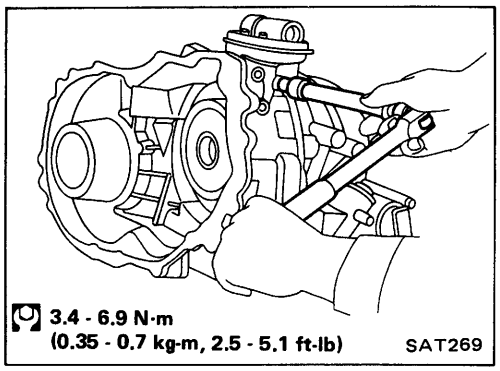


SAT393

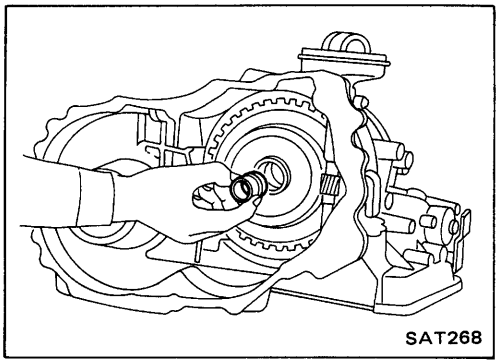
Ensure that its bent end is positioned so that it does not interfere with parking pawl.



18. Apply vaseline to bearing race, then attach it to rear internal gear.

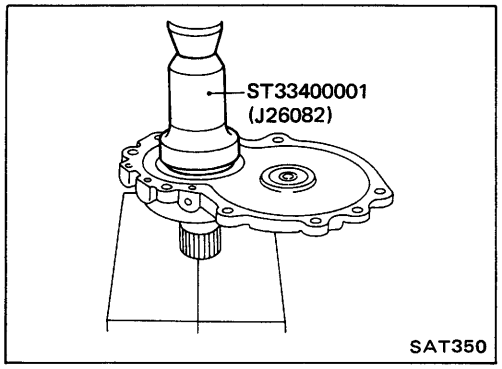


19. Install rear internal gear, then assemble governor shaft assembly.
20. Install governor shaft retaining bolt.



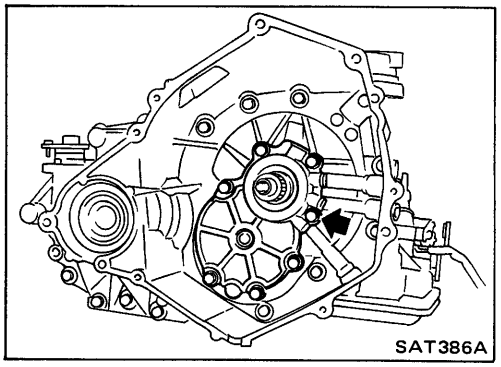
21. Install seal bushing.

Never forget to install seal bushing to prevent sun gear and output shaft from becoming jammed.



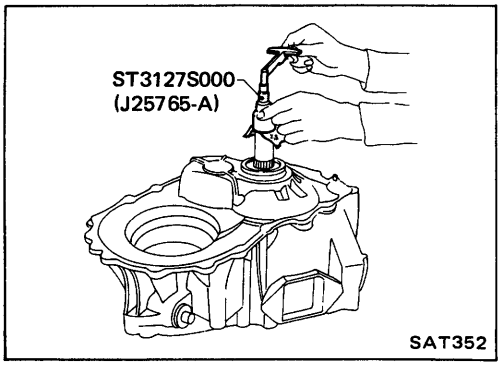
22. If transmission case, output shaft, tapered roller bearing or front cover is replaced, output shaft should be adjusted by means of shims.

a. Lubricate bearing outer race.
b. Press bearing outer race into converter housing.
c. Install two or three shims on front cover, and press bearing outer race into front cover.



d. Install gasket and front cover on converter housing.

Clean all front cover securing bolts and apply locking sealant to threads of bolts except for one indicated by arrow.



e. Measure output shaft preload.

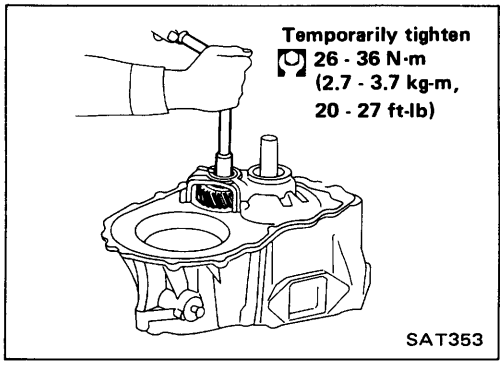
Specified output shaft bearing preload:
0.35 - 0.47 N·m
(3.6 - 4.8 kg-cm, 3.1 - 4.2 in-lb)

- **Turn output shaft at least 10 times before measuring output shaft bearing preload.**
- **Ensure that output shaft turns smoothly without binding.**

- **If any abnormalities are noted above, or output shaft bearing preload is outside specified range, disassemble and reassemble again.**

Available shims: Refer to S.D.S.

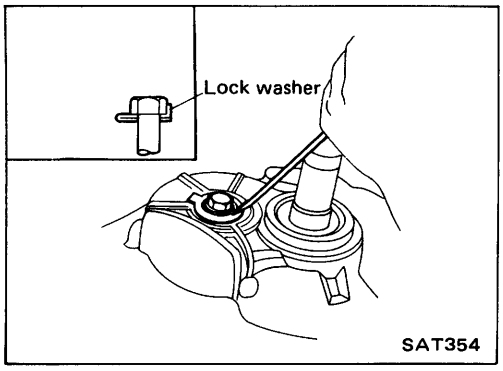
23. Adjust idler bearing preload as follows:
a. Clean threads of bolts and converter housing with solvent.
b. Apply locking sealant to threads of bolts and install them into place.



c. Install lock washer and idler gear bolt, and tighten bolt temporarily.

Temporary torque:
26 - 36 N·m
(2.7 - 3.7 kg-m, 20 - 27 ft-lb)

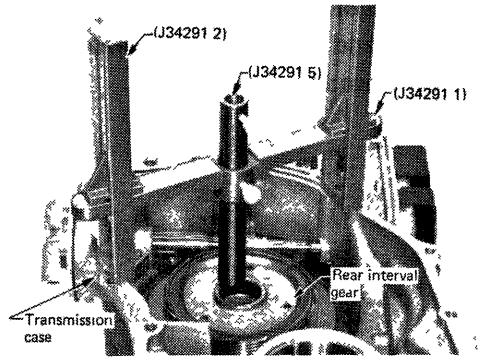
Be sure to align lock washer with groove on converter housing.



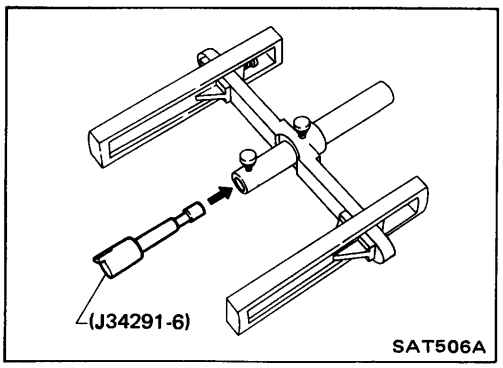
d. After tightening bolt, turn output shaft five complete rotations. Loosen idler gear bolt, then tighten it to specified torque.

Specified torque:
3.0 - 4.0 N·m
(0.31 - 0.41 kg-m, 2.2 - 3.0 ft-lb)

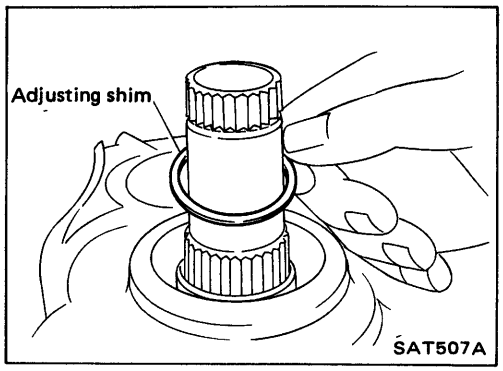
e. Bend lock washer.
f. Turn output shaft to make sure it operates smoothly.



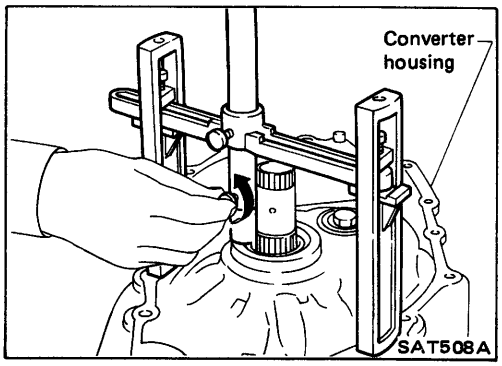
24. After adjusting output shaft bearing preload, adjust output shaft end play as follows:
a. Place J 34291-1 (bridge), J 34291-2 (legs) and J 34291-5 (gauging cylinder) on machined surface of transmission case (no gasket). Position bridge legs so the short ends of the legs are down, and adjust legs to fit onto housing properly. Allow gauging cylinder to rest on center machined surface of rear internal gear and lock it in place with thumbscrew.



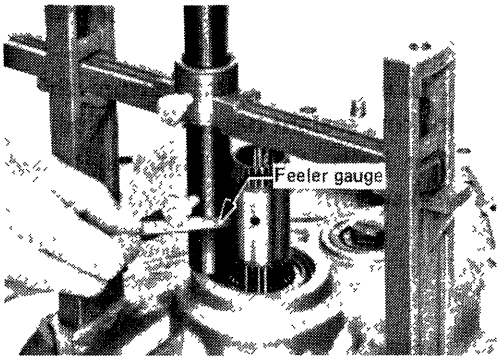
b. Insert J 34291-6 (output shaft end-play gauging plunger) into gauging cylinder. Lock gauging plunger by tightening thumbscrew.



c. Remove output shaft end play adjusting shim at end of output shaft.



d. Place bridge, gauging cylinder, and gauging plunger onto machined surface of converter housing. Loosen plunger set screw and allow plunger to rest on inner bearing race of output shaft. Now lock plunger setscrew.



e. Use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.

f. Use your feeler gauge measurement and following adjusting shim chart to select correct shim thickness to give you proper output shaft endplay.

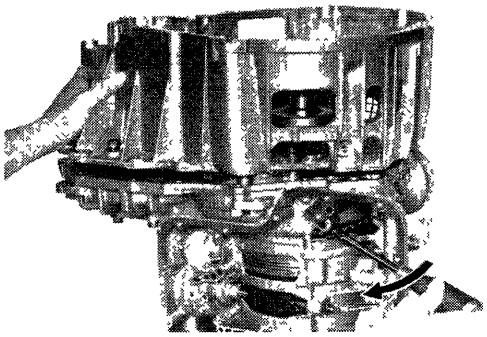
End play:

0.25 - 0.55 mm (0.0098 - 0.0217 in)

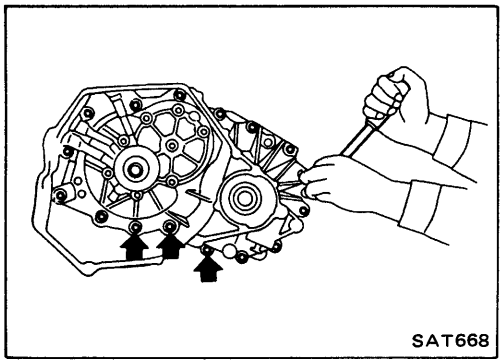
Output shaft end play adjusting shim

Thickness mm (in)	Part Number
0.3 (0.012)	31484-01X00
0.5 (0.020)	31484-01X01
0.7 (0.028)	31484-01X02
0.9 (0.035)	31484-01X03
1.1 (0.043)	31484-01X04
1.3 (0.051)	31484-01X05
1.5 (0.059)	31484-01X06
1.7 (0.067)	31484-01X07

25. Attach output shaft shim to output shaft.
26. Put gasket on transmission case.
27. Install converter housing assembly on transmission case.

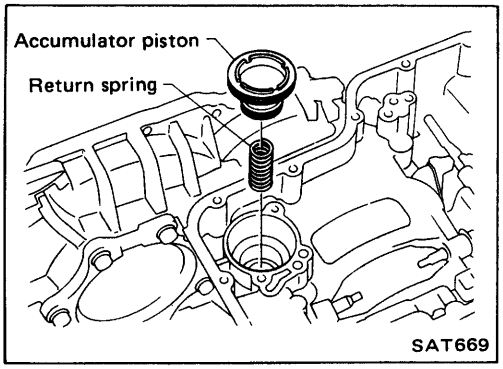


28. Turn parking gear (rear internal gear) clockwise with screwdriver while supporting converter housing assembly by hand, until output shaft splines, front carrier, and rear internal gear are engaged properly.


SAT668

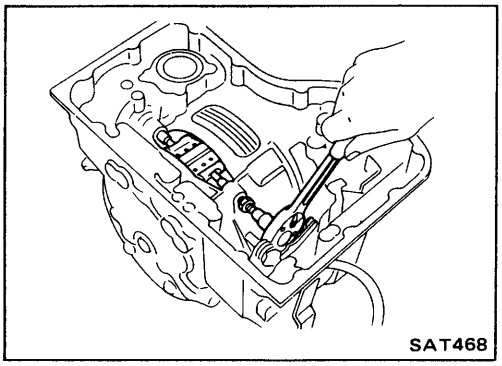
29. Tighten converter housing securing bolts to the specified torque.

Before installing bolts marked ◀ in figure at left, ensure that bolt threads are clean and that locking sealant has been applied. Apply A.T.F. to threads of other bolts. Ensure that the transmission case has been cleaned with solvent.



SAT669

30. Apply vaseline to lathe cut ring, then install return spring and accumulator piston on transmission case.


SAT468

31. Adjust brake band as follows:
a. First torque anchor end pin.

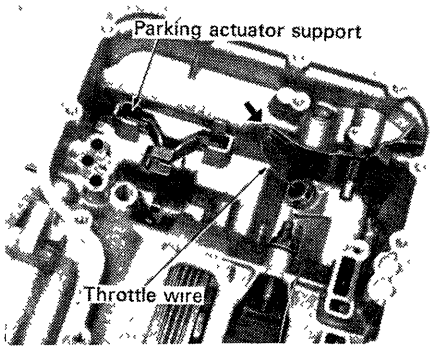
Anchor end pin:

◯ : 4 - 6 N·m

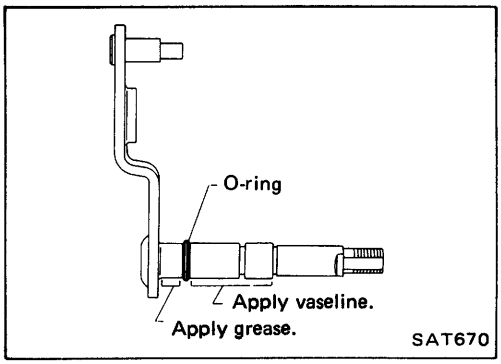
(0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)

b. Back off anchor end pin 2.5 turns.
c. Tighten lock nut while holding anchor end pin lock nut stationary.

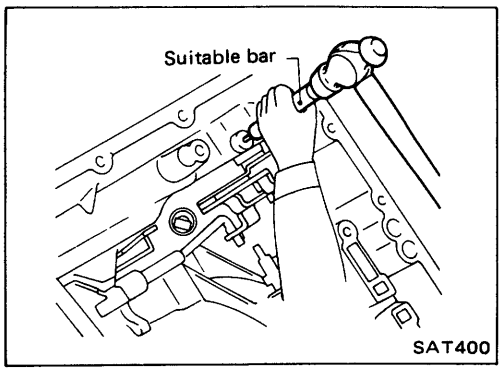
Lock nut:
: 16 - 22 N·m
(1.6 - 2.2 kg-m, 12 - 16 ft-lb)



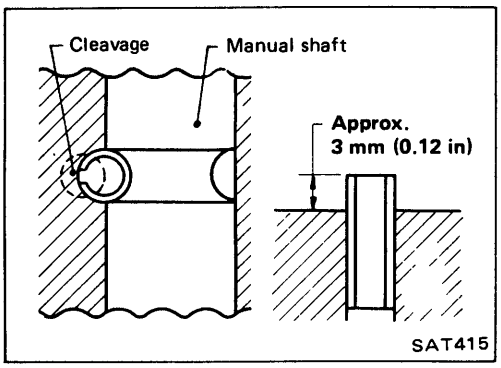
32. Assemble parking actuator support and throttle wire to transmission case.



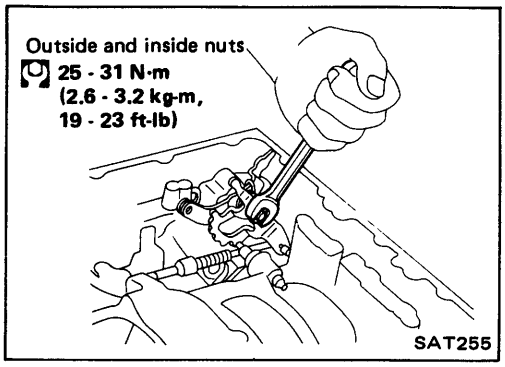
33. Apply grease and vaseline to manual shaft.



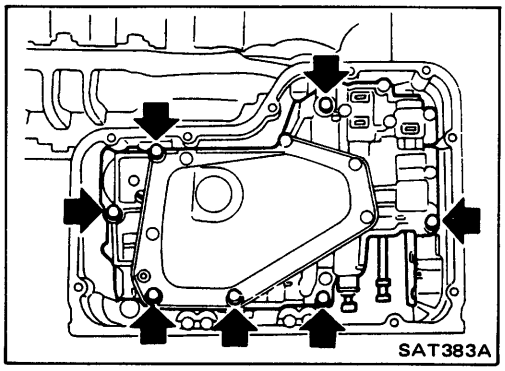
34. Secure manual shaft with retaining pin.



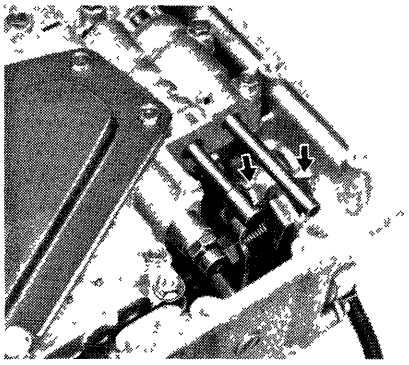
Always install retaining pin with cleavage facing transmission case.



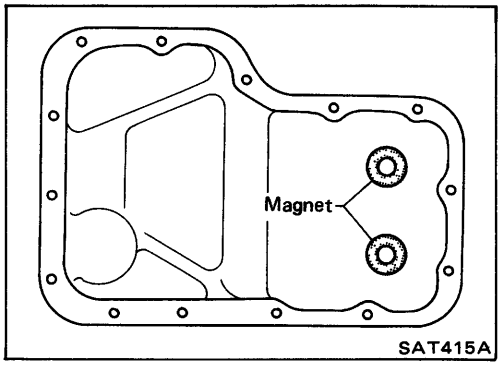
35. Install throttle lever, manual plate, selector range lever and parking rod assembly, then tighten manual shaft securing nuts.



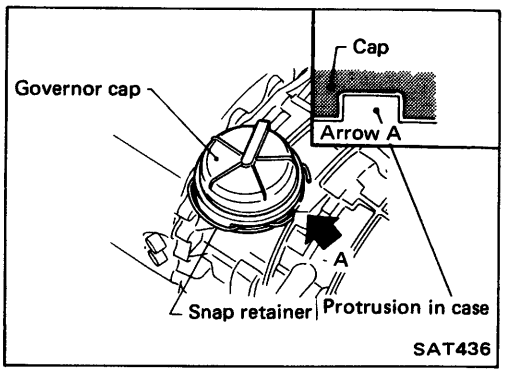
36. Insert manual valve to control valve body, then assemble them to transmission case.



Pay attention to the direction of manual and detent valves' grooves.

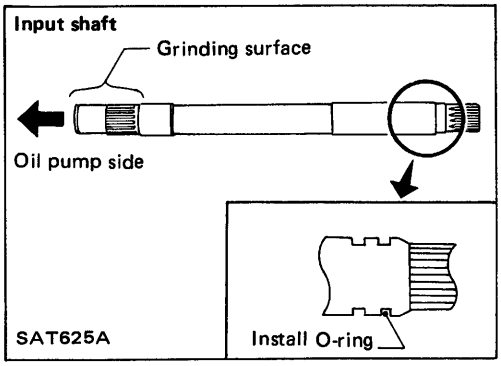


37. Before installing oil pan, check alignment and operation of manual lever and parking pawl engagement. Blow mechanism with air to clean.
38. Install two magnets into oil pan. Install oil pan with new gasket and oil pan guard.

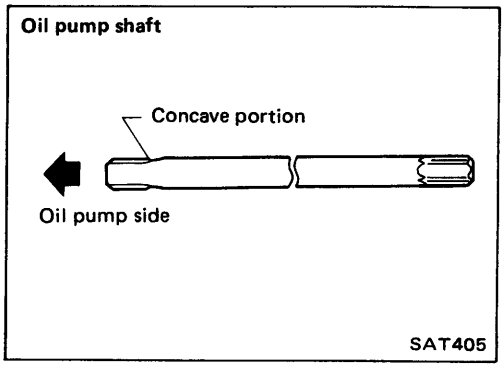


39. Install seal ring and governor cap, then secure it with snap retainer.

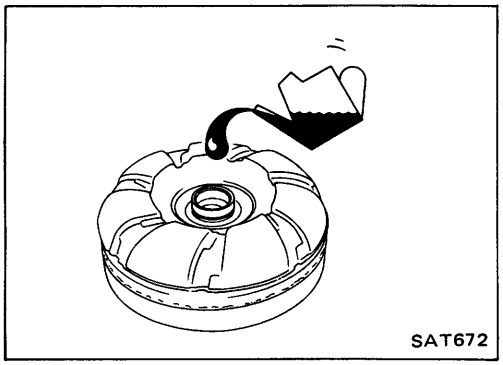
When installing snap retainer, pay attention to its direction.



40. Install O-ring on input shaft.
    Then install input shaft.



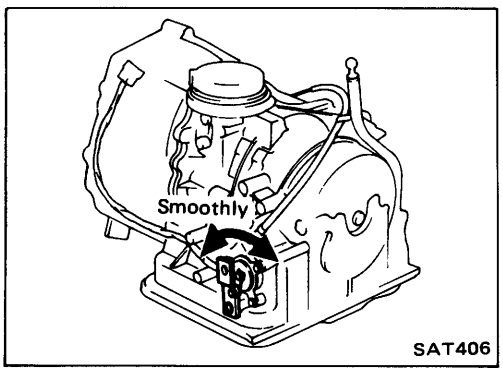
41. Install oil pump shaft.



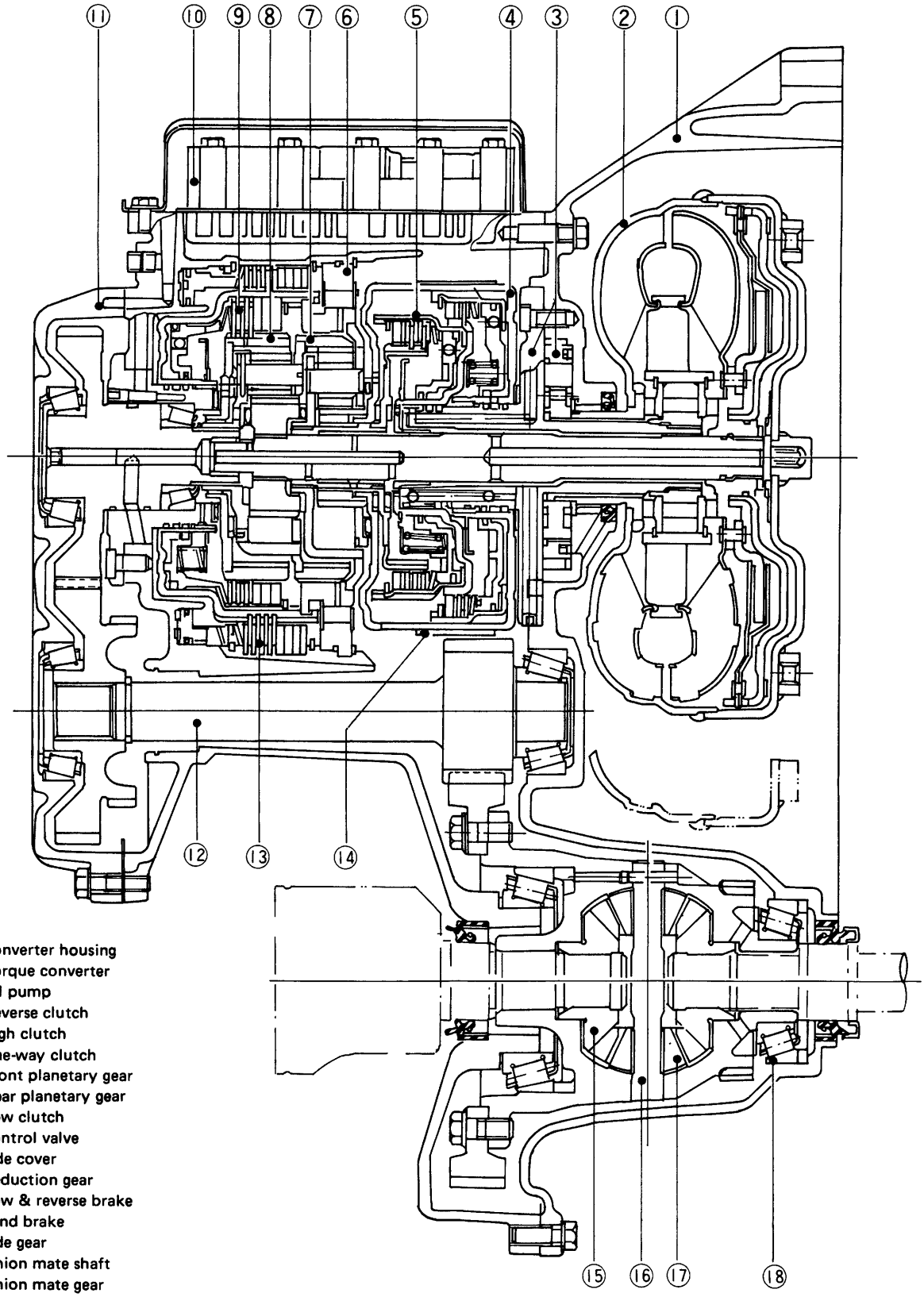
42. Carefully inspect torque converter for damage. Check converter hub for grooves caused by hardened seals. Also check bushing contact area.
43. Lubricate oil pump lip seal and converter neck before installing converter.
44. Pour approx. 2-liters (2-1/8 US qt, 1-3/4 Imp qt) of automatic transmission fluid into torque converter.
45. Install torque converter to converter housing.

Be careful not to scratch front cover oil seal.

46. Apply sealant to threads of drain plug and install it in place.
47. Install inhibitor switch to transmission case.
48. Adjust inhibitor switch. Refer to On-vehicle Service.



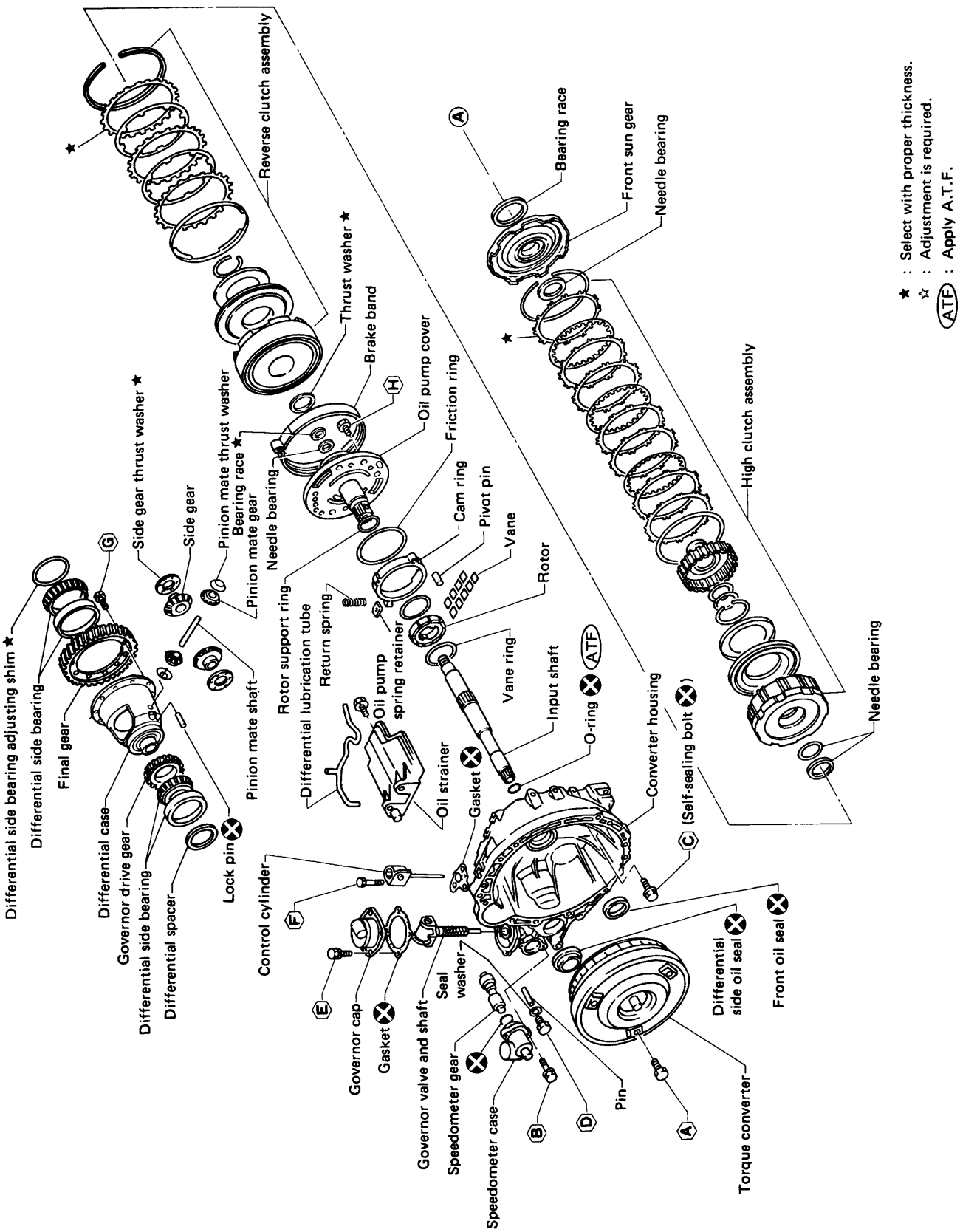
49. Make sure that manual lever operates smoothly.

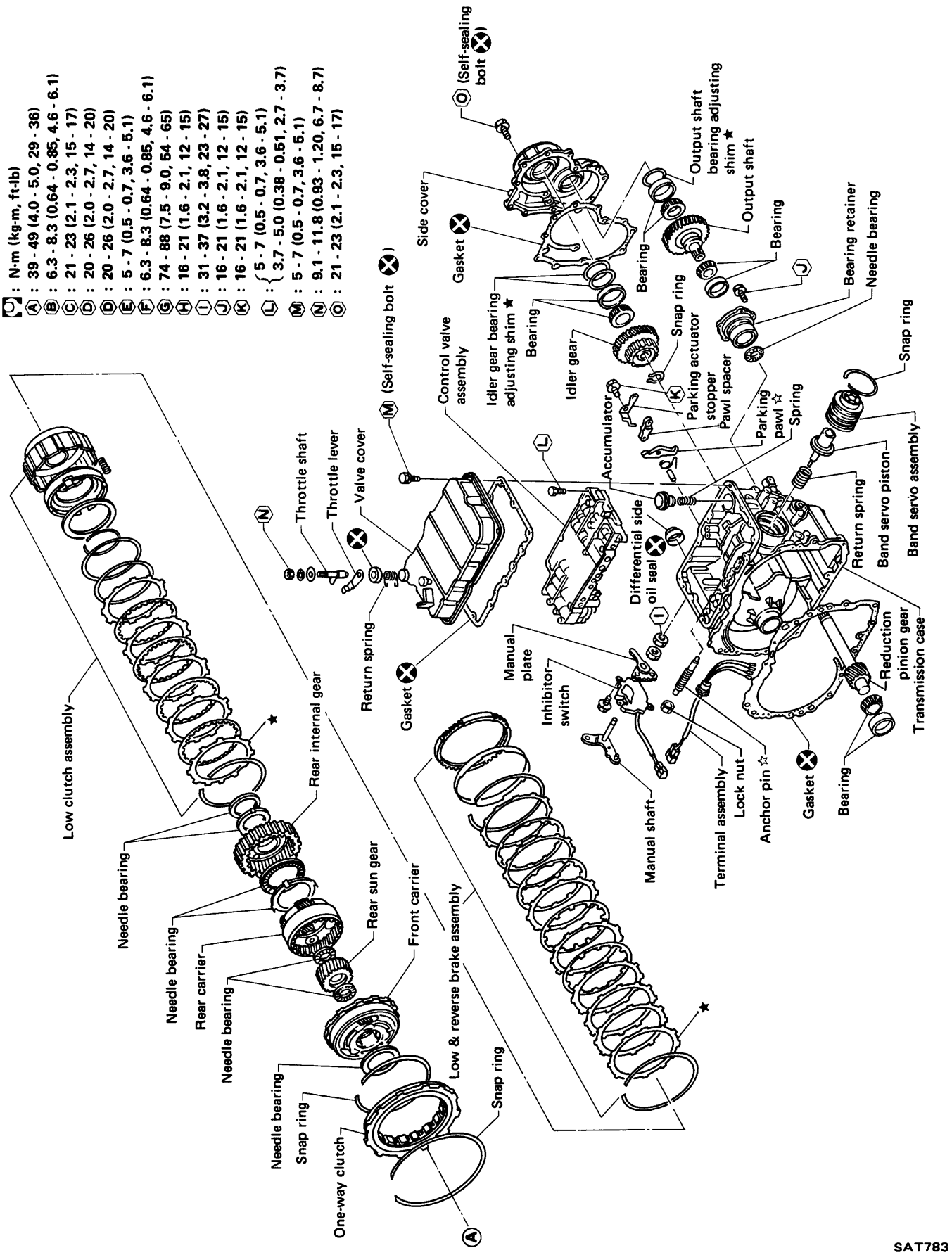


1 Converter housing
2 Torque converter
3 Oil pump
4 Reverse clutch
5 High clutch
6 One-way clutch
7 Front planetary gear
8 Rear planetary gear
9 Low clutch
10 Control valve
11 Side cover
12 Reduction gear
13 Low & reverse brake
14 Band brake
15 Side gear
16 Pinion mate shaft
17 Pinion mate gear
18 Differential side bearing

SAT768

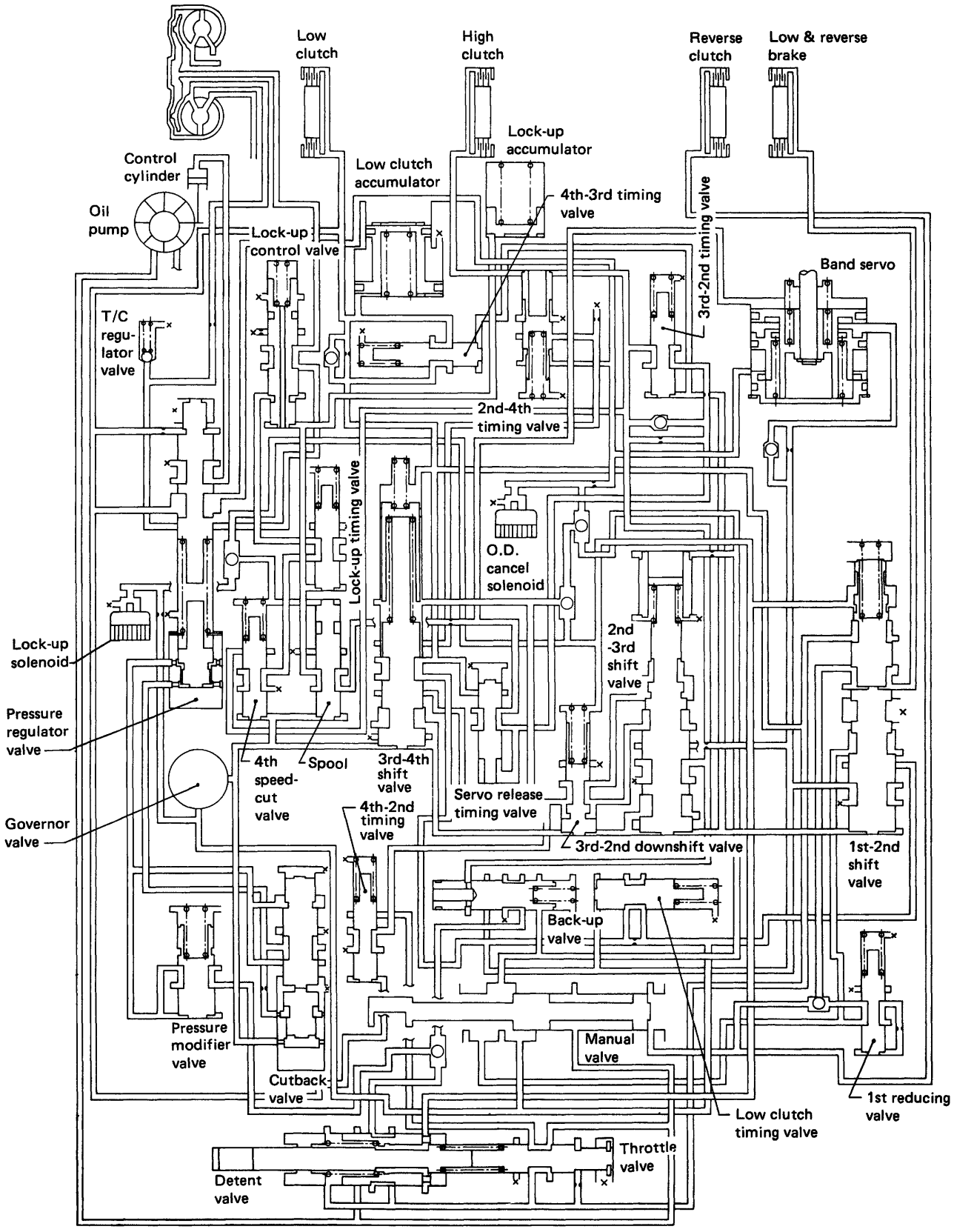
NOTE


★ : Select with proper thickness.
☆ : Adjustment is required.
ATF : Apply A.T.F.
Reverse clutch assembly
Thrust washer ★
Brake band
Oil pump cover
Friction ring
Cam ring
Pivot pin
Vane
Rotor
Vane ring
Input shaft
O-ring ATF
Converter housing
(Self-sealing bolt
Bearing race
Front sun gear
Needle bearing
High clutch assembly
Needle bearing
Differential side bearing adjusting shim ★
Differential side bearing
Final gear
Differential case
Governor drive gear
Differential side bearing
Differential spacer
Lock pin
Side gear thrust washer ★
Side gear
Pinion mate thrust washer
Bearing race ★
Pinion mate gear
Pinion mate shaft
Needle bearing
Rotor support ring
Differential lubrication tube
Return spring
Oil pump spring retainer
Oil strainer
Gasket
Control cylinder
Governor cap
Gasket
Governor valve and shaft
Seal washer
Speedometer gear
Speedometer case
Pin
Differential side oil seal
Front oil seal
Torque converter


: N·m (kg-m, ft-lb)
Ⓐ : 39 - 49 (4.0 - 5.0, 29 - 36)
Ⓑ : 6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Ⓒ : 21 - 23 (2.1 - 2.3, 15 - 17)
Ⓓ : 20 - 26 (2.0 - 2.7, 14 - 20)
Ⓔ : 20 - 26 (2.0 - 2.7, 14 - 20)
Ⓕ : 5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Ⓖ : 6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Ⓗ : 74 - 88 (7.5 - 9.0, 54 - 65)
Ⓘ : 16 - 21 (1.6 - 2.1, 12 - 15)
Ⓙ : 31 - 37 (3.2 - 3.8, 23 - 27)
Ⓚ : 16 - 21 (1.6 - 2.1, 12 - 15)
Ⓛ : 16 - 21 (1.6 - 2.1, 12 - 15)
Ⓛ : 5 - 7 (0.5 - 0.7, 3.6 - 5.1)
3.7 - 5.0 (0.38 - 0.51, 2.7 - 3.7)
Ⓜ : 5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Ⓝ : 9.1 - 11.8 (0.93 - 1.20, 6.7 - 8.7)
Ⓞ : 21 - 23 (2.1 - 2.3, 15 - 17)
Low clutch assembly
Needle bearing
Rear internal gear
Needle bearing
Rear carrier
Needle bearing
Rear sun gear
Front carrier
Needle bearing
Snap ring
One-way clutch
Low & reverse brake assembly
Snap ring
Ⓐ
Ⓝ
Throttle shaft
Throttle lever
Valve cover
Return spring
Gasket
Ⓜ (Self-sealing bolt)
Control valve assembly
Side cover
Gasket
Ⓞ (Self-sealing bolt)
Idler gear bearing adjusting shim ★
Bearing
Idler gear
Bearing
Output shaft bearing adjusting shim ★
Output shaft
Bearing
Ⓛ
Accumulator
Ⓚ
Parking actuator
Snap ring
Parking stopper Pawl spacer
Parking pawl ☆
Spring
Bearing retainer
Needle bearing
Snap ring
Manual plate
Inhibitor switch
Ⓘ
Differential side oil seal
Return spring
Band servo piston
Band servo assembly
Manual shaft
Terminal assembly
Lock nut
Anchor pin ☆
Gasket
Bearing
Reduction pinion gear
Transmission case

SAT783

Hydraulic Control Circuits



SAT186A

Mechanical Operation

Each part operates as shown in the following table at each gear position.

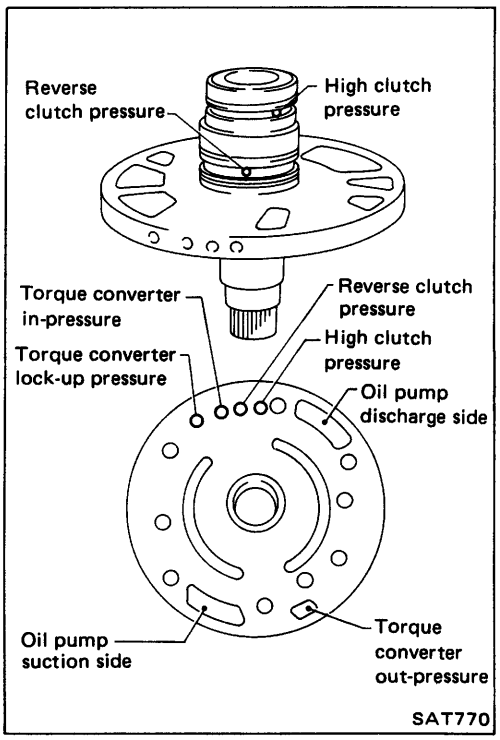
RL4F02A

Range		Gear ratio	Reverse clutch	High clutch	Low clutch	Band servo		Low & reverse brake	One-way clutch	Parking pawl	Lock-up
						Operation	Release				
Park		–								on	
Reverse		2.272	on					on			
Neutral		–									
Drive	D_1 Low	2.785			on				on		
	D_2 Second	1.545			on	on					
	D_3 Top (3rd)	1.000		on	on	(on)	on				
	D_4 O.D. (4th)	0.694		on		on					on
2	2_1 Low	2.785			on				on		
	2_2 Second	1.545			on	on					
1	1_1 Low	2.785			on			on	on		
	1_2 Second	1.545			on	on					

Oil Channel

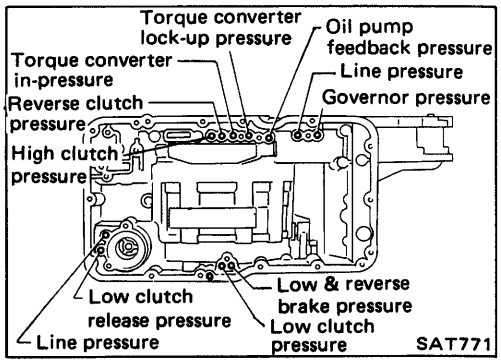
Oil channels which connect components are located in areas shown below.

OIL CHANNELS IN OIL PUMP COVER

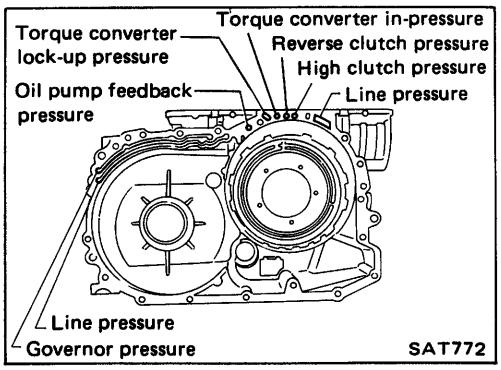


OIL CHANNELS IN TRANSMISSION CASE

Control valve attaching side

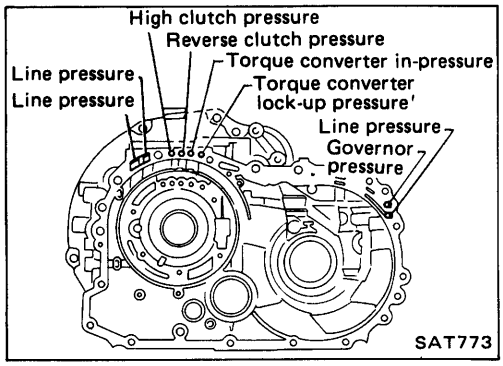


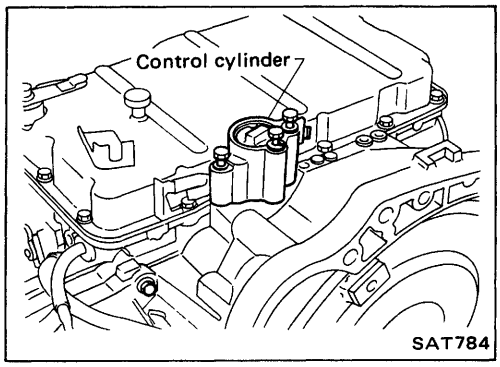
Converter housing attaching side



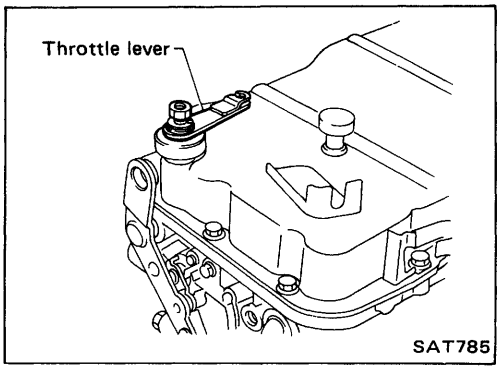
Oil Channel (Cont'd)

OIL CHANNELS IN CONVERTER HOUSING

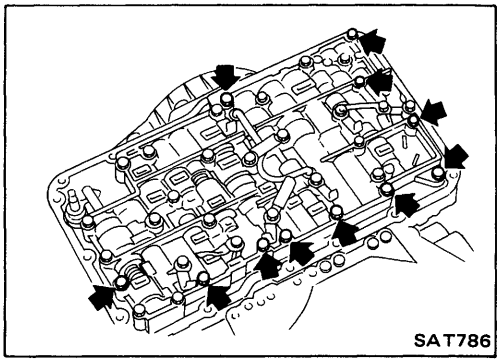




1. Drain A.T.F.
2. Remove torque converter.
3. Remove control cylinder.



4. Remove throttle lever and valve cover.



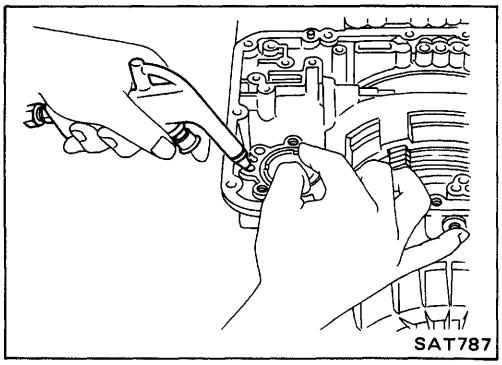
5. Disconnect harness connectors on control valve and remove control valve assembly.



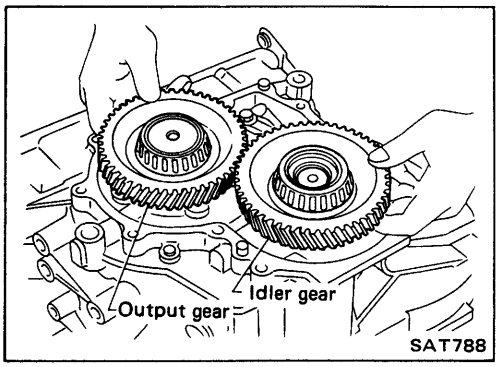
6. Remove terminal assembly.

CAUTION:

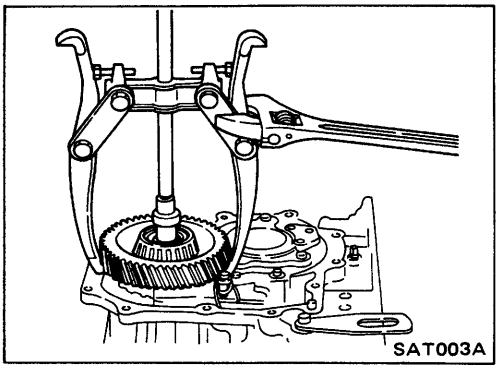
The terminal retrieving hooks will break if they are forced inward too far. Bend them gently inward while pulling carefully outward on the terminal. Do not pull on the wires.



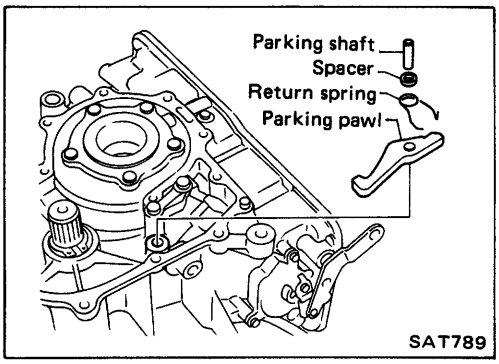
7. Remove throttle shaft and its return spring.
8. Remove accumulator.



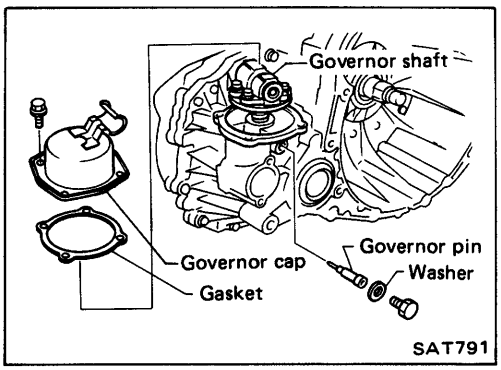
9. Remove side cover.
10. Remove output gear.



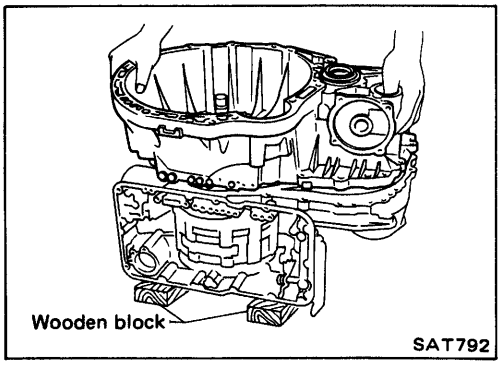
11. Draw out idler gear.



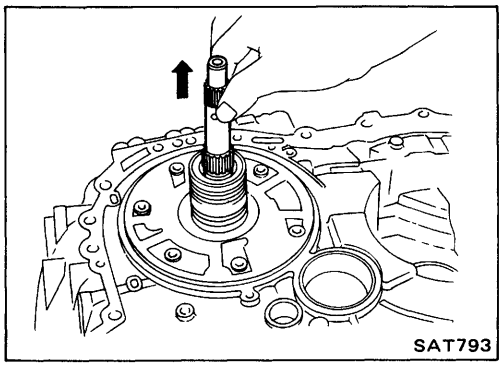
12. Remove parking pawl, return spring, pawl shaft and spacer.



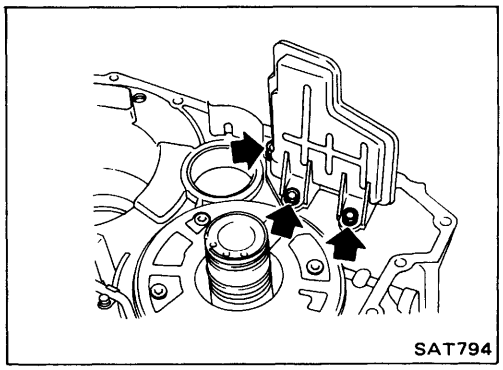
13. Remove speedometer case and speedometer gear.
14. Remove governor cap and pin, then draw out governor shaft assembly.



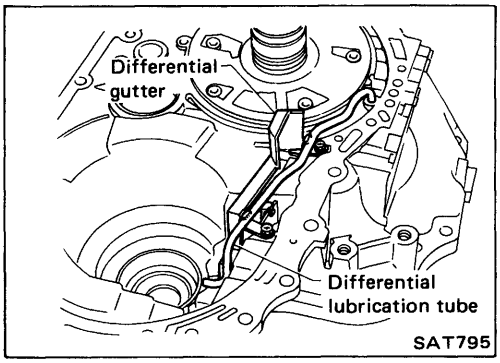
15. Put transaxle assembly on wooden block and remove converter housing.


SAT793

16. Remove final drive assembly and reduction pinion gear.
17. After removing O-ring from input shaft, extract input shaft from converter housing.

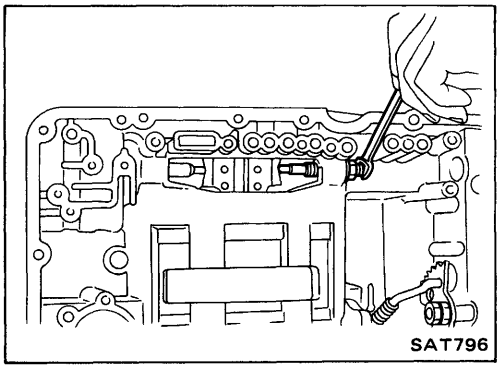

SAT794

18. Remove oil strainer.

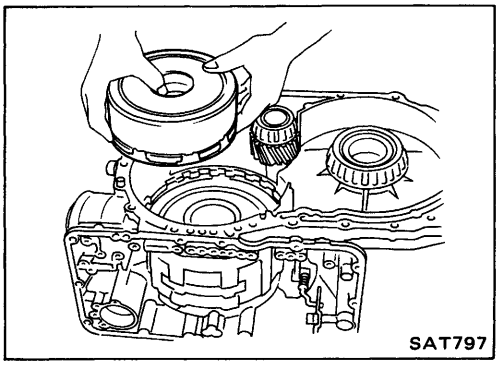


SAT795

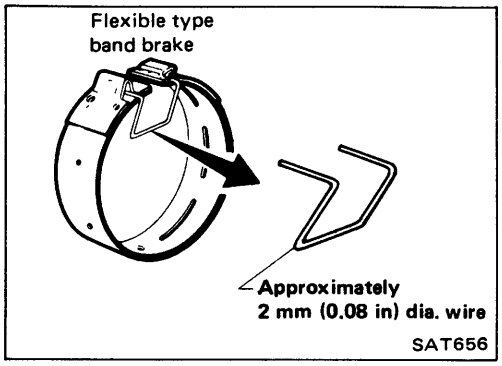
19. Remove differential lubrication tube and differential gutter.


SAT796

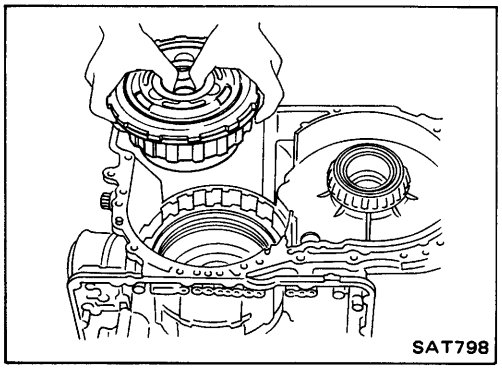
20. Loosen band brake stem lock nut, then back off piston stem.


SAT797

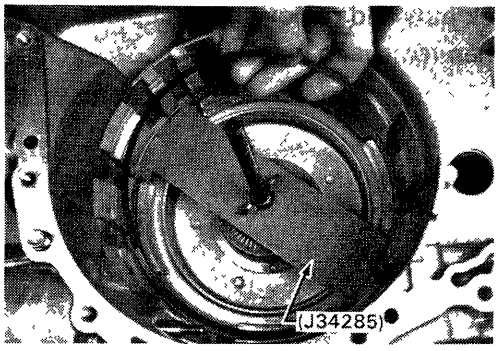
21. Remove brake band and high clutch & reverse clutch pack.



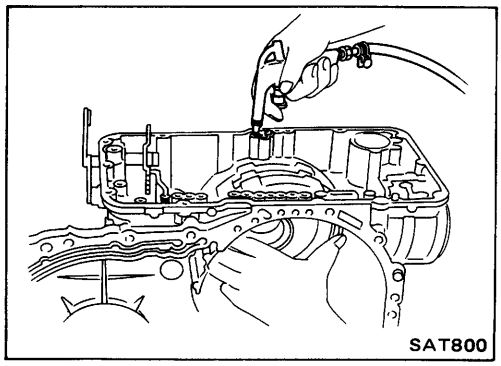
To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. Before removing the brake band, always secure it with a clip as shown in the figure at left.
Leave the clip in position after removing the brake band.



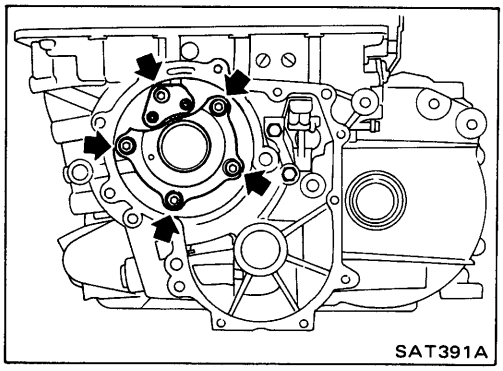
22. Remove one-way clutch, front carrier, rear carrier and low clutch as a set.



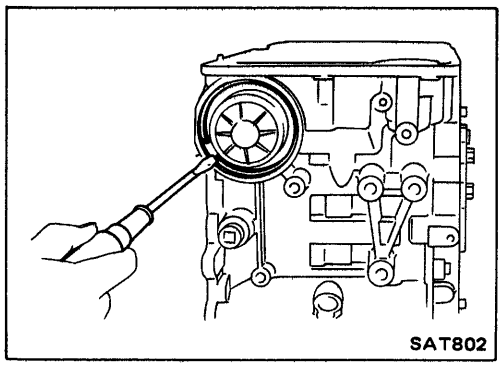
23. Remove low & reverse brake clutches, and detach low & reverse brake retainer snap ring pushing retainer.



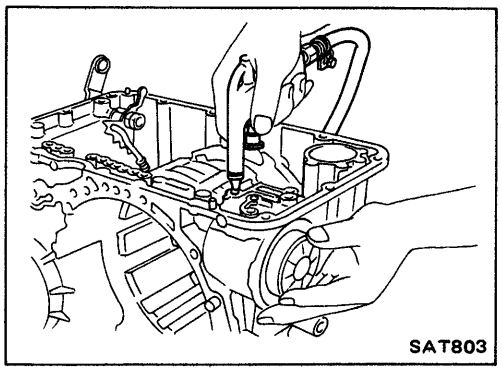
24. Remove low and reverse brake piston with compressed air.



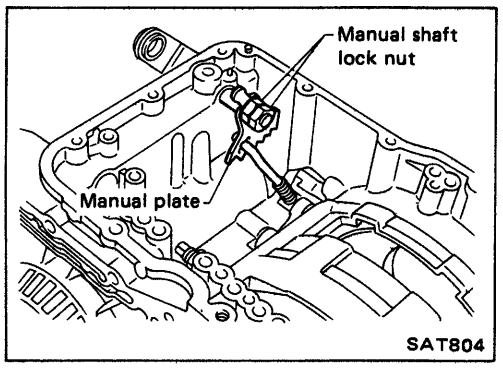
25. Remove bearing retainer assembly.


SAT802

26. Remove band servo snap ring.


SAT803

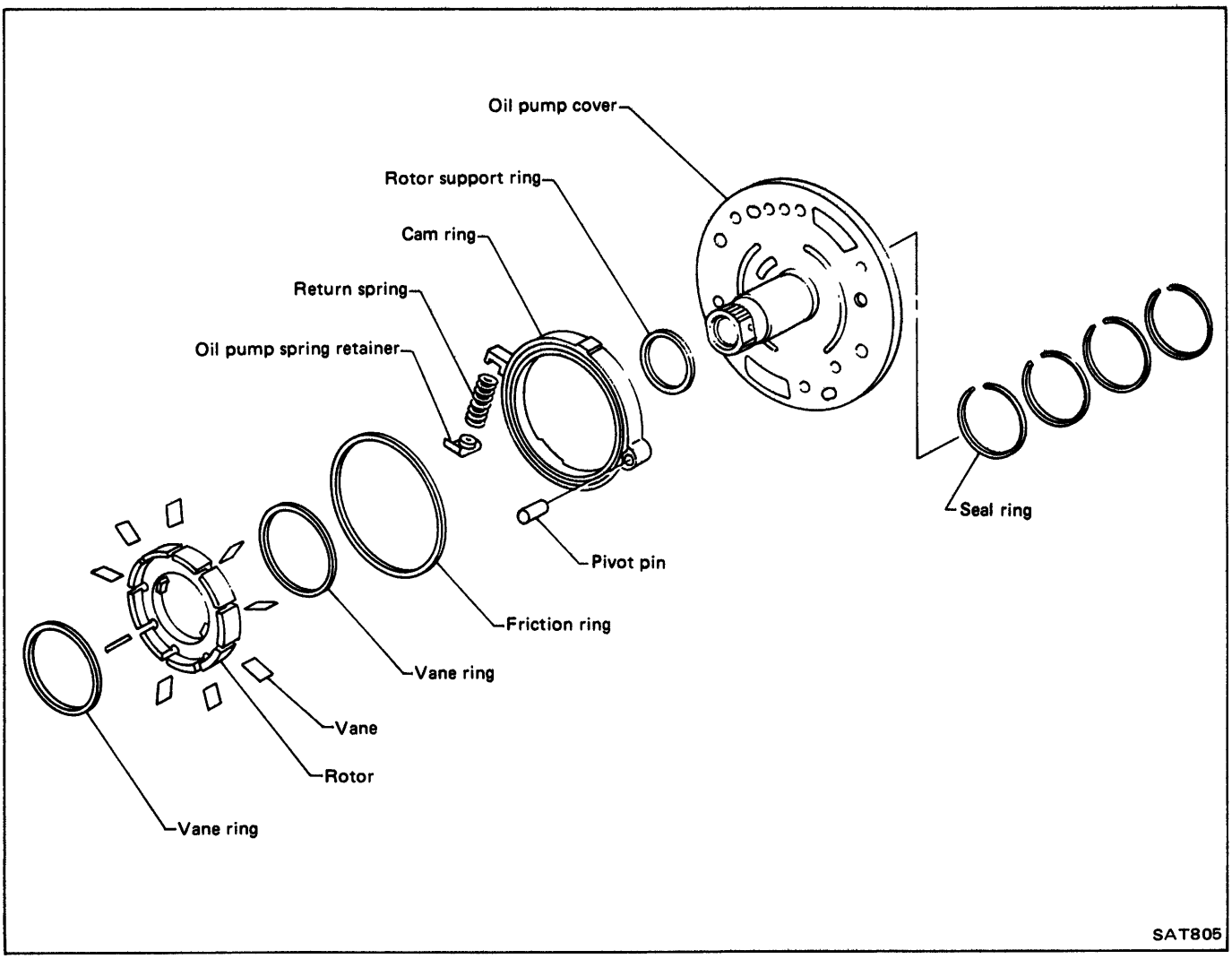
27. Remove band brake servo, retainer and return spring.

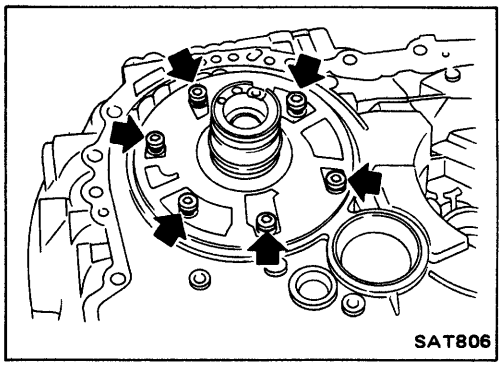


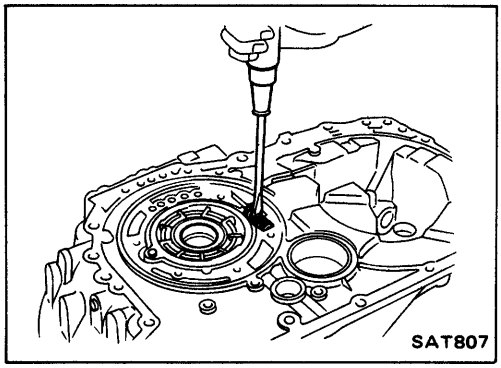
SAT804

28. Loosen manual shaft lock nuts and remove manual plate.
29. Pull out retaining pin, then remove manual shaft.

Oil Pump







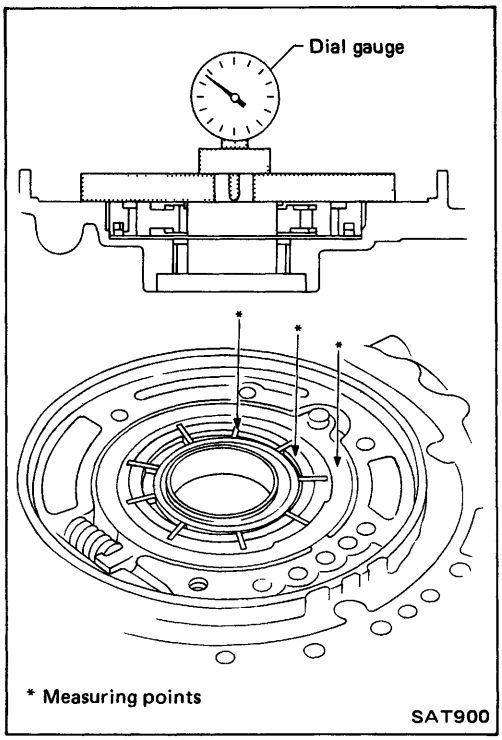
DISASSEMBLY

1. Remove oil pump cover.

2. Remove cam ring spring taking care not to damage converter housing.

Oil Pump (Cont'd)

INSPECTION

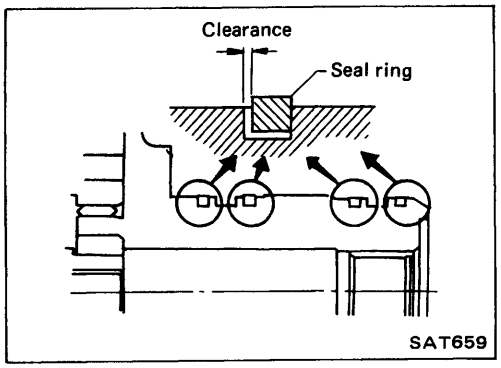


1. Inspect oil pump cover, cam ring, rotor and vanes for damage and visible wear.
2. Measure clearance between clutch housing and cam ring, rotor and vanes in at least four places along their circumstances. The maximum measured value should be within the specified range.

Be sure to remove friction ring and vane ring when measuring clearance.

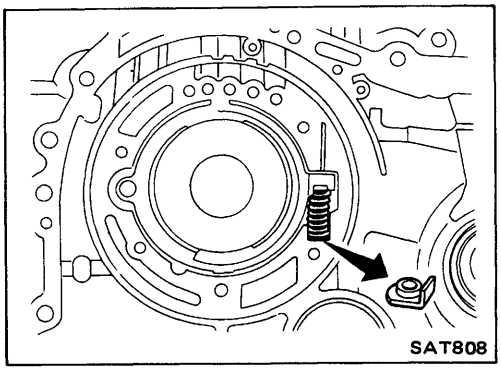
Standard clearance:
0.010 - 0.024 mm (0.0004 - 0.0009 in)
Wear limit:
0.034 mm (0.0013 in)

If the clearance is out of above specification, replace oil pump as an assembly.



3. Measure clearance between seal ring and ring groove.

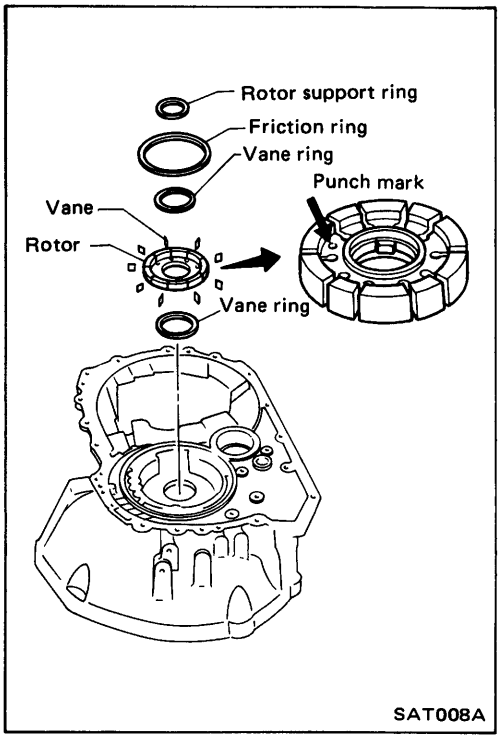
Standard clearance:
0.10 - 0.25 mm (0.0039 - 0.0098 in)
Wear limit:
0.25 mm (0.0098 in)



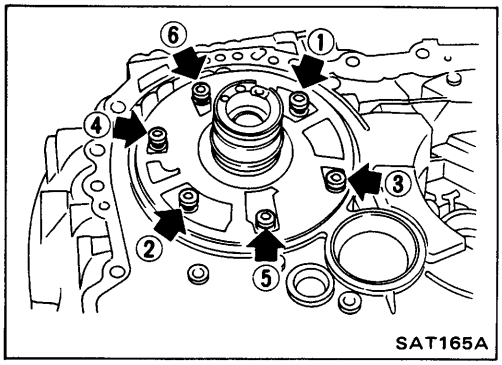
ASSEMBLY

1. Install cam ring, oil pump spring retainer and cam ring spring paying attention to the direction of the retainer.

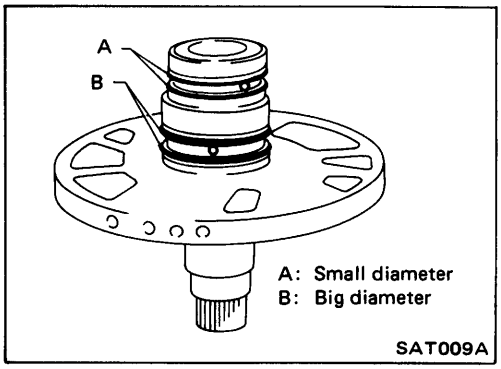
Oil Pump (Cont'd)



2. Assemble rotor, vanes, friction ring, rotor support ring and vane rings.
   Pay attention to direction of rotor.

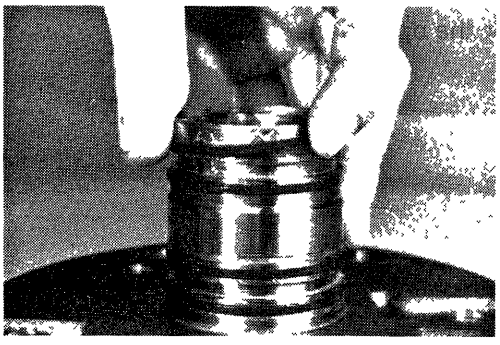


3. Install oil pump cover.
   Tighten down cover evenly in a criss-cross type pattern.



4. Rotate the pump when it has been assembled to ensure that all parts have been correctly assembled.
5. Install seal rings.

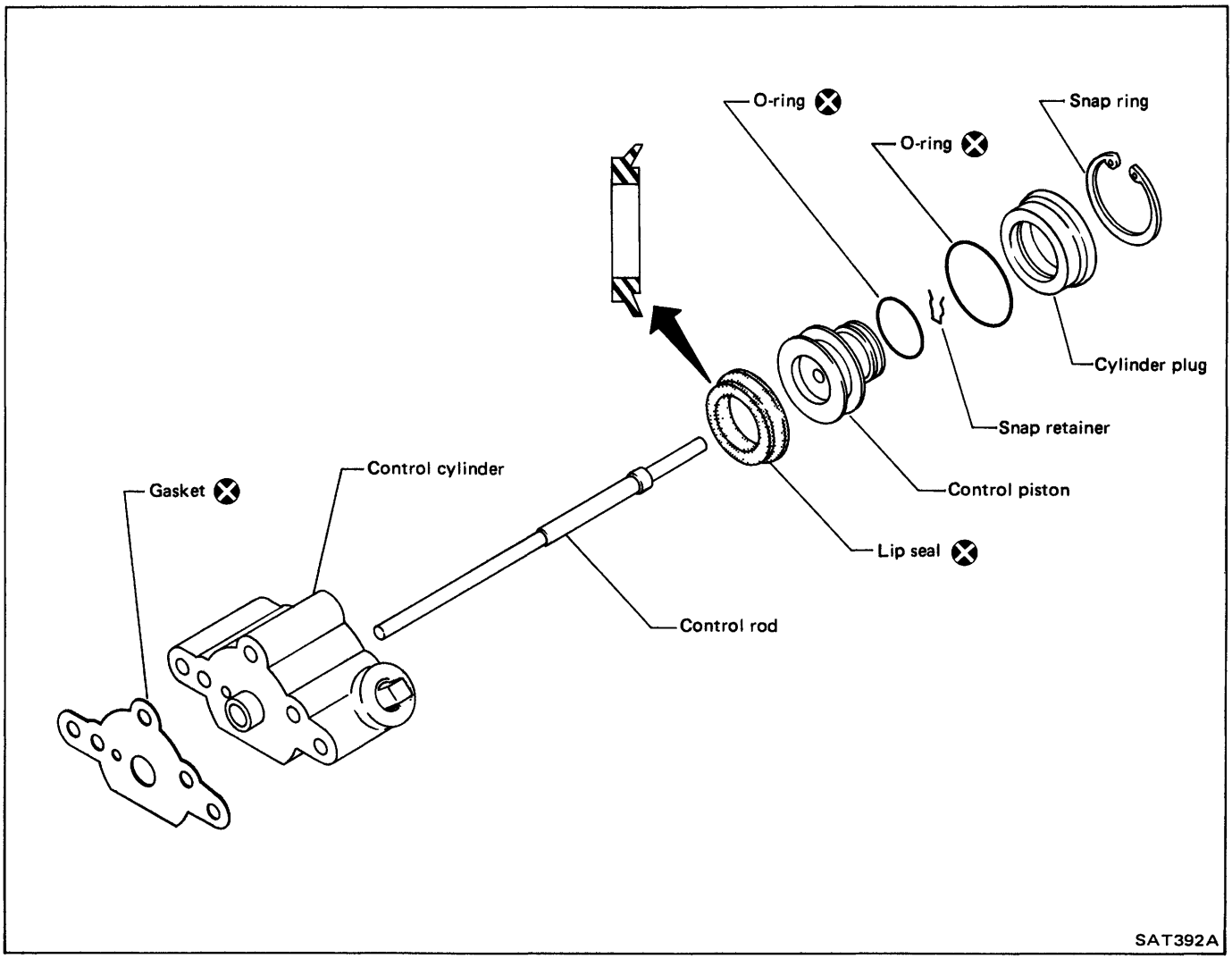
Refer to the figure at left for proper locations of the two different types of seal rings.

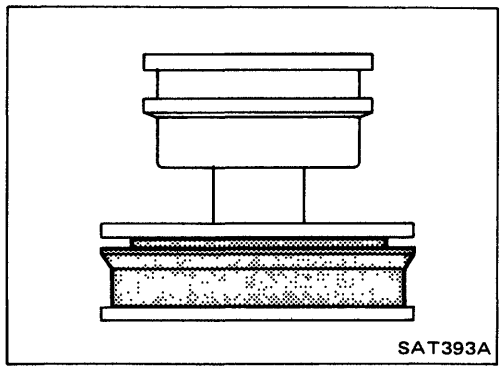


CAUTION:

These seal rings can be cut or deformed if they are improperly seated in their grooves when the drum is installed. Clean the ring grooves carefully and fill them with petroleum jelly. Then install the rings making sure they fit into the grooves as tightly as possible.

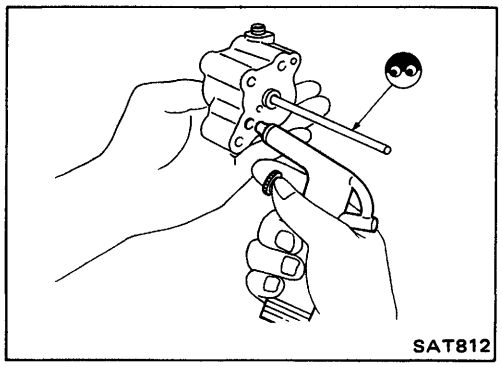
Control Cylinder





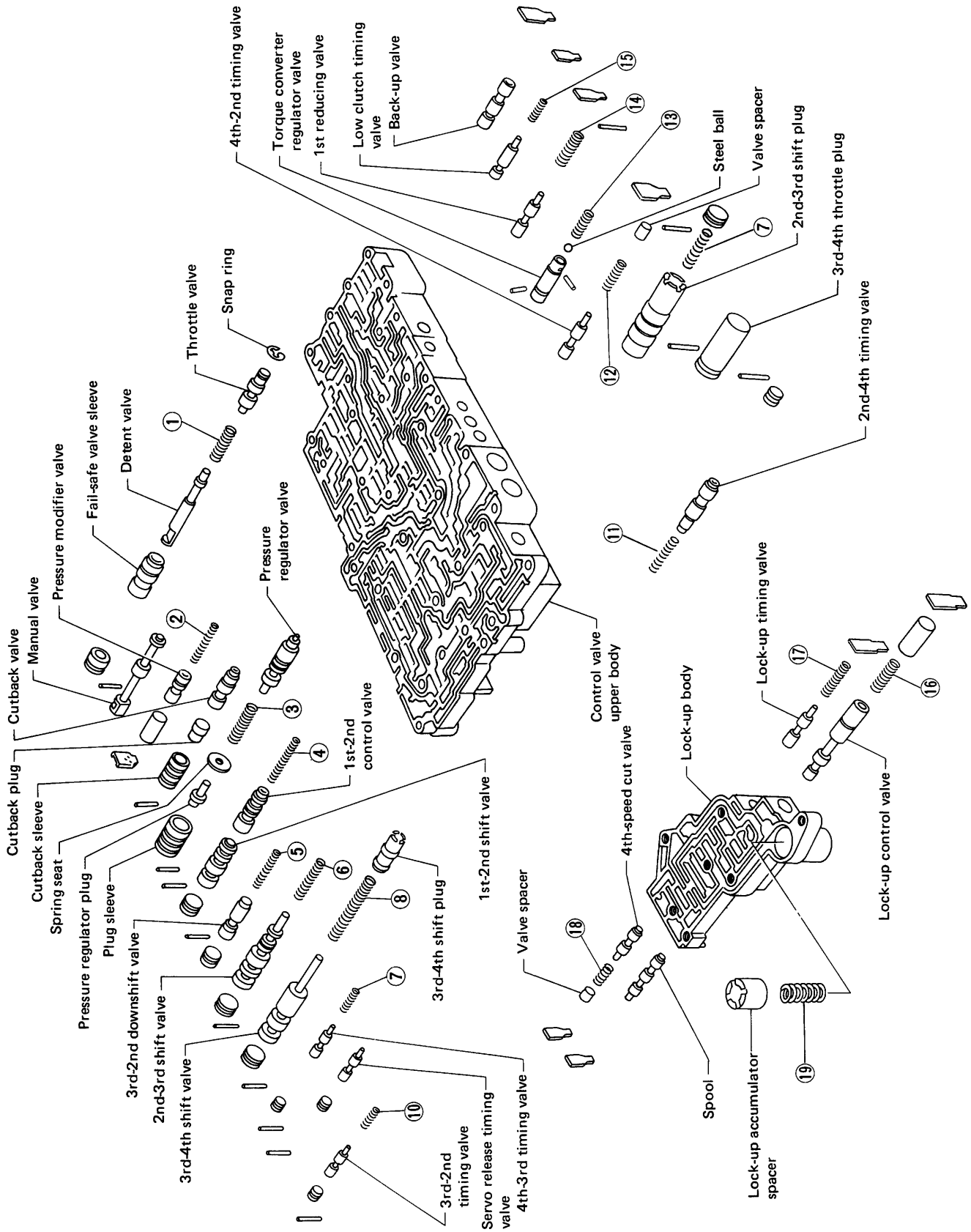
INSPECTION AND ASSEMBLY

- Inspect control cylinder body, control piston and cylinder plug for scratches or damage. Replace if necessary.
- When assembling, pay attention to the direction of lip seal.



- After assembling, check the operation.

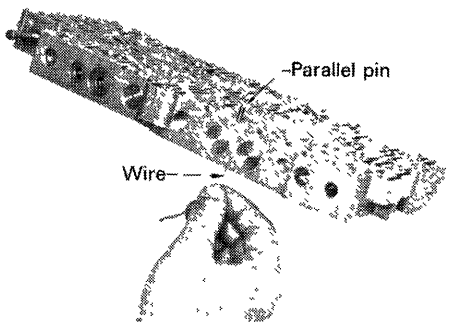
Control Valve Body



SAT796B

Control Valve Body (Cont'd)

DISASSEMBLY



During valve body separation, do not lose the 9 steel balls on valve body.

Manual valve was removed when valve body was removed from transaxle. Include valve in subsequent inspection and service sequence.

INSPECTION

A newly manufactured valve body represents precision manufactured valves assembled with close tolerances into precision bores of the valve body. If inspection reveals excessive clearances, 0.03 mm (0.0012 in) or more, between the valves and the valve body bores, replace the entire valve body rather than attempt rework.

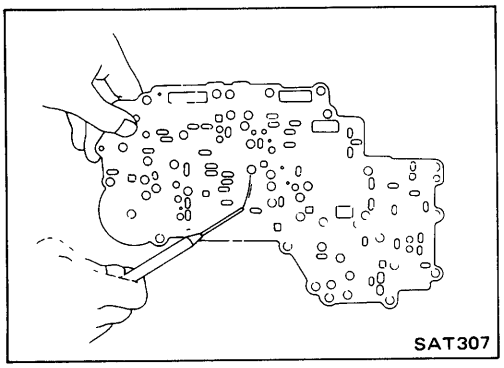
If one or more valves are sticking from varnish deposits or burns resulting from deteriorated oil or overheating, you may be able to clean the valves and valve bodies. Always use crocus cloth, which is a very fine type of cutting material. Never use emery cloth, as it is too coarse and can scratch the valves or valve bores. Scratches can lead to future deposits of varnish or foreign matter.

During cleaning, do not remove the sharp edges of the valve. When edges are rounded or scratched, entry is provided for dirt or foreign matter to work into the sides of the valves and hinder valve movement.

The valves may be cleaned using alcohol or lacquer thinner. The valve bodies can be dip cleaned with a good carburetor cleaner or lacquer thinner. Do not leave valve bodies submerged in carburetor cleaner longer than five minutes. Rinse parts thoroughly and dry.

Lubricate all parts in clean A.T.F. before reassembly.

1. Check valves for signs of burning. Replace if beyond clean-up.



2. Check separator plate for scratches or damage. Replace if necessary. Scratches or score marks can cause oil to by-pass correct oil passages and result in system malfunction.

Control Valve Body (Cont'd)

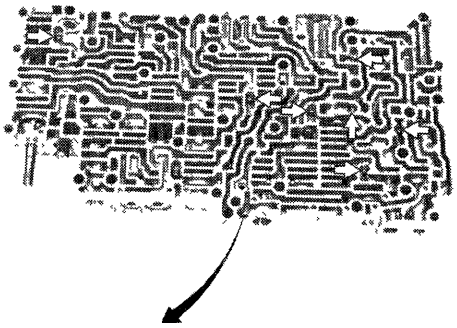
3. Check oil passages in upper and lower valve bodies for varnish deposits, scratches or other damage that would impair valve movement. Check threaded holes and related bolts and screws for stripped threads; replace as needed.
4. Check valve springs for damage. Measure free length of valve springs. If the free length is out of specification, replace it. Numbers of each valve spring listed in table below are the same as those in the figure on page AT-103.

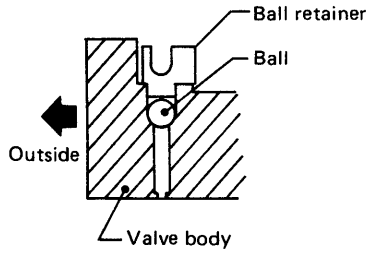
Valve spring	Free length mm (in)
① Throttle valve	34.25 (1.3484)
② Pressure modifier valve	46.4 (1.827)
③ Pressure regulator valve	40.3 (1.587)
④ 1st-2nd shift valve	50.1 (1.972)
⑤ 3rd-2nd downshift valve	42.0 (1.654)
⑥ 2nd-3rd shift valve	42.0 (1.654)
⑦ 2nd-3rd shift plug	39.5 (1.555)
⑧ 3rd-4th shift valve	70.25 (2.7657)
⑨ 4th-3rd timing valve	29.7 (1.169)
⑩ 3rd-2nd timing valve	21.4 (0.843)
⑪ 2nd-4th timing valve	34.2 (1.346)
⑫ 4th-2nd timing valve	23.1 (0.909)
⑬ Torque converter regulator valve	27 (1.06)
⑭ 1st reducing valve	26.4 (1.039)
⑮ Low clutch timing valve	29.7 (1.169)
⑯ Lock-up control valve	36.0 (1.417)
⑰ Lock-up timing valve	29.7 (1.169)
⑱ 4th speed cut valve	22.6 (0.890)
⑲ Lock-up accumulator	41.8 (1.646)

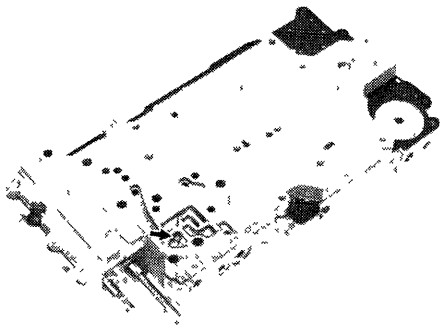
Control Valve Body (Cont'd)

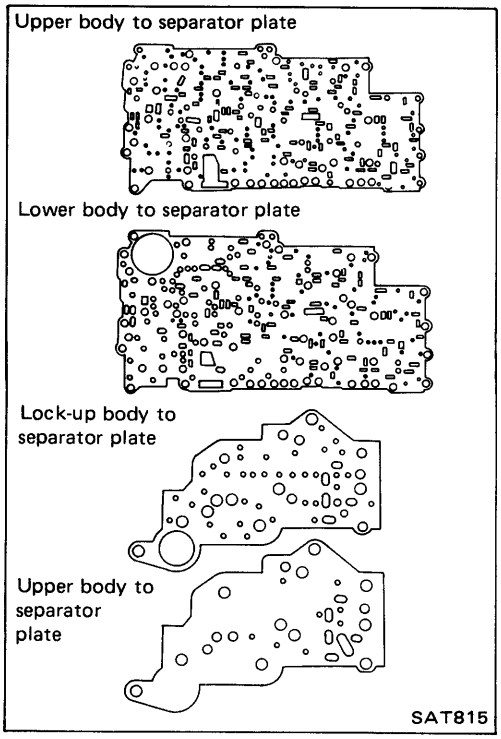
ASSEMBLY

1. Reinstall steel balls in valve body.





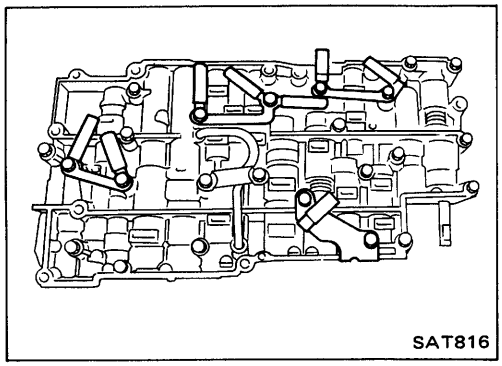




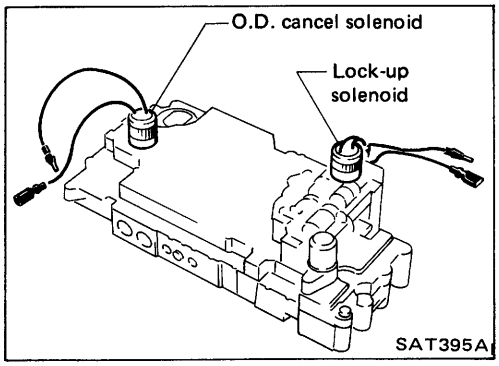
2. Assemble separator plate and lower valve body on upper valve body and lock-up body.

- **Dip gasket in A.T.F. before installation.**
- **Pay attention to the position of gaskets.**

Control Valve Body (Cont'd)



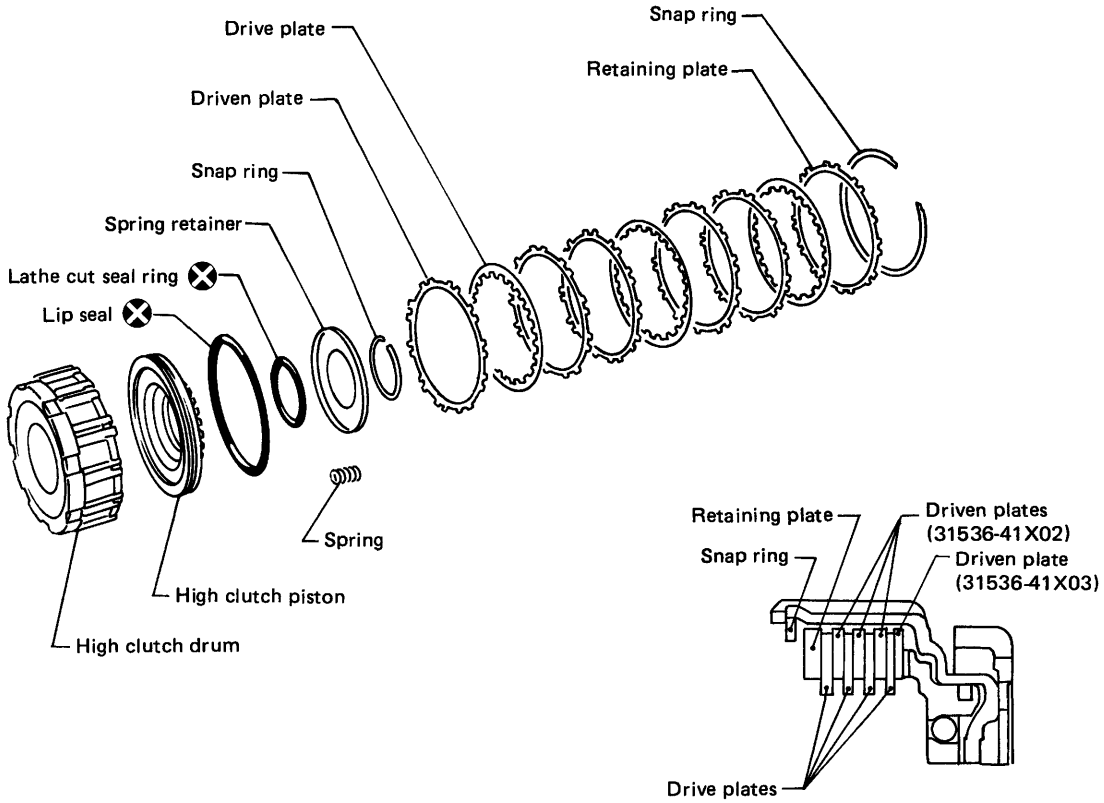
- **When installing these bolts, first be sure to install the two reamer bolts to their original positions.**
- **Pay attention to the position of harness clamps when installing control valve bolts.**



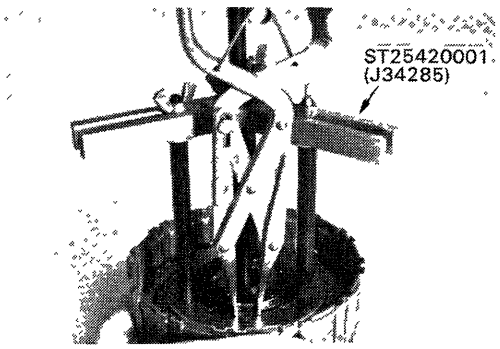
3. Install lock-up solenoid and O.D. cancel solenoid.

High Clutch

In regard to the number of clutch sheets (drive plate and driven plate), refer to S.D.S.

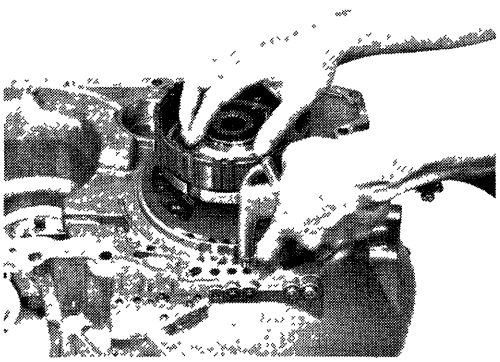


SAT714A



DISASSEMBLY

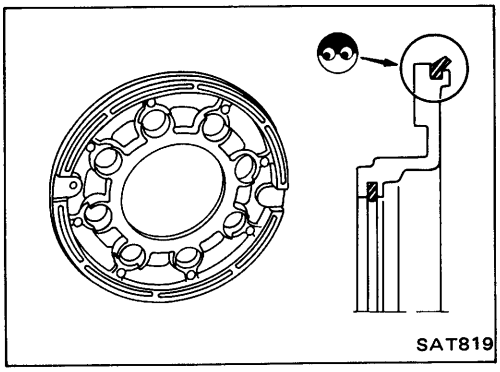
- Compress clutch springs and remove snap ring from spring retainer.



- Place clutch drum onto oil pump, and withdraw clutch piston with compressed air.

High Clutch (Cont'd)

INSPECTION AND ASSEMBLY



1. Check clutch drive plate facing for wear or damage. Drive plate thickness must not be less than 1.8 mm (0.071 in).

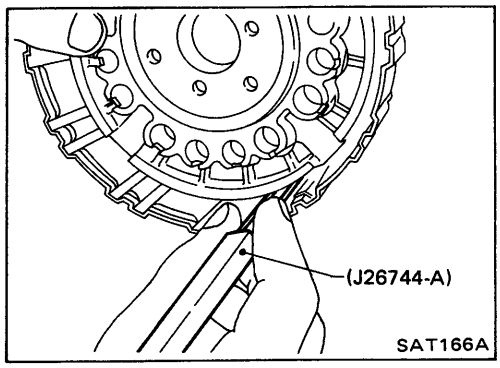
Standard drive plate thickness:
1.6 mm (0.063 in)

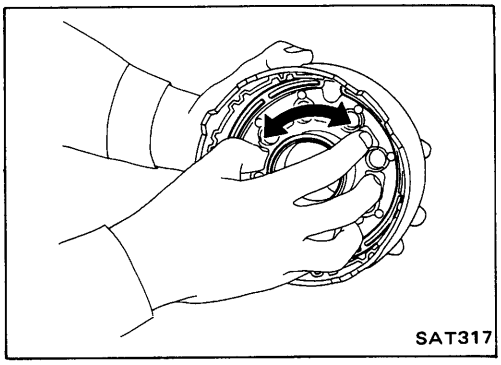
2. Check for wear on snap ring, weak or broken coil springs, and warped spring retainer.
3. Lubricate clutch drum bushing, and install inner seal and piston seal as illustrated. Be careful not to stretch seals during installation.

- Never assemble clutch dry; always lubricate its components thoroughly.
- Always install piston seal in direction shown in figure at left.

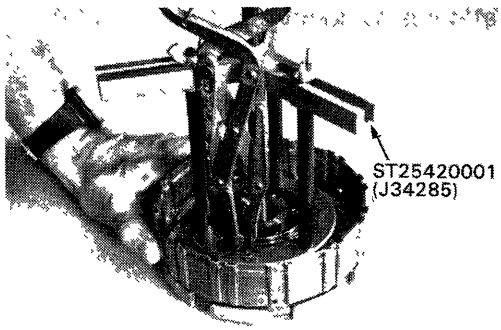
4. Assemble piston, being careful not to allow seal to kink or become damaged during installation.

Use Tool, which does not damage lip seal, to make sure the lip seal goes into place.

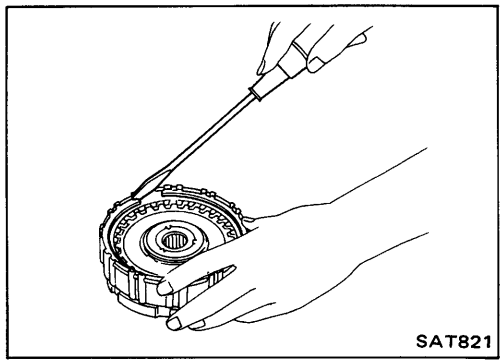




After installing piston, turn piston by hand to ensure that there is no binding.

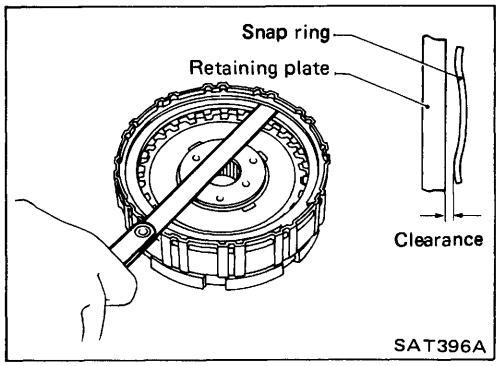


5. Install clutch springs.
6. Reinstall snap ring. Be sure snap ring is properly seated.



7. Install driven plates, drive plates, and secure with snap ring.

High Clutch (Cont'd)



8. Measure clearance between retaining plate and snap ring. Always measure the existing minimum clearance, since snap ring is a wave type.

Specified clearance:

Standard

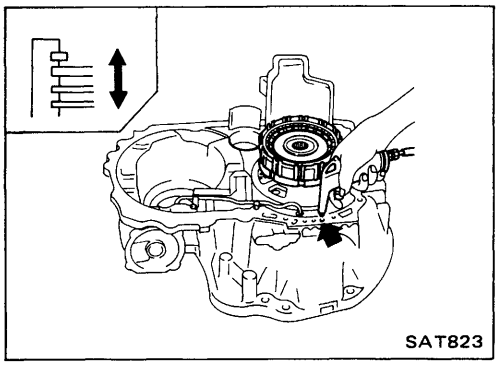
1.8 - 2.2 mm (0.071 - 0.087 in)

Allowable limit

3.0 mm (0.118 in)

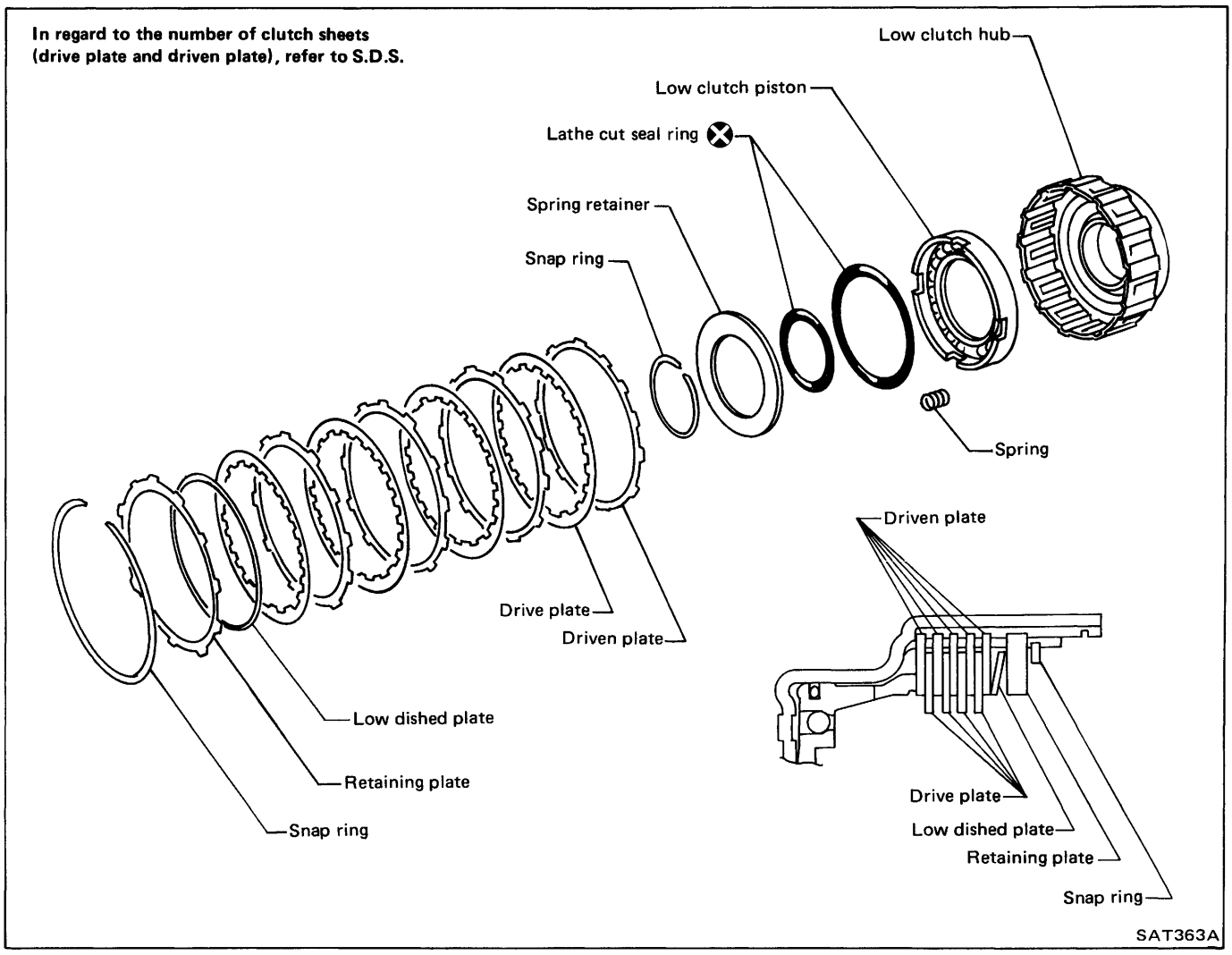
Retaining plate of high clutch

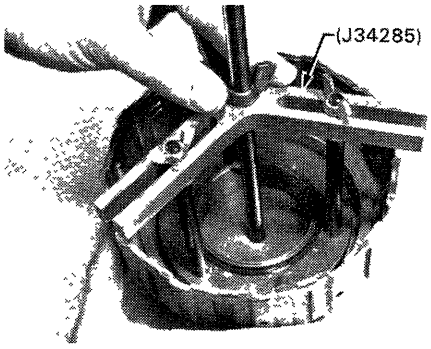
Thickness mm (in)	Part number
3.6 (0.142)	31537-41X61
3.8 (0.150)	31537-41X62
4.0 (0.157)	31537-41X63
4.2 (0.165)	31537-41X64
4.4 (0.173)	31537-41X65
4.6 (0.181)	31537-41X66
4.8 (0.189)	31537-41X67
5.0 (0.197)	31537-41X68



9. Check high clutch operation using compressed air.

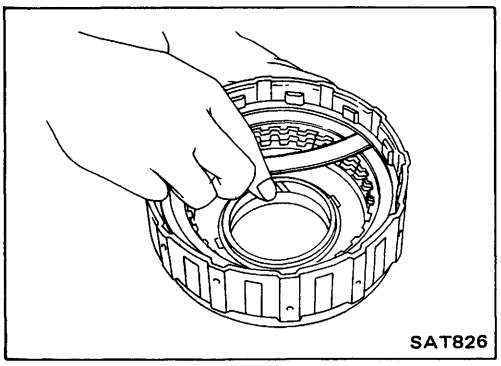
Low Clutch





- Use Tool to remove the clutch spring snap ring.

Low Clutch (Cont'd)


SAT826

Service procedures for low clutch are essentially the same as those for high clutch, with the following exception:

Specified clearance between retaining plate and snap ring:

Standard

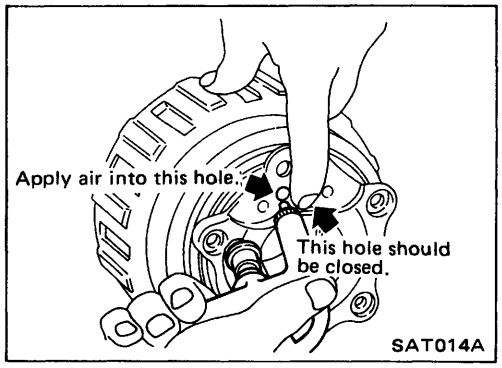
0.5 - 0.8 mm (0.020 - 0.031 in)

Allowable limit

1.6 mm (0.063 in)

Retaining plate of low clutch

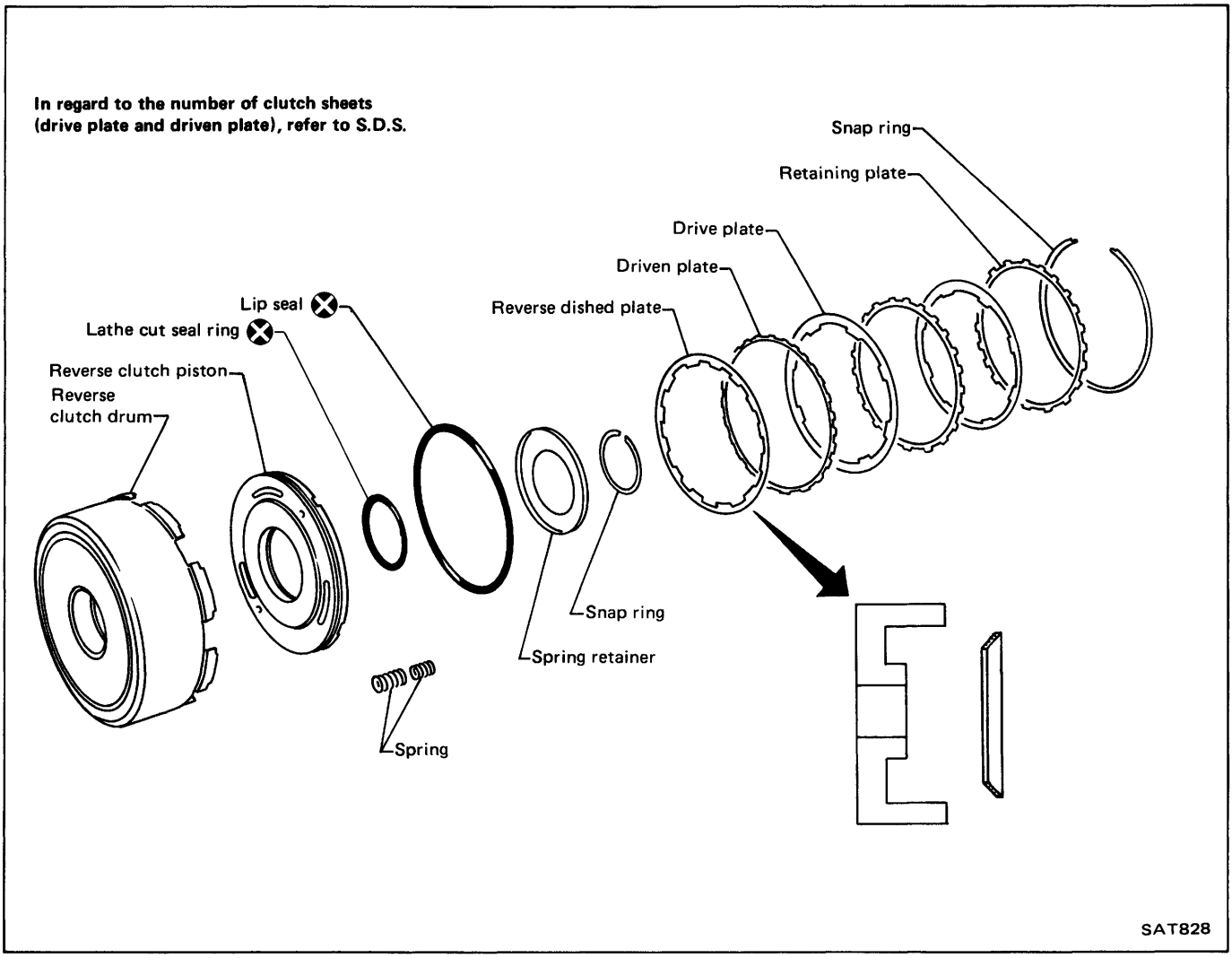
Thickness mm (in)	Part number
4.8 (0.189)	31597-21X00
5.0 (0.197)	31597-21X01
5.2 (0.205)	31597-21X02
5.4 (0.213)	31597-21X03
5.6 (0.220)	31597-21X04
5.8 (0.228)	31597-21X05
6.0 (0.236)	31597-21X06

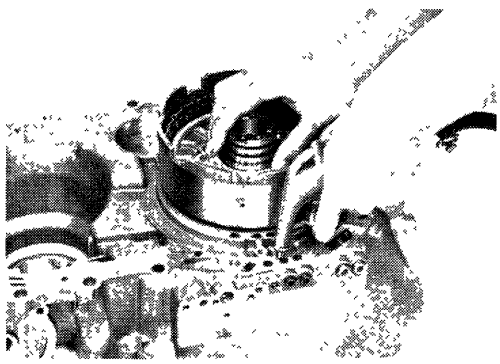


SAT014A

After assembly, check the operation of clutch.

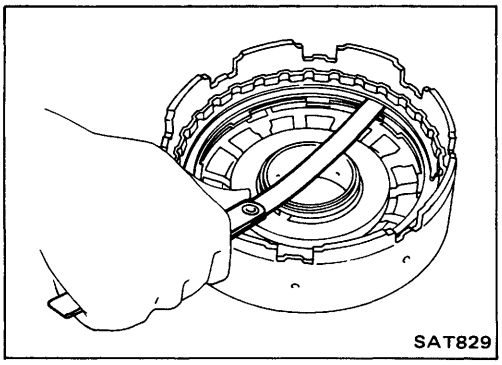
Reverse Clutch





Service procedures for reverse clutch are essentially the same as those for high clutch, with the following exception.

- Remove reverse clutch piston.



Specified clearance between retaining plate and snap ring:

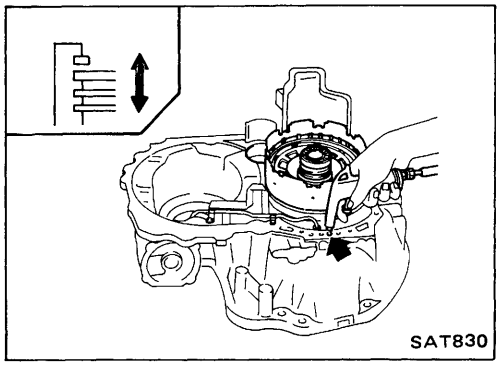
Standard

0.5 - 0.8 mm (0.020 - 0.031 in)

Allowable limit

1.2 mm (0.047 in)

Reverse Clutch (Cont'd)



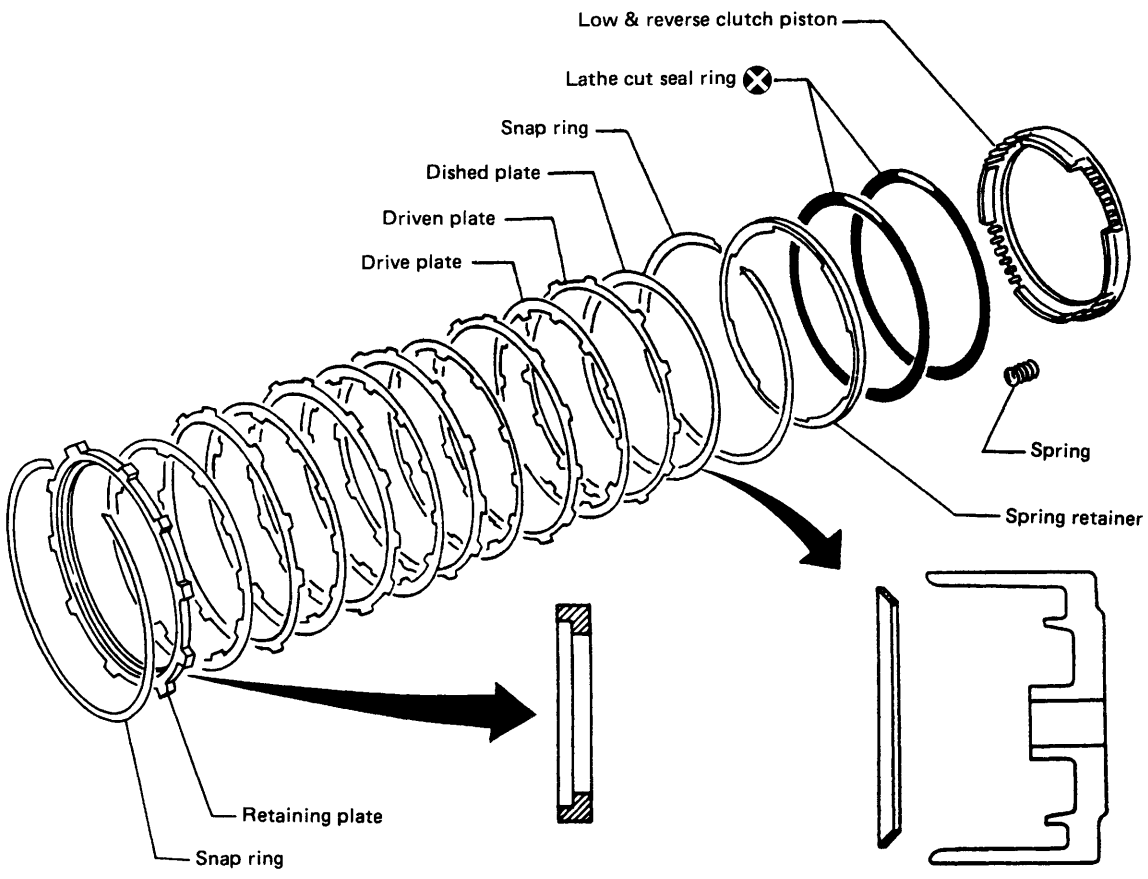
Retaining plate of reverse clutch

Thickness mm (in)	Part number
4.6 (0.181)	31537-21X15
4.8 (0.189)	31537-21X16
5.0 (0.197)	31537-21X17
5.2 (0.205)	31537-21X18
5.4 (0.213)	31537-21X19
5.6 (0.220)	31537-21X20
5.8 (0.228)	31537-21X21
6.0 (0.236)	31537-21X22

After assembly, check the operation of clutch.

Low & Reverse Brake

In regard to the number of clutch sheets (drive plate and driven plate), refer to S.D.S.



Low & Reverse Brake (Cont'd)

INSPECTION

- Examine low and reverse brake for damaged clutch drive plate facing and worn snap ring.
- Check drive plate facing for wear or damage; if necessary, replace.

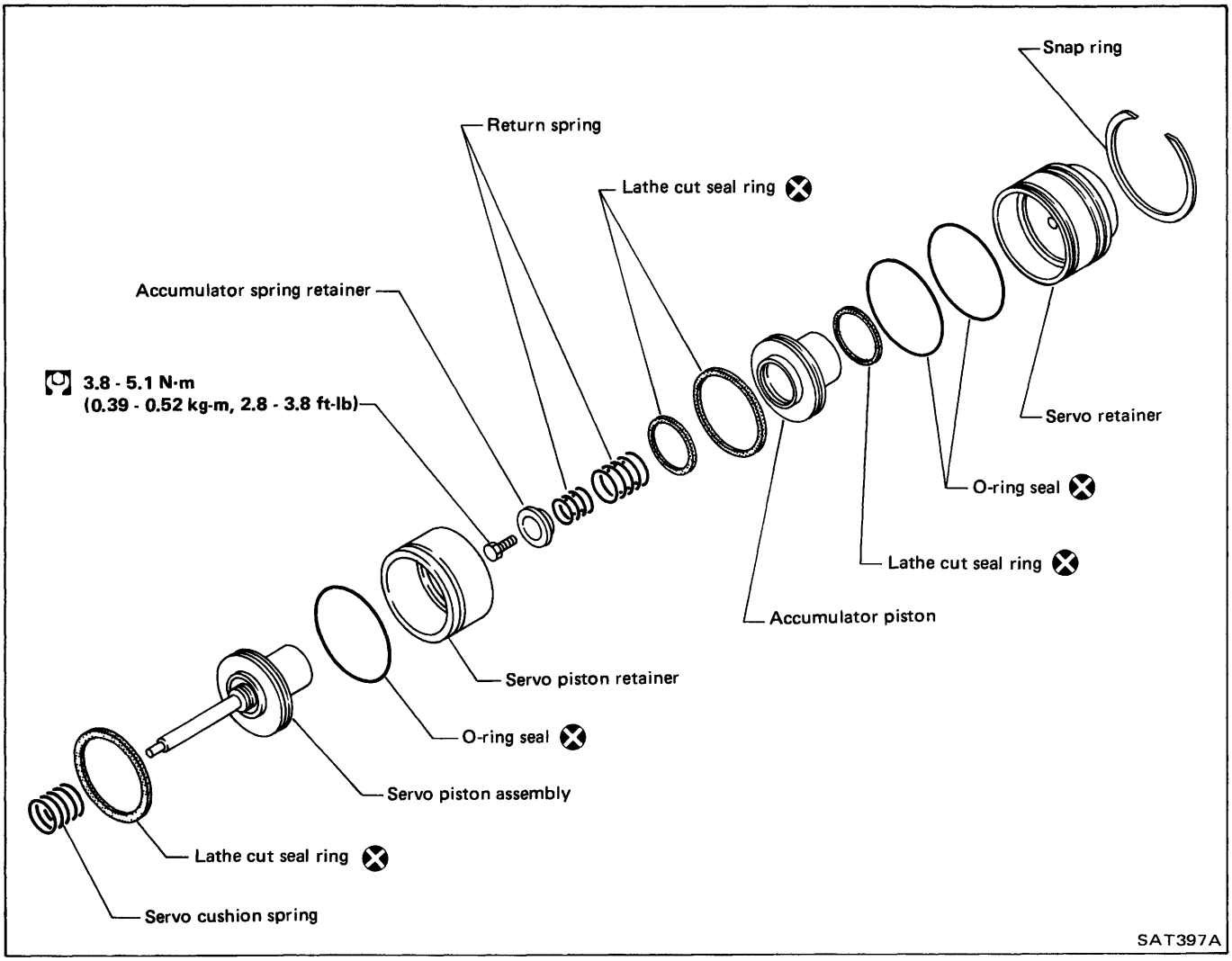
Drive plate thickness:
Standard
2.0 mm (0.079 in)
Allowable limit
1.8 mm (0.071 in)

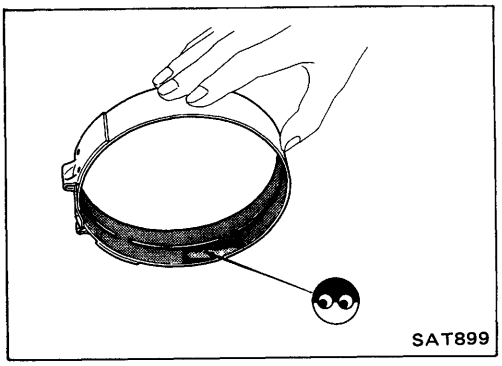
Specified clearance between retaining plate and snap ring:
Standard
1.2 - 1.6 mm (0.047 - 0.063 in)
Allowable limit
2.8 mm (0.110 in)

Retaining plate of low & reverse brake

Thickness mm (in)	Part number
3.4 (0.134)	31667-21X00
3.6 (0.142)	31667-21X01
3.8 (0.150)	31667-21X02
4.0 (0.157)	31667-21X03
4.2 (0.165)	31667-21X04
4.4 (0.173)	31667-21X05
4.6 (0.181)	31667-21X06
4.8 (0.189)	31667-21X07
5.0 (0.197)	31667-21X08

Brake Band and Band Servo

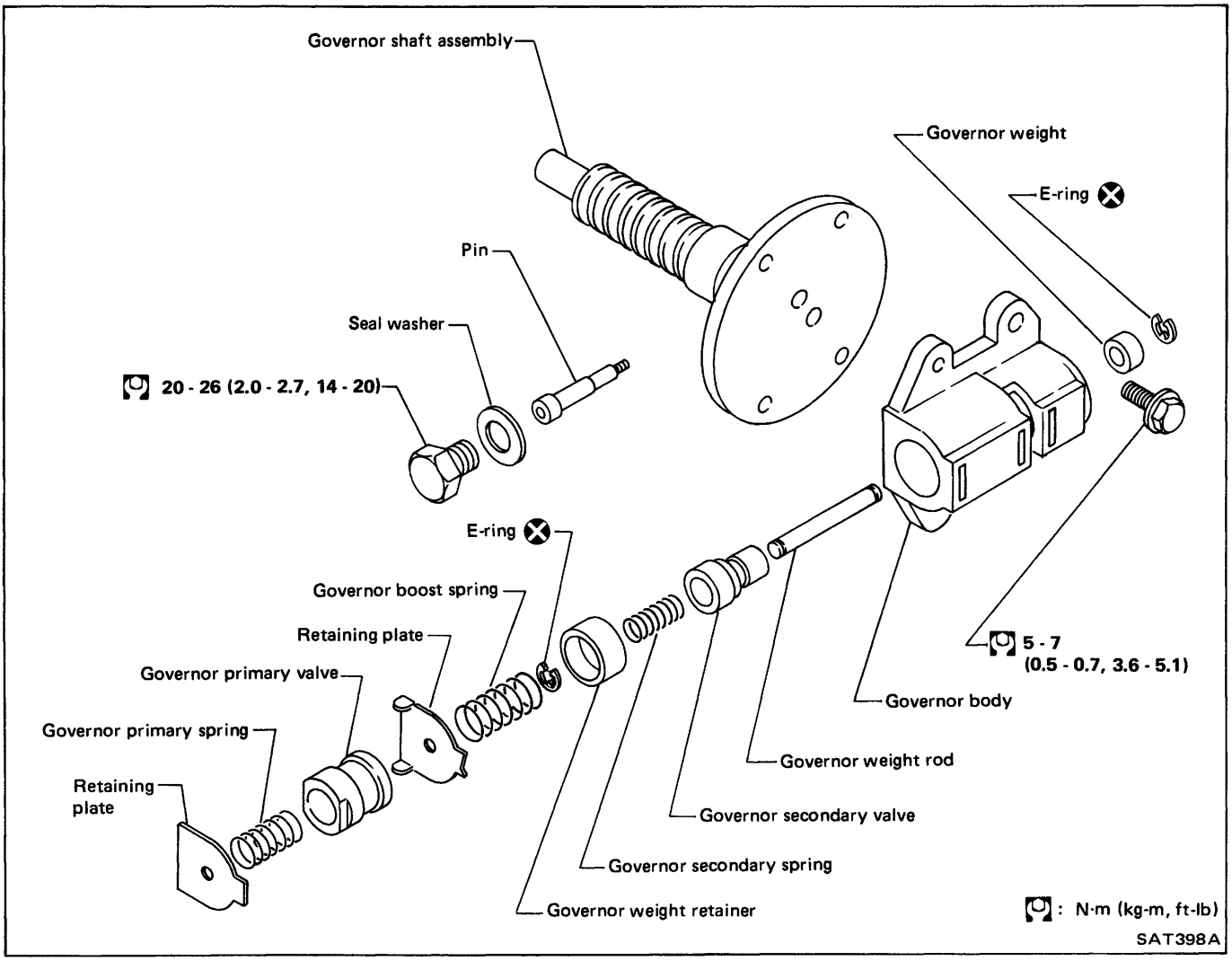




INSPECTION

- Inspect band friction material for wear. If cracked, chipped or burnt spots are apparent, replace the band.
- Check band servo components for wear and scoring.

Governor

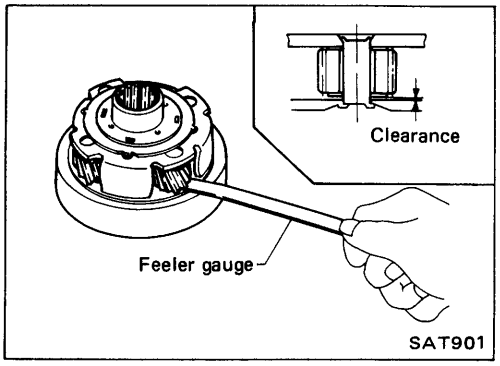


INSPECTION

- Check governor valves and valve body for indication of burning or scratches.
- Check valve springs for damage.
  Measure free length of valve springs.

Valve spring	Free length mm (in)
Primary governor	32.3 (1.272)
Secondary governor	21.9 (0.862)
Governor boost	28.7 (1.130)

If any abnormalities are found, replace governor body, valves and springs as an assembly.



Planetary Carrier

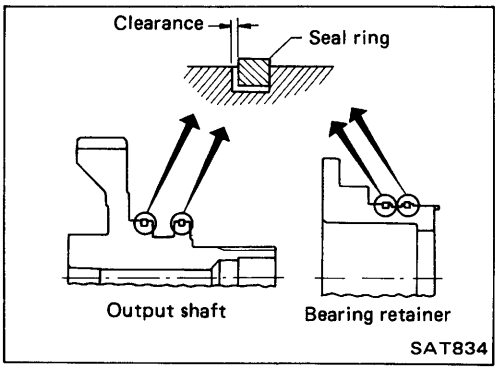
INSPECTION

- Check clearance between pinion washer and planetary carrier with a feeler gauge.

  Standard clearance:

  0.20 - 0.70 mm (0.0079 - 0.0276 in)

  Replace if the clearance exceeds 0.80 mm (0.0315 in).
- Check planetary gear sets and bearings for damaged or worn gears.



Bearing Retainer and Output Shaft

INSPECTION

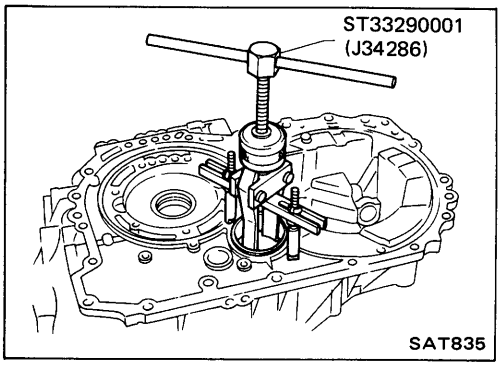
Measure clearance between seal ring and ring groove.

Standard clearance:

0.10 - 0.25 mm (0.0039 - 0.0098 in)

Wear limit:

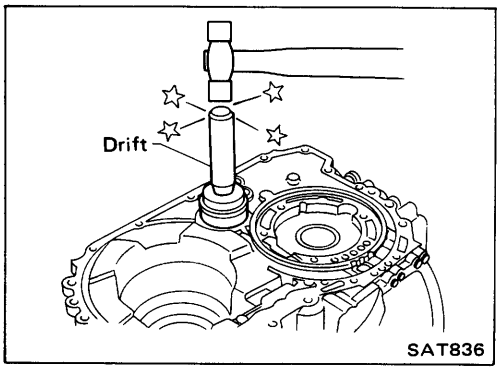
0.25 mm (0.0098 in)

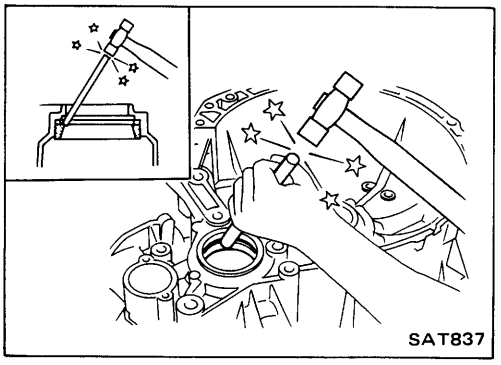


Converter Housing and Transmission Case

BEARING OUTER RACE

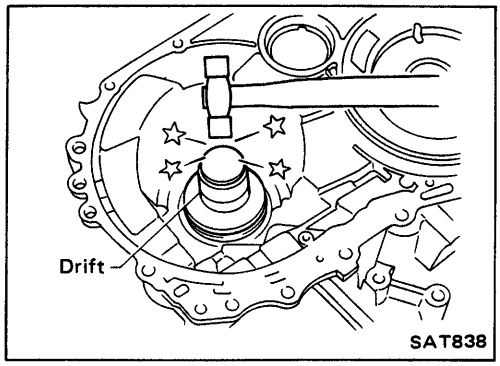
- Reduction pinion gear front bearing outer race.

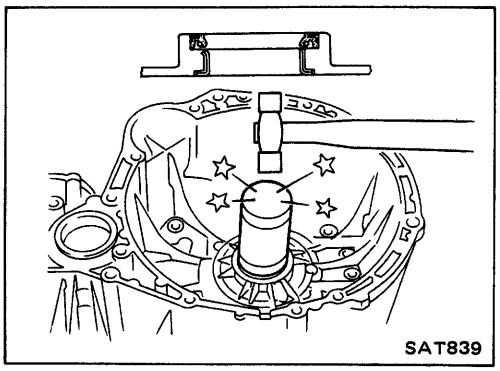




- Differential side bearing outer race.

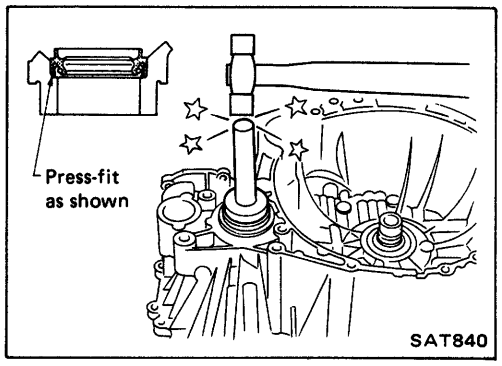
Converter Housing and Transmission Case (Cont'd)





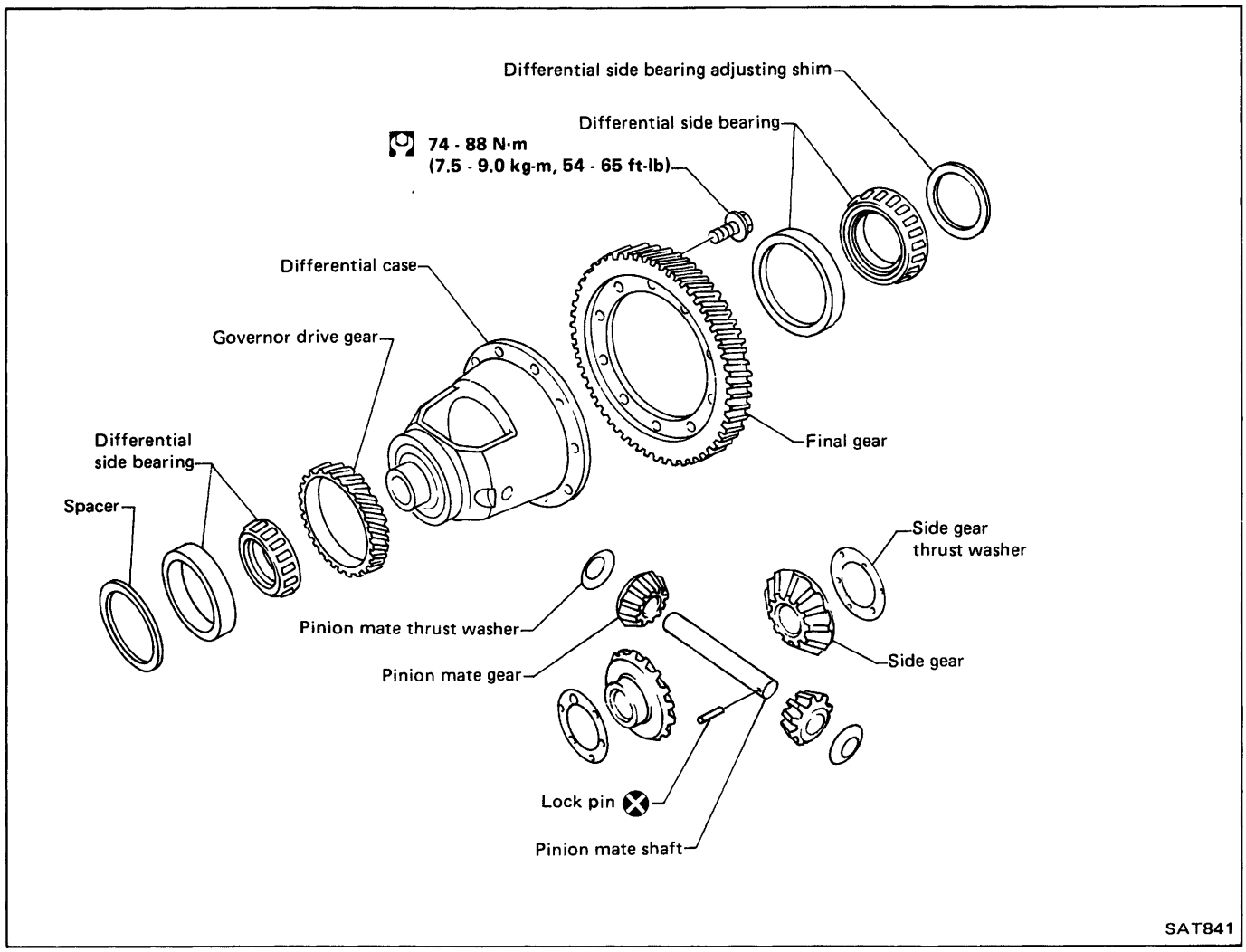
OIL SEAL

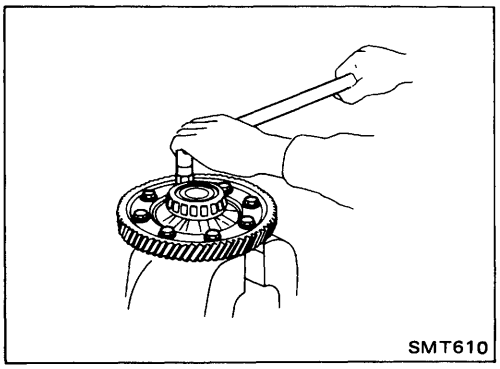
- Torque converter oil seal.



- Differential side oil seal.

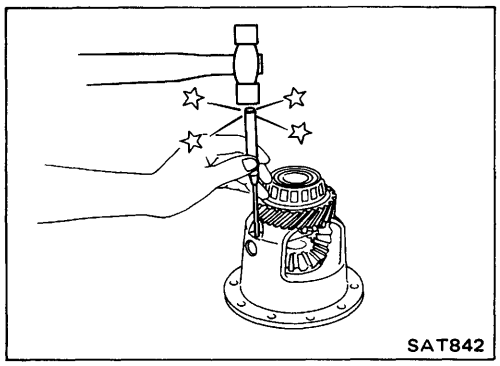
Final Drive





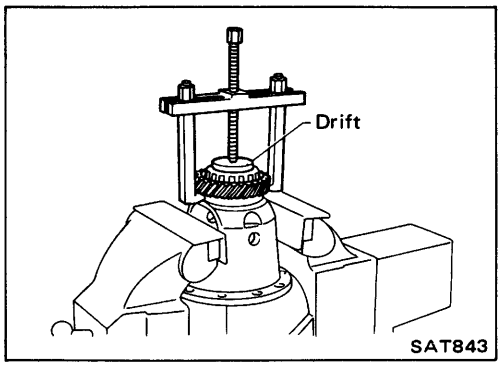
DISASSEMBLY

1. Remove final gear.

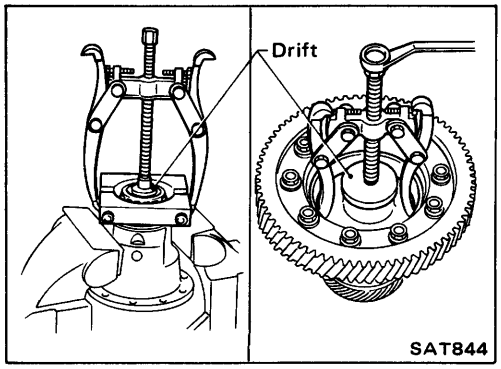


2. Drive out pinion mate shaft lock pin and draw out pinion mate shaft.

Final Drive (Cont'd)

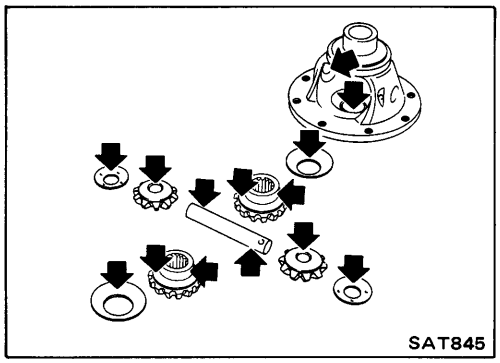


3. Remove governor drive gear.

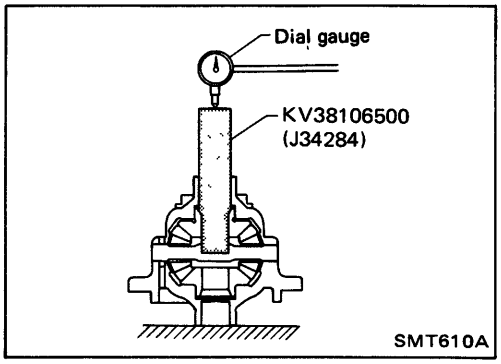


4. Drive out differential side bearing outer race and inner cone.

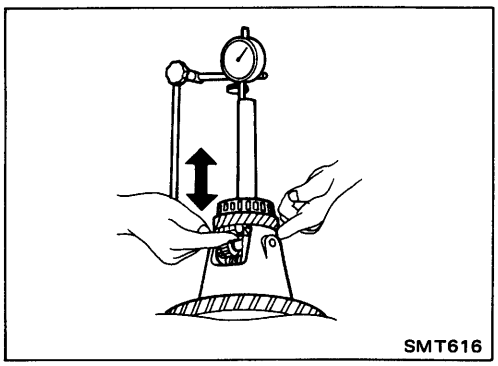
INSPECTION



1. Check mating surface of differential case, side gears and pinion mate gears. Replace as required.



2. Check clearance between side gear and differential case with washer following the procedure below.
a. Set Tool and dial gauge on side gear.



b. Move side gear up and down to measure dial gauge deflection. Always measure gauge deflection on both side gears.

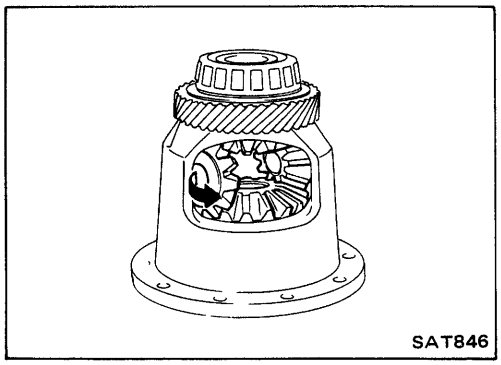
Clearance between side gear and differential case with washer:

0.1 - 0.2 mm (0.004 - 0.008 in)

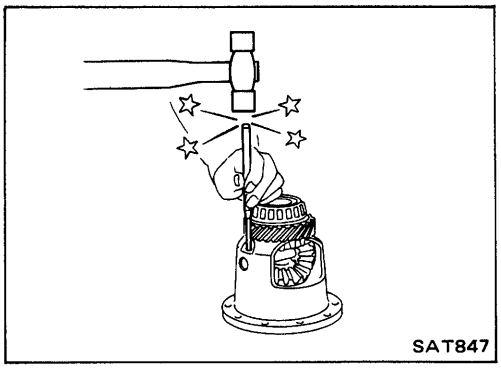
c. If clearance exceeds the specified value, check for wear and replace necessary parts.
3. Check tapered roller bearings for wear, scratches, pitching or flaking.

Final Drive (Cont'd)

ASSEMBLY



1. Install the side gear and thrust washer in the differential case.
2. Install the pinion mate gear and thrust washer in the differential case while rotating them.

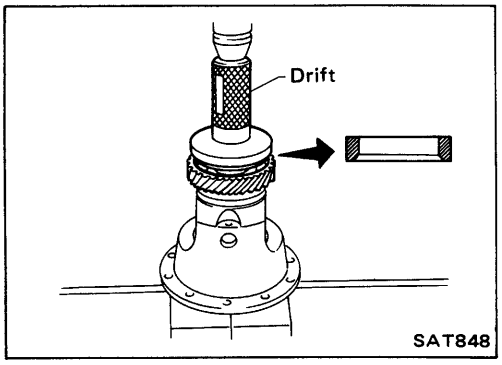


3. Insert pinion mate shaft.

When inserting, be careful not to damage pinion mate washers.

4. Measure clearance between side gear and pinion mate gear, referring to "Inspection". If necessary, adjust.

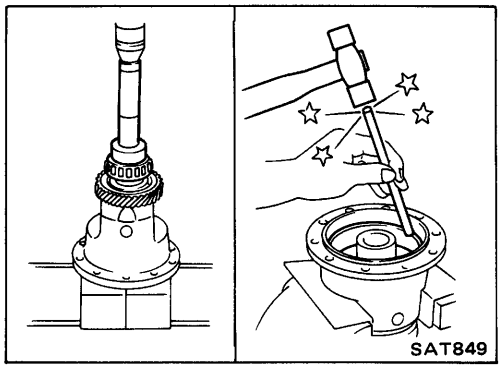
Side gear to pinion mate clearance:
0.1 - 0.2 mm (0.004 - 0.008 in)
Side gear thrust washer:
Refer to S.D.S.



5. Install pinion mate shaft lock pin using a punch.

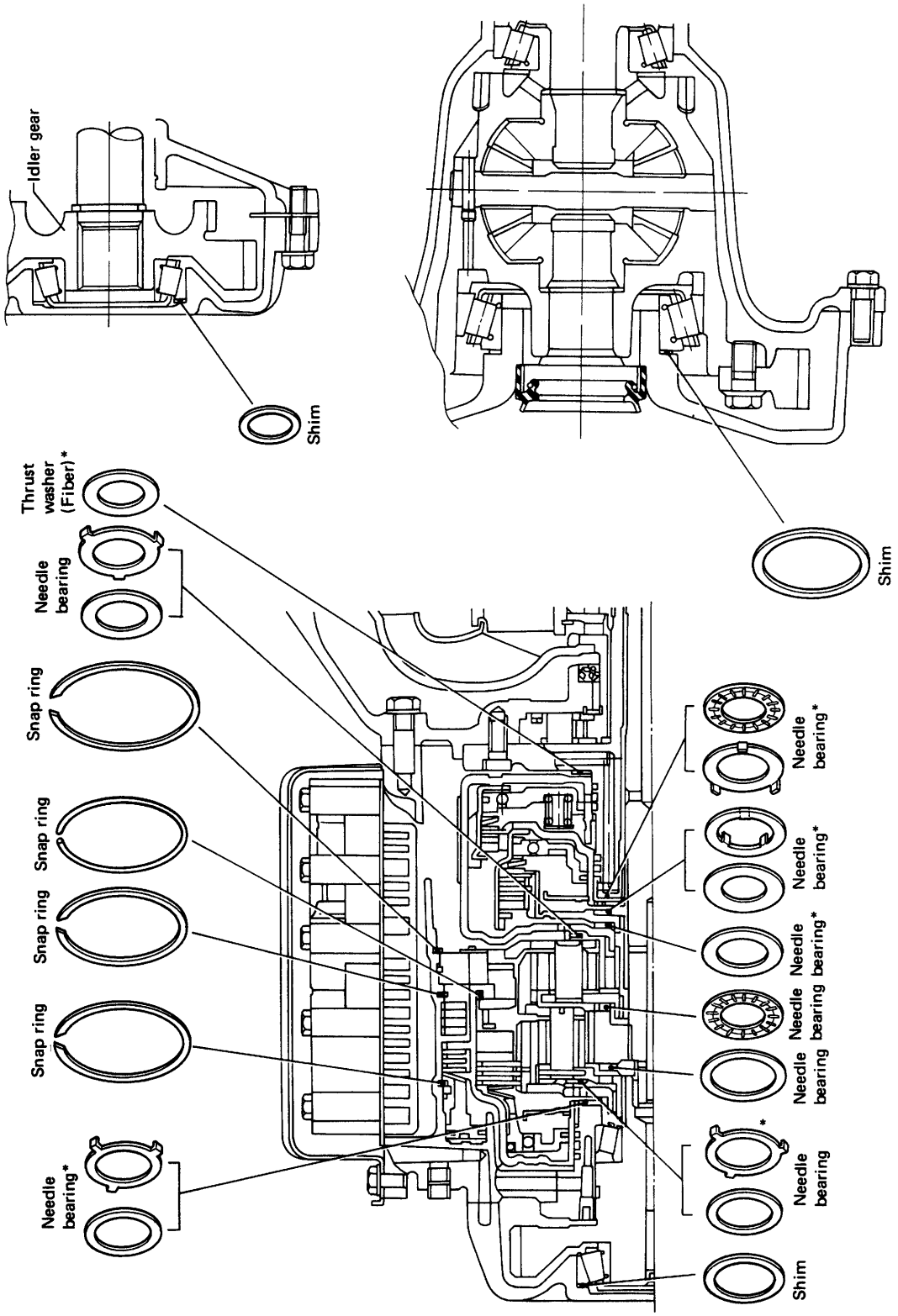
Make sure that lock pin is flush with case.

