

QUICK REFERENCE CHART : G20 1993

ENGINE TUNE-UP DATA

Engine model		SR20DE		
Firing order		1-3-4-2		
Idle speed	rpm	M/T A/T (in "N" position)	800±50	
Ignition timing (B.T.D.C. at idle speed)		15°±2°		
CO% at idle		Idle mixture screw is preset and sealed at factory.		
Drive belt deflection (Cold)		mm (in)	Used belt deflection	
			Limit	Deflection after adjustment
Alternator	With air conditioner compressor	11.5 - 12.5 (0.453 - 0.492)	7 - 8 (0.28 - 0.31)	6.5 - 7.5 (0.256 - 0.295)
	Without air conditioner compressor	12 - 13 (0.47 - 0.51)	8 - 9 (0.31 - 0.35)	7 - 8 (0.28 - 0.31)
Power steering oil pump		6 - 7 (0.24 - 0.28)	4 - 5 (0.16 - 0.20)	3.5 - 4.5 (0.138 - 0.177)
Applied pushing force		N (kg, lb)	98 (10, 22)	
Radiator cap relief pressure		kPa (kg/cm ² , psi)	78 - 98 (0.8 - 1.0, 11 - 14)	
Cooling system leakage testing pressure		kPa (kg/cm ² , psi)	157 (1.6, 23)	
Compression pressure	Standard	1,226 (12.5, 178)/300		
	kPa (kg/cm ² , psi)/rpm	Minimum	1,030 (10.5, 149)/300	
Spark plug		Type (Standard)	PFR5B-11, BKR6E	

FRONT WHEEL ALIGNMENT (Unladen*)

Camber	degree	-0°45' to 0°45'
Caster	degree	1°05' - 2°35'
Kingpin inclination	degree	13°45' - 15°15'
Toe-in		
A - B	mm (in)	0 - 2 (0 - 0.08)
Total angle 2θ	degree	0° - 12°
Wheel turning angle (Full turn)	degree	
Inside		33° - 37°
Outside		28° - 32°

* Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools and mats in designated positions.

REAR WHEEL ALIGNMENT (Unladen*)

Camber	degree	-1°45' to -0°15'
Toe-in		
A - B	mm (in)	-2 to 2 (-0.08 to 0.08)
Total angle 2θ	degree	-12° to 12°

* Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools and mats in designated positions.

BRAKE

Unit. mm (in)		
Front brake		
Pad wear limit		2.0 (0.079)
Rotor repair limit		20.0 (0.787)
Rear brake		
Pad wear limit		2.0 (0.079)
Rotor repair limit		8.0 (0.315)
Pedal free height	For CANADA	151 - 161 (5.94 - 6.34)
	M/T Except for Canada	158 - 168 (6.22 - 6.61)
	A/T	159 - 169 (6.26 - 6.65)
Pedal depressed height*	M/T	80 (3.15) or more
	A/T	85 (3.35) or more

* Under force of 490 N (50 kg, 110 lb) with engine running

REFILL CAPACITIES

Unit		Liter	US measure
Fuel tank		60	15-7/8 gal
Coolant (With reservoir tank)	M/T	6.1	6-1/2 qt
	A/T	6.5	6-7/8 qt
Engine	With oil filter	3.4	3-5/8 qt
	Without oil filter	3.2	3-3/8 qt
Transaxle	M/T	3.5 - 3.7	3-3/4 - 3-7/8 qt
	A/T	7.0	7-3/8 qt
Power steering system		0.9	1 qt
Air conditioning system	Compressor oil	0.2	6.8 fl oz
	Refrigerant	0.70 - 0.80 kg	1.54 - 1.76 lb



I N F I N I T I ®

G20

MODEL P10 SERIES

QUICK REFERENCE INDEX

GENERAL INFORMATION _____	GI
MAINTENANCE _____	MA
ENGINE MECHANICAL _____	EM
ENGINE LUBRICATION & COOLING SYSTEMS —	LC
ENGINE FUEL & EMISSION CONTROL SYSTEM —	EF & EC
ACCELERATOR CONTROL, FUEL & _____ EXHAUST SYSTEMS	FE
CLUTCH _____	CL
MANUAL TRANSAXLE _____	MT
AUTOMATIC TRANSAXLE _____	AT
FRONT AXLE & FRONT SUSPENSION _____	FA
REAR AXLE & REAR SUSPENSION _____	RA
BRAKE SYSTEM _____	BR
STEERING SYSTEM _____	ST
BODY _____	BF
HEATER & AIR CONDITIONER _____	HA
ELECTRICAL SYSTEM _____	EL



I N F I N I T I ®

© 1992 NISSAN MOTOR CO., LTD. Printed in Japan

Not to be reproduced in whole or in part without the prior written permission of Nissan Motor Company Ltd., Tokyo, Japan.

FOREWORD

This manual contains maintenance and repair procedures for the 1993 INFINITI G20.

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 INFINITI must first completely satisfy himself that neither his safety nor the vehicle's safety will be jeopardized by the service method selected.



I N F I N I T I [®]



NISSAN MOTOR CO., LTD.

Overseas Service Department

Tokyo, Japan

GENERAL INFORMATION

SECTION **GI**

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

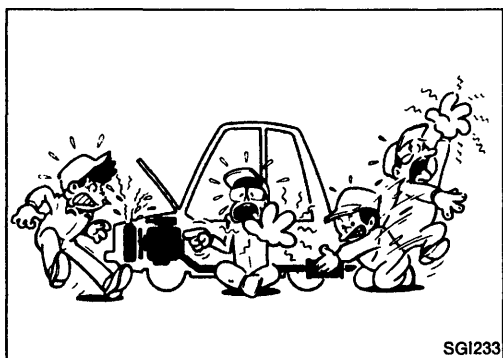
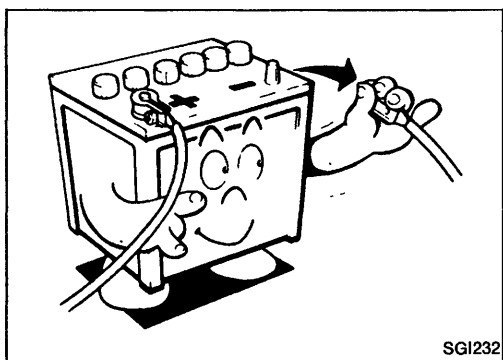
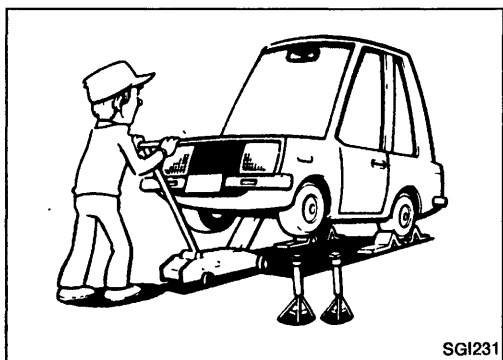
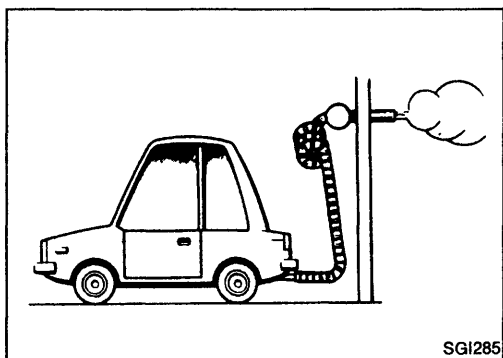
EL

CONTENTS

PRECAUTIONS	2	Checking Equipment.....	13
General Precautions	2	IDENTIFICATION INFORMATION	14
Precautions for Multiport Fuel Injection System or E.C.C.S. Engine.....	3	Model Variation.....	14
Precautions for Three Way Catalyst.....	4	Identification Number.....	15
Precautions for Fuel	4	Dimensions.....	17
HOW TO USE THIS MANUAL	5	Wheels and Tires	17
HOW TO READ WIRING DIAGRAMS	7	LIFTING POINTS AND TOW TRUCK TOWING	18
HOW TO FOLLOW FLOW CHART IN TROUBLE		Preparation.....	18
DIAGNOSES	10	Board-on Lift	18
CONSULT CHECKING SYSTEM	13	Garage Jack and Safety Stand.....	19
Function and System Application.....	13	2-pole Lift.....	19
Lithium Battery Replacement.....	13	Tow Truck Towing.....	20
		TIGHTENING TORQUE OF STANDARD BOLTS	21

PRECAUTIONS

Observe the following precautions to ensure safe and proper servicing. These precautions are not described in each individual section.

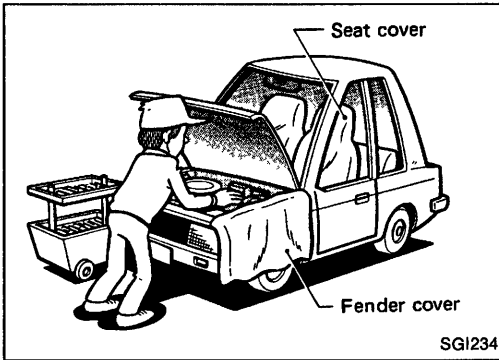


General Precautions

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.
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, be careful not to lose your balance and drop them. Also, do not allow them to strike adjacent parts, especially the brake tubes and master cylinder.
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.
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.

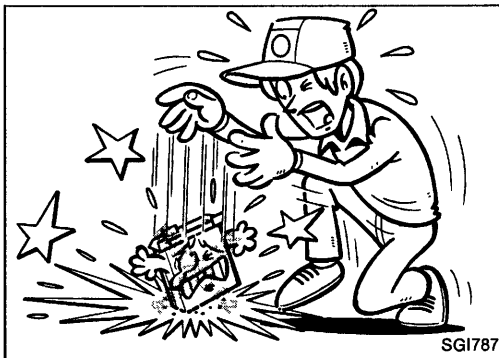
PRECAUTIONS

General Precautions (Cont'd)



6. Before servicing the vehicle, protect fenders, upholstery and carpeting with appropriate covers. 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. with new ones.
9. Replace inner and outer races of tapered roller bearings and needle bearings as a set.
10. Arrange the disassembled parts in accordance with their assembled locations and sequence.
11. Do not touch the terminals of electrical components which use microcomputers (such as ECMs). Static electricity may damage internal electronic components.
12. After disconnecting vacuum or air hoses, attach a tag to indicate the proper connection.
13. Use only the lubricants specified in MA section.
14. Use approved bonding agent, sealants or their equivalents when required.
15. Use tools and recommended special tools where specified for safe and efficient service repairs.
16. When repairing the fuel, oil, water, vacuum or exhaust systems, check all affected lines for leaks.
17. Dispose of drained oil or the solvent used for cleaning parts in an appropriate manner.



Precautions for Multiport Fuel Injection System or E.C.C.S. Engine

1. Before connecting or disconnecting multiport fuel injection system or E.C.C.S. harness connector to or from any multiport fuel injection system or ECM (ECCS control module), be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal. Otherwise, there may be damage to ECM.
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 ECM and mass air flow sensor.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

PRECAUTIONS

Precautions for Three Way Catalyst

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

1. Use unleaded gasoline only. Leaded gasoline will seriously damage the three way catalyst.
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 three way catalyst.
4. Do not place the vehicle on inflammable material. Keep inflammable material off the exhaust pipe.

Precautions for Fuel

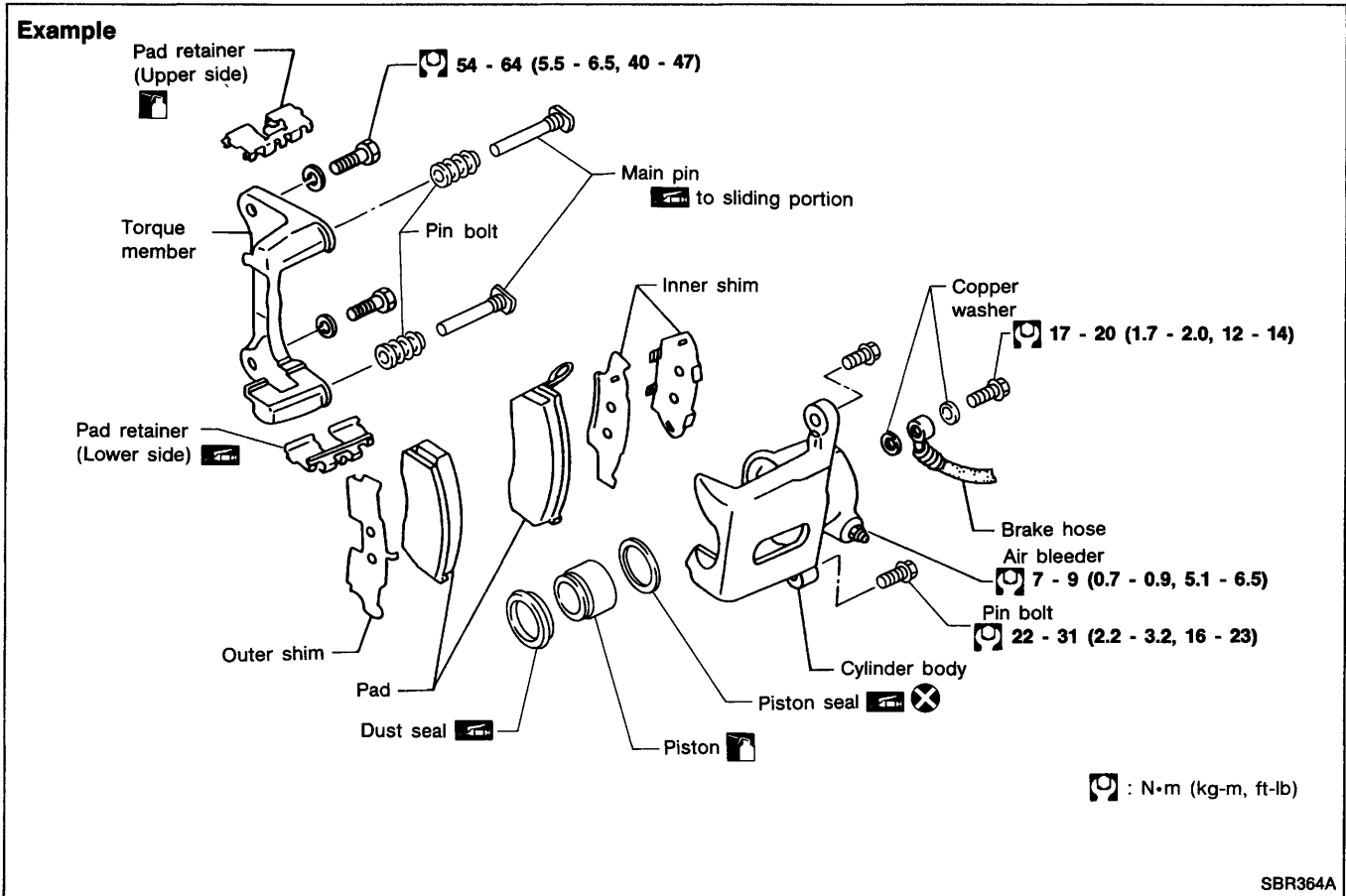
Use unleaded gasoline with an octane rating of at least 87 AKI (Anti-Knock Index) number (research octane number 91).

CAUTION:

Do not use leaded gasoline. Using leaded gasoline will damage the three way catalyst.

HOW TO USE THIS MANUAL

1. **A QUICK REFERENCE INDEX**, a black tab (e.g. **BR**) 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. "BR-5").
5. **THE LARGE ILLUSTRATIONS** are exploded views (See below.) and contain tightening torques, lubrication points and other information necessary to perform repairs. The illustrations should be used in reference to service matters only. When ordering parts, refer to the appropriate **PARTS CATALOG**.



6. **THE SMALL ILLUSTRATIONS** show 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 illustrations. Assembly, inspection and adjustment procedures for complicated units such as the automatic transaxle or transmission, etc. are presented in a step-by-step format where necessary.
7. The following **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 after every disassembly.
- (P) : Apply petroleum jelly.
- (ATF) : Apply A.T.F.
- ★ : Select with proper thickness.

- ☆ : Adjustment is required.
- S.D.S. : Service Data and Specifications
- L.H. : Left-Hand
- A/T : Automatic Transaxle/Transmission
- Tool : Special Service Tools
- A.T.F. : Automatic Transmission Fluid
- D₁ : Drive range 1st gear
- D₂ : Drive range 2nd gear
- D₃ : Drive range 3rd gear
- D₄ : Drive range 4th gear
- O.D. : Overdrive

HOW TO USE THIS MANUAL

8. The **UNITS** given in this manual are primarily expressed as SI UNITS (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)

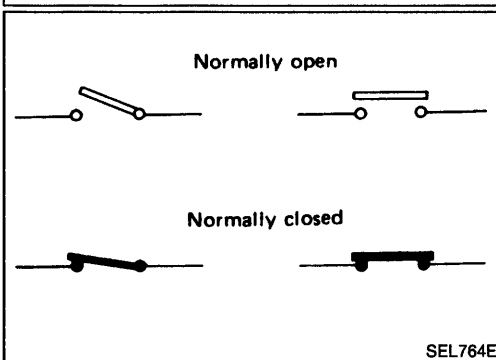
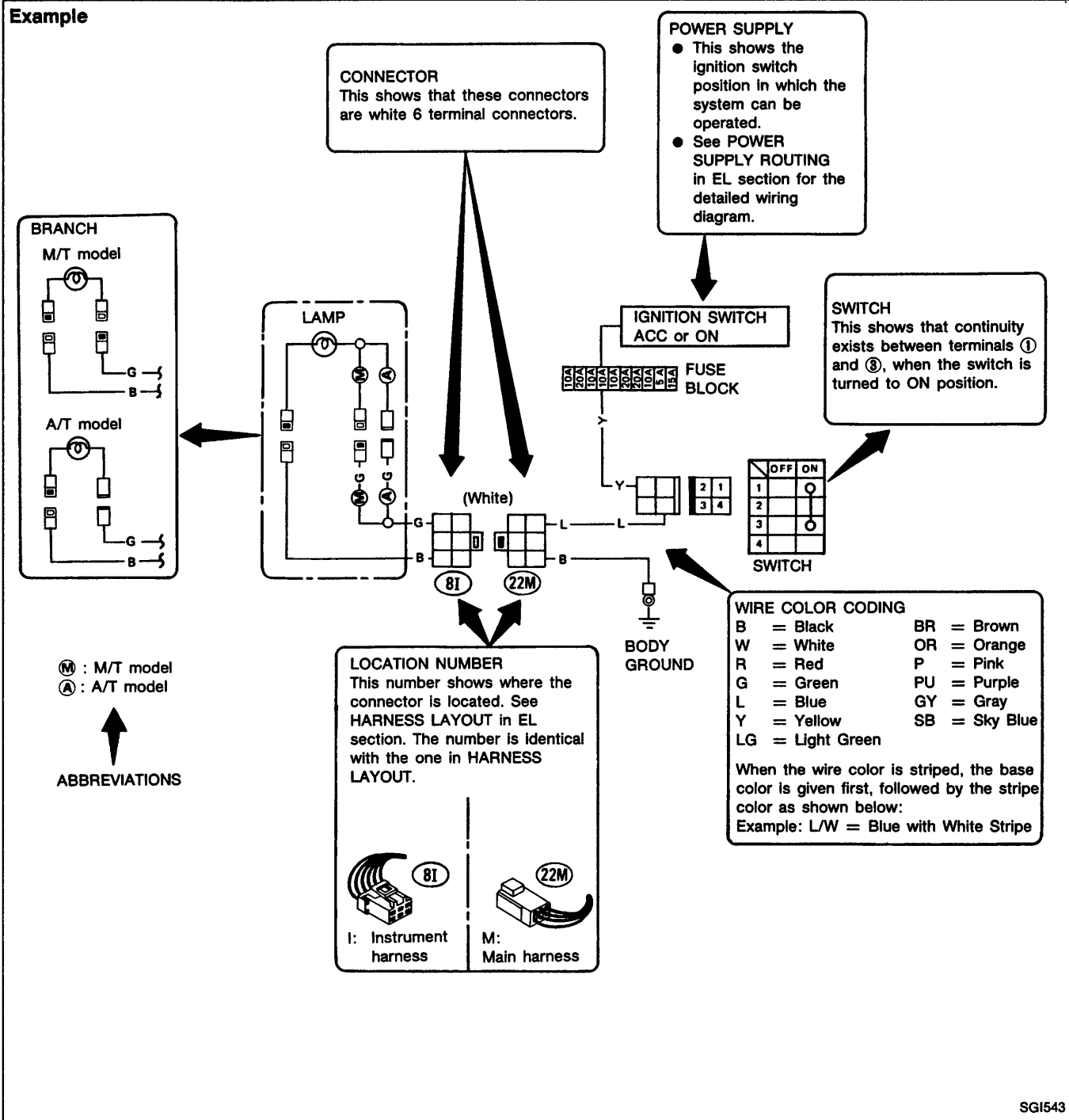
9. **TROUBLE DIAGNOSES** are included in sections dealing with complicated components.
10. **SERVICE DATA AND SPECIFICATIONS** are contained at the end of each section for quick reference of data.
11. The captions **WARNING** and **CAUTION** warn you of steps that must be followed to prevent personal injury and/or damage to some part of the vehicle.
- **WARNING** indicates the possibility of personal injury if instructions are not followed.
 - **CAUTION** indicates the possibility of component damage if instructions are not followed.
 - **BOLD TYPED STATEMENTS** except **WARNING** and **CAUTION** give you helpful information.

HOW TO READ WIRING DIAGRAMS

WIRING DIAGRAM

Symbols used in WIRING DIAGRAM are shown below:

Example



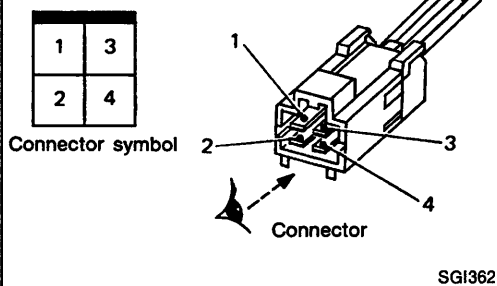
SWITCH POSITIONS

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.

HOW TO READ WIRING DIAGRAMS

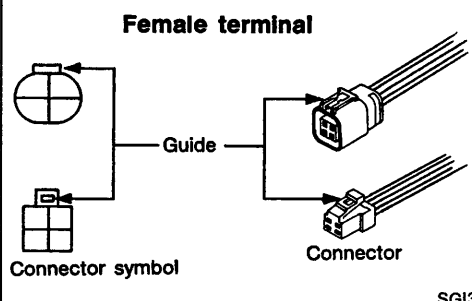
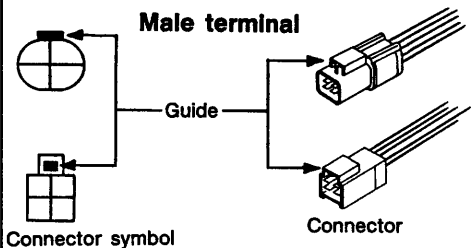
Example



CONNECTOR SYMBOLS

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

Example

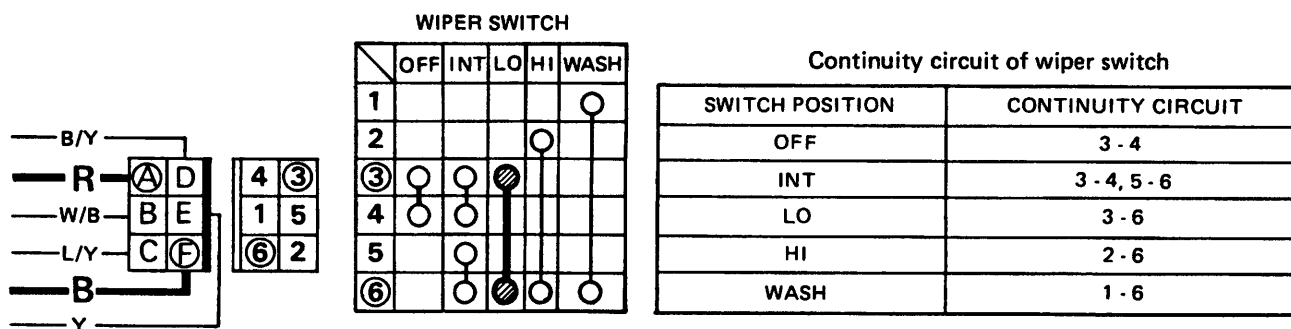


- Male and female terminals
Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.

MULTIPLE SWITCH

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

Example



Example: Wiper switch in LO position

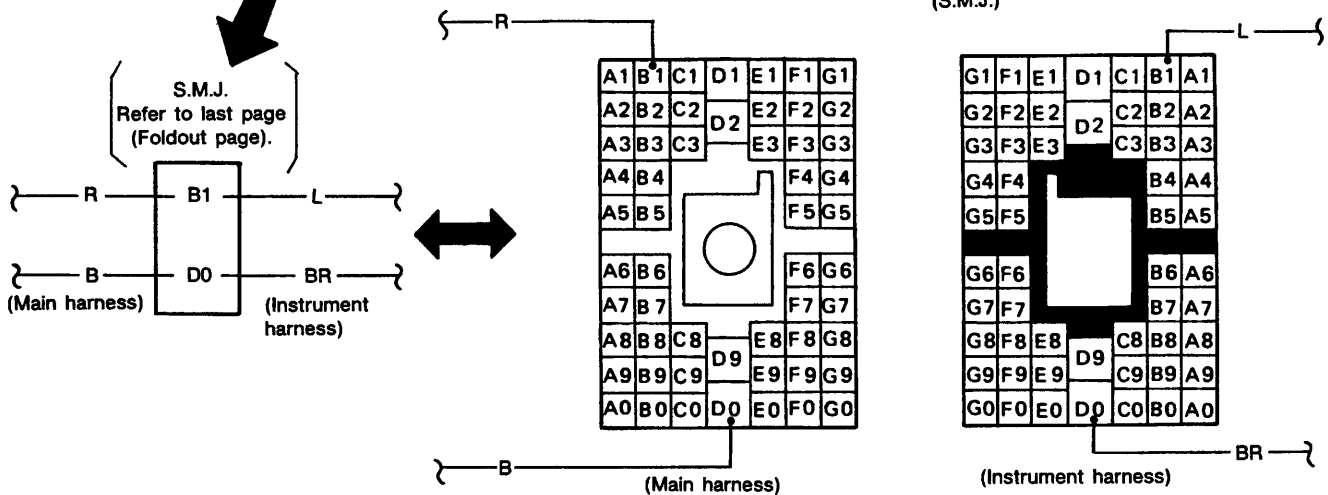
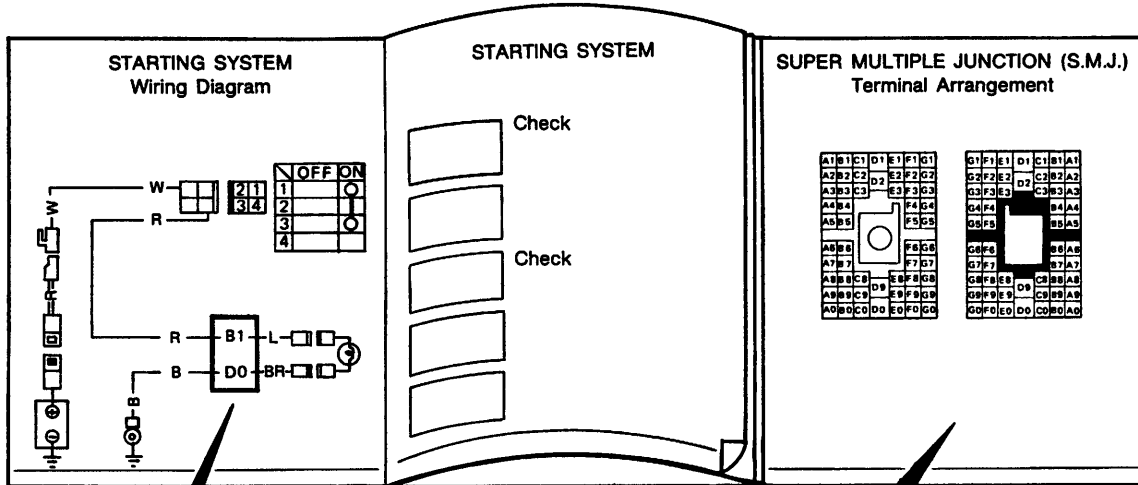
Continuity circuit: Red wire — (A) terminal — (③) terminal — Wiper switch (● — ●: LO) — (⑥) terminal — (F) terminal — Black wire

HOW TO READ WIRING DIAGRAMS

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.

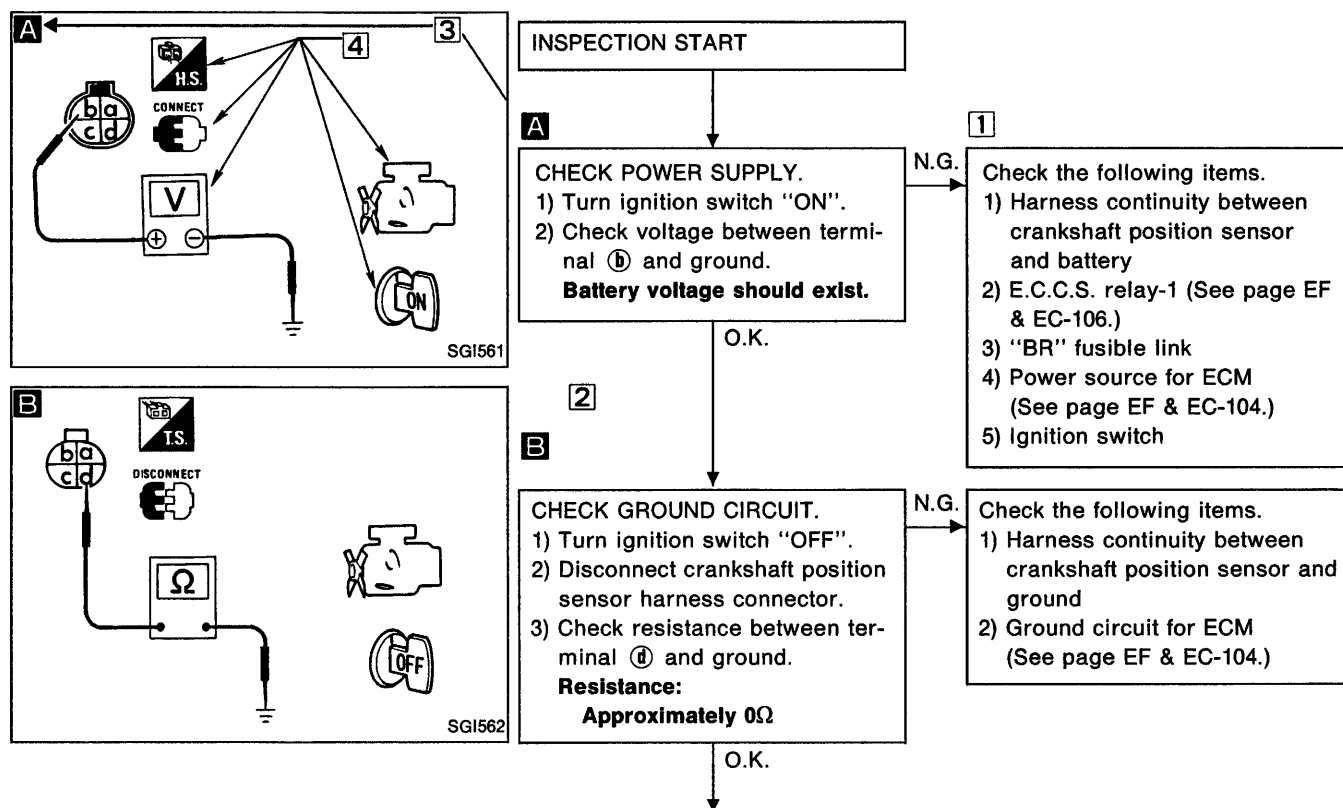
Example



SEL653F

HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES

Example



NOTICE

The flow chart indicates work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

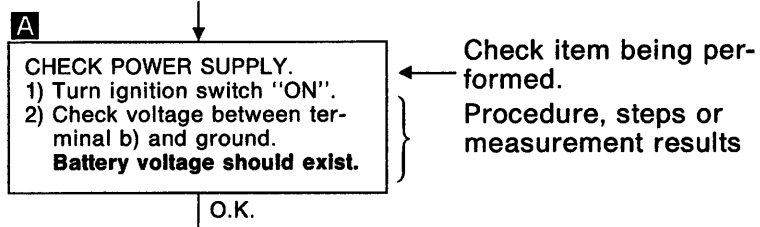
- 1) Use the flow chart after locating probable causes of a problem following the "Preliminary Check" or the "Symptom Chart".
- 2) After repairs, re-check that the problem has been completely eliminated.
- 3) Refer to Component Parts Location and Harness Layout for the Systems described in each section for identification/location of components and harness connectors.
- 4) Refer to the Circuit Diagram for Quick Pinpoint Check. If you must check circuit continuity between harness connectors in more detail, such as when a sub-harness is used, refer to Wiring Diagram and Harness Layout in EL section for identification of harness connectors.
- 5) When checking circuit continuity, ignition switch should be "OFF".
- 6) Before checking voltage at connectors, check battery voltage.
- 7) After accomplishing the Diagnostic Procedures and Electrical Components Inspection, make sure that all harness connectors are reconnected as they were.

HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES

HOW TO FOLLOW THIS FLOW CHART

1 Work and diagnostic procedure

Start to diagnose a problem using procedures indicated in enclosed blocks, as shown in the following example.



2 Measurement results

Required results are indicated in bold type in the corresponding block, as shown below:

These have the following meanings:

Battery voltage → 11 - 14V or approximately 12V

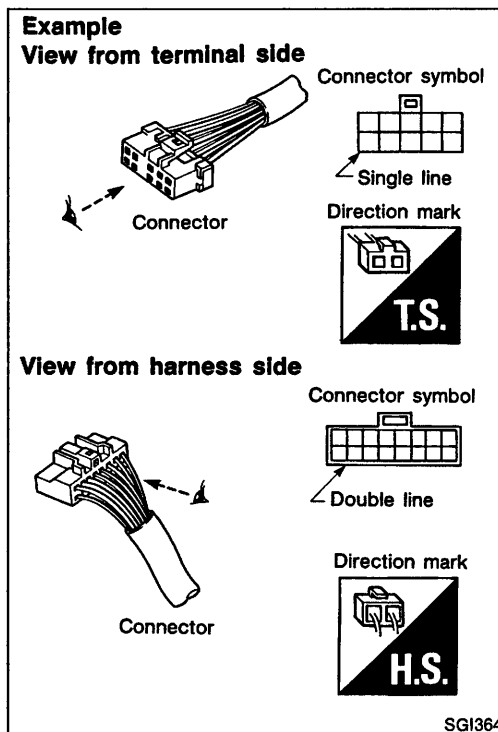
Voltage: Approximately 0V → Less than 1V

3 Cross reference of work symbols in the text and illustrations

Illustrations are provided as visual aids for work procedures. For example, symbol **A** indicated in the left upper portion of each illustration corresponds with the symbol in the flow chart for easy identification. More precisely, the procedure under the "CHECK POWER SUPPLY" outlined previously is indicated by an illustration **A**

4 Symbols used in illustrations

Symbols included in illustrations refer to measurements or procedures. Before diagnosing a problem, familiarize yourself with each symbol.



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 by a double line.

HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES

Key to symbols signifying measurements or procedures

Symbol	Symbol explanation	Symbol	Symbol explanation
	Check after disconnecting the connector to be measured.		Current should be measured with an ammeter.
	Check after connecting the connector to be measured.		Procedure with CONSULT
	Insert key into ignition switch.		Procedure without CONSULT
	Remove key from ignition switch.		A/C switch is "OFF".
	Turn ignition switch to "OFF" position.		A/C switch is "ON".
	Turn ignition switch to "ON" position.		Fan switch is "ON". (At any position except for "OFF" position)
	Turn ignition switch to "START" position.		Fan switch is "OFF".
	Turn ignition switch from "OFF" to "ACC" position.		Apply battery voltage directly to components.
	Turn ignition switch from "ACC" to "OFF" position.		Drive vehicle.
	Turn ignition switch from "OFF" to "ON" position.		Disconnect battery negative cable.
	Turn ignition switch from "ON" to "OFF" position.		Depress brake pedal.
	Do not start engine, or check with engine stopped.		Release brake pedal.
	Start engine, or check with engine running.		Depress accelerator pedal.
	Apply parking brake.		Release accelerator pedal.
	Release parking brake.	Pin terminal check for S.M.J. type ECM and A/T control unit connectors. For details regarding the terminal arrangement, refer to the foldout page.	
	Check after engine is warmed up sufficiently.		
	Voltage should be measured with a voltmeter.		
	Circuit resistance should be measured with an ohmmeter.		

CONSULT CHECKING SYSTEM

Function and System Application

Diagnostic test mode	Function	E.C.C.S.
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT.	X
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.	X
Data monitor	Input/Output data in the ECM can be read.	X
Active test	Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range.	X
ECM part number	ECM part number can be read.	X
Function test	E.C.C.S. faults can be isolated to a general area, semi-automatically and in a short time, by following the directions on the screen.	X

X: Applicable

Lithium Battery Replacement

CONSULT contains a lithium battery. When replacing the battery obey the following:

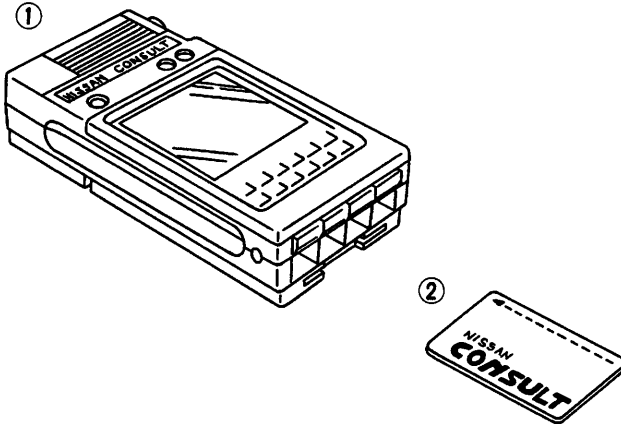
WARNING:

Replace the lithium battery with SANYO Electric Co., Ltd., CR2032 only. Use of another battery may present a risk of fire or explosion. The battery may present a fire or chemical burn hazard if mistreated. Do not recharge, disassemble or dispose of in fire.

Keep the battery out of reach of children and discard used battery conforming to the local regulations.

Checking Equipment

When ordering the below equipment, contact your INFINITI distributor.

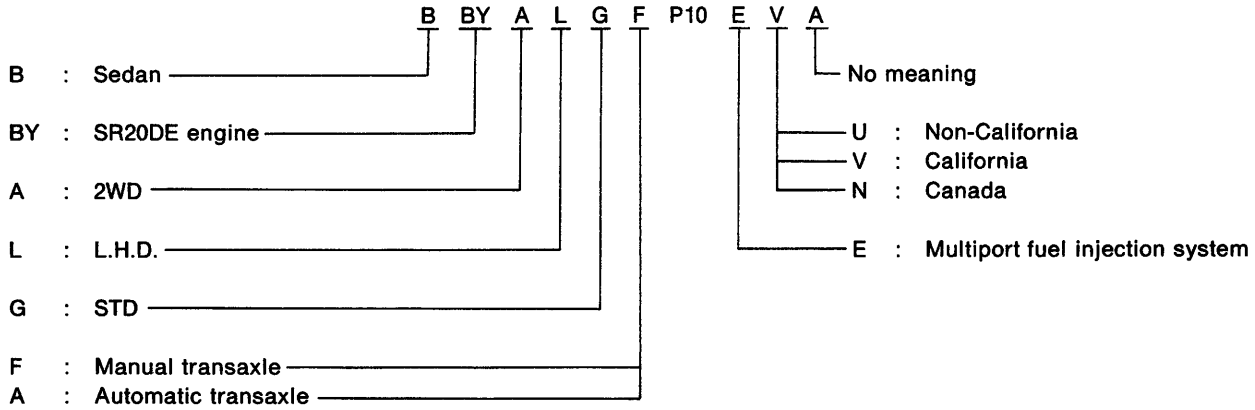
Tool name	Description
NISSAN CONSULT kit ① CONSULT unit and accessories ② Program card (UE920)	

IDENTIFICATION INFORMATION

Model Variation

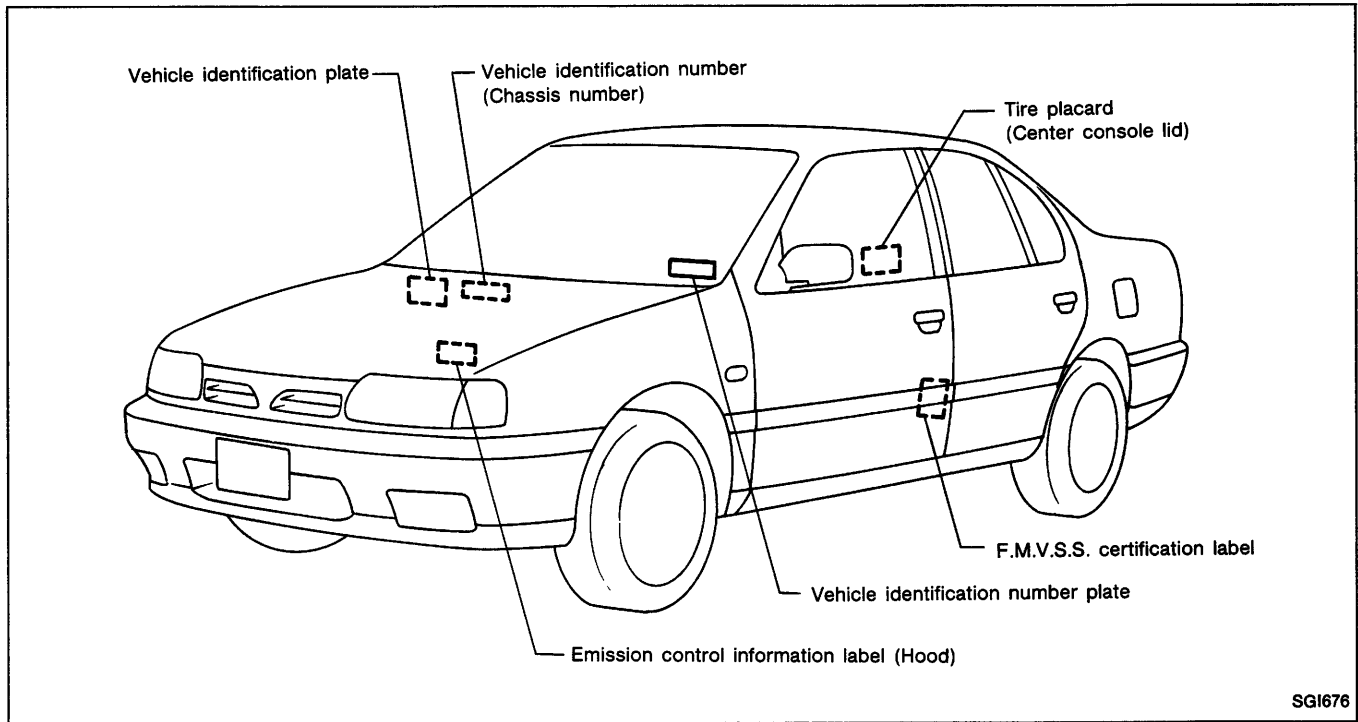
Body	Destination	Grade	Model	Engine	Transaxle
Sedan	Non-California	STD	BBYALGFP10EUA	SR20DE	RS5F32A
			BBYALGAP10EUA		RL4F03A
	California		BBYALGFP10EVA		RS5F32A
			BBYALGAP10EVA		RL4F03A
	Canada		BBYALGFP10ENA		RS5F32A
			BBYALGAP10ENA		RL4F03A

Prefix and suffix designations:

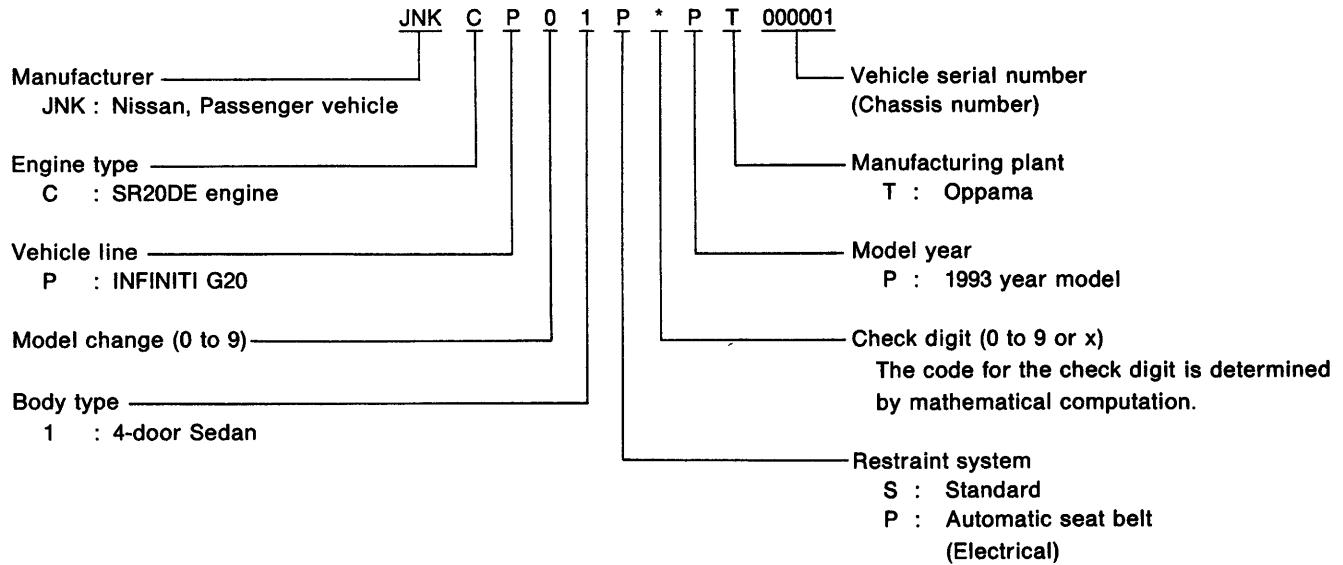


IDENTIFICATION INFORMATION

Identification Number



VEHICLE IDENTIFICATION NUMBER ARRANGEMENT



IDENTIFICATION INFORMATION

Identification Number (Cont'd)

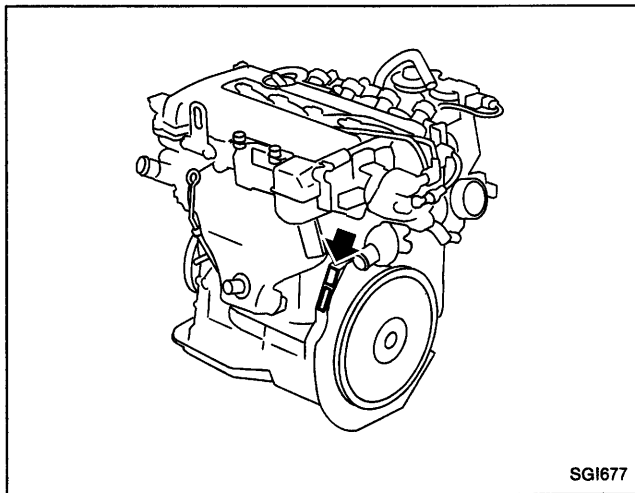
IDENTIFICATION PLATE

NISSAN MOTOR CO., LTD. JAPAN			
型式	TYPE	△	
CHASSIS NO	△		
NO. DE CHASSIS			
MODEL	△		
MODELO			
○ カラー COLOR TRIM	△	△	○
トリム COLOR GUARNICION			
エンジン ENGINE	△	△	CC
ジン MOTOR			
ミッション TRANS. AXLE	△	△	
アクスル TRANS. EJE			
	工場	PLANT	
		PLANTA	
日産自動車株式会社 MADE IN JAPAN			

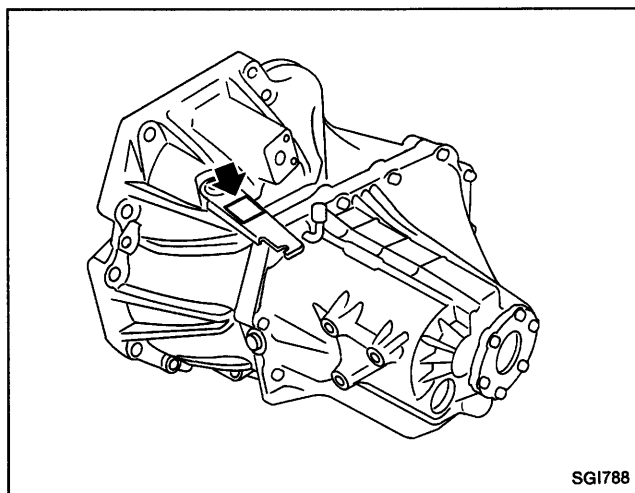
- 1 Type
- 2 Vehicle identification number (Chassis number)
- 3 Model
- 4 Body color code
- 5 Trim color code
- 6 Engine model
- 7 Engine displacement
- 8 Transmission model
- 9 Axle model

SGI315

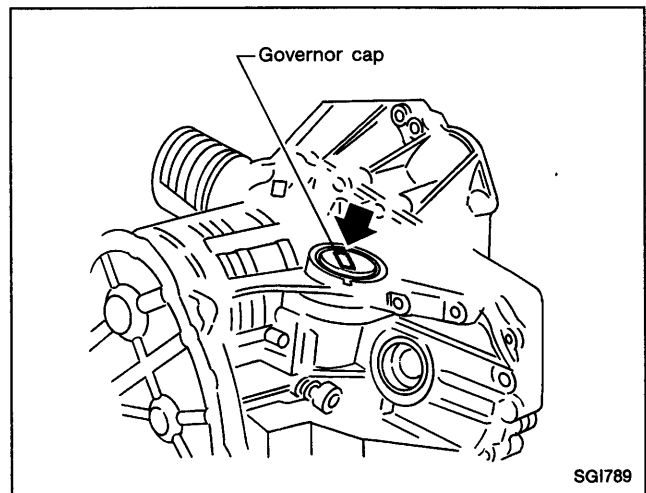
ENGINE SERIAL NUMBER



MANUAL TRANSAXLE NUMBER



AUTOMATIC TRANSAXLE NUMBER



IDENTIFICATION INFORMATION

Dimensions

Unit: mm (in)

Model		Sedan
Overall length		4,440 (174.8)
Overall width		1,694 (66.7)
Overall height		1,389 (54.7)
Wheel base		2,550 (100.4)
Tread	Front	1,471 (57.9)
	Rear	1,461 (57.5)

GI

MA

EM

LC

EF &
EC

FE

CL

Wheels and Tires

Road wheel	Aluminum	6-JJ x 14
	Offset mm (in)	45 (1.77)
Tire size	Conventional	195/60HR14
	Spare	T125/70D15

MT

AT

FA

RA

BR

ST

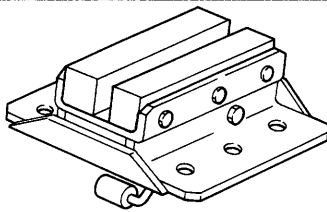
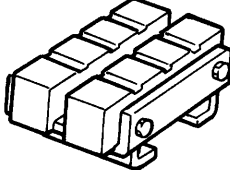
BF

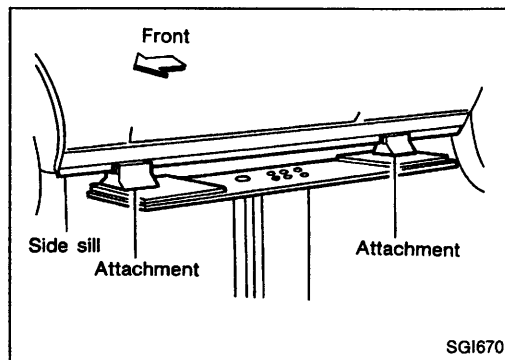
HA

EL

Preparation

SPECIAL SERVICE TOOLS

Tool number Tool name	Description
LM4086-0200 Board-on lift attachment	
LM4519-0000 Safety stand attachment	



Board-on Lift

Models without sill spoiler

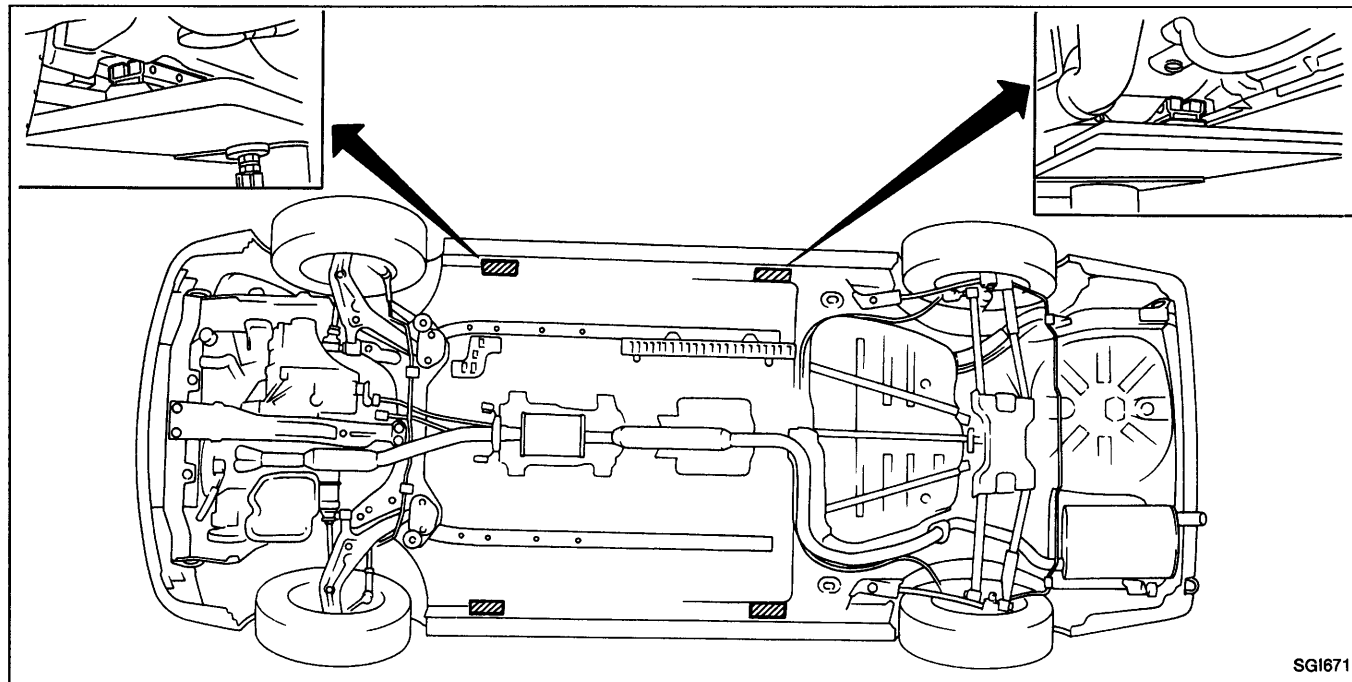
CAUTION:

Make sure vehicle is empty when lifting.

- The board-on lift attachment (LM4086-0200) set at front end of vehicle should be set on the front of the sill under the front door opening.
- Position attachments at front and rear ends of board-on lift.

Models with sill spoiler

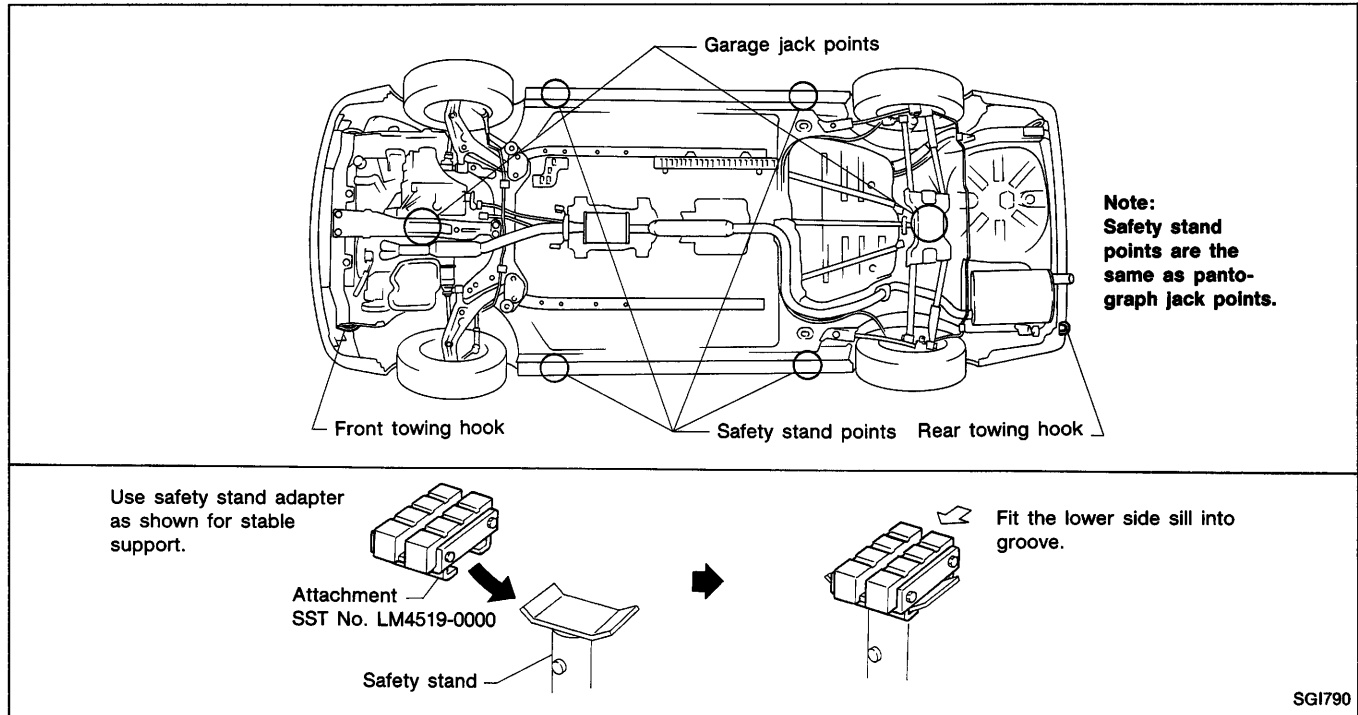
Fix board-on lift attachments to inner side of sill.



Garage Jack and Safety Stand

WARNING:

- Never get under the vehicle while it is supported only by the jack. Always use safety stands when you have to get under the vehicle.
- Place wheel chocks at both front and back of the wheels on the ground.

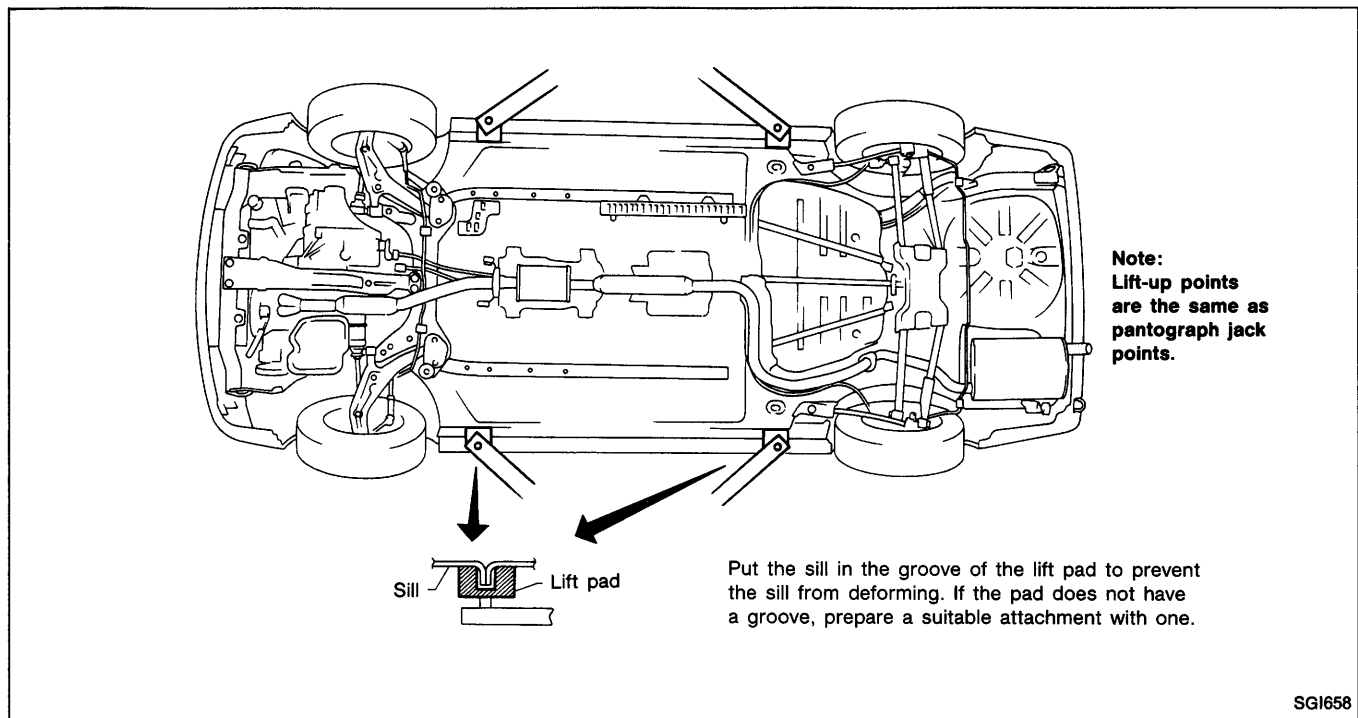


2-pole Lift

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.

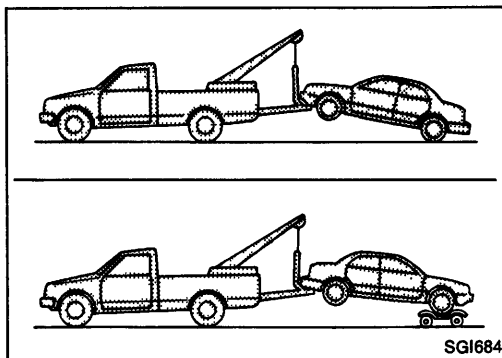
When setting the lift arm, do not allow the arm to contact the brake tubes and fuel lines.



Tow Truck Towing

CAUTION:

- All applicable 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 a towing operation.
- When towing with the rear wheels on the ground, release the parking brake and move the gearshift lever to neutral position ("N" position).



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

TOWING AN AUTOMATIC TRANSAXLE MODEL WITH FOUR WHEELS ON GROUND

Observe the following restricted towing speeds and distances.

Speed:

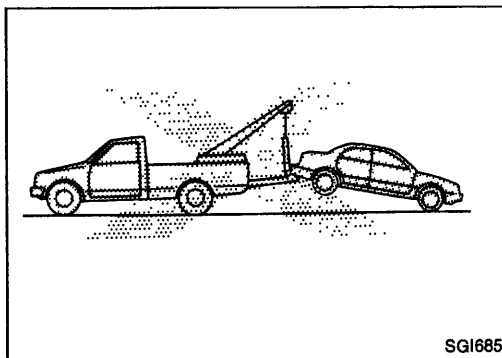
Below 50 km/h (30 MPH)

Distance:

Less than 65 km (40 miles)

CAUTION:

Never tow an automatic transaxle model from the rear (i.e., backward) with four wheels on the ground as this may cause serious and expensive damage to the transaxle.



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.

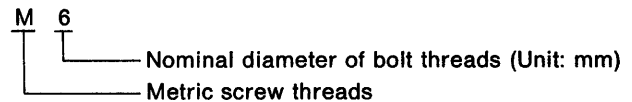
TIGHTENING TORQUE OF STANDARD BOLTS

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
7T	M14	14.0	1.5	74	7.5	54	88	9.0	65
	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
9T	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
	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
9T	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



MAINTENANCE

SECTION MA

CONTENTS

PREPARATION.....	2	CHASSIS AND BODY MAINTENANCE	15
Special Service Tool.....	2	Checking Exhaust System	15
GENERAL MAINTENANCE	3	Checking M/T Oil	15
PERIODIC MAINTENANCE	5	Changing M/T Oil.....	15
Schedule 1.....	6	Checking A/T Fluid Level	15
Schedule 2.....	7	Changing A/T Fluid	15
RECOMMENDED FLUIDS AND LUBRICANTS	8	Balancing Wheels	16
Fluids and Lubricants	8	Tire Rotation.....	16
SAE Viscosity Number	8	Checking Brake Fluid Level and Leaks	16
ENGINE MAINTENANCE.....	9	Checking Brake Lines and Cables.....	16
Checking Drive Belts	9	Checking Disc Brake	16
Changing Engine Coolant.....	10	Checking Steering Gear and Linkage.....	17
Checking Fuel Lines	11	Checking Power Steering Fluid and Lines	17
Changing Fuel Filter	11	Lubricating Hood Latches, Locks and Hinges.....	18
Changing Air Cleaner Filter	12	Checking Seat Belts, Buckles, Retractors,	
Changing Engine Oil.....	12	Anchors and Adjusters	18
Changing Oil Filter.....	13	SERVICE DATA AND SPECIFICATIONS (S.D.S.).....	19
Changing Spark Plugs (Platinum-tipped type)	13	Engine Maintenance	19
Changing Spark Plugs (Conventional type).....	14	Chassis and Body Maintenance.....	19
Checking Vapor Lines.....	14		

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

Tool number (Kent-Moore No.) Tool name	Description
KV10115800 (J38956) Oil filter cap wrench 65 mm (2.56 in) dia.	 SMA327C

GENERAL MAINTENANCE

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 INFINITI dealers do them.

Item	Reference page	
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.	—	GI MA EM
Wheel nuts When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary.	—	LC
Tire rotation Tires should be rotated every 12,000 km (7,500 miles).	MA-16	EF & EC
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.	MA-16 FA-5	FE
Windshield wiper blades Check for cracks or wear if they do not wipe properly.	—	CL
Doors and engine hood Check that all doors and the engine hood operate smoothly as well as the trunk lid and back hatch. Also ensure, that all latches lock securely. Lubricate hinges, latches, rollers and links 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.	MA-18	MT
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.	—	AT FA
Warning lights and buzzers/chimes Make sure that all warning lights and buzzers/chimes are operating properly.	—	RA
Windshield wiper and washer Check that the wipers and washer operate properly and that the wipers do not streak.	—	BR
Windshield defroster Check that the air comes out of the defroster outlets properly and in sufficient quantity when operating the heater or air conditioner.	—	ST
Steering wheel Check that it has the specified free play. Be sure to check for changes in the steering condition, such as excessive free play, hard steering or strange noises. Free play: Less than 35 mm (1.38 in)	—	BF
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. Check that the latches lock securely for folding-down rear seatbacks.	—	HA
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.	MA-18	EL
Clutch pedal Make sure the pedal operates smoothly and check that it has the proper free travel.	CL-4	
Brakes Check that the brake does not pull the vehicle to one side when applied.	—	

GENERAL MAINTENANCE

Item	Reference page
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. Be certain to keep floor mats away from the pedal.	BR-6 BR-9
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.	BR-22
Automatic transaxle "Park position" 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.	—
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.	MA-10
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 fluid level Make sure that the brake fluid level is between the "MAX" and "MIN" lines on the reservoir.	MA-16
Battery Check the fluid level in each cell. It should be between the "MAX" and "MIN" lines.	—
Engine drive belts Make sure that no belt is frayed, worn, cracked or oily.	MA-9
Engine oil level Check the level on the dipstick after parking the vehicle on a level spot and turning off the engine.	MA-12
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.	MA-17
Automatic transaxle fluid level Check the level on the dipstick after putting the selector lever in "P" with the engine idling.	MA-15
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.	MA-15
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 can easily 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 gasoline fumes are evident, check for the cause and correct it immediately.	—

PERIODIC MAINTENANCE

Two different maintenance schedules are provided, and should be used, depending upon the conditions in which the vehicle is mainly operated. **After 60,000 miles (96,000 km) or 48 months, continue the periodic maintenance at the same mileage/time intervals.**

SCHEDULE 1

Follow Periodic Maintenance Schedule 1 if your driving habits frequently includes one or more of the following driving conditions:

- Repeated short trips of less than 5 miles (8 km).
- Repeated short trips of less than 10 miles (16 km) with outside temperatures remaining below freezing.
- Operating in hot weather in stop-and-go “rush hour” traffic.
- Extensive idling and/or low speed driving for long distances, such as police, taxi or door-to-door delivery use.
- Driving in dusty conditions.
- Driving on rough, muddy, or salt spread roads.
- Towing a trailer, using a camper or a car-top carrier.

SCHEDULE 2

Follow Periodic Maintenance Schedule 2 if none of the driving conditions shown in Schedule 1 apply to your driving habits.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

Schedule 1

Abbreviations: R = Replace I = Inspect. Correct or replace as necessary. []: Perform service at the mileage intervals only

MAINTENANCE OPERATION

Perform at number of miles, kilometers or months, whichever comes first.	3.75 (6)	7.5 (12)	11.25 (18)	15 (24)	18.75 (30)	22.5 (36)	26.25 (42)	30 (48)	33.75 (54)	37.5 (60)	41.25 (66)	45 (72)	48.75 (78)	52.5 (84)	56.25 (90)	60 (96)	Reference page
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	

EMISSION CONTROL SYSTEM MAINTENANCE

Service "A"																	
Engine oil	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MA-12
Engine oil filter	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MA-13
Service "E"																	
Air cleaner filter	See NOTE (1).																[R] MA-12
Service "F"																	
Vapor lines								I*								I*	MA-14
Fuel lines								I*								I*	MA-11
Fuel filter	See NOTE (2)*.																MA-11
Service "G"																	
Drive belts	See NOTE (3).																I* MA-9
Service "J"																	
Engine coolant	See NOTE (4).																R* MA-10
Service "H"																	
Spark plugs (PLATINUM-TIPPED type)	See NOTE (5).																[R] MA-13

CHASSIS AND BODY MAINTENANCE

Service "B"																	
Brake pads & discs	I			I		I		I		I		I		I		I	MA-16
Steering gear & linkage, axle & suspension parts	I			I		I		I		I		I		I		I	MA-17, FA-4, RA-4
Steering linkage ball joints & front suspension ball joints	I			I		I		I		I		I		I		I	MA-17, FA-4
Exhaust system & drive shaft boots	I			I		I		I		I		I		I		I	MA-15, FA-6
Service "D"																	
Brake lines & cables				I				I				I				I	MA-16
Automatic & manual transaxle oil	See NOTE (6).																I MA-15

- NOTE: (1)** If operating mainly in dusty conditions, more frequent maintenance may be required.
- (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)** After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months.
- (4)** After 60,000 miles (96,000 km) or 48 months, replace every 30,000 miles (48,000 km) or 24 months.
- (5)** 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.
- (6)** If towing a trailer, using a camper or a car-top carrier, or driving on rough or muddy roads, change (not just inspect) oil at every 30,000 miles (48,000 km) or 24 months.
- (7)** Maintenance items and intervals with "*" are recommended by INFINITI 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.

Schedule 2

Abbreviations: R = Replace I = Inspect. Correct or replace as necessary. []: Perform service at the mileage intervals only

MAINTENANCE OPERATION

Perform at number of miles, kilometers or months, whichever comes first.	MAINTENANCE INTERVAL										Reference page
	Miles x 1,000 (km x 1,000)	7.5 (12)	15 (24)	22.5 (36)	30 (48)	37.5 (60)	45 (72)	52.5 (84)	60 (96)		
	Months	6	12	18	24	30	36	42	48		

EMISSION CONTROL SYSTEM MAINTENANCE

Service "A"											
Engine oil	R	R	R	R	R	R	R	R	R	MA-12	
Service "C"											
Engine oil filter		R			R		R		R	MA-13	
Service "E"											
Air cleaner filter					[R]				[R]	MA-12	
Service "F"											
Vapor lines					I*				I*	MA-14	
Fuel lines					I*				I*	MA-11	
Fuel filter										MA-11	
Service "G"											
Drive belts									I*	MA-9	
Service "J"											
Engine coolant									R*	MA-10	
Service "H"											
Spark plugs (PLATINUM-TIPPED Type)									[R]	MA-13	

CHASSIS AND BODY MAINTENANCE

Service "D"											
Brake lines & cables			I		I		I		I	MA-16	
Brake pads & discs			I		I		I		I	MA-16	
Automatic & manual transaxle oil			I		I		I		I	MA-15	
Exhaust system					I		I		I	MA-15	
Drive shaft boots			I		I		I		I	FA-6	
Service "F"											
Steering gear linkage axle & suspension parts					I				I	MA-17, FA-4, RA-4	

NOTE: (1) 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.

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

(3) After 60,000 miles (96,000 km) or 48 months, replace every 30,000 miles (48,000 km) or 24 months.

(4) 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.

(5) Maintenance items and intervals with "*" are recommended by INFINITI 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.

RECOMMENDED FLUIDS AND LUBRICANTS

Fluids and Lubricants

		Capacity (Approximate)			Recommended fluids and lubricants
		US measure	Imp measure	Liter	
Engine oil (Refill)					
With oil filter		3-5/8 qt	3 qt	3.4	Energy Conserving Oils of API SG *2, *3
Without oil filter		3-3/8 qt	2-7/8 qt	3.2	
Cooling system (With reservoir tank)	M/T	6-1/2 qt	5-3/8 qt	6.1	Anti-freeze coolant (Ethylene glycol base)
	A/T	6-7/8 qt	5-3/4 qt	6.5	
Manual transaxle gear oil		7-3/8 - 7-7/8 pt	6-1/8 - 6-1/2 pt	3.5 - 3.7	API GL-4*2
Automatic transaxle fluid		7-3/8 qt	6-1/8 qt	7.0	Genuine ATF*1 or equivalent Type DEXRON™ II-E
Power steering fluid		—	—	—	Type DEXRON™ II or equivalent
Brake fluid		—	—	—	Genuine Brake Fluid*1 or equivalent DOT 3 (US FMVSS No. 116)
Multi-purpose grease		—	—	—	NLGI No. 2 (Lithium soap base)

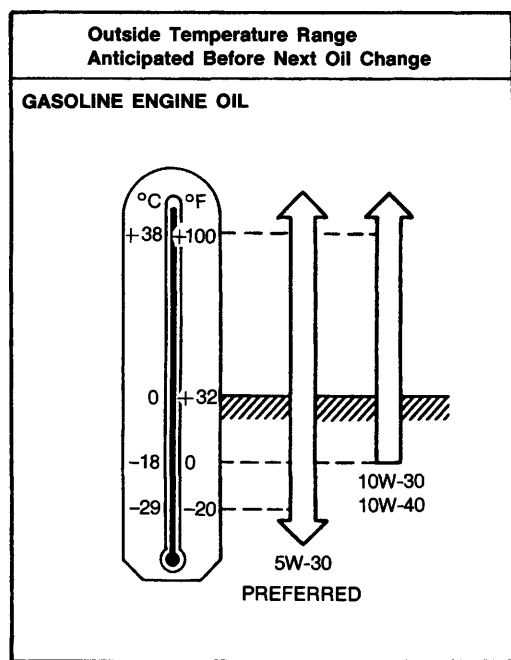
*1: Available in mainland U.S.A. through your INFINITI dealer.

*2: For further details, see "Recommended SAE viscosity number".

*3: Energy conserving oils

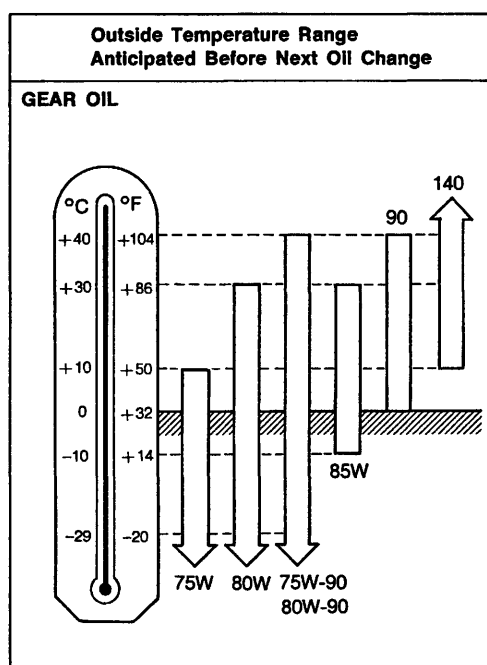
These oils can be identified by such labels as EC-I, EC-II energy conserving, energy saving, improved fuel economy, etc.

SAE Viscosity Number



T10008

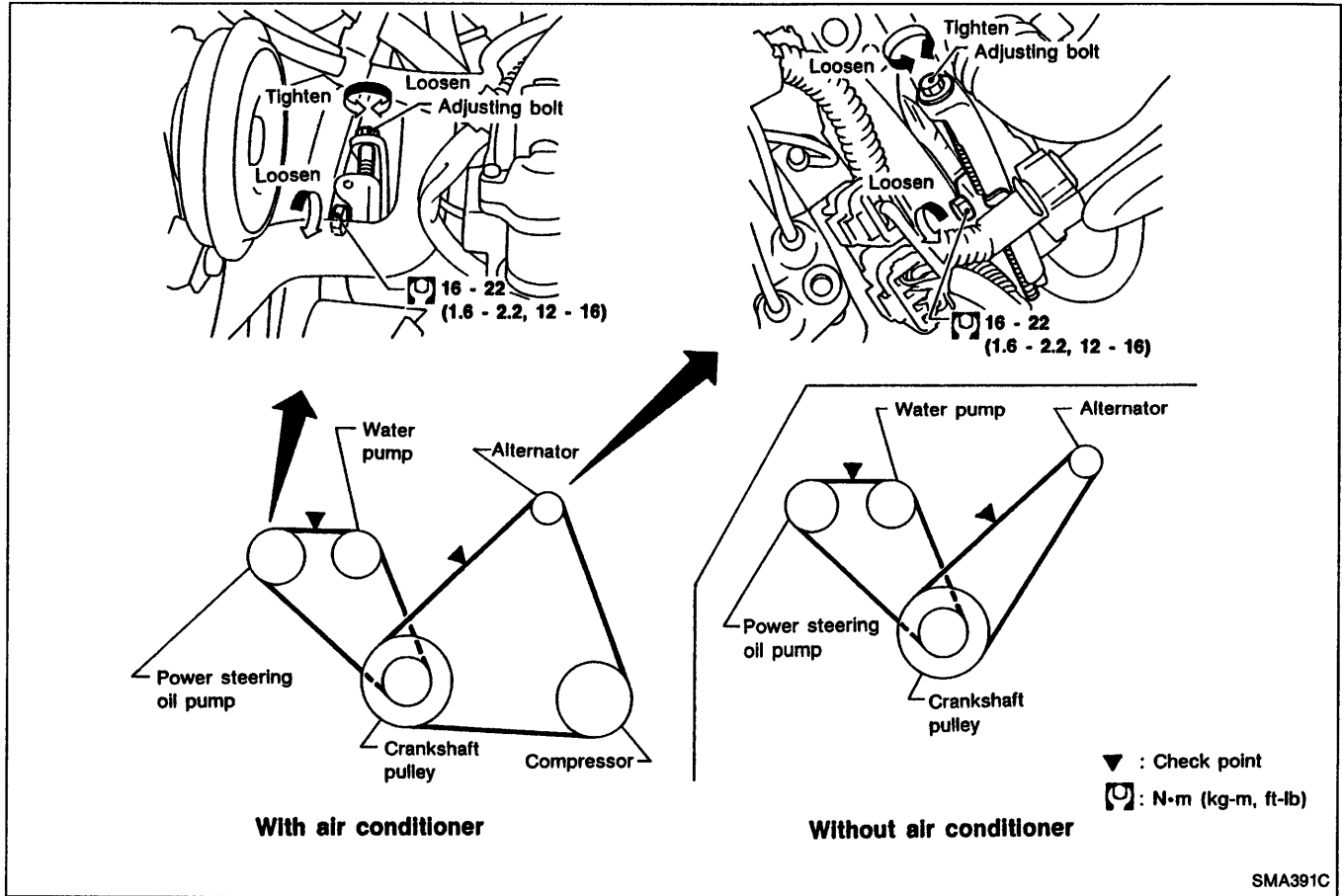
5W-30 is preferable for all ambient temperatures. 20W-40 and 20W-50 are usable for ambient temperatures above 10°C (50°F) for all seasons.



T10003

80W-90 is preferable for ambient temperatures below 40°C (104°F).

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.

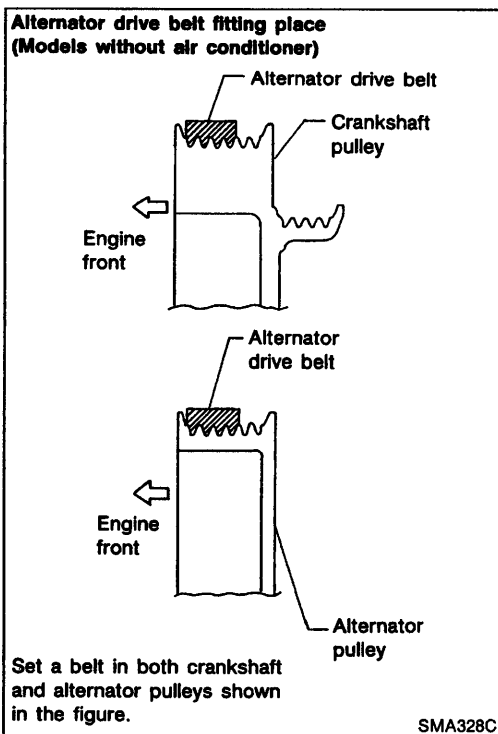
Adjust if belt deflections exceed the limit.

Belt deflection:

Unit: mm (in)

Drive belts	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator			
With air conditioner compressor	11.5 - 12.5 (0.453 - 0.492)	7 - 8 (0.28 - 0.31)	6.5 - 7.5 (0.256 - 0.295)
Without air conditioner compressor	12 - 13 (0.47 - 0.51)	8 - 9 (0.31 - 0.35)	7 - 8 (0.28 - 0.31)
Power steering oil pump	6 - 7 (0.24 - 0.28)	4 - 5 (0.16 - 0.20)	3.5 - 4.5 (0.138 - 0.177)
Applied pushing force	98 N (10 kg, 22 lb)		

Inspect drive belt deflections when engine is cold.

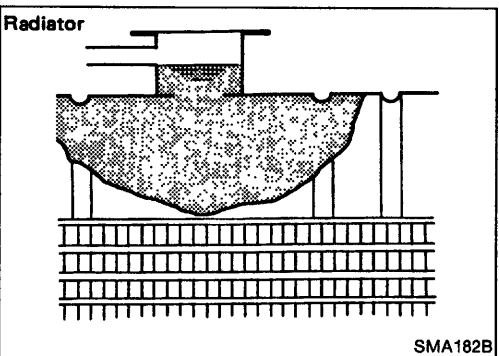
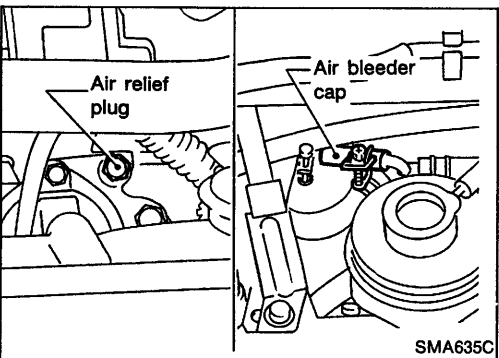
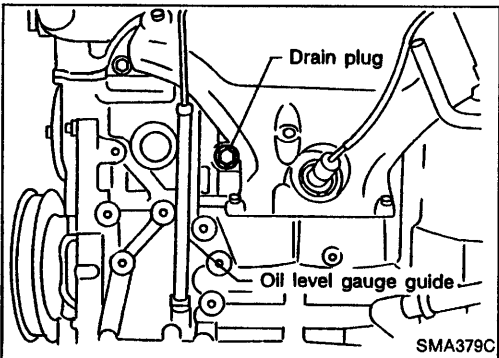
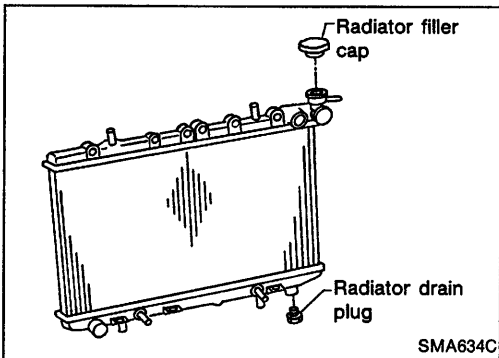
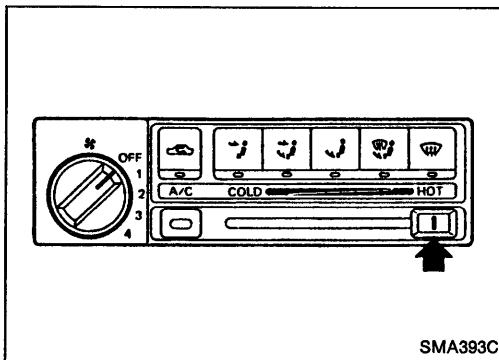


Changing Engine Coolant

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".



2. Remove radiator drain plug and radiator filler cap.
 3. Remove reservoir tank, drain coolant, then clean reservoir tank.
Install it temporarily.
- Be careful not to allow coolant to contact drive belts.

4. Remove cylinder block drain plug, air relief plug and air bleeder cap.
5. Install radiator drain plug and tighten cylinder block drain plug securely.
6. Fill radiator and reservoir tank with water.
Air relief plug is reinstalled once coolant spills from the air relief hole during refill.
Then fill radiator and reservoir tank with water.

Air relief plug:

10 N·m (1.0 kg-m, 7 ft-lb)

7. Reinstall radiator filler cap and air bleeder cap.
8. Warm up engine until radiator fan operates, then race engine 2 or 3 times under no-load.

- Make sure that air conditioner 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 thread of drain plug.

8 - 12 N·m (0.8 - 1.2 kg-m, 5.8 - 8.7 ft-lb)

12. Reinstall reservoir tank.

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: ℓ (US qt, Imp qt)

M/T	6.1 (6-1/2, 5-3/8)
A/T	6.5 (6-7/8, 5-3/4)

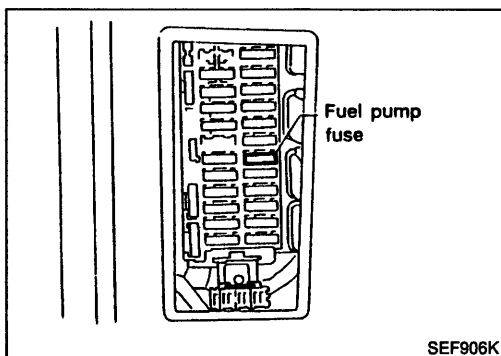
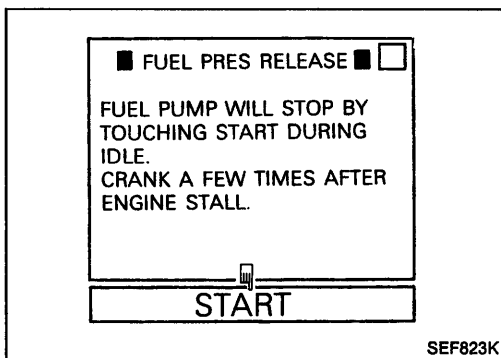
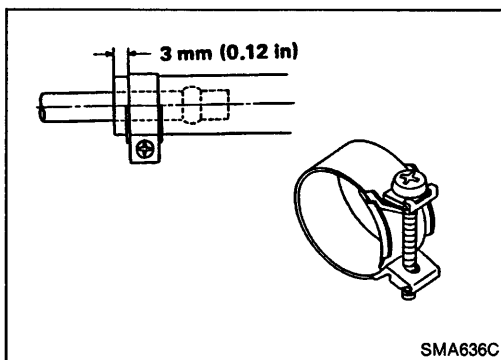
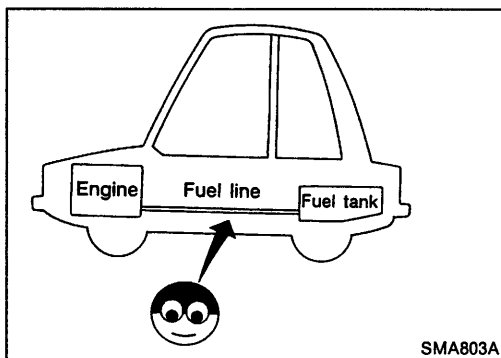
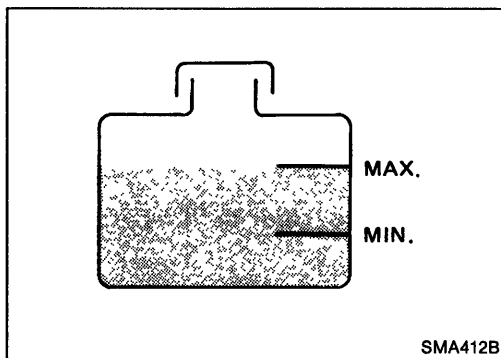
ENGINE MAINTENANCE

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.
15. Start and warm up engine, then increase engine speed to 4,000 rpm. Check that radiator coolant level does not lower, and that no water noise is heard in heater core. If water noise is heard, bleed air referring to "Refilling Engine Coolant" in section LC.



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.



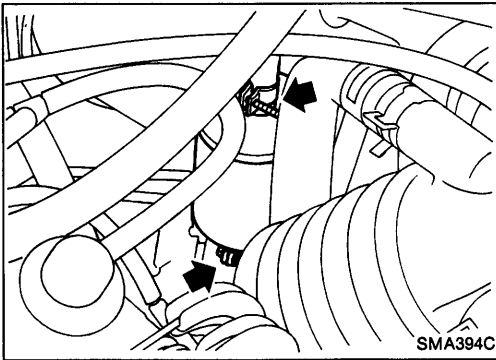
1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode and release fuel pressure to zero.
2. Turn ignition switch off.



1. Remove fuel pump fuse.
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 fuel pump fuse.

ENGINE MAINTENANCE

Changing Fuel Filter (Cont'd)

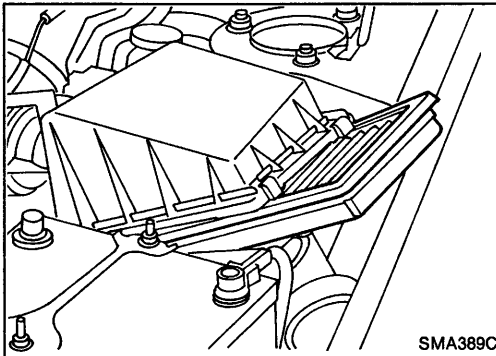


5. Loosen fuel hose clamps.
 6. Replace fuel filter.
- Be careful not to spill fuel over engine compartment. Place a shop towel to absorb fuel.
 - Use a high-pressure type fuel filter. Do not use a synthetic resinous fuel filter.
 - When tightening fuel hose clamps, refer to "Checking Fuel Lines".

Changing Air Cleaner Filter

Viscous paper type

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



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.

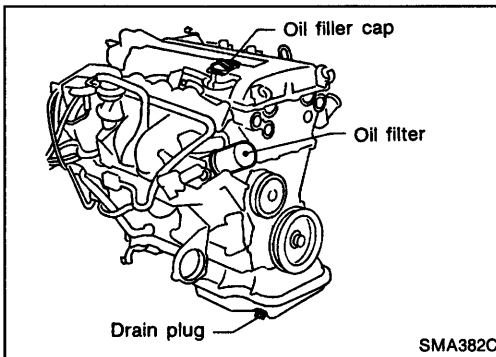
Oil grade: API SG

Viscosity: See MA-8.

Refill oil capacity (Approximate):

Unit: ℓ (US qt, Imp qt)

With oil filter change	3.4 (3-5/8, 3)
Without oil filter change	3.2 (3-3/8, 2-7/8)



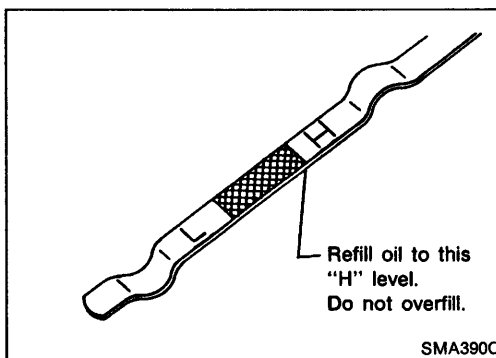
CAUTION:

- Be sure to clean drain plug and install with new washer.

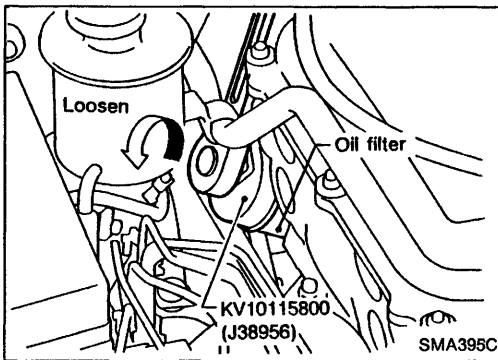
Drain plug:

: 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

The refill capacity changes depending on the oil temperature and drain time, use these values as a reference and be certain to check with the dipstick when changing the oil.



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.

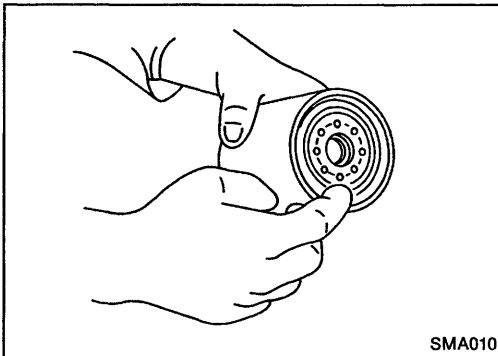


Changing Oil Filter

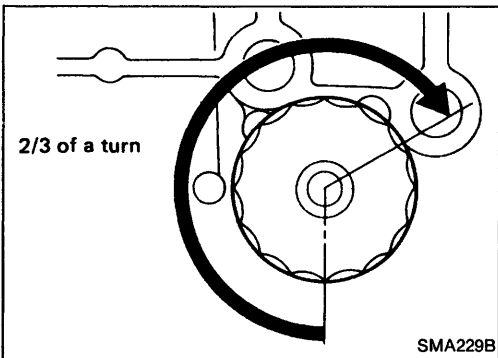
1. Remove oil filter with Tool.

WARNING:

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



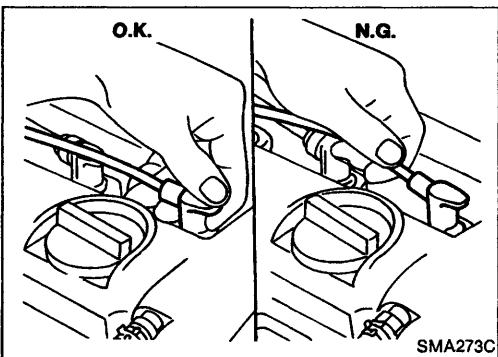
2. Before installing new oil filter, clean the oil filter mounting surface on cylinder block, and coat the rubber seal of oil filter with a little engine oil.



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.



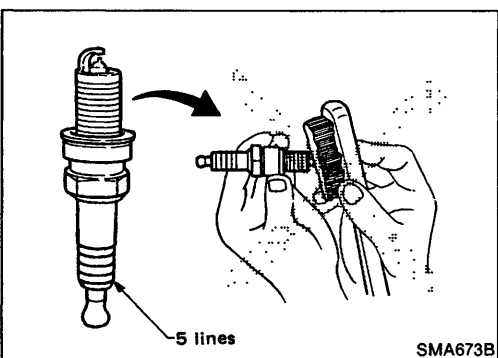
Changing Spark Plugs (Platinum-tipped type)

1. Disconnect ignition wires from spark plugs at boot. Do not pull on the wire.
2. Remove spark plugs with 16 mm (0.63 in) spark plug wrench.

Spark plug:

Standard type PFR5B-11

Alternative type PFR6B-11, PFR7B-11



- 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/cm², 85 psi)

Cleaning time:

Less than 20 seconds

ENGINE MAINTENANCE

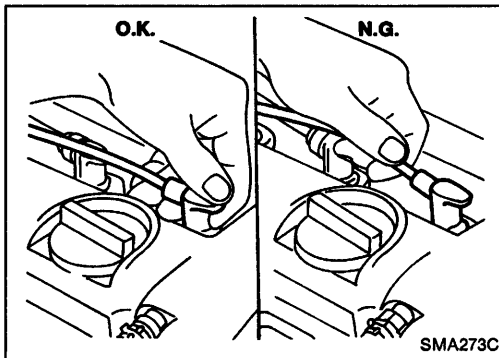
Changing Spark Plugs (Platinum-tipped type) (Cont'd)

3. Install spark plugs. Reconnect ignition wires according to nos. indicated on them.

Spark plug:

: 20 - 29 N·m

(2.0 - 3.0 kg-m, 14 - 22 ft-lb)



Changing Spark Plugs (Conventional type)

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

2. Remove spark plugs with spark plug wrench.

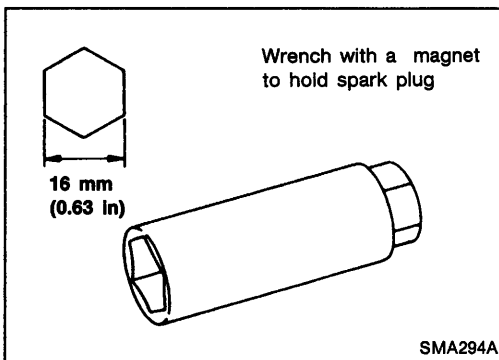
Spark plug:

Standard type

BKR6E

Alternative type

BKR5E, BKR7E



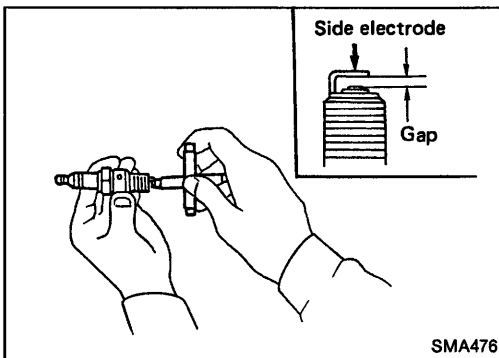
3. Check gap of each new spark plug.

Gap: 0.8 - 0.9 mm (0.031 - 0.035 in)

4. Install spark plugs. Reconnect ignition wires according to nos. indicated on them.

Spark plug:

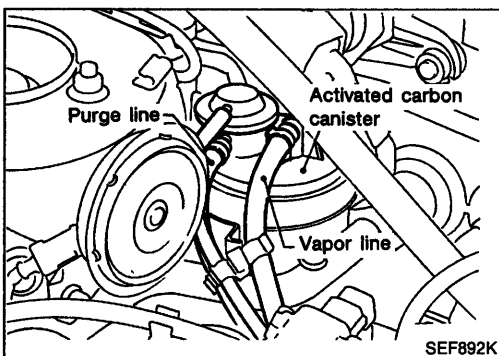
: 20 - 29 N·m (2 - 3 kg-m, 14 - 22 ft-lb)

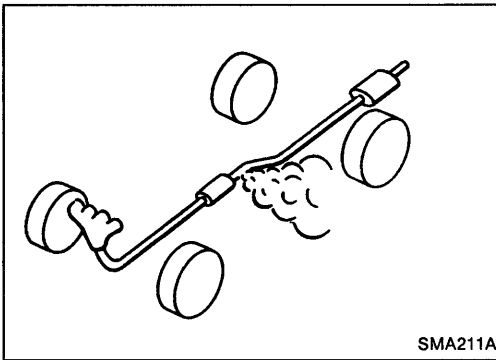


Checking Vapor Lines

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.

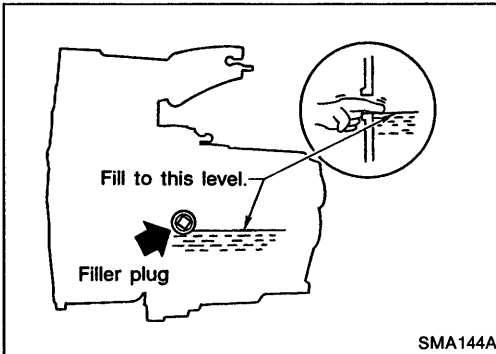
Refer to EVAPORATIVE EMISSION SYSTEM in EF & EC section.





Checking Exhaust System

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



Checking M/T Oil

Check for oil leaks and oil level.

Never start engine while checking oil level.

: Filler plug 10 - 20 N·m (1.0 - 2.0 kg-m, 7 - 14 ft-lb)

Changing M/T Oil

1. Drain oil from drain plug and refill with new gear oil.
2. Check oil level.

Oil capacity: 3.5 - 3.7 ℓ (7-3/8 - 7-7/8 US pt, 6-1/8 - 6-1/2 Imp pt)

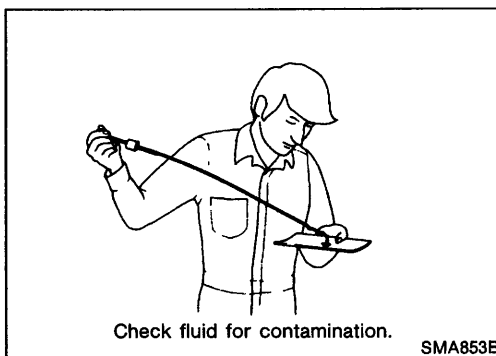
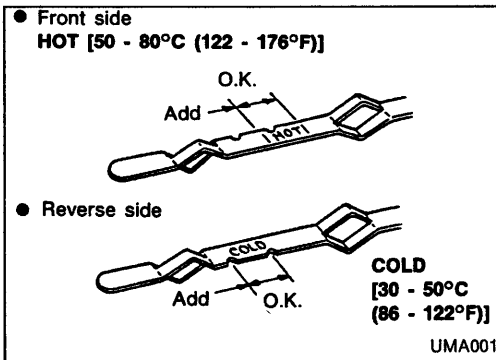
: Drain plug 25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)

Checking A/T Fluid Level

1. Check for fluid leakage and fluid level.
Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) after vehicle has been driven approximately 5 minutes in urban areas after engine is warmed up. But it can be checked at fluid temperatures of 30 to 50°C (86 to 122°F) using "COLD" range on dipstick for reference after engine is warmed up and before driving. However, fluid level must be rechecked using "HOT" range.

- 1) Park vehicle on 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.
- 4) Remove dipstick and wipe it clean with lint-free paper.
- 5) Re-insert dipstick into charging pipe as far as it will go.
- 6) Remove dipstick and note reading. If level is at low side of either range, add fluid to the charging pipe.

Do not overfill.



2. 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.

Changing A/T Fluid

Oil capacity (With torque converter):

7.0 ℓ (7-3/8 US qt, 6-1/8 Imp qt)

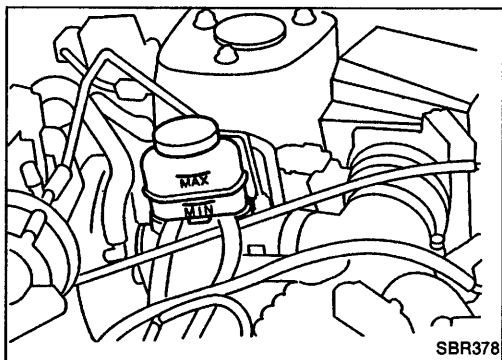
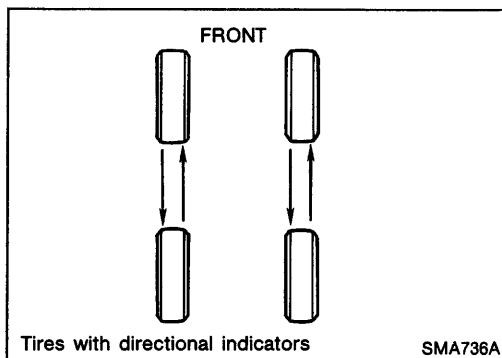
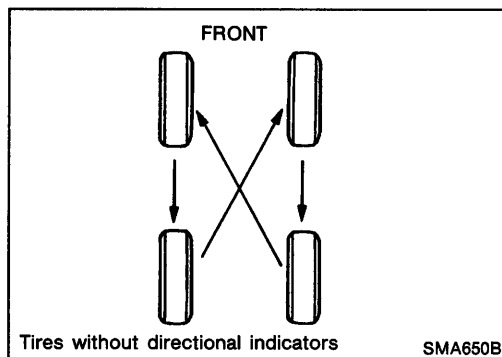
Drain plug:

: 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

Use genuine Nissan ATF or equivalent type DEXRON™II-E.

Balancing Wheels

- Adjust wheel balance using road wheel center.
Refer to S.D.S.

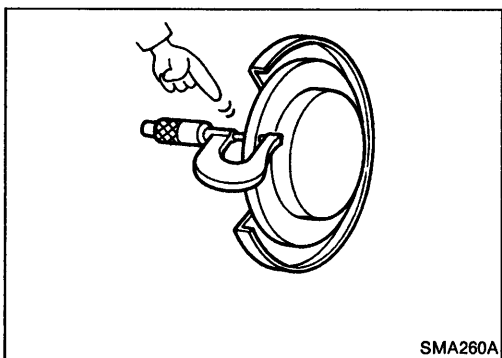


Checking Brake Fluid Level and Leaks

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

Checking Brake Lines and Cables

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



Checking Disc Brake

ROTOR

Check condition and thickness.

Unit: mm (in)

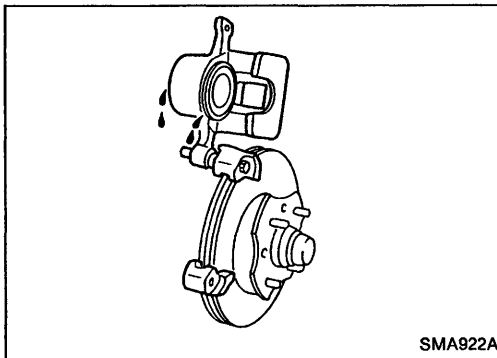
	CL25VA	CL9HA
Standard thickness	22 (0.87)	9 (0.35)
Minimum thickness	20.0 (0.787)	8.0 (0.315)

CHASSIS AND BODY MAINTENANCE

Checking Disc Brake (Cont'd)

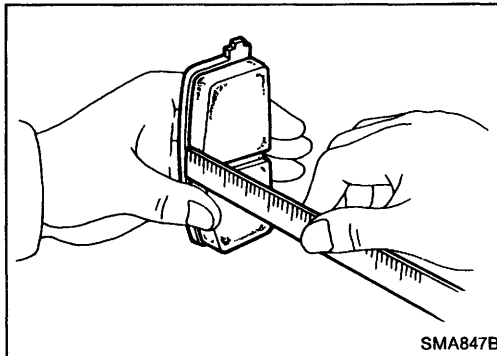
CALIPER

Check operation and for leakage.



PAD

Check for wear or damage.



Unit: mm (in)

	CL25VA	CL9HA
Standard thickness	11 (0.43)	10 (0.39)
Minimum thickness	2.0 (0.079)	2.0 (0.079)

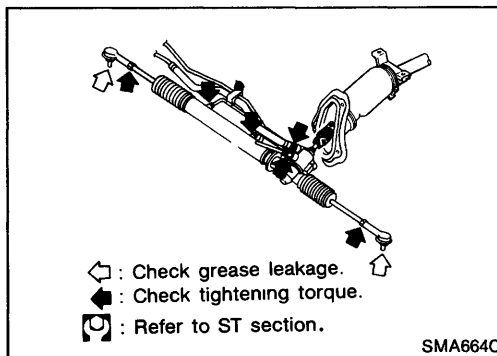
Checking Steering Gear and Linkage

STEERING GEAR

- Check gear housing and boots for looseness, damage or grease leakage.
- Check connection with steering column for looseness.

STEERING LINKAGE

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



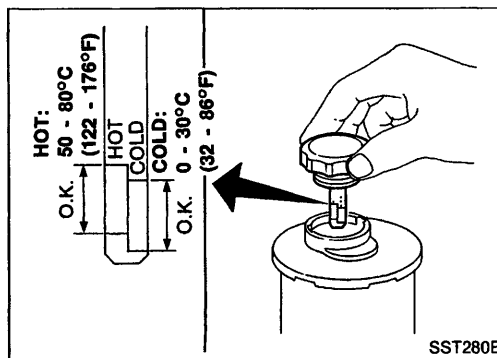
Checking Power Steering Fluid and Lines

Check fluid level.

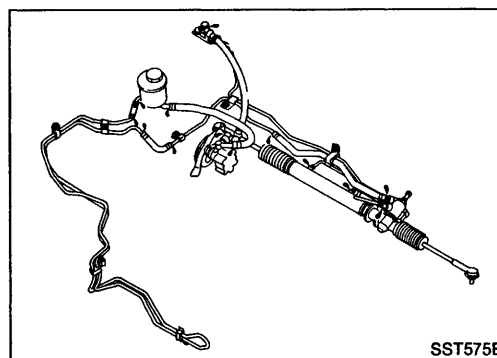
Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) or using "COLD" range on dipstick at fluid temperatures of 0 to 30°C (32 to 86°F).

CAUTION:

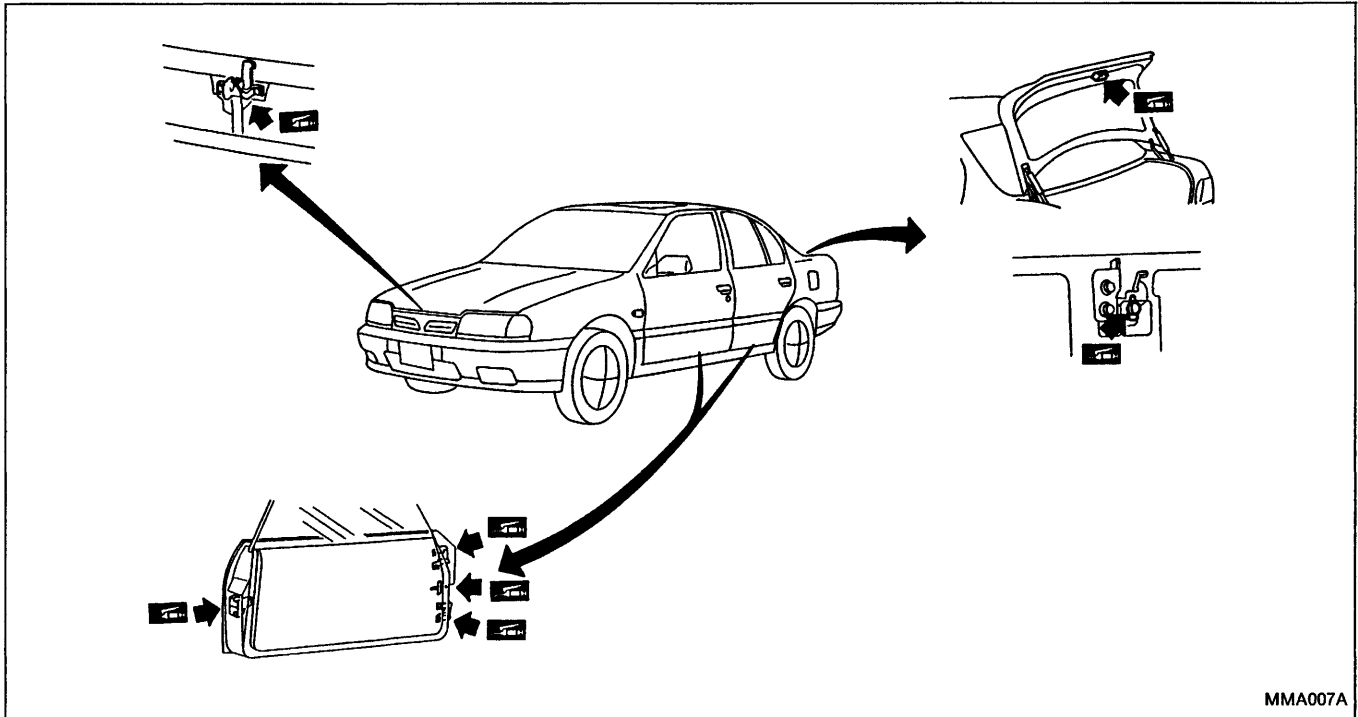
- Do not overfill.
- Recommended fluid is Automatic Transmission Fluid type DEXRON™II or equivalent.



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



Lubricating Hood Latches, Locks and Hinges



MMA007A

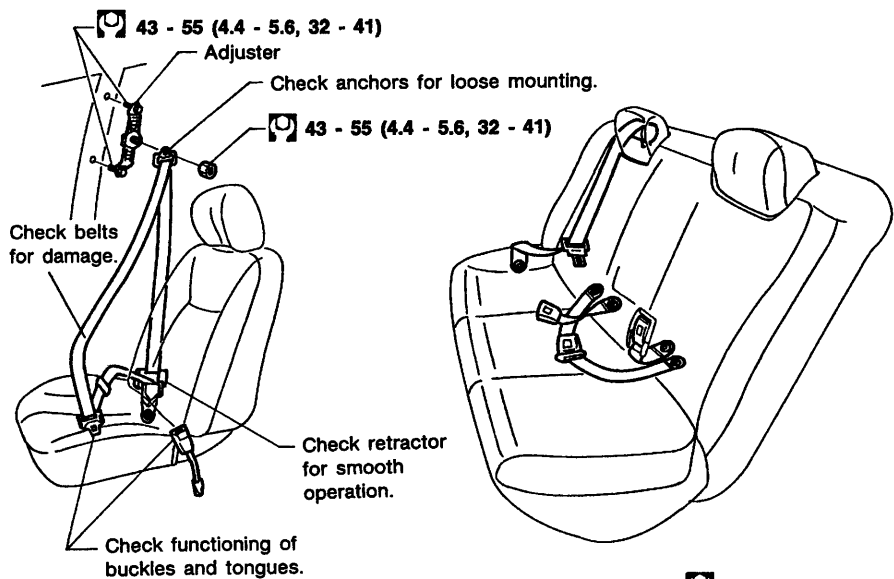
Checking Seat Belts, Buckles, Retractors, Anchors and Adjusters

CAUTION:

1. All seat belt assemblies, including retractors and attaching hardware such as guide rail set, etc., should be inspected after any collision. Nissan recommends that all seat belt assemblies in use during a collision be replaced unless the collision was minor and the belts show no damage and continue to operate properly. Seat belt assemblies not in use during a collision should also be inspected and replaced if either damage or improper operation is noted.
2. If the condition of any component of seat belt assembly is questionable, do not have it repaired, but replaced as seat belt assembly.
3. If webbing is cut, frayed, or damaged, replace belt assembly.
4. Do not spill drinks, oil, etc. on inner lap belt buckle. Never oil tongue and buckle.
5. Use a genuine seat belt assembly.

Anchor bolt
43 - 55 N·m
(4.4 - 5.6 kg-m,
32 - 41 ft-lb)

For 2-point motorized automatic seat belts, refer to BF section.



: N·m (kg-m, ft-lb)

MMA008A

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Engine Maintenance

INSPECTION AND ADJUSTMENT

Drive belt deflection

Unit: mm (in)

Drive belts	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator			
With air conditioner compressor	11.5 - 12.5 (0.453 - 0.492)	7 - 8 (0.28 - 0.31)	6.5 - 7.5 (0.256 - 0.295)
Without air conditioner compressor	12 - 13 (0.47 - 0.51)	8 - 9 (0.31 - 0.35)	7 - 8 (0.28 - 0.31)
Power steering oil pump	6 - 7 (0.24 - 0.28)	4 - 5 (0.16 - 0.20)	3.5 - 4.5 (0.138 - 0.177)
Applied pushing force	98 N (10 kg, 22 lb)		

Spark plug

	Platinum-tipped type	Conventional type
Type		
Standard	PFR5B-11	BKR6E
Alternative	PFR6B-11 PFR7B-11	BKR5E BKR7E
Plug gap mm (in)	1.0 - 1.1 (0.039 - 0.043)	0.8 - 0.9 (0.031 - 0.035)

GI

MA

EM

LC

EF &
EC

FE

CL

MT

Chassis and Body Maintenance

INSPECTION AND ADJUSTMENT

Brake

Disc brake	mm (in)	
Pad		
Standard thickness		
CL25VA		11 (0.43)
CL9HA		10 (0.39)
Minimum thickness		
CL25VA		2.0 (0.079)
CL9HA		2.0 (0.079)
Rotor		
Standard thickness		
CL25VA		22 (0.87)
CL9HA		9 (0.35)
Minimum thickness		
CL25VA		20 (0.79)
CL9HA		8.0 (0.315)

Wheel balance

Maximum allowable unbalance g (oz)	Dynamic (at rim flange)	10 (0.35) (one side)
	Static	20 (0.71)

AT

FA

RA

BR

ST

BF

HA

EL

ENGINE MECHANICAL

SECTION **EM**

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

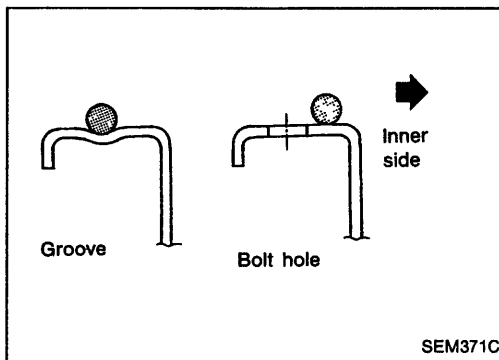
CONTENTS

PRECAUTIONS	2	ACCEL-DRUM UNIT	31
Parts Requiring Angular Tightening	2	CYLINDER HEAD	32
Liquid Gasket Application Procedure	2	Removal.....	33
PREPARATION	3	Disassembly	33
Special Service Tools	3	Inspection	35
Commercial Service Tools	5	Assembly	40
OUTER COMPONENT PARTS	6	Installation.....	43
COMPRESSION PRESSURE	9	ENGINE REMOVAL	44
Measurement of Compression Pressure	9	Removal.....	45
OIL PAN	10	Installation.....	46
Removal.....	10	CYLINDER BLOCK	47
Installation.....	13	Disassembly	48
TIMING CHAIN	15	Inspection	48
Removal.....	16	Assembly.....	55
Inspection	20	SERVICE DATA AND SPECIFICATIONS (S.D.S.)	58
Installation.....	21	General Specifications.....	58
OIL SEAL REPLACEMENT	29	Inspection and Adjustment.....	58

PRECAUTIONS

Parts Requiring Angular Tightening

- Some important engine parts are tightened using an angular-tightening method rather than a torque setting method.
- If these parts are tightened using a torque setting method, dispersal of the tightening force (axial bolt force) will be two or three times that of the dispersal produced by using the correct angular-tightening method.
- Although the torque setting values (described in this manual) are equivalent to those used when bolts and nuts are tightened with an angular-tightening method, they should be used for reference only.
- To assure the satisfactory maintenance of the engine, bolts and nuts must be tightened using an angular-tightening method.
- Before tightening the bolts and nuts, ensure that the thread and seating surfaces are clean and then coated with engine oil.
- The bolts and nuts which require the angular-tightening method are as follows:
 - (1) Cylinder head bolts
 - (2) Main bearing cap bolts
 - (3) Connecting rod cap nuts.

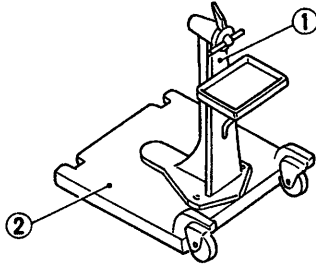
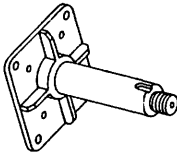
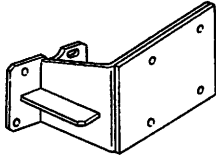
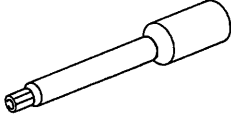
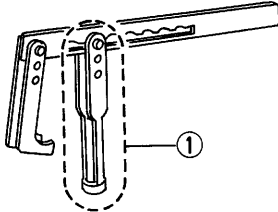
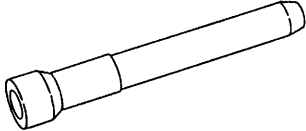
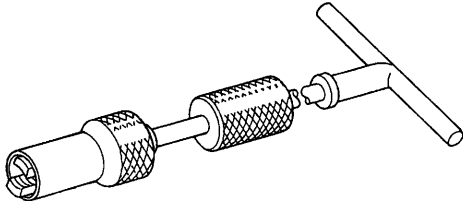


Liquid Gasket Application Procedure

- Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves, and then completely clean any oil stains from these portions.**
- Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)**
 - Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 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).
- Apply liquid gasket to inner surface around hole perimeter area.**
(Assembly should be done within 5 minutes after coating.)
- Wait at least 30 minutes before refilling engine oil and engine coolant.**

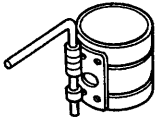
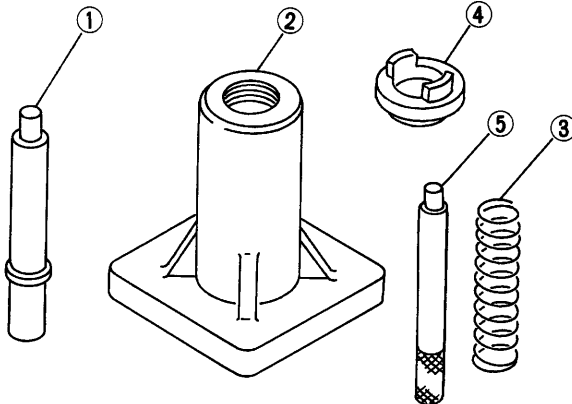
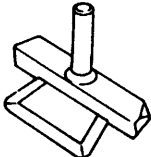
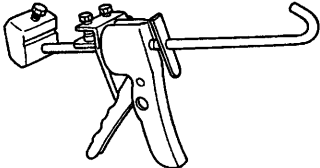
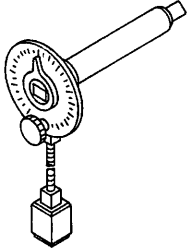
PREPARATION

Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description	
ST0501S000 (—) Engine stand assembly ① ST05011000 (—) Engine stand ② ST05012000 (—) Base		Disassembling and assembling GI MA EM LC
KV10106500 (—) Engine stand shaft		EF & EC FE
KV10115300 (—) Engine sub-attachment		CL MT
ST10120000 (J24239-01) Cylinder head bolt wrench		Loosening and tightening cylinder head bolt AT FA
KV10116200 (J26336-A) Valve spring compressor ① KV10115900 (J26336-20) Attachment		Disassembling valve mechanism RA BR
(J38958) Valve oil seal drift		Installing valve oil seal ST BF
KV10107902 (J38959) Valve oil seal puller		Displacement valve lip seal HA EL

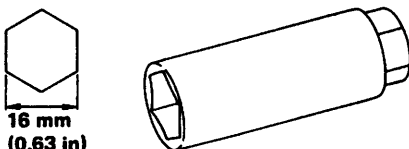
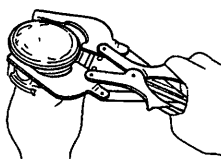
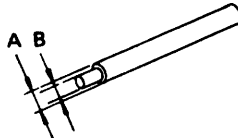
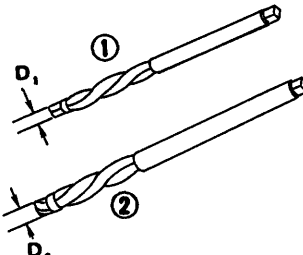
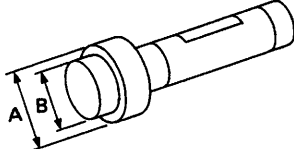
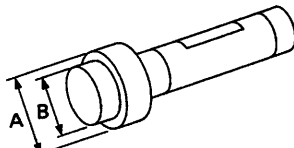
PREPARATION

Special Service Tools (Cont'd)

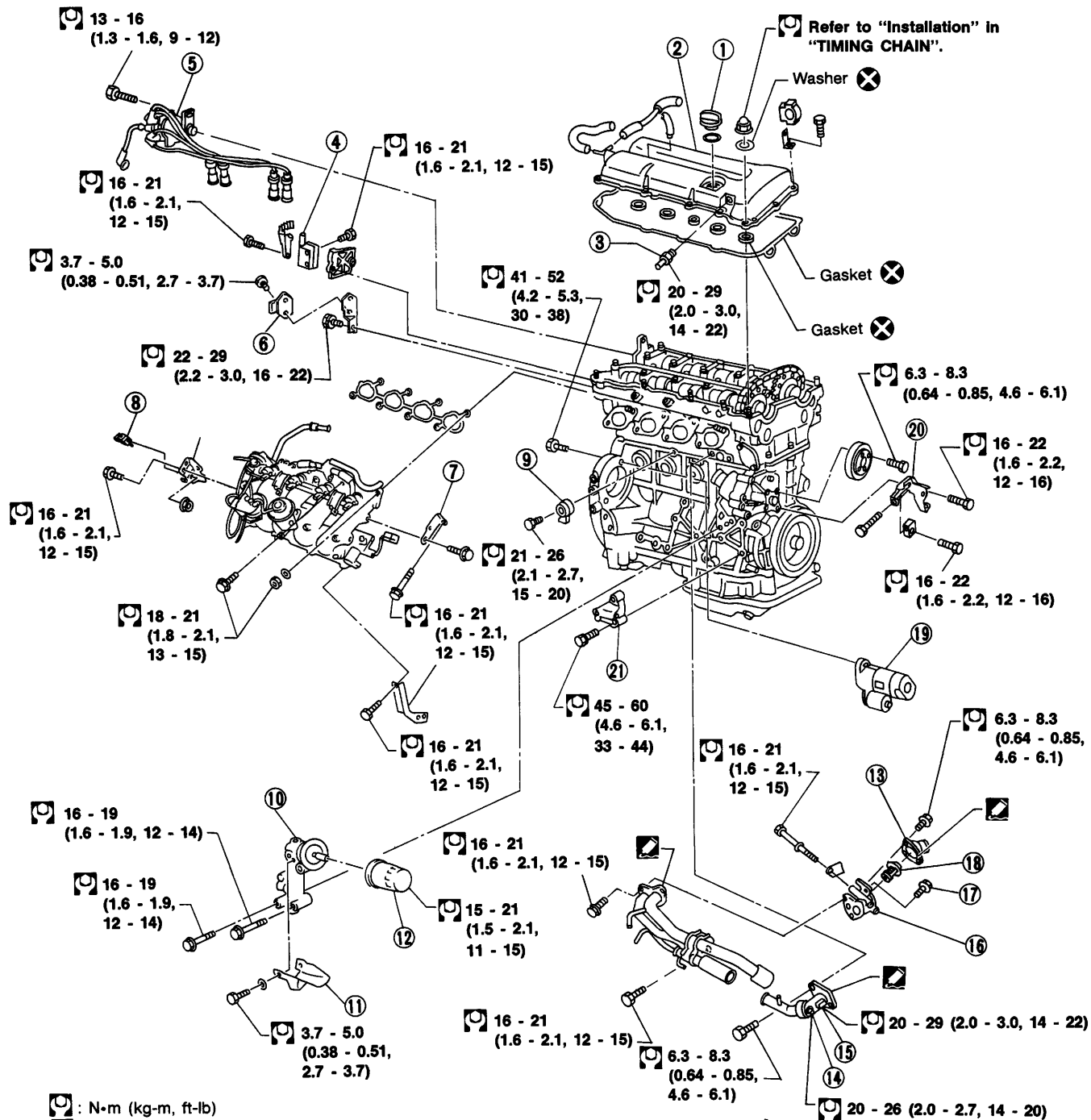
Tool number (Kent-Moore No.) Tool name	Description
KV10115700 (J38957) Dial gauge stand	Adjusting shims 
EM03470000 (J8037) Piston ring compressor	Installing piston assembly into cylinder bore 
KV10107400 (J26365-12, J26365) Piston pin press stand ① KV10107310 (—) Center shaft ② ST13040020 (—) Stand ③ ST13040030 (—) Spring ④ KV10107320 (—) Cap ⑤ ST13040050 (—) Drift	Disassembling and assembling piston pin 
KV10111100 (J37228) Seal cutter	Removing oil pan 
WS39930000 (—) Tube presser	Pressing the tube of liquid gasket 
KV10112100 (—) Angle wrench	Tightening bolts for bearing cap, cylinder head, etc. 

PREPARATION

Commercial Service Tools

Tool name	Description								
Spark plug wrench	Removing and installing spark plug		GI MA						
Valve seat cutter set	Finishing valve seat dimensions		EM						
Piston ring expander	Removing and installing piston ring		LC EF & EC						
Valve guide drift	Removing and installing valve guide	 Intake & Exhaust A = 9.5 mm (0.374 in) dia. B = 5.0 mm (0.197 in) dia.	FE CL MT						
Valve guide reamer	Reaming valve guide ① or hole for oversize valve guide ②	Unit: mm (in) dia. <table><tr><td></td><td>D₁</td><td>D₂</td></tr><tr><td>Intake & Exhaust</td><td>6.0 (0.236)</td><td>10.175 (0.4006)</td></tr></table> 		D ₁	D ₂	Intake & Exhaust	6.0 (0.236)	10.175 (0.4006)	AT FA RA BR
	D ₁	D ₂							
Intake & Exhaust	6.0 (0.236)	10.175 (0.4006)							
Front oil seal drift	Installing front oil seal	 A = 75 mm (2.95 in) dia. B = 45 mm (1.77 in) dia.	ST BF						
Rear oil seal drift	Installing rear oil seal	 A = 110 mm (4.33 in) dia. B = 80 mm (3.15 in) dia.	HA EL						

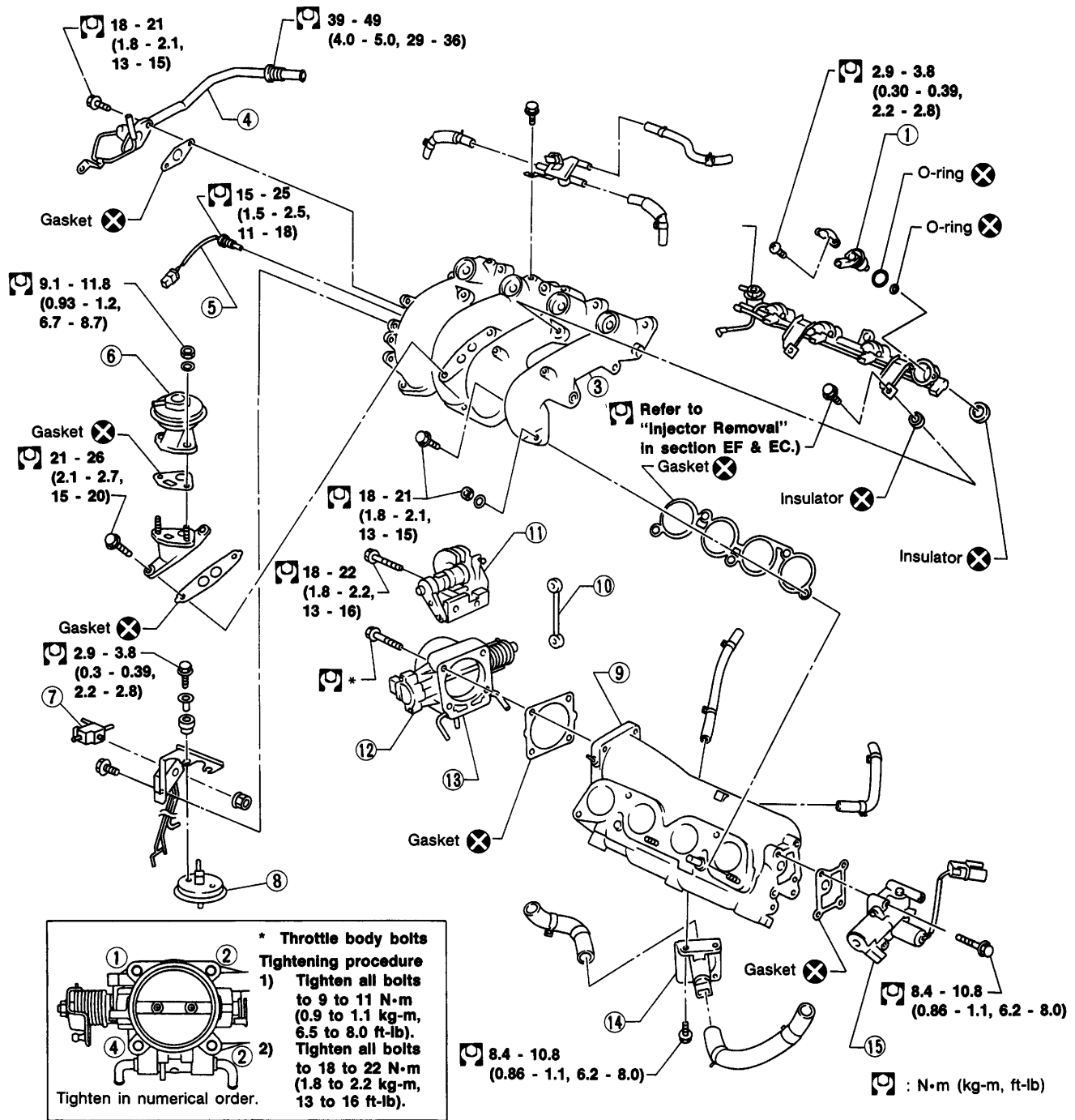
OUTER COMPONENT PARTS



SEM028E

- | | | |
|---|---|---|
| ① Oil filler cap | ⑧ EGR & canister control solenoid valve | ⑮ Engine coolant temperature sensor |
| ② Rocker cover | ⑨ Knock sensor | ⑯ Thermostat housing |
| ③ P.C.V. valve | ⑩ Oil filter bracket | ⑰ Air relief plug |
| ④ Ignition coil | ⑪ Oil catcher | ⑱ Thermostat |
| ⑤ Crankshaft position sensor built into distributor | ⑫ Oil filter | ⑲ Starter motor |
| ⑥ Power transistor | ⑬ Water inlet | ⑳ Power steering oil pump adjusting bar |
| ⑦ Intake manifold supports | ⑭ Thermal transmitter | ㉑ Power steering oil pump bracket |

OUTER COMPONENT PARTS



- ① Injector
- ② Pressure regulator
- ③ Intake manifold
- ④ EGR tube
- ⑤ EGR temperature sensor

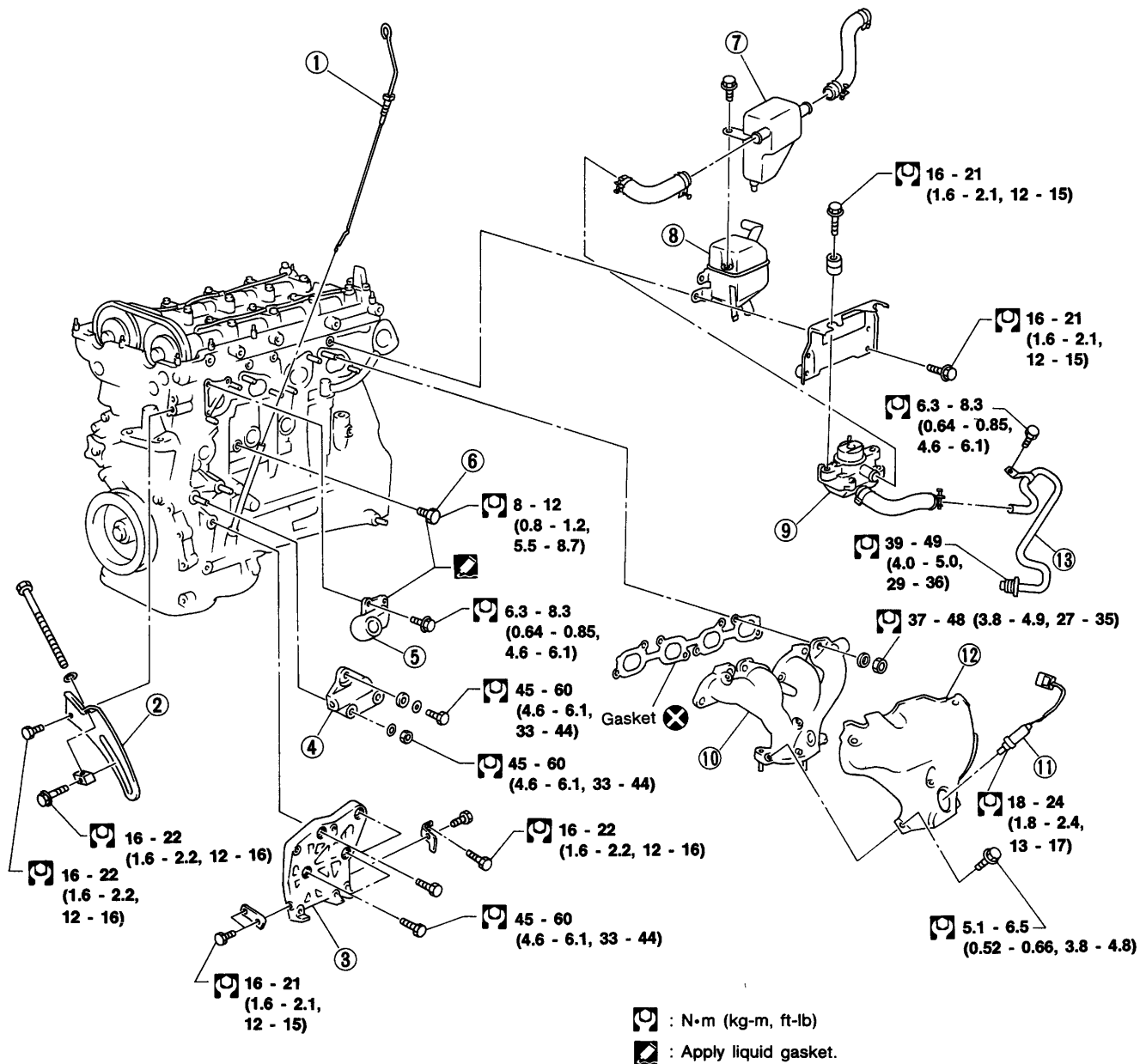
- ⑥ EGR valve
- ⑦ PAIRC-solenoid valve
- ⑧ EGRC-BPT valve
- ⑨ Intake manifold collector
- ⑩ Rod

- ⑪ Accel-drum unit
- ⑫ Throttle position sensor
- ⑬ Throttle body
- ⑭ IACV-air regulator
- ⑮ IACV-AAC valve

SEM356E

GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

OUTER COMPONENT PARTS



SEM577D

- ① Oil level gauge
- ② Alternator adjusting bar
- ③ Compressor bracket
- ④ Alternator bracket
- ⑤ Water outlet

- ⑥ Drain plug
- ⑦ Resonator
- ⑧ Oil separator
- ⑨ PAIR valve

- ⑩ Exhaust manifold
- ⑪ Heated oxygen sensor
- ⑫ Exhaust manifold cover
- ⑬ PAIR valve tube

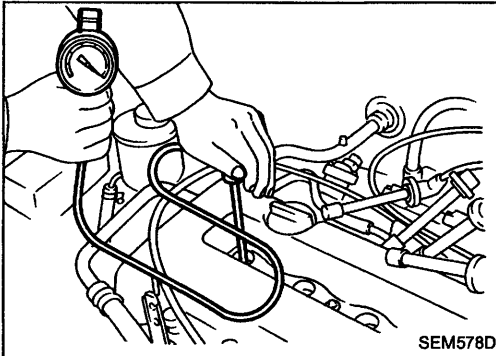
Measurement of Compression Pressure

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.

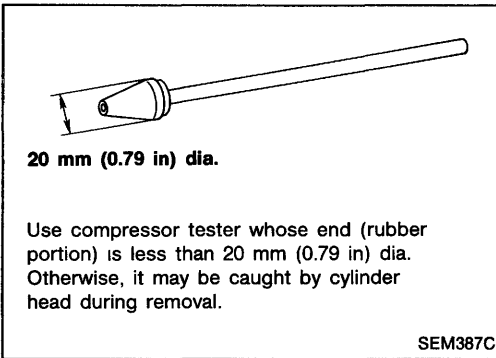
GI

MA

EM



SEM578D



20 mm (0.79 in) dia.

Use compressor tester whose end (rubber portion) is less than 20 mm (0.79 in) dia. Otherwise, it may be caught by cylinder head during removal.

SEM387C

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 speed.**
Compression pressure: kPa (kg/cm², psi)/300 rpm
Standard
1,226 (12.5, 178)
Minimum
1,030 (10.5, 149)
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.**

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

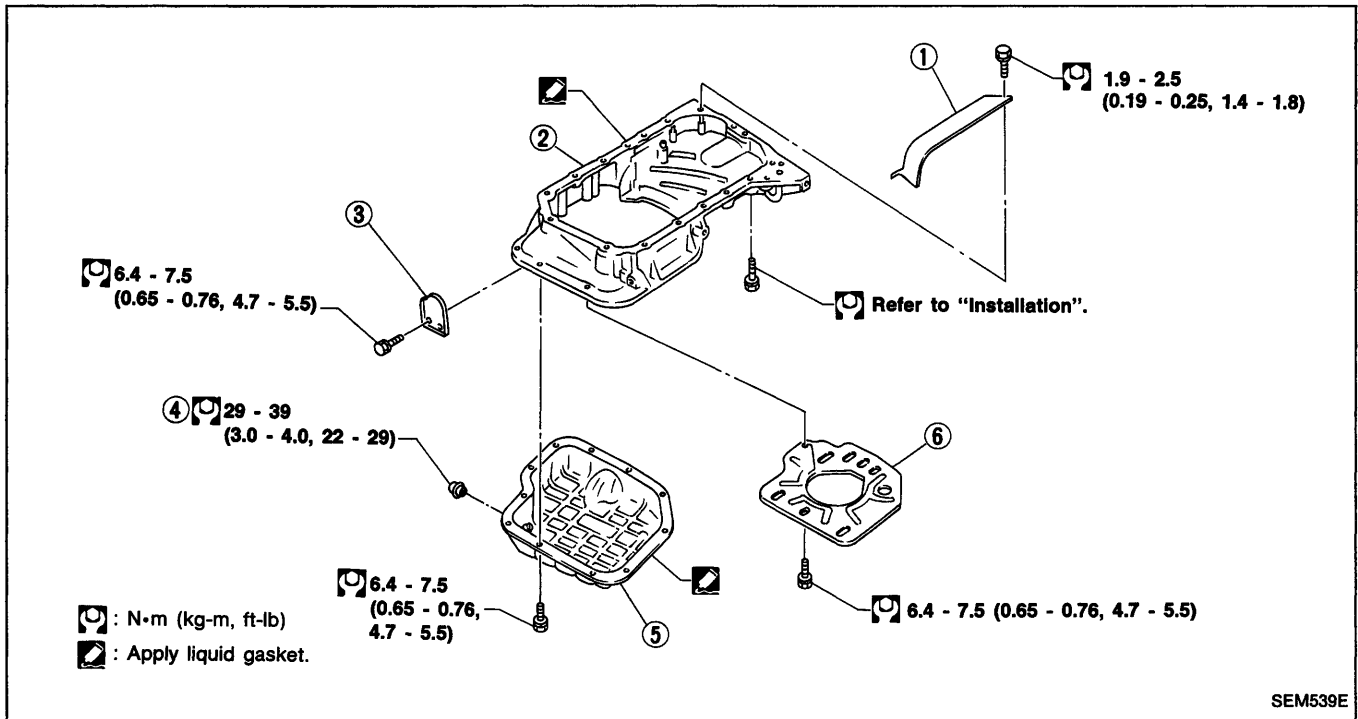
ST

BF

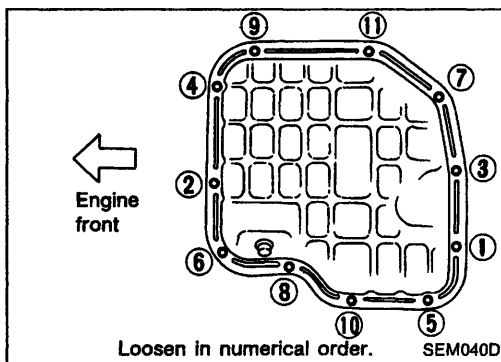
HA

EL

OIL PAN

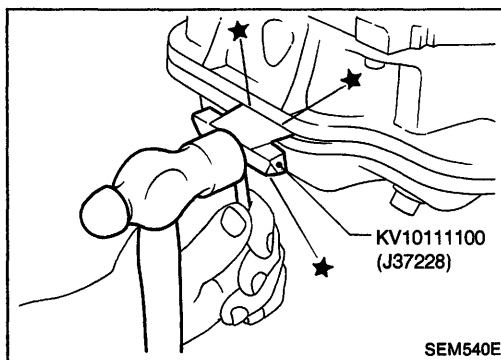


- ① Side gallery baffle plate
- ② Aluminum oil pan
- ③ Rear cover plate
- ④ Drain plug
- ⑤ Steel oil pan
- ⑥ Baffle plate



Removal

1. Remove engine under cover.
2. Drain engine oil.
3. Remove steel oil pan bolts.

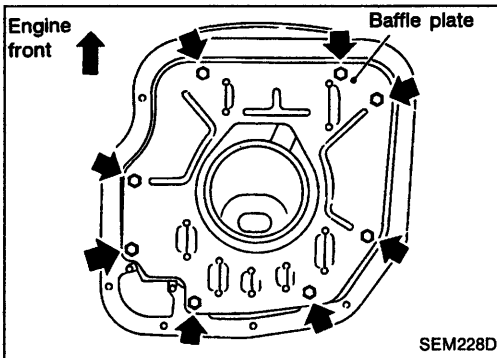
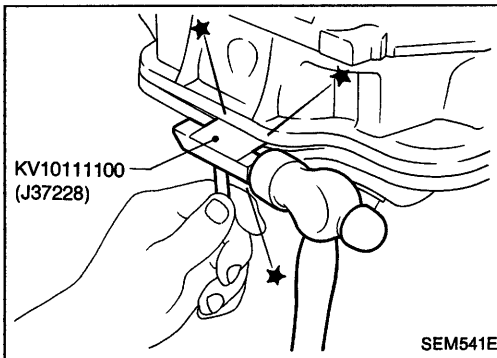


4. Remove steel oil pan.
 - (1) Insert Tool between aluminum oil pan and steel oil pan.
 - Be careful not to damage aluminum mating surface.
 - Do not insert screwdriver, or oil pan flange will be deformed.

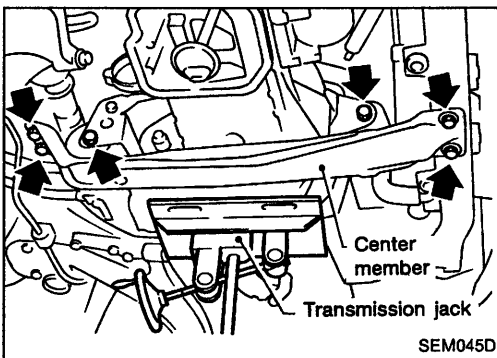
OIL PAN

Removal (Cont'd)

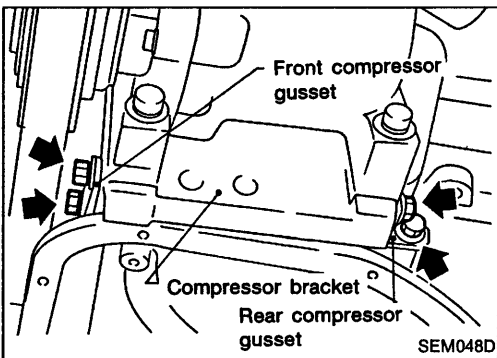
- (2) Slide Tool by tapping on the side of the Tool with a hammer.
- (3) Remove steel oil pan.



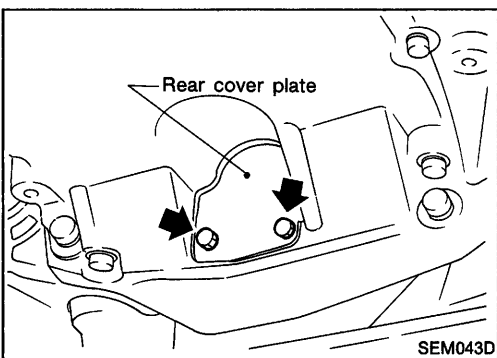
5. Remove baffle plate.



6. Remove front tube.
7. Set a suitable transmission jack under transaxle and hoist engine with engine slinger.
8. Remove center member.
9. Remove A/T shift control cable. (A/T only)



10. Remove compressor gussets.



11. Remove rear cover plate.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

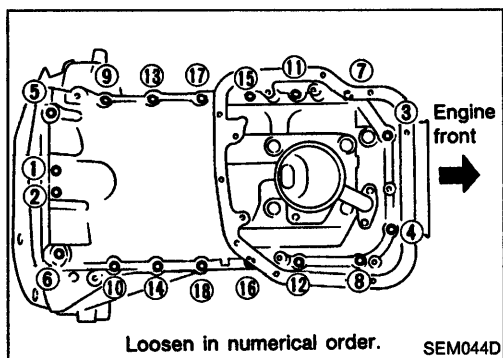
HA

EL

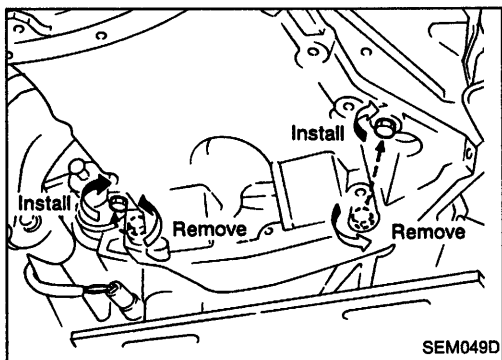
OIL PAN

Removal (Cont'd)

12. Remove aluminum oil pan bolts.



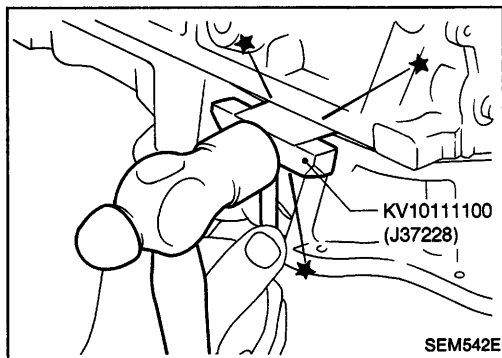
13. Remove the two engine to transaxle bolts and refit them into vacant holes as indicated. Tighten bolts to release aluminum oil pan from cylinder block.



14. Remove aluminum oil pan.

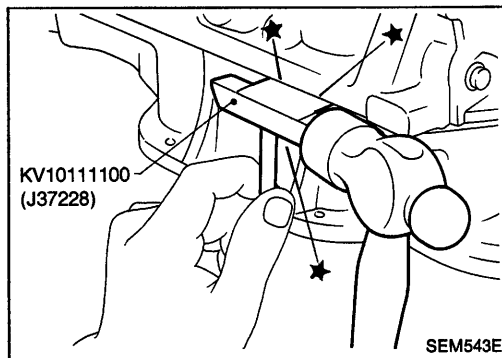
(1) Insert Tool between cylinder block and aluminum oil pan.

- Be careful not to damage aluminum mating surface.
- Do not insert screwdriver, or oil pan flange will be deformed.

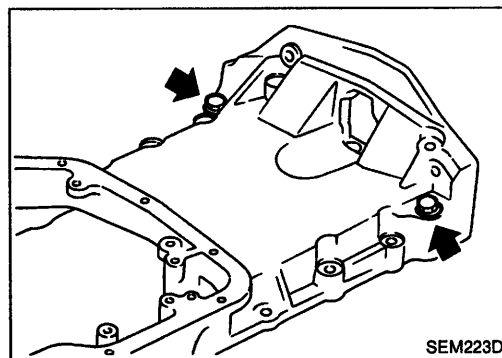


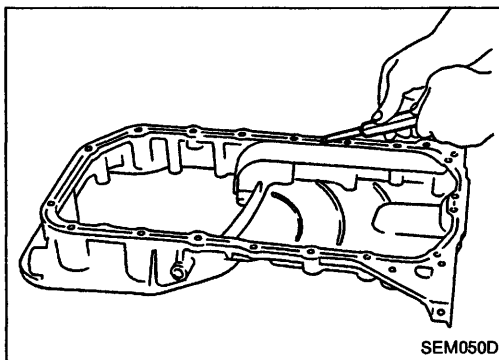
(2) Slide Tool by tapping on the side of the Tool with a hammer.

(3) Remove aluminum oil pan.



15. Remove the two engine to transaxle bolts previously installed in aluminum oil pan.





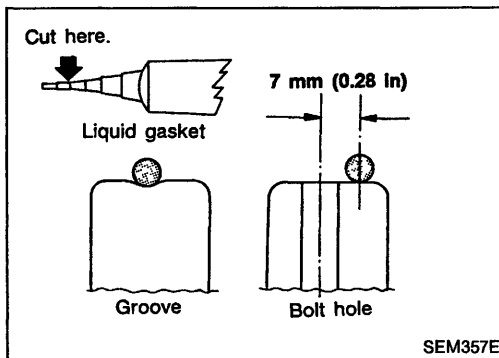
Installation

1. Install aluminum oil pan.
- (1) Before installing aluminum oil pan, remove all traces of liquid gasket from mating surfaces using a scraper.
 - Also remove traces of liquid gasket from mating surface of cylinder block and front cover.

GI

MA

EM



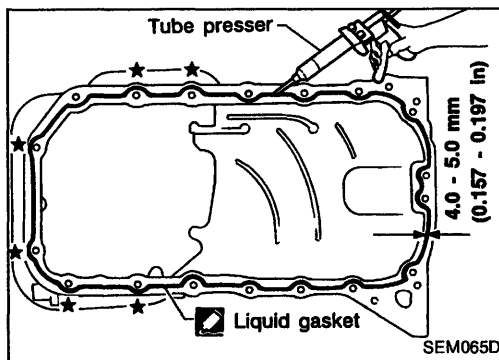
- (2) Apply a continuous bead of liquid gasket to mating surface of aluminum oil pan.

- Use Genuine Liquid Gasket or equivalent.
- Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide.
- Attaching should be done within 5 minutes after coating.

LC

EF &
EC

FE



- For areas marked with "★", apply liquid gasket to the outer side of the bolt hole.

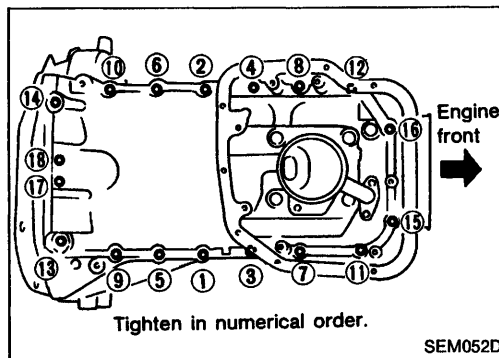
CL

MT

AT

FA

RA



- (3) Install aluminum oil pan.
- Install bolts in the reverse order of removal.

① - ⑯ bolts:

⌚: 16 - 19 N·m (1.6 - 1.9 kg-m, 12 - 14 ft-lb)

⑰, ⑱ bolts:

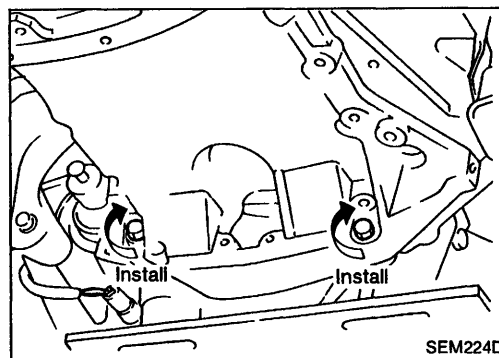
⌚: 6.4 - 7.5 N·m (0.65 - 0.76 kg-m, 4.7 - 5.5 ft-lb)

BR

ST

BF

HA

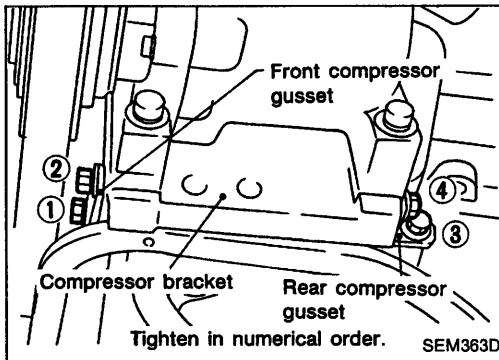


2. Install the two engine to transaxle bolts.
3. Install rear cover plate.

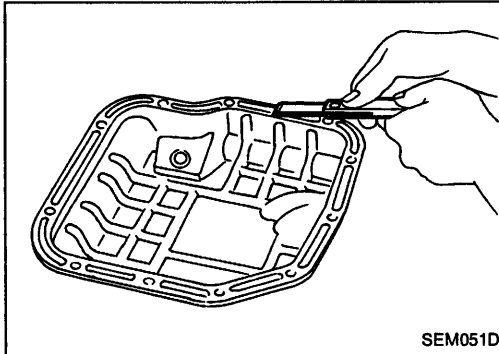
EL

OIL PAN

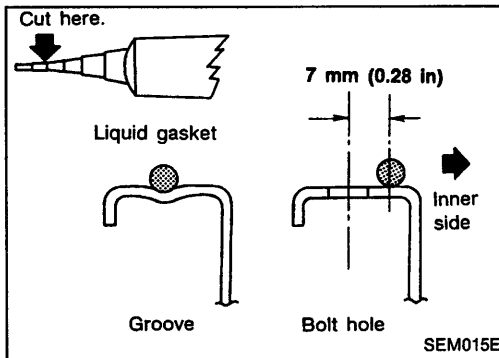
Installation (Cont'd)



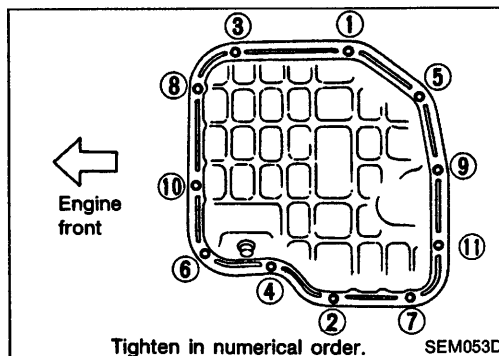
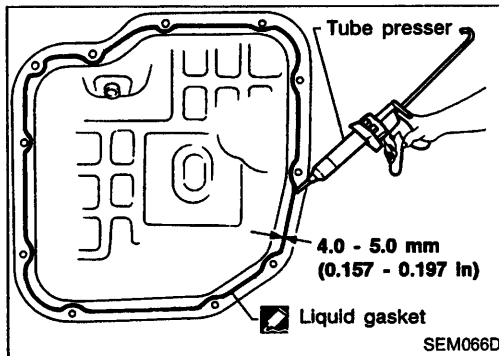
4. Install compressor gussets.
5. Install A/T shift control cable. (A/T only)
6. Install center member.
7. Install front tube.
8. Install baffle plate.



9. Install steel oil pan.
 - (1) Before installing steel oil pan, remove all traces of liquid gasket from mating surfaces using a scraper.
 - Also remove traces of liquid gasket from mating surface of aluminum oil pan.

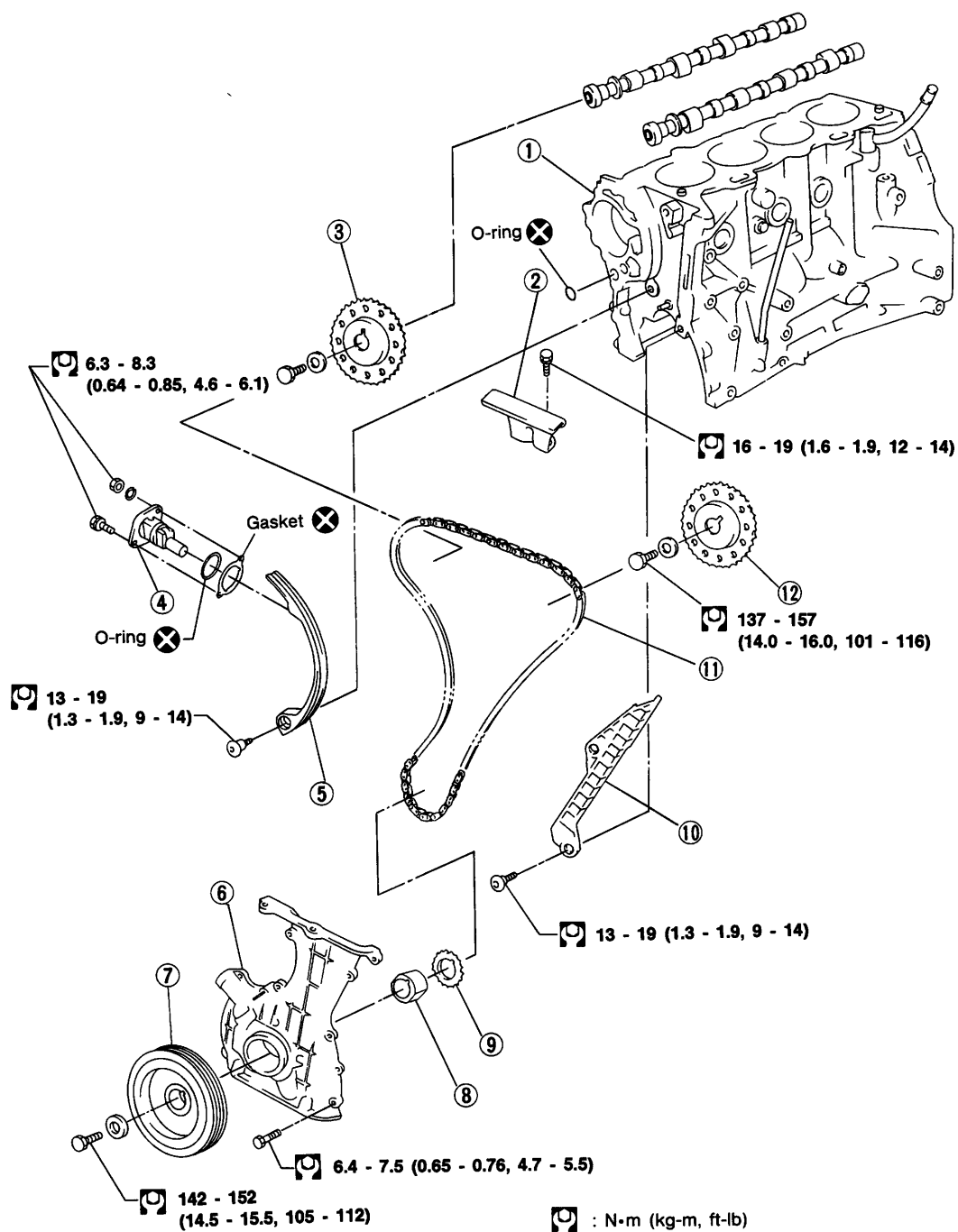


- (2) Apply a continuous bead of liquid gasket to mating surface of steel oil pan.
 - **Use Genuine Liquid Gasket or equivalent.**
 - **Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide.**
 - **Attaching should be done within 5 minutes after coating.**



- (3) Install steel oil pan.
 - Install bolts in the reverse order of removal together with heated oxygen sensor harness bracket.
 - Wait at least 30 minutes before refilling engine oil.

TIMING CHAIN



- ① Cylinder block
- ② Chain guide
- ③ R.H. camshaft sprocket
- ④ Chain tensioner

- ⑤ Chain guide
- ⑥ Front cover
- ⑦ Crank pulley
- ⑧ Oil pump spacer

- ⑨ Crankshaft sprocket
- ⑩ Chain guide
- ⑪ Timing chain
- ⑫ L.H. camshaft sprocket

SEM604D

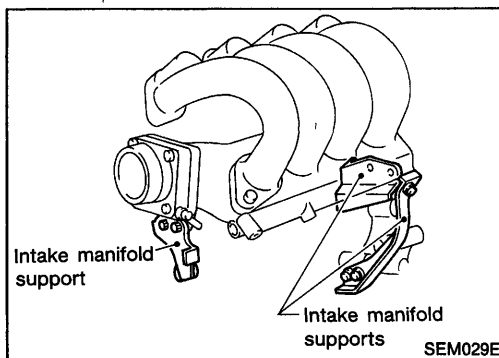
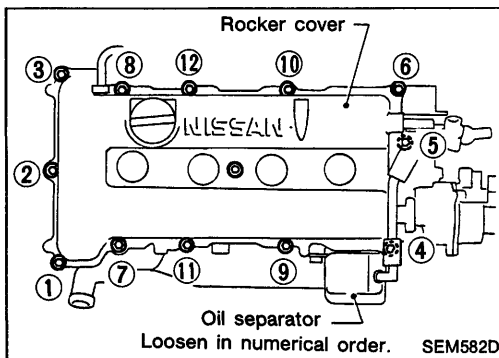
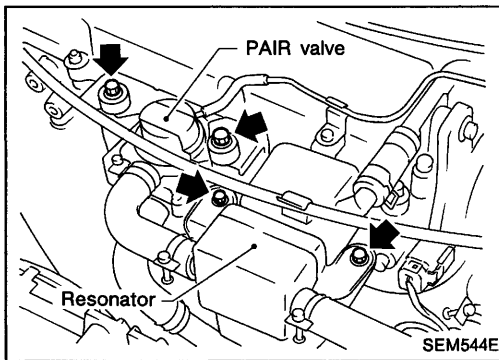
TIMING CHAIN

CAUTION:

- After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.
- When installing sliding parts such as rocker arms, camshafts, chain tensioner and oil seal, be sure to apply new engine oil on their sliding surfaces.
- When tightening cylinder head bolts, camshaft sprocket bolts, crankshaft pulley bolt and camshaft bracket bolts, apply new engine oil to thread portions and seat surfaces of bolts.

Removal

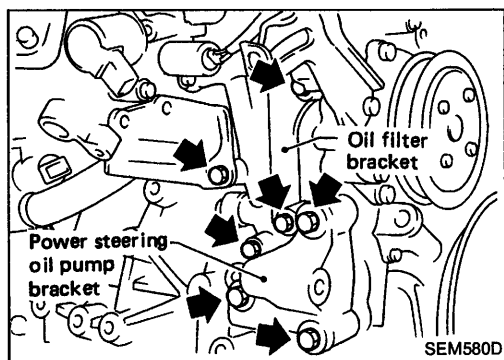
1. Release fuel pressure.
Refer to "Releasing Fuel Pressure" in section EF & EC.
2. Remove engine under covers.
3. Remove front R.H. wheel and engine side cover.
4. Drain coolant by removing cylinder block drain plug and radiator drain cock.
5. Remove radiator.
6. Remove air duct to intake manifold.
7. Remove drive belts and water pump pulley.
8. Remove alternator.
9. Remove power steering oil pump.
10. Remove vacuum hoses, fuel hoses, wires, harness, connectors and so on.
11. Remove all spark plugs.
12. Remove PAIR valve and resonator.



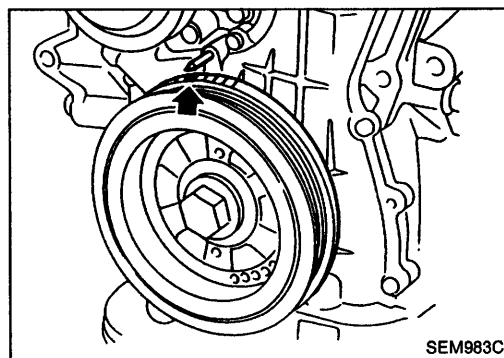
13. Remove rocker cover and oil separator.
14. Remove intake manifold supports.

TIMING CHAIN

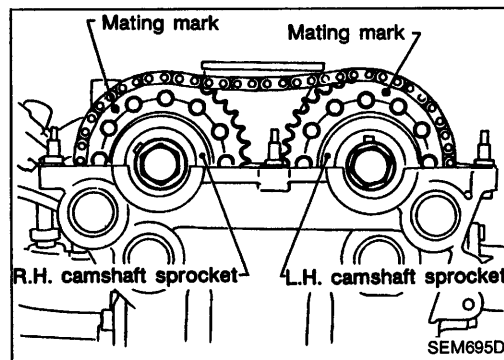
Removal (Cont'd)



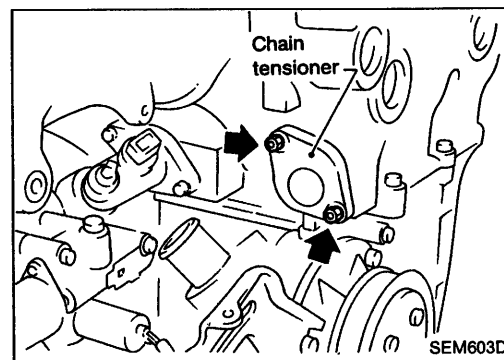
15. Remove oil filter bracket and power steering oil pump bracket.



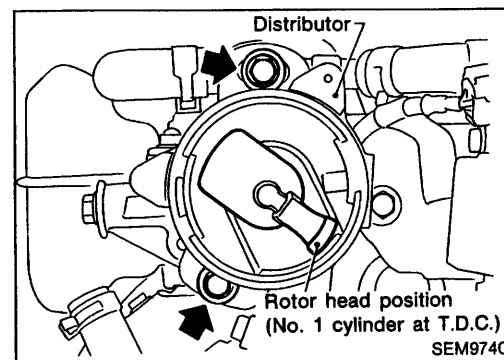
16. Set No. 1 piston at T.D.C. on the compression stroke by rotating crankshaft.



- Rotate crankshaft until mating mark on camshaft sprocket is set at position indicated in figure at left.



17. Remove chain tensioner.



18. Remove distributor.
Do not turn rotor with distributor removed.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

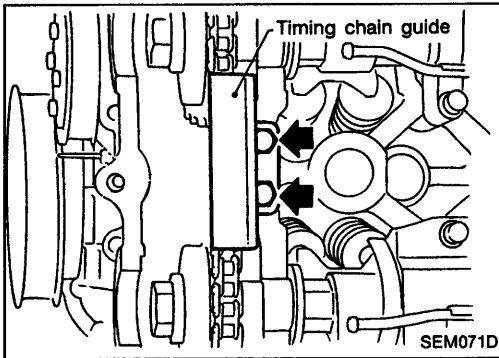
HA

EL

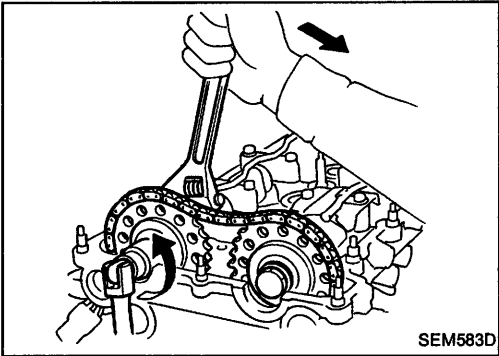
TIMING CHAIN

Removal (Cont'd)

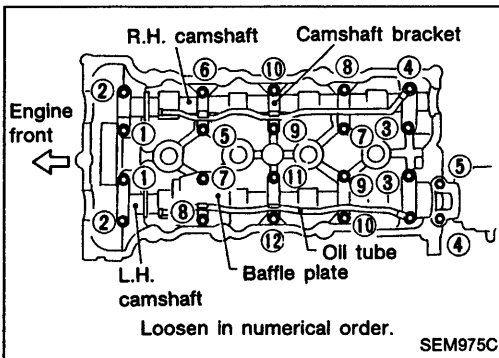
19. Remove timing chain guide.



20. Remove camshaft sprockets.

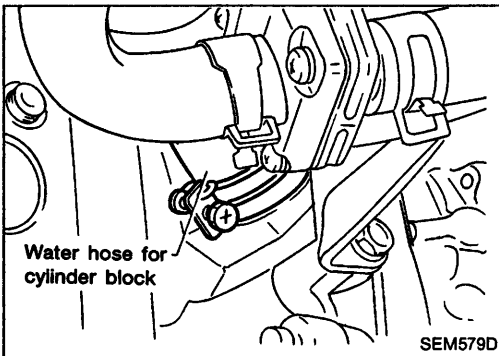


21. Remove camshafts, camshaft brackets, oil tubes and baffle plate.

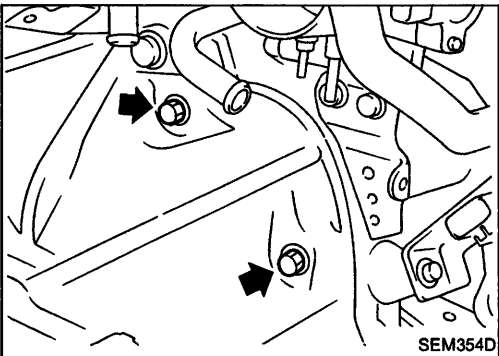


22. Remove the following water hoses.

- Water hose for cylinder block.
- Water hoses from heater.



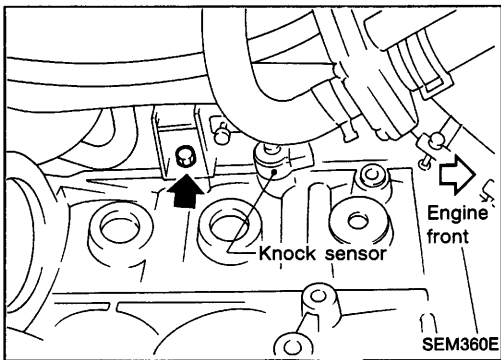
23. Remove starter motor.



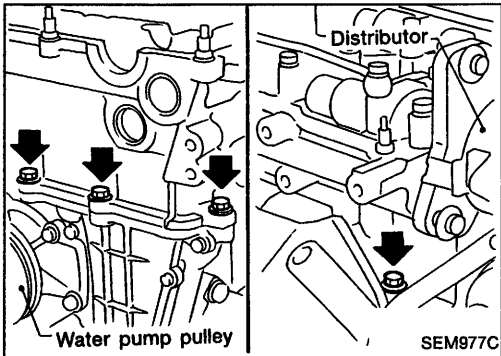
TIMING CHAIN

Removal (Cont'd)

24. Remove water pipe bolt.



25. Remove cylinder head outside bolts.

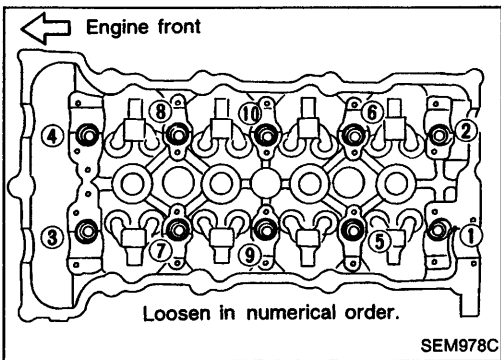


26. Remove cylinder head bolts.

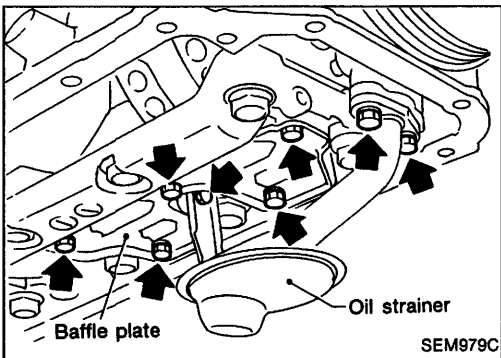
● **Bolts should be loosened in two or three steps.**

27. Remove cylinder head completely with intake and exhaust manifolds.

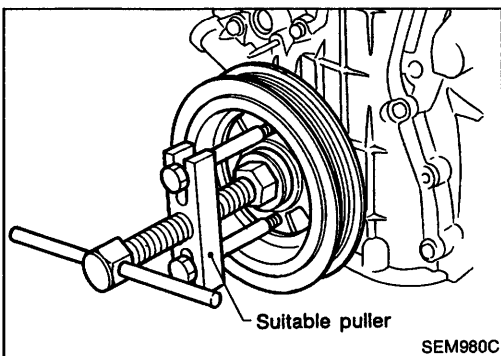
28. Remove oil pans.
Refer to "Removal" in "OIL PAN".



29. Remove oil strainer and baffle plate.



30. Remove crankshaft pulley.



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

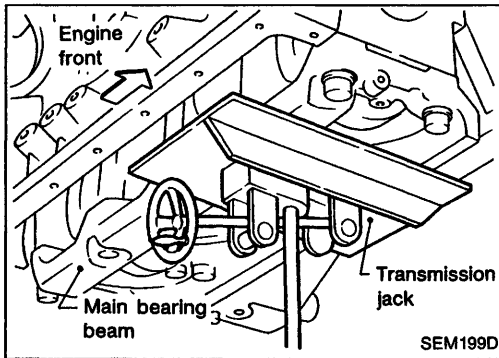
BF

HA

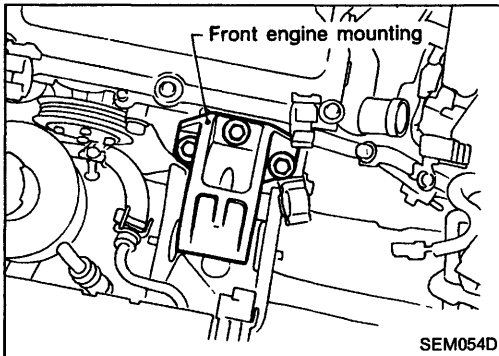
EL

TIMING CHAIN

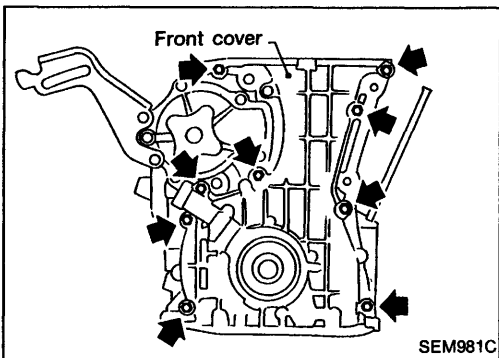
Removal (Cont'd)



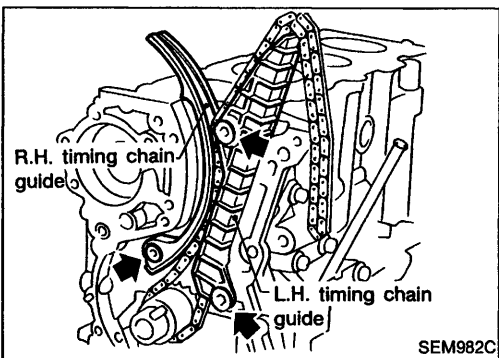
31. Set a suitable transmission jack under main bearing beam.



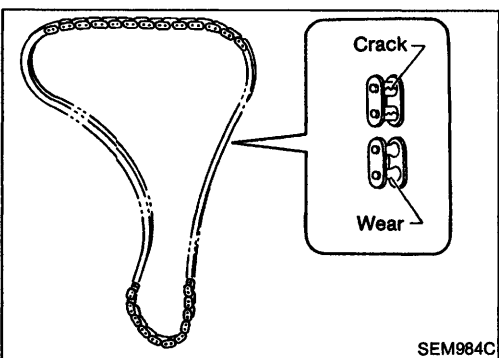
32. Remove front engine mounting.



33. Remove front cover.



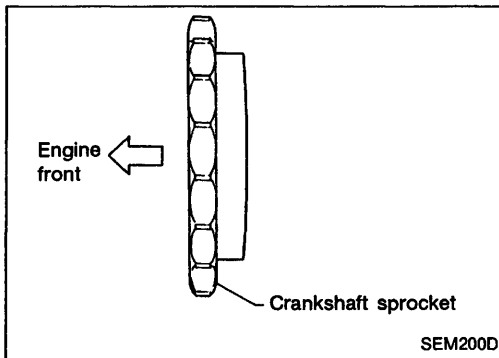
34. Remove timing chain guides and timing chain.



Inspection

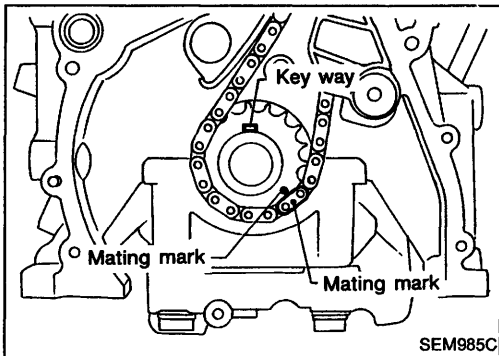
Check for cracks and excessive wear at roller links. Replace chain if necessary.

TIMING CHAIN

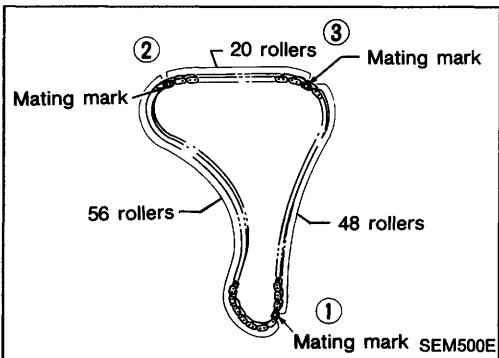


Installation

1. Install crankshaft sprocket on crankshaft.

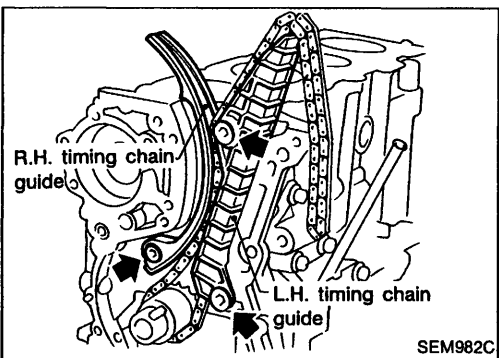


2. Position crankshaft so that No. 1 piston is set at T.D.C. (Keyway at 12 o'clock-mating mark at 4 o'clock approx.) fit timing chain to crankshaft sprocket so that mating mark is in line with mating mark on crankshaft sprocket.

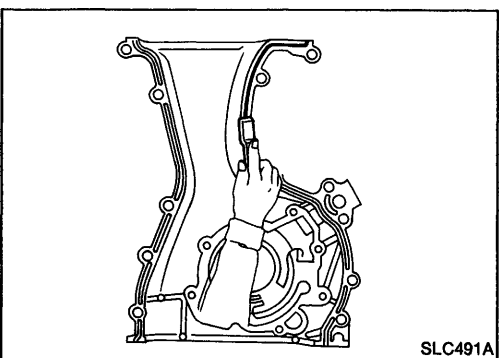


- Mating mark color on timing chain.

- ① : Gold
- ②, ③ : Silver



3. Install timing chain and timing chain guides.



4. Before installing front cover, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

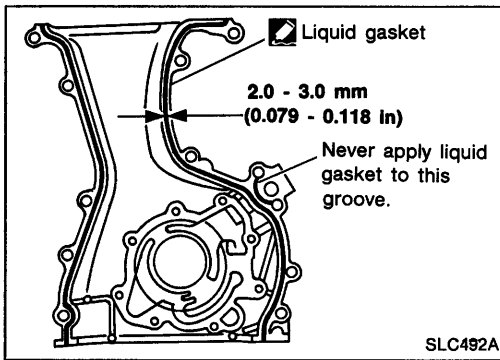
BF

HA

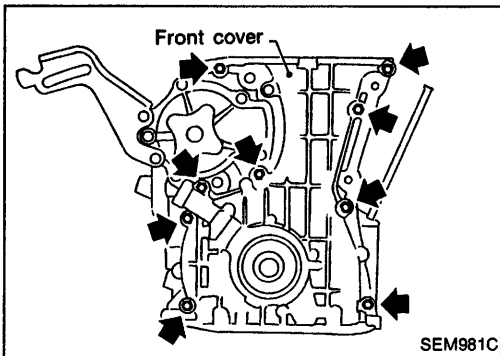
EL

TIMING CHAIN

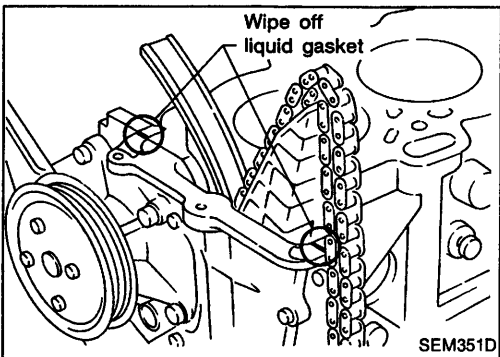
Installation (Cont'd)



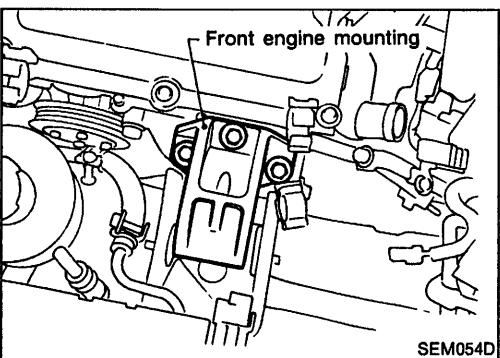
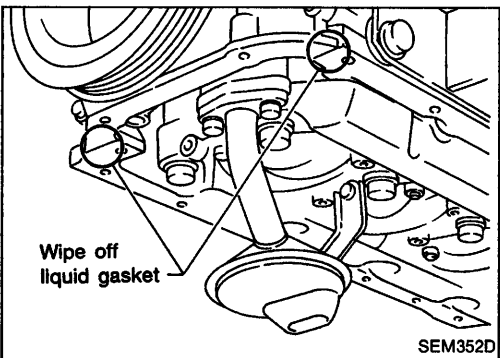
5. Apply a continuous bead of liquid gasket to mating surface of front cover.
- Use Genuine Liquid Gasket or equivalent.



6. Install oil pump drive spacer and front cover.



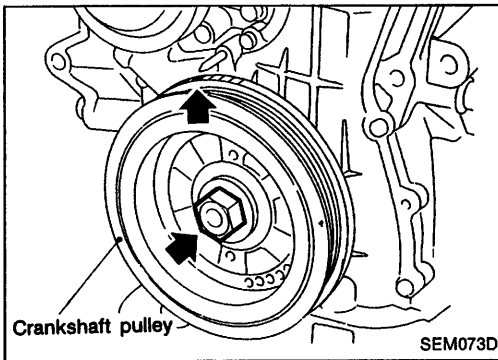
- Wipe off excessive liquid gasket.



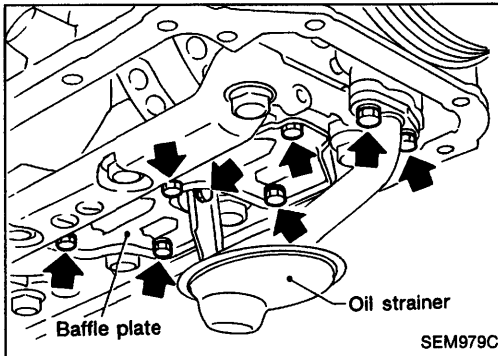
7. Install front engine mounting.

TIMING CHAIN

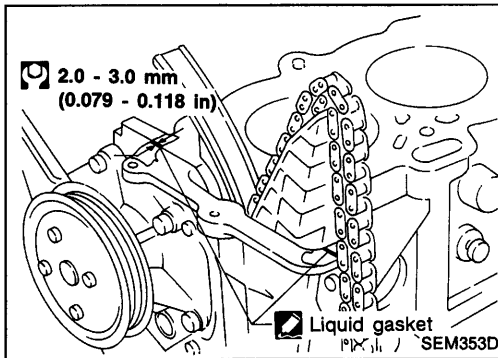
Installation (Cont'd)



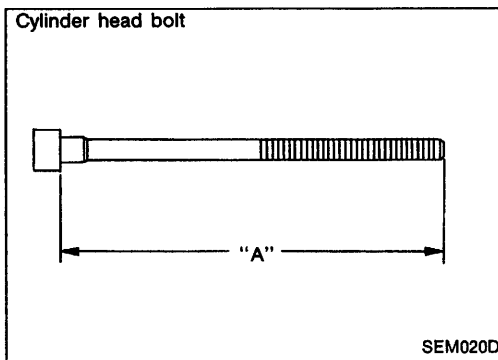
8. Install crankshaft pulley.
9. Set No. 1 piston at T.D.C. on its compression stroke.



10. Install oil strainer and baffle plate.
11. Install oil pan.
Refer to "Installation" in "OIL PAN".



12. Before installing cylinder head gasket, apply a continuous bead of liquid gasket to mating surface of cylinder block.



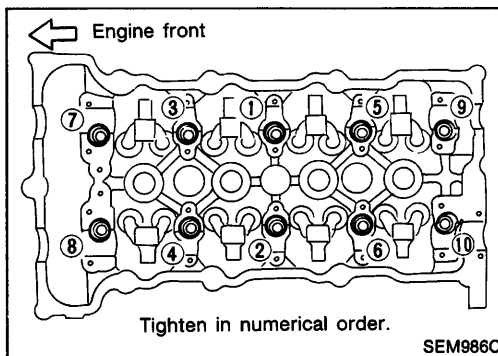
13. Install cylinder head completely with intake and exhaust manifolds.

CAUTION:

The cylinder head bolts can be reused providing dimension "A" is not exceeded.

Dimension "A":

158.2 mm (6.228 in)



● Tightening procedure:

- a Tighten all bolts to 39 N·m (4.0 kg-m, 29 ft-lb).
- b Tighten all bolts to 78 N·m (8.0 kg-m, 58 ft-lb).
- c Loosen all bolts completely.
- d Tighten all bolts to 34 to 44 N·m (3.5 to 4.5 kg-m, 25 to 33 ft-lb).

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

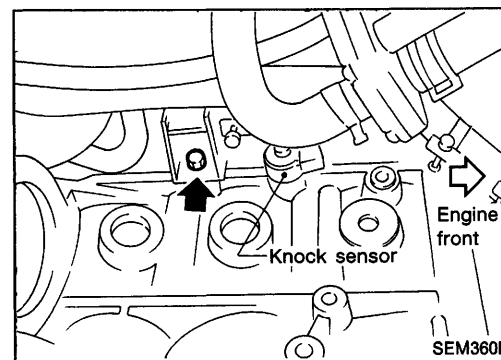
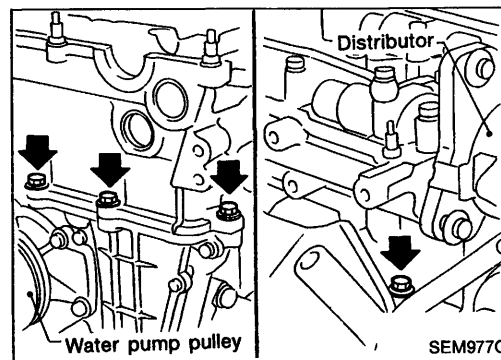
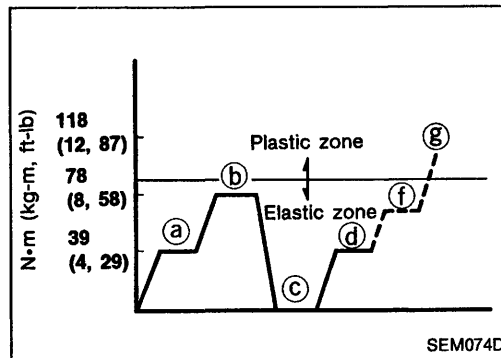
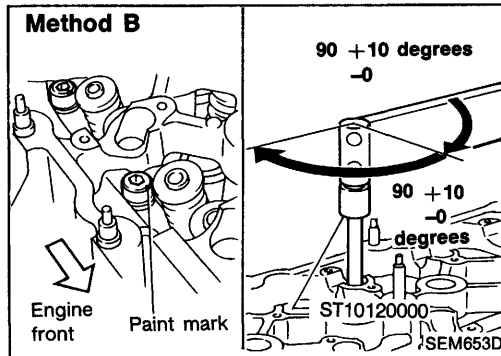
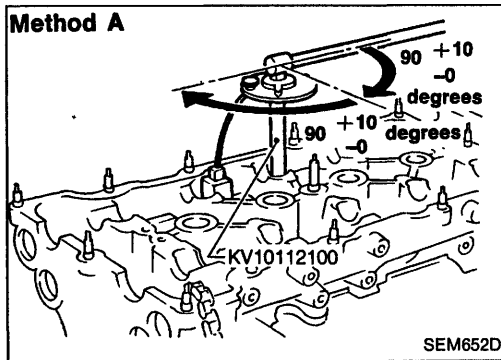
BF

HA

EL

TIMING CHAIN

Installation (Cont'd)



Ⓔ Method A: Turn all bolts 90 to 100 degrees clockwise with Tool or suitable angle wrench.

Method B: If angle wrench is not available, mark the side of each cylinder head bolt with a paint mark facing the front of the engine, then turn all bolts 90 to 100 degrees clockwise.

Ⓘ Turn all bolts 90 to 100 degrees clockwise.

ⓖ Ensure that paint mark on each bolt faces the rear of the engine. (Method B only)

Do not turn any bolt 180 to 200 degrees clockwise all at once.

	Tightening torque N·m (kg-m, ft-lb)
Ⓐ	39 (4.0, 29)
Ⓑ	78 (8.0, 58)
Ⓒ	0 (0, 0)
Ⓓ	39 ± 5 (4.0 ± 0.5, 28.9 ± 3.6)
Ⓔ	90 ⁺¹⁰ / ₋₀ degrees
Ⓘ	90 ⁺¹⁰ / ₋₀ degrees

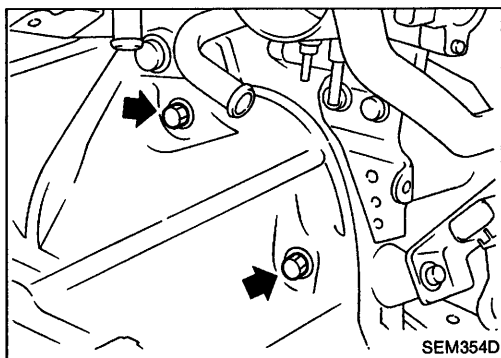
14. Install cylinder head outside bolts.

15. Install water pipe bolt.

TIMING CHAIN

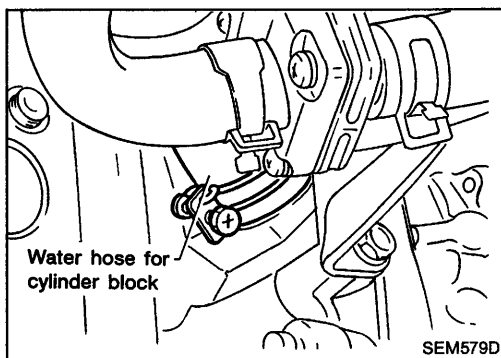
Installation (Cont'd)

16. Install starter motor.



17. Install the following water hoses.

- Water hose for cylinder block.
- Water hoses for heater.

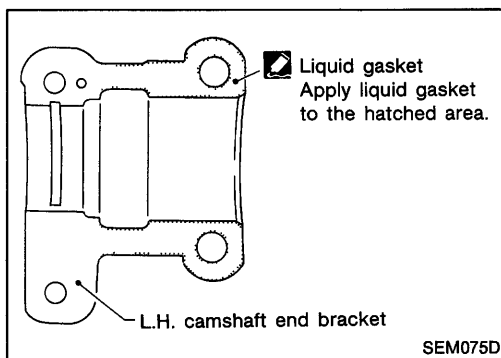


18. Before installing L.H. camshaft end bracket, remove all traces of liquid gasket from mating surface.

- Also remove traces of liquid gasket from mating surface of cylinder head.

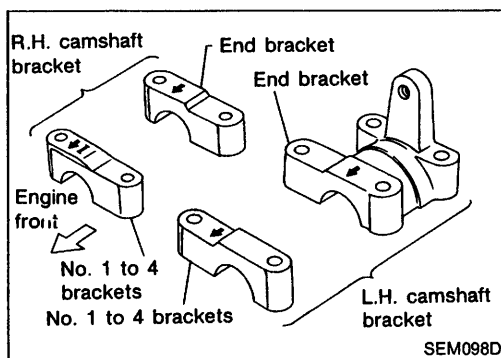
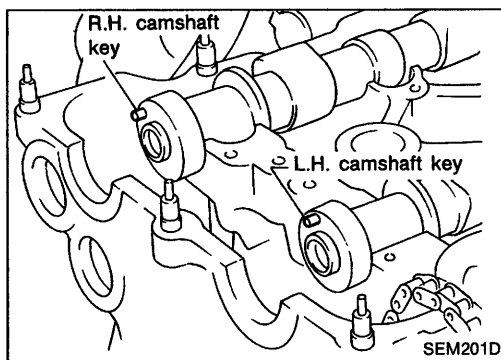
19. Apply a continuous bead of liquid gasket to mating surface of L.H. camshaft end bracket.

- Use Genuine Liquid Gasket or equivalent.



20. Install camshafts, camshaft brackets, oil tubes and baffle plate.

- Position camshaft.
 - L.H. camshaft key at about 12 o'clock
 - R.H. camshaft key at about 10 o'clock



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

TIMING CHAIN

Installation (Cont'd)

- Tightening procedure

STEP 1:

R.H. camshaft

Tighten bolts ⑨ - ⑩ in that order then
tighten bolts ① - ⑧ in that order.

⌚: 2 N·m (0.2 kg-m, 1.4 ft-lb)

L.H. camshaft

Tighten bolts ⑪ - ⑫ in that order then
tighten bolts ① - ⑩ in that order.

⌚: 2 N·m (0.2 kg-m, 1.4 ft-lb)

STEP 2:

Tighten bolts in the specified order.

⌚: 6 N·m (0.6 kg-m, 4.3 ft-lb)

STEP 3:

Tighten bolts in the specified order.

⌚: 9.0 - 11.8 N·m

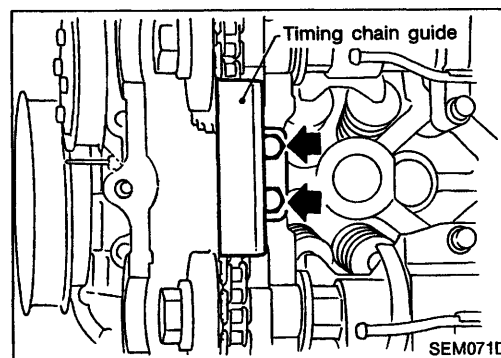
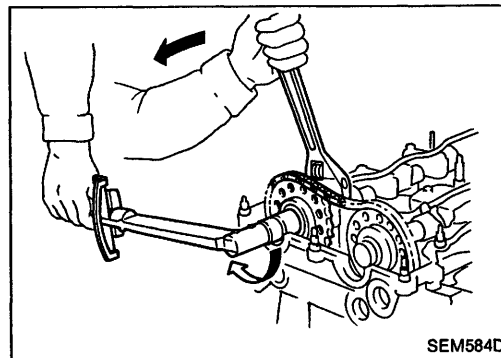
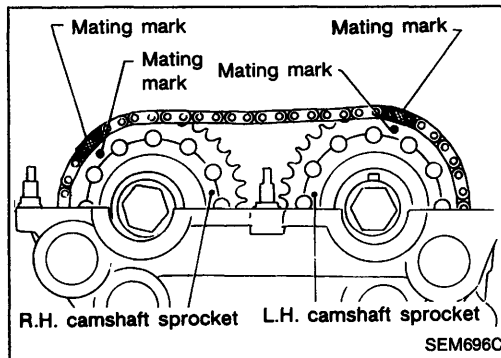
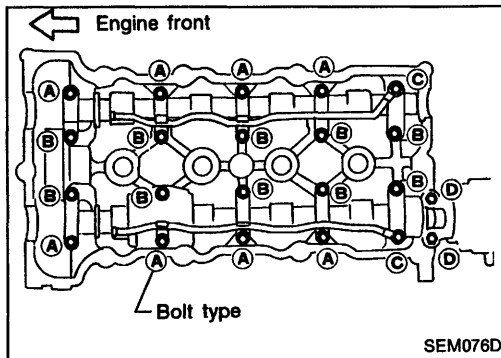
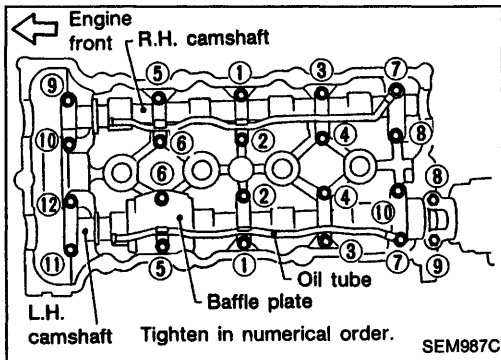
(0.92 - 1.2 kg-m, 6.7 - 8.7 ft-lb)

... Bolt type ① ② ③

⌚: 18 - 25 N·m

(1.8 - 2.6 kg-m, 13 - 19 ft-lb)

... Bolt type ④



21. Install camshaft sprockets.

Line up mating marks on timing chain with mating marks on camshaft sprockets.

- Lock camshafts as shown in figure and tighten to specified torque.

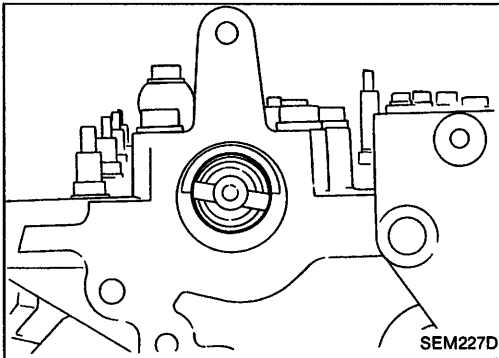
⌚: 137 - 157 N·m

(14.0 - 16.0 kg-m, 101 - 116 ft-lb)

22. Install timing chain guide.

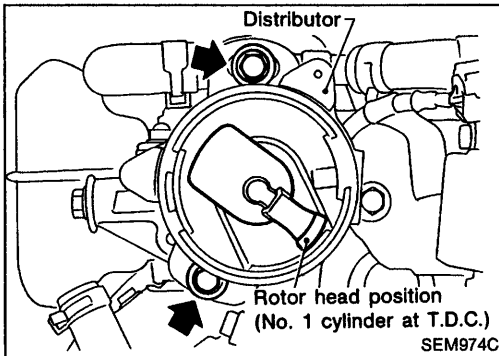
TIMING CHAIN

Installation (Cont'd)

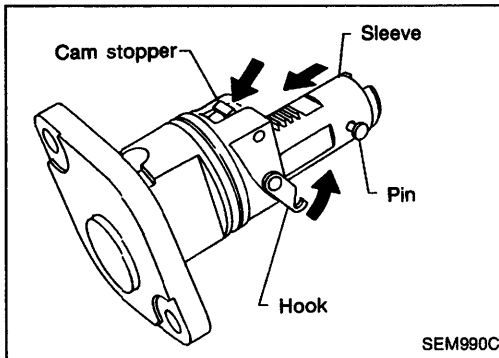


23. Install distributor.

- Make sure that position of camshaft is as shown in figure.

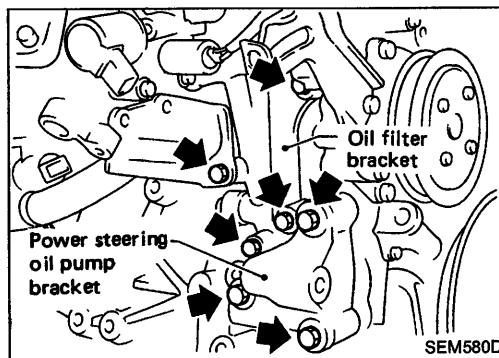
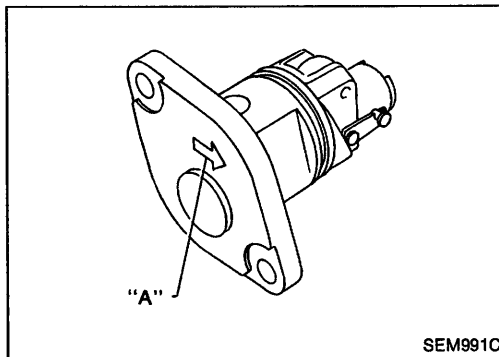


- After installing, confirm that distributor rotor head is set as shown in figure.



24. Install chain tensioner.

Make sure the camshaft sprockets are tightened completely. Press cam stopper down and "press-in" sleeve until hook can be engaged on pin. When tensioner is bolted in position the hook will release automatically. Ensure arrow "A" faces the front of the engine.



25. Install oil filter bracket and power steering oil pump bracket.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

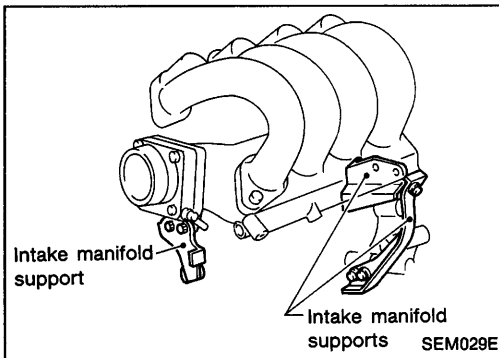
HA

EL

TIMING CHAIN

Installation (Cont'd)

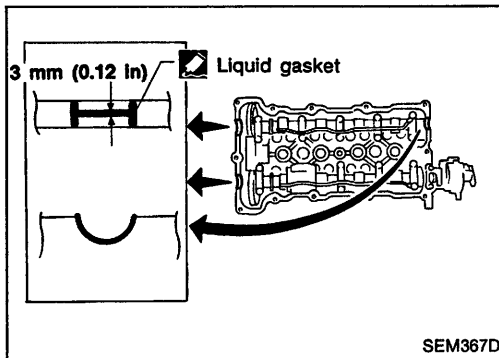
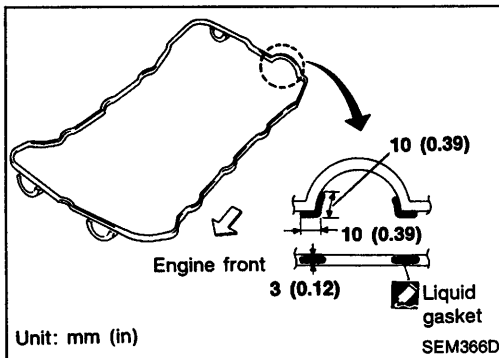
26. Install intake manifold supports.



27. Before installing rocker cover, remove all traces of liquid gasket from mating surface of rocker cover gasket to cylinder head.

28. Apply a continuous bead of liquid gasket to mating surface of rocker cover gasket and cylinder head.

- Use Genuine Liquid Gasket or equivalent.

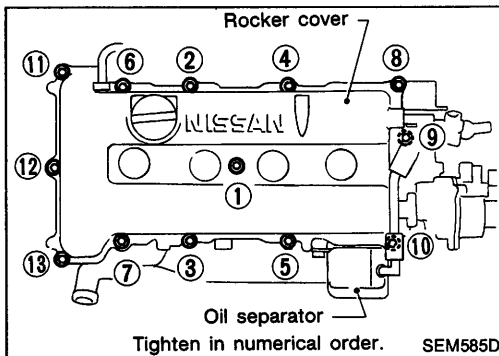


29. Install rocker cover and oil separator.

Rocker cover tightening procedure:

(1) Tighten nuts ① - ⑩ - ⑪ - ⑬ - ⑧ in that order to 4 N·m (0.4 kg-m, 2.9 ft-lb).

(2) Tighten nuts ① to ⑬ as indicated in figure to 8 to 10 N·m (0.8 to 1.0 kg-m, 5.8 to 7.2 ft-lb).



30. Install PAIR valve and resonator.

31. Refit spark plugs and leads.

32. Install vacuum hoses, fuel hoses, wires, harness, connectors and so on.

33. Install power steering oil pump and alternator.

34. Install water pump pulley and drive belts.

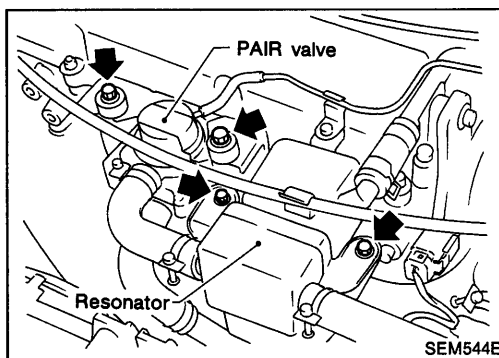
35. Refit air duct to intake manifold.

36. Install radiator.

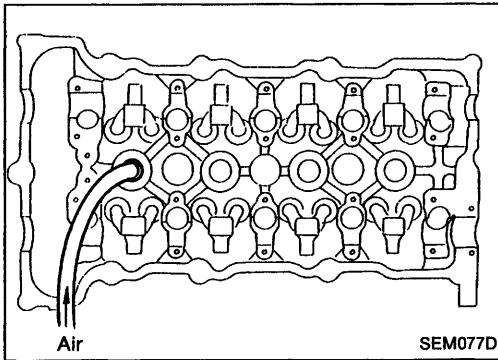
37. Refit hoses and refill with coolant. Refer to MA section.

38. Install engine side cover and front R.H. wheel.

39. Install engine under covers.



OIL SEAL REPLACEMENT



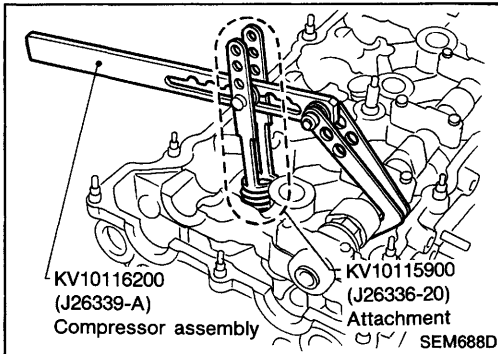
VALVE OIL SEAL

1. Remove accelerator cable.
2. Remove rocker cover and oil separator.
3. Remove camshafts and sprockets.
Refer to "Removal" in "TIMING CHAIN".
4. Remove spark plugs.
5. Install air hose adapter into spark plug hole and apply air pressure to hold valves in place. Apply a pressure of 490 kPa (5 kg/cm², 71 psi).
6. Remove rocker arm, rocker arm guide and shim.

GI

MA

EM



7. Remove valve spring with Tool.

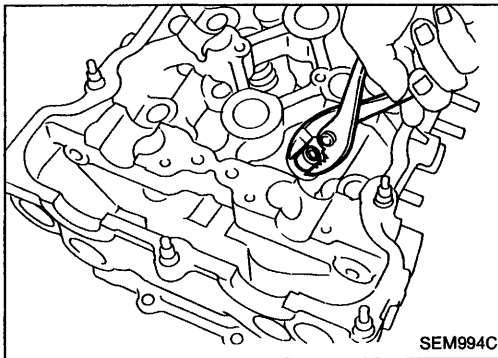
Piston concerned should be set at T.D.C. to prevent valve from falling.

LC

EF &
EC

FE

CL



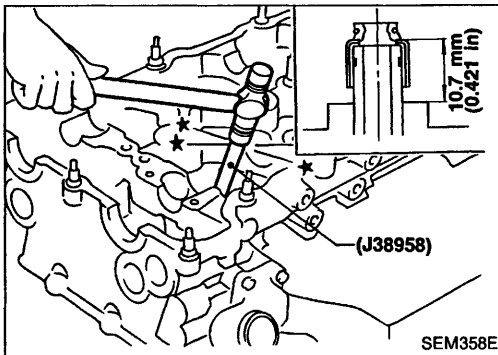
8. Remove valve oil seal.

MT

AT

FA

RA



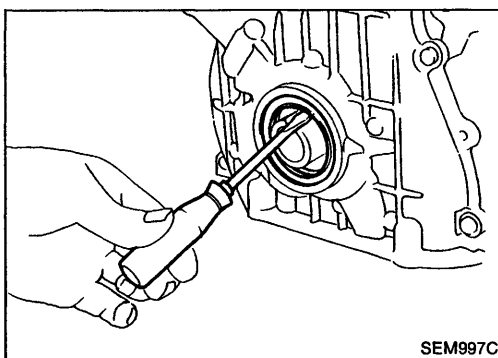
9. Apply engine oil to new valve oil seal and install it with Tool.

BR

ST

BF

HA



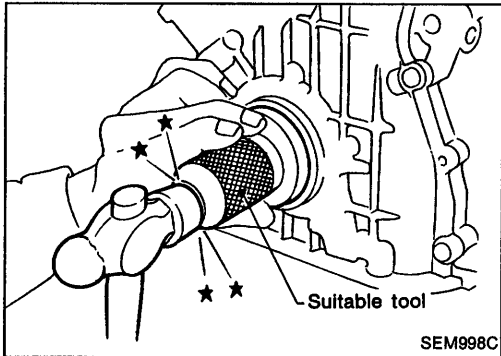
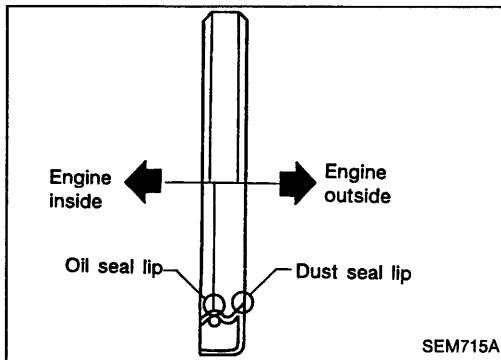
FRONT OIL SEAL

1. Remove the following parts:
 - Engine under cover
 - Front R.H. wheel and engine side cover
 - Drive belts
 - Crankshaft pulley
2. Remove front oil seal.

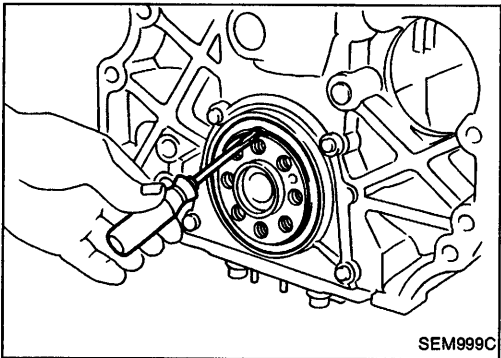
Be careful not to scratch front cover.

EL

OIL SEAL REPLACEMENT



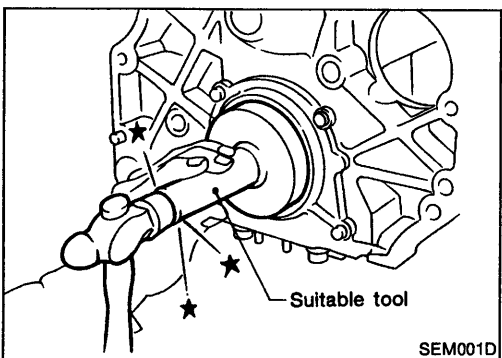
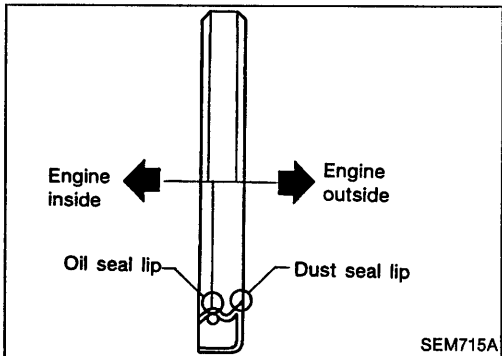
3. Apply engine oil to new oil seal and install it using a suitable tool.



REAR OIL SEAL

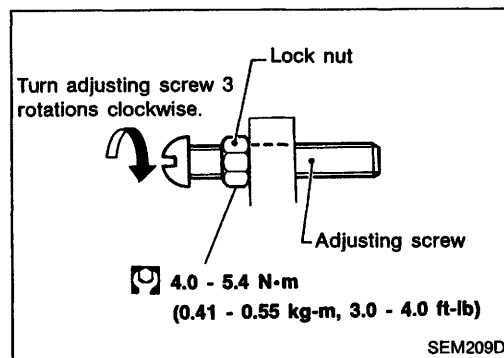
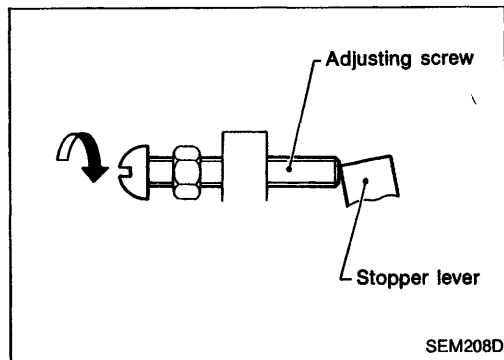
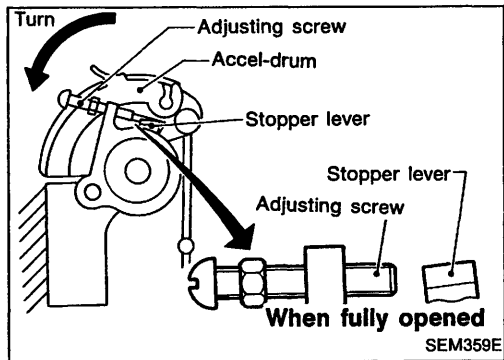
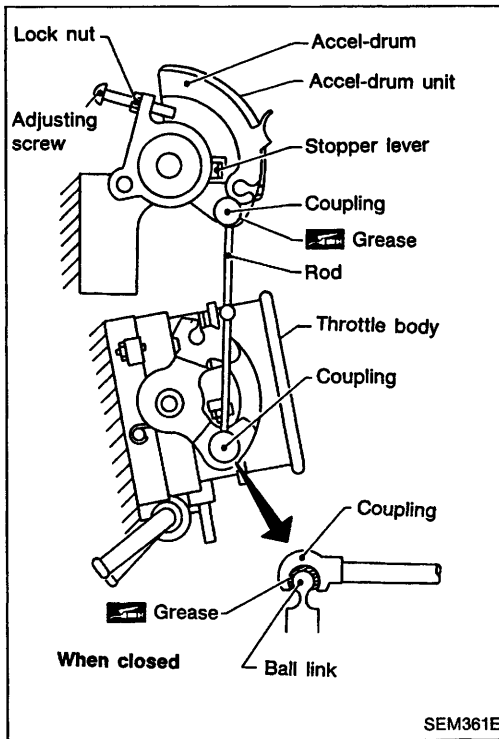
1. Remove transaxle. (Refer to MT or AT section.)
2. Remove flywheel or drive plate.
3. Remove rear oil seal.

Be careful not to scratch rear oil seal retainer.



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

ACCEL-DRUM UNIT



Adjust accel-drum unit whenever any of the following parts (new or old) are installed:

- Accel-drum unit
- Throttle body
- Rod (Always replace with a new one after removal.)

1. Install accel-drum unit and throttle body.
2. Apply grease all over the inside of the rod couplings.

Use genuine Nissan grease or equivalent.

3. Insert each one coupling to ball links of throttle body and accel-drum unit.
4. Loosen lock nut.
5. Loosen adjusting screw enough.

6. Manually turn accel-drum until throttle valve is fully open.

- Check that stopper lever is not touching adjusting screw. If it is, loosen adjusting screw to maintain clearance between the two

7. Turn adjusting screw until it touches stopper lever.

8. Back off accel-drum.

9. Turn adjusting screw 3 rotations clockwise.

10. Tighten lock nut.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

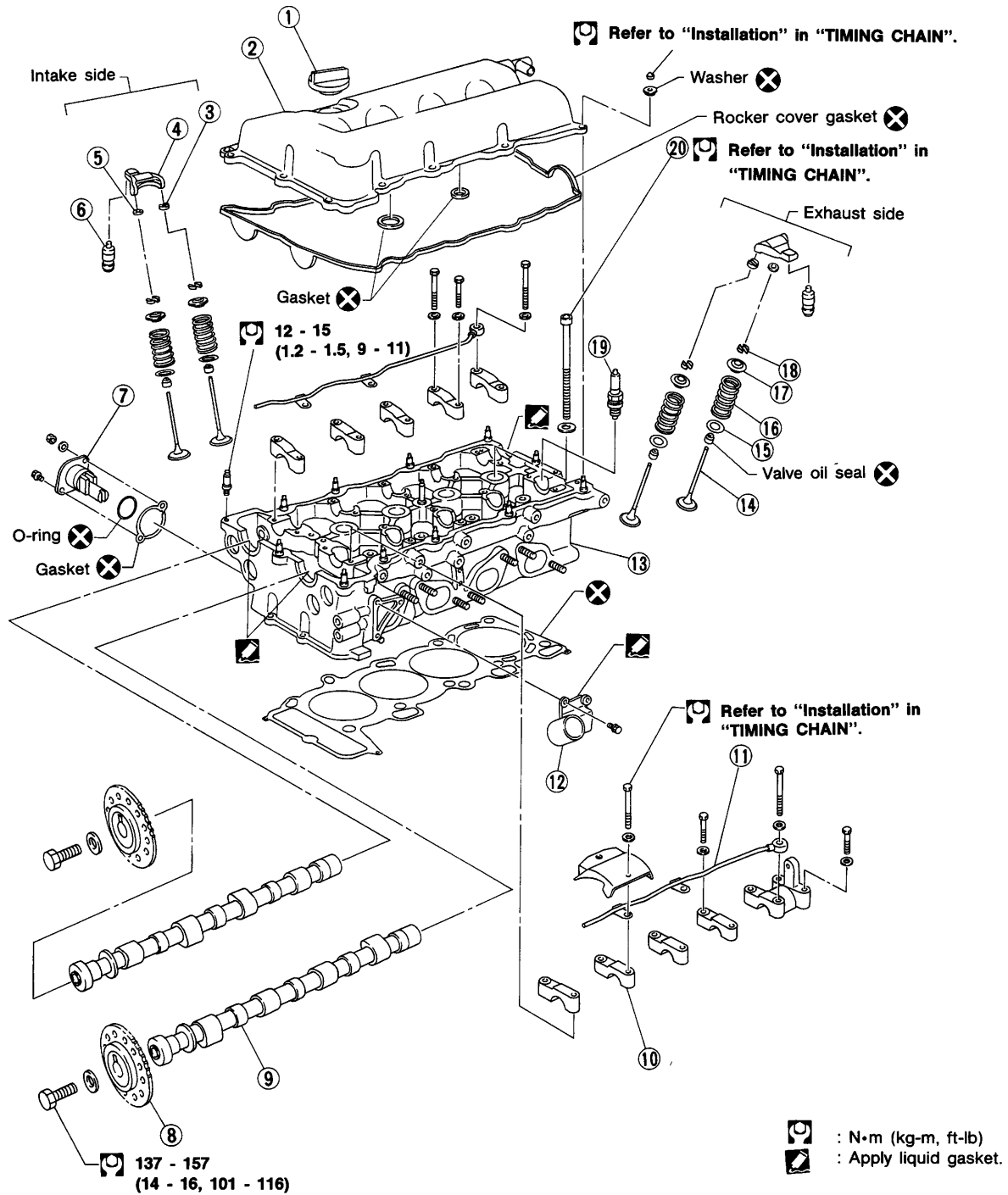
ST

BF

HA

EL

CYLINDER HEAD



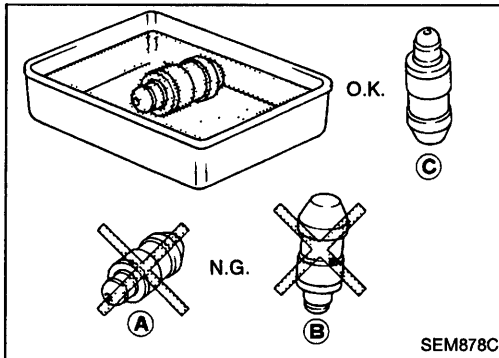
SEM605D

- | | | |
|---------------------------|---------------------|-------------------------|
| ① Oil filler cap | ⑧ Camshaft sprocket | ⑮ Valve spring seat |
| ② Rocker cover | ⑨ Camshaft | ⑯ Valve spring |
| ③ Rocker arm guide | ⑩ Camshaft bracket | ⑰ Valve spring retainer |
| ④ Rocker arm | ⑪ Oil tube | ⑱ Valve collet |
| ⑤ Shim | ⑫ Water outlet | ⑲ Spark plug |
| ⑥ Hydraulic lash adjuster | ⑬ Cylinder head | ⑳ Cylinder head bolt |
| ⑦ Chain tensioner | ⑭ Valve | |

CYLINDER HEAD

CAUTION:

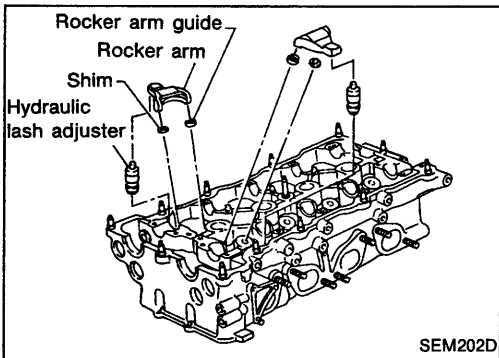
- When installing sliding parts such as rocker arms, camshaft and oil seal, be sure to apply new engine oil on their sliding surfaces.
- When tightening cylinder head bolts, camshaft sprocket bolts and camshaft bracket bolts, apply new engine oil to thread portions and seat surfaces of bolts.



- If a hydraulic lash adjuster is kept on its side, there is a risk of air entering it. After removal, always set hydraulic lash adjuster straight up, or when laying it on its side, have it soak in new engine oil.
- Do not disassemble hydraulic lash adjusters.
- Attach tags to lash adjusters so as not to mix them up.

Removal

- This removal is the same procedure as those for timing chain. Refer to "Removal" in "TIMING CHAIN".

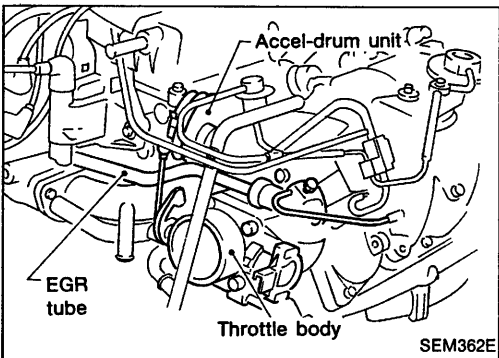


Disassembly

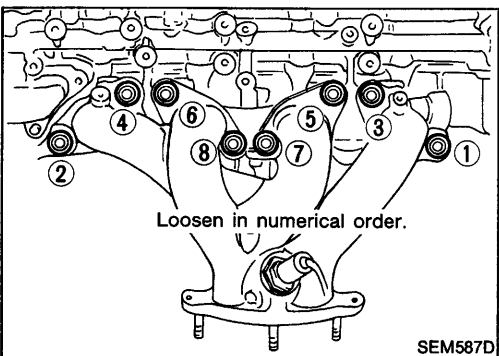
1. Remove rocker arms, shims, rocker arm guides and hydraulic lash adjusters from cylinder head.

CAUTION:

Keep parts in order so that they can be installed in their original positions during assembly. (Install parts in their original positions.)



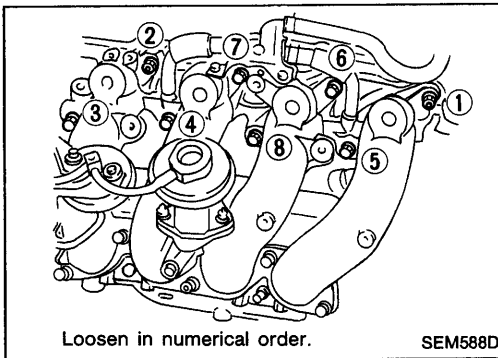
2. Remove throttle body with accel-drum unit.
3. Remove EGR tube.



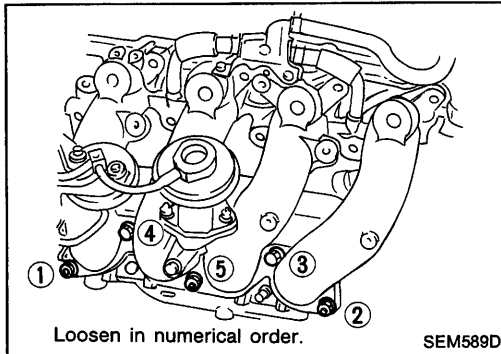
4. Remove exhaust manifold cover.
5. Remove exhaust manifold.

CYLINDER HEAD

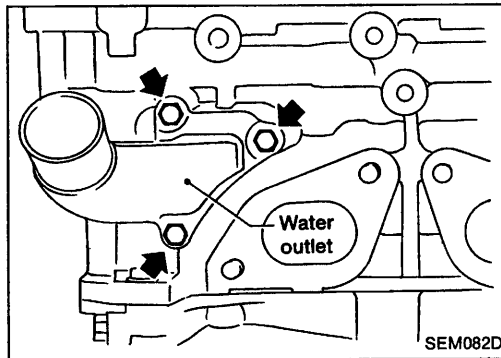
Disassembly (Cont'd)



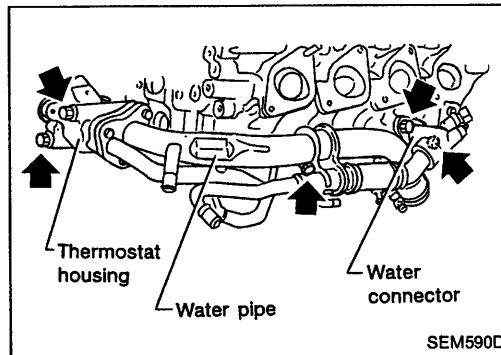
6. Remove fuel tube assembly.
Refer to "Injector Removal and Installation" in EF & EC section.
7. Remove intake manifold.



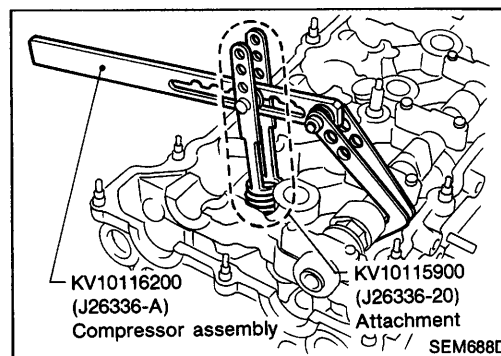
8. Remove intake manifold collector from intake manifold.



9. Remove water outlet.



10. Remove water connector.
11. Remove thermostat housing with water pipe.

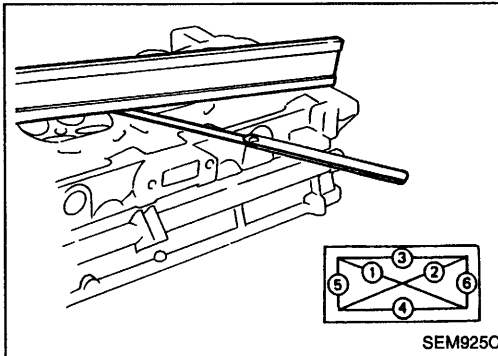
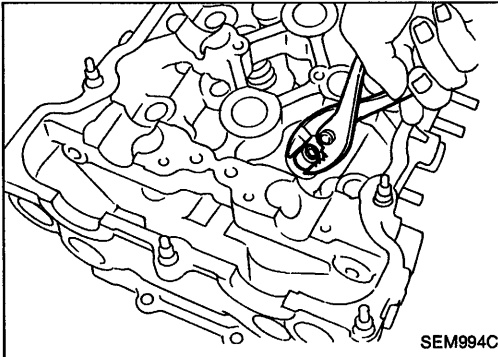


12. Remove valve components with Tool.

CYLINDER HEAD

Disassembly (Cont'd)

13. Remove valve oil seal with a suitable tool.



Inspection

CYLINDER HEAD DISTORTION

Head surface flatness:

Standard

Less than 0.03 mm (0.0012 in)

Limit

0.1 mm (0.004 in)

If beyond the specified limit, replace or resurface.

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:

$A + B = 0.2 \text{ mm (0.008 in)}$

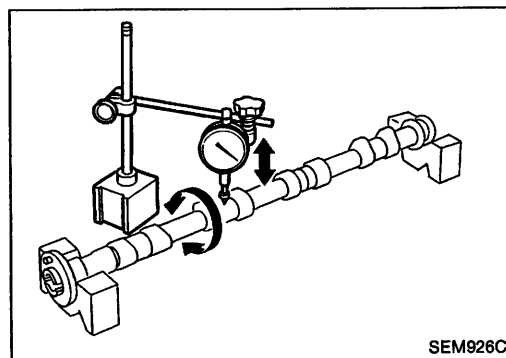
After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

Nominal cylinder head height:

136.9 - 137.1 mm (5.390 - 5.398 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):

Standard

Less than 0.02 mm (0.0008 in)

Limit

0.1 mm (0.004 in)

2. If it exceeds the limit, replace camshaft.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

CYLINDER HEAD

Inspection (Cont'd)

CAMSHAFT CAM HEIGHT

1. Measure camshaft cam height.

Standard cam height:

Intake

38.408 - 38.598 mm (1.5121 - 1.5196 in)

Exhaust

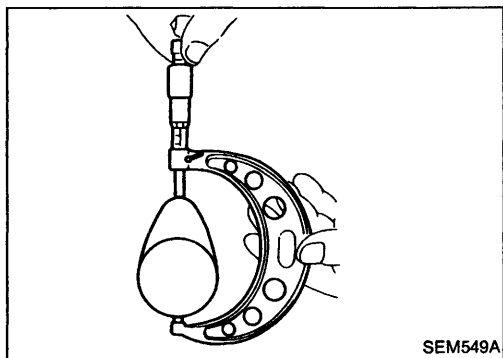
37.920 - 38.110 mm (1.4929 - 1.5004 in)

Cam wear limit:

Intake & Exhaust

0.2 mm (0.008 in)

2. If wear is beyond the limit, replace camshaft.



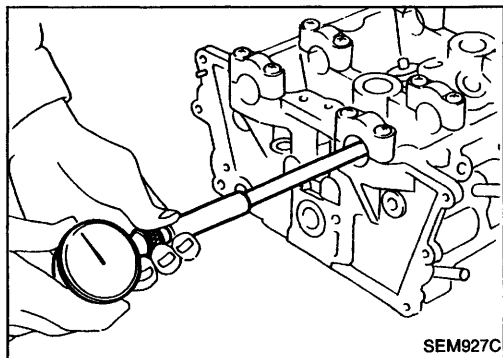
CAMSHAFT JOURNAL CLEARANCE

1. Install camshaft bracket and tighten bolts to the specified torque.

2. Measure inner diameter of camshaft bearing.

Standard inner diameter:

28.000 - 28.021 mm (1.1024 - 1.1032 in)



3. Measure outer diameter of camshaft journal.

Standard outer diameter:

27.935 - 27.955 mm (1.0998 - 1.1006 in)

4. If clearance exceeds the limit, replace camshaft and/or cylinder head.

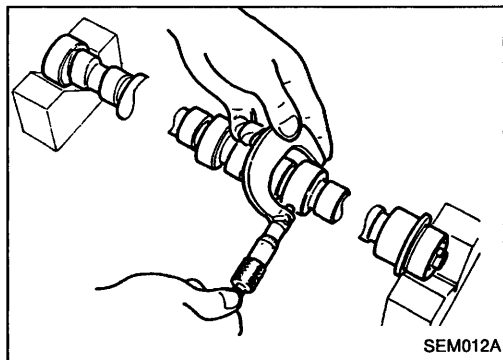
Camshaft journal clearance:

Standard

0.045 - 0.086 mm (0.0018 - 0.0034 in)

Limit

0.12 mm (0.0047 in)



CAMSHAFT END PLAY

1. Install camshaft in cylinder head.

2. Measure camshaft end play.

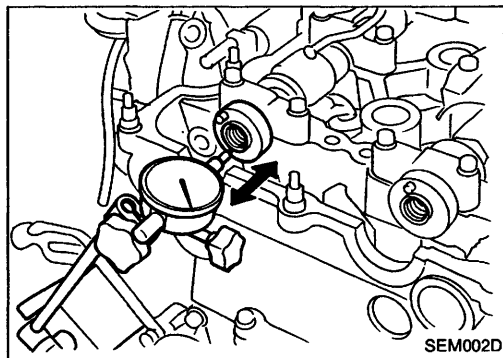
Camshaft end play:

Standard

0.055 - 0.139 mm (0.0022 - 0.0055 in)

Limit

0.20 mm (0.0079 in)



CAMSHAFT SPROCKET RUNOUT

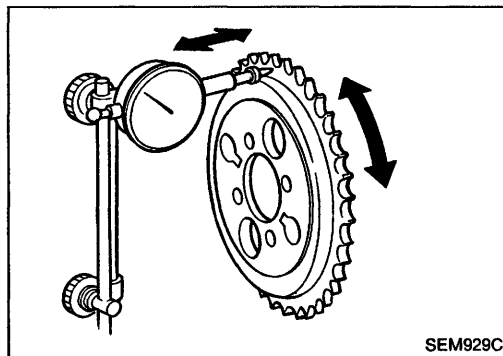
1. Install sprocket on camshaft.

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.



CYLINDER HEAD

Inspection (Cont'd)

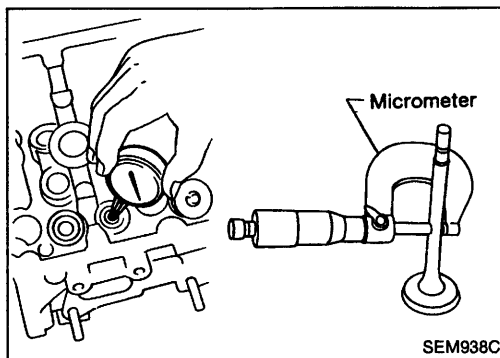
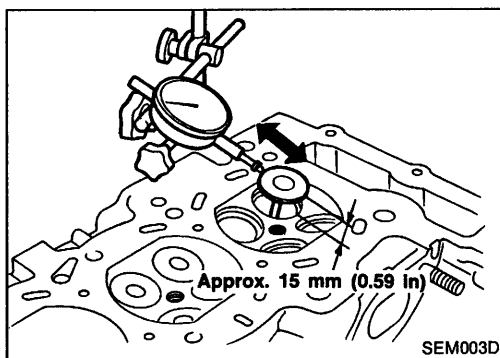
VALVE GUIDE CLEARANCE

1. Measure valve deflection in a parallel direction with rocker arm. (Valve and valve guide mostly wear in this direction.)

Valve deflection limit (Dial gauge reading):

Intake & Exhaust

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:

Standard

Intake 0.020 - 0.053 mm (0.0008 - 0.0021 in)

Exhaust 0.040 - 0.073 mm (0.0016 - 0.0029 in)

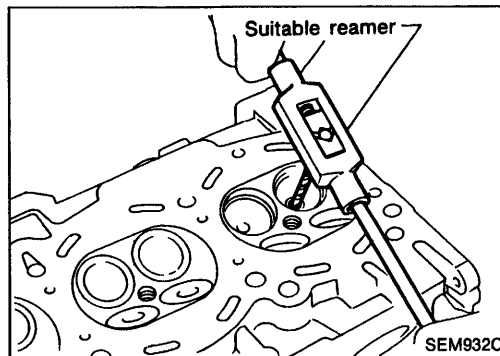
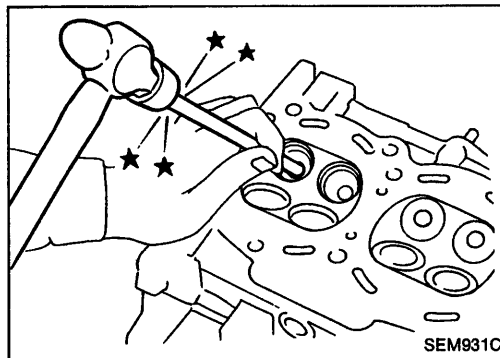
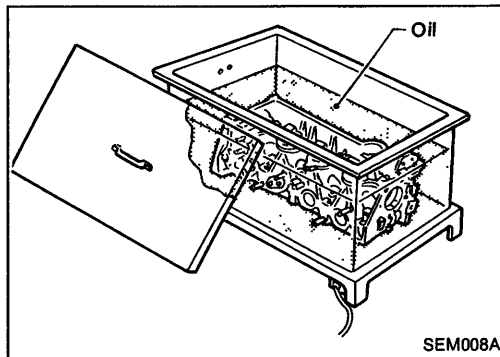
Limit

Intake & Exhaust 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 110 to 130°C (230 to 266°F).



3. Ream cylinder head valve guide hole.

Valve guide hole diameter

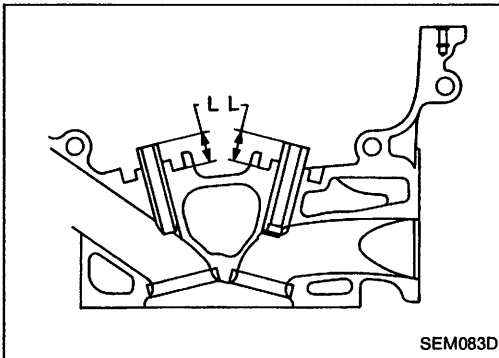
(for service parts):

Intake & Exhaust

10.175 - 10.196 mm (0.4006 - 0.4014 in)

CYLINDER HEAD

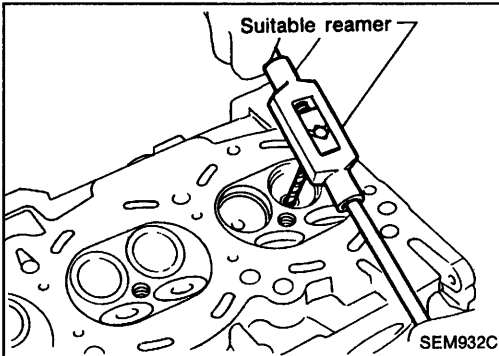
Inspection (Cont'd)



4. Heat cylinder head to 110 to 130°C (230 to 266°F) and press service valve guide onto cylinder head.

Projection "L":

14.0 - 14.2 mm (0.551 - 0.559 in)

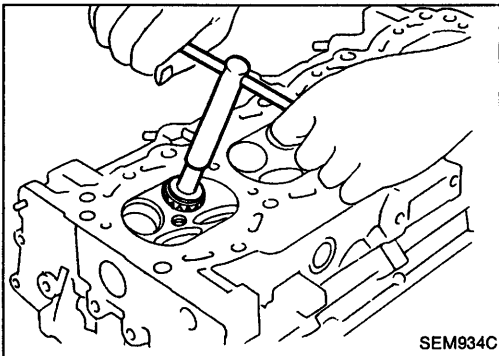


5. Ream valve guide.

Valve guide inner diameter:

Intake & Exhaust

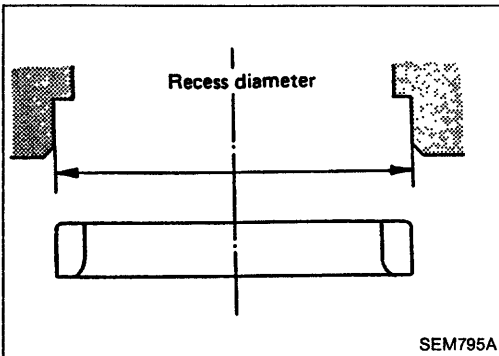
6.000 - 6.018 mm (0.2362 - 0.2369 in)



VALVE SEATS

Check valve seats for any evidence of pitting at valve contact surface, and reset 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.

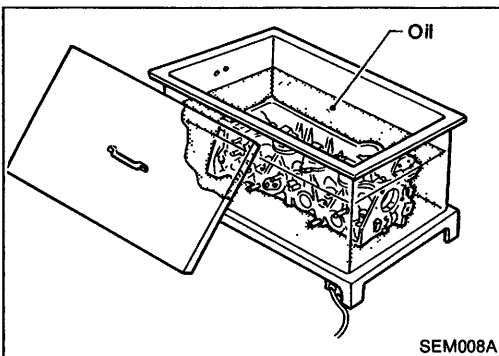
Reaming bore for service valve seat

Oversize [0.5 mm (0.020 in)]:

Intake 35.500 - 35.516 mm (1.3976 - 1.3983 in)

Exhaust 31.500 - 31.516 mm (1.2402 - 1.2408 in)

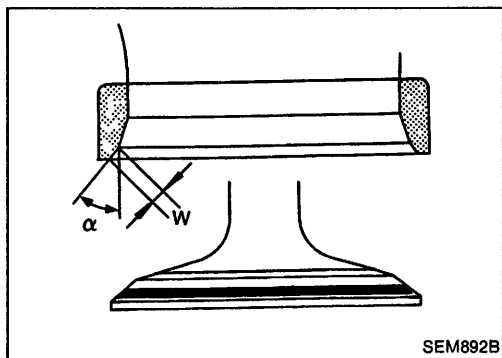
Reaming should be done in circles concentric to the valve guide center so that valve seat will have the correct fit.



3. Heat cylinder head to 110 to 130°C (230 to 266°F).
4. Press fit valve seat until it seats on the bottom.

CYLINDER HEAD

Inspection (Cont'd)



5. Cut or grind valve seat using a 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°53' - 45°07'

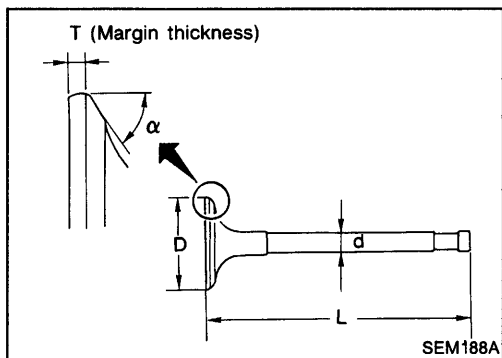
Contacting width " W ":

Intake

1.4 - 1.7 mm (0.055 - 0.067 in)

Exhaust

1.7 - 2.0 mm (0.067 - 0.079 in)

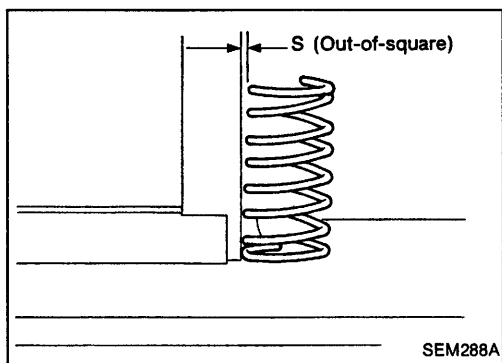


VALVE DIMENSIONS

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

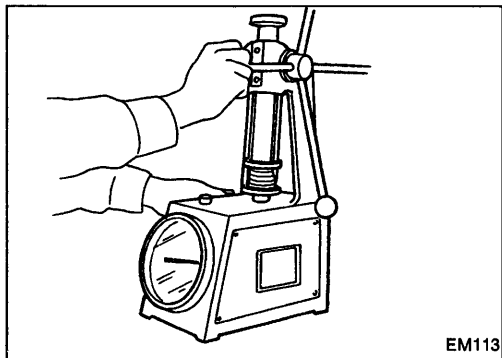
Squareness

1. Measure " S " dimension.

Out-of-square:

Less than 2.2 mm (0.087 in)

2. If it exceeds the limit, replace spring.



Pressure

Check valve spring pressure.

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

Standard

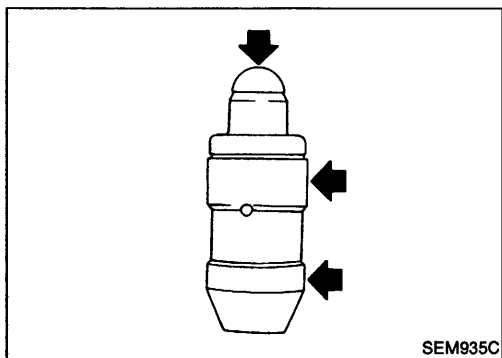
569.00 - 641.57 (58.02 - 65.42,

127.93 - 144.25) at 30.0 (1.181)

Limit

More than 549.2 (56.0, 123.5) at 30.0 (1.181)

If it exceeds the limit, replace spring.

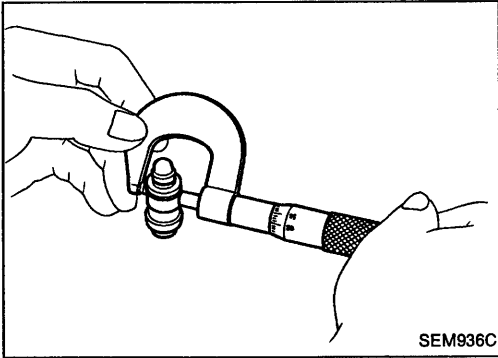


HYDRAULIC LASH ADJUSTER

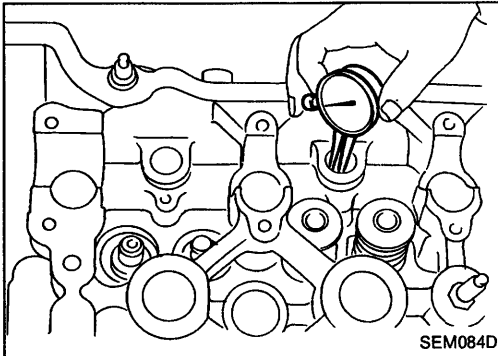
1. Check contact and sliding surfaces for wear or scratches.

CYLINDER HEAD

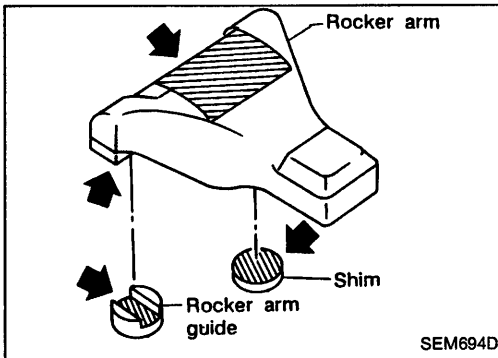
Inspection (Cont'd)



2. Check diameter of lash adjuster.
Outer diameter:
16.980 - 16.993 mm (0.6685 - 0.6690 in)

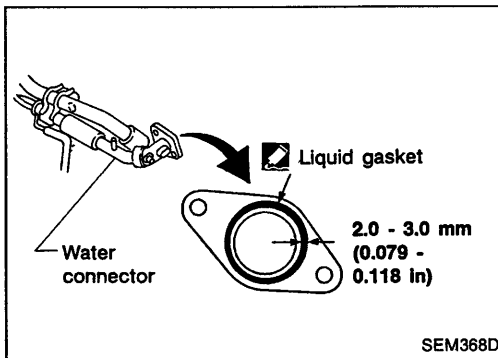


3. Check lash adjuster guide inner diameter.
Inner diameter:
17.000 - 17.020 mm (0.6693 - 0.6701 in)
Standard clearance between lash adjuster and adjuster guide:
0.007 - 0.040 mm (0.0003 - 0.0016 in)



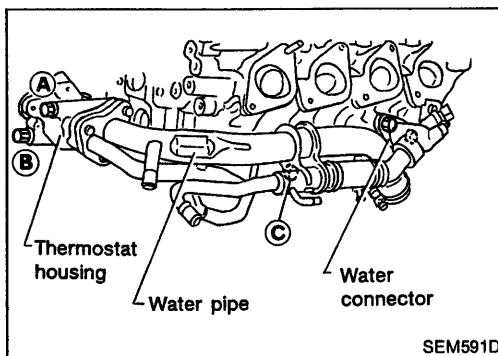
ROCKER ARM, SHIM AND ROCKER ARM GUIDE

Check contact and sliding surfaces of rocker arms, shims and rocker arm guides for wear or scratches.



Assembly

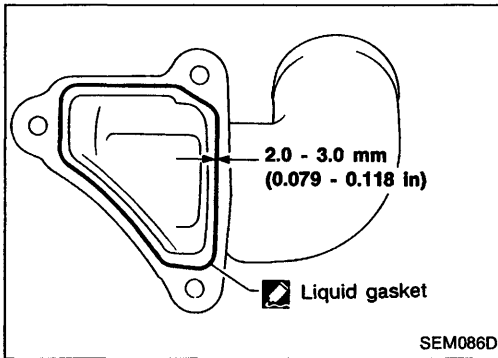
1. Install water connector.
 - (1) Before installing water connector, remove all traces of liquid gasket from mating surface using a scraper.
 - Also remove traces of liquid gasket from mating surface of cylinder head.
 - (2) Apply a continuous bead of liquid gasket to mating surface of water connector.
 - **Use Genuine Liquid Gasket or equivalent.**



2. Install thermostat housing with water pipe.
 - Tightening procedure:
 - (1) Tighten bolt **A** to 2 - 5 N·m (0.2 - 0.5 kg-m, 1.4 - 3.6 ft-lb).
 - (2) Tighten bolt **C** to 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb).
 - (3) Tighten bolt **A** to 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb).
 - (4) Tighten bolt **B** to 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb).
 - **Perform steps (2) through (4) after installing cylinder head on cylinder block.**

CYLINDER HEAD

Assembly (Cont'd)

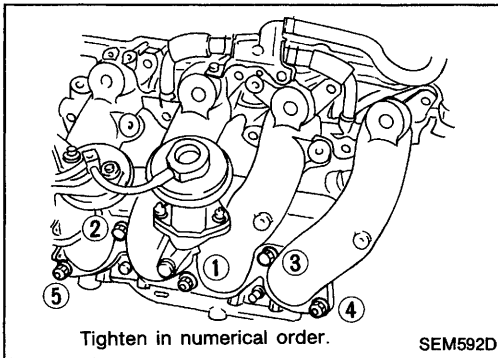


3. Install water outlet.
 - (1) Before installing water outlet, remove all traces of liquid gasket from mating surface using a scraper.
 - Also remove traces of liquid gasket from mating surface of cylinder head.
 - (2) Apply a continuous bead of liquid gasket to mating surface of water outlet.
 - **Use Genuine Liquid Gasket or equivalent.**

GI

MA

EM



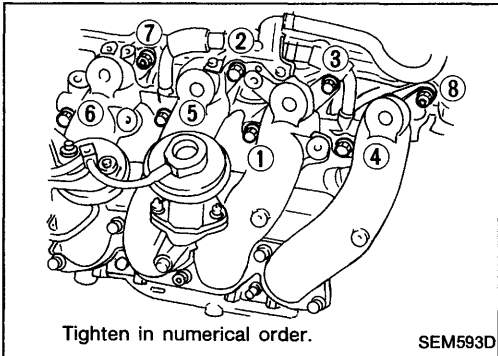
4. Install intake manifold collector to intake manifold.

LC

EF &
EC

FE

CL



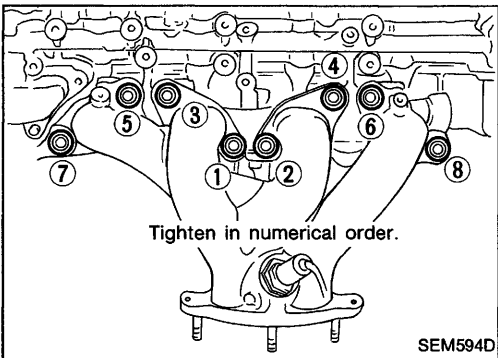
5. Install intake manifold.
6. Install fuel tube assembly.
Refer to "Injector Removal and Installation" in EF & EC section.

MT

AT

FA

RA



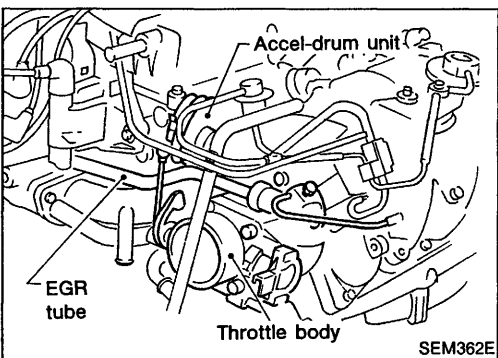
7. Install exhaust manifold.
8. Install exhaust manifold cover.

BR

ST

BF

HA

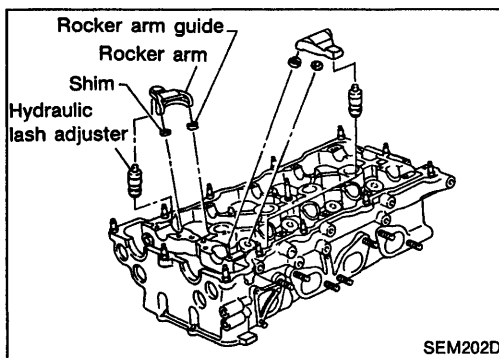
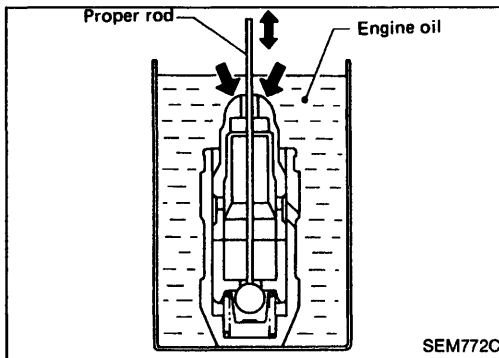
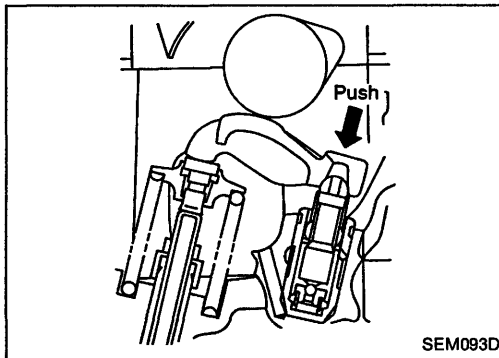
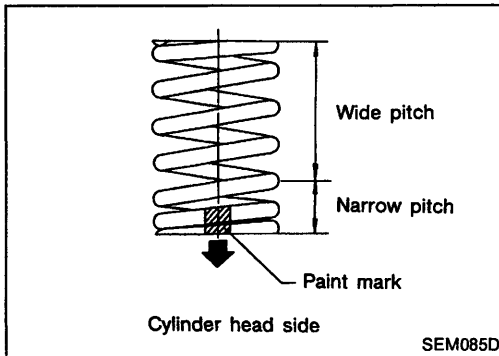
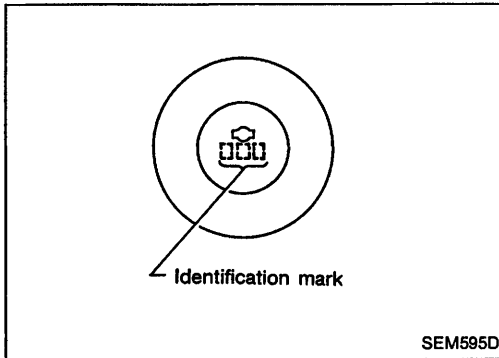


9. Install EGR tube.
10. Install throttle body with accel-drum unit.
11. Adjust accel-drum unit.
Refer to "ACCEL-DRUM UNIT".

EL

CYLINDER HEAD

Assembly (Cont'd)



12. Install valve component parts.

- Install valves, noting their identification marks as indicated in the table below.

	Identification mark
Intake valve	53J
Exhaust valve	64Y

- Always use new valve oil seal. Refer to OIL SEAL REPLACEMENT.
- Before installing valve oil seal, install valve spring seat.
- Install valve spring (uneven pitch type) with its narrow pitched side toward cylinder head side (paint mark).
- After installing valve component parts, use plastic hammer to lightly tap valve stem tip to assure a proper fit.

13. Check hydraulic lash adjusters.

- (1) When rocker arm can be moved at least 1 mm (0.04 in) by pushing at hydraulic lash adjuster location, it indicates that there is air in the high pressure chamber. Noise will be emitted from hydraulic lash adjuster if engine is started without bleeding air.

- (2) Remove hydraulic lash adjuster and dip in a container filled with engine oil. While pushing plunger as shown in figure, lightly push check ball using a thin rod. Air is completely bled when plunger no longer moves.

Air cannot be bled from this type of lash adjuster by running the engine.

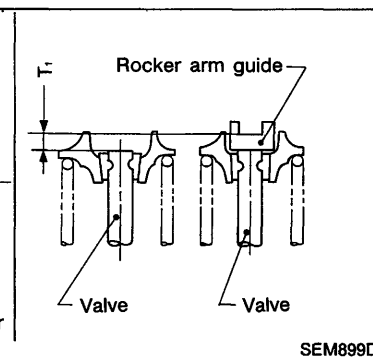
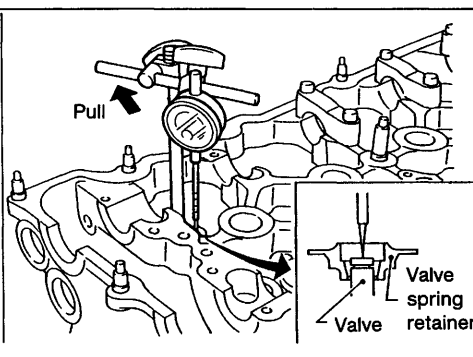
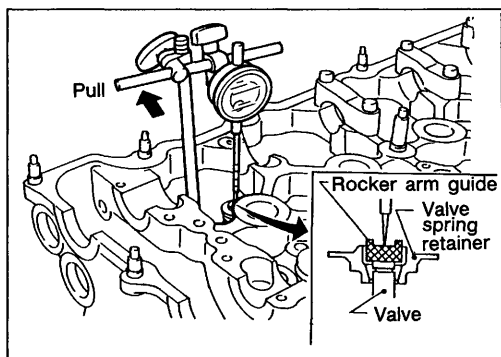
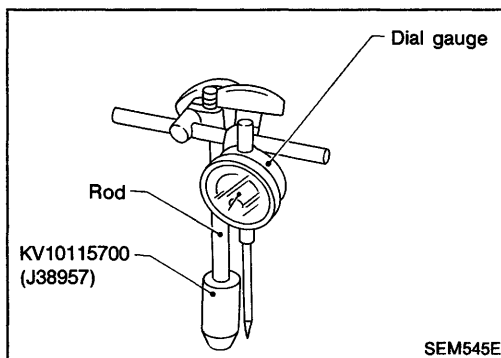
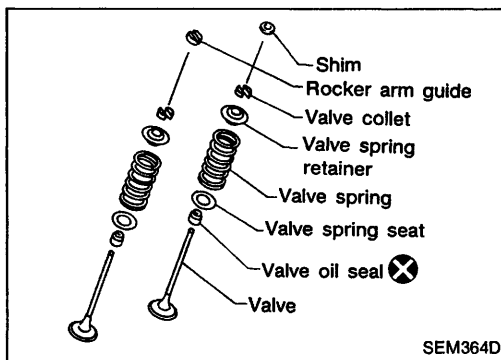
14. Install rocker arms, shims, rocker arm guides and hydraulic lash adjusters.

CAUTION:

Install all parts in their original positions.

CYLINDER HEAD

Assembly (Cont'd)



15. Select a suitable shim when replacing valve, cylinder head, shim, rocker arm guide and/or valve seat with new one(s), as follows:

- 1) Install valve component parts to cylinder head (Except shim).
- Always replace rocker arm guide with a new one.

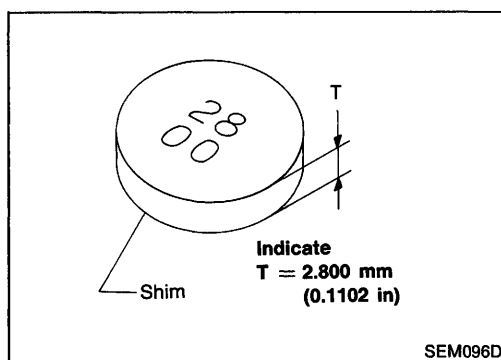
2) Remove hydraulic lash adjuster.

3) Install Tool* into hydraulic lash adjuster fixing hole.

* Tool [KV10115700 (J38957)] is screwed into magnetic stand rod used with dial gauge.

4) Measure difference in level (T_1) between sliding surface of rocker arm guide against rocker arm and valve stem end on shim side with valve, valve spring, collet, retainer and rocker arm guide installed to the head (Except shim),

When measuring, lightly pull dial indicator rod toward you to eliminate play in Tool [KV10115700 (J38957)].



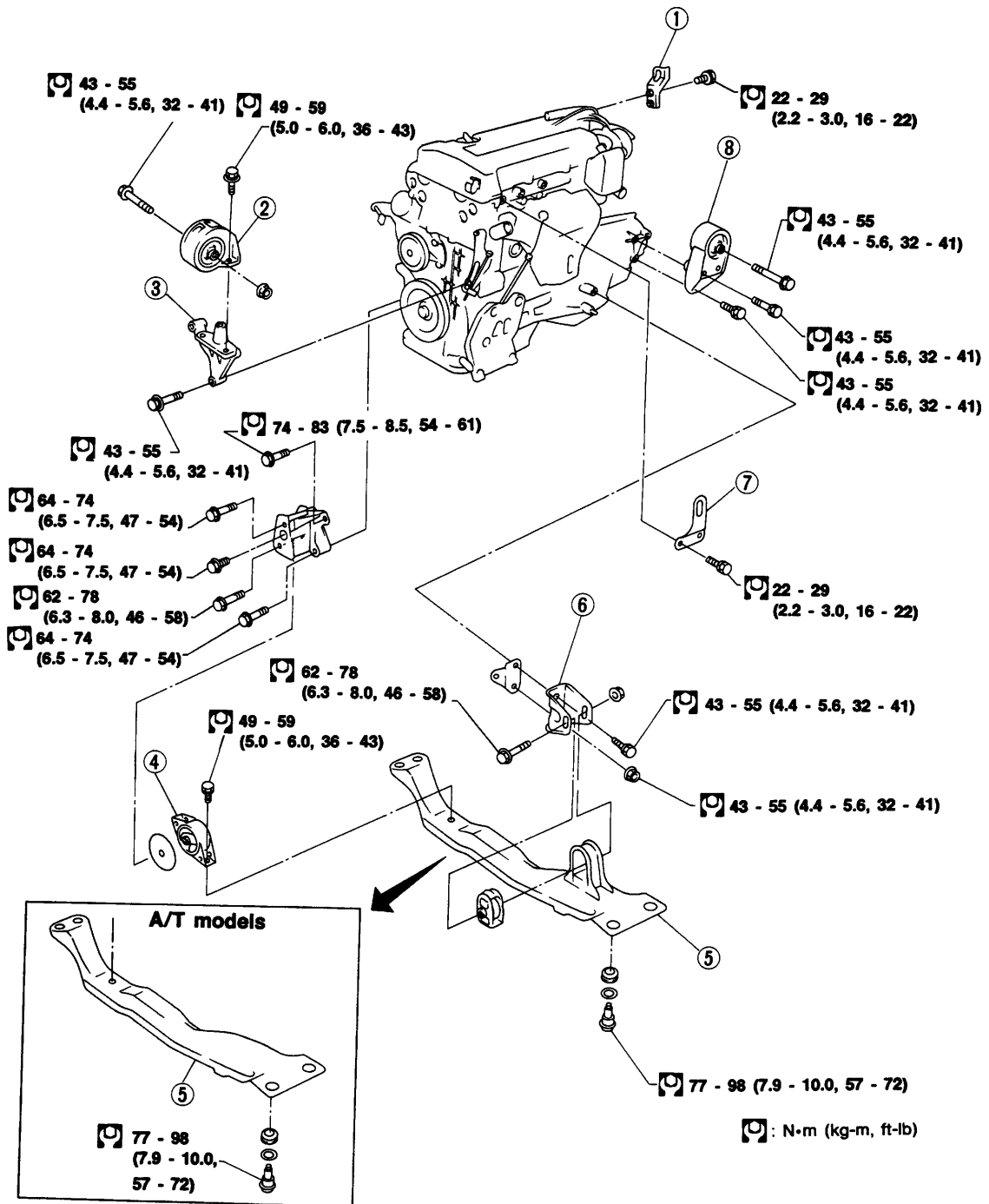
5) Select a shim having a thickness (T) that makes -0.025 mm (-0.0010 in) $\leq [(T) - (T_1)] \leq 0.025 \text{ mm}$ (0.0010 in).

- Shims are available in 17 different thicknesses ranging from 2.800 mm (0.1102 in) to 3.200 mm (0.1260 in) in increments of 0.025 mm (0.0010 in).

Installation

- This installation is the same procedure as those for timing chain. Refer to "Installation" in "TIMING CHAIN".

ENGINE REMOVAL



SEM687D

- | | | |
|--------------------------------------|--------------------|-------------------------------------|
| ① Rear engine slinger | ④ Rear insulator | ⑦ Front engine slinger |
| ② Front engine mounting (Fluid type) | ⑤ Center member | ⑧ Rear engine mounting (Fluid type) |
| ③ Mounting bracket | ⑥ Mounting bracket | |

ENGINE REMOVAL

WARNING:

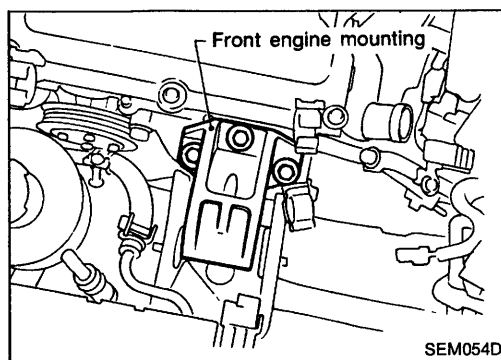
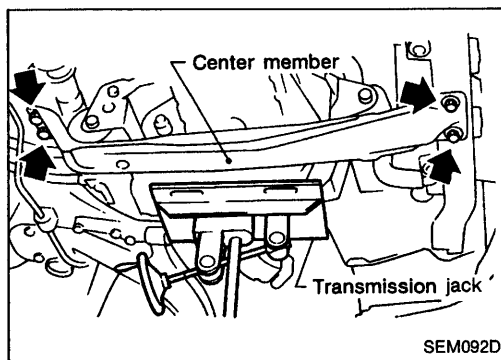
- a. Situate vehicle on a flat and solid surface.
- b. Place chocks at front and back of rear wheels.
- c. Do not remove engine until exhaust system has completely cooled off.
Otherwise, you may burn yourself and/or fire may break out in fuel line.
- d. For safety during subsequent steps, the tension 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. Be sure to hoist engine and transaxle in a safe manner.
- g. 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.