6. Install governor drive gear.



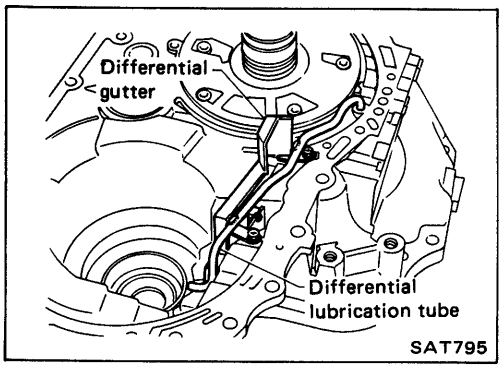
7. Press on differential side bearing inner cone and outer race.
8. Install final gear.

When installing/assembling needle bearing and bearing race, use the following illustration as a guide to installation procedures and locations.

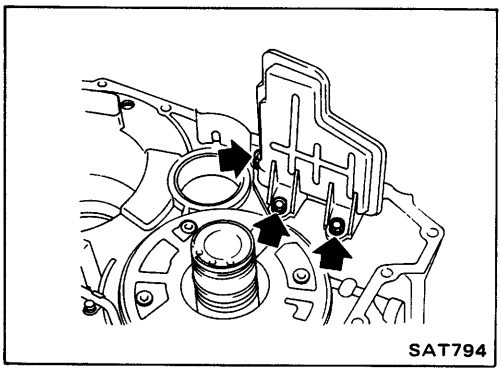


When installing, apply vaseline to parts with "*" so that they will not drop off.

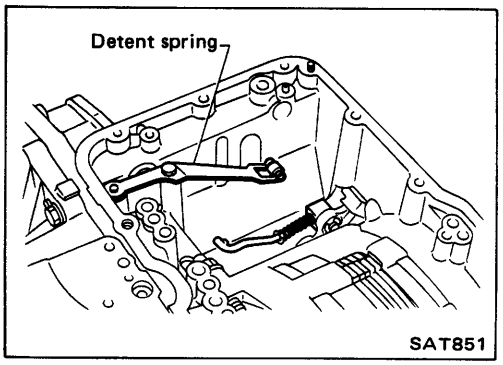
SAT850



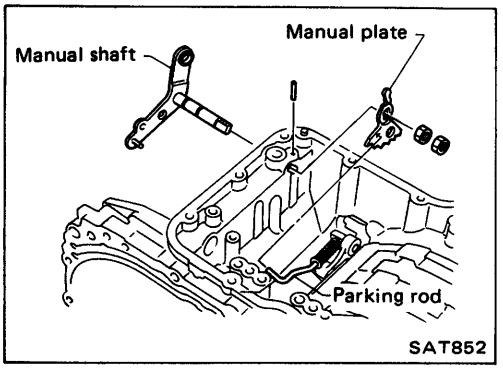
1. Install differential lubrication tube and differential gutter to converter housing.



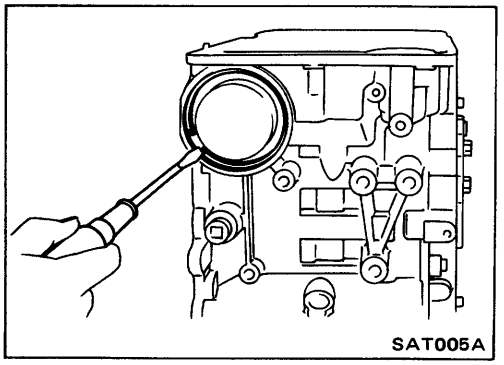
2. Install oil strainer.



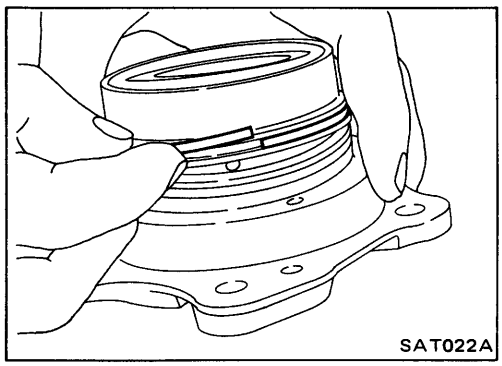
3. Install detent spring assembly.



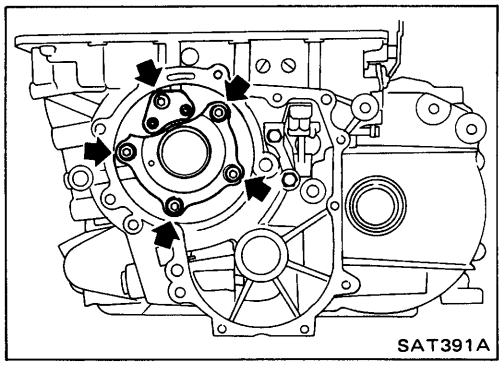
4. Pass parking rod into the hole in the manual plate and then install manual plate on manual shaft.



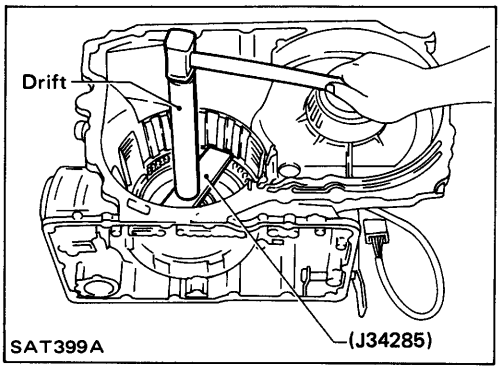
5. Install band brake servo, retainer and return spring and secure with snap ring.


SAT022A

6. Install bearing retainer assembly.
a. Install seal rings onto bearing retainer with great care. Clean the grooves and liberally apply petroleum jelly to hold the rings in place. Otherwise, they could be cut or deformed when the low clutch and carrier assembly are installed.

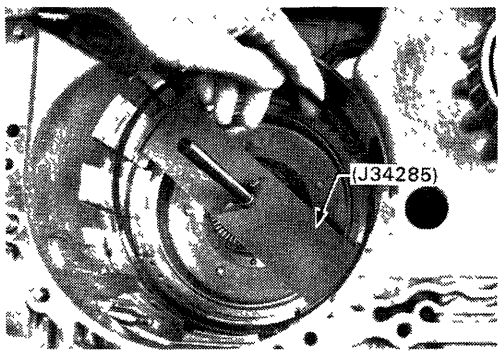

SAT391A

b. Install bearing retainer assembly.

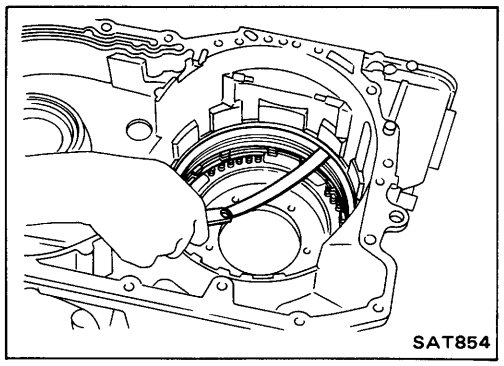


SAT399A

7. Lubricate low and reverse brake piston seal, then install piston by tapping it evenly with Tool.



8. Install low and reverse brake retainer, and secure with snap ring.
9. Install low and reverse brake driven & drive plates and retaining plate, then secure with snap ring.


SAT854

10. After low and reverse brake has been completely assembled, measure clearance between snap ring and retainer plate. If measurement exceeds specifications, it can be adjusted by replacing retainer plate with one of a different thickness.

Low and reverse brake clearance:

Standard

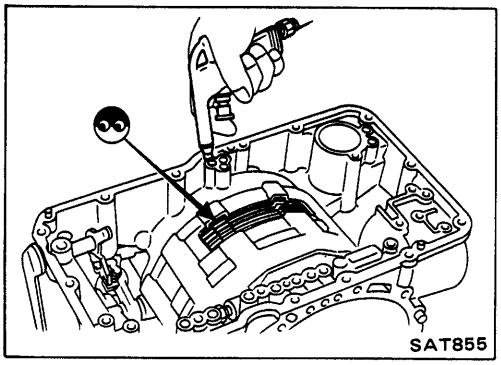
2.2 - 2.6 mm (0.087 - 0.102 in)

Allowable limit

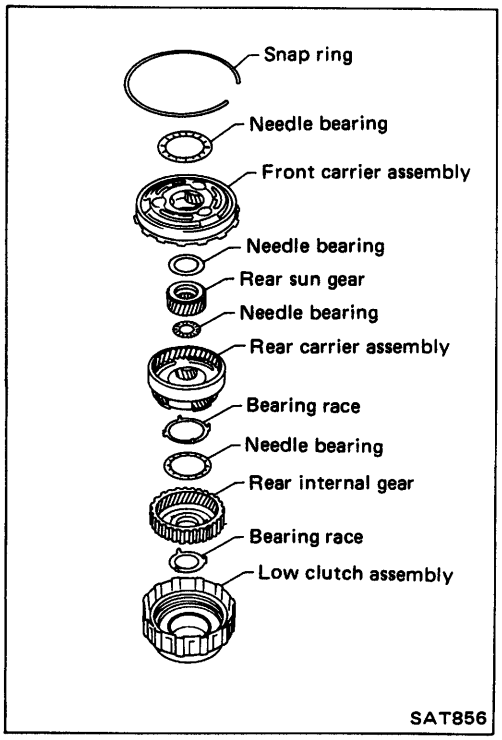
3.6 mm (0.142 in)

Retaining plate of low & reverse brake

Thickness mm (in)	Part number
3.4 (0.134)	31667-21X00
3.6 (0.142)	31667-21X01
3.8 (0.150)	31667-21X02
4.0 (0.157)	31667-21X03
4.2 (0.165)	31667-21X04
4.4 (0.173)	31667-21X05
4.6 (0.181)	31667-21X06
4.8 (0.189)	31667-21X07
5.0 (0.197)	31667-21X08

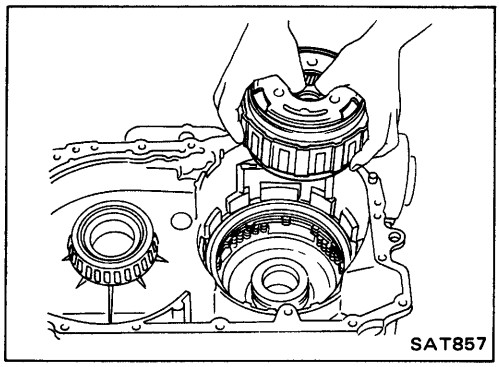

SAT855

Check low & reverse brake operation using air.

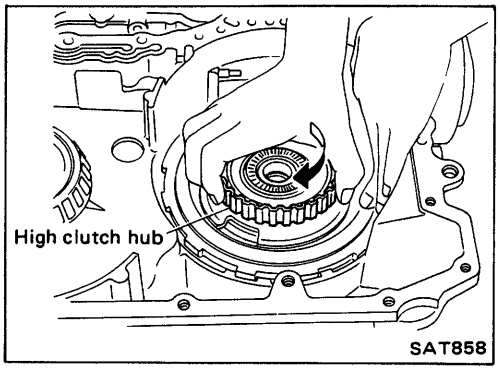


SAT856

11. Assemble front carrier, rear carrier and low clutch.

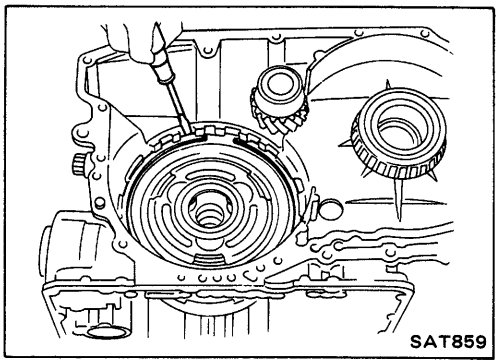

SAT857

12. Install carrier set.

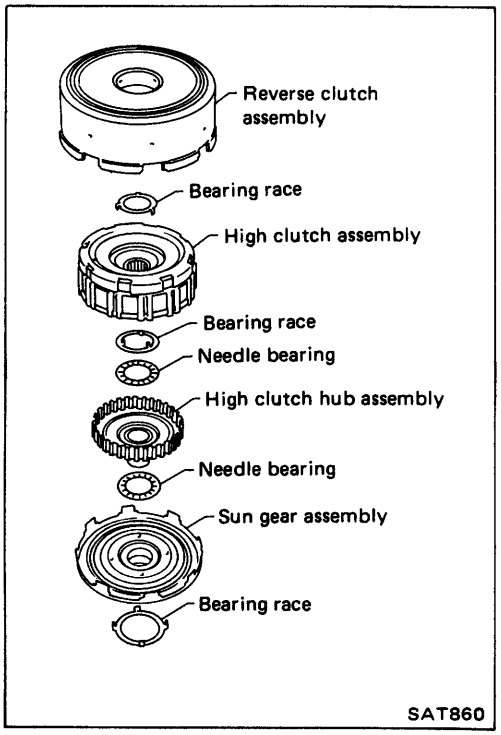


SAT858

13. Install one-way clutch assembly while rotating front carrier with high clutch hub.

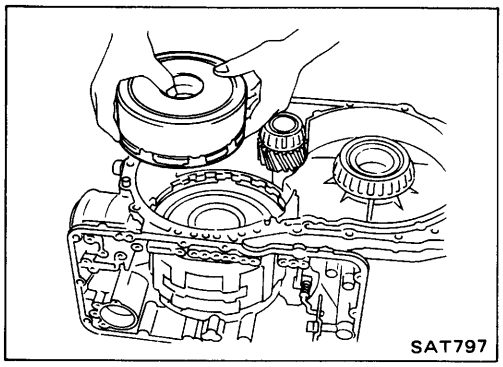

SAT859

14. Remove high clutch hub, and install clutch snap ring.

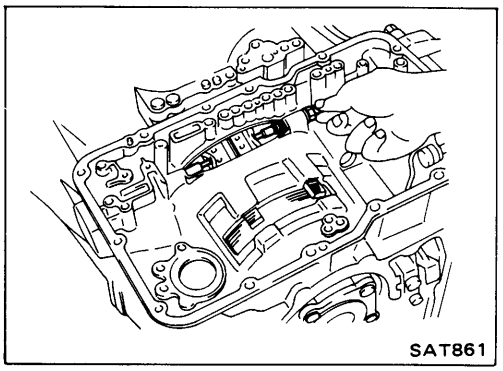


SAT860

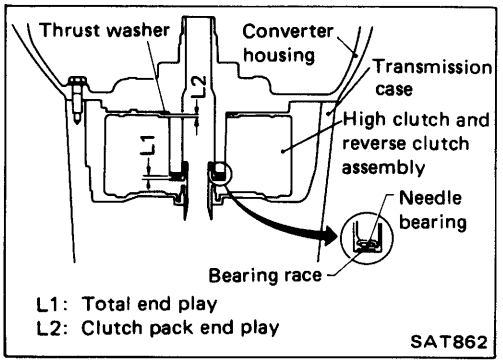
15. Assemble reverse clutch and high clutch.


SAT797

16. Install reverse and high clutch as a pack.


SAT861

17. Install brake band and anchor pin. Temporarily tighten anchor bolt by hand.

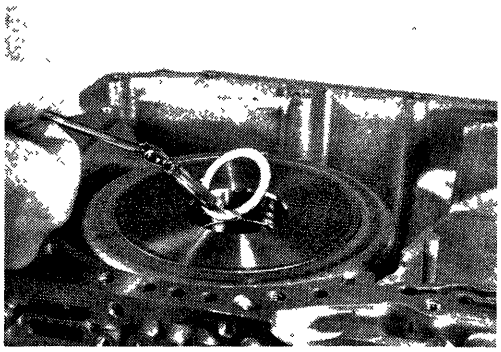


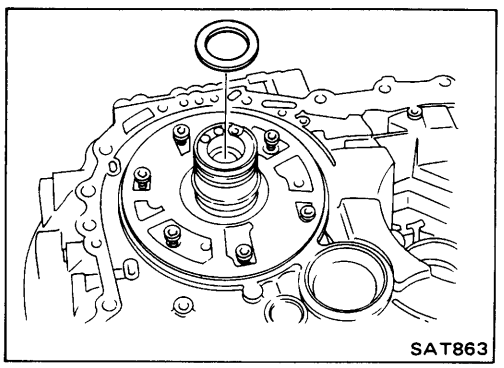
SAT862

18. Adjust total end play and clutch pack end play as follows:

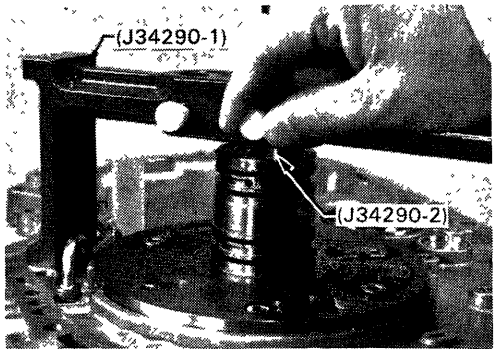
Total end play

a. Remove thrust bearing race from high clutch drum.

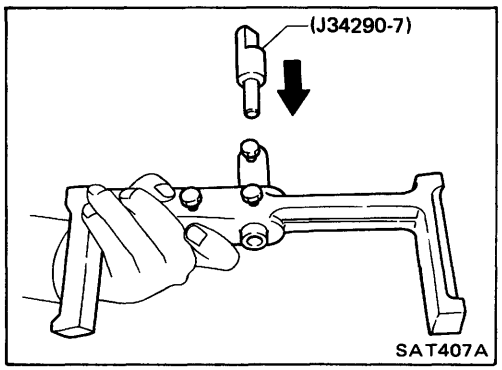



SAT863

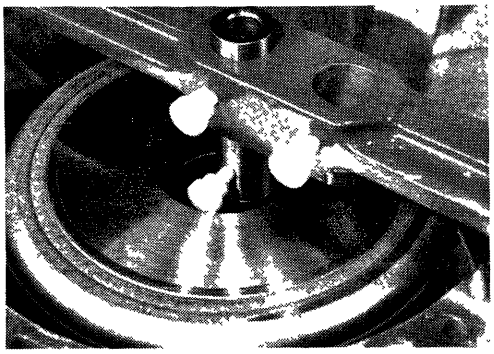
b. Install needle bearing on top of oil pump cover.



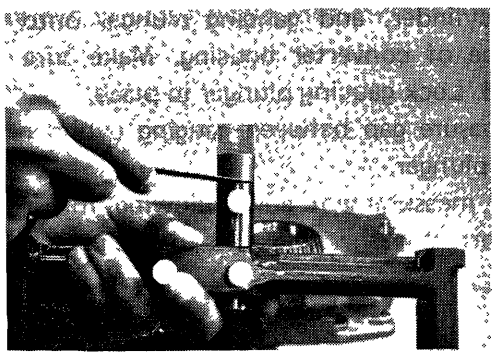
c. Place Tools (bridge and gauging cylinder) on machined gasket surface of converter housing. Allow gauging cylinder to rest on needle bearing and lock it in place with thumbscrew.



d. Insert Tool (total end play gauging plunger) into gauging cylinder.



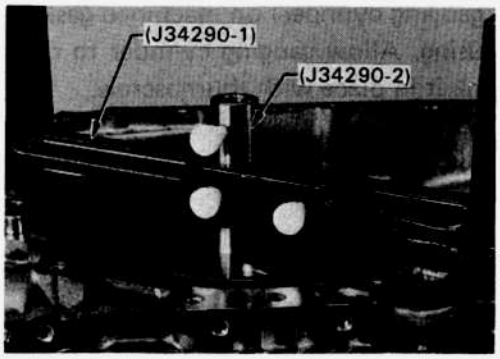
e. Place bridge, legs up, onto machined gasket surface of transmission case, allowing gauging plunger to rest on surface where bearing race was removed. Lock plunger in place.



f. Remove bridge and use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.
g. Use your feeler gauge reading to select appropriate bearing race thickness from following chart:

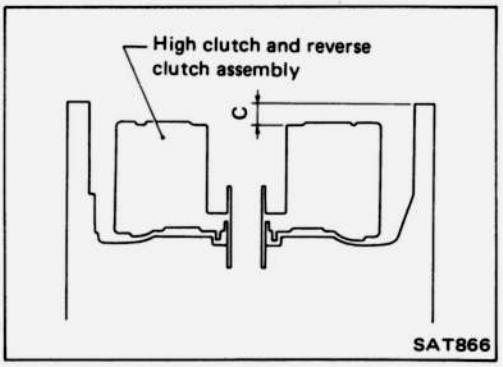
Oil pump housing bearing race

Thickness mm (in)	Part number
0.8 (0.031)	31429-21X00
1.0 (0.039)	31429-21X01
1.2 (0.047)	31429-21X02
1.4 (0.055)	31429-21X03
1.6 (0.063)	31429-21X04
1.8 (0.071)	31429-21X05
2.0 (0.079)	31429-21X06

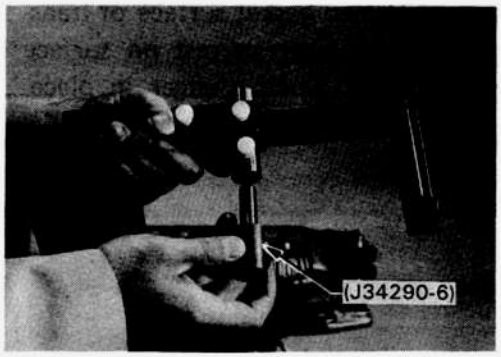


Clutch pack end play

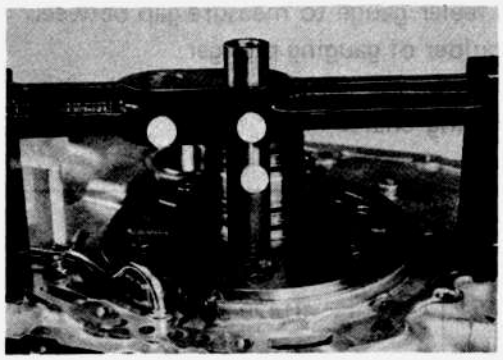
a. Place Tools (bridge and gauging cylinder) onto machined gasket surface of transmission case and allow cylinder to rest on high clutch drum. Lock cylinder into place.

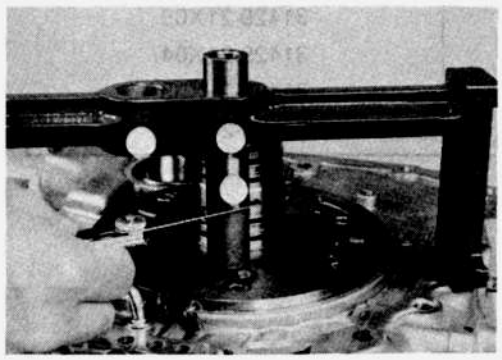


- You are now measuring dimension "C".



b. Now, insert Tool (clutch pack gauging plunger) into gauging cylinder.

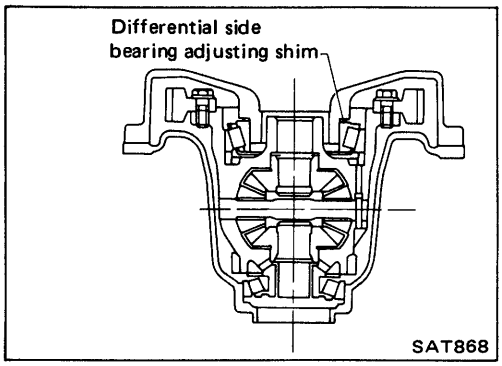




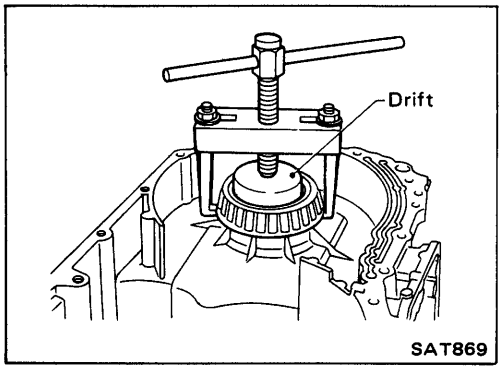
c. Place bridge, gauging cylinder, and gauging plunger onto machined gasket surface of converter housing. Make sure thrust washer is removed. Lock gauging plunger in place.
d. Use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.
e. Use your feeler gauge measurement and following thrust washer chart to select correct washer thickness to give proper clutch pack end play:

Clutch pack thrust washer

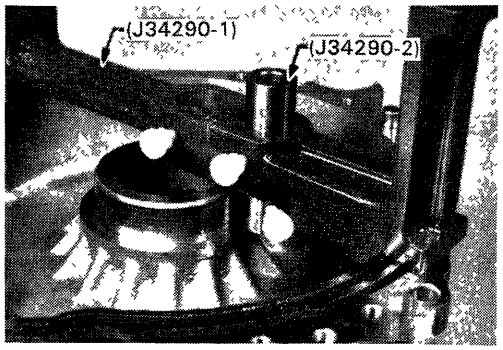
Thickness mm (in)	Part number
0.7 (0.028)	31528-21X00
0.9 (0.035)	31528-21X01
1.1 (0.043)	31528-21X02
1.3 (0.051)	31528-21X03
1.5 (0.059)	31528-21X04
1.7 (0.067)	31528-21X05
1.9 (0.075)	31528-21X06



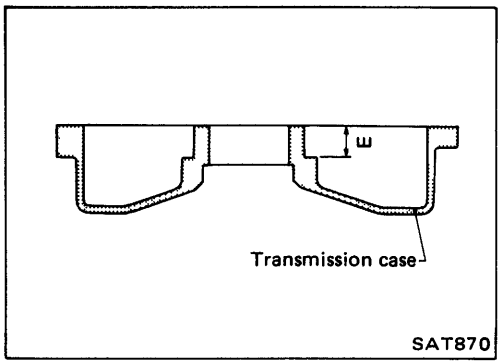
19. Adjust differential side bearing preload as follows:



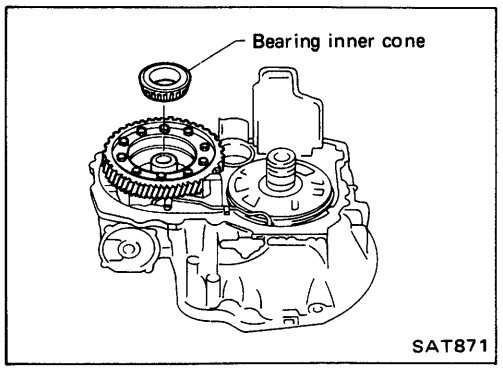
a. Remove left side bearing inner cone from transmission case.



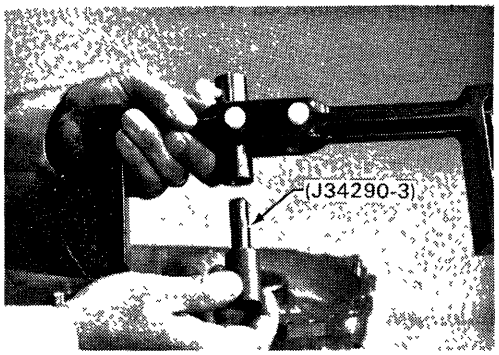
b. Place Tools (bridge and gauging cylinder) on machined gasket surface of transmission case and allow gauging cylinder to rest on bearing mating surface. Lock gauging cylinder in place.



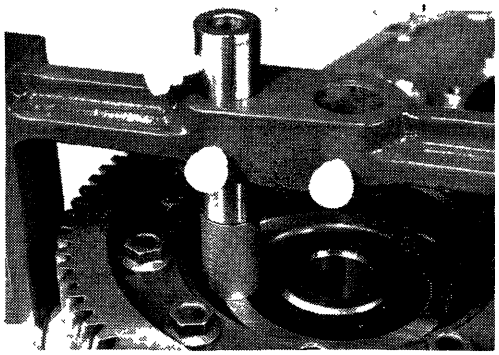
- You are now measuring dimension "E".



c. Put final drive assembly into converter housing, then put side bearing inner cone on differential case.
d. Hold inner bearing cone in place while spinning final drive assembly in order to seat bearings.

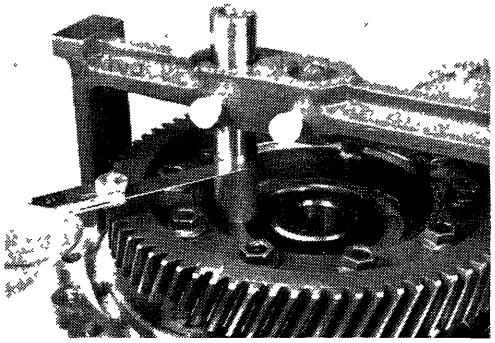


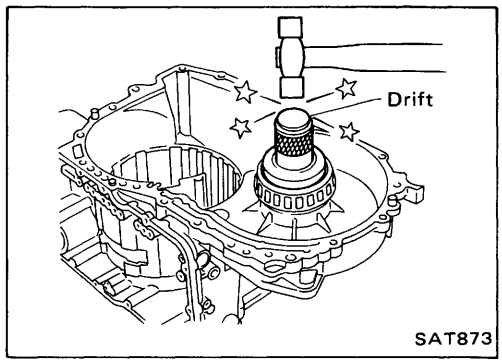
e. Insert Tool (differential side bearing gauging plunger) into gauging cylinder.



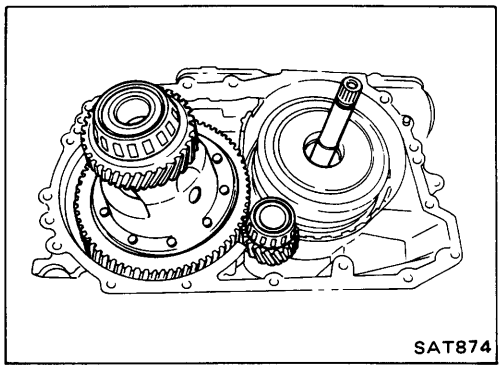
f. Place bridge, gauging cylinder, and gauging plunger onto machined gasket surface of converter housing and allow gauging plunger to rest on surface of bearing inner cone. Lock plunger in place.
g. Use feeler gauge to measure clearance between gauging cylinder and shoulder of the gauging plunger.
h. Use your feeler gauge reading and following chart to select appropriate side bearing preload shim(s).

Differential side bearing adjusting shim:
Refer to S.D.S.

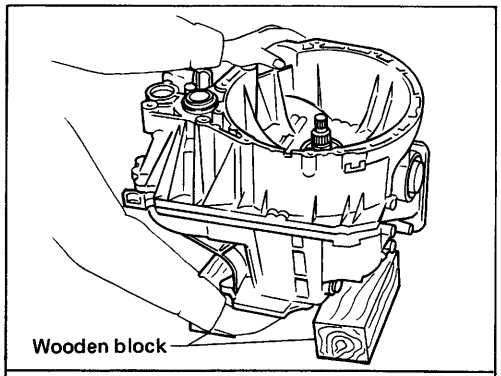


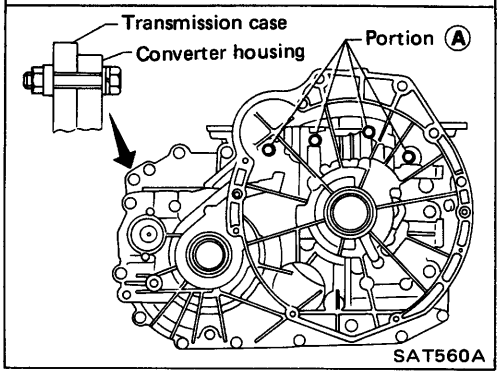


i. Install selected shims and left side bearing inner cone.


SAT874

20. Place transmission case onto wooden blocks, and install reduction pinion gear, differential case assembly and input shaft.

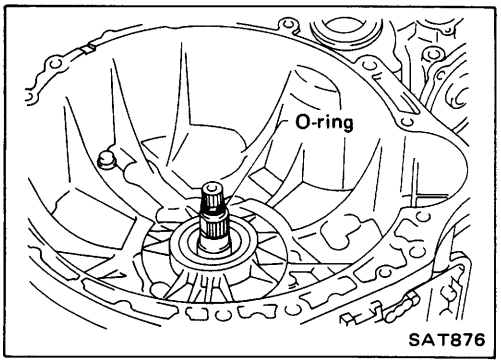




SAT560A

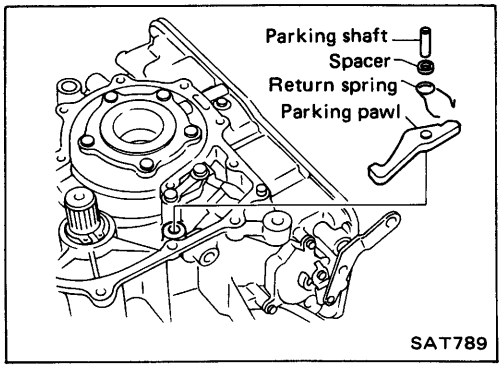
21. Place gasket on transmission case and install converter housing while assuring that reduction pinion gear does not interfere with transmission case.

Always use new bolts at portion Ⓐ as they are self-sealing bolts. Apply A.T.F. to thread of other bolts by that fix converter housing to transmission case when installing them.



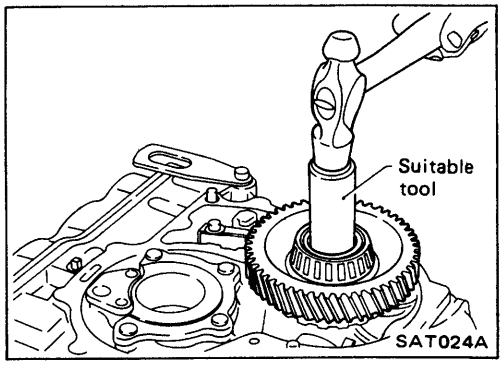
SAT876

22. Install O-ring onto input shaft.

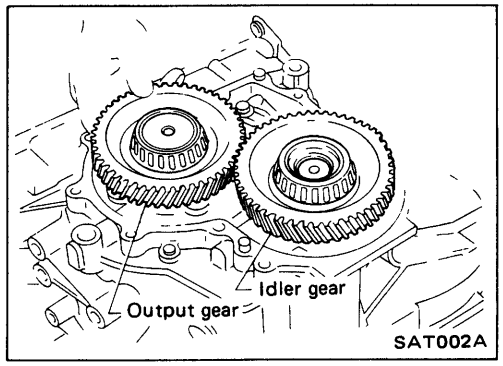


SAT789

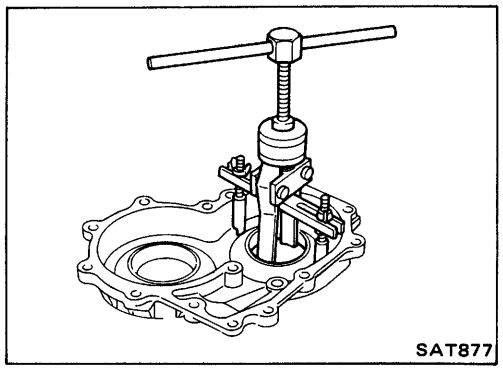
23. Install parking pawl, return spring, pawl shaft and spacer.



24. Install idler gear.

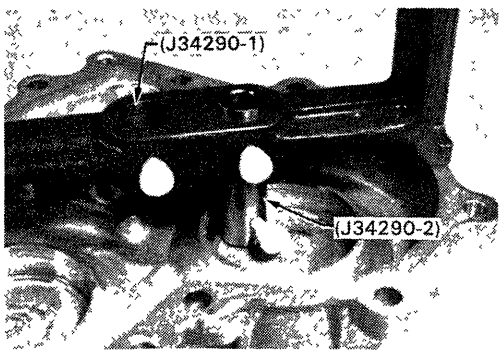


25. Install output gear.

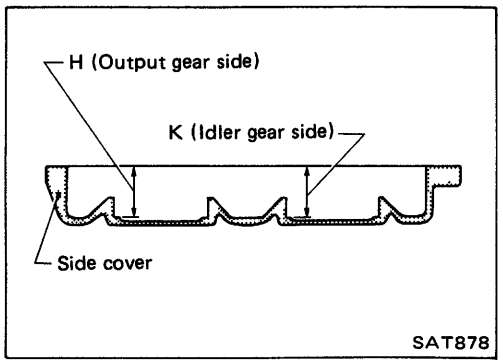


26. Adjust output shaft and idler gear bearing preload as follows:

a. Remove output gear and idler gear bearing outer races and shims. (The races will interchange, so be sure to keep each race with its correct bearing.)

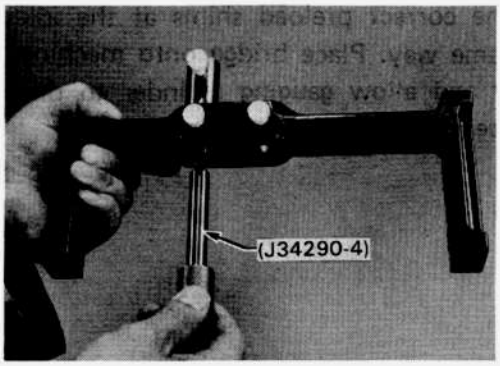


b. Place Tools (bridge and gauging cylinder) onto machined gasket surface of side cover. Allow gauging cylinder to drop into output gear bearing race bore until it bottoms. Lock cylinder in place with the thumbscrew.

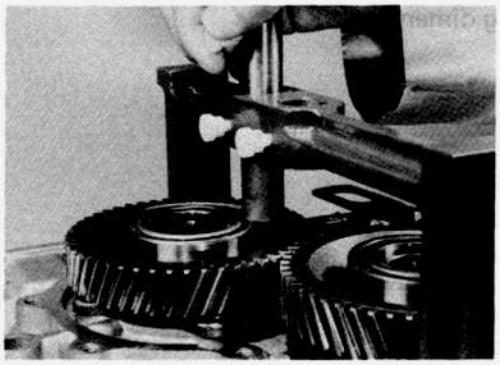


- You are now measuring dimension "H".

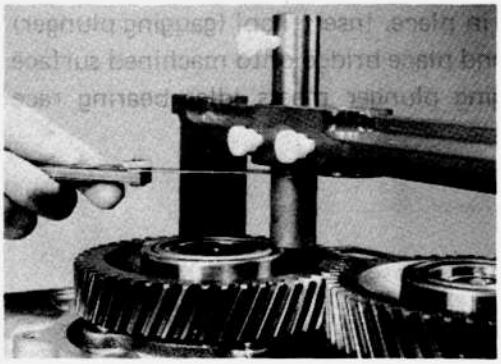
c. Put correct bearing races on the output gear and idler gear bearings, and turn races to seat bearings.



d. Place Tool (output gauging plunger) into the gauging cylinder.



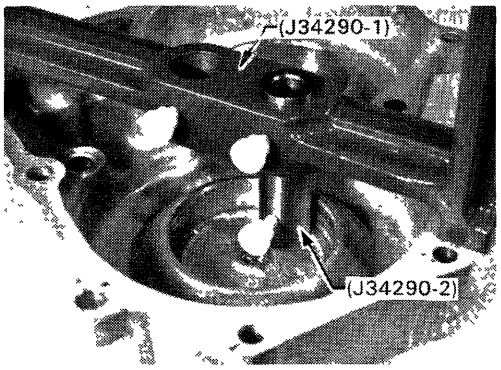
e. Now, place bridge onto machined gasket surface of transmission case and allow gauging plunger to drop onto rear surface of output gear bearing race.



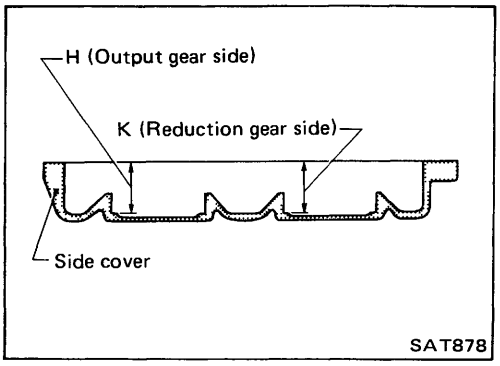
f. Lock gauging plunger in place with thumbscrew. Use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.
g. Use feeler gauge reading to select the correct shim(s) from following chart:

Output shaft bearing adjusting shim

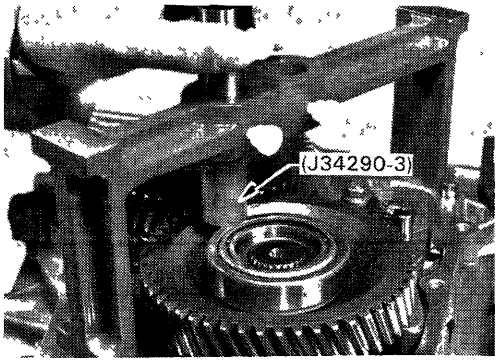
Thickness mm (in)	Part number
0.12 (0.0047)	31499-21X00
0.16 (0.0063)	31499-21X01
0.20 (0.0079)	31499-21X02
0.24 (0.0094)	31499-21X03
0.28 (0.0110)	31499-21X04
0.32 (0.0126)	31499-21X05
0.36 (0.0142)	31499-21X06
0.40 (0.0157)	31499-21X07
0.44 (0.0173)	31499-21X08
0.48 (0.0189)	31499-21X09
0.52 (0.0205)	31499-21X10
0.56 (0.0220)	31499-21X11
0.60 (0.0236)	31499-21X12
0.64 (0.0252)	31499-21X13
0.68 (0.0268)	31499-21X14
0.72 (0.0283)	31499-21X15
0.76 (0.0299)	31499-21X16
0.80 (0.0315)	31499-21X17
0.84 (0.0331)	31499-21X18
0.88 (0.0346)	31499-21X19
0.92 (0.0362)	31499-21X20
1.44 (0.0567)	31499-21X21
1.96 (0.0772)	31499-21X22



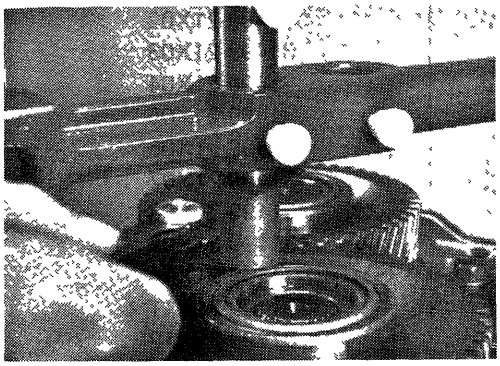
h. Now, measure for the correct preload shims at the idler gear bearing in the same way. Place bridge onto machined surface of side cover and allow gauging cylinder to drop until it contacts idler bearing race mating surface.



- You are now measuring dimension "K".



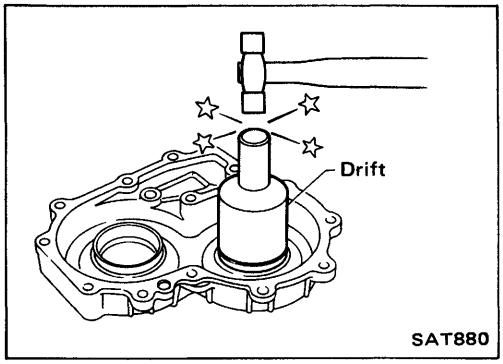
i. Lock gauging cylinder in place. Insert Tool (gauging plunger) into gauging cylinder and place bridge onto machined surface of case, so that gauging plunger meets idler bearing race rear surface.



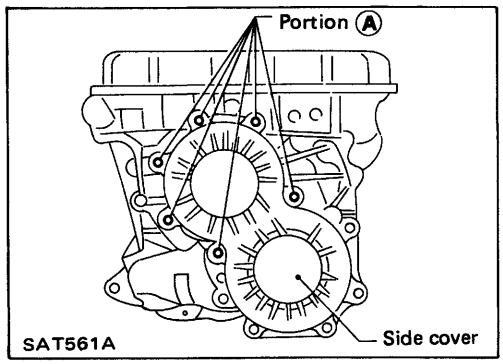
j. Lock gauging plunger in place and use feeler gauge to measure gap between gauging cylinder and gauging plunger.
k. Use your measured distance and the following chart to select correct shim(s) for idler gear bearing preload.

Idler gear bearing adjusting shim

Thickness mm (in)	Part number
0.36 (0.0142)	31499-21X06
0.40 (0.0157)	31499-21X07
0.44 (0.0173)	31499-21X08
0.48 (0.0189)	31499-21X09
0.52 (0.0205)	31499-21X10
0.56 (0.0220)	31499-21X11
0.60 (0.0236)	31499-21X12
0.64 (0.0252)	31499-21X13
0.68 (0.0268)	31499-21X14
0.72 (0.0283)	31499-21X15
0.76 (0.0299)	31499-21X16
0.80 (0.0315)	31499-21X17
0.84 (0.0331)	31499-21X18
0.88 (0.0346)	31499-21X19
0.92 (0.0362)	31499-21X20
1.44 (0.0567)	31499-21X21
1.96 (0.0772)	31499-21X22

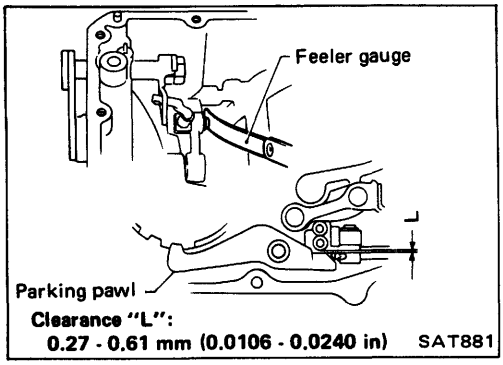


l. Install selected shim(s) and bearing outer races.



27. Install side cover and gasket.

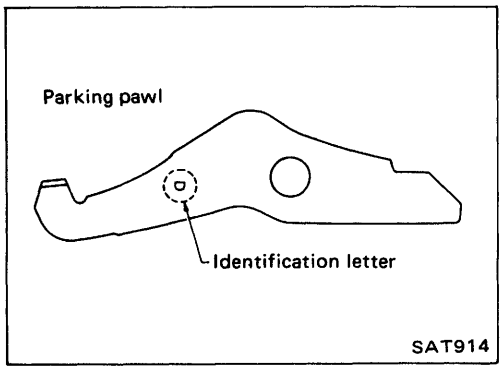
Always use new bolts at portion Ⓐ as they are self-sealing bolts. Apply A.T.F. to thread of other bolts by that fix side cover to transmission case when installing them.



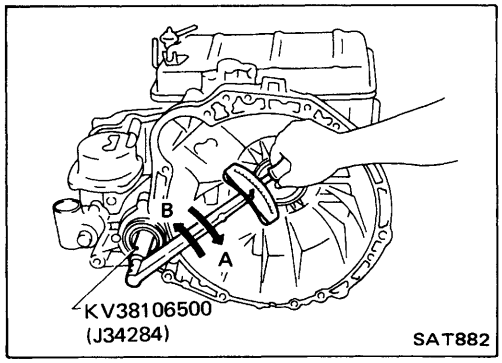
28. Move manual lever until parking pawl engages idler gear. Measure clearance between parking pawl and parking actuator.

If clearance is outside specifications, replace parking pawl.

Part number	Identification letter
31989-21X00	D
31989-21X01	E
31989-21X02	F



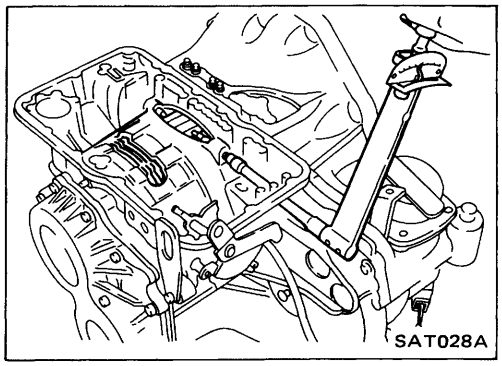
Example:
When parking pawl with identification letter "E" is used:
Clearance "L" is larger → Replace with parking pawl with identification letter "D".
Clearance "L" is smaller → Replace with parking pawl with identification letter "F".



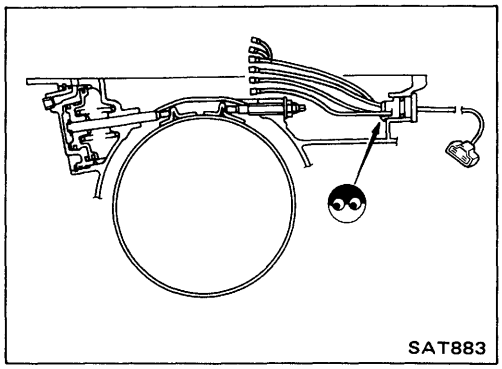
29. Insert Tool into final drive portion to see if internal parts rotates smoothly. Rotating in direction "B" is slightly harder than in direction "A".

If abnormalities are noted, proceed with the following.

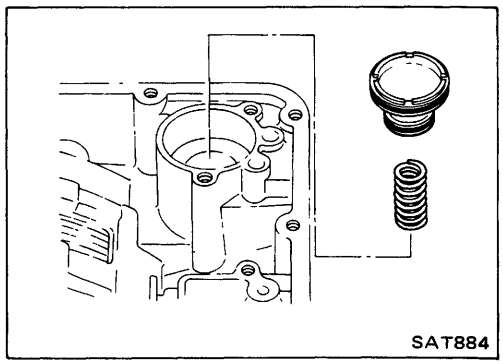
- Disassemble parts to see if they are properly assembled.
- Readjust bearing preloads of final drive, output shaft and idler gear.



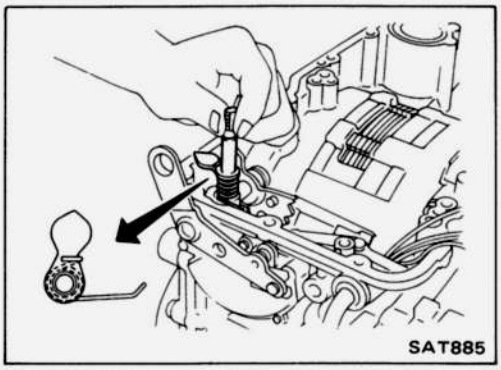
30. Adjust brake band.
1) First tighten anchor end pin.
2) Back off anchor end pin 5-1/4 turns.
3) Tighten lock nut while holding anchor end pin stationary.



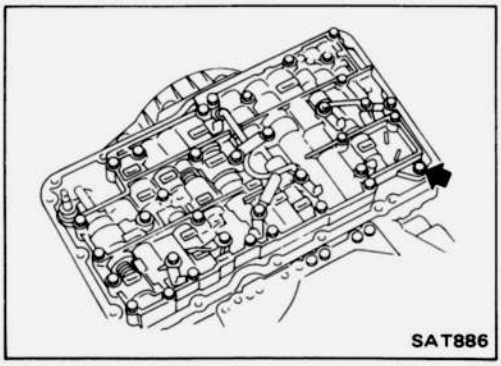
31. Install terminal assembly, paying attention to the direction of its hook.



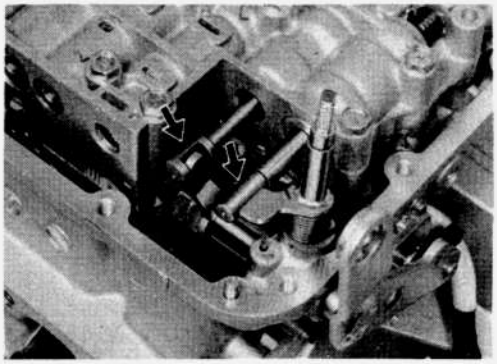
32. Install accumulator and spring.


SAT885

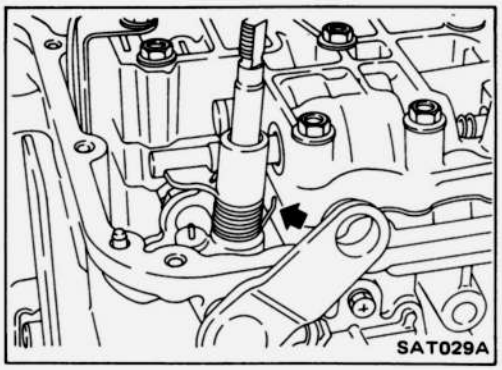
33. Install throttle shaft and return spring.


SAT886

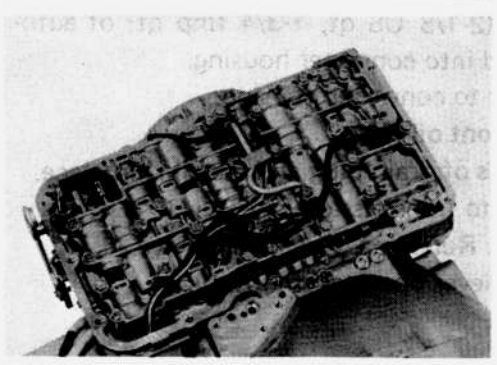
34. Insert manual valve to control valve body, then assemble them to transmission case.
    Pointed by arrow:
    : 3.7 - 5.0 N·m
    (0.38 - 0.51 kg-m, 2.7 - 3.7 ft-lb)
    Others:
    : 7 - 9 N·m
    (0.7 - 0.9 kg-m, 5.1 - 6.5 ft-lb)



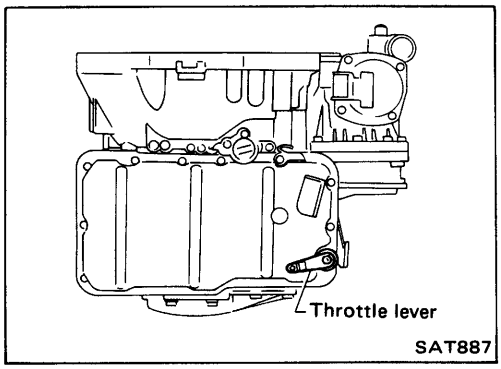
- **Pay attention to the direction of manual and detent valves' grooves.**


SAT029A

35. Set throttle shaft return spring as shown at left.

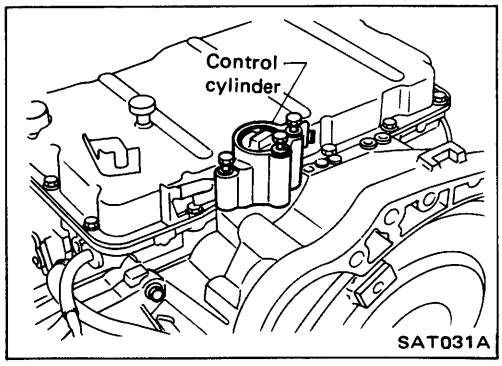


36. Connect harness connectors between terminal assembly and solenoids.

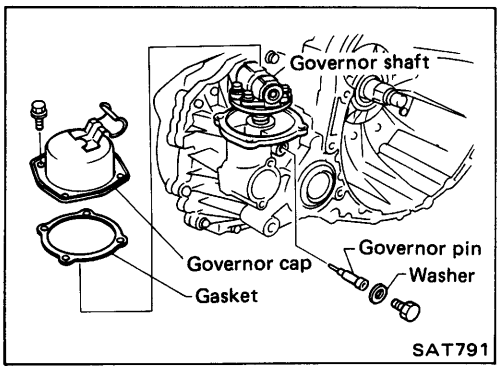


37. Put gasket on transmission case and install valve cover and throttle lever.

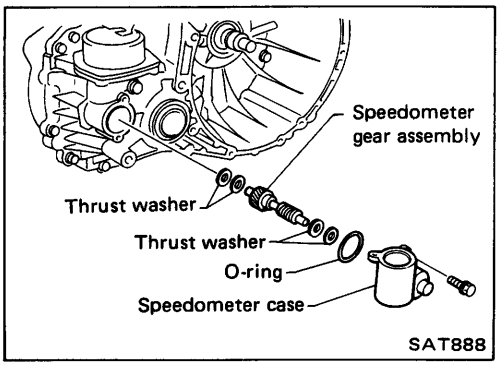
Clean valve cover securing bolts and apply locking sealant to threads of bolts.



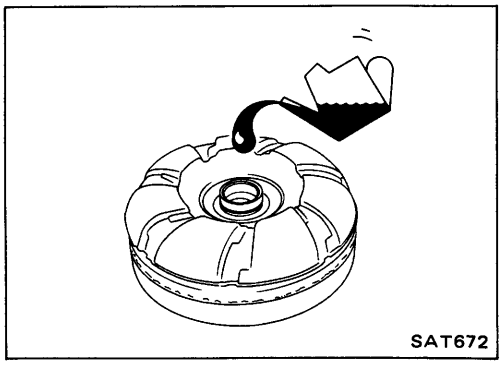
38. Install control cylinder.



39. Install governor parts.



40. Install speedometer parts.



41. Pour approx. 2 liters (2-1/8 US qt, 1-3/4 Imp qt) of automatic transmission fluid into converter housing.
42. Install torque converter to converter housing.

Be careful not to scratch front oil seal.

43. Apply sealant to threads of drain plug and install it in place.
44. Install inhibitor switch to transmission case.
45. **Adjust inhibitor switch. Refer to On-vehicle Service.**
46. Make sure that manual lever operates smoothly.

General Specifications

Applied model	GA16i	CA18DE
Automatic transaxle model	RL3F01A	RL4F02A
Automatic transaxle assembly Model code number	15X66	23X73
Transaxle gear ratio 1st 2nd 3rd 4th Reverse Final drive	 2.826 1.543 1.000 — 2.364 3.600	 2.785 1.545 1.000 0.694 2.272 4.133
Recommended oil	Automatic transmission fluid Type DEXRON ™	
Oil capacity ℓ (US qt, Imp qt)	6.3 (6-5/8, 5-1/2)	6.8 (7-1/4, 6)

Specifications and Adjustment (RL3F01A)

High-reverse clutch (Front) Number of drive plates	3	
Number of driven plates	3	
Clearance mm (in) Standard Allowable limit	 1.0 - 1.4 (0.039 - 0.055) 2.0 (0.079)	
Drive plate thickness mm (in) Standard Allowable limit	 1.50 - 1.65 (0.0591 - 0.0650) 1.4 (0.055)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.4 (0.134)	31537-01X05
	3.6 (0.142)	31537-01X00
	3.8 (0.150)	31537-01X01
	4.0 (0.157)	31537-01X02
	4.2 (0.165)	31537-01X03
	4.4 (0.173)	31537-01X04
Forward clutch (Rear) Number of drive plates	4	
Number of driven plates	4	
Clearance mm (in) Standard Allowable limit	 0.5 - 0.8 (0.020 - 0.031) 1.6 (0.063)	
Drive plate thickness mm (in) Standard Allowable limit	 1.50 - 1.65 (0.0591 - 0.0650) 1.4 (0.055)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.4 (0.134)	31537-01X05
	3.6 (0.142)	31537-01X00
	3.8 (0.150)	31537-01X01
	4.0 (0.157)	31537-01X02
	4.2 (0.165)	31537-01X03
	4.4 (0.173)	31537-01X04

Specifications and Adjustment (Cont'd)

Low & reverse brake Number of drive plates	5	
Number of driven plates	5	
Clearance mm (in) Standard Allowable limit	1.80 - 2.20 (0.0709 - 0.0866) 3.2 (0.126)	
Drive plate thickness mm (in) Standard Allowable limit	1.9 - 2.05 (0.0748 - 0.0807) 1.8 (0.071)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.6 (0.142)	31667-01X00
	3.8 (0.150)	31667-01X01
	4.0 (0.157)	31667-01X02
	4.2 (0.165)	31667-01X03
	4.4 (0.173)	31667-01X04
Brake band Piston size mm (in) Big dia. Small dia.	68 (2.68) 40 (1.57)	
Descrimination of separator plate	CB*1	
Oil pump clearance mm (in) Outer gear-pump housing Standard Allowable limit	0.20 - 0.30 (0.0079 - 0.0118) 0.35 (0.0138)	
Outer gear-crescent Standard Allowable limit	0.20 - 0.30 (0.0079 - 0.0118) 0.35 (0.0138)	
Gears-pump housing Standard Allowable limit	0.02 - 0.04 (0.0008 - 0.0016) 0.08 (0.0031)	
Seal ring-ring groove Standard Allowable limit	0.10 - 0.25 (0.0039 - 0.0098) 0.25 (0.0098)	
Planetary carrier mm (in) Clearance between pinion washer and planetary carrier Standard Allowable limit	0.20 - 0.70 (0.0079 - 0.0276) 0.80 (0.0315)	

*1: Punch mark on separator plate

OUTPUT SHAFT BEARING PRELOAD

0.35 - 0.47 N·m (3.6 - 4.8 kg-cm, 3.1 - 4.2 in-lb)

OUTPUT SHAFT BEARING PRELOAD ADJUSTING SHIM

Thickness mm (in)	Part number
0.11 (0.0043)	31499-01X00
0.13 (0.0051)	31499-01X01
0.15 (0.0059)	31499-01X02
0.17 (0.0067)	31499-01X03
0.19 (0.0075)	31499-01X04
0.30 (0.0118)	31499-01X05
0.40 (0.0157)	31499-01X06
0.50 (0.0197)	31499-01X07
0.60 (0.0236)	31499-01X08
0.70 (0.0276)	31499-01X09
0.80 (0.0315)	31499-01X10
0.90 (0.0354)	31499-01X11
1.00 (0.0394)	31499-01X12

OUTPUT SHAFT END PLAY

0.25 - 0.55 mm (0.0098 - 0.0217 in)

OUTPUT SHAFT END PLAY ADJUSTING SHIM

Thickness mm (in)	Part number
0.3 (0.012)	31484-01X00
0.5 (0.020)	31484-01X01
0.7 (0.028)	31484-01X02
0.9 (0.035)	31484-01X03
1.1 (0.043)	31484-01X04
1.3 (0.051)	31484-01X05
1.5 (0.059)	31484-01X06
1.7 (0.067)	31484-01X07

Specifications and Adjustment (Cont'd)

DIFFERENTIAL SIDE BEARING PRELOAD

5.9 - 7.4 N·m (60 - 75 kg-cm, 52 - 65 in-lb)

Differential side bearing preload adjusting shim

Thickness mm (in)	Part number
0.44 (0.0173)	38454-01X60
0.48 (0.0189)	38454-01X61
0.52 (0.0205)	38454-01X62
0.56 (0.0220)	38454-01X63
0.60 (0.0236)	38454-01X64
0.64 (0.0252)	38454-01X65
0.68 (0.0268)	38454-01X66
0.72 (0.0283)	38454-01X67
0.76 (0.0299)	38454-01X68
0.80 (0.0315)	38454-01X69
0.84 (0.0331)	38454-01X70
0.88 (0.0346)	38454-01X71
0.92 (0.0362)	38454-01X72

OIL PUMP OUTER GEAR

Thickness mm (in)	Part number
14.99 - 15.00 (0.5902 - 0.5906)	31347-01X00
14.98 - 14.99 (0.5898 - 0.5902)	31347-01X01
14.97 - 14.98 (0.5894 - 0.5898)	31347-01X02
14.96 - 14.97 (0.5890 - 0.5894)	31347-01X03

OIL PUMP INNER GEAR

Thickness mm (in)	Part number
14.99 - 15.00 (0.5902 - 0.5906)	31346-01X00
14.98 - 14.99 (0.5898 - 0.5902)	31346-01X01
14.97 - 14.98 (0.5894 - 0.5898)	31346-01X02
14.96 - 14.97 (0.5890 - 0.5894)	31346-01X03

CLEARANCE BETWEEN SIDE GEAR AND DIFFERENTIAL CASE WITH WASHER

0.3 mm (0.012 in) or less

SIDE GEAR THRUST WASHER

Thickness mm (in)	Part number
0.76 - 0.81 (0.0299 - 0.0319)	38424-01M00 or 01M10
0.81 - 0.86 (0.0319 - 0.0339)	38424-01M01 or 01M11
0.86 - 0.91 (0.0339 - 0.0358)	38424-01M02 or 01M12
0.91 - 0.96 (0.0358 - 0.0378)	38424-01M03 or 01M13

STALL REVOLUTION

Engine model	rpm
GA16i	2,300 - 2,600

Tightening Torque

Unit	N·m	kg-m	ft-lb
Drive plate to torque converter	39 - 49	4.0 - 5.0	29 - 36
Converter housing to engine	30 - 40	3.1 - 4.1	22 - 30
Transaxle case to converter housing	19 - 23	1.9 - 2.3	14 - 17
Transaxle case to front cover	19 - 23	1.9 - 2.3	14 - 17
Oil pan to transaxle case	5 - 7	0.5 - 0.7	3.6 - 5.1
Bearing retainer to transaxle case	19 - 25	1.9 - 2.5	14 - 18
Piston stem (when adjusting band brake)	4 - 5 *	0.4 - 0.5 *	2.9 - 3.6 *
Piston stem lock nut	16 - 22	1.6 - 2.2	12 - 16
Low and reverse brake piston retainer	7 - 9	0.7 - 0.9	5.1 - 6.5
Control valve body to transaxle case	7 - 9	0.7 - 0.9	5.1 - 6.5
Lower valve body to upper valve body	7 - 9	0.7 - 0.9	5.1 - 6.5
Final gear bolt	74 - 88	7.5 - 9.0	54 - 65

Unit	N·m	kg-m	ft-lb
Oil strainer to lower valve body	10 - 12	1.0 - 1.2	7 - 9
Governor valve body to governor shaft	5 - 7	0.5 - 0.7	3.6 - 5.1
Governor shaft securing nut	3.4 - 6.9	0.35 - 0.7	2.5 - 5.1
Idler gear (when adjusting turning frictional force)	26 - 36	2.7 - 3.7	20 - 27
Idler gear lock nut		**	
Throttle wire securing nut	5 - 7	0.5 - 0.7	3.6 - 5.1
Control cable securing nut	8 - 11	0.8 - 1.1	5.8 - 8.0
Inhibitor switch to transaxle case	2.0 - 2.5	0.20 - 0.26	1.4 - 1.9
Manual shaft lock nut	31 - 42	3.2 - 4.3	23 - 31
Test plug (oil pressure inspection hole)	5 - 10	0.5 - 1.0	3.6 - 7.2
Oil cooler pipe to transmission case	29 - 49	3.0 - 5.0	22 - 36
Gusset to converter housing	16 - 21	1.6 - 2.1	12 - 15

* : Turn back 2.5 turns after tightening.
**: Refer to Assembly.

Specifications and Adjustment (RL4F02A)

Transaxle model number	23X73	
High clutch Number of drive plates	4	
Number of driven plates	4	
Clearance mm (in) Standard Allowable limit	1.8 - 2.2 (0.071 - 0.087) 3.0 (0.118)	
Drive plate thickness mm (in) Standard Allowable limit	1.6 (0.063) 1.4 (0.055)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.6 (0.142)	31537-41X61
	3.8 (0.150)	31537-41X62
	4.0 (0.157)	31537-41X63
	4.2 (0.165)	31537-41X64
	4.4 (0.173)	31537-41X65
	4.6 (0.181)	31537-41X66
	4.8 (0.189)	31537-41X67
	5.0 (0.197)	31537-41X68
Low clutch Number of drive plates	4	
Number of driven plates	5	
Clearance mm (in) Standard Allowable limit	0.5 - 0.8 (0.020 - 0.031) 1.6 (0.063)	
Drive plate thickness mm (in) Standard Allowable limit	2.0 (0.079) 1.8 (0.071)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.8 (0.189)	31597-21X00
	5.0 (0.197)	31597-21X01
	5.2 (0.205)	31597-21X02
	5.4 (0.213)	31597-21X03
	5.6 (0.220)	31597-21X04
	5.8 (0.228)	31597-21X05
	6.0 (0.236)	31597-21X06

Transaxle model number	23X73	
Reverse clutch Number of drive plates	2	
Number of driven plates	2	
Clearance mm (in) Standard Allowable limit	0.5 - 0.8 (0.020 - 0.031) 1.2 (0.047)	
Drive plate thickness mm (in) Standard Allowable limit	2.0 (0.079) 1.8 (0.071)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.6 (0.181)	31537-21X15
	4.8 (0.189)	31537-21X16
	5.0 (0.197)	31537-21X17
	5.2 (0.205)	31537-21X18
	5.4 (0.213)	31537-21X19
	5.6 (0.220)	31537-21X20
	5.8 (0.228)	31537-21X21
	6.0 (0.236)	31537-21X22
Low & reverse brake Number of drive plates	6	
Number of driven plates	6	
Clearance mm (in) Standard Allowable limit	1.2 - 1.6 (0.047 - 0.063) 2.8 (0.110)	
Drive plate thickness mm (in) Standard Allowable limit	2.0 (0.079) 1.8 (0.071)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.4 (0.134)	31667-21X00
	3.6 (0.142)	31667-21X01
	3.8 (0.150)	31667-21X02
	4.0 (0.157)	31667-21X03
	4.2 (0.165)	31667-21X04
	4.4 (0.173)	31667-21X05
	4.6 (0.181)	31667-21X06
	4.8 (0.189)	31667-21X07
	5.0 (0.197)	31667-21X08

Specifications and Adjustment (Cont'd)

Transaxle model number	23X73
Brake band piston size mm (in)	
Big dia.	65 (2.56)
Small dia.	36 (1.42)
Planetary carrier mm (in)	
Clearance between pinion washer and planetary carrier	
Standard	0.20 - 0.70 (0.0079 - 0.0276)
Allowable limit	0.80 (0.0315)
Oil pump clearance mm (in)	
Cam ring — oil pump cover	
Standard	0.010 - 0.024 (0.0004 - 0.0009)
Allowable limit	0.034 (0.0013)
Rotor — oil pump cover	
Standard	0.017 - 0.031 (0.0007 - 0.0012)
Allowable limit	0.034 (0.0013)
Vane — oil pump cover	
Standard	0.017 - 0.031 (0.0007 - 0.0012)
Allowable limit	0.034 (0.0013)

CLUTCH PACK END PLAY

0.4 - 0.8 mm (0.016 - 0.031 in)

Clutch pack thrust washer

Thickness mm (in)	Part number
0.7 (0.028)	31528-21X00
0.9 (0.035)	31528-21X01
1.1 (0.043)	31528-21X02
1.3 (0.051)	31528-21X03
1.5 (0.059)	31528-21X04
1.7 (0.067)	31528-21X05
1.9 (0.075)	31528-21X06

TOTAL END PLAY

0.25 - 0.55 mm (0.0098 - 0.0217 in)

Oil pump housing bearing race (For total end play)

Thickness mm (in)	Part number
0.8 (0.031)	31429-21X00
1.0 (0.039)	31429-21X01
1.2 (0.047)	31429-21X02
1.4 (0.055)	31429-21X03
1.6 (0.063)	31429-21X04
1.8 (0.071)	31429-21X05
2.0 (0.079)	31429-21X06

Differential side bearing adjusting shim

Thickness mm (in)	Part number
0.12 (0.0047)	38453-21X13
0.16 (0.0063)	38453-21X14
0.20 (0.0079)	38453-21X15
0.24 (0.0094)	38453-21X16
0.28 (0.0110)	38453-21X17
0.32 (0.0126)	38453-21X18
0.36 (0.0142)	38453-21X19
0.40 (0.0157)	38453-21X20
0.44 (0.0173)	38453-21X00
0.48 (0.0189)	38453-21X01
0.52 (0.0205)	38453-21X02
0.56 (0.0220)	38453-21X03
0.60 (0.0236)	38453-21X04
0.64 (0.0252)	38453-21X05
0.68 (0.0268)	38453-21X06
0.72 (0.0283)	38453-21X07
0.76 (0.0299)	38453-21X08
0.80 (0.0315)	38453-21X09
0.84 (0.0331)	38453-21X10
0.88 (0.0346)	38453-21X11
0.92 (0.0362)	38453-21X12

Specifications and Adjustment (Cont'd)

Output shaft bearing adjusting shim

Thickness mm (in)	Part number
0.12 (0.0047)	31499-21X00
0.16 (0.0063)	31499-21X01
0.20 (0.0079)	31499-21X02
0.24 (0.0094)	31499-21X03
0.28 (0.0110)	31499-21X04
0.32 (0.0126)	31499-21X05
0.36 (0.0142)	31499-21X06
0.40 (0.0157)	31499-21X07
0.44 (0.0173)	31499-21X08
0.48 (0.0189)	31499-21X09
0.52 (0.0205)	31499-21X10
0.56 (0.0220)	31499-21X11
0.60 (0.0236)	31499-21X12
0.64 (0.0252)	31499-21X13
0.68 (0.0268)	31499-21X14
0.72 (0.0283)	31499-21X15
0.76 (0.0299)	31499-21X16
0.80 (0.0315)	31499-21X17
0.84 (0.0331)	31499-21X18
0.88 (0.0346)	31499-21X19
0.92 (0.0362)	31499-21X20
1.44 (0.0567)	31499-21X21
1.96 (0.0772)	31499-21X22

Idler gear bearing adjusting shim

Thickness mm (in)	Part number
0.36 (0.0142)	31499-21X06
0.40 (0.0157)	31499-21X07
0.44 (0.0173)	31499-21X08
0.48 (0.0189)	31499-21X09
0.52 (0.0205)	31499-21X10
0.56 (0.0220)	31499-21X11
0.60 (0.0236)	31499-21X12
0.64 (0.0252)	31499-21X13
0.68 (0.0268)	31499-21X14
0.72 (0.0283)	31499-21X15
0.76 (0.0299)	31499-21X16
0.80 (0.0315)	31499-21X17
0.84 (0.0331)	31499-21X18
0.88 (0.0346)	31499-21X19
0.92 (0.0362)	31499-21X20
1.44 (0.0567)	31499-21X21
1.96 (0.0772)	31499-21X22

CLEARANCE BETWEEN SIDE GEAR AND DIFFERENTIAL CASE WITH WASHER

0.1 - 0.2 mm (0.004 - 0.008 in)

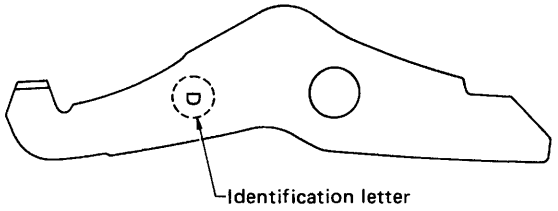
Side gear thrust washer

Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-E3000 or E3020
0.80 - 0.85 (0.0315 - 0.0335)	38424-E3001 or E3021
0.85 - 0.90 (0.0335 - 0.0354)	38424-E3002 or E3022
0.90 - 0.95 (0.0354 - 0.0374)	38424-E3003 or E3023

PARKING PAWL

Clearance "A":

0.27 - 0.61 mm (0.0106 - 0.0240 in)



SAT914

Identification letter	Part number
D	31989-21X00
E	31989-21X01
F	31989-21X02

STALL REVOLUTION

Engine model	rpm
CA18DE	2,550 - 2,850

Tightening Torque

Unit	N·m	kg-m	ft-lb
Drive plate to torque converter	39 - 49	4.0 - 5.0	29 - 36
Converter housing to engine	39 - 49	4.0 - 5.0	29 - 36
Engine rear plate to converter housing	30 - 40	3.1 - 4.1	22 - 30
Dust cover to converter housing	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Gusset to converter housing	30 - 40	3.1 - 4.1	22 - 30
Transmission case to converter housing	21 - 23	2.1 - 2.3	15 - 17
Transmission case to side cover	21 - 23	2.1 - 2.3	15 - 17
Transmission case to valve cover	5 - 7	0.5 - 0.7	3.6 - 5.1
Transmission case to bearing retainer	16 - 21	1.6 - 2.1	12 - 15
Oil pump cover to converter housing	16 - 21	1.6 - 2.1	12 - 15

Unit	N·m	kg-m	ft-lb
Control valve body to transmission case	5 - 7 3.7 - 5.0	0.5 - 0.7 0.38 - 0.51	3.6 - 5.1 2.7 - 3.7
Governor cap to converter housing	5 - 7	0.5 - 0.7	3.6 - 5.1
Speedometer case to converter housing	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Inhibitor switch to transmission case	2.0 - 2.5	0.20 - 0.26	1.4 - 1.9
Throttle lever lock nut	9.1 - 11.8	0.93 - 1.20	6.7 - 8.7
Actuator support to transmission case	16 - 21	1.6 - 2.1	12 - 15
Band piston stem (when adjusting band brake)	4 - 6*	0.4 - 0.6*	2.9 - 4.3*
Lower valve body to upper valve body	3.4 - 4.4	0.35 - 0.45	2.5 - 3.3
Final drive bolt	74 - 88	7.5 - 9.0	54 - 65
Governor valve body to governor shaft	5 - 7	0.5 - 0.7	3.6 - 5.1
Governor shaft securing bolt	20 - 26	2.0 - 2.7	14 - 20
Manual shaft lock nut	31 - 37	3.2 - 3.8	23 - 27
Oil strainer to converter housing	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Control cylinder to transmission case	6.3 - 8.3	0.64 - 0.84	4.6 - 6.1
Test plug (oil pressure inspection hole)	5 - 10	0.5 - 1.0	3.6 - 7.2
Piston stem lock nut	31 - 42	3.2 - 4.3	23 - 31
Detent spring to transmission case	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Drain plug to transmission case	15 - 20	1.5 - 2.0	11 - 14
Drain plug to converter housing	10 - 15	1.0 - 1.5	7 - 11
Oil cooler pipe to transmission case	29 - 49	3.0 - 5.0	22 - 36

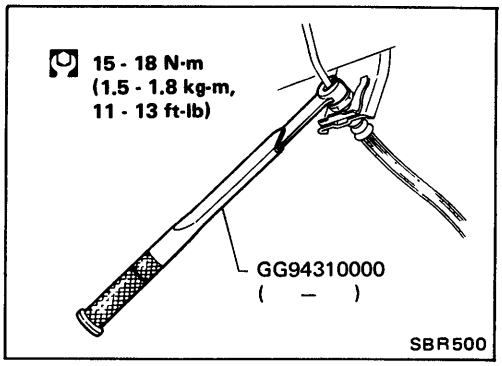
*: Turn back 5-1/4 turns after tightening.

FRONT AXLE & FRONT SUSPENSION

SECTION FA

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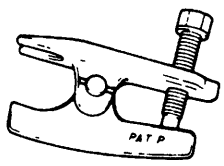
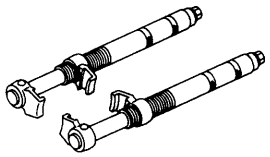
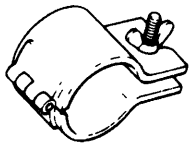
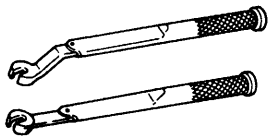
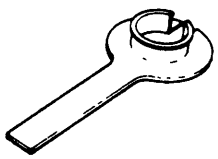
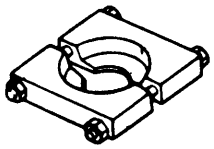


Precautions

(1) When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.
*** Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**
(2) When removing each suspension part, check wheel alignment and adjust if necessary.
(3) Use Tool when removing or installing brake tubes.

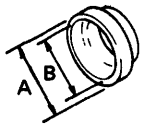
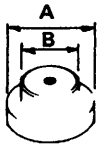
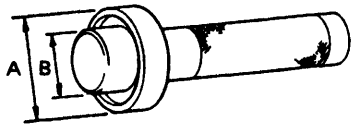
Preparation

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
HT72520000 (J25730-A) Ball joint remover		Removing tie-rod outer end and lower ball joint
HT71780000 (–) Spring compressor		Removing and installing coil spring
ST35652000 (–) Strut attachment		Fixing strut assembly
GG94310000 (–) Flare nut torque wrench		Removing and installing brake piping
KV38105500 (J33904) Differential side oil seal protector		Installing drive shaft
ST30031000 (J22912-01) Bearing puller		Removing inner race of wheel bearing

Preparation (Cont'd)

SPECIAL SERVICE TOOLS

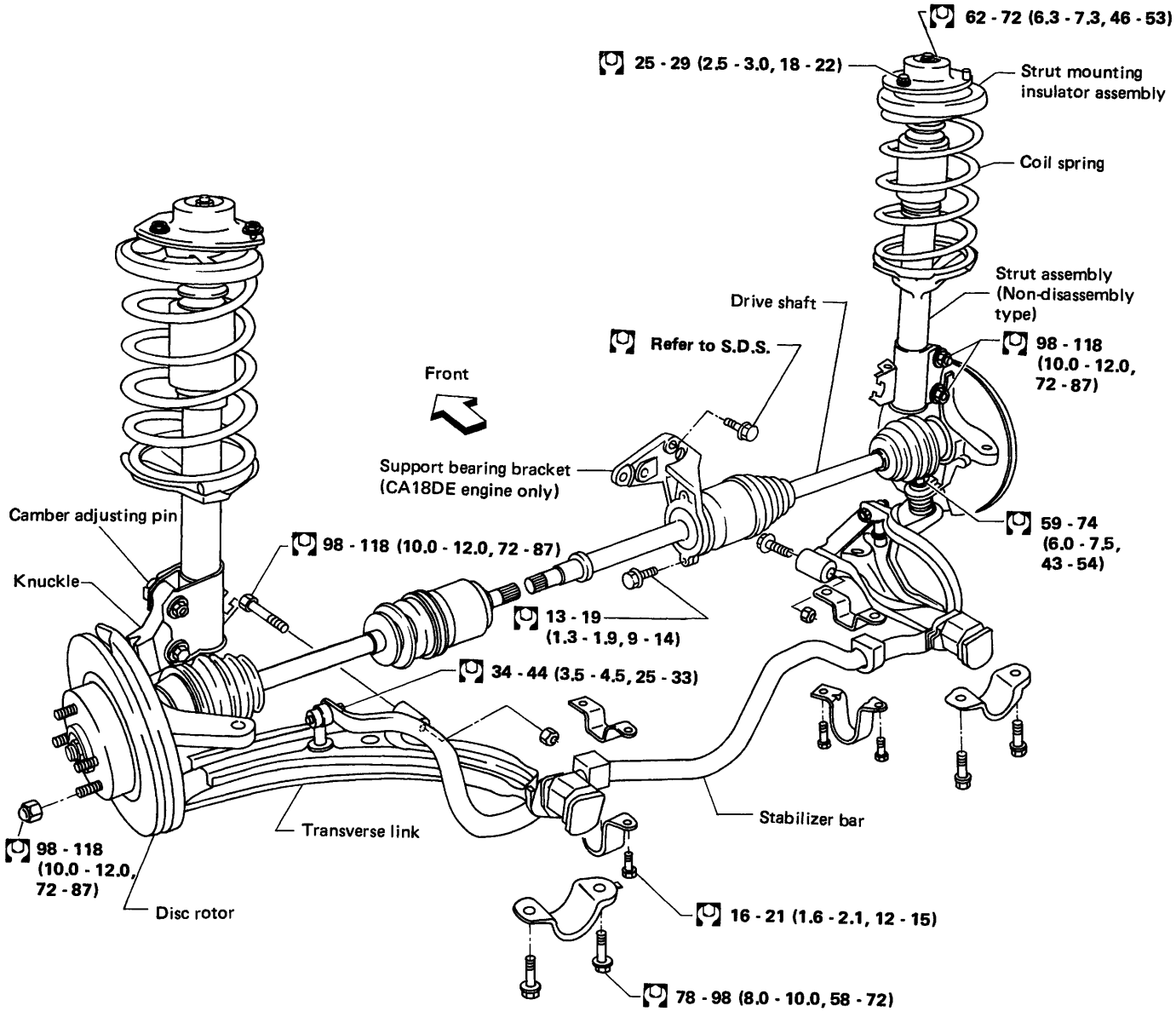
Tool number (Kent-Moore No.) Tool name	Description
KV38102510 (–) Drift	 Installing wheel bearing assembly **A: 71 mm (2.80 in) dia.** **B: 65 mm (2.56 in) dia.**
ST30621000 (–) Drift	 Installing wheel bearing assembly and wheel hub **A: 79 mm (3.11 in) dia.** **B: 59 mm (2.32 in) dia.**
ST33220000 (J25804-01) Drift	 Removing wheel hub **A: 37 mm (1.46 in) dia.** **B: 22 mm (0.87 in) dia.**

Wheel alignment

- **Caster and kingpin inclination cannot be adjusted.**
- **Camber and toe-in can be adjusted.**
  Camber: −1° 15′ to 0° 15′
  Toe-in: −1 to 1 mm (−0.04 to 0.04 in)

Wheel bearing

- **Tightening wheel bearing lock nut: 196 - 275 N·m (20 - 28 kg-m, 145 - 203 ft-lb)**
- **Axial end play: 0.05 mm (0.0020 in) or less**

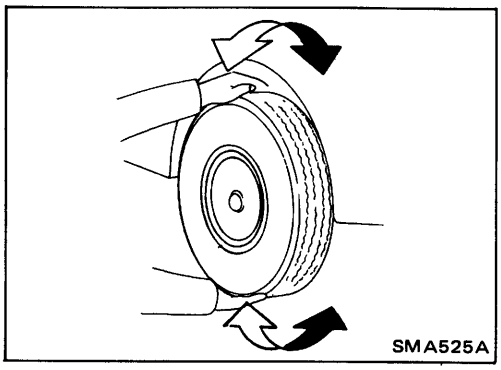


When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

*** Fuel, radiator coolant and engine oil fill. Spare tire, jack, hand tools and mats in designated positions.**

: N·m (kg-m, ft-lb)

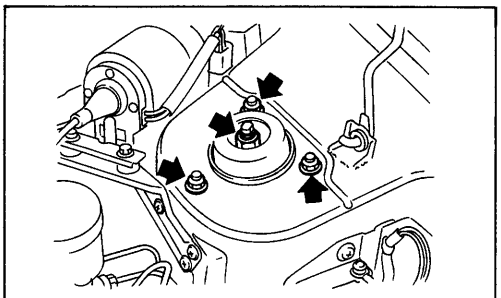
SFA200A


SMA525A

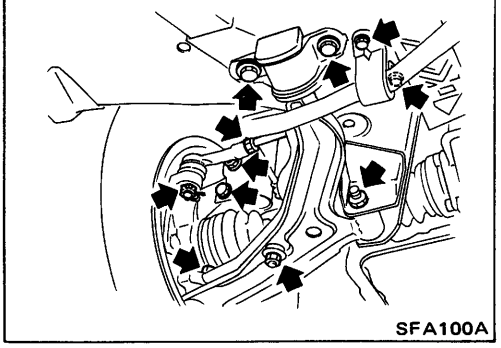
Front Axle and Front Suspension Parts

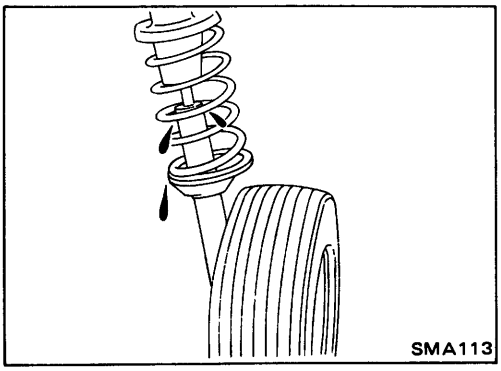
- Check front axle and front suspension parts for looseness, cracks, wear or other damage.

(1) Shake each front wheel.

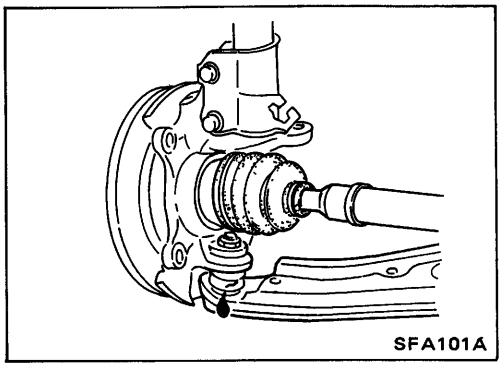

SFA099A

(2) Make sure that cotter pin is inserted.
(3) Retighten all nuts and bolts to the specified torque.
Tightening torque: Refer to S.D.S.
(4) Check front axle and front suspension parts for wear, cracks or other damage.

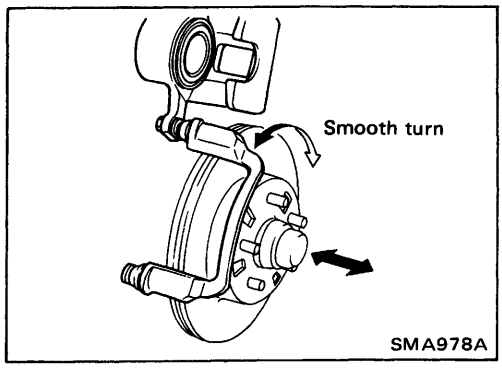

SFA100A


SMA113

- Check strut (shock absorber) for oil leakage or other damage.


SFA101A

- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.

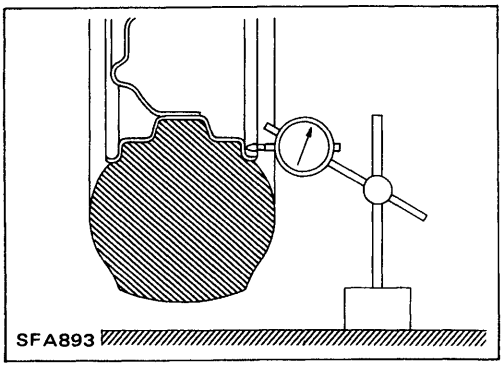


Front Wheel Bearing

- Check that wheel bearings operate smoothly.
- Check axial end play.

Axial end play: 0.05 mm (0.0020 in) or less

If there is any axial end play or wheel bearing does not turn smoothly, replace wheel bearing assembly.
Refer to FRONT AXLE — Wheel Hub and Knuckle.



Front Wheel Alignment

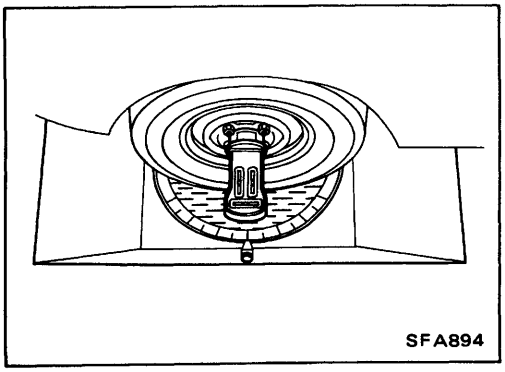
Before checking front wheel alignment, be sure to make a preliminary inspection.

PRELIMINARY INSPECTION

- Check tires for wear and proper inflation.
- Check wheel runout.

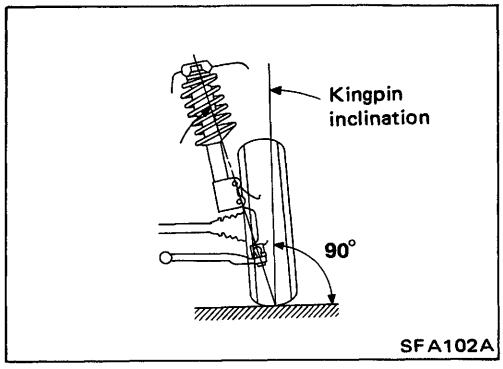
Lateral runout:
1.0 mm (0.039 in) or less

- Check front wheel bearings for looseness.
- Check front suspension for looseness.
- Check steering linkage for looseness.
- Check that front shock absorbers work properly.
- Check vehicle posture (Unladen):
  "Unladen"
  Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



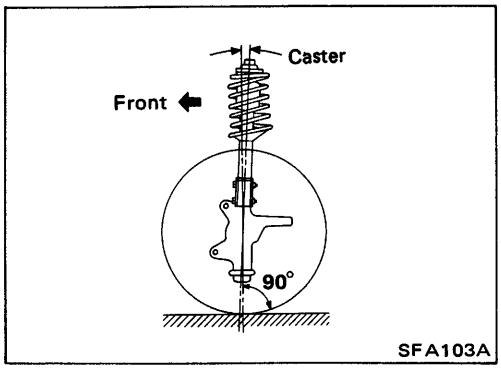
CAMBER, CASTER AND KINGPIN INCLINATION

- **Caster and kingpin inclination are preset at factory and cannot be adjusted.**
  If the caster and kingpin inclination are not within specifications, inspect and replace any damaged or worn front suspension parts.
- **Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge and adjust in accordance with the following procedures.**



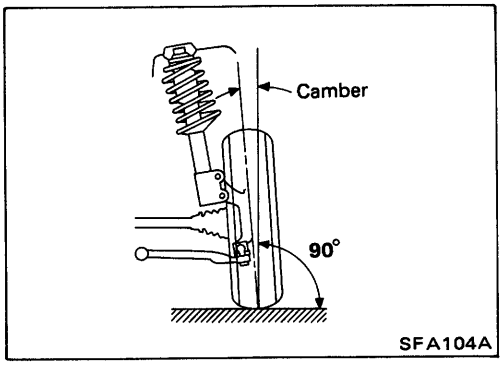
Kingpin inclination (Unladen)
13°40' - 15°10'

Front Wheel Alignment (Cont'd)



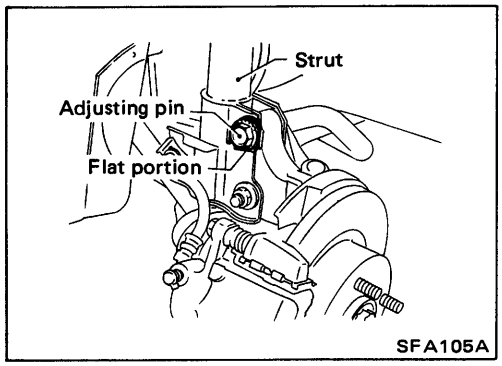
Caster (Unladen)

1°10′ - 2°40′



Camber (Unladen)

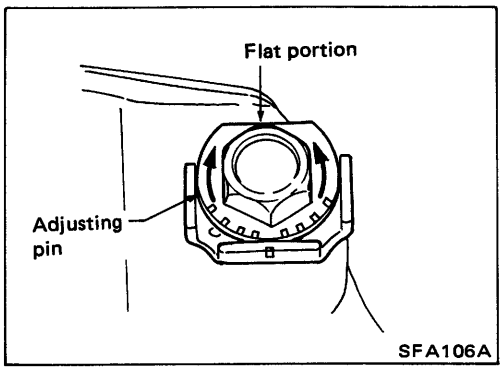
−1°15′ to 0°15′



If camber is not within specification, adjust by turning the adjusting pin.

(1) Remove the adjusting pin.

Adjusting pin is factory-installed with the flat portion facing down.



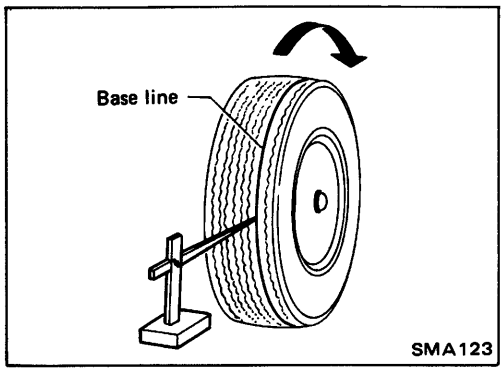
(2) Install adjusting pin with the flat portion facing up.

(3) Turn the adjusting pin to adjust.

Camber changes about 15′ with each graduation of the adjusting pin.

(4) Tighten to the specified torque.

: 98 - 118 N·m (10.0 - 12.0 kg-m, 72 - 87 ft-lb)

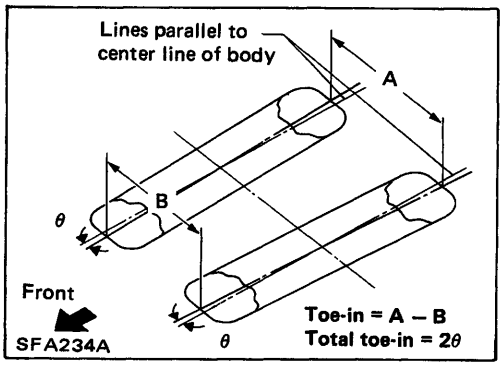


TOE-IN

1. Mark a base line across the tread.

After lowering front of vehicle, move it up and down to eliminate friction, and set steering wheel in straight-ahead position.

Front Wheel Alignment (Cont'd)



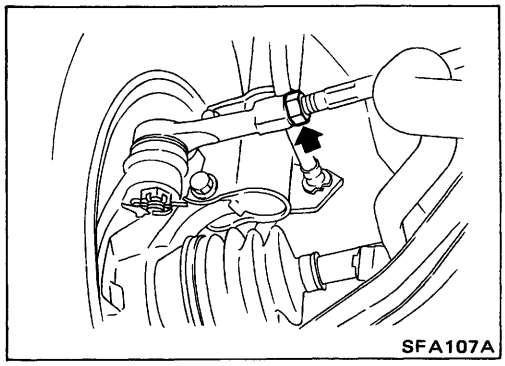
2. Measure toe-in.

Measure distance "A" and "B" at the same height as hub center.

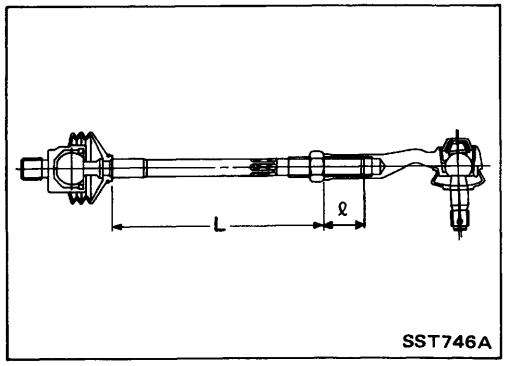
Toe-in (Unladen):

A – B —1 to 1 mm (–0.04 to 0.04 in)

2θ (Total toe-in) —6′ to 6′



3. Adjust toe-in by varying the length of steering tie-rods.



Length "ℓ" must be 25 mm (0.98 in) or more.

Make sure that the left and right tie-rods are the same length.

Tie-rod length "L"-reference data:

176 mm (6.93 in)

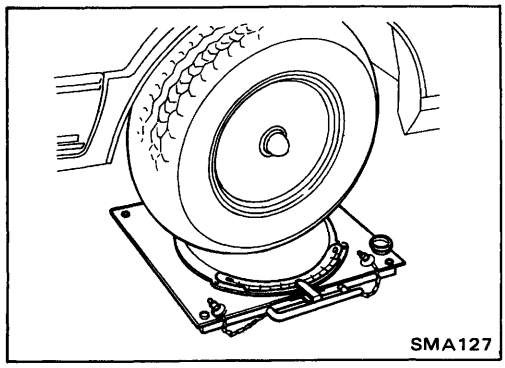
4. Tighten to the specified torque.

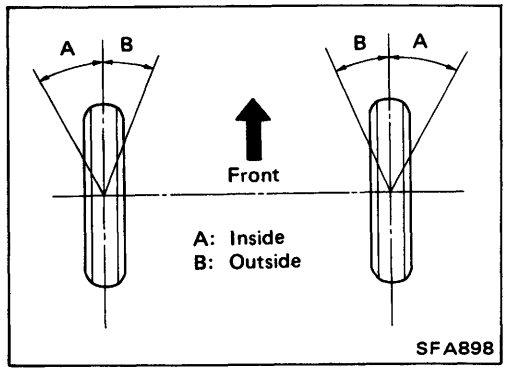
Tie-rod lock nut:

: 37 - 46 N·m (3.8 - 4.7 kg-m, 27 - 34 ft-lb)

FRONT WHEEL TURNING ANGLE

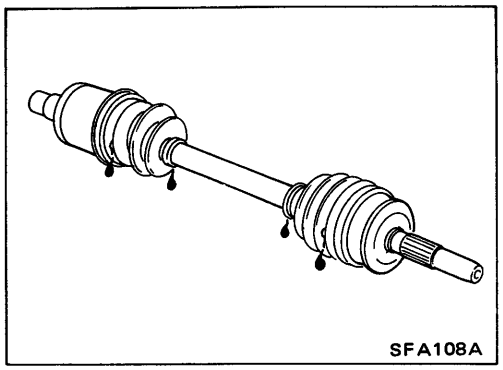
1. Set wheels in straight ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.





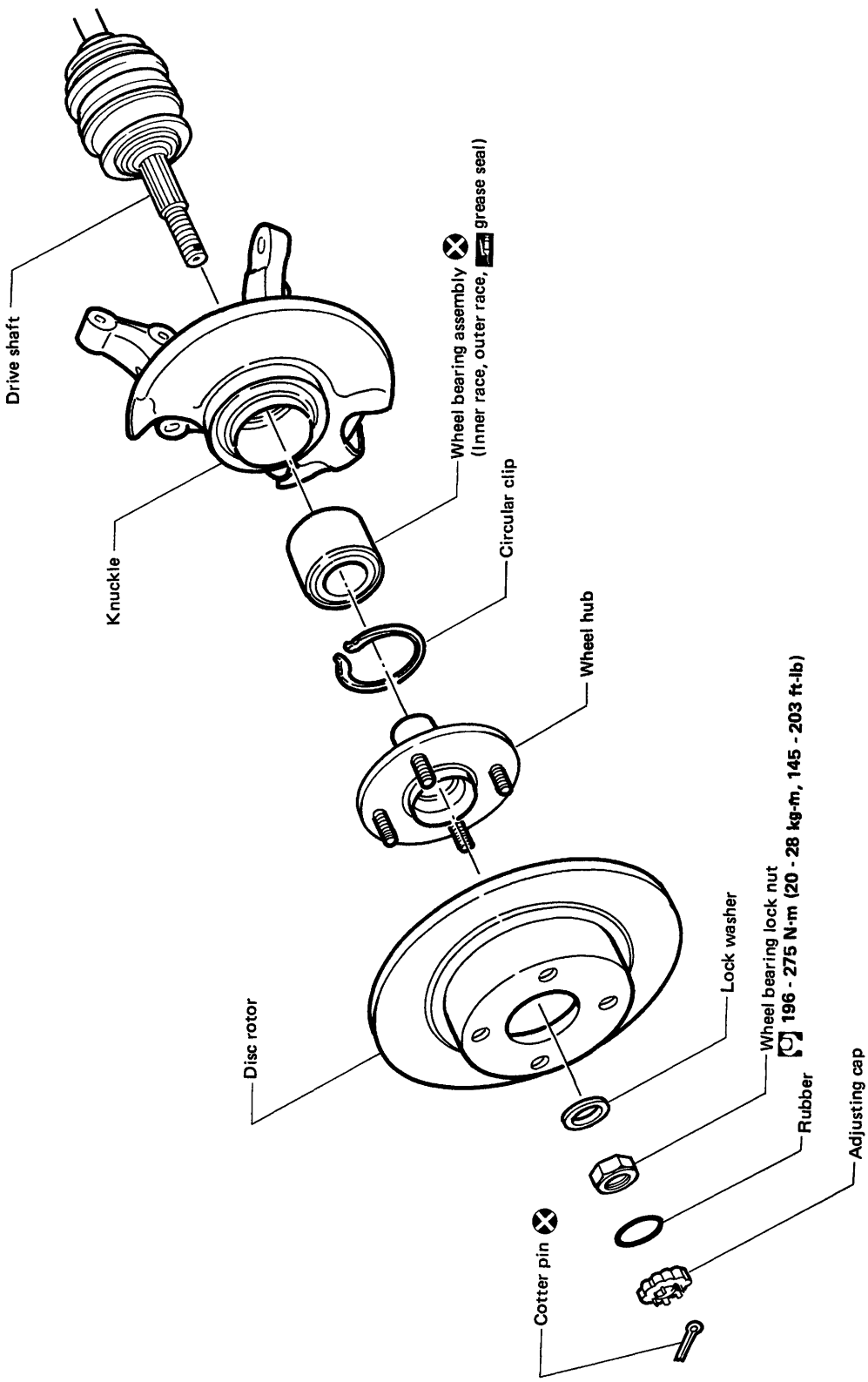
2. Rotate steering wheel all the way right and left; measure turning angle.

Wheel turning angle		GA16i engine models	CA18DE engine models
Full turns	Inside wheel: A	37° - 40°	36° - 39°
	Outside wheel: B	32°30′	30°
Toe-out turn (at 20°)	Inside wheel: A	21°36′	22°24′
	Outside wheel: B	20°	

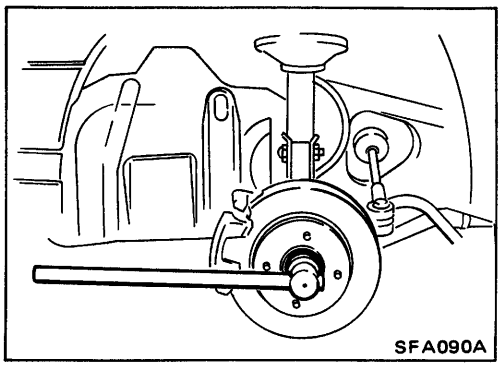


Drive Shaft

- Check for grease leakage or other damage.

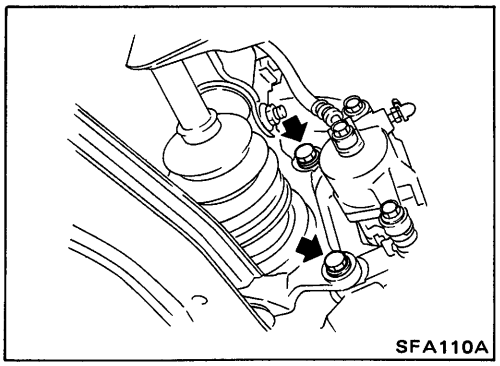

Drive shaft
Knuckle
Wheel bearing assembly
(Inner race, outer race, grease seal)
Circular clip
Wheel hub
Disc rotor
Lock washer
Wheel bearing lock nut
196 - 275 N·m (20 - 28 kg-m, 145 - 203 ft-lb)
Rubber
Adjusting cap
Cotter pin
CAUTION:
• Tighten wheel bearing lock nut to the specified torque.
• Preload adjustment of wheel bearing not necessary.
• Axial end play: 0.05 mm (0.0020 in) or less
• Install lock washer with chamfer side facing wheel bearing lock nut.

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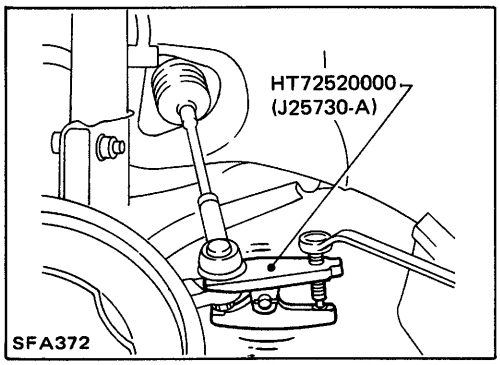
Removal

- Remove wheel bearing lock nut while depressing brake pedal.

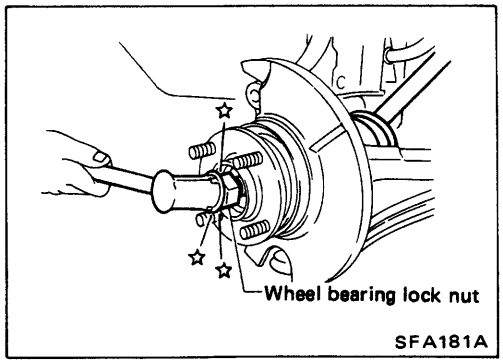


- Remove brake caliper assembly.

Brake hose does not need to be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out.
Make sure brake hose is not twisted.

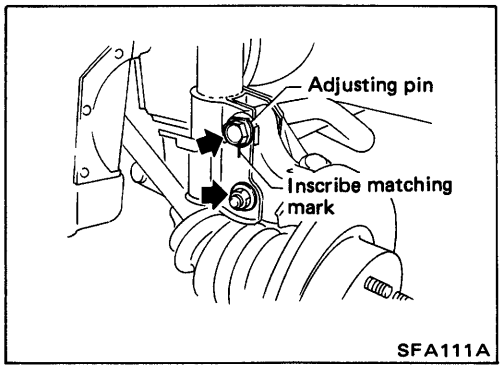


- Remove tie-rod ball joint.



- Separate drive shaft from knuckle by slightly tapping it.

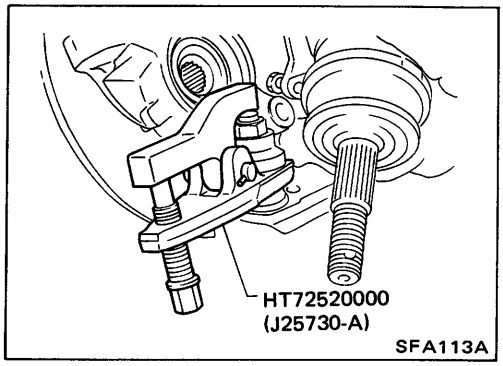
Cover boots with waste cloth so as not to damage them when removing drive shaft.



- Remove bolts and nuts as shown at left.

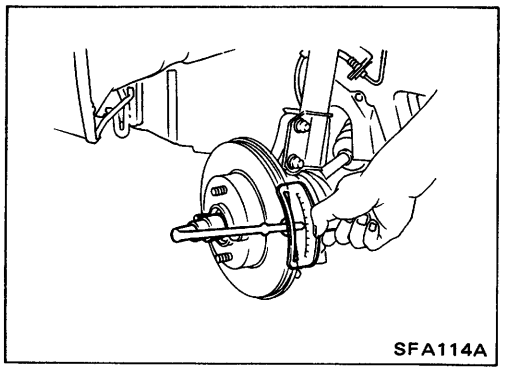
Make a matching mark before removing adjusting pin.

Removal (Cont'd)



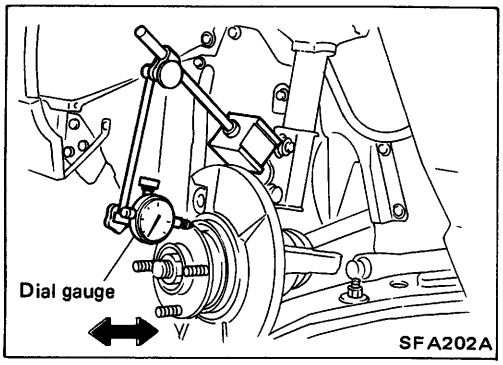
- Loosen lower ball joint tightening nut.
- Separate knuckle from lower ball joint stud with Tool.
- Remove knuckle from transverse link.

Installation



- Install knuckle with wheel hub.
- Tighten wheel bearing lock nut.

  ⓞ : **196 - 275 N·m**
  (20 - 28 kg-m, 145 - 203 ft-lb)



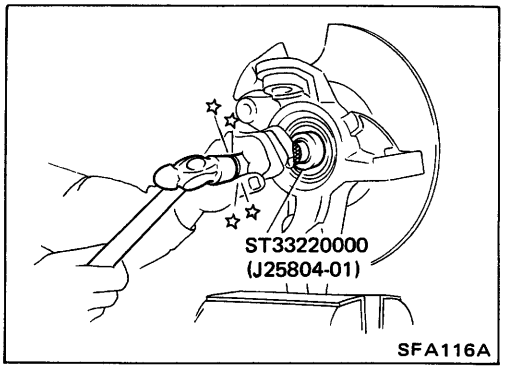
- Check wheel bearing axial end play.

  Axial end play: 0.05 mm (0.0020 in) or less

Disassembly

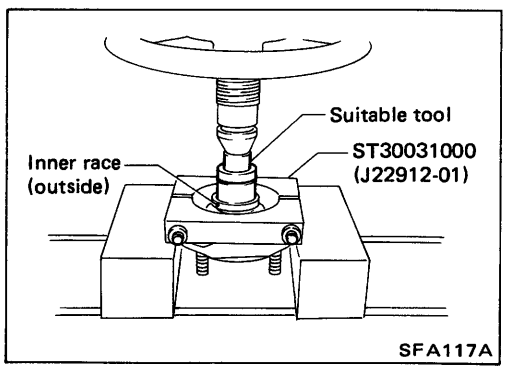
CAUTION:

When removing wheel hub from knuckle or wheel bearing from knuckle, replace wheel bearing assembly (outer race, inner race and grease seal) with a new one.



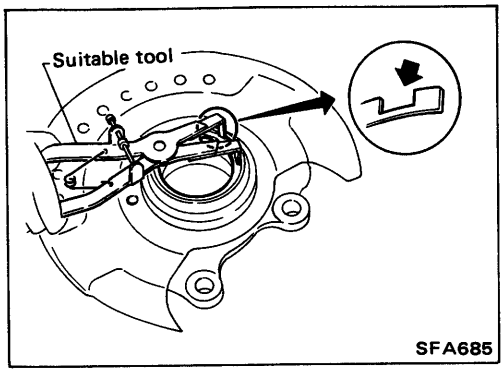
WHEEL HUB

- Drive out hub with inner race (outside) from knuckle with Tool.



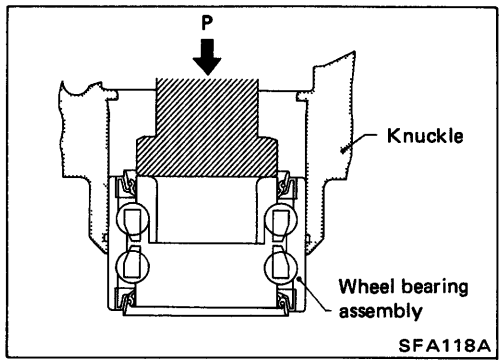
- Draw out inner race (outside) from wheel hub.
- Remove inner race (inside) from wheel bearing.

Disassembly (Cont'd)



WHEEL BEARING

- Remove circular clip with suitable tool.



- First install inner race (inside) of removed wheel bearing.
- Press out wheel bearing assembly from knuckle.

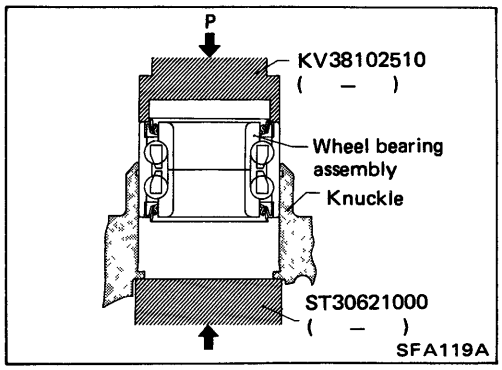
Inspection

WHEEL HUB AND KNUCKLE

- Check wheel hub and knuckle for cracks by using a magnetic exploration or dyeing test.

CIRCULAR CLIP

- Check circular clip for wear or cracks.
  Replace if necessary.



Assembly

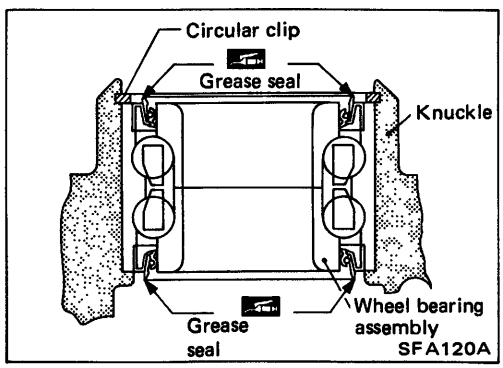
1. Press new wheel bearing assembly into knuckle from outside of knuckle.

CAUTION:

Do not press on inner race of wheel bearing assembly.

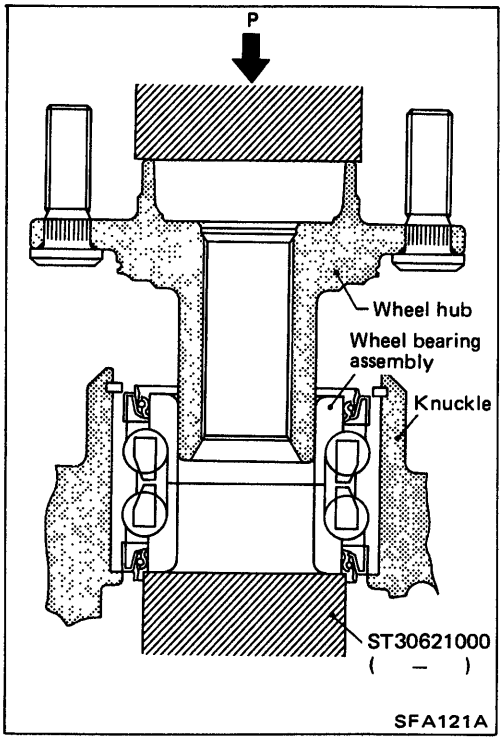
Do not apply oil or grease to mating surfaces of wheel bearing outer race and knuckle.

Be careful not to damage grease seals.



2. Install circular clip into groove of knuckle.
3. Apply multi-purpose grease to sealing lip.

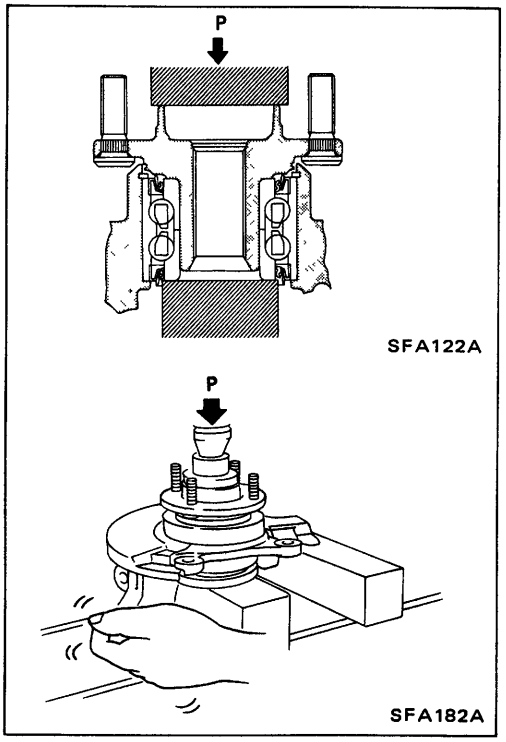
Assembly (Cont'd)



4. Press hub into knuckle.

Maximum load P:

29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)



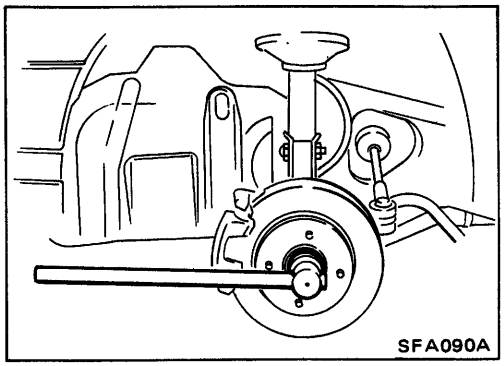
5. Check bearing preload.

(1) Add load P with a press.

P = 44.1 kN (4.5 ton, 5.0 US ton, 4.43 Imp ton)

(2) Spin knuckle several turns in both directions.

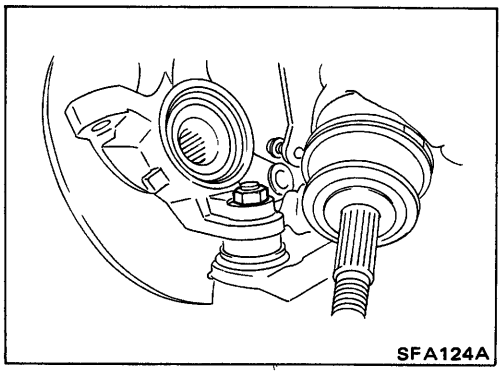
(3) Make sure that wheel bearings operate smoothly.


SFA090A

Removal

- Remove wheel bearing lock nut while depressing brake pedal.
- Remove brake caliper assembly.

Brake hose does not need to be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out.
Make sure brake hose is not twisted.

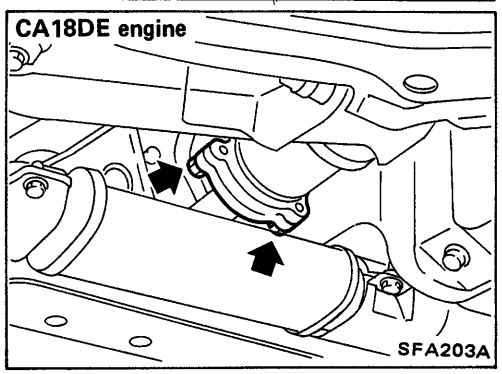

SFA124A

- Remove tie-rod ball joint.
- Separate drive shaft from knuckle by slightly tapping it.

Cover boots with waste cloth so as not to damage them when removing drive shaft.

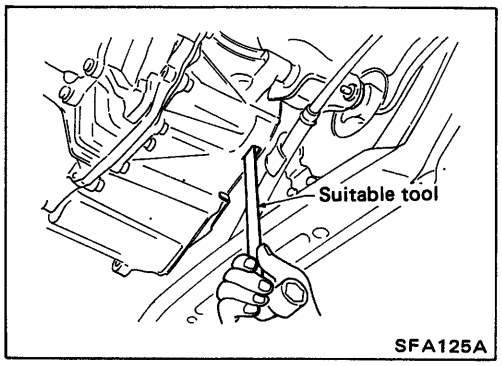
Refer to FRONT AXLE — Wheel Hub and Knuckle.

- For A/T models, remove left drive shaft after removing right drive shaft.

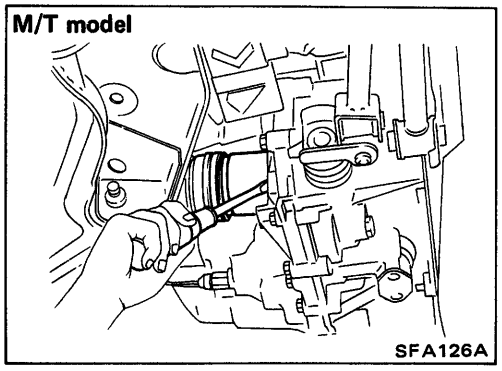


SFA203A

1. Remove right drive shaft from transaxle.
- Remove support bearing retainer bolts. — CA18DE engine —



SFA125A



SFA126A

2. Remove left drive shaft from transaxle.

FOR M/T MODELS

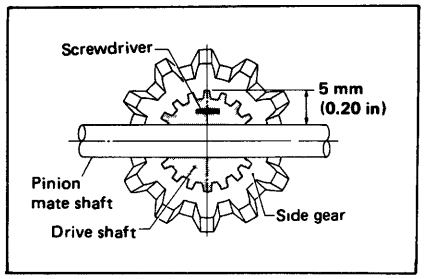
Removal (Cont'd)

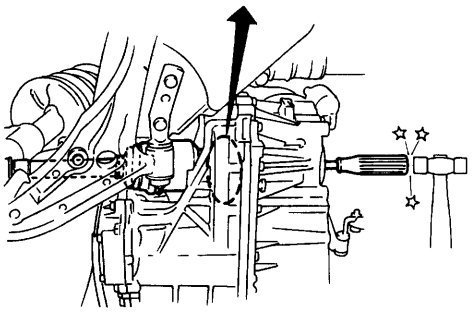
FOR A/T MODELS

- Remove left drive shaft with a screwdriver.

Be careful not to damage pinion mate shaft and side gear.

A/T model



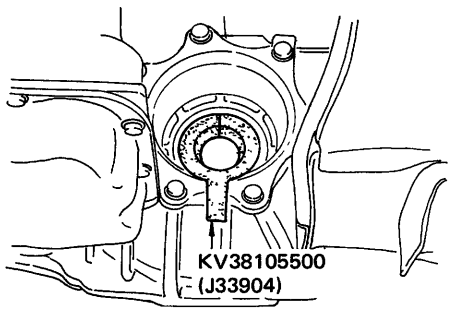


SFA730

Installation

TRANSAXLE SIDE

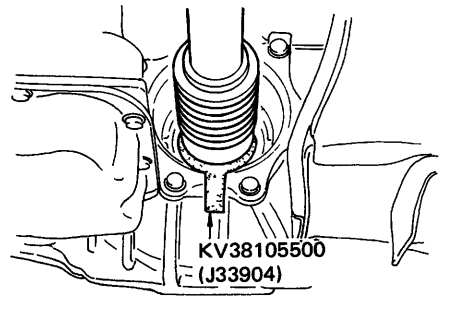
1. Drive a new oil seal to transaxle. Refer to section MT or AT.
2. Set Tool along the inner circumference of oil seal (transaxle side).



SFA127A

3. Insert drive shaft into transaxle, be sure to properly align the serrations and then withdraw Tool.
4. Push drive shaft, then press-fit circular clip on the drive shaft into circular clip groove of side gear.

- **After it is inserted, try to pull flange out of slide joint by hand to make sure that circular clip is properly meshed with side gear and will not come out.**



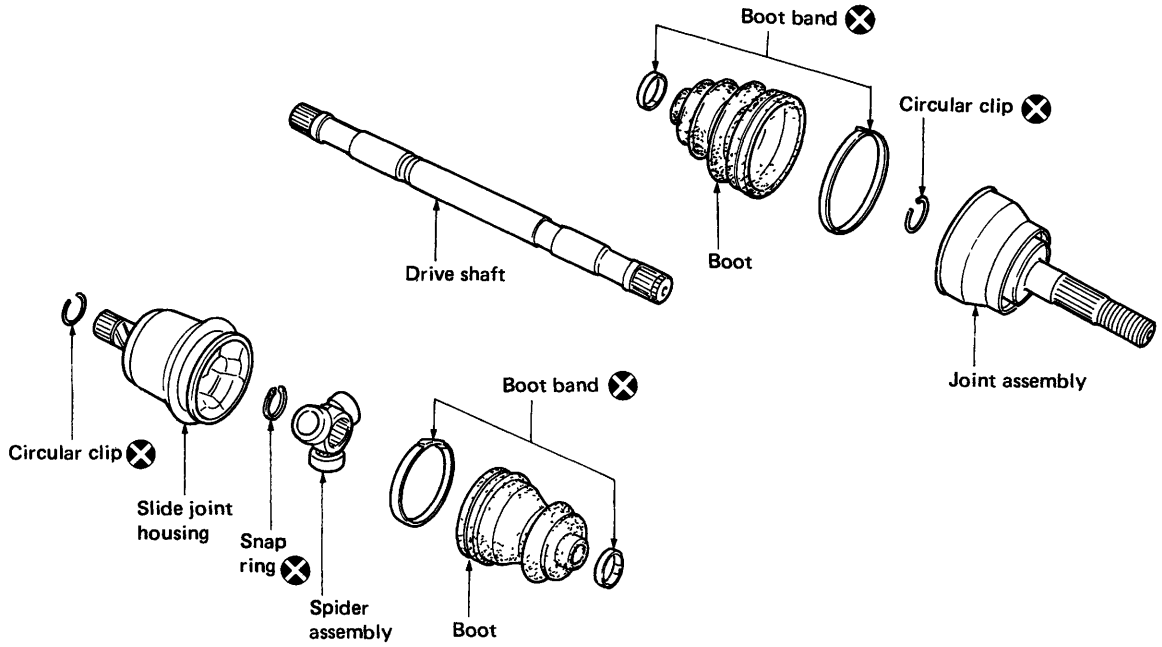
SFA128A

WHEEL SIDE

- Install knuckle to strut assembly.
- Tighten wheel bearing lock nut.

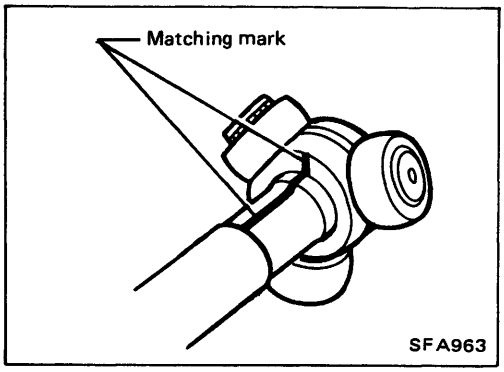
Components

Circular clip:
Make sure circular clip is properly installed with side gear (transaxle side) and joint assembly (wheel side), and will not come out.
Drive shaft joint grease:
Use Nissan Genuine Grease or equivalent after every overhaul.



Be careful not to damage boots. Use suitable protector or cloth during removal and installation.

SRA923

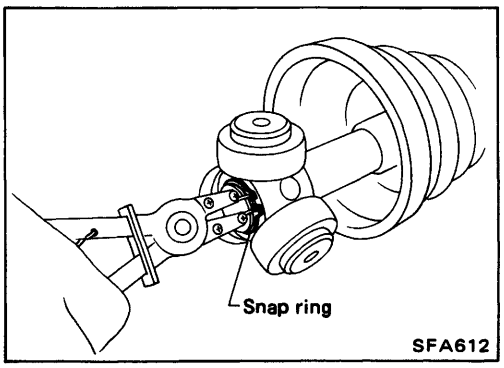


SFA963

Disassembly

TRANSAXLE SIDE

1. Remove boot bands.
2. Put matching marks on slide joint housing and drive shaft before separating joint assembly.
3. Put matching marks on spider assembly and drive shaft.



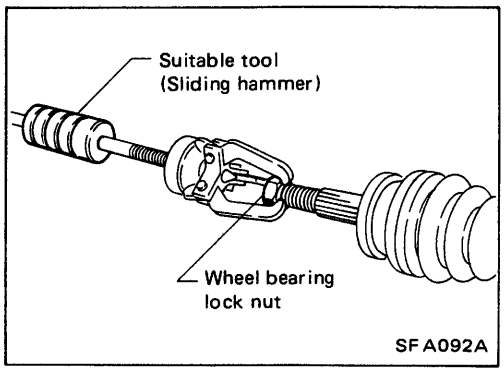
SFA612

4. Pry off snap ring, then remove spider assembly.

CAUTION:
Do not disassemble spider assembly.

5. Draw out boot.

Cover drive shaft serration with tape so as not to damage the boot.



Disassembly (Cont'd)

WHEEL SIDE

CAUTION:

The joint on the wheel side cannot be disassembled.

- Before separating joint assembly, put matching marks on drive shaft and joint assembly.
- Separate joint assembly with suitable tool.

Be careful not to damage threads on drive shaft.

- Remove boot bands.

Inspection

Thoroughly clean all parts in cleaning solvent, and dry with compressed air. Check parts for evidence of deformation or other damage.

DRIVE SHAFT

Replace drive shaft if it is twisted or cracked.

BOOT

Check boot for fatigue, cracks, or wear. Replace boot with new boot bands.

JOINT ASSEMBLY (Transaxle side)

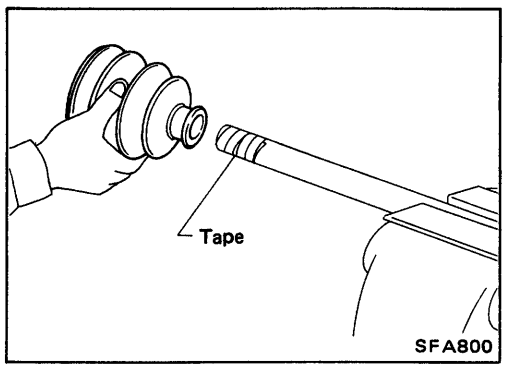
- Check spider assembly for needle bearing and washer damage. Replace spider assembly if necessary.
- Check roller surfaces for scratches, wear or other damage. Replace if necessary.
- Check serration for deformation. Replace if necessary.
- Check slide joint housing for any damage. Replace if necessary.

JOINT ASSEMBLY (Wheel side)

Replace joint assembly if it is deformed or damaged.

Assembly

- **After drive shaft has been assembled, ensure that it moves smoothly over its entire range without binding.**
- **Use NISSAN GENUINE GREASE or equivalent after every overhaul.**

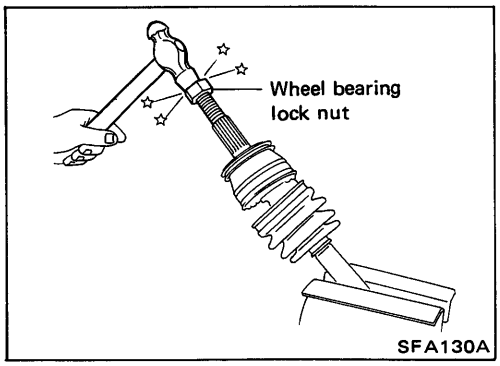


WHEEL SIDE

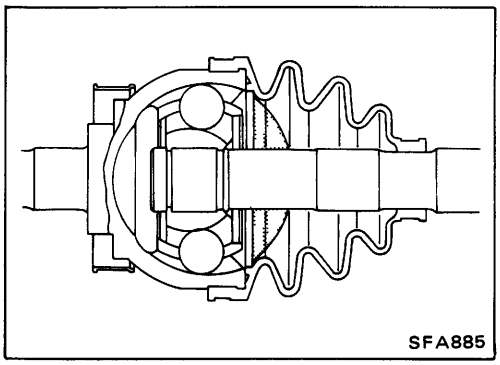
1. Install boot and new small boot band on drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.

Assembly (Cont'd)



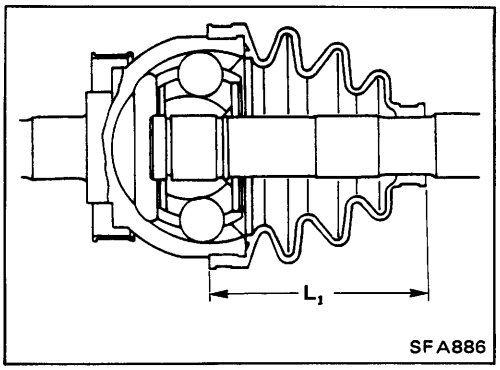
2. Set joint assembly onto drive shaft by lightly tapping it. Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.



3. Pack drive shaft with specified amount of grease.

Specified amount of grease:

155 - 175 g (5.47 - 6.17 oz)

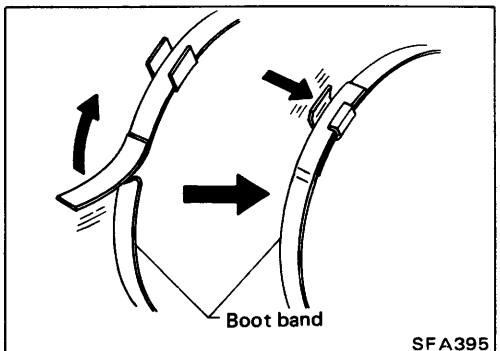


4. Set boot so that it does not swell and deform when its length is "L_1".

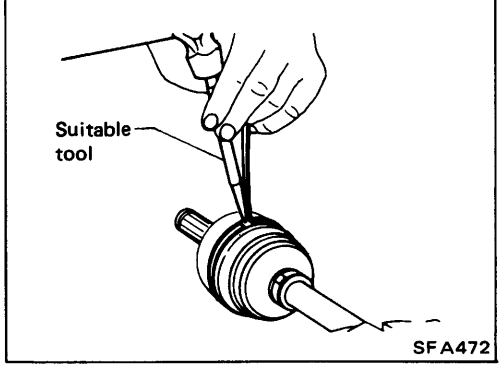
Length "L_1":

96 - 98 mm (3.78 - 3.86 in)

Make sure that boot is properly installed on the drive shaft groove.

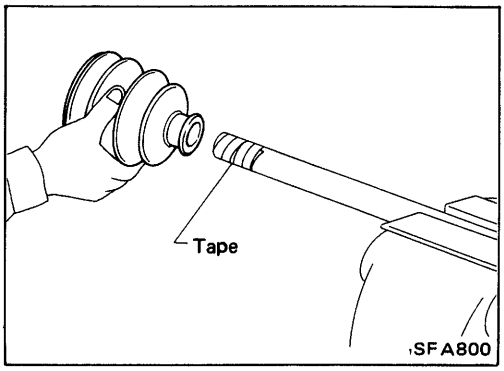


5. Lock new larger and smaller boot bands securely with a suitable tool.



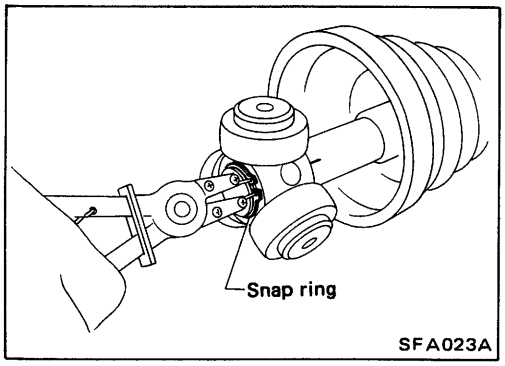
Assembly (Cont'd)

TRANSAXLE SIDE

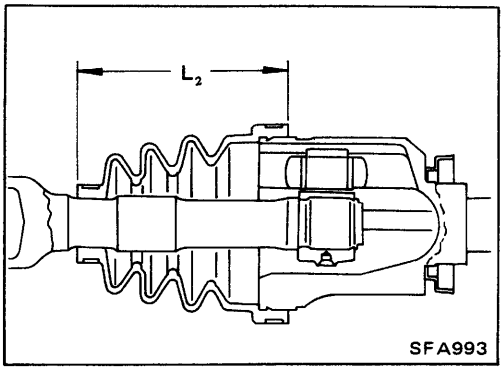


1. Install boot and new small boot band on drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.



2. Install spider assembly securely, making sure the marks which were made during disassembly are properly aligned.
3. Install new snap ring.



4. Pack drive shaft with specified amount of grease.

Specified amount of grease:

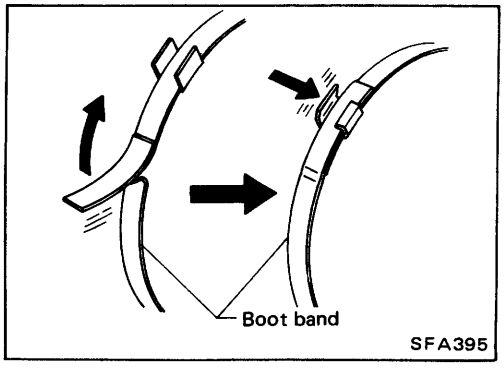
220 - 240 g (7.76 - 8.46 oz)

5. Install slide joint housing.
6. Set boot so that it does not swell and deform when its length is "L_2".

Length "L_2":

101.5 - 103.5 mm (4.00 - 4.07 in)

Make sure that boot is properly installed on the drive shaft groove.

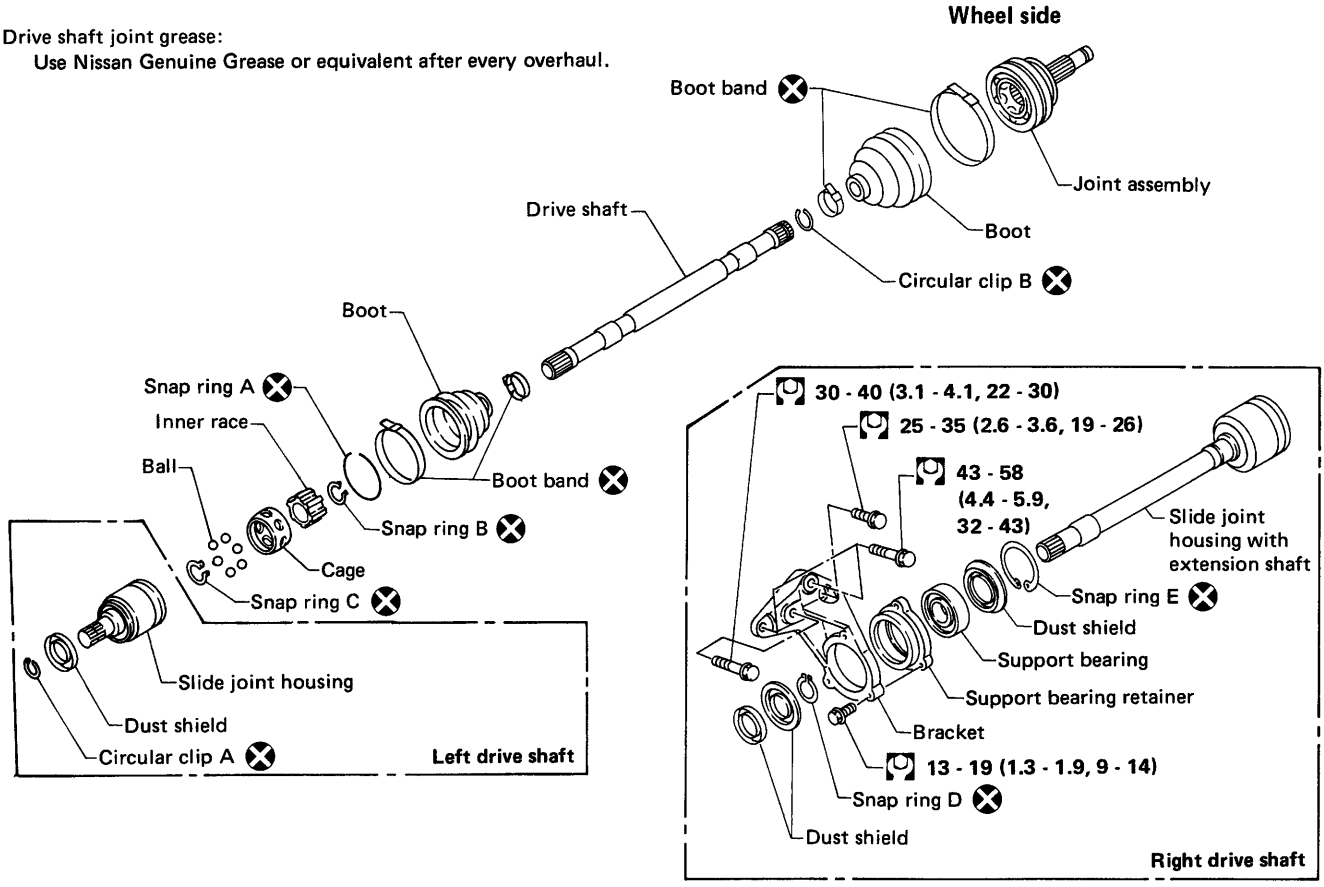


7. Lock new larger and smaller boot bands securely with a suitable tool.

Components

Circular clip:
Make sure circular clip is properly meshed with side gear (transaxle side) and joint assembly (wheel side), and will not come out.

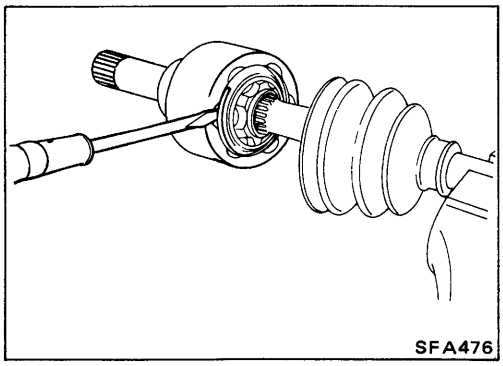
Drive shaft joint grease:
Use Nissan Genuine Grease or equivalent after every overhaul.



Be careful not to damage boots. Use suitable protector or cloth during removal and installation.

: N·m (kg-m, ft-lb)

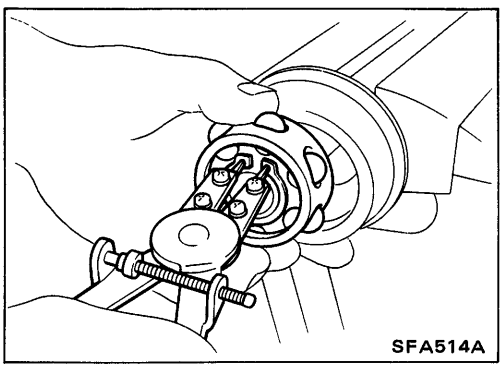
SFA148A



Disassembly

TRANSAXLE SIDE

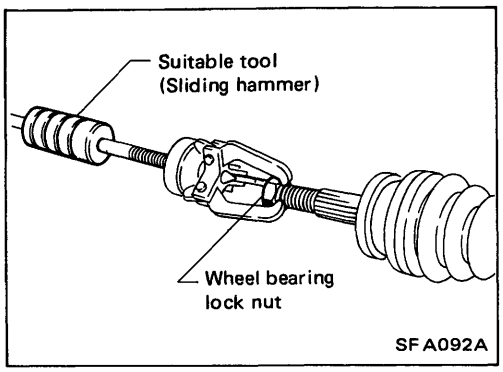
1. Remove boot bands.
2. Put matching marks on slide joint housing and inner race, before separating joint assembly.
3. Pry off snap ring "A" with a screwdriver, and pull out slide joint housing.



4. Put matching marks on inner race and drive shaft.
5. Pry off snap ring "C", then remove ball cage, inner race and balls as a unit.
6. Pry off snap ring "B".
7. Draw out boot.

Cover drive shaft serration with tape so as not to damage the boot.

Disassembly (Cont'd)



WHEEL SIDE

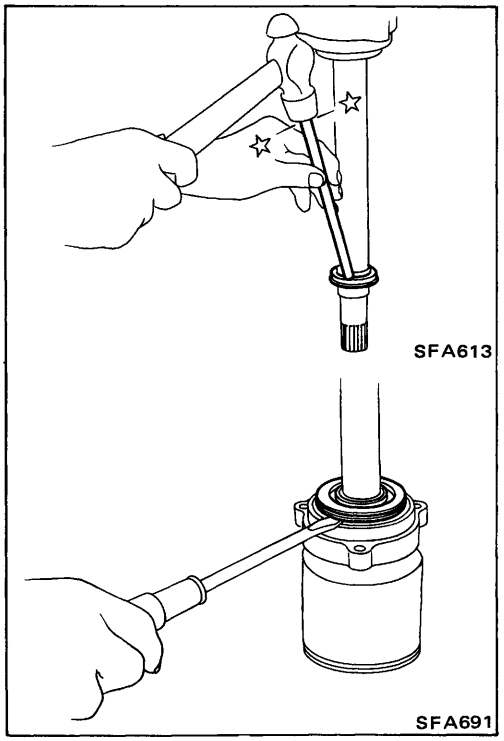
CAUTION:

The joint on the wheel side cannot be disassembled.

- Before separating joint assembly, put matching marks on drive shaft and joint assembly.
- Separate joint assembly with suitable tool.

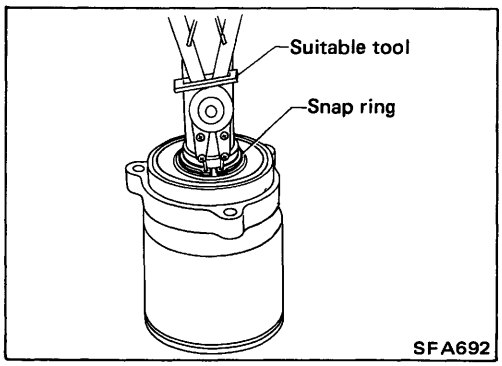
Be careful not to damage threads on drive shaft.

- Remove boot bands.

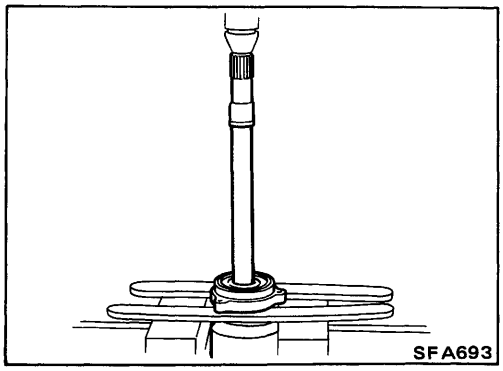


SUPPORT BEARING

- Remove dust shield.

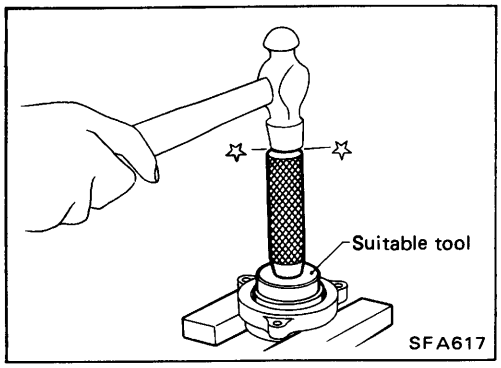


- Pry off snap ring.



- Press support bearing assembly out of drive shaft.

Disassembly (Cont'd)



- Press support bearing out of retainer.

Inspection

Thoroughly clean all parts in cleaning solvent, and dry with compressed air. Check parts for evidence of deformation or other damage.

DRIVE SHAFT

Replace drive shaft if it is twisted or cracked.

BOOT

Check boot for fatigue, cracks, or wear. Replace boot with new boot bands.

JOINT ASSEMBLY (Transaxle side)

- Replace any parts of double offset joint which show signs of scorching, rust, wear or excessive play.
- Check serration for deformation. Replace if necessary.
- Check slide joint housing for any damage. Replace if necessary.

JOINT ASSEMBLY (Wheel side)

Replace joint assembly if it is deformed or damaged.

SUPPORT BEARING

Make sure wheel bearing rolls freely and is free from noise, cracks, pitting or wear.

SUPPORT BEARING BRACKET

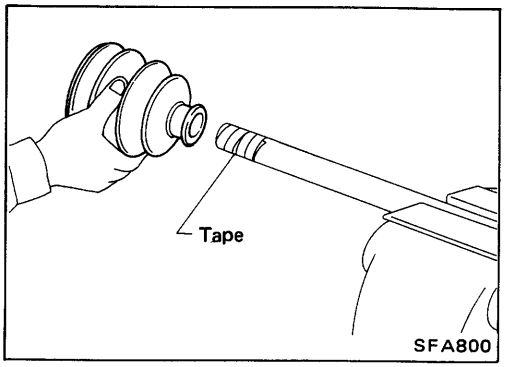
Check support bearing bracket for cracks with a magnetic exploration or dyeing test.

Assembly

- **After drive shaft has been assembled, ensure that it moves smoothly over its entire range without binding.**
- **Use NISSAN GENUINE GREASE or equivalent after every overhaul.**

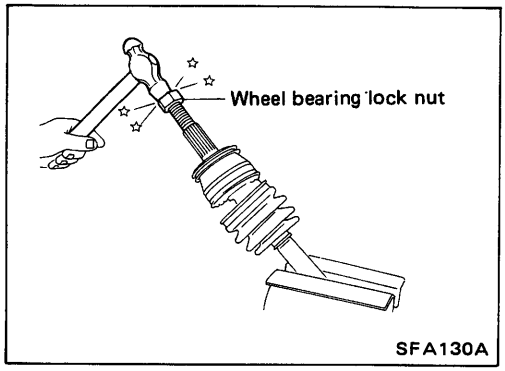
Assembly (Cont'd)

WHEEL SIDE

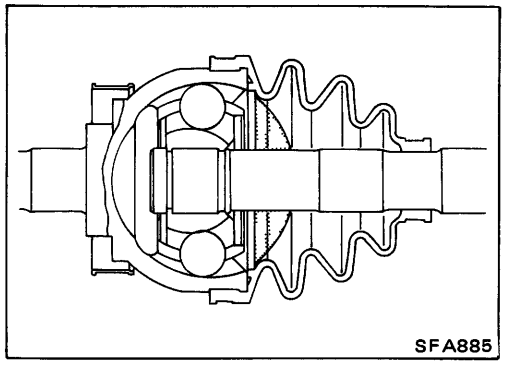


1. Install boot and new small boot band on drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.

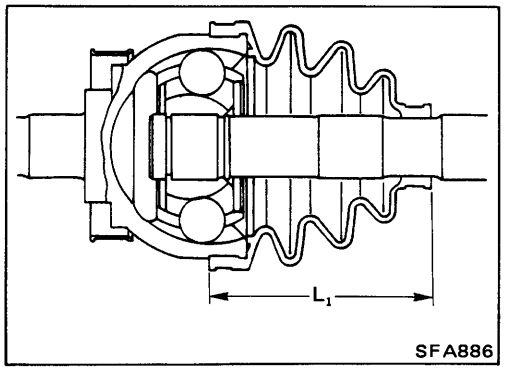


2. Set joint assembly onto drive shaft by lightly tapping it. Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.



3. Pack drive shaft with specified amount of grease.

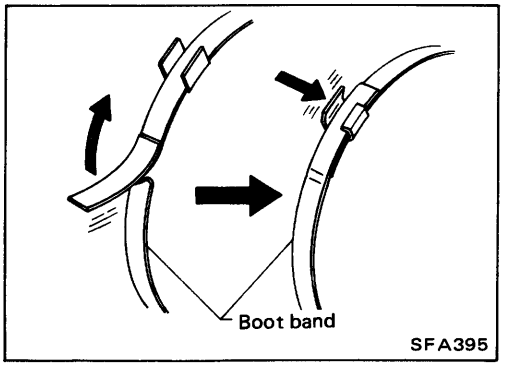
Specified amount of grease:
110 - 130 g (3.88 - 4.59 oz)



4. Set boot so that it does not swell and deform when its length is "L_1".

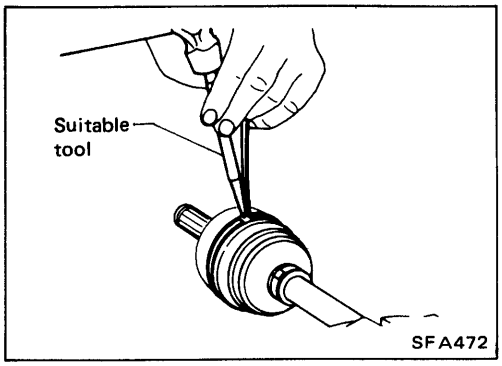
Length "L_1":
GA16i 96 - 98 mm (3.78 - 3.86 in)
CA18DE 99.5 - 101.5 mm (3.917 - 3.996 in)

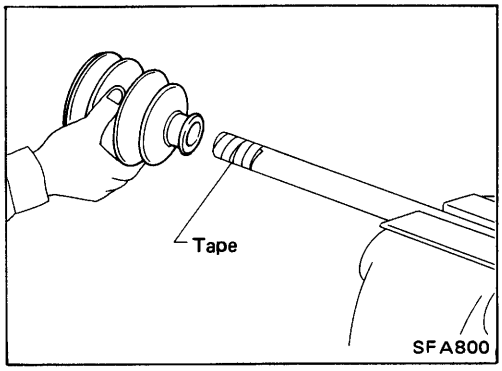
Make sure that boot is properly installed on the drive shaft groove.



5. Lock new larger and smaller boot bands securely with a suitable tool.

Assembly (Cont'd)

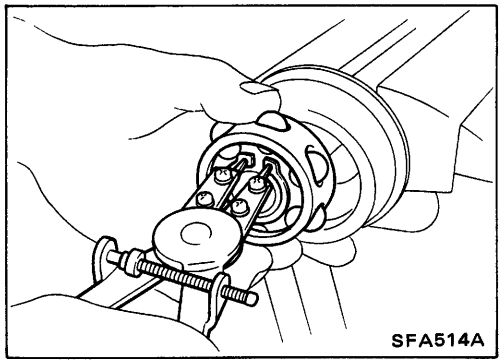




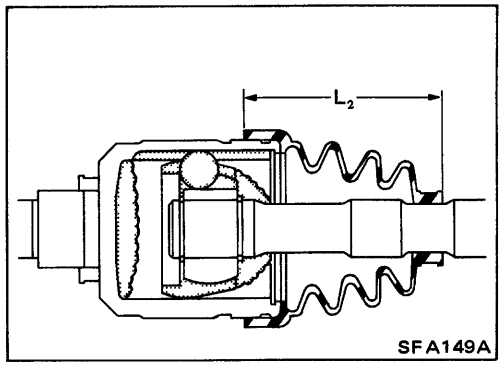
TRANSAXLE SIDE

1. Install boot and new small boot band on drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.



2. Install new snap ring "B", then securely install ball cage, inner race and balls as a unit, making sure the marks which were made during disassembly are properly aligned.
3. Install new snap ring "C".



4. Pack drive shaft with specified amount of grease.

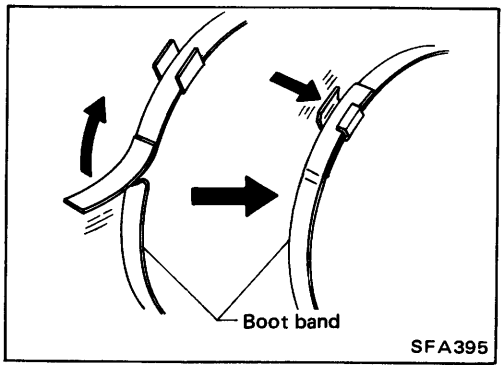
Specified amount of grease:
140 - 160 g (4.94 - 5.64 oz)

5. Install slide joint housing, then install new snap ring "A".
6. Set boot so that it does not swell and deform when its length is "L_2".

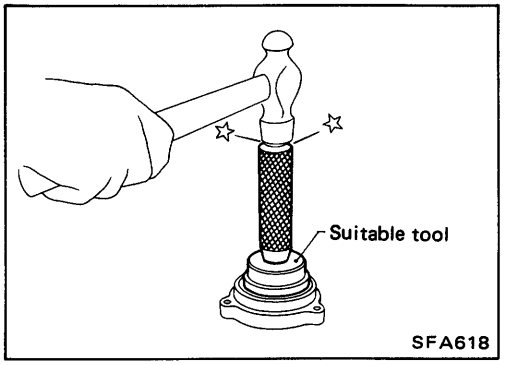
Length "L_2":
GA16i 101.5 - 103.5 mm (4.00 - 4.07 in)
CA18DE 97 - 99 mm (3.82 - 3.90 in)

Make sure that boot is properly installed on the drive shaft groove.

Assembly (Cont'd)

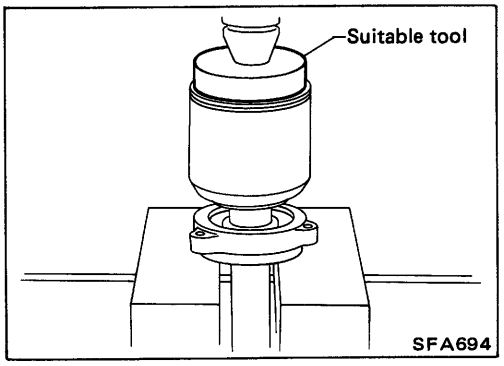


7. Lock new larger and smaller boot bands securely with a suitable tool.

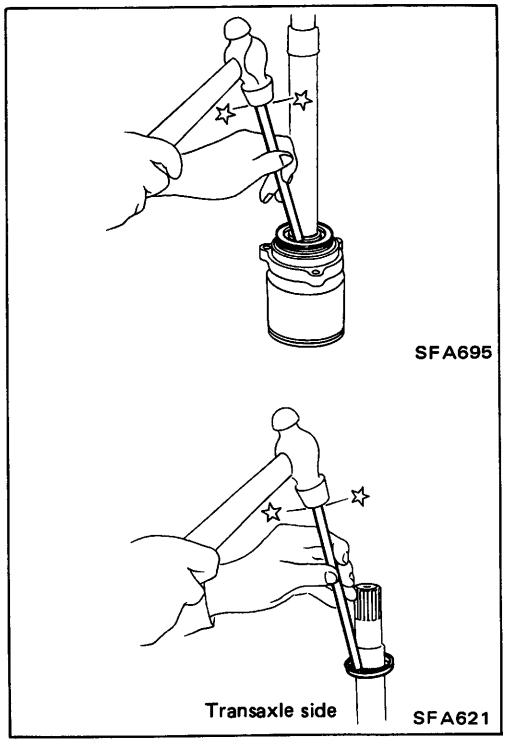


SUPPORT BEARING

- Press bearing into retainer.



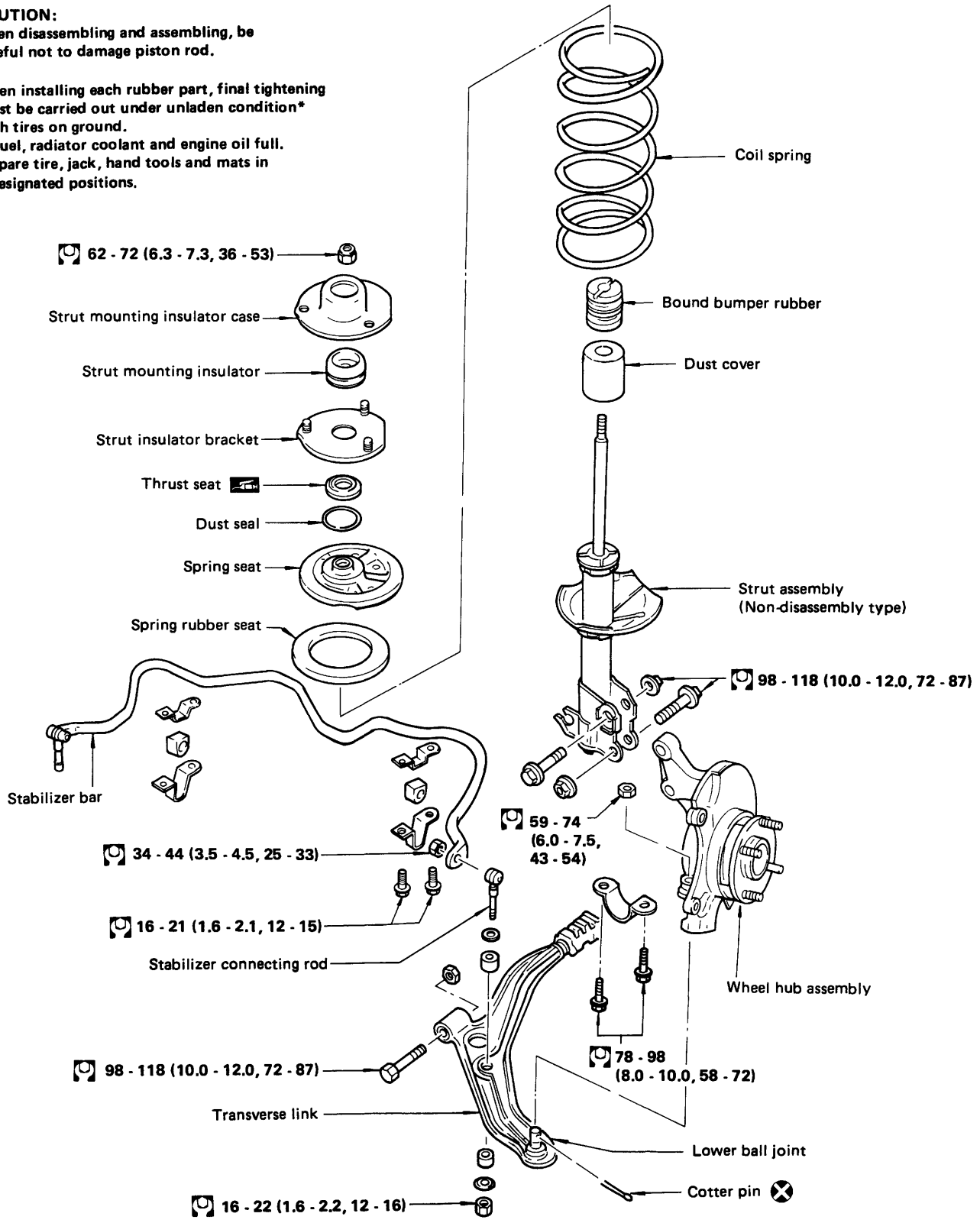
- Press drive shaft into bearing.



- Install snap ring.
- Install new dust shields.

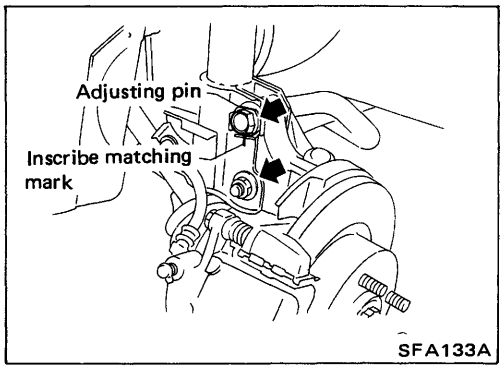
CAUTION:
When disassembling and assembling, be careful not to damage piston rod.

When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.
*** Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**



: N·m (kg-m, ft-lb)

SFA183A

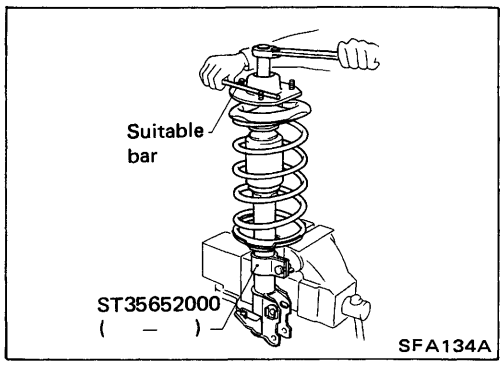


Removal and Installation

- Remove strut assembly fixing bolts and nuts (to hoodledge).

Do not remove piston rod lock nut on vehicle.

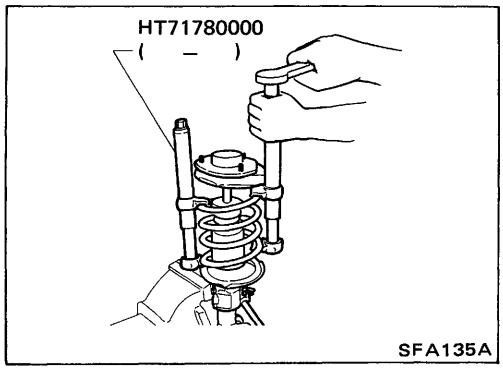
Put matching marks on strut lower bracket and camber adjusting pin.



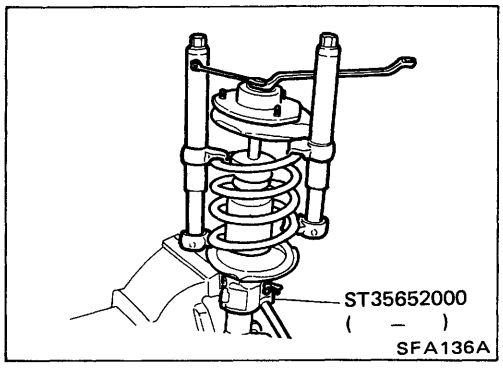
Disassembly

1. Set strut assembly on vise with Tool, then loosen piston rod lock nut.

- **Do not remove piston rod lock nut.**



2. Compress spring with Tool so as to permit turning of strut mounting insulator by hand.



3. Remove piston rod lock nut.

Inspection

STRUT ASSEMBLY

- If oil leakage occurs on welded or gland packing portion, replace strut assembly.
- Inspect piston rod for cracks, deformation or other damage. Replace strut assembly if necessary.
- Inspect threads for cracks or other damage. Replace strut assembly if necessary.

Inspection (Cont'd)

STRUT MOUNTING INSULATOR

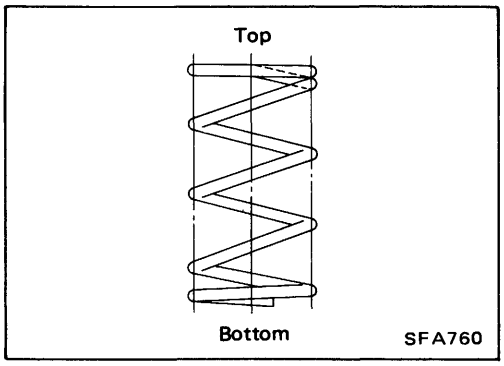
Check cemented rubber-to-metal portion for melting or cracks. Check rubber parts for deterioration.

THRUST SEAT

Check for cracks, deformation or other damage. Replace if necessary.

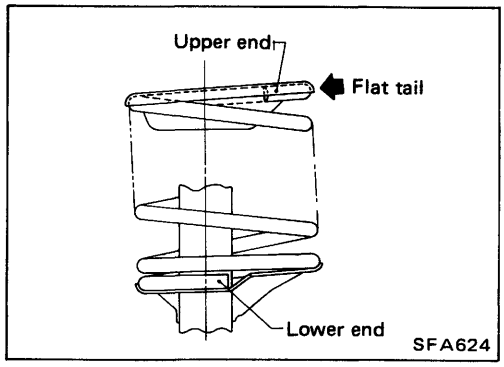
COIL SPRING

Check for cracks, deformation or other damage. Replace if necessary.

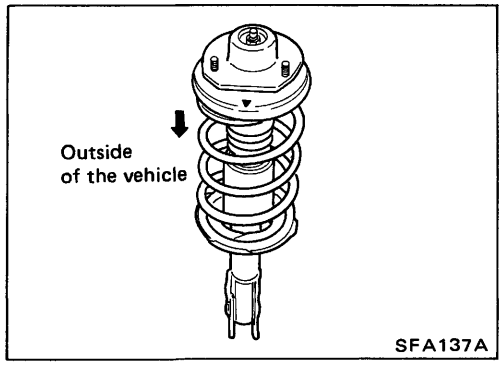


Assembly

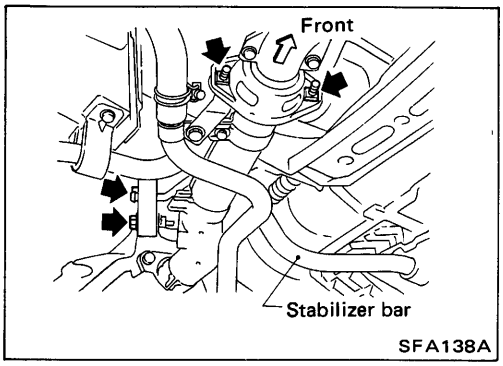
- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)



- When installing coil spring on strut, it must be positioned as shown.



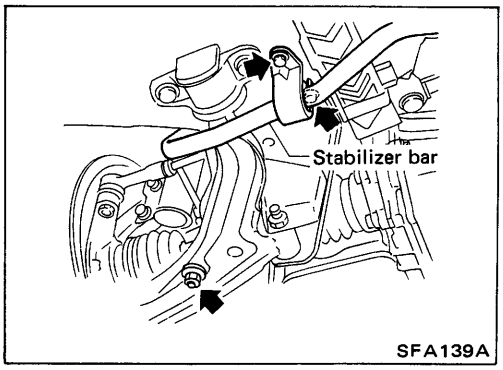
- When installing spring seat, make sure that it is positioned as shown.



SFA138A

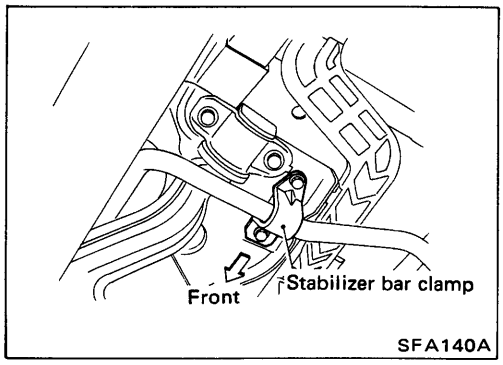
Removal and Installation

- Remove exhaust tube fixing bolts (as shown at left).



SFA139A

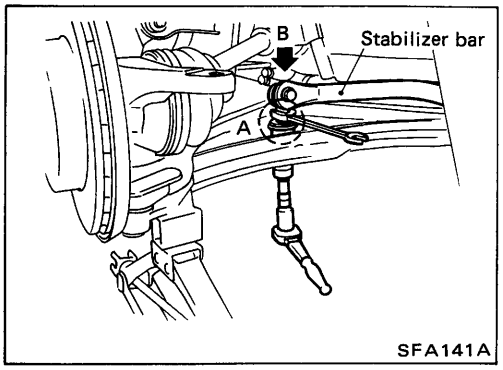
- Remove stabilizer attaching bolts and nuts, then pull out stabilizer pushing down exhaust tube.



SFA140A

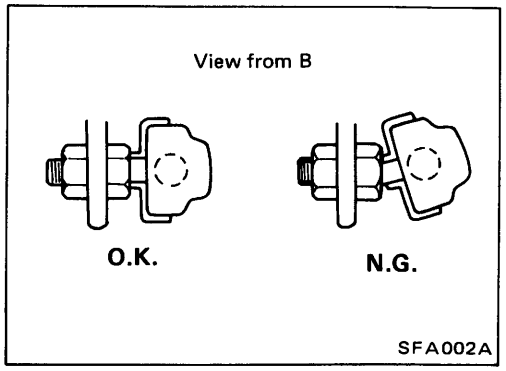
- Install stabilizer rear side bushings, then install front side bushings.

When installing stabilizer bar clamp, make sure direction is correct (as shown at left).



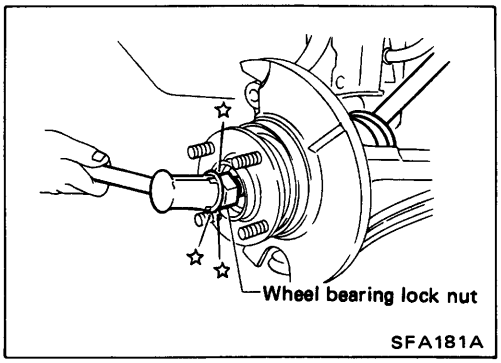
SFA141A

- When removing and installing stabilizer bar, fix portion A.



SFA002A

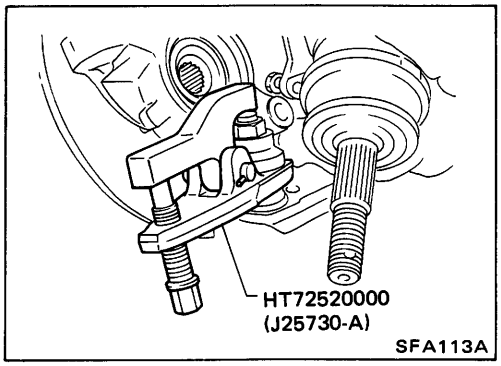
- Install stabilizer bar with ball joint socket properly placed.



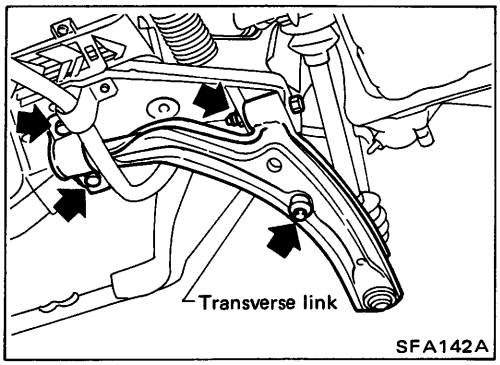
Removal and Installation

1. Remove wheel bearing lock nut.
2. Remove tie-rod ball joint.
3. Remove strut lower bracket fixing bolts and nuts.
4. Separate drive shaft from knuckle by slightly tapping drive shaft end.

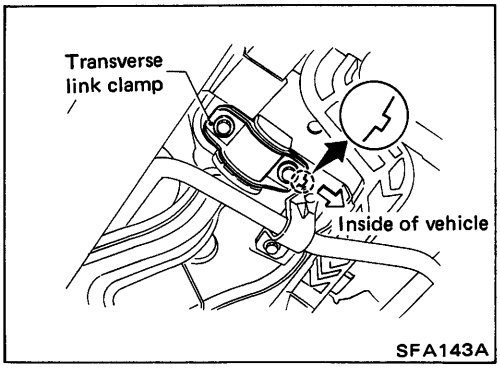
Cover boots with waste cloth so as not to damage them when removing drive shaft.



5. Separate lower ball joint stud from knuckle with Tool.
   Refer to FRONT AXLE – Wheel Hub and Knuckle.



6. Remove bolts and nuts as shown at left.



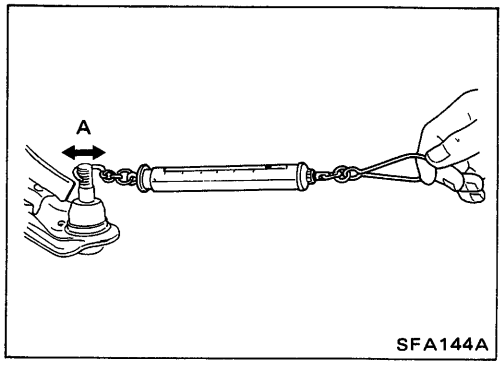
- When installing transverse link clamp, make sure direction is correct.

- When installing, final tightening must be carried out at curb weight with tires on ground.
- After installing, check wheel alignment.
  Refer to CHECK AND ADJUSTMENT – On-vehicle.

Inspection

TRANSVERSE LINK

- Check transverse link for damage, cracks and deformation; replace transverse link if necessary.
- Check rubber bushing for damage, cracks and deformation; replace transverse link if necessary.

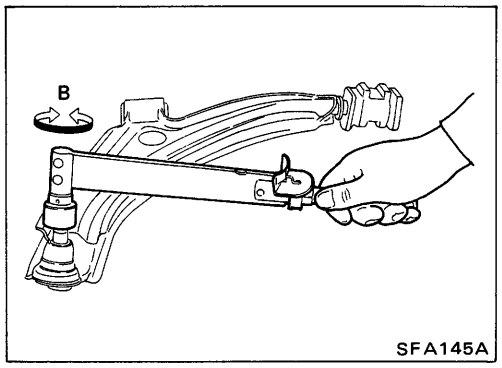


LOWER BALL JOINT

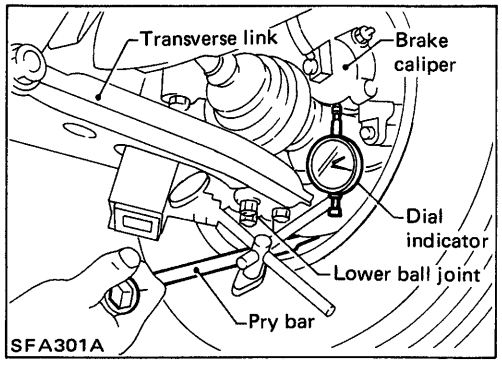
- Check ball joint for play. If ball stud is worn, play in axial direction is excessive or joint is hard to swing, replace transverse link.

Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.

Turning torque "A":
(measure point: cotter pin hole of ball stud)
New parts
15.7 - 80.4 N (1.6 - 8.1 kg, 3.5 - 18.1 lb)
Used parts
7.8 - 80.4 N (0.5 - 8.1 kg, 1.8 - 18.1 lb)



Turning torque "B":
New parts
1.0 - 4.9 N·m (10 - 50 kg-cm, 8.7 - 43.4 in-lb)
Used parts
0.5 - 4.9 N·m (3 - 50 kg-cm, 4.3 - 43.4 in-lb)



- Check vertical end play.

(1) Jack up front of vehicle and set the stands.
(2) Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
(3) Make sure front wheels are straight and brake pedal is depressed.
(4) Place a pry bar between transverse link and inner rim of road wheel.
(5) While pushing and releasing pry bar, observe maximum dial indicator value.
(6) Replace transverse link or lower ball joint if ball joint movement is beyond service specifications.

Vertical end play "C":
0 mm (0 in)

General Specifications

COIL SPRING

Item \ Model	GA16i engine				CA18DE engine			
	M/T (without A/C)	M/T (with A/C)	A/T (without A/C)	A/T (with A/C)	M/T (without A/C)	M/T (with A/C)	A/T (without A/C)	A/T (with A/C)
Wire diameter [Left/right] mm (in)	11.8 (0.465)/ 11.7 (0.461)	11.8 (0.465)/ 11.8 (0.465)	11.9 (0.469)/ 11.8 (0.465)	12.1 (0.476)/ 11.9 (0.469)	12.0 (0.472)	12.1 (0.476)		12.3 (0.484)
Coil diameter mm (in)	130 (5.12)	130 (5.12)	130 (5.12)	130 (5.12)	130 (5.12)	130 (5.12)		130 (5.12)
Free length [Left/right] mm (in)	343.0 (13.50)/ 335.5 (13.21)	343.0 (13.50)/ 343.0 (13.50)	350.5 (13.80)/ 343.0 (13.50)	358.0 (14.09)/ 350.5 (13.80)	335.5 (13.21)	341.5 (13.44)		348.5 (13.72)
Spring constant N/mm (kg/mm, lb/in)	19.6 (2.0, 112)	19.6 (2.0, 112)	19.6 (2.0, 112)	19.6 (2.0, 112)	21.6 (2.2, 123)	21.6 (2.2, 123)		21.6 (2.2, 123)
Identification color [Left/right]	White x 2, Pink x 1/ White x 1, Pink x 1	White x 2, Pink x 1/ White x 2, Pink x 1	Yellow green x 1, Pink x 1/ White x 2, Pink x 1	Pink x 1, Pink x 1/ Yellow green x 1, Pink x 1	Yellow x 1, Orange x 1	Orange x 1, Orange x 1		Pink x 1, Blue x 2

STRUT

Item \ Model	GA16i engine	CA18DE engine
Piston rod diameter mm (in)	18 (0.71)	
Stroke mm (in)	161 (6.34)	
Damping force N (kg, lb) [at 0.3 m (1.0 ft)/sec.]		
Expansion	667 - 902 (68 - 92, 150 - 203)	922 - 1,236 (94 - 126, 207 - 278)
Compression	226 - 363 (23 - 37, 23 - 82)	255 - 392 (26 - 40, 57 - 88)

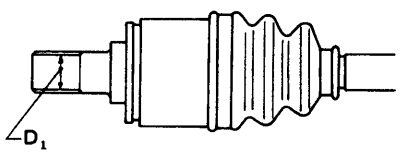
FRONT STABILIZER BAR

Item \ Model	GA16i engine	CA18DE engine
Stabilizer diameter mm (in)	25.4 (1.000)	28.6 (1.126)

DRIVE SHAFT

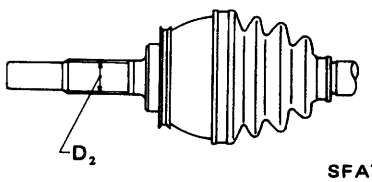
Item \ Model	GA16i engine	CA18DE engine
Joint type		
Transaxle side	TS79C	DS86
Wheel side	ZF90	BF86
Diameter mm (in)		
Transaxle side D_1	25 (0.98)	26 (1.02)
Wheel side D_2	26 (1.02)	26 (1.02)
Grease name		
Transaxle side	Nissan genuine grease or equivalent	
Wheel side	Nissan genuine grease or equivalent	
Capacity g (oz)		
Transaxle side	220 - 240 (7.76 - 8.46)	140 - 160 (4.94 - 5.64)
Wheel side	155 - 175 (5.47 - 6.17)	110 - 130 (3.88 - 4.59)

Transaxle side



SFA563

Wheel side



SFA726

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*)

Item \ Model		GA16i engine	CA18DE engine
Camber	degree	−1°15′ to 0°15′	
Caster	degree	1°10′ - 2°40′	
Toe-in (Total)	mm (in)	−1 to 1 (−0.04 to 0.04)	
	degree	−6′ to 6′	
Kingpin inclination	degree	13°40′ - 15°15′	
Front wheel turning angle Toe-out turn inside/ outside	degree	21°36′/20°	22°24′/20°
Full turn inside/ outside	degree	37° - 40°/32°30′	36° - 39°/30°

*: Tankful of fuel, radiator coolant and engine oil full
Spare tire, jack, hand tools, mats in designated positions

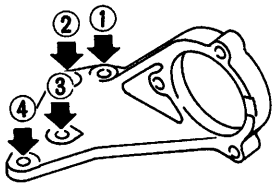
LOWER BALL JOINT

Turning torque "A" (Measuring point: cotter pin hole of ball stud)		
New parts	N (kg, lb)	15.7 - 79.4 (1.6 - 8.1, 3.5 - 17.9)
Used parts	N (kg, lb)	4.9 - 79.4 (0.5 - 8.1, 1.1 - 17.9)
Turning torque "B"	N·m (kg-cm, in-lb)	
New parts		1.0 - 4.9 (10 - 50, 8.7 - 43.4)
Used parts		0.3 - 4.9 (3 - 50, 2.6 - 43.4)
Vertical end play "C"	mm (in)	0 (0)

WHEEL BEARING

Wheel bearing axial end play mm (in)	0.05 (0.0020) or less
Wheel bearing lock nut Tightening torque N·m (kg-m, ft-lb)	196 - 275 (20 - 28, 145 - 203)

Tightening Torque

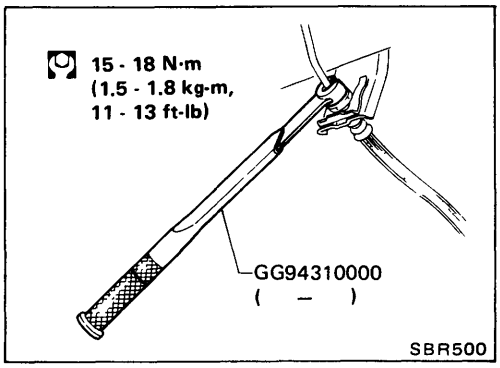
Item	N·m	kg-m	ft-lb
Strut assembly			
Piston rod self-locking nut	62 - 72	6.3 - 7.3	46 - 53
Strut to body	25 - 29	2.5 - 3.0	18 - 22
Strut to knuckle	98 - 118	10 - 12	72 - 87
Lower ball joint			
Stud nut	59 - 74	6.0 - 7.5	43 - 54
Tie rod			
Lock nut	37 - 46	3.8 - 4.7	27 - 34
Stud nut	29 - 39	3 - 4	22 - 29
Transverse link			
Securing bolt	78 - 98	8 - 10	58 - 72
Securing nut	98 - 118	10 - 12	72 - 87
Axle			
Wheel bearing lock nut	196 - 275	20 - 28	145 - 203
Caliper	54 - 64	5.5 - 6.5	40 - 47
Wheel nut	98 - 118	10 - 12	72 - 87
Stabilizer bar			
Stabilizer bar clamp to body	16 - 21	1.6 - 2.1	12 - 15
Connecting rod to transverse link	16 - 21	1.6 - 2.2	12 - 15
Stabilizer bar to ball joint	34 - 44	3.5 - 4.5	25 - 33
Front axle support bearing bracket (CA18DE engine)			
To retainer	13 - 19	1.3 - 1.9	9 - 14
To engine			
 SFA096A			
No. 1	25 - 35	2.6 - 3.6	19 - 26
No. 2, 4	43 - 58	4.4 - 5.9	32 - 43
No. 3	30 - 40	3.1 - 4.1	22 - 30

REAR AXLE & REAR SUSPENSION

SECTION RA

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REAR SUSPENSION RA-10
REAR SUSPENSION – Coil Spring and Strut Assembly RA-11
REAR SUSPENSION – Parallel Link and Radius Rod RA-13
SERVICE DATA AND SPECIFICATIONS (S.D.S.) RA-14

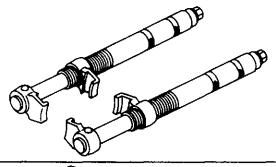
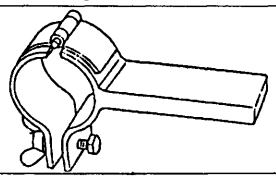
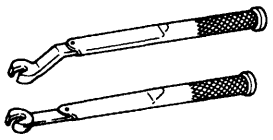
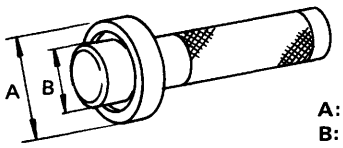
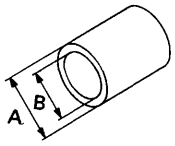


Precautions

(1) When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.
  * Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, and mats in designated positions.
(2) When removing each suspension part, check wheel alignment and adjust if necessary.
(3) Use Tool when removing or installing brake tubes.
(4) Do not jack up at the parallel links.

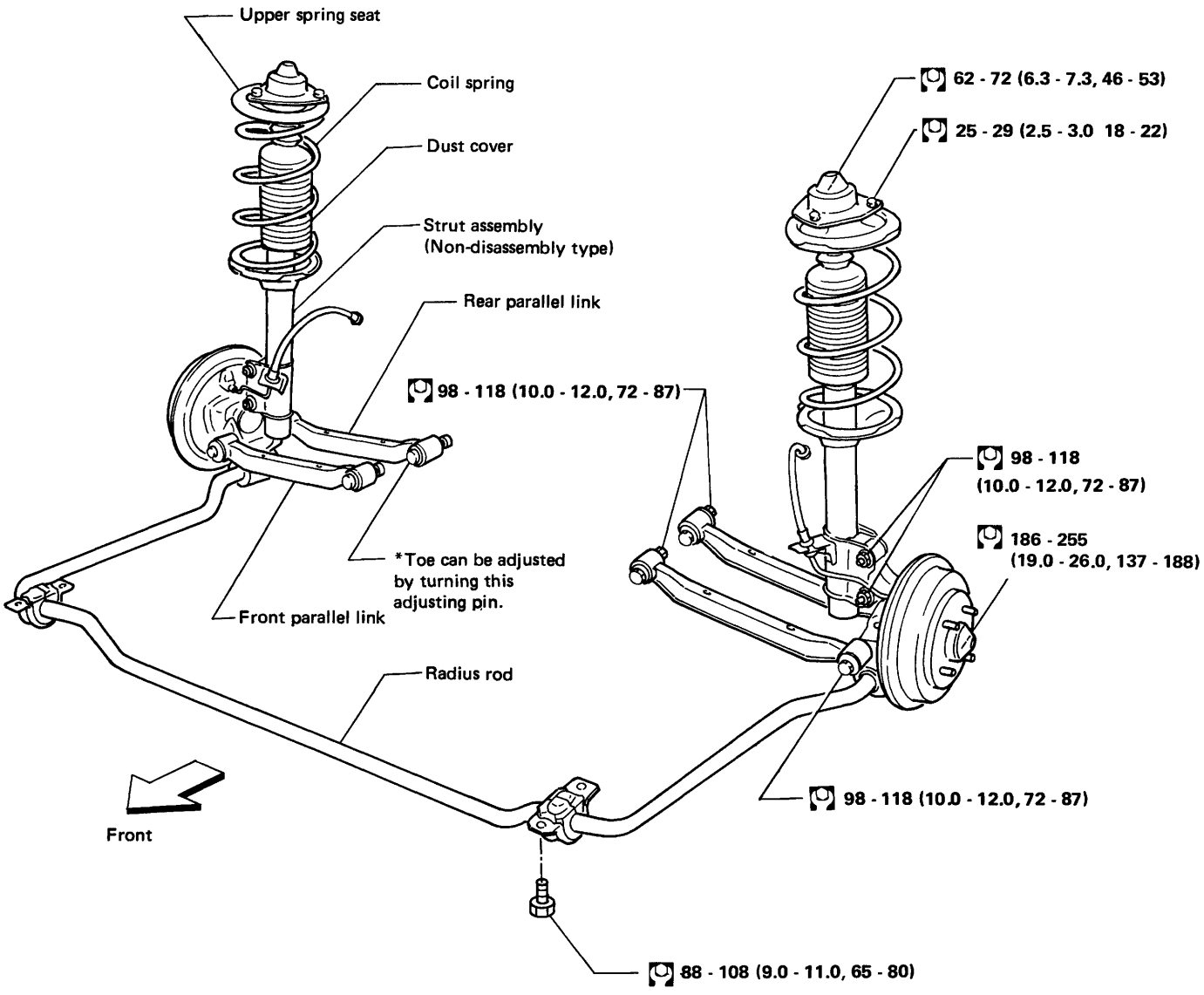
Preparation

SPECIAL SERVICE TOOLS

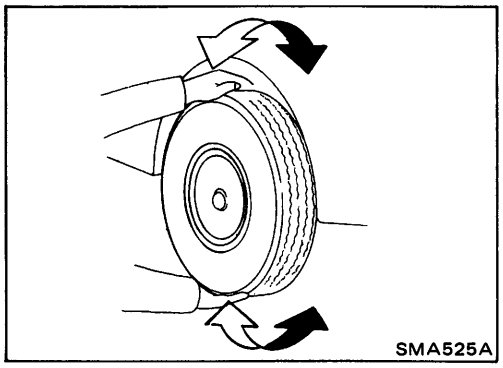
Tool number (Kent-Moore No.) Tool name	Description	
HT71780000 (–) Spring compressor		Removing and installing coil spring
ST35652000 (–) Strut attachment		Fixing strut assembly
GG94310000 (–) Flare nut torque wrench		Removing and installing brake piping
ST33220000 (J25804-01) Differential side bearing drift		Removing wheel bearing **A: 37 mm (1.46 in) dia.** **B: 22 mm (0.87 in) dia.**
ST33200000 (J26082) Differential side bearing drift		Installing wheel bearing **A: 60 mm (2.36 in) dia.** **B: 44.5 mm (1.752 in) dia.**

CAUTION:
Do not jack up at the parallel links.
Wheel alignment
- **Camber cannot be adjusted.**
- **Vehicle requires only toe-in adjustment.**
  –1.5 to 2.5 mm (–0.059 to 0.098 in)
  –9′ to 15′ (Total toe-in)

Wheel bearing
- **Tightening torque: 186 - 216 N·m (19.0 - 22.0 kg-m, 137 - 159 ft-lb)**
- **Axial end play: 0.05 mm (0.0020 in) or less**



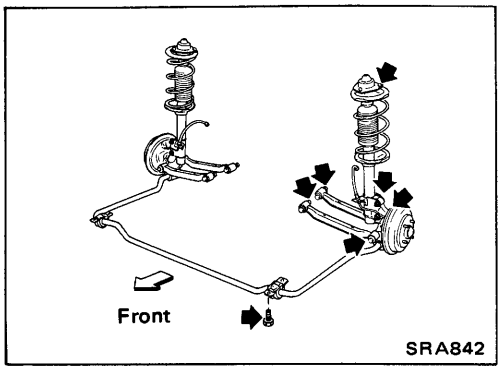
SRA841


SMA525A

Rear Axle and Rear Suspension Parts

- Check axle and suspension parts for looseness, wear or damage.

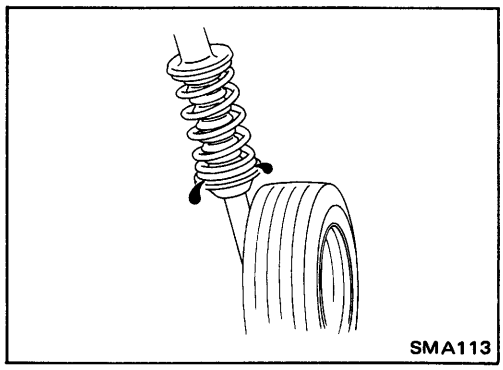
(1) Shake each rear wheel.



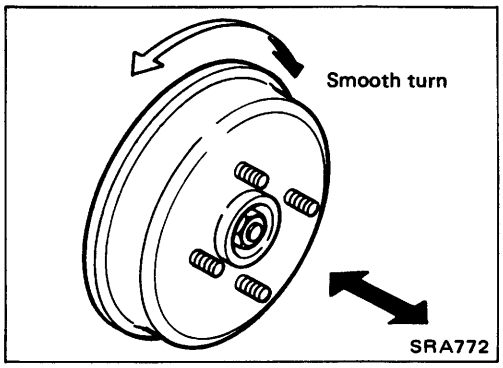
SRA842

(2) Retighten all nuts and bolts to the specified torque.

Tightening torque: Refer to S.D.S.


SMA113

(3) Check strut (shock absorber) for oil leakage or other damage.



SRA772

Rear Wheel Bearing

- Check tightening torque of wheel bearing lock nut.

: 186 - 255 N·m (19 - 26 kg-m, 137 - 188 ft-lb)

- Check that wheel bearings operate smoothly.
- Check axial end play.

Axial end play:
0.05 mm (0.0020 in) or less

If there is any axial end play or wheel bearing does not turn smoothly, replace wheel bearing assembly.

Refer to REAR AXLE-Wheel Hub and Knuckle Spindle.

Rear Wheel Alignment

PRELIMINARY INSPECTION

Make following checks. Adjust, repair or replace if necessary.

- Check tires for wear and proper inflation.
- Check rear wheel bearings for looseness.
- Check wheel runout.

Lateral runout:
1.0 mm (0.039 in) or less

- Check if rear strut (shock absorber) works properly.
- Check rear axle and rear suspension parts for looseness.

Rear Wheel Alignment (Cont'd)

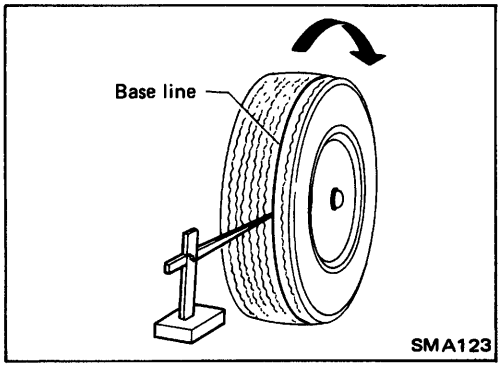
- Check vehicle posture (Unladen).
  "Unladen":
  Fuel tank, radiator and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

CAMBER

Camber is preset at factory and cannot be adjusted.

Camber: −2°00′ to −0°30′

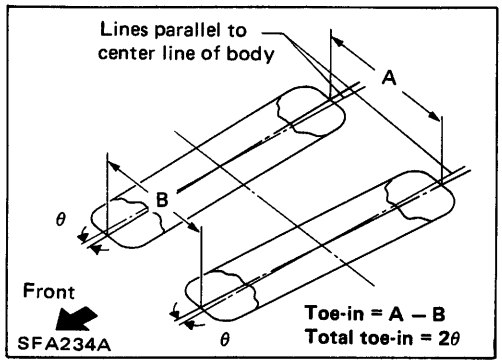
If the camber is not within specification, inspect and replace any damaged or worn rear suspension parts.



TOE-IN

1. Mark a base line across the tread.

After lowering rear of vehicle, move it up and down to eliminate friction.

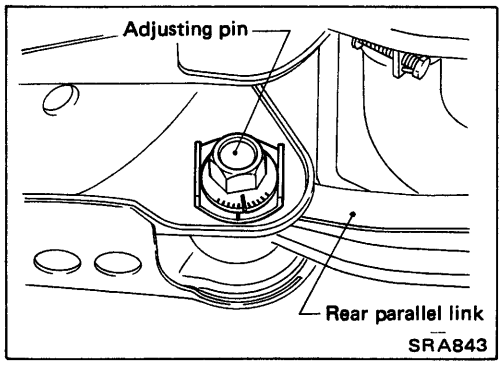


2. Measure toe-in.

Measure distance "A" and "B" at the same height as hub center.

Toe-out:

A − B	**−1.5 to 2.5 mm (−0.059 to 0.098 in)**
2θ	**−9′ to 15′**

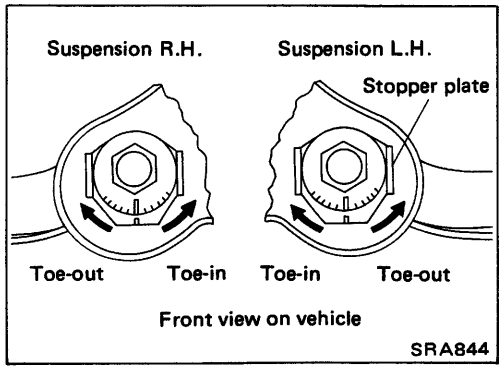


3. Adjust toe-in by turning adjusting pins.

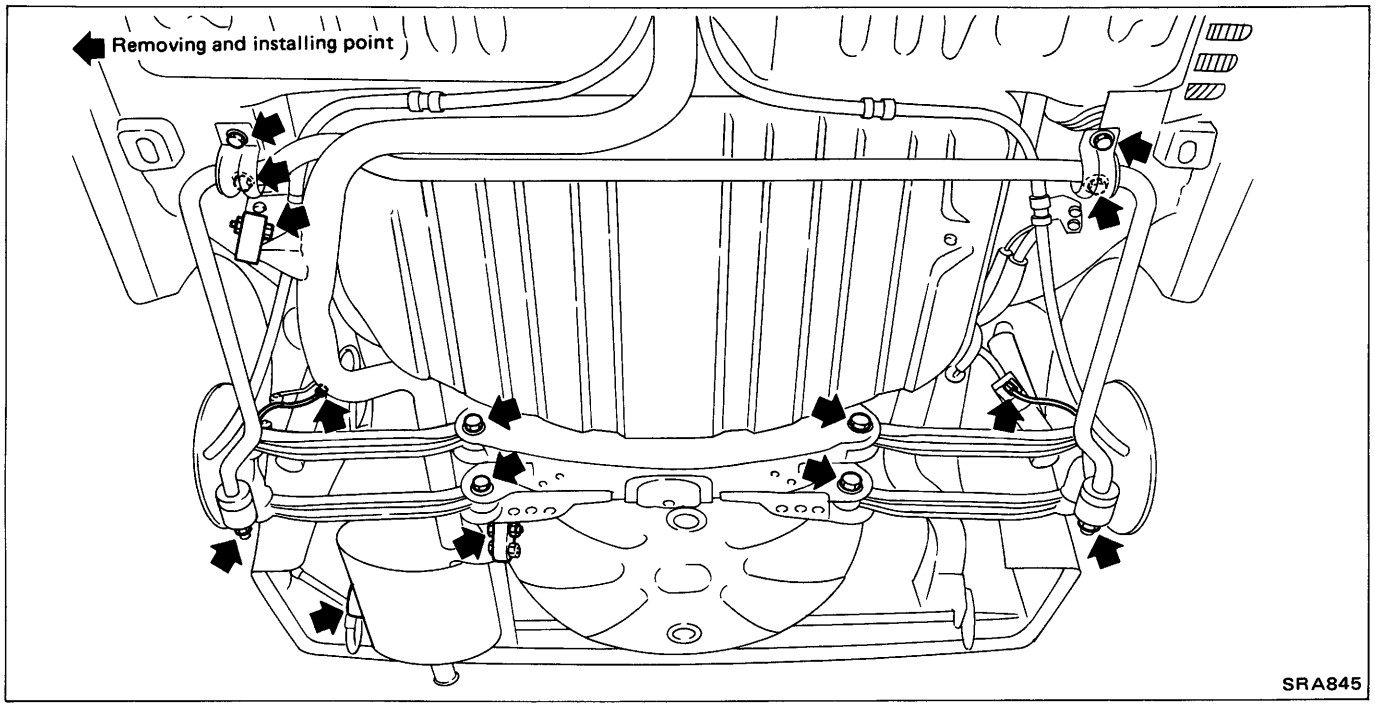
Toe changes about 2 mm (0.08 in) [One side] with each graduation of the pin.

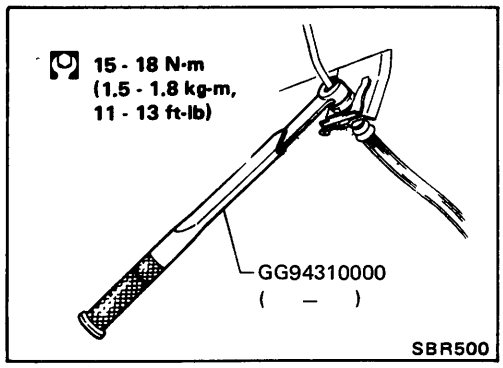
4. Tighten to the specified torque.

: 98 - 118 N·m
(10.0 - 12.0 kg-m, 72 - 87 ft-lb)



Removal and Installation



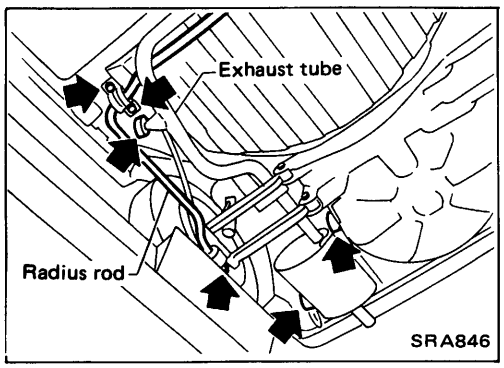


CAUTION:

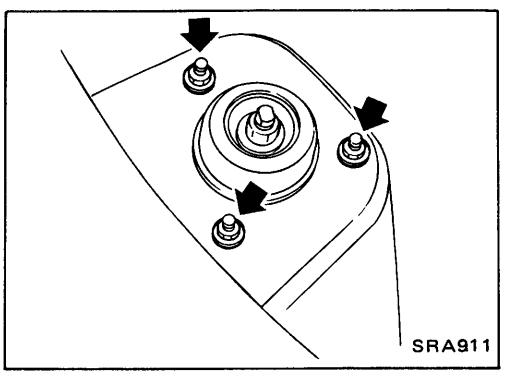
Do not jack up at the parallel links.

1. Disconnect brake hydraulic line and parking brake cable at equalizer.

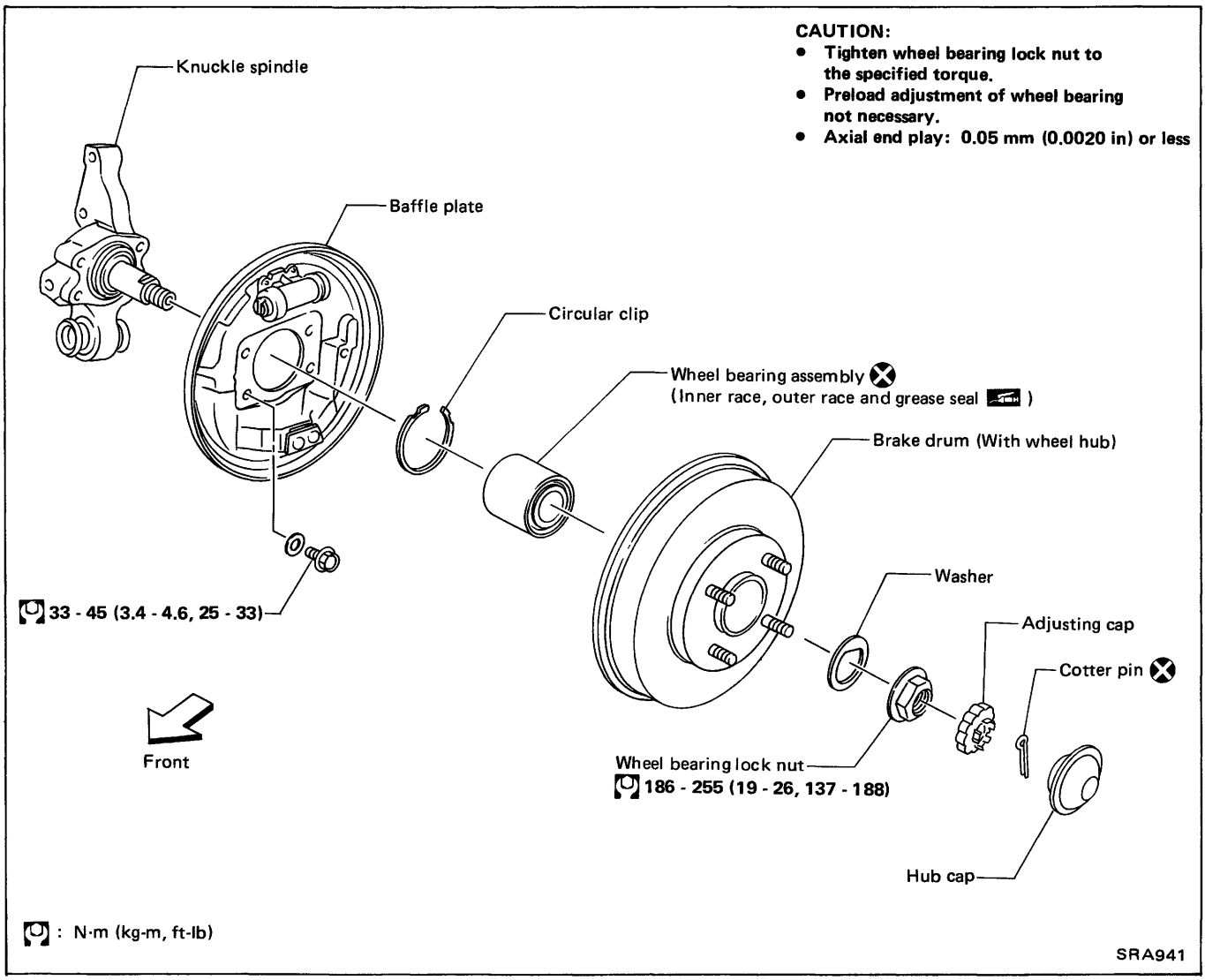
Use Tool when removing or installing brake tubes.

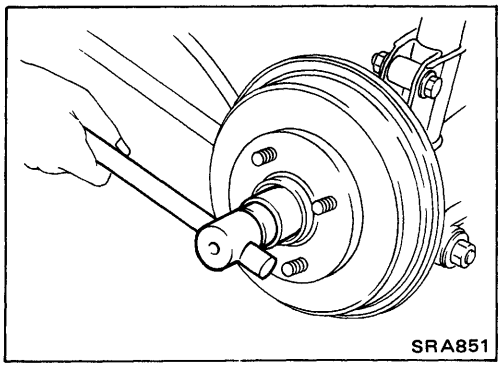


2. Remove exhaust tube fixing bolts.
3. Remove radius rod fixing bolts, then pull out radius rod pushing down exhaust tube.



- Remove upper end nut of shock absorber.

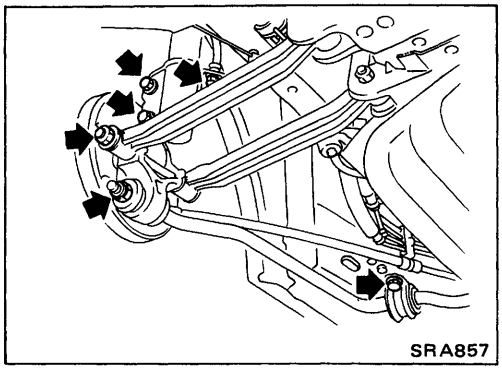

CAUTION:
• Tighten wheel bearing lock nut to the specified torque.
• Preload adjustment of wheel bearing not necessary.
• Axial end play: 0.05 mm (0.0020 in) or less
Knuckle spindle
Baffle plate
Circular clip
Wheel bearing assembly
(Inner race, outer race and grease seal)
Brake drum (With wheel hub)
Washer
Adjusting cap
Cotter pin
33 - 45 (3.4 - 4.6, 25 - 33)
Front
Wheel bearing lock nut
186 - 255 (19 - 26, 137 - 188)
Hub cap
: N·m (kg-m, ft-lb)
SRA941


SRA851

Removal and Installation

WHEEL HUB

- Remove wheel bearing lock nut.
- Remove brake drum (with wheel hub) with wheel bearing from knuckle spindle.
- After installing, check wheel bearing.
  Refer to Rear Wheel Bearing in CHECK AND ADJUSTMENT — On-vehicle.


SRA857

KNUCKLE SPINDLE

- Disconnect brake hydraulic line and parking brake cable.

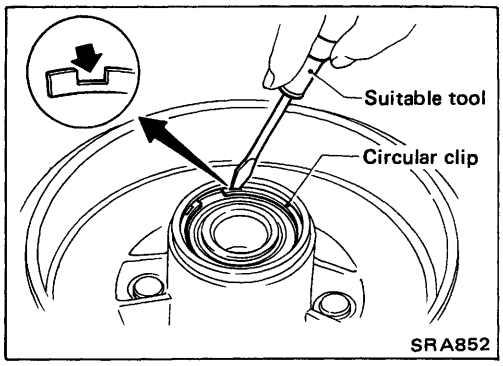
Use Tool (GG94310000) when removing or installing brake tubes.

- Remove bolts and nuts as shown.

Disassembly

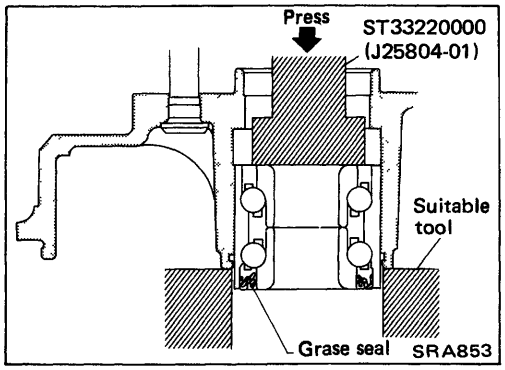
CAUTION:

When removing wheel bearing from wheel hub, replace wheel bearing assembly (outer rece, inner race and grease seal) with a new one.



SRA852

- Remove circular clip with suitable tool.



SRA853

- Press out wheel bearing.

Inspection

WHEEL HUB

- Check wheel hub for any cracks by using a magnetic exploration or dyeing test.

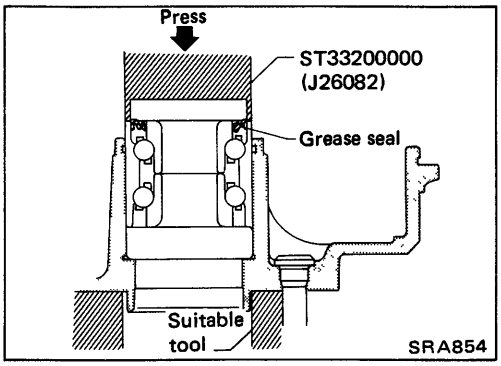
CIRCULAR CLIP

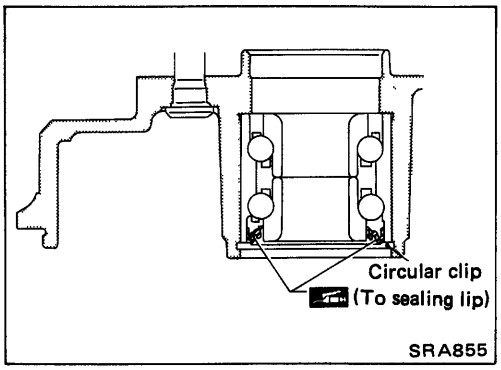
- Check circular clip for wear or cracks.
  Replace if necessary

Inspection (Cont'd)

KNUCKLE SPINDLE

- Check knuckle spindle for deformation, tapping mark or cracks (by magnetic or dyeing test) and replace if damaged.





Assembly

1. Press new wheel bearing assembly into wheel hub from inside of brake drum (with wheel hub).

   Maximum load P:

   29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)

CAUTION:

Do not press inner race of wheel bearing assembly.

Do not apply oil or grease to mating surfaces of wheel bearing outer race and wheel hub.

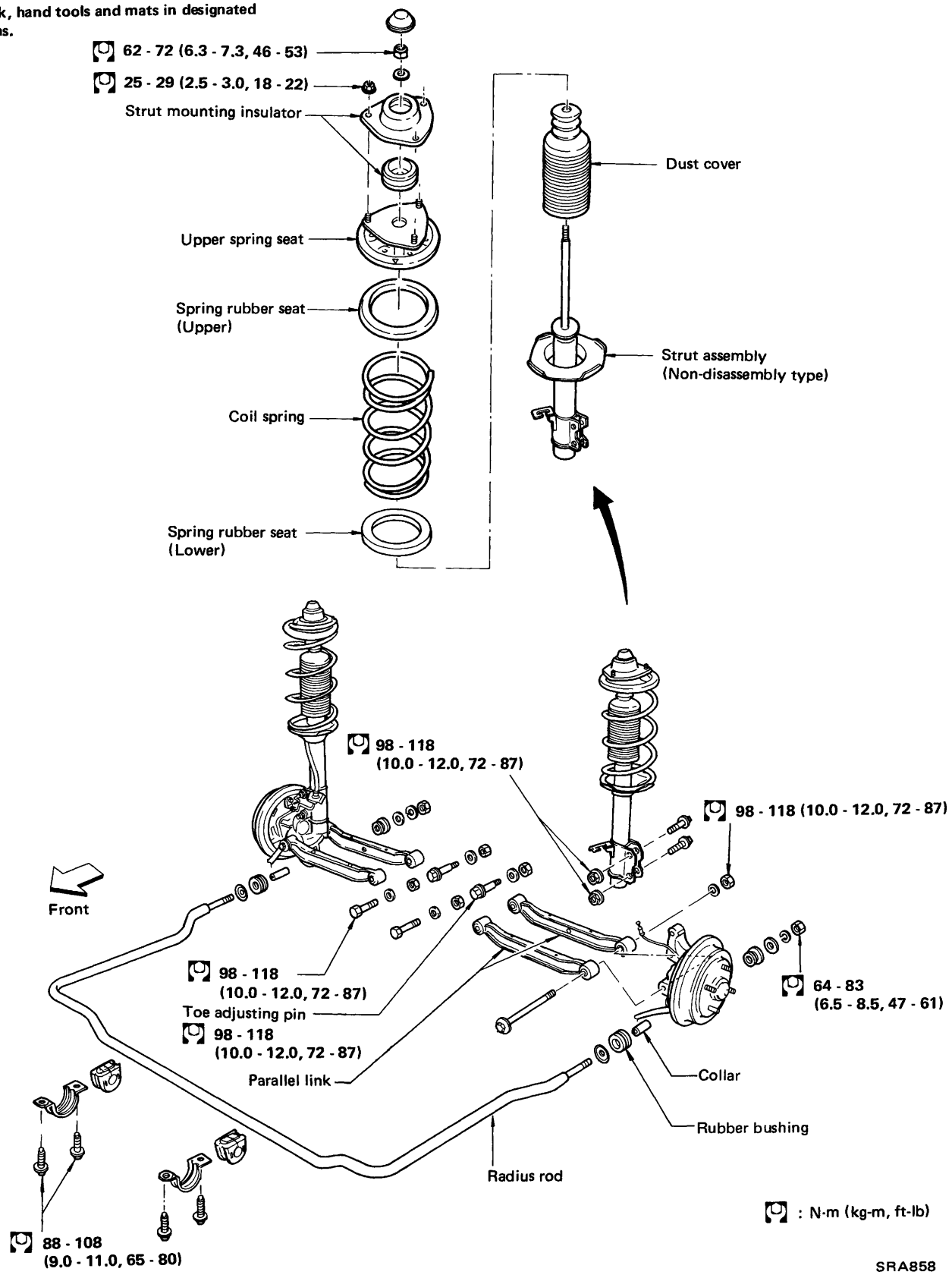
Be careful not to damage grease seal.

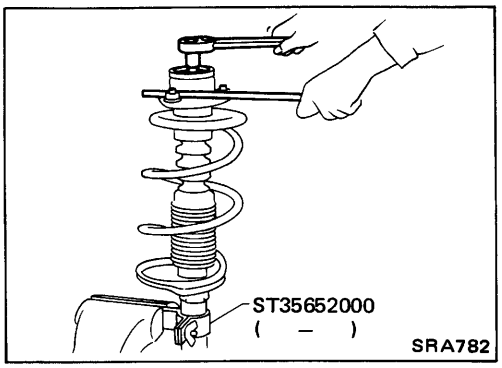
2. Install circular clip into groove of wheel hub.
3. Apply multi-purpose grease to sealing lip.

CAUTION:
Do not jack up at the parallel links.

When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

*** Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**

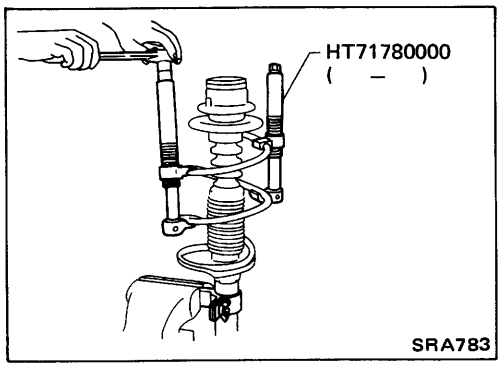




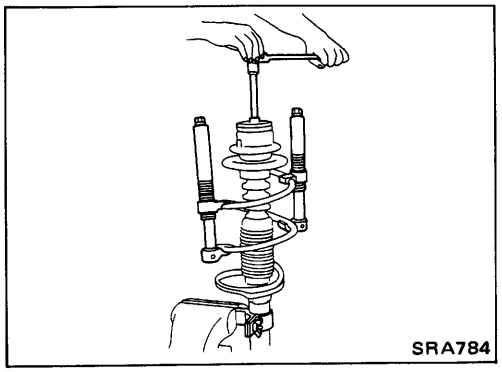
Disassembly

1. Set strut assembly on vice with attachment, then loosen piston rod lock nut.

- **Do not remove piston rod lock nut.**



2. Compress spring with suitable tool so that the strut mounting insulator can be turned by hand.



3. Remove piston rod lock nut.

Inspection

STRUT ASSEMBLY

- If oil leakage occurs on welded or gland packing portion, replace strut assembly.
- Inspect piston rod for cracks, deformation or other damage. Replace strut assembly if necessary.
- Inspect threads for cracks or other damage. Replace strut assembly if necessary.

STRUT MOUNTING INSULATOR

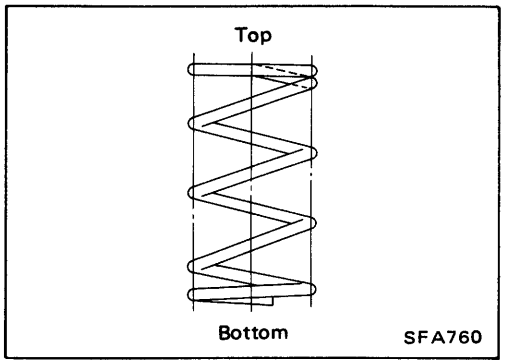
Check cemented rubber-to-metal portion for melting or cracks. Check rubber parts for deterioration.

SPRING SEAT

Check for cracks, deformation or other damage. Replace if necessary.

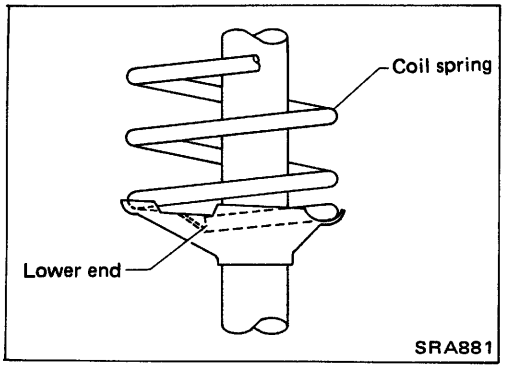
COIL SPRING

Check for cracks, deformation or other damage. Replace if necessary.

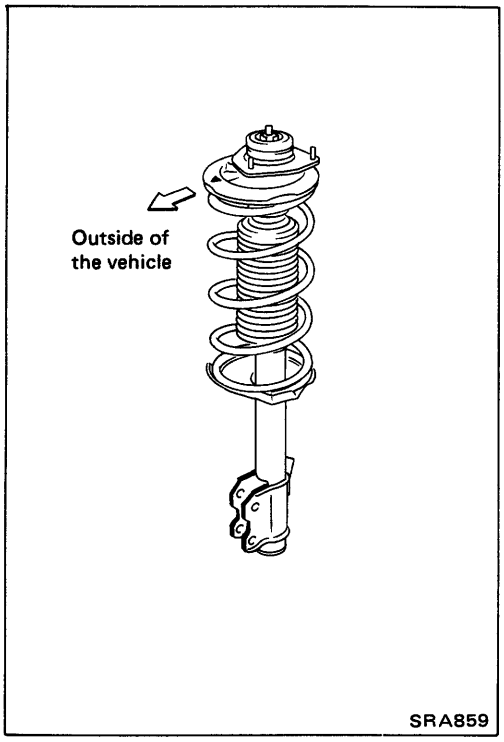


Assembly

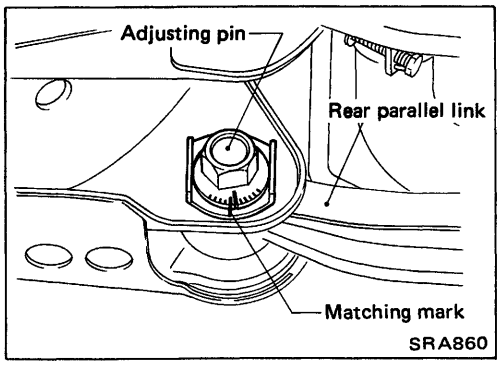
- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)

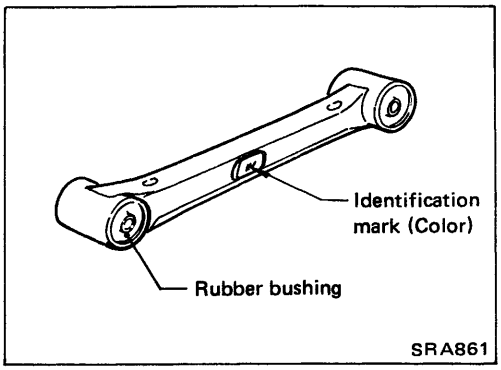


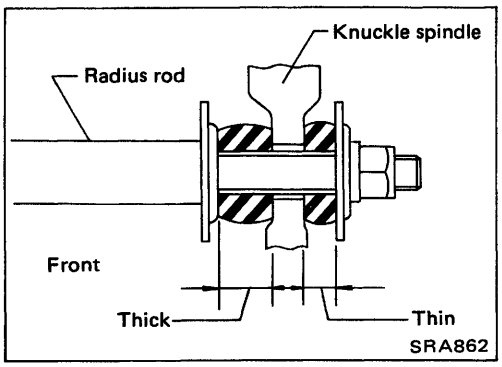
- When installing coil spring on strut, it must be positioned as shown.

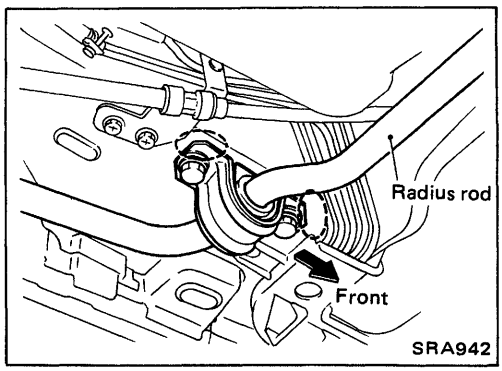


- When installing upper spring seat, make sure that it is positioned as shown.









Removal and Installation

- Refer to Removal and Installation in REAR AXLE AND REAR SUSPENSION ASSEMBLY.

PARALLEL LINK

Before removing parallel link fixing bolts, make a toe adjusting-pin matching mark.

- When installing, confirm identification mark (Color) on parallel link.

Parallel link	Identification mark (Color)	Parts number of rubber bushing
Front	Green	55157 50A00
Rear	Blue	55157 80M00

RADIUS ROD

- When installing each rubber bushing, pay attention to their positions.

- When installing radius rod clamps, pay attention to their direction.

Inspection

- Check parallel link and radius rod for cracks, distortion or other damage.
- Check rubber bushing for cracks, distortion or other damage.

General Specifications

COIL SPRING

Item \ Model	GA16i engine	CA18DE engine
Wire diameter mm (in)	9.4 - 11.3 (0.370 - 0.445)	9.5 - 11.4 (0.374 - 0.449)
Coil diameter mm (in)	130 (5.12)	
Free length mm (in)	302.0 (11.89)	311.5 (12.26)
Spring constant N/mm (kg/mm, lb/in)	15.6 - 25.5 (1.59 - 2.60, 89.0 - 145.6)	
Identification color	Yellow x 1 White x 1	Yellow x 1 Pink x 1

STRUT

Item \ Model	GA16i engine	CA18DE engine
Piston rod diameter mm (in)	18 (0.71)	
Stroke mm (in)	226.5 (8.92)	
Damping force N (kg, lb) [at 0.3 m (1.0 ft)/sec.]		
Expansion	422 - 598 (43 - 61, 95 - 135)	490 - 686 (50 - 70, 110 - 154)
Compression	147 - 265 (15 - 27, 33 - 60)	226 - 363 (23 - 37, 51 - 82)

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

Item \ Model		All
Camber	degree	–2°00′ to –0°30′
Toe-in	mm (in)	–1.5 to 2.5 (–0.059 to 0.098)
	(Total) degree	–9′ to 15′

*1 Tankful of fuel, radiator coolant and engine oil full
Spare tire, jack, hand tools, mats in designated positions

WHEEL BEARING

Wheel bearing axial end play mm (in)	0.05 (0.0020) or less
Wheel bearing lock nut Tightening torque N·m (kg-m, ft-lb)	186 - 255 (19 - 26, 137 - 188)

Tightening Torque

Unit	N·m	kg-m	ft-lb
Wheel nut	98 - 118	10 - 12	72 - 87
Wheel bearing lock nut	186 - 255	19 - 26	137 - 188
Strut assembly			
Piston rod self-locking nut	62 - 72	6.3 - 7.3	46 - 53
Strut to body	25 - 29	2.5 - 3.0	18 - 22
Strut to knuckle	98 - 118	10 - 12	72 - 87
Parallel link			
Parallel link to suspension member	98 - 118	10 - 12	72 - 87
Parallel link to knuckle	98 - 118	10 - 12	72 - 87
Radius rod			
Radius rod to knuckle	64 - 83	6.5 - 8.5	47 - 61
Radius rod bracket to body	88 - 108	9 - 11	65 - 80

BRAKE SYSTEM

SECTION BR

CONTENTS

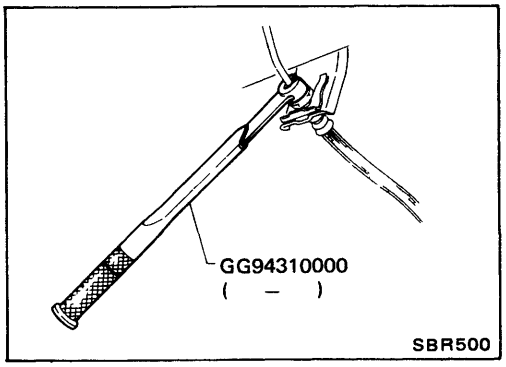
PRECAUTIONS AND PREPARATION ..... BR- 2
CHECK AND ADJUSTMENT ..... BR- 3
BRAKE HYDRAULIC LINE ..... BR- 4
BRAKE PEDAL AND BRACKET ..... BR- 7
BRAKE BOOSTER ..... BR- 9
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FRONT DISC BRAKE (CL18B, AD18VB) — Caliper BR-13
FRONT DISC BRAKE (CL18B, AD18VB) — Rotor BR-17
REAR DRUM BRAKE (LT20A) BR-18
PARKING BRAKE CONTROL BR-20
SERVICE DATA AND SPECIFICATIONS (S.D.S.) BR-22

Precautions

- Recommended fluid is brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- To clean or wash all parts of master cylinder, disc brake caliper and wheel cylinder, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene. They will ruin the rubber parts of the hydraulic system.

WARNING:

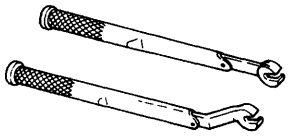
- Clean pad and shoe dust using a dust collector after cleaning with waste cloth.

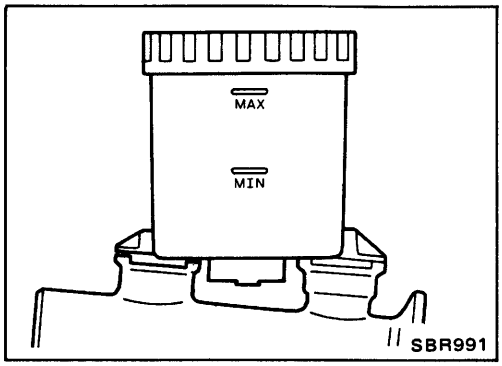


- Use Tool when removing and installing brake tube.

Preparation

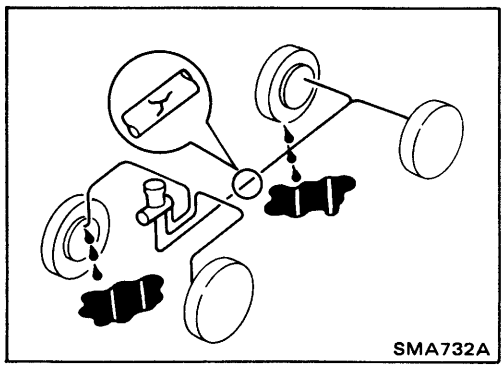
SPECIAL SERVICE TOOL

Tool number (Kent-Moore No.) Tool name	Description	
GG94310000 (–) Flare nut torque wrench		Removing and installing each brake piping



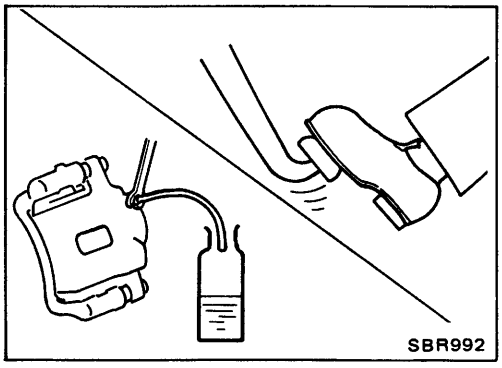
Checking Brake Fluid Level

- Check fluid level in reservoir tank. It should be between Max. and Min. lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.



Checking Brake System

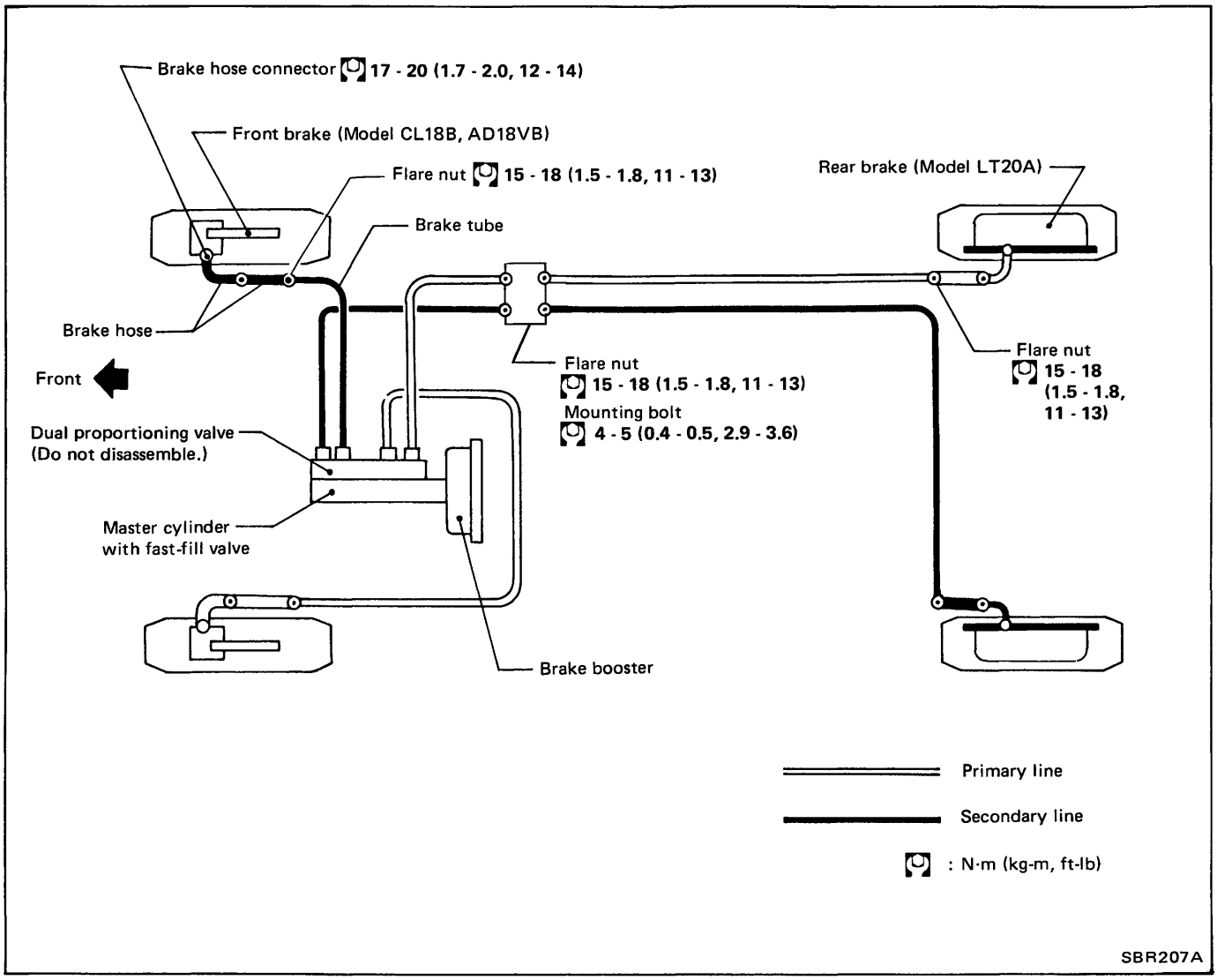
- Check brake lines (tubes and hoses) for evidence of cracks, deterioration or other damage. Replace any damaged parts.
  If leakage occurs around joints, retighten or, if necessary, replace damaged parts.
- Be sure to check for oil leakage by fully depressing brake pedal.

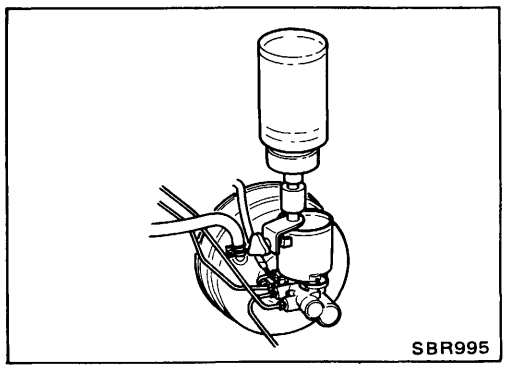


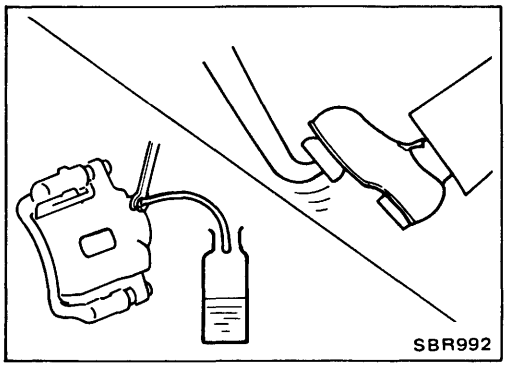
Changing Brake Fluid

1. Drain brake fluid using each air bleeder valve.
2. Refill until new brake fluid comes out of each air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill brake fluid.
   Refer to Bleeding Procedure.

- **Refill with recommended brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**







Bleeding Sequence

CAUTION:

- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **Fill reservoir with recommended brake fluid, and make sure it is kept full at all times while bleeding air out of system.**
- **Place a container beneath master cylinder to avoid spillage of brake fluid.**

- Bleed air according to the following procedure:
  Left rear wheel cylinder → Right front caliper → Right rear wheel cylinder → Left front caliper

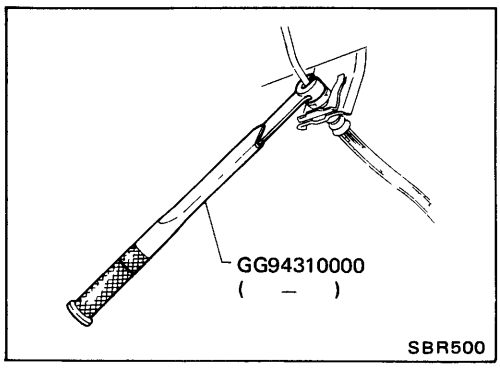
Bleeding Procedure

- **To bleed air out of master cylinder, use the following procedure.**

1) Connect a transparent vinyl tube to air bleeder valve.
2) Fully depress brake pedal several times.
3) With brake pedal depressed, open air bleeder valve to release air.
4) Close air bleeder valve.
5) Release brake pedal slowly.
6) **Wait 5 seconds.**
7) Repeat steps 2) through 6) until clear brake fluid comes out of air bleeder valve.

- **To bleed air out of lines, wheel cylinders and calipers, use the following procedure.**

1) Connect a transparent vinyl tube to air bleeder valve.
2) Fully depress brake pedal several times.
3) With brake pedal depressed, open air bleeder valve to release air.
4) Close air bleeder valve.
5) Release brake pedal slowly.
6) Repeat steps 2) through 5) until clear brake fluid comes out of air bleeder valve.



Removal and Installation

CAUTION:

a. **Use Tool when removing and installing brake tube.**

b. **Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.**

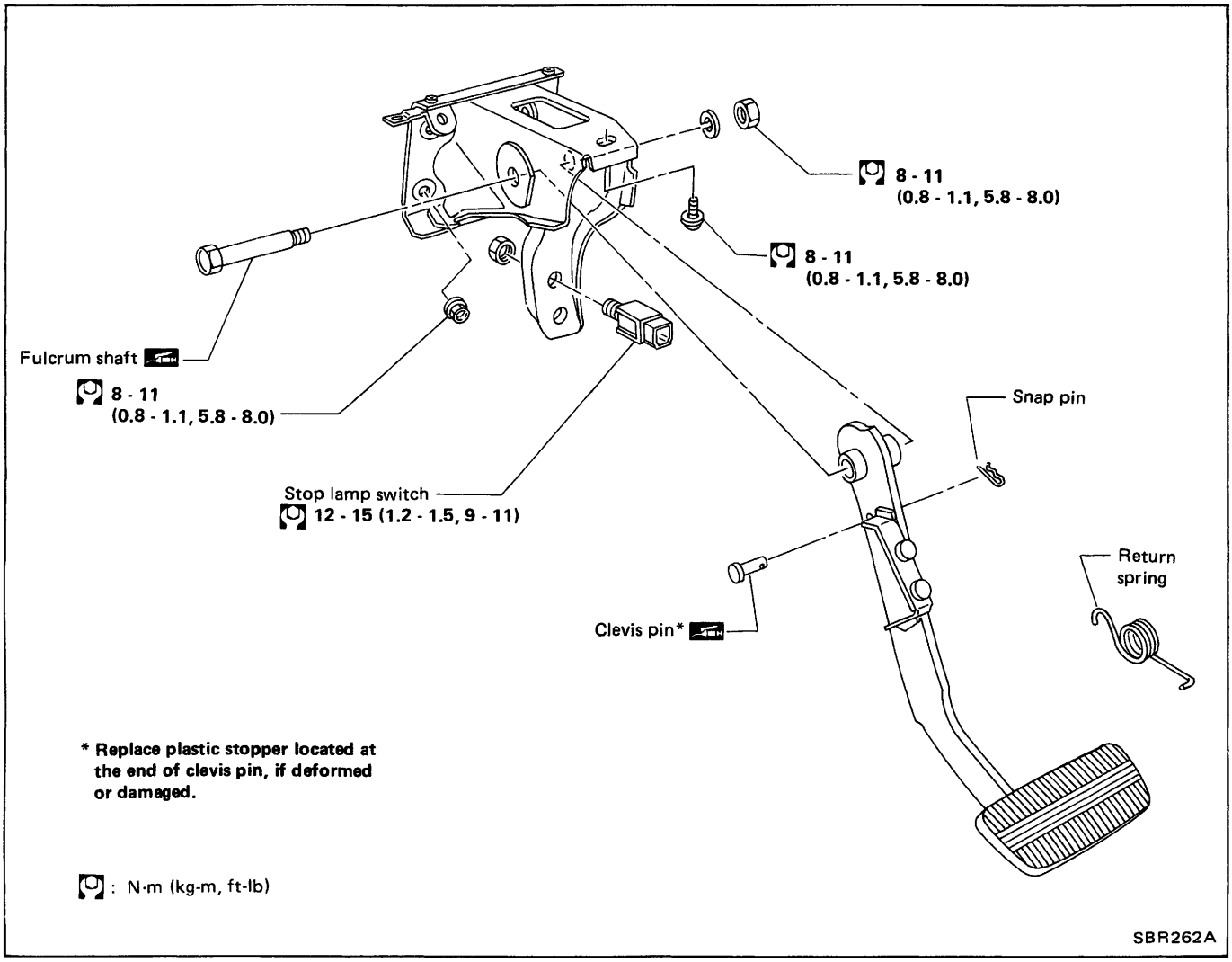
- To remove brake hose, first remove flare nut securing brake tube to hose, then withdraw lock spring. Next disconnect the other side.
- All hoses must be free from excessive bending, twisting and pulling.
- After installing brake lines, be sure to check for oil leakage by fully depressing brake pedal.

Inspection

Check brake lines (tubes and hoses) for evidence of cracks, deterioration or other damage. Replace any damaged parts.

If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

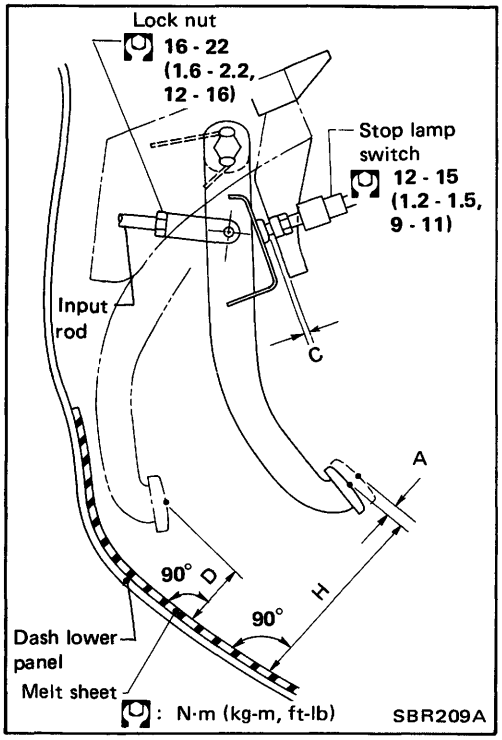
Removal and Installation

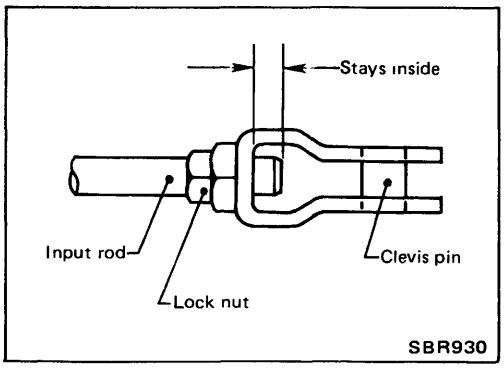


Inspection

Check brake pedal for the following items.

- Brake pedal bend
- Clevis pin deformation
- Cracks of any welded portion





Pedal Adjustment

Check brake pedal free height from melt sheet. Adjust if necessary.

H: Free height
Refer to S.D.S.

D: Depressed height
Refer to S.D.S.
Under force of 490 N (50 kg, 110 lb) with engine running

C: Clearance between pedal stopper and threaded end of stop lamp switch
0.3 - 1.0 mm (0.012 - 0.039 in)

A: Pedal free play
1 - 3 mm (0.04 - 0.12 in)

1. Adjust pedal free height with brake booster input rod. Then tighten lock nut.

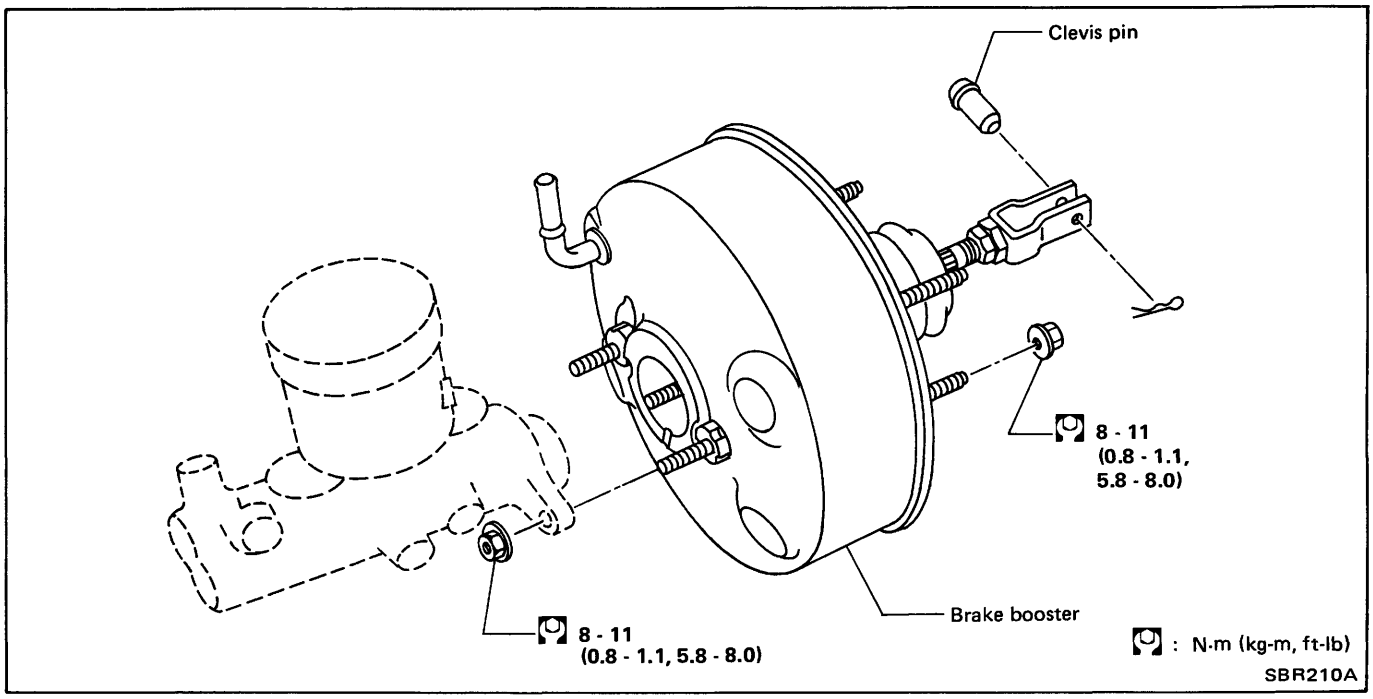
Make sure that the tip of input rod stays inside.

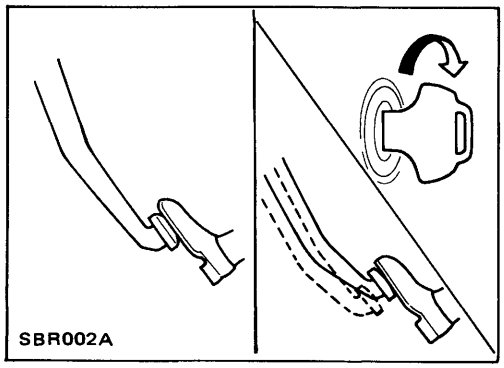
2. Adjust clearance "C" with stop lamp switch. Then tighten lock nuts.
3. Check pedal free play.

Make sure that stop lamp is off when pedal is released.

4. Check brake pedal depressed height with engine running.
   If depressed height is below the specified value, check brake system for leaks, accumulation of air or any damaged components such as master cylinder, wheel cylinder, etc. Make the necessary repairs, if necessary.

Removal and Installation





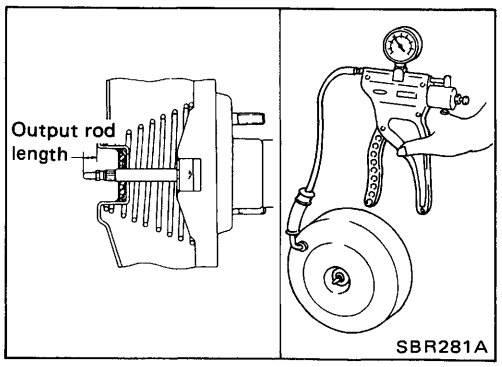
Inspection

OPERATING CHECK

- Depress brake pedal several times with engine off, then check that there is no change in pedal stroke.
- Depress brake pedal, then start engine. If pedal goes down slightly, operation is normal.

AIRTIGHT CHECK

- Start engine, then stop it in one or two minutes. Depress brake pedal several times slowly. If pedal goes further down the first time and gradually rises after second or third time, the booster is airtight.
- Depress brake pedal while engine is running, then stop engine with pedal depressed. If there is no change in pedal stroke for thirty seconds, brake booster is airtight.



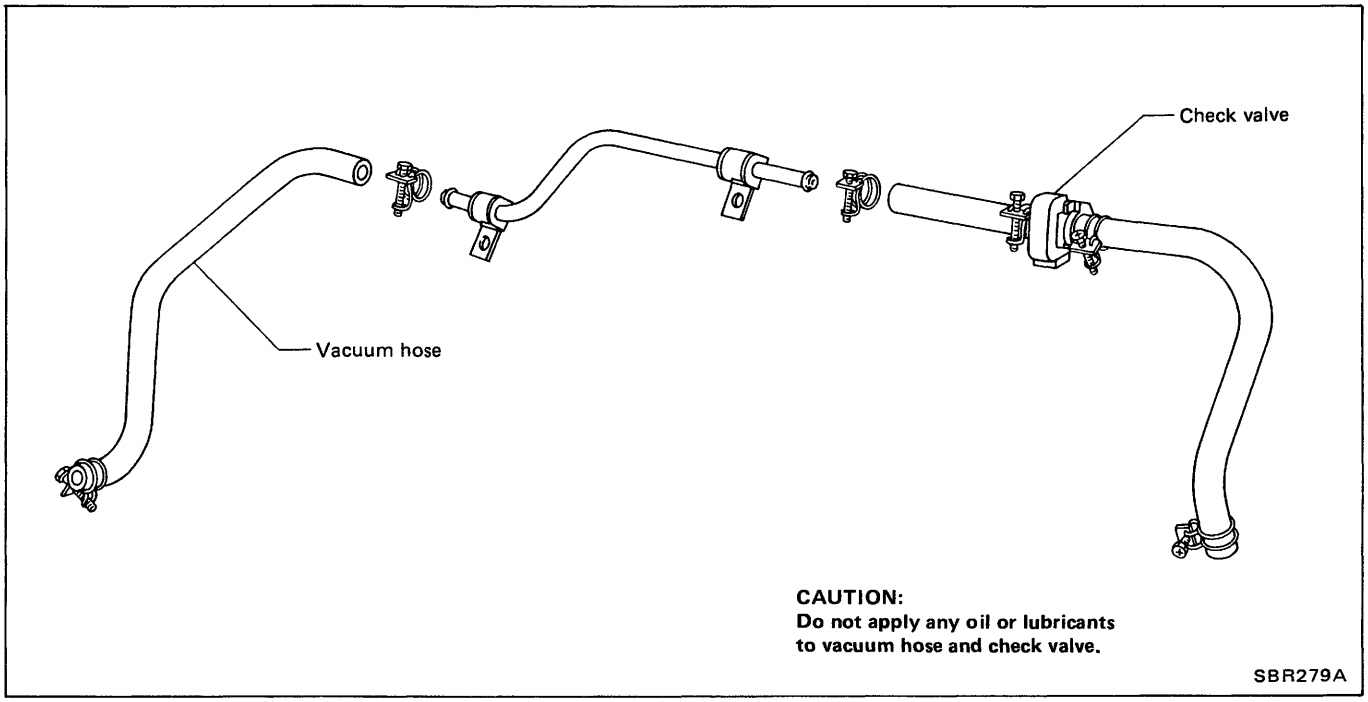
OUTPUT ROD LENGTH CHECK

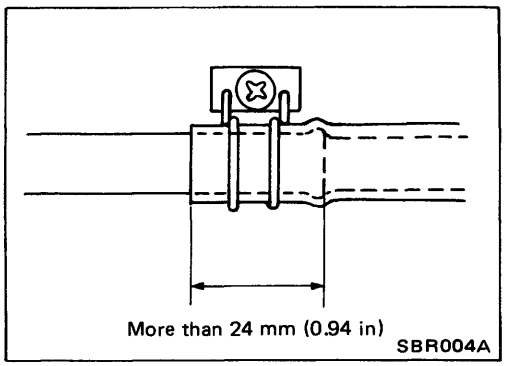
1. Supply brake booster with vacuum of −66.7 kPa (−500 mmHg, −19.69 inHg) using a handy vacuum pump.
2. Check output rod length.

   Specified length:

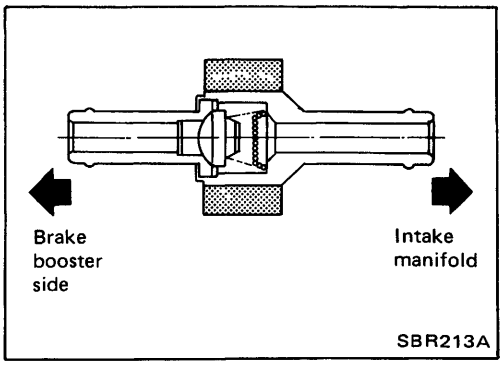
   10.275 - 10.525 mm (0.4045 - 0.4144 in)

Removal and Installation

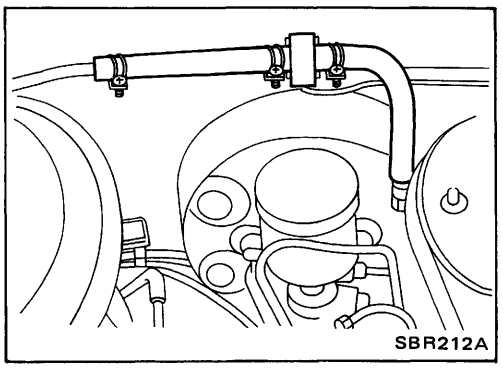




- Insert vacuum tube into vacuum hose more than 24 mm (0.94 in).



- Install check valve properly paying attention to its direction.



Inspection

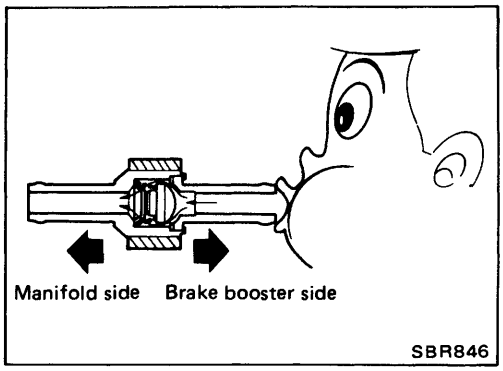
HOSES AND CONNECTORS

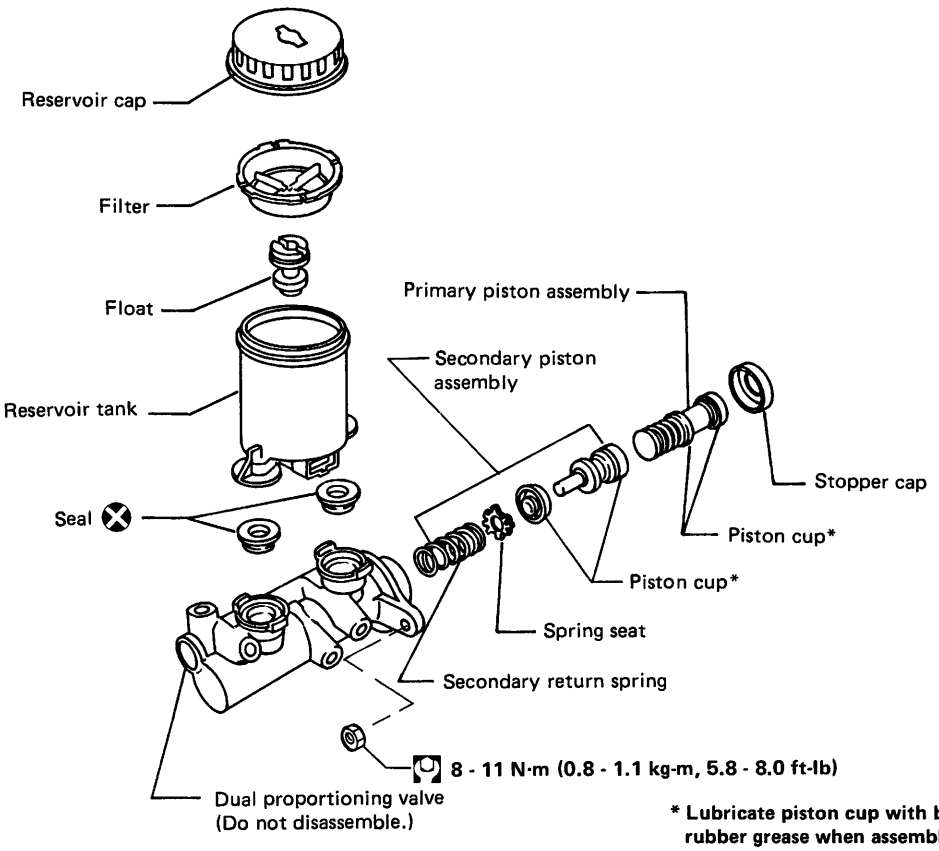
- Check condition of vacuum hoses and connectors.
- Check vacuum hoses for air tightness.

Inspection (Cont'd)

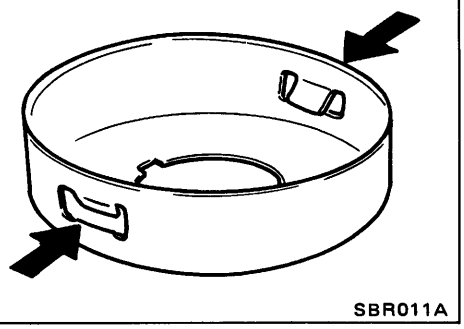
CHECK VALVE

- If valve does not open when pressure is applied to the brake booster side of check valve, replace check valve with a new one.



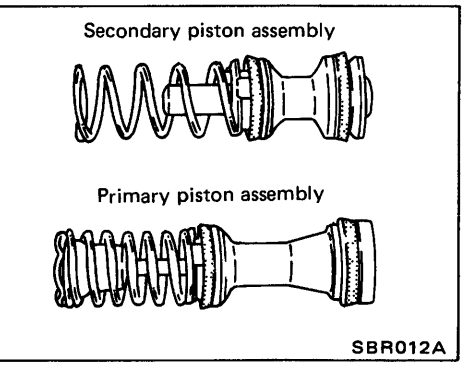


SBR216A



SBR011A

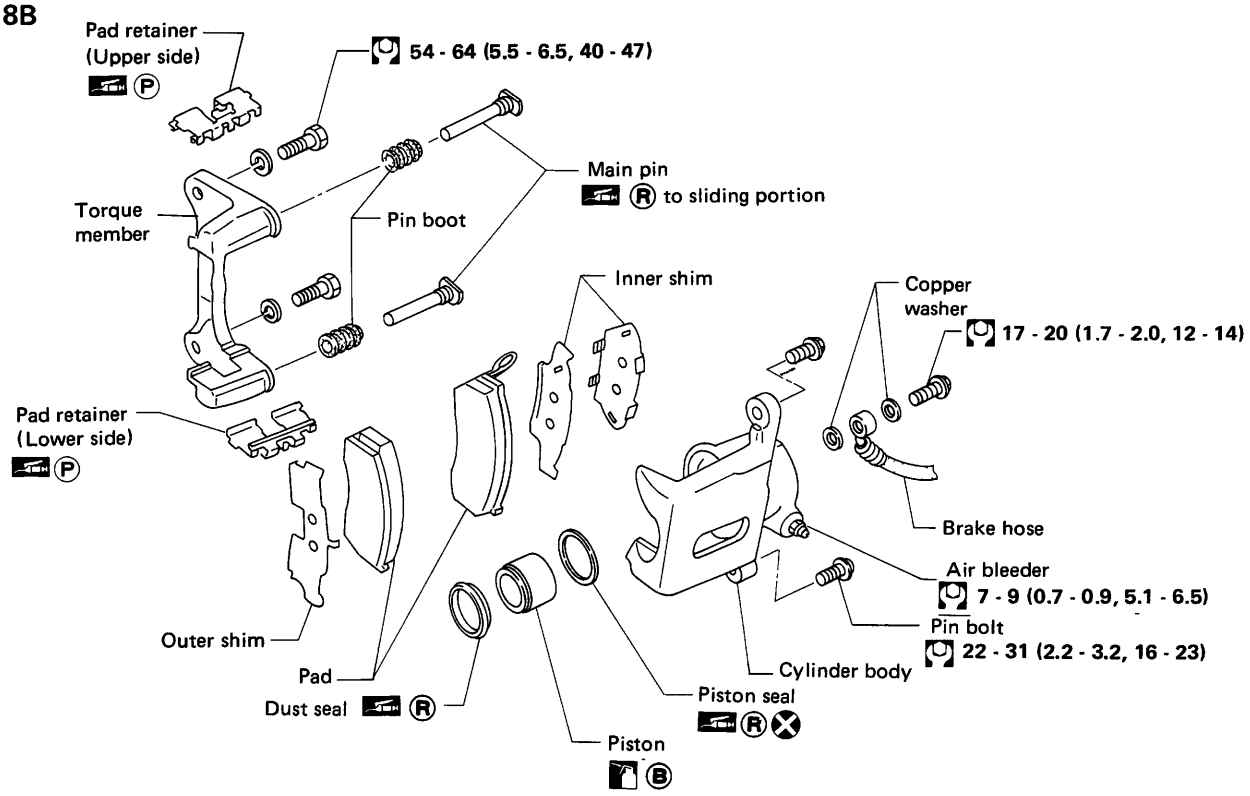
- Replace stopper cap if the claw is damaged or deformed.
- Bend claws inside when installing stopper cap.



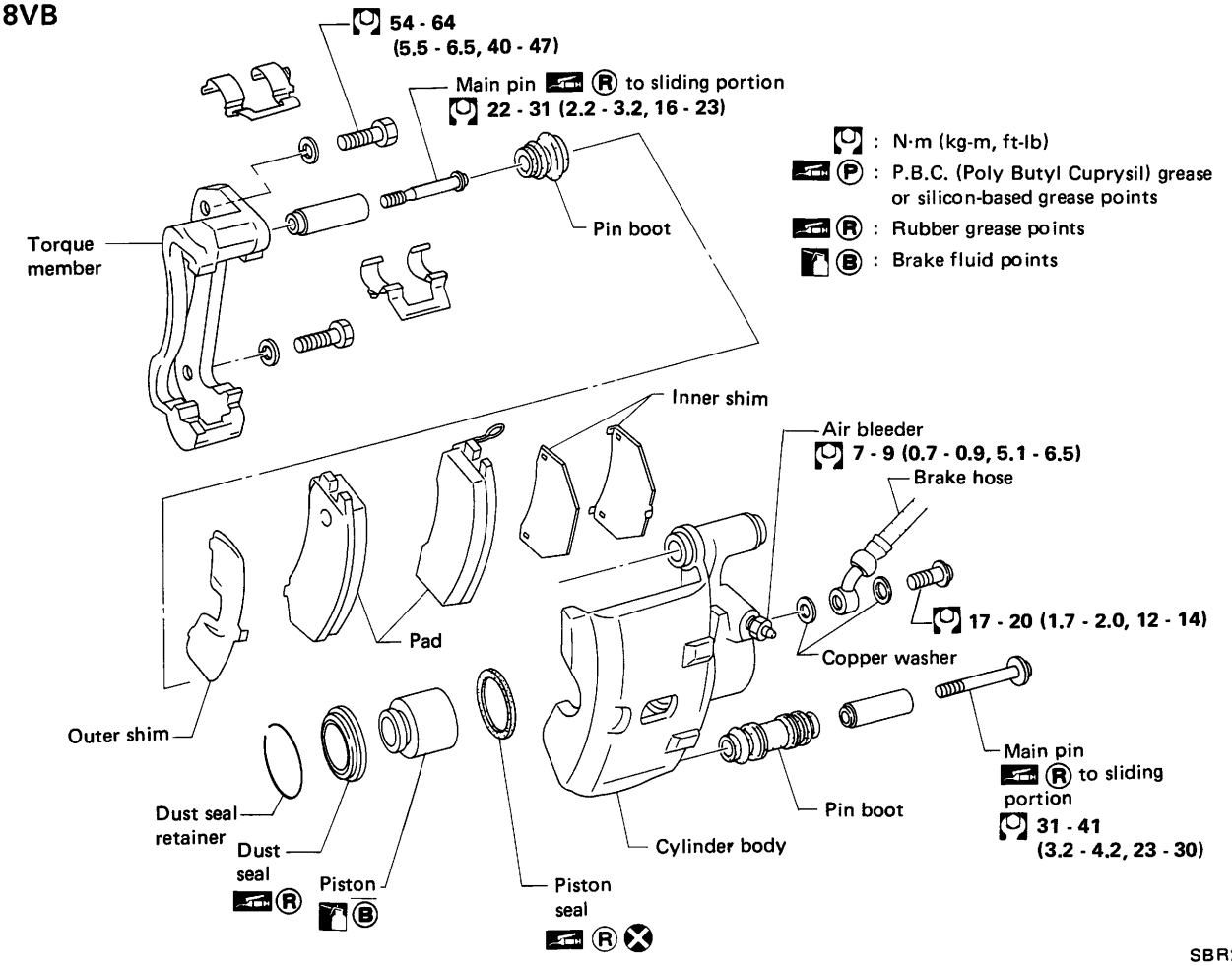
SBR012A

- Replace piston as an assembly when disassembled.
- Pay attention to the direction of piston cups in figure at left.
- Check parts for wear or damage. Replace if any of above conditions are observed.

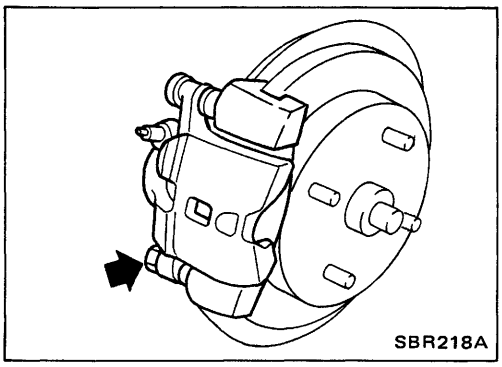
CL18B



AD18VB

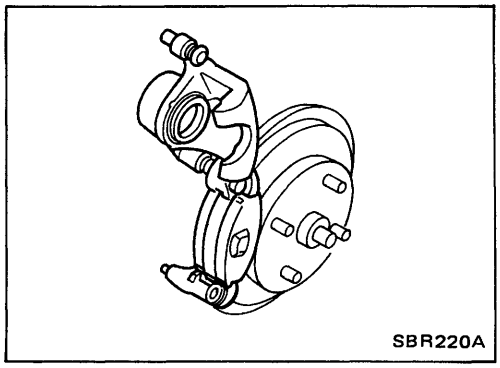


SBR217A


SBR218A

Pad Replacement

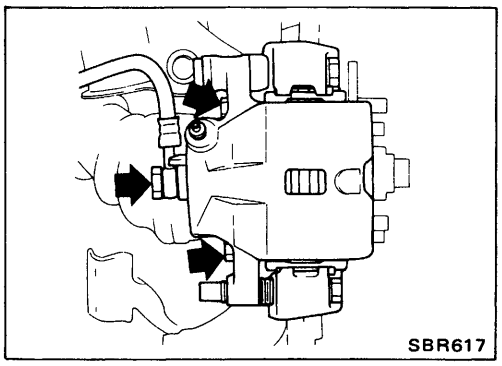
1. Remove guide pin.


SBR220A

2. Swing cylinder body upward. Then remove pad retainer, and inner and outer shims.

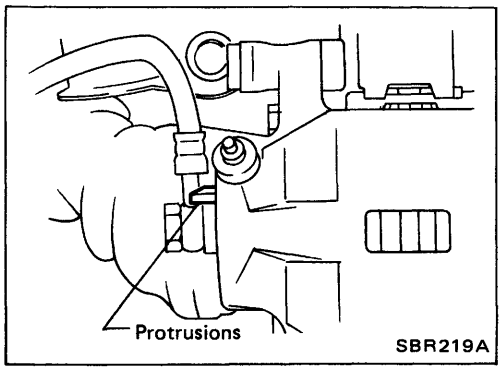
CAUTION:

- **When cylinder body is swung up, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage dust seal or get oil on rotor. Always replace shims in replacing pads.**


SBR617

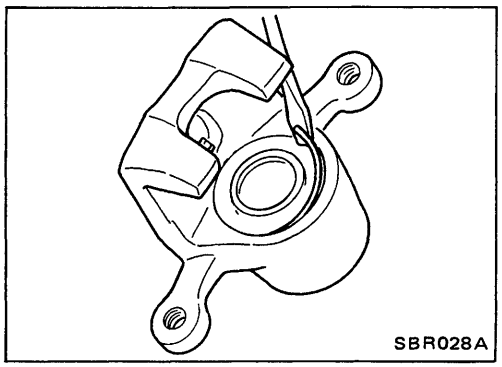
Removal and Installation

- Remove torque member fixing bolts and union bolt.



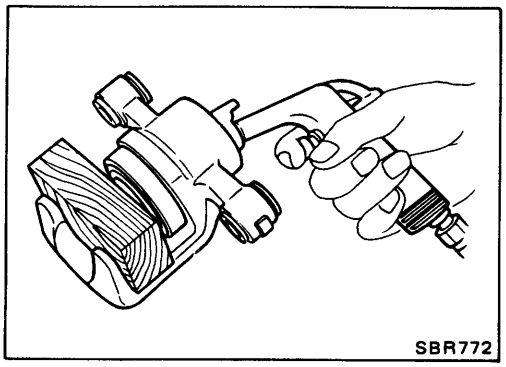
SBR219A

- Install brake hose to caliper securely.


SBR028A

- Remove dust seal retainer with a screwdriver (AD18VB only).

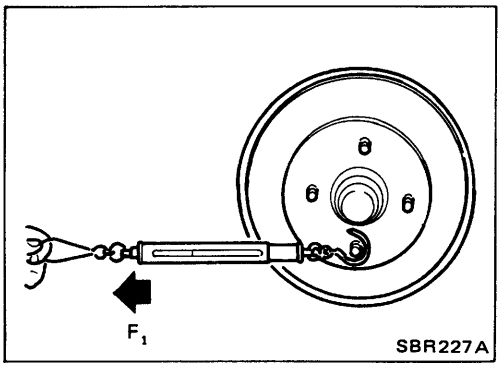
Removal and Installation (Cont'd)


SBR772

Push out piston with dust seal with compressed air.

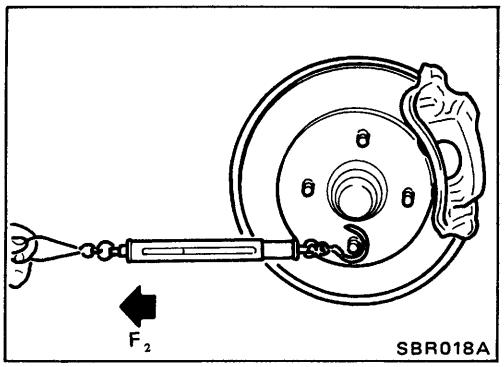
Inspection

INSPECTION OF BRAKE DRAG FORCE



SBR227A

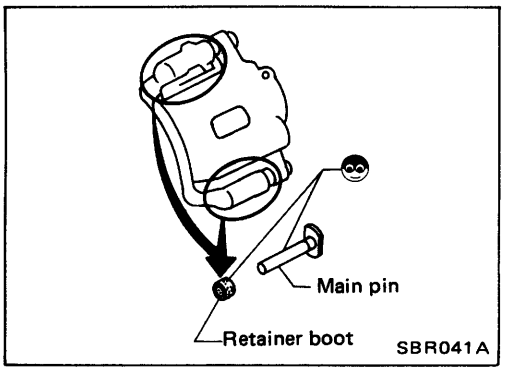
(1) Swing cylinder body upward.
(2) Make sure that wheel bearing is adjusted properly. Refer to section FA.
(3) Measure rotating force (F_1).



SBR018A

(4) Install caliper with pads to the original position.
(5) Depress brake pedal for 5 seconds.
(6) Release brake pedal, rotate disc rotor 10 revolutions.
(7) Measure rotating force (F_2).
(8) Calculate brake drag force by subtracting F_1 from F_2.

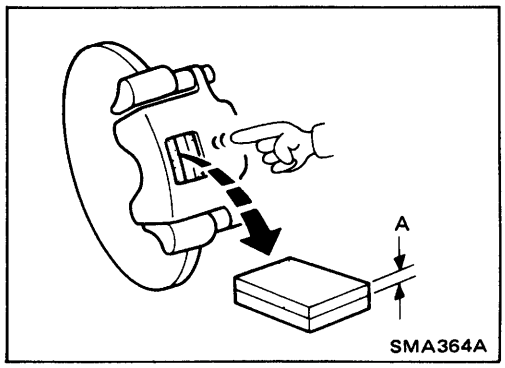
Maximum brake drag force ($F_2 - F_1$):
103.0 N (10.5 kg, 23.2 lb)



SBR041A

If it is not within specification, check main pins and retainer boots in caliper.

- **Make sure that wheel bearing is adjusted properly.**
- **Disc pads and disc rotor must be dried.**



SMA364A

DISC PAD

Check disc pad for wear or damage.

Pad wear limit (A):
2.0 mm (0.079 in)

Inspection (Cont'd)

CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body
- Minor damage from rust or foreign materials may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

CAUTION:

Use brake fluid to clean. Never use mineral oil.

PISTON

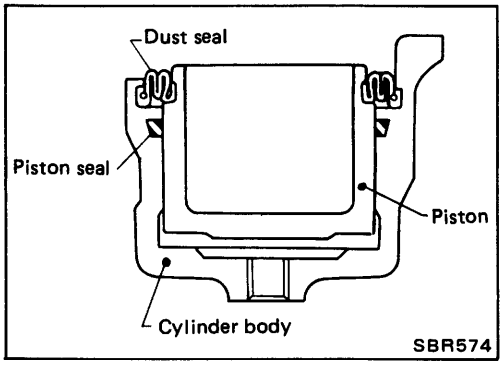
Check piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.

CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

MAIN PIN, PIN BOLT AND PIN BOOT

Check for wear, cracks or other damage. Replace if any of the above conditions are observed.



Assembly

- Insert piston seal into groove on cylinder body.
- With dust seal fitted to piston, install piston into cylinder body.

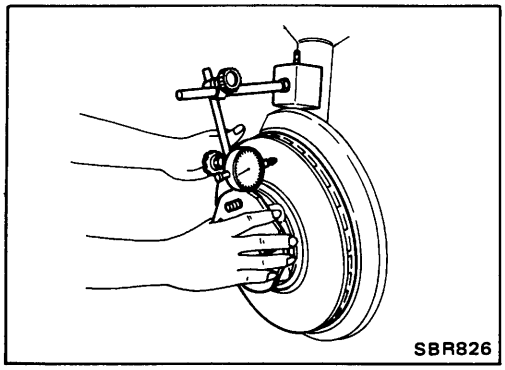
CAUTION:

- **Secure dust seal properly.**

Inspection

RUBBING SURFACE

Check rotor for roughness, cracks or chips.


SBR826

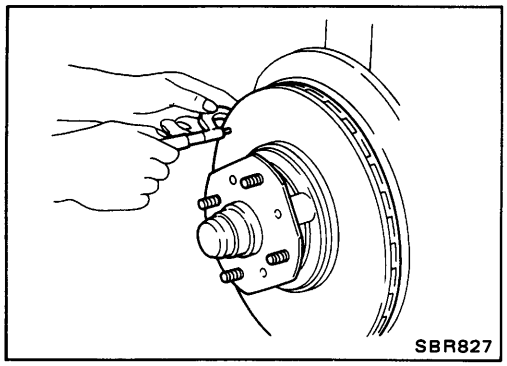
RUNOUT

Make sure that axial end play is within the specifications before measuring. Refer to section FA.

Then check runout with a dial indicator.

Rotor repair limit:

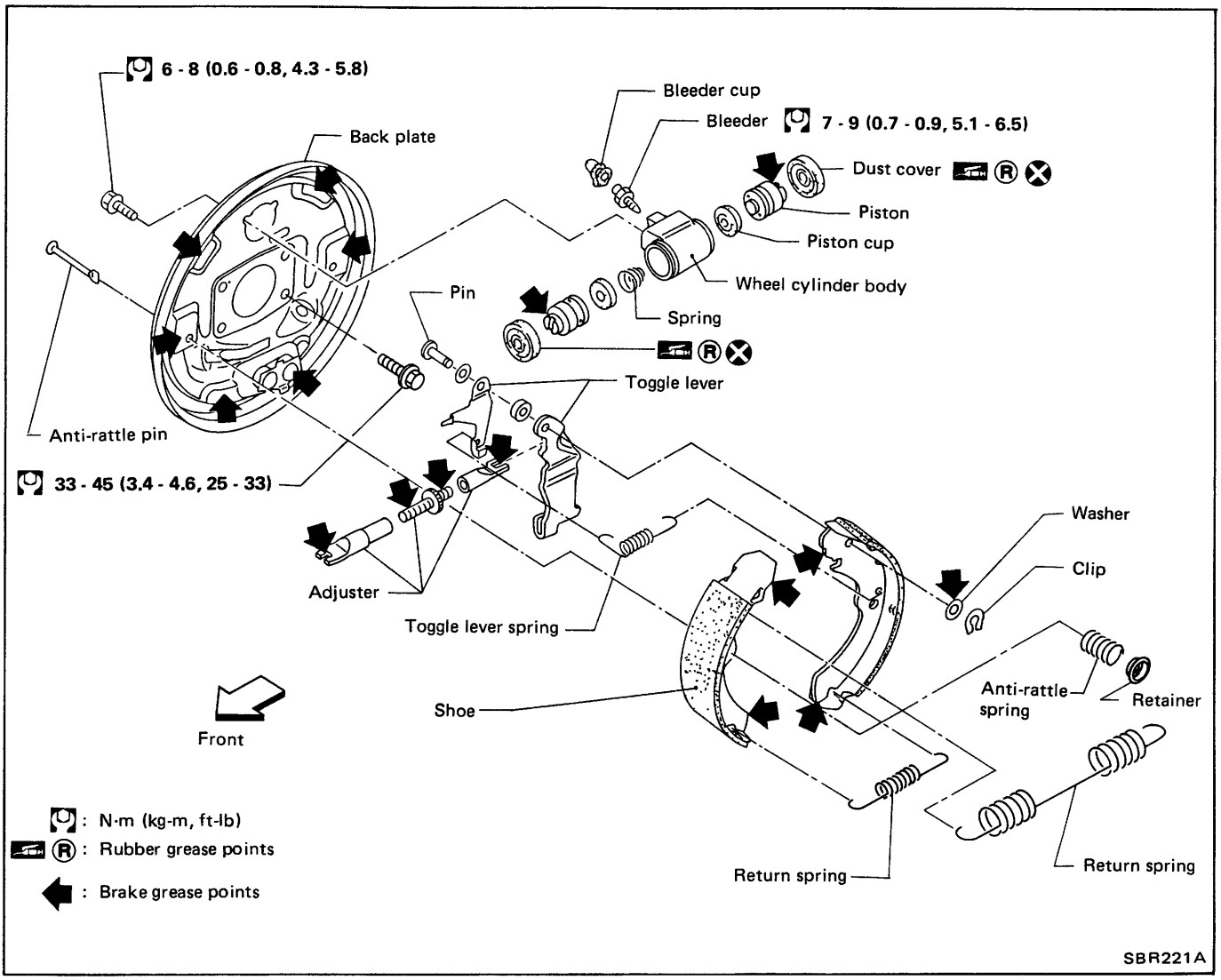
Maximum runout
(Total indicator reading at center of rotor pad contact surface)
0.07 mm (0.0028 in)

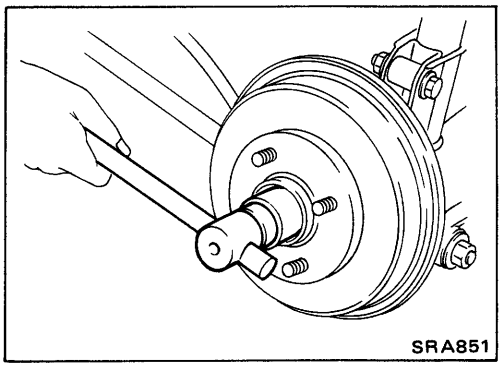

SBR827

THICKNESS

Rotor repair limit:

Minimum thickness
CL18B 10.0 mm (0.394 in)
AD18VB 16.0 mm (0.630 in)

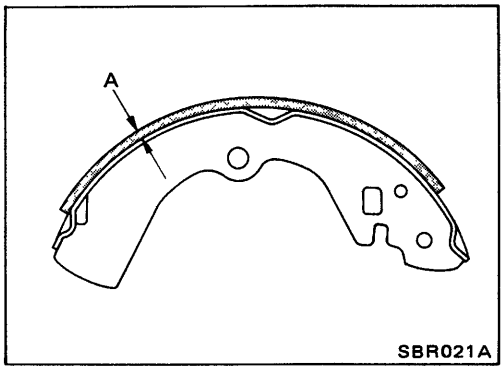




Brake Drum Removal

- Release parking brake control lever fully.
- Remove hub cap and wheel bearing lock nut.

Refer to section RA.



Shoe Replacement

- Measure lining thickness.

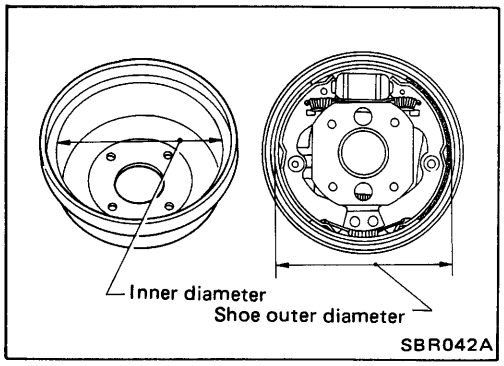
Lining wear limit (A):
1.5 mm (0.059 in)

Before installing new shoes, rotate nut until adjuster rod is at its shortest point.

After installation is completed, adjust shoe-to-drum clearance. Refer to Removal and Installation.

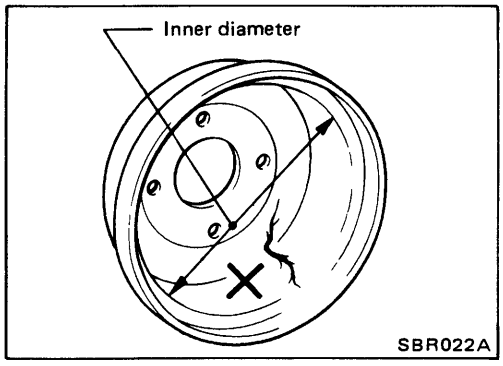
Wheel Cylinder Inspection

Check parts for score, wear or damage. Replace if any of the above conditions are observed.



Removal and Installation

When installing, measure inner diameter of the drum and adjust so that shoe outer diameter at its center is smaller than drum inner diameter by 0.35 to 0.55 mm (0.0138 to 0.0217 in) by rotating the adjuster. Then operate parking brake lever to adjust shoe clearance.

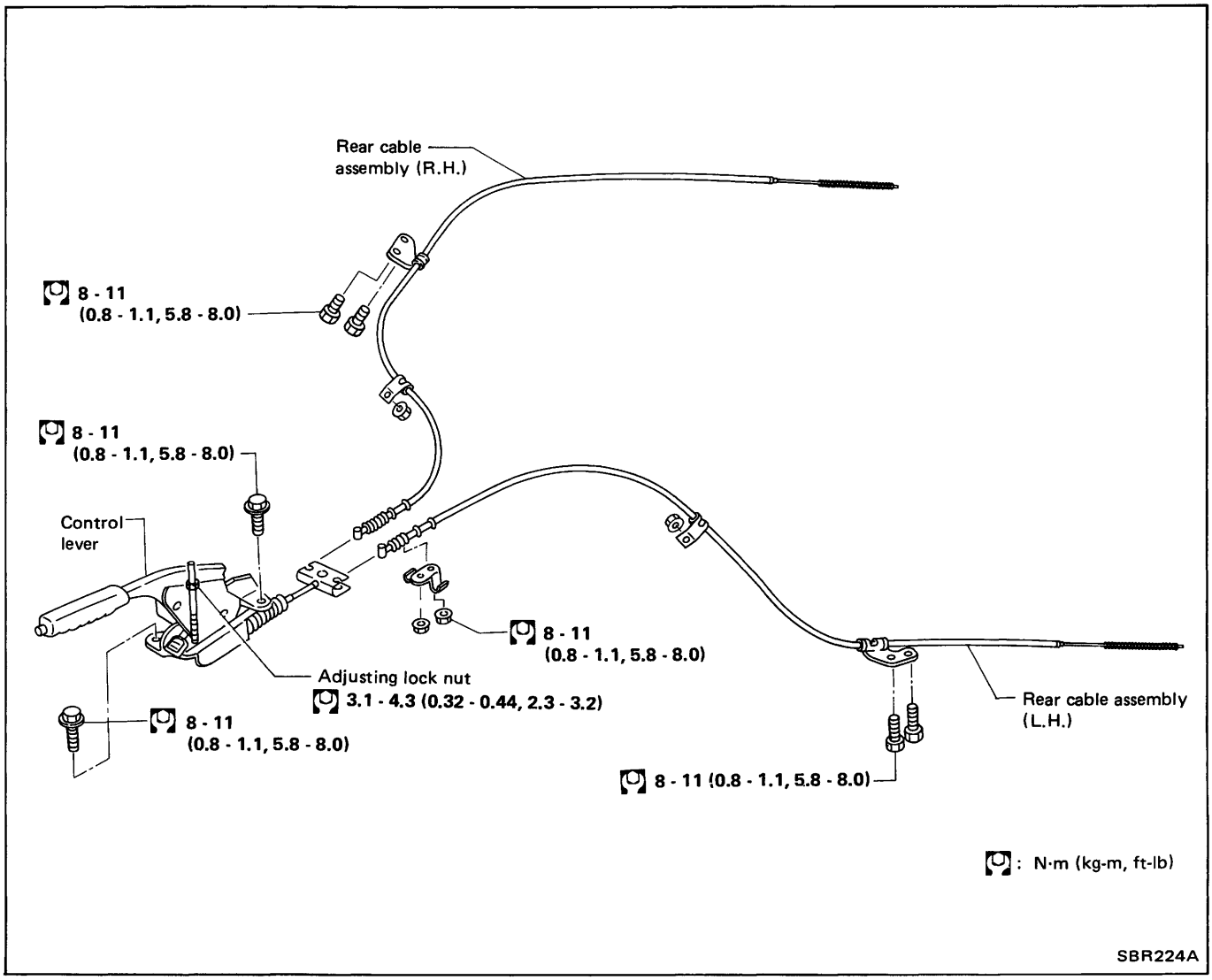


Drum Inspection

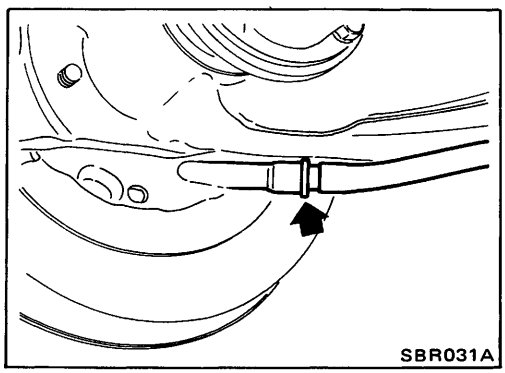
Standard inner diameter:
203.2 mm (8 in)
Maximum inner diameter:
204.5 mm (8.05 in)
Out-of-roundness (ellipticity):
0.03 mm (0.0012 in) or less
Radial runout (Total indicator reading):
0.05 mm (0.0020 in) or less

- Contact surface should be finefinished with No. 120 to 150 emery paper.
- Using a drum racer, lathe brake drum if it shows score marks, partial wear or stepped wear.
- After brake drum has been completely reconditioned or replaced, check drum and shoes for proper contact pattern.