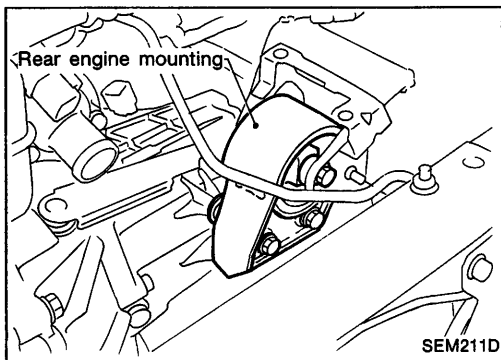
Removal

1. Remove engine under cover and hood.
2. Drain coolant from both cylinder block, and radiator.
3. Drain engine oil from drain plug of oil pan.
4. Remove vacuum hoses, fuel hoses, wires, harness and connectors and so on.
5. Remove exhaust tubes, ball joints and drive shafts.
6. Remove radiator and fans.
7. Remove drive belts.
8. Remove alternator, compressor and power steering oil pump from engine.
9. Set a suitable transmission jack under transaxle. Hoist engine with engine slinger.
10. Remove center member.
11. Remove engine mounting bolts from both sides and then slowly lower transmission jack.

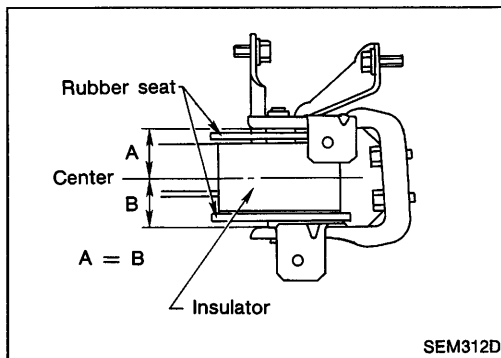
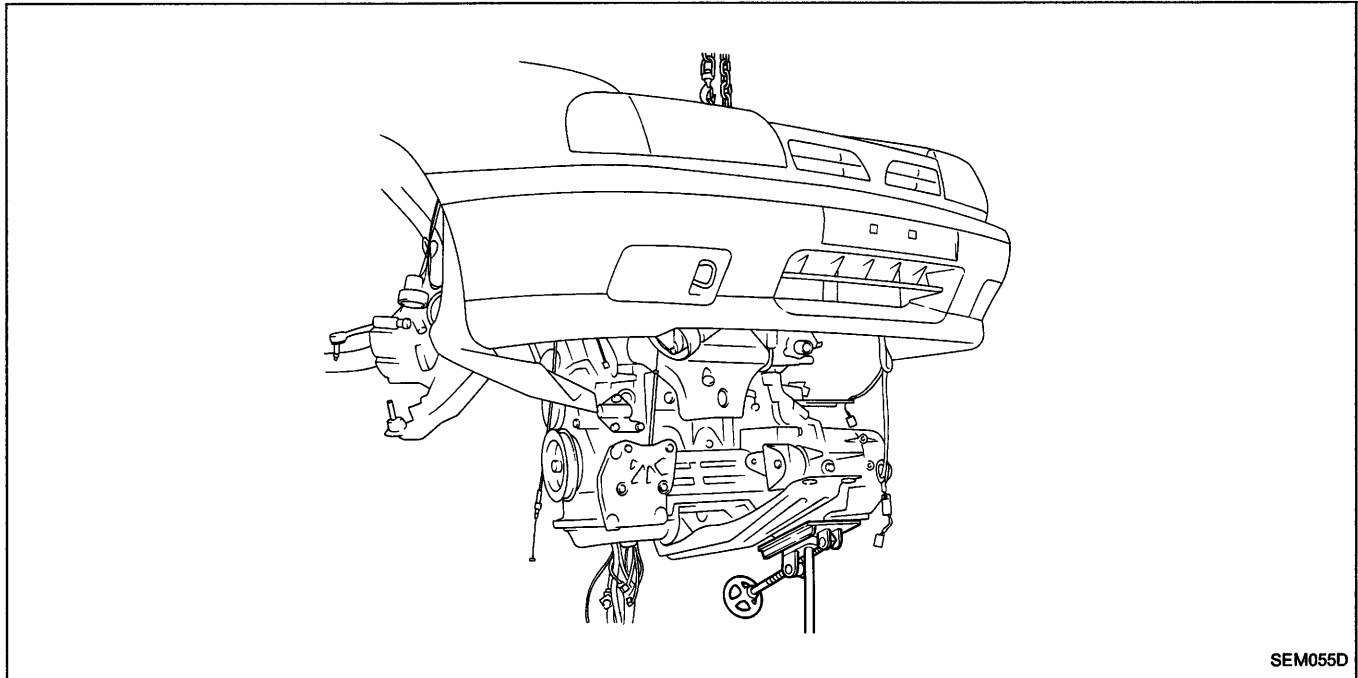


ENGINE REMOVAL

Removal (Cont'd)

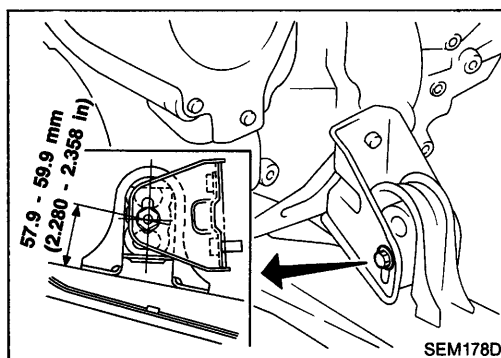


12. Remove engine with transaxle as shown.



Installation

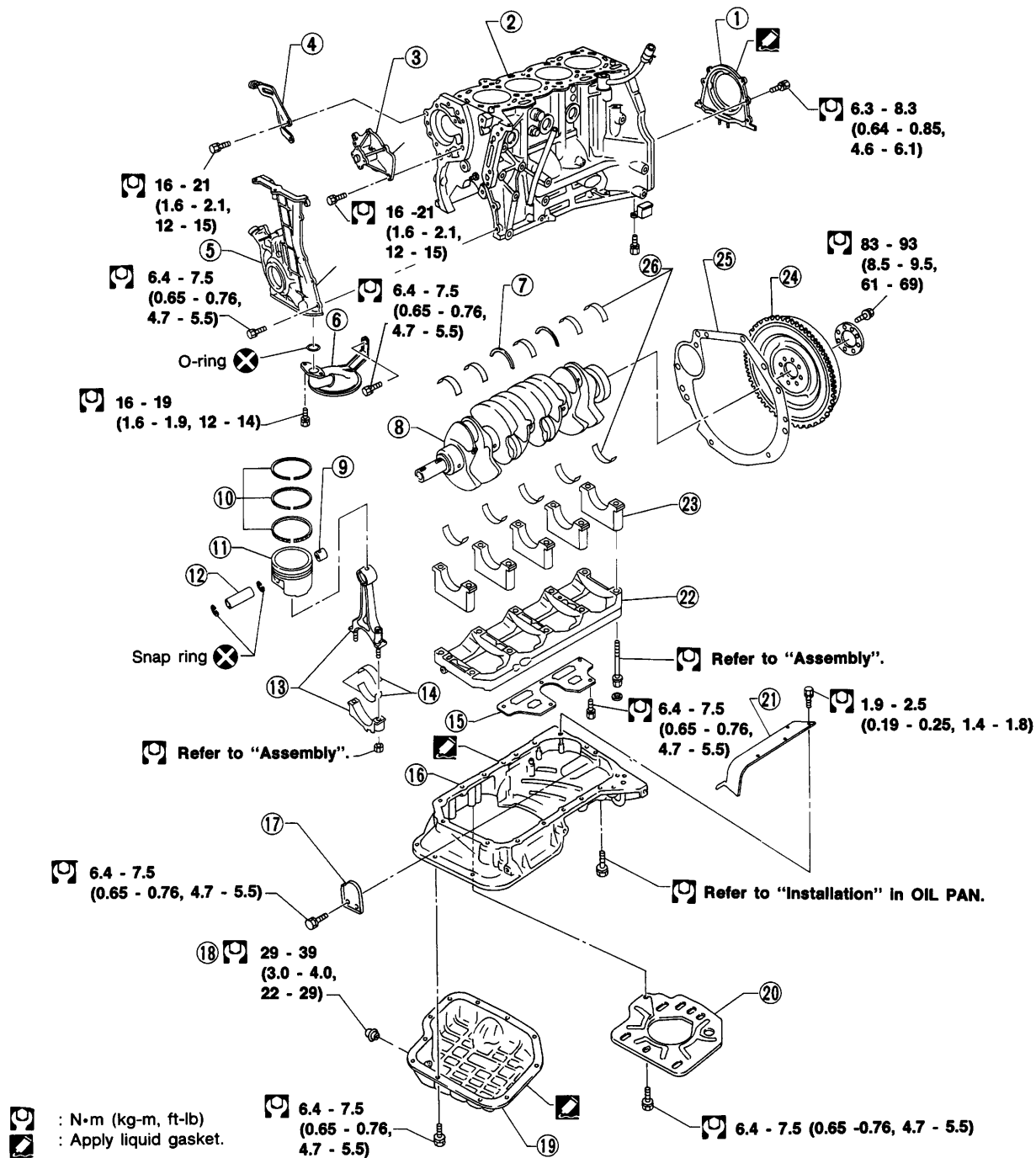
1. Install engine mounting bracket and fixing bolts.
Be sure that insulators are correctly positioned on the brackets.
2. Carefully lower the engine onto engine mounting insulators.



When installing the engine, adjust the height of the engine mounting as shown. (For M/T)

3. Installation is in the reverse order of removal.

CYLINDER BLOCK



- ① Rear oil seal retainer
- ② Cylinder block
- ③ Water pump
- ④ Power steering oil pump adjusting bar
- ⑤ Front cover with oil pump
- ⑥ Oil strainer
- ⑦ Thrust bearing
- ⑧ Crankshaft
- ⑨ Connecting rod bushing

- ⑩ Piston rings
- ⑪ Piston
- ⑫ Piston pin
- ⑬ Connecting rod
- ⑭ Connecting rod bearing
- ⑮ Baffle plate
- ⑯ Aluminum oil pan
- ⑰ Rear cover plate
- ⑱ Drain plug

- ⑲ Steel oil pan
- ⑳ Baffle plate
- ㉑ Side gallery baffle plate
- ㉒ Main bearing beam
- ㉓ Main bearing cap
- ㉔ Flywheel or drive plate
- ㉕ Rear plate
- ㉖ Main bearing

SEM501E

CYLINDER BLOCK

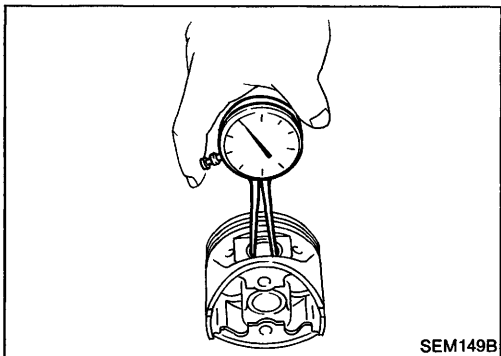
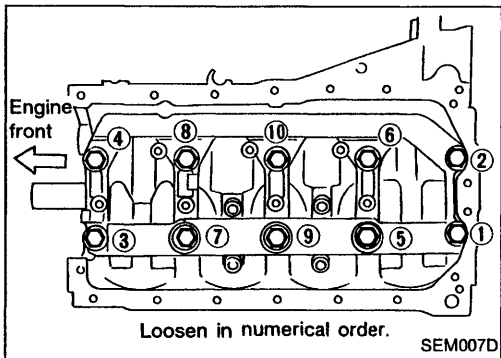
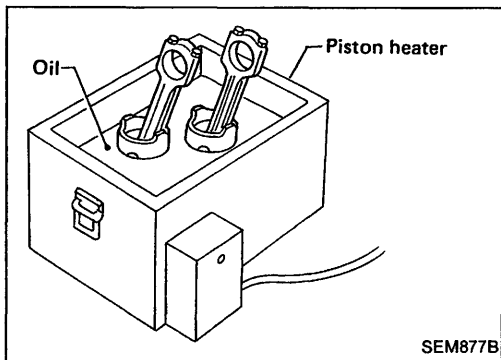
CAUTION:

- When installing sliding parts such as bearings and pistons, be sure to apply new 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. Remove engine.
Refer to "ENGINE REMOVAL".
2. Remove cylinder head.
Refer to "Removal" in "TIMING CHAIN".
3. Remove oil pan.
Refer to "Removal" in "OIL PAN".
4. Remove timing chain.
Refer to "Removal" in "TIMING CHAIN".
5. Remove pistons with connecting rod.
 - 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.
6. Remove rear oil seal retainer.
7. Remove bearing beam, bearing cap and crankshaft.
 - Before removing bearing cap, measure crankshaft end play.
 - Bolts should be loosened in two or three steps.



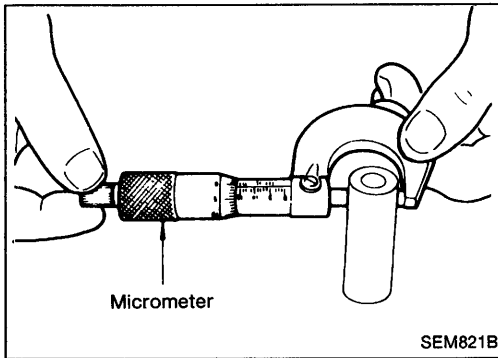
Inspection

PISTON AND PISTON PIN CLEARANCE

1. Measure inner diameter of piston pin hole "dp".
Standard diameter "dp":
21.987 - 21.999 mm (0.8656 - 0.8661 in)

CYLINDER BLOCK

Inspection (Cont'd)



2. Measure outer diameter of piston pin "Dp".

Standard diameter "Dp":

21.989 - 22.001 mm (0.8657 - 0.8662 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.

GI

MA

EM

PISTON RING SIDE CLEARANCE

Side clearance:

Top ring

0.045 - 0.080 mm (0.0018 - 0.0031 in)

2nd ring

0.030 - 0.065 mm (0.0012 - 0.0026 in)

Max. limit of side clearance:

0.2 mm (0.008 in)

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

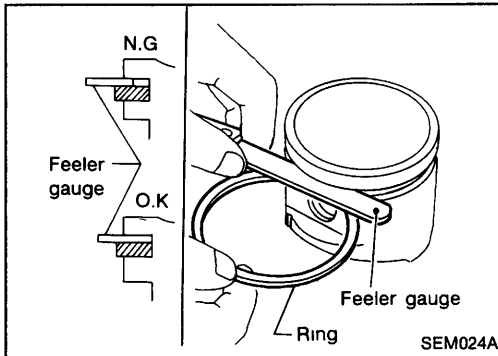
LC

EF &

EC

FE

CL



PISTON RING END GAP

End gap:

Top ring 0.20 - 0.30 mm (0.0079 - 0.0118 in)

2nd ring 0.35 - 0.50 mm (0.0138 - 0.0197 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.

MT

AT

FA

RA

CONNECTING ROD BEND AND TORSION

Bend:

Limit 0.15 mm (0.0059 in)

per 100 mm (3.94 in) length

Torsion:

Limit 0.30 mm (0.0118 in)

per 100 mm (3.94 in) length

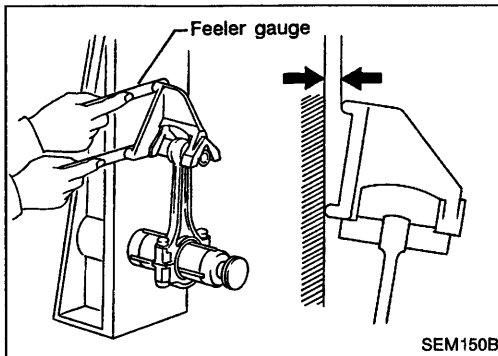
If it exceeds the limit, replace connecting rod assembly.

BR

ST

BF

HA



CYLINDER BLOCK DISTORTION AND WEAR

1. Clean upper face of cylinder block and measure the distortion.

Standard:

Less than 0.03 mm (0.0012 in)

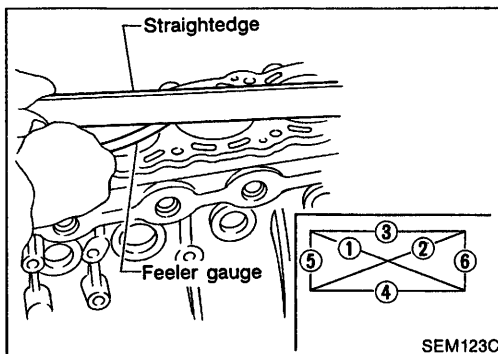
Limit:

0.10 mm (0.0039 in)

2. If out of specification, resurface it.

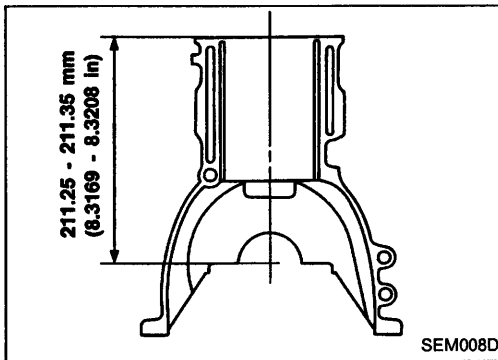
The resurfacing limit is determined by cylinder head resurfacing in engine.

EL



CYLINDER BLOCK

Inspection (Cont'd)



Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

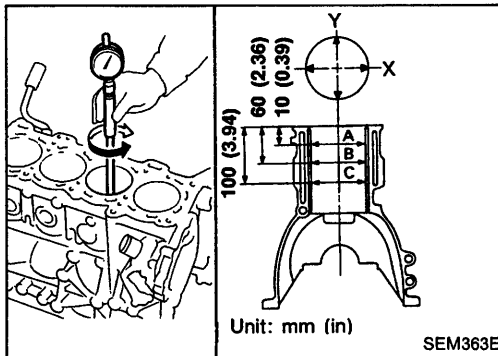
$$A + B = 0.2 \text{ mm (0.008 in)}$$

Nominal cylinder block height

from crankshaft center:

$$211.25 - 211.35 \text{ mm (8.3169 - 8.3208 in)}$$

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:

$$86.000 - 86.030 \text{ mm (3.3858 - 3.3870 in)}$$

Wear limit: 0.20 mm (0.0079 in)

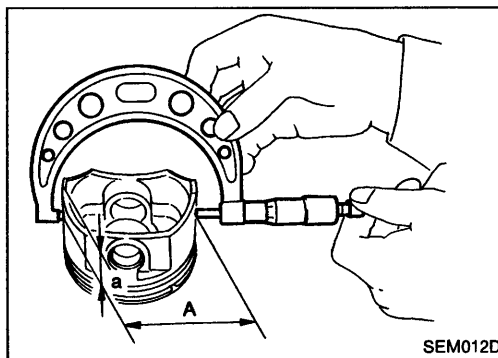
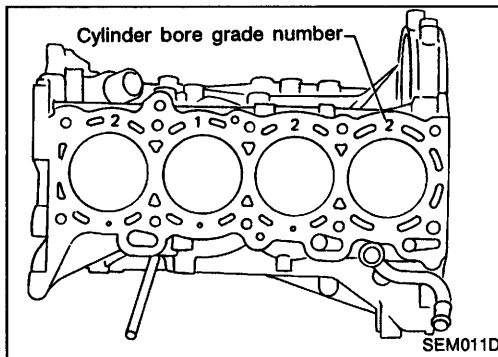
Out-of-round limit: 0.015 mm (0.0006 in)

Taper limit: 0.010 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.

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



3. Measure piston skirt diameter.

Piston diameter "A": Refer to S.D.S.

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

$$11.0 \text{ mm (0.433 in)}$$

4. Check that piston-to-bore clearance is within specification.

Piston-to-bore clearance "B":

$$0.010 - 0.030 \text{ mm (0.0004 - 0.0012 in)}$$

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.

CYLINDER BLOCK

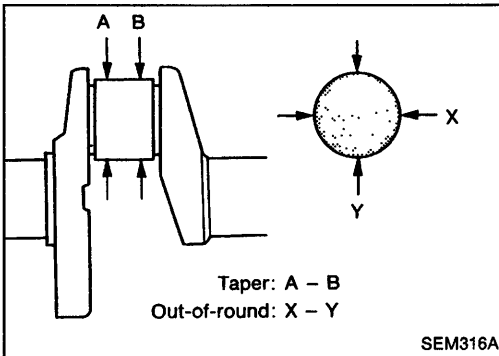
Inspection (Cont'd)

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.

GI

MA

EM



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 0.005 mm (0.0002 in)

LC

EF &
EC

FE

CL

3. Measure crankshaft runout.

Runout (Total indicator reading):

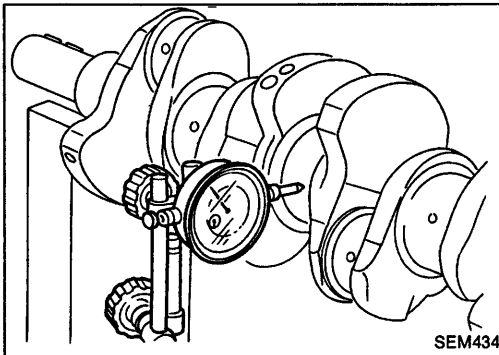
Less than 0.05 mm (0.0020 in)

MT

AT

FA

RA



BEARING CLEARANCE

- Either of the following two methods may be used, however, method "A" gives more reliable results and is preferable.

Method A (Using bore gauge & micrometer)

Main bearing

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

BR

ST

BF

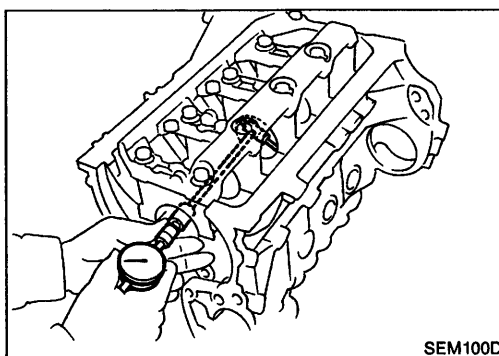
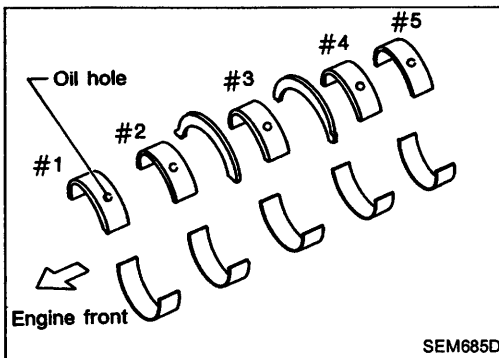
HA

2. Install main bearing cap and main bearing beam to cylinder block.

Tighten all bolts in correct order in two or three stages.

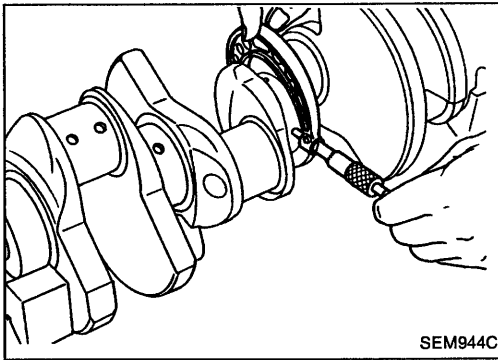
3. Measure inner diameter "A" of each main bearing.

EL



CYLINDER BLOCK

Inspection (Cont'd)



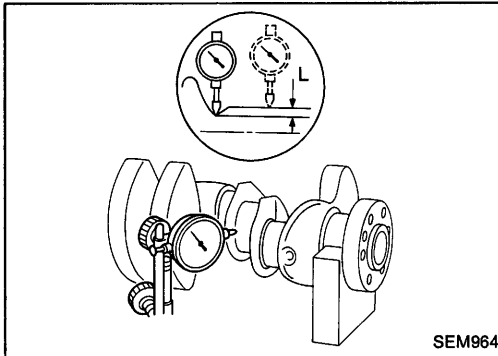
4. Measure outer diameter "Dm" of each crankshaft main journal.
5. Calculate main bearing clearance.

$$\text{Main bearing clearance} = A - D_m$$

Standard: 0.004 - 0.022 mm (0.0002 - 0.0009 in)

Limit: 0.050 mm (0.0020 in)

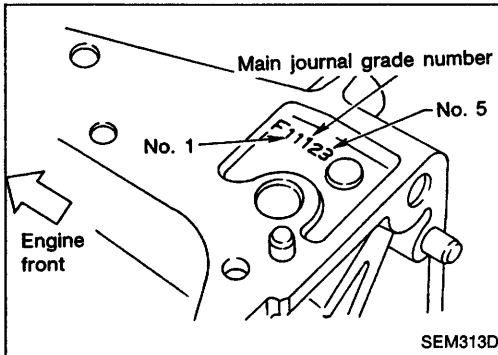
6. If it exceeds the limit, replace bearing.
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing.



- a. When grinding crankshaft journal, confirm that "L" dimension in fillet roll is more than the specified limit.

"L": 0.1 mm (0.004 in)

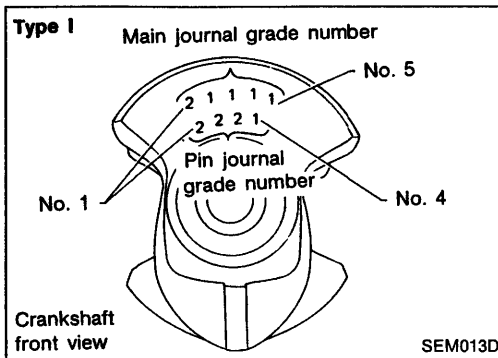
- b. Refer to S.D.S. for grinding crankshaft and available service parts.



8. If crankshaft is reused, measure main bearing clearances and select thickness of main bearings.

If crankshaft is replaced with a new one, 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.



- 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.

How to select main bearings (Identification mark and color)

Crankshaft journal grade number	Main journal grade number			
	0	1	2	3
0	0 (A, Black)	1 (B, Brown)	2 (C, Green)	3 (D, Yellow)
1	1 (B, Brown)	2 (C, Green)	3 (D, Yellow)	4 (E, Blue)
2	2 (C, Green)	3 (D, Yellow)	4 (E, Blue)	5 (F, Pink)
3	3 (D, Yellow)	4 (E, Blue)	5 (F, Pink)	6 (G, No color)

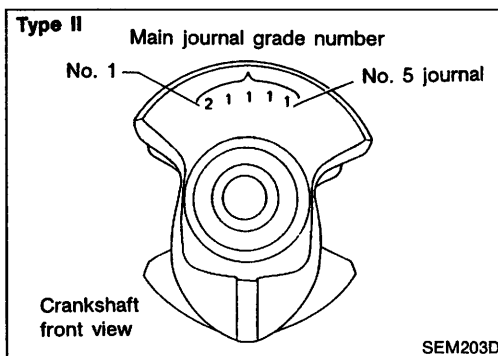
For example:

Main journal grade number: 1

Crankshaft journal grade number: 2

Main bearing grade number = 1 + 2

= 3 (D, Yellow)



CYLINDER BLOCK

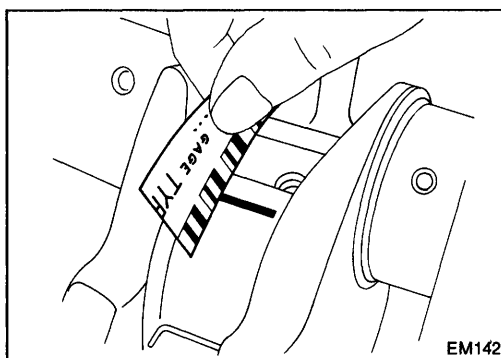
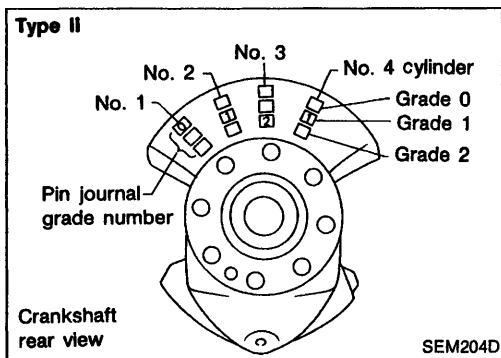
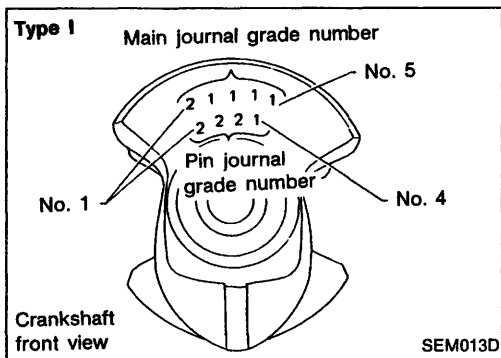
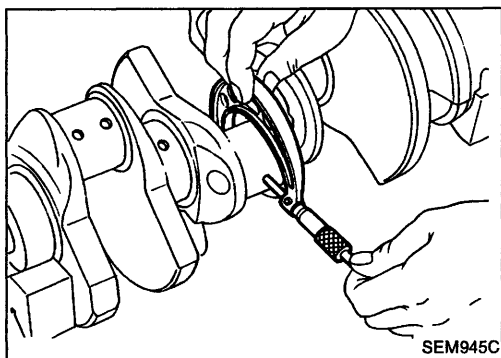
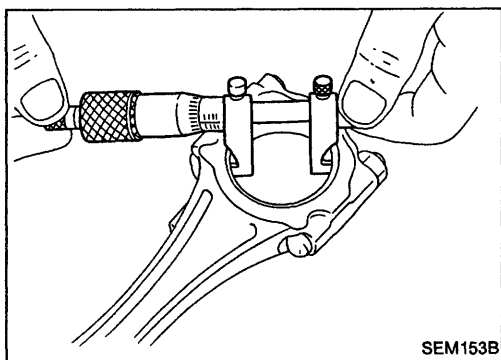
Inspection (Cont'd)

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: 0.020 - 0.045 mm (0.0008 - 0.0018 in)
Limit: 0.090 mm (0.0035 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".

8. If crankshaft 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	0
1	1
2	2

Identification color:

Grade 0; No color

Grade 1; Black

Grade 2; Brown

Method B (Using plastigage)

CAUTION:

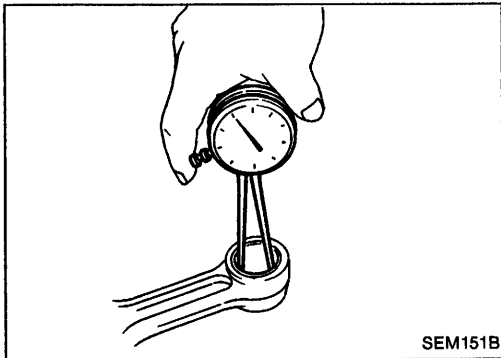
- Do not turn crankshaft or connecting rod while plastigage is being inserted.
- When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. Then if excessive bearing clearance exists, use a thicker main bearing or undersized bearing so that the specified bearing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

CYLINDER BLOCK

Inspection (Cont'd)

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 bushing clearance.
Connecting rod bushing clearance = C - Dp

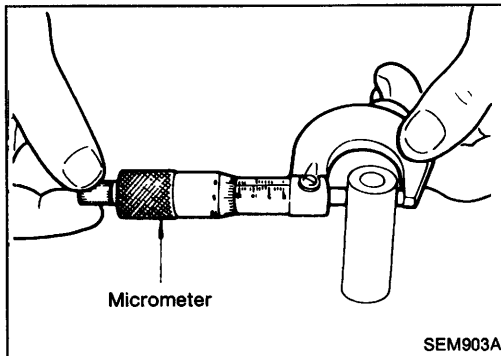
Standard:

0.005 - 0.017 mm (0.0002 - 0.0007 in)

Limit:

0.023 mm (0.0009 in)

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



REPLACEMENT OF CONNECTING ROD BUSHING (Small end)

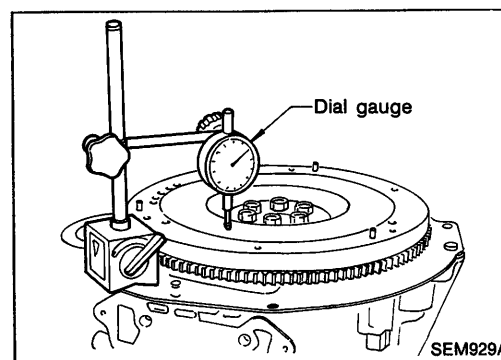
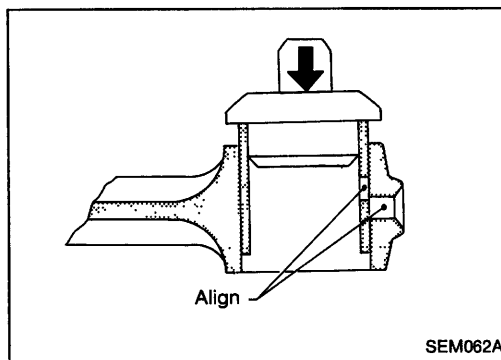
1. Drive in small end bushing until it is flush with end surface of rod.

Be sure to align the oil holes.

2. After driving in small end bushing, ream the bushing so that clearance between connecting rod bushing and piston pin is the 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):

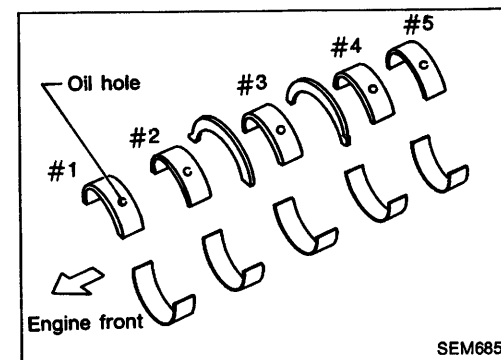
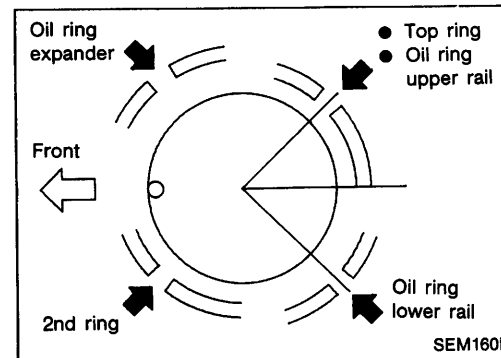
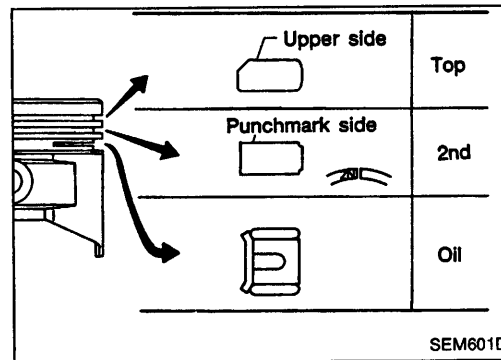
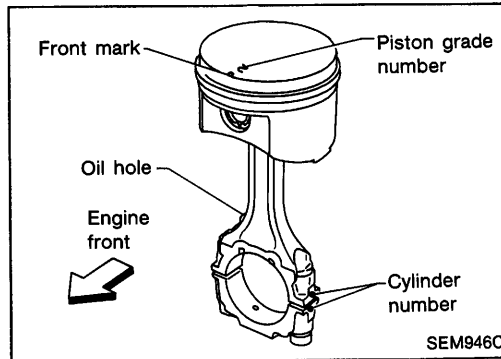
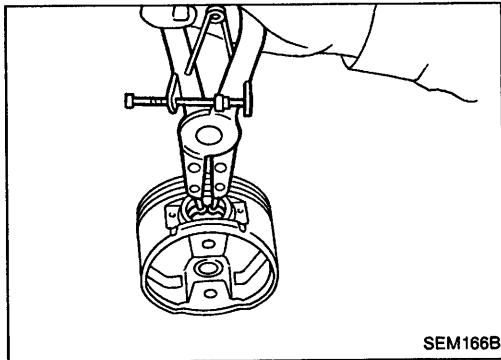
Flywheel (M/T model)

Less than 0.10 mm (0.0039 in)

Drive plate (A/T model)

Less than 0.20 mm (0.0079 in)

CYLINDER BLOCK



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.

3. Set piston rings as shown.

CAUTION:

- When piston rings are not replaced, make sure that piston rings are mounted in their original positions.
- When piston rings are being replaced and no punchmark is present, piston rings can be mounted with either side up.

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" of this section.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

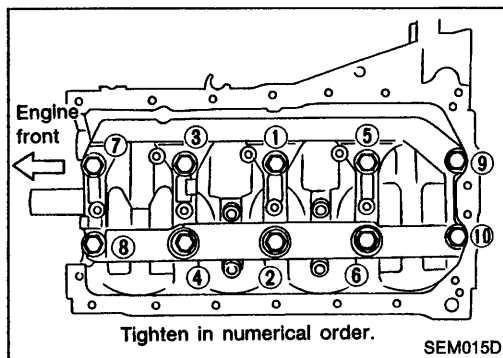
BF

HA

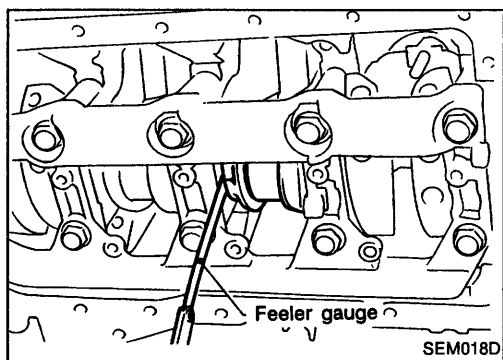
EL

CYLINDER BLOCK

Assembly (Cont'd)



2. Install crankshaft, main bearing caps and beam 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.
 - Tightening procedure
 - 1) Tighten bolts to 32 to 38 N·m (3.3 to 3.9 kg-m, 24 to 28 ft-lb).
 - 2) Turn bolts 45 to 50 degrees clockwise or if angle wrench is not available, tighten bolts to 73 to 82 N·m (7.4 to 8.4 kg-m, 54 to 61 ft-lb).
 - After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.



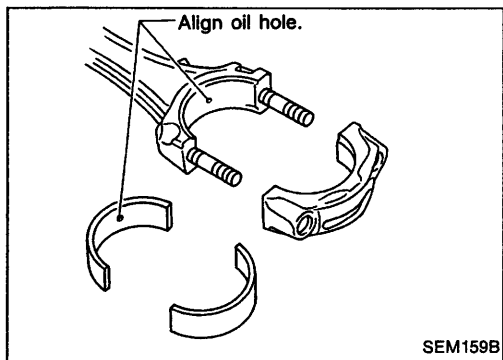
3. Measure crankshaft end play.

Crankshaft end play:

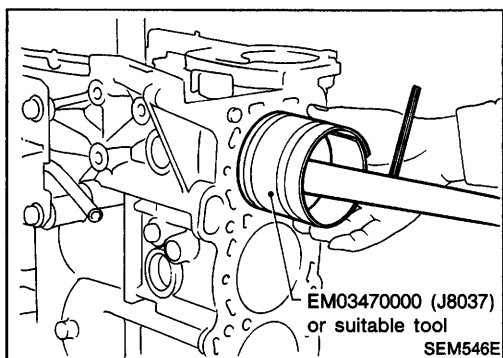
Standard
0.10 - 0.26 mm (0.0039 - 0.0102 in)

Limit
0.30 mm (0.0118 in)

If beyond the limit, replace thrust bearings with new ones.



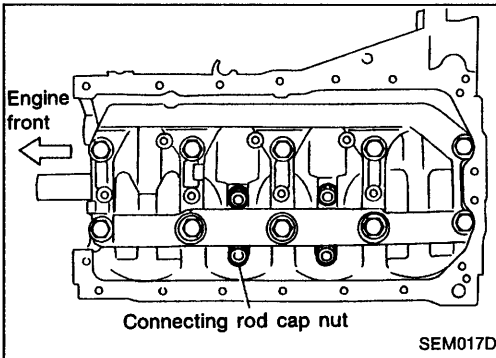
4. Install connecting rod bearings in connecting rods and connecting rod caps.
 - Confirm that correct bearings are used. Refer to "Inspection".
 - Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.



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.

CYLINDER BLOCK

Assembly (Cont'd)



- b. Install connecting rod caps.
Tighten connecting rod cap nuts to the specified torque.

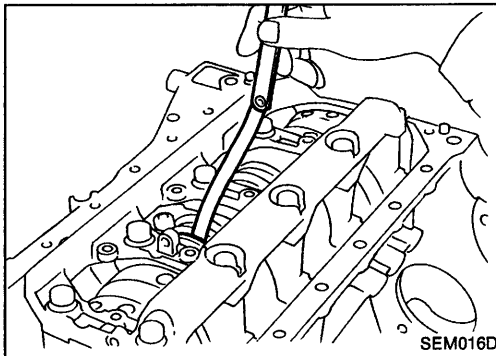
Tightening procedure:

- 1) Tighten nuts to 14 to 16 N·m (1.4 to 1.6 kg-m, 10 to 12 ft-lb).
- 2) Turn nuts 60 to 65 degrees clockwise or if angle wrench is not available, tighten nuts to 38 to 44 N·m (3.9 to 4.5 kg-m, 28 to 33 ft-lb).

GI

MA

EM



6. Measure connecting rod side clearance.

Connecting rod side clearance:

Standard

0.20 - 0.35 mm (0.0079 - 0.0138 in)

Limit

0.50 mm (0.0197 in)

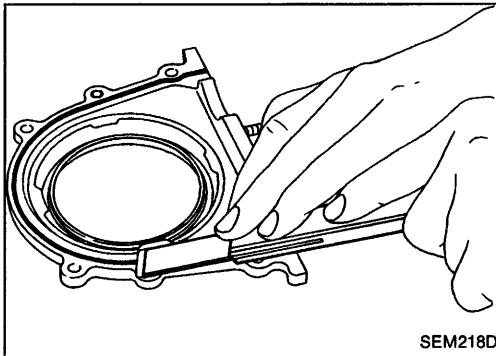
If beyond the limit, replace connecting rod and/or crankshaft.

LC

EF &
EC

FE

CL



7. Install rear oil seal retainer.

- (1) Before installing rear oil seal retainer, remove all traces of liquid gasket from mating surface using a scraper.

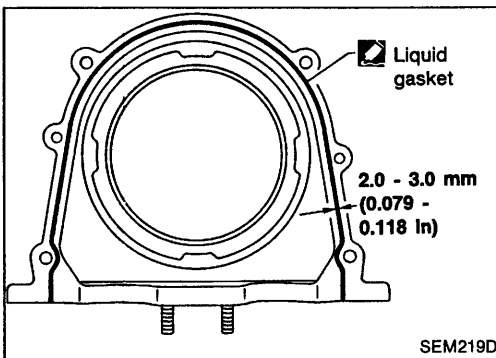
- Also remove traces of liquid gasket from mating surface of cylinder block.

MT

AT

FA

RA



- (2) Apply a continuous bead of liquid gasket to mating surface of rear oil seal retainer.

- Use Genuine Liquid Gasket or equivalent.

BR

ST

BF

HA

EL

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

Cylinder arrangement	In-line 4	
Displacement	cm ³ (cu in)	1,998 (121.92)
Bore and stroke	mm (in)	86 x 86 (3.39 x 3.39)
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	9.5	

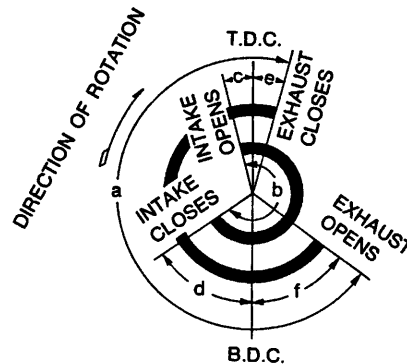
COMPRESSION PRESSURE

Unit: kPa (kg/cm², psi)/300 rpm

Compression pressure

Standard	1,226 (12.5, 178)
Minimum	1,030 (10.5, 149)
Differential limit between cylinders	98 (1.0, 14)

Valve timing



EM120
Unit: degree

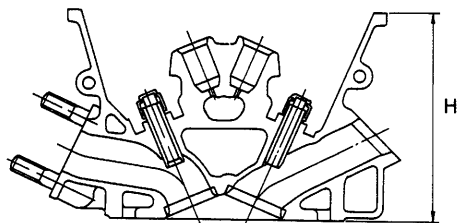
a	b	c	d	e	f
240°	248°	13°	55°	3°	57°

Inspection and Adjustment

CYLINDER HEAD

Unit: mm (in)

	Standard	Limit
Head surface distortion	Less than 0.03 (0.0012)	0.1 (0.004)



Nominal cylinder head height:
H = 136.9 - 137.1 (5.390 - 5.398)

SEM956C

Valve spring

Free height	mm (in)	49.36 (1.9433)
Pressure	N (kg, lb) at height mm (in)	
Standard		569.00 - 641.57 (58.02 - 65.42, 127.93 - 144.25) at 30.0 (1.181)
Limit		549.2 (56.0, 123.5) at 30.0 (1.181)
Out-of-square	mm (in)	Less than 2.2 (0.087)

Hydraulic lash adjuster (H.L.A.)

Unit: mm (in)

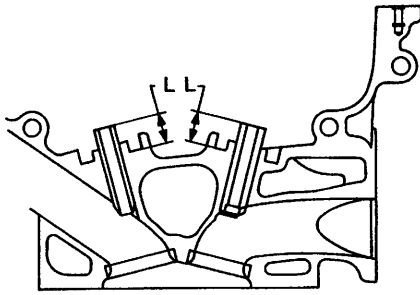
H.L.A. outer diameter	16.980 - 16.993 (0.6685 - 0.6690)
H.L.A. guide inner diameter	17.000 - 17.020 (0.6693 - 0.6701)
Clearance between H.L.A. and H.L.A. guide	0.007 - 0.040 (0.0003 - 0.0016)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

Valve guide

Unit: mm (in)

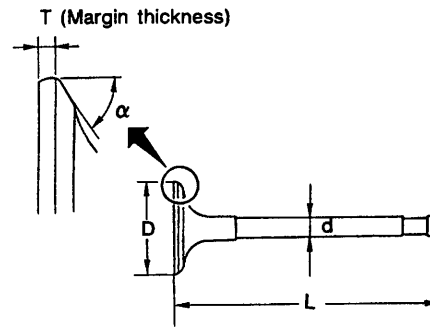


SEM083D

		Standard	Service
Valve guide			
Outer diameter	Intake	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
	Exhaust	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
Valve guide			
Inner diameter (Finished size)	Intake	6.000 - 6.018 (0.2362 - 0.2369)	
	Exhaust	6.000 - 6.018 (0.2362 - 0.2369)	
Cylinder head valve guide hole diameter	Intake	9.975 - 9.996 (0.3927 - 0.3935)	10.175 - 10.196 (0.4006 - 0.4014)
	Exhaust	9.975 - 9.996 (0.3927 - 0.3935)	10.175 - 10.196 (0.4006 - 0.4014)
Interference fit of valve guide		0.027 - 0.059 (0.0011 - 0.0023)	
		Standard	Limit
Stem to guide clearance	Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.1 (0.004)
	Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)
Valve deflection limit		0.2 (0.008)	
Projection length "L"		14.0 - 14.2 (0.551 - 0.559)	

VALVE

Unit: mm (in)



SEM188

Valve head diameter "D"		
Intake	34.0 - 34.2 (1.339 - 1.346)	EF & EC
Exhaust	30.0 - 30.2 (1.181 - 1.189)	
Valve length "L"		
Intake	101.19 - 101.61 (3.9839 - 4.0004)	FE
Exhaust	102.11 - 102.53 (4.0201 - 4.0366)	CL
Valve stem diameter "d"		
Intake	5.965 - 5.980 (0.2348 - 0.2354)	MT
Exhaust	5.945 - 5.960 (0.2341 - 0.2346)	
Valve seat angle "α"		
Intake	45°15' - 45°45'	AT
Exhaust		FA
Valve margin "T"		
Intake	1.1 (0.043)	RA
Exhaust	1.3 (0.051)	
Valve margin "T" limit		More than 0.5 (0.020)
Valve stem end surface grinding limit		Less than 0.2 (0.008)
Valve clearance		
Intake		ST
Exhaust	0 (0)	BF

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

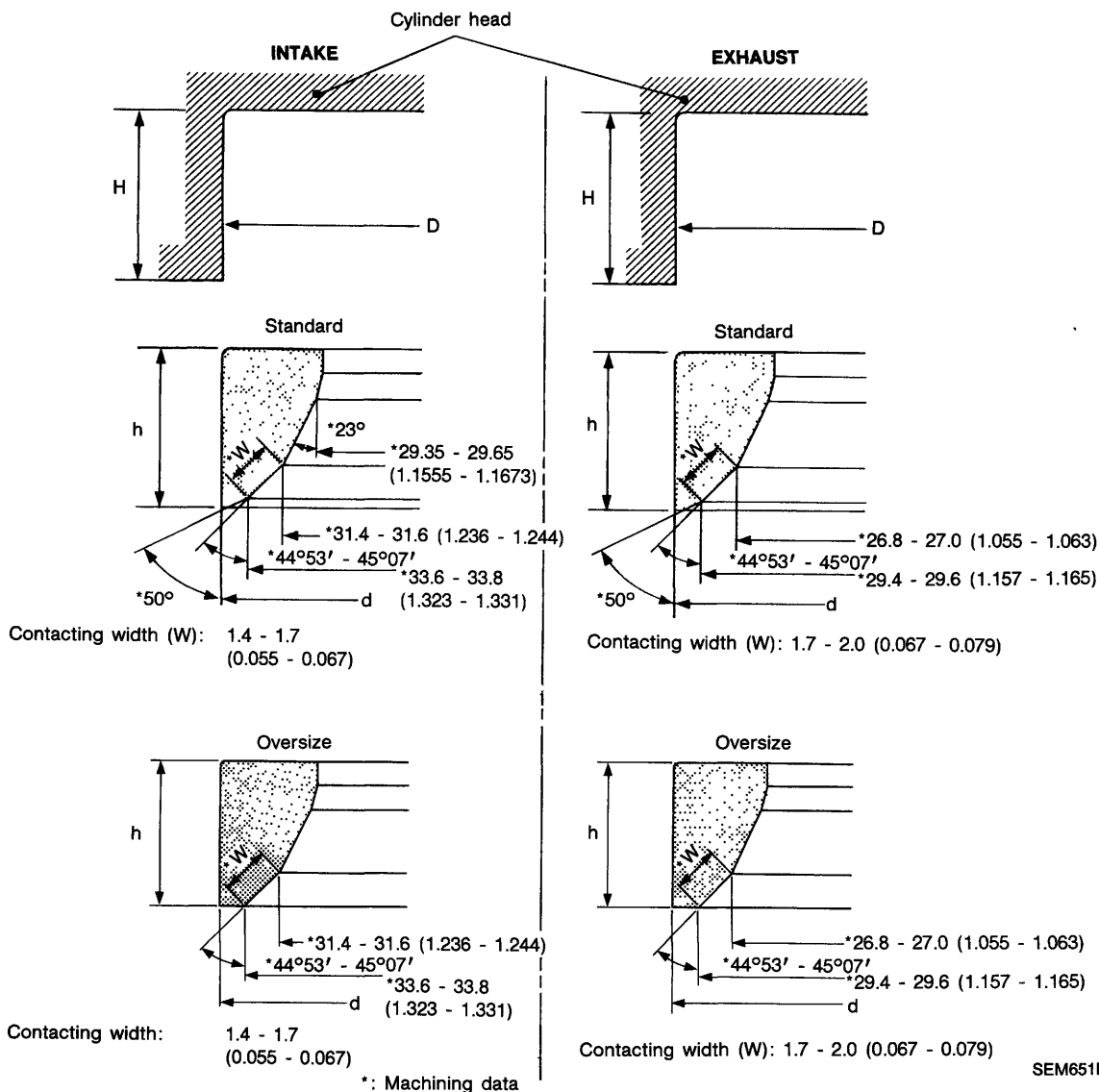
EL

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

Valve seat

Unit: mm (in)



		Standard	Service
Cylinder head seat recess diameter (D)	In.	35.000 - 35.016 (1.3780 - 1.3786)	35.500 - 35.516 (1.3976 - 1.3983)
	Ex.	31.000 - 31.016 (1.2205 - 1.2211)	31.500 - 31.516 (1.2402 - 1.2408)
Valve seat interference fit	In.	0.064 - 0.096 (0.0025 - 0.0038)	
	Ex.	0.064 - 0.096 (0.0025 - 0.0038)	
Valve seat outer diameter (d)	In.	35.080 - 35.096 (1.3811 - 1.3817)	35.580 - 35.596 (1.4008 - 1.4014)
	Ex.	31.080 - 31.096 (1.2236 - 1.2242)	31.580 - 31.596 (1.2433 - 1.2439)
Depth (H)	In.	6.25 (0.2461)	
	Ex.	6.25 (0.2461)	
Height (h)		6.2 - 6.3 (0.244 - 0.248)	5.4 - 5.5 (0.213 - 0.217)

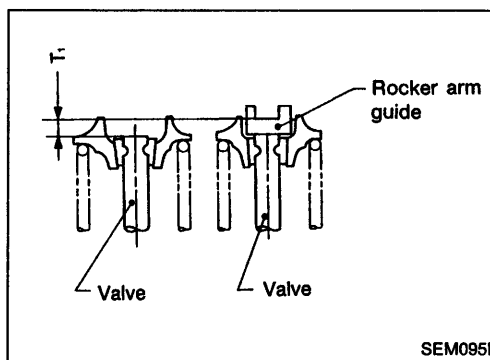
SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

Valve clearance adjustment

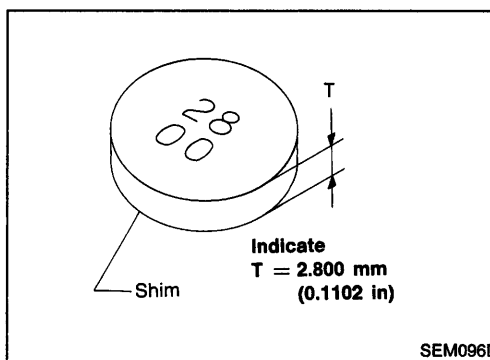
Unit: mm (in)

Valve clearance	
Intake	0 (0)
Exhaust	0 (0)
Valve clearance	
Adjustment valve limit [(T) - (T ₁)]	$-0.025 (-0.0010) \leq$ $[(T) - (T_1)] \leq 0.025 (0.0010)$



Available shim

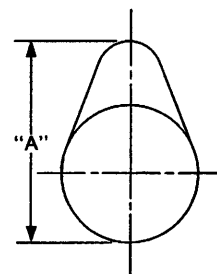
Thickness mm (in)	Identification mark
2.800 (0.1102)	28 00
2.825 (0.1112)	28 25
2.850 (0.1122)	28 50
2.875 (0.1132)	28 75
2.900 (0.1142)	29 00
2.925 (0.1152)	29 25
2.950 (0.1161)	29 50
2.975 (0.1171)	29 75
3.000 (0.1181)	30 00
3.025 (0.1191)	30 25
3.050 (0.1201)	30 50
3.075 (0.1211)	30 75
3.100 (0.1220)	31 00
3.125 (0.1230)	31 25
3.150 (0.1240)	31 50
3.175 (0.1250)	31 75
3.200 (0.1260)	32 00



CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

	Standard	Limit
Camshaft journal to bearing clearance	0.045 - 0.086 (0.0018 - 0.0034)	0.12 (0.0047)
Inner diameter of camshaft bearing	28.000 - 28.021 (1.1024 - 1.1032)	—
Outer diameter of camshaft journal	27.935 - 27.955 (1.0998 - 1.1006)	—
Camshaft runout [T.I.R.*]	Less than 0.02 (0.0008)	0.1 (0.004)
Camshaft sprocket runout [T.I.R.*]	Less than 0.25 (0.0098)	—
Camshaft end play	0.055 - 0.139 (0.0022 - 0.0055)	0.20 (0.0079)



EM671

Cam height "A"

Intake	38.408 - 38.598 (1.5121 - 1.5196)
Exhaust	37.920 - 38.110 (1.4929 - 1.5004)
Wear limit of cam height	0.2 (0.008)
Valve lift	
Intake	10.0 (0.394)
Exhaust	9.2 (0.362)

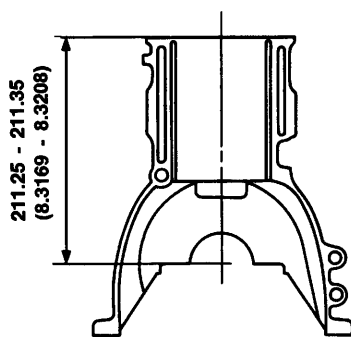
*Total indicator reading

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

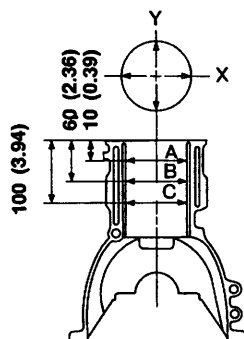
Inspection and Adjustment (Cont'd)

CYLINDER BLOCK

Unit: mm (in)



SEM964E



SEM686D

Surface flatness

Standard	Less than 0.03 (0.0012)
Limit	0.10 (0.0039)

Cylinder bore

Inner diameter

Standard

Grade No. 1	86.000 - 86.010 (3.3858 - 3.3862)
Grade No. 2	86.010 - 86.020 (3.3862 - 3.3866)
Grade No. 3	86.020 - 86.030 (3.3866 - 3.3870)

Wear limit	0.20 (0.0079)
------------	---------------

Out-of-round (X - Y)	Less than 0.015 (0.0006)
----------------------	--------------------------

Taper (A - B - C)	Less than 0.010 (0.0004)
-------------------	--------------------------

Difference in inner diameter between cylinders

Limit	Less than 0.05 (0.0020)
-------	-------------------------

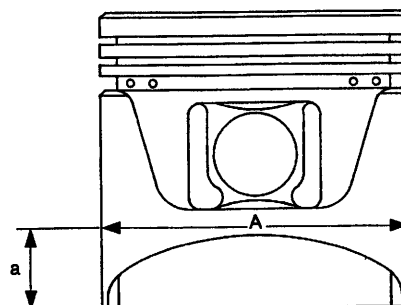
Main journal inner diameter

Grade No. 0	58.944 - 58.950 (2.3206 - 2.3209)
Grade No. 1	58.950 - 58.956 (2.3209 - 2.3211)
Grade No. 2	58.956 - 58.962 (2.3211 - 2.3213)
Grade No. 3	58.962 - 58.968 (2.3213 - 2.3216)

PISTON, PISTON RING AND PISTON PIN

Available piston

Unit: mm (in)



SEM750C

Piston skirt diameter "A"

Standard

Grade No. 1	85.980 - 85.990 (3.3850 - 3.3854)
Grade No. 2	85.990 - 86.000 (3.3854 - 3.3858)
Grade No. 3	86.000 - 86.010 (3.3858 - 3.3862)
0.20 (0.0079) over-size (Service)	86.180 - 86.210 (3.3929 - 3.3941)

"a" dimension	11.0 (0.433)
---------------	--------------

Piston clearance to cylinder block	0.010 - 0.030 (0.0004 - 0.0012)
------------------------------------	---------------------------------

Piston pin hole diameter	21.987 - 21.999 (0.8656 - 0.8661)
--------------------------	-----------------------------------

Piston ring

Unit: mm (in)

	Standard	Limit
Side clearance		
Top	0.045 - 0.080 (0.0018 - 0.0031)	0.2 (0.008)
2nd	0.030 - 0.065 (0.0012 - 0.0026)	
End gap		
Top	0.20 - 0.30 (0.0079 - 0.0118)	1.0 (0.039)
2nd	0.35 - 0.50 (0.0138 - 0.0197)	
Oil (rail ring)	0.20 - 0.60 (0.0079 - 0.0236)	

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

Piston pin

Unit: mm (in)

Piston pin outer diameter	21.989 - 22.001 (0.8657 - 0.8662)
Interference fit of piston pin to piston	0 - 0.004 (0 - 0.0002)
Piston pin to connecting rod bushing clearance	
Standard	0.005 - 0.017 (0.0002 - 0.0007)
Limit	0.023 (0.0009)

* Values measured at ambient temperature of 20°C (68°F)

CONNECTING ROD

Unit: mm (in)

Center distance	136.30 (5.3661)
Bend, torsion [per 100 (3.94)]	
Limit	0.15 (0.0059)
Torsion [per 100 (3.94)]	
Limit	0.3 (0.0012)
Connecting rod small end inner diameter	24.980 - 25.000 (0.9835 - 0.9843)
Piston pin bushing inner diameter*	22.000 - 22.012 (0.8661 - 0.8666)
Connecting rod big end inner diameter	51.000 - 51.013 (2.0079 - 2.0084)
Side clearance	
Standard	0.20 - 0.35 (0.0079 - 0.0138)
Limit	0.5 (0.020)

*After installing in connecting rod

CRANKSHAFT

Unit: mm (in)

Main journal dia. "Dm"

Grade No. 0	54.974 - 54.980 (2.1643 - 2.1646)
Grade No. 1	54.968 - 54.974 (2.1641 - 2.1643)
Grade No. 2	54.962 - 54.968 (2.1639 - 2.1641)
Grade No. 3	54.956 - 54.962 (2.1636 - 2.1639)

Pin journal dia. "Dp"

Grade No. 0	47.968 - 47.974 (1.8885 - 1.8887)
Grade No. 1	47.962 - 47.968 (1.8883 - 1.8885)
Grade No. 2	47.956 - 47.962 (1.8880 - 1.8883)

Center distance "r"

47.2 (1.858)

Out-of-round (X - Y)

Standard	Less than 0.005 (0.0002)
----------	--------------------------

Taper (A - B)

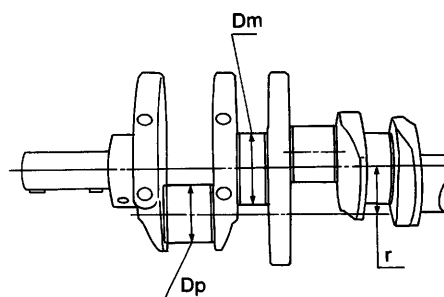
Standard	Less than 0.005 (0.0002)
----------	--------------------------

Runout [T.I.R.]

Standard	Less than 0.025 (0.0010)
Limit	Less than 0.05 (0.0020)

Free end play

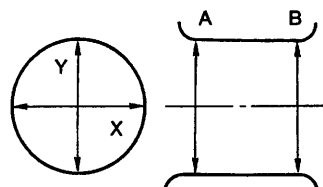
Standard	0.10 - 0.26 (0.0039 - 0.0102)
Limit	0.30 (0.0118)



SEM954C

Out-of-round
Taper

X - Y
A - B

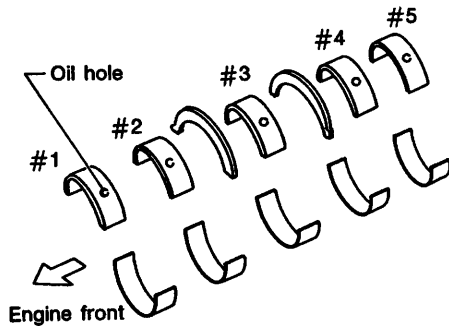


EM715

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

AVAILABLE MAIN BEARING



SEM685D

Main bearing (Standard)

Unit: mm (in)

Grade number	Thickness "T"	Width "W"	Identification color (mark)
0	1.977 - 1.980 (0.0778 - 0.0780)	18.9 - 19.1 (0.744 - 0.752)	Black (A)
1	1.980 - 1.983 (0.0780 - 0.0781)		Brown (B)
2	1.983 - 1.986 (0.0781 - 0.0782)		Green (C)
3	1.986 - 1.989 (0.0782 - 0.0783)		Yellow (D)
4	1.989 - 1.992 (0.0783 - 0.0784)		Blue (E)
5	1.992 - 1.995 (0.0784 - 0.0785)		Pink (F)
6	1.995 - 1.998 (0.0785 - 0.0787)		No color (G)

Main bearing (Undersize)

Unit: mm (in)

Undersize	Thickness "T"	Main journal diameter "Dm"
0.25 (0.0098)	2.109 - 2.117 (0.0830 - 0.0833)	Grind so that bearing clearance is the specified value.

AVAILABLE CONNECTING ROD BEARING

Connecting rod bearing

Standard size

Unit: mm (in)

Grade number	Thickness "T"	Width "W"	Identification color (mark)
0	1.500 - 1.503 (0.0591 - 0.0592)	16.9 - 17.1 (0.665 - 0.673)	No color (A)
1	1.503 - 1.506 (0.0592 - 0.0593)		Black (B)
2	1.506 - 1.509 (0.0593 - 0.0594)		Brown (C)

Undersize

Unit: mm (in)

Undersize	Thickness "T"	Crank pin journal diameter "Dp"
0.08 (0.0031)	1.541 - 1.549 (0.0607 - 0.0610)	Grind so that bearing clearance is the specified value.
0.12 (0.0047)	1.561 - 1.569 (0.0615 - 0.0618)	
0.25 (0.0098)	1.626 - 1.634 (0.0640 - 0.0643)	

Bearing clearance

Unit: mm (in)

Main bearing clearance		
Standard	0.004 - 0.022 (0.0002 - 0.0009)	
Limit	0.05 (0.0020)	
Connecting rod bearing clearance		
Standard	0.020 - 0.045 (0.0008 - 0.0018)	
Limit	0.09 (0.0035)	

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Camshaft sprocket runout limit [T.I.R.]	0.25 (0.0098)
Flywheel runout limit [T.I.R.]	0.1 (0.004)
Drive plate runout limit [T.I.R.]	0.2 (0.008)

ENGINE LUBRICATION & COOLING SYSTEMS

SECTION **LC**

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

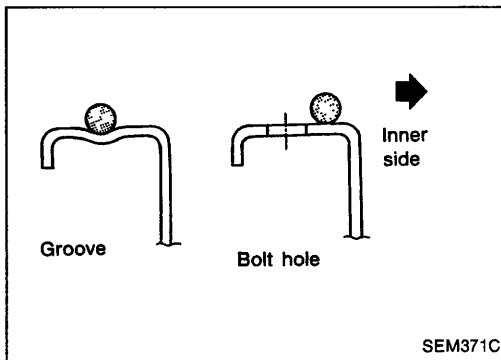
HA

EL

CONTENTS

PRECAUTION	2	System Check.....	8
Liquid Gasket Application Procedure	2	Cooling System Inspection.....	8
PREPARATION	3	Water Pump.....	9
Special Service Tools	3	Thermostat	10
ENGINE LUBRICATION SYSTEM	4	Water Outlet	11
Lubrication Circuit.....	4	Radiator	11
Oil Pressure Check.....	4	Refilling Engine Coolant.....	12
Oil Pump.....	5	SERVICE DATA AND SPECIFICATIONS (S.D.S.)	14
ENGINE COOLING SYSTEM	8	Engine Lubrication System.....	14
Cooling Circuit	8	Engine Cooling System	14

PRECAUTION

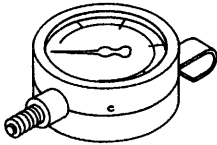
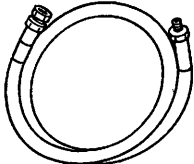
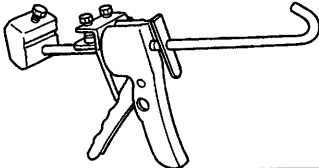
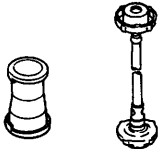


Liquid Gasket Application Procedure

- Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surface and grooves, and then completely clean any oil stains from these portions.
- Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
 - 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).
- Apply liquid gasket to inner surface around hole perimeter area.
(Assembly should be done within 5 minutes after coating.)
- Wait at least 30 minutes before refilling engine oil and engine coolant.

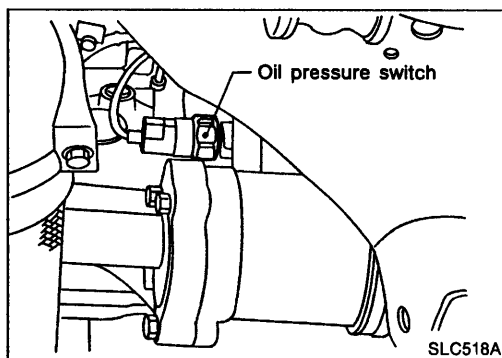
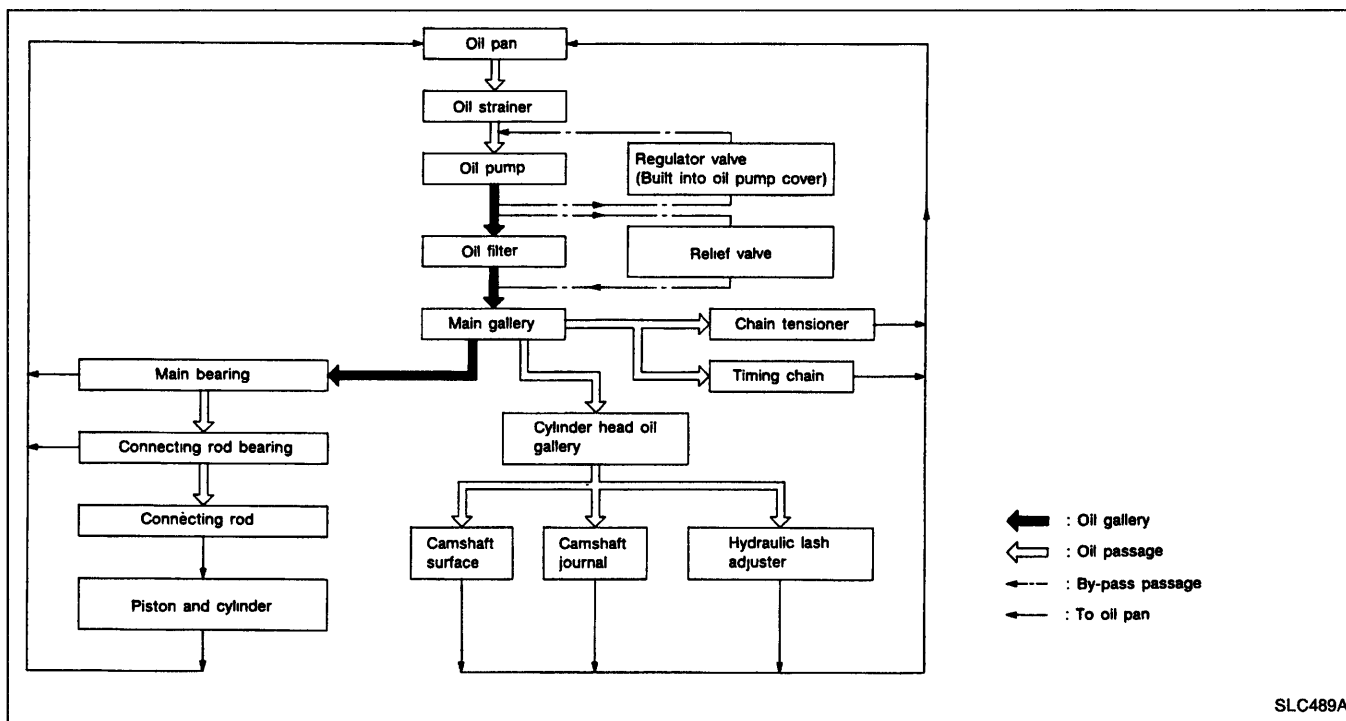
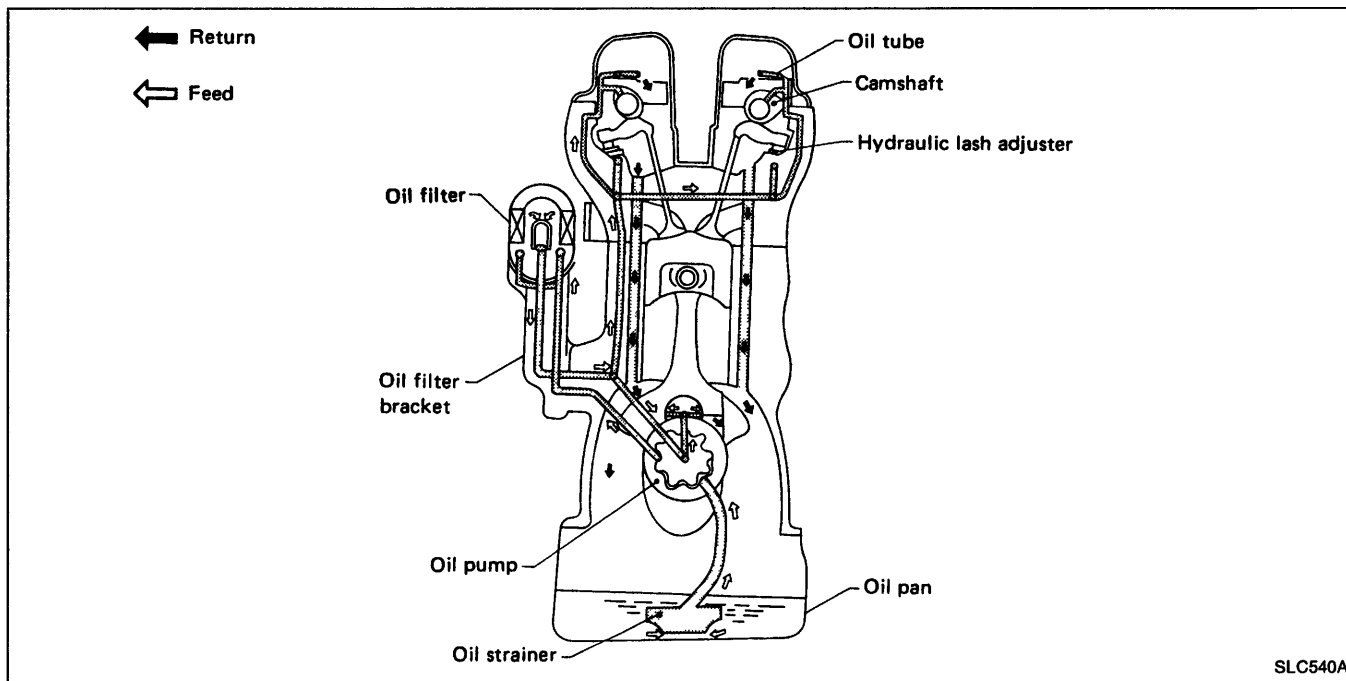
PREPARATION

Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description	
ST25051001 (J25695-1) Oil pressure gauge		GI MA EM
ST25052000 (J25695-2) Hose	 Adapting oil pressure gauge to cylinder block	LC EF & EC
WS39930000 (—) Tube presser	 Pressing the tube of liquid gasket	FE CL
EG17650301 (—) Radiator cap tester adapter	 Adapting radiator cap tester to radiator filler neck	MT AT FA RA BR ST BF HA EL

ENGINE LUBRICATION SYSTEM

Lubrication Circuit

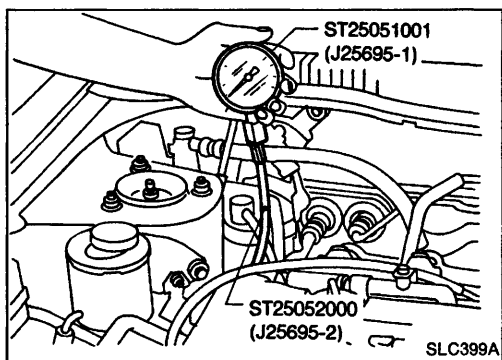


Oil Pressure Check

WARNING:

- Be careful not to burn yourself, as the engine and oil may be hot.
 - Oil pressure check should be done in "Neutral position".
1. Check oil level.
 2. Remove oil pressure switch.

ENGINE LUBRICATION SYSTEM



Oil Pressure Check (Cont'd)

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 speed rpm	Approximate discharge pressure kPa (kg/cm ² , psi)
Idle speed	More than 78 (0.8, 11)
3,200	314 - 392 (3.2 - 4.0, 46 - 57)

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

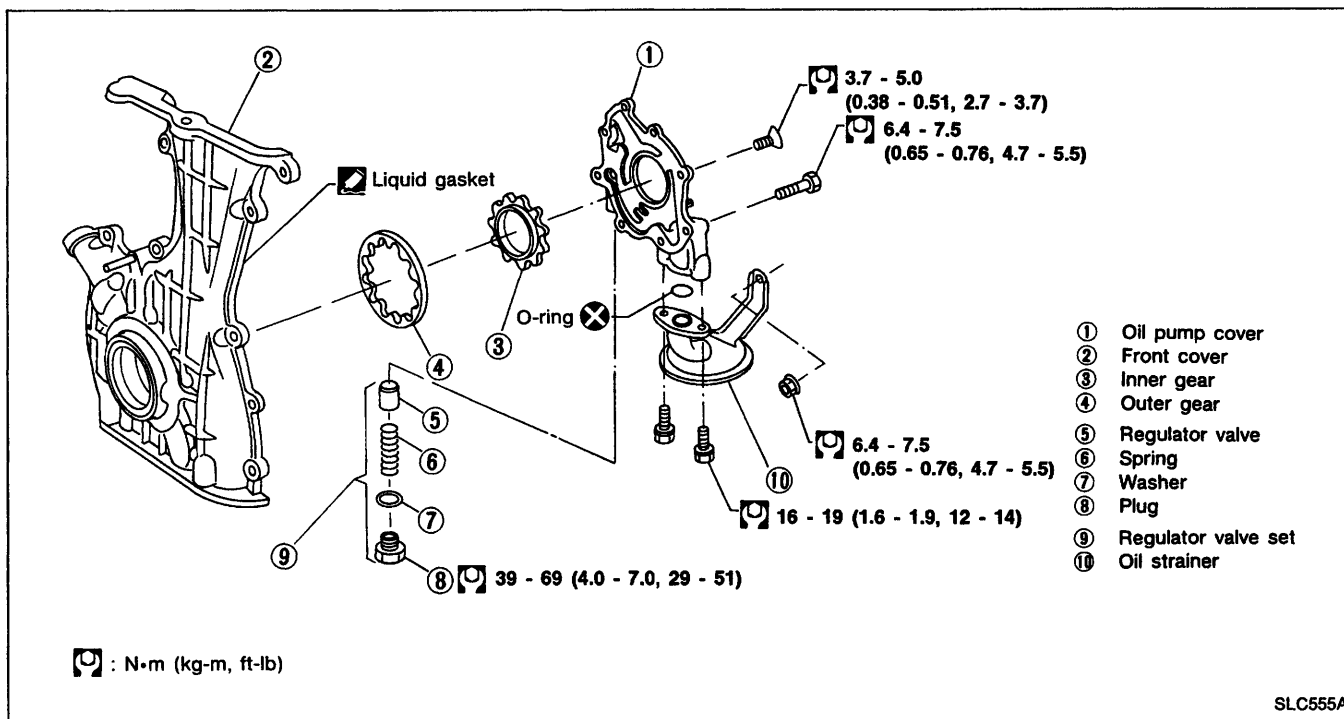
6. Install oil pressure switch with sealant.

Oil Pump

REMOVAL

1. Remove drive belts.
2. Remove cylinder head. (Refer to EM section.)
3. Remove oil pans. (Refer to EM section.)
4. Remove oil strainer and baffle plate.
5. Remove front cover assembly.

DISASSEMBLY AND ASSEMBLY



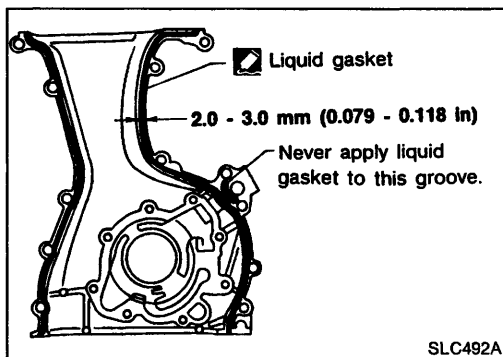
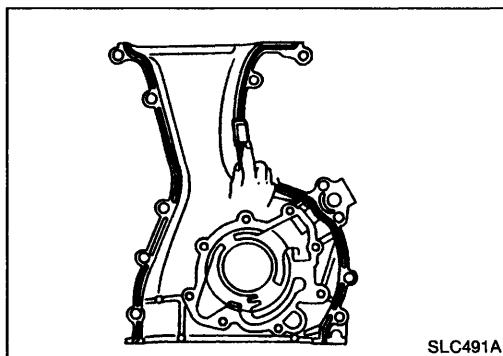
- Always replace oil seal and O-ring with new ones.
- When installing oil pump, apply engine oil to inner and outer gears.
- Be sure that O-rings are properly fitted.

ENGINE LUBRICATION SYSTEM

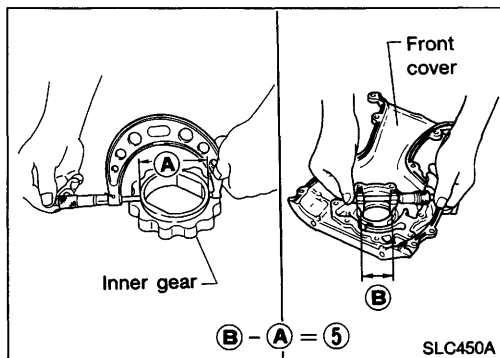
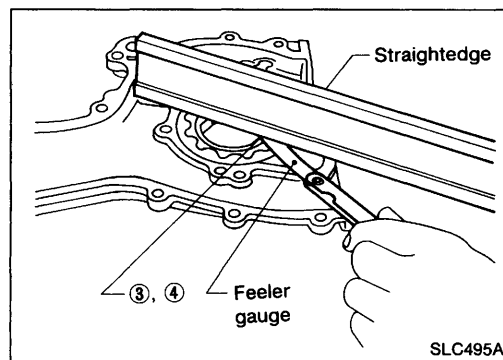
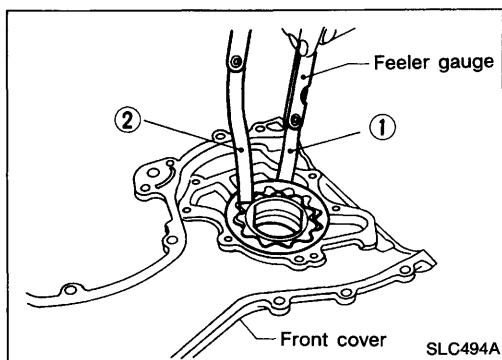
Oil Pump (Cont'd)

INSTALLATION

- Before installing front cover assembly, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.



1. Apply a continuous bead of liquid gasket to mating surface of front cover assembly.
- Use Genuine Liquid Gasket or equivalent.
2. Installation is the reverse order of removal.



SLC860A

ENGINE LUBRICATION SYSTEM

Oil Pump (Cont'd)

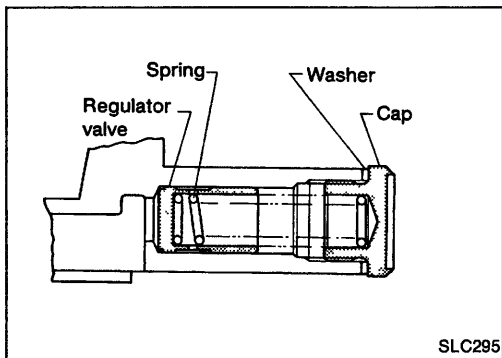
INSPECTION

Using a feeler gauge, check the following clearances:

Unit: mm (in)

Body to outer gear clearance ①	0.114 - 0.200 (0.0045 - 0.0079)	GI
Inner gear to outer gear tip clearance ②	Below 0.18 (0.0071)	MA
Body to inner gear clearance ③	0.05 - 0.09 (0.0020 - 0.0035)	EM
Body to outer gear clearance ④	0.05 - 0.11 (0.0020 - 0.0043)	LC
Inner gear to brazed portion of housing clearance ⑤	0.045 - 0.091 (0.0018 - 0.0036)	EF & EC

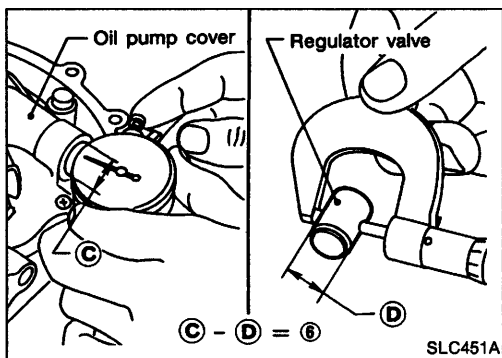
- If the tip clearance (②) exceeds the limit, replace gear set.
- If body to gear clearances (①, ③, ④, ⑤) exceed the limit, replace front cover assembly.



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 cover.

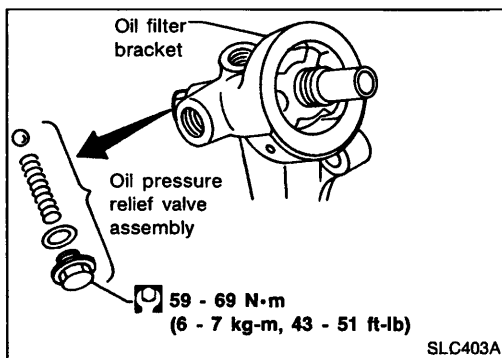


4. Check regulator valve to oil pump cover clearance.

Clearance:

⑥ : 0.040 - 0.097 mm (0.0016 - 0.0038 in)

If it exceeds the limit, replace oil pump cover.

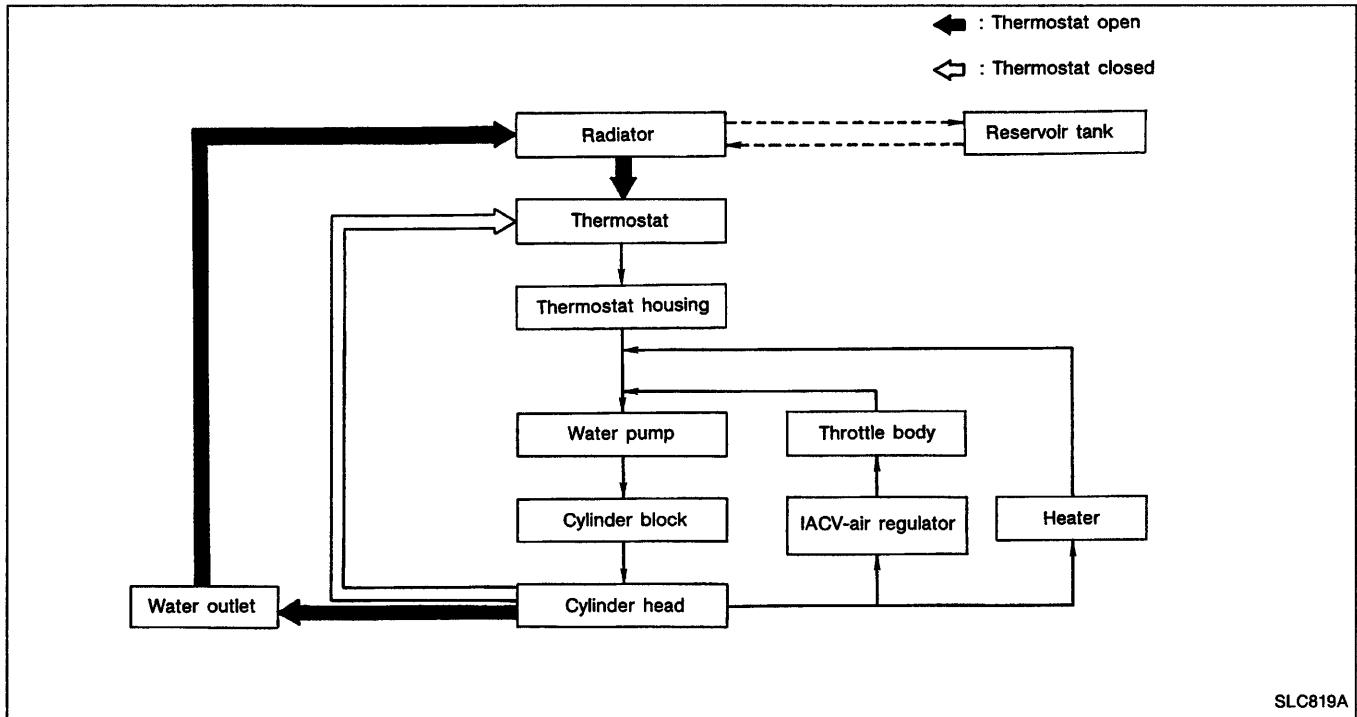


OIL PRESSURE RELIEF VALVE INSPECTION

Inspect oil pressure relief valve for movement, cracks and breaks. If damaged, replace oil filter bracket assembly.

ENGINE COOLING SYSTEM

Cooling Circuit

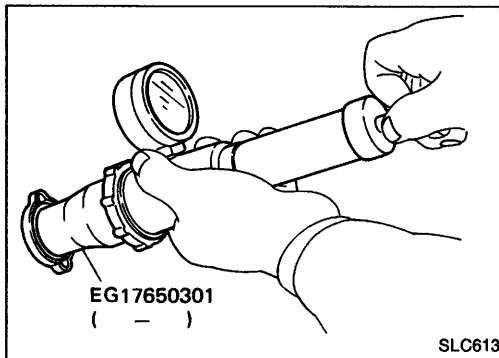


System Check

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 the cap and carefully remove it by turning it a quarter turn to allow built-up pressure to escape and then turn the cap all the way off.



Cooling System Inspection

CHECKING HOSES

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

CHECKING RADIATOR CAP

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

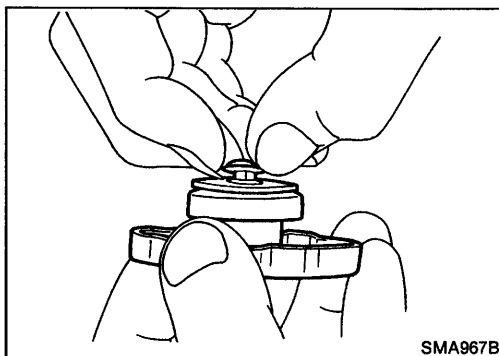
Radiator cap relief pressure:

78 - 98 kPa

(0.8 - 1.0 kg/cm², 11 - 14 psi)

Pull the negative pressure valve to open it.

Check that it closes completely when released.



ENGINE COOLING SYSTEM

Cooling System Inspection (Cont'd)

CHECKING COOLING SYSTEM FOR LEAKS

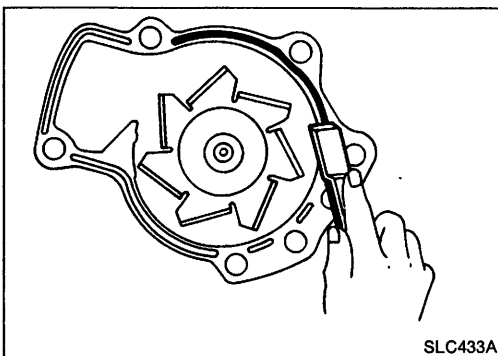
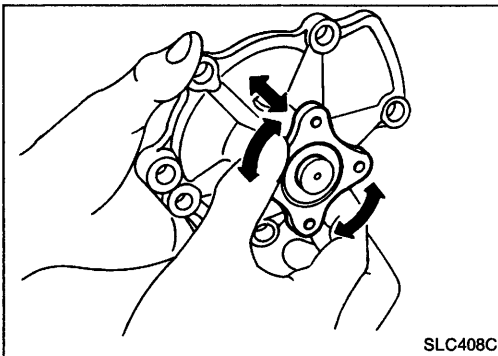
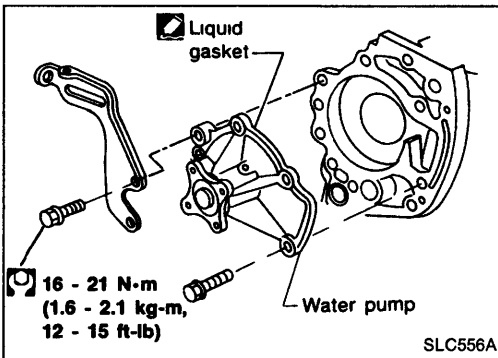
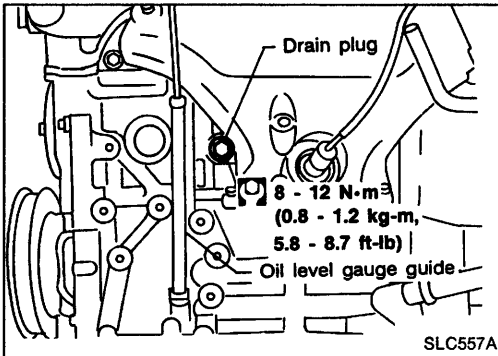
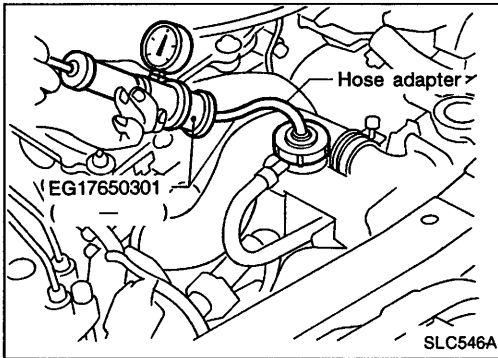
To check for leakage, apply pressure to the cooling system with a tester.

Testing pressure:

157 kPa (1.6 kg/cm², 23 psi)

CAUTION:

Higher than the specified pressure may cause radiator damage.



Water Pump

REMOVAL

1. Drain coolant from radiator.
2. Remove cylinder block drain plug located at left front of cylinder block and drain coolant.
3. Remove front R.H. wheel and engine side cover.
4. Remove drive belts.
5. Remove front engine mounting.

6. Remove water pump.

CAUTION:

- When removing water pump assembly, be careful not to get coolant on drive 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.
2. Check for rough operation due to excessive end play.

INSTALLATION

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

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

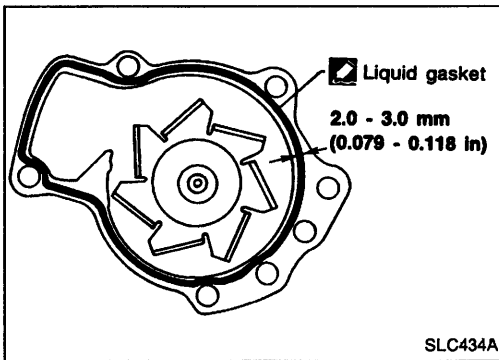
BF

HA

EL

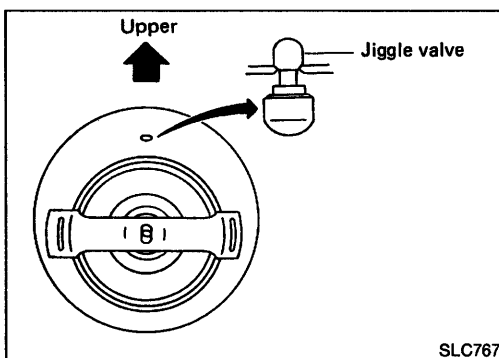
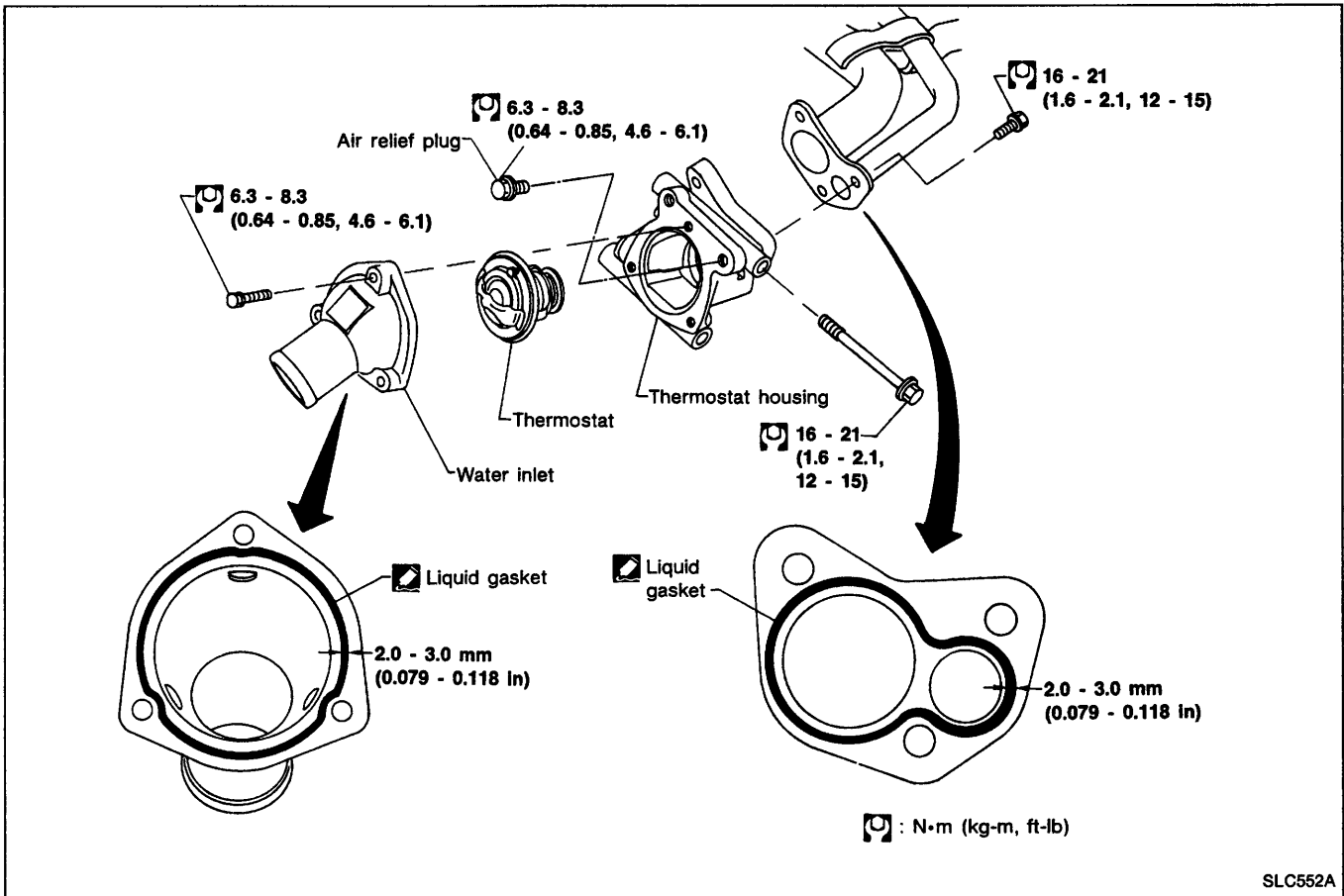
ENGINE COOLING SYSTEM

Water Pump (Cont'd)



2. Apply a continuous bead of liquid gasket to mating surface of water pump.
- Use Genuine Liquid Gasket or equivalent.

Thermostat



REMOVAL AND INSTALLATION

1. Drain engine coolant.
 2. Remove lower radiator hose.
 3. Remove water inlet, then take out thermostat.
 4. Install thermostat with jiggle valve or air bleeder facing upward.
- After installation, run engine for a few minutes, and check for leaks.
 - Be careful not to spill coolant over engine compartment. Use a rag to absorb coolant.

ENGINE COOLING SYSTEM

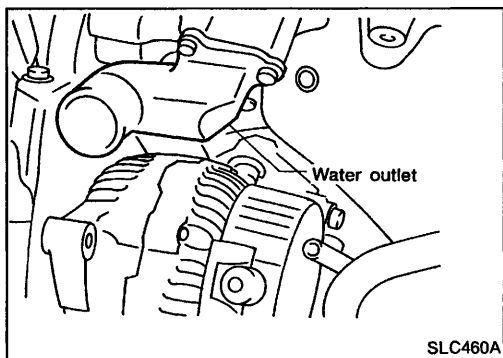
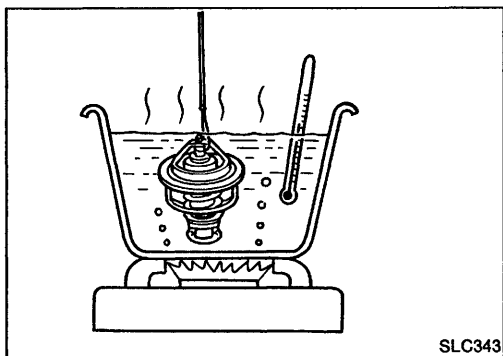
Thermostat (Cont'd)

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)

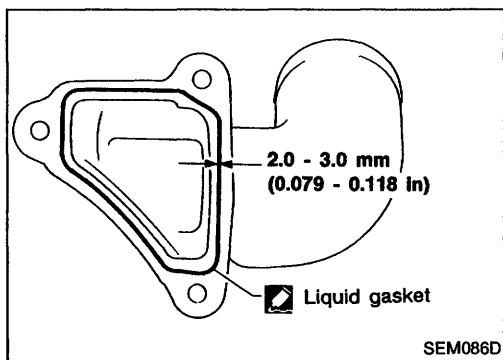
3. Then check if valve closes at 5°C (9°F) below valve opening temperature.



Water Outlet

INSPECTION

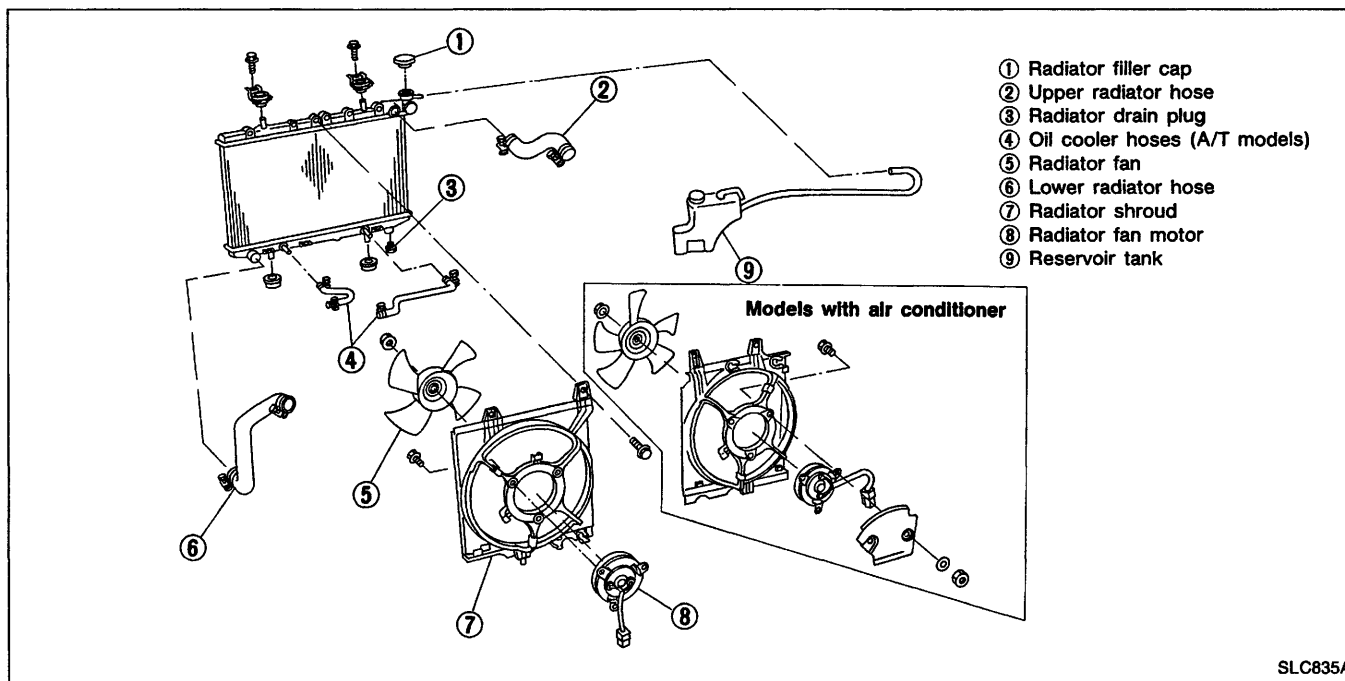
Visually inspect for water leaks. If there is leakage, apply liquid gasket.

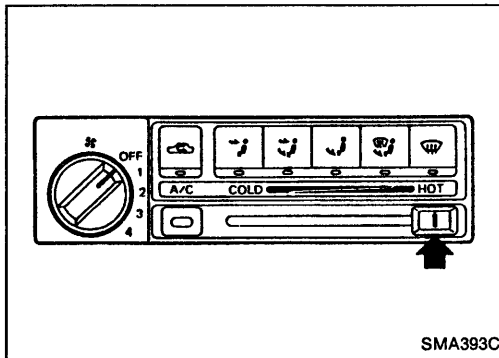


INSTALLATION

1. Before installing water outlet, remove all traces of liquid gasket from mating surface of water outlet using a scraper.
 - Also remove traces of liquid gasket from mating surface of cylinder head.
2. Apply a continuous bead of liquid gasket to mating surface of water outlet.
 - Use Genuine Liquid Gasket or equivalent.

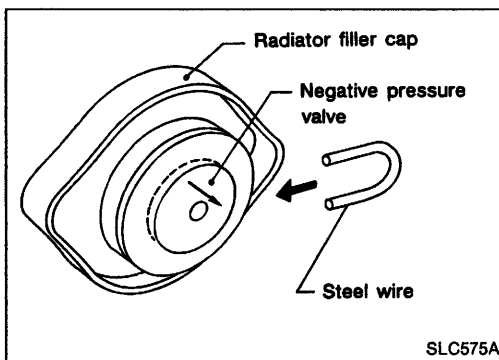
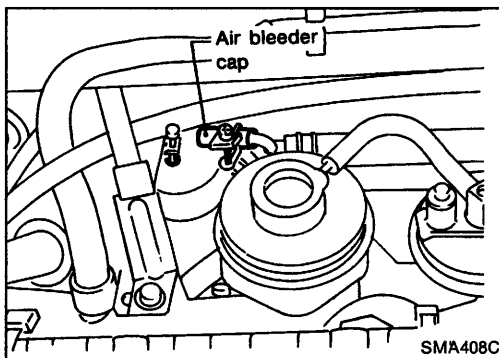
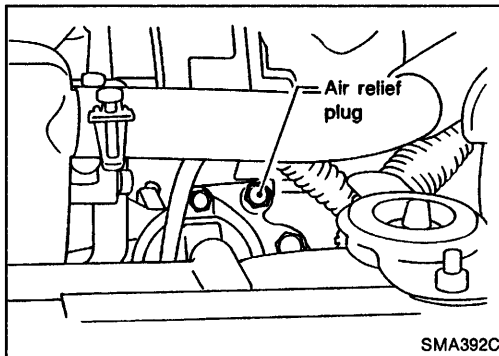
Radiator





Refilling Engine Coolant

1. Set heater temperature control lever to Maximum Hot position.



2. Remove radiator filler cap, air relief plug and air bleeder cap.
3. Fill radiator with coolant and fill reservoir tank to Max line with coolant.
 - Air relief plug is reinstalled once coolant spills from the air relief hole during refill. Then fill radiator and reservoir tank with coolant.
4. Reinstall air bleeder cap.

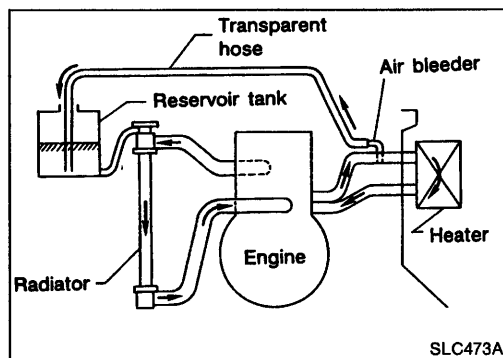
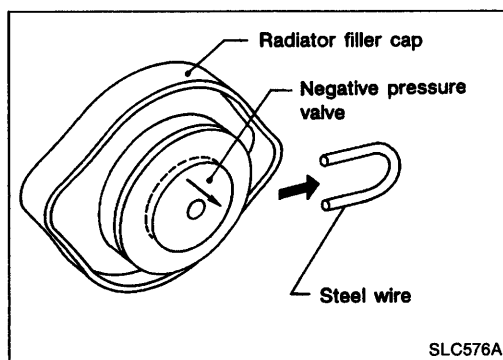
5. Install a temporary radiator filler cap which allows air and coolant in cooling system to be directed into reservoir tank regardless of pressure.
 - Install a suitable steel wire between negative pressure valve and its seat as shown in the picture.
6. Warm up engine to normal operating temperature.
7. Run engine at 2,500 rpm for 10 seconds and return to idle speed.
 - Repeat 2 or 3 times

Watch coolant temperature gauge so as not to overheat the engine.

8. Stop engine and cool it down.
 - Cool down using a fan to reduce the time.
9. Remove the temporary radiator filler cap and check coolant level.
 - If necessary, refill radiator up to filler neck with coolant.
10. Refill reservoir tank to Max line with coolant.
11. Repeat step 7 through step 10 two or more times.

ENGINE COOLING SYSTEM

Refilling Engine Coolant (Cont'd)



12. Install a proper radiator filler cap. (Original radiator filler cap)
13. Warm up engine, and check for sound of coolant flow while running engine from idle up to 4,000 rpm with heater temperature control lever set at several positions between COOL and HOT.

- Sound may be noticeable at heater water cock.

14. If sound is heard, bleed air from cooling system according to the following steps.

- 1) Cool engine down and remove air bleeder cap on heater inlet hose.

- 2) Attach a suitable transparent hose at air bleeder pipe and put the opposite end of the hose into coolant of reservoir tank.

- 3) Install the temporary radiator filler cap and check for proper connection of all coolant related hoses.

- 4) Start engine and check for bubbles in reservoir tank.

- 5) Set heater temperature control lever to max "COOL" position in order to bypass coolant through the transparent hose.

- 6) Run engine up to 2,300 rpm until bubbles disappear in the transparent hose.

Do not run engine over 2,300 rpm because engine may be damaged due to reduced coolant flow.

- 7) After removing bubbles, set heater temperature control lever to max "HOT" position and check for sound of coolant flow.

- 8) If sound is heard, repeat step 5) through step 7).

15. Stop engine and cool it down.

16. Install a proper radiator filler cap. (Original radiator filler cap)

17. Remove the transparent hose and install air bleeder cap.

18. Check any removed parts for secure reinstallation.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Engine Lubrication System

Oil pressure check

Engine speed rpm	Approximate discharge pressure kPa (kg/cm ² , psi)
Idle speed	More than 78 (0.8, 11)
3,200	314 - 392 (3.2 - 4.0, 46 - 57)

Regulator valve inspection

Unit: mm (in)

Regulator valve to oil pump cover clearance	0.040 - 0.097 (0.0016 - 0.0038)
--	---------------------------------

Oil pump inspection

Unit: mm (in)

Body to outer gear clearance	0.114 - 0.200 (0.0045 - 0.0079)
Inner gear to outer gear tip clearance	Below 0.18 (0.0071)
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)
Inner gear to brazed portion of housing clearance	0.045 - 0.091 (0.0018 - 0.0036)

Engine Cooling System

Thermostat

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

ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION **EF & EC**

GI

MA

EM

LC

**EF &
EC**

CONTENTS

PRECAUTIONS AND PREPARATION	3	
Engine Fuel & Emission Control System.....	3	
Special Service Tool.....	3	
ENGINE AND EMISSION CONTROL OVERALL		
SYSTEM	4	
ECCS Component Parts Location.....	4	
System Diagram.....	7	
System Chart.....	8	
Vacuum Hose Drawing.....	9	
Circuit Diagram.....	10	
ENGINE AND EMISSION CONTROL PARTS		
DESCRIPTION	11	
Engine Control Module (ECM)-ECCS Control Module.....	11	
Crankshaft Position Sensor (CKPS).....	11	
Mass Air Flow Sensor (MAFS).....	11	
Engine Coolant Temperature Sensor (ECTS).....	12	
Throttle Position Sensor (TP) & Soft Closed Throttle Position (CTP) Switch.....	12	
Fuel Injector.....	12	
Pressure Regulator.....	13	
Heated Oxygen Sensor (HO2S).....	13	
Fuel Pump.....	13	
Power Transistor & Ignition Coil.....	13	
Idle Air Control Valve (IACV)-Air Regulator.....	14	
Idle Air Adjusting (I.A.A.) Unit.....	14	
Idle Air Control Valve (IACV)-Auxiliary Air Control (AAC) Valve.....	14	
Vehicle Speed Sensor (VSS).....	14	
Exhaust Gas Recirculation (EGR) Valve.....	15	
EGR Control (EGRC)-BPT Valve.....	15	
EGR & Canister Control Solenoid Valve.....	15	
Pulsed Secondary Air Injection (PAIRC) Solenoid Valve.....	15	
Pulsed Secondary Air Injection (PAIR) Valve (PAIR valve).....	15	
Power Steering Oil Pressure Switch.....	16	
EGR Temperature Sensor (California models only).....	16	FE
Knock Sensor (KS).....	16	
Fuel Filter.....	16	CL
Data Link Connector for CONSULT.....	16	
Activated Carbon Canister.....	17	
ENGINE AND EMISSION CONTROL SYSTEM		
DESCRIPTION	18	MT
Multiport Fuel Injection (MFI) System.....	18	
Distributor Ignition (DI) System.....	20	AT
Idle Air Control (IACV) System.....	22	
Fuel Pump Control.....	23	FA
EGR (Exhaust Gas Recirculation) & Canister Control.....	23	RA
Radiator Fan Control.....	24	
Heated Oxygen Sensor (HO2S) Heater Control.....	25	
Idle Air Control Valve (IACV)-Air Regulator Control.....	25	BR
Acceleration Cut Control.....	25	
Pulsed Secondary Air Injection (PAIR) Valve (PAIR valve) Control.....	26	ST
Fail-safe System.....	26	
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE		
RATIO INSPECTION	28	BF
TROUBLE DIAGNOSES	35	
Contents.....	35	HA
MULTIPORT FUEL INJECTION SYSTEM		
INSPECTION	185	
Releasing Fuel Pressure.....	185	EL
Fuel Pressure Check.....	185	
Injector Removal and Installation.....	186	
EVAPORATIVE EMISSION SYSTEM	187	
Description.....	187	
Inspection.....	187	
CRANKCASE EMISSION CONTROL SYSTEM	189	
Description.....	189	
Inspection.....	189	

CONTENTS (Cont'd.)

SERVICE DATA AND SPECIFICATIONS (S.D.S.).....	191
General Specifications.....	191
Inspection and Adjustment.....	191

Note: Refer to Foldout page for “ECCS WIRING DIAGRAM”.

When you read wiring diagrams:

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

When you perform trouble diagnoses, read GI section, “HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES”.

PRECAUTIONS AND PREPARATION

Engine Fuel & Emission Control System

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

ECM

- Do not disassemble ECM (ECCS control module).
- Do not turn diagnosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ECM value. The ECM 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.

WIRELESS EQUIPMENT

- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.
 - 1) Keep the antenna as far as possible away from the ECM.
 - 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.

BATTERY

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

INJECTOR

- Do not disconnect injector harness connectors with engine running.
- Do not apply battery power directly to injectors.

ECCS PARTS HANDLING

- Handle mass air flow sensor carefully to avoid damage.
- Do not disassemble mass air flow sensor.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble IACV-AAC valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the crankshaft position sensor.

WHEN STARTING

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

FUEL PUMP

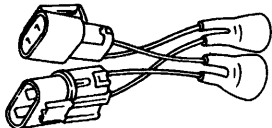
- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.

ECCS HARNESS HANDLING

- Securely connect ECCS harness connectors. A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep ECCS harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an ECCS system malfunction due to receiving external noise, degraded operation of ICs, etc.
- Keep ECCS parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

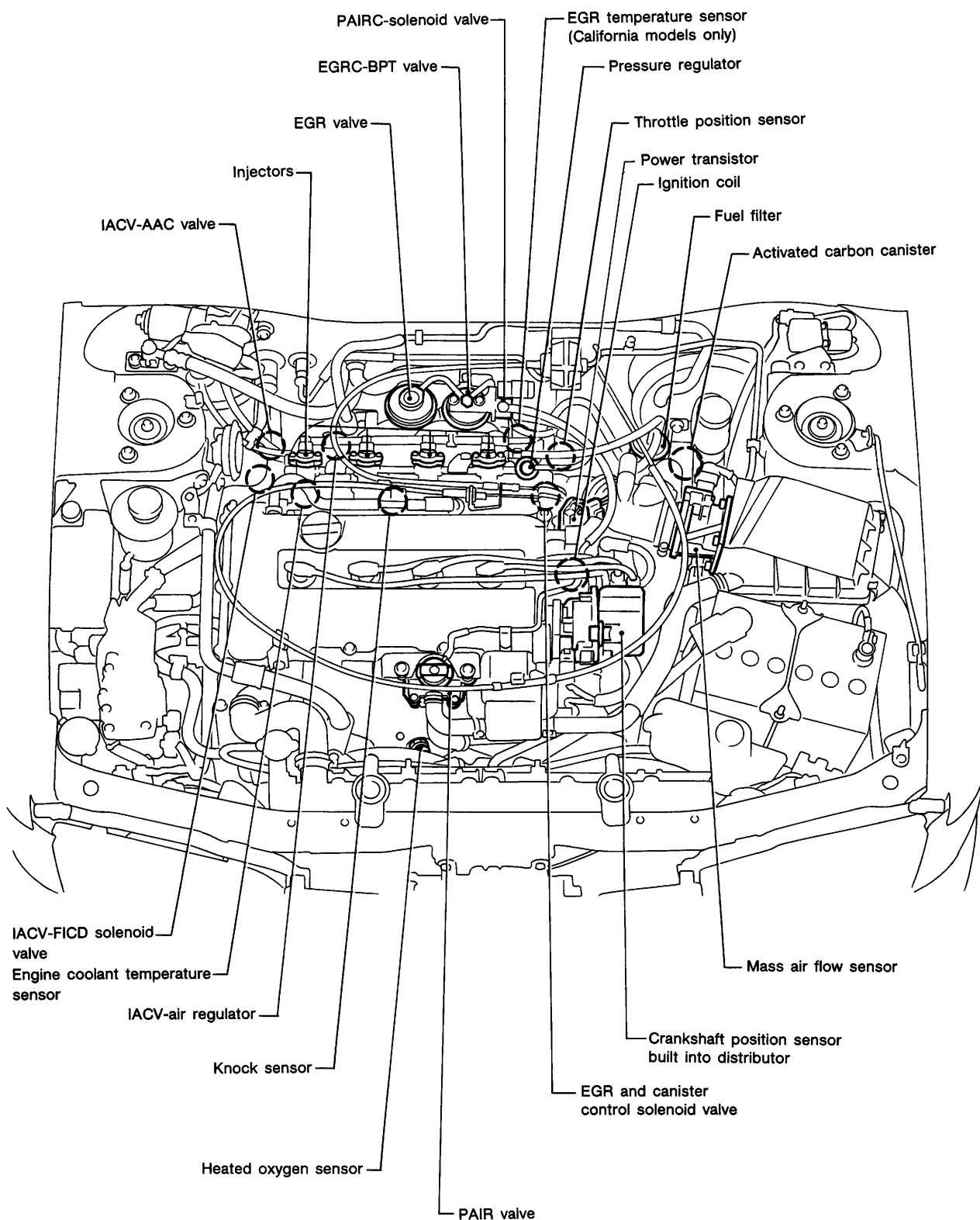
MEF015D

Special Service Tool

Tool number (Kent-Moore No.) Tool name	Description
EG11160000 (—) Adapter harness	Measuring engine speed 

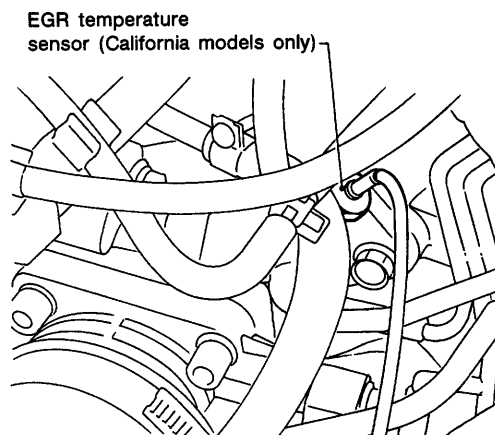
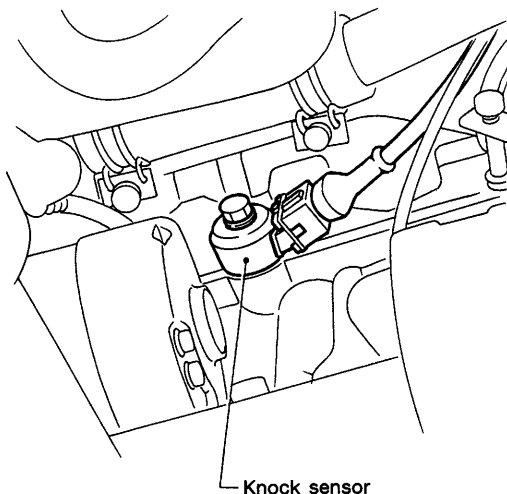
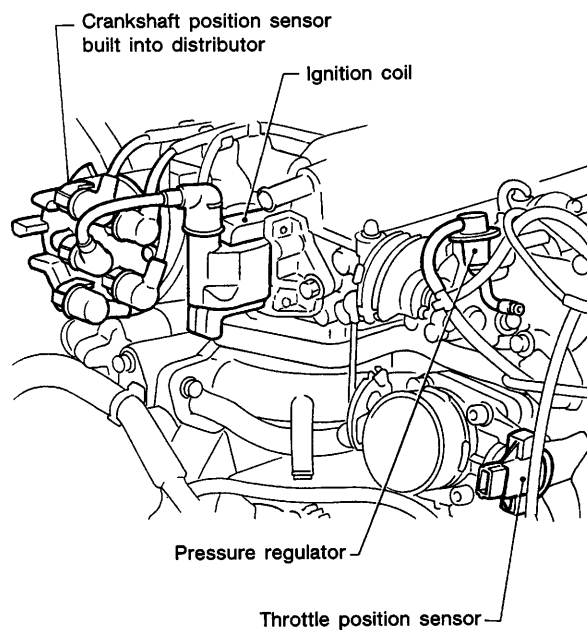
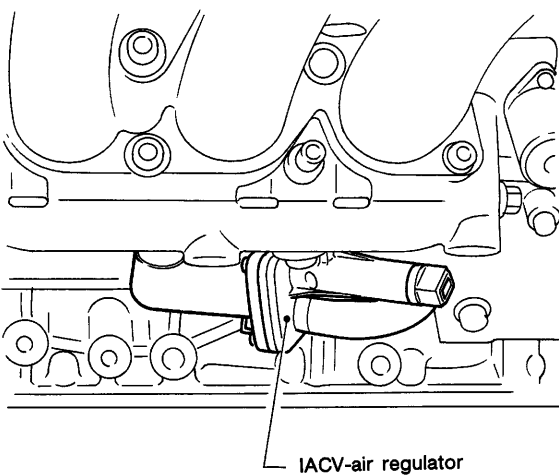
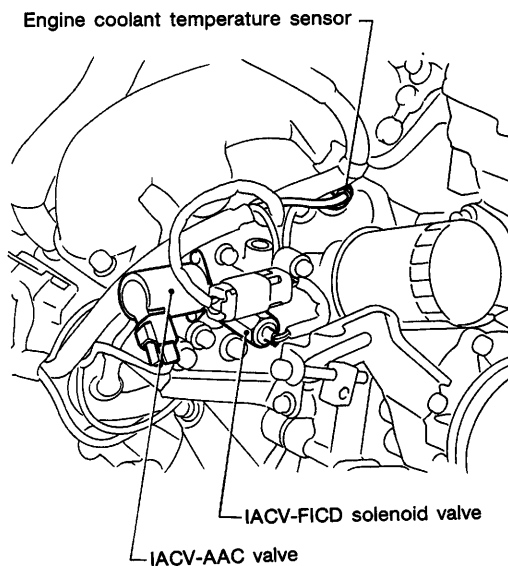
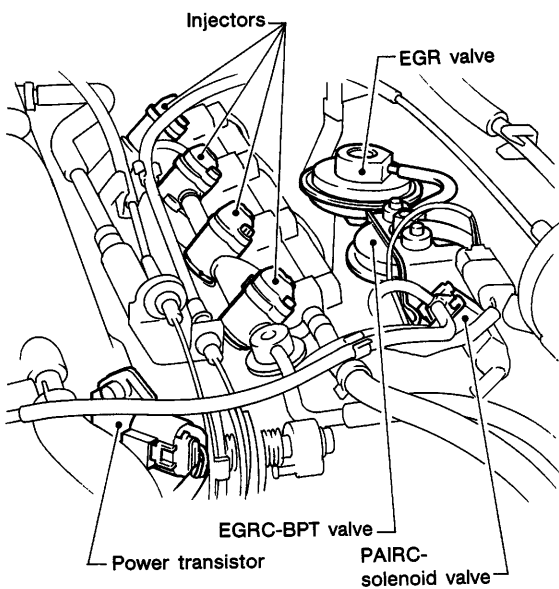
ENGINE AND EMISSION CONTROL OVERALL SYSTEM

ECCS Component Parts Location



ENGINE AND EMISSION CONTROL OVERALL SYSTEM

ECCS Component Parts Location (Cont'd)



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

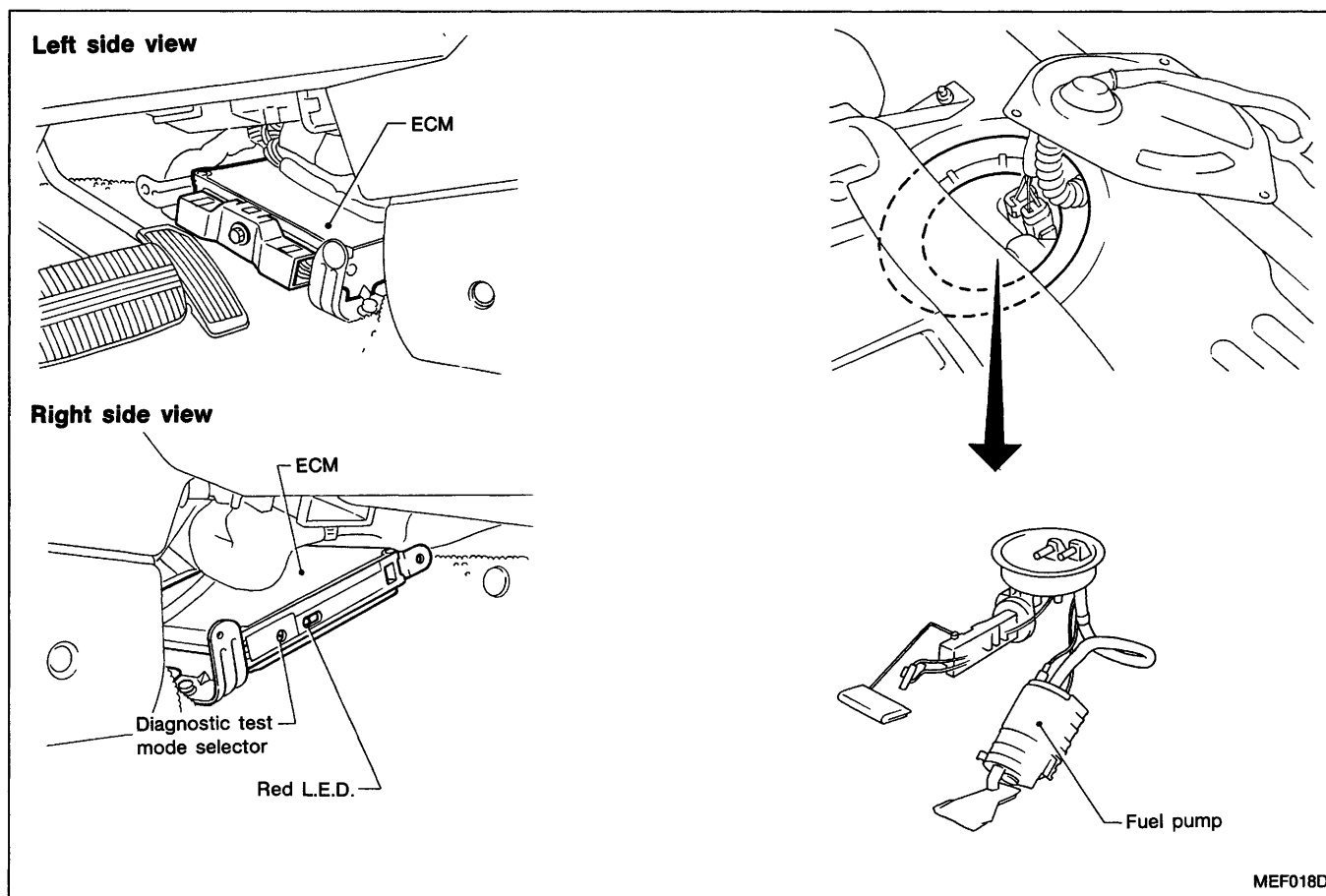
BF

HA

EL

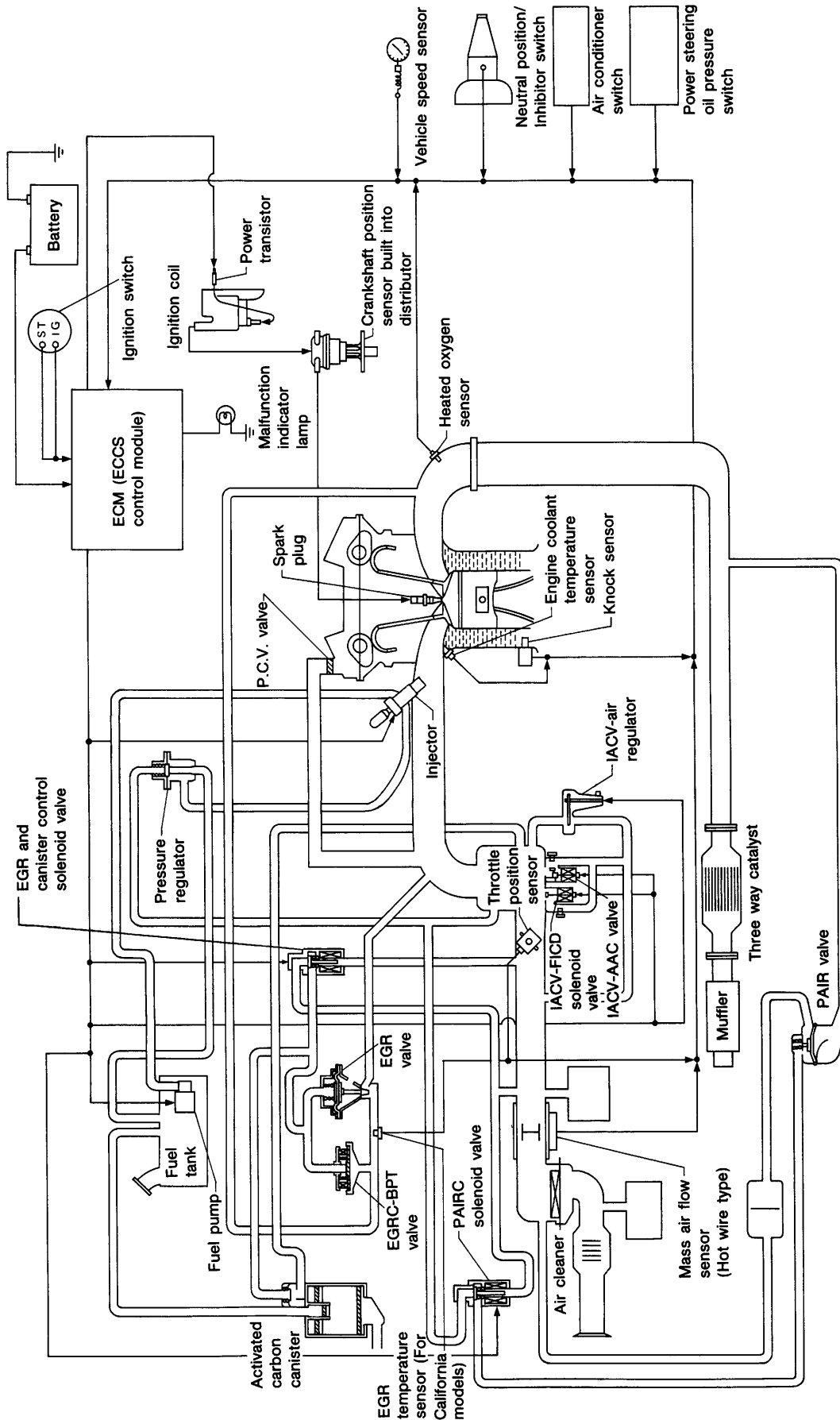
ENGINE AND EMISSION CONTROL OVERALL SYSTEM

ECCS Component Parts Location (Cont'd)



ENGINE AND EMISSION CONTROL OVERALL SYSTEM

System Diagram



GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

FA

RA

BR

ST

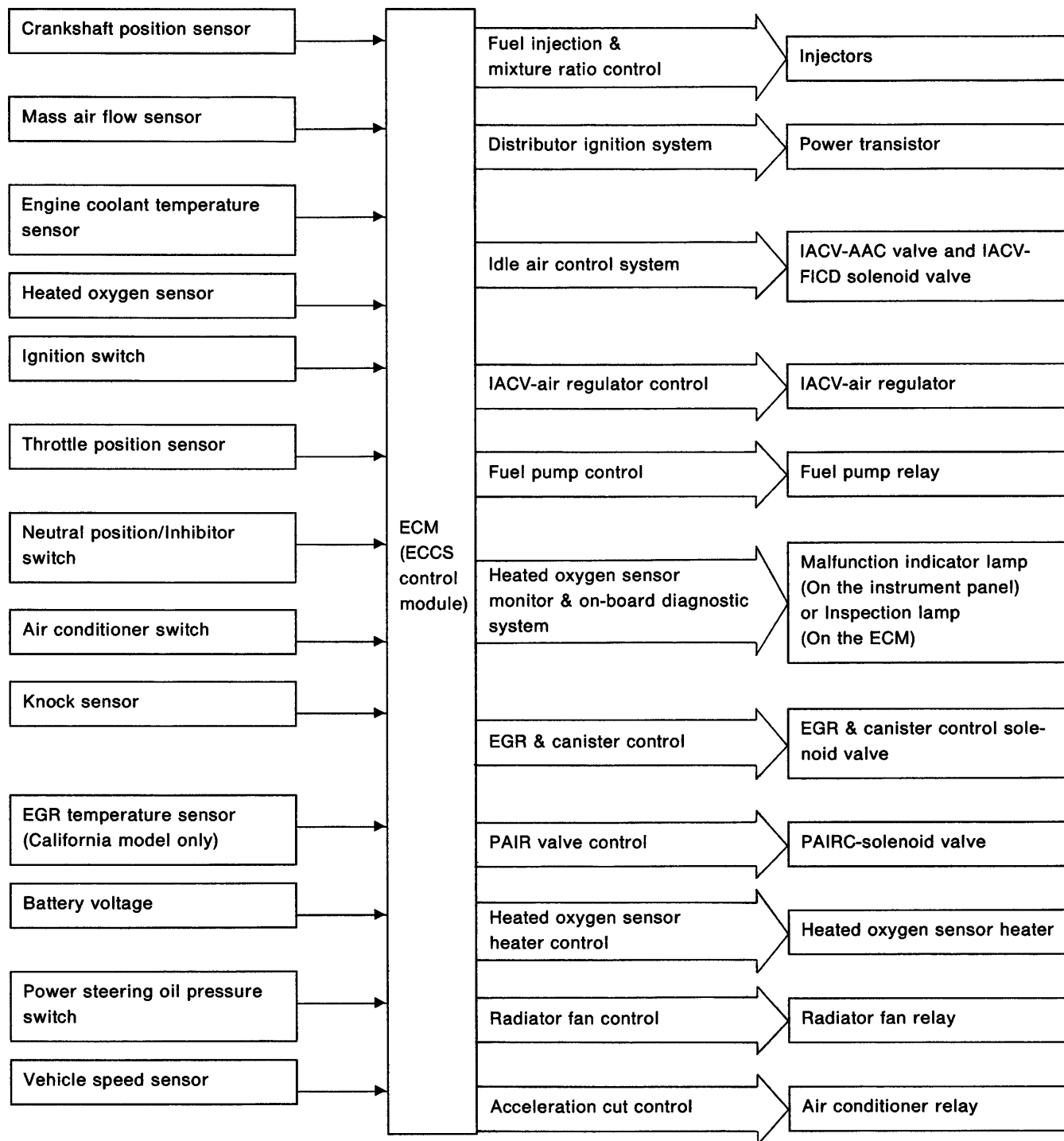
BF

HA

EL

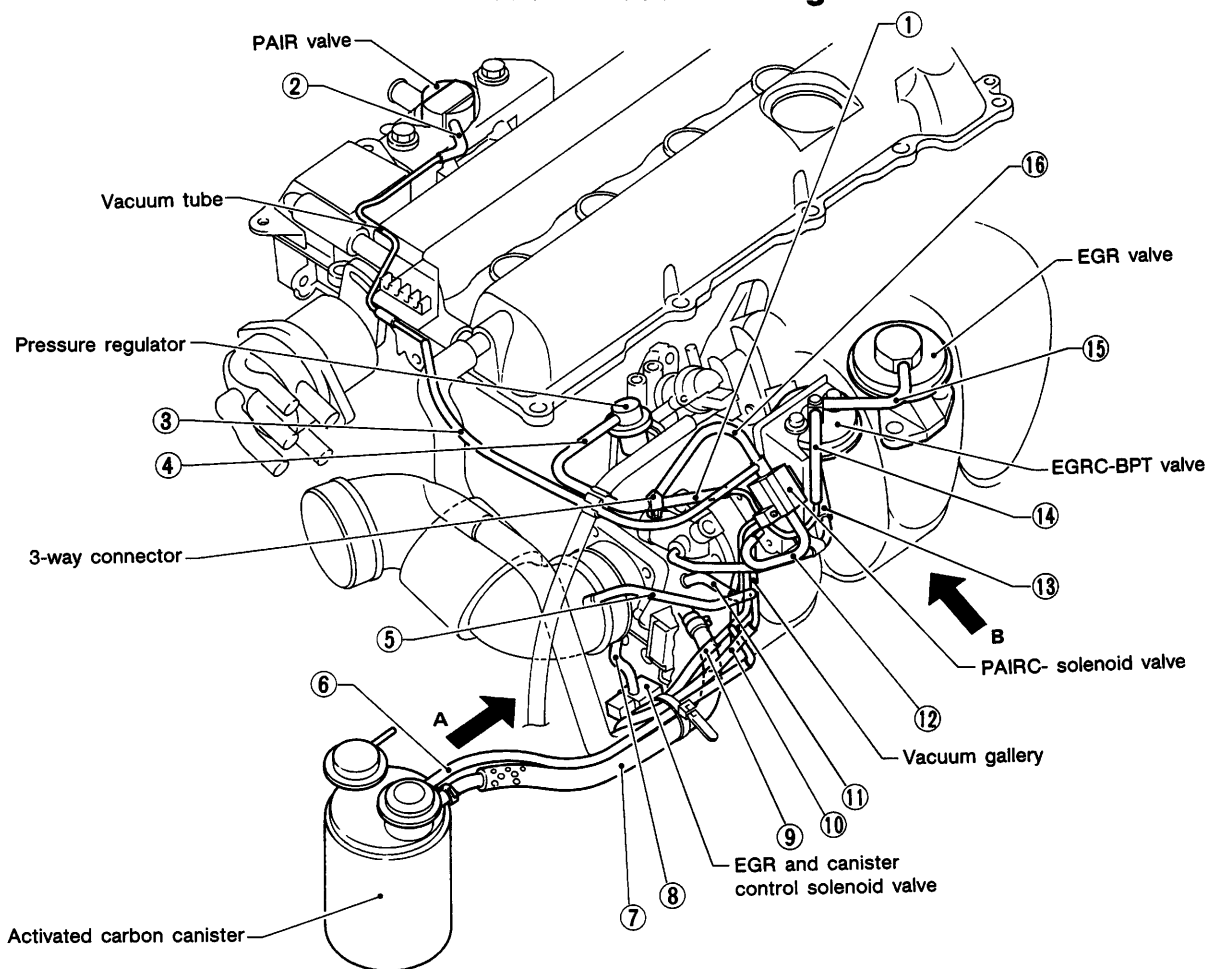
ENGINE AND EMISSION CONTROL OVERALL SYSTEM

System Chart

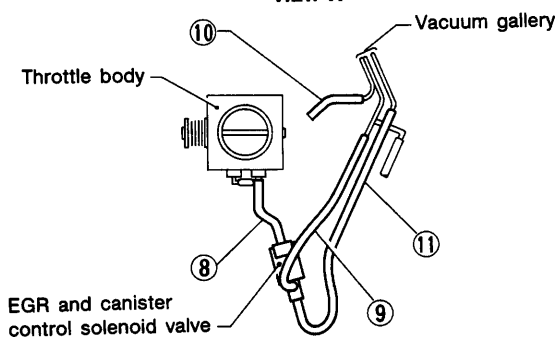


ENGINE AND EMISSION CONTROL OVERALL SYSTEM

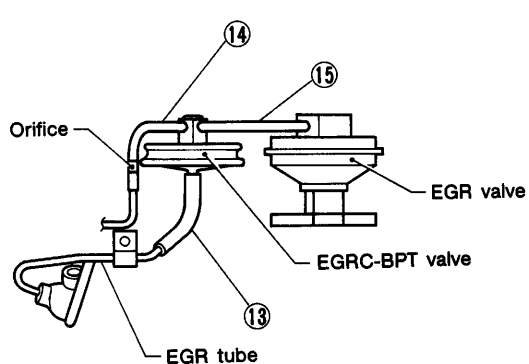
Vacuum Hose Drawing



VIEW A



VIEW B



MEF020D

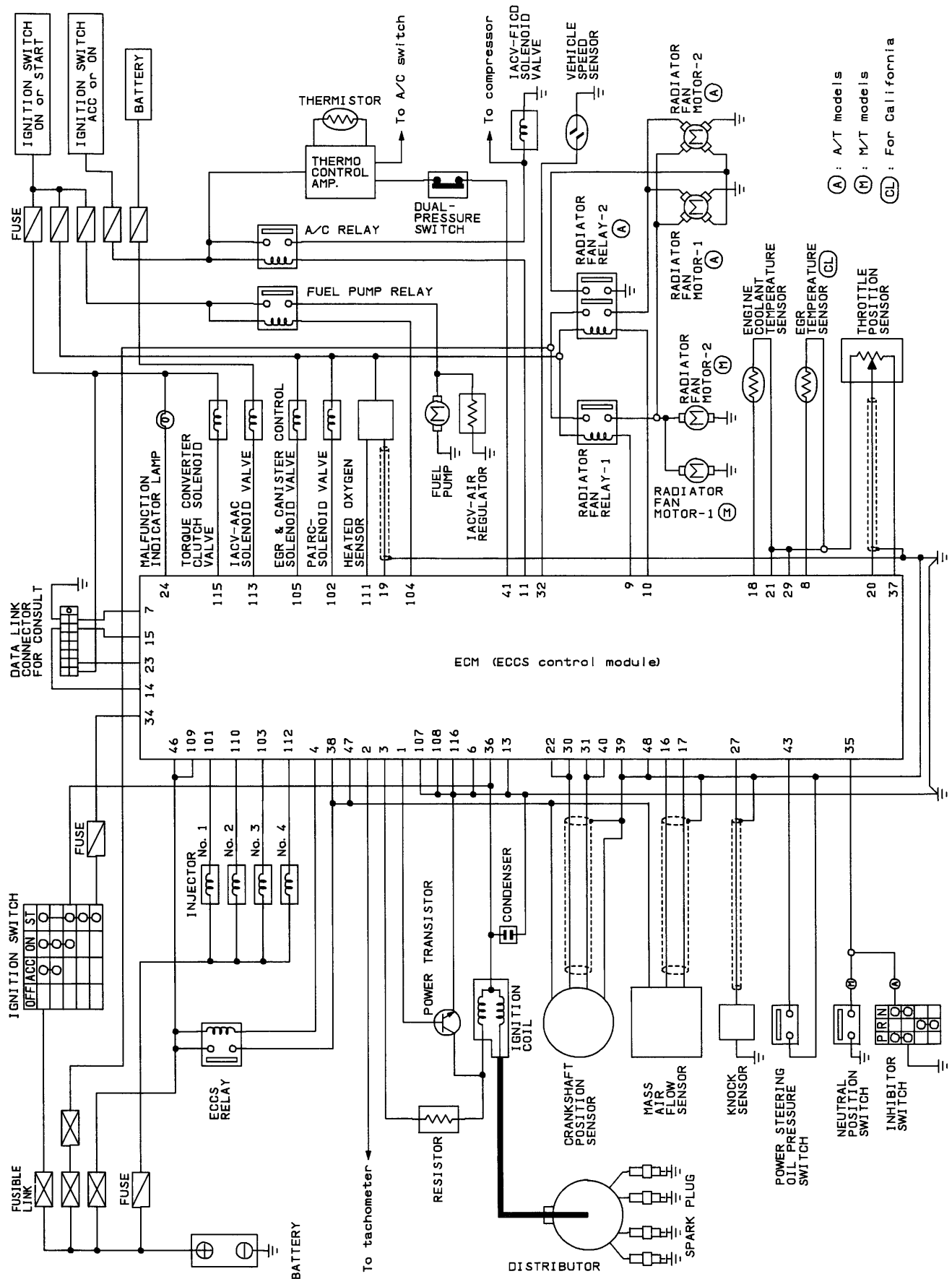
- ① 3-way connector to vacuum gallery
- ② PAIR valve to vacuum tube
- ③ Vacuum tube to PAIRC-solenoid valve
- ④ Pressure regulator to 3-way connector
- ⑤ Air duct to vacuum gallery
- ⑥ Actuated carbon canister (vacuum line) to vacuum gallery

- ⑦ Activated carbon canister (purge line) to intake manifold collector
- ⑧ Throttle body to EGR and canister control solenoid valve
- ⑨ EGR and canister control solenoid valve to vacuum gallery
- ⑩ EGR and canister control solenoid valve to vacuum gallery
- ⑪ Intake manifold collector to vacuum gallery

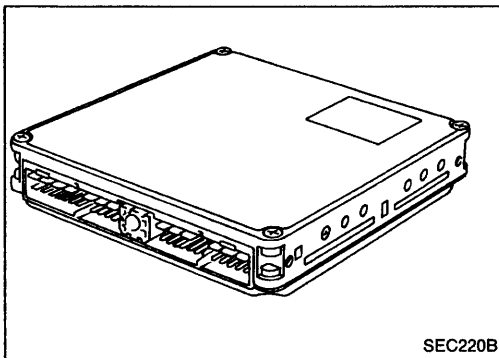
- ⑫ PAIRC-solenoid valve to vacuum gallery
- ⑬ EGRC-BPT valve to EGR tube
- ⑭ EGRC-BPT valve to vacuum gallery
- ⑮ EGR valve to EGRC-BPT valve
- ⑯ PAIRC-solenoid valve to 3-way connector

ENGINE AND EMISSION CONTROL OVERALL SYSTEM

Circuit Diagram



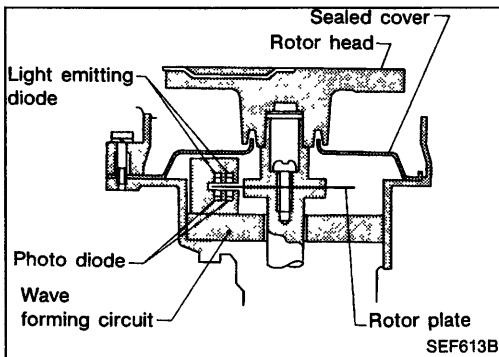
MEF145D



SEC220B

Engine Control Module (ECM)-ECCS Control Module

The ECM consists of a microcomputer, inspection lamp, a diagnostic test mode selector, and connectors for signal input and output and for power supply. The unit controls the engine.

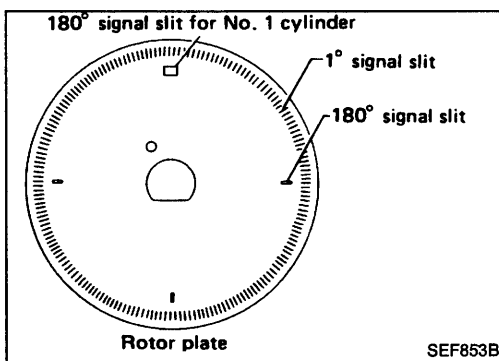


SEF613B

Crankshaft Position Sensor (CKPS)

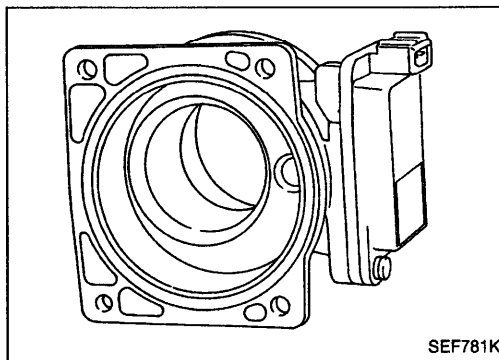
The crankshaft position sensor is a basic component of the entire ECCS. It monitors engine speed and piston position, and sends signals to the ECM to control fuel injection, ignition timing and other functions.

The crankshaft position 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.



SEF853B

When the rotor plate passes between the L.E.D. and the photo diode, the slits in the rotor plate continually cut the light being transmitted to the photo diode from the L.E.D. This generates rough-shaped pulses which are converted into on-off pulses by the wave-forming circuit, which are sent to the ECM.



SEF781K

Mass Air Flow Sensor (MAFS)

The mass air flow sensor measures the intake air flow rate by taking a part of the entire flow. Measurements are made in such a manner that the ECM receives electrical output signals varied by the amount of heat emitting from the hot wire placed in the stream of the intake air.

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

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

GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

FA

RA

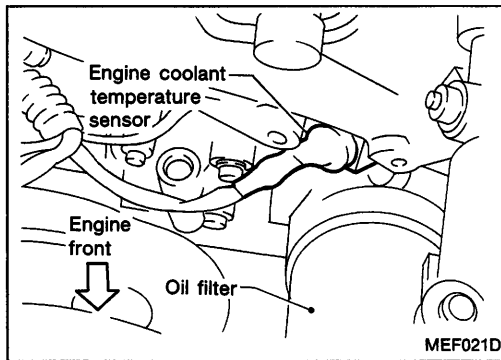
BR

ST

BF

HA

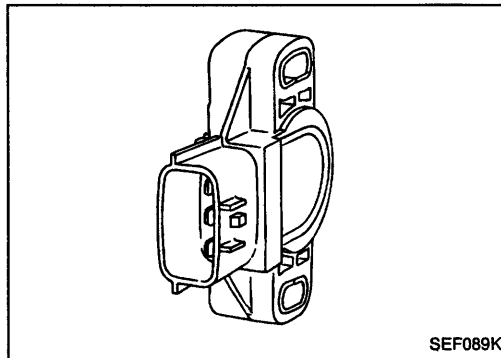
EL



Engine Coolant Temperature Sensor (ECTS)

The engine coolant temperature sensor, located behind the oil filter, detects engine coolant temperature and transmits a signal to the ECM.

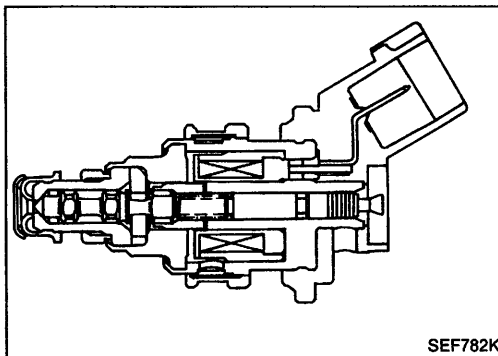
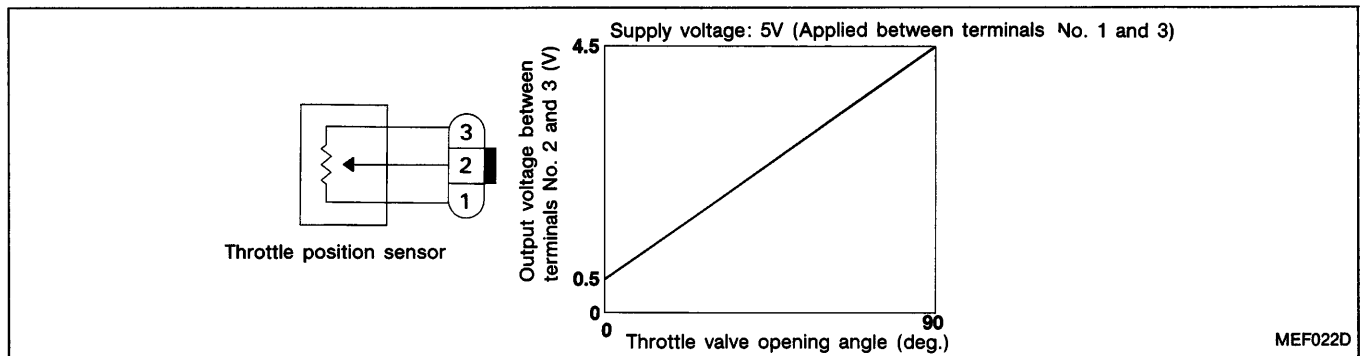
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



Throttle Position Sensor (TP) & Soft Closed Throttle Position (CTP) Switch

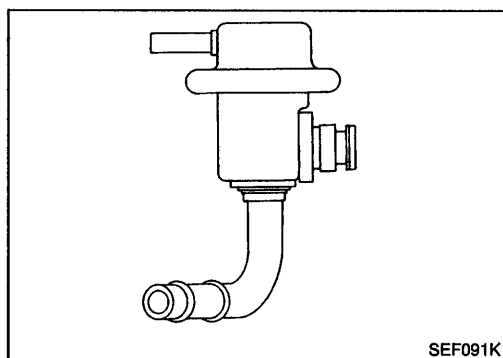
The throttle position sensor responds to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle position into output voltage, and emits the voltage signal to the ECM. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds the voltage signal to the ECM.

Idle position of the throttle valve is determined by the ECM receiving the signal from the throttle position sensor. This system is called "soft closed throttle position switch". This one controls engine operation such as fuel cut.



Fuel Injector

The fuel injector is a small, elaborate solenoid valve. As the ECM sends injection signals to the injector, the coil in the injector pulls the needle valve back and fuel is released into the intake manifold through the nozzle. The injected fuel is controlled by the ECM in terms of injection pulse duration.



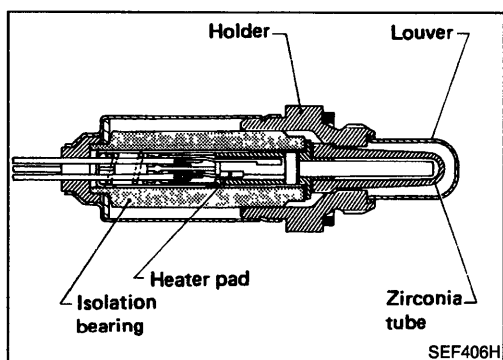
Pressure Regulator

The pressure regulator maintains the fuel pressure at 299.1 kPa (3.05 kg/cm², 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.

GI

MA

EM



Heated Oxygen Sensor (HO2S)

The heated oxygen 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 heated oxygen sensor detects the amount of oxygen in the exhaust gas and sends the signal of approximately 1V or 0V to the ECM. A heater is used to activate the sensor.

LC

EF & EC

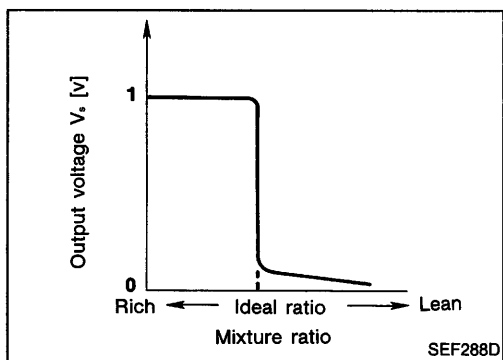
FE

CL

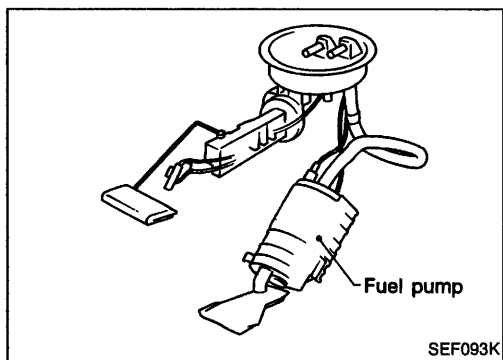
MT

AT

FA



RA



Fuel Pump

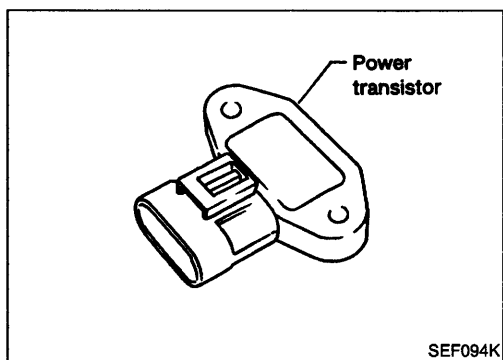
A turbine type design fuel pump is used and is situated in the fuel tank.

BR

ST

BF

HA



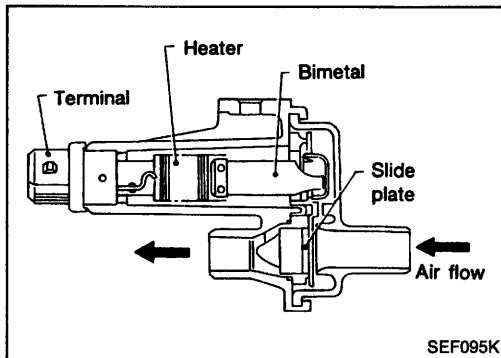
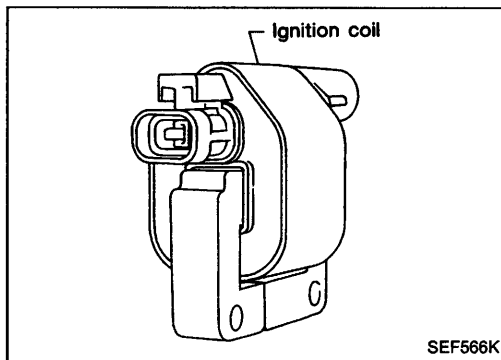
Power Transistor & Ignition Coil

The ignition signal from the ECM 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.

EL

ENGINE AND EMISSION CONTROL PARTS DESCRIPTION

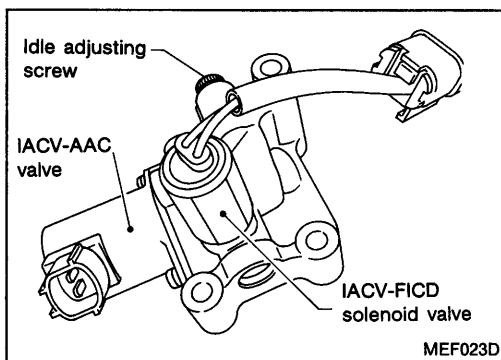
Power Transistor & Ignition Coil (Cont'd)



Idle Air Control Valve (IACV)-Air Regulator

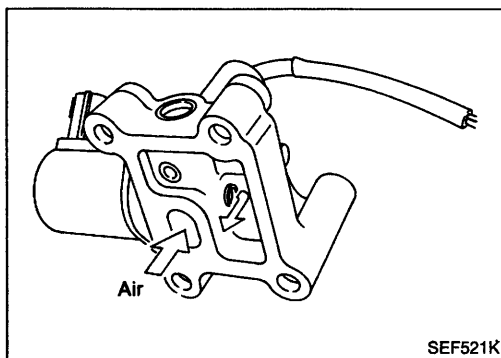
The IACV-air regulator provides an air by-pass when the engine is cold for a fast idle during warm-up.

A bimetal, heater and rotary shutter are built into the IACV-air regulator. When the bimetal temperature is low, the air by-pass port opens. As the engine starts and electric current flows through a heater, the bimetal begins to turn the shutter to close the by-pass port. The air passage remains closed until the engine stops and the bimetal temperature drops.



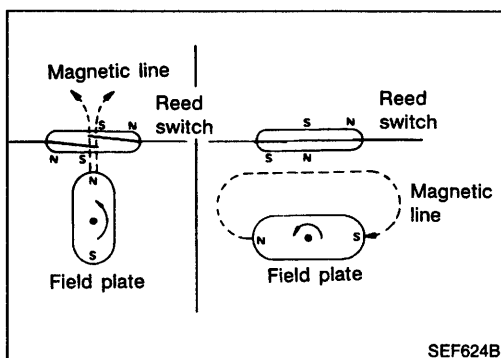
Idle Air Adjusting (I.A.A.) Unit

The I.A.A. unit is made up of the IACV-AAC valve, IACV-FICD solenoid valve and idle adjusting screw. It receives the signal from the ECM and controls the idle speed at the preset value.



Idle Air Control Valve (IACV)-Auxiliary Air Control (AAC) Valve

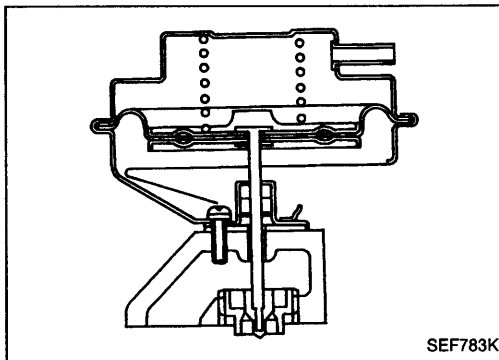
The ECM actuates the IACV-AAC valve by an ON/OFF pulse. The longer that ON duty is left on, the larger the amount of air that will flow through the IACV-AAC valve.



Vehicle Speed Sensor (VSS)

The vehicle speed sensor provides a vehicle speed signal to the ECM.

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



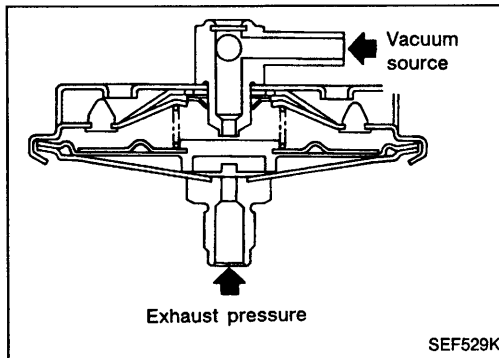
Exhaust Gas Recirculation (EGR) Valve

The EGR 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.

GI

MA

EM



EGR Control (EGRC)-BPT Valve

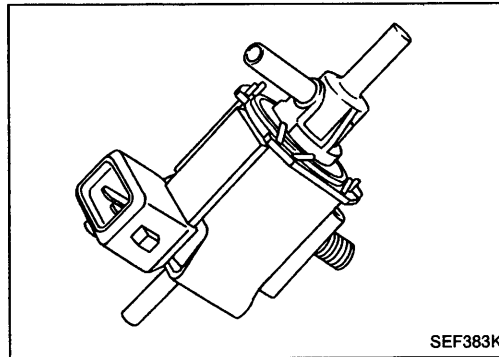
The EGRC-BPT valve monitors exhaust pressure to activate the diaphragm, controlling throttle body vacuum applied to the EGR valve. In other words, recirculated exhaust gas is controlled in response to positioning of the EGR valve or to engine operation.

LC

EF &
EC

FE

CL



EGR & Canister Control Solenoid Valve

The EGR and canister systems are controlled only by the ECM. At both low- and high-speed revolutions of engine, the solenoid valve turns on and accordingly the EGR valve and canister cut the exhaust gas and fuel vapor leading to the intake manifold.

MT

AT

Pulsed Secondary Air Injection (PAIRC) Solenoid Valve

The PAIRC-solenoid valve cuts the intake manifold vacuum signal for PAIR valve control. It responds to the ON/OFF signal from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal, the coil pulls the plunger downward and feeds the vacuum signal to the PAIR valve control valve.

FA

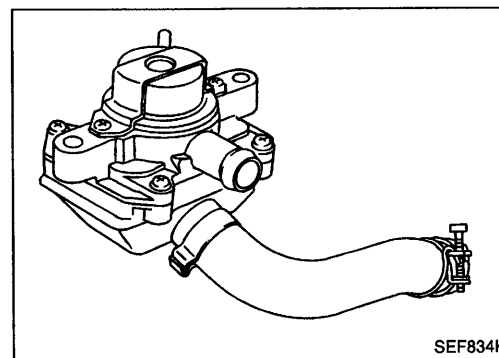
RA

BR

ST

BF

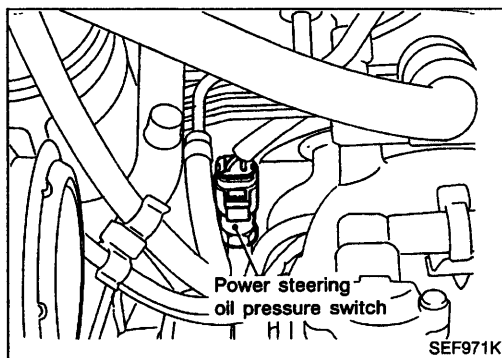
HA



Pulsed Secondary Air Injection (PAIR) Valve (PAIR valve)

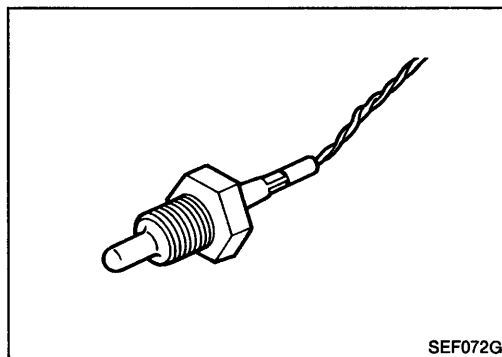
The PAIR valve sends secondary air to the exhaust manifold, using a vacuum created by exhaust pulsation in the exhaust manifold. When the exhaust pressure is below atmospheric pressure (negative pressure), secondary air is sent to the exhaust manifold. When the exhaust pressure is above atmospheric pressure,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

EL



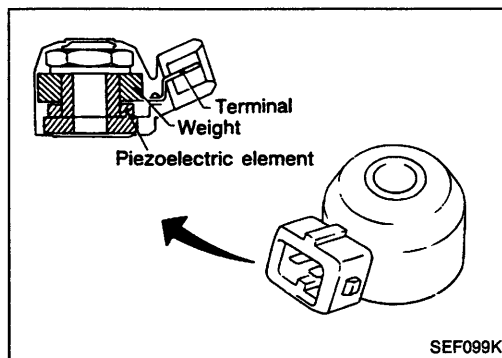
Power Steering Oil Pressure Switch

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects the power steering load, sending the load signal to the ECM. The ECM then sends the idle-up signal to the IACV-AAC valve.



EGR Temperature Sensor (California models only)

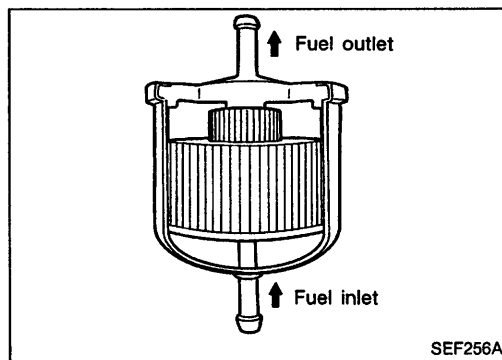
The EGR temperature sensor monitors in exhaust gas temperature and transmits a signal to the ECM. The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electric resistance of the thermistor decreases in response to the temperature rise.



Knock Sensor (KS)

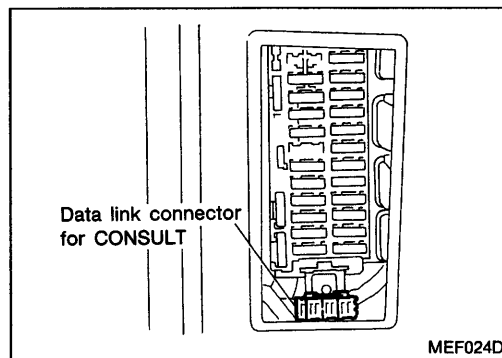
The knock sensor is attached to the cylinder block and senses engine knocking conditions.

A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is delivered as output.



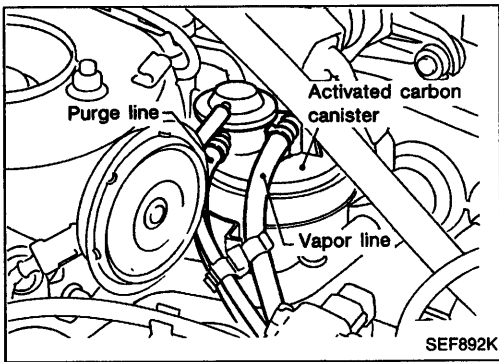
Fuel Filter

The specially designed fuel filter has a metal case in order to withstand high fuel pressure.



Data Link Connector for CONSULT

The data link connector for CONSULT is located behind the fuse box cover.



Activated Carbon Canister

The carbon canister is filled with active charcoal to absorb evaporative gases produced in the fuel tank. These absorbed gases are then delivered to the intake manifold by manifold vacuum for combustion purposes.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

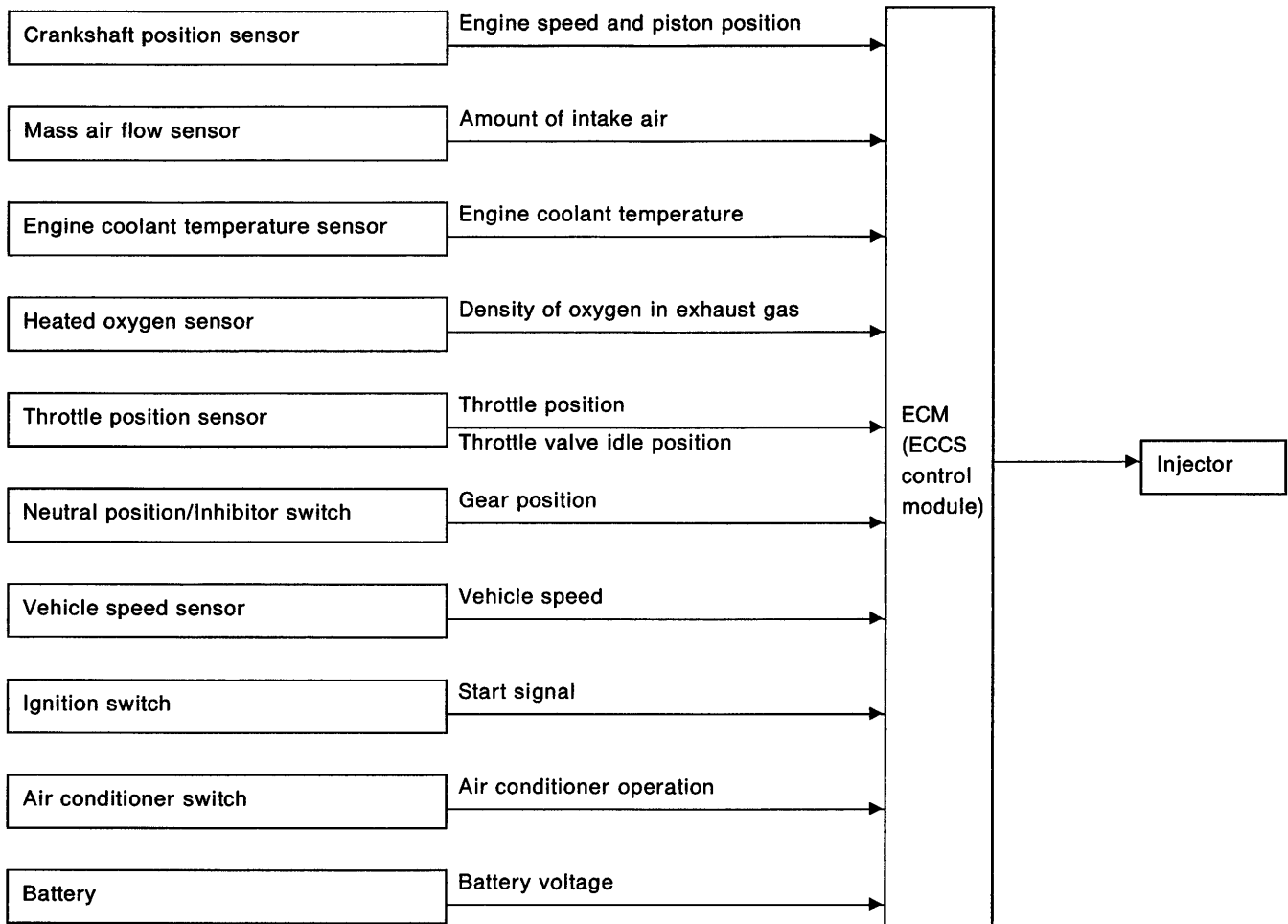
BF

HA

EL

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



BASIC MULTIPOINT FUEL INJECTION SYSTEM

The amount of fuel injected from the fuel injector, or the length of time the valve remains open, is determined by the ECM. The basic amount of fuel injected is a program value mapped in the ECM memory. In other words, the program value is preset by engine operating conditions determined by input signals (for engine speed and air intake) from both the crankshaft position sensor and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injection is compensated for to improve engine performance under various operating conditions as listed below.

<Fuel increase>

- 1) During warm-up
- 2) When starting the engine
- 3) During acceleration
- 4) Hot-engine operation
- 5) When selector lever is changed from "N" to "D" (A/T models only)

<Fuel decrease>

- 1) During deceleration

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Multiport Fuel Injection (MFI) System (Cont'd)

MIXTURE RATIO FEEDBACK CONTROL

Mixture ratio feedback system is designed to precisely control the mixture ratio to the stoichiometric point so that the three-way catalyst can reduce CO, HC and NOx emissions. This system uses an heated oxygen sensor in the exhaust manifold to check the air-fuel ratio. The ECM adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the range of the stoichiometric air-fuel ratio.

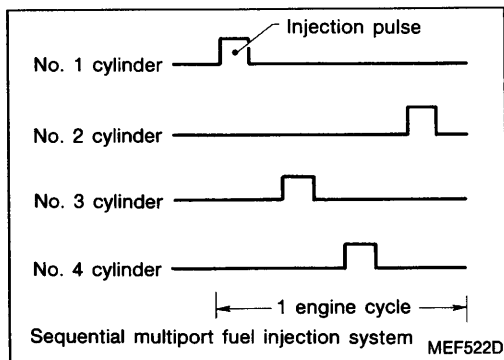
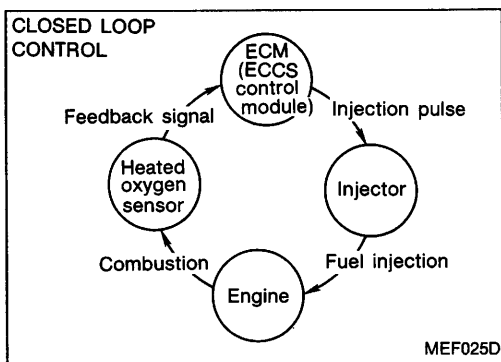
This stage refers to the closed loop control condition. The open-loop control condition refers to that under which the ECM detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

- 1) Deceleration
- 2) High-load operation
- 3) Engine idling
- 4) Malfunction of heated oxygen sensor or its circuit
- 5) Insufficient activation of heated oxygen sensor at low engine coolant temperature
- 6) Engine starting
- 7) Hot-engine operation
- 8) When all of the following conditions are met:
 - Ignition switch "ON"
 - Soft closed throttle position switch "ON"
 - Neutral position switch "OFF"
 - Engine running at idle speed
 - Vehicle running at slow speed

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the heated oxygen sensor. This feedback signal is then sent to the ECM to control the amount of fuel injection to provide a basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. This is due to manufacturing errors (e.g., mass air flow sensor hot wire) and changes during operation (injector clogging, etc.) of ECCS parts which directly affect the mixture ratio.

Accordingly, a difference between the basic and theoretical mixture ratios is quantitatively monitored in this system. It is then computed in terms of "fuel injection duration" to automatically compensate for the difference between the two ratios.



FUEL INJECTION TIMING

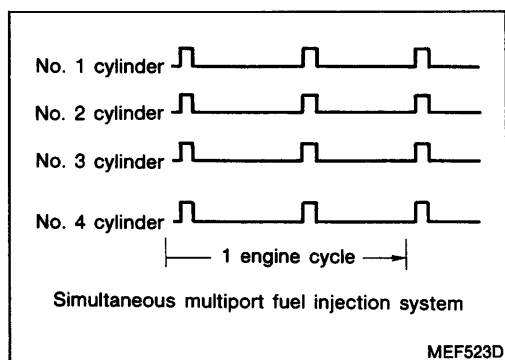
Two types of fuel injection systems are used — simultaneous multiport fuel injection system and sequential multiport fuel injection system. In the former, fuel is injected into all four cylinders simultaneously twice each engine cycle.

In other words, pulse signals of the same width are simultaneously transmitted from the ECM to the four injectors two times for each engine cycle.

In the sequential multiport fuel injection system, fuel is injected into each cylinder during each engine cycle according to the firing order.

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Multiport Fuel Injection (MFI) System (Cont'd)



When the engine is being started and/or if the fail-safe system (C.P.U. of ECM) is operating, simultaneous multiport fuel injection system is used.

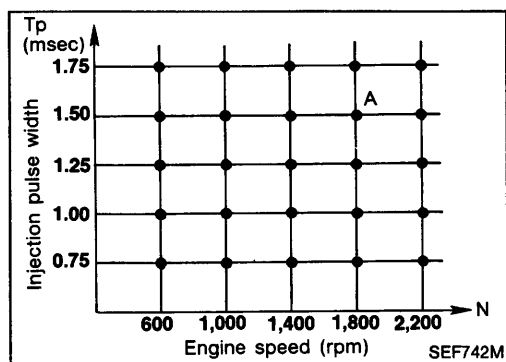
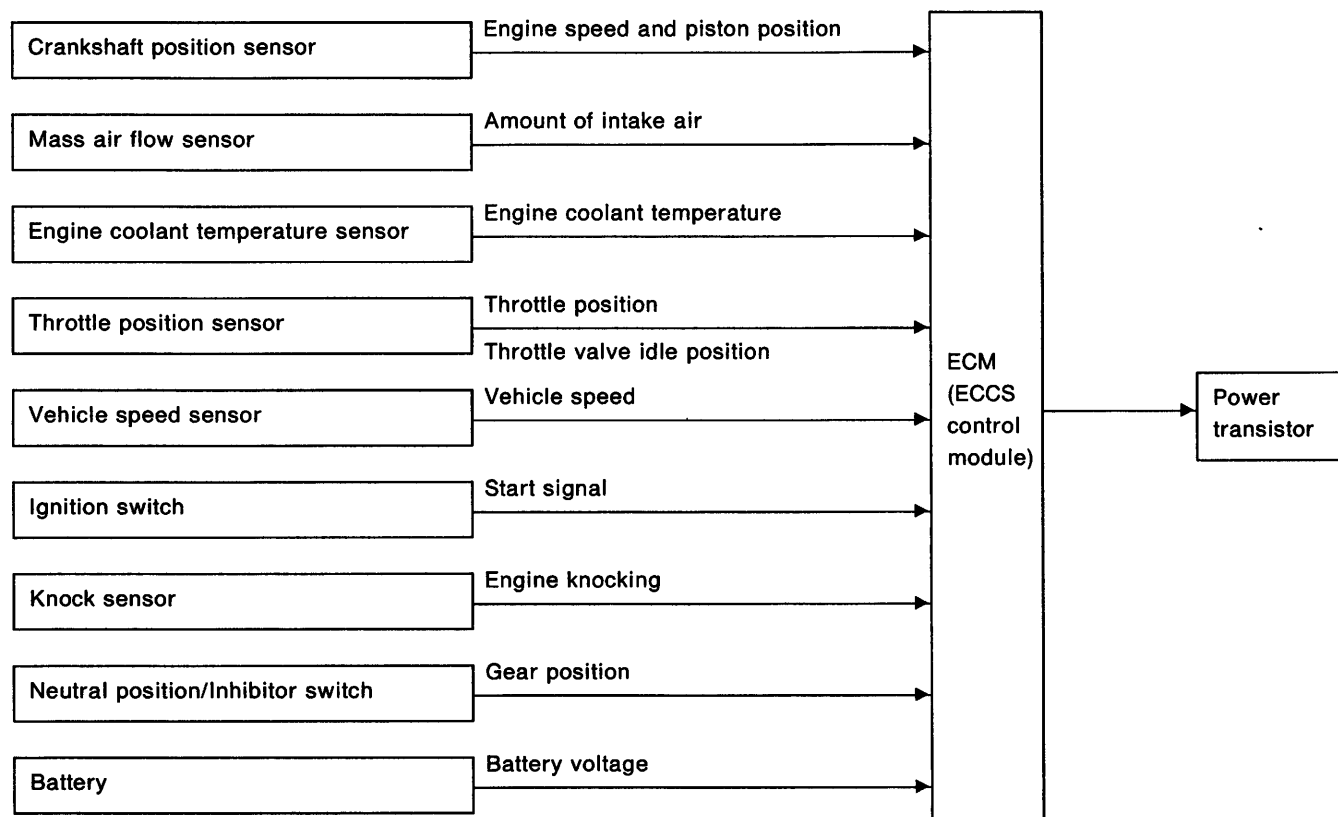
When the engine is running sequential multiport fuel injection system is used.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

Distributor Ignition (DI) System

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM in order to maintain the best air-fuel ratio in response to every running condition of the engine.

The ignition timing data is stored in the ECM located in the ECM, in the form of the map shown below.

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Distributor Ignition (DI) System (Cont'd)

The ECM detects information such as the injection pulse width and crankshaft position sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted to the power transistor.

e.g. N: 1,800 rpm, Tp: 1.50 msec

A °B.T.D.C.

In addition to this,

- 1) At starting
- 2) During warm-up
- 3) At idle
- 4) At acceleration
- 5) Hot-engine operation

the ignition timing is revised by the ECM according to the other data stored in the ECM.

The retard system by knock sensor is designed only for emergencies. The basic ignition timing is pre-programmed within the anti-knocking zone, even if recommended fuel is used under dry conditions. Consequently, the retard system does not operate under normal driving conditions.

However, if engine knocking occurs, the knock sensor monitors the condition and the signal is transmitted to the ECM (ECCS control module). After receiving it, the ECM retards the ignition timing to avoid the knocking condition.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

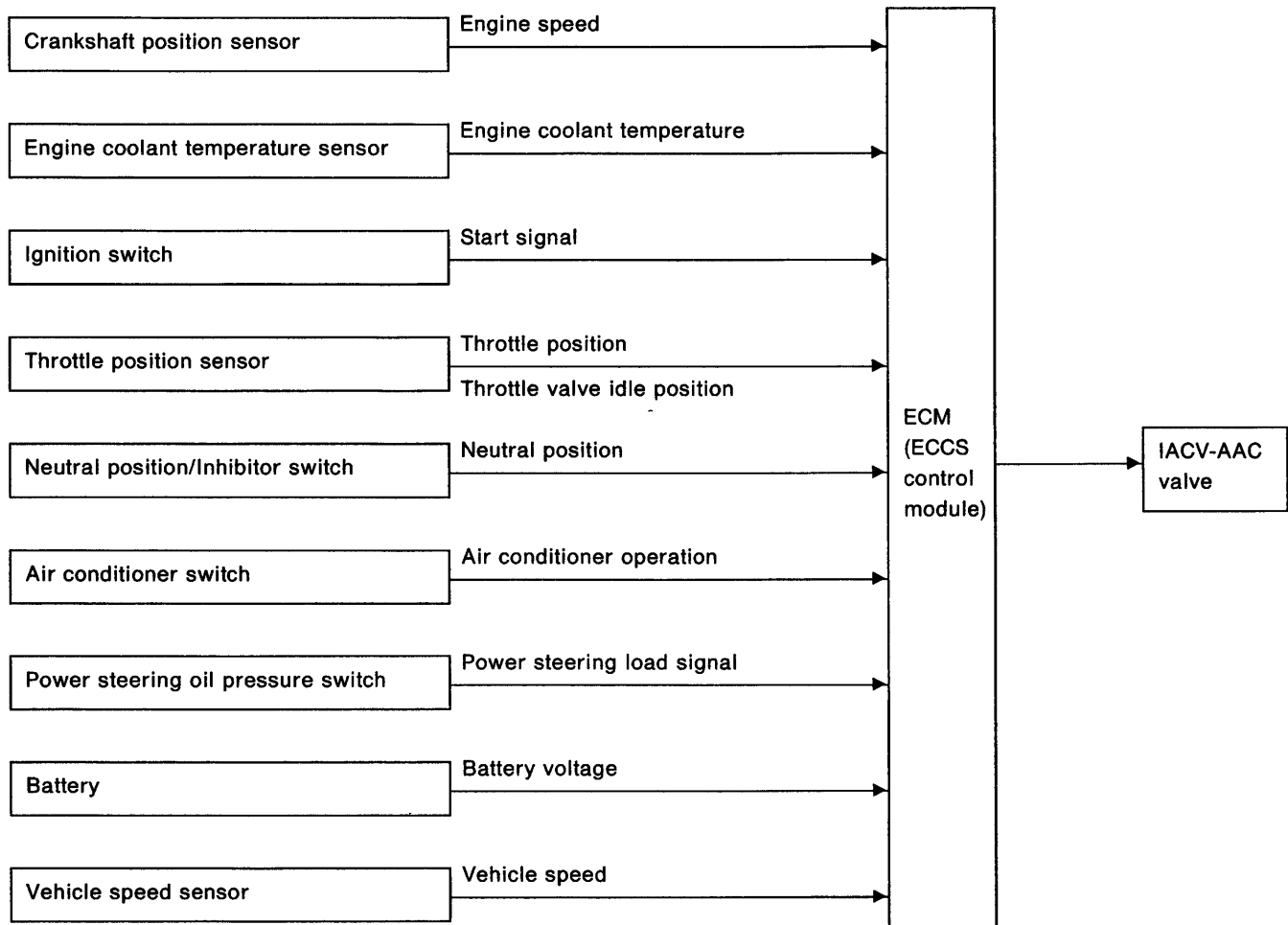
BF

HA

EL

Idle Air Control (IACV) System

INPUT/OUTPUT SIGNAL LINE

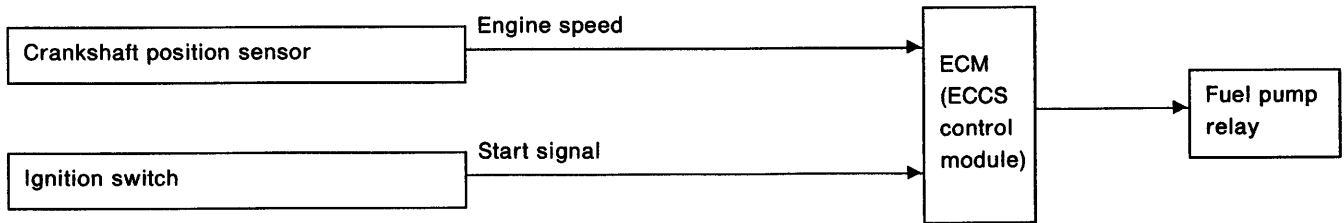


SYSTEM DESCRIPTION

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve repeats ON/OFF operation according to the signal sent from the ECM. The crankshaft position sensor detects the actual engine speed and sends a signal to the ECM. The ECM then controls the ON/OFF time of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as warming up and during deceleration, fuel consumption, and engine load (air conditioner, electrical load).

Fuel Pump Control

INPUT/OUTPUT SIGNAL LINE



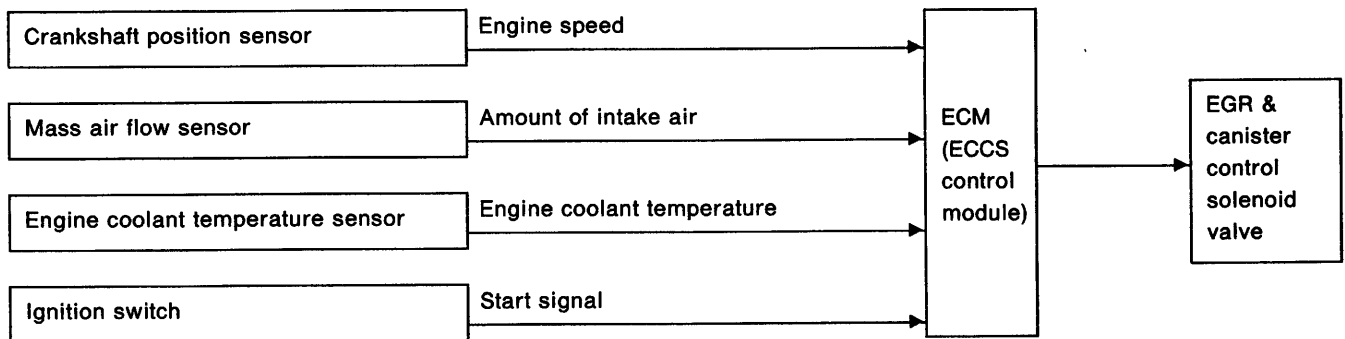
SYSTEM DESCRIPTION

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 180° signal from the crankshaft position sensor, it knows that the engine is rotating, and causes the pump to perform. If the 180° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 5 seconds
Engine running and cranking	Operates
When engine is stopped	Stops in 1 second
Except as shown above	Stops

EGR (Exhaust Gas Recirculation) & Canister Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

In addition, a system is provided which precisely cuts and controls port vacuum applied to the EGR valve and canister to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM. When the ECM detects any of the following conditions, current flows through the solenoid valve in the EGR and canister control vacuum line.

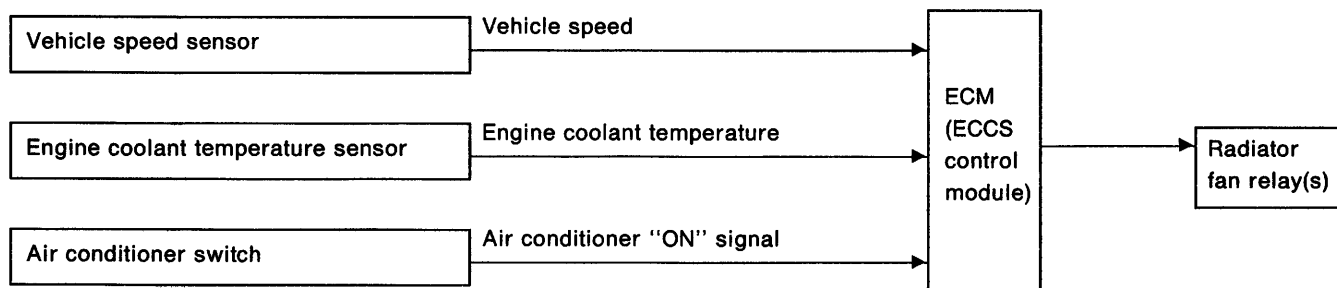
This causes the port vacuum to be discharged into the atmosphere so that the EGR valve and canister remain closed.

- 1) Low engine coolant temperature
- 2) Engine starting
- 3) High-speed engine operation
- 4) Engine idling
- 5) Excessively high engine coolant temperature
- 6) Mass air flow sensor malfunction

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Radiator Fan Control

INPUT/OUTPUT SIGNAL LINE



FOR M/T MODELS

The ECM controls the radiator fan corresponding to the vehicle speed, engine coolant temperature, and air conditioner ON signal. The control system has 2-step control [ON/OFF].

Operation

Air conditioner switch is "OFF"

Engine coolant temperature °C (°F)	Radiator fans	Remarks
94 (201) or less	OFF	
Between 95 (203) and 99 (210)	OFF	Vehicle speed is 19 km/h (12 MPH) or less
	ON	Vehicle speed is 20 km/h (12 MPH) or more
100 (212) or more	ON	

Air conditioner switch is "ON"

Engine coolant temperature °C (°F)	Radiator fans	Remarks
94 (201) or less	OFF	Vehicle speed is 80 km/h (50 MPH) or more
	ON	Vehicle speed is 79 km/h (49 MPH) or less
95 (203) or more	ON	

FOR A/T MODELS

The ECM performs ON/OFF control and LOW/HIGH speed control of the radiator fan corresponding to the vehicle speed, engine coolant temperature, and air conditioner ON signal.

Operation

Air conditioner switch is "OFF"

Engine coolant temperature °C (°F)	Radiator fans	Remarks
94 (201) or less	OFF	
Between 95 (203) and 99 (210)	LOW	
Between 100 (212) and 104 (219)	LOW	Vehicle speed is 19 km/h (12 MPH) or less
	HIGH	Vehicle speed is 20 km/h (12 MPH) or more
105 (221) or more	HIGH	

Air conditioner switch is "ON"

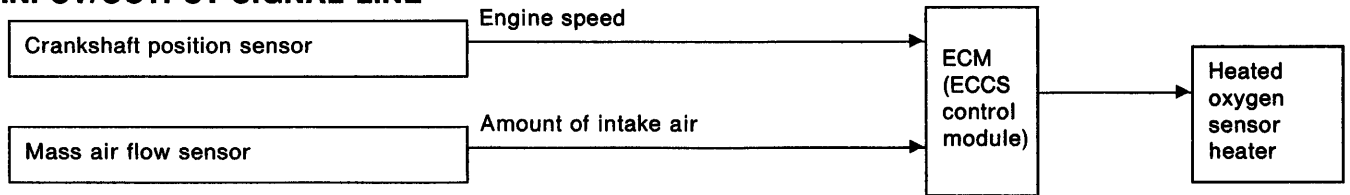
Engine coolant temperature °C (°F)	Radiator fans	Remarks
94 (201) or less	OFF	Vehicle speed is 80 km/h (50 MPH) or more
	LOW	Vehicle speed is 79 km/h (49 MPH) or less
Between 95 (203) and 99 (210)	LOW	
Between 100 (212) and 104 (219)	LOW	Vehicle speed is 19 km/h (12 MPH) or less
	HIGH	Vehicle speed is 20 km/h (12 MPH) or more
105 (221) or more	HIGH	

The radiator fan operates at HIGH if the self-diagnosing engine coolant temperature sensor system results in "N.G."

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Heated Oxygen Sensor (HO2S) Heater Control

INPUT/OUTPUT SIGNAL LINE



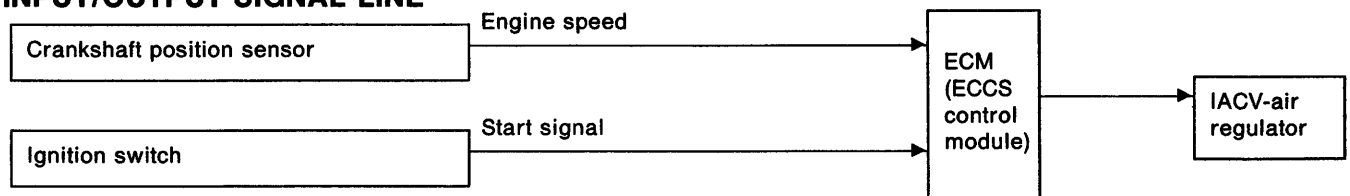
The ECM performs ON/OFF control of the heated oxygen sensor heater corresponding to the engine speed and engine load.

OPERATION

Engine speed rpm	Engine load	Heated oxygen sensor heater
Above 3,200	—	OFF
Below 3,200	Heavy load	OFF
	Middle or light load	ON

Idle Air Control Valve (IACV)-Air Regulator Control

INPUT/OUTPUT SIGNAL LINE



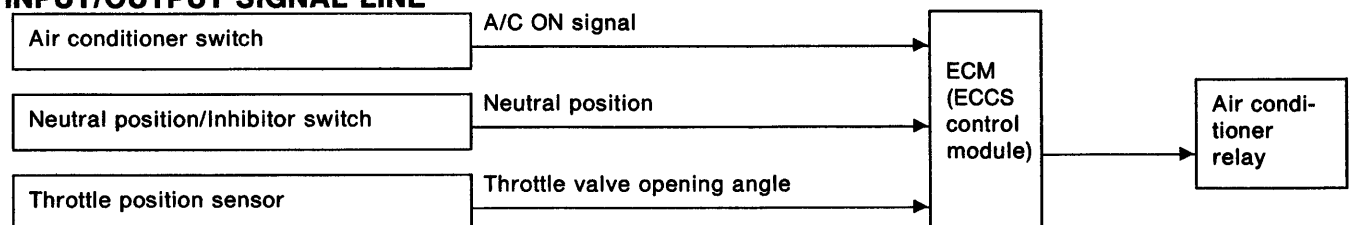
SYSTEM DESCRIPTION

The IACV-air regulator is controlled by the ECM at the same time as fuel pump ON-OFF control.

Condition	IACV-air regulator operation
Ignition switch is turned to ON	Operates for 5 seconds
While engine is running and cranking	Operates
When engine is stopped	OFF in 1 second
Except as shown above	OFF

Acceleration Cut Control

INPUT/OUTPUT SIGNAL LINE

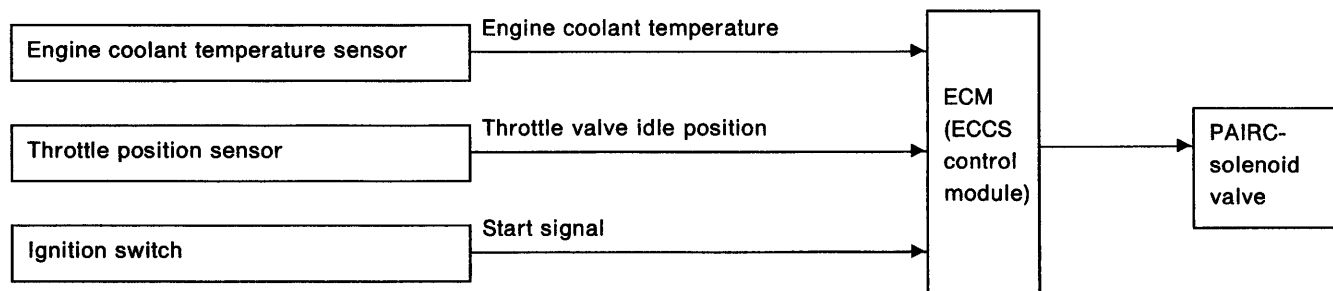


SYSTEM DESCRIPTION

When the accelerator pedal is fully depressed, the air conditioner is turned off for a few seconds. This system improves acceleration when the air conditioner is used.

Pulsed Secondary Air Injection (PAIR) Valve (PAIR valve) Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The PAIR system is designed to send secondary air to the exhaust manifold, utilizing the 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 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 PAIR valve is controlled by the ECM (ECCS control module), corresponding to the engine coolant temperature. When the engine is cold, the PAIR valve control system operates to reduce HC and CO.

In extremely cold conditions, PAIR valve control system does not operate to reduce after-burning. This system also operates during deceleration for the purpose of blowing off water around the PAIR valve.

Engine condition	Water temperature °C (°F)	PAIRC-solenoid valve	PAIR valve control system
Idle or deceleration	Between 28 (82) and 105 (221)	ON	Operates

Fail-safe System

C.P.U. MALFUNCTION OF ECM

Outline

The fail-safe system makes engine starting possible if there is something malfunctioning in the ECM's C.P.U. circuit. In former models, engine starting was difficult under the conditions mentioned above. But with the provisions provided in this fail-safe system, it is possible to start the engine.

Fail-safe system activating condition when ECM is malfunctioning

The computing function of the ECM was judged to be malfunctioning.

When the fail-safe system activates, i.e. if the ECM detects a malfunction condition in the C.P.U. of ECM, the MALFUNCTION INDICATOR LAMP on the instrument panel lights to warn the driver.

Engine control, with fail-safe system, operates when ECM is malfunctioning

When the fail-safe system is operating, fuel injection, ignition timing, fuel pump operation, IACV-AAC valve operation and radiator fan operation are controlled under certain limitations.

Operation

	Operation
Fuel injection	Simultaneous multiport fuel injection system
Ignition timing	Ignition timing is fixed at the preset value.
Fuel pump	Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls.
IACV-AAC valve	Full open
Radiator fans	Radiator fan relay "ON"

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Fail-safe System (Cont'd)

Cancellation of fail-safe system when ECM is malfunctioning

Activation of the fail-safe system is canceled each time the ignition switch is turned OFF. The system is reactivated if all of the above-mentioned activating conditions are satisfied after turning the ignition switch from OFF to ON.

MASS AIR FLOW SENSOR MALFUNCTION

If the mass air flow sensor output voltage is above or below the specified value, the ECM senses an mass air flow sensor malfunction. In case of a malfunction, the throttle position sensor substitutes for the mass air flow sensor.

Though mass air flow sensor 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 ECM.
Running	OFF		Engine speed will not rise above 2,400 rpm

ENGINE COOLANT TEMPERATURE SENSOR MALFUNCTION

When engine coolant temperature sensor output voltage is below or above the specified value, water temperature is fixed at the preset value as follows:

Operation

Condition	Engine coolant temperature decided
Just as ignition switch is turned ON or Start	30°C (86°F)
More than 6 minutes after ignition ON or Start	80°C (176°F)
Except as shown above	30 - 80°C (86 - 176°F) (Depends on the time)

THROTTLE POSITION SENSOR MALFUNCTION

Description

When the output signal of throttle position sensor is abnormal the ECM judges it as a malfunctioning of throttle position sensor.

The ECM does not use the throttle position sensor signal, but judges the idle position by the amount of fuel injected and the engine speed.

Operation

	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

KNOCK SENSOR MALFUNCTION

When the output signal of the knock sensor is abnormal, the ECM judges it to be malfunctioning. When knock sensor is malfunctioning, ignition timing will retard according to operating conditions.

IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION

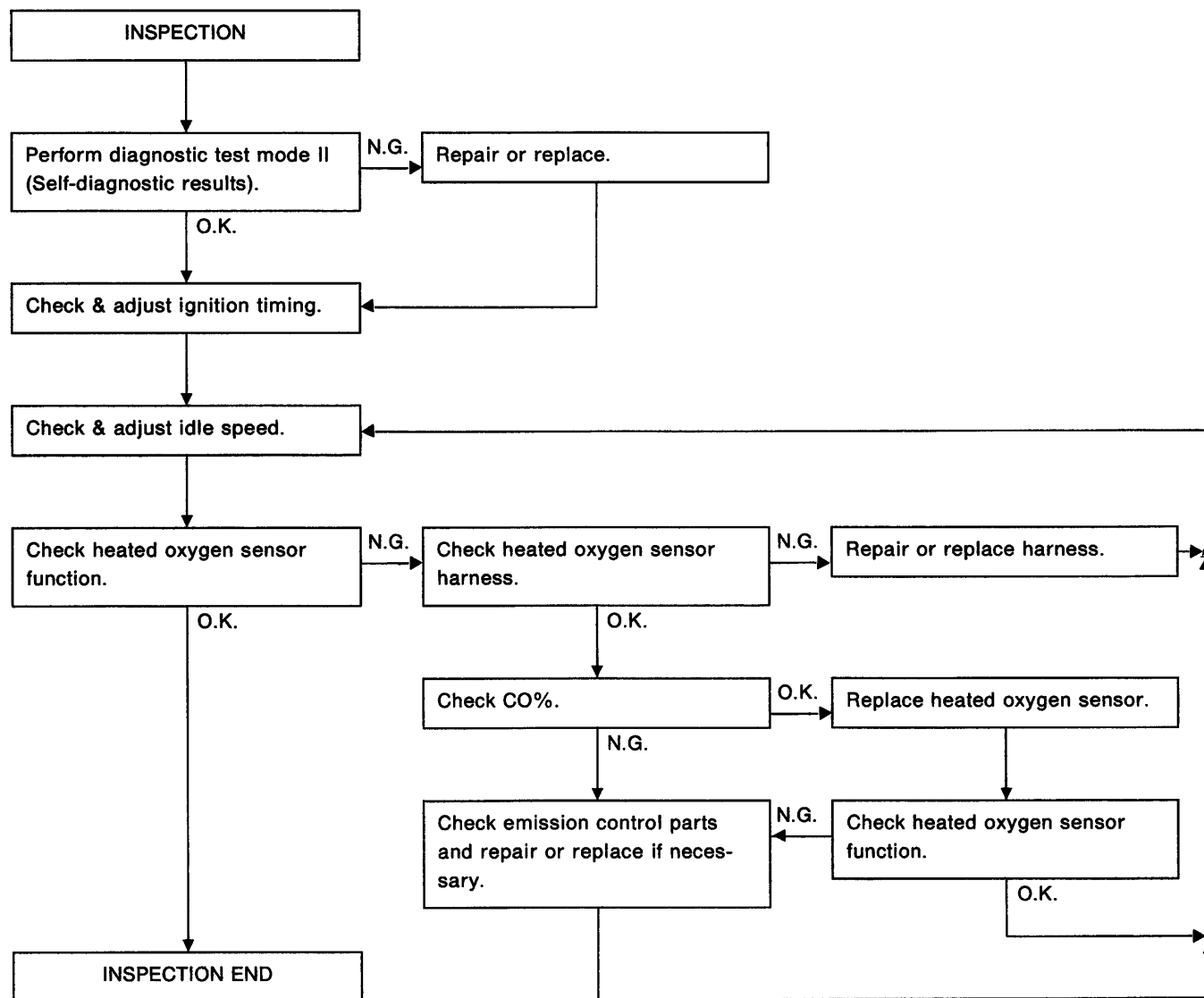
PREPARATION

1. Make sure that the following parts are in good order.

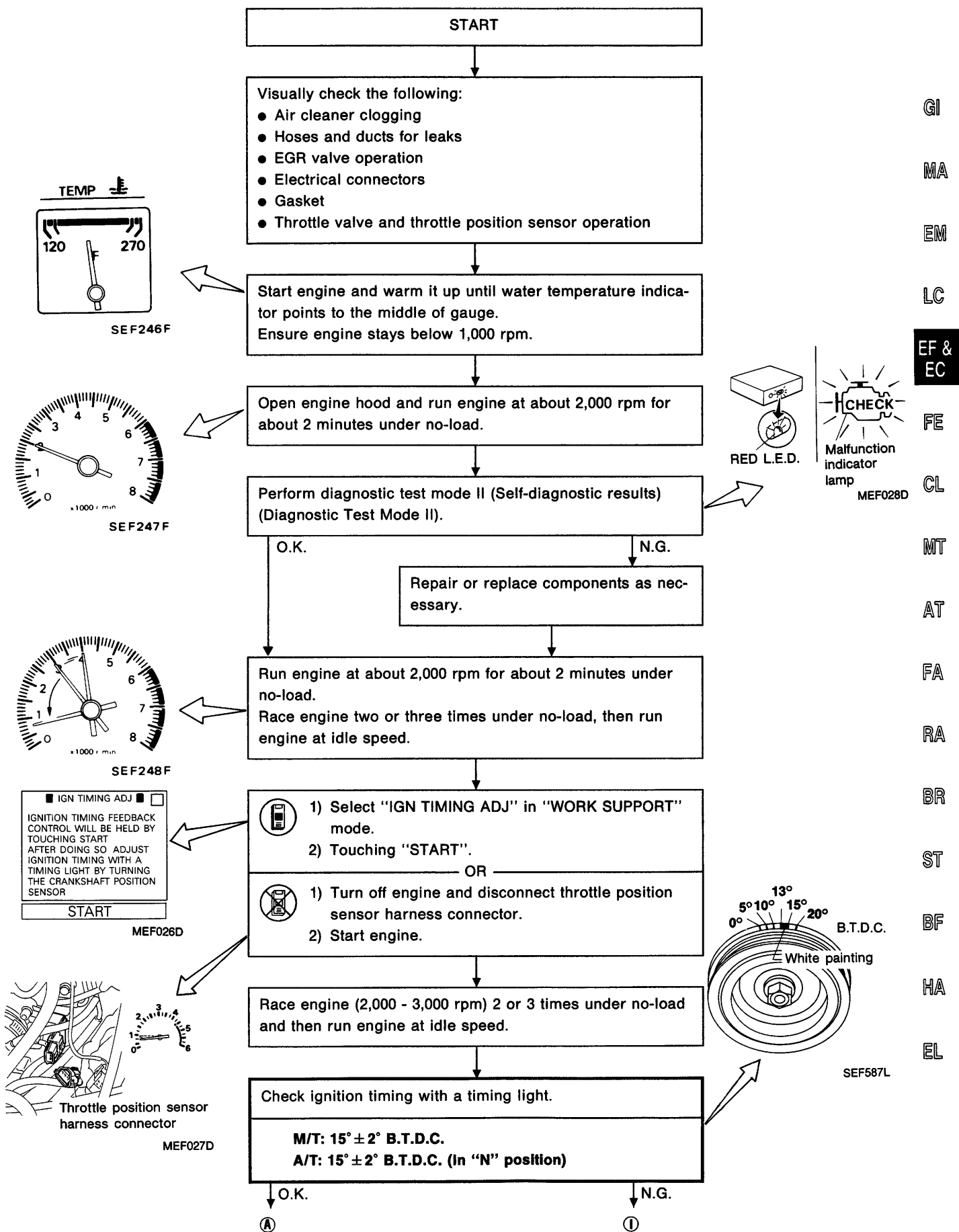
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- ECM harness connector
- Vacuum hoses
- Air intake system (Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- Engine compression
- Throttle valve

2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. On automatic transaxle equipped models, when checking Idle speed, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.
4. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
5. Turn off headlamps, heater blower, rear defogger.
6. Keep front wheels pointed straight ahead.
7. Make the check after the radiator fan has stopped.

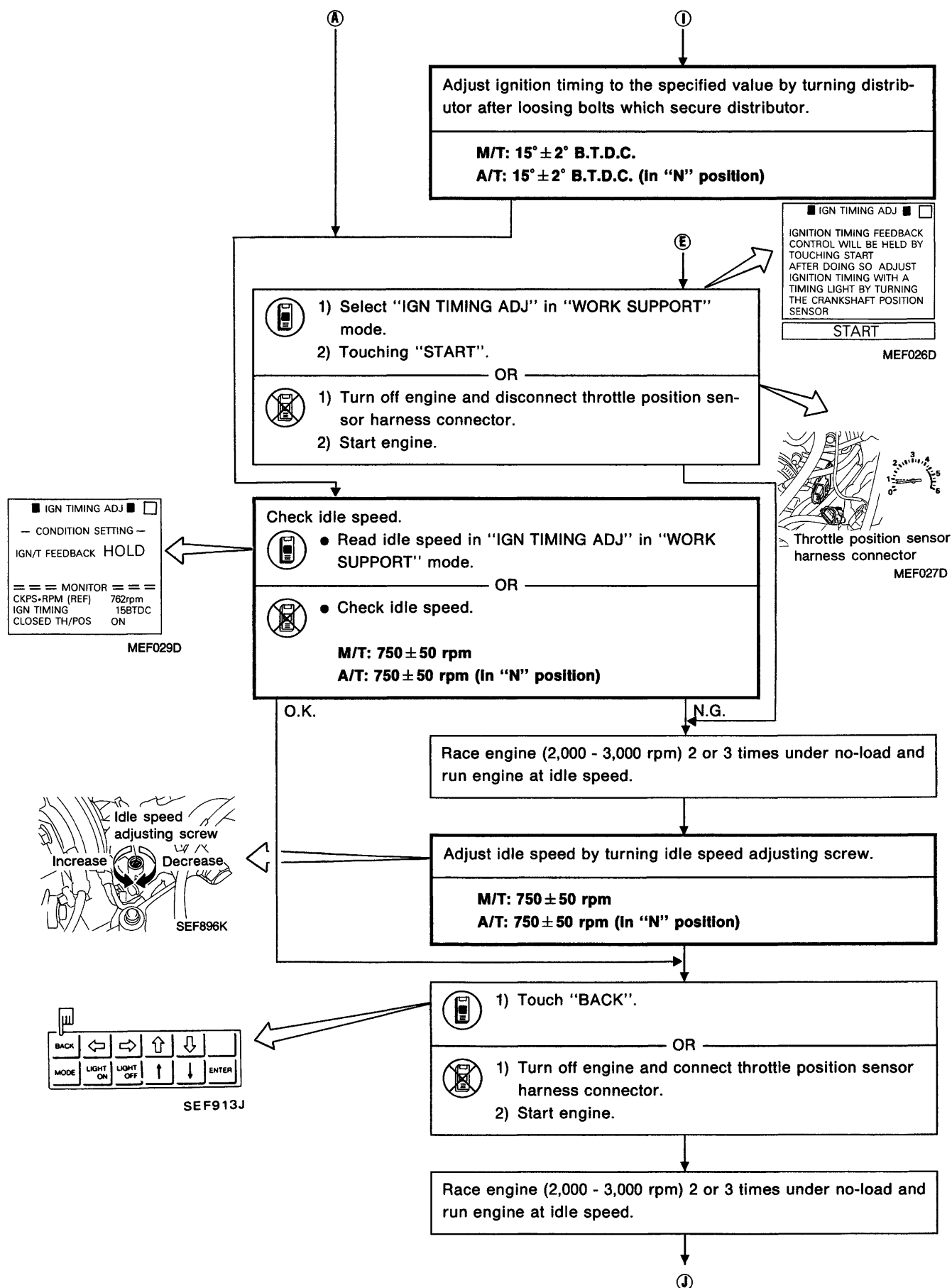
Overall inspection sequence



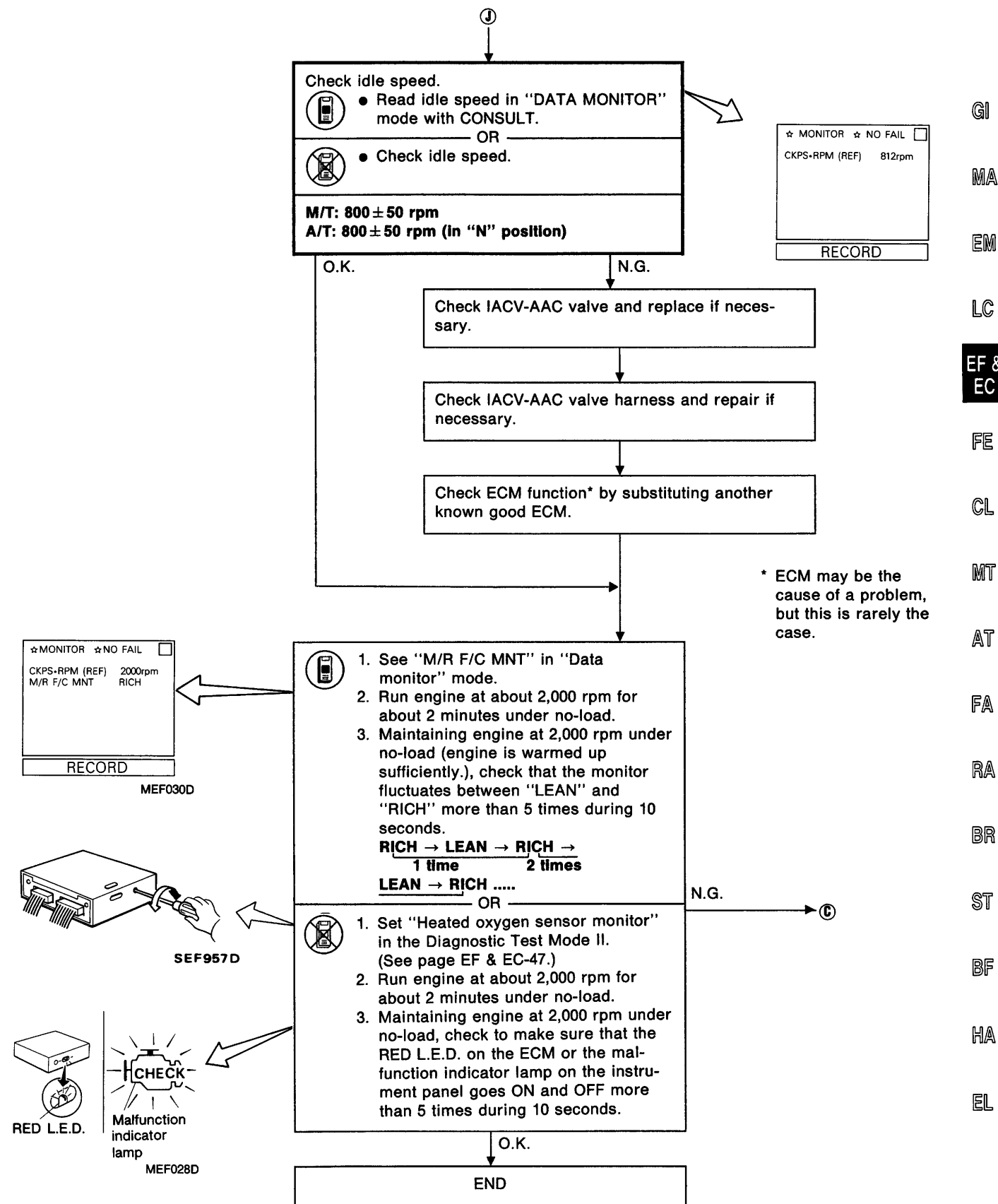
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



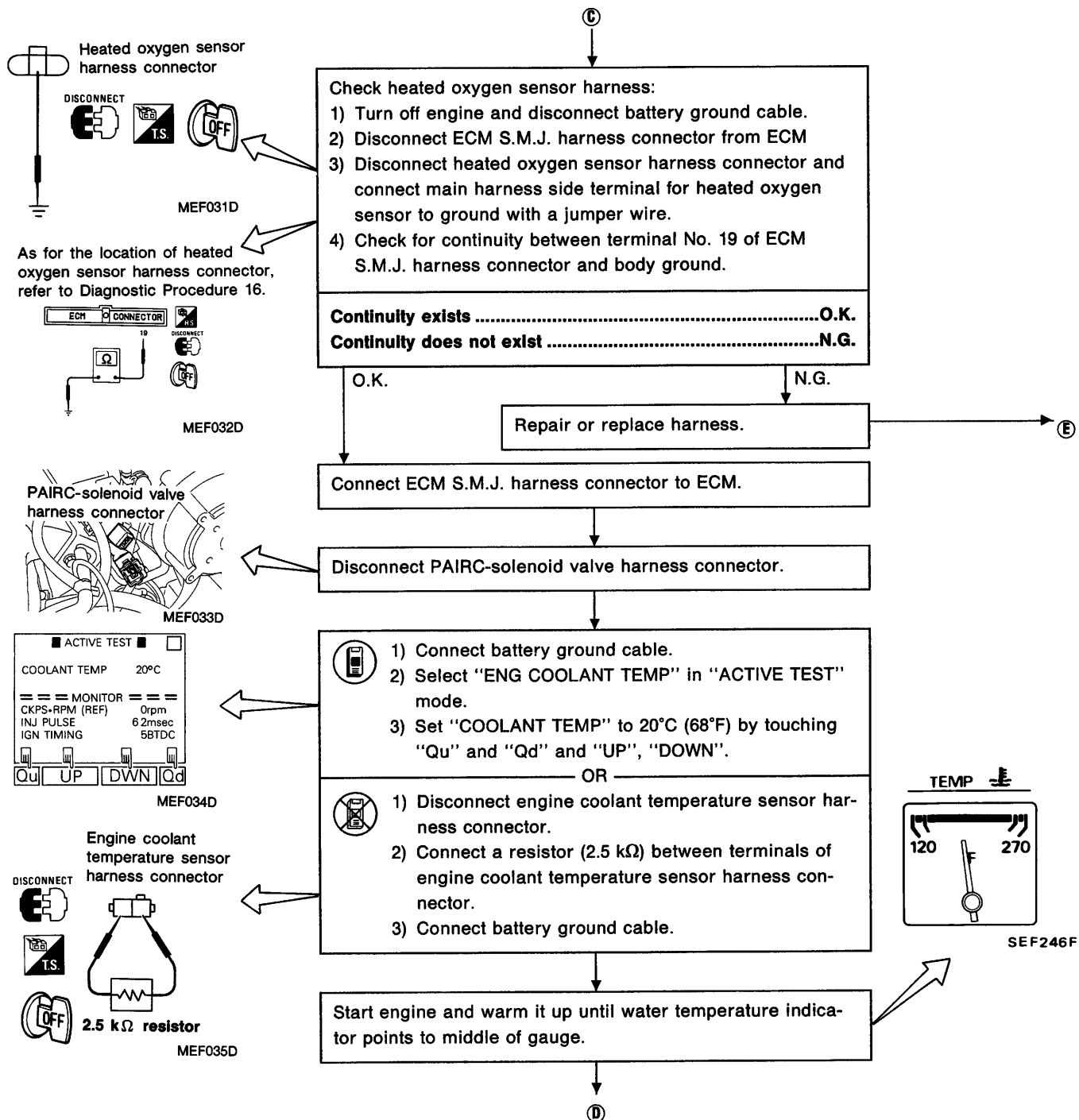
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



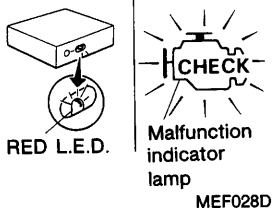
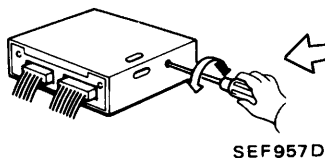
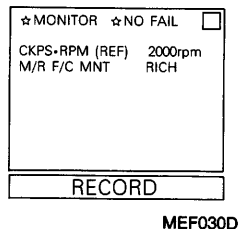
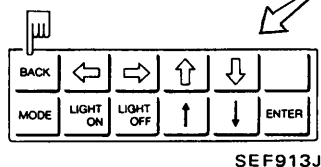
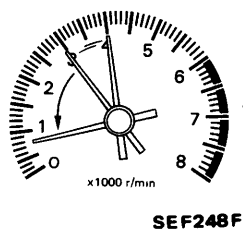
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



① Race engine two or three times under no-load, then run engine at idle speed.

Check "CO" %.

Idle CO: Less than 10%

After checking CO%,

- 1) Touch "BACK".
- 2) Connect PAIRC-solenoid valve harness connector.

- 1) Disconnect the resistor from terminals of engine coolant temperature sensor harness connector
- 2) Connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.
- 3) Connect PAIRC-solenoid valve harness connector.

N.G.

O.K.

Replace heated oxygen sensor.

1. See "M/R F/C MNT" in "Data monitor" mode.
2. Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.

RICH → LEAN → RICH →
1 time 2 times

LEAN → RICH

OR

1. Set "Heated oxygen sensor monitor" in the Diagnostic Test Mode II. (See page EF & EC-47.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that the RED L.E.D. on the ECM or the malfunction indicator lamp on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

N.G.

O.K.

②

③

GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

FA

RA

BR

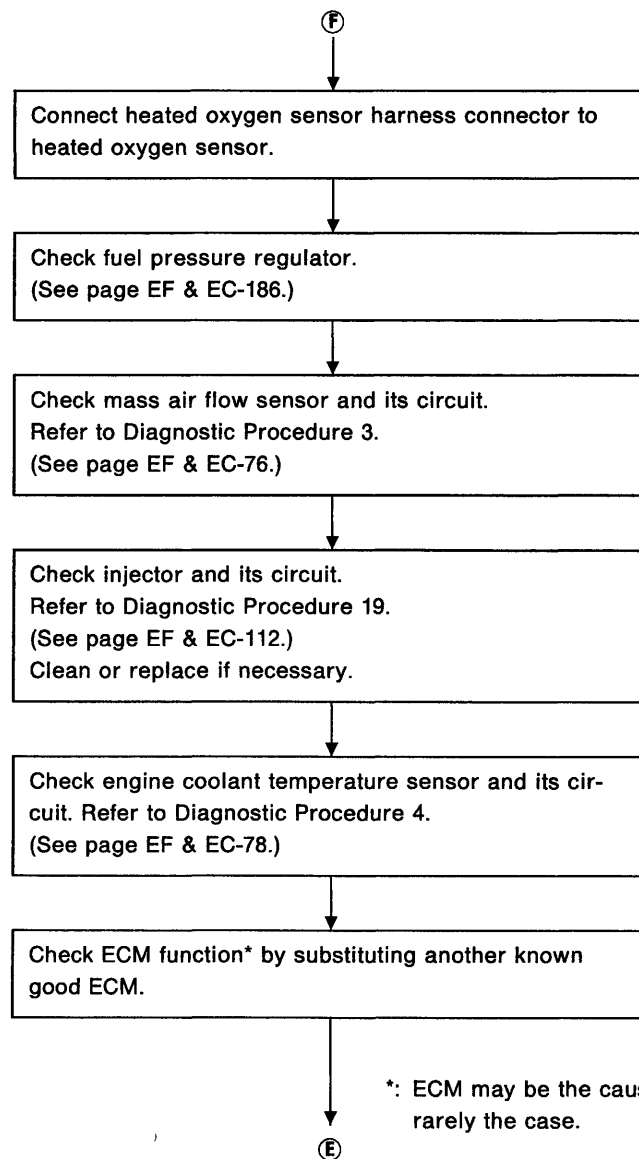
ST

BF

HA

EL

IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



*: ECM may be the cause of a problem, but this is rarely the case.

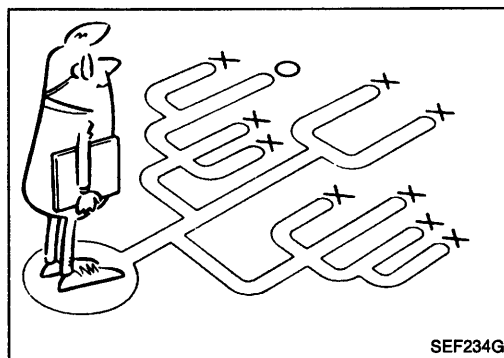
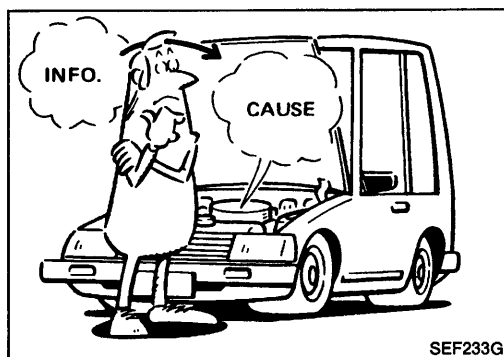
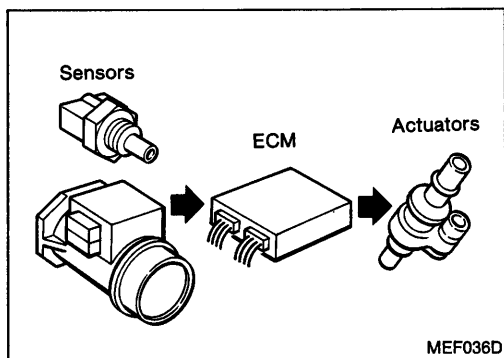
Contents

How to Perform Trouble Diagnoses for Quick and Accurate Repair	EF & EC- 37	
On-board Diagnostic System	EF & EC- 42	
On-board Diagnostic System — Diagnostic Test Mode I	EF & EC- 44	GI
On-board Diagnostic System — Diagnostic Test Mode II (Self-diagnostic results)	EF & EC- 45	
On-board Diagnostic System — Diagnostic Test Mode II (Heated oxygen sensor monitor) ..	EF & EC- 47	MA
Consult	EF & EC- 48	
Diagnostic Procedure	EF & EC- 58	
Basic Inspection	EF & EC- 60	EM
How to Execute On-board diagnostic system in Diagnostic Test Mode II	EF & EC- 63	
Diagnostic Procedure 1		LC
MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)	EF & EC- 70	
Diagnostic Procedure 2		EF & EC
CRANKSHAFT POSITION SENSOR (Diagnostic trouble code No. 11)	EF & EC- 73	
Diagnostic Procedure 3		FE
MASS AIR FLOW SENSOR (Diagnostic trouble code No. 12 )	EF & EC- 75	
Diagnostic Procedure 4		CL
ENGINE COOLANT TEMPERATURE SENSOR (Diagnostic trouble code No. 13 ) ..	EF & EC- 77	
Diagnostic Procedure 5		MT
VEHICLE SPEED SENSOR (Diagnostic trouble code No. 14 )	EF & EC- 79	
Diagnostic Procedure 6		AT
IGNITION SIGNAL (Diagnostic trouble code No. 21)	EF & EC- 81	
Diagnostic Procedure 7		FA
ECM (ECCS CONTROL MODULE) (Diagnostic trouble code No. 31 )	EF & EC- 84	
Diagnostic Procedure 8		RA
EGR FUNCTION (Diagnostic trouble code No. 32 )	EF & EC- 85	
Diagnostic Procedure 9		BR
HEATED OXYGEN SENSOR (Diagnostic trouble code No. 33 )	EF & EC- 88	
Diagnostic Procedure 10		ST
KNOCK SENSOR (Diagnostic trouble code No. 34)	EF & EC- 91	
Diagnostic Procedure 11		BF
EGR TEMPERATURE SENSOR (Diagnostic trouble code No. 35 )	EF & EC- 93	
Diagnostic Procedure 12		HA
THROTTLE POSITION SENSOR (Diagnostic trouble code No. 43 )	EF & EC- 95	
Diagnostic Procedure 13		EL
INJECTOR LEAK (Diagnostic trouble code No. 45 )	EF & EC- 97	
Diagnostic Procedure 14		
CRANKSHAFT POSITION SENSOR (Not self-diagnostic item)	EF & EC- 99	
Diagnostic Procedure 15		
EGR CONTROL (Not self-diagnostic item)	EF & EC-101	
Diagnostic Procedure 16		
HEATED OXYGEN SENSOR HEATER (Not self-diagnostic item)	EF & EC-104	

TROUBLE DIAGNOSES

Contents (Cont'd)

Diagnostic Procedure 17	
START SIGNAL (Not self-diagnostic item)	EF & EC-106
Diagnostic Procedure 18	
PAIR valve CONTROL (Not self-diagnostic item)	EF & EC-108
Diagnostic Procedure 19	
INJECTOR (Not self-diagnostic item)	EF & EC-111
Diagnostic Procedure 20	
FUEL PUMP (Not self-diagnostic item)	EF & EC-113
Diagnostic Procedure 21	
IACV-AIR REGULATOR (Not self-diagnostic item)	EF & EC-116
Diagnostic Procedure 22	
IACV-AAC VALVE (Not self-diagnostic item)	EF & EC-118
Diagnostic Procedure 23	
RADIATOR FAN CONTROL (Not self-diagnostic item)	EF & EC-121
Diagnostic Procedure 24	
POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)	EF & EC-130
Diagnostic Procedure 25	
NEUTRAL POSITION INHIBITOR SWITCH (Not self-diagnostic item)	EF & EC-133
Diagnostic Procedure 26 — Symptom — High Idling after Warm-up	EF & EC-138
Diagnostic Procedure 27 — Symptom — Hunting	EF & EC-139
Diagnostic Procedure 28 — Symptom — Unstable Idle	EF & EC-141
Diagnostic Procedure 29 — Symptom — Hard to Start or Impossible to Start when the Engine is Cold	EF & EC-144
Diagnostic Procedure 30 — Symptom — Hard to Start or Impossible to Start when the Engine is Hot	EF & EC-145
Diagnostic Procedure 31 — Symptom — Hard to Start or Impossible to Start under Normal Conditions	EF & EC-147
Diagnostic Procedure 32 — Symptom — Hesitation when the Engine is Hot	EF & EC-149
Diagnostic Procedure 33 — Symptom — Hesitation when the Engine is Cold	EF & EC-150
Diagnostic Procedure 34 — Symptom — Hesitation under Normal Conditions	EF & EC-151
Diagnostic Procedure 35 — Symptom — Engine Stalls when turning	EF & EC-152
Diagnostic Procedure 36 — Symptom — Engine Stalls when the Engine is Hot	EF & EC-154
Diagnostic Procedure 37 — Symptom — Engine Stalls when the Engine is Cold	EF & EC-156
Diagnostic Procedure 38 — Symptom — Engine Stalls when Stepping on the Accelerator Momentarily	EF & EC-158
Diagnostic Procedure 39 — Symptom — Engine Stalls after Decelerating	EF & EC-160
Diagnostic Procedure 40 — Symptom — Engine Stalls when Accelerating or when Driving at Constant Speed	EF & EC-163
Diagnostic Procedure 41 — Symptom — Engine Stalls when the Electrical Load is Heavy	EF & EC-165
Diagnostic Procedure 42 — Symptom — Lack of Power and Stumble	EF & EC-167
Diagnostic Procedure 43 — Symptom — Knock	EF & EC-168
Diagnostic Procedure 44 — Symptom — Surge	EF & EC-170
Diagnostic Procedure 45 — Symptom — Backfire through the Intake	EF & EC-171
Diagnostic Procedure 46 — Symptom — Backfire through the Exhaust	EF & EC-171
Electrical Components Inspection	EF & EC-172



How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM 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 improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

A visual check only may not find the cause of the problems, so 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 interaction 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.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

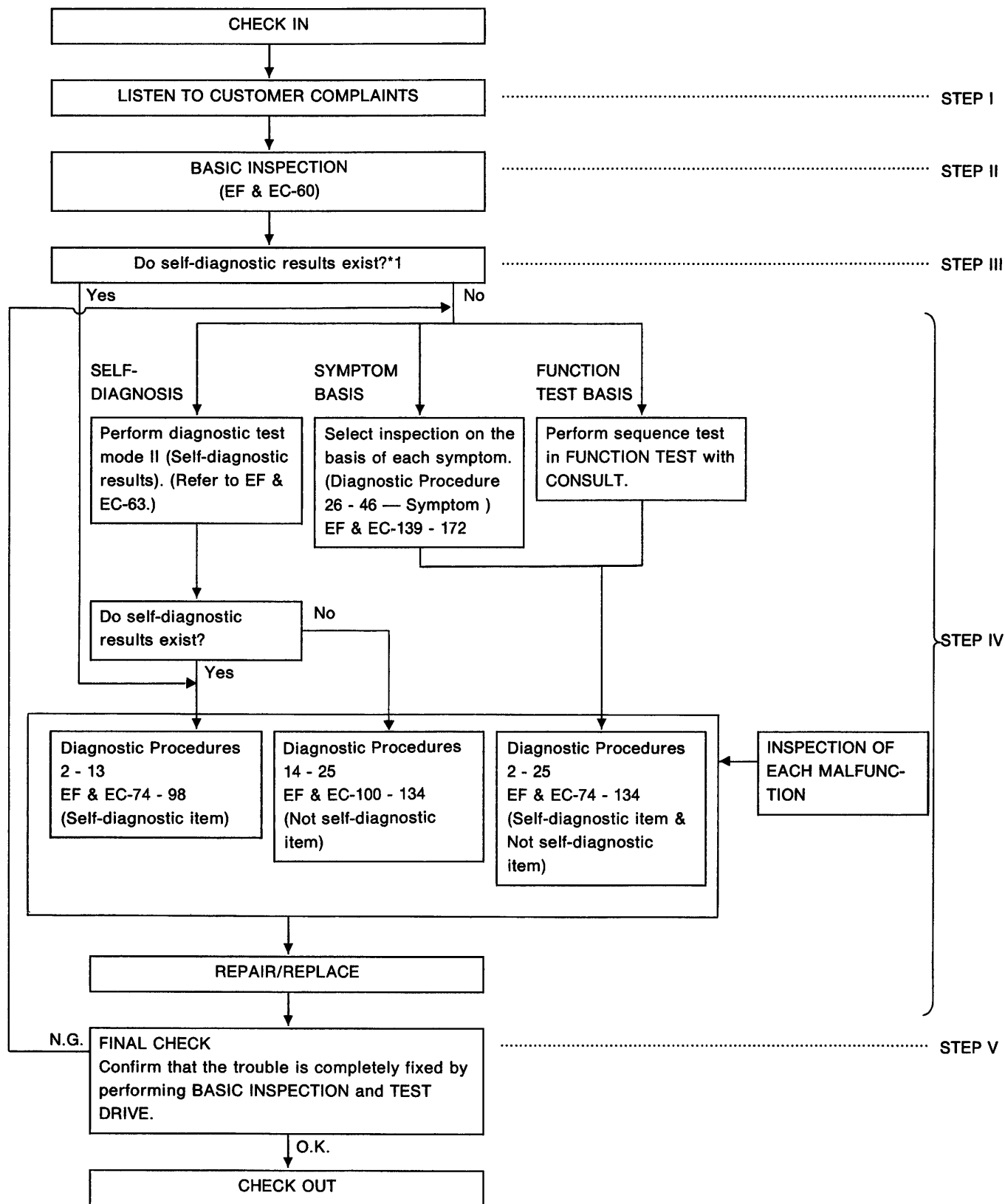
HA

EL

TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

WORK FLOW



*1: If the on-board diagnostic system cannot be performed, check main power supply and ground circuit. (See Diagnostic Procedure 1)

*2: If the trouble is not duplicated, see INTERMITTENT PROBLEM SIMULATION (EF & EC-41).

TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

DESCRIPTION FOR WORK FLOW

STEP	DESCRIPTION	
STEP I	Identify the trouble using the "DIAGNOSTIC WORKSHEET" as shown on the next page.	GI
STEP II	Be sure to carry out the Basic Inspection, or the results of inspections thereafter may be misinterpreted.	
STEP III	Check the self-diagnostic results stored in the ECM of the failed vehicle.	MA
STEP IV	Perform inspection often selecting from the following three tests according to the trouble observed.	
	1. Diagnostic Test Mode II (Self-diagnostic results) Follow the Diagnostic Test Mode II (Self-diagnostic results) procedure for each item described in "How to Execute Diagnostic Test Mode II (Self-diagnostic results). Non-self-diagnostic procedures described for some items will also provide results which are equal to the self-diagnostic results.	EM
	2. SYMPTOM BASIS This inspection is of a simplified method. When performing inspection of a part, the corresponding system must be checked thoroughly by selecting the appropriate check item from Diagnostic Procedures 2 - 25.	LC
	3. FUNCTION TEST BASIS (Sequence test) In this inspection, the CONSULT judges "OK" or "NG" on each system in place of a technician. When performing inspection of a part, the corresponding system must be checked thoroughly by selecting the appropriate check item from Diagnostic Procedures 2 - 25.	EF & EC
	4. Diagnostic Procedure ● This inspection program is prepared using the data obtained when disconnection of harness or connectors has occurred in the respective circuit. ● Inspection of the "Not self-diagnostic item" does not actually start with the execution of Diagnostic Test Mode II. However, inspection is started by assuming that the Diagnostic Test Mode II has already been performed. ● When a system having the Diagnostic Test Mode II function contains any circuit placed outside the range of this Diagnostic Test Mode II function, it is arranged that the "Not self-diagnostic item" of such a system will be performed when the self-diagnostic result is OK. Example: CRANKSHAFT POSITION SENSOR	FE
STEP V	1. FINAL CHECK item is not described in the "Not self-diagnostic item". However, this FINAL CHECK must be performed without fail in order to ensure that the trouble has been repaired, and also that the unit disassembled in the course of the repair work has been reassembled correctly.	CL
	2. If the same trouble phenomenon is observed again in the final check: Go back to STEP IV, and perform the inspection using a method which is different from the previous method.	MT
	3. If the cause of the trouble is still unknown even after conducting step 2 above, check the circuit of each system for a short by using the voltage available at the "ECM INPUT/OUTPUT SIGNAL INSPECTION" terminal.	AT
		FA
		RA
		BR
		ST
		BF
		HA
		EL

TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

DIAGNOSTIC WORKSHEET

There are many kinds of operating conditions that lead to malfunctions on engine components.

A good grasp of such conditions can make trouble-shooting 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.

KEY POINTS

WHAT Vehicle & engine model

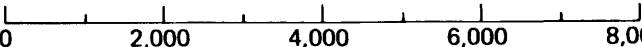
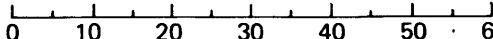
WHEN Date, Frequencies

WHERE..... Road conditions

HOW Operating conditions,
Weather conditions,
Symptoms

SEF907L

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 ☐ Knock ☐ 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 affected			
	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			
Malfunction indicator lamp		☐ Turned on ☐ Not turned on			

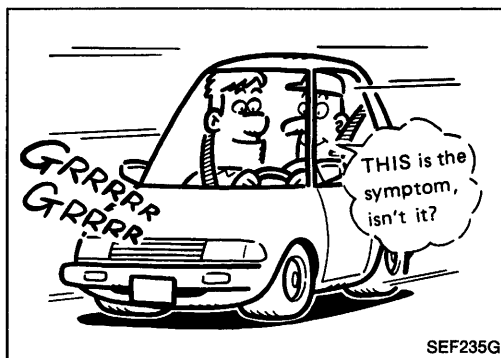
TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

INTERMITTENT PROBLEM SIMULATION

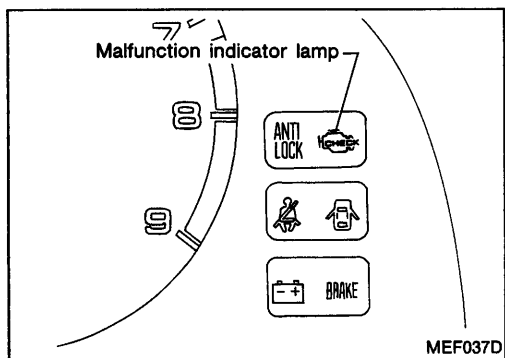
In order to duplicate an intermittent problem, it is effective to create similar conditions for component parts, under which the problem might occur.

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	Crankshaft position sensor	Advanced	Rotate distributor clockwise.
			Retarded	Rotate distributor counterclockwise.
3	Mixture ratio feedback control	Heated oxygen sensor	Suspended	Disconnect heated oxygen sensor harness connector.
		ECM	Operation check	Perform diagnostic test mode II (Self-diagnostic results) at 2,000 rpm.
4	Idle speed	IACV-AAC valve	Raised	Turn idle adjusting screw counterclockwise.
			Lowered	Turn idle adjusting screw clockwise.
5	Electrical connection (Electric continuity)	Harness connectors and wires	Poor electrical connection or improper wiring	Tap or wiggle.
				Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks.
6	Temperature	ECM	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 headlamps, air conditioner, rear defogger, etc.
9	Closed throttle position switch condition	ECM	ON-OFF switching	Rotate throttle position sensor body.
10	Ignition spark	Timing light	Spark power check	Try to flash timing light for each cylinder using ignition coil adapter (S.S.T.).

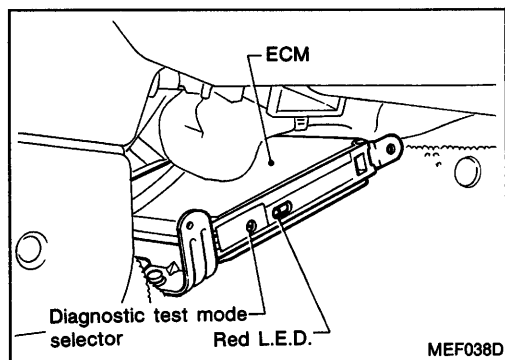
TROUBLE DIAGNOSES



On-board Diagnostic System

MALFUNCTION INDICATOR LAMP

A malfunction indicator lamp has been adopted on all models. This light blinks simultaneously with the RED L.E.D. on the ECM.



ECM L.E.D.

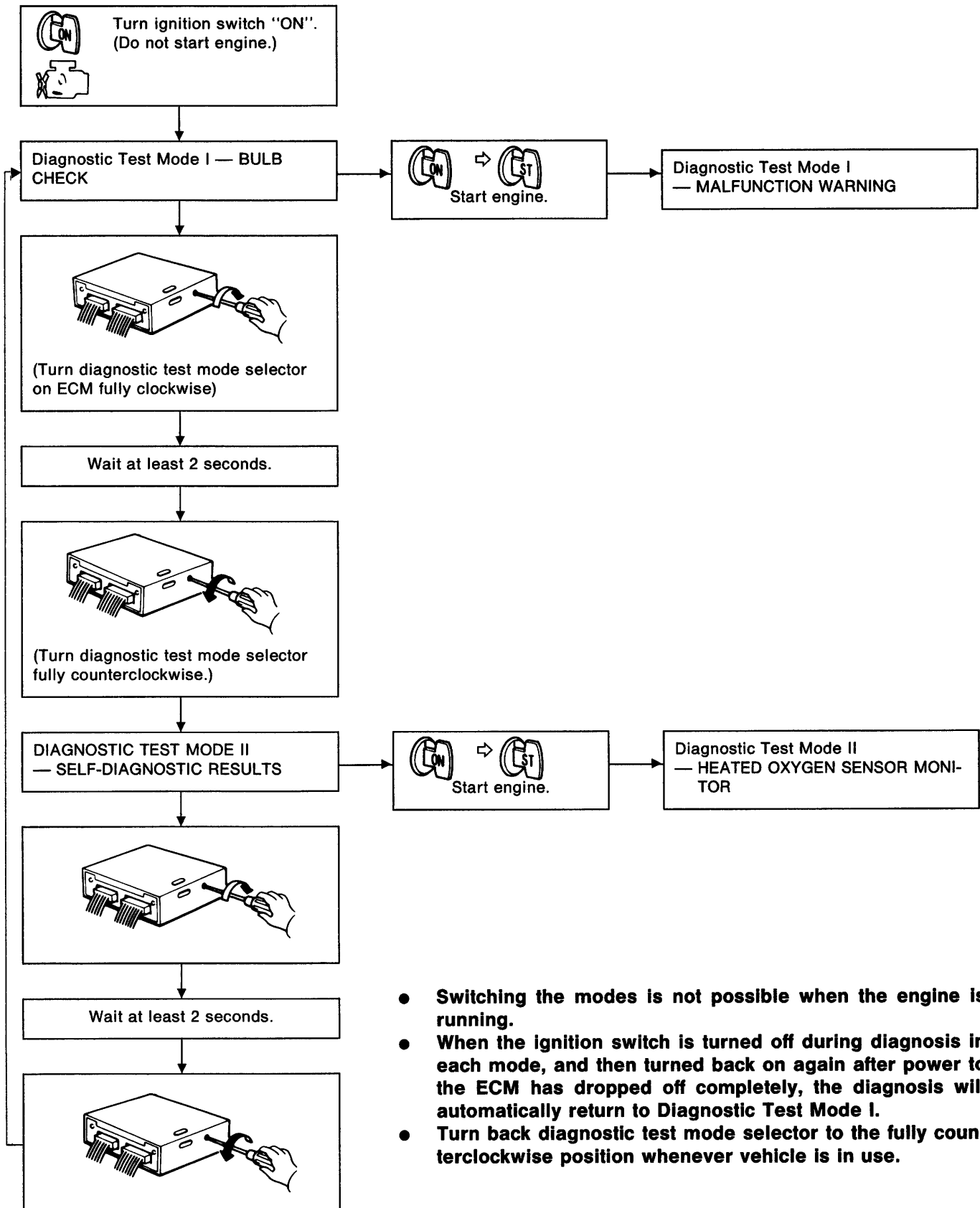
The ECM has only one RED L.E.D.

ON-BOARD DIAGNOSTIC SYSTEM FUNCTION

Condition		Diagnostic Test Mode I	Diagnostic Test Mode II
Ignition switch in "ON" position	Engine stopped 	BULB CHECK	SELF-DIAGNOSTIC RESULTS
	Engine running 	MALFUNCTION WARNING	HEATED OXYGEN SENSOR MONITOR

TROUBLE DIAGNOSES

On-board Diagnostic System (Cont'd) HOW TO SWITCH DIAGNOSTIC TEST MODES



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

TROUBLE DIAGNOSES

On-board Diagnostic System — Diagnostic Test Mode I

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the RED L.E.D. in the ECM and the MALFUNCTION INDICATOR LAMP in the instrument panel stay "ON". If either remain "OFF", check the bulb in the MALFUNCTION INDICATOR LAMP or the RED L.E.D.

DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

FOR CALIFORNIA MODELS

MALFUNCTION INDICATOR LAMP and RED L.E.D.	Condition
ON	When the following malfunctions (malfunction indicator lamp item) are detected or the ECM's C.P.U. is malfunctioning.
OFF	O.K.

Diagnostic trouble code No.	Malfunction
12	Mass air flow sensor circuit
13	Engine coolant temperature sensor circuit
14	Vehicle speed sensor circuit
31	ECM (ECCS control module)
32	EGR function
33	Heated oxygen sensor circuit
35	EGR temperature sensor circuit
43	Throttle position sensor circuit
45	Injector leak

- These Diagnostic Trouble Code Numbers are clarified in Diagnostic Test Mode II — SELF- DIAGNOSTIC RESULTS.
- The RED L.E.D. and the MALFUNCTION INDICATOR LAMP will turn off when normal condition is detected. At this time, the Diagnostic Test Mode II — SELF-DIAGNOSTIC RESULTS memory must be cleared as the contents remain stored.

FOR NON-CALIFORNIA MODELS

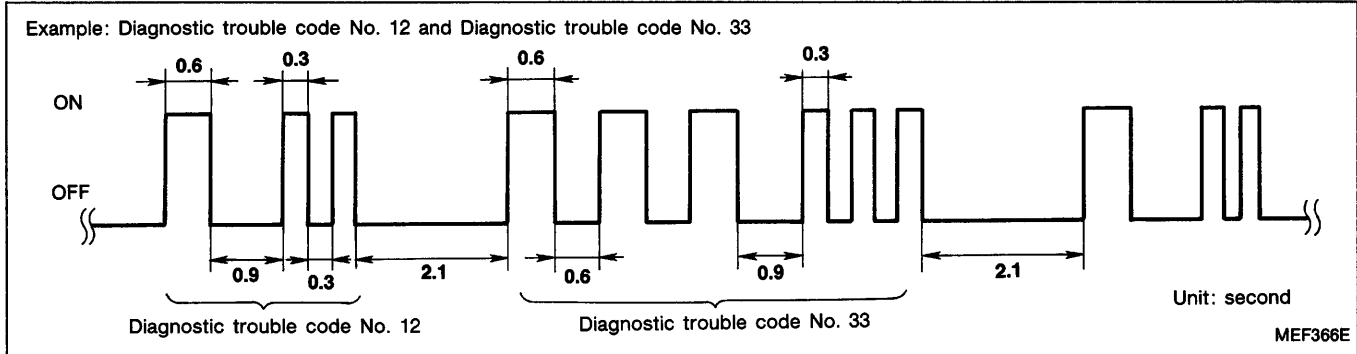
MALFUNCTION INDICATOR LAMP and RED L.E.D.	Condition
ON	When the ECM's C.P.U. is malfunctioning.
OFF	O.K.

TROUBLE DIAGNOSES

On-board Diagnostic System — Diagnostic Test Mode II (Self-diagnostic results)

DESCRIPTION

In this mode, a diagnostic trouble code is indicated by the number of flashes from the RED L.E.D. or the MALFUNCTION INDICATOR LAMP as shown below:



Long (0.6 second) blinking indicates the number of ten digits and short (0.3 second) blinking indicates the number of single digits.

For example, the red L.E.D. flashes once for 0.6 seconds and then it flashes twice for 0.3 seconds. This indicates the number "12" and refers to a malfunction in the mass air flow sensor. In this way, all the problems are classified by their diagnostic trouble code numbers.

The diagnostic results will remain in ECM memory.

Display diagnostic trouble code table

Diagnostic trouble code No.	Detected items	California models	Non-California models
11*	Crankshaft position sensor circuit	X	X
12 	Mass air flow sensor circuit	X	X
13 	Engine coolant temperature sensor circuit	X	X
14 	Vehicle speed sensor circuit	X	X
21*	Ignition signal circuit	X	X
31 	ECM	X	X
32 	EGR function	X	—
33 	Heated oxygen sensor circuit	X	X
34	Knock sensor circuit	X	X
35 	EGR temperature sensor circuit	X	—
43 	Throttle position sensor circuit	X	X
45 	Injector leak	X	—
55	No malfunction in the above circuits	X	X

X: Available

—: Not available

 : Malfunction indicator lamp item

*: Check items causing a malfunction of crankshaft position sensor circuit first, if both diagnostic trouble code No. 11 and 21 are displayed at the same time.

TROUBLE DIAGNOSES

On-board Diagnostic System — Diagnostic Test Mode II (Self-diagnostic results) (Cont'd)

Diagnostic trouble code No.	Detected items	Malfunction is detected when ...	Check item (remedy)
*11	Crankshaft position 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.	Harness and connector (If harness and connector are normal, replace crankshaft position sensor.)
12	Mass air flow sensor circuit	The mass air flow sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	Harness and connector (If harness and connector are normal, replace mass air flow sensor.)
13	Engine coolant temperature sensor circuit	The engine coolant temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	- Harness and connector - Engine coolant temperature sensor
14	Vehicle speed sensor circuit	The vehicle speed sensor circuit is open or shorted.	- Harness and connector - Vehicle speed sensor (reed switch)
*21	Ignition signal circuit	The ignition signal in the primary circuit is not entered during engine cranking or running.	- Harness and connector - Power transistor unit
31	ECM	ECM calculation function is malfunctioning.	[Replace ECM (ECCS control module).]
32	EGR function	EGR valve does not operate. (EGR valve spring does not lift.)	- EGR valve - EGR & canister control solenoid valve
33	Heated oxygen sensor circuit	The heated oxygen sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	- Harness and connector - Heated oxygen sensor - Fuel pressure - Injectors - Intake air leaks
34	Knock sensor circuit	The knock sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	- Harness and connector - Knock sensor
35	EGR temperature sensor circuit	The EGR temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	- Harness and connector - EGR temperature sensor
43	Throttle position sensor circuit	The throttle position sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	- Harness and connector - Throttle position sensor
45	Injector leak	Fuel leaks from injector.	Injector

*: Check items causing a malfunction of crankshaft position sensor circuit first, if both diagnostic trouble code No. 11 and 21 come out at the same time.

HOW TO ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)

The diagnostic trouble code is erased from the backup memory on the ECM when the diagnostic test mode is changed from Diagnostic Test Mode II to Diagnostic Test Mode I. (Refer to "HOW TO SWITCH MODES".)

- When the battery terminal is disconnected, the diagnostic trouble code will be lost from the backup memory within 24 hours.
- Before starting on-board diagnostic system, do not erase the stored memory before beginning on-board diagnostic system.

TROUBLE DIAGNOSES

On-board Diagnostic System — Diagnostic Test Mode II (Heated oxygen sensor monitor)

DESCRIPTION

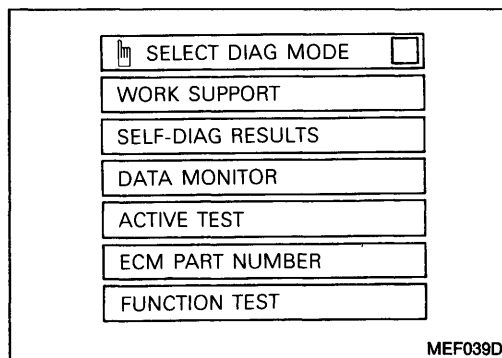
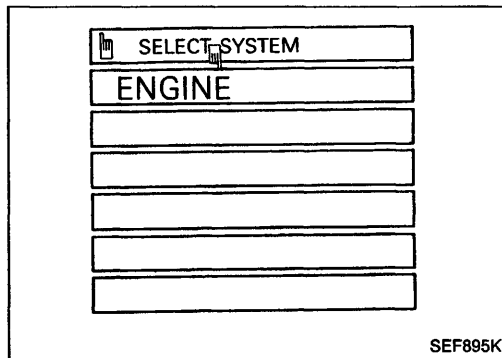
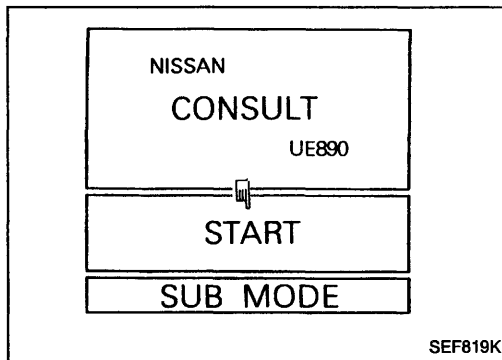
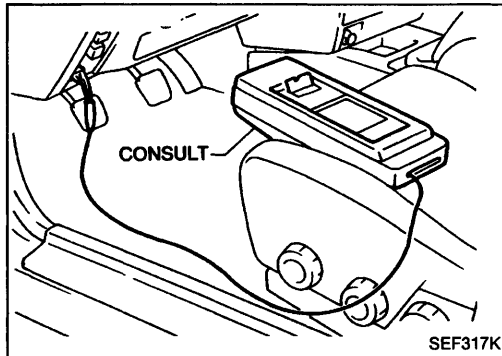
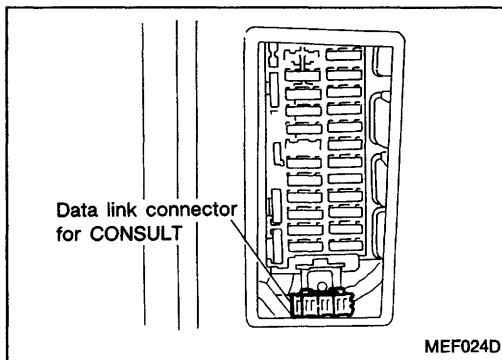
In this mode, the MALFUNCTION INDICATOR LAMP and RED L.E.D. display the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor.

MALFUNCTION INDICATOR LAMP and RED L.E.D.	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop system
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop system

*: Maintains conditions just before switching to open loop.

HOW TO CHECK HEATED OXYGEN SENSOR

1. Set Diagnostic Test Mode II. (Refer to "HOW TO SWITCH MODES".)
2. Start engine and warm it up until engine coolant temperature indicator points to the middle of the gauge.
3. Run engine at about 2,000 rpm for about 2 minutes under no-load conditions.
4. Make sure RED L.E.D. or MALFUNCTION INDICATOR LAMP goes ON and OFF more than 5 times every 10 seconds; measured at 2,000 rpm under no-load.



Consult

CONSULT INSPECTION PROCEDURE

1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located behind the fuse box cover.)

3. Turn on ignition switch.
4. Touch "START".

5. Touch "ENGINE".

6. Perform each diagnostic test mode according to the inspection sheet as follows:

For further information, see the CONSULT Operation Manual.

TROUBLE DIAGNOSES

Consult (Cont'd)

ECCS COMPONENT PARTS APPLICATION

ECCS COMPONENT PARTS		DIAGNOSTIC TEST MODE				
		WORK SUPPORT	SELF- DIAG- NOSTIC RESULTS	DATA MONITOR	ACTIVE TEST	FUNCTION TEST
INPUT	Crankshaft position sensor		X	X		
	Mass air flow sensor		X	X		
	Engine coolant temperature sensor		X	X	X	
	Heated oxygen sensors		X	X		X
	Vehicle speed sensors		X	X		X
	Throttle position sensor	X	X	X		X
	EGR temperature sensor*		X	X		
	Knock sensor		X			
	Ignition switch (start signal)			X		X
	Air conditioner switch			X		
	Neutral position switch			X		X
	Power steering oil pump switch			X		X
	Battery			X		
OUT- PUT	Injectors		X	X	X	X
	Power transistor (ignition timing)	X	X (Ignition signal)	X	X	X
	IACV-AAC valve	X		X	X	X
	EGR & canister control solenoid valve			X	X	X
	Air conditioner relay			X		
	Fuel pump relay	X		X	X	X
	Radiator fan			X	X	X
	PAIRC-solenoid valve			X	X	

: The ECCS component part marked “” is applicable to vehicles for California only.

X: Applicable

TROUBLE DIAGNOSES

Consult (Cont'd)

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit.
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.
Data monitor	Input/Output data in the ECM can be read.
Active test	Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
ECM part numbers	ECM part numbers can be read.
Function test	Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG".

WORK SUPPORT MODE

WORK ITEM	CONDITION	USAGE
THRTL POS SEN ADJ	CHECK THE THROTTLE POSITION SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITIONS. ● IGN SW "ON" ● ENG NOT RUNNING ● ACC PEDAL NOT PRESSED	When adjusting throttle position sensor initial position.
IGNITION TIMING ADJ	● IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING "START". AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CRANKSHAFT POSITION SENSOR.	When adjusting initial ignition timing.
IACV-AAC VALVE ADJ	SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS. ● ENGINE WARMED UP ● NO-LOAD	When adjusting idle speed.
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line.

TROUBLE DIAGNOSES

Consult (Cont'd)

SELF-DIAGNOSTIC MODE

DIAGNOSTIC ITEM	DIAGNOSTIC ITEM IS DETECTED WHEN ...	CHECK ITEM (REMEDY)
CRANK POSITION SEN*	- 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.	Harness and connector (If harness and connector are normal, replace crankshaft position sensor.)
MASS AIR FLOW SEN	The mass air flow sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	Harness and connector (If harness and connector are normal, replace mass air flow sensor.)
COOLANT TEMP SEN	The engine coolant temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	- Harness and connector - Engine coolant temperature sensor
VEHICLE SPEED SEN	The vehicle speed sensor circuit is open or shorted.	- Harness and connector - Vehicle speed sensor (reed switch)
IGN SIGNAL-PRIMARY*	The ignition signal in primary circuit is not entered during engine cranking or running.	- Harness and connector - Power transistor unit
ECM	ECM calculation function is malfunctioning.	(Replace ECM (ECCS control module).)
EGRC SOLENOID/V	EGR valve does not operate. (EGR valve spring does not lift.)	- EGR valve - EGR & canister control solenoid valve
OXGEN SEN	The heated oxygen sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	- Harness and connector - Heated oxygen sensor - Fuel pressure - Injectors - Intake air leaks
KNOCK SENSOR	The knock sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	- Harness and connector - Knock sensor
EGR TEMP SENSOR**	The EGR temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	- Harness and connector - EGR temperature sensor
THROTTLE POSI SEN	The throttle position sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	- Harness and connector - Throttle position sensor
INJECTOR-LEAK**	Fuel leaks from injector.	Injector

*: Check items causing a malfunction of crankshaft position sensor circuit first, if both "CRANKSHAFT POSITION SENSOR" and "IGN SIGNAL-PRIMARY" come out at the same time.

** : The diagnostic item marked "****" is applicable to vehicles for California only.

TROUBLE DIAGNOSES

Consult (Cont'd)

DATA MONITOR MODE

Remarks:

- The monitor item marked "****" is applicable to vehicles for California only.
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
- * Specification data may not be directly related to their components signals/values/operations.
- i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the crankshaft position sensor and other ignition timing related sensors.
- If the real-time diagnosis results are NG and the on-board diagnostic system results are OK when diagnosing the mass air flow sensor, first check to see if the fuel pump control circuit is normal.

MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
CKPS-RPM (REF)	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.	● Harness and connector ● Crankshaft position sensor
MAS AIR/FL SE	● Engine: After warming up, idle the engine ● A/C switch "OFF" ● Shift lever "N"	Idle	1.3 - 1.7V	● Harness and connector ● Mass air flow sensor
		2,000 rpm	1.7 - 2.1V	
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)	● Harness and connector ● Engine coolant temperature sensor
O2 SEN	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0V	● Harness and connector ● Heated oxygen sensor ● Intake air leaks ● Injectors
M/R F/C MNT			LEAN ↔ RICH Changes more than 5 times during 10 seconds.	
VHCL SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value	● Harness and connector ● Vehicle speed sensor
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V	● Battery ● ECM power supply circuit
THRTL POS SEN	● Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.45 - 0.55V	● Harness and connector ● Throttle position sensor ● Throttle position sensor adjustment
		Throttle valve fully opened	Approx. 4.0V	
EGR TEMP SEN**	● Engine: After warming up		Less than 4.5V	● Harness and connector ● EGR temperature sensor
START SIGNAL	● Ignition switch: ON → START		OFF → ON	● Harness and connector ● Starter switch
CLOSED TH/POS	● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON	● Harness and connector ● Throttle position sensor ● Throttle position sensor adjustment
		Throttle valve: Slightly open	OFF	
AIR COND SIG	● Engine: After warming up, idle the engine	A/C switch "OFF"	OFF	● Harness and connector ● Air conditioner switch
		A/C switch "ON"	ON	
NEUT POSI SW	● Ignition switch: ON	Shift lever "P" or "N"	ON	● Harness and connector ● Neutral position switch
		Except above	OFF	

TROUBLE DIAGNOSES

Consult (Cont'd)

MONITOR ITEM	CONDITION			SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
PW/ST SIGNAL	● Engine: After warming up, idle the engine		Steering wheel in neutral position (forward direction)	OFF	● Harness and connector ● Power steering oil pressure switch
			The steering wheel is turned	ON	
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking ● When engine is stopped (stops in 1.0 seconds)			ON	● Harness and connector ● Fuel pump relay
	Except as shown above			OFF	
RADIATOR FAN	● After warming up engine, idle the engine. ● A/C switch "OFF"	M/T	Engine coolant temperature is 99°C (210°F) or less	OFF	● Harness and connector ● Radiator fan relay ● Radiator fan
			Engine coolant temperature is 100°C (212°F) or more	ON	
		A/T	Engine coolant temperature is 94°C (201°F) or less	OFF	
			Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW	
			Engine coolant temperature is 105°C (221°F) or more	HIGH	
INJ PULSE	● Engine: After warming up ● A/C switch "OFF" ● Shift lever "N" ● No-load		Idle	2.4 - 3.2 msec.	● Harness and connector ● Injector ● Mass air flow sensor ● Intake air system
			2,000 rpm	1.9 - 2.8 msec.	
IGN TIMING	ditto		Idle	15° B.T.D.C.	● Harness and connector ● Crankshaft position sensor
			2,000 rpm	More than 25° B.T.D.C.	
IACV-AAC/V	ditto		Idle	20 - 40%	● Harness and connector ● IACV-AAC valve
			2,000 rpm	—	
A/F ALPHA	● Engine: After warming up		Maintaining engine speed at 2,000 rpm	75 - 125%	● Harness and connector ● Injectors ● Mass air flow sensor ● Heated oxygen sensor ● Canister purge line ● Intake air system
AIR COND RLY	● Air conditioner switch OFF → ON			OFF → ON	● Harness and connector ● Air conditioner switch ● Air conditioner relay
EGRC SOL/V	● Engine: After warming up ● A/C switch "OFF" ● Shift lever "N" ● No-load		2,000 rpm	OFF	● Harness and connector ● EGR & canister control solenoid valve
			4,000 rpm	ON	
PAIRC-SOL/V	● Engine: After warming up ● Shift lever "N" ● No-load		Idle	ON	● Harness and connector ● PAIRC-solenoid valve
			2,000 rpm	OFF	

GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

TROUBLE DIAGNOSES

Consult (Cont'd)

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connector ● Fuel injectors ● Heated oxygen sensor
IACV-AAC/V OPENING	● Engine: After warming up, idle the engine. ● Change the IACV-AAC valve opening percent using CONSULT.	Engine speed changes according to the opening percent.	● Harness and connector ● IACV-AAC valve
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connector ● Engine coolant temperature sensor ● Fuel injectors
IGNITION TIMING	● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	● Adjust initial ignition timing
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch "OFF" ● Shift lever "N" ● Cut off each injector signal one at a time using CONSULT.	Engine runs rough or dies.	● Harness and connector ● Compression ● Injectors ● Power transistor ● Spark plugs ● Ignition coils
RADIATOR FAN	● Ignition switch: ON ● Turn the radiator fan "ON" and "OFF" using CONSULT.	Radiator fan moves and stops.	● Harness and connector ● Radiator fan motor
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay "ON" and "OFF" using CONSULT and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connector ● Fuel pump relay
EGRC SOLENOID VALVE	● Ignition switch: ON ● Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound.	Each solenoid valve makes an operating sound.	● Harness and connector ● Solenoid valve
PAIRC-SOLENOID/V			
SELF-LEARNING CONT	● In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen.		

TROUBLE DIAGNOSES

Consult (Cont'd)

FUNCTION TEST MODE

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)	
SELF-DIAG RESULTS	● Ignition switch: ON (Engine stopped) ● Displays the results of on-board diagnostic system.	—		Objective system	GI MA
CLOSED THROTTLE POSI (CLOSED THROTTLE POSITION SWITCH CIRCUIT)	● Ignition switch: ON (Engine stopped) ● Closed throttle position switch circuit is tested when throttle is opened and closed fully. ("IDLE POSITION" is the test item name for the vehicles in which idle is selected by throttle position sensor.)	Throttle valve: opened	OFF	● Harness and connector ● Throttle position sensor (Closed throttle position switch) ● Throttle position sensor (Closed throttle position switch) adjustment ● Throttle linkage ● Verify operation in DATA MONITOR mode.	EM LC
		Throttle valve: closed	ON		EF & EC
THROTTLE POSI SEN	● Ignition switch: ON (Engine stopped) ● Throttle position sensor circuit is tested when throttle is opened and closed fully.	Range (Throttle valve fully opened — Throttle valve fully closed)	More than 3.0V	● Harness and connector ● Throttle position sensor ● Throttle position sensor adjustment ● Throttle linkage ● Verify operation in DATA MONITOR mode.	FE CL MT
NEUTRAL POSI SW CKT	● Ignition switch: ON (Engine stopped) ● Neutral position switch circuit is tested when shift lever is manipulated.	OUT OF N/P-RANGE	OFF	● Harness and connector ● Neutral position switch/ Inhibitor switch ● Linkage + Inhibitor switch adjustment	AT FA
		IN N-RANGE	ON		
FUEL PUMP CIRCUIT	● Ignition switch: ON (Engine stopped) ● Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched.	There is pressure pulsation on the fuel feed hose.		● Harness and connector ● Fuel pump ● Fuel pump relay ● Fuel filter clogging ● Fuel level	RA BR
EGRC SOL/V CIRCUIT	● Ignition switch: ON (Engine stopped) ● EGR control S/V circuit is tested by checking solenoid valve operating noise.	The solenoid valve makes an operating sound every 3 seconds.		● Harness and connector ● EGRC-solenoid valve	ST BF
RADIATOR FAN CIRCUIT	● Ignition switch: ON (Engine stopped) ● Radiator fan circuit is tested when radiator fan is rotated.	● The radiator fan rotates and stops every 3 seconds.		● Harness and connector ● Radiator fan motor ● Radiator fan relay	HA EL

TROUBLE DIAGNOSES

Consult (Cont'd)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
START SIGNAL CIRCUIT	● Ignition switch: ON → START ● Start signal circuit is tested when engine is started by operating the starter. Battery voltage and water temperature before cranking, and average battery voltage, mass air flow sensor output voltage and cranking speed during cranking are displayed.	Start signal: OFF → ON		● Harness and connector ● Ignition switch
PW/ST SIGNAL CIRCUIT	● Ignition switch: ON (Engine running) ● Power steering circuit is tested when steering wheel is rotated fully and then set to a straight line running position.	Locked position	ON	● Harness and connector ● Power steering oil pressure switch ● Power steering oil pump
		Neutral position	OFF	
VEHICLE SPEED SEN CKT	● Vehicle speed sensor circuit is tested when vehicle is running at a speed of 10 km/h (6 MPH) or higher.	Vehicle speed sensor input signal is greater than 4 km/h (2 MPH)		● Harness and connector ● Vehicle speed sensor ● Electric speedometer
IGN TIMING ADJ	● After warming up, idle the engine. ● Ignition timing adjustment is checked by reading ignition timing with a timing light and checking whether it agrees with specifications.	The timing light indicates the same value on the screen.		● Adjust ignition timing (by moving crankshaft position sensor or distributor) ● Crankshaft position sensor drive mechanism
MIXTURE RATIO TEST	● Air-fuel ratio feedback circuit (injection system, ignition system, vacuum system, etc.) is tested by examining the heated oxygen sensor output at 2,000 rpm under non-loaded state.	● Heated oxygen sensor COUNT: More than 5 times during 10 seconds		● INJECTION SYS (Injector, fuel pressure regulator, harness or connector) ● IGNITION SYS (Spark plug, power transistor, ignition coil, harness or connector) ● VACUUM SYS (Intake air leaks) ● Heated oxygen sensor circuit ● Heated oxygen sensor operation ● Fuel pressure high or low ● Mass air flow sensor

TROUBLE DIAGNOSES

Consult (Cont'd)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)	
POWER BALANCE	● After warming up, idle the engine. ● Injector operation of each cylinder is stopped one after another, and resultant change in engine rotation is examined to evaluate combustion of each cylinder. (This is only displayed for models where a sequential multiport fuel injection system is used.)	Difference in engine speed is greater than 25 rpm before and after cutting off the injector of each cylinder.	● Injector circuit (Injector, harness or connector) ● Ignition circuit (Spark plug, power transistor, ignition coil, harness or connector) ● Compression ● Valve timing	GI MA EM LC
IACV-AAC/V SYSTEM	● After warming up, idle the engine. ● IACV-AAC valve system is tested by detecting change in engine speed when IACV-AAC valve opening is changed to 0%, 20% and 80%.	Difference in engine speed is greater than 150 rpm between when valve opening is at 80% (102 steps) and at 20% (25 steps).	● Harness and connector ● IACV-AAC valve ● Air passage restriction between air inlet and IACV-AAC valve ● IAS (Idle adjusting screw) adjustment	EF & EC FE CL

MT

AT

FA

RA

BR

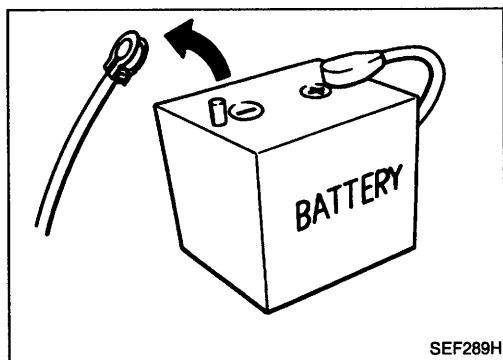
ST

BF

HA

EL

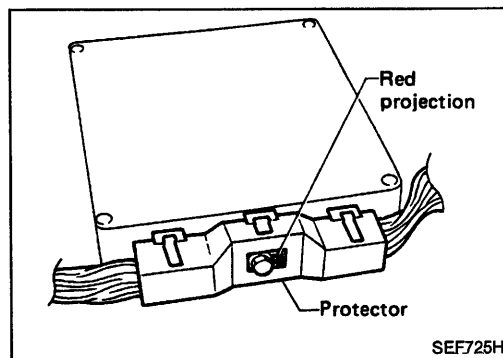
TROUBLE DIAGNOSES



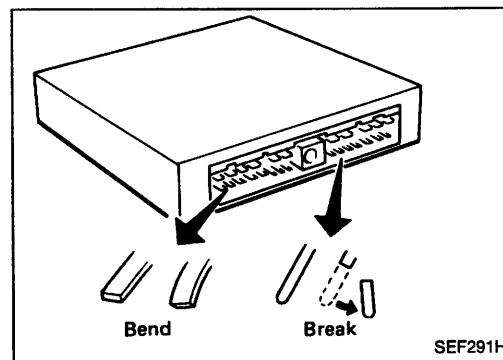
Diagnostic Procedure

CAUTION:

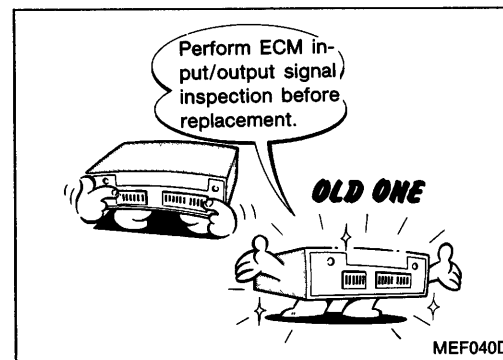
1. Before connecting or disconnecting the ECM harness connector to or from any ECM, be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage ECM as battery voltage is applied to ECM even if ignition switch is turned off. Failure to do so may damage the ECM.



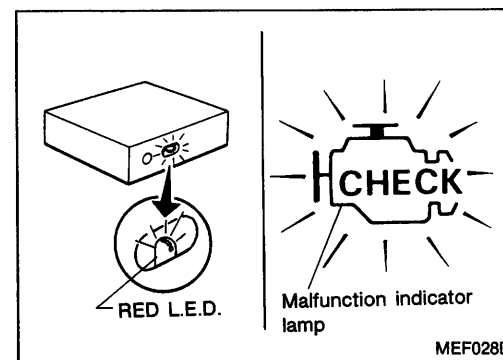
2. When connecting ECM harness connector, tighten securing bolt until red projection is in line with connector face.



3. When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).
4. Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.



5. Before replacing ECM, perform ECM input/output signal inspection and make sure whether ECM functions properly or not. (See page EF & EC-173.)



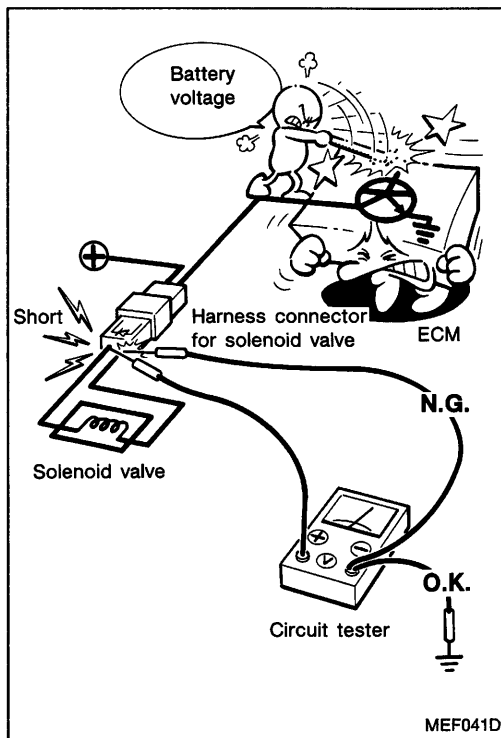
6. After performing this "Diagnostic Procedure", perform diagnostic test mode II (Self-diagnostic results) and driving test.

TROUBLE DIAGNOSES

Diagnostic Procedure (Cont'd)

7. When measuring ECM controlled components supply voltage 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 ECM power transistor.



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

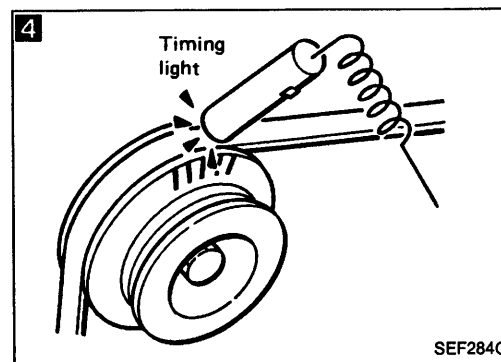
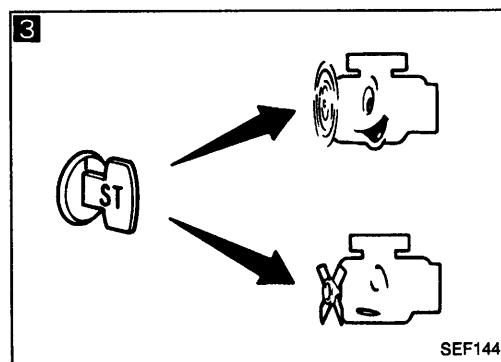
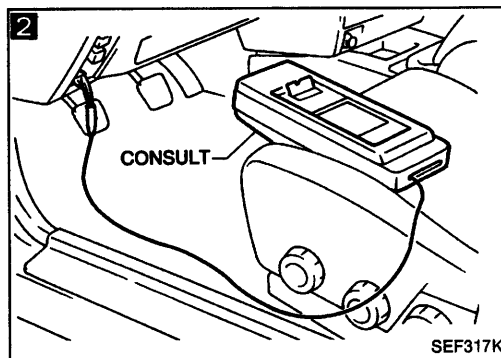
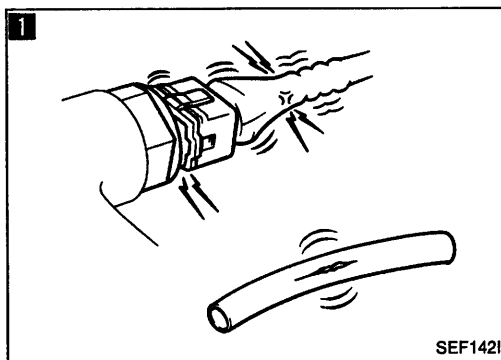
BR

ST

BF

HA

EL



Basic Inspection

1

BEFORE STARTING

1. Check service records for any recent repairs that may indicate a related problem, or the current need for scheduled maintenance.
2. Open engine hood and check the following:
 - Harness connectors for proper connections
 - Vacuum hoses for splits, kinks, and proper connections
 - Wiring for proper connections, pinches, and cuts

2

CONNECT CONSULT TO THE VEHICLE

Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. (Refer to page EF & EC-48.)

3

DOES ENGINE START?

No

Go to **6**.

Yes

4

CHECK IGNITION TIMING.

Warm up engine sufficiently and check ignition timing at idle using timing light. (Refer to page EF & EC-28.)

Ignition timing:

$15^{\circ} \pm 2^{\circ}$ B.T.D.C.

N.G.

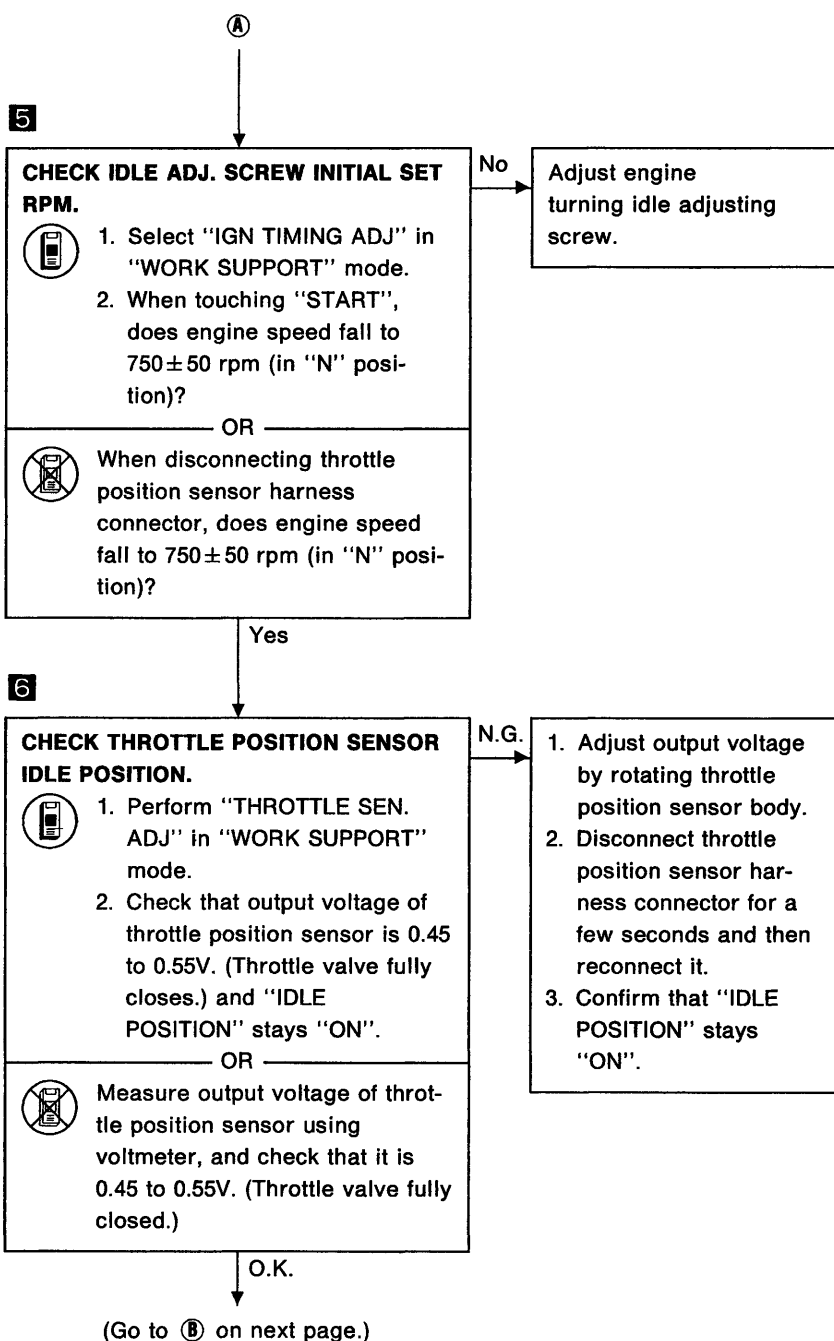
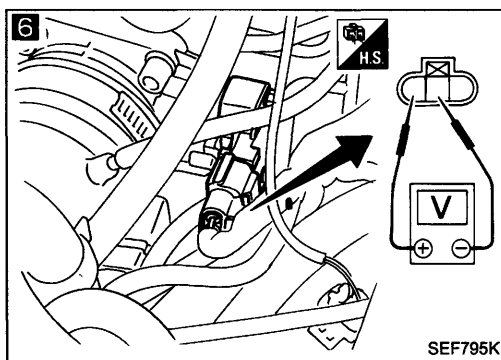
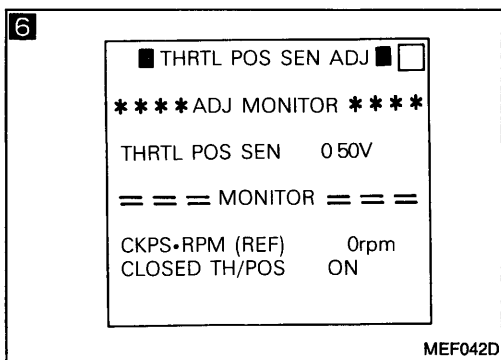
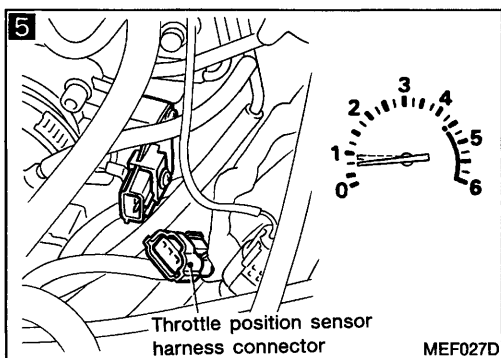
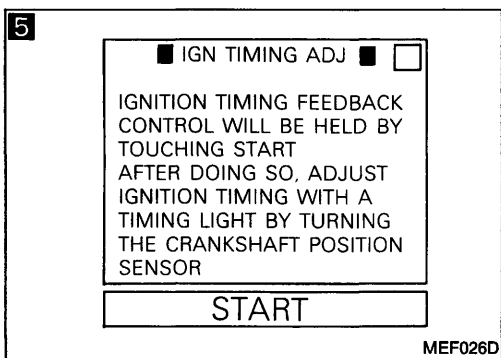
Adjust ignition timing by turning crankshaft position sensor.

O.K.

(Go to **A** on next page.)

TROUBLE DIAGNOSES

Basic Inspection (Cont'd)



GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

Basic Inspection (Cont'd)

TROUBLE DIAGNOSES

How to Execute On-board Diagnostic System in Diagnostic Test Mode II

Detected items	Display Diagnostic trouble code No.	How to perform diagnostic test mode II (Self-diagnostic results) judgement	
		Illustration	Method
Crankshaft position sensor circuit	11	☆ MONITOR ☆ NO FAIL CKPS-RPM (REF) 800rpm MAS AIR/FL SE 1.55V COOLAN TEMP/S 79°C O2 SEN 0.80V M/R F/C MNT RICH VHCL SPEED SE 0km/h BATTERY VOLT 14.0V THRTL POS SEN 0.50V EGR TEMP SEN 2.4V RECORD MEF046D MEF045D	PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS). 1) Start engine or crank engine more than 2 seconds. 2) Select "DATA MONITOR" mode with CONSULT. ☆ NO FAIL OR 2) Turn ignition switch "OFF" and then "ON". 3) Perform diagnostic test mode II (Self-diagnostic results) with ECM. Malfunction indicator lamp and red L.E.D. display diagnostic trouble code No. 55.
Mass air flow sensor circuit	12	☆ MONITOR ☆ NO FAIL CKPS-RPM (REF) 800rpm MAS AIR/FL SE 1.55V COOLAN TEMP/S 79°C O2 SEN 0.80V M/R F/C MNT RICH VHCL SPEED SE 0km/h BATTERY VOLT 14.0V THRTL POS SEN 0.50V EGR TEMP SEN 2.4V RECORD MEF046D MEF045D	PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS). 1) Turn ignition switch "ON" wait for at least 5 seconds and then start engine. 2) Select "DATA MONITOR" mode with CONSULT. ☆ NO FAIL OR 2) Perform diagnostic test mode II (Self-diagnostic results) with ECM. Malfunction indicator lamp and red L.E.D. display diagnostic trouble code No. 55.

TROUBLE DIAGNOSES

How to Execute On-board Diagnostic System in Diagnostic Test Mode II (Cont'd)

Detected items	Display Diagnostic trouble code No.	How to perform diagnostic test mode II (Self-diagnostic results) judgement	
		Illustration	Method
Engine coolant temperature sensor circuit	13	☆ MONITOR ☆ NO FAIL ☒ CKPS-RPM (REF) 800rpm MAS AIR/FL SE 1.55V COOLAN TEMP/S 79°C O2 SEN 0.80V M/R F/C MNT RICH VHCL SPEED SE 0km/h BATTERY VOLT 14.0V THRTL POS SEN 0.50V EGR TEMP SEN 2.4V RECORD MEF046D RED L.E.D. Malfunction indicator lamp MEF045D	PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS). 1) Turn ignition switch "ON" or start engine. 2) Select "DATA MONITOR" mode with CONSULT. ☆ NO FAIL OR 2) Perform diagnostic test mode II (Self-diagnostic results) with ECM. Malfunction indicator lamp and red L.E.D. display diagnostic trouble code No. 55.
		■ VEHICLE SPEED SEN CKT ■ AFTER TOUCH START, DRIVE VEHICLE AT 10km/h (6mph) OR MORE WITHIN 15sec NEXT START MEF047D ☆ MONITOR ☆ NO FAIL ☐ VHCL SPEED SE 20km/h NEUT POSI SW OFF RECORD MEF048D RED L.E.D. Malfunction indicator lamp MEF045d	CHECK OVERALL FUNCTION. 1) Jack up drive wheels. 2) Start engine. 3) Perform "VEHICLE SPEED SEN CIRCUIT" in "FUNCTION TEST" mode with CONSULT. OR 2) Start engine. 3) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT. CONSULT value should be the same as the speedometer indication. OR 1) Start engine and warm it up sufficiently. 2) Shift to a suitable gear position and maintain the following test drive conditions for at least 5 seconds. Driving conditions (1) Engine speed: 2,600 ± 400 rpm (2) Intake manifold vacuum: -26.7 ± 13.3 kPa (-200 ± 100 mmHg, -7.87 ± 3.94 inHg) (3) Vehicle speed 5 km/h (3MPH) or more 3) If malfunction indicator lamp comes on during test drive, perform diagnostic test mode II (Self-diagnostic results) with ECM. Malfunction indicator lamp and red L.E.D. display diagnostic trouble code No. 55.

*: Diagnostic test mode II (self-diagnostic results) is not performed but this method provides results which are equal to the self-diagnostic results.

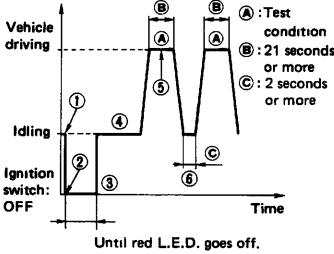
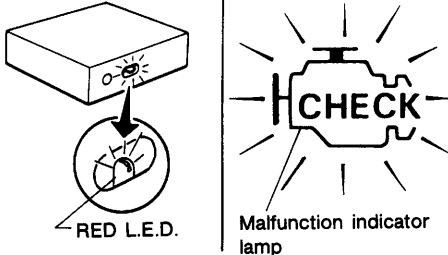
TROUBLE DIAGNOSES

How to Execute On-board Diagnostic System in Diagnostic Test Mode II (Cont'd)

Detected items	Display Diagnostic trouble code No.	How to perform diagnostic test mode II (Self-diagnostic results) judgement	
		Illustration	Method
Ignition signal circuit	21	☆MONITOR ☆NO FAIL CKPS•RPM (REF) 800rpm MAS AIR/FL SE 1.55V COOLAN TEMP/S 79°C O2 SEN 0.80V M/R F/C MNT RICH VHCL SPEED SE 0km/h BATTERY VOLT 14.0V THRTL POS SEN 0.50V EGR TEMP SEN 2.4V RECORD MEF046D	PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS). 1) Start engine. 2) Select "DATA MONITOR" mode with CONSULT. ☆ NO FAIL OR 2) Turn ignition switch "OFF" and then "ON". 3) Perform diagnostic test mode II (Self-diagnostic results) with ECM. Malfunction indicator lamp and red L.E.D. display diagnostic trouble code No. 55.
		☆MONITOR ☆NO FAIL CKPS•RPM (REF) 0rpm MAS AIR/FL SE 0.81V COOLAN TEMP/S 21°C O2 SEN 0.00V M/R F/C MNT RICH VHCL SPEED SE 0km/h BATTERY VOLT 12.0V THRTL POS SEN 0.50V EGR TEMP SEN 4.2V RECORD MEF049D	PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS). 1) Turn ignition switch "ON". 2) Select "DATA MONITOR" mode with CONSULT. ☆ NO FAIL OR 2) Perform diagnostic test mode II (Self-diagnostic results) with ECM. Malfunction indicator lamp and red L.E.D. display diagnostic trouble code No. 55.

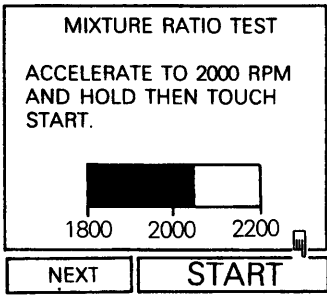
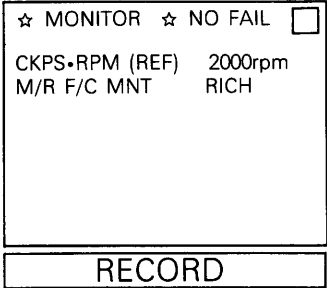
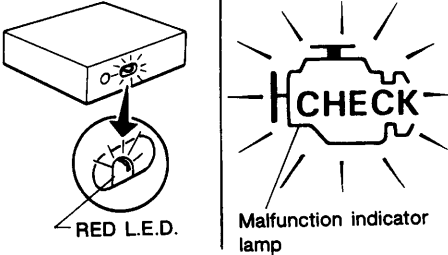
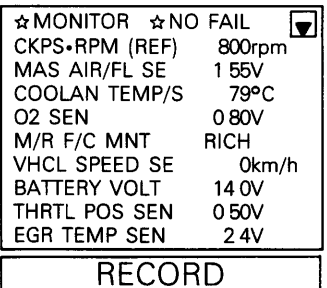
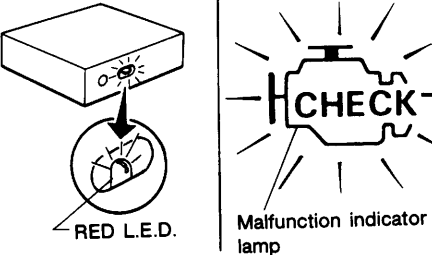
TROUBLE DIAGNOSES

How to Execute On-board Diagnostic System in Diagnostic Test Mode II (Cont'd)

Detected items	Display Diagnostic trouble code No.	How to perform diagnostic test mode II (Self-diagnostic results) judgement	
		Illustration	Method
EGR function	32	A ROAD TEST Test condition Drive vehicle under the following conditions with a suitable shift position. (1) Engine speed: 2,400±200 rpm (2) Intake manifold vacuum: -33.3±6.7 kPa (-250±50 mmHg, -8.84±1.97 inHg) Driving mode  ① Start engine and warm it up sufficiently. ② Turn off ignition switch and keep it off until red L.E.D. goes off. ③ Start engine and make sure that air conditioner switch and rear defogger are turned "OFF" during test drive. ④ Keep engine running for at least 210 seconds ⑤ Shift to suitable gear position and drive in "Test condition" for at least 21 seconds. ⑥ Decrease engine revolutions to less than 1,500 rpm for at least 2 seconds. ⑦ Repeat steps ⑤ through ⑥ at least 1 more time. SEF969K B  RED L.E.D. Malfunction indicator lamp MEF045D	PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS). 1) Turn ignition switch "ON". 2) Perform diagnostic test mode II (Self-diagnostic results) with ECM. Make sure that diagnostic trouble code No. (12, 13, 35 and 43) is not displayed. 3) Perform test drive under the following conditions. (1) Warm up engine sufficiently. (2) Use test driving modes indicated in figure A. 4) If malfunction indicator lamp comes on during test drive, perform diagnostic test mode II (Self-diagnostic results) with ECM. B Malfunction indicator lamp and red L.E.D. display diagnostic trouble code No. 55.

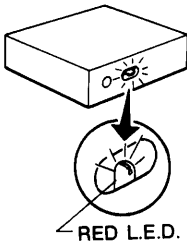
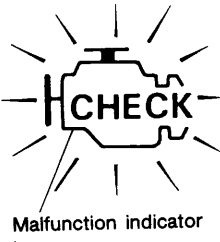
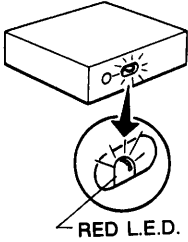
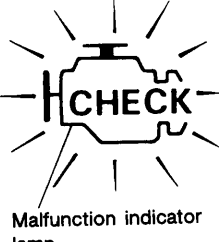
TROUBLE DIAGNOSES

How to Execute On-board Diagnostic System in Diagnostic Test Mode II (Cont'd)

Detected items	Display Diagnostic trouble code No.	How to perform diagnostic test mode II (Self-diagnostic results) judgement		
		Illustration	Method	
Heated oxygen sensor circuit*	33	  	CHECK OVERALL FUNCTION. 1) Start engine and warm it up sufficiently. 2) Perform "MIXTURE RATIO TEST" in "FUNCTION TEST" mode with CONSULT. OR 2) Make sure that "M/R F/C MNT(R)" in "DATA MONITOR" mode indicates "RICH" and "LEAN" periodically more than 5 times during 10 seconds at 2,000 rpm OR 2) Make sure that malfunction indicator lamp and red L.E.D. on ECM go on and off periodically more than 5 times during 10 seconds at 2,000 rpm in Diagnostic Test Mode II.	GI MA EM LC EF & EC FE CL MT AT FA RA
Knock sensor circuit	34	 	PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS). 1) Start engine. 2) Select "DATA MONITOR" mode with CONSULT. ☆ NO FAIL OR 2) Turn ignition switch "OFF" and then "ON". 3) Perform diagnostic test mode II (Self-diagnostic results) with ECM. Malfunction indicator lamp and red L.E.D. display diagnostic trouble code No. 55.	BR ST BF HA EL

TROUBLE DIAGNOSES

How to Execute On-board Diagnostic System in Diagnostic Test Mode II (Cont'd)

Detected items	Display Diagnostic trouble code No.	How to perform diagnostic test mode II (Self-diagnostic results) judgement	
		Illustration	Method
EGR temperature sensor circuit	35	☆MONITOR ☆NO FAIL ▼ CKPS•RPM (REF) 800rpm MAS AIR/FL SE 1.55V COOLAN TEMP/S 79°C O2 SEN 0.80V M/R F/C MNT RICH VHCL SPEED SE 0km/h BATTERY VOLT 14.0V THRTL POS SEN 0.50V EGR TEMP SEN 2.4V RECORD   MEF046D MEF045D	PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS). 1) Start engine and warm it up sufficiently. 2) Select "DATA MONITOR" mode with CONSULT. ☆ NO FAIL OR 2) Turn ignition switch "OFF" and then "ON". 3) Perform diagnostic test mode II (Self-diagnostic results) with ECM. Malfunction indicator lamp and red L.E.D. display diagnostic trouble code No. 55.
Throttle position sensor circuit	43	☆MONITOR ☆NO FAIL ▼ CKPS•RPM (REF) 800rpm MAS AIR/FL SE 1.55V COOLAN TEMP/S 79°C O2 SEN 0.80V M/R F/C MNT RICH VHCL SPEED SE 0km/h BATTERY VOLT 14.0V THRTL POS SEN 0.50V EGR TEMP SEN 2.4V RECORD   MEF046D MEF045D	PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS). 1) Jack up drive wheels 2) Start engine. 3) Shift to a suitable gear position (Except "P" or "N"), and run engine at vehicle speed of 5 km/h (3 MPH) or higher for at least 10 seconds. 4) Select "DATA MONITOR" mode with CONSULT. ☆ NO FAIL OR 4) Turn ignition switch "OFF" and then "ON". 5) Perform diagnostic test mode II (Self-diagnostic results) with ECM. Malfunction indicator lamp and red L.E.D. display diagnostic trouble code No. 55.

*: Diagnostic test mode II (self-diagnostic results) is not performed but this method provides results which are equal to the self-diagnostic results.

TROUBLE DIAGNOSES

How to Execute On-board Diagnostic System in Diagnostic Test Mode II (Cont'd)

Detected items	Display Diagnostic trouble code No.	How to perform diagnostic test mode II (Self-diagnostic results) judgement	
		Illustration	Method
Injector leak	45	A ROAD TEST Test condition Drive vehicle under the following conditions with a suitable shift position. (1) Engine speed: $2,600 \pm 200$ rpm (2) Intake manifold vacuum: -40.0 ± 6.7 kPa $(-300 \pm 50$ mmHg, -11.81 ± 1.97 inHg) Driving mode ① Start engine and warm it up sufficiently. ② Turn ignition switch OFF and wait for at least 10 seconds. ③ Start engine and keep it at idle speed for at least 30 seconds. ④ Shift to suitable gear position and drive in "Test condition" for at least 5 seconds. ⑤ Repeat steps ③ through ④ at least 1 more times. SEF241L	PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS). 1) Perform test drive as indicated in figure A . 2) If malfunction indicator lamp comes on during test drive, perform diagnostic test mode II (Self-diagnostic results) with ECM. B Malfunction indicator lamp and red L.E.D. display diagnostic trouble code No. 55.
		B MEF051D	

GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

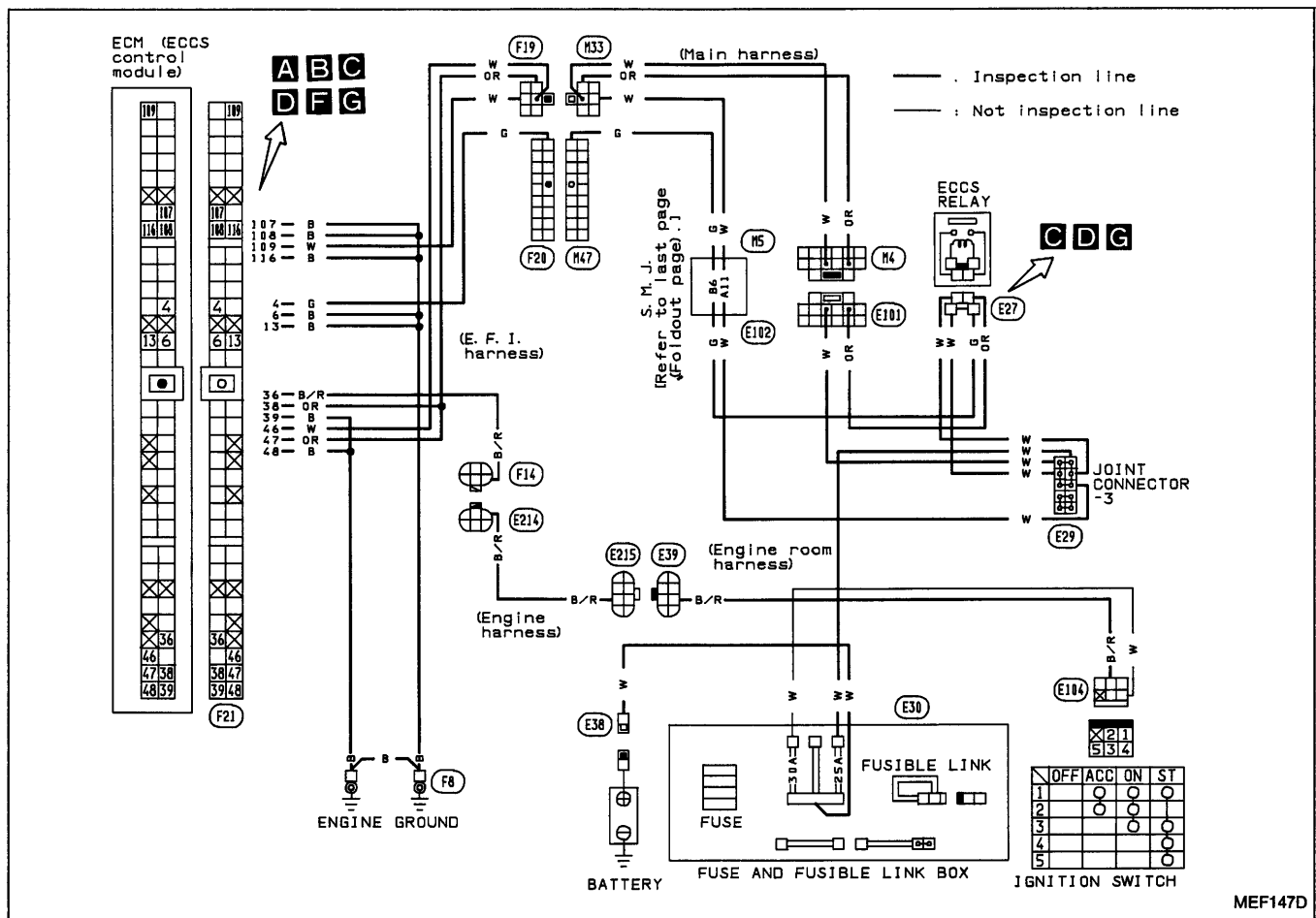
HA

EL

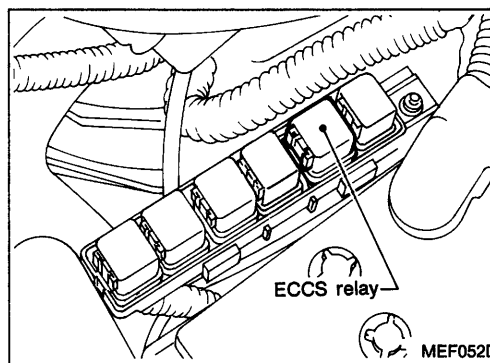
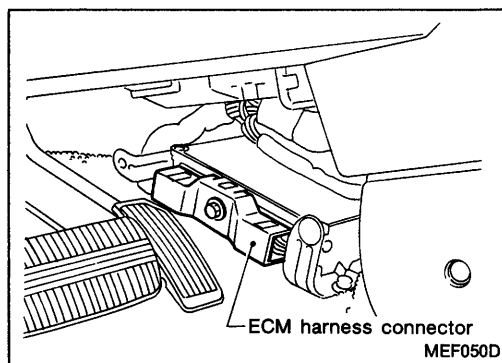
TROUBLE DIAGNOSES

Diagnostic Procedure 1

MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)

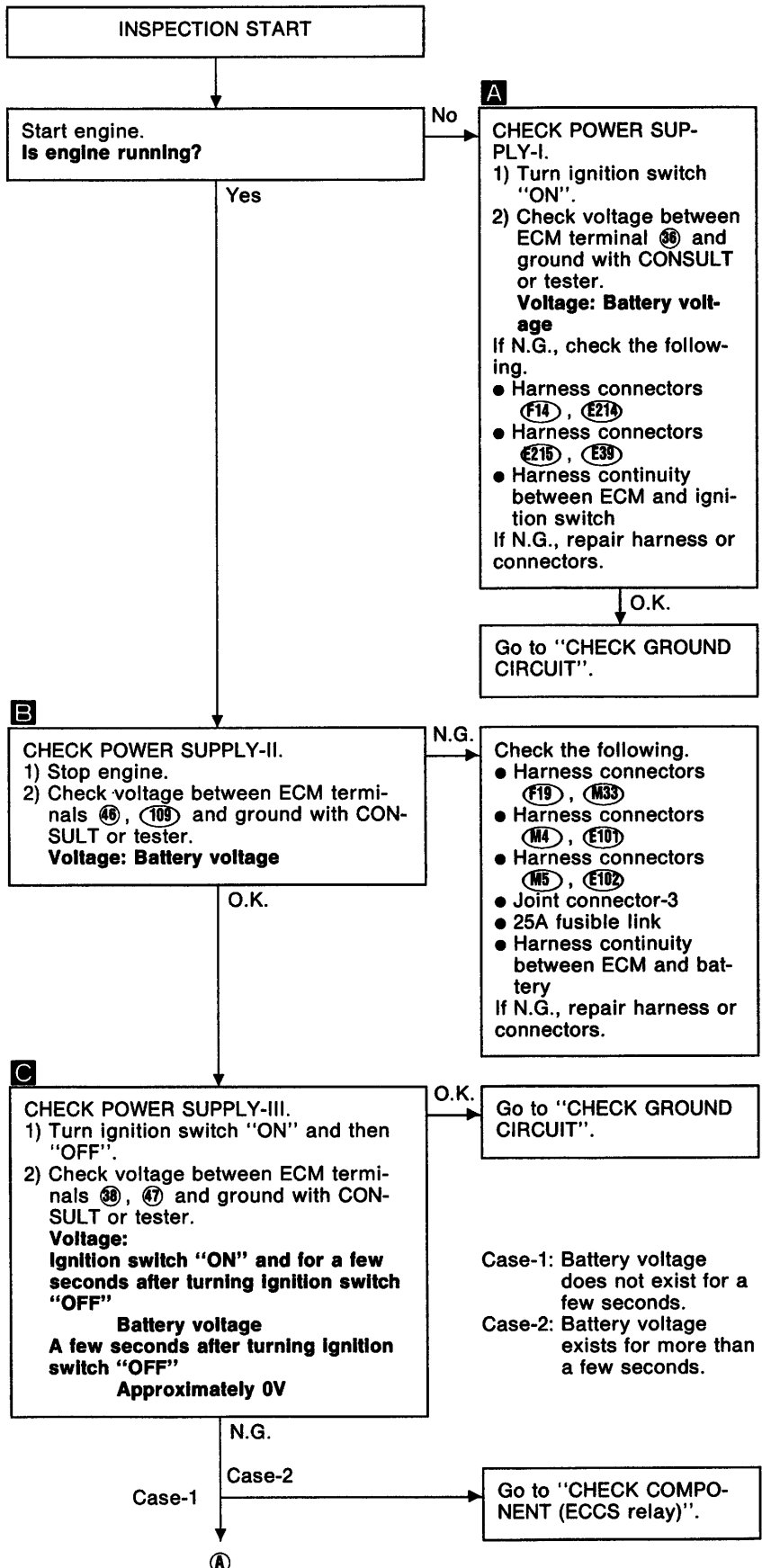
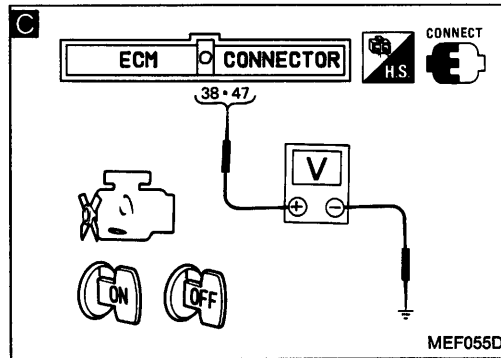
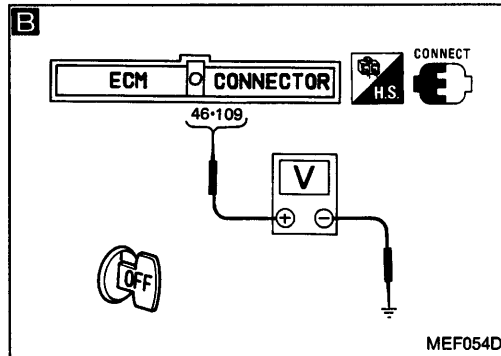
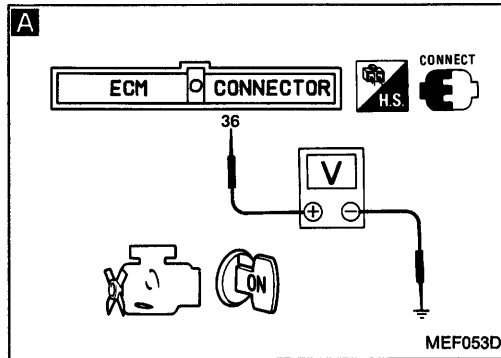


Harness layout



TROUBLE DIAGNOSES

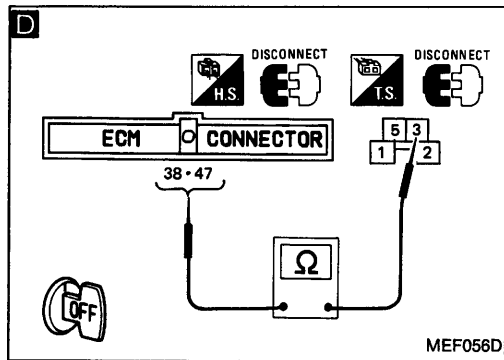
MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)



GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

TROUBLE DIAGNOSES

MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)



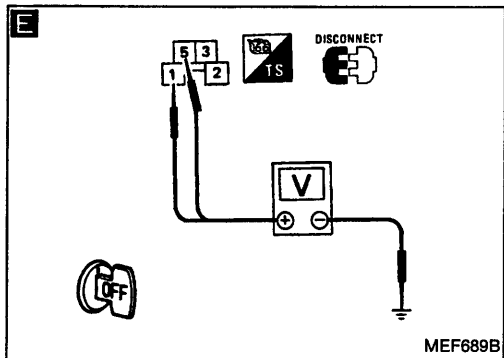
D

CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM

- 1) Disconnect ECM harness connector.
- 2) Disconnect ECCS relay.
- 3) Check harness continuity between ECM terminals ③⑧, ④⑦ and terminal ③.

Continuity should exist.

N.G. Repair harness or connectors.



E

CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.

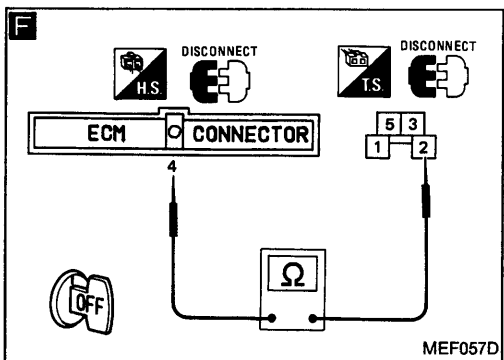
- 1) Check voltage between terminals ①, ⑤ and ground with CONSULT or tester.

Voltage: Battery voltage

N.G. Check the following.

- Joint connector-3
- Harness continuity between ECCS relay and battery

If N.G., repair harness or connectors.



F

CHECK OUTPUT SIGNAL CIRCUIT.

- 1) Check harness continuity between ECM terminal ④ and terminal ②.

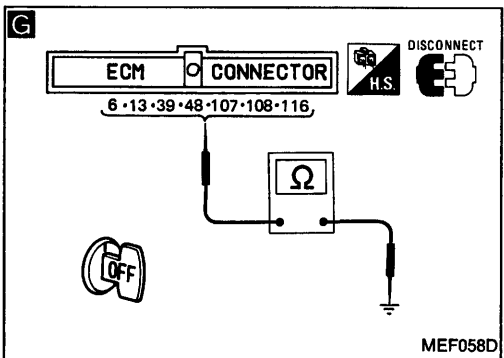
Continuity should exist.

N.G. Repair harness or connectors.

CHECK COMPONENT (ECCS relay).

Refer to "Electrical Components Inspection". (See page EF & EC-184.)

N.G. Replace ECCS relay.



G

CHECK GROUND CIRCUIT.

- 1) Turn ignition switch "OFF".
- 2) Disconnect ECM harness connector.
- 3) Check harness continuity between ECM terminals ⑥, ⑬, ③⑨, ④⑧, ⑩⑦, ⑩⑧, ⑪⑥ and engine ground.

Continuity should exist.

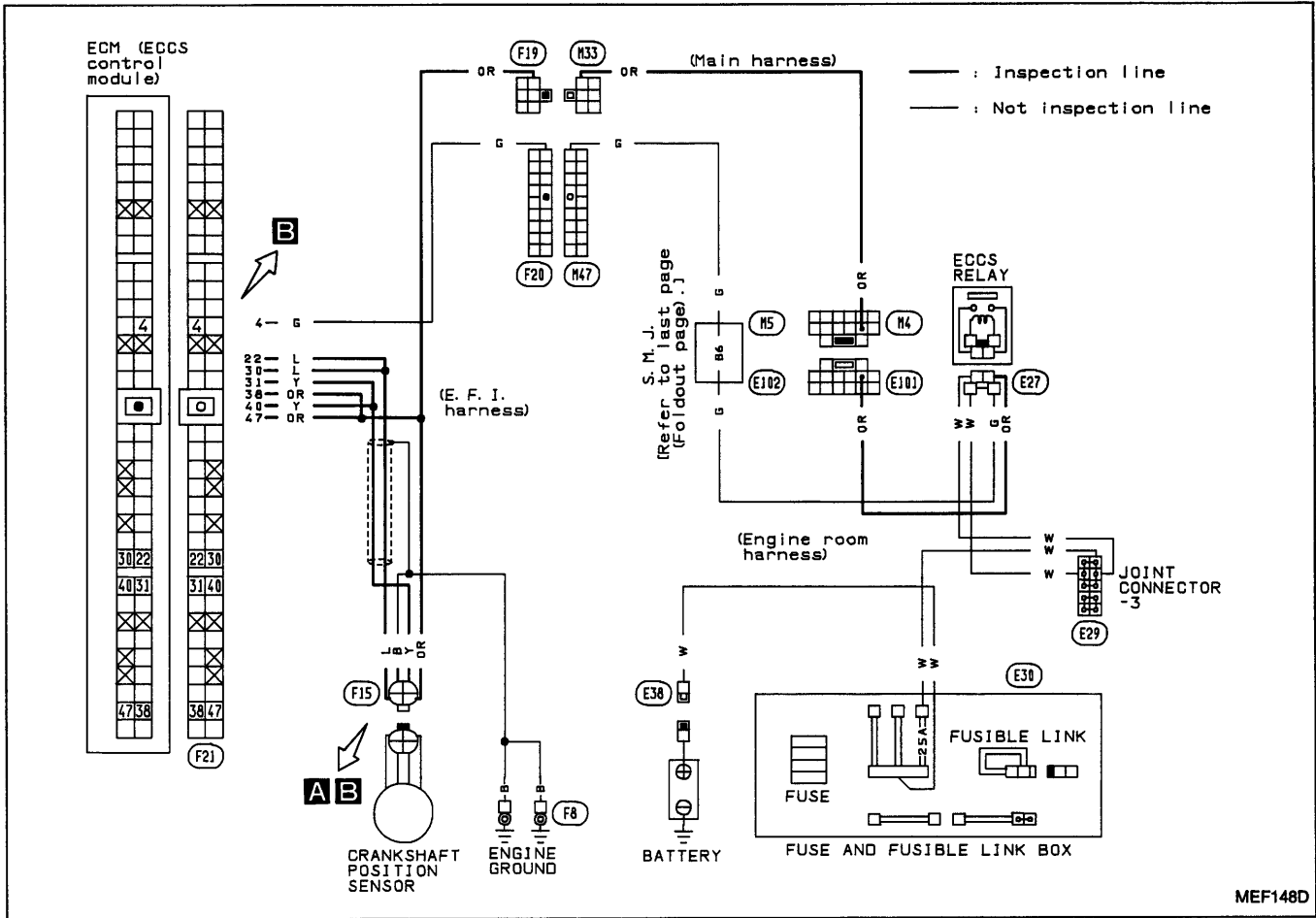
N.G. Repair harness or connectors.

Check ECM pin terminals for damage or the connection of ECM harness connector.

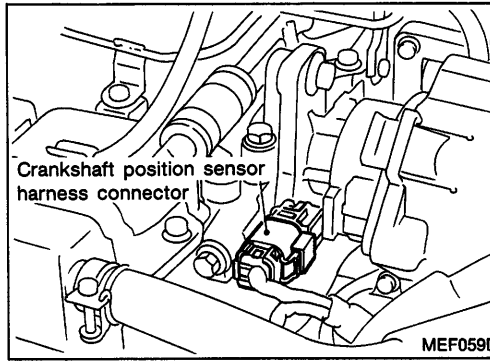
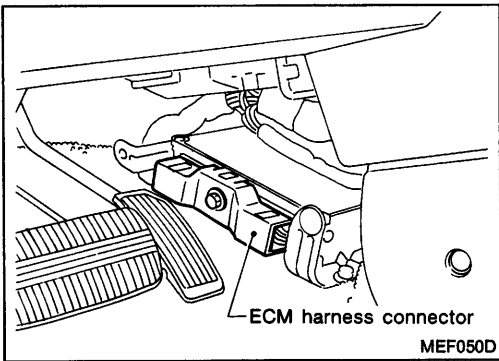
INSPECTION END

Diagnostic Procedure 2

CRANKSHAFT POSITION SENSOR (Diagnostic trouble code No. 11)

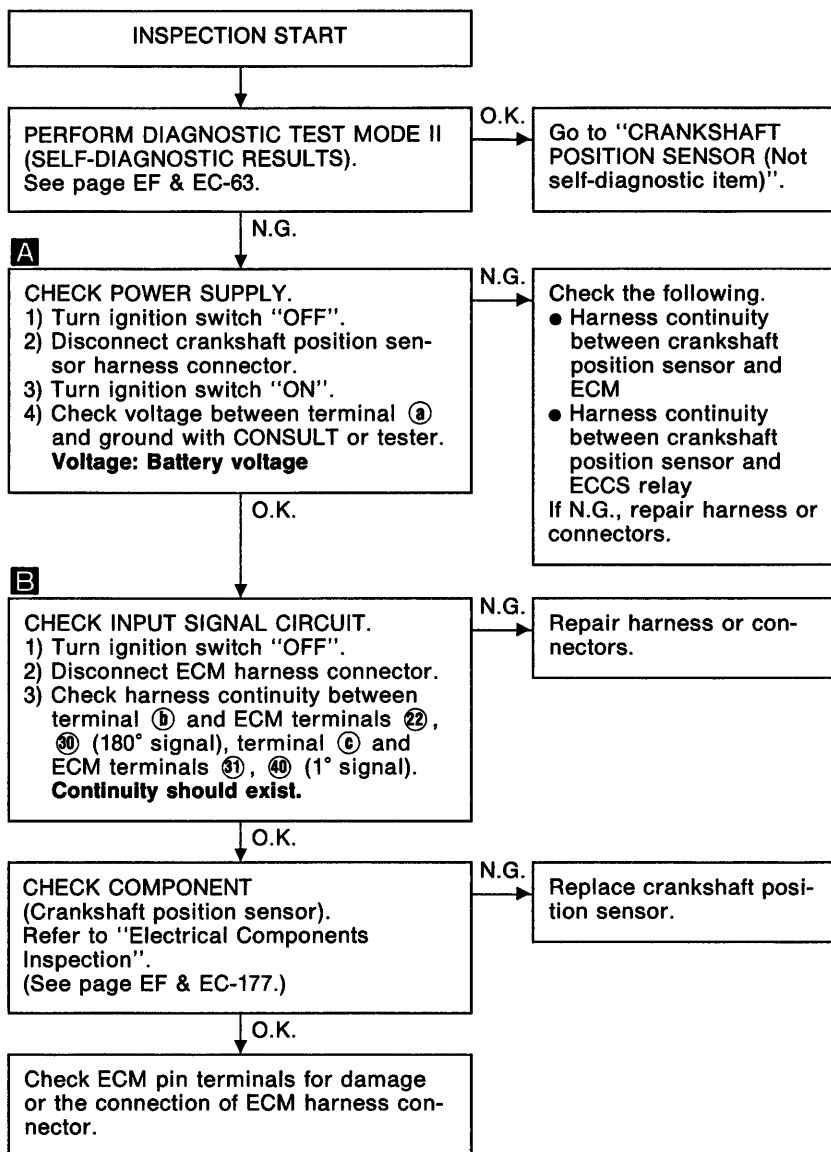
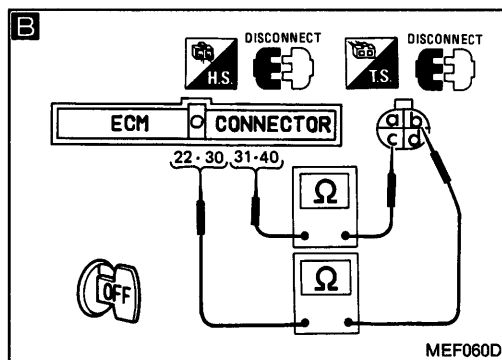
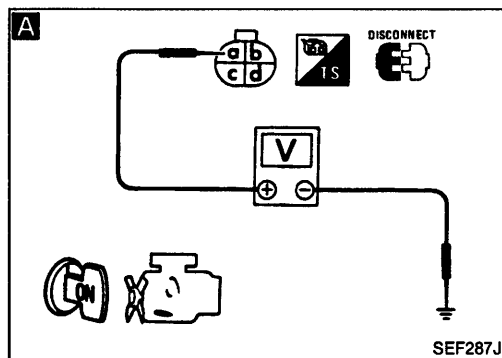


Harness layout

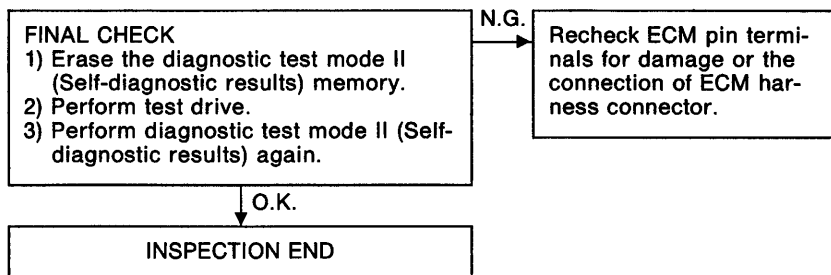


TROUBLE DIAGNOSES

CRANKSHAFT POSITION SENSOR (Diagnostic trouble code No.11)



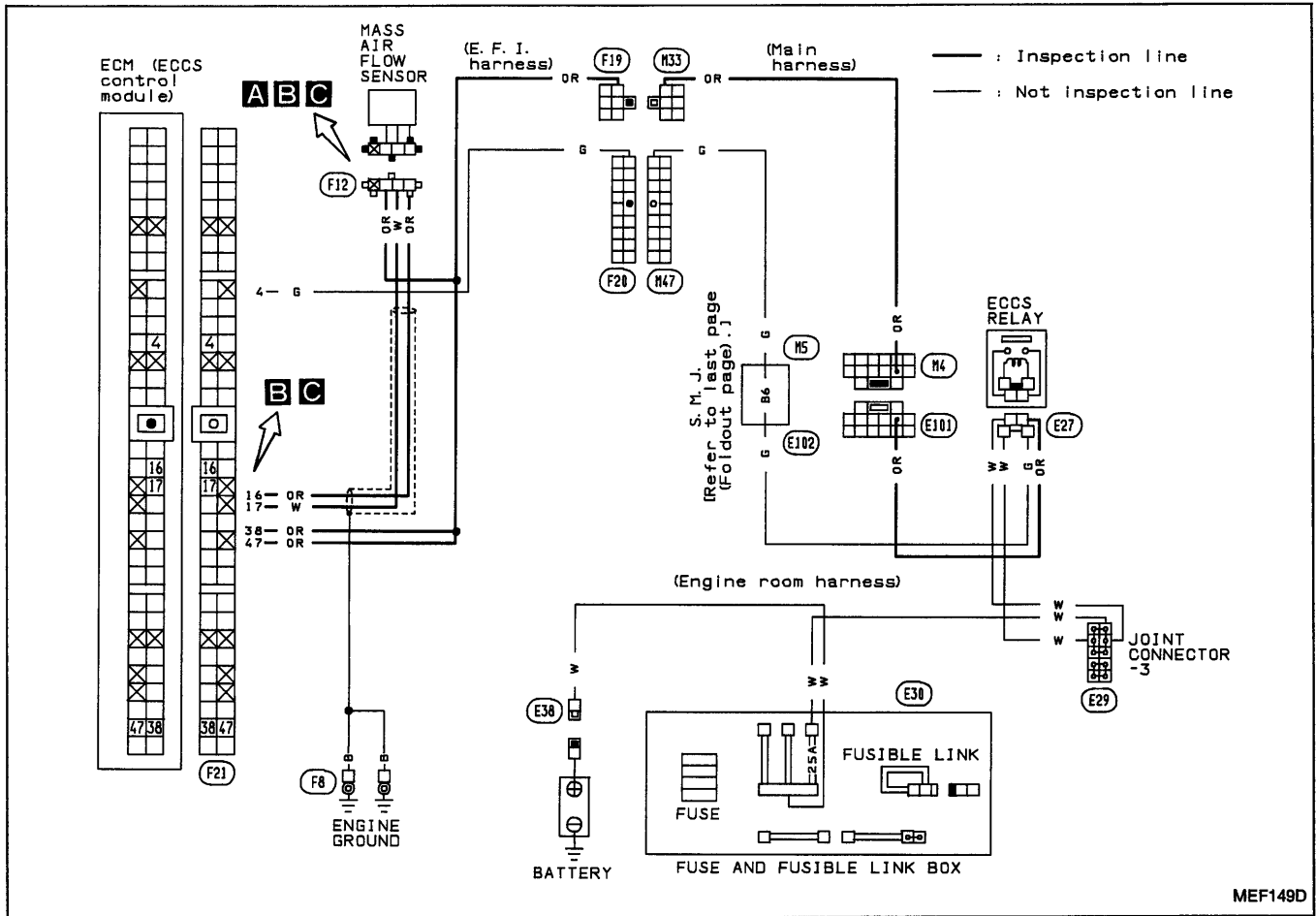
Perform FINAL CHECK by the following procedure after repair is completed.



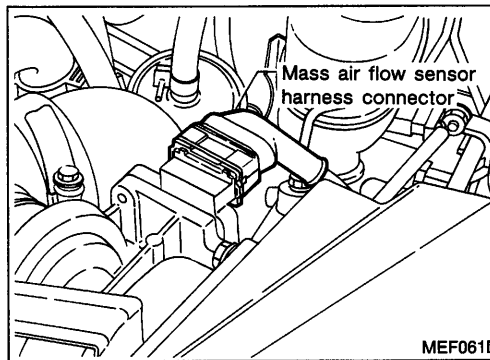
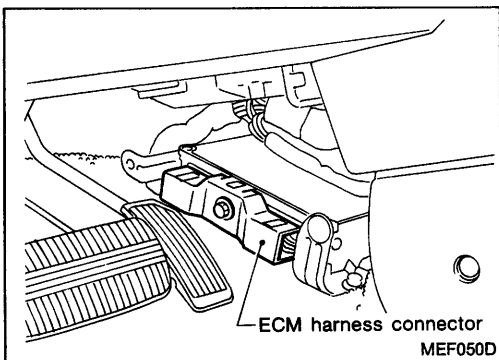
TROUBLE DIAGNOSES

Diagnostic Procedure 3

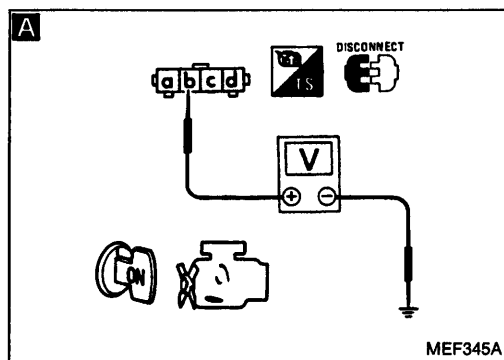
MASS AIR FLOW SENSOR (Diagnostic trouble code No. 12)  (Malfunction indicator lamp item)



Harness layout



TROUBLE DIAGNOSES



MASS AIR FLOW SENSOR (Diagnostic trouble code No.12) (Malfunction indicator lamp item)

INSPECTION START

PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).
See page EF & EC-63.

O.K.

INSPECTION END

N.G.

A

CHECK POWER SUPPLY.

- 1) Turn ignition switch "OFF".
- 2) Disconnect mass air flow sensor harness connector.
- 3) Turn ignition switch "ON".
- 4) Check voltage between terminal (b) and ground with CONSULT or tester.
Voltage: Battery voltage

N.G.

Check the following.

- Harness continuity between mass air flow sensor and ECM
 - Harness continuity between mass air flow sensor and ECCS relay
- If N.G., repair harness or connectors.

O.K.

B

CHECK GROUND CIRCUIT.

- 1) Turn ignition switch "OFF".
- 2) Disconnect ECM harness connector.
- 3) Check harness continuity between terminal (c) and ECM terminal (17).
Continuity should exist.

N.G.

Repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL CIRCUIT.

- 1) Check harness continuity between terminal (d) and ECM terminal (16).
Continuity should exist.

N.G.

Repair harness or connectors.

O.K.

CHECK COMPONENT
(Mass air flow sensor).

Refer to "Electrical Components Inspection".
(See page EF & EC-177.)

N.G.

Replace mass air flow sensor.

O.K.

Check ECM pin terminals for damage or the connection of ECM harness connector.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

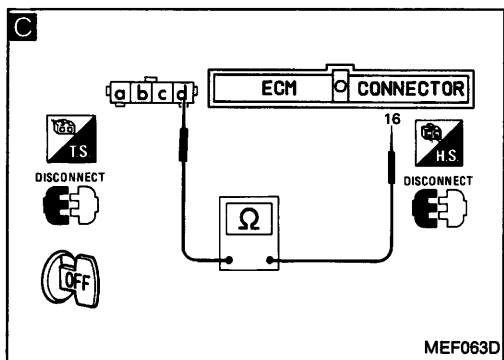
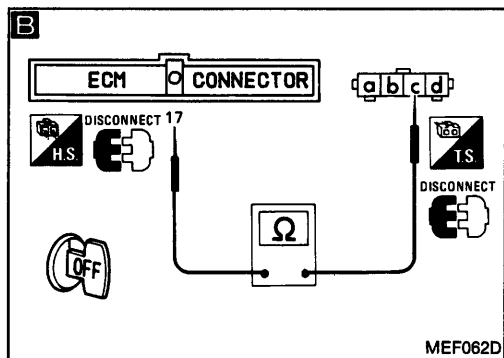
- 1) Erase the diagnostic test mode II (Self-diagnostic results) memory.
- 2) Perform test drive.
- 3) Perform diagnostic test mode II (Self-diagnostic results) again.

N.G.

Recheck ECM pin terminals for damage or the connection of ECM harness connector.

O.K.

INSPECTION END

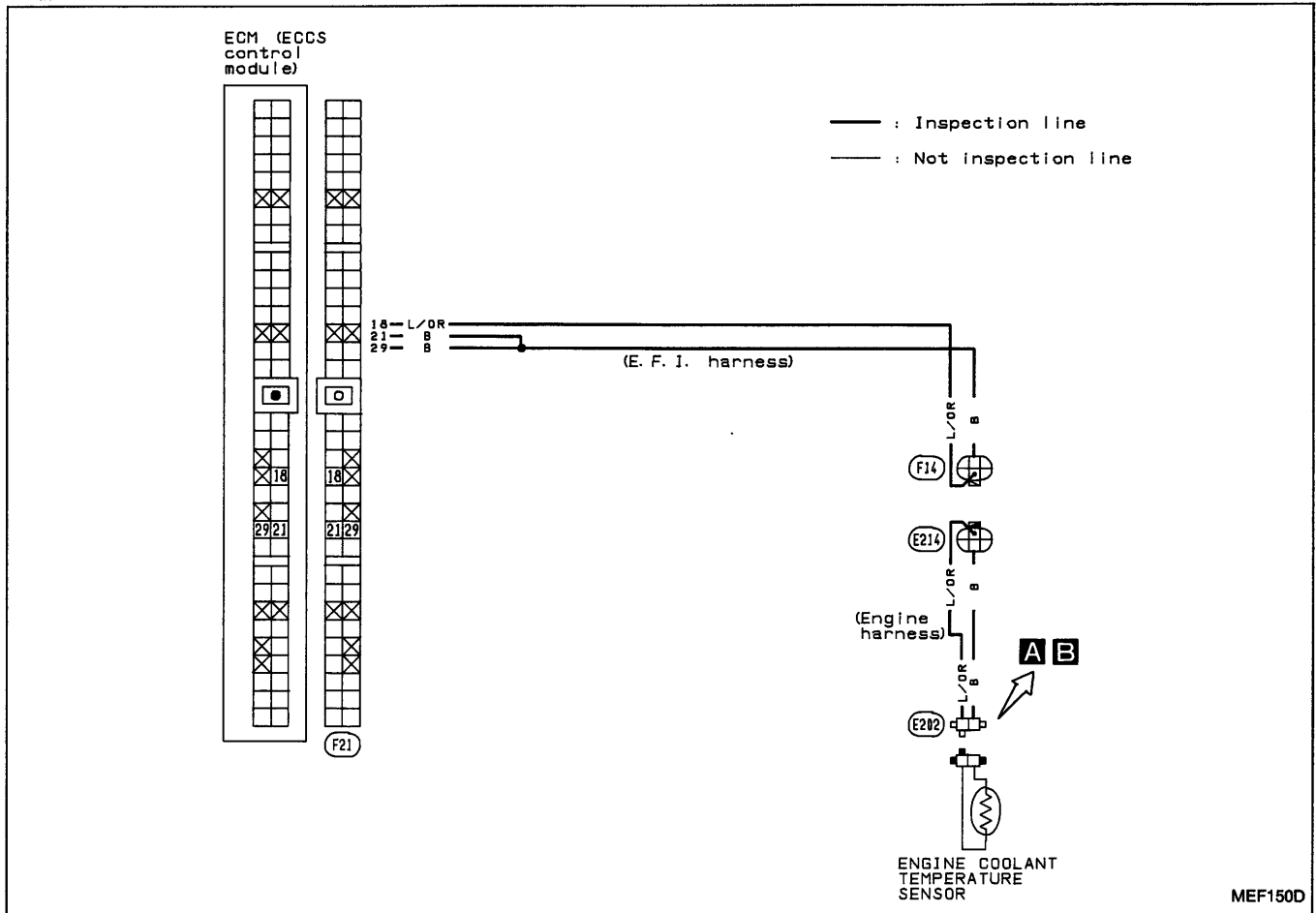


TROUBLE DIAGNOSES

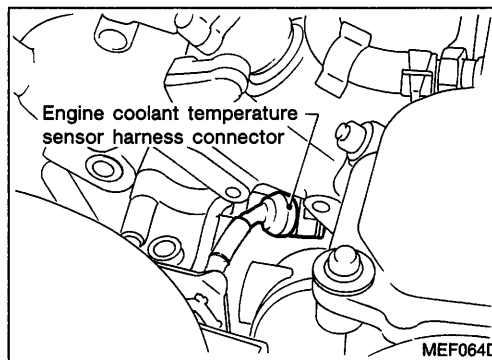
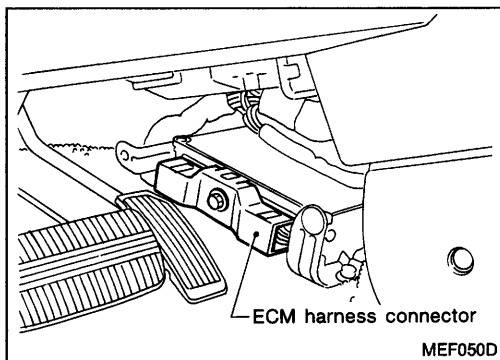
Diagnostic Procedure 4

ENGINE COOLANT TEMPERATURE SENSOR (Diagnostic trouble code No. 13)

 (Malfunction indicator lamp item)



Harness layout



GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

FA

RA

BR

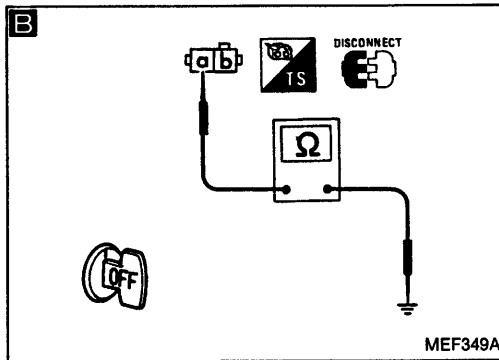
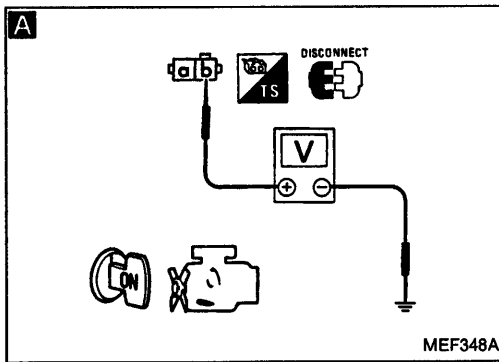
ST

BF

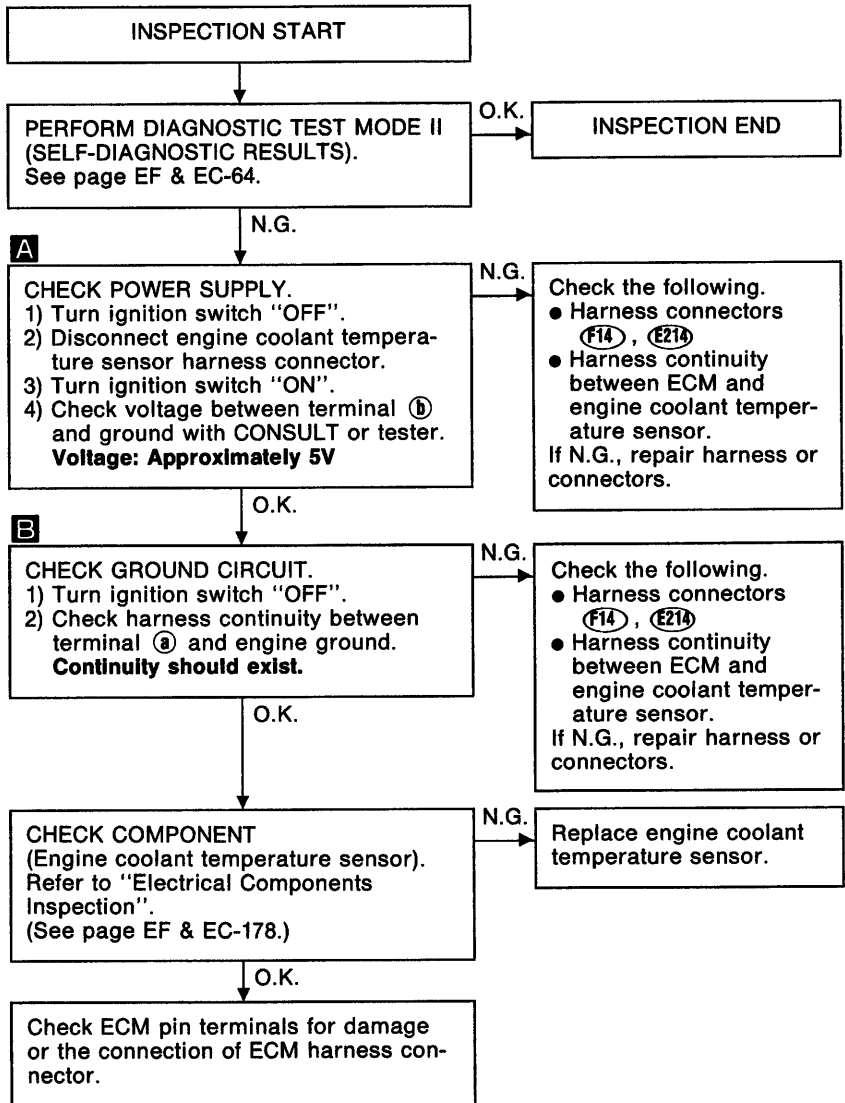
HA

EL

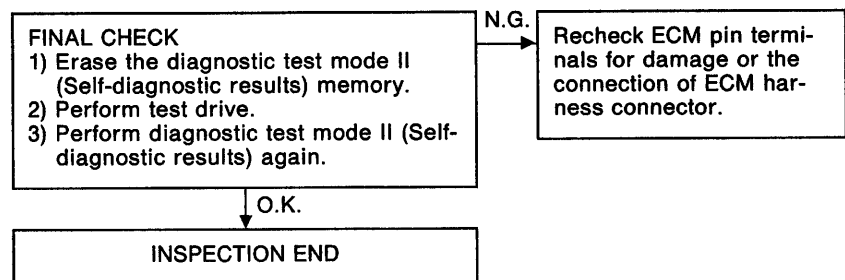
TROUBLE DIAGNOSES



ENGINE COOLANT TEMPERATURE SENSOR (Diagnostic trouble code No.13) (Malfunction indicator lamp item)

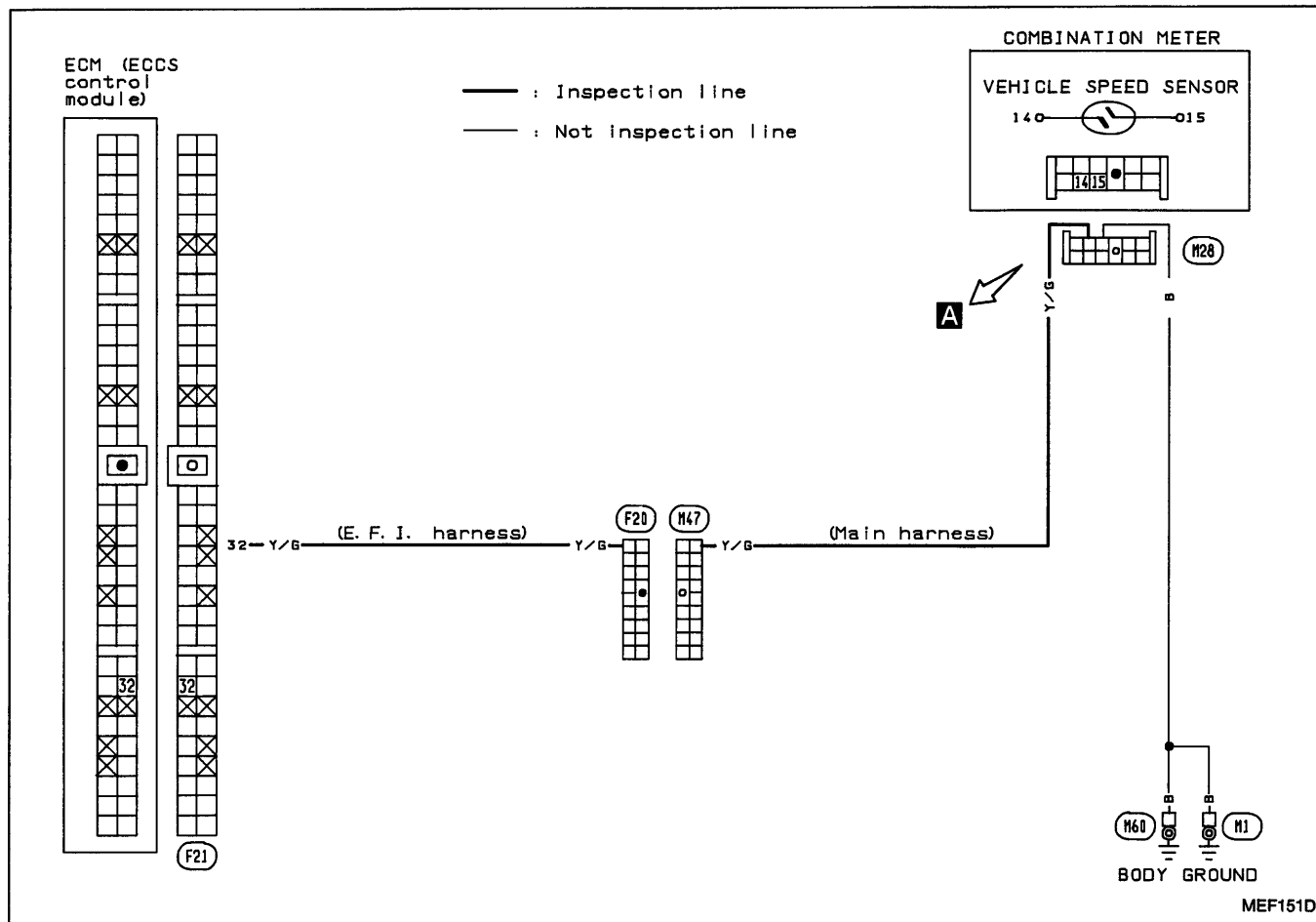


Perform FINAL CHECK by the following procedure after repair is completed.

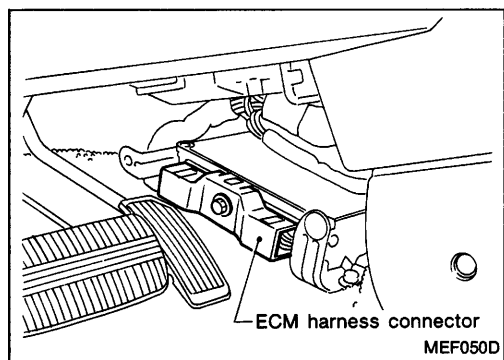


Diagnostic Procedure 5

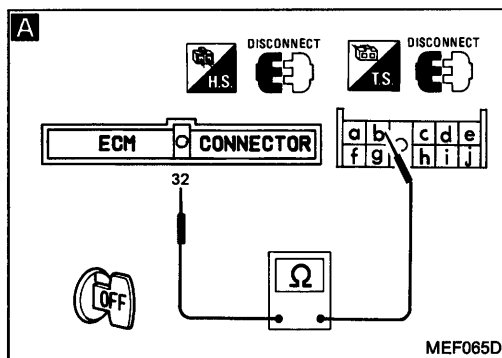
VEHICLE SPEED SENSOR (Diagnostic trouble code No. 14)  (Malfunction indicator lamp item)



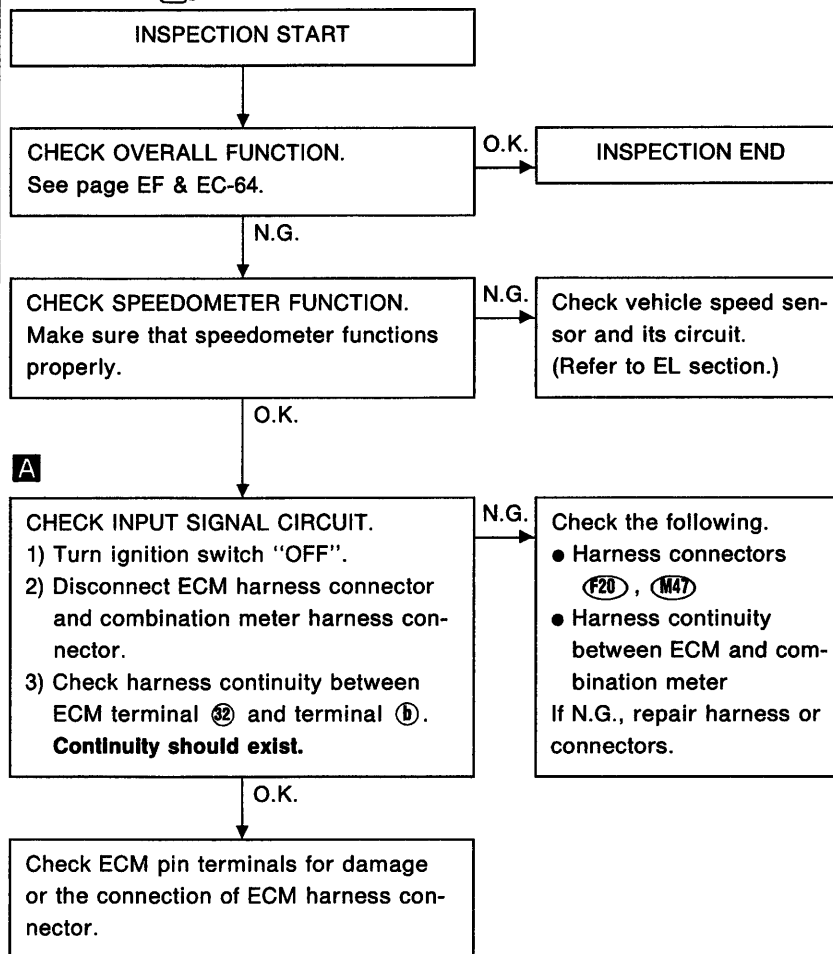
Harness layout



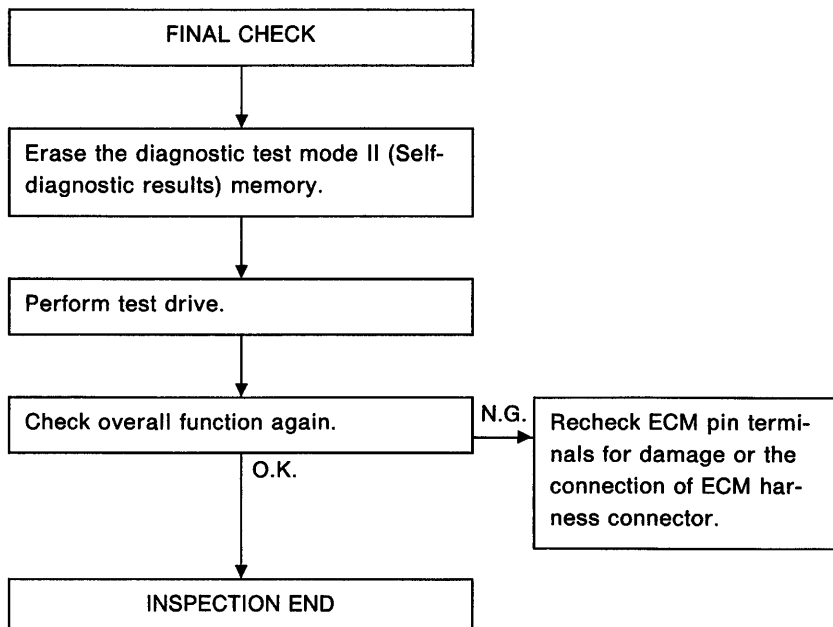
TROUBLE DIAGNOSES



VEHICLE SPEED SENSOR (Diagnostic trouble code No.14) (Malfunction indicator lamp item)

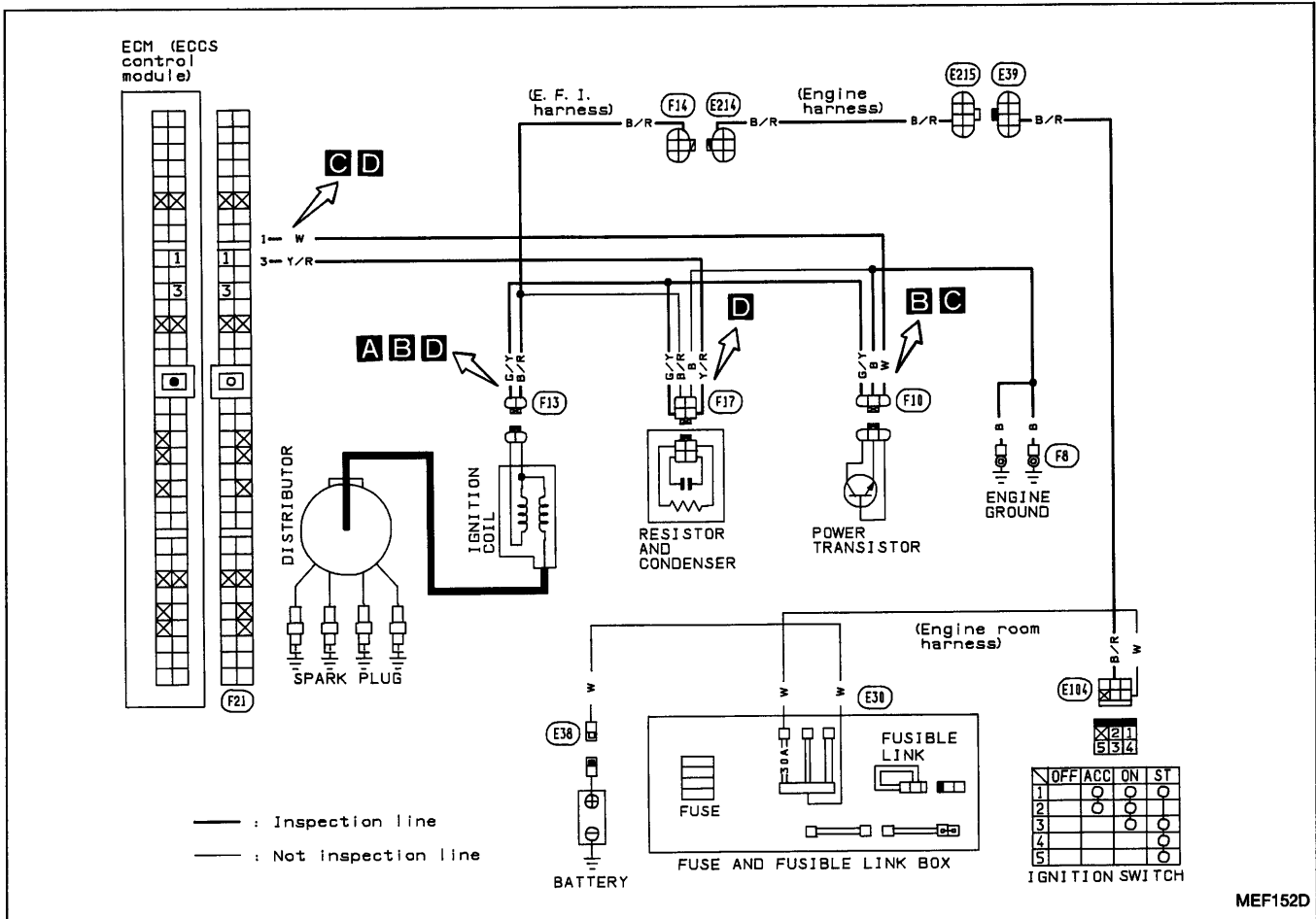


Perform FINAL CHECK by the following procedure after repair is completed.

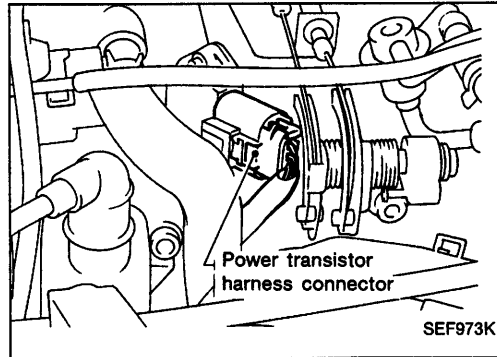
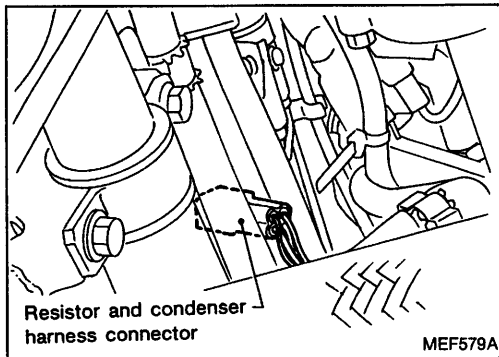
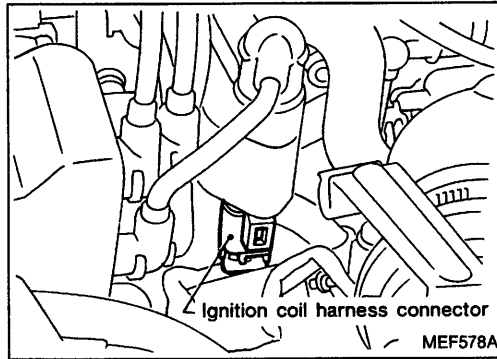
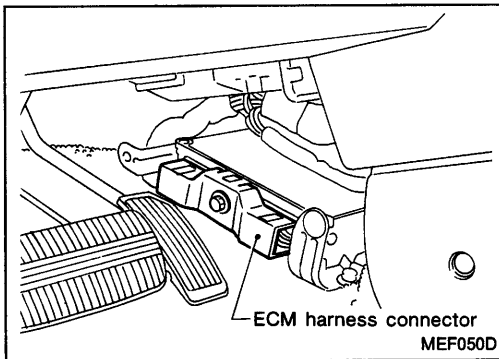


Diagnostic Procedure 6

IGNITION SIGNAL (Diagnostic trouble code No. 21)

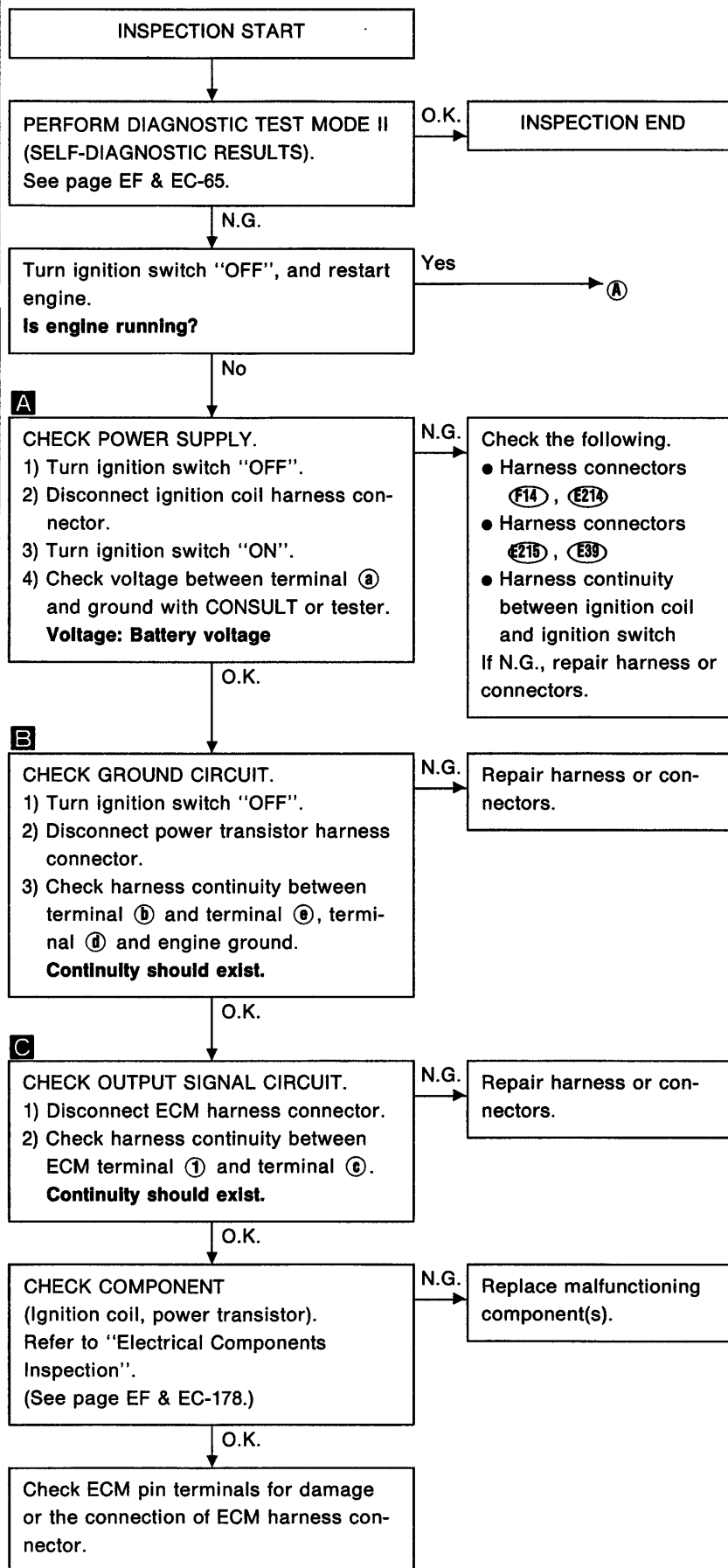
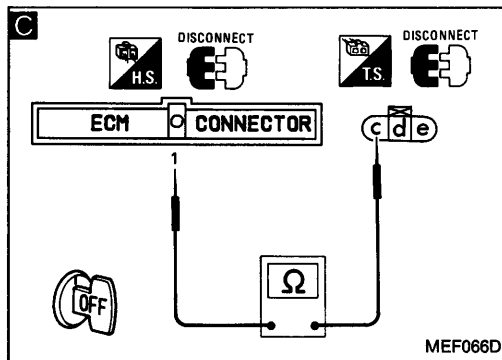
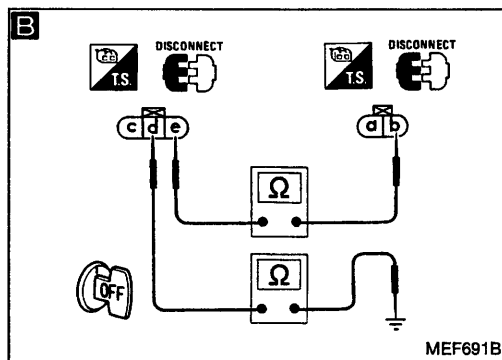
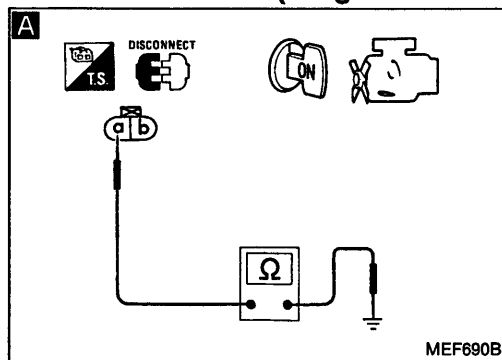


Harness layout



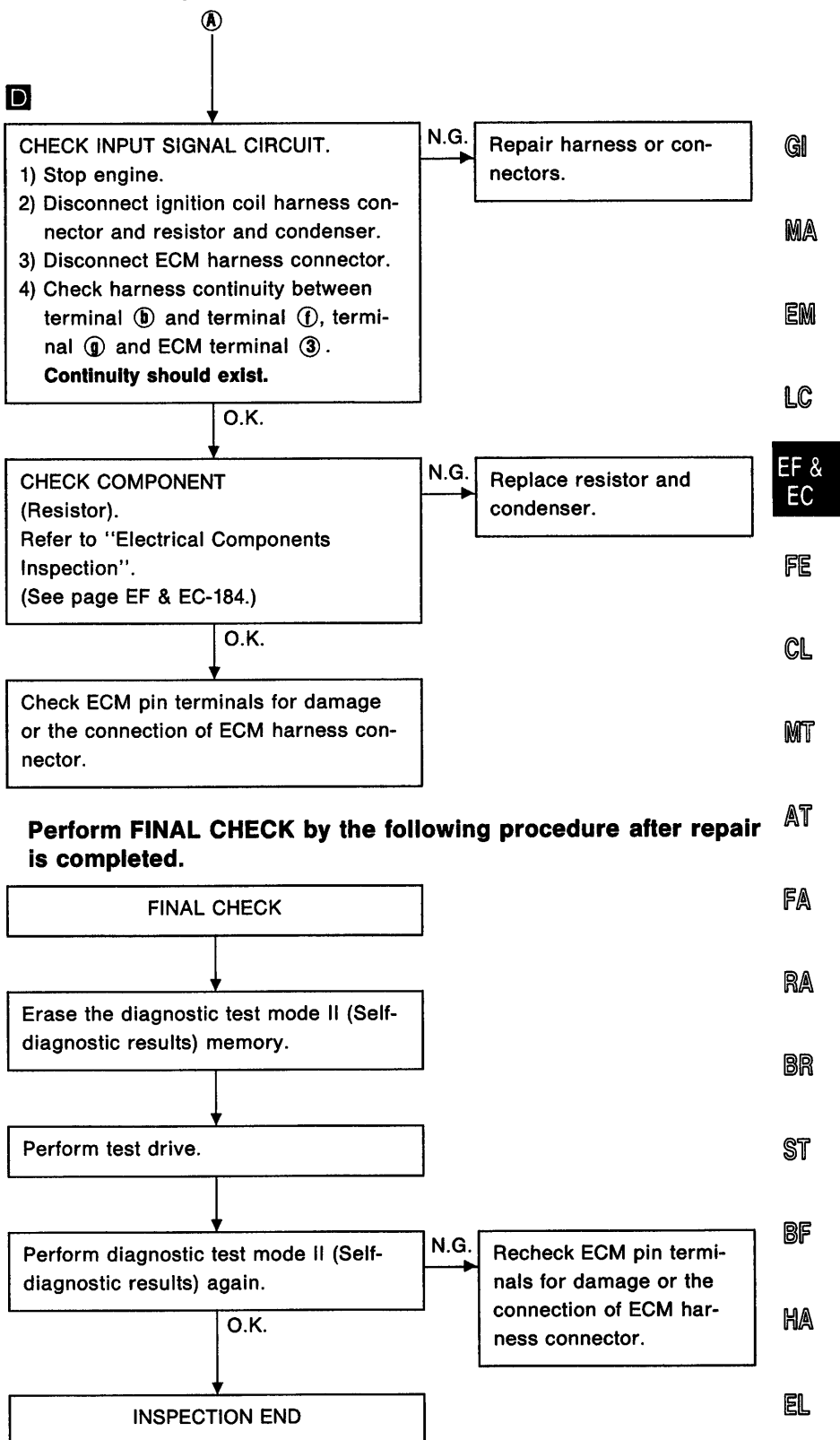
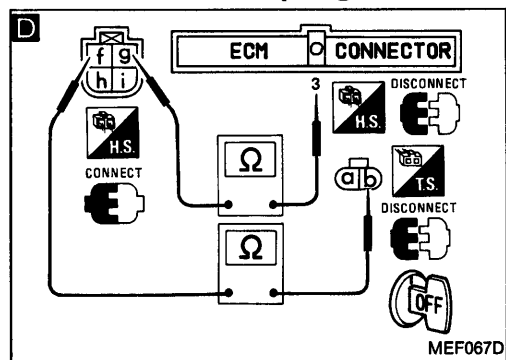
TROUBLE DIAGNOSES

IGNITION SIGNAL (Diagnostic trouble code No.21)



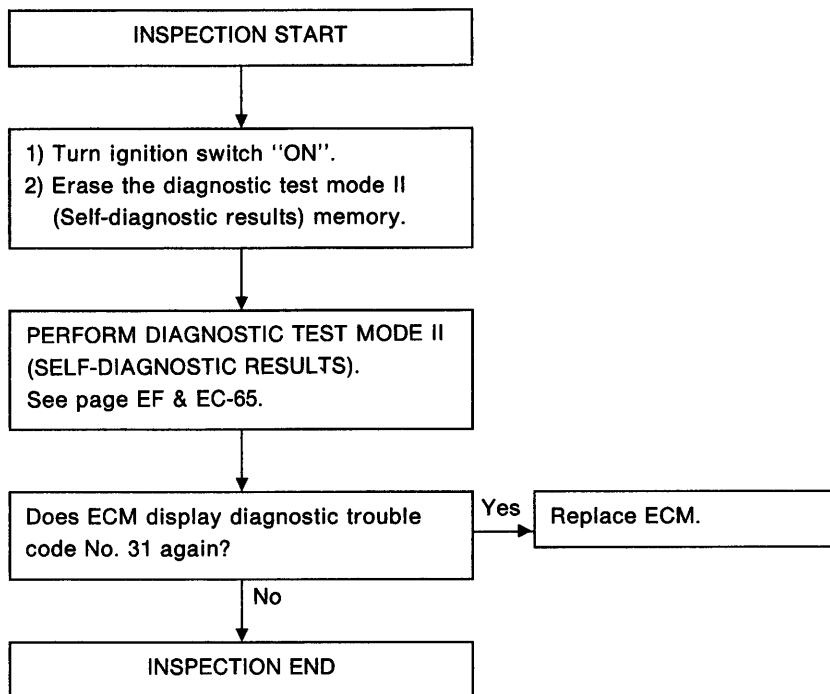
TROUBLE DIAGNOSES

IGNITION SIGNAL (Diagnostic trouble code No.21)



Diagnostic Procedure 7

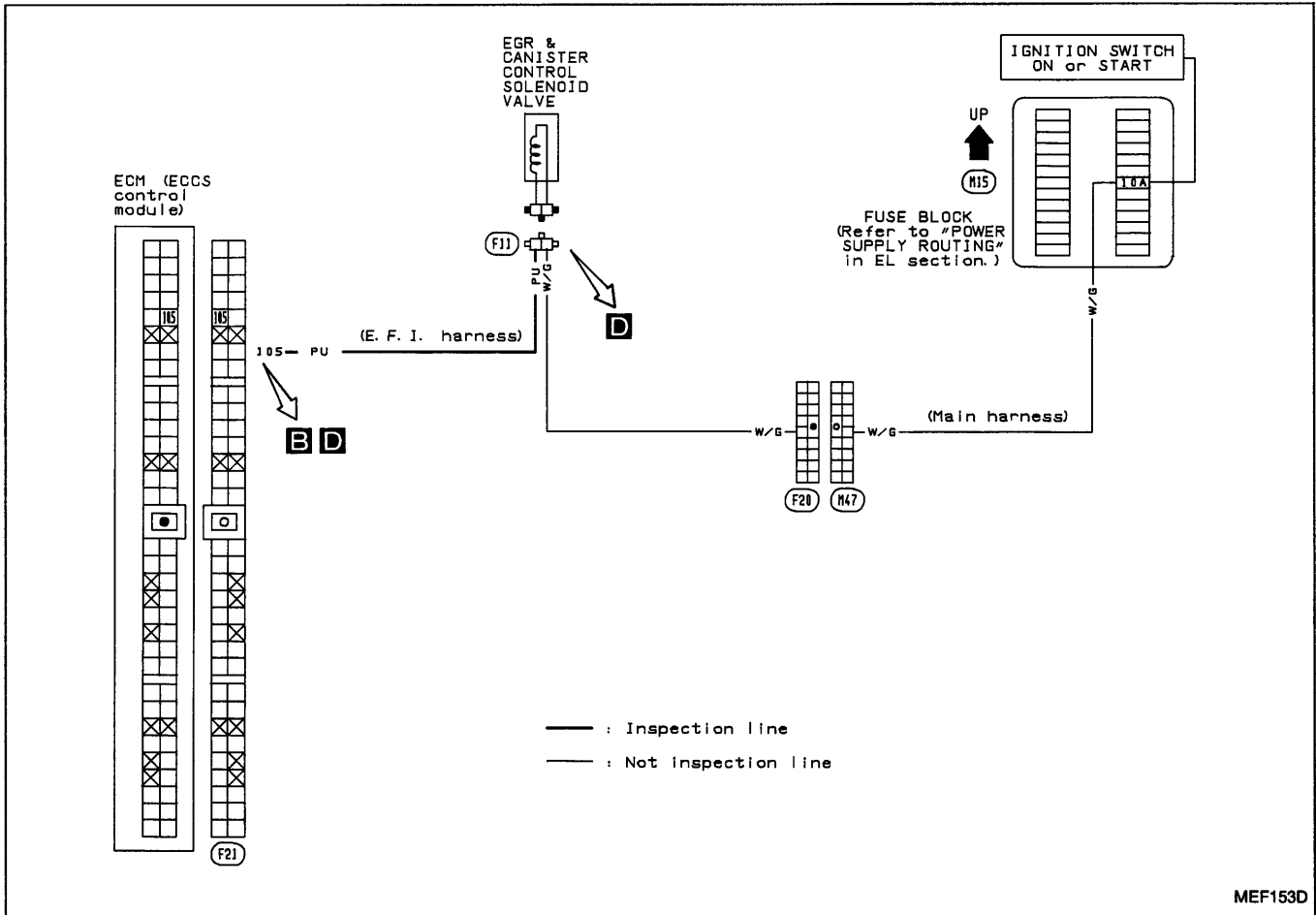
ECM (ECCS CONTROL MODULE)  **(Diagnostic trouble code No. 31)**
(Malfunction Indicator lamp item)



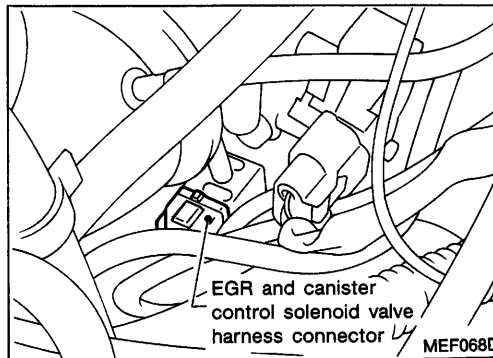
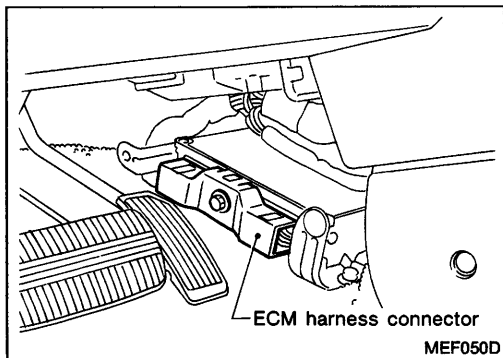
TROUBLE DIAGNOSES

Diagnostic Procedure 8

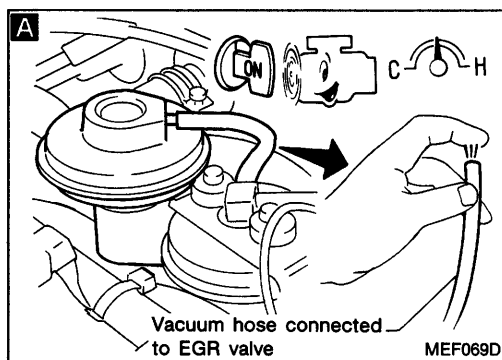
EGR FUNCTION (Diagnostic trouble code No. 32)  (Malfunction indicator lamp item):
California models



Harness layout



TROUBLE DIAGNOSES



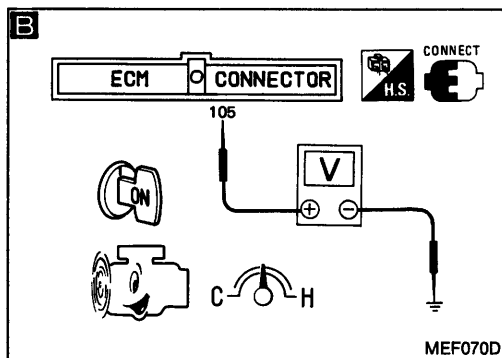
EGR FUNCTION (Diagnostic trouble code No.32) (Malfunction indicator lamp item) : California models

INSPECTION START

PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS). See page EF & EC-66.

O.K. Go to EGR CONTROL (Not self-diagnostic item).

N.G.



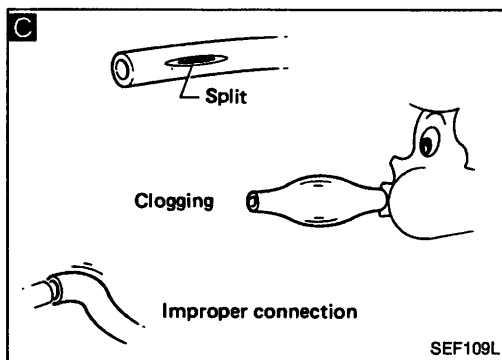
A CHECK VACUUM SOURCE TO EGR VALVE.
1) Start engine and warm it up sufficiently.
2) Keep engine speed at about 2,000 rpm.
3) Disconnect vacuum hose to EGR valve.
4) Make sure that vacuum exists.
Vacuum should exist.

O.K. CHECK COMPONENTS (EGR valve, and EGRC-BPT valve). Refer to "Electrical Components Inspection". (See page EF & EC-182.)

N.G.

Replace malfunctioning component(s).

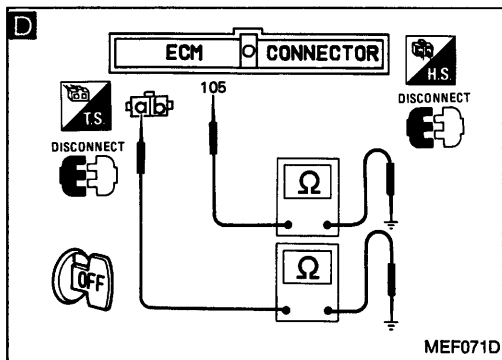
N.G.



B CHECK CONTROL FUNCTION.
1) Check voltage between ECM terminal 105 and ground under the following conditions with CONSULT or tester.
Voltage:
Engine speed is 4,000 rpm.
0.6 - 0.8V
Engine speed is 2,000 rpm.
Battery voltage

O.K. **C** CHECK VACUUM HOSE.
1) Check vacuum hose for clogging, cracks and proper connection.

N.G.



D CHECK OUTPUT SIGNAL CIRCUIT.
1) Stop engine.
2) Disconnect ECM harness connector.
3) Disconnect EGR & canister control solenoid valve harness connector.
4) Check harness continuity between ECM terminal 105 and ground, terminal 8 and ground.
Continuity should not exist.

N.G. Repair harness or connectors between ECM and EGR & canister control solenoid valve.

O.K.

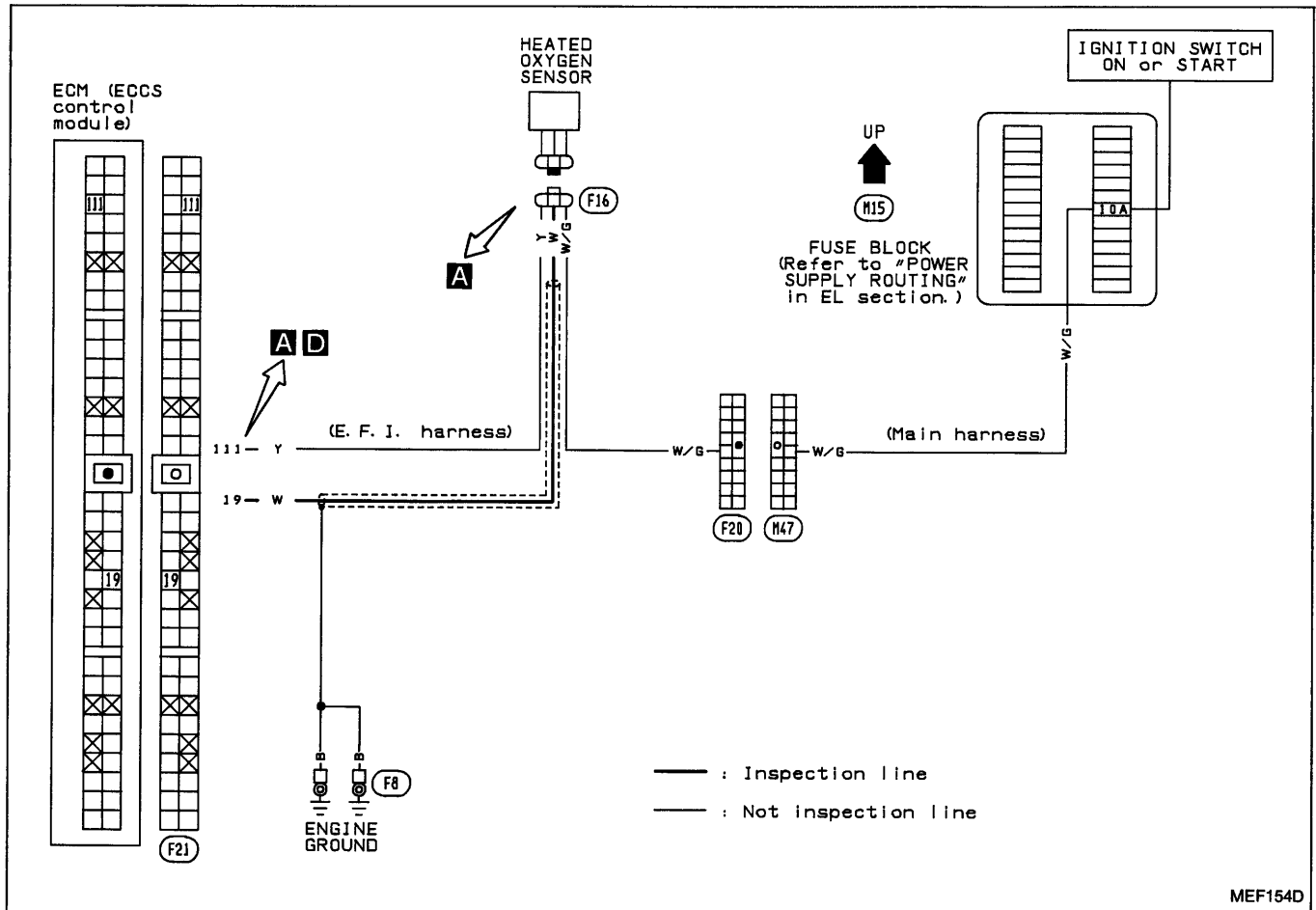
A

GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

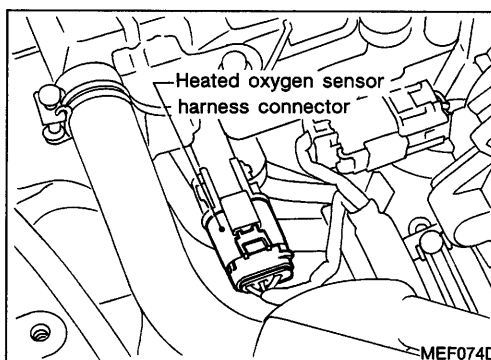
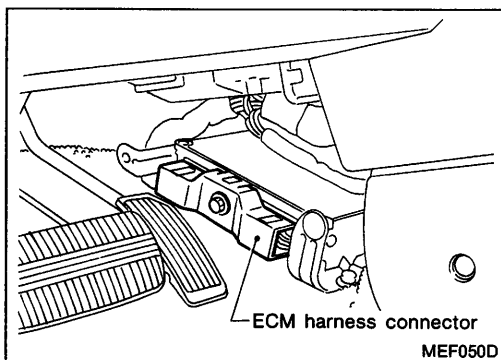
TROUBLE DIAGNOSES

Diagnostic Procedure 9

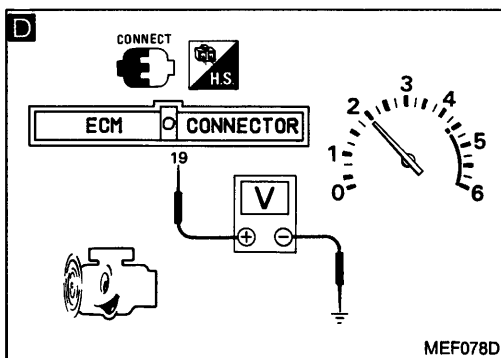
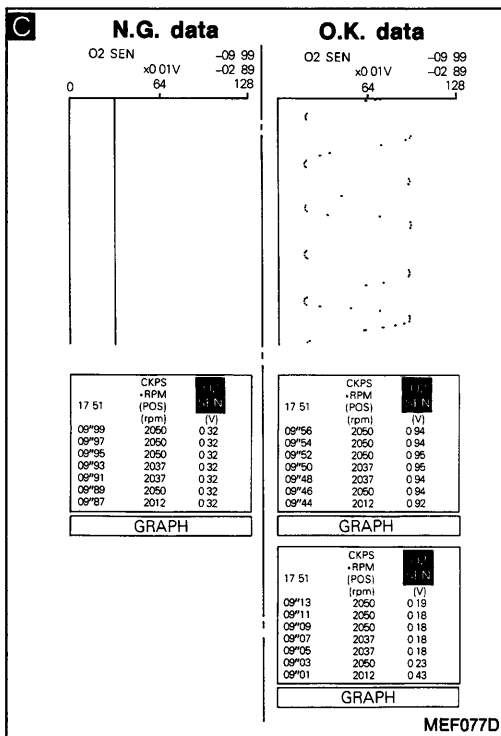
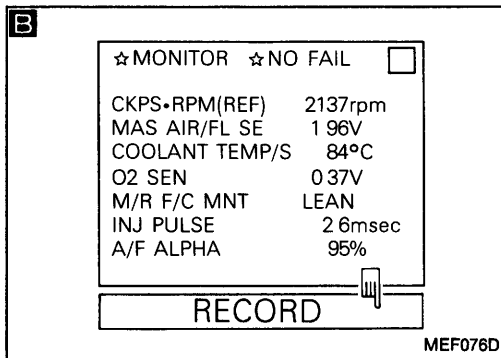
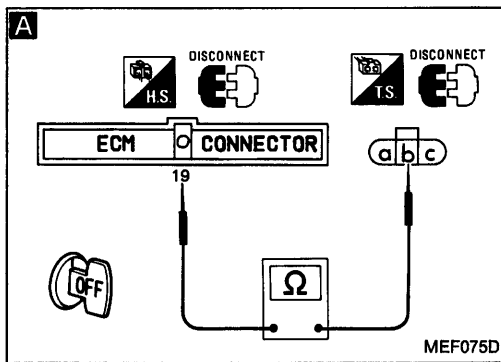
HEATED OXYGEN SENSOR (Diagnostic trouble code No. 33)  (Malfunction indicator lamp item): California models only



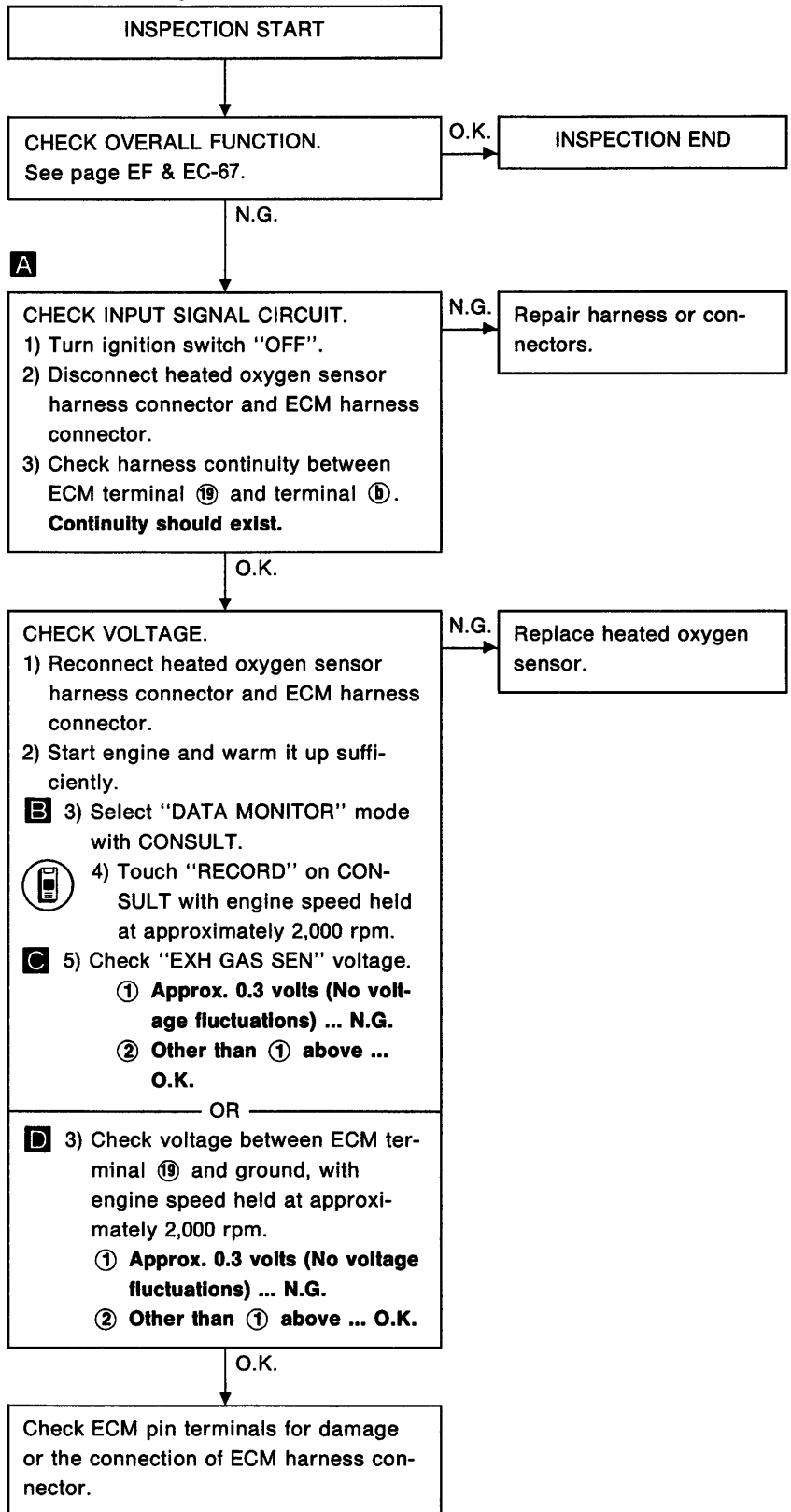
Harness layout



TROUBLE DIAGNOSES



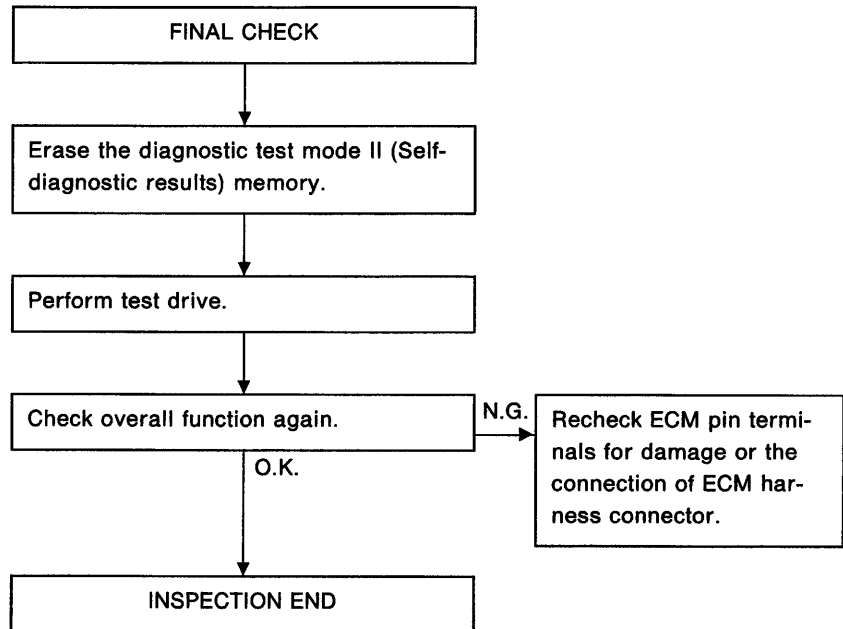
HEATED OXYGEN SENSOR (Diagnostic trouble code No.33) (Malfunction indicator lamp item) : California models only



TROUBLE DIAGNOSES

HEATED OXYGEN SENSOR (Diagnostic trouble code No.33)  (Malfunction indicator lamp item) : California models only

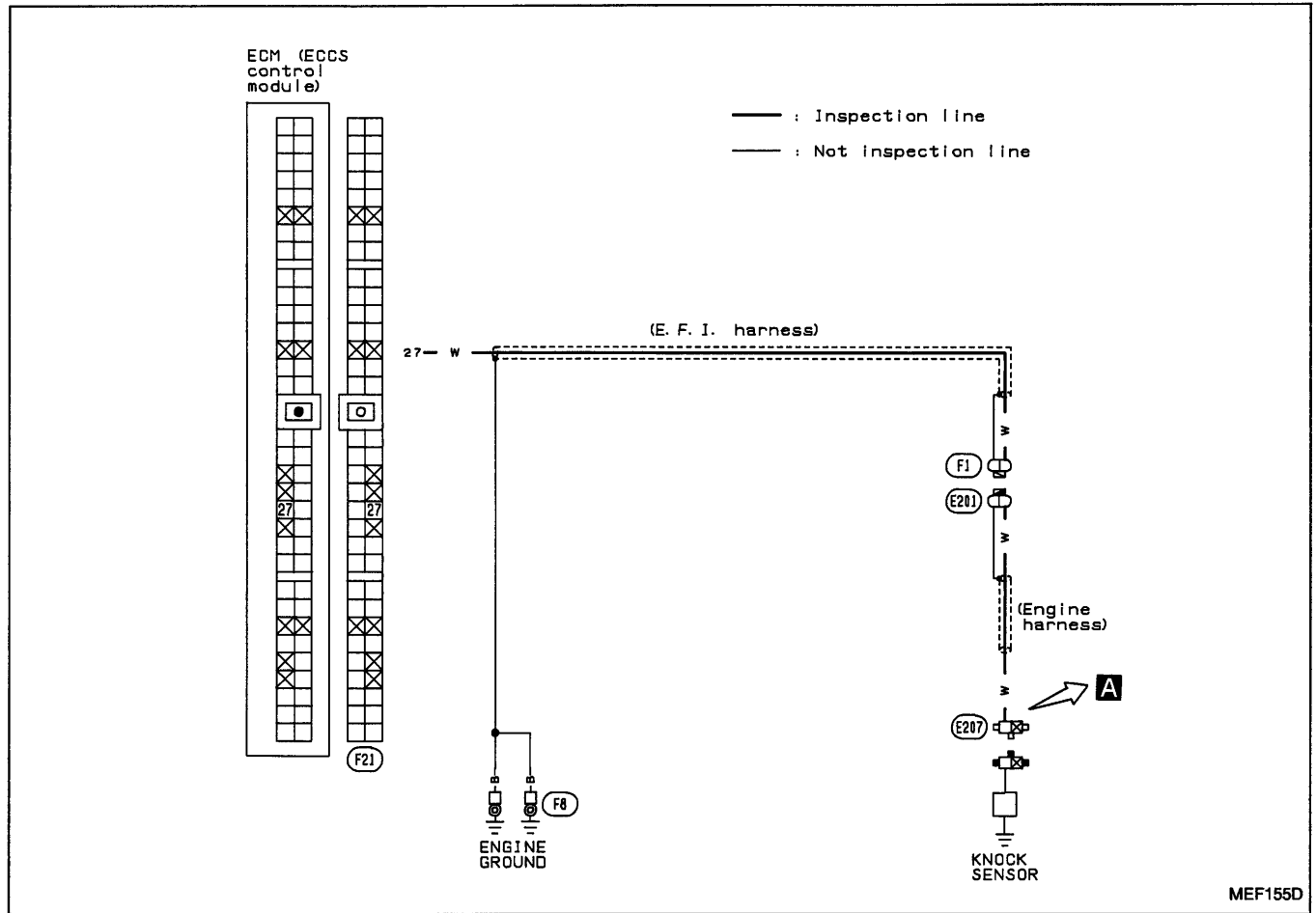
Perform FINAL CHECK by the following procedure after repair is completed.



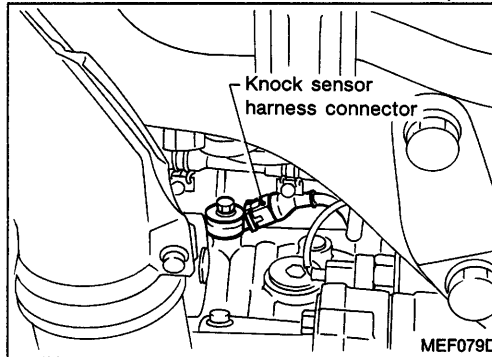
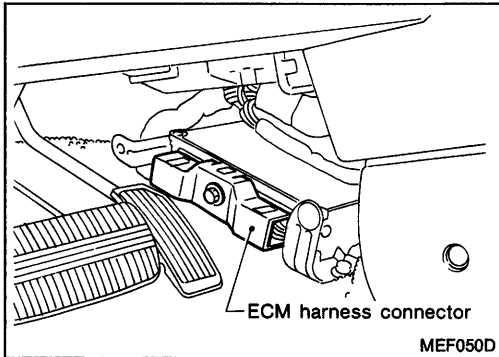
TROUBLE DIAGNOSES

Diagnostic Procedure 10

KNOCK SENSOR (Diagnostic trouble code No. 34)

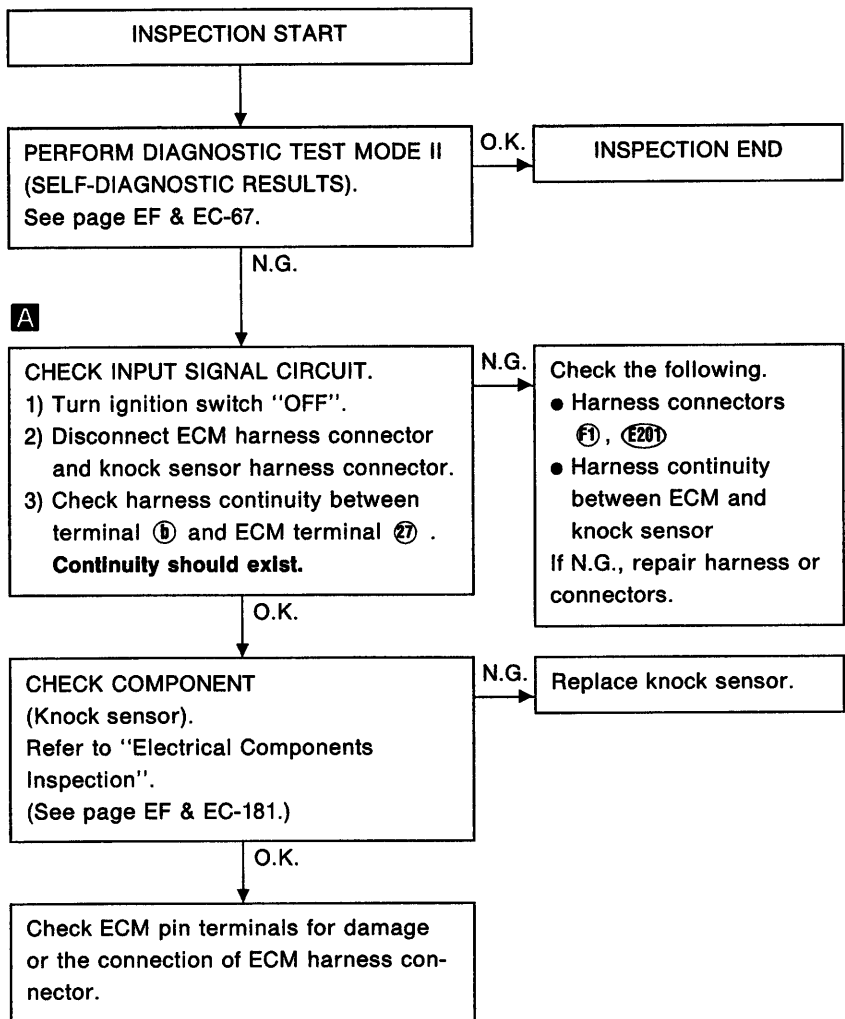
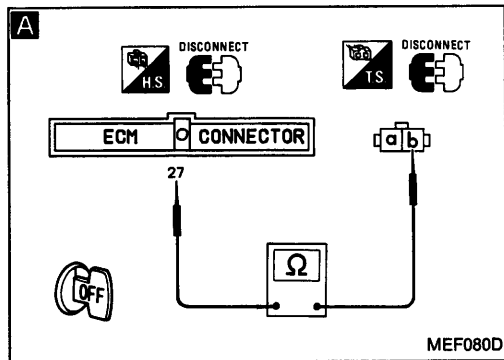


Harness layout

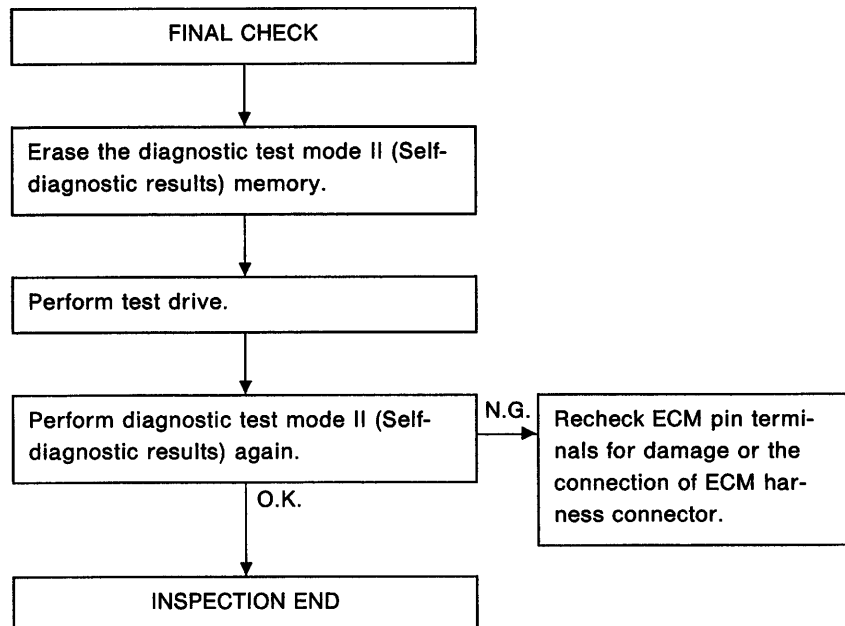


TROUBLE DIAGNOSES

KNOCK SENSOR (Diagnostic trouble code No.34)



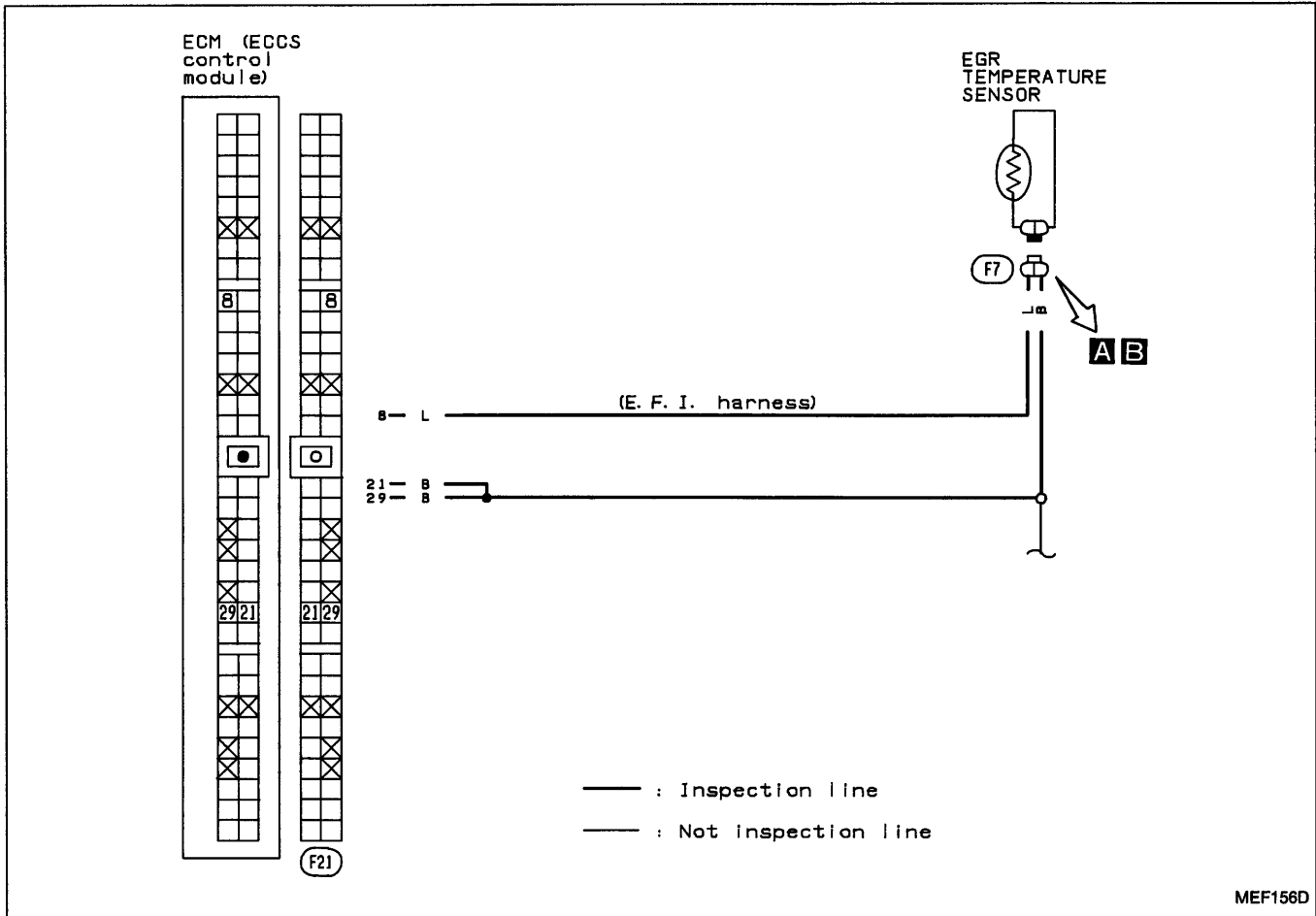
Perform FINAL CHECK by the following procedure after repair is completed.



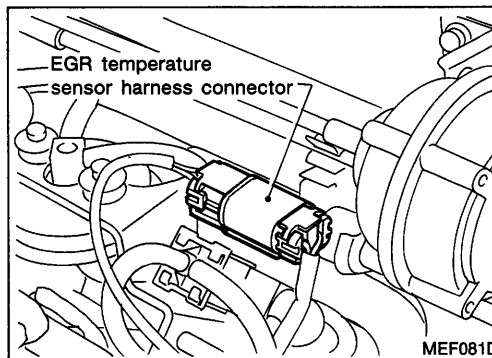
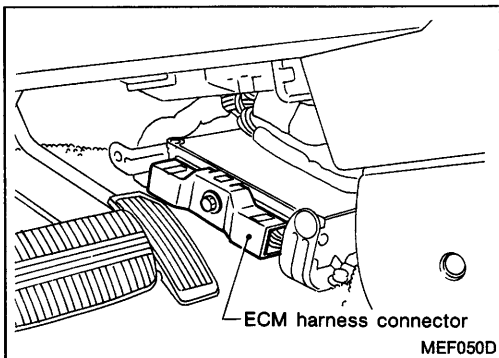
TROUBLE DIAGNOSES

Diagnostic Procedure 11

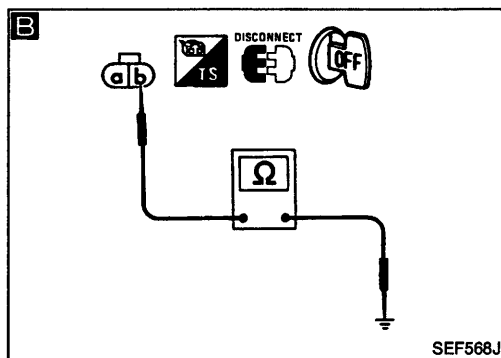
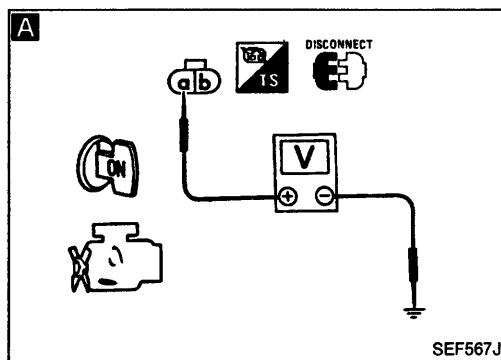
EGR TEMPERATURE SENSOR (Diagnostic trouble code No. 35)  (Malfunction indicator lamp item): California models only



Harness layout



TROUBLE DIAGNOSES



EGR TEMPERATURE SENSOR (Diagnostic trouble code No.35) (Malfunction indicator lamp item) : California models only

INSPECTION START

PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).
See page EF & EC-68.

O.K.

INSPECTION END

N.G.

A CHECK POWER SUPPLY.

- 1) Turn ignition switch "OFF".
- 2) Disconnect EGR temperature sensor harness connector.
- 3) Turn ignition switch "ON".
- 4) Check voltage between terminal ③ and ground with CONSULT or tester.
Voltage: Approximately 5V

N.G.

Repair harness or connectors.

O.K.

B CHECK GROUND CIRCUIT.

- 1) Turn ignition switch "OFF".
- 2) Check harness continuity between terminal ① and engine ground.
Continuity should exist.

N.G.

Repair harness or connectors.

O.K.

CHECK COMPONENT (EGR temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-183.)

N.G.

Replace EGR temperature sensor.

O.K.

Check ECM pin terminals for damage or the connection of ECM harness connector.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

Erase the diagnostic test mode II (Self-diagnostic results) memory.

Perform test drive.

Perform diagnostic test mode II (Self-diagnostic results) again.

N.G.

Recheck ECM pin terminals for damage or the connection of ECM harness connector.

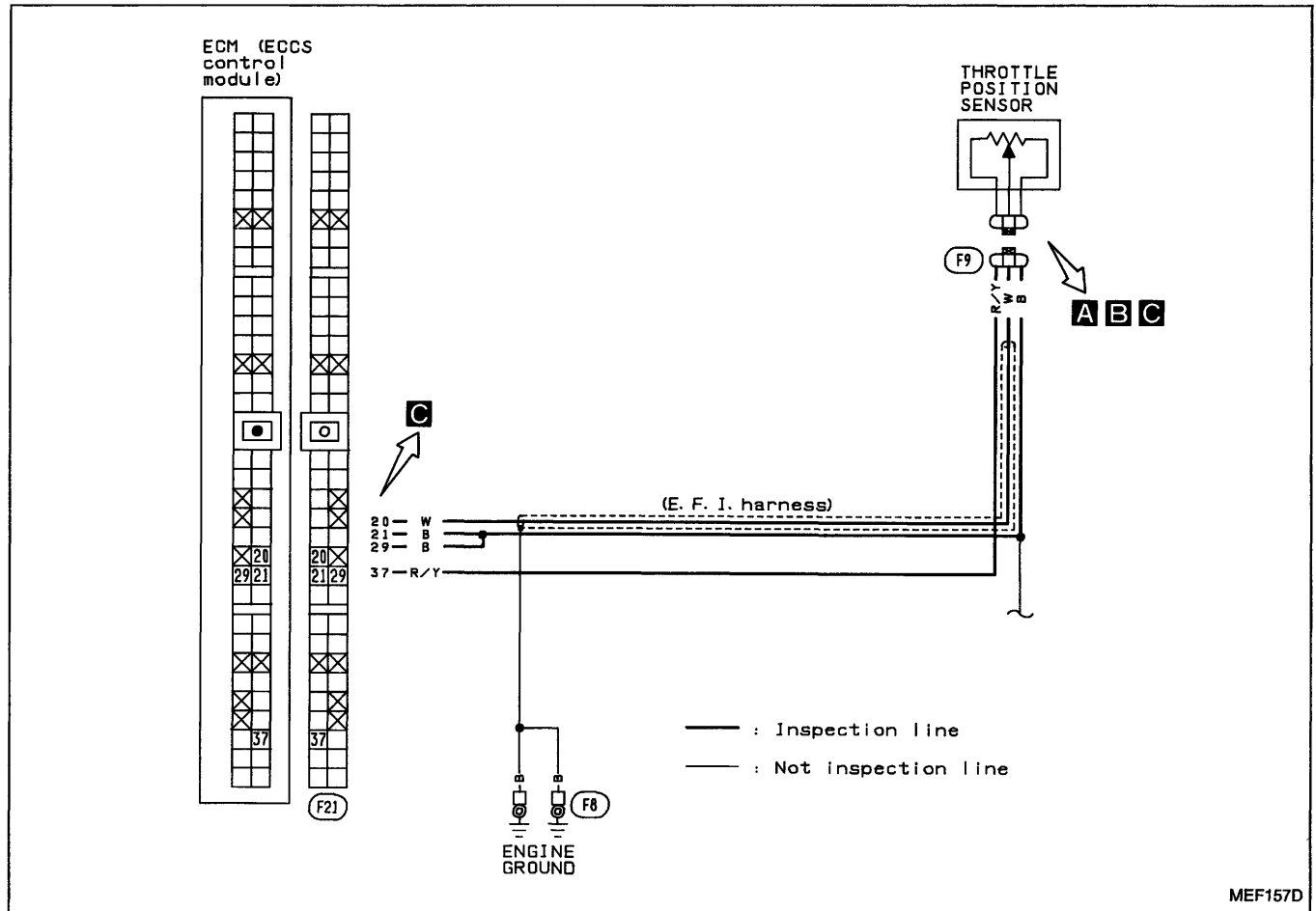
O.K.

INSPECTION END

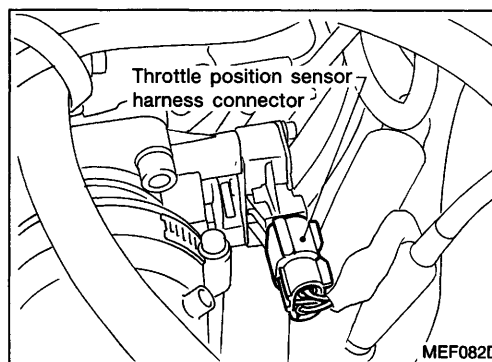
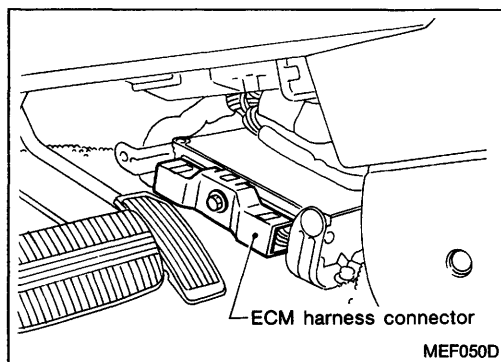
TROUBLE DIAGNOSES

Diagnostic Procedure 12

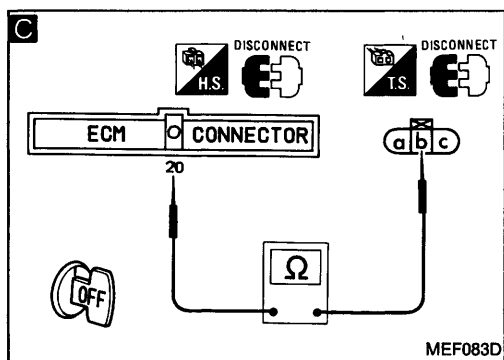
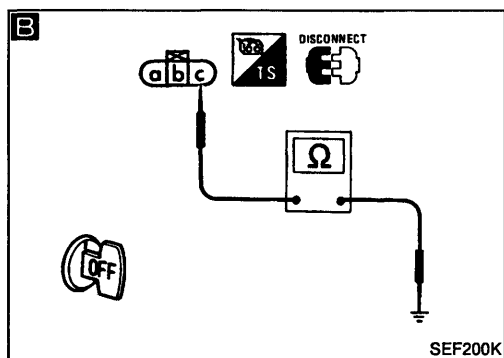
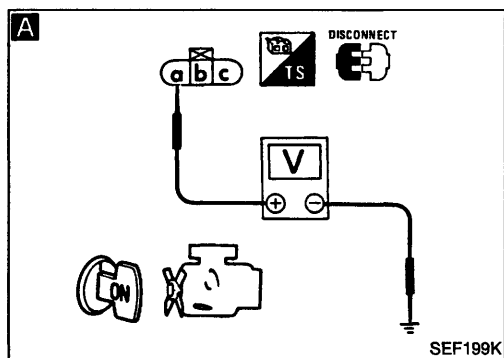
THROTTLE POSITION SENSOR (Diagnostic trouble code No. 43)  (Malfunction indicator lamp item)



Harness layout



TROUBLE DIAGNOSES



THROTTLE POSITION SENSOR (Diagnostic trouble code No.43) (Malfunction indicator lamp item)

INSPECTION START

PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).
See page EF & EC-68.

O.K.

INSPECTION END

N.G.

A

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect throttle position sensor harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal **a** and ground with CONSULT or tester.
Voltage: Approximately 5V

N.G.

Repair harness or connectors.

O.K.

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal **c** and engine ground.
Continuity should exist.

N.G.

Repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal **20** and terminal **b**.
Continuity should exist.

N.G.

Repair harness or connectors.

O.K.

CHECK COMPONENT
(Throttle position sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-179.)

N.G.

Replace throttle position sensor.

O.K.

Check ECM pin terminals for damage or the connection of ECM harness connector.

Perform FINAL CHECK by the following procedure after repair is completed.

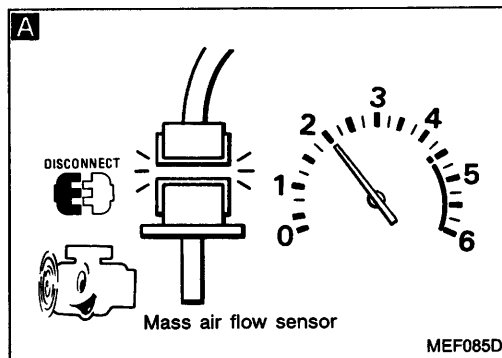
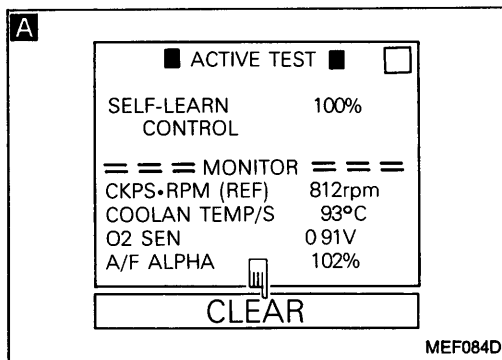
FINAL CHECK
1) Erase the diagnostic test mode II (Self-diagnostic results) memory.
2) Perform test drive.
3) Perform diagnostic test mode II (Self-diagnostic results) again.

N.G.

Recheck ECM pin terminals for damage or the connection of ECM harness connector.

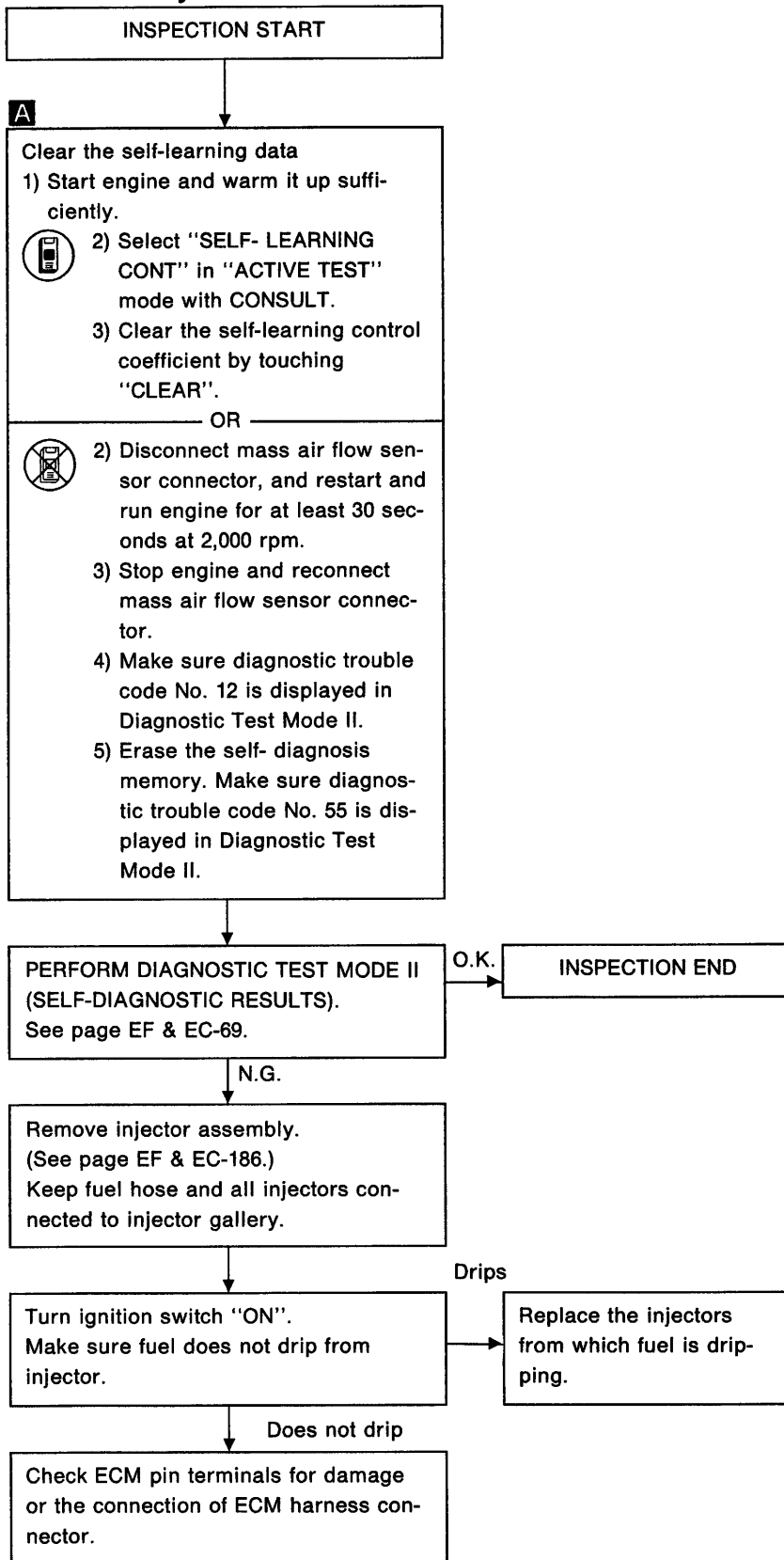
O.K.

INSPECTION END



Diagnostic Procedure 13

INJECTOR LEAK (Diagnostic trouble code No. 45) (Malfunction indicator lamp item): California models only



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

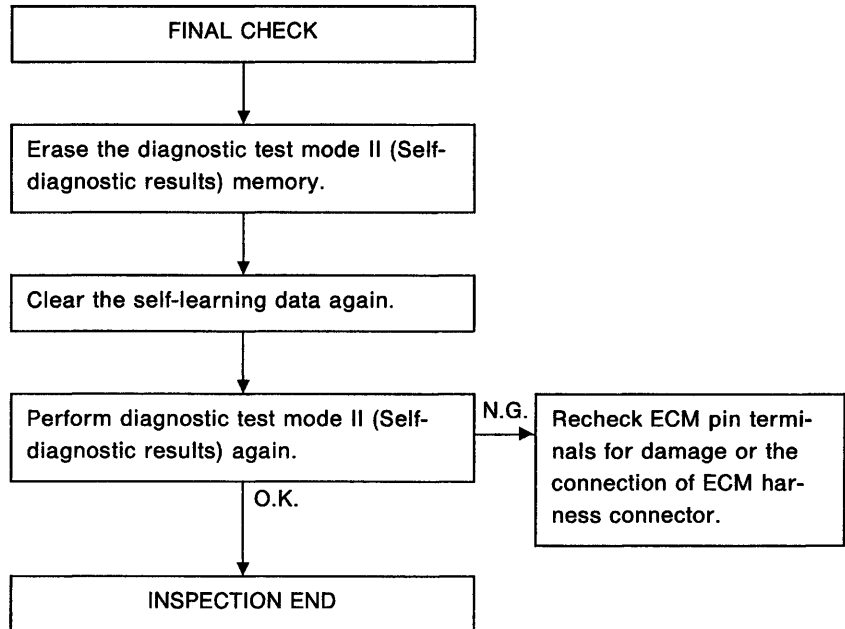
HA

EL

TROUBLE DIAGNOSES

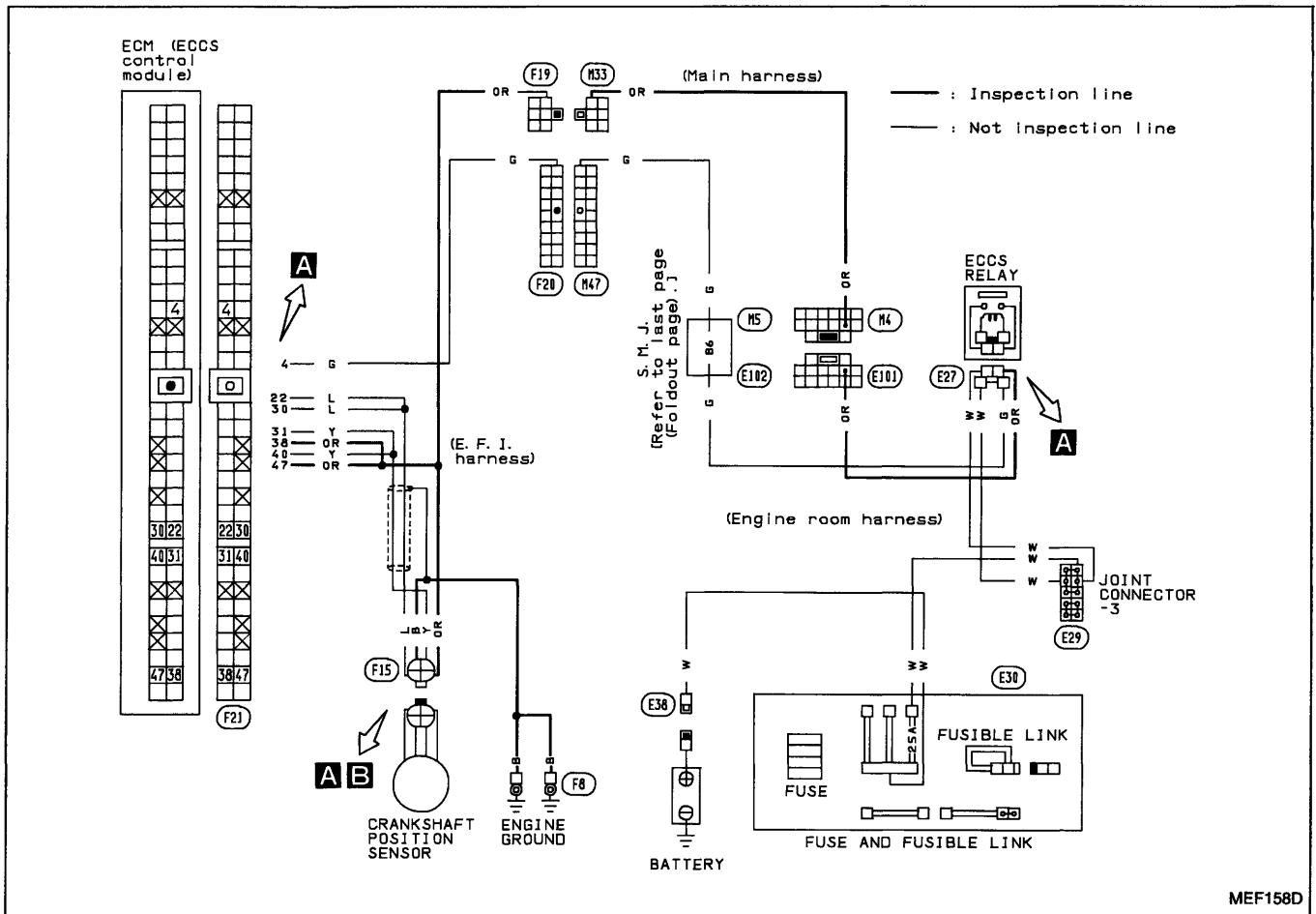
INJECTOR LEAK (Diagnostic trouble code No. 45)  (Malfunction indicator lamp item):
California models only

Perform FINAL CHECK by the following procedure after repair is completed.

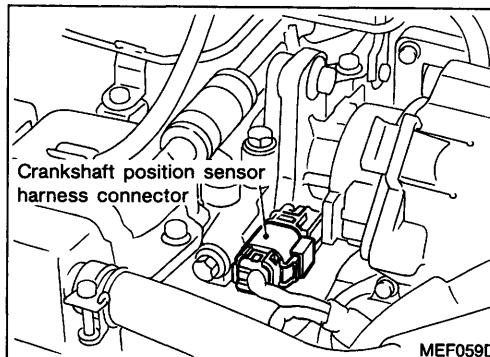
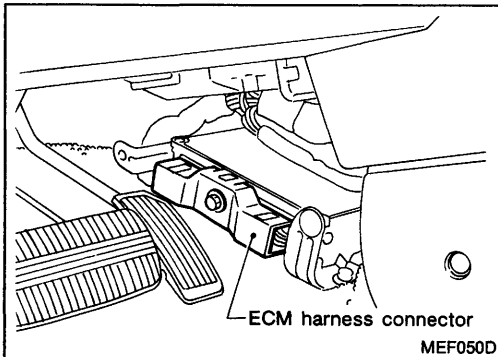


Diagnostic Procedure 14

CRANKSHAFT POSITION SENSOR (Not self-diagnostic item)

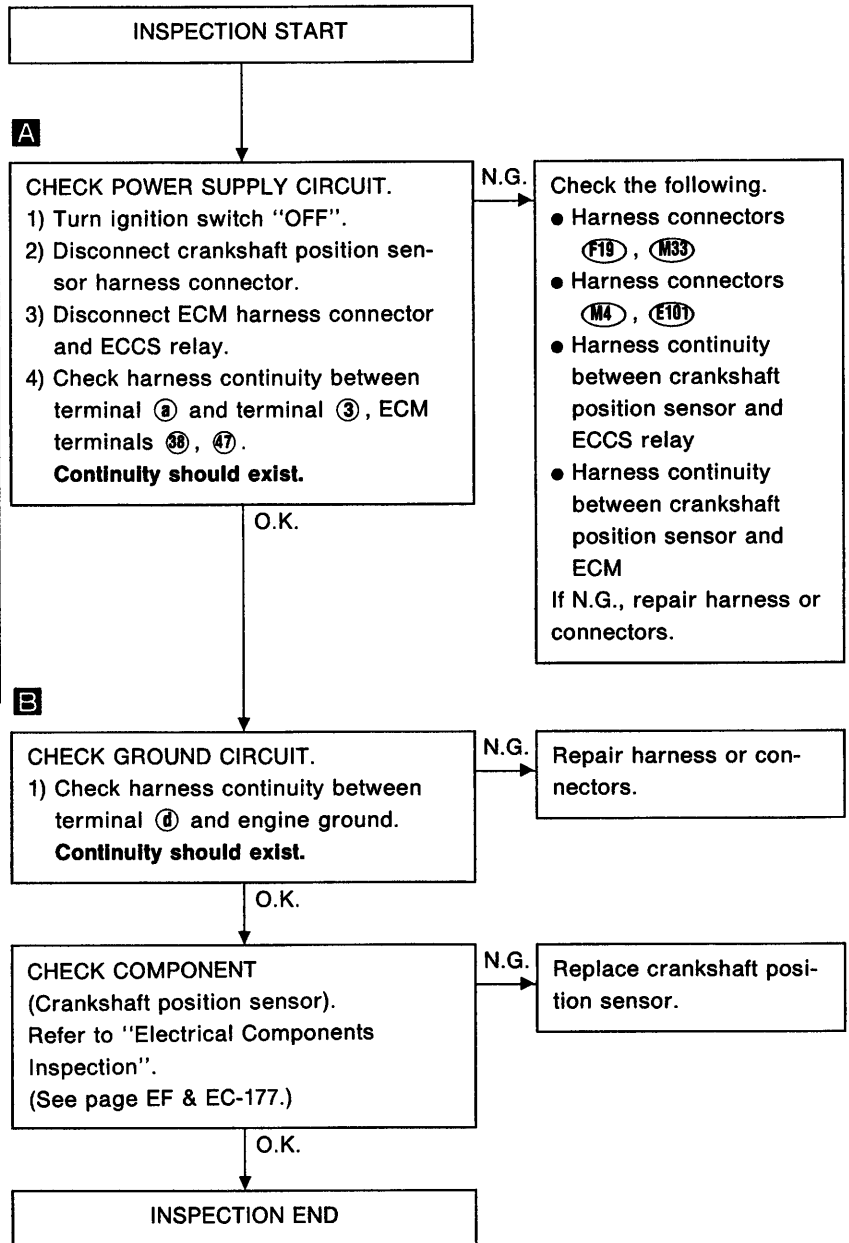
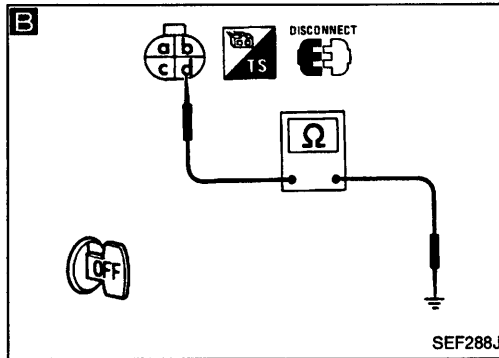
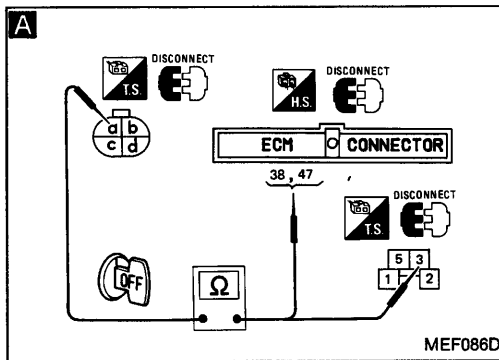


Harness layout



TROUBLE DIAGNOSES

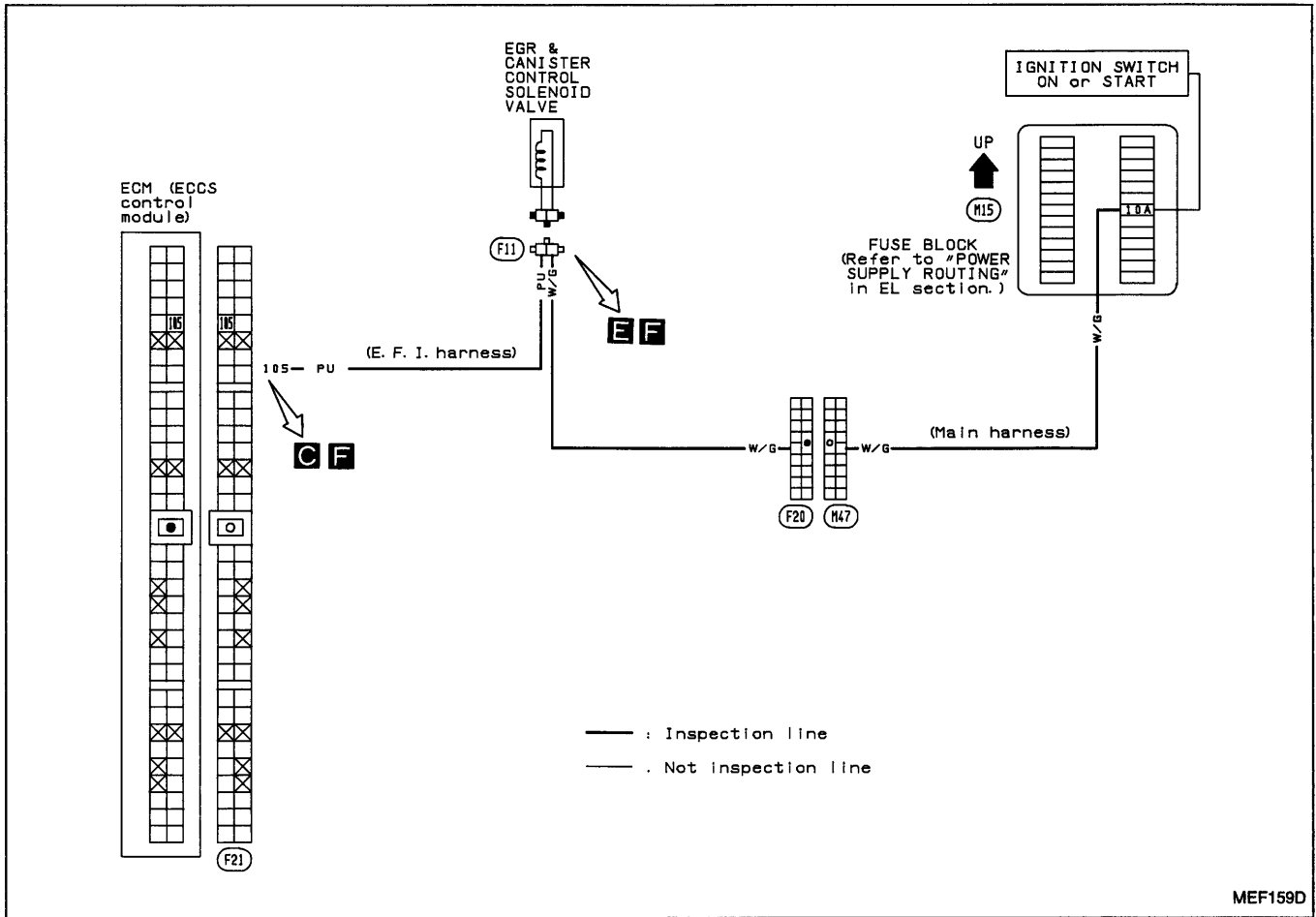
CRANKSHAFT POSITION SENSOR (Not self-diagnostic item)



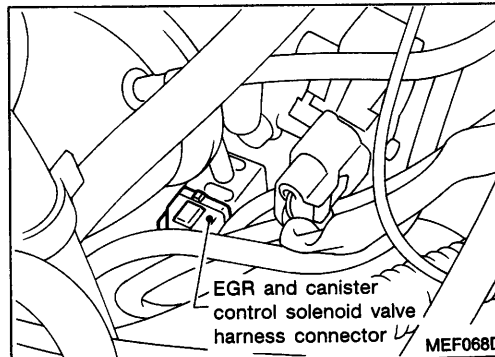
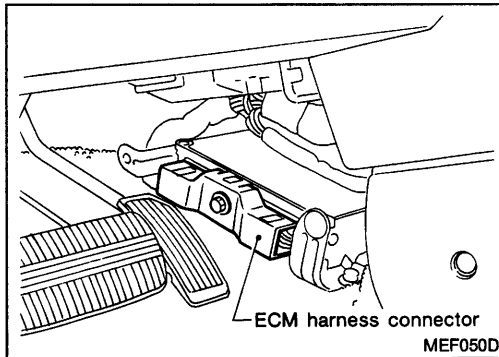
TROUBLE DIAGNOSES

Diagnostic Procedure 15

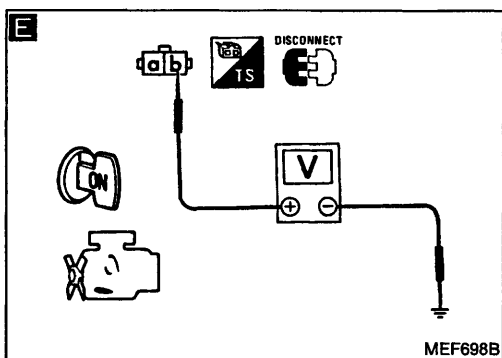
EGR CONTROL (Not self-diagnostic item)



Harness layout

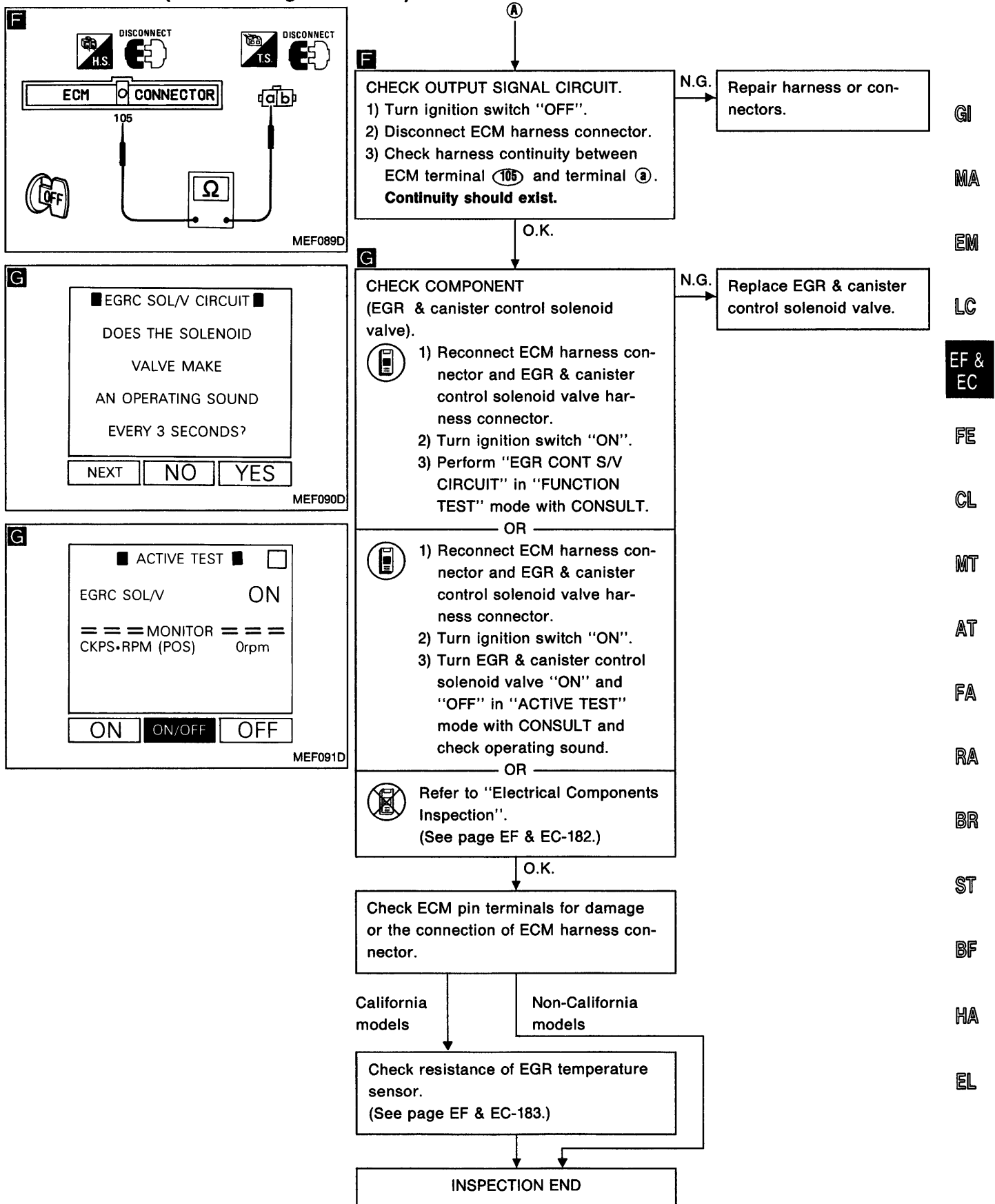


EGR CONTROL (Not self-diagnostic item)



TROUBLE DIAGNOSES

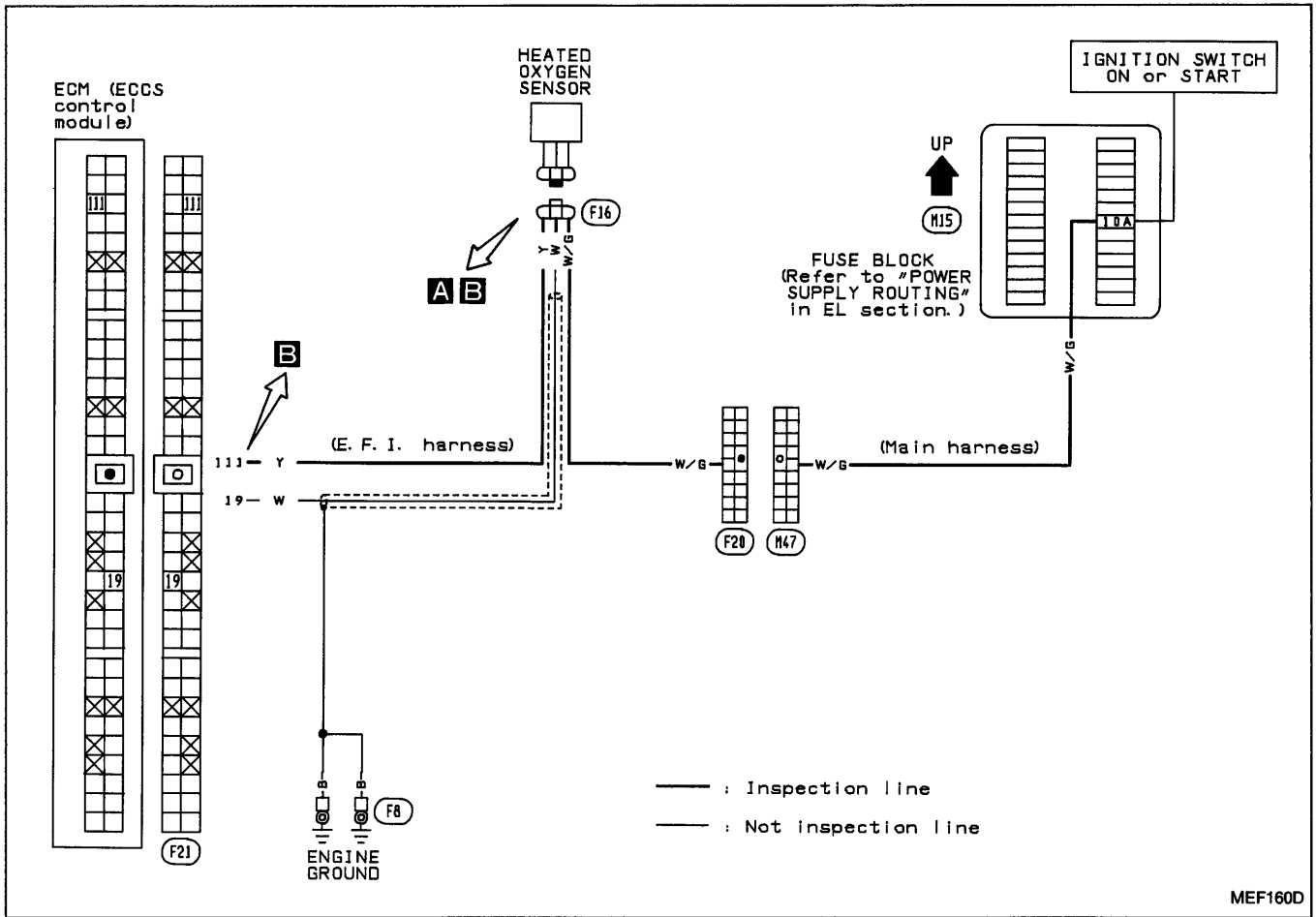
EGR CONTROL (Not self-diagnostic item)



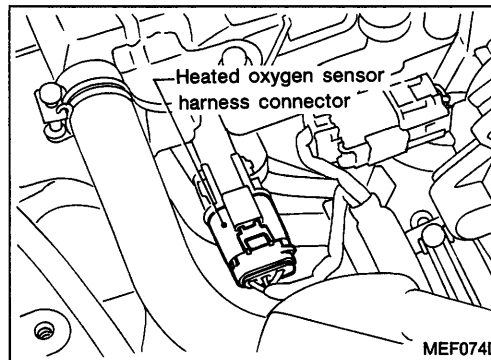
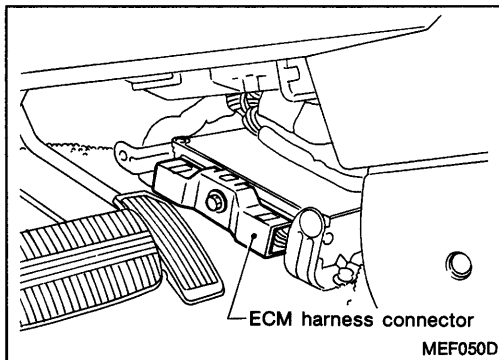
TROUBLE DIAGNOSES

Diagnostic Procedure 16

HEATED OXYGEN SENSOR HEATER (Not self-diagnostic item)

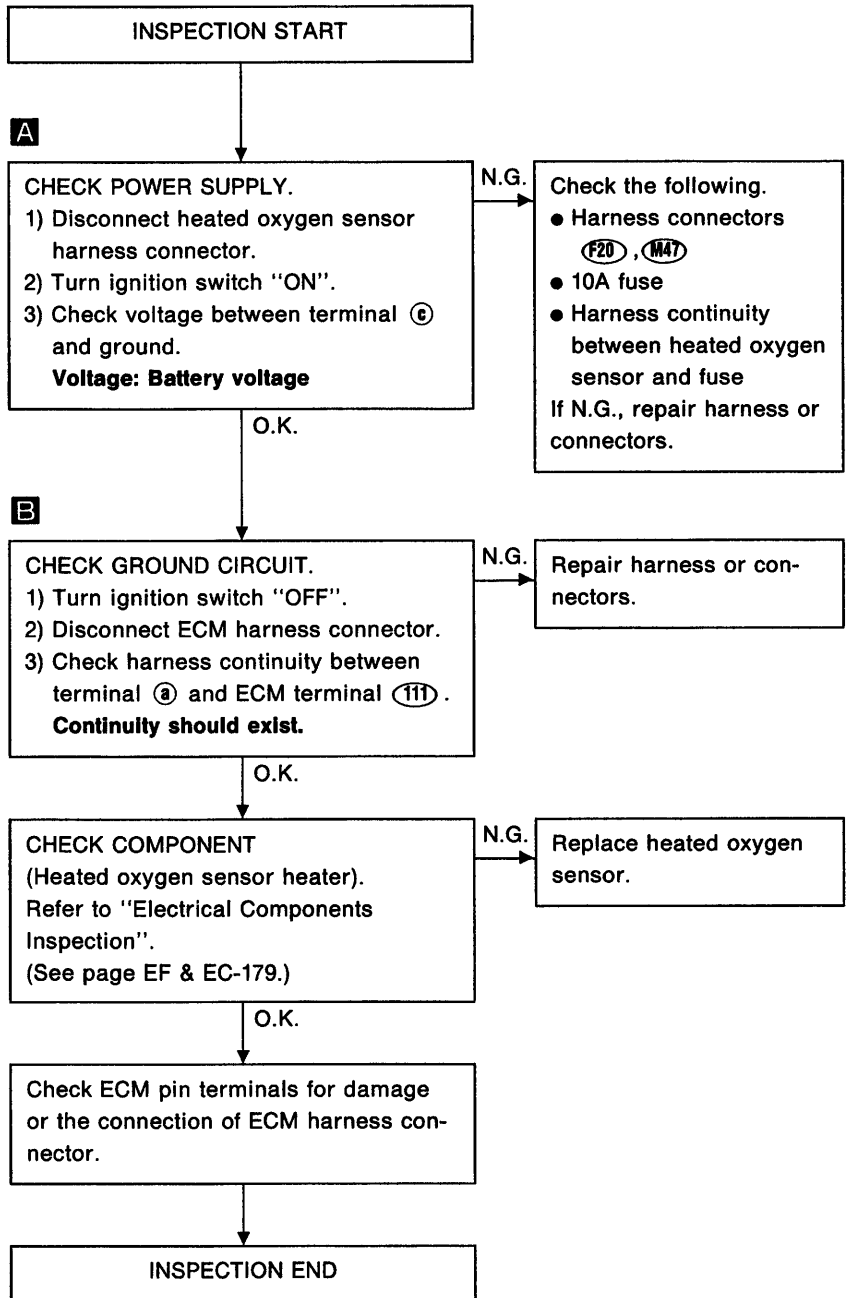
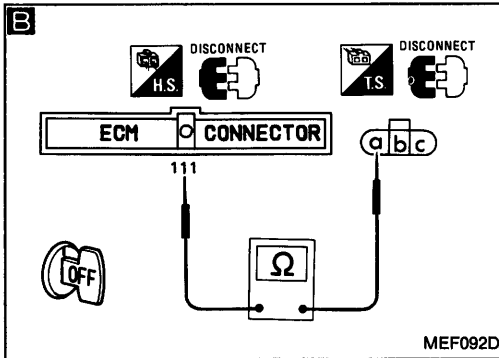
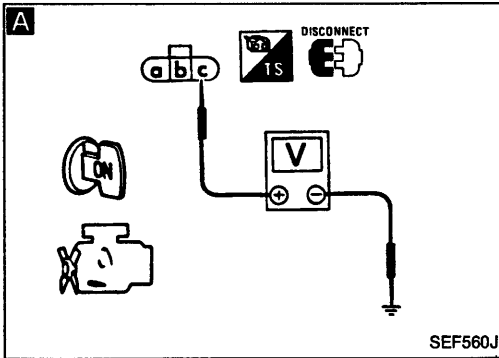


Harness layout



TROUBLE DIAGNOSES

HEATED OXYGEN SENSOR HEATER (Not self-diagnostic item)

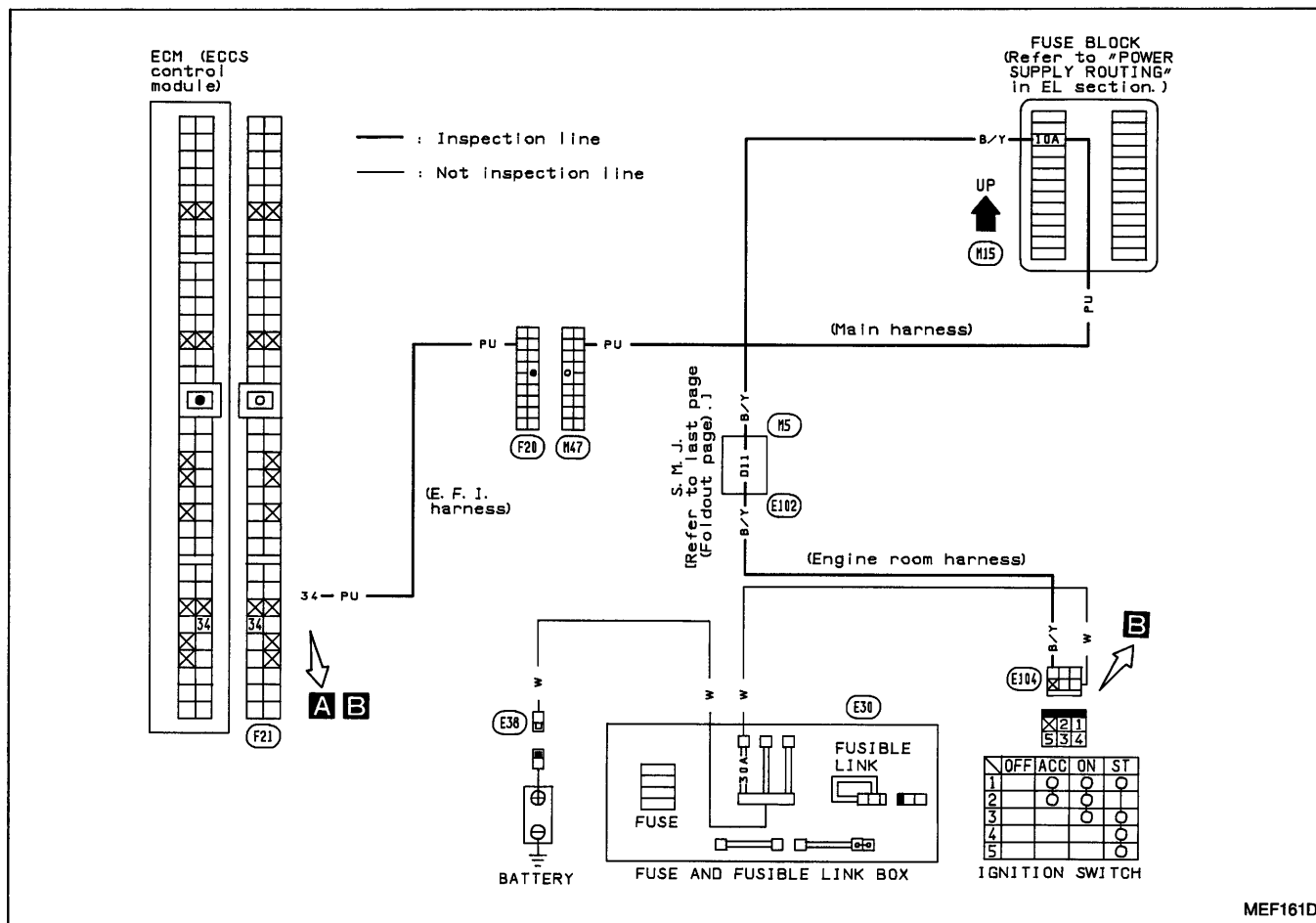


GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

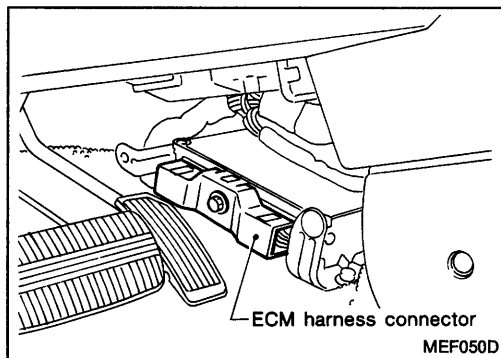
TROUBLE DIAGNOSES

Diagnostic Procedure 17

START SIGNAL (Not self-diagnostic item)



Harness layout



TROUBLE DIAGNOSES

START SIGNAL (Not self-diagnostic item)

A

■ START SIGNAL CKT ■

1. CLOSE THROTTLE, SHIFT TO P OR N RANGE
2. TOUCH START AND START ENGINE IMMEDIATELY

NEXT
START

SEF191L

A

☆ MONITOR
☆ NO FAIL ☐

START SIGNAL	ON
CLOSED TH/POS	ON
AIR COND SIG	OFF
NEUT POSI SW	ON

RECORD

MEF093D

A

ECM

CONNECTOR

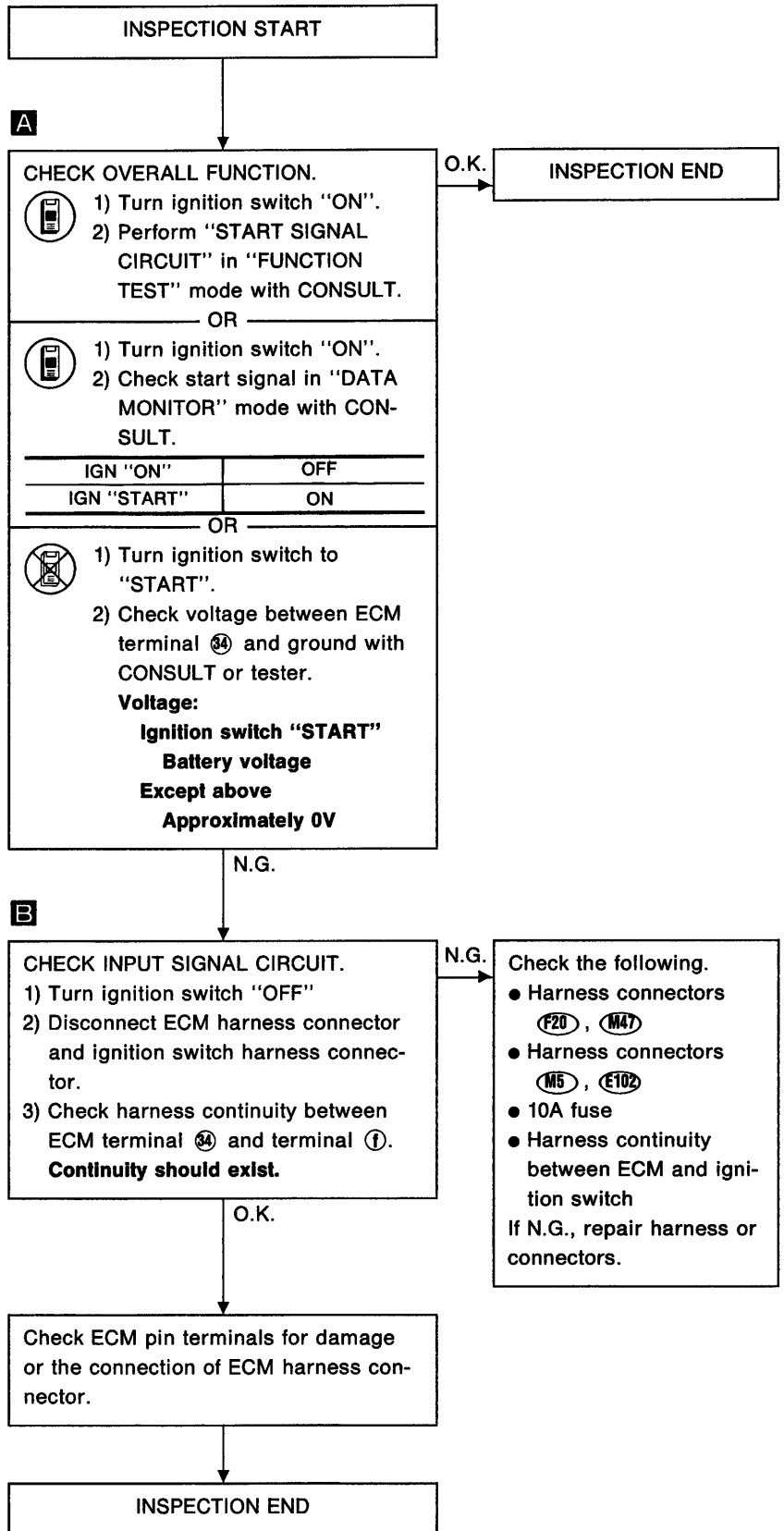
MEF094D

B

ECM

CONNECTOR

MEF095D

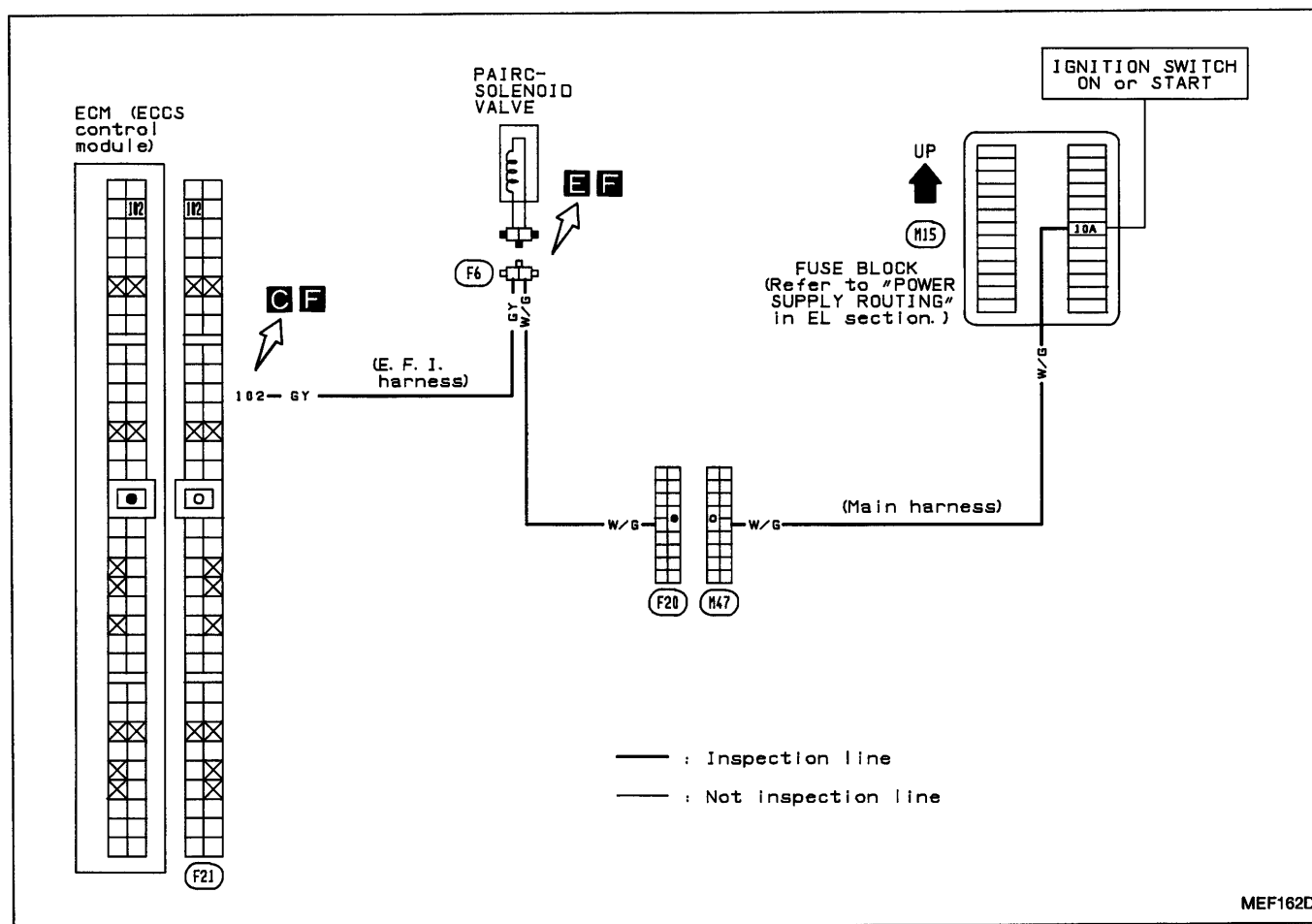


GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

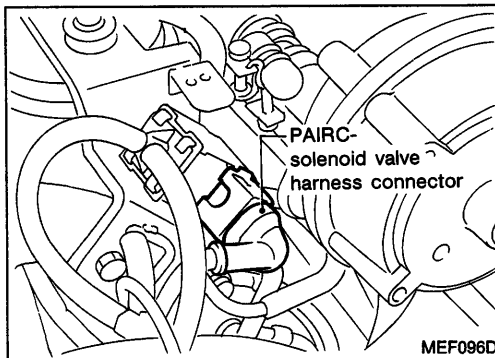
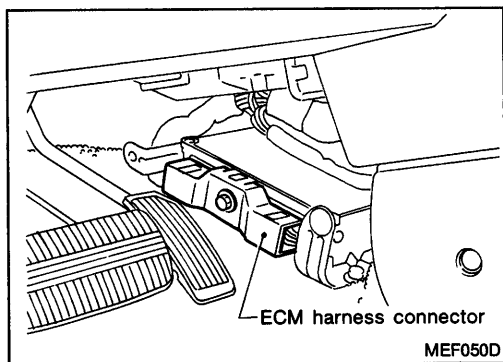
TROUBLE DIAGNOSES

Diagnostic Procedure 18

PAIR VALVE CONTROL (Not self-diagnostic item)

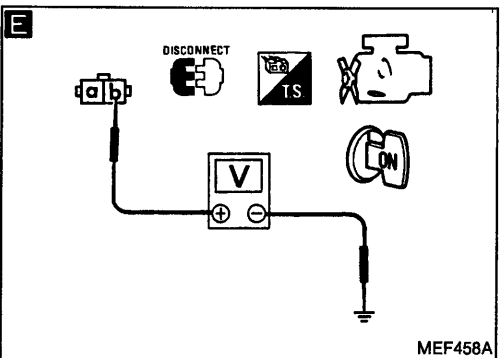
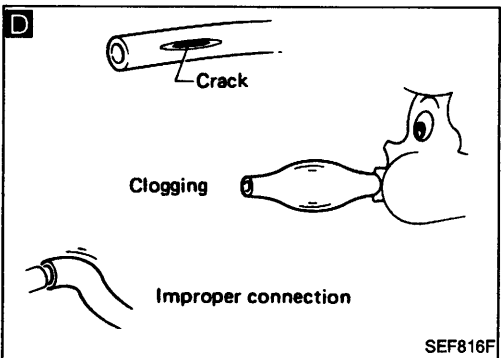
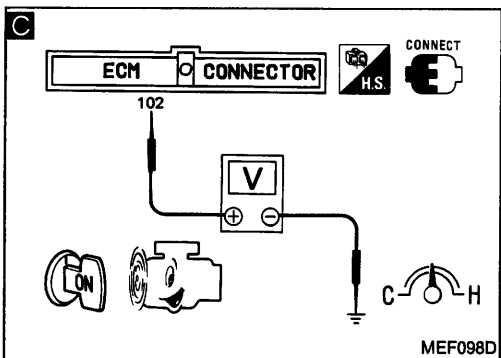
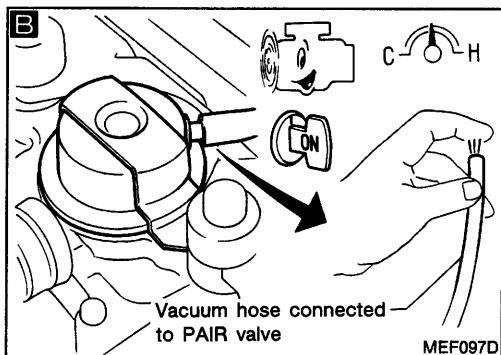
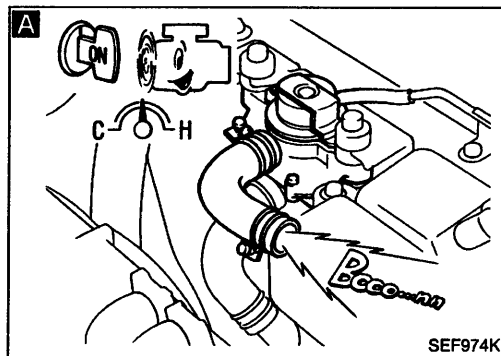


Harness layout



TROUBLE DIAGNOSES

PAIR VALVE CONTROL (Not self-diagnostic item)



INSPECTION START

A

CHECK OVERALL FUNCTION.

- 1) Start engine and warm it up sufficiently.
- 2) Run engine at about 2,000 rpm for about 2 minutes under no-load.
- 3) Make sure that the red L.E.D. on the ECM or the malfunction indicator lamp on the instrument panel goes on and off periodically more than 5 times during 10 seconds at 2,000 rpm under no-load.
- 4) Release accelerator pedal fully, and run engine at idle.
- 5) Listen to PAIR valve operating sound.

At Idle and during deceleration:

PAIR valve should operate.

Accelerator pedal is depressed:

PAIR valve should not operate.

O.K.

INSPECTION END

N.G.

B

CHECK VACUUM SOURCE TO PAIR valve

- 1) Disconnect vacuum hose to PAIR valve
- 2) Make sure that vacuum exists under the following conditions.

At Idle and during deceleration:

Vacuum should exist.

Accelerator pedal is depressed:

Vacuum should not exist.

O.K.

CHECK COMPONENT (PAIR valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-182.)

N.G.

C

CHECK CONTROL FUNCTION.

- 1) Check voltage between ECM terminal 102 and ground with CONSULT or tester.

Voltage:

At Idle and during deceleration

0.6 - 0.8V

Accelerator pedal is depressed:

Battery voltage

O.K.

CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks and proper connections.

N.G.

A

GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

FA

RA

BR

ST

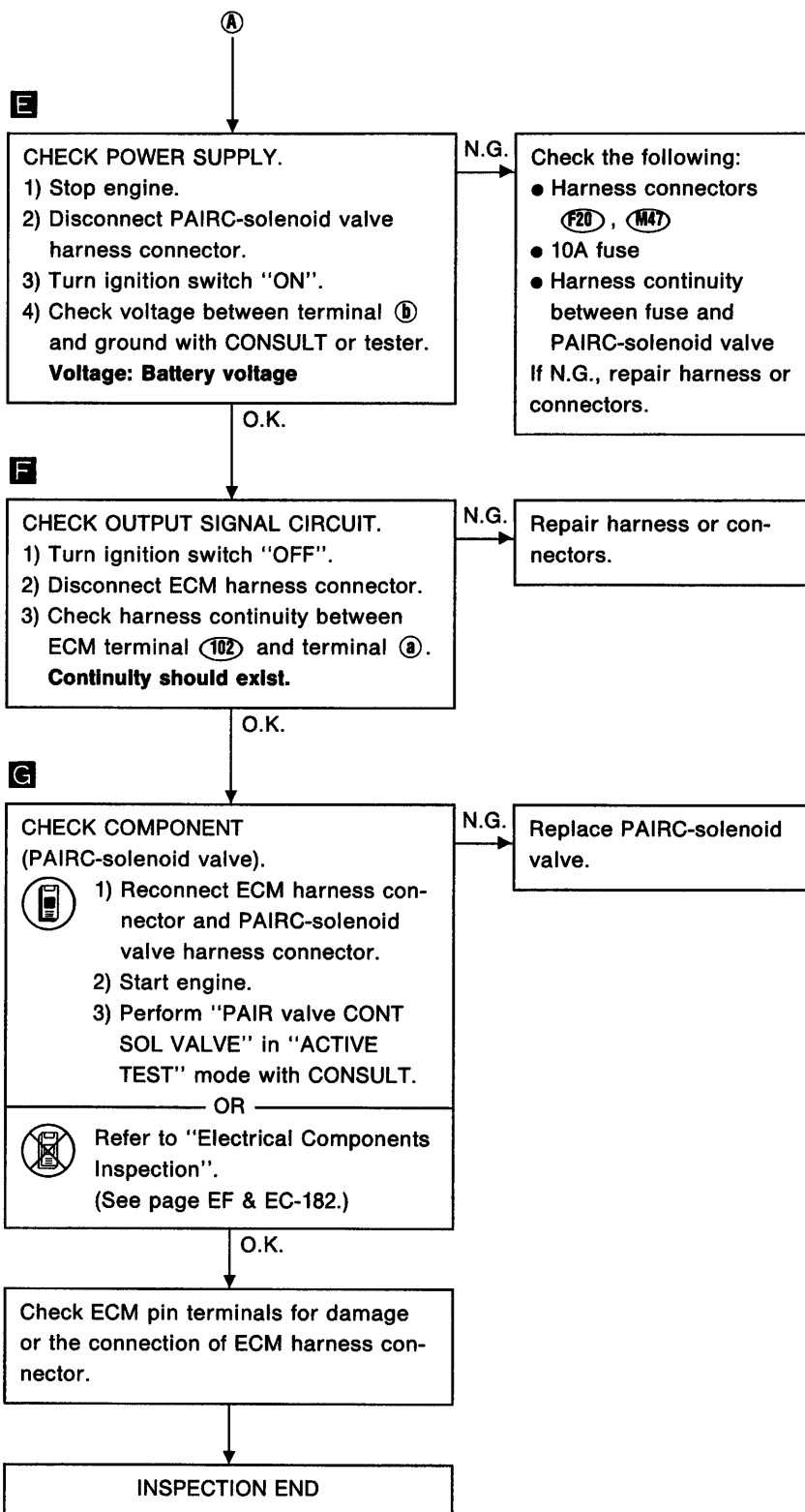
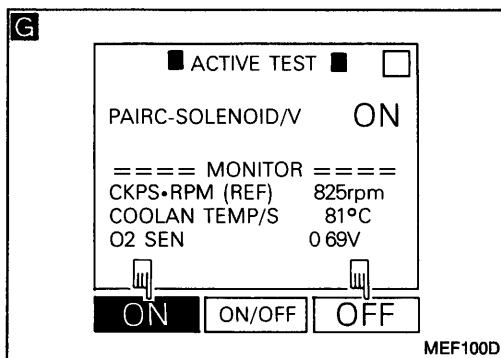
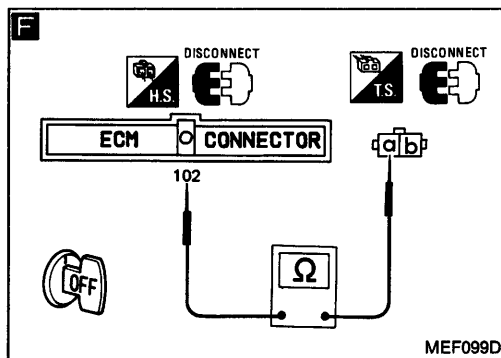
BF

HA

EL

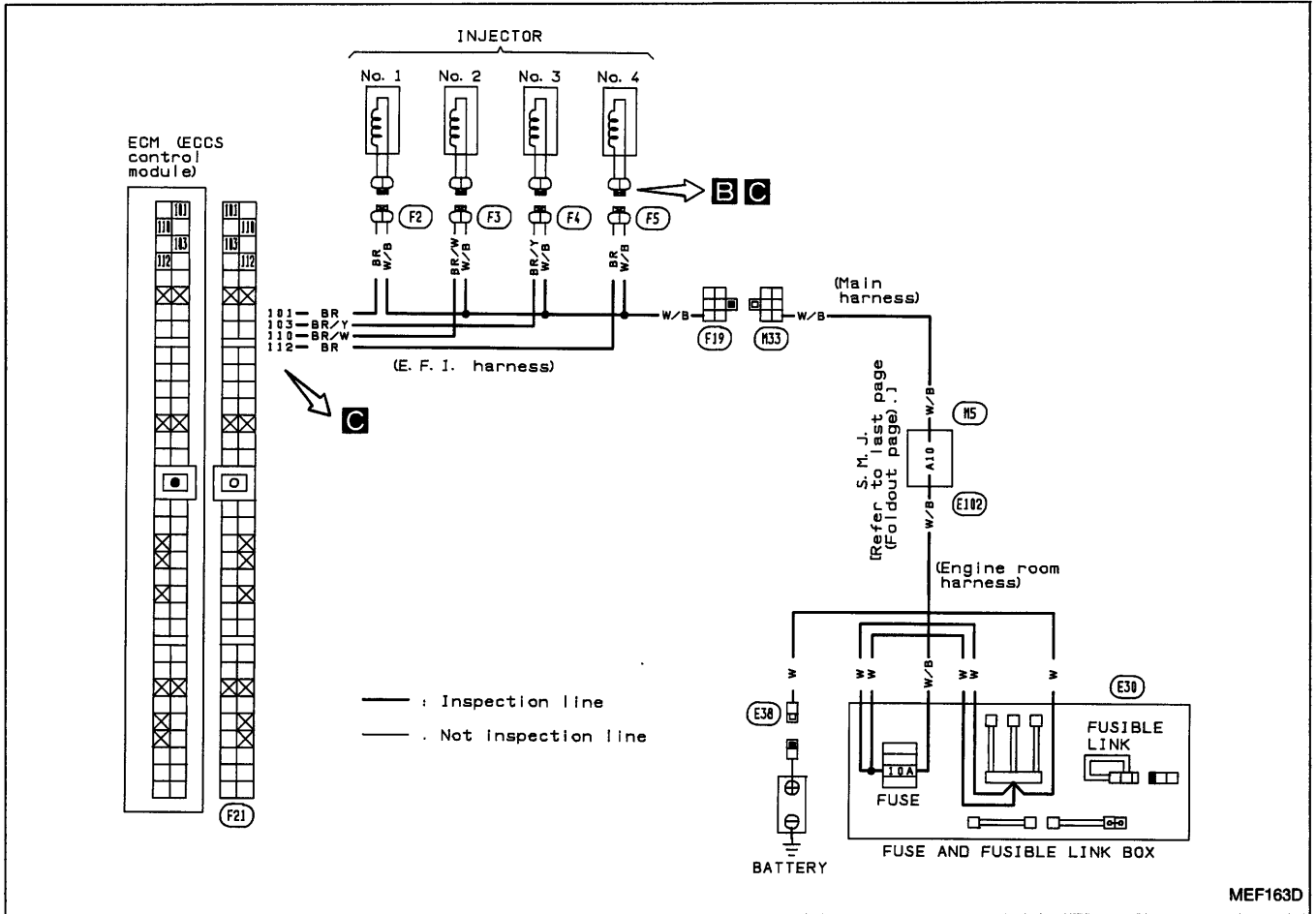
TROUBLE DIAGNOSES

PAIR VALVE CONTROL (Not self-diagnostic item)

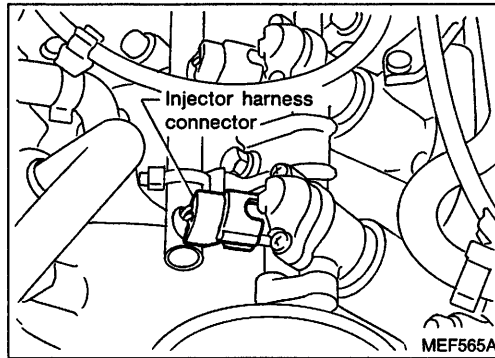
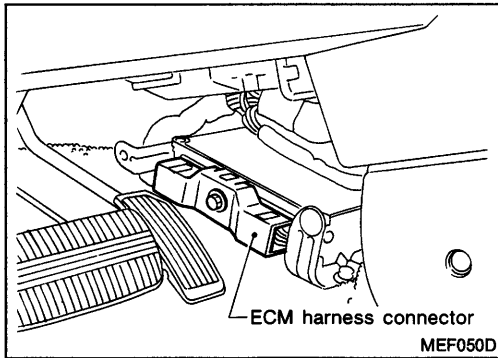


Diagnostic Procedure 19

INJECTOR (Not self-diagnostic item)

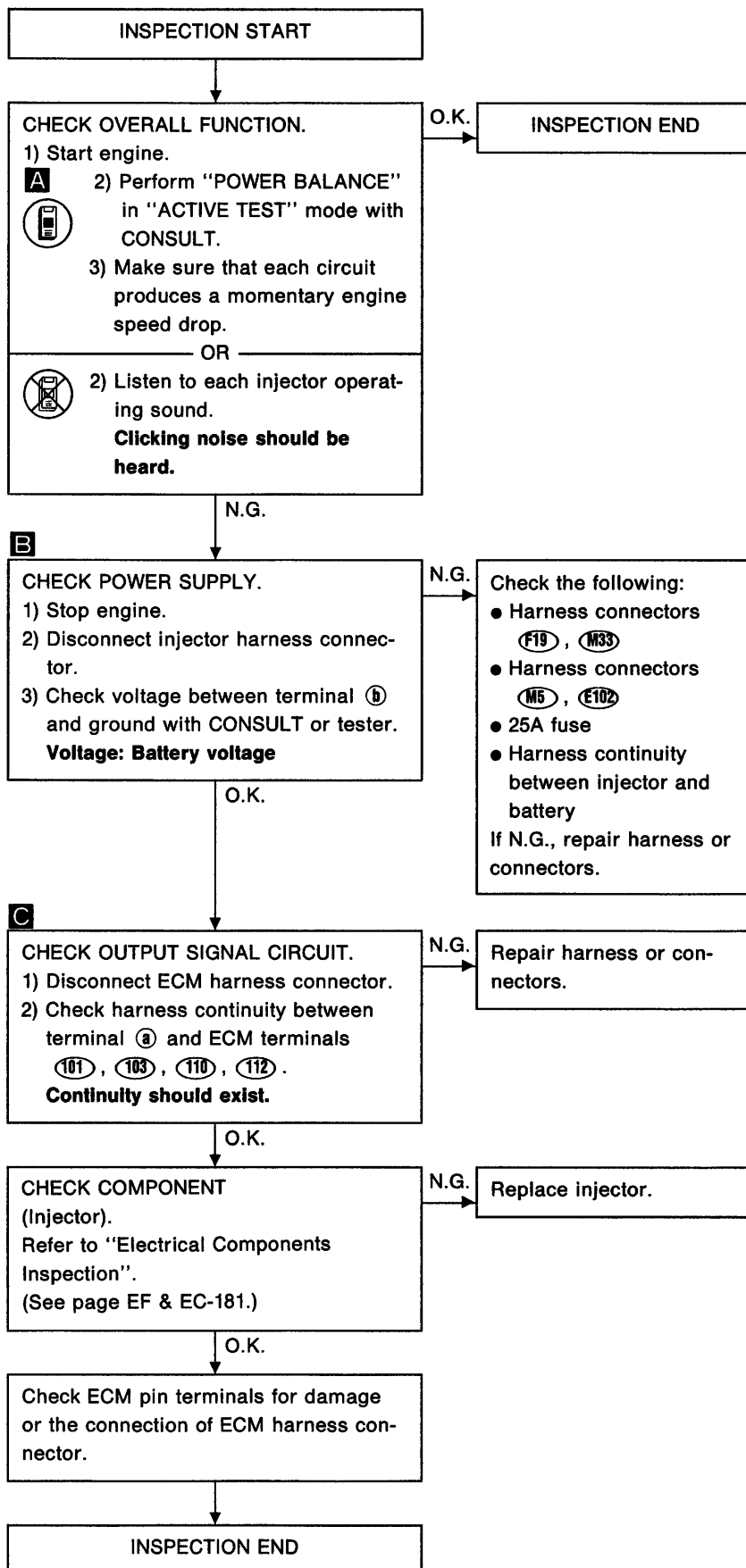
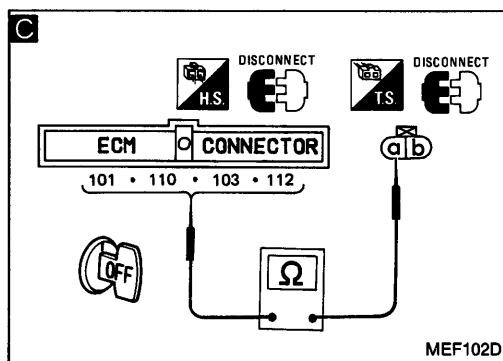
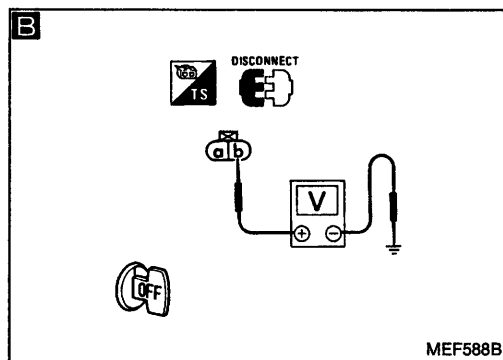
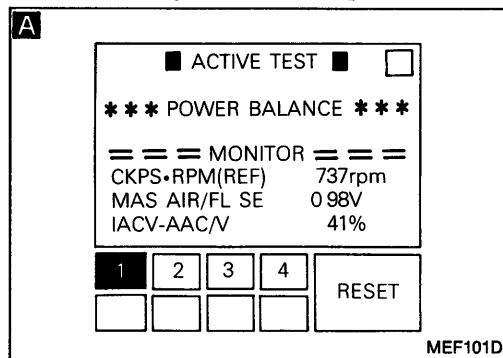


Harness layout



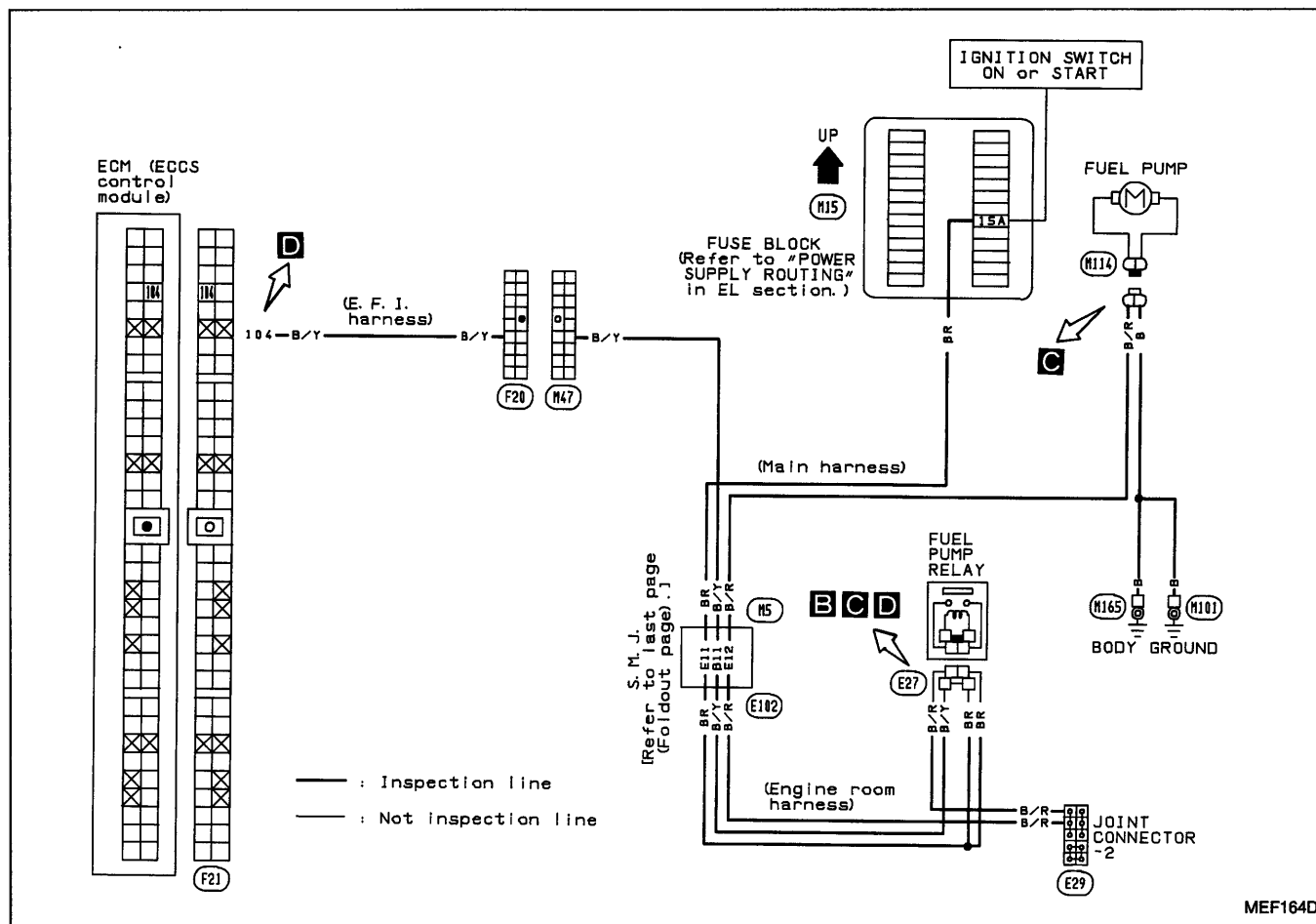
TROUBLE DIAGNOSES

INJECTOR (Not self-diagnostic item)

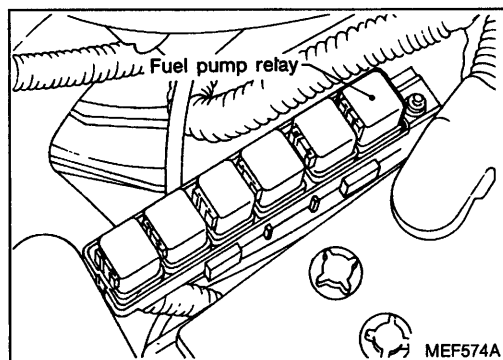
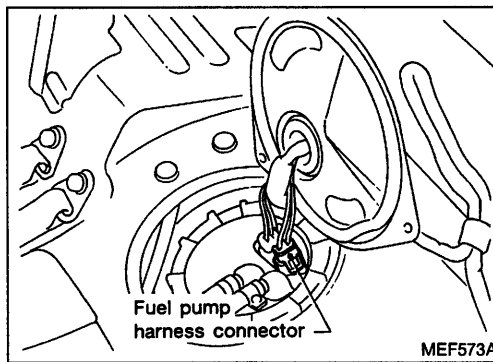
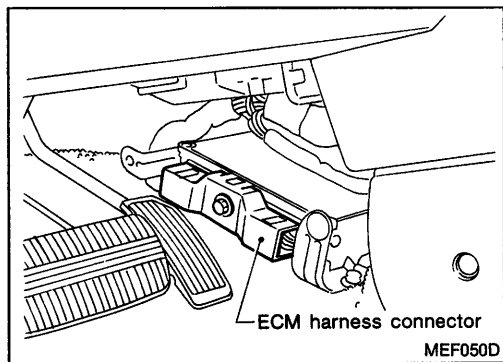


Diagnostic Procedure 20

FUEL PUMP (Not self-diagnostic item)

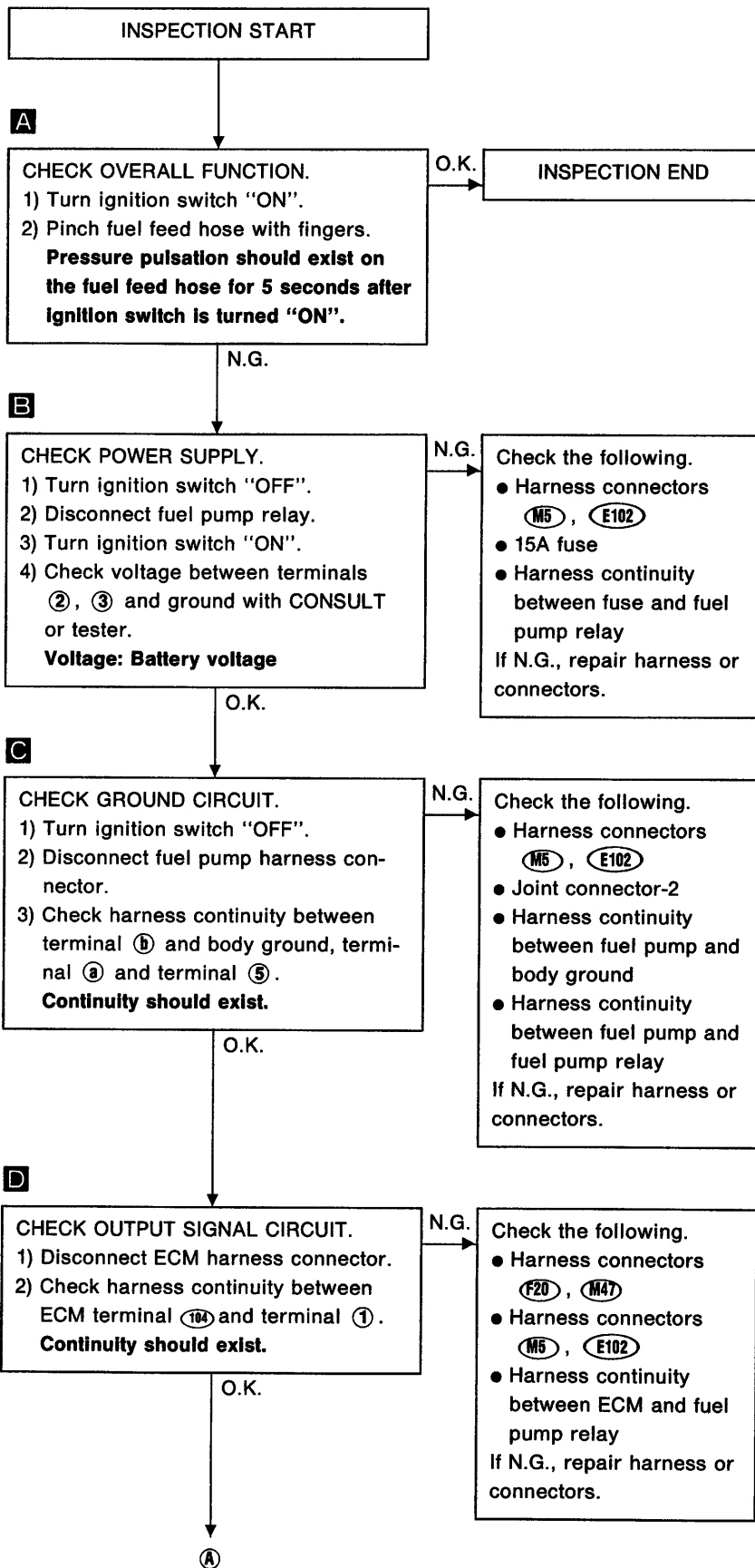
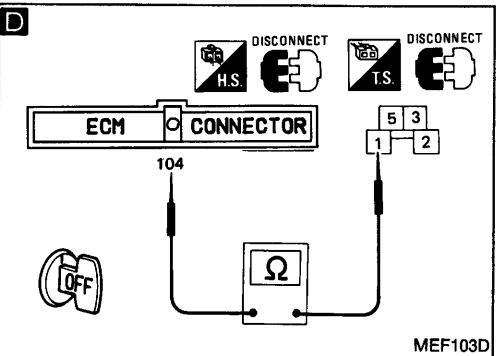
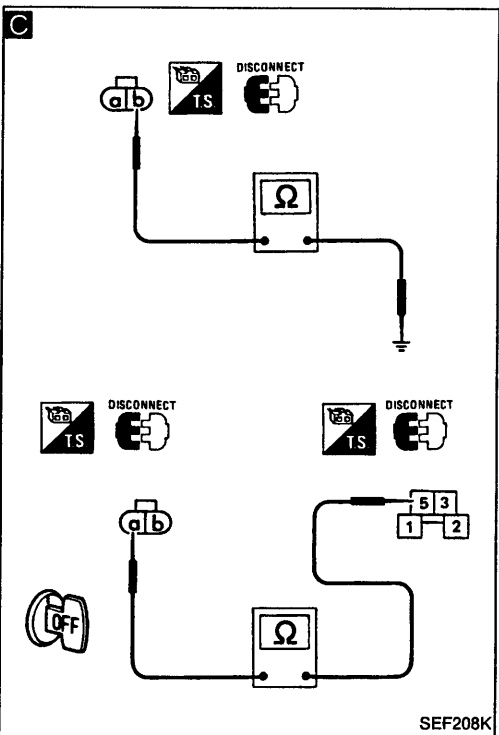
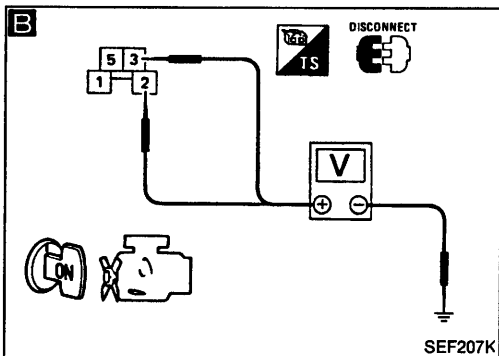
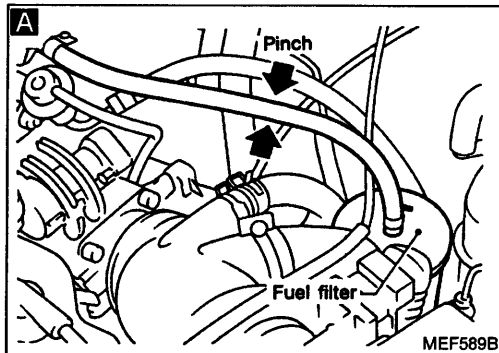


Harness layout



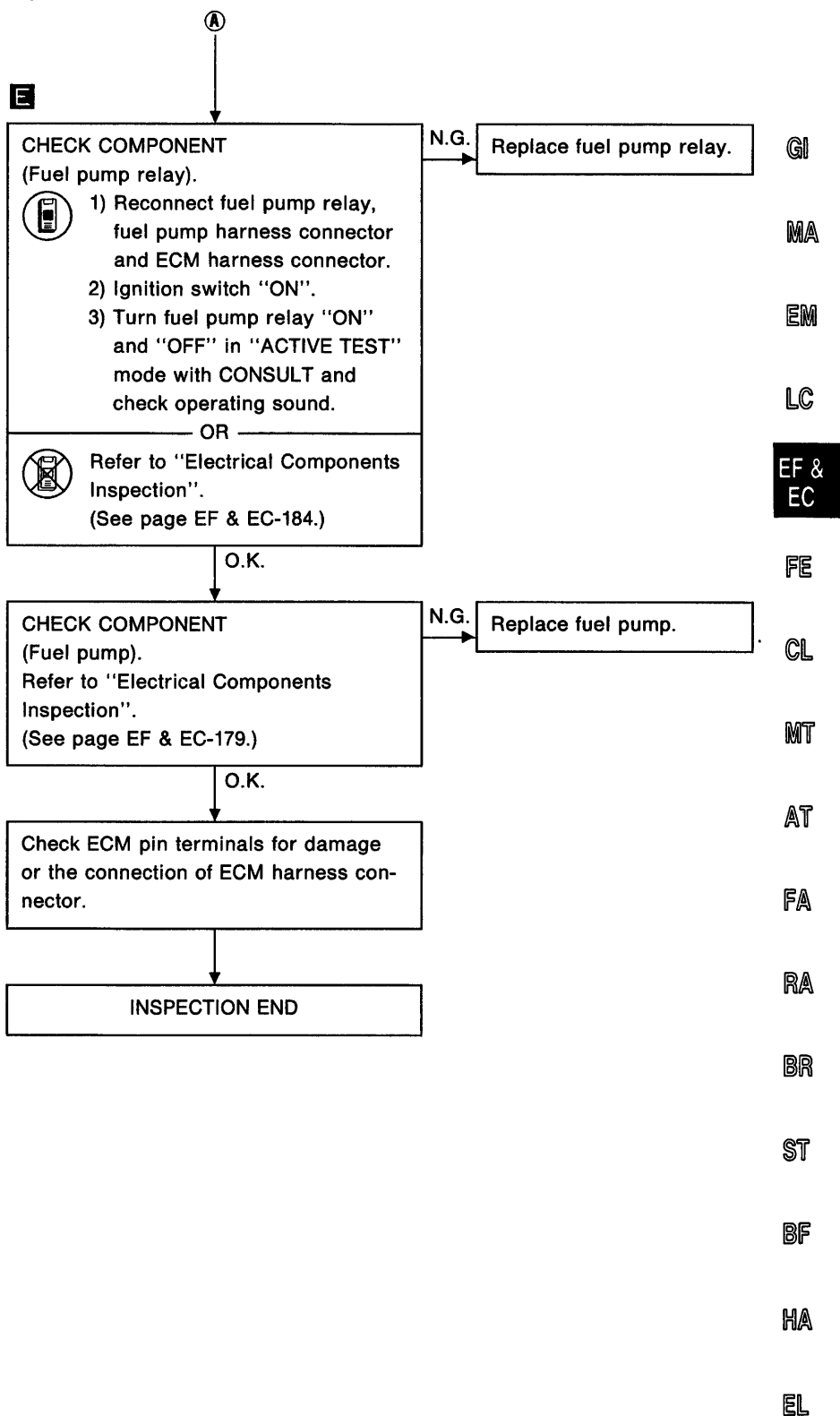
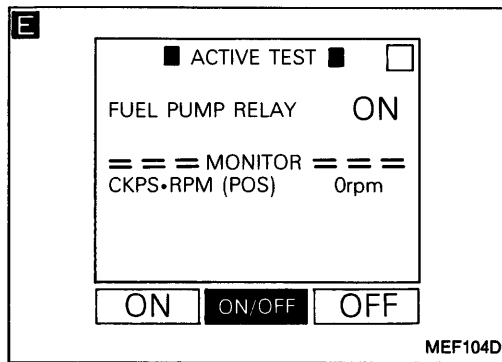
TROUBLE DIAGNOSES

FUEL PUMP (Not self-diagnostic item)



TROUBLE DIAGNOSES

FUEL PUMP (Not self-diagnostic item)



Diagnostic Procedure 21

IACV-AIR REGULATOR (Not self-diagnostic item)

ECM (ECGS control module)

IGNITION SWITCH ON or START

FUSE BLOCK (Refer to "POWER SUPPLY ROUTING" in EL section.)

UP (N15)

104-B/Y (E.F.I. harness)

B/Y (F28) (N47)

(Main harness)

IACV-AIR REGULATOR

E204

B/C

S.M.J. (Refer to last page (Foldout page).)

E11 B11 B/Y

FUEL PUMP RELAY

E27

(Engine room harness)

B/R

E216 E40

B/R

(Engine harness)

E215 E39

B

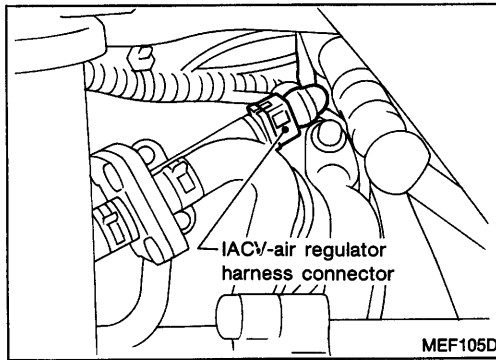
E10 E33

BODY GROUND

JOINT CONNECTOR -2

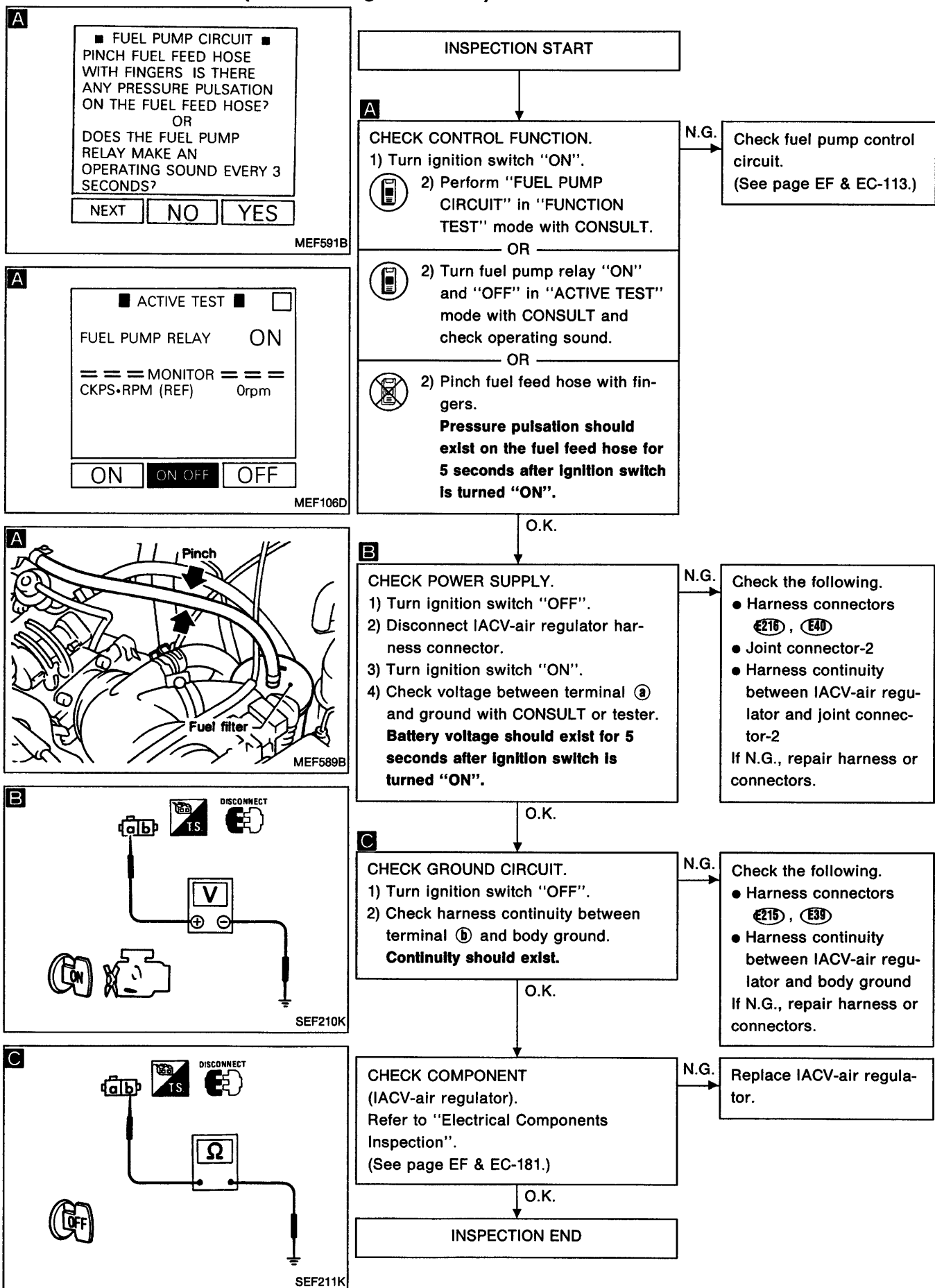
E29

ECM harness connector
MEF050D



TROUBLE DIAGNOSES

IACV-AIR REGULATOR (Not self-diagnostic item)



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

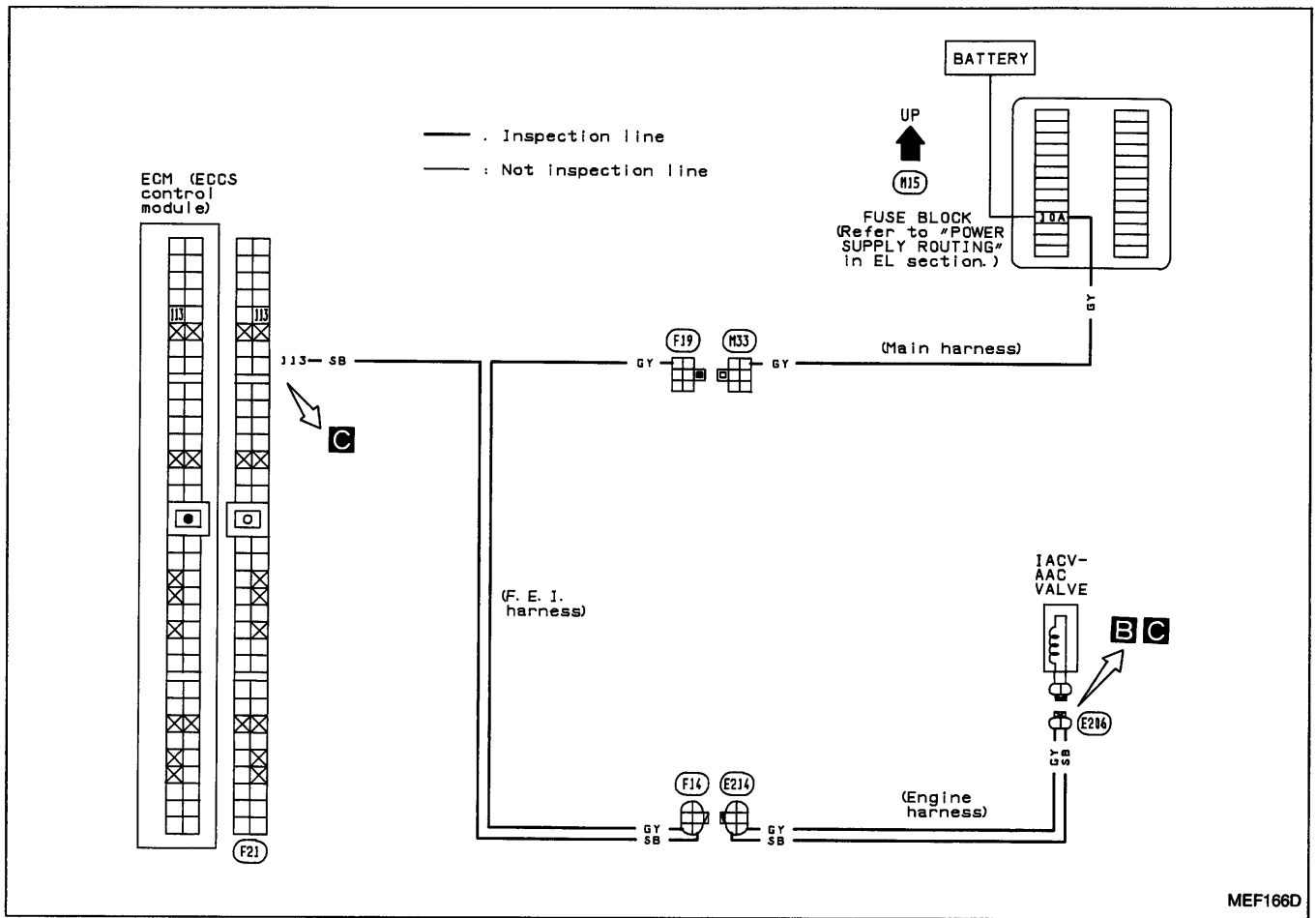
HA

EL

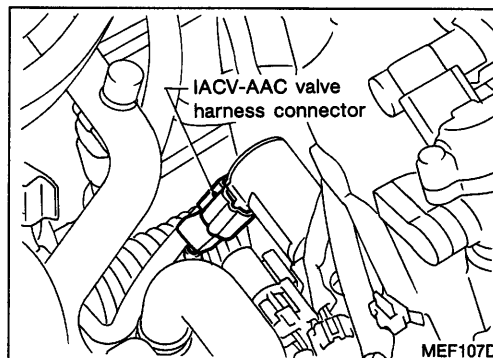
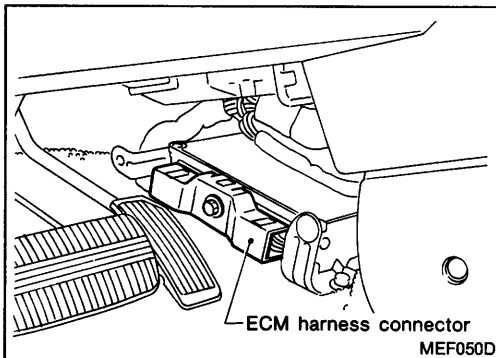
TROUBLE DIAGNOSES

Diagnostic Procedure 22

IACV-AAC VALVE (Not self-diagnostic item)

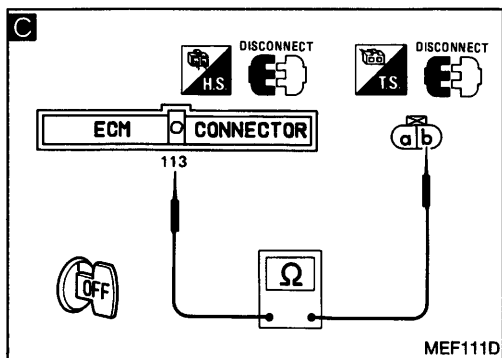
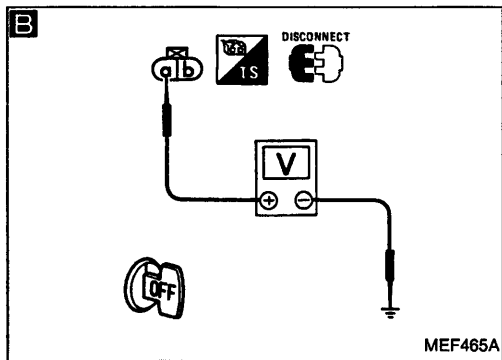
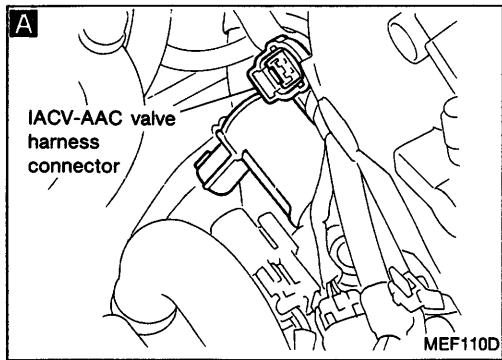
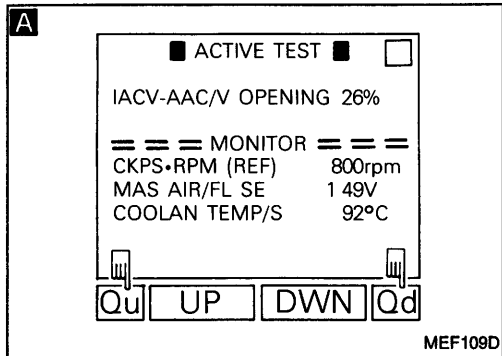
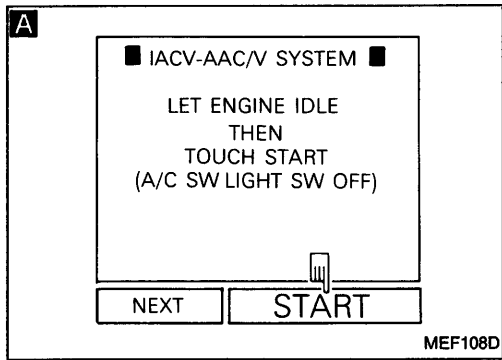


Harness layout



TROUBLE DIAGNOSES

IACV-AAC VALVE (Not self-diagnostic item)



INSPECTION START

A

CHECK OVERALL FUNCTION.

- 1) Start engine and warm it up sufficiently.
- 2) Check idle speed.
800 ± 50 rpm
If N.G., adjust idle speed.
- 3) Perform "IACV-AAC VALVE SYSTEM" in "FUNCTION TEST" mode with CONSULT.

O.K. → INSPECTION END

OR

- 1) Select "IACV-AAC/V OPENING" in "ACTIVE TEST" mode with CONSULT.
- 2) When touching "Qu" and "Qd", check that engine speed changes according to the IACV-AAC valve opening percentage.

OR

- 3) Disconnect IACV-AAC valve harness connector.
- 4) Make sure that idle speed drops.

N.G. → B

B

CHECK POWER SUPPLY.

- 1) Stop engine.
- 2) Disconnect IACV-AAC valve harness connector.
- 3) Check voltage between terminal ⑧ and ground with CONSULT or tester.
Voltage: Battery voltage

O.K. → C

N.G. → Check the following.

- Harness connectors (F9, M33)
- Harness connectors (F14, E214)
- 10A fuse
- Harness continuity between IACV-AAC valve and fuse

If N.G., repair harness or connectors.

C

CHECK OUTPUT SIGNAL CIRCUIT.

- 1) Disconnect ECM harness connector.
- 2) Check harness continuity between ECM terminal ⑪③ and terminal ①.

Continuity should exist.

O.K. → A

N.G. → Check the following.

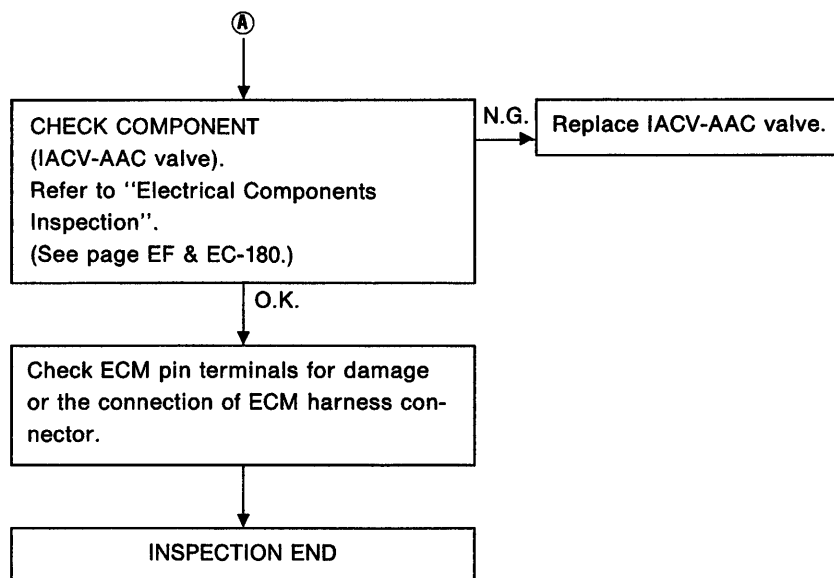
- Harness connectors (F14, E214)
- Harness continuity between ECM and IACV-AAC valve

If N.G., repair harness or connectors.

GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

TROUBLE DIAGNOSES

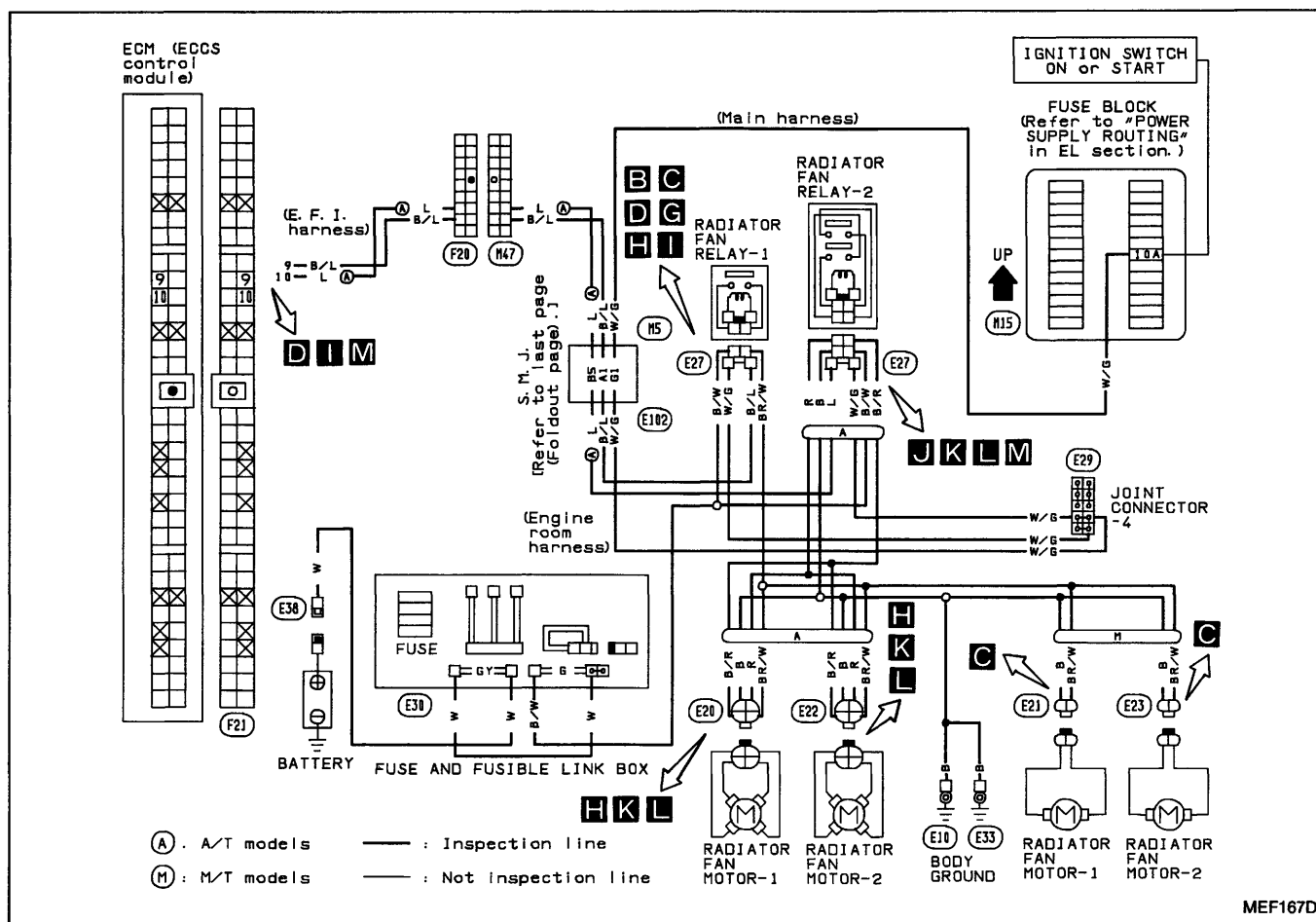
IACV-315AACVALVE (Not self-diagnostic item)



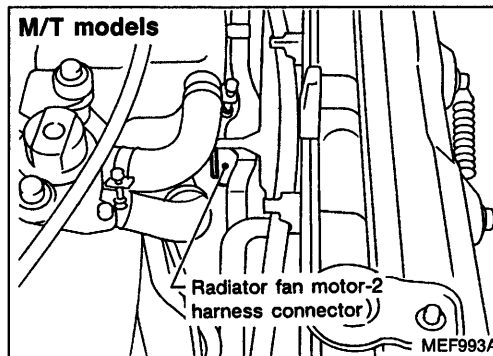
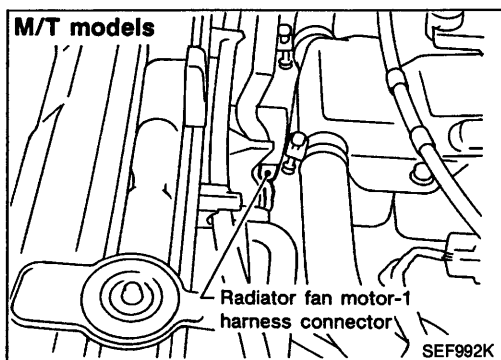
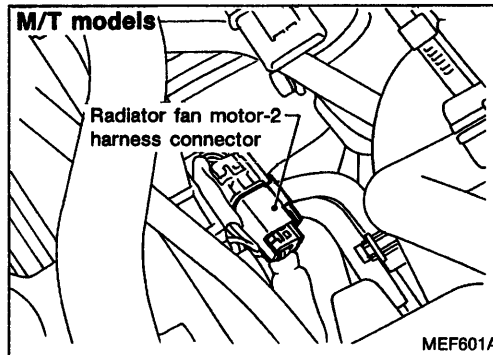
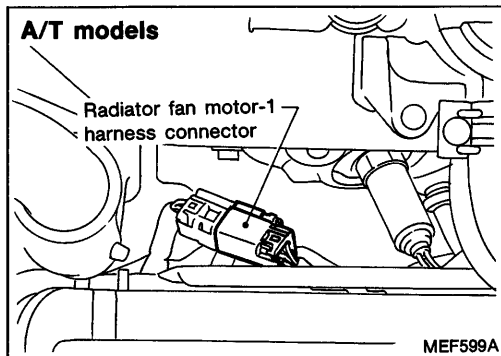
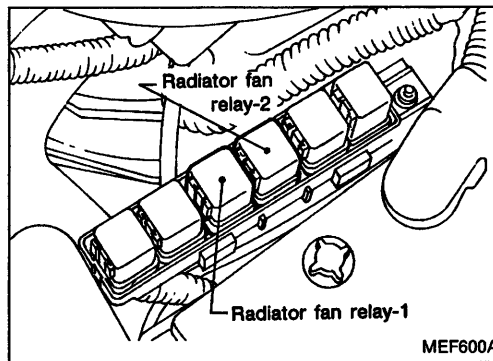
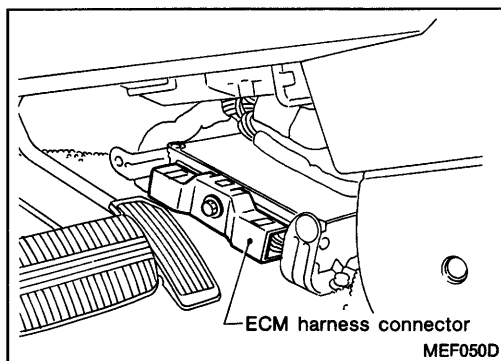
TROUBLE DIAGNOSES

Diagnostic Procedure 23

RADIATOR FAN CONTROL (Not self-diagnostic item)



RADIATOR FAN CONTROL (Not self-diagnostic item)



TROUBLE DIAGNOSES

RADIATOR FAN CONTROL (Not self-diagnostic item)

A

■ RADIATOR FAN CIRCUIT ■

DOES
RADIATOR FAN
ROTATE AND STOP
EVERY 3 SECONDS ?

NEXT NO YES

MEF594B

A

■ ACTIVE TEST ■

RADIATOR FAN ON

== MONITOR ==

COOLAN TEMP/S 78°C

ON OFF

MEF112D

A

Radiator fan

MEF596B

B

DISCONNECT

MEF602A

C

DISCONNECT

MEF466A

M/T models

INSPECTION START

A

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Perform "RADIATOR FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1) Turn ignition switch "ON".
2) Perform "RADIATOR FAN" in "ACTIVE TEST" mode with CONSULT.

OR

1) Start engine.
2) Set temperature lever at full cold position.
3) Turn air conditioner switch "ON".
4) Turn blower fan switch "ON".
5) Run engine at idle for a few minutes with air conditioner operating.
6) Make sure that radiator fan operates.

O.K. INSPECTION END

N.G.

Turn air conditioner switch and blower fan switch "OFF".

B

CHECK POWER SUPPLY.

1) Turn ignition switch "OFF".
2) Disconnect radiator fan relay-1.
3) Turn ignition switch "ON".
4) Check voltage between terminals ①, ⑤ and ground with CONSULT or tester.

Voltage: Battery voltage

O.K.

N.G. Check the following.

- Harness connectors (M5, E102)
- Joint connector-4
- "G" fusible link
- "GY" fusible link
- 10A fuse
- Harness continuity between battery and radiator fan relay-1
- Harness continuity between fuse and radiator fan relay-1

If N.G., repair harness or connectors.

GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

FA

RA

BR

ST

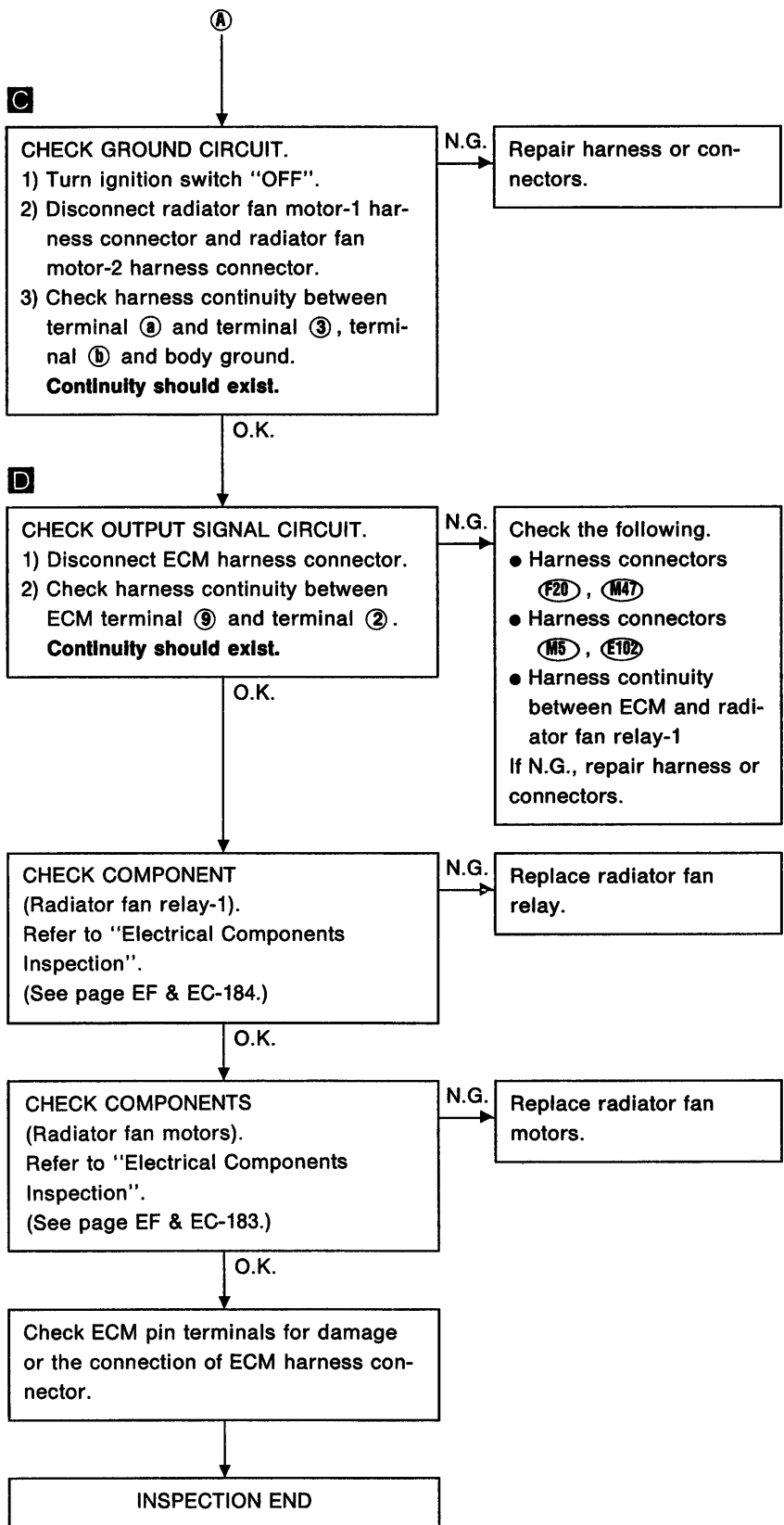
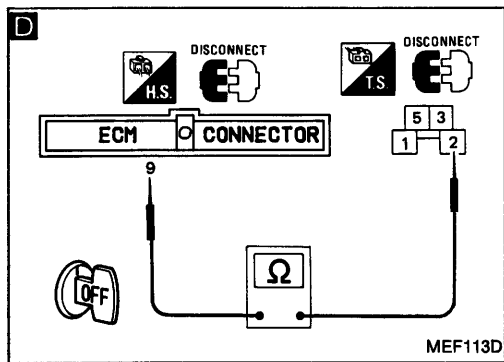
BF

HA

EL

TROUBLE DIAGNOSES

RADIATOR FAN CONTROL (Not self-diagnostic item)



TROUBLE DIAGNOSES

RADIATOR FAN CONTROL (Not self-diagnostic item)

E

■ RADIATOR FAN CIRCUIT ■

DOES
RADIATOR FAN
ROTATE AND STOP
EVERY 3 SECONDS ?

NEXT NO YES

MEF597B

E

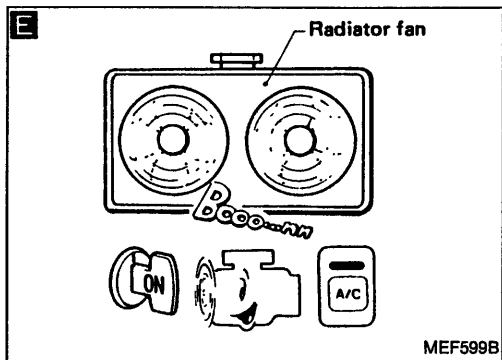
■ ACTIVE TEST ■

RADIATOR FAN OFF

== MONITOR ==
COOLANT TEMP/S 88°C

HI LOW OFF

MEF114D



A/T models

INSPECTION START

E

CHECK RADIATOR FAN LOW SPEED OPERATION.

1) Disconnect radiator fan relay-2.
2) Turn ignition switch "ON".
3) Perform "RADIATOR FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

2) Turn ignition switch "ON".
3) Perform "RADIATOR FAN" in "ACTIVE TEST" mode with CONSULT.

OR

2) Start engine.
3) Set temperature lever of full cold position.
4) Turn air conditioner switch "ON".
5) Turn blower fan switch "ON".
6) Run engine at idle for a few minutes with air conditioner operating.
7) Make sure that radiator fan operates at low speed.

N.G. Check radiator fan low speed control circuit. (Go to **PROCEDURE A**.)

O.K.

A

GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

TROUBLE DIAGNOSES

RADIATOR FAN CONTROL (Not self-diagnostic item)

F

■ RADIATOR FAN CIRCUIT ■

DOES
RADIATOR FAN
ROTATE AND STOP
EVERY 3 SECONDS ?