Removal and Installation



- Before removing parking brake control, remove console box and heat insulator.



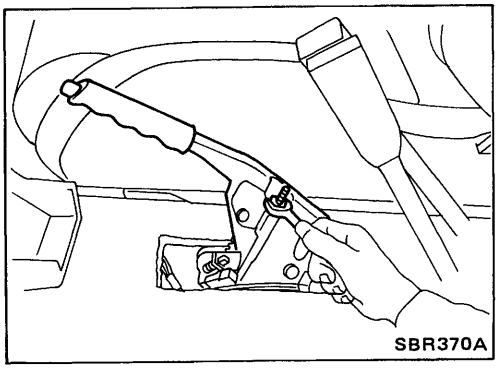
- Install rear cable by tapping the flanged section of cable cover with a hammer and punch.
  Be careful not to damage cable.
- Make sure there is no free play after installation.

Inspection

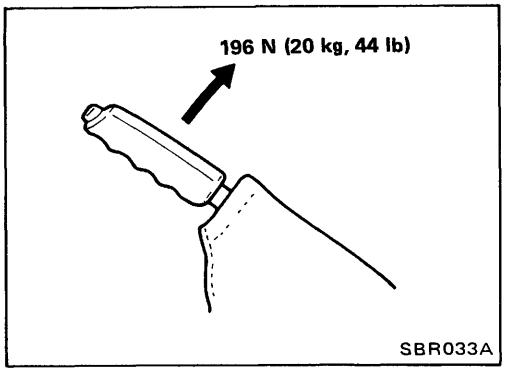
1. Check control lever for wear or other damage. Replace if necessary.
2. Check parking brake cables and switch for discontinuity or deterioration. Replace if necessary.
3. Check warning lamp and switch. Correct if necessary.
4. Check parts at each connecting portion and, if found deformed or damaged, replace.

Adjustment

Adjust control lever stroke as follows:



1. Turn adjusting nut.



2. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.
   Number of notches: 7 - 11

3. Bend parking brake warning lamp switch plate so that brake warning light comes on when ratchet at parking brake lever is pulled "A" notches and goes out when fully released.
   Number of notches "A": 1 - 2

General Specifications

Engine		CA18DE	GA16i
Front brake Brake model		AD18VB	CL18B
Pad Width x thickness x length	mm (in)	44.3 x 10.0 x 100.8 (1.744 x 0.394 x 3.968)	37.0 x 10.0 x 94.0 (1.457 x 0.394 x 3.701)
Rotor outer diameter	mm (in)	250 (9.84)	240 (9.45)
Caliper inner diameter	mm (in)	48.1 (1.894)	
Rear brake Brake model		LT20A	
Lining Width x thickness x length	mm (in)	35 x 4.5 x 195 (1.38 x 0.177 x 7.68)	
Drum inner diameter	mm (in)	203.2 (8)	
Wheel cylinder	mm (in)	15.87 (5/8)	
Master cylinder Inner diameter	mm (in)	Large ... 25.4 (1) Small ... 20.64 (13/16)	Large ... 23.81 (15/16) Small ... 19.05 (3/4)
Brake booster Model		G20, M20	G18, M18
Diaphragm diameter	mm (in)	205 (8.07)	180 (7.09)
Control valve Type		Dual proportioning valve (within master cylinder)	
Split point kPa (kg/cm^2, psi) x reducing ratio		2,452 (25, 356) x 0.2	2,452 (25, 356) x 0.4
Recommended brake fluid		DOT 3	

Inspection and Adjustment

BRAKE PEDAL

Free height "H" mm (in)	A/T	164 - 174 (6.46 - 6.85)
	M/T	160 - 168 (6.30 - 6.61)
Depressed height "D" [Under force of 490 N (50 kg, 110 lb) with engine running] mm (in)	A/T	85 (3.35) or more
	M/T	80 (3.15) or more
Clearance between pedal stopper and threaded end of stop lamp switch "C" mm (in)		0.3 - 1.0 (0.012 - 0.039)
Pedal free play "A" mm (in)		1 - 3 (0.04 - 0.12)

DRUM BRAKE

Brake model	LT20A
Lining wear limit Minimum thickness mm (in)	1.5 (0.059)
Drum repair limit Inner diameter (Max.) mm (in)	204.5 (8.05)
Out-of-round mm (in)	0.03 (0.0012) or less
Runout mm (in)	0.05 (0.0020) or less

PARKING BRAKE

Type	Center lever type
Number of notches when warning lamp switch comes on	1 - 2
Number of notches [When pulled under force of 196 N (20 kg, 44 lb)]	7 - 11

DISC BRAKE

Brake model	CL18B	AD18VB
Pad wear limit Minimum thickness mm (in)	2.0 (0.079)	
Rotor repair limit Maximum runout mm (in)	0.07 (0.0028)	
Minimum thickness mm (in)	10.0 (0.394)	16.0 (0.630)

Tightening Torque

Item	N·m	kg-m	ft-lb
Brake pedal			
Pedal bracket to body	8 - 11	0.8 - 1.1	5.8 - 8.0
Stop lamp switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Brake booster			
Brake booster to body	8 - 11	0.8 - 1.1	5.8 - 8.0
Input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
Brake booster to master cylinder	8 - 11	0.8 - 1.1	5.8 - 8.0
Brake tube connector			
Brake tube to connector	15 - 18	1.5 - 1.8	11 - 13
Brake tube connector mounting bolt	4 - 5	0.4 - 0.5	2.9 - 3.6
Brake tube flare nut	15 - 18	1.5 - 1.8	11 - 13
Wheel cylinder air bleeder	7 - 9	0.7 - 0.9	5.1 - 6.5
Front disc brake			
Union bolt	17 - 20	1.7 - 2.0	12 - 14
Torque member fixing bolt	54 - 64	5.5 - 6.5	40 - 47
Pin bolt			
CL18B	22 - 31	2.2 - 3.2	16 - 23
AD18VB	31 - 41	3.2 - 4.2	23 - 30
Rear drum brake			
Wheel cylinder to back plate	6 - 8	0.6 - 0.8	4.3 - 5.8
Back plate fixing bolt	33 - 45	3.4 - 4.6	25 - 33
Parking brake			
Control lever to body	8 - 11	0.8 - 1.1	5.8 - 8.0
Adjuster lock nut	3.1 - 4.3	0.32 - 0.44	2.3 - 3.2
Cable clamp to body	8 - 11	0.8 - 1.1	5.8 - 8.0

STEERING SYSTEM

SECTION ST

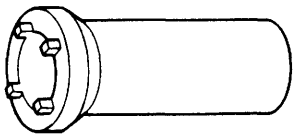
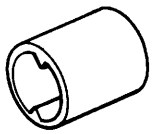
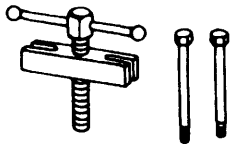
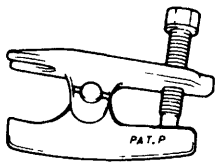
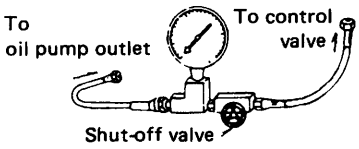
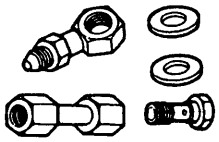
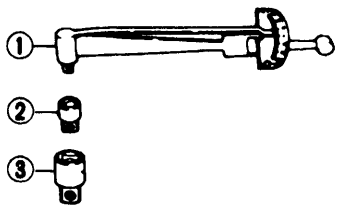
CONTENTS

PRECAUTIONS ..... ST- 2
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ON-VEHICLE INSPECTION ..... ST- 6
STEERING WHEEL AND STEERING COLUMN ST-11
POWER STEERING GEAR AND LINKAGE (Model PR24SA) ST-16
POWER STEERING OIL PUMP ST-28
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ST-33

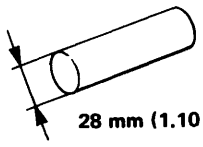
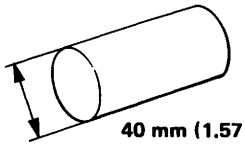
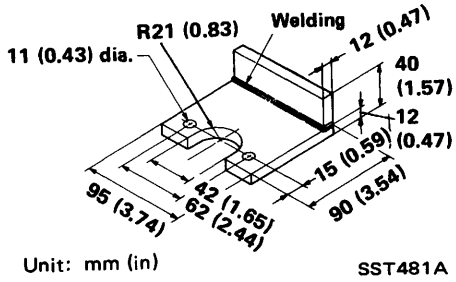
- The power steering gear and oil pump should be disassembled only when repairing an "oil leak". They should not be disassembled to repair any other steering defect, steering noise, etc.
- Before disassembly, thoroughly clean the outside of the unit.
- Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- When disassembling parts, be sure to place them in order in parts rack so they can be put back in the unit in their proper positions.
- Use a nylon cloth or paper towel for wiping parts clean. Common shop rags can leave lint that might interfere with the operation.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Before assembly, apply a coat of recommended A.T.F.* to hydraulic parts. Vaseline may be applied to O-rings and seals. Do not use any grease.
- Gaskets, seals and O-rings should be replaced. Care should be taken to avoid damaging O-rings, seals and gaskets when assembling. It is also very important to perform functional tests whenever it is designated.

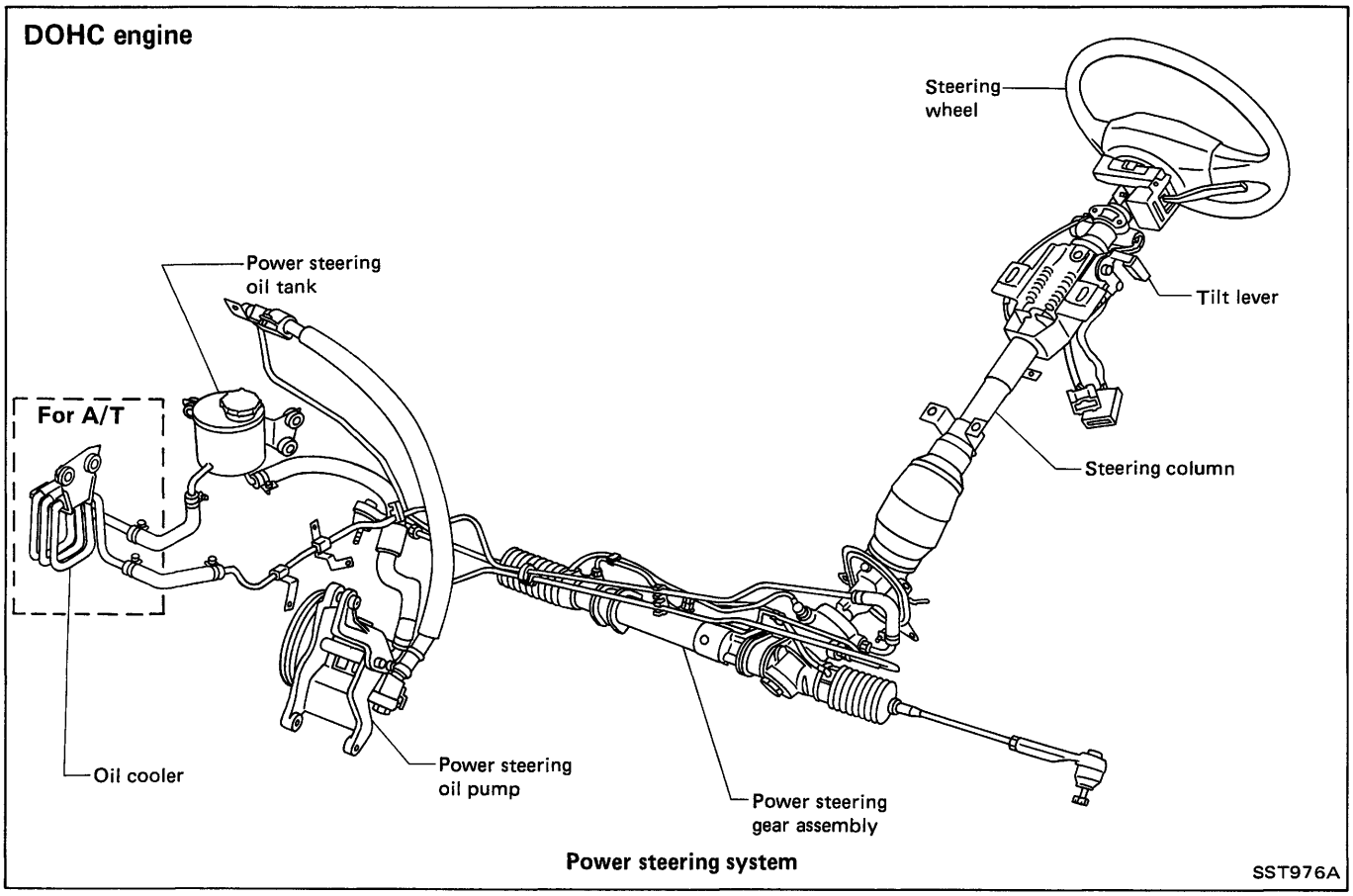
*: Automatic Transmission Fluid

SPECIAL SERVICE TOOLS

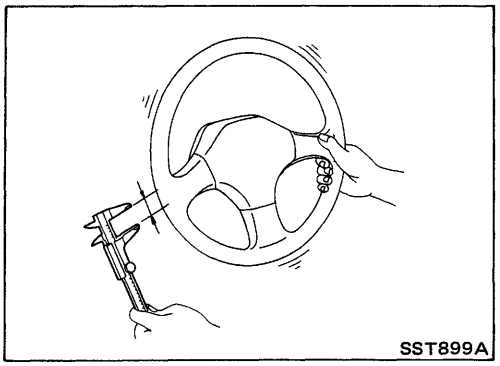
Tool number (Kent-Moore No.) Tool name	Description	
KV48102000 (J28822) End cover socket wrench		Removing and installing rear cover and end cover
KV48100700 (J26364) Torque adapter		Measuring pinion rotating torque
ST27180001 (J25726-A) Steering wheel puller		Removing steering wheel
HT72520000 (J25730-A) Ball joint remover		Removing ball joint
ST27091000 (J26357) Pressure gauge		Measuring oil pressure
KV48102500 (–) Pressure gauge adapter		Measuring oil pressure
ST3127S00 (See J25765-A) 1 GG91030000 (J25765-A) Torque wrench 2 HT62940000 (–) Socket adapter 3 HT62900000 (–) Socker adapter		Measuring turning torque

COMMERCIAL SERVICE TOOLS

Tool name	Description	
Rear oil seal drift		Installing rear oil seal
Pinion oil seal drift		Installing pinion oil seal
Oil pump attachment		Disassembling and assembling oil pump



Power steering system


SST899A

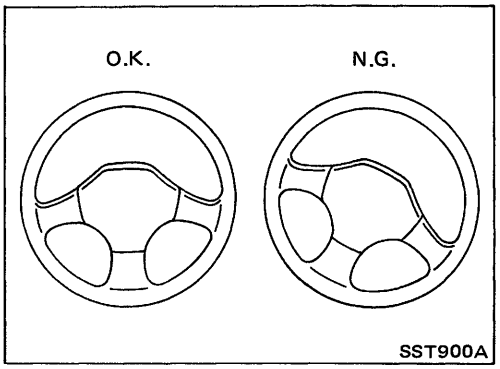
Checking Steering Wheel Play

- With wheels in a straight ahead position, check steering wheel play.

  Steering wheel play:

  35 mm (1.38 in) or less

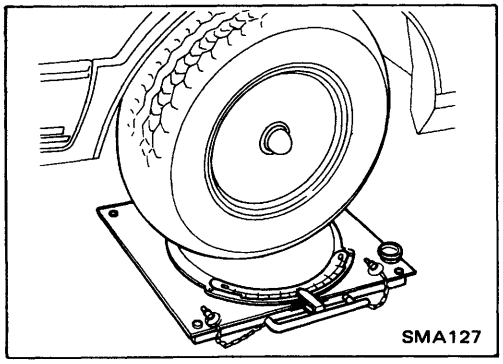
- If it is not within specification, check tie-rod outer and inner ball joints and/or pinion & rack assembly.



SST900A

Checking Neutral Position on Steering Wheel

- Check that the steering wheel is in the neutral position when driving straight ahead.
- If it is not in the neutral position, remove the steering wheel and re-install it correctly in the neutral position.
- If the neutral position is between two serrated teeth, loosen tie-rod lock nut and move tie-rod in the opposite direction by the same amount on both left and right sides to compensate for error in the neutral position.


SMA127

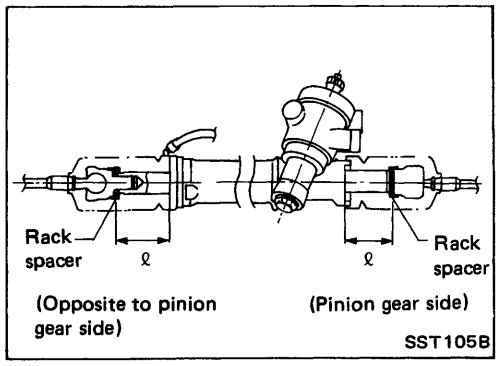
Checking Front Wheel Turning Angle

- Rotate steering wheel all the way right and left; measure turning angle.

  Turning angle:

  Full turns and toe-out turn

  Refer to section FA for S.D.S.

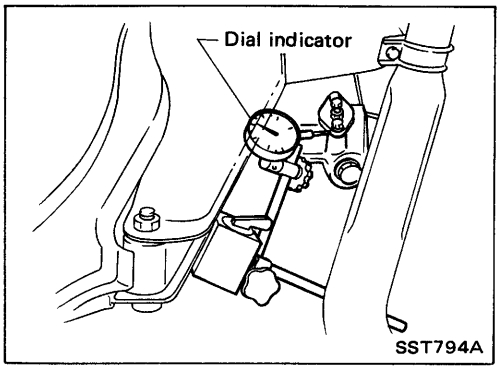


SST105B

- If it is not within specification, check rack stroke.

  Measure length "ℓ":

  Refer to S.D.S.



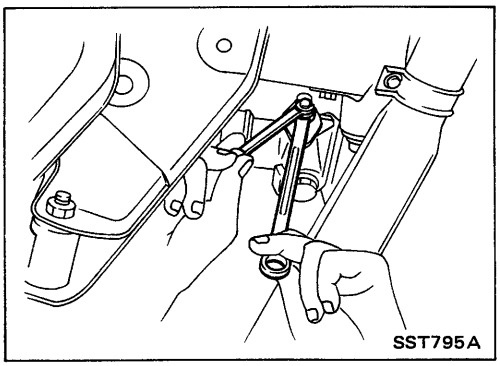
Checking Gear Housing Movement

- Check the movement of steering gear housing during stationary steering. The maximum allowable movement is as follows:

Movement of gear housing:
±2 mm (±0.08 in) (on dry paved surface) or less

When a force of 49 N (5 kg, 11 lb) is applied to steering wheel. On models equipped with power steering, turn off ignition key while checking.

- If movement exceeds the limit, replace mount insulator after confirming proper installation of gear housing clamps.



Adjusting Rack Retainer

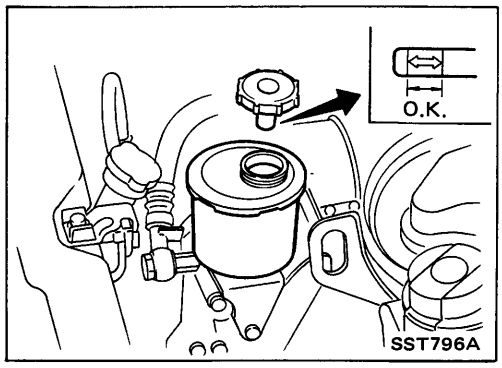
- Perform this driving test on a flat road.

1. Check whether vehicle moves in a straight line when steering wheel is released.
2. Check whether steering wheel returns to neutral position when steering wheel is released from a slightly turned (approx. 20°) position.

- If any abnormality is found, correct it by resetting adjusting screw.

Checking and Adjusting Drive Belts

Refer to section MA for Drive Belt Inspection.

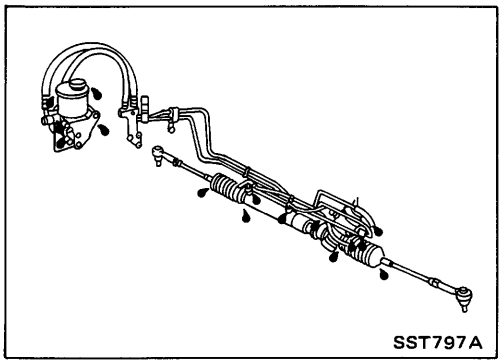


Checking Fluid Level

Check the fluid level when the fluid is cold.

CAUTION:

- **Do not overfill.**
- **Recommended fluid is Automatic Transmission Fluid "Dexron Type".**



Checking Fluid Leakage

Check lines for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.

1. Run engine at idle speed or 1,000 rpm.

Make sure temperature of fluid in oil tank rises to 60 to 80°C (140 to 176°F).

2. Turn steering wheel right-to-left several times.
3. Hold steering wheel at each "lock" position for five seconds and carefully check for fluid leakage.

CAUTION:

Do not hold steering wheel at lock position for more than fifteen seconds at a time.

4. If fluid leakage at connectors is noticed, loosen flare nut and then retighten.

Do not overtighten connector as this can damage O-ring, washer and connector.

Bleeding Hydraulic System

1. Raise front end of vehicle until wheels clear ground.
2. While adding fluid, quickly turn steering wheel fully to right and left and lightly touch steering stoppers.
   Repeat steering wheel operation until fluid level no longer decreases.
3. Start engine.
   Repeat step 2 above.

Bleeding Hydraulic System (Cont'd)

- Incomplete air bleeding will cause the following to occur. When this happens, bleed air again.

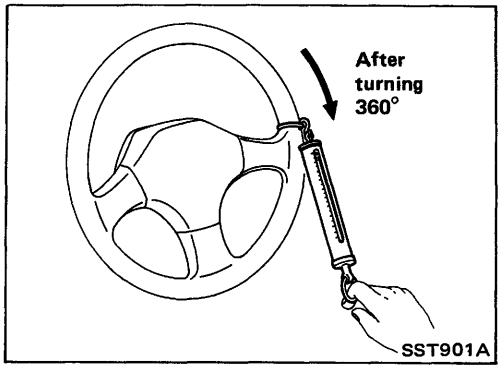
① Generation of air bubbles in reservoir tank
② Generation of clicking noise in oil pump
③ Excessive buzzing in oil pump

In steering while the vehicle is stationary, or when moving wheel slowly, fluid noise may occur in the valve or oil pump. This type of fluid noise is inherent in an integral power steering system, and it will not affect performance or durability of the system.

Checking Steering Wheel Turning Force

1. Park vehicle on a level, dry surface and set parking brake.
2. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F)].

Tires need to be inflated to normal pressure.



3. Check steering wheel turning force when steering wheel has been turned 360° from neutral position.

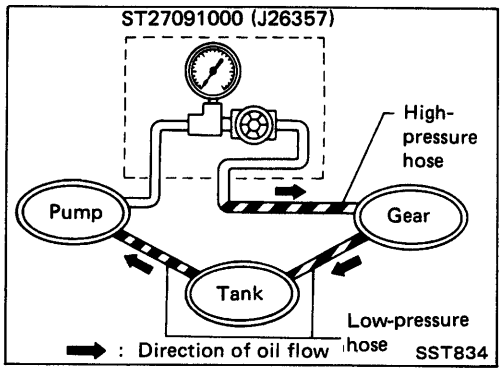
Steering wheel turning force:
39 N (4 kg, 9 lb) or less

Checking Hydraulic System

Before starting, check belt tension, driving pulley and tire pressure.

1. Set Tool. Open shut-off valve. Then bleed air. (See "Bleeding Hydraulic System".)
2. Run engine.

Make sure temperature of fluid in tank rises to 60 to 80°C (140 to 176°F).



Checking Hydraulic System (Cont'd)

WARNING:

Warm up engine with shut-off valve fully opened. If engine is started with shut-off valve closed, oil pressure in oil pump will increase to relief pressure, resulting in an abnormal rise in oil temperature.

3. Check pressure with steering wheel fully turned to left and right positions.

CAUTION:

Do not hold steering wheel in lock position for more than fifteen seconds.

Oil pump maximum standard pressure:
6,375 kPa (65 kg/cm^2, 924 psi) at idling

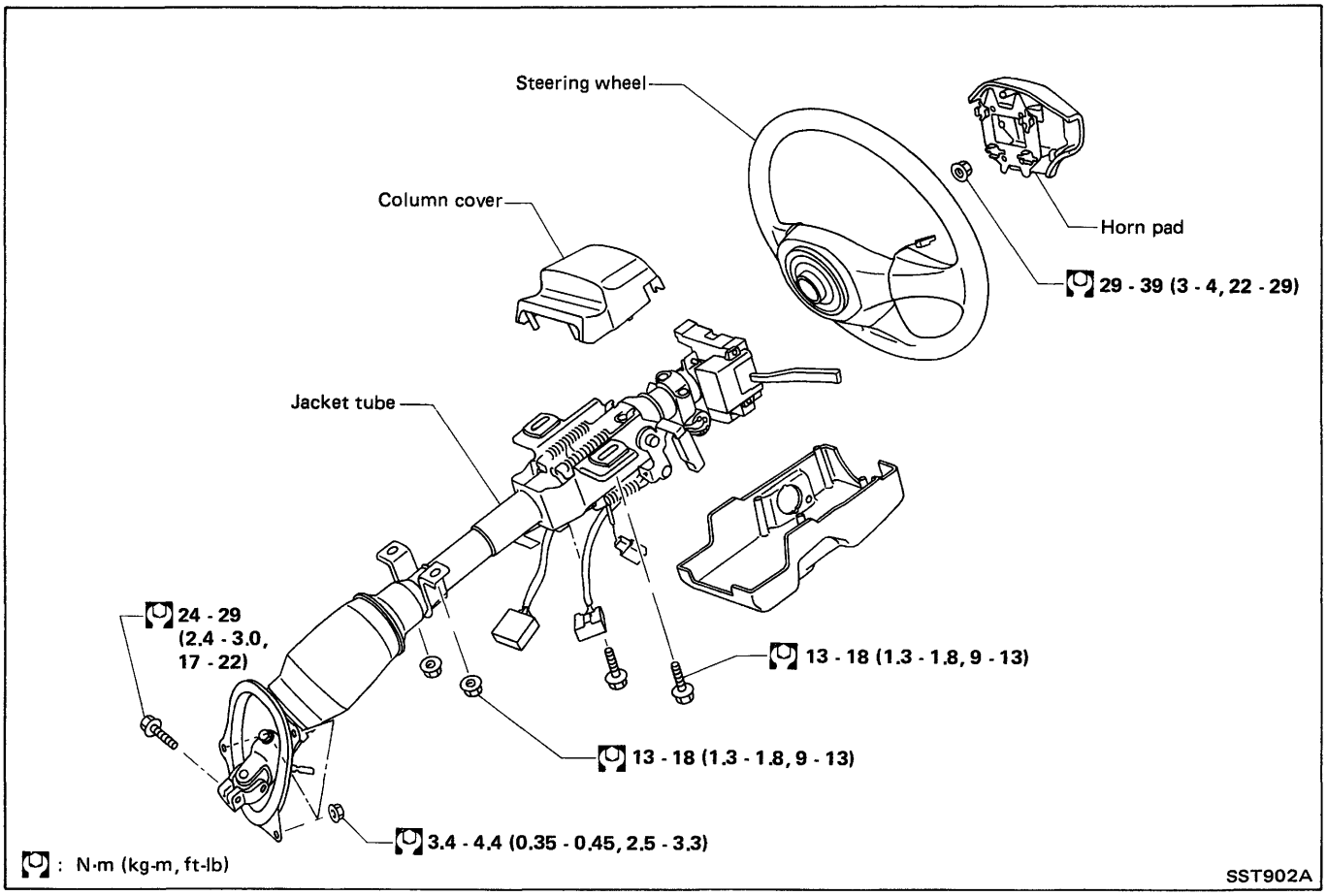
4. If oil pressure is below the standard level, slowly close shut-off valve and check pressure.
- When pressure reaches standard level, gear is damaged.
- When pressure remains beyond standard level, pump is damaged.
5. If oil pressure is higher than the standard level, pump is damaged.

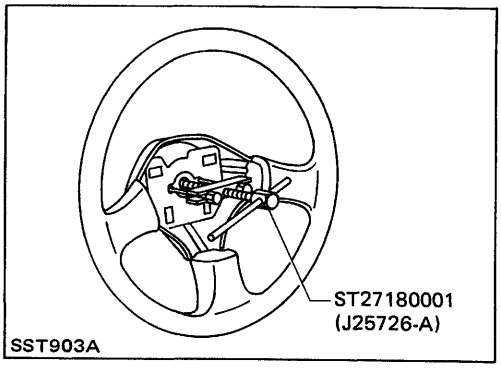
CAUTION:

Do not close shut-off valve for more than fifteen seconds.

6. After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.

Removal and Installation

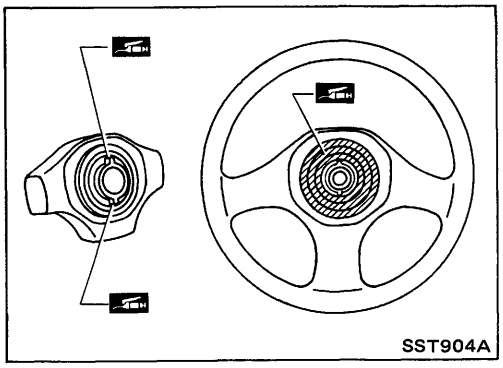




STEERING WHEEL

- Remove steering wheel with Tool.

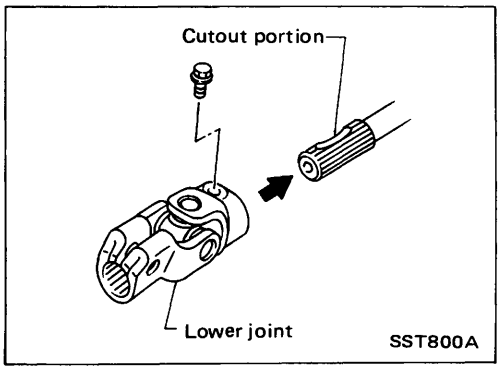
Removal and Installation (Cont'd)



- When installing steering wheel, apply multi-purpose grease to entire surface of turn signal cancel pin (both portions) and also to horn contact slip ring.

STEERING COLUMN

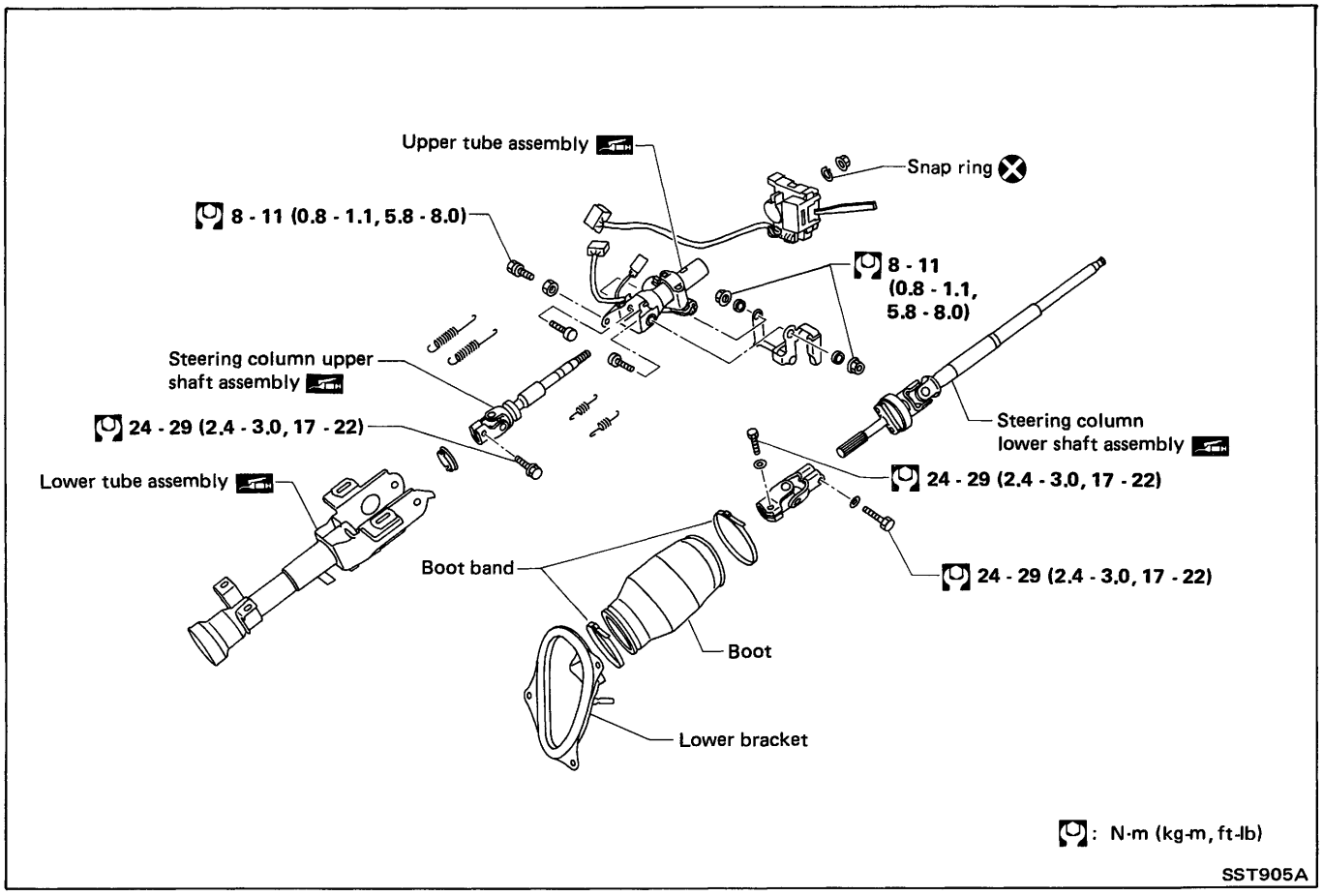
- When installing steering column, finger tighten all lower bracket and clamp retaining bolts; then retighten them securely. Make sure that undue stress is not applied to steering column.



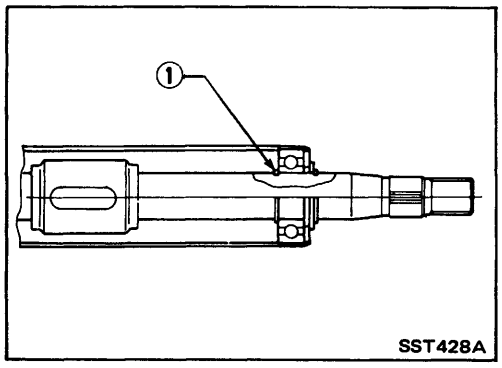
- When fitting steering lower joint, be sure tightening bolt faces cutout portion perfectly.

- After installing steering column, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal.

Disassembly and Assembly

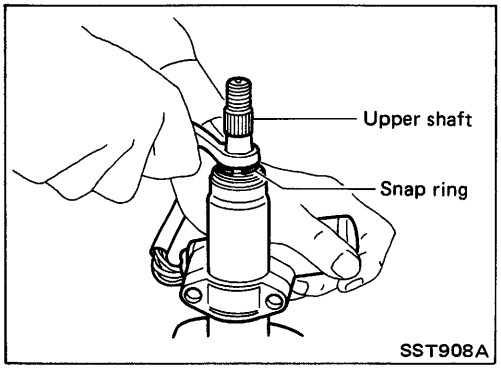


- Afrer installing, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal.

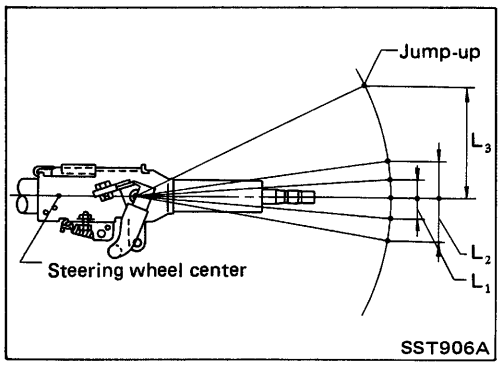


- When disassembling and assembling, unlock steering lock with key.
- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.
- Install snap ring ① before inserting shaft into jacket tube.

Disassembly and Assembly (Cont'd)



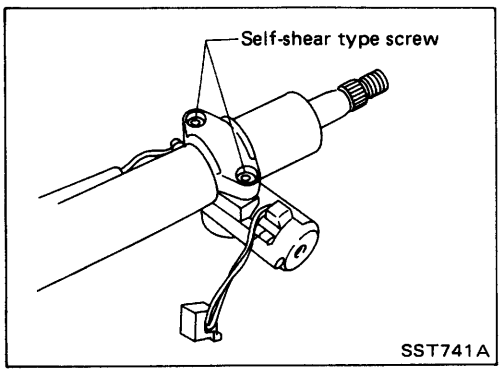
- Install snap ring on upper shaft with box wrench.



- **Tilt mechanism**

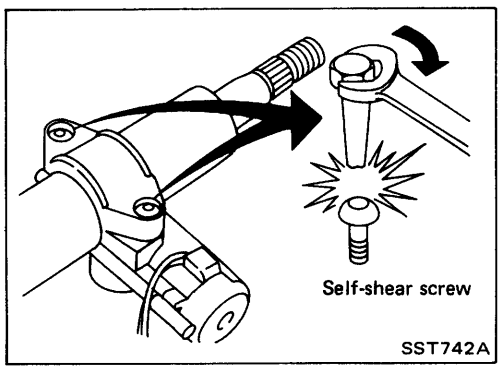
  After installing steering column, check tilt mechanism operation.

  L_1 : 7 mm (0.28 in)
  L_2 : 14 mm (0.55 in)
  L_3 : 94 mm (3.70 in)

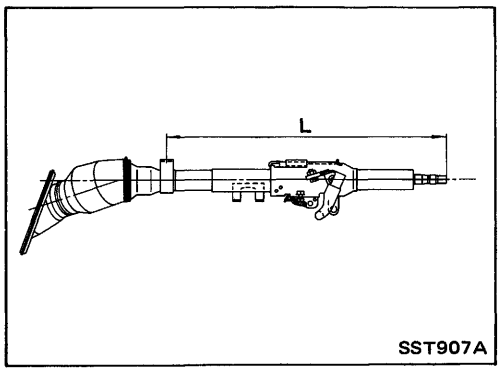


- **Steering lock**

a) Break self-shear type screws with a drill or other appropriate tool.



b) Install self-shear type screws and then cut off self-shear type screw heads.



Inspection

- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.

(1) Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.

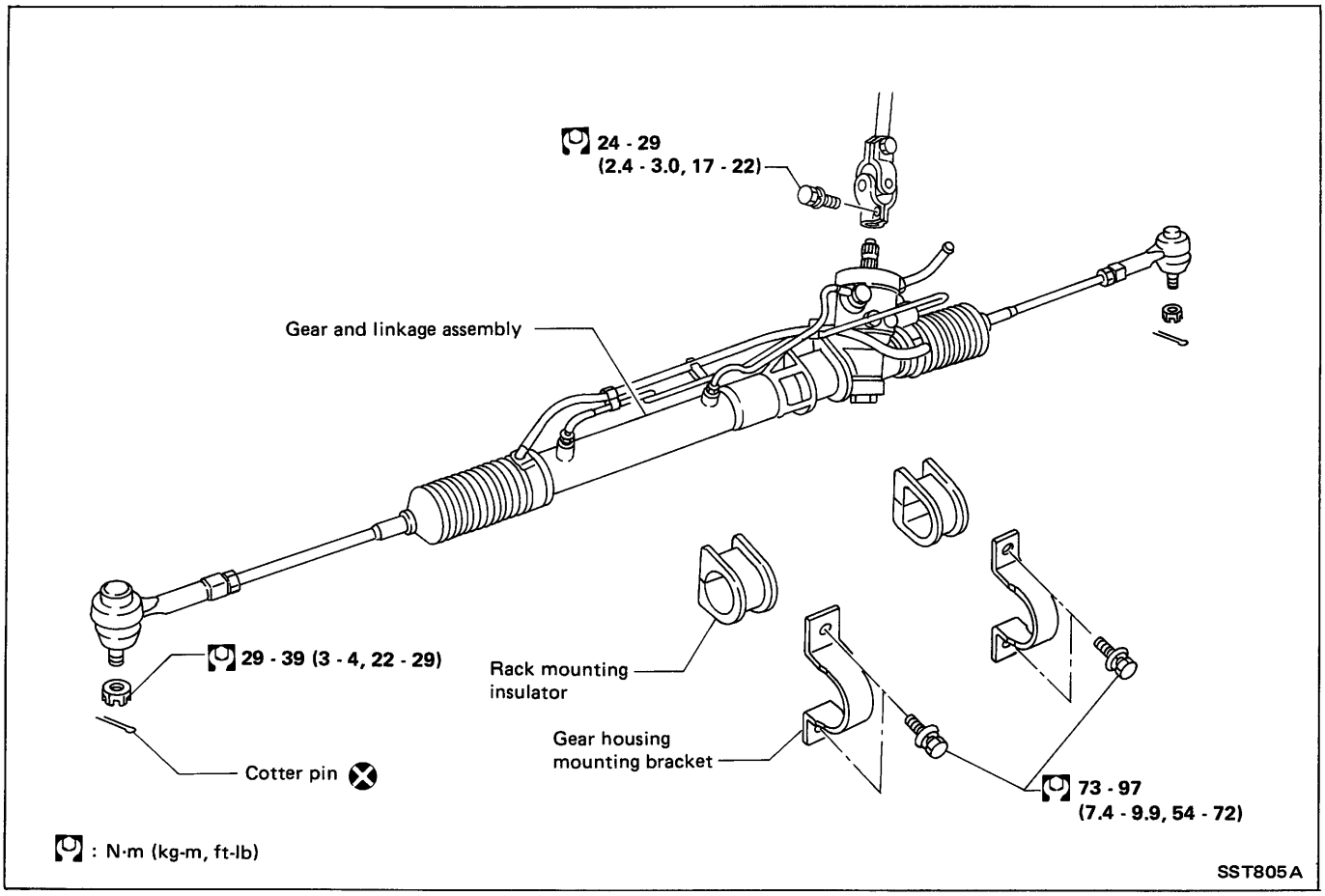
(2) Check jacket tube for deformation or breakage. Replace if necessary.

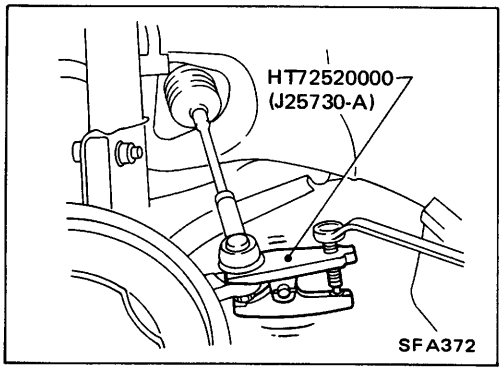
- When the vehicle is involved in a light collision, check column length "L". If it is not within specifications, replace steering column as an assembly.

Column length "L":

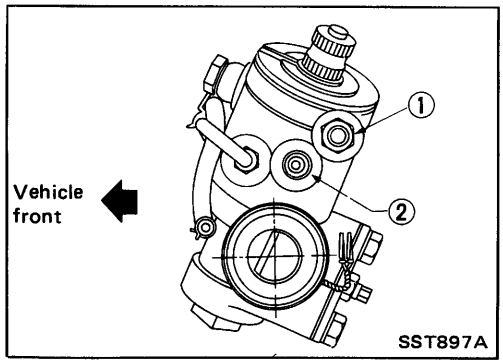
L = 511.7 - 513.3 mm (20.15 - 20.21 in)

Removal and Installation





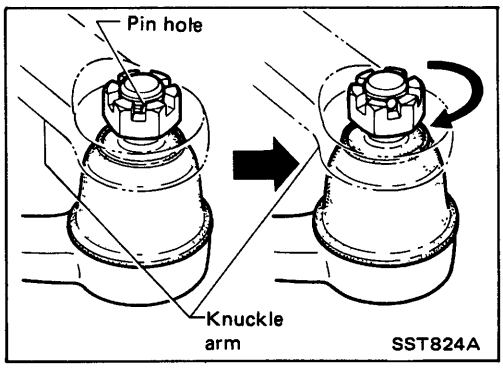
- Detach tie-rod outer sockets from knuckle arms with Tool.



- Install pipe connector as shown in figure at left.
  - ① Low-pressure side
  - ② High-pressure side

Removal and Installation (Cont'd)

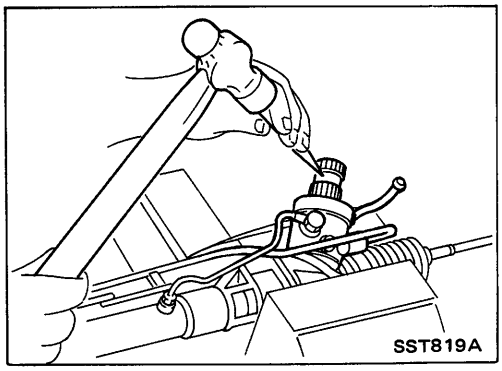
- Observe specified tightening torque when tightening high-pressure and low-pressure pipe connectors. Excessive tightening can damage threads or damaged connector O-ring.
- The O-ring in low-pressure pipe connector is larger than that in high-pressure connector. Take care to install the proper O-ring.



- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3 to 4 kg-m, 22 to 29 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

CAUTION:

Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).

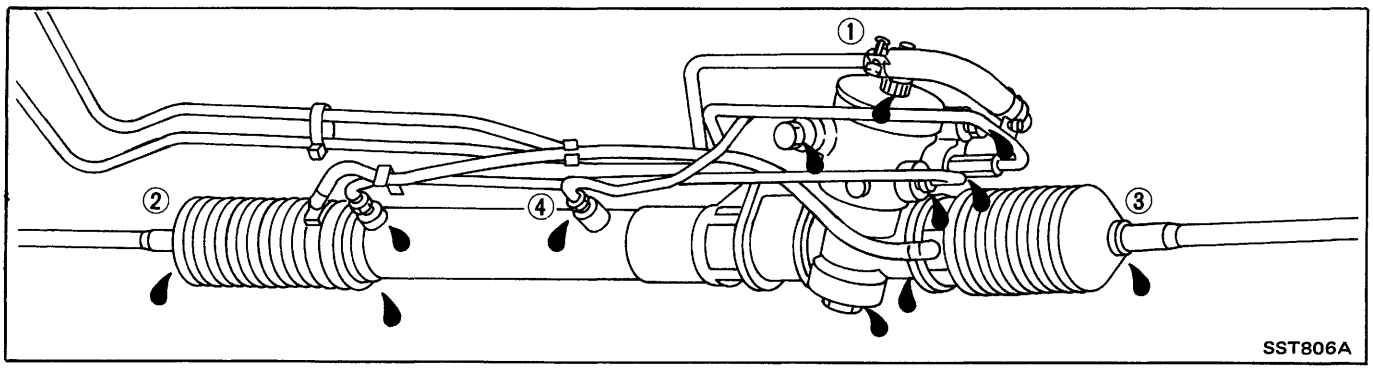


- Before removing lower joint from gear, set gear in neutral (wheels in straight ahead position). After removing lower joint, put matching mark on pinion shaft and pinion housing to record neutral position of gear.
- To install, set left and right dust boost to equal deflection, and attach lower joint by aligning match marks of pinion shaft and pinion housing.

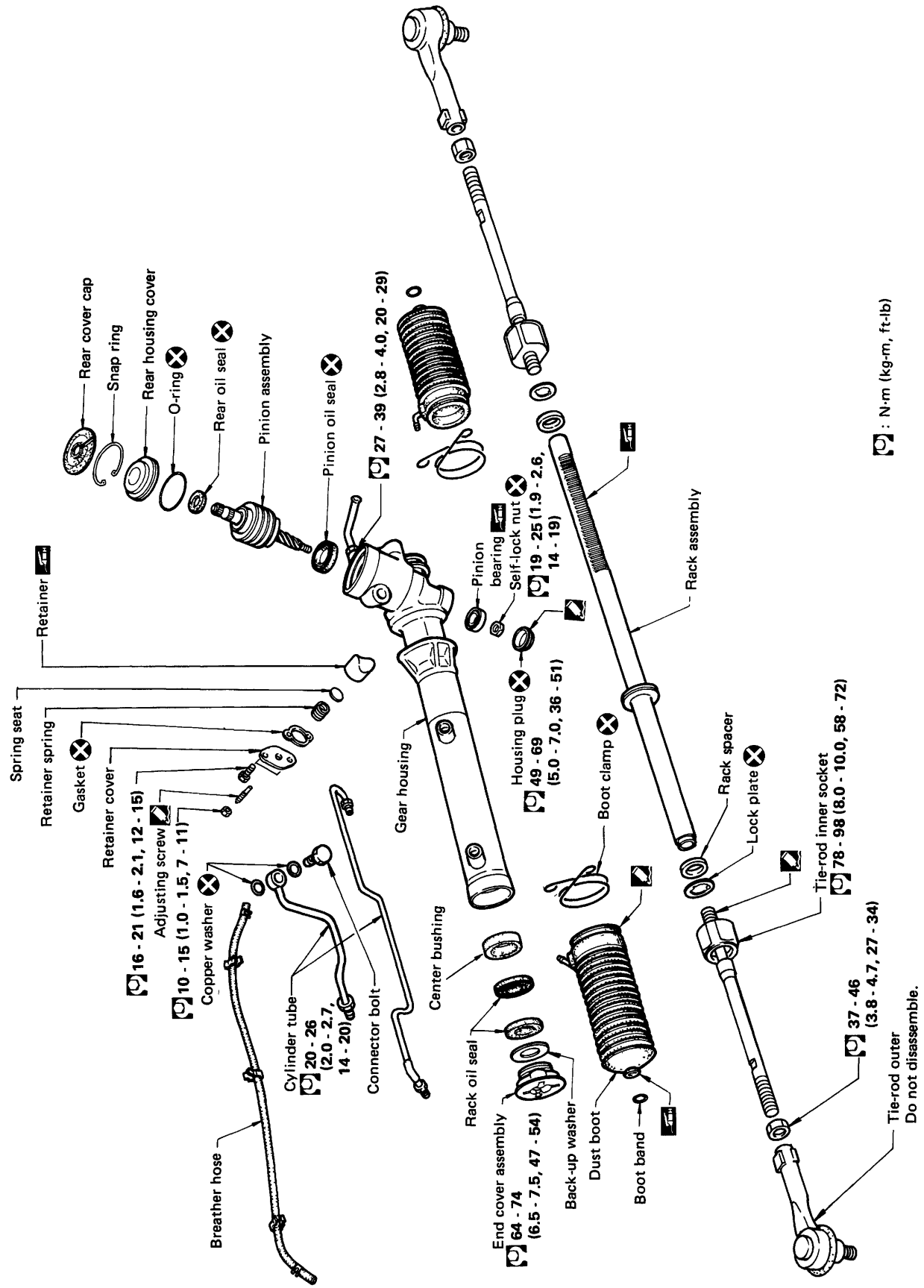
Disassembly and Assembly

The table below lists four ways to repair oil leaks in the steering gear, depending on the location of the leak. **See the following figure for oil leak locations.**

Item \ Position of oil leak	① Rear cover cap portion and rear housing	② Boot	③ Boot	④ Cylinder tube
Operation	■ Replacement • Rear oil seal • Pinion oil seal • O-ring • Snap ring	■ Replacement • Rack oil seal • Boot clamp	■ Replacement • Rack oil seals • Plastic ring • O-ring • Back-up collar • Boot clamp	■ Replacement • Cylinder tube • Copper washer
Procedure	Remove gear from vehicle. Measure rack starting force and pinion rotating torque. Replace parts described above. Replace rack oil seal. Replace parts described above. Replace cylinder tube. Measure pinion rotating torque. Adjust adjusting screw. Measure rack starting force and pinion rotating torque.			
Service parts to be prepared	• Pinion seal kit	• Gear housing seal kit	• Rack packing • Pinion seal kit	• Gear housing seal kit

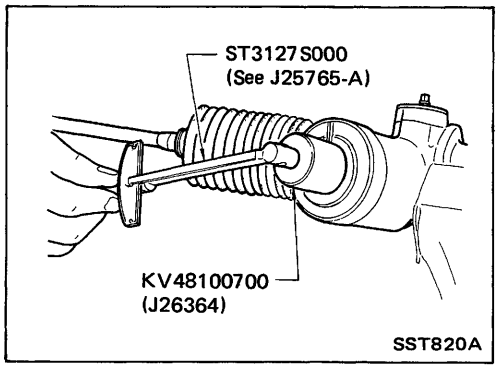


Disassembly and Assembly (Cont'd)



SST807A

Disassembly and Assembly (Cont'd)



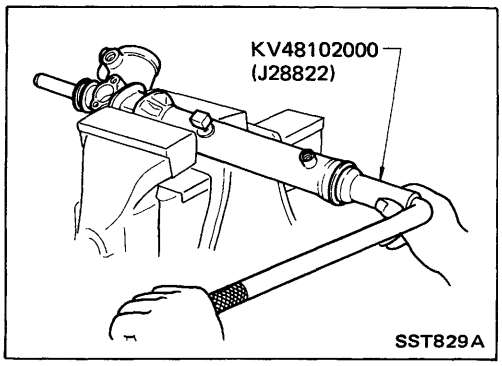
1. Prior to disassembling, measure pinion rotating torque and record the pinion rotating torque as a reference.

- **Before measuring, be sure to disconnect cylinder tube and drain fluid.**
- **Use soft jaws when holding steering gear housing. Handle it carefully as it is made of aluminum.**

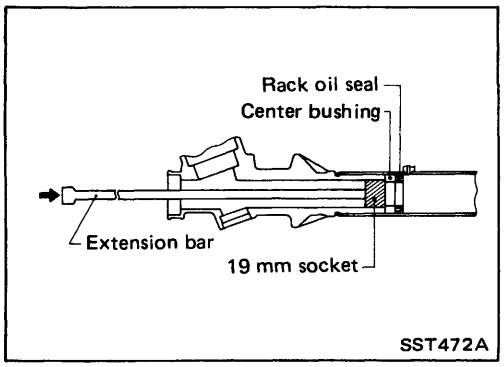
Average rotating torque:
0.8 - 1.3 N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)

Max. rotating torque:
1.9 N·m (19 kg-cm, 16 in-lb) or less

2. Remove tie-rod outer sockets and boots.
3. Loosen tie-rod inner socket.
4. Remove retainer.
5. Remove pinion assembly.
6. Remove cylinder tubes.

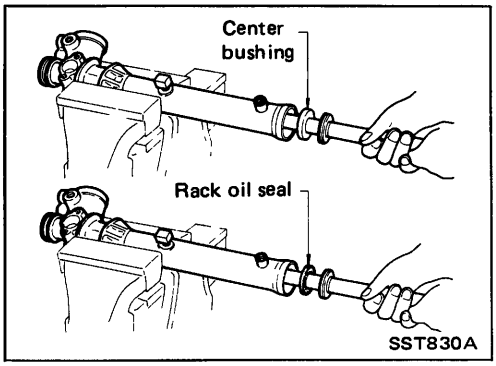


7. Drill staked portion of cylinder end cover with drill of 2 to 2.5 mm (0.079 to 0.098 in) diameter, until the staking will be eliminated.
8. Remove cylinder end cover assembly with Tool.
9. Draw out rack assembly.



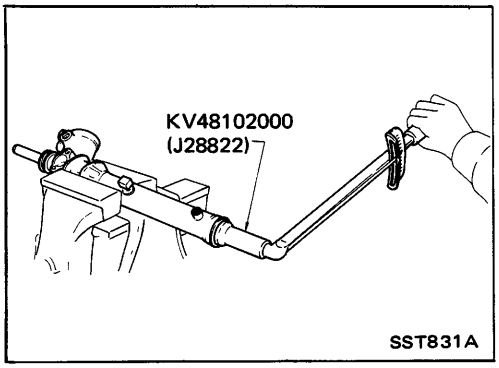
10. Remove center bushing and rack oil seal using 19 mm socket and extension bar.

Do not scratch inner surfaces of pinion housing.

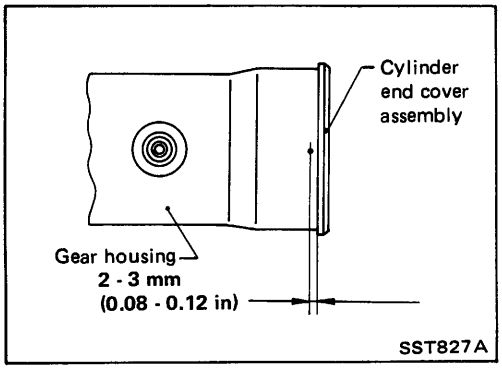


Assembly

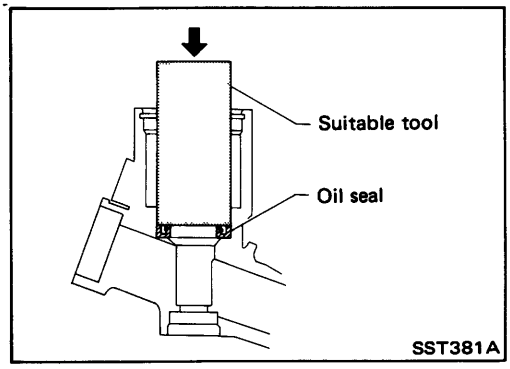
1. Install center bushing and rack oil seal with rack assembly.



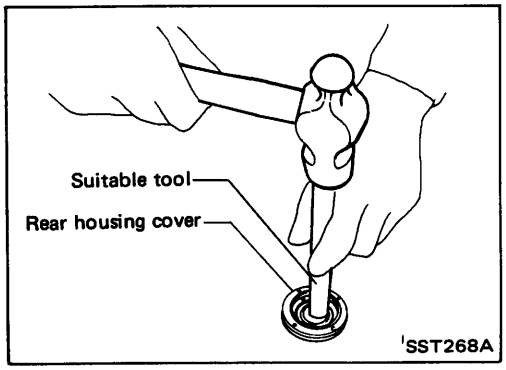
2. Tighten cylinder end cover assembly with Tool.



3. Fasten cylinder end cover assembly to gear housing by staking.

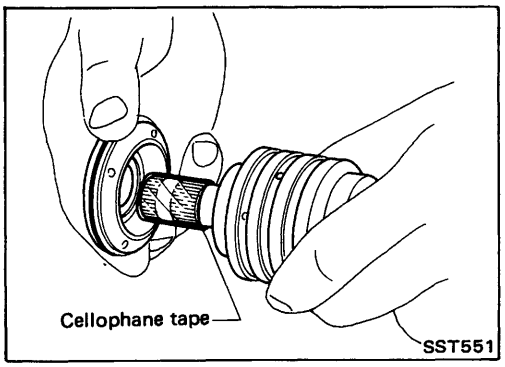


4. Coat seal lip of oil seal with multi-purpose grease and install new pinion oil seal to pinion housing with suitable tool.



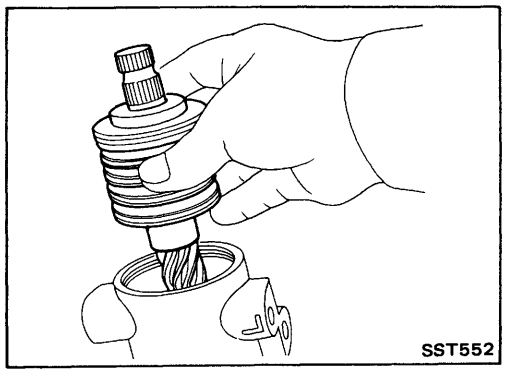
5. Install rear oil seal with suitable tool.

Assembly (Cont'd)



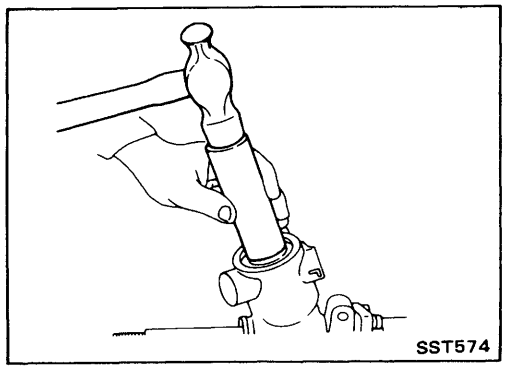
6. Install rear housing cover assembly to pinion.

Wrap cellophane tape around pinion serrations to prevent rear oil seal from being damaged.

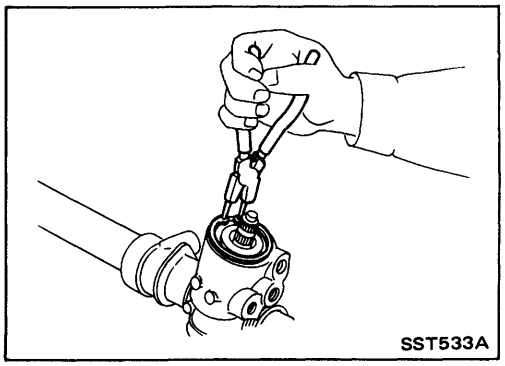


7. Install pinion assembly to pinion housing.

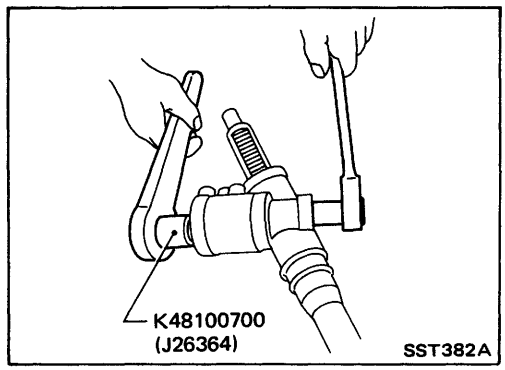
Be careful not to damage pinion oil seal.



8. When installing pinion assembly, use suitable tool.



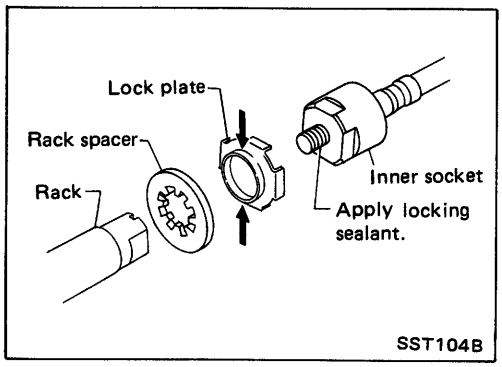
9. Install snap ring.



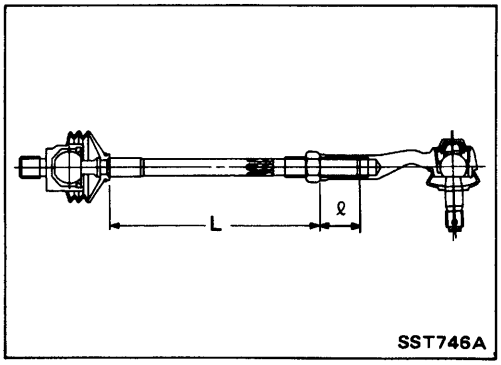
10. Tighten self-lock nut with Tool.

Assembly (Cont'd)

11. Install retainer, retainer spring, gasket and retainer cover.

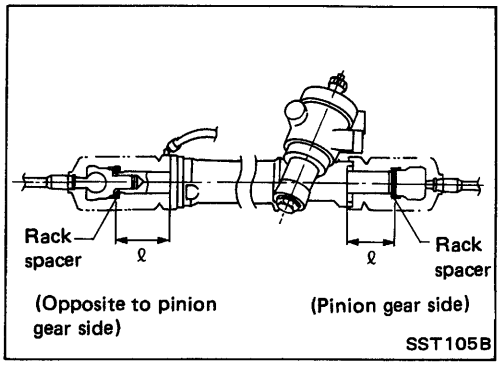


12. Apply locking sealant to threaded portion of inner so ˙et and install inner socket to rack end together with new lock plate.
13. Tighten inner socket and securely punch lock plate at groove portion of rack.



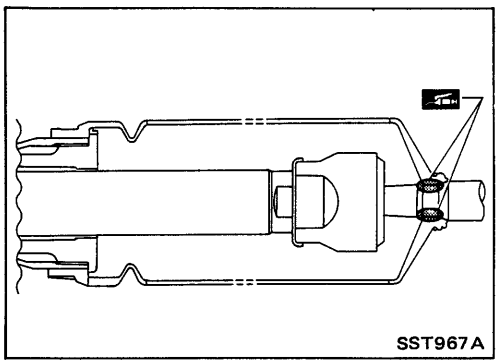
14. Tighten outer socket lock nut.

Tie-rod length "L":
176.4 mm (6.94 in)
Screwed length "ℓ":
25 mm (0.98 in) or more



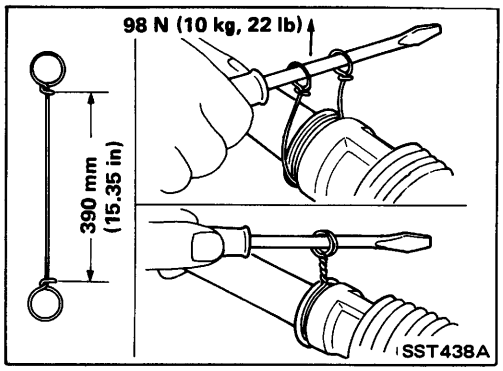
15. Measure rack stroke.

Measure length "ℓ":
Refer to S.D.S.

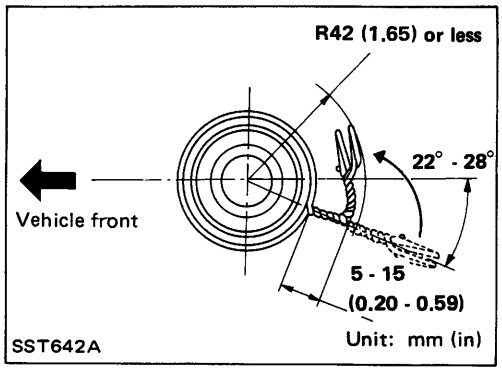


16. Apply a coat of sealant to contact surfaces between boot and cylinder before installing boot.

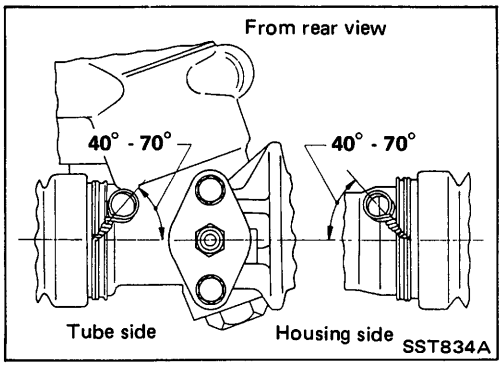
Assembly (Cont'd)



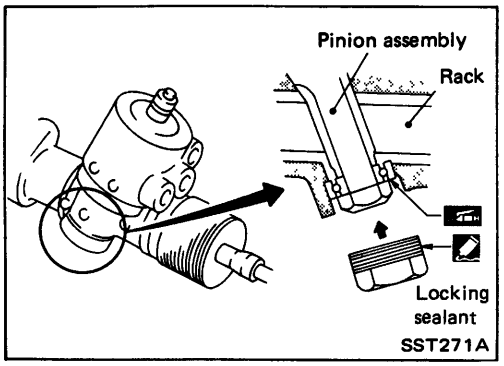
17. Install boot clamps.
- To install, wrap boot clamp around boot groove twice. Tighten clamp by twisting rings at both ends four or four and a half turns with screwdriver while pulling with a force of approx. 98 N (10 kg, 22 lb).



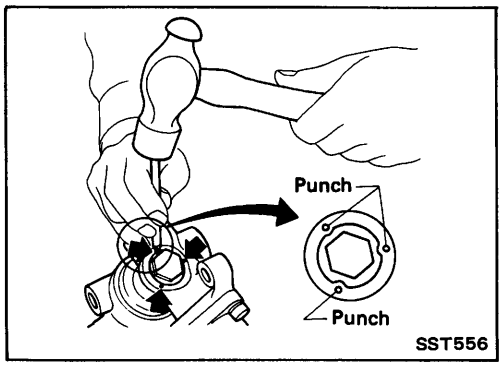
- Install boot clamp so that it is to the rear of the vehicle when gear housing is attached to the body. (This will avoid interference with other parts.)



- After twisting boot clamp four or four and a half turns, bend twisted end diagonally so it does not contact boot.



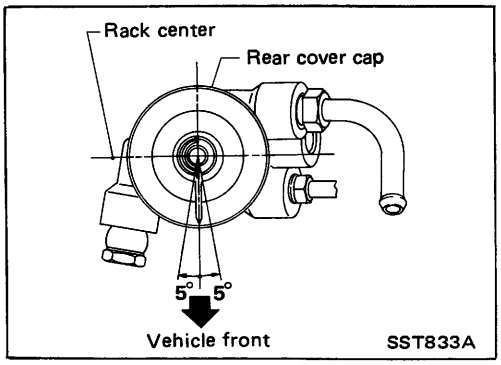
18. Apply grease to pinion bearing, coat threads of housing plug with locking sealant, and tighten plug.



19. Stake housing plug at three places with a punch.

Assembly (Cont'd)

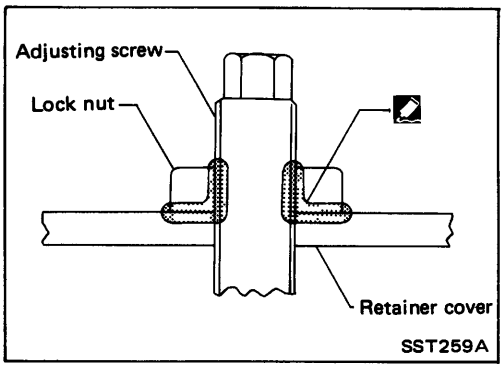
20. Set rear cover cap in neutral position.



Adjustment

Adjust pinion rotating torque as follows:

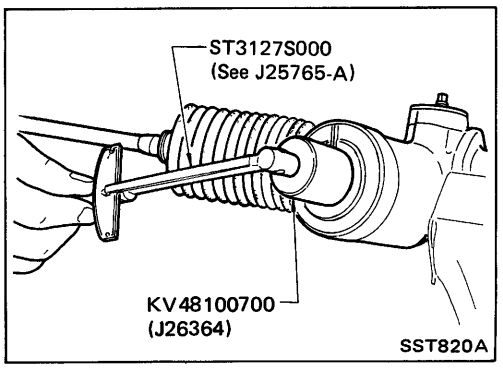
1. Set gears to Neutral.
2. Tighten adjusting screw one or two times to a torque of 4.9 N·m (50 kg-cm, 43 in-lb).
3. Loosen adjusting screw, then retighten it to 0.05 to 0.20 N·m (0.5 to 2 kg-cm, 0.43 to 1.74 in-lb).



4. Apply a coat of locking sealant to adjusting screw and lock nut.

- Shaded areas shown in the figure at left refer to portions that should be coated with sealant.

5. Prevent adjusting screw from turning, and tighten lock nut to specified torque.



6. Move rack over its entire stroke several times.
7. Measure pinion rotating torque within the range of ±100° from neutral position.

   Average rotating torque:
   [(Max. value + Min. value) x 0.5]
   0.8 - 1.3 N·m
   (8 - 13 kg-cm, 6.9 - 11.3 in-lb)
   Max. rotating torque:
   1.9 N·m (19 kg-cm, 16 in-lb) or less

8. If pinion rotating torque is not within the specifications, readjust.

Inspection

Thoroughly clean all parts in cleaning solvent or automatic transmission fluid "Dexron Type", and blow dry with compressed air, if available.

BOOT

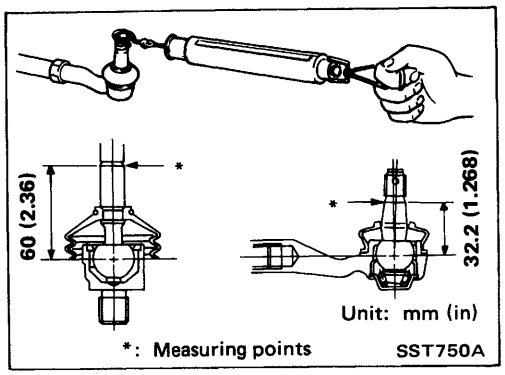
Check condition of boot. If it is cracked excessively, replace boot.

RACK

Thoroughly examine rack gear. If rack gear is damaged, cracked or worn, replace.

PINION ASSEMBLY

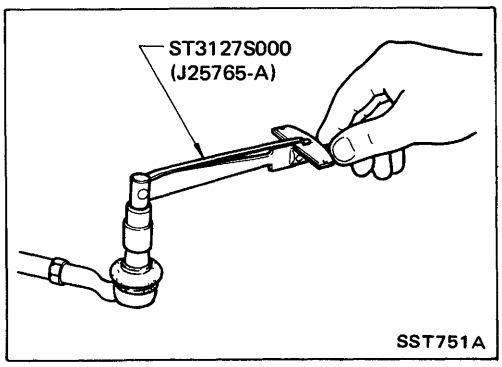
- Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace.
- Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers and races. Replace if necessary.



TIE-ROD OUTER AND INNER SOCKET

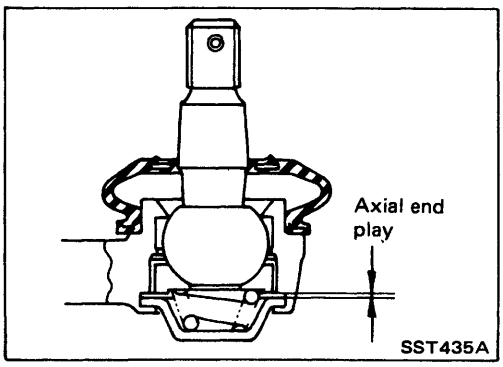
- Check ball joint for swinging force.

  Tie-rod outer ball joint:
  4.51 - 91.21 N
  (0.46 - 9.3 kg, 1.01 - 20.51 lb)
  Tie-rod inner ball joint:
  1.67 - 122.59 N
  (0.17 - 12.5 kg, 0.37 - 27.56 lb)



- Check ball joint for rotating torque.

  Tie-rod outer ball joint:
  0.15 - 2.94 N·m
  (1.5 - 30 kg-cm, 1.3 - 26.0 in-lb)



- Check ball joint for axial end play.

  Tie-rod outer ball joint:
  1.3 mm (0.051 in) or less
  Tie-rod inner ball joint:
  0 mm (0 in)

Inspection (Cont'd)

- Check condition of dust cover. If it is cracked excessively, replace it.

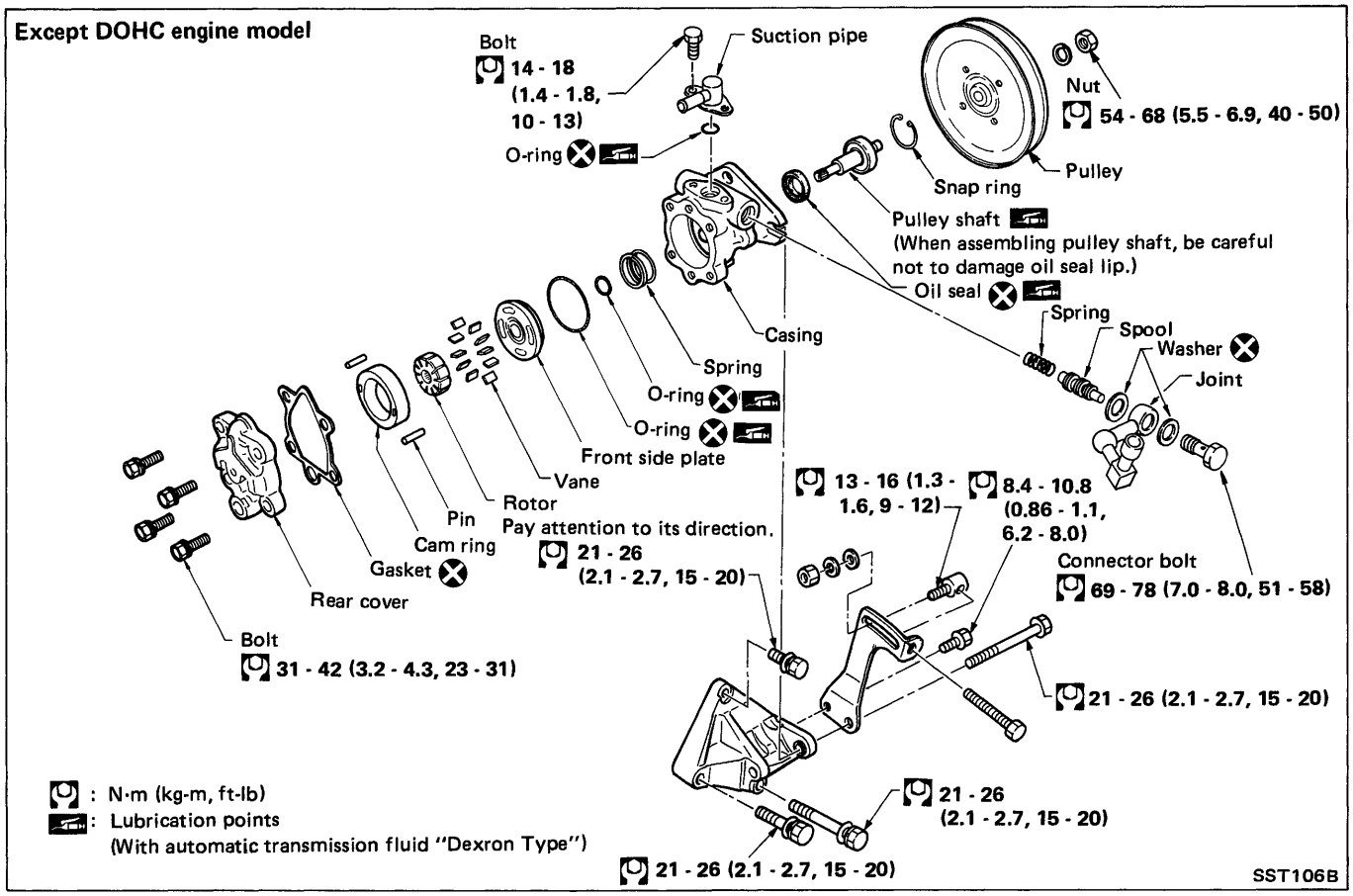
CYLINDER TUBES AND BREATHER HOSE

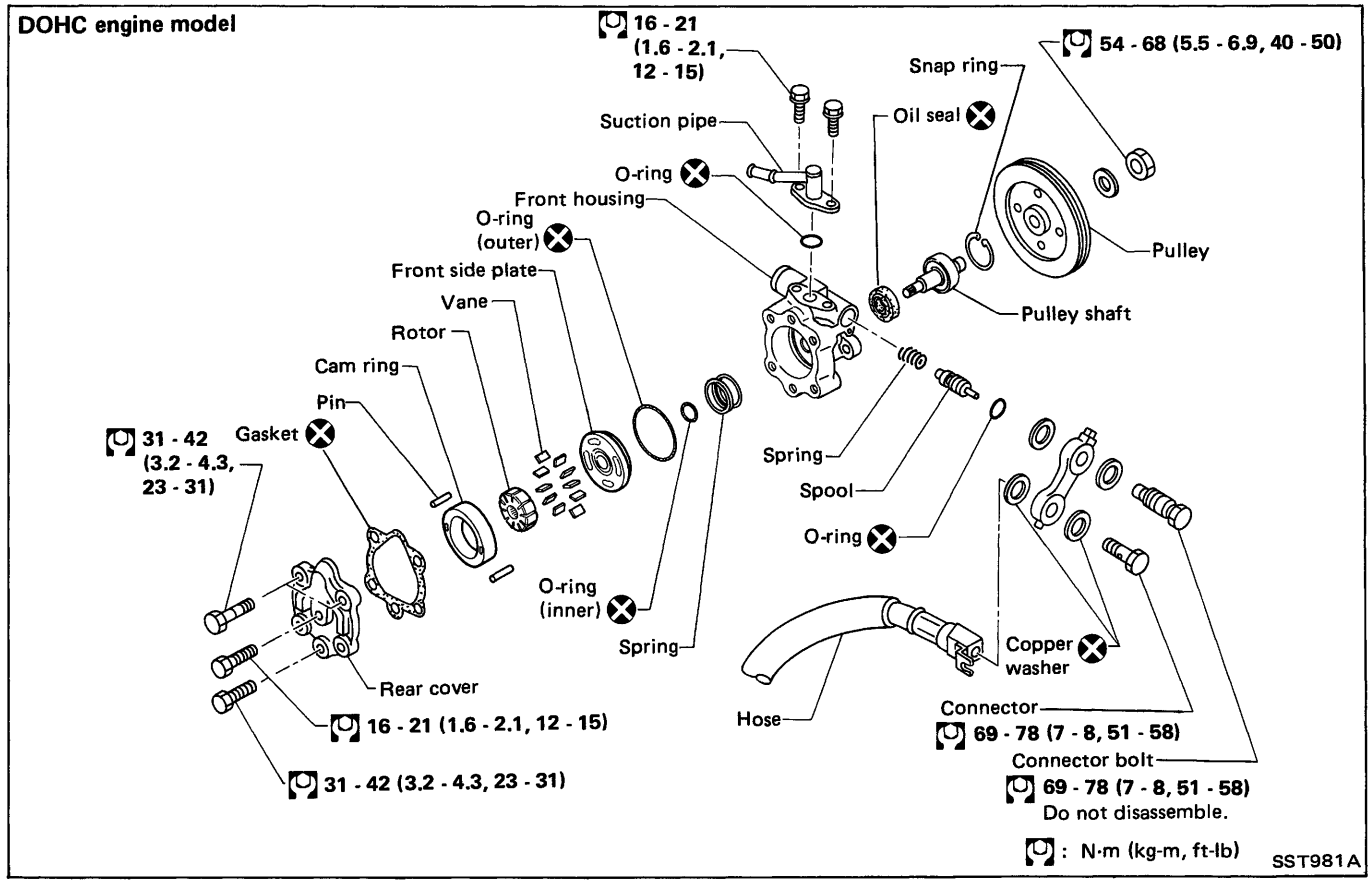
Check cylinder tubes and breather hose for scratches or other damage. Replace if necessary.

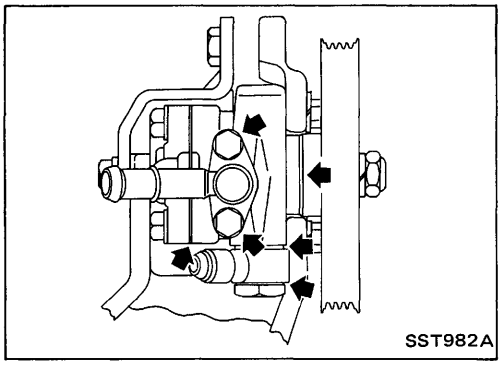
STEERING GEAR COMPONENT PARTS

Thoroughly examine steering gear component parts. If parts are damaged, cracked or worn, replace steering gear as an assembly.

Disassembly and Assembly







Pre-disassembly Inspection

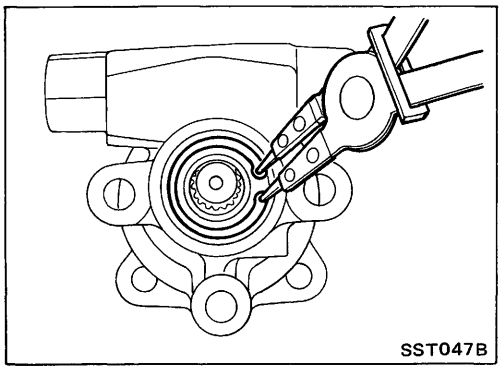
The power steering oil pump should be disassembled only if any of the following phenomena are noted.

- Oil leak as shown in figure.
- Deformed or damaged pulley

Disassembly

CAUTION:

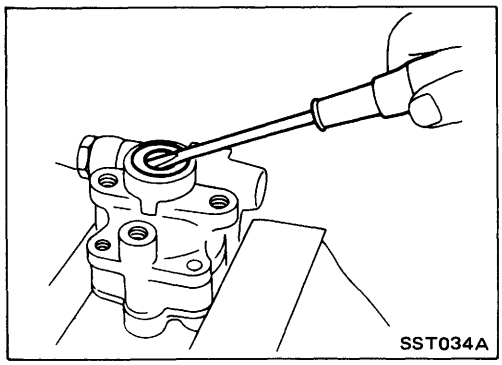
- **The parts which can be disassembled are strictly limited. Never disassemble parts other than the specified ones.**
- **Disassembly should be performed in a place as clean as possible.**
- **Hands should be cleaned before disassembly.**
- **Do not use a rag. Be sure to use nylon or paper cloth.**
- **Be sure to follow procedures and cautions indicated in the Service Manual.**
- **When disassembling and reassembling, do not allow any foreign matter to enter or contact any parts.**



- Remove snap ring, then draw pulley shaft out.

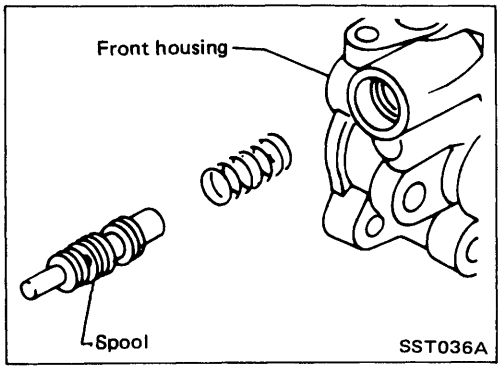
Be careful not to drop pulley shaft.

Disassembly (Cont'd)



- Remove oil seal.

Be careful not to damage front housing.



- Remove connector.

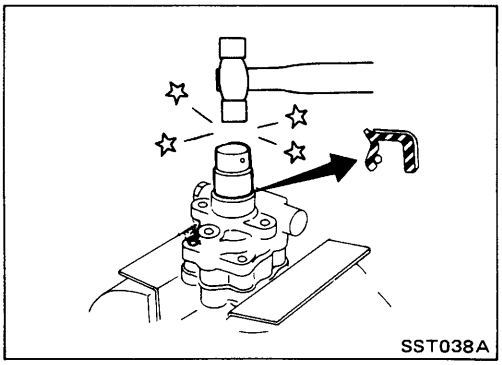
Be careful not to drop spool.

Inspection

Wash all disassembled parts in suitable cleaning solvent.

PULLEY AND PULLEY SHAFT

a. **If pulley is cracked or deformed, replace it.**
b. **If an oil leak is noticed around pulley shaft oil seal, replace it.**
c. **If serration of pulley or pulley shaft is deformed or worn, replace.**

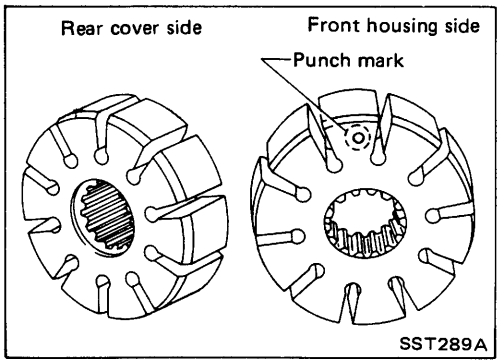

SST038A

Assembly

Assemble oil pump in the reverse order of disassembly, noting the following instructions.

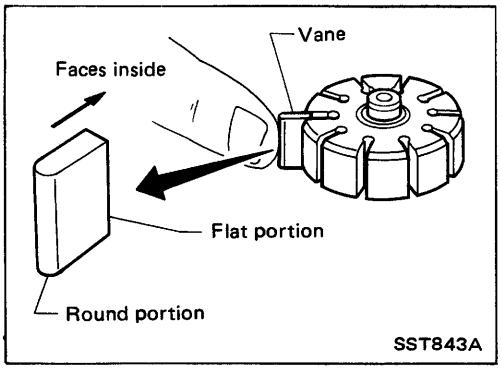
- Before installing O-rings and oil seal, apply a thin coat of A.T.F.* to them.
- Make certain that O-rings and oil seal are installed properly.
- When assembling vanes to rotor, rounded surfaces of vanes must be facing cam case side.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.

*: Automatic Transmission Fluid



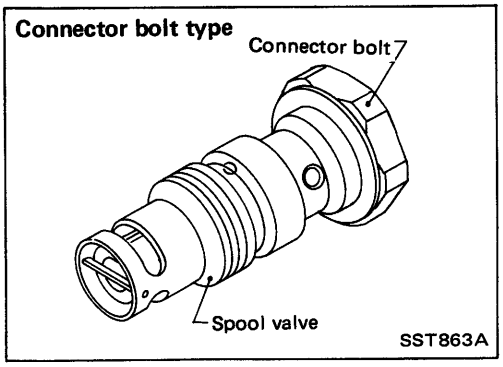
SST289A

- Pay attention to the direction of rotor.



SST843A

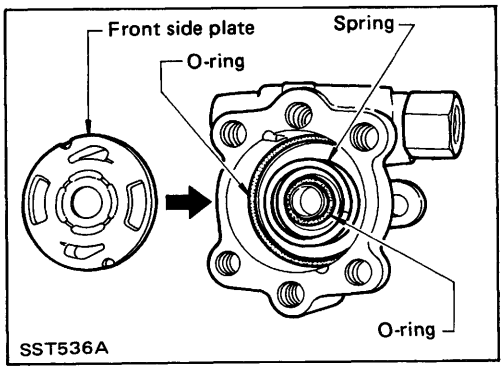
- Install vanes properly.



SST863A

CAUTION:
Do not remove spool valve from connector.

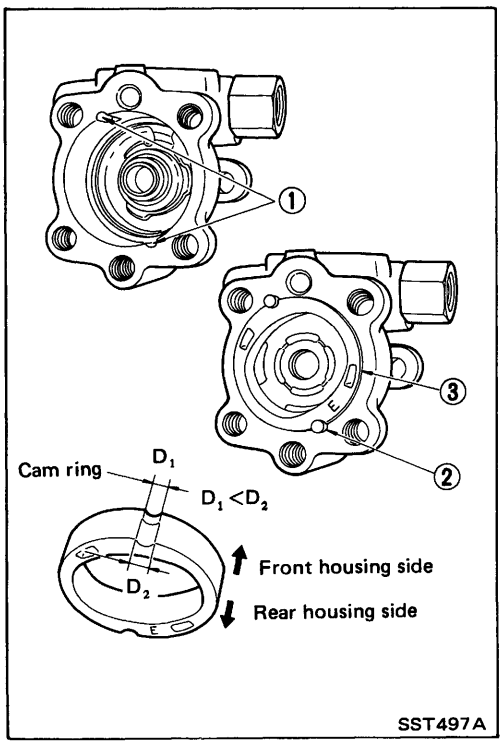
Assembly (Cont'd)



Except DOHC engine model

- Apply A.T.F.* to O-ring.

*: Automatic Transmission Fluid



- Insert pin ② into pin groove ① of front housing and rotor. Then install cam ring ③ as shown at left.

- Apply a coat of A.T.F.* to O-ring.

General Specifications

Steering model	Power steering
Item	PR24SA
Steering column	Collapsible
Turns of steering wheel (Lock to lock) DOHC engine model	2.7
Except DOHC engine model	2.9

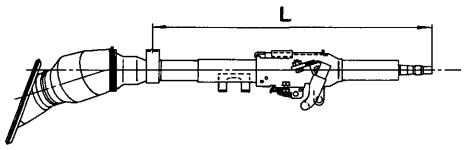
Inspection and Adjustment

GENERAL

Steering wheel axial play mm (in)	0 (0)
Steering wheel play mm (in)	35 (1.38) or less
Movement of gear housing mm (in)	±2 (±0.08) or less

STEERING COLUMN

Steering column length "L" mm (in)	511.7 - 513.3 (20.15 - 20.21)

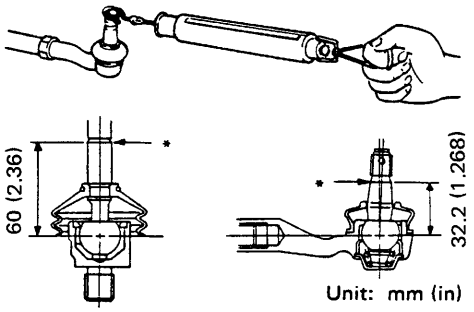


SST907A

Inspection and Adjustment (Cont'd)

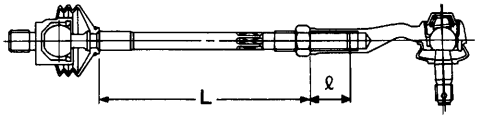
STEERING GEAR AND LINKAGE

Tie-rod outer ball joint Swing force* N (kg, lb)	9.12 - 91.21 (0.93 - 9.3, 2.05 - 20.51)
Rotating torque N·m (kg-cm, in-lb)	0.3 - 2.9 (3 - 30, 2.6 - 26.0)
Axial end play mm (in)	0.1 - 0.8 (0.004 - 0.031)
Tie-rod inner ball joint Swinging force* N (kg, lb)	8.14 - 122.59 (0.83 - 12.5, 1.83 - 27.56)
Axial end play mm (in)	0 (0)



*: Measuring points SST750A

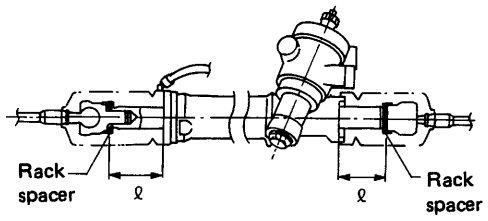
Tie-rod length "L" mm (in)	176.4 (6.94)



SST746A

	Average
Pinion rotating torque (Pinion gear and rack gear assembly) N·m (kg-cm, in-lb)	0.8 - 1.3 (8 - 13, 6.9 - 11.3)
Steering wheel turning force at 360° position from neutral N (kg, lb)	39 (4, 9) or less
Normal operating temperature of fluid °C (°F)	60 - 80 (140 - 176)
Fluid capacity ℓ (US qt, Imp qt)	Approximately 0.9 (1, 3/4)
Oil pump maximum standard pressure kPa (kg/cm², psi)	6,375 (65, 924)

Measured length "ℓ" mm (in)	65.5 (2.579)*1 70.0 (2.756)*2



SST105B

*1: DOHC engine model
*2: Except DOHC engine model

Tightening Torque

STEERING COLUMN

Unit	N·m	kg-m	ft-lb
Steering wheel nut	29 - 39	3.0 - 4.0	22 - 29
Lower joint to column	24 - 29	2.4 - 3.0	17 - 22
Lower joint to gear	24 - 29	2.4 - 3.0	17 - 22
Hole cover to dash panel	3.4 - 4.4	0.35 - 0.45	2.5 - 3.3
Lower bracket to pedal bracket	13 - 18	1.3 - 1.8	9 - 13
Steering column clamp to mounting bracket	13 - 18	1.3 - 1.8	9 - 13
Tilt lever fixing bolt	8 - 11	0.8 - 1.1	5.8 - 8.0

Model PR24SA

Unit	N·m	kg-m	ft-lb
Gear and linkage			
Tie-rod to knuckle	29 - 39	3 - 4	22 - 29
Tie-rod lock nut	37 - 46	3.8 - 4.7	27 - 34
Tie-rod to gear	78 - 98	8 - 10	58 - 72
Gear housing clamp bolt	73 - 97	7.4 - 9.9	54 - 72
Retainer cover fixing bolt	16 - 21	1.6 - 2.1	12 - 15
Adjusting screw lock nut	10 - 15	1.0 - 1.5	7 - 11
Self-lock nut	19 - 25	1.9 - 2.6	14 - 19
Housing plug	49 - 69	5 - 7	36 - 51
Cylinder tube flare nut	20 - 26	2.0 - 2.7	14 - 20
End cover	64 - 74	6.5 - 7.5	47 - 54
Low-pressure connector at gear	27 - 39	2.8 - 4.0	20 - 29
Oil pump, tank and hoses			
Connector bolt	49 - 69	5 - 7	36 - 51
Connector	69 - 78	7 - 8	51 - 58
High-pressure pipe to gear	15 - 25	1.5 - 2.5	11 - 18
Pulley lock nut	54 - 68	5.5 - 6.9	40 - 50
Suction pipe (DOHC engine)	16 - 21	1.6 - 2.1	12 - 15
Tank bracket securing bolt (DOHC engine)	3.1 - 4.3	0.32 - 0.44	2.3 - 3.2
Rear cover fixing bolt	38 - 52	3.9 - 5.3	28 - 38
Tank fixing bolt at oil pump (Except DOHC engine)	16 - 21	1.6 - 2.1	12 - 15

SECTION BF

CONTENTS

GENERAL SERVICING
(Including all clips & fasteners for this model) ..... BF- 2
BODY END
(Including back door & fuel filler lid opener) ..... BF- 7
DOOR BF-10
INSTRUMENT BF-12
INTERIOR AND EXTERIOR
(EXTERIOR includes weatherstrips and rubber seals) BF-14
SEAT BF-22
WINDSHIELD AND WINDOWS BF-24
CANOPY BF-29
T-BAR ROOF BF-30
REAR AIR SPOILER AND HIGH-MOUNTED STOP LAMP BF-32
MIRROR
(Including electrically controlled door mirror wiring diagram) BF-33
REAR COMBINATION LAMP
(Installed with nuts and butyl sealant) BF-34
BODY ALIGNMENT
(Including the coordinates of the points and actual dimensions between the points) BF-35

★ **For seat belt, refer to MA section.**

★ **"Remarks" and "Connections" in electrical diagram show the terminal meaning and actual electrical flow.**

★ **For connector Nos. in wiring diagrams in this section, refer to Harness Layout in EL section.**

★ **Method of reading electrical diagrams in BF section is basically the same as in the EL section.**
So refer to "HOW TO READ WIRING DIAGRAM" in GI section.

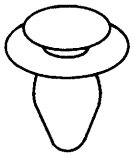
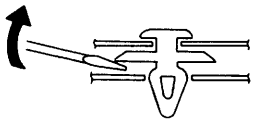
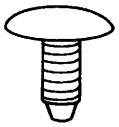
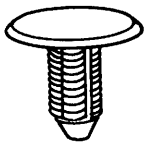
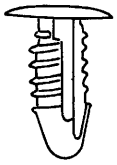
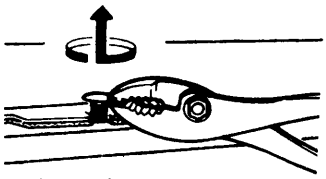
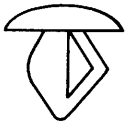
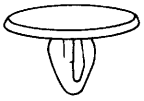
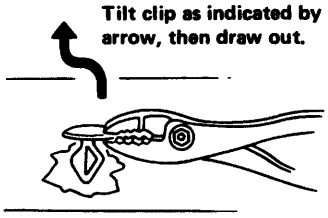
★ **For power supply routing, refer to "POWER SUPPLY" in EL section.**

Precautions

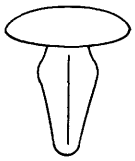
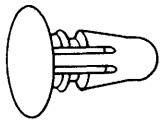
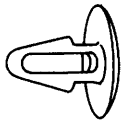
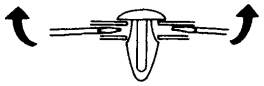
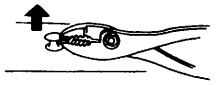
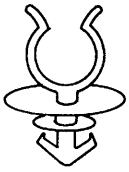
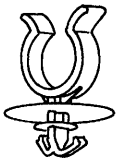
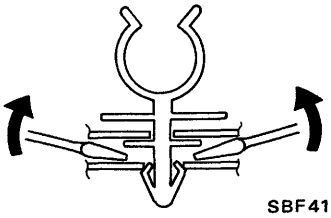
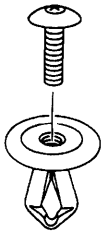
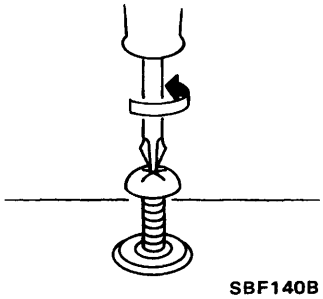
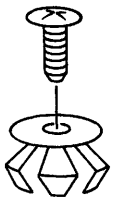
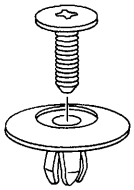
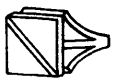
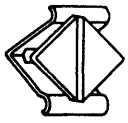
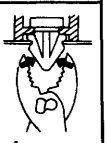
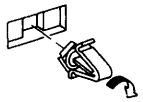
- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removing or installation. Be careful not to soil or damage them.
- Apply sealing compound where necessary when installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.
- When replacing any metal parts (for example body outer panel, members, etc.), be sure to take rust prevention measures.

Clip and Fastener

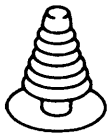
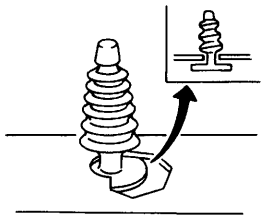
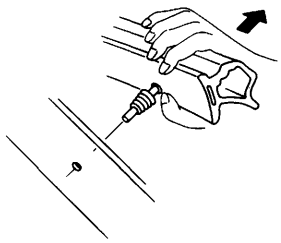
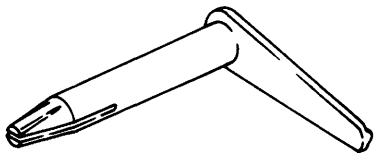
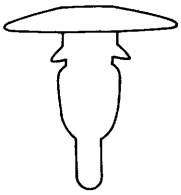
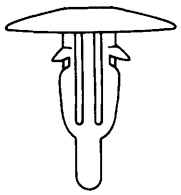
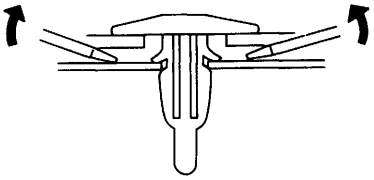
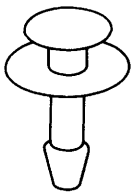
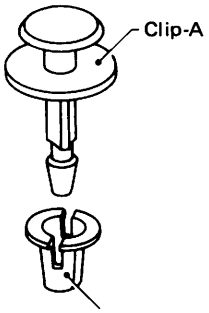
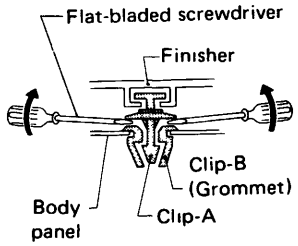
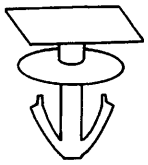
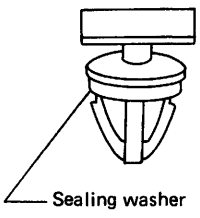
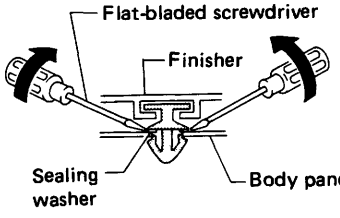
- Clips and fasteners in BF section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

No.	Symbol	Shape	Removal & Installation
C101	 SBF092B	 SBF109B	**Removal:** **Remove by bending up with a flat-bladed screwdriver.**  SBF094B
C102	 SBF113B	 SBF114B  SBF137B	 **Removal:** **Pull up by rotating** SBF115B
C105	 SBF141B	 SBF142B	**Removal:** **Tilt clip as indicated by arrow, then draw out.**  SBF143B

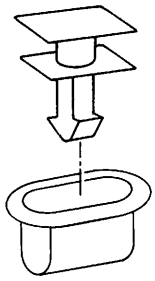
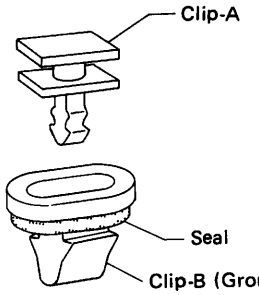
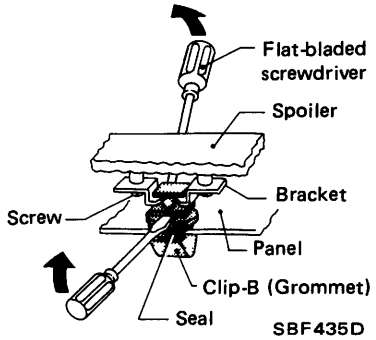
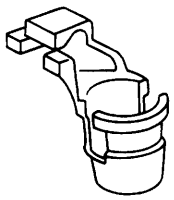
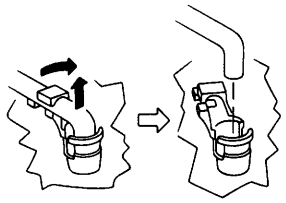
Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & Installation
C106	 SBF089B	   SBF090B	**Removal:** **Remove with flat-bladed screwdrivers or pliers.**   SBF091B
C112	 SBF409D	 SBF410D	**Removal:** **Remove by bending up with flat-bladed screwdrivers.**  SBF411D
CS102	 SBF138B	 SBF139B	**Removal:** **Screw out with a Phillips screwdriver.**  SBF140B
CS103	 SBF363B	 SBF364B	
CG101	 SBF144B	  SBF145B	**Removal:**  **Rotate 45° to remove.**  **Removal:** **Installation:**  SBF085B

Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & Installation
CE103	 SBF103B	 SBF104B	**Removal:**  SBF147B
CE114	 SBF353C		—
CE117	 SBF173D	 SBF174D	**Removal:** **Remove with flat-bladed screwdrivers or pliers.**  SBF175D
CF113	 SBF035C	 SBF036C Clip-B (Grommet)	**Removal:**  SBF652B
CF119	 SBF419D	 SBF420D	 SBF421D

Clip and Fastener (Cont'd)

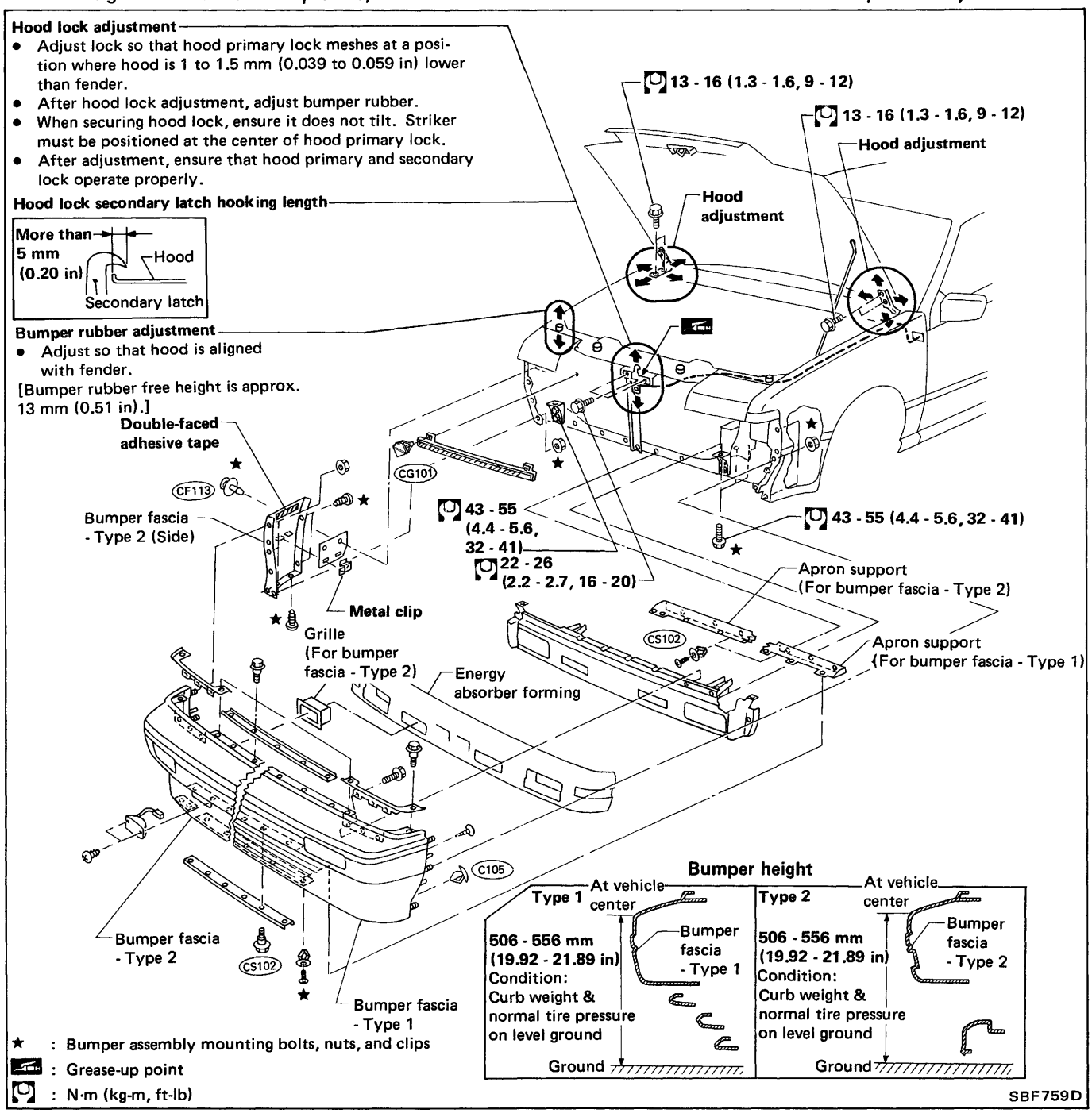
No.	Symbol	Shape	Removal & Installation
CF120	 SBF433D	 SBF434D	 SBF435D
CR103	 SBF768B		**Removal:** **Holder portion of clip must be spread out to remove rod.**  SBF770B

NOTE

- When removing and installing hood or back door, place a cloth or other padding on hood or back door corners to avoid scratching vehicle body.
- When removing clip or fastener, refer to "Clip and Fastener".
- Apply sealing compound where necessary when installing parts.

Body Front End

- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood lock engaging mechanism.
- Hood lock control cable: Do not attempt to bend cable forcibly. Doing so increases effort required to unlock hood.
- Bumper fascia: It is made of plastic, so do not use excessive force and take care to keep oil away from it.
- Front grille: It is made of plastic, so do not use excessive force and take care to keep oil away from it.



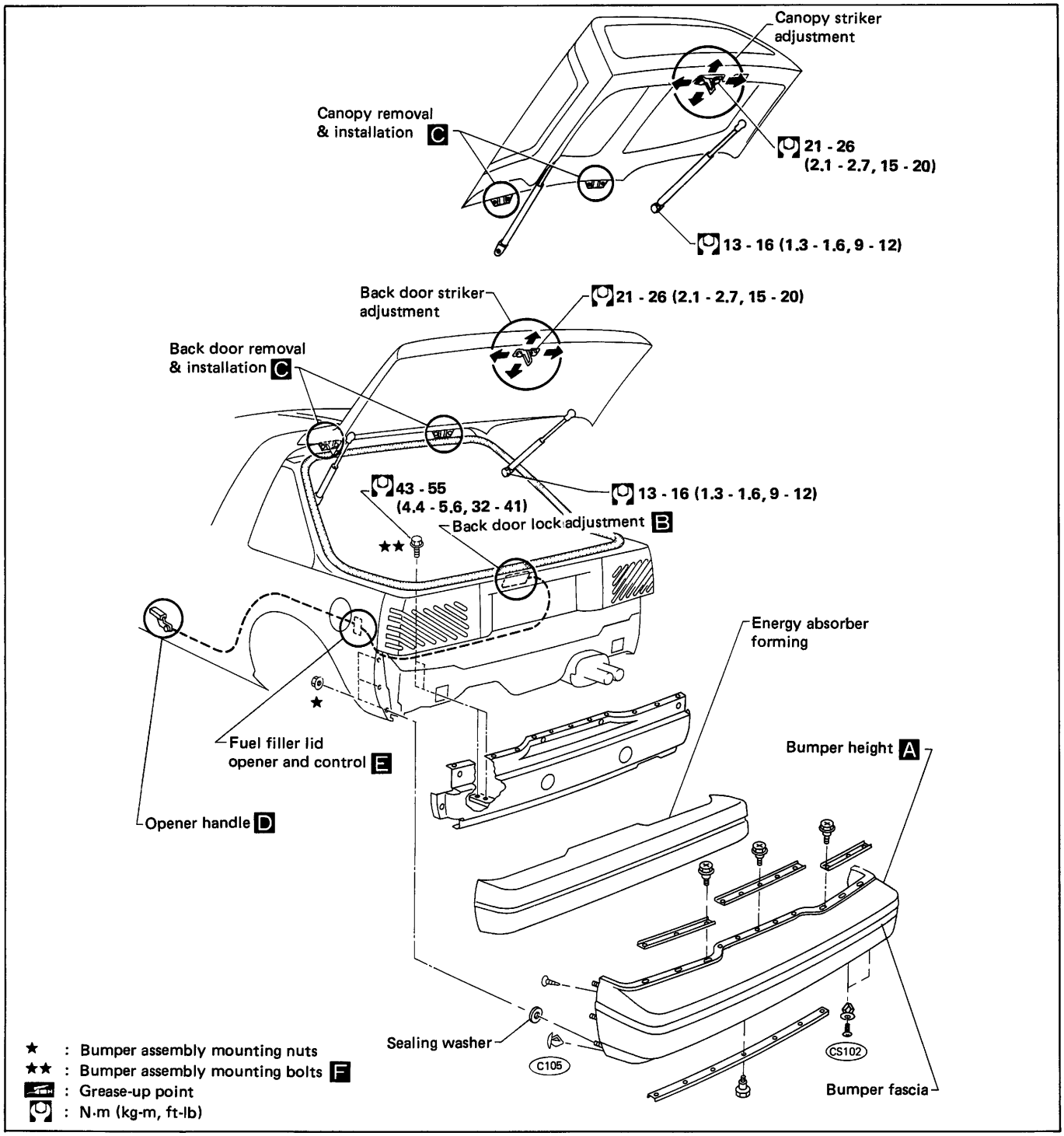
Body Rear End and Opener

- Back door lock system adjustment: Adjust lock & striker so that they are in the center. After adjustment, check back door lock operation.
- Bumper fascia: It is made of plastic, so do not use excessive force and take care to keep oil away from it.
- Opener cable: Do not attempt to bend cable using excessive force.
- After installing/adjusting opener, make sure that back door and fuel filler lid open smoothly.

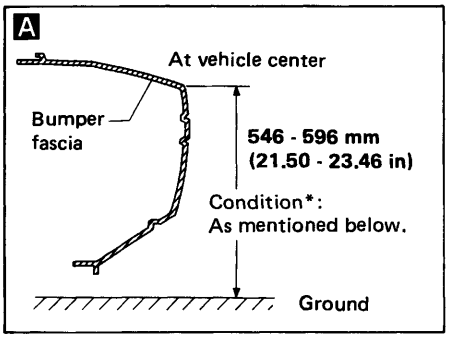
WARNING:

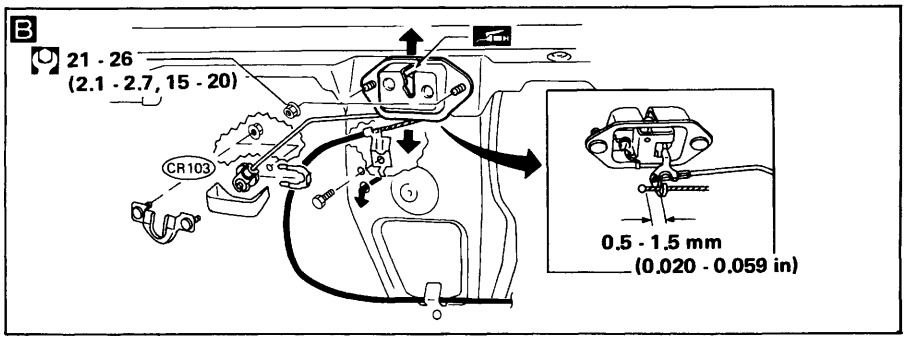
a. **Be careful not to scratch back door stay when installing back door. A scratched stay may cause gas leakage.**

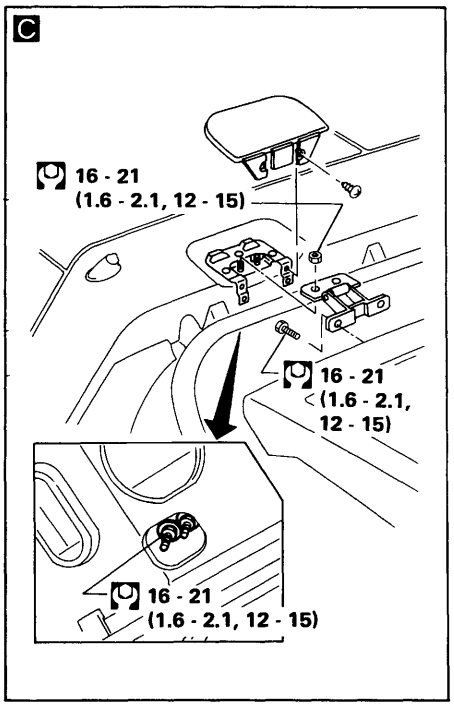
b. **The contents of the back door stay are under pressure. Do not take apart, puncture, apply heat or allow fire near it.**

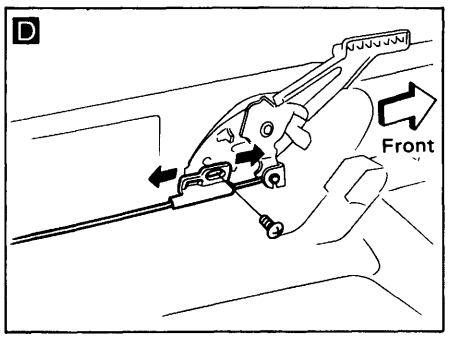


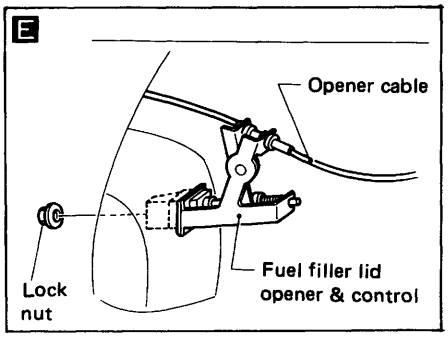
Body Rear End and Opener (Cont'd)

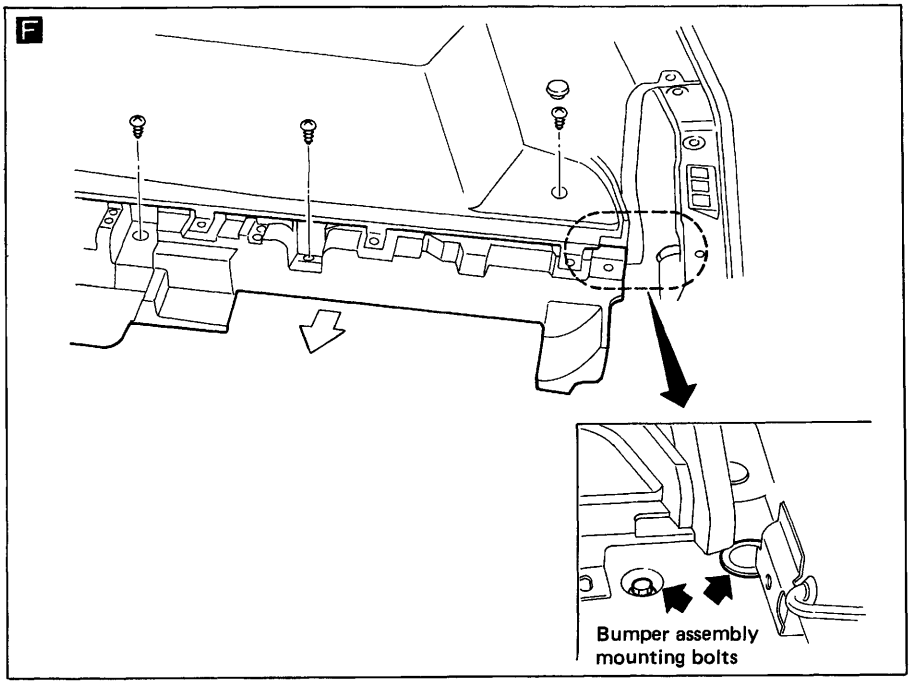










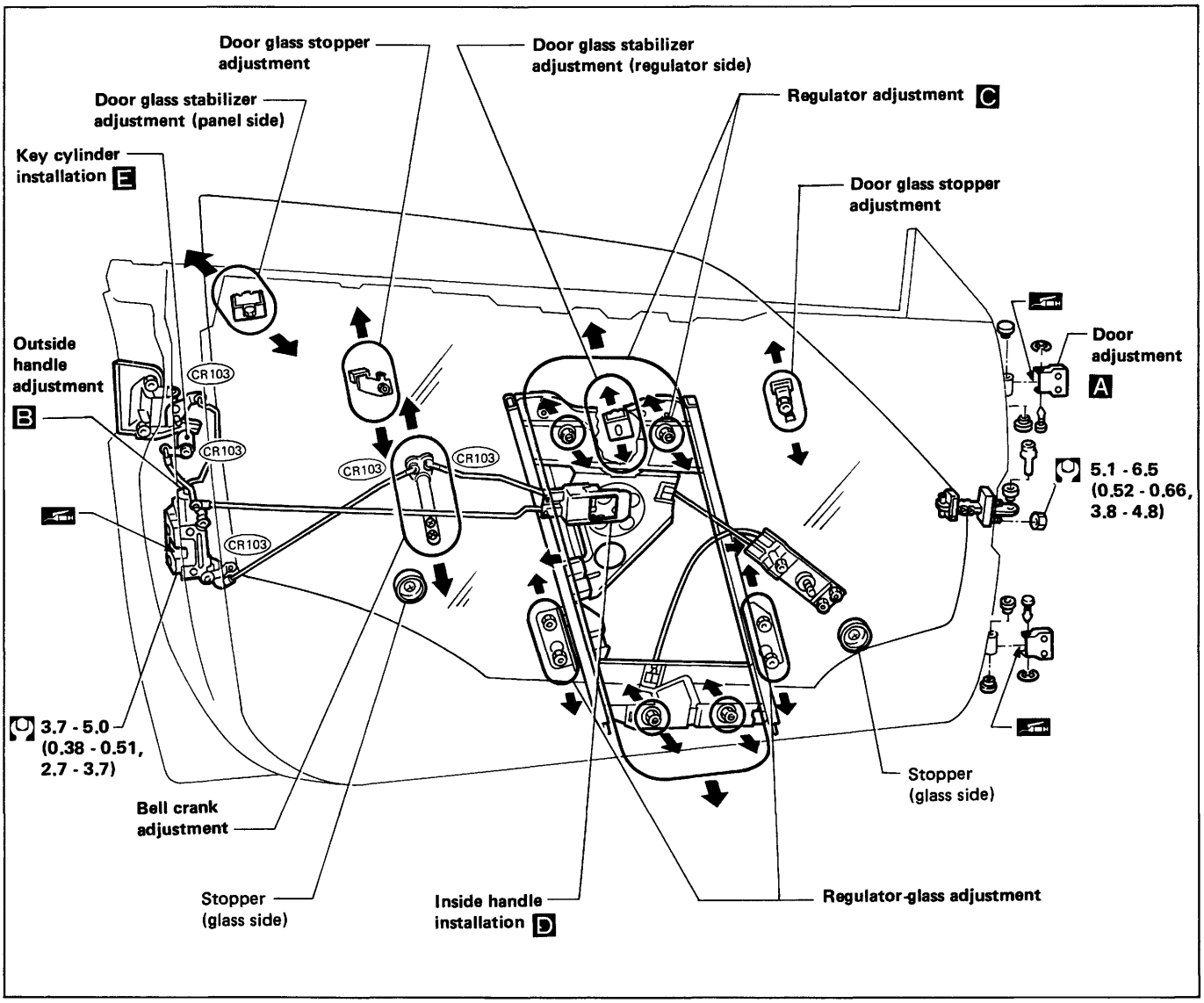


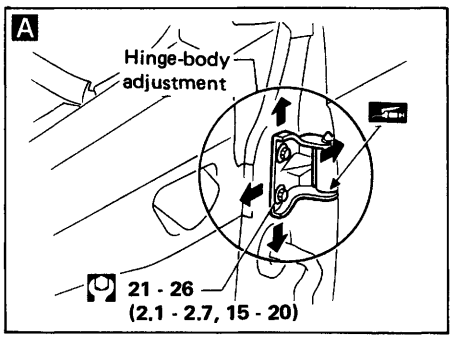
* : Condition : Curb weight & normal tire pressure on level ground.
For Canopy model, do not put the back door in the luggage space.

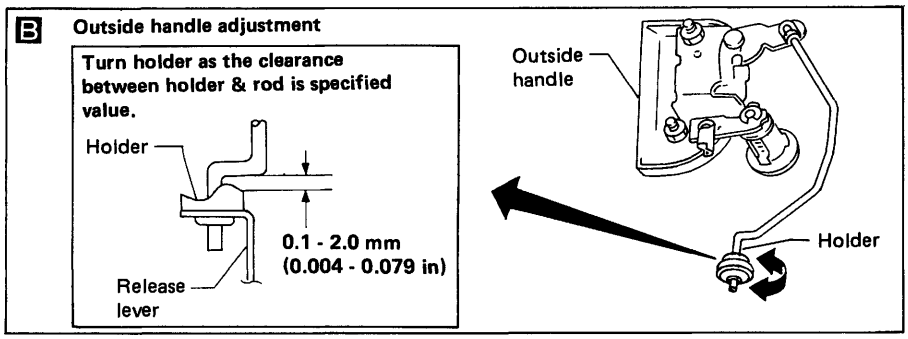
SBF206E

- When removing door, be sure not to scratch vehicle body.
- When removing clip or fastener, refer to "Clip and Fastener".
- After adjusting door or door lock, check door lock operation.

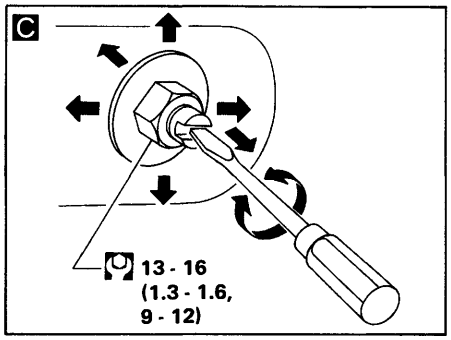
Front Door

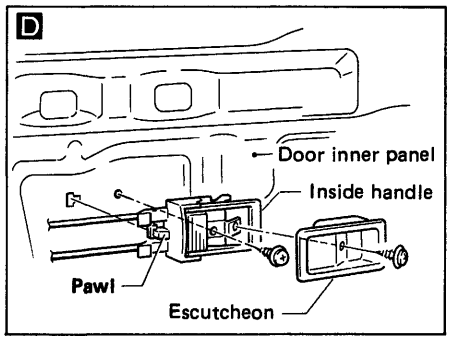


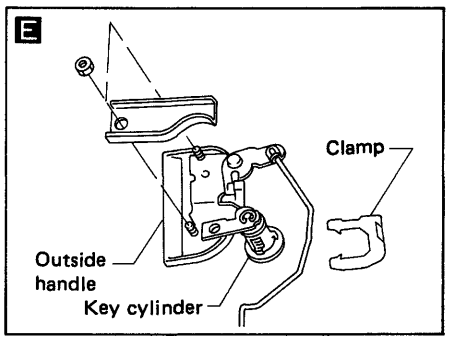


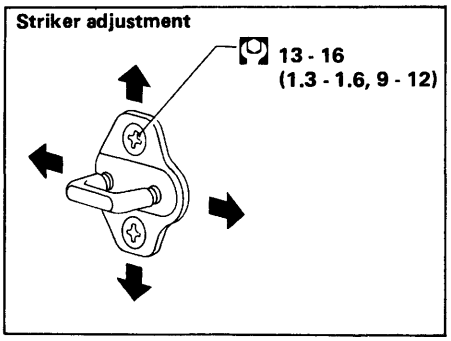


Front Door (Cont'd)





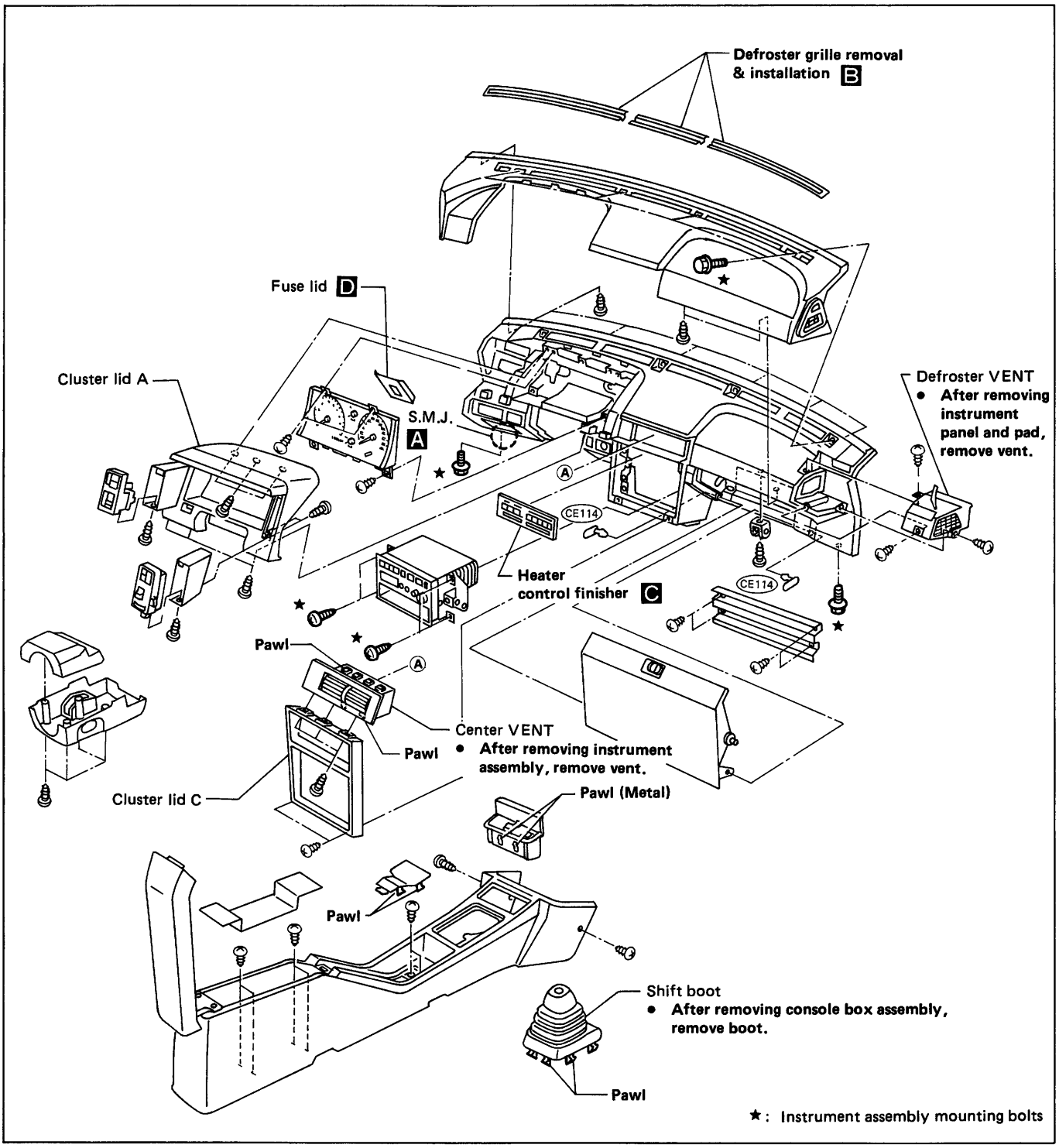




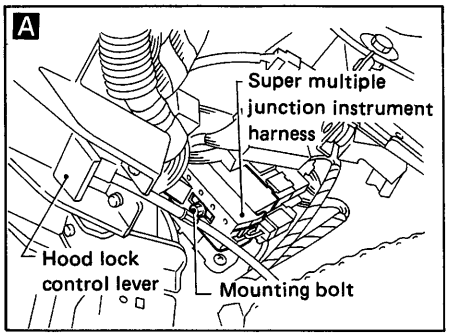
: Grease-up points
: N·m (kg-m, ft-lb)

SBF443D

- These parts are made of plastic, so do not use excessive force and be careful not to damage them.
- When removing clip or fastener, refer to "Clip and Fastener".
- When you remove instrument assembly, you should remove Front defroster grille, Cluster lid A, Combination meter, Cluster lid C, Heater control finisher, Heater control, Radio, S.M.J. and Hood lock control lever first.

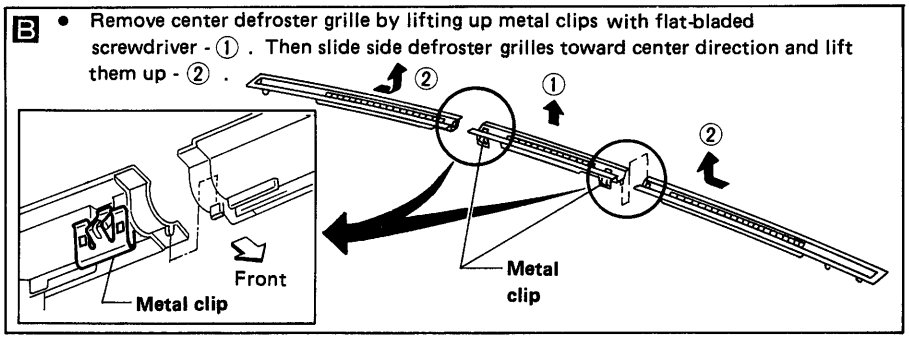


A

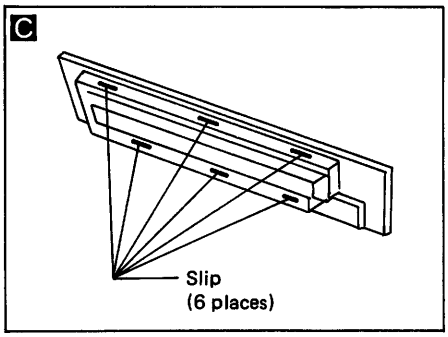


B

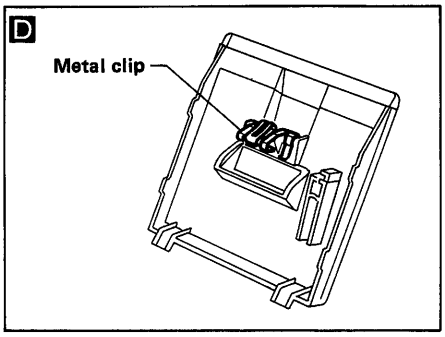
- Remove center defroster grille by lifting up metal clips with flat-bladed screwdriver - ① . Then slide side defroster grilles toward center direction and lift them up - ② .



C



D

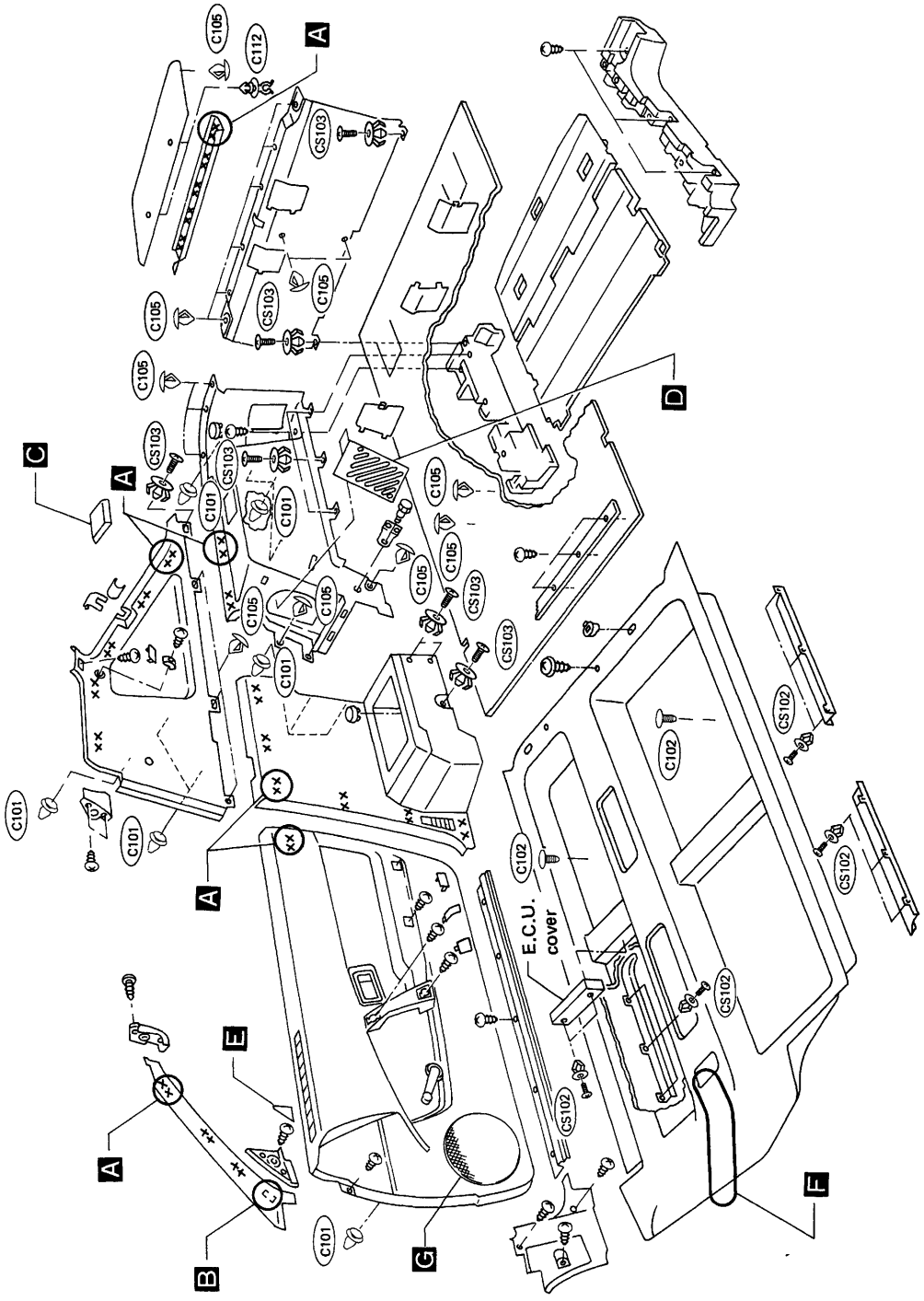


SBF339D

- When removing clip or fastener, refer to "Clip and Fastener".
- When handling interior or exterior, do not use excessive force and take care not to damage them.

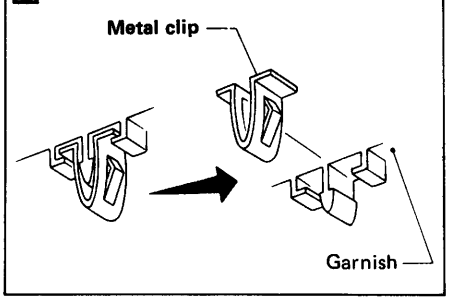
Interior

BODY SIDE, FLOOR AND LUGGAGE ROOM TRIM

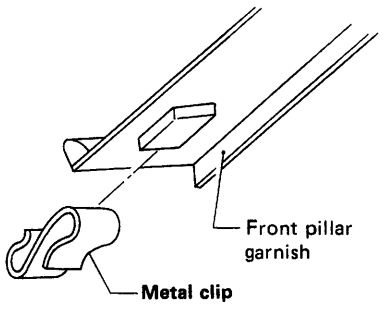


Interior (Cont'd)

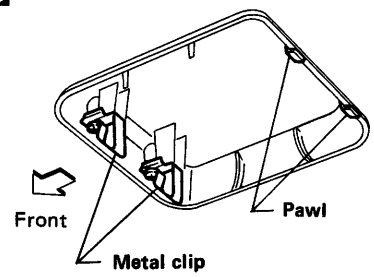
A



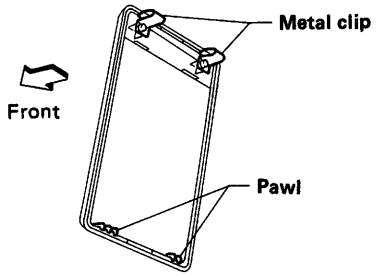
B



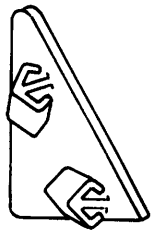
C



D

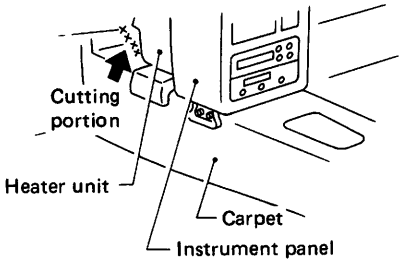


E

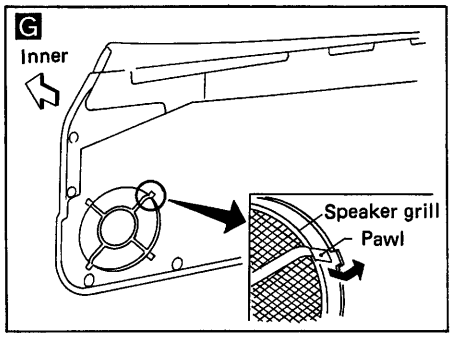


F

When removing or installing carpet, instrument panel has to be removed or carpet has to be cut at the portion shown by arrow, as carpet is a one-piece design.