NEXT NO YES

MEF600B

F

■ ACTIVE TEST ■ ☐

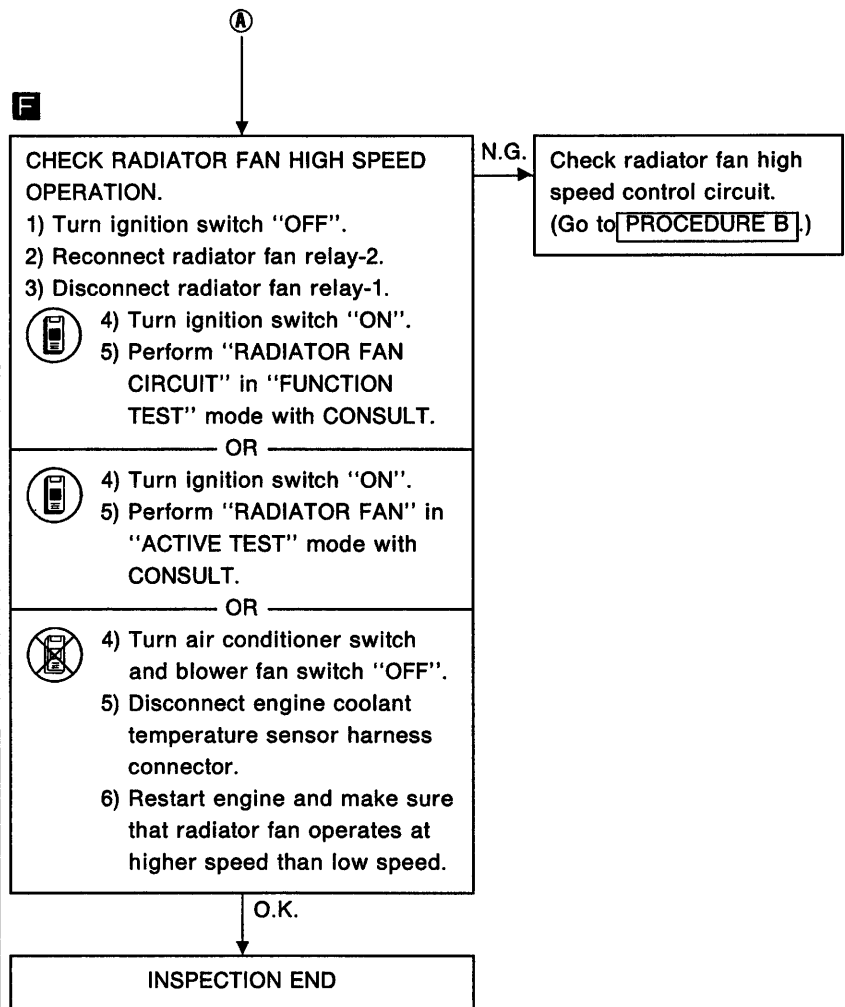
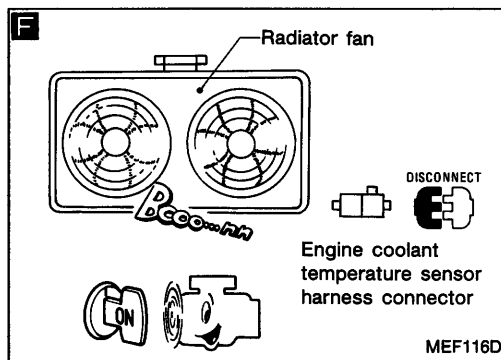
RADIATOR FAN OFF

== MONITOR ==

COOLANT TEMP/S 88°C

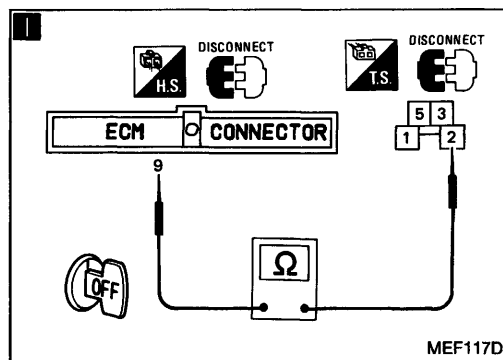
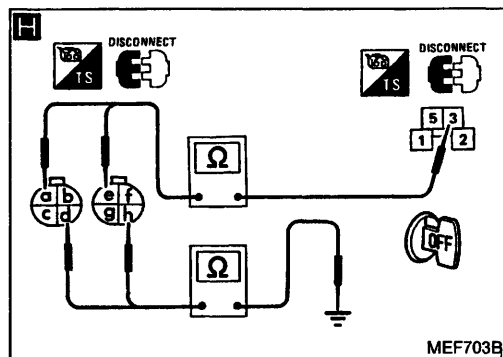
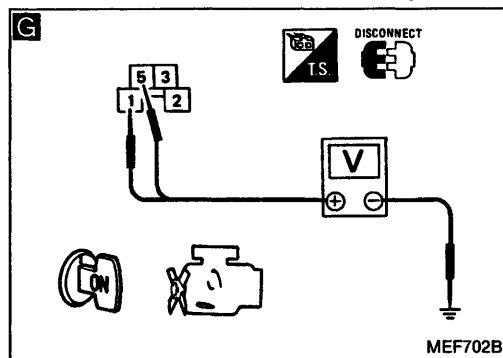
HI LOW OFF

MEF115D



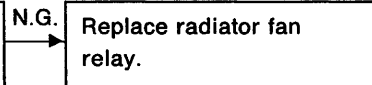
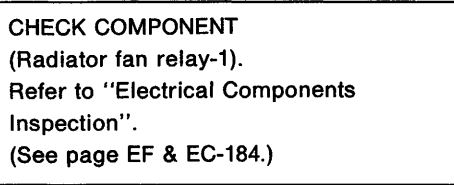
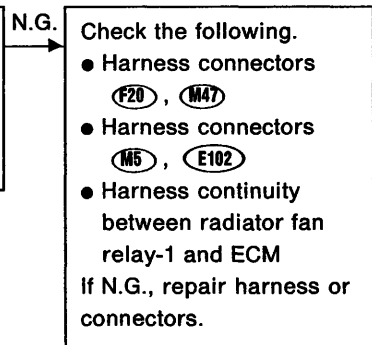
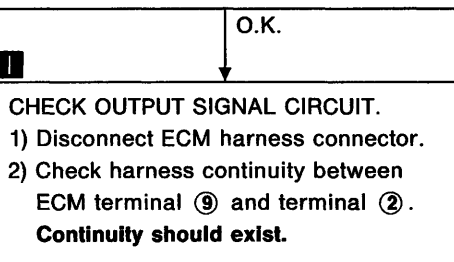
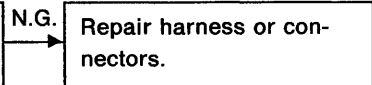
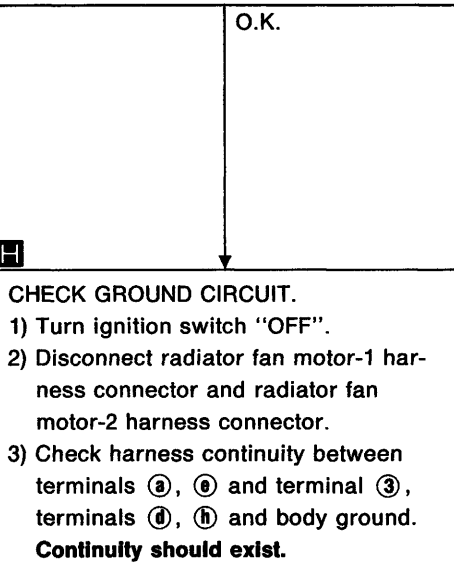
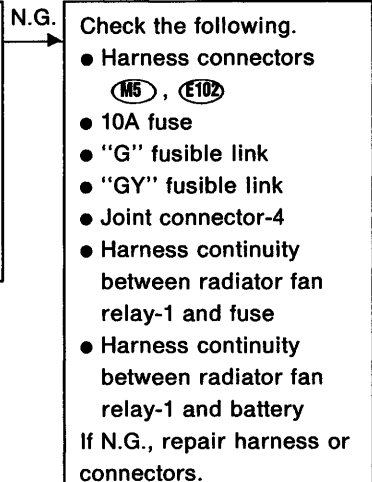
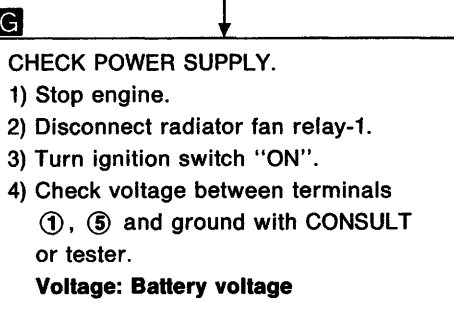
TROUBLE DIAGNOSES

RADIATOR FAN CONTROL (Not self-diagnostic item)



PROCEDURE A

INSPECTION START



Ⓐ

GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

FA

RA

BR

ST

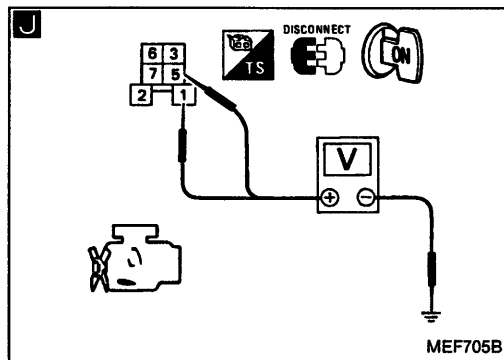
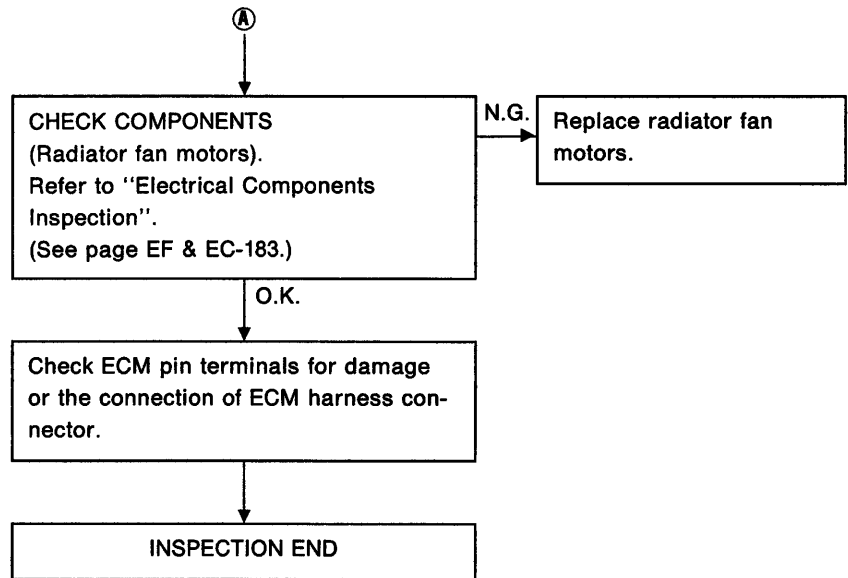
BF

HA

EL

TROUBLE DIAGNOSES

RADIATOR FAN CONTROL (Not self-diagnostic item)

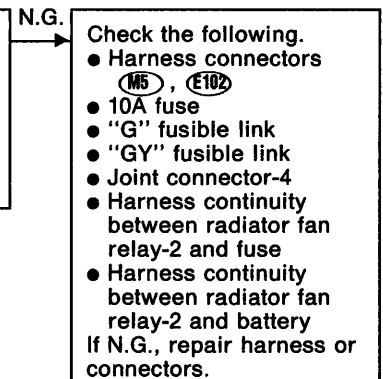


PROCEDURE B

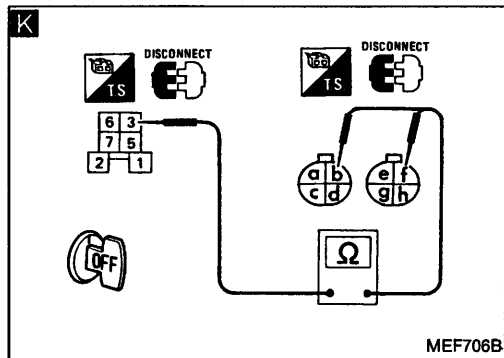
INSPECTION START

CHECK POWER SUPPLY.

- 1) Stop engine.
- 2) Disconnect radiator fan relay-2.
- 3) Turn ignition switch "ON".
- 4) Check voltage between terminals ①, ⑤ and ground.
Voltage: Battery voltage

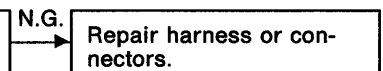


O.K.



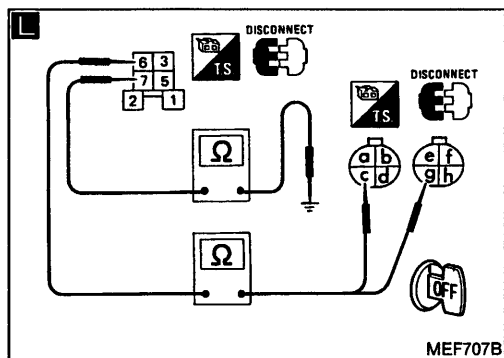
CHECK GROUND CIRCUIT.

- 1) Turn ignition switch "OFF".
- 2) Disconnect radiator fan motor-1 harness connector and radiator fan motor-2 harness connector.
- K** 3) Check harness continuity between terminal ③ and terminals ⑥, ①.
Continuity should exist.
- L** 4) Check harness continuity between terminal ⑥ and terminals ③, ①, terminal ⑦ and body ground.
Continuity should exist.

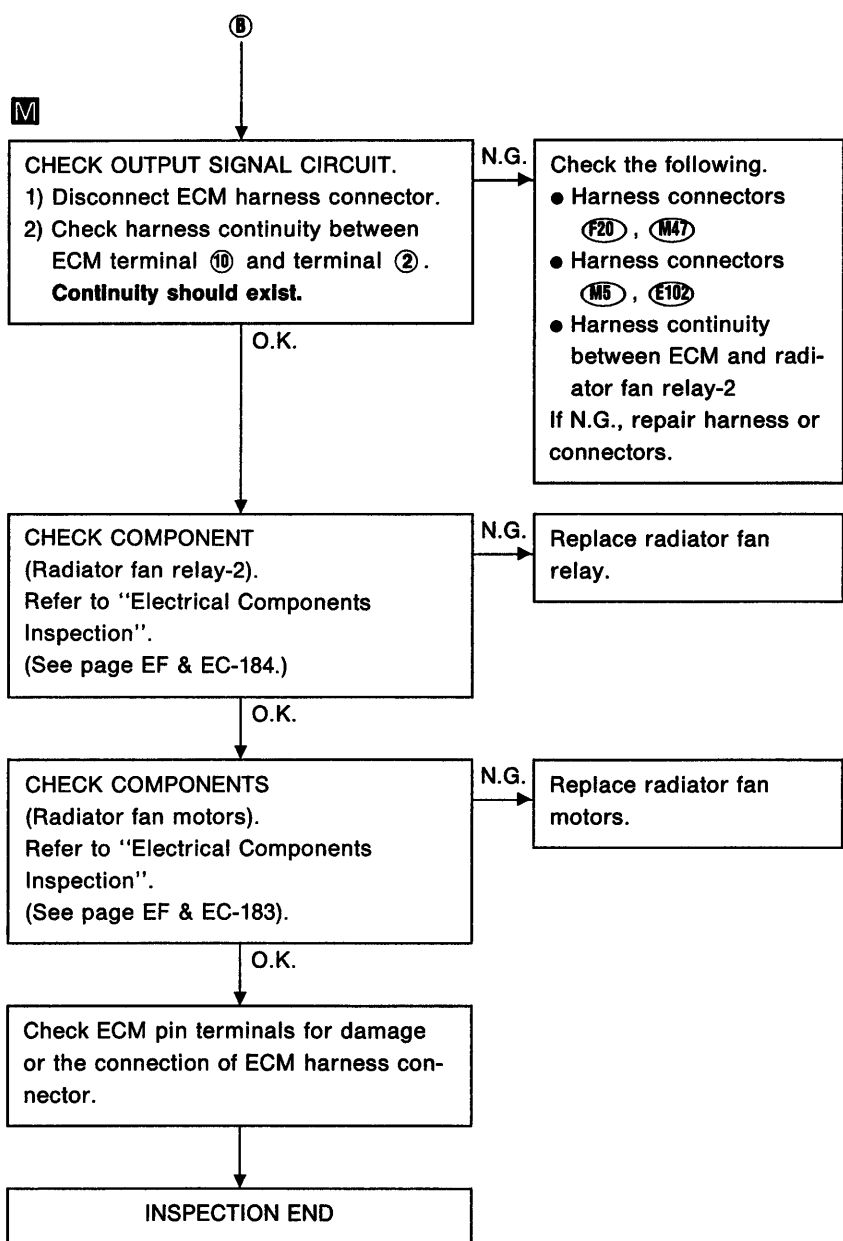
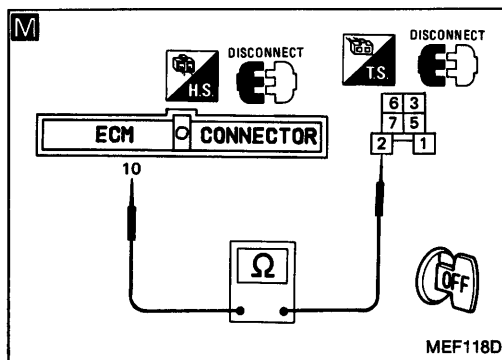


O.K.

⑧



TROUBLE DIAGNOSES



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

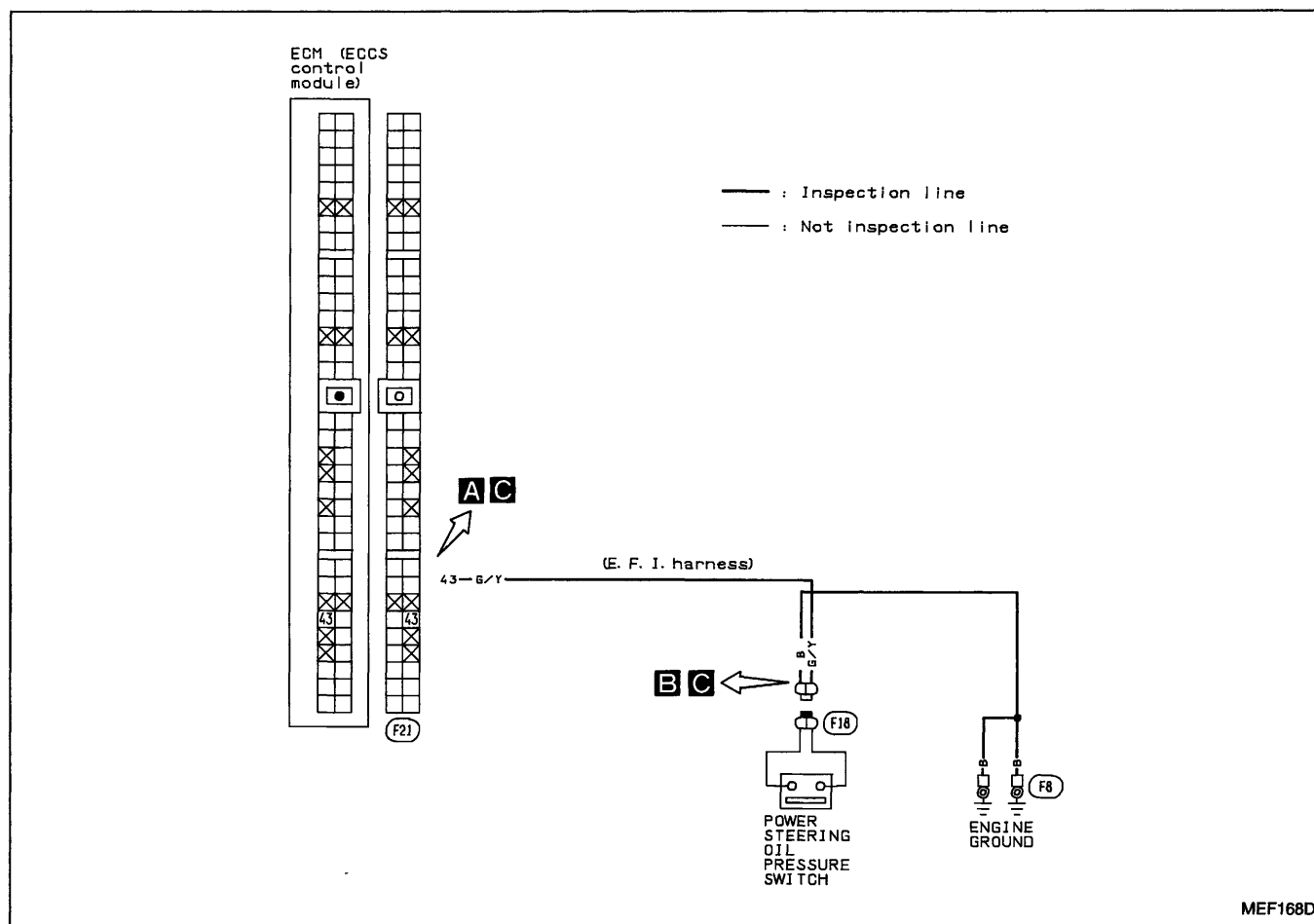
BF

HA

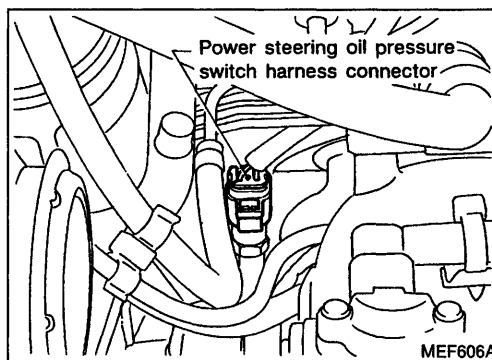
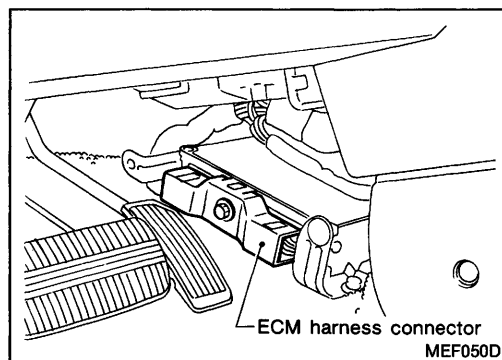
EL

Diagnostic Procedure 24

POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)

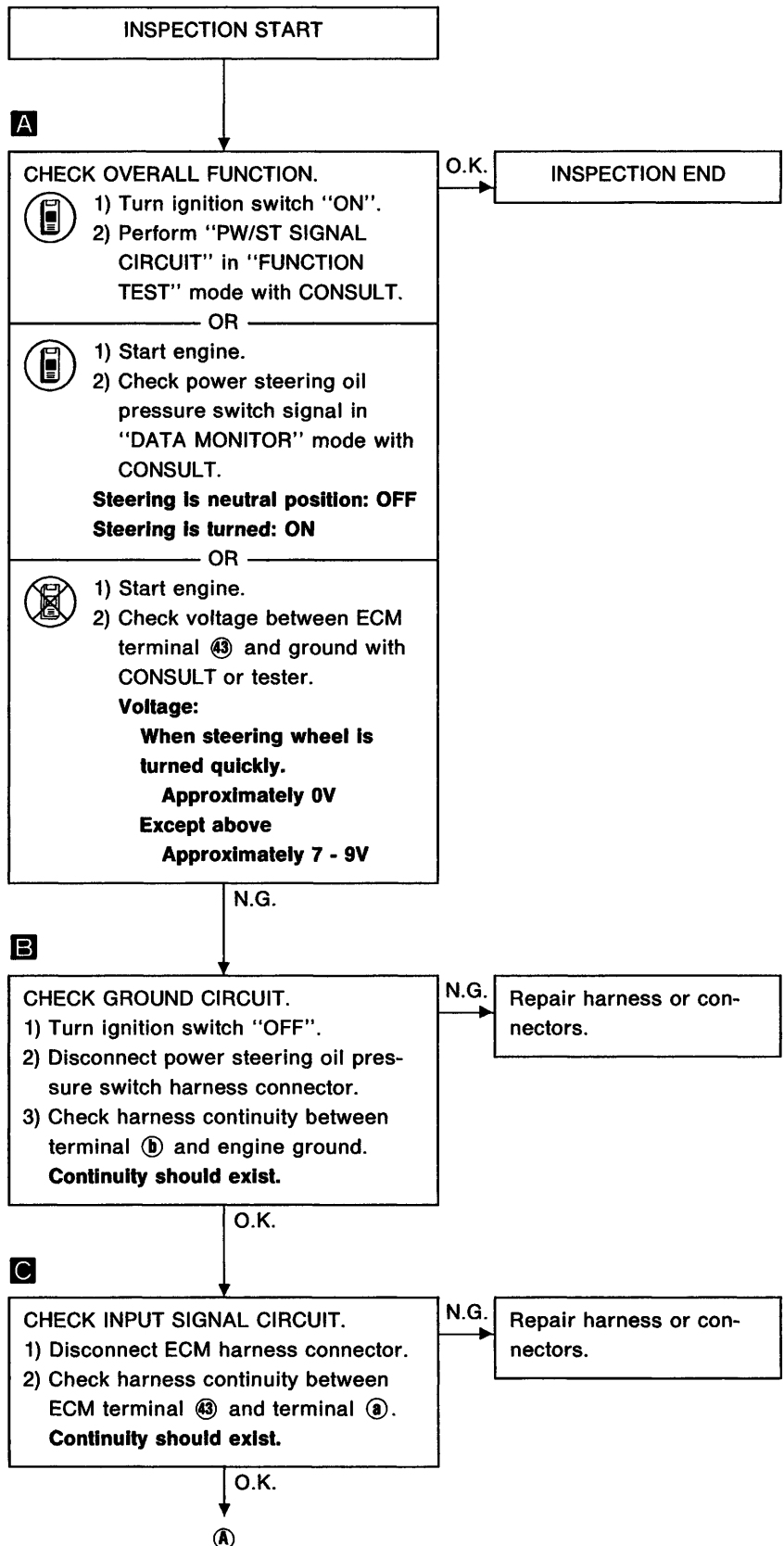
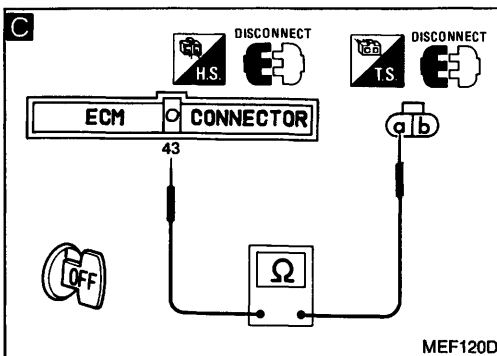
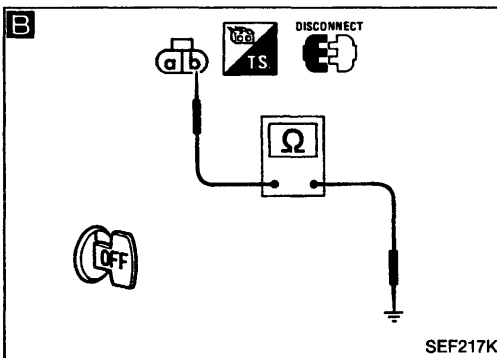
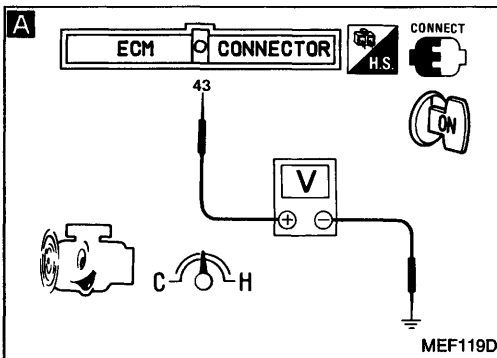
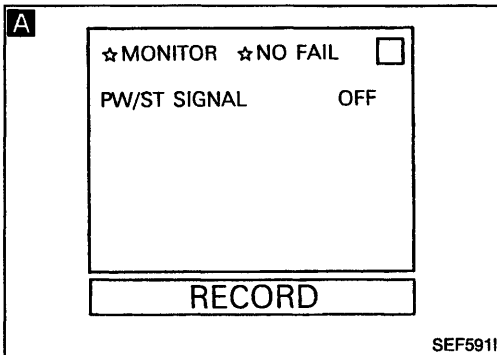
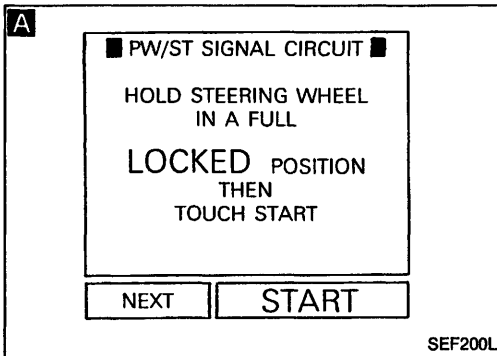


Harness layout



TROUBLE DIAGNOSES

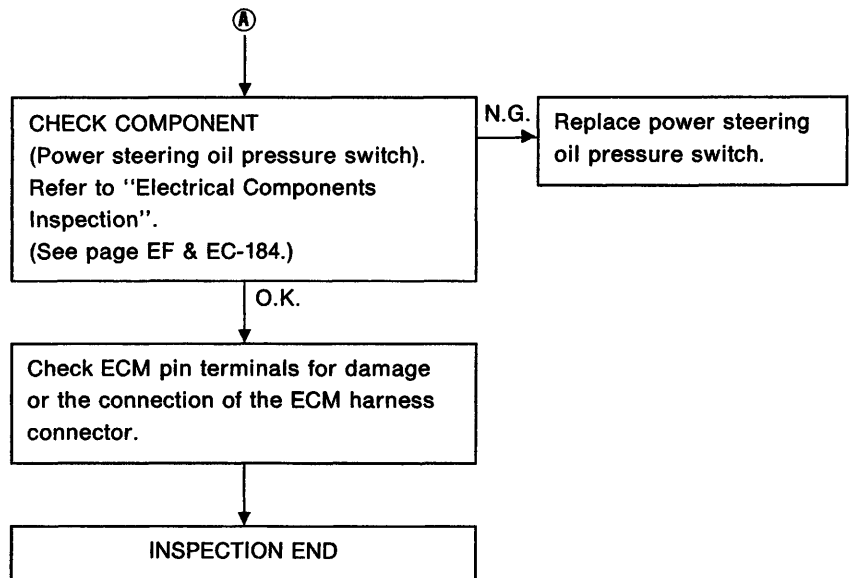
POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)



GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

TROUBLE DIAGNOSES

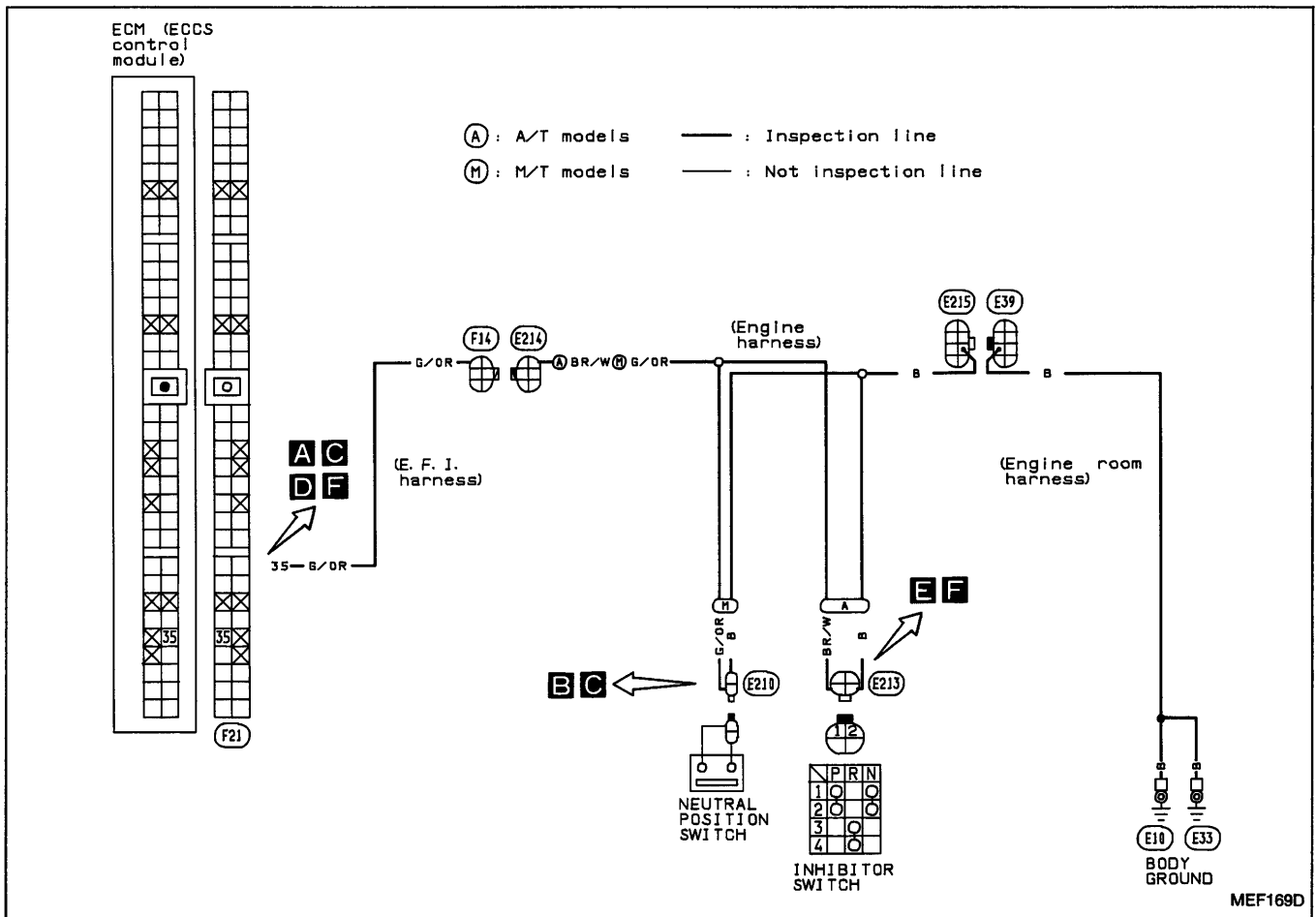
POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)



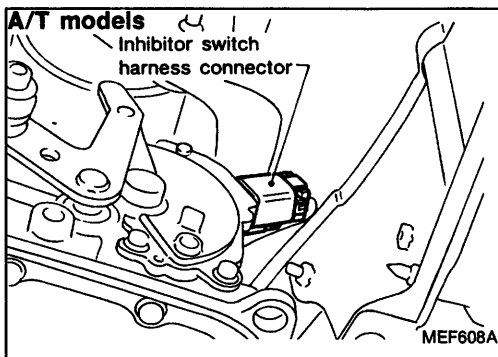
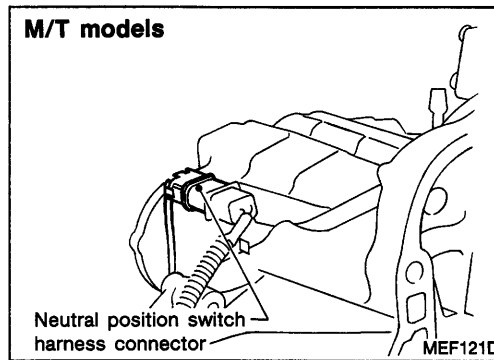
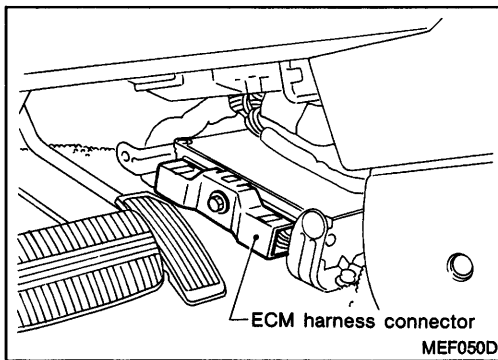
TROUBLE DIAGNOSES

Diagnostic Procedure 25

NEUTRAL POSITION/INHIBITOR SWITCH (Not self-diagnostic Item)

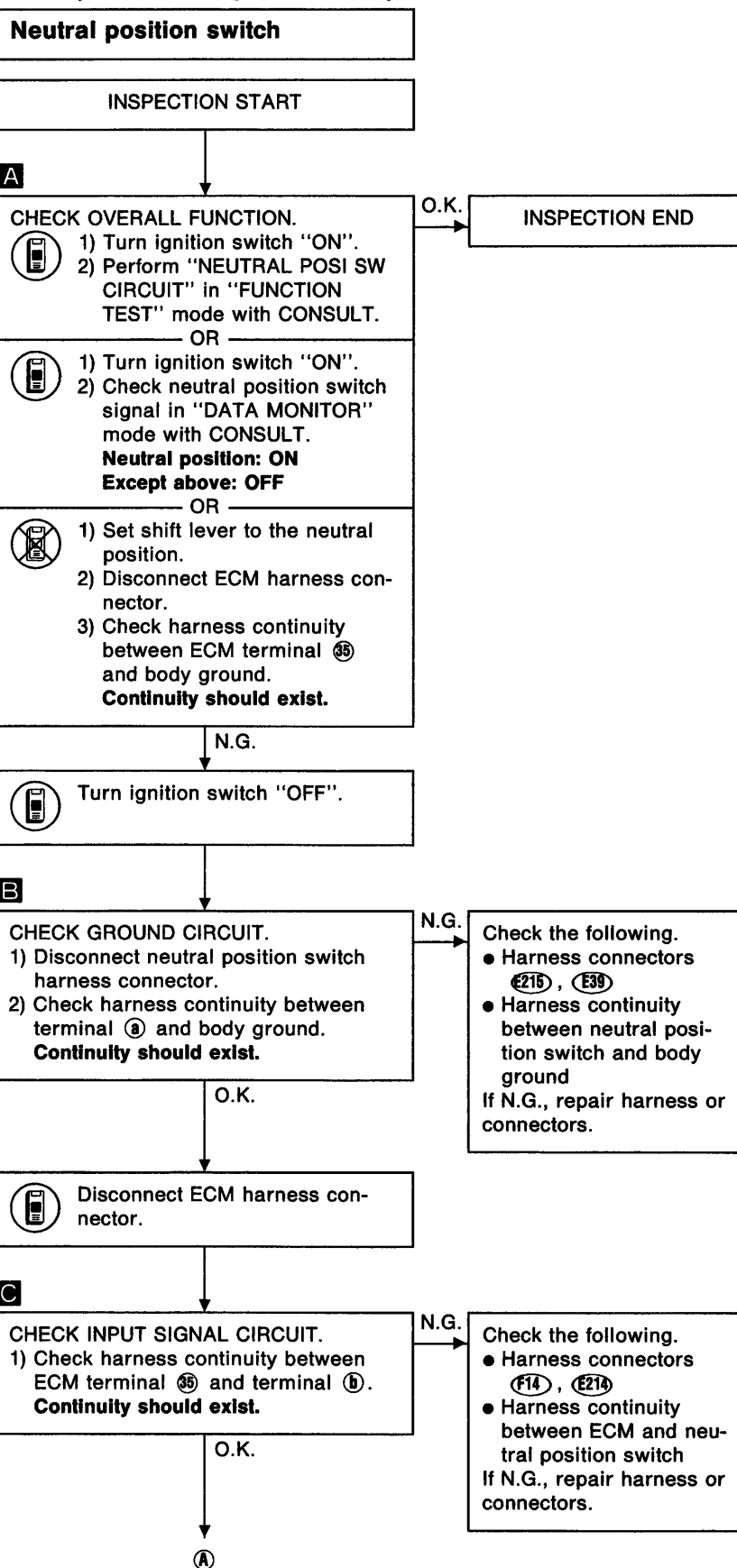
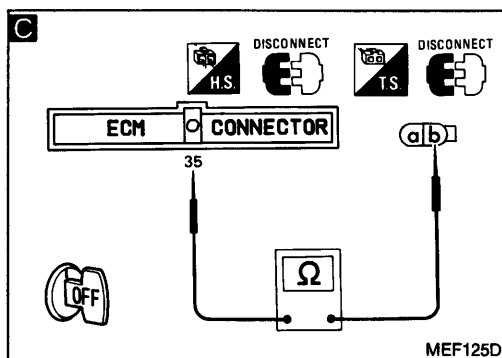
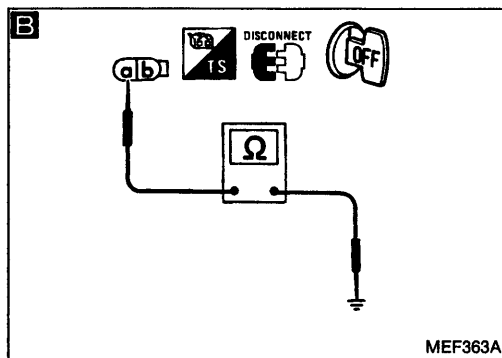
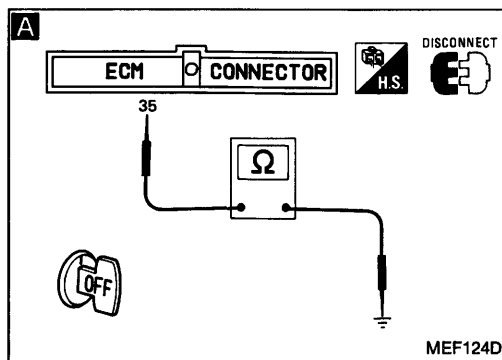
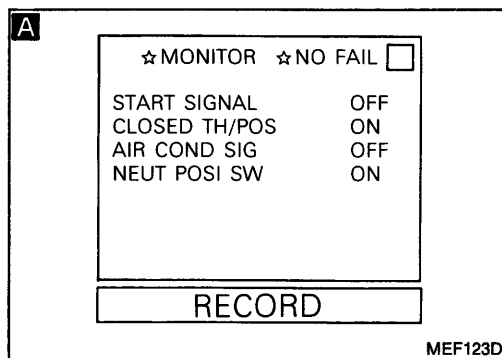
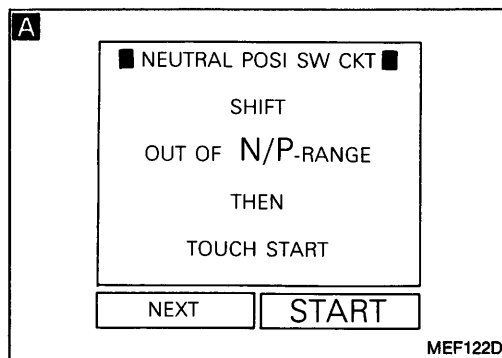


Harness layout



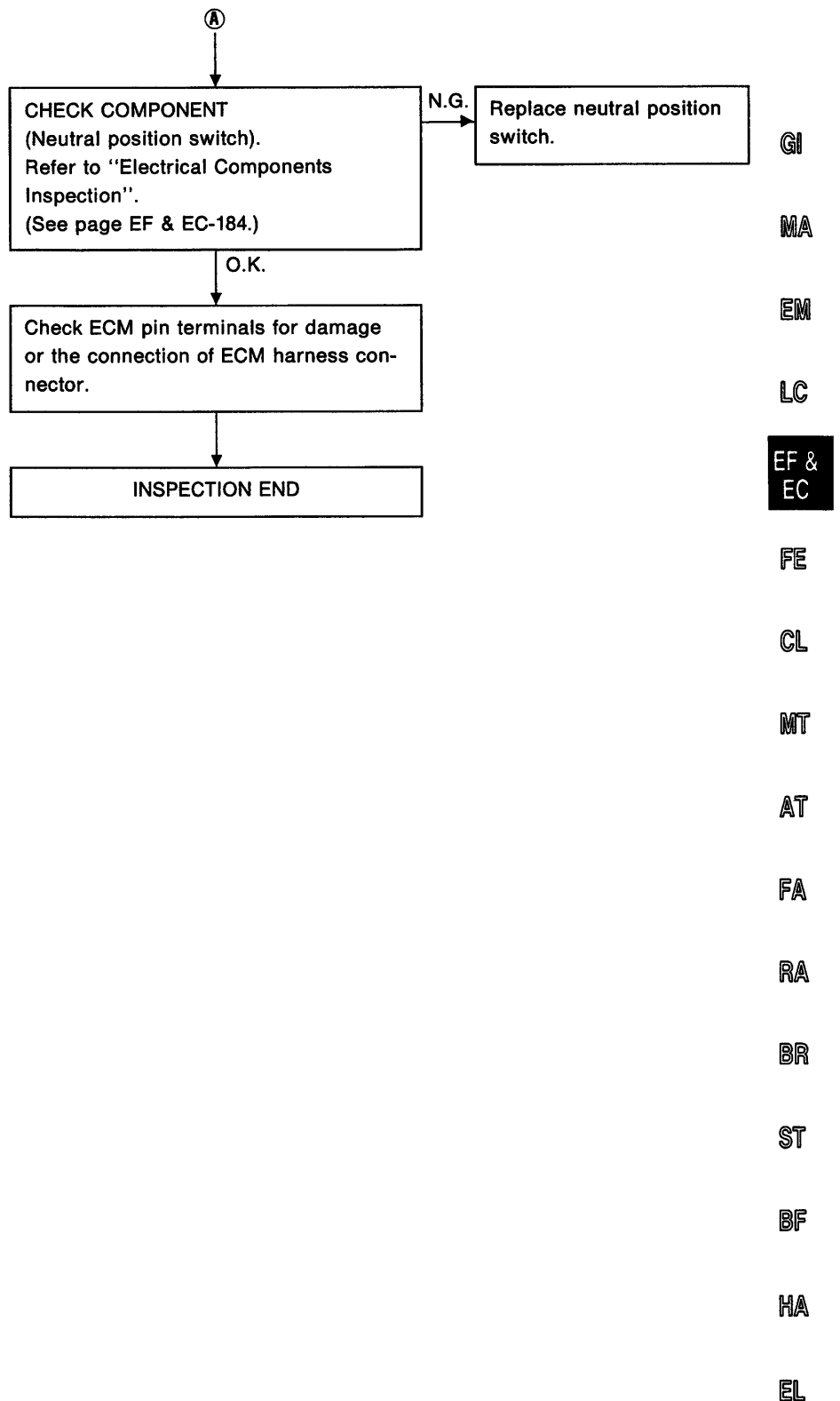
TROUBLE DIAGNOSES

NEUTRAL POSITION/INHIBITOR SWITCH (Not self-diagnostic item)



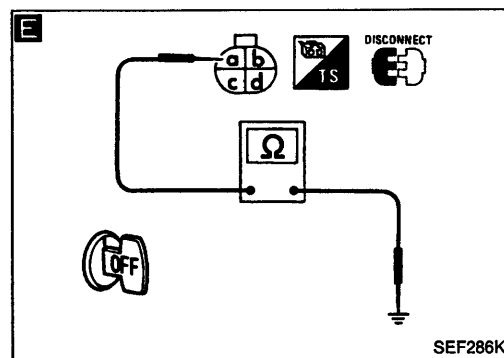
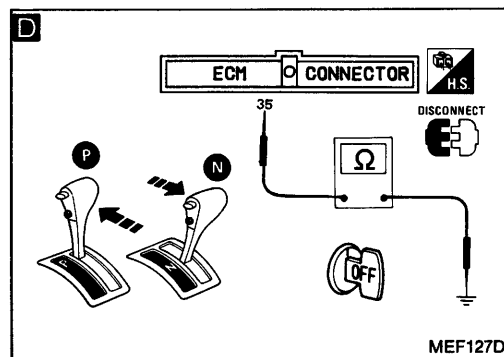
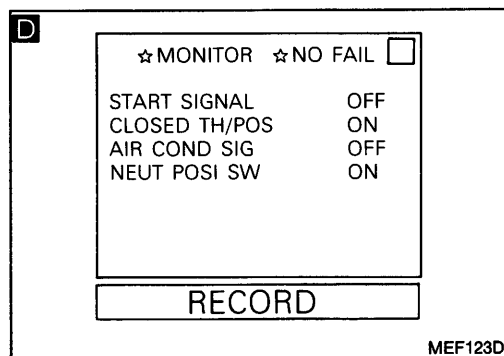
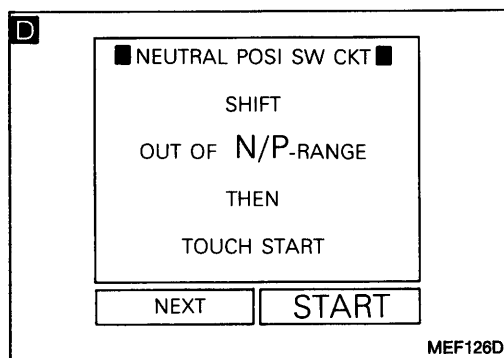
TROUBLE DIAGNOSES

NEUTRAL POSITION/INHIBITOR SWITCH (Not self-diagnostic item)



TROUBLE DIAGNOSES

NEUTRAL POSITION/INHIBITOR SWITCH (Not self-diagnostic item)



Inhibitor switch

INSPECTION START

D

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Perform "NEUTRAL POSI SW CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

O.K.

INSPECTION END

OR

1) Turn ignition switch "ON".
2) Check neutral position switch signal in "DATA MONITOR" mode with CONSULT.
"N" or "P": ON
Except above: OFF

OR

1) Shift selector lever to "P" range.
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal 35 and body ground.
Continuity should exist.
4) Shift selector lever to "N" range.
5) Check harness continuity between ECM terminal 35 and body ground.
Continuity should exist.

N.G.

1) Turn ignition switch "OFF".

E

CHECK GROUND CIRCUIT.

1) Disconnect inhibitor switch harness connector.
2) Check harness continuity between terminal 3 and body ground.
Continuity should exist.

N.G.

Check the following.

- Harness connectors E215, E39
- Harness continuity between inhibitor switch and body ground

If N.G., repair harness or connectors.

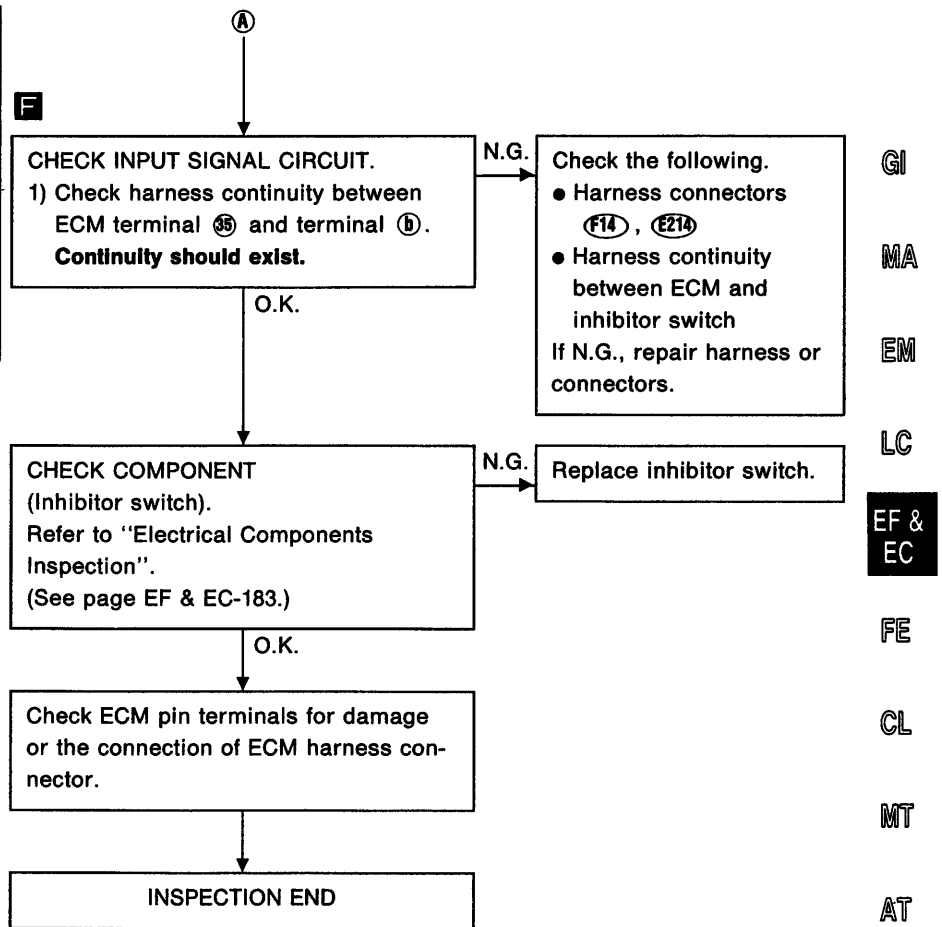
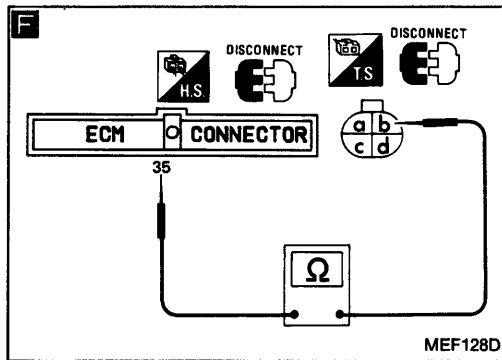
O.K.

1) Disconnect ECM harness connector.

Ⓐ

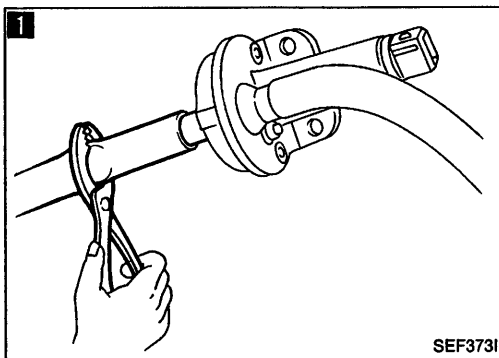
TROUBLE DIAGNOSES

NEUTRAL POSITION/INHIBITOR SWITCH (Not self-diagnostic item)



TROUBLE DIAGNOSES

Diagnostic Procedure 26 — Symptom — High Idling after Warm-up



SEF373I

1

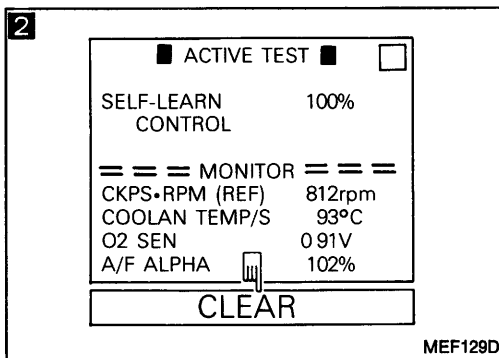
CHECK IACV-AIR REGULATOR.
When pinching the IACV-air regulator hose, does the engine speed drop?

Yes

Check IACV-air regulator and circuit.
(See page EF & EC-116.)

No

2



MEF129D

CHECK INTAKE AIR LEAK.



1. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode.
2. Clear the self-learning control coefficient by touching "CLEAR".
3. Does the engine speed drop?

Yes

Discover air leak location and repair.

OR



1. Disconnect heated oxygen sensor harness connector.
2. After racing engine at 2,000 rpm under no-load for about 30 seconds, does the engine speed drop?

No

3

CHECK THROTTLE LINKAGE.

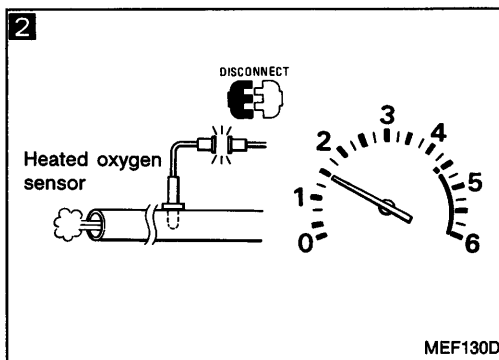
1. Check that throttle linkage moves smoothly.
2. Confirm that throttle valve both fully opens and fully closes.

N.G.

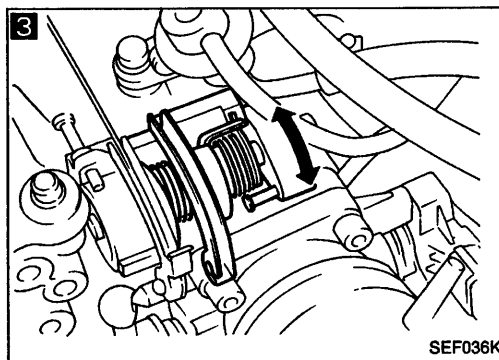
Repair throttle linkage or sticking of throttle valve.

O.K.

INSPECTION END

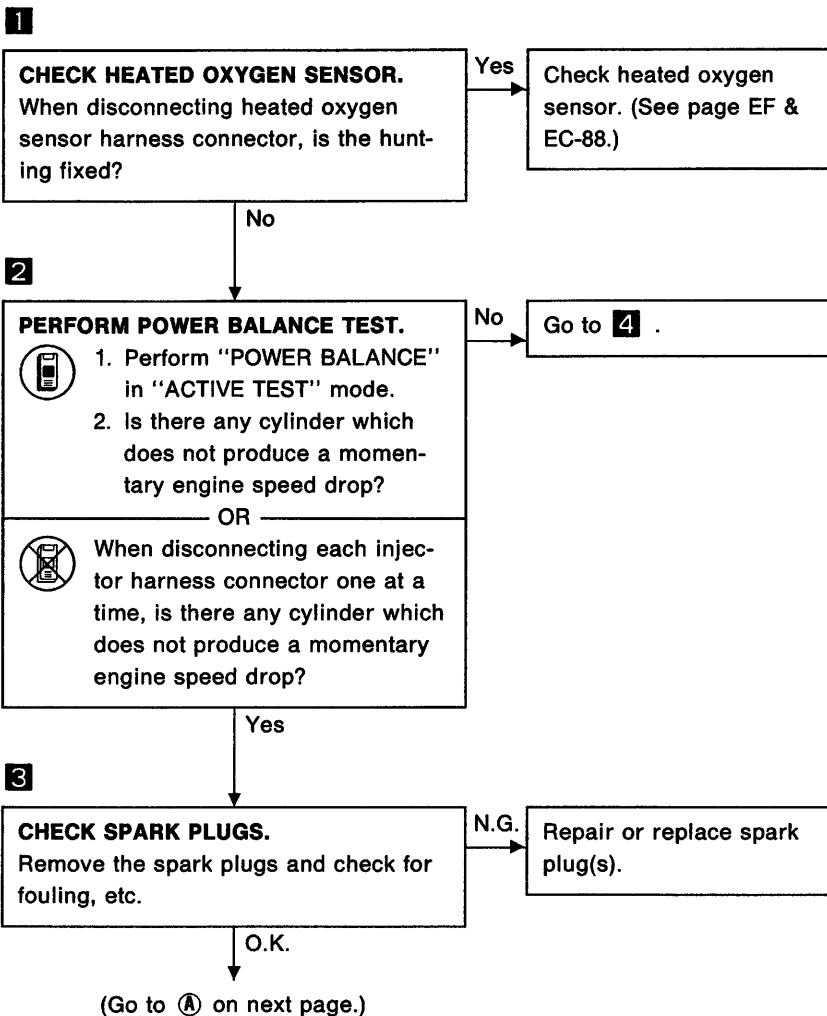
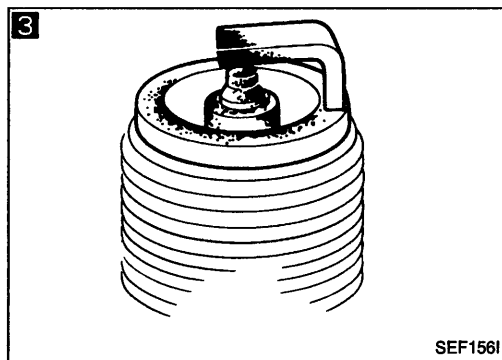
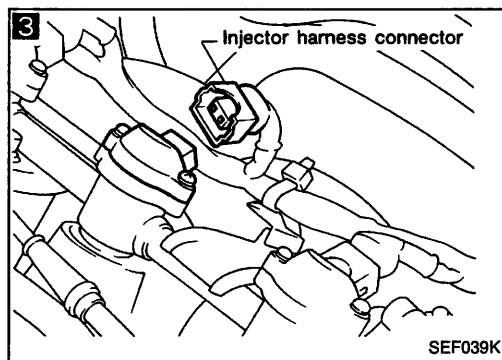
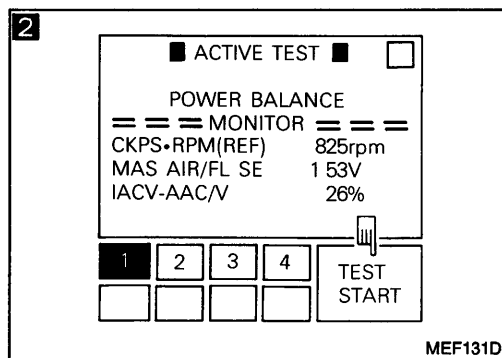
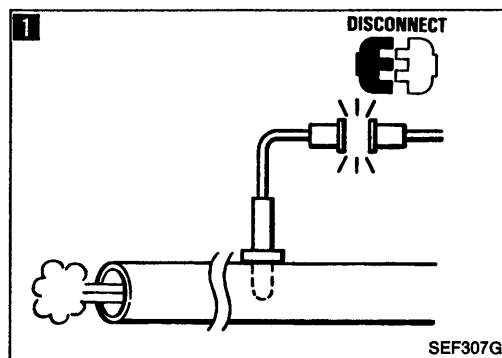


MEF130D



SEF036K

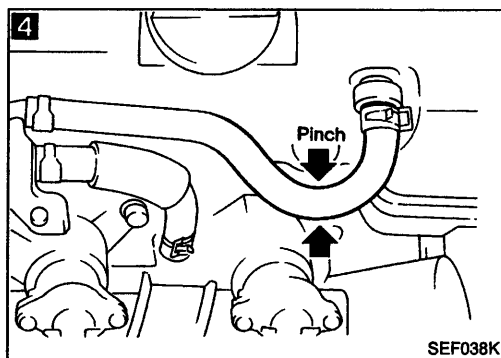
Diagnostic Procedure 27 — Symptom — Hunting



GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

TROUBLE DIAGNOSES

Diagnostic Procedure 27 — Symptom — Hunting (Cont'd)



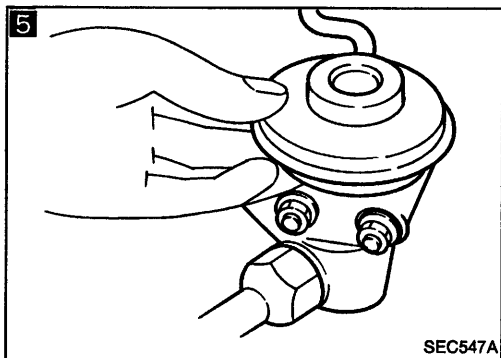
4

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes

Discover air leak location and repair.

No



5

CHECK EGR VALVE
Check EGR valve for sticking

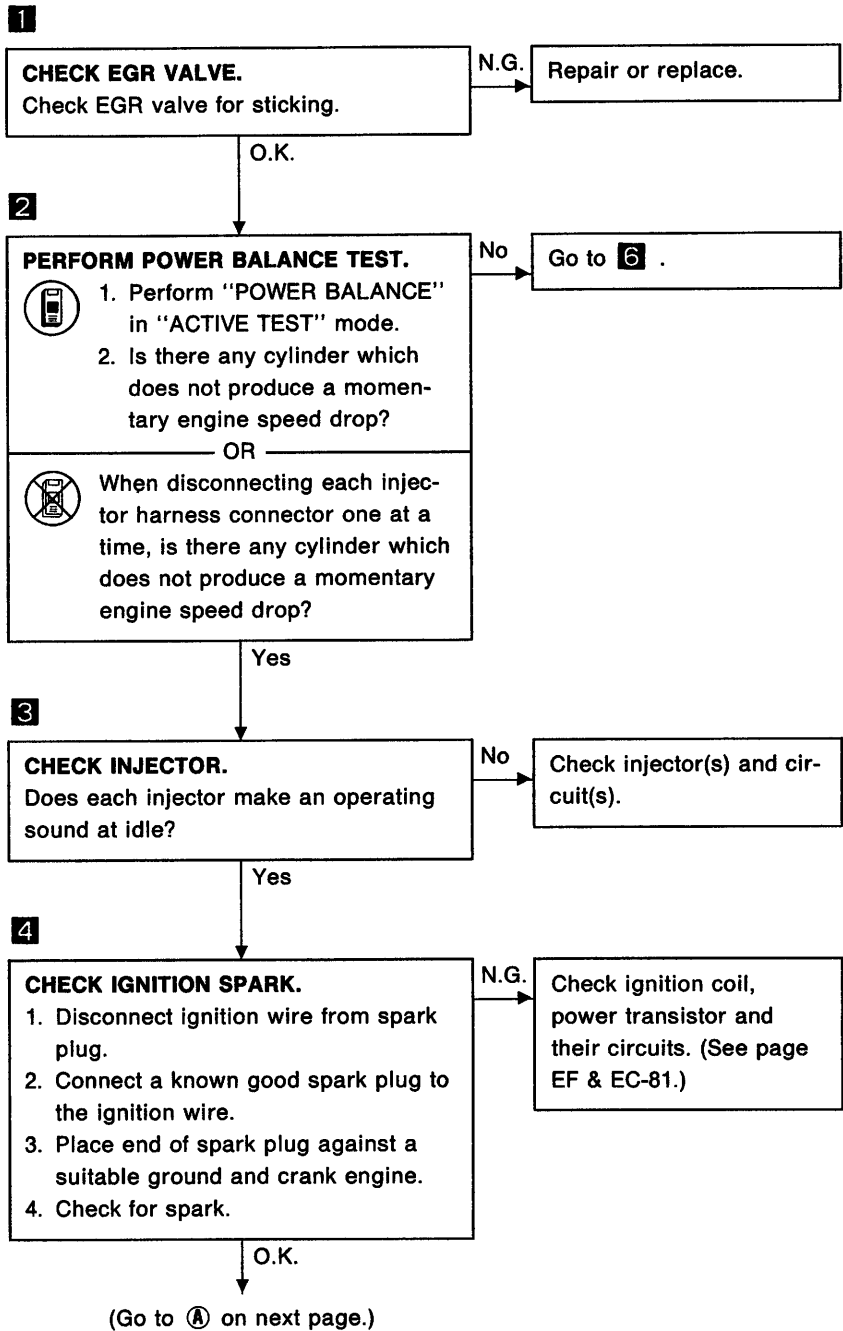
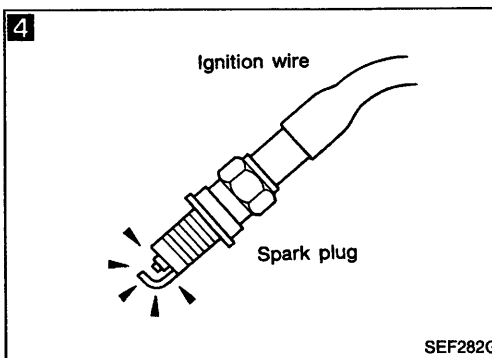
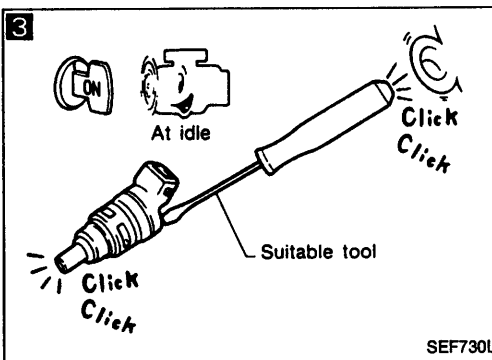
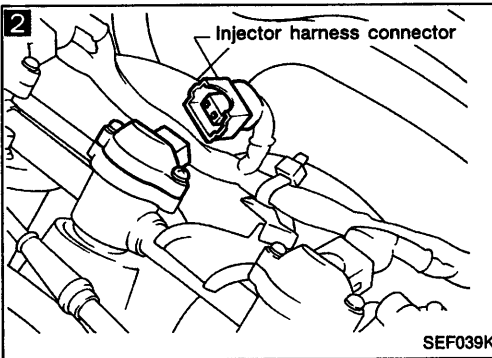
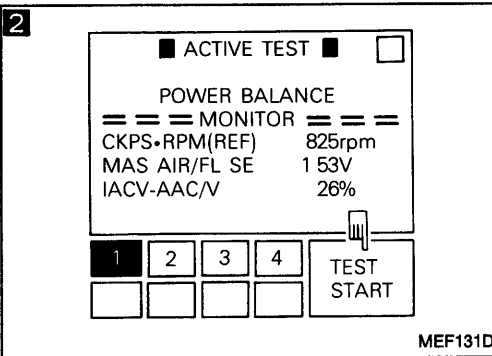
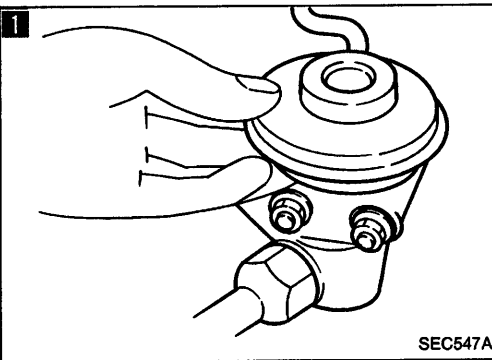
N.G.

Repair or replace

O.K.

INSPECTION END

Diagnostic Procedure 28 — Symptom — Unstable Idle



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

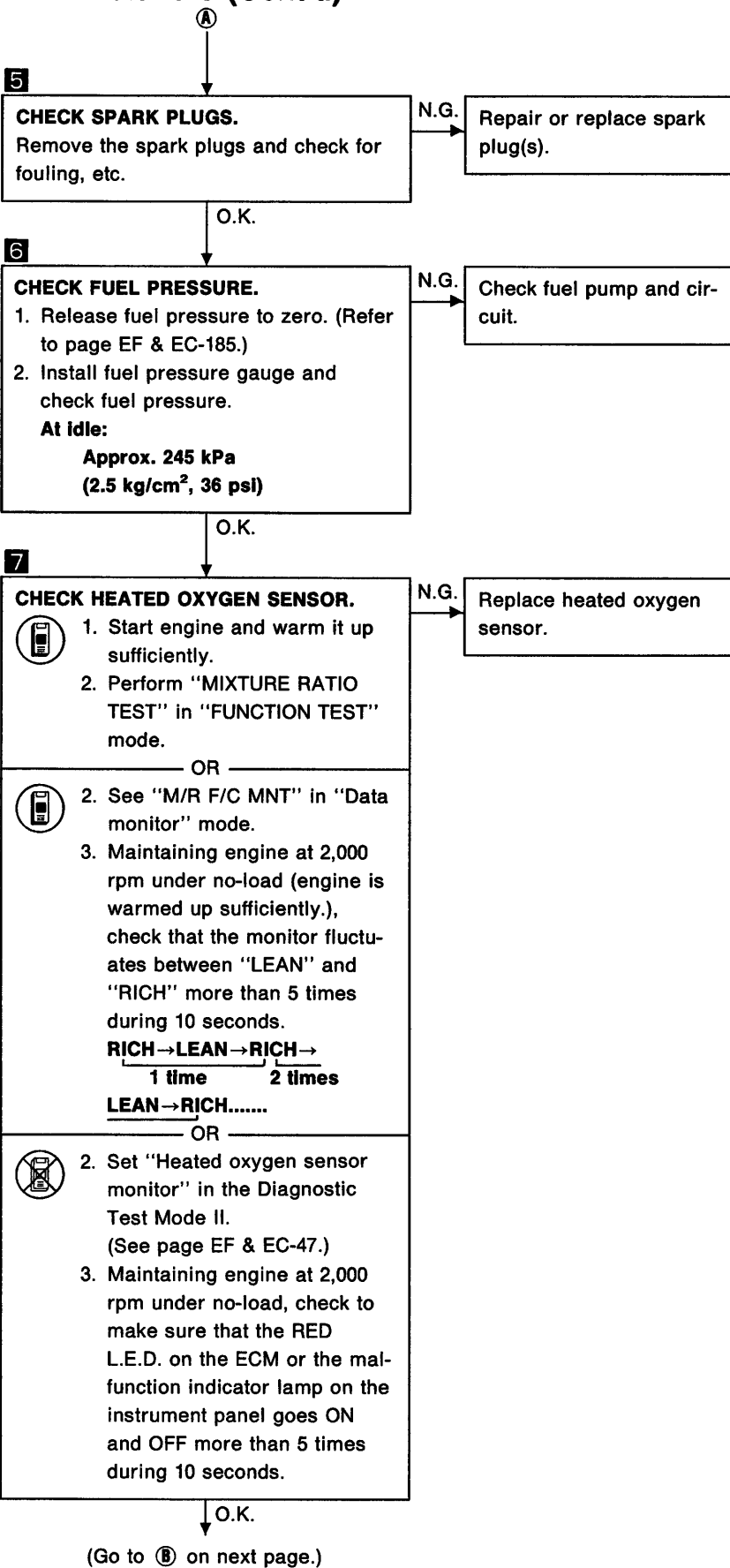
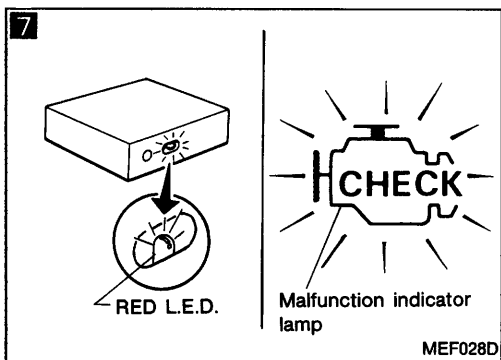
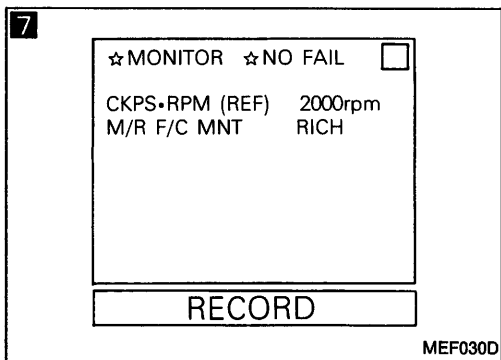
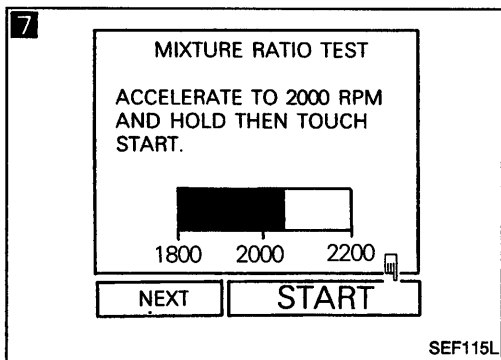
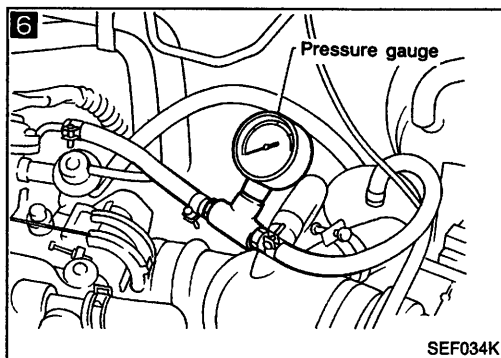
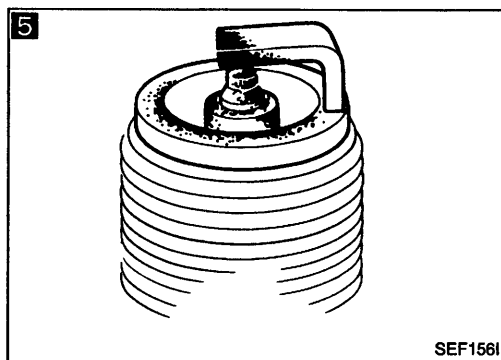
BF

HA

EL

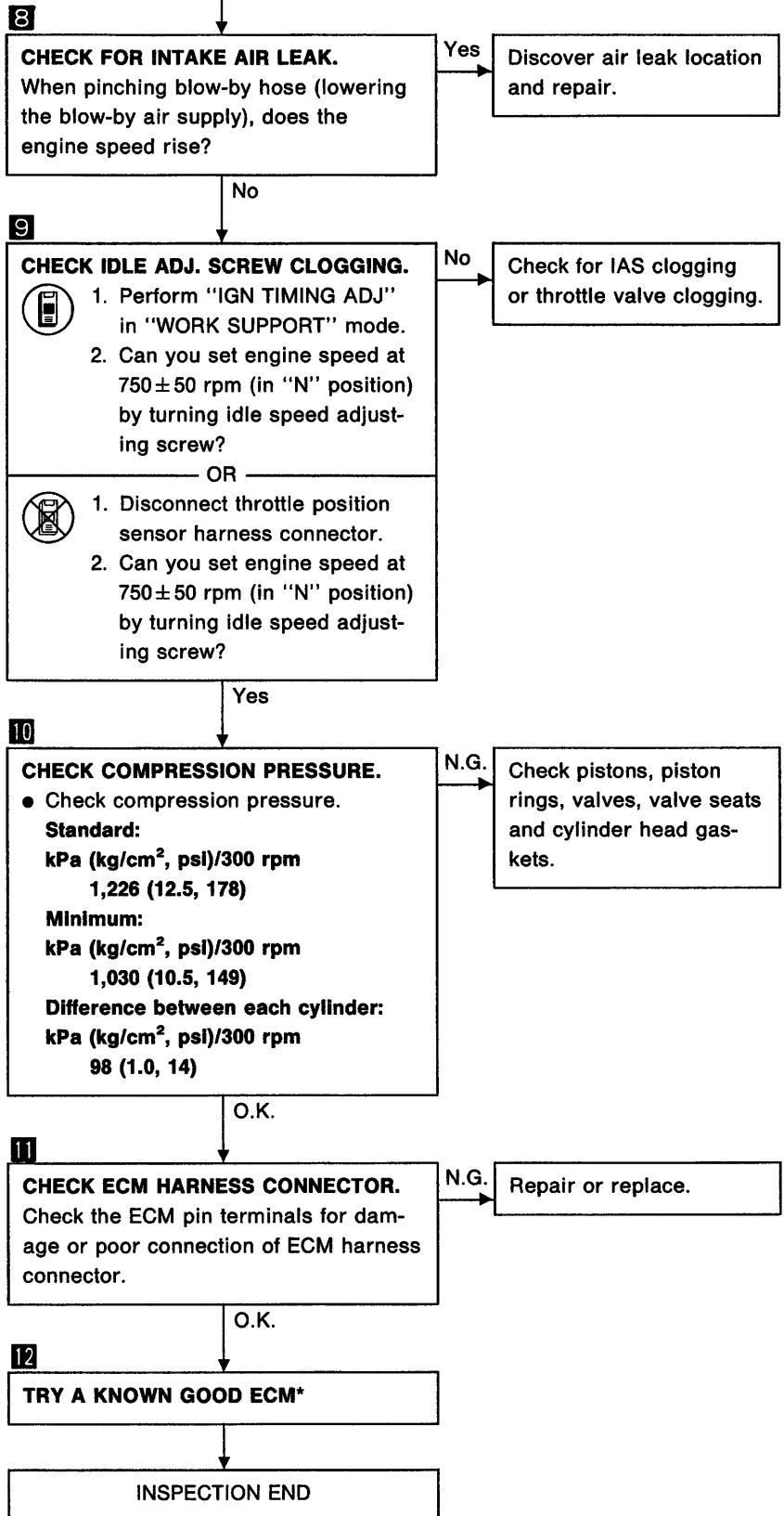
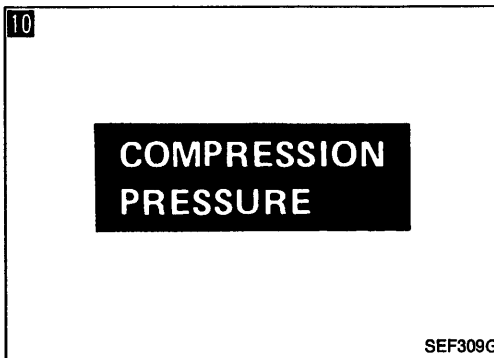
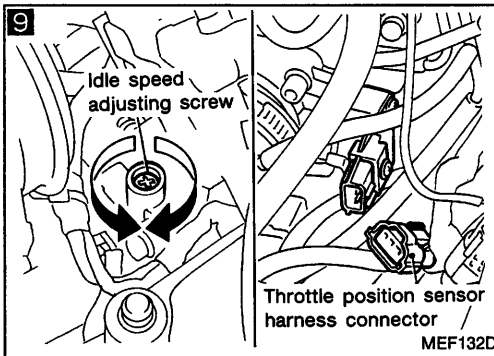
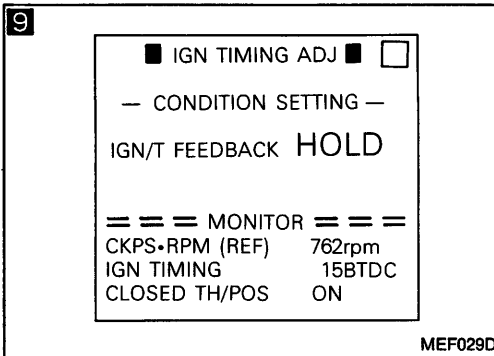
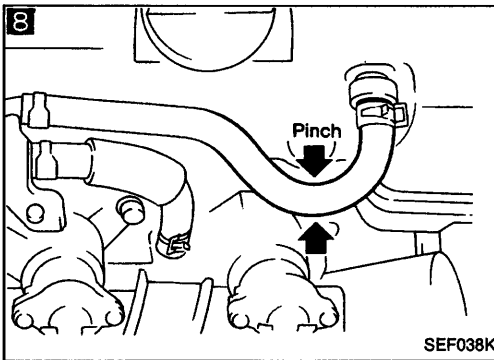
TROUBLE DIAGNOSES

Diagnostic Procedure 28 — Symptom — Unstable Idle (Cont'd)

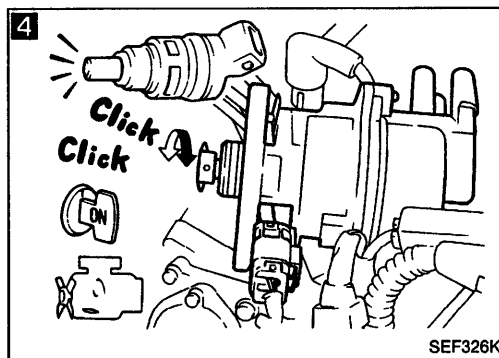
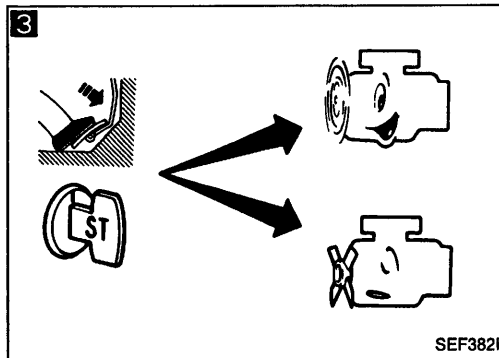
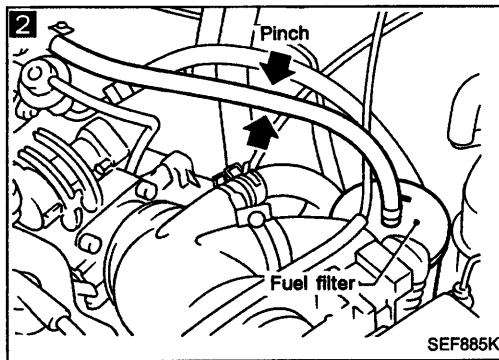
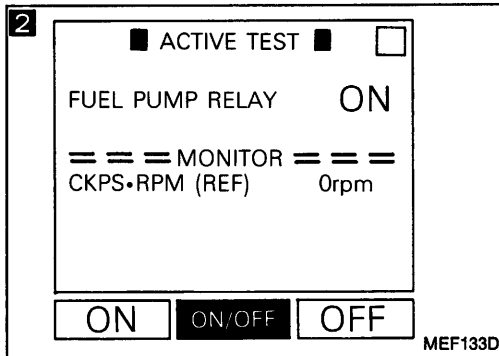
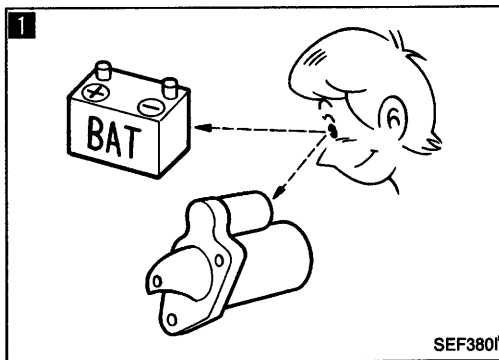


TROUBLE DIAGNOSES

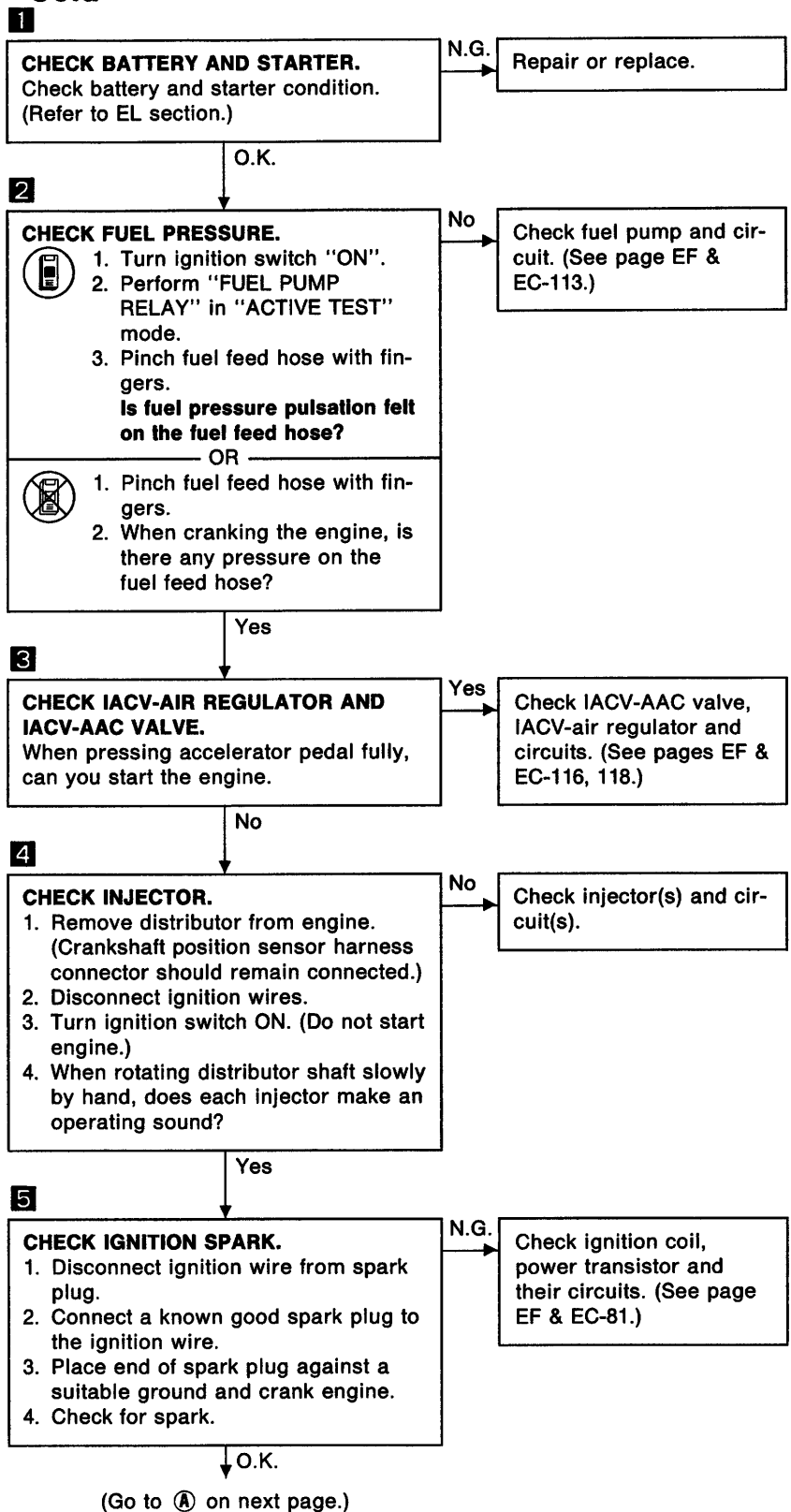
Diagnostic Procedure 28 — Symptom — Unstable Idle (Cont'd)



*: ECM may be the cause of a problem, but this is rarely the case.

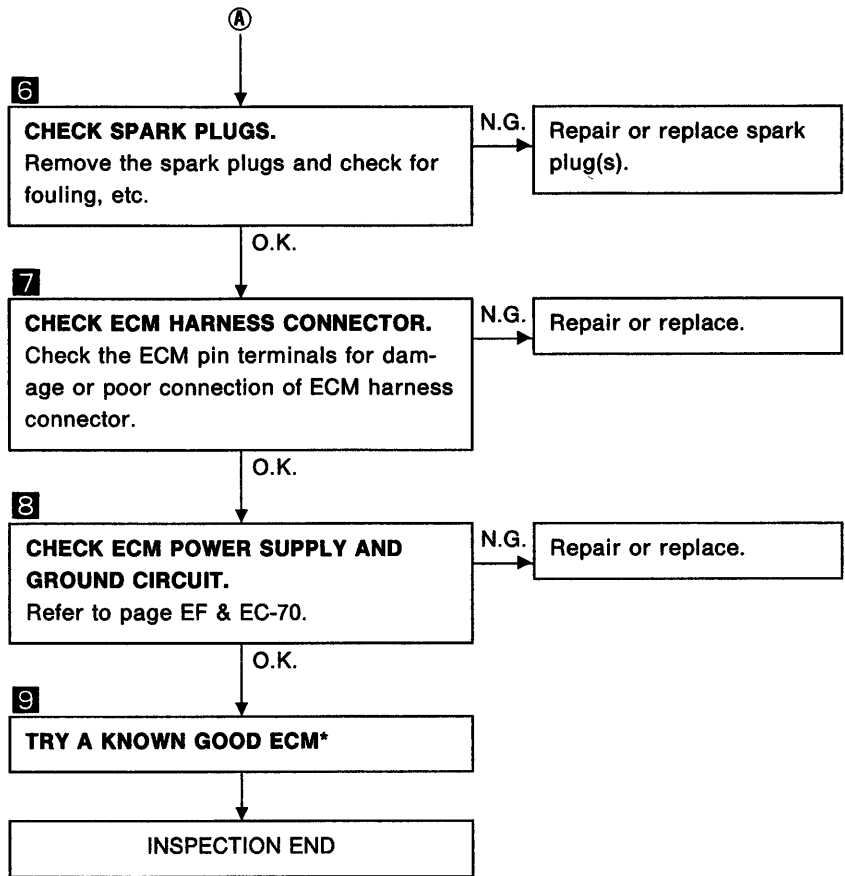
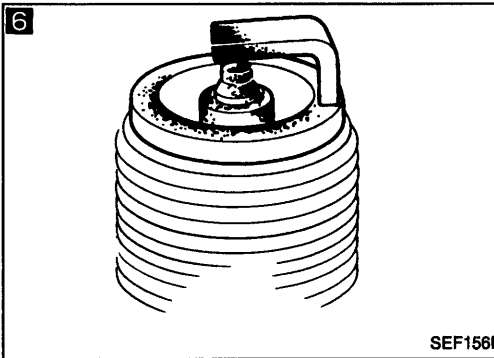
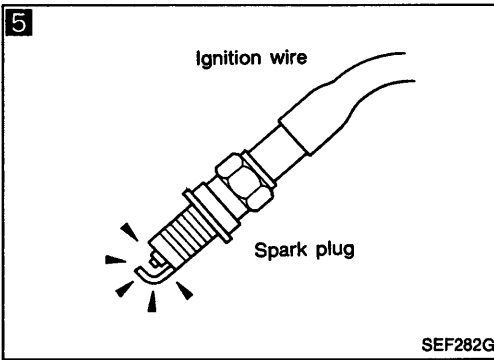


Diagnostic Procedure 29 — Symptom — Hard to Start or Impossible to Start when the Engine is Cold

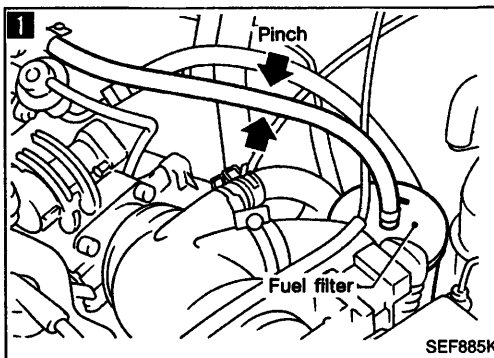
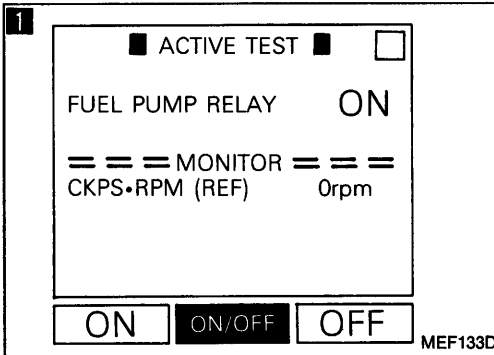


TROUBLE DIAGNOSES

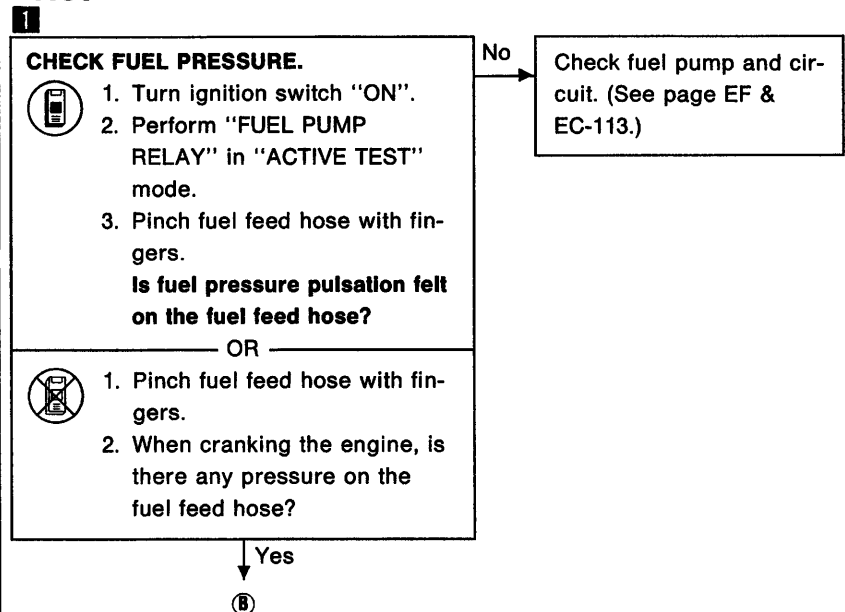
Diagnostic Procedure 29 — Symptom — Hard to Start or Impossible to Start when the Engine is Cold (Cont'd)



*: ECM may be the cause of a problem, but this is rarely the case.

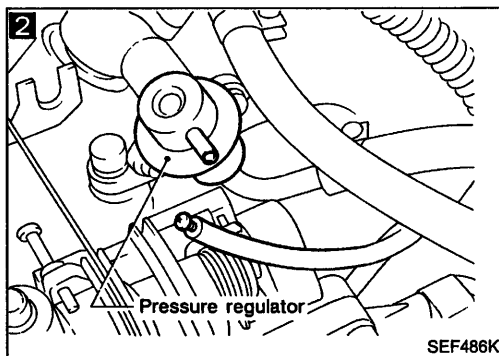


Diagnostic Procedure 30 — Symptom — Hard to Start or Impossible to Start when the Engine is Hot



TROUBLE DIAGNOSES

Diagnostic Procedure 30 — Symptom — Hard to Start or Impossible to Start when the Engine is Hot (Cont'd)



2

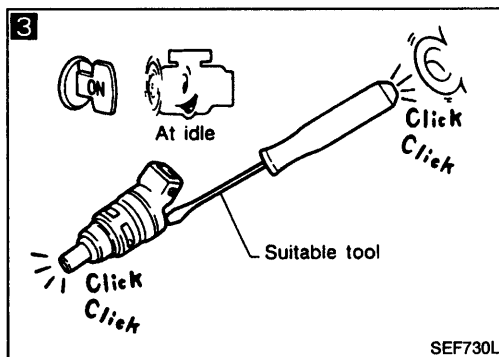
CHECK FUEL VAPOR.

1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Can you start engine?

Yes

Check fuel properties.

No



3

CHECK INJECTOR.

Does each injector make an operating sound at idle?

No

Check injector(s) and circuit(s).

Yes

4

CHECK IGNITION SPARK.

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G.

Check ignition coil, power transistor and circuits. (See page EF & EC-81.)

O.K.

5

CHECK ECM HARNESS CONNECTOR.

Check the ECM pin terminals for damage or poor connection of ECM harness connector.

N.G.

Repair or replace.

O.K.

6

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.

Refer to page EF & EC-70.

N.G.

Repair or replace.

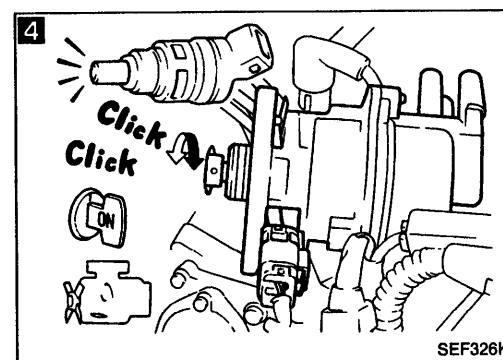
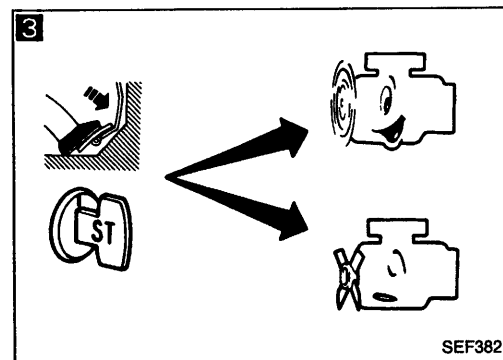
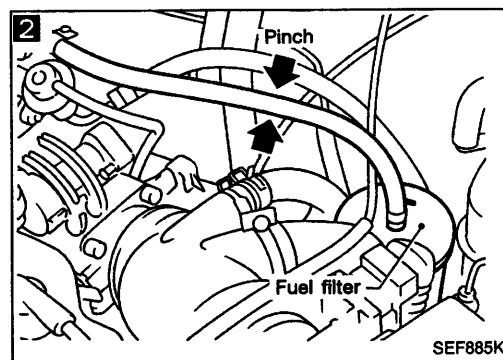
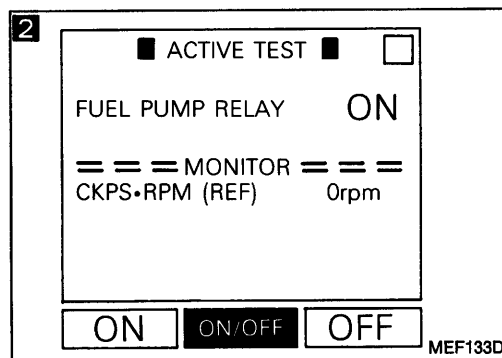
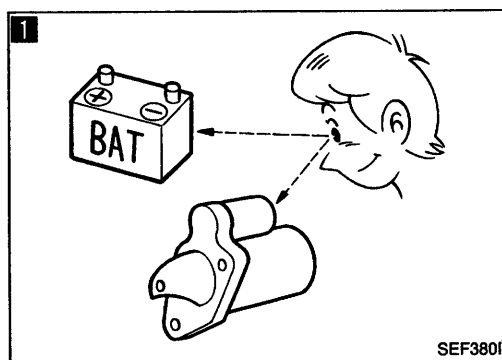
O.K.

7

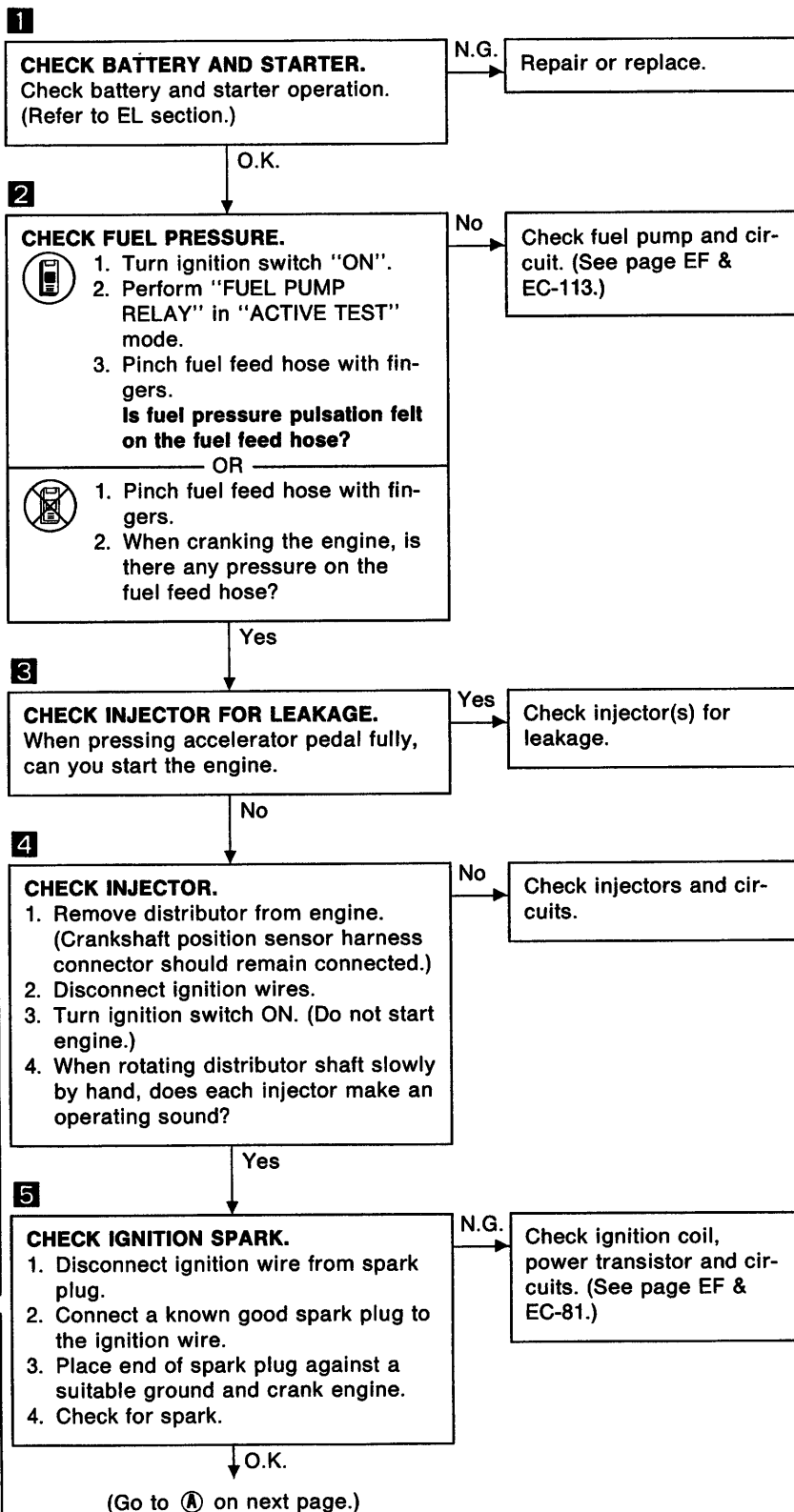
TRY A KNOWN GOOD ECM*

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.



Diagnostic Procedure 31 — Symptom — Hard to Start or Impossible to Start under Normal Conditions



GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

FA

RA

BR

ST

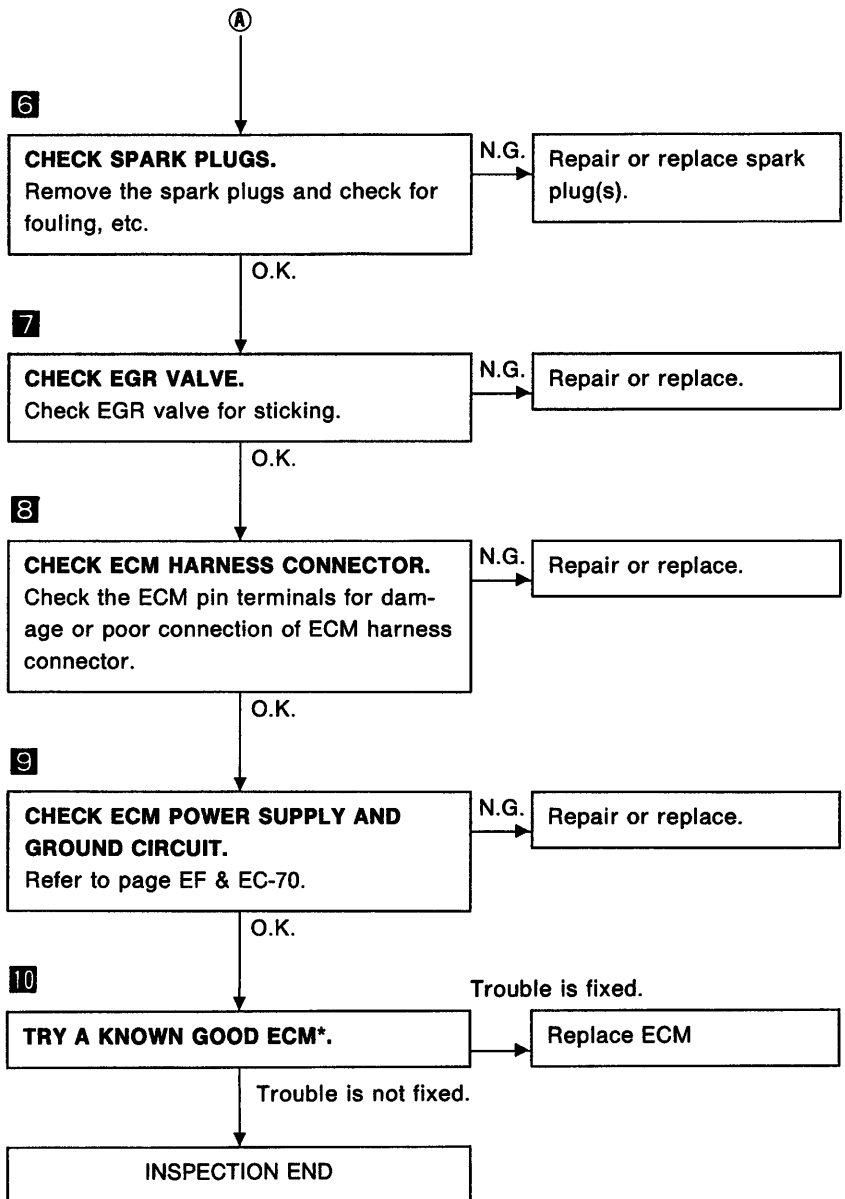
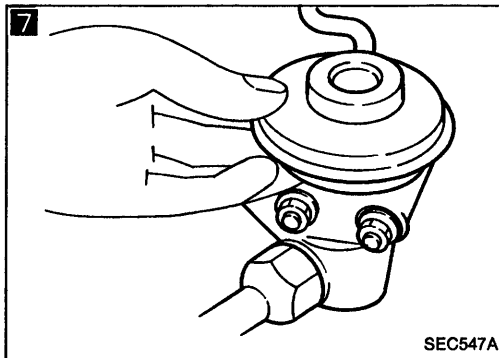
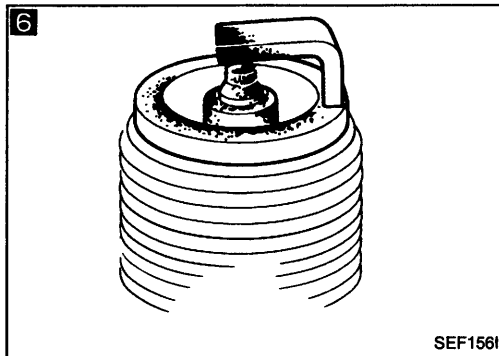
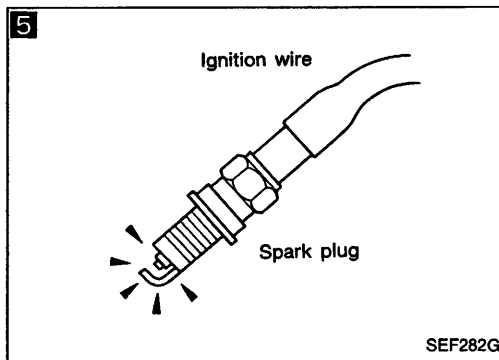
BF

HA

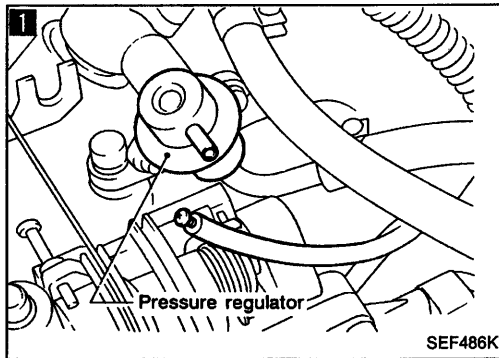
EL

TROUBLE DIAGNOSES

Diagnostic Procedure 31 — Symptom — Hard to Start or Impossible to Start under Normal Conditions (Cont'd)



*: ECM may be the cause of a problem, but this is rarely the case.



Diagnostic Procedure 32 — Symptom — Hesitation when the Engine is Hot

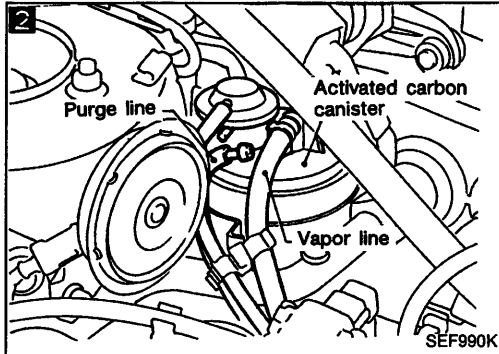
1**CHECK FUEL VAPOR.**

1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes

Check fuel properties.

No

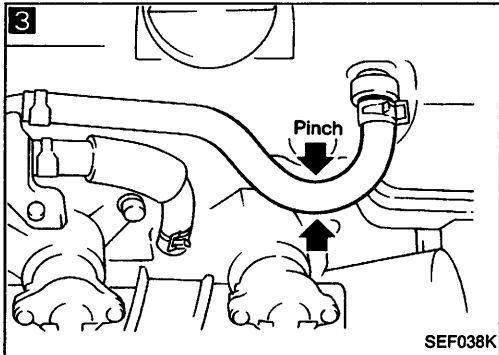
**2****CHECK CANISTER PURGE.**

1. Disconnect canister purge line hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes

Check purge and vacuum line.

No

**3****CHECK FOR INTAKE AIR LEAK.**

- When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes

Discover air leak location and repair.

No

INSPECTION END

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

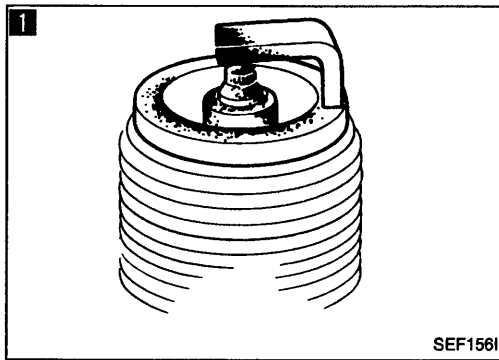
ST

BF

HA

EL

TROUBLE DIAGNOSES



Diagnostic Procedure 33 — Symptom — Hesitation when the Engine is Cold

1

CHECK SPARK PLUGS.

Remove spark plugs and check for fouling, etc.

N.G.

Repair or replace spark plug(s).

O.K.

2

CHECK FOR INTAKE AIR LEAK.

When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes

Discover air leak location and repair.

No

3

TRY A KNOWN GOOD MASS AIR FLOW SENSOR.

Trouble is fixed.

Replace mass air flow sensor.

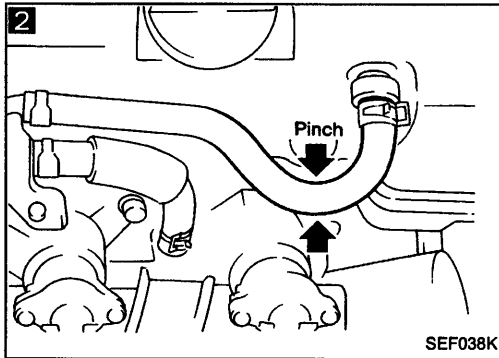
Trouble is not fixed.

4

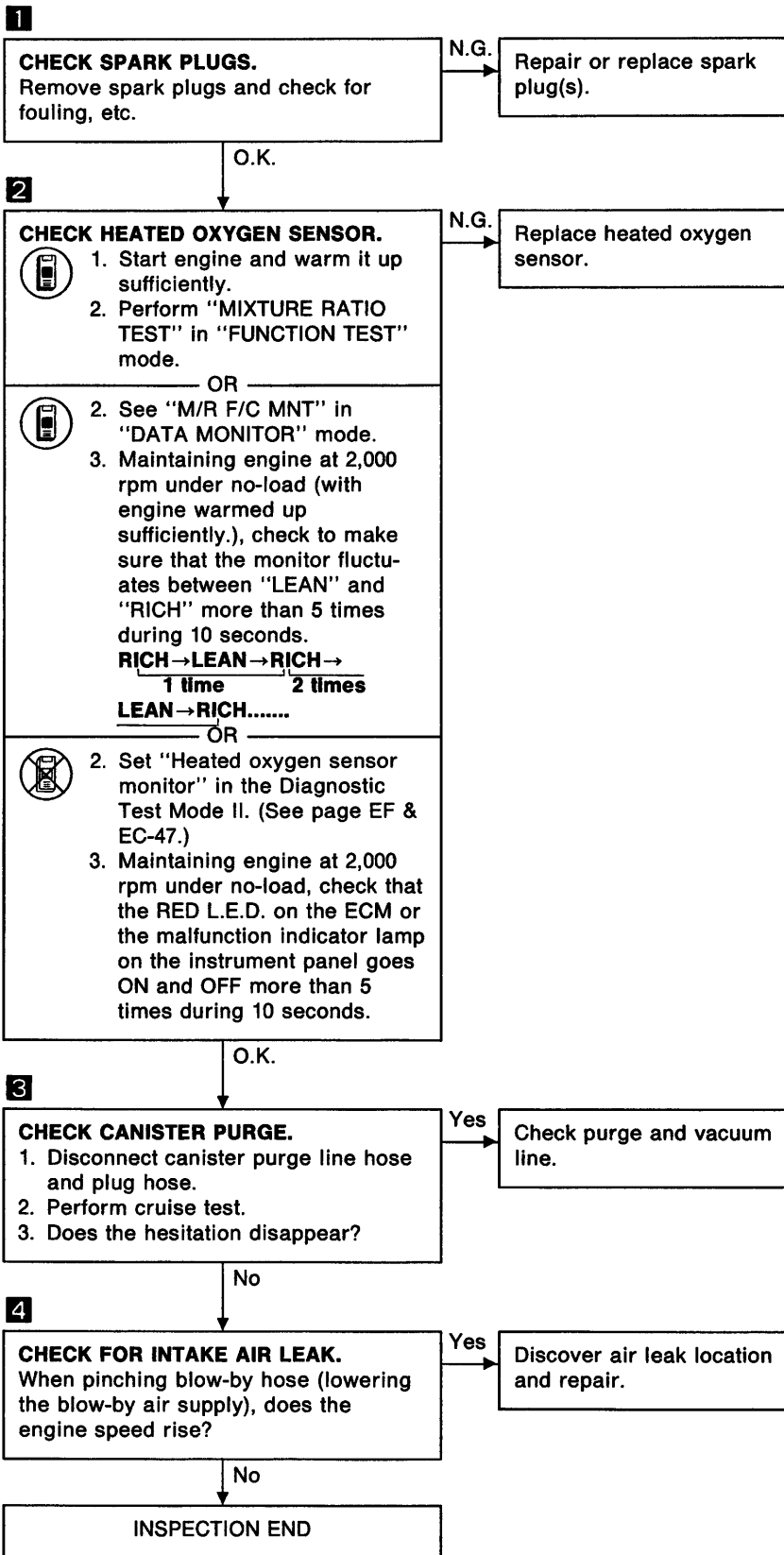
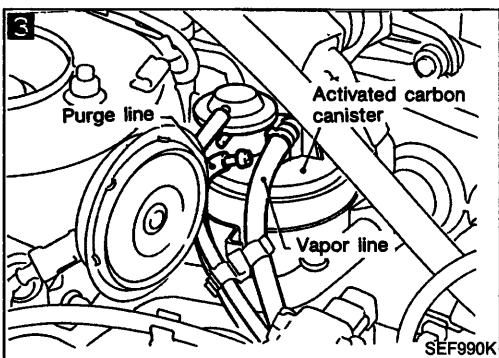
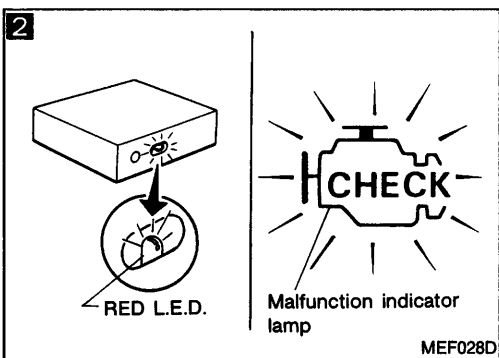
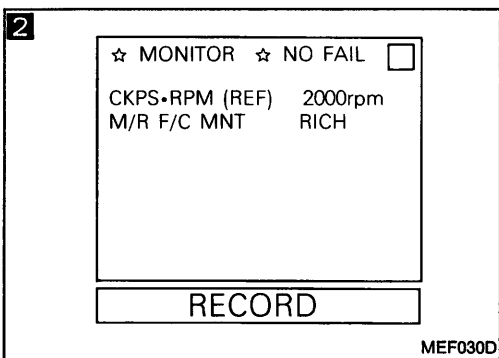
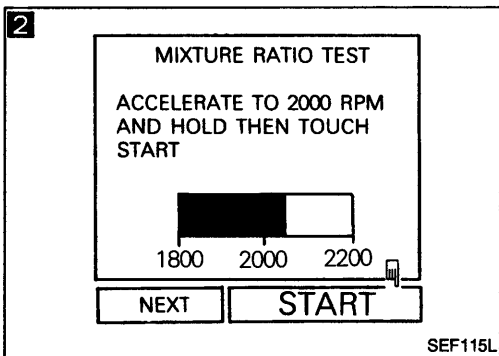
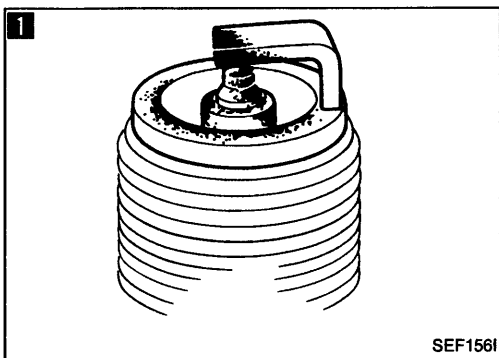
CHECK FOR INTAKE VALVE DEPOSITS.

If there are deposits on intake valves, clean them.

INSPECTION END



Diagnostic Procedure 34 — Symptom — Hesitation under Normal Conditions



GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

FA

RA

BR

ST

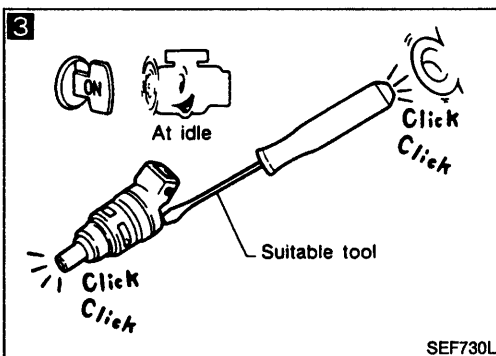
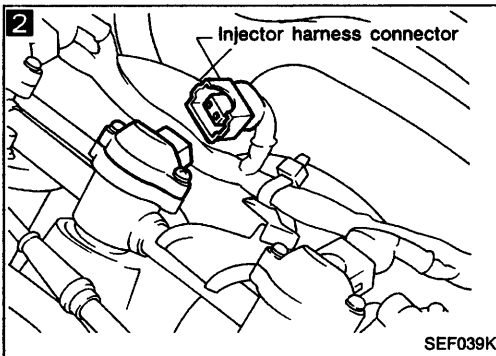
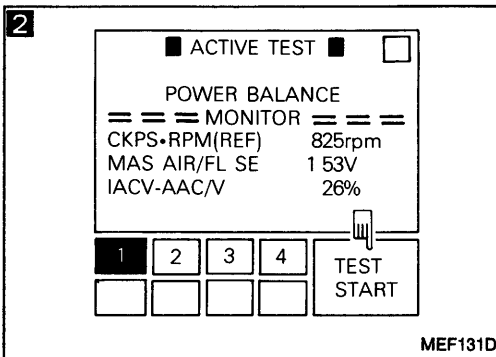
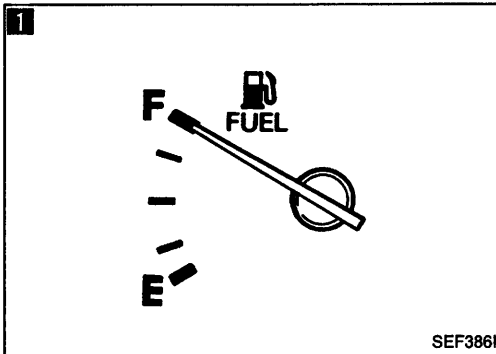
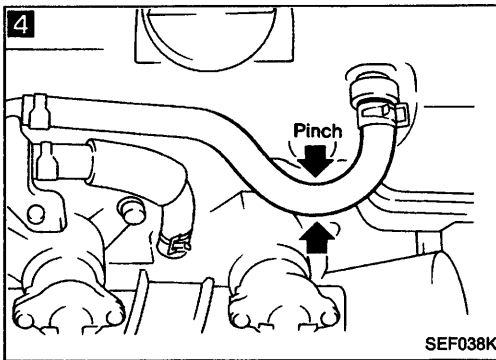
BF

HA

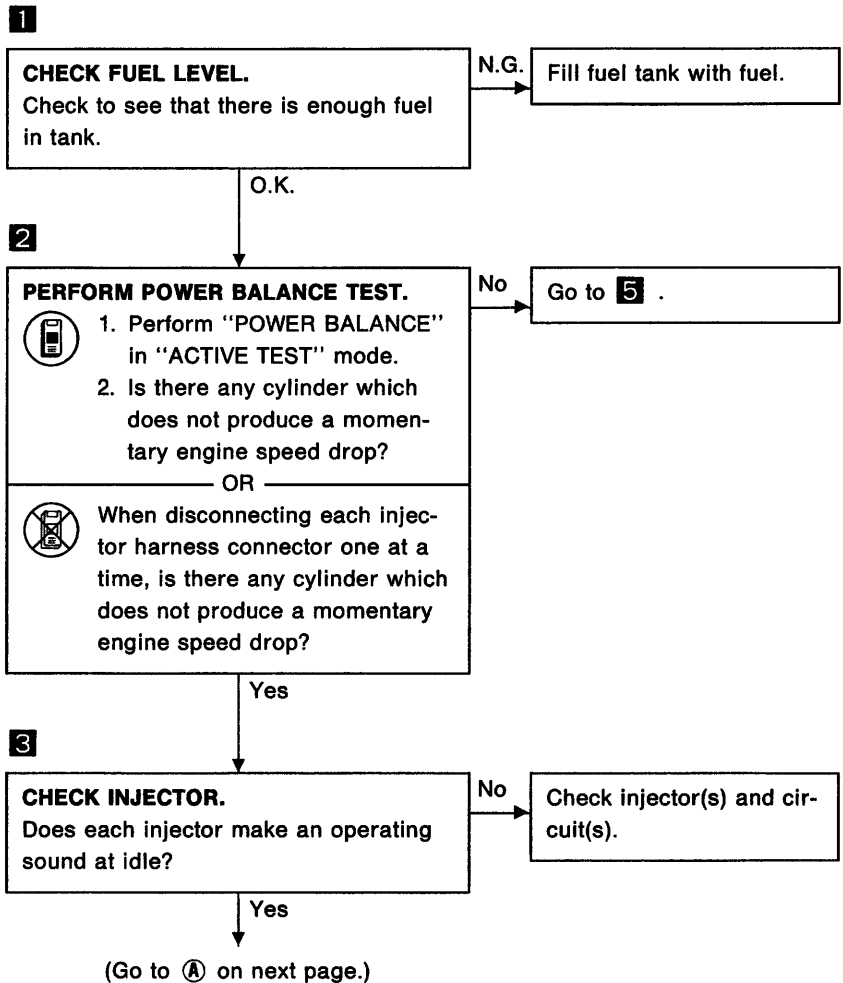
EL

TROUBLE DIAGNOSES

Diagnostic Procedure 34 — Symptom — Hesitation under Normal Conditions (Cont'd)

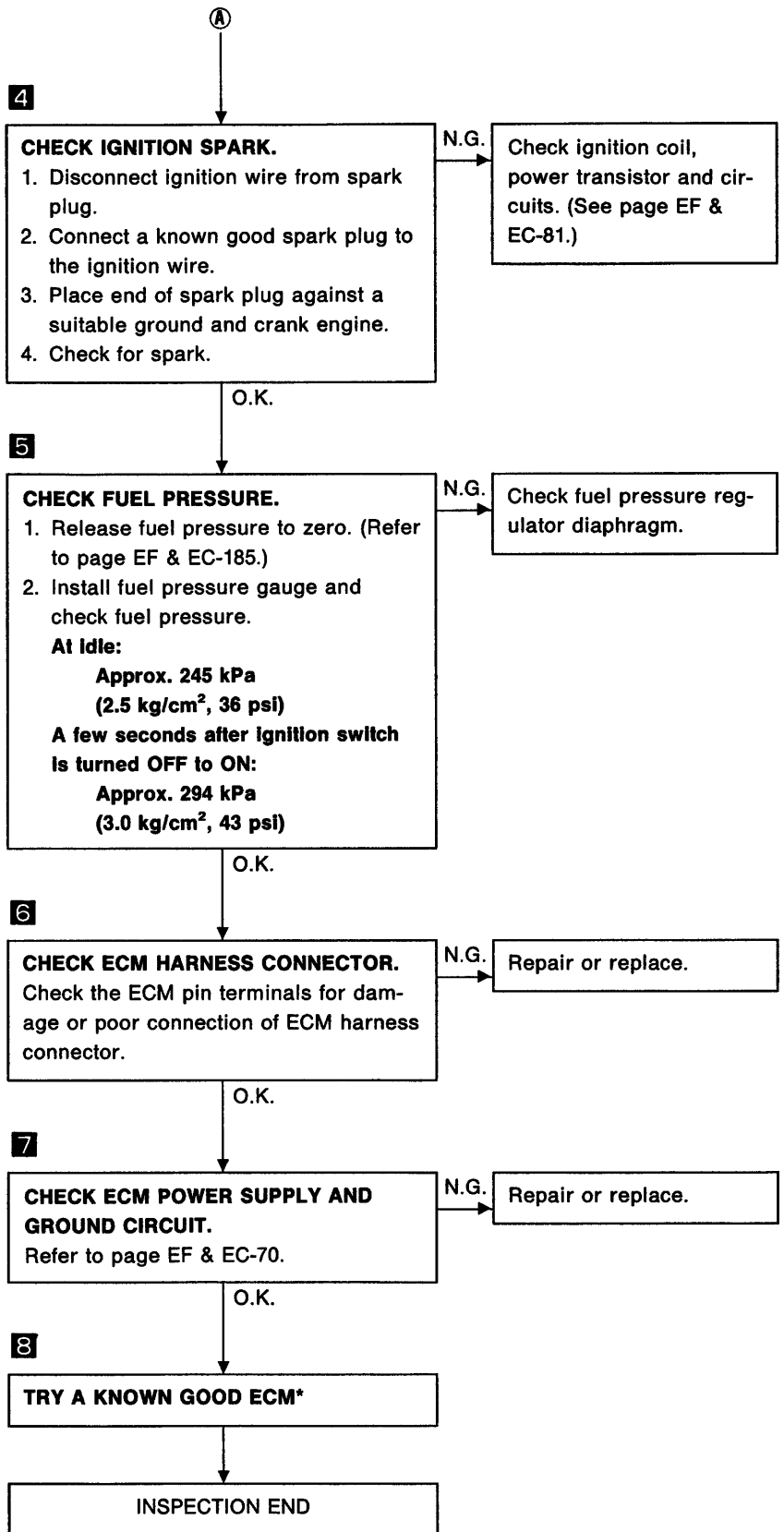
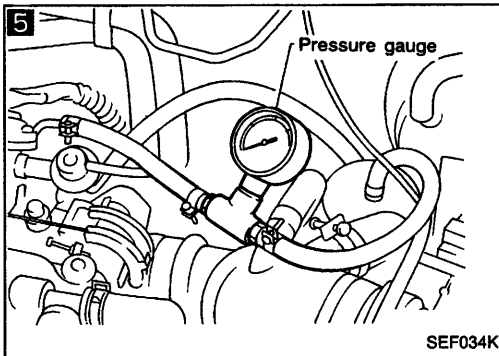
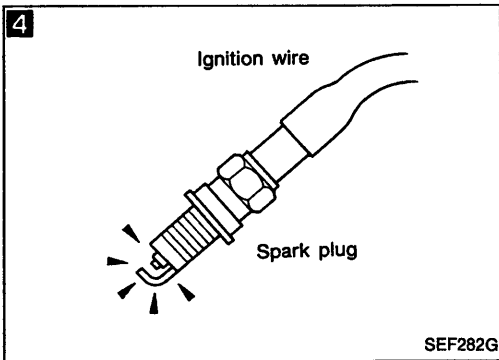


Diagnostic Procedure 35 — Symptom — Engine Stalls when Turning



TROUBLE DIAGNOSES

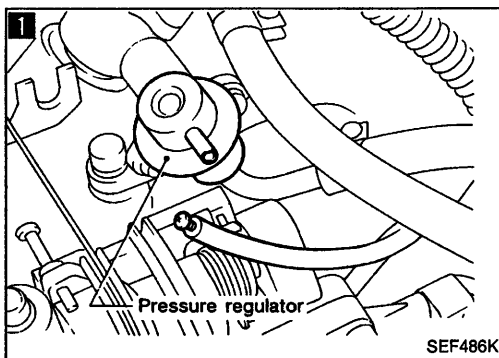
Diagnostic Procedure 35 — Symptom — Engine Stalls when Turning (Cont'd)



GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 36 — Symptom — Engine Stalls when the Engine is Hot



1

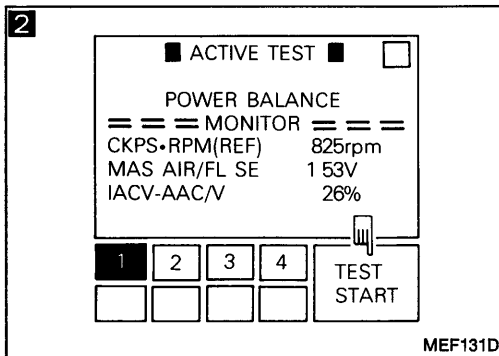
CHECK FUEL VAPOR.

1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Perform cruise test.
3. Does the engine stall disappear?

Yes

Check fuel properties.

No



2

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No

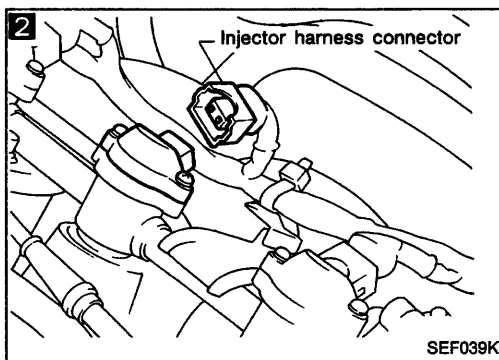
Go to **5**.

OR



When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes



3

CHECK INJECTOR.

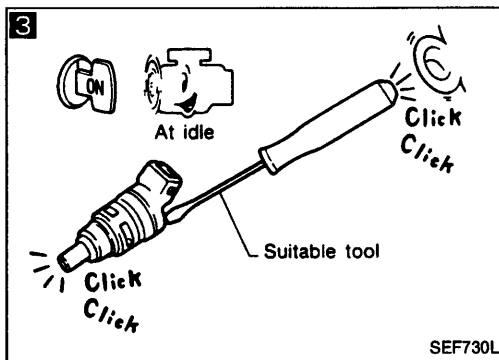
Does each injector make an operating sound at idle?

No

Check injector(s) and circuit(s).

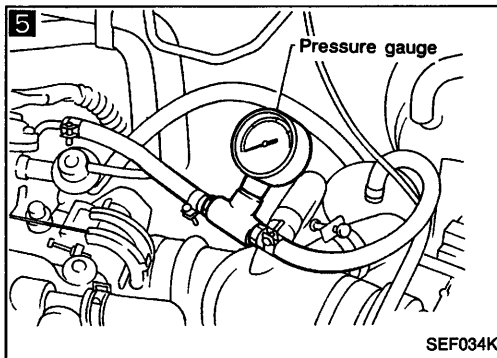
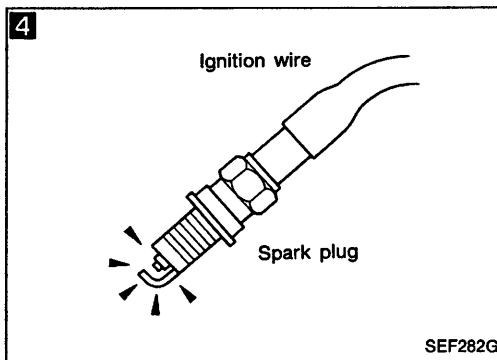
Yes

(Go to **A** on next page.)



TROUBLE DIAGNOSES

Diagnostic Procedure 36 — Symptom — Engine Stalls when the Engine is Hot (Cont'd)



1

CHECK IGNITION SPARK.

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G.

Check ignition coil, power transistor and their circuits. (See page EF & EC-81.)

O.K.

5

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-185.)
2. Install fuel pressure gauge and check fuel pressure.

N.G.

Check fuel pressure regulator diaphragm.

At idle:

Approx. 245 kPa
(2.5 kg/cm², 36 psi)

A few seconds after Ignition switch is turned OFF to ON:

Approx. 294 kPa
(3.0 kg/cm², 43 psi)

O.K.

6

CHECK ECM HARNESS CONNECTOR.

Check the ECM pin terminals for damage or poor connection of ECM harness connector.

N.G.

Repair or replace.

O.K.

7

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.

Refer to page EF & EC-70.

N.G.

Repair or replace.

O.K.

8

TRY A KNOWN GOOD ECM*.

Trouble is fixed.

Replace ECM

Trouble is not fixed.

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.

GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

FA

RA

BR

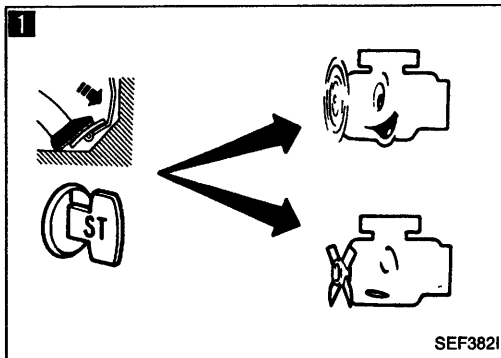
ST

BF

HA

EL

Diagnostic Procedure 37 — Symptom — Engine Stalls when the Engine is Cold



1

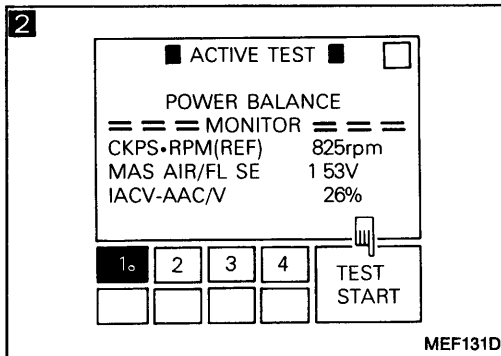
CHECK IACV-AIR REGULATOR AND IACV-AAC VALVE.

When the engine is cold, can you start the engine when pressing accelerator pedal fully?

N.G.

Check IACV-AAC valve, IACV-air regulator and circuits. (See pages EF & EC-116, 118.)

O.K.



2

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

N.G.

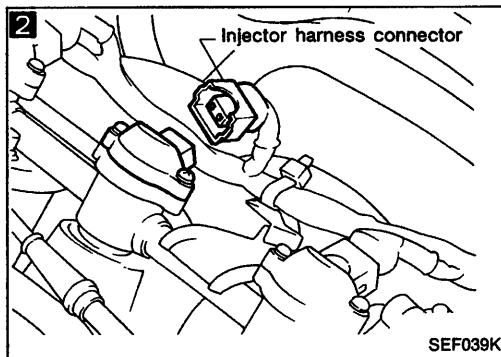
Go to **6**.

OR



When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

O.K.



3

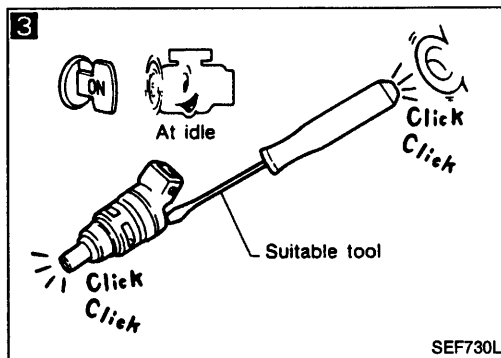
CHECK INJECTOR.

Does each injector make an operating sound at idle?

N.G.

Check injector(s) and circuit(s).

O.K.



4

CHECK IGNITION SPARK.

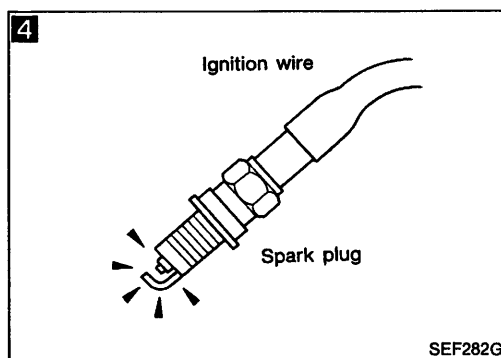
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G.

Check ignition coil, power transistor and circuits. (See page EF & EC-81.)

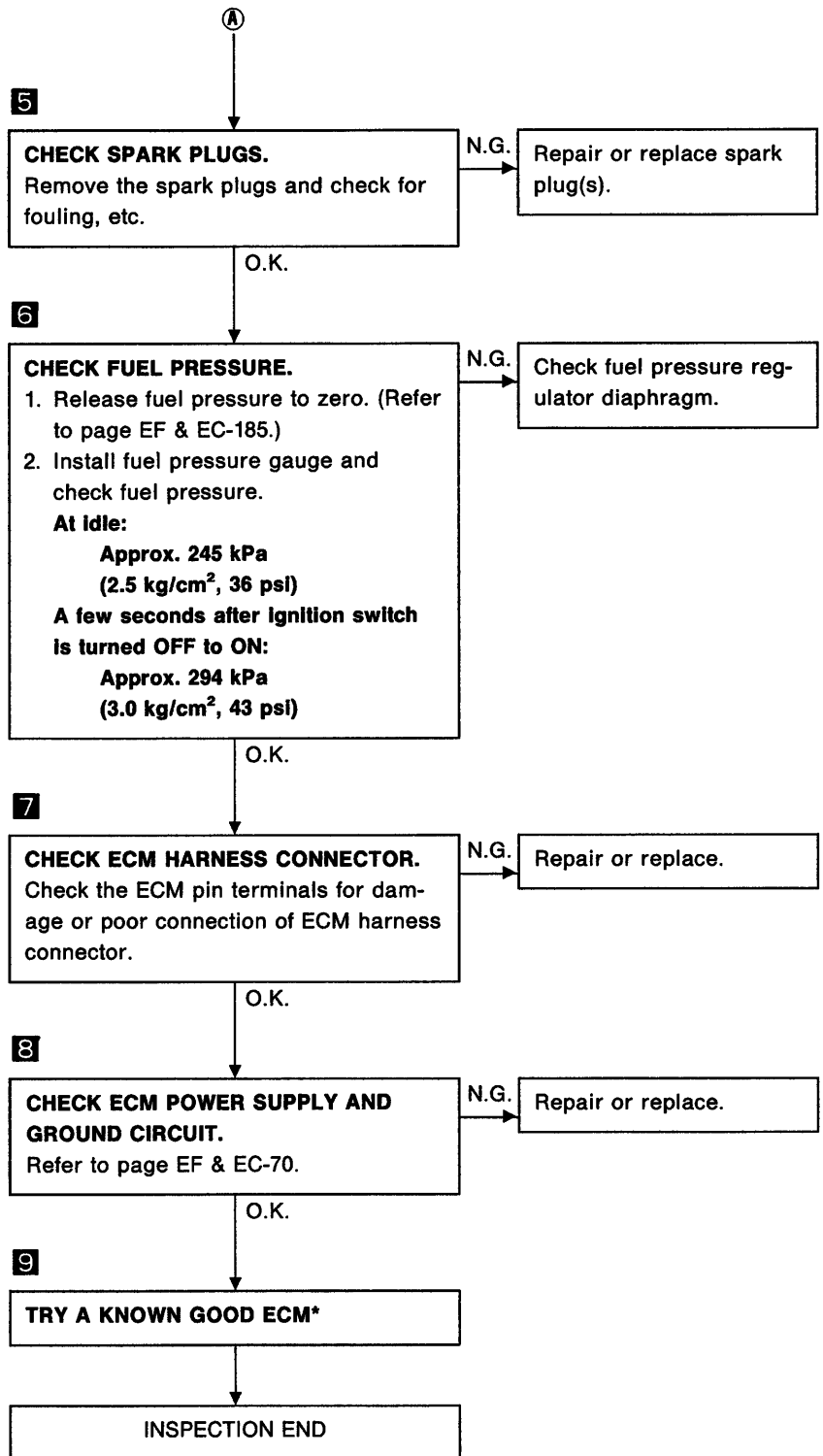
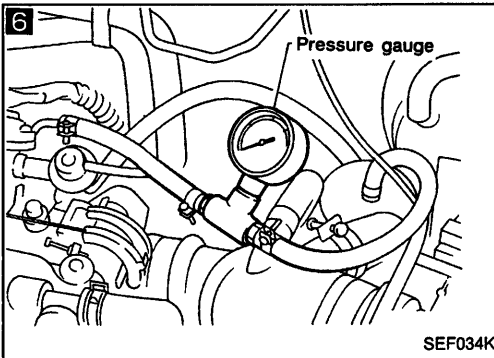
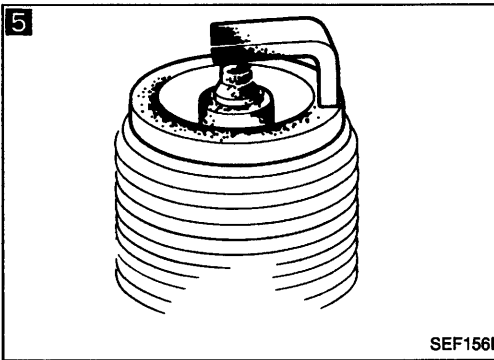
O.K.

(Go to **A** on next page.)



TROUBLE DIAGNOSES

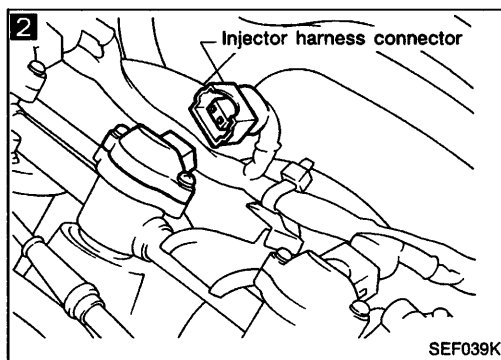
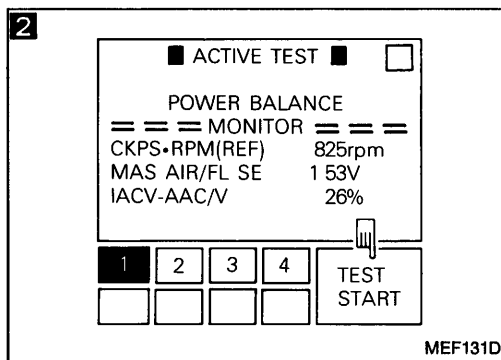
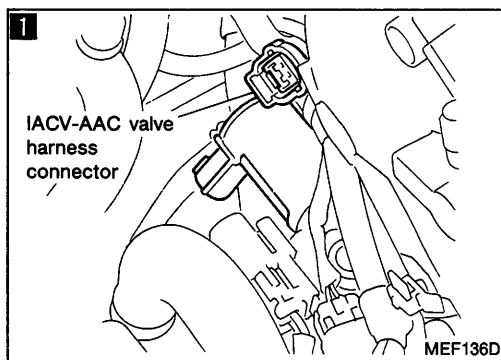
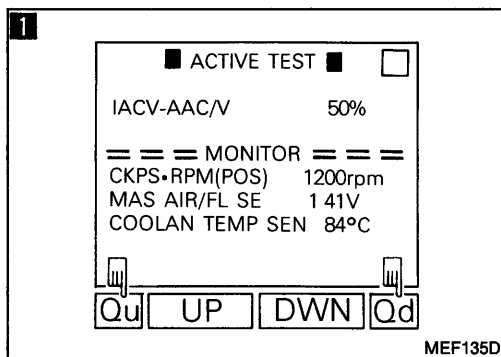
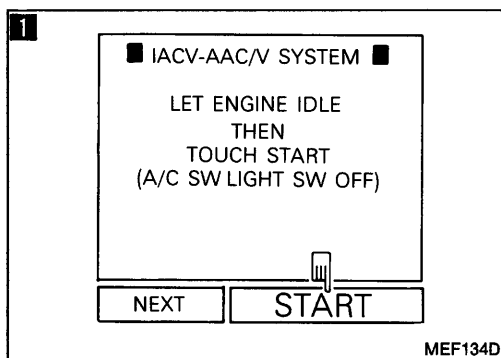
Diagnostic Procedure 37 — Symptom — Engine Stalls when the Engine is Cold (Cont'd)



*: ECM may be the cause of a problem, but this is rarely the case.

GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

Diagnostic Procedure 38 — Symptom — Engine Stalls when Stepping on the Accelerator Momentarily



1

CHECK IACV-AAC VALVE.

1. Start engine and warm it up sufficiently.

2. Perform "IACV-AAC VALVE SYSTEM" in "FUNCTION TEST" mode.

OR

1. Select "IACV-AAC VALVE OPENING" in "ACTIVE TEST" mode.

2. When touching "Qu" and "Qd", does the engine speed change according to the percent of IACV-AAC valve opening?

OR

When disconnecting IACV-AAC valve harness connector, does the engine speed drop?

No → Check IACV-AAC valve and circuit. (See page EF & EC-118.)

2

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.

2. Is there any cylinder which does not produce a momentary engine speed drop?

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **5**.

3

CHECK INJECTOR.

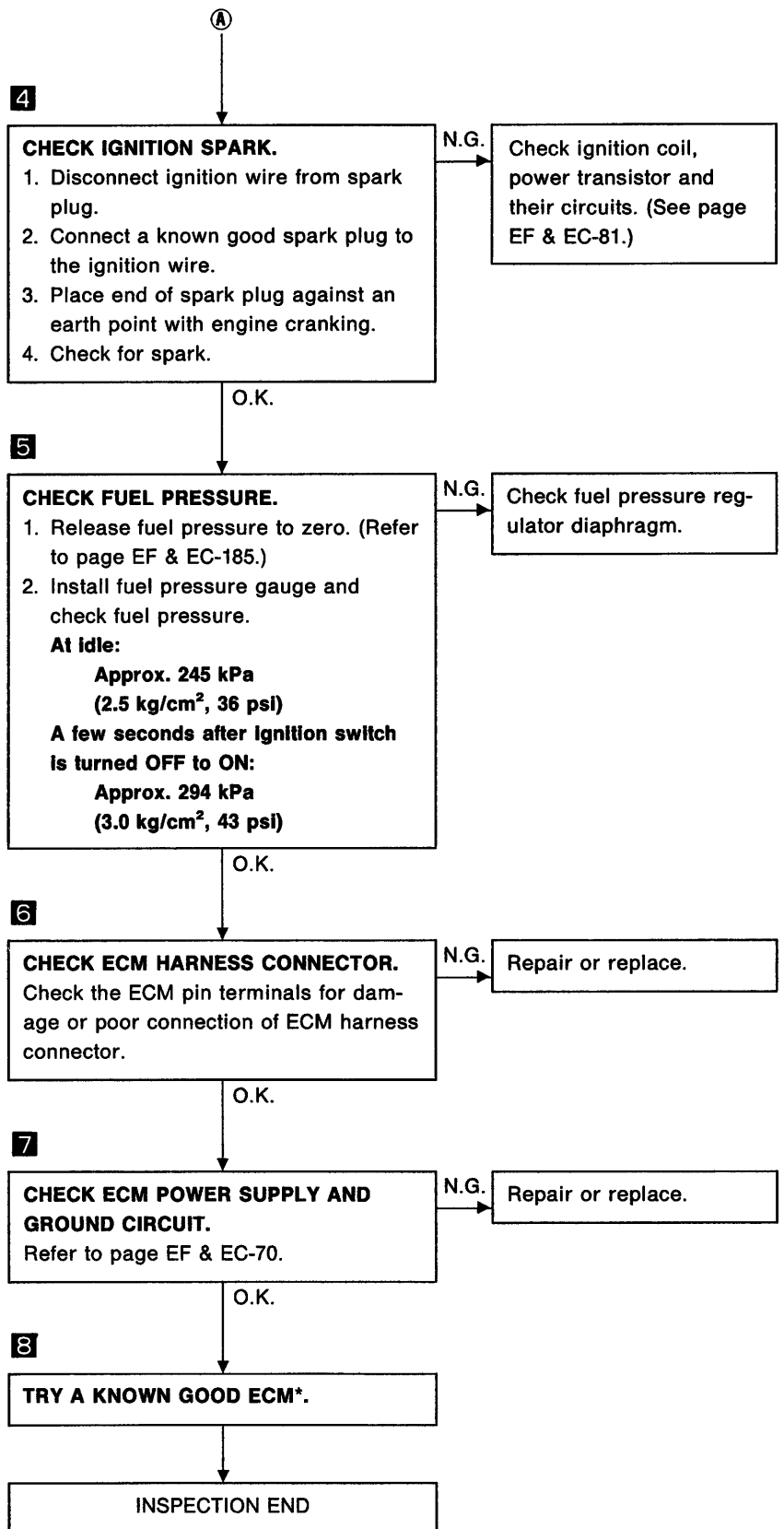
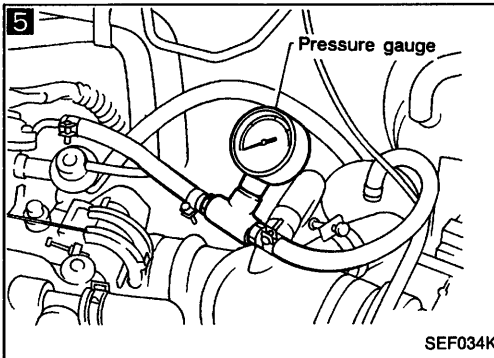
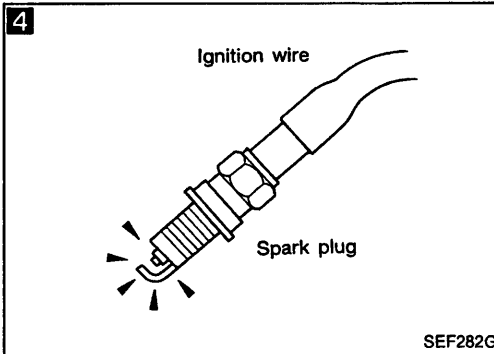
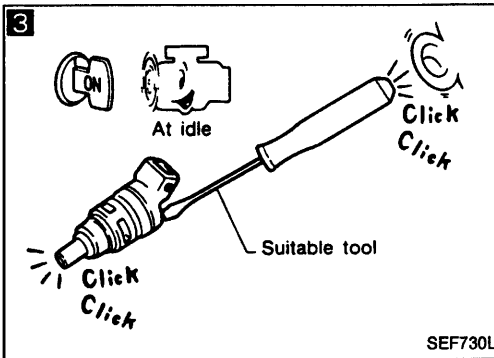
Does each injector make an operating sound at idle?

No → Check injector(s) and their circuit(s).

Yes
(Go to **A** on next page.)

TROUBLE DIAGNOSES

Diagnostic Procedure 38 — Symptom — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)



GI

MA

EM

LC

EF & EC

FE

CL

MT

AT

FA

RA

BR

ST

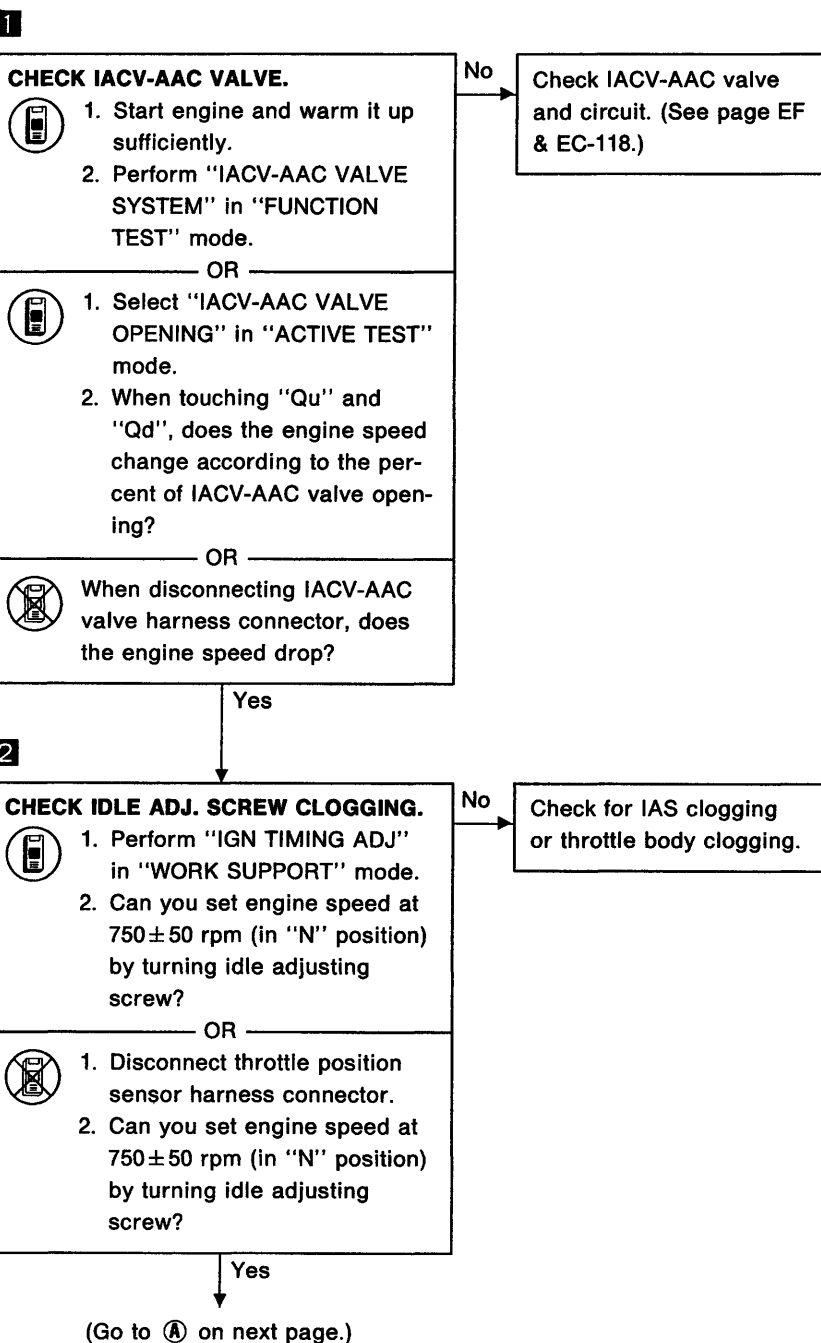
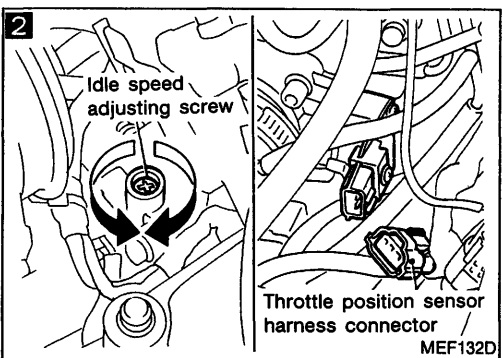
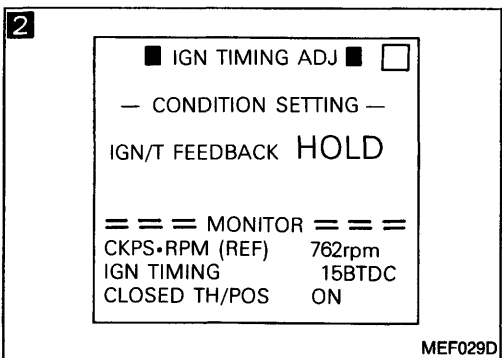
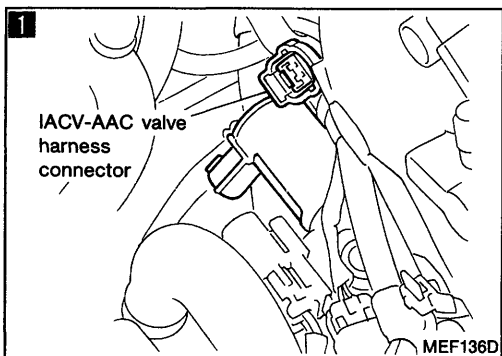
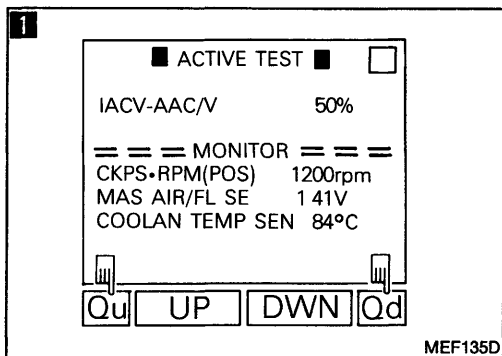
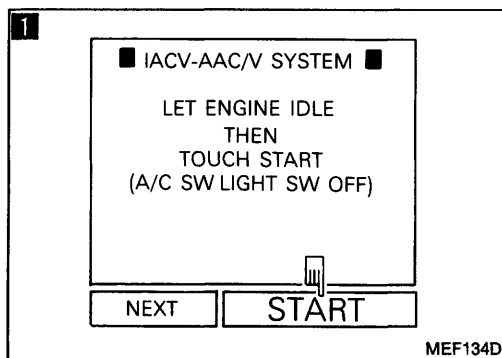
BF

HA

EL

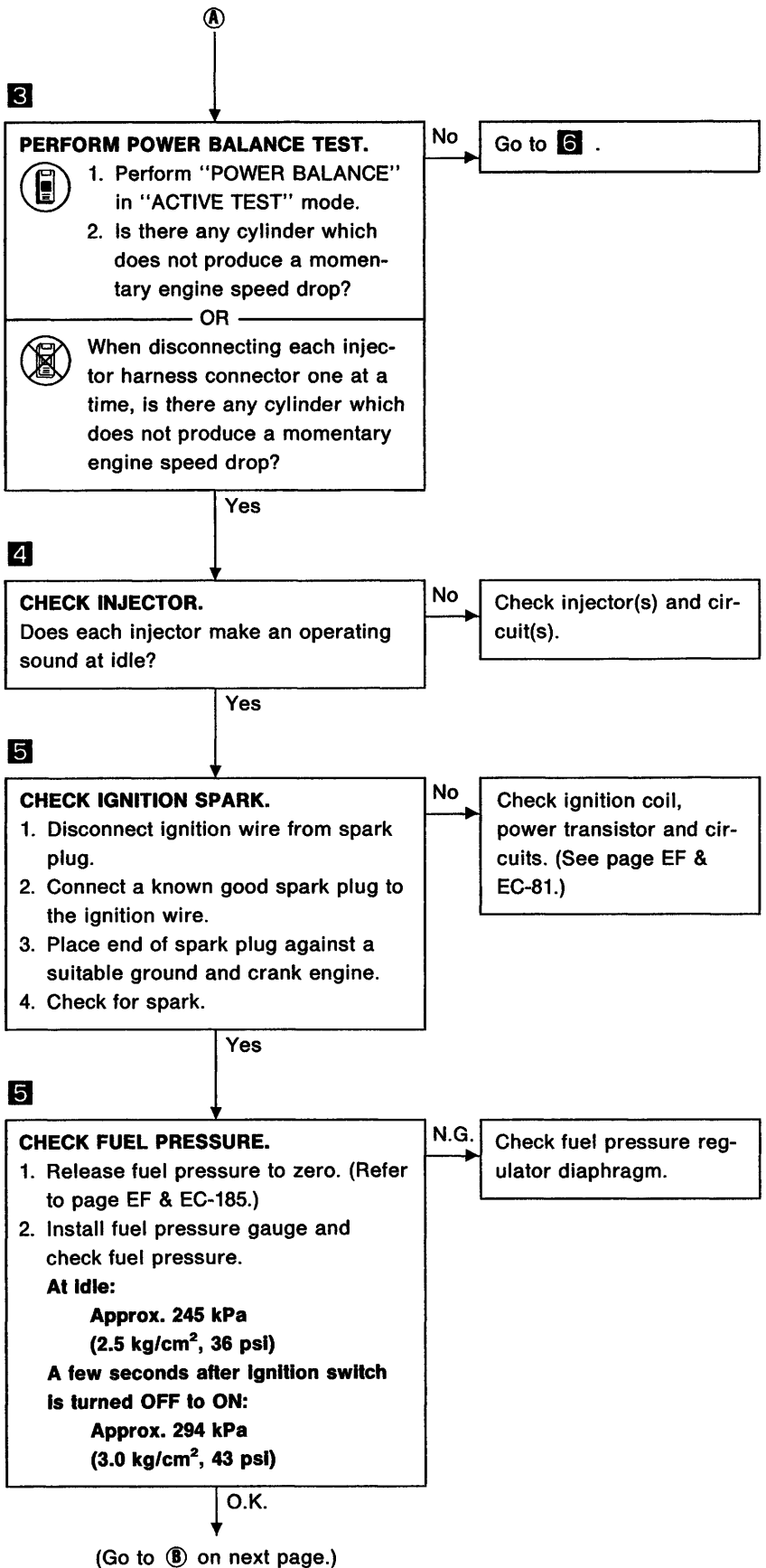
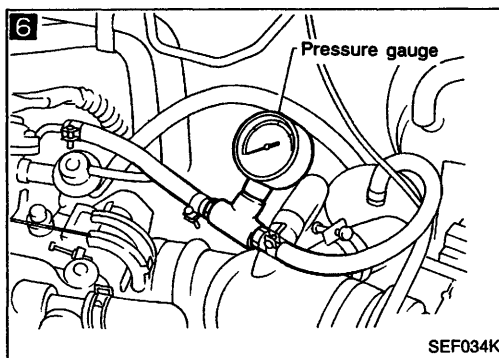
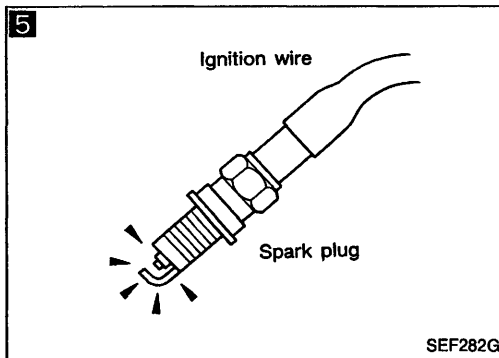
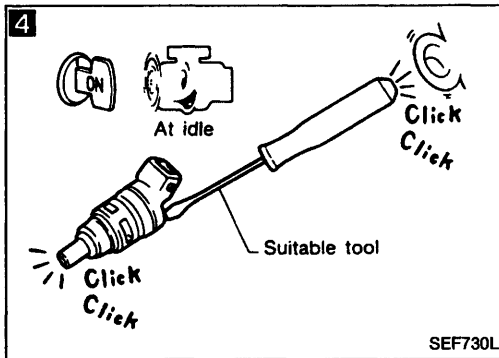
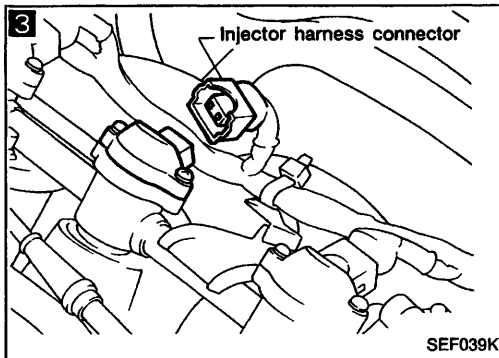
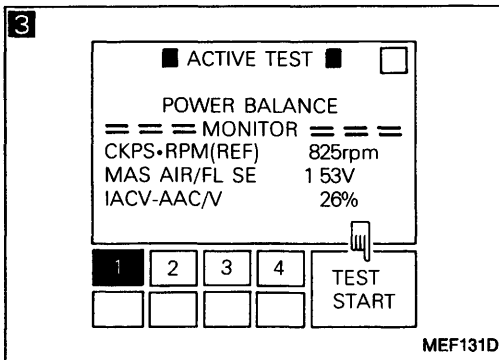
*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 39 — Symptom — Engine Stalls after Decelerating



TROUBLE DIAGNOSES

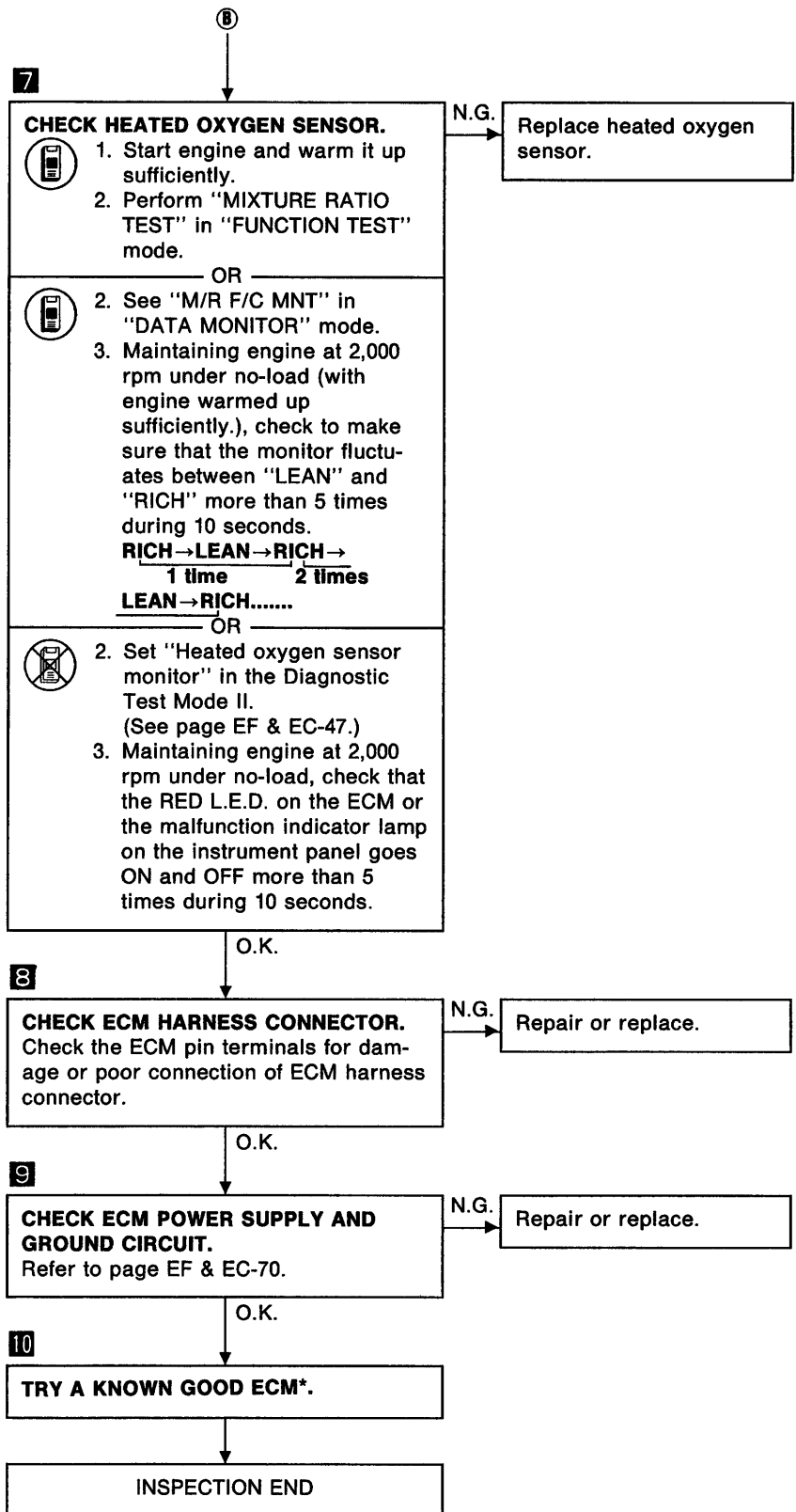
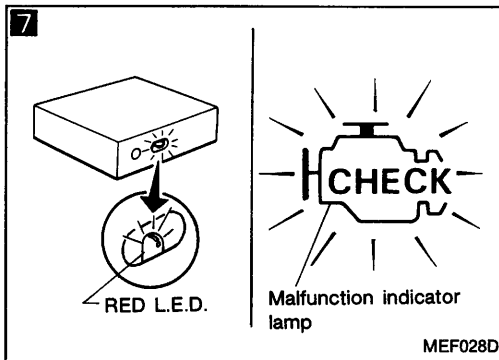
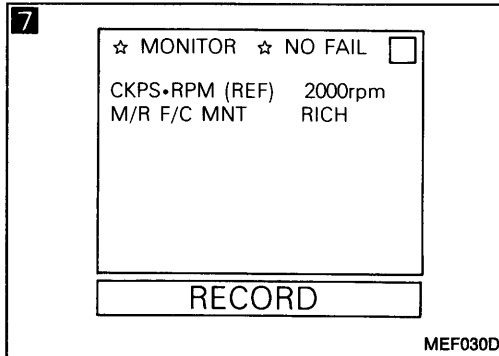
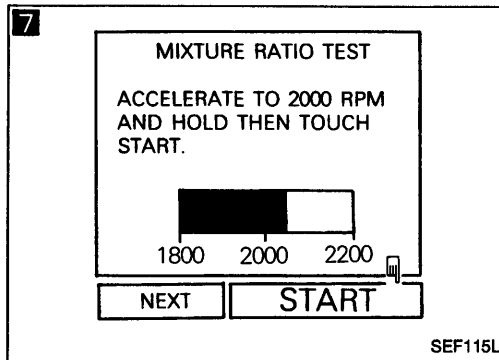
Diagnostic Procedure 39 — Symptom — Engine Stalls after Decelerating (Cont'd)



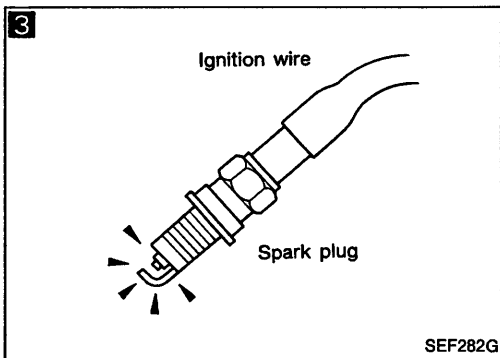
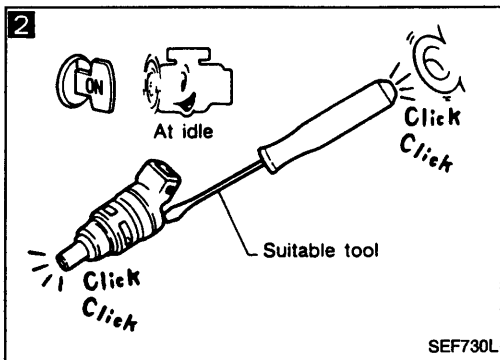
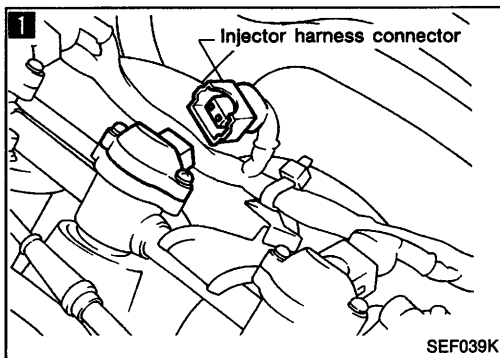
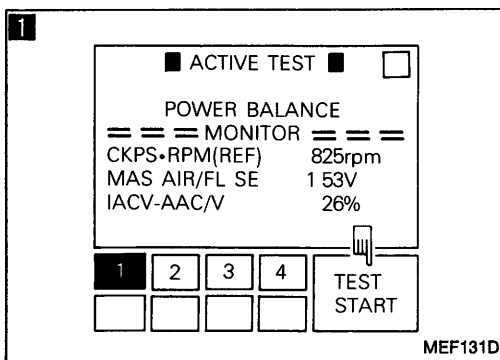
GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

TROUBLE DIAGNOSES

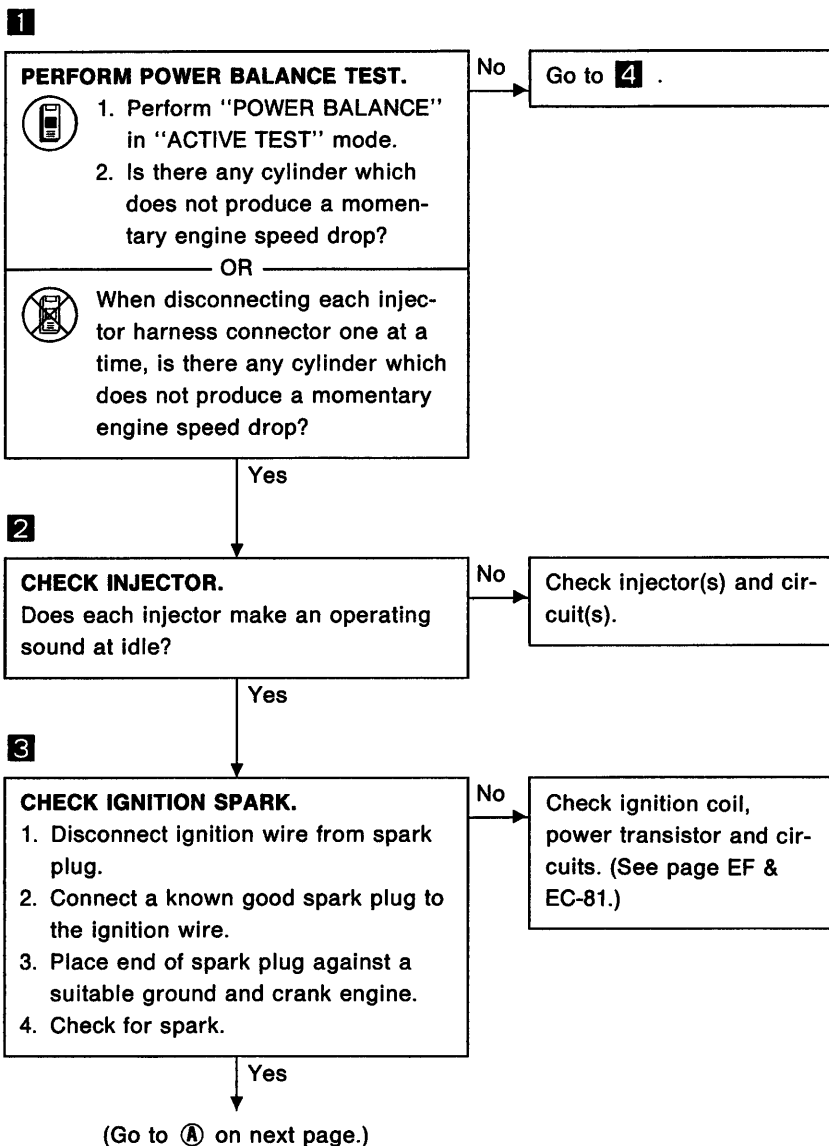
Diagnostic Procedure 39 — Symptom — Engine Stalls after Decelerating (Cont'd)



*: ECM may be the cause of a problem, but this is rarely the case.



Diagnostic Procedure 40 — Symptom — Engine Stalls when Accelerating or when Driving at Constant Speed



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

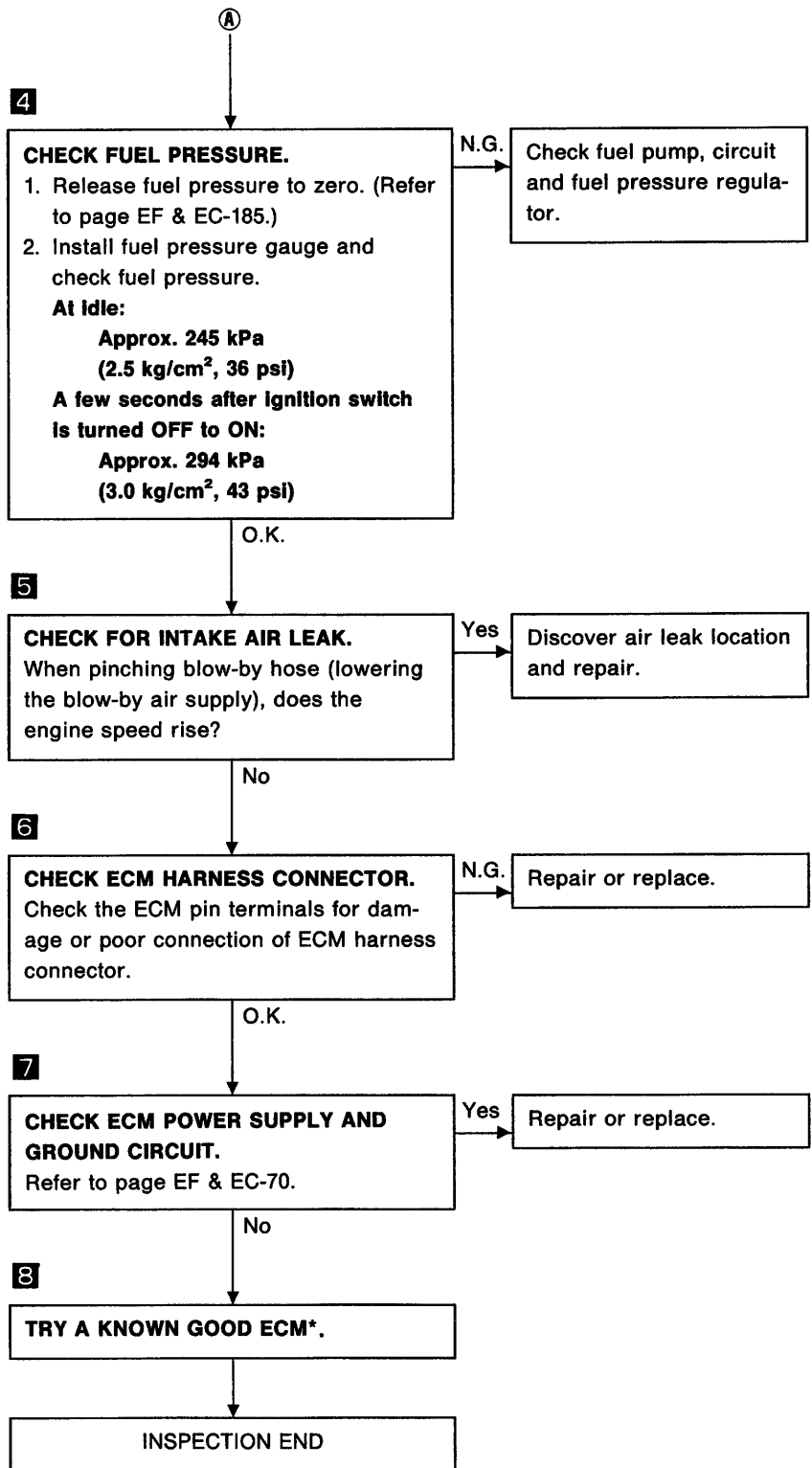
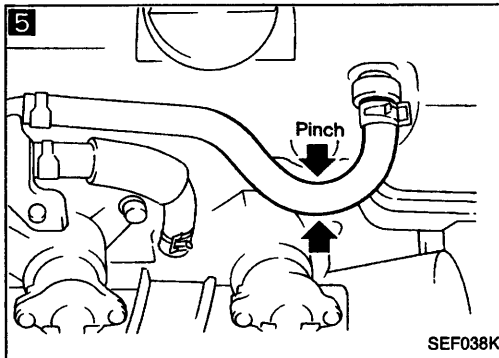
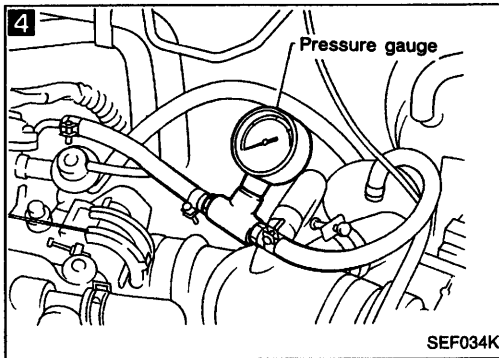
BF

HA

EL

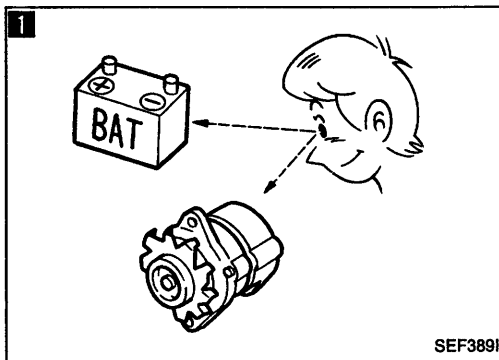
TROUBLE DIAGNOSES

Diagnostic Procedure 40 — Symptom — Engine Stalls when Accelerating or when Driving at Constant Speed (Cont'd)



*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 41 — Symptom — Engine Stalls when the Electrical Load is Heavy



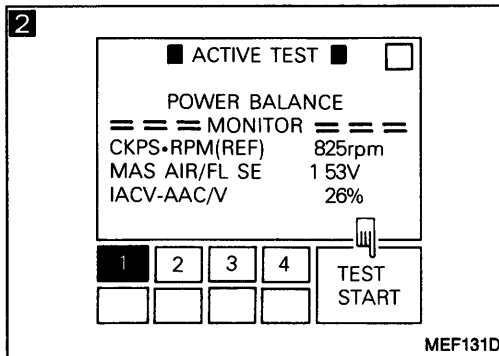
1

CHECK BATTERY AND ALTERNATOR.
Check battery and alternator condition.
(Refer to EL section.)

N.G. Repair or replace.

O.K.

2



PERFORM POWER BALANCE TEST.



1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No Go to 5.

OR



When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes

3

CHECK INJECTOR.
Does each injector make an operating sound at idle?

No Check injector(s) and circuit(s).

Yes

4

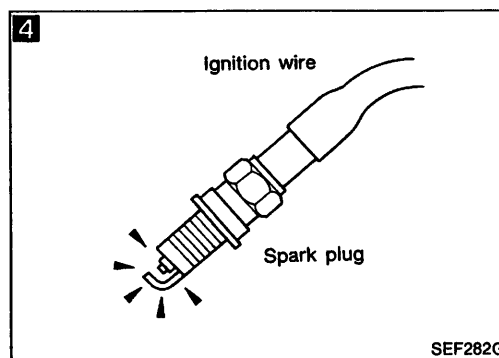
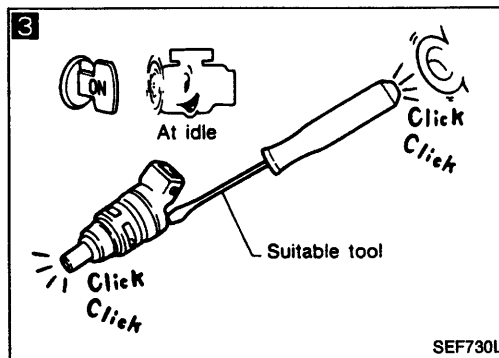
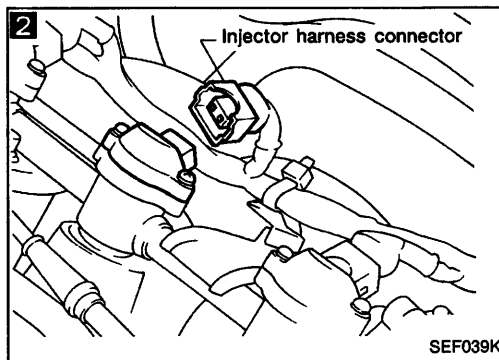
CHECK IGNITION SPARK.

1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. Check ignition coil, power transistor and circuits. (See page EF & EC-81.)

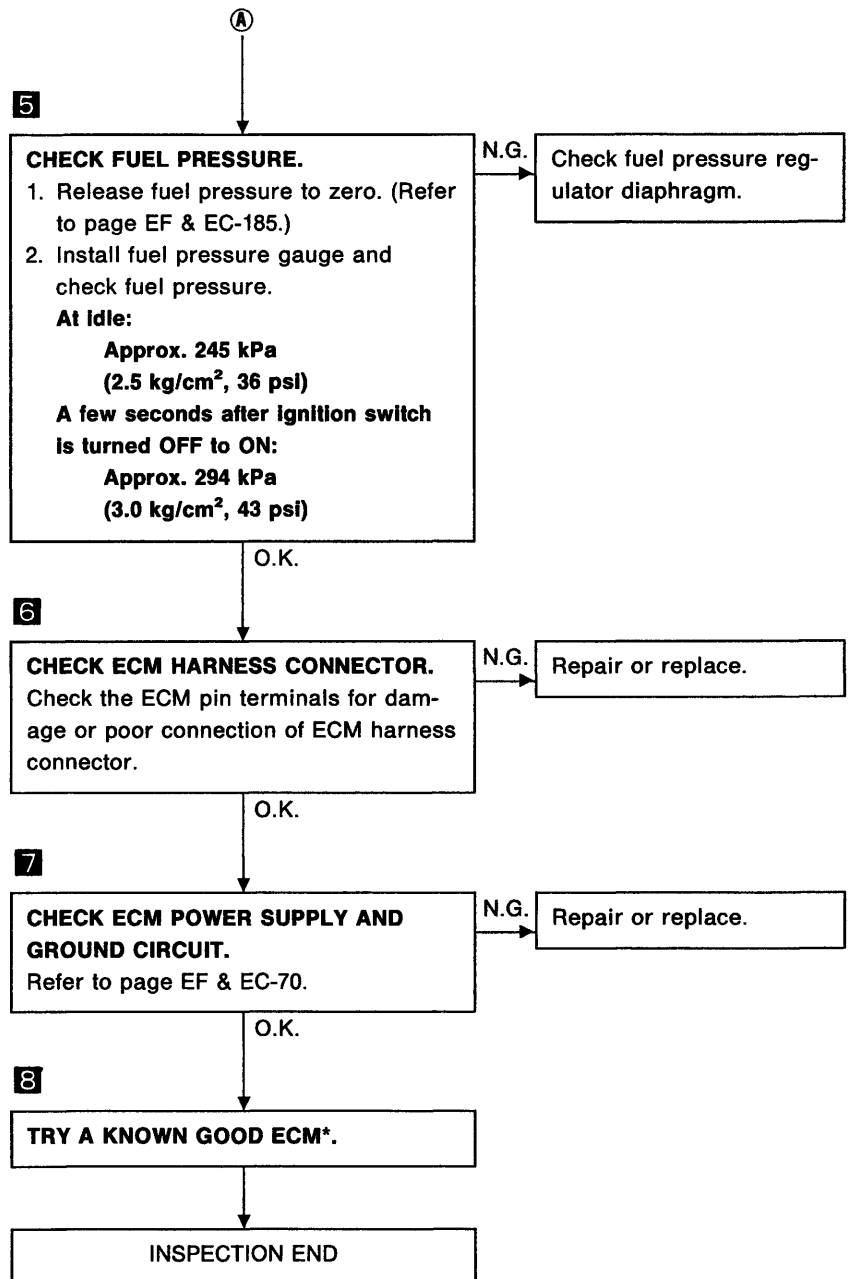
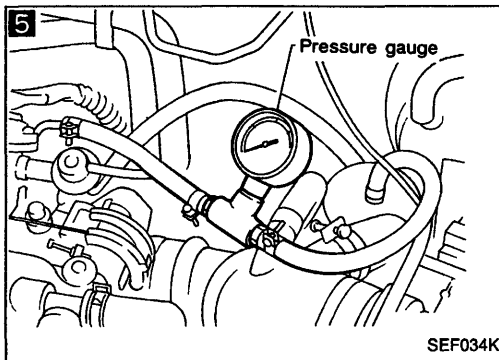
O.K.

(Go to A on next page.)

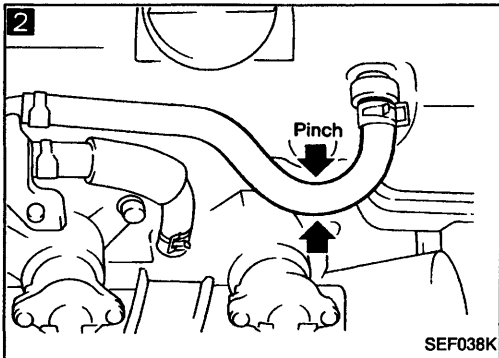
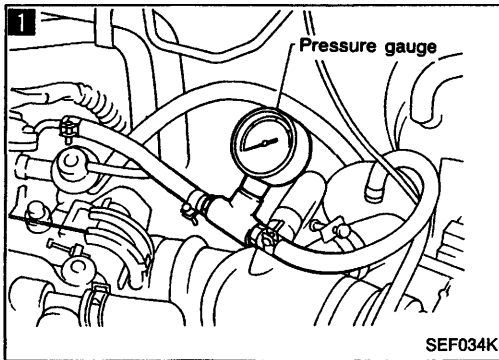


TROUBLE DIAGNOSES

Diagnostic Procedure 41 — Symptom — Engine Stalls when the Electrical Load is Heavy (Cont'd)



*: ECM may be the cause of a problem, but this is rarely the case.



Diagnostic Procedure 42 — Symptom — Lack of Power and Stumble

1

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero. (Refer to page EF & EC-185.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:

**Approx. 245 kPa
(2.5 kg/cm², 36 psi)**

**A few seconds after Ignition switch
is turned OFF to ON:**

**Approx. 294 kPa
(3.0 kg/cm², 43 psi)**

N.G.

Check fuel pressure regulator diaphragm.

O.K.

2

CHECK FOR INTAKE AIR LEAK.

When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes

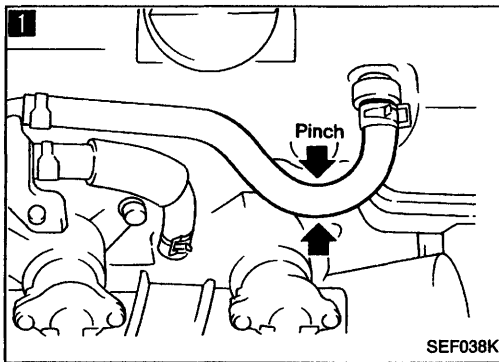
Discover air leak location and repair.

No

INSPECTION END

GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

Diagnostic Procedure 43 — Symptom — Knock



1

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes

Discover air leak location and repair.

No

2

CHECK EGR OPERATION.
1. Apply vacuum directly to the EGR valve using a handy vacuum pump.
2. Check to see that the engine runs rough or dies.

No

Check EGR valve for sticking.

Yes

3

CHECK EGR & CANISTER CONTROL SOLENOID VALVE.



1. Start engine and warm it up sufficiently.
2. Perform "EGRC SOL/V" in "FUNCTION TEST" mode.

OR



1. Turn ignition switch "ON"
2. Select "EGRC SOL/V" in "ACTIVE TEST" mode.
3. Turn EGR & canister control solenoid valve ON and OFF.
4. Check operating sound.

OR



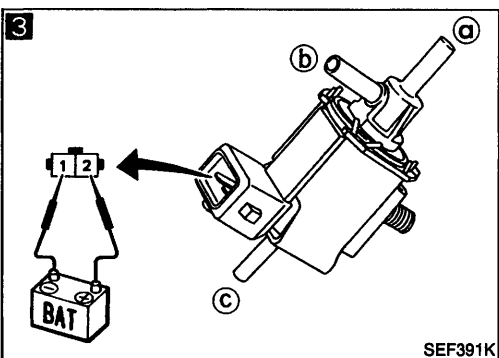
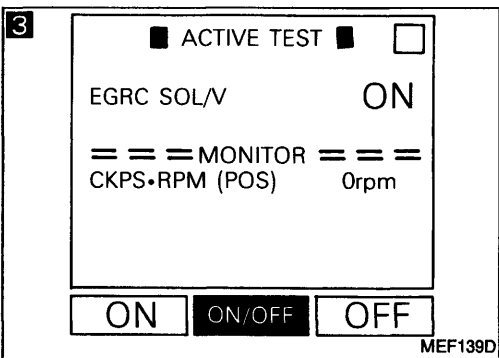
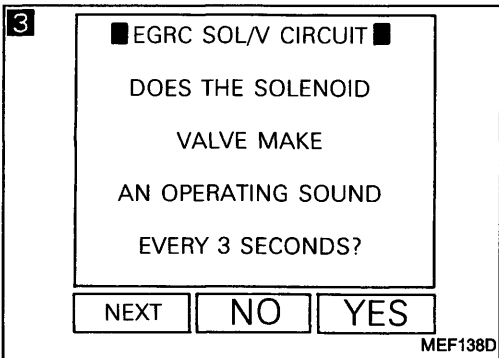
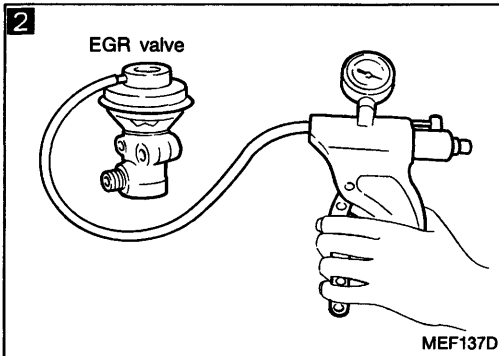
1. Disconnect EGR & canister control solenoid valve harness connector.
2. Supply EGR & canister control solenoid valve terminals with battery current and check operating sound.

N.G.

Check solenoid valve and circuit.

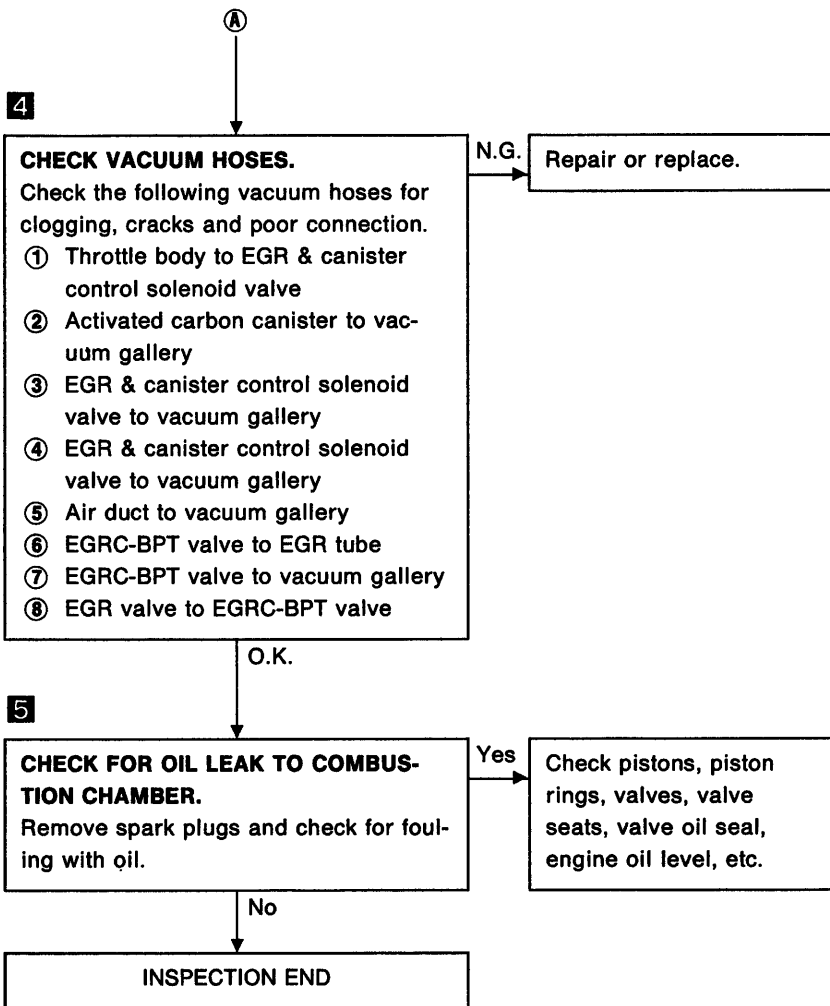
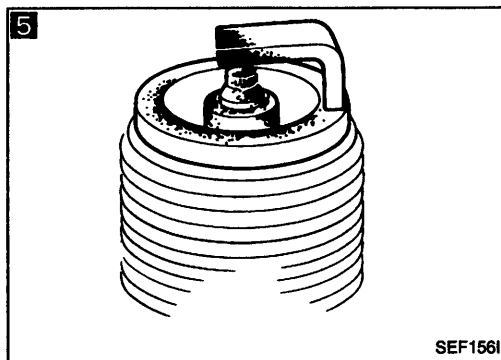
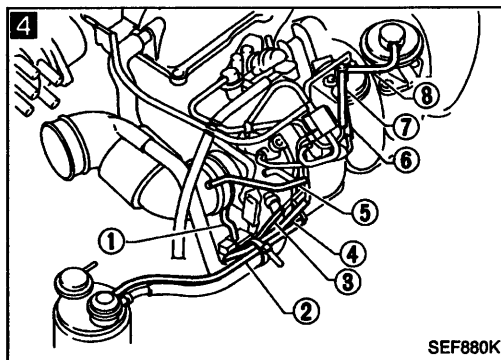
O.K.

(Go to **A** on next page.)



TROUBLE DIAGNOSES

Diagnostic Procedure 43 — Symptom — Knock (Cont'd)



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

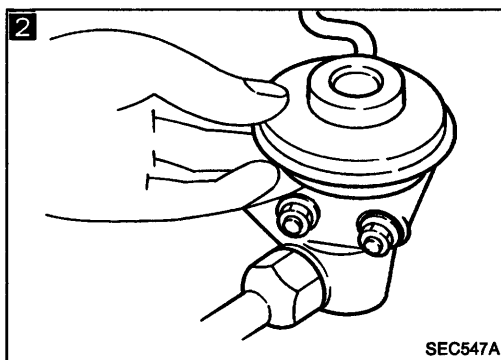
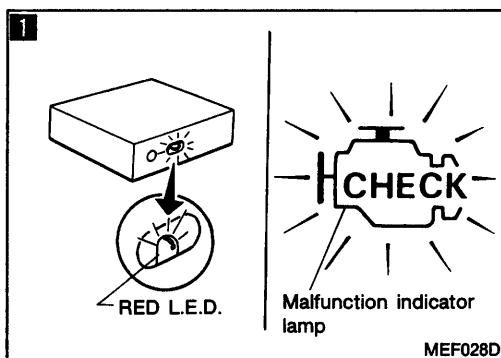
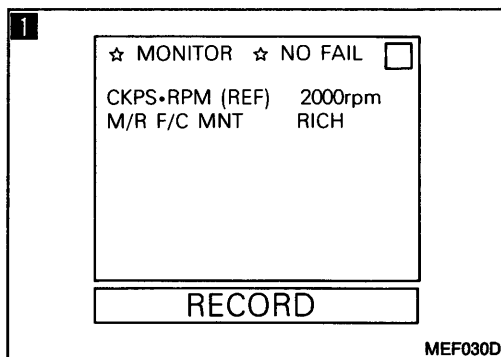
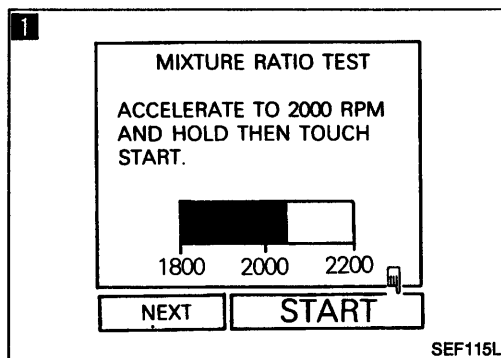
ST

BF

HA

EL

Diagnostic Procedure 44 — Symptom — Surge



1 CHECK HEATED OXYGEN SENSOR.



1. Start engine and warm it up sufficiently.
2. Perform "MIXTURE RATIO TEST" in "FUNCTION TEST" mode.

OR



2. See "M/R F/C MNT" in "DATA MONITOR" mode.
3. Maintaining engine at 2,000 rpm under no-load (with engine warmed up sufficiently.), check to make sure that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.

RICH→LEAN→RICH→

1 time 2 times

LEAN→RICH.....

OR



2. Set "Heated oxygen sensor monitor" in the Diagnostic Test Mode II.
(See page EF & EC-47.)
3. Maintaining engine at 2,000 rpm under no-load, check that the RED L.E.D. on the ECM or the malfunction indicator lamp on the instrument panel goes ON and OFF more than 5 times during 10 seconds.

N.G.

Replace heated oxygen sensor.

O.K.

2

CHECK EGR VALVE.

Check EGR valve for sticking.

N.G.

Repair or replace.

O.K.

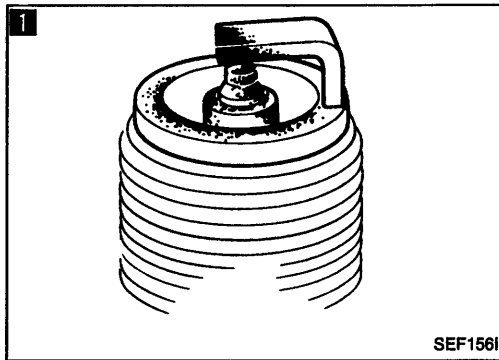
3

TRY A KNOWN GOOD ECM*.

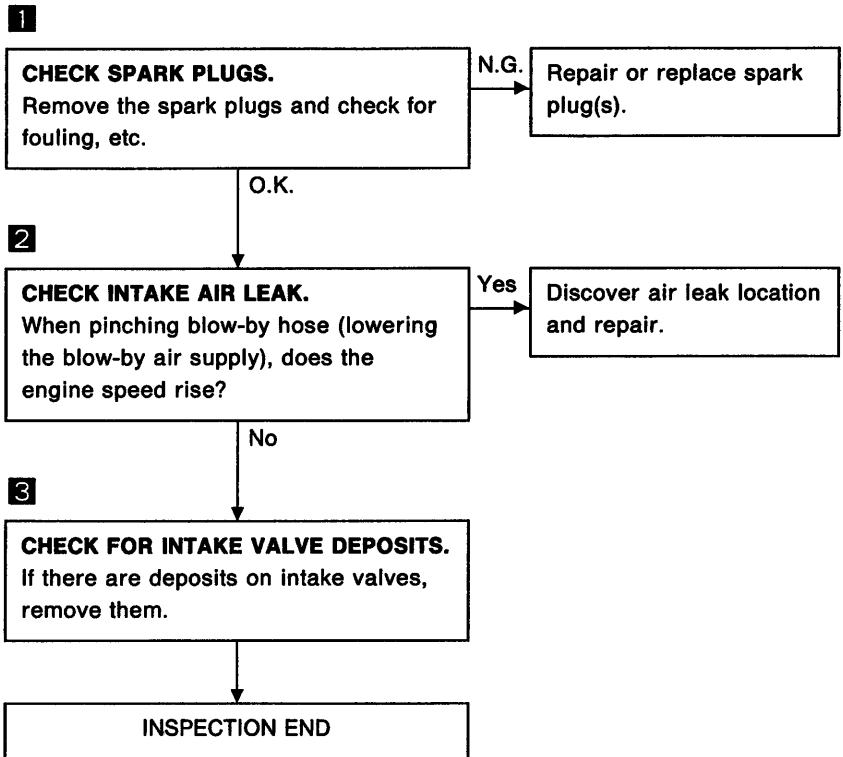
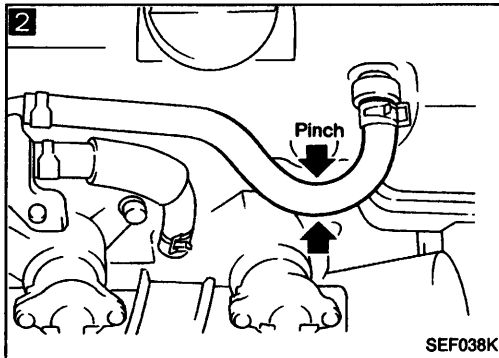
INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.

TROUBLE DIAGNOSES

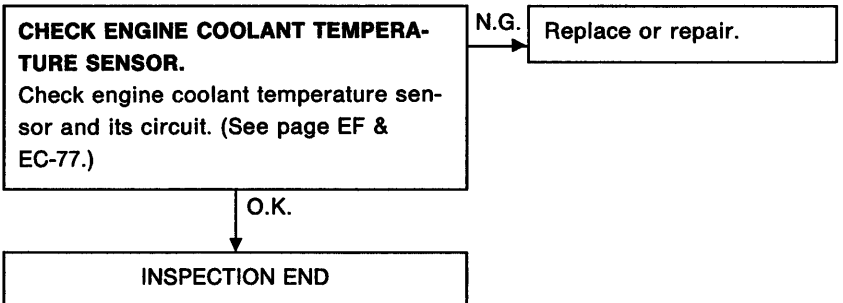


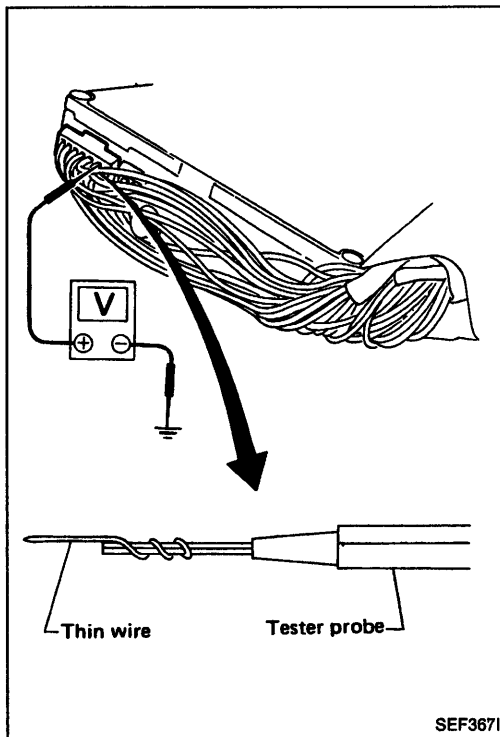
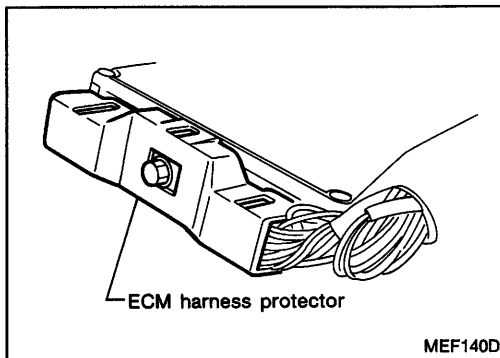
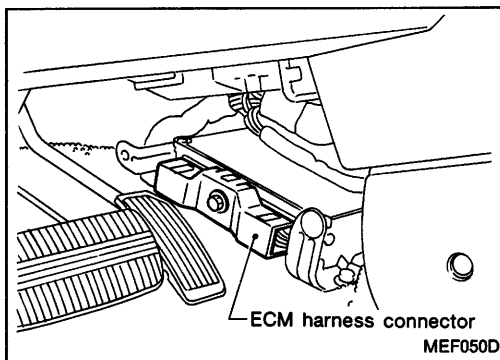
Diagnostic Procedure 45 — Symptom — Backfire through the Intake



GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

Diagnostic Procedure 46 — Symptom — Backfire through the Exhaust





Electrical Components Inspection

ECM INPUT/OUTPUT SIGNAL INSPECTION

1. ECM is located behind the center console panel. For this inspection, remove the center console under cover.
2. Remove ECM harness protector.
3. Perform all voltage measurements with the connectors connected. Extend tester probe as shown to perform tests easily.

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

ECM inspection table

*Data are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA	
1	Ignition signal	Engine is running. └ Idle speed	0.3 - 0.5V	GI MA
		Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.7V	EM
3	Ignition check	Engine is running. └ Idle speed	Approximately 12V	LC
4	ECCS relay (Self-shutoff)	Engine is running. └ Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF".	0 - 1V	EF & EC FE
		Ignition switch "OFF" └ A few seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)	CL
8	EGR temperature sensor	Engine is running. (Warm-up condition) └ Idle speed	Less than 4.5V	MT AT
		Engine is running. (Warm-up condition) └ EGR system is operating.	0 - 1.0V	FA
9 10	Radiator fan relay (Low) Radiator fan relay (High)	Engine is running. └ Radiator fan is not operating.	BATTERY VOLTAGE (11 - 14V)	RA
		Engine is running. └ Radiator fan is operating.	0.6 - 0.8V	BR
11	Air conditioner relay	Engine is running. └ Both A/C switch and blower switch are "ON".	0.6 - 0.8V	ST
		Engine is running. └ A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)	BF
16	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	1.3 - 1.7V	HA
		Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	1.7 - 2.1V	EL

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

*Data are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
18	Engine coolant temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine coolant temperature.
19	Heated oxygen sensor	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm.	0 - Approximately 1.0V
20	Throttle position sensor	Ignition switch "ON" └ Accelerator pedal released	0.45 - 0.55V
		Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
22 30	Crankshaft position sensor (Reference signal)	Engine is running. └ Do not run engine at high speed under no-load.	0.2 - 0.5V
27	Knock sensor	Engine is running. └ Idle speed	2.0 - 3.0V
31 40	Crankshaft position sensor (Position signal)	Engine is running. └ Do not run engine at high speed under no-load.	2.0 - 3.0V
34	Start signal	Ignition switch "ON"	Approximately 0V
		Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
35	Neutral position switch (M/T models) Inhibitor switch (A/T models)	Ignition switch "ON" └ Gear position is "Neutral position" (M/T models) └ Gear position is "N" or "P" (A/T models)	0V
		Ignition switch "ON" └ Except the above gear position	BATTERY VOLTAGE (11 - 14V)
36	Ignition switch	Ignition switch "OFF"	0V
		Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
37	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
38 47	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

*Data are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA	
41	Air conditioner switch	Engine is running. └ Both air conditioner switch and blower switch are "ON".	Approximately 0V	GI
		Engine is running. └ Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)	MA EM
43	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned.	0V	LC
		Engine is running. └ Steering wheel is not being turned.	7 - 10V	EF & EC FE
46	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)	
101	Injector No. 1	Engine is running	BATTERY VOLTAGE (11 - 14V)	CL
103	Injector No. 3			
110	Injector No. 2			MT
112	Injector No. 4			
102	PAIRC-solenoid valve	Engine is running. (Warm-up condition) └ Idle speed.	0.6 - 0.8V	AT
		Engine is running. (Warm-up condition) └ Accelerator pedal is depressed.	BATTERY VOLTAGE	FA RA
104	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V	BR
		Ignition switch "ON" └ 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)	ST BF
105	EGR & canister control solenoid valve	Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)	HA
		Engine is running. (Warm-up condition) └ Engine speed is 4,000 rpm.	0.6 - 0.8V	EL

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

*Data are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
111	Heated oxygen sensor heater	Engine is running. └ Engine speed is below 3,200 rpm.	0V
		Engine is running. └ Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)
113	IACV-AAC valve	Engine is running. └ Idle speed	9 - 14V
		Engine is running. └ Steering wheel is being turned. └ Air conditioner is operating. └ Rear defogger is "ON". └ Headlamp are in high position.	5 - 9V

ECM HARNESS CONNECTOR TERMINAL LAYOUT

101	102	103	104	105	106	107	108	1	2	3	4	5	6	7	15	16	17	18	19	20	21	22	31	32	33	34	35	36	37	38	39
109	110	111	112	113	114	115	116	8	9	10	11	12	13	14	23	24	25	26	27	28	29	30	40	41	42	43	44	45	46	47	48



SEF877K

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

CRANKSHAFT POSITION SENSOR

1. Remove distributor from engine. (Crankshaft position sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch "ON".
4. Rotate distributor shaft slowly by hand and check voltage between terminals ③, ④ and ground.

Terminal	Voltage
③ (180° signal)	Tester's pointer fluctuates between 5V and 0V.
④ (1° signal)	

If N.G., replace distributor assembly with crankshaft position sensor.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

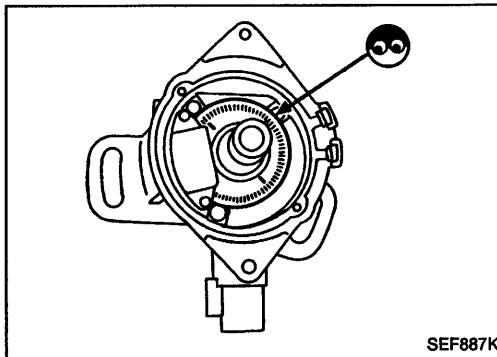
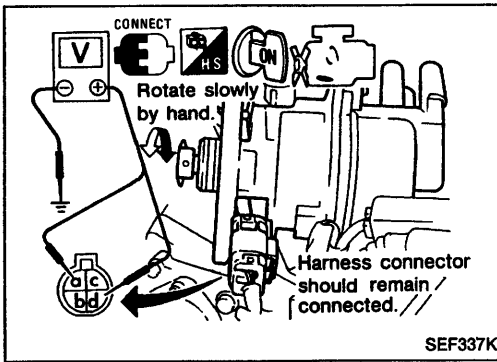
BR

ST

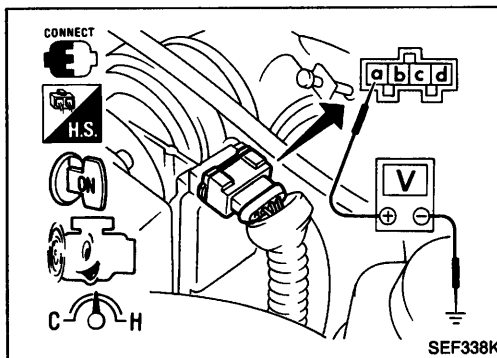
BF

HA

EL



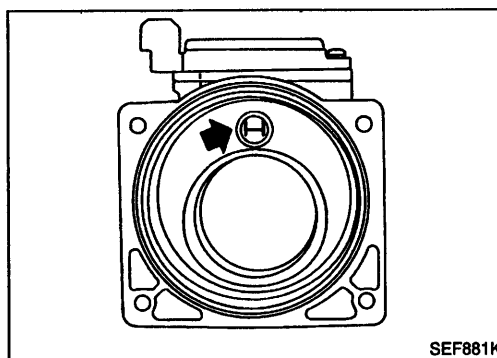
5. Visually check signal plate for damage or dust.



MASS AIR FLOW SENSOR

1. Peel mass air flow sensor harness connector rubber as shown in the figure if the harness connector is connected.
2. Turn ignition switch "ON".
3. Start engine and warm it up sufficiently.
4. Check voltage between terminal ③ and ground.

Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Less than 1.0
Idle (Engine is warm-up sufficiently.)	1.3 - 1.7V



5. If N.G., remove mass air flow sensor from air duct. Check hot wire for damage or dust.

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

ENGINE COOLANT TEMPERATURE SENSOR

1. Disconnect engine coolant temperature sensor harness connector.
2. Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.0
80 (176)	0.30 - 0.33

If N.G., replace engine coolant temperature sensor.

IGNITION COIL

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

Terminal	Resistance
① - ②	Approximately 1.0Ω
① - ③	Approximately 10 kΩ

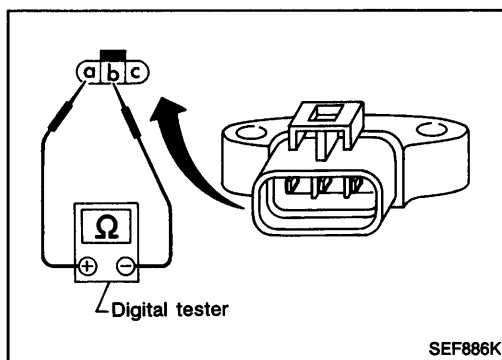
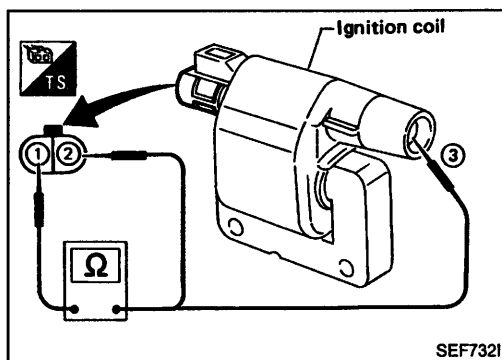
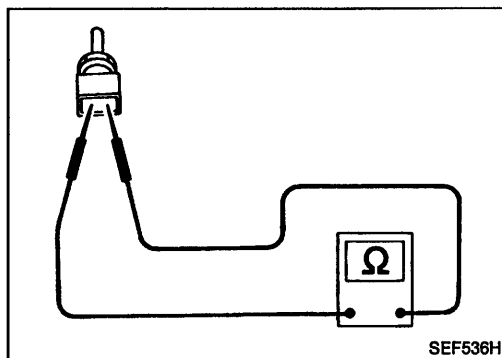
If N.G., replace ignition coil.

POWER TRANSISTOR

1. Disconnect power transistor harness connector.
2. Check power transistor continuity between terminals with a digital tester as shown in the figure.

	Terminal ①		Terminal ②		Terminal ③	
	Resistance Ω	Result	Resistance Ω	Result	Resistance Ω	Result
⊖ terminal side	—	—	∞	O.K.	∞	O.K.
⊕ terminal side	—	—	Not ∞ or 0	N.G.	Not ∞ or 0	N.G.
Terminal ①	—	—	0	N.G.	0	N.G.
Terminal ②	∞	N.G.	—	—	∞	N.G.
Terminal ③	Not ∞ or 0	O.K.	—	—	Not ∞ or 0	O.K.
	0	N.G.	—	—	0	N.G.
Terminal ①	∞	N.G.	∞	N.G.	—	—
Terminal ②	Not ∞ or 0	O.K.	Not ∞ or 0	O.K.	—	—
Terminal ③	0	N.G.	0	N.G.	—	—

If N.G., replace power transistor.

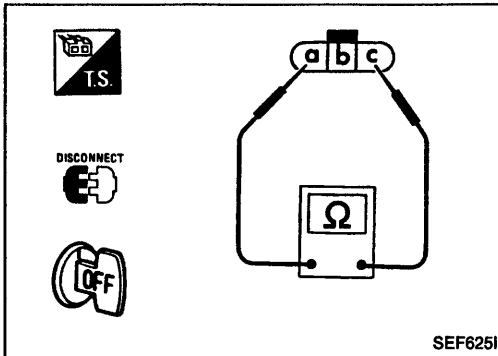
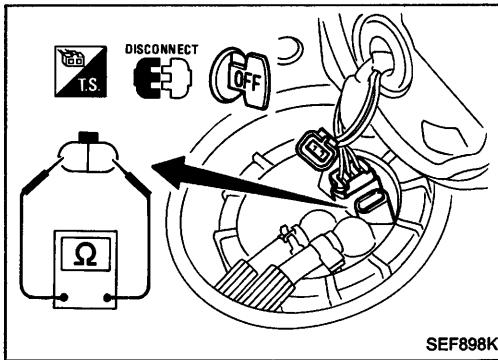


TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

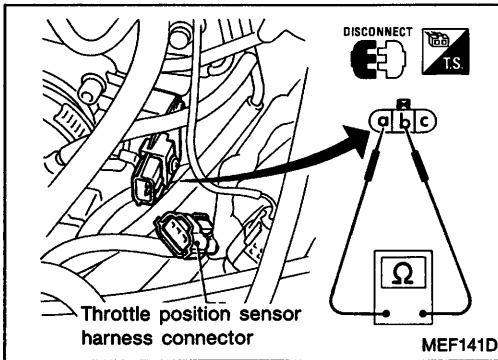
FUEL PUMP

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ③ and ④.
Resistance: Approximately 0.7Ω
If N.G., replace fuel pump.



HEATED OXYGEN SENSOR HEATER

- Check resistance between terminals ③ and ④.
Resistance: 3 - 1,000 Ω
If N.G., replace heated oxygen sensor.



THROTTLE POSITION SENSOR

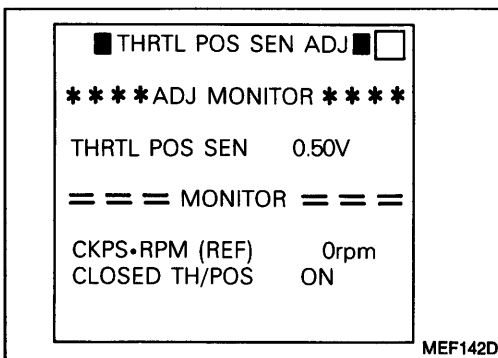
1. Disconnect throttle position sensor harness connector.
2. Make sure that resistance between terminals ③ and ④ changes when opening throttle valve manually.

Accelerator pedal conditions	Resistance k Ω
Completely released	Approximately 2
Partially released	2 - 10
Completely depressed	Approximately 10

If N.G., replace throttle position sensor.

Adjustment

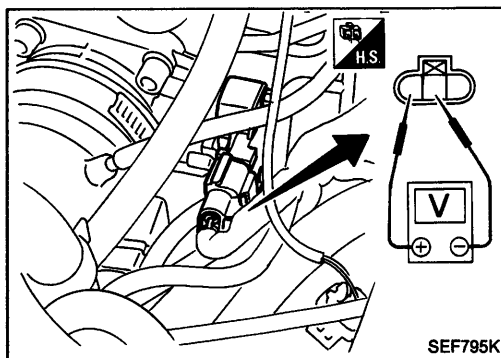
If throttle position sensor is replaced or removed, it is necessary to install in proper position, by following the procedure as shown below:



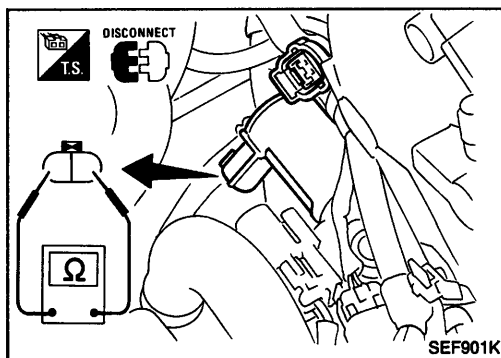
1. Install throttle position sensor body in throttle body. Do not tighten bolts. Leave bolts loose.
2. Connect throttle position sensor harness connector.
3. Start engine and warm it up sufficiently.
4. Perform "THROTTLE SEN ADJ" in "WORK SUPPORT" mode.
Measure output voltage of throttle position sensor using voltmeter.

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)



5. Adjust by rotating throttle position sensor body so that output voltage is 0.45 to 0.55V.
6. Tighten mounting bolts.
7. Disconnect throttle position sensor harness connector for a few seconds and then reconnect it.



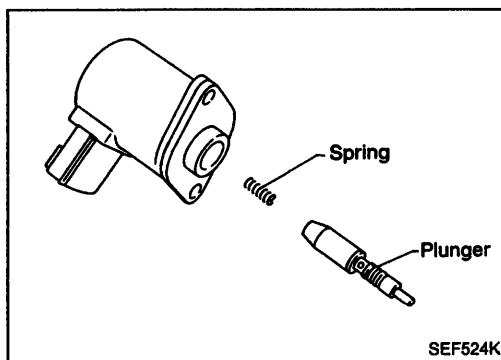
IACV-AAC VALVE

Disconnect IACV-AAC valve harness connector.

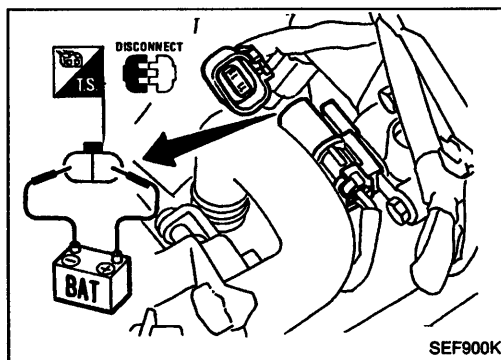
- Check IACV-AAC valve resistance.

Resistance:

Approximately 10Ω



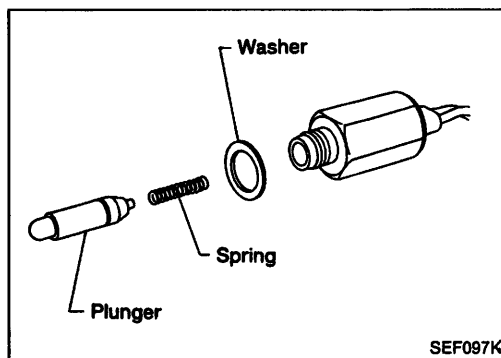
- Check plunger for seizing or sticking.
- Check for broken spring.



IACV-FICD SOLENOID VALVE

Disconnect IACV-FICD solenoid valve harness connector.

- Check for clicking sound when applying 12V direct current to terminals.



- Check plunger for seizing or sticking.
- Check for broken spring.

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

IACV-AIR REGULATOR

Disconnect IACV-air regulator harness connector.

- Check IACV-air regulator resistance.

Resistance:

Approximately 70 - 80Ω

- Check IACV-air regulator for clogging.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

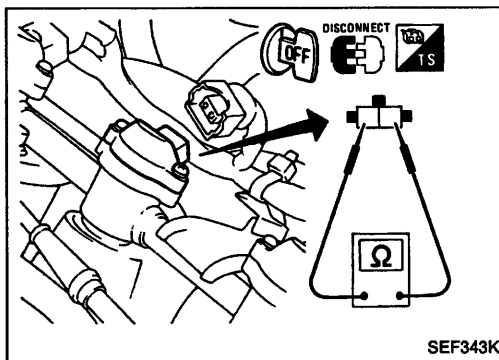
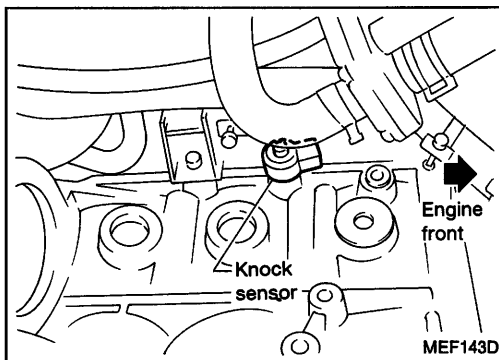
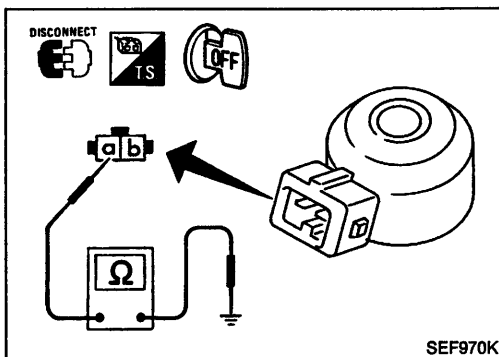
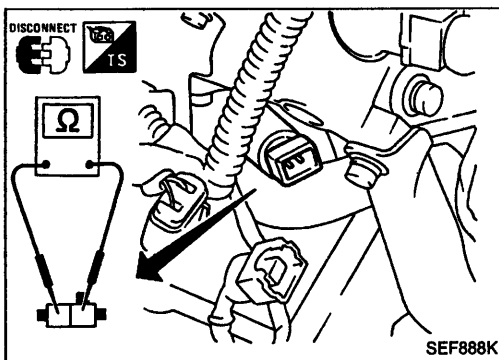
BR

ST

BF

HA

EL



KNOCK SENSOR

1. Disconnect knock sensor harness connector.
2. Check continuity between terminal ③ and ground.

Continuity should exist.

- It is necessary to use an ohmmeter which can measure more than 10 MΩ.

CAUTION:

Discard any knock sensor which has been dropped or undergone shocks; use a new one.

Installation

Install knock sensor with connector side facing engine front.

- When installing knock sensor, ensure both upper and lower sides of knock sensor and cylinder block mating surface are clean and free from foreign particles.
- When tightening knock sensor, be careful not to apply excessive force to connector.
- Make sure knock sensor is not in contact with any adjacent part after installing.

INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 10 - 14Ω

If N.G., replace injector.

TROUBLE DIAGNOSES

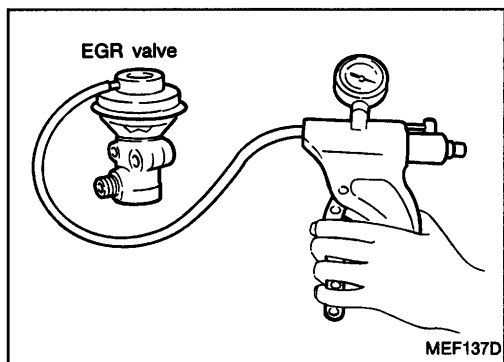
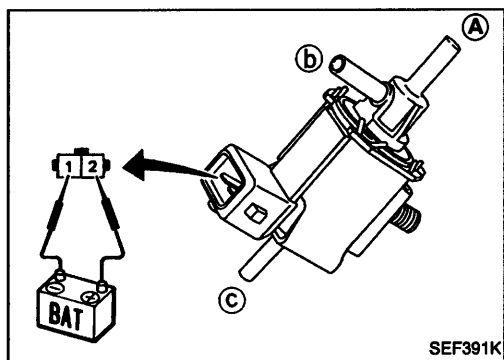
Electrical Components Inspection (Cont'd)

EGR & CANISTER CONTROL SOLENOID VALVE AND PAIRC-SOLENOID VALVE

Check solenoid valve, following the table as shown below:

Conditions	Air passage continuity between ③ and ④	Air passage continuity between ④ and ⑤
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If N.G., replace EGR & canister control solenoid valve.

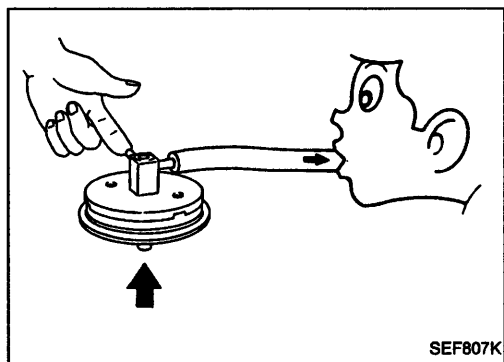


EGR VALVE

Apply vacuum to EGR vacuum port with a hand vacuum pump.

EGR valve spring should lift.

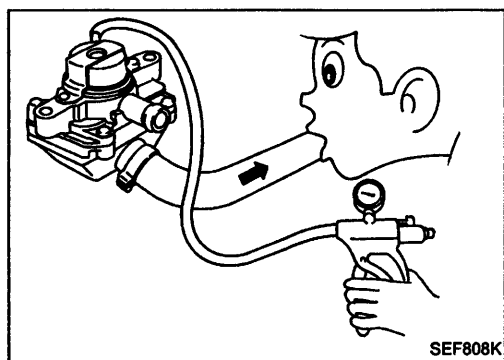
If N.G., replace EGR valve.



EGRC-BPT VALVE

Plug one of two ports of EGRC-BPT valve.

Apply a pressure above 0.490 kPa (50 mmH₂O, 1.97 inH₂O) to check for leakage. If a leak is noted, replace valve.



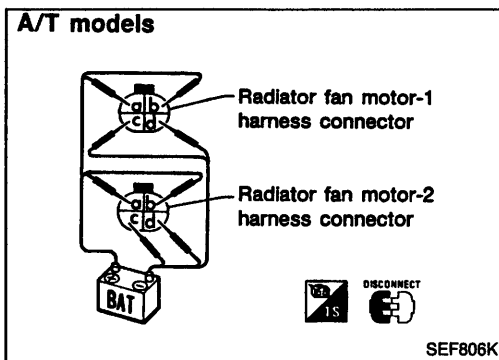
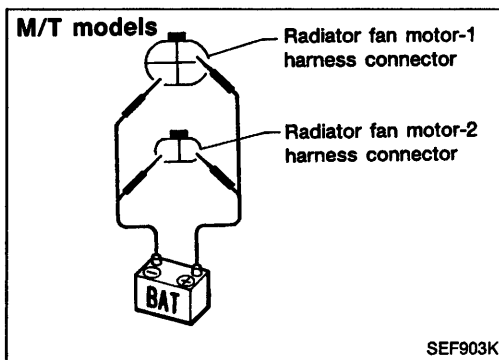
PAIR VALVE (PAIR valve)

Apply vacuum to vacuum motor, suck or blow hose to make sure that air flows only towards the air induction side.

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

RADIATOR FAN MOTORS-1 AND -2



M/T models:

1. Disconnect radiator fan motor harness connectors.
2. Supply radiator fan motor terminals with battery voltage and check operation.

Radiator fan motor should operate.

If N.G., replace radiator fan motor.

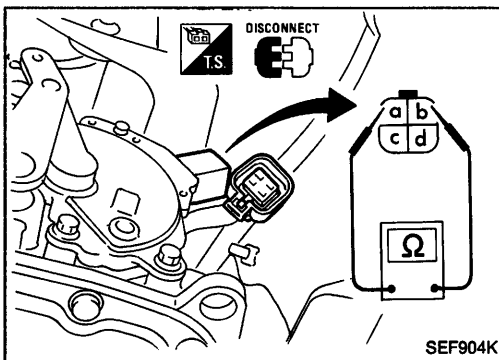
A/T models:

1. Disconnect radiator fan motor harness connectors.
2. Supply radiator fan motor terminals with battery voltage and check operation.

	Speed	Terminals	
		(⊕)	(⊖)
Radiator fan motor-1	Low	(b)	(c)
	High	(a, b)	(c, d)
Radiator fan motor-2	Low	(b)	(c)
	High	(a, b)	(c, d)

Radiator fan motor should operate.

If N.G., replace radiator fan motor.



INHIBITOR SWITCH

Check continuity between terminals (a) and (b).

Conditions	Continuity
Shift to "P" position	Yes
Shift to "N" position	Yes
Shift to position other than "P" and "N"	No

If N.G., replace inhibitor switch.

EGR TEMPERATURE SENSOR

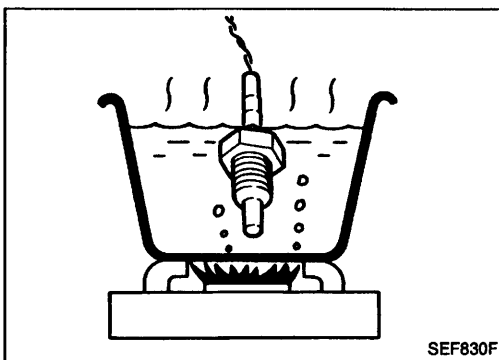
Check resistance change and resistance value at 100°C (212°F).

- Resistance should decrease in response to temperature increase.

Resistance: 100°C (212°F)

85.3 ± 8.53 kΩ

If N.G., replace EGR temperature sensor.

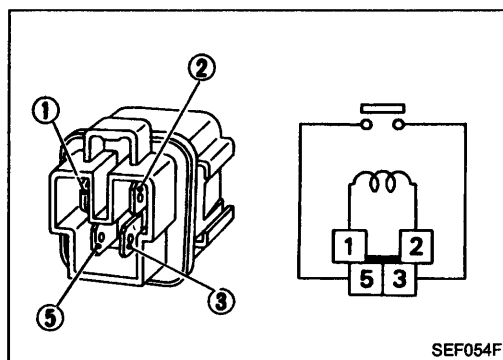


TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

ECCS RELAY, RADIATOR FAN RELAY FOR M/T MODELS AND FUEL PUMP RELAY

Check continuity between terminals ③ and ⑤.

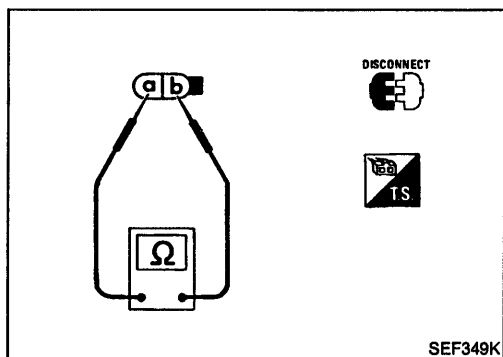


Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If N.G., replace relay.

NEUTRAL POSITION SWITCH

Check continuity between terminals ① and ②.



Conditions	Continuity
Shift to Neutral position	Yes
Shift to other position	No

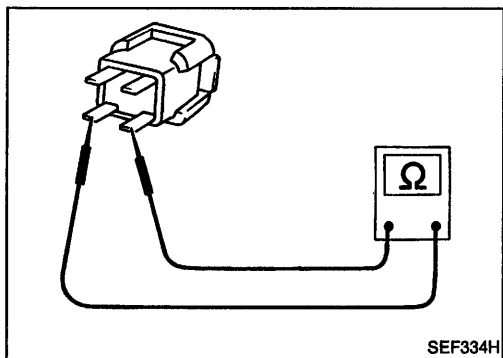
If N.G., replace relay.

RESISTOR

1. Disconnect resistor harness connector.
2. Check resistance between terminals ① and ②.

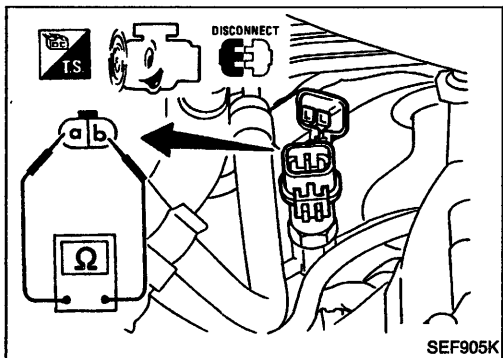
Resistance: Approximately 2.2 kΩ

If N.G., replace resistor.



POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector. Then start engine.
2. Check continuity between terminals ① and ②.

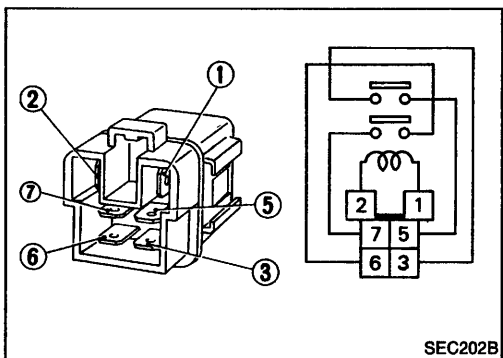


Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No

If N.G., replace power steering oil pressure switch.

RADIATOR FAN RELAYS-1, -2 AND -3 FOR A/T MODELS

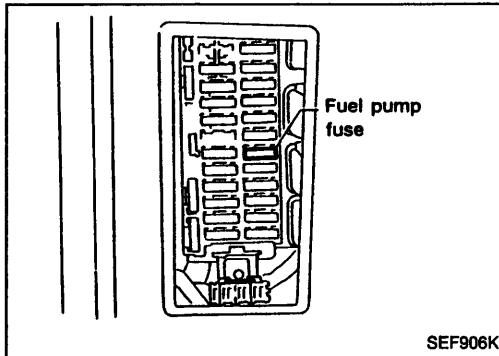
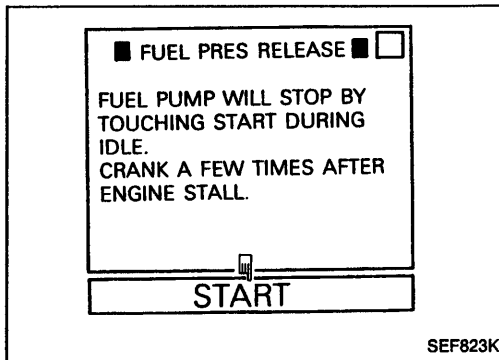
Check continuity between terminals ③ and ⑤, ⑥ and ⑦.



Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If N.G., replace relay.

MULTIPOINT FUEL INJECTION SYSTEM INSPECTION



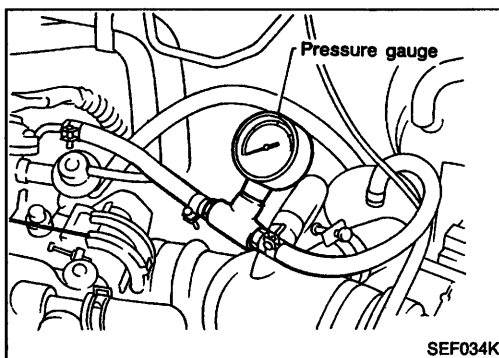
Releasing Fuel Pressure

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

1. Turn ignition switch "ON".
 2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT. GI
 3. Start engine. MA
 4. After engine stalls, crank it two or three times to release all fuel pressure. EM
 5. Turn ignition switch off.
1. Remove fuse for fuel pump. LC
 2. Start engine. EF & EC
 3. After engine stalls, crank it two or three times to release all fuel pressure. FE
 4. Turn ignition switch off and reconnect fuel pump fuse. CL

Fuel Pressure Check

- a. When reconnecting fuel line, always use new clamps. MT
 - b. Make sure that clamp screw does not contact adjacent parts. AT
 - c. Use a torque driver to tighten clamps. FA
 - d. Use Pressure Gauge to check fuel pressure. RA
 - e. Do not perform fuel pressure check while fuel pressure regulator control system is operating; otherwise, fuel pressure gauge might indicate incorrect readings. BR
1. Release fuel pressure to zero. ST
 2. Disconnect fuel hose between fuel filter and fuel tube (engine side). BF
 3. Install pressure gauge between fuel filter and fuel tube. HA
 4. Start engine and check for fuel leakage. EL
5. Read the indication of fuel pressure gauge.
At idling:
Approximately 245 kPa (2.5 kg/cm², 36 psi)
A few seconds after Ignition switch is turned OFF to ON:
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.

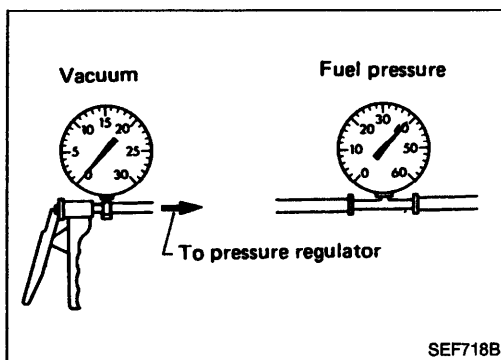


MULTIPOINT FUEL INJECTION SYSTEM INSPECTION

Fuel Pressure Check (Cont'd)

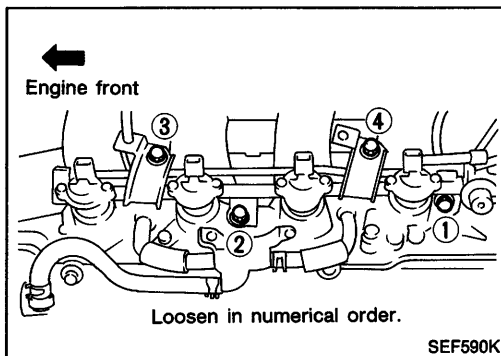
9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

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. Disconnect injector harness connectors.
3. Disconnect vacuum hose from pressure regulator.
4. Disconnect fuel hoses from fuel tube assembly.
5. Remove injectors with fuel tube assembly.

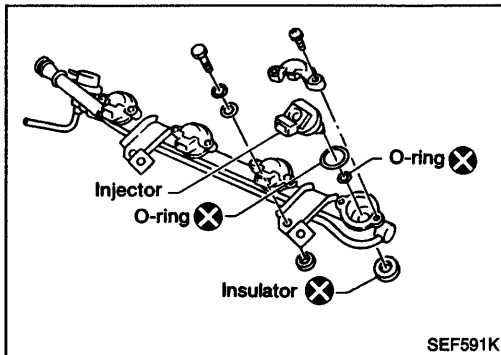


6. Push out any malfunctioning injector from fuel tube assembly.

Do not extract injector by pinching connector.

7. Replace or clean injector as necessary.
8. Install injector to fuel tube assembly.

Always replace O-rings and insulators with new ones. Lubricate O-rings with a smear of silicone oil.



9. Install injectors with fuel tube assembly to intake manifold. Tighten fuel tube bolts to the specified torque.

Tightening procedure:

- 1) Tighten all bolts to 9.3 to 10.8 N·m (0.95 to 1.1 kg-m, 6.9 to 8.0 ft-lb).
- 2) Tighten all bolts to 21 to 26 N·m (2.1 to 2.7 kg-m, 15 to 20 ft-lb).

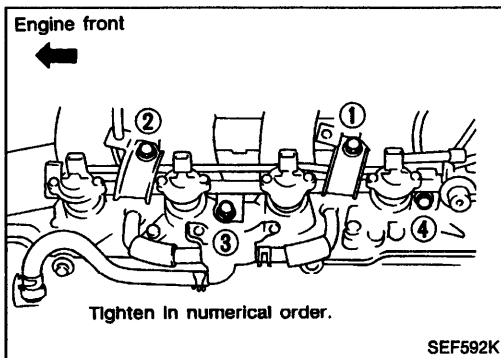
10. Install fuel hoses to fuel tube assembly.

Lubricate fuel hoses with a smear of silicone oil.

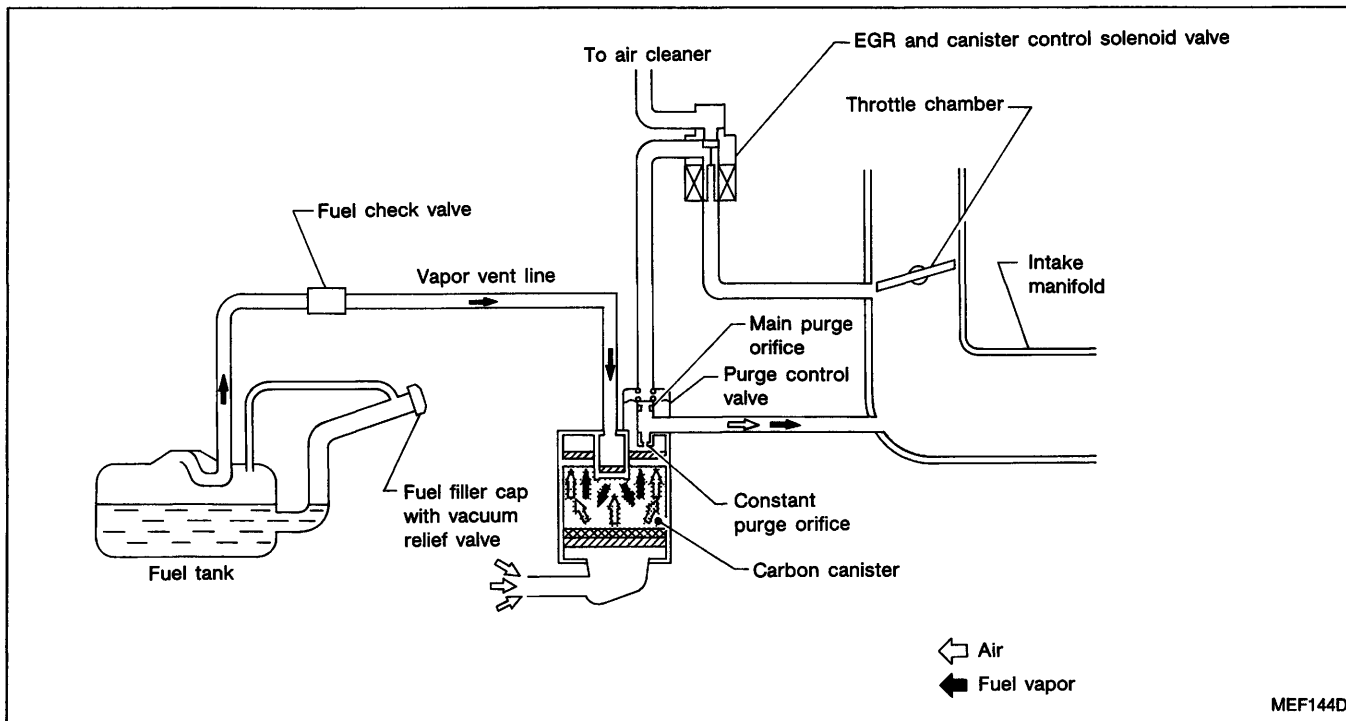
11. Reinstall any parts removed in reverse order of removal.

CAUTION:

After properly connecting fuel hose to injector and fuel tube assembly, check connection for fuel leakage.



Description

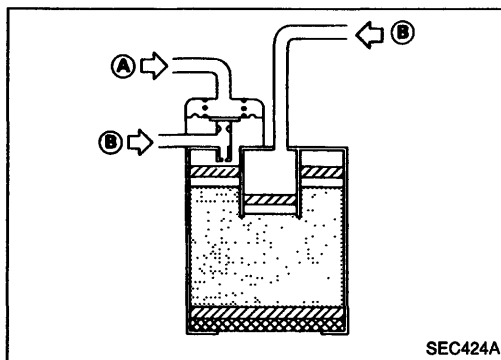


The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

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:

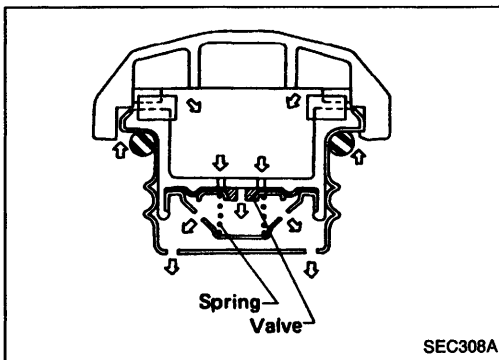
- Ⓐ : Blow air and ensure that there is no leakage.
- Ⓑ : Blow air and ensure that there is leakage.

EVAPORATIVE EMISSION SYSTEM

Inspection (Cont'd)

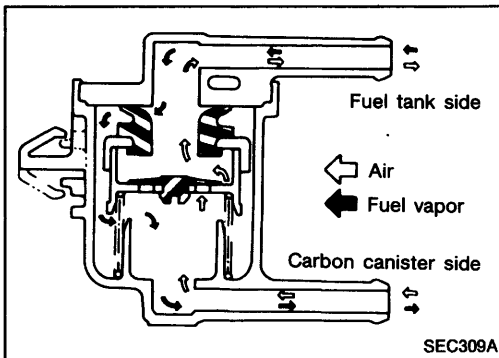
FUEL TANK VACUUM RELIEF VALVE

1. Wipe clean valve housing.
2. Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. If valve is clogged or if no resistance is felt, replace cap as an assembly.

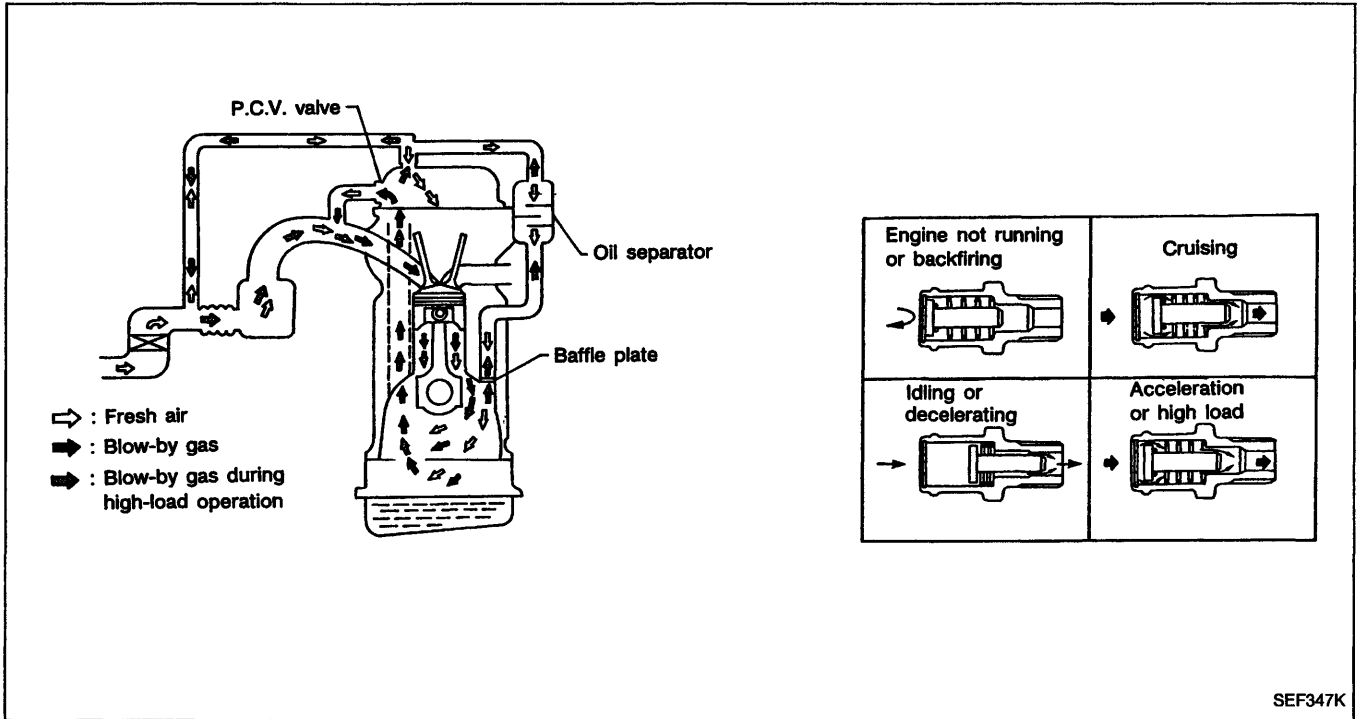


FUEL CHECK VALVE

1. Blow air through connector on fuel tank side. A considerable resistance should be felt and a portion of air flow should be directed toward the canister.
2. Blow air through connector on canister side. Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.



Description



This system returns blow-by gas to both the intake manifold and air inlet tubes.

The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.

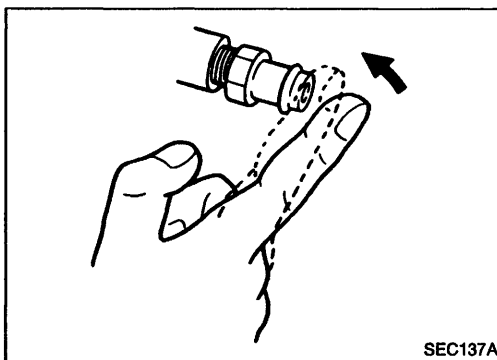
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.

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 inlet tubes, through the hose connecting air inlet tubes 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 inlet tubes under all conditions.



Inspection

P.C.V. (Positive Crankcase Ventilation)

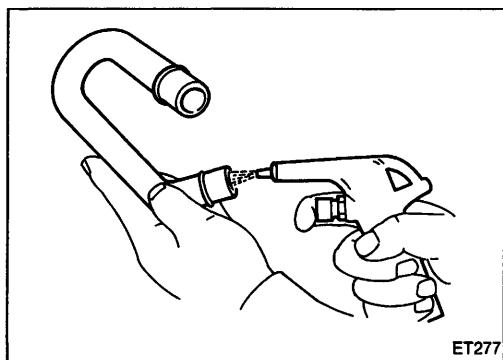
With engine running at idle, remove ventilation hose from P.C.V. valve; if the valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

CRANKCASE EMISSION CONTROL SYSTEM

Inspection (Cont'd)

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.



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

PRESSURE REGULATOR Fuel pressure at idling kPa (kg/cm ² , psi)	
Vacuum hose is connected	Approximately 245 (2.5, 36)
Vacuum hose is disconnected	Approximately 294 (3.0, 43)

GI

MA

Inspection and Adjustment

EM

Idle speed*1	rpm	
No-load*2 (in "N" position)		800 ± 50
Air conditioner: ON (in "N" position)		850 ± 50
Ignition timing		15° ± 2° B.T.D.C.
Throttle position sensor idle position	V	0.45 - 0.55

*1: Feedback controlled and needs no adjustments

*2: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater, fan & rear defogger)

EGR TEMPERATURE SENSOR

Resistance [at 100°C (212°F)]	kΩ	85.3 ± 8.53
----------------------------------	----	-------------

LC

EF &
EC

HEATED OXYGEN SENSOR HEATER

Resistance	Ω	3 - 1,000
------------	---	-----------

FE

FUEL PUMP

Resistance	Ω	Approximately 0.7
------------	---	-------------------

CL

MT

IGNITION COIL

Primary voltage	V	12
Primary resistance [at 20°C (68°F)]	Ω	Approximately 1.0
Secondary resistance [at 20°C (68°F)]	kΩ	Approximately 10.0

IACV-AAC VALVE

Resistance	Ω	Approximately 10.0
------------	---	--------------------

AT

FA

INJECTOR

Resistance	Ω	10 - 14
------------	---	---------

RA

BR

MASS AIR FLOW SENSOR

Supply voltage	V	Battery voltage (11 - 14)
Output voltage	V	1.3 - 1.7*

*: Engine is warmed up sufficiently and idling under no-load.

RESISTOR

Resistance	kΩ	Approximately 2.2
------------	----	-------------------

ST

ENGINE COOLANT TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
80 (176)	0.30 - 0.33

THROTTLE POSITION SENSOR

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 2
Partially released	2 - 10
Completely depressed	Approximately 10

BF

HA

EL

ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS

SECTION **FE**

GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

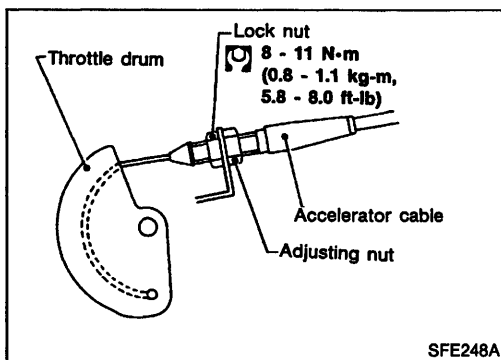
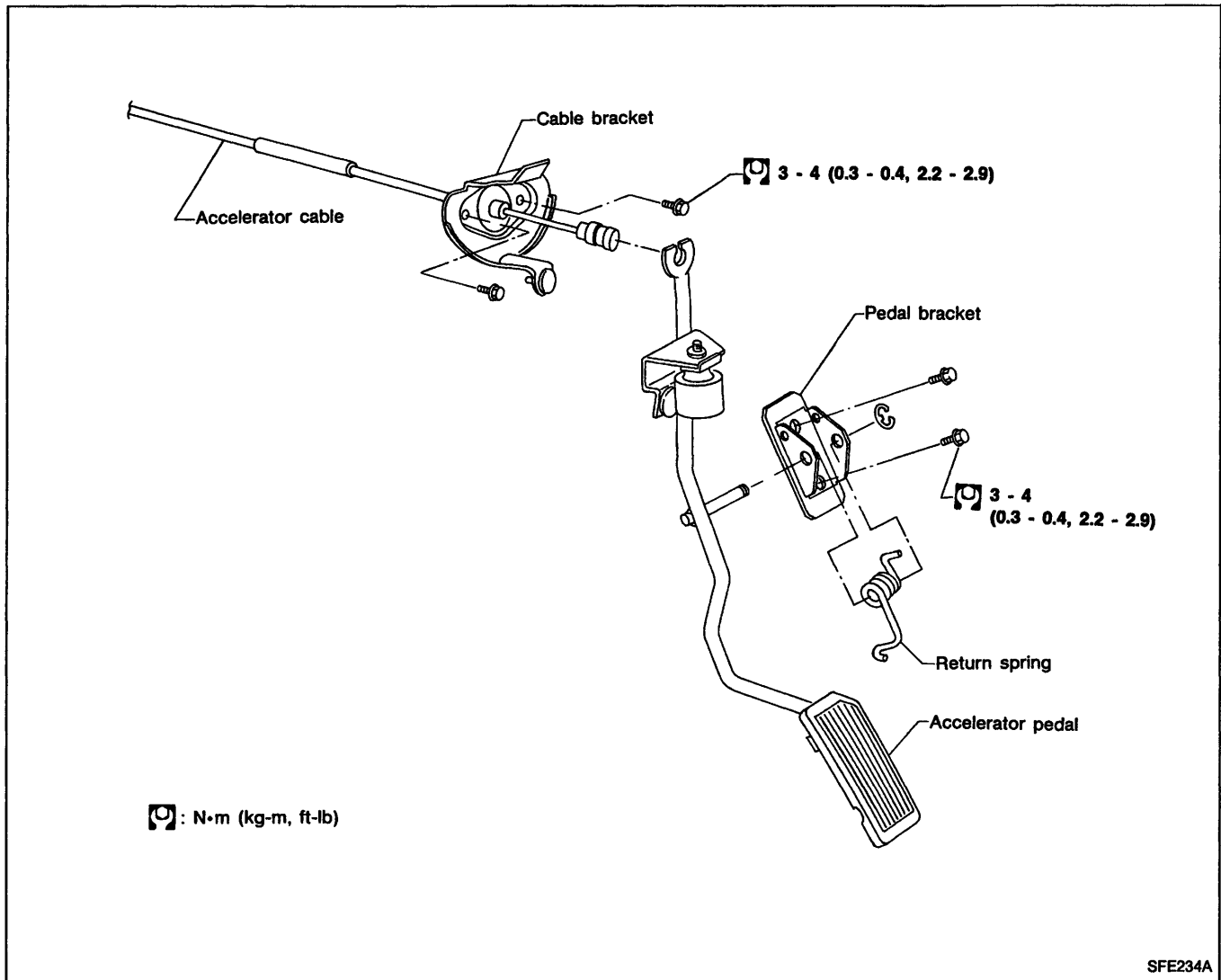
CONTENTS

ACCELERATOR CONTROL SYSTEM	2	Fuel Tank.....	3
Adjusting Accelerator Cable	2	Fuel Pump and Gauge.....	5
FUEL SYSTEM	3	EXHAUST SYSTEM	6
Special Service Tool.....	3		

ACCELERATOR CONTROL SYSTEM

CAUTION:

- When removing accelerator cable, make a mark to indicate lock nut's initial position.
- Check that throttle valve opens fully when accelerator pedal is fully depressed and that it returns to idle position when pedal is released.
- Check accelerator control parts for improper contact with any adjacent parts.
- When connecting accelerator cable, be careful not to twist or scratch its inner wire.
- For A/T throttle wire adjustment, refer to "ON-VEHICLE SERVICE" in AT section.
- Refer to EL section for A.S.C.D. cable adjustment.

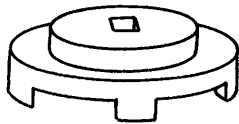


Adjusting Accelerator Cable

1. Loosen lock nut, and tighten adjusting nut until throttle drum starts to move.
2. From that position turn back adjusting nut 1.5 to 2 turns, and fasten it with lock nut.

FUEL SYSTEM

Special Service Tool

Tool number (Kent-Moore No.) Tool name	Description
KV999G0010 (X38879) Fuel tank lock ring socket	

GI

MA

EM

Fuel Tank

LC

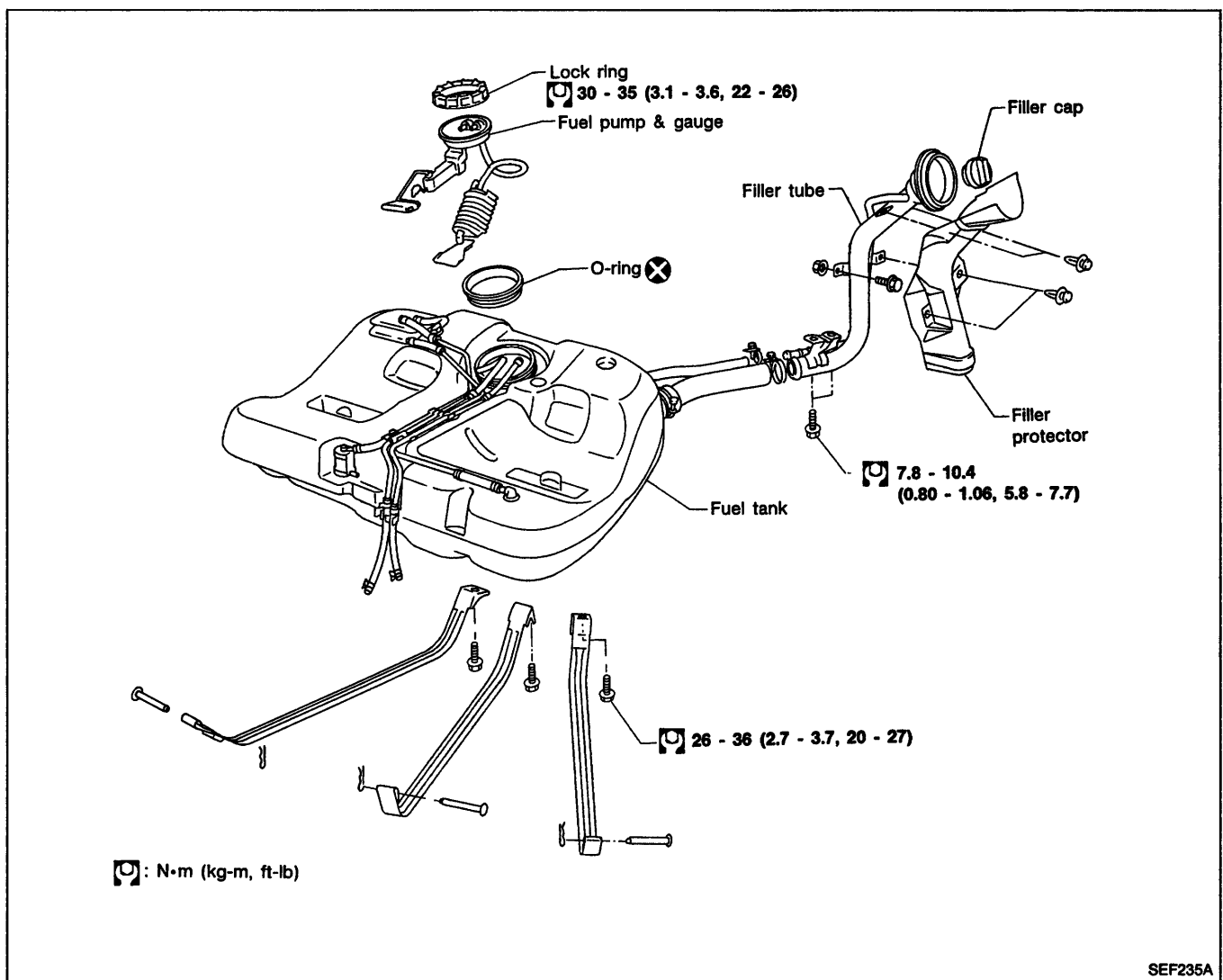
WARNING:

When replacing fuel line parts, be sure to observe the following:

- Put a "CAUTION: INFLAMMABLE" sign in workshop.
- Be sure to furnish workshop with a CO₂ fire extinguisher.
- 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.
- Drain fuel from Fuel Tank and put drained fuel in an explosion-proof container and put lid on securely.

EF &
EC

FE



CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

SEF235A

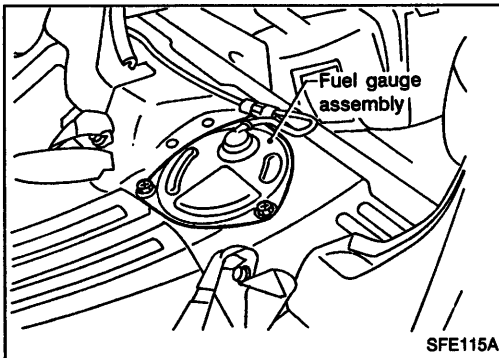
FUEL SYSTEM

Fuel Tank (Cont'd)

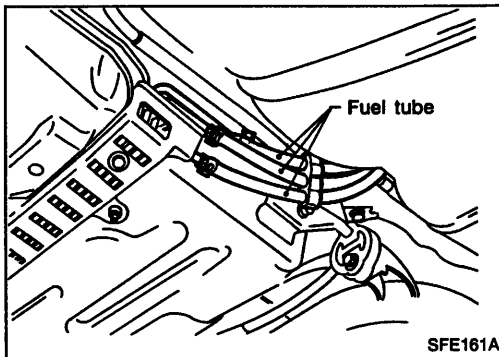
REMOVAL

CAUTION:

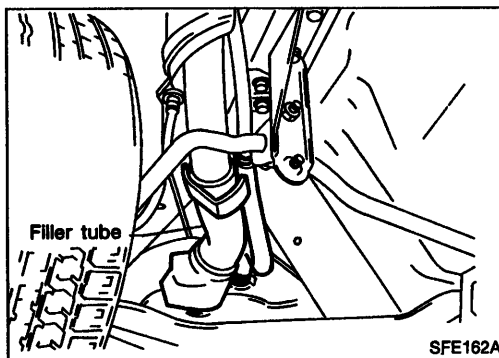
- Do not disconnect any fuel line unless absolutely necessary.
- Plug hose and pipe openings to prevent entry of dust or dirt.



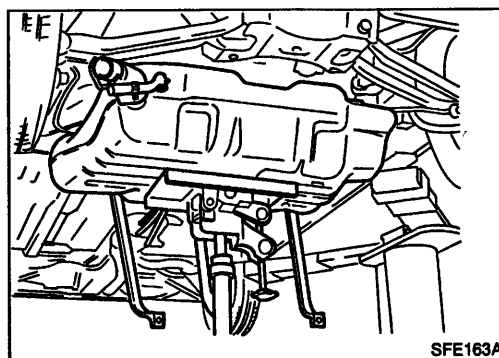
1. Release fuel pressure from fuel line. Refer to "Changing Fuel Filter" in MA section.
2. Remove inspection hole cover located under the rear seat.
3. Disconnect connectors under inspection hole cover.



4. Disconnect tubes.



5. Disconnect filler protector.
6. Disconnect filler tube.



7. Remove fuel tank mounting bolts (three), and remove fuel tank as shown in the figure.

FUEL SYSTEM

Fuel Tank (Cont'd)

INSTALLATION

- Installation procedure is basically the reverse order of removal.

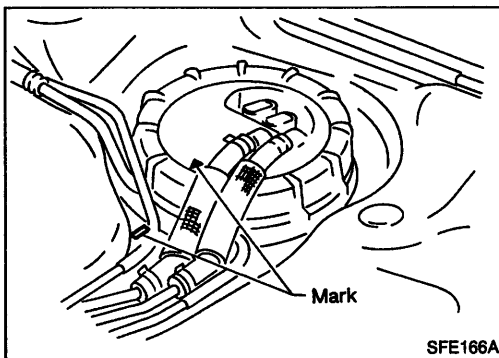
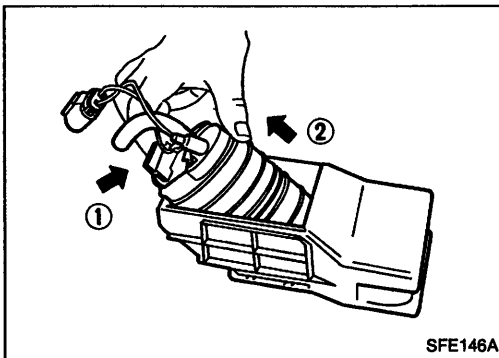
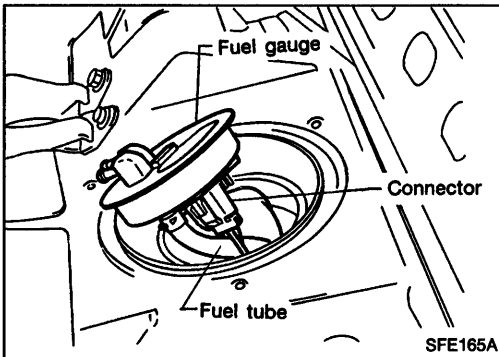
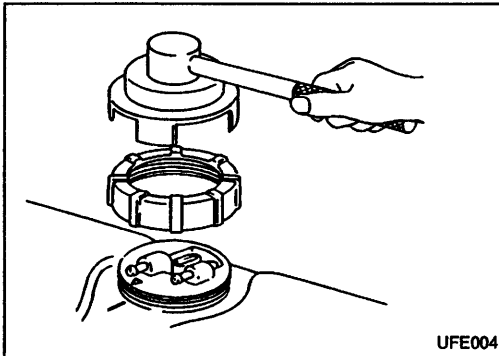
CAUTION:

- Do not kink or twist hose and tube when they are installed.
- Do not tighten hose clamps excessively to avoid damaging hoses.
- Be careful of designated direction of fuel check valve (Refer to section EF & EC).
- Tighten bolts to specified torque. After installation, run engine and check for leaks at connections.

Fuel Pump and Gauge

REMOVAL

1. Release fuel pressure from fuel line.
Refer to "Changing Fuel Filter" in MA section.
2. Remove inspection hole cover located beneath rear seat.
3. Disconnect connectors and fuel tubes.
4. Remove lock ring (Use S.S.T. X38879).



INSTALLATION

- Installation procedure is basically the reverse order of removal.

CAUTION:

- Always replace O-ring with a new one.
- Align parts with alignment marks.
- Tighten lock ring to specified torque.
- After installation, run engine and check for leaks at connections.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

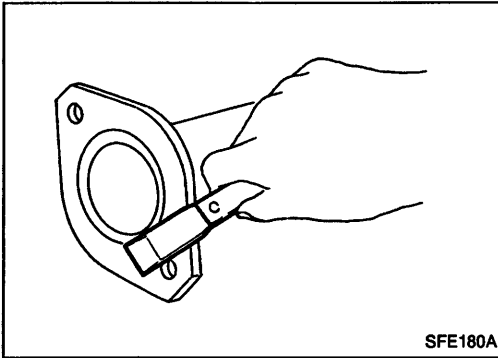
ST

BF

HA

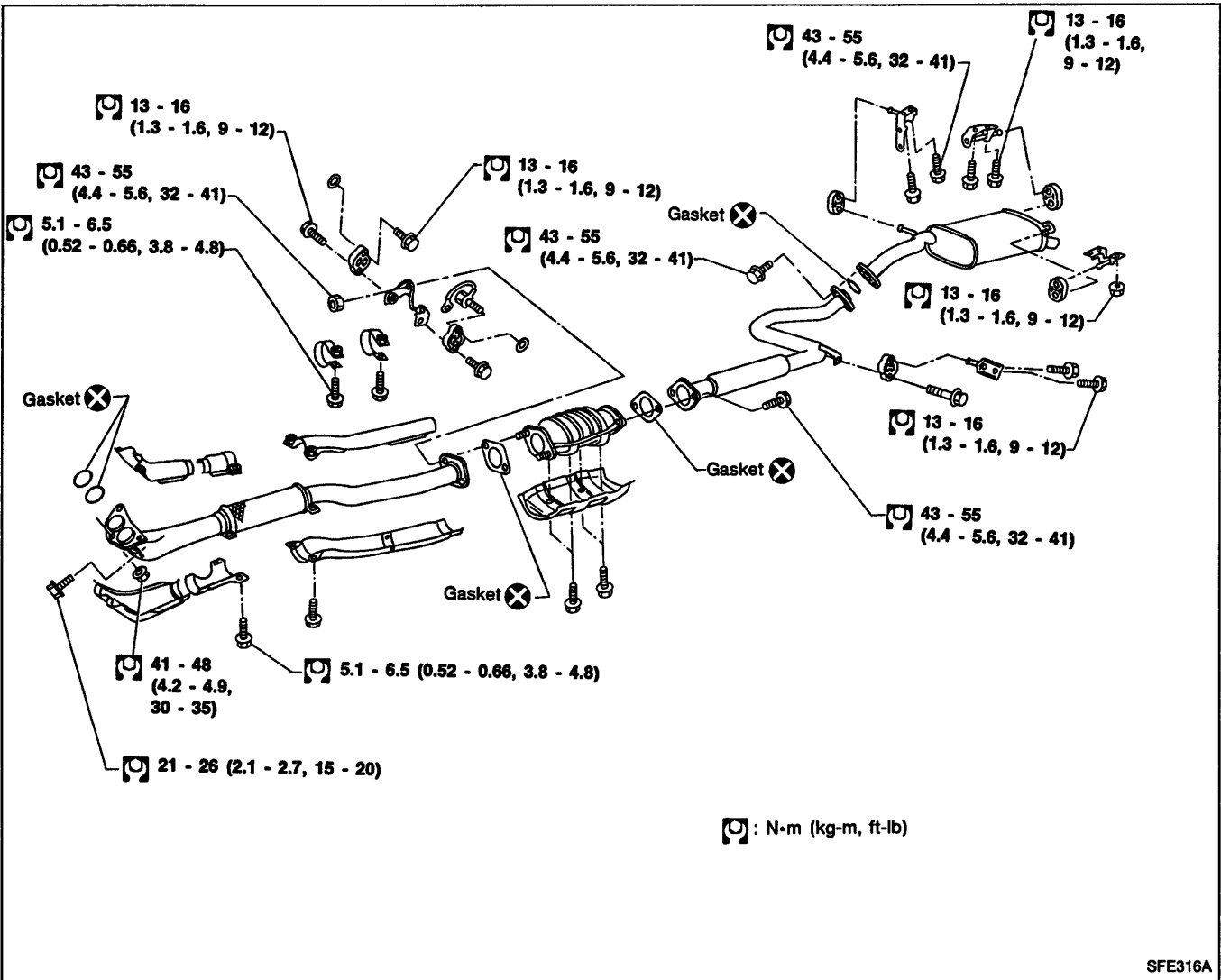
EL

EXHAUST SYSTEM



CAUTION:

- Always replace exhaust gaskets with new ones when reassembling.
If gasket is left on flange surface, scrape off completely as shown at left.
- With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.
- After installation, check to ensure that mounting brackets and mounting insulators are free from undue stress. If any of the above parts are not installed properly, excessive noise or vibration may be transmitted to the vehicle body.



CLUTCH

SECTION **CL**

CONTENTS

PRECAUTION AND PREPARATION	2	CLUTCH DISC AND CLUTCH COVER	6
Precaution	2	Clutch Disc	6
Special Service Tools	2	Clutch Cover and Flywheel	7
CLUTCH SYSTEM	3	SERVICE DATA AND SPECIFICATIONS (S.D.S.)	8
INSPECTION AND ADJUSTMENT	4	General Specifications	8
Adjusting Clutch Pedal	4	Inspection and Adjustment	8
CLUTCH RELEASE MECHANISM	5		

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

PRECAUTION AND PREPARATION

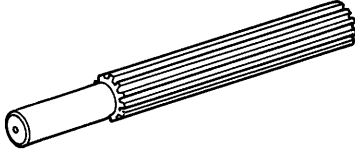
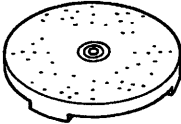
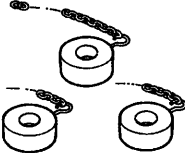
Precaution

WARNING:

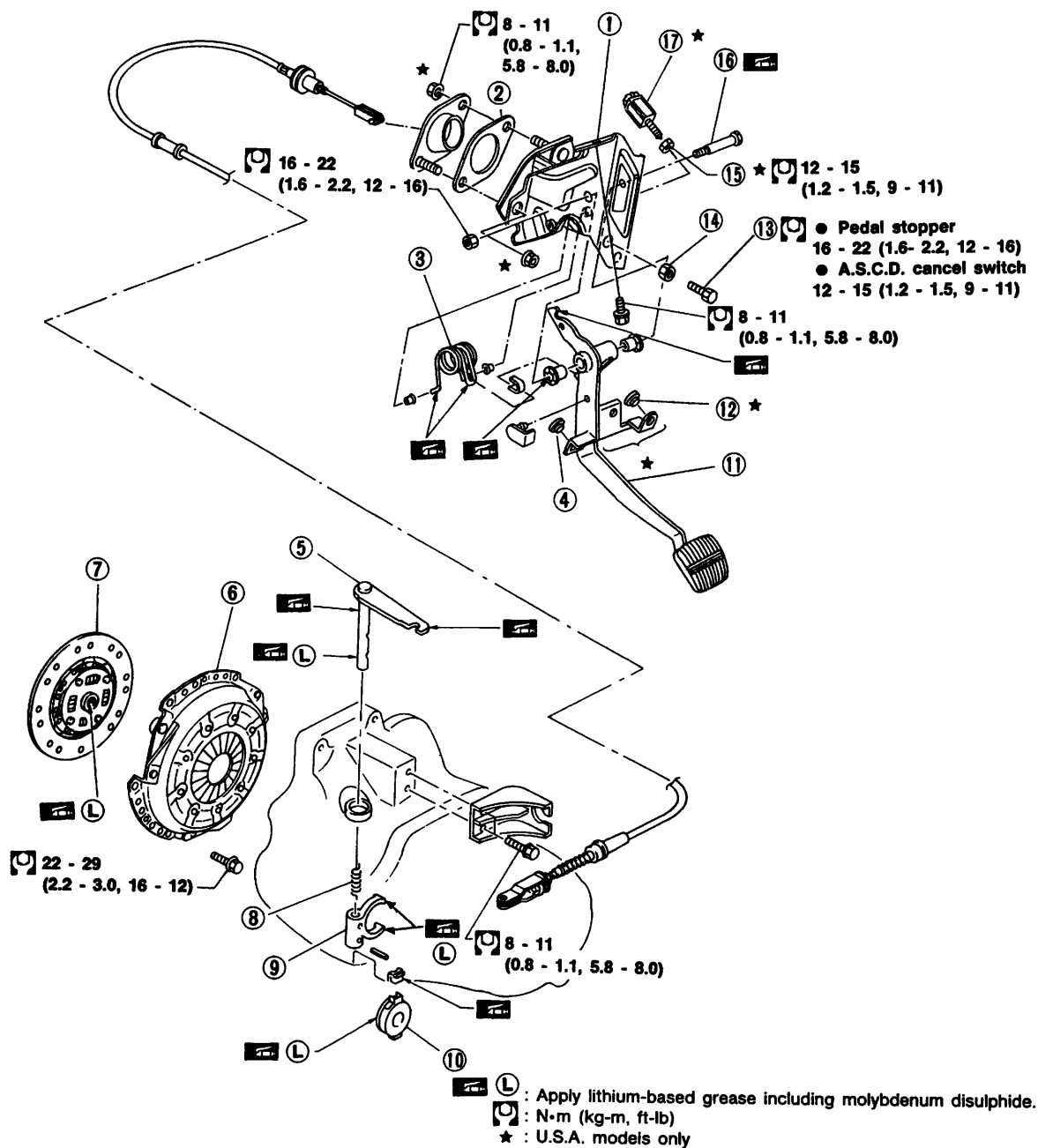
After cleaning the clutch disc, wipe it with a dust collector. Do not use compressed air.

Special Service Tools

*: Special tool or commercial equivalent

Tool number (Kent-Moore No.) Tool name	Description	
KV30101000* (J33213) Clutch aligning bar	Installing clutch cover and clutch disc	
ST20050010 (—) Base plate	Inspecting diaphragm spring of clutch cover	
ST20050100 (—) Distance piece	Inspecting diaphragm spring of clutch cover	
ST20050240* (—) Diaphragm spring adjusting wrench	Adjusting unevenness of diaphragm spring of clutch cover	

CLUTCH SYSTEM



- ① Clutch pedal bracket
- ② Insulator
- ③ Assist spring
- ④ Stopper rubber
- ⑤ Withdrawal lever
- ⑥ Clutch cover

- ⑦ Clutch disc
- ⑧ Return spring
- ⑨ Clutch lever
- ⑩ Release bearing
- ⑪ Clutch pedal
- ⑫ Stopper rubber

- ⑬ Pedal stopper or A.S.C.D. cancel switch
- ⑭ Lock nut
- ⑮ Lock nut
- ⑯ Fulcrum pin
- ⑰ Clutch interlock switch

Adjusting Clutch Pedal

1. Adjust pedal height with pedal stopper or A.S.C.D. cancel switch.

Pedal height "H":

159.5 - 169.5 mm (6.28 - 6.67 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 to 3.5 turns, and then tighten lock nut.

Withdrawal lever play "B":

2.5 - 3.5 mm (0.098 - 0.138 in)

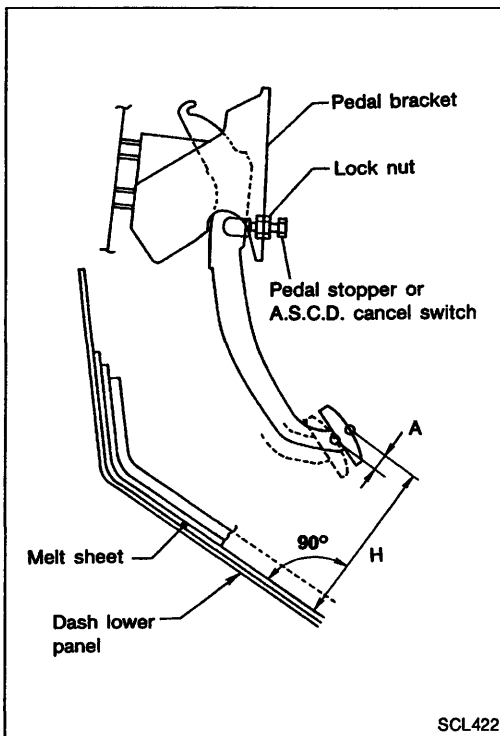
Lock nut:

3 - 4 N·m (0.3 - 0.4 kg-m, 2.2 - 2.9 ft-lb)

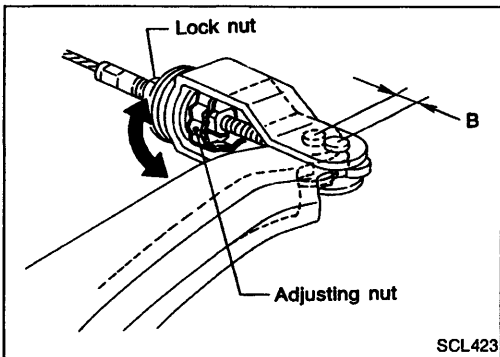
3. As a final check, measure pedal free travel at center of pedal pad.

Pedal free travel "A":

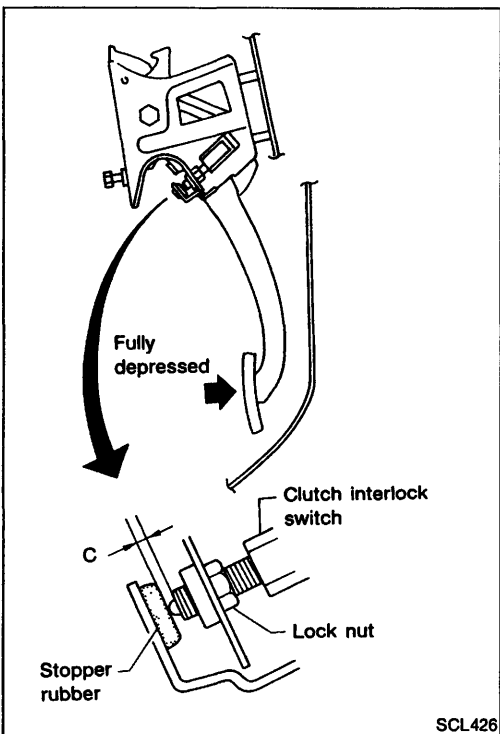
10.8 - 15.1 mm (0.425 - 0.594 in)



SCL422



SCL423



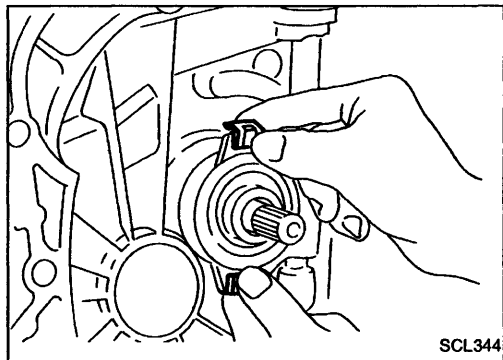
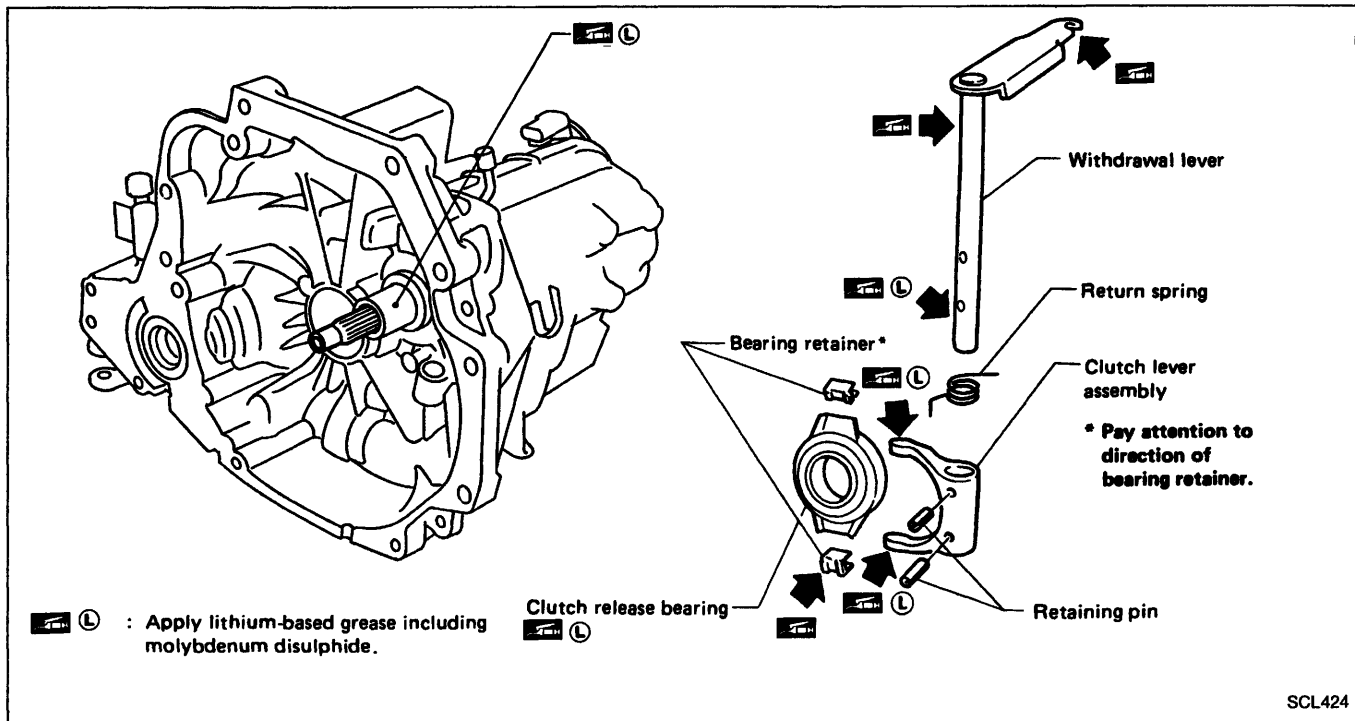
SCL426

4. U.S.A. models only
Adjust clearance "C" between stopper rubber and threaded end of clutch interlock switch while depressing clutch pedal fully.

Clearance "C":

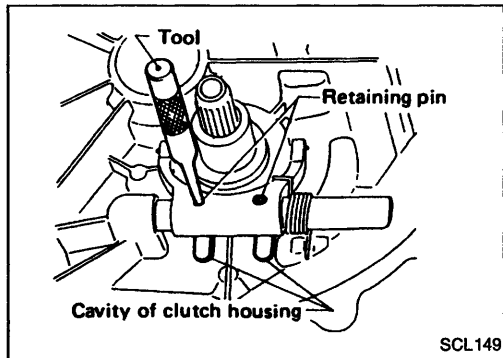
0.1 - 1.0 mm (0.004 - 0.039 in)

CLUTCH RELEASE MECHANISM



REMOVAL AND INSTALLATION

- Remove release bearing by pulling bearing retainers outward.

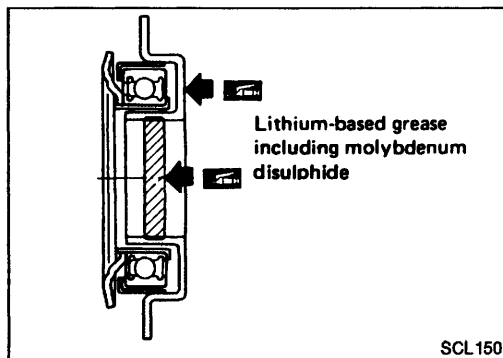


- Align retaining pin with cavity of clutch housing and tap out retaining pin.

INSPECTION

Check the following items, and replace if necessary.

- Release bearing, to see that it rolls freely and is free from noise, cracks, pitting or wear.
- Release sleeve and withdrawal lever rubbing surface, for wear, rust or damage.

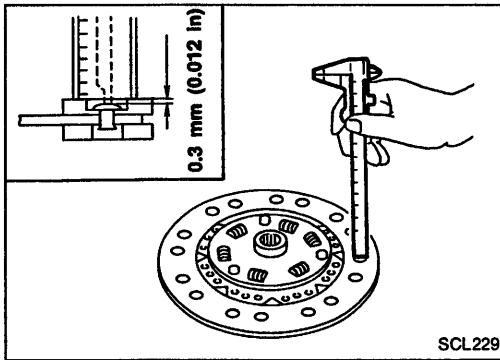
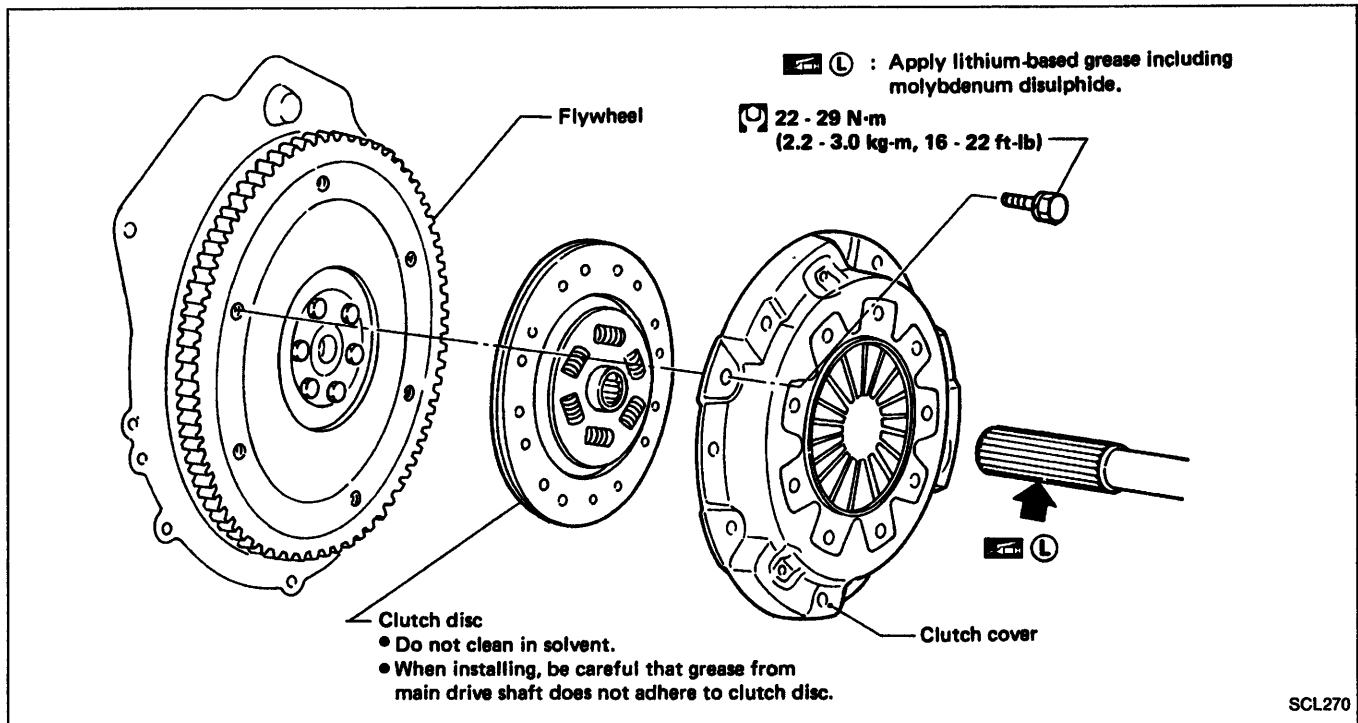


LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.
- Too much lubricant might damage clutch disc facing.

CLUTCH DISC AND CLUTCH COVER

Adjusting Clutch Pedal

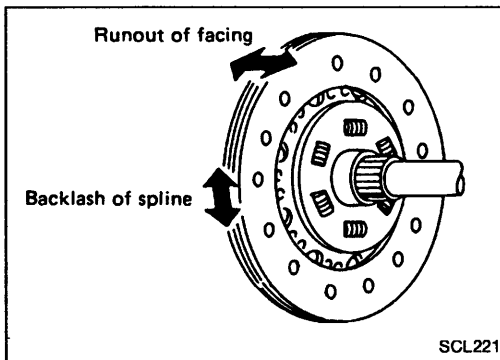


Clutch Disc

INSPECTION

Check clutch disc for wear of facing.

Wear limit of facing surface to rivet head:
0.3 mm (0.012 in)



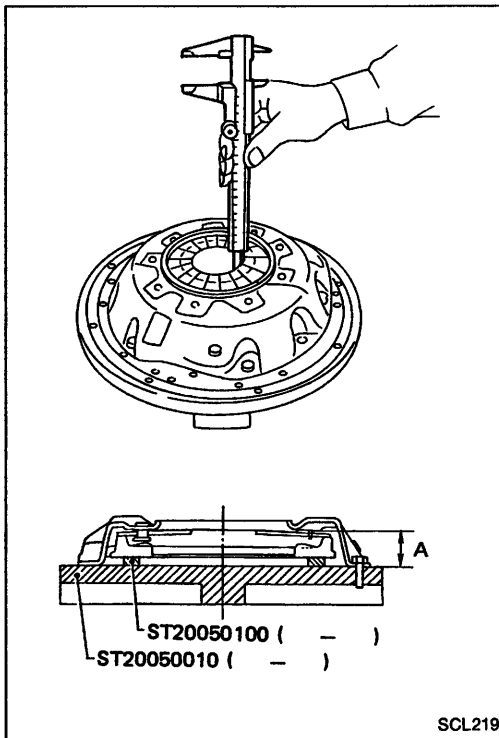
- Check clutch disc for backlash of spline and runout of facing.

Maximum backlash of spline (at outer edge of disc):
215TBL 0.9 mm (0.035 in)

Runout limit:
1.0 mm (0.039 in)

Distance of runout check point (from hub center):
215TBL 102.5 mm (4.04 in)

- Check clutch disc for burns, discoloration or oil or grease leakage. Replace if necessary.



Clutch Cover and Flywheel

INSPECTION AND ADJUSTMENT

- Set Tool and check height and unevenness of diaphragm spring.

Diaphragm spring height "A":

C215S 30.5 - 32.5 mm (1.201 - 1.280 in)

- Check thrust rings for wear or damage by shaking cover assembly and listening for chattering noise, or lightly hammering on rivets for a slightly cracked noise. Replace clutch cover assembly if necessary.
- Check pressure plate and clutch disc contact surface for slight burns or discoloration. Repair pressure plate with emery paper.
- Check pressure plate and clutch disc contact surface for deformation or damage. Replace if necessary.

GI

MA

EM

LC

EF &
EC

FE

CL

- Adjust unevenness of diaphragm spring with Tool.

Uneven limit:

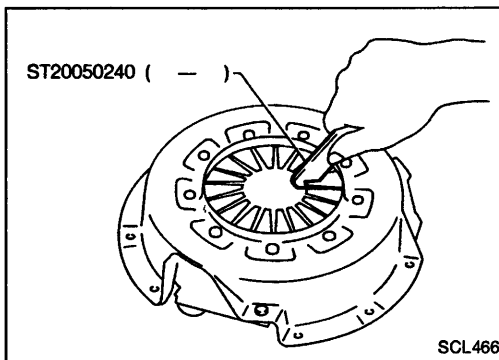
0.7 mm (0.028 in)

MT

AT

FA

RA



FLYWHEEL INSPECTION

- Check contact surface of flywheel for slight burns or discoloration. Repair flywheel with emery paper.
- Check flywheel runout.

Runout (Total indicator reading):

Flywheel

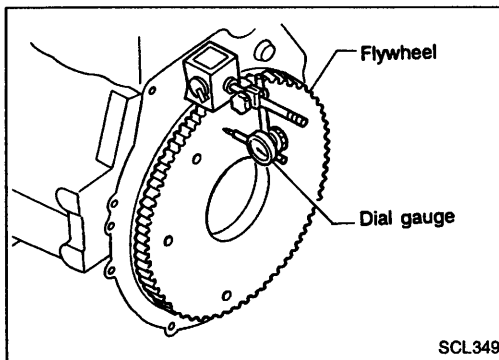
Less than 0.15 mm (0.0059 in)

BR

ST

BF

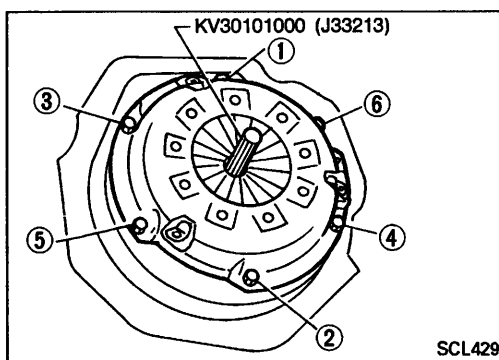
HA



INSTALLATION

- Insert Tool into clutch disc hub when installing clutch cover and disc.
- Tighten bolts in numerical order.
- **Be careful that grease does not contaminate clutch facing.**

EL



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

CLUTCH CONTROL SYSTEM

Type of clutch control	Mechanical type
------------------------	-----------------

CLUTCH COVER

Engine	SR20DE
Model	C215S
Full-load	N (kg, lb) 4,413 (450, 992)

CLUTCH DISC

Unit: mm (in)

Engine	SR20DE
Model	215TBL
Facing size (Outer dia. x inner dia. x thickness)	215 x 140 x 3.5 (8.46 x 5.51 x 0.138)
Thickness of disc assembly with load	7.6 - 8.0 (0.299 - 0.315) with 3,923 N (400 kg, 882 lb)

Inspection and Adjustment

CLUTCH PEDAL

Unit: mm (in)

Pedal height*	159.5 - 169.5 (6.28 - 6.67)
Pedal free travel	10.8 - 15.1 (0.425 - 0.594)
Withdrawal lever play	2.5 - 3.5 (0.098 - 0.138)

*: Measured from surface of melt sheet to surface of pedal pad.

CLUTCH COVER

Unit: mm (in)

Cover model	C215S
Diaphragm spring height	30.5 - 32.5 (1.201 - 1.280)
Uneven limit of diaphragm spring toe height "A"	0.7 (0.028)

CLUTCH DISC

Unit: mm (in)

Disc model	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 hub center)	102.5 (4.04)
Maximum backlash of spline (at outer edge of disc)	0.9 (0.035)

MANUAL TRANSAXLE

SECTION **MT**

CONTENTS

PREPARATION	2	DISASSEMBLY	13
Special Service Tools	2	REPAIR FOR COMPONENT PARTS	16
Commercial Service Tools	4	Input Shaft and Gears.....	16
ON-VEHICLE SERVICE	5	Mainshaft and Gears	18
Replacing Oil Seal	5	Final Drive	24
Check of Position Switch	6	Shift Control Components.....	28
REMOVAL AND INSTALLATION	7	Case Components.....	29
Removal.....	7	ADJUSTMENT	32
Installation	8	Differential Side Bearing Preload	32
TRANSAXLE GEAR CONTROL	9	ASSEMBLY	33
MAJOR OVERHAUL	10	SERVICE DATA AND SPECIFICATIONS (S.D.S.)	37
Case Components.....	10	General Specifications.....	37
Gear Components	11	Inspection and Adjustment.....	37
Shift Control Components.....	12		

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

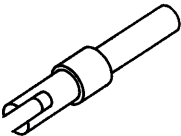
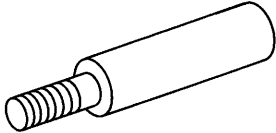
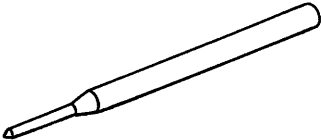
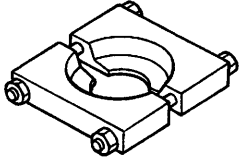
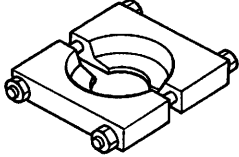
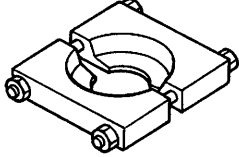
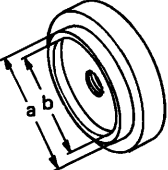
BF

HA

EL

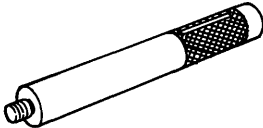
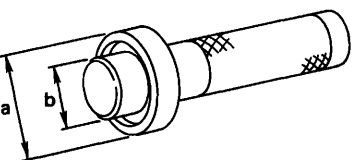
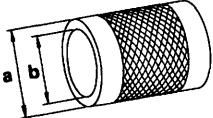
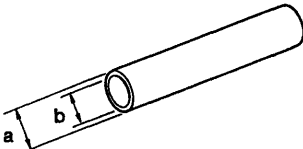
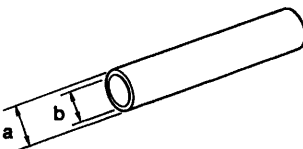
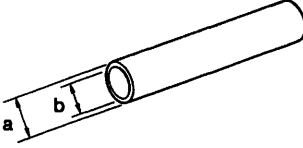
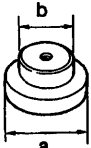
PREPARATION

Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description
KV38107700 (—) Preload adapter	 Measuring turning torque of final drive assembly Selecting differential side bearing adjusting shim (Use with KV38106000.)
KV38106000 (—) Height gauge adapter (differential side bearing)	 Selecting differential side bearing adjusting shim (Use with KV38105900 or KV38107700.)
KV32101000 (J25689-A) Pin punch	 Removing and installing retaining pin
ST22730000 (J25681) Puller	 Removing 5th main gear
ST30031000 (J22912-01) Puller	 Removing differential side bearing inner race (F32A) Removing 3rd and 4th synchronizer Measuring wear of 2nd & 3rd baulk ring
ST30021000 (J22912-01) Puller	 Removing 5th synchronizer
ST33290001 (J34286) Puller	 Removing differential oil seal Removing differential side bearing outer race
KV31103000 (—) Drift	 Installing differential oil seal (Use with ST35325000.) (Except for F32V left side) a: 59 mm (2.32 in) dia. b: 49 mm (1.93 in) dia.

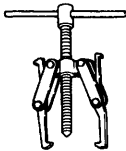
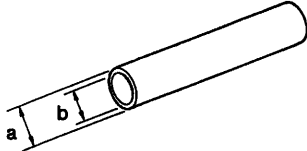
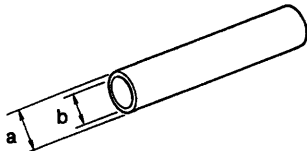
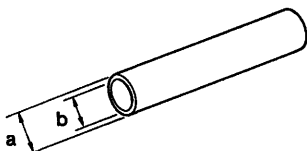
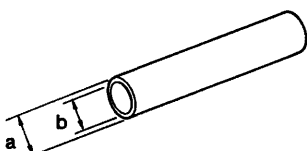
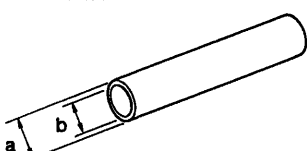
PREPARATION

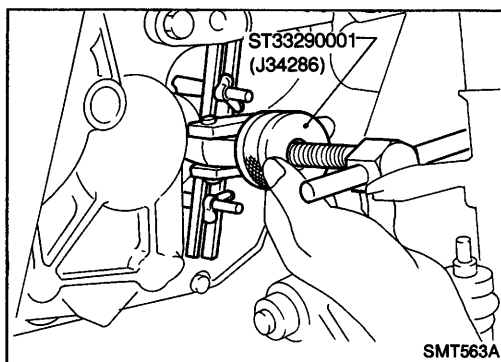
Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	
ST35325000 (—) Drift handle		Installing differential oil seal (Use with KV31103000.) GI MA
KV38102100 (J25803-01) Drift		Installing input shaft rear bearing a: 44 mm (1.73 in) dia. b: 24.5 mm (0.965 in) dia. EM LC
ST33200000 (J26082) Drift		Installing mainshaft front bearing a: 60 mm (2.36 in) dia. b: 44.5 mm (1.752 in) dia. EF & EC FE
ST22350000 (J25678-01) Drift		Installing input shaft front bearing a: 34 mm (1.34 in) dia. b: 28 mm (1.10 in) dia. CL MT
ST22452000 (—) Drift		Installing 1st & 2nd synchronizer Installing 3rd & 4th synchronizer a: 45 mm (1.77 in) dia. b: 36 mm (1.42 in) dia. AT FA
ST37750000 (J25863-01) Drift		Installing 5th main gear Installing input shaft oil seal Installing 5th synchronizer a: 40 mm (1.57 in) dia. b: 31 mm (1.22 in) dia. RA BR
ST30621000 (J25742-5) Drift		Installing differential side bearing outer race (F32A and right side of F32V) (Use with ST30611000.) a: 79 mm (3.11 in) dia. b: 59 mm (2.32 in) dia. ST BF HA
ST30611000 (J25742-1) Drift handle		(Use with ST30621000.) EL

PREPARATION

Commercial Service Tools

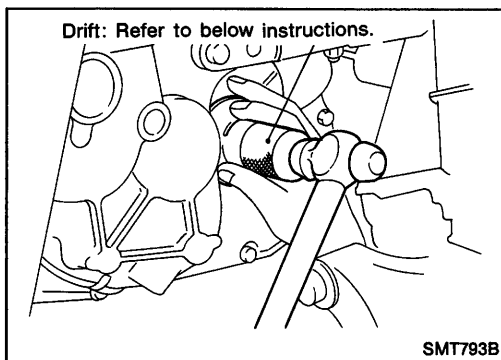
Tool name	Description
Puller	 Removing input shaft front bearing Removing mainshaft rear bearing
Drift	 Installing differential side bearing inner race (F32V right side and F32A) a: 56 mm (2.20 in) dia. b: 50.5 mm (1.988 in) dia.
Drift	 Installing striking rod oil seal a: 38 mm (1.50 in) dia. b: 32 mm (1.26 in) dia.
Drift	 Installing differential oil seal (F32V left side) a: 88 mm (3.46 in) dia. b: 72 mm (2.83 in) dia.
Drift	 Installing differential side bearing outer race (F32V left side) a: 104 mm (4.09 in) dia. b: 98 mm (3.86 in) dia.
Drift	 Installing differential side bearing inner race (F32V left side) a: 91 mm (3.58 in) dia. b: 81 mm (3.19 in) dia.



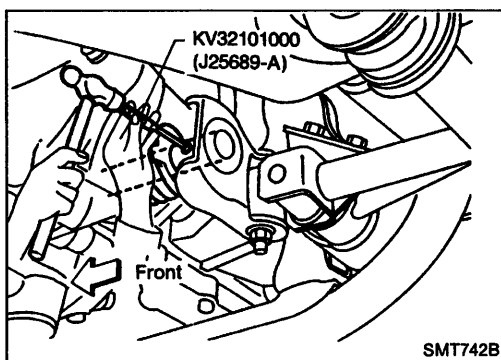
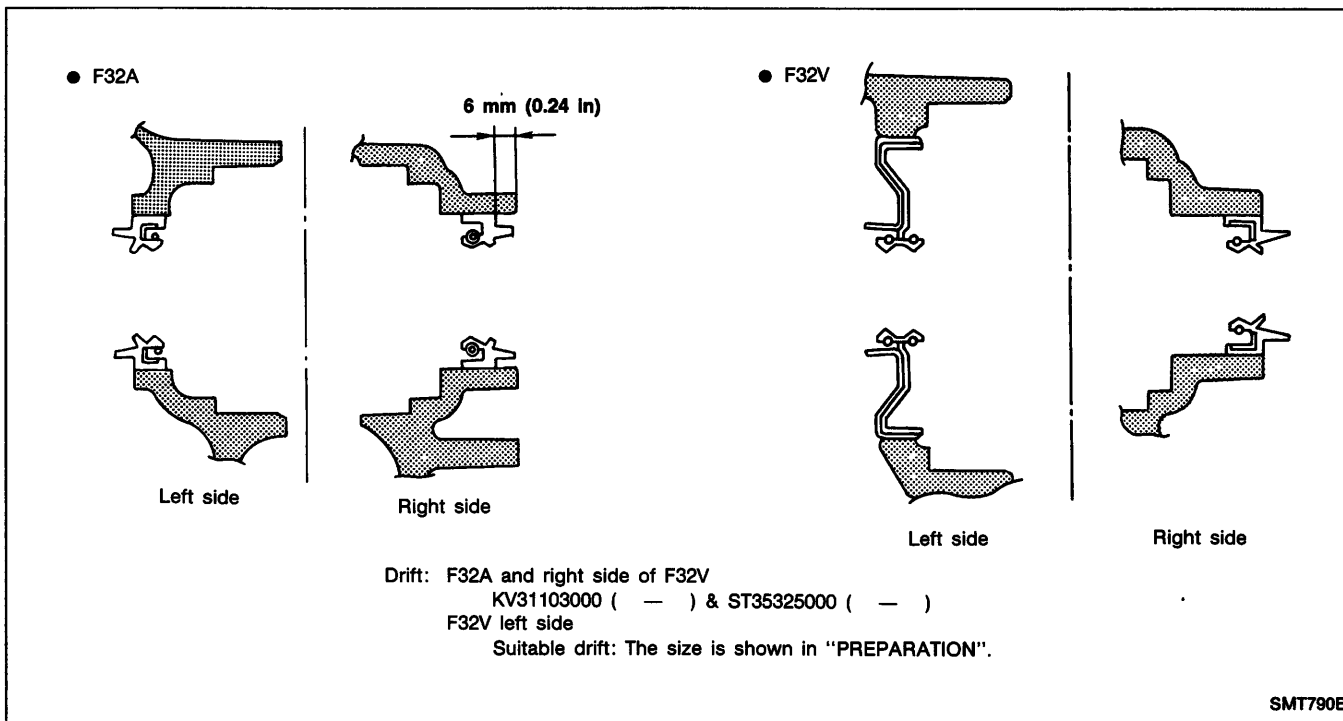
Replacing Oil Seal

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.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

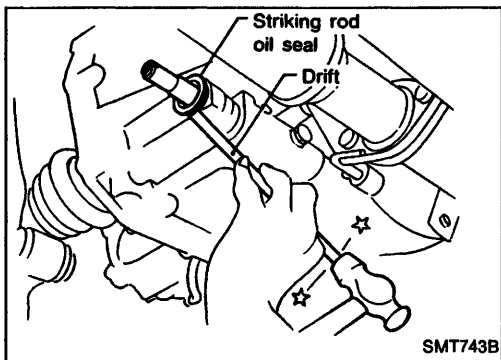
HA

EL

ON-VEHICLE SERVICE

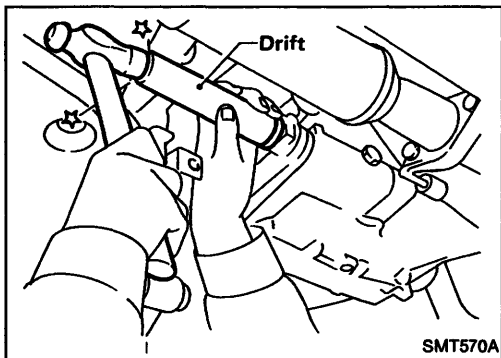
Replacing Oil Seal (Cont'd)

3. Remove striking rod oil seal.



4. Install striking rod oil seal.

- Apply multi-purpose grease to seal lip of oil seal before installing.



Check of Position Switch

BACK-UP LAMP SWITCH

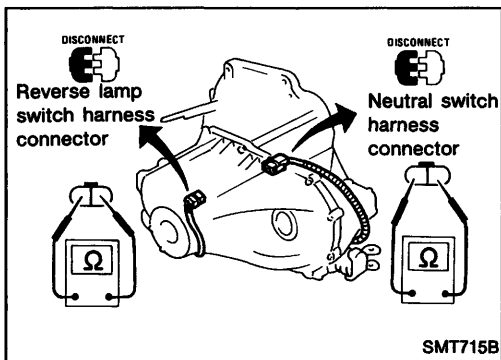
- Check continuity.

Gear position	Continuity
Reverse	Yes
Except reverse	No

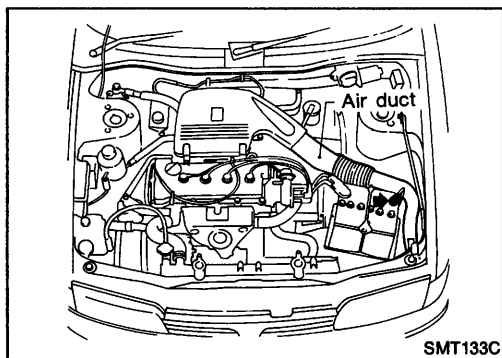
NEUTRAL SWITCH

- Check continuity.

Gear position	Continuity
Neutral	Yes
Except neutral	No

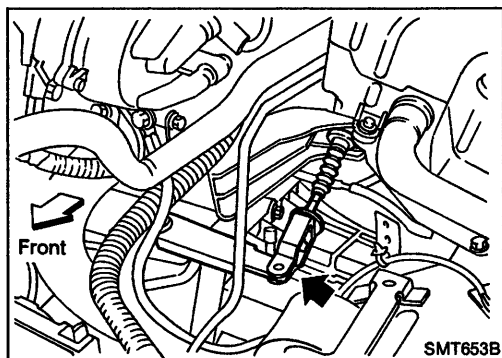


REMOVAL AND INSTALLATION

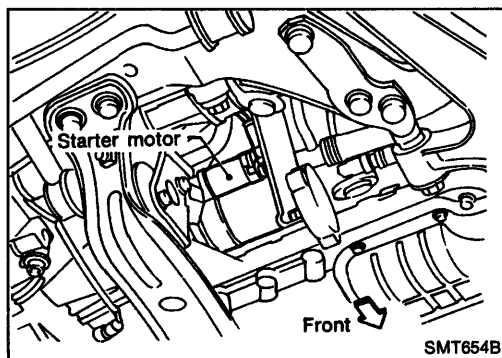


Removal

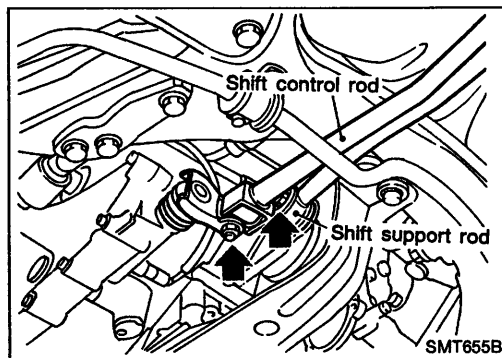
1. Remove battery negative terminal.
2. Remove air duct.



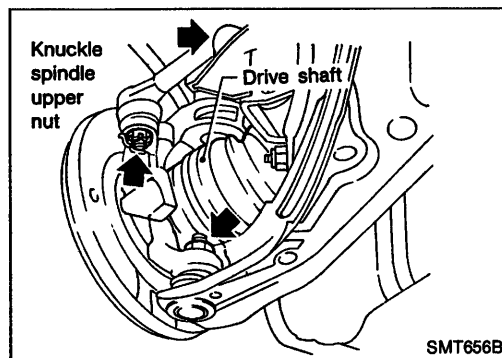
3. Disconnect clutch control cable from transaxle.
4. Disconnect speedometer cable from transaxle.
5. Disconnect back-up lamp switch, neutral switch and ground harness connectors.



6. Remove starter motor from transaxle.



7. Remove shift control rod and support rod from transaxle.
8. Drain gear oil from transaxle.
9. Remove exhaust front tube.



10. Draw out drive shafts from transaxle — Refer to section FA.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

REMOVAL AND INSTALLATION

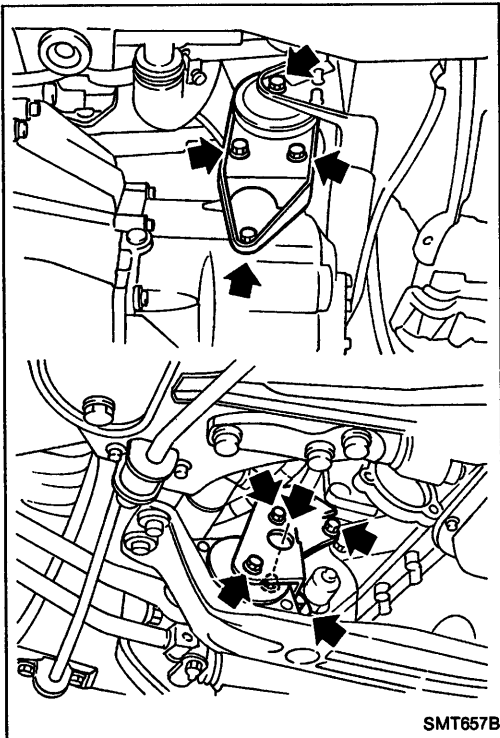
Removal (Cont'd)

11. Support engine by placing a jack under oil pan.

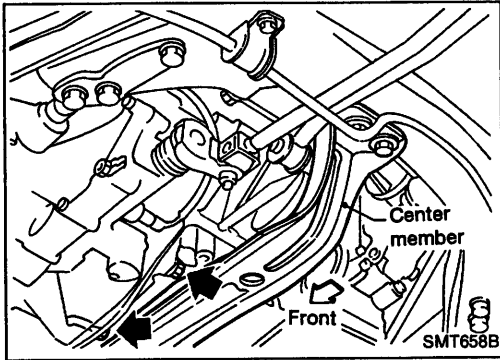
CAUTION:

Do not place jack under oil pan drain plug.

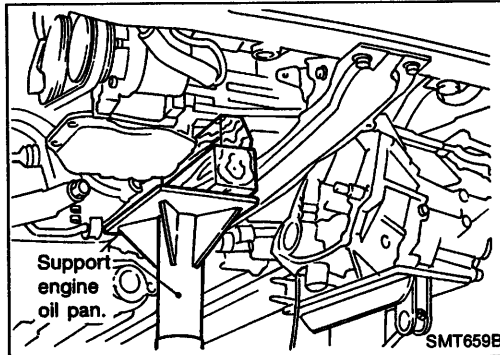
12. Remove rear and L.H. mounts.



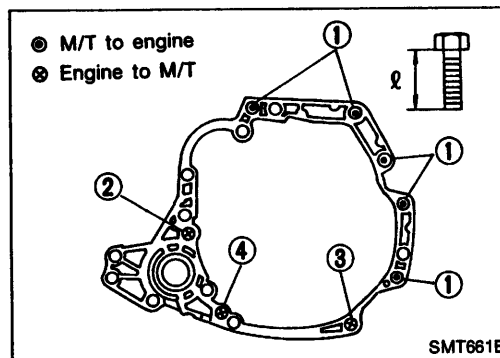
13. Raise jack for access to lower housing bolts. Remove bolts. Lower jack.



14. Remove bolts securing transaxle.
15. Lower transaxle while supporting it with a jack.



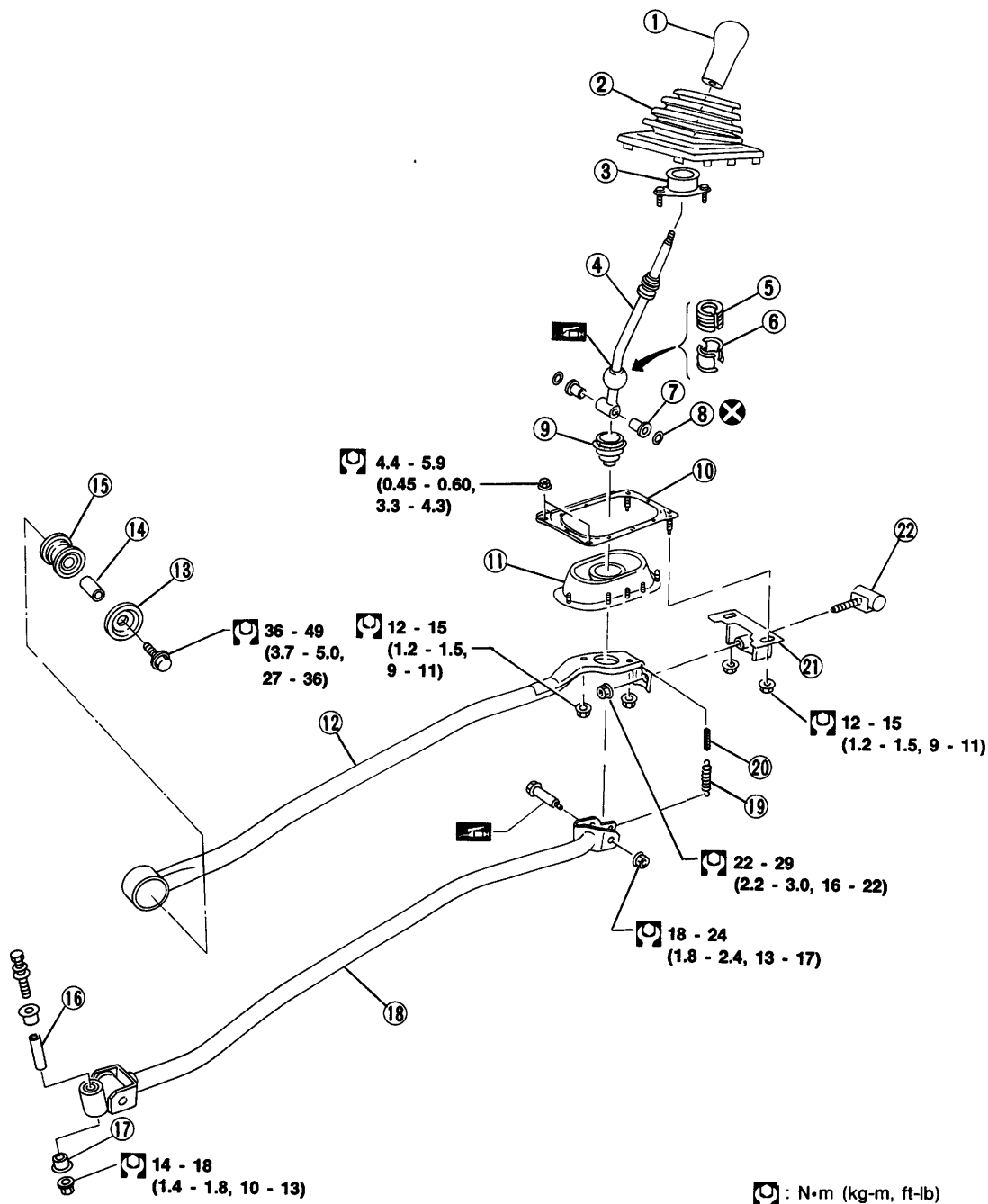
Installation



Bolt No.	Tightening torque N·m (kg-m, ft-lb)	"ℓ" mm (in)
①	70 - 79 (7.1 - 8.1, 51 - 59)	55 (2.17)
②	70 - 79 (7.1 - 8.1, 51 - 59)	65 (2.56)
③	30 - 40 (3.1 - 4.1, 22 - 30)	35 (1.38)
④	30 - 40 (3.1 - 4.1, 22 - 30)	45 (1.77)

● Reinstall any part removed.

TRANSAXLE GEAR CONTROL



- ① Control lever knob
- ② Boot
- ③ Control lever socket
- ④ Control lever
- ⑤ Insulator
- ⑥ Seat
- ⑦ Bushing
- ⑧ O-ring

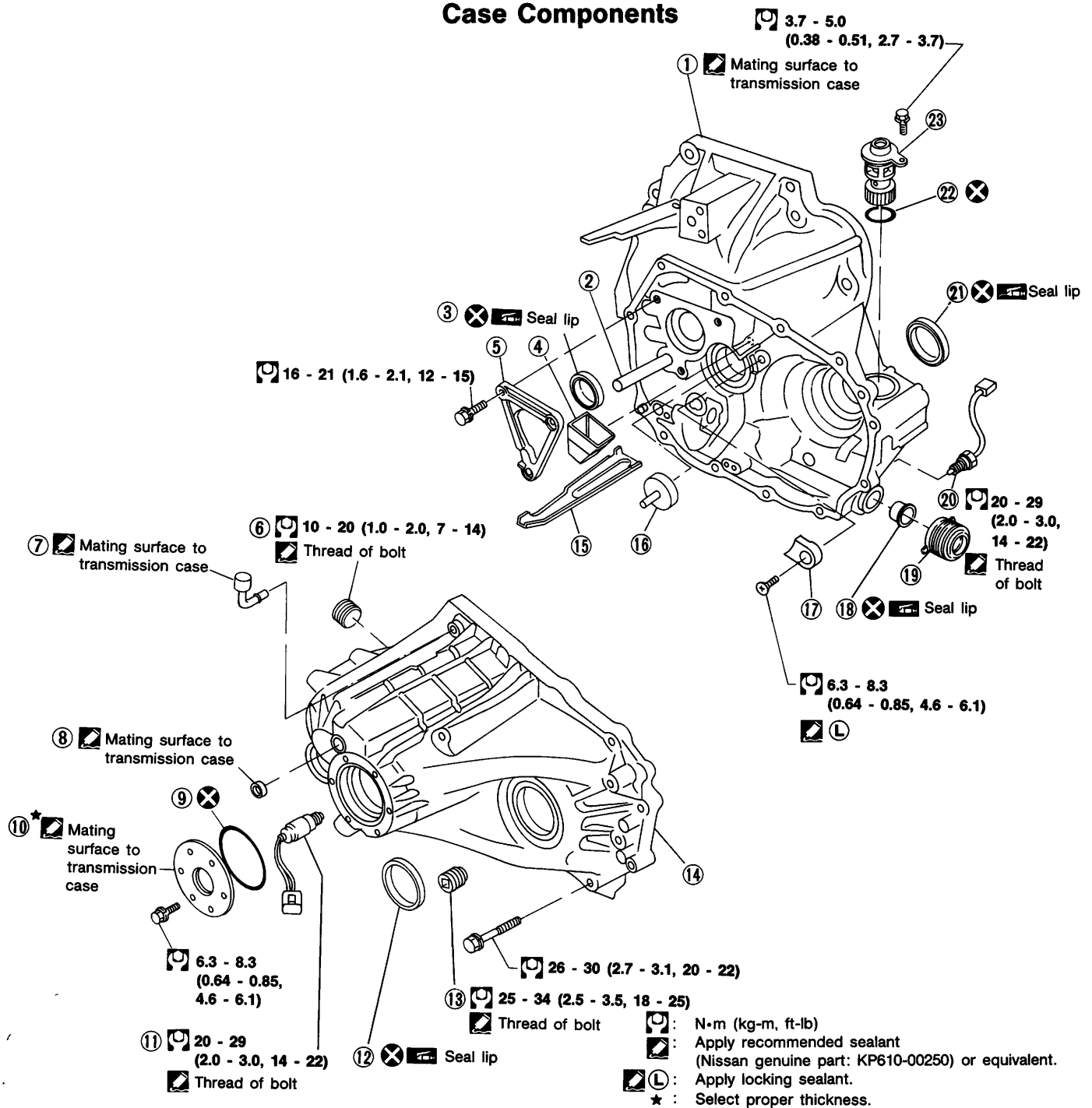
- ⑨ Dust boot
- ⑩ Plate bolt
- ⑪ Transaxle hole cover
- ⑫ Support rod
- ⑬ Plate
- ⑭ Collar
- ⑮ Bushing

- ⑯ Collar
- ⑰ Bushing
- ⑱ Control rod
- ⑲ Return spring
- ⑳ Return spring rubber
- ㉑ Holder bracket
- ㉒ Mass damper

SMT791B

MAJOR OVERHAUL

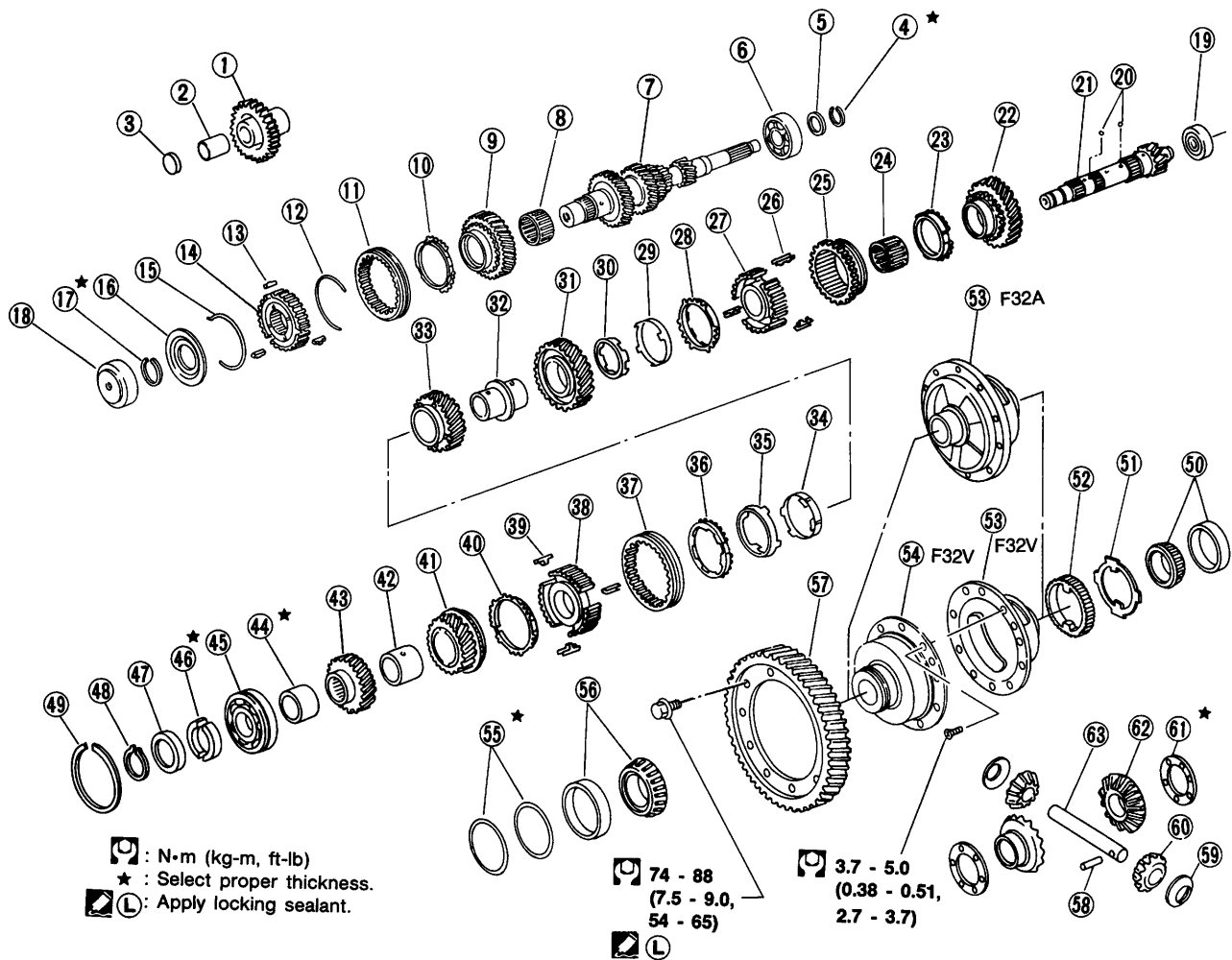
Case Components



SMT764B

- | | | |
|------------------------|-------------------------|-------------------------------|
| ① Clutch housing | ⑨ O-ring | ⑰ Bearing retainer |
| ② Reverse idler shaft | ⑩ Case cover | ⑱ Striking rod oil seal |
| ③ Input shaft oil seal | ⑪ Reverse lamp switch | ⑲ Boot |
| ④ Oil pocket | ⑫ Differential oil seal | ⑳ Neutral switch |
| ⑤ Bearing retainer | ⑬ Drain plug | ㉑ Differential oil seal |
| ⑥ Filler plug | ⑭ Transmission case | ㉒ O-ring |
| ⑦ Air breather | ⑮ Oil gutter | ㉓ Speedometer pinion assembly |
| ⑧ Welch plug | ⑯ Oil channel | |

Gear Components

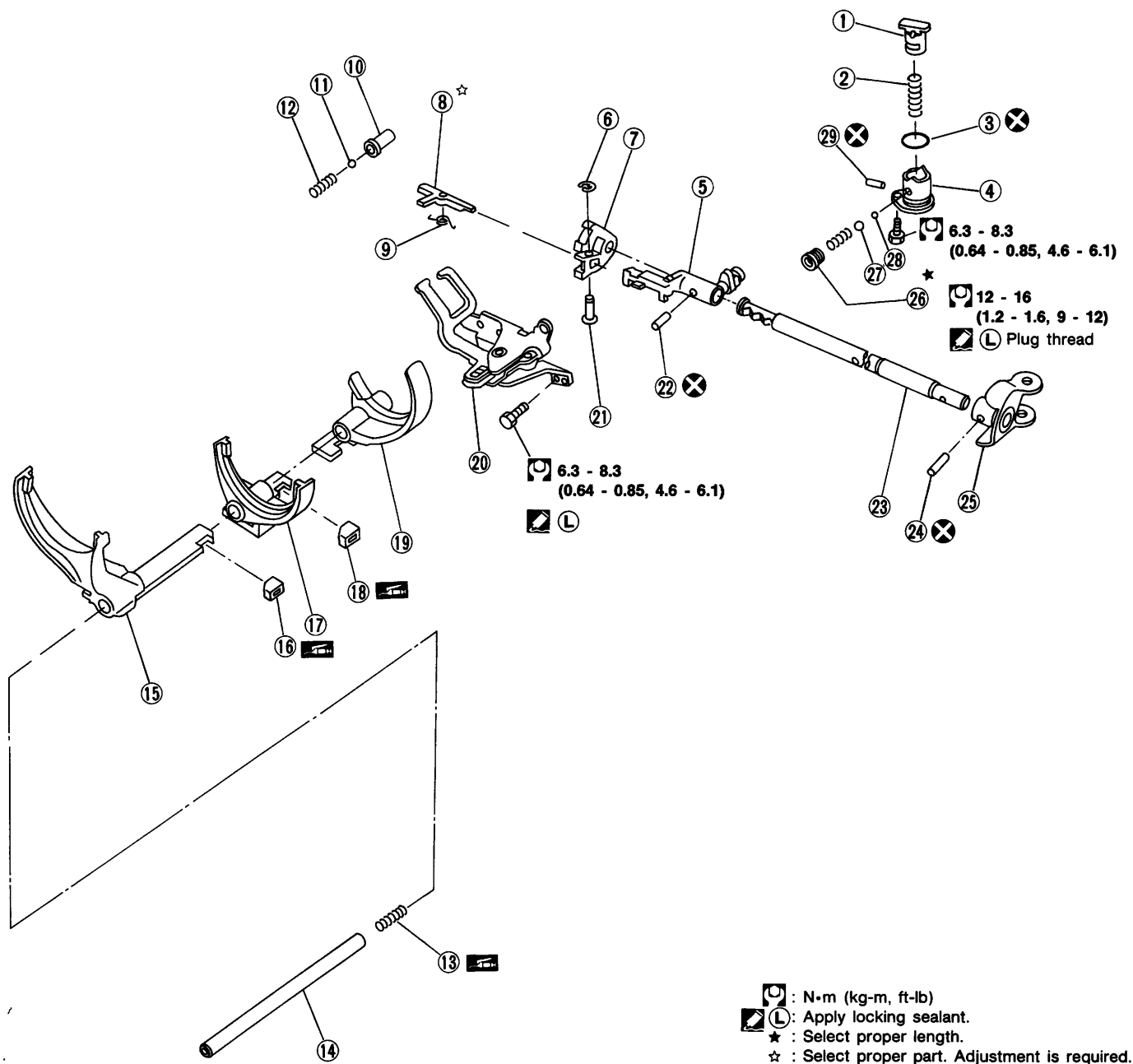


SMT792B

- | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|--------------------------|------------------------|-------------|----------|-----------------------------|---------------|---------------------------|------------------|--------------|-------------------|---------------|-----------------|-----------------------------|---------------|---------------|-------------|-----------------------|---------------------------|--------------|-------------|-----------------|--------------|---------------------------|---------------------------------------|-----------------|------------------------------|------------------------|------------------------------|------------------------|-----------------|---------------------|-----------------|------------------------|------------------------------|------------------------|-------------------|------------------------------|-----------------|--------------|-----------------|--------------------|-----------------|----------|--------------------------|----------|-----------------|-------------|-----------------------------|---------------------|------------------------|-------------------|------------------|--|---------------------------|------------|---------------|---------------|------------------|---------------|-----------|-------------------|
| ① Reverse idler gear | ②③ Reverse idler bushing | ④ Reverse idler spacer | ⑤ Snap ring | ⑥ Spacer | ⑦ Input shaft front bearing | ⑧ Input shaft | ⑨ 5th gear needle bearing | ⑩ 5th input gear | ⑪ Baulk ring | ⑫ Coupling sleeve | ⑬ Spread ring | ⑭ Insert spring | ⑮ 5th gear synchronizer hub | ⑯ Spread ring | ⑰ 5th stopper | ⑱ Snap ring | ⑲ Input shaft bearing | ⑳ Mainshaft front bearing | ㉑ Steel ball | ㉒ Mainshaft | ㉓ 1st main gear | ㉔ Baulk ring | ㉕ 1st gear needle bearing | ㉖ Reverse main gear (Coupling sleeve) | ㉗ Insert spring | ㉘ 1st & 2nd synchronizer hub | ㉙ 2nd outer baulk ring | ㉚ 2nd gear synchronizer cone | ㉛ 2nd inner baulk ring | ㉜ 2nd main gear | ㉝ 2nd & 3rd bushing | ㉞ 3rd main gear | ㉟ 3rd inner baulk ring | ㊱ 3rd gear synchronizer cone | ㊲ 3rd outer baulk ring | ㊳ Coupling sleeve | ㊴ 3rd & 4th synchronizer hub | ㊵ Insert spring | ㊶ Baulk ring | ㊷ 4th main gear | ㊸ 4th gear bushing | ㊹ 5th main gear | ㊺ Spacer | ㊻ Mainshaft rear bearing | ㊼ C-ring | ㊽ C-ring holder | ㊾ Snap ring | ㊿ Differential side bearing | Speedometer stopper | Speedometer drive gear | Differential case | Viscous coupling | Differential side bearing adjusting shim | Differential side bearing | Final gear | Retaining pin | Thrust washer | Pinion mate gear | Thrust washer | Side gear | Pinion mate shaft |
|----------------------|--------------------------|------------------------|-------------|----------|-----------------------------|---------------|---------------------------|------------------|--------------|-------------------|---------------|-----------------|-----------------------------|---------------|---------------|-------------|-----------------------|---------------------------|--------------|-------------|-----------------|--------------|---------------------------|---------------------------------------|-----------------|------------------------------|------------------------|------------------------------|------------------------|-----------------|---------------------|-----------------|------------------------|------------------------------|------------------------|-------------------|------------------------------|-----------------|--------------|-----------------|--------------------|-----------------|----------|--------------------------|----------|-----------------|-------------|-----------------------------|---------------------|------------------------|-------------------|------------------|--|---------------------------|------------|---------------|---------------|------------------|---------------|-----------|-------------------|

MAJOR OVERHAUL

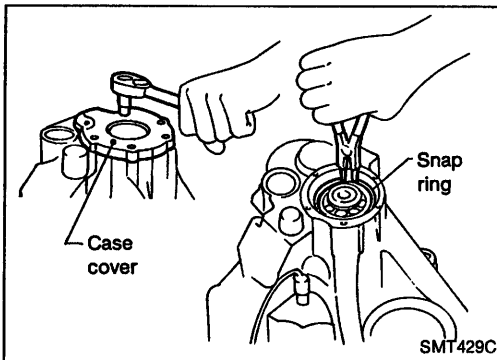
Shift Control Components



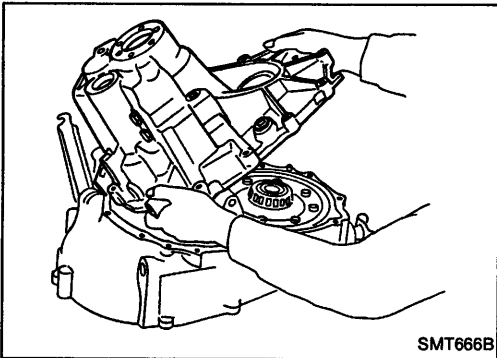
SMT716B

- | | | |
|----------------------------|--------------------------------|-----------------------|
| ① Check plunger | ⑪ Shift check ball | ⑲ Control bracket pin |
| ② Select return spring | ⑫ Check spring | ⑳ Retaining pin |
| ③ O-ring | ⑬ Fork shaft supporting spring | ㉑ Striking rod |
| ④ Check sleeve | ⑭ Fork shaft | ㉒ Retaining pin |
| ⑤ Striking lever | ⑮ 5th shift fork | ㉓ Yoke |
| ⑥ Snap ring | ⑯ Shift cap | ㉔ Reverse check plug |
| ⑦ Striking interlock | ⑰ 3rd & 4th shift fork | ㉕ Check ball (Large) |
| ⑧ Reverse brake cam | ⑱ Shift cap | ㉖ Check ball (Small) |
| ⑨ Reverse check cam spring | ㉑ 1st & 2nd shift fork | ㉗ Stopper pin |
| ⑩ Check ball plug | ㉒ Control bracket | |

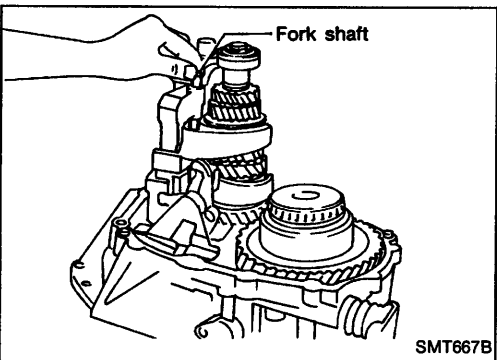
DISASSEMBLY



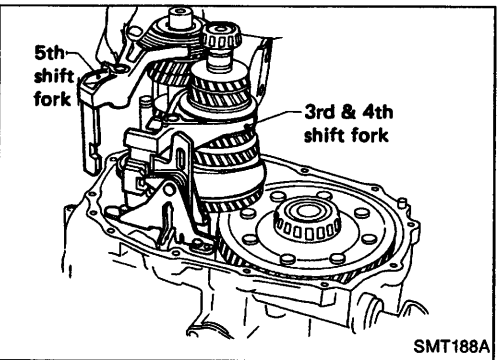
1. Remove case cover.
2. Remove mainshaft bearing snap ring.



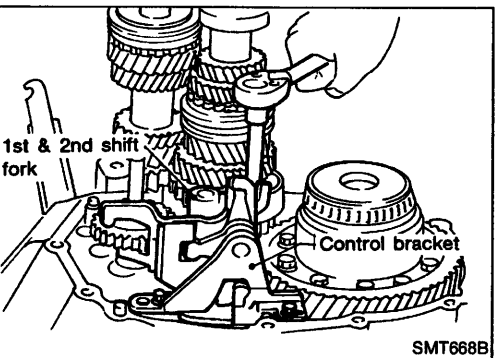
3. Remove transmission case while slightly tilting it to prevent 5th shift fork from interfering with case.



4. Draw out reverse idler spacer and fork shaft.



5. Remove 5th and 3rd & 4th shift forks.
 - Be careful not to lose shifter cap.



6. Remove control bracket with 1st & 2nd shift fork.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

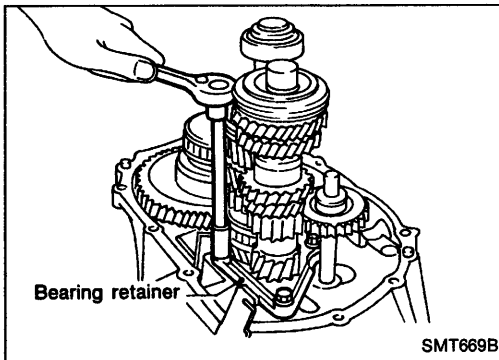
ST

BF

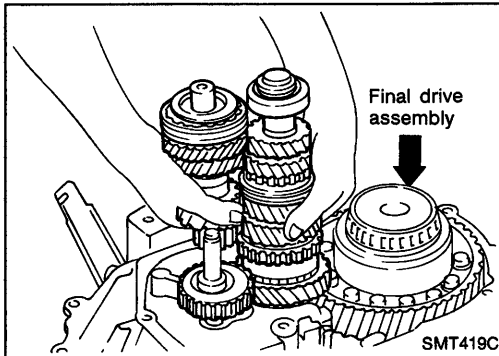
HA

EL

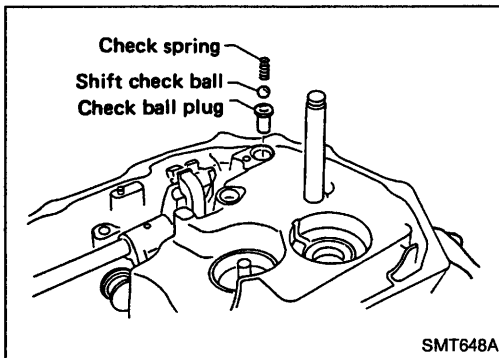
DISASSEMBLY



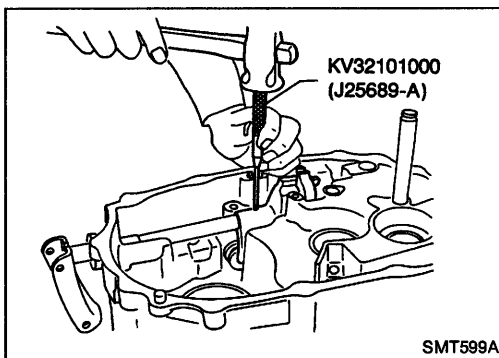
7. Remove gear components from clutch housing.
 - a. Remove input shaft front bearing retainer securing bolts.



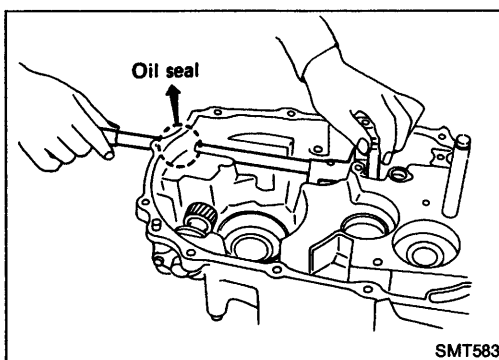
- b. Remove input shaft with bearing retainer, mainshaft assembly and reverse idler gear.
 - **Always withdraw mainshaft straight out. Failure to do so can damage resin oil channel on clutch housing side.**
 - **Do not draw out reverse idler shaft from clutch housing because these fittings will be loose. When removing input shaft, be careful not to scratch oil seal lip with shaft spline.**
 - c. Remove final drive assembly.



8. Remove oil pocket, shift check ball, check spring and check ball plug.

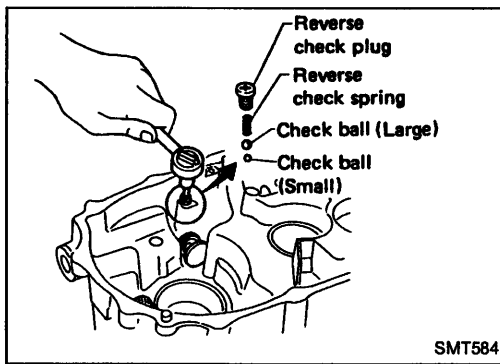


9. Drive retaining pin out of striking lever, then remove striking rod, striking lever and striking interlock.
 - **Select a position where retaining pin does not interfere with clutch housing when removing retaining pin.**

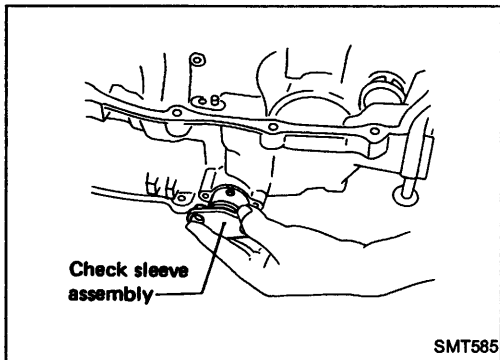


- **Be careful not to damage oil seal lip, when removing striking rod. If necessary, tape edges of striking rod.**

DISASSEMBLY



10. Remove reverse check plug, then detach reverse check spring and check balls.
 - If the smaller ball does not come out, remove it together with check sleeve assembly.



11. Remove check sleeve assembly.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

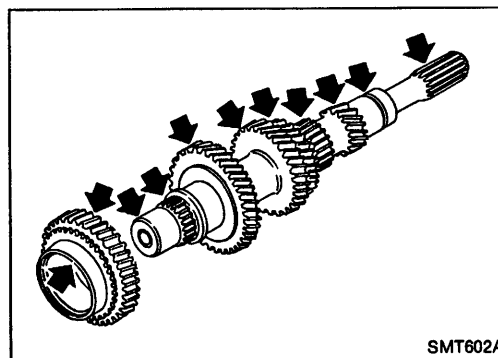
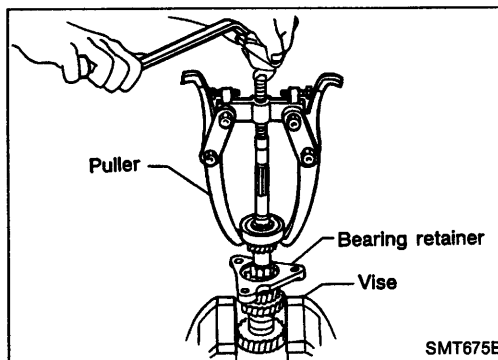
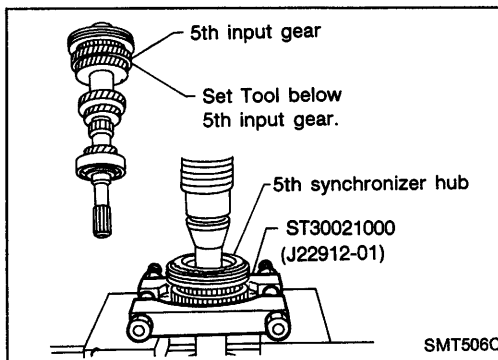
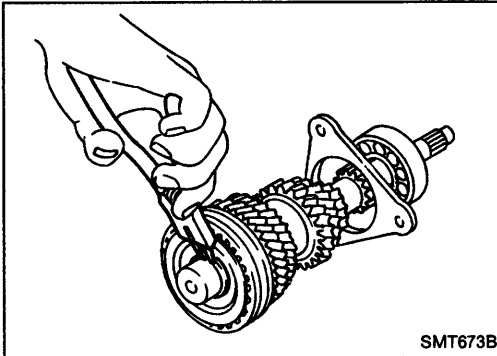
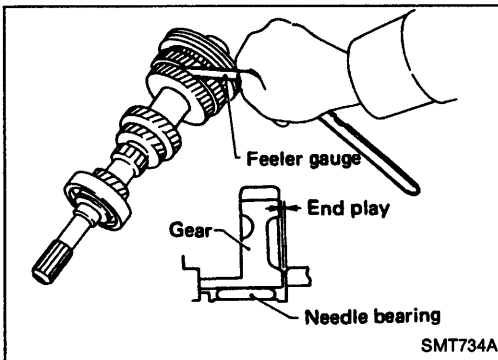
HA

EL

Input Shaft and Gears

DISASSEMBLY

1. Before disassembly, check 5th input gear end play.
Gear end play: 0.18 - 0.31 mm (0.0071 - 0.0122 in)
 - If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring groove — Refer to "Assembly — Input Shaft and Gears".
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.
5. Pull out input shaft front bearing.
6. Remove bearing retainer.



INSPECTION

Gear and shaft

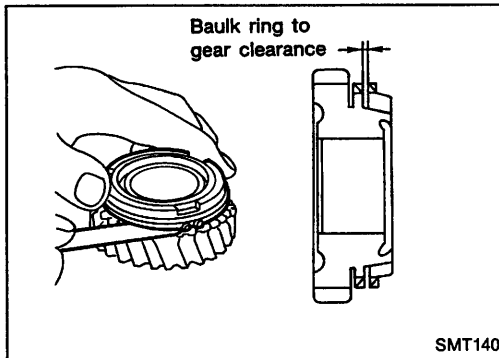
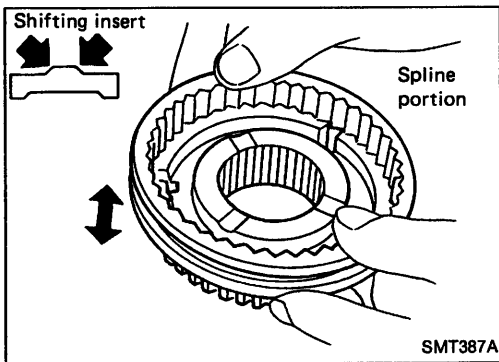
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

REPAIR FOR COMPONENT PARTS

Input Shaft and Gears (Cont'd)

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 wear or deformation.



- Measure clearance between baulk ring and gear.

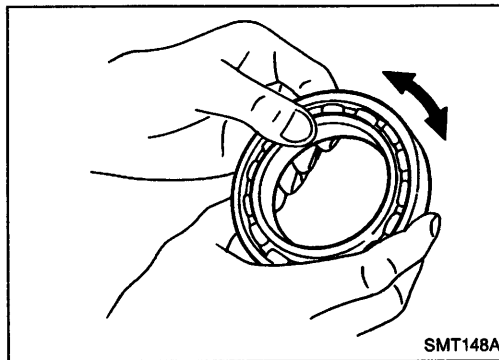
Clearance between baulk ring and gear:

Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

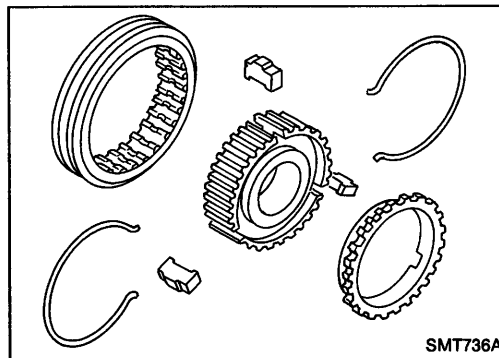
Wear limit

0.7 mm (0.028 in)



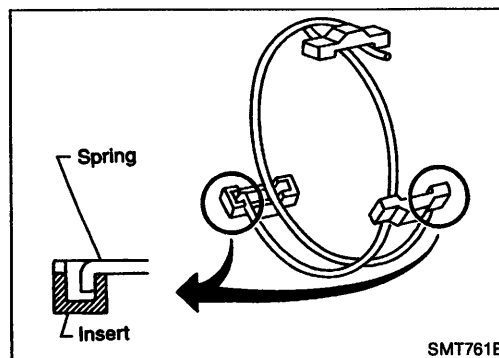
Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.



ASSEMBLY

1. Assemble 5th synchronizer.



- Be careful not to hook front and rear ends of spread spring to the same insert.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

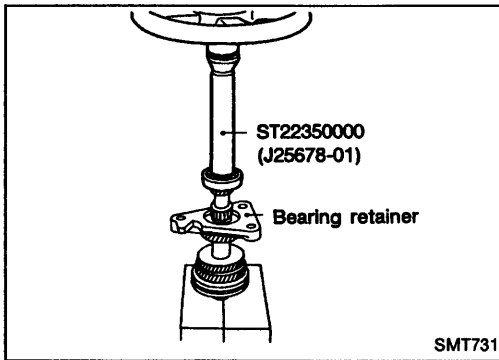
BF

HA

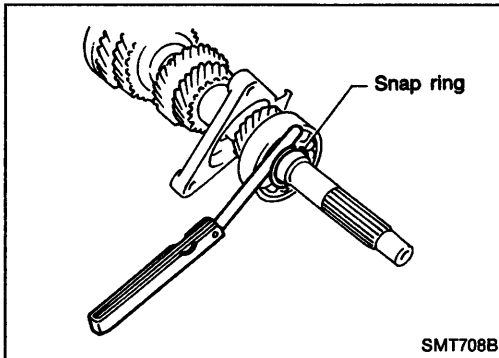
EL

REPAIR FOR COMPONENT PARTS

Input Shaft and Gears (Cont'd)



2. Install bearing retainer.
3. Press on input shaft front bearing.
4. Install input gear spacer.



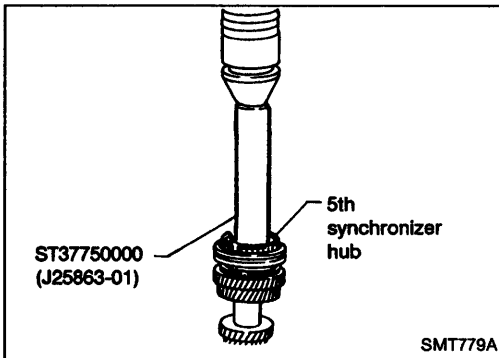
5. Select proper snap ring of input shaft front bearing to minimize clearance of groove in input shaft and then install it.

Allowable clearance of groove:

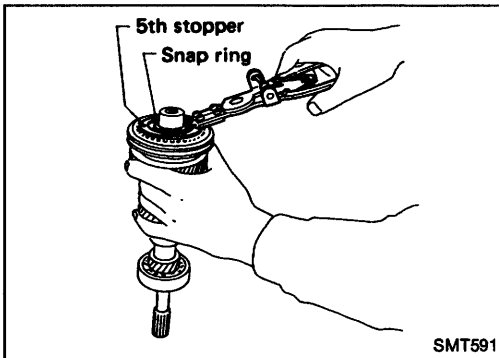
0 - 0.1 mm (0 - 0.004 in)

Snap rings of input shaft front bearing:

Refer to S.D.S.



6. Install 5th gear needle bearing, 5th input gear, 5th synchronizer and 5th stopper.
7. Measure gear end play as a final check — Refer to "Disassembly — Input Shaft and Gears".



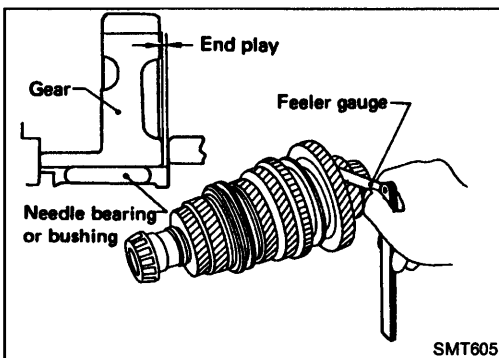
8. Select proper snap ring of 5th synchronizer hub to minimize clearance of groove in input shaft and install it.

Allowable clearance of groove:

0 - 0.1 mm (0 - 0.004 in)

Snap ring of 5th synchronizer:

Refer to S.D.S.



Mainshaft and Gears

DISASSEMBLY

1. Before disassembly, measure gear end play.

Gear end play:

1st main gear

0.18 - 0.31 mm (0.0071 - 0.0122 in)

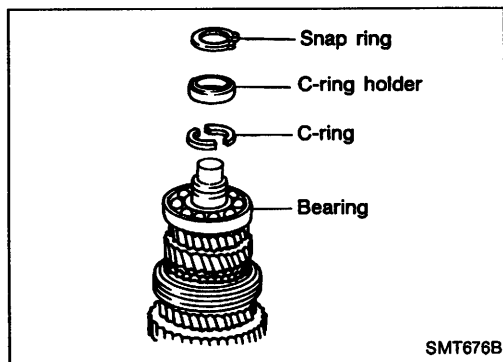
2nd-4th main gear

0.20 - 0.30 mm (0.0079 - 0.0118 in)

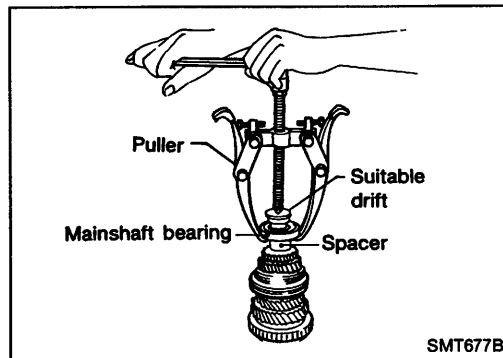
- If end play is not within the specified limit, disassemble and check the parts.

REPAIR FOR COMPONENT PARTS

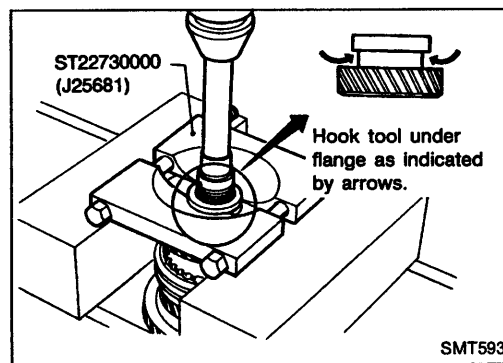
Mainshaft and Gears (Cont'd)



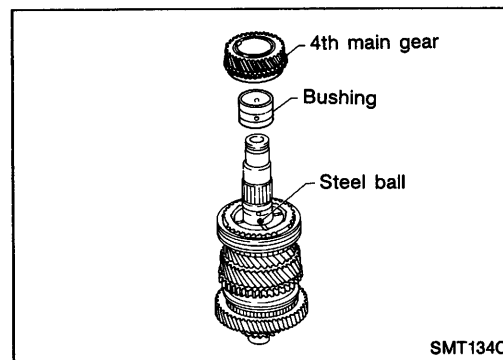
2. Remove mainshaft rear bearing snap ring, C-ring holder and C-rings.



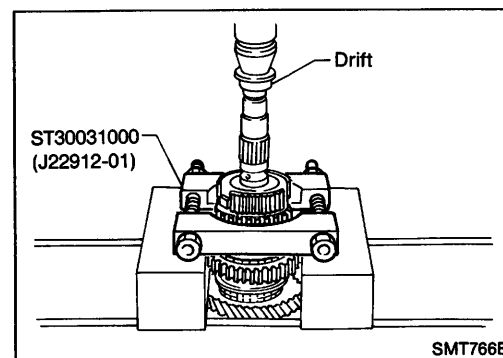
3. Remove mainshaft bearing and spacer.



4. Remove 5th main gear.



5. Remove 4th main gear, 4th gear bushing and steel ball.
- Take care not to lose steel ball.



6. Remove 3rd & 4th synchronizer and 3rd main gear.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

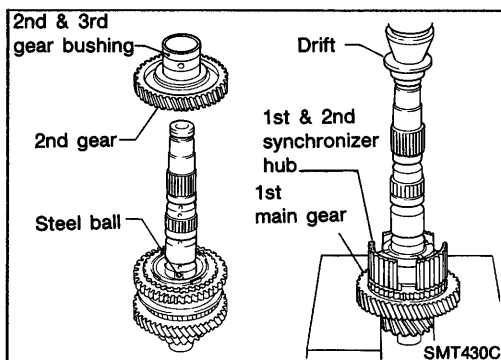
BF

HA

EL

REPAIR FOR COMPONENT PARTS

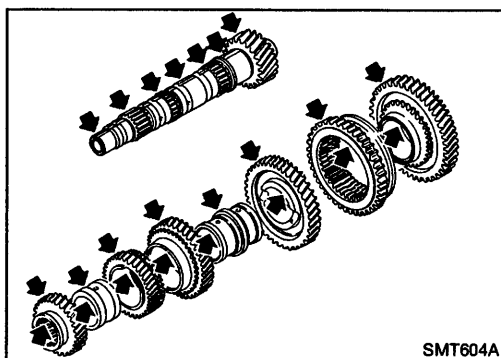
Mainshaft and Gears (Cont'd)



7. Remove 2nd & 3rd bushing and 2nd main gear.

- Take care not to lose the steel ball.

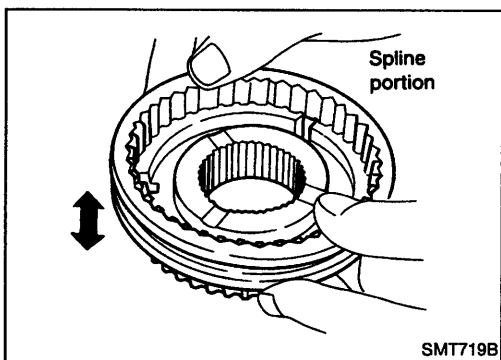
8. Remove 1st & 2nd synchronizer hub and 1st main gear.



INSPECTION

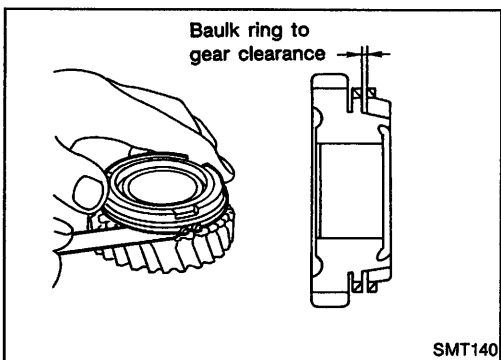
Gear and shaft

- 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.



- Measure clearance between baulk ring and gear.
Clearance between baulk rings and gears, for 1st and 4th gear only:

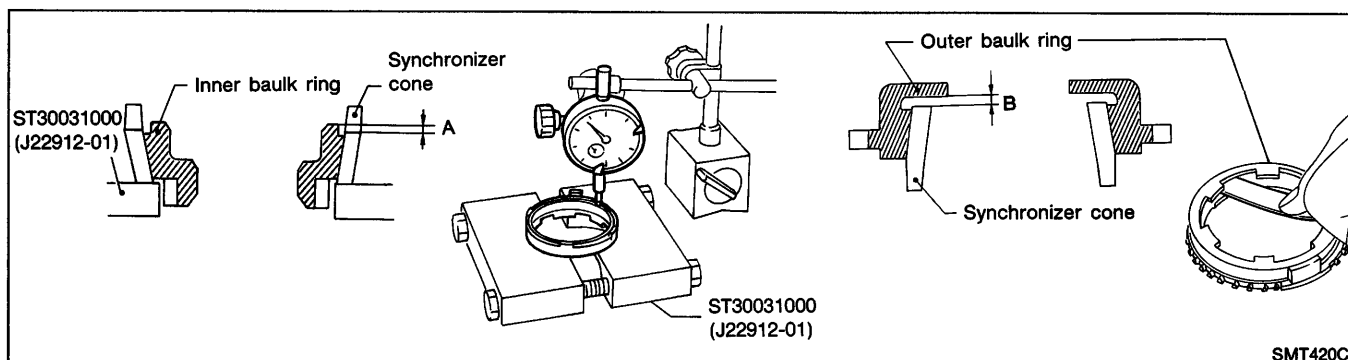
Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

Wear limit

0.7 mm (0.028 in)

- 2nd and 3rd gears have inner and outer baulk rings and so have different measurements.



REPAIR FOR COMPONENT PARTS

Mainshaft and Gears (Cont'd)

- Measure wear of 2nd and 3rd baulk ring.
- a. Place baulk rings in position on synchronizer cone.
- b. While holding baulk ring against synchronizer cone as far as it will go, measure dimensions "A" and "B".

Standard:

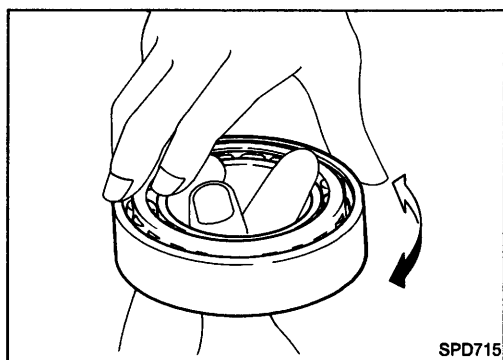
A 0.7 - 0.9 mm (0.028 - 0.035 in)

B 0.6 - 1.1 mm (0.024 - 0.043 in)

Wear limit:

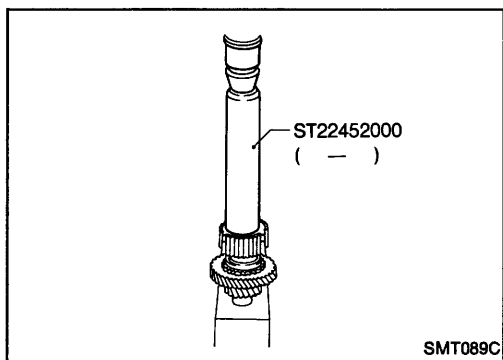
0.2 mm (0.008 in)

- c. If dimension "A" or "B" is smaller than the wear limit, replace baulk ring.



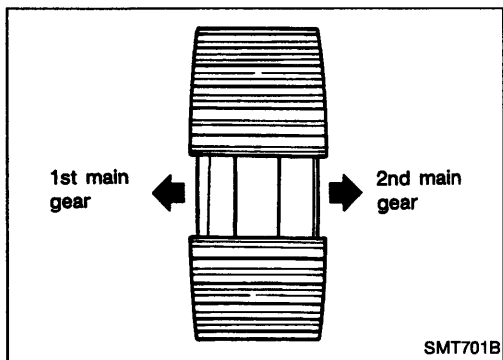
Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **The mainshaft front bearing cannot be re-used. It must be replaced once removed.**

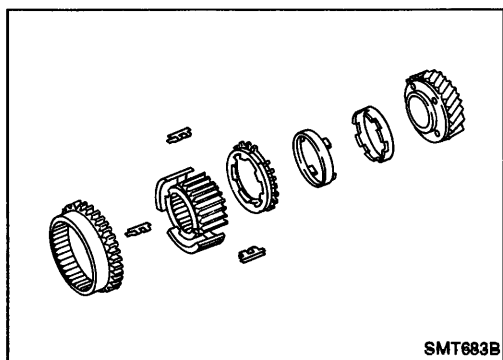


ASSEMBLY

1. Install 1st gear needle bearing, 1st main gear and baulk ring.
2. Press on 1st & 2nd synchronizer hub.



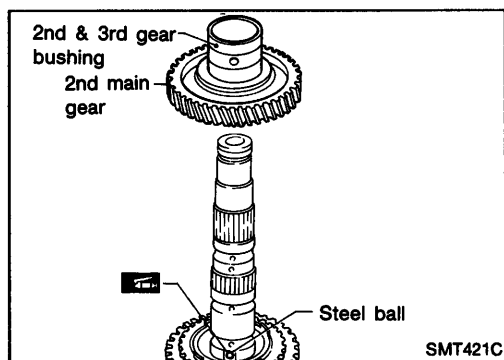
- Ensure correct fitting of 1st & 2nd synchronizer hub.



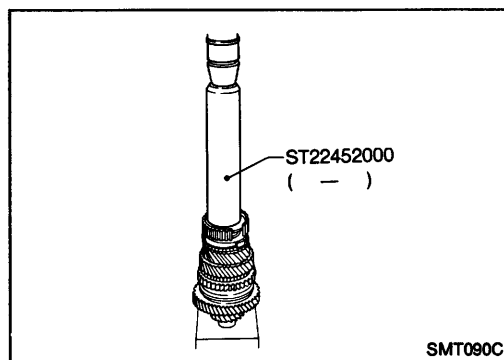
3. Install 2nd synchronizer cone, outer & inner baulk ring and 1st & 2nd coupling sleeve.

REPAIR FOR COMPONENT PARTS

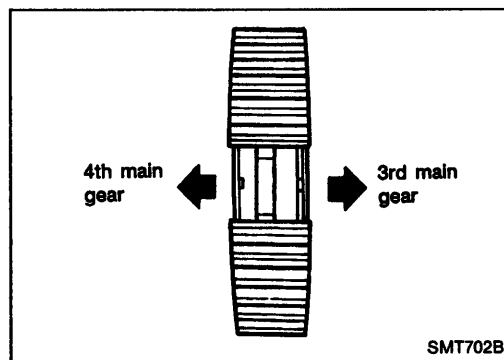
Mainshaft and Gears (Cont'd)



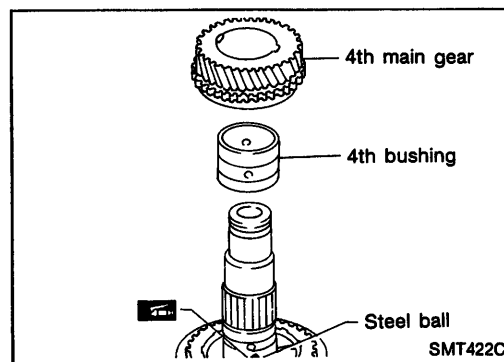
4. Install steel ball, 2nd main gear, 2nd & 3rd bushing.
 - Apply gear oil to 2nd & 3rd bushing before installing it.
 - Apply multi-purpose grease to steel ball before installing it.
 - 2nd & 3rd bushing has a groove in which steel ball fits.



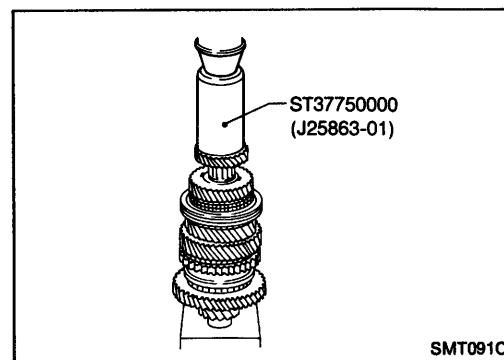
5. Install 3rd main gear, synchronizer cone, outer & inner baulk ring.
6. Press on 3rd & 4th synchronizer hub.



- Ensure correct fitting of 3rd & 4th synchronizer hub.
7. Install 3rd & 4th coupling sleeve and 4th baulk ring.



8. 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.



9. Press on 5th main gear.

REPAIR FOR COMPONENT PARTS

Mainshaft and Gears (Cont'd)

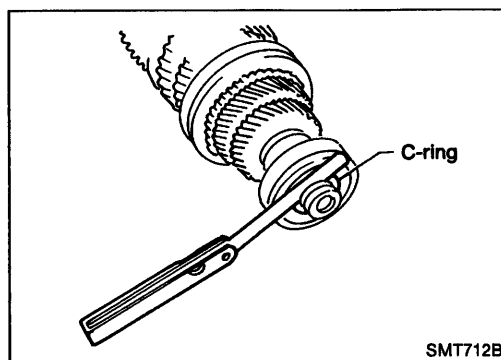
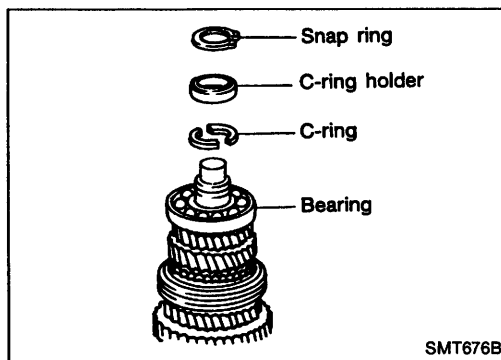
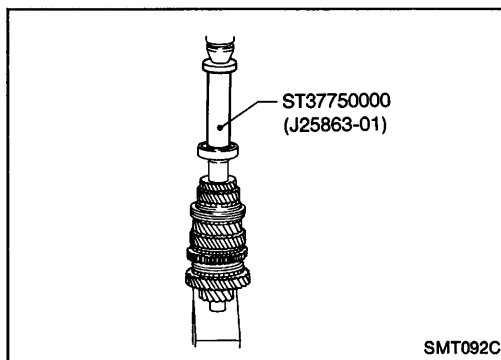
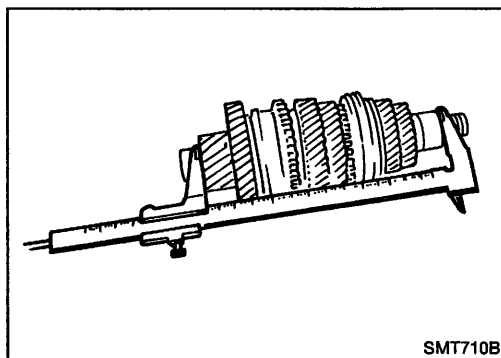
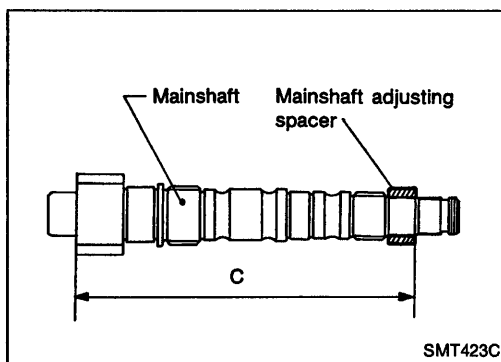
10. Select proper mainshaft bearing spacer to give correct bearing distance.

Bearing distance "C":

230.15 - 230.25 mm (9.0610 - 9.0649 in)

Spacers available:

Thickness mm (in)	Part number
18.91 (0.7445)	32347-50J00
18.98 (0.7472)	32347-50J01
19.05 (0.7500)	32347-50J02
19.12 (0.7528)	32347-50J03
19.19 (0.7555)	32347-50J04
19.26 (0.7583)	32347-50J05
19.33 (0.7610)	32347-50J06
19.40 (0.7638)	32347-50J07
19.47 (0.7665)	32347-50J08



11. Press on mainshaft rear bearing.

12. 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-rings:

Refer to S.D.S.

13. Install C-ring holder and snap ring.

14. Measure gear end play as the final check — Refer to "Disassembly".

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

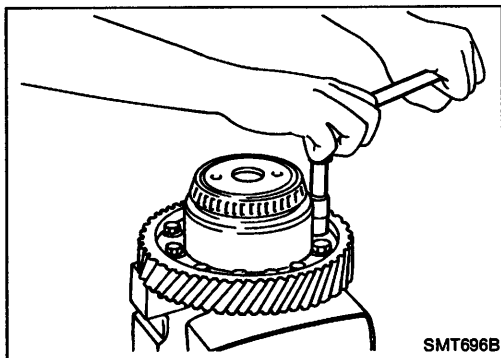
BR

ST

BF

HA

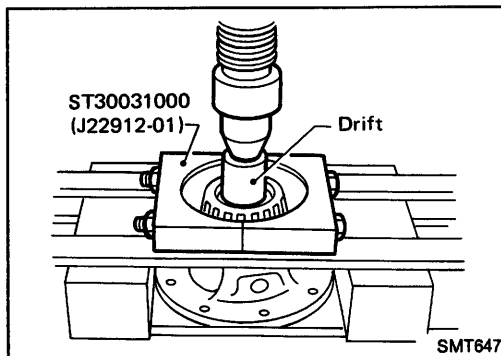
EL



Final Drive

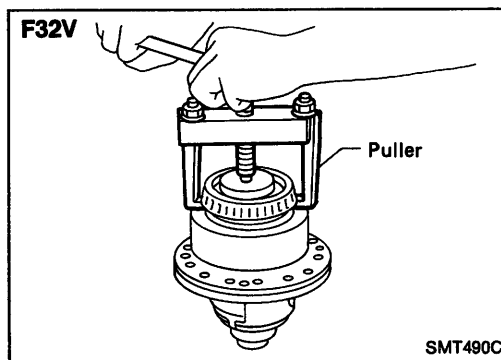
DISASSEMBLY

1. Remove final gear.
2. Remove speedometer drive gear by cutting it.

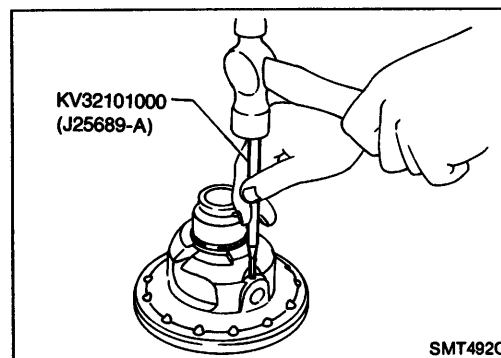
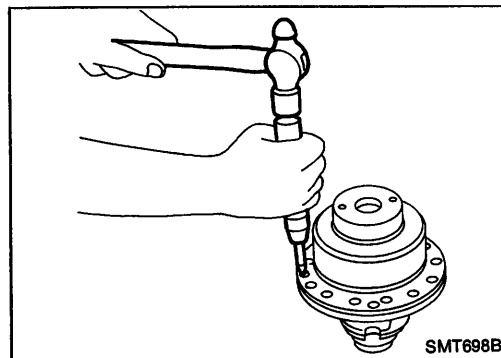


3. Pull out differential side bearings.

- Be careful not to mix up the right and left bearings — RS5F32A



4. Remove viscous coupling.



5. Drive out retaining pin and draw out pinion mate shaft.
6. Remove pinion mate gears and side gears.

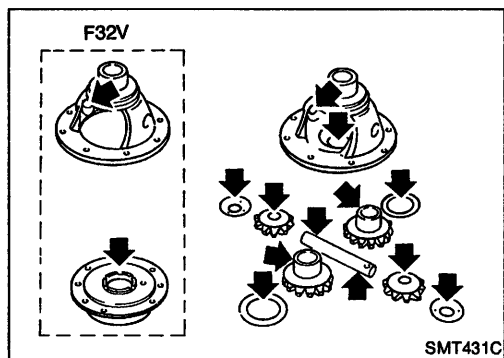
REPAIR FOR COMPONENT PARTS

Final Drive (Cont'd)

INSPECTION

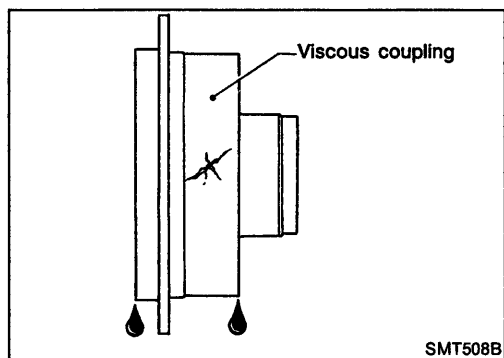
Gear, washer, shaft and case

- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.



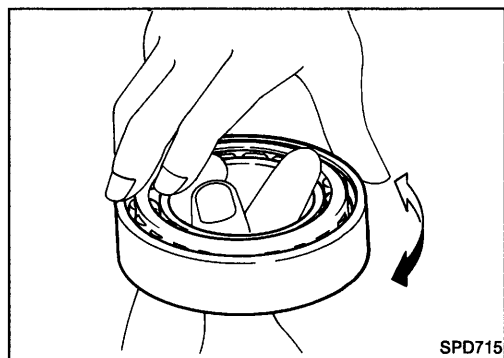
Viscous coupling — RS5F32V

- Check case for cracks.
- Check silicone oil for leakage.



Bearing

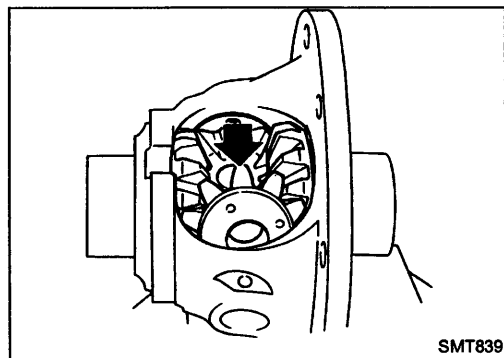
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- When replacing tapered roller bearing, replace outer and inner race as a set.



ASSEMBLY

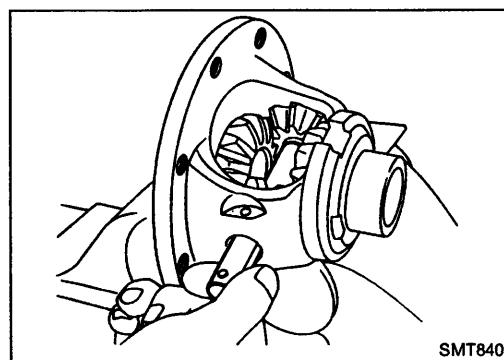
— RS5F32A —

1. Attach side gear thrust washers to 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.



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

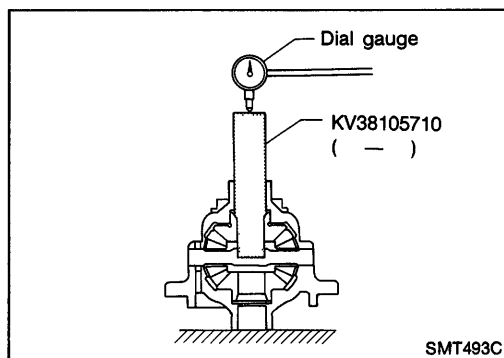
BF

HA

EL

REPAIR FOR COMPONENT PARTS

Final Drive (Cont'd)



3. Measure clearance between side gear and differential case with washers using the following procedure:
 - a. Set Tool and dial indicator on side gear.
 - b. Move side gear up and down to measure dial indicator deflection. Always measure on both side gears.

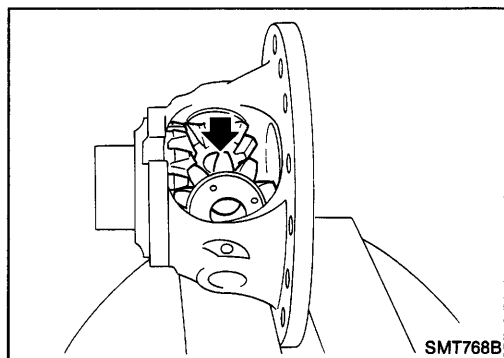
Clearance between side gear and differential case with washers:

0.1 - 0.2 mm (0.004 - 0.008 in)

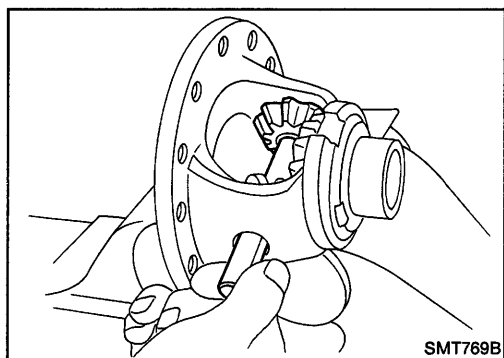
- c. If not within specification, adjust clearance by changing thickness of side gear thrust washers.

Side gear thrust washers: Refer to S.D.S.

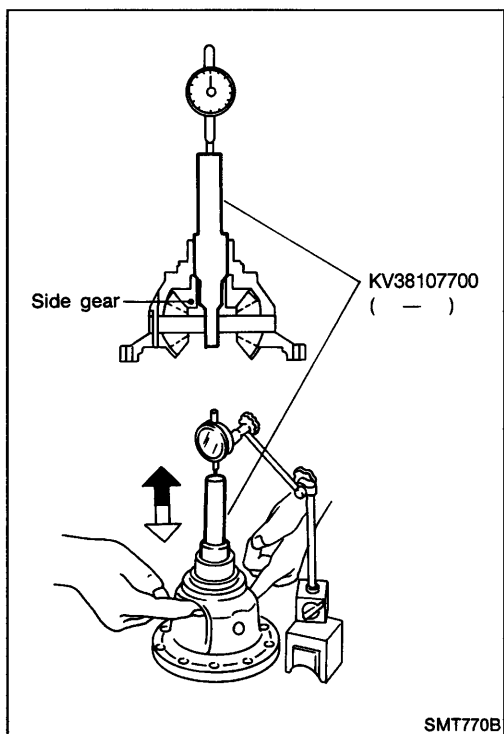
— RS5F32V —



1. Attach side gear thrust washer to side gear and install them in differential case.
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.**



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.

Clearance between side gear and differential case with washers:

0.1 - 0.2 mm (0.004 - 0.008 in)

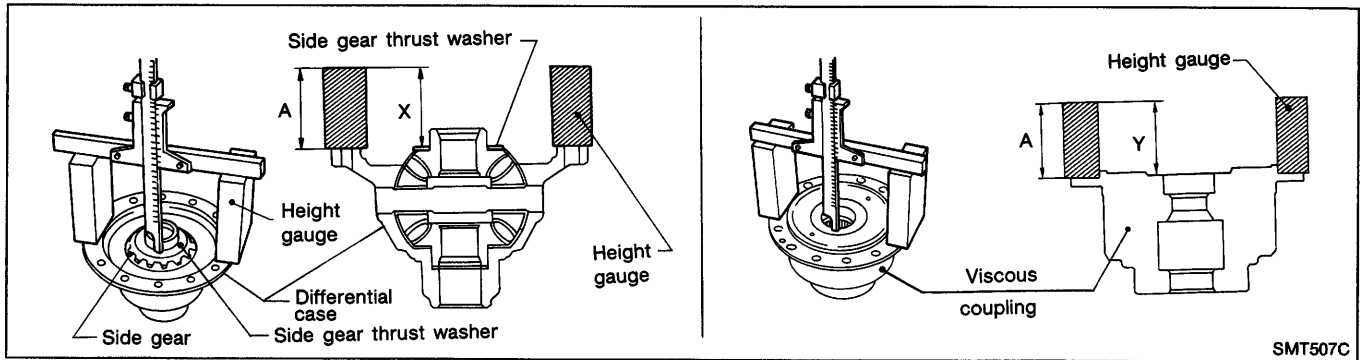
- c. If not within specification, adjust clearance by changing thickness of side gear thrust washers.

Side gear thrust washers for differential case side:

Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115

REPAIR FOR COMPONENT PARTS

Final Drive (Cont'd)



4. Measure clearance between side gear and viscous coupling with washers following the procedure below.

- a. Set remaining side gear with washer on pinion mate gears.
- b. Measure distance "X".

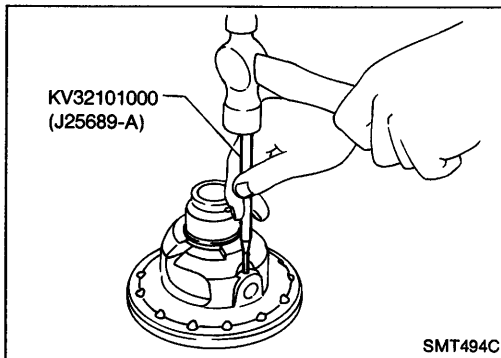
- **Side gear might be uneven, so measure it in at least 4 places along the circumference and take an average reading.**

- c. Measure dimension "Y".
Clearance between side gear and viscous coupling with washers can be obtained by " $X + Y - 2A$ ".

Specification: 0.1 - 0.2 mm (0.004 - 0.008 in)

- d. If not within specification, adjust clearance by changing thickness of side gear thrust washer.

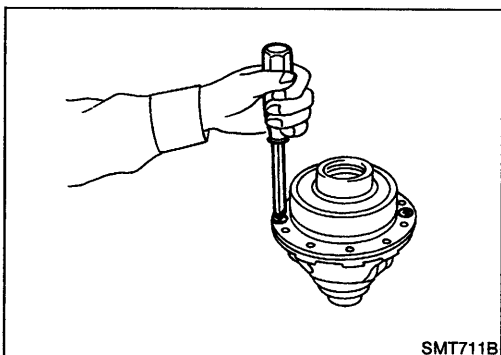
**Side gear thrust washers for viscous coupling side:
Refer to S.D.S.**



— RS5F32A & RS5F32V —

5. Install retaining pin.

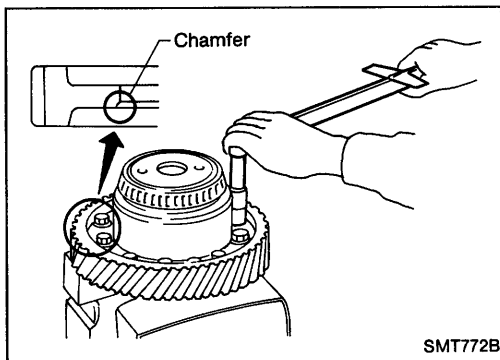
- **Make sure that retaining pin is flush with case.**



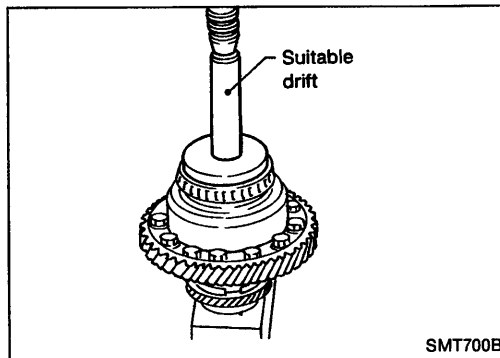
6. Install viscous coupling — RS5F32V.

REPAIR FOR COMPONENT PARTS

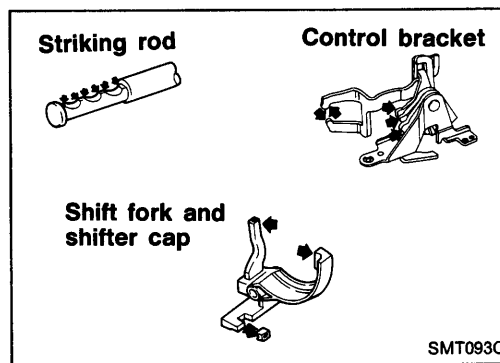
Final Drive (Cont'd)



7. Install final gear.
 - Apply locking sealant to final gear fixing bolts before installing them.
8. Install speedometer drive gear.



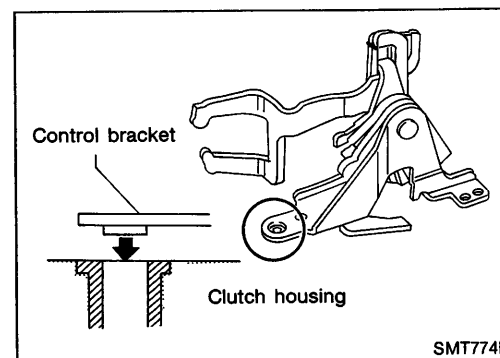
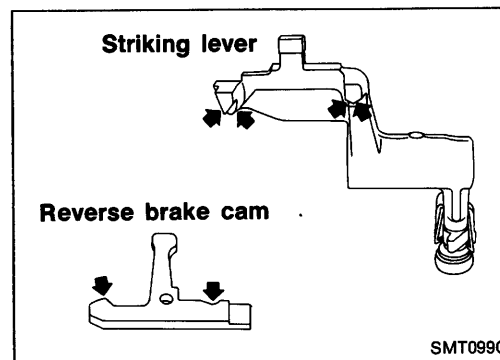
9. Press on differential side bearings.



Shift Control Components

INSPECTION

- Check contact surface and sliding surface for wear, scratches, projections or other damage.

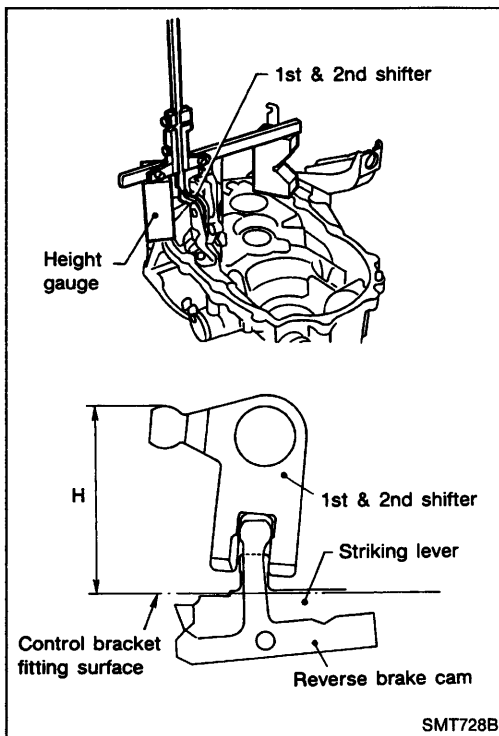


ADJUSTMENT OF INPUT SHAFT BRAKING MECHANISM

1. Install striking lever & rod, striking interlock assembly and control bracket on clutch housing exactly.
 - When installing control bracket on clutch housing, assure protrusion beneath bracket is correctly seated.

REPAIR FOR COMPONENT PARTS

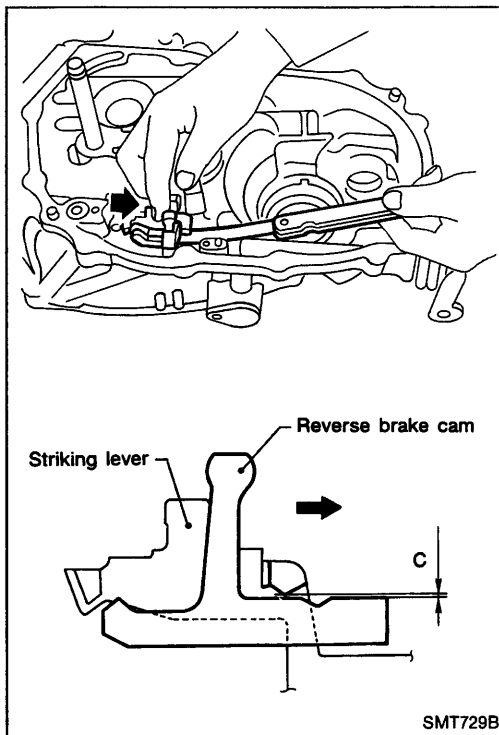
Shift Control Components (Cont'd)



2. Measure maximum height "H" while shifting from neutral to reverse position.

Maximum height "H":

67.38 - 67.86 mm (2.6528 - 2.6716 in)



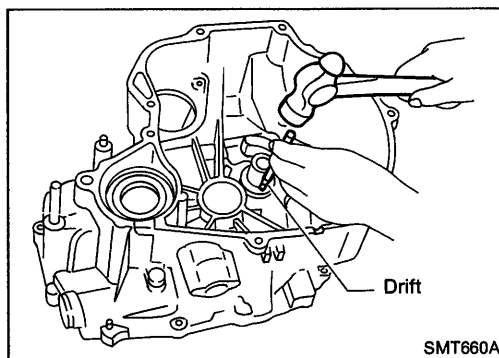
3. Measure clearance "C" between reverse brake cam and striking lever while shifting to reverse position.

Clearance "C":

0.05 - 0.20 mm (0.0020 - 0.0079 in)

If "H" or "C" is not within specification, replace the following parts as a set.

- Striking lever assembly
- Striking interlock assembly (This includes reverse brake cam.)
- Control bracket assembly



Case Components

Input shaft oil seal

1. Drive out input shaft oil seal.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

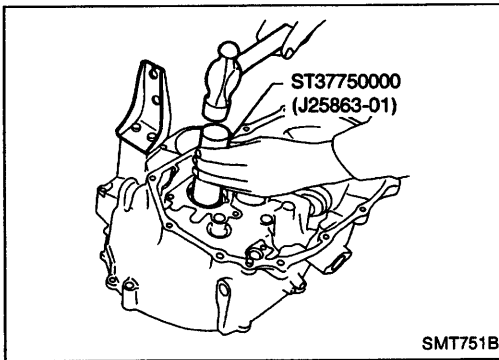
BF

HA

EL

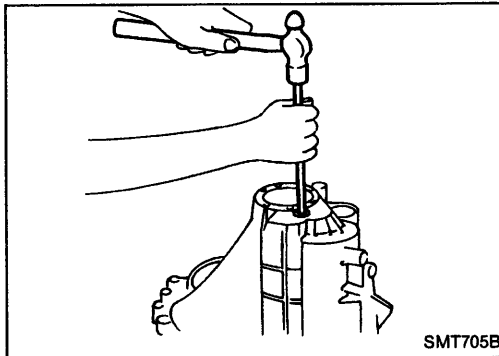
REPAIR FOR COMPONENT PARTS

Case Components (Cont'd)



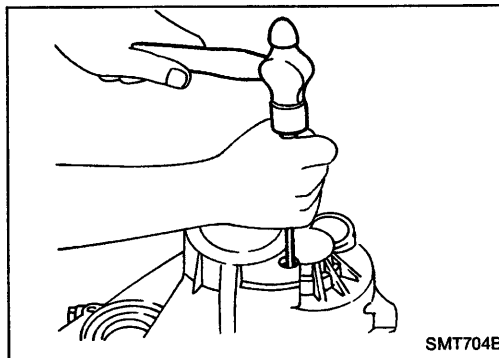
2. Install input shaft oil seal.

- Apply multi-purpose grease to seal lip of oil seal before installing.

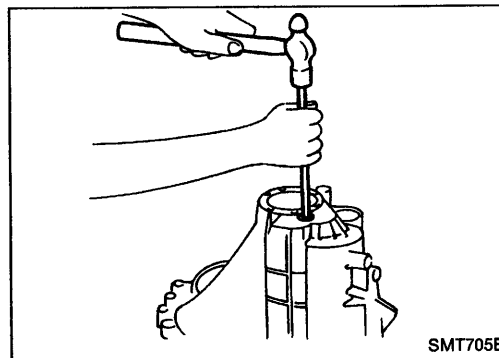


Input shaft rear bearing

1. Remove welch plug from transmission case.

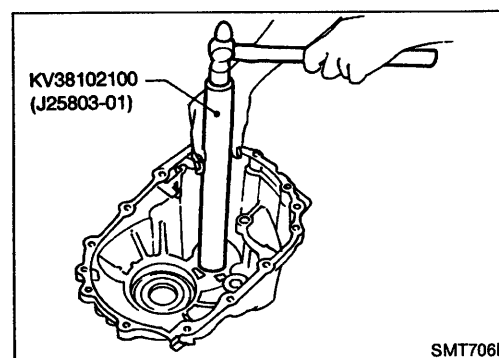


2. Remove input shaft rear bearing by tapping it from welch plug hole.



3. Install welch plug.

- Apply recommended sealant to mating surface of transmission case.



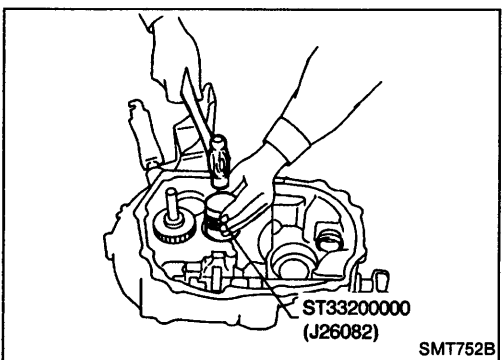
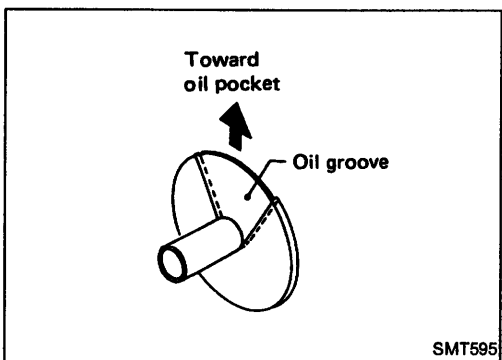
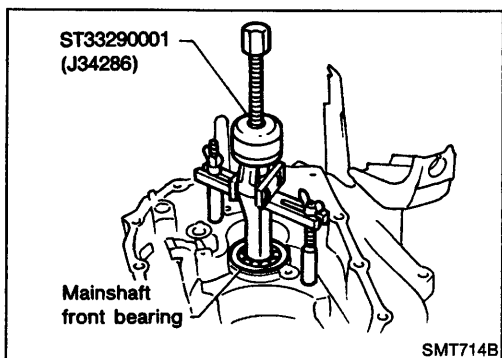
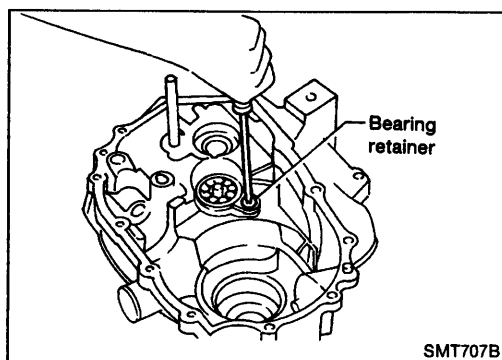
4. Install input shaft rear bearing.

REPAIR FOR COMPONENT PARTS

Case Components (Cont'd)

Mainshaft front bearing and oil channel

1. Remove mainshaft front bearing retainer.



2. Remove mainshaft front bearing.
3. Remove oil channel.

4. Install oil channel.

- Ensure that oil groove in oil channel always faces toward oil pocket when installing it on clutch housing.

5. Install mainshaft front bearing.
6. Install mainshaft front bearing retainer.

Apply locking sealant to thread of screw before installation.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

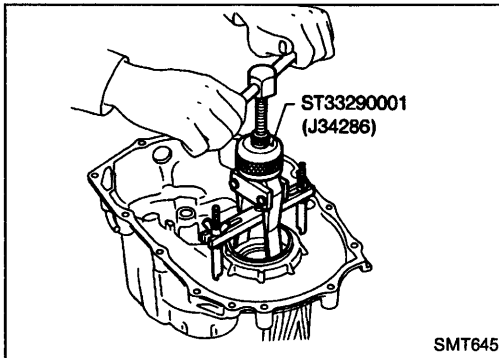
HA

EL

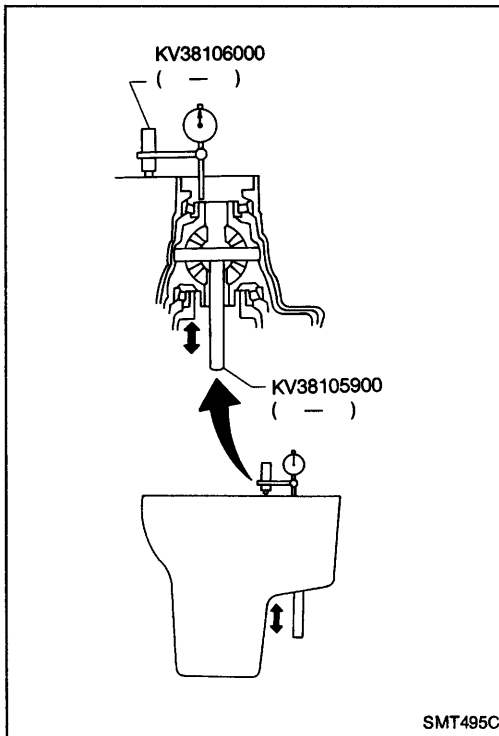
Differential Side Bearing Preload

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. Reinstall differential side bearing outer race without shim.
 3. Install final drive assembly on clutch housing.
 4. Install transmission case on clutch housing.
- Tighten transmission case fixing bolts to the specified torque.



5. Set dial indicator on front end of differential case.
6. Insert Tool all the way into differential side gear.
7. Move Tool up and down and measure dial indicator deflection.
8. Select shim considering bearing preload.

Suitable shim thickness = Dial indicator deflection + Specified bearing preload

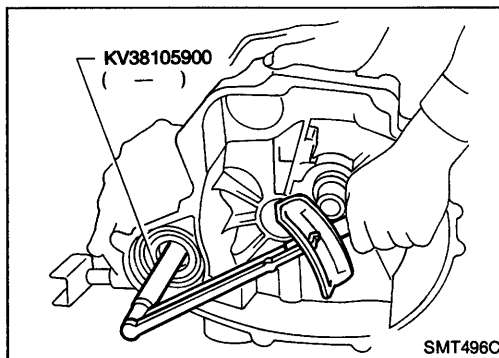
Differential side bearing adjusting shims:

Refer to S.D.S.

Bearing preload:

0.25 - 0.30 mm (0.0098 - 0.0118 in)

9. Install selected shim and differential side bearing outer race.
 10. 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.

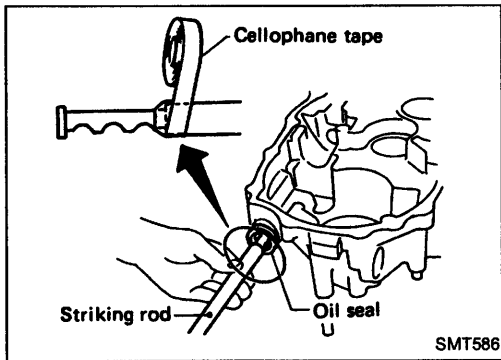
Turning torque of final drive assembly

(New bearing):

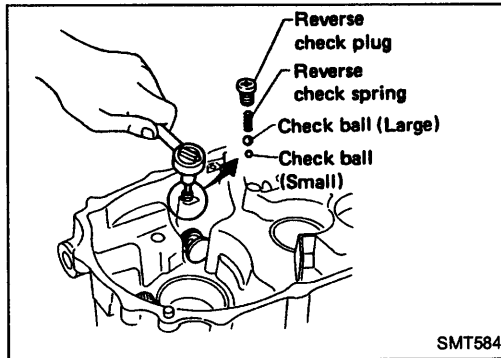
2.9 - 6.9 N·m (30 - 70 kg-cm, 26 - 61 in-lb)

- When old bearing is used again, turning torque will be slightly less than the above.
- Make sure torque is close to the 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.

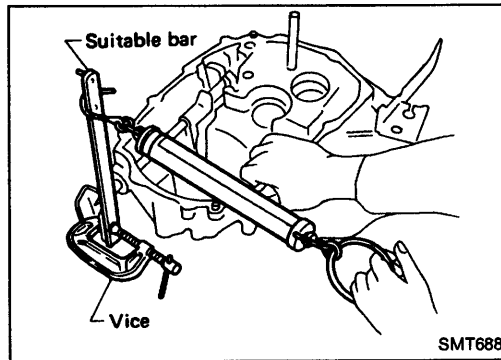
ASSEMBLY



1. Install striking rod, lever and interlock.
- When inserting striking rod into clutch housing, tape edges of striking rod to avoid damaging oil seal lip.



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)

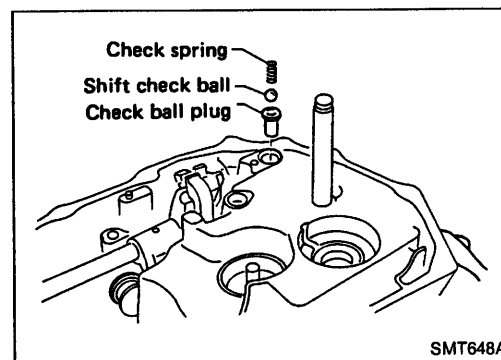
- If not within specification, select another check plug having a different length and reinstall it.

Available reverse check plugs:

Thickness mm (in)	Part number
7.1 (0.280)	32188-M8002
7.7 (0.303)	32188-M8003
8.3 (0.327)	32188-M8001*
8.9 (0.350)	32188-M8004

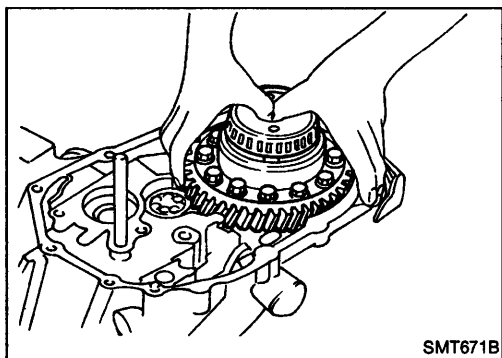
*Standard size check plug.

5. Install selected reverse check plug.
- Apply locking sealant to thread of plug before installing it.**

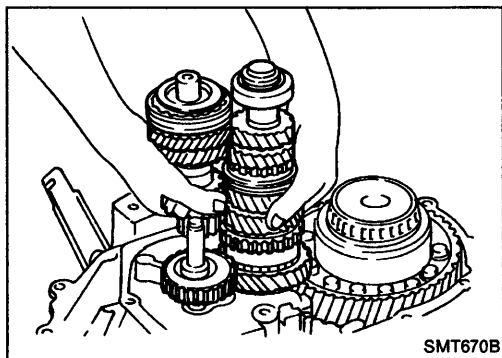


6. Install check ball plug, shift check ball and check spring.
7. Install oil pocket.

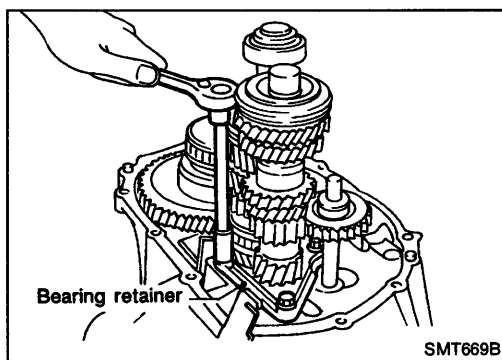
ASSEMBLY



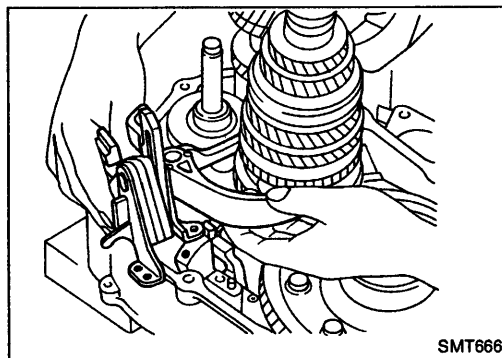
8. Install gear components onto clutch housing.
- a. Install final drive assembly.



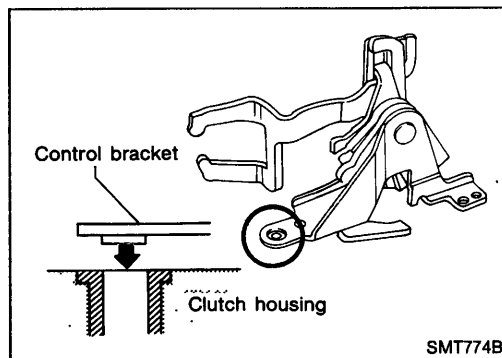
- b. Install input shaft assembly with bearing retainer, main-shaft assembly and reverse idler gear.
- **Be careful not to damage oil seal lip with splines of input shaft while shaft is being inserted into clutch housing.**
- **Be careful not to damage oil channel when inserting main-shaft into clutch housing.**



- c. Install input shaft front bearing retainer.

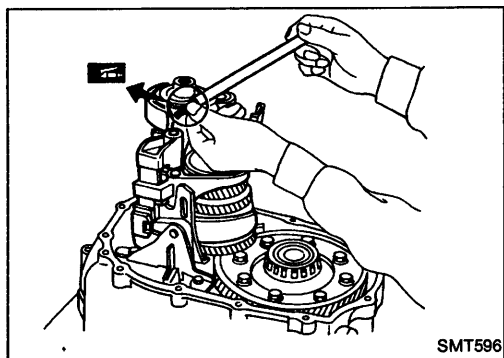


9. Apply grease to shifter caps, then install it to control bracket. Install control bracket with 1st & 2nd shift fork.



- **When installing control bracket on clutch housing, ensure protrusion beneath bracket is correctly seated.**
10. Install 3rd & 4th and 5th shift forks.

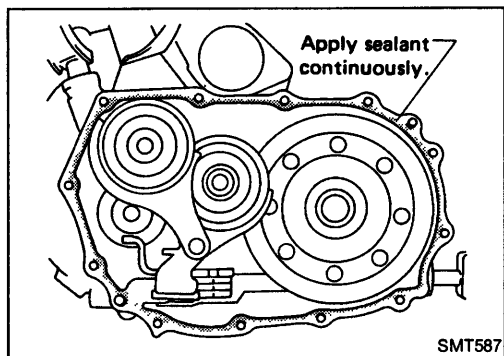
ASSEMBLY



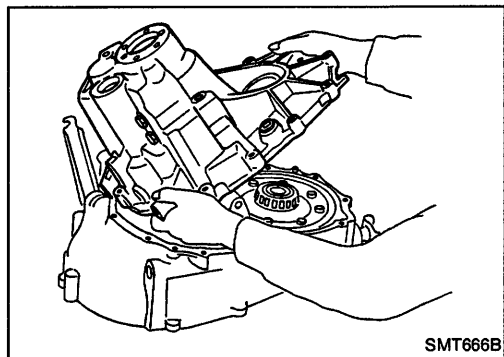
11. Insert fork shaft.

- Apply multi-purpose grease to support spring before installing.

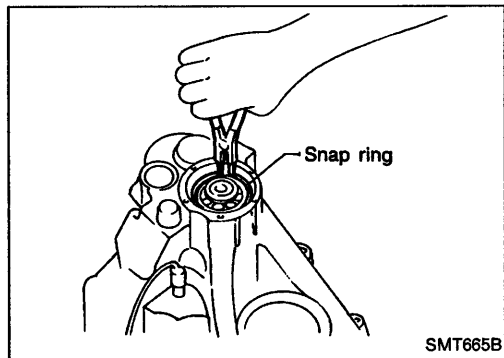
12. Install reverse idler spacer.



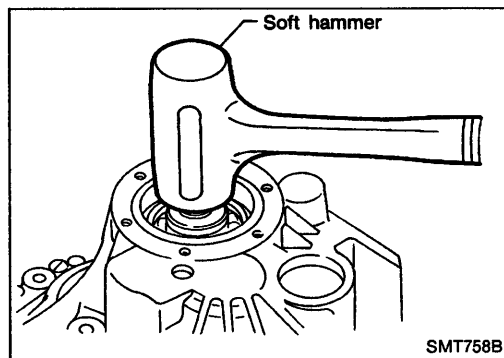
13. Apply recommended sealant to mating surface of clutch housing.



14. Install transmission case on clutch housing.



15. Install mainshaft front bearing snap ring.



16. Tap mainshaft with a rubber hammer to ensure mainshaft rear bearing is properly seated.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

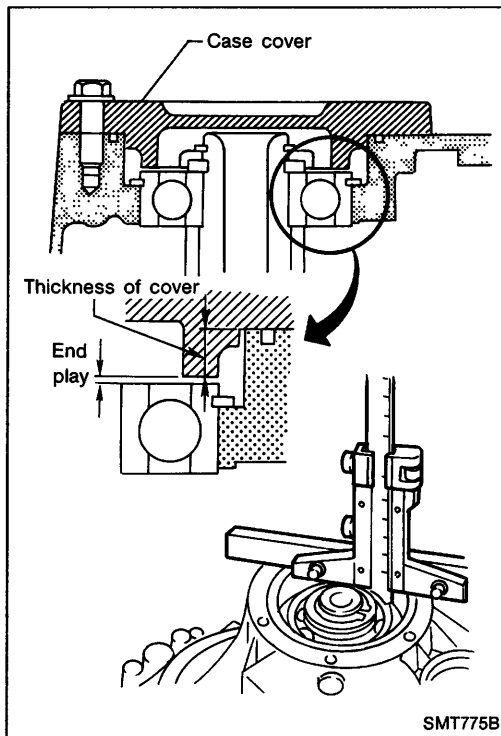
ST

BF

HA

EL

ASSEMBLY



17. Check mainshaft bearing end play.

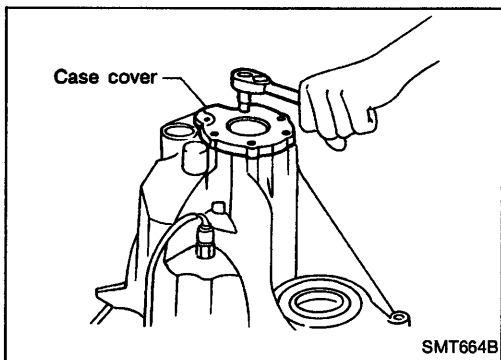
Mainshaft bearing end play:

0 - 0.1 mm (0 - 0.004 in)

- If not within specification, select another case cover having a different thickness.

Available case covers:

Refer to S.D.S.



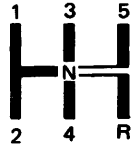
18. Install O-ring and case cover on transmission case.

Apply recommended sealant to mating surface of transmission case.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

TRANSAXLE

Engine	SR20DE		
Transaxle model	RS5F32A & RS5F32V		
Number of speeds	5		
Synchromesh type	Warner		
Shift pattern			
Gear ratio	Number of teeth		
	Input gear	Main gear	
1st	3.063	16	49
2nd	1.826	23	42
3rd	1.207	29	35
4th	0.926	41	38
5th	0.733	45	33
Reverse	3.153	13	41
Reverse idler gear	31		
Oil capacity	3.5 - 3.7ℓ (7-3/8 - 7-7/8 US pt, 6-1/8 - 6-1/2 Imp pt)		

FINAL GEAR

Engine	SR20DE	
Final gear ratio	4.058	
Number of teeth	Final gear/Pinion	69/17
	Side gear/Pinion mate gear	14/10

Inspection and Adjustment

GEAR END PLAY

Gear	End play mm (in)
1st main gear	0.18 - 0.31 (0.0071 - 0.0122)
2nd main gear	0.20 - 0.30 (0.0079 - 0.0118)
3rd main gear	0.20 - 0.30 (0.0079 - 0.0118)
4th main gear	0.20 - 0.30 (0.0079 - 0.0118)
5th input gear	0.18 - 0.31 (0.0071 - 0.0122)

CLEARANCE BETWEEN BAULK RING AND GEAR

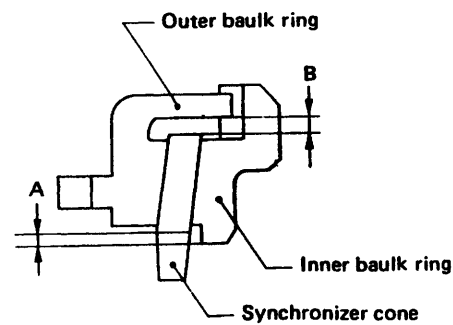
1st, 4th, 5th baulk ring

Unit: mm (in)

Standard	Wear limit
1.00 - 1.35 (0.0394 - 0.0531)	0.7 (0.028)

2nd and 3rd baulk ring

Unit: mm (in)



SMT044B

Dimension	Standard	Wear limit
A	0.7 - 0.9 (0.028 - 0.035)	0.2 (0.008)
B	0.6 - 1.1 (0.024 - 0.043)	

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

AVAILABLE CHECK PLUGS AND CASE COVERS

Reverse check plug

Reverse check turning torque (At striking rod)		4.9 - 7.4 N·m (50 - 75 kg-cm, 43 - 65 in-lb)
Length 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

MAINSHAFT END PLAY

Mainshaft end play (Clearance between end of case cover and mainshaft rear bearing outer race)	0 - 0.1 mm (0 - 0.004 in)
--	------------------------------

Case cover

Main shaft bearing end play	0 - 0.1 mm (0 - 0.004 in)	
Thickness mm (in)	Part number	
10.78 (0.4244)	32131-50J00	
10.83 (0.4264)	32131-50J01	
10.88 (0.4283)	32131-50J02	
10.93 (0.4303)	32131-50J03	
10.98 (0.4323)	32131-50J04	
11.03 (0.4343)	32131-50J05	

AVAILABLE SNAP RINGS

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	

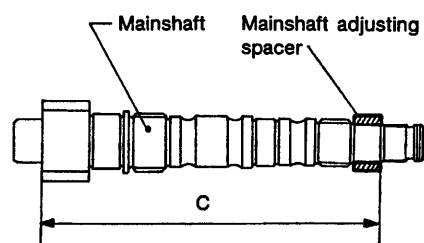
AVAILABLE C-RINGS

Mainshaft C-ring

Allowable clearance		0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number	
4.45 (0.1752)	32348-50J00	
4.52 (0.1780)	32348-50J01	
4.59 (0.1807)	32348-50J02	
4.66 (0.1835)	32348-50J03	
4.73 (0.1862)	32348-50J04	
4.80 (0.1890)	32348-50J05	
4.87 (0.1917)	32348-50J06	
4.94 (0.1945)	32348-50J07	

AVAILABLE SPACERS

Mainshaft bearing adjusting spacer



SMT423C

Bearing distance: C		230.15 - 230.25 mm (9.0610 - 9.0649 in)
Thickness mm (in)	Part number	
18.91 (0.7445)	32347-50J00	
18.98 (0.7472)	32347-50J01	
19.05 (0.7500)	32347-50J02	
19.12 (0.7528)	32347-50J03	
19.19 (0.7555)	32347-50J04	
19.26 (0.7583)	32347-50J05	
19.33 (0.7610)	32347-50J06	
19.40 (0.7638)	32347-50J07	
19.47 (0.7665)	32347-50J08	

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

AVAILABLE WASHERS

Differential side gear thrust washer

Allowable clearance between side gear and differential case or viscous coupling with washer			0.1 - 0.2 mm (0.004 - 0.008 in)
		Thickness mm (in)	Part number
F32A		0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
		0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
		0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
		0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
		0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115
F32V	Viscous coupling side	0.70 - 0.75 (0.0276 - 0.0295)	38424-D2110
		0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
		0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
		0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
		0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
		0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115
		1.00 - 1.05 (0.0394 - 0.0413)	38424-D2116
		1.05 - 1.10 (0.0413 - 0.0433)	38424-D2117
		1.10 - 1.15 (0.0433 - 0.0453)	38424-D2118
		1.15 - 1.20 (0.0453 - 0.0472)	38424-D2119
		1.20 - 1.25 (0.0472 - 0.0492)	38424-D2120
		1.25 - 1.30 (0.0492 - 0.0512)	38424-D2121
		1.30 - 1.35 (0.0512 - 0.0531)	38424-D2122
	Differential case side	0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
		0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
		0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
		0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
		0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115

AVAILABLE SHIMS

— DIFFERENTIAL SIDE BEARING PRELOAD AND ADJUSTING SHIM

Bearing preload

Differential side bearing	0.25 - 0.30 mm (0.0098 - 0.0118 in)
---------------------------	--

Turning torque (New bearing)

Final drive	2.9 - 6.9 N·m (30 - 70 kg·m, 26 - 61 in·lb)
-------------	---

Differential side bearing adjusting shims RS5F32A

Thickness mm (in)	Part number	Thickness mm (in)	Part number
0.44 (0.0173)	38454-M8000	0.72 (0.0283)	38454-M8007
0.48 (0.0189)	38454-M8001	0.76 (0.0299)	38454-M8008
0.56 (0.0220)	38454-M8003	0.80 (0.0315)	38454-M8009
0.60 (0.0236)	38454-M8004	0.84 (0.0331)	38454-M8010
0.64 (0.0252)	38454-M8005	0.88 (0.0346)	38454-M8011
0.68 (0.0268)	38454-M8006		

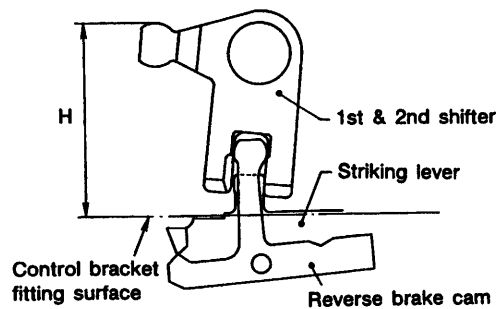
RS5F32V

Thickness mm (in)	Part number	Thickness mm (in)	Part number
0.28 (0.0110)	31439-31X00	0.68 (0.0268)	31439-31X10
0.32 (0.0126)	31439-31X01	0.72 (0.0283)	31439-31X11
0.36 (0.0142)	31439-31X02	0.76 (0.0299)	31439-31X12
0.40 (0.0157)	31439-31X03	0.80 (0.0315)	31439-31X13
0.44 (0.0173)	31439-31X04	0.84 (0.0331)	31439-31X14
0.48 (0.0189)	31439-31X05	0.88 (0.0346)	31439-31X15
0.52 (0.0205)	31439-31X06	0.92 (0.0362)	31439-31X16
0.56 (0.0220)	31439-31X07	0.96 (0.0378)	31439-31X17
0.60 (0.0236)	31439-31X08	1.44 (0.0567)	31439-31X18
0.64 (0.0252)	31439-31X09		

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

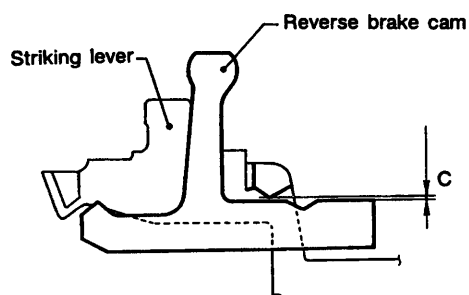
Inspection and Adjustment (Cont'd)

Reverse brake cam



SMT735B

Maximum height "H" between the control bracket fitting surface and 1-2 shifter mm (in)	67.38 - 67.86 (2.6528 - 2.6716)
--	------------------------------------



SMT736B

Clearance "C" between reverse brake cam and striking lever mm (in)	0.05 - 0.20 (0.0020 - 0.0079)
--	----------------------------------

AUTOMATIC TRANSAXLE

SECTION **AT**

CONTENTS

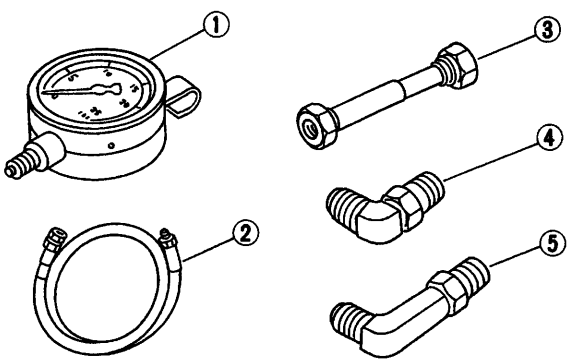
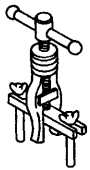
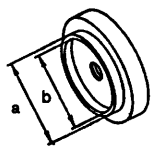
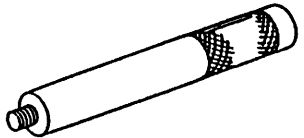
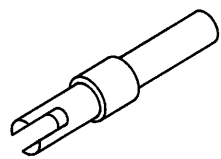
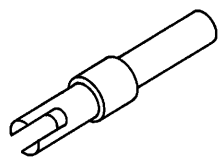
PREPARATION AND PRECAUTIONS	2	Locations of Bearings, Thrust Washers and Snap Rings	44
Special Service Tools	2	DISASSEMBLY	45
Commercial Service Tools	4	REPAIR FOR COMPONENT PARTS	60
Precautions	5	Manual Shaft and Throttle Lever	60
TROUBLE DIAGNOSES	6	Oil Pump	63
Preliminary Check (Prior to road testing)	6	Control Valve Assembly	67
Road Testing	6	Control Valve Upper Body	75
Stall Testing	14	Control Valve Lower Body	79
Pressure Testing	16	Reverse Clutch	82
Circuit Diagram	18	High Clutch	86
Wiring Diagram	18	Forward Clutch and Overrun Clutch	91
Component Check	19	Low & Reverse Brake	97
TROUBLE DIAGNOSES — A/T Shift Lock System	20	Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub	101
Contents	20	Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer	105
ON-VEHICLE SERVICE	30	Band Servo Piston Assembly	110
Control Valve Assembly and Accumulator	30	Final Drive	115
Throttle Wire Adjustment	31	ASSEMBLY	121
Control Cable Adjustment	32	Assembly 1	121
Governor Valve	32	Adjustment 1	122
Inhibitor Switch Adjustment	32	Assembly 2	126
Differential Side Oil Seal Replacement	33	Adjustment 2	131
REMOVAL AND INSTALLATION	34	Assembly 3	134
Removal	34	SERVICE DATA AND SPECIFICATIONS (S.D.S.)	143
Installation	35	General Specifications	143
MAJOR OVERHAUL	37	Specifications and Adjustments	143
Hydraulic Control Circuit	41		
Mechanical Operation	42		
Oil Channel	43		

When you read wiring diagrams:

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

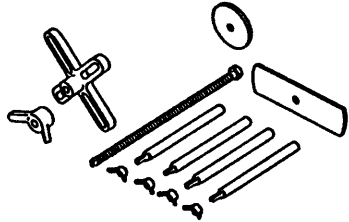
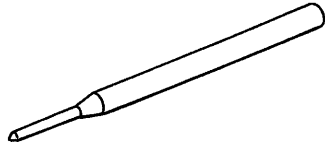
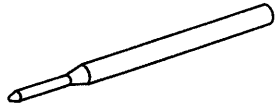
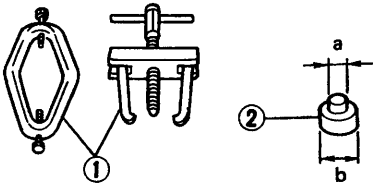
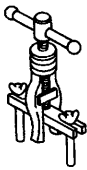
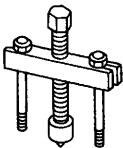
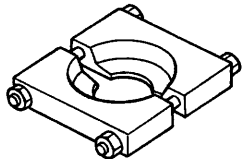
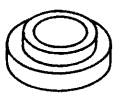
PREPARATION AND PRECAUTIONS

Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description
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 line pressure and governor pressure
ST33290001 (J34286) Puller	 Removing differential side oil seals
KV31103000 (—) Drift	 Installing R.H. side differential oil seal (Use with ST35325000.) a: 76 mm (2.99 in) dia. b: 67 mm (2.64 in) dia.
ST35325000 (—) Drift	 Installing R.H. side differential oil seal (Use with KV31103000.)
KV38105710 (—) Preload adapter	 RL4F03A ● Measuring turning torque of final drive assembly ● Measuring clearance between side gear and differential case with washer ● Selecting differential side bearing adjusting shim
KV38107700 (—) Preload adapter	 RL4F03V ● Measuring turning torque of final drive assembly ● Measuring clearance between side gear and differential case with washer ● Selecting differential side bearing adjusting shim

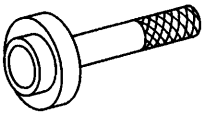
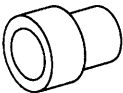
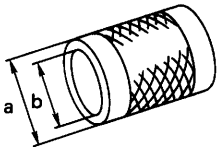
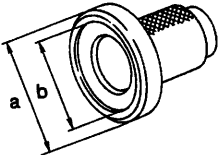
PREPARATION AND PRECAUTIONS

Special Service Tools (Cont'd)

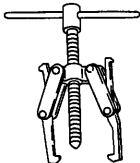
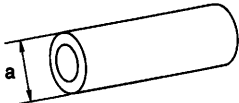
Tool number (Kent-Moore No.) Tool name	Description	
KV31103200 (—) Clutch spring compressor		Removing and installing clutch return spring & spring retainer GI MA EM
ST23540000 (—) Pin punch		Removing and installing parking rod plate and manual plate pins. LC EF & EC
KV32101000 (J25689-A) Pin punch		● Installing throttle lever and manual shaft retaining pins ● Removing and installing differential pinion mate shaft retaining pin. FE CL
ST3306S001 (—) Differential side bearing puller set ① ST33051001 (—) Puller ② ST33061000 (J8107-2) Adapter	 a: 28.5 mm (1.122 in) dia. b: 38 mm (1.50 in) dia.	Removing differential side bearing inner race MT AT FA
KV381054S0 (—) Puller		● Removing differential side bearing outer race ● Removing idler gear bearing outer race ● Removing needle bearing from bearing retainer RA BR
ST27180001 (—) Puller		Removing idler gear ST BF
ST30031000 (—) Puller		Removing reduction gear bearing inner race HA EL
ST35272000 (—) Drift		● Installing reduction gear bearing inner race ● Installing idler gear bearing inner race

PREPARATION AND PRECAUTIONS

Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description
ST37830000 (—) Drift	 Installing idler gear bearing outer race
ST35321000 (—) Drift	 Installing output shaft bearing
ST33200000 (J37067) Drift	 Installing differential side bearing inner race a: 60 mm (2.36 in) dia. b: 44.5 mm (1.752 in) dia.
ST30633000 (—) Drift	 Installing differential side bearing outer race
ST35271000 (—) Drift	 Installing idler gear a: 76 mm (2.99 in) dia. b: 67 mm (2.64 in) dia.

Commercial Service Tools

Tool name	Description
Puller	 ● Removing idler gear bearing inner race ● Removing and installing band servo piston snap ring
Drift	 Removing idler gear bearing inner race a: 34 mm (1.34 in) dia.
Drift	 Installing needle bearing onto bearing retainer a: 36 mm (1.42 in) dia.

Precautions

- Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transaxle.
- When disassembling parts, place them in order in a parts rack so that they can be put back into 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 any time the transaxle is disassembled.
- It is very important to perform functional tests whenever they are indicated.
- The valve body contains precision parts and requires extreme care when parts are removed and serviced. Place removed parts in order 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.
- Properly installed valves, sleeves, plugs, etc. will slide along their bores in the valve body under their own weight.
- Before assembly, apply a coat of recommended A.T.F. to all parts. Petroleum jelly may be applied to O-rings and seals and used to hold small bearings and washers in place during reassembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- After overhaul, refill the transaxle with new A.T.F.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

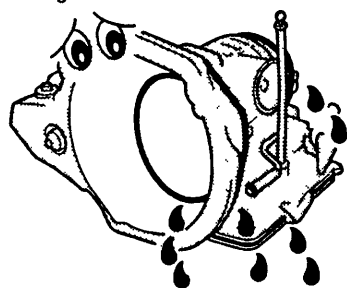
ST

BF

HA

EL

Fluid leakage



SAT288G

Preliminary Check (Prior to road testing)

A/T FLUID CHECK

Fluid leakage check

1. Clean area suspected of leaking, — for example, mating surface of converter housing and transmission case.
2. Start engine, apply foot brake, place selector lever in “D” position and wait a few minutes.
3. Stop engine.
4. Check for fresh leakage.

Fluid condition check

Fluid color	Suspected problem
Dark or black with burned odor	Wear of frictional material
Milky pink	Water contamination — Road water entering through filler tube or breather
Varnished fluid, light to dark brown and tacky	Oxidation — Over or under filling — Overheating

Fluid level check — Refer to section MA.

Road Testing

Perform road tests using “Symptom” chart. Refer to page AT-10.

“P” POSITION

1. Place selector lever in “P” position and start the engine. Stop the engine and repeat the procedure in all positions, including neutral position.
2. Stop vehicle on a slight upgrade and place selector lever in “P” position. Release parking brake to make sure vehicle remains locked.

“R” POSITION

1. Manually move selector lever from “P” to “R”, and note shift quality.
2. Drive vehicle in reverse long enough to detect slippage or other abnormalities.

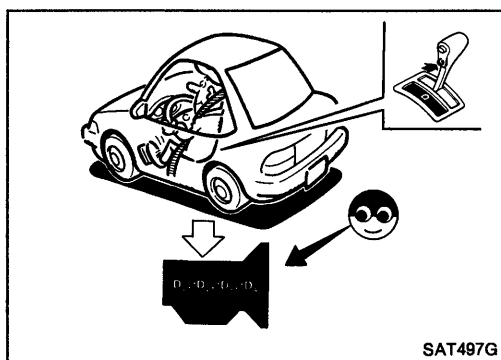
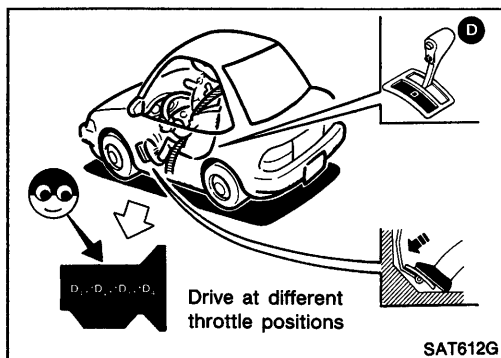
“N” POSITION

1. Manually move selector lever from “R” and “D” to “N” and note quality.
2. Release parking brake with selector lever in “N” position. 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.)

TROUBLE DIAGNOSES

Road Testing (Cont'd)

"D" POSITION



1. Manually shift selector lever from "N" to "D" position, and note shift quality.
2. Using the shift schedule as a reference, drive vehicle in "D" position. 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, whether lock-up properly occurs while driving vehicle in proper gear position.
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 60 to 70 km/h (37 to 43 MPH) position in "D₃" position 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 30 to 40 km/h (19 to 25 MPH) ("D₂" position) at half to light throttle position, fully depress accelerator pedal to make sure it downshifts from 2nd to 1st gear.

GI

MA

EM

LC

EF &
EC

FE

CL

"2" POSITION

1. Shift to "2" position and make sure vehicle starts 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 ("2₂" position), fully depress accelerator pedal to make sure it downshifts from 2nd to 1st gear.
5. Allow vehicle to run idle while in "2" position to make sure that it downshifts to 1st gear.
6. Move selector lever to "D" position and allow vehicle to operate at 40 to 50 km/h (25 to 31 MPH). Then, shift to "2" position to make sure it downshifts to 2nd gear.

MT

AT

FA

RA

BR

ST

"1" POSITION

1. Place selector lever in "1" position and accelerate vehicle. Make sure it does not shift from 1st to 2nd gear although vehicle speed increases.
2. While vehicle is being driven in "1" position, release accelerator pedal to make sure that engine compression acts as a brake.
3. Place selector lever in "D" or "2" position and allow vehicle to run at 20 to 30 km/h (12 to 19 MPH). Then move selector lever to "1" position to make sure it downshifts to 1st gear.

BF

HA

EL

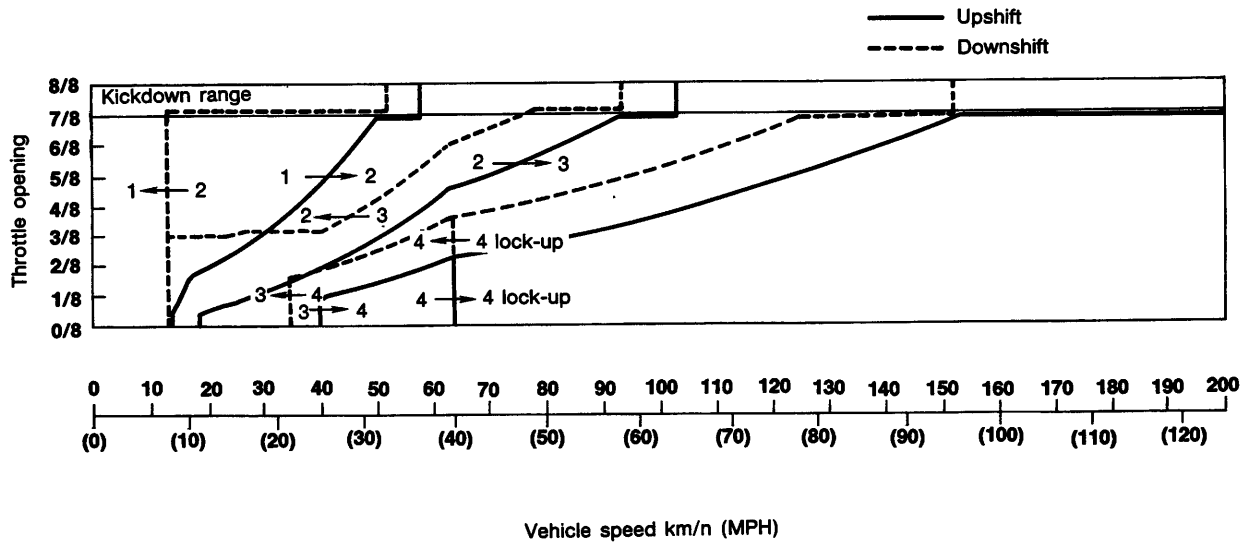
VEHICLE SPEED WHEN SHIFTING GEARS

This check should be carried out when oil temperature is between 50 and 80°C (122 and 176°F) after the vehicle has been driven approx. 10 minutes.

TROUBLE DIAGNOSES

Road Testing (Cont'd)

SHIFT SCHEDULE



SAT833D

TROUBLE DIAGNOSES

Note

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

TROUBLE DIAGNOSES

Road Testing (Cont'd)

ROAD TEST SYMPTOM CHART

Numbers are arranged in order of probability. Perform inspections starting with number one and work up.

Circled numbers indicate that the transaxle must be removed from the vehicle.

 : Valve expected to be malfunctioning

ROAD TEST SYMPTOM CHART Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transaxle must be removed from the vehicle. : Valve expected to be malfunctioning		ON VEHICLE														
		Oil level and oil quality	Control cable	Inhibitor switch and wiring	Throttle wire	Engine idling rpm	Line pressure	Control valve	Throttle valve & detent valve	Manual valve	Pressure regulator valve	3-4 shift valve	2-3 shift valve	1-2 shift valve	Overrun clutch control valve	Pressure modifier valve
Sharp shocks in shifting from "N" to "D" position		1	2	.	5	3	4	7								
Shift shocks	When shifting from 1st to 2nd or 2nd to 3rd	1	2	.	4	.	3	6								
	When shifting from 3rd to 4th	1	2	.	4	.	3	5								
	When shifting from D to 2 and 1 position. When O.D. switch is set from "ON" to "OFF"	1	2	.	4	.	3	5								
	When shifting from 2nd to 1st in "1" position	1	2	.	4	.	3	5								
Shift slippage when upshifting	When shifting from 1st to 2nd	1	2	.	4	.	3	5								
	When shifting from 2nd to 3rd	1	2	.	4	.	3	6								
	When shifting from 3rd to 4th	1	2	.	4	.	3	5								
Shift slippage with accelerator pedal depressed	When shifting from 4th to 2nd	1	2	.	5	.	3	6								
	When shifting from 4th to 3rd	1	2	.	4	.	3	6								
	When shifting from 4th to 1st and shifting from 3rd to 1st	1	2	.	5	.	3	6								
Poor power/acceleration	When vehicle starts	1	2	.	4	.	3	6								
	When upshifting	1	2	.	4	.	3	7								
No engine braking	When shifting from "D" to "2" and "1" position	1	2	.	4	.	3	5								
	When O.D. switch is set from "ON" to "OFF"	1	2	.	4	.	3	7								
	When shifting from 2nd to 1st in "1" position	1	2	.	4	.	3	5								
Shift quality	Too low a gear change point from 2nd to 3rd and from 3rd to 2nd.	1	.	.	3	.	2	6								
	Too high a gear change point from 2nd to 3rd and from 3rd to 2nd.	1	.	.	3	.	2	6								
	Too low a gear change point from 2nd to 1st in "1" position.	1	.	.	3	.	2	6								
	Too high a gear change point from 2nd to 1st in "1" position.	1	.	.	3	.	2	6								

TROUBLE DIAGNOSES

Road Testing (Cont'd)

ON VEHICLE														OFF VEHICLE													
Kickdown modifier valve	1-2 accumulator valve	3-2 timing valve	1st reducing valve	Torque converter relief valve	Throttle modifier valve	4th speed cut valve	Lock-up control valve	4-2 sequence valve	Governor pressure	Governor valve	O.D. cancel solenoid valve	Torque converter clutch solenoid valve	Accumulator 3-R	Accumulator N-D	Ignition switch and starter motor	O.D. control switch and wiring	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low & reverse clutch	Brake band	Parking components
									.	.	.	.	6	.	.	.	9	8	.	.	.	.	.	.	.	.	.
									.	.	.	.	5	.	.	.	8	.	.	.	.	.	.	.	7	.	.
									.	.	.	.	.	.	.	.	8	.	.	.	.	7	.	.	6	.	.
									.	.	.	.	.	.	.	.	.	.	8	.	.	.	7	.	.	6	.
									.	.	.	.	.	.	.	.	7	.	.	.	.	.	.	6	.	.	.
									.	.	.	.	.	.	.	.	7	.	.	.	.	.	.	6	.	.	.
									.	.	.	.	5	.	.	.	9	.	8	.	.	.	.	.	7	.	.
									.	.	.	.	.	.	.	.	8	.	7	.	.	.	.	.	6	.	.
									4	7	.	.	.	.	.	.	8	9	10	11	13	14	15	16	17	12	.
									.	.	.	.	5	.	.	.	7	.	8	.	.	10	.	11	9	.	.
									4	7	.	.	.	.	.	.	11	.	8	.	10	.	.	.	9	.	.
									.	.	.	.	5	.	.	.	9	.	7	8	.	.	.	.	.	.	.
									5	6	.	.	.	.	.	.	9	.	.	8	.	.	.	.	.	.	.
									.	.	.	.	.	.	.	.	.	.	.	.	.	6	.	.	.	.	.
									.	.	6	.	.	.	5	.	.	.	.	.	.	.	8	.	.	.	.
									.	.	.	.	.	.	.	.	.	.	.	.	.	6	.	7	.	.	.
									4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
									4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
									4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
									4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

TROUBLE DIAGNOSES

Road Testing (Cont'd)

Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transaxle must be removed from the vehicle.

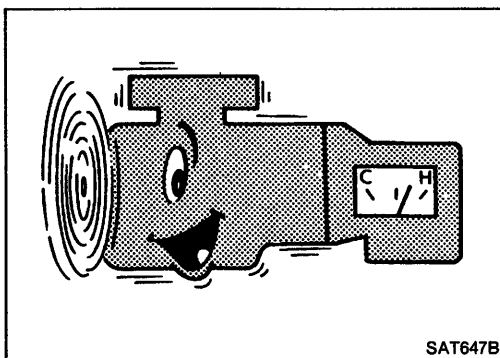
 : Valve expected to be malfunctioning

Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transaxle must be removed from the vehicle.		ON VEHICLE														
		Oil level and oil quality	Control cable	Inhibitor switch and wiring	Throttle wire	Engine idling rpm	Line pressure	Control valve	Throttle valve & detent valve	Manual valve	Pressure regulator valve	3-4 shift valve	2-3 shift valve	1-2 shift valve	Overrun clutch control valve	Pressure modifier valve
Shift quality	Failure to change gear from 4th to 2nd with accelerator pedal depressed.	1	.	.	3	.	2	6								
	Failure to change gear from 3rd to 2nd with accelerator pedal depressed.	1	.	.	3	.	2	6								
	Failure to change gear from 1st to 2nd in "D" and "2" position.	1	.	.	3	.	2	6								
	Vehicle does not start from "1st" in "D" and "2" position.	1	.	.	3	.	2	6								
	Failure to change gear to 3rd and 4th in "D" position.	1	.	.	3	.	2	6								
	Changes gear to 1st directly when selector lever is set from "D" to "1" position.	1	.	.	3	.	2	6								
	Changes gear to 2nd in "1" position.	1	.	.	3	.	2	6								
Lock-up quality	Lock-up point is extremely high or low.	1	.	.	3	.	2	6								
	Torque converter does not lock-up.	1	.	.	3	.	2	7								
	Lock-up is not released when accelerator pedal is released.	1	.	.	.	.	.	2								
Engine does not start in "P" and "N" positions or engine starts in positions other than "P" and "N" positions.		.	2	3	.	.	.	.								
Vehicle moves with selector lever in "P" position.		.	1	.	.	.	.	.								

TROUBLE DIAGNOSES

Road Testing (Cont'd)

ON VEHICLE																OFF VEHICLE											
Kickdown modifier valve	1-2 accumulator valve	3-2 timing valve	1st reducing valve	Torque converter relief valve	Throttle modifier valve	4th speed cut valve	Lock-up control valve	4-2 sequence valve	Governor pressure	Governor valve	O.D. cancel solenoid valve	Torque converter clutch solenoid valve	Accumulator 3-R	Accumulator N-D	Ignition switch and starter motor	O.D. control switch and wiring	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low & reverse clutch	Brake band	Parking components
									4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
									4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
									4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
									4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
									4	5	7	.	.	.	.	8	.	.	.	.	.	.	.	.	.	.	.
									4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
									4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
									4	5	.	6	.	.	.	.	8	.	.	.	.	.	.	.	.	.	.
									.	.	.	3	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.
									.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
									.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2



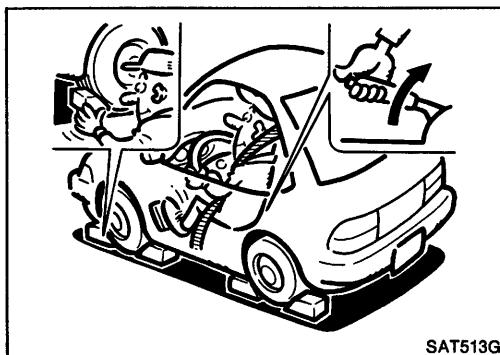
Stall Testing

STALL TEST PROCEDURE

1. Check A/T and engine fluid levels. If necessary, add fluid.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

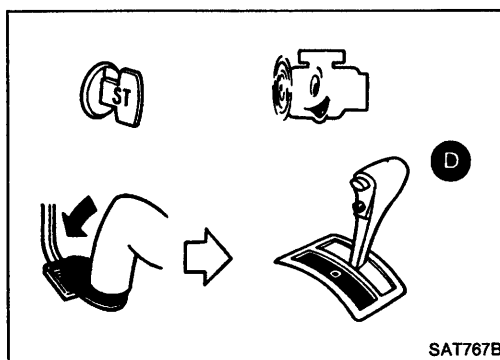
A.T.F. operating temperature:

50 - 80°C (122 - 176°F)

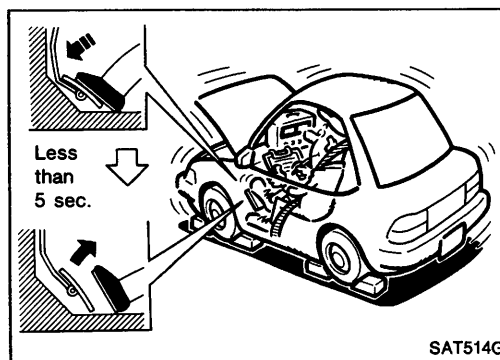


3. Set parking brake and block wheels.
4. Install a tachometer where it can be seen by driver during test.

- **It is good practice to put a mark at point of specified engine speed on indicator.**



5. Start engine, apply foot brake, and place selector lever in "D" position.

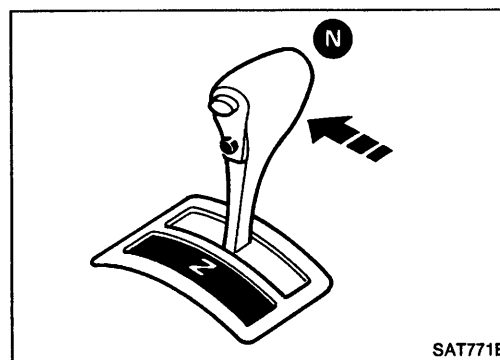


6. Accelerate to wide-open throttle gradually while applying foot brake.
7. Quickly note the engine stall revolution and immediately release throttle.

- **During test, never hold throttle wide-open for more than 5 seconds.**

Stall revolution standard:

1,900 - 2,200 rpm



8. Shift selector lever to "N" position.

9. Cool off A.T.F.

- **Run engine at idle for at least one minute.**

10. Perform stall tests in the same manner as in steps 5 through 9 with selector lever in "2", "1" and "R" position, respectively.

TROUBLE DIAGNOSES

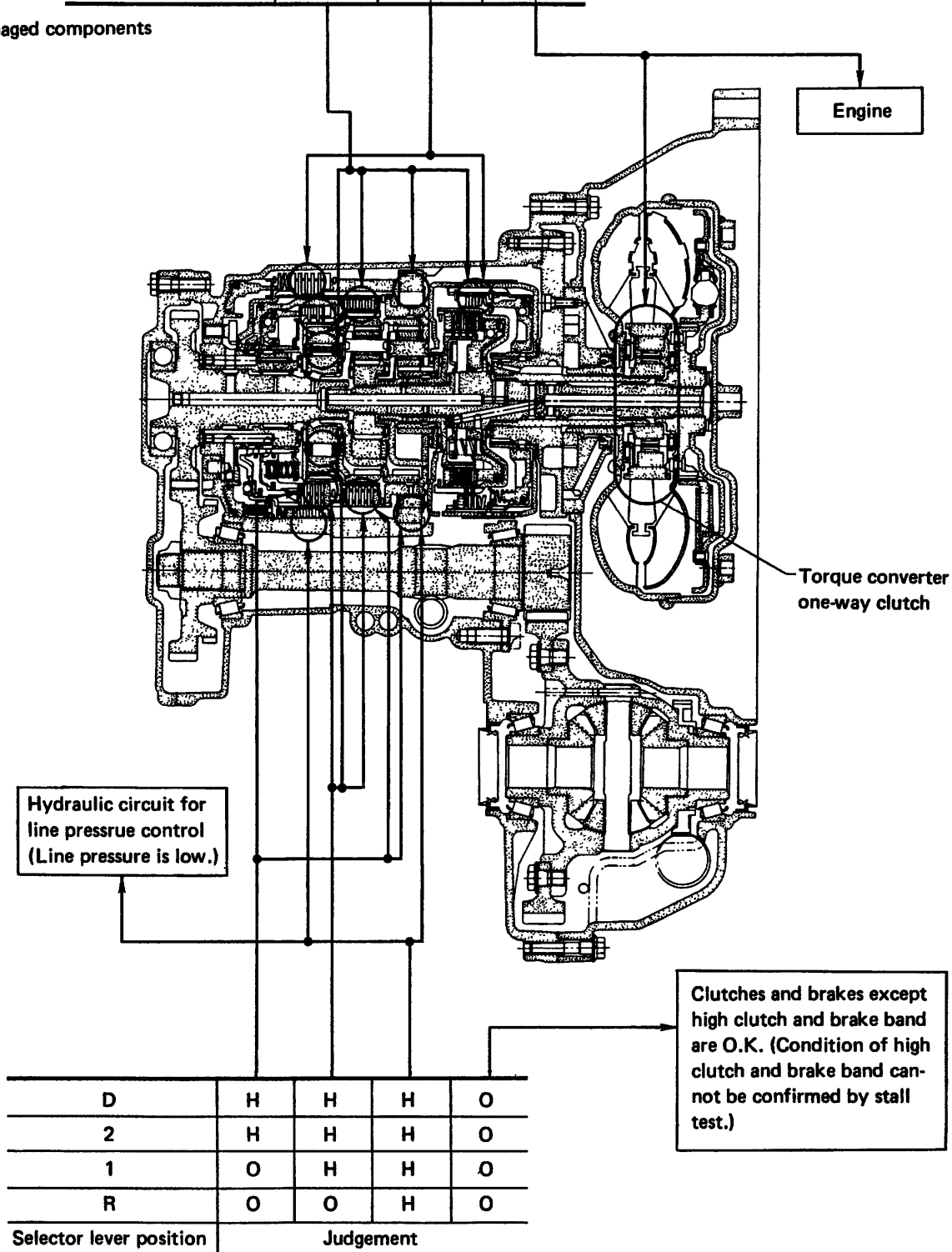
Stall Testing (Cont'd)

JUDGMENT OF STALL TEST

Selector lever position	Judgement		
D	H	O	L
2	H	O	L
1	O	O	L
R	H	H	L

O : Stall revolution is normal.
H : Stall revolution is higher than specified.
L : Stall revolution is lower than specified.

Damaged components



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

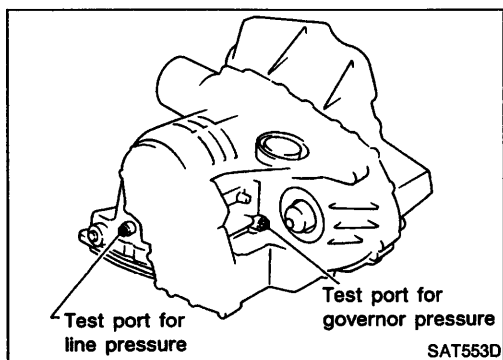
ST

BF

HA

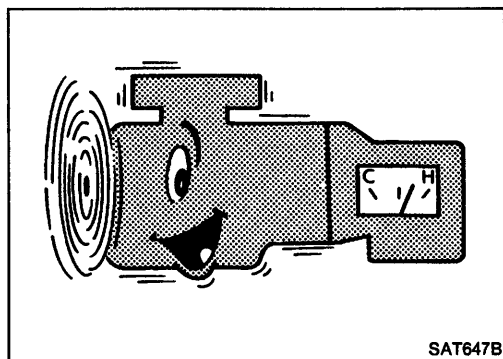
EL

TROUBLE DIAGNOSES



Pressure Testing

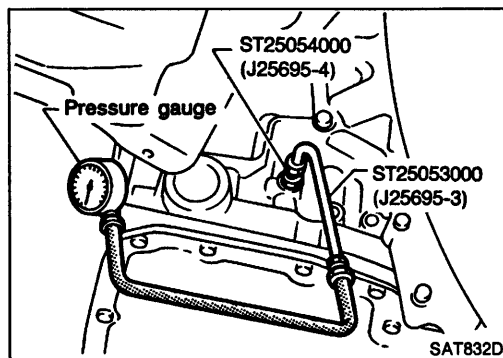
- Location of pressure test port.
- Always replace pressure plugs as they are self-sealing bolts.



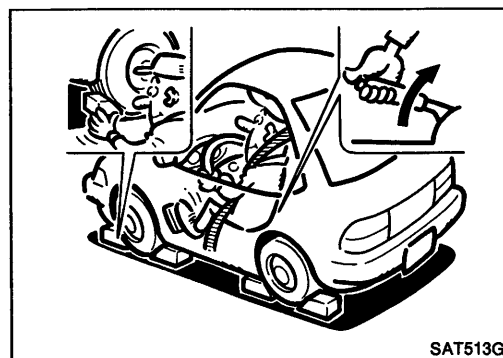
LINE PRESSURE TEST PROCEDURE

1. Check A/T and engine fluid levels. If necessary, add fluid.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

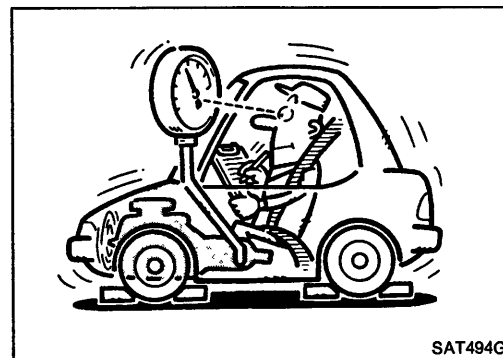
A.T.F. operating temperature:
50 - 80°C (122 - 176°F)



3. Install pressure gauge to line pressure port.



4. Set parking brake and block wheels.
- Continue to depress brake pedal fully while line pressure test is being performed at stall speed.



5. Start engine and measure line pressure at idle and stall speed.

Line pressure:
Refer to S.D.S.

JUDGMENT OF LINE PRESSURE TEST

- If line pressure does not rise, first check to make sure that throttle wire is connected properly.
- 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

TROUBLE DIAGNOSES

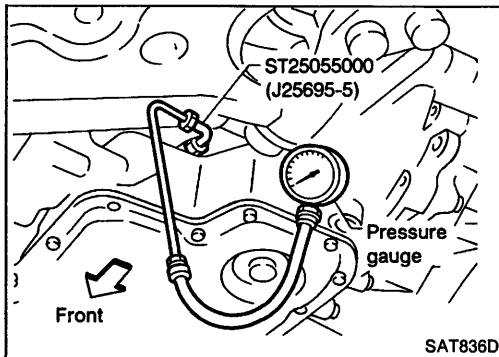
Pressure Testing (Cont'd)

- 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 low and reverse brake circuit, line pressure becomes low in "R" position but is normal in "P", "D", "2" or "1" position.
 - 3) When line pressure is high while idling, pressure regulator valve may have stuck.

GI

MA

EM



GOVERNOR PRESSURE TESTING

1. Check A/T and engine fluid levels. If necessary, add fluid.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

LC

EF &
EC

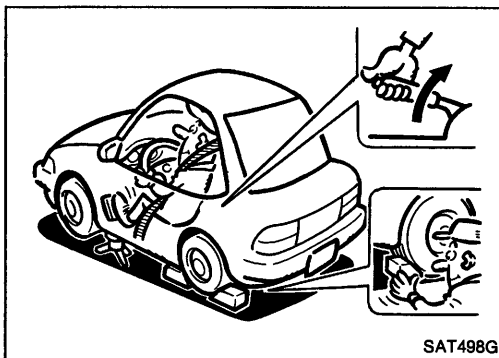
A.T.F. operating temperature:

50 - 80°C (122 - 176°F)

3. Install pressure gauge to governor pressure port.

FE

CL



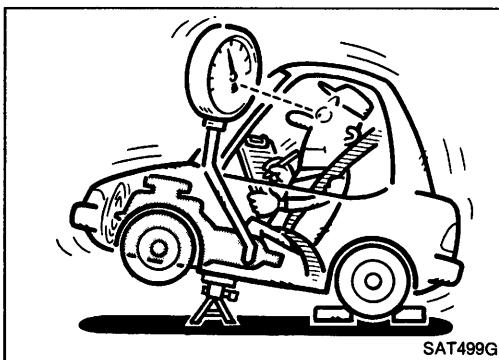
4. Set parking brake and block rear wheels.
 5. Jack up front wheels.
 6. Set selector lever in D position and drive vehicle.
- Be careful of rotating wheels.

MT

AT

FA

RA



Governor pressure:

- Governor pressure is not generated when vehicle is stopped, (front wheels are not rotating).
- Governor pressure rises gradually in response to vehicle speed, (front wheel r.p.m.).

BR

ST

If not, check governor valve assembly. Refer to "REPAIR FOR COMPONENT PARTS".

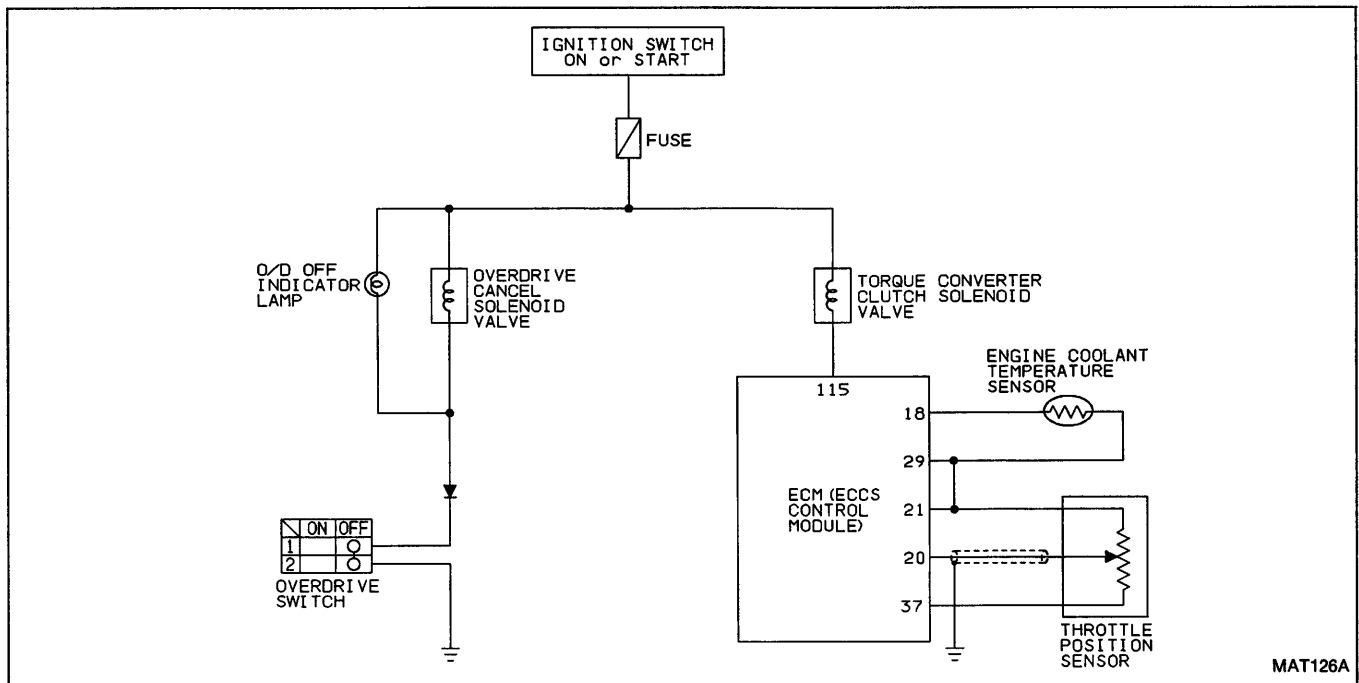
BF

HA

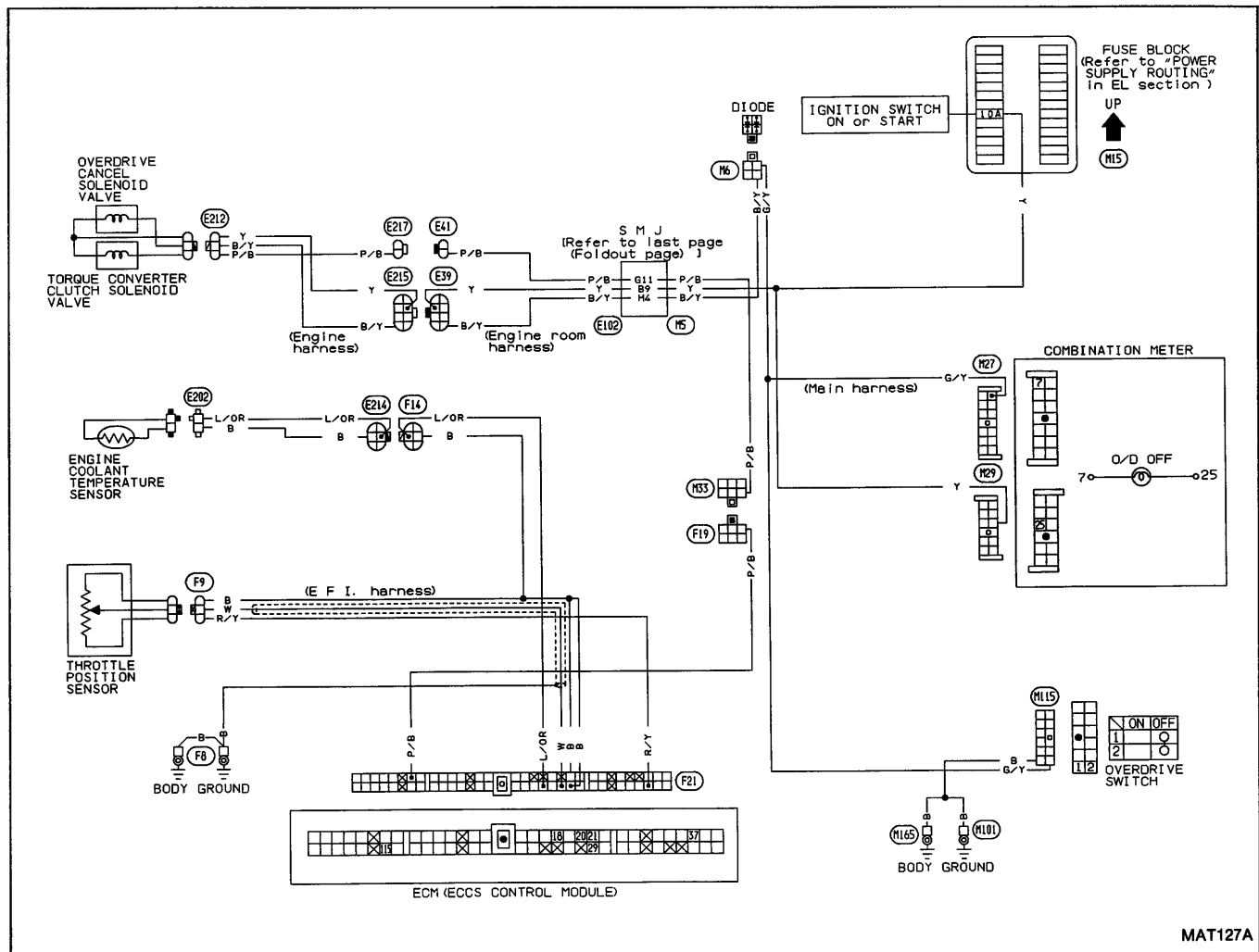
EL

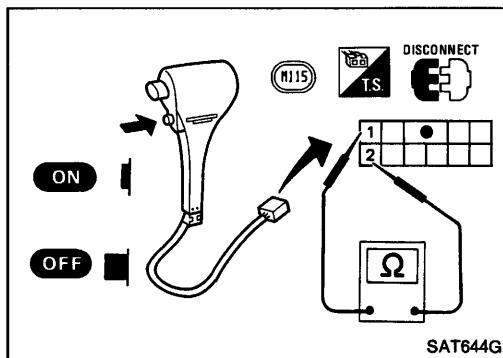
TROUBLE DIAGNOSES

Circuit Diagram



Wiring Diagram



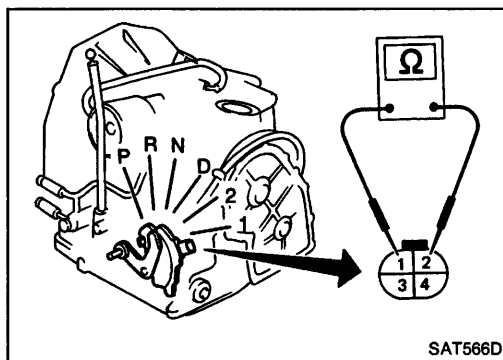


Component Check

OVERDRIVE CONTROL SWITCH

- Check continuity between two terminals.

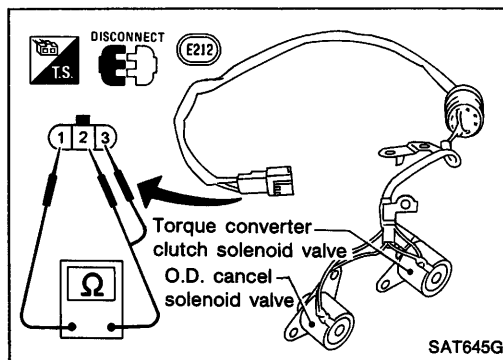
O.D. switch position	Continuity
ON	No
OFF	Yes



INHIBITOR SWITCH

- Check continuity at "N", "P" and "R" positions.
- With control lever held in "N" position, turn manual lever an equal amount in both directions to see if current flow positions are nearly the same.
(When manual lever is in each position, continuity normally exists within 1.5° in either direction.)
If current flows outside normal position, or if normal flow position is out of specifications, properly adjust inhibitor switch.

Position	Terminal No.			
	①	②	③	④
P,N	○	○		
R			○	○



O.D. CANCEL SOLENOID VALVE AND TORQUE CONVERTER CLUTCH SOLENOID VALVE

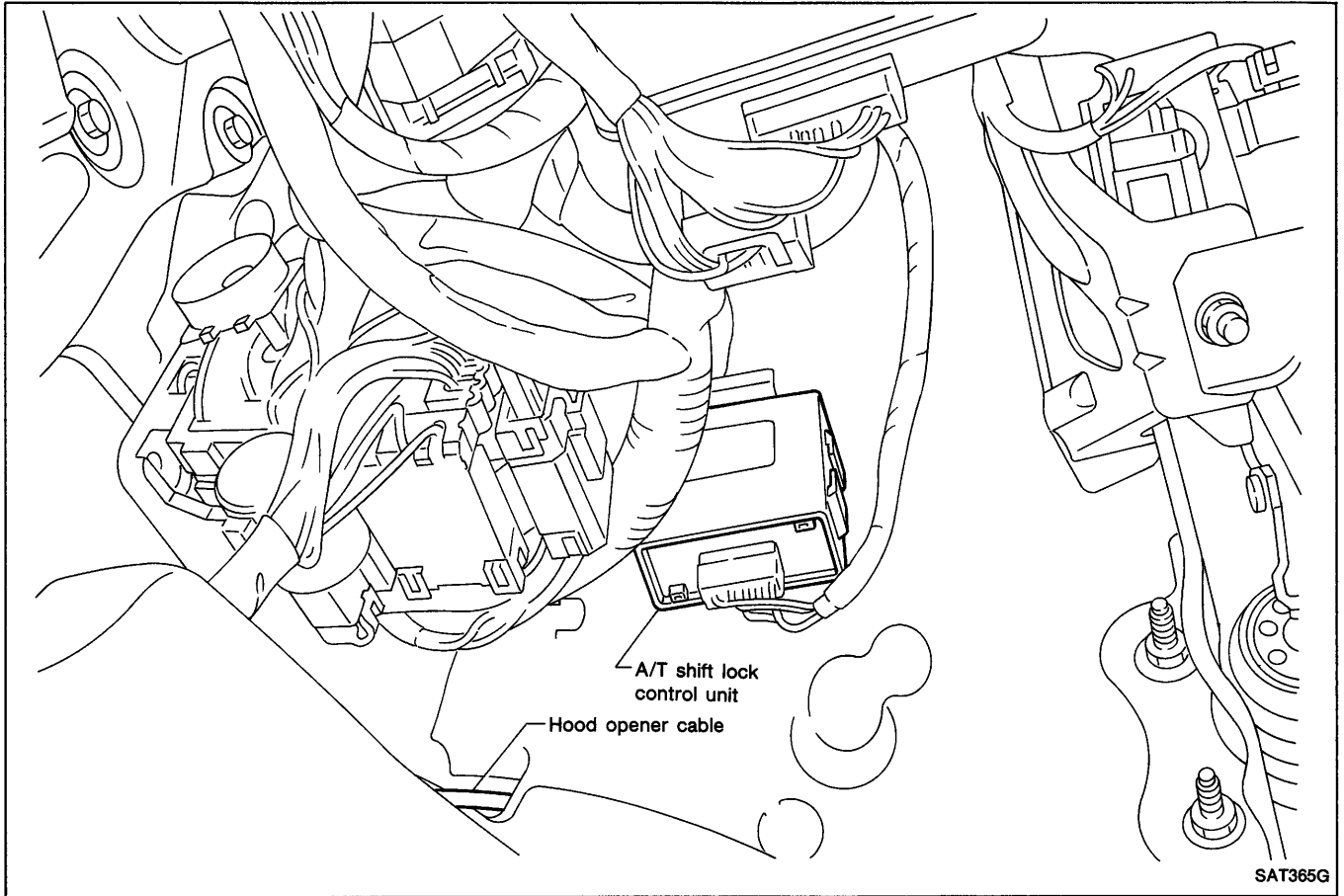
- Check resistance between terminals of each solenoid.

Solenoid	Terminal No.	Resistance
O.D. cancel solenoid valve	① — ②	Approximately 25 Ω
Torque converter clutch solenoid valve	① — ③	

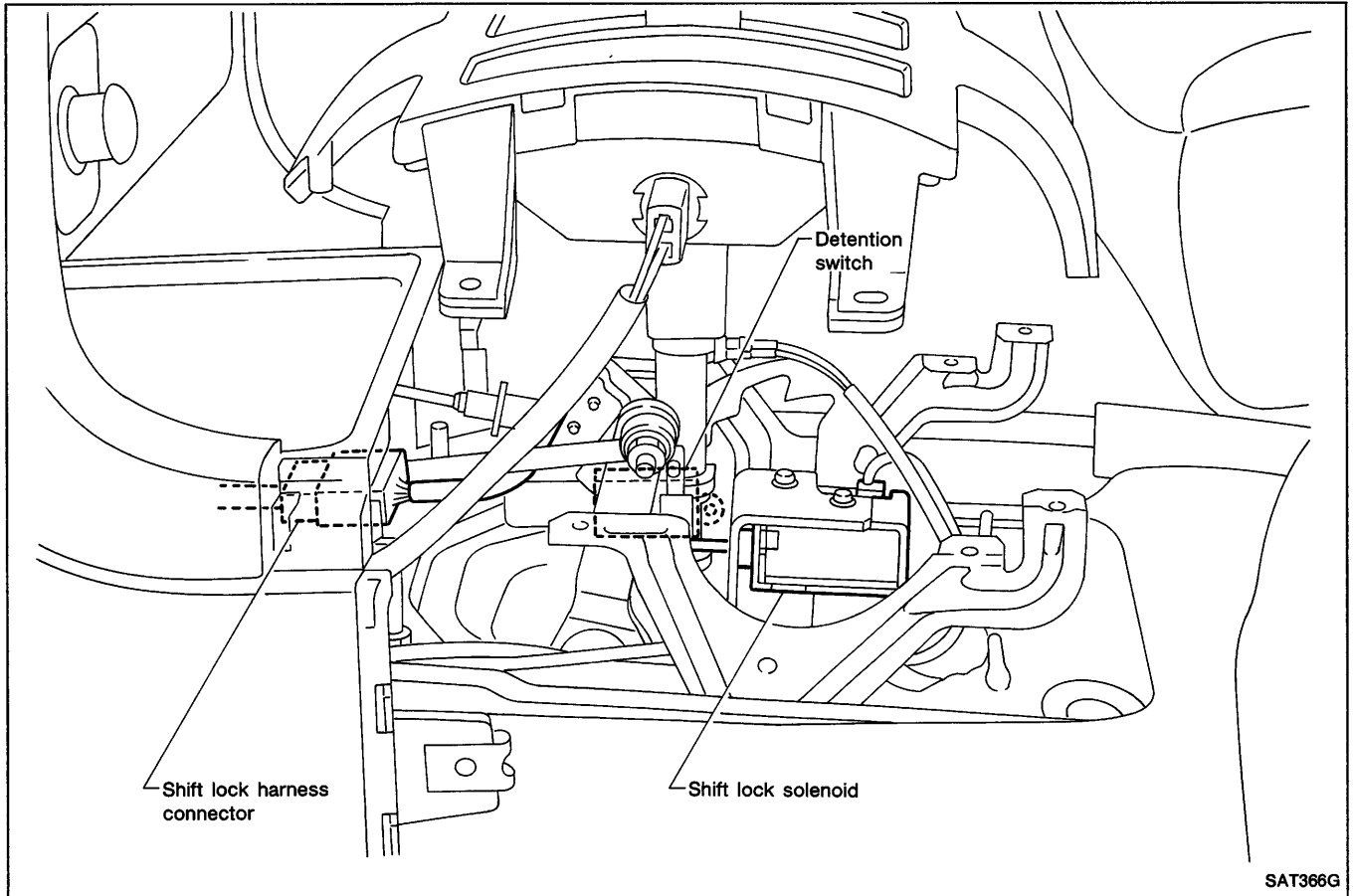
Contents

Shift Lock System Electrical Parts Location	AT-21
Circuit Diagram for Quick Pinpoint Check	AT-22
Wiring Diagram	AT-22
Diagnostic Procedure	AT-23
SYMPTOM 1: Selector lever cannot be moved from "P" position when applying brake pedal or can be moved when releasing brake pedal. Selector lever can be moved from "P" position when key is removed from key cylinder.	
SYMPTOM 2: Ignition key cannot be removed when selector lever is set to "P" position or can be removed when selector lever is set to any position except "P".	
Key Interlock Cable	AT-27
Shift Lock Control Unit Inspection	AT-28
Shift Lock Control Unit Inspection Table	AT-28
Component Check	AT-29

Shift Lock System Electrical Parts Location



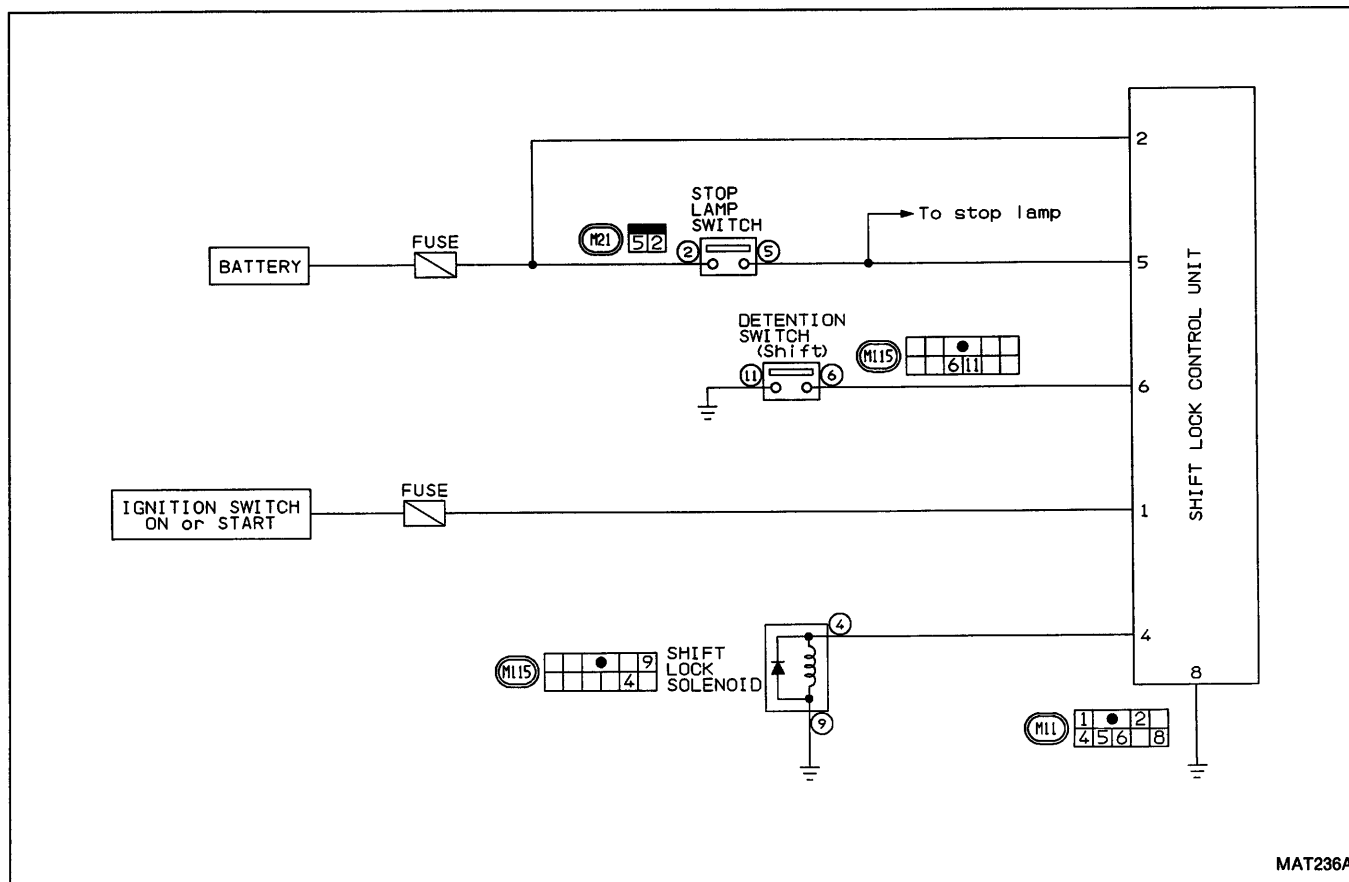
GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT



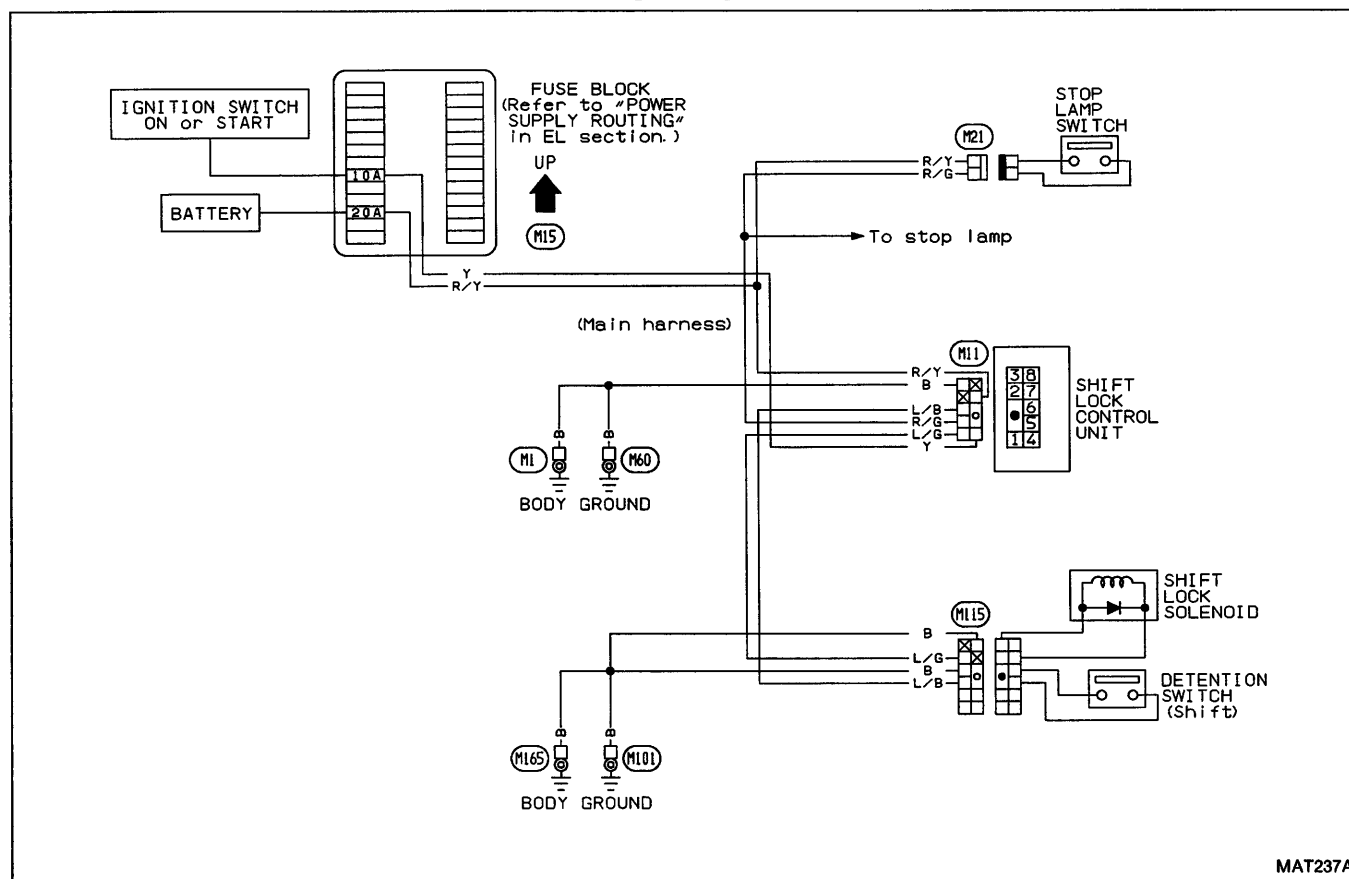
FA
RA
BR
ST
BF
HA
EL

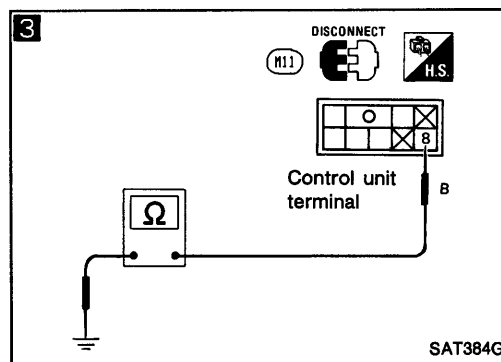
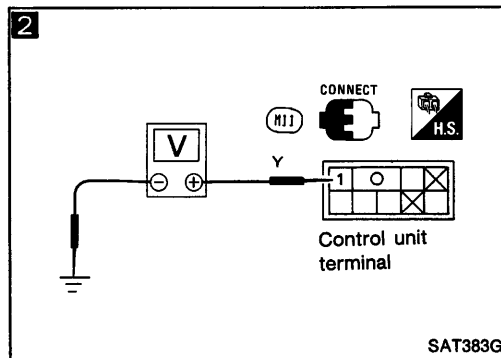
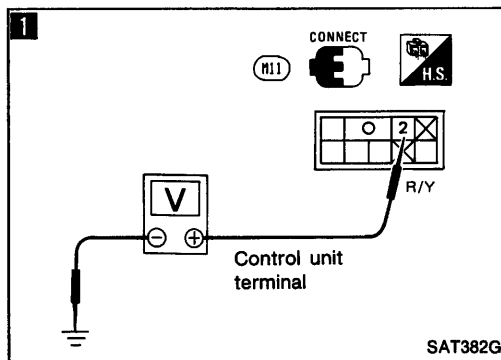
TROUBLE DIAGNOSES — A/T Shift Lock System

Circuit Diagram for Quick Pinpoint Check



Wiring Diagram





Diagnostic Procedure

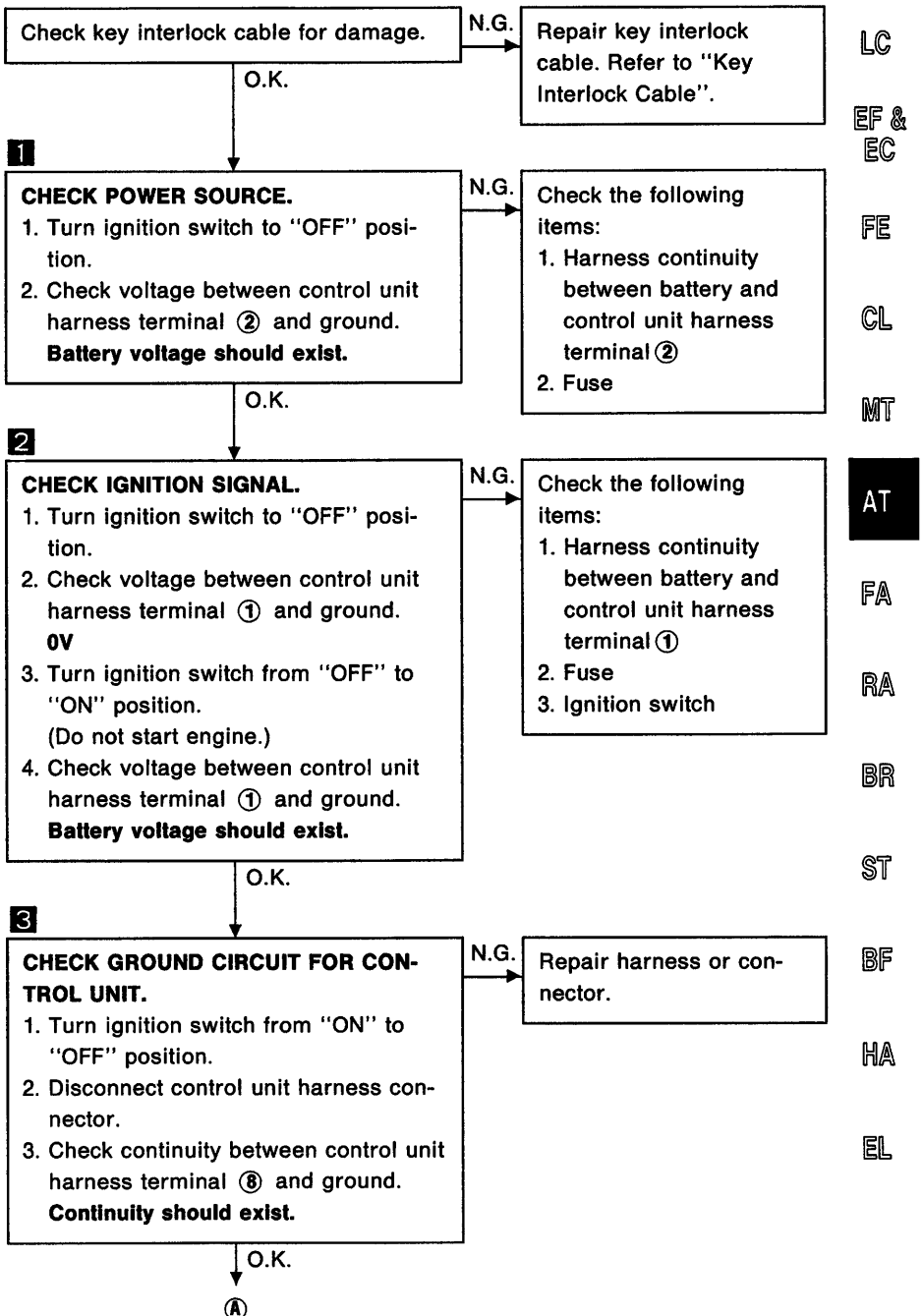
SYMPTOM 1:

With key in "ON" position, selector lever cannot be moved from "P" position when applying brake pedal or can be moved when releasing brake pedal.

Selector lever can be moved from "P" position when key is removed from key cylinder.

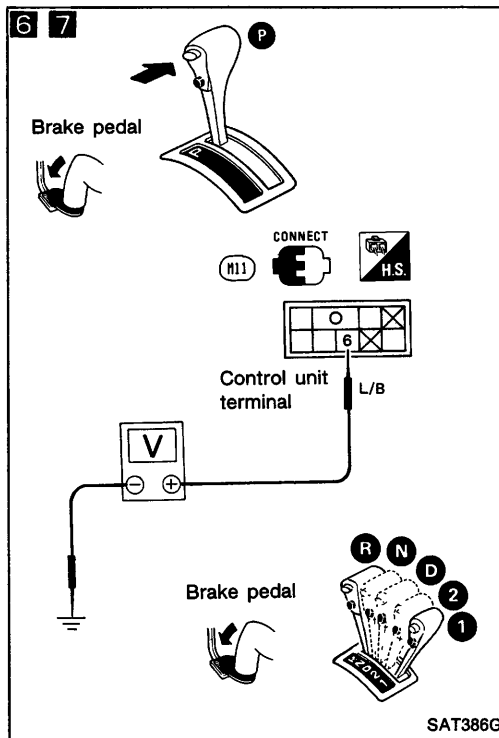
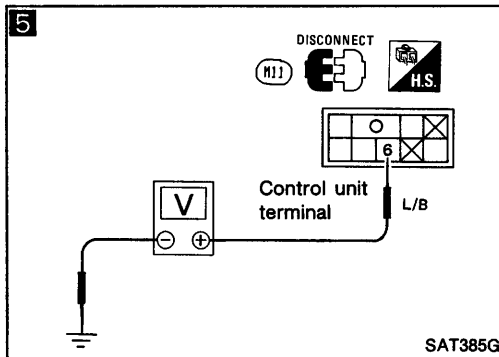
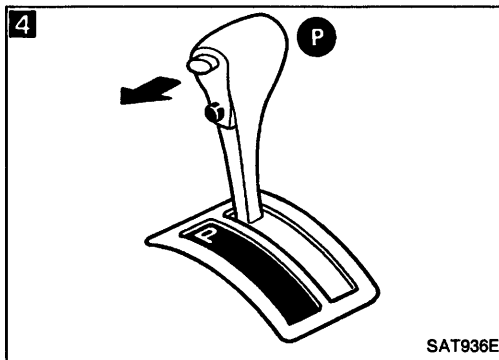
SYMPTOM 2:

Ignition key cannot be removed when selector lever is set to "P" position or can be removed when selector lever is set to any position except "P".



TROUBLE DIAGNOSES — A/T Shift Lock System

Diagnostic Procedure (Cont'd)



CHECK INPUT SIGNAL (DETENTION SWITCH).

1. Reconnect control unit harness connector.

2. Turn ignition switch from "OFF" to "ON" position.

(Do not start engine.)

3. Set selector lever in "P" position and release selector lever button.

When selector lever cannot be moved from "P" position with brake pedal depressed, set ignition key to "ACC" position and move lever. Then set ignition key to "ON" position.

4. Disconnect control unit harness connector.

5. Check continuity between control unit harness terminal ⑥ and ground.

Continuity should not exist.

N.G.

Check detention switch —shift.
(Refer to "COMPONENT CHECK".)

O.K.

CHECK INPUT SIGNAL (DETENTION SWITCH).

1. Turn ignition switch to "ON" position.

(Do not start engine.)

2. Check continuity between control unit harness terminal ⑥ and ground with brake pedal depressed and selector lever button pushed.

Continuity should exist.

3. Check continuity between control unit harness terminal ⑥ and ground with selector lever set in any position except "P".

Battery voltage should exist.

N.G.

Check the following items:

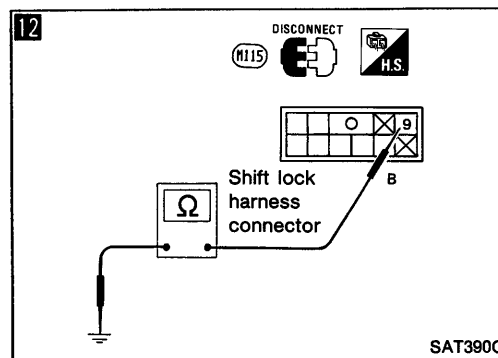
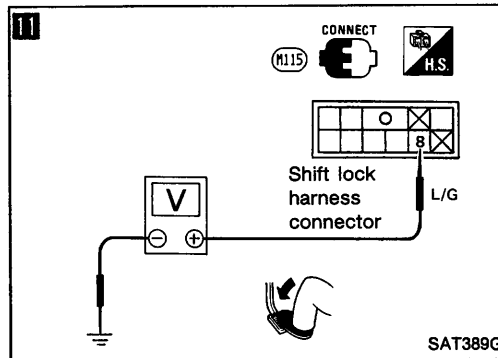
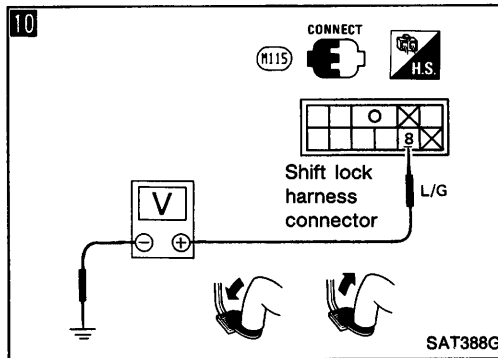
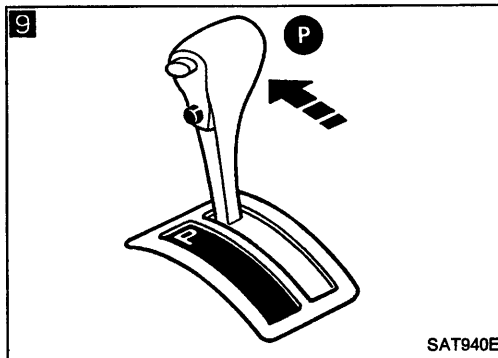
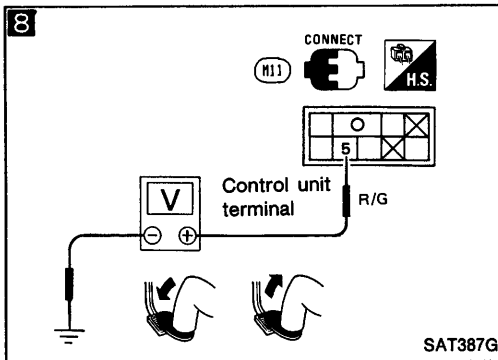
1. Harness continuity between control unit harness terminal ⑥ and detention switch harness terminal ⑥
2. Harness continuity between detention switch harness terminal ⑥ and ground
3. Detention switch (Refer to "COMPONENT CHECK".)

O.K.

⑧

TROUBLE DIAGNOSES — A/T Shift Lock System

Diagnostic Procedure (Cont'd)



8

CHECK INPUT SIGNAL (STOP LAMP SWITCH).
Turn ignition switch to "ON" position.
(Do not start engine.)

- Check voltage between control unit harness terminal ⑤ and ground.

Brake pedal	Voltage
Depressed	Battery voltage
Released	0V

O.K.

9

Set selector lever in "P" position.

CHECK OUTPUT SIGNAL (SHIFT LOCK SOLENOID).

- Turn ignition switch to "ON" position.
(Do not start engine.)
- Check voltage between shift lock harness connector terminal ⑧ and body ground.

Brake pedal	Voltage
Depressed	Battery voltage
Released	0V

3. Turn ignition switch from "ON" to "OFF" position.

11

- Check voltage between shift lock harness connector terminal ⑧ and ground with brake pedal depressed.
0V

O.K.

12

CHECK GROUND CIRCUIT FOR SHIFT LOCK SOLENOID.

- Disconnect shift lock harness connector.
- Check continuity between shift lock harness terminal ⑨ and ground.
Continuity should exist.

O.K.

③

N.G.

Check the following items:

- Harness continuity between control unit harness terminal ⑤ and stop lamp switch harness terminal ②
- Harness continuity between stop lamp switch harness terminal ① and fuse
- Stop lamp switch (Refer to "COMPONENT CHECK".)

N.G.

Check harness continuity between control unit harness terminal ④ and shift lock solenoid harness terminal ⑧.

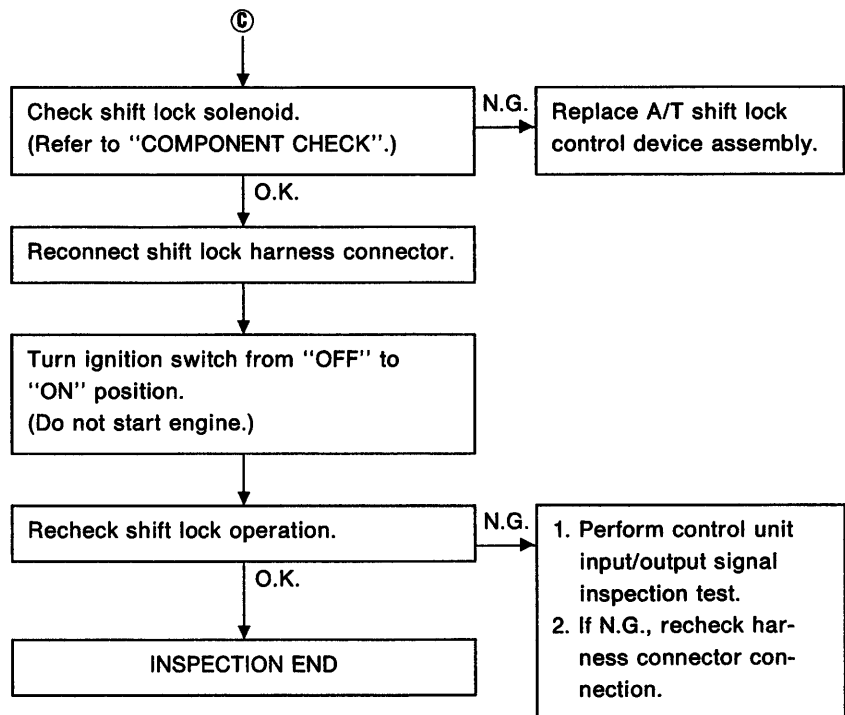
N.G.

Repair harness or connector.

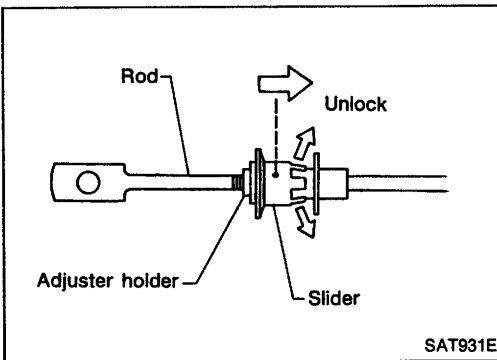
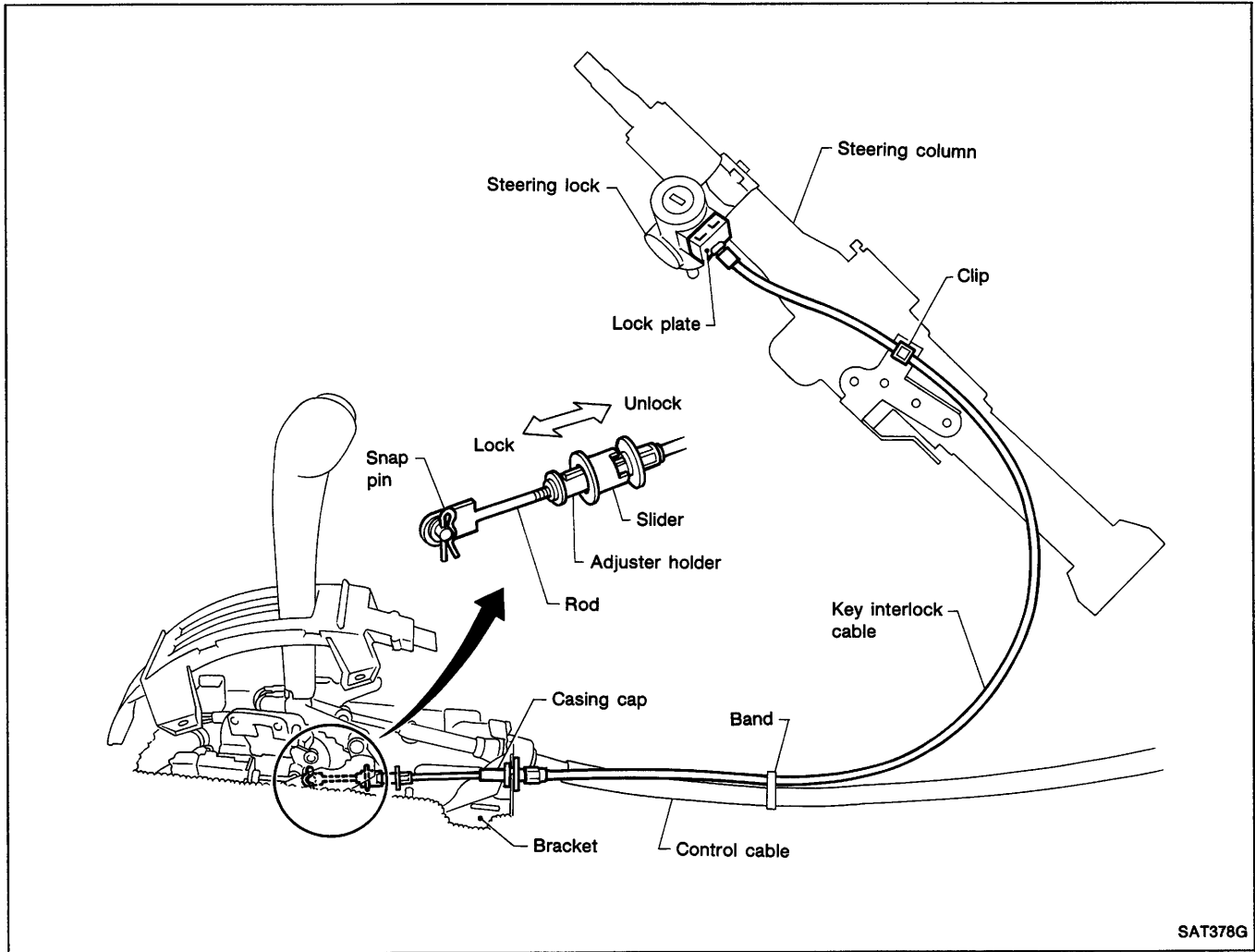
GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

TROUBLE DIAGNOSES — A/T Shift Lock System

Diagnostic Procedure (Cont'd)



Key Interlock Cable

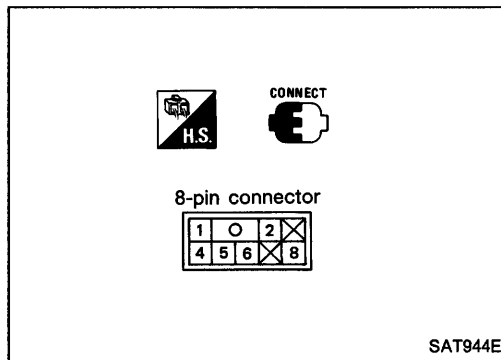


REMOVAL

1. Remove snap pin temporarily and remove key interlock cable from vehicle.
2. Unlock slider from adjuster holder and remove rod from cable.
3. Install rod to control device with snap pin.

INSTALLATION

1. Set key interlock cable to steering lock assembly and install lock plate.
2. Clamp cable to steering column and fix to control cable with band.
3. Set control lever to "P".
4. Insert rod into adjuster holder.
5. Install casing cap to bracket.
6. Move slider in order to fix adjuster holder to rod.



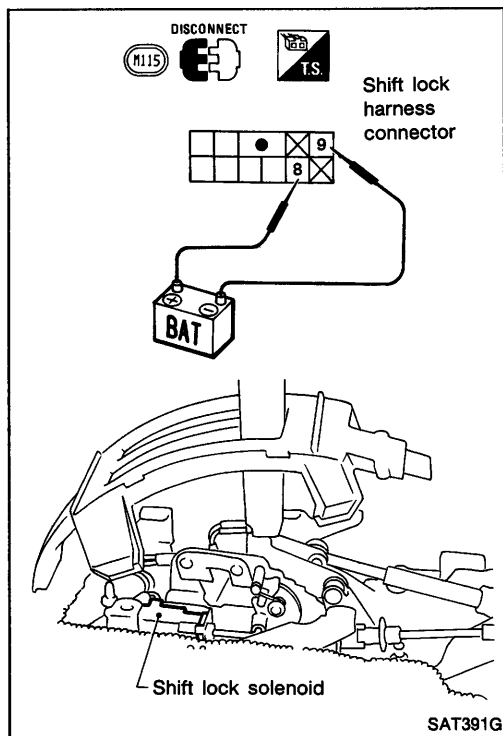
Shift Lock Control Unit Inspection

- Measure voltage between each terminal and terminal ⑧ by following "Shift Lock Control Unit Inspection Table".
- Pin connector terminal layout.

Shift Lock Control Unit Inspection Table

(Data are reference values.)

Terminal No.		Item	Condition	Judgment standard
⊕	⊖			
1	8	Ignition signal	Turn ignition switch to "ON" position.	Battery voltage
			Except above	0V
2		Power source	Any condition	Battery voltage
4		Shift lock signal	● Turn ignition switch to "ON" position ● When selector lever is set in "P" position and brake pedal is depressed.	Battery voltage
			Except above	0V
5		Stop lamp switch	When brake pedal is depressed.	Battery voltage
			When brake pedal is released.	0V
6		Detention switch	● When key is inserted into key cylinder and selector lever is set in "P" position with selector lever button pushed. ● When selector lever is set in any position except "P".	Battery voltage
			Except above	0V



Component Check

SHIFT LOCK SOLENOID

- Check operation by applying battery voltage to shift lock harness connector.

GI

MA

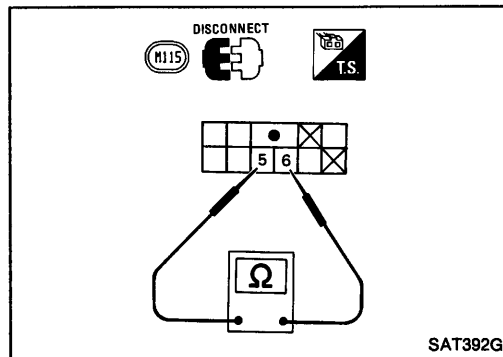
EM

LC

EF &
EC

FE

CL



DETENTION SWITCH

- Check continuity between terminals ⑤ and ⑥ of shift lock harness connector.

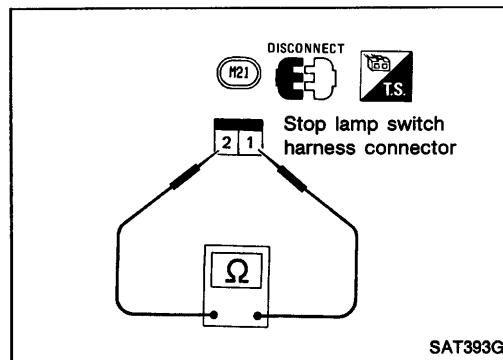
MT

Condition	Continuity
When selector lever is set in "P" position and selector lever button is released	No
Except above	Yes

AT

FA

RA



STOP LAMP SWITCH

- Check continuity between terminals ① and ② of stop lamp switch harness connector.

BR

Condition	Continuity
When brake pedal is depressed	Yes
When brake pedal is released	No

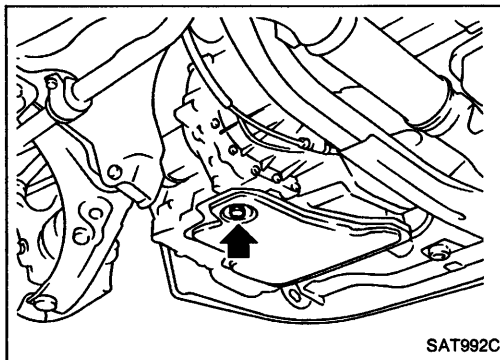
ST

BF

Check stop lamp switch after adjusting brake pedal — refer to section BR.

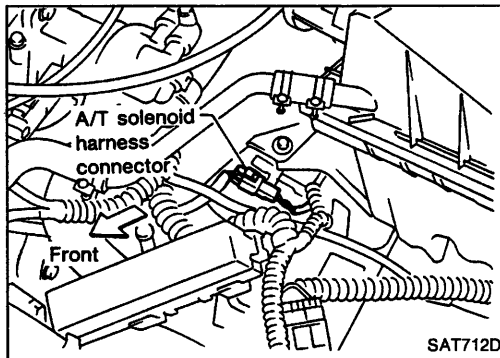
HA

EL

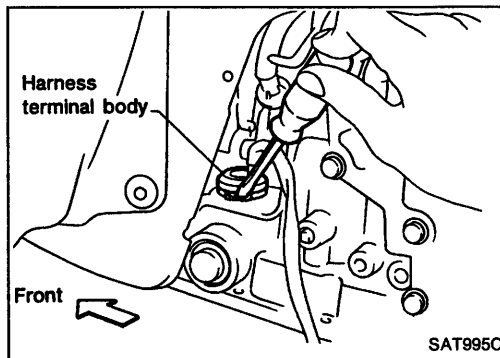


Control Valve Assembly and Accumulator REMOVAL

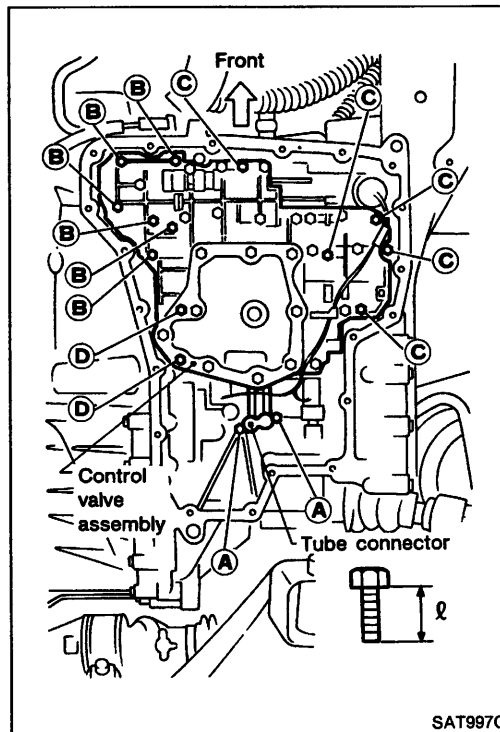
1. Drain A.T.F. from transaxle.
2. Remove oil pan and gasket.



3. Disconnect A/T solenoid harness connector.



4. Remove stopper ring from A/T solenoid harness terminal body.
5. Remove A/T solenoid harness from transmission case by pushing on terminal body.



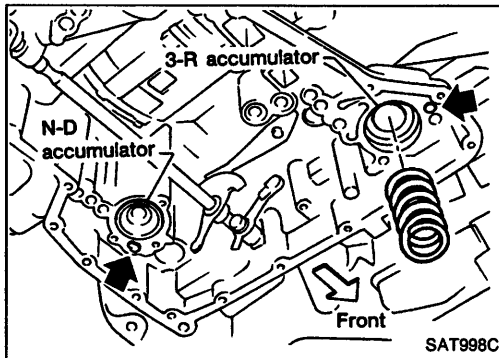
6. Remove control valve assembly by removing fixing bolts.

Bolt length, number and location:

Bolt symbol	A	B	C	D
Bolt length "ℓ"	25.0	33.0	40.0	43.5
 ℓ mm (in)	(0.984)	(1.299)	(1.575)	(1.713)
Number of bolts	2	6	5	2

- Be careful not to drop manual valve, tube connector, tubes and 3-R accumulator return spring.
7. Disassemble and inspect control valve assembly if necessary — Refer to "REPAIR FOR COMPONENT PARTS".

Control Valve Assembly and Accumulator (Cont'd)

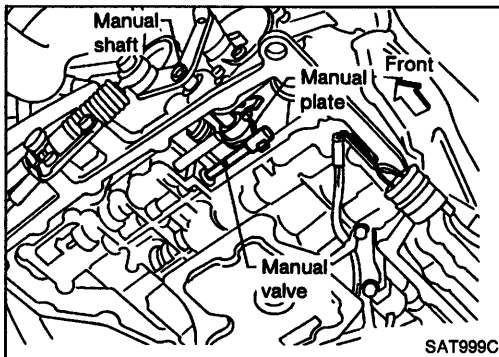


8. Remove 3-R and N-D accumulators by applying compressed air if necessary.
- Hold each piston with a rag.

GI

MA

EM



INSTALLATION

- Set manual shaft in Neutral position, then align manual plate with groove in manual valve.
- After installing control valve to transmission case, make sure that selector lever can be moved to all positions.

LC

EF &
EC

FE

CL

Throttle Wire Adjustment

1. Turn ignition switch to OFF.
 2. Move adjusting tube in direction "T" (Transaxle side) while pressing lock plate.
 3. Return lock plate.
 4. Move throttle drum from "P₂" to "P₁" quickly [Adjusting tube moves in the direction "U" (Engine side) depressing the lock plate.]
- Ensure that throttle wire stroke "L" is within the specified range between full throttle and idle.

MT

AT

FA

RA

Throttle wire stroke "L":

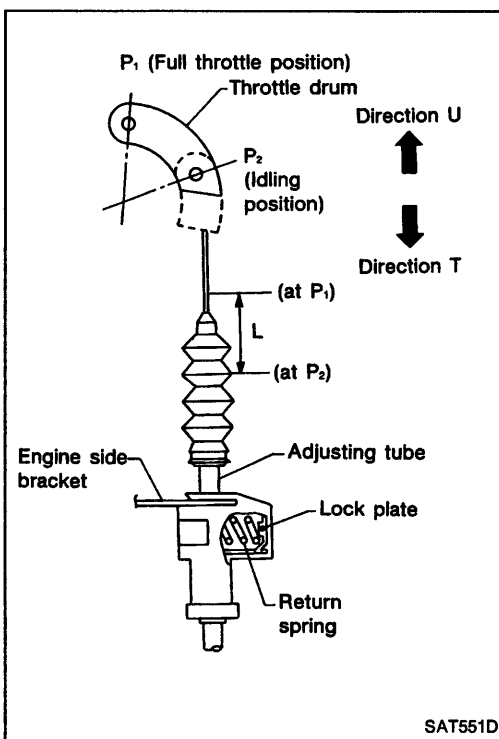
39 - 43 mm (1.54 - 1.69 in)

- Adjust throttle wire stroke after throttle wire/accelerator wire has been installed and adjusted.
- Put mark on throttle wire to facilitate measuring wire stroke.

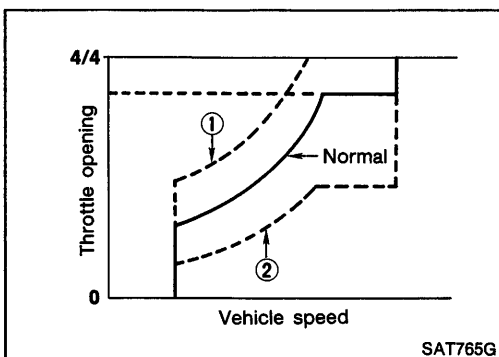
BR

ST

BF



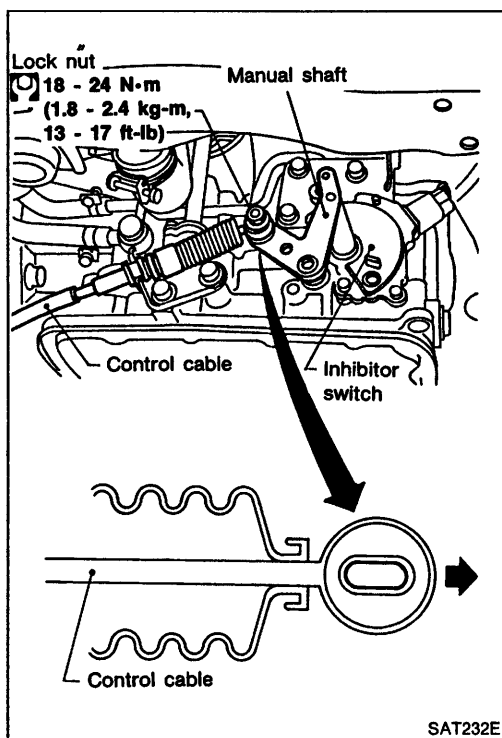
HA



EL

If throttle wire stroke is improperly adjusted, the following problems may arise.

- When full-open position "P₁" of throttle drum is too far in direction "T", shift schedule will be as shown by ② in figure, and kickdown range will greatly increase.
 - When full-open position "P₁" of throttle drum is too far in direction "U", shift schedule will be as shown by ① in figure, and kickdown will not occur.
5. After properly adjusting throttle wire, ensure the parting line is as straight as possible.



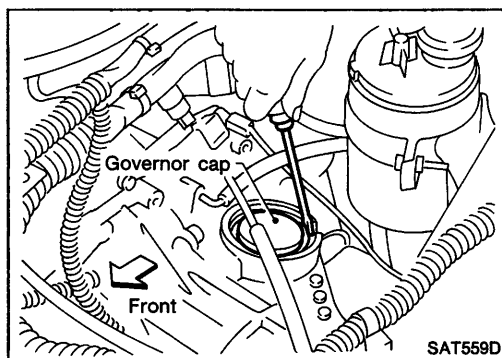
Control Cable Adjustment

Move selector lever from the "P" position to the "1" position. You should be able to feel the detents in each position. If the detents cannot be felt or the pointer indicating the position is improperly aligned, the control cable needs adjustment.

1. Place selector lever in "P" position.
2. Loosen control cable lock nut and place manual shaft in "P" position.
3. Pull control cable in the direction of the arrow shown in the illustration by specified force.

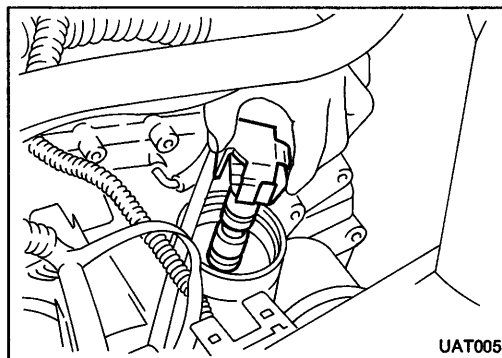
Specified force: 6.9 N (0.7 kg, 1.5 lb)

4. Return control cable in the opposite direction of the arrow for 1.0 mm (0.039 in).
5. Tighten control cable lock nut.
6. Move selector lever from "P" position to "1" position and make sure that selector lever can be moved smoothly and without any sliding noise.
7. Apply grease to contacting areas of selector lever and control cable. Install any part removed.

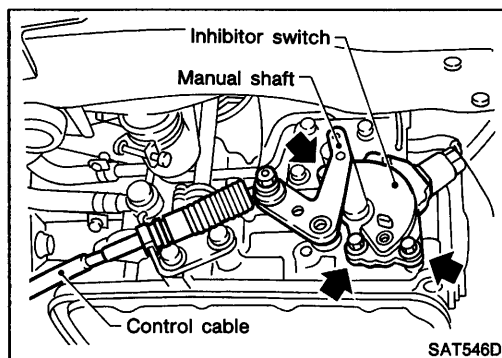


Governor Valve

1. Remove governor cap snap ring and spacer.
2. Remove governor cap and O-ring.



3. Remove governor valve assembly from transaxle.
4. Check governor valve assembly if necessary — Refer to "DISASSEMBLY".

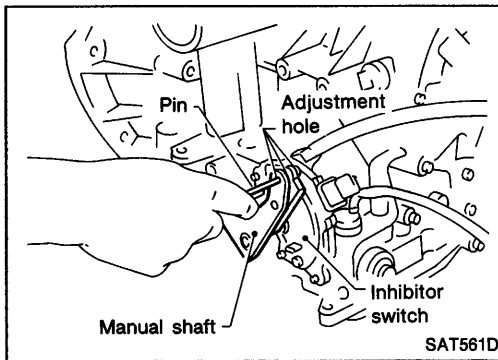


Inhibitor Switch Adjustment

1. Remove control cable end from manual shaft.
2. Set manual shaft in "N" position.
3. Loosen inhibitor switch fixing bolts.

ON-VEHICLE SERVICE

Inhibitor Switch Adjustment (Cont'd)



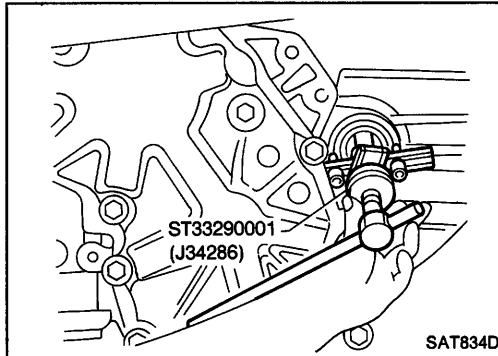
4. Insert 4.0 mm (0.157 in) dia. pin into adjustment holes in both inhibitor switch and manual shaft as near vertically as possible.
5. Tighten inhibitor switch fixing bolts.
6. Remove pin from adjustment holes after adjusting inhibitor switch.
7. Reinstall any part removed.
8. Adjust control cable — Refer to "Control Cable Installation and Adjustment".
9. Check continuity of inhibitor switch — Refer to "ELECTRICAL SYSTEM".

GI

MA

EM

Differential Side Oil Seal Replacement



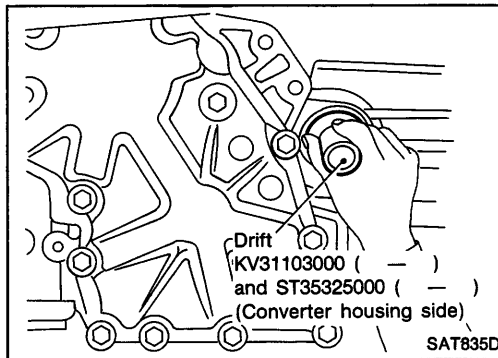
1. Remove drive shaft assembly. — Refer to section FA.
2. Remove oil seal.

LC

EF &
EC

FE

CL



3. Install oil seal.

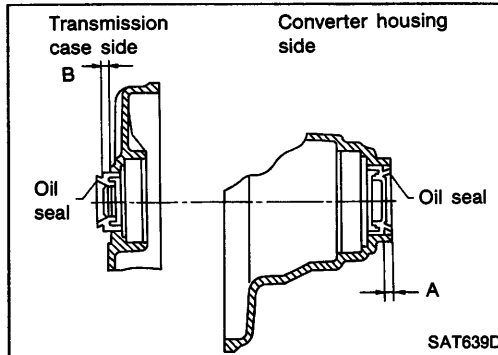
- Apply A.T.F. to oil seal surface before installing.

MT

AT

FA

RA



- Install oil seal so that dimensions "A" and "B" are within specifications.

Unit: mm (in)

Dimension A	Dimension B
5.5 - 6.5 (0.217 - 0.256)	0.5 (0.020) or less

BR

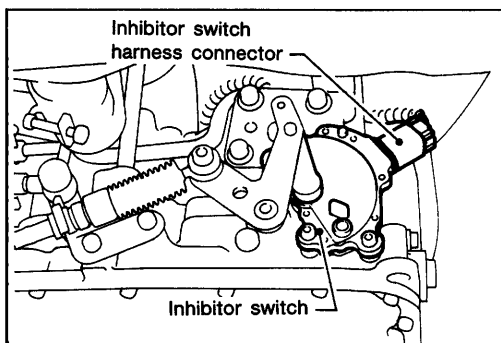
ST

BF

HA

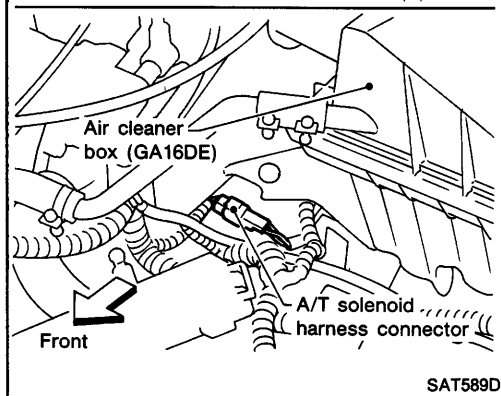
EL

REMOVAL AND INSTALLATION

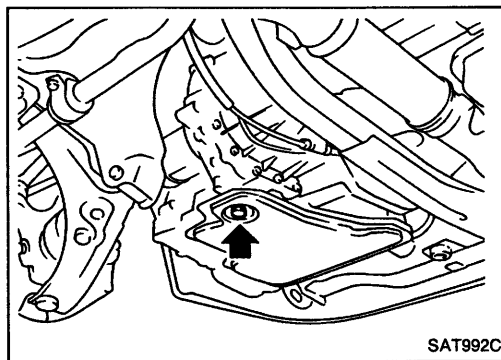


Removal

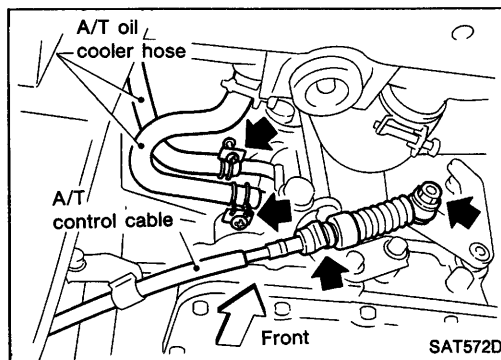
- Remove battery and bracket.
- Remove air duct.
- Disconnect A/T solenoid harness connector and inhibitor switch harness connector.
- Disconnect throttle wire at engine side.



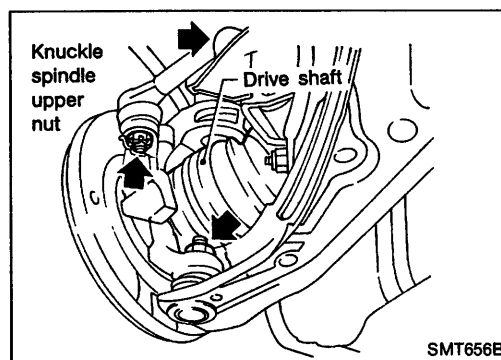
- Drain A.T.F.



- Disconnect control cable from transaxle.
- Disconnect oil cooler hoses.

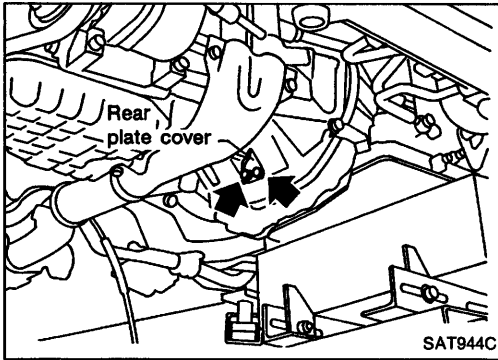


- Remove drive shafts — Refer to "Section FA".
- Remove exhaust front tube.
- Remove starter motor from transaxle.

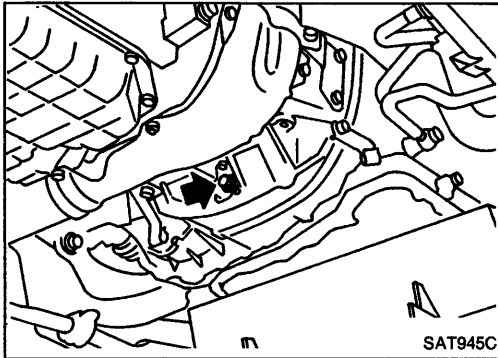


REMOVAL AND INSTALLATION

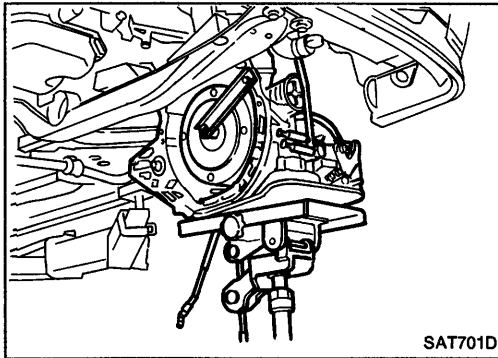
Removal (Cont'd)



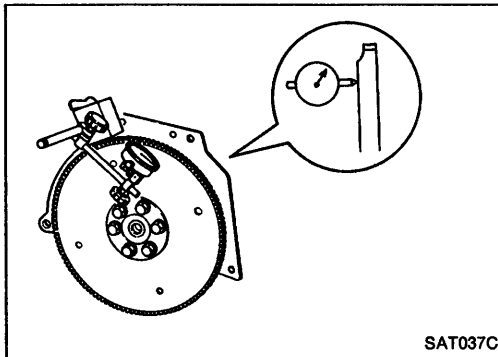
- Remove rear plate cover.



- Remove bolts securing torque converter to drive plate.
Rotate crankshaft for access to securing bolts.
- Support engine by placing a jack under oil pan.
Do not place jack under oil pan drain plug.