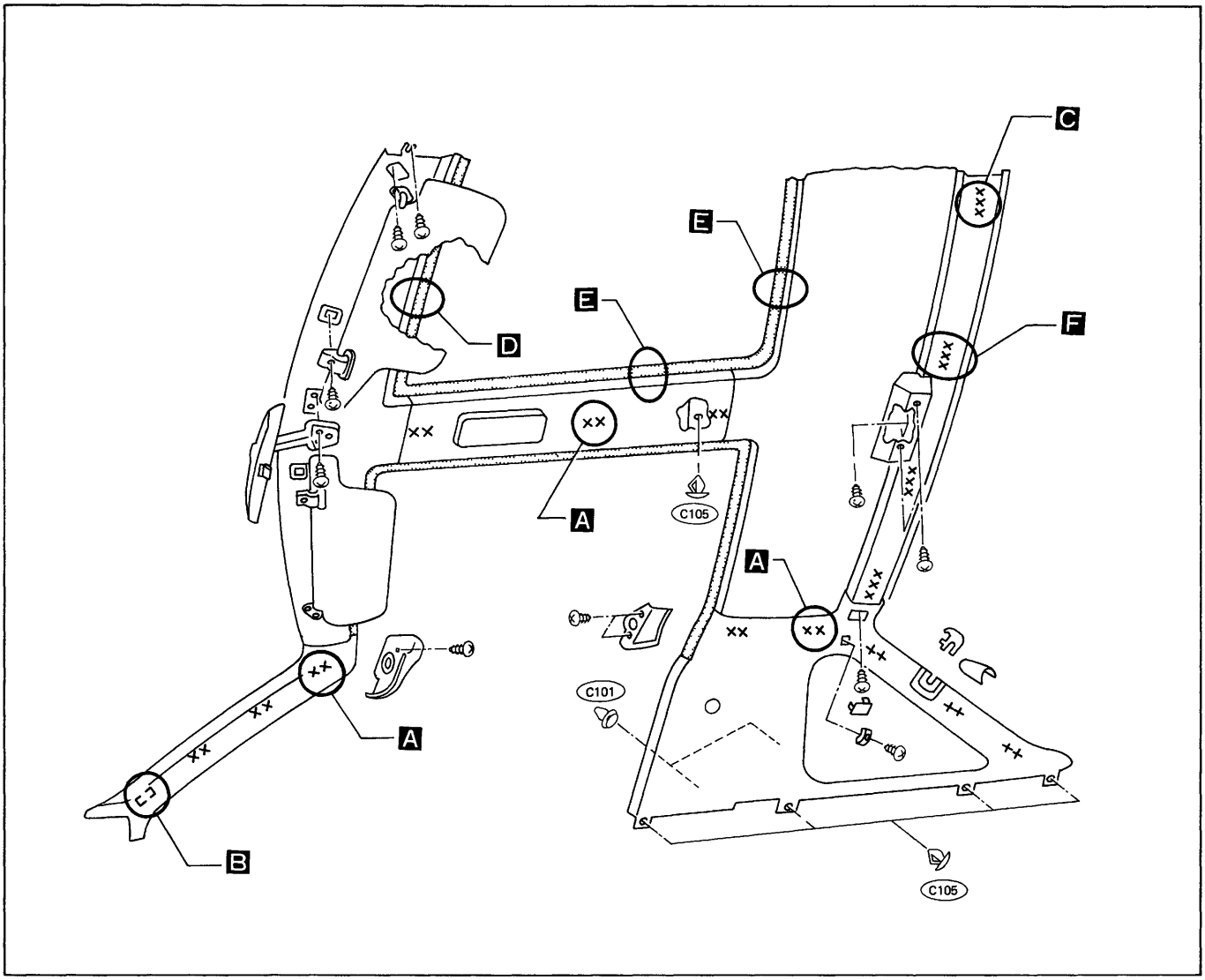
G

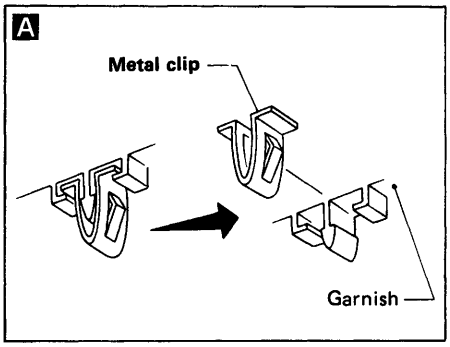


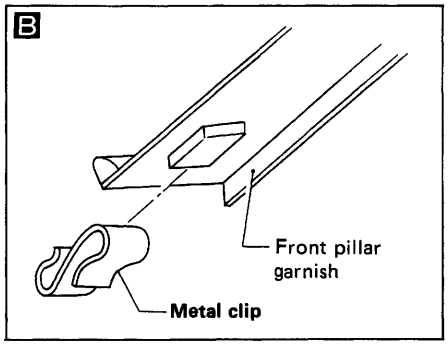
SBF208E

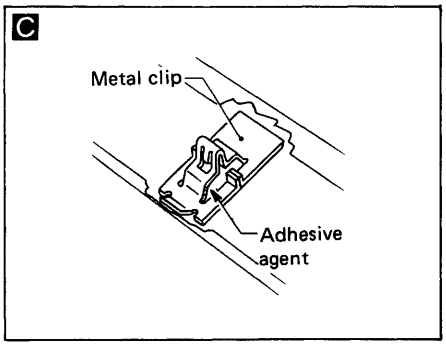
Interior (Cont'd)

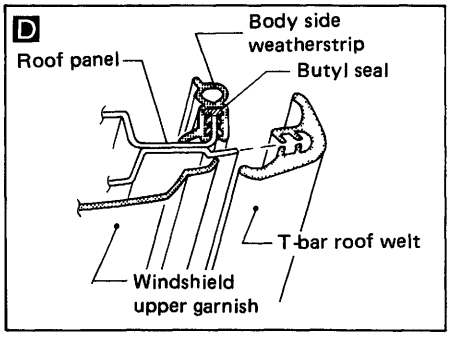
ROOF TRIM

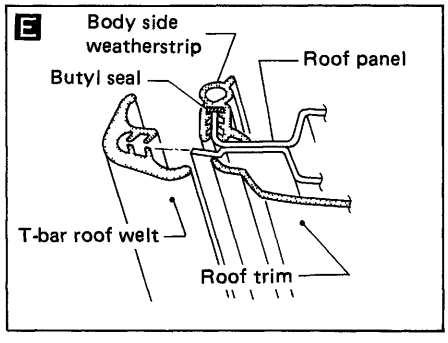


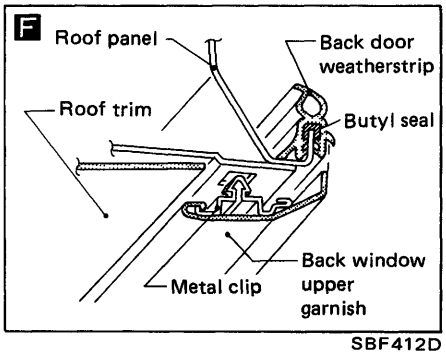








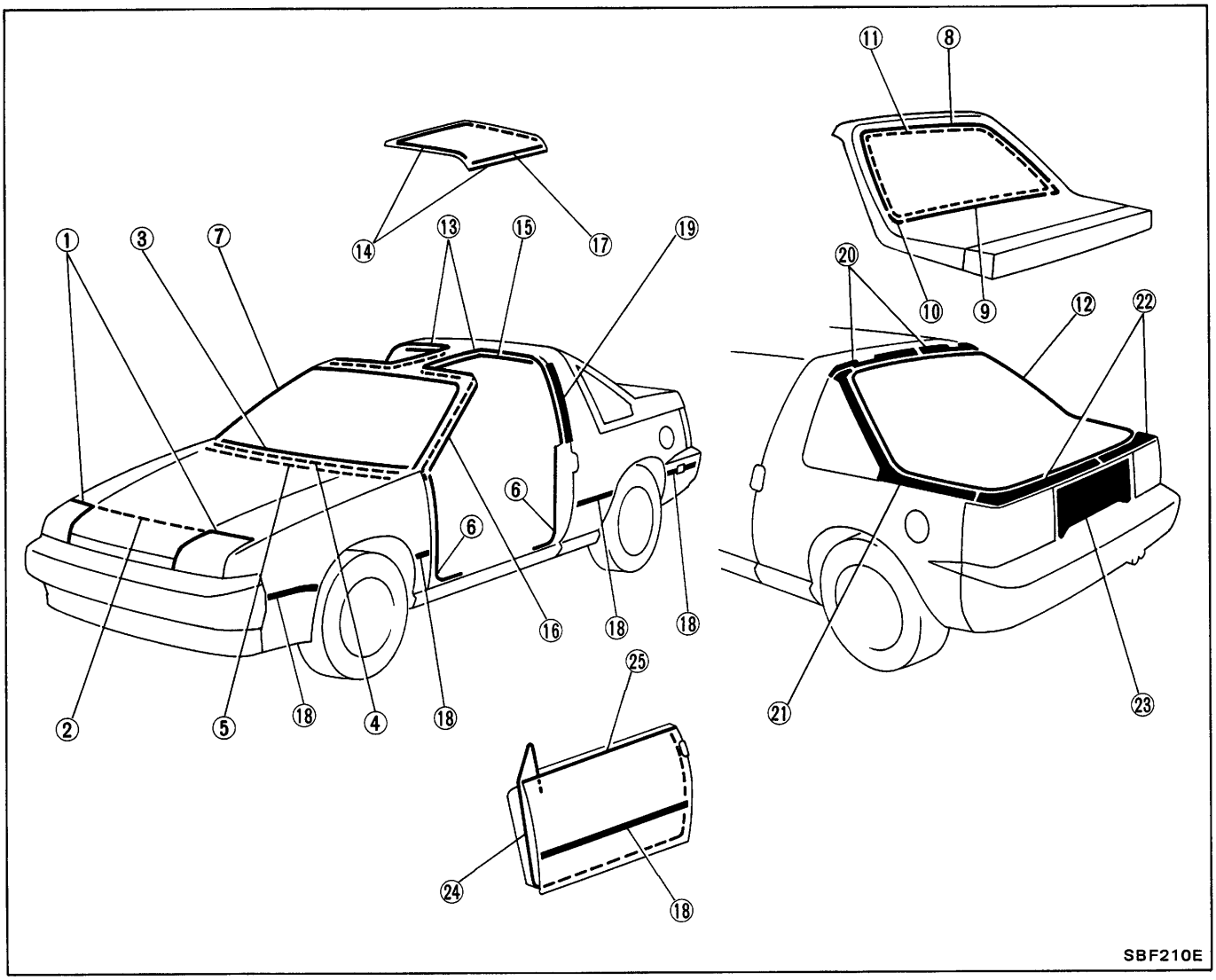




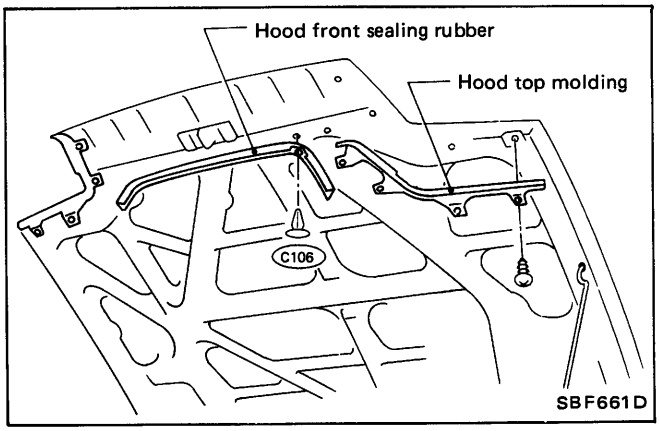
SBF412D

Exterior

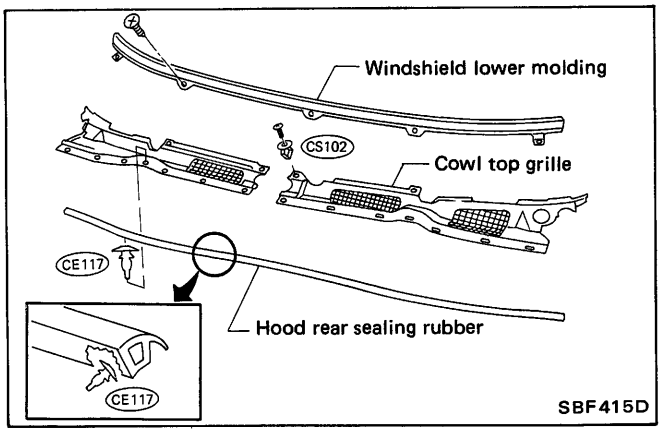
- Apply sealing compound where necessary while installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.
- When removing clip or fastener, refer to "Clip and Fastener".



① ② **Hood top molding and Hood front sealing rubber**

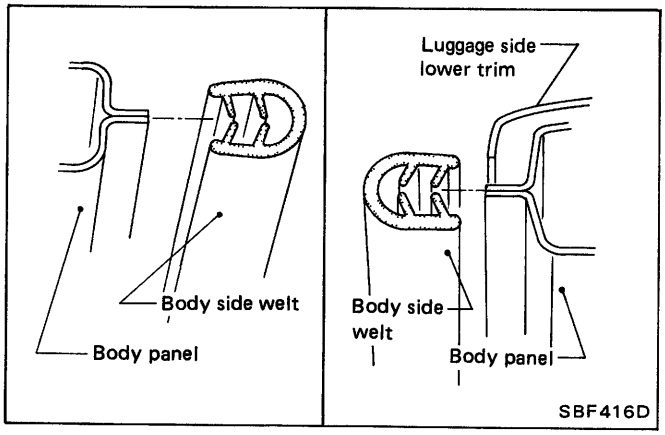


③ ④ ⑤ **Windshield lower molding, Cowl top grille and Hood rear sealing rubber**



Exterior (Cont'd)

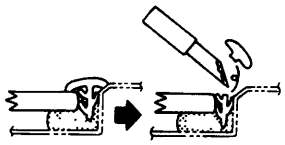
⑥ Body side welt



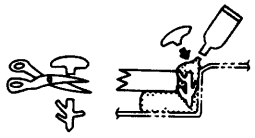
⑦ Windshield upper & side molding

Method 1

Cut off top portion of molding and clean glass and panel surfaces.



Apply sealant to top portion of molding.



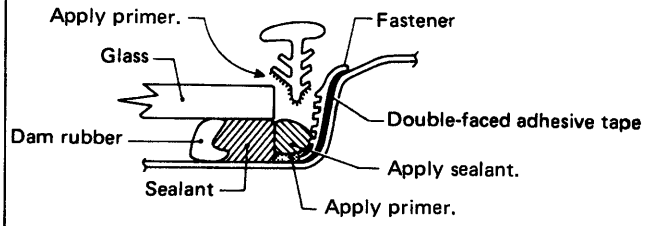
Cut off lower portion of new molding.



Finish well to give it a good appearance.

Method 2

1. Cut off sealant at glass end.
2. Clean the side on which panel was mounted.
3. Set molding fastener and apply sealant & primer to body panel, and apply primer to molding.

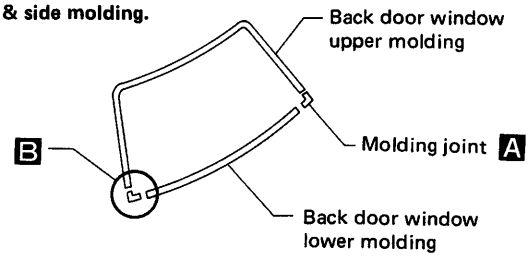


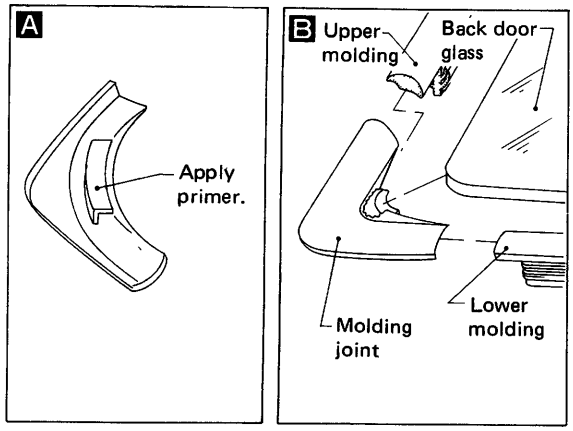
4. Install molding by aligning the molding mark located on center with vehicle center.
   Be sure to install tightly so that there is no gap around the corner.

SBF519B

⑧ ⑨ ⑩ Back door window upper molding, Back door window lower molding and Molding joint

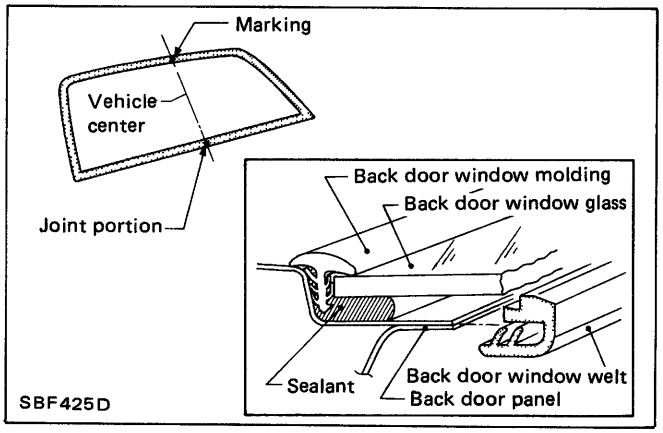
- As for upper and lower molding it is basically the same as that of windshield upper & side molding. So refer to **Windshield upper & side molding.**





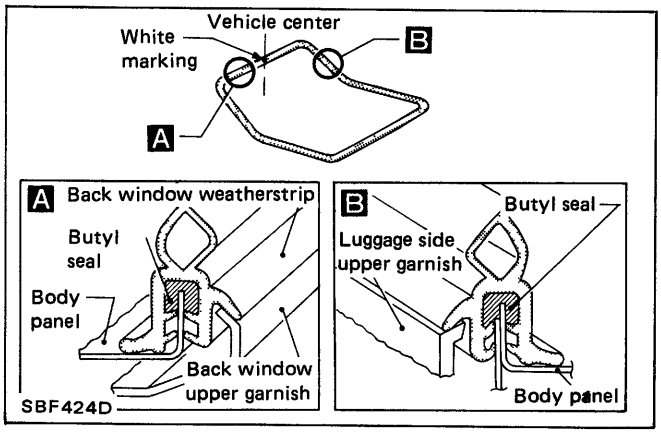
SBF761D

⑪ Back door window welt



SBF425D

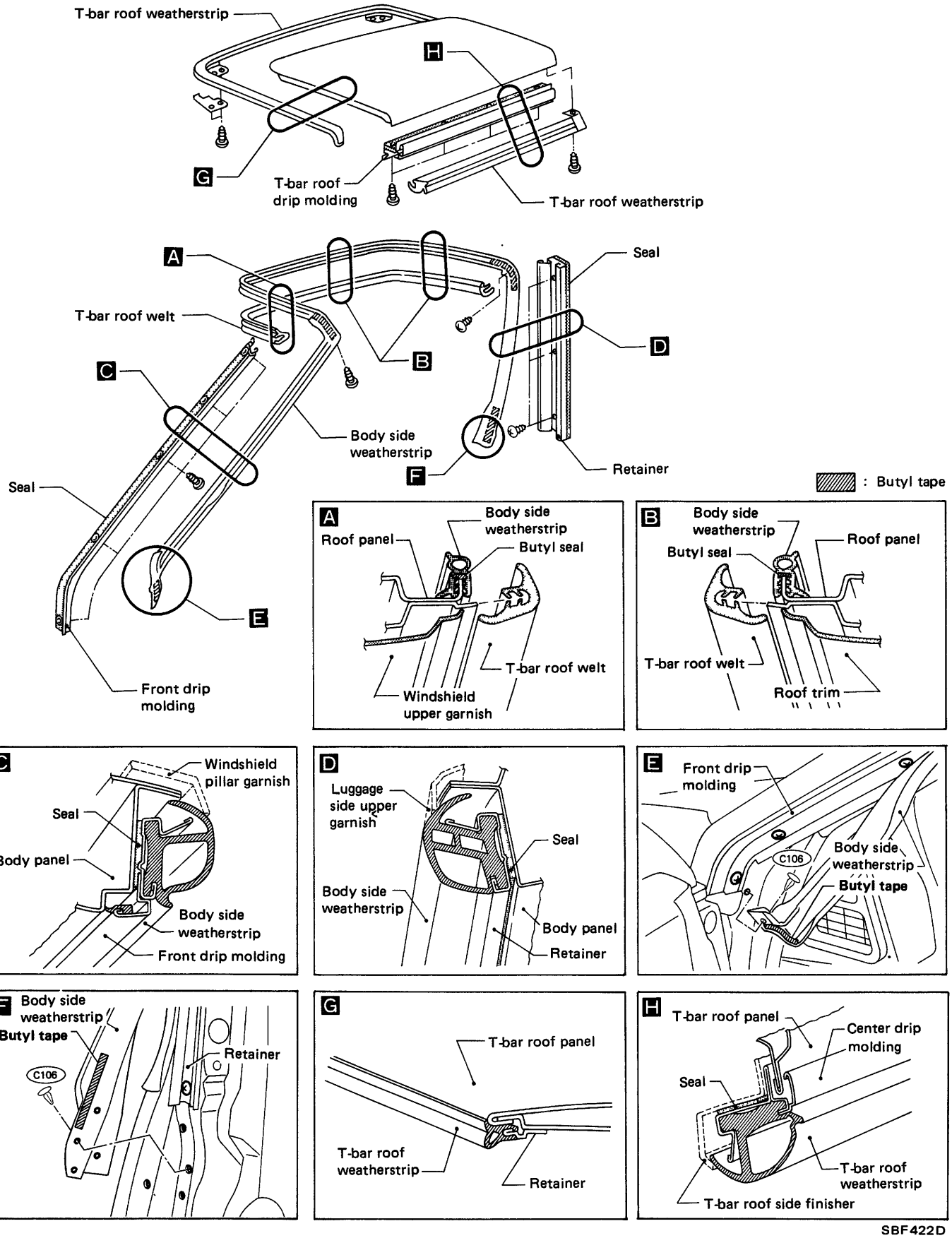
⑫ Back door weatherstrip



SBF424D

Exterior (Cont'd)

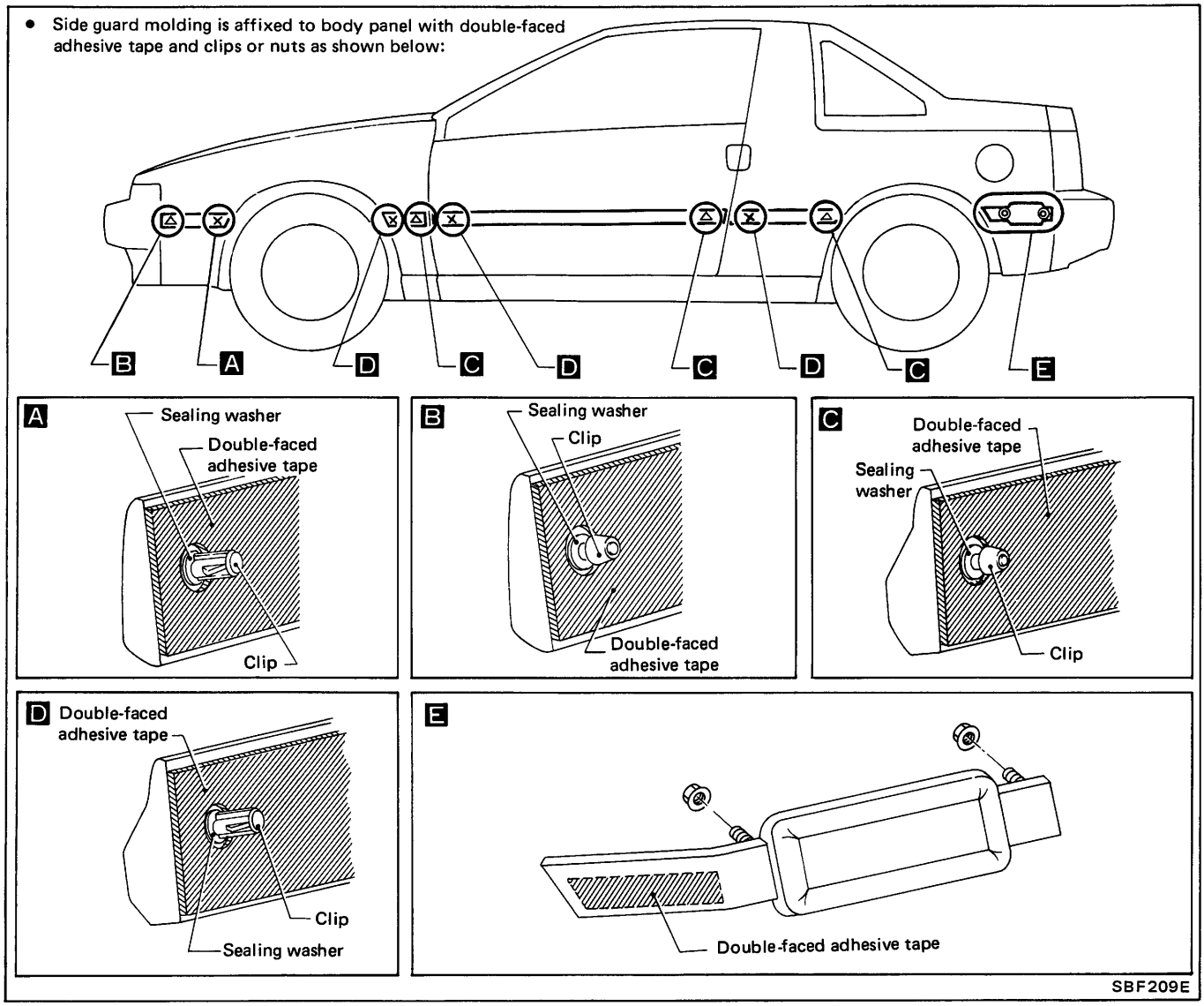
⑬ ⑭ ⑮ ⑯ ⑰ **Body side weatherstrip, T-bar roof weatherstrips, T-bar roof welt, Front drip molding and Center drip molding**



SBF422D

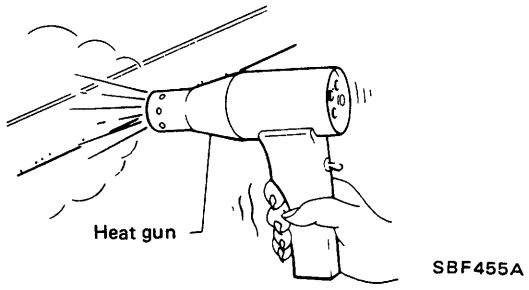
Exterior (Cont'd)

⑱ Side guard molding



- **Removal:**

1. Heat molding portion to 30 to 40°C (86 to 104°F) with a heat gun.



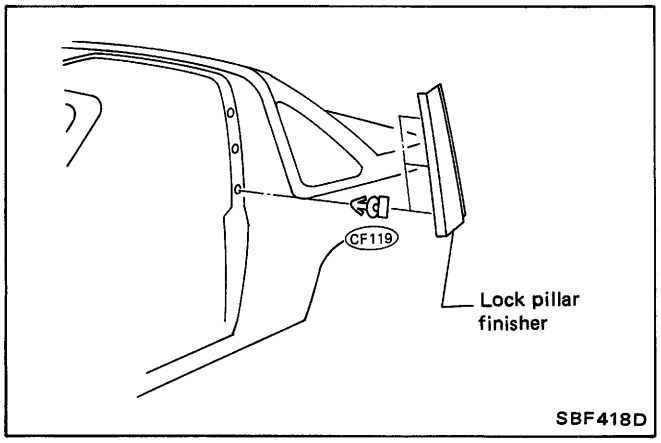
2. Raise end of molding and, while cutting off bonding agent, detach molding.

- **Installation.**

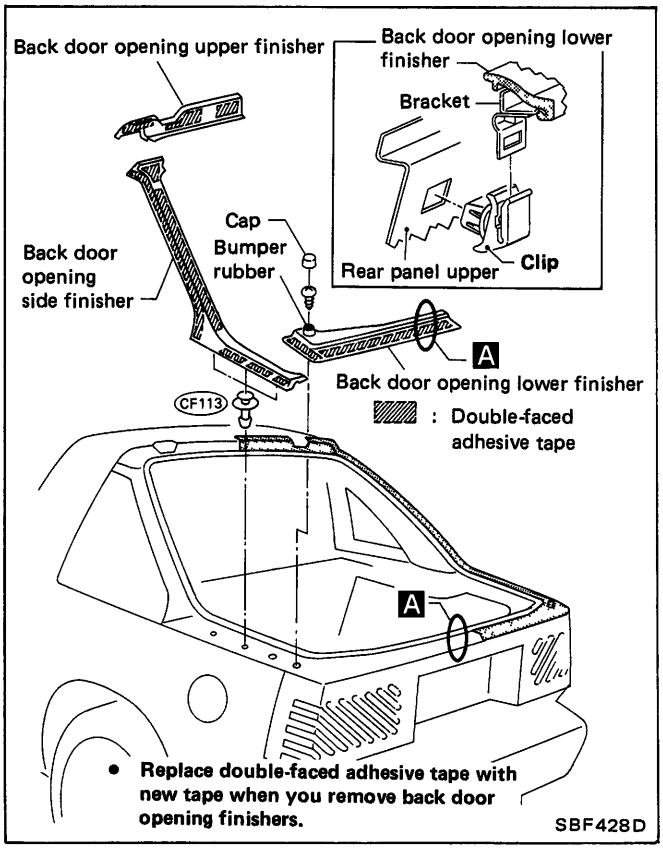
1. Remove all traces of bonding agent from body panel. Then clean contact face of body.
2. Heat body panel and molding to 30 to 40°C (86 to 104°F) with a heat gun. Then install molding.

Exterior (Cont'd)

⑲ Lock pillar finisher

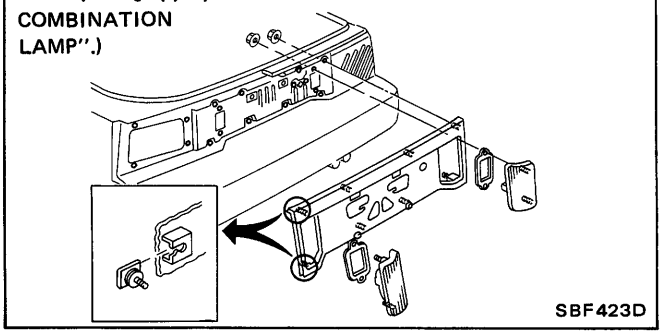


⑳ ㉑ ㉒ Back door opening upper, side and lower finisher

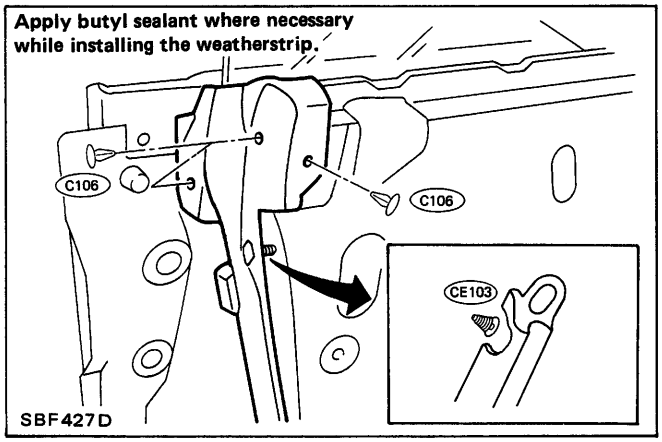


㉓ Rear finisher

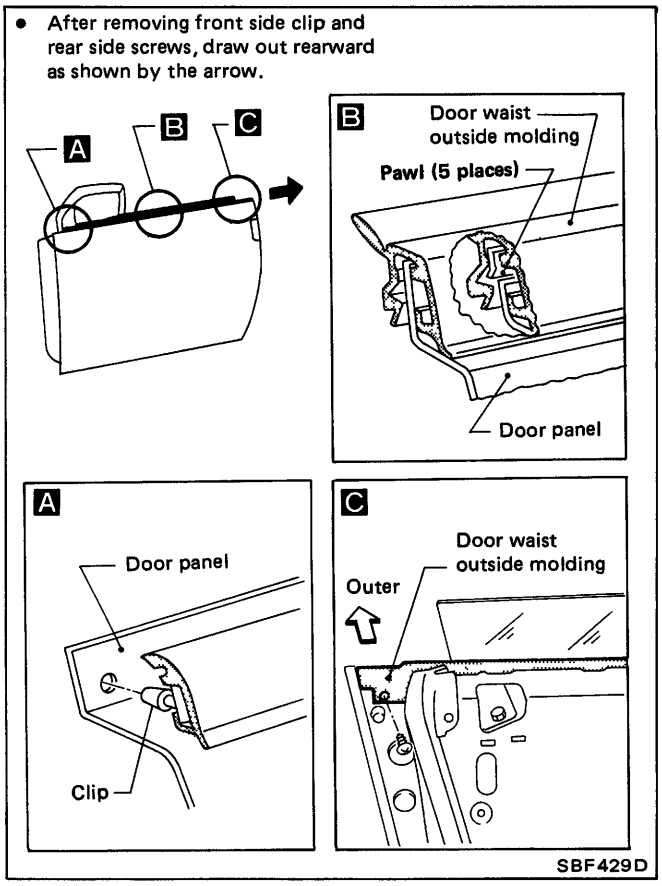
Remove rear finisher after removing back door opening side, lower finisher and one side of rear combination lamp. (Refer to **Back door opening upper, side and lower finisher** and "REAR COMBINATION LAMP".)



㉔ Door weatherstrip

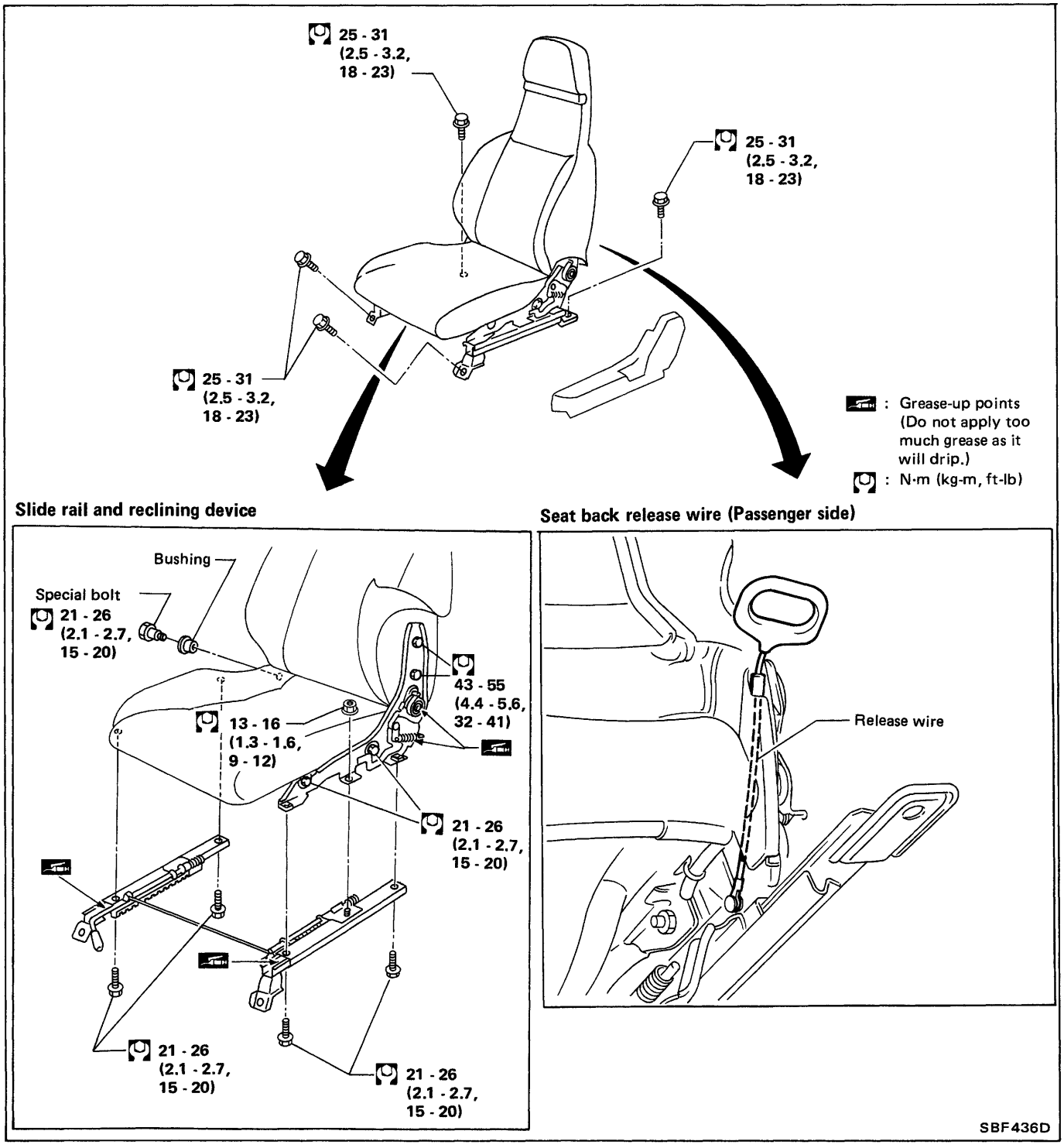


㉕ Door waist outside molding

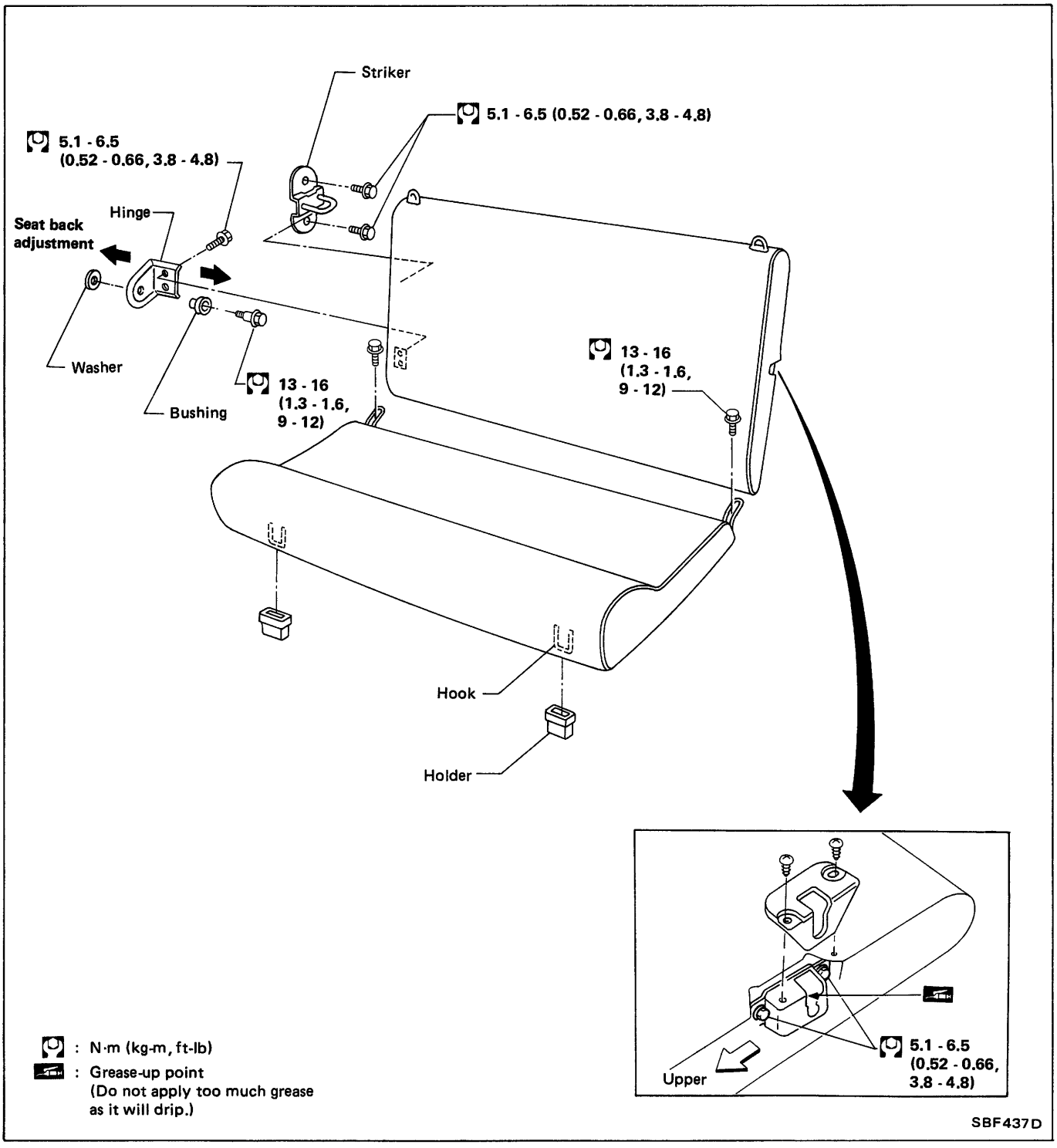


- When removing or installing the seat trim, carefully handle it to keep dirt out and avoid damage.

Front Seat



Rear Seat


Striker
5.1 - 6.5 (0.52 - 0.66, 3.8 - 4.8)
5.1 - 6.5
(0.52 - 0.66, 3.8 - 4.8)
Hinge
Seat back adjustment
Washer
Bushing
13 - 16
(1.3 - 1.6,
9 - 12)
13 - 16
(1.3 - 1.6,
9 - 12)
Hook
Holder
Upper
5.1 - 6.5
(0.52 - 0.66,
3.8 - 4.8)
: N·m (kg-m, ft-lb)
: Grease-up point
(Do not apply too much grease
as it will drip.)
SBF437D

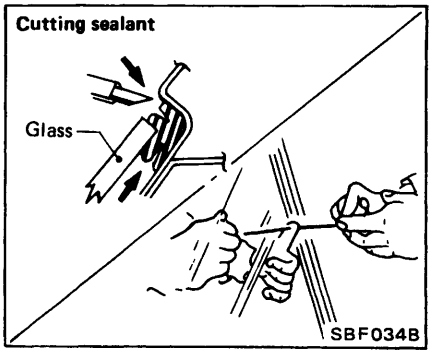
Windshield, Back Door Window and Side Window

Ⓦ : Windshield (Body side)
Ⓑ : Back door window (Body side)
Ⓢ : Side window (Body side)

ⓦ : Windshield (Glass side)
ⓑ : Back door window (Glass side)
ⓢ : Side window (Glass side)

REMOVAL

- As for windshield and back door window, after removing moldings, remove glass.

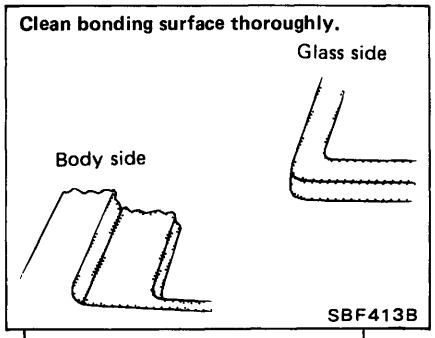


CAUTION:
Be careful not to scratch glass when removing.

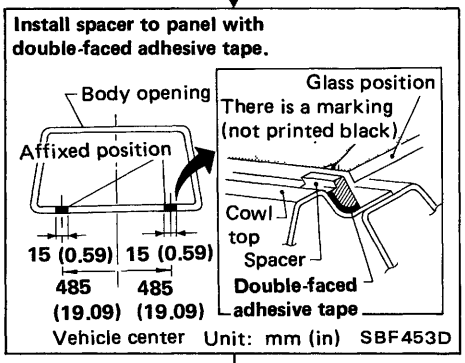
INSTALLATION

- **Use Genuine Nissan Sealant kit or equivalent. Follow instructions furnished with it.**
- **After installation, the vehicle should remain stationary for about 24 hours.**
- **Do not use sealant which is more than 12 months past its production date.**
- **Do not leave cartridge unattended with its cap open.**
- **Keep primers and sealant in a cool, dry place. Ideally, sealant should be stored in a refrigerator.**
- **Be sure to install moldings.**

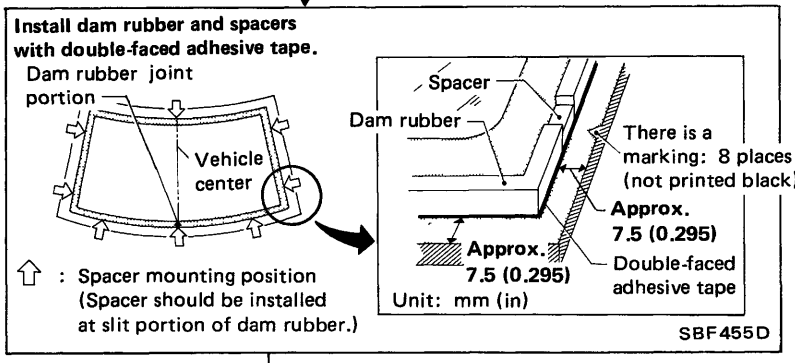
WARNING:
Keep heat or open flames away as primers are flammable.



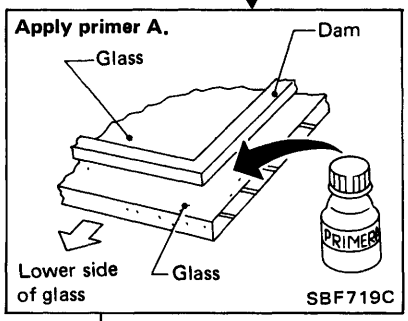
Ⓦ Ⓑ Ⓢ

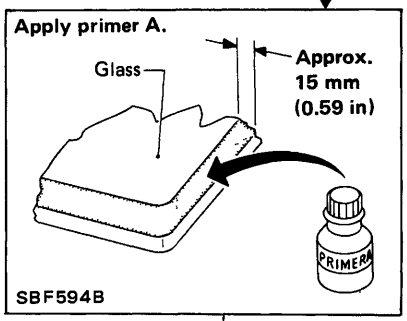


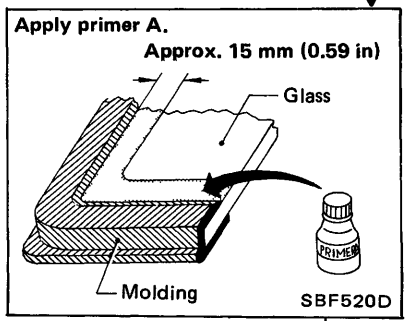
Ⓦ ⓑ ⓢ



Ⓦ Ⓑ Ⓢ







CAUTION:
Allow primers to dry for 10 to 15 minutes before processing to the next step.

CAUTION:
Allow primers to dry for 10 to 15 minutes before processing to the next step.

Ⓦ Ⓑ Ⓢ

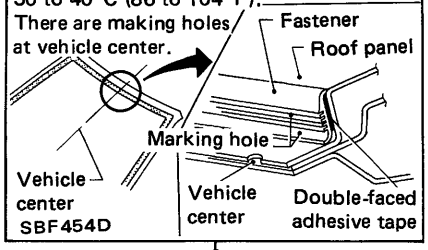
Windshield, Back Door Window and Side Window (Cont'd)

Ⓦ : Windshield (Body side)
Ⓑ : Back door window (Body side)
Ⓢ : Side window (Body side)

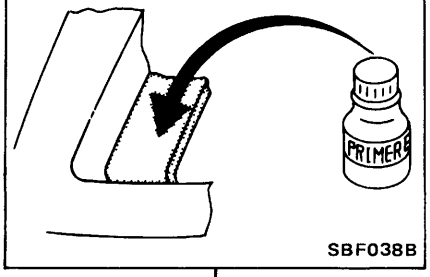
Ⓦ : Windshield (Glass side)
Ⓑ : Back door window (Glass side)
Ⓢ : Side window (Glass side)

ⓌⒷⓈ

Install molding fastener. When installing it, heat body panel and fastener to approx. 30 to 40°C (86 to 104°F).
There are making holes at vehicle center.



Apply primer E.



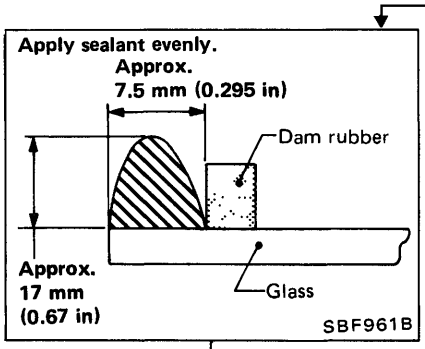
CAUTION:
Allow primers to dry for 10 to 15 miniutes before proceeding to the next step

ⓌⓈ Ⓑ

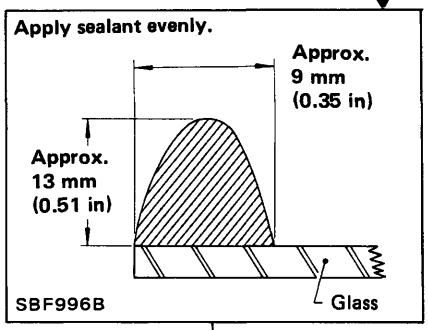
Ⓑ **Install back door window welt. For details, refer to "Exterior."**

Ⓦ Ⓑ Ⓢ

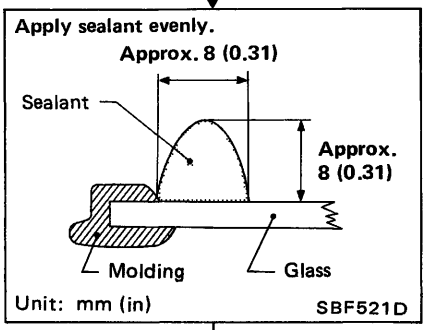
Apply sealant evenly.



Apply sealant evenly.



Apply sealant evenly.



CAUTION:
Windshield glass should be installed within 15 minutes of applying sealant: sealant starts to harden 15 minutes after it is applied.

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Windshield glass should be installed within 15 minutes of applying sealant: sealant starts to harden 15 minutes after it is applied.

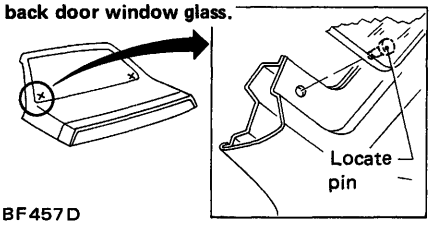
Ⓐ

Windshield, Back Door Window and Side Window (Cont'd)

A

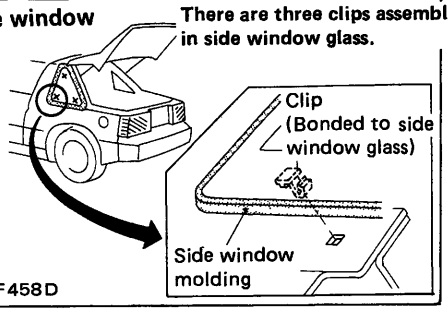
Set glass in position and press glass lightly and evenly.

Back door window
There are two locate pins assembled at lower corner of back door window glass.



SBF457D

Side window **There are three clips assembled in side window glass.**

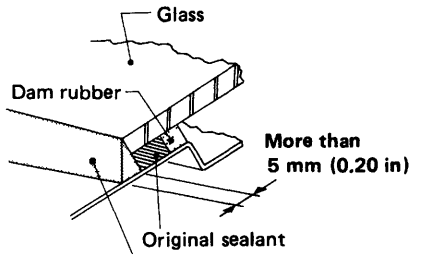


SBF458D

Windshield

Back door window and Side window

Apply additional sealant uniformly to the lower portion of glass, as shown below:



SBF720C

Check for water leakage.

CAUTION:
For sealant drying time, refer to "Drying Time of Sealant".

Windshield

Back door window

Apply sealant to upper & side molding fixing portion.

Apply sealant to upper and lower molding fixing portion.

Set upper & side molding.

CAUTION:
Molding must be installed securely so that it is in position and leaves no gap.

Install lower molding.

For details of moldings, refer to "Exterior".

Set upper molding, lower molding and molding joint.

Drying Time of Sealant

- Chart below shows time required for sealant to dry desired hardness.

Unit: days

		Windshield			Back door window			Side window		
	Relative humidity %	90	50	25	90	50	25	90	50	25
Temperature °C (°F)	25 (77)	1.0	1.8	3.5	0.8	1.4	2.7	1.1	1.9	3.7
	5 (41)	2.2	6.0	9.6	1.7	4.6	7.4	2.3	6.3	10.0

CAUTION:

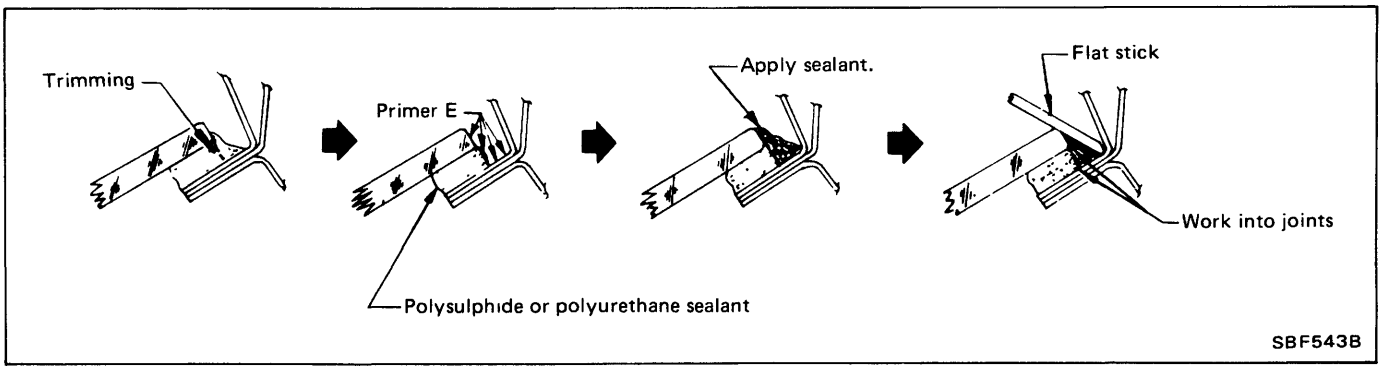
Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

Repairing Water Leak

Leaks can be repaired without removing and reinstalling glass.

If water is leaking between caulking material and body or between glass and caulking material, determine the extent of the leak by applying water while pushing glass outward.

To stop the leak, apply primer and then sealant to the leak point.



After this, install molding securely.

NOTE

Canopy Side Window and Back Window

- Glass removal and installation procedures are the same as those of side window and windshield. Refer to "WINDSHIELD AND WINDOWS".
- The drying time for sealant is the same as that of windshield and back door window. Refer to " Drying Time of Sealant".

- **Apply primer A.**

Body side

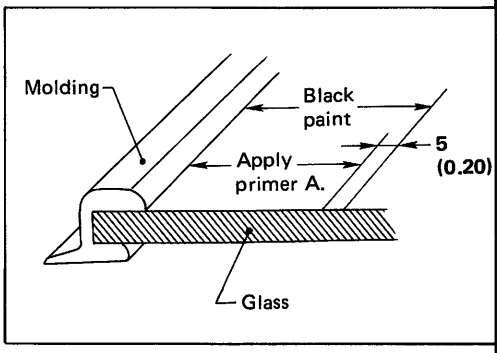
Apply primer A to flanged portion of canopy.

CAUTION:

Allow primers to dry for 10 to 15 minutes before processing to the next step.

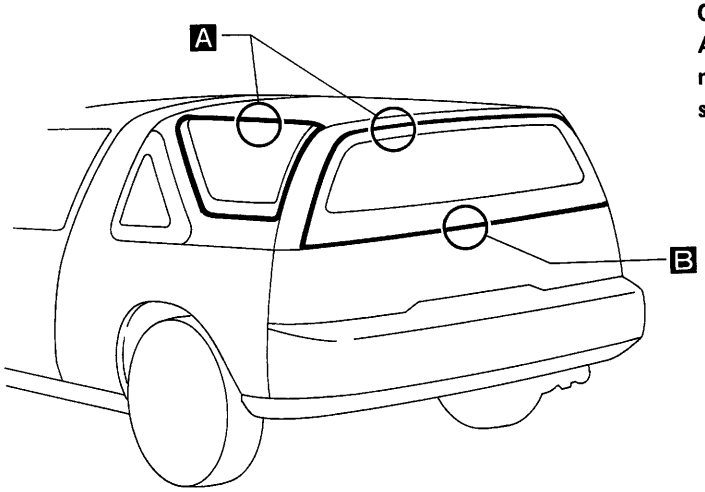
- **Apply primer E.**

Glass side



CAUTION:

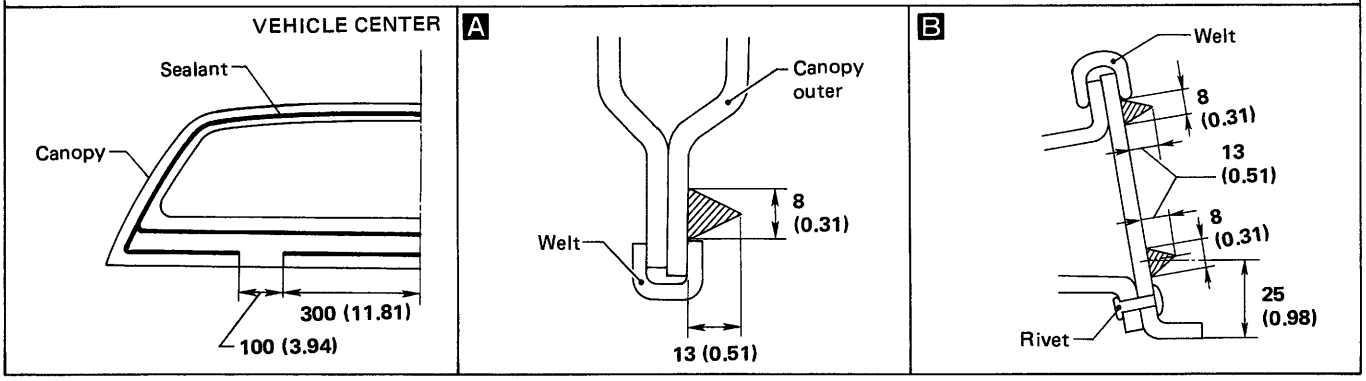
Allow primers to dry for 10 to 15 minutes before processing to the next step.



- Before bonding glass, fit welt into canopy body. Using welt as a guide, apply sealant to canopy along welt.

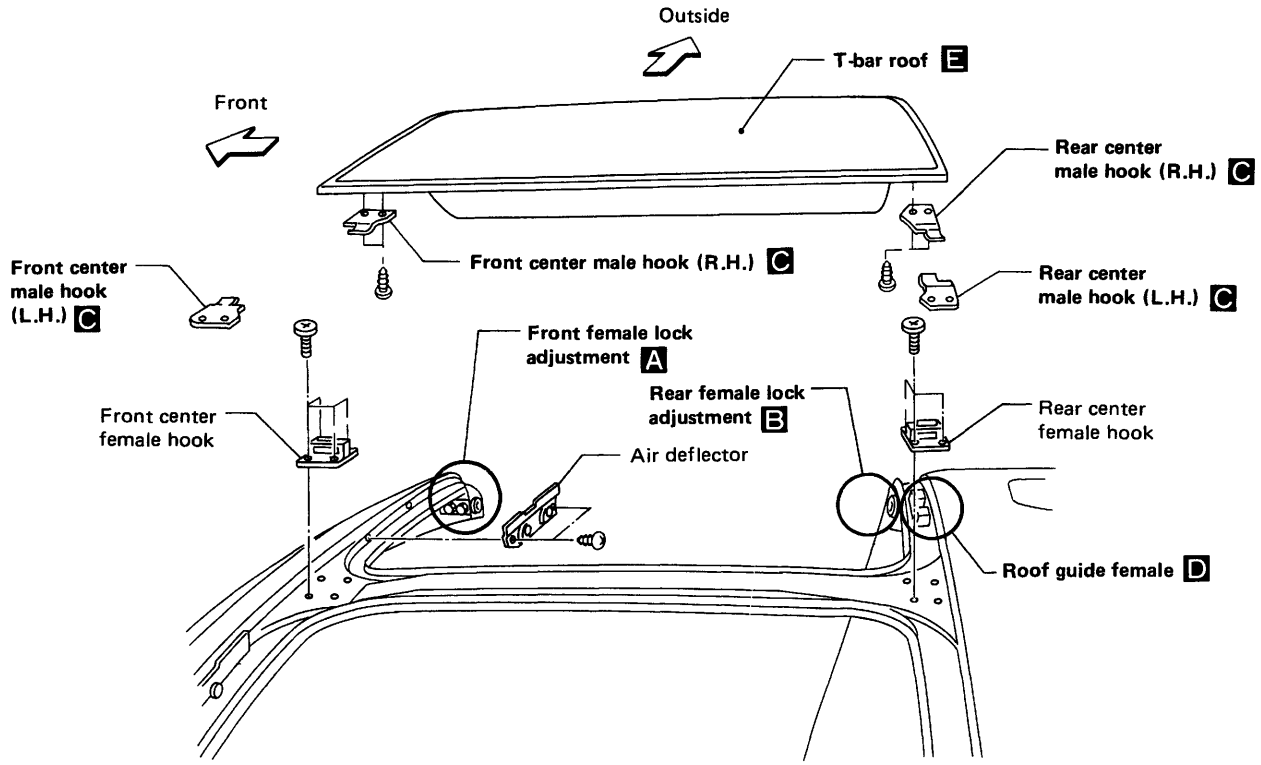
Sealant

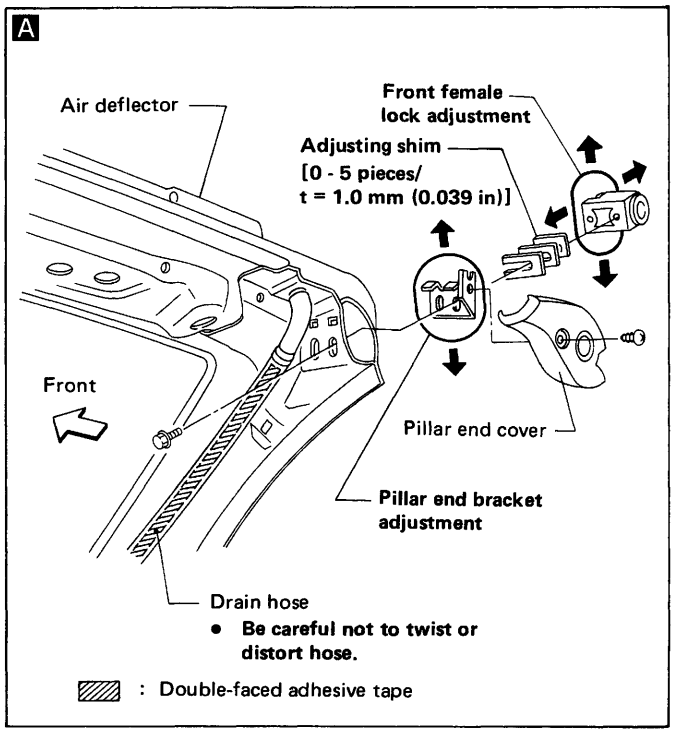
Unit: mm (in)

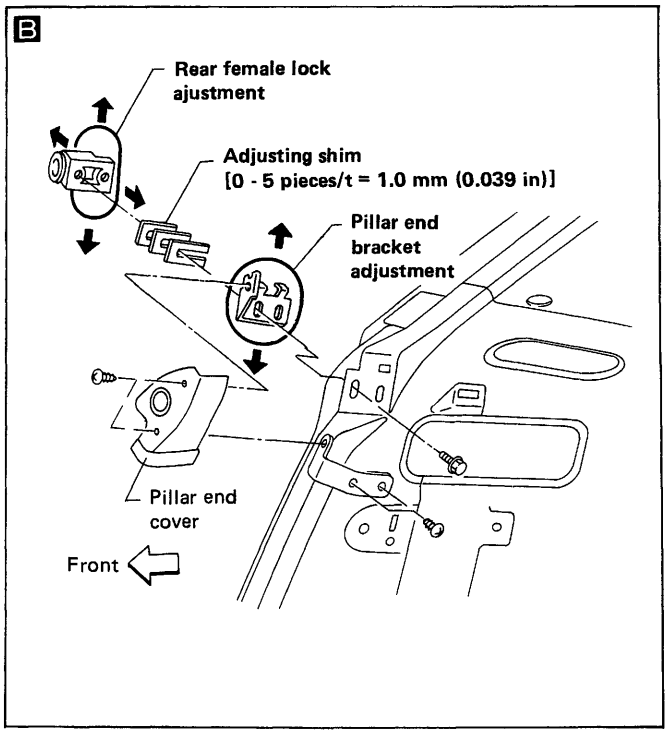


SBF763D

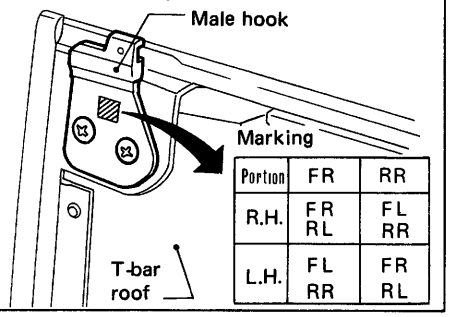
- Handle T-bar roof with care so as not to damage it.
- Apply sealant to portions susceptible to water leakage if necessary.
- As for T-bar roof drip molding, T-bar roof weatherstrip, T-bar roof welt and body side weatherstrip, refer to "Exterior".





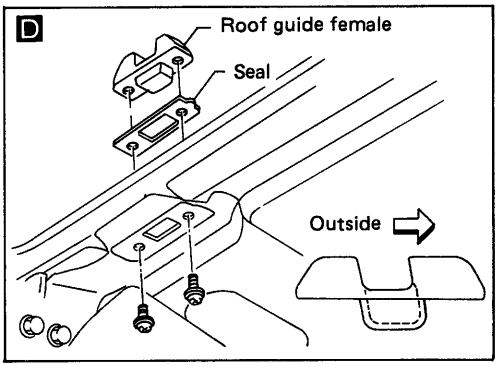


C
- There is a marking on the surface of male hook.



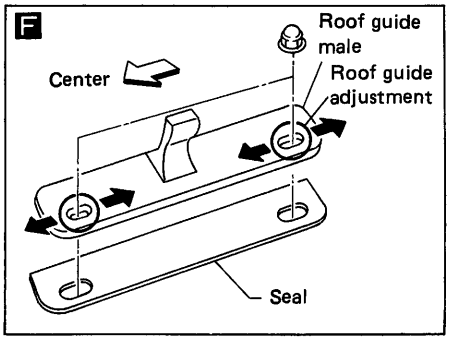
Portion	FR	RR
R.H.	FR RL	FL RR
L.H.	FL RR	FR RL

D

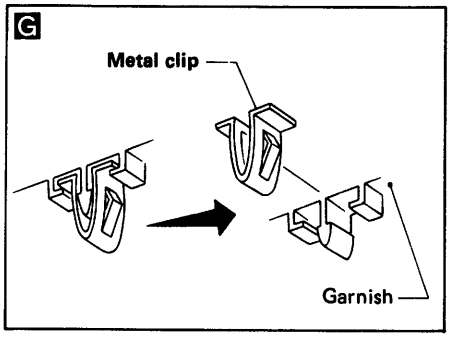


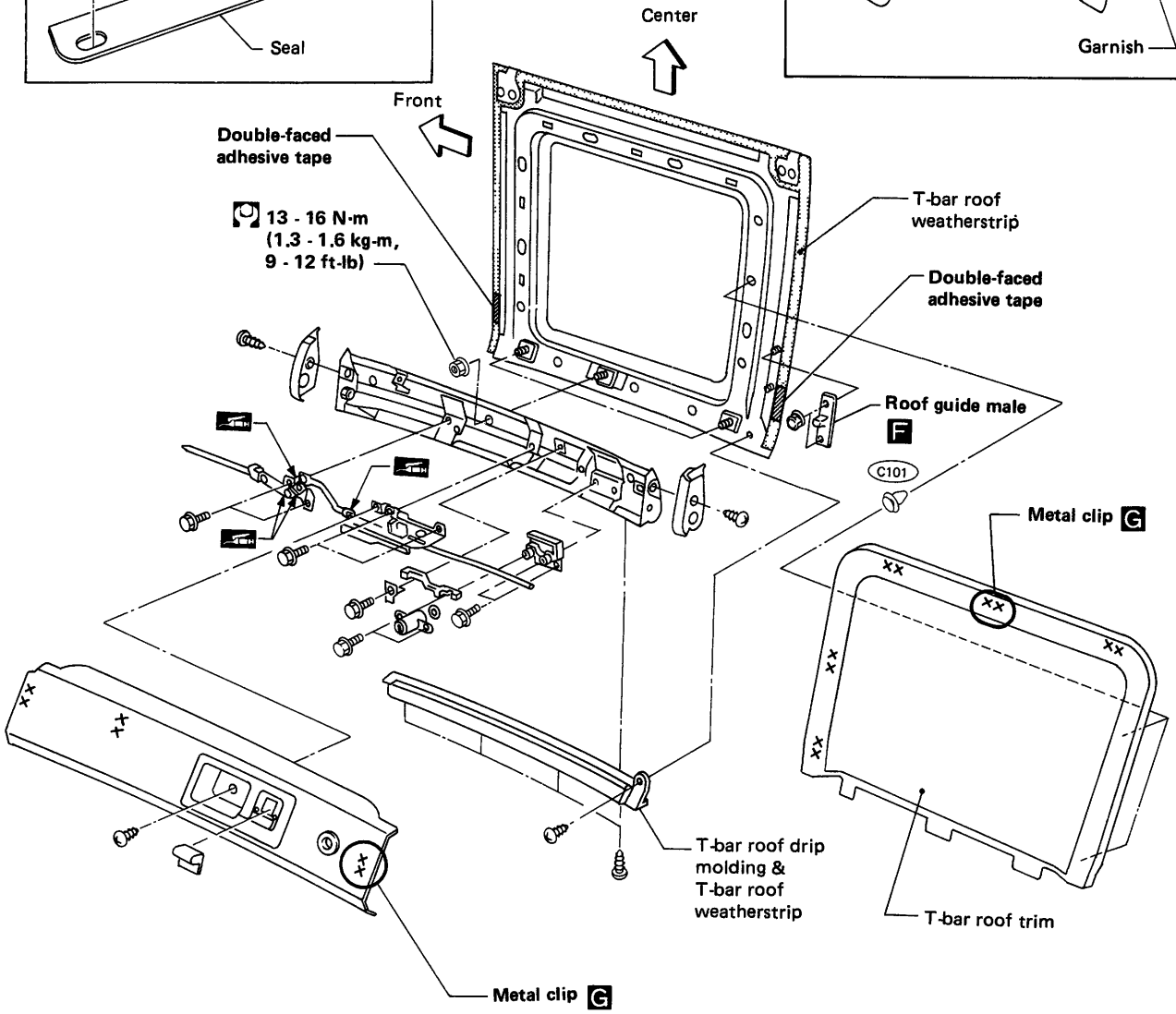
E

F



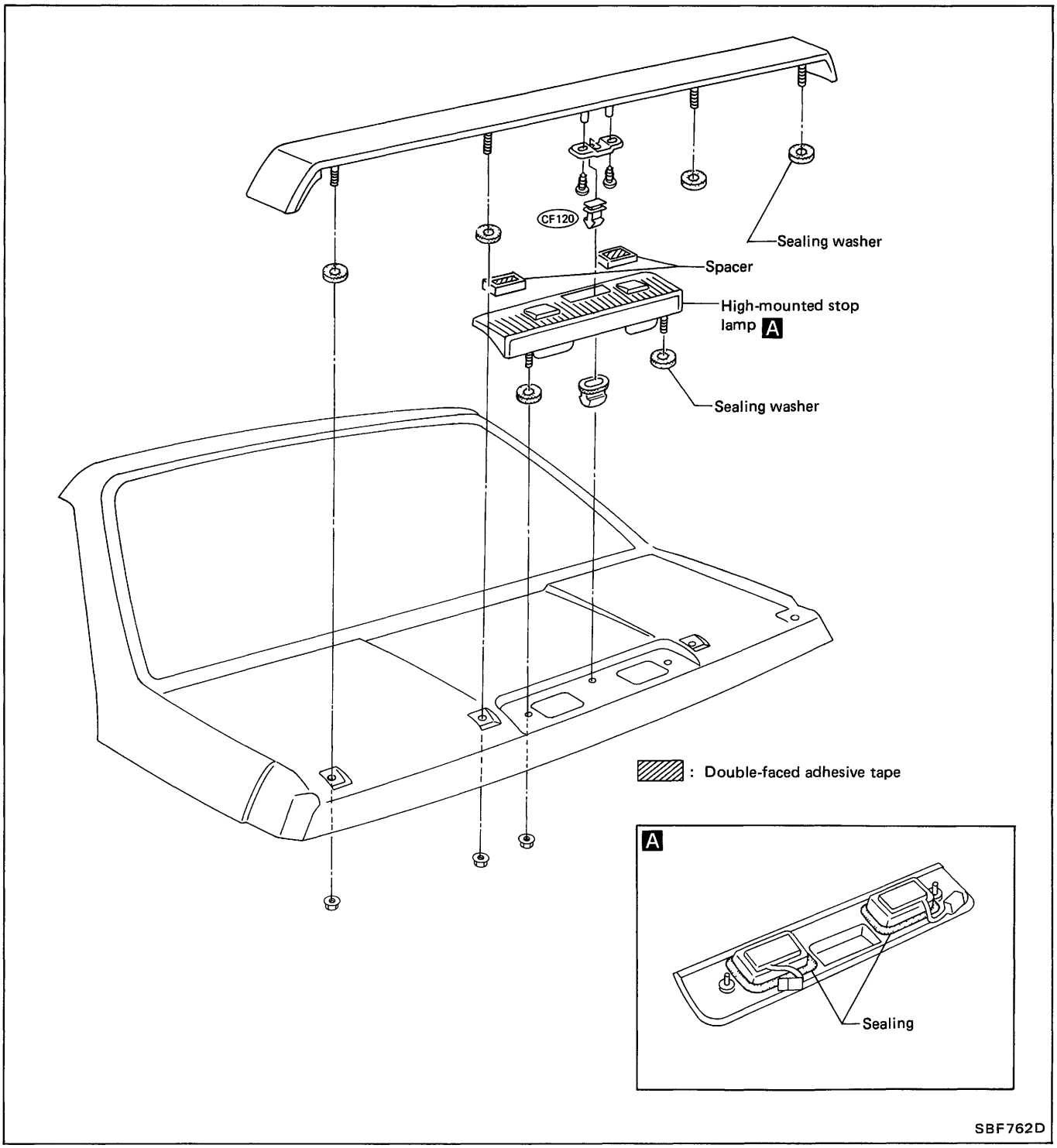
G



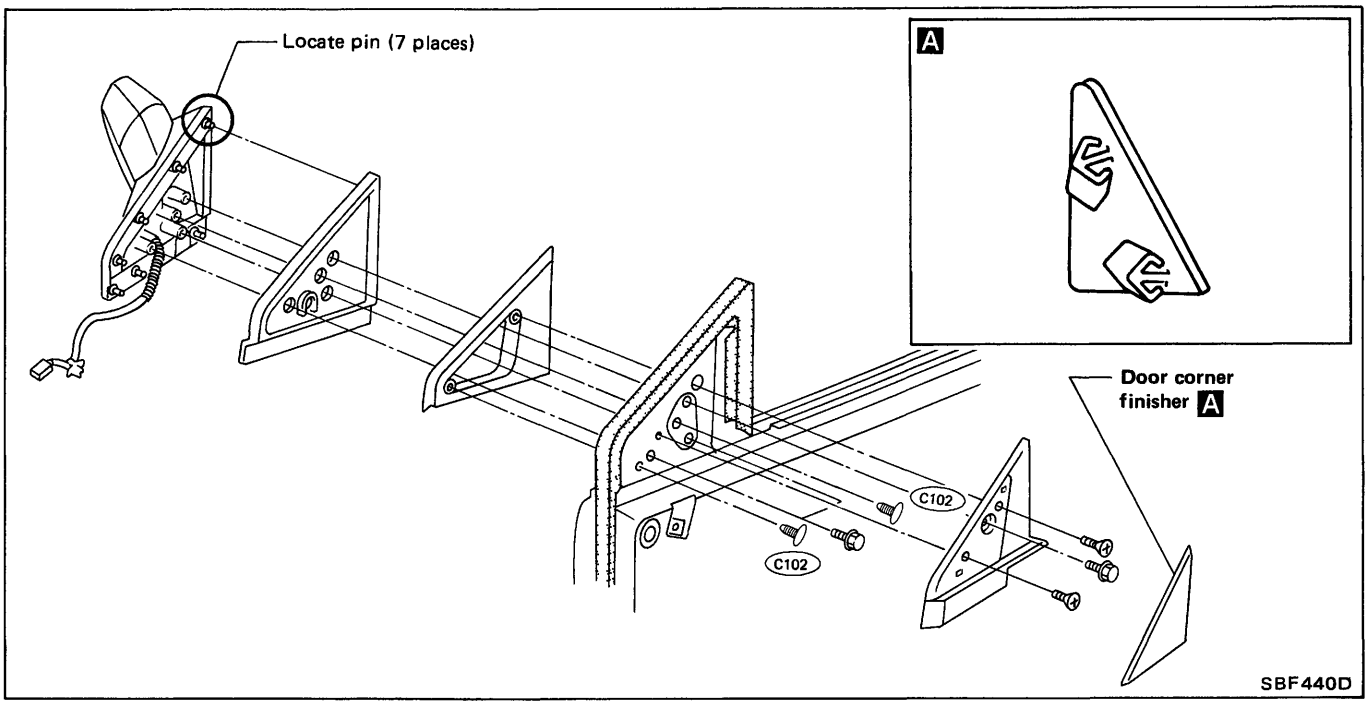


: Grease-up points

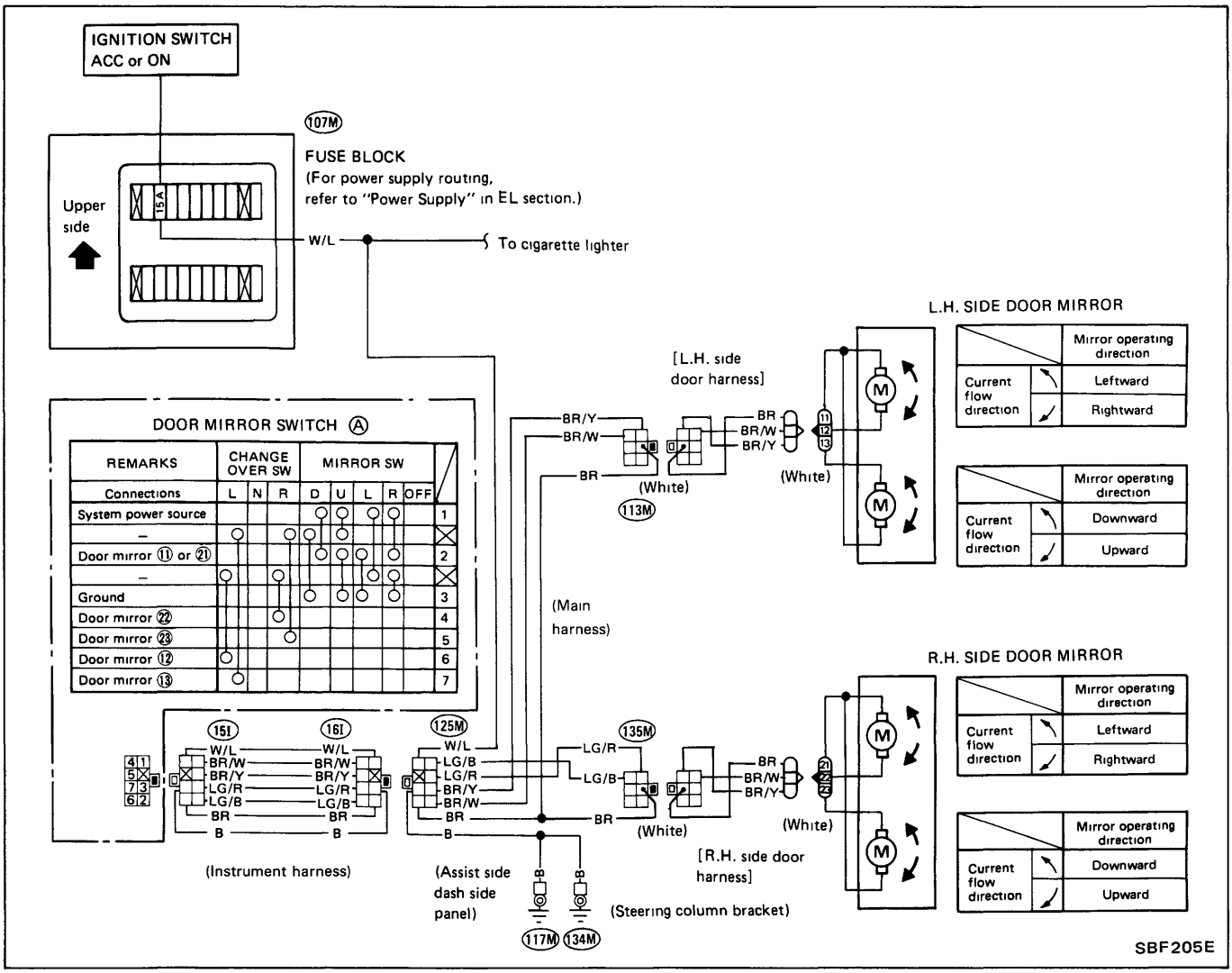
SBF207E


CF120
Sealing washer
Spacer
High-mounted stop lamp A
Sealing washer
: Double-faced adhesive tape
A
Sealing
SBF762D

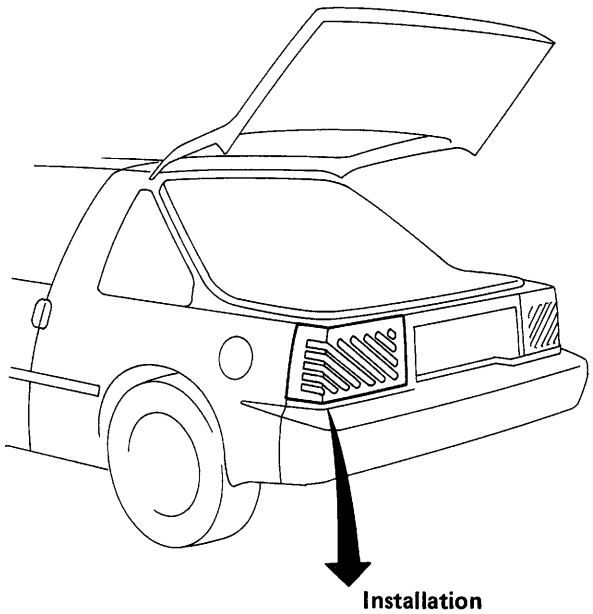
Door Mirror



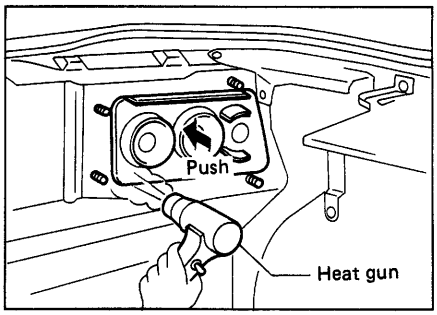
WIRING DIAGRAM



- Rear combination lamps are installed with nuts and butyl sealant.

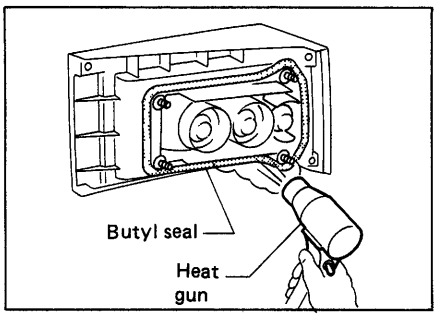


Removal



- Remove back door opening rear finisher before removing rear combination lamp. As for back door opening finisher, refer to "Exterior".
- **Warm up lamp assembly area to a temperature of a little below 60°C (140°F).**

Installation



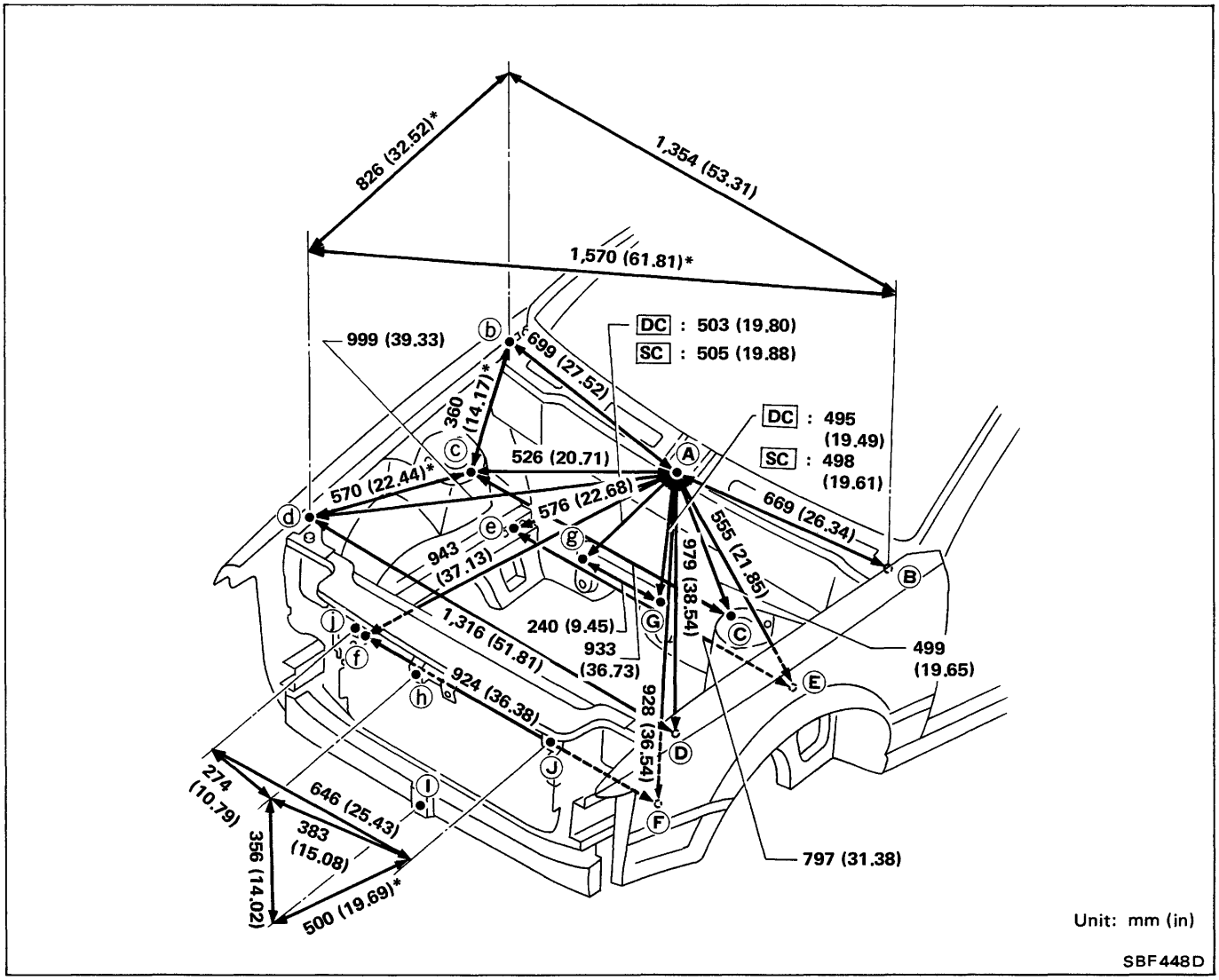
- **Apply butyl seal evenly as it tends to become thin in the corners.**
- **Warm up lamp assembly area to a temperature of a little below 60°C (140°F).**

SBF438D

- All dimensions indicated in figures are actual ones.
- When a tram tracking gauge is used, adjust both pointers to equal length and check the pointers and gauge itself to make sure there is no free play.
- When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
- Measurements should be taken at the center of the mounting holes.
- An asterisk (*) following the value at the measuring point indicates that the measuring point on the other side is symmetrically the same value.
- Measurement points
  The coordinates of the measurement points are the distances measured from the respective dimension lines in the directions of "x", "y" and "z".
  Dimension lines: "x" line – Center line of vehicle
  "y" line – Center line of front axle (Any measurement point in front of the dimension line refers to a minus "–" value.)
  "z" line – Datum line (Any measurement point under the dimension line refers to a minus "–" value.)

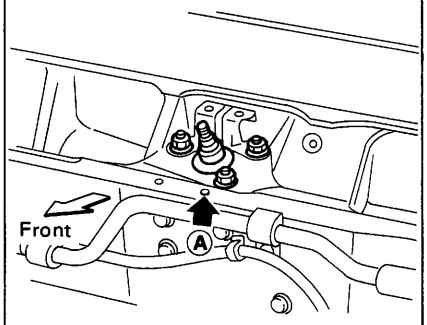
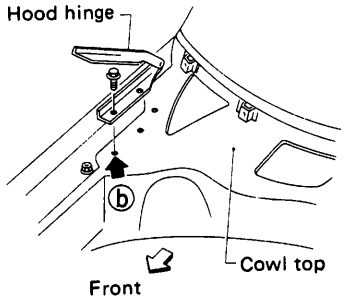
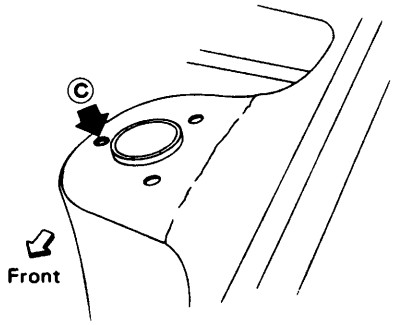
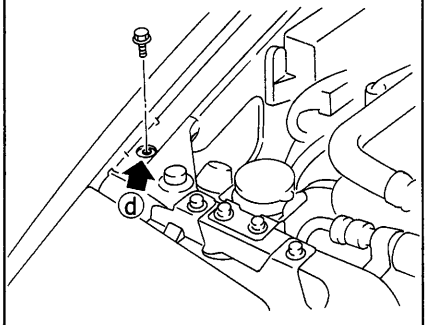
DC : CA18DE Engine Model
SC : GA16i Engine Model

Engine Compartment

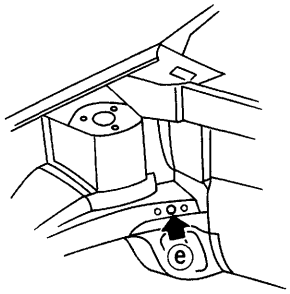
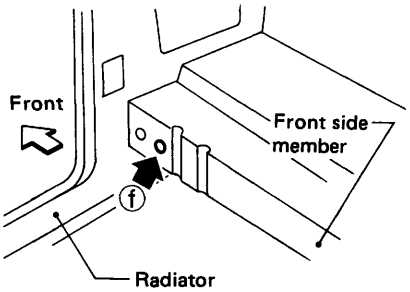
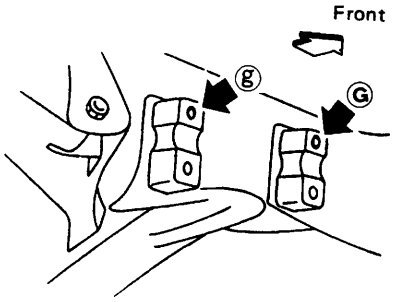
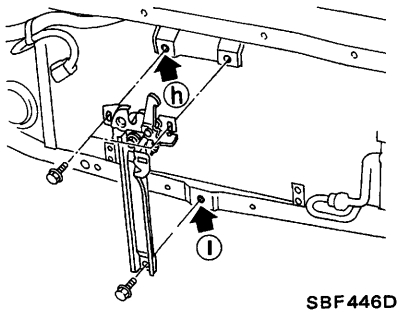
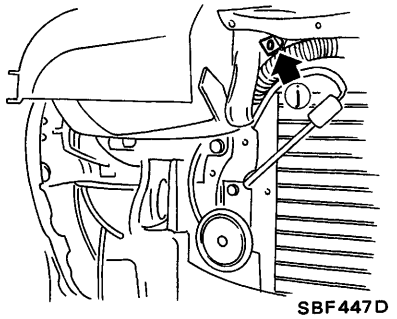


Engine Compartment (Cont'd)

MEASUREMENT POINTS

Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in)		
				"x"	"y"	"z"
Ⓐ	5 (0.20)	 SBF195D	Hole for seal rubber fitting clip on cowl top front upper flange	15.0 (0.591)	207.0 (8.15)	633.0 (24.92)
Ⓑ ⓑ	13 (0.51)	 SBF673B	Hole for hood hinge mounting on cowl top (Front side portion)	677.0 (26.65)	300.0 (11.81)	612.6 (24.12)
Ⓒ Ⓒ	9 (0.35)	 SBF669B	Hole for front strut tower mounting	466.4 (18.36)	17.2 (0.677)	538.9 (21.22)
Ⓓ ⓓ	9 (0.35)	 SBF444D	Hole for front fender mounting on hoodledge (Behind front fender front portion)	658.0 (25.91)	−517.0 (−20.35)	491.0 (19.33)

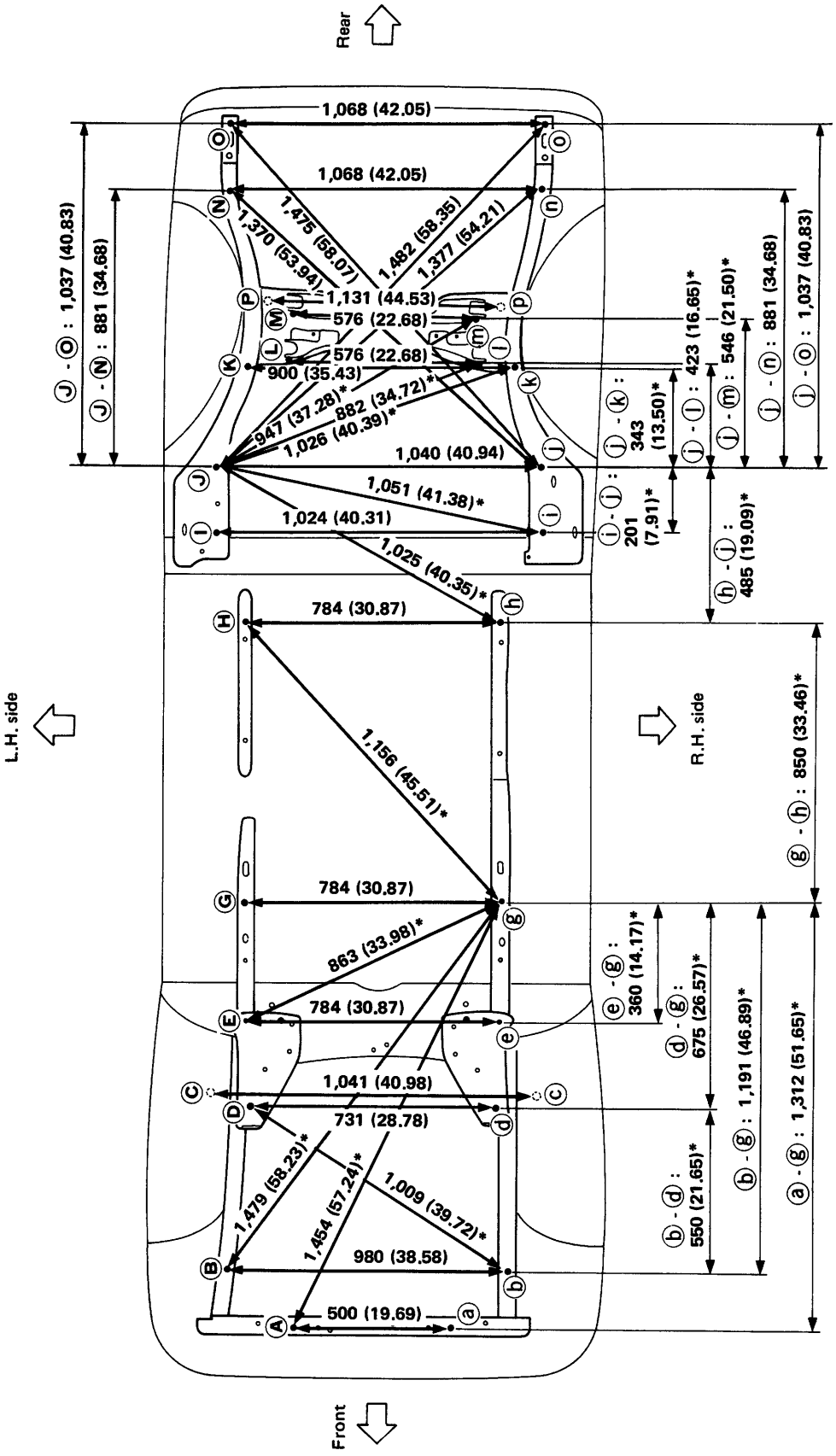
Engine Compartment (Cont'd)

Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in) "x"	"y"	"z"
Ⓔ ⓔ	16 (0.63)	 SBF445D	Hole for locating at rear portion of front side member (For canister hose)	398.6 (15.69)	150.8 (5.94)	236.0 (9.29)
Ⓕ ⓕ	16 (0.63)	 SBF910C	Hole for locating at front portion of front side member	462.0 (18.19)	−500.0 (−19.69)	230.0 (9.06)
Ⓖ ⓖ	15 (0.59)	 SBF233C	Hole for steering gear box mounting	120.0 (4.72)	SC 162.5 (6.40) DC : 184.4 (7.26)	SC 148.2 (5.83) DC : 149.4 (5.88)
ⓗ	11 (0.43)	 SBF446D	Hole for hood lock mounting (R.H. side hole)	R.H. side 55.5 (2.185)	−684.9 (−26.96)	401.0 (15.79)
ⓘ	11 (0.43)		Hole for hood lock stay mounting at front surface of radiator core lower support	0.0 (0.00)	−635.7 (−25.03)	52.9 (2.083)
Ⓙ ⓙ	9 (0.35)	 SBF447D	Hole for radiator mounting on radiator core side support	323.0 (12.72)	−633.0 (−24.92)	434.0 (17.09)

Underbody

MEASUREMENT

Unit: mm (in)

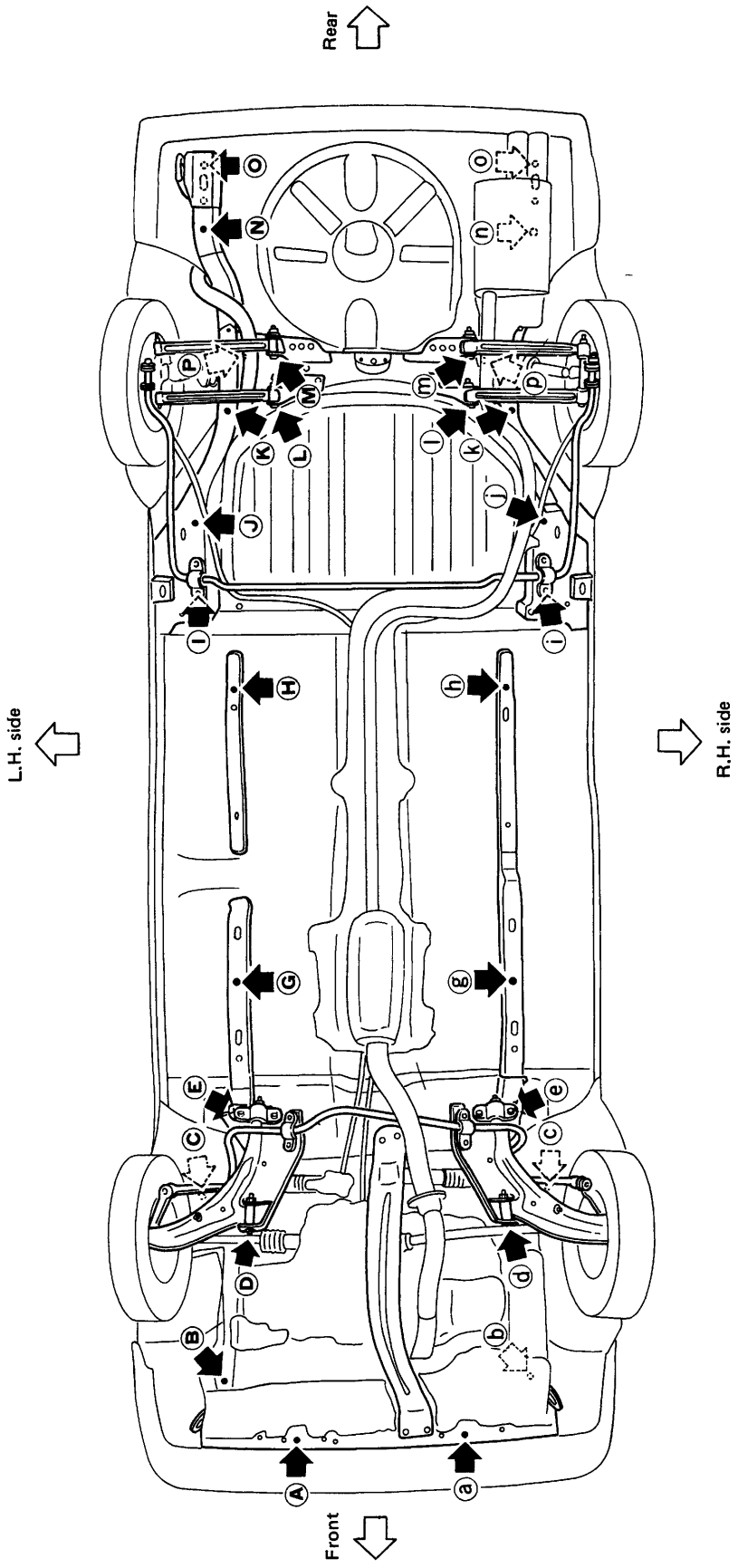


All dimensions indicated in these figures are actual ones.
(There are no projected dimensions.)

SBF449D

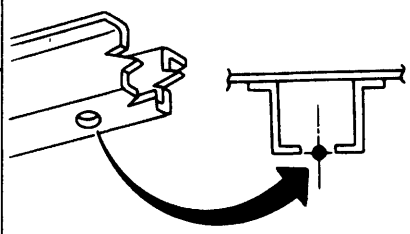
Underbody (Cont'd)

MEASUREMENT POINTS

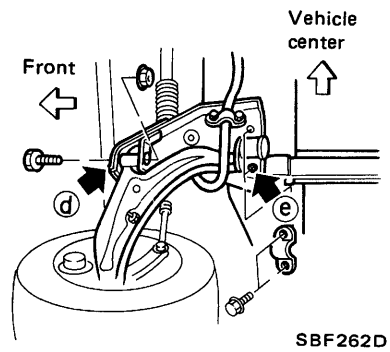
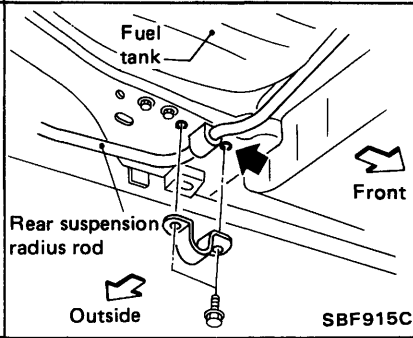
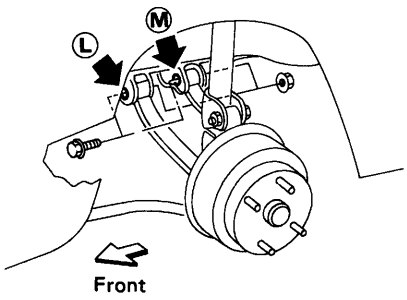
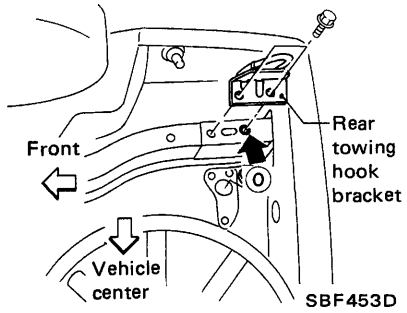
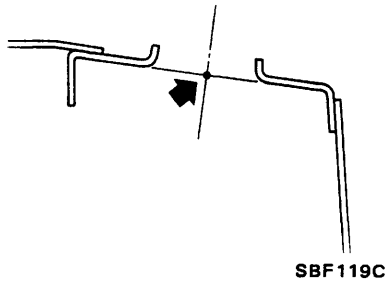


SBF450D

Underbody (Cont'd)

Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in)		
				"x"	"y"	"z"
Ⓐ ⓐ	14 (0.55)	 SBF427B	Hole for locating at underside of radiator core lower support	250.0 (9.84)	−600.0 (−23.62)	34.1 (1.343)
Ⓑ ⓑ	16 (0.63)		Hole for locating at underside of front side member front portion	490.0 (19.29)	−460.0 (−18.11)	181.0 (7.13)
Ⓖ ⓖ	16 (0.63)		Hole for locating at underside of front side member front extension rear portion	392.0 (15.43)	700.0 (27.56)	−72.6 (−2.858)
Ⓗ ⓗ	16 (0.63)		Hole for locating at underside of front side member rear extension rear portion	392.0 (15.43)	1,550.0 (61.02)	−71.7 (−2.823)
Ⓙ ⓙ	14 (0.55)		Hole for locating at underside of rear side member front portion	520.0 (20.47)	2,005.2 (78.94)	36.8 (1.449)
Ⓚ ⓚ	20 (0.79)		Hole for locating & waxing at underside of rear side member center portion	450.0 (17.72)	2,325.0 (91.54)	138.6 (5.46)
Ⓝ ⓝ	16 (0.63)		Hole for locating at underside of rear side member rear portion	L.H. side 529.0 (20.83) R.H. side 539.0 (21.22)	2,880.0 (113.39)	138.6 (5.46)

Underbody (Cont'd)

Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in)		
				"x"	"y"	"z"
Ⓓ ⓓ	14 (0.55)	 SBF262D	Hole for front suspension transverse link front mounting at underside of bracket (Rear side hole)	365.5 (14.39)	25.7 (1.012)	−44.0 (−1.732)
Ⓔ ⓔ	17 (0.67)		Hole for front suspension transverse link rear mounting at underside of mounting gusset (Outer side hole)	391.9 (15.43)	343.6 (13.53)	−19.5 (−0.768)
Ⓘ ⓘ	16 (0.63)	 SBF915C	Hole for rear suspension radius rod mounting (Front side hole)	512.0 (20.16)	1,806.8 (71.13)	8.2 (0.323)
Ⓛ ⓛ	14.3 (0.563)	 SBF916C	Hole for rear suspension parallel link mounting at front bracket (Front side hole)	288.0 (11.34)	2,358.5 (92.85)	19.2 (0.756)
Ⓜ ⓜ	14.3 x 23 (0.563 x 0.906)		Hole for rear suspension parallel link mounting at rear bracket (Front side hole)	288.0 (11.34)	2,498.7 (98.37)	10.0 (0.394)
Ⓞ ⓞ	14 (0.55)	 SBF453D	Hole for rear towing hook bracket mounting at underside of rear side member extension	L.H. side 529.0 (20.83) R.H. side 539.0 (21.22)	3,037.0 (119.57)	140.0 (5.51)
Ⓒ ⓒ	73 (2.87)	 SBF119C	Hole for front strut upper mounting at underside of spring support	520.5 (20.49)	17.2 (0.677)	545.6 (21.48)
Ⓟ ⓟ	69.4 (2.732)		Hole for rear strut upper mounting at underside of spring support	565.4 (22.26)	2,495.8 (98.26)	576.2 (22.68)

HEATER & AIR CONDITIONER

SECTION HA

CONTENTS

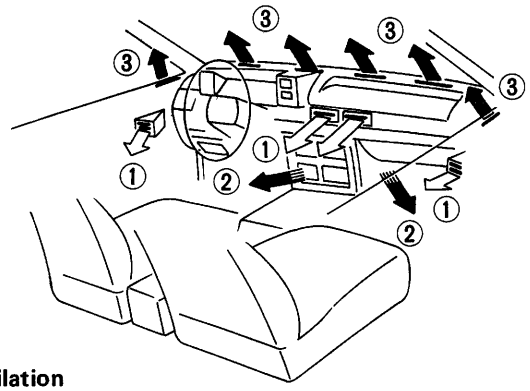
AIR FLOW AND COMPONENT LAYOUT ..... HA- 2
DOOR CONTROL ..... HA- 4
HEATER ELECTRICAL CIRCUIT ..... HA- 6
PRECAUTIONS ..... HA- 7
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When you read wiring diagrams:

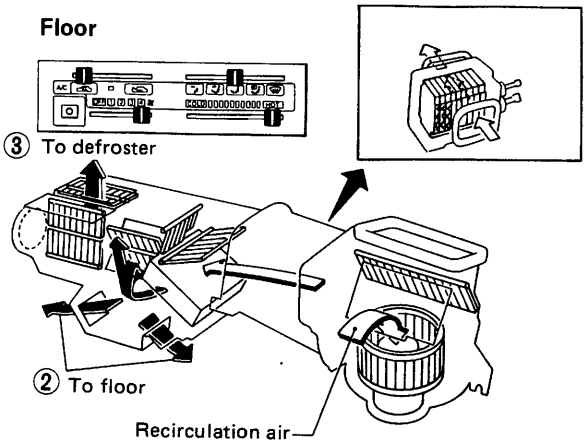
- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

1989 Pulsar Service Manual
AM89-002 (TS89-014)
Revised: February 1989

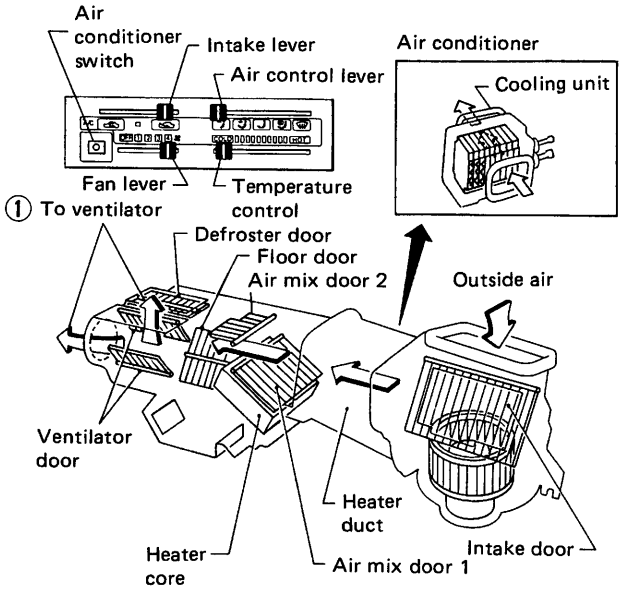
Air Flow



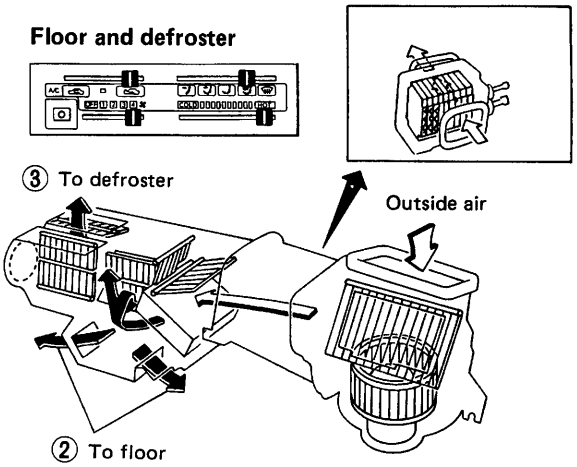
Floor



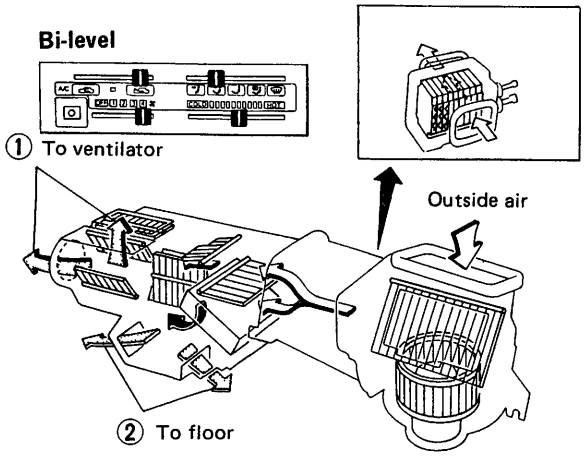
Ventilation



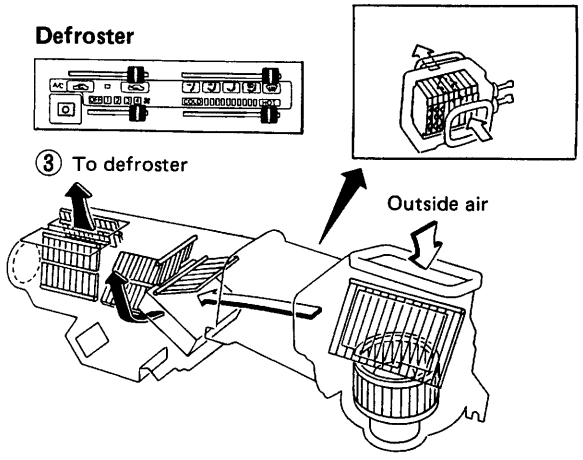
Floor and defroster



Bi-level



Defroster



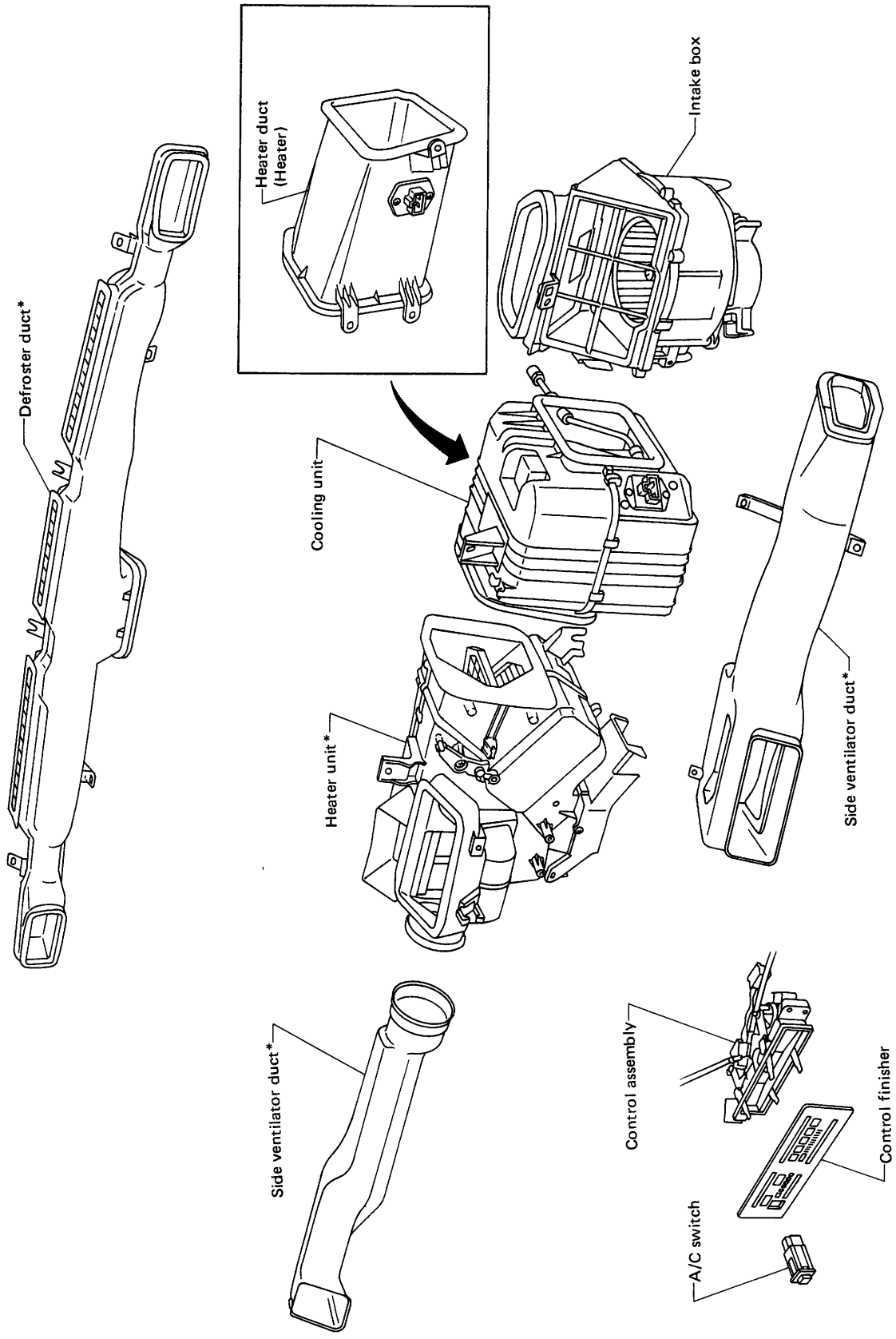
: Air passed through heater core

: Mixed air (+)

: Air not passed through heater core

RHA331A

Component Layout

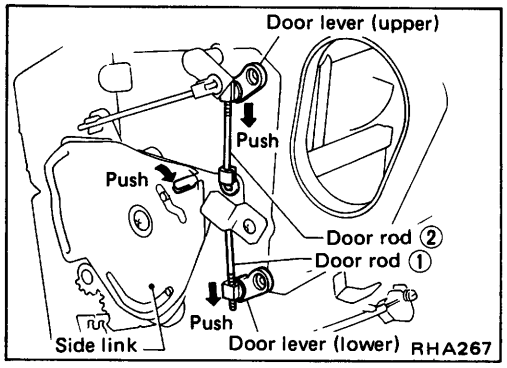


* For removal, it is necessary to remove instrument assembly.

RHA684

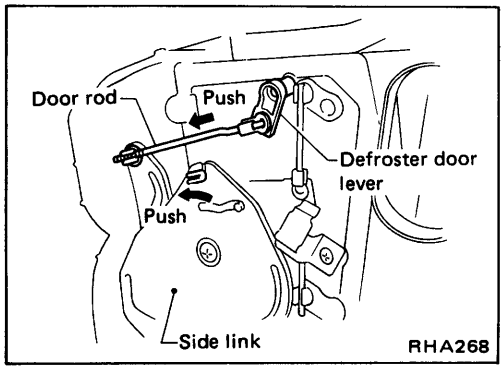
Control Cable and Rod Adjustment

- **When adjusting ventilator door rod and defroster door rod, disconnect air control cable from side link first, and then adjust door rod.**
  Reconnect and readjust air control cable.



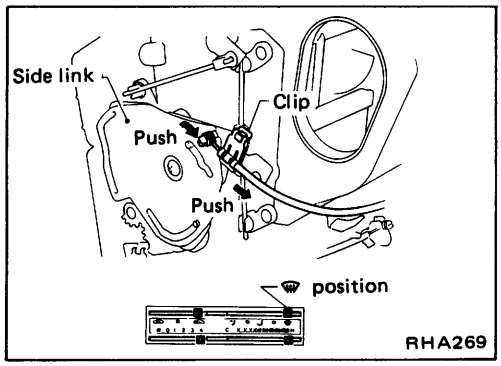
VENTILATOR DOOR CONTROL ROD

1. Move side link in direction of arrow.
2. With upper and lower ventilator door levers held in the direction of the arrow, connect rods ① and ② to their corresponding ventilator door levers in that order.



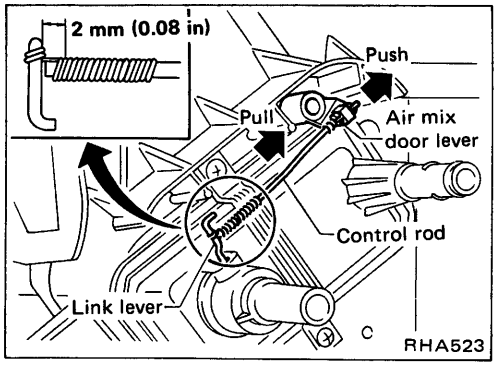
DEFROSTER DOOR CONTROL ROD

1. Move side link in direction of arrow.
2. Connect rod to side link while pushing defroster door lever in direction of arrow.



AIR CONTROL CABLE

- Clamp the cable while pushing cable outer and side link in direction of arrow.

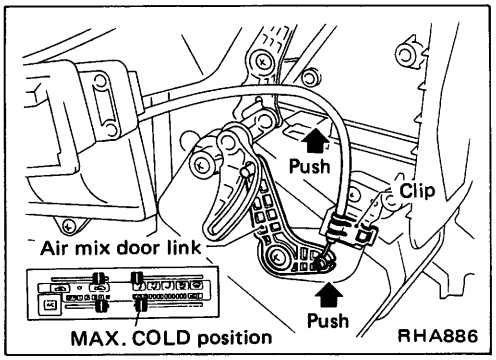


WATER COCK CONTROL ROD

- **When adjusting water cock control rod, first disconnect temperature control cable from air mix door lever and then adjust control rod. Reconnect temperature control cable and readjust it. (Refer to next item.)**

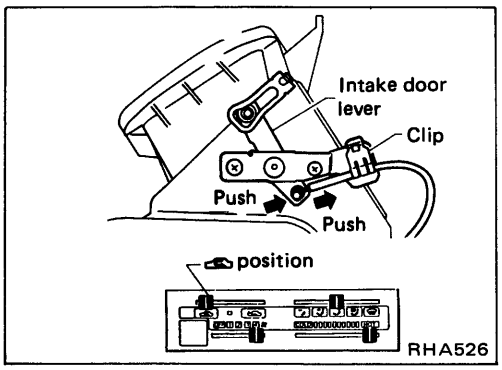
1. Push air mix door lever in direction of arrow.
2. Pull control rod of water cock in direction of arrow so as to make clearance of about 2 mm (0.08 in) between ends of rod and link lever and connect the rod to door lever.

Control Cable and Rod Adjustment (Cont'd)



TEMPERATURE CONTROL CABLE

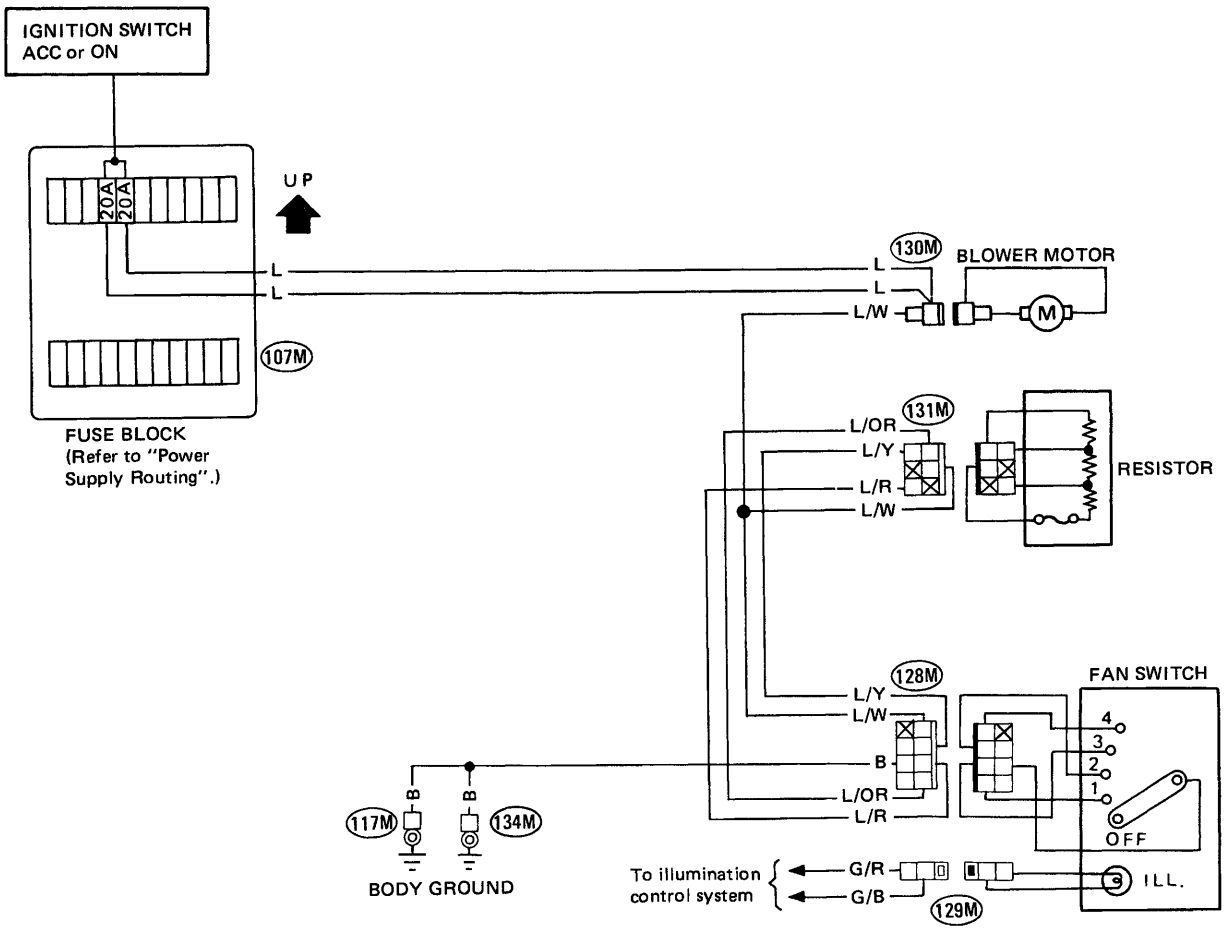
- Clamp the cable while pushing cable outer and air mix door link in direction of arrow.



INTAKE DOOR CONTROL CABLE

- Clamp the cable while pushing cable outer and intake door lever in direction of arrow.

Wiring Diagram

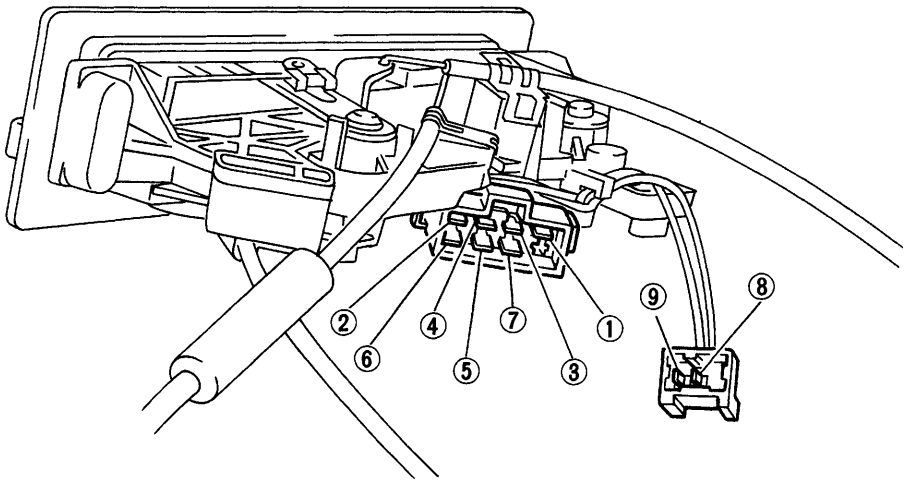


Fan Switch Check

Fan switch

LEVER POSITION / TERMINAL	OFF	1	2	3	4
1					○
2		○			○
3			○		
4				○	
5		○	○	○	○
6		○	○	○	○
7		○	○	○	○
8		○		○	
9		○			

Illumination lamp



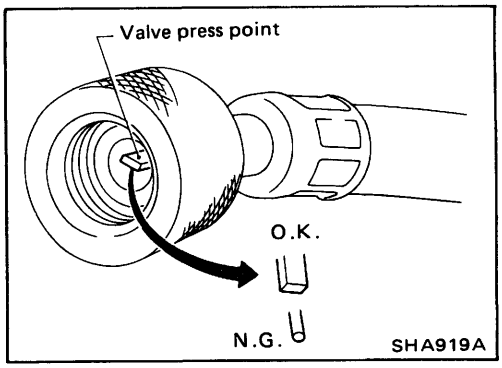
RHA711

WARNING:

- Always wear eye protection when working around the system.
- Always be careful that refrigerant does not come in contact with your skin.
- Keep refrigerant containers stored below 40°C (104°F) and never drop from high places.
- Work in well-ventilated area because refrigerant gas evaporates quickly and breathing may become difficult due to the lack of oxygen.
- Keep refrigerant away from open flames because poisonous gas will be produced if it burns.
- Do not increase can temperature beyond 40°C (104°F) in charging.
- Do not heat refrigerant can with an open flame. There is danger that can will explode.

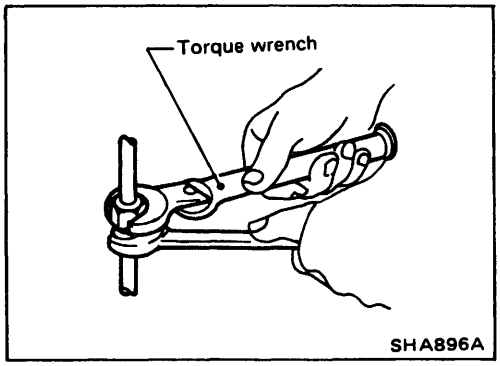
CAUTION:

- Do not use steam to clean surface of condenser or evaporator. Be sure to use cold water or compressed air.
- Compressed air must never be used to clean a dirty line. Clean with refrigerant gas.



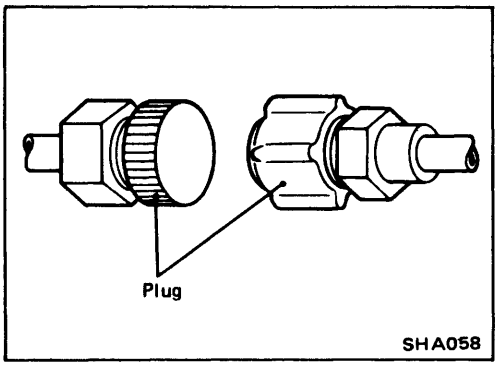
- Do not use manifold gauge whose press point shape is different from that shown. Otherwise, insufficient evacuating may occur.

- Do not over-tighten service valve cap.
- Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

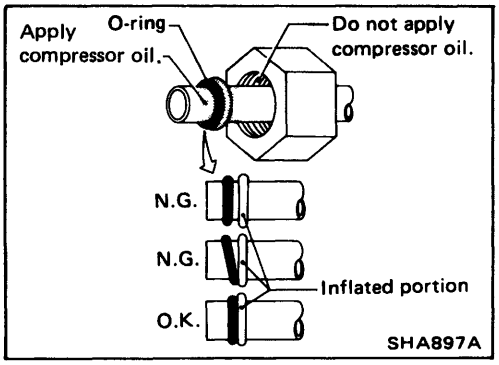


WARNING:
Gradually loosen discharge side hose fitting, and remove it after remaining pressure has been released.
CAUTION:
When replacing or cleaning refrigerant cycle components, observe the following.

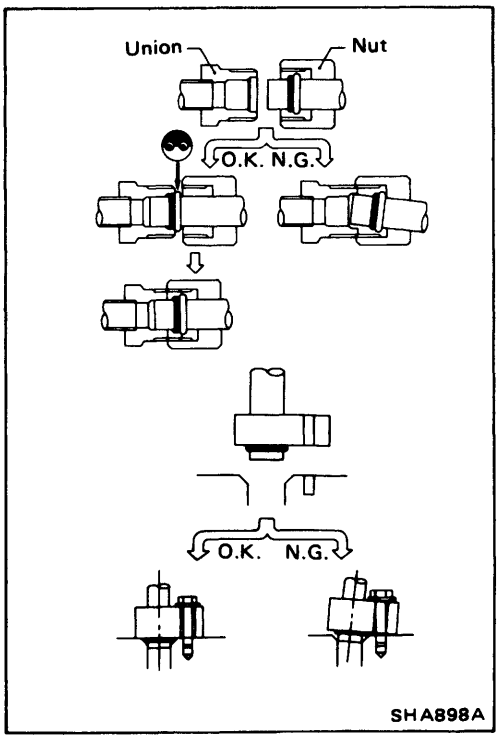
- **Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.**
- **When connecting tubes, always use a torque wrench.**



- **After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.**



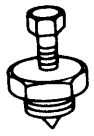
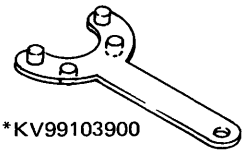
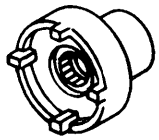
- **Always replace used O-rings.**
- **When connecting tube, apply compressor oil to portions shown in illustration. Be careful not to apply oil to threaded portion.**
- **O-ring must be closely attached to inflated portion of tube.**



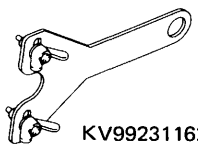
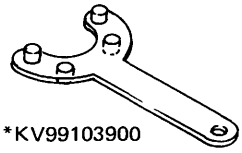
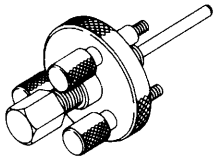
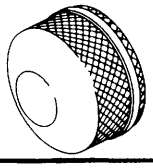
- **After inserting tube into union until O-ring is no longer visible, tighten nut to specified torque.**
- **After connecting line, conduct leak test and make sure that there is no leakage from connections. When the gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.**

SPECIAL SERVICE TOOLS

Model NVR 140S

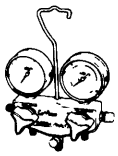
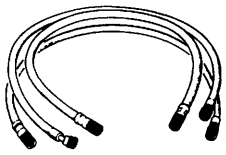
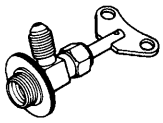
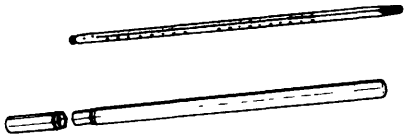
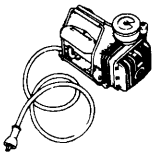
Tool number (Kent-Moore No.) Tool name	Description	
KV998VR001 (–) Clutch hub puller		Removing clutch disc
KV99231010 or *KV99103900 (–) Clutch disc wrench	 KV99231010  *KV99103900	Removing shaft nut and clutch disc
KV99235160* (J29751) Nut wrench		Removing lock nut

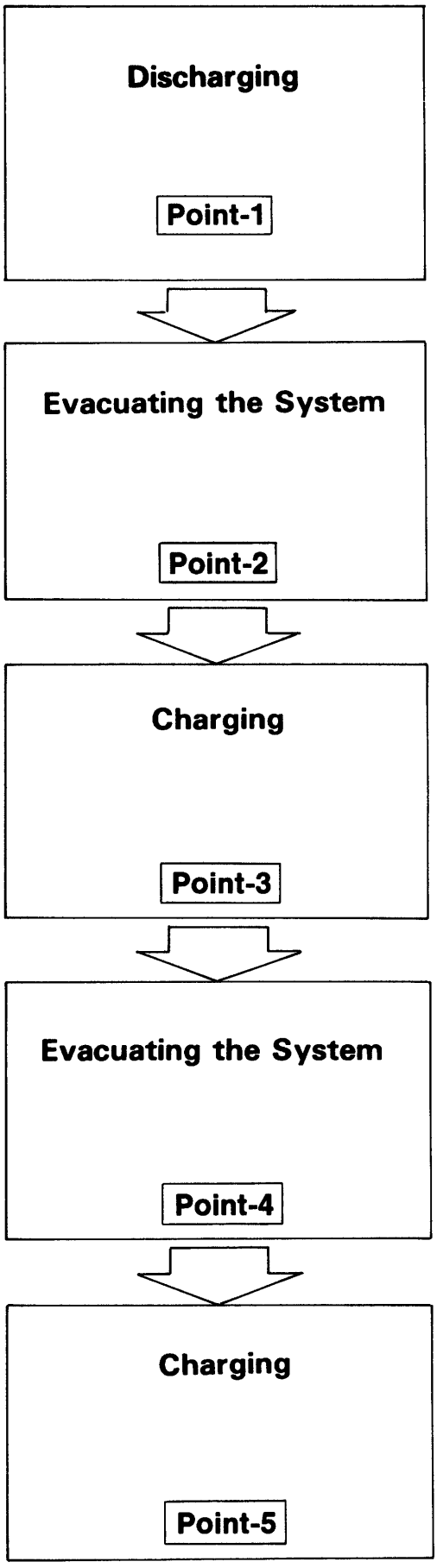
Model DKV-14C

Tool number Tool name	Description	
KV99231162 or *KV99103900 (–)	 KV99231162  *KV99103900	Removing shaft nut and clutch disc
KV99232340 (–) Clutch disc puller		Removing clutch disc
KV99234330 (–) Pulley installer		Installing pulley

*: **This tool is used for both NVR 14S and DKV-14C.**

SERVICE TOOLS

Tool name	Description	
Manifold gauge		Using discharge and charge refrigerant into system
Charging hose		Using discharge and evacuate, charge refrigerant into system
Charge valve		Using discharge and charge refrigerant into system
Thermometer		Using check temperature
Vacuum pump		Using evacuate refrigerant system
Electric leak-detector	**Nominal sensitivity:** **15 - 25 g (0.53 - 0.88 oz)/year** 	Using check refrigerant leaks



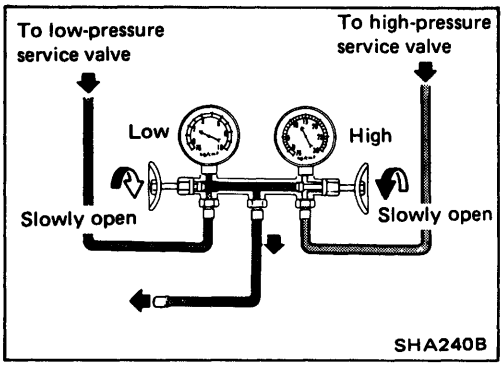
Discharge refrigerant system.

Run pump for 5 minutes.

Charge refrigerant into system.
When low-pressure gauge reading is 98 kPa (1.0 kg/cm^2, 14 psi), completely close high-pressure valve of manifold gauge and stop charging.

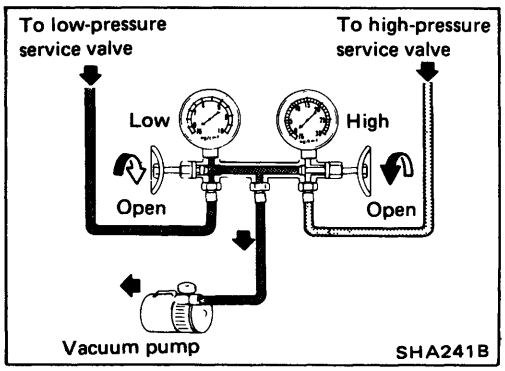
Run pump for 20 minutes.

Charge the specified amount of refrigerant into system.



Discharging—Point-1

Slowly open the valves to discharge only refrigerant. If they are opened quickly, compressor oil will also be discharged.



Evacuating the System—Point-2

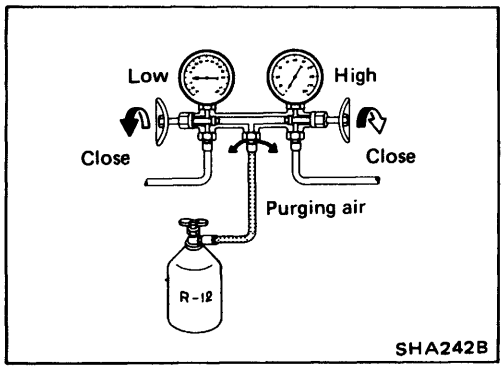
1. Start pump, then open both valves and run pump for about 5 minutes.
2. When low gauge has reached approx. 101.3 kPa (760 mmHg, 29.92 inHg), completely close both valves of gauge and stop vacuum pump. Let it stand for 5 to 10 minutes in this state and confirm that the reading does not rise.

a. The low-pressure gauge reads lower by 3.3 kPa (25 mmHg, 0.98 inHg) per 300 m (1,000 ft) elevation. Perform evacuation according to the following table.

b. The rate of ascension of the low-pressure gauge should be less than 3.3 kPa (25 mmHg, 0.98 inHg) in 5 minutes.

Elevation m (ft)	Vacuum of system* kPa (mmHg, inHg)
0 (0)	101.3 (760, 29.92)
300 (1,000)	98.0 (735, 28.94)
600 (2,000)	94.6 (710, 27.95)
900 (3,000)	91.3 (685, 26.97)

*: Values show reading of the low-pressure gauge.

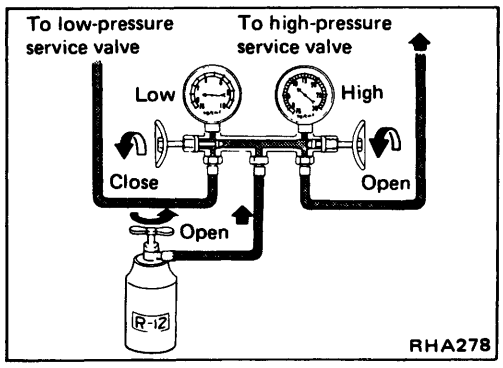


Charging—Point-3

1. Evacuate refrigerant system.

Refer to "Point-2".

2. Close manifold gauge valves securely and disconnect charging hose from vacuum pump.
3. Purge air from center charging hose.
   1) Connect center charging hose to refrigerant can through charge valve.
   2) Break seal of refrigerant can and purge air.

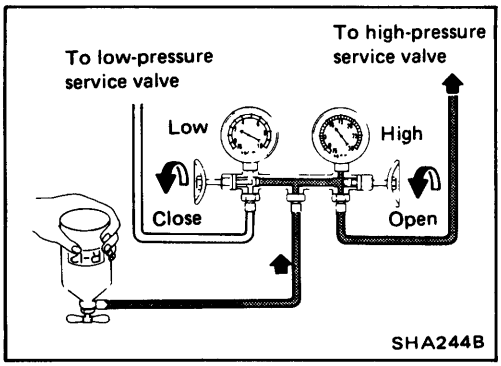


4. Charge refrigerant into system.

WARNING:

Ensure that engine is off.

   1) Open high-pressure valve of manifold gauge and charge refrigerant into system.

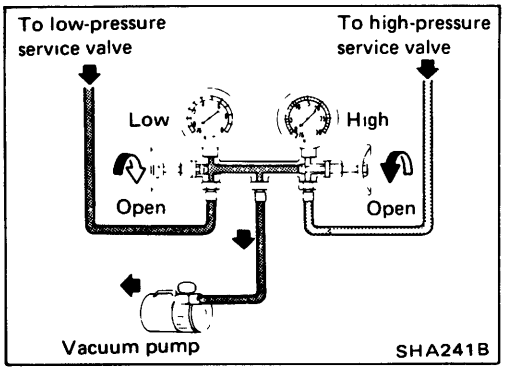


Charging—Point-3 (Cont'd)

CAUTION:

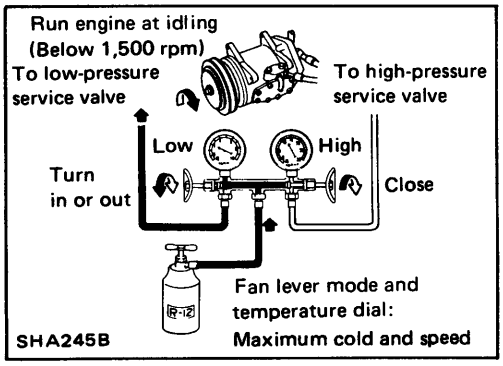
If charging liquefied refrigerant into system with the can turned upside down to reduce charging time, charge it only through high-pressure (discharge) service valve. After charging, the compressor should always be turned several times manually.

2) When low-pressure gauge reading is 98 kPa (1.0 kg/cm^2, 14 psi), completely close high-pressure valve of manifold gauge and stop charging.



Evacuating the System—Point-4

1. Close manifold gauge valve securely and disconnect charging hose from refrigerant can.
2. Connect center charging hose to vacuum pump.
3. Start pump, then open both valves and run pump for about 20 minutes.



Charging—Point-5

1. Charge refrigerant into system.

Refer to "Point-3".

WARNING:

Ensure that engine is off.

1) Open low-pressure valve of manifold gauge and charge refrigerant into system.
2) When refrigerant charging speed slows down, close high-pressure valve of manifold gauge and open low-pressure valve of manifold gauge and charge refrigerant while running the compressor for ease of charging.
3) Start engine — Air conditioning system ON, maximum temperature set, maximum blower speed. Open low-pressure valve on gauge set, with can in upright position, and monitor sight glass. Charge is complete when sight glass is clear.

Charging—Point-5 (Cont'd)

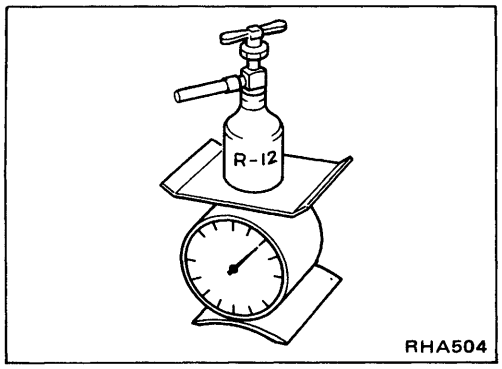
Cycling clutch systems will produce bubbles in sight glass when clutch engages. Therefore, allow 5 seconds after clutch engages to determine if bubbles continue, and, if so, add refrigerant to clear sight glass.

WARNING:

Never charge refrigerant through high-pressure side (discharge side) of system since this will force refrigerant back into refrigerant can and can may explode.

4. Charge refrigerant while controlling low-pressure gauge reading at 275 kPa (2.8 kg/cm^2, 40 psi) or less by turning in or out low-pressure valve of manifold gauge.

- **Be sure to purge air from charging hose when replacing can with a new one.**



5. Charge the specified amount of refrigerant into system by weighing charged refrigerant with scale. Overcharging will cause discharge pressure to rise.

   Refrigerant amount:

   0.85 - 0.95 kg (1.87 - 2.09 lb)

The state of the bubbles in sight glass should only be used for checking whether the amount of charged refrigerant is small or not. The amount of charged refrigerant can be correctly judged by means of discharge pressure.

6. After charging, be sure to install valve cap on service valve.
7. Confirm that there are no leaks in system by checking with a leak detector.

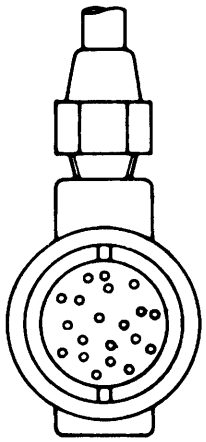
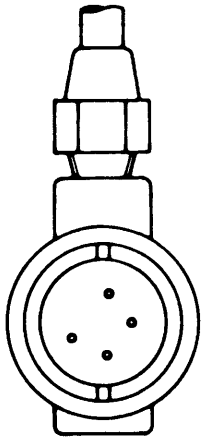
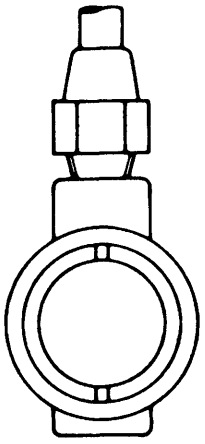
- When refrigerant charging is performed with a charging cylinder, charging station, or automatic charging equipment, engine off, charge only through high side, after specified refrigerant amount has entered the system, close high pressure valve on gauge set. Start engine return to idle speed, operate A/C at maximum temperature setting, high blower. Observe sight glass to confirm complete charge.

Overcharging will result in increased high pressures, and reduced performance.

Checking Refrigerant Level

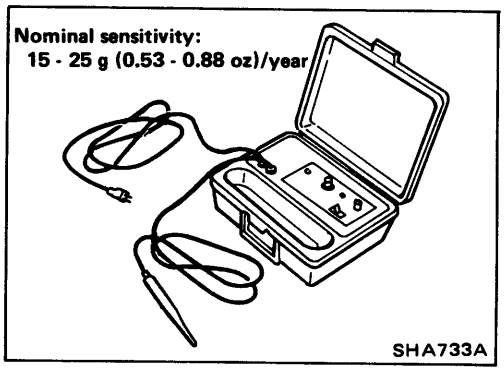
CONDITION

- Door window: Open
- A/C switch: ON
- TEMP. lever position: Max. COLD
- FAN lever position: 4
- Check sight glass after a lapse of about five minutes.

Amount of refrigerant / Check item	Almost no refrigerant	Insufficient	Suitable	Too much refrigerant
Temperature of high-pressure and low-pressure lines.	Almost no difference between high-pressure and low-pressure side temperature.	High-pressure side is warm and low-pressure side is fairly cold.	High-pressure side is hot and low-pressure side is cold.	High-pressure side is abnormally hot.
State in sight glass.	Bubbles flow continuously. Bubbles will disappear and something like mist will flow when refrigerant is nearly gone.	The bubbles are seen at intervals of 1 - 2 seconds.	Almost transparent. Bubbles may appear when engine speed is raised and lowered.	No bubbles can be seen.
			No clear difference exists between these two conditions.	
	 AC256	 AC257	 AC258	
Pressure of system.	High-pressure side is abnormally low.	Both pressures on high and low-pressure sides are slightly low.	Both pressures on high and low-pressure sides are normal.	Both pressures on high and low-pressure sides are abnormally high.
Repair.	Stop compressor immediately and conduct an overall check.	Check for gas leakage, repair as required, replenish and charge system.		Discharge refrigerant from service valve of low pressure side.

a. The bubbles seen through the sight glass are influenced by the ambient temperature. Since the bubbles are hard to show up in comparatively low temperatures below 20°C (68°F), it is possible that a slightly larger amount of refrigerant would be filled, if supplied according to the sight glass. Recheck the amount when it exceeds 20°C (68°F). In higher temperature the bubbles are easy to show up.

b. When the screen in the receiver drier is clogged, the bubbles will appear even if the amount or refrigerant is normal. In this case, the outlet side pipe of the receiver drier becomes considerably cold.

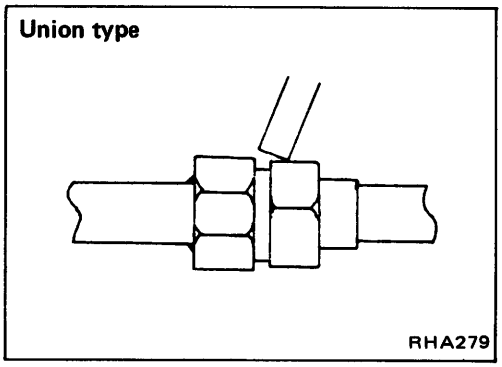


Checking Refrigerant Leaks

ELECTRIC LEAK DETECTOR

The leak detector is a delicate device that detects small amounts of halogen.

To use the device properly, read the manufacturer's manuals. Also perform the specified maintenance and inspections.

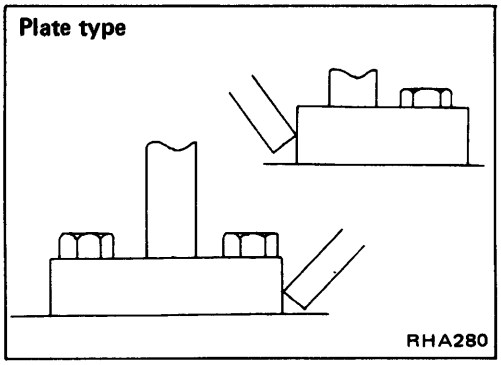


GENERAL PRECAUTIONS FOR HANDLING LEAK DETECTOR

Place the probe on connection fitting and wait for 5 seconds or more.

To check cooling unit, wait for 10 seconds or more.

Keep the probe as still as possible for one more minute.

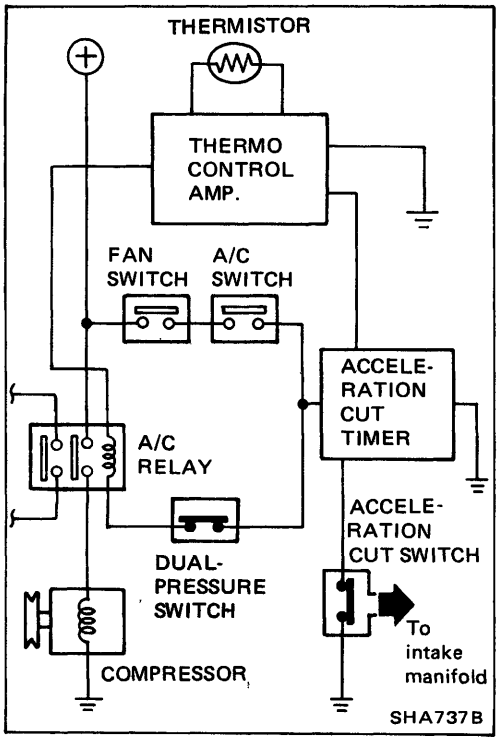


When testing single-bolt flange, place the probe on the opposite side of the fitting.

MEASUREMENT STANDARD

If any leak is noted with a detector having a nominal sensitivity of 15 to 25 g (0.53 to 0.88 oz)/year, that leak must be repaired.

- The nominal sensitivity of the detector is determined under the assumption that all the leaking gas is collected by the detector. Accordingly, the quantity of gas actually leaking can amount to five to ten times the indicated value. Generally speaking, leakage of 150 to 200 g (5.29 to 7.05 oz) of refrigerant can cause insufficient cooling.
- Oil deposited during assembling must be wiped off before inspection. Refrigerant easily dissolves in oil, and the presence of oil can cause an error in measurement.
  This precaution is important when checking a used car for refrigerant leakage.
- If oil is noted at or around connections, it indicates that refrigerant is leaking.

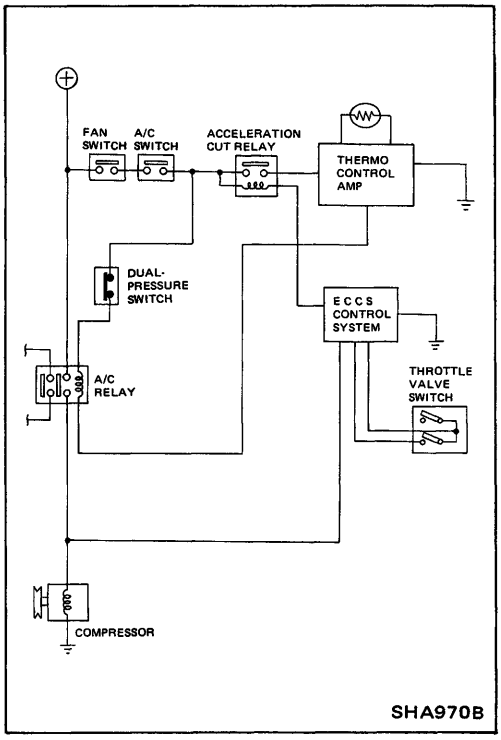


Acceleration Cut System

GA16i engine automatic transaxle model

This system is used to monitor the vacuum pressure in the intake manifold. When the engine is heavily overloaded, the compressor is turned off for 5 seconds to reduce the overloading.

Acceleration cut switch stays open position under the specified vacuum pressure [below approx. –22.7 kPa (–170 mmHg, –6.69 inHg)].



CA18DE engine model

This system is controlled by E.C.C.S. control unit. When the engine is heavily overloaded (throttle valve switch is turned to full throttle side), the compressor is turned off for 4 seconds to reduce the overloading.

Refrigeration Cycle

REFRIGERANT FLOW

The refrigerant flows in the standard pattern, that is, through the compressor, the condenser, the receiver drier, through the evaporator, and back to the compressor.

The refrigerant evaporation through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

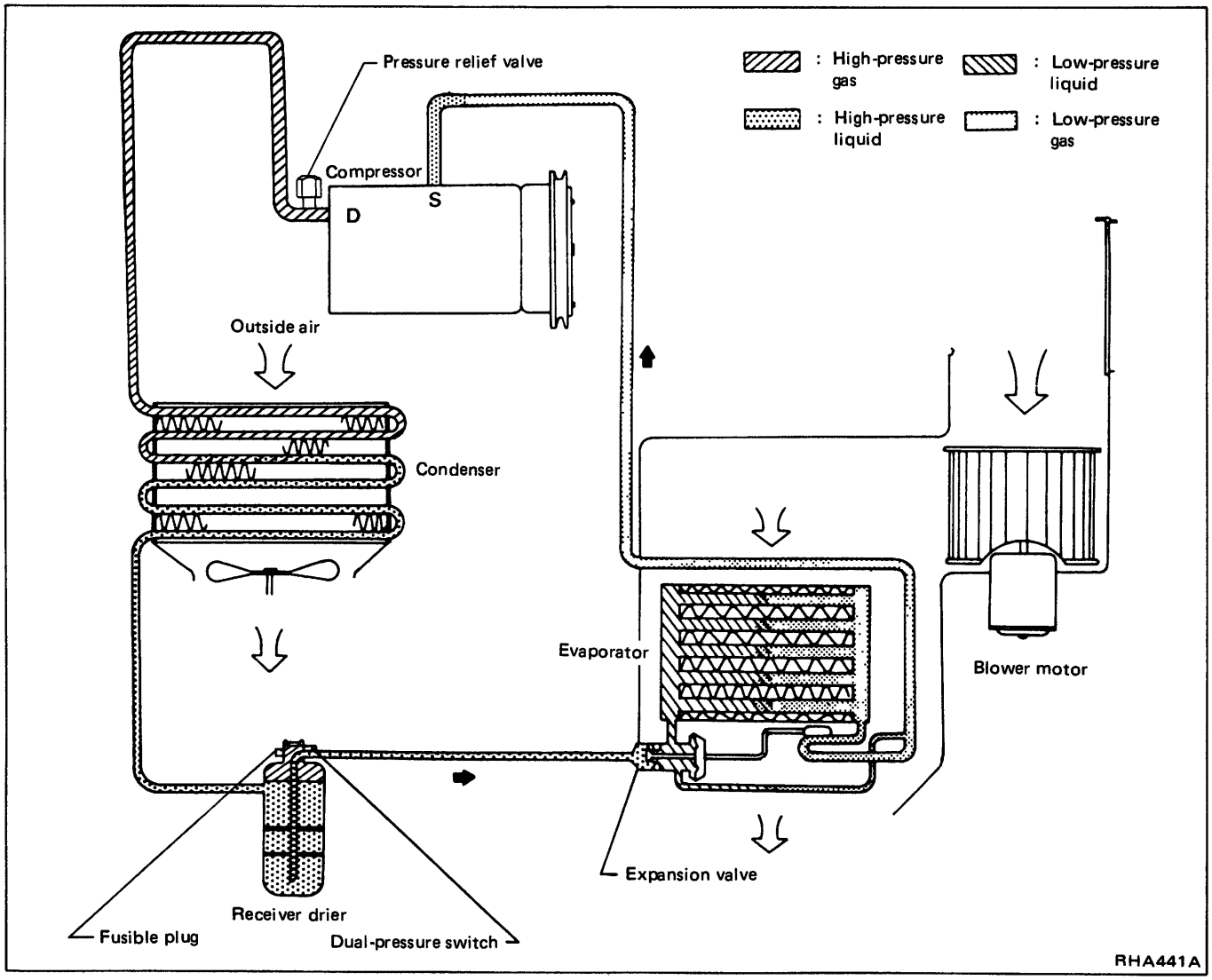
FREEZE PROTECTION – Compressor control

The compressor cycles on and off to maintain the evaporator temperature within a specified range. When the evaporator coil temperature falls below a specified point, the thermo control amplifier interrupts the compressor operation. When the evaporator coil temperature rises above the specification, the thermo control amplifier allows compressor operation.

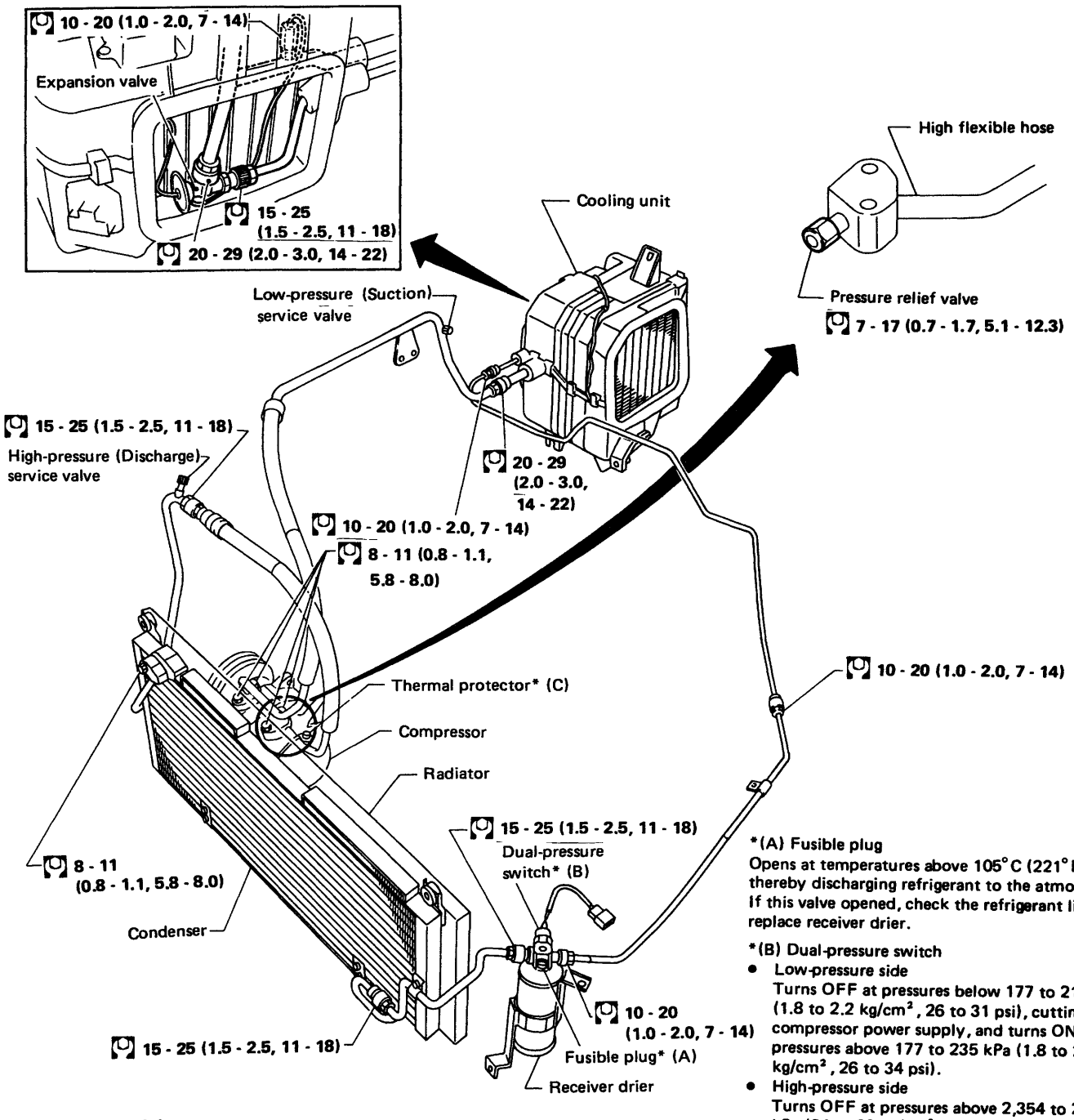
The refrigerant system is protected against excessively high or low pressures by the dual pressure switch, located on the receiver drier. If the system pressure rises above, or falls below the specifications, the dual pressure switch opens to interrupt the compressor operation.

PRESSURE RELIEF VALVE

The refrigerant system is also protected by a pressure relief valve, located on the end of high flexible hose near compressor. When the refrigerant pressure in the system increases to an abnormal level [more than 3,727 kPa (38 kg/cm^2, 540 psi)], the release port on the pressure relief valve automatically openes and releasing the refrigerant into the atomosphere.



Refrigerant Lines



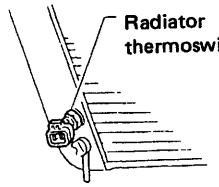
*(A) Fusible plug
Opens at temperatures above 105°C (221°F), thereby discharging refrigerant to the atmosphere. If this valve opened, check the refrigerant line and replace receiver drier.

*(B) Dual-pressure switch
- Low-pressure side
  Turns OFF at pressures below 177 to 216 kPa (1.8 to 2.2 kg/cm², 26 to 31 psi), cutting compressor power supply, and turns ON at pressures above 177 to 235 kPa (1.8 to 2.4 kg/cm², 26 to 34 psi).
- High-pressure side
  Turns OFF at pressures above 2,354 to 2,844 kPa (24 to 29 kg/cm², 341 to 412 psi), cutting compressor power supply, and turns ON at pressures below 1,863 to 2,256 kPa (19 to 23 kg/cm², 270 to 327 psi).

*(C) Thermal protector

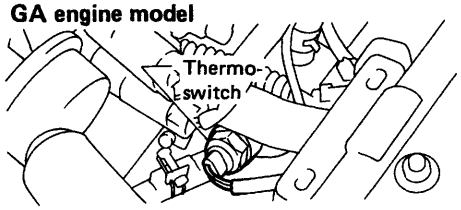
Compressor	DKV-14C	NVR 140S	Operation
Temperature of compressor	°C (°F)	°C (°F)	
Increasing to approx.	145 - 155 (293 - 311)	135 - 145 (275 - 293)	Turns OFF
Decreasing to approx.	130 - 140 (266 - 284)	120 - 130 (248 - 266)	Turns ON

CA engine model



Water temperature °C (°F)	Operation
Increasing to 90 (194)	ON
Decreasing to 83 (181)	OFF

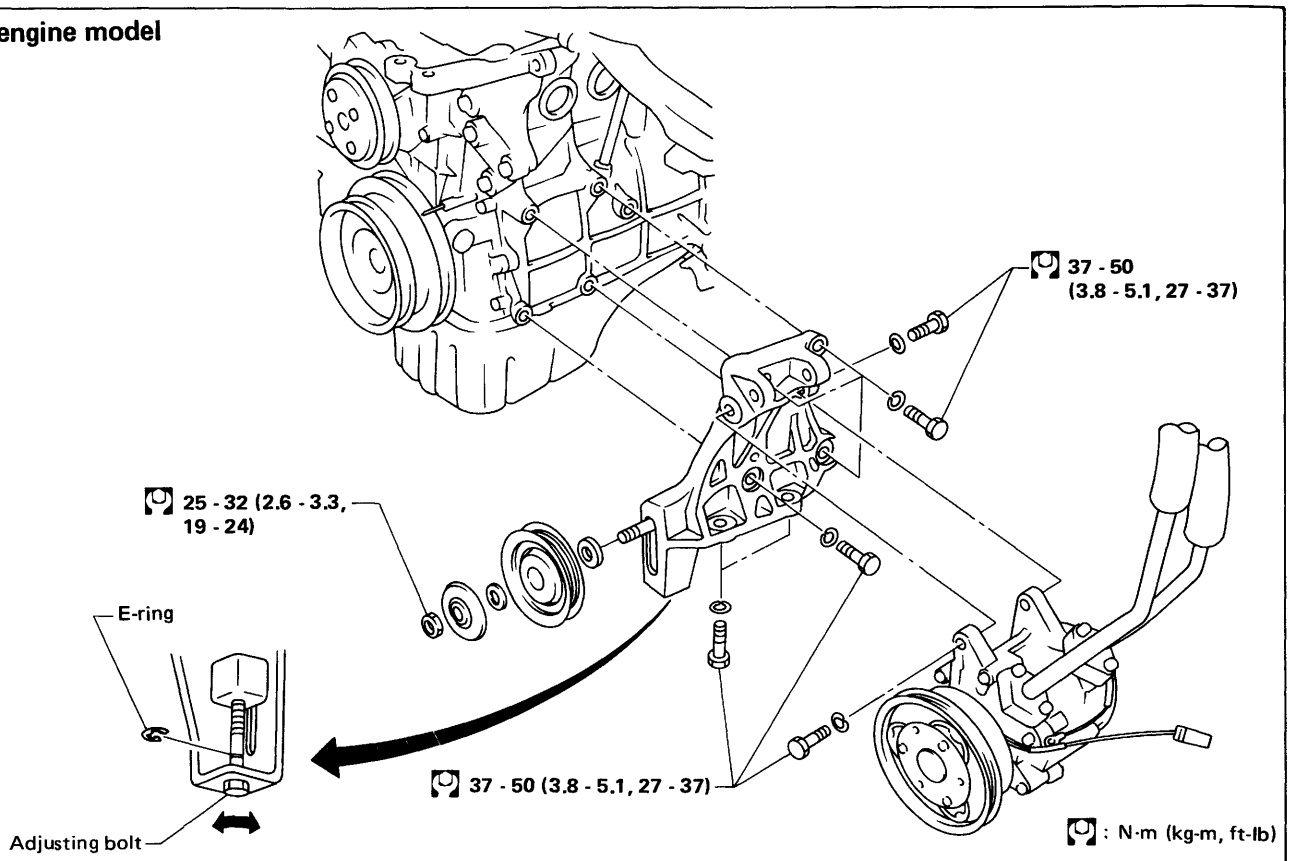
GA engine model



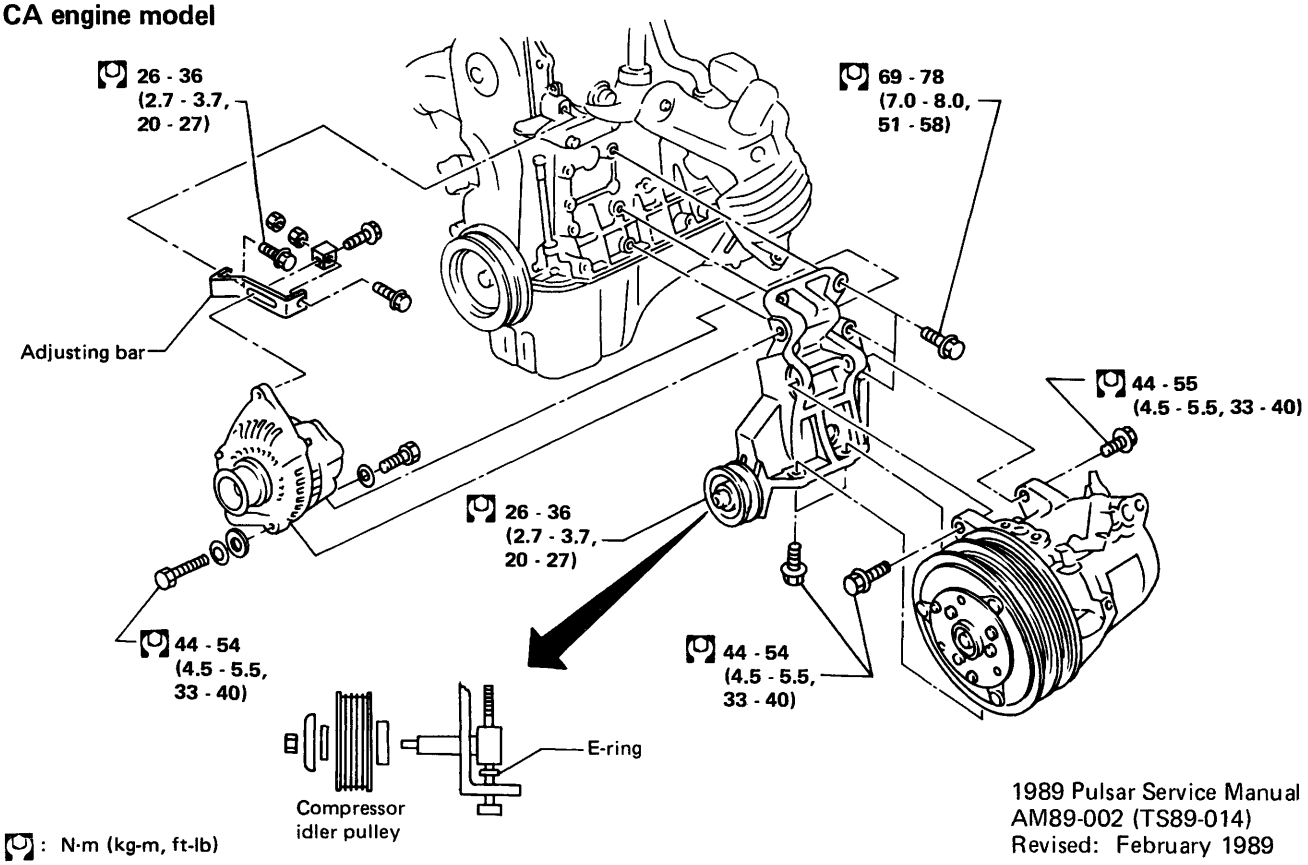
Water temperature °C (°F)	Operation
Increasing to 82 - 88 (180 - 190)	ON
Decreasing to 75 - 81 (167 - 178)	OFF

Compressor Mounting

GA engine model



CA engine model

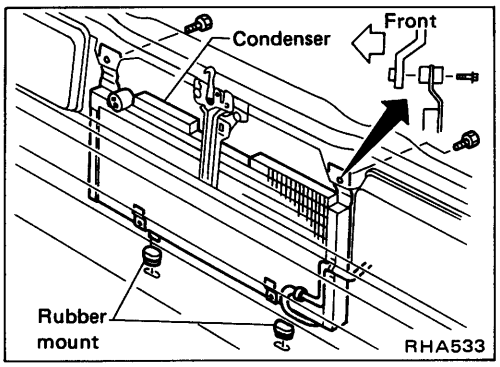


1989 Pulsar Service Manual
AM89-002 (TS89-014)
Revised: February 1989

Condenser

REMOVAL AND INSTALLATION

1. Discharge refrigerant from system.
2. Remove hood lock stay.
3. Remove radiator fixing bolts.
4. Disconnect high pressure tubes from condenser.



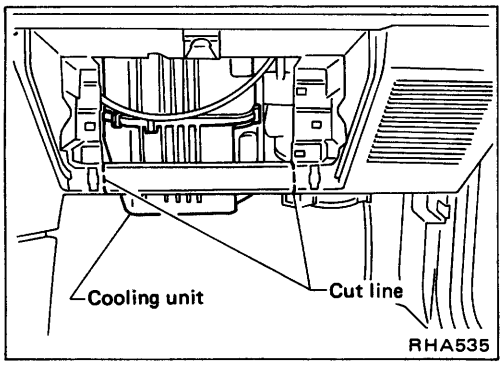
5. Remove condenser fixing bolts.
6. Remove condenser, between bottom radiator core support and bumper.
7. Installation is in the reverse order of removal.

Confirm that the condenser lower mounting rubber is securely set in the existing hole of the radiator core support.

Cooling Unit

REMOVAL AND INSTALLATION

1. Discharge refrigerant from system.
2. Disconnect connectors from cooling unit.



3. For vehicles with factory installed air conditioner, cut instrument panel. (Cut and discard)
4. Remove cooling unit fixing bolts.
5. Remove cooling unit.
6. Installation is in the reverse order of removal.

Performance Chart

TEST CONDITION

Testing must be performed as follows:

Vehicle location:	Indoors or in the shade (in a well ventilated place)
Doors:	Closed
Door window:	Open
Hood:	Open
TEMP. lever position:	Max. COLD
Air control lever position:	(Ventilation)
INTAKE lever position:	(Recirculation)
FAN lever position:	4
Engine speed:	1,500 rpm
Time required before starting testing after air conditioner starts operating:	More than 10 minutes

TEST READING

All models

Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
40 - 60	20 (68)	4.8 - 7.0 (41 - 45)
	25 (77)	9.0 - 11.8 (48 - 53)
	30 (86)	13.6 - 16.8 (56 - 62)
	35 (95)	18.8 - 22.0 (66 - 72)
60 - 80	20 (68)	7.0 - 9.4 (45 - 49)
	25 (77)	11.8 - 14.4 (53 - 58)
	30 (86)	16.8 - 20.0 (62 - 68)
	35 (95)	22.0 - 26.0 (72 - 79)

Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (kg/cm^2, psi)	Low-pressure (Suction side) kPa (kg/cm^2, psi)
Relative humidity %	Air temperature °C (°F)		
40 - 80	25 (77)	1,079 - 1,295 (11.0 - 13.2, 156 - 188)	137 - 196 (1.4 - 2.0, 20 - 28)
	30 (86)	1,285 - 1,520 (13.1 - 15.5, 186 - 220)	186 - 245 (1.9 - 2.5, 27 - 36)
	35 (95)	1,510 - 1,775 (15.4 - 18.1, 219 - 257)	235 - 314 (2.4 - 3.2, 34 - 46)
	40 (104)	1,755 - 2,059 (17.9 - 21.0, 255 - 299)	304 - 392 (3.1 - 4.0, 44 - 57)

Checking and Adjusting

The oil used to lubricate the compressor is circulating with the refrigerant.
Whenever replacing any component of the system or a large amount of gas leakage occurs, add oil to maintain the original amount of oil.

OIL CAPACITY

Unit: mℓ (US fl oz, Imp fl oz)

Applied model	NVR 140S	DKV-14C
Capacity Total in system	200 (6.8, 7.0)	
Amount of oil which can be drained	Approx. 100 (3.4, 3.5)*	70 - 120 (2.4 - 4.1, 2.5 - 4.2)*
Compressor (Service parts) charging amount	200 (6.8, 7.0)	

*: All oil cannot be drained from system.

OIL RETURN OPERATION

Before checking and adjusting oil level, operate compressor at engine idling speed, with controls set for maximum cooling and high blower speed, for 20 to 30 minutes in order to return oil to compressor

CHECKING AND ADJUSTING FOR USED COMPRESSOR

1. After oil return operation, stop the engine and discharge refrigerant and then remove compressor from the vehicle.
2. Drain compressor oil from compressor discharge port and measure the amount.

Oil is sometimes hard to extract when compressor is cooled. Remove oil while compressor is warm [maintained to 40 to 50°C (104 to 122°F)].

3. If the amount is less than 90 mℓ (3.0 US fl oz, 3.2 Imp fl oz) for NVR 140S or 70 mℓ (2.4 US fl oz, 2.5 Imp fl oz) for DKV-14C, some refrigerant may have leaked out. Conduct leak tests on connections of each system, and if necessary, repair or replace malfunctioning parts.
4. Check the purity of the oil and then adjust oil level following the procedure below.
   (a) When oil is clean;

Unit: mℓ (US fl oz, Imp fl oz)

Amount of oil drained		Adjusting procedure
NVR 140S	DKV-14C	
Above 90 (3.0, 3.2)*	Above 70 (2.4, 2.5)*	Oil level is right. Pour in same amount of oil as was drained out.
Below 90 (3.0, 3.2)	Below 70 (2.4, 2.5)	Oil level may be low. Pour in 90 mℓ (3.0 US fl oz, 3.2 Imp fl oz) of oil for NVR 140S or 70 mℓ (2.4 US fl oz, 2.5 Imp fl oz) for DKV-14C.

*: If amount of oil drained is much greater than under normal circumstances, flush air conditioner system with refrigerant. Then pour in 200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil into air conditioner system.

   (b) When oil contains chips or other foreign material;
   After air conditioner system has been flushed with refrigerant, replace receiver drier. Then pour in 200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil into air conditioner system.

CHECKING AND ADJUSTING FOR COMPRESSOR REPLACEMENT

200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged in compressor (service parts). So it is necessary to drain the proper amount of oil from new compressor. Follow the procedure below.

1. After oil return operation, drain compressor oil from used compressor and measure the amount.
   (It is the same procedure as CHECKING AND ADJUSTING FOR USED COMPRESSOR.)

Checking and Adjusting (Cont'd)

2. Check the purity of the oil and then adjust oil level following the procedure below.

For NVR 140S

(a) When oil is clean;

Unit: mℓ (US fl oz, Imp fl oz)

Amount of oil drained from used compressor	Draining amount of oil from new compressor
Above 90 (3.0, 3.2)*	200 (6.8, 7.0) – [Amount of oil drained + 20 (0.7, 0.7)]
Below 90 (3.0, 3.2)	90 (3.0, 3.2)

*: If amount of oil drained is greater than under normal circumstances, flush air conditioner system with refrigerant. Then install new compressor [200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged compressor service parts.].

Example:

Unit: mℓ (US fl oz, Imp fl oz)

Amount of oil drained from used compressor	Draining amount of oil from new compressor
110 (3.7, 3.9)	70 (2.4, 2.5)
70 (2.4, 2.5)	90 (3.0, 3.2)

(b) When oil contains chips or foreign material; After air conditioner system has been flushed with refrigerant, replace receiver drier. Then install new compressor [200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged in compressor service parts.].

For DKV-14C

(a) When oil is clean;

Unit: mℓ (US fl oz, Imp fl oz)

Amount of oil drained from used compressor	Draining amount of oil from new compressor
Above 70 (2.4, 2.5)*	200 (6.8, 7.0) – [Amount of oil drained + 20 (0.7, 0.7)]
Below 70 (2.4, 2.5)	110 (3.7, 3.9)

*: If amount of oil drained is greater than under normal circumstances, flush air conditioner system with refrigerant. Then install new compressor [200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged in compressor service parts.]

Example: Unit: mℓ (US fl oz, Imp fl oz)

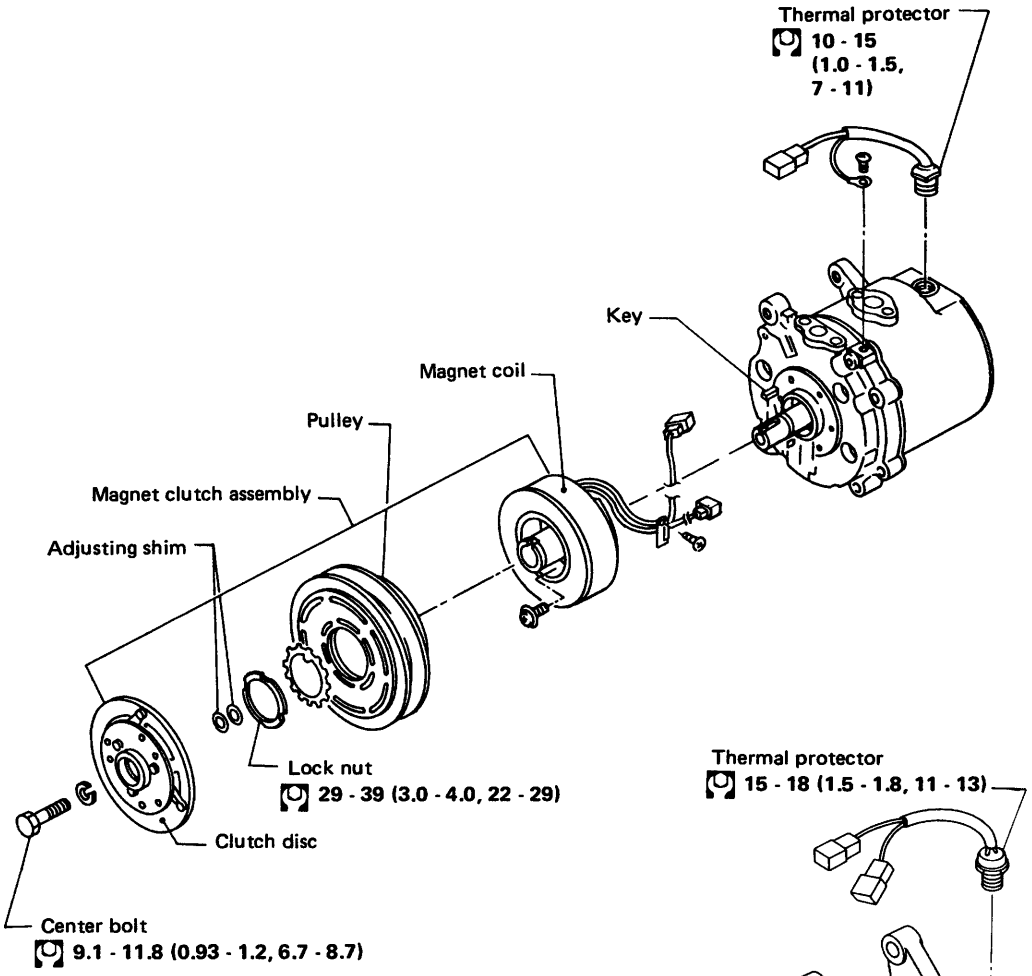
Amount of oil drained from used compressor	Draining amount of oil from new compressor
90 (3.0, 3.2)	90 (3.0, 3.2)
50 (1.7, 1.8)	110 (3.7, 3.9)

(b) When oil contains chips or foreign material; After air conditioner system has been flushed with refrigerant, replace receiver drier. Then install new compressor [200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged in compressor service parts.].

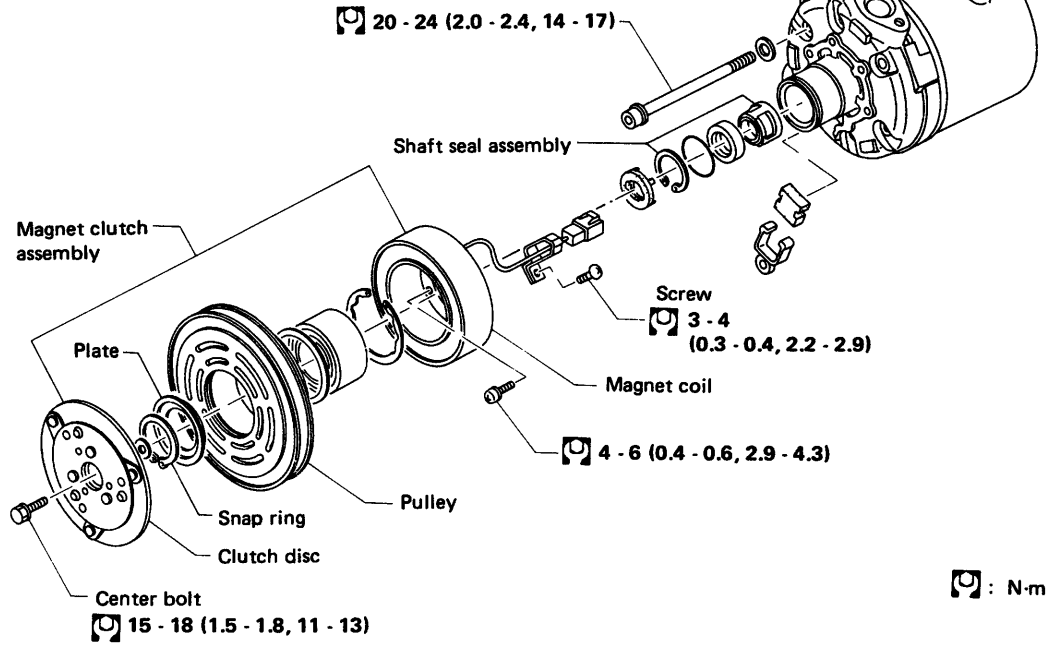
Precautions

- Plug all openings to prevent moisture and foreign matter from entering.
- Do not leave compressor on its side or upside down for more than 10 minutes.
- When replacing or repairing compressor, check compressor oil level in system.
- When replacing with a new compressor, drain specified oil from new compressor. Refer to COMPRESSOR OIL.
- Be sure there is no oil or dirt on frictional surface of clutch disc and pulley.
- When replacing compressor clutch, be careful not to scratch shaft or bend pulley.
- When replacing compressor clutch assembly, do not forget BREAK-IN OPERATION.
- When storing a compressor, be sure to fill it with refrigerant to prevent rust formation. Add refrigerant at the low-pressure side and purge air at the high-pressure side, while rotating shaft by hand.

Model NVR 140S (ATSUGI make)

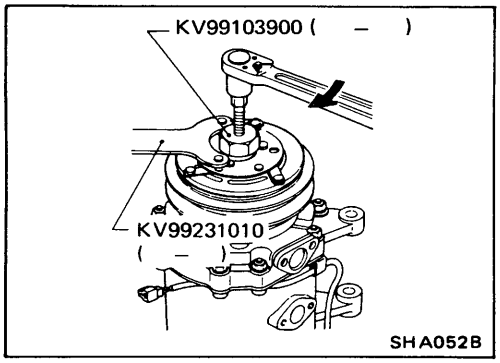


Model DKV-14C (DIESEL-KIKI make)



: N·m (kg-m, ft-lb)

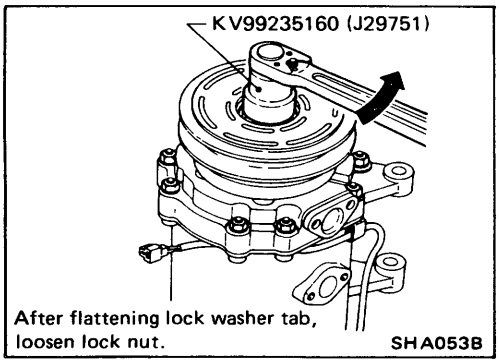
RHA925A



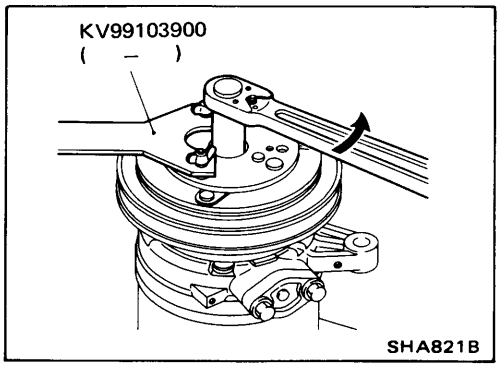
Compressor Clutch

REMOVAL [Model NVR 140S (ATSUGI make)]

- When removing center bolt, hold clutch disc with clutch disc wrench.
- Using clutch disc puller, clutch disc can be removed.

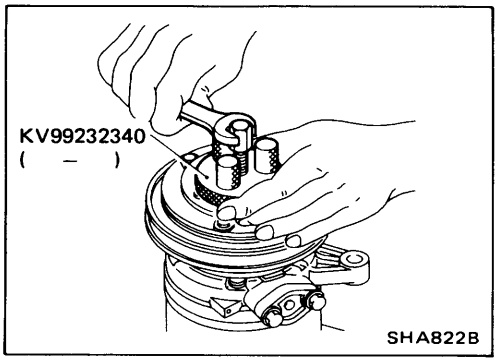


- Bend down pawl of lock washer.
- When removing pulley, remove lock nut with nut wrench.

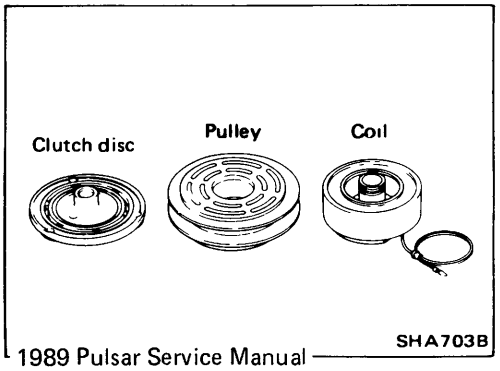


REMOVAL [Model DKV-14C (DIESEL-KIKI make)]

- When removing center bolt, hold clutch disc with clutch disc wrench.



- Using clutch disc puller clutch disc can be removed easily.



INSPECTION

Clutch disc

If the contact surface shows signs of damage due to excessive heat, the clutch disc and pulley should be replaced.

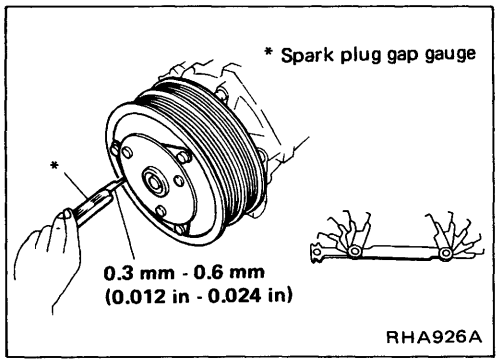
Pulley

Check the appearance of the pulley assembly. If the contact surface of the pulley shows signs of excessive grooving due to slippage, both the pulley and clutch disc should be replaced. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.

Coil

Check coil for loose connection or cracked insulation.

Compressor Clutch (Cont'd)



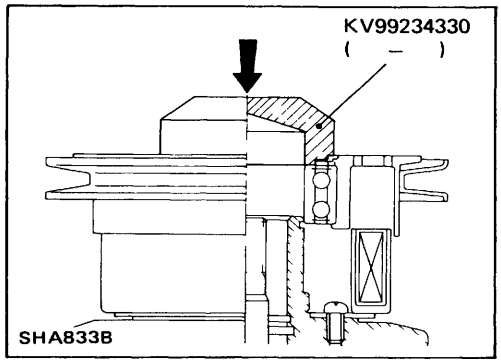
ADJUSTMENT [Model NVR 140S (ATSUGI make)]

- When assembling clutch disc, adjust disc-to-pulley clearance with shims.

BREAK-IN OPERATION [Model NVR 140S (ATSUGI make)]

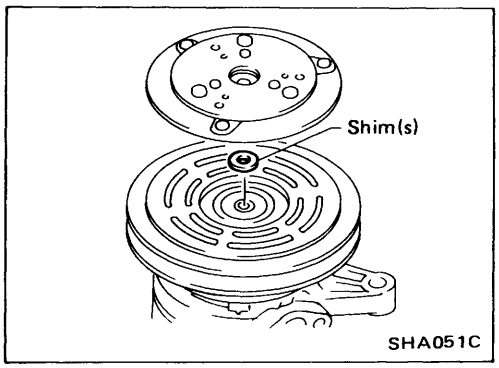
When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch about thirty times.

Break-in operation raises the level of transmitted torque.



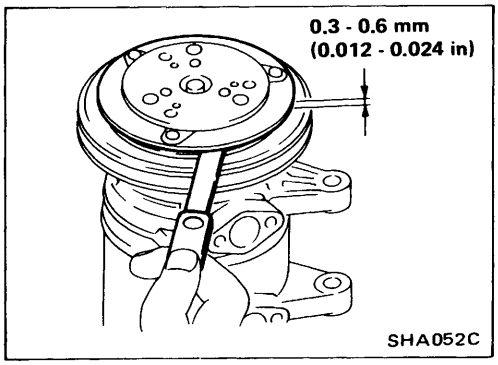
INSTALLATION [Model DKV-14C (DIESEL-KIKI make)]

- Press pulley assembly onto the neck of coil assembly using pulley installer.
- Wipe oil thoroughly off the clutch surface.



ADJUSTMENT [Model DKV-14C (DIESEL-KIKI make)]

- Select adjusting shim(s) which give(s) the correct clearance between pulley and clutch disc.
- Using a plastic mallet, tape clutch disc in place on drive shaft.
- Do not use excessive force with a plastic mallet or in a press, or internal damages may result.
- Place spring washer and center bolt onto drive shaft. Tighten center bolt to drive clutch wheel onto drive shaft.



- Check clearance around the entire periphery of clutch disc.

  Disc-to-pulley clearance:

  0.3 - 0.6 mm (0.012 - 0.024 in)

  If the specified clearance is not obtained, replace adjusting spacer and readjust.

BREAK-IN OPERATION [Model DKV-14C (DIESEL-KIKI meke)]

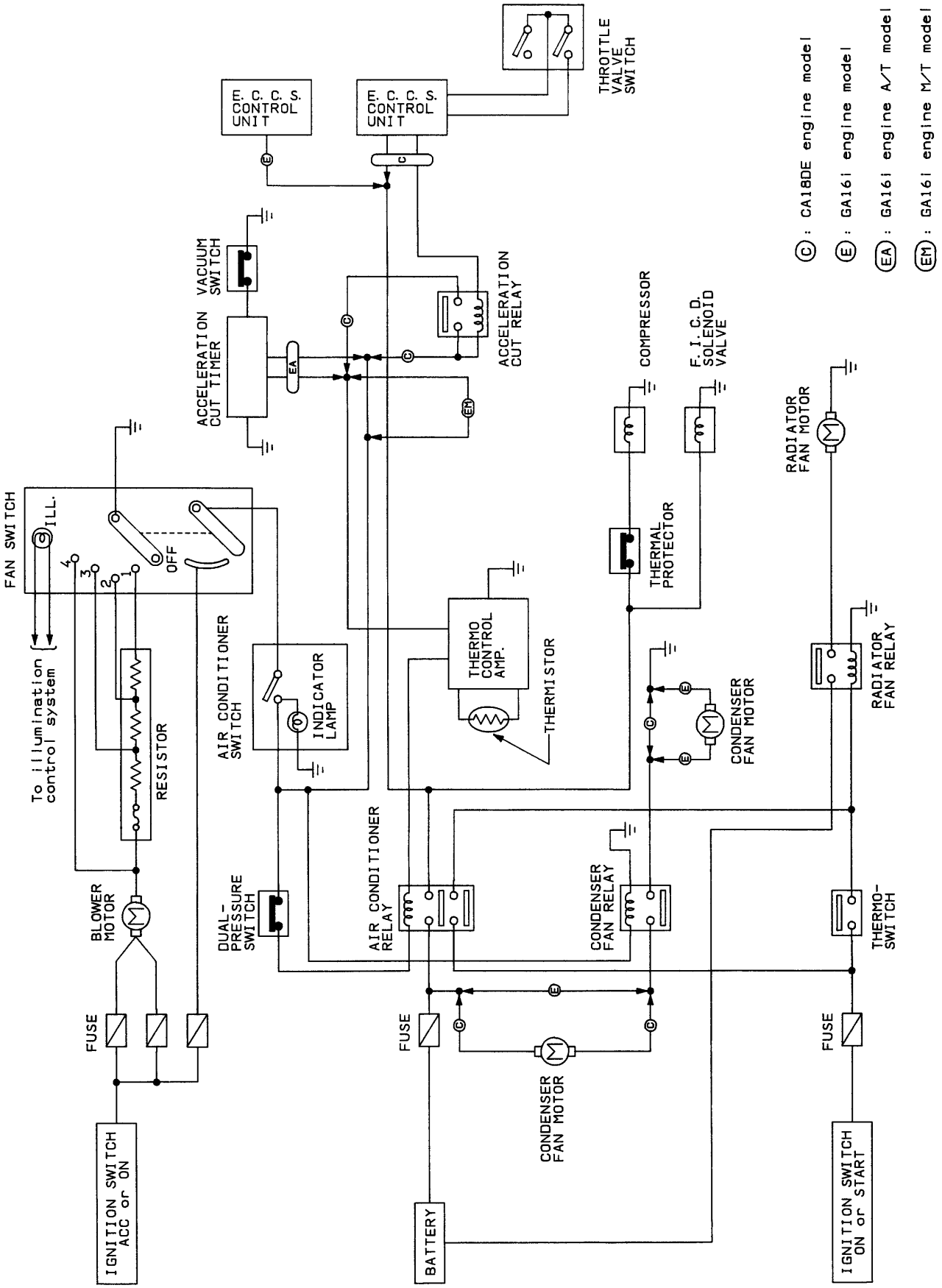
When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch about thirty times. Break-in operation raises the level of transmitted torque.

Thermal Protector

INSPECTION

- When servicing, do not allow foreign matter to get into compressor.
- Check continuity between two terminals.

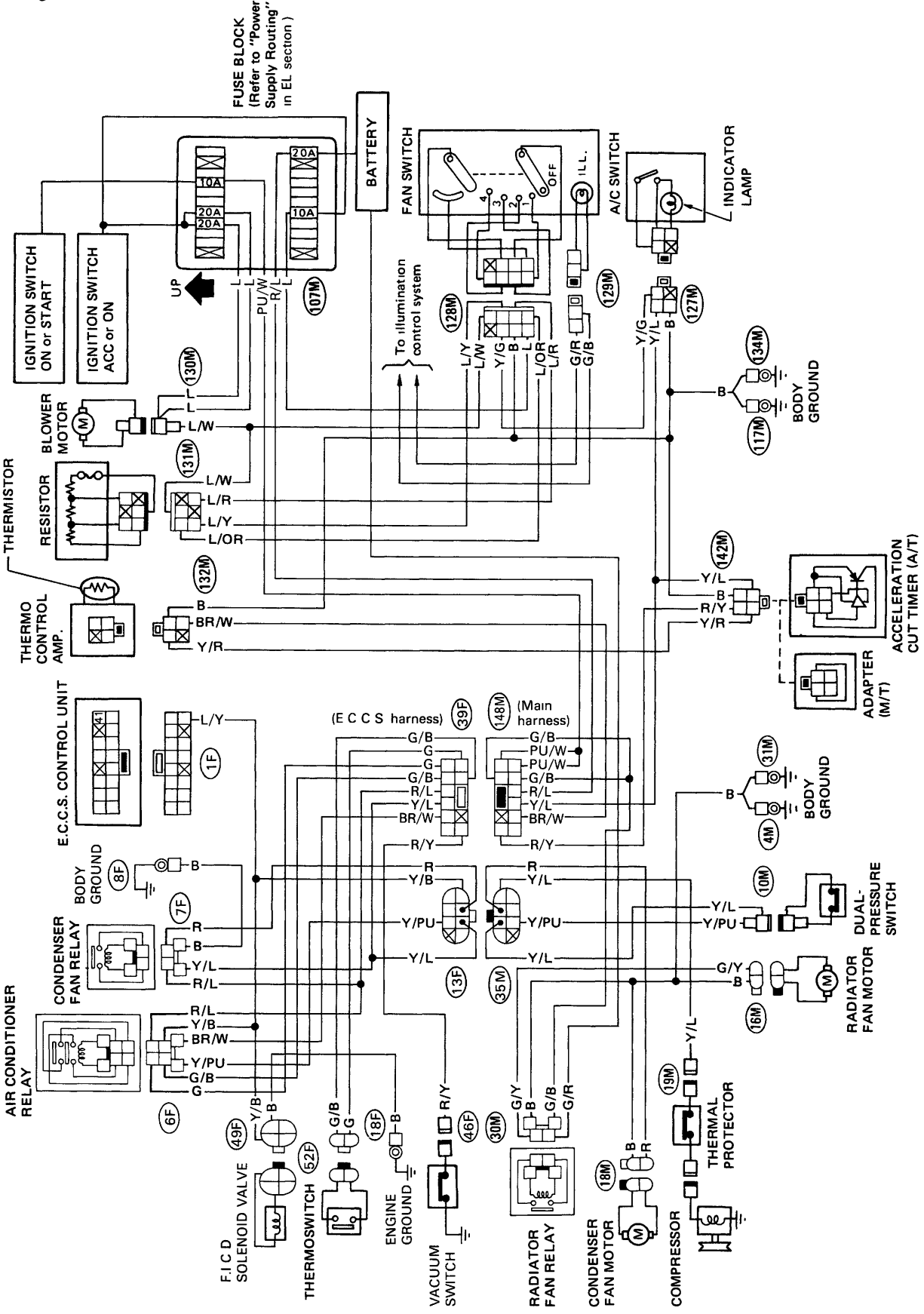
Schematic



SHA107C

Wiring Diagram

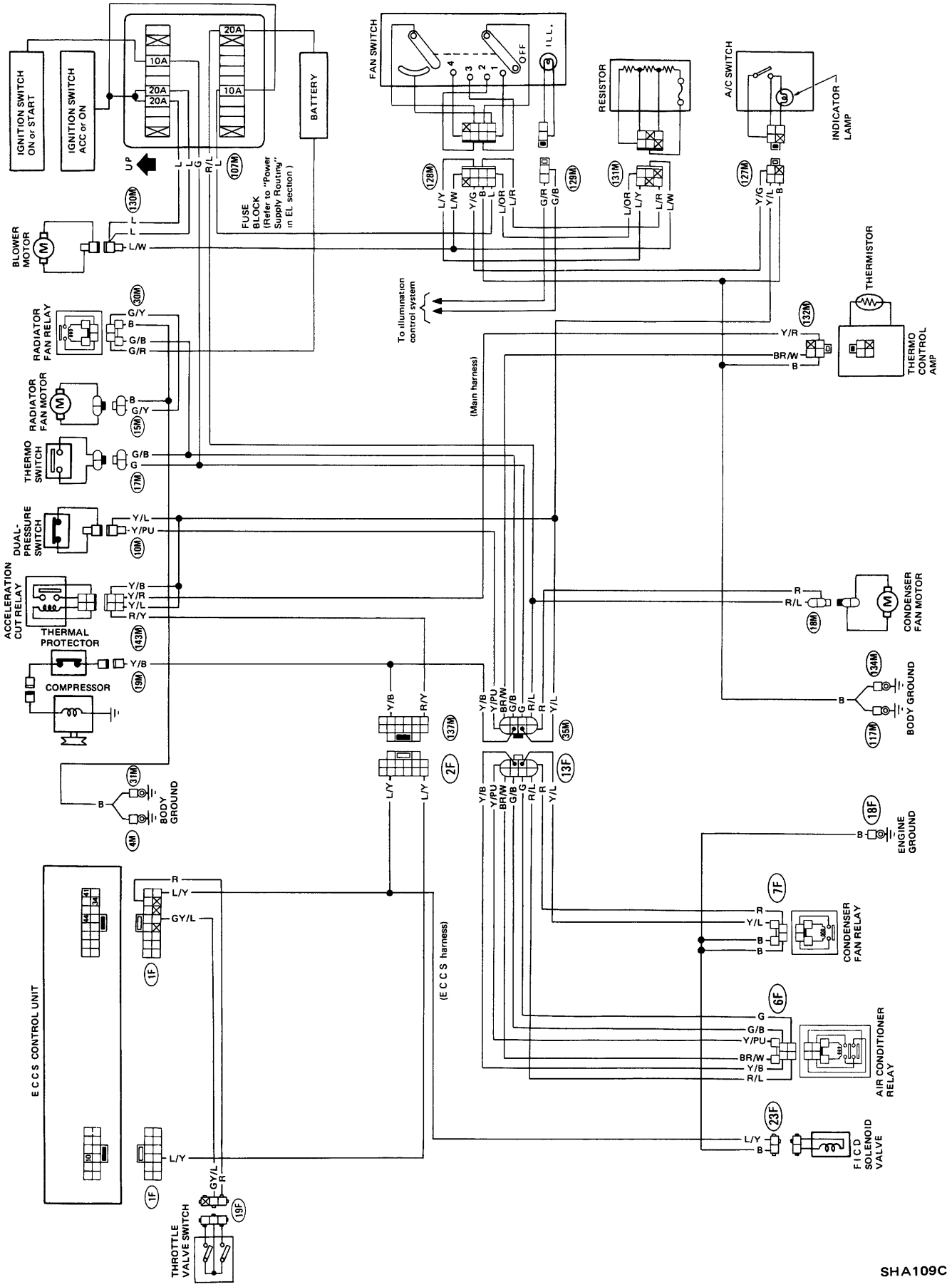
GA16i engine model



SHA108C

Wiring Diagram (Cont'd)

CA18DE engine model



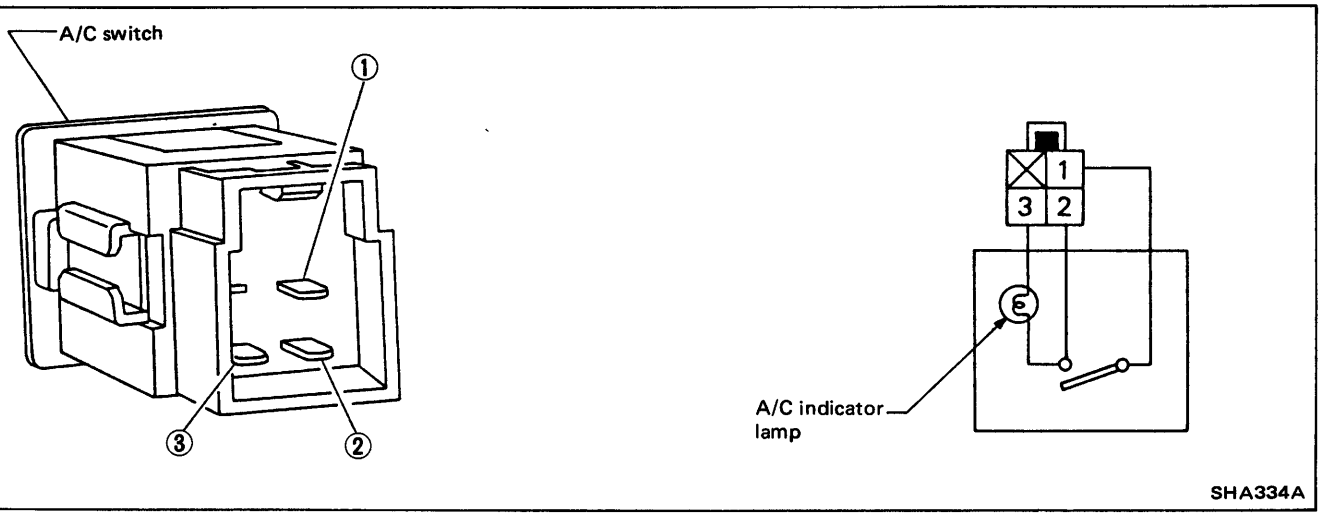
SHA109C

Inspection

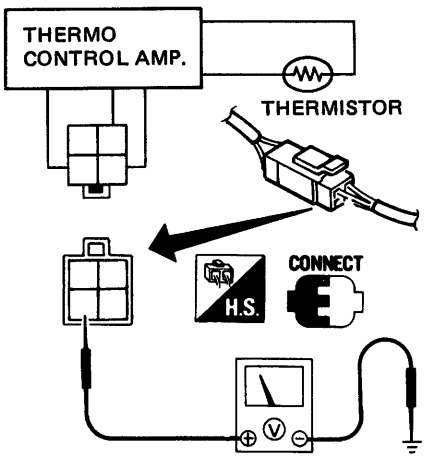
FAN SWITCH

Refer to HA-6.

A/C SWITCH



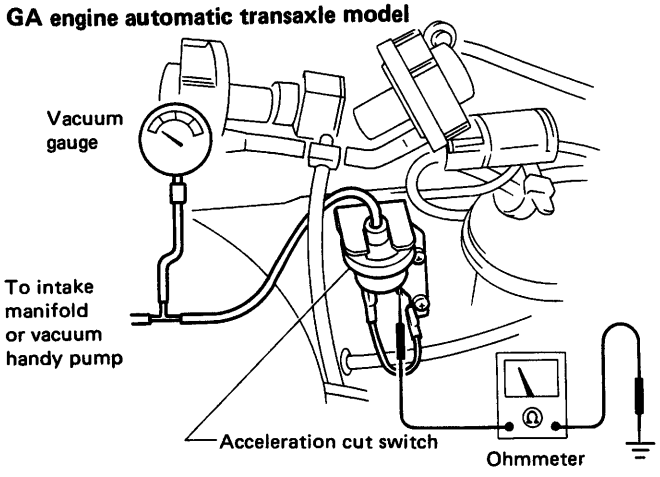
THERMO CONTROL AMP.



Evaporator outlet air temperatoure °C (°F)	Thermo amp. operation	Tester
Decreasing to 0.1 - 0.9 (32 - 34)	Turn OFF	Approx. 12V
Increasing to 2.5 - 3.5 (37 - 38)	Turn ON	Approx. 0V

SHA946B

ACCELERATION CUT SWITCH



Pressure	Above –1.3 kPa (–10 mmHg, –0.39 inHg)	Below –22.7 kPa (–170 mmHg, –6.69 inHg)
Switch	ON	OFF

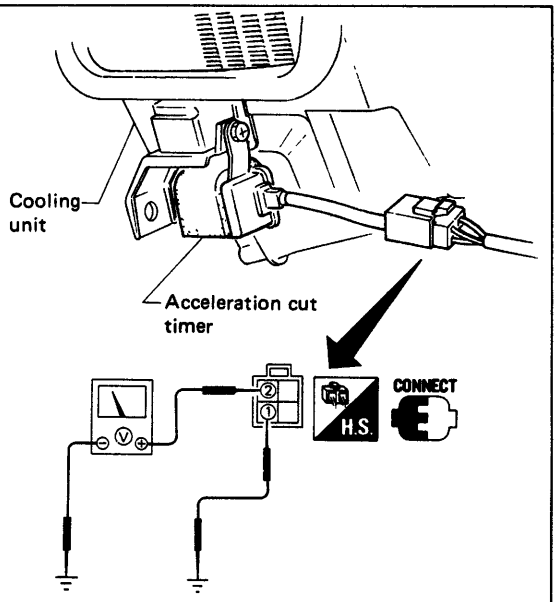
RHA504A

Inspection (Cont'd)

ACCELERATION CUT TIMER

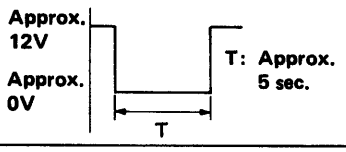
GA16i engine automatic transaxle model

1. Start engine and air conditioning is ON.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal ② and body ground when connecting terminal ① and body ground with a jumper cable.



Specification of terminal ②

- Voltmeter indicates approx. 0V for approx. 5 seconds after connecting terminal ① and body ground.

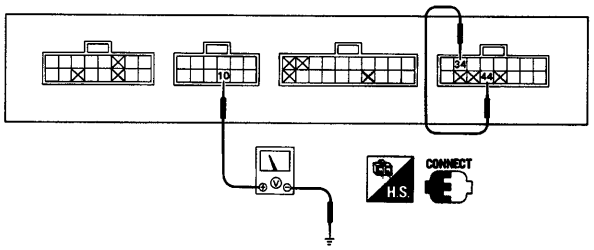


CA18DE engine model

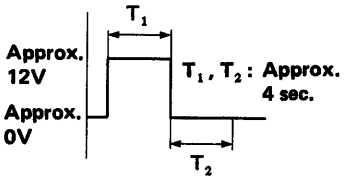
1. Start engine and air conditioning is ON.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal ⑩ and body ground when connecting terminals ㉞ and ㊹ with a jumper cable.

- Voltmeter indicates approx. 12V for approx. 4 seconds (T_1) after connecting terminal ㉞ and ㊹.

If terminals ㉞ and ㊹ are connected again for approx. 4 seconds (T_2), voltmeter will not indicate approx. 12V but indicates approx. 0V.

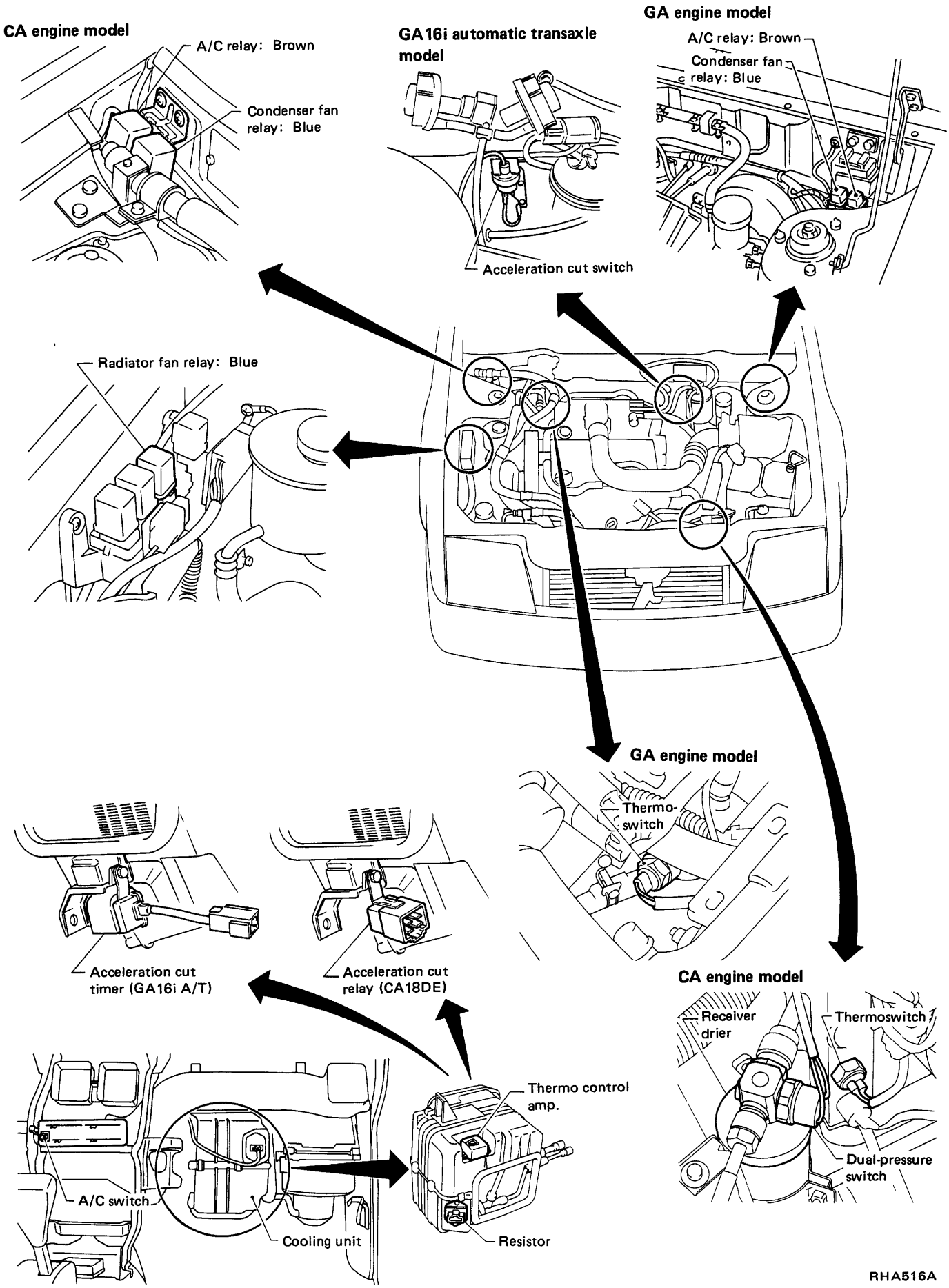


Specification of terminal ⑩



SHA975B

A/C COMPONENT LAYOUT



RHA516A

General Specifications

COMPRESSOR

Model	ATSUGI make NVR 140S	DIESEL KIKI make DKV -14C	ATSUGI make NVR 140S
Engine	GA16i		CA18DE
Type	Vane rotary		
Displacement cm^3 (cu in)/rev.	140 (8.54)		
Direction of rotation	Clockwise (Viewed from drive end)		
Drive belt	Poly V type		

LUBRICATION OIL

Model	NVR 140S	DKV-14C
Type	SUNISO 5GS	
Capacity mℓ (US fl oz, Imp fl oz) Total in system	200 (6.8, 7.0)	
Amount of oil which can be drained	Approx. 100 (3.4, 3.5)	70 - 120 (2.4 - 4.1, 2.5 - 4.2)
Compressor (Service parts) charging amount	200 (6.8, 7.0)	

REFRIGERANT

Type		R-12
Capacity	kg (lb)	0.85 - 0.95 (1.87 - 2.09)

Inspection and Adjustment

ENGINE IDLING SPEED

When A/C is ON (F.I.C.D. is actuated)

: Reference data* Unit: rpm

Transaxle	Engine model GA16i	CA18DE
Manual	900 - 1,100	950 - 1,050
Automatic (At "N" range)		

*: Engine idling speed when A/C is ON depends on idling speed when A/C is OFF.
For idle speed adjustment when A/C is OFF, refer to EF & EC section.

BELT TENSION

Refer to Checking Drive Belts (MA section).

COMPRESSOR

Model	NVR 140S	DKV-14C
Clutch disc-to-pulley clearance mm (in)	0.3 - 0.6 (0.012 - 0.024)	

1989 Pulsar Service Manual
AM89-002 (TS89-014)
Revised: February 1989

Tightening Torque

COMPRESSOR INSTALLATION

	GA engine			CA engine		
	N·m	kg-m	ft-lb	N·m	kg-m	ft-lb
Compressor bracket to cylinder block	25 - 35	2.6 - 3.6	19 - 26	69 - 78	7.0 - 8.0	51 - 58
Compressor to compressor bracket	25 - 35	2.6 - 3.6	19 - 26	44 - 54	4.5 - 5.5	33 - 40
Idler pulley to compressor bracket	16 - 22	1.6 - 2.2	12 - 16	26 - 36	2.7 - 3.7	20 - 27

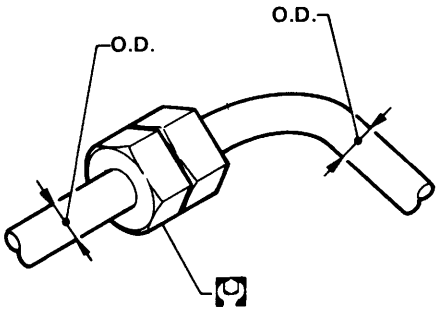
COMPRESSOR

Model	NVR140S		
	N·m	kg-m	ft-lb
Center bolt	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Clutch pulley lock nut	29 - 39	3.0 - 4.0	22 - 29
Thermal protector	10 - 15	1.0 - 1.5	7 - 11

REFRIGERANT LINE

When connecting lines made of different material, basically use the lower tightening torque of the two.

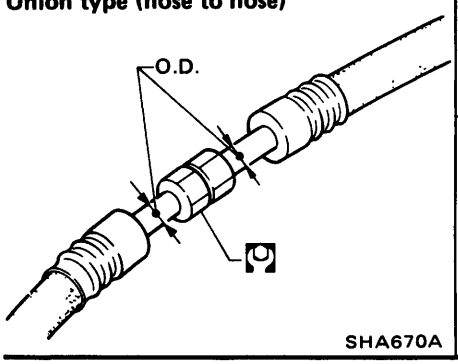
Union type (pipe to pipe)



SHA669A

Pipe O.D. mm (in)	Material					
	Steel or copper			Aluminum		
	N·m	kg-m	ft-lb	N·m	kg-m	ft-lb
6 (1/4)	10 - 20	1.0 - 2.0	7 - 14	–	–	–
8 (5/16)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
10 (3/8)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
12 (1/2)	20 - 29	2.0 - 3.0	14 - 22	15 - 25	1.5 - 2.5	11 - 18
16 (5/8)	25 - 34	2.5 - 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22
19 (3/4)	25 - 34	2.5 - 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22

Union type (hose to hose)

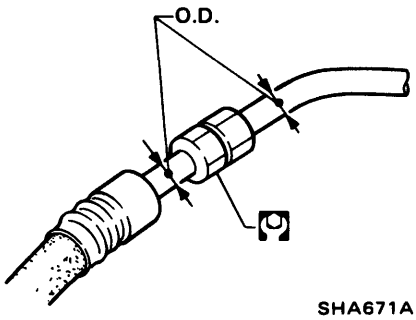


SHA670A

Pipe O.D. mm (in)	Material					
	Steel or copper			Aluminum		
	N·m	kg-m	ft-lb	N·m	kg-m	ft-lb
6 (1/4)	10 - 20	1.0 - 2.0	7 - 14	–	–	–
8 (5/16)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
10 (3/8)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
12 (1/2)	25 - 34	2.5- 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22
16 (5/8)	25 - 34	2.5 - 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22

Tightening Torque (Cont'd)

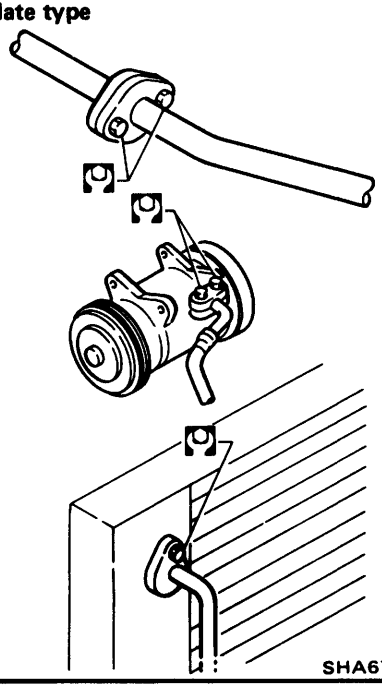
Union type (hose to pipe)



SHA671A

- Use tightening torque for flexible hose.

Plate type


SHA672A

Bolt type				Tightening torque		
Grade	Nominal size	Bolt diameter mm	Pitch mm	N·m	kg-m	ft-lb
4T	M6	6.0	1.0	3 - 4	0.3 - 0.4	2.2 - 2.9
	M8	8.0	1.25	8 - 11	0.8 - 1.1	5.8 - 8.0
	M10	10.0	1.5	16 - 22	1.6 - 2.2	12 - 16
7T	M6	6.0	1.0	6 - 7	0.6 - 0.7	4.3 - 5.1
	M8	8.0	1.25	14 - 18	1.4 - 1.8	10 - 13
	M10	10.0	1.5	25 - 35	2.6 - 3.6	19 - 26

ELECTRICAL SYSTEM

SECTION EL

When you read wiring diagrams:
- Read GI section, "HOW TO READ WIRING DIAGRAMS".

CONTENTS

HARNESS CONNECTOR ..... EL- 2
STANDARDIZED RELAY ..... EL- 3
POWER SUPPLY ROUTING ..... EL- 5
BATTERY ..... EL- 8
STARTING SYSTEM EL-16
STARTING SYSTEM — Starter — EL-18
CHARGING SYSTEM EL-33
CHARGING SYSTEM — Alternator — EL-35
COMBINATION SWITCH EL-44
INSTRUMENT SWITCH EL-45
HEADLAMP EL-47
EXTERIOR LAMP EL-60
INTERIOR LAMP EL-64
METER AND GAUGES EL-66
WARNING LAMPS AND CHIME EL-71
WIPER AND WASHER EL-75
HORN, CIGARETTE LIGHTER AND CLOCK EL-78
REAR WINDOW DEFOGGER EL-79
AUDIO EL-82
LOCATION OF ELECTRICAL UNITS EL-85
HARNESS LAYOUT EL-87
SPECIAL SERVICE TOOL EL-98
SUPER MULTIPLE JUNCTION (S.M.J.) EL-99

EL

WIRING DIAGRAM REFERENCE CHART

E.C.C.S. (Ignition system) ..... EF & EC SECTION
LOCK-UP CONTROL ..... AT SECTION
O.D. CONTROL ..... AT SECTION
ELECTRIC DOOR MIRROR ..... BF SECTION
HEATER AND AIR CONDITIONER ..... HA SECTION

Description

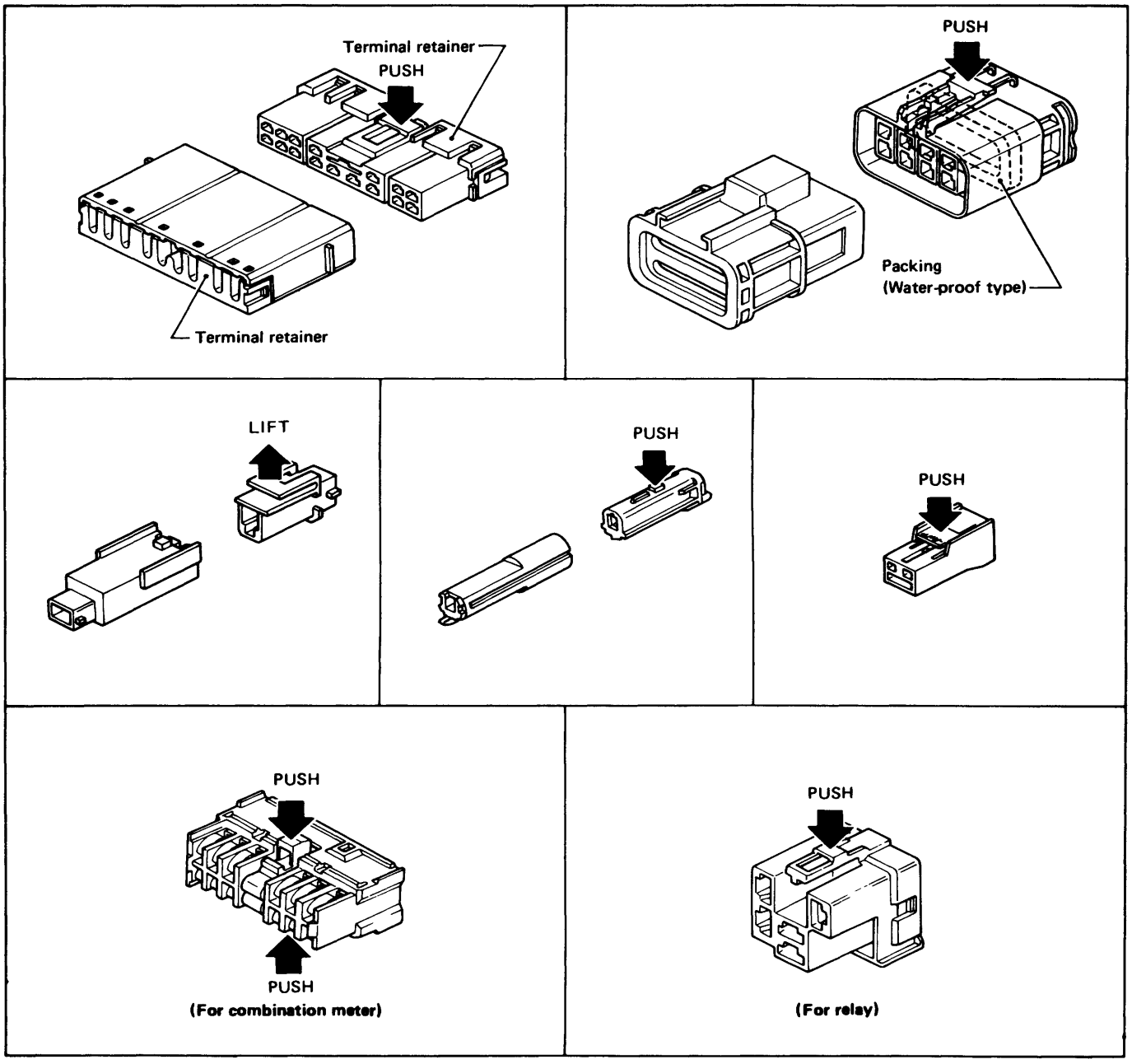
HARNESS CONNECTOR

- All harness connectors have been modified to prevent accidental looseness or disconnection.
- The connector can be disconnected by pushing or lifting the locking section.

CAUTION:

Do not pull the harness when disconnecting the connector.

[Example]

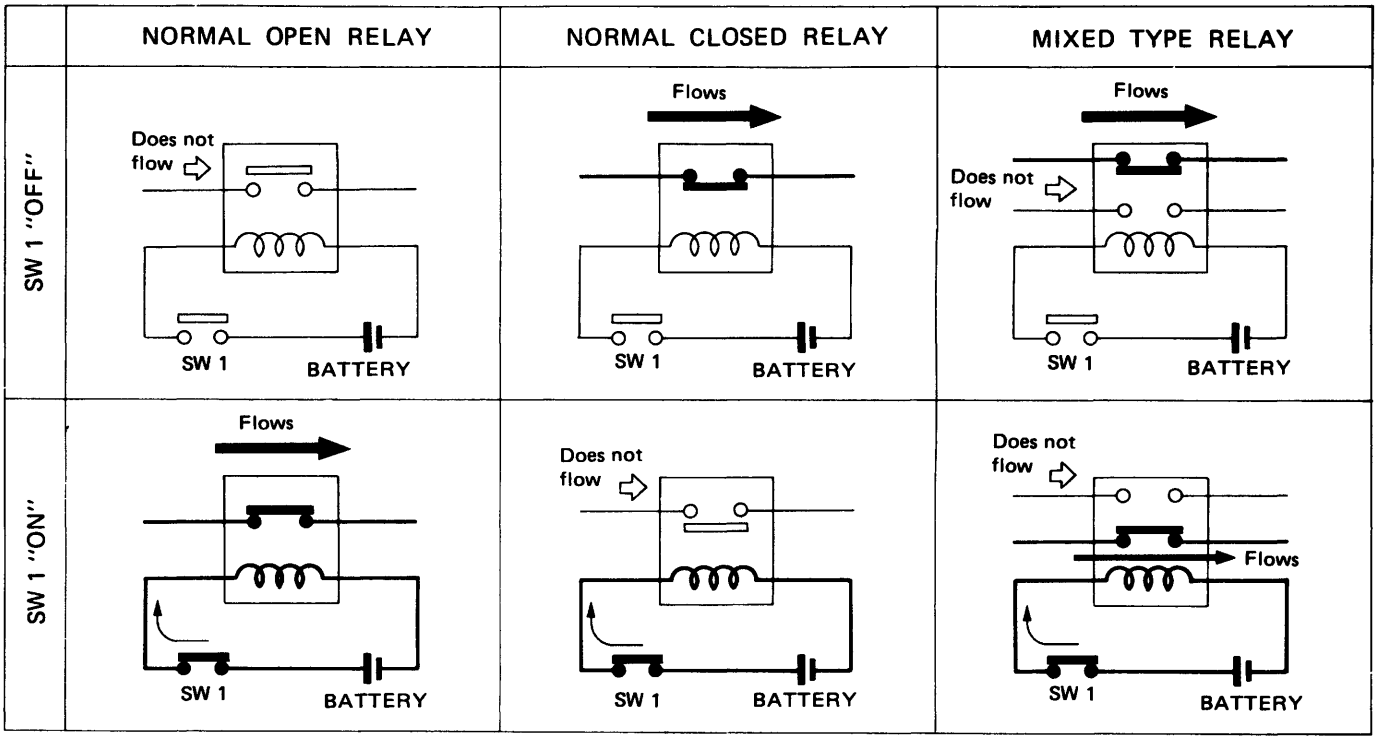


SEL769D

Description

NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

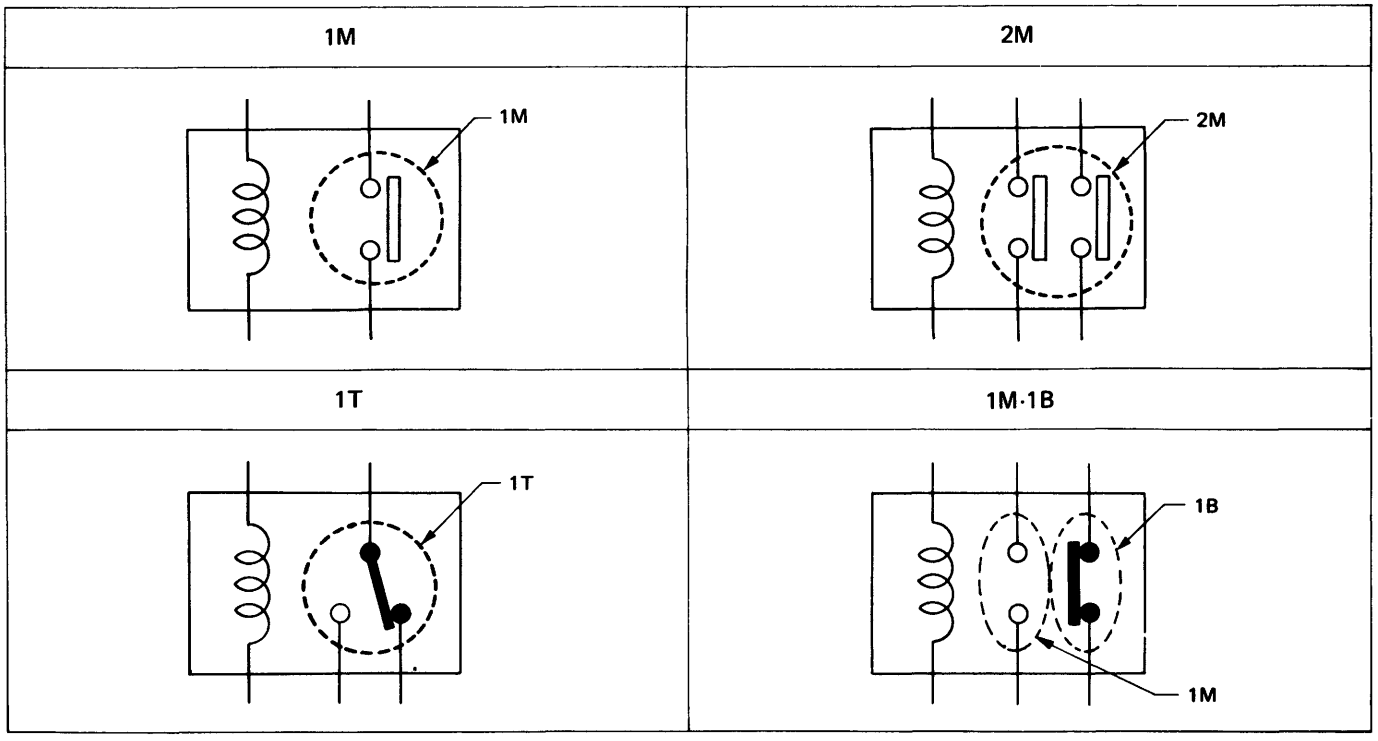
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



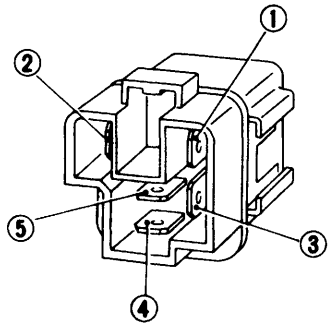
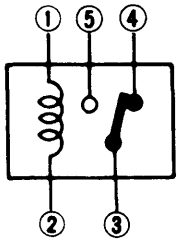
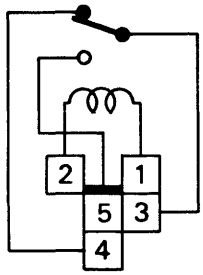
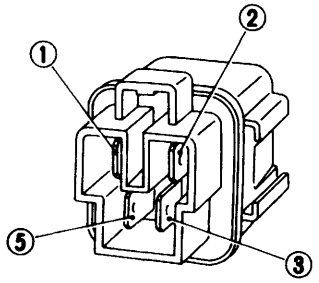
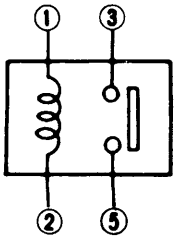
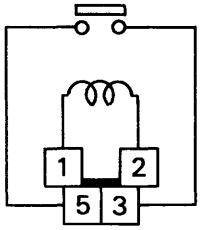
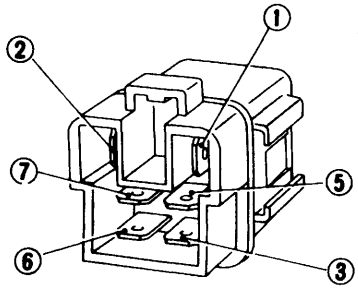
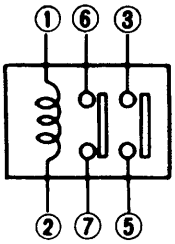
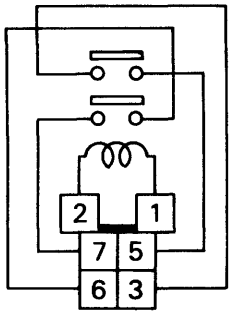
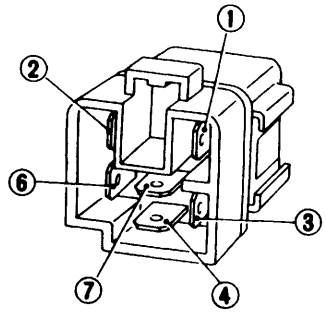
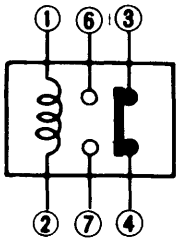
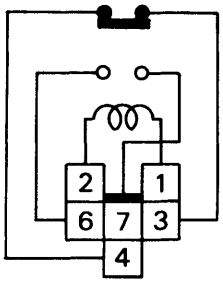
SEL881H

TYPE OF STANDARDIZED RELAYS

1M ..... 1 Make
1T ..... 1 Transfer
2M ..... 2 Make
1M·1B ..... 1 Make 1 Break



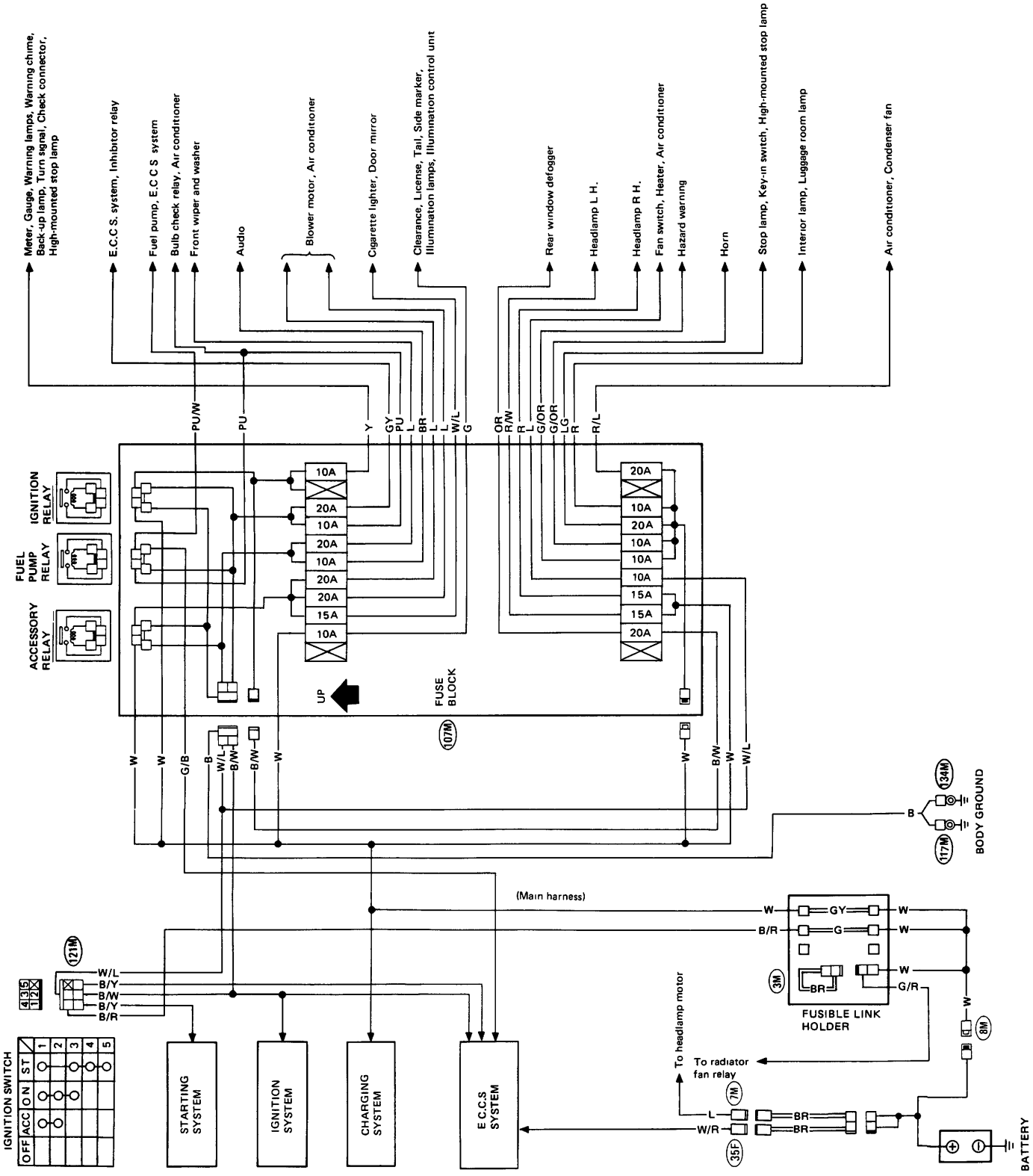
SEL882H

Type	Outer view	Circuit	Connector symbol and connection	Case color
1T				BLACK
1M				BLUE
2M				BROWN
1M·1B				GRAY

SEL883H

Wiring Diagram

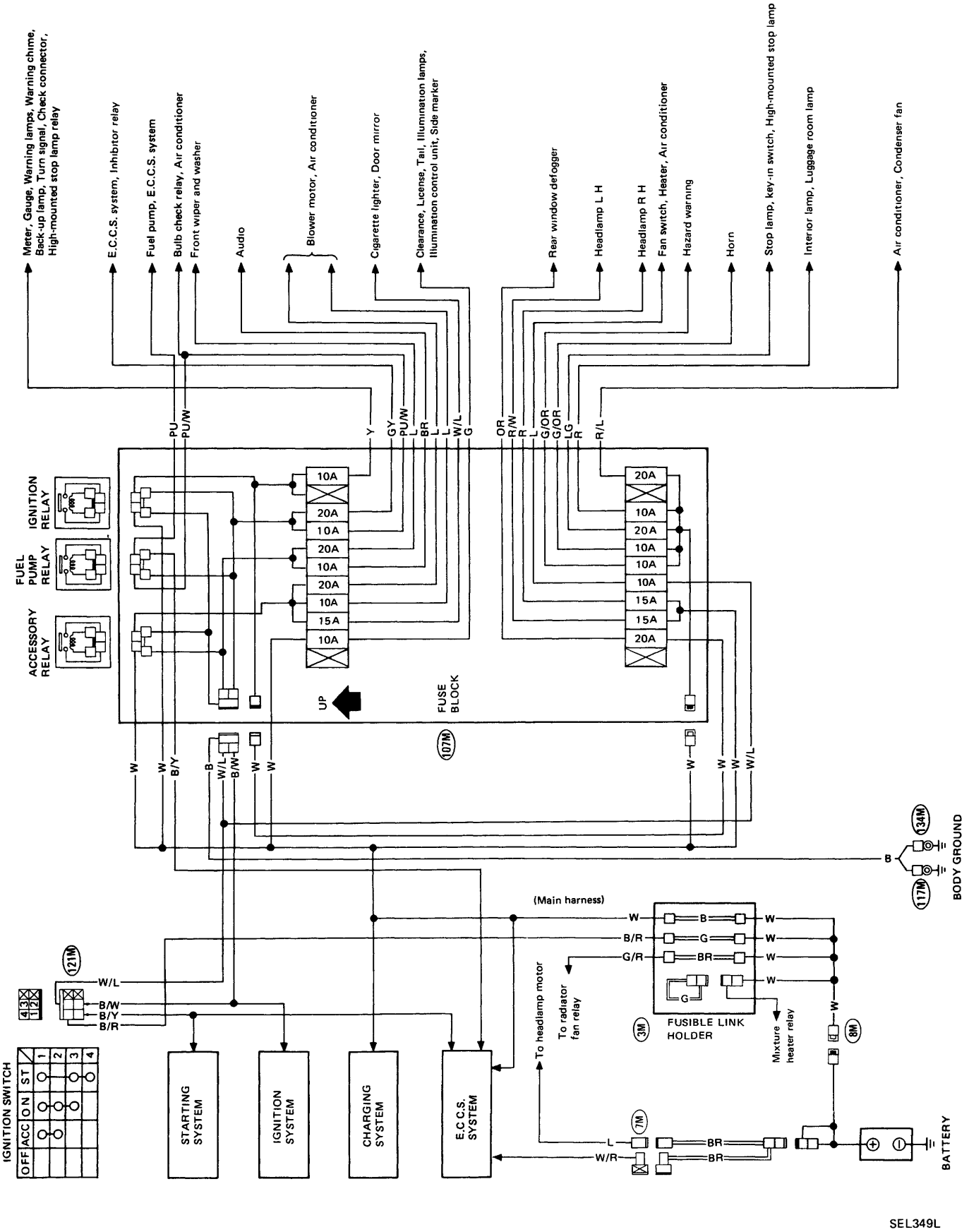
CA18DE ENGINE MODEL



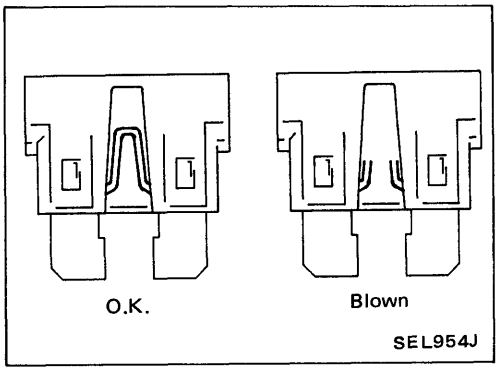
SEL348L

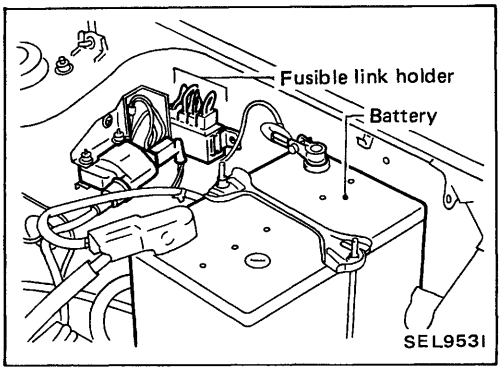
Wiring Diagram (Cont'd)

GA16i ENGINE MODEL



SEL349L





Fuse

a. **If fuse is blown, be sure to eliminate cause of problem before installing new fuse.**
b. **Use fuse of specified rating. Never use fuse of more than specified rating.**
c. **Do not install fuse in oblique direction; always insert it into fuse holder properly.**
d. **Remove fuse for clock if vehicle is not used for a long period of time.**

Fusible Link

A melted fusible link can be detected either by visual inspection or by feeling with finger tip. If its condition is questionable, use circuit tester or test lamp.

CAUTION:

a. **If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.**
b. **Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness or vinyl or rubber parts.**

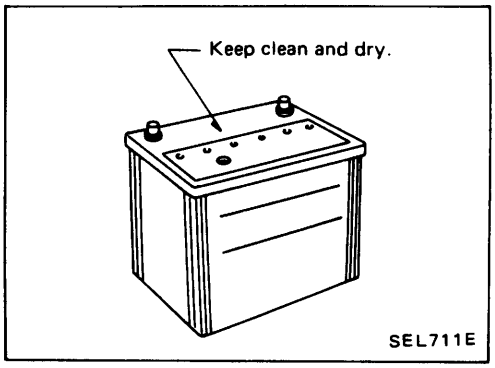
FUSIBLE LINK VARIATION

Color	Maximum amperage (A)
Brown	15
Green	20
Red	30
Black	35
Gray	40

*Temperature condition: Less than 80°C (176°F)

CAUTION:

a. If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
b. After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
c. Never add distilled water through the hole used to check specific gravity.

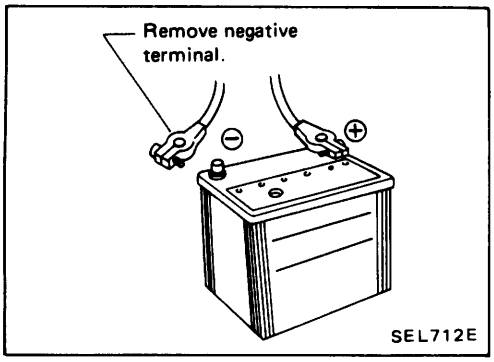


How to Handle Battery

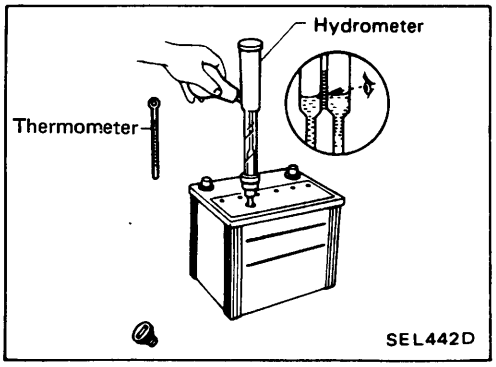
METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

- The battery surface (particularly its top) should always be kept clean and dry.
  If the top surface of a battery is wet with electrolyte or water, leakage current will cause the battery to discharge. Always keep the battery clean and dry.



- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal. (If the vehicle has an extended storage switch, turn it off.)



- Check the charge condition of the battery.
  Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.

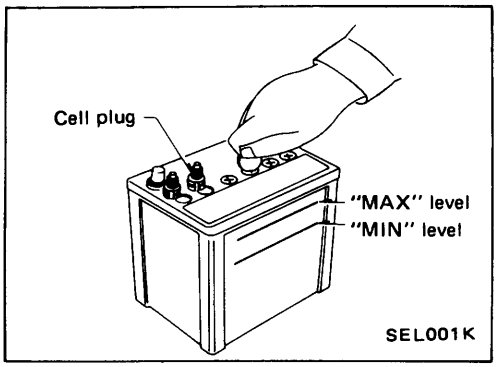
How to Handle Battery (Cont'd)

CHECKING ELECTROLYTE LEVEL

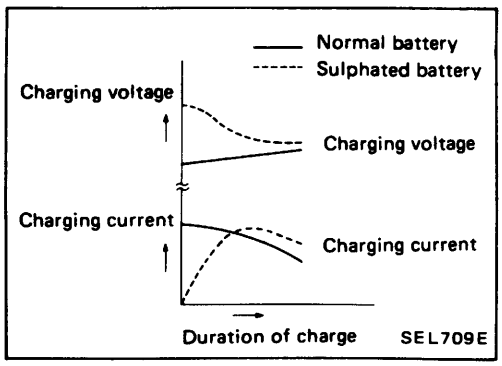
WARNING:

Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If the acid contacts the eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

Normally the battery does not require additional water. However, when the battery is used under severe conditions, adding distilled water may be necessary during the battery life.



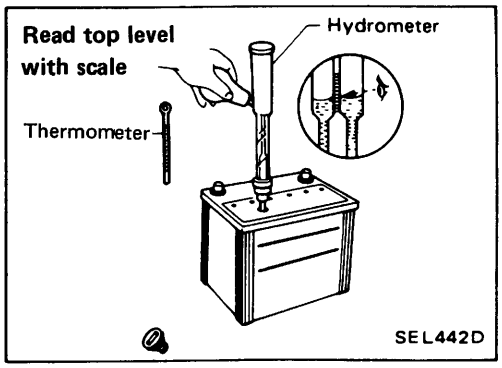
- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



SULPHATION

When a battery has been left unattended for a long period of time and has a specific gravity of less than 1.100, it will be completely discharged, resulting in sulphation on the cell plates.

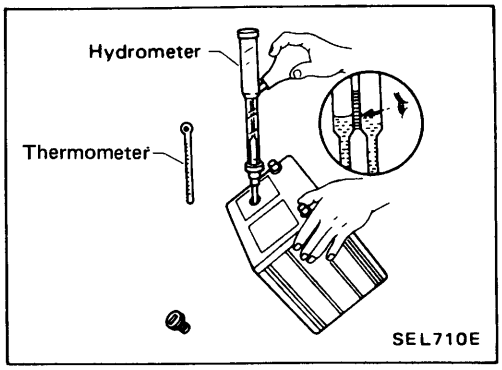
Compared with a battery discharged under normal conditions, the current flow in a "sulphated" battery is not as smooth although its voltage is high during the initial stage of charging, as shown in the figure at the left.



SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.

How to Handle Battery (Cont'd)

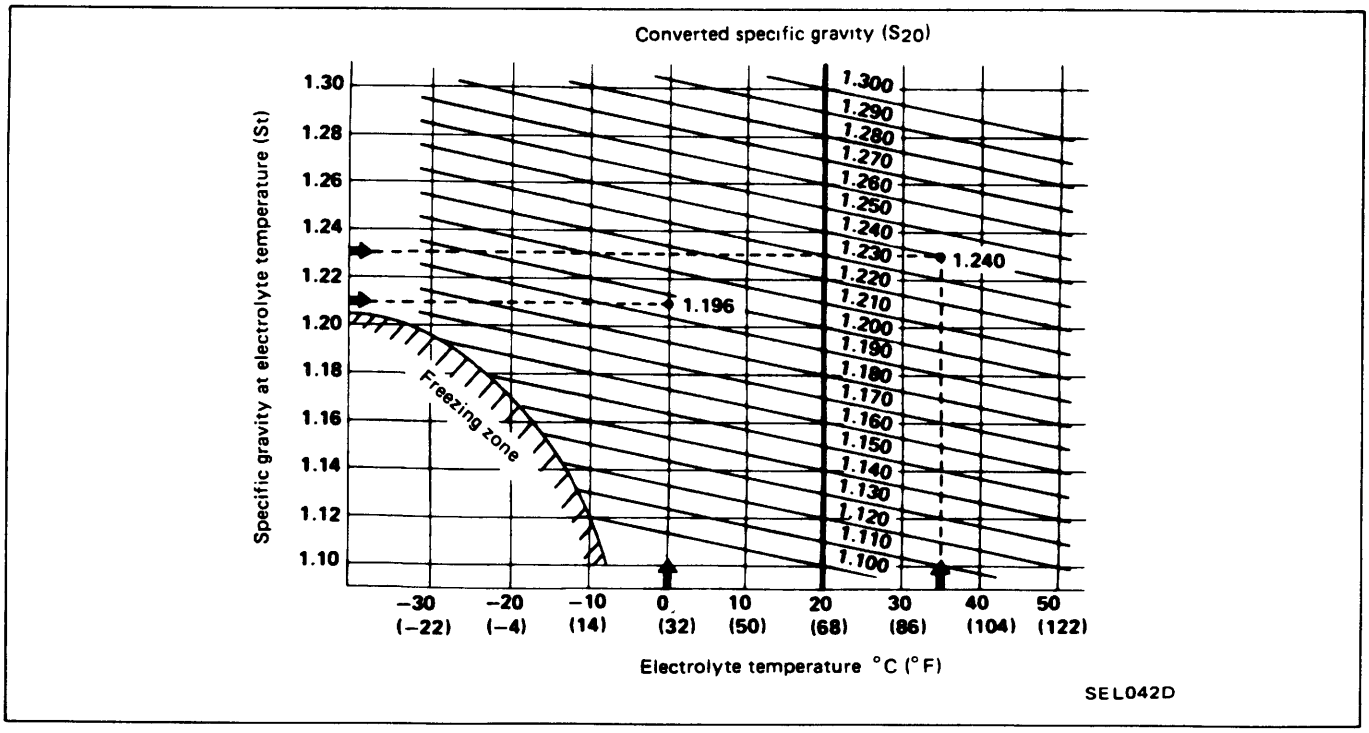


- When electrolyte level is too low, tilt battery case to raise it for easy measurement.

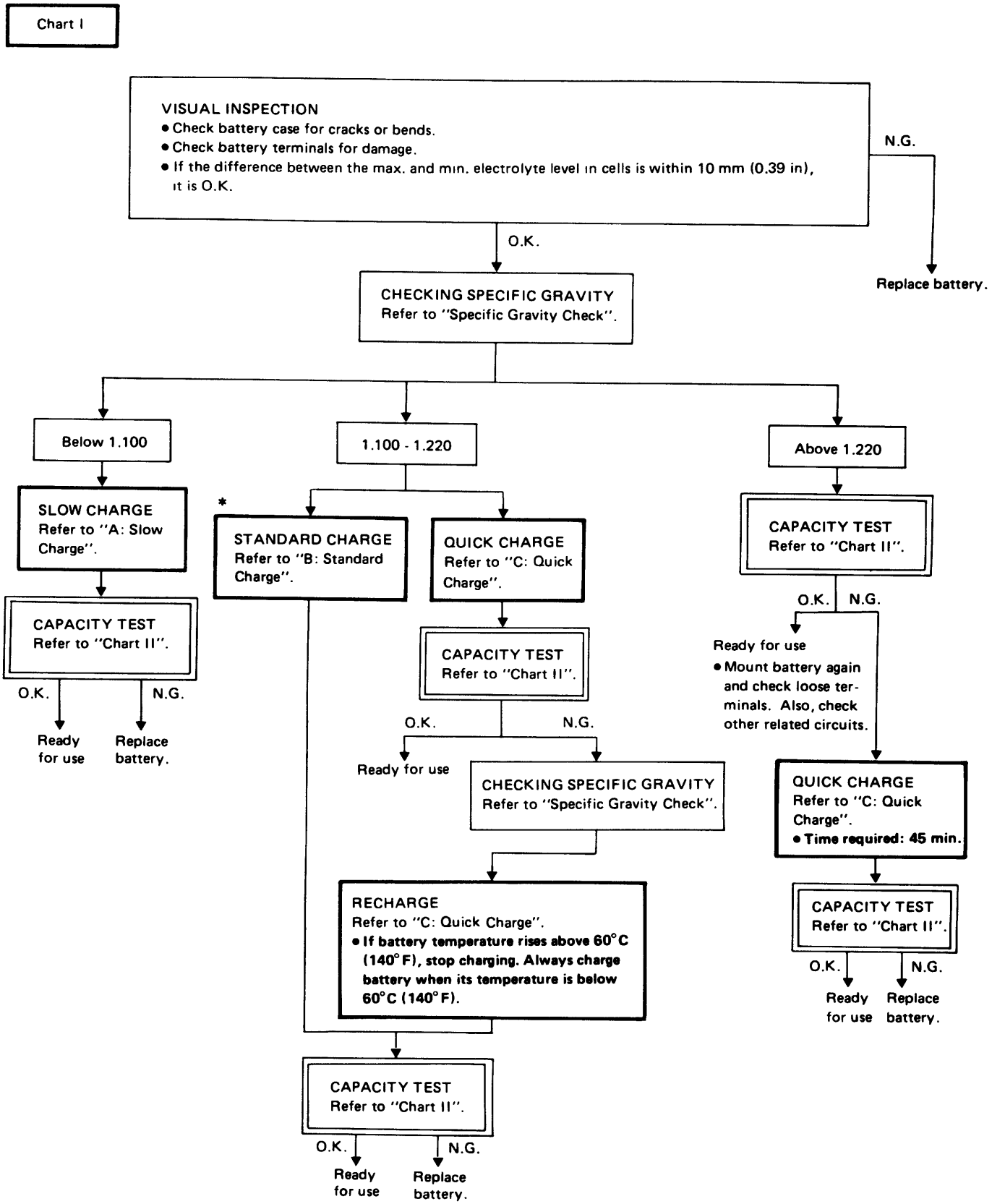
2. Convert into specific gravity at 20°C (68°F).

Example:

- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20°C (68°F) is 1.240.
- When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20°C (68°F) is 1.196.



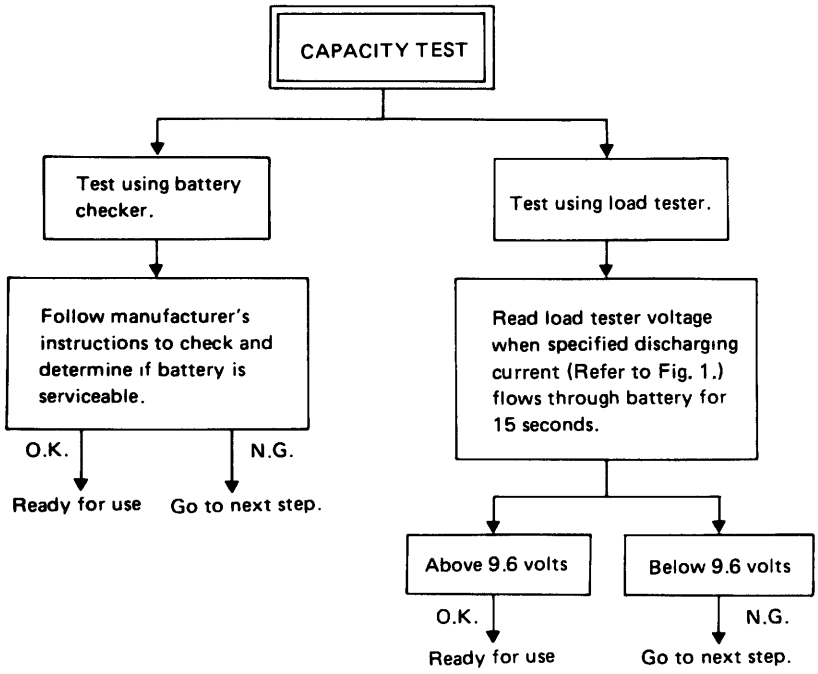
Battery Test and Charging Chart



* "STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.

Battery Test and Charging Chart (Cont'd)

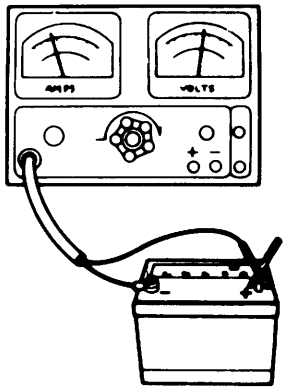
Chart II



- Check battery type and determine the specified current using the following table.

Fig. 1 DISCHARGING CURRENT (Load tester)

Type	Current (A)
28B19R(L)	90
34B19R(L)	99
46B24R(L)	135
55B24R(L)	135
50D23R(L)	150
55D23R(L)	180
65D26R(L)	195
80D26R(L)	195
75D31R(L)	210
95D31R(L)	240
95E41R(L)	300
130E41R(L)	330



SEL697B

Battery Test and Charging Chart (Cont'd)

A: SLOW CHARGE

Determine initial charging current from specific gravity referring to Fig. 2.

- Charge battery.
- Check charging voltage 30 minutes after starting the battery charge.

12 to 15 volts — O.K. → Continue to charge for 12 hours.

Below 12 volts or above 15 volts — N.G. → Replace battery.

CHECKING SPECIFIC GRAVITY
Refer to "Specific Gravity Check".

Conduct additional charge as per Fig 3, if necessary.

Go to "CAPACITY TEST".

Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

BATTERY TYPE / CONVERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L)	50D23R(L) 55D23R(L)	65D26R(L) 80D26R(L)	75D31R(L)	95D31R(L) 95E41R(L)	130E41R(L)
Below 1.100	4.0 (A)	5.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	10.0 (A)	14.0 (A)

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

Fig. 3 ADDITIONAL CHARGE (Slow charge)

Below 1.150	1.150 - 1.200	1.200 - 1.240	Above 1.240
Charge for 5 hours at initial charging current setting.	Charge for 4 hours at initial charging current setting.	Charge for 2 hours at initial charging current setting.	

Go to "CAPACITY TEST".

CAUTION:

a. **Set charging current to value specified in Fig. 2. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
b. **Keep battery away from open flame while it is being charged.**
c. **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
d. **If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).**

Battery Test and Charging Chart (Cont'd)

B: STANDARD CHARGE

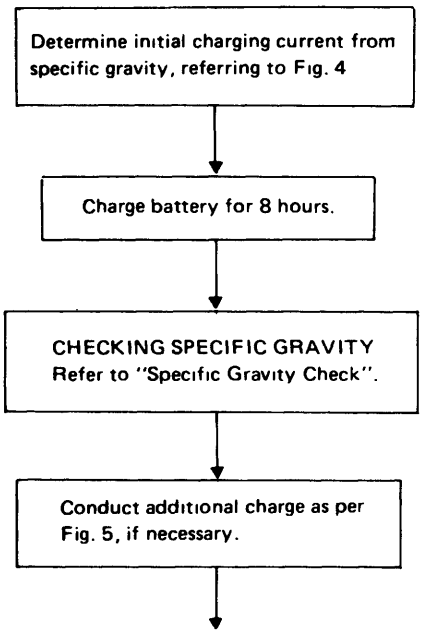
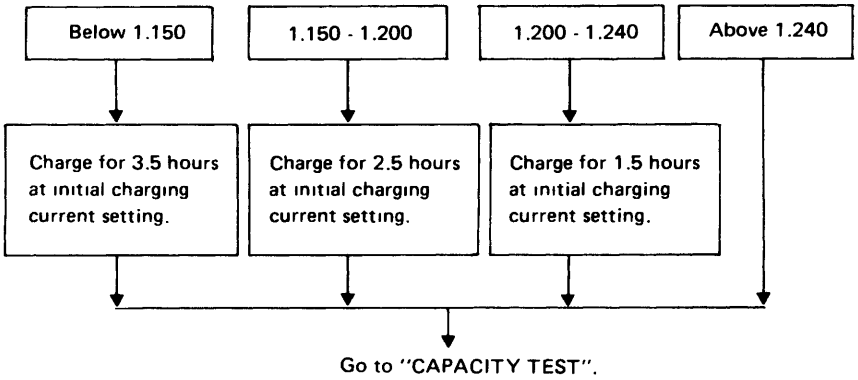


Fig. 4 INITIAL CHARGING CURRENT SETTING
(Standard charge)

BATTERY TYPE / CONVERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L)	50D23R(L) 55D23R(L)	65D26R(L) 80D26R(L)	75D31R(L)	95D31R(L) 95E41R(L)	130E41R(L)
1.100 - 1.130	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	13.0 (A)
1.130 - 1.160	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	11.0 (A)
1.160 - 1.190	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	9.0 (A)
1.190 - 1.220	2.0 (A)	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	5.0 (A)	7.0 (A)

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

Fig. 5 ADDITIONAL CHARGE (Standard charge)



CAUTION:

a. **Do not use standard charge method on a battery whose specific gravity is less than 1.100.**
b. **Set charging current to value specified in Fig. 4. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
c. **Keep battery away from open flame while it is being charged.**
d. **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
e. **If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).**

Battery Test and Charging Chart (Cont'd)

C: QUICK CHARGE

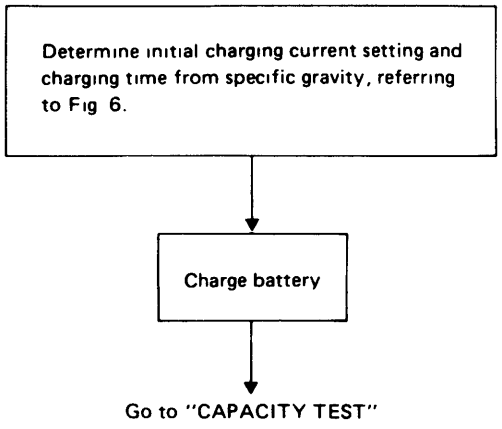


Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

CONVERTED SPECIFIC GRAVITY \ BATTERY TYPE / CURRENT [A]	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L) 50D23R(L)	55D23R(L) 65D26R(L) 80D26R(L)	75D31R(L) 95D31R(L) 95E41R(L)	130E41R(L)
	10 (A)	15 (A)	20 (A)	30 (A)	40 (A)
1.100 - 1.130	2.5 hours				
1.130 - 1.160	2.0 hours				
1.160 - 1.190	1.5 hours				
1.190 - 1.220	1.0 hours				
Above 1.220	0.75 hours (45 min.)				

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

CAUTION:

a. Do not use quick charge method on a battery whose specific gravity is less than 1.100.

b. Set initial charging current to value specified in Fig. 6. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.

c. Keep battery away from open flame while it is being charged.

d. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.

e. Be careful of a rise in battery temperature because a large current flow is required during quick-charge operation.
If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

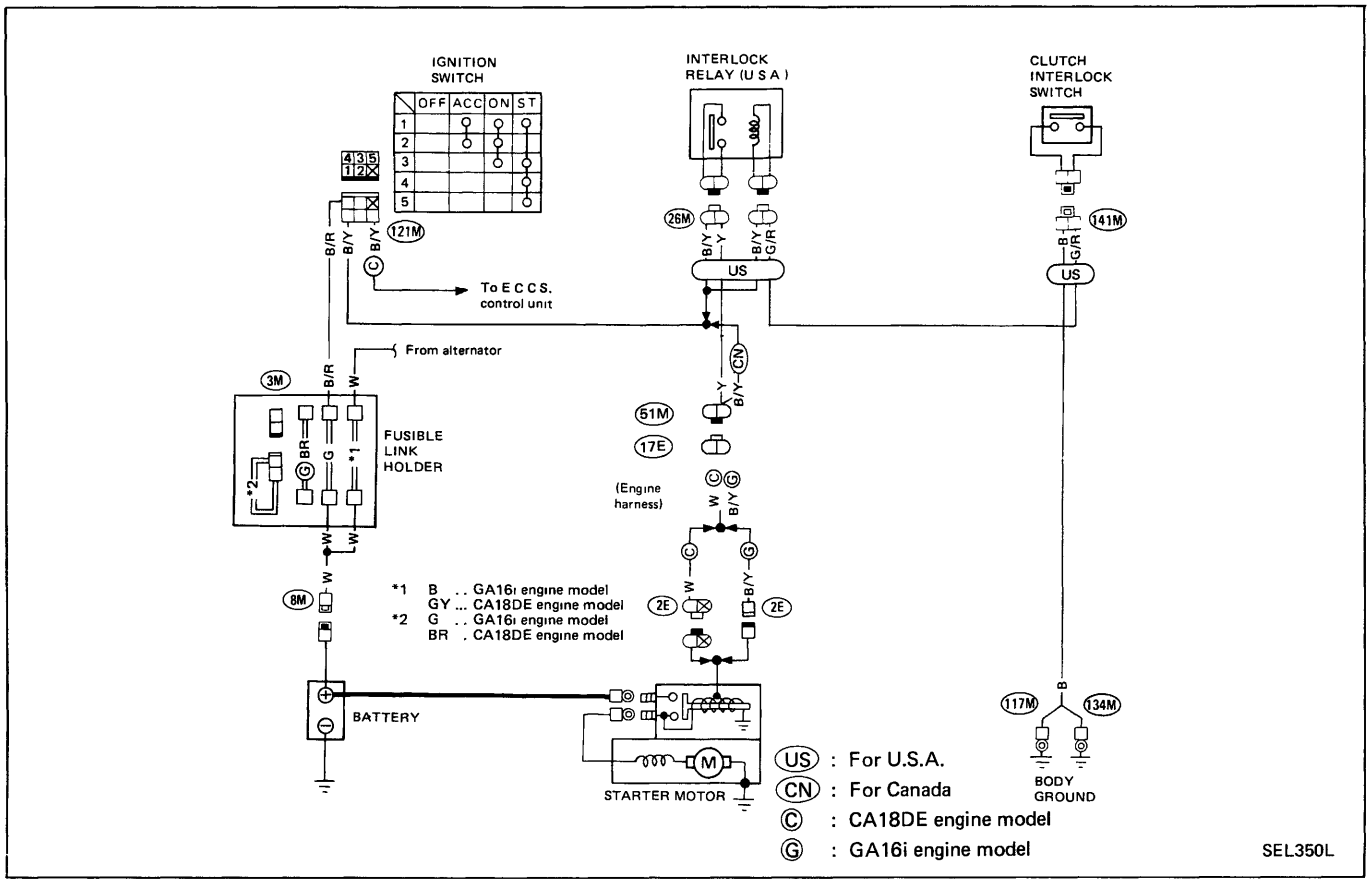
f. Do not exceed the charging time specified in Fig. 6, because charging battery over the charging time can cause deterioration of the battery.

Service Data and Specifications (S.D.S.)