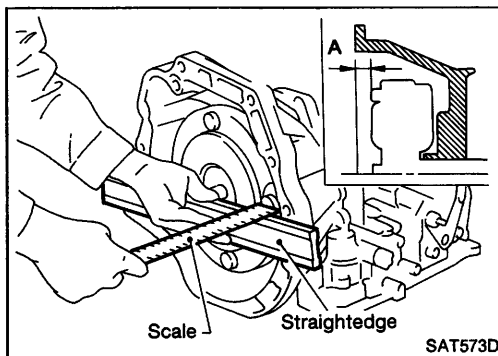


- Support transaxle with a jack.
- Remove mountings from transaxle.
- Remove bolts fixing A/T to engine.
- Lower transaxle while supporting it with a jack.



Installation

- Drive plate runout
Maximum allowable runout:
Refer to EM section ("Inspection", "CYLINDER BLOCK").
If this runout is out of specification, replace drive plate with ring gear.



- When connecting torque converter to transaxle, measure distance "A" to be certain that they are correctly assembled.
Distance "A":
15.9 mm (0.626 in) or more

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

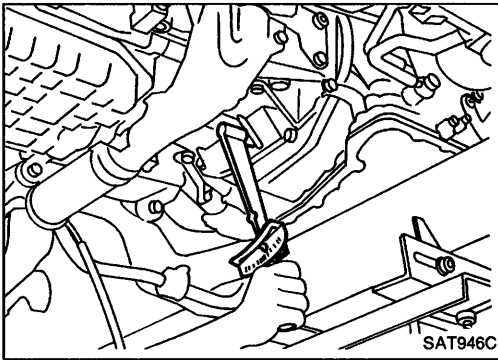
BF

HA

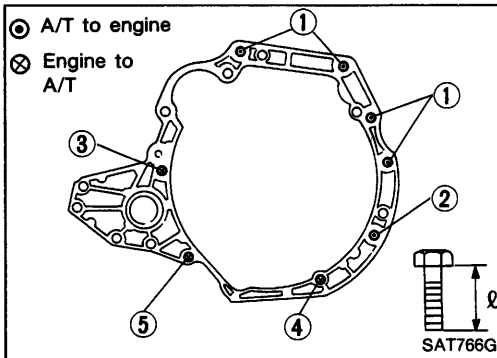
EL

REMOVAL AND INSTALLATION

Installation (Cont'd)



- Install converter to drive plate.
- After converter is installed to drive plate, rotate crankshaft several turns and check to be sure that transaxle rotates freely without binding.



- Tighten bolts fixing transaxle

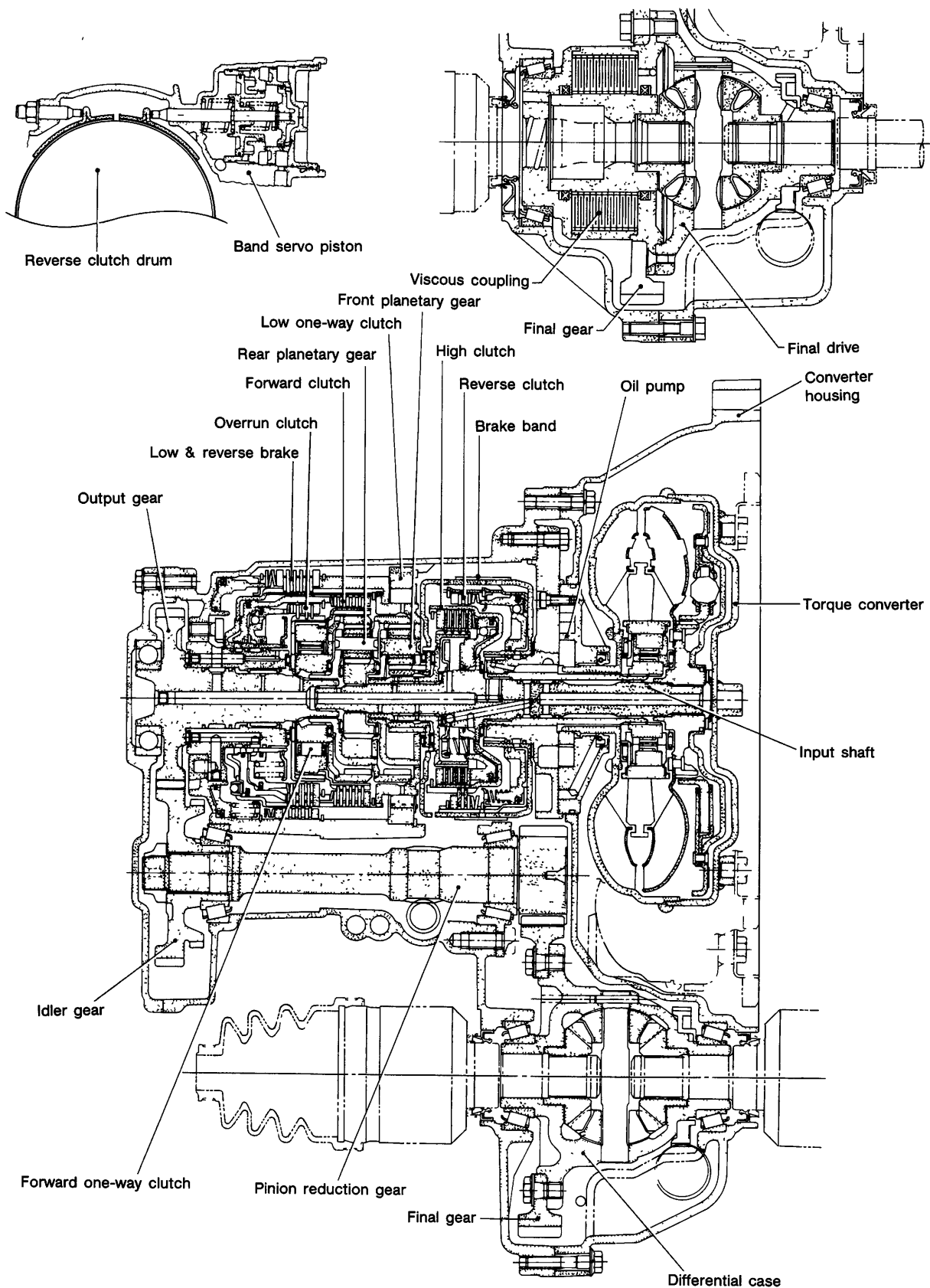
Bolt No.	Tightening torque N·m (kg-m, ft-lb)	Bolt length "ℓ" mm (in)
①	70 - 79 (7.1 - 8.1, 51 - 59)	55 (2.17)
②	70 - 79 (7.1 - 8.1, 51 - 59)	50 (1.97)
③	70 - 79 (7.1 - 8.1, 51 - 59)	65 (2.56)
④	16 - 21 (1.6 - 2.1, 12 - 15)	35 (1.38)
⑤	16 - 21 (1.6 - 2.1, 12 - 15)	45 (1.77)

- Reinstall any part removed.
- Refill transaxle with A.T.F. and check fluid level.
- Adjust control cable and throttle wire. Refer to "ON-VEHICLE SERVICE".
- Check inhibitor switch for operation.
- Move selector lever through all positions to be sure that transaxle operates correctly. With parking brake applied, idle engine. Move selector lever through "N" to "D", to "2", to "1" and "R". A slight shock should be felt through the hand gripping the selector each time the transaxle is shifted.
- Perform road test — Refer to "ROAD TESTING".

MAJOR OVERHAUL

RL4F03A

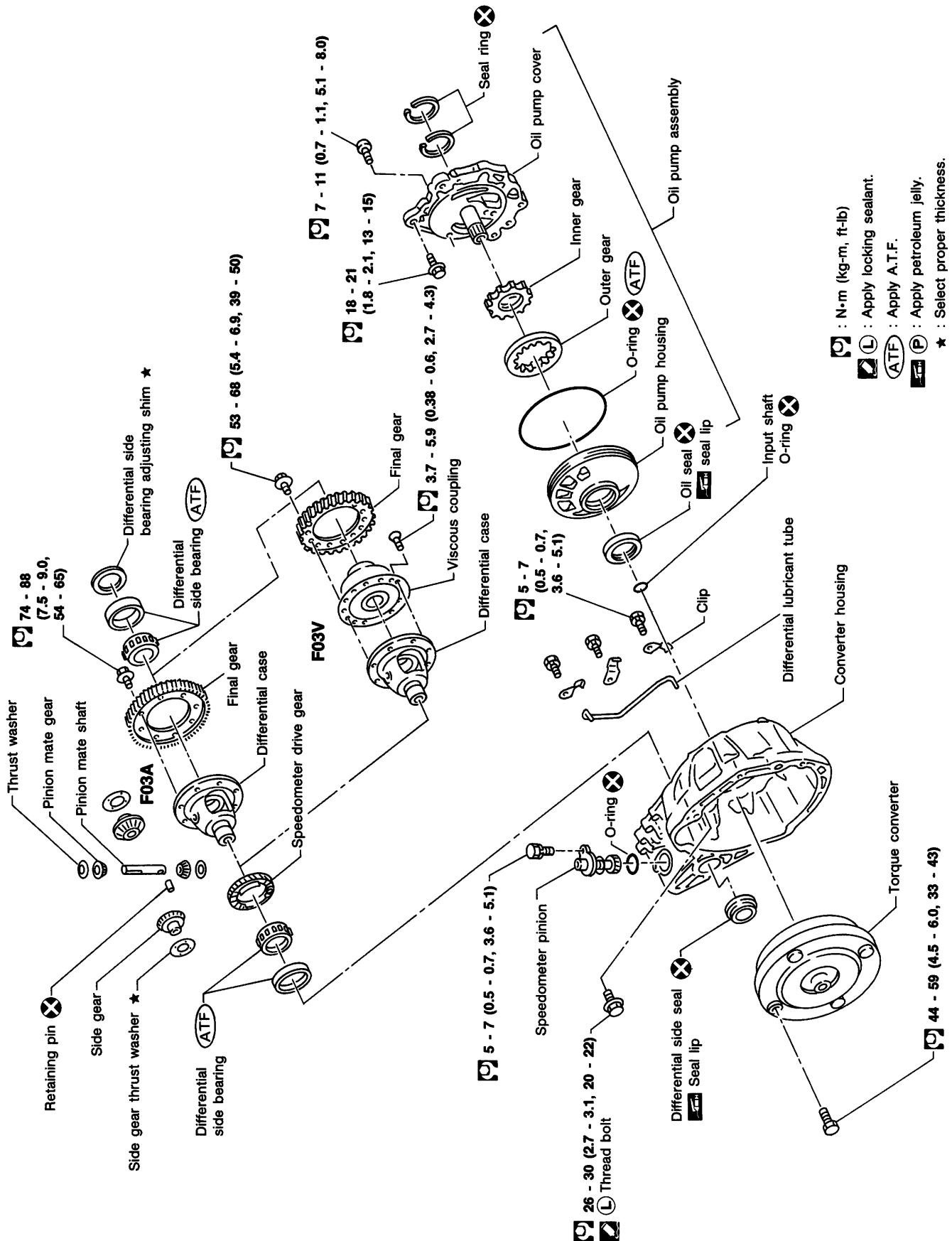
RL4F03V



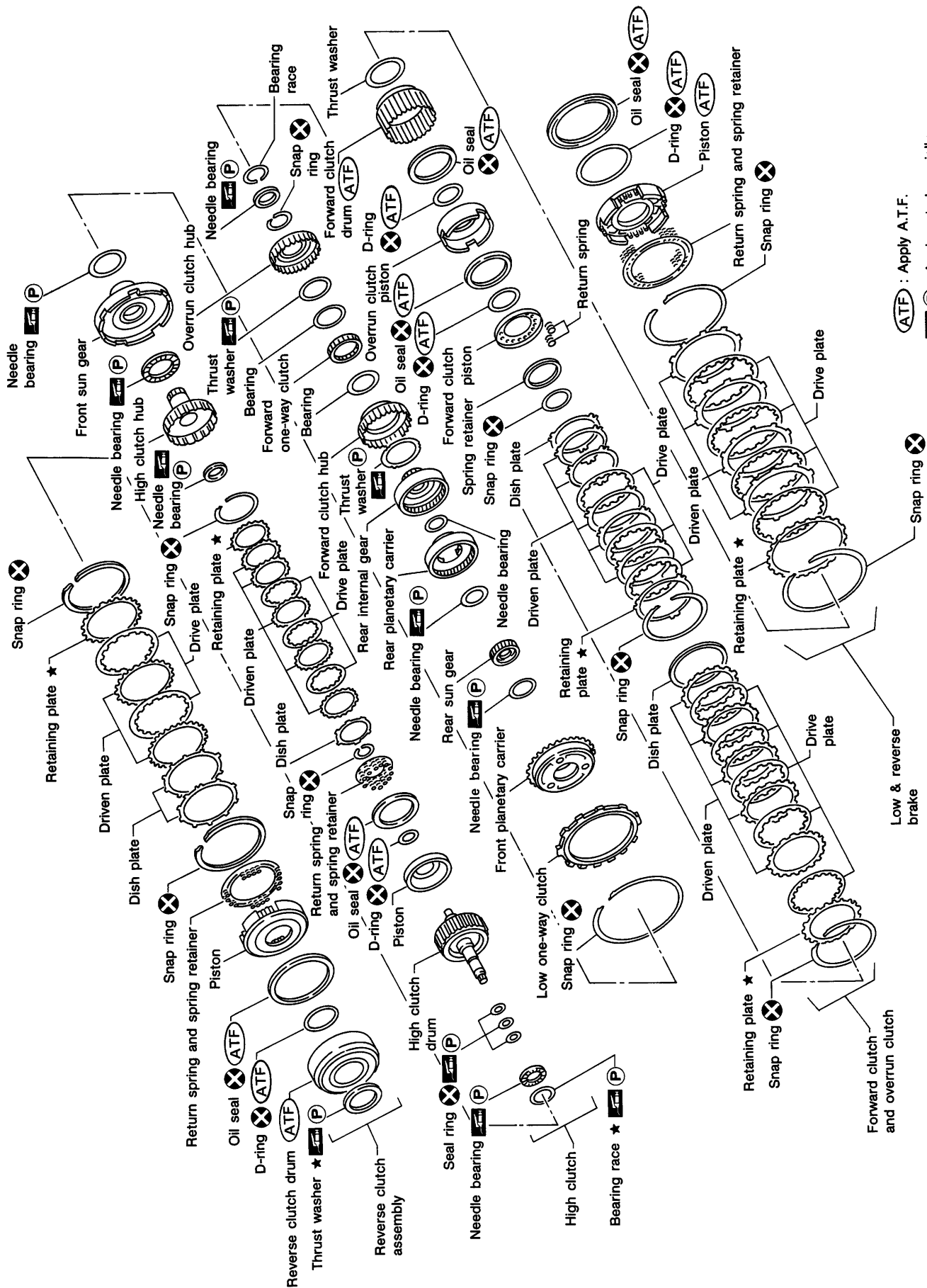
GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

SAT912E

MAJOR OVERHAUL



MAJOR OVERHAUL

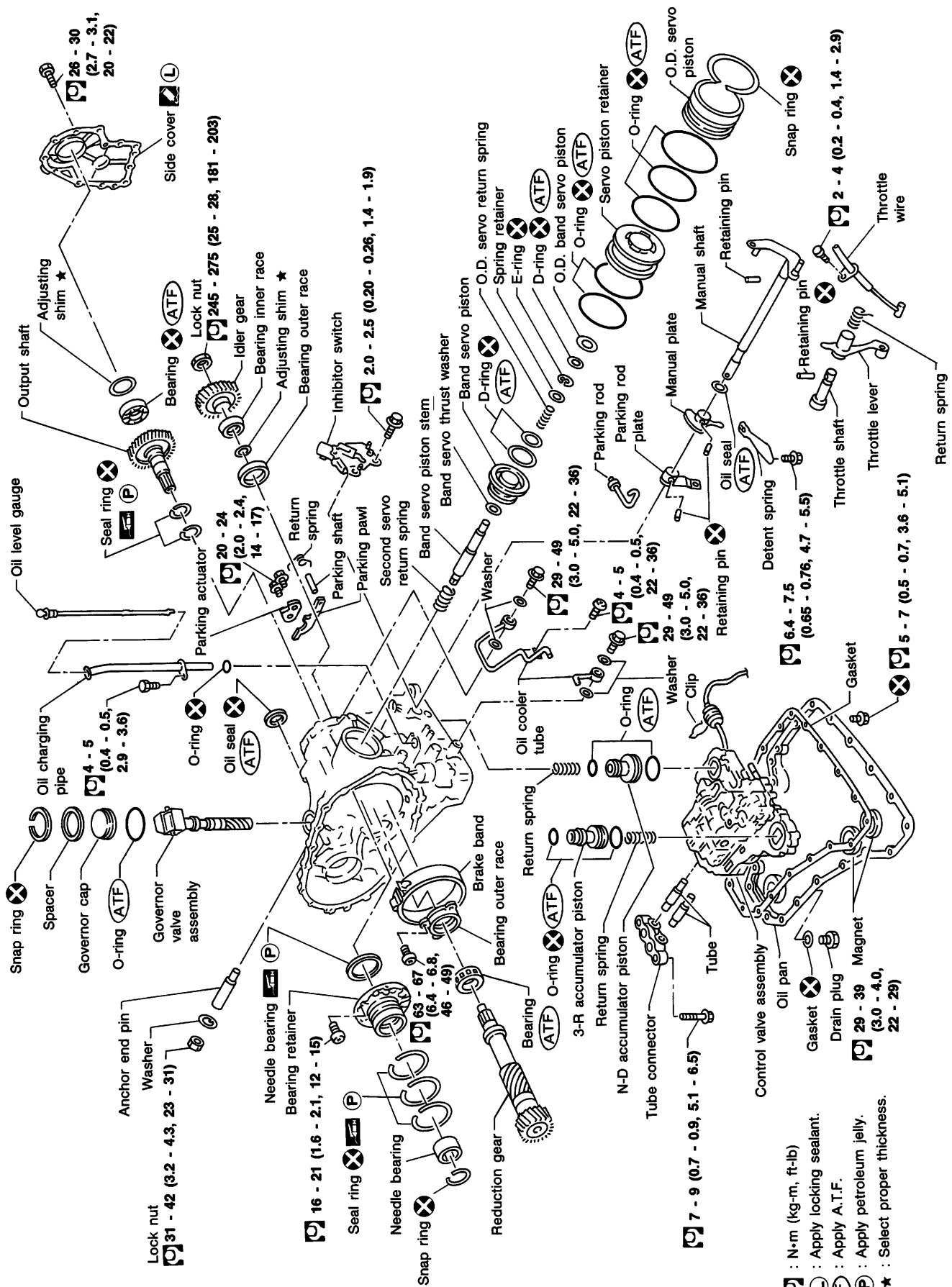


(ATF) : Apply A.T.F.
(P) : Apply petroleum jelly.
★ : Select proper thickness.

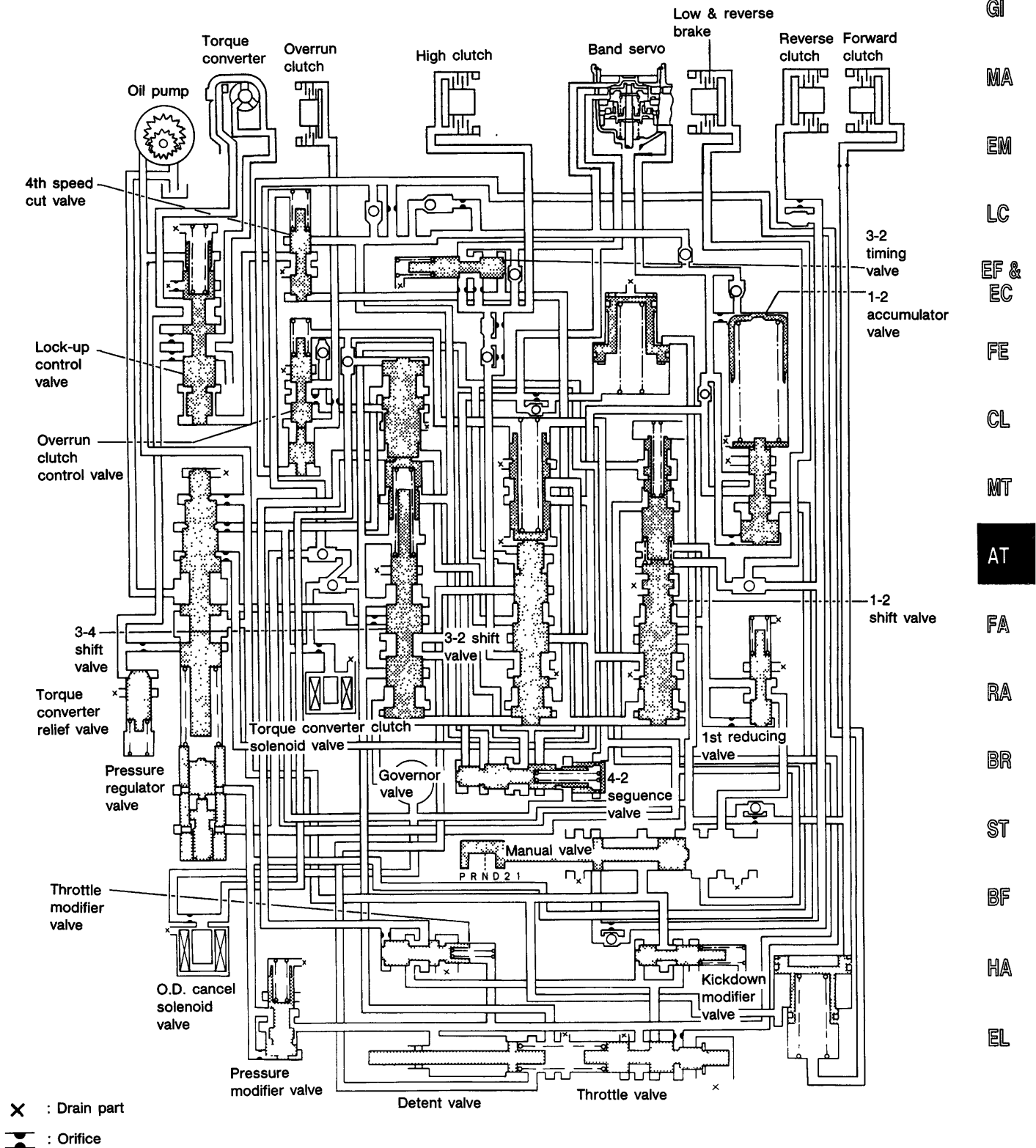
★ : Select proper thickness.

GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

MAJOR OVERHAUL



Hydraulic Control Circuit



MAJOR OVERHAUL

Mechanical Operation

Shift position	Reverse clutch	High clutch	Forward clutch	Overrun clutch	Band servo			Forward one-way clutch	Low one-way clutch	Low & reverse brake	Lock-up	Remarks
					2nd apply	3rd release	4th apply					
P												PARK POSITION
R	○									○		REVERSE POSITION
N												NEUTRAL POSITION
D*4	1st		○	⊙				●	●			Automatic shift 1 ↔ 2 ↔ 3 ↔ 4
	2nd		○	*1 ⊙	○			●				
	3rd	○	○	⊙	*2 ⊗	⊗		●				
	4th	○	⊗		*3 ⊗	⊗	○				○	
2	1st		○	○				●	●			Automatic shift 1 ↔ 2
	2nd		○	○	○			●				
1	1st		○	○				●		○		Locks (held stationary) in 1st speed 1 ← 2
	2nd		○	○	○			●				

*1: Operates when overdrive switch is being set in "OFF" position.

*2: Oil pressure is applied to both 2nd "apply" side and 3rd "release" side of band servo piston. However, brake band does not contract because oil pressure area on the "release" side is greater than that on the "apply" side.

*3: Oil pressure is applied to 4th "apply" side in condition *2 above, and brake band contracts.

*4: A/T will not shift to 4th when overdrive switch is set in "OFF" position.

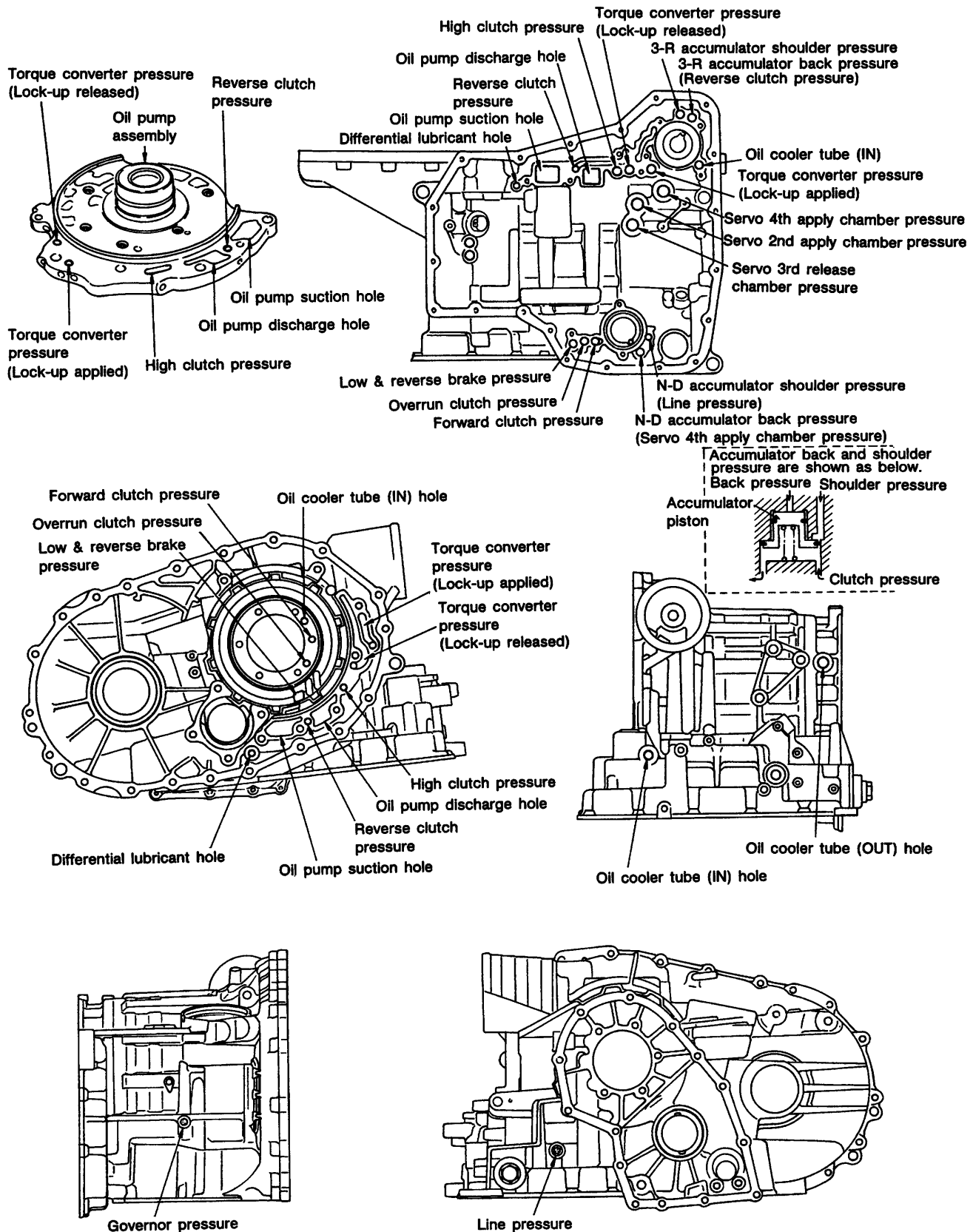
○: Operates

⊙: Operates when throttle opening is less than 1/16.

●: Operates during "progressive" acceleration.

⊗: Operates but does not affect power transmission.

Oil Channel



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

MAJOR OVERHAUL

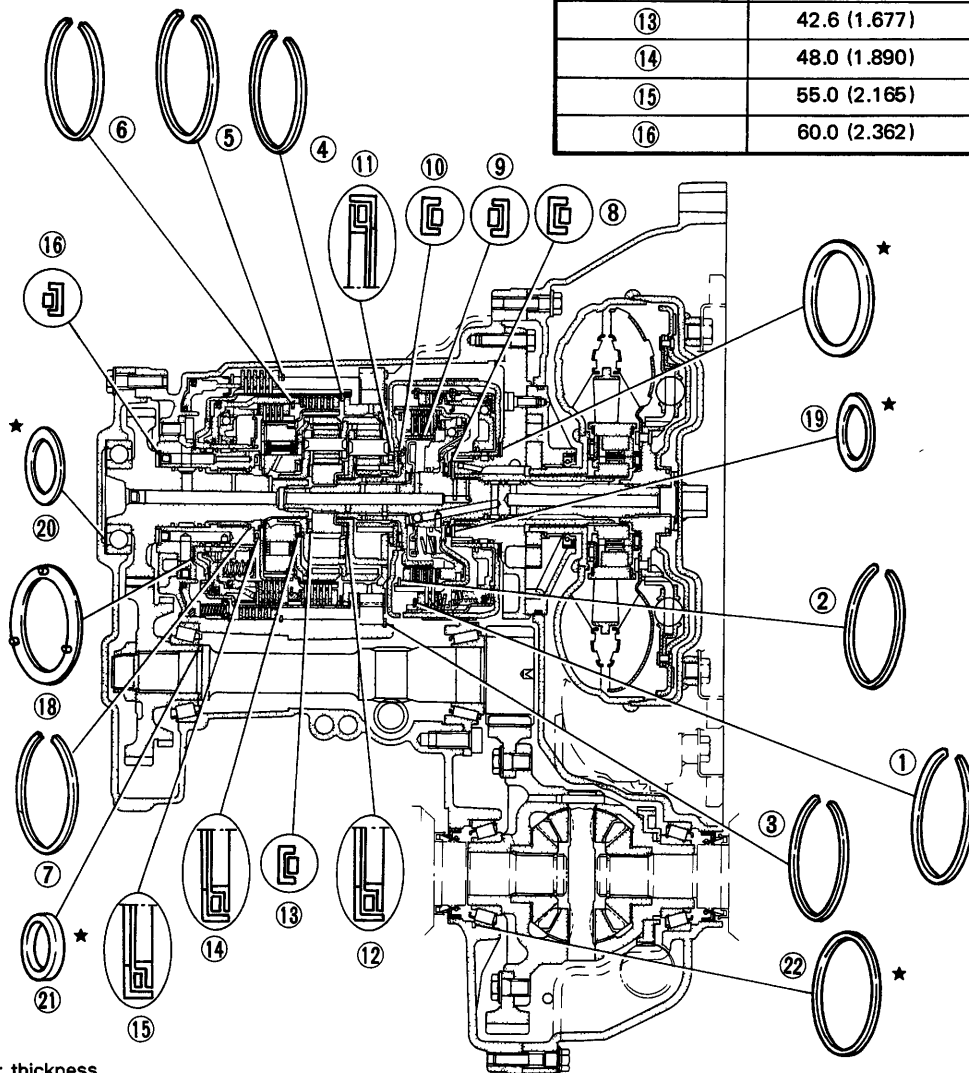
Locations of Bearings, Thrust Washers and Snap Rings

Outer diameter and color of thrust washers

Item number	Outer diameter mm (in)	Color
⑰	72.0 (2.835)	Black
⑱	78.5 (3.091)	

Outer & inner diameter of needle bearings

Item number	Outer diameter mm (in)	Inner diameter mm (in)
⑧	47.0 (1.850)	32.0 (1.260)
⑨	35.0 (1.378)	20.0 (0.787)
⑩	60.0 (2.362)	42.0 (1.654)
⑪	60.0 (2.362)	45.0 (1.772)
⑫	47.0 (1.850)	30.0 (1.181)
⑬	42.6 (1.677)	26.0 (1.024)
⑭	48.0 (1.890)	33.5 (1.319)
⑮	55.0 (2.165)	40.5 (1.594)
⑯	60.0 (2.362)	40.0 (1.575)



★: Select proper thickness.

Outer & inner diameter of bearing race and adjusting shims

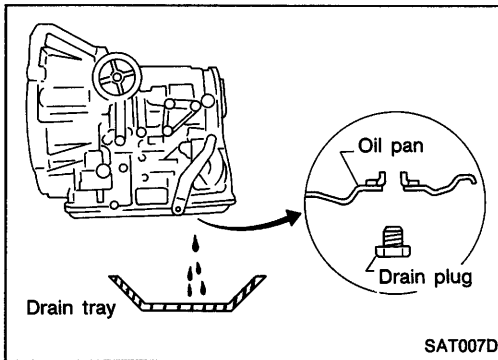
Item number		Outer diameter mm (in)	Inner diameter mm (in)
⑲		48.0 (1.890)	33.0 (1.299)
⑳		72.0 (2.835)	61.0 (2.402)
㉑		34.5 (1.358)	26.1 (1.028)
㉒	RL4F03A	68.0 (2.677)	60.0 (2.362)
	RL4F03V	105.0 (4.13)	96.0 (3.780)

Outer diameter of snap rings

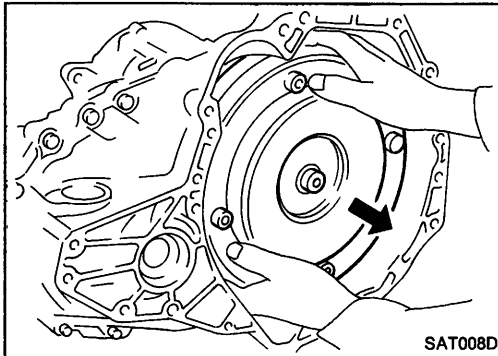
Item number	Outer diameter mm (in)
①	142.0 (5.59)
②	113.0 (4.45)
③	162.4 (6.39)
④	135.4 (5.33)
⑤	159.0 (6.26)
⑥	126.0 (4.96)
⑦	40.5 (1.594)

SAT838D

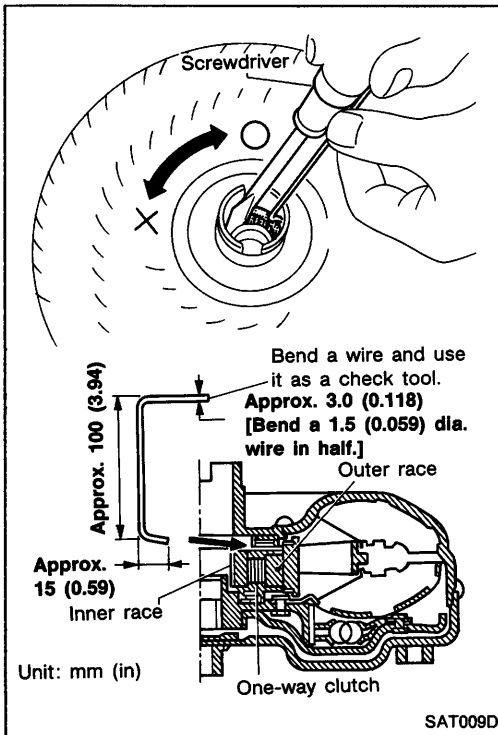
DISASSEMBLY



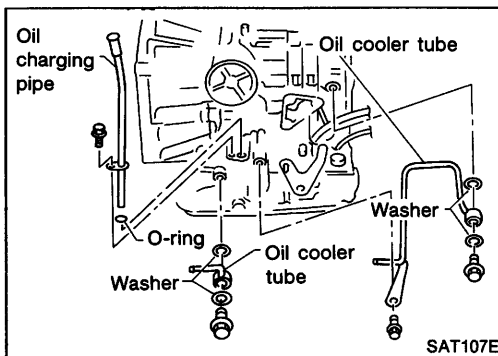
1. Drain A.T.F. through drain plug.



2. Remove torque converter.



3. Check torque converter one-way clutch using check tool as shown at left.
 - a. Insert check tool into the groove of bearing support built into one-way clutch outer race.
 - b. When fixing bearing support with check tool, rotate one-way clutch spline using screwdriver.
 - c. Check that inner race rotates clockwise only. If not, replace torque converter assembly.



4. Remove oil charging pipe and oil cooler tube.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

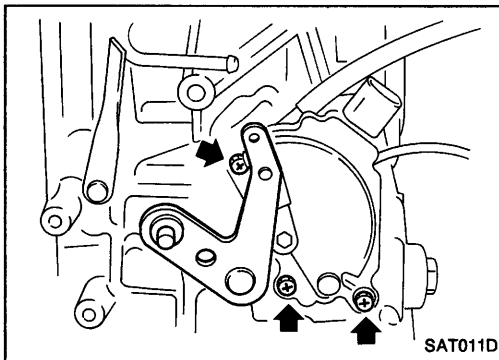
ST

BF

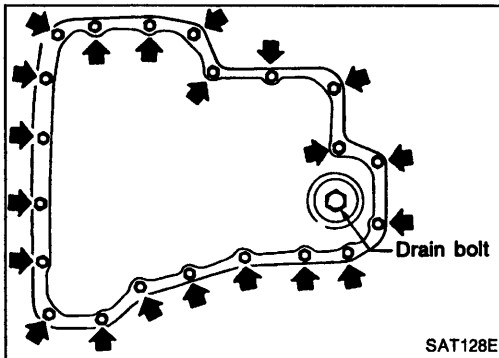
HA

EL

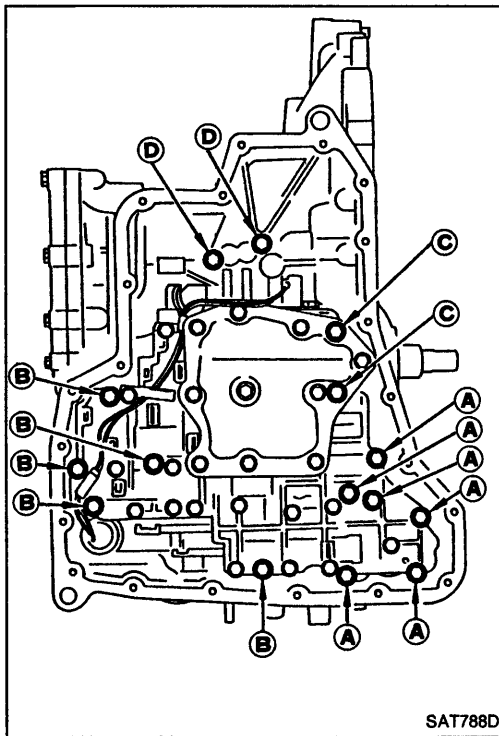
DISASSEMBLY



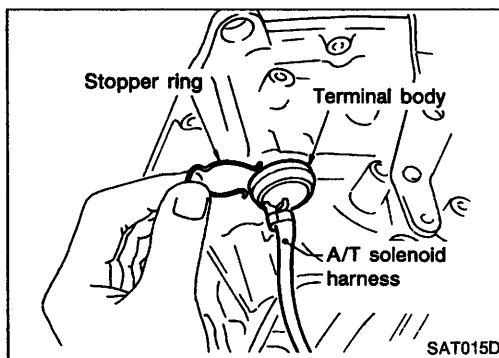
5. Set manual lever to position "P".
6. Remove inhibitor switch.



7. Remove oil pan and oil pan gasket.
 - **Do not reuse oil pan bolts.**
8. Analyze foreign materials in oil pan to trace possible causes of malfunction. 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.

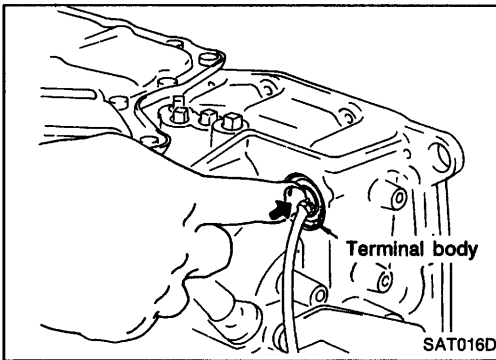


9. Remove control valve assembly according to the following procedures.
 - a. Remove control valve assembly mounting bolts (A), (B), (C) and (D).

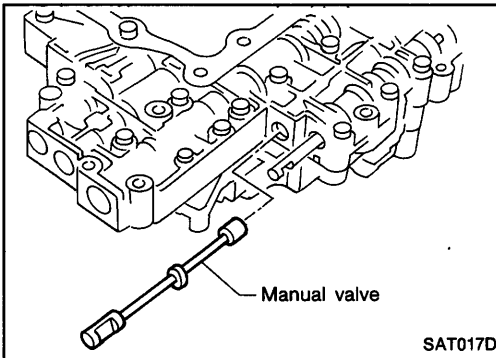


- b. Remove stopper ring from terminal body.

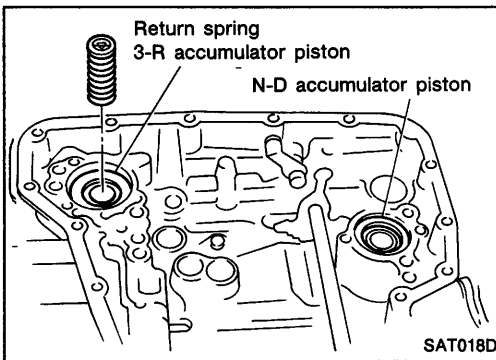
DISASSEMBLY



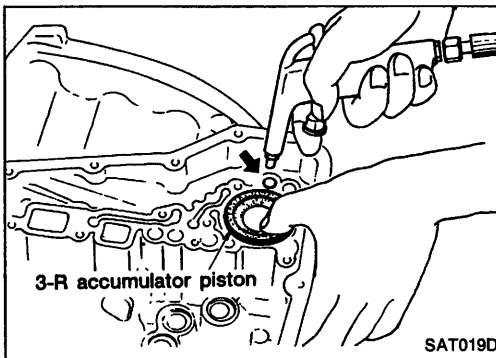
- c. Push terminal body into transmission case and draw out solenoid harness.



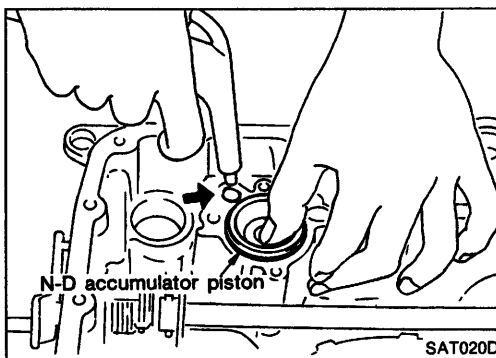
10. Remove manual valve from control valve assembly.



11. Remove return spring from 3-R accumulator piston.



12. Remove 3-R accumulator piston with compressed air.
13. Remove O-rings from 3-R accumulator piston.



14. Remove N-D accumulator piston and return spring with compressed air.
15. Remove O-rings from N-D accumulator piston.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

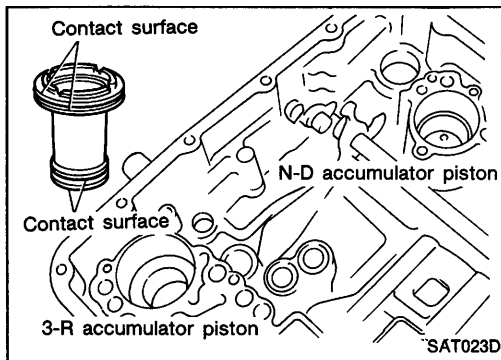
ST

BF

HA

EL

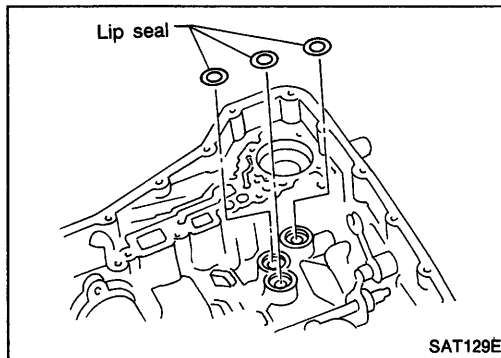
DISASSEMBLY



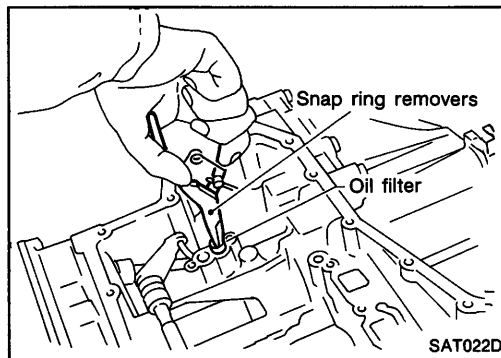
16. Check accumulator pistons and contact surface of transmission case for damage.
17. Check accumulator return springs for damage and free length.

Unit: mm (in)

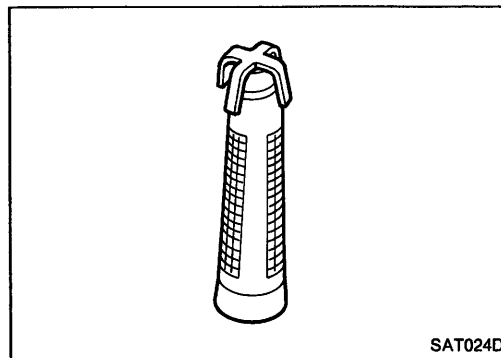
Spring	Free length	Outer diameter
3-R accumulator spring	56.4 (2.220)	21.0 (0.827)
N-D accumulator spring	43.5 (1.713)	28.0 (1.102)



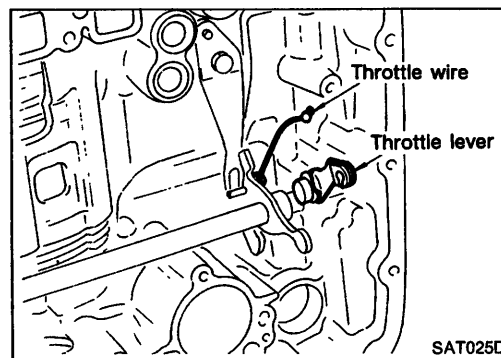
18. Remove lip seals from band servo oil port.



19. Remove governor oil filter.

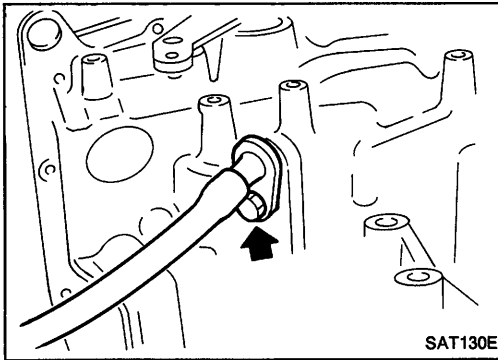


20. Check governor oil filter for damage or clogging.

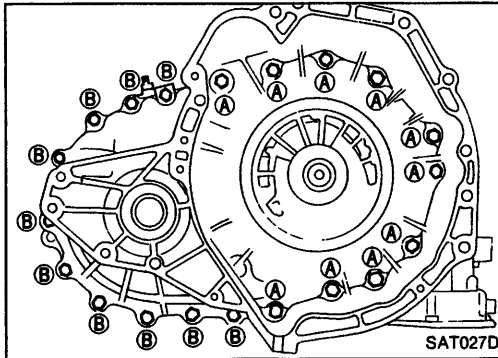


21. Remove throttle wire from throttle lever.

DISASSEMBLY

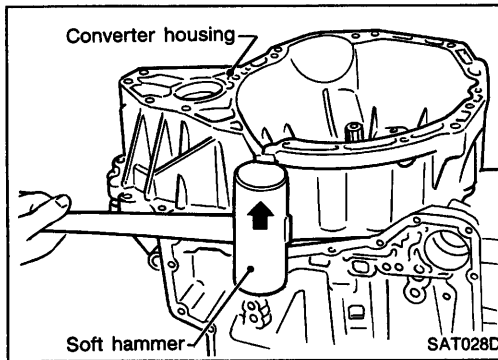


22. Remove throttle wire mounting bolt.
23. Draw out throttle wire from transmission case.

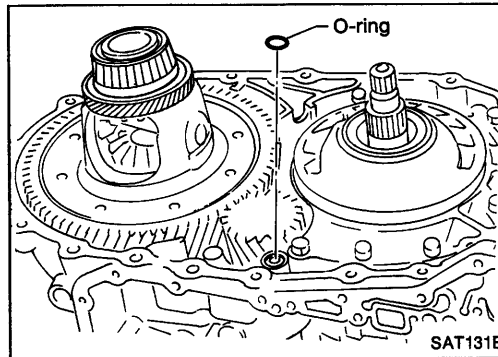


24. Remove converter housing according to the following procedures.

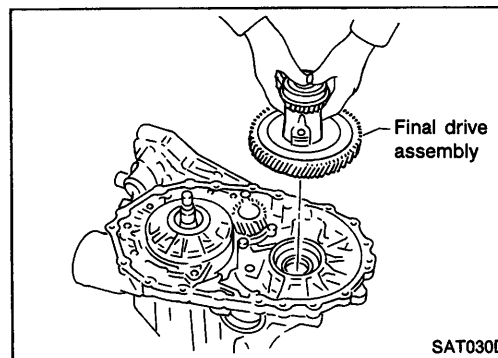
- a. Remove converter housing mounting bolts (A) and (B).



- b. Remove converter housing by tapping it lightly.



- c. Remove O-ring from differential oil port.



25. Remove final drive assembly from transmission case.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

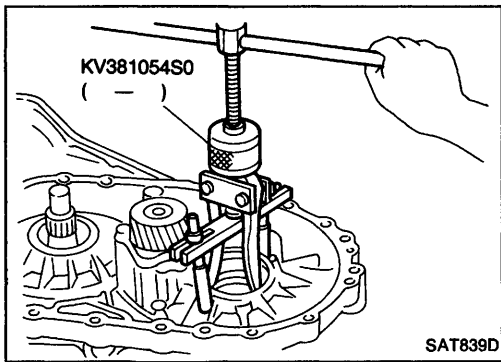
ST

BF

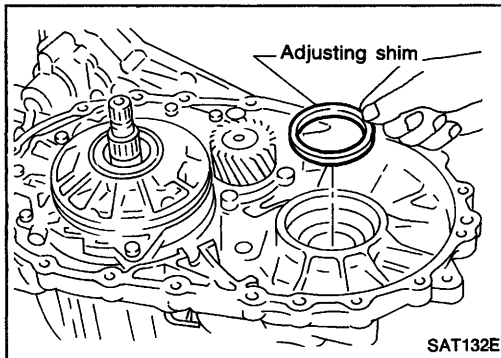
HA

EL

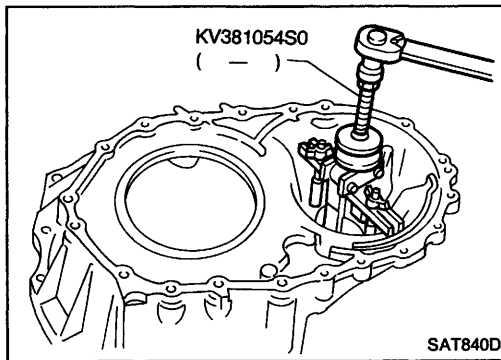
DISASSEMBLY



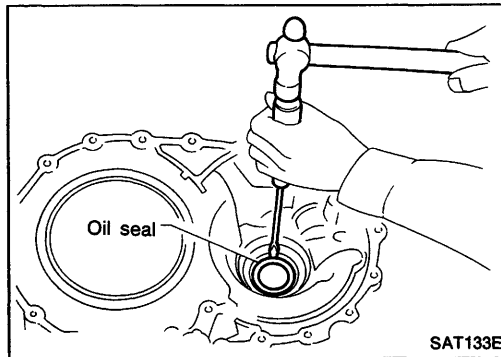
26. Remove differential side bearing outer race from transmission case.



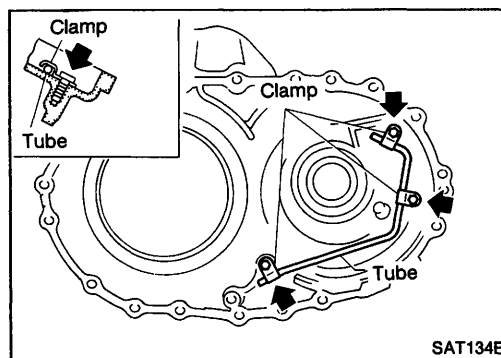
27. Remove differential side bearing adjusting shim from transmission case.



28. Remove differential side bearing outer race from converter housing.

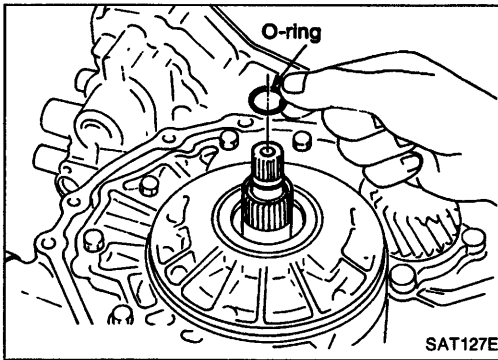


29. Remove oil seal with screwdriver from converter housing.
● Be careful not to damage case.

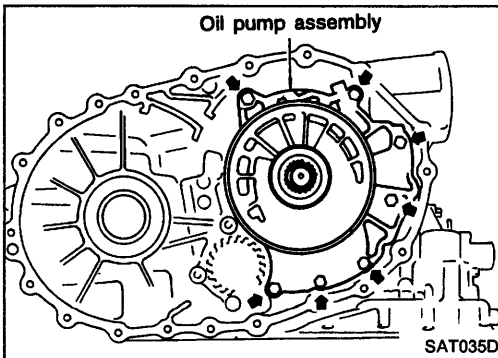


30. Remove oil tube from converter housing.

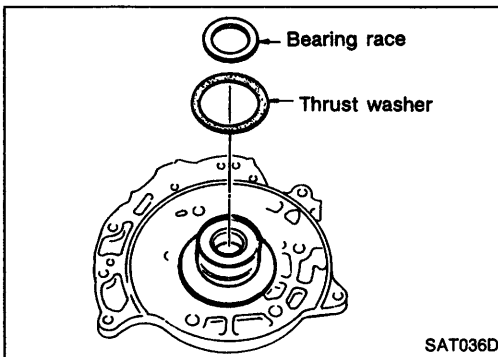
DISASSEMBLY



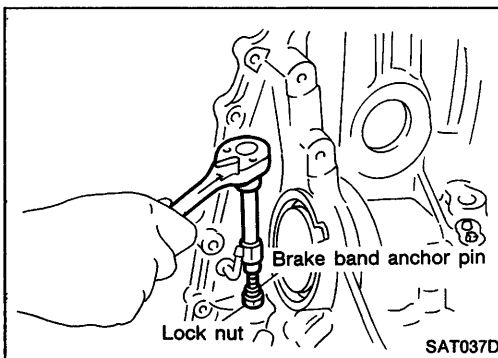
31. Remove oil pump according to the following procedures.
- Remove O-ring from input shaft.



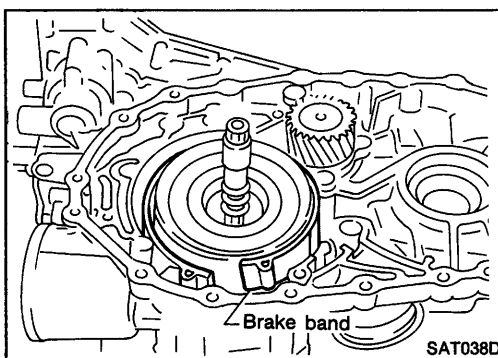
- Remove oil pump assembly from transmission case.



- Remove thrust washer and bearing race from oil pump assembly.



32. Remove brake band according to the following procedures.
- Loosen lock nut, then back off band servo anchor end pin.



- Remove brake band from transmission case.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

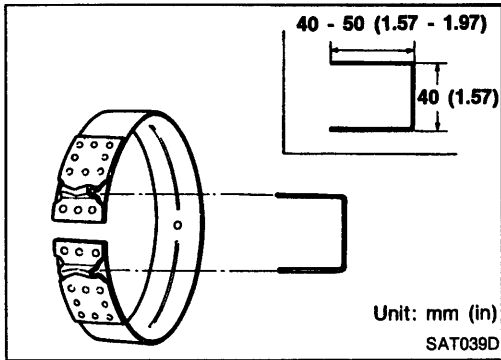
ST

BF

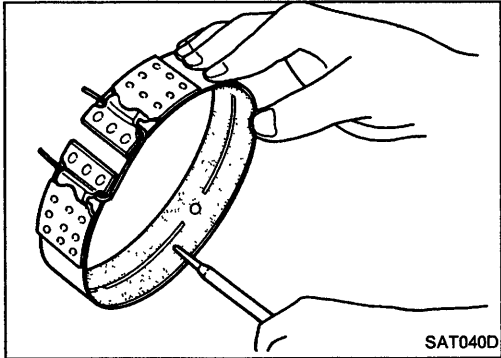
HA

EL

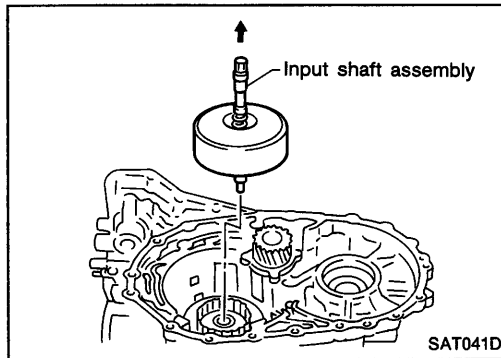
DISASSEMBLY



- To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. When 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.

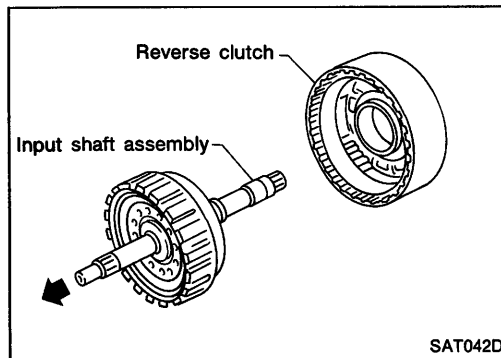


- c. Check brake band facing for damage, cracks, wear or burns.

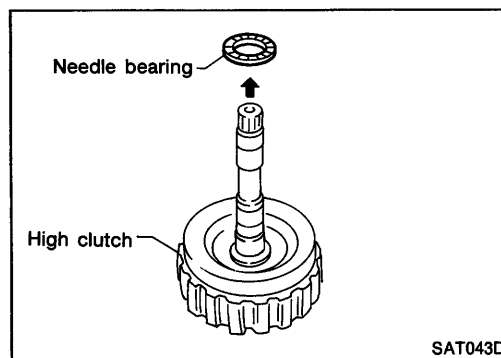


- 33. Remove input shaft assembly (high clutch) and reverse clutch according to the following procedures.

- a. Remove input shaft assembly (high clutch) with reverse clutch.

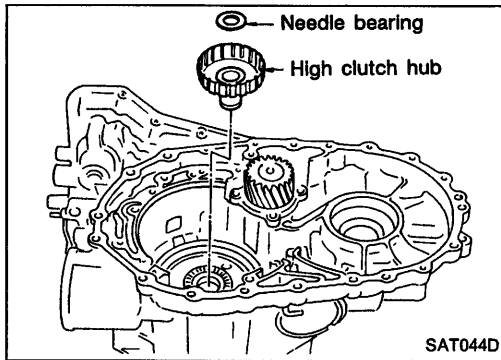


- b. Remove input shaft assembly (high clutch) from reverse clutch.

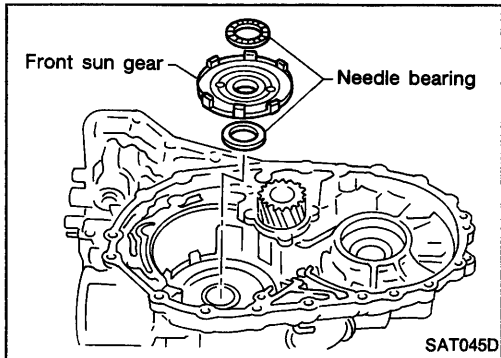


- c. Remove needle bearing from high clutch drum.
- d. Check input shaft assembly and needle bearing for damage or wear.

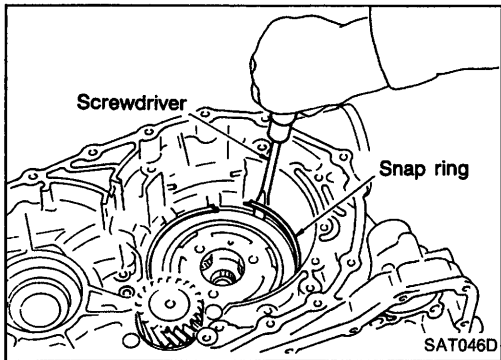
DISASSEMBLY



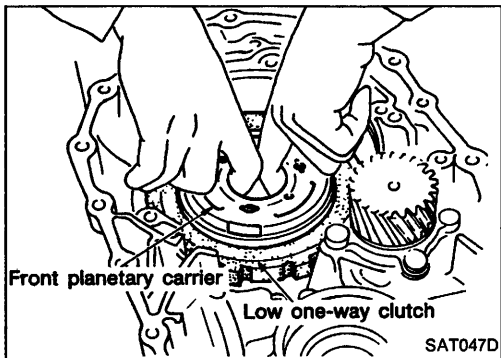
34. Remove high clutch hub and needle bearing from transmission case.
35. Check high clutch hub and needle bearing for damage or wear.



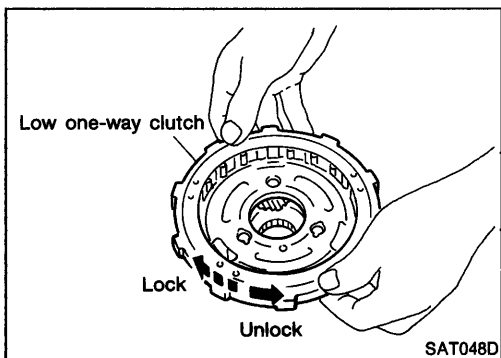
36. Remove front sun gear and needle bearings from transmission case.
37. Check front sun gear and needle bearings for damage or wear.



38. Remove front planetary carrier assembly and low one-way clutch according to the following procedures.
 - a. Remove snap ring with flat-bladed screwdriver.



- b. Remove front planetary carrier with low one-way clutch.



- c. Check that low one-way clutch rotates in the direction of the arrow and locks in the opposite direction.
 - d. Remove low one-way clutch from front planetary carrier while rotating it toward unlock.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

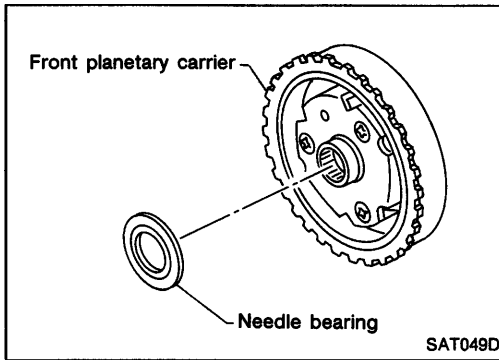
ST

BF

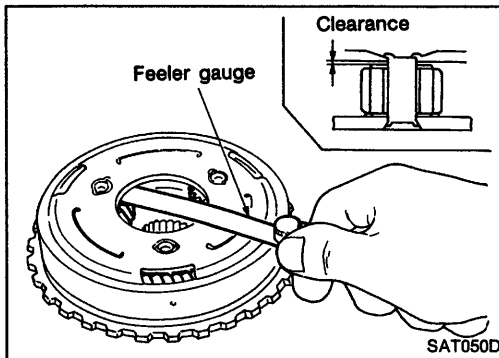
HA

EL

DISASSEMBLY



e. Remove needle bearing from front planetary carrier.



f. Check front planetary carrier, low one-way clutch and needle bearing for damage or wear.

g. Check clearance between pinion washer and planetary carrier with feeler gauge.

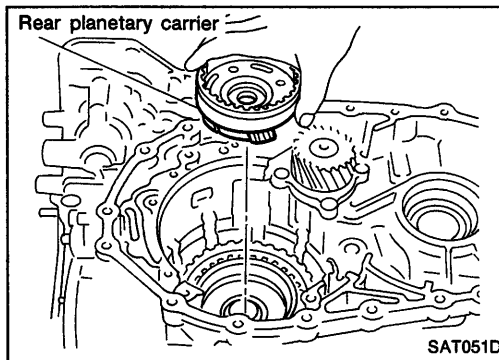
Standard clearance:

0.15 - 0.70 mm (0.0059 - 0.0276 in)

Allowable limit:

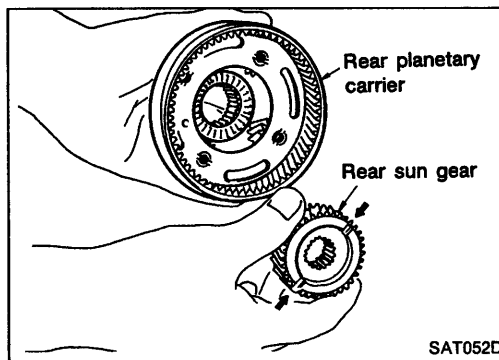
0.80 mm (0.0315 in)

Replace front planetary carrier if the clearance exceeds allowable limit.

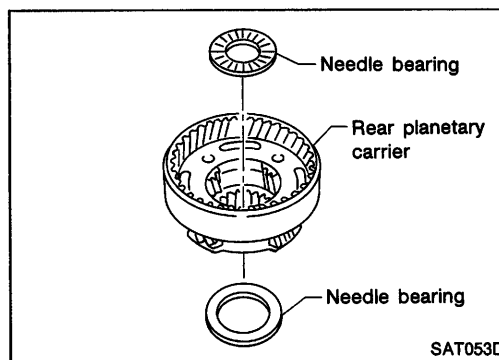


39. Remove rear planetary carrier assembly and rear sun gear according to the following procedures.

a. Remove rear planetary carrier assembly from transmission case.

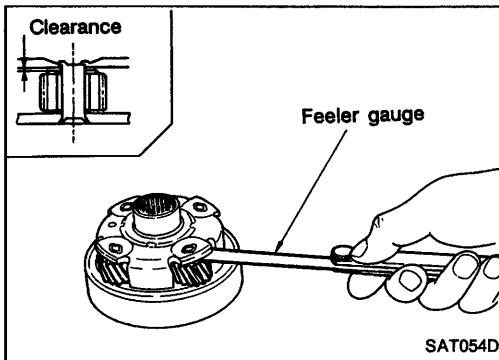


b. Remove rear sun gear from rear planetary carrier.



c. Remove needle bearings from rear planetary carrier assembly.

DISASSEMBLY



- d. Check rear planetary carrier, rear sun gear and needle bearings for damage or wear.
- e. Check clearance between pinion washer and rear planetary carrier with feeler gauge.

Standard clearance:

0.15 - 0.70 mm (0.0059 - 0.0276 in)

Allowable limit:

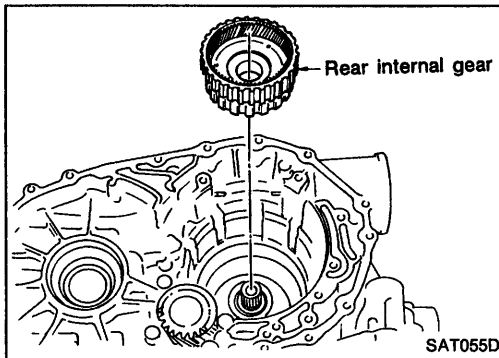
0.80 mm (0.0315 in)

Replace rear planetary carrier if the clearance exceeds allowable limit.

GI

MA

EM



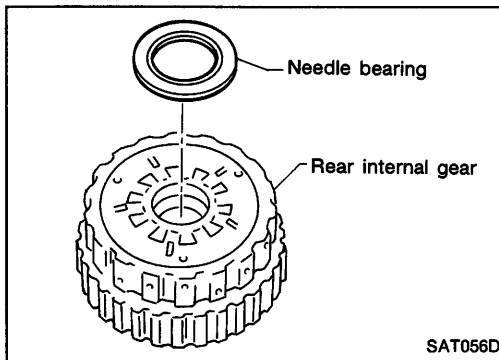
40. Remove rear internal gear from transmission case.

LC

EF &
EC

FE

CL



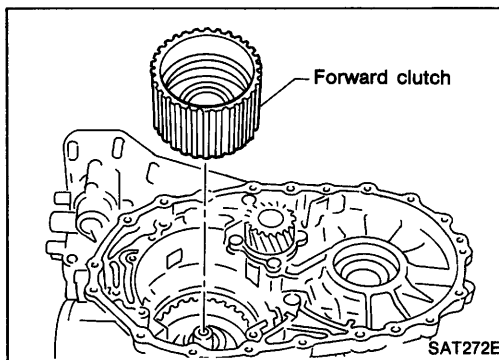
41. Remove needle bearing from rear internal gear.
42. Check needle bearing for damage or wear.

MT

AT

FA

RA



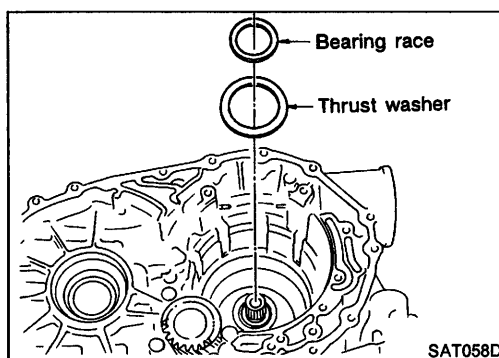
43. Remove forward clutch assembly from transmission case.

BR

ST

BF

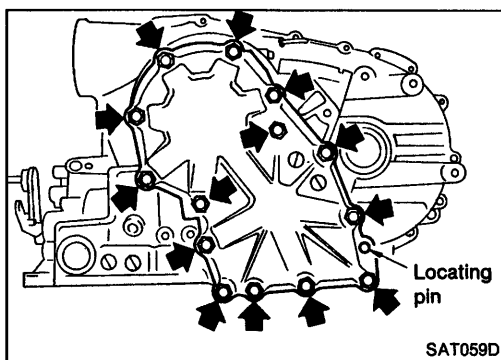
HA



44. Remove needle bearing from transmission case.

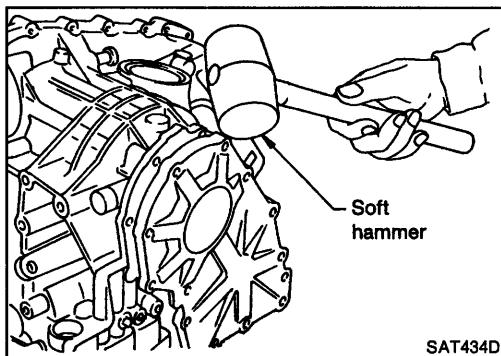
EL

DISASSEMBLY



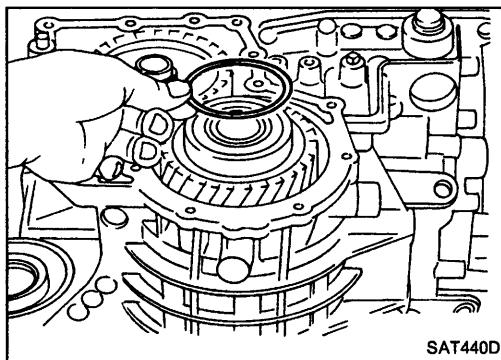
45. Remove output shaft assembly according to the following procedures.

a. Remove side cover bolts.

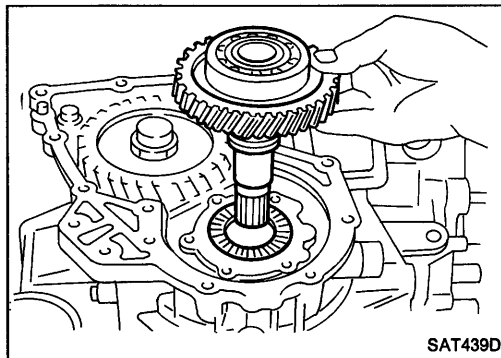


b. Remove side cover by lightly tapping it with a soft hammer.

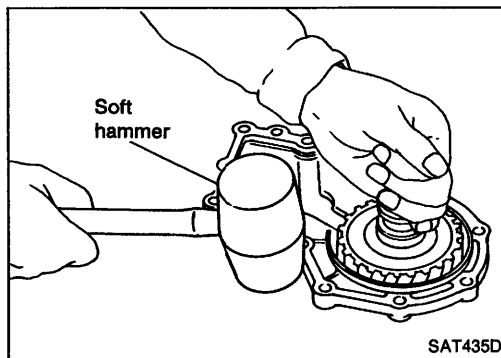
● **Be careful not to drop output shaft assembly as output shaft assembly may be removed together with side cover.**



c. Remove adjusting shim.

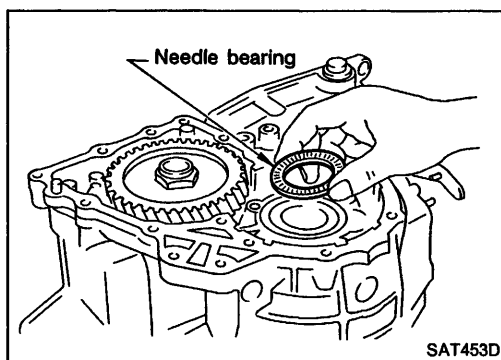


d. Remove output shaft assembly.

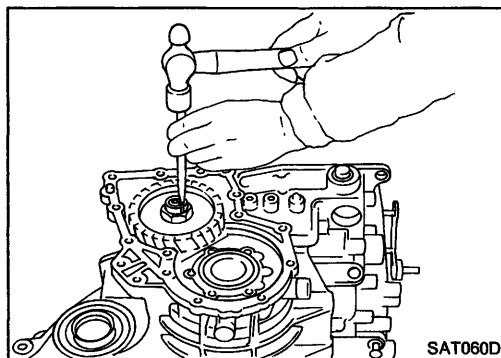


● **If output shaft assembly was removed together with side cover, remove side cover by tapping it lightly with a soft hammer.**

DISASSEMBLY

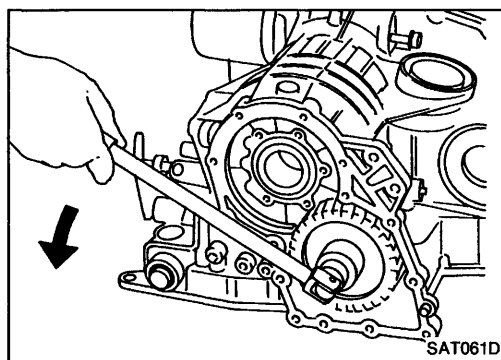


e. Remove needle bearing.

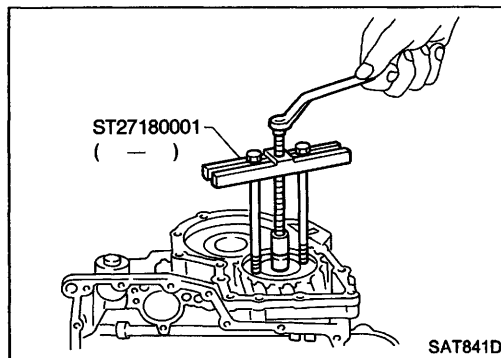


46. Disassemble reduction gear according to the following procedures.

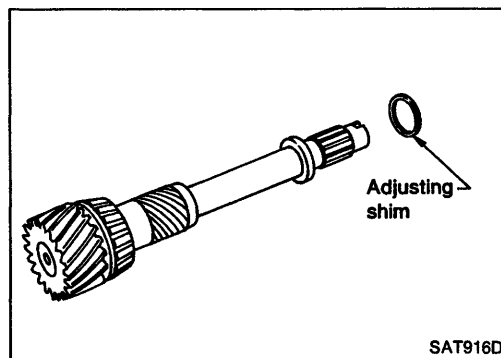
- Set manual lever to position "P" to fix idler gear.
- Unlock idler gear lock nut using a pin punch.



- Remove idler gear lock nut.
- Do not reuse idler gear lock nut.



d. Remove idler gear with puller.



- Remove reduction gear.
- Remove adjusting shim from reduction gear.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

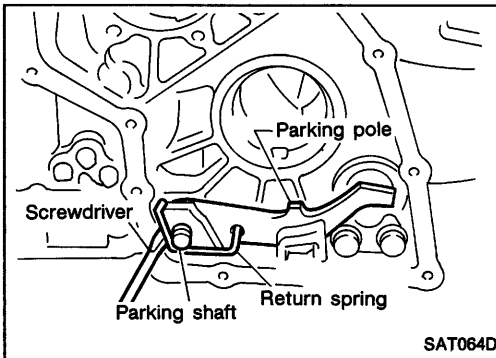
ST

BF

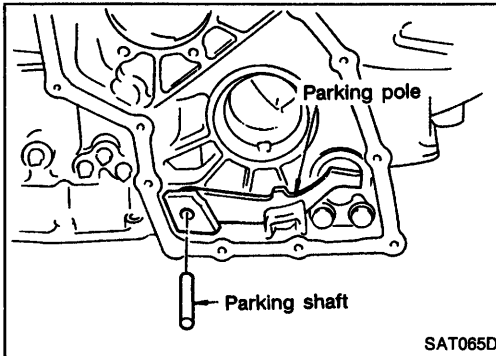
HA

EL

DISASSEMBLY

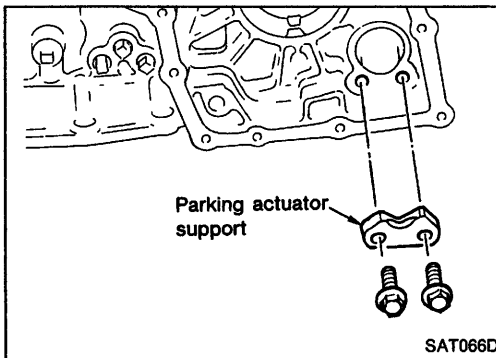


47. Remove return spring from parking shaft with screwdriver.



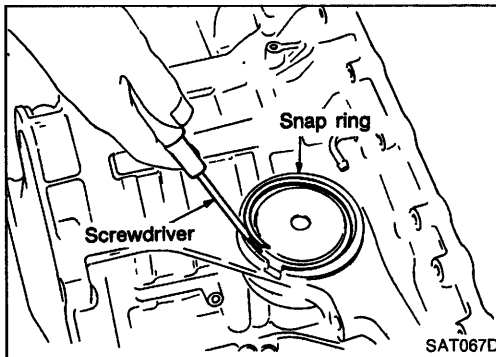
48. Draw out parking shaft and remove parking pole from transmission case.

49. Check parking pole and shaft for damage or wear.



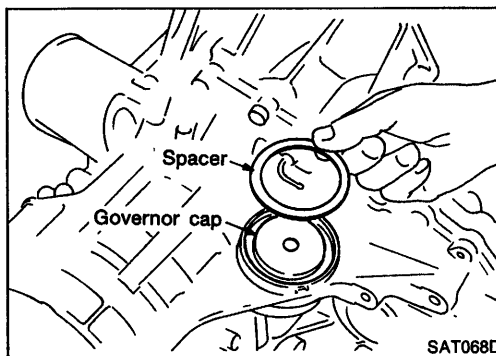
50. Remove parking actuator support from transmission case.

51. Check parking actuator support for damage or wear.



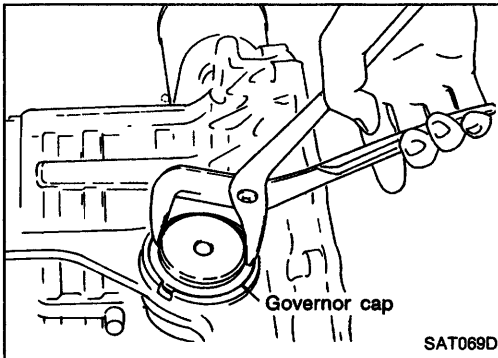
52. Remove governor valve assembly according to the following procedures.

a. Remove snap ring with screwdriver.

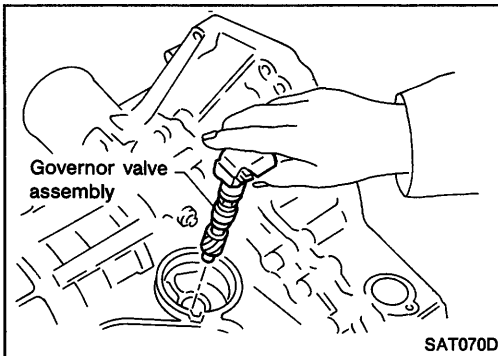


b. Remove spacer from governor cap.

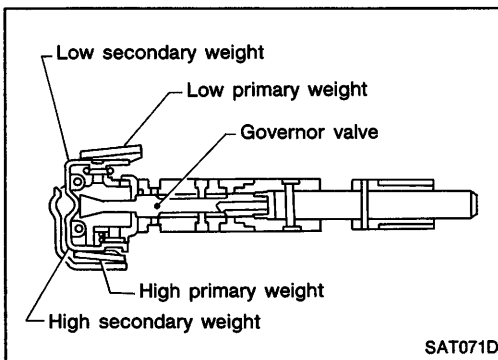
DISASSEMBLY



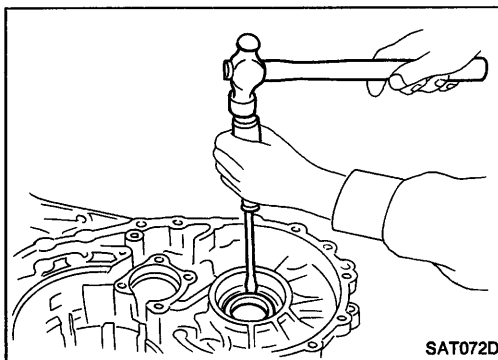
- c. Remove governor cap with water pump pliers.
- d. Remove O-ring from governor cap.



- e. Remove governor valve assembly.



- f. Close low primary weight. Make sure governor valve smoothly lowers under its own weight with topside of governor assembly down.
- g. With topside of governor assembly down, operate both low and high secondary weights to ensure governor valve is functioning properly.



- 53. Remove side oil seal with screwdriver from transmission case.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

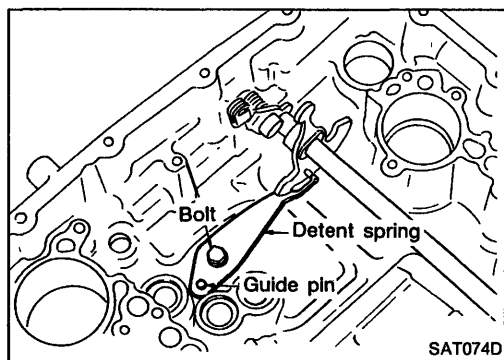
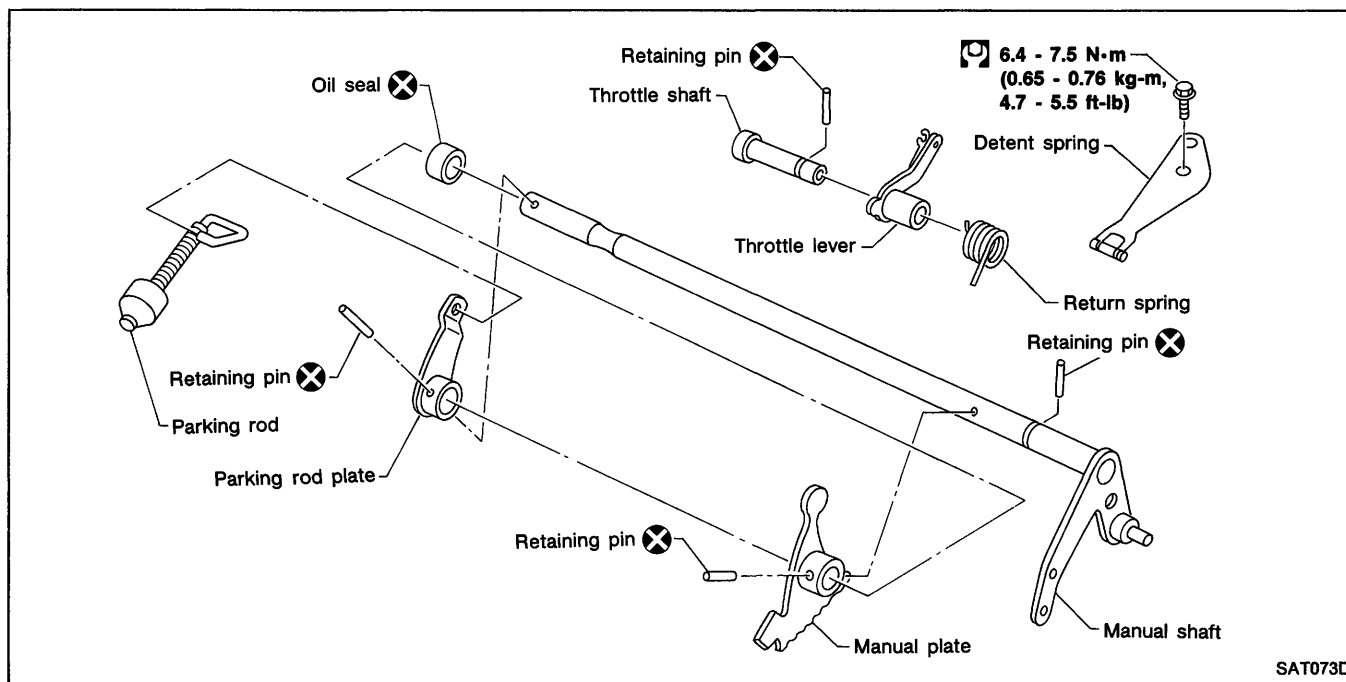
ST

BF

HA

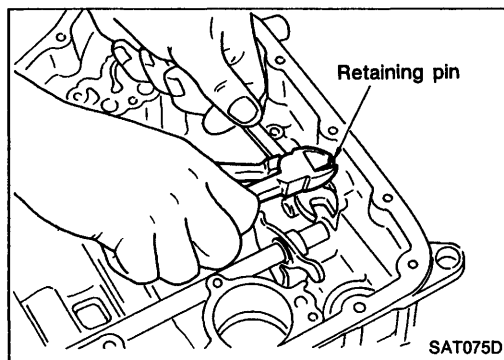
EL

Manual Shaft and Throttle Lever

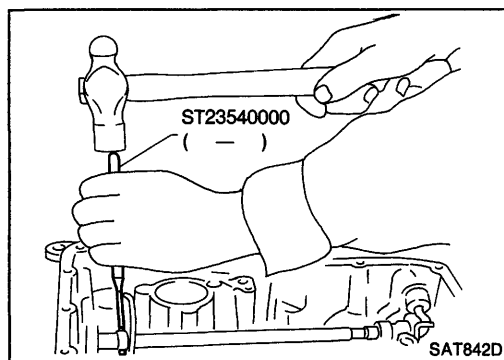


REMOVAL

1. Remove detent spring from transmission case.



2. Pull out throttle shaft retaining pin.
3. Draw out throttle shaft from transmission case.

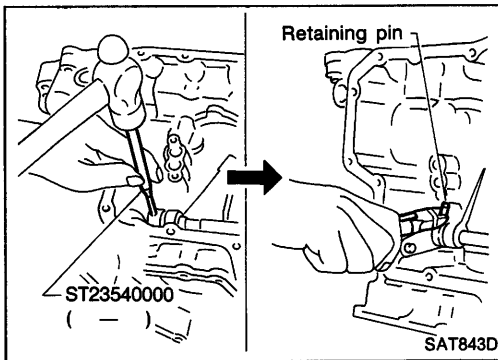


4. Drive out manual plate retaining pin.

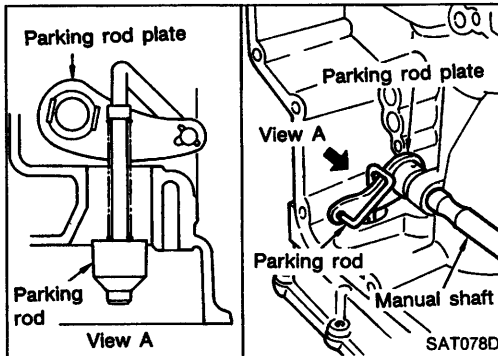
REPAIR FOR COMPONENT PARTS

Manual Shaft and Throttle Lever (Cont'd)

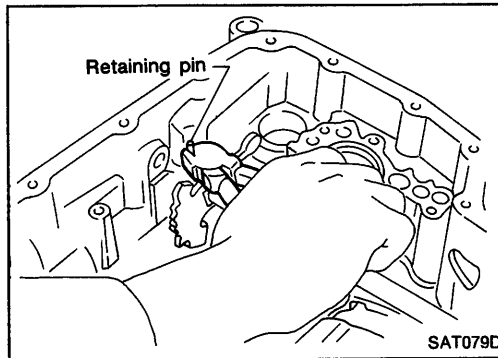
5. Drive and pull out parking rod plate retaining pin.



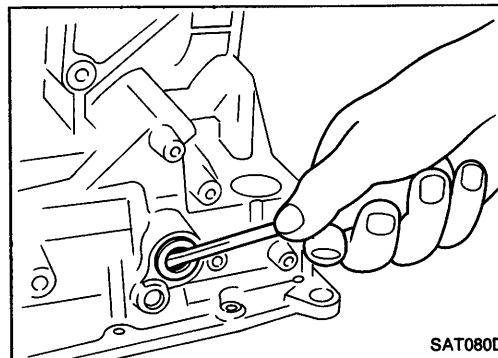
6. Remove parking rod plate from manual shaft.
7. Draw out parking rod from transmission case.



8. Pull out manual shaft retaining pin.
9. Remove manual shaft and manual plate from transmission case.



10. Remove manual shaft oil seal.



INSPECTION

- Check component parts for wear or damage. Replace if necessary.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

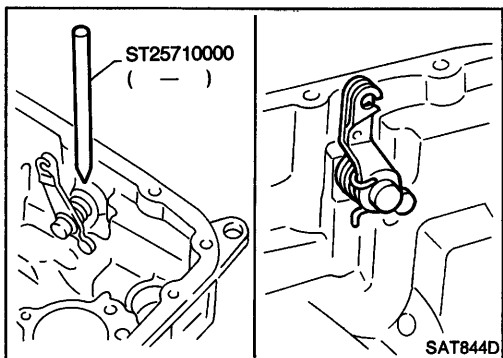
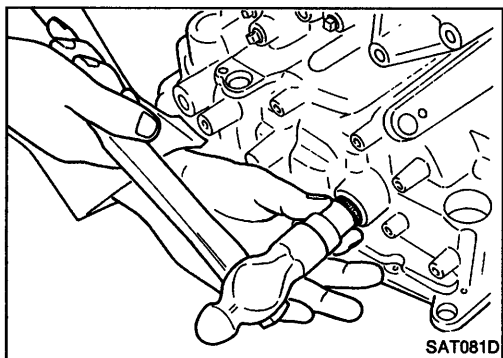
EL

REPAIR FOR COMPONENT PARTS

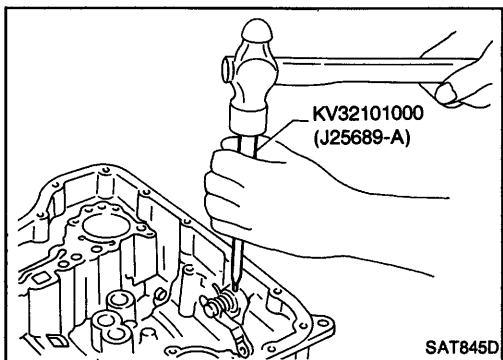
Manual Shaft and Throttle Lever (Cont'd)

INSTALLATION

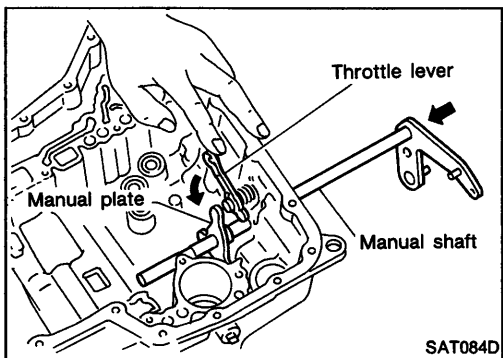
1. Install manual shaft oil seal.
 - Apply A.T.F. to outer surface of oil seal.



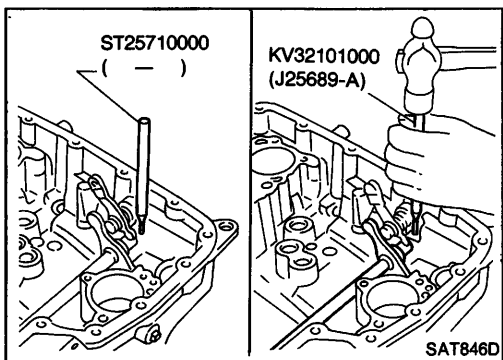
2. Install throttle lever and return spring on throttle shaft.
3. Install throttle lever assembly on transmission case.



4. Align groove of throttle shaft and hole of transmission case.
5. Install a new throttle shaft retaining pin.



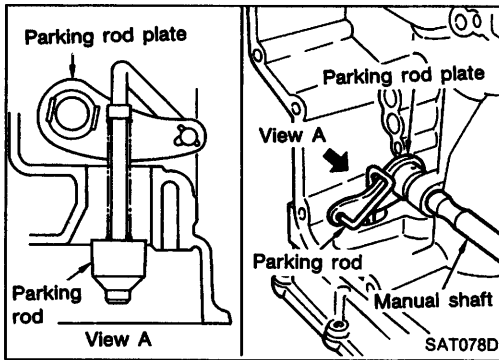
6. Move throttle lever in the direction of the arrow.
7. Install manual shaft and manual plate.



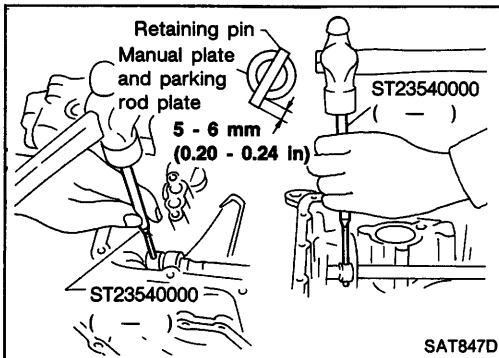
8. Align groove of manual shaft and hole of transmission case.
9. Install manual shaft retaining pin.

REPAIR FOR COMPONENT PARTS

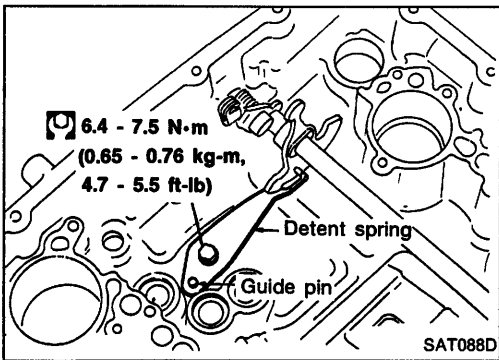
Manual Shaft and Throttle Lever (Cont'd)



10. Install parking rod to parking rod plate.
11. Install parking rod assembly to manual shaft.

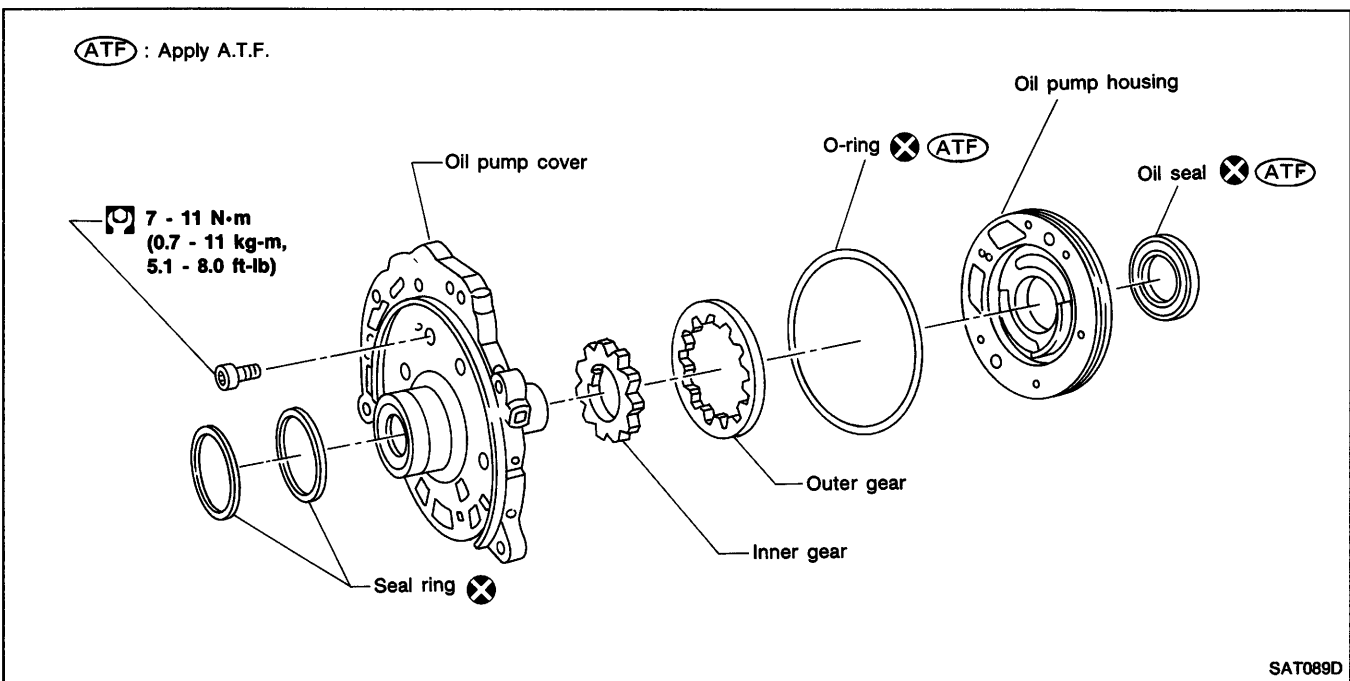


12. Install manual plate retaining pin and parking rod plate retaining pin.



13. Install detent spring.

Oil Pump

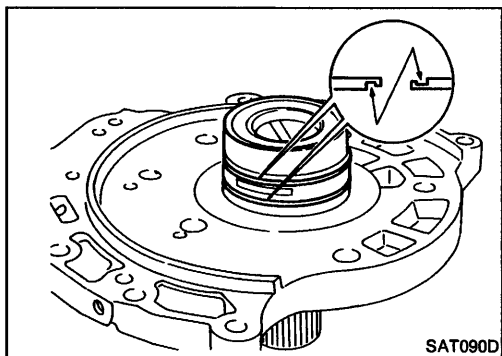


REPAIR FOR COMPONENT PARTS

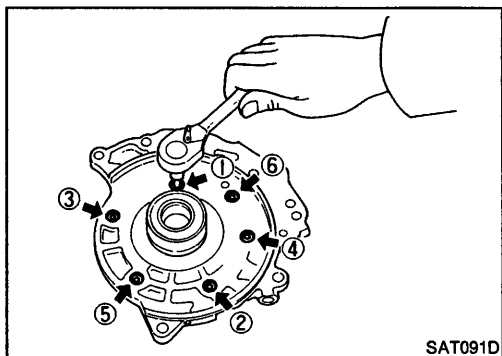
Oil Pump (Cont'd)

DISASSEMBLY

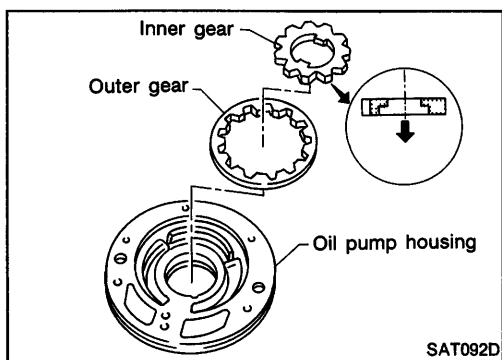
1. Remove seal rings by undoing hooks.



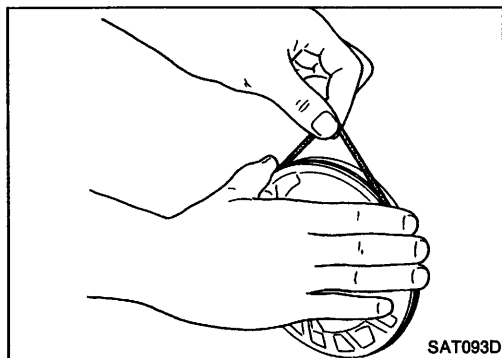
2. Loosen bolts in numerical order and remove oil pump cover.



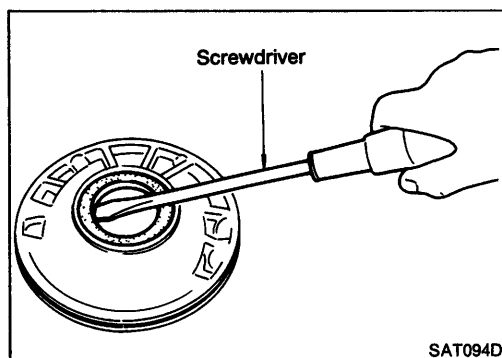
3. Remove inner and outer gear from oil pump housing.



4. Remove O-ring from oil pump housing.



5. Remove oil pump housing oil seal.



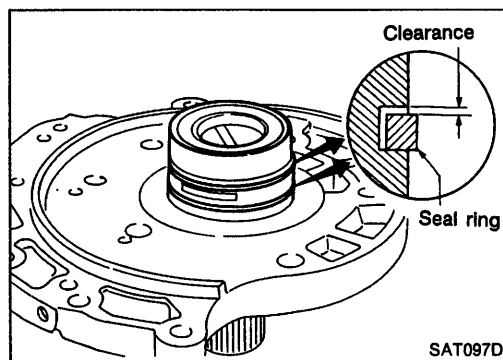
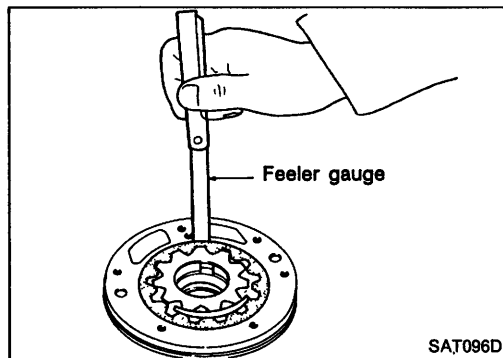
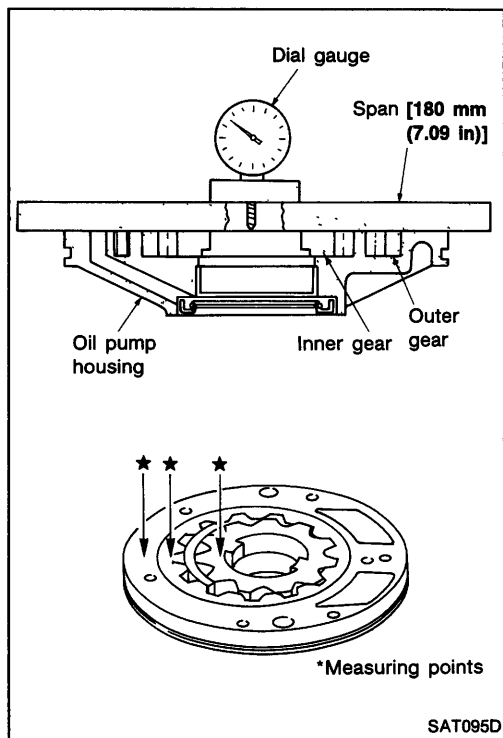
REPAIR FOR COMPONENT PARTS

Oil Pump (Cont'd)

INSPECTION

Oil pump housing, oil pump cover, inner gear and outer gear

- Check for wear or damage.



Side clearance

- Measure side clearance between end of oil pump housing and inner and outer gears in at least four places along their circumferences. Maximum measured values should be within specified ranges.

Standard clearance:

0.02 - 0.04 mm (0.0008 - 0.0016 in)

- If clearance is less than standard, select inner and outer gear as a set so that clearance is within specifications.

Inner and outer gear:

Refer to S.D.S.

- If clearance is more than standard, replace whole oil pump assembly except oil pump cover.

- Measure clearance between outer gear and oil pump housing.

Standard clearance:

0.08 - 0.15 mm (0.0031 - 0.0059 in)

Allowable limit:

0.15 mm (0.0059 in)

- If not within allowable limit, replace whole oil pump assembly except oil pump cover.

Seal ring clearance

- Measure clearance between seal ring and ring groove.

Standard clearance:

0.07 - 0.19 mm (0.0028 - 0.0075 in)

Allowable limit:

0.19 mm (0.0075 in)

- If not within allowable limit, replace oil pump cover assembly.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

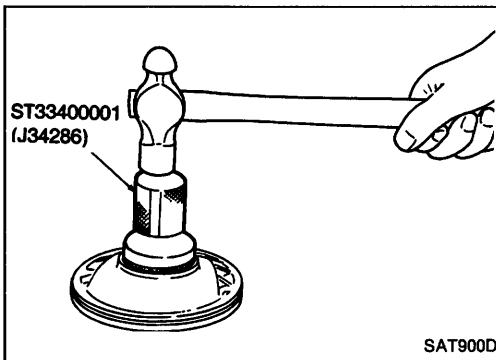
EL

REPAIR FOR COMPONENT PARTS

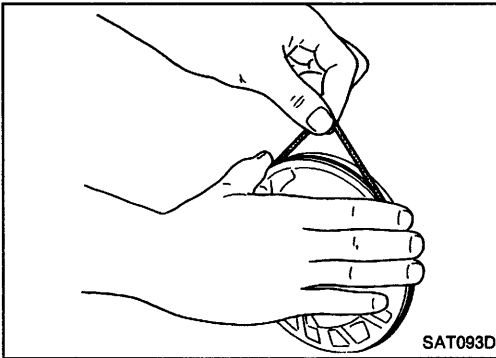
Oil Pump (Cont'd)

ASSEMBLY

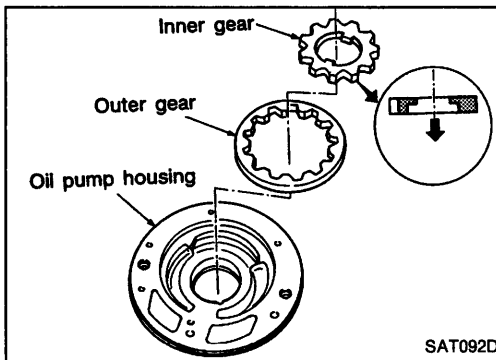
1. Install oil seal on oil pump housing.



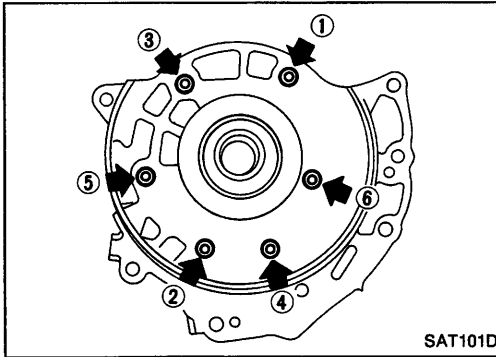
2. Install O-ring on oil pump housing.
 - Apply A.T.F. to O-ring.



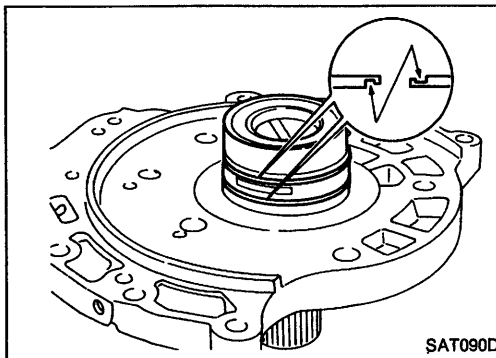
3. Install inner and outer gears on oil pump housing.
 - Be careful of direction of inner gear.



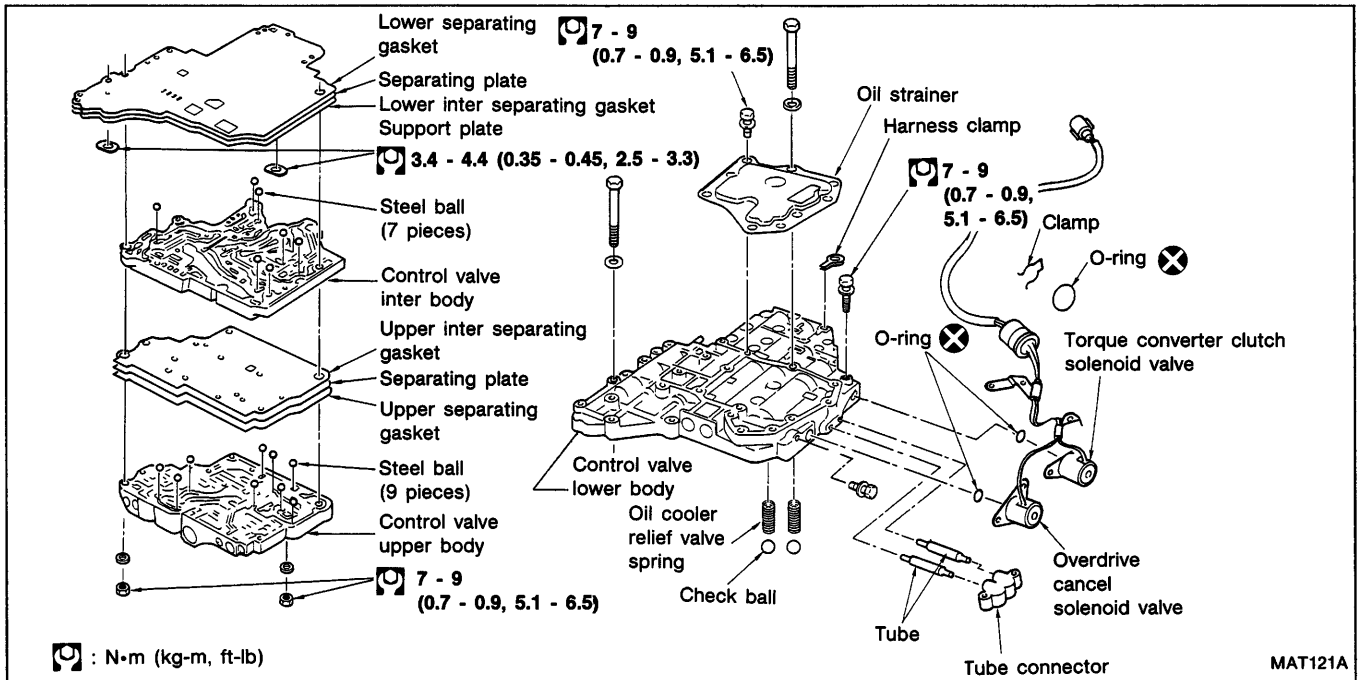
4. Install oil pump cover on oil pump housing.
 - a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly on oil pump housing assembly, then remove masking tape.
 - b. Tighten bolts in a criss-cross pattern.



5. Install new seal rings carefully after packing ring groove with petroleum jelly and attach hooks.
 - Do not spread gap of seal ring excessively while installing. The ring may be deformed.

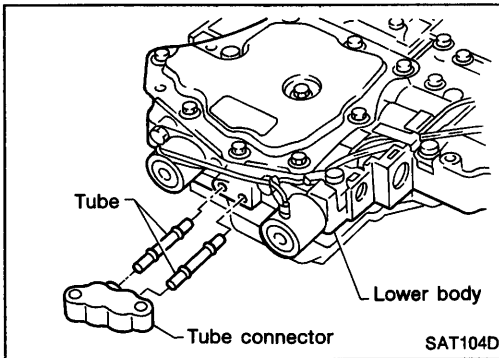


Control Valve Assembly



DISASSEMBLY

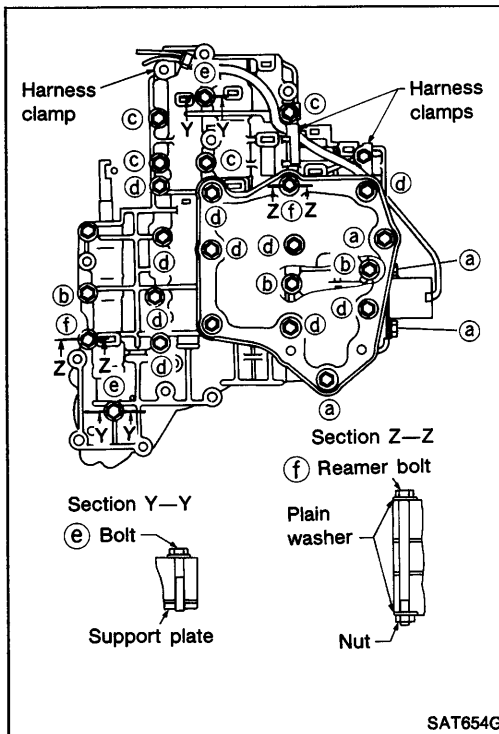
1. Remove tube connector and tube from control valve lower body.



2. Disassemble upper, inter and lower bodies.

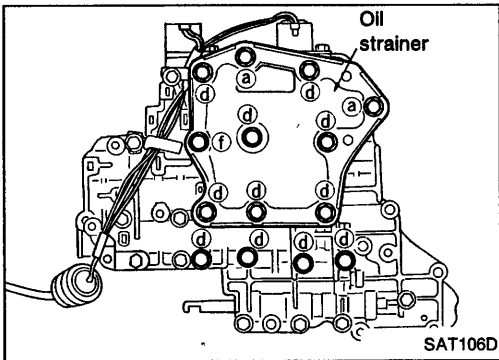
Bolt length, number and location:

Bolt symbol	(a)	(b)	(c)	(d)	(e)	(f)
Bolt length "ℓ" mm (in)	13.5 (0.531)	58.0 (2.283)	40.0 (1.575)	66.0 (2.598)	33.0 (1.299)	78.0 (3.071)
Number of bolts	4	3	6	11	2	2

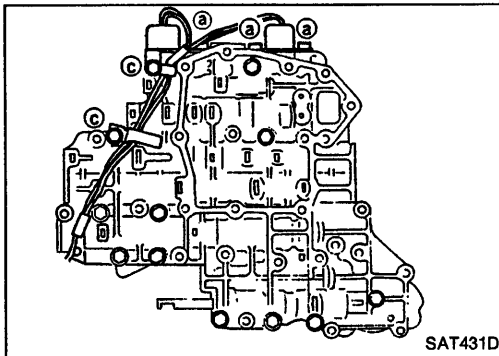


REPAIR FOR COMPONENT PARTS

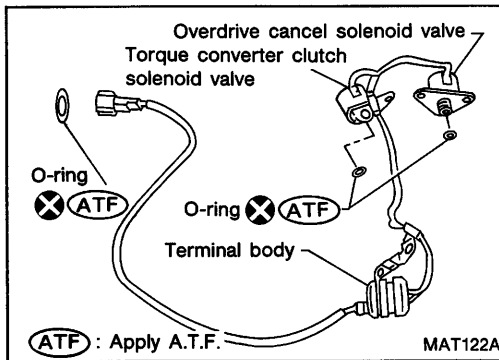
Control Valve Assembly (Cont'd)



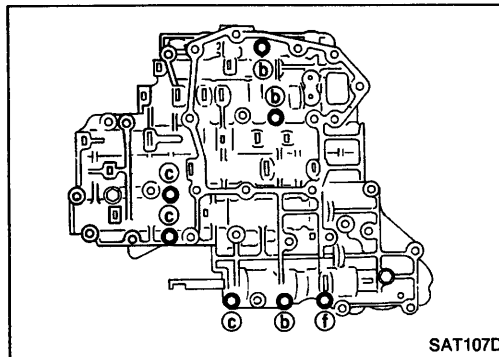
- a. Remove bolts ③, ④ and ⑤ and remove oil strainer from control valve assembly.



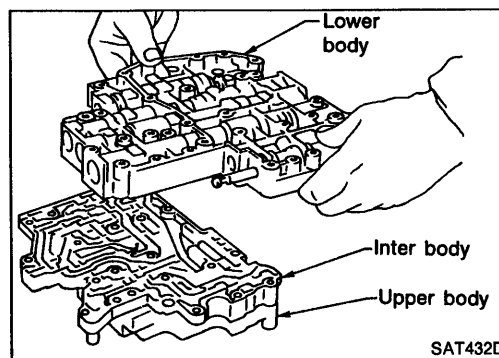
- b. Remove O.D. cancel solenoid valve and torque converter clutch solenoid valve from control valve assembly.



- c. Remove O-rings from O.D. cancel solenoid valve, torque converter clutch solenoid valve and harness terminal body.



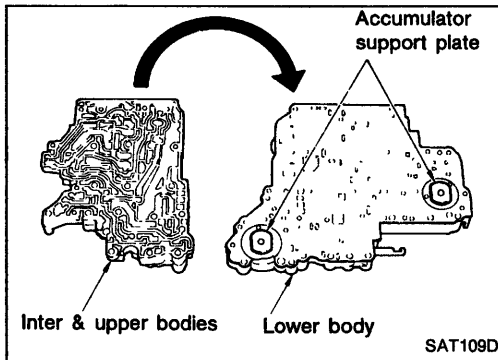
- d. Place upper body facedown, and remove bolts ⑥, ⑦ and ⑧.



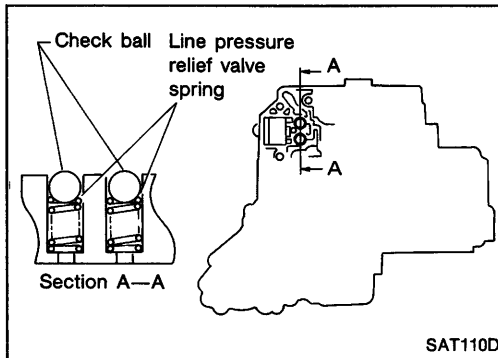
- e. Remove inter body from lower body.

REPAIR FOR COMPONENT PARTS

Control Valve Assembly (Cont'd)

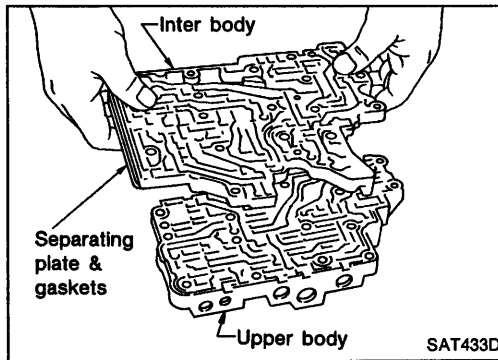


- f. Turn over lower body, and remove accumulator support plate.

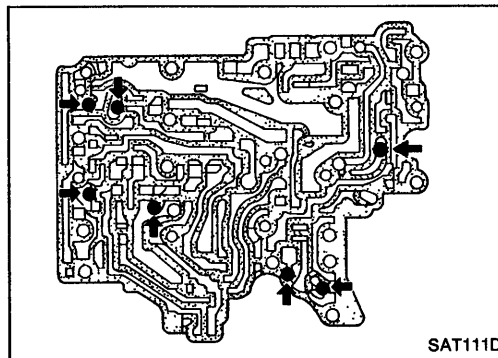


- g. Remove separating plate and separating gasket from lower body.
h. Remove steel balls and relief valve springs from lower body.

- Be careful not to lose steel balls and relief valve springs.

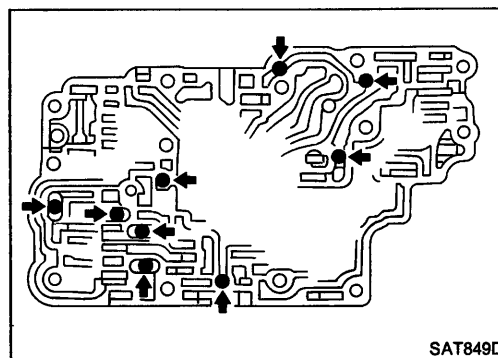


- i. Remove inter body with separating plate and separating gasket from upper body.



- j. Check to see that steel balls are properly positioned in inter body and then remove them from inter body.

- Be careful not to lose steel balls.



- k. Check to see that steel balls are properly positioned in upper body and then remove them from upper body.

- Be careful not to lose steel balls.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

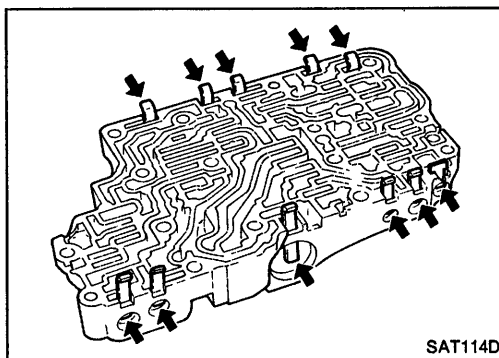
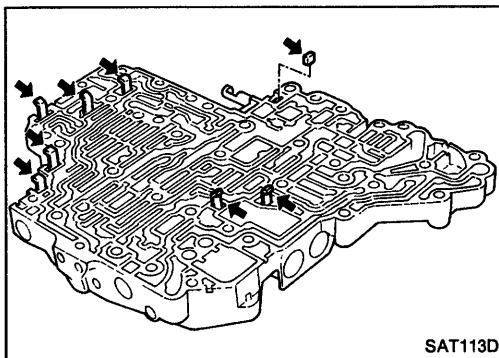
REPAIR FOR COMPONENT PARTS

Control Valve Assembly (Cont'd)

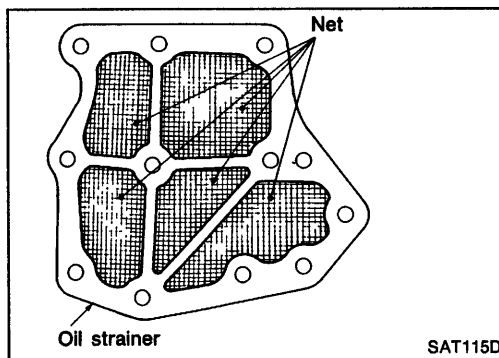
INSPECTION

Lower and upper bodies

- Check to see that retainer plates are properly positioned in lower body.

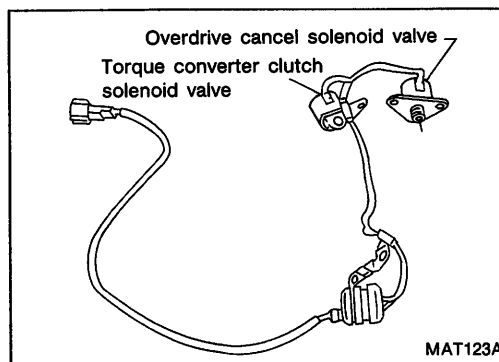


- Check to see that retainer plates are properly positioned in upper body.
- Be careful not to lose these parts.



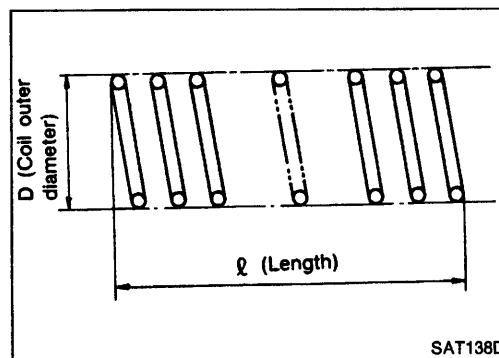
Oil strainer

- Check wire netting of oil strainer for damage.



O.D. cancel solenoid valve and torque converter clutch solenoid valve

- Measure resistance — Refer to "ELECTRICAL SYSTEM".



Oil cooler relief valve spring.

- Check springs for damage or deformation.
- Measure free length and outer diameter

Inspection standard:

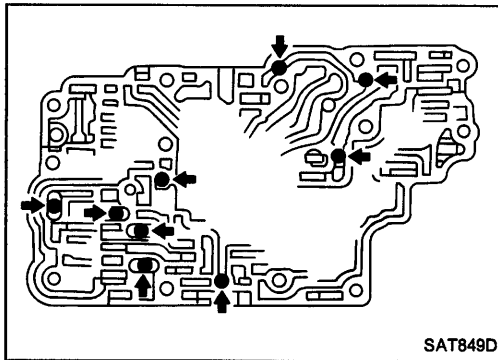
Unit: mm (in)

Part No.	ℓ	D
31872-31X00	17.02 (0.6701)	8.0 (0.315)

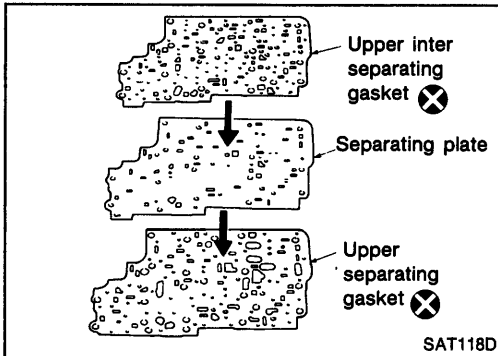
REPAIR FOR COMPONENT PARTS

Control Valve Assembly (Cont'd)

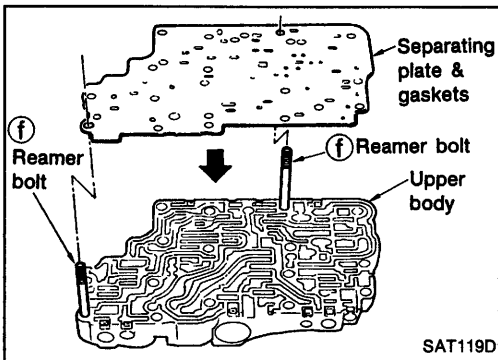
ASSEMBLY



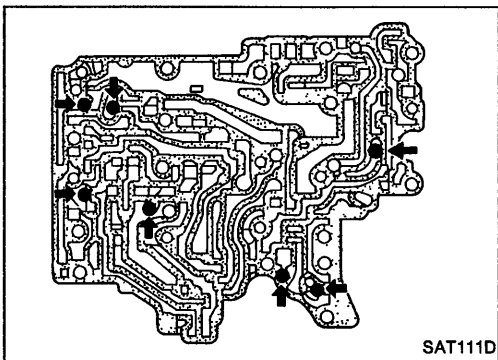
1. Install upper, inter and lower body.
 - a. Place oil circuit of upper body face up. Install steel balls in their proper positions.



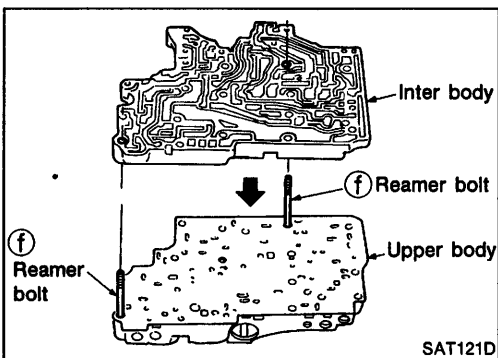
- b. Install upper separating gasket, upper inter separating gasket and upper separating plate in order shown in illustration.



- c. Install reamer bolts (f) from bottom of upper body and install separating gaskets and separating plate as a set on upper body using reamer bolts as guides.



- d. Place lower body side of inter body face up. Install steel balls in their proper positions.



- e. Install inter body on upper body using reamer bolts (f) as guides.
- Be careful not to dislocate or drop steel balls.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

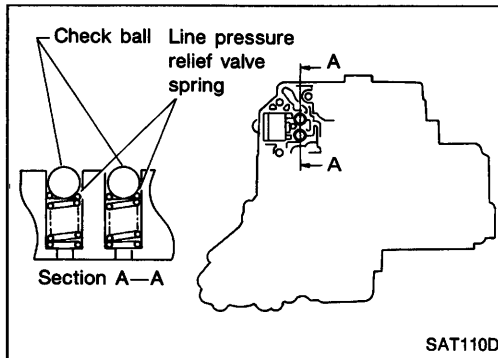
BF

HA

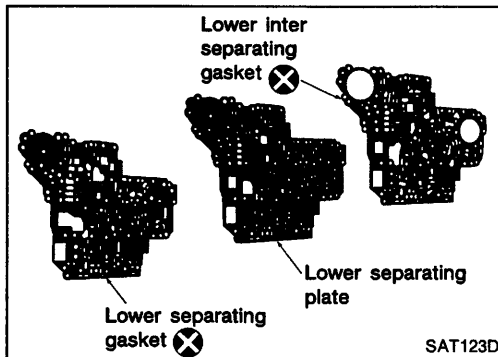
EL

REPAIR FOR COMPONENT PARTS

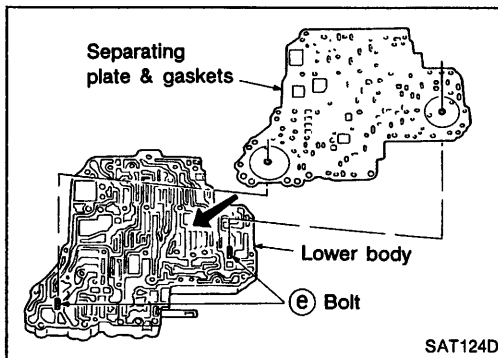
Control Valve Assembly (Cont'd)



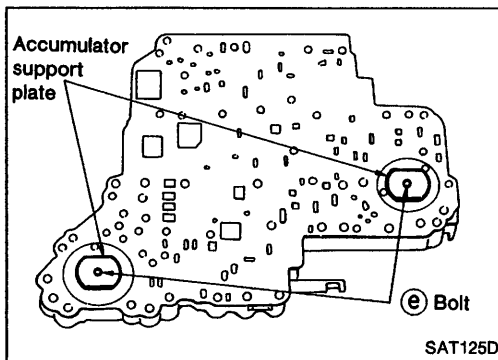
- f. Install steel balls and relief valve springs in their proper positions in lower body.



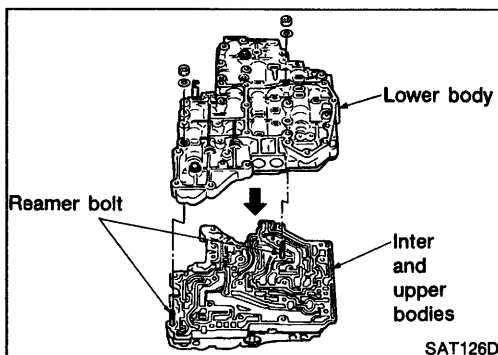
- g. Install lower separating gasket, inter separating gasket and lower separating plate in order shown in illustration.



- h. Install support plate fixing bolts ⑨ from bottom of lower body and install separating gaskets and separating plate as a set on lower body using bolts ⑨ as guides.



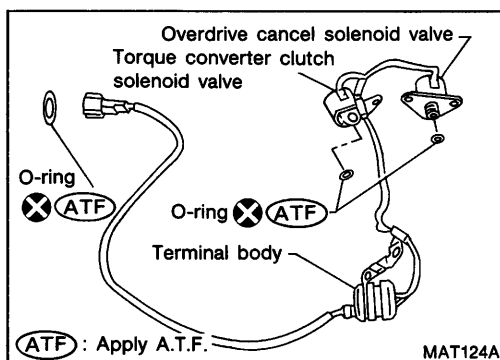
- i. Temporarily install support plates on lower body.



- j. Install lower body on inter body using reamer bolts ① as guides and tighten reamer bolts ① slightly.

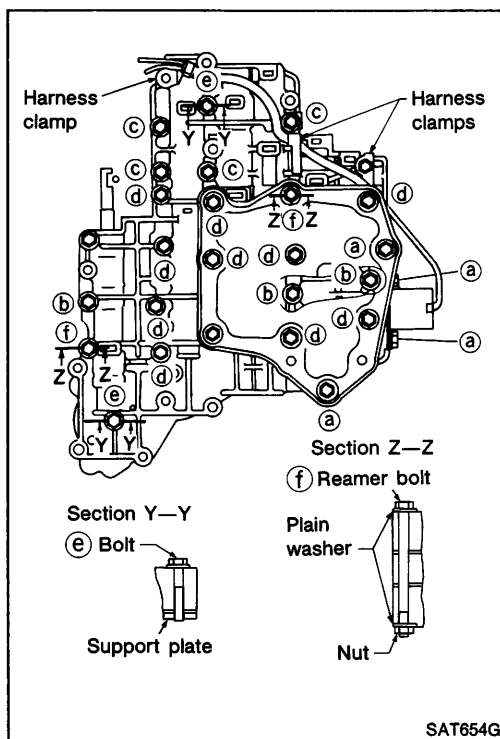
REPAIR FOR COMPONENT PARTS

Control Valve Assembly (Cont'd)



2. Install O-rings to O.D. cancel solenoid valve, torque converter clutch solenoid valve and harness connector.

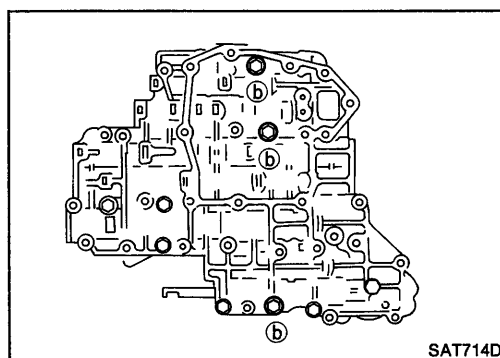
- Apply A.T.F. to O-rings.



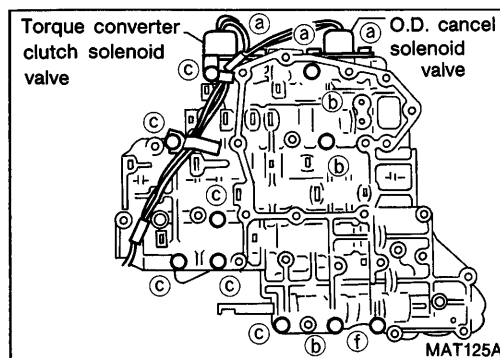
3. Install and tighten bolts.

Bolt length, number and location:

Bolt symbol	(a)	(b)	(c)	(d)	(e)	(f)
Bolt length "ℓ" mm (in)	13.5 (0.531)	58.0 (2.283)	40.0 (1.575)	66.0 (2.598)	33.0 (1.299)	78.0 (3.071)
Number of bolts	4	3	6	11	2	2



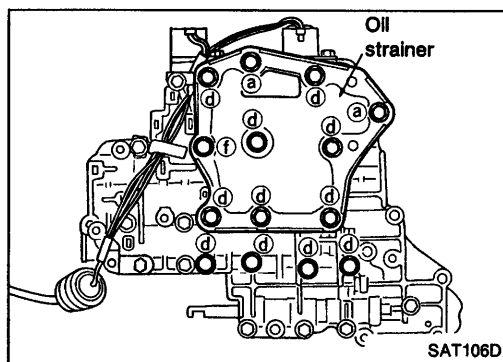
- a. Install and tighten bolts (b) slightly.



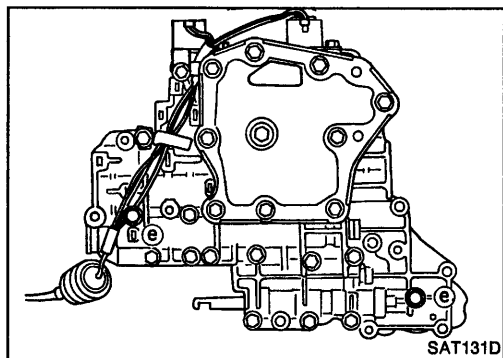
- b. Install O.D. cancel solenoid valve and torque converter clutch solenoid valve to lower body.
- c. Install and tighten bolts (a) and (e) slightly.
- d. Remove both reamer bolts (f) previously installed as guides. Install one reamer bolt (f) (marked in illustration) from lower body side.
- e. Tighten bolts (a), (b), (c) and (f) to specified torque.

REPAIR FOR COMPONENT PARTS

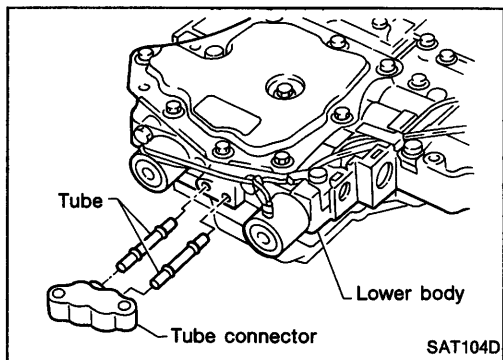
Control Valve Assembly (Cont'd)



- f. Install oil strainer and the other reamer bolt ① (marked in illustration), then tighten bolts ②, ④ and ① to specified torque.



- g. Install support plates and tighten bolts ⑤ to specified torque.



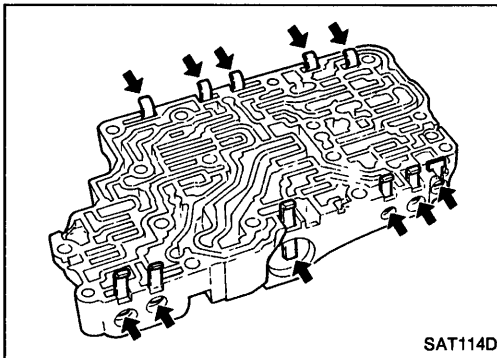
- h. Install tube connector and tubes to lower body.
● Install oil circuit side of tube connector face up.

REPAIR FOR COMPONENT PARTS

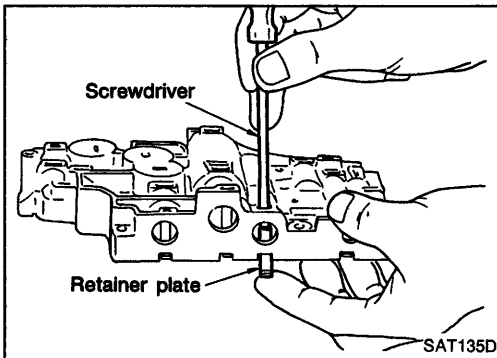
Control Valve Upper Body (Cont'd)

DISASSEMBLY

1. Remove valves at retainer plates.
 - Do not use a magnetic "hand".

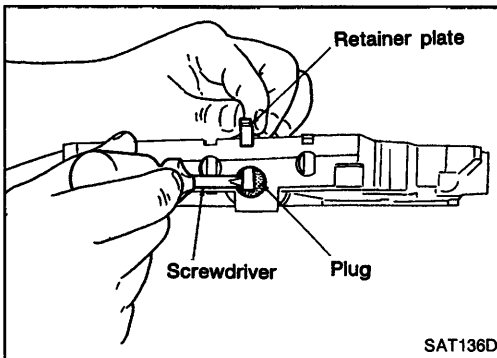


- a. Use a screwdriver to pry out retainer plates.



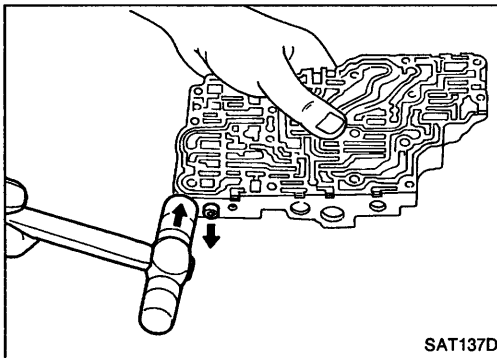
- b. Remove retainer plates while holding spring, plugs or sleeves.

- Remove plugs slowly to prevent internal parts from jumping out.



- c. Place mating surface of valve body face down, and remove internal parts.

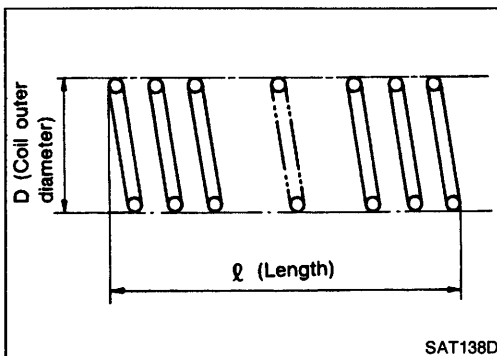
- If a valve is hard to remove, place valve body face down and lightly tap it with a soft hammer.
- Be careful not to drop or damage valves and sleeves.



INSPECTION

Valve spring

- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.
- Numbers of each valve spring listed in table on the next page are the same as those in the figure on page AT-75.



REPAIR FOR COMPONENT PARTS

Control Valve Upper Body (Cont'd)

Inspection standard

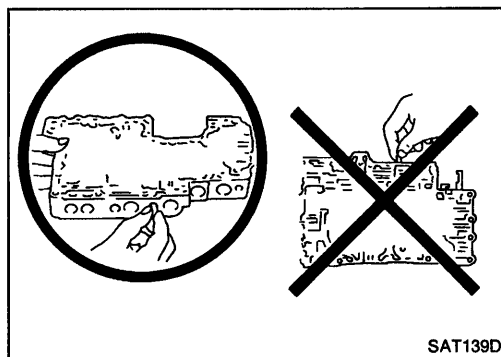
Unit: mm (in)

	Parts	Part No.	ℓ	D
①	Pressure modifier valve spring	31742-31X64	25.0 (0.984)	7.9 (0.311)
②	Kickdown modifier valve spring	31742-31X03	40.5 (1.594)	9.0 (0.354)
③	1-2 accumulator valve spring	31742-31X63	50.9 (2.004)	12.6 (0.496)
④	3-2 timing valve spring	31736-21X00	26.3 (1.035)	7.2 (0.283)
⑤	1st reducing valve spring	31835-21X08	22.6 (0.890)	7.3 (0.287)
⑥	Torque converter relief valve spring	31742-31X06	23.5 (0.925)	7.4 (0.291)
⑦	Throttle modifier valve spring	31742-31X07	29.5 (1.161)	5.5 (0.217)
⑧	4th speed cut valve spring	31835-21X02	23.2 (0.913)	6.2 (0.244)
⑨	Lock-up control valve spring	31742-31X08	39.5 (1.555)	5.0 (0.197)
⑩	4-2 sequence valve spring	31742-31X09	39.5 (1.555)	5.1 (0.201)

- Replace valve springs if deformed or fatigued.

Control valves

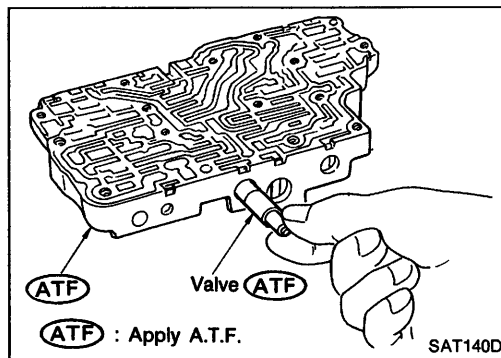
- Check sliding surfaces of valves, sleeves and plugs.



SAT139D

ASSEMBLY

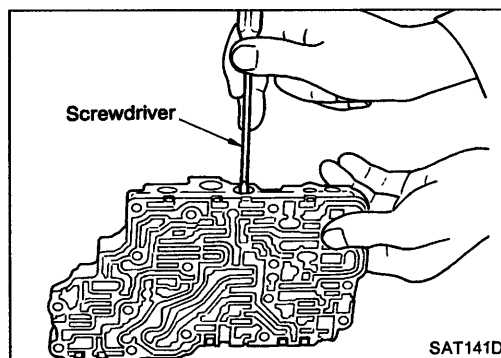
- Lay control valve body down when installing valves. Do not stand the control valve body upright.



SAT140D

1. Lubricate the control valve body and all valves with A.T.F. Install control valves by sliding them carefully into their bores.

- Be careful not to scratch or damage valve body.



SAT141D

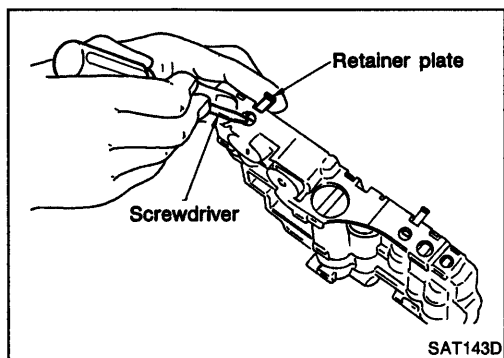
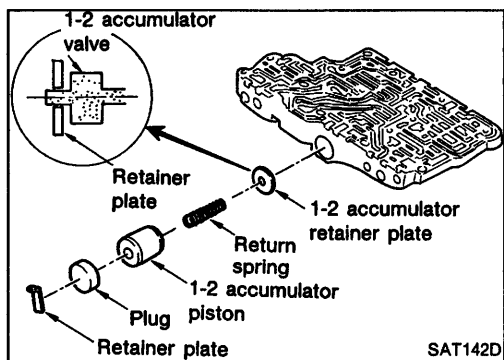
- Wrap a small screwdriver with vinyl tape and use it to insert the valves into their proper positions.

REPAIR FOR COMPONENT PARTS

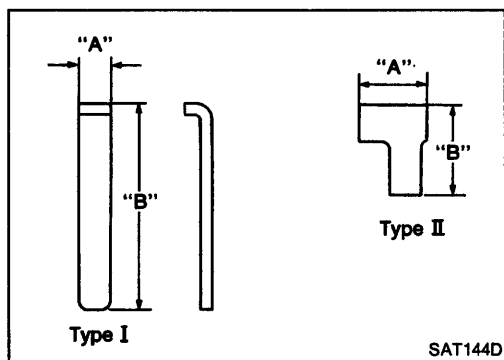
Control Valve Upper Body (Cont'd)

1-2 accumulator valve

- Install 1-2 accumulator valve and then align 1-2 accumulator retainer plate with 1-2 accumulator valve from opposite side of control valve body.
- Install return spring, 1-2 accumulator piston and plug.



2. Install retainer plates
- Install retainer plate while pushing plug or return spring.



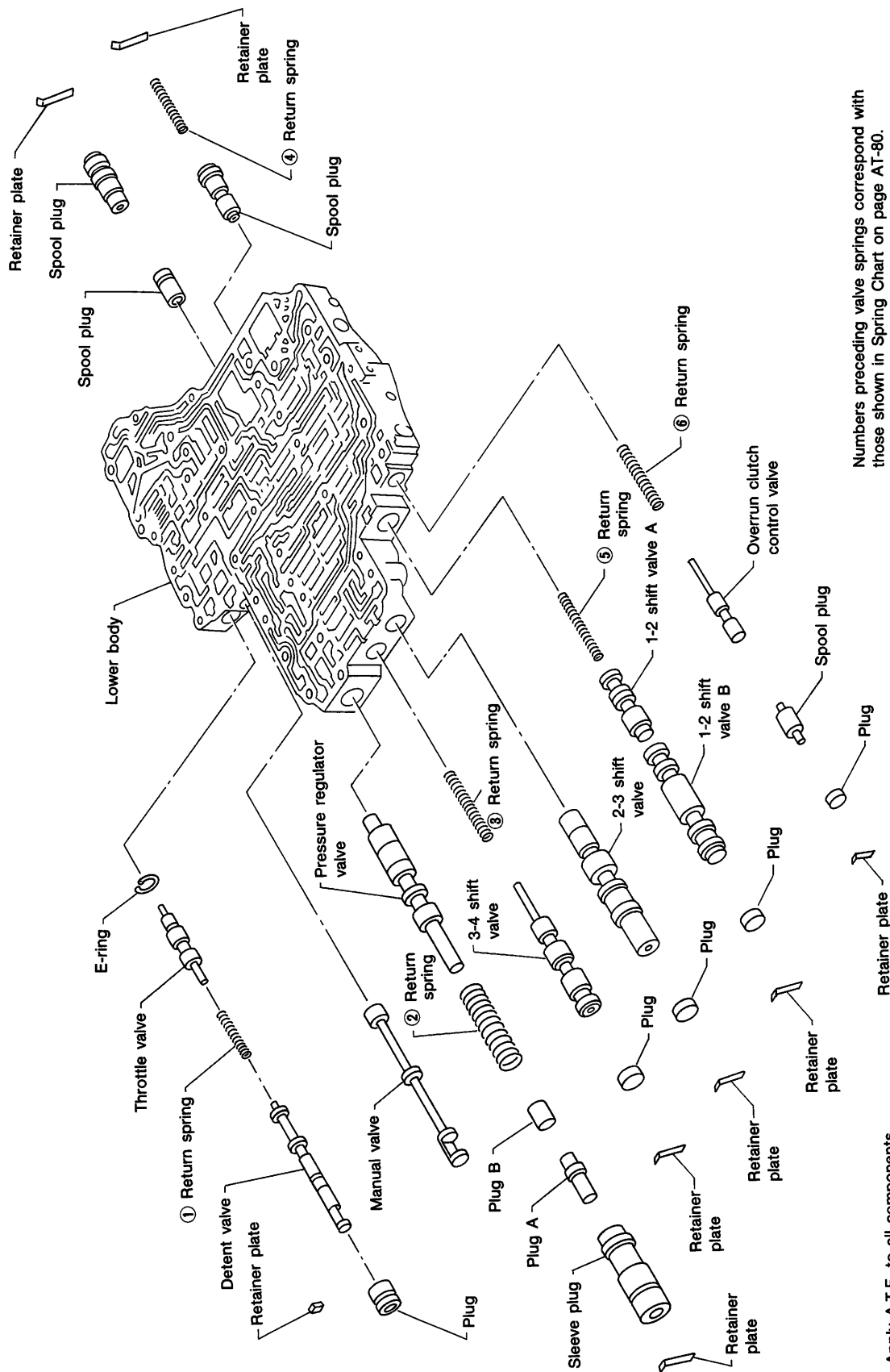
Retainer plate

Unit: mm (in)

Name of control valve	Length A	Length B	Type
Pressure modifier valve	6.0 (0.236)	28.0 (1.102)	I
Lock-up control valve			
4-2 sequence valve			
Kickdown modifier valve	6.0 (0.236)	21.5 (0.846)	
3-2 timing valve			
1st reducing valve			
Throttle modifier valve			
4th speed cut valve	6.0 (0.236)	37.5 (1.476)	
1-2 accumulator valve			
Torque converter relief valve	13.0 (0.512)	17.0 (0.669)	II

- Install proper retainer plates.

Control Valve Lower Body



Apply A.T.F. to all components before installation.

Numbers preceding valve springs correspond with those shown in Spring Chart on page AT-80.

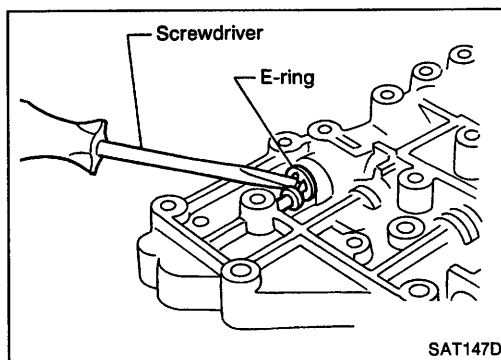
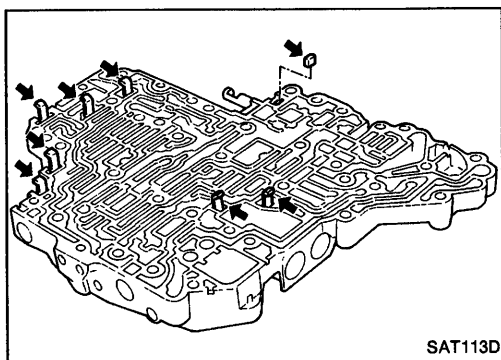
GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

REPAIR FOR COMPONENT PARTS

Control Valve Lower Body (Cont'd)

DISASSEMBLY

1. Remove valves at retainer plate.
For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body.



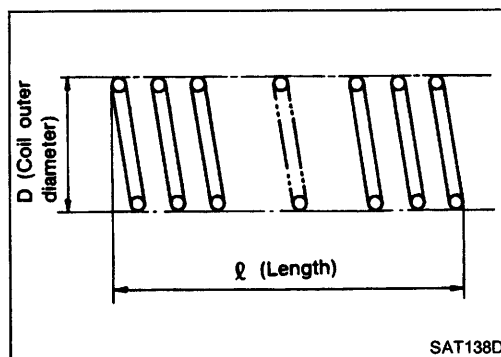
Throttle valve

- Remove throttle valve at E-ring.

INSPECTION

Valve springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.
- Numbers for each valve spring listed in the table below are the same as those in the figure on page AT-79.



Inspection standard

Unit: mm (in)

	Parts	Part No.	ℓ	D
①	Throttle valve & detent valve spring	31802-31X06	32.0 (1.260)	10.0 (0.394)
②	Pressure regulator valve spring	31742-31X00	52.24 (2.0567)	15.0 (0.591)
③	3-4 shift valve spring	31762-31X11	52.0 (2.047)	8.0 (0.315)
④	2-3 shift valve spring	31762-31X01	52.7 (2.075)	7.0 (0.276)
⑤	1-2 shift valve spring	31762-31X09	44.5 (1.752)	5.3 (0.209)
⑥	Overrun clutch control valve spring	31742-31X60	48.9 (1.925)	7.0 (0.276)

- Replace valve springs if deformed or fatigued.

Control valves

- Check sliding surfaces of control valves, sleeves and plugs for damage.

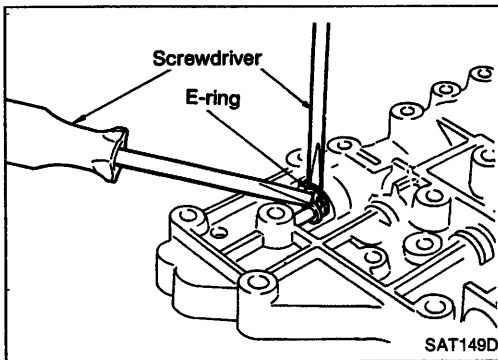
REPAIR FOR COMPONENT PARTS

Control Valve Lower Body (Cont'd)

ASSEMBLY

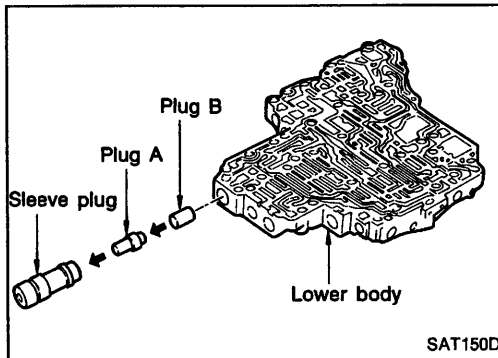
Throttle valve

- Insert throttle valve to control valve body and then install E-ring to throttle valve.



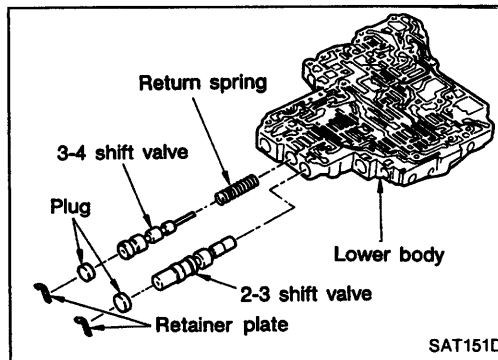
Pressure regulator valve

- Install pressure regulator valve after assembling sleeve plug, plug A and plug B.

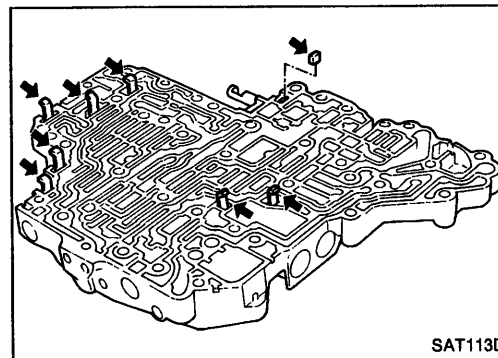


3-4 shift valve and 2-3 shift valve

- Install 3-4 shift valve and 2-3 shift valve after fixing plugs with retainer plates on the opposite side.



- Install control valves.
For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body.

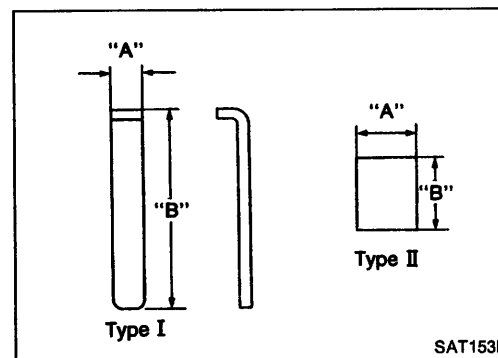


Retainer plate

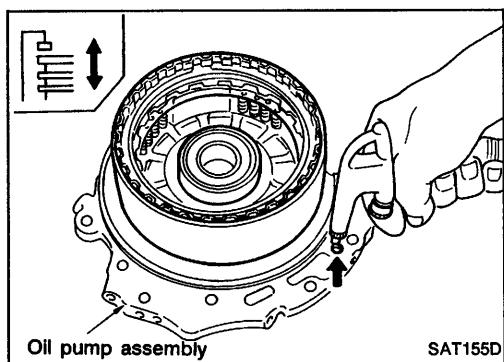
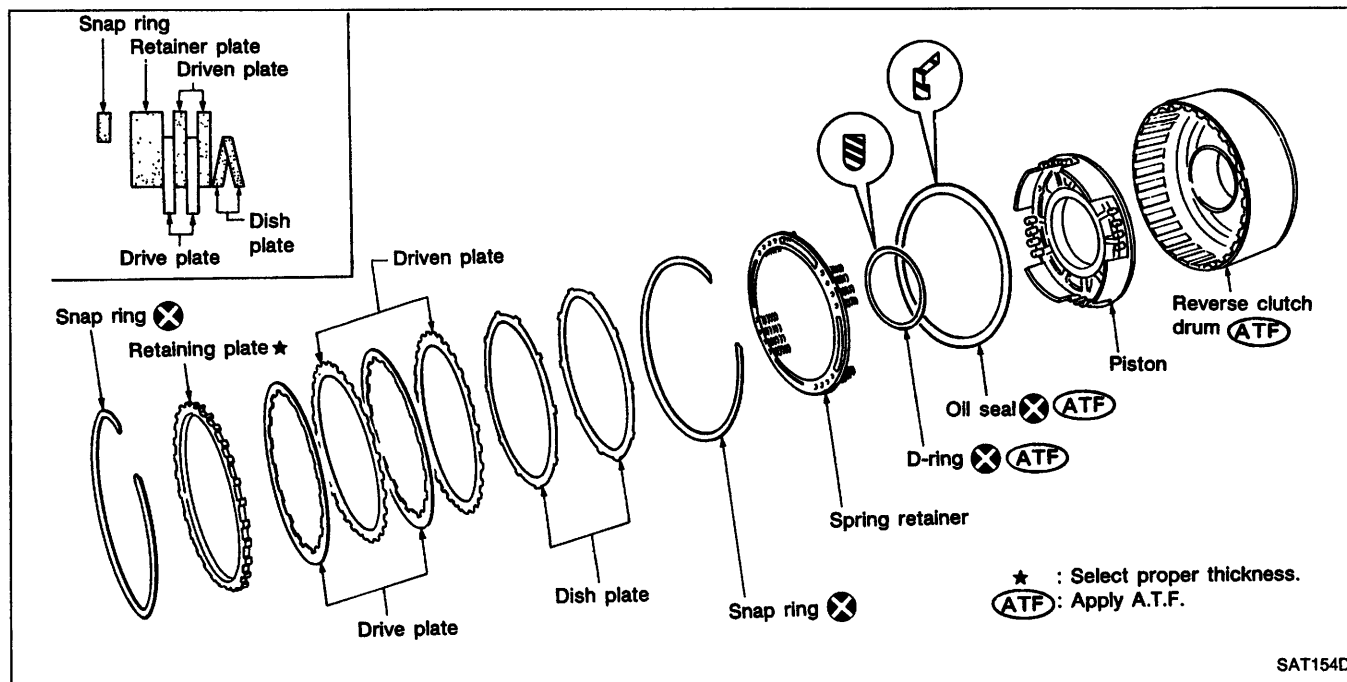
Unit: mm (in)

Name of control valve	Length A	Length B	Type
Throttle valve & detent valve	6.0 (0.236)	7.2 (0.283)	I
Pressure regulator valve	6.0 (0.236)	28.0 (1.102)	II
3-4 shift valve			
2-3 shift valve			
1-2 shift valve			
Overrun clutch control valve			

- Install proper retainer plates

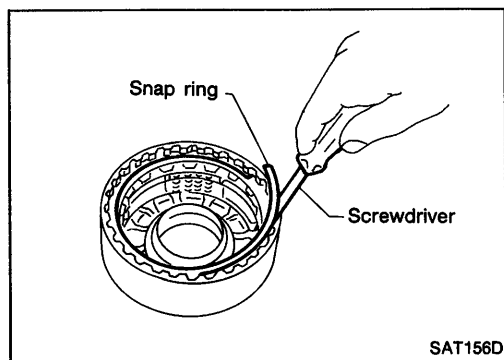


Reverse Clutch

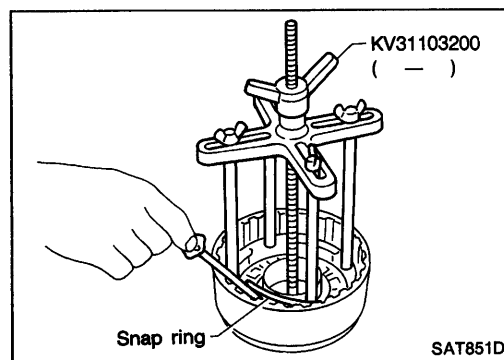


DISASSEMBLY

1. Check operation of reverse clutch
 - a. Install seal ring onto drum support of oil pump cover and install reverse clutch assembly. Apply compressed air to oil hole.
 - b. Check to see that retaining plate moves to snap ring.
 - c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.



2. Remove snap ring.
3. Remove drive plates, driven plates, retaining plate, and dish plates.

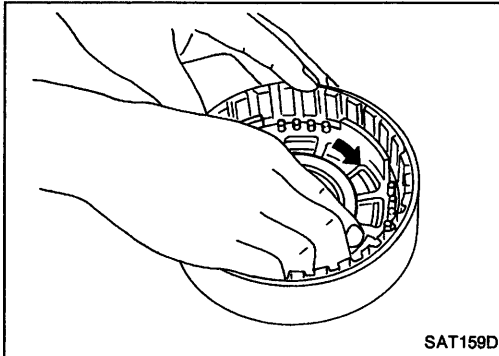
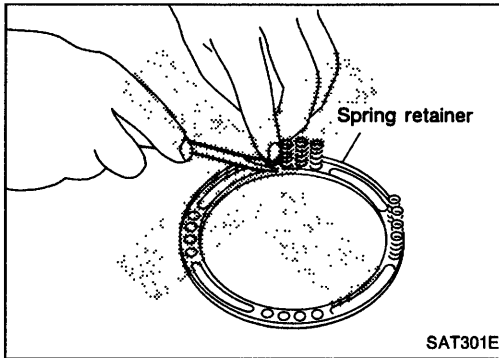


4. Set Tool on spring retainer and remove snap ring from reverse clutch drum while compressing return springs.
 - Set Tool directly over springs.
 - Do not expand snap ring excessively.
5. Remove spring retainer and return springs.

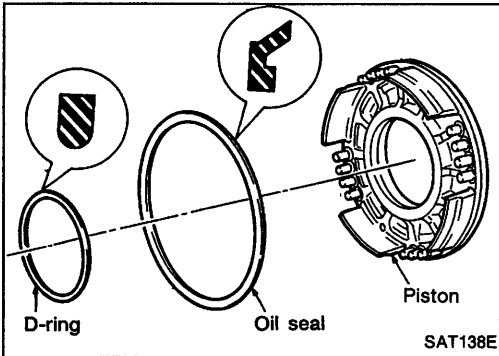
REPAIR FOR COMPONENT PARTS

Reverse Clutch (Cont'd)

- Do not remove return springs from spring retainer.



6. Remove piston from reverse clutch drum by turning it.

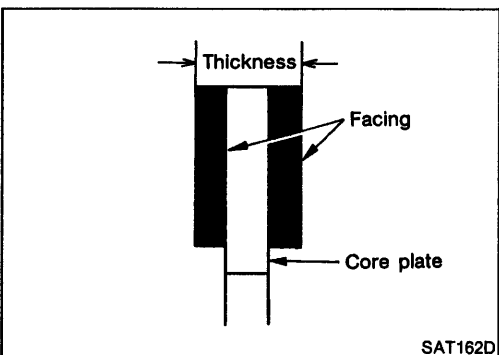


7. Remove D-ring and oil seal from piston.

INSPECTION

Reverse clutch snap ring, spring retainer and return springs

- Check for deformation, fatigue or damage. If necessary, replace.
- When replacing spring retainer and return springs, replace them as a set.



Reverse clutch drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.
Thickness of drive plate:
Standard value: 2.0 mm (0.079 in)
Wear limit: 1.8 mm (0.071 in)
- If not within wear limit, replace.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

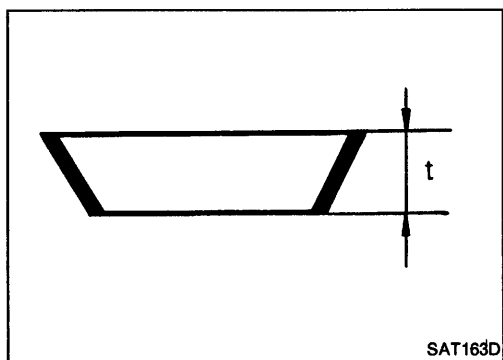
EL

REPAIR FOR COMPONENT PARTS

Reverse Clutch (Cont'd)

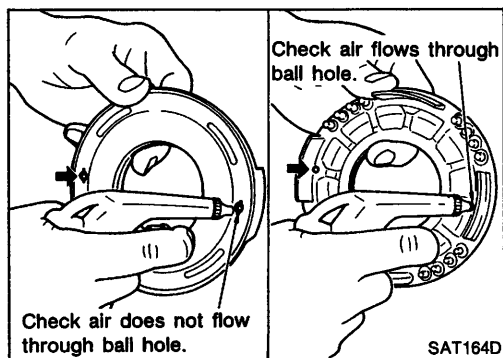
Reverse clutch dish plates

- Check for deformation or damage.
- Measure thickness of dish plate.
Thickness of dish plate: 2.8 mm (0.110 in)
- If deformed or fatigued, replace.



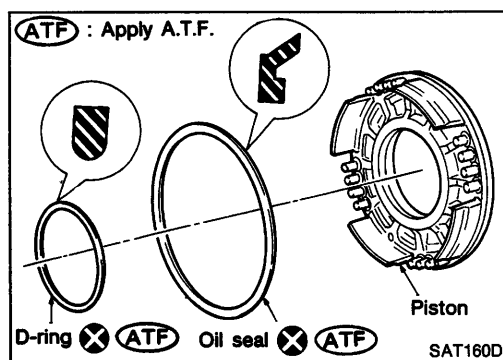
Reverse clutch piston

- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring to make sure that there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure that air leaks past ball.

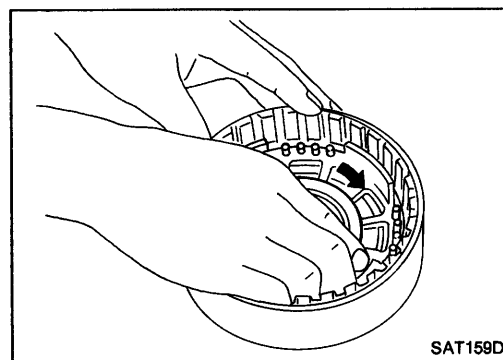


ASSEMBLY

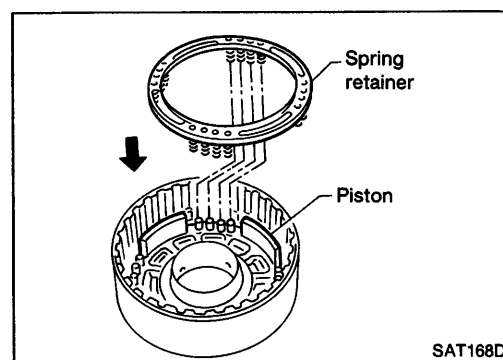
1. Install D-ring and oil seal on piston.
 - Take care with the direction of oil seal.
 - Apply A.T.F. to both parts.



2. Install piston assembly by turning it slowly.
 - Apply A.T.F. to inner surface of drum.

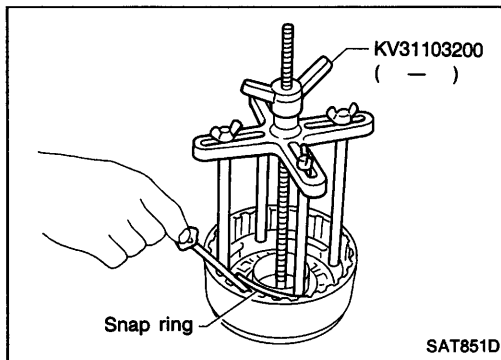


3. Install return springs and spring retainer on piston.

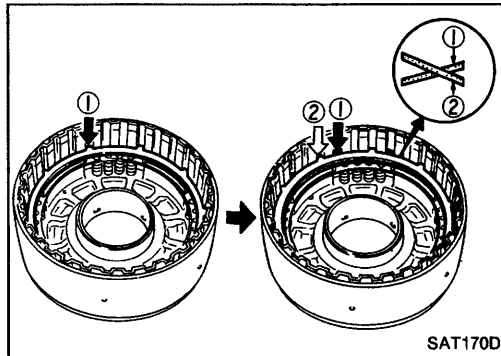


REPAIR FOR COMPONENT PARTS

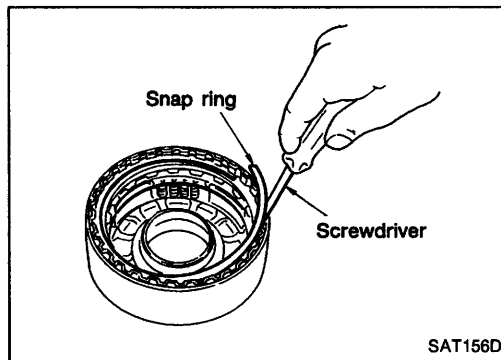
Reverse Clutch (Cont'd)



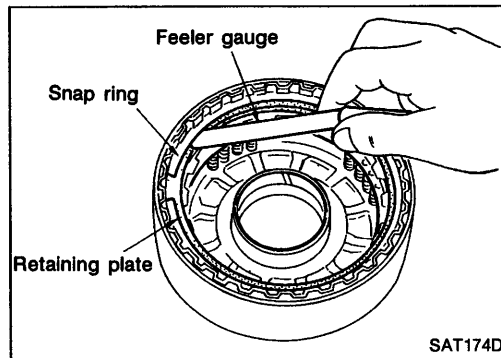
4. Set Tool on spring retainer and install snap ring while compressing return springs.
- Set Tool directly over return springs.



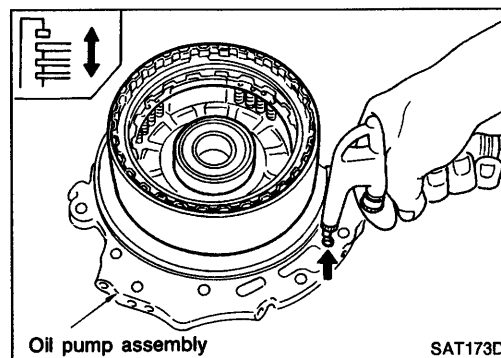
5. Install drive plates, driven plates, retaining plate and dish plates.
- Do not align the projections on the two dish plates.



6. Install snap ring.



7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
Specified clearance:
Standard 0.5 - 0.8 mm (0.020 - 0.031 in)
Allowable limit 1.2 mm (0.047 in)
Retaining plate: Refer to S.D.S.



8. Check operation of reverse clutch. Refer to "DISASSEMBLY" of Reverse Clutch.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

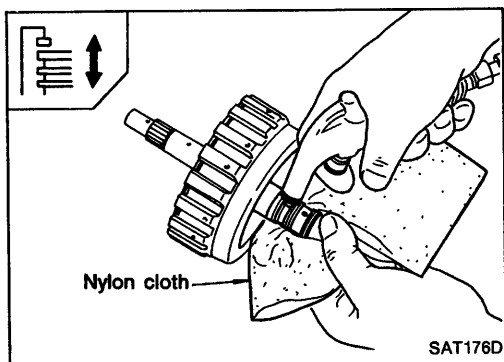
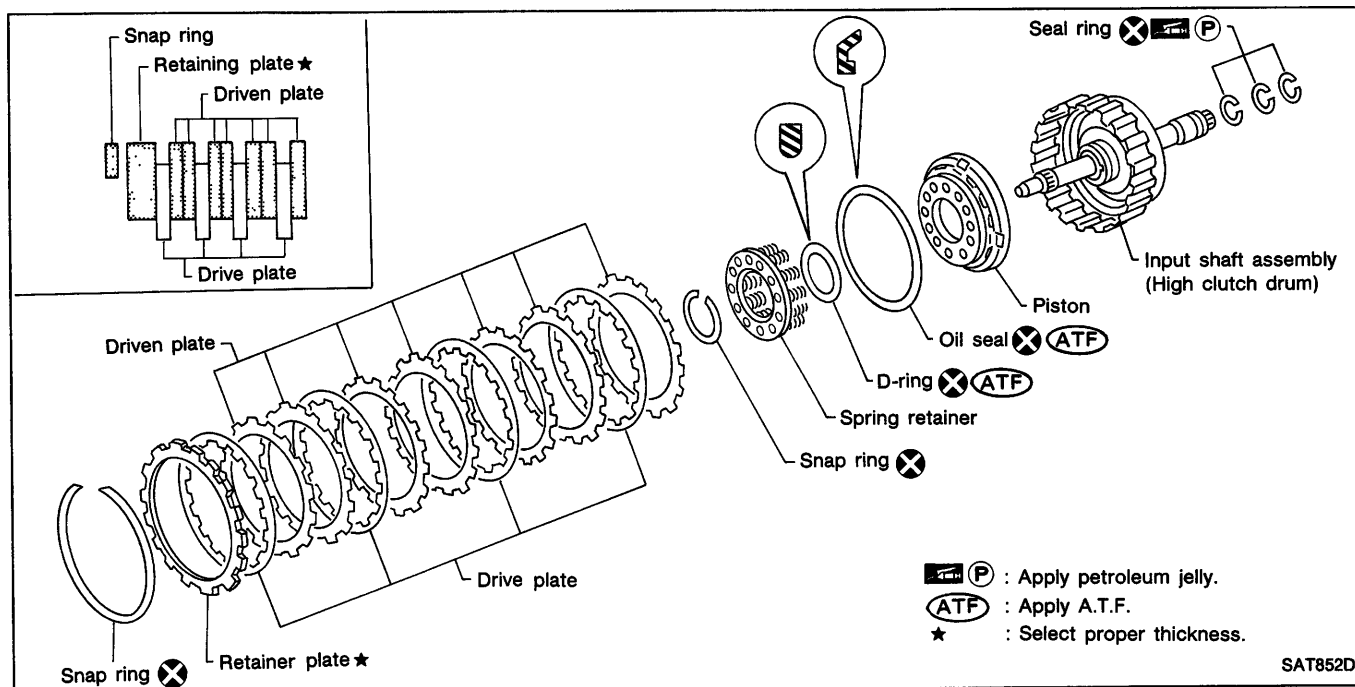
ST

BF

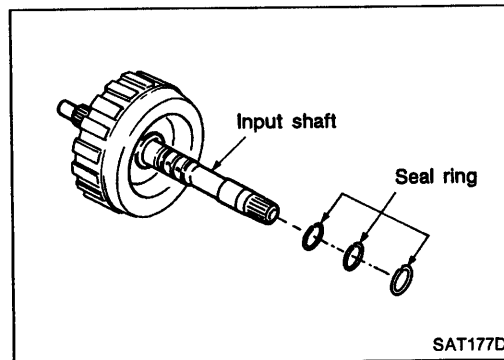
HA

EL

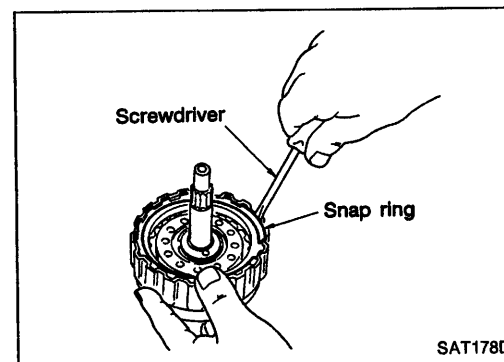
High Clutch



1. Check operation of high clutch.
 - a. Apply compressed air to oil hole of input shaft with nylon cloth.
 - **Stop up hole on opposite side of input shaft with nylon cloth.**
 - b. Check to see that retaining plate moves to snap ring.
 - c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.



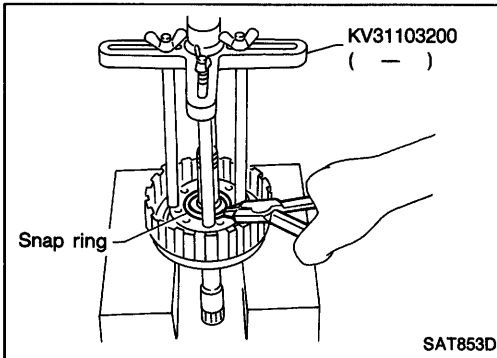
2. Remove seal rings from input shaft.
 - **Always replace when removed.**



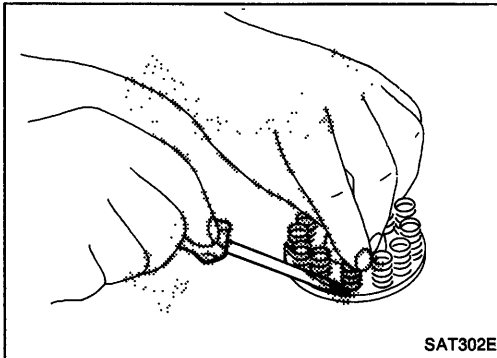
3. Remove snap ring.
4. Remove drive plates, driven plates, retaining plate and dish plate.

REPAIR FOR COMPONENT PARTS

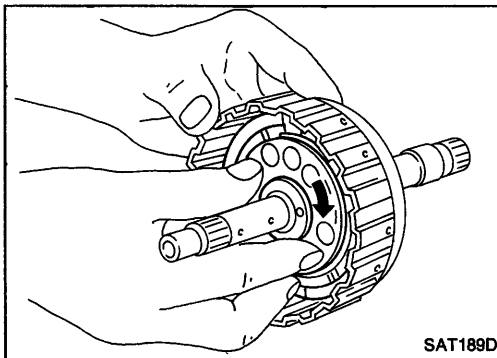
High Clutch (Cont'd)



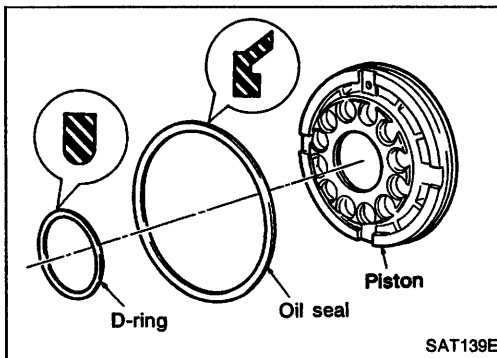
5. Set Tool on spring retainer and remove snap ring from high clutch drum while compressing return springs.
- **Set Tool directly over springs.**
- **Do not expand snap ring excessively.**
6. Remove spring retainer and return springs.



- **Do not remove return springs from spring retainer.**



7. Remove piston from high clutch drum by turning it.



8. Remove D-ring and oil seal from piston.

INSPECTION

High clutch snap ring, spring retainer and return springs.

- Check for deformation, fatigue or damage. If necessary, replace.
- **When replacing spring retainer and return springs, replace them as a set.**

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

REPAIR FOR COMPONENT PARTS

High Clutch (Cont'd)

High clutch drive plates

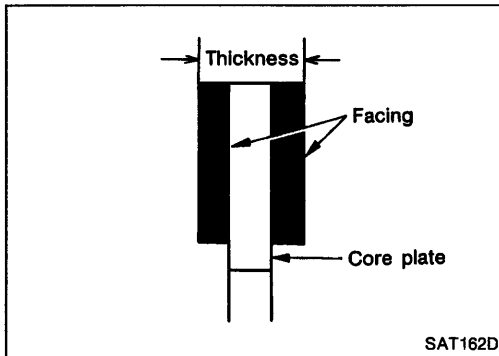
- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate:

Standard value 1.6 mm (0.063 in)

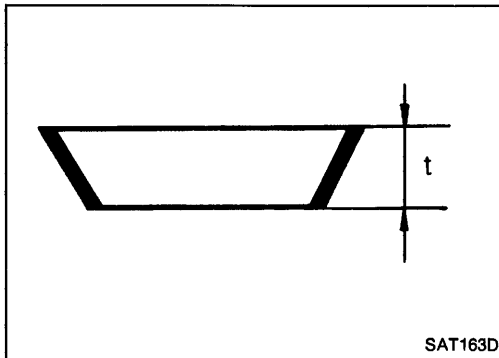
Wear limit 1.4 mm (0.055 in)

- If not within wear limit, replace.



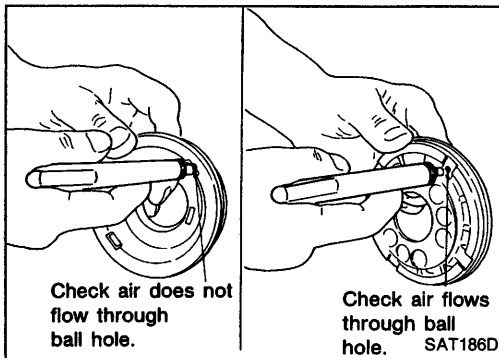
High clutch dish plate

- Check for deformation or damage.
 - Measure thickness of dish plate.
- Thickness of dish plate: 2.7 mm (0.106 in)**
- If deformed or fatigued, replace.



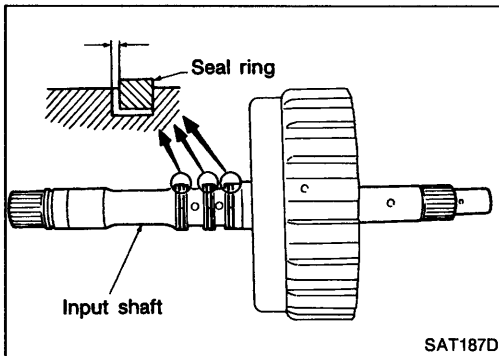
High clutch piston

- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring to make sure that there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure that air leaks past ball.



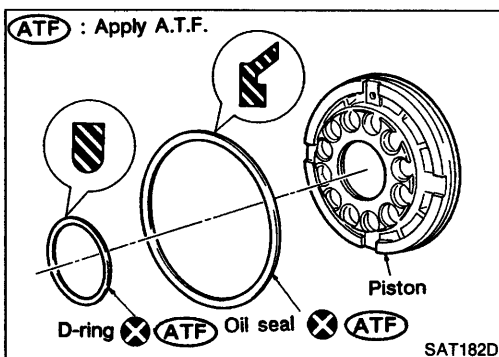
Seal ring clearance

- Measure clearance between seal ring and ring groove.
- Standard clearance: 0.08 - 0.23 mm (0.0031 - 0.0091 in)**
- Allowable limit: 0.23 mm (0.0091 in)**
- If not within allowable limit, replace input shaft assembly.



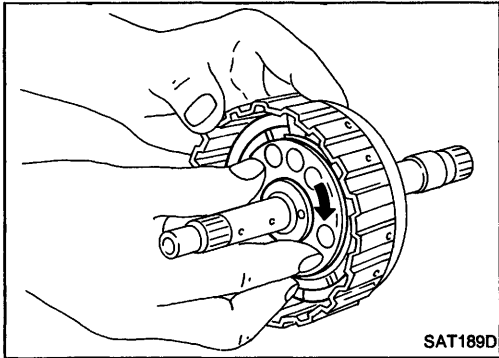
ASSEMBLY

1. Install D-ring and oil seal on piston.
- Take care with the direction of oil seal.
 - Apply A.T.F. to both parts.

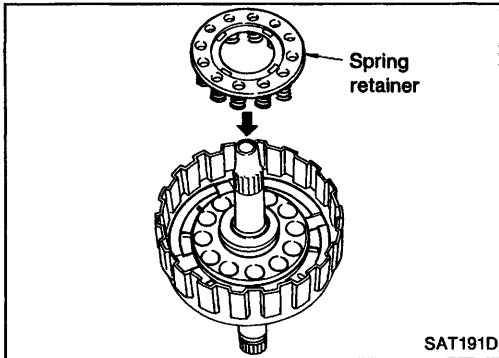


REPAIR FOR COMPONENT PARTS

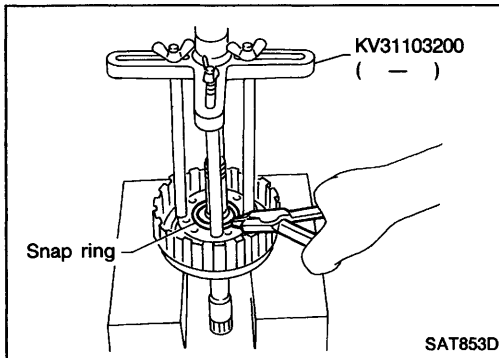
High Clutch (Cont'd)



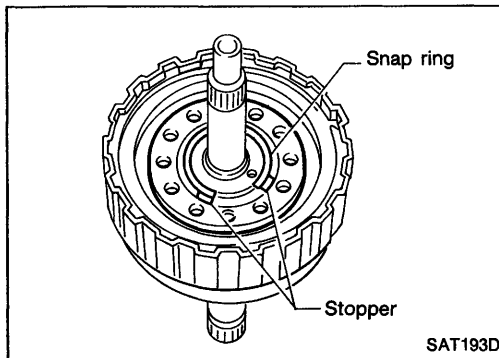
2. Install piston assembly by turning it slowly.
- Apply A.T.F. to inner surface of drum.



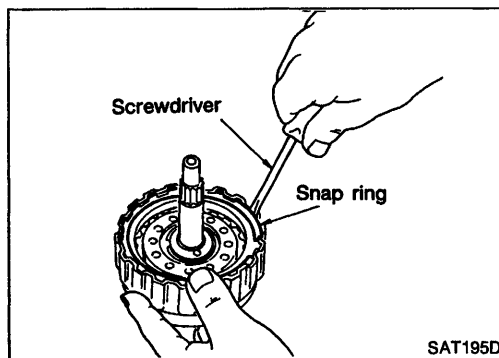
3. Install return springs and spring retainer on piston.



4. Set Tool on spring retainer and install snap ring while compressing return springs.
- Set Tool directly over return springs.



- Do not align snap ring gap with spring retainer stopper.



5. Install drive plates, driven plates, retaining plate and dish plate.
6. Install snap ring.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

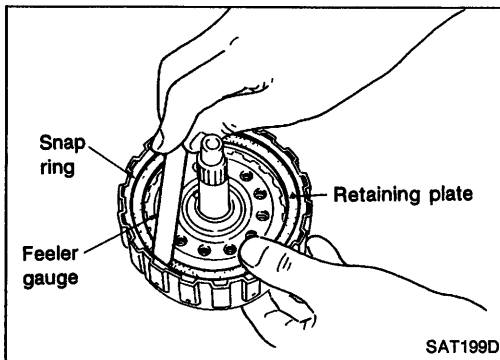
BF

HA

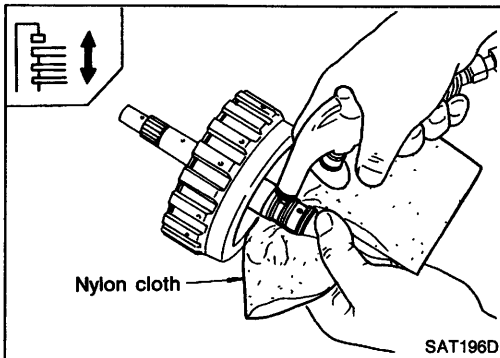
EL

REPAIR FOR COMPONENT PARTS

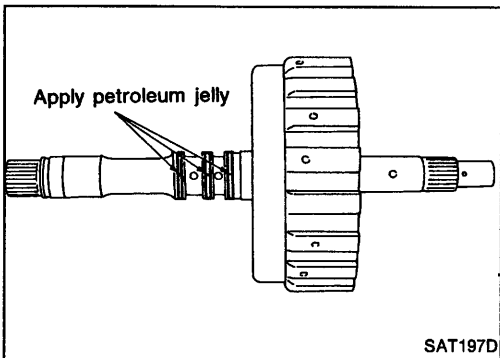
High Clutch (Cont'd)



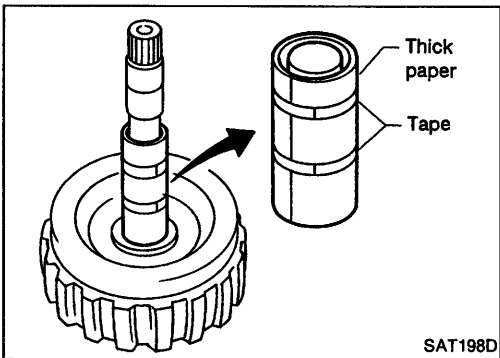
7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
Specified clearance:
Standard 1.4 - 1.8 mm (0.055 - 0.071 in)
Allowable limit 2.6 mm (0.102 in)
Retaining plate: Refer to S.D.S.



8. Check operation of high clutch.
Refer to "DISASSEMBLY" of High Clutch.

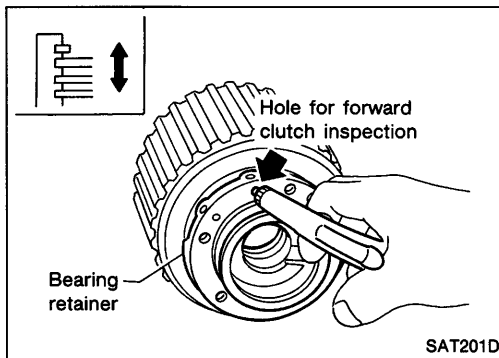
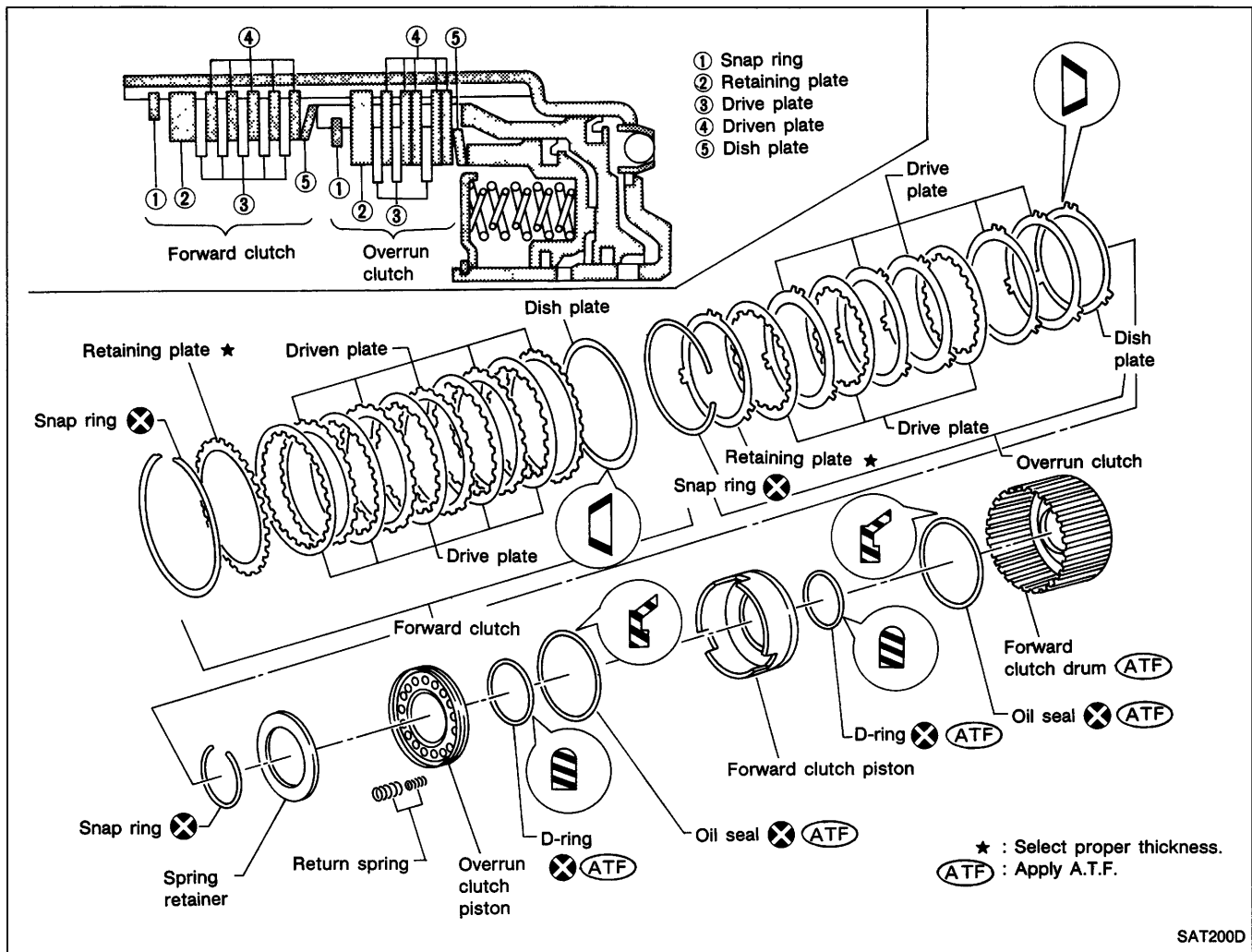


9. Install seal rings to input shaft.
 - **Apply petroleum jelly to seal rings.**
 - **Always replace when removed.**



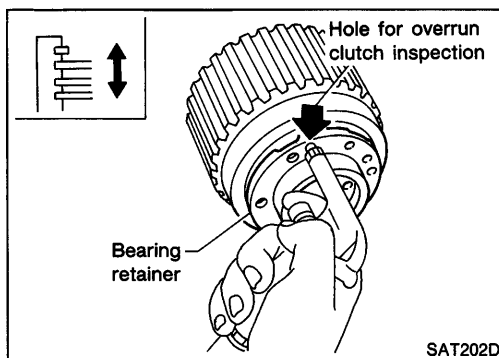
- **Roll paper around seal rings to prevent seal rings from spreading.**

Forward Clutch and Overrun Clutch



DISASSEMBLY

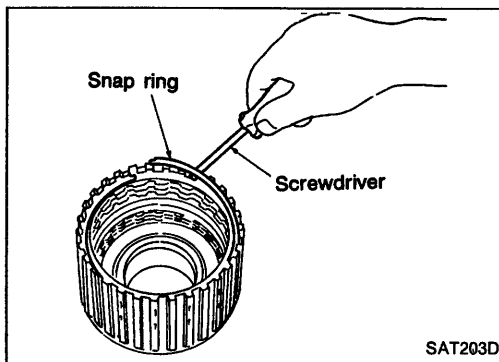
1. Check operation of forward clutch and overrun clutch.
 - a. Install bearing retainer on forward clutch drum.
 - b. Apply compressed air to oil hole of forward clutch drum.
 - c. Check to see that retaining plate moves to snap ring.



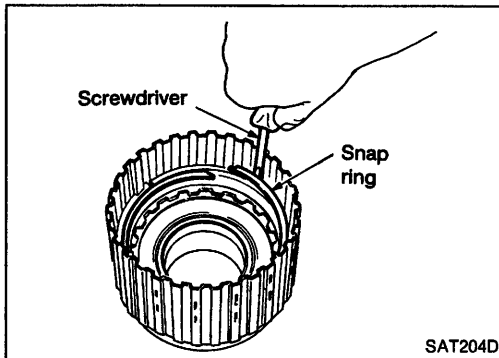
- d. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

REPAIR FOR COMPONENT PARTS

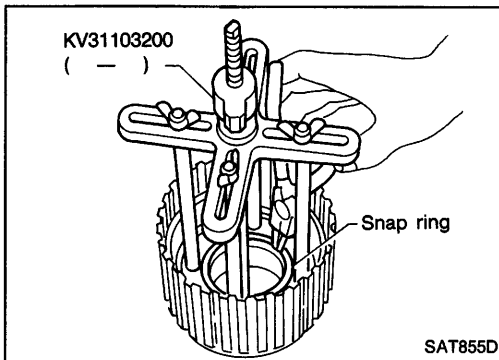
Forward Clutch and Overrun Clutch (Cont'd)



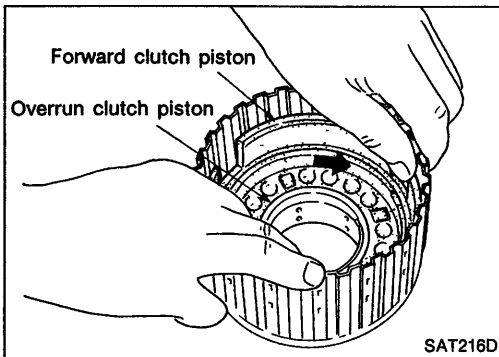
2. Remove snap ring for forward clutch.
3. Remove drive plates, driven plates, retaining plate and dish plate for forward clutch.



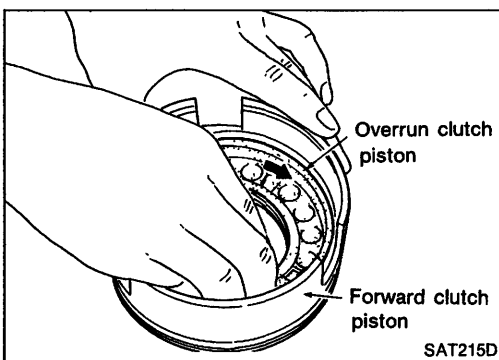
4. Remove snap ring for overrun clutch.
5. Remove drive plates, driven plates, retaining plate and dish plate for overrun clutch.



6. Set Tool on spring retainer and remove snap ring from forward clutch drum while compressing return springs.
 - **Set Tool directly over return springs.**
 - **Do not expand snap ring excessively.**
7. Remove spring retainer and return springs.



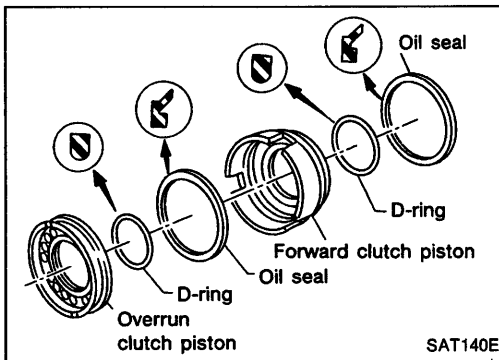
8. Remove forward clutch piston with overrun clutch piston from forward clutch drum by turning it.



9. Remove overrun clutch piston from forward clutch piston by turning it.

REPAIR FOR COMPONENT PARTS

Forward Clutch and Overrun Clutch (Cont'd)

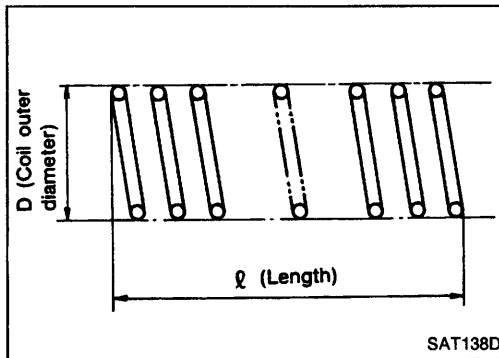


10. Remove D-rings and oil seals from forward clutch piston and overrun clutch piston.

INSPECTION

Snap rings and spring retainer

- Check for deformation, fatigue or damage.



Forward clutch and overrun clutch return springs

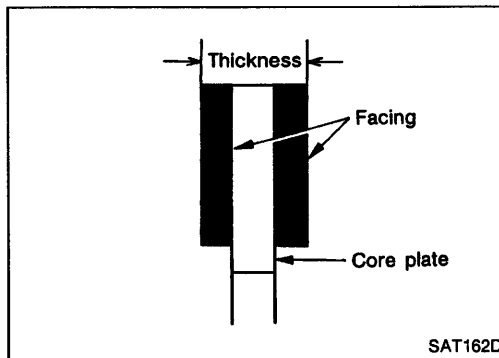
- Check for deformation or damage.
- Measure free length and outer diameter.

Inspection standard:

Unit: mm (in)

Parts		Part No.	ℓ	D
Return spring	inner	31505-31X02	26.3 (1.035)	7.7 (0.303)
	outer	31505-31X03	26.6 (1.047)	10.6 (0.417)

- Replace if deformed or fatigued.



Forward clutch and overrun clutch drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate:

Forward clutch

Standard value: 1.8 mm (0.071 in)

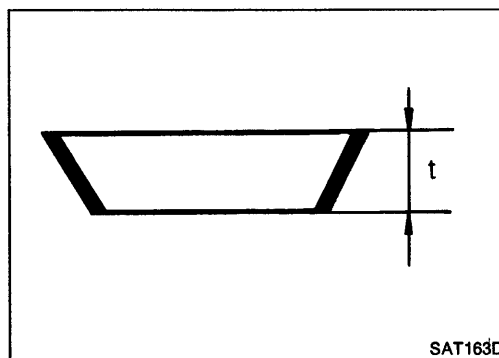
Wear limit: 1.6 mm (0.063 in)

Overrun clutch

Standard value: 1.6 mm (0.063 in)

Wear limit: 1.4 mm (0.055 in)

- If not within wear limit, replace.



Forward clutch and overrun clutch dish plates

- Check for deformation or damage.
- Measure thickness of dish plate.

Thickness of dish plate:

Forward clutch 2.5 mm (0.098 in)

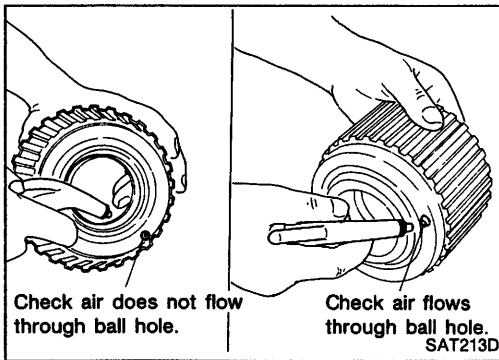
Overrun clutch 2.15 mm (0.0846 in)

- If deformed or fatigued, replace.

REPAIR FOR COMPONENT PARTS

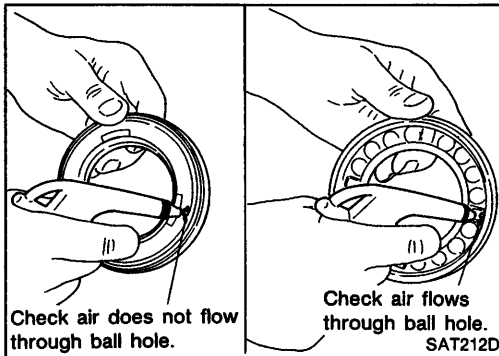
Forward Clutch and Overrun Clutch (Cont'd)

Forward clutch drum



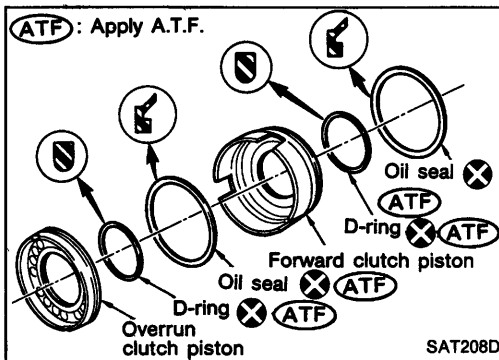
- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole from outside of forward clutch drum to make sure that air leaks past ball.
- Apply compressed air to oil hole from inside of forward clutch drum to make sure that there is no air leakage.

Overrun clutch piston

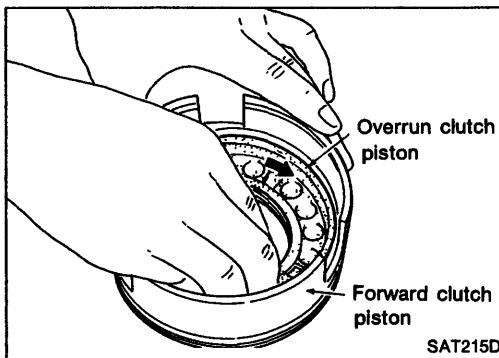


- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring to make sure that there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure that air leaks past ball.

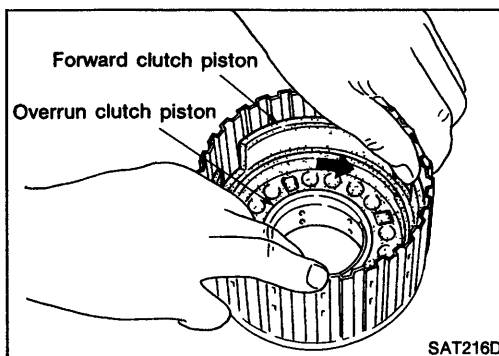
ASSEMBLY



1. Install D-rings and oil seals on forward clutch piston and overrun clutch piston.
- Take care with direction of oil seal.
 - Apply A.T.F. to both parts.



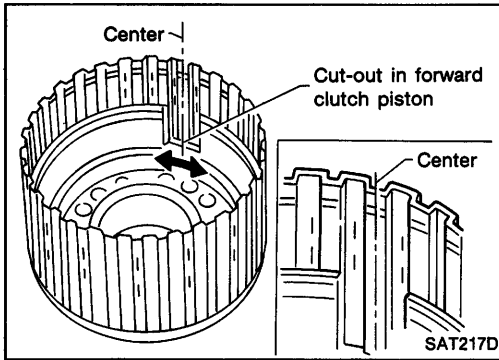
2. Install overrun clutch piston assembly on forward clutch piston by turning it slowly.
- Apply A.T.F. to inner surface of forward clutch piston.



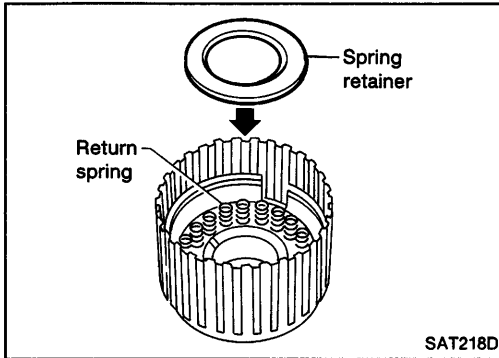
3. Install forward clutch piston assembly on forward clutch drum by turning it slowly.
- Apply A.T.F. to inner surface of drum.

REPAIR FOR COMPONENT PARTS

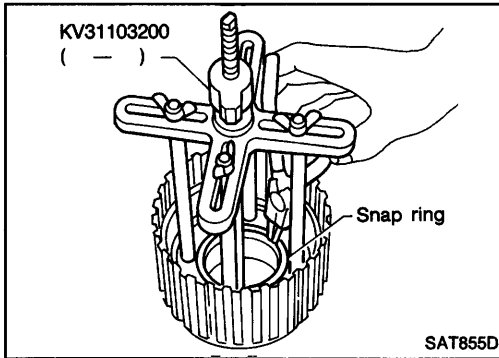
Forward Clutch and Overrun Clutch (Cont'd)



4. Align cut-out in forward clutch piston with groove in forward clutch drum.

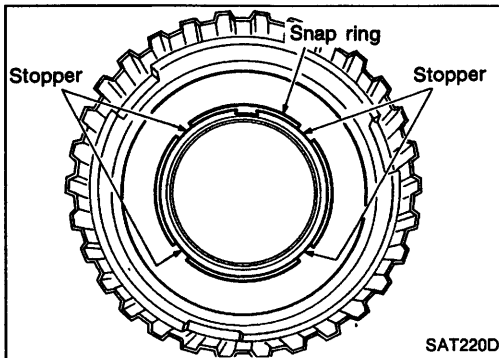


5. Install return spring on overrun clutch piston.
6. Install spring retainer on return springs.

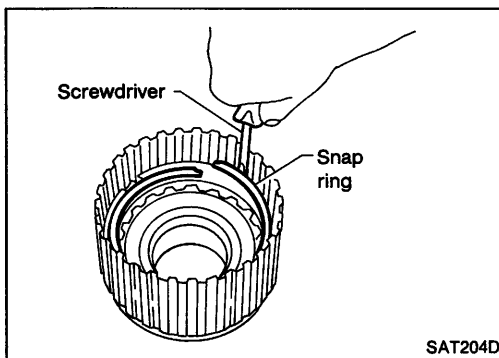


7. Set Tool on spring retainer and install snap ring while compressing return springs.

- Set Tool directly over return springs.



- Do not align snap ring gap with spring retainer stopper.



8. Install drive plates, driven plates, retaining plate and dish plate for overrun clutch.
9. Install snap ring for overrun clutch.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

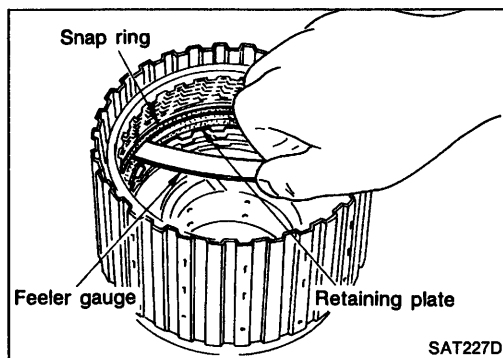
BF

HA

EL

REPAIR FOR COMPONENT PARTS

Forward Clutch and Overrun Clutch (Cont'd)



10. Measure clearance between overrun clutch retaining plate and snap ring.

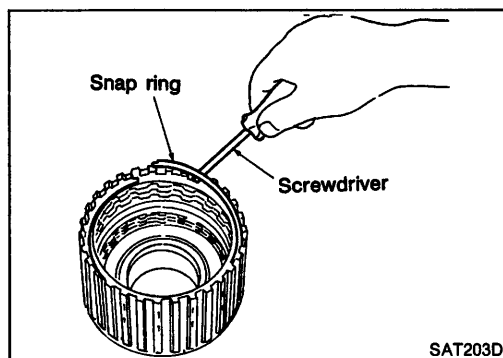
If not within allowable limit, select proper retaining plate.

Specified clearance:

Standard 1.0 - 1.4 mm (0.039 - 0.055 in)

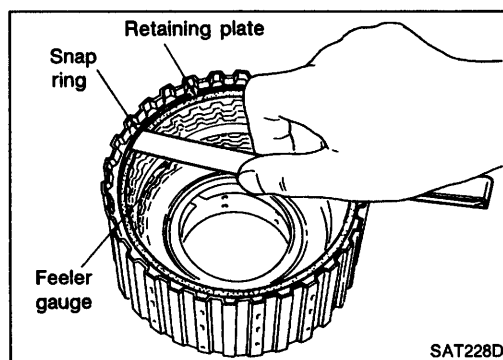
Allowable limit 2.0 mm (0.079 in)

Overrun clutch retaining plate: Refer to S.D.S.



11. Install drive plates, driven plates, retaining plate and dish plate for forward clutch.

12. Install snap ring for forward clutch.



13. Measure clearance between forward clutch retaining plate and snap ring.

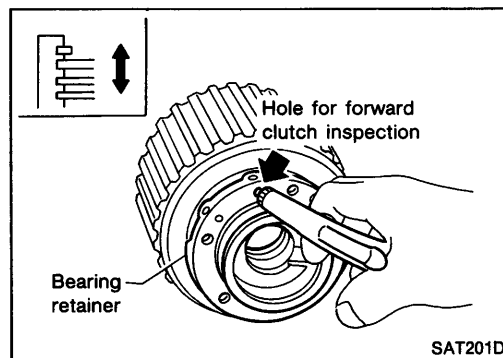
If not within allowable limit, select proper retaining plate.

Specified clearance:

Standard 0.45 - 0.85 mm (0.0177 - 0.0335 in)

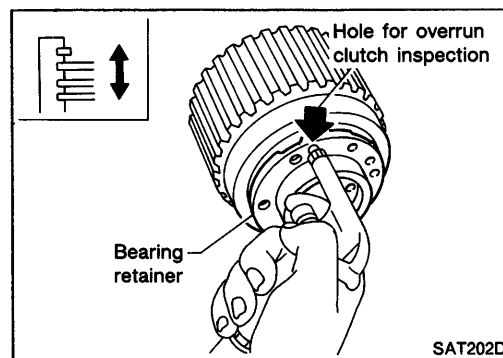
Allowable limit 1.85 mm (0.0728 in)

Forward clutch retaining plate: Refer to S.D.S.



14. Check operation of forward clutch.

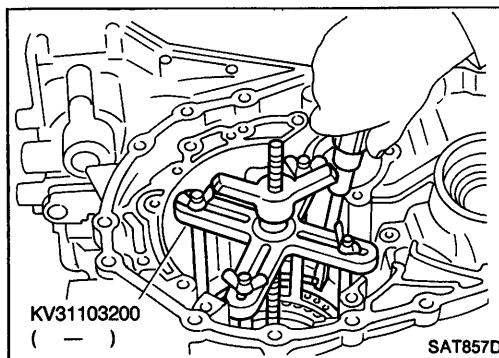
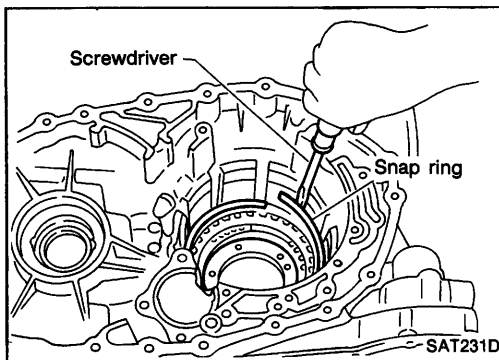
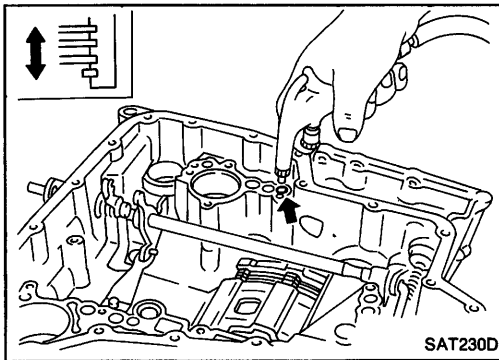
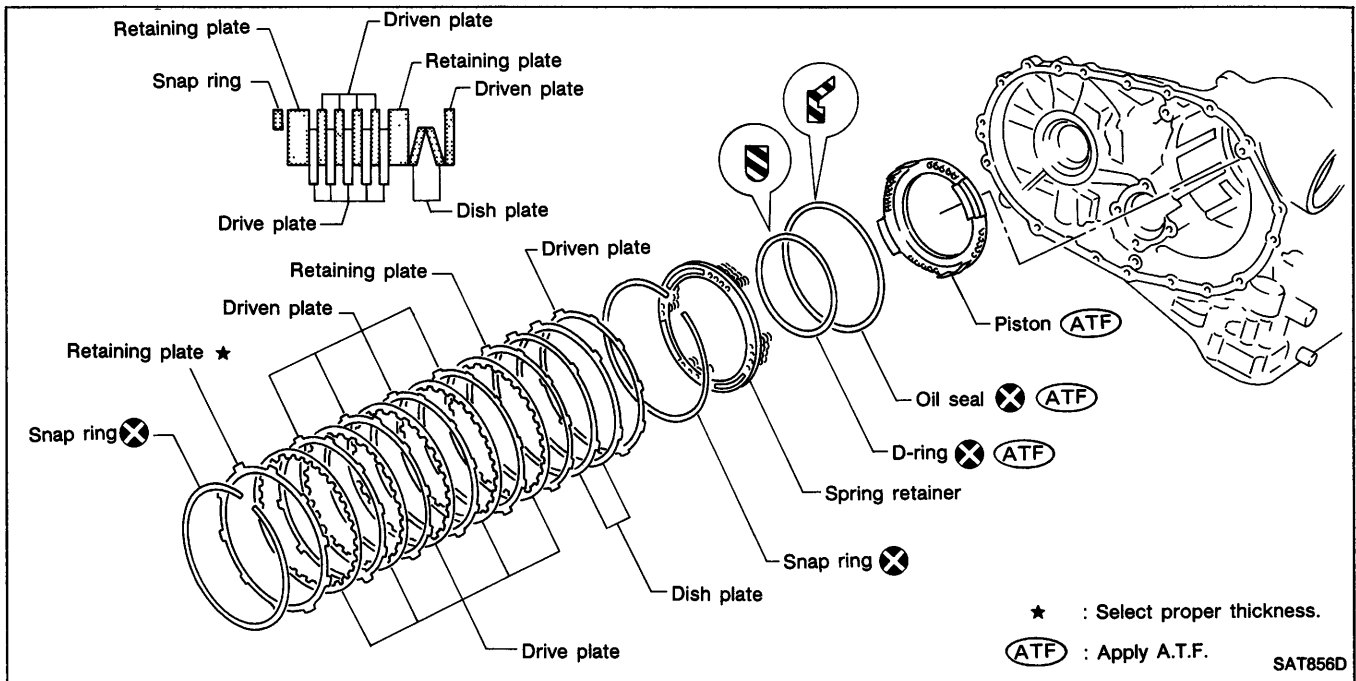
Refer to "DISASSEMBLY" of Forward Clutch and Overrun Clutch.



15. Check operation of overrun clutch.

Refer to "DISASSEMBLY" of Forward Clutch and Overrun Clutch.

Low & Reverse Brake



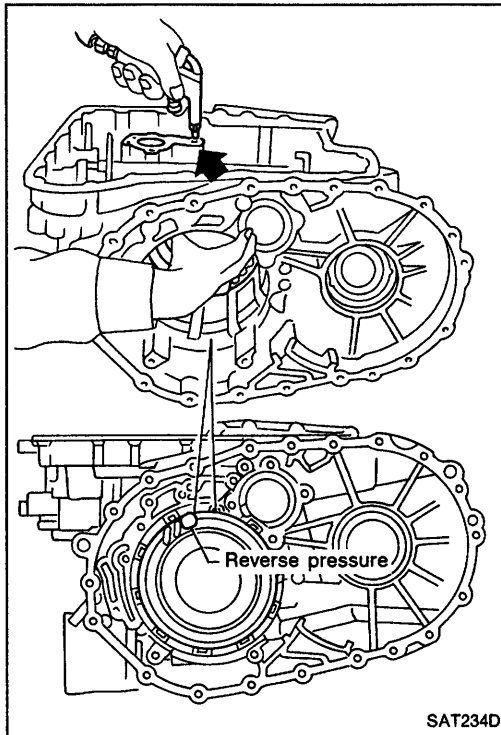
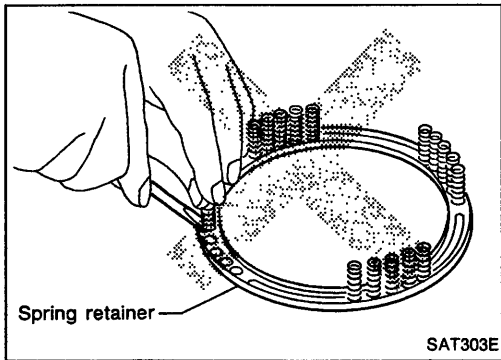
DISASSEMBLY

1. Check operation of low & reverse brake.
 - a. Apply compressed air to oil hole of transmission case.
 - b. Check to see that retaining plate moves to snap ring.
 - c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.
2. Stand transmission case.
3. Remove snap ring.
4. Remove drive plates, driven plates and retaining plate from transmission case.
5. Set Tool on spring retainer and remove snap ring while compressing return springs.
 - Set Tool directly over return springs.
 - Do not expand snap ring excessively.
6. Remove spring retainer and return springs.

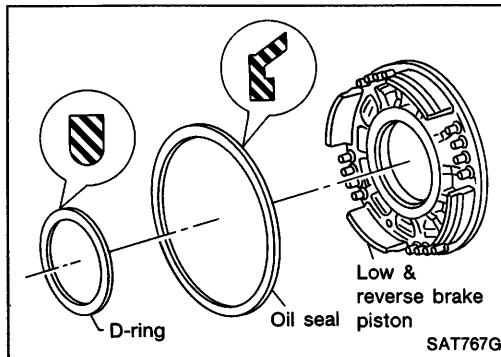
REPAIR FOR COMPONENT PARTS

Low & Reverse Brake (Cont'd)

- Do not remove return springs from spring retainer.



7. Apply compressed air to oil hole of transmission case while holding piston.
8. Remove piston from transmission case by turning it.



9. Remove D-ring and oil seal from piston.

INSPECTION

Low & reverse clutch snap ring, spring retainer and return springs

- Check for deformation, fatigue or damage. If necessary, replace.
- When replacing spring retainer and return springs, replace them as a set.

REPAIR FOR COMPONENT PARTS

Low & Reverse Brake (Cont'd)

Low & reverse brake drive plate

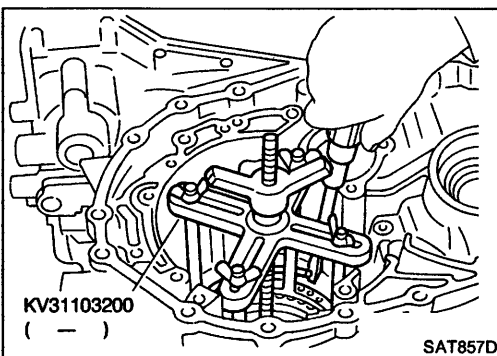
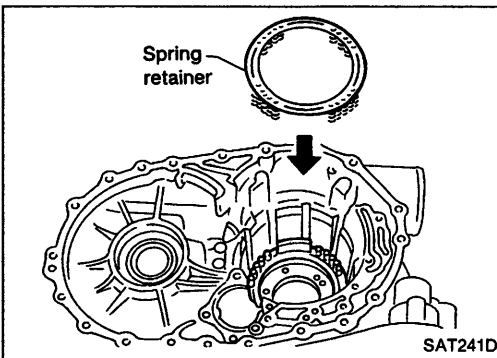
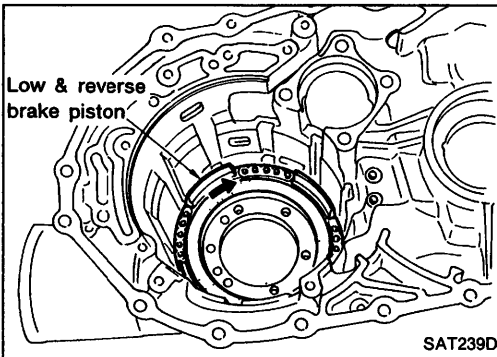
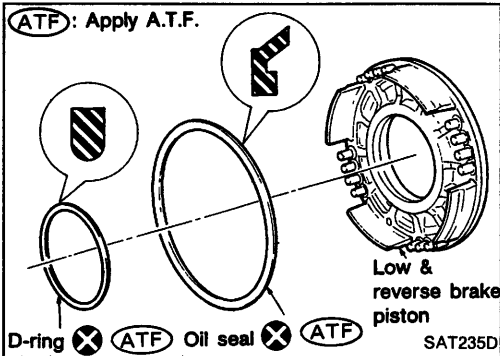
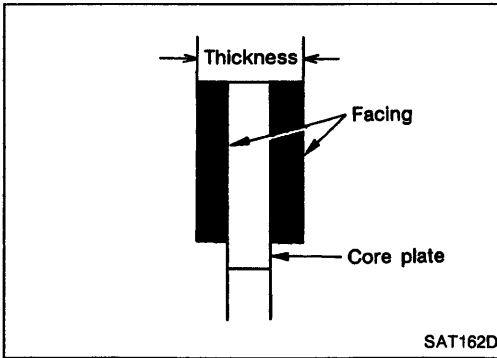
- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate:

Standard value 2.0 mm (0.079 in)

Wear limit 1.8 mm (0.071 in)

- If not within wear limit, replace.



ASSEMBLY

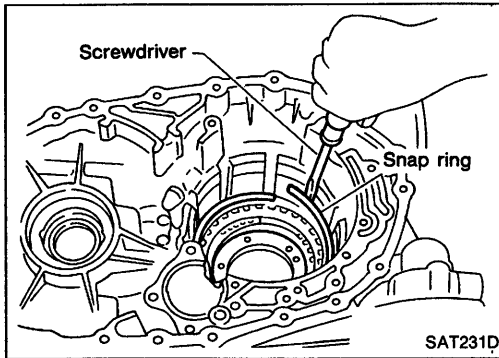
1. Install D-ring and oil seal on piston.
- Take care with the direction of oil seal.
- Apply A.T.F. to both parts.
2. Stand transmission case.
3. Install piston assembly on transmission case by turning it slowly.
- Apply A.T.F. to inner surface of transmission case.

4. Install return springs and spring retainer on piston.

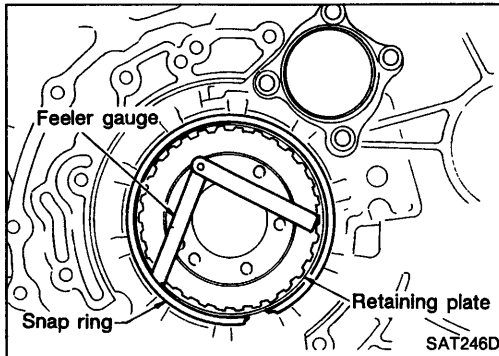
5. Install snap ring while compressing return springs.
- Set Tool directly over return springs.

REPAIR FOR COMPONENT PARTS

Low & Reverse Brake (Cont'd)



6. Install drive plates, driven plates and retaining plate.
7. Install snap ring.



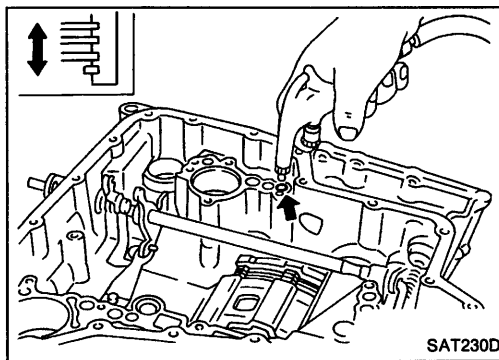
8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate. (front side)

Specified clearance:

Standard 1.4 - 1.8 mm (0.055 - 0.071 in)

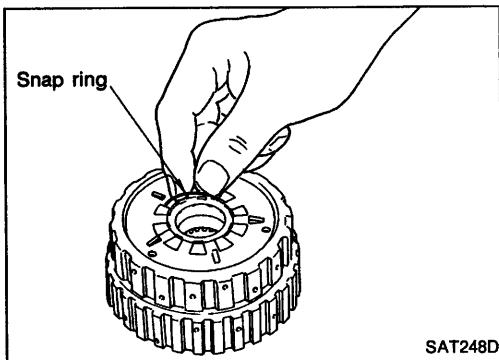
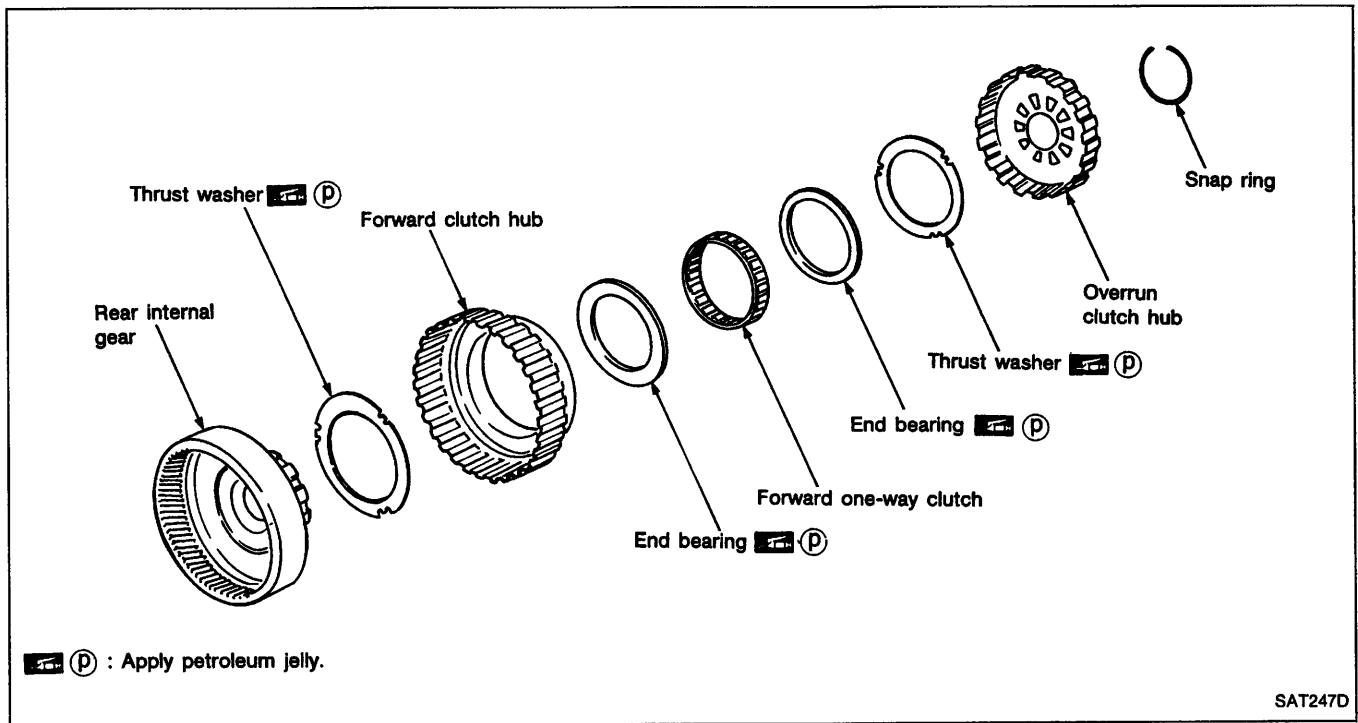
Allowable limit 2.8 mm (0.110 in)

Retaining plate: Refer to S.D.S.



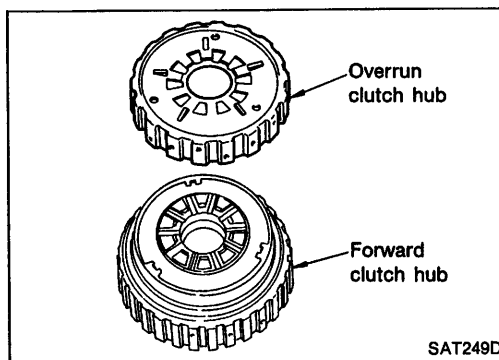
9. Check operation of low & reverse brake. Refer to "DISASSEMBLY" of low & reverse brake.

Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub



DISASSEMBLY

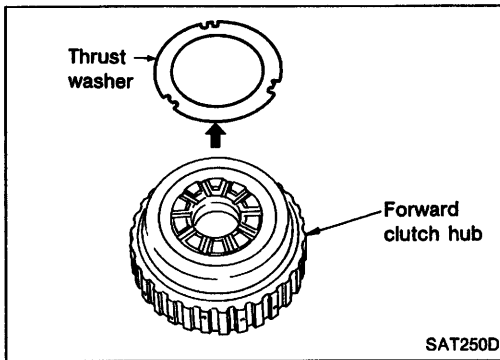
1. Remove snap ring from overrun clutch hub.
2. Remove overrun clutch hub from forward clutch hub.



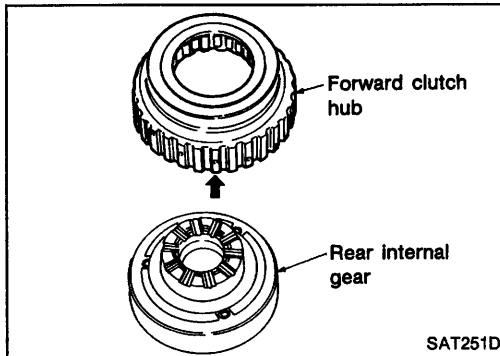
REPAIR FOR COMPONENT PARTS

Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)

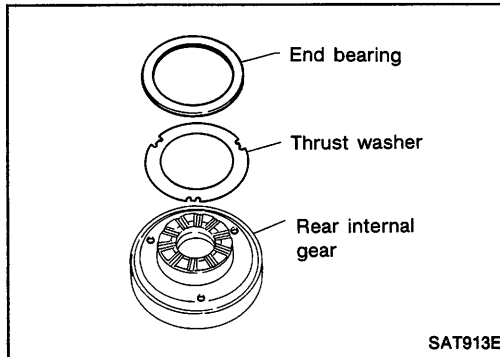
3. Remove thrust washer from forward clutch hub.



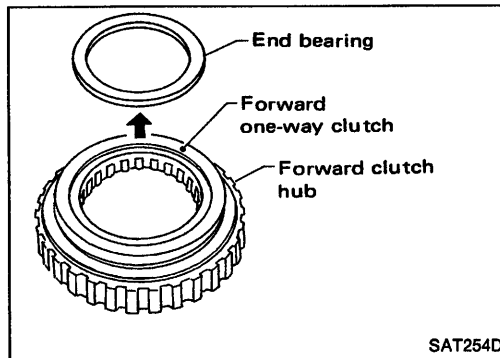
4. Remove forward clutch hub from rear internal gear.



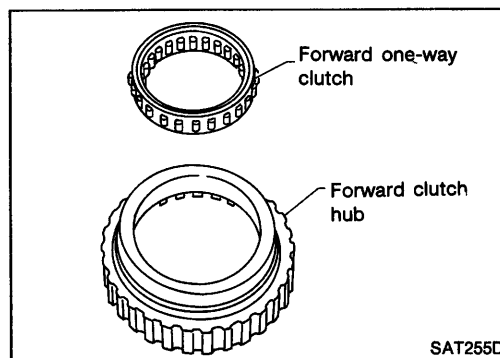
5. Remove end bearing from rear internal gear.
6. Remove thrust washer from rear internal gear.



7. Remove end bearing from forward one-way clutch.



8. Remove forward one-way clutch from forward clutch hub.



REPAIR FOR COMPONENT PARTS

Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)

INSPECTION

Rear internal gear, forward clutch hub and overrun clutch hub

- Check rubbing surfaces for wear or damage.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

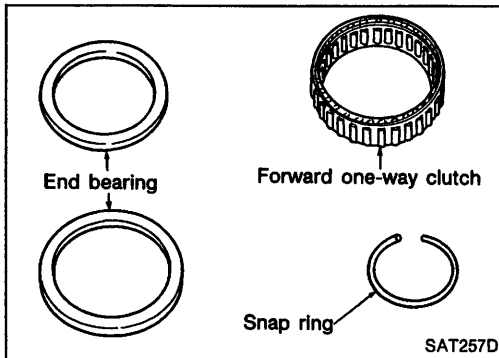
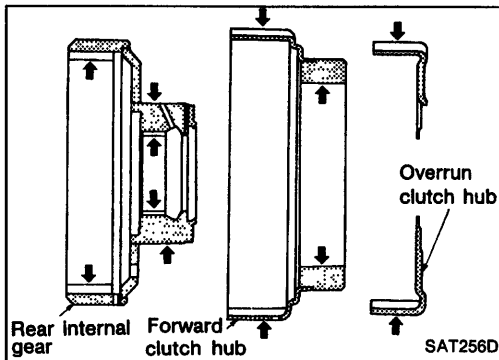
BR

ST

BF

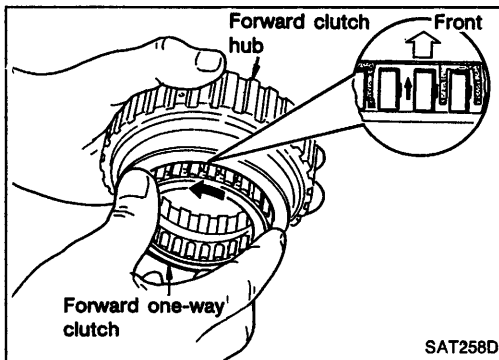
HA

EL



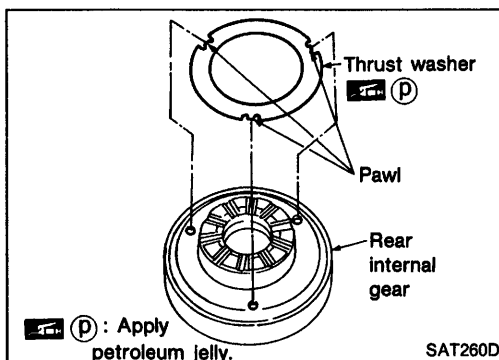
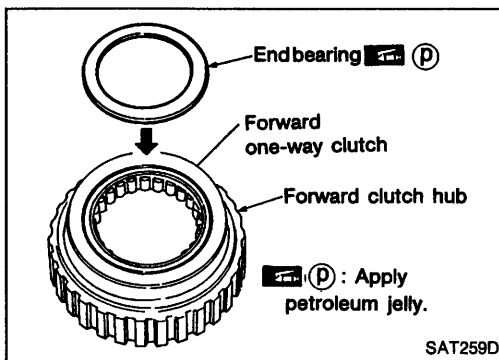
Snap ring, end bearings and forward one-way clutch

- Check snap ring and end bearings for deformation and damage.
- Check forward one-way clutch for wear and damage.



ASSEMBLY

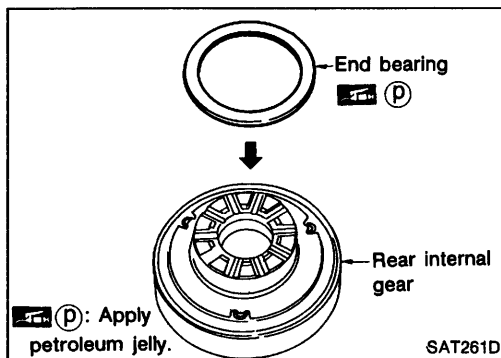
1. Install forward one-way clutch on forward clutch.
- Take care with the direction of forward one-way clutch.



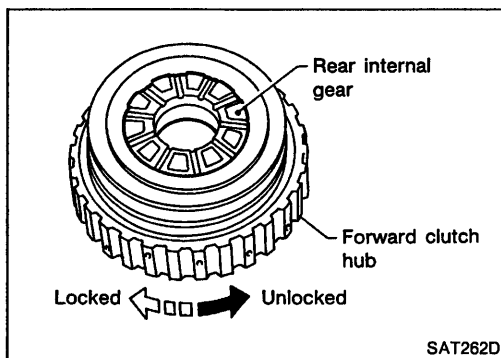
2. Install end bearing on forward one-way clutch.
- Apply petroleum jelly to end bearing.
3. Install thrust washer on rear internal gear.
- Apply petroleum jelly to thrust washer.
- Align hooks of thrust washer with holes of rear internal gear.

REPAIR FOR COMPONENT PARTS

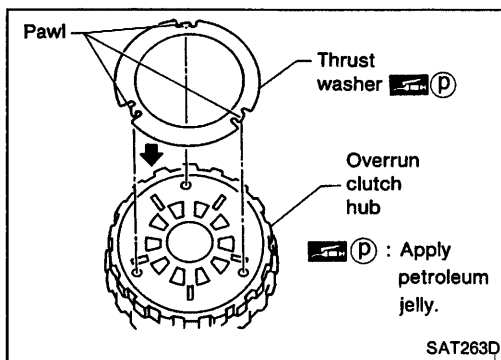
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)



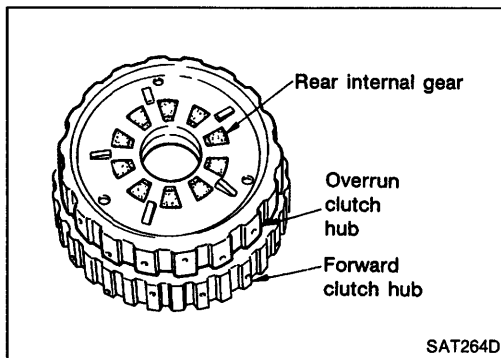
4. Install end bearing on rear internal gear.
- Apply petroleum jelly to end bearing.



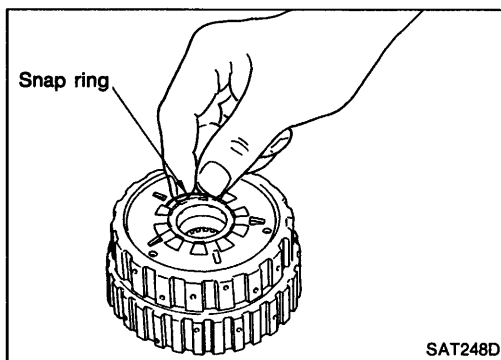
5. Install forward clutch hub on rear internal gear.
- Check operation of forward one-way clutch.



6. Install thrust washer on overrun clutch hub.
- Apply petroleum jelly to thrust washer.
- Align hooks of thrust washer with holes of overrun clutch hub.

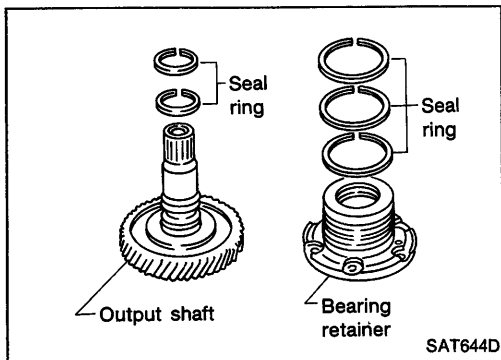
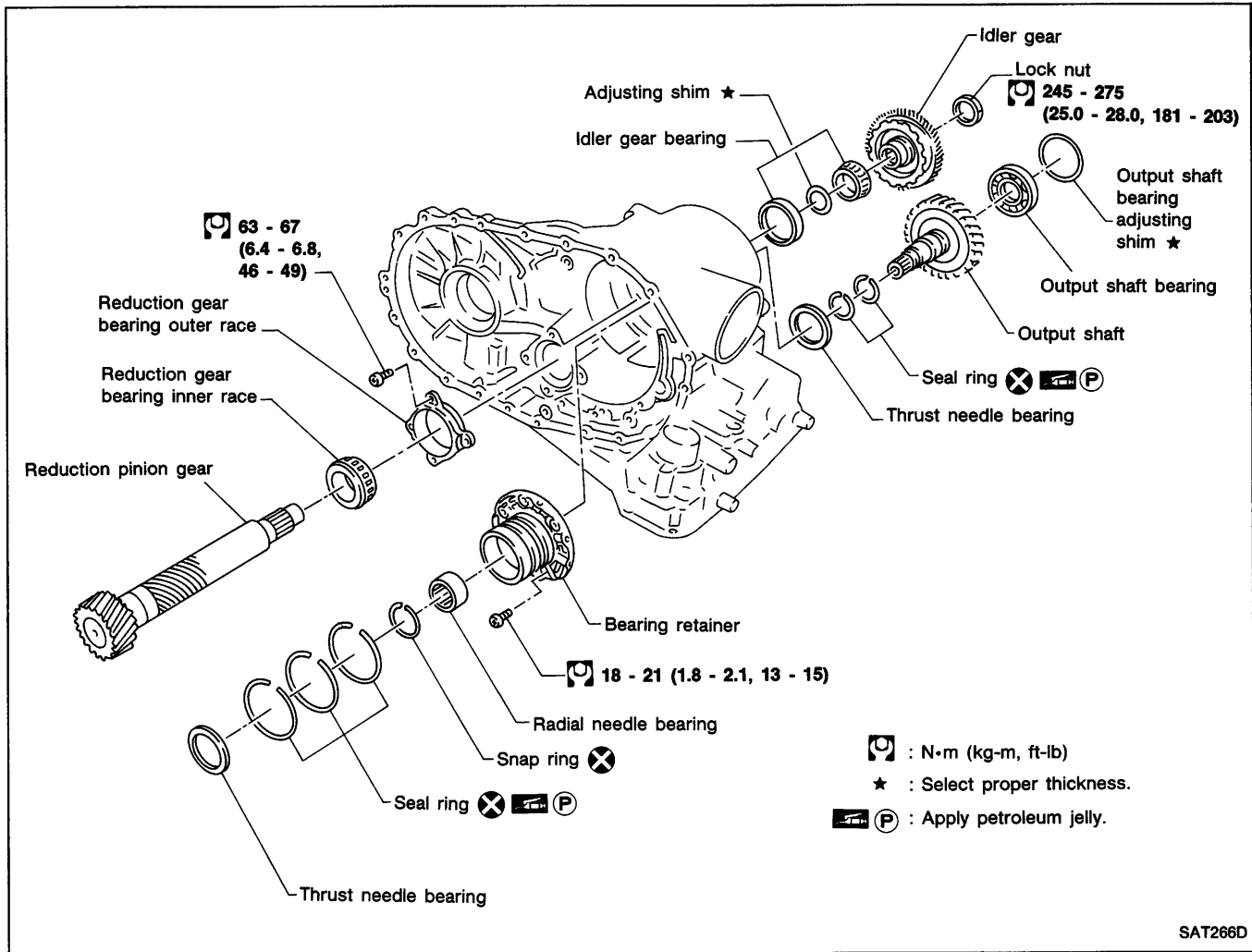


7. Install overrun clutch hub on rear internal gear.
- Align projections of rear internal gear with holes of overrun clutch hub.



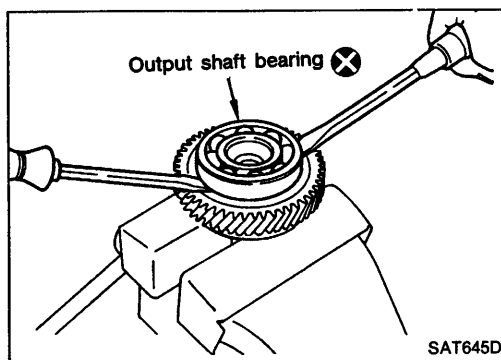
8. Install snap ring to groove of rear internal gear.

Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer



DISASSEMBLY

1. Remove seal rings from output shaft and bearing retainer.

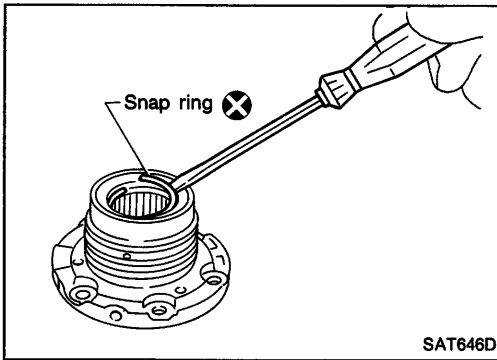


2. Remove output shaft bearing with screwdrivers.
 - Always replace bearing with a new one when removed.
 - Do not damage output shaft.

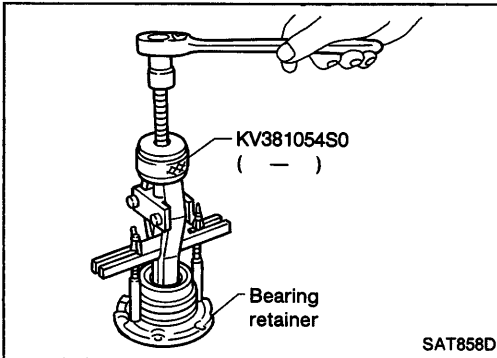
REPAIR FOR COMPONENT PARTS

Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)

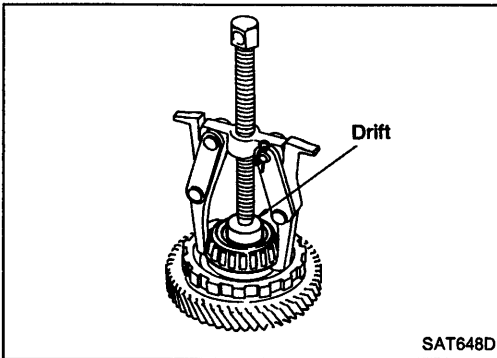
3. Remove snap ring from bearing retainer.



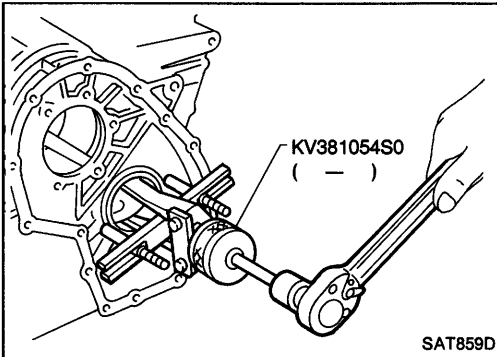
4. Remove needle bearing from bearing retainer.



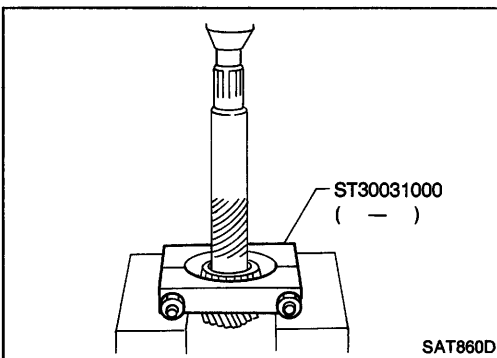
5. Remove idler gear bearing inner race from idler gear.



6. Remove idler gear bearing outer race from transmission case.

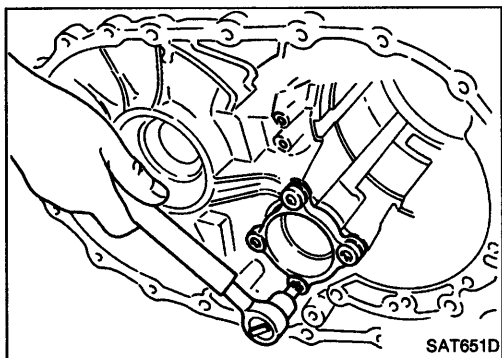


7. Press out reduction gear bearing inner race from reduction gear.



REPAIR FOR COMPONENT PARTS

Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)

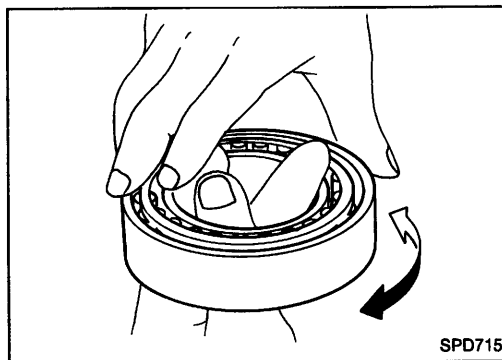


8. Remove reduction gear bearing outer race from transmission case.

INSPECTION

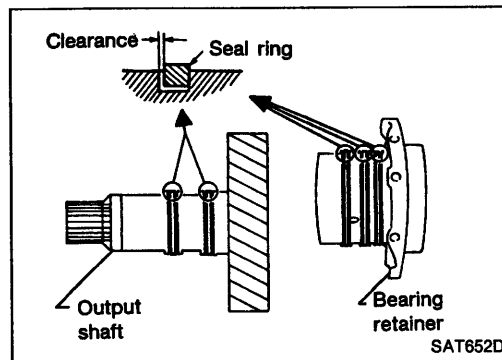
Output shaft, idler gear and reduction gear

- Check shafts for cracks, wear or bending.
- Check gears for wear, chips and cracks.



Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing taper roller bearing, replace outer and inner race as a set.**



Seal ring clearance

- Install new seal rings to output shaft.
- Measure clearance between seal ring and ring groove of output shaft.

Standard clearance:

0.10 - 0.25 mm (0.0039 - 0.0098 in)

Allowable limit:

0.25 mm (0.0098 in)

- If not within allowable limit, replace output shaft.
- Install new seal rings to bearing retainer.
- Measure clearance between seal ring and ring groove of bearing retainer.

Standard clearance:

0.10 - 0.25 mm (0.0039 - 0.0098 in)

Allowable limit:

0.25 mm (0.0098 in)

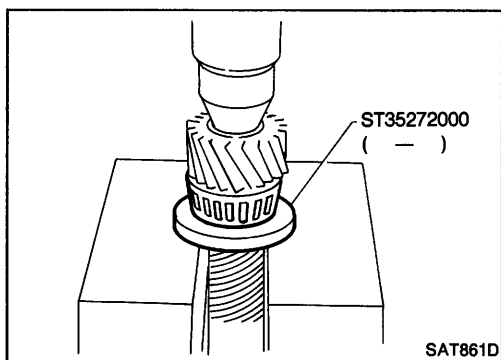
- If not within allowable limit, replace bearing retainer.

REPAIR FOR COMPONENT PARTS

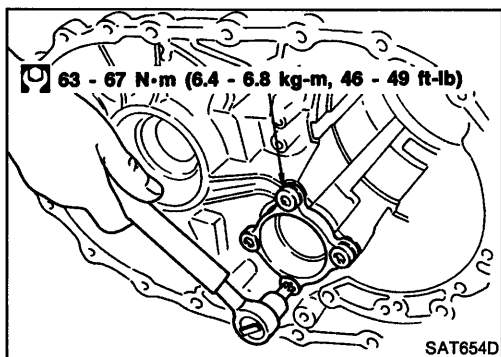
Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)

ASSEMBLY

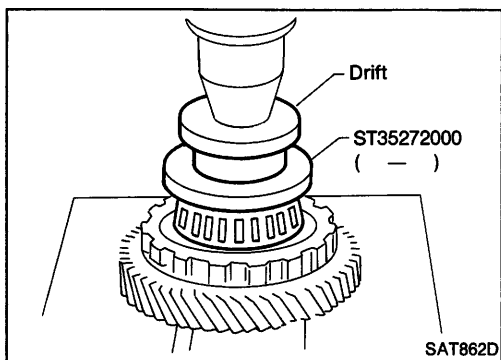
1. Press reduction gear bearing inner race on reduction gear.



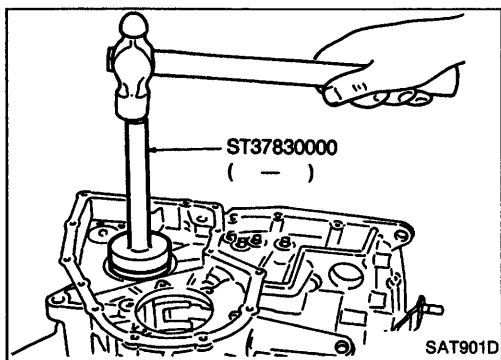
2. Install reduction gear bearing outer race on transmission case.



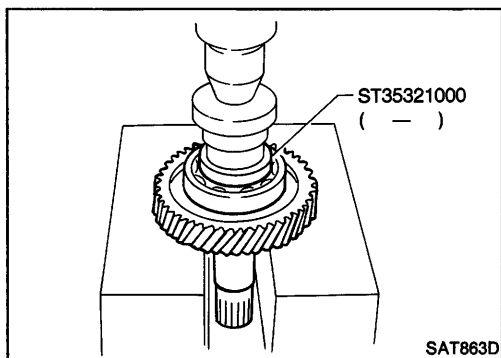
3. Press idler gear bearing inner race on idler gear.



4. Install idler gear bearing outer race on transmission case.



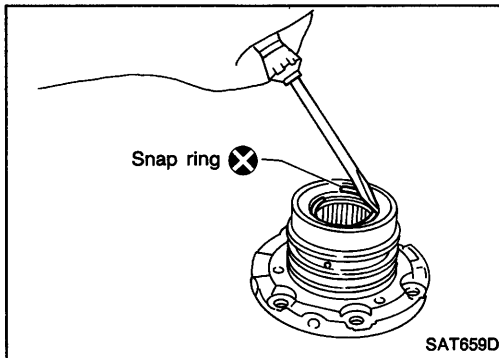
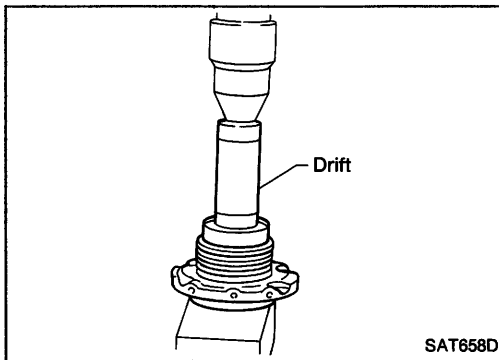
5. Press output shaft bearing on output shaft.



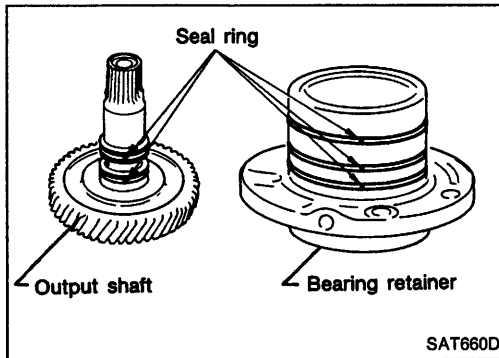
REPAIR FOR COMPONENT PARTS

Output Shaft, Idler Gear, Reduction Gear and Bearing Retainer (Cont'd)

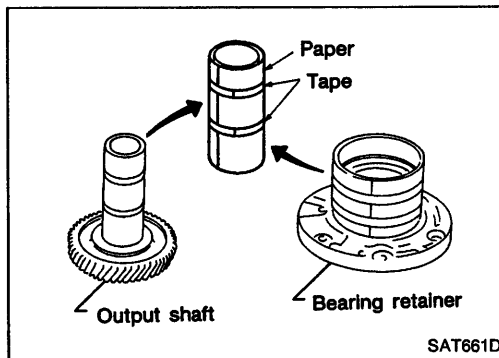
6. Press needle bearing on bearing retainer.



7. Install snap ring to bearing retainer.



8. Install new seal rings to output shaft and bearing retainer carefully after packing ring grooves with petroleum jelly.



- Roll paper around seal rings to prevent seal rings from spreading.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

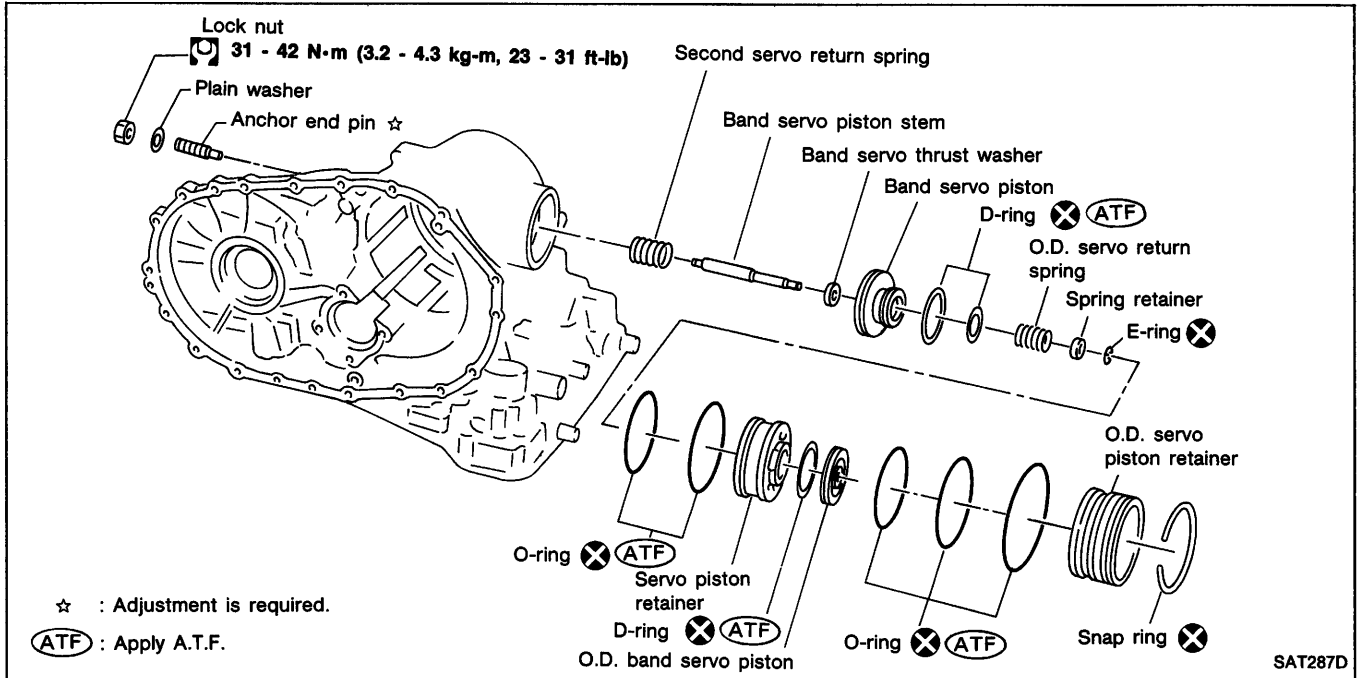
ST

BF

HA

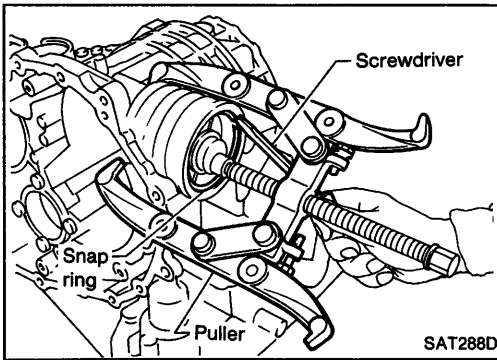
EL

Band Servo Piston Assembly



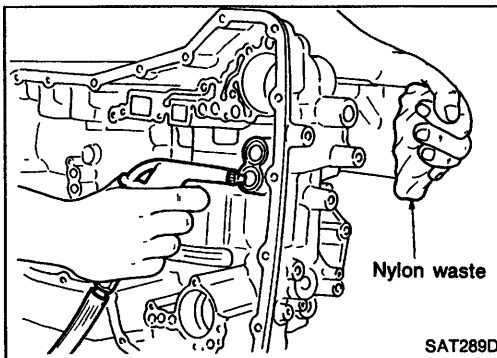
DISASSEMBLY

1. Remove band servo piston snap ring.



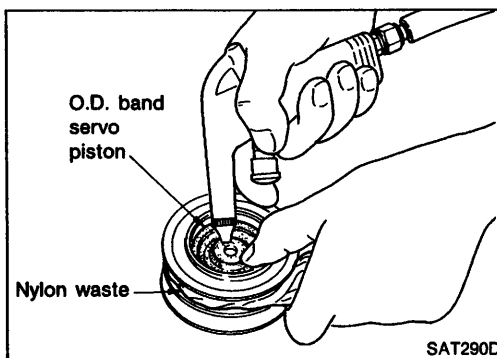
2. Apply compressed air to oil hole in transmission case to remove O.D. servo piston retainer and band servo piston assembly.

- Hold band servo piston assembly with a rag.



3. Apply compressed air to oil hole in O.D. servo piston retainer to remove O.D. band servo piston from retainer.

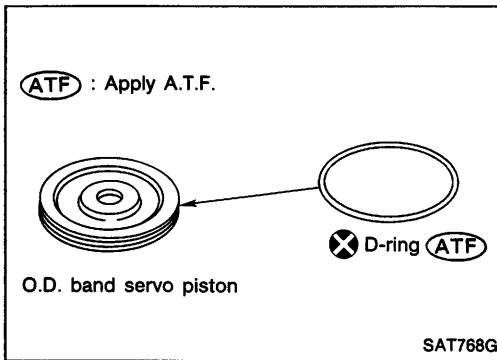
- Hold O.D. band servo piston while applying compressed air.



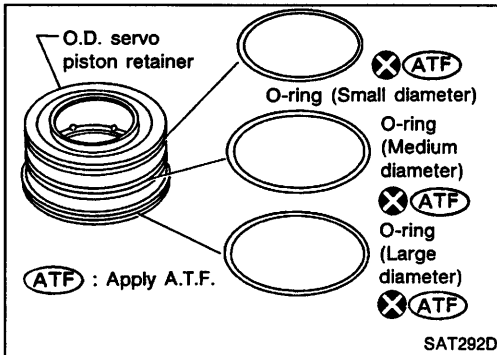
REPAIR FOR COMPONENT PARTS

Band Servo Piston Assembly (Cont'd)

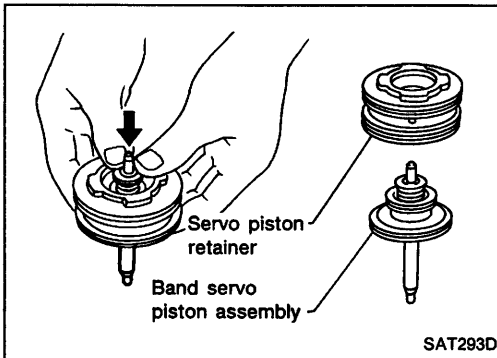
4. Remove D-ring from O.D. band servo piston.



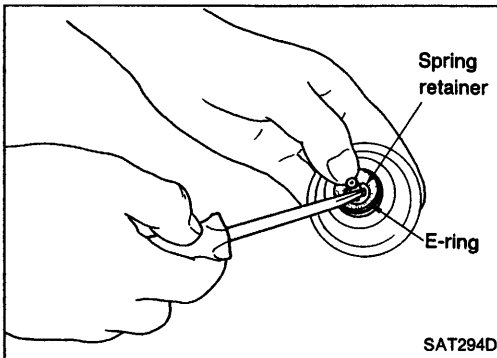
5. Remove O-rings from O.D. servo piston retainer.



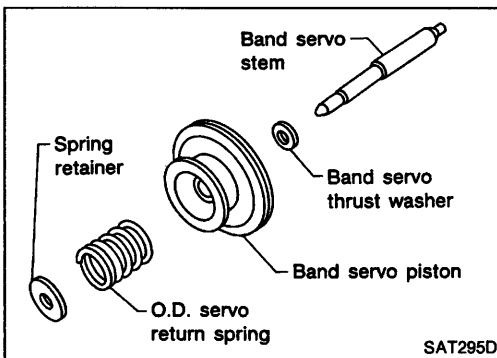
6. Remove band servo piston assembly from servo piston retainer by pushing it forward.



7. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.



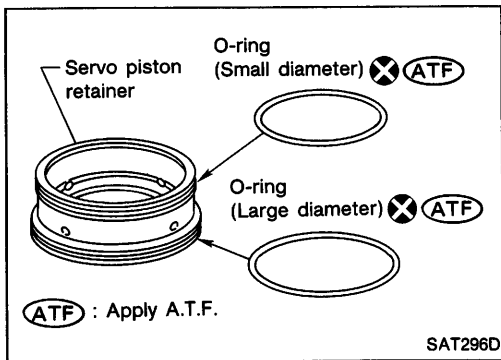
8. Remove O.D. servo return spring, band servo thrust washer and band servo piston stem from band servo piston.



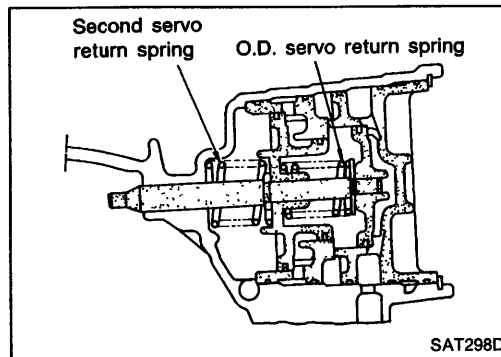
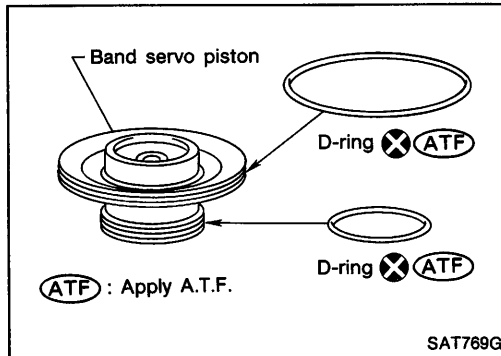
REPAIR FOR COMPONENT PARTS

Band Servo Piston Assembly (Cont'd)

9. Remove O-rings from servo piston retainer.



10. Remove D-rings from band servo piston.



INSPECTION

Pistons, retainers and piston stem

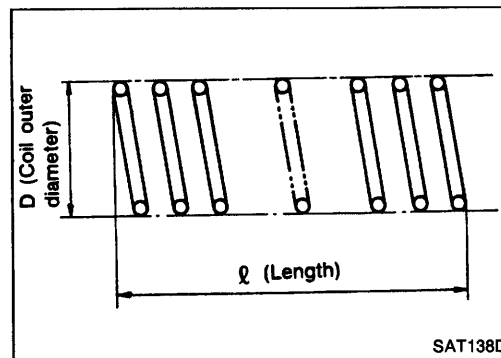
- Check frictional surfaces for abnormal wear or damage.

Return springs

- Check for deformation or damage.
- Measure free length and outer diameter.

Inspection standard

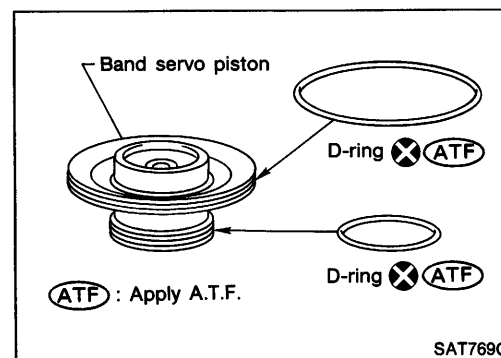
Parts	Unit: mm (in)	
	Free length	Outer diameter
2nd servo return spring	32.5 (1.280)	25.9 (1.020)
O.D. servo return spring	31.0 (1.220)	21.7 (0.854)



ASSEMBLY

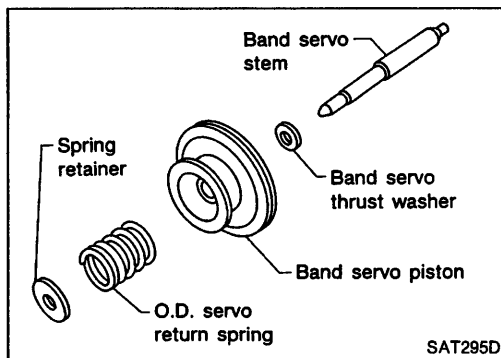
1. Install D-rings to servo piston retainer.

- Apply A.T.F. to D-rings.
- Pay attention to position of each O-ring.