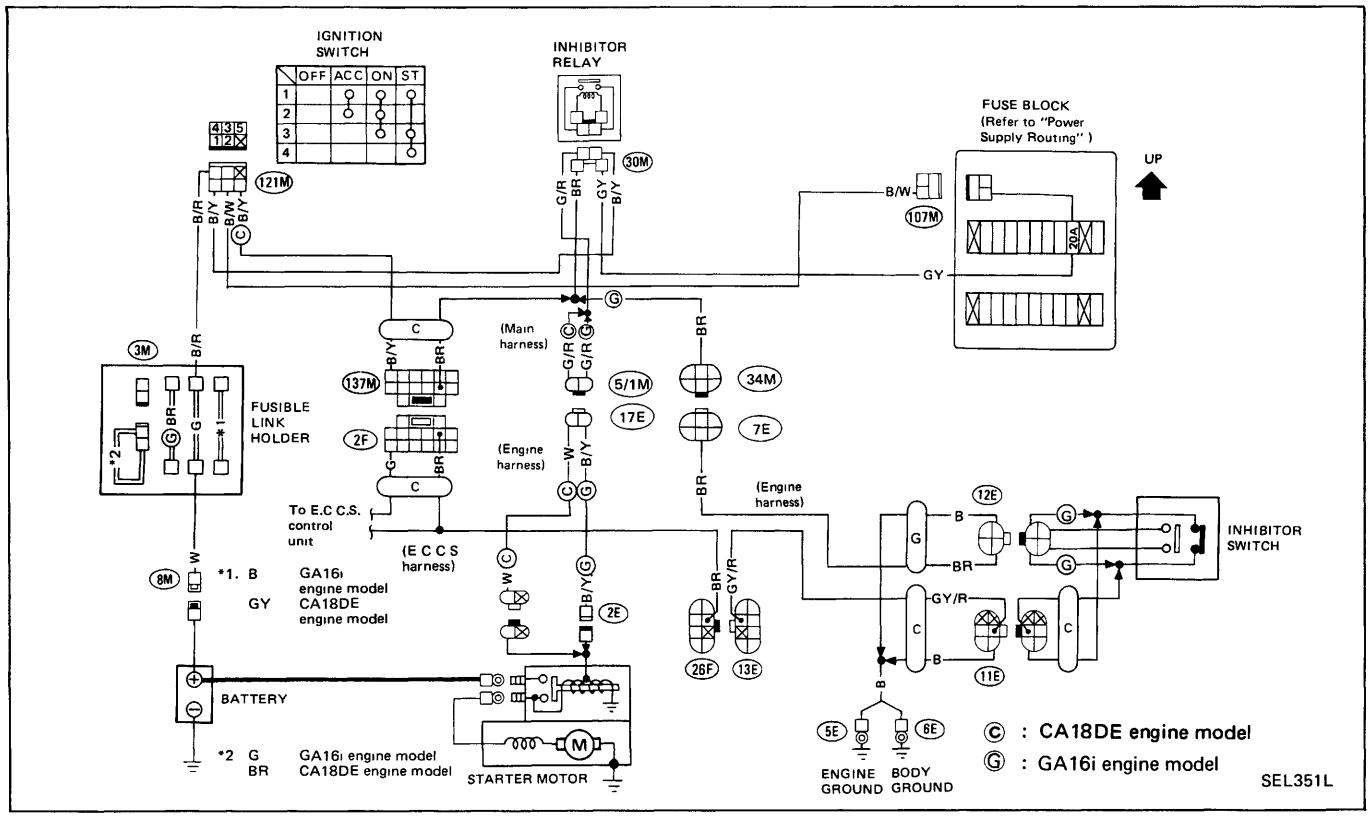
Applied area		U.S.A.	Canada, optional for U.S.A.
Type		55D23L	65D26L
Capacity	V-AH	12-60	12-65

Wiring Diagram

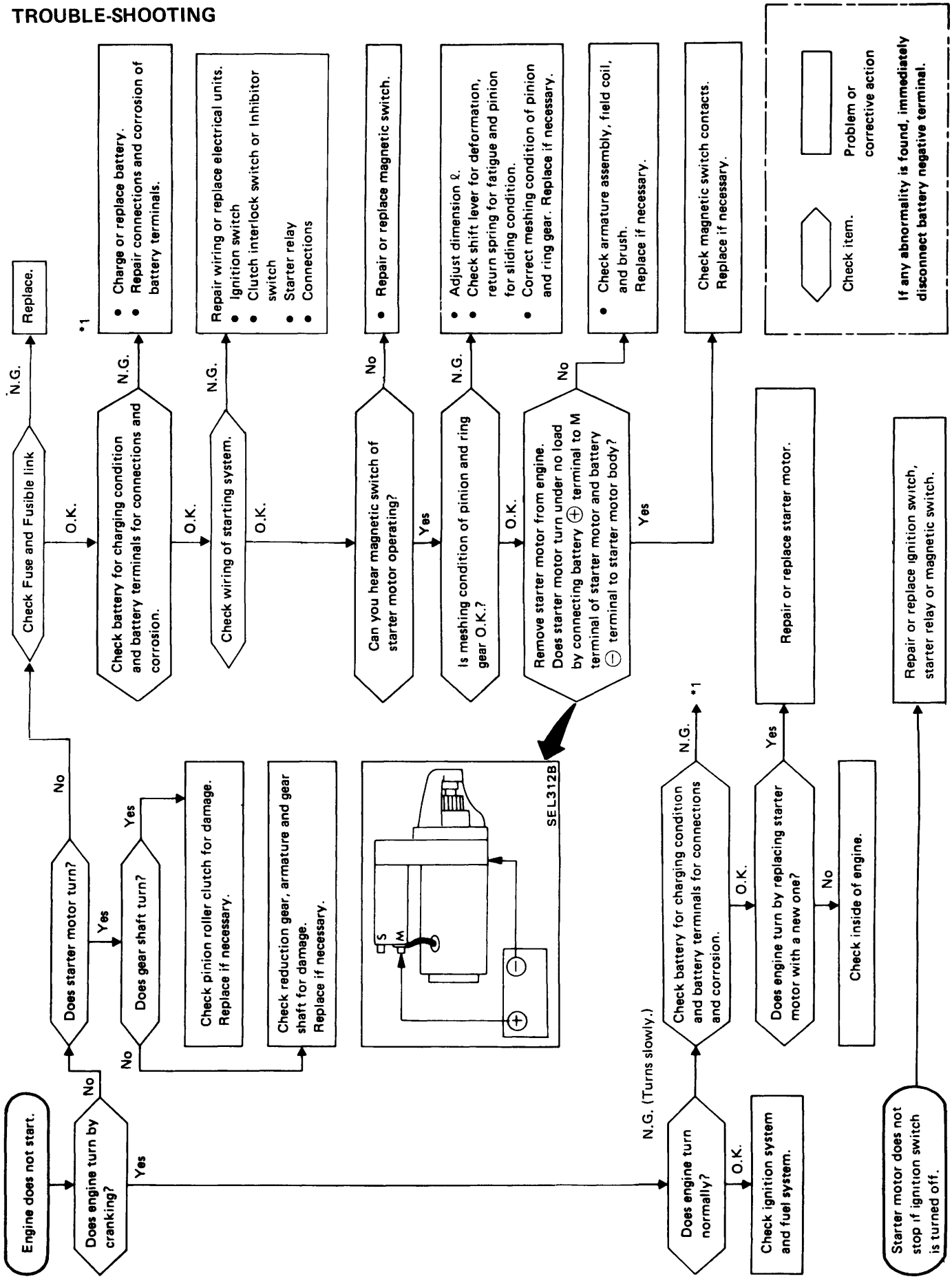
M/T MODEL



A/T MODEL

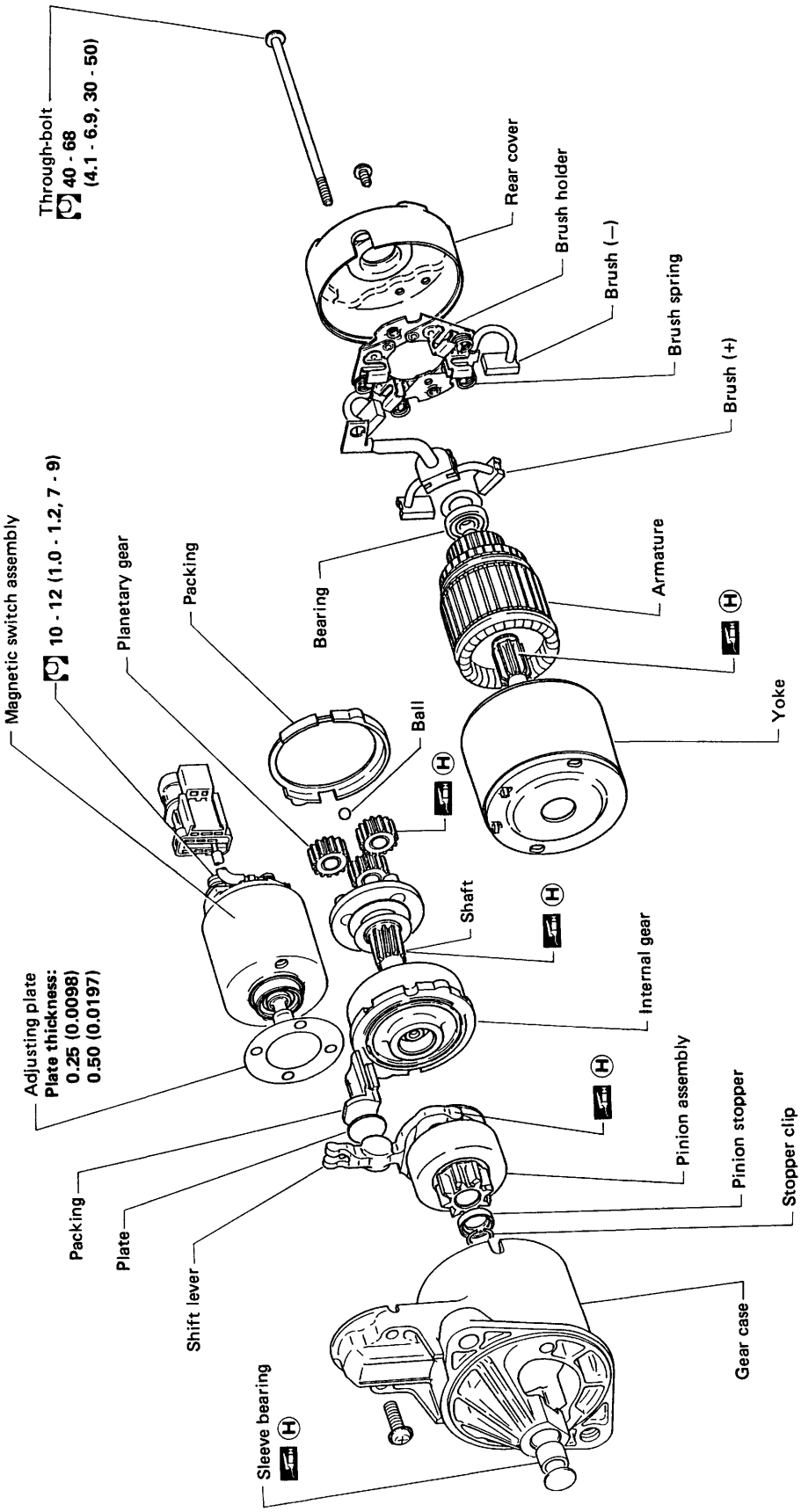


TROUBLE-SHOOTING



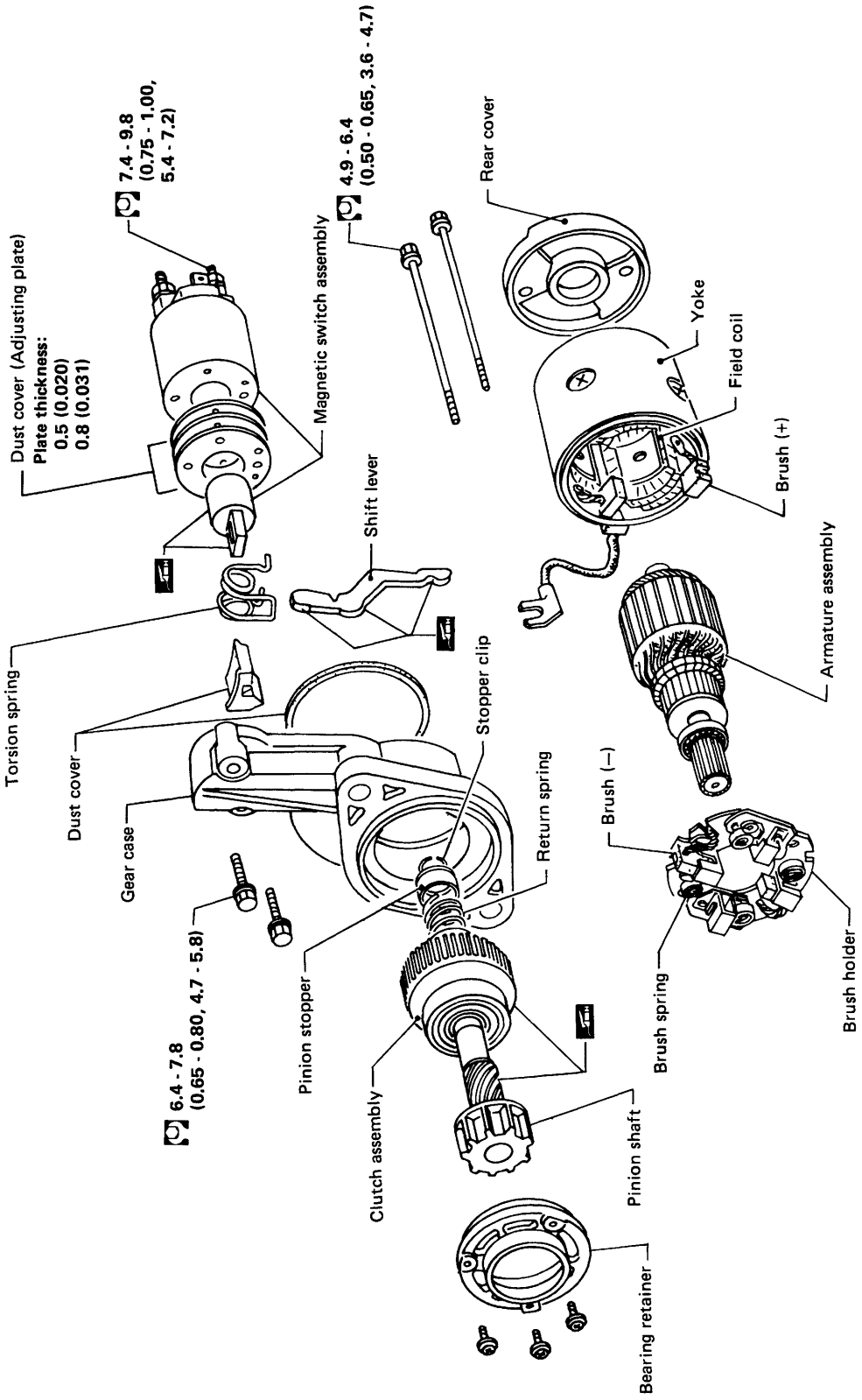
Construction

M1T70985



Construction (Cont'd)

S114-475A

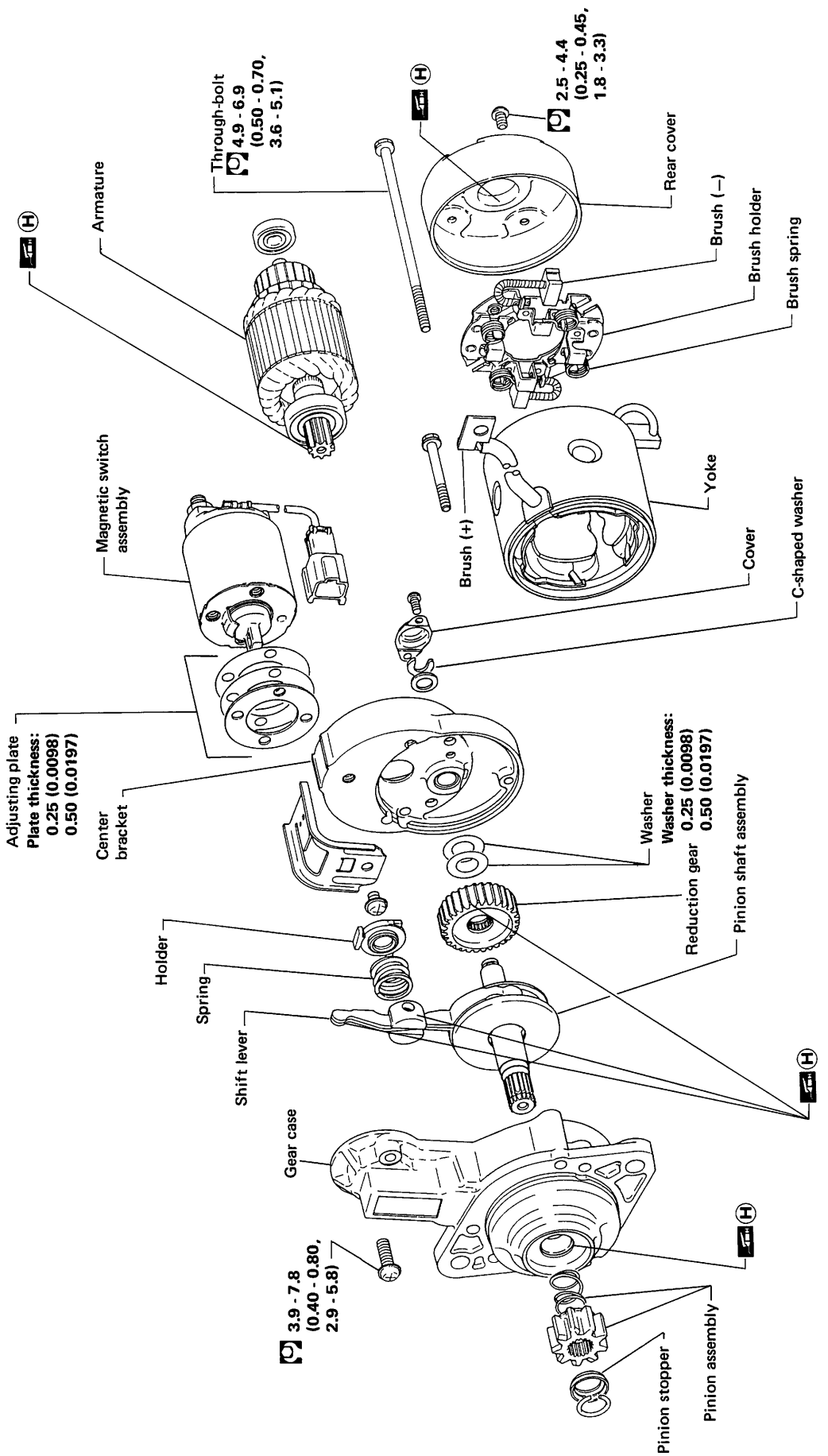


Unit: mm (in)
: N·m (kg-m, ft-lb)
: High-temperature grease point

SEL623D

Construction (Cont'd)

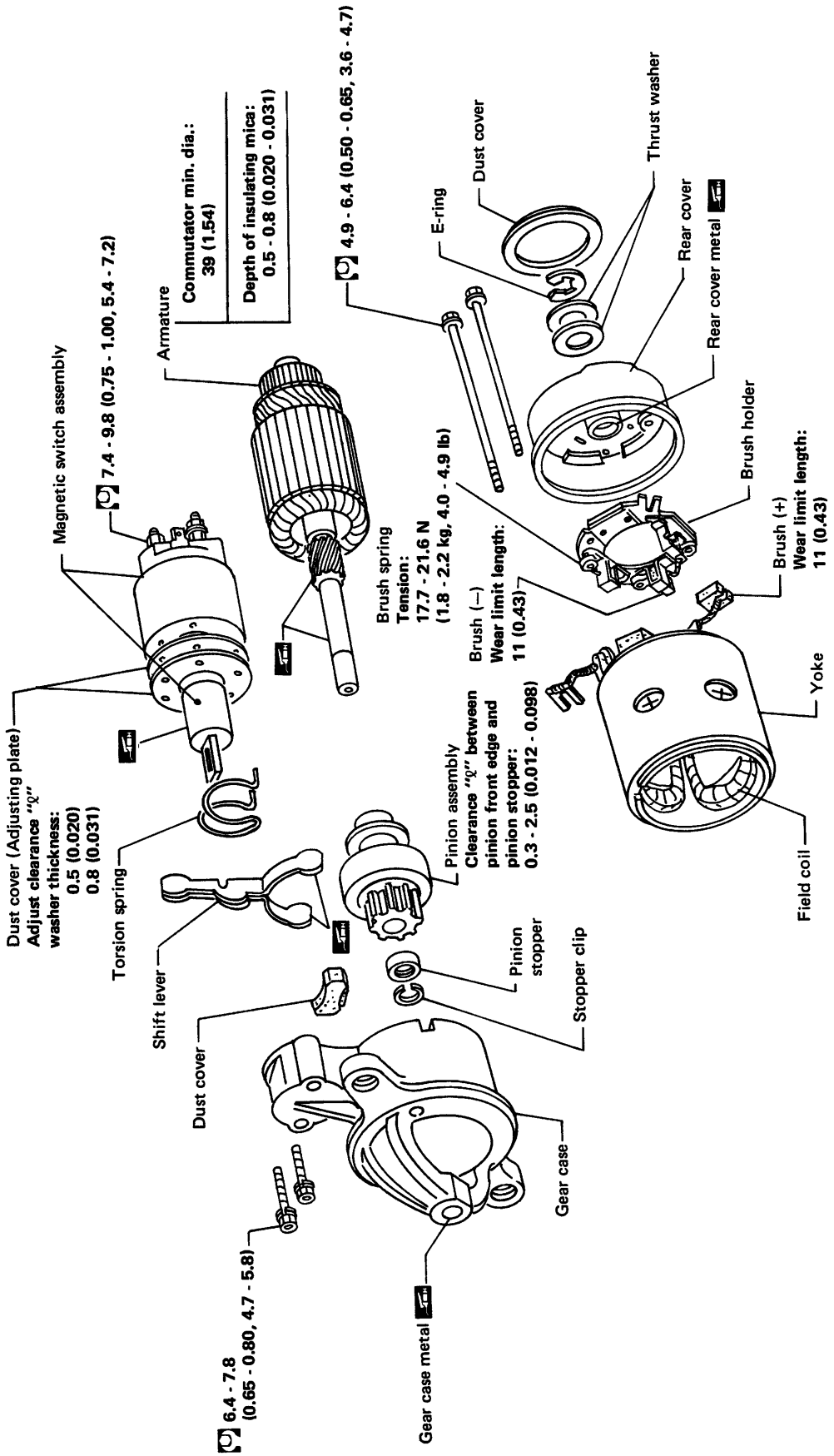
M2T53882



SEL573L

Construction (Cont'd)

S114-617A

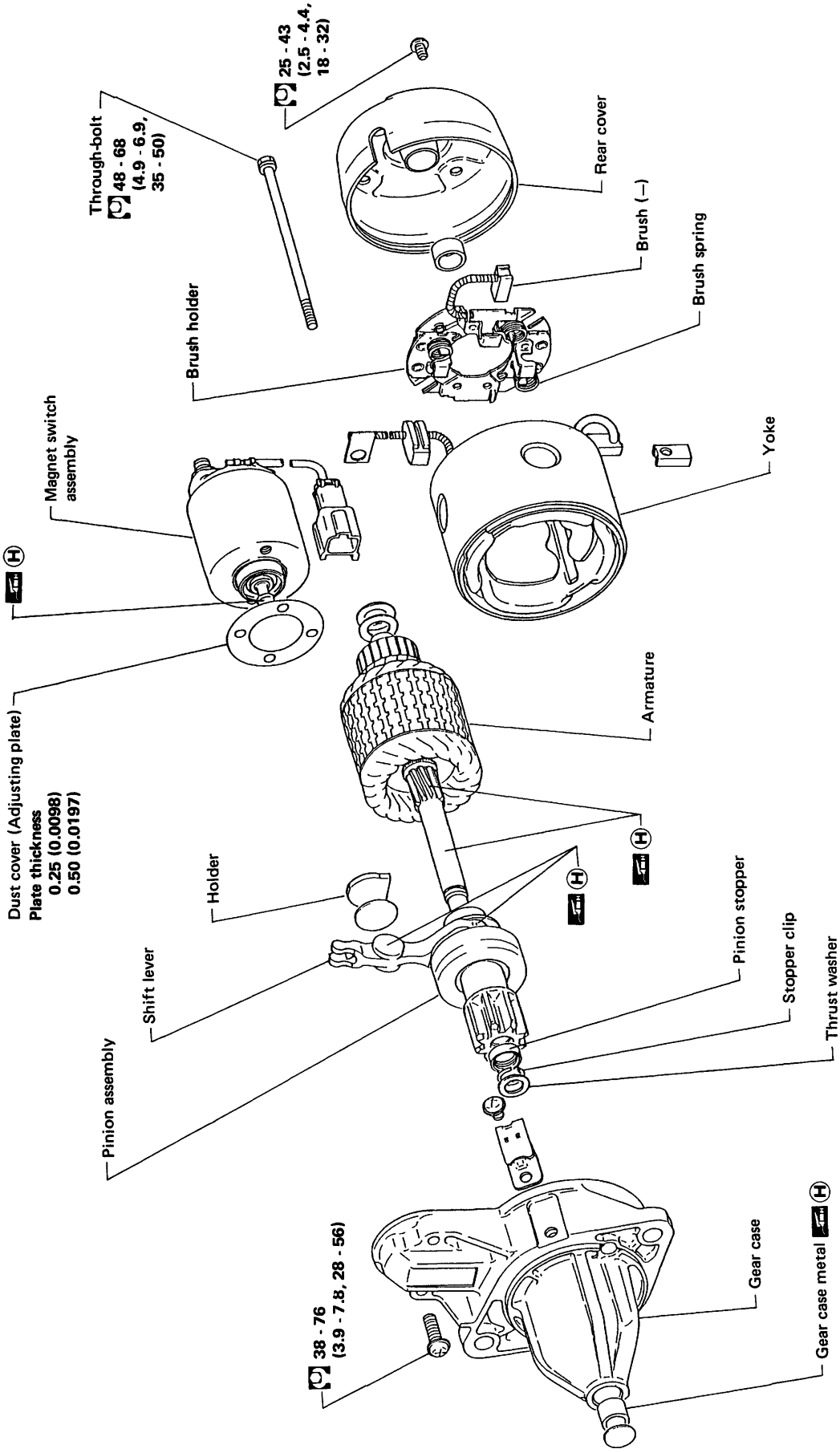


Unit: mm (in)
: N·m (kg-m, ft-lb)
: High-temperature grease point

SEL556B

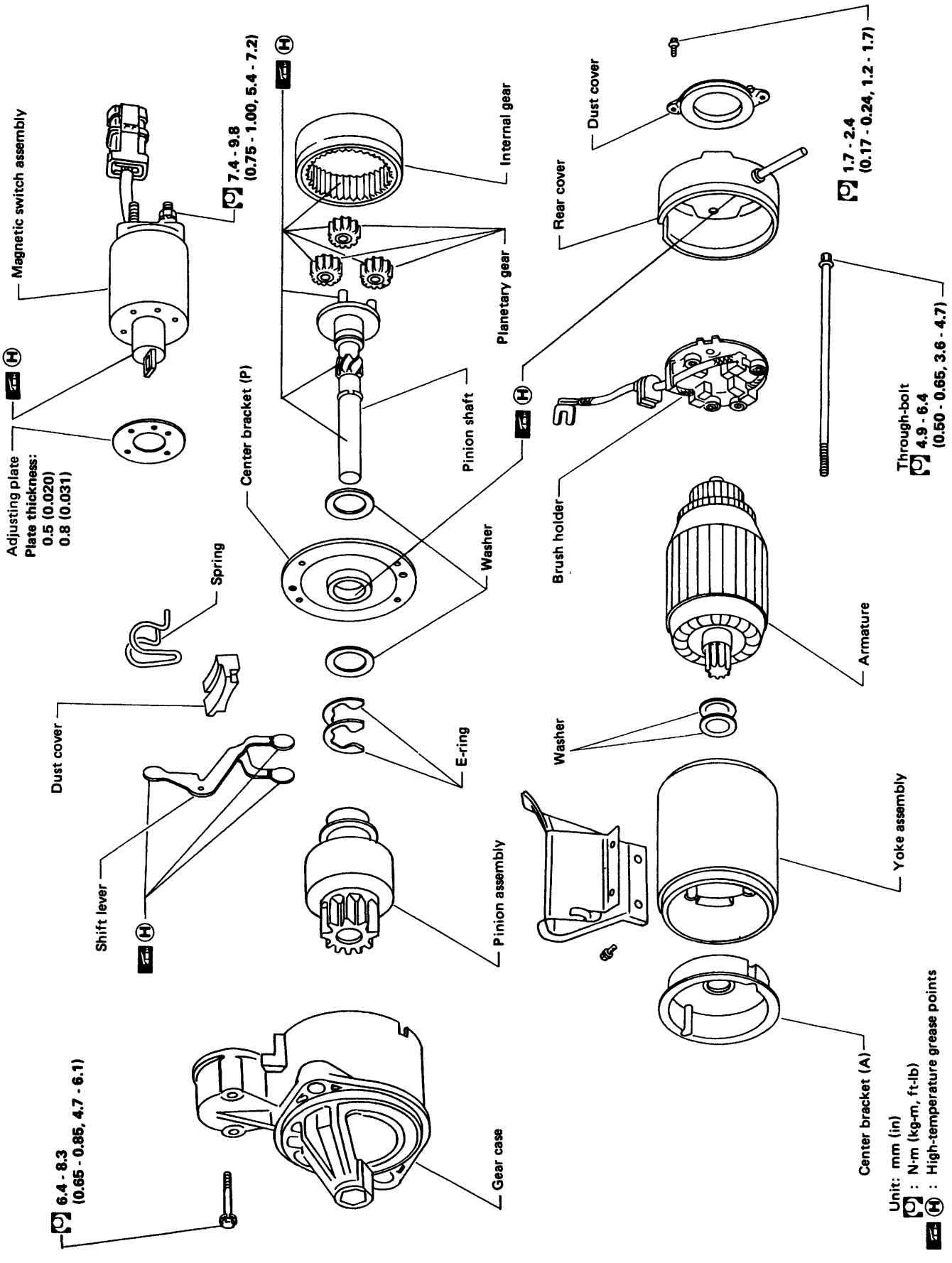
Construction (Cont'd)

M3T37782



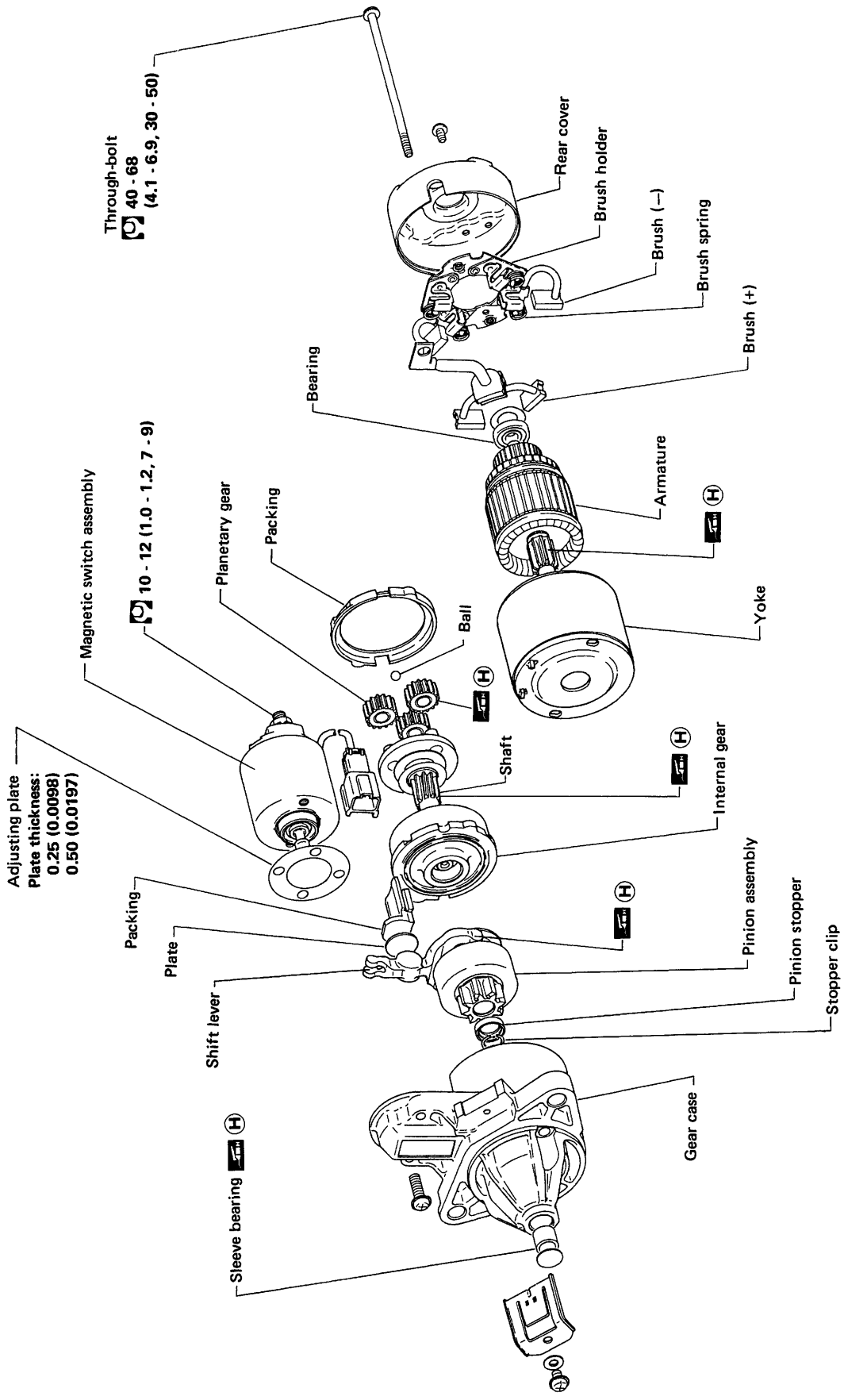
Construction (Cont'd)

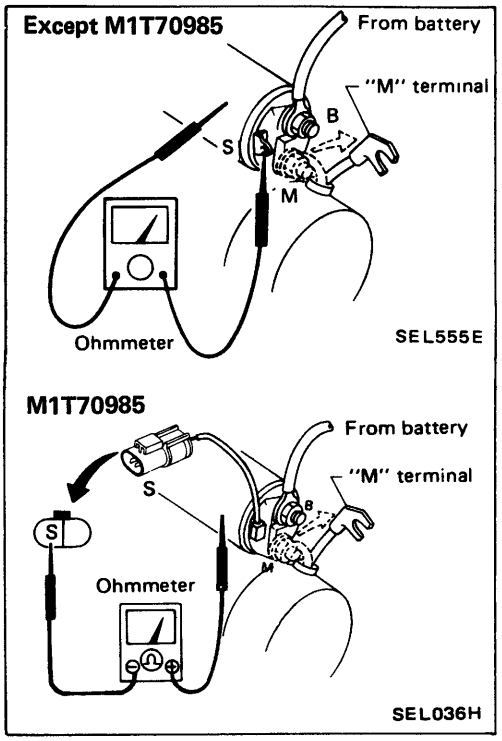
S114-520B



Construction (Cont'd)

M1T72085



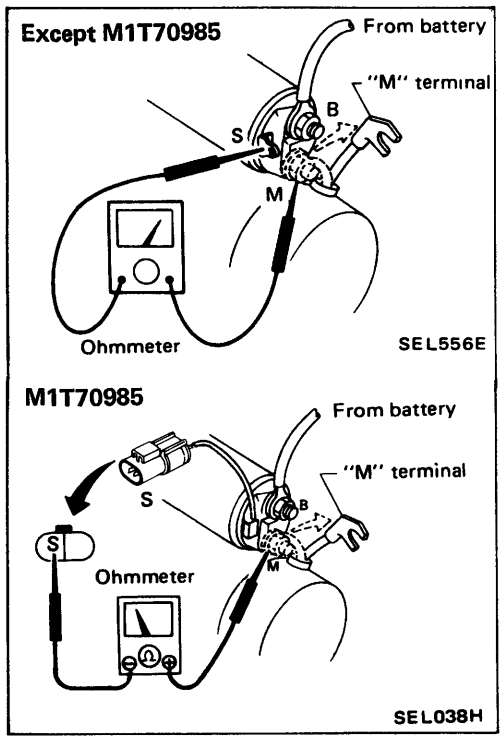


Magnetic Switch Check

- Before starting to check, disconnect battery ground cable.
- Disconnect "M" terminal of starter motor.

1. Continuity test (between "S" terminal and switch body).

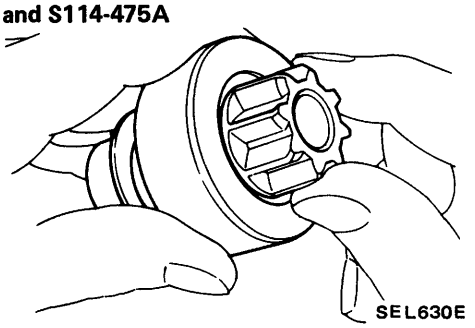
- No continuity ... Replace.



2. Continuity test (between "S" terminal and "M" terminal).

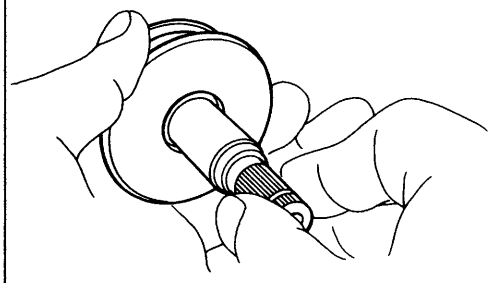
- No continuity ... Replace.

Except M2T53882 and S114-475A



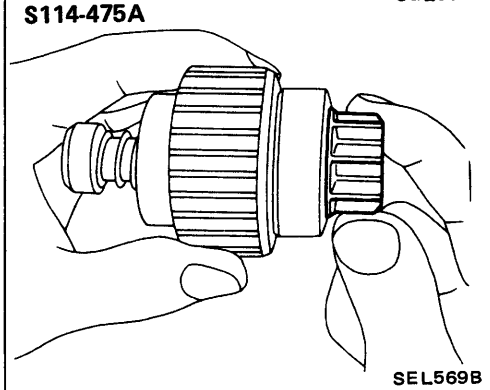
SEL630E

M2T53882



SEL557E

S114-475A



SEL569B

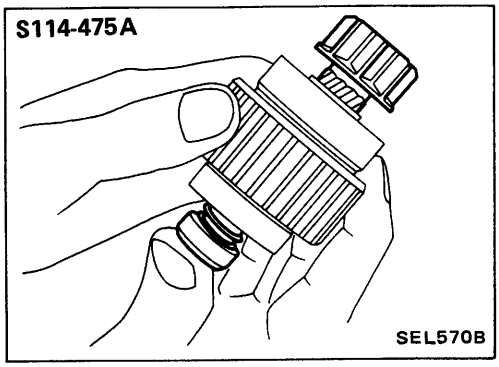
Pinion/Clutch Check

1. Inspect pinion teeth.
- Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
- If it does not lock (or locks) in either direction or unusual resistance is evident. ... Replace.

REDUCTION GEAR TYPE

3. Inspect reduction gear teeth.
- Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)

S114-475A

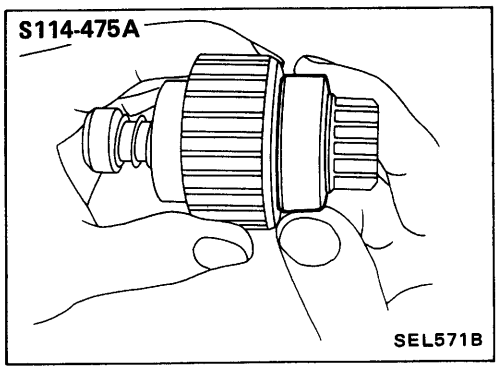


SEL570B

[S114-475A]

4. Check pinion movement.
- If it is hard to move, apply high-temperature grease or, if necessary, replace.

Pinion/Clutch Check (Cont'd)



[S114-475A]

5. Check ball bearing.
   Spin outer race of ball bearing to ensure that it turns smoothly without binding.

- Abnormal resistance ... Replace.

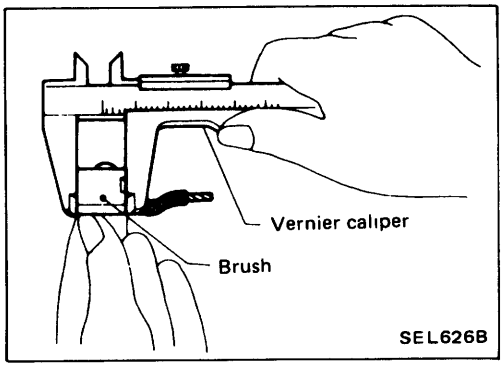
Brush Check

BRUSH

Check wear of brush.

Wear limit length:
Refer to S.D.S.

- Excessive wear ... Replace.



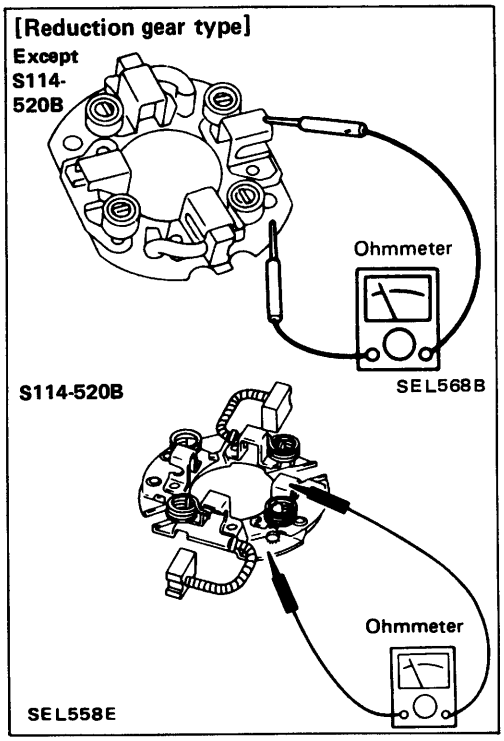
BRUSH HOLDER

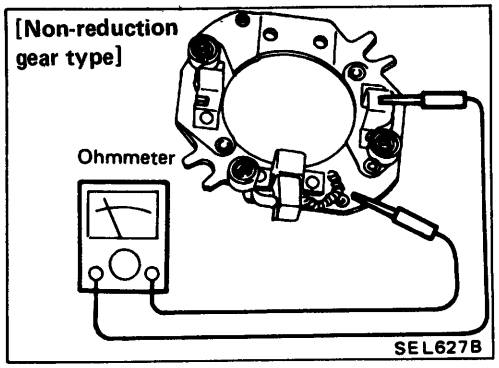
1. Perform insulation test between brush holder (positive side) and its base (negative side).

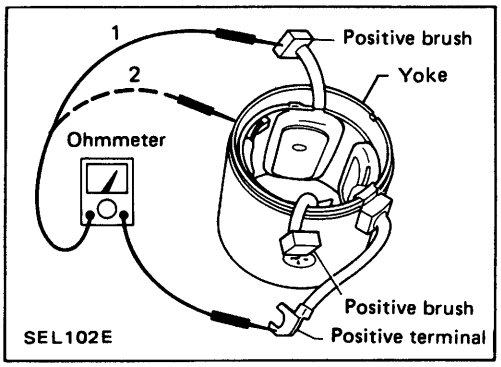
- Continuity exists. ... Replace.

2. Check brush to see if it moves smoothly.

- If brush holder is bent, replace it; if sliding surface is dirty, clean.



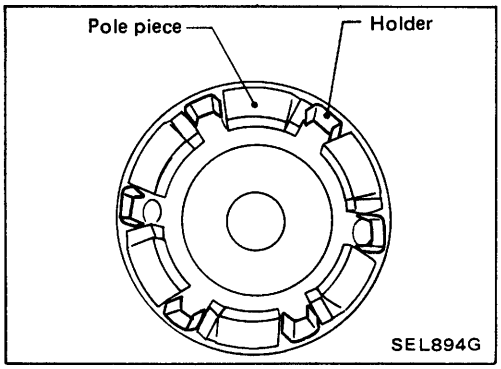




Field Coil Check [M2T53882, M3T37782, S114-475A, S114-617A]

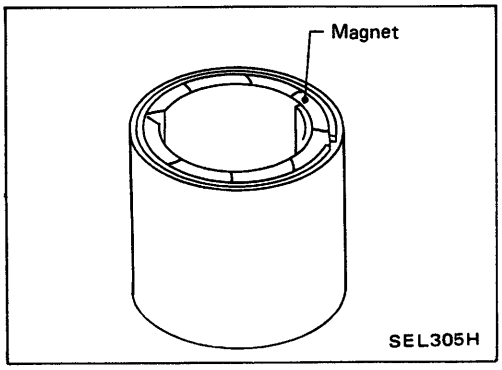
1. Continuity test (between field coil positive terminal and positive brushes).
- No continuity ... Replace field coil.

2. Insulation test (between field coil positive terminal and yoke).
- Continuity exists. ... Replace field coil.



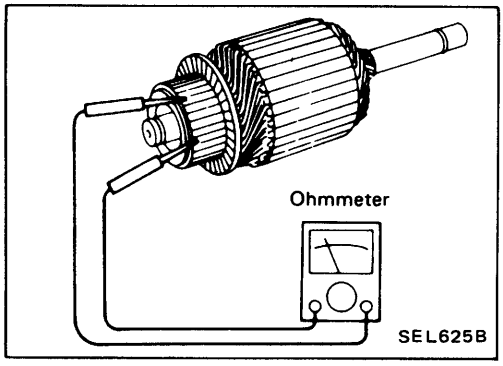
Pole Piece Check [M1T70985, M1T72085]

Pole piece is secured to yoke by bonding agent. Check pole piece to see that it is secured to yoke and for any cracks. Replace malfunctioning parts as an assembly.
Holder may move slightly as it is only inserted and not bonded.



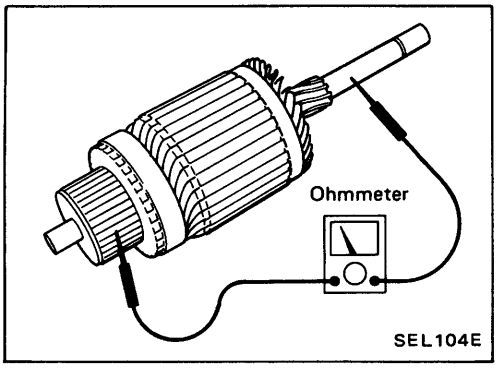
Yoke Assembly Check [S114-520B]

Check magnet for cracks. If there is any crack, replace malfunctioning parts as an assembly.



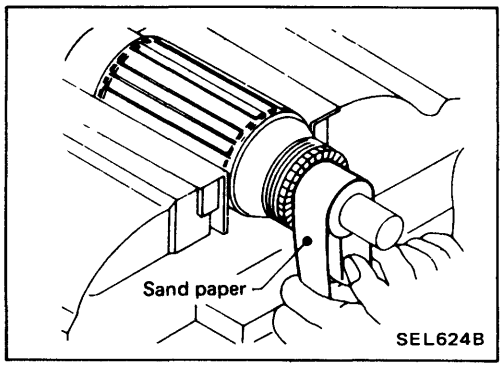
Armature Check

1. Continuity test (between two segments side by side).
- No continuity ... Replace.

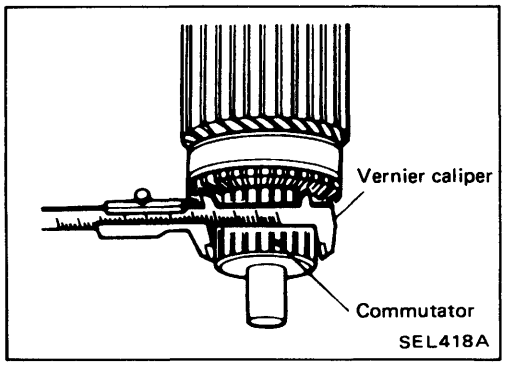


2. Insulation test (between each commutator bar and shaft).
- Continuity exists. ... Replace.

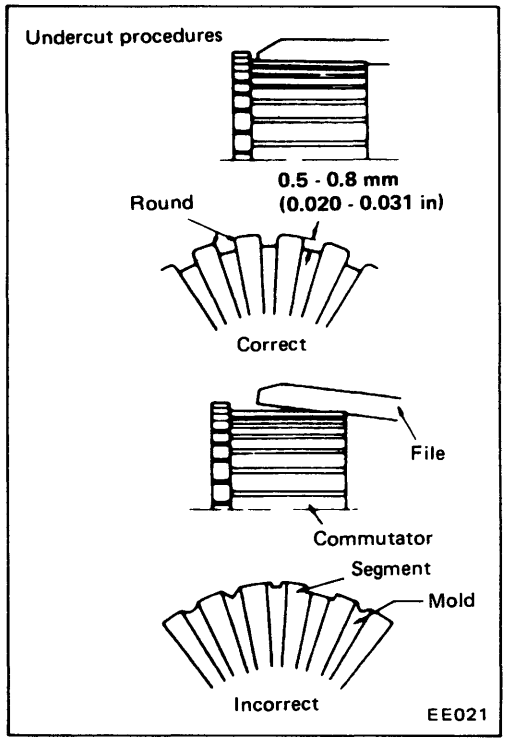
Armature Check (Cont'd)



3. Check commutator surface.
- Rough ... Sand lightly with No. 500 - 600 sandpaper.



4. Check diameter of commutator.
Commutator minimum diameter:
Refer to S.D.S.
- Less than specified value ... Replace.



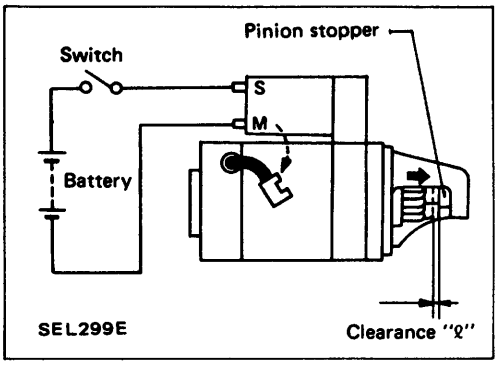
5. Check depth of insulating mold from commutator surface.
- Less than 0.2 mm (0.008 in) ... Undercut to 0.5 to 0.8 mm (0.020 to 0.031 in)

Assembly

Apply high-temperature grease to lubricate the bearing, gears and frictional surface when assembling the starter.
Carefully observe the following instructions.

Assembly (Cont'd)

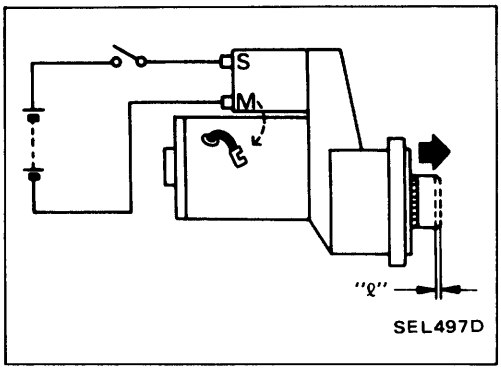
PINION PROTRUSION LENGTH ADJUSTMENT



Non-reduction gear type

With pinion driven out by magnetic switch, push pinion back to remove slack and measure clearance " ℓ " between the front edge of the pinion and the pinion stopper.

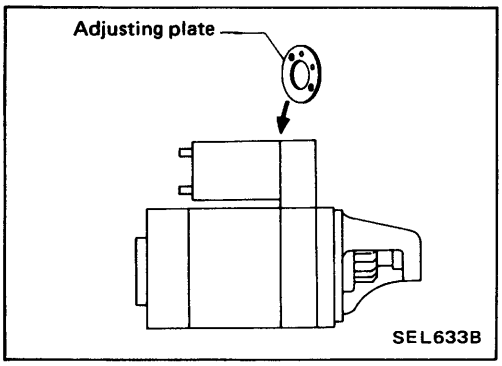
Clearance " ℓ ":
Refer to S.D.S.

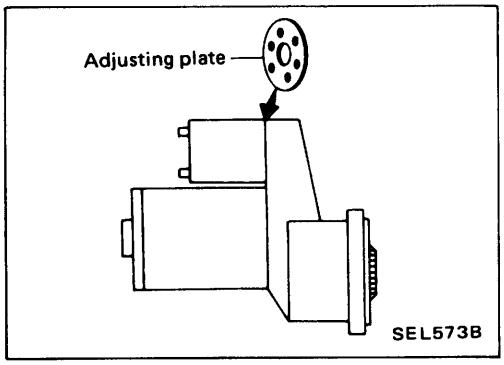


Reduction gear type

Compare movement " ℓ " in height of pinion when it is pushed out with magnetic switch energized and when it is pulled out by hand until it touches stopper.

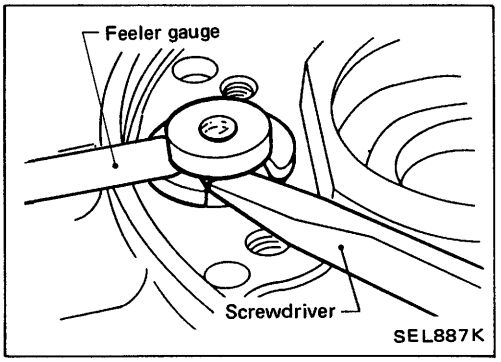
Movement " ℓ ":
Refer to S.D.S.





- Not in the specified value ... Adjust by adjusting plate.

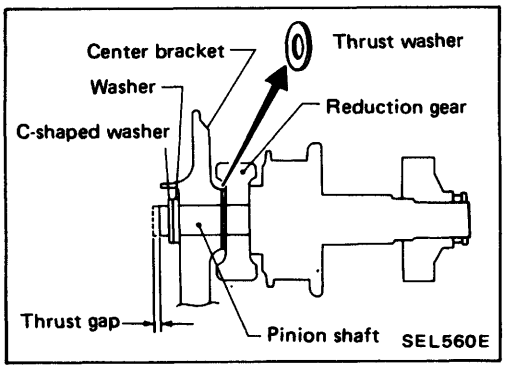
PINION SHAFT THRUST GAP ADJUSTMENT [M2T53882]



Check thrust gap with a gap gauge by pulling pinion shaft in the axial direction with a screwdriver.

Maximum of thrust gap:
0.5 mm (0.020 in)

Assembly (Cont'd)

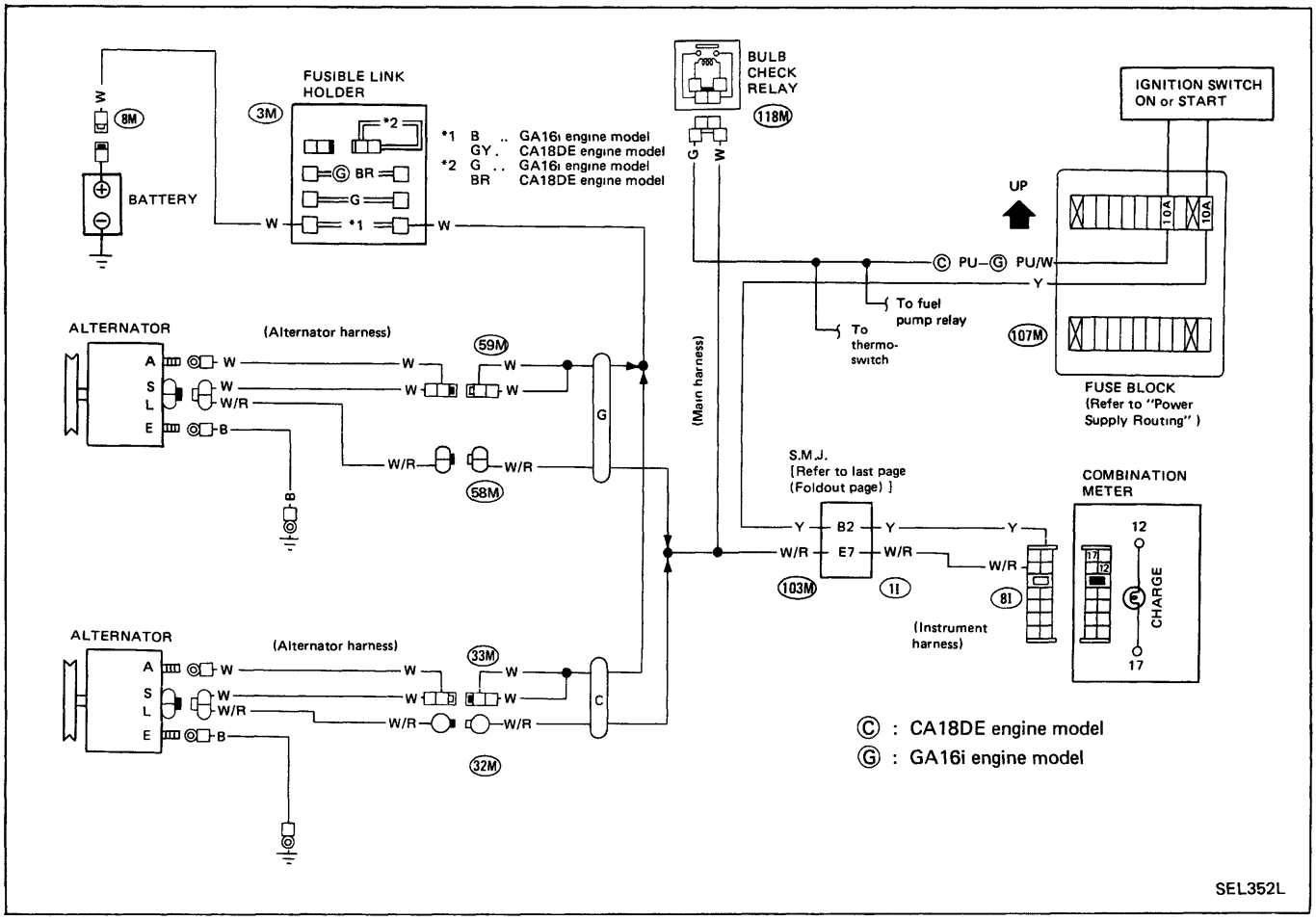


- If thrust gap is over the specified value, adjust it with adjusting plate.

STARTER

Type	M1T70985	S114-475A	M2T53882	S114-617A	M3T37782	S114-520B	M1T72085
	MITSUBISHI make	HITACHI make	MITSUBISHI make	HITACHI make	MITSUBISHI make	HITACHI make	MITSUBISHI make
	Reduction gear type			Non-reduction gear type		Reduction gear type	
Applied model	CA18DE engine	GA16i engine M/T except for California		GA16i engine M/T for California		GA16i engine A/T	
System voltage V	12						
No-load Terminal voltage V	11.0			11.5		11.0	
Current A	50 - 75	Less than 100		Less than 60		Less than 90	50 - 75
Revolution rpm	3,000 - 4,000	More than 3,900	More than 2,900	More than 7,000	More than 6,500	More than 2,950	3,000 - 4,000
Minimum diameter of commutator mm (in)	28.8 (1.134)	29.0 (1.142)	31.4 (1.236)	39.0 (1.535)	38.1 (1.500)	32.0 (1.260)	28.8 (1.134)
Minimum length of brush mm (in)	12.0 (0.472)	11.0 (0.433)	11.5 (0.453)	11.0 (0.433)	11.5 (0.453)	11.0 (0.433)	12.0 (0.472)
Brush spring tension N (kg, lb)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	15.7 - 19.6 (1.6 - 2.0, 3.5 - 4.4)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)
Movement "ℓ" in height of pinion assembly mm (in)	0.5 - 2.0 (0.020 - 0.079)	0.3 - 1.5 (0.012 - 0.059)	0.5 - 2.0 (0.020 - 0.079)	–	0.5 - 2.0 (0.020 - 0.079)	–	0.5 - 2.0 (0.020 - 0.079)
Clearance of bearing metal and armature shaft mm (in)	–	–	–	0.2 (0.008)	–	0.2 (0.008)	–
Clearance "ℓ" between pinion front edge and pinion stopper mm (in)	–	–	–	0.3 - 2.5 (0.012 - 0.098)	–	0.3 - 1.5 (0.012 - 0.059)	–

Wiring Diagram

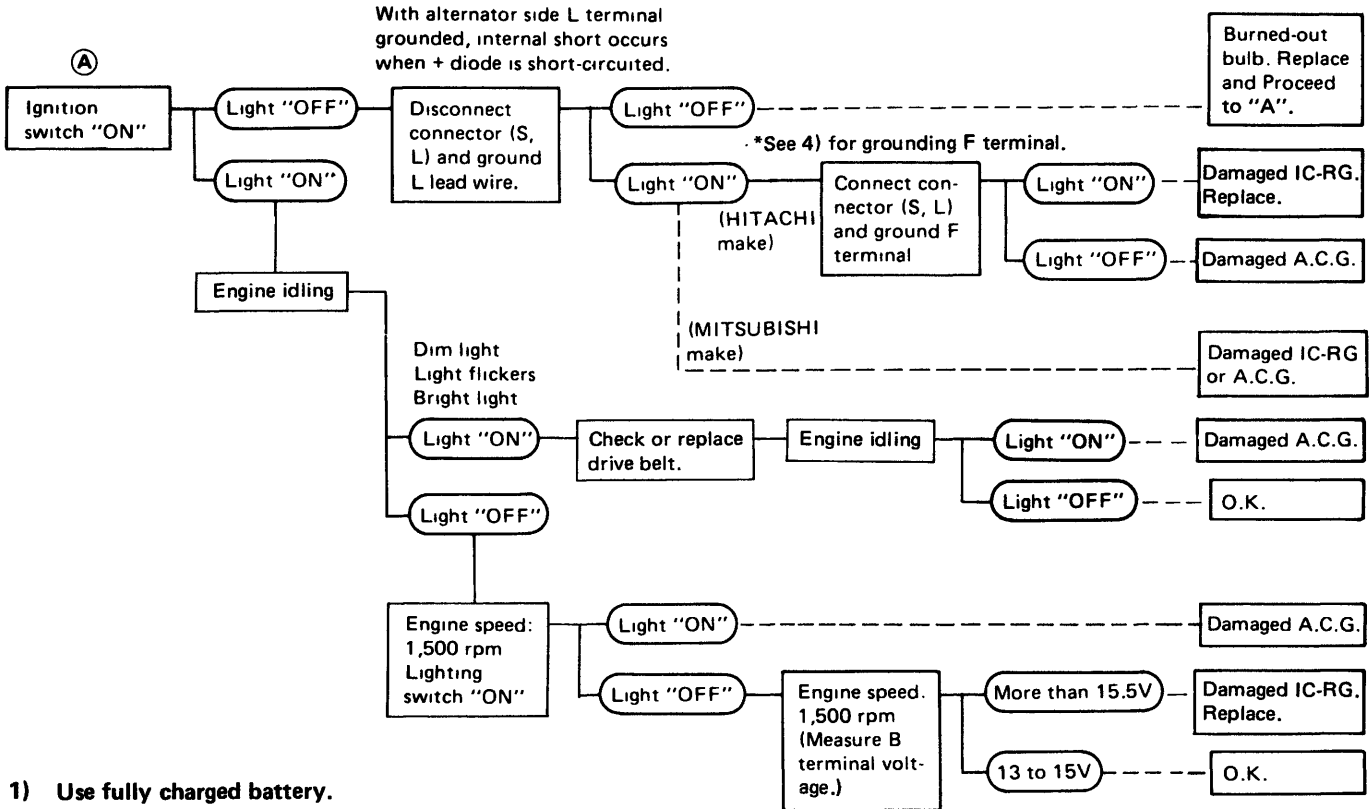


Trouble-shooting

Before conducting an alternator test, make sure that the battery is fully charged. A 30-volt voltmeter and suitable test probes are necessary for the test. The alternator can be checked easily by referring to the Inspection Table.

Before starting trouble-shooting, inspect the fusible link.

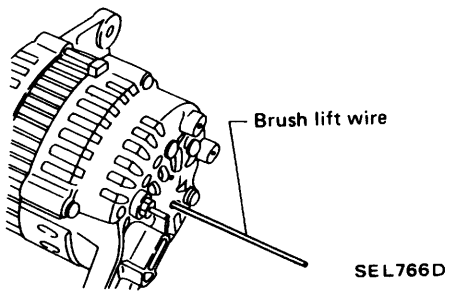
WITH IC REGULATOR



1) **Use fully charged battery.**
2) **Light : Charge warning light**
   A.C.G. : Alternator parts except IC regulator
   IC-RG : IC regulator
   O.K. : IC alternator is in good condition.
3) **When reaching "Damaged A.C.G.", remove alternator from vehicle and disassemble, inspect and correct or replace faulty parts.**
4) ***Method of grounding F terminal (HITACHI make only)**

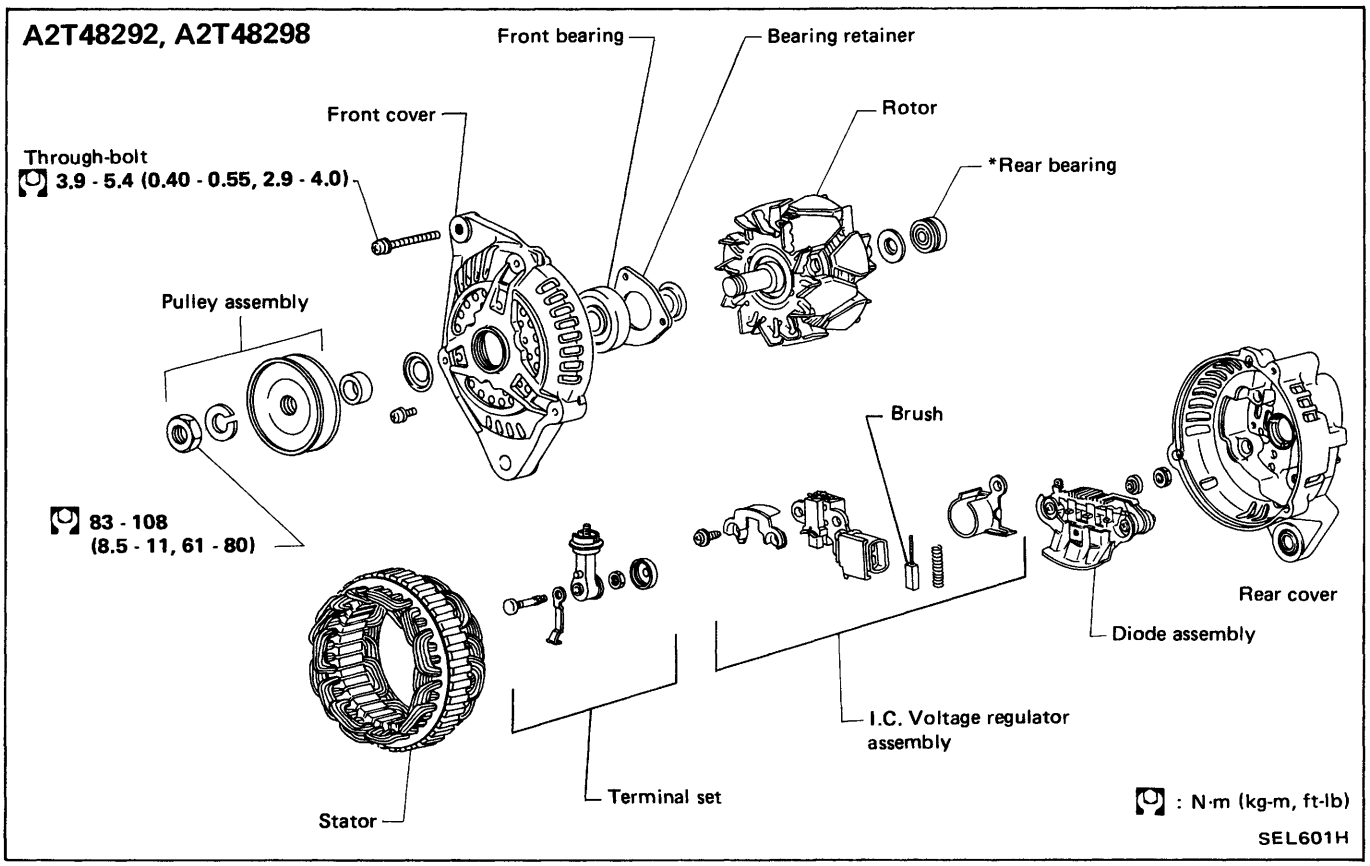
Gasoline engine model

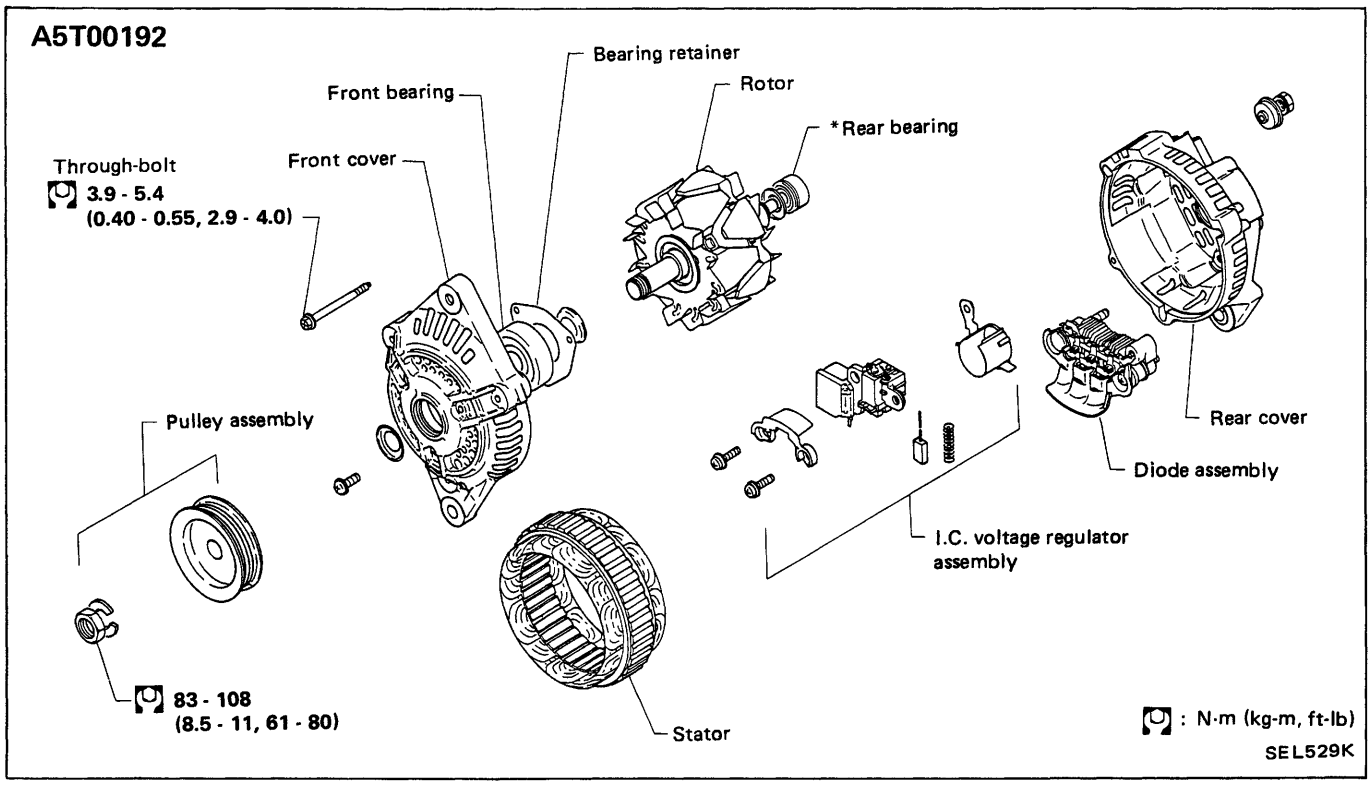
Contact tip of wire with brush and attach wire to alternator body.



5) **Terminals "S", "L", "B" and "E" are marked on rear cover of alternator.**

Construction





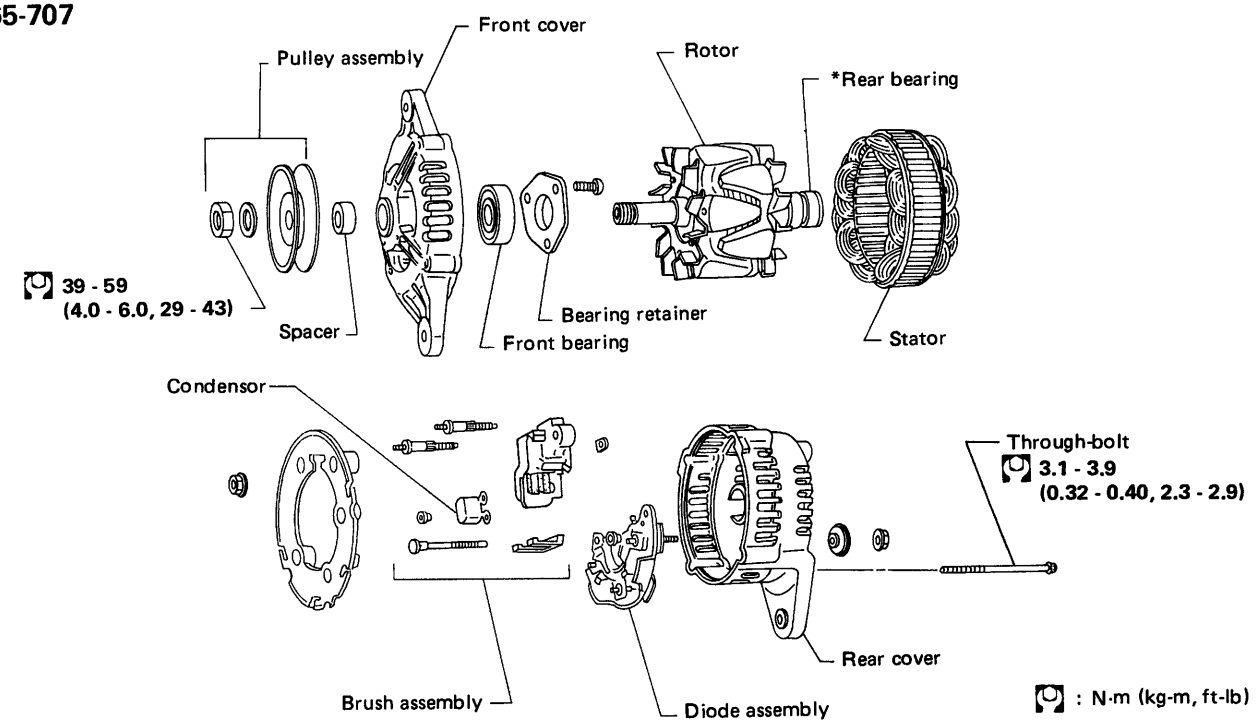
***Rear bearing**

CAUTION:

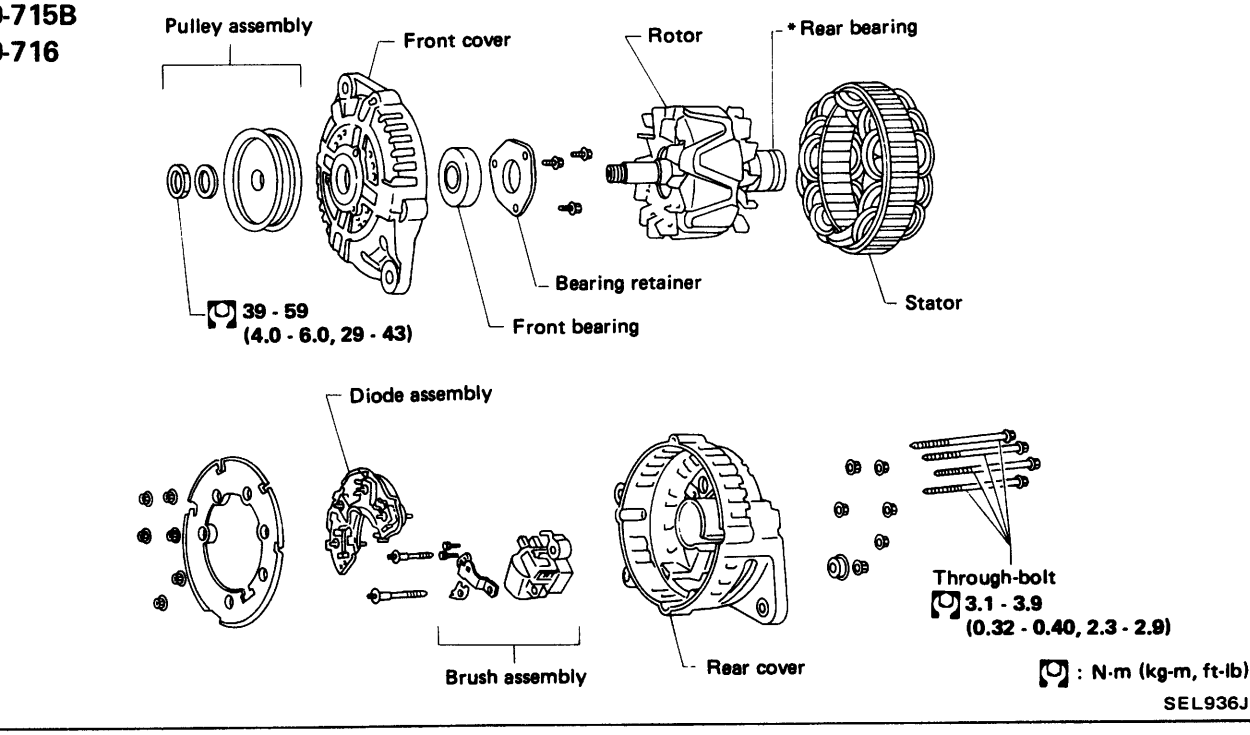
Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. Be careful not to lose this ring during removal.

Construction (Cont'd)

LR165-707



LR170-715B
LR170-716



***Rear bearing**

CAUTION:

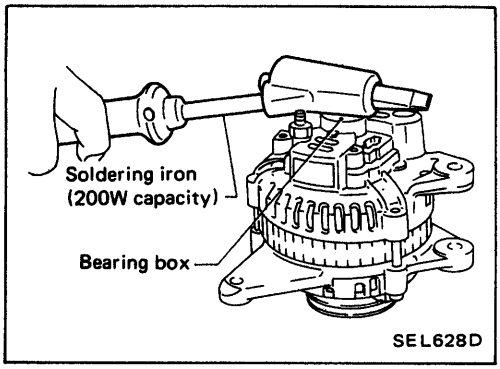
Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. Be careful not to lose this ring during removal.

REAR BEARING

CAUTION:

Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. Be careful not to lose this ring during removal.

Do not reuse rear bearing or oil seal after removal. Replace with a new one.



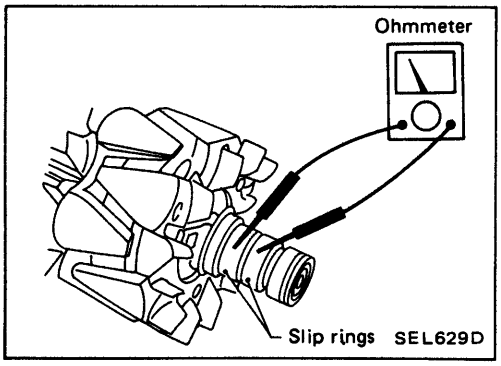
Disassembly

REAR COVER REMOVAL

CAUTION:

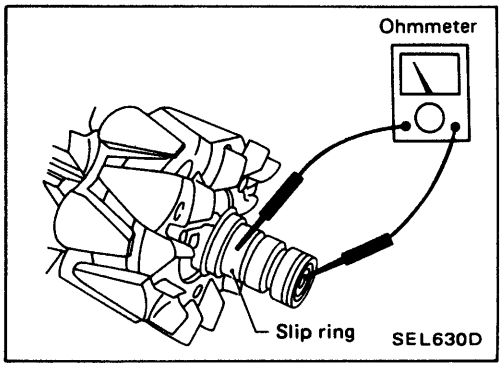
Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. To facilitate removal of rear cover, heat just bearing box section with a 200W soldering iron.

Do not use a heat gun, as it can damage diode assembly.



Rotor Slip Ring Check

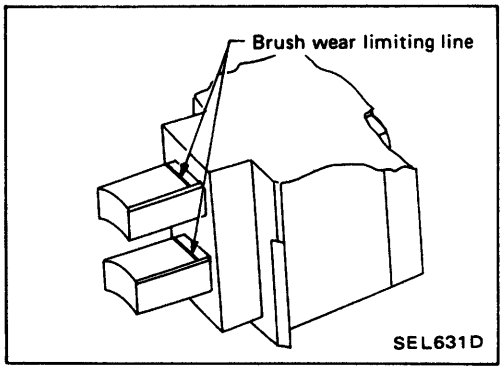
1. Continuity test
- No continuity ... Replace rotor.



2. Insulator test
- Continuity exists. ... Replace rotor.

3. Check slip ring for wear.

Slip ring minimum outer diameter:
Refer to S.D.S.

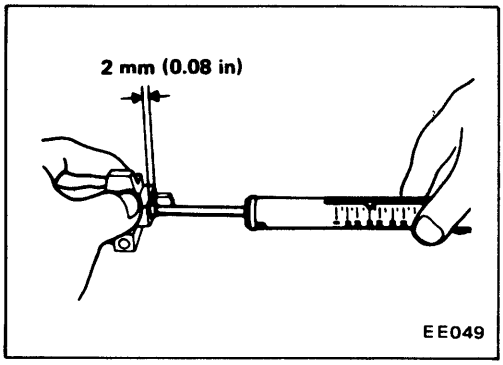


Brush Check

1. Check smooth movement of brush.
- Not smooth ... Check brush holder and clean.

2. Check brush for wear.
- Replace brush if it is worn down to the limit line.

Brush Check (Cont'd)



3. Check brush lead wire for damage.
- Damaged ... Replace.

4. Check brush spring pressure.
Measure brush spring pressure with brush projected approximately 2 mm (0.08 in) from brush holder.

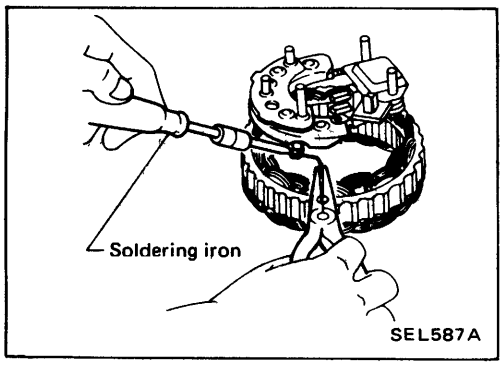
Spring pressure:
Refer to S.D.S.

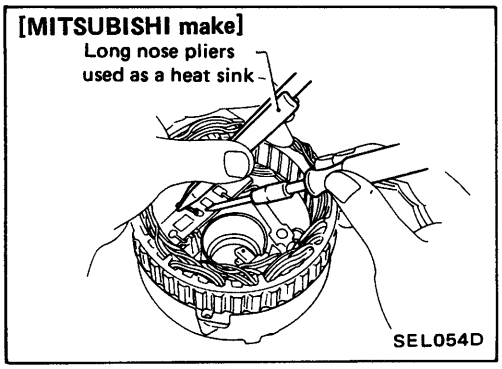
- Not within the specified values ... Replace.

Stator Check

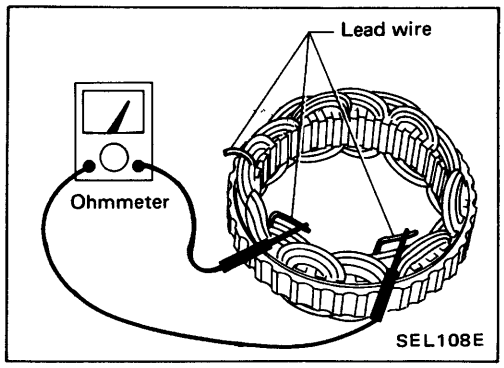
To test the stator or diode, separate them by unsoldering the connecting wires.

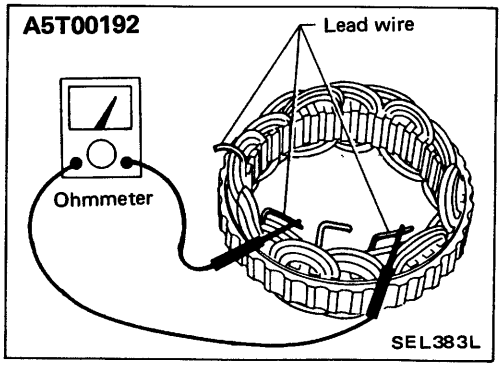
CAUTION:
Use only as much heat as required to melt solder. Otherwise, diodes will be damaged by excessive heat.



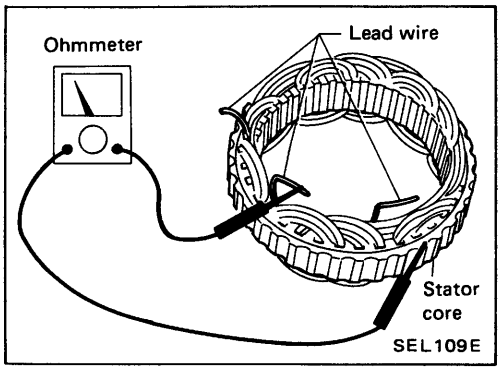


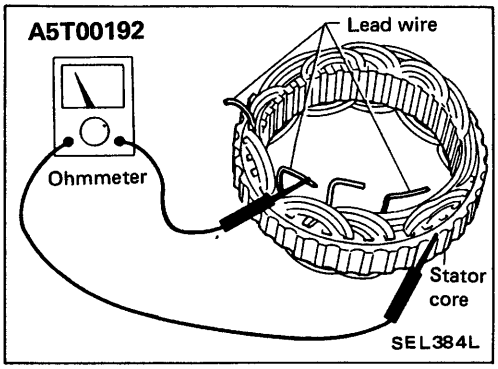
1. Continuity test
- No continuity ... Replace stator.





Stator Check (Cont'd)





2. Ground test
- Continuity exists. ... Replace stator.

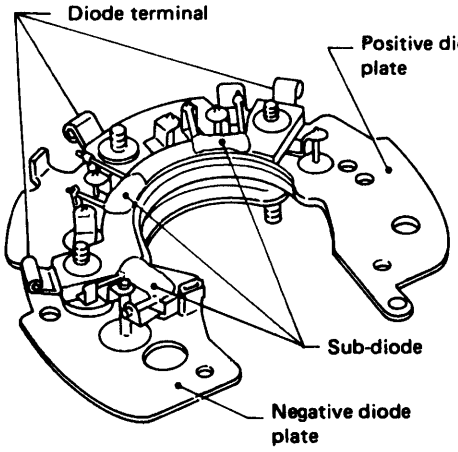
Diode Check

MAIN DIODES

- Use an ohmmeter to check condition of diodes as indicated in chart below:
- If any of the test results is not satisfactory, replace diode assembly.

	Ohmmeter probes		Continuity
	Positive ⊕	Negative ⊖	
Diodes check (Positive side)	Positive diode plate	Diode terminals	Yes
	Diode terminals	Positive diode plate	No
Diodes check (Negative side)	Negative diode plate	Diode terminals	No
	Diode terminals	Negative diode plate	Yes

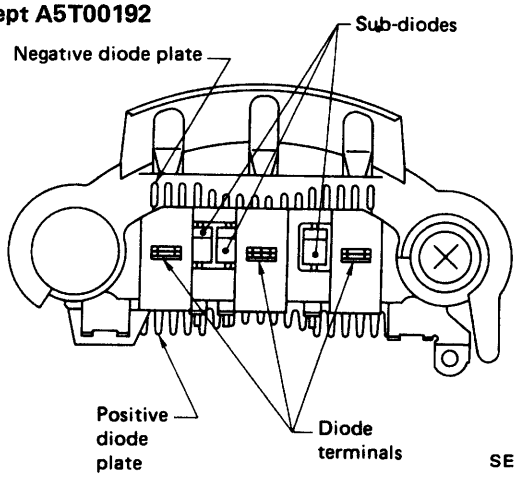
[HITACHI make]



SEL768D

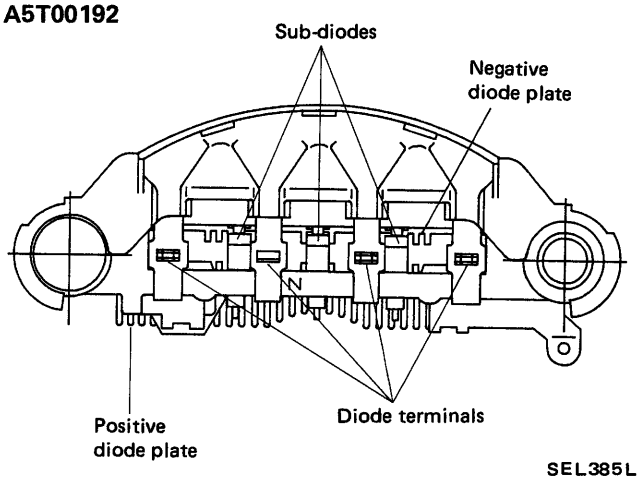
[MITSUBISHI make]

Except A5T00192



SEL493H

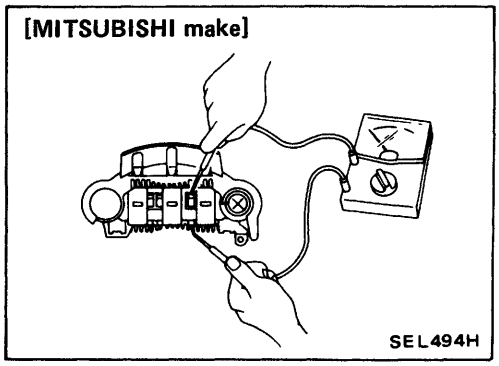
A5T00192



SEL385L

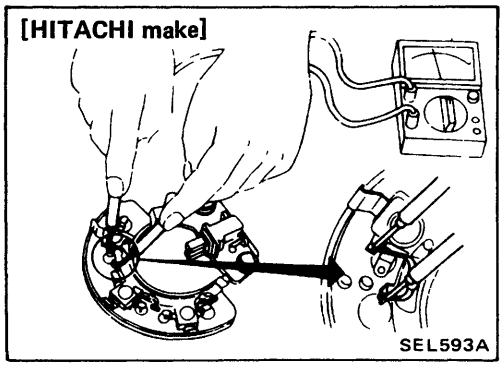
Diode Check (Cont'd)

[MITSUBISHI make]



SEL494H

[HITACHI make]



SEL593A

SUB-DIODES

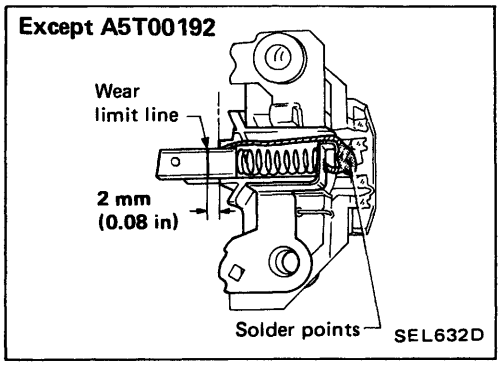
- Attach ohmmeter's probe to each end of diode to check for continuity.
- Continuity is N.G. ... Replace diode assembly.

Assembly

Carefully observe the following instructions.

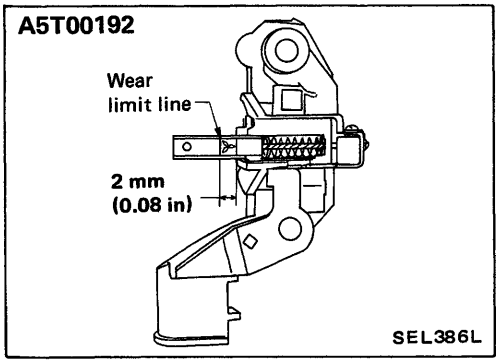
- When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.

Except A5T00192



SEL632D

A5T00192



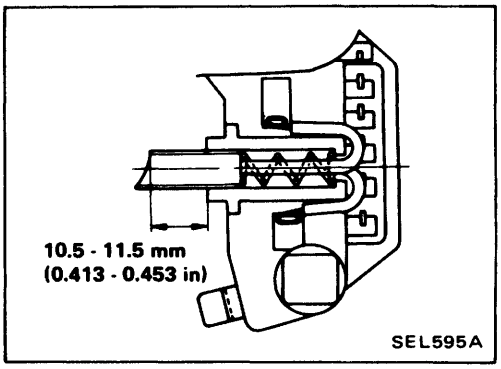
SEL386L

WHEN SOLDERING BRUSH LEAD WIRE

[MITSUBISHI make]

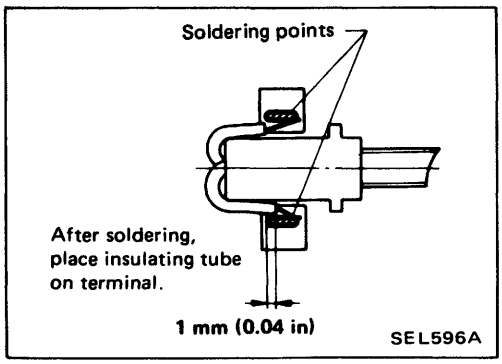
- Position brush so that its wear limit line protrudes 2 mm (0.08 in) beyond end face of brush holder.

Assembly (Cont'd)



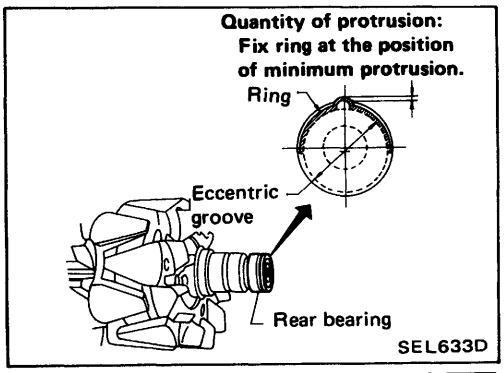
[HITACHI make]

(1) Position brush so that it extends 10.5 to 11.5 mm (0.413 to 0.453 in) from brush holder.



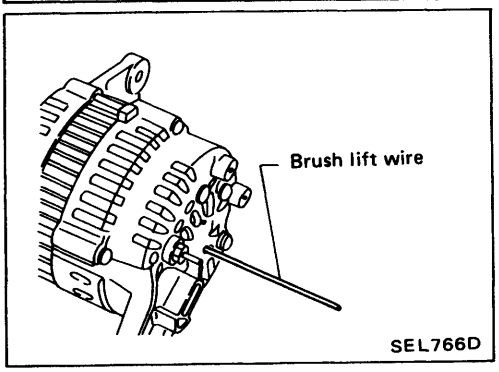
(2) Coil lead wire 1.5 times around terminal groove. Solder outside of terminal.

When soldering, be careful not to let solder adhere to insulating tube as it will weaken the tube and cause it to break.



RING FITTING IN REAR BEARING

- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.

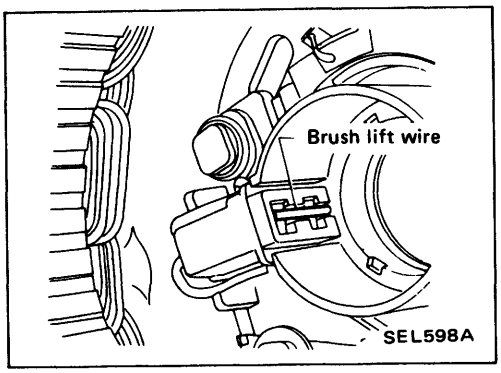


REAR COVER INSTALLATION

(1) Before installing front cover with pulley and rotor with rear cover, push brush up with fingers and retain brush by inserting brush lift wire into brush lift hole from outside.

(2) After installing front and rear sides of alternator, pull brush lift wire by pushing toward the center.

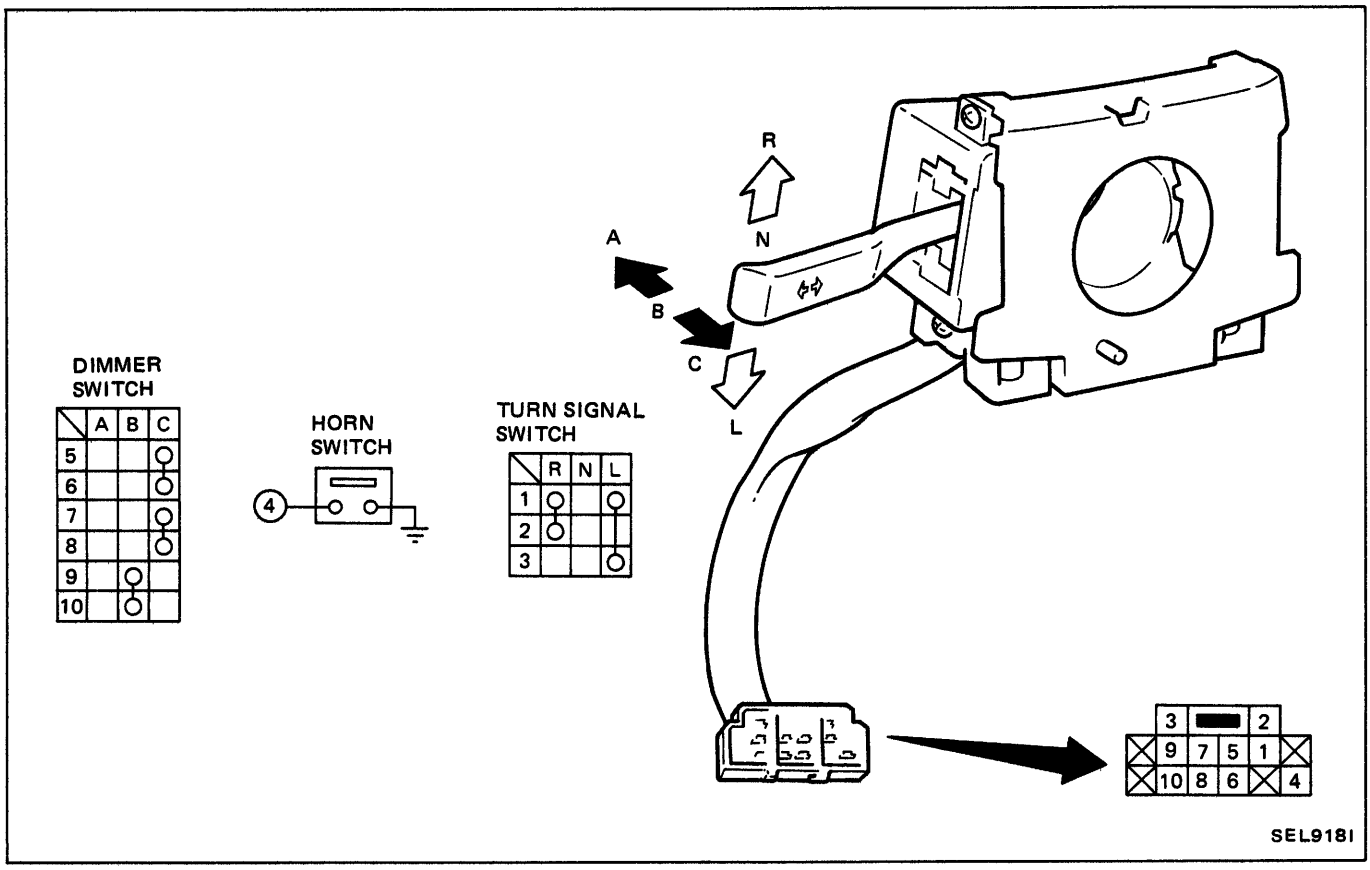
Do not pull brush lift wire by pushing toward outside of rear cover as it will damage slip ring sliding surface.

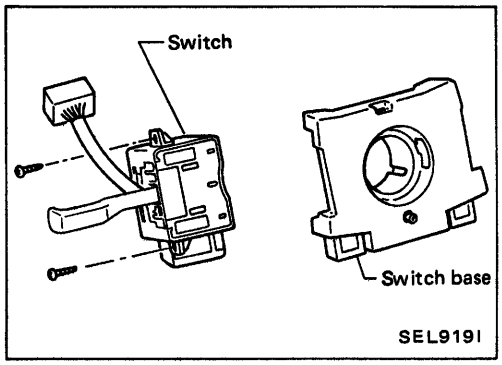


ALTERNATOR

Type		LR170-715B	A2T48298	LR170-716	A2T48292	LR165-707	A5T00192
		HITACHI make	MITSUBISHI make	HITACHI make	MITSUBISHI make	HITACHI make	MITSUBISHI make
Applied model		CA18DE engine				GA16i engine	
		Without A/C		With A/C			
Nominal rating	V-A	12 - 70				12 - 65	
Ground polarity		Negative					
Minimum revolution under no-load (When 13.5 volts is applied)	rpm	Less than 950	Less than 1,300	Less than 950	Less than 1,300	Less than 950	1,100
Hot output current	A/rpm	More than 50/2,500 More than 67/5,000	More than 50/2,500 More than 70/5,000			More than 17/1,300 More than 48/2,500 More than 62/5,000	More than 16/1,300 More than 50/2,500
Regulated output voltage	V	14.1 - 14.7					
Minimum length of brush	mm (in)	7 (0.28)	8 (0.31)	7 (0.28)	8 (0.31)	6 (0.24)	8 (0.31)
Brush spring pressure	N (g, oz)	2.746 - 3.923 (280 - 400, 9.88 - 14.11)	3.040 - 4.217 (310 - 430, 10.93 - 15.17)	2.746 - 3.923 (280 - 400, 9.88 - 14.11)	3.040 - 4.217 (310 - 430, 10.93 - 15.17)	1.471 - 3.334 (150 - 340, 5.29 - 11.99)	3.040 - 4.217 (310 - 430, 10.93 - 15.17)
Slip ring minimum outer diameter	mm (in)	More than 30.6 (1.205)	More than 22.4 (0.882)	More than 30.6 (1.205)	More than 22.4 (0.882)	More than 26.8 (1.055)	More than 22.1 (0.870)

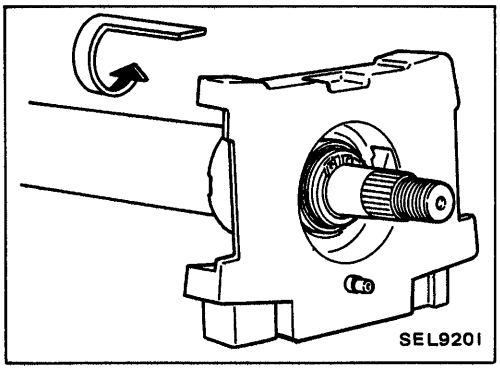
Check





Replacement

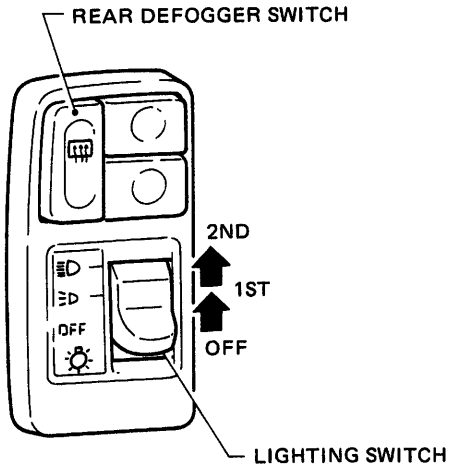
Dimmer switch & turn signal switch can be replaced without removing combination switch base.



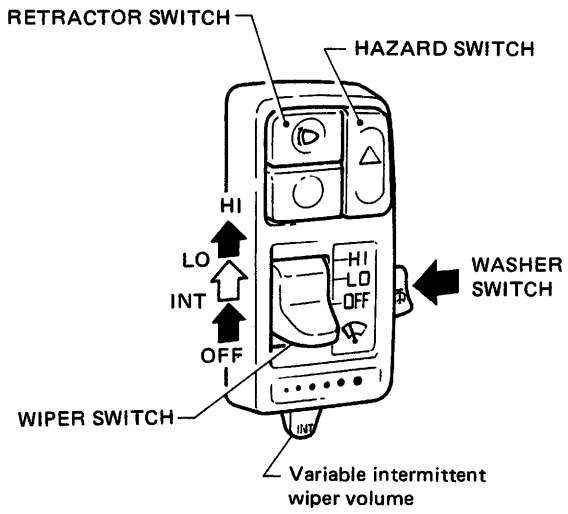
To remove combination switch base, loosen base attaching screw and turn after pushing on it.

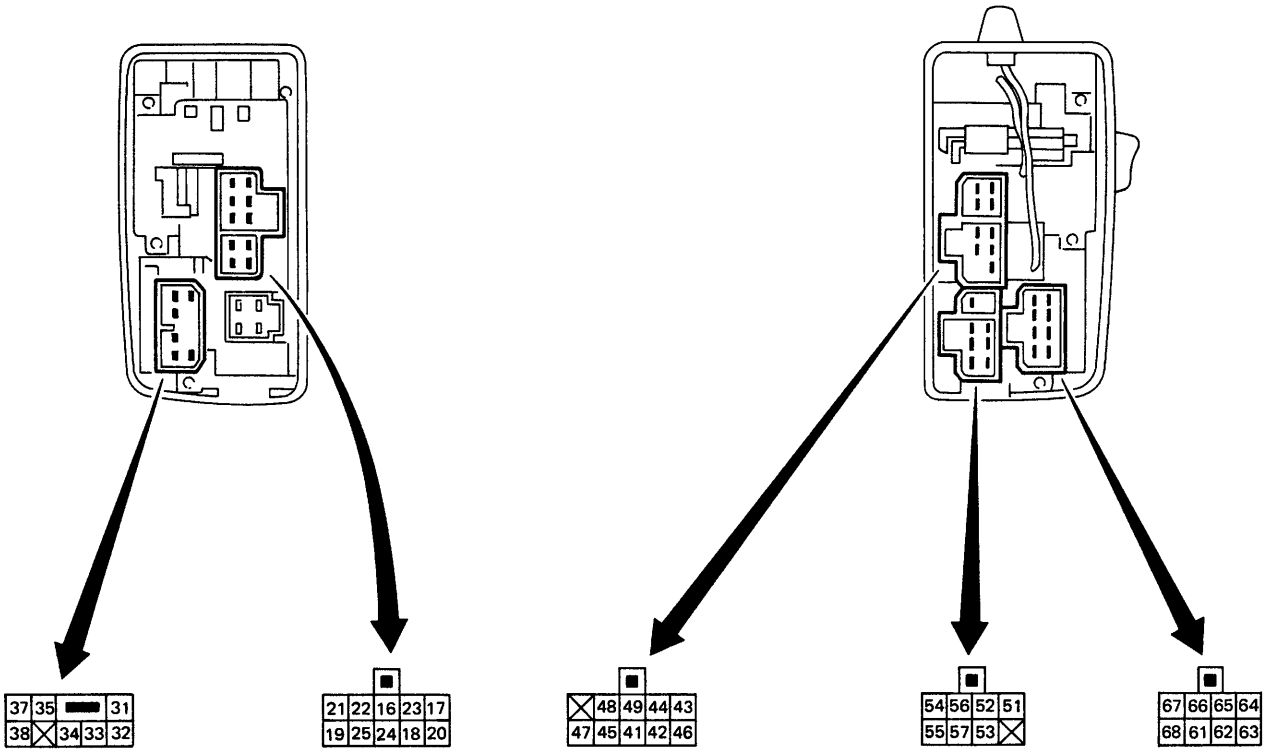
Check

L.H.

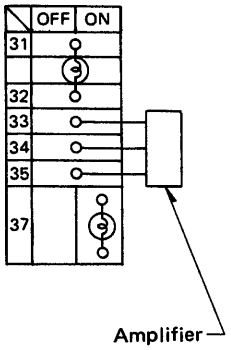


R.H.

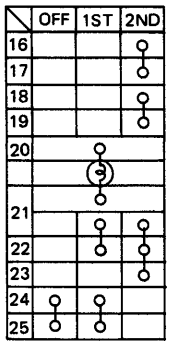




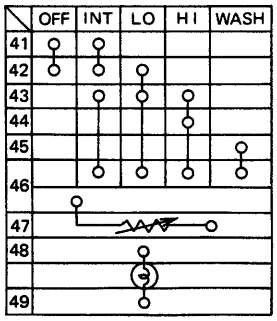
REAR DEFOGGER SWITCH



LIGHTING SWITCH

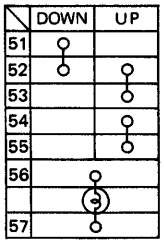


WIPER and WASHER SWITCH

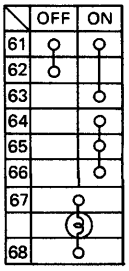


Resistance between 46 and 47:
0 - 1,000 [Ω]

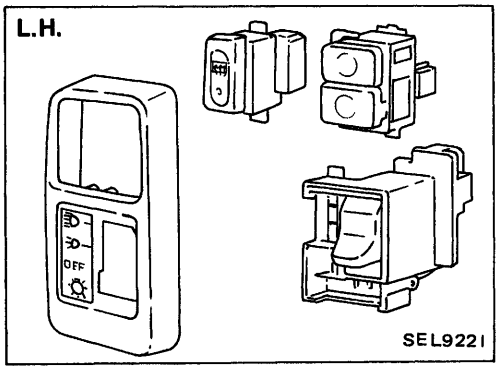
RETRACTOR SWITCH

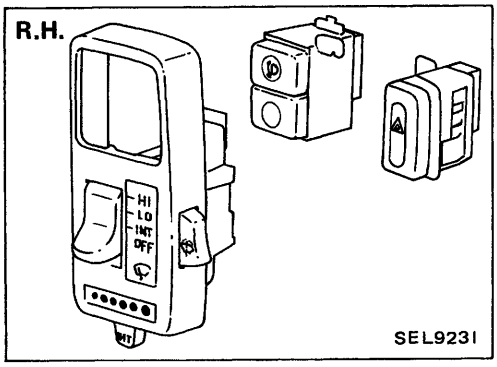


HAZARD SWITCH



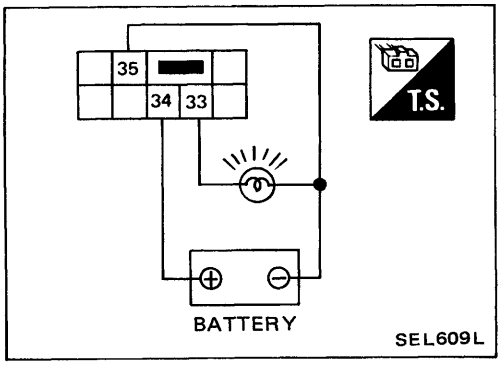
SEL608L





Replacement

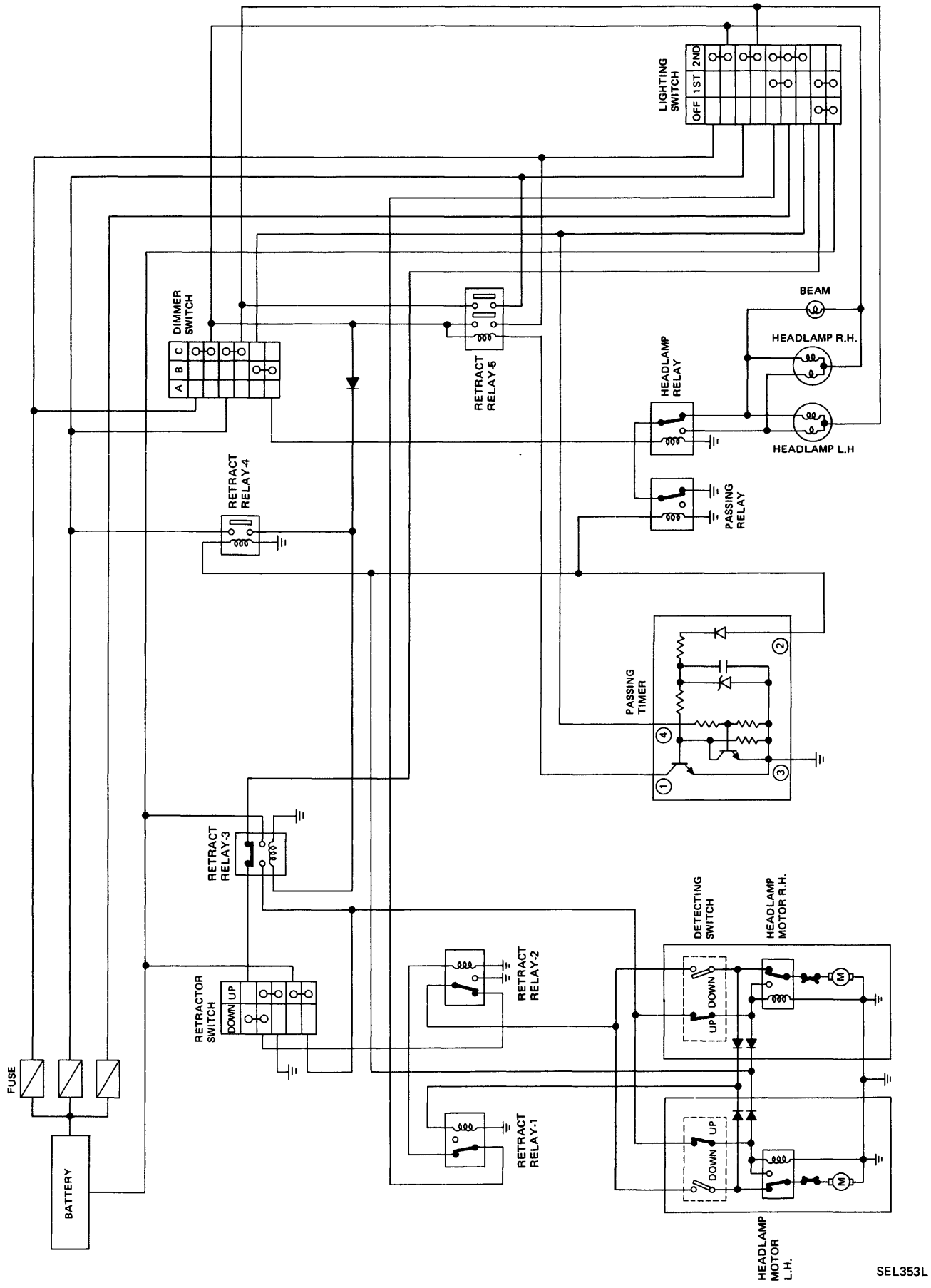
Each switch can be replaced individually.



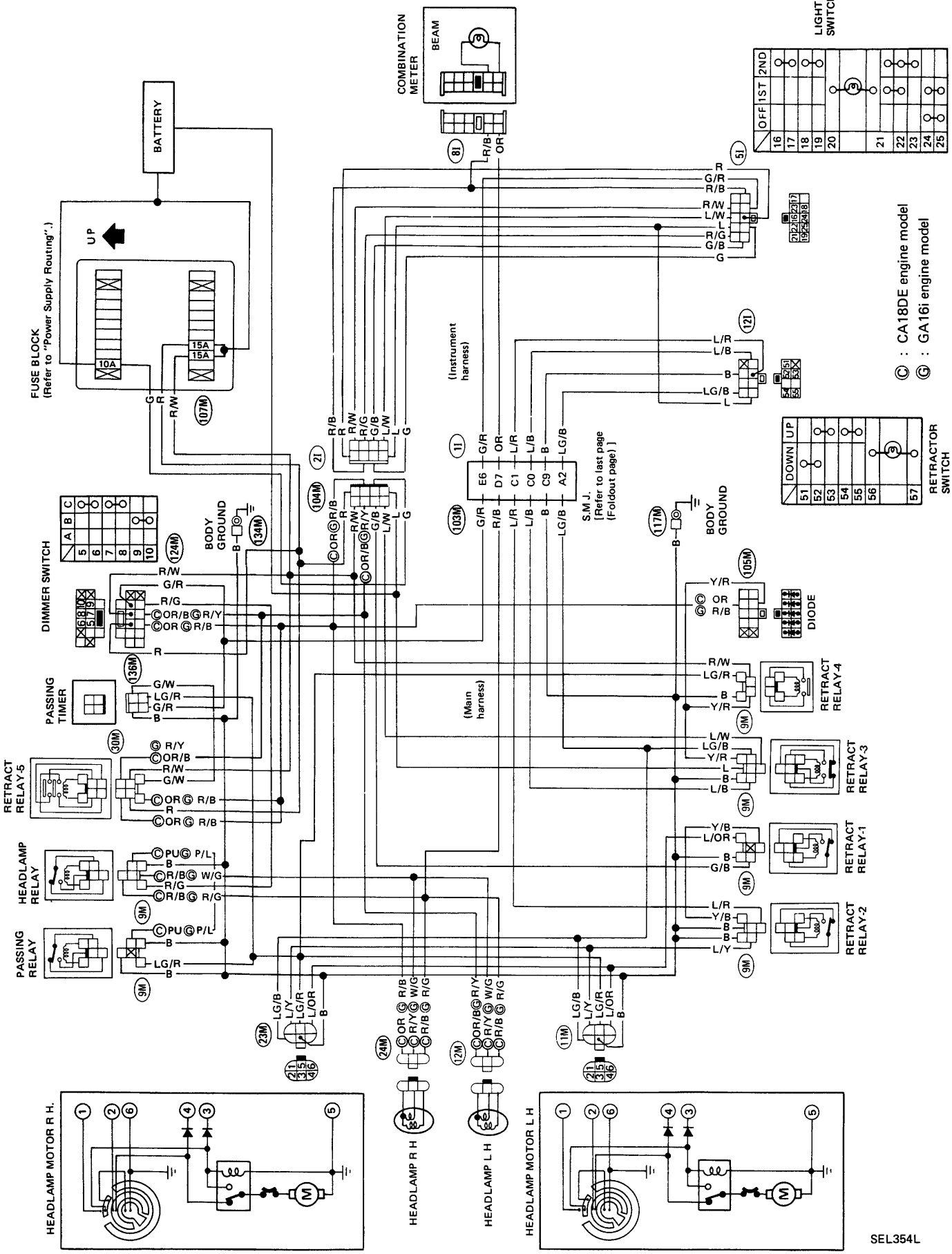
Rear Defogger Amplifire Check

1. Connect as shown in the figure to the left.
2. If test lamp comes on for a few minutes, rear defogger amplifier is normal.

Schematic


LIGHTING SWITCH
OFF
1ST
2ND
DIMMER SWITCH
A
B
C
RETRACT RELAY-5
BEAM
HEADLAMP R.H.
HEADLAMP RELAY
HEADLAMP L.H
RETRACT RELAY-4
PASSING RELAY
PASSING TIMER
RETRACT RELAY-3
DETECTING SWITCH
HEADLAMP MOTOR R.H.
RETRACTOR SWITCH
UP
DOWN
RETRACT RELAY-2
FUSE
BATTERY
RETRACT RELAY-1
HEADLAMP MOTOR L.H.
SEL353L

Wiring Diagram



Trouble-shooting

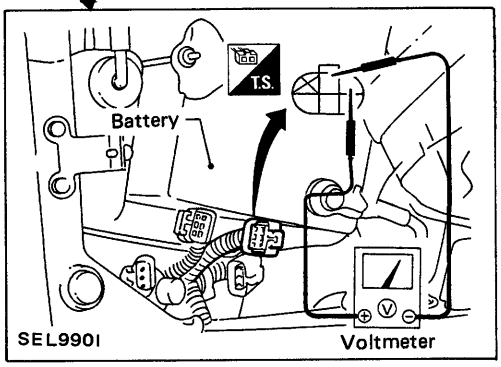
Headlamps do not open when turning lighting switch to "2ND" (or when turning dimmer switch to "C").

Refer to STANDARDIZED RELAY, POWER SUPPLY ROUTING, and HEADLAMP Wiring diagram.

Does headlamp motor operate?
- Yes → Repair headlamp motor linkage.
- No →

Do headlamps come on?
- No → Check fuses for headlamps.
  - O.K. → Check lighting switch. (Check dimmer switch.)
    - O.K. → Check harness between:
      - battery and fuses
      - fuses and lighting switch (dimmer switch)
    - O.K. → (back to Check headlamp motor "UP" power source.)
- Yes →

Check headlamp motor "UP" power source.
- N.G. → Check fusible link for headlamp motor.
  - O.K. → Check retract relay 3.
    - O.K. → Check diodes between lighting switch (dimmer switch) and retract relay 3.
      - O.K. → Check harness between:
        - lighting switch (dimmer switch) and retract relay 3
        - fusible link and retract relay 3
        - retract relay 3 and headlamp motor
- O.K. → Check headlamp motor and motor ground.
  - → Refer to headlamp motor check.



When turning lighting switch to "2ND" (or dimmer switch to "C") and headlamps reach the "up" position.
Battery voltage should exist. ... O.K.

Trouble-shooting (Cont'd)

Headlamps do not open
when turning retractor switch to "UP", and when headlamps open by operating lighting switch (dimmer switch).

O.K.

Check retractor switch.

O.K.

Check harness between:
- fusible link and retractor switch
- retractor switch and headlamp motor

Headlamps do not close.

Check retract switch and lighting switch.

O.K.

Check retract relay 3 and retract relay 2.

O.K.

Check harness between:
- lighting switch and retract relay 3
- retract relay 3 and retract switch
- retract switch and retract relay 2
- retract relay 2 and headlamp motor

Headlamps do not come on when dimmer switch is in "PASSING" mode.

Check dimmer switch.

O.K.

Check retract relay 5.

O.K.

Check harness between:
- dimmer switch and headlamps.
- dimmer switch and retract relay 5.
- retract relay 5 and passing timer
- passing timer and headlamp motor

O.K.

Check passing timer. N.G. → Replace.

Description

BASIC OPERATION

Condition		Operation		
Lighting switch	Retractor switch	C/O*	Headlamp motor	Headlamps
OFF → 1ST	OFF		No operation	OFF
1ST → 2ND	OFF	[A]	Open	ON after headlamp motor reaches fully open position.
2ND → 1ST	OFF		Held to open position	OFF
1ST → OFF	OFF	[B]	Closed	OFF
Momentarily turned to PASSING	OFF	[C]	Opened and closed after headlamps go off.	Momentarily ON after headlamp motor reaches fully open position, and go off.
OFF	ON	[D]	Open	OFF

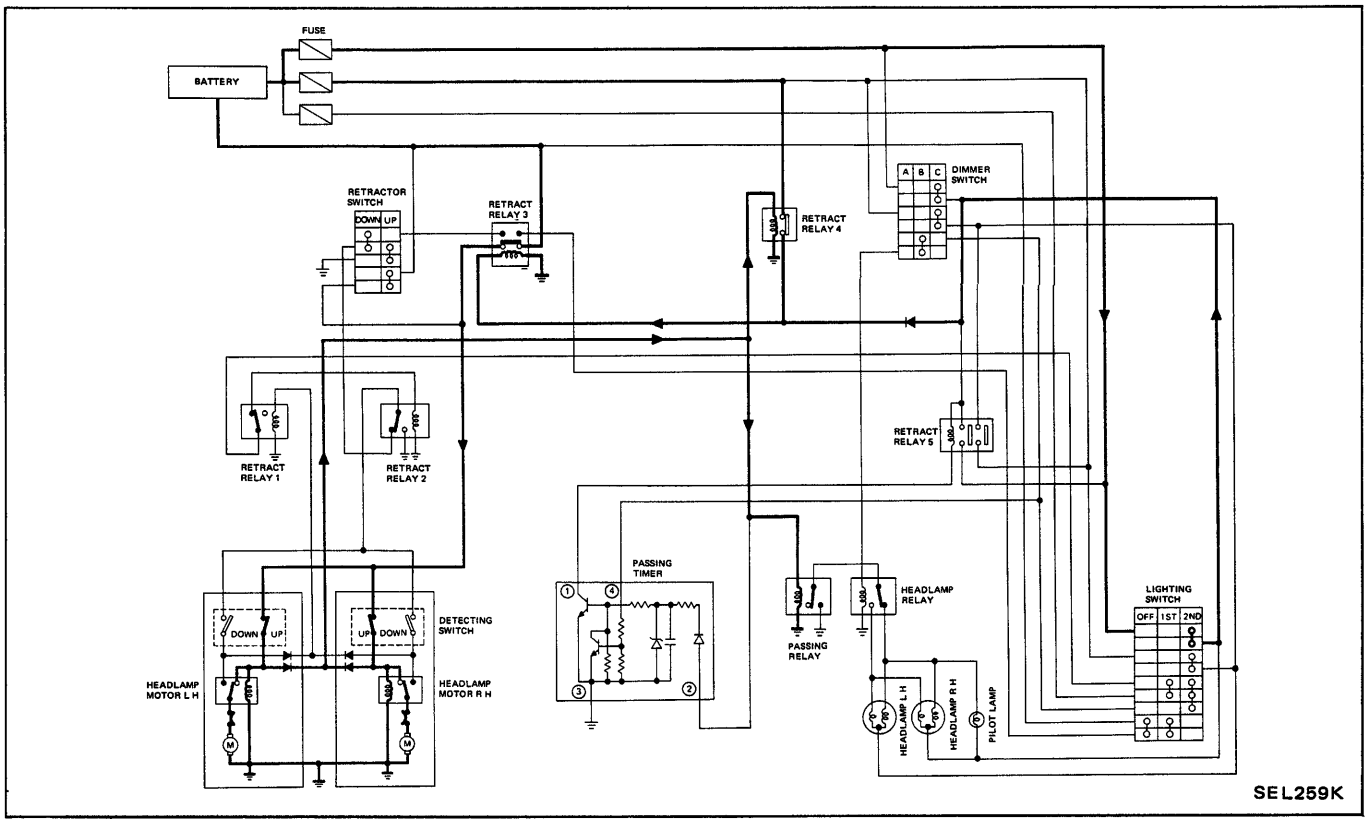
*: Refer to CIRCUIT OPERATION.

Description (Cont'd)

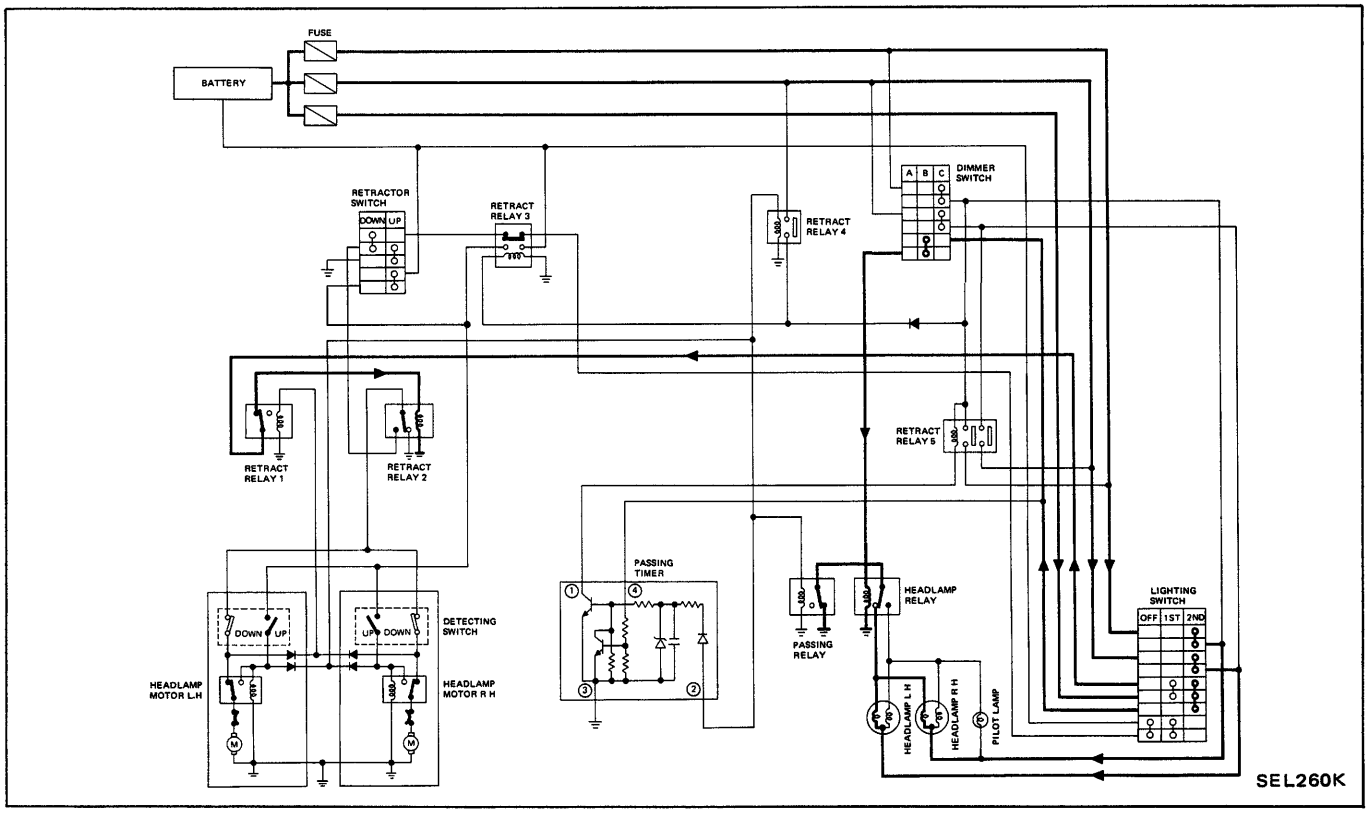
CIRCUIT OPERATION

[A] When lighting switch is switched from "1ST" → "2ND"

A-1: While operating the headlamp motor to open position

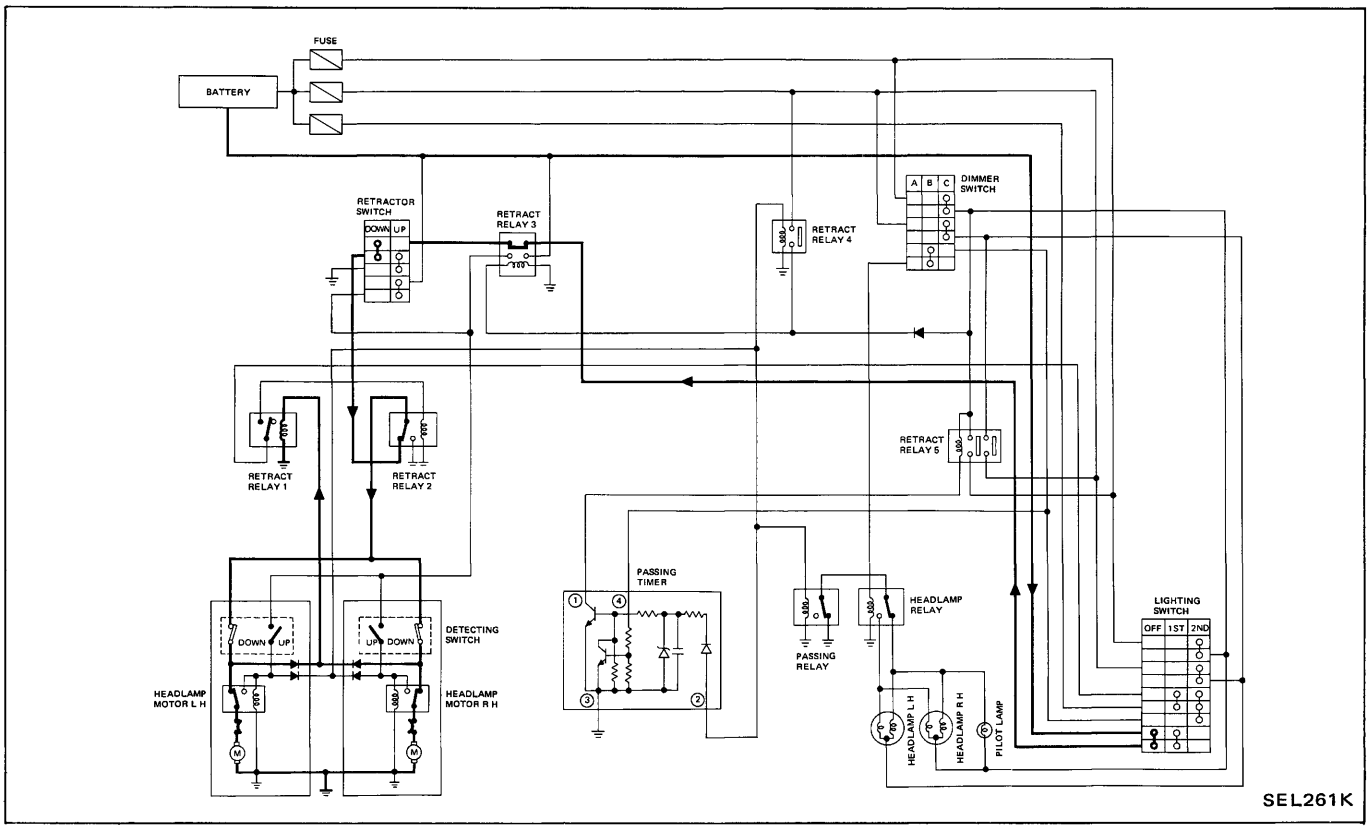


A-2: After the headlamp motor reaches fully open position

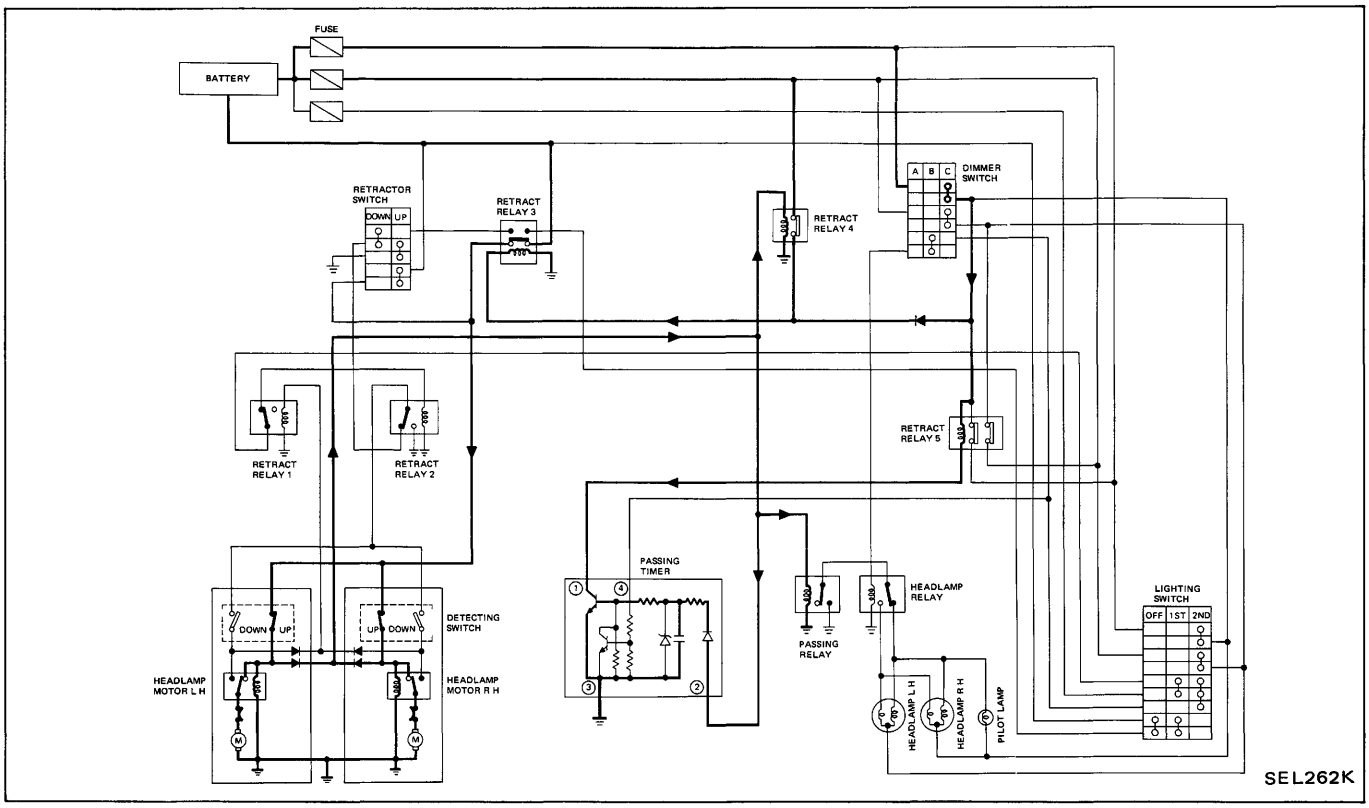


Description (Cont'd)

[B] When lighting switch is switched from "1ST" → "OFF"
(While operating the headlamp motor to closed position)

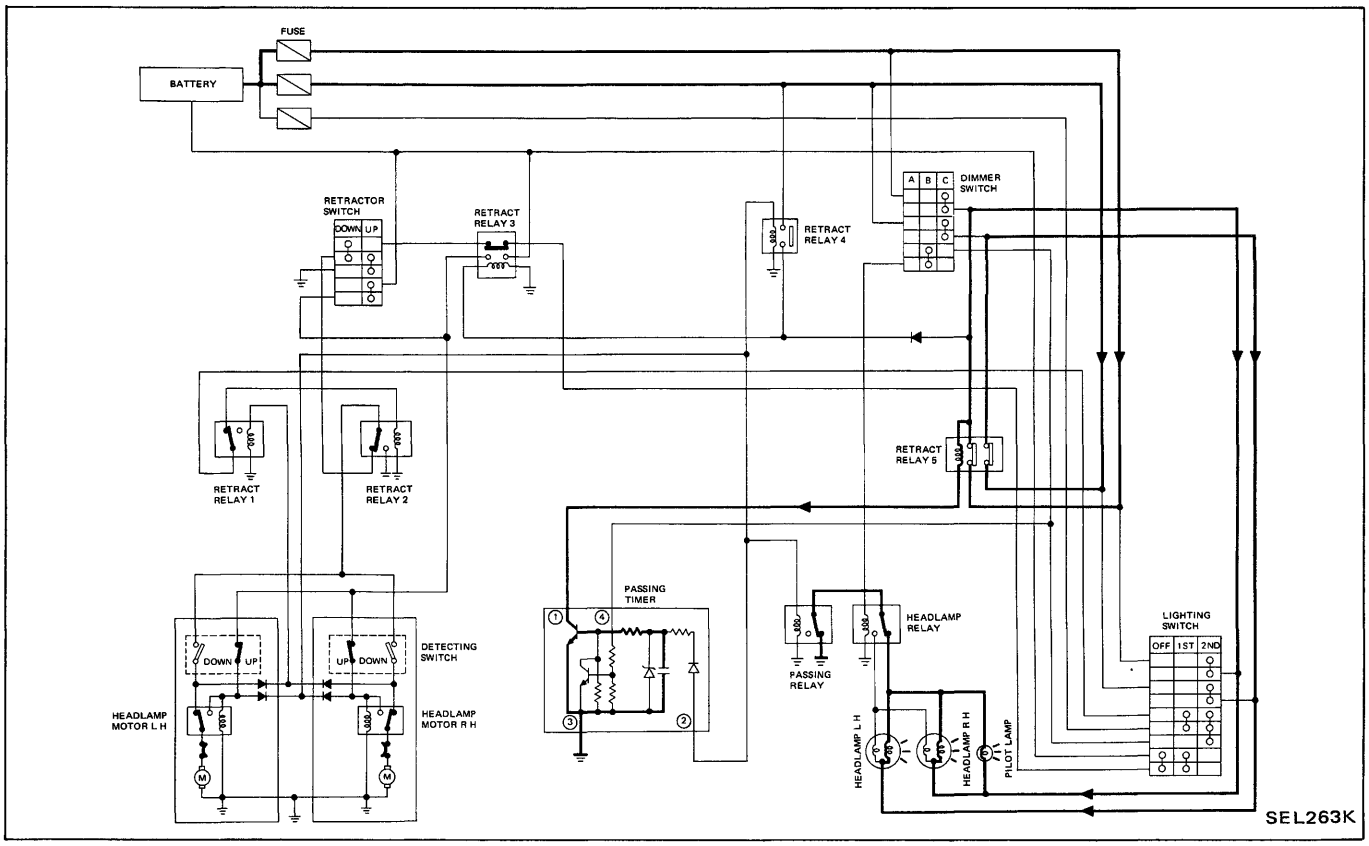


[C] When lighting switch is switched to "PASSING"
C-1: While operating the headlamp motor to open position

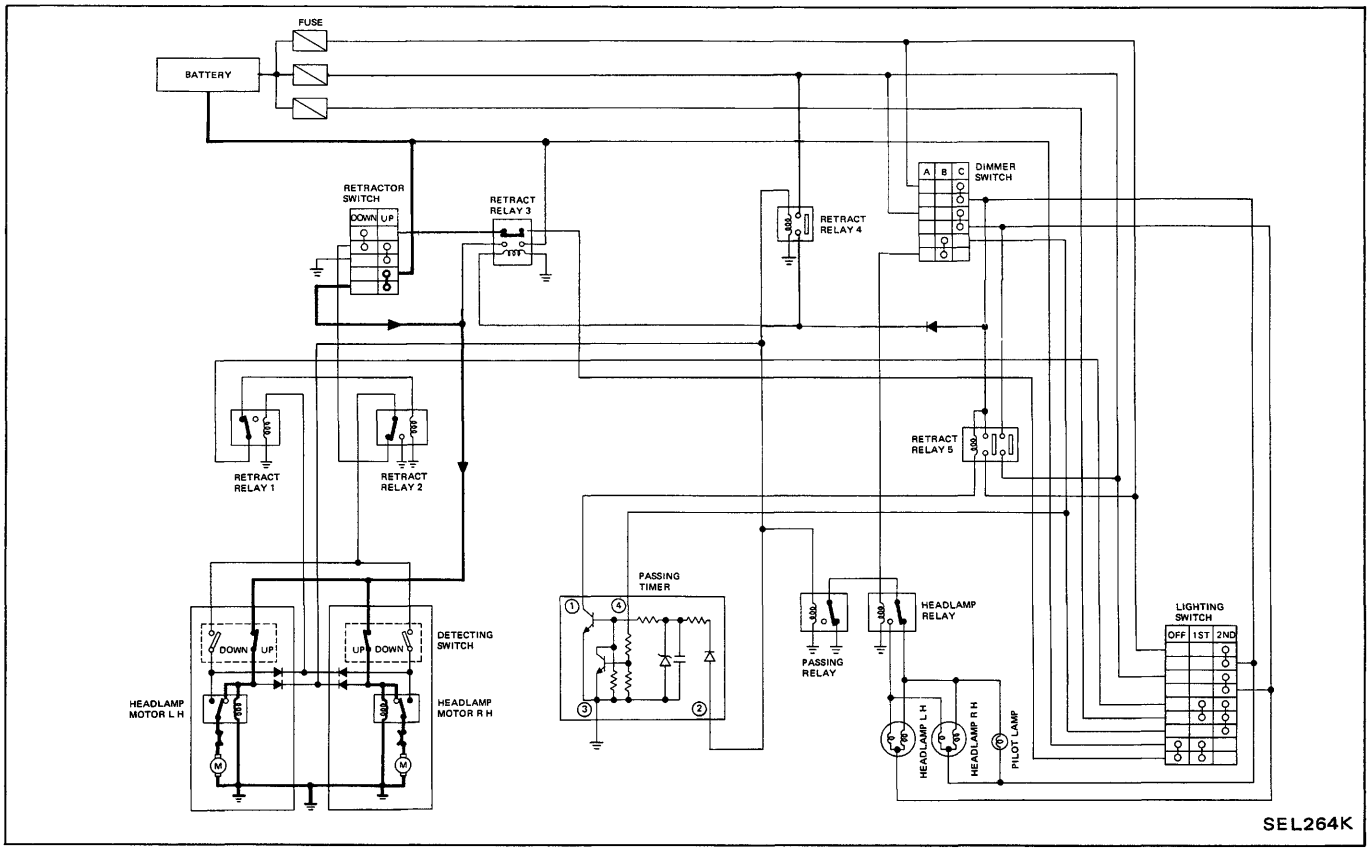


Description (Cont'd)

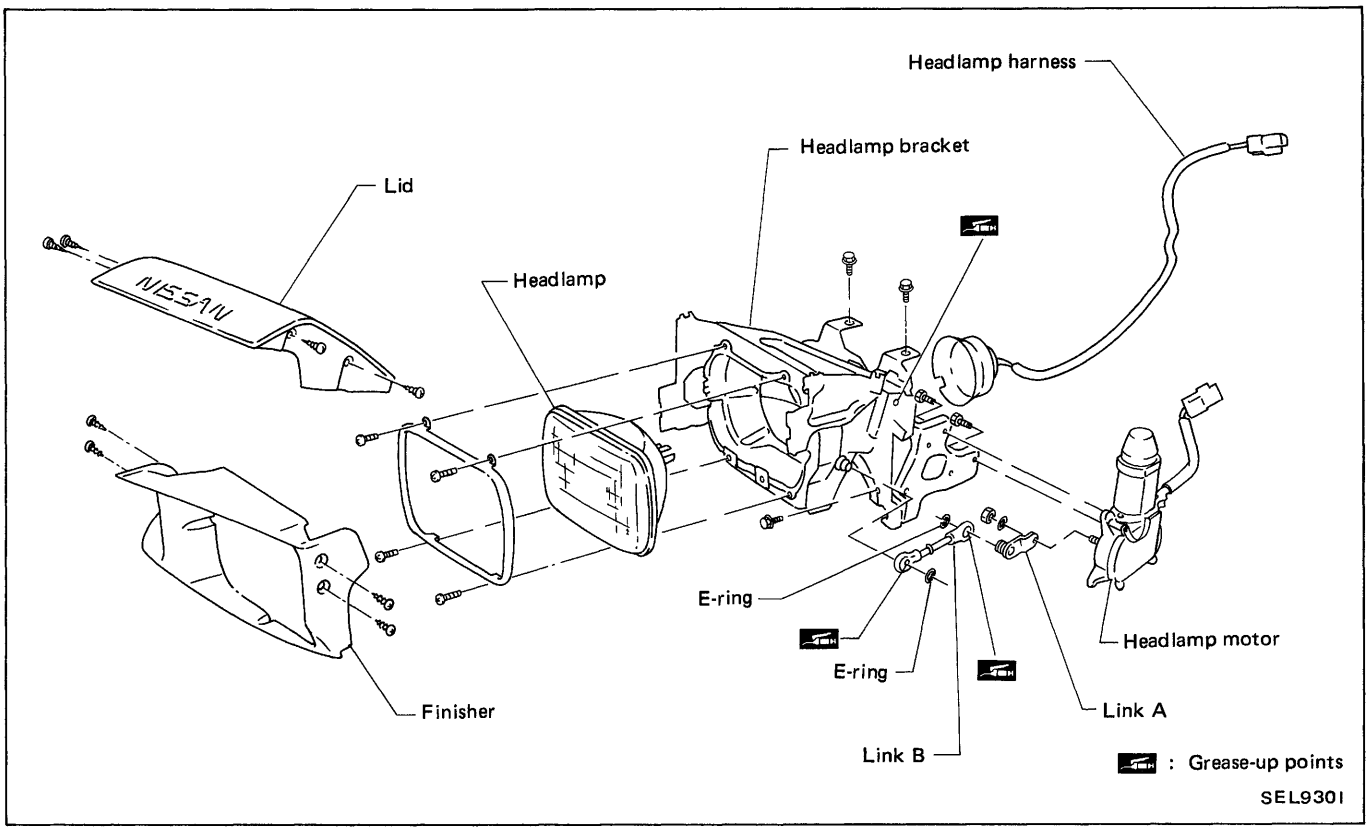
C-2: After the headlamp reaches fully open position



[D] When retractor switch is turned ON
(While operating the headlamp motor to open position)

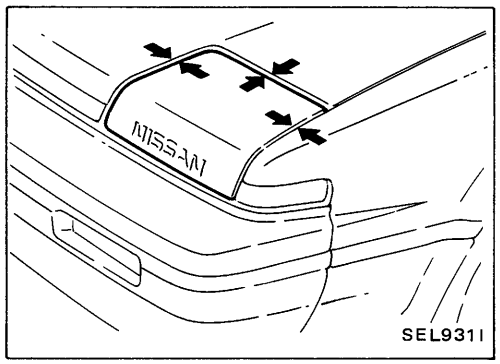


Constructions



Assembly

1. Set the headlamp motor to "CLOSE" position.
- Connect harness to headlamp motor and set retract switch to "CLOSE". Headlamp motor can now be set to "DOWN" with retract switch.
2. Assemble headlamp motor to the headlamp bracket.
3. Assemble the link A to the headlamp motor.
4. Assemble link B to link A and the headlamp bracket.
5. Assemble headlamp, finisher and lid.



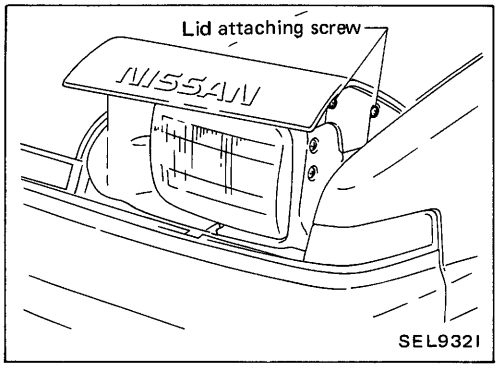
Installation and Adjustment

Before doing this, be sure to disconnect battery ground cable.

1. Install headlamp bracket to body temporarily.

1) Determine headlamp bracket location on body so that alignment between lid, hood, and fender looks straight.

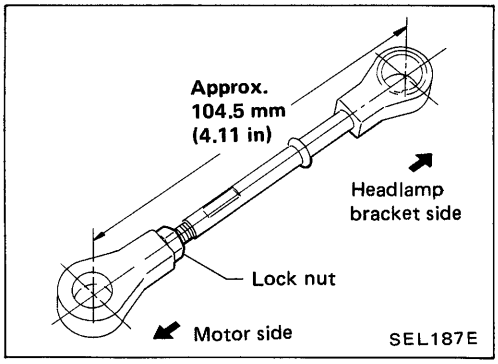
2) After adjusting alignment, tighten headlamp bracket securely to body.



2. Adjust lid alignment.

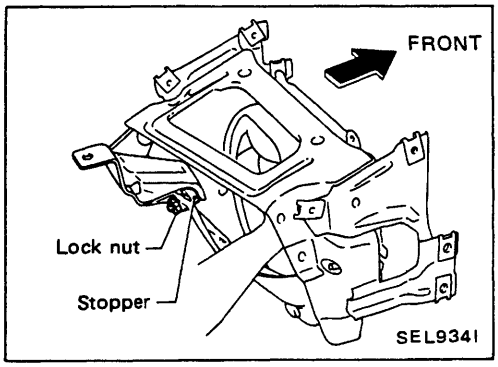
- Adjust lid, hood and fender for alignment while opening and closing headlamp with motor manual knob.

Use motor manual knob to open and close headlamp, and adjust alignment while checking that lid is not interfering with hood.

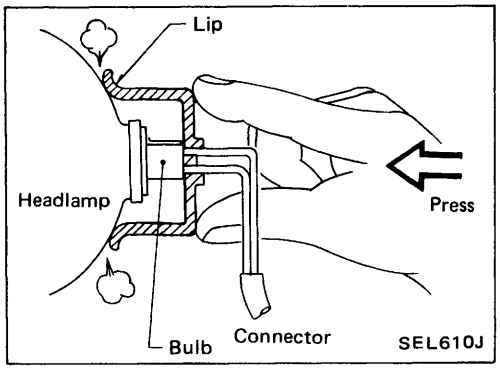


3. When the link B is changed, confirm that link B is the length shown left, then tighten lock nut firmly.

Installation and Adjustment (Cont'd)



4. Adjust stopper.
1) Loosen lock nut on stopper.
2) Turn motor manual knob to open headlamp assembly completely.
3) Adjust stopper screw.



INSTALLING HEADLAMP RUBBER CAP

Press the rubber cap firmly so the lip makes contact with the headlamp body.

Aiming Adjustment

When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. For operating instructions of any aimer, it should be in good repair, calibrated and used according to respective operation manuals supplied with the unit.

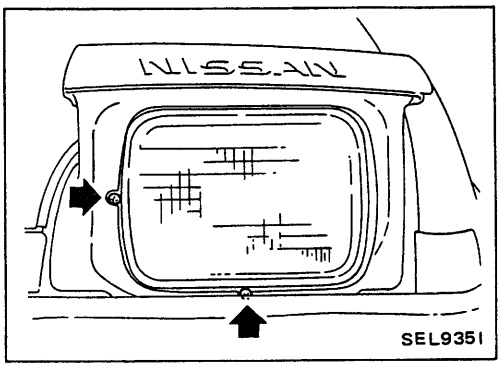
If any aimer is not available, aiming adjustment can be done as follows:

For details, refer to the regulations in your own country.

CAUTION:

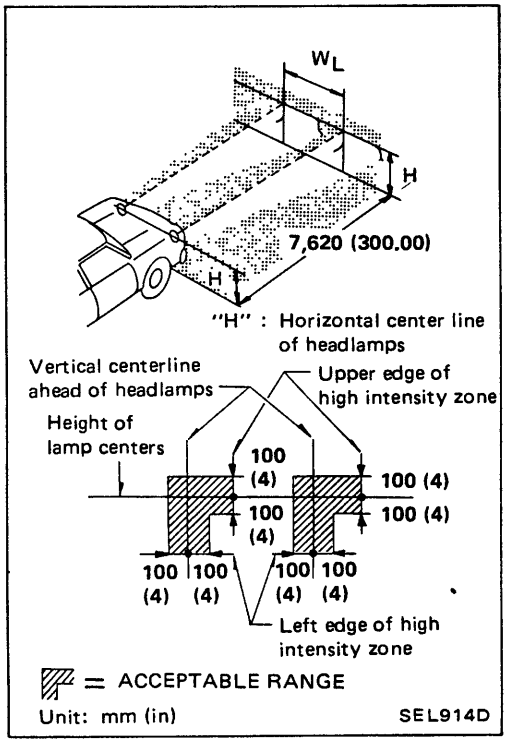
a. **Keep all tires inflated to correct pressures.**
b. **Place vehicle and tester on one and same flat surface.**
c. **See that there is no load in vehicle (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).**

Aiming Adjustment (Cont'd)



1. Turn headlamp low beam on.
2. Use adjusting screws to perform aiming adjustment.

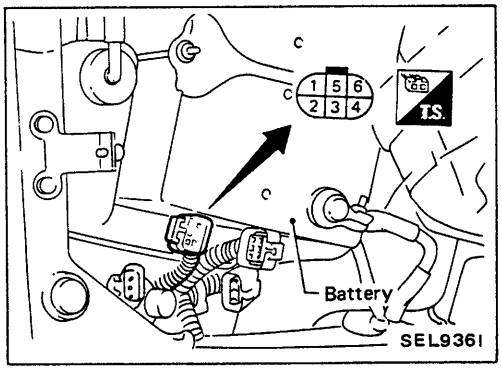
- **First tighten the adjusting screw all the way and then make adjustment by loosening the screw.**



- **Adjust headlamps so that upper edge and left edge of high intensity zone are within the acceptable range as shown at left.**
- **Dotted lines in illustration show center of headlamp.**

"H": Horizontal center line of headlamps
"WL": Distance between each headlamp center

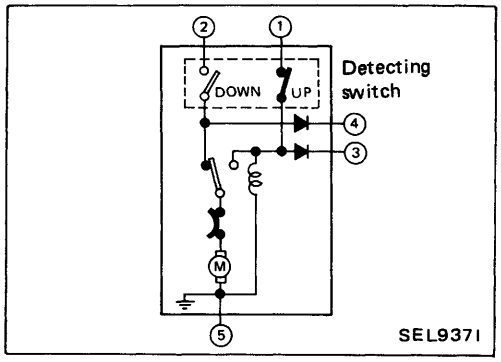
Headlamp Motor Check



1. Disconnect battery ground cable.
2. Disconnect the headlamp motor connector.
3. Use an ohmmeter to check for continuity in headlamp motor circuit while rotating motor with manual knob.

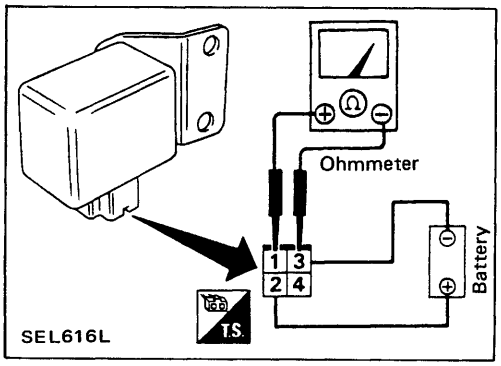
Link A position	Ohmmeter probe (+)	Ohmmeter probe (−)	Continuity
"CLOSE"	①	⑤	YES
	②	⑤	NO
	①	③	NO
	③	①	YES
"OPEN"	①	⑤	NO
	②	⑤	YES
	②	④	NO
	④	②	YES

Headlamp Motor Check (Cont'd)



- Detecting switch position:

Headlamp position	UP switch	DOWN switch
"OPEN"	OFF	ON
"CLOSED"	ON	OFF
Between "OPEN" and "CLOSED"	ON	ON



Passing Timer Check

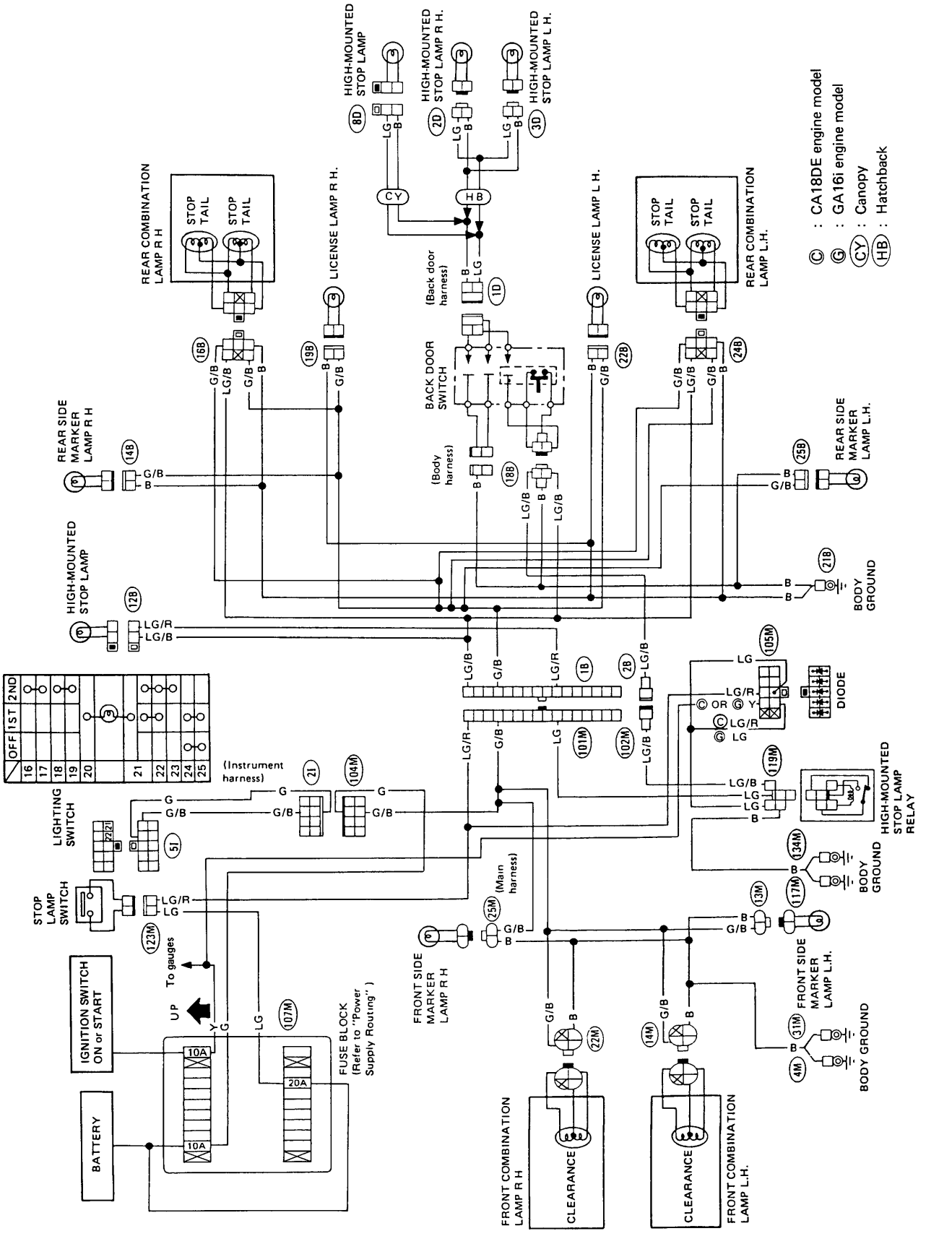
1. Disconnect harness connector from Passing Timer and connect battery and ohmmeter as shown.

Continuity exists.

2. Disconnect battery.

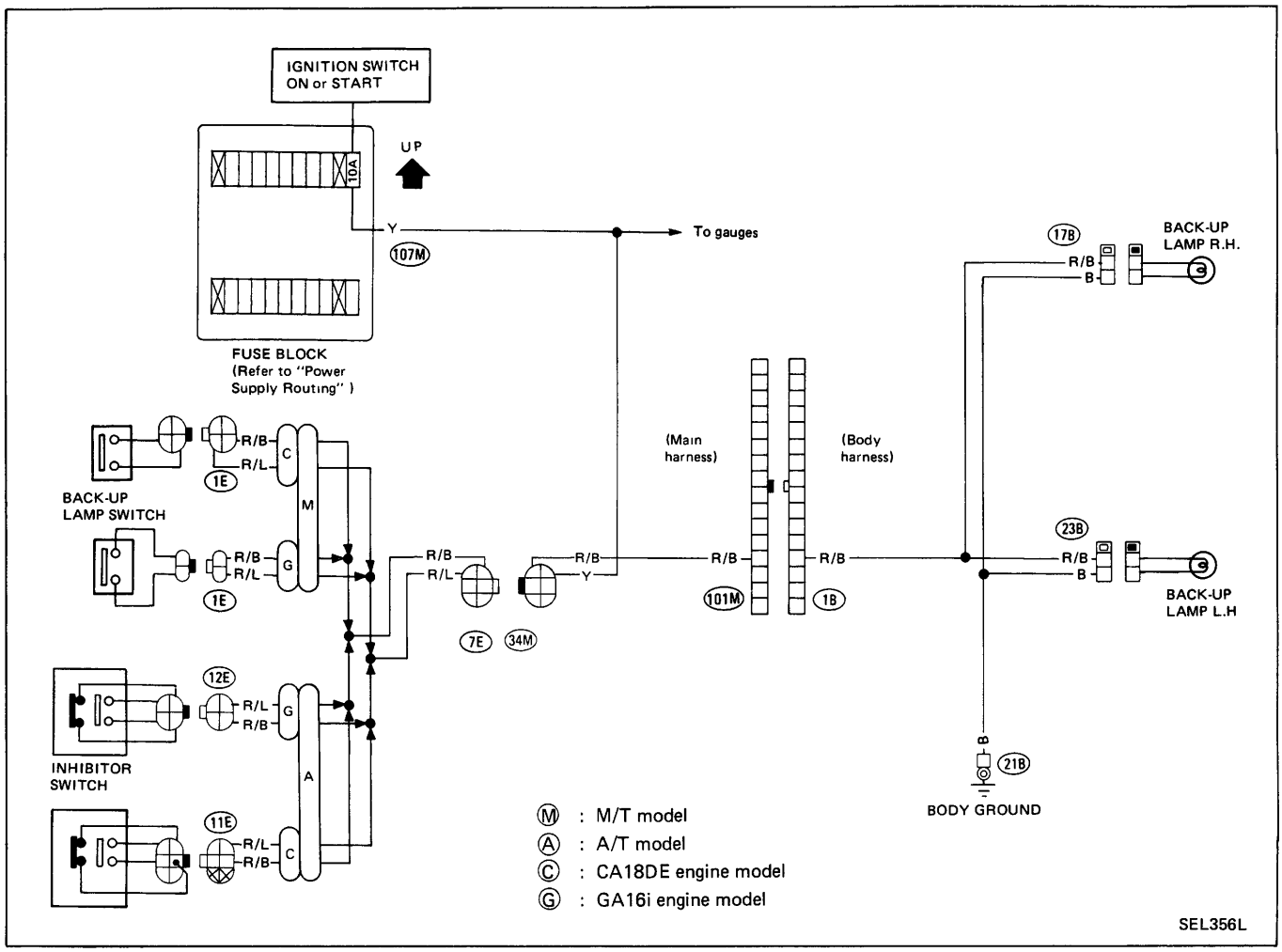
There is a little time-lag (Approx. 0.2 [sec.]) of no continuity. ... O.K.

Clearance, License, Tail and Stop Lamps/Wiring Diagram

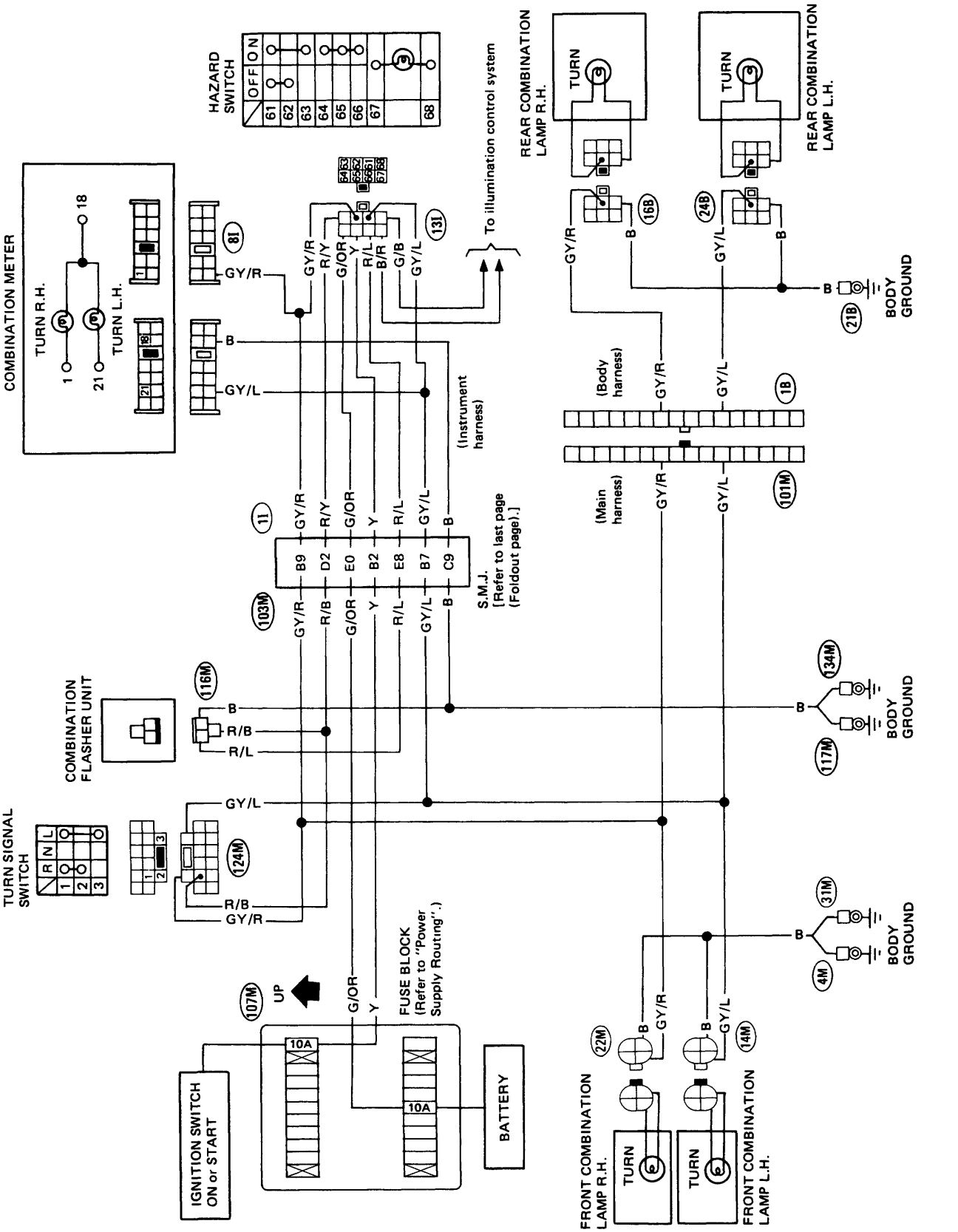


SEL355L

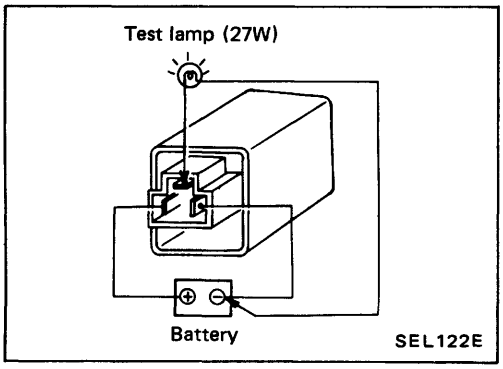
Back-up Lamp/Wiring Diagram



Turn Signal and Hazard Warning Lamps/Wiring Diagram



SEL357L



Combination Flasher Unit Check

- Before checking, ensure that bulbs meet specifications.
- Connect a battery and test lamp to the combination flasher unit, as shown. Combination flasher unit is properly functioning if it blinks when power is supplied to the circuit.

Bulb Specifications

HEADLAMPS

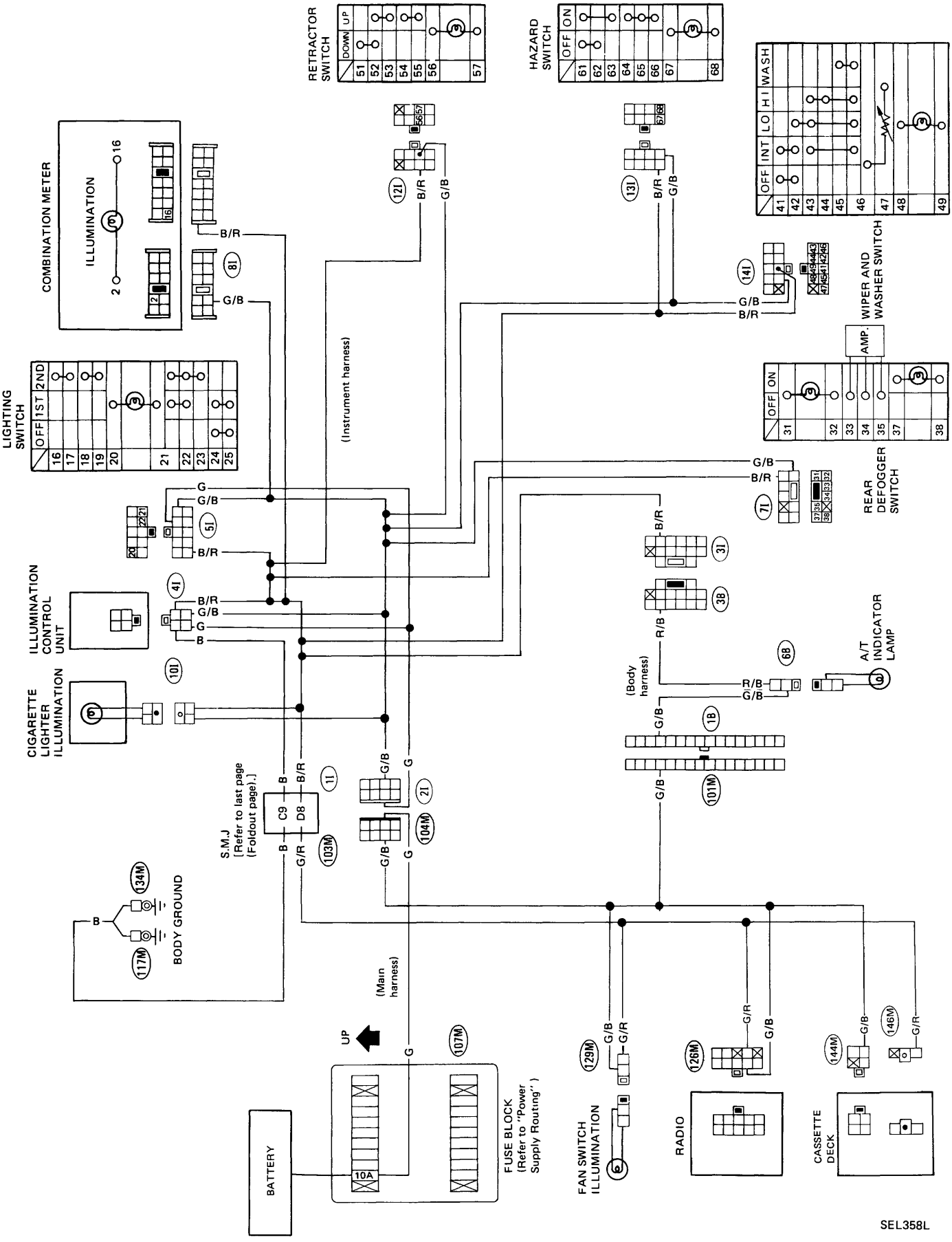
Item	Wattage (W)	Bulb No.
Sealed beam (halogen)	65/35	H6054

OTHER LAMPS

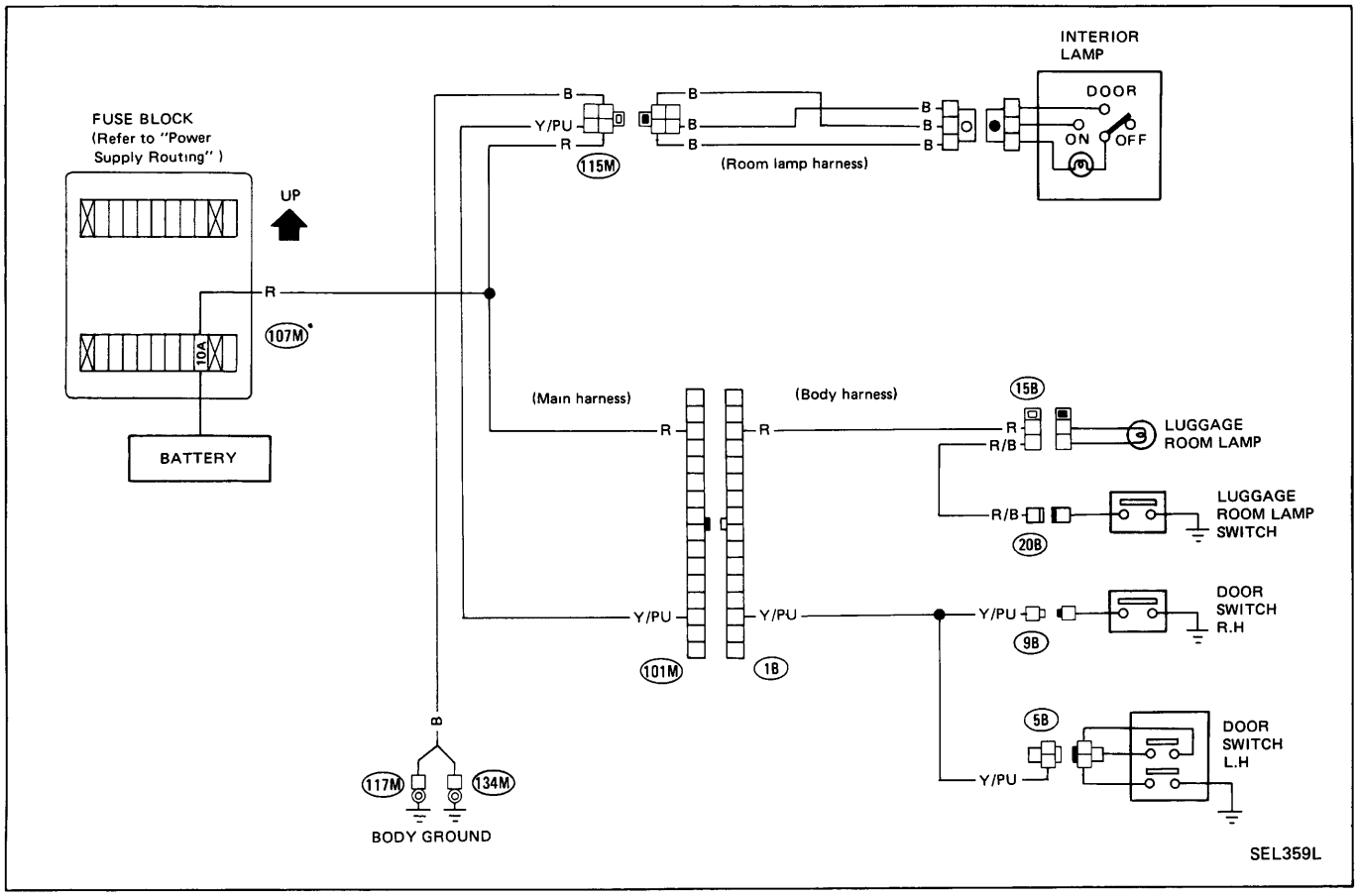
Item	Wattage (W)	Bulb No.
Front side marker	3.8	194
Front turn signal lamp/Clearance	27/8	1157
License plate lamp	10, 8	–, 67*
Rear combination lamp		
Tail & Stop	27/8	1157
Turn signal	27	1156
Back-up lamp	27	1156
High-mounted stop lamp (Interior)	27	1156
(Rear hatch)	27	1156
Rear side marker lamp	3.8	194
Interior lamp	10	–
Luggage compartment lamp	5	194

*For 8 (W) bulb

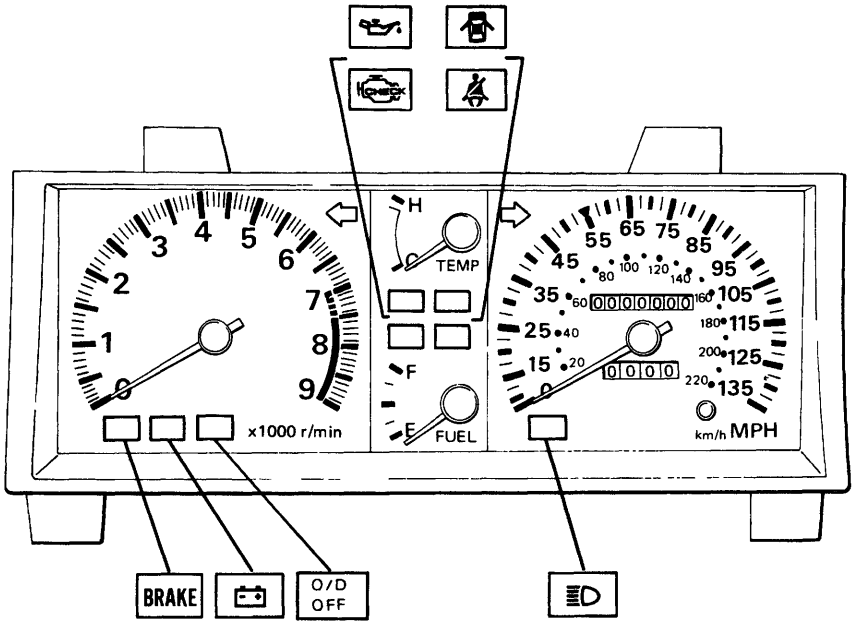
Illumination/Wiring Diagram

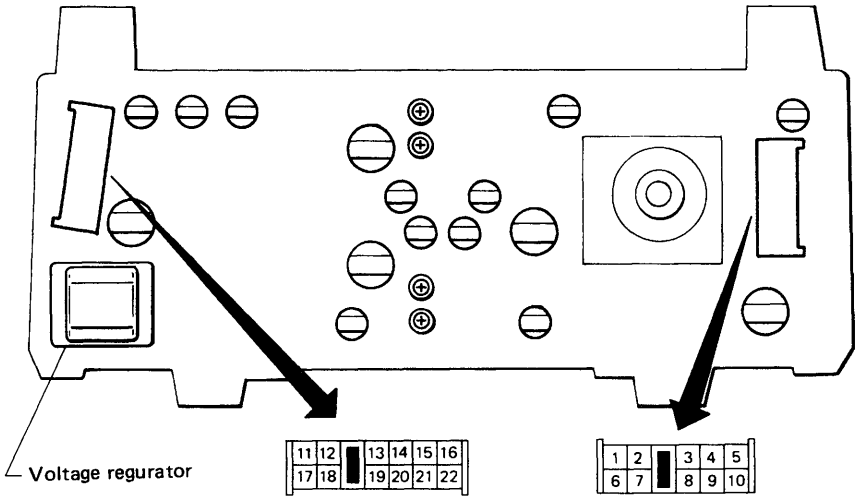


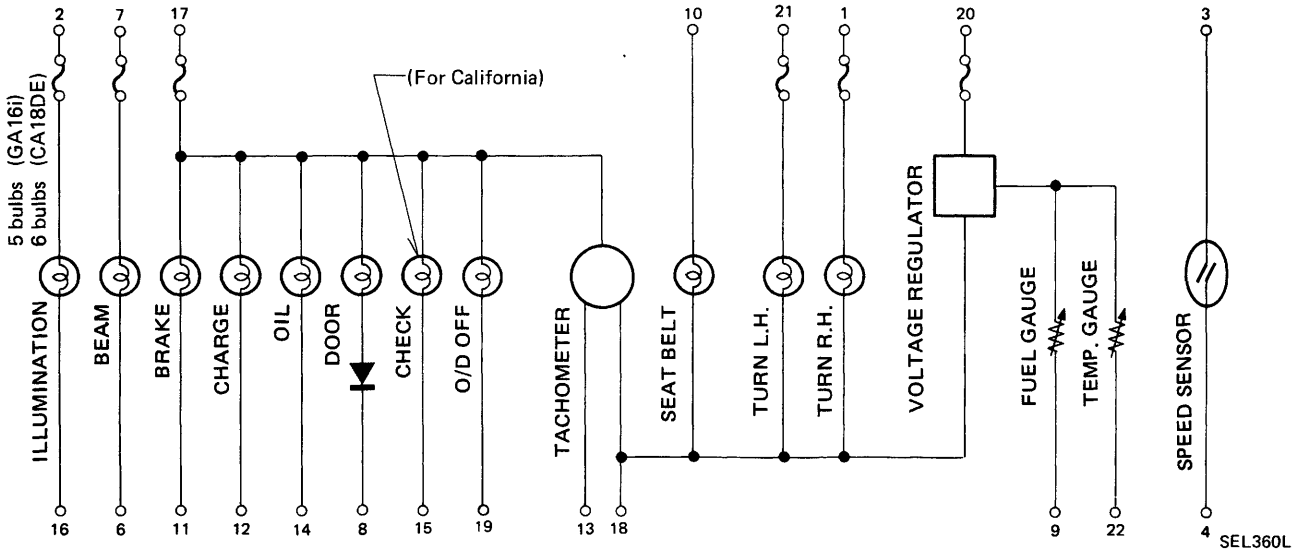
Interior and Luggage Room Lamps/Wiring Diagram



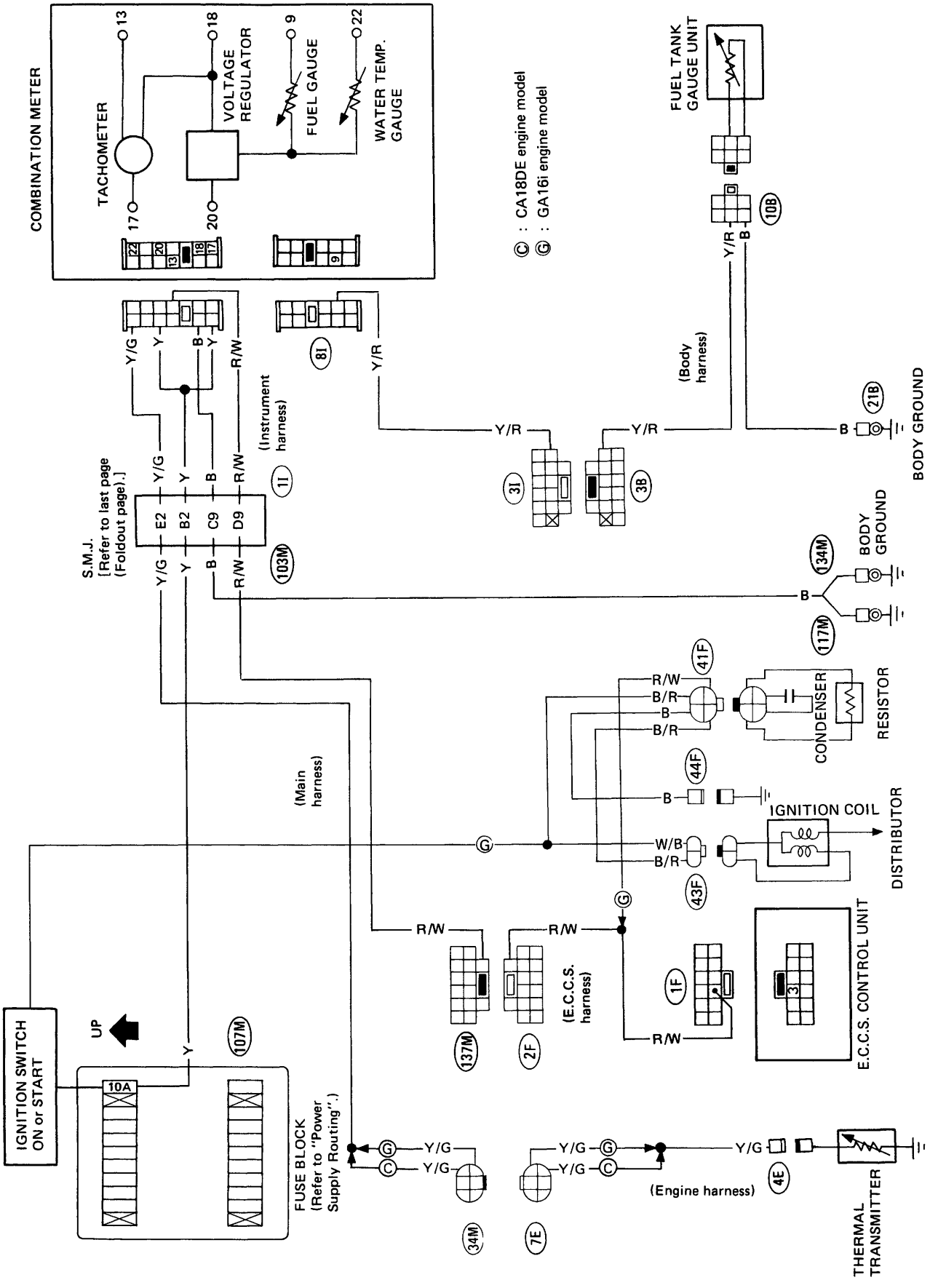
Combination Meter





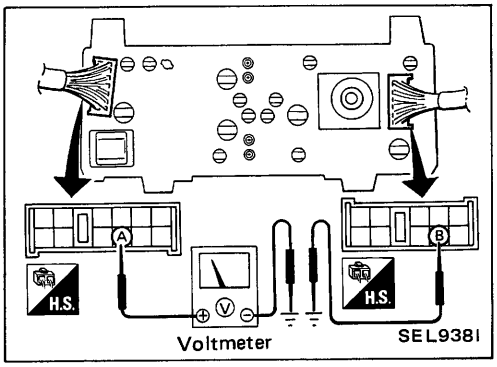


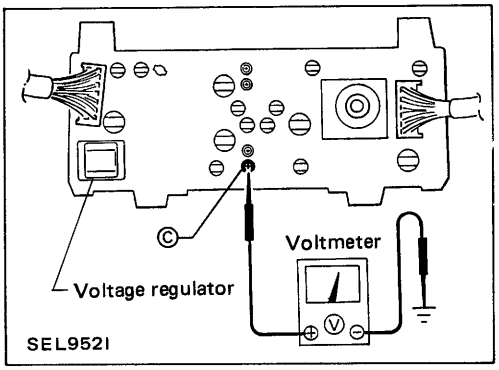
Combination Meter/Wiring Diagram



SEL361L

Inspection/Fuel Gauge





INSPECTION START

CHECK POWER SOURCE
1) Turn ignition switch "ON".
2) Check voltage between terminal Ⓐ and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Fusible link and fuse
2) Harness continuity between battery terminal and combination meter.
3) Ignition relay
4) Ignition switch

O.K.

CHECK VOLTAGE REGULATOR
1) Turn ignition switch "ON".
2) Check voltage between Ⓒ and ground.
Approx. 8 volts should exist.

N.G. → Replace voltage regurator.

O.K.

CHECK FUEL GAUGE
1) Turn ignition switch "ON".
2) Connect terminal Ⓑ to ground with suitable lead wire.
Fuel gauge should operate "Empty" to "Full".
CAUTION:
Do not hold this state for more than one minutes.

N.G. → Replace.

O.K.

CHECK HARNESS
Check harness continuity between combination meter and fuel tank gauge unit harness.

N.G. → Repair or replace.

O.K.

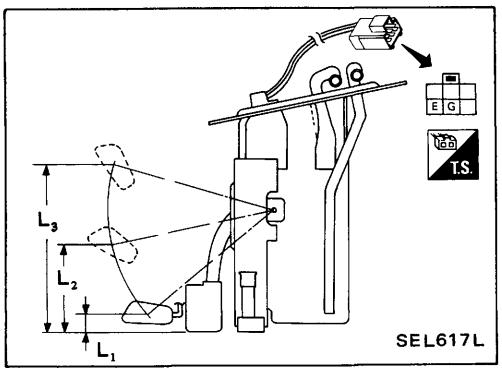
CHECK COMPONENT
Check fuel tank gauge unit.
Refer to "Fuel Tank Gauge Unit Check".

N.G. → Replace.
Refer to FE section.

O.K.

Reinstall any part removed.

INSPECTION END

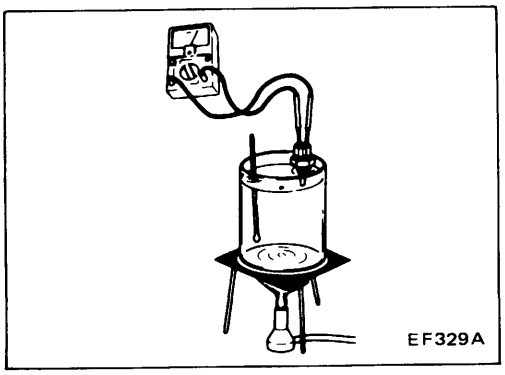


Fuel Tank Gauge Unit Check

- For removal, refer to FE section.

Check the resistance between terminals Ⓖ and Ⓔ.

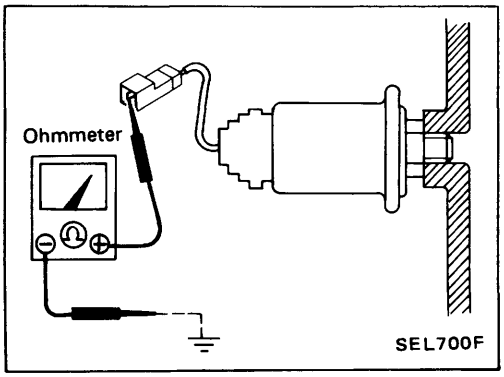
Ohmmeter		Float position L mm (in)	Resistance value (Ω)
(+)	(−)		
G	E	Full L_3 = Approx. 129 (5.08)	Approx. 9
		1/2 L_2 = Approx. 70 (2.76)	Approx. 30
		Empty L_1 = Approx. 19 (0.75)	Approx. 89



Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

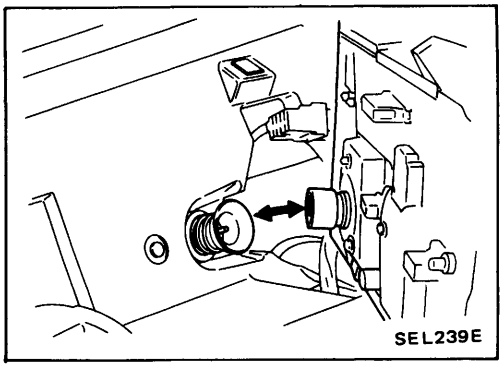
Water temperature	Resistance
60°C (140°F)	Approx. 70 - 90Ω
100°C (212°F)	Approx. 20 - 24Ω



Oil Pressure Switch Check

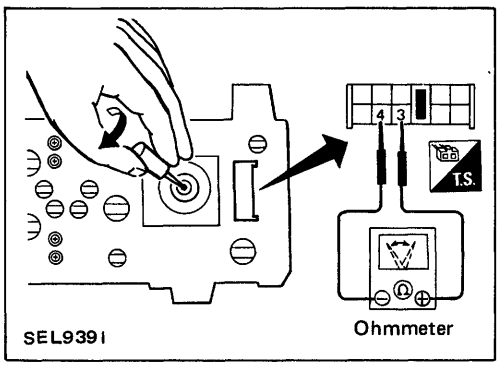
Check the continuity between the terminals of oil pressure switch and body ground.

Engine	Continuity
When engine is running	NO
When engine is stopped	YES



Speedometer Cable Removal and Installation

Combination meter and speedometer cable can be joined together simply by inserting combination meter.



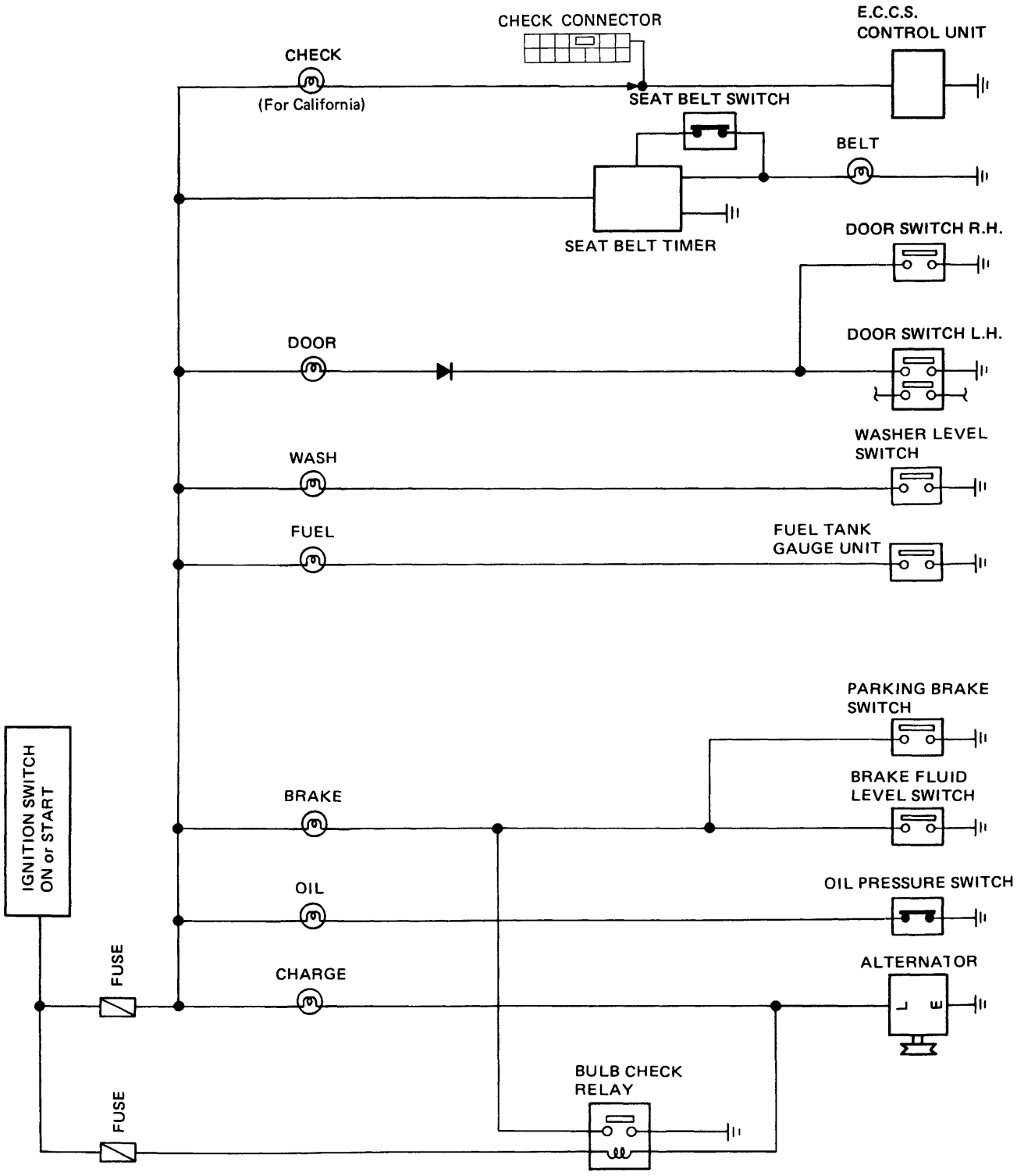
Speed Sensor Signal Check

- A speed sensor is built into the speedometer.

1. Turn speedometer slowly using a small screwdriver.
2. Check continuity of speed sensor circuit.

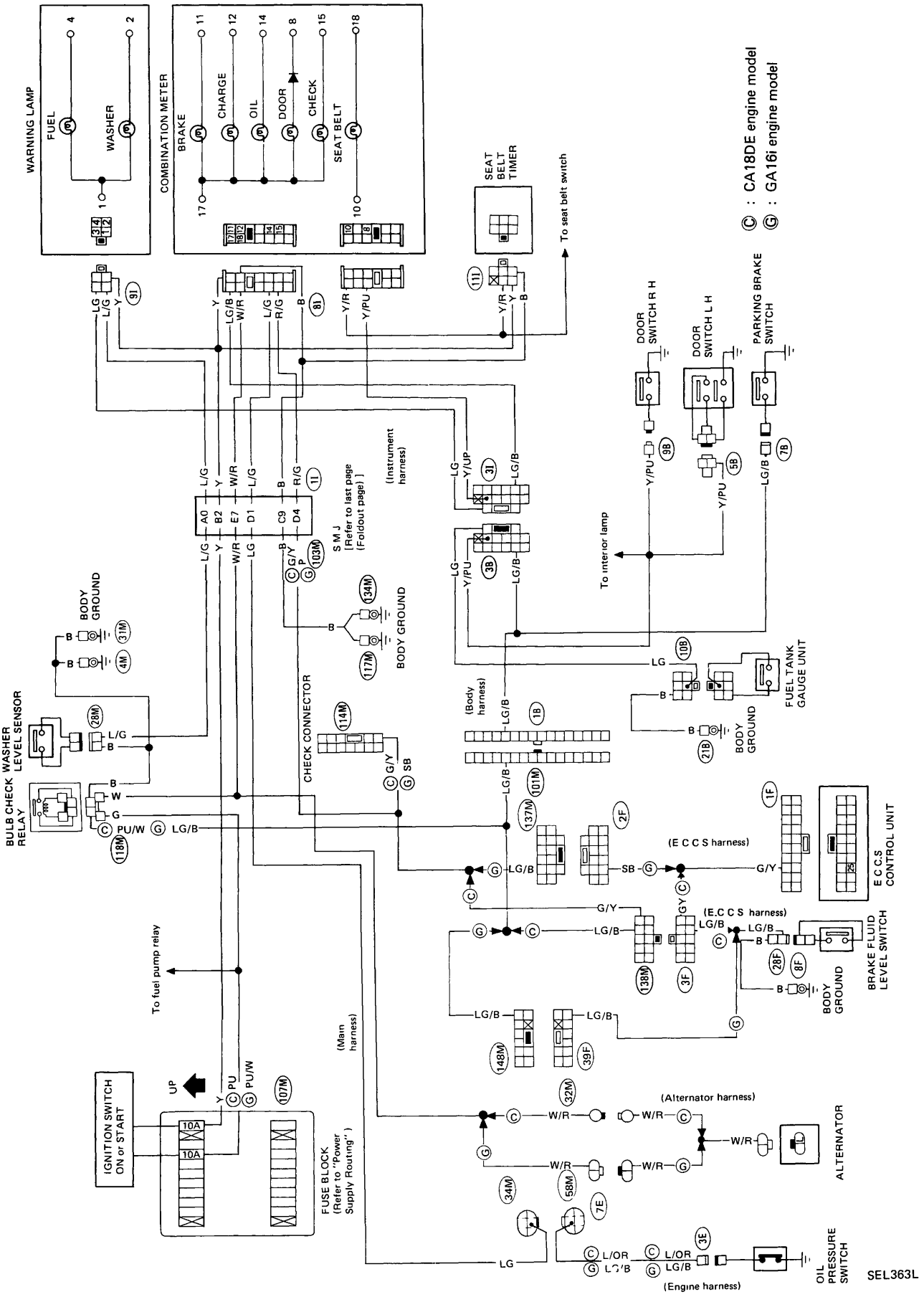
Continuity exists two times for each turn ... O.K.

Warning Lamps/Schematic

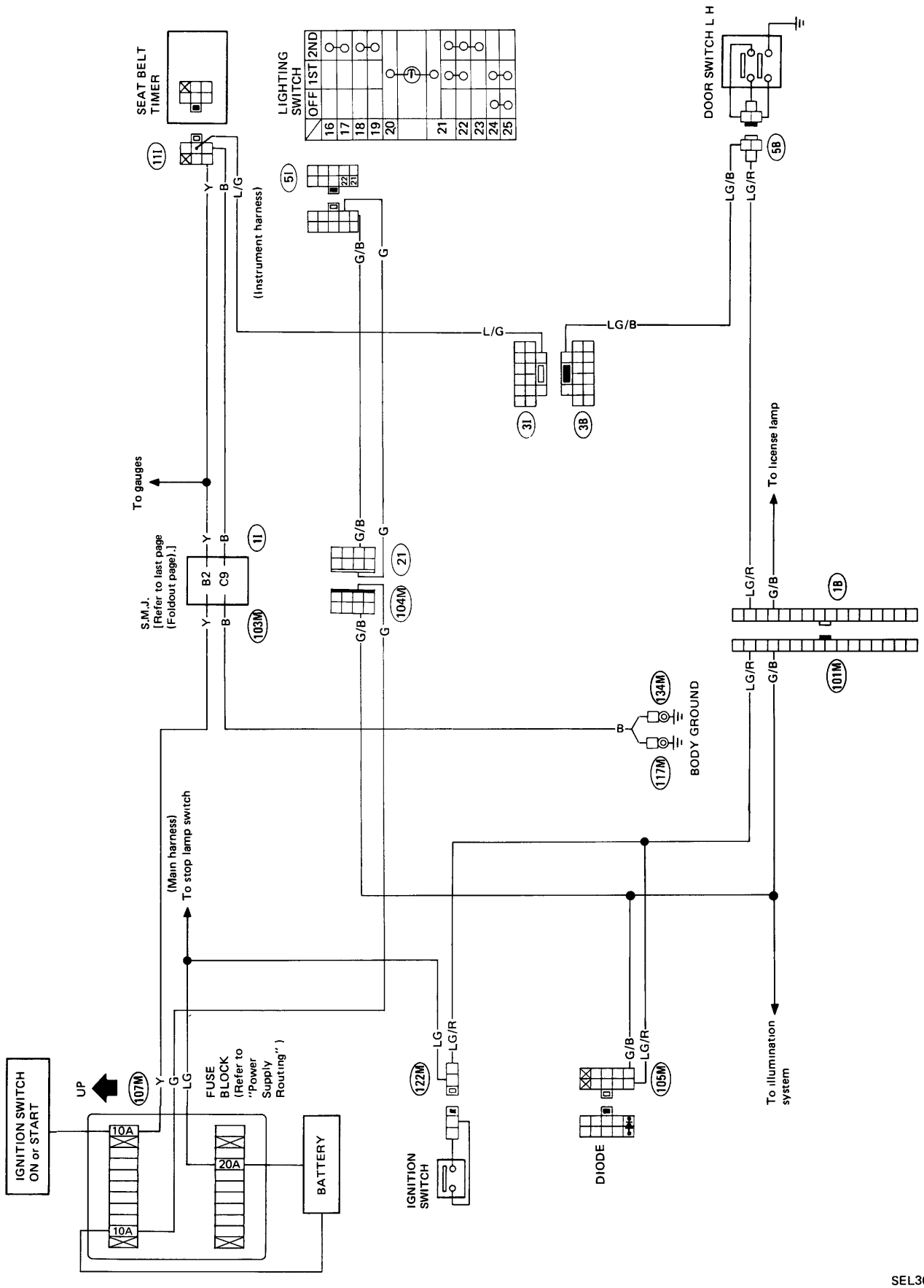


SEL362L

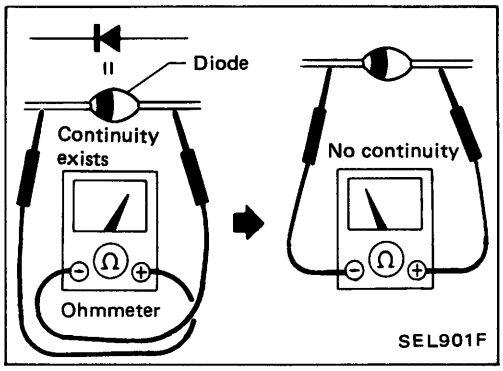
Warning Lamps/Wiring Diagram



Warning Chime/Wiring Diagram

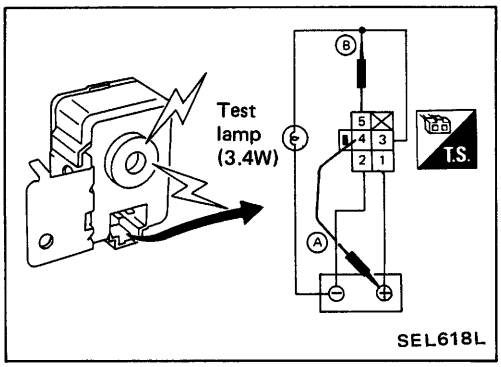


SEL364L



Diode Check

- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure on the left.

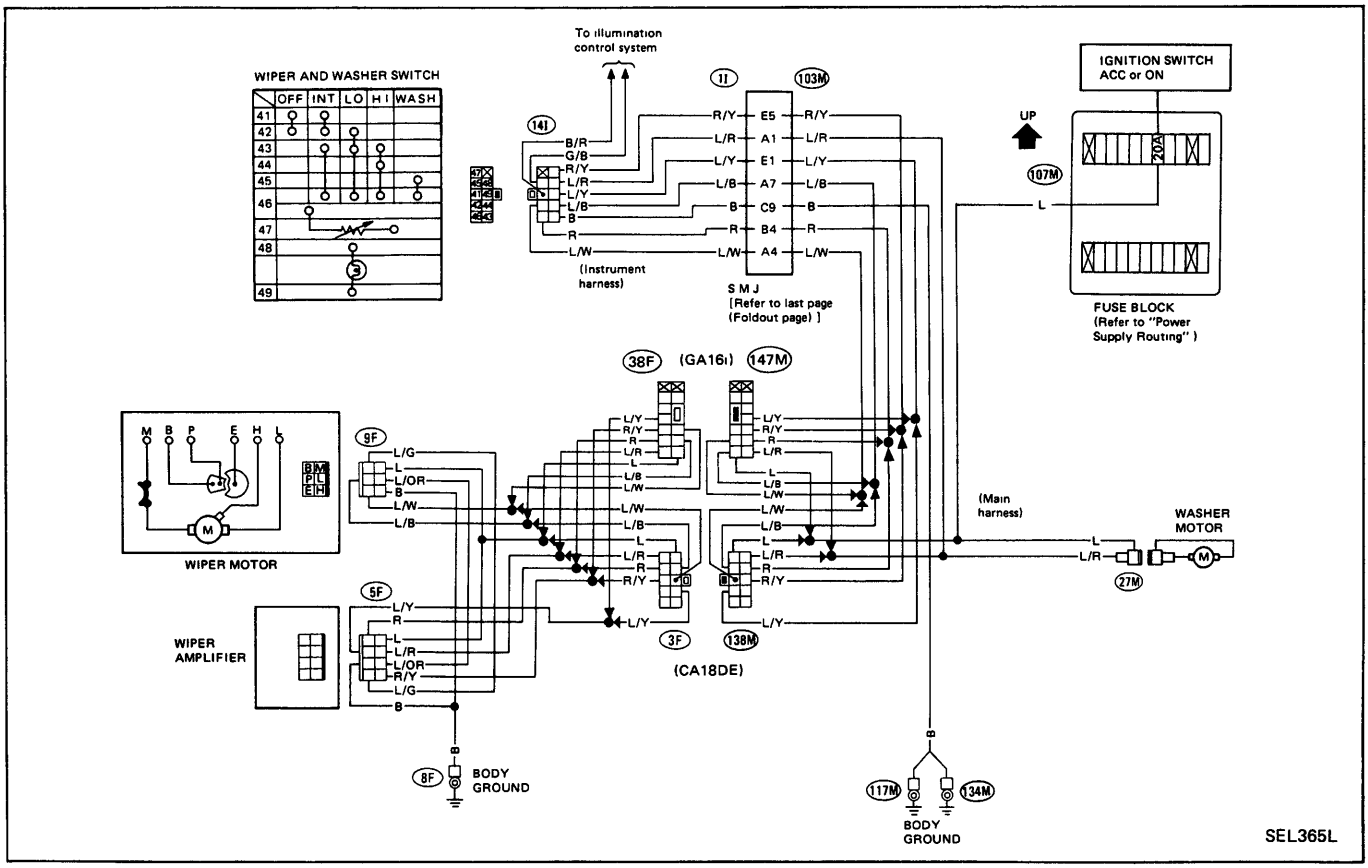


Seat Belt Timer Check

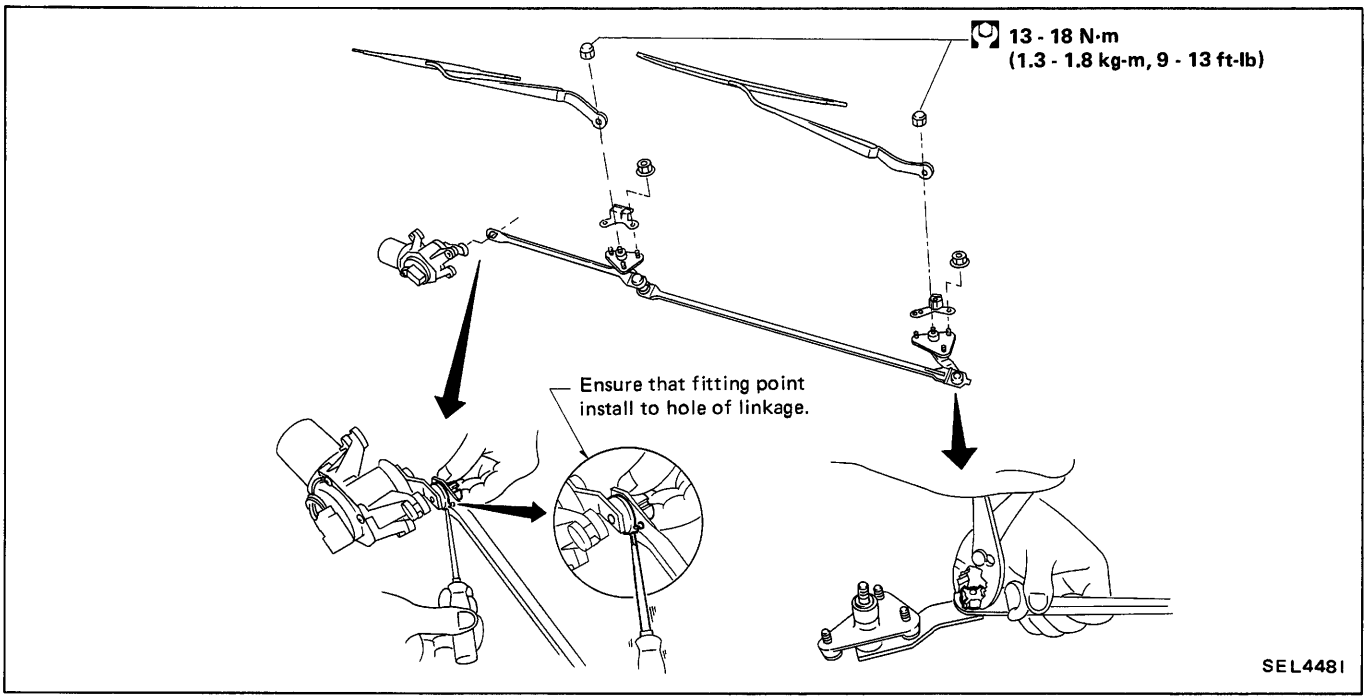
Connect as shown in the figure to the left.

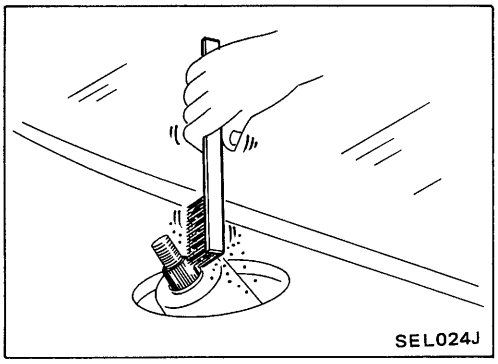
Terminal	Function
Ⓐ ⊕	Chime operates.
Ⓑ ⑤	Test lamp illuminates for 4 to 8 seconds.

Wiring Diagram



Windshield Wiper Removal and Installation





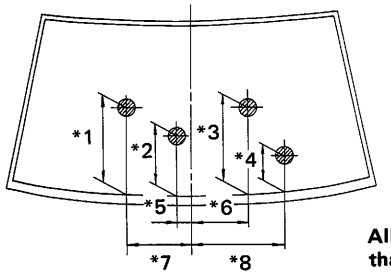
Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.

1. Prior to wiper arm installation, turn on wiper switch to operate wiper motor and then turn it "OFF" (Auto Stop).
2. Lift the blade up and then set it down onto glass surface to set the blade end to clearance "C" immediately before tightening nut.
3. Eject washer fluid. Turn on wiper switch to operate wiper motor and then turn it "OFF".
4. Ensure that wiper blades stop within clearance "C".

- Tighten windshield wiper arm nuts to specified torque.

  13 - 18 N·m (1.3 - 1.8 kg-m, 9 - 13 ft-lb)

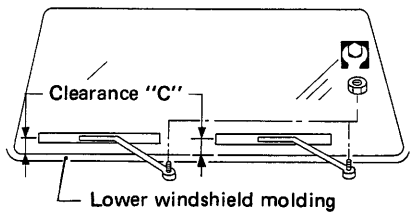
Front wiper and washer



Unit: mm (in)

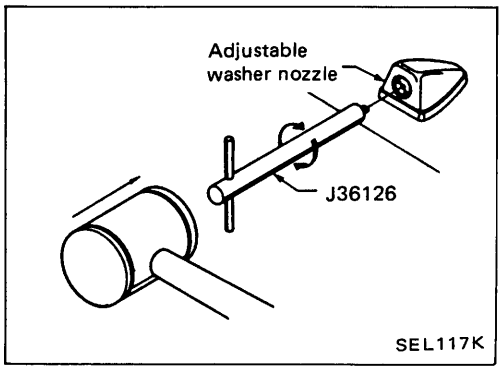
*1:	455 (17.91)
*2:	197 (7.76)
*3:	397 (15.63)
*4:	198 (7.80)
*5:	116 (4.57)
*6:	139 (5.47)
*7:	290 (11.42)
*8:	382 (15.04)

All the diameters of these circles are less than 80 (3.15).



C: 0 - 5 (0 - 0.20) (end of blade)

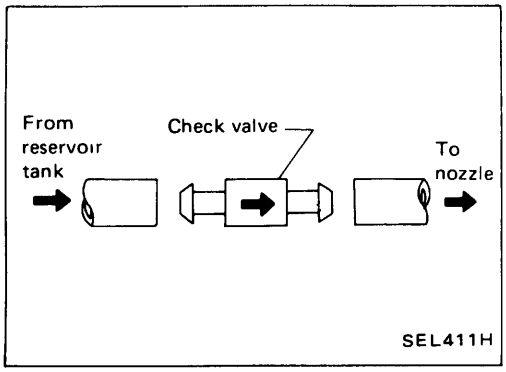
SEL940I



Washer Nozzle Adjustment

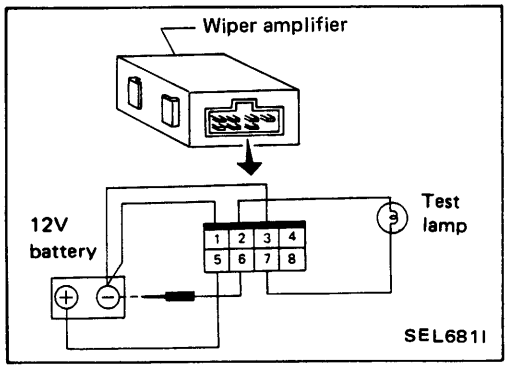
- Using Tool J36126, adjust windshield washer nozzle to correct its spray pattern.

Before attempting to turn the nozzle, gently tap the end of the tool to free the nozzle.
This will prevent "rounding out" the small female square in the center of the nozzle.



Check Valve

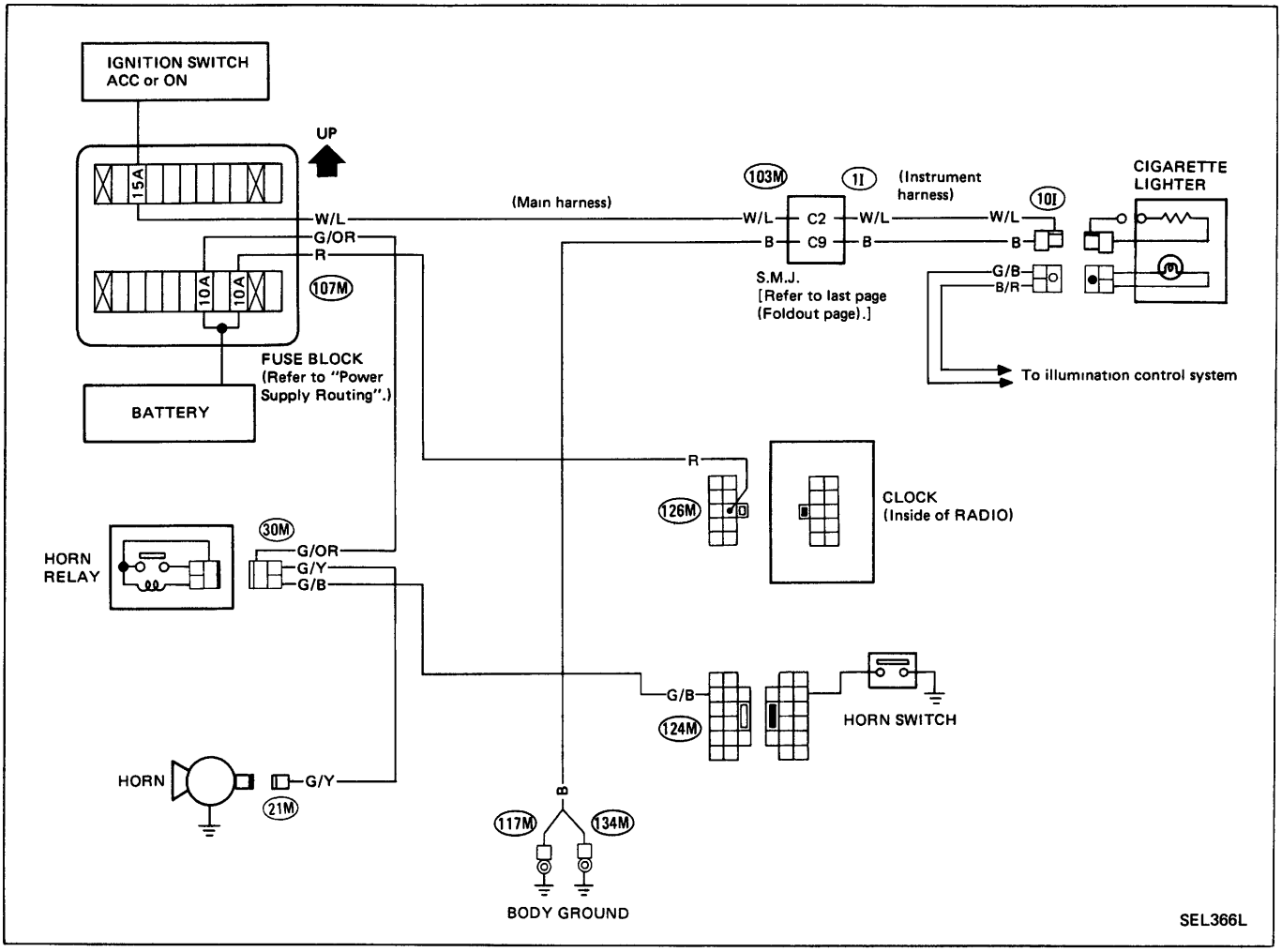
- A check valve is provided in the washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.



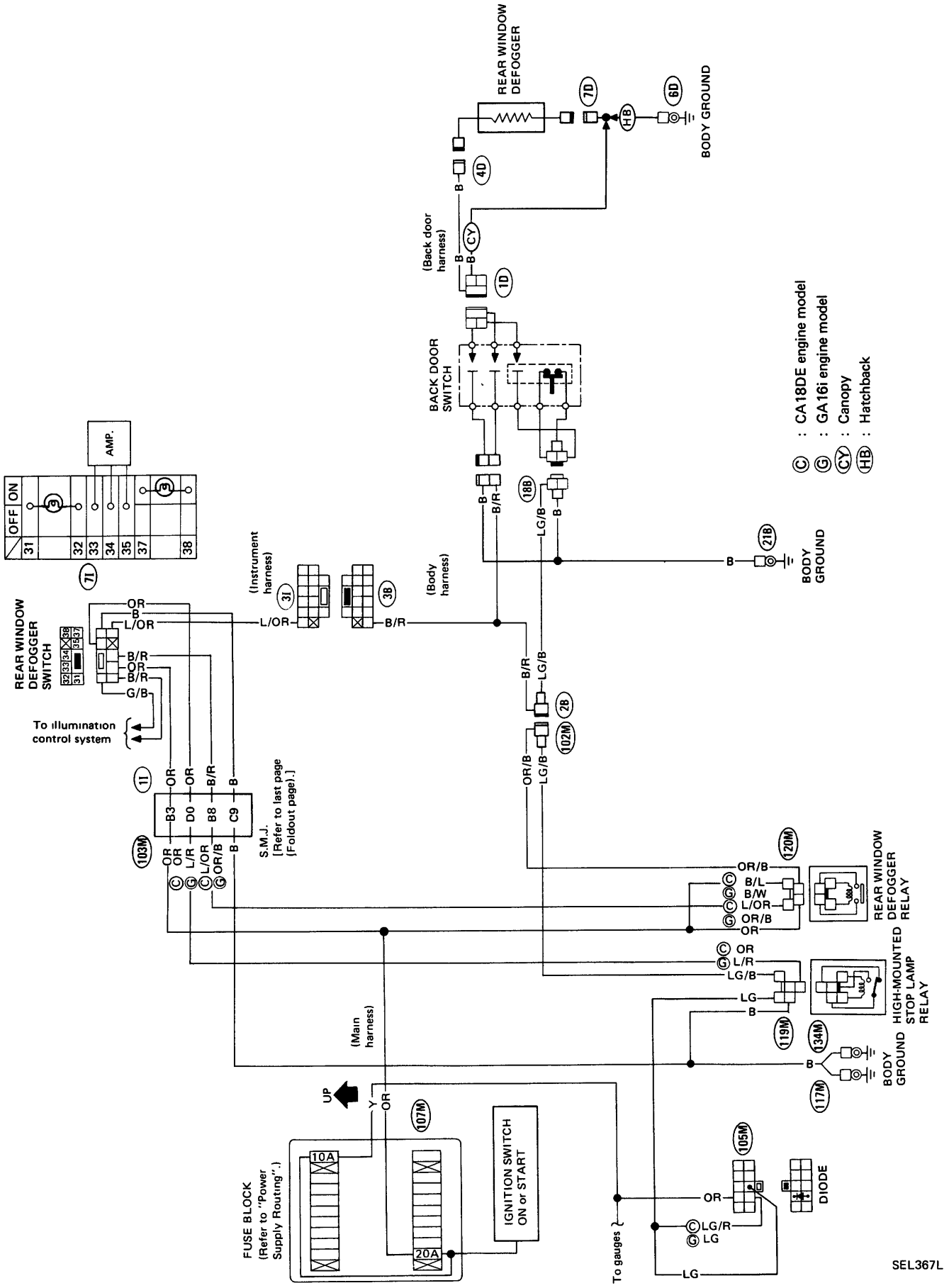
Wiper Amplifier Check

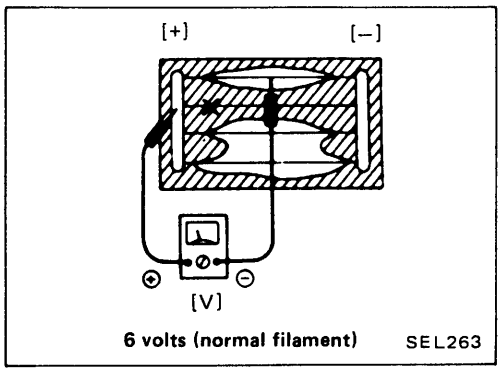
1. Connect as shown in the figure to the left.
2. If test lamp comes on when connected to terminal ⑥ and battery ground, wiper amplifier is normal.

Wiring Diagram



Wiring Diagram

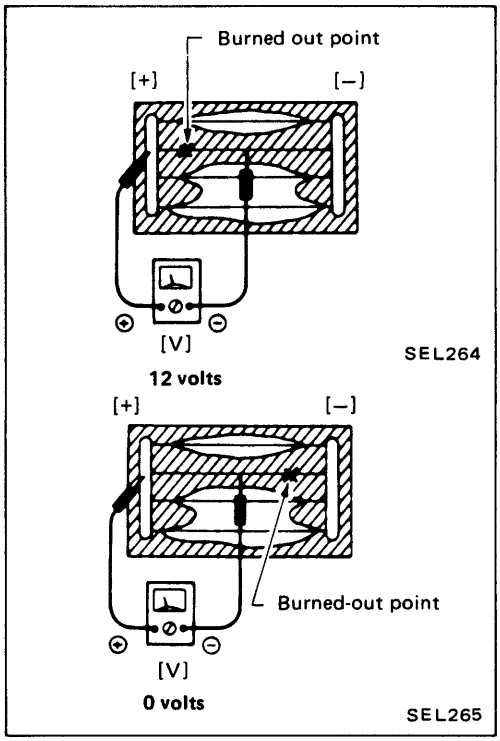




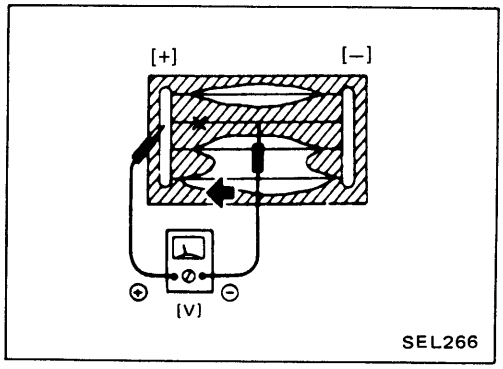
6 volts (normal filament) SEL263

Filament Check

1. Attach probe circuit tester (in volt range) to middle portion of each filament.



2. If a filament is burned out, circuit tester registers 0 or 12 volts.

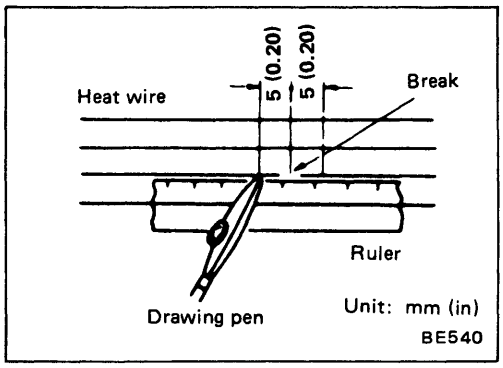


3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.

Filament Repair

REPAIR EQUIPMENT

1. Conductive silver composition (Dupont No. 4817 or equivalent)
2. Ruler 30 cm (11.8 in) long
3. Drawing pen
4. Heat gun
5. Alcohol
6. Cloth

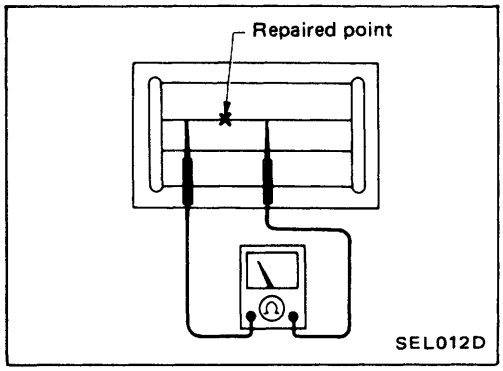


REPAIRING PROCEDURE

1. Wiper broken heat wire and its surrounding area clean with a cloth dampened in alcohol.
2. Apply a small amount of conductive silver composition to tip of drawing pen.

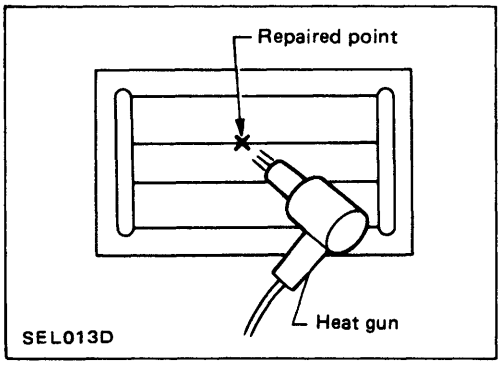
Shake silver composition container before use.

3. Place ruler on glass along broken line. Deposit conductive silver composition on break with drawing pen. Slightly overlap existing heat wire on both sides [preferably 5 mm (0.20 in)] of the break.



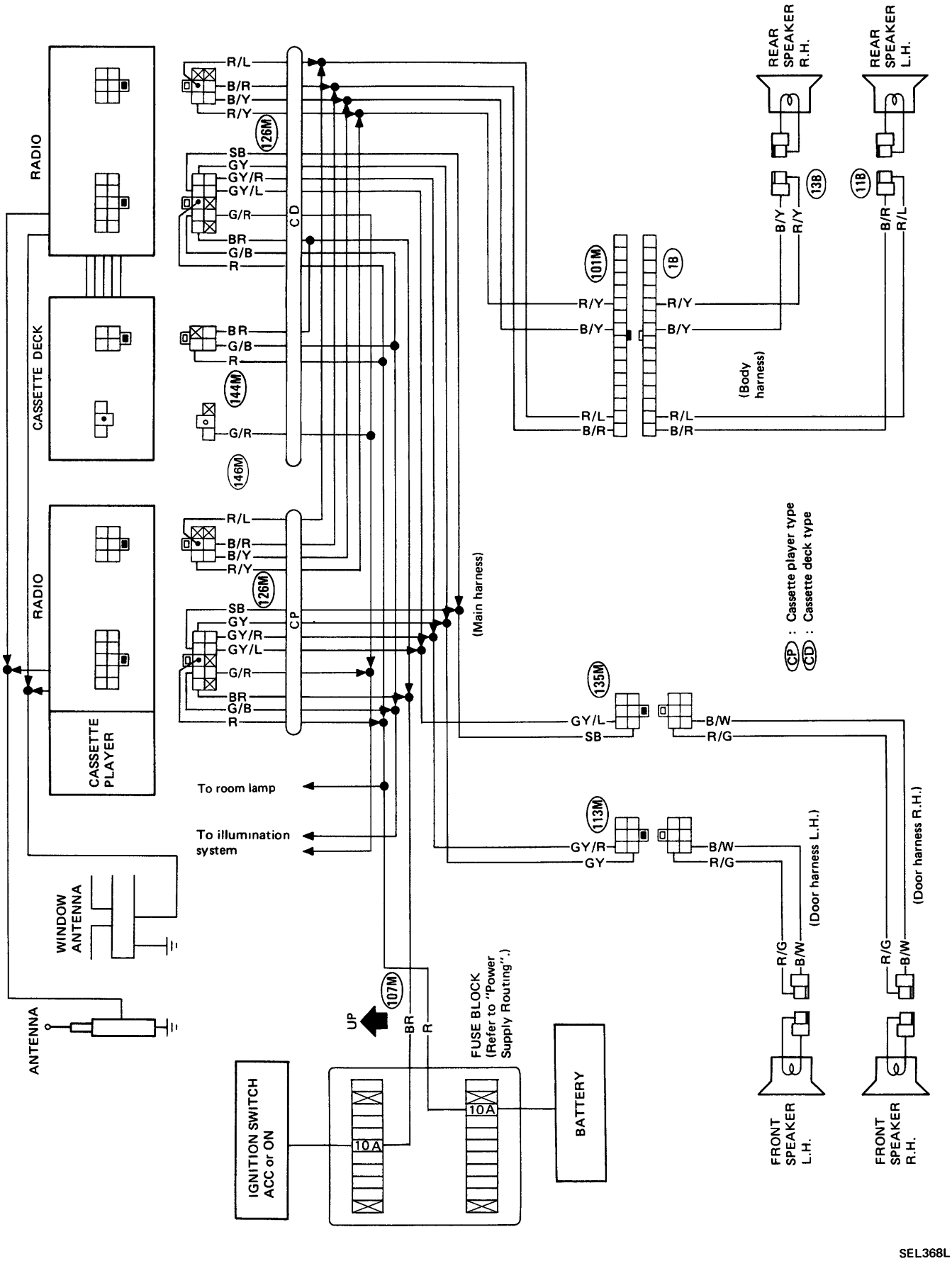
4. After repair has been completed, check repaired wire for ontinuity. This check should be conducted 10 minutes after silver compositon is deposited.

Do not touch repaired area while test is being conducted.



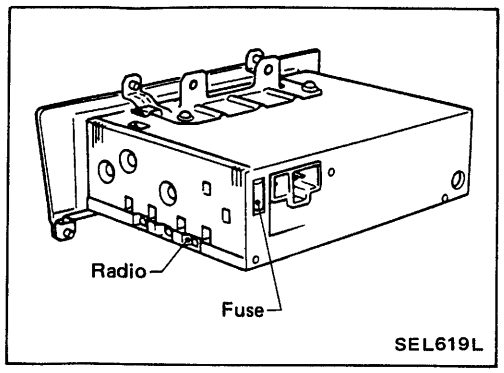
5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

Wiring Diagram



SEL368L

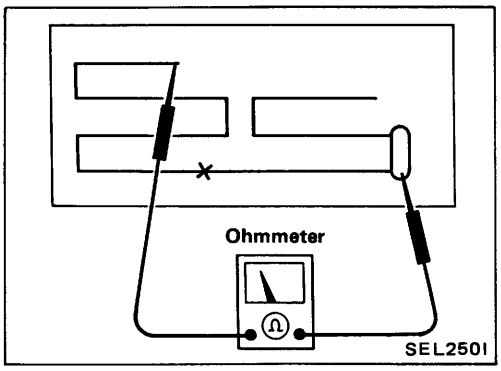
Radio Fuse Check



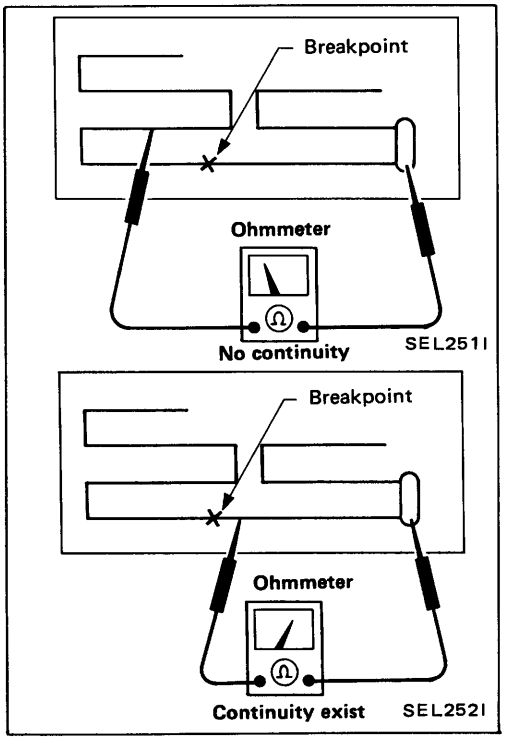
Window Antenna Repair

ELEMENT CHECK

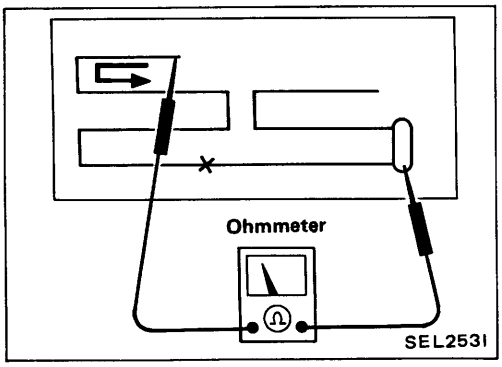
1. Attach probe circuit tester (in ohm range) to antenna terminal on each side.



2. If an element is broken, no continuity will exist.



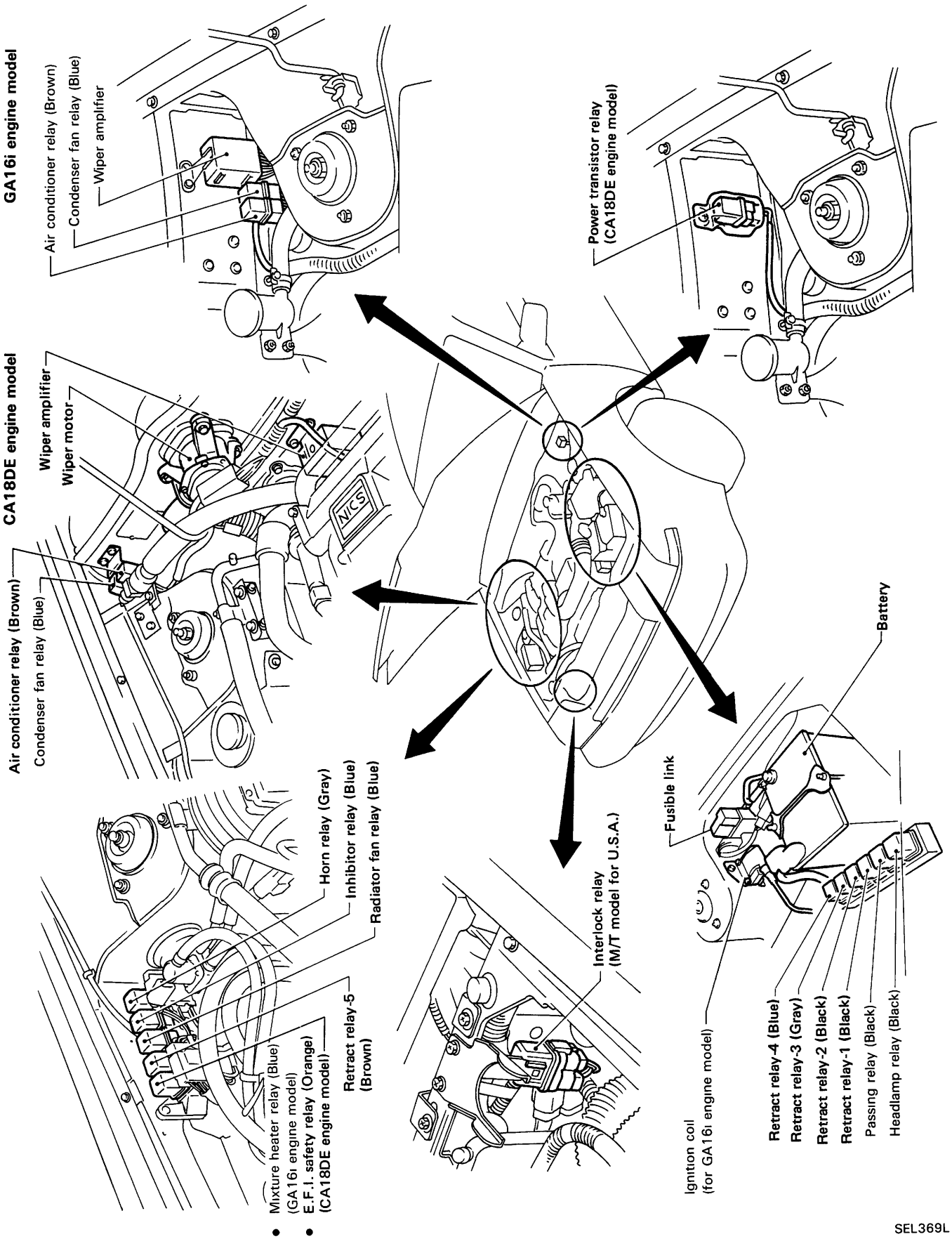
3. To locate broken point, move probe to left and right along element to determine point where tester needle swings abruptly.



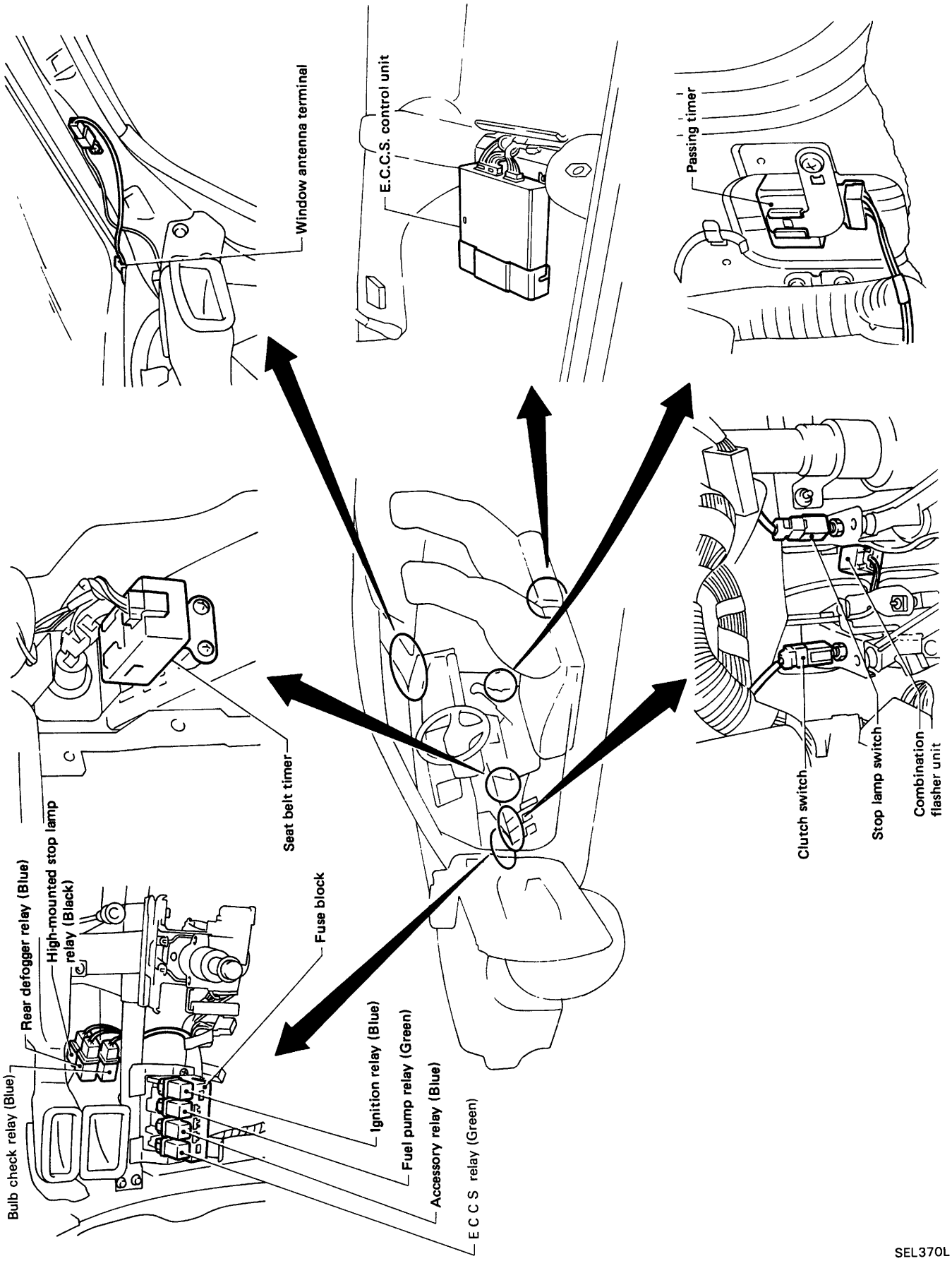
ELEMENT REPAIR

Refer to REAR WINDOW DEFOGGER "Filament Repair".

Engine Compartment



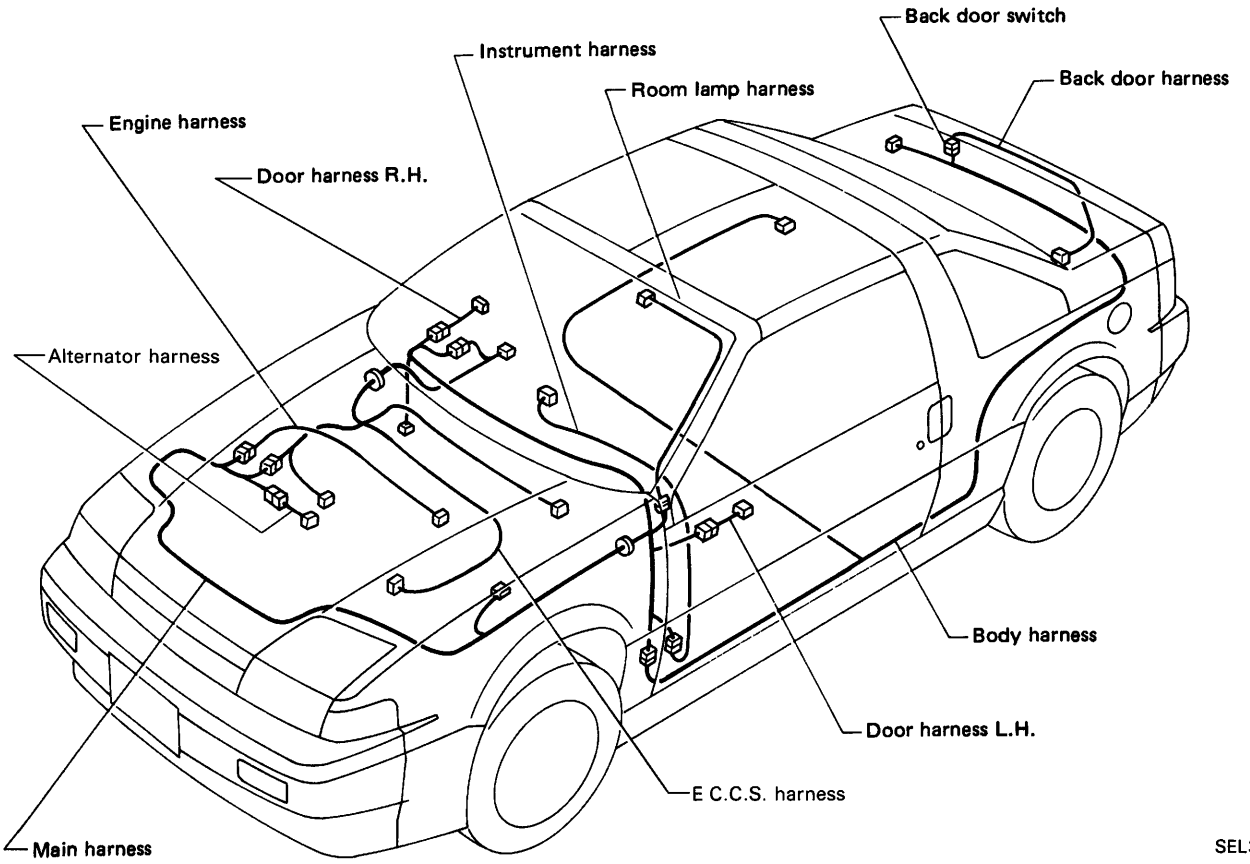
Passenger Compartment



SEL370L

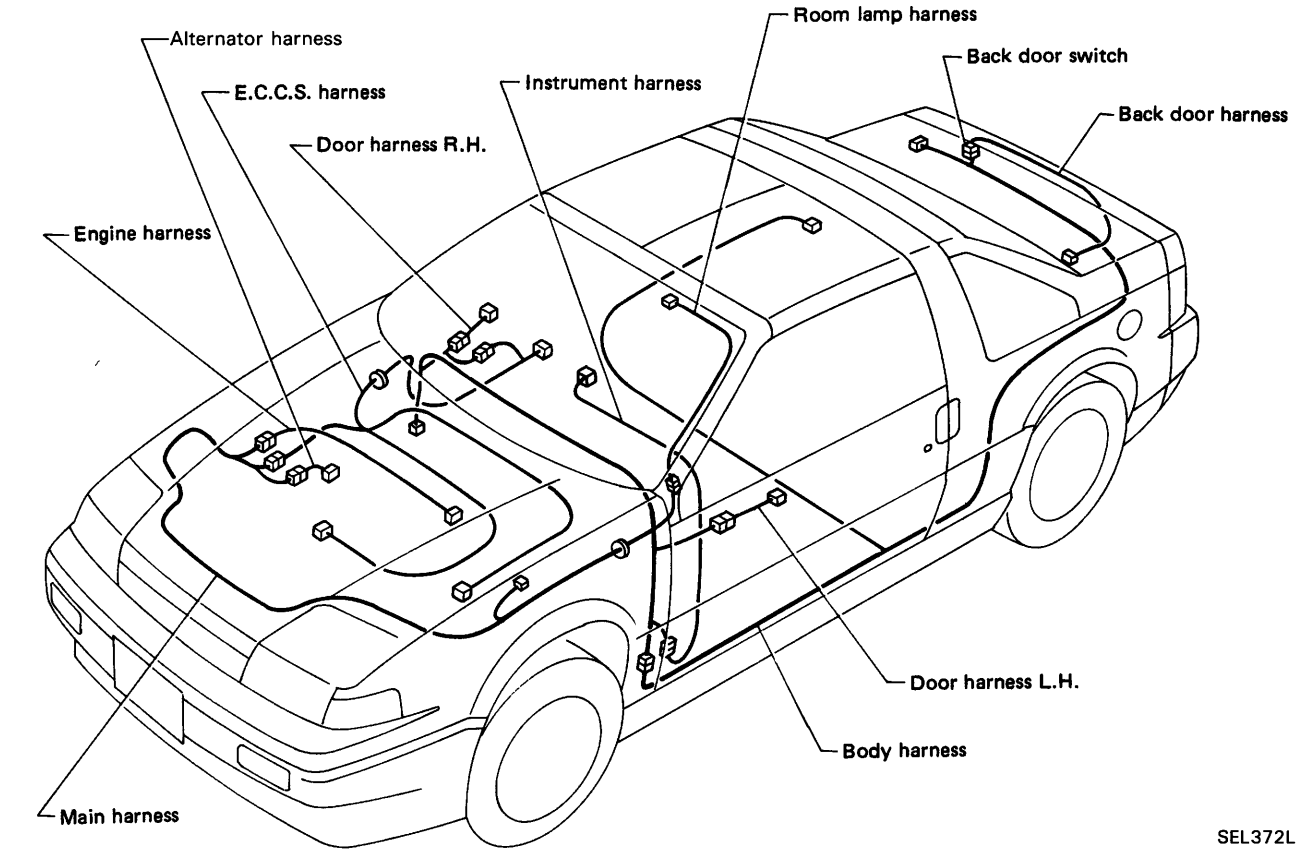
Outline

GA16i ENGINE MODEL



SEL371L

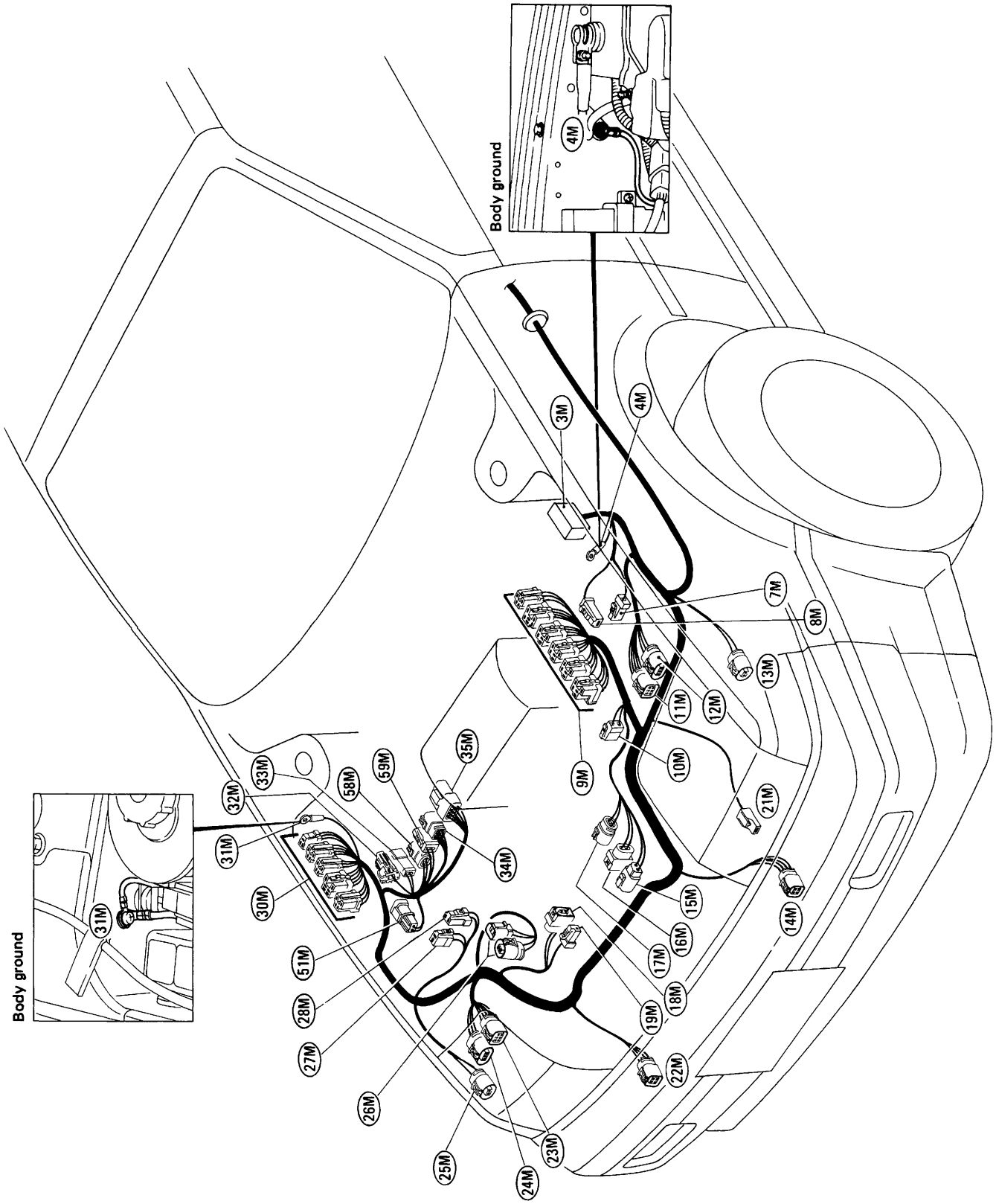
CA18DE ENGINE MODEL



SEL372L

Main Harness

ENGINE COMPARTMENT



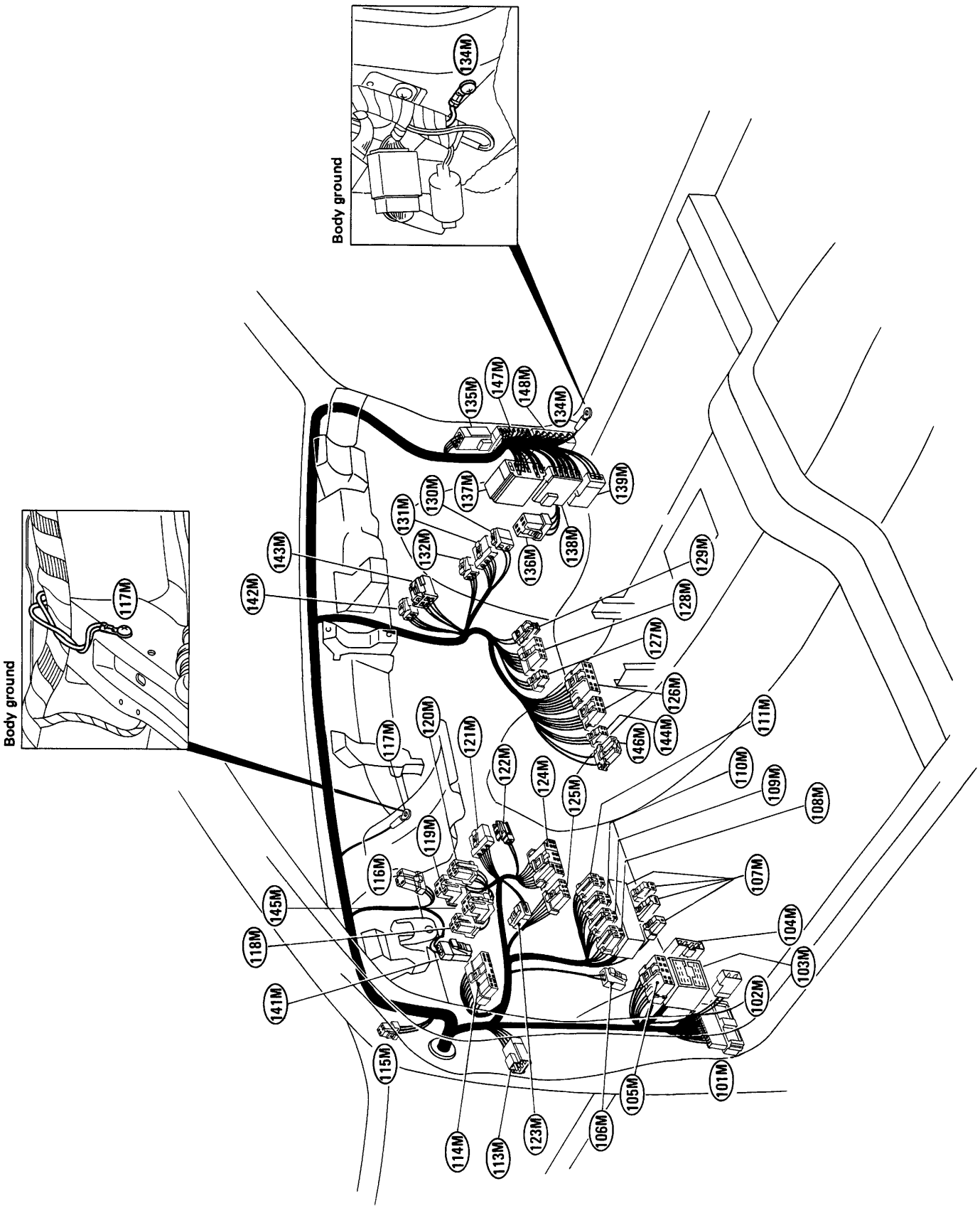
Main Harness (Cont'd)

(3M) : Fusible link holder
(4M) : Body ground
(7M) : Fusible link
(8M) : Battery
(9M) : Relays on bracket (Refer to LOCATION OF ELECTRICAL UNITS.)
(10M) : Dual-pressure switch
(11M) : Headlamp motor L.H.
(12M) : Headlamp L.H.
(13M) : Front side marker lamp L.H.
(14M) : Front combination lamp L.H.
(15M) : Radiator fan motor (CA18DE engine model)
(16M) : Radiator fan motor (GA16i engine model)
(17M) : Thermoswitch (CA18DE engine model)
(18M) : Condenser fan motor
(19M) : Thermal protector
(21M) : Horn
(22M) : Front combination lamp R.H.
(23M) : Headlamp motor R.H.
(24M) : Headlamp R.H.
(25M) : Front side marker lamp R.H.
(26M) : Interlock relay (M/T model for U.S.A.)
(27M) : Washer motor
(28M) : Washer level sensor
(30M) : Relays on bracket (Refer to LOCATION OF ELECTRICAL UNITS.)
(31M) : Body ground
(32M) : To alternator harness (CA18DE engine model)
(33M) : To alternator harness (CA18DE engine model)
(34M) : To (7E)
(35M) : To (13F)
(51M) : To (17E)
(58M) : To alternator harness (GA16i engine model)
(59M) : To alternator harness (GA16i engine model)

SEL373L

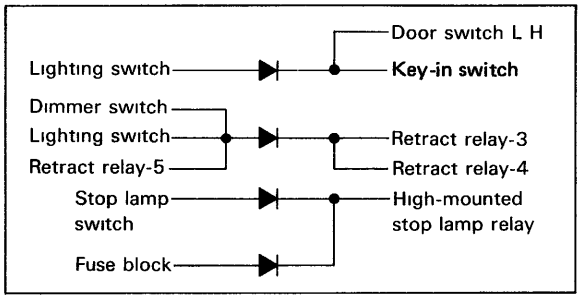
Main Harness (Cont'd)

PASSENGER COMPARTMENT



(101M) : To (1B)
(102M) : To (2B)
(103M) : To (1I)
(104M) : To (2I)
(105M) : Diode
(106M) : Clutch switch (GA16i engine M/T model)
(107M) : Fuse block
(108M) : E.C C S. relay
(109M) : Accessory relay
(110M) : Fuel pump relay
(111M) : Ignition relay
(113M) : To door harness L.H.
(114M) : Check connector
(115M) : To room lamp harness
(116M) : Combination flasher unit
(117M) : Body ground
(118M) : Bulb check relay
(119M) : High-mounted stop lamp relay
(120M) : Rear window deffoger relay
(121M) : Ignition switch
(122M) : Key-in switch
(123M) : Stop lamp switch
(124M) : Combination switch
(125M) : To (16I)
(126M) : Radio
(127M) : Air conditioner switch
(128M) : Fan switch
(129M) : Fan switch illumination
(130M) : Blower motor
(131M) : Heater resistor
(132M) : Thermo control amplifier
(134M) : Body ground
(135M) : To door harness R.H.
(136M) : Passing timer
(137M) : To (2F)
(138M) : To (3F) (CA18DE engine model)
(139M) : To (4F) (CA18DE engine model)
(141M) : Clutch interlock switch (M/T model for U.S A.)
(142M) : Acceleration cut timer (GA16i engine model)
(143M) : Acceleration cut relay (CA18DE engine model)
(144M) : Cassette deck
(146M) Cassette deck illumination
(147M) To (38F) (GA16i engine model)
(148M) To (39F) (GA16i engine model)

Diode (105M)

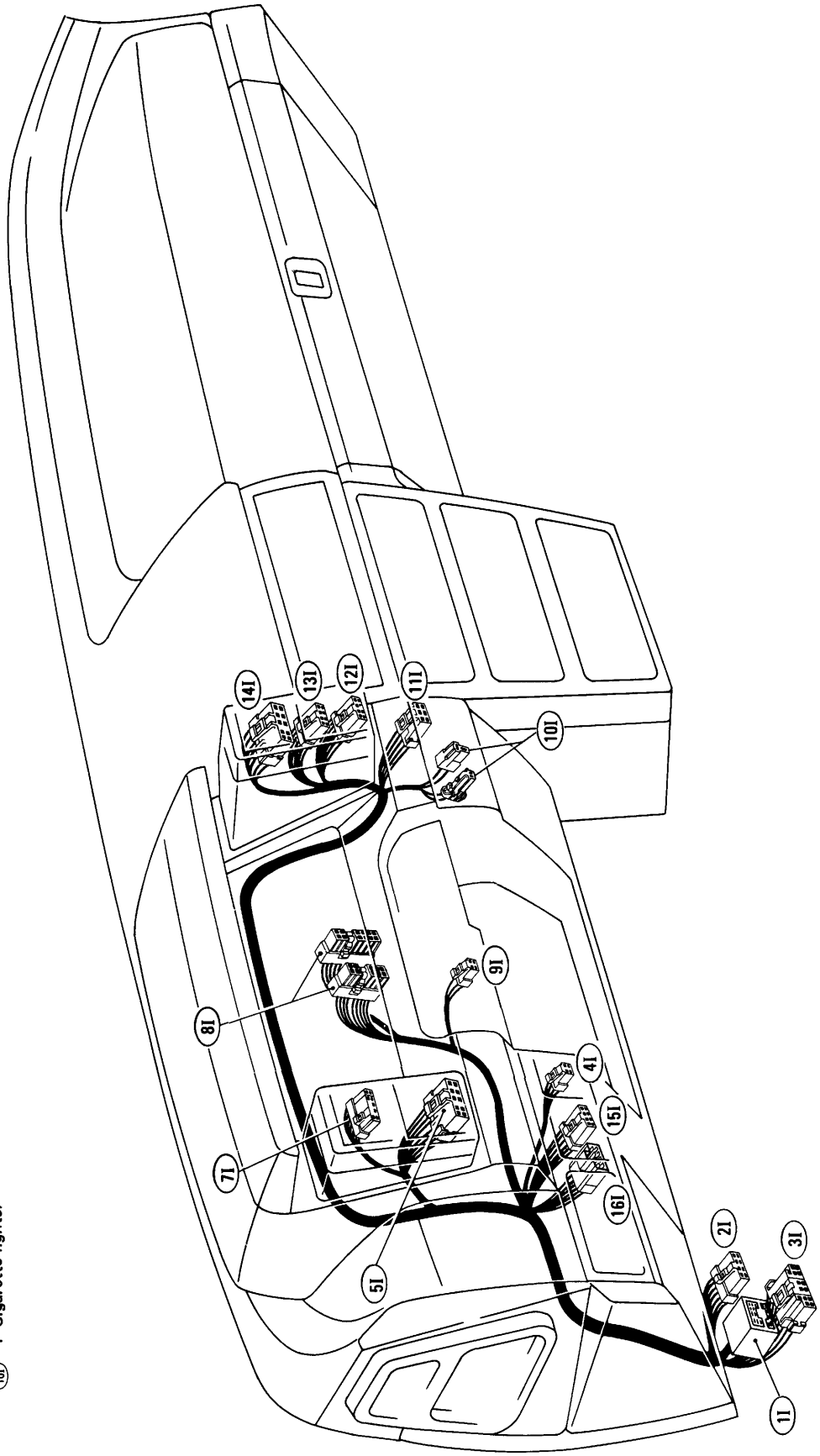


SEL374L

Instrument Harness

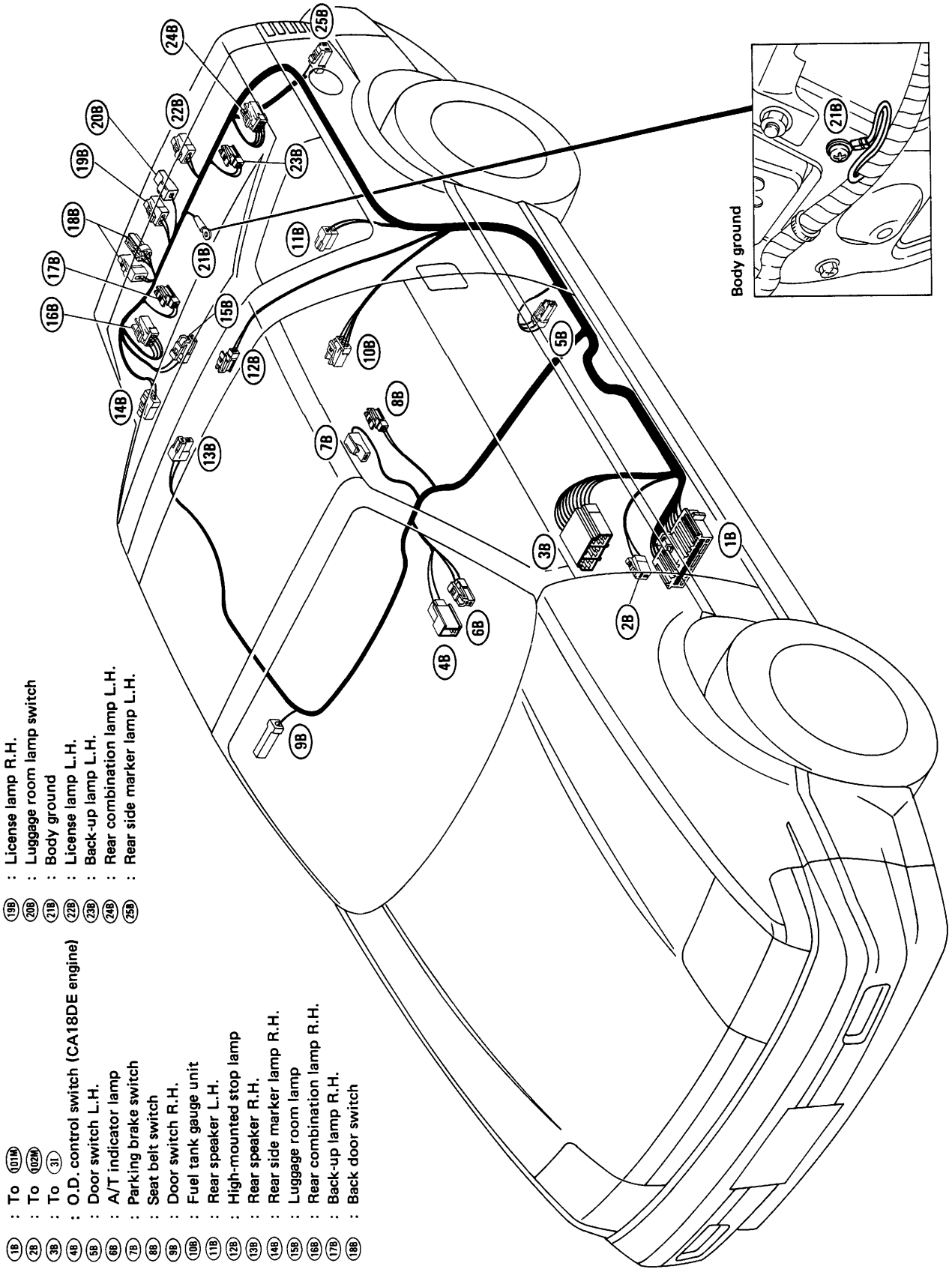
(1) : To (103M)
(2) : To (104M)
(3) : To (3B)
(4) : Illumination control unit
(5) : Lighting switch
(7) : Rear window deffoger switch
(8) : Combination meter
(9) : Warning lamp
(10) : Cigarette lighter

(11) : Seat belt timer
(12) : Retractor switch
(13) : Hazard switch
(14) : Wiper and washer switch
(15) : Mirror control switch
(16) : To (125M)



SEL375L

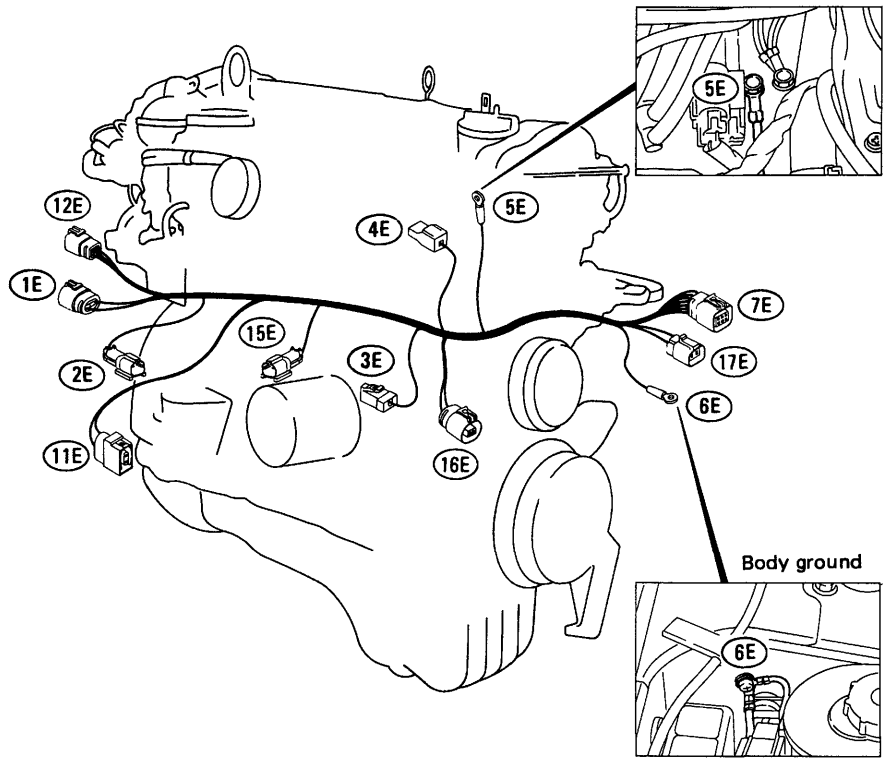
Body Harness



SEL376L

Engine Harness

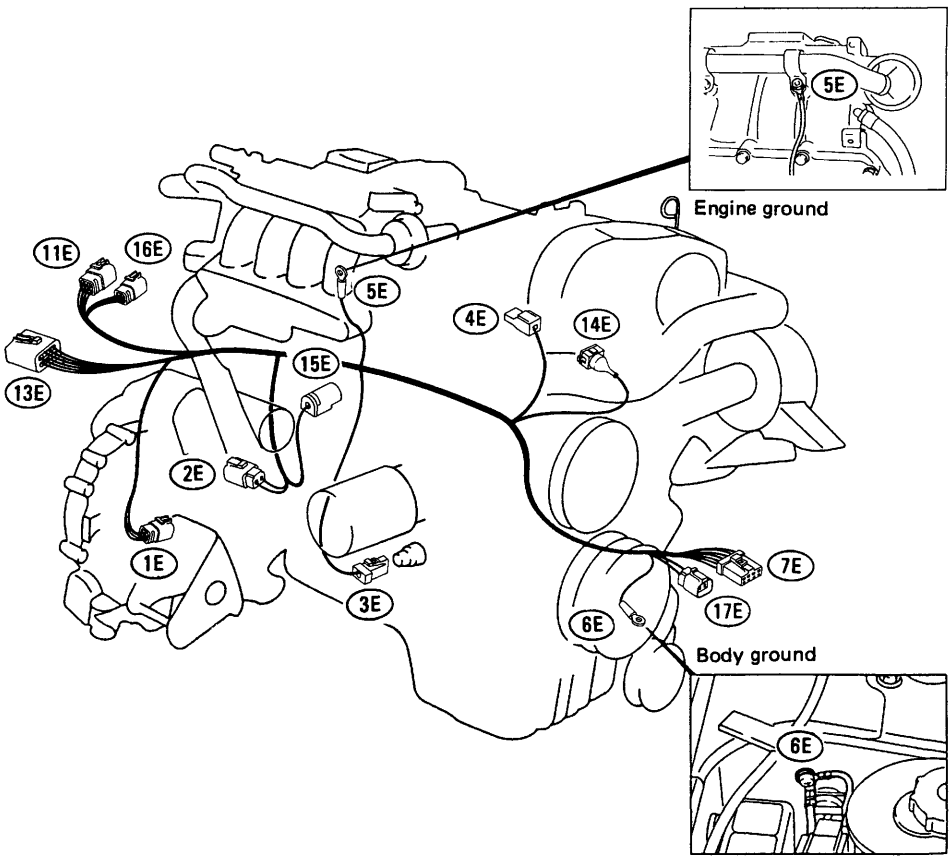
GA16i engine model



(1E) : Back-up lamp switch (M/T model)
(2E) : Starter motor (M/T model)
(3E) : Oil pressure switch
(4E) : Thermal transmitter
(5E) : Engine ground
(6E) : Body ground
(7E) : To (34M)
(11E) : Neutral switch (M/T model)
(12E) : Inhibitor switch (A/T model)
(15E) : Starter motor (A/T model)
(16E) : Exhaust gas temperature sensor (For California)
(17E) : To (51M)

SEL377L

CA18DE engine model

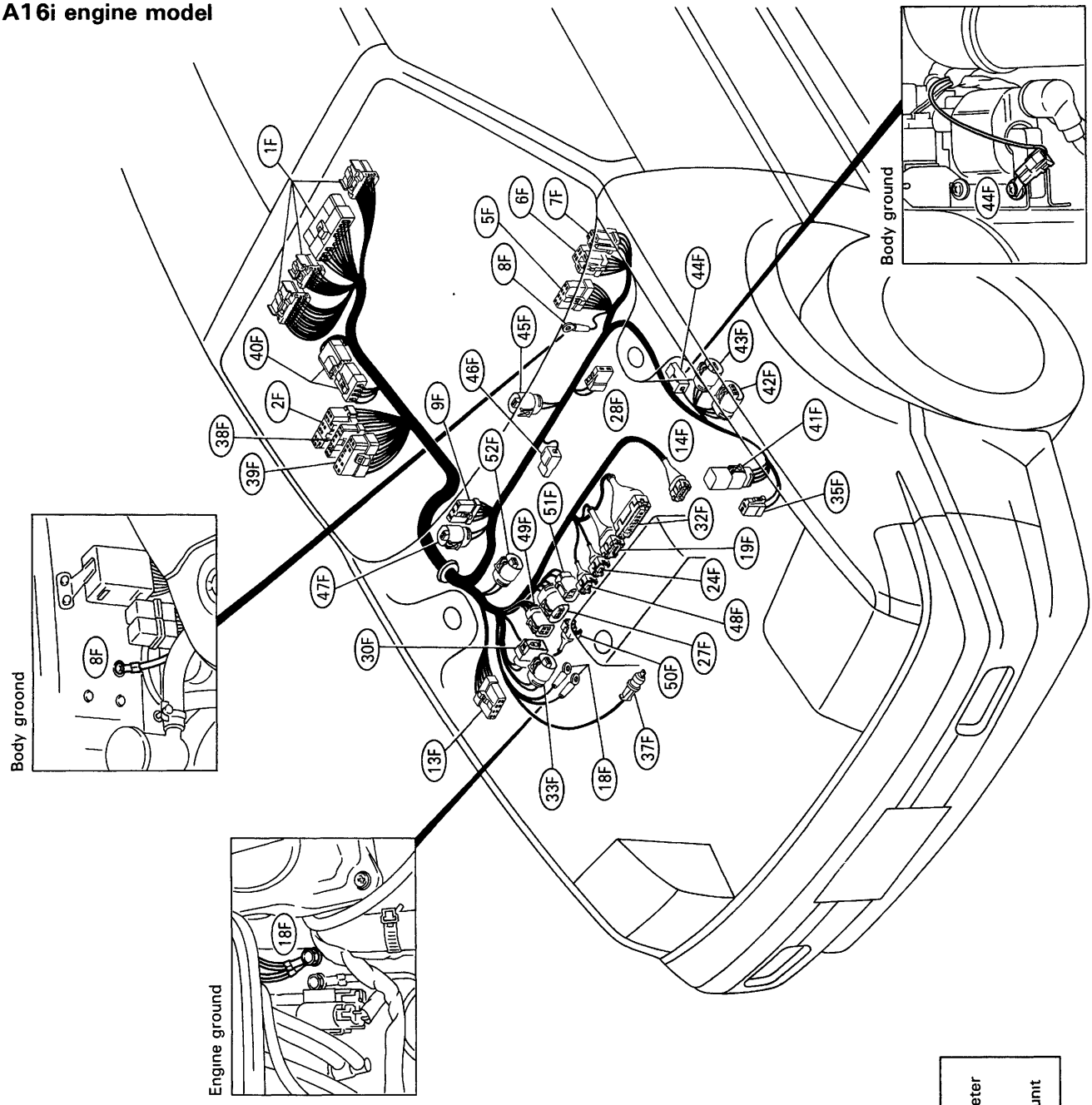


(1E) : Neutral switch and back-up lamp switch (M/T model)
(2E) : Starter motor
(3E) : Oil pressure switch
(4E) : Thermal transmitter
(5E) : Engine ground
(6E) : Body ground
(7E) : To (34M)
(11E) : Inhibitor switch (A/T model)
(13E) : To (26F)
(14E) : Water temperature sensor
(15E) : Detonation sensor
(16E) : Lock-up solenoid valve and O.D. cancel solenoid valve (A/T model)
(17E) : To (51M)

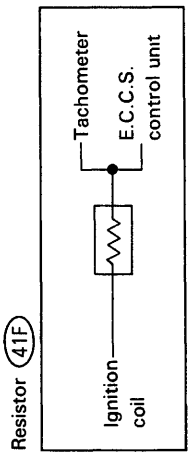
SEL378L

E.C.C.S. Harness

GA16i engine model



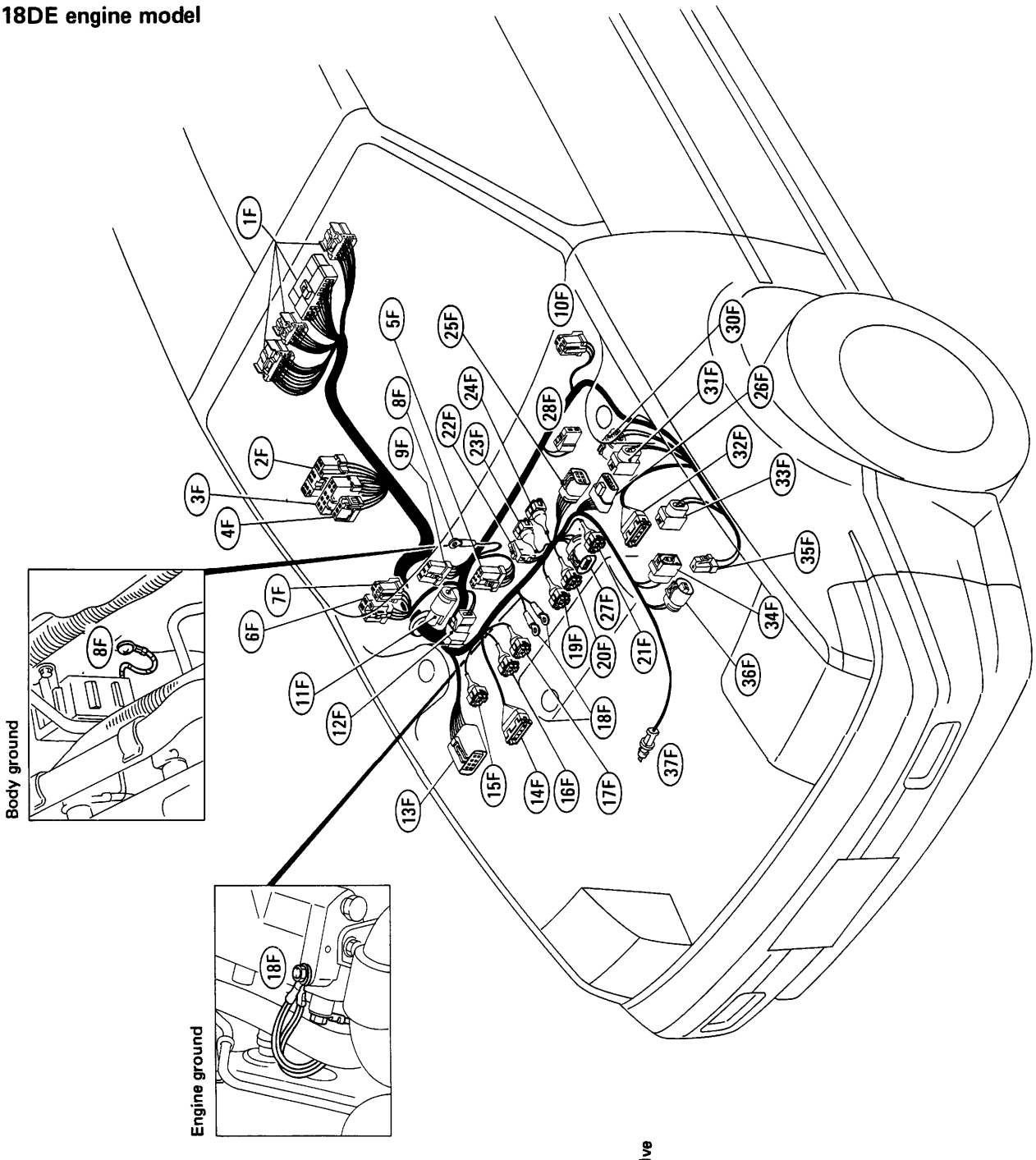
(1F) · E.C.C.S. control unit
(2F) · To (37M)
(5F) · Wiper amplifier
(6F) · Air conditioner relay
(7F) · Condenser fan relay
(8F) · Body ground
(9F) · Wiper motor
(13F) · To (35M)
(14F) : Crank angle sensor
(18F) : Engine ground
(19F) · Idle switch
(24F) · A.A.C valve
(27F) · Throttle sensor
(28F) · Brake fluid level switch
(30F) · A.I.V control solenoid valve
(32F) · Air flow meter
(33F) : E.G.R & canister control solenoid valve
(35F) · Fusible link
(37F) · Exhaust gas sensor
(38F) · To (47M)
(39F) · To (48M)
(40F) : Joint connector
(41F) : Resistor & condensor
(42F) · Power transistor
(43F) : Ignision coil
(44F) : Body ground
(45F) · Dropping resistor
(46F) : Vacuum switch (A/T model)
(47F) · Power steering oil pressure switch
(48F) · Fuel injector
(49F) · Idle-up solenoid valve and F.I.C.D. solenoid valve
(50F) : Water temperature sensor
(51F) : Mixture heater
(52F) : **Thermoswitch**



SEL379L

E.C.C.S. Harness (Cont'd)

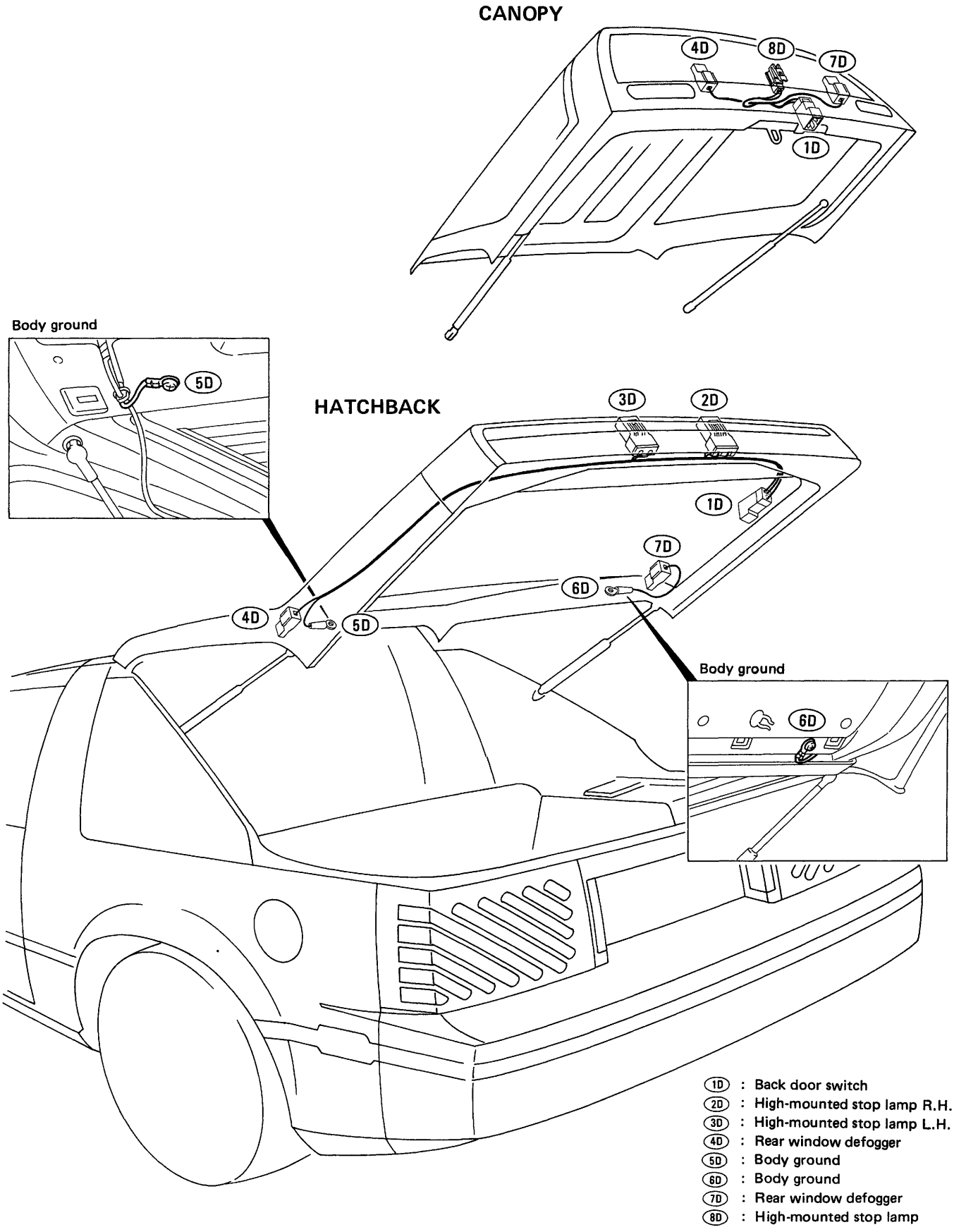
CA18DE engine model



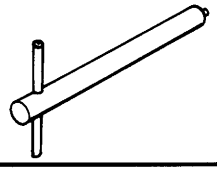
1F : E.C.C.S. control unit
2F : To (137M)
3F : To (138M)
4F : To (139M)
5F : Wiper amplifier
6F : Air conditioner relay
7F : Condenser fan relay
8F : Body ground
9F : Wiper motor
10F : Power transistor relay
11F : Check connector
12F : Resistor
13F : To (35M)
14F : Crank angle sensor
15F : Air regulator
16F : Injector 1
17F : Injector 2
18F : Engine ground
19F : Idle switch
20F : Injector 3
21F : Injector 4
22F : Condenser
23F : F.I.C.D. solenoid valve
24F : A.A.C. solenoid valve
25F : Power transistor unit
26F : To (13E)
27F : Throttle sensor
28F : Brake fluid level switch
30F : A.I.V. control solenoid valve
31F : Power control valve solenoid valve
32F : Air flow meter
33F : E.G.R. control solenoid valve
34F : Exhaust gas temperature sensor (For California)
35F : Fusible link
36F : To E.C.C.S. sub-harness
37F : Exhaust gas sensor

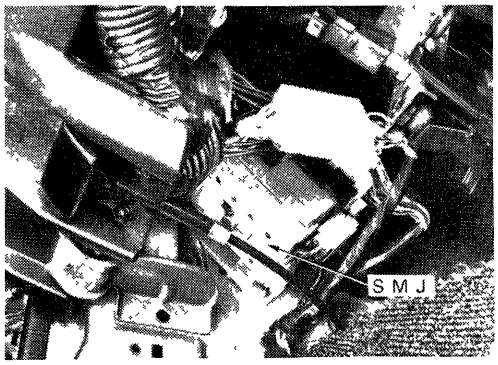
SEL380L

Back Door Harness



SEL288K

Tool number	Tool name
J36126	Washer nozzle adjusting tool 



INSTALLATION

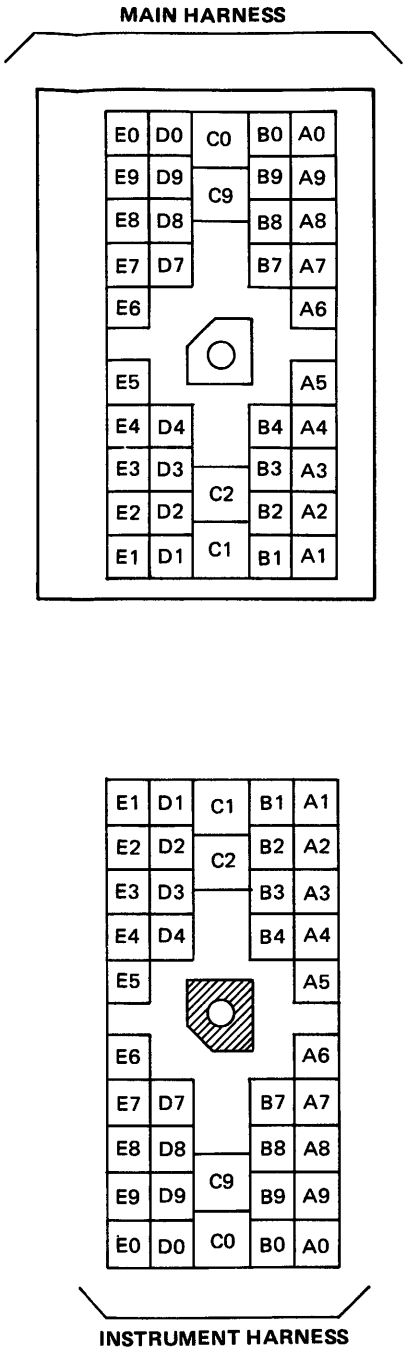
To install S.M.J., tighten bolts until orange "fulltight" mark appears and then retighten to specified torque as required.

: 3 - 5 N·m (0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)

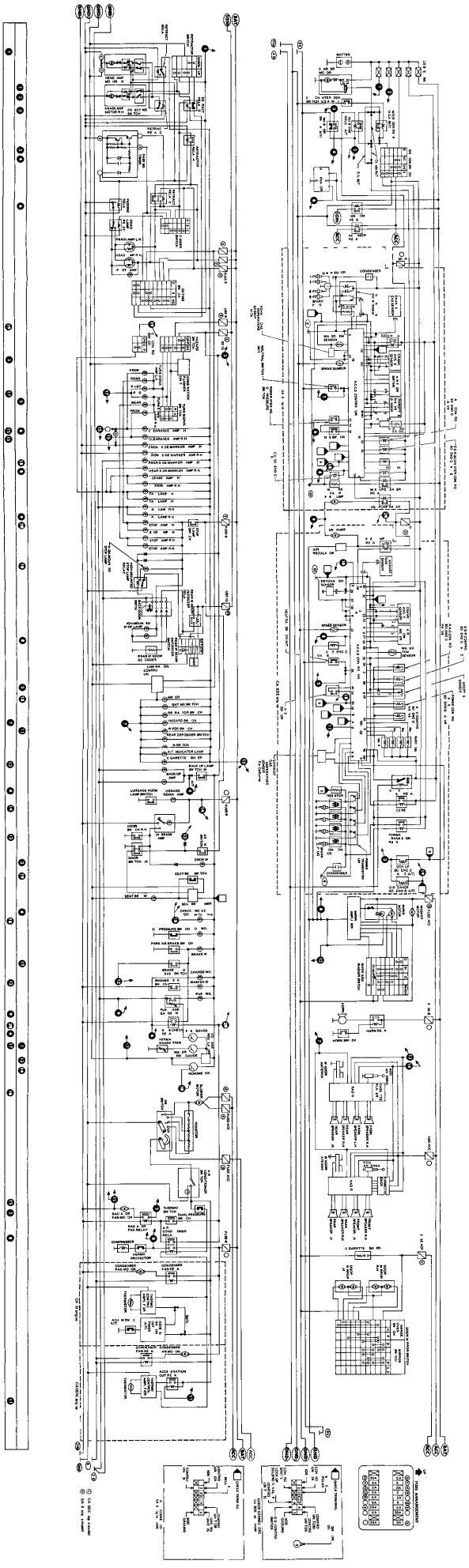
CAUTION:

Do not overtighten bolts, otherwise, they may be damaged.

Terminal Arrangement (Model N13 series)



1989 NISSAN PULSAR
CIRCUIT DIAGRAM



INCH TO METRIC CONVERSION TABLE

(Rounded-off for automotive use)

inches	mm	inches	mm
.100	2.54	.610	15.49
.110	2.79	.620	15.75
.120	3.05	.630	16.00
.130	3.30	.640	16.26
.140	3.56	.650	16.51
.150	3.81	.660	16.76
.160	4.06	.670	17.02
.170	4.32	.680	17.27
.180	4.57	.690	17.53
.190	4.83	.700	17.78
.200	5.08	.710	18.03
.210	5.33	.720	18.29
.220	5.59	.730	18.54
.230	5.84	.740	18.80
.240	6.10	.750	19.05
.250	6.35	.760	19.30
.260	6.60	.770	19.56
.270	6.86	.780	19.81
.280	7.11	.790	20.07
.290	7.37	.800	20.32
.300	7.62	.810	20.57
.310	7.87	.820	20.83
.320	8.13	.830	21.08
.330	8.38	.840	21.34
.340	8.64	.850	21.59
.350	8.89	.860	21.84
.360	9.14	.870	22.10
.370	9.40	.880	22.35
.380	9.65	.890	22.61
.390	9.91	.900	22.86
.400	10.16	.910	23.11
.410	10.41	.920	23.37
.420	10.67	.930	23.62
.430	10.92	.940	23.88
.440	11.18	.950	24.11
.450	11.43	.960	24.38
.460	11.68	.970	24.64
.470	11.94	.980	24.89
.480	12.19	.990	25.15
.490	12.45	1.000	25.40
.500	12.70	2.000	50.80
.510	12.95	3.000	76.20
.520	13.21	4.000	101.60
.530	13.46	5.000	127.00
.540	13.72	6.000	152.40
.550	13.97	7.000	177.80
.560	14.22	8.000	203.20
.570	14.48	9.000	228.60
.580	14.73	10.000	254.00
.590	14.99	20.000	508.00
.600	15.24		

METRIC TO INCH CONVERSION TABLE

(Rounded-off for automotive use)

mm	inches	mm	inches
1	.0394	51	2.008
2	.079	52	2.047
3	.118	53	2.087
4	.157	54	2.126
5	.197	55	2.165
6	.236	56	2.205
7	.276	57	2.244
8	.315	58	2.283
9	.354	59	2.323
10	.394	60	2.362
11	.433	61	2.402
12	472	62	2.441
13	.512	63	2.480
14	.551	64	2.520
15	.591	65	2.559
16	.630	66	2.598
17	.669	67	2.638
18	.709	68	2.677
19	.748	69	2.717
20	.787	70	2.756
21	.827	71	2.795
22	.866	72	2.835
23	.906	73	2.874
24	.945	74	2.913
25	.984	75	2.953
26	1.024	76	2.992
27	1.063	77	3.031
28	1.102	78	3.071
29	1.142	79	3.110
30	1.181	80	3.150
31	1.220	81	3.189
32	1.260	82	3.228
33	1.299	83	3.268
34	1.339	84	3.307
35	1.378	85	3.346
36	1.417	86	3.386
37	1.457	87	3.425
38	1.496	88	3.465
39	1.535	89	3.504
40	1.575	90	3.543
41	1.614	91	3.583
42	1.654	92	3.622
43	1.693	93	3.661
44	1.732	94	3.701
45	1.772	95	3.740
46	1.811	96	3.780
47	1.850	97	3.819
48	1.890	98	3.858
49	1.929	99	3.898
50	1.969	100	3.937

QUICK REFERENCE CHART : PULSAR NX [ ] 1989

ENGINE TUNE-UP DATA GA16i & CA18DE

	GA16i		CA18DE	
	M/T	A/T	M/T	A/T
Firing order	1-3-4-2			
Idle speed*1 rpm				
Check	800±100*2	750±100*2	800±50*2	700±50*2
Adjust	725±50*3	675±50*3	750±50*4	650±50*4
Ignition timing				
Check	7°±5° B.T.D.C.		15°±2° B.T.D.C.	
Adjust	7° B.T.D.C. *3		15° B.T.D.C.	
Idle CO	Idle mixture is preset and sealed at factory.			
Valve clearance (Hot) mm (in)				
Intake	0 (0) (Automatic adjusting)			
Exhaust	0 (0) (Automatic adjusting)			
Engine compression pressure kPa (kg/cm², psi)/rpm				
Standard	1,245 (12.7, 181)/350		1,373 (14.0, 199)/350	
Minimum	981 (10.0, 142)/350		1,177 (12.0, 171)/350	
Differential limit between cylinders	98 (1.0, 14)/350		98 (1.0, 14)/350	
Spark plug				
Type				
Standard	BCPR5ES-11		PFR6A-11	
Hot	BCPR4ES-11		PFR5A-11	
Cold	BCPR6ES-11		PFR7A-11	
Gap mm (in)	1.0 - 1.1 (0.039 - 0.043)		Do not check and adjust plug gap.	

Drive belt deflection (Cold) mm (in)	GA16i Used belt			CA18DE Used belt		
	Limit	Adjust deflection	Set deflection of new belt	Limit	Adjust deflection	Set deflection of new belt
Alternator	11 (0.43)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)	12 (0.47)*5	6 - 8 (0.24 - 0.31)	5 - 7 (0.20 - 0.28)
				10 (0.39)	5 - 7 (0.20 - 0.28)	
Air conditioner compressor	7.5 (0.295)	4 - 6 (0.16 - 0.24)	3 - 5 (0.12 - 0.20)	6 (0.24)	3 - 4 (0.12 - 0.16)	3 - 4 (0.12 - 0.16)
Power steering pump	7.5 (0.295)	4 - 6 (0.16 - 0.24)	3 - 5 (0.12 - 0.20)	12.5 (0.492)	7 - 9 (0.28 - 0.35)	6 - 8 (0.24 - 0.31)
Applied pressed force N (kg, lb)	98 (10, 22)					

Tightening torque N·m (kg-m, ft-lb)	
Valve rocker adjusting nut	Automatic adjusting
Oil pan drain plug	29 - 39 (3.0 - 4.0, 22 - 29)
Spark plug	20 - 29 (2.0 - 3.0, 14 - 22)

*1 A/T: in "D" range.
*2 Feedback controlled and need no adjustments.
*3 Adjust with throttle sensor harness disconnected. Refer to section EF & EC.
*4 Adjust with A.A.C. valve harness disconnected.
*5 Without air conditioner model.

CLUTCH PEDAL

GA16i engine model — Unit: mm (in)

Pedal free height	162 - 172 (6.38 - 6.77)
Withdrawal lever play	2.5 - 3.5 (0.098 - 0.138)

CA18DE engine model — Unit: mm (in)

Pedal free height	162 - 172 (6.38 - 6.77)
Pedal free play	1 - 3 (0.04 - 0.12)

REAR WHEEL BEARING

Tightening torque	N·m (kg-m, ft-lb)	186 - 255 (19 - 26, 137 - 188)
Axial end play	mm (in)	0.05 (0.0020) or less

WHEEL ALIGNMENT (Unladen*)

Item	Model	Front GA16i	Front CA18DE	Rear
Camber	degree	−1°15′ to 0°15′		−2°00′ to −0°30′
Caster	degree	1°10′ - 2°40′		–
Toe-in				
	mm (in)	−1 to 1 (−0.04 to 0.04)		−1.5 to 2.5 (−0.059 to 0.098)
(Total)	degree	−6′ to 6′		−9′ to 15′
Front wheel turning angle				
Toe-out turns (Inside/Outside)	degree	21°36′/20°	22°24′/20°	–
Full turn				
Inside	degree	37° - 40°	36° - 39°	–
Outside	degree	32°30′	30°	–

* Tankful of fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools, mats in designated positions.

BRAKE

Unit: mm (in)

Front brake	GA16i	CA18DE
Pad wear limit	2.0 (0.079)	
Rotor repair limit	10.0 (0.394)	16.0 (0.630)
Rear brake		
Lining wear limit	1.5 (0.059)	
Drum inner diameter repair limit	204.5 (8.05)	
Pedal free height		
M/T model	160 - 168 (6.30 - 6.61)	
A/T model	164 - 174 (6.46 - 6.85)	
Pedal depressed height*1		
M/T model	80 (3.15) or more	
A/T model	85 (3.35) or more	
Parking brake		
Number of notches*2	7 - 11	

*1 Under force of 490 N (50 kg, 110 lb) with engine running
*2 At pulling force 196 N (20 kg, 44 lb)

REFILL CAPACITIES

Unit		Liter GA16i	Liter CA18DE	US measure GA16i	US measure CA18DE
Engine model					
Fuel tank		50		13-1/4 gal	
Coolant	M/T	5.4	5.6	5-3/4 qt	5-7/8 qt
	A/T	5.9		6-1/4 qt	
Engine	With oil filter	3.2	3.5	3-3/8 qt	3-3/4 qt
	Without oil filter	2.8	3.1	3 qt	3-1/4 qt
Transaxle	M/T	2.7	4.7	5-3/4 pt	10 pt
	A/T	6.3	6.8	6-5/8 qt	7-1/4 qt
Power steering system		0.9		1 qt	
Air conditioning system	Compressor oil	0.2		6.8 fl oz	
	Refrigerant	0.85 - 0.95 kg		1.87 - 2.09 lb	

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