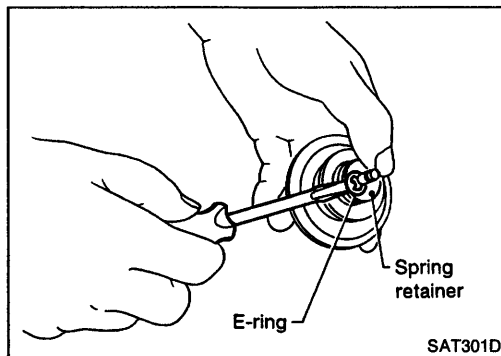


REPAIR FOR COMPONENT PARTS

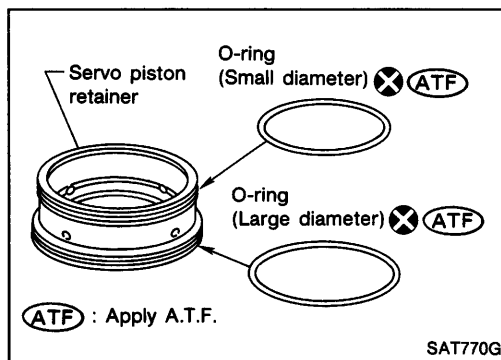
Band Servo Piston Assembly (Cont'd)



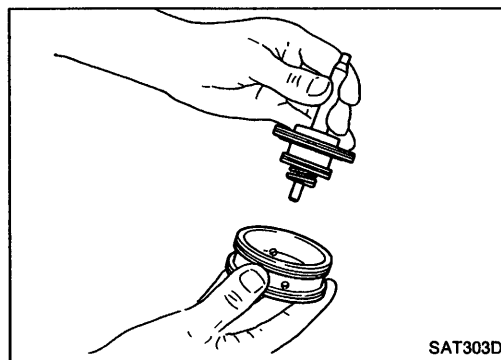
2. Install band servo piston stem, band servo thrust washer, O.D. servo return spring and spring retainer to band servo piston.



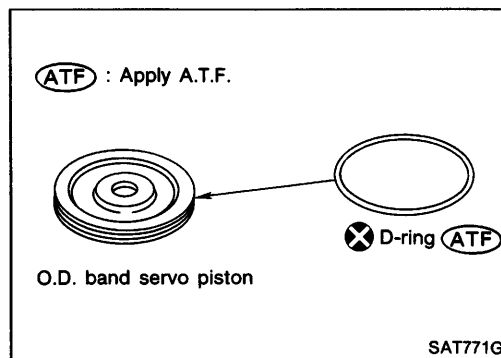
3. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.



4. Install O-rings to servo piston retainer.
 - Apply A.T.F. to O-rings.
 - Pay attention to position of each O-ring.



5. Install band servo piston assembly to servo piston retainer by pushing it inward.



6. Install D-ring to O.D. band servo piston.
 - Apply A.T.F. to D-ring.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

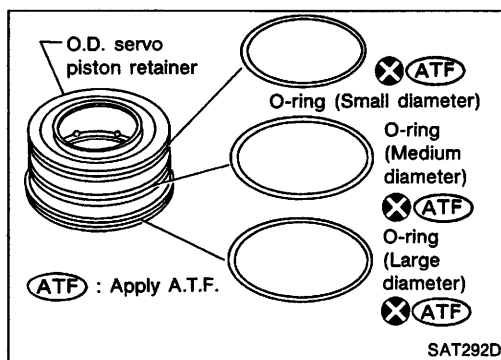
BF

HA

EL

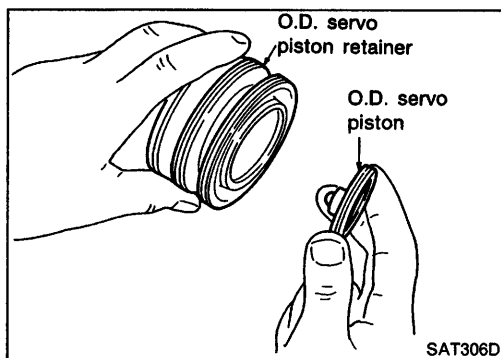
REPAIR FOR COMPONENT PARTS

Band Servo Piston Assembly (Cont'd)

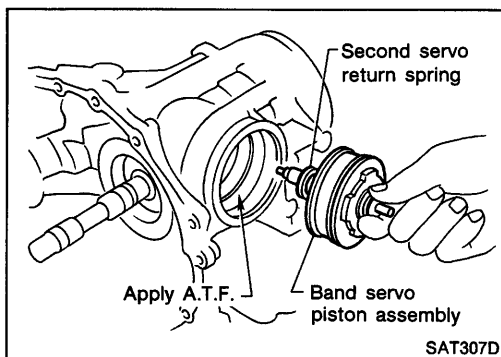


7. Install O-rings to O.D. servo piston retainer.

- Apply A.T.F. to O-rings.
- Pay attention to position of each O-ring.

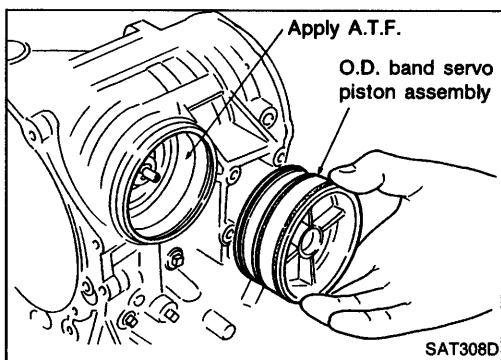


8. Install O.D. band servo piston to O.D. servo piston retainer.



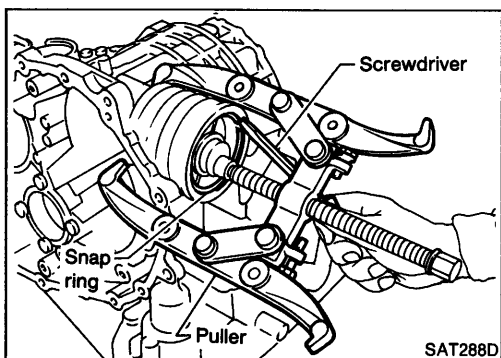
9. Install band servo piston assembly and 2nd servo return spring to transmission case.

- Apply A.T.F. to O-ring of band servo piston and transmission case.



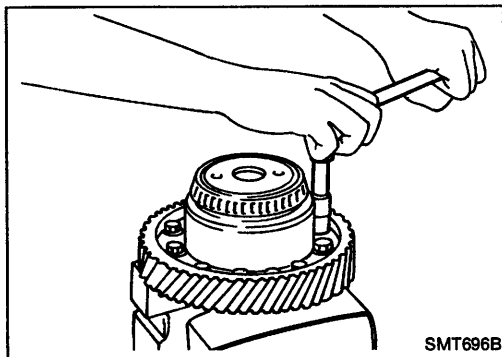
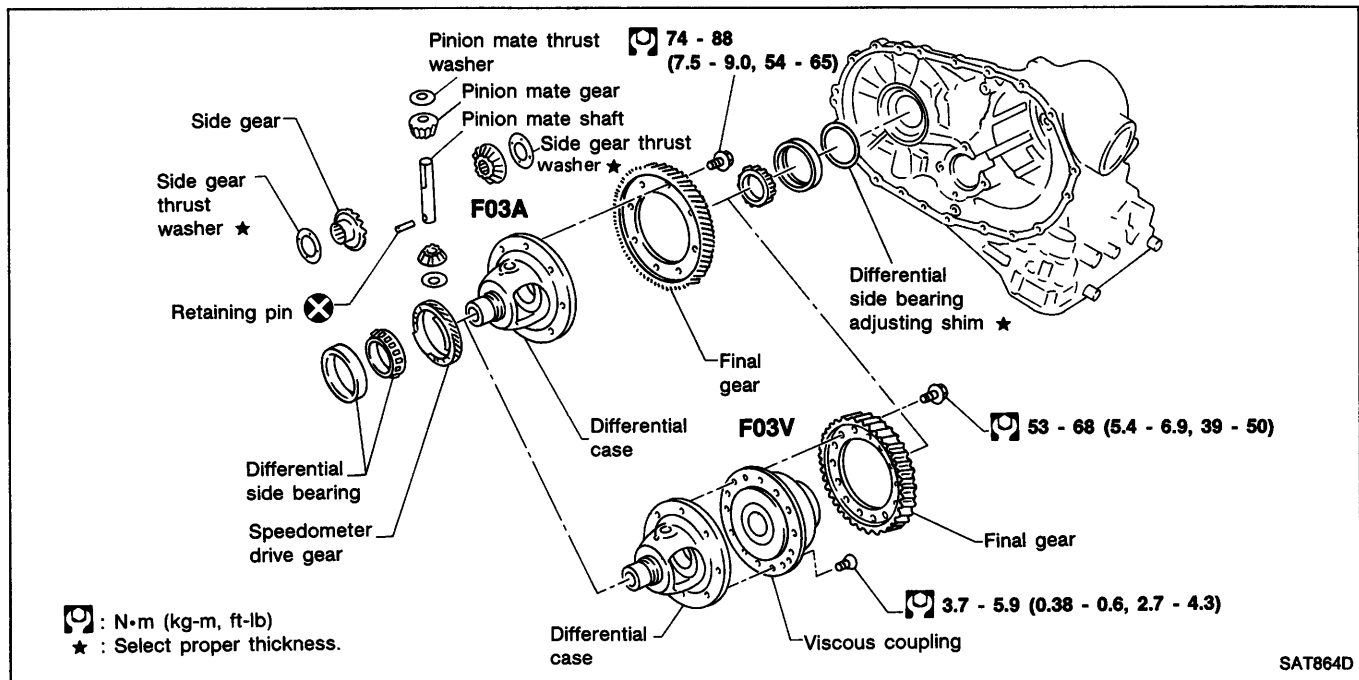
10. Install O.D. band servo piston assembly to transmission case.

- Apply A.T.F. to O-ring of band servo piston and transmission case.



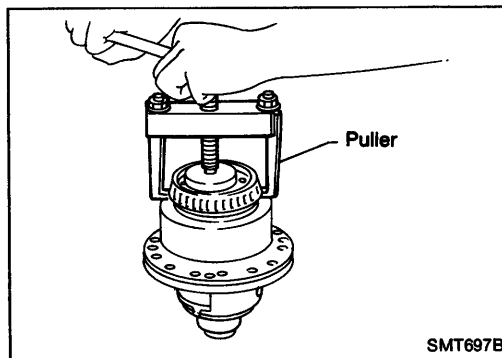
11. Install band servo piston snap ring to transmission case.

Final Drive

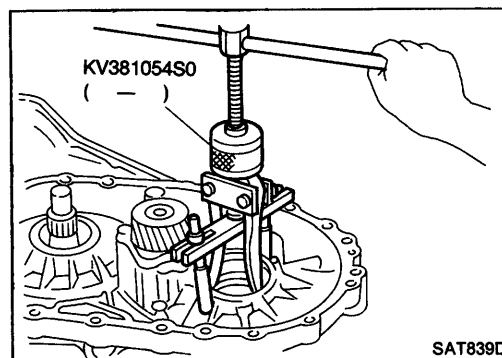


DISASSEMBLY

1. Remove final gear.



2. Press out differential side bearings.

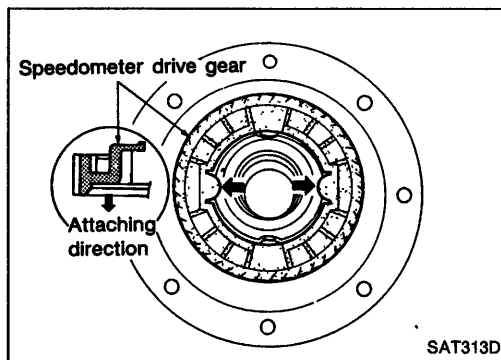


3. Remove differential side bearing outer race, and side bearing adjusting shim from transmission case.

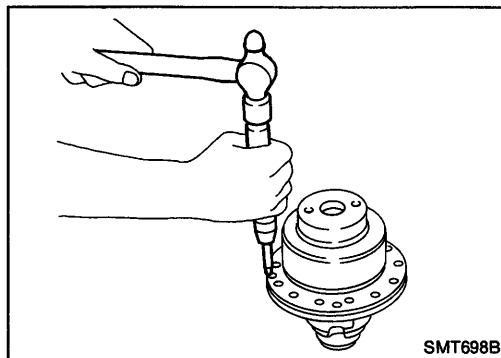
REPAIR FOR COMPONENT PARTS

Final Drive (Cont'd)

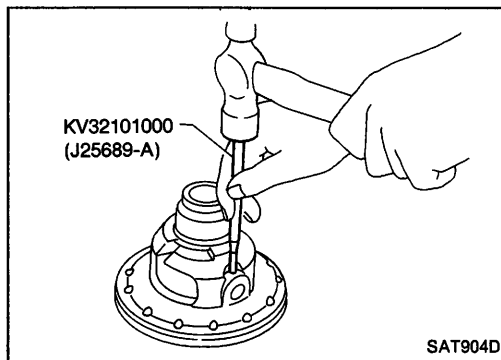
4. Remove speedometer drive gear.



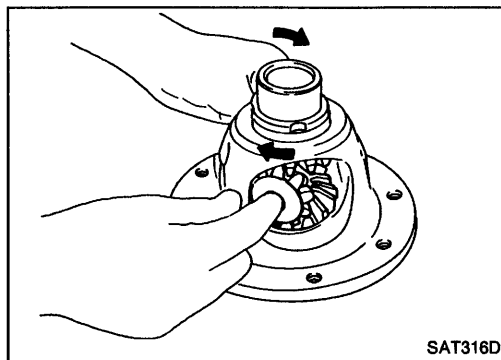
5. Remove viscous coupling — RL4F03V.



6. Drive out pinion mate shaft retaining pin.



7. Draw out pinion mate shaft from differential case.
8. Remove pinion mate gears and side gears.



REPAIR FOR COMPONENT PARTS

Final Drive (Cont'd)

INSPECTION

Gear, washer, shaft and case

- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

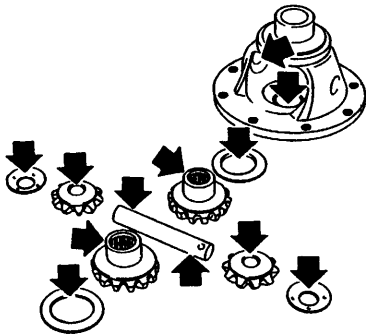
ST

BF

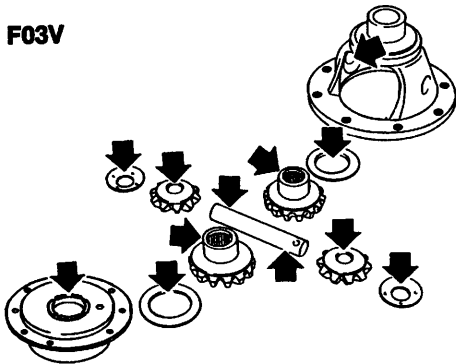
HA

EL

F03A



F03V



SAT865D

Viscous coupling — RL4F03V

- Check case for cracks.
- Check silicone oil for leakage

MT

AT

FA

RA

BR

ST

BF

HA

EL

Bearings

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing taper roller bearing, replace outer and inner race as a set.**

BR

ST

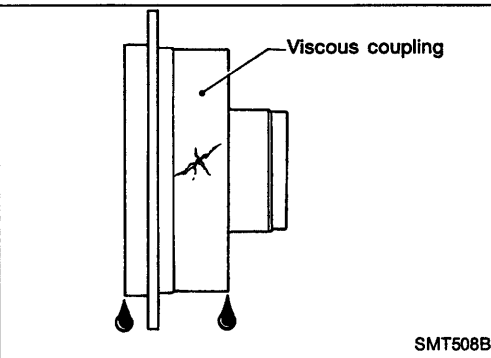
BF

HA

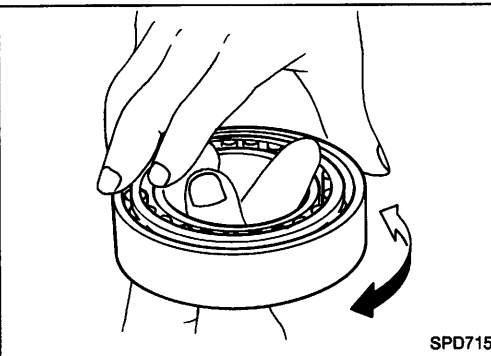
EL

ASSEMBLY

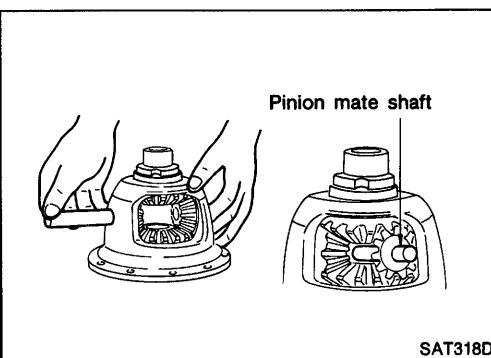
1. Install side gears and thrust washers in differential case.
 2. Install pinion mate gears and thrust washers in differential case while rotating them.
- **Apply A.T.F. to any parts.**



SMT508B



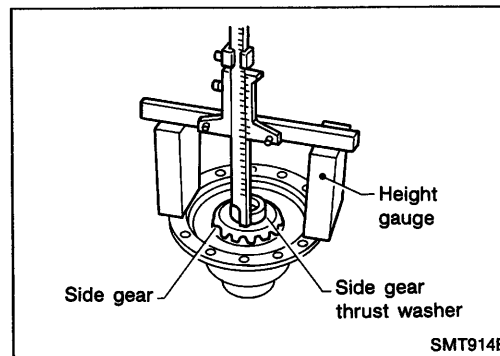
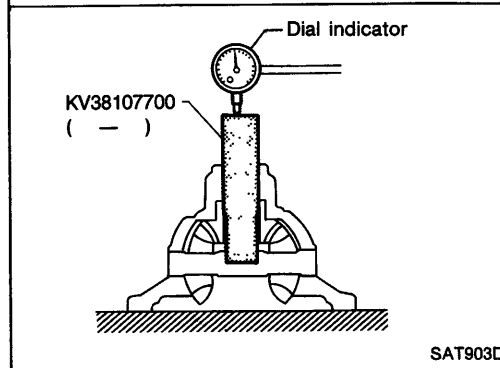
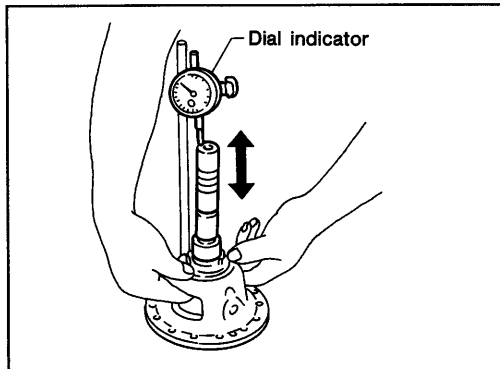
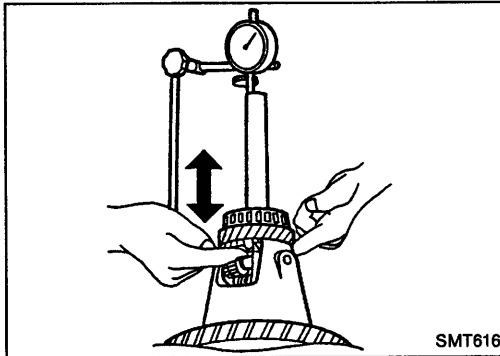
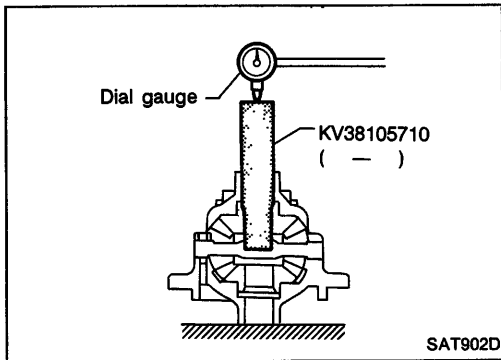
SPD715



SAT318D

REPAIR FOR COMPONENT PARTS

Final Drive (Cont'd)



— RL4F03A —

3. Measure clearance between side gear and differential case with washers using the following procedure.
 - 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 specifications, adjust clearance by changing thickness of side gear thrust washers.

Side gear thrust washer: Refer to S.D.S.

— RL4F03V —

3. Measure clearance between side gear and differential case & viscous coupling with washers using the following procedure:

Differential case side

- a. Set Tool and dial indicator on side gear.
- b. Move side gear up and down to measure dial indicator deflection.

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 washer.

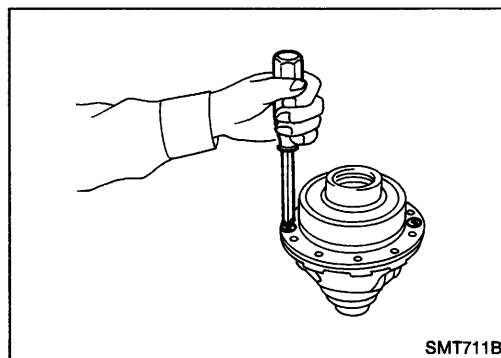
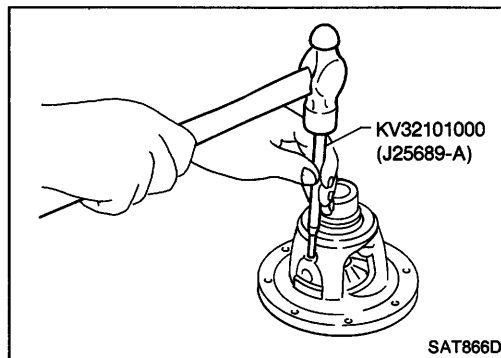
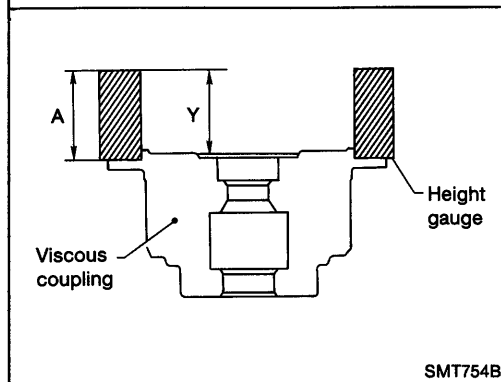
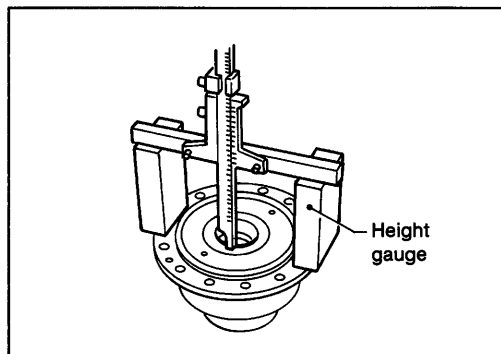
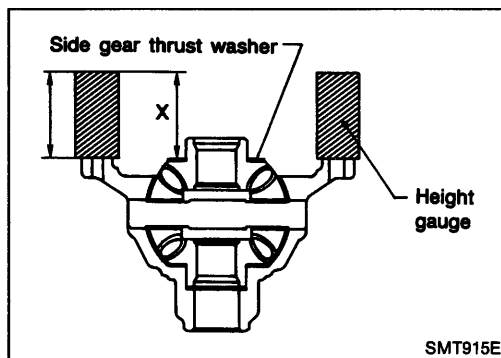
**Side gear thrust washers for differential case side:
Refer to S.D.S.**

Viscous coupling side

- a. Place side gear and thrust washer on pinion mate gears installed on differential case.
- b. Measure dimension X.
- **Measure dimension X in at least four places.**

REPAIR FOR COMPONENT PARTS

Final Drive (Cont'd)



- c. Measure dimension Y.
- **Measure dimension Y in at least four places.**
Clearance between side gear and viscous coupling
 $= X + Y - 2A: 0.1 - 0.2 \text{ mm } (0.004 - 0.008 \text{ in})$
A: Height of gauge
- d. If not within specification, adjust clearance by changing thickness of side gear thrust washer.
Side gear thrust washers for viscous coupling side:
Refer to S.D.S.

4. Install retaining pin.
- **Make sure that retaining pin is flush with case.**
5. Install viscous coupling — RL4F03V.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

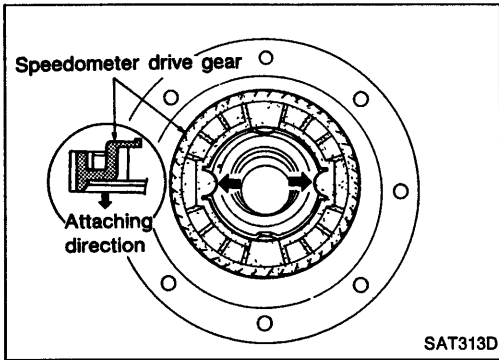
BF

HA

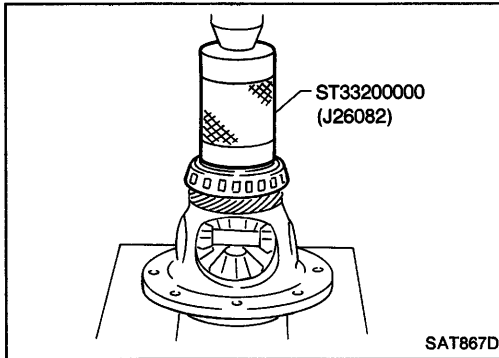
EL

REPAIR FOR COMPONENT PARTS

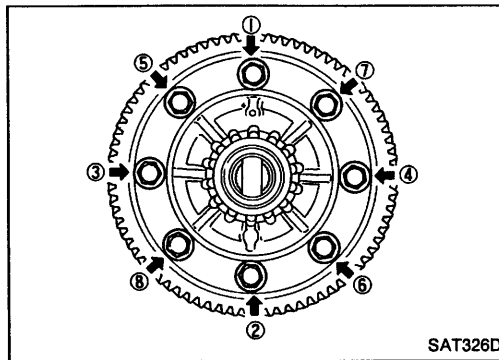
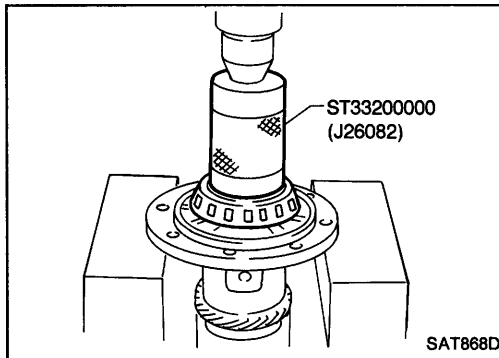
Final Drive (Cont'd)



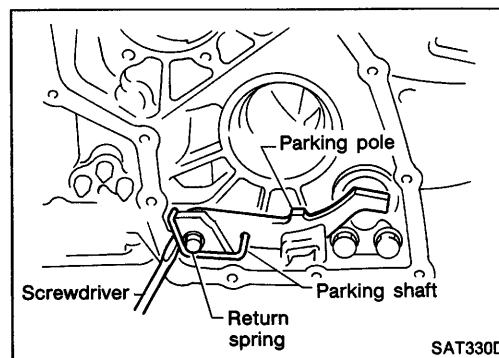
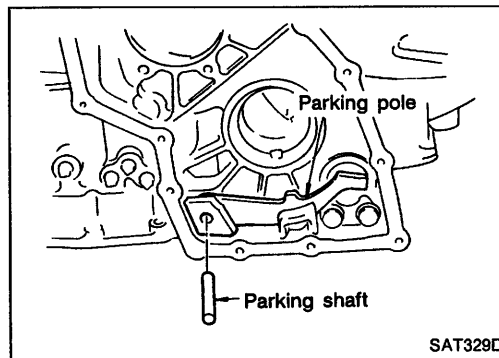
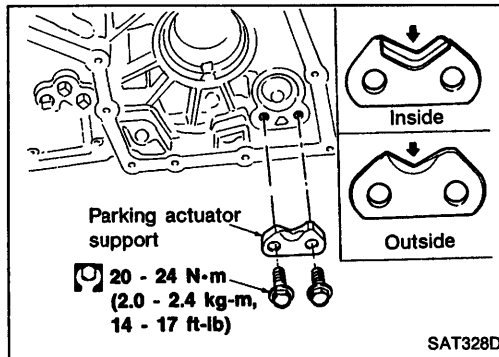
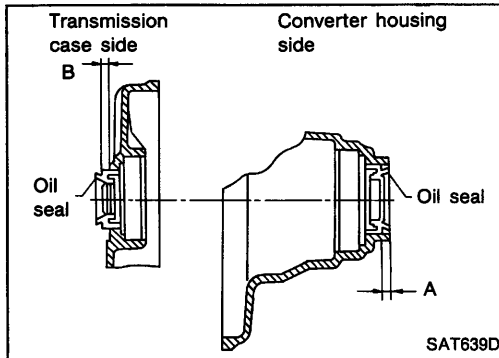
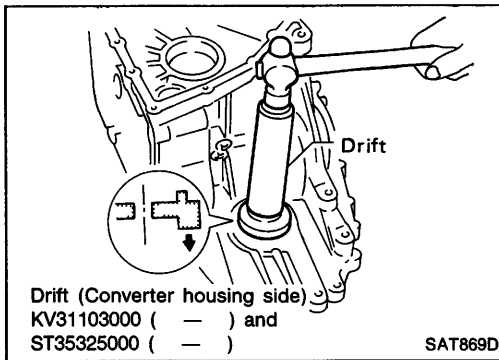
6. Install speedometer drive gear on differential case.
 - **Align the projection of speedometer drive gear with the groove of differential case.**



7. Press differential side bearings on differential case.



8. Install final gear and tighten fixing bolts in numerical order.



Assembly 1

1. Install differential side oil seals on transmission case and converter housing so that "A" and "B" are within specifications.

Unit: mm (in)

A	B
5.5 - 6.5 (0.217 - 0.256)	0.5 (0.020) or less

2. Install parking actuator support to transmission case.
 - Pay attention to direction of parking actuator support.

3. Install parking pawl on transmission case and fix it with parking shaft.

4. Install return spring.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

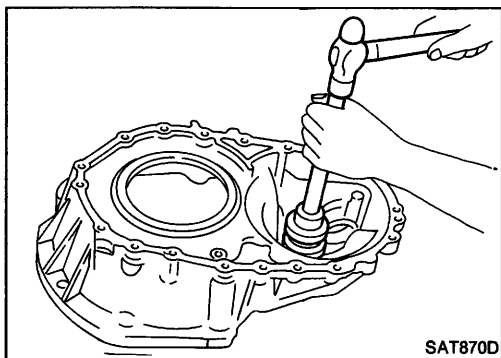
BR

ST

BF

HA

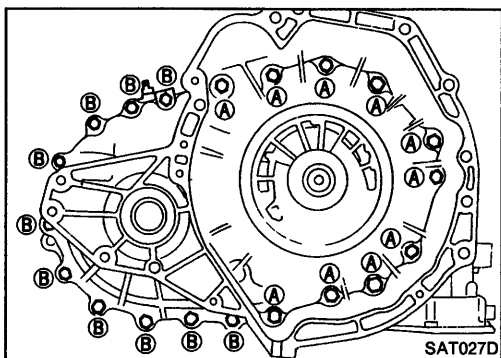
EL



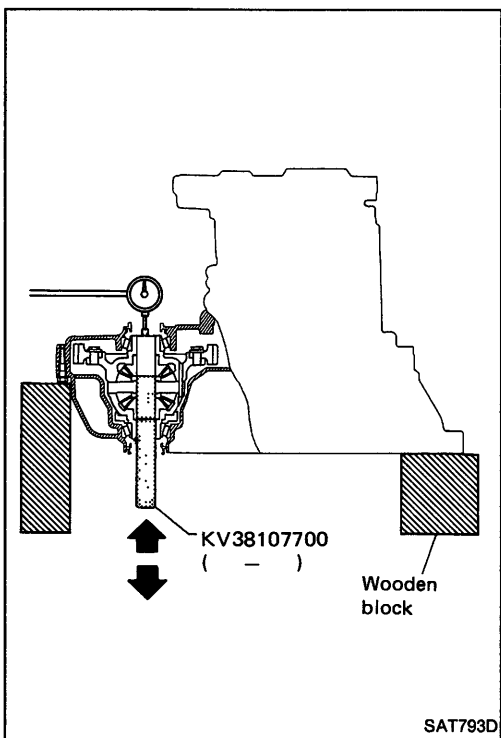
Adjustment 1

DIFFERENTIAL SIDE BEARING PRELOAD

1. Install differential side bearing outer race without adjusting shim on transmission case.
2. Install differential side bearing outer race on converter housing.

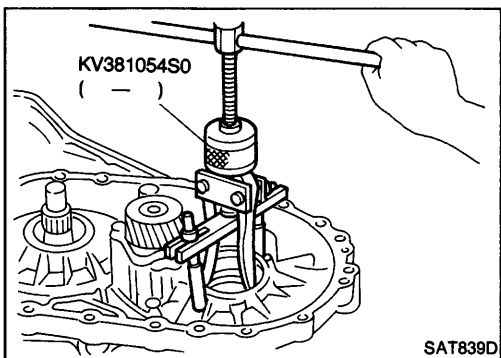


3. Place final drive assembly on transmission case.
4. Install transmission case on converter housing and tighten transmission case fixing bolts (A) and (B) to the specified torque.



5. Attach dial indicator on differential case at converter housing side.
6. Insert Tool into differential side gear from transmission case. — RL4F03A
Insert Tool into differential side gear from converter housing side. — RL4F03V
7. Move Tool up and down and measure dial indicator deflection.
8. Select proper thickness of differential side bearing adjusting shim(s) using S.D.S. table as a guide.

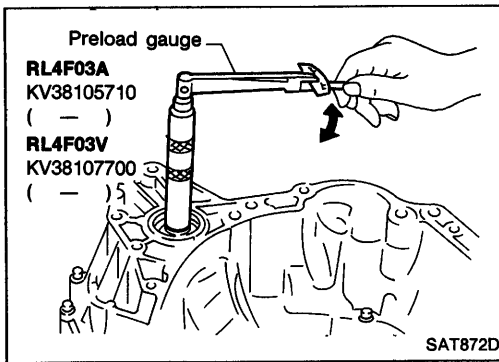
Differential side bearing adjusting shim: Refer to S.D.S.



9. Remove converter housing from transmission case.
10. Remove final drive assembly from transmission case.
11. Remove differential side bearing outer race from transmission case.
12. Reinstall differential side bearing outer race and shim(s) selected from S.D.S. table on transmission case.
13. Reinstall converter housing on transmission case and tighten transmission case fixing bolts to the specified torque.

ASSEMBLY

Adjustment 1 (Cont'd)



14. Insert Tool into differential case and measure turning torque of final drive assembly.

- When measuring turning torque, turn final drive assembly in both directions several times to seat bearing rollers correctly.

Turning torque of final drive assembly (New bearing):
0.49 - 1.08 N·m (5.0 - 11.0 kg-cm, 4.3 - 9.5 in-lb)

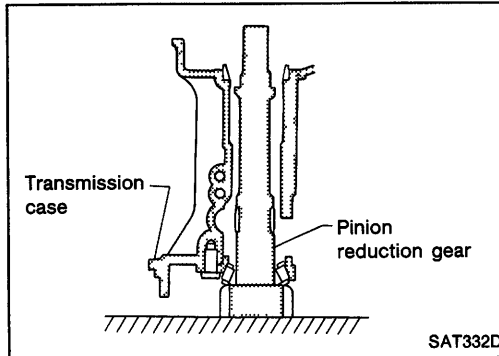
- When old bearing is used again, turning torque will be slightly less than the above.
- Make sure torque is close to the specified range.

GI

MA

EM

REDUCTION GEAR BEARING PRELOAD



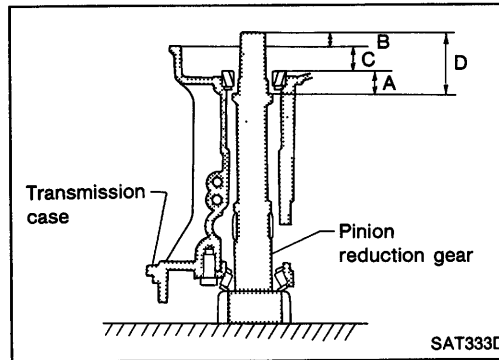
1. Remove transmission case and final drive assembly from converter housing.
2. Select proper thickness of reduction gear bearing adjusting shim using the following procedures.
 - a. Place reduction gear on transmission case as shown.

LC

EF &
EC

FE

CL



- b. Place idler gear bearing on transmission case.
- c. Measure dimensions "B" "C" and "D" and calculate dimension "A".

$$A = D - (B + C)$$

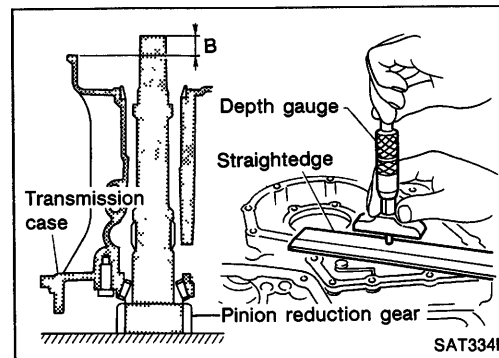
"A": Distance between the surface of idler gear bearing inner race and the adjusting shim mating surface of reduction gear.

MT

AT

FA

RA



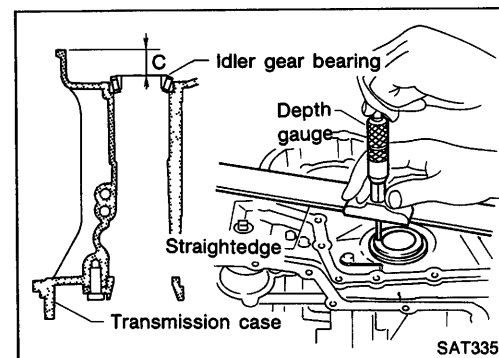
- Measure dimension "B" between the end of reduction gear and the surface of transmission case.
- Measure dimension "B" in at least two places.

BR

ST

BF

HA

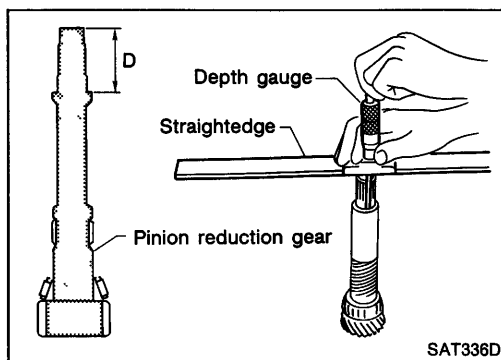


- Measure dimension "C" between the surface of idler gear bearing inner race and the surface of transmission case.
- Measure dimension "C" in at least two places.

EL

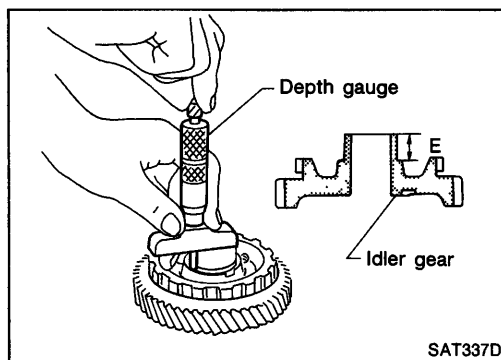
ASSEMBLY

Adjustment 1 (Cont'd)



- Measure dimension "D" between the end of reduction gear and the adjusting shim mating surface of reduction gear.
- **Measure dimension "D" in at least two places.**
- Calculate dimension "A"

$$A = D - (B + C)$$

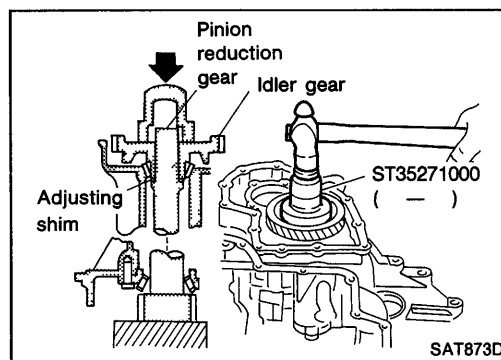


- d. Measure dimension "E" between the end of idler gear and the idler gear bearing inner race mating surface of idler gear.
- **Measure dimension "E" in at least two places.**

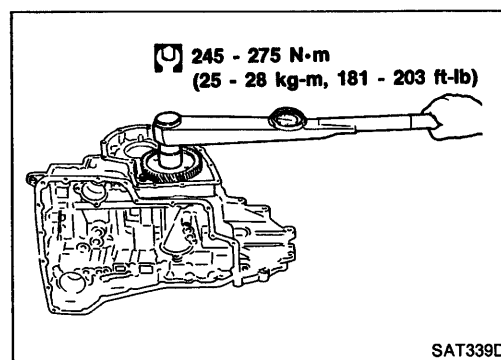
- e. Calculate "T" and select proper thickness of reduction gear bearing adjusting shim using S.D.S. table as a guide.

$$T = A - E$$

Reduction gear bearing adjusting shim: Refer to S.D.S.



3. Install reduction gear and reduction gear bearing adjusting shim selected in step 2-e on transmission case.
 4. Press idler gear bearing inner race on idler gear.
 5. Press idler gear on reduction gear.
- **Press idler gear so that idler gear can be locked by parking pawl.**

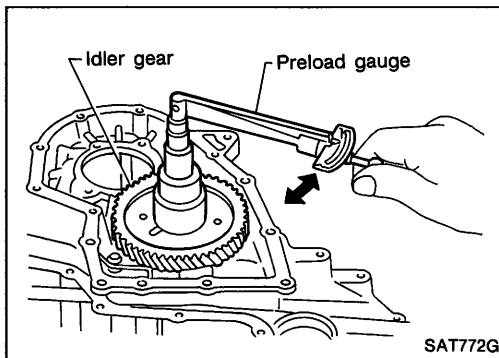


**245 - 275 N·m
(25 - 28 kg-m, 181 - 203 ft-lb)**

6. Tighten idler gear lock nut to the specified torque.
- **Lock idler gear with parking pawl when tightening lock nut.**

ASSEMBLY

Adjustment 1 (Cont'd)



7. Measure turning torque of reduction gear.

- When measuring turning torque, turn reduction gear in both directions several times to seat bearing rollers correctly.

Turning torque of reduction gear:

0.11 - 0.69 N·m (1.1 - 7.0 kg-cm, 0.95 - 6.08 in-lb)

GI

MA

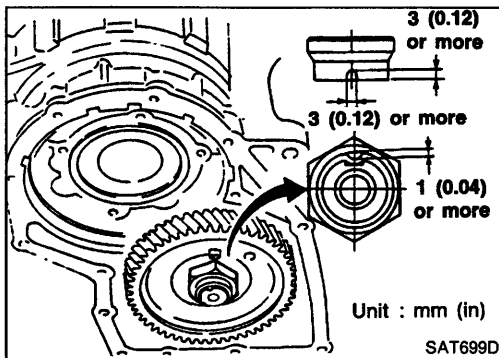
EM

LC

EF &
EC

FE

CL



8. After properly adjusting turning torque, clinch idler gear lock nut as shown.

MT

AT

FA

RA

BR

ST

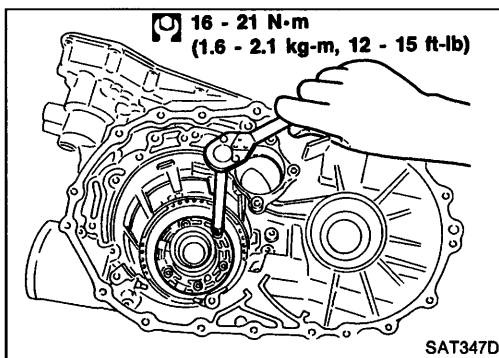
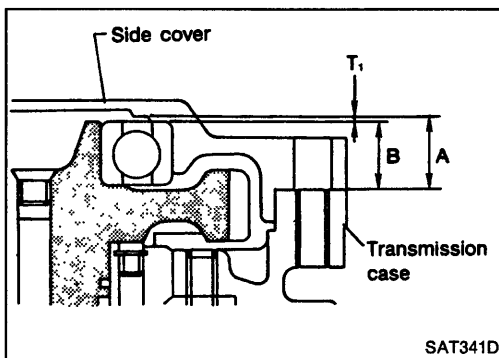
BF

HA

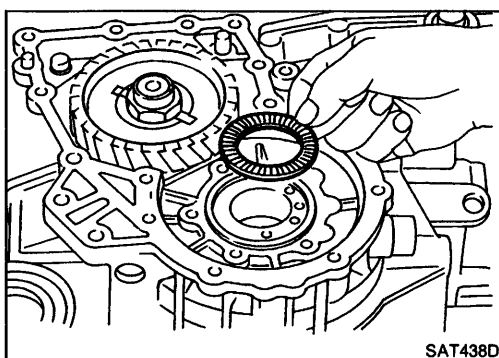
EL

OUTPUT SHAFT END PLAY

- Measure clearance between side cover and the end of the output shaft bearing.
- Select proper thickness of adjusting shim so that clearance is within specifications.



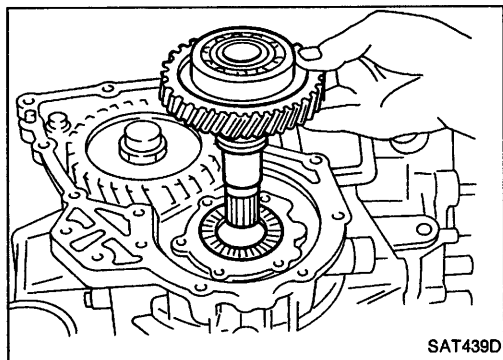
1. Install bearing retainer for output shaft.



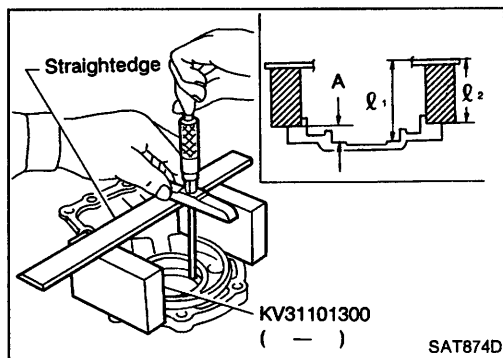
2. Install output shaft thrust needle bearing on bearing retainer.

ASSEMBLY

Adjustment 1 (Cont'd)



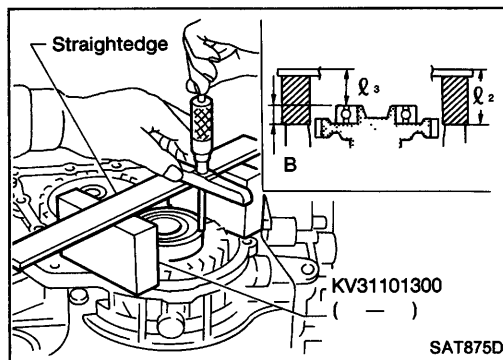
3. Install output shaft on transmission case.



4. Measure dimensions " l_1 " and " l_2 " at side cover and then calculate dimension "A".

- Measure dimensions " l_1 " and " l_2 " in at least two places.
- "A": Distance between transmission case fitting surface and adjusting shim mating surface.

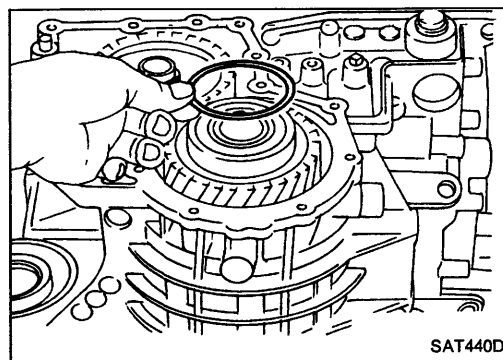
$$A = l_1 - l_2 \quad l_2: \text{Height of gauge}$$



5. Measure dimensions " l_2 " and " l_3 " and then calculate dimension "B".

- Measure dimensions " l_2 " and " l_3 " in at least two places.
- "B": Distance between the end of output shaft bearing outer race and the side cover fitting surface of transmission case.

$$B = l_2 - l_3 \quad l_2: \text{Height of gauge}$$



6. Select proper thickness of adjusting shim so that output shaft end play (clearance between side cover and output shaft bearing) is within specifications.

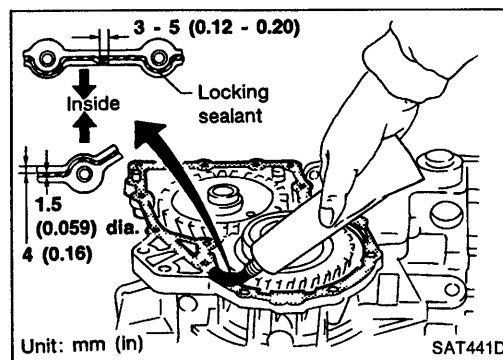
Output shaft end play (A - B):

0 - 0.5 mm (0 - 0.020 in)

Output shaft end play adjusting shim:

Refer to S.D.S.

7. Install adjusting shim on output shaft bearing.

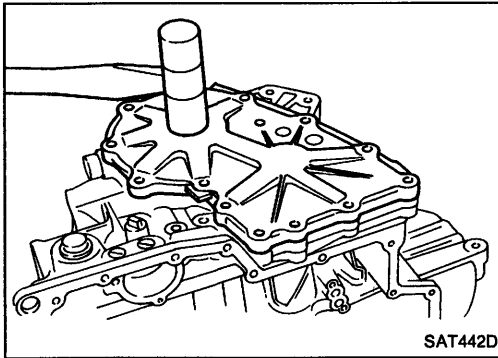


Assembly 2

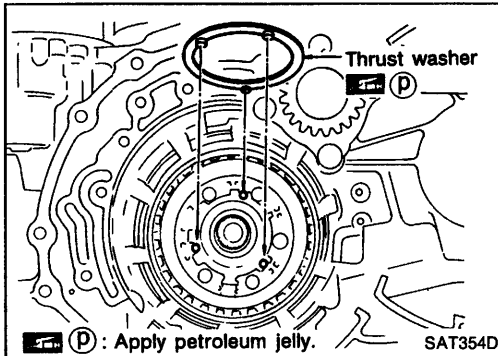
1. Apply locking sealant to transmission case as shown in illustration.

ASSEMBLY

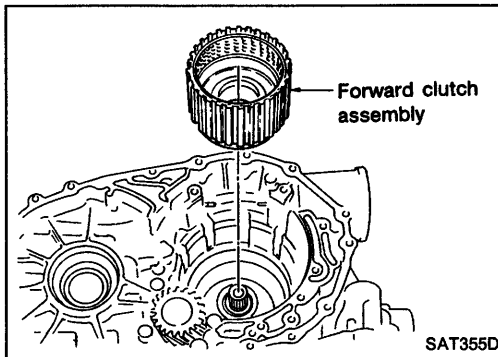
Assembly 2 (Cont'd)



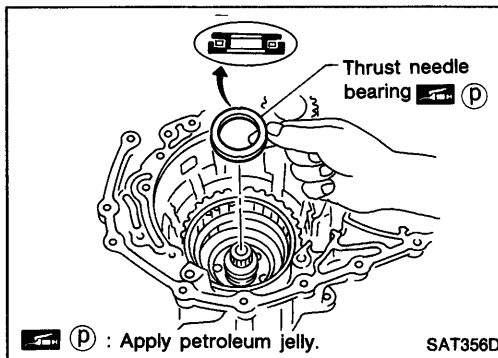
2. Install side cover on transmission case and tighten fixing bolt to the specified torque.



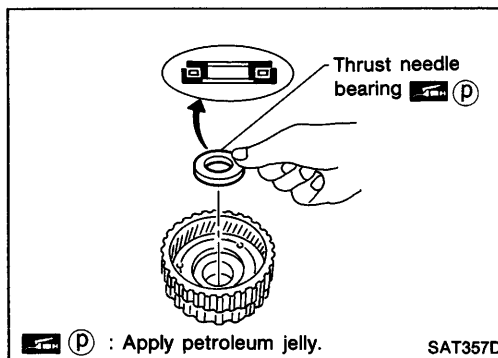
3. Remove paper rolled around bearing retainer.
 4. Install thrust washer on bearing retainer.
- **Apply petroleum jelly to thrust washer.**



5. Install forward clutch assembly.
- **Align teeth of low & reverse brake drive plates before installing.**
 - **Make sure that bearing retainer seal rings are not spread.**



6. Install thrust needle bearing on bearing retainer.
- **Apply petroleum jelly to thrust needle bearing.**
 - **Pay attention to direction of thrust needle bearing.**



7. Install thrust needle bearing on rear internal gear.
- **Apply petroleum jelly to thrust needle bearing.**
 - **Pay attention to direction of thrust needle bearing.**

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

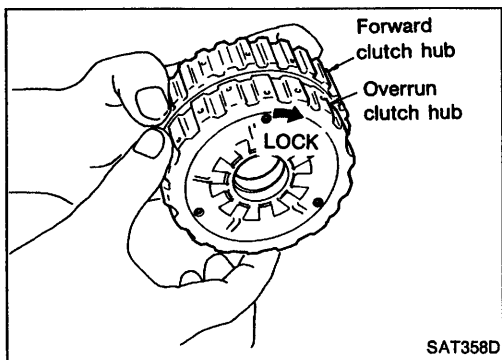
BF

HA

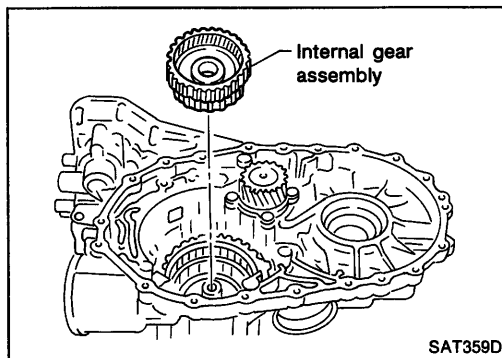
EL

ASSEMBLY

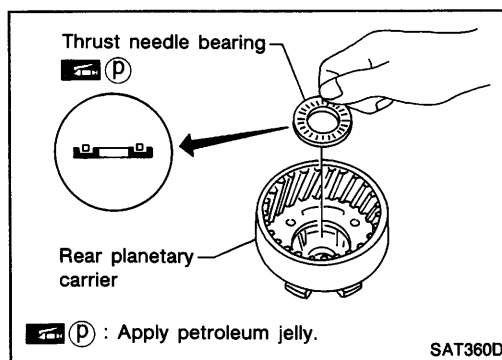
Assembly 2 (Cont'd)



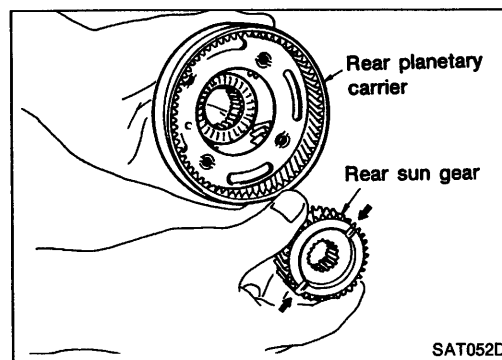
8. Hold forward clutch hub and turn overrun clutch hub. Check overrun clutch hub for correct directions of lock and unlock.
- If not shown as illustration, check installed direction of forward one-way clutch.



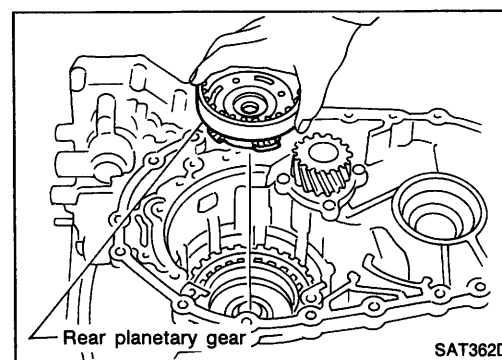
9. Install rear internal gear assembly.
- **Align teeth of forward clutch and overrun clutch drive plates before installing.**



10. Install needle bearing on rear planetary carrier.
- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**



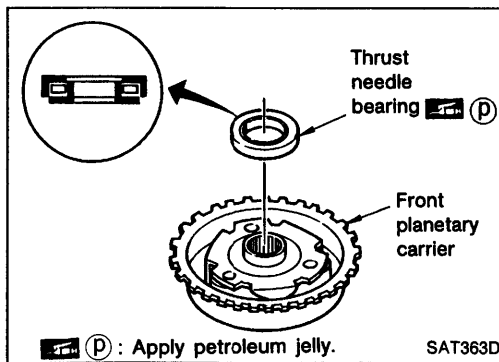
11. Install rear sun gear on rear planetary carrier.
- **Pay attention to direction of rear sun gear.**



12. Install rear planetary carrier on transmission case.

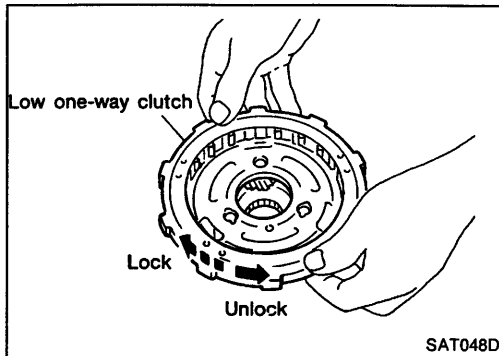
ASSEMBLY

Assembly 2 (Cont'd)



13. Install thrust needle bearing on front planetary carrier.

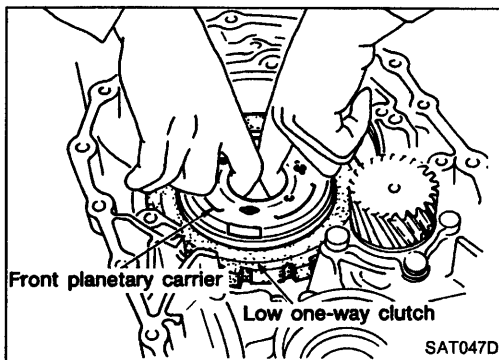
- Apply petroleum jelly to thrust needle bearing.
- Pay attention to direction of thrust needle bearing.



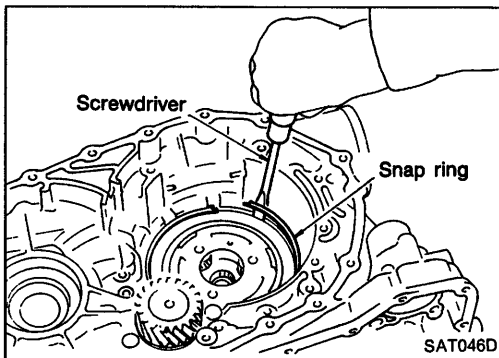
14. Install low one-way clutch to front planetary carrier by turning it in the direction of the arrow shown.

15. While holding front planetary carrier, turn low one-way clutch.

Check low one-way clutch for correct directions of lock and unlock.

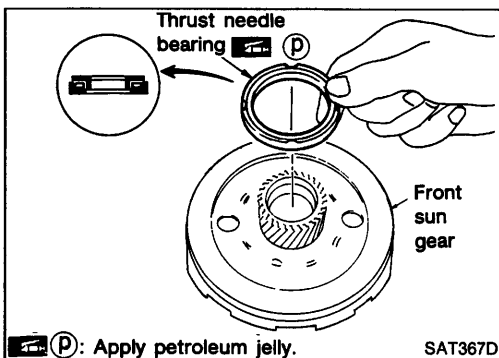


16. Install front planetary carrier assembly with low one-way clutch on transmission case.



17. Install snap ring with screwdriver.

- If forward clutch, overrun clutch and all bearings are not installed correctly, snap ring will not fit in groove of transmission case.



18. Install needle bearing on front sun gear.

- Apply petroleum jelly to needle bearing.
- Pay attention to direction of needle bearing.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

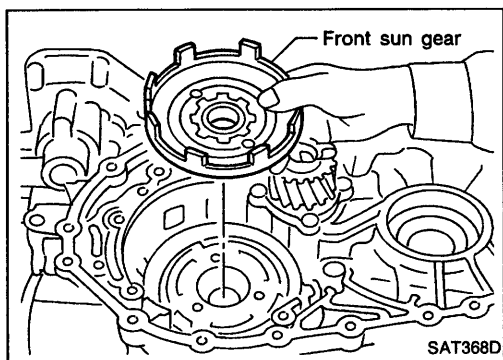
BF

HA

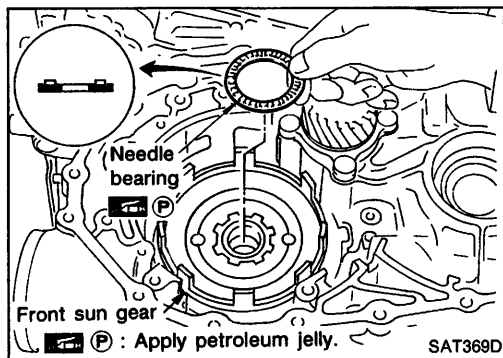
EL

ASSEMBLY

Assembly 2 (Cont'd)

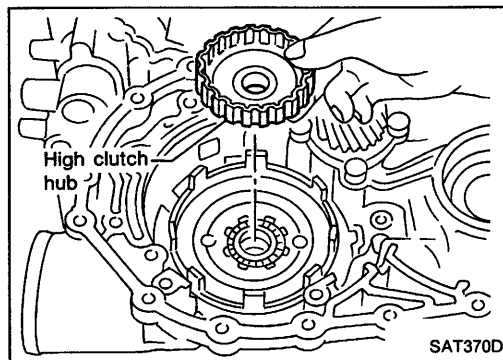


19. Install front sun gear on front planetary carrier.

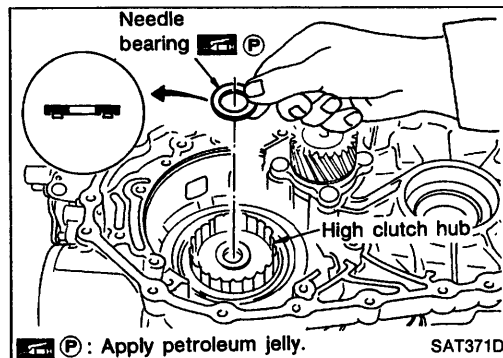


20. Install needle bearing on front sun gear.

- Apply petroleum jelly to needle bearing.
- Pay attention to direction of needle bearing.

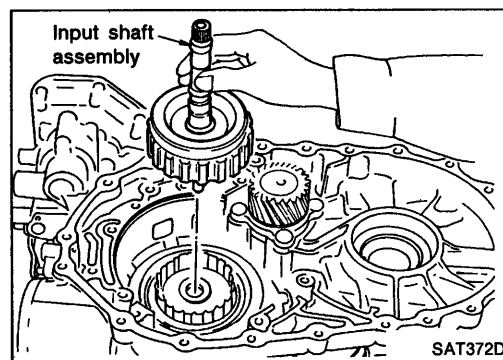


21. Install high clutch hub on front sun gear.



22. Install needle bearing on high clutch hub.

- Apply petroleum jelly to needle bearing.
- Pay attention to direction of needle bearing.



23. Remove paper rolled around input shaft.

24. Install input shaft assembly.

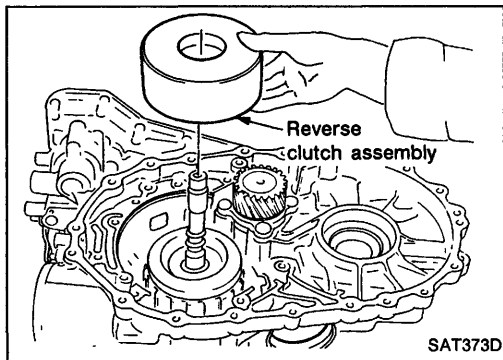
- Align teeth of high clutch drive plates before installing.

ASSEMBLY

Assembly 2 (Cont'd)

25. Install reverse clutch assembly.

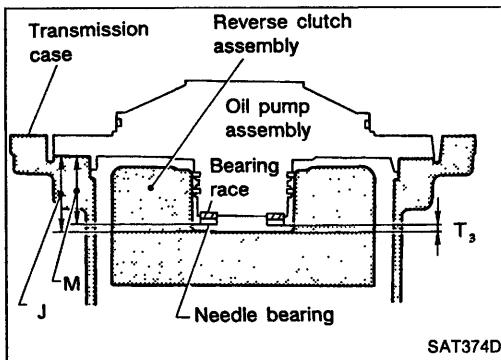
- Align teeth of reverse clutch drive plates before installing.



Adjustment 2

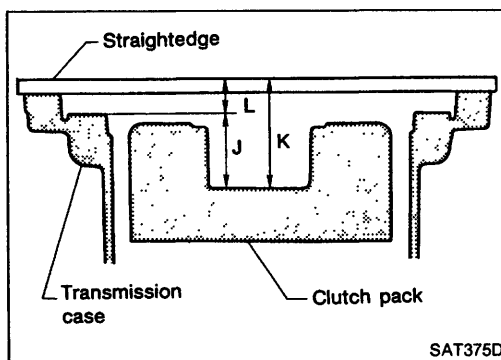
When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

Part name	Total end play	Reverse clutch end play
Transmission case	●	●
Overrun clutch hub	●	●
Rear internal gear	●	●
Rear planetary carrier	●	●
Rear sun gear	●	●
Front planetary carrier	●	●
Front sun gear	●	●
High clutch hub	●	●
High clutch drum	●	●
Oil pump cover	●	●
Reverse clutch drum	●	●



TOTAL END PLAY

- Measure clearance between reverse clutch drum and needle bearing for oil pump cover.
- Select proper thickness of bearing race so that end play is within specifications.

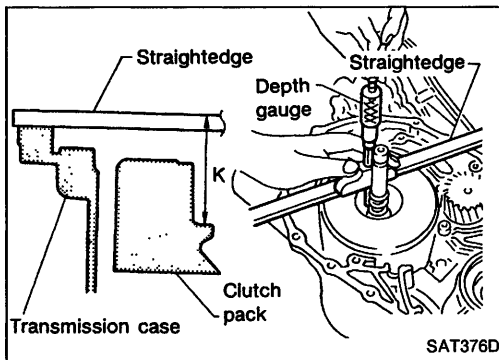


1. Measure dimensions "K" and "L" and then calculate dimension "J".

ASSEMBLY

Adjustment 2 (Cont'd)

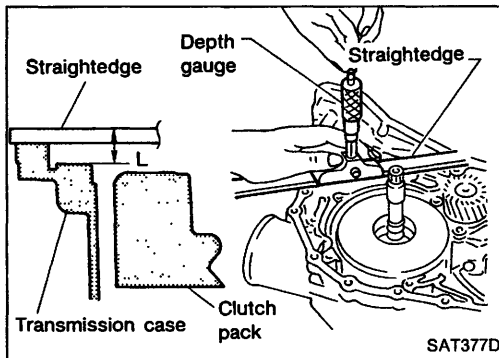
- a. Measure dimension "K".



- b. Measure dimension "L".
c. Calculate dimension "J".

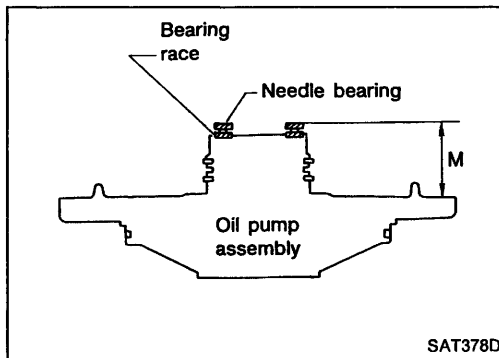
"J": Distance between oil pump fitting surface of transmission case and needle bearing mating surface of high clutch drum.

$$J = K - L$$



2. Measure dimension "M".

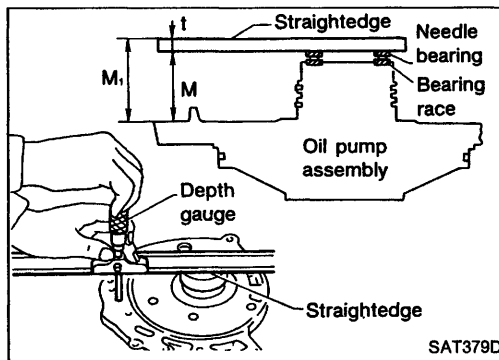
- a. Place bearing race and needle bearing on oil pump assembly.



- b. Measure dimension "M".

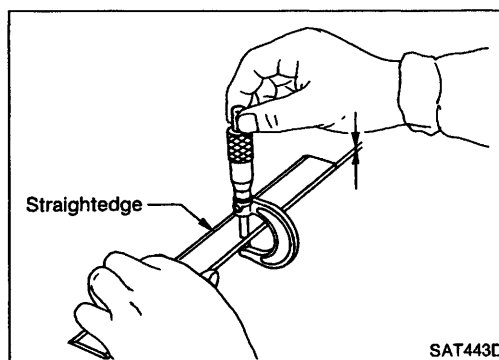
"M": Distance between transmission case fitting surface of oil pump cover and needle bearing on oil pump cover.

"M₁": Indication of gauge.



- c. Measure thickness of straightedge "t".

$$M = M_1 - t$$



ASSEMBLY

Adjustment 2 (Cont'd)

- Adjust total end play " T_3 ".

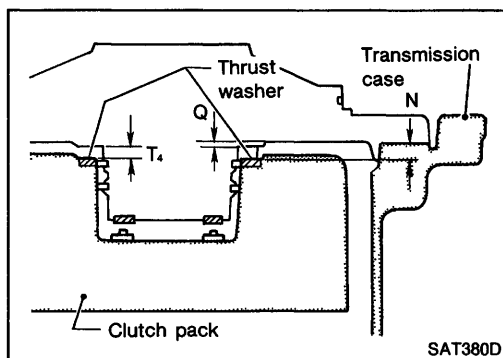
$$T_3 = J - M$$

Total end play " T_3 ":

0.25 - 0.55 mm (0.0098 - 0.0217 in)

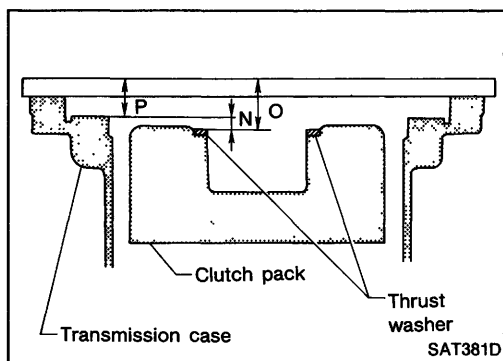
- Select proper thickness of bearing race so that total end play is within specifications.

Bearing races: Refer to S.D.S.

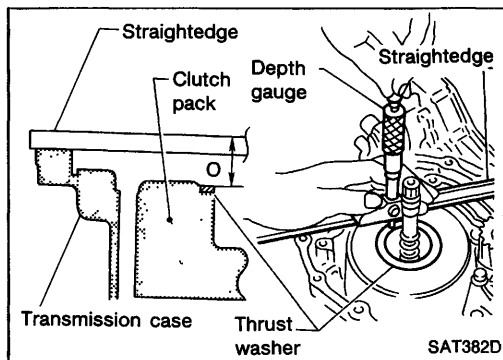


REVERSE CLUTCH END PLAY

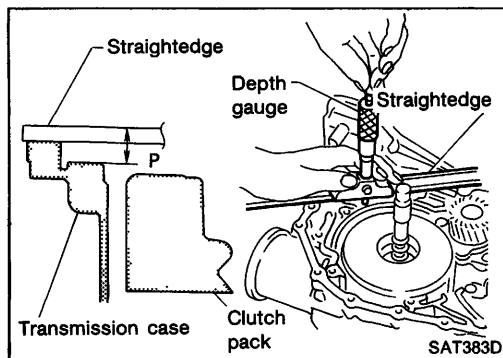
- Measure clearance between oil pump cover and thrust washer for reverse clutch drum.
- Select proper thickness of thrust washer so that end play is within specification.



- Measure dimensions " O " and " P " and then calculate dimension " N ".



- Place thrust washer on reverse clutch drum.
- Measure dimension " O ".



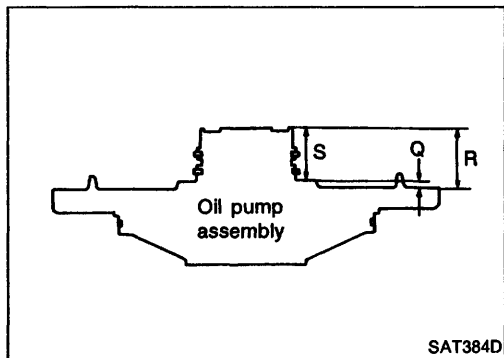
- Measure dimension " P ".
- Calculate dimension " N ".

" N ": Distance between oil pump fitting surface of transmission case and thrust washer on reverse clutch drum.

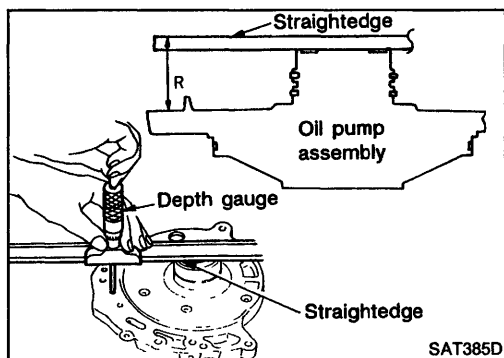
$$N = O - P$$

ASSEMBLY

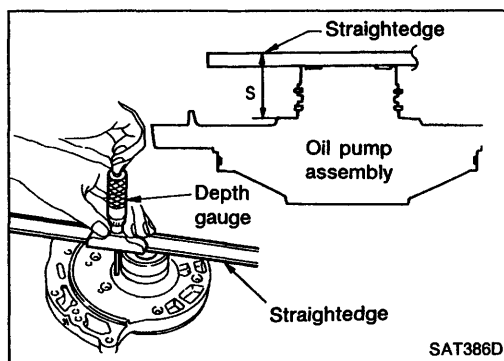
Adjustment 2 (Cont'd)



2. Measure dimensions "R" and "S" and then calculate dimension "Q".



- a. Measure dimension "R".



- b. Measure dimension "S".
- c. Calculate dimension "Q".

"Q": Distance between transmission case fitting surface and thrust washer mating surface.

$$Q = R - S$$

3. Adjust reverse clutch end play "T₄".

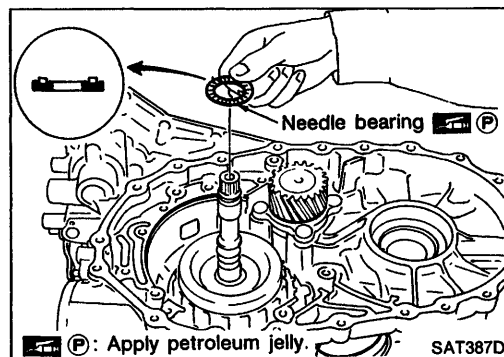
$$T_4 = N - Q$$

Reverse clutch end play:

0.65 - 1.0 mm (0.0256 - 0.0394 in)

- Select proper thickness of thrust washer so that reverse clutch end play is within specifications.

Thrust washer: Refer to S.D.S.

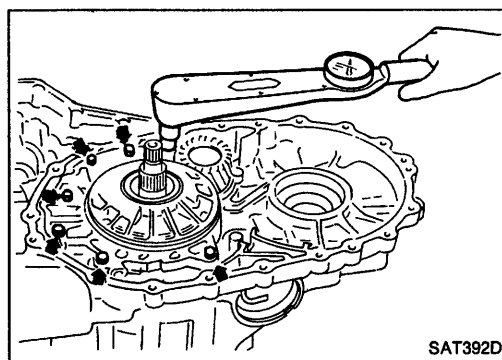
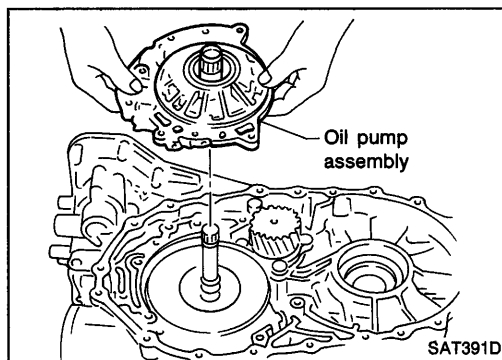
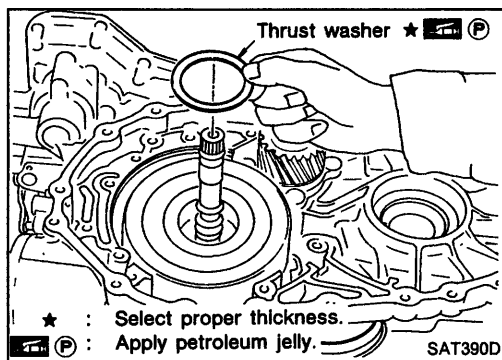
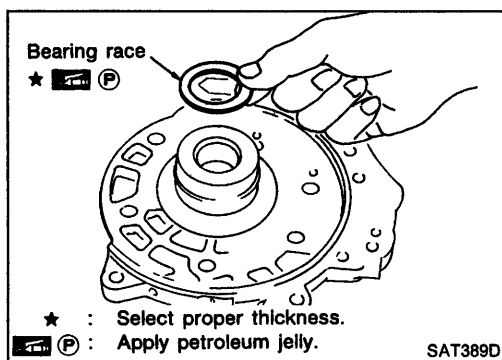
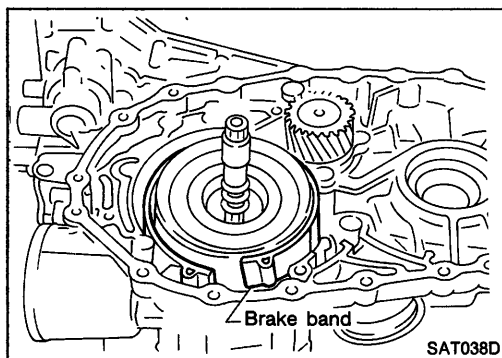


Assembly 3

1. Remove reverse clutch assembly and install needle bearing on high clutch assembly.
- **Pay attention to direction of needle bearing.**
2. Install reverse clutch assembly.

ASSEMBLY

Assembly 3 (Cont'd)



3. Install anchor end pin, washer and lock nut on transmission case.
4. Place brake band on periphery of reverse clutch drum. Then, tighten anchor end pin just enough so that brake band is fitted on periphery of reverse clutch drum uniformly.

5. Place bearing race selected in total end play adjustment step on oil pump cover.

- Apply petroleum jelly to bearing race.

6. Place thrust washer selected in reverse clutch end play step on reverse clutch drum.

- Apply petroleum jelly to thrust washer.

7. Install oil pump assembly on transmission case.

8. Tighten oil pump fixing bolts to the specified torque.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

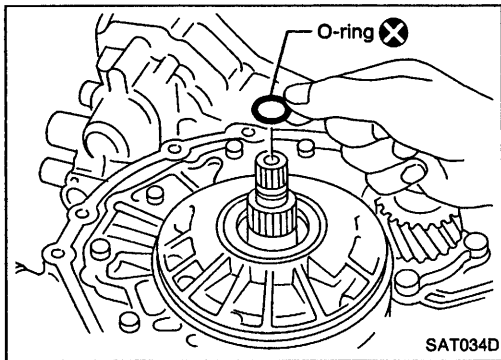
BF

HA

EL

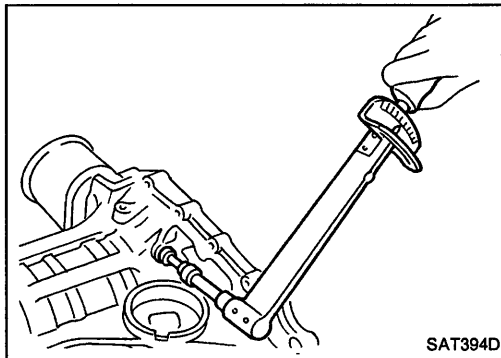
ASSEMBLY

Assembly 3 (Cont'd)



9. Install O-ring to input shaft.

- Apply A.T.F. to O-ring.

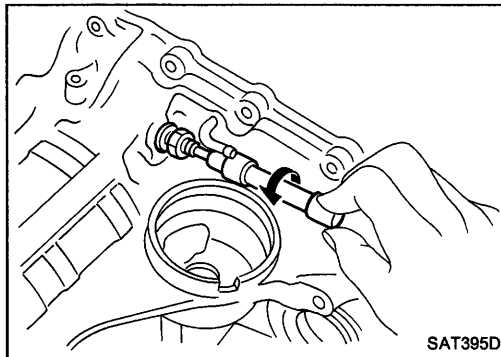


10. Adjust brake band.

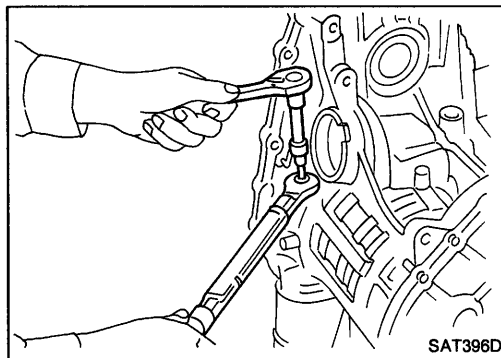
a. Tighten anchor end pin to the specified torque.

Anchor end pin:

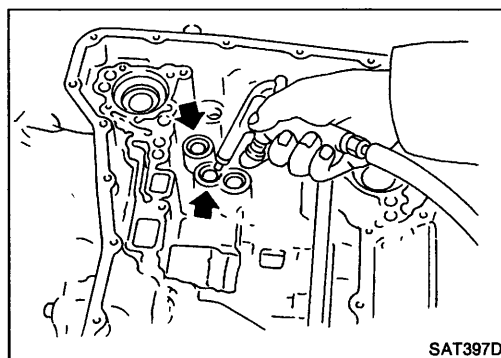
: 4 - 6 N·m (0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)



b. Back off anchor end pin two and a half turns.



c. While holding anchor end pin, tighten lock nut.

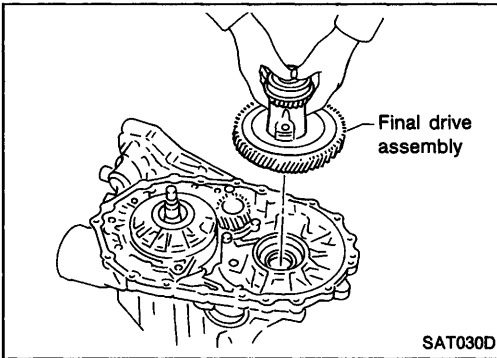


11. Apply compressed air to oil holes of transmission case and check operation of brake band.

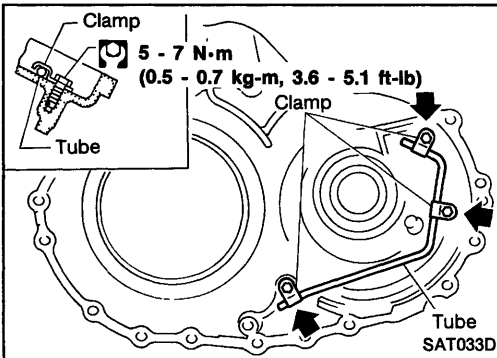
ASSEMBLY

Assembly 3 (Cont'd)

12. Install final drive assembly on transmission case.



13. Install oil tube on converter housing.

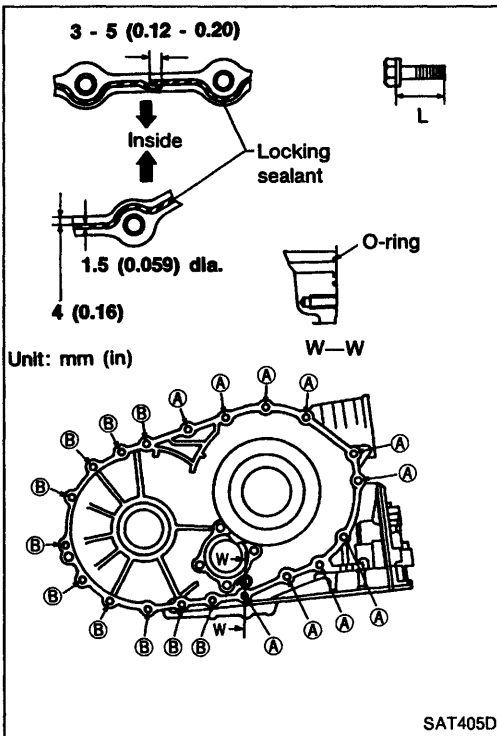


14. Install O-ring on differential oil port of transmission case.

15. Install converter housing on transmission case.

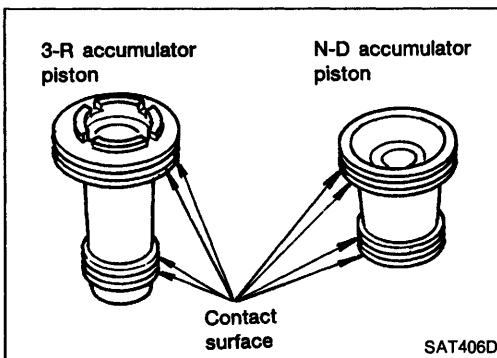
- Apply locking sealant to mating surface of converter housing.

Bolt	Length mm (in)
Ⓐ	30 (1.18)
Ⓑ	40 (1.57)



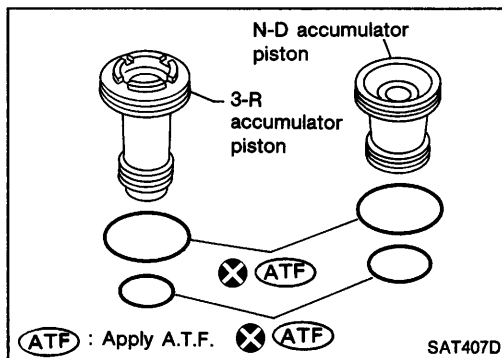
16. Install accumulator piston.

- a. Check contact surface of accumulator piston for damage.



ASSEMBLY

Assembly 3 (Cont'd)



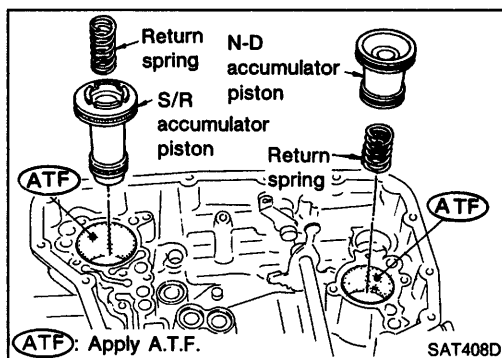
b. Install O-rings on accumulator piston.

- Apply A.T.F. to O-rings.

Accumulator piston O-rings:

Unit: mm (in)

Accumulator	Inner diameter (Small)	Inner diameter (Large)
3-R accumulator	26.9 (1.059)	44.2 (1.740)
N-D accumulator	34.6 (1.362)	39.4 (1.551)



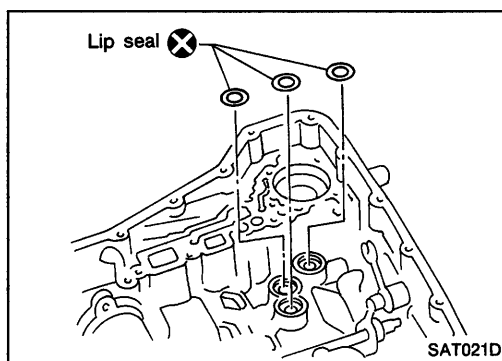
c. Install accumulator pistons and return springs on transmission case.

- Apply A.T.F. to inner surface of transmission case.

Return springs:

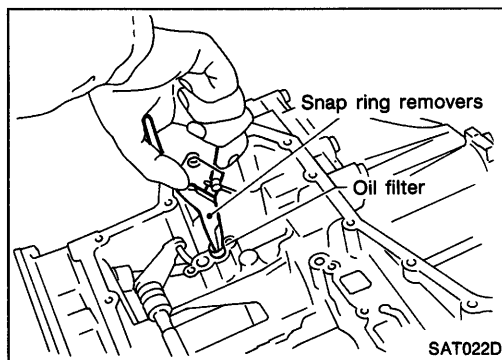
Unit: mm (in)

Spring	Free length	Outer diameter
3-R accumulator spring	56.4 (2.220)	21.0 (0.827)
N-D accumulator spring	43.5 (1.713)	28.0 (1.102)



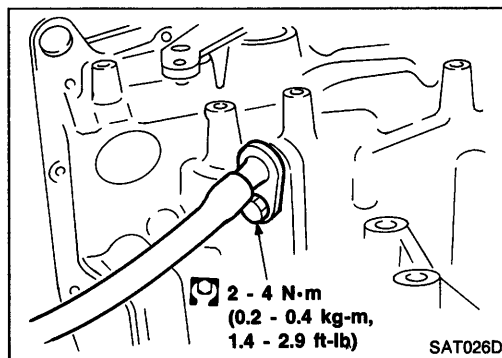
17. Install lip seals for band servo oil holes on transmission case.

- Apply petroleum jelly to lip seals.



18. Install oil filter for governor valve.

- Pay attention to direction of oil filter.

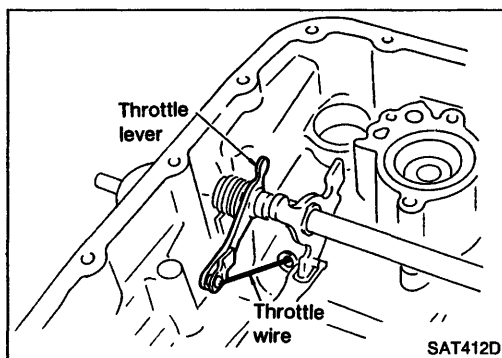


19. Install throttle wire to transmission case.

ASSEMBLY

Assembly 3 (Cont'd)

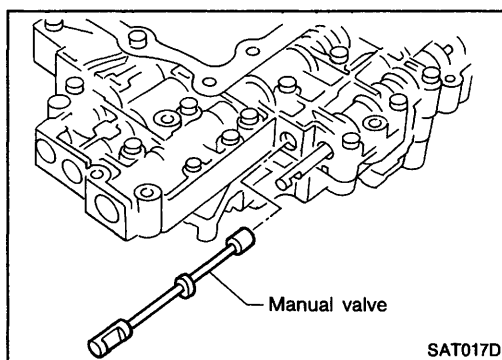
20. Install throttle wire to throttle lever.



21. Install control valve assembly.

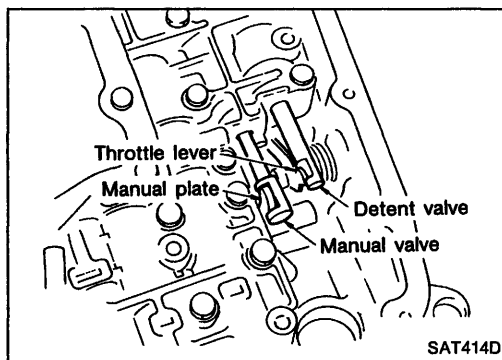
a. Insert manual valve into control valve assembly.

● Apply A.T.F. to manual valve.

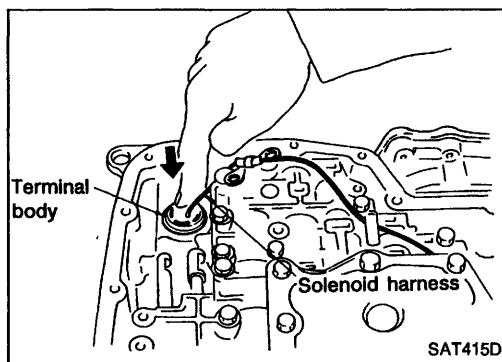


b. Set manual shaft in Neutral position.

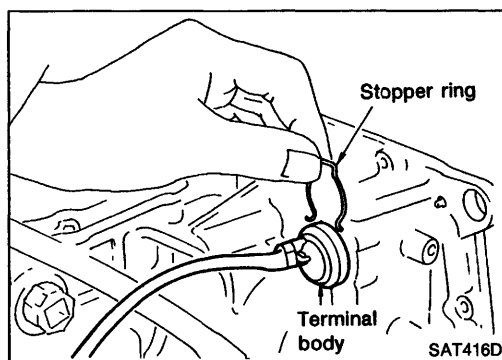
c. Install control valve assembly on transmission case while aligning manual valve with manual plate and detent valve with throttle lever.



d. Pass solenoid harness through transmission case and install terminal body on transmission case by pushing it.



e. Install stopper ring to terminal body.



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

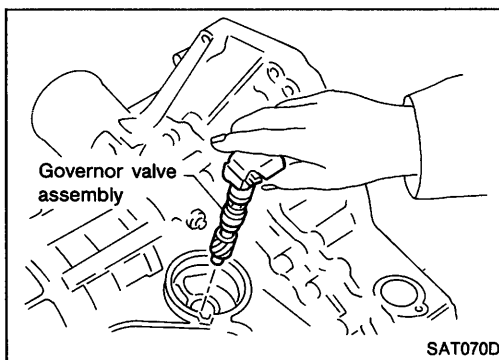
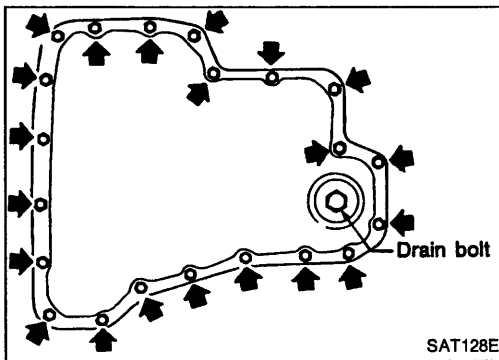
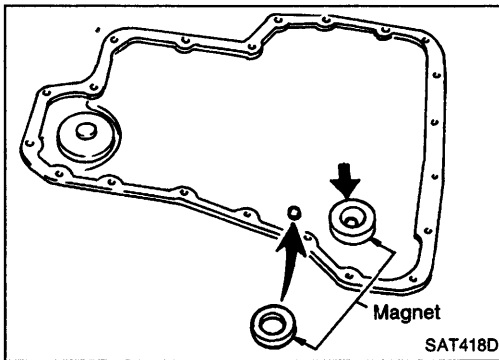
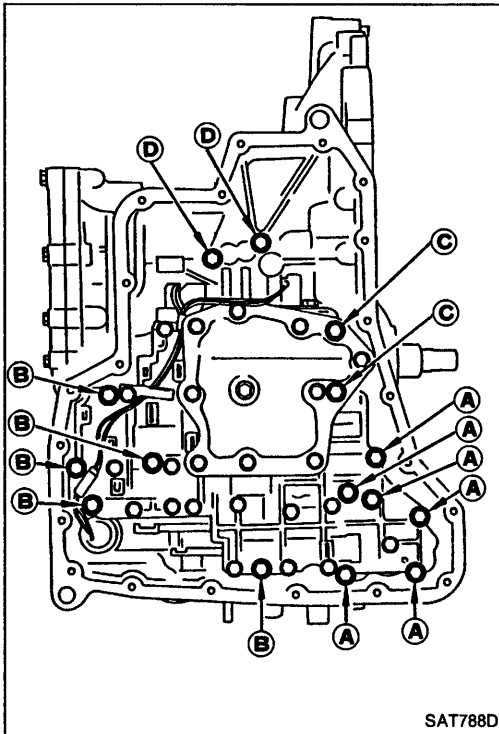
ASSEMBLY

Assembly 3 (Cont'd)

f. Tighten bolts **(A)**, **(B)**, **(C)** and **(D)**.

Bolt length, number and location:

Bolt	(A)	(B)	(C)	(D)
Bolt length "ℓ"  ℓ mm (in)	33.0 (1.299)	40.0 (1.575)	43.5 (1.713)	25.0 (0.984)
Number of bolts	6	5	2	2



22. Install oil pan.

a. Attach a magnet to oil pan.

b. Install new oil pan gasket on transmission case.

c. Install oil pan on transmission case.

- **Always replace oil pan bolts as they are self-sealing bolts.**
- **Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.**

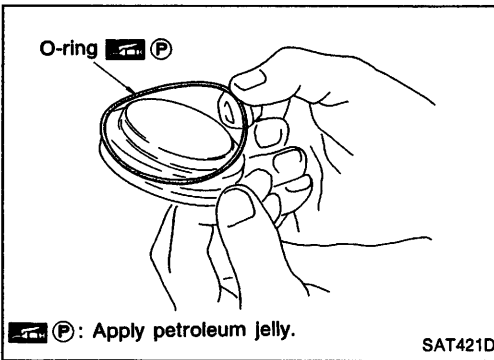
d. Tighten drain plug to the specified torque.

23. Install governor valve.

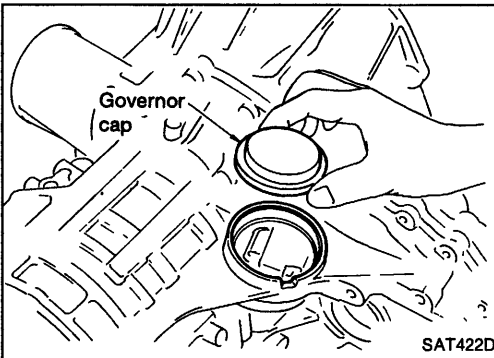
a. Install governor valve assembly into transmission case.

ASSEMBLY

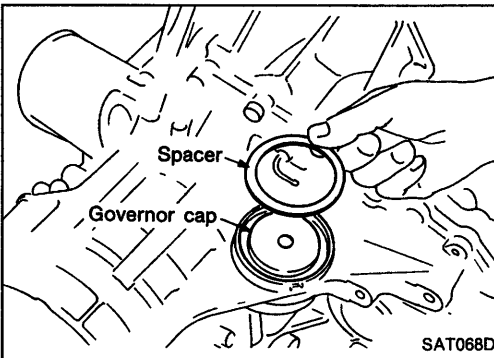
Assembly 3 (Cont'd)



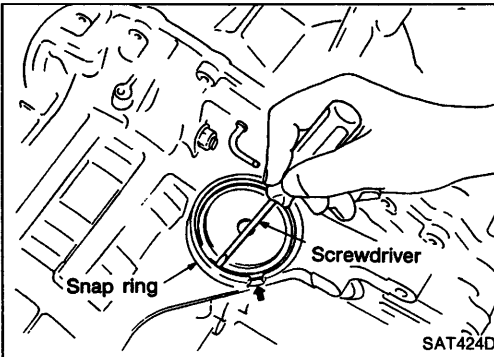
- b. Install O-ring to governor cap.
- **Apply A.T.F. to O-ring.**



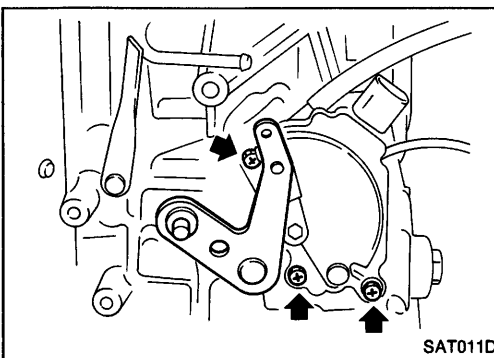
- c. Install governor cap onto transmission case.



- d. Place spacer on governor cap.



- e. Install snap ring onto transmission case with screwdriver.
- **Align snap ring gap with the notch of transmission case.**



- 24. Install inhibitor switch.
- a. Set manual lever in "P" position.
- b. Temporarily install inhibitor switch on manual shaft.
- c. Move selector lever to "N" position.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

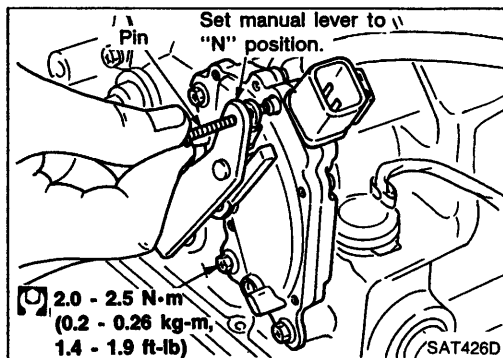
BF

HA

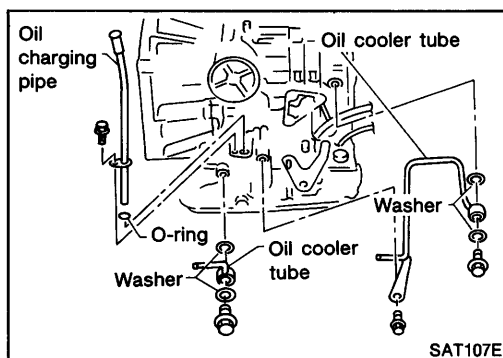
EL

ASSEMBLY

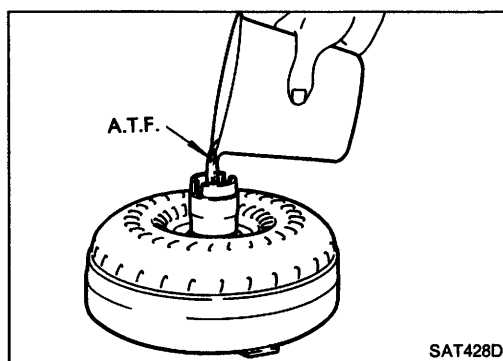
Assembly 3 (Cont'd)



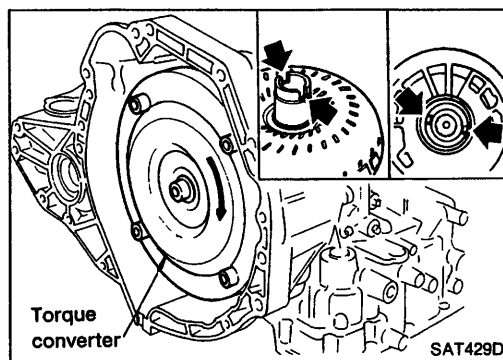
- d. Insert 4.0 mm (0.157 in) dia. pin into adjustment hole in both inhibitor switch and manual shaft as near vertically as possible.
- e. Tighten inhibitor switch fixing bolts.
- f. Remove pin from adjustment hole after adjusting inhibitor switch.



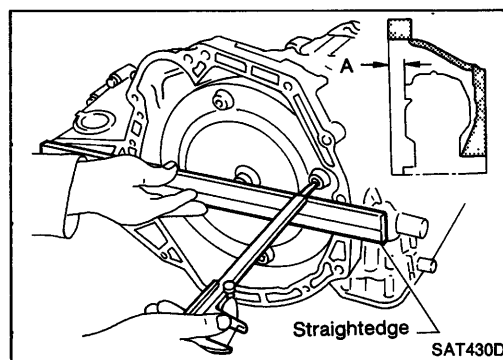
25. Install oil charging pipe and oil cooler tube to transmission case.



26. Install torque converter.
 - a. Pour A.T.F. into torque converter.
 - Approximately 1 liters (1-1/8 US qt, 7/8 Imp qt) of fluid are required for a new torque converter.
 - When reusing old torque converter, add the same amount of fluid as was drained.



- b. Install torque converter while aligning notches of torque converter with notches of oil pump.



- c. Measure distance "A" to check that torque converter is in proper position.

Distance "A": 15.9 mm (0.626 in) or more

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

Engine	SR20DE	
Automatic transaxle model	RL4F03A	RL4F03V
Automatic transaxle assembly		
Model code number	31X71	31X72
Transaxle gear ratio		
1st	2.861	
2nd	1.562	
3rd	1.000	
4th	0.697	
Reverse	2.310	
Final drive	4.072	
Recommended oil	Genuine Nissan ATF or equivalent type DEXRON™ II-E	
Oil capacity ℓ (US qt, Imp qt)	7.0 (7-3/8, 6-1/8)	

Specifications and Adjustments

VEHICLE SPEED WHEN SHIFTING GEARS

Throttle position	Vehicle speed km/h (MPH)						
	D ₁ → D ₂	D ₂ → D ₃	D ₃ → D ₄	D ₄ → D ₃	D ₃ → D ₂	D ₂ → D ₁	1 ₂ → 1 ₁
Full throttle	53 - 61 (33 - 38)	99 - 107 (62 - 66)	—	148 - 156 (92 - 97)	89 - 97 (55 - 60)	47 - 55 (29 - 34)	50 - 58 (31 - 36)
Half throttle	29 - 37 (18 - 23)	52 - 60 (32 - 37)	104 - 112 (65 - 70)	63 - 71 (39 - 44)	41 - 49 (25 - 30)	9 - 17 (6 - 11)	50 - 58 (31 - 36)

VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

Throttle opening	Gear position	Vehicle speed km/h (MPH)	
		Lock-up "ON"	Lock-up "OFF"
2/8	D ₄	59 - 67 (37 - 42)	55 - 63 (34 - 39)

STALL REVOLUTION

Stall revolution rpm	1,900 - 2,200
----------------------	---------------

THROTTLE WIRE ADJUSTMENT

Unit: mm (in)	
Throttle wire stroke	39 - 43 (1.54 - 1.69)

LINE PRESSURE

Engine speed rpm	Line pressure kPa (kg/cm ² , psi)			
	R position	D position	2 position	1 position
Idle	883 (9.0, 128)	637 (6.5, 92)	441 (4.5, 64)	1,138 (11.6, 165)
Stall	1,765 (18.0, 256)	1,275 (13.0, 185)	883 (9.0, 128)	1,275 (13.0, 185)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Specifications and Adjustments (Cont'd)

CONTROL VALVES

Control valve return springs

Unit: mm (in)

Parts		Part No.	Free length	Outer diameter
Upper body	Pressure modifier valve spring	31742-31X64	25.0 (0.984)	7.9 (0.311)
	Kickdown modifier valve spring	31742-31X03	40.5 (1.594)	9.0 (0.354)
	1-2 accumulator valve spring	31742-31X63	50.9 (2.004)	12.6 (0.496)
	3-2 timing valve spring	31736-21X00	26.3 (1.035)	7.2 (0.283)
	1st reducing valve spring	31835-21X08	22.6 (0.890)	7.3 (0.287)
	Torque converter relief valve spring	31742-31X06	23.5 (0.925)	7.4 (0.291)
	Throttle modifier valve spring	31742-31X07	29.5 (1.161)	5.5 (0.217)
	4th speed cut valve spring	31835-21X02	23.2 (0.913)	6.2 (0.244)
	Lock-up control valve spring	31742-31X08	39.5 (1.555)	5.0 (0.197)
	4-2 sequence valve spring	31742-31X09	39.5 (1.555)	5.1 (0.201)
	Oil cooler relief valve spring	31872-31X00	17.02 (0.6701)	8.0 (0.315)
Lower body	Throttle valve and detent valve spring	31802-31X06	32.0 (1.260)	10.0 (0.394)
	Pressure regulator valve spring	31742-31X00	52.24 (2.0567)	15.0 (0.591)
	3-4 shift valve spring	31762-31X11	52.0 (2.047)	8.0 (0.315)
	2-3 shift valve spring	31762-31X01	52.7 (2.075)	7.0 (0.276)
	1-2 shift valve spring	31762-31X09	44.5 (1.752)	5.3 (0.209)
	Overrun clutch control valve spring	31742-31X60	48.9 (1.925)	7.0 (0.276)

CLUTCHES AND BRAKES

Reverse clutch		
Number of drive plates	2	
Number of driven plates	2	
Drive plate thickness mm (in)		
Standard	2.0 (0.079)	
Wear limit	1.8 (0.071)	
Clearance mm (in)		
Standard	0.5 - 0.8 (0.020 - 0.031)	
Allowable limit	1.2 (0.047)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.4 (0.173)	31537-31X00
	4.6 (0.181)	31537-31X01
	4.8 (0.189)	31537-31X02
	5.0 (0.197)	31537-31X03
	5.2 (0.205)	31537-31X04

High clutch		
Number of drive plates	4	
Number of driven plates	7	
Drive plate thickness mm (in)		
Standard	1.6 (0.063)	
Wear limit	1.4 (0.055)	
Clearance mm (in)		
Standard	1.4 - 1.8 (0.055 - 0.071)	
Allowable limit	2.6 (0.102)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.6 (0.142)	31537-31X10
	3.8 (0.150)	31537-31X11
	4.0 (0.157)	31537-31X12
	4.2 (0.165)	31537-31X13
	4.4 (0.173)	31537-31X14
	4.6 (0.181)	31537-31X15
	4.8 (0.189)	31537-31X16
	5.0 (0.197)	31537-31X17

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Specifications and Adjustments (Cont'd)

Forward clutch		
Number of drive plates	5	
Number of driven plates	5	
Drive plate thickness mm (in)		
Standard	1.8 (0.071)	
Wear limit	1.6 (0.063)	
Clearance mm (in)		
Standard	0.45 - 0.85 (0.0177 - 0.0335)	
Allowable limit	1.85 (0.0728)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.6 (0.142)	31537-31X60
	3.8 (0.150)	31537-31X61
	4.0 (0.157)	31537-31X62
	4.2 (0.165)	31537-31X63
	4.4 (0.173)	31537-31X64
	4.6 (0.181)	31537-31X65
Overrun clutch		
Number of drive plates	3	
Number of driven plates	5	
Drive plate thickness mm (in)		
Standard	1.6 (0.063)	
Wear limit	1.4 (0.055)	
Clearance mm (in)		
Standard	1.0 - 1.4 (0.039 - 0.055)	
Allowable limit	2.0 (0.079)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.6 (0.142)	31537-31X70
	3.8 (0.150)	31537-31X71
	4.0 (0.157)	31537-31X72
	4.2 (0.165)	31537-31X73
	4.4 (0.173)	31537-31X74

Low & reverse brake		
Number of drive plates	5	
Number of driven plates	5	
Drive plate thickness mm (in)		
Standard	2.0 (0.079)	
Wear limit	1.8 (0.071)	
Clearance mm (in)		
Standard	1.4 - 1.8 (0.055 - 0.071)	
Allowable limit	2.8 (0.110)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.6 (0.142)	31667-31X10
	3.8 (0.150)	31667-31X11
	4.0 (0.157)	31667-31X12
	4.2 (0.165)	31667-31X13
	4.4 (0.173)	31667-31X14
	4.6 (0.181)	31667-31X15
Brake band		
Anchor end bolt tightening torque N·m (kg-m, ft-lb)	4 - 6 (0.4 - 0.6, 2.9 - 4.3)	
Number of returning revolutions for anchor end bolt	2.5 ± 0.125	
Lock nut tightening torque N·m (kg-m, ft-lb)	31 - 42 (3.2 - 4.3, 23 - 31)	

Clutches and brakes return spring

Unit: mm (in)

Parts		Free length	Outer diameter
Forward clutch (Overrun clutch) (16 pcs)	Inner	26.3 (1.035)	7.7 (0.303)
	Outer	26.6 (1.047)	10.6 (0.417)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Specifications and Adjustments (Cont'd)

OIL PUMP

Oil pump		
Oil pump side clearance mm (in)	0.02 - 0.04 (0.0008 - 0.0016)	
Thickness of inner gear and outer gear	Inner gear	
	Thickness mm (in)	Part number
	9.99 - 10.00 (0.3933 - 0.3937)	31346-31X00
	9.98 - 9.99 (0.3929 - 0.3933)	31346-31X01
	9.97 - 9.98 (0.3925 - 0.3929)	31346-31X02
	Outer gear	
	Thickness mm (in)	Part number
	9.99 - 10.00 (0.3933 - 0.3937)	31347-31X00
	9.98 - 9.99 (0.3929 - 0.3933)	31347-31X01
	9.97 - 9.98 (0.3925 - 0.3929)	31347-31X02
	Clearance between oil pump housing and outer gear mm (in)	
	Standard Allowable limit	
	0.08 - 0.15 (0.0031 - 0.0059) 0.15 (0.0059)	
	Oil pump cover seal ring clearance mm (in)	
	Standard Allowable limit	
	0.07 - 0.19 (0.0028 - 0.0075) 0.19 (0.0075)	

INPUT SHAFT

Input shaft seal ring clearance mm (in)	
Standard	0.08 - 0.23 (0.0031 - 0.0091)
Allowable limit	0.23 (0.0091)

PLANETARY CARRIER

Clearance between planetary carrier and pinion washer mm (in)	
Standard	0.15 - 0.70 (0.0059 - 0.0276)
Allowable limit	0.80 (0.0315)

FINAL DRIVE

Differential side gear clearance

Clearance between side gear and differential case with washer mm (in)	0.1 - 0.2 (0.004 - 0.008)
---	---------------------------

Differential side gear thrust washers for F03A

Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115

Differential side gear thrust washers for F03V

Thickness mm (in)		Part number
Viscous coupling side	0.70 - 0.75 (0.0276 - 0.0295)	38424-D2110
	0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
	0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
	0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
	0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
	0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115
	1.00 - 1.05 (0.0394 - 0.0413)	38424-D2116
	1.05 - 1.10 (0.0413 - 0.0433)	38424-D2117
	1.10 - 1.15 (0.0433 - 0.0453)	38424-D2118
	1.15 - 1.20 (0.0453 - 0.0472)	38424-D2119
	1.20 - 1.25 (0.0472 - 0.0492)	38424-D2120
	1.25 - 1.30 (0.0492 - 0.0512)	38424-D2121
	1.30 - 1.35 (0.0512 - 0.0531)	38424-D2122
	0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
	0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
	0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
Differential case side	0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
	0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Specifications and Adjustments (Cont'd)

Bearing preload

Differential side bearing pre-load "T" mm (in)	0.04 - 0.09 (0.0016 - 0.0035)
---	-------------------------------

Turning torque

Turning torque of final drive assembly N·m (kg-cm, in-lb)	0.49 - 1.08 (5.0 - 11.0, 4.3 - 9.5)
--	-------------------------------------

Differential side bearing adjusting shims for F03A

Thickness mm (in)	Part number
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

Differential side bearing adjusting shims for F03V

Thickness mm (in)	Part number
0.28 (0.0110)	31439-31X00
0.32 (0.0126)	31439-31X01
0.36 (0.0142)	31439-31X02
0.40 (0.0157)	31439-31X03
0.44 (0.0173)	31439-31X04
0.48 (0.0189)	31439-31X05
0.52 (0.0205)	31439-31X06
0.56 (0.0220)	31439-31X07
0.60 (0.0236)	31439-31X08
0.64 (0.0252)	31439-31X09
0.68 (0.0268)	31439-31X10
0.72 (0.0283)	31439-31X11
0.76 (0.0299)	31439-31X12
0.80 (0.0315)	31439-31X13
0.84 (0.0331)	31439-31X14
0.88 (0.0346)	31439-31X15
0.92 (0.0362)	31439-31X16
0.96 (0.0378)	31439-31X17
1.44 (0.0567)	31439-31X18

Table for selecting differential side bearing adjusting shim(s) for F03A

Unit: mm (in)

Dial indicator deflection	Suitable shim(s)	
0.31 - 0.35 (0.0122 - 0.0138)	0.40 (0.0157)	GI
0.35 - 0.39 (0.0138 - 0.0154)	0.44 (0.0173)	
0.39 - 0.43 (0.0154 - 0.0169)	0.48 (0.0189)	MA
0.43 - 0.47 (0.0169 - 0.0185)	0.52 (0.0205)	
0.47 - 0.51 (0.0185 - 0.0201)	0.56 (0.0220)	EM
0.51 - 0.55 (0.0201 - 0.0217)	0.60 (0.0236)	
0.55 - 0.59 (0.0217 - 0.0232)	0.64 (0.0252)	
0.59 - 0.63 (0.0232 - 0.0248)	0.68 (0.0268)	LC
0.63 - 0.67 (0.0248 - 0.0264)	0.72 (0.0283)	
0.67 - 0.71 (0.0264 - 0.0280)	0.76 (0.0299)	EF & EC
0.71 - 0.75 (0.0280 - 0.0295)	0.80 (0.0315)	
0.75 - 0.79 (0.0295 - 0.0311)	0.84 (0.0331)	
0.79 - 0.83 (0.0311 - 0.0327)	0.88 (0.0346)	FE
0.83 - 0.87 (0.0327 - 0.0343)	0.92 (0.0362)	
0.87 - 0.91 (0.0343 - 0.0358)	0.48 (0.0189) + 0.48 (0.0189)	
0.91 - 0.95 (0.0358 - 0.0374)	0.48 (0.0189) + 0.52 (0.0205)	CL
0.95 - 0.99 (0.0374 - 0.0390)	0.52 (0.0205) + 0.52 (0.0205)	
0.99 - 1.03 (0.0390 - 0.0406)	0.52 (0.0205) + 0.56 (0.0220)	
1.03 - 1.07 (0.0406 - 0.0421)	0.56 (0.0220) + 0.56 (0.0220)	MT
1.07 - 1.11 (0.0421 - 0.0437)	0.56 (0.0220) + 0.60 (0.0236)	
1.11 - 1.15 (0.0437 - 0.0453)	0.60 (0.0236) + 0.60 (0.0236)	AT
1.15 - 1.19 (0.0453 - 0.0469)	0.60 (0.0236) + 0.64 (0.0252)	
1.19 - 1.23 (0.0469 - 0.0484)	0.64 (0.0252) + 0.64 (0.0252)	
1.23 - 1.27 (0.0484 - 0.0500)	0.64 (0.0252) + 0.68 (0.0268)	FA
1.27 - 1.31 (0.0500 - 0.0516)	0.68 (0.0268) + 0.68 (0.0268)	
1.31 - 1.35 (0.0516 - 0.0531)	0.68 (0.0268) + 0.72 (0.0283)	
1.35 - 1.39 (0.0531 - 0.0547)	1.44 (0.0567)	RA
1.39 - 1.43 (0.0547 - 0.0563)	0.72 (0.0283) + 0.76 (0.0299)	
1.43 - 1.47 (0.0563 - 0.0579)	0.76 (0.0299) + 0.76 (0.0299)	BR
1.47 - 1.51 (0.0579 - 0.0594)	0.76 (0.0299) + 0.80 (0.0315)	
1.51 - 1.55 (0.0594 - 0.0610)	0.80 (0.0315) + 0.80 (0.0315)	
1.55 - 1.59 (0.0610 - 0.0626)	0.80 (0.0315) + 0.84 (0.0331)	ST
1.59 - 1.63 (0.0626 - 0.0642)	0.84 (0.0331) + 0.84 (0.0331)	
1.63 - 1.67 (0.0642 - 0.0657)	0.84 (0.0331) + 0.88 (0.0346)	
1.67 - 1.71 (0.0657 - 0.0673)	0.88 (0.0346) + 0.88 (0.0346)	BF
1.71 - 1.75 (0.0673 - 0.0689)	0.88 (0.0346) + 0.92 (0.0362)	
1.75 - 1.79 (0.0689 - 0.0705)	0.92 (0.0362) + 0.92 (0.0362)	
1.79 - 1.83 (0.0705 - 0.0720)	0.44 (0.0173) + 1.44 (0.0567)	HA
1.83 - 1.87 (0.0720 - 0.0736)	0.48 (0.0189) + 1.44 (0.0567)	
1.87 - 1.91 (0.0736 - 0.0752)	0.52 (0.0205) + 1.44 (0.0567)	
1.91 - 1.95 (0.0752 - 0.0768)	0.56 (0.0220) + 1.44 (0.0567)	EL

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Specifications and Adjustments (Cont'd)

Table for selecting differential side bearing adjusting shim(s) for F03V

Unit: mm (in)

Dial indicator deflection	Suitable shim(s)
0.19 - 0.23 (0.0075 - 0.0091)	0.28 (0.0110)
0.23 - 0.27 (0.0091 - 0.0106)	0.32 (0.0126)
0.27 - 0.31 (0.0106 - 0.0122)	0.36 (0.0142)
0.31 - 0.35 (0.0122 - 0.0138)	0.40 (0.0157)
0.35 - 0.39 (0.0138 - 0.0154)	0.44 (0.0173)
0.39 - 0.43 (0.0154 - 0.0169)	0.48 (0.0189)
0.43 - 0.47 (0.0169 - 0.0185)	0.52 (0.0205)
0.47 - 0.51 (0.0185 - 0.0201)	0.56 (0.0220)
0.51 - 0.55 (0.0201 - 0.0217)	0.60 (0.0236)
0.55 - 0.59 (0.0217 - 0.0232)	0.64 (0.0252)
0.59 - 0.63 (0.0232 - 0.0248)	0.68 (0.0268)
0.63 - 0.67 (0.0248 - 0.0264)	0.72 (0.0283)
0.67 - 0.71 (0.0264 - 0.0280)	0.76 (0.0299)
0.71 - 0.75 (0.0280 - 0.0295)	0.80 (0.0315)
0.75 - 0.79 (0.0295 - 0.0311)	0.84 (0.0331)
0.79 - 0.83 (0.0311 - 0.0327)	0.88 (0.0346)
0.83 - 0.87 (0.0327 - 0.0343)	0.92 (0.0362)
0.87 - 0.91 (0.0343 - 0.0358)	0.48 (0.0189) + 0.48 (0.0189)
0.91 - 0.95 (0.0358 - 0.0374)	0.48 (0.0189) + 0.52 (0.0205)
0.95 - 0.99 (0.0374 - 0.0390)	0.52 (0.0205) + 0.52 (0.0205)
0.99 - 1.03 (0.0390 - 0.0406)	0.52 (0.0205) + 0.56 (0.0220)
1.03 - 1.07 (0.0406 - 0.0421)	0.56 (0.0220) + 0.56 (0.0220)
1.07 - 1.11 (0.0421 - 0.0437)	0.56 (0.0220) + 0.60 (0.0236)
1.11 - 1.15 (0.0437 - 0.0453)	0.60 (0.0236) + 0.60 (0.0236)
1.15 - 1.19 (0.0453 - 0.0469)	0.60 (0.0236) + 0.64 (0.0252)
1.19 - 1.23 (0.0469 - 0.0484)	0.64 (0.0252) + 0.64 (0.0252)
1.23 - 1.27 (0.0484 - 0.0500)	0.64 (0.0252) + 0.68 (0.0268)
1.27 - 1.31 (0.0500 - 0.0516)	0.68 (0.0268) + 0.68 (0.0268)
1.31 - 1.35 (0.0516 - 0.0531)	0.68 (0.0268) + 0.72 (0.0283)
1.35 - 1.39 (0.0531 - 0.0547)	1.44 (0.0567)
1.39 - 1.43 (0.0547 - 0.0563)	0.72 (0.0283) + 0.76 (0.0299)
1.43 - 1.47 (0.0563 - 0.0579)	0.76 (0.0299) + 0.76 (0.0299)
1.47 - 1.51 (0.0579 - 0.0594)	0.76 (0.0299) + 0.80 (0.0315)
1.51 - 1.55 (0.0594 - 0.0610)	0.80 (0.0315) + 0.80 (0.0315)
1.55 - 1.59 (0.0610 - 0.0626)	0.80 (0.0315) + 0.84 (0.0331)
1.59 - 1.63 (0.0626 - 0.0642)	0.84 (0.0331) + 0.84 (0.0331)
1.63 - 1.67 (0.0642 - 0.0657)	0.84 (0.0331) + 0.88 (0.0346)
1.67 - 1.71 (0.0657 - 0.0673)	0.88 (0.0346) + 0.88 (0.0346)
1.71 - 1.75 (0.0673 - 0.0689)	0.88 (0.0346) + 0.92 (0.0362)
1.75 - 1.79 (0.0689 - 0.0705)	0.92 (0.0362) + 0.92 (0.0362)
1.79 - 1.83 (0.0705 - 0.0720)	0.92 (0.0362) + 0.96 (0.0378)
1.83 - 1.87 (0.0720 - 0.0736)	0.96 (0.0378) + 0.96 (0.0378)
1.87 - 1.91 (0.0736 - 0.0752)	0.52 (0.0205) + 1.44 (0.0567)
1.91 - 1.95 (0.0752 - 0.0768)	0.56 (0.0220) + 1.44 (0.0567)

REDUCTION GEAR

Bearing preload

Reduction gear bearing pre-load mm (in)	0.05 (0.0020)
--	---------------

Turning torque

Turning torque of reduction gear N·m (kg·cm, in·lb)	0.11 - 0.69 (1.1 - 7.0, 0.95 - 6.08)
--	--------------------------------------

Reduction gear bearing adjusting shims

Thickness mm (in)	Part number
1.10 (0.0433)	31438-31X00
1.14 (0.0449)	31438-31X01
1.18 (0.0465)	31438-31X02
1.22 (0.0480)	31438-31X03
1.26 (0.0496)	31438-31X04
1.30 (0.0512)	31438-31X05
1.34 (0.0528)	31438-31X06
1.38 (0.0543)	31438-31X07
1.42 (0.0559)	31438-31X08
1.46 (0.0575)	31438-31X09
1.50 (0.0591)	31438-31X10
1.54 (0.0606)	31438-31X11
1.58 (0.0622)	31438-31X12
1.62 (0.0638)	31438-31X13
1.66 (0.0654)	31438-31X14
1.70 (0.0669)	31438-31X15
1.74 (0.0685)	31438-31X16
1.78 (0.0701)	31438-31X17
1.82 (0.0717)	31438-31X18
1.86 (0.0732)	31438-31X19
1.90 (0.0748)	31438-31X20
1.92 (0.0756)	31439-31X60
1.94 (0.0764)	31438-31X21
1.96 (0.0772)	31439-31X61
1.98 (0.0780)	31438-31X22
2.00 (0.0787)	31439-31X62
2.02 (0.0795)	31438-31X23
2.04 (0.0803)	31439-31X63
2.06 (0.0811)	31438-31X24
2.08 (0.0819)	31439-31X64
2.10 (0.0827)	31438-31X60
2.12 (0.0835)	31439-31X65
2.14 (0.0843)	31438-31X61
2.16 (0.0850)	31439-31X66
2.18 (0.0858)	31438-31X62
2.20 (0.0866)	31439-31X67
2.22 (0.0874)	31438-31X63
2.24 (0.0882)	31439-31X68
2.26 (0.0890)	31438-31X64
2.28 (0.0898)	31439-31X69
2.30 (0.0906)	31438-31X65
2.34 (0.0921)	31438-31X66
2.38 (0.0937)	31438-31X67
2.42 (0.0953)	31438-31X68
2.46 (0.0969)	31438-31X69
2.50 (0.0984)	31438-31X70
2.54 (0.1000)	31438-31X71
2.58 (0.1016)	31438-31X72
2.62 (0.1031)	31438-31X73
2.66 (0.1047)	31438-31X74
2.70 (0.1063)	31438-31X75
2.74 (0.1079)	31438-31X76
2.78 (0.1094)	31438-31X77
2.82 (0.1110)	31438-31X78

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Specifications and Adjustments (Cont'd)

Table for selecting reduction gear bearing adjusting shim

Unit: mm (in)

Dimension "T"	Suitable shim(s)
1.13 - 1.17 (0.0445 - 0.0461)	1.10 (0.0433)
1.17 - 1.21 (0.0461 - 0.0476)	1.14 (0.0449)
1.21 - 1.25 (0.0476 - 0.0492)	1.18 (0.0465)
1.25 - 1.29 (0.0492 - 0.0508)	1.22 (0.0480)
1.29 - 1.33 (0.0508 - 0.0524)	1.26 (0.0496)
1.33 - 1.37 (0.0524 - 0.0539)	1.30 (0.0512)
1.37 - 1.41 (0.0539 - 0.0161)	1.34 (0.0528)
1.41 - 1.45 (0.0161 - 0.0571)	1.38 (0.0543)
1.45 - 1.49 (0.0571 - 0.0587)	1.42 (0.0559)
1.49 - 1.53 (0.0587 - 0.0602)	1.46 (0.0575)
1.53 - 1.57 (0.0602 - 0.0618)	1.50 (0.0591)
1.57 - 1.61 (0.0618 - 0.0634)	1.54 (0.0606)
1.61 - 1.65 (0.0634 - 0.0650)	1.58 (0.0622)
1.65 - 1.69 (0.0650 - 0.0665)	1.62 (0.0638)
1.69 - 1.73 (0.0665 - 0.0681)	1.66 (0.0654)
1.73 - 1.77 (0.0681 - 0.0697)	1.70 (0.0669)
1.77 - 1.81 (0.0697 - 0.0713)	1.74 (0.0685)
1.81 - 1.85 (0.0713 - 0.0728)	1.78 (0.0701)
1.85 - 1.89 (0.0728 - 0.0744)	1.82 (0.0717)
1.89 - 1.93 (0.0744 - 0.0760)	1.86 (0.0732)
1.93 - 1.97 (0.0760 - 0.0776)	1.90 (0.0748)
1.97 - 2.01 (0.0776 - 0.0791)	1.94 (0.0764)
2.01 - 2.05 (0.0791 - 0.0807)	1.98 (0.0780)
2.05 - 2.09 (0.0807 - 0.0823)	2.02 (0.0795)
2.09 - 2.13 (0.0823 - 0.0839)	2.06 (0.0811)
2.13 - 2.17 (0.0839 - 0.0854)	2.10 (0.0827)
2.17 - 2.21 (0.0854 - 0.0870)	2.14 (0.0843)
2.21 - 2.25 (0.0870 - 0.0886)	2.18 (0.0858)
2.25 - 2.29 (0.0886 - 0.0902)	2.22 (0.0874)
2.29 - 2.33 (0.0902 - 0.0917)	2.26 (0.0890)
2.33 - 2.37 (0.0917 - 0.0933)	2.30 (0.0906)
2.37 - 2.41 (0.0933 - 0.0949)	2.34 (0.0921)
2.41 - 2.45 (0.0949 - 0.0965)	2.38 (0.0937)
2.45 - 2.49 (0.0965 - 0.0980)	2.42 (0.0953)
2.49 - 2.53 (0.0980 - 0.0996)	2.46 (0.0969)
2.53 - 2.57 (0.0996 - 0.1012)	2.50 (0.0984)
2.57 - 2.61 (0.1012 - 0.1028)	2.54 (0.1000)
2.61 - 2.65 (0.1028 - 0.1043)	2.58 (0.1016)
2.65 - 2.69 (0.1043 - 0.1059)	2.62 (0.1031)
2.69 - 2.73 (0.1059 - 0.1075)	2.66 (0.1047)
2.73 - 2.77 (0.1075 - 0.1091)	2.70 (0.1063)
2.77 - 2.81 (0.1091 - 0.1106)	2.74 (0.1079)
2.81 - 2.85 (0.1106 - 0.1122)	2.78 (0.1094)
2.85 - 2.89 (0.1122 - 0.1138)	2.82 (0.1110)

OUTPUT SHAFT

Seal ring clearance

Output shaft seal ring clearance mm (in)		
Standard	0.10 - 0.25 (0.0039 - 0.0098)	GI
Allowable limit	0.25 (0.0098)	MA

End play

Output shaft end play mm (in)		
0 - 0.5 (0 - 0.020)		EM

Output shaft adjusting shims

Thickness mm (in)	Part number	
0.56 (0.0220)	31438-31X46	EF & EC
0.96 (0.0378)	31438-31X47	FE
1.36 (0.0535)	31438-31X48	

BEARING RETAINER

Seal ring clearance

Bearing retainer seal ring clearance mm (in)		
Standard	0.10 - 0.25 (0.0039 - 0.0098)	MT
Allowable limit	0.25 (0.0098)	AT

TOTAL END PLAY

Total end play mm (in)		
0.25 - 0.55 (0.0098 - 0.0217)		RA

Bearing race for adjusting total end play

Thickness mm (in)	Part number	
0.6 (0.024)	31435-31X01	
0.8 (0.031)	31435-31X02	BF
1.0 (0.039)	31435-31X03	
1.2 (0.047)	31435-31X04	HA
1.4 (0.055)	31435-31X05	
1.6 (0.063)	31435-31X06	
1.8 (0.071)	31435-31X07	EL
2.0 (0.079)	31435-31X08	
2.2 (0.087)	31435-31X09	

REVERSE CLUTCH END PLAY

Reverse clutch end play mm (in)		
0.65 - 1.0 (0.0256 - 0.0394)		

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Specifications and Adjustments (Cont'd)

Thrust washer for adjusting reverse clutch end play

Thickness mm (in)	Part number
0.65 (0.0256)	31508-31X00
0.80 (0.0315)	31508-31X01
0.95 (0.0374)	31508-31X02
1.10 (0.0433)	31508-31X03
1.25 (0.0492)	31508-31X04
1.40 (0.0551)	31508-31X05
1.55 (0.0610)	31508-31X06

ACCUMULATOR

O-ring

Unit: mm (in)

Accumulator	Inner diameter (Small)	Inner diameter (Large)
3-R accumulator	26.9 (1.059)	44.2 (1.740)
N-D accumulator	34.6 (1.362)	39.4 (1.551)

Return spring

Unit: mm (in)

Accumulator	Free length	Outer diameter
3-R accumulator	56.4 (2.220)	21.0 (0.827)
N-D accumulator	43.5 (1.713)	28.0 (1.102)

BAND SERVO

Return spring

Unit: mm (in)

Return spring	Free length	Outer diameter
2nd servo return spring	32.5 (1.280)	25.9 (1.020)
O.D. servo return spring	31.0 (1.220)	21.7 (0.854)

REMOVAL AND INSTALLATION

Distance between end of converter housing and torque converter	15.9 mm (0.626 in) or more
Drive plate runout limit	0.2 mm (0.008 in)

FRONT AXLE & FRONT SUSPENSION

SECTION **FA**

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

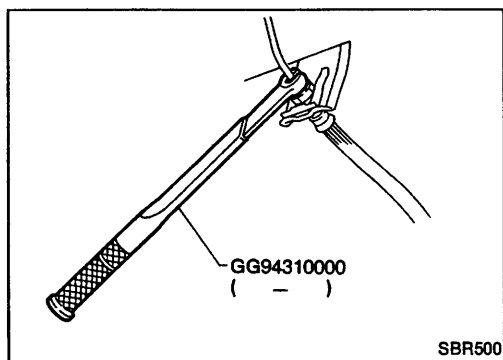
HA

EL

CONTENTS

PRECAUTIONS AND PREPARATION	2	Wheel Hub and Knuckle	8
Precautions.....	2	Drive Shaft.....	11
Special Service Tools	2	FRONT SUSPENSION	18
FRONT AXLE AND FRONT SUSPENSION	3	Coil Spring and Shock Absorber	19
ON-VEHICLE SERVICE	4	Third Link and Upper Link.....	20
Front Axle and Front Suspension Parts.....	4	Stabilizer Bar	22
Front Wheel Bearing.....	5	Transverse Link and Lower Ball Joint.....	23
Front Wheel Alignment.....	5	SERVICE DATA AND SPECIFICATIONS (S.D.S.)	24
Drive Shaft.....	6	General Specifications.....	24
FRONT AXLE	7	Inspection and Adjustment.....	25

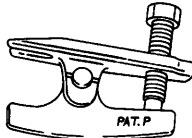
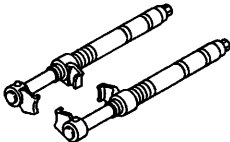
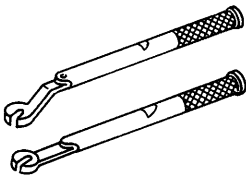
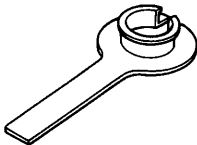
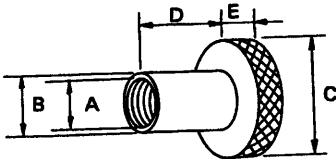
PRECAUTIONS AND PREPARATION



Precautions

- When installing rubber parts, 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.
- When removing each suspension part, check wheel alignment and adjust if necessary.
- Use Tool when removing or installing brake tubes.

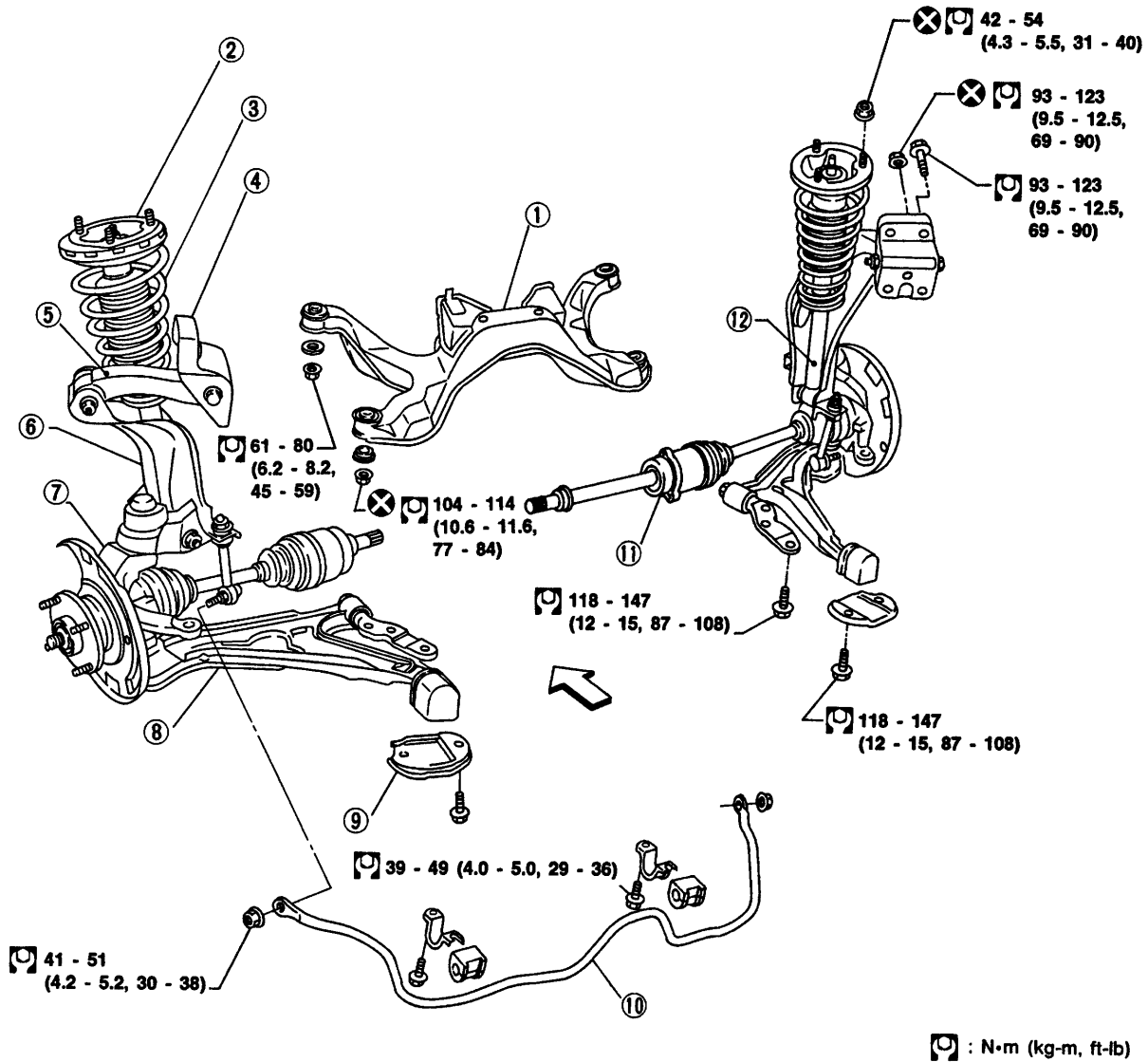
Special Service Tools

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
GG94310000 (—) Flare nut torque wrench	 Removing and installing brake piping
KV38106700 (J34296) KV38106800 (J34297) Differential side oil seal protector	 Installing drive shaft L.H.: KV38106700 R.H.: KV38106800
IM23600800 (—) Attachment Wheel alignment	 Measure wheel alignment A: Screw M24 x 1.5 B: 35 (1.38) dia. C: 65 (2.56) dia. D: 56 (2.20) E: 12 (0.47) Unit: mm (in)

FRONT AXLE AND FRONT SUSPENSION

When installing rubber parts, 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.



- ① Front suspension member
- ② Shock absorber mounting insulator
- ③ Coil spring
- ④ Upper link bracket

- ⑤ Upper link
- ⑥ Third link
- ⑦ Knuckle
- ⑧ Transverse link

- ⑨ Clamp
- ⑩ Stabilizer bar
- ⑪ Drive shaft
- ⑫ Shock absorber

SFA908A

GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

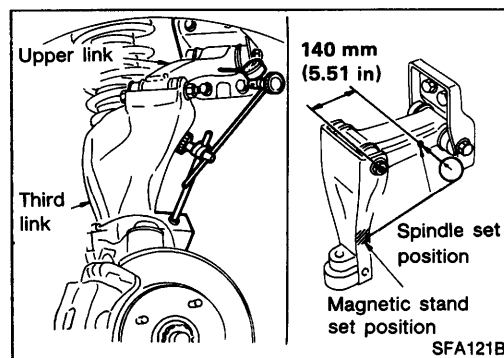
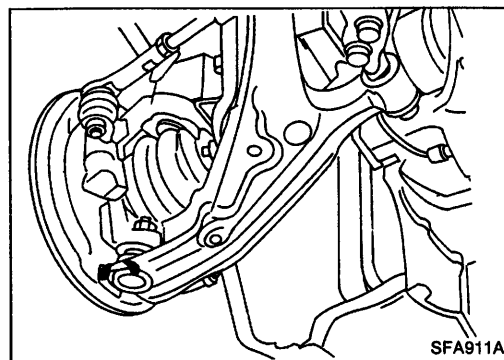
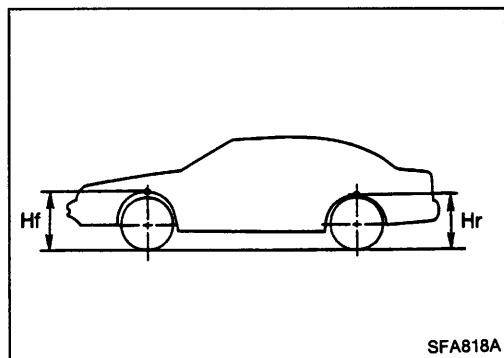
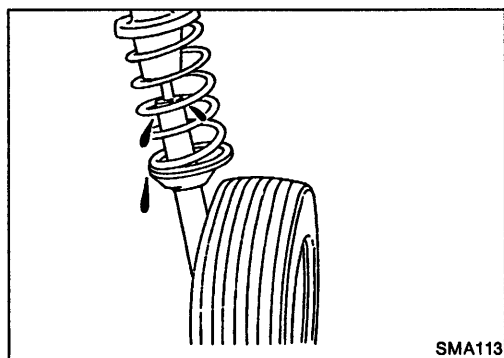
Front Axle and Front Suspension Parts

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

- Make sure that cotter pin is inserted.
- Retighten all nuts and bolts to the specified torque.

Tightening torque:

Refer to FRONT SUSPENSION.



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

- Check spring height from the top of the wheelarch to the ground.

- (1) Vehicle must be unladen*, parked on a level surface, and tires checked for proper inflation and wear (tread wear indicator must not be showing).

*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

- (2) Bounce the vehicle up and down several times before measuring.

Standard height:

Front (Hf): 653.5 mm (25.73 in)

Rear (Hr): 644.5 mm (25.37 in)

- (3) Spring height is not adjustable. If out of specification, check for worn springs or suspension parts.

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

- Check upper link free play.

- (1) Jack up front of vehicle and set stands.
- (2) Set steering wheel in straight-forward direction and lock it using key lock.
- (3) Remove front wheels.

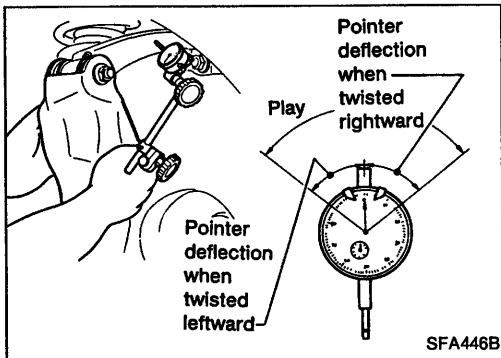
On axle side

- (4) Install dial gauge.
 - a. Install magnet stand on third link.
 - b. Set dial gauge in position.

Set dial gauge spindle in contact with flat surface of upper link at 140 mm (5.51 in) measured directly from center of upper link retaining bolt on third link side. (Reset dial gauge.)

ON-VEHICLE SERVICE

Front Axle and Front Suspension Parts (Cont'd)



- (5) While holding flanges of third link with both hands, twist third link fully to the right and read dial gauge indication. Similarly, twist third link to the left and read dial gauge indication.

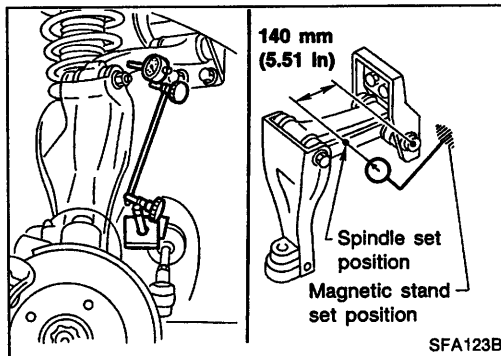
Free play = (Gauge indication when third link is fully twisted to the right) + (Gauge indication when third link is fully twisted to the left)

Allowable free play range:
7.0 mm (0.276 in), max.

GI

MA

EM



On body side

- (6) Install dial gauge.
a. Install magnet stand on front suspension mount member.
b. Set dial gauge in position.
Set dial gauge spindle in contact with flat surface of upper link at 140 mm (5.51 in) measured directly from center of retaining bolt on bracket side. (Reset dial gauge.)

- (7) Measure free play in the same manner as on axle side.

Allowable free play range: 5.0 mm (0.197 in), max.

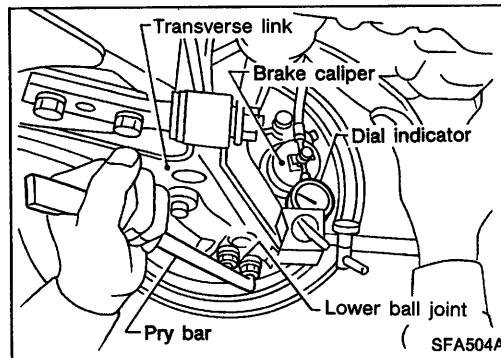
- (8) If free play exceeds specifications, replace upper link assembly.

LC

EF &
EC

FE

CL



- Check suspension ball joint 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 raising and releasing pry bar, observe maximum dial indicator value.

Vertical end play: 0 mm (0 in)

- (6) If ball joint movement is beyond specifications, remove and recheck it.

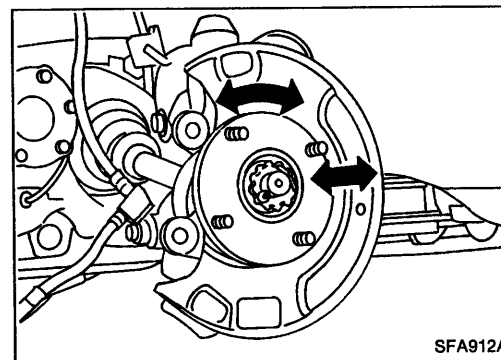
MT

AT

FA

RA

BR



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 axial end play is not within specification or wheel bearing does not turn smoothly, replace wheel bearing assembly.

Refer to FRONT AXLE — Wheel Hub and Knuckle.

ST

BF

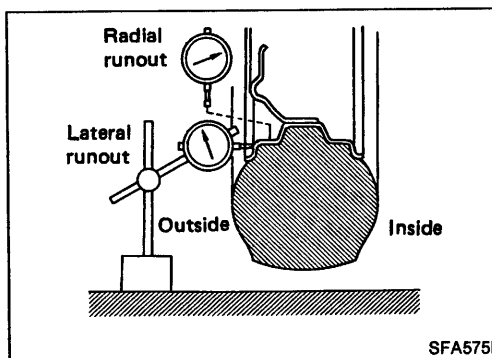
HA

Front Wheel Alignment

Before checking front wheel alignment, be sure to make a preliminary inspection (Unladen*).

*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

EL



ON-VEHICLE SERVICE

Front Wheel Alignment (Cont'd)

PRELIMINARY INSPECTION

1. Check tires for wear and improper inflation.
2. Check wheel runout.

Wheel runout:

Refer to S.D.S.

3. Check front wheel bearings for looseness.
4. Check front suspension for looseness.
5. Check steering linkage for looseness.
6. Check that front shock absorbers work properly by using the standard bounce test.
7. Check vehicle posture (Unladen).

CAMBER, CASTER AND KINGPIN INCLINATION

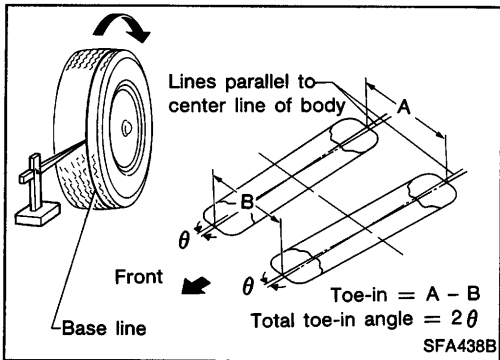
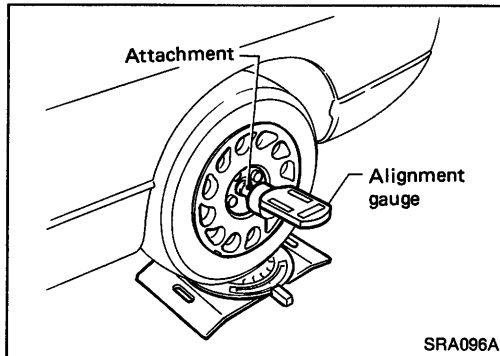
Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.

1. Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge.

Camber, caster and kingpin inclination:

Refer to S.D.S.

2. If camber, caster and kingpin inclination are not within specification, inspect and replace any damaged or worn front suspension parts.

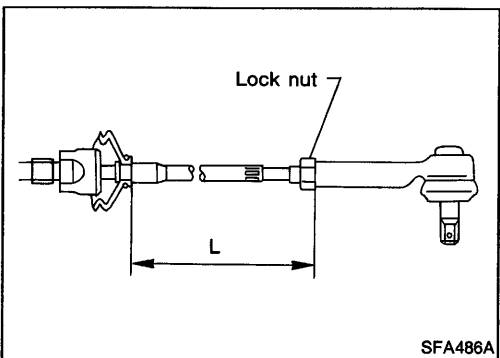


TOE-IN

1. Draw 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.
2. Measure toe-in.
 - Measure distance "A" and "B" at the same height as hub center.

Toe-in:

Refer to S.D.S.



3. Adjust toe-in by varying the length of steering tie-rods.
 - (1) Loosen lock nuts.
 - (2) Adjust toe-in by screwing tie-rods in and out.

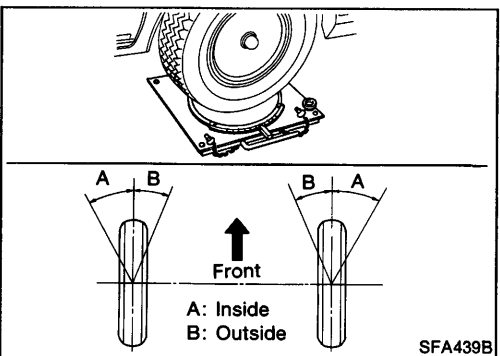
Standard length "L":

Refer to ST section.

- (3) Tighten lock nuts to specified torque.

Lock nut tightening torque:

Refer to ST section.



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.

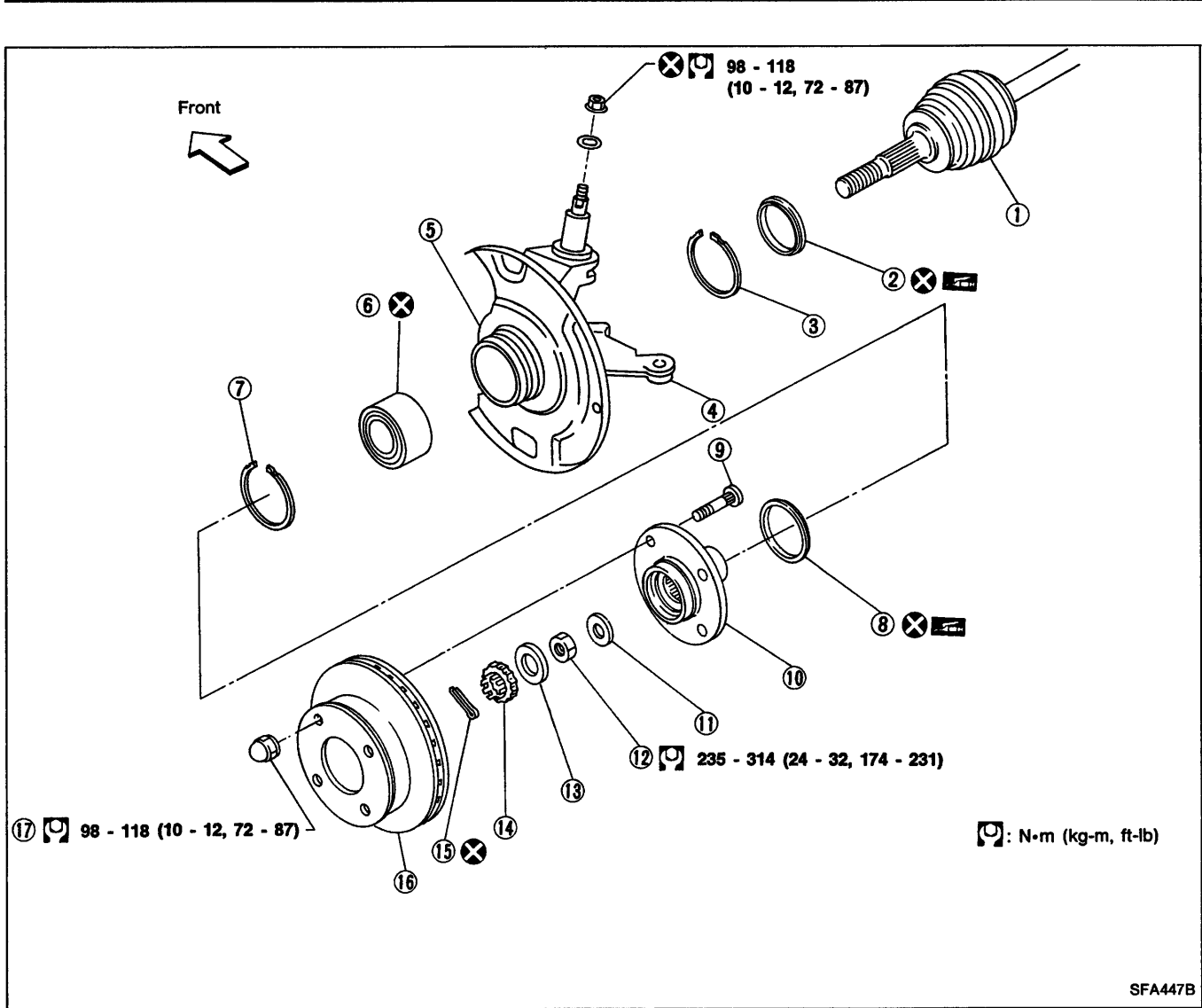
Wheel turning angle (Full turn):

Inside wheel/Outside wheel

33° - 37°/28° - 32°

Drive Shaft

Check for grease leakage or other damage.



- | | | |
|--------------------------|--------------------------|-----------------|
| ① Drive shaft | ⑦ Snap ring | ⑬ Insulator |
| ② Inner grease seal | ⑧ Outer grease seal | ⑭ Adjusting cap |
| ③ Snap ring | ⑨ Wheel bolt | ⑮ Cotter pin |
| ④ Knuckle | ⑩ Wheel hub | ⑯ Disc rotor |
| ⑤ Baffle plate | ⑪ Plain washer | ⑰ Wheel nut |
| ⑥ Wheel bearing assembly | ⑫ Wheel bearing lock nut | |

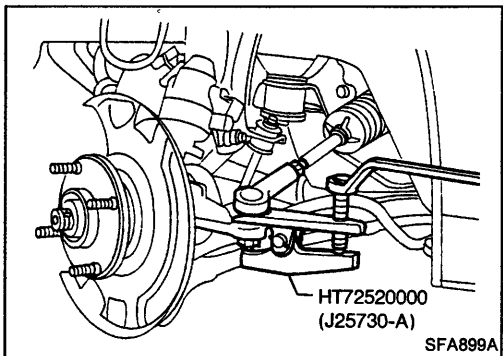
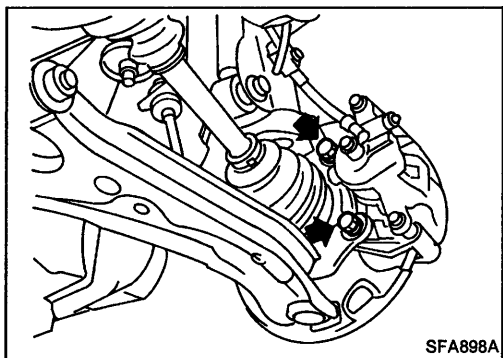
FRONT AXLE

Wheel Hub and Knuckle

REMOVAL

- Remove wheel bearing lock nut.
- Remove brake caliper assembly and rotor.

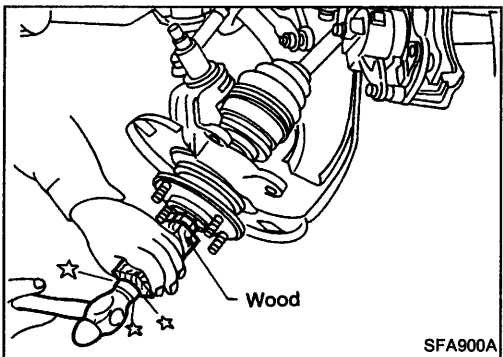
Brake hose need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Make sure brake hose is not twisted.



- Separate tie-rod from knuckle with Tool.

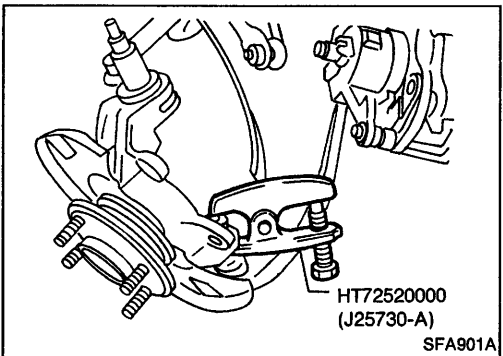
Install stud nut inverted on stud bolt to prevent damage to stud bolt.

- Remove kingpin cap and securing nut. Separate kingpin from knuckle.

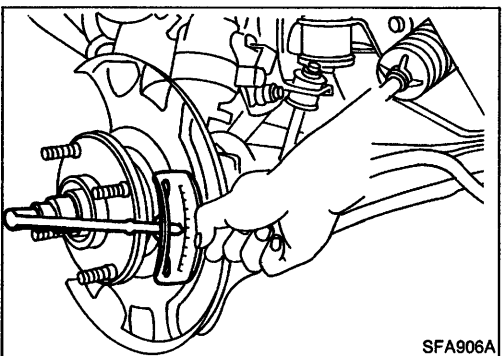


- Separate drive shaft from knuckle with drift.

When removing drive shaft, cover boots with shop towel to prevent damage to them.



- Remove ball joint securing nut. Separate from knuckle using Tool (as for tie-rod).



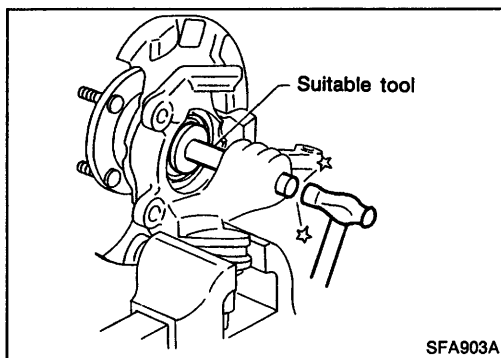
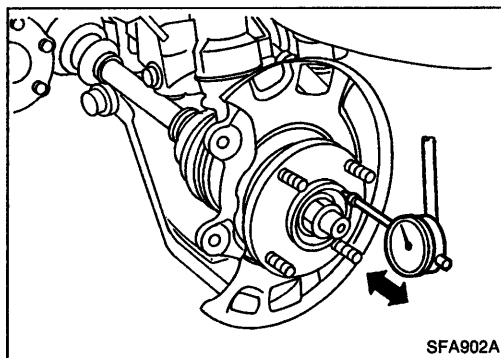
INSTALLATION

- Install knuckle with wheel hub.
- Tighten wheel bearing lock nut.
**⚙: 235 - 314 N·m
(24 - 32 kg-m, 174 - 231 ft-lb)**
- Check that wheel bearings operate smoothly.

FRONT AXLE

Wheel Hub and Knuckle (Cont'd)

- Check wheel bearing axial end play.
Axial end play:
0.05 mm (0.0020 in) or less.



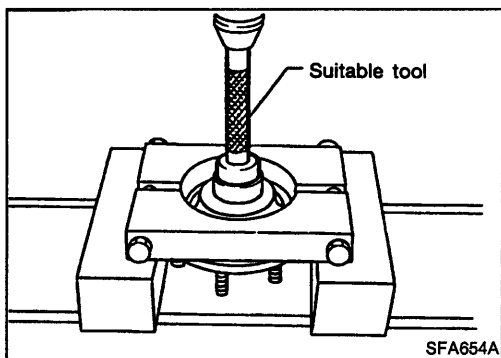
DISASSEMBLY

CAUTION:

When removing wheel hub or wheel bearing from knuckle, replace wheel bearing assembly (outer race, inner races and grease seals) with a new one.

Wheel hub

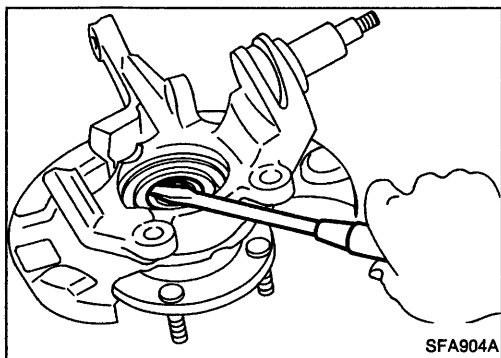
Drive out hub with inner race (outside) from knuckle with a suitable tool.



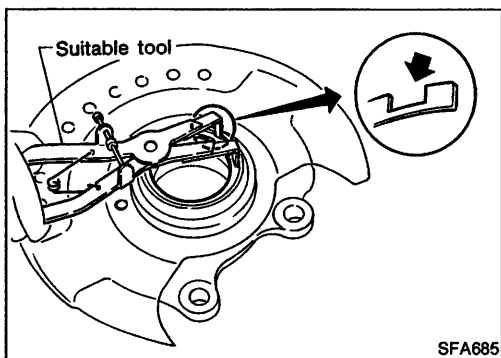
Wheel bearing

When replacing wheel bearing, replace complete wheel bearing assembly (including inner and outer races).

- Remove bearing inner race (outside), then remove outer grease seal.



- Remove inner grease seal from knuckle.



- Remove inner and outer snap rings.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

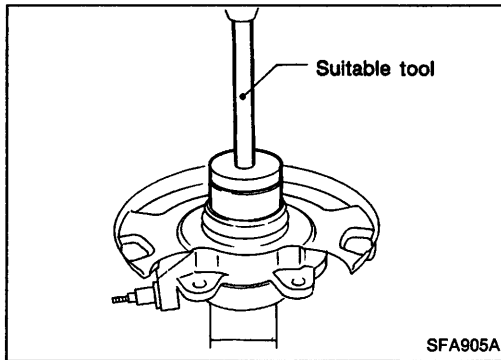
HA

EL

FRONT AXLE

Wheel Hub and Knuckle (Cont'd)

- Press out bearing outer race.



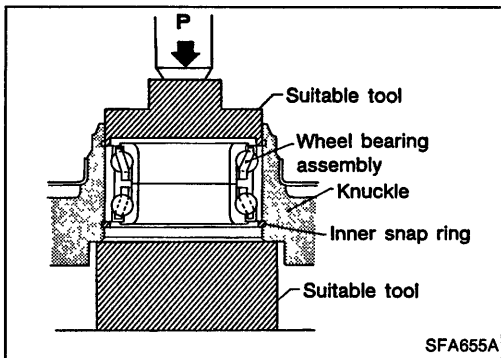
INSPECTION

Wheel hub and knuckle

Check wheel hub and knuckle for cracks by using a magnetic exploration or dyeing test.

Snap ring

Check snap ring for wear or cracks. Replace if necessary.



ASSEMBLY

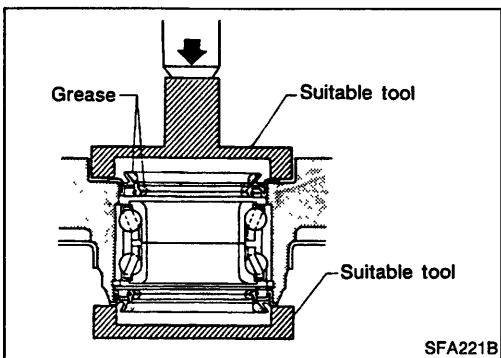
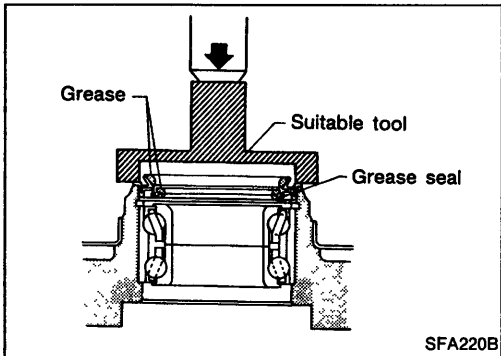
1. Install inner snap ring into groove of knuckle.
2. Press new wheel bearing assembly into knuckle until it contacts snap ring.

Maximum load P:

49 kN (5 ton, 5.5 US ton, 4.9 Imp ton)

CAUTION:

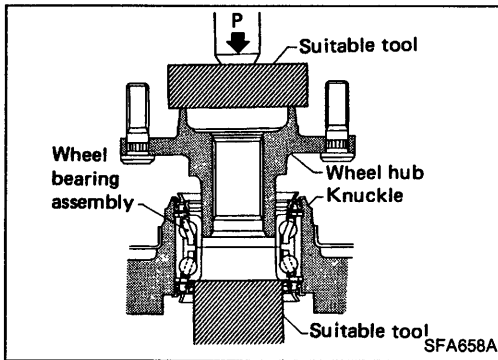
- Do not press inner race of wheel bearing assembly.
 - Do not apply oil or grease to mating surfaces of wheel bearing outer race and knuckle.
3. Install outer snap ring into groove of knuckle.
 4. Pack grease seal lip with multi-purpose grease.
 5. Install outer grease seal.



6. Install inner grease seal.

FRONT AXLE

Wheel Hub and Knuckle (Cont'd)

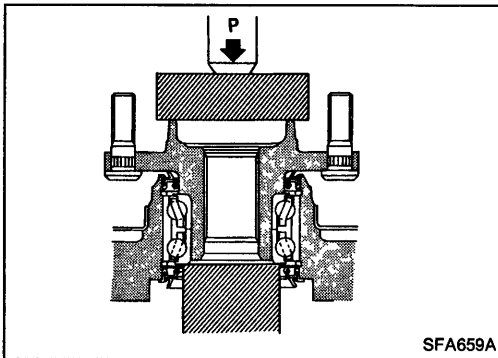


7. Press wheel hub into knuckle.

Maximum load P:

29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)

Be careful not to damage grease seal.



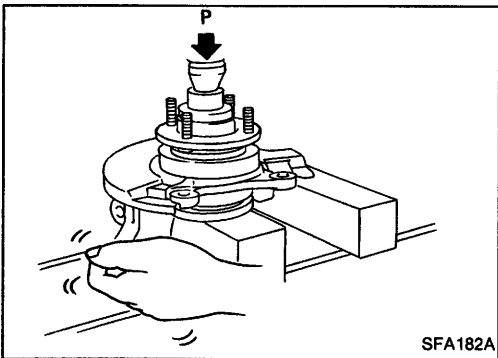
8. Check bearing operation.

- (1) Add load P with press.

Load P:

34.3 - 49.0 kN

(3.5 - 5.0 ton, 3.9 - 5.5 US ton, 3.44 - 4.92 Imp ton)



- (2) Spin knuckle several turns in both directions.

- (3) Make sure that wheel bearings operate smoothly.

Drive Shaft

REMOVAL

- Remove wheel bearing lock nut.
- Remove brake caliper assembly and rotor.

Brake hose need not be disconnected from brake caliper.

Be careful not to depress brake pedal, or piston will pop out.

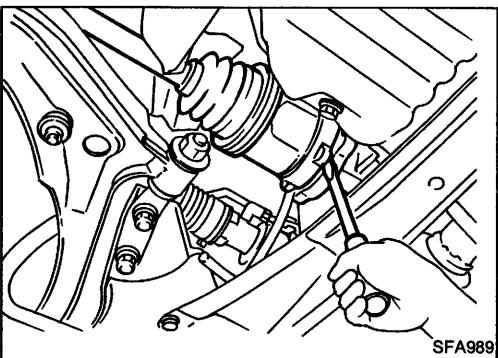
Do not pull or twist brake hose.

- Remove tie-rod ball joint.
- Remove upper knuckle nut.
- Separate drive shaft from knuckle by lightly tapping it. If it is hard to remove, use a puller.

When removing drive shaft, cover boots with shop towel to prevent damage to them.

Refer to FRONT AXLE — Wheel Hub and Knuckle.

1. Remove right drive shaft from transaxle.

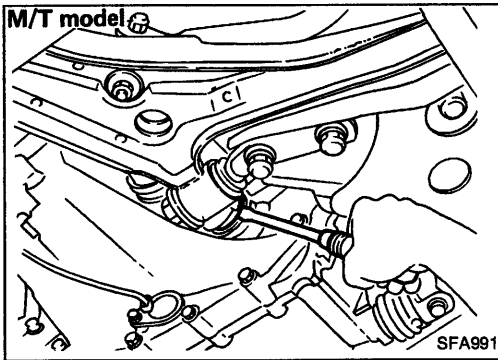


FRONT AXLE

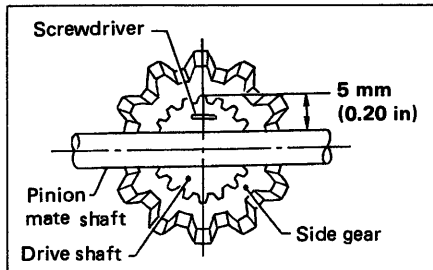
Drive Shaft (Cont'd)

2. Remove left drive shaft from transaxle.

— For M/T models —



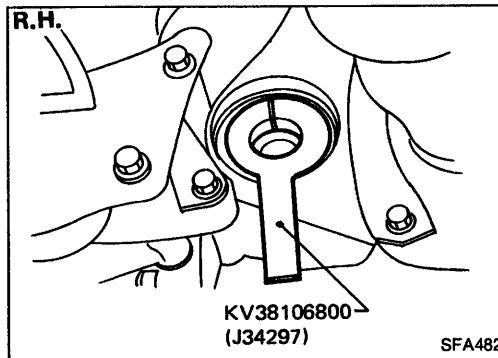
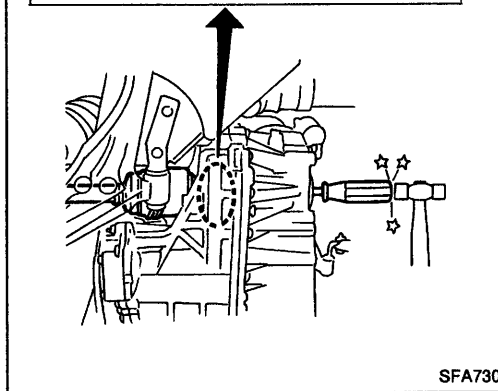
A/T model



— For A/T models —

● Remove left drive shaft with a suitable tool.

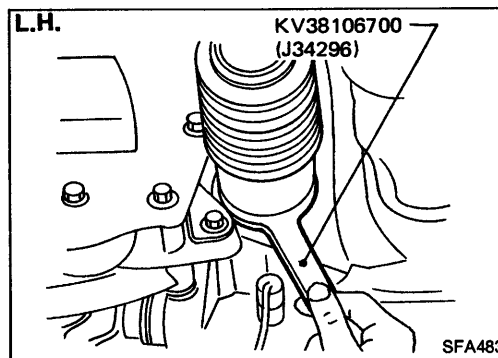
Be careful not to damage pinion mate shaft and side gear.



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.



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.
5. After its insertion, try to pull the flange out of the slide joint by hand. If it pulls out, the circular clip is not properly meshed with the side gear.

FRONT AXLE

Drive Shaft (Cont'd)

Wheel side

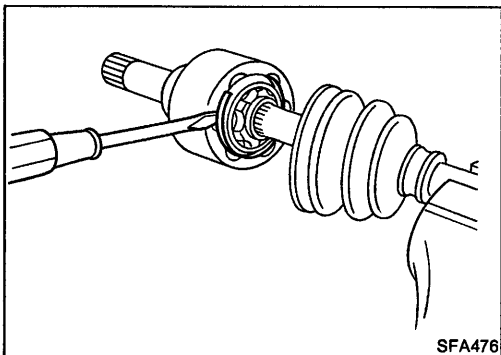
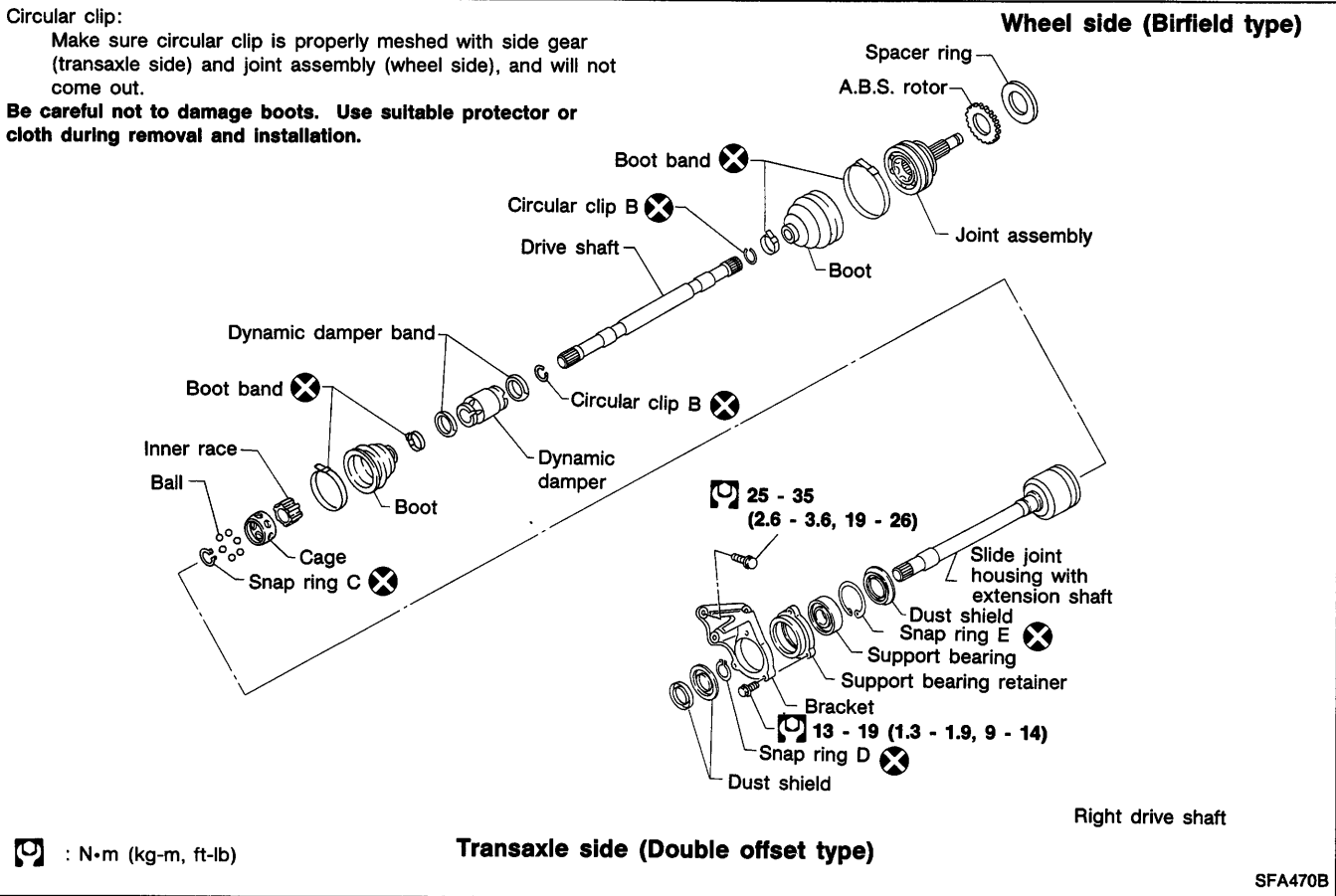
- Install drive shaft into knuckle.
- Tighten upper knuckle nut and wheel bearing lock nut. Refer to section Installation in FRONT AXLE — Wheel Hub and Knuckle.

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.

Be careful not to damage boots. Use suitable protector or cloth during removal and installation.



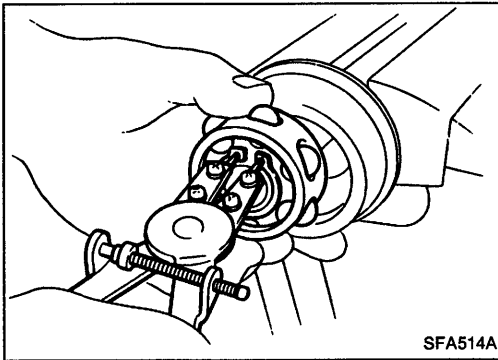
DISASSEMBLY

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.

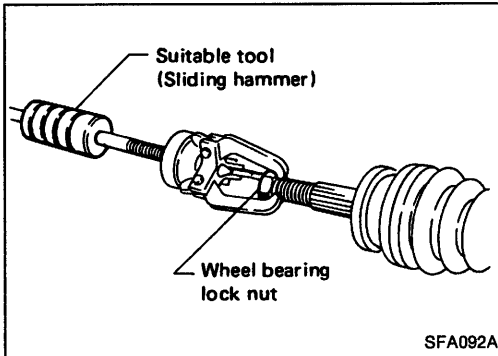
FRONT AXLE

Drive Shaft (Cont'd)



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 serrations with tape so as not to damage the boot.



Wheel side (Birfield type)

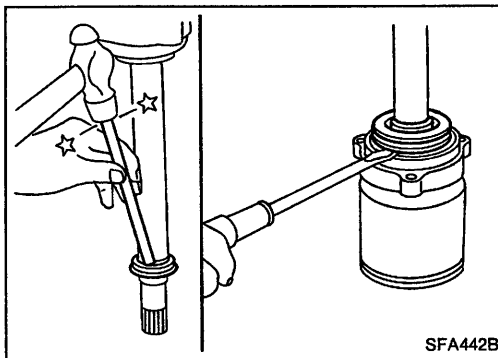
CAUTION:

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 a suitable tool.

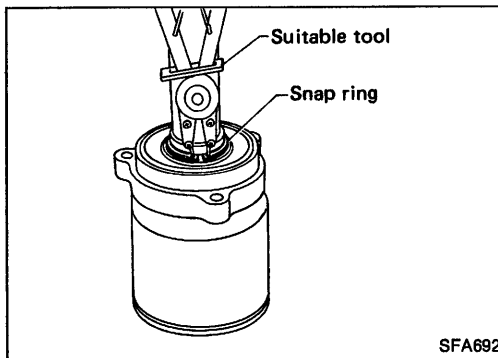
Be careful not to damage threads on drive shaft.

- Draw out boot.

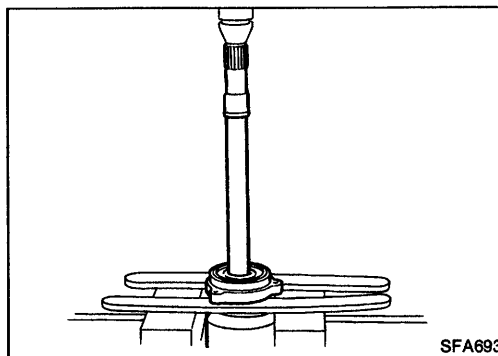


Support bearing

- Remove outer dust shield.
- Remove inner dust shield.



- Pry off snap ring.

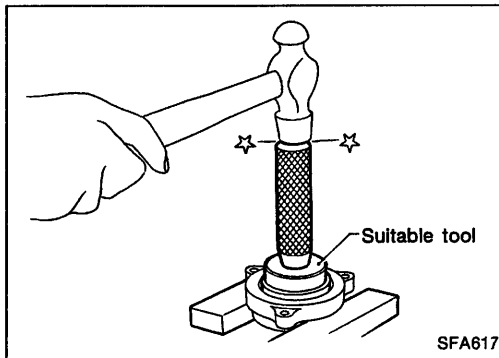


- Press support bearing assembly out of drive shaft.

FRONT AXLE

Drive Shaft (Cont'd)

- Press support bearing out of retainer.



GI

MA

EM

INSPECTION

Thoroughly clean all parts in cleaning solvent, and dry with compressed air. Check parts for evidence of deformation or other damage.

LC

EF &
EC

Drive shaft

Replace drive shaft if it is twisted or cracked.

FE

Boot

Check boot for fatigue, cracks or wear. Replace boot with new boot bands.

CL

MT

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.

AT

FA

Joint assembly (Wheel side)

Replace joint assembly if it is deformed or damaged.

RA

Support bearing

Make sure wheel bearing rolls freely and is free from noise, cracks, pitting or wear.

BR

ST

Support bearing bracket

Check support bearing bracket for cracks with a magnetic exploration or dyeing test.

BF

ASSEMBLY

HA

- 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.

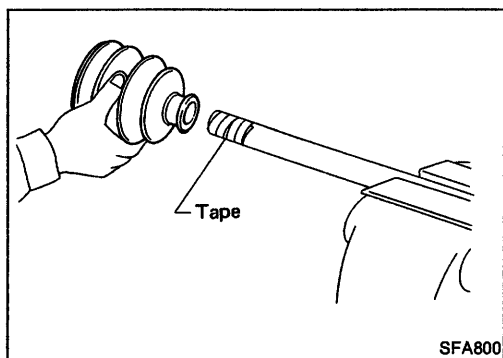
EL

FRONT AXLE

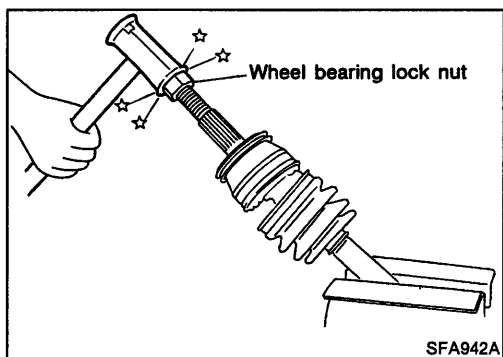
Drive Shaft (Cont'd)

Wheel side (Birfield type)

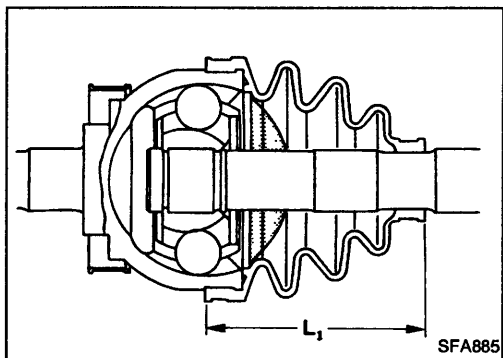
1. Install boot and new small boot band on drive shaft.
Cover drive shaft serration with tape so as not to damage boot during installation.



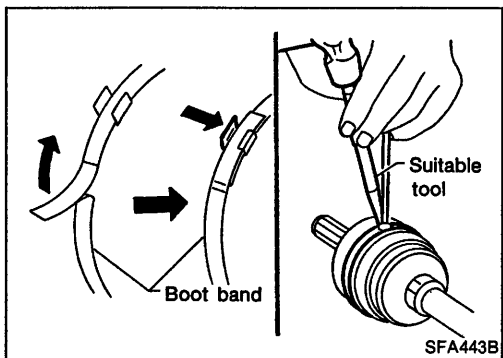
2. Set joint assembly onto drive shaft by lightly tapping it. Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.



3. Pack drive shaft with specified amount of grease.
Specified amount of grease:
105 - 125 ml (3.6 - 4.2 US fl oz, 3.7 - 4.4 Imp fl oz)
4. Make sure that boot is properly installed on the drive shaft groove.
Set boot so that it does not swell and deform when its length is "L₁".
Length "L₁":
100.5 mm (3.96 in)



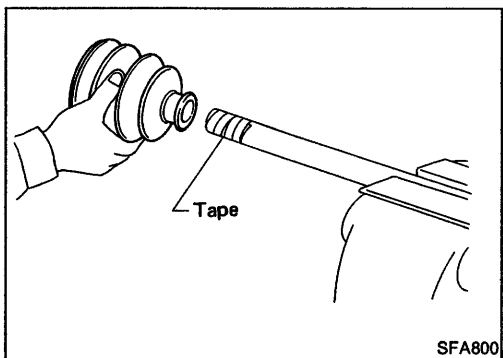
5. Lock new larger and smaller boot bands securely with a suitable tool.



Transaxle side

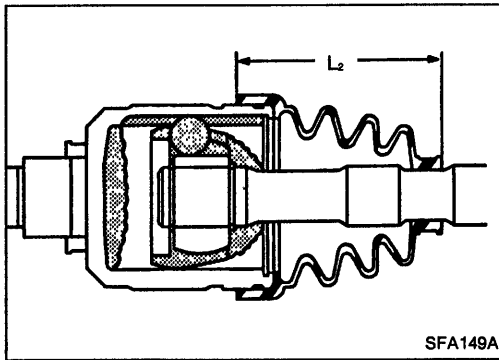
(Double offset type)

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.



FRONT AXLE

Drive Shaft (Cont'd)



2. Pack drive shaft with specified amount of grease.
Specified amount of grease:
140 - 160 ml (4.7 - 5.4 US fl oz, 4.9 - 5.6 Imp fl oz)
3. Install slide joint housing.
4. Make sure that boot is properly installed on the drive shaft groove.
 Set boot so that it does not swell and deform when its length is "L₂".
Length "L₂":
98 mm (3.86 in)
5. Lock new larger and smaller boot bands securely with a suitable tool.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

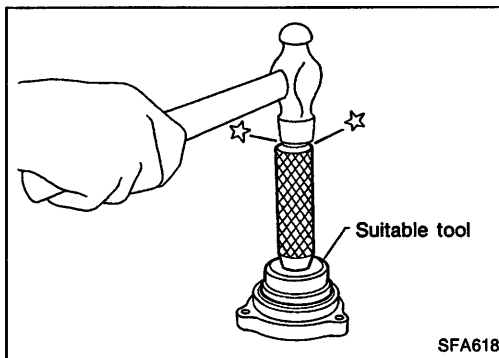
BR

ST

BF

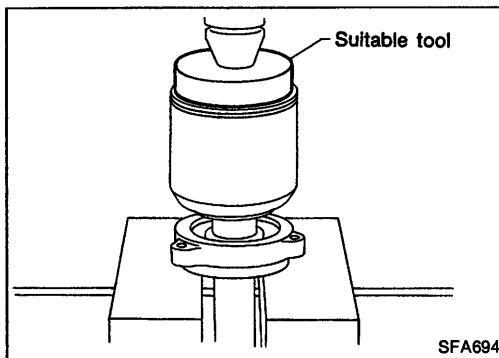
HA

EL

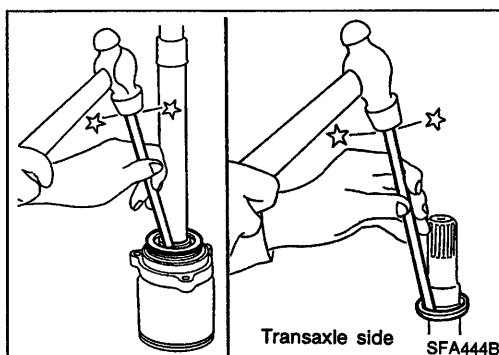


Support bearing

- Press bearing into retainer.



- Press drive shaft into bearing.

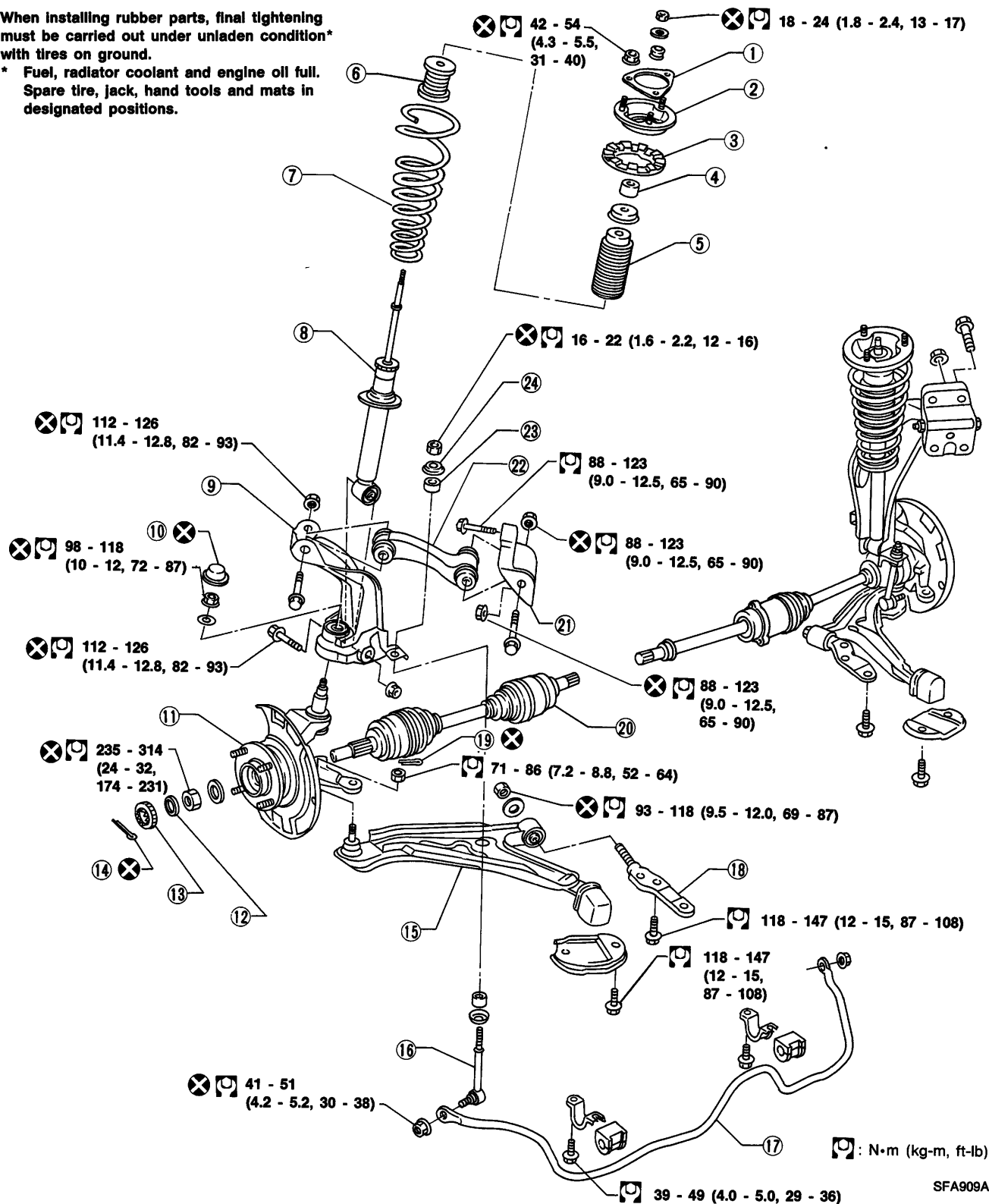


- Install snap ring.
- Install new dust shield.

FRONT SUSPENSION

When installing rubber parts, 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.



SFA909A

- | | | |
|-----------------------|---|----------------------|
| ① Gasket | ⑩ Cap | ⑮ Gusset pin |
| ② Upper mounting | ⑪ Wheel hub and steering knuckle assembly | ⑯ Cotter pin |
| ③ Upper rubber seat | ⑫ Insulator | ⑰ Drive shaft |
| ④ Bound bumper rubber | ⑬ Adjusting cap | ⑱ Upper link bracket |
| ⑤ Dust cover | ⑭ Cotter pin | ⑳ Upper link |
| ⑥ Bound bumper rubber | ⑮ Transverse link | ㉑ Bushing |
| ⑦ Coil spring | ⑯ Connecting rod | ㉒ Washer |
| ⑧ Shock absorber | ⑰ Stabilizer | |
| ⑨ Third link | | |

Coil Spring and Shock Absorber

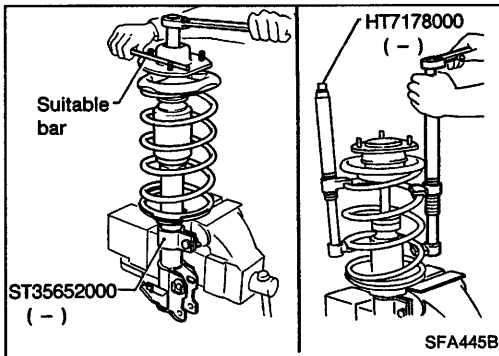
REMOVAL

- Remove shock absorber fixing bolt and nut (to hoodledge).
- **Do not remove piston rod lock nut.**

GI

MA

EM



DISASSEMBLY

1. Set shock absorber on vise, then loosen piston rod lock nut.
2. Compress spring with Tool so that shock absorber mounting insulator can be turned by hand.

LC

EF &
EC

FE

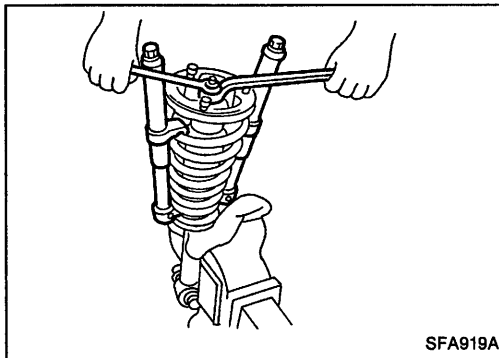
CL

3. Remove piston rod lock nut.

MT

AT

FA



RA

INSPECTION

Shock absorber assembly

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

BR

ST

BF

Mounting insulator and rubber parts

- Check cemented rubber-to-metal portion for separation or cracks. Check rubber parts for deterioration. Replace if necessary.

HA

EL

Coil spring

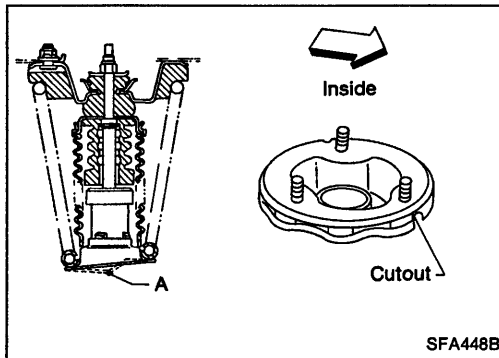
- Check for cracks, deformation or other damage. Replace if necessary.

FRONT SUSPENSION

Coil Spring and Shock Absorber (Cont'd)

ASSEMBLY

- When shock absorber is installed, it must be positioned so that arrow point A faces rearward on L.H. side, and forward on R.H. side.
- Install upper spring seat with its cutout facing the inside of the vehicle.



Third Link and Upper Link

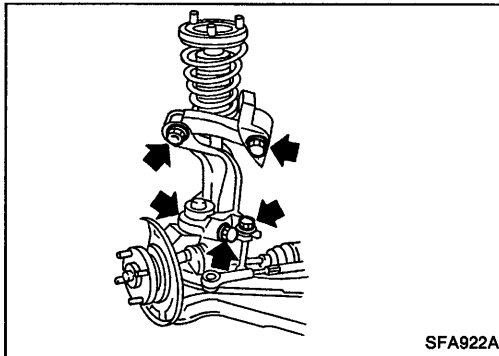
REMOVAL

CAUTION:

Kingpin bearing usually does not require maintenance. If any of the following symptoms are noted, replace kingpin bearing assembly.

- Growling noise is emitted from kingpin bearing during operation.
- Kingpin bearing drags or turns roughly when steering knuckle is turned by hand.

1. Remove cap and kingpin nut.
2. Remove shock absorber fixing nut and upper link fixing bolts.
3. Remove stabilizer connecting rod.
4. Remove third link and upper link.



INSTALLATION

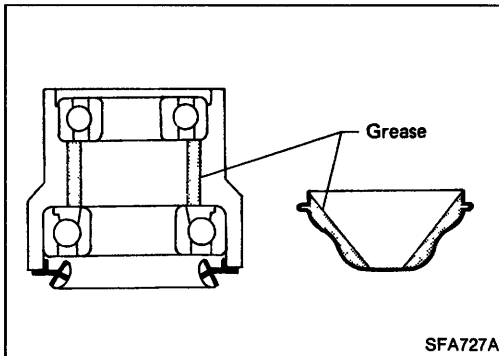
Third link

- Pack kingpin housing and cap with multi-purpose grease.

Grease capacity:

Kingpin housing 4 g (0.14 oz)

Cap 10 g (0.35 oz)

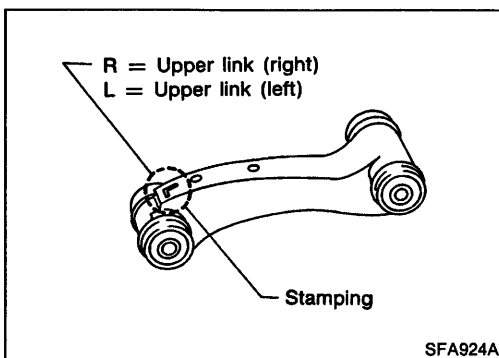


Upper link

- Upper link has "L" or "R" stamped on it as shown.

Upper link bushings cannot be disassembled.

- When installing upper link, make sure that parts are in their correct positions.

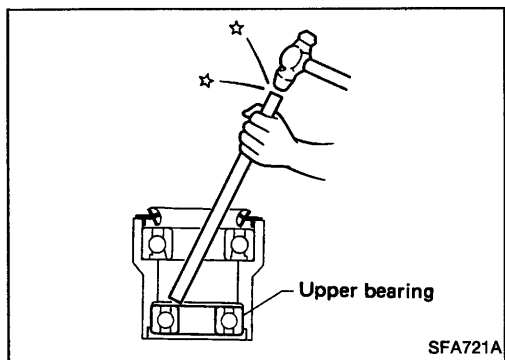


FRONT SUSPENSION

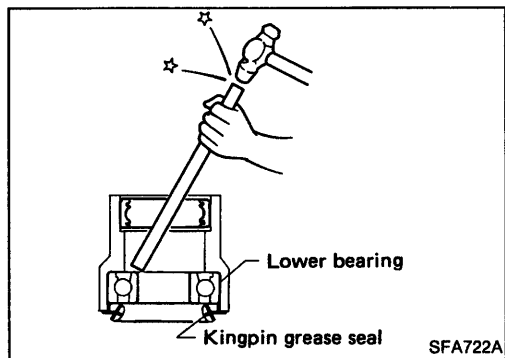
Third Link and Upper Link (Cont'd)

DISASSEMBLY

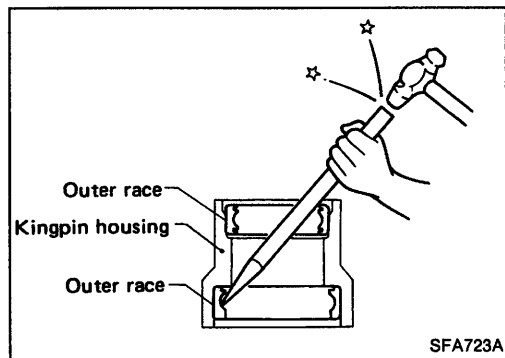
- Remove upper bearing (inner race and ball).



- Remove kingpin grease seal.
- Remove lower bearing (inner race and ball).

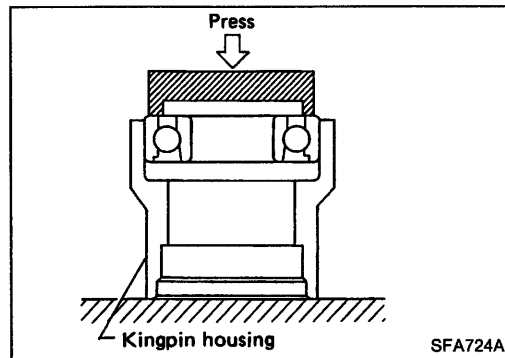


- Remove upper and lower outer race.
- **Be careful not to damage kingpin housing.**

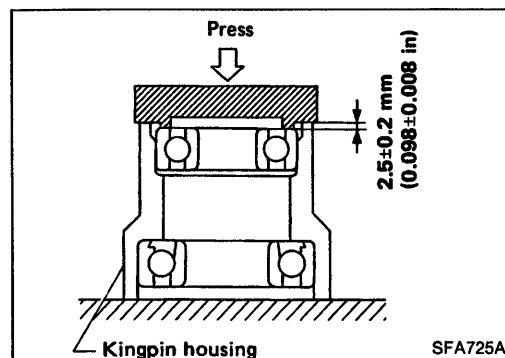


ASSEMBLY

- Install lower bearing.



- Install upper bearing.



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

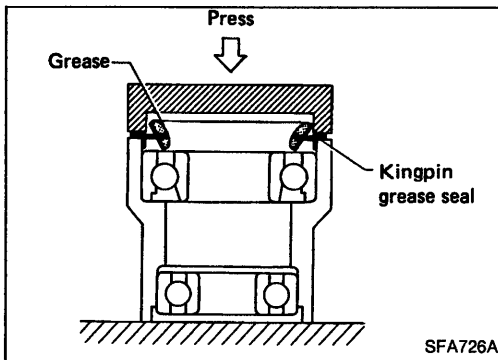
BF

HA

EL

FRONT SUSPENSION

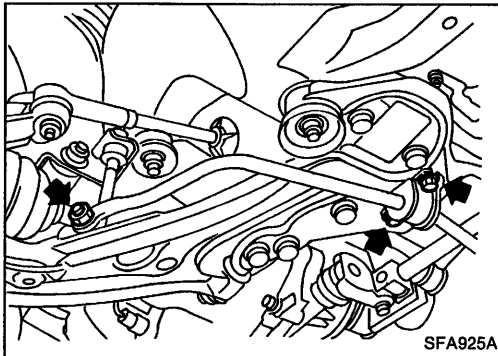
Third Link and Upper Link (Cont'd)



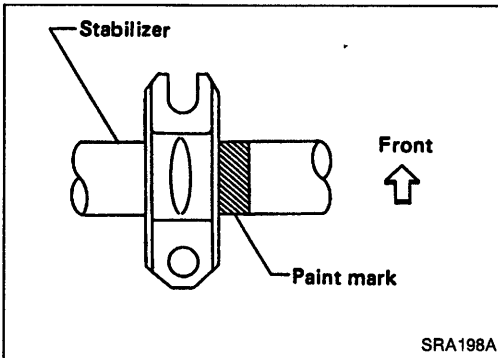
- Install lower oil seal.
- Apply multi-purpose grease to oil seal lip.

Stabilizer Bar

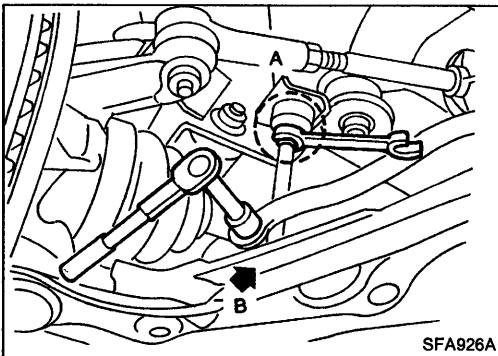
REMOVAL AND INSTALLATION



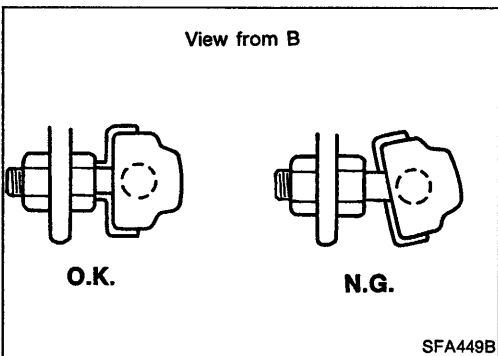
- Remove stabilizer bar.



- When installing stabilizer, make sure that paint mark and clamp face in their correct directions.

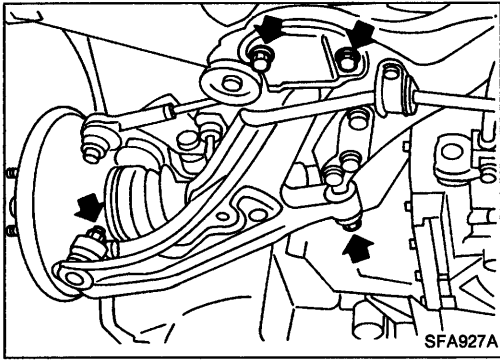


- When removing and installing stabilizer bar, fix portion A.



- Install stabilizer bar with ball joint socket properly placed.

FRONT SUSPENSION



Transverse Link and Lower Ball Joint

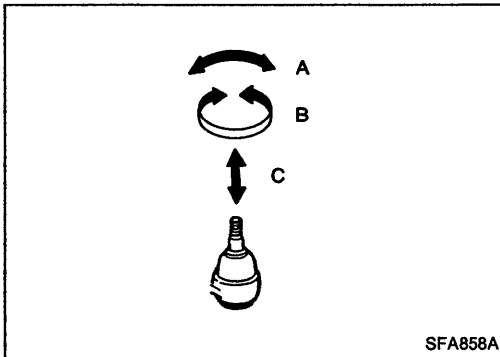
REMOVAL AND INSTALLATION

- Remove tension rod, ball joint and transverse link assembly.
- During installation, final tightening must be done at curb weight with tires on ground.
- After installation, check wheel alignment. Refer to "Front Wheel Alignment" of ON-VEHICLE SERVICE.

INSPECTION

Transverse link

- Check transverse link for damage, cracks or deformation. Replace it 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 assembly.

Swing force and turning torque

Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.

Swing force "A":

(measuring point: cotter pin hole of ball stud)

7.8 - 54.9 N (0.8 - 5.6 kg, 1.8 - 12.3 lb)

Turning torque "B":

0.5 - 3.4 N·m (5 - 35 kg-cm, 4.3 - 30.4 in-lb)

Vertical end play "C":

0 mm (0 in)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

COIL SPRING

Applied model	M/T	A/T
Wire diameter mm (in)		
minor/major	10.2 (0.402)/ 12.1 (0.476)	10.3 (0.406)/ 12.2 (0.480)
Coil center diameter mm (in)		
minor/major	78.2 (3.079)/ 140.1 (5.52)	78.3 (3.083)/ 140.2 (5.52)
Free length mm (in)	411.0 (16.18)	417.0 (16.42)
Identification color	Orange x 2, Light green x 1	Light green x 2, Red x 1

SHOCK ABSORBER

Applied model	M/T	A/T
Piston rod diameter mm (in)	12.5 (0.492)	

STABILIZER BAR

Stabilizer bar diameter mm (in)	19 (0.75)
---------------------------------	-----------

WHEELARCH HEIGHT (Unladen*)



SFA818A

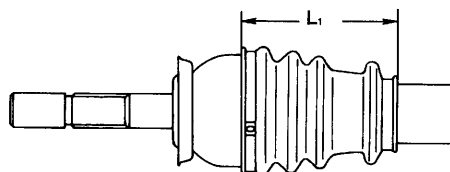
Applied model	All
Front (Hf) mm (in)	653.5 (25.73)
Rear (Hr) mm (in)	644.5 (25.37)

*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

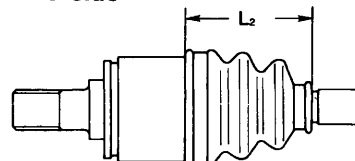
DRIVE SHAFT

Joint type	
Transaxle side	DS86
Wheel side	BF86
Grease	
Quality	Nissan genuine grease or equivalent
Capacity ml (US fl oz, Imp fl oz)	
Transaxle side	140 - 160 (4.7 - 5.4, 4.9 - 5.6)
Wheel side	105 - 125 (3.6 - 4.2, 3.7 - 4.4)
Boot length mm (in)	
Transaxle side "L ₂ "	98 (3.86)
Wheel side "L ₁ "	100.5 (3.96)

Wheel side



Transaxle side



SFA705B

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

Camber	degree	-0°45' to 0°45'
Caster	degree	1°05' - 2°35'
Kingpin inclination	degree	13°45' - 15°15'
Toe-in		
A - B	mm (in)	0 - 2 (0 - 0.08)
Total angle 2θ	degree	0' - 12'
Front wheel turning angle		
Full turn*2	degree	
Inside		33° - 37°
Outside		28° - 32°

*1: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

*2: On power steering models, wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.

WHEEL BEARING

Wheel bearing axial end play limit	mm (in)	0.05 (0.0020) or less
Wheel bearing lock nut tightening torque	N-m (kg-m, ft-lb)	235 - 314 (24 - 32, 174 - 231)

LOWER BALL JOINT

Swing force "A" (Measuring point: cotter pin hole of ball stud)	N (kg, lb)	7.8 - 54.9 (0.8 - 5.6, 1.8 - 12.3)
Turning torque "B" N-m (kg-cm, in-lb)		0.49 - 3.43 (5.0 - 35, 4.3 - 30.4)
Vertical end play "C"	mm (in)	0 (0)

WHEEL RUNOUT

Wheel type	Aluminum	Steel
Radial runout limit mm (in)	0.3 (0.012)	0.5 (0.020)
Lateral runout limit mm (in)	0.3 (0.012)	0.8 (0.031)

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

REAR AXLE & REAR SUSPENSION

SECTION **RA**

CONTENTS

PRECAUTIONS AND PREPARATION	2	Wheel Hub	6
Precautions.....	2	REAR SUSPENSION	7
Special Service Tools	2	Removal and Installation	8
REAR AXLE AND REAR SUSPENSION	3	Coil Spring and Strut Assembly.....	8
ON-VEHICLE SERVICE	4	Stabilizer Bar	9
Rear Axle and Rear Suspension Parts	4	SERVICE DATA AND SPECIFICATIONS (S.D.S.)	10
Rear Wheel Bearing	4	General Specifications.....	10
Rear Wheel Alignment.....	4	Inspection and Adjustment.....	10
REAR AXLE	6		

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

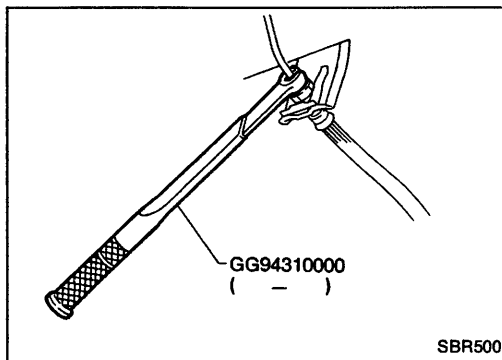
ST

BF

HA

EL

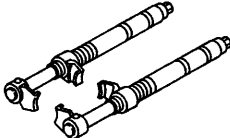
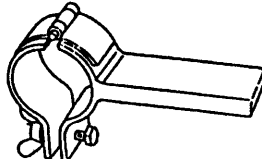
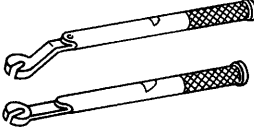
PRECAUTIONS AND PREPARATION

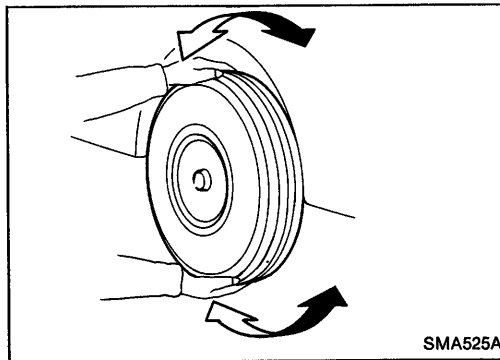


Precautions

- When installing rubber parts, 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.
- Use Tool when removing or installing brake tubes.
- When removing each suspension part, check wheel alignment and adjust if necessary.
- Do not jack up at the parallel links.

Special Service Tools

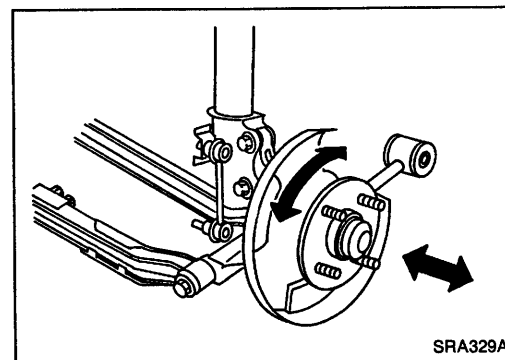
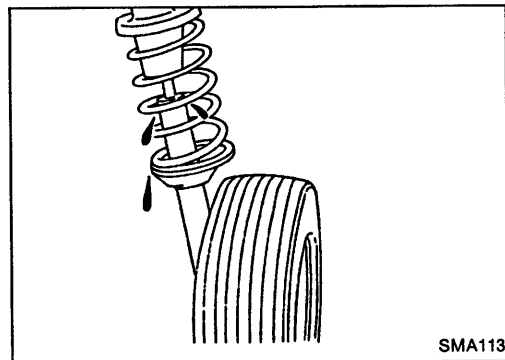
Tool number (Kent-Moore No.) Tool name	Description
HT71780000 (—) Spring compressor	 Removing and installing coil spring
ST35652000 (—) Strut attachment	 Fixing strut assembly
GG94310000 (—) Flare nut torque wrench	 Removing and installing brake piping



Rear Axle and Rear Suspension Parts

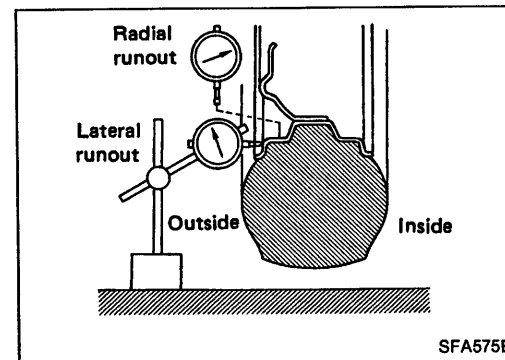
Check axle and suspension parts for looseness, wear or damage.

- Shake each rear wheel to see excessive play.
- Retighten all nuts and bolts to the specified torque.
Tightening torque: Refer to REAR SUSPENSION.
- Check strut (shock absorber) for oil leakage or other damage.
- Check wheelarch height. Refer to ON-VEHICLE SERVICE in section FA.



Rear Wheel Bearing

- Check axial end play.
Axial end play:
0.05 mm (0.0020 in) or less
- Check that wheel bearings operate smoothly.
- Check tightening torque of wheel bearing lock nut.
⌚: 186 - 255 N·m
(19 - 26 kg-m, 137 - 188 ft-lb)
- If there is any axial end play or wheel bearing does not turn smoothly, replace wheel bearing assembly. Refer to REAR AXLE — Wheel Hub.



Rear Wheel Alignment

PRELIMINARY INSPECTION

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

- Check tires for wear and for improper inflation.
 - Check rear wheel bearings for looseness.
 - Check wheel runout.
Wheel runout: Refer to S.D.S. in FA section.
 - Check that rear strut (shock absorber) works properly.
 - Check rear axle and rear suspension parts for looseness.
 - Check vehicle posture (Unladen*).
- *: Fuel, 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:

Refer to S.D.S.

- If the camber is not within specification, inspect and replace any damaged or worn rear suspension parts.

ON-VEHICLE SERVICE

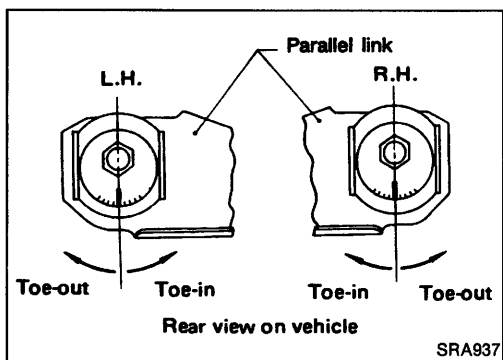
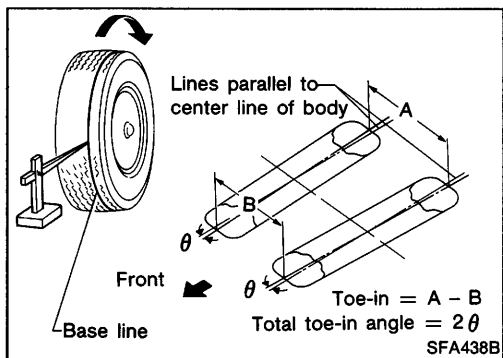
Rear Wheel Alignment (Cont'd)

TOE-IN

1. Draw 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-in:

Refer to S.D.S.



3. Loosen adjusting bolt fixing nuts.
4. Adjust toe-in by turning adjusting bolts.

Toe changes about 2.0 mm (0.079 in) [One side] with each graduation of the adjusting bolt.

5. Tighten adjusting bolt fixing nuts to the specified torque.

□: 108 - 127 N·m
(11 - 13 kg-m, 80 - 94 ft-lb)

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

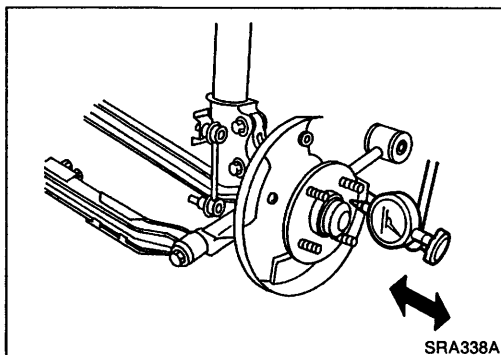
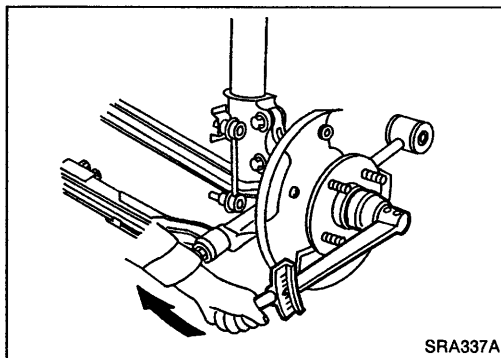
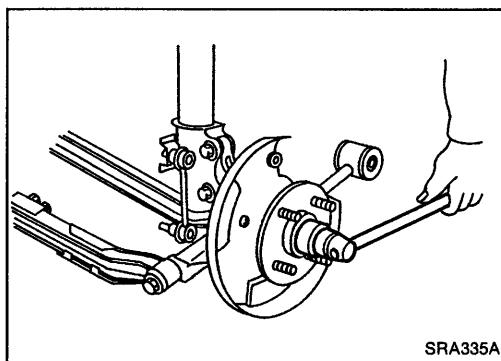
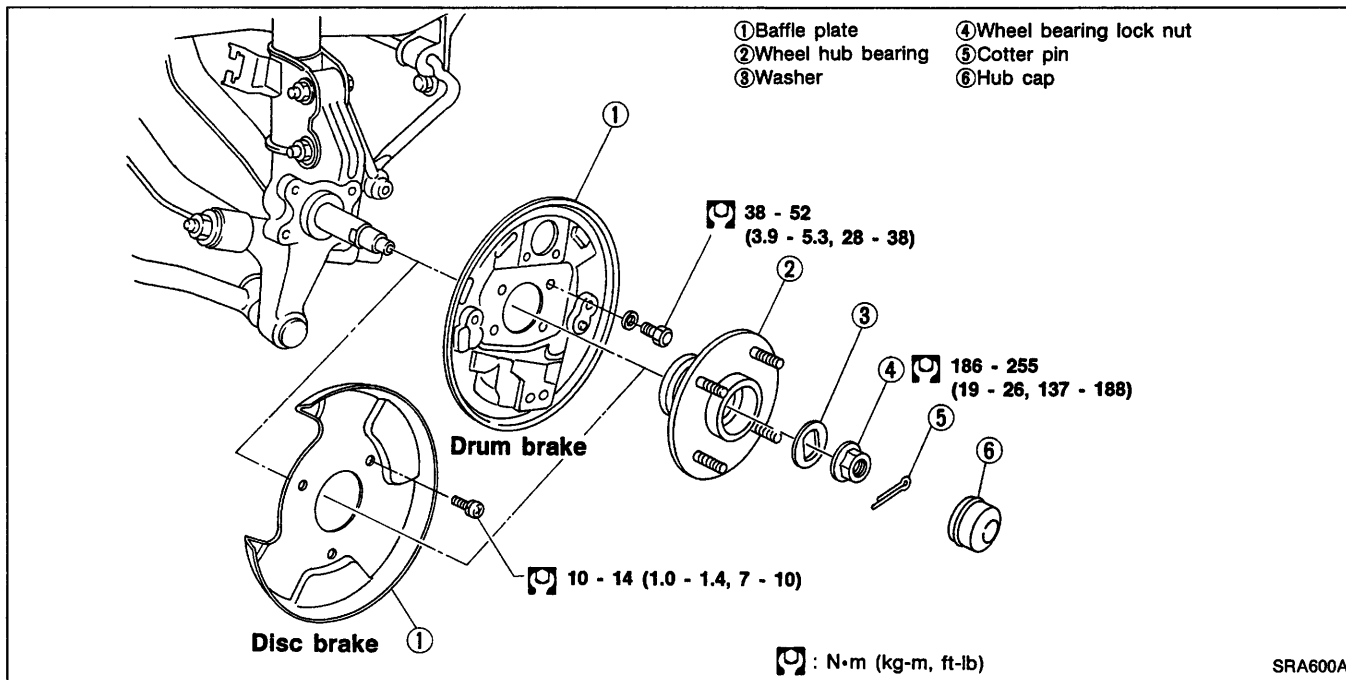
ST

BF

HA

EL

Wheel Hub



REMOVAL

CAUTION:

Wheel hub bearing usually does not require maintenance. If any of the following symptoms are noted, replace wheel hub bearing assembly.

- Growling noise is emitted from wheel hub bearing during operation.
- Wheel hub bearing drags or turns roughly when hub is turned with your hand after bearing lock nut is tightened to specified torque.
- If the wheel hub bearing assembly is removed, it must be renewed. The old assembly must not be re-used.

- 1) Remove brake caliper assembly and rotor.
- 2) Remove wheel bearing lock nut.

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.

INSTALLATION

- Install wheel hub bearing.
- Tighten wheel bearing lock nut.
: 186 - 255 N·m (19 - 26 kg-m, 137 - 188 ft-lb)
- Check that wheel bearings operate smoothly.
- Check wheel bearing axial end play.
Axial end play:
0.05 mm (0.0020 in) or less

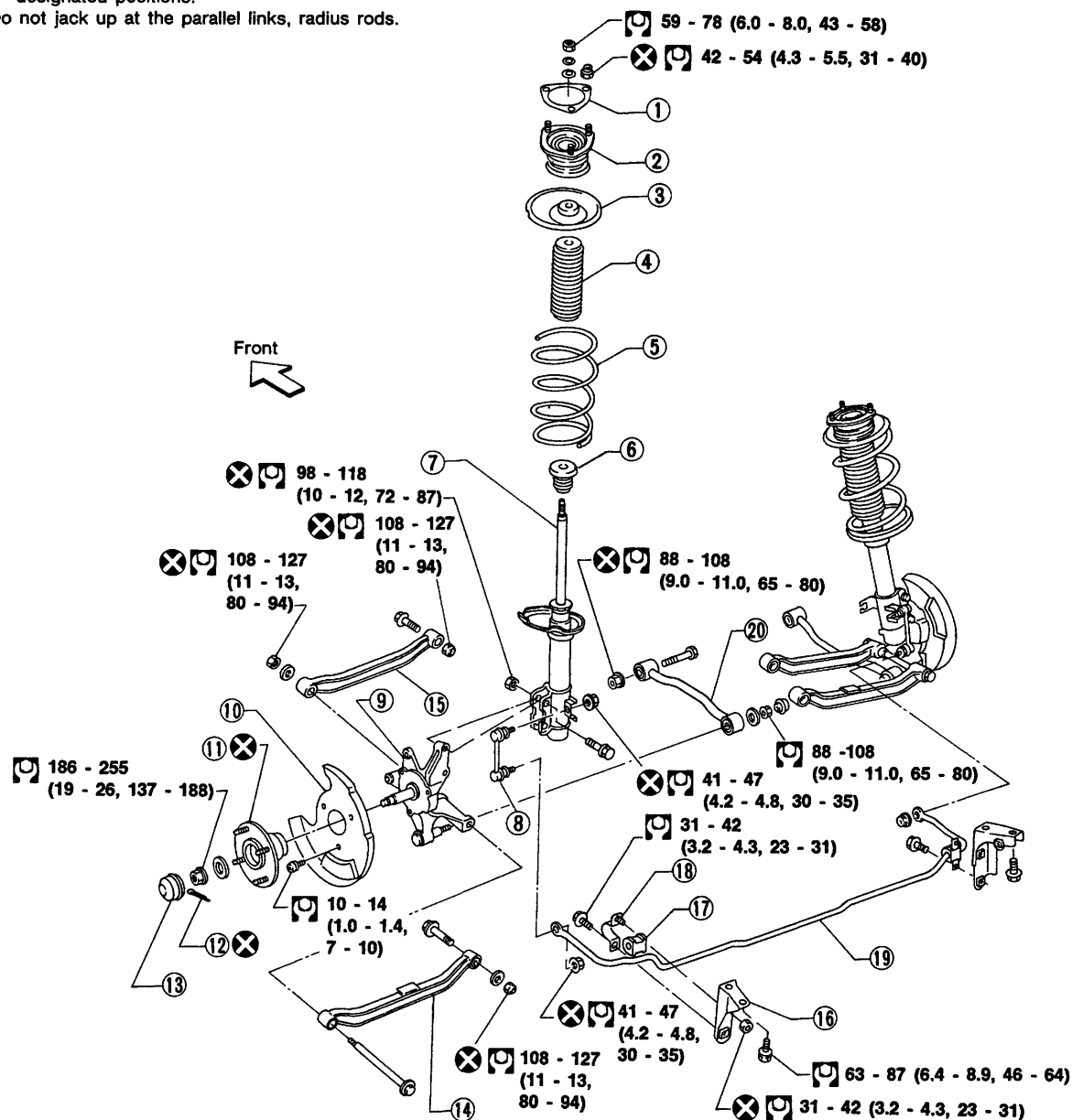
REAR SUSPENSION

When installing rubber parts, 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.

Do not jack up at the parallel links, radius rods.



: N·m (kg-m, ft-lb)

SRA601A

- | | | |
|----------------------------|----------------------|-----------------------|
| ① Gasket | ⑧ Connecting rod | ⑮ Front parallel link |
| ② Strut mounting insulator | ⑨ Knuckle assembly | ⑯ Mounting bracket |
| ③ Upper spring seat | ⑩ Baffle plate | ⑰ Bushing |
| ④ Dust cover | ⑪ Wheel hub bearing | ⑱ Clamp |
| ⑤ Coil spring | ⑫ Cotter pin | ⑲ Stabilizer bar |
| ⑥ Bound bumper | ⑬ Cap | ⑳ Radius rod |
| ⑦ Strut assembly | ⑭ Rear parallel link | |

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

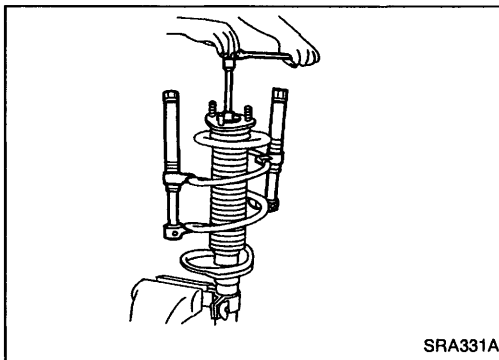
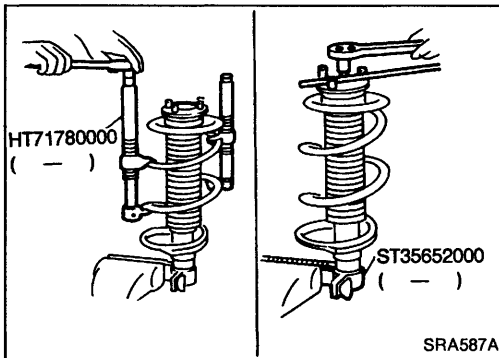
EL

Removal and Installation

CAUTION:

Do not jack up at the parallel links or radius rods.

- Remove suspension assembly.
- 1) Remove brake caliper assembly and rotor.
- 2) Remove parallel link fixing bolt, radius rod fixing bolt, stabilizer fixing bolt and stabilizer connecting rod.
- 3) Remove rear seat and finisher. Refer to section BF.
- 4) Remove strut securing nuts (Upper side). Then pull out strut assembly.



Coil Spring and Strut Assembly

DISASSEMBLY

1. Set strut assembly in vise with attachment, then loosen piston rod lock nut.

Do not remove piston rod lock nut.

2. Compress spring with Tool so that the strut mounting insulator can be turned by hand.

3. Remove piston rod lock nut.
4. Remove spring, complete with Tool.

INSPECTION

Strut assembly

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

Spring rubber seat and dust cover

Check rubber parts for deterioration or cracks.
Replace if necessary.

Strut mounting insulator

- Check cemented rubber-to-metal portion for melting or cracks.
- Check rubber parts for deterioration.

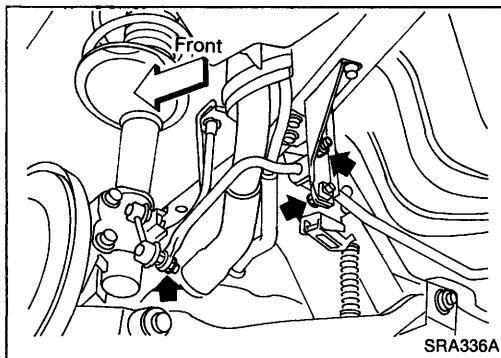
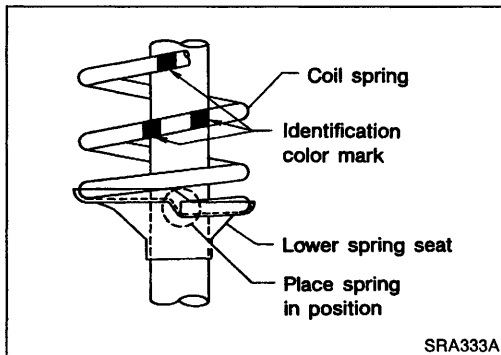
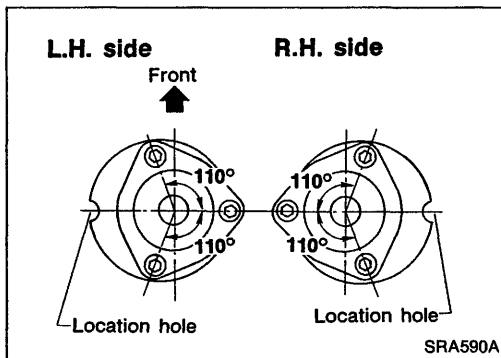
Coil spring

Check for cracks, deformation or other damage.
Replace if necessary.

REAR SUSPENSION

Coil Spring and Strut Assembly (Cont'd)

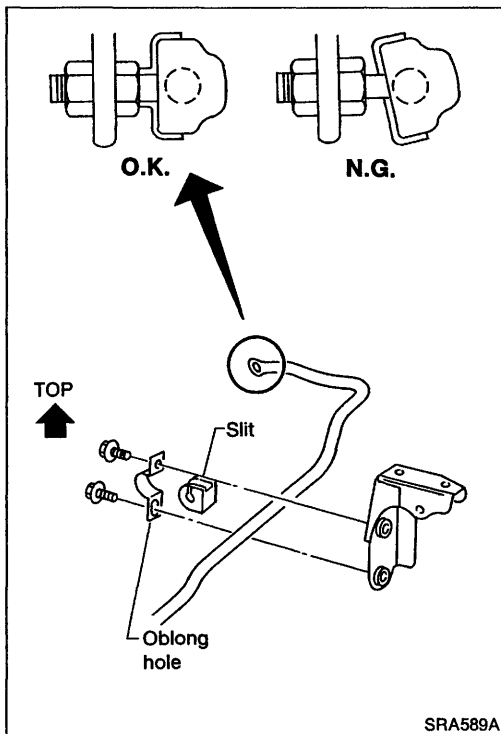
ASSEMBLY



Stabilizer Bar

REMOVAL AND INSTALLATION

- Remove stabilizer bar.



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

COIL SPRING

Wire diameter	mm (in)	12.3 (0.484)
Coil diameter (average)	mm (in)	150.3 (5.92)
Free length	mm (in)	317.5 (12.50)
Spring constant	N/mm (kg/mm, lb/in)	19.6 (2.0, 112)
Identification color		Yellow x 2, Red x 1

SHOCK ABSORBER

Damping force [at 0.3 m (1.0 ft)/sec.]	N (kg, lb)	
Expansion		667 - 902 (68 - 92, 150 - 203)
Compression		265 - 422 (27 - 43, 60 - 95)
Piston rod diameter	mm (in)	22 (0.87)

REAR STABILIZER BAR

Applied model	M/T	A/T
Stabilizer bar diameter mm (in)	18 (0.71)	17 (0.67)
Identification color	Orange	Light green

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*)

Applied model		All
Camber	degree	-1°45' to -0°15'
Toe-in		
A - B	mm (in)	-2 to 2 (-0.08 to 0.08)
Total angle 2θ	degree	-12' to 12'

* Fuel, radiator coolant and engine oil full.

Spare tire, jack, hand tools and mats in designated positions.

WHEEL BEARING

Applied model		All
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)

BRAKE SYSTEM

SECTION **BR**

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

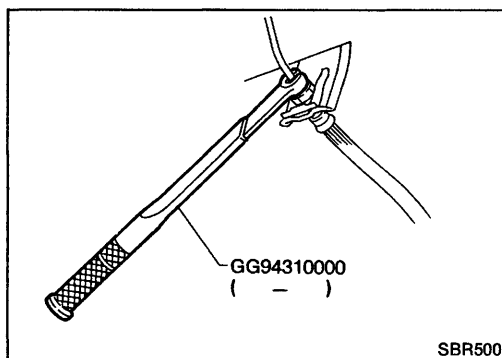
CONTENTS

PRECAUTIONS AND PREPARATION	2	Disassembly	13
Precautions	2	Inspection — Caliper	13
Special Service Tools	2	Inspection — Rotor	13
CHECK AND ADJUSTMENT	3	Assembly	14
Checking Brake Fluid Level	3	Installation	14
Checking Brake Line	3	REAR DISC BRAKE	15
Changing Brake Fluid	3	Pad Replacement	15
Bleeding Brake System	3	Removal	17
BRAKE HYDRAULIC LINE/CONTROL VALVE	4	Disassembly	17
Brake Hydraulic Line	4	Inspection — Caliper	18
Dual Proportioning Valve	5	Inspection — Rotor	19
BRAKE PEDAL AND BRACKET	6	Assembly	19
Removal and Installation	6	Installation	20
Inspection	6	PARKING BRAKE CONTROL	21
Adjustment	6	Removal and Installation	21
MASTER CYLINDER	7	Inspection	22
Removal	7	Adjustment	22
Disassembly	7	ANTI-LOCK BRAKING SYSTEM	23
Inspection	8	Purpose	23
Assembly	8	Operation	23
Installation	8	System Components	25
BRAKE BOOSTER/VACUUM HOSE	9	System Description	25
On-vehicle Service	9	Circuit Diagram	28
Removal — Brake Booster	9	Wiring Diagram	29
Inspection — Brake Booster	9	Operation of Actuator Hydraulic Circuit	30
Installation — Brake Booster	9	Removal and Installation	36
Removal and Installation — Vacuum Hose	10	TROUBLE DIAGNOSES	38
Inspection — Vacuum Hose	10	Contents	38
FRONT DISC BRAKE	11	SERVICE DATA AND SPECIFICATIONS (S.D.S.)	58
Pad Replacement	11	General Specifications	58
Removal	12	Inspection and Adjustment	58

PRECAUTIONS AND PREPARATION

Precautions

- Use brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
- 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 rubber parts of hydraulic system.

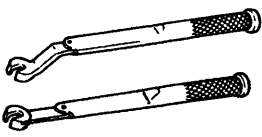
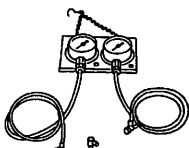
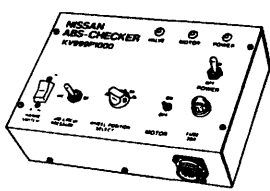
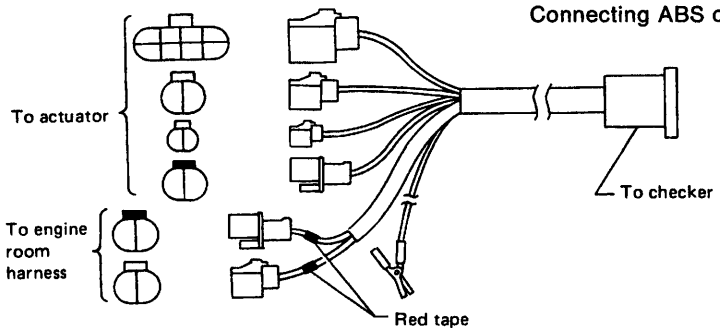


- Use Tool when removing and installing brake tube.

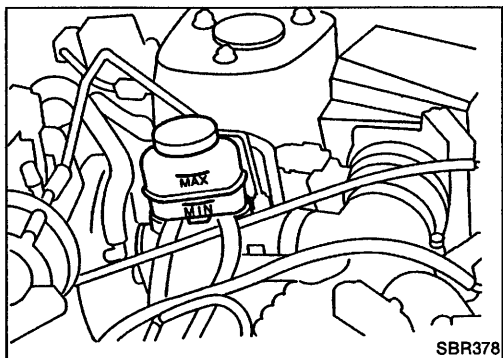
WARNING:

- Clean brake pads and shoes with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description
GG94310000 (—) Flare nut torque wrench	 Removing and installing each brake piping
KV991V0010 (—) Brake fluid pressure gauge	 Measuring brake fluid pressure
KV999P1000 (—) ABS checker	 Checking ABS actuator operation
KV999P1010 (—) ABS checker adapter harness	 Connecting ABS checker with actuator

CHECK AND ADJUSTMENT



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.
- When brake warning lamp comes on even when parking brake lever is released, check brake system for leaks.

GI

Checking Brake Line

MA

CAUTION:

If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

EM

1. Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.
2. Check for oil leakage by fully depressing brake pedal while engine is running.

LC

EF &
EC

Changing Brake Fluid

CAUTION:

- Refill with new brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.

FE

CL

1. Connect a vinyl tube to each air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
3. Refill until new brake fluid comes out of each air bleeder valve.

MT

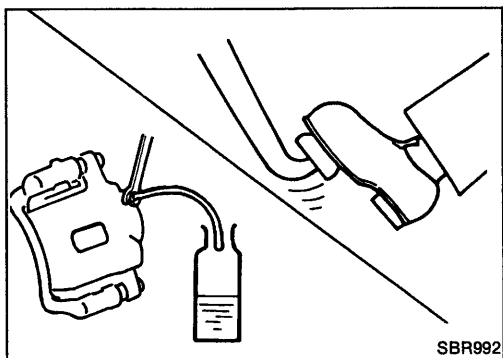
AT

Use same procedure as in bleeding hydraulic system to refill brake fluid.

FA

Refer to "Bleeding Brake System".

RA



Bleeding Brake System

BR

CAUTION:

- Carefully monitor brake fluid level at master cylinder during bleeding operation.
- Fill reservoir with new brake fluid "DOT 3". Make sure it is full at all times while bleeding air out of system.
- Place a container under master cylinder to avoid spillage of brake fluid.

ST

BF

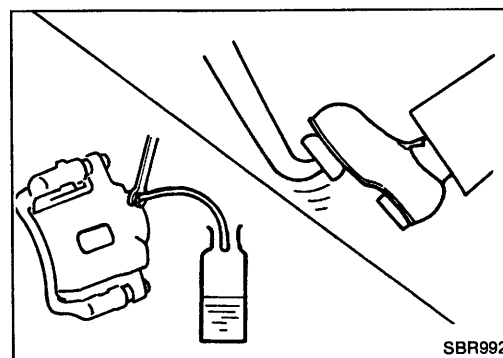
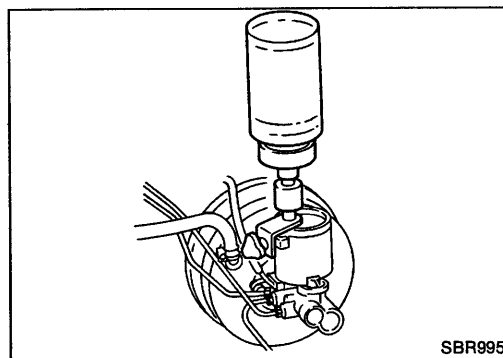
- Bleed air in the following order.

HA

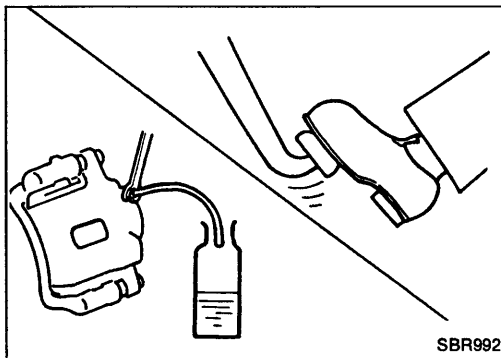
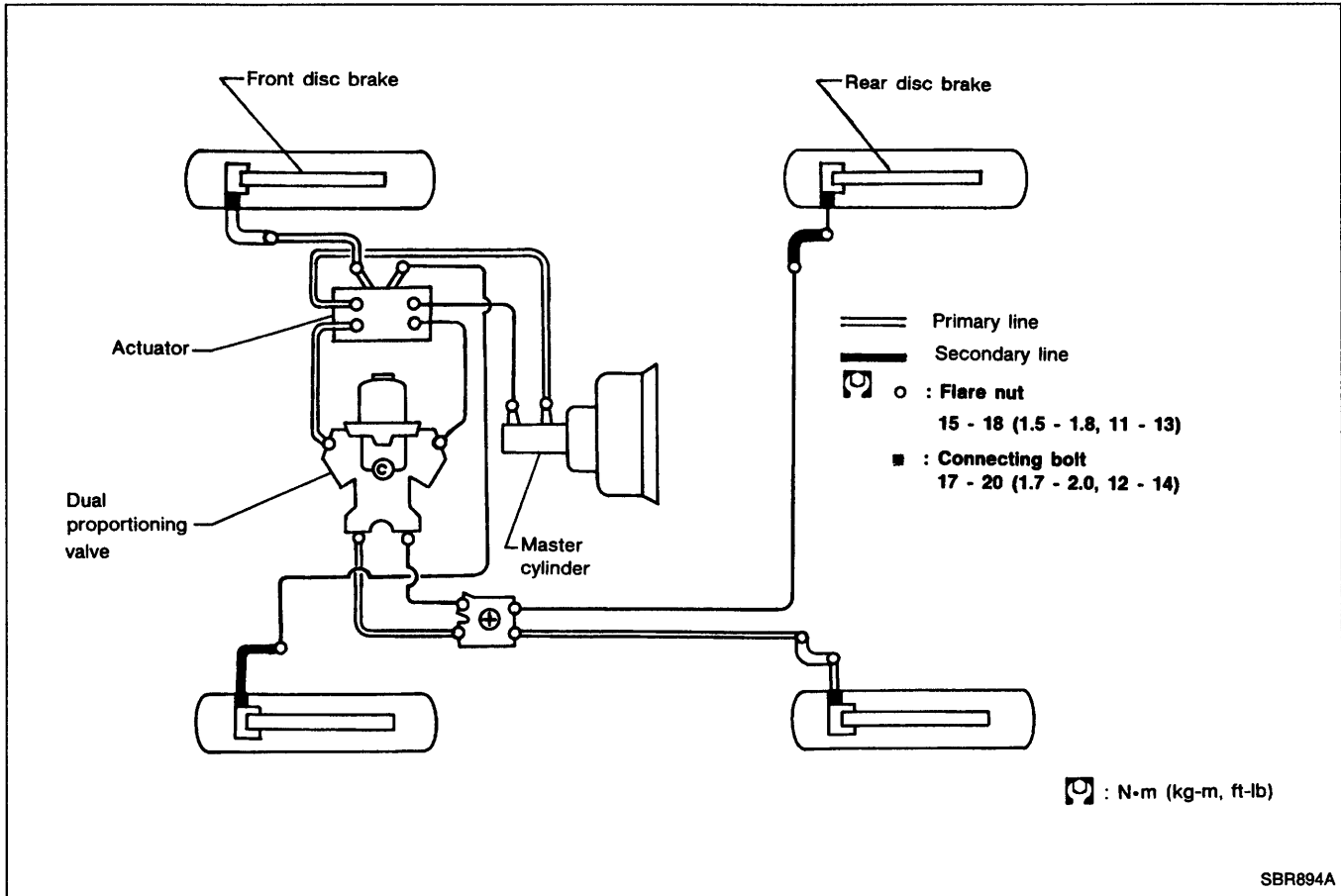
1. Left rear brake
2. Right front brake
3. Right rear brake
4. Left front brake

EL

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.



Brake Hydraulic Line



REMOVAL

CAUTION:

- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
 - All hoses must be free from excessive bending, twisting and pulling.
1. Connect a vinyl tube to air bleeder valve.
 2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
 3. Remove flare nut securing brake tube to hose, then withdraw lock spring.
 4. Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.

INSPECTION

Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.

BRAKE HYDRAULIC LINE/CONTROL VALVE

Brake Hydraulic Line (Cont'd)

INSTALLATION

CAUTION:

- Refill with new brake fluid "DOT 3".
 - Never reuse drained brake fluid.
1. Tighten all flare nuts and connecting bolts.

Specification:

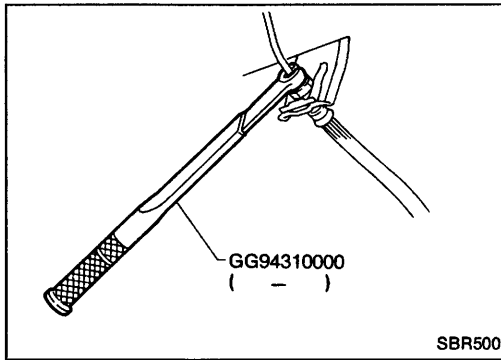
Flare nut

15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)

Connecting bolt

17 - 20 N·m (1.7 - 2.0 kg-m, 12 - 14 ft-lb)

2. Refill until new brake fluid comes out of each air bleeder valve.
3. Bleed air. Refer to "Bleeding Brake System".



GI

MA

EM

LC

EF &
EC

FE

CL

Dual Proportioning Valve

INSPECTION

CAUTION:

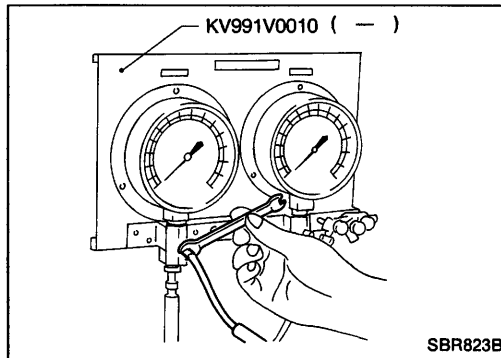
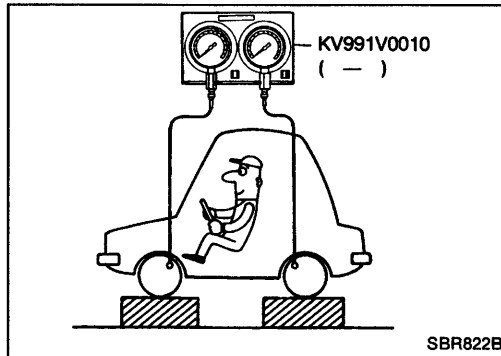
- Carefully monitor brake fluid level at master cylinder.
- Use new brake fluid "DOT 3".
- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on paint areas, wash it away with water immediately.

1. Connect Tool to air bleeders of front and rear brakes on either L.H. and R.H. side.
2. Bleed air from the Tool.
3. Check fluid pressure by depressing brake pedal.

Unit: kPa (kg/cm², psi)

Applied pressure (Front brake)	5,884 (60, 853)
Output pressure (Rear brake)	3,629 - 4,021 (37 - 41, 526 - 583)

4. Bleed air after disconnecting the Tool. Refer to "Bleeding Brake System".



MT

AT

FA

RA

BR

ST

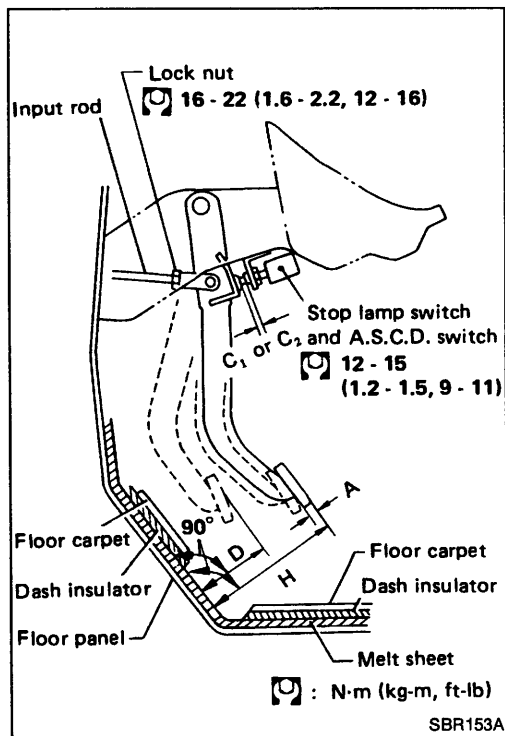
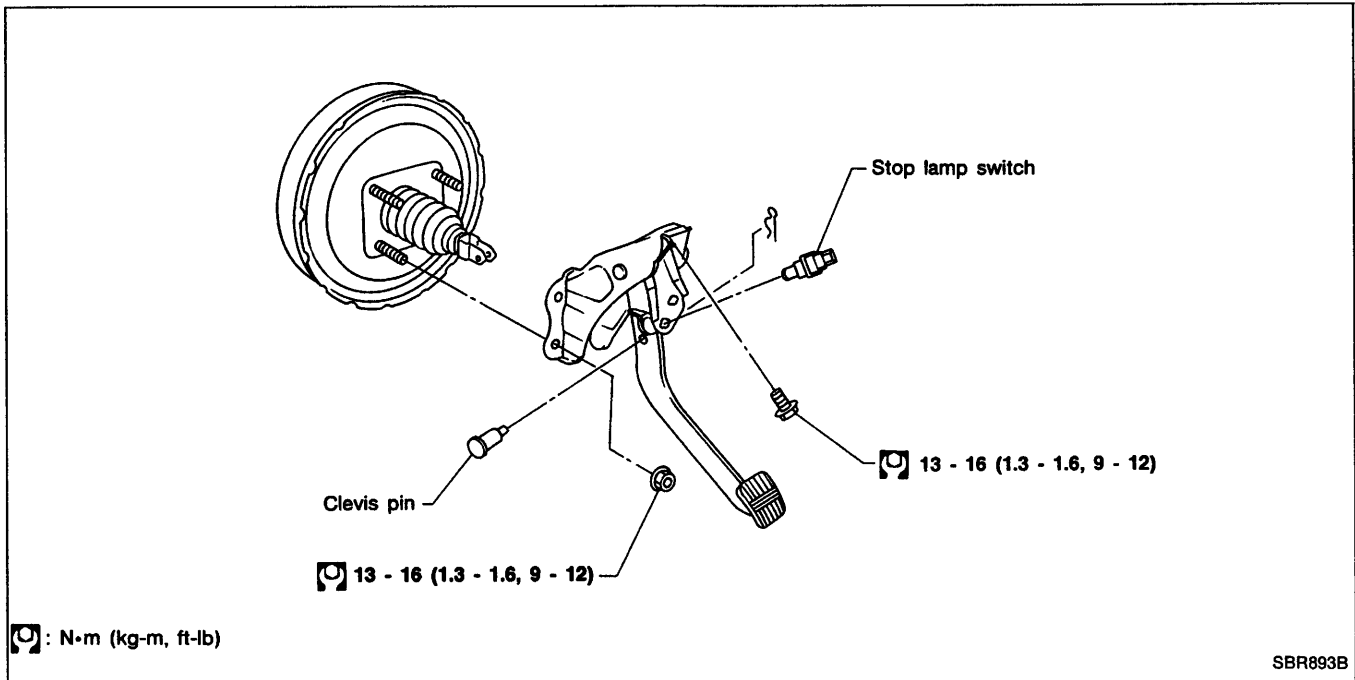
BF

HA

EL

BRAKE PEDAL AND BRACKET

Removal and Installation



Inspection

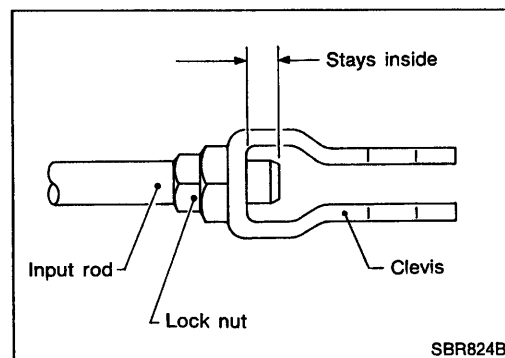
Check brake pedal for following items.

- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion

Adjustment

Check brake pedal free height from dash reinforcement panel. 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
- C₁, C₂: **Clearance between pedal stopper and threaded end of stop lamp switch and A.S.C.D. switch**
0.3 - 1.0 mm (0.012 - 0.039 in)
- A: **Pedal free play**
1 - 3 mm (0.04 - 0.12 in)



1. Loosen lock nut and adjust pedal free height by turning brake booster input rod. Then tighten lock nut.

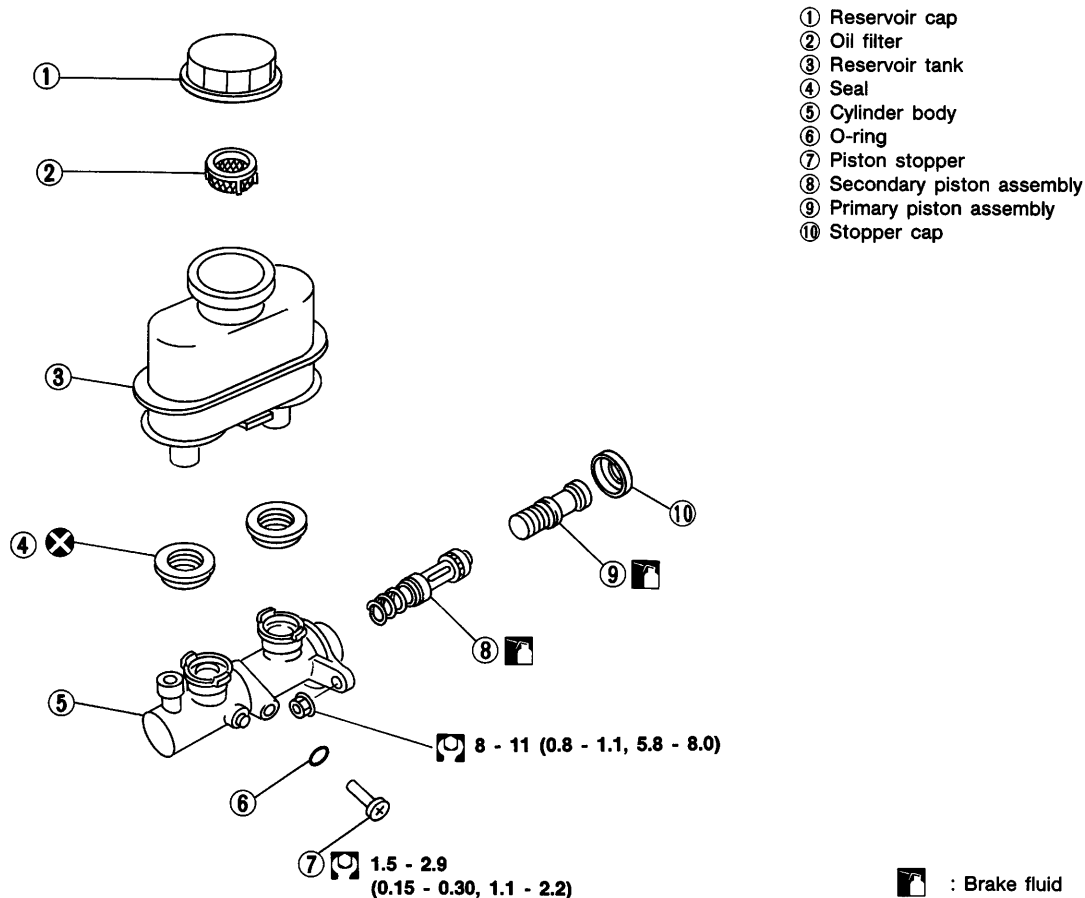
2. Check pedal free play.

Make sure that stop lamps go off when pedal is released.

3. Check brake pedal's depressed height while engine is running.

If depressed height is below specified value, check brake system for leaks, accumulation of air or any damage to components (master cylinder, wheel cylinder, etc.); then make necessary repairs.

MASTER CYLINDER



SBR239C

Removal

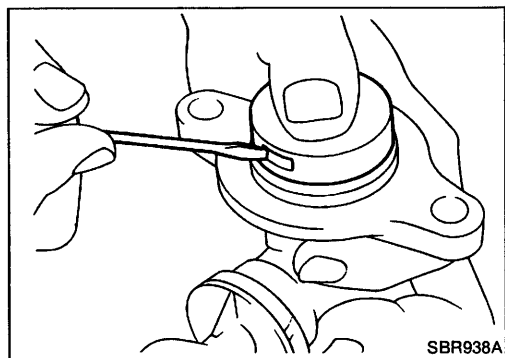
CAUTION:

Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.

1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve, depressing brake pedal to empty fluid from master cylinder.
3. Remove brake pipe flare nuts.
4. Remove master cylinder mounting nuts.

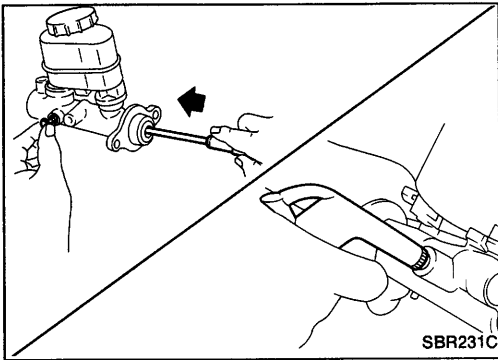
Disassembly

1. Bend claws of stopper cap outward.



MASTER CYLINDER

Disassembly (Cont'd)



2. Remove valve stopper while piston is pushed into cylinder.
3. Remove piston assemblies.

If it is difficult to remove secondary piston assembly, gradually apply compressed air through fluid outlet.

4. Draw out reservoir tank.

Inspection

Check for the following items.

Replace any part if damaged.

Master cylinder:

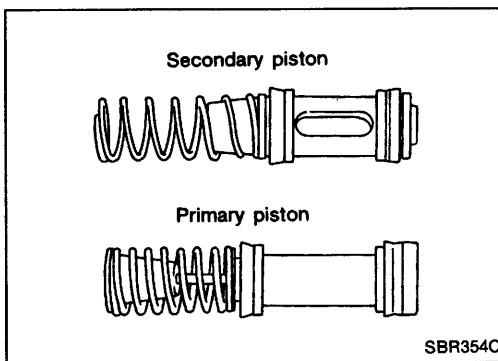
- Pin holes or scratches on inner wall.

Piston:

- Deformation of or scratches on piston cups.

Stopper cap:

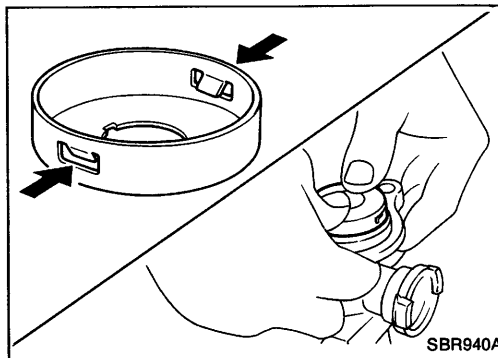
- Damage or excessive deformation of claws.



Assembly

1. Insert secondary piston assembly. Then insert primary piston assembly.

- Pay attention to alignment of secondary piston slit with valve stopper mounting hole of cylinder body.



2. Install stopper cap.

Before installing stopper cap, ensure that claws are bent inward.

3. Push reservoir tank seals.
4. Push reservoir tank into master cylinder.
5. Install valve stopper while piston is pushed into cylinder.

Installation

CAUTION:

- Refill with new brake fluid "DOT 3".
- Never reuse drained brake fluid.

1. Place master cylinder onto brake booster and secure mounting nuts lightly.
2. Fit flare nuts to master cylinder.
3. Tighten mounting nuts.

Specification:

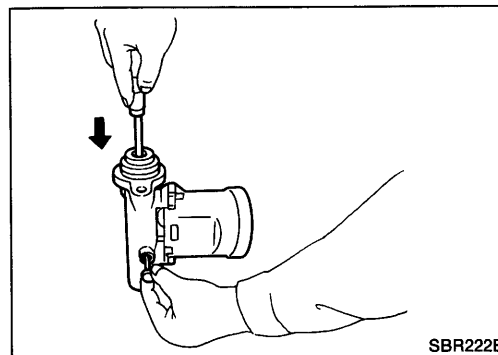
8 - 11 N·m (0.8 - 1.1 kg-m, 5.8 - 8.0 ft-lb)

4. Tighten flare nuts.

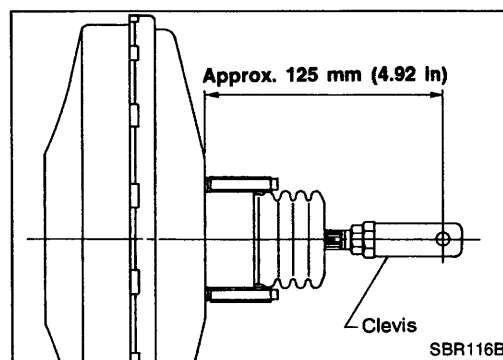
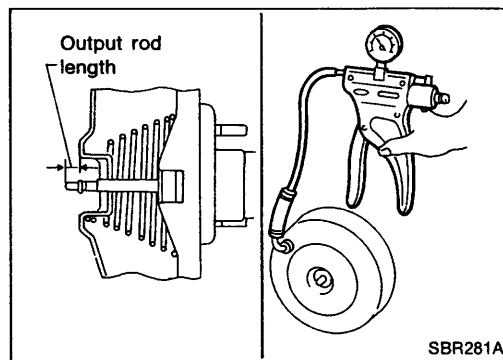
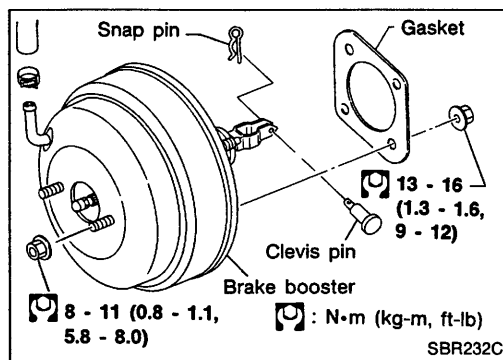
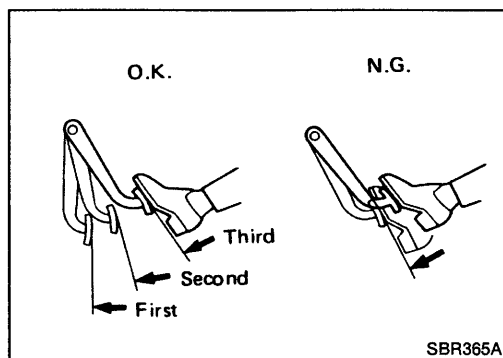
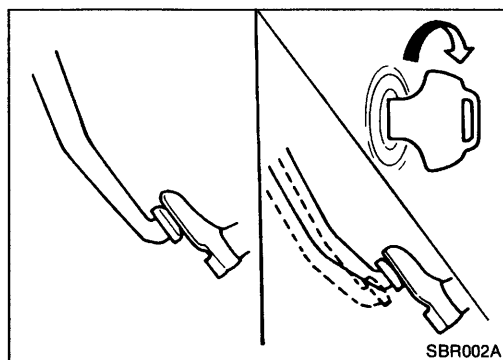
Specification:

15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)

5. Bleed air. Refer to "Bleeding Brake System".



BRAKE BOOSTER/VACUUM HOSE



On-vehicle Service

OPERATING CHECK

- Depress brake pedal several times with engine off, and 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, and stop it after 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, booster is airtight.
- Depress brake pedal while engine is running, and stop engine with pedal depressed. If there is no change in pedal stroke after holding pedal down **30 seconds**, brake booster is airtight.

Removal — Brake Booster

CAUTION:

- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
- Be careful not to deform or bend brake pipes, during removal of booster.

Inspection — Brake Booster

OUTPUT ROD LENGTH CHECK

1. Apply vacuum of -66.7 kPa (-500 mmHg , -19.69 inHg) to brake booster with a handy vacuum pump.
2. Check output rod length.

Specified length:

10.275 - 10.525 mm (0.4045 - 0.4144 in)

Installation — Brake Booster

CAUTION:

- Be careful not to deform or bend brake pipes, during installation of booster.
 - Replace clevis pin if damaged.
 - Refill with new brake fluid "DOT 3".
 - Never reuse drained brake fluid.
1. Before fitting booster, temporarily adjust clevis to dimension shown. (Does not apply to vehicles fitted with ABS)
 2. Fit booster, then secure mounting nuts (brake pedal bracket to master cylinder) lightly.

BRAKE BOOSTER/VACUUM HOSE

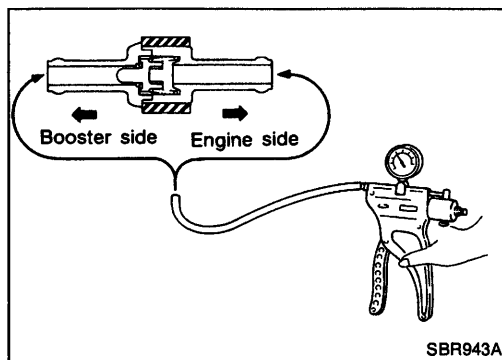
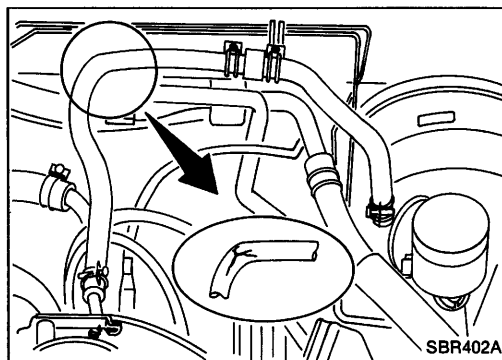
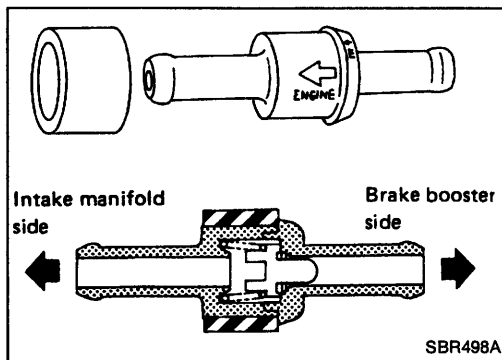
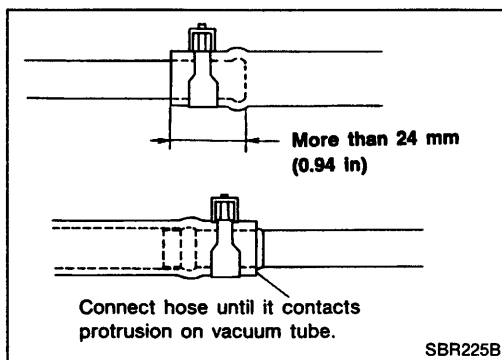
Installation — Brake Booster (Cont'd)

3. Connect brake pedal and booster input rod with clevis pin.
4. Secure mounting nuts.

Specification:

13 - 16 N·m (1.3 - 1.6 kg-m, 9 - 12 ft-lb)

5. Install master cylinder. Refer to "Installation" in "MASTER CYLINDER".
6. Bleed air. Refer to "Bleeding Brake System".



Removal and Installation — Vacuum Hose

CAUTION:

When installing vacuum hoses, pay attention to the following points.

- Do not apply any oil or lubricants to vacuum hose and check valve.
- Insert vacuum tube into vacuum hose more than 24 mm (0.94 in).

- Install check valve, paying attention to its direction.

Inspection — Vacuum Hose

HOSES AND CONNECTORS

Check vacuum lines, connections and check valve for airtightness, improper attachment chafing and deterioration.

CHECK VALVE

Check vacuum with a vacuum pump.

Connect to booster side	Vacuum should exist.
Connect to engine side	Vacuum should not exist.

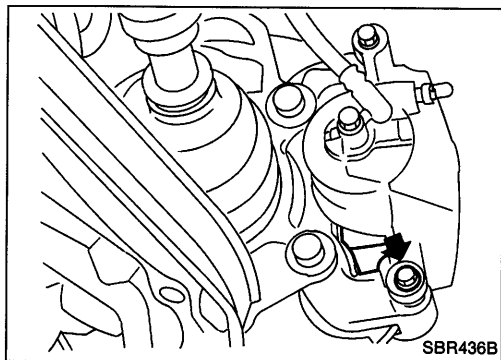
Pad Replacement

WARNING:

Clean brake pads with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

CAUTION:

- When cylinder body is open, do not depress brake pedal because piston will pop out.
- Be careful not to damage piston boot or get oil on rotor. Always replace shims when replacing pads.
- If shims are rusted or show peeling of the rubber coat, replace them with new shims.
- It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.



1. Remove master cylinder reservoir cap.
2. Remove pin bolt.
3. Open cylinder body upward. Then remove pad retainers, and inner and outer shims.

Standard pad thickness:

11 mm (0.43 in)

Pad wear limit:

2.0 mm (0.079 in)

Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

CL25VA

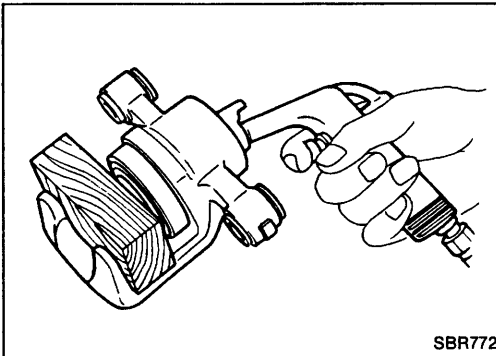
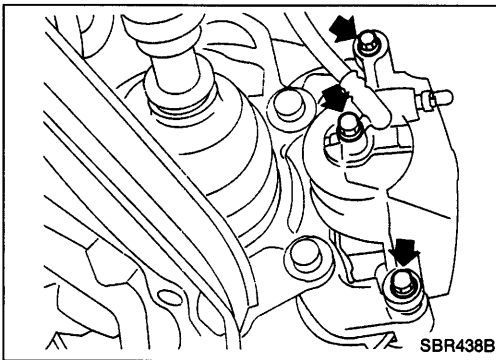
- BR-12

FRONT DISC BRAKE

Removal (Cont'd)

Remove torque member fixing bolts and connecting bolt.

It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend caliper assembly with wire so as not to stretch brake hose.



Disassembly

WARNING:

Do not place your fingers in front of piston.

CAUTION:

Do not scratch or score cylinder wall.

1. Push out piston with piston boot with compressed air.
2. Remove piston seal with a suitable tool.

Inspection — Caliper

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

CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

Check piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.

SLIDE PIN, PIN BOLT AND PIN BOOT

Check for wear, cracks or other damage. Replace if any of the above conditions are observed.

Inspection — Rotor

RUBBING SURFACE

Check rotor for roughness, cracks or chips.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

FRONT DISC BRAKE

Inspection — Rotor (Cont'd)

RUNOUT

1. Secure rotor to wheel hub with at least two nuts (M12 x 1.25).
2. Check runout using a dial indicator.

Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to section FA.

Maximum runout:

0.07 mm (0.0028 in)

3. If the runout is out of specification, find minimum runout position as follows:
 - a. Remove nuts and rotor from wheel hub.
 - b. Shift the rotor one hole and secure rotor to wheel hub with nuts.
 - c. Measure runout.
 - d. Repeat steps a. to c. so that minimum runout position can be found.
4. If the runout is still out of specification, turn rotor with on-car brake lathe ("MAD, DL-8700", "AMMCO 700 and 705" or equivalent).

THICKNESS

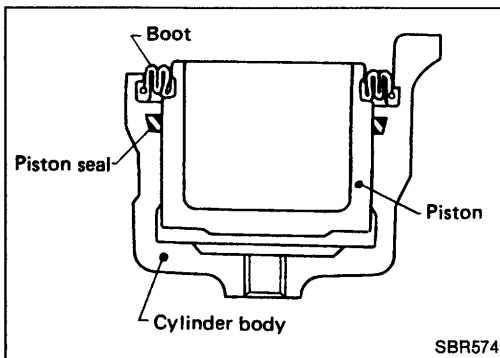
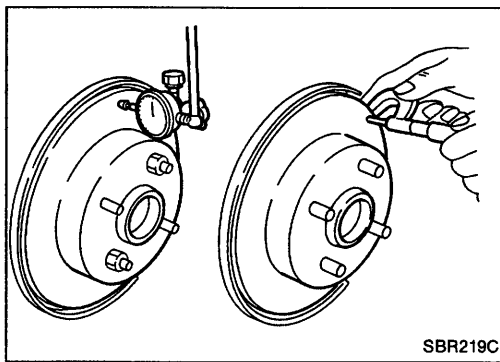
Thickness variation (At least 8 positions):

Maximum 0.01 mm (0.0004 in)

If thickness variation exceeds the specification, turn rotor with on-car brake lathe.

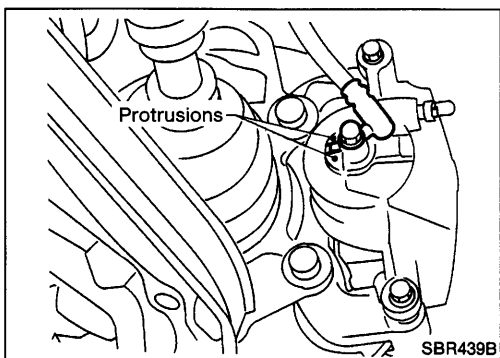
Rotor repair limit:

20.0 mm (0.787 in)



Assembly

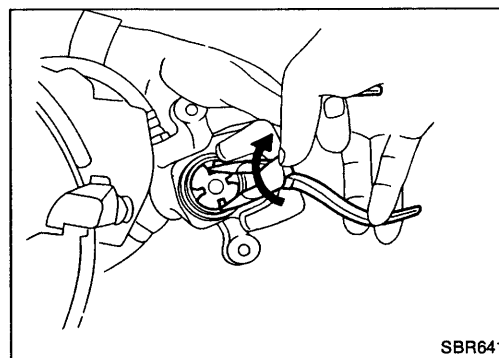
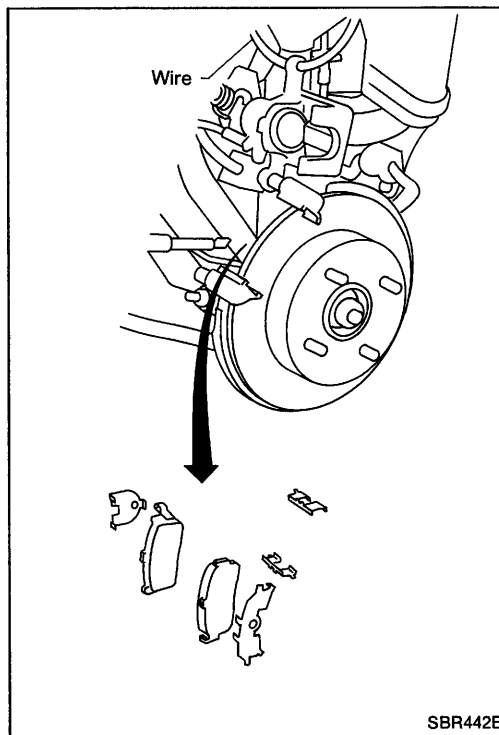
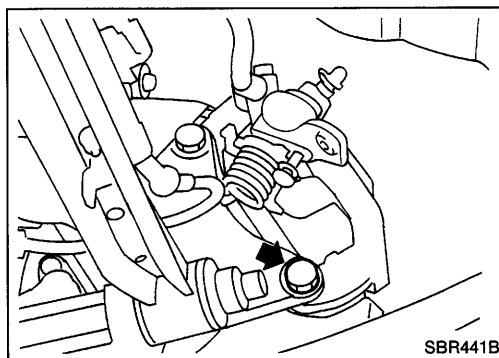
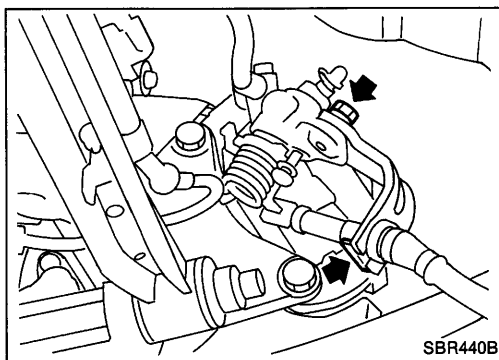
1. Insert piston seal into groove on cylinder body.
2. With piston boot fitted to piston, insert piston boot into groove on cylinder body and install piston.
3. Properly secure piston boot.



Installation

CAUTION:

- Refill with new brake fluid "DOT 3".
 - Never reuse drained brake fluid.
1. Install brake hose to caliper securely.
 2. Install all parts and secure all bolts.
 3. Bleed air. Refer to "Bleeding Brake System".



Pad Replacement

WARNING:

Clean brake pads with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

CAUTION:

- When cylinder body is open, do not depress brake pedal because piston will pop out.
- Be careful not to damage piston boot or get oil on rotor. Always replace shims in replacing pads.
- If shims are rusted or show peeling of rubber coat, replace them with new shims.
- It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.

1. Remove master cylinder reservoir cap.
2. Remove brake cable mounting bracket bolt and lock spring.
3. Disconnect cable.
4. Remove pin bolt.

5. Open cylinder body upward. Then remove pad retainers, and inner and outer shims.

Standard pad thickness:

10 mm (0.39 in)

Pad wear limit:

2.0 mm (0.079 in)

6. When installing new pads, push piston into cylinder body by gently turning piston clockwise, as shown.

Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.

GI

MA

EM

LC

EF &

EC

FE

CL

MT

AT

FA

RA

BR

ST

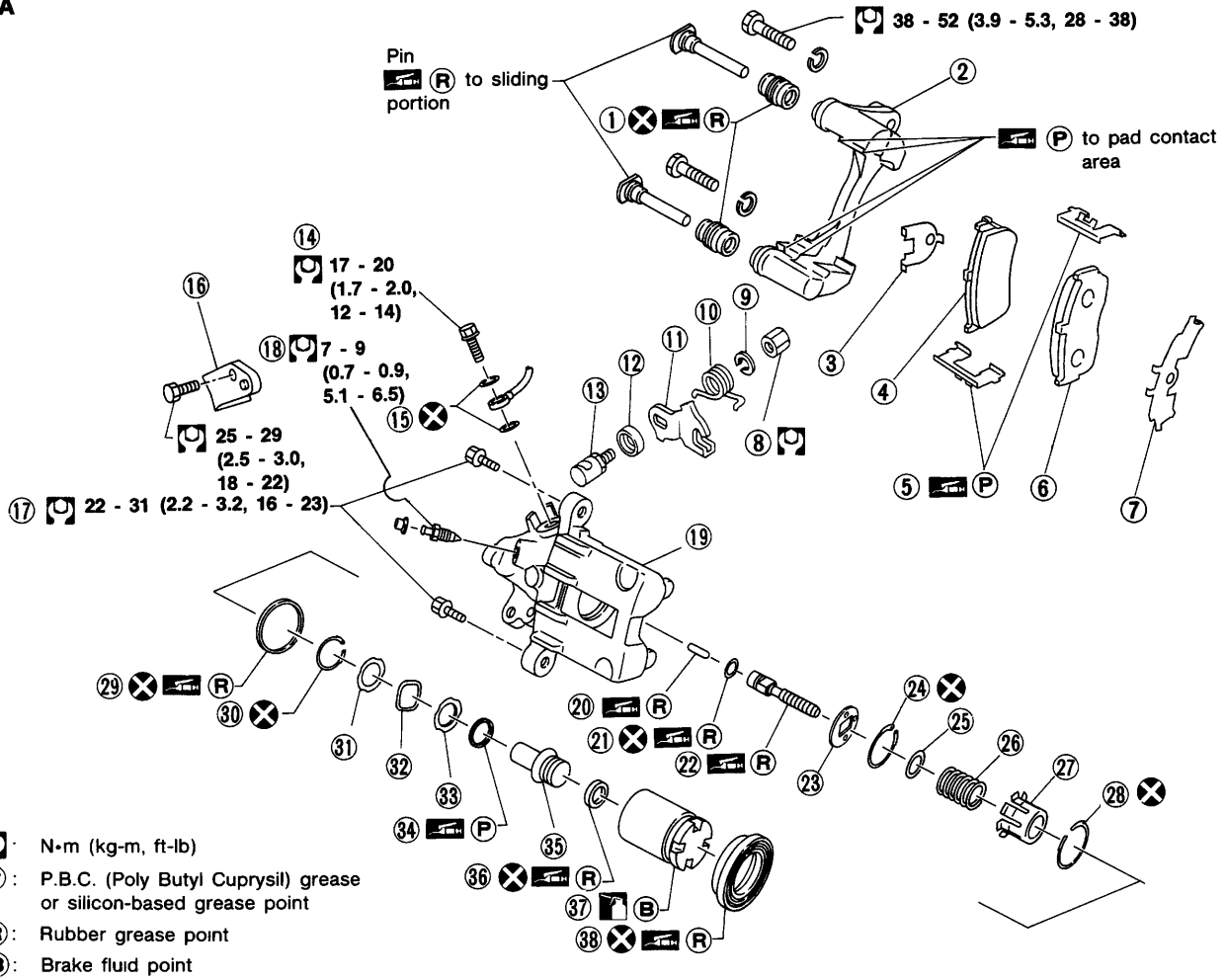
BF

HA

EL

REAR DISC BRAKE

CL9HA



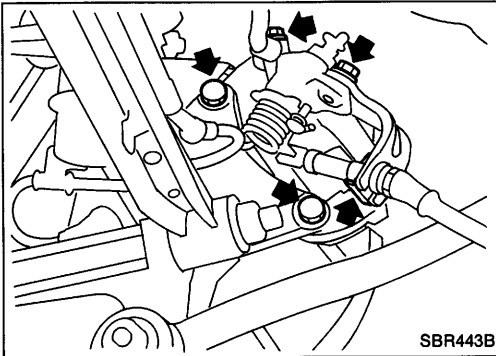
SBR914B

- | | | |
|-----------------|--------------------------|-----------------|
| ① Pin boot | ⑭ Connecting bolt | ⑳ Spring cover |
| ② Torque member | ⑮ Copper washer | ㉑ Ring B |
| ③ Outer shim | ⑯ Cable mounting bracket | ㉒ Piston seal |
| ④ Pad | ⑰ Pin bolt | ㉓ Ring A |
| ⑤ Pad retainer | ⑱ Bleed screw | ㉔ Spacer |
| ⑥ Pad | ⑲ Cylinder | ㉕ Wave washer |
| ⑦ Inner shim | ㉑ Rod | ㉖ Spacer |
| ⑧ Nut | ㉒ O-ring | ㉗ Ball bearing |
| ⑨ Spring washer | ㉓ Push rod | ㉘ Adjusting nut |
| ⑩ Return spring | ㉔ Key plate | ㉙ Cup |
| ⑪ Lever | ㉕ Ring C | ㉚ Piston |
| ⑫ Cam boot | ㉖ Seat | ㉛ Piston boot |
| ⑬ Adjusting cam | ㉗ Spring | |

Removal

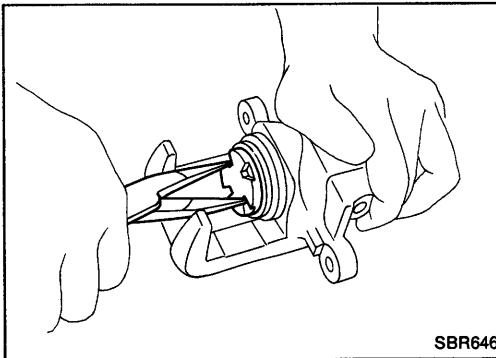
WARNING:

Clean brake pads with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.



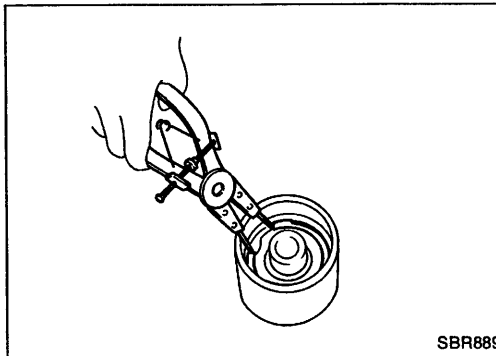
1. Remove brake cable mounting bracket bolt and lock spring.
2. Remove torque member fixing bolts and connecting bolt.

It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend caliper assembly with wire so as not to stretch brake hose.

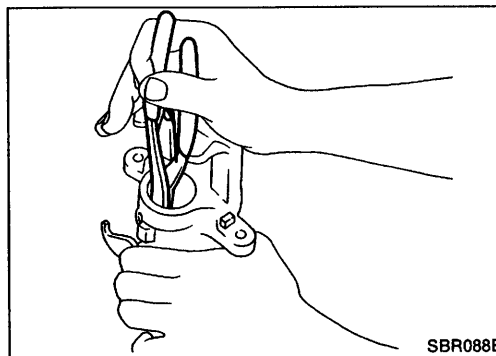


Disassembly

1. Remove piston by turning it counterclockwise with suitable long nose pliers.



2. Pry off ring A from piston with suitable pliers and remove adjusting nut.



3. Disassemble cylinder body.
 - a. Pry off ring B with suitable pliers, then remove spring cover, spring and seat.
 - b. Pry off ring C, then remove key plate, push rod and rod.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

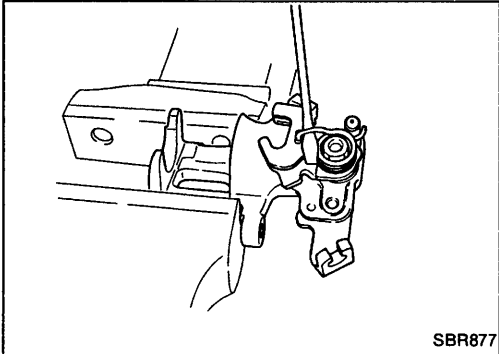
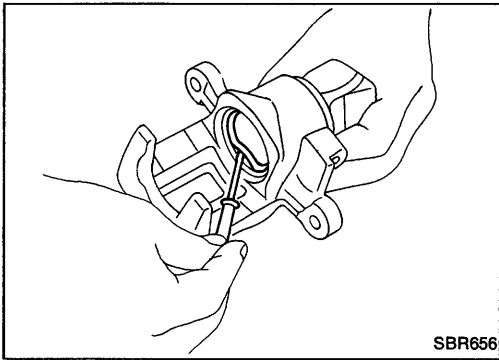
EL

REAR DISC BRAKE

Disassembly (Cont'd)

c. Remove piston seal.

Be careful not to damage cylinder body.



4. Remove return spring, stopper bolt and lever.

Inspection — Caliper

CAUTION:

Use brake fluid to clean cylinder. Never use mineral oil.

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.

TORQUE MEMBER

Check for wear, cracks or other damage. Replace if necessary.

PISTON

CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface.

Check piston for score, rust, wear, damage or presence of foreign materials.

Replace if any of the above conditions are observed.

PIN AND PIN BOOT

Check for wear, cracks or other damage.

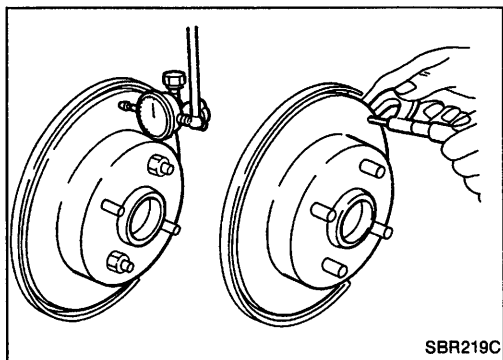
Replace if any of the above conditions are observed.

REAR DISC BRAKE

Inspection — Rotor

RUBBING SURFACE

Check rotor for roughness, cracks or chips.



RUNOUT

1. Secure rotor to wheel hub with two nuts (M12 x 1.25).
2. Check runout using a dial indicator.

Make sure that axial end play is within the specifications before measuring. Refer to section RA.

3. Change relative positions of rotor and wheel hub so that runout is minimized.

Maximum runout:
0.07 mm (0.0028 in)

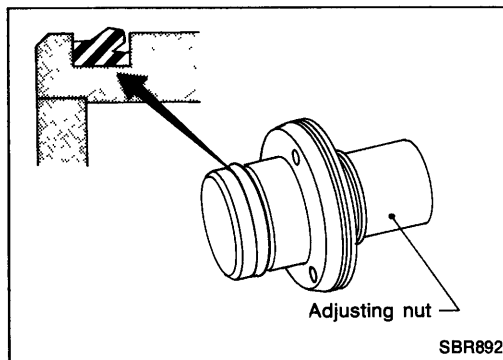
THICKNESS

Rotor repair limit:

Standard thickness
9 mm (0.35 in)

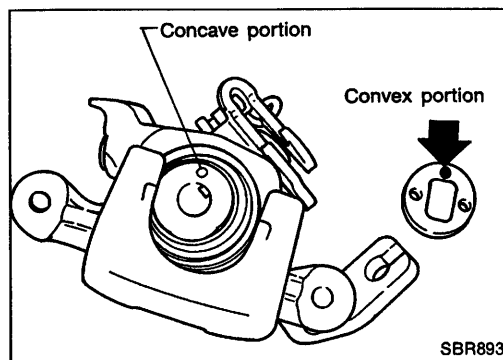
Minimum thickness
8 mm (0.31 in)

Thickness variation (At least 8 portions)
Maximum 0.02 mm (0.0008 in)



Assembly

1. Install cup in the specified direction.



2. Fit push rod into square hole in key plate. Also match convex portion of key plate with concave portion of cylinder.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

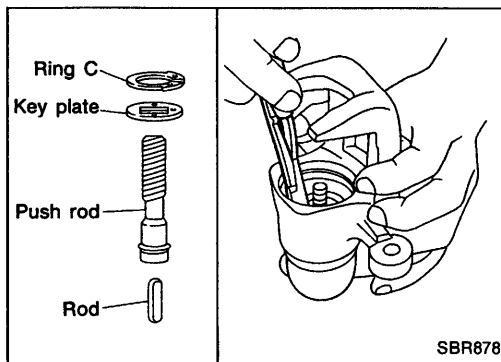
BF

HA

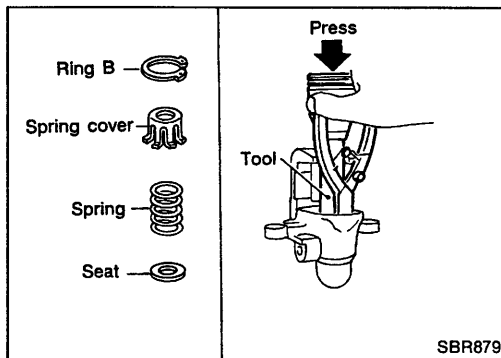
EL

REAR DISC BRAKE

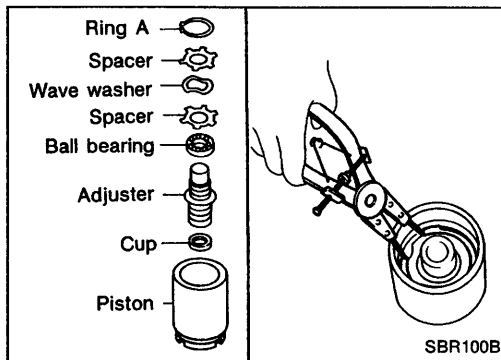
Assembly (Cont'd)



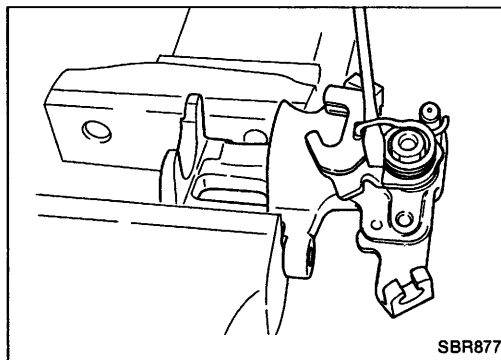
3. Install ring C with a suitable tool.



4. Install seat, spring, spring cover and ring B with suitable press and drift.



5. Install cup, adjuster, bearing, spacers, washers and ring A with a suitable tool.



6. Fit lever and tighten stopper bolt.

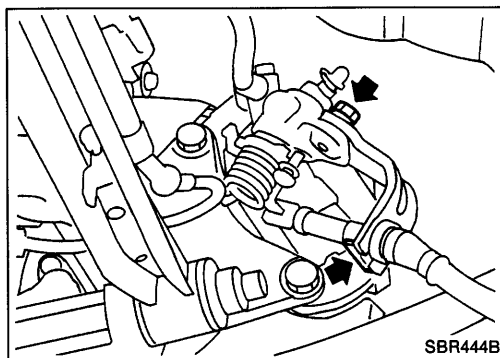
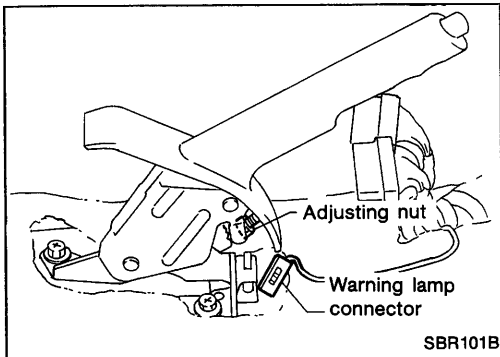
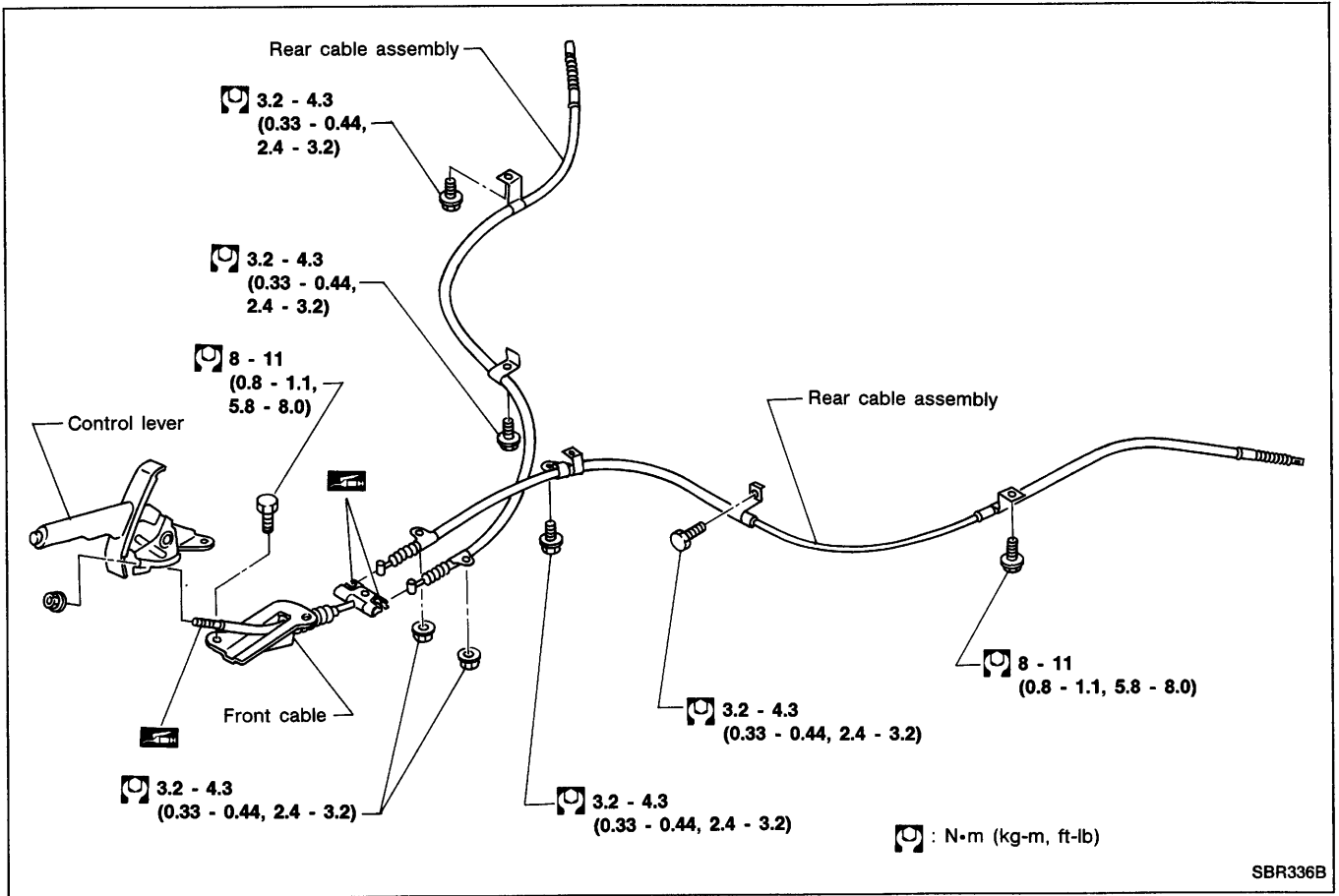
7. Fit return spring in the order shown.

Installation

CAUTION:

- Refill with new brake fluid "DOT 3".
 - Never reuse drained brake fluid.
1. Install brake hose to caliper securely.
 2. Install all parts and secure all bolts.
 3. Bleed air. Refer to "Bleeding Brake System".

PARKING BRAKE CONTROL



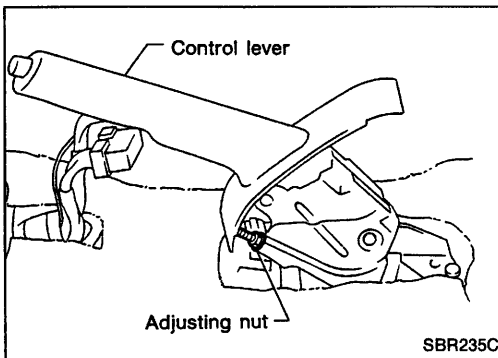
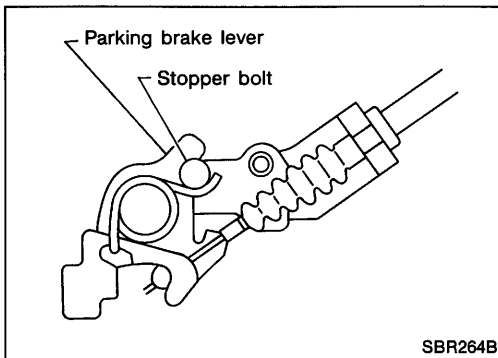
Removal and Installation

1. To remove parking brake cable, first remove center console.
2. Disconnect warning lamp connector.
3. Remove bolts, slacken off and remove adjusting nut.
4. Remove cable mounting bracket and lock plate.

PARKING BRAKE CONTROL

Inspection

1. Check control lever for wear or other damage. Replace if necessary.
2. Check wires for discontinuity or deterioration. Replace if necessary.
3. Check warning lamp and switch. Replace if necessary.
4. Check parts at each connecting portion and, if found deformed or damaged, replace.



Adjustment

Pay attention to the following points after adjustment.

- a. There is no drag when control lever is being released.
- b. Parking brake lever returns to stopper bolt when control lever for rear disc brake models is released.

1. Loosen parking brake cable.
2. Depress brake pedal fully more than 5 times.
3. Adjust control lever by turning adjusting nut.
4. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.
Number of notches : 7 - 9 [196 N (20 kg, 44 lb)]
5. Bend parking brake warning lamp switchplate so that brake warning lamp comes on when ratchet at parking brake lever is pulled "A" notches and goes out when fully released.

Number of "A" notches : 1

ANTI-LOCK BRAKING SYSTEM

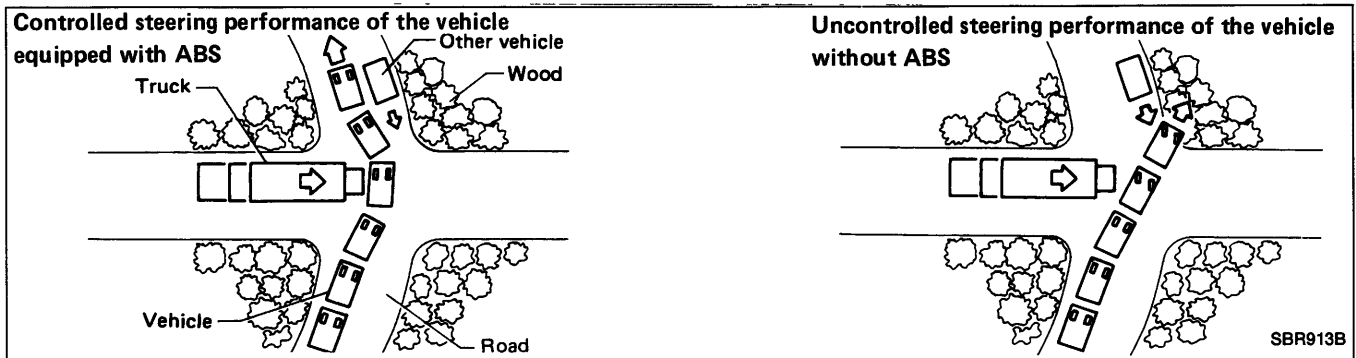
Purpose

- Excessive braking in any condition (Dry or wet) will adversely affect the normal turning of the vehicle's wheels and they may lock up.
- When the front wheels are locked, a vehicle cannot be controlled by the steering system.
- When the rear wheels are locked, the vehicle will enter a flat spin.

The ABS, by the use of electronic and hydraulic components, allows for control of braking force so that locking of the wheels can be avoided in the circumstances described above.

The ABS:

- 1) Ensures proper tracking performance through steering wheel operation.
- 2) Enables obstacles to be avoided through steering wheel operation.
- 3) Ensures vehicle stability by preventing flat spins.



Operation

The ABS is controlled by an electronic control unit (E.C.U.), which receives signals from various sensors relating to vehicle condition, speed, etc.

The hydraulic circuit is controlled by an actuator containing an electric motor, pump, damper, orifice and 4 solenoids (one per wheel). The E.C.U. directs the actuator to increase, hold or decrease hydraulic pressure to all or individual wheels.

The E.C.U. receives information regarding wheel speed from sensors, mounted one per wheel.

When excessive braking force causes a wheel to lock, the E.C.U. sends a 5 amp current to the actuator to release the locked wheel.

As the wheel unlocks, it can be steered. The E.C.U. senses wheel speed is increasing and re-applies hydraulic pressure. The wheel locks again, is released, steered, braked, and so on. This continuous locking and unlocking of the wheels allows for rapid speed reduction and the vehicle to be steered in the correct manner.

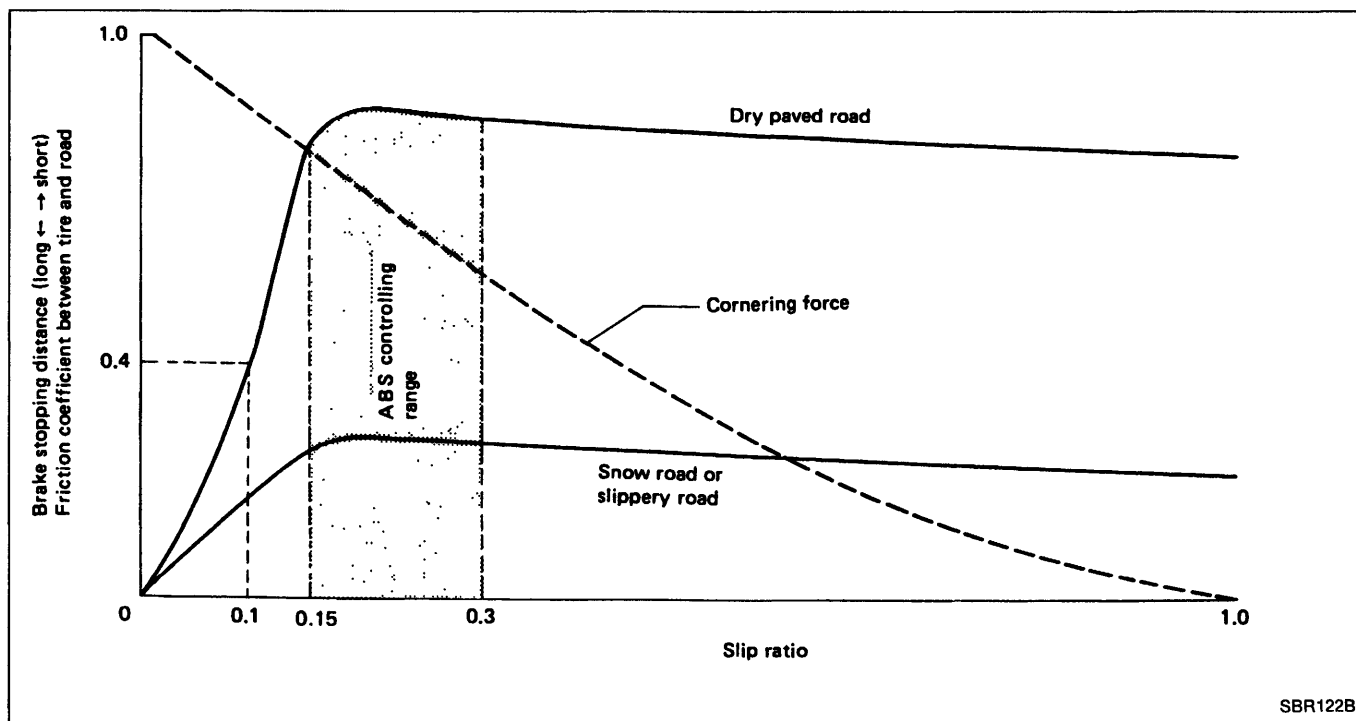
The hydraulic pressure can also be "held" constant by a 2 amp current sent from the E.C.U. to the actuator.

The rear wheels utilize a load-sensing valve to further prevent wheel locking, especially under minimum vehicle load conditions.

However, when the vehicle speed is less than 10 km/h (6MPH), this system does not work.

ANTI-LOCK BRAKING SYSTEM

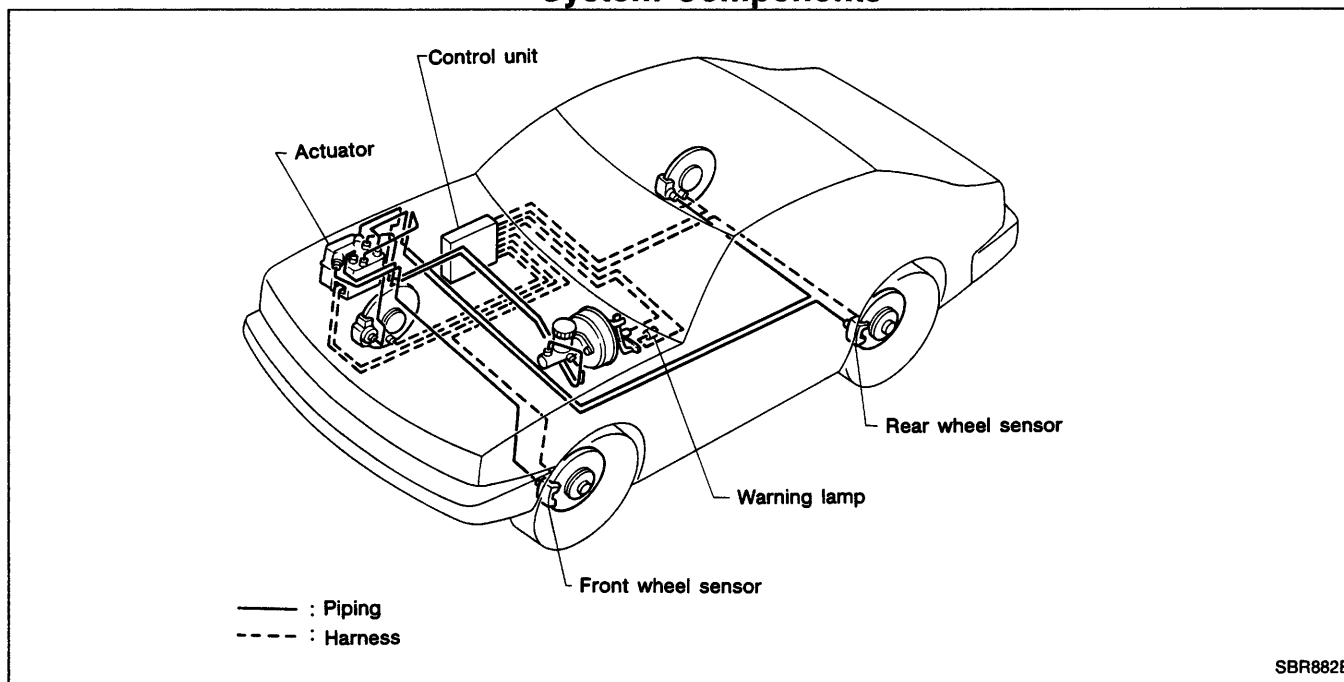
Operation (Cont'd)



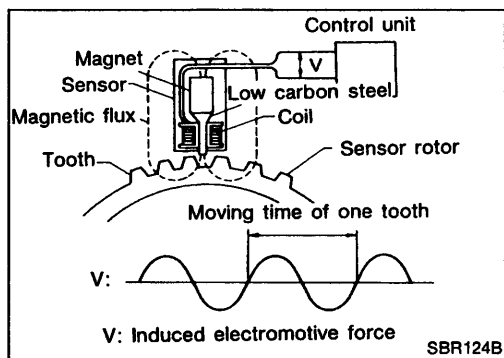
$$\text{SLIP RATIO} = \frac{\text{VEHICLE SPEED} - \text{WHEEL SPEED}}{\text{VEHICLE SPEED}}$$

- The applied brake condition is expressed by a slip ratio, as shown above. If the slip ratio is in the range from 0.15 to 0.3, the wheel has adequate cornering performance, and also minimum stopping distance can be achieved.
- The slip ratio formula indicates the control of wheel speed by the brakes. The Anti-lock Braking System (ABS) controls brake fluid pressure using the slip ratios and locking condition calculation contained in the ABS control unit.
- To adjust wheel speed so that the optimum slip ratio can be obtained, the ABS must sense wheel speed and vehicle speed through a wheel speed sensor. If the brake is applied, especially in the locked wheel condition, the vehicle speed differs from the wheel speed.
- After the wheel speed changes from the vehicle speed due to excessive brake force, the ABS calculates vehicle speed when the reduced wheel speed reaches the minimum.

System Components



GI
MA
EM
LC
EF &
EC
FE
CL

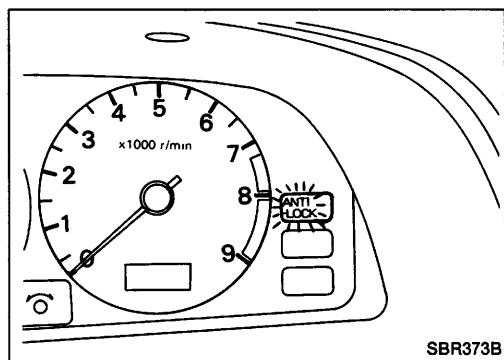


System Description

SENSOR

The sensor unit consists of a gear-shaped rotor and a sensor element which contains a bar magnet around which a coil is wound. The sensor is installed on the back side of the brake rotor. Sine-wave current is generated by the sensor as the wheel rotates. The frequency and voltage increase(s) as the rotating speed increases.

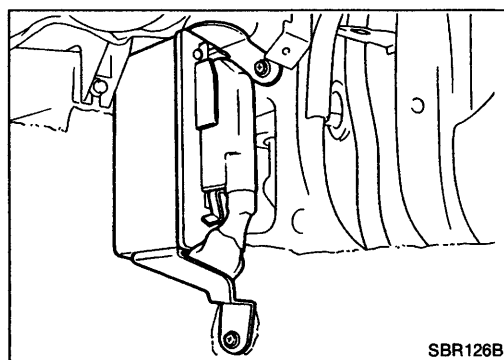
MT
AT
FA
RA



CONTROL UNIT

The control unit computes the rotating speed of the wheel by the signal current sent from the sensor, and supplies a DC current of about 5 amperes, about 2 amperes, or 0 amperes to the actuator solenoid valve provided for each wheel by changing its internal resistance. It also controls ON-OFF operation of the valve relay and pump relay. If any electrically detectable malfunction should occur in the system, the control unit causes the warning light to light up. In this condition, the ABS will be deactivated by the control unit, and the vehicle's braking system reverts to normal operation.

BR
ST
BF
HA

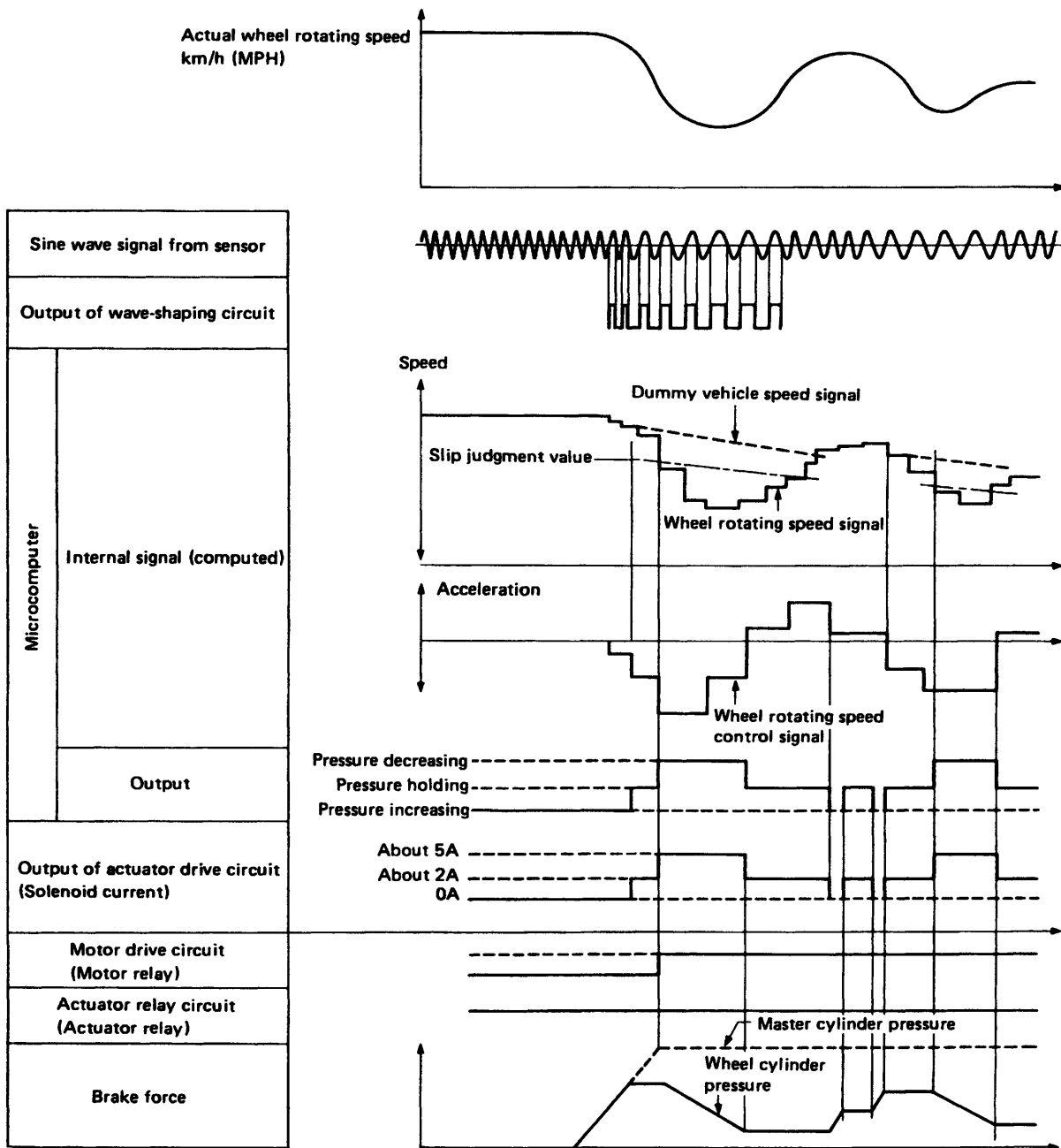


EL

ANTI-LOCK BRAKING SYSTEM

System Description (Cont'd)

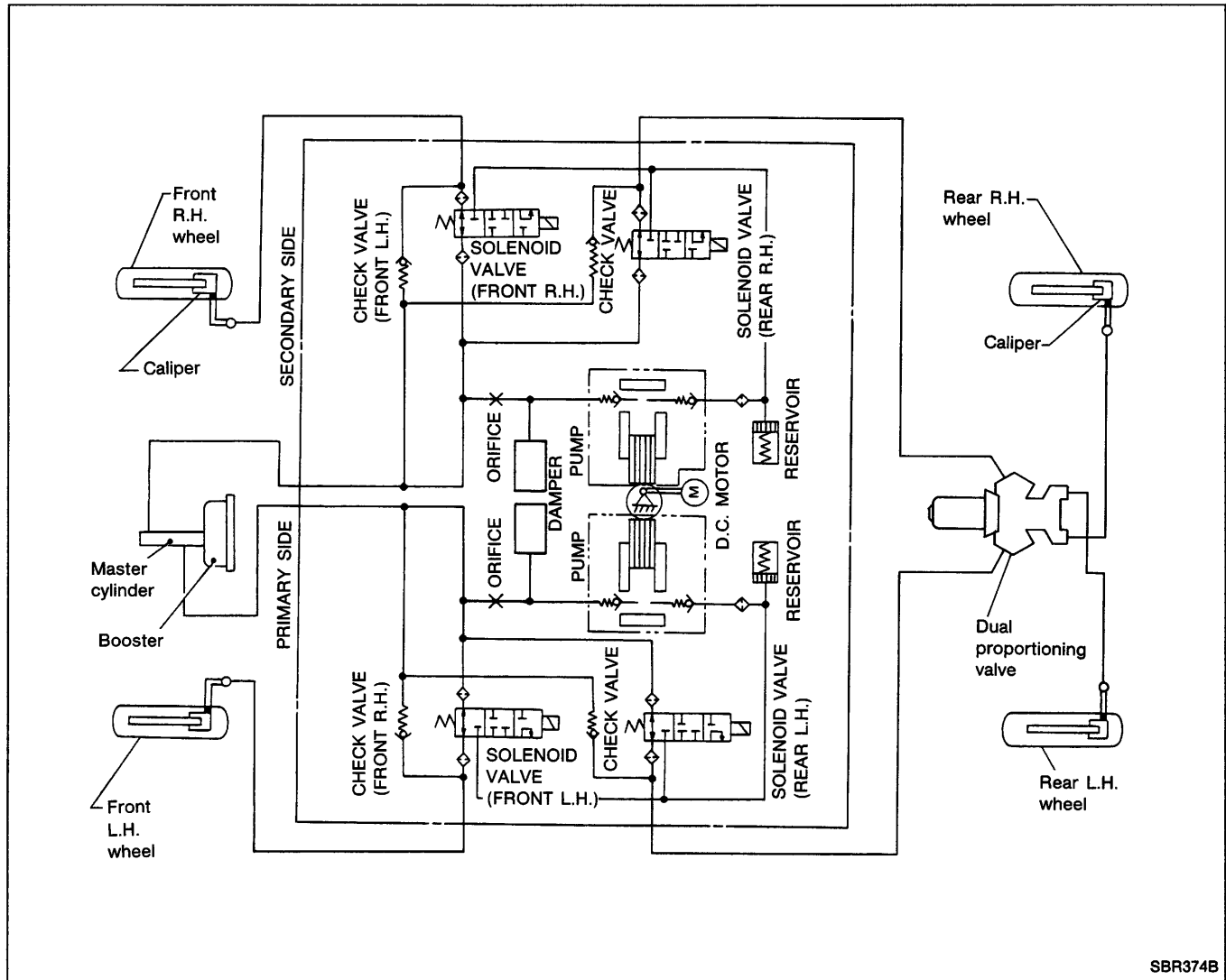
CONTROL UNIT CONTROL CHART



ANTI-LOCK BRAKING SYSTEM

System Description (Cont'd)

ACTUATOR

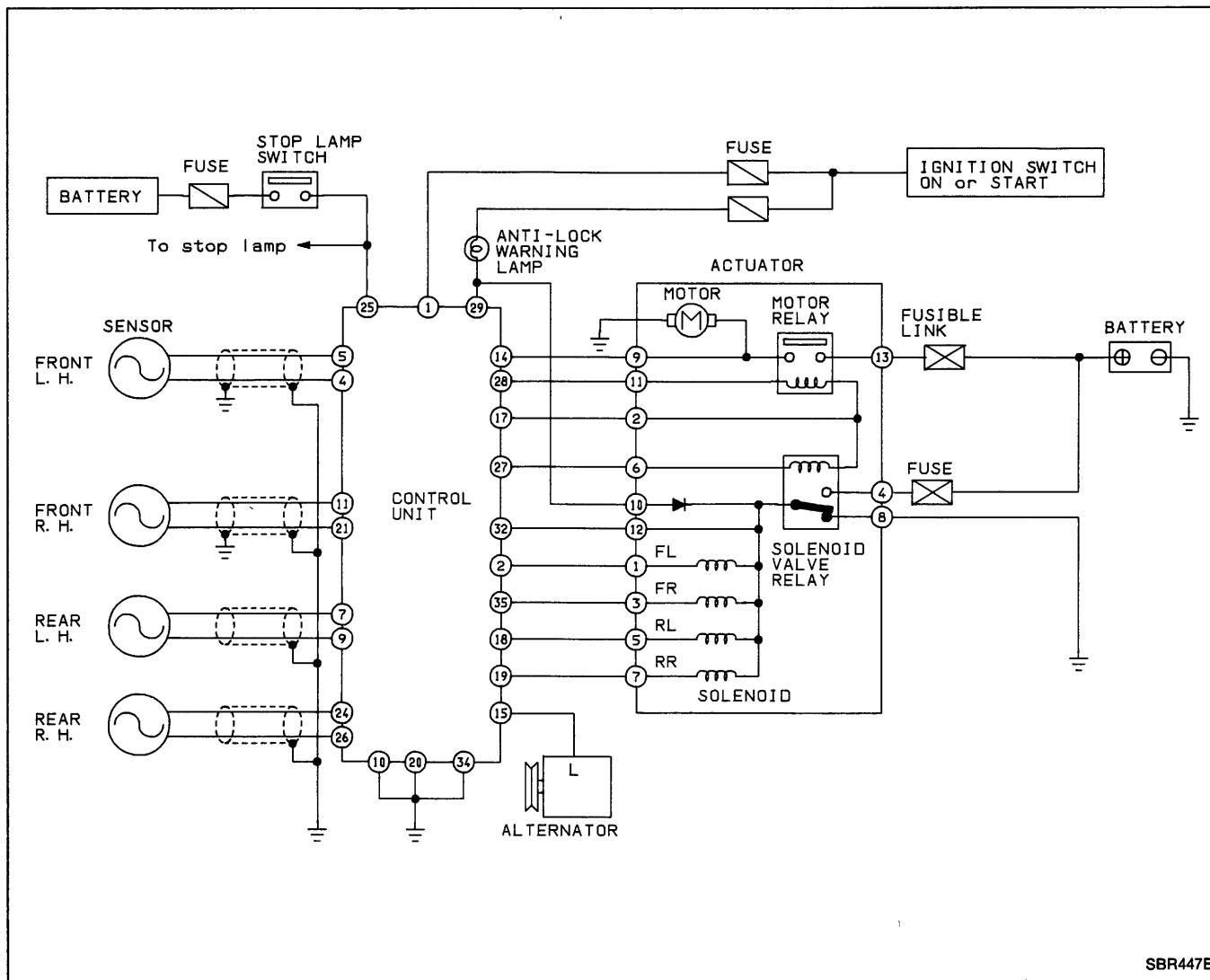


SBR374B

The actuator consists of solenoid valves, a pump, a reservoir (for pressure decreasing), and a damper and orifice (to prevent high pressure fluid produced by the pump from being applied to the master cylinder). The solenoid valve changes its spool position corresponding to the control unit output amperage: it forms a pressure decreasing circuit at about 5 amperes, a pressure holding circuit at about 2 amperes, and a pressure increasing circuit at 0 amperes. When the pressure decreasing circuit is formed, the brake fluid in the caliper flows into the reservoir and the pressure drops. The pump delivers the fluid to the damper and the orifice to reduce fluid pressure, before its return to the master cylinder. When the pressure holding circuit is formed, the caliper line is cut off, and the fluid pressure in the caliper is kept constant.

ANTI-LOCK BRAKING SYSTEM

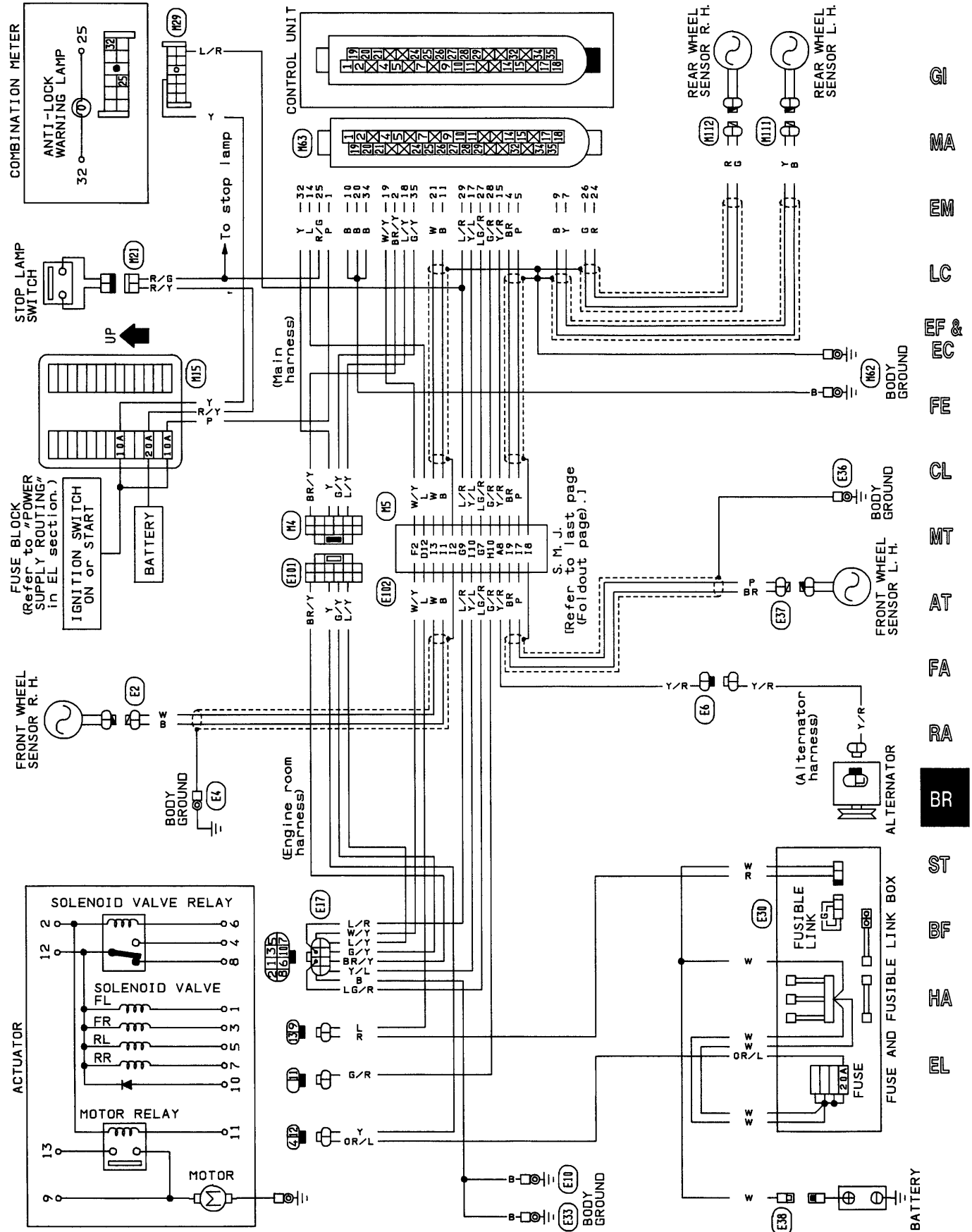
Circuit Diagram



SBR447B

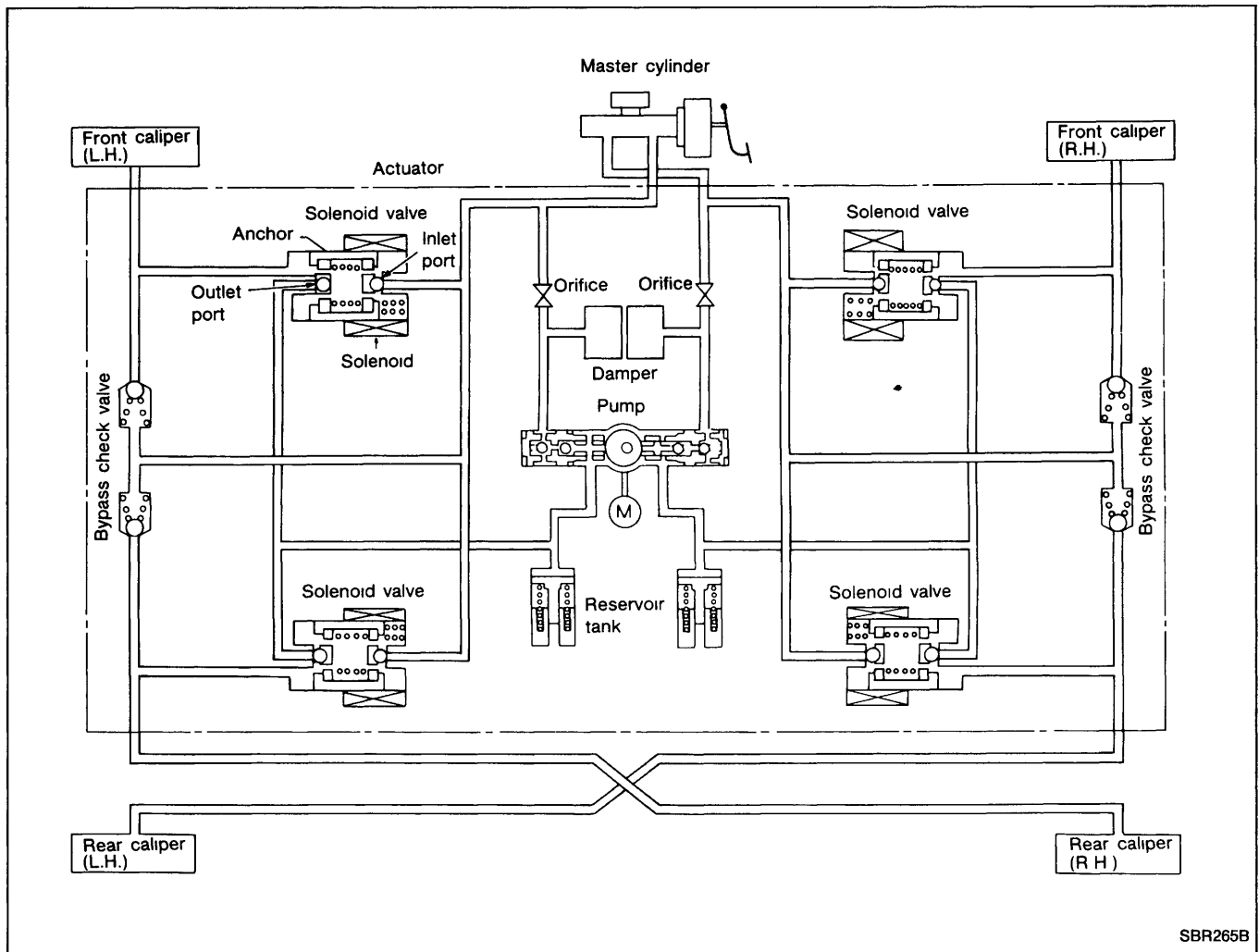
ANTI-LOCK BRAKING SYSTEM

Wiring Diagram



ANTI-LOCK BRAKING SYSTEM

Operation of Actuator Hydraulic Circuit

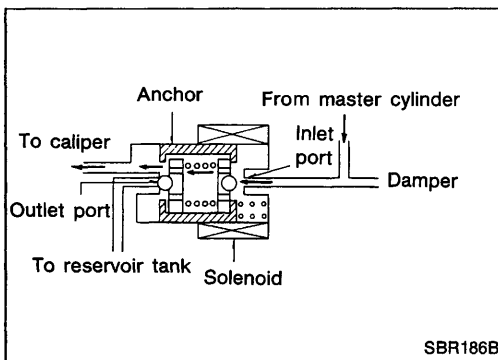


SBR265B

COMPONENT PARTS AND THEIR FUNCTIONS

Solenoid valve

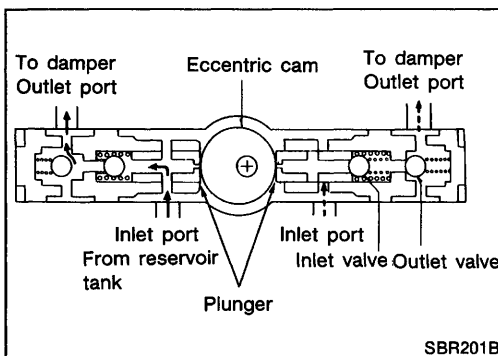
Current flowing through the solenoid controls the anchor position. Thus, the required ports open or close so that brake pressure to the caliper is adjusted properly.



SBR186B

Pump

The pump delivers **brake fluid to the damper and the orifice to decrease fluid pressure in the caliper**. When the pump shaft's eccentric cam pushes the plunger to the left (as shown in the figure), oil from the reservoir tank is delivered to the damper and the orifice via the inlet and outlet ports and the inlet and outlet valves. At this point, the plunger on the right side of the pump is held stationary so that both the inlet and outlet ports as well as the inlet and outlet valves are closed. In this manner, the valve controls suction and discharge.



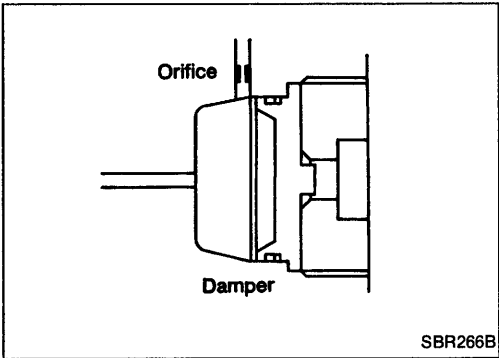
SBR201B

ANTI-LOCK BRAKING SYSTEM

Operation of Actuator Hydraulic Circuit (Cont'd)

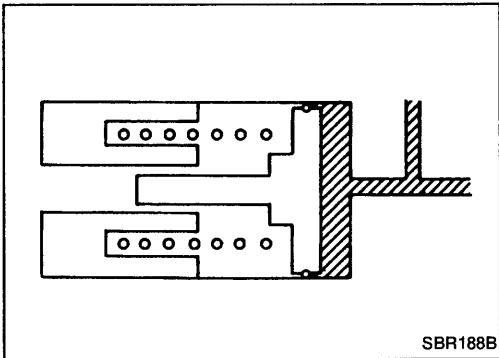
Damper and Orifice

The damper temporarily stores high pressure brake fluid (pulsation fluid) delivered from the pump and the orifice allows the brake fluid to return to the master cylinder smoothly.



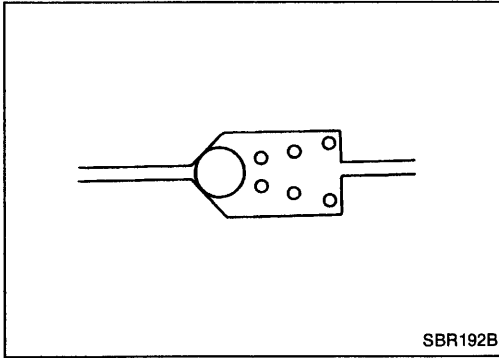
Reservoir tank

The reservoir tank temporarily stores brake fluid returning from the calipers as required in order to provide a smooth pressure decrease in the calipers.



Bypass check valve

During brake release, brake fluid returns from the caliper to the master cylinder through this valve without entering the solenoid valve and feeling valve.



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

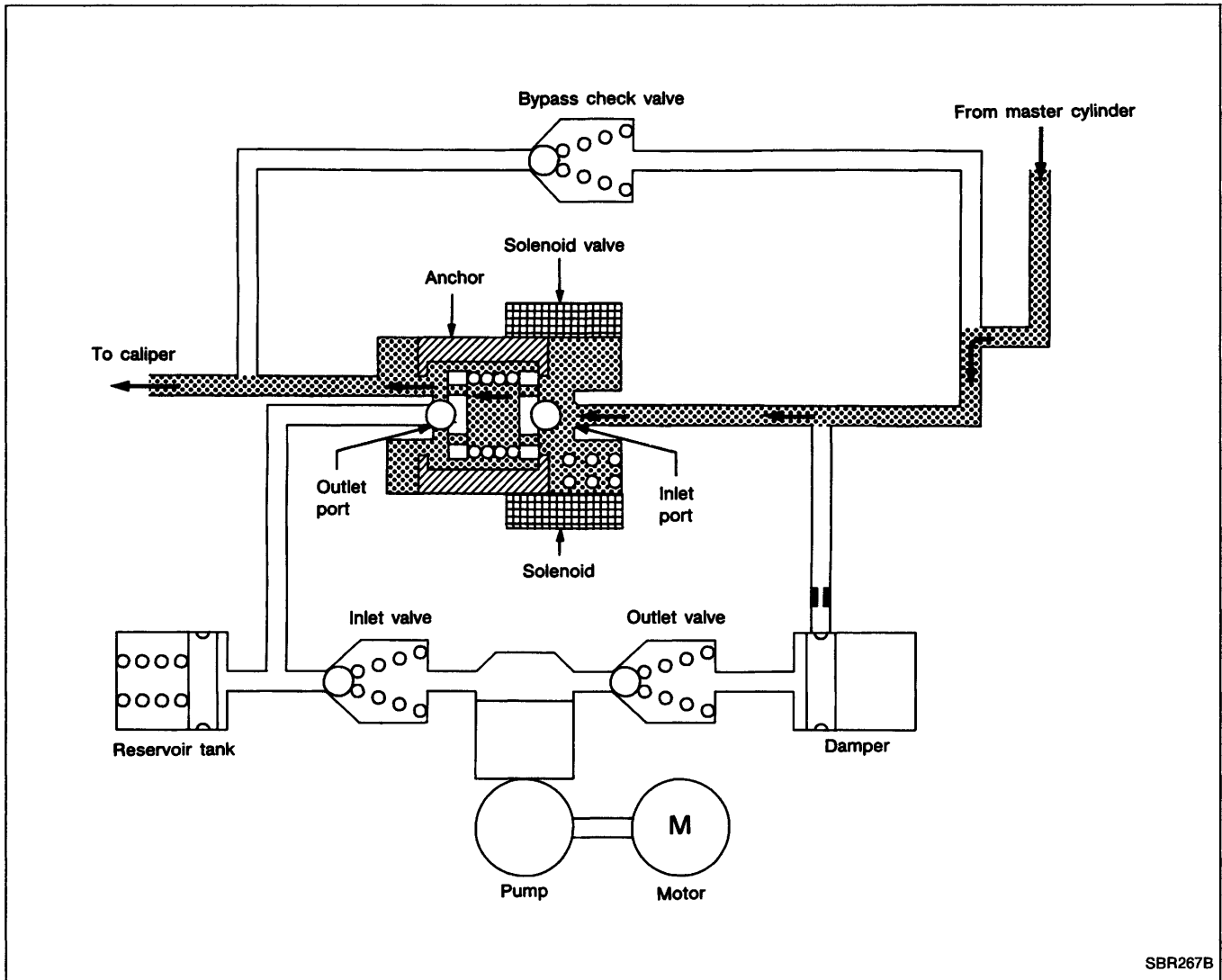
HA

EL

ANTI-LOCK BRAKING SYSTEM

Operation of Actuator Hydraulic Circuit (Cont'd)

NORMAL BRAKE OPERATION (ABS is not operating)



Description

Electric current to the solenoid ... 0 [A]

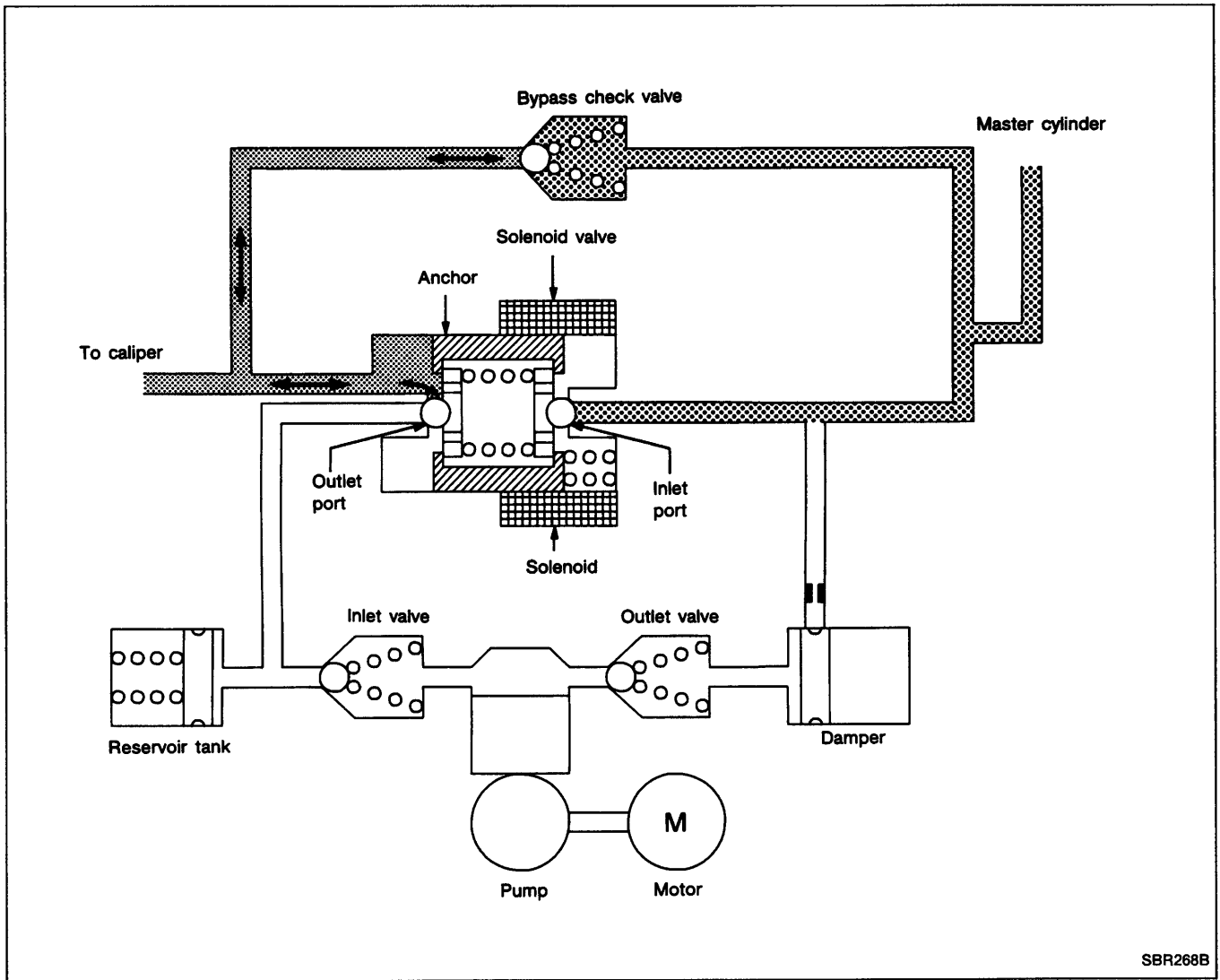
1. Magnetic force is not produced at the solenoid valve so that the anchor is not attracted toward the solenoid.
2. The inlet port is opened and the outlet port is closed.
Since the outlet port of the solenoid valve is closed, brake fluid pressure is not delivered to the reservoir tank.
3. Master cylinder brake fluid pressure is directly transmitted to the caliper (= disc brake) via the inlet port of the solenoid valve.

ANTI-LOCK BRAKING SYSTEM

Operation of Actuator Hydraulic Circuit (Cont'd)

ANTI-LOCK OPERATION

Operation during pressure "Hold" (Wheels begin to slip)



Description

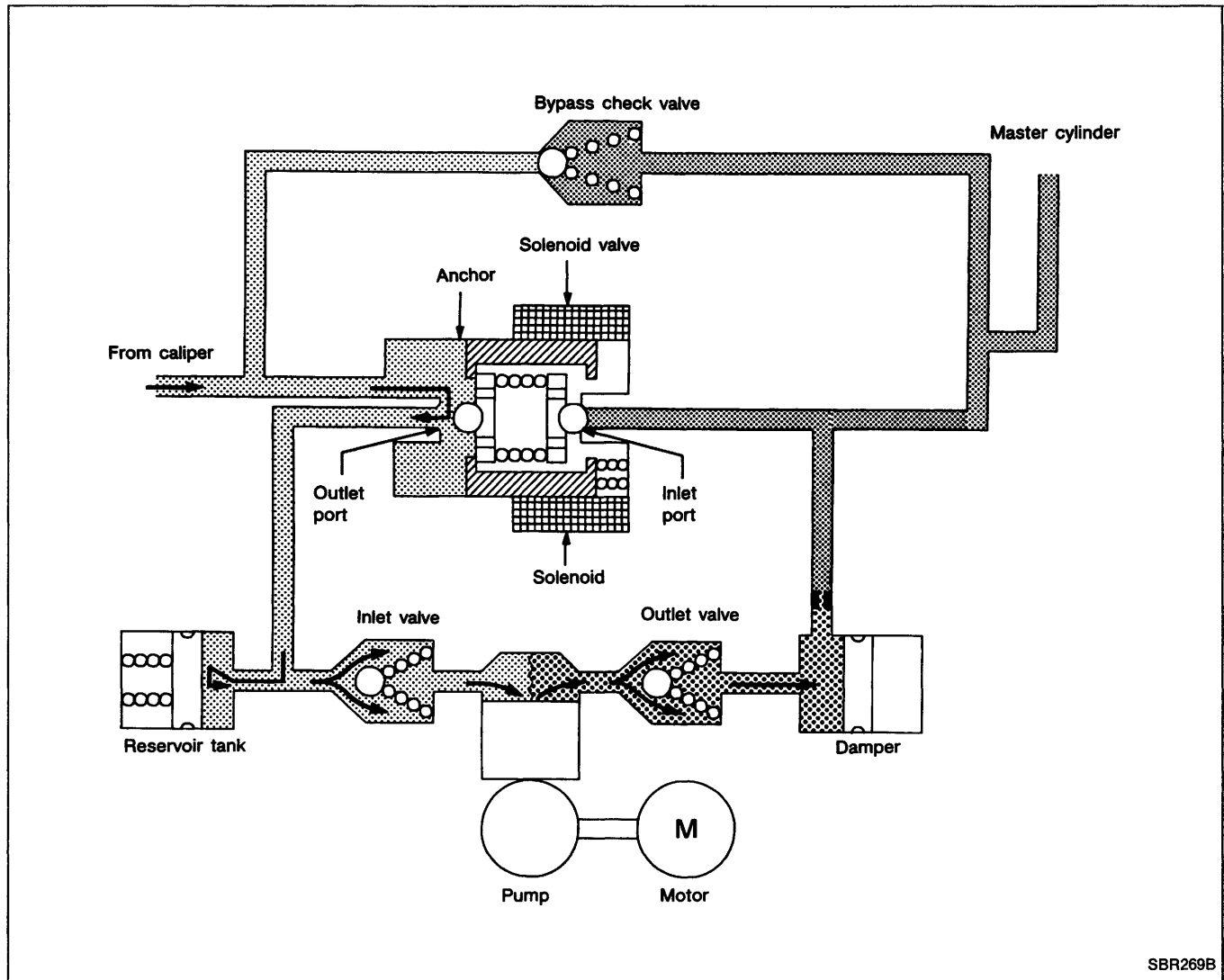
Electric current to the solenoid ... 2 [A]

1. Magnetic force produced by current "2[A]" attracts the anchor to a position where the anchor and return spring are balanced. (Travel distance is small.)
2. Both inlet and outlet ports are closed.
Caliper fluid pressure is not delivered to the reservoir tank since the outlet port of the solenoid valve is closed. The bypass check valve is closed due to high master cylinder fluid pressure.
3. Master cylinder fluid pressure is not delivered to the solenoid valve so that caliper pressure is held.

ANTI-LOCK BRAKING SYSTEM

Operation of Actuator Hydraulic Circuit (Cont'd)

Operation during pressure "Decrease" (Wheels slip excessively)



Description

Electric current to the solenoid ... 5 [A]

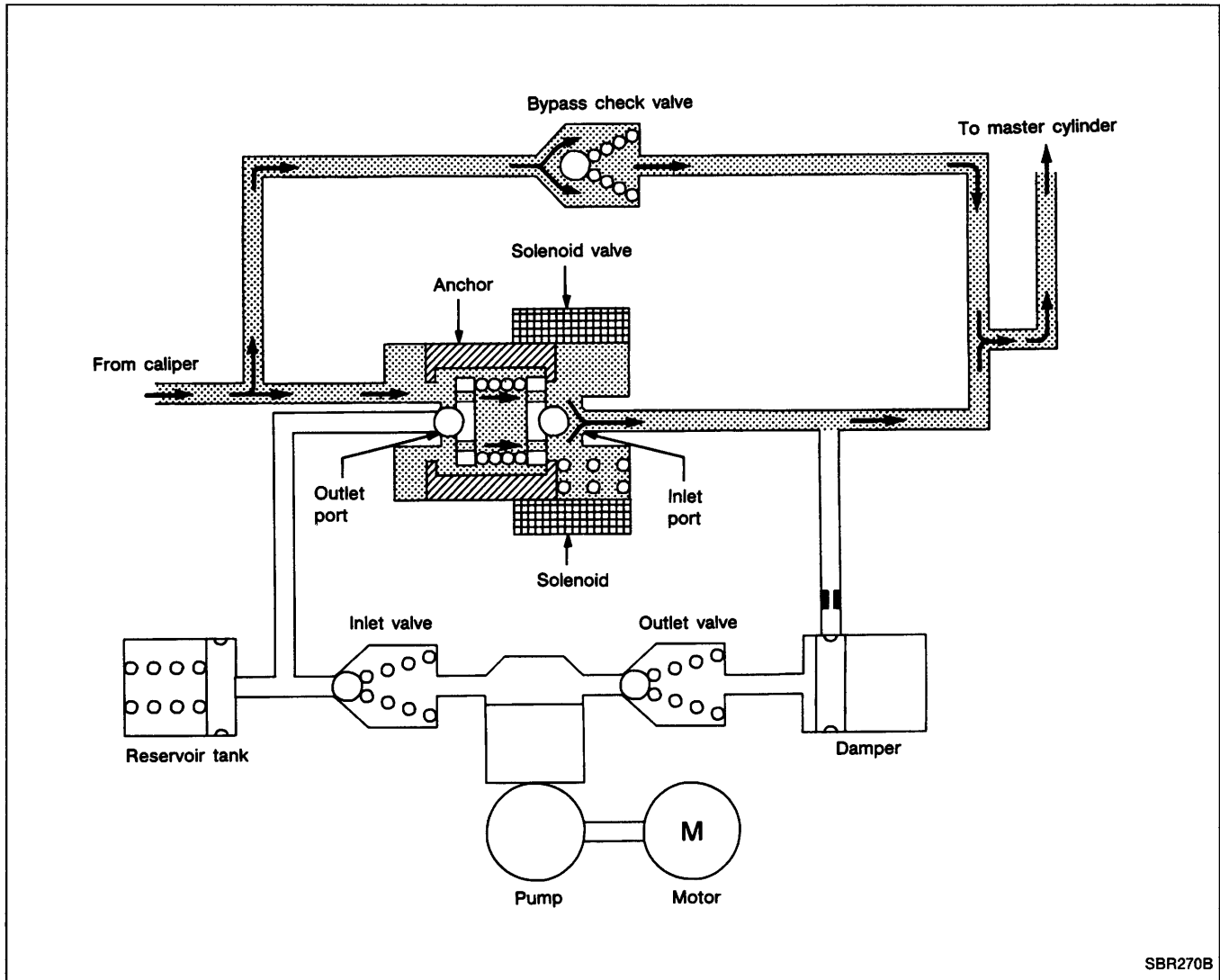
1. Magnetic force of the solenoid increases to attract the anchor further.
2. The inlet port remains closed and the outlet port opens.
3. Master cylinder fluid pressure does not act on the caliper since the inlet port of the solenoid valve is closed.
4. Caliper pressure is delivered to the reservoir tank via the outlet port of the solenoid valve so that it decreases.
5. Current "5[A]" to the solenoid is controlled and the pump motor activates at the same time. This operation returns brake fluid (which eventually returns to the reservoir) through the damper and the orifice so that the high pressure brake fluid does not apply to the master cylinder directly.

[The above operation is repeated in a very short period of time. As a result, each wheel is prevented from locking up.]

ANTI-LOCK BRAKING SYSTEM

Operation of Actuator Hydraulic Circuit (Cont'd)

OPERATION DURING BRAKE RELEASE



Description

Electric current to the solenoid ... 0 [A]

1. Master cylinder fluid pressure decreases so that the bypass valve opens. This allows caliper fluid pressure to return to the master cylinder.
2. The bypass check valve is set to open at low pressure to return the caliper fluid to the master cylinder quickly.

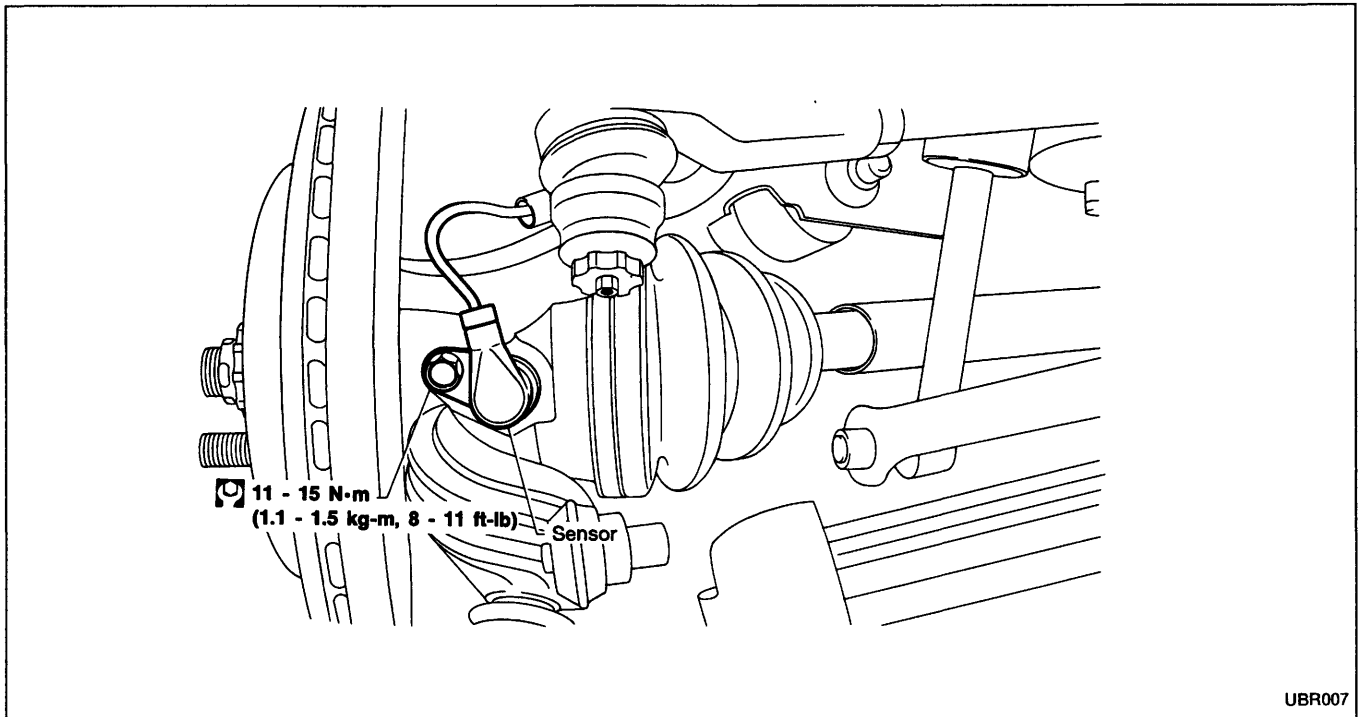
ANTI-LOCK BRAKING SYSTEM

Removal and Installation

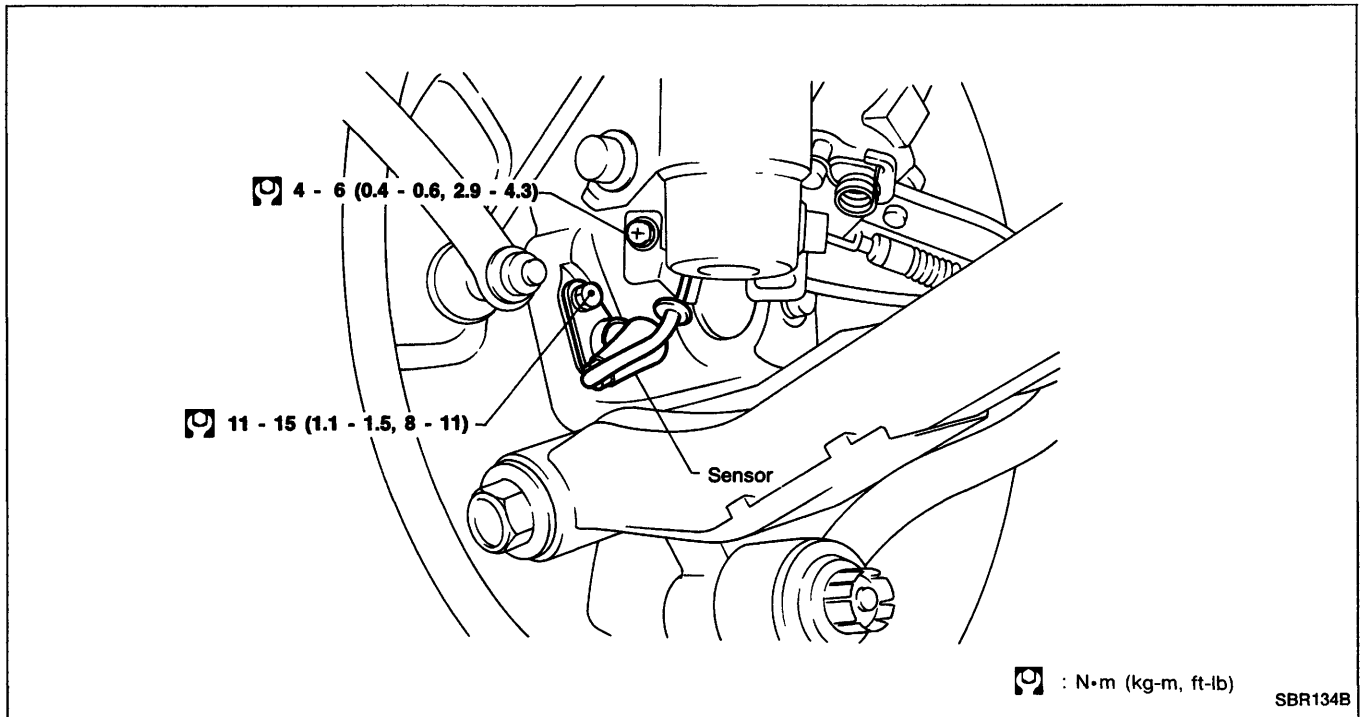
CAUTION:

Be careful not to damage sensor edge and sensor rotor teeth.

FRONT WHEEL SENSOR



REAR SENSOR

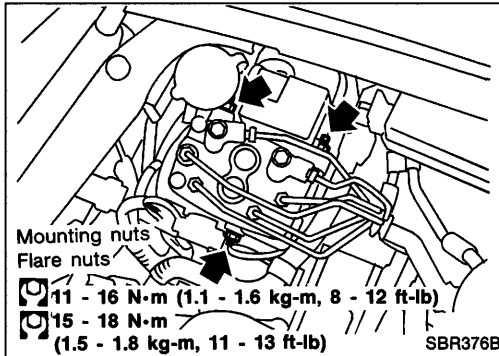
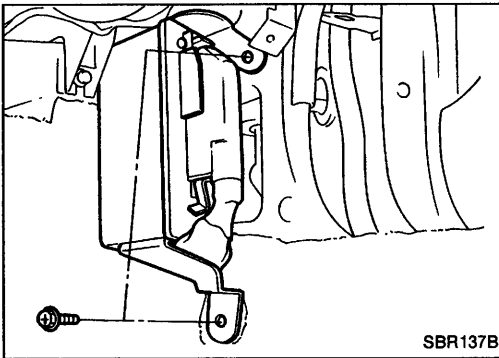


ANTI-LOCK BRAKING SYSTEM

Removal and Installation (Cont'd)

CONTROL UNIT

Location: Front passenger side dash side lower.



ACTUATOR

Removal

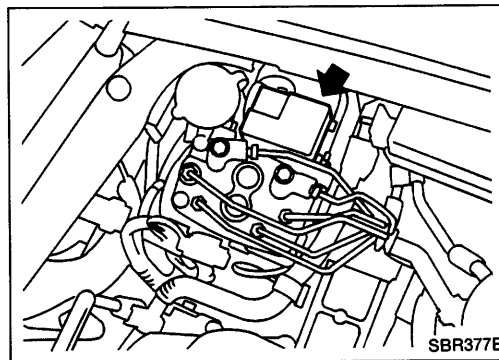
1. Disconnect battery cable.
2. Drain brake fluid. Refer to "Changing Brake Fluid" in "CHECK AND ADJUSTMENT".
3. Apply different colored paint to each pipe connector and actuator to prevent incorrect connection.
4. Disconnect connector, brake pipes and remove fixing nuts and actuator ground cable.

Installation

CAUTION:

After installation, refill brake fluid. Then bleed air. Refer to "CHECK AND ADJUSTMENT".

1. Tighten actuator ground cable.
2. Connect brake pipes temporarily.
3. Tighten fixing nuts.
4. Tighten brake pipes.
5. Connect connector and battery cable.



ACTUATOR RELAYS

LARGE: Motor Relay

SMALL: Solenoid Valve Relay

1. Disconnect battery cable.
2. Remove actuator relay cover.
3. Pull out relays.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

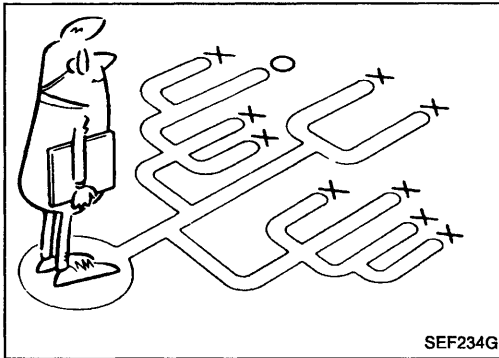
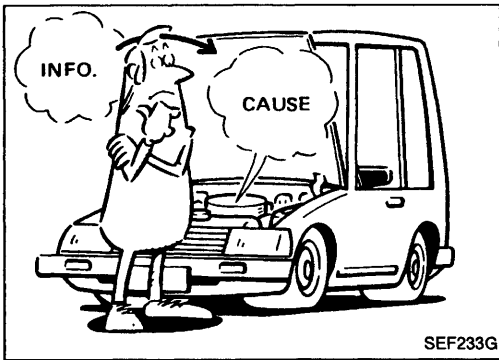
HA

EL

TROUBLE DIAGNOSES

Contents

How to Perform Trouble Diagnoses for Quick and Accurate Repair	BR-39
Symptom Chart	BR-42
Preliminary Check 1	BR-43
Preliminary Check 2	BR-43
Preliminary Check 3, 4	BR-44
Self-diagnosis	BR-45
Component Parts and Harness Connector Location	BR-46
Ground Circuit Check	BR-47
Circuit Diagram for Quick Pinpoint Check	BR-47
Diagnostic Procedure 1 — Pedal vibration and noise	BR-48
Diagnostic Procedure 2 — Long stopping distance	BR-49
Diagnostic Procedure 3 — Unexpected pedal action	BR-50
Diagnostic Procedure 4 — ABS does not work	BR-50
Diagnostic Procedure 5 — ABS works but warning activates	BR-51
Diagnostic Procedure 6 — ABS works frequently	BR-51
Diagnostic Procedure 7 — ACTUATOR SOLENOID (L.E.D. flashing number 1-4)	BR-52
Diagnostic Procedure 8 — WHEEL SPEED SENSOR (L.E.D. flashing number 5-8)	BR-52
Diagnostic Procedure 9 — ACTUATOR MOTOR RELAY (L.E.D. flashing number 9)	BR-53
Diagnostic Procedure 10 — ACTUATOR SOLENOID VALVE RELAY (L.E.D. flashing number 10)	BR-54
Diagnostic Procedure 11 — CONTROL UNIT (L.E.D. flashing number 16)	BR-55
Diagnostic Procedure 12 — CONTROL UNIT OR POWER SUPPLY AND GROUND CIRCUIT (Warning activates but L.E.D. comes off.)	BR-55
Electrical Components Inspection	BR-56



How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The ABS system has an electronic control unit to control major functions. 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 air leaks in the booster or lines, lack of brake fluid, or other problems with brake system.

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, so a road test should be carried out.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with an ABS complaint. The customer is a very good source 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 brake problems on an ABS controlled vehicle.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

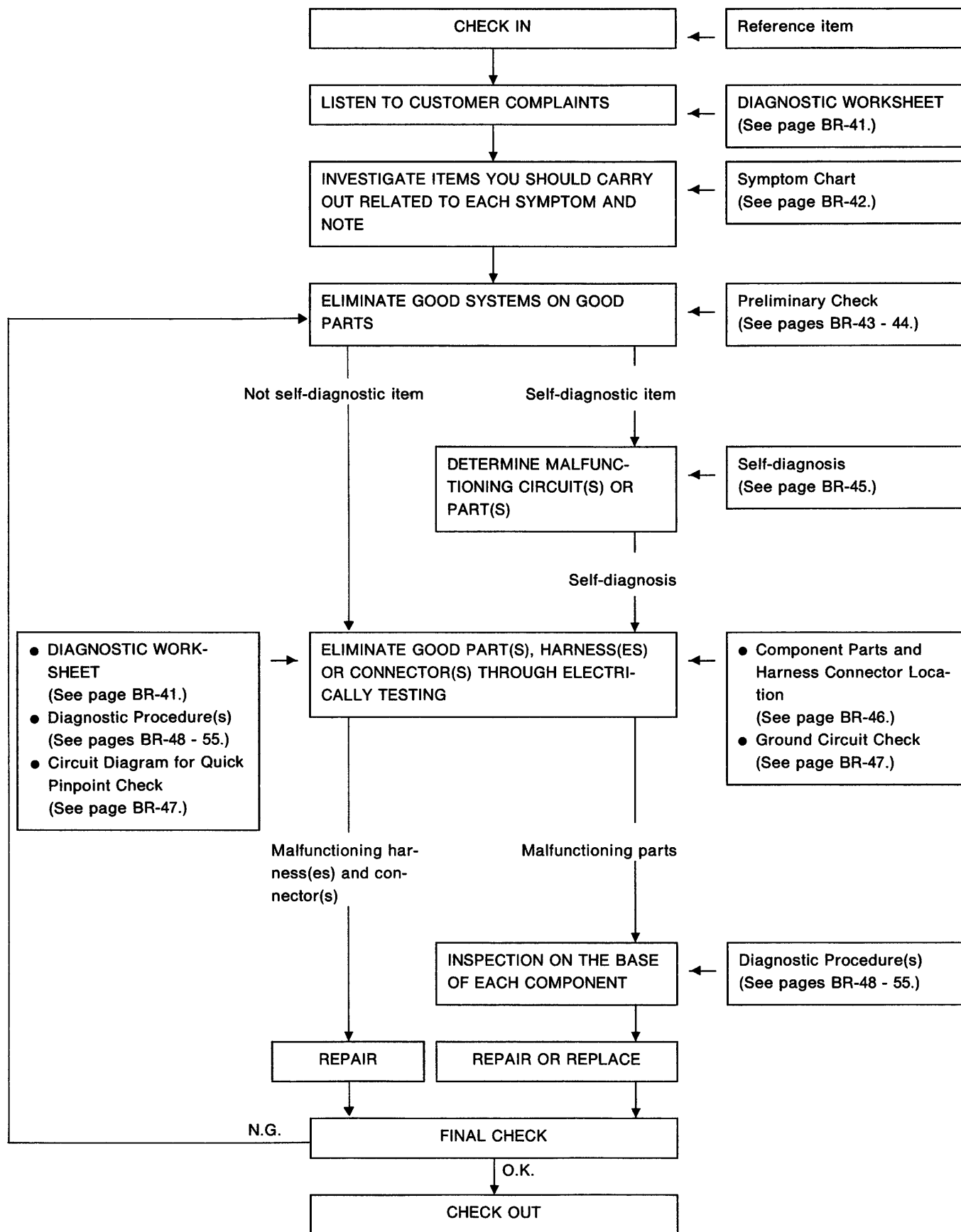
HA

EL

TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

WORK FLOW



TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

KEY POINTS

WHAT Vehicle 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 customer complaints, even if the system is normal.

A good grasp of such conditions can make trouble-shooting faster and more accurate.

In general, feelings for a problem depend on each customer's information. It is therefore 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 trouble-shooting.

Worksheet Sample

Customer name MR/MS		Model & Year			VIN		
Engine #		Trans.			Mileage		
Incident Date		Manuf. Date			In Service Date		
Symptoms	☐ Pedal vibration and noise	☐ Warning activates	☐ Long stopping distance	☐ Abnormal pedal action	☐ ABS doesn't work	☐ ABS works but warning activates	☐ ABS works frequently
Engine conditions		☐ When starting ☐ After starting ☐ Engine speed: 5,000 rpm or more					
Road conditions		☐ Low friction road (☐ Snow ☐ Gravel ☐ Other) ☐ Protrusion					
Driving conditions		☐ High speed cornering ☐ Vehicle speed: Greater than 10 km/h (6 MPH) ☐ Vehicle speed: 10 km/h (6 MPH) or less ☐ Vehicle is stopped					
Applying brake conditions		☐ Suddenly ☐ Gradually					
Other conditions		☐ Operation of electrical equipment ☐ Large pedal stroke ☐ Operation of clutch					

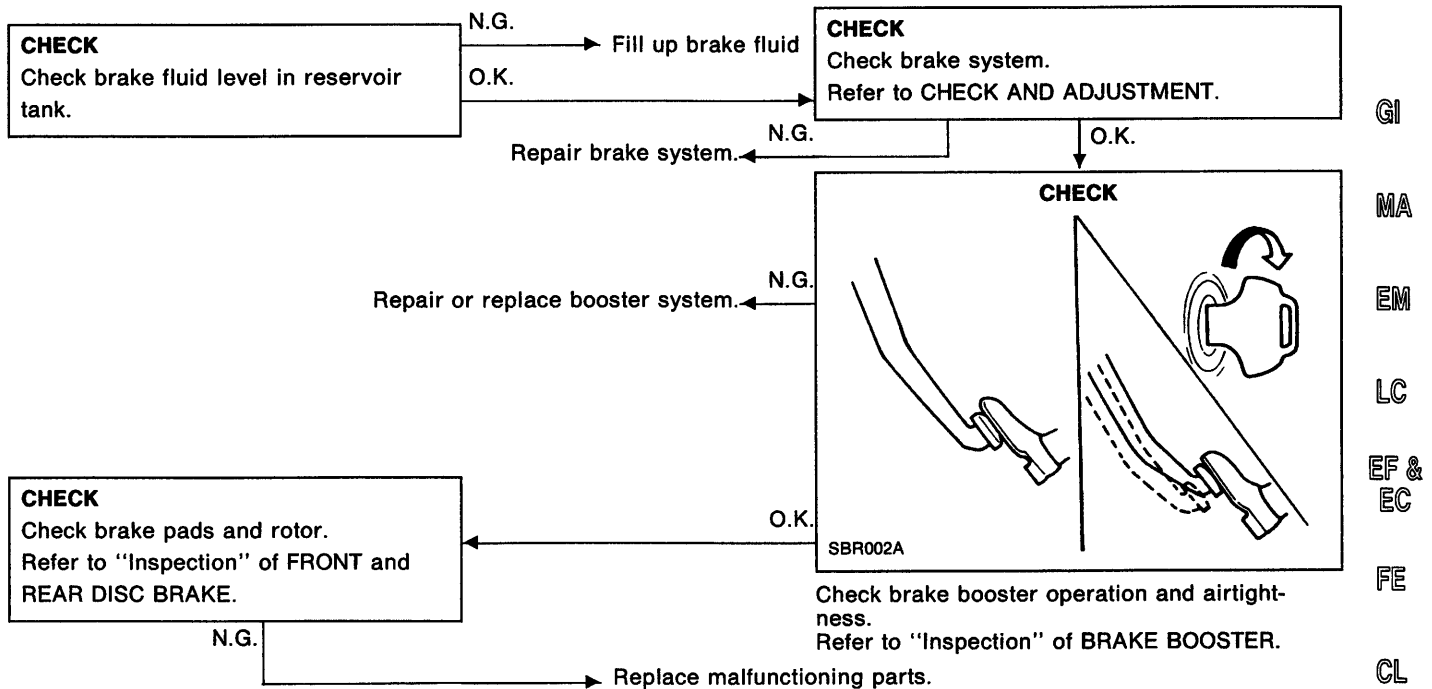
TROUBLE DIAGNOSES

Symptom Chart

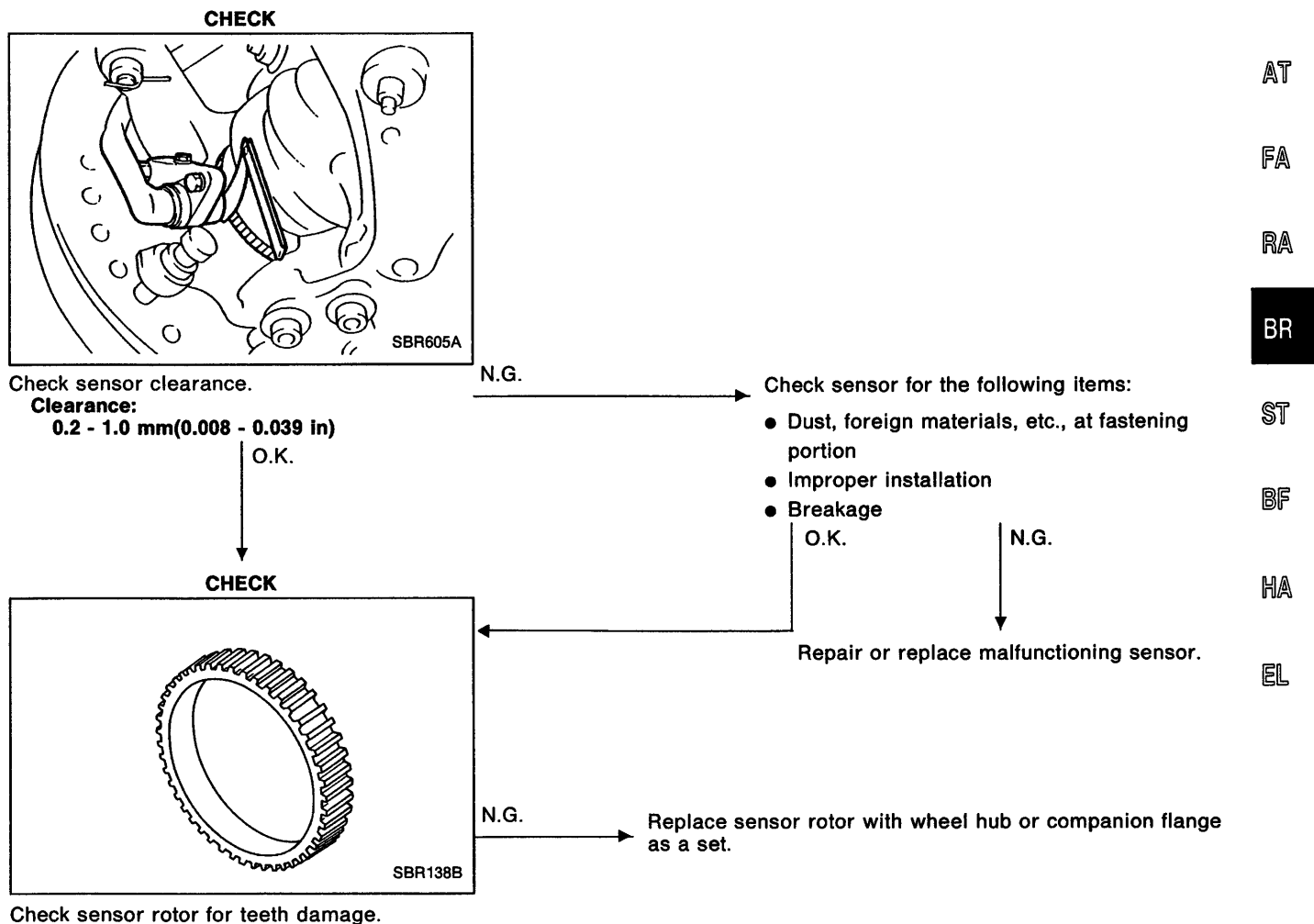
PROCEDURE	Electrical Components Inspection	Ground Circuit Check	Diagnostic Procedure (Select inspection with L.E.D. flashing No.)	Diagnostic Procedure	Preliminary Check	
REFERENCE PAGE	BR-56	BR-47	BR-55 BR-55 BR-54 BR-53 BR-52 BR-52	BR-51 BR-51 BR-50 BR-50 BR-49 BR-48	BR-44 BR-40 BR-43 BR-43	
SYMPTOM	Actuator inspection	Motor ground	Diagnostic Procedure 12 Diagnostic Procedure 11 Diagnostic Procedure 10 Diagnostic Procedure 9 Diagnostic Procedure 8 Diagnostic Procedure 7	Diagnostic Procedure 6 Diagnostic Procedure 5 Diagnostic Procedure 4 Diagnostic Procedure 3 Diagnostic Procedure 2 Diagnostic Procedure 1	Preliminary Check 4 Preliminary Check 3 Preliminary Check 2 Preliminary Check 1	
	Pedal vibration & noise		○		○	
	Warning activates		○		○	
	Long stopping distance		○			○
	Unexpected pedal action		○	○		○
	ABS does not work	○	○			
	ABS works but warning activates	○				
	ABS works frequently					○

TROUBLE DIAGNOSES

Preliminary Check 1

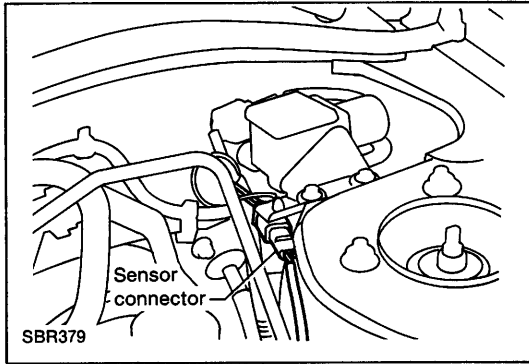


Preliminary Check 2



TROUBLE DIAGNOSES

Preliminary Check 3 CHECK



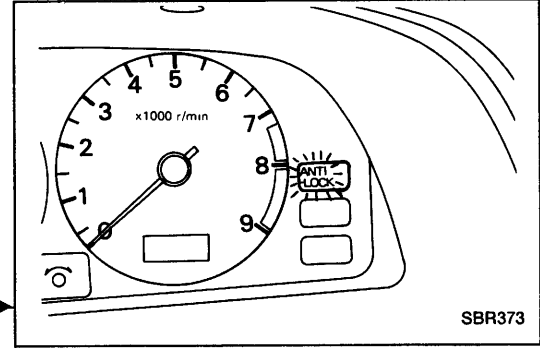
Measure each sensor resistance.
0.8 - 12 kΩ

N.G. → Replace.

O.K. →

Preliminary Check 3, 4

Preliminary Check 4 CHECK



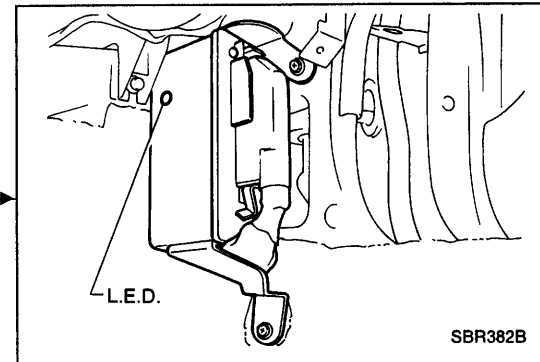
Check warning lamp activation.
When ignition switch is turned on, warning lamp turns on.

O.K. →

N.G. →

Check fuse.
Check bulb condition and remedy.

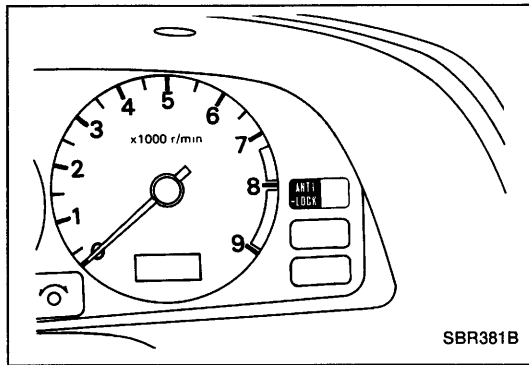
CHECK



- Keep engine on and running.
- Count the number of L.E.D. flashes during 5 to 10 second "OFF" period.

Go to Self-diagnosis.
(See next page.)

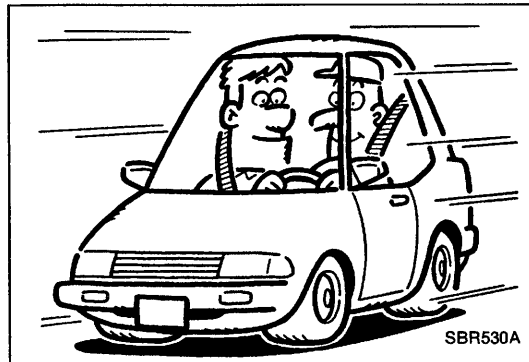
CHECK



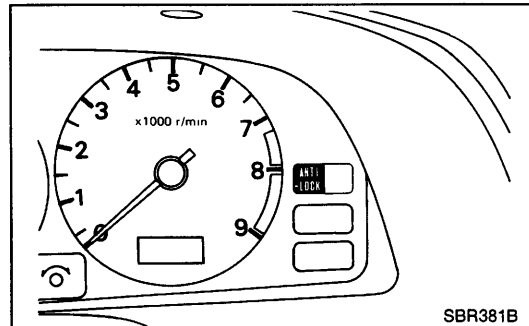
Check warning lamp for deactivation.
When engine starts, warning lamp deactivates.

↓ O.K.

DRIVE



CHECK



Ensure warning lamp remains off while driving.

N.G. →

O.K. →

If Preliminary Check 2 is not performed and there is abnormal ABS operation, perform Preliminary Check 2.

Self-diagnosis

CHECKING THE NUMBER OF L.E.D. FLASHES

When a problem occurs in the ABS, the warning light on the instrument panel comes on. As shown in the Table, the control unit performs self-diagnosis.

To obtain satisfactory self-diagnosing results, the vehicle must be driven above 30 km/h (19 MPH) for at least one minute before the self-diagnosis is performed. After the vehicle is stopped, the number of L.E.D. flashes is counted while the engine is running.

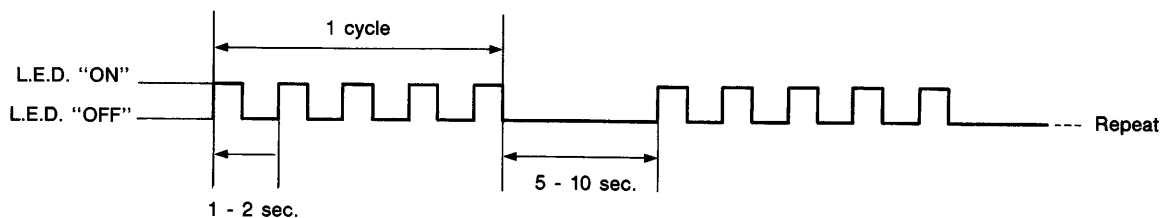
The L.E.D. is located on the control unit, identifying a malfunctioning part or unit by the number of flashes. Both the warning light and the L.E.D. persistently activate, even after a malfunctioning part or unit has been repaired, unless the ignition switch is turned "OFF". After repairs, turn the ignition switch "OFF". Then start the engine and drive the vehicle over 30 km/h (19 MPH) for at least one minute to ensure that the malfunctioning part or unit has been repaired properly.

If more than two circuits malfunction at the same time, the L.E.D. will flash to indicate one of the malfunctioning circuits. After the circuit has been repaired, the L.E.D. will then flash to indicate that the other circuit is malfunctioning.

No. of L.E.D. flashes	Malfunctioning part or unit
1	Left front actuator solenoid circuit
2	Right front actuator solenoid circuit
3	Right rear actuator solenoid circuit
4	Left rear actuator solenoid circuit
5	Left front wheel sensor circuit
6	Right front wheel sensor circuit
7	Right rear wheel sensor circuit
8	Left rear wheel sensor circuit
9	Motor and motor relay
10	Solenoid valve relay
16	Control unit
Warning activates and L.E.D. "OFF"	Power supply or ground circuit for control unit

Example

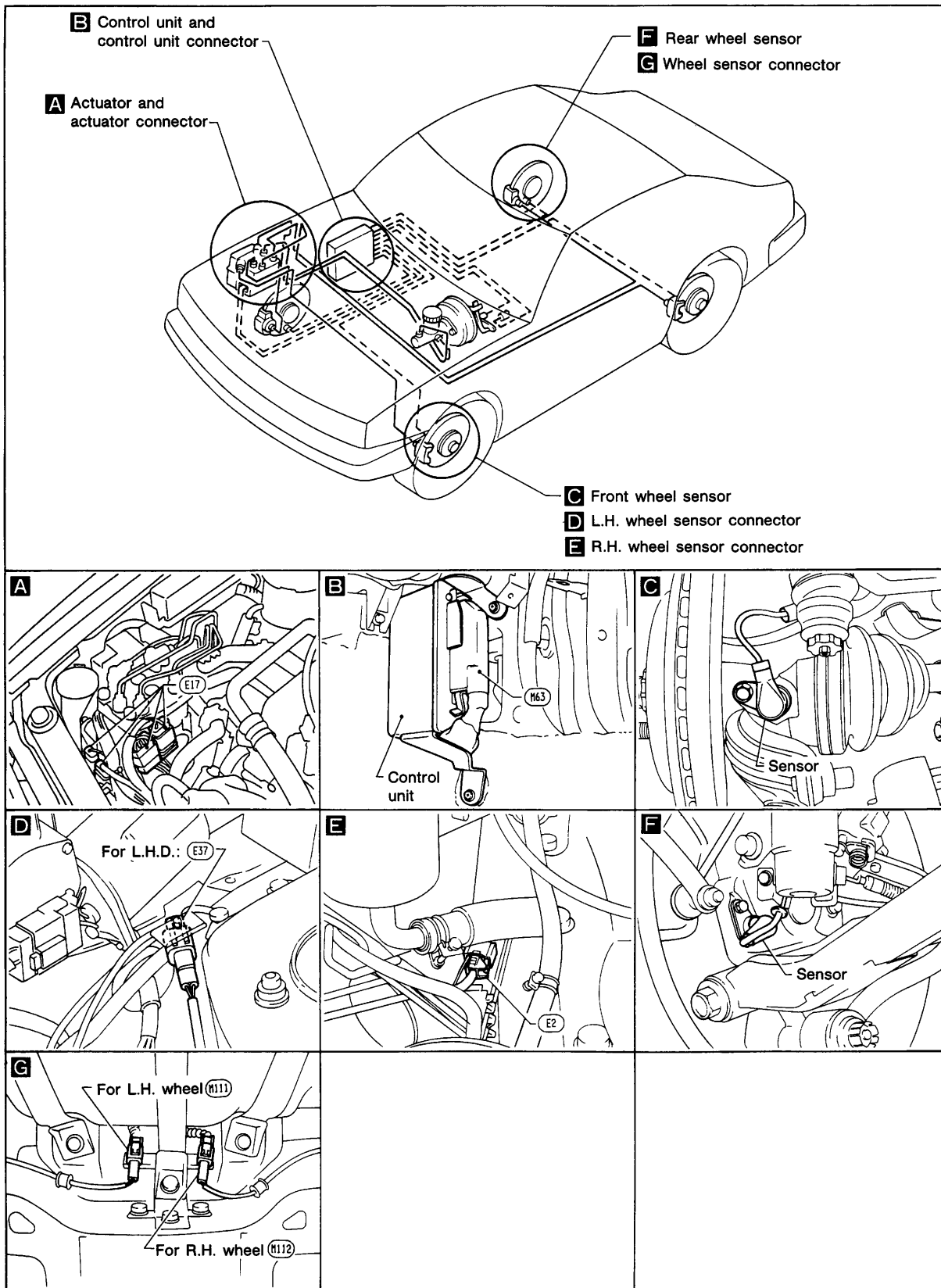
Improper operation of left front rotor sensor circuit

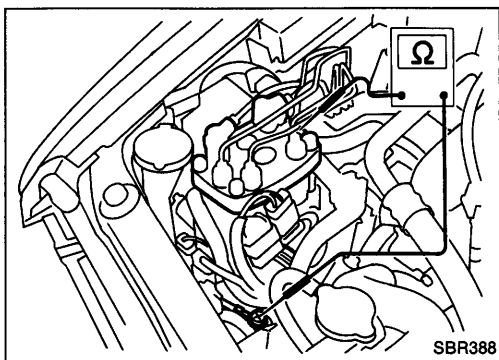


SBR531A

Go to Diagnostic Procedures 7-12, where malfunction portion is concerned.

Component Parts and Harness Connector Location





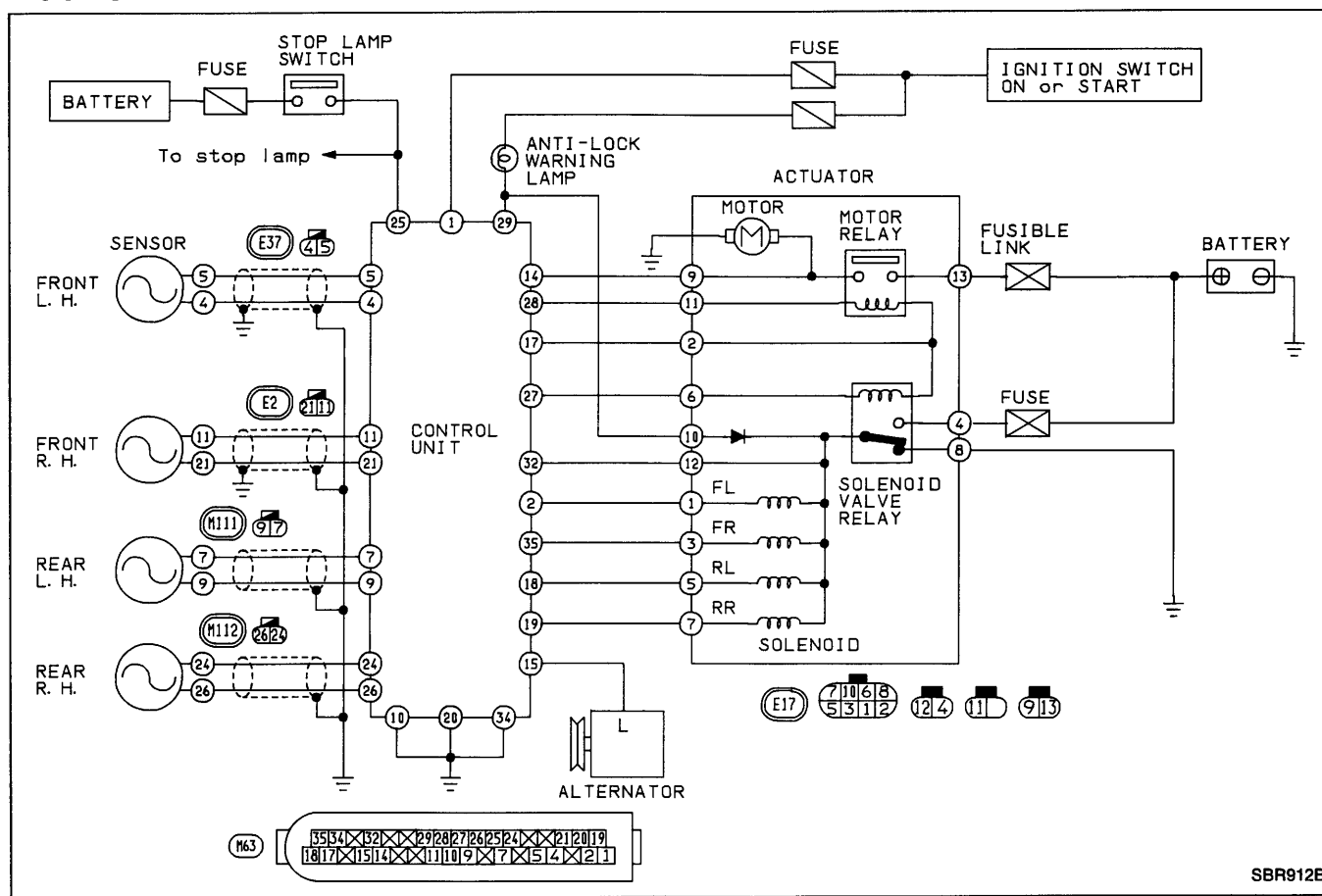
Ground Circuit Check

ACTUATOR MOTOR GROUND

- Check resistance between both terminals.
Resistance: 0Ω

Circuit Diagram for Quick Pinpoint Check

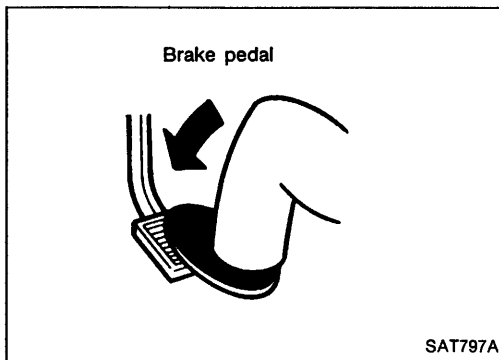
- The unit side connectors with a double circle "⊖" are connected to the harness side connectors shown in the "Component Parts and Harness Connector Location". (See page BR-46.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "○".



Diagnostic Procedure 1

SYMPTOM: Pedal vibration and noise

Refer to worksheet result.



Check whether the symptom appears only when brake is applied suddenly.

Yes

When brake is suddenly applied, A.B.S. works and produces pedal vibration or noise.

No

Check whether the symptom appears only when engine is started.

Yes

Carry out self-diagnosis (See page BR-45.)



No

Check whether the symptom appears only before the vehicle speed reaches 10 km/h (6 MPH) immediately after starting engine.

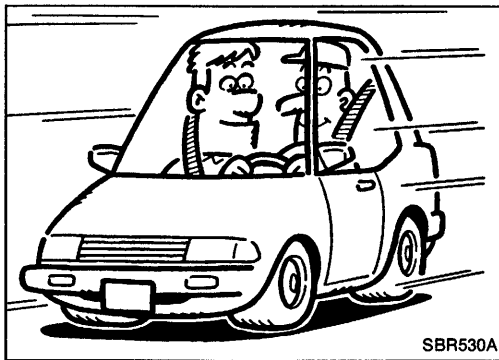
Yes

Check whether the symptom disappears within 5 seconds.

No

Yes

A.B.S. may sometimes operate when load is high and voltage is low due to insufficient alternator output.



No

Check whether the symptom appears while the vehicle is being driven.

No

Ⓐ

Yes

Check whether the symptom appears when brake is applied gradually.

No

(Appears when brake is not applied.)

Yes

Check if there are any conditions, among those listed below, when symptom appears.

- Shifting
- Operating clutch
- Passing over bumps/potholes

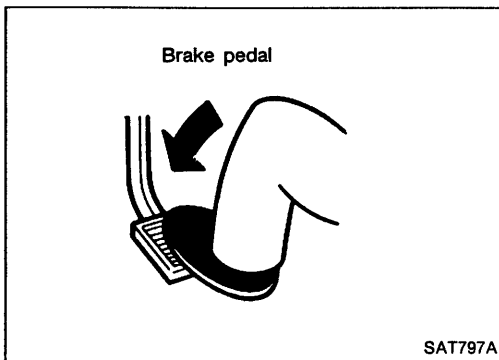
No

Yes

Ⓐ

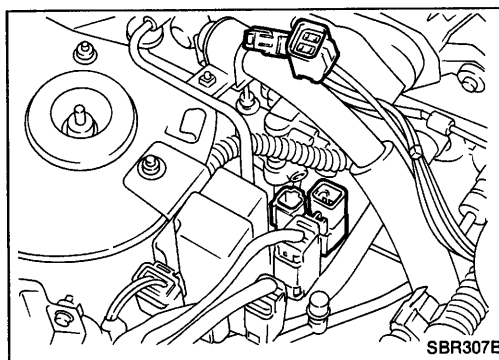
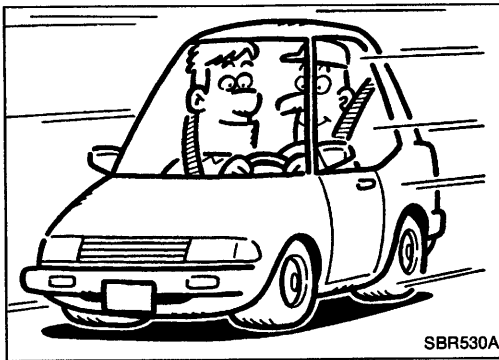
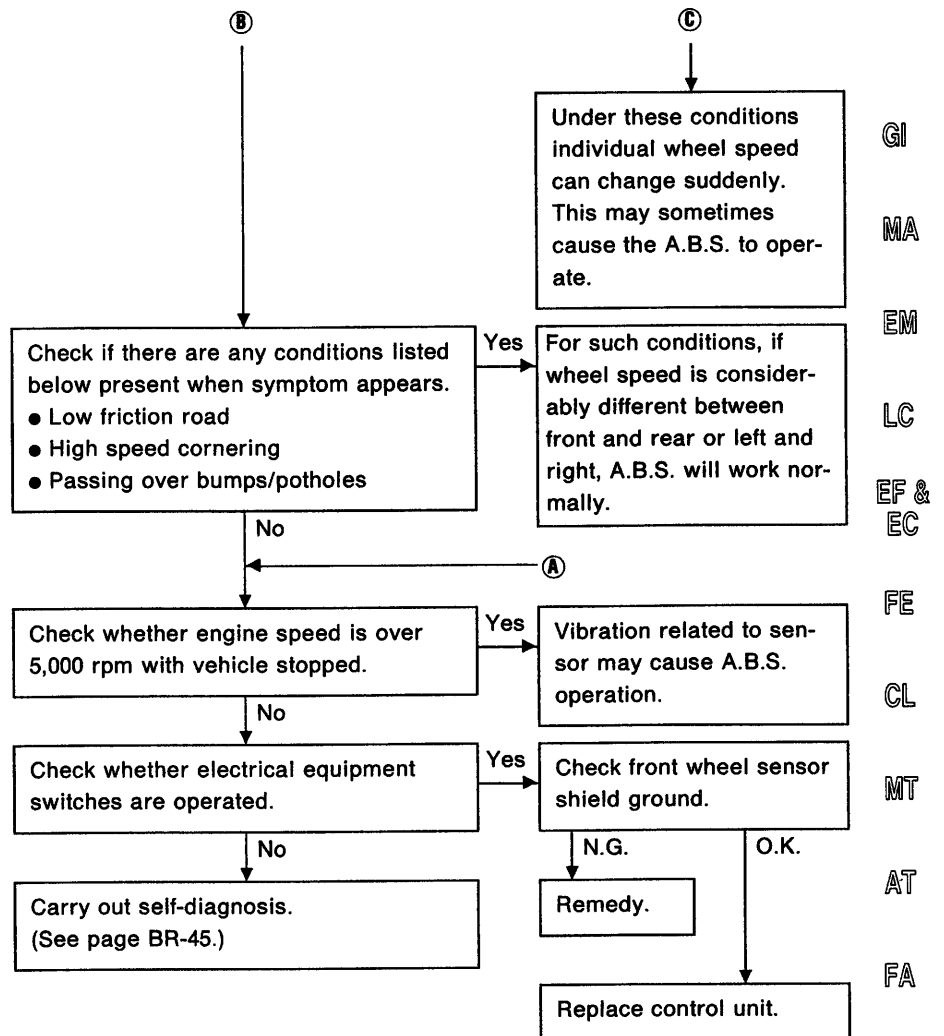
Ⓒ

Ⓑ



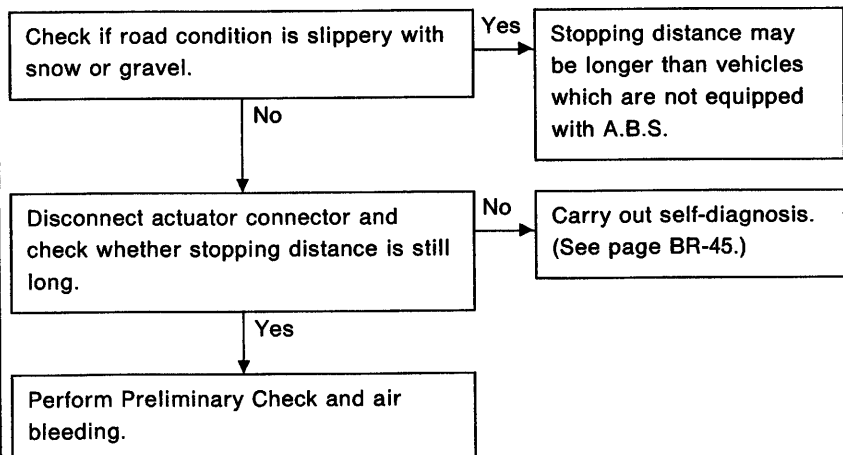
TROUBLE DIAGNOSES

Diagnostic Procedure 1 (Cont'd)



Diagnostic Procedure 2

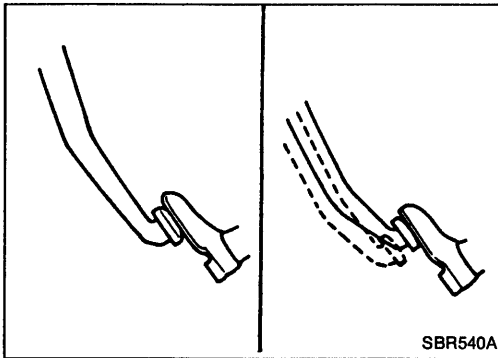
SYMPTOM: Long stopping distance
Refer to worksheet results.



Diagnostic Procedure 3

SYMPTOM: Unexpected pedal action

Refer to worksheet results.



Check whether brake pedal stroke is excessively large.

Yes

Vehicle equipped with ABS may have a tendency for large pedal strokes.

No

Check that brake pedal force is firm but brake is effective.

Yes

Normal condition.

No

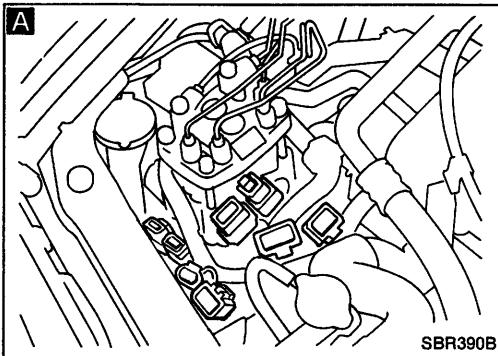
A Disconnect actuator connector and check whether brake is effective.

Yes

Carry out self-diagnosis. (See page BR-45.)

No

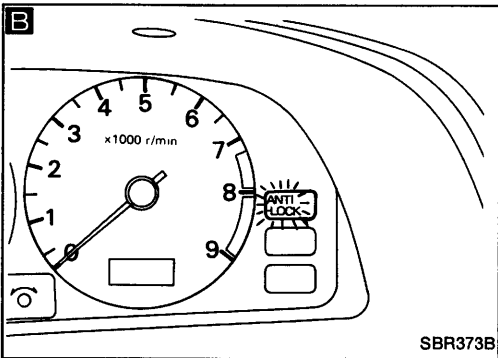
Perform Preliminary Check 1.



Diagnostic Procedure 4

SYMPTOM: ABS does not work.

Refer to worksheet results.



B Check whether warning activates.

Yes

Carry out self-diagnosis. (See page BR-45.)

No

Check whether vehicle speed is under 10 km/h (6 MPH).

Yes

ABS does not work in this condition.

No

Refer to Preliminary Check 3 result.

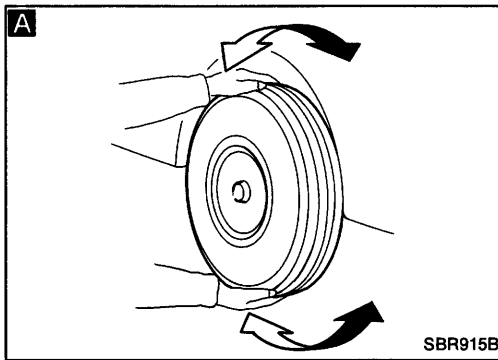
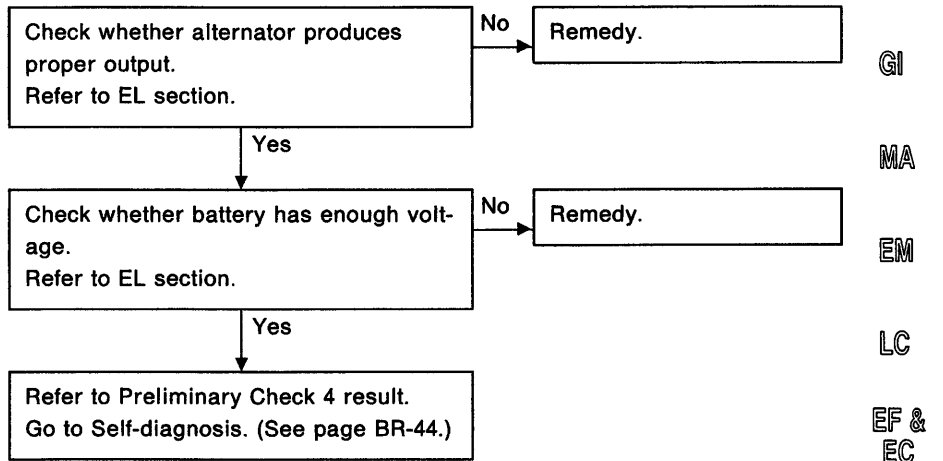
O.K. but ABS still does not work.

Check actuator by referring to Electrical Components Inspection — ACTUATOR. (See page BR-56.)

TROUBLE DIAGNOSES

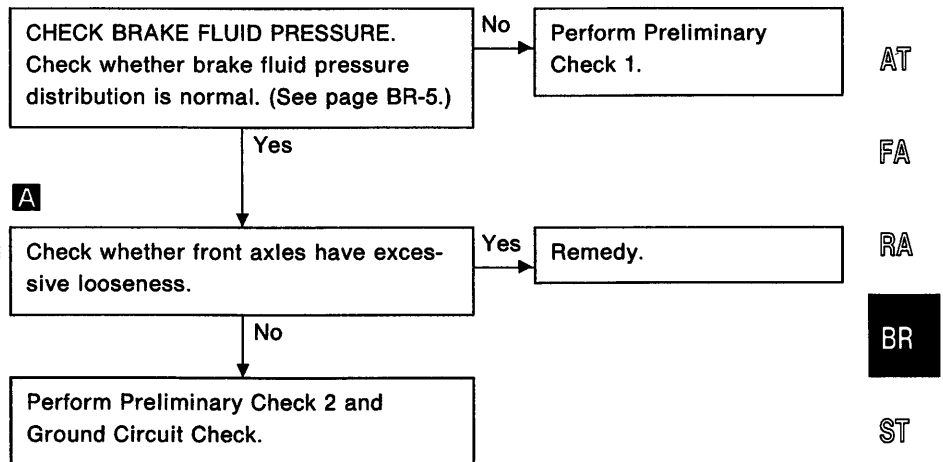
Diagnostic Procedure 5

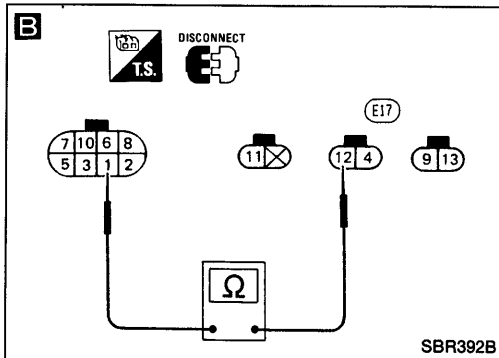
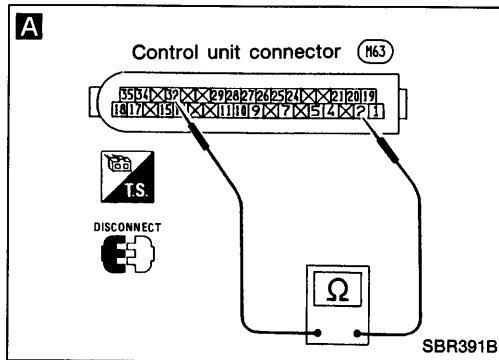
SYMPTOM: ABS works but warning activates.



Diagnostic Procedure 6

SYMPTOM: ABS works frequently.





Diagnostic Procedure 7

ACTUATOR SOLENOID (L.E.D. flashing number 1 - 4)

INSPECTION START

Remove battery negative terminal connector.

A

CHECK SOLENOID VALVE RESISTANCE.
Check resistance between control unit connector (vehicle side) terminals shown below.

Flashing number 1: ③② and ②

Flashing number 2: ③② and ③⑤

Flashing number 3: ③② and ①⑧

Flashing number 4: ③② and ①⑨

Resistance: 0.7 - 1.6Ω

O.K.

Replace control unit.

N.G.

B

Check resistance between actuator connector (actuator side) terminals shown below.

Flashing number 1: ①② and ①

Flashing number 2: ①② and ③

Flashing number 3: ①② and ⑤

Flashing number 4: ①② and ⑦

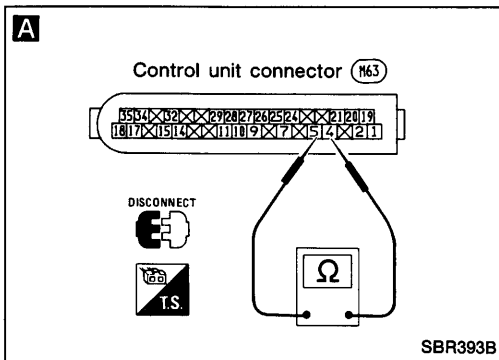
Resistance: 0.7 - 1.6Ω

O.K.

Repair harness between actuator connector and control unit connector.

N.G.

Replace actuator.



Diagnostic Procedure 8

WHEEL SPEED SENSOR (L.E.D. flashing number 5 - 8)

INSPECTION START

Remove battery negative terminal connector.

A

CHECK SPEED SENSOR RESISTANCE.
Check resistance between control unit connector (vehicle side) terminals shown below.

Flashing number 5 (Fr. L.H.): ④ and ⑤

Flashing number 6 (Fr. R.H.): ①① and ②①

Flashing number 7 (Rr. R.H.): ②④ and ②⑥

Flashing number 8 (Rr. L.H.): ⑦ and ⑨

Resistance: 0.8 - 1.2kΩ

O.K.

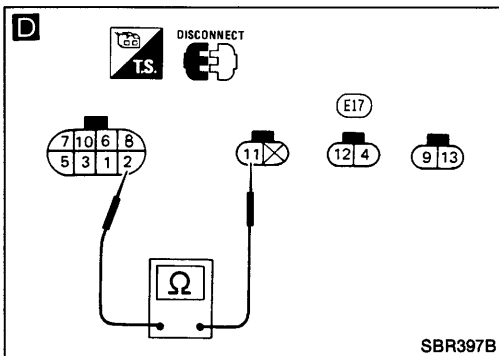
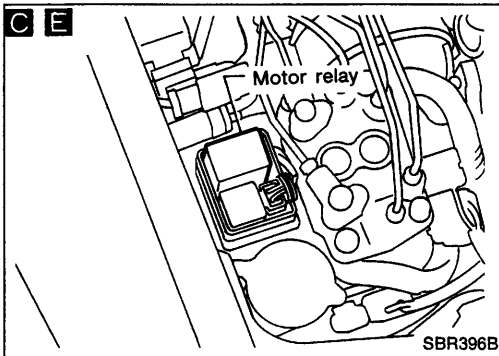
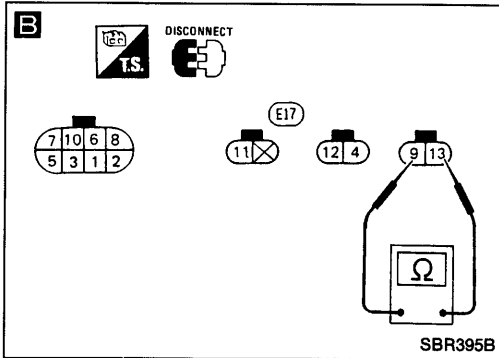
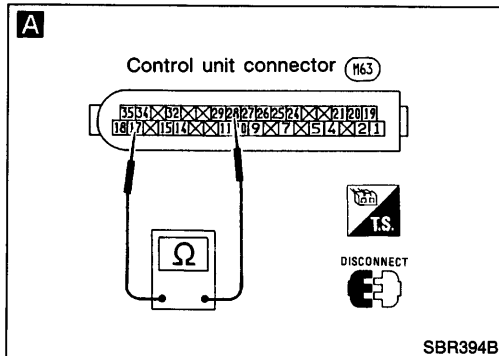
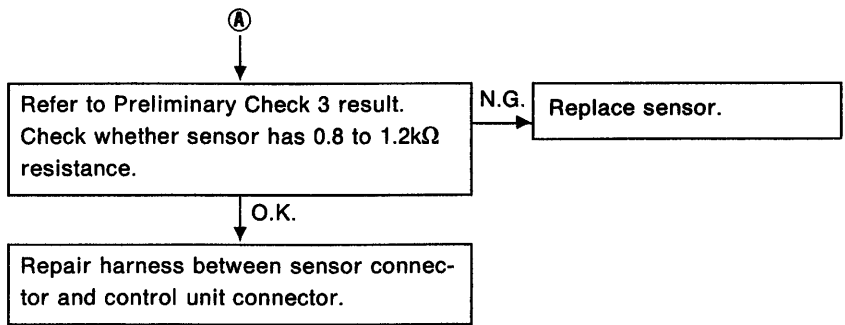
Replace control unit.

N.G.

A

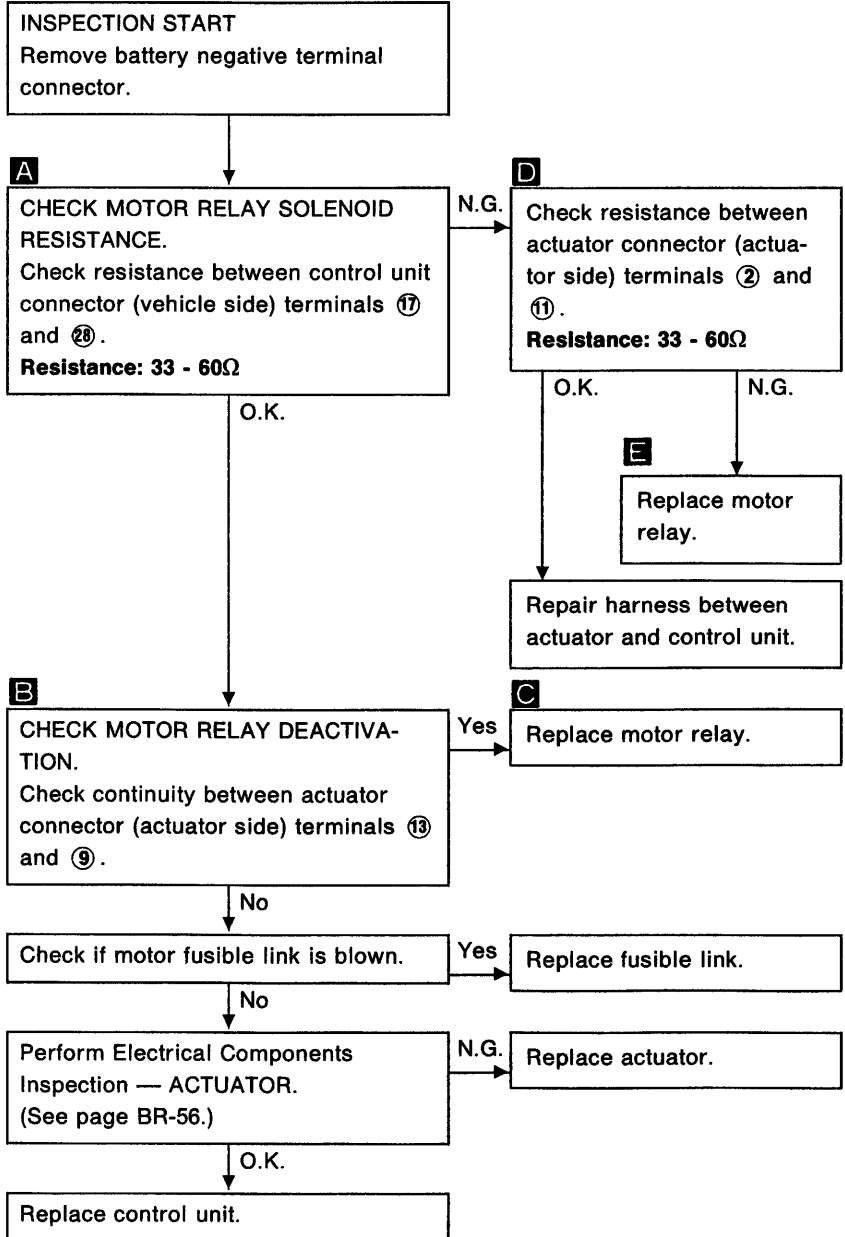
TROUBLE DIAGNOSES

Diagnostic Procedure 8 (Cont'd)



Diagnostic Procedure 9

ACTUATOR MOTOR RELAY (L.E.D. flashing number 9)

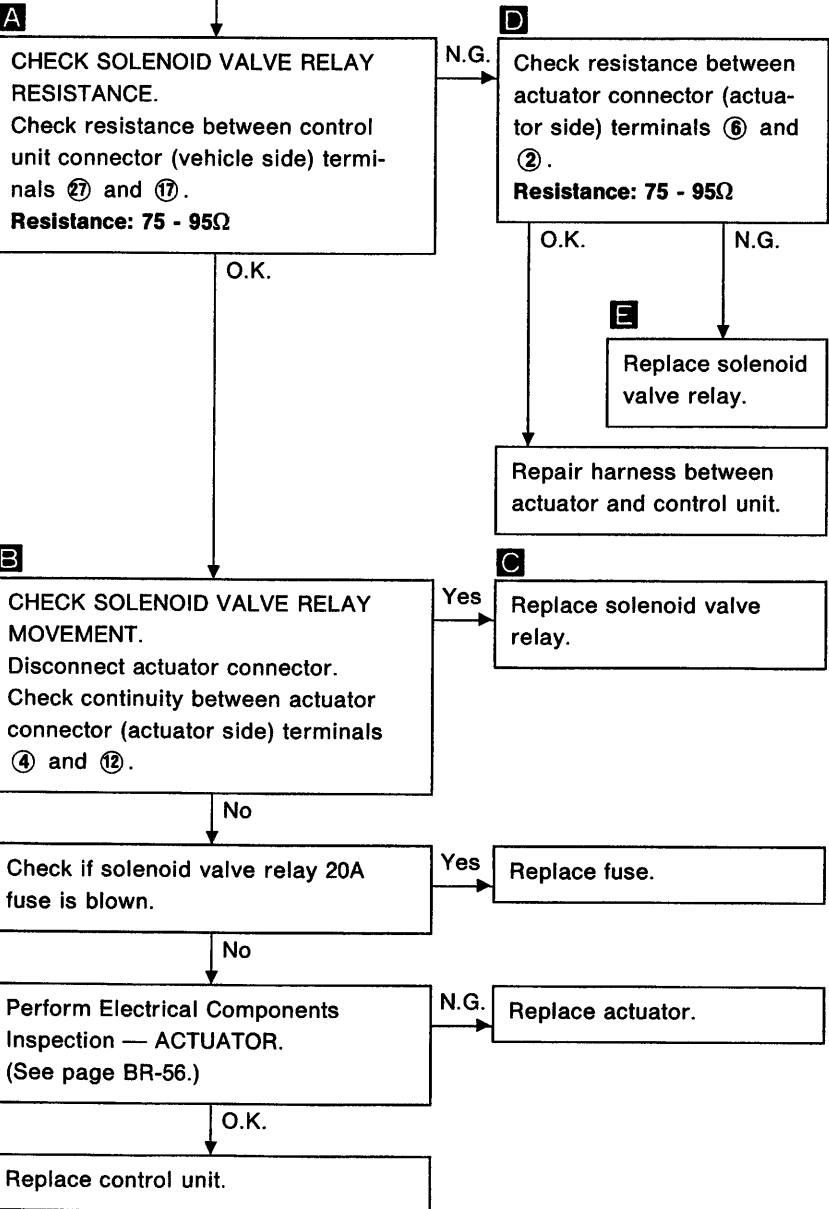
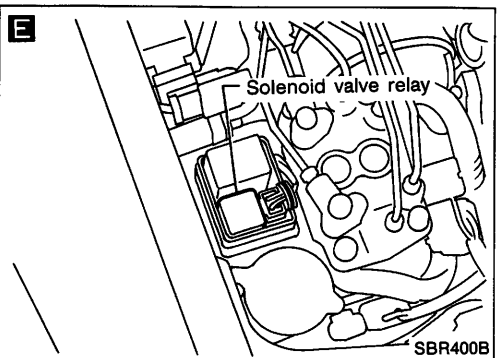
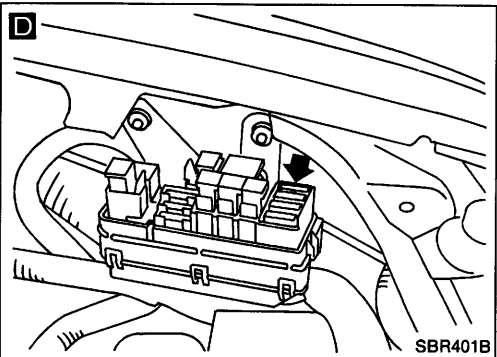
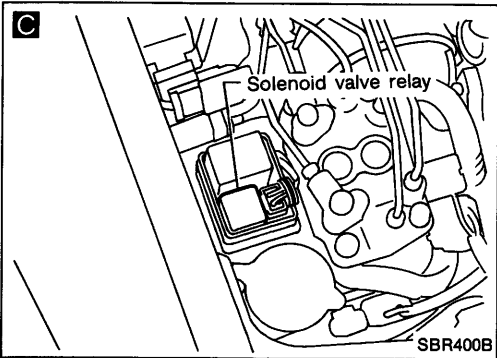
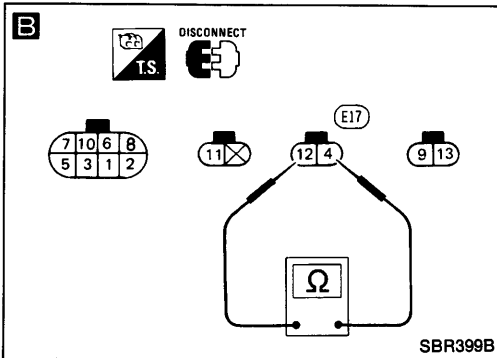
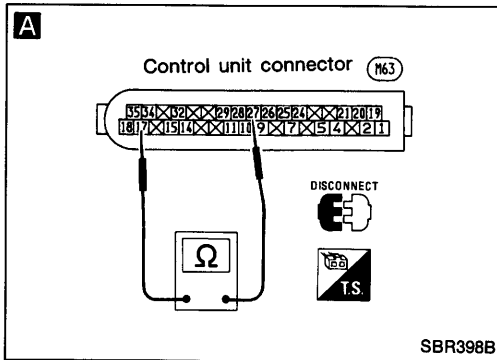


Diagnostic Procedure 10

ACTUATOR SOLENOID VALVE RELAY (L.E.D. flashing number 10)

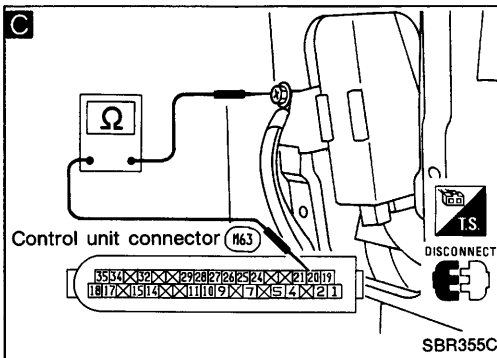
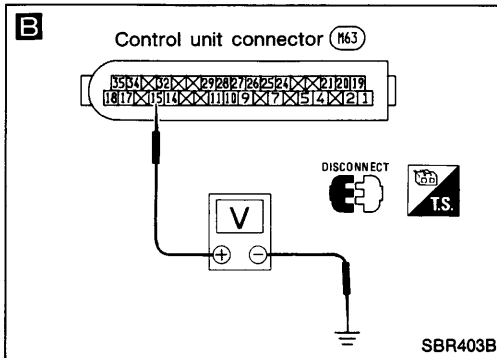
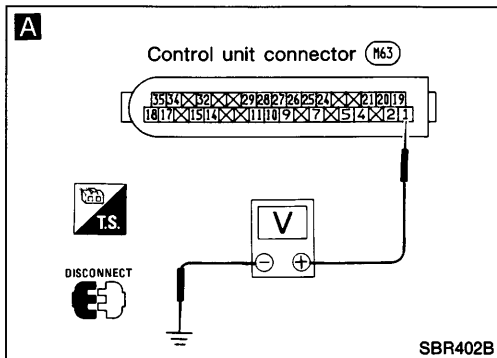
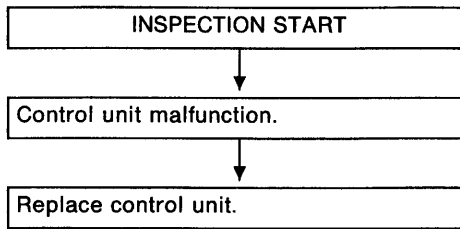
INSPECTION START

Remove battery negative terminal connector.



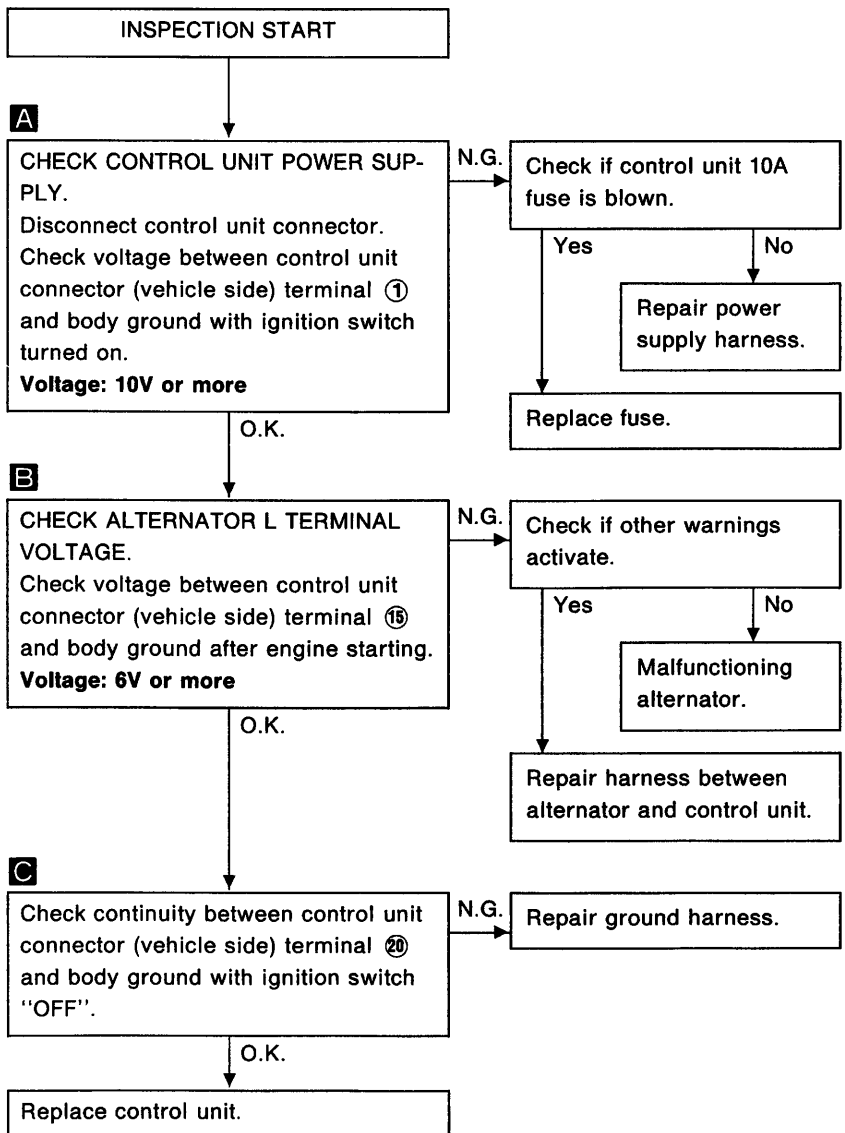
Diagnostic Procedure 11

CONTROL UNIT (L.E.D. flashing number 16)



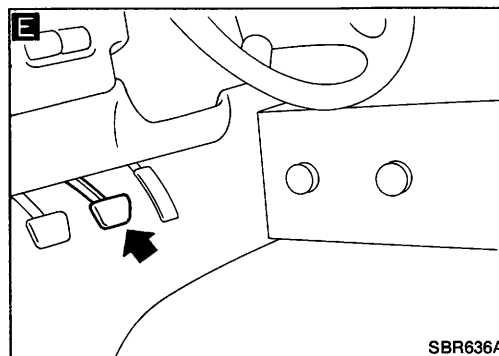
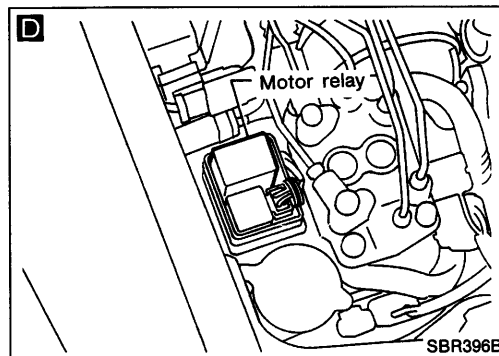
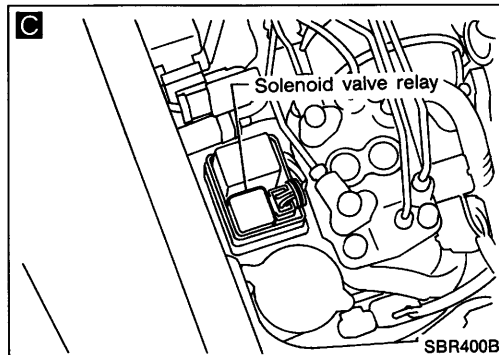
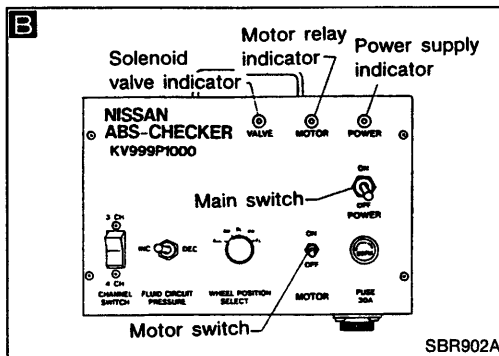
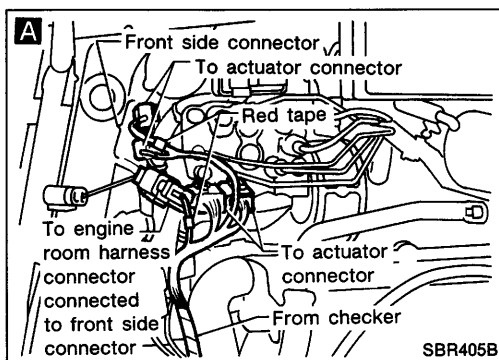
Diagnostic Procedure 12

CONTROL UNIT OR POWER SUPPLY AND GROUND CIRCUIT (Warning activates but L.E.D. comes off.)



Electrical Components Inspection

ACTUATOR (Not self-diagnostic item)



INSPECTION START

A Connect ABS checker to actuator connector and vehicle harness with battery terminal connected and all checker switches turned off.
Use harness for 4 channel.
Set channel select switch to 4 channel.

B Turn checker main switch on.
Check power supply indicator for coming on.

No → Replace battery with fully charged new one, if checker connection is correct.

Check checker valve relay indicator for coming on.

No → **C** Replace solenoid valve relay, if checker connection is correct.

Select one valve — FL, FR, RL or RR. (valves corresponding to each wheel position.)
Select brake circuit pressure decreasing position by switch then turn motor switch on.
Select pressure increasing position.

Yes → Repeat so that all valve will be performed.

B Check motor relay indicator for coming on while motor switch is turned on.

No → **D** Replace motor relay, if checker connection is correct.

Check motor for operational sound beside the actuator in a quiet place.

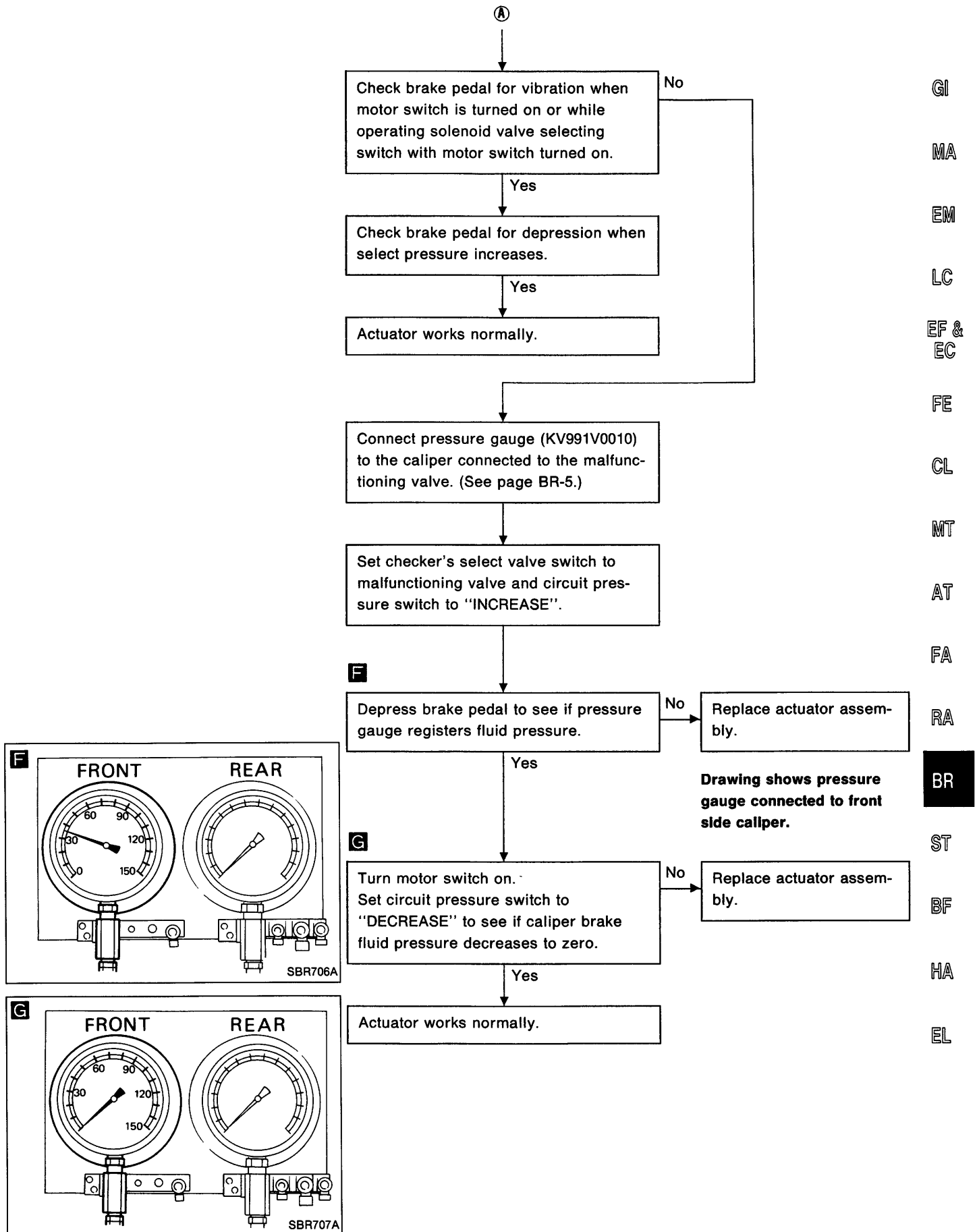
No → Replace actuator as assembly, if Diagnostic Procedures 7 - 12 are already performed and checker connection is correct.

E Bring checker in the vehicle and depress the brake pedal.
Perform step **A** again.

①

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

Front brake	
Brake model	CL25VA disc brake
Cylinder bore diameter mm (in)	57.2 (2.252)
Pad mm (in) Length x width x thickness	125.6 x 45.3 x 11 (4.94 x 1.783 x 0.43)
Rotor outer diameter x thick- ness mm (in)	257 x 22 (10.12 x 0.87)
Rear brake	
Brake model	CL9HA disc brake
Cylinder bore diameter mm (in)	33.96 (1.3370)
Pad mm (in) Length x width x thickness	89.1 x 39.5 x 10 (3.508 x 1.555 x 0.39)
Rotor outer diameter x thickness mm (in)	258 x 9 (10.16 x 0.35)

Master cylinder	
Cylinder bore diameter mm (in)	23.81 (15/16)
Control valve	
Valve model	Dual proportioning valve
Split point kPa (kg/cm ² , psi) x reducing ratio	2,452 (25, 356) x 0.4
Brake booster	
Booster model	M195T
Diaphragm diameter mm (in)	Primary: 205 (8.07) Secondary: 180 (7.09)
Recommended brake fluid	DOT 3

Inspection and Adjustment

DISC BRAKE

Brake model	CL25VA	CL9HA
Pad wear limit mm (in) Minimum thickness	2.0 (0.079)	
Rotor repair limit mm (in) Minimum thickness	20.0 (0.787)	8 (0.31)

PARKING BRAKE

Type	Center lever
Number of notches [under force of 196 N (20 kg, 44 lb)]	7 - 9
Number of notches when warning lamp switch comes on	1

BRAKE PEDAL

Free height "H" mm (in)		
M/T	Except for Canada	158 - 168 (6.22 - 6.61)
	For Canada	151 - 161 (5.94 - 6.34)
A/T		159 - 169 (6.26 - 6.65)
Depressed height "D" mm (in)		
[under force of 490 N (50 kg, 110 lb) with engine running]		M/T : 80 (3.15) A/T: 85 (3.35)
Pedal free play "A" mm (in)		1 - 3 (0.04 - 0.12)
Clearance "C" between pedal stopper and threaded end of stop lamp switch or A.S.C.D. switch mm (in)		0.3 - 1.0 (0.012 - 0.039)

STEERING SYSTEM

SECTION **ST**

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

CONTENTS

PRECAUTIONS AND PREPARATION	2	Disassembly and Assembly	8
Precautions.....	2	Inspection	9
Special Service Tools	2	POWER STEERING GEAR AND LINKAGE	10
Commercial Service Tool	3	Removal.....	10
ON-VEHICLE SERVICE	4	Installation	11
Checking Steering Wheel Play	4	Disassembly	12
Checking Neutral Position on Steering Wheel	4	Inspection	13
Front Wheel Turning Angle	4	Assembly	14
Checking Gear Housing Movement	4	Adjustment	18
Checking and Adjusting Drive Belts	4	POWER STEERING OIL PUMP	20
Checking Fluid Level	5	Pre-disassembly Inspection	20
Checking Fluid Leakage	5	Disassembly	21
Bleeding Hydraulic System	5	Inspection	21
Checking Steering Wheel Turning Force.....	6	Assembly	22
Checking Hydraulic System.....	6	SERVICE DATA AND SPECIFICATIONS (S.D.S.)	23
STEERING WHEEL AND STEERING COLUMN	7	General Specifications.....	23
Removal.....	7	Inspection and Adjustment.....	23
Installation.....	7		

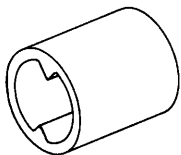
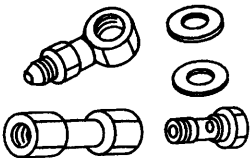
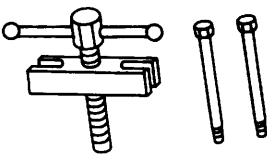
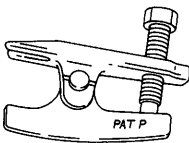
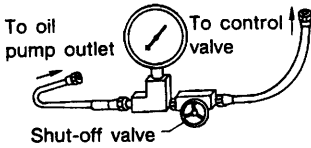
PRECAUTIONS AND PREPARATION

Precautions

- 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 on a part rack so they can be reinstalled in their proper positions.
- Use nylon cloths or paper towels to clean the parts; common shop rags can leave lint that might interfere with their operation.
- Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.
- 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.
- Replace all gaskets, seals and O-rings. Avoid damaging O-rings, seals and gaskets during installation. Perform functional tests whenever designated.

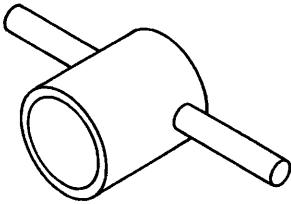
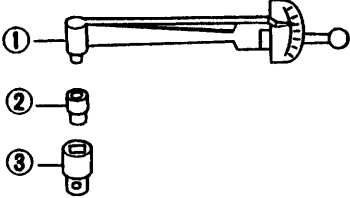
*: Automatic transmission fluid

Special Service Tools

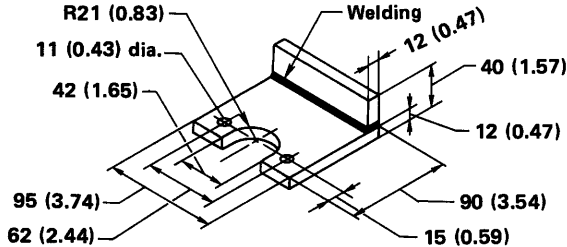
Tool number (Kent-Moore No.) Tool name	Description
KV48100700 (J26364) Torque adapter	 Measuring pinion rotating torque
KV48102500 (—) Pressure gauge adapter	 Measuring oil pressure
ST27180001 (J25726-A) Steering wheel puller	 Removing and installing steering wheel
HT72520000 (J25730-A) Ball joint remover	 Removing ball joint
ST27091000 (J26357) Pressure gauge	 Measuring oil pressure

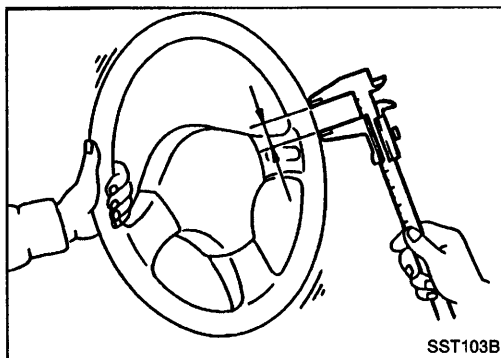
PRECAUTIONS AND PREPARATION

Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	
KV48104400 (—) Rack seal ring reformer	Reforming teflon ring 	GI MA EM LC
ST3127S000 (See J25765-A) ① GG91030000 (J25765-A) Torque wrench ② HT62940000 (—) Socket adapter ③ HT62900000 (—) Socket adapter	Measuring turning torque 	EF & EC FE CL MT

Commercial Service Tool

Tool name	Description	
Oil pump attachment	Disassembling and assembling oil pump  SST481A Unit: mm (in)	AT FA RA BR ST BF HA EL



SST103B

Checking Steering Wheel Play

1. With wheels in a straight-ahead position, check steering wheel play.

Steering wheel play: 35 mm (1.38 in) or less

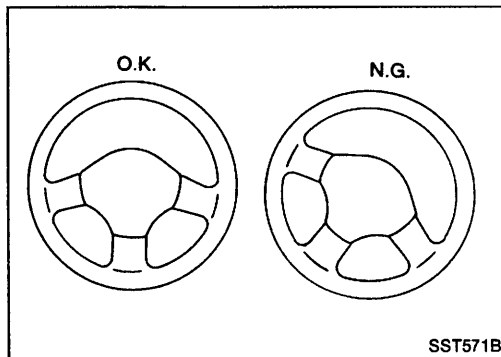
2. If it is not within specification, check steering gear assembly when front suspension and axle, steering gear assembly and steering column are mounted correctly.

Checking Neutral Position on Steering Wheel

- Make sure that wheel alignment is correct.
Wheel alignment: Refer to section FA for S.D.S.
- Verify that the steering gear is centered before removing the steering wheel.

Checking

1. Check that the steering wheel is in the neutral position when driving straight ahead.
2. If it is not in the neutral position, remove the steering wheel and reinstall it correctly.
3. 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.



SST571B

Front Wheel Turning Angle

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

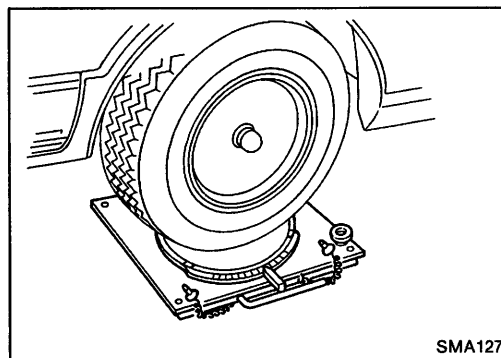
Turning angle of full turns:

Refer to section FA for S.D.S.

2. If it is not within specification, check rack stroke.

Rack stroke "L":

Refer to S.D.S.



SMA127

Checking Gear Housing Movement

1. Check the movement of steering gear housing during stationary steering on a dry paved surface.

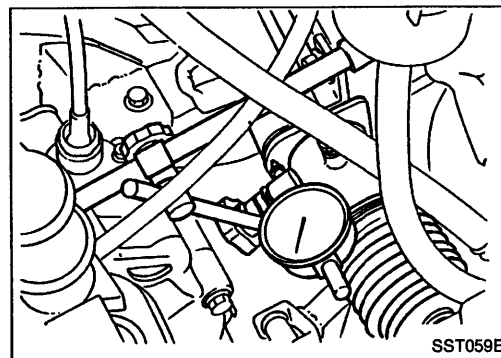
- Apply a force of 49 N (5 kg, 11 lb) to steering wheel to check the gear housing movement.

Turn off ignition key while checking.

Movement of gear housing:

± 2 mm (± 0.08 in) or less

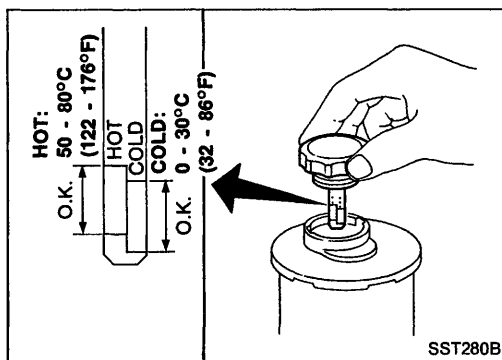
2. If movement exceeds the limit, replace mount insulator after confirming proper installation of gear housing clamps.



SST059B

Checking and Adjusting Drive Belts

Refer to section MA for Drive Belt Inspection.



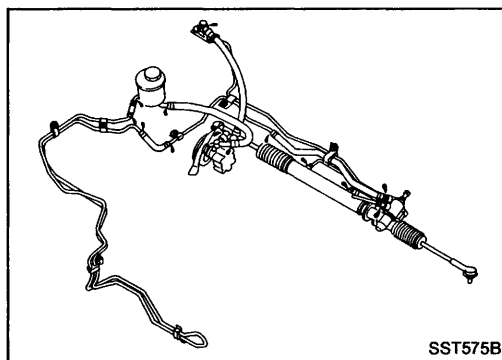
Checking Fluid Level

Check fluid level.

Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) or using "COLD" range on dipstick at fluid temperatures of 0 to 30°C (32 to 86°F).

CAUTION:

- Do not overfill.
- Recommended fluid is Automatic Transmission Fluid type DEXRON™II or equivalent.



Checking Fluid Leakage

Check the lines for improper attachment and for leaks, cracks, damage, loose connections, chafing or deterioration.

1. Run engine between idle speed and 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 the steering wheel in a locked position for more than 15 seconds.

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 are clear of the ground.

2. Add fluid into oil tank to specified level. Meanwhile quickly turn steering wheel fully to right and left and lightly touch steering stoppers.

Repeat steering wheel operation until fluid level no longer decreases.

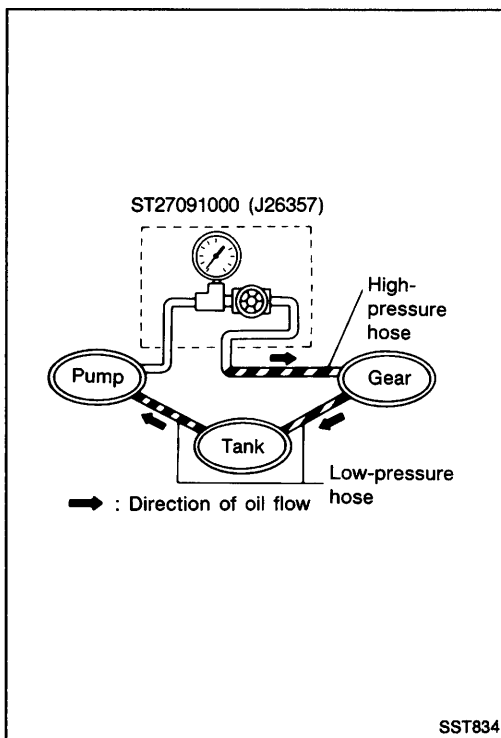
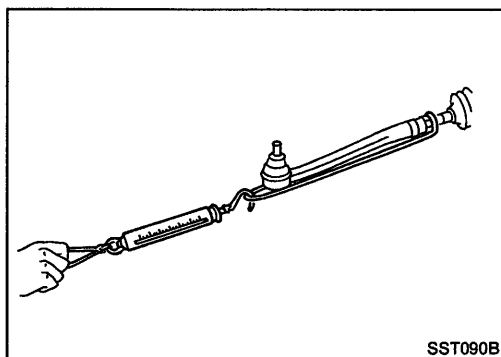
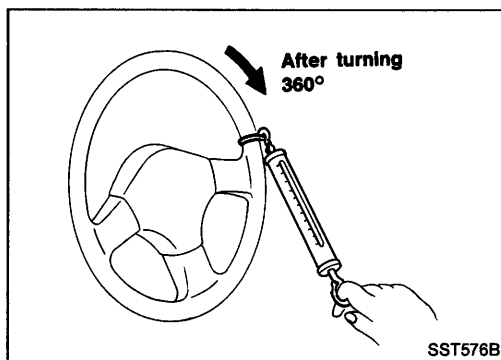
3. Start engine.

Repeat step 2 above.

- Incomplete air bleeding will cause the following to occur. When this happens, bleed air again.

- a. Generation of air bubbles in reservoir tank
- b. Generation of clicking noise in oil pump
- c. Excessive buzzing in oil pump

While the vehicle is stationary or while moving the steering wheel slowly, fluid noise may occur in the valve or oil pump. This noise is inherent in this 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. Start engine.
3. 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.

4. 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

5. If steering wheel turning force is out of specifications, check rack sliding force to detect condition of steering gear assembly.
 - a. Disconnect steering column lower joint and knuckle arms from the gear.
 - b. Start and run engine at idle to make sure steering fluid has reached normal operating temperature.
 - c. While pulling tie-rod slowly from the neutral position, make sure rack sliding force is within specification.

Rack sliding force: 284 N (29 kg, 64 lb) or less

6. If rack sliding force is not within specification, replace steering gear assembly.

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).

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 with engine idling at 1,000 rpm.

CAUTION:

Do not hold the steering wheel in a locked position for more than 15 seconds.

Oil pump maximum standard pressure:

7,649 - 8,238 kPa (78 - 84 kg/cm², 1,109 - 1,194 psi)

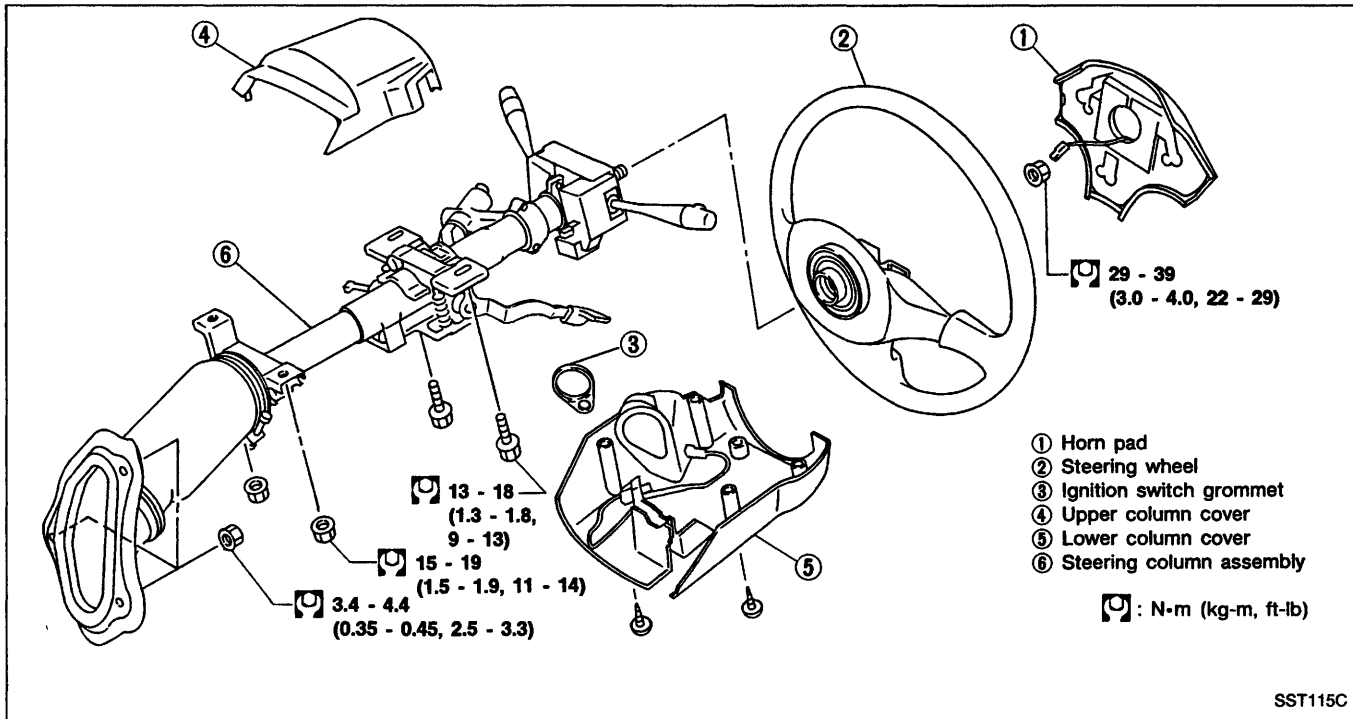
4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.
 - When pressure reaches standard pressure, gear is damaged.
 - When pressure remains below standard pressure, pump is damaged.

CAUTION:

Do not close shut-off valve for more than 15 seconds.

5. If oil pressure is higher than standard pressure, check oil pump flow control valve.
6. After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.

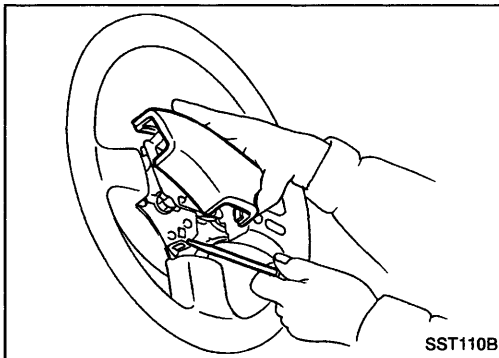
STEERING WHEEL AND STEERING COLUMN



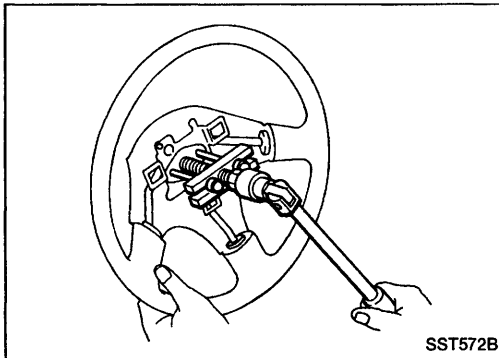
Removal

STEERING WHEEL

1. Pull out horn pad.



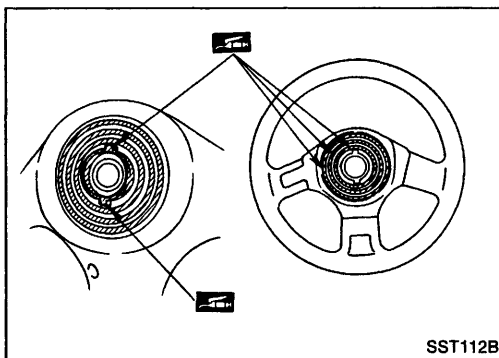
2. Remove steering wheel with Tool.



Installation

STEERING WHEEL

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.

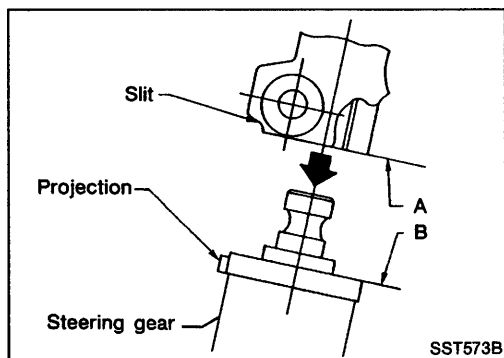
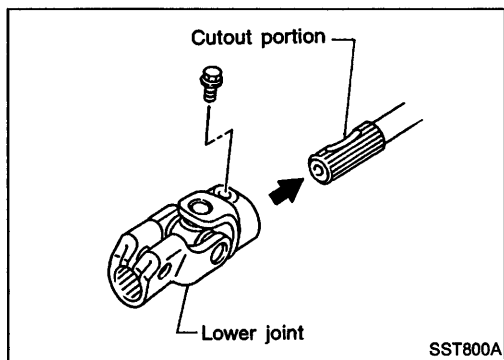


STEERING WHEEL AND STEERING COLUMN

Installation (Cont'd)

STEERING COLUMN

- When installing steering column, fingertighten all lower bracket and clamp retaining bolts; then tighten them securely. Do not apply undue stress to steering column.
- When attaching lower joint, be sure tightening bolt faces cutout portion.

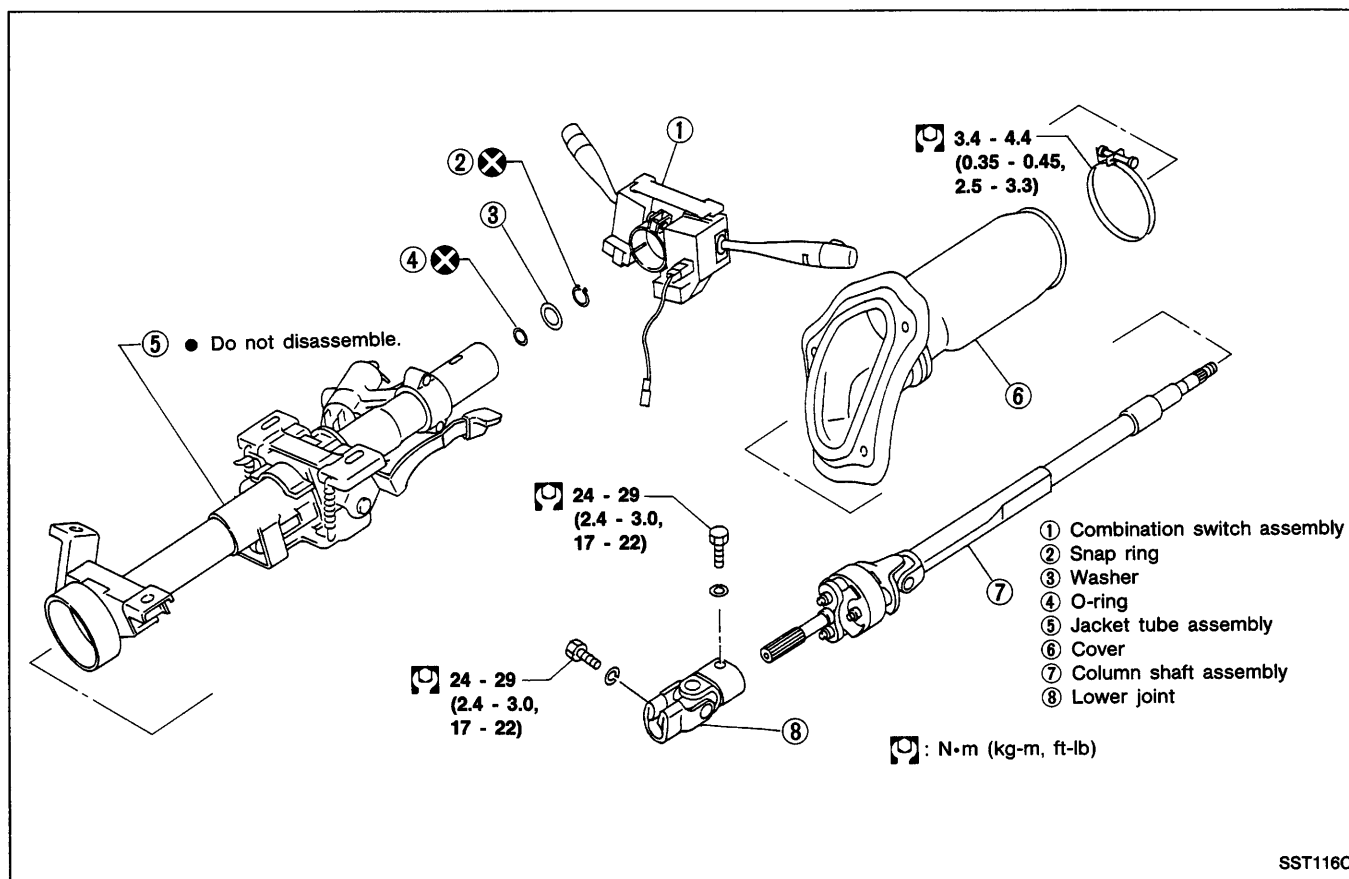


- Align slit of lower joint with projection on dust cover. Insert joint until surface A contacts surface B.

CAUTION:

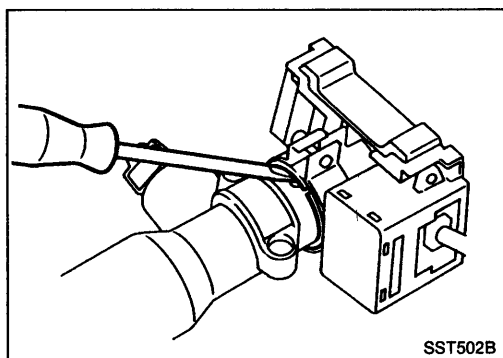
After installing steering column, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal. Be sure that the steering wheel is in a neutral position when driving straight ahead.

Disassembly and Assembly

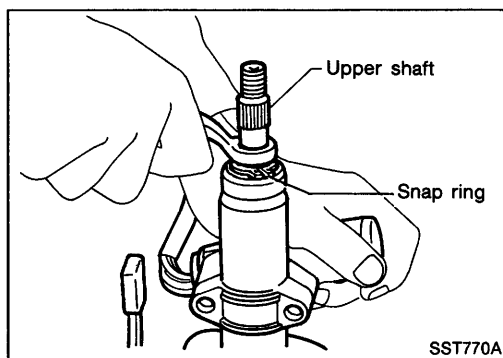


STEERING WHEEL AND STEERING COLUMN

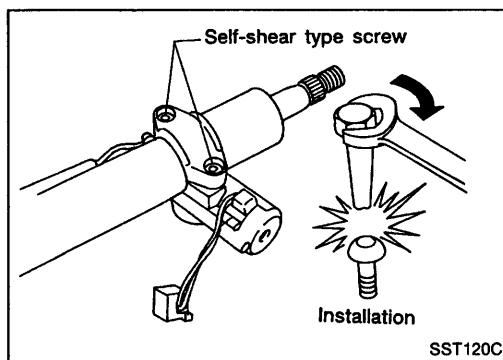
Disassembly and Assembly (Cont'd)



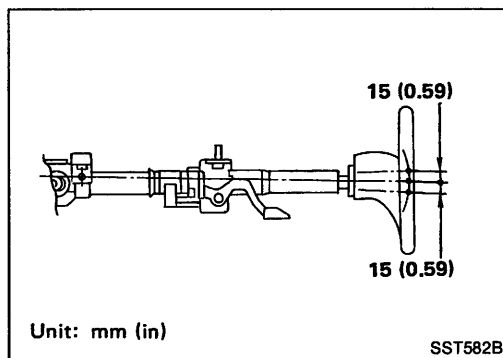
- To remove combination switch, insert a suitable tool between mating portion. Lift switch bracket and pull it out.
- When disassembling and assembling, unlock steering lock with key.



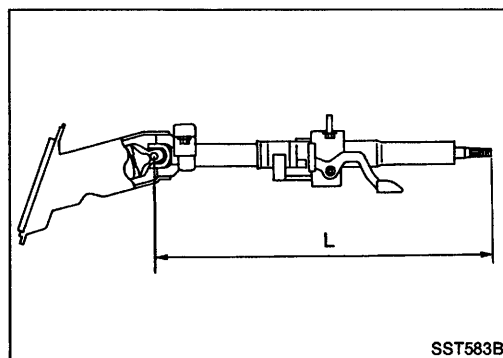
- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.
- Install snap ring on upper shaft with a suitable tool.



- 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.



- After installing steering column, check tilt mechanism operation. (Vehicles with tilt system)



Inspection

- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.
 - a. Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.
 - b. 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": 556.2 - 557.8 mm (21.90 - 21.96 in)

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

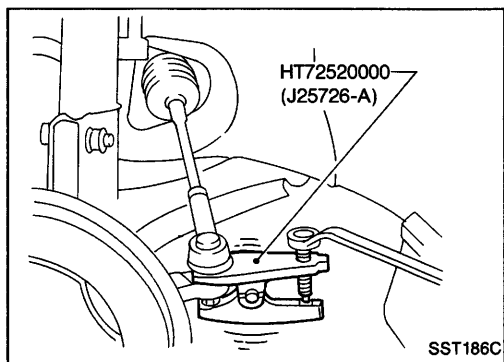
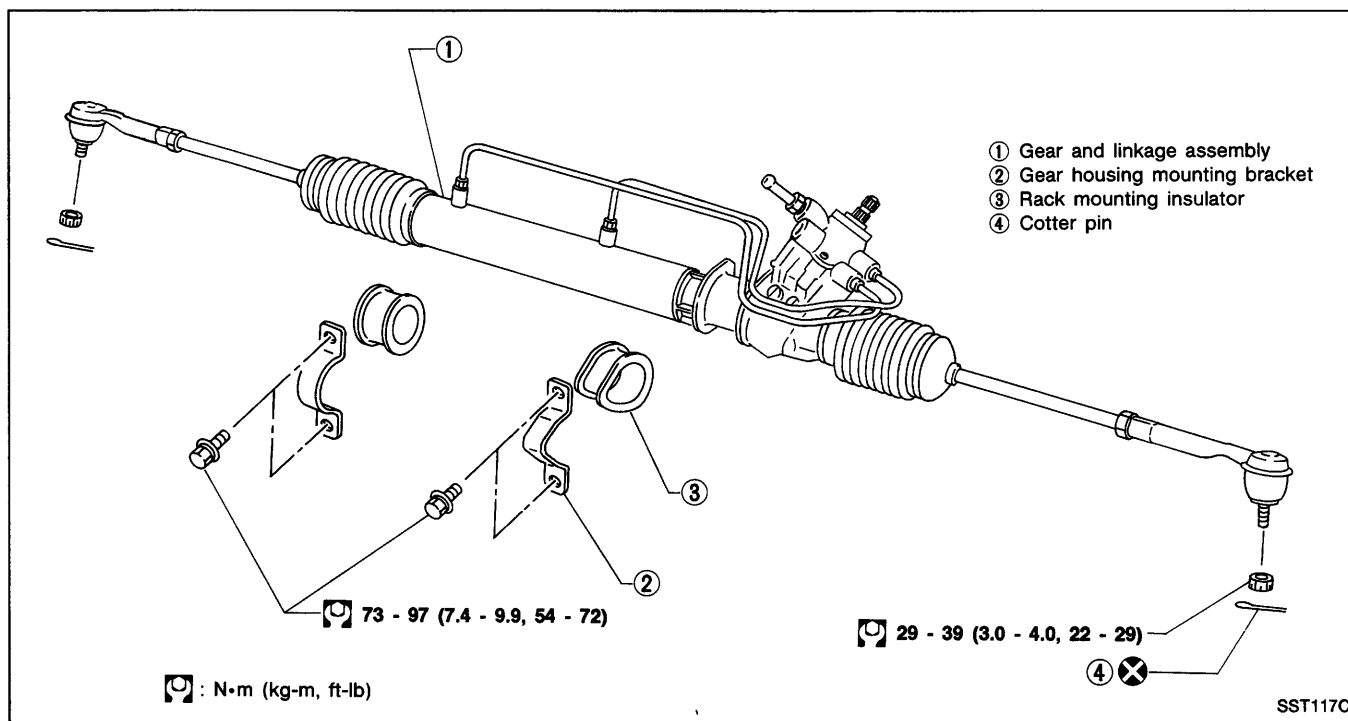
ST

BF

HA

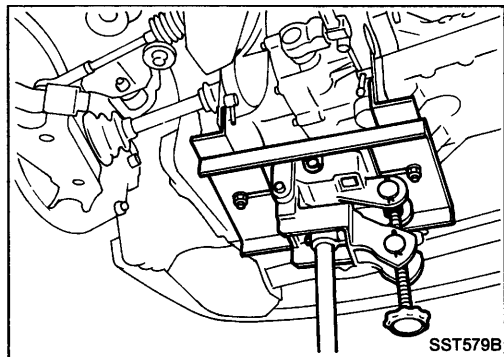
EL

POWER STEERING GEAR AND LINKAGE

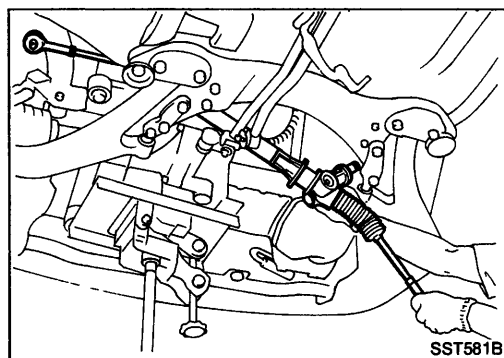


Removal

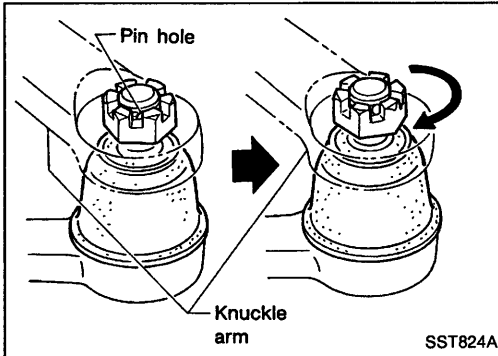
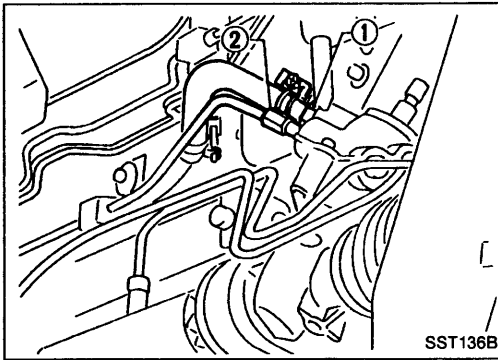
- Detach tie-rod outer sockets from knuckle arms with Tool.
- Remove high and low pressure connectors.
- Remove exhaust front tube.
- Remove steering lower joint.
- Remove gear housing brackets.



- Support transmission housing with engine jack.
- Remove center member with engine mounting rear bracket.



- Remove steering gear assembly.



Installation

- Install pipe connector.
- Observe specified tightening torque when tightening high-pressure and low-pressure pipe connectors. Excessive tightening will damage threads of connector or 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.

Connector tightening torque:

Low-pressure side "1"

27 - 39 N·m (2.8 - 4.0 kg-m, 20 - 29 ft-lb)

High-pressure side "2"

15 - 25 N·m (1.5 - 2.5 kg-m, 11 - 18 ft-lb)

- 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).

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

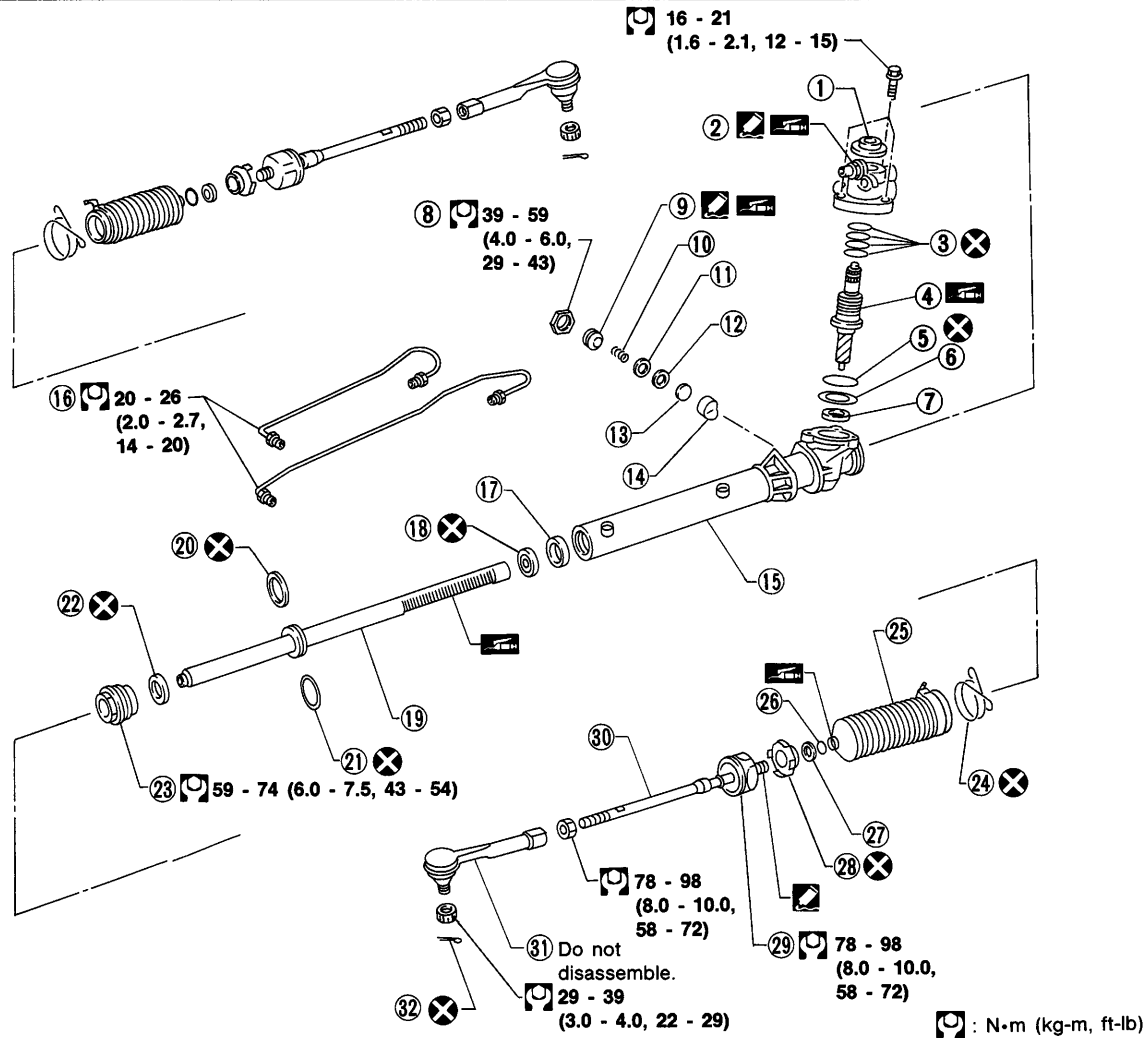
ST

BF

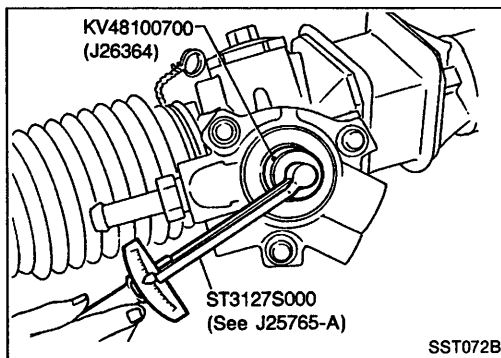
HA

EL

POWER STEERING GEAR AND LINKAGE



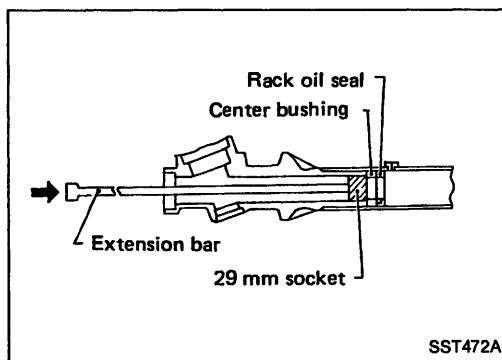
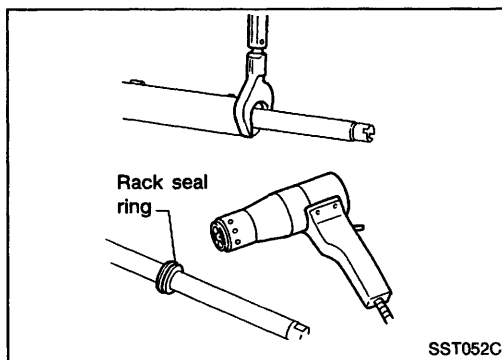
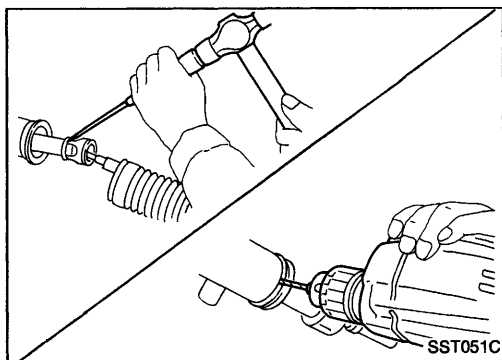
- | | | |
|-------------------------|---------------------|------------------------|
| ① Rear housing cover | ⑫ Washer | ⑳ End cover assembly |
| ② Rear housing assembly | ⑬ Spring seat | ㉑ Boot clamp |
| ③ Pinion seal ring | ⑭ Retainer | ㉒ Dust boot |
| ④ Pinion assembly | ⑮ Gear housing | ㉓ Boot band |
| ⑤ O-ring | ⑯ Gear housing tube | ㉔ Rack spacer |
| ⑥ Shim | ⑰ Center bushing | ㉕ Lock plate |
| ⑦ Pinion oil seal | ⑱ Rack assembly | ㉖ Tie-rod inner socket |
| ⑧ Lock nut | ㉒ Rack seal ring | ㉗ Tie-rod |
| ⑨ Adjusting screw | ㉓ O-ring | ㉘ Tie-rod outer |
| ⑩ Spring | ㉔ Rack oil seal | ㉙ Cotter pin |
| ⑪ Spring disc | | |



Disassembly

1. Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.
 - Before measuring, disconnect gear housing tube and drain fluid.
 - Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.

POWER STEERING GEAR AND LINKAGE



Disassembly (Cont'd)

2. Remove pinion gear.
Be careful not to damage pinion gear when removing pinion seal ring.

3. Remove tie-rod outer sockets and boots.
4. Loosen tie-rod inner socket by prying up staked portion, and remove socket.
5. Remove retainer.
6. Remove pinion assembly.
7. Drill staked portion of gear housing end with drill of 2 to 2.5 mm (0.079 to 0.098 in) diameter, until the staking is eliminated.

8. Remove end cover assembly with a suitable tool.

9. Draw out rack assembly.

10. Remove rack seal ring.

- Using a heat gun, heat rack seal to approximately 40°C (104°F).

- Remove rack seal ring.

Be careful not to damage rack.

11. Remove center bushing and rack oil seal using tape wrapped socket and extension bar.

Do not scratch inner surfaces of pinion housing.

Inspection

Thoroughly clean all parts in cleaning solvent or automatic transmission fluid type DEXRON™II or equivalent, and blow dry with compressed air, if available.

BOOT

Check condition of boot. If cracked excessively, replace it.

RACK

Thoroughly examine rack gear. If damaged, cracked or worn, replace it.

PINION ASSEMBLY

- Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace it.
- Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers and races. Replace if necessary.

GEAR HOUSING CYLINDER

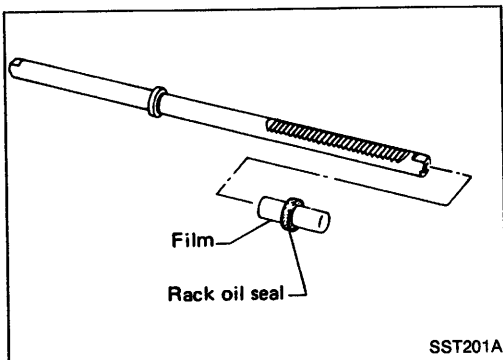
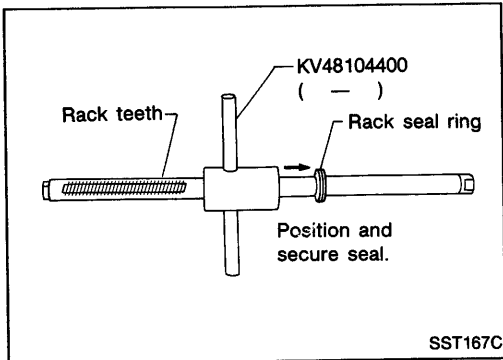
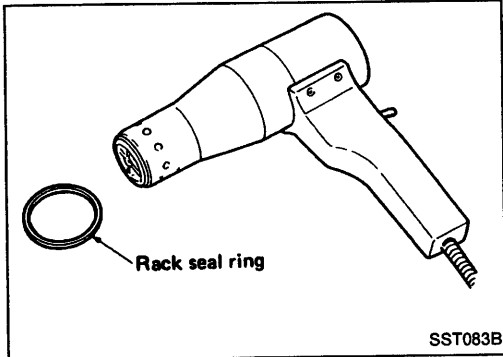
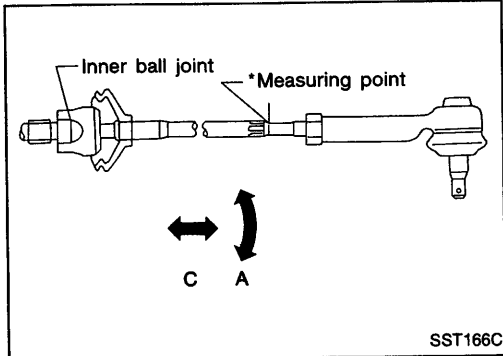
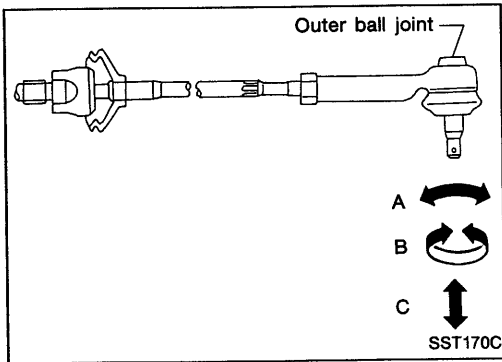
Check gear housing cylinder bore for scratches or other damage. Replace if necessary.

POWER STEERING GEAR AND LINKAGE

Inspection (Cont'd)

TIE-ROD OUTER AND INNER SOCKETS

- Check ball joints for swinging force.
Tie-rod outer and inner ball joints swinging force "A":
Refer to S.D.S.
- Check ball joint for rotating torque.
Tie-rod outer ball joint rotating torque "B":
Refer to S.D.S.
- Check ball joints for axial end play.
Tie-rod outer and inner ball joints axial end play "C":
Refer to S.D.S.
- Check condition of dust cover. If cracked excessively, replace.



Assembly

1. Using a heat gun, heat new rack seal ring (made of Teflon) to approximately 40°C (104°F) and install it onto rack with your hand.

2. Using Tool, compress periphery of rack seal ring to position and secure it on rack.

Always insert Tool from the rack gear side.

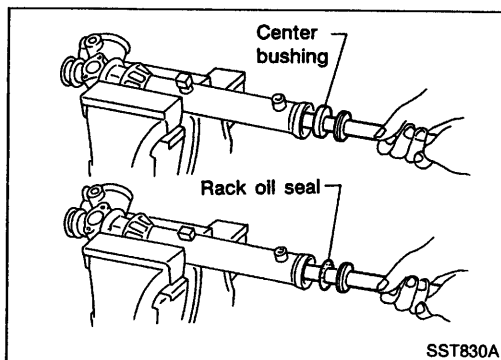
3. Insert new rack oil seal.

- Place plastic film into rack oil seal to prevent damage by rack teeth.
- Do not forget to remove plastic film after rack oil seal is positioned properly.
- Make sure lips of rack oil seal face each other.

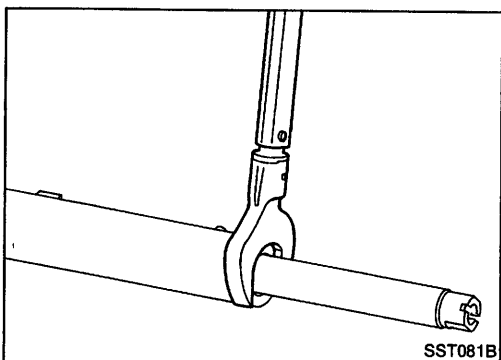
POWER STEERING GEAR AND LINKAGE

Assembly (Cont'd)

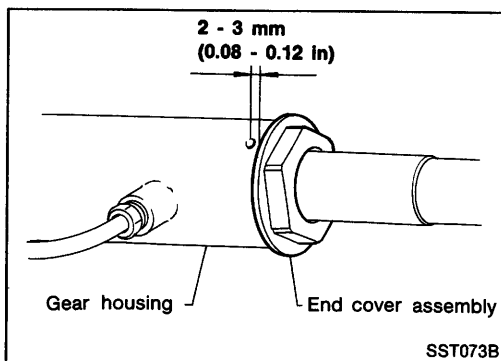
4. Install center bushing and rack oil seal with rack assembly.



5. Tighten end cover assembly with a suitable tool.

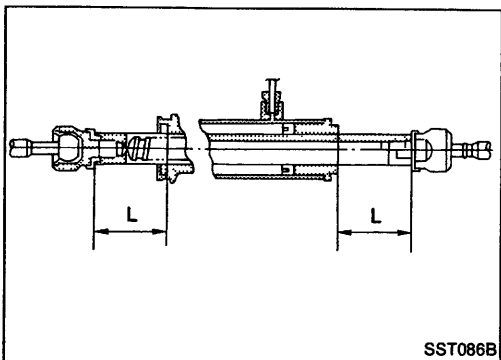


6. Fasten end cover assembly to gear housing by staking.



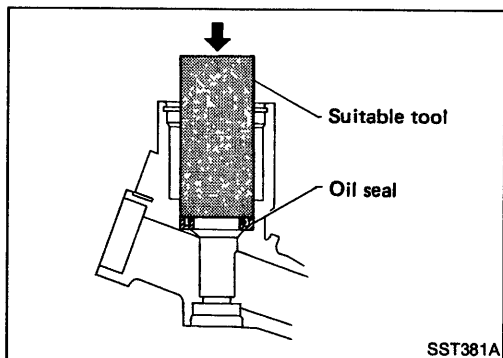
7. Set rack gear in neutral position.

Rack stroke "L":
Refer to S.D.S.



8. Coat seal lip of new pinion oil seal with multi-purpose grease and install it to pinion housing of gear housing with a suitable tool.

Make sure lip of oil seal faces up when installed.



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

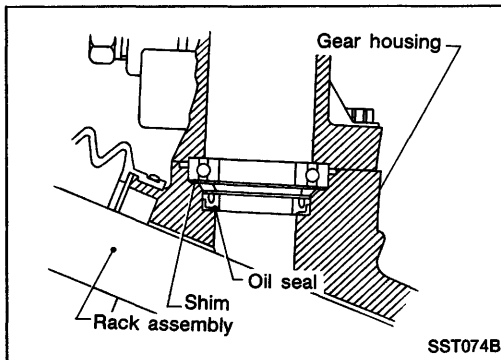
BF

HA

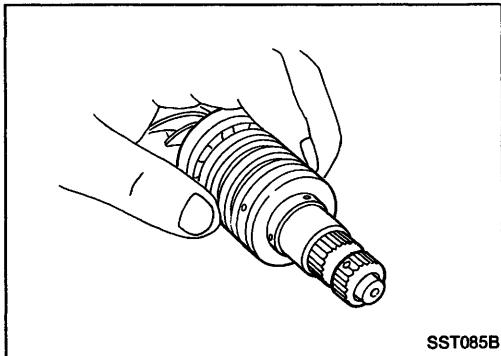
EL

POWER STEERING GEAR AND LINKAGE

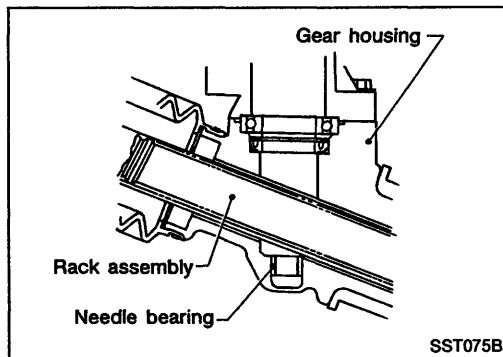
Assembly (Cont'd)



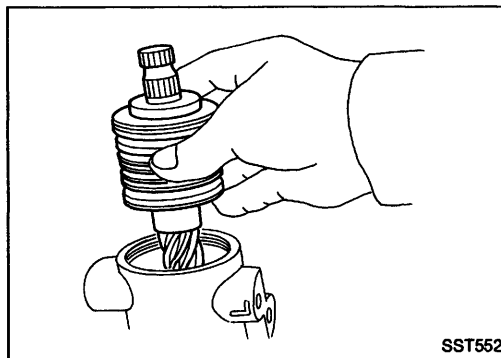
9. Install pinion bearing adjusting shim(s).
- Whenever pinion assembly, gear housing and rear housing are disassembled, replace shim(s) with new ones. Always use the same number of shim(s) when replacing.



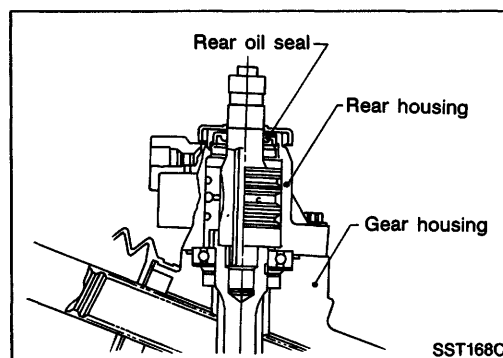
10. Install new pinion seal ring (made of Teflon) on pinion gear assembly.
- Using a heat gun, heat pinion seal ring to approximately 40°C (104°F) before installing it onto pinion gear assembly.
- Make sure pinion seal ring is properly settled in valve groove.



11. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip before installing pinion assembly in gear housing.



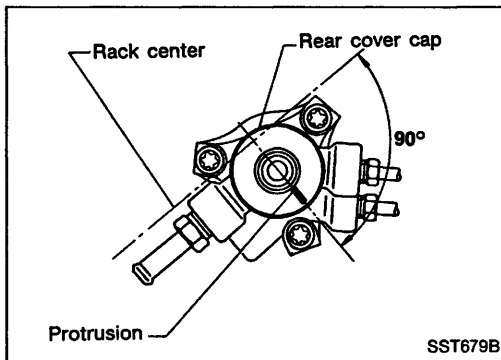
12. Install pinion assembly to pinion housing.
Be careful not to damage pinion oil seal.



13. Apply a coat of multi-purpose grease to new rear oil seal lip before installing rear housing.

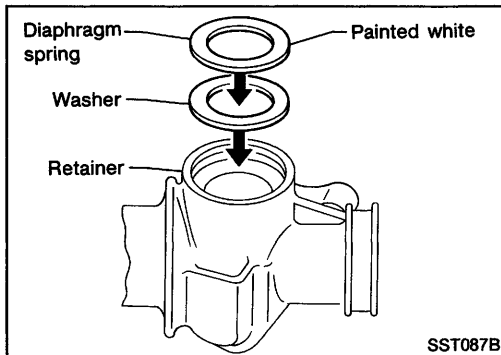
POWER STEERING GEAR AND LINKAGE

Assembly (Cont'd)

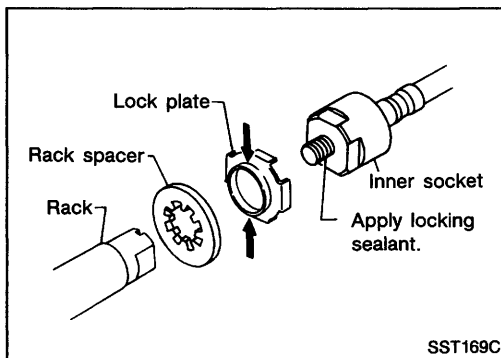


14. Install rear cover cap so that protrusion of rear housing cover is positioned as shown in figure at left when rack is centralized.

Be careful not to damage worm ring and oil seal.



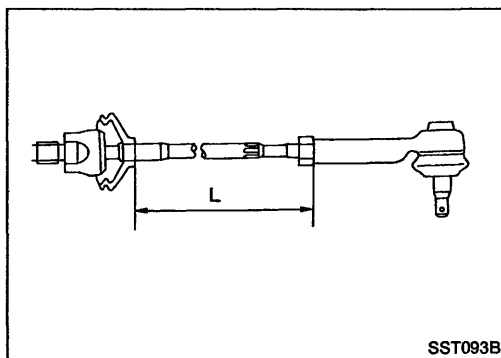
15. Install diaphragm spring into gear housing.
- Always install retainer, spring washer and diaphragm spring in that order.
 - Make sure convex end (painted white) of diaphragm spring faces outward when installing.
16. Install retainer spring and adjusting screw temporarily.



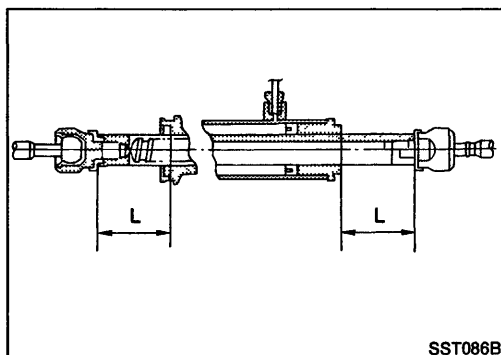
17. Install new lock plate.
- Attach lock plate to side rod inner socket .
 - Apply locking sealant to inner socket threads .
Screw inner socket into rack and tighten to specified torque.
 - Clinch two places of lock plate at rack's groove.

CAUTION:

To prevent scratching the boot, remove burrs from lock plate.



18. Tighten outer socket lock nut.
Tie-rod length "L":
Refer to S.D.S.



19. Measure rack stroke.
Rack stroke "L":
Refer to S.D.S.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

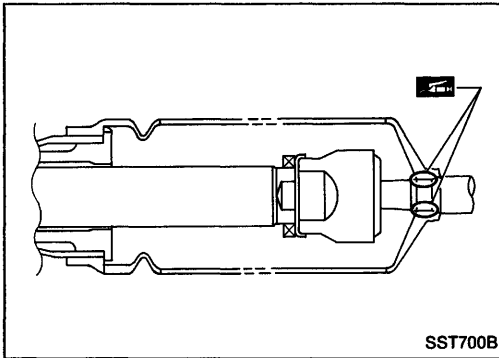
BF

HA

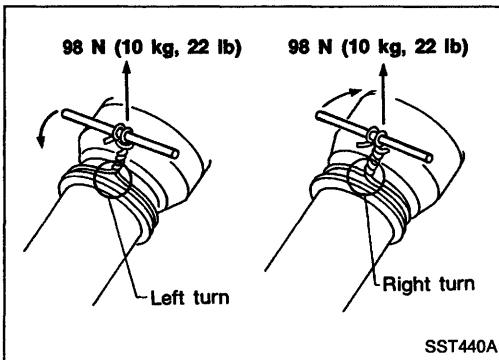
EL

POWER STEERING GEAR AND LINKAGE

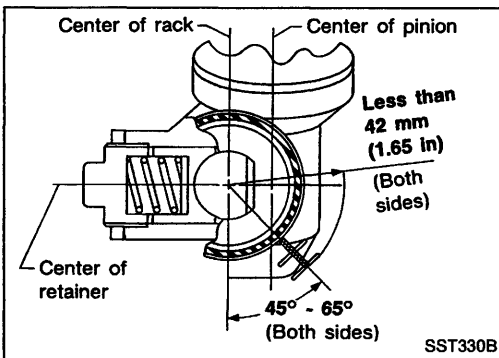
Assembly (Cont'd)



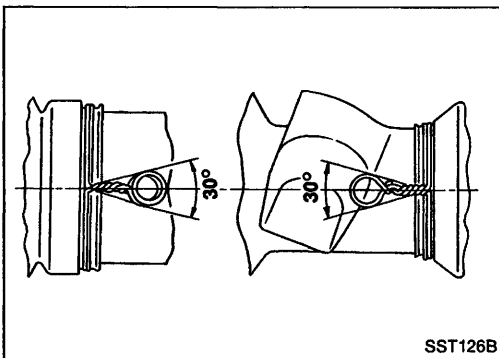
20. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.



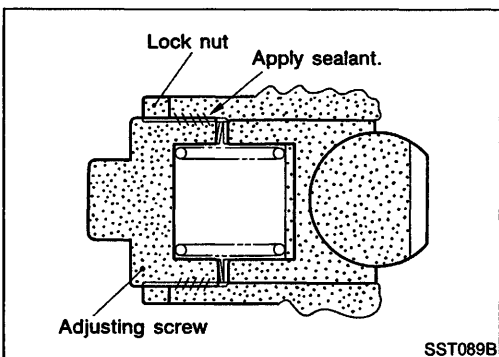
21. Install boot clamps.
- To install, wrap boot clamp around boot groove twice. Tighten clamp by twisting rings at both ends 4 to 4-1/2 turns with screwdriver while pulling with a force of approx. 98 N (10 kg, 22 lb).
 - Twist boot clamp in the direction shown in figure at left.



- Install boot clamps so they are behind the gear housing when it is attached to the vehicle. (This will prevent interference with other parts.)



- After twisting boot clamp, bend twisted and diagonally so it does not contact boot.



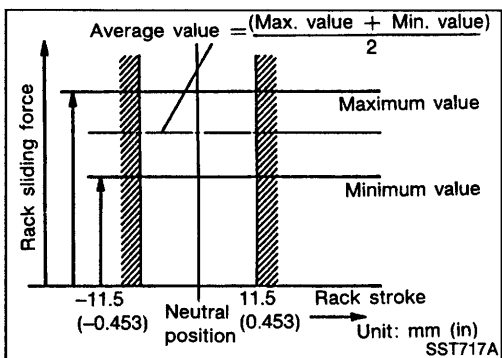
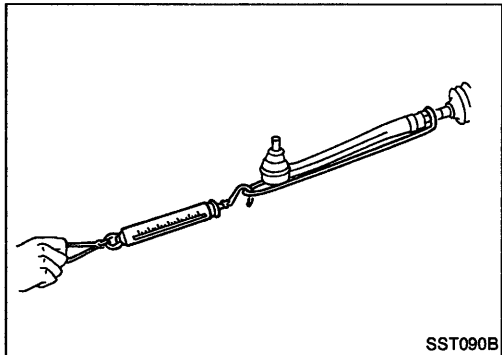
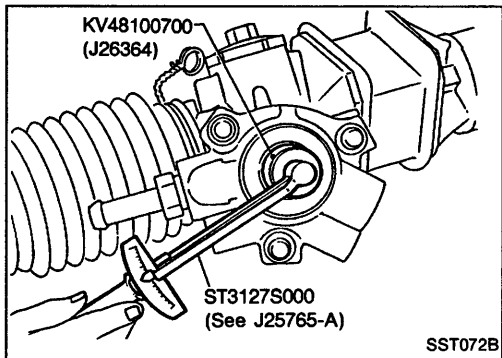
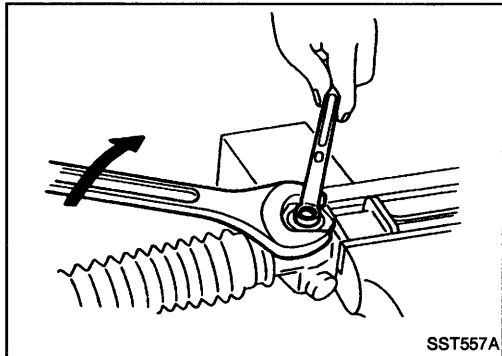
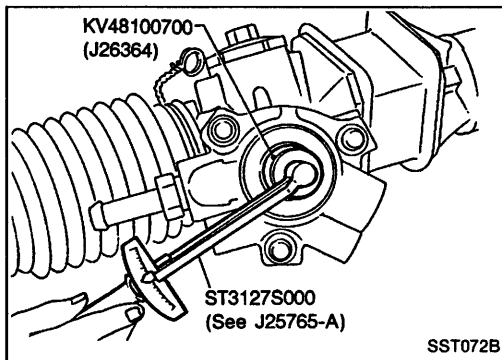
Adjustment

Adjust pinion rotating torque as follows:

1. Set rack to the neutral position without fluid in the gear.
2. Coat the adjusting screw with locking sealant and screw it in.
3. Lightly tighten lock nut.
4. Tighten adjusting screw to a torque of 4.9 to 5.9 N·m (50 to 60 kg-cm, 43 to 52 in-lb).
5. Loosen adjusting screw, then retighten it to 0.2 N·m (2 kg-cm, 1.7 in-lb).

POWER STEERING GEAR AND LINKAGE

Adjustment (Cont'd)



6. Move rack over its entire stroke several times.
7. Measure pinion rotating torque within the range of 180° from neutral position.
Stop the gear at the point of maximum torque.
8. Loosen adjusting screw, then retighten it to 4.9 N·m (50 kg-cm, 43 in-lb).
9. Loosen adjusting screw by 40° to 60°.

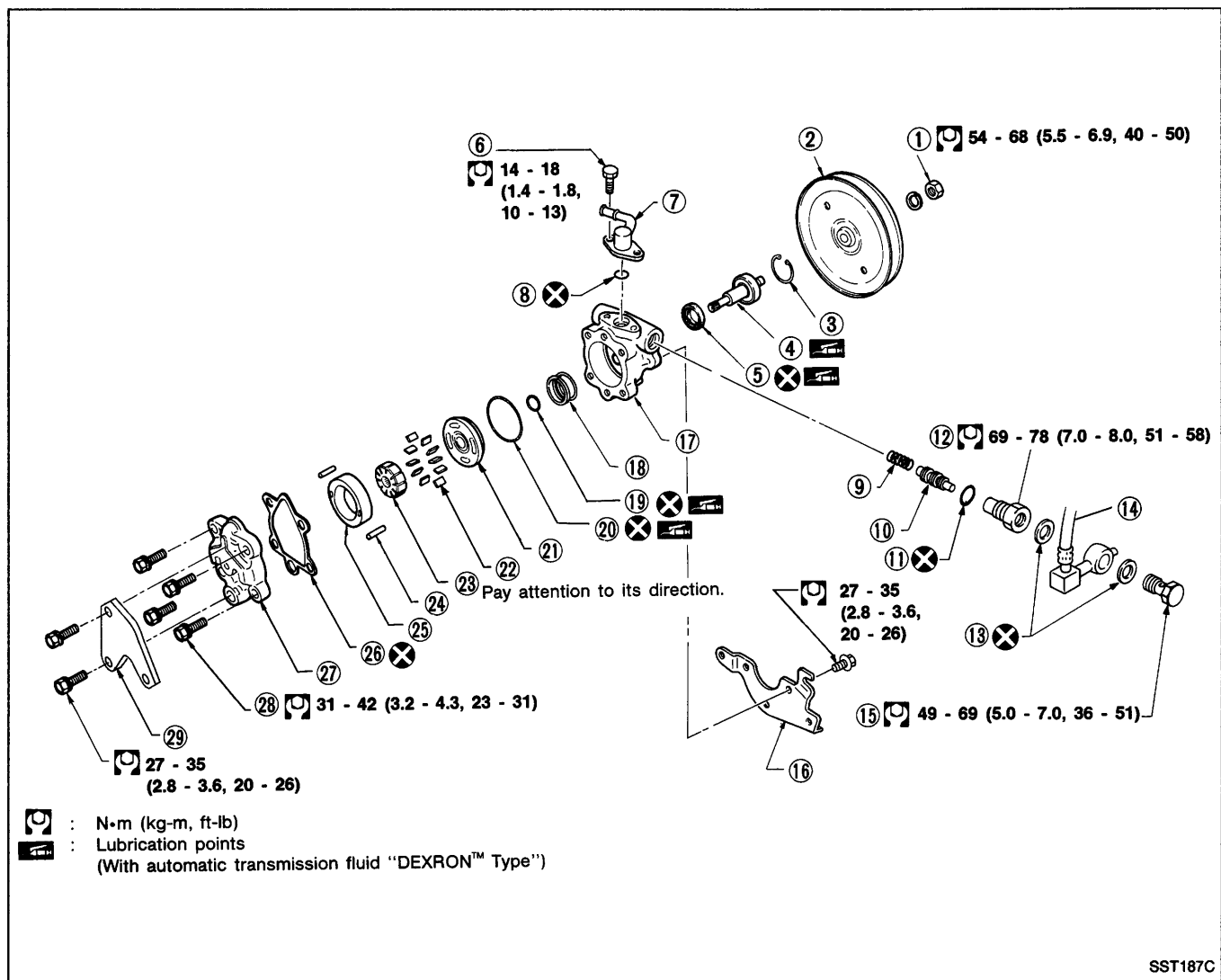
10. Prevent adjusting screw from turning, and tighten lock nut to specified torque.

11. Measure pinion rotating torque.
Within ±100° from the neutral position:
Average rotating torque
0.8 - 1.3 N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)
Maximum torque deviation 0.4 N·m (4 kg-cm, 3.5 in-lb)
Except for above measuring range:
Maximum rotating torque 1.9 N·m (19 kg-cm, 16 in-lb)
Maximum force deviation 0.6 N·m (6 kg-cm, 5.2 in-lb)
 - If pinion rotating torque is not within specifications, readjust it starting from procedure 4. If pinion rotating torque is still out of specifications after readjustment, replace steering gear assembly.

12. Check rack sliding force on vehicle as follows:
 - a. Install steering gear onto vehicle, but do not connect tie-rod to knuckle arm.
 - b. Connect all piping and fill with steering fluid.
 - c. Start engine and bleed air completely.
 - d. Disconnect steering column lower joint from the gear.
 - e. Keep engine at idle and make sure steering fluid has reached normal operating temperature.
 - f. While pulling tie-rod slowly in the ±11.5 mm (±0.453 in) range from the neutral position, make sure rack sliding force is within specification.

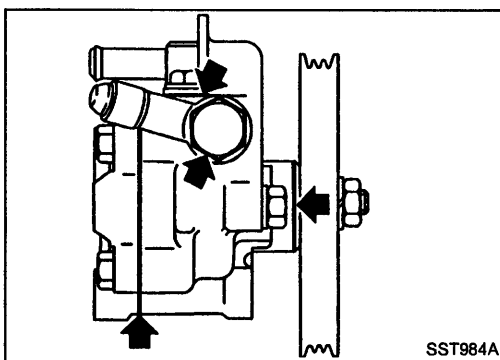
- Average rack sliding force:**
284 N (29 kg, 64 lb)
- Maximum rack sliding force:**
Not more than 39 N (4 kg, 9 lb) beyond above value
- If rack sliding force is not within specification, readjust by repeating adjustment procedure from the beginning.
 - If rack sliding force is still out of specification after readjustment, gear assembly needs to be replaced.

POWER STEERING OIL PUMP



SST187C

- | | | |
|----------------------|------------------|--------------------|
| ① Nut | ⑪ O-ring | ⑳ Front side plate |
| ② Pulley | ⑫ Connector | ㉑ Vane |
| ③ Snap ring | ⑬ Washer | ㉒ Rotor |
| ④ Drive shaft | ⑭ Hose | ㉓ Pin |
| ⑤ Oil seal | ⑮ Connector bolt | ㉔ Cam ring |
| ⑥ Bolt | ⑯ Bracket | ㉕ Gasket |
| ⑦ Suction pipe | ⑰ Front housing | ㉖ Rear housing |
| ⑧ O-ring | ⑱ Spring | ㉗ Bolt |
| ⑨ Spring | ㉒ O-ring | ㉘ Bracket |
| ⑩ Flow control valve | | |



Pre-disassembly Inspection

Disassemble the power steering oil pump only if the following items are found.

- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.
- Poor performance.

Disassembly

CAUTION:

- Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.
- Disassemble in as clean a place as possible.
- Clean your hands before disassembly.
- Do not use rags; use nylon cloths or paper towels.
- Follow the procedures and cautions in the Service Manual.
- When disassembling and reassembling, do not let foreign matter enter or contact the parts.

GI

MA

EM

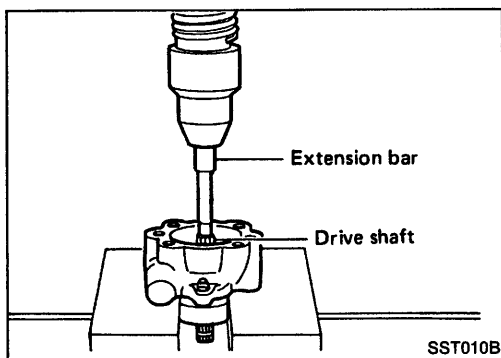
- Remove snap ring, then draw drive shaft out.
Be careful not to drop drive shaft.

LC

EF &
EC

FE

CL



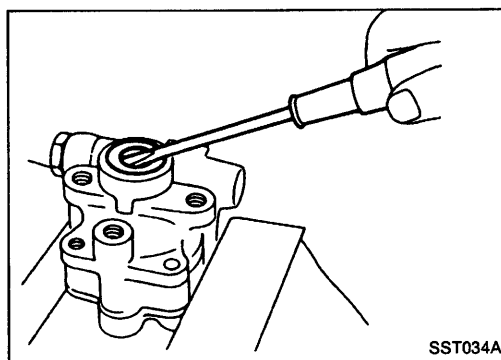
- Remove oil seal.
Be careful not to damage front housing.

MT

AT

FA

RA



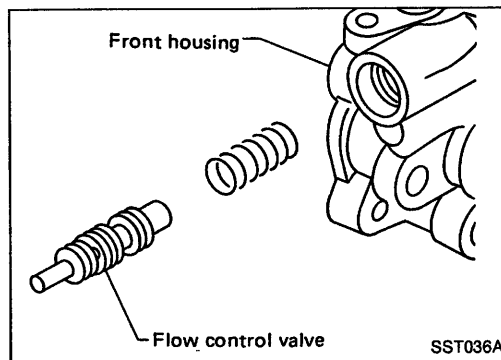
- Remove connector.
Be careful not to drop flow control valve.

BR

ST

BF

HA

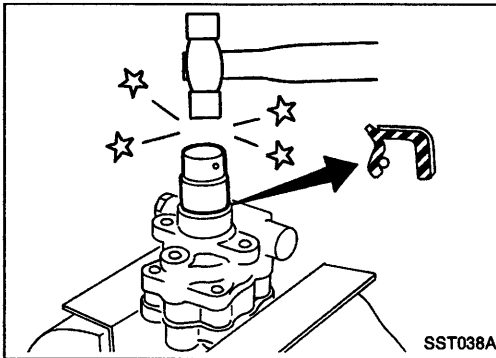


Inspection

Inspect each component part for wear, deformation, scratches and cracks. If damage is found, replace the part.

EL

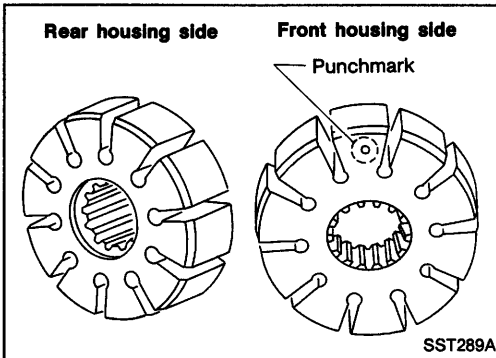
POWER STEERING OIL PUMP



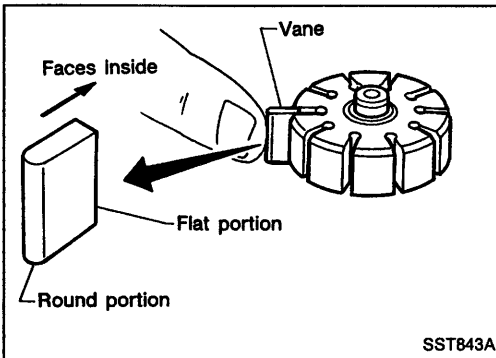
Assembly

Assemble oil pump, noting the following instructions.

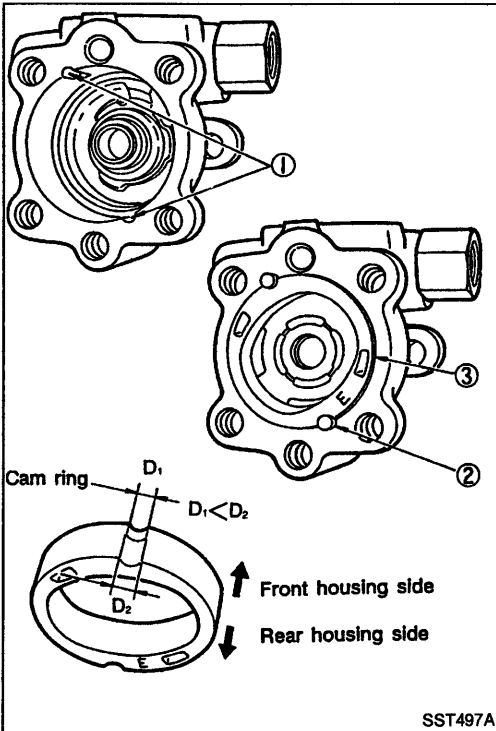
- Make sure O-rings and oil seal are properly installed.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.
- Cam ring, rotor and vanes must be replaced as a set if necessary.
- Coat each part with A.T.F. when assembling.



- Pay attention to the direction of rotor.



- When assembling vanes to rotor, rounded surfaces of vanes must face cam ring side.



- Insert pin ② into pin groove ① of front housing and front side plate. Then install cam ring ③ as shown at left.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

Applied model	All
Steering model	Power steering
Steering gear type	PR26SC
Steering overall gear ratio	17.7
Turns of steering wheel (Lock to lock)	2.9
Steering column type	Collapsible, tilt

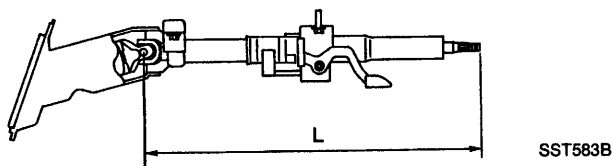
Inspection and Adjustment

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

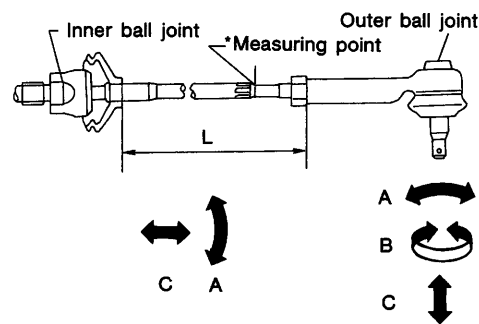
STEERING COLUMN

Steering column length "L" mm (in)	556.2 - 557.8 (21.90 - 21.96)
---------------------------------------	-------------------------------



STEERING GEAR AND LINKAGE

Steering gear type	PR26SC
Tie-rod outer ball joint Swinging force at cotter pin hole "A" N (kg, lb)	6.9 - 63.7 (0.7 - 6.5, 1.5 - 14.3)
Rotating torque "B" N-m (kg-cm, in-lb)	0.3 - 2.9 (3 - 30, 2.6 - 26.0)
Axial end play limit "C" mm (in)	0.5 (0.020) or less
Tie-rod inner ball joint Swinging force* "A", "C" N (kg, lb)	5.69 - 51.29 (0.58 - 5.23, 1.28 - 11.53)
Axial end play limit mm (in)	0 (0)
Tie-rod standard length "L" mm (in)	181.1 (7.13)

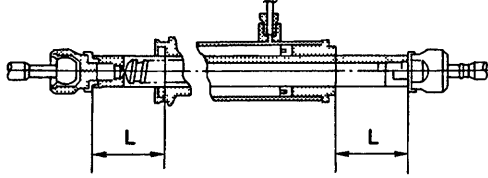


SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

STEERING GEAR AND LINKAGE (Cont'd)

Steering gear type	PR26SC
Rack stroke "L"	69.5 (2.736)
mm (in)	



SST086B

Pinion gear preload without gear oil	
N-m (kg-cm, in-lb)	
Within $\pm 100^\circ$ from the neutral position	
Average rotating torque	0.78 - 1.27 (8.0 - 13.0, 6.9 - 11.3)
Maximum torque deviation	0.4 (4, 3.5)
Except above range	
Maximum rotating torque	1.9 (19, 16)
Maximum torque deviation	0.6 (6, 5.2)

Rack sliding force	N (kg, lb)	
Under normal operating oil pressure		
Range within ± 11.5 mm (± 0.453 in) from the neutral position		284 (29, 64)
Maximum force deviation		39 (4, 9)
Except above range		Not more than 39 (4, 9) beyond above value
Retainer adjustment		
Adjusting screw		
Initial tightening torque	N-m (kg-cm, in-lb)	4.9 - 5.9 (50 - 60, 43 - 52)
Retightening torque after loosening		0.2 (2, 1.7)
Tightening torque after gear has settled		4.9 (50, 43)
Returning angle	degree	$40^\circ - 60^\circ$
Steering wheel turning force (Measured at one full turn from the neutral position)	N (kg, lb)	39 (4, 9) or less
Fluid capacity (Approximate)	ℓ (US qt, Imp qt)	0.9 (1, 3/4)
Oil pump maximum pressure	kPa (kg/cm ² , psi)	7,649 - 8,238 (78 - 84, 1,109 - 1,194)

SECTION **BF**

GI

MA

EM

LC

EF &
EC

CONTENTS

GENERAL SERVICING	2	2-POINT MOTORIZED AUTOMATIC SEAT BELT	
Precautions.....	2	SYSTEM	34
Circuit Breaker Inspection.....	2	Unit Location	34
Clip and Fastener	2	Wiring Diagram	36
BODY END	5	Description	38
Body Front End	5	2-POINT MOTORIZED AUTOMATIC SEAT BELT	
Body Rear End and Opener	6	SYSTEM — Trouble Diagnoses	41
DOOR	9	Contents.....	41
Front Door	9	SUN ROOF	64
Rear Door	10	Wiring Diagram	64
Power Window	11	Electric Sun Roof	64
Power Door Lock.....	14	WINDSHIELD AND WINDOWS	66
INSTRUMENT PANEL	20	Windshield and Rear Window	66
INTERIOR AND EXTERIOR	22	MIRROR	67
Interior	22	Door Mirror	67
Exterior	26	REAR AIR SPOILER	69
SEAT	32	BODY ALIGNMENT	70
Front Seat.....	32	Engine Compartment	70
Rear Seat	33	Underbody	72

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

When you read wiring diagrams:

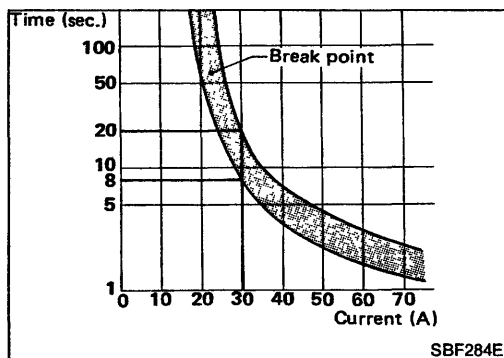
- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

★ For seat belt, refer to MA 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.



Circuit Breaker Inspection

For example, when current is 30A, the circuit is broken within 8 to 20 seconds.

Circuit breakers are used in the following systems.

- Power window & power door lock
- Power sun roof
- Trunk lid and fuel filler lid opener
- 2-point motorized automatic seat belt system

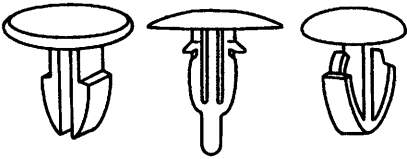
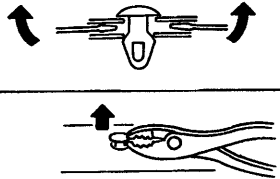
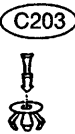
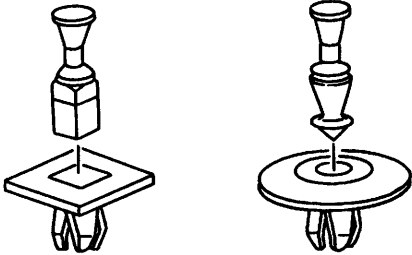
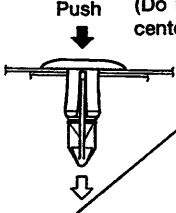
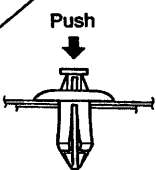
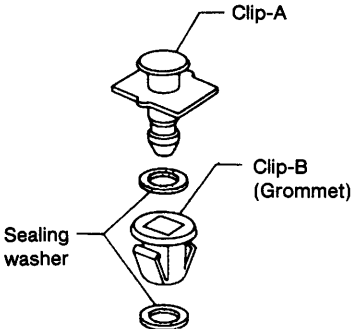
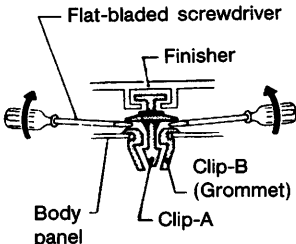
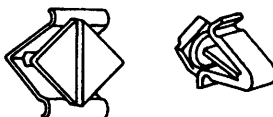
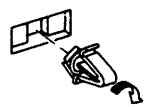
Clip and Fastener

- 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	Shapes	Removal & Installation
C101 	 SBF256G	Removal: Remove by bending up with flat-bladed screwdrivers. SBF367B
C102 	 SBF114B SBF137B	Removal: Pull up by rotating. SBF115B

GENERAL SERVICING

Clip and Fastener (Cont'd)

No. Symbol	Shapes	Removal & Installation
C103 	 SBF257G	Removal: Remove with a flat-bladed screwdriver or pliers.  SBF292C
C203 	 SBF258G	Push center pin to catching position. (Do not remove center pin by hitting it.) Push  Installation: Push  SBF708E
CF118 	 SBF151D	Removal:  SBF652B
CG101 	 SBF145B	Removal  Rotate 45° to remove. Installation  Removal  SBF085B

GI

MA

EM

LC

EF &

EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

GENERAL SERVICING

Clip and Fastener (Cont'd)

No. Symbol	Shapes	Removal & Installation
CR103	A perspective view of a U-shaped metal clip with a rectangular tab on one side. SBF768B	Removal: Holder portion of clip must be spread out to remove rod. Two diagrams showing the removal process. The first shows a hand spreading the holder portion of the clip. The second shows the clip being removed from a rod. SBF770B
CS101 A small icon of a screw with a Phillips head and a washer.	Four diagrams showing the fastener CS101 in different configurations: 1) A screw with a washer. 2) A screw with a washer and a conical base. 3) A screw with a washer and a square base. 4) A screw with a washer and a circular base. SBF260G	Removal: Screw out with a Phillips screwdriver. A diagram showing a Phillips screwdriver being used to remove a screw from a surface. SBF140B

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 locks engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly. Doing so increases effort required to unlock hood.

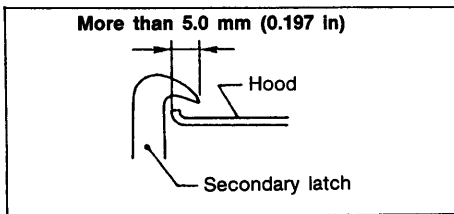
REMOVAL — Front bumper assembly

- ① Remove clearance lamps.
- ② Remove headlamps.
- ③ Remove left and right nuts securing bumper fascia to fender.
- ④ Remove left and right screws securing bumper fascia to fender protector.
- ⑤ Remove left and right clips (C203) securing bumper fascia to radiator core lower support.
- ⑥ Remove left and right pins.
- ⑦ Remove left and right bolts securing bumper stay to side member.

Hood lock adjustment

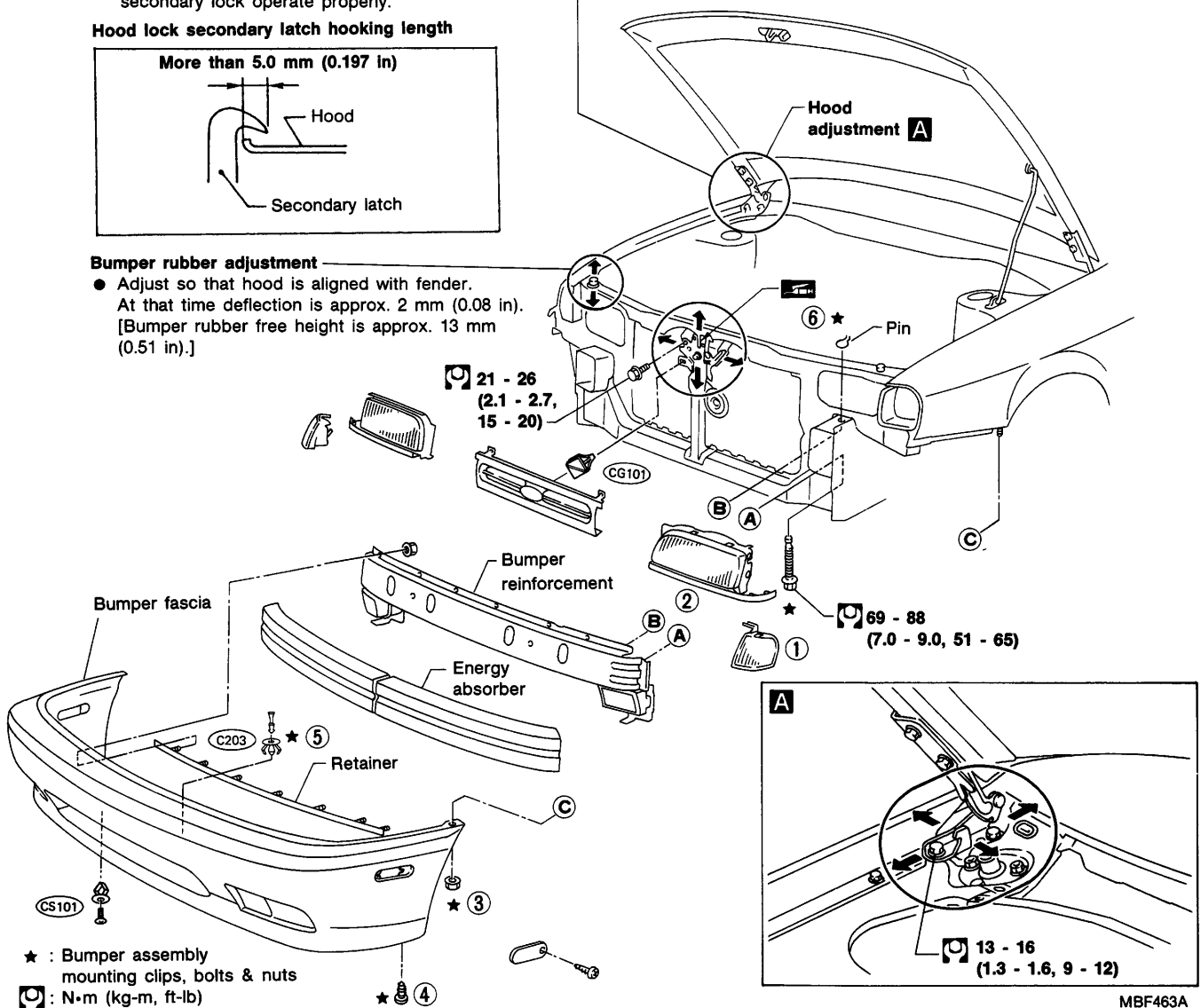
- Adjust hood so that hood primary lock meshes at a position 1 to 1.5 mm (0.039 to 0.059 in) lower than fender.
- After hood lock adjustment, adjust bumper rubber.
- When securing hood lock, ensure it does not tilt. Striker must be positioned at the center of hood primary lock.
- After adjustment, ensure that hood primary and secondary lock operate properly.

Hood lock secondary latch hooking length



Bumper rubber adjustment

- Adjust so that hood is aligned with fender. At that time deflection is approx. 2 mm (0.08 in). [Bumper rubber free height is approx. 13 mm (0.51 in).]



MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

Body Rear End and Opener

- Trunk door adjustment: Adjust at hinge portion for proper fit.
- Trunk door lock system adjustment: Adjust striker so that it is in the center of the lock. After adjustment, check lock operation.
- Opener cable: Do not attempt to bend cable using excessive force.
- After installation, make sure that trunk lid/back door and fuel filler lid open smoothly.

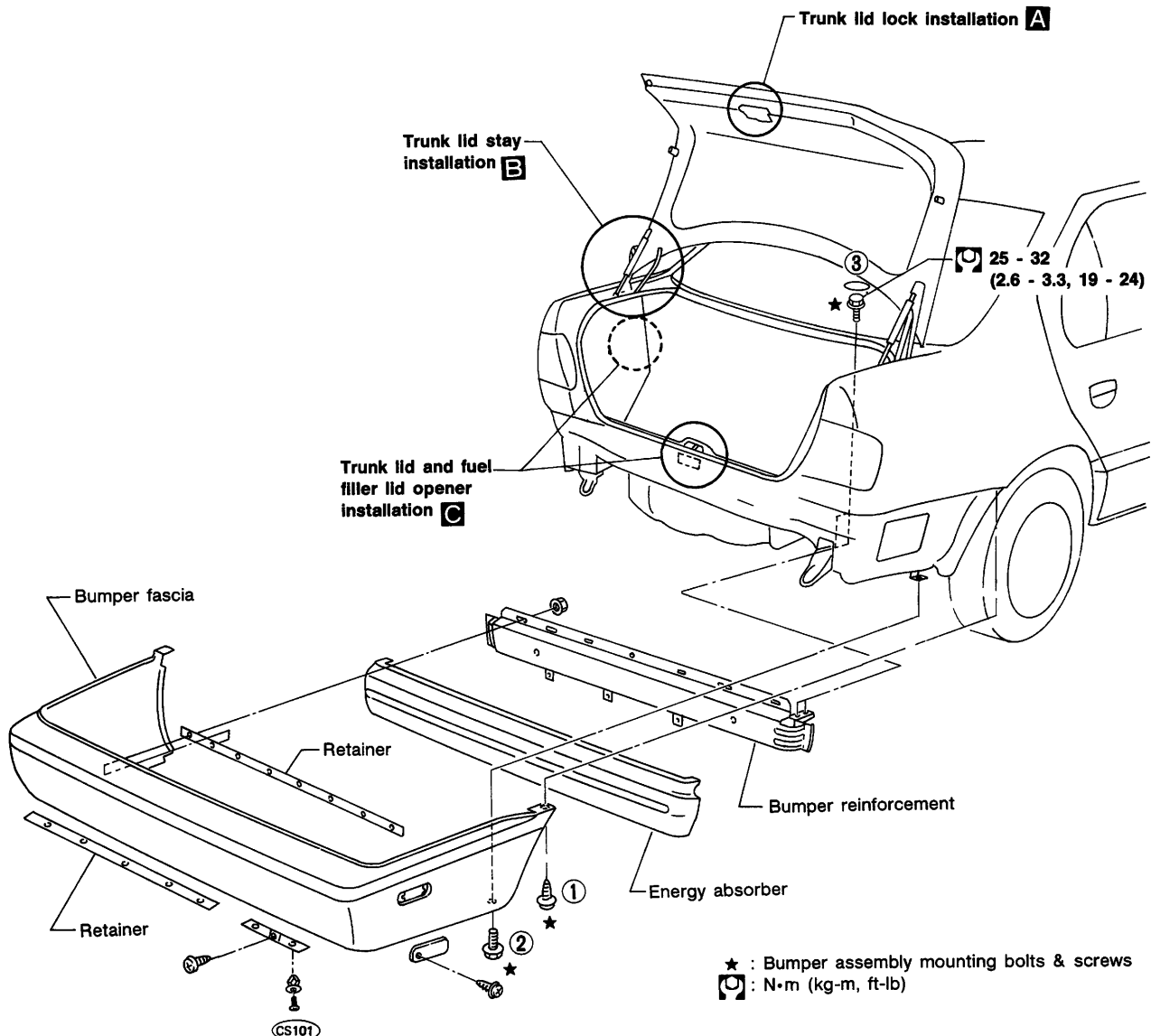
SEDAN

WARNING:

- a. Be careful not to scratch trunk lid stay when installing back door. A scratched stay may cause gas leakage.
- b. The contents of the trunk lid stay are under pressure. Do not take apart, puncture, apply heat or allow fire near it.

Removal — Rear bumper assembly

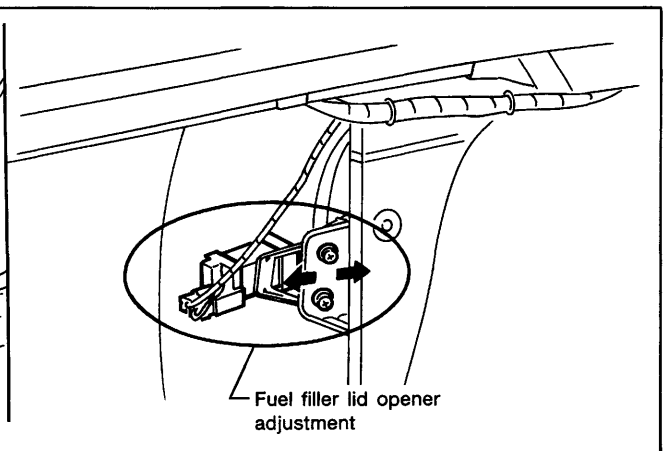
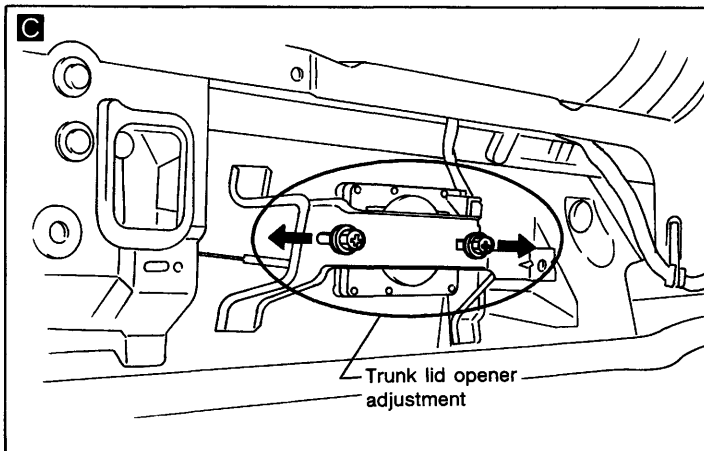
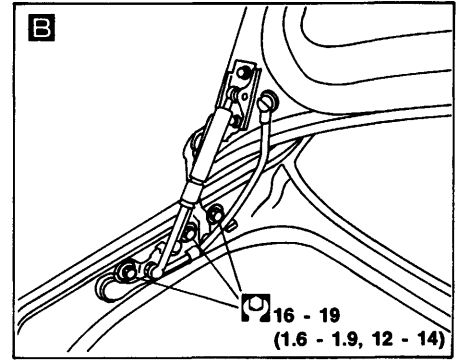
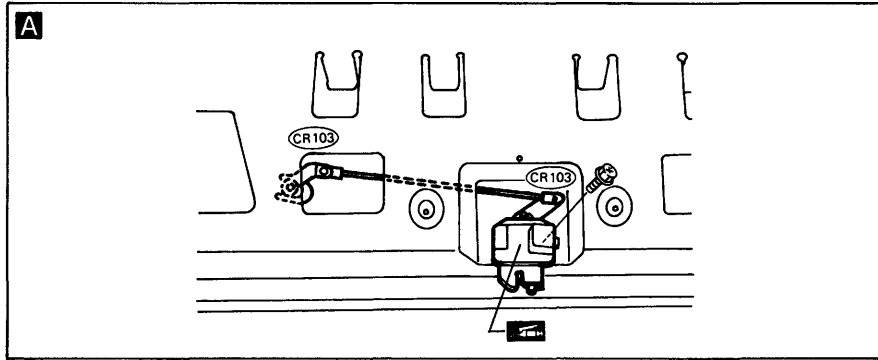
- ① Remove left and right screws securing bumper fascia to wheelarch.
- ② Remove left and right bolts securing bumper fascia to bracket.
- ③ Remove the four left and right bolts securing bumper stay to rear side member.



BODY END

Body Rear End and Opener (Cont'd)

Installation (Refer to figures below.)



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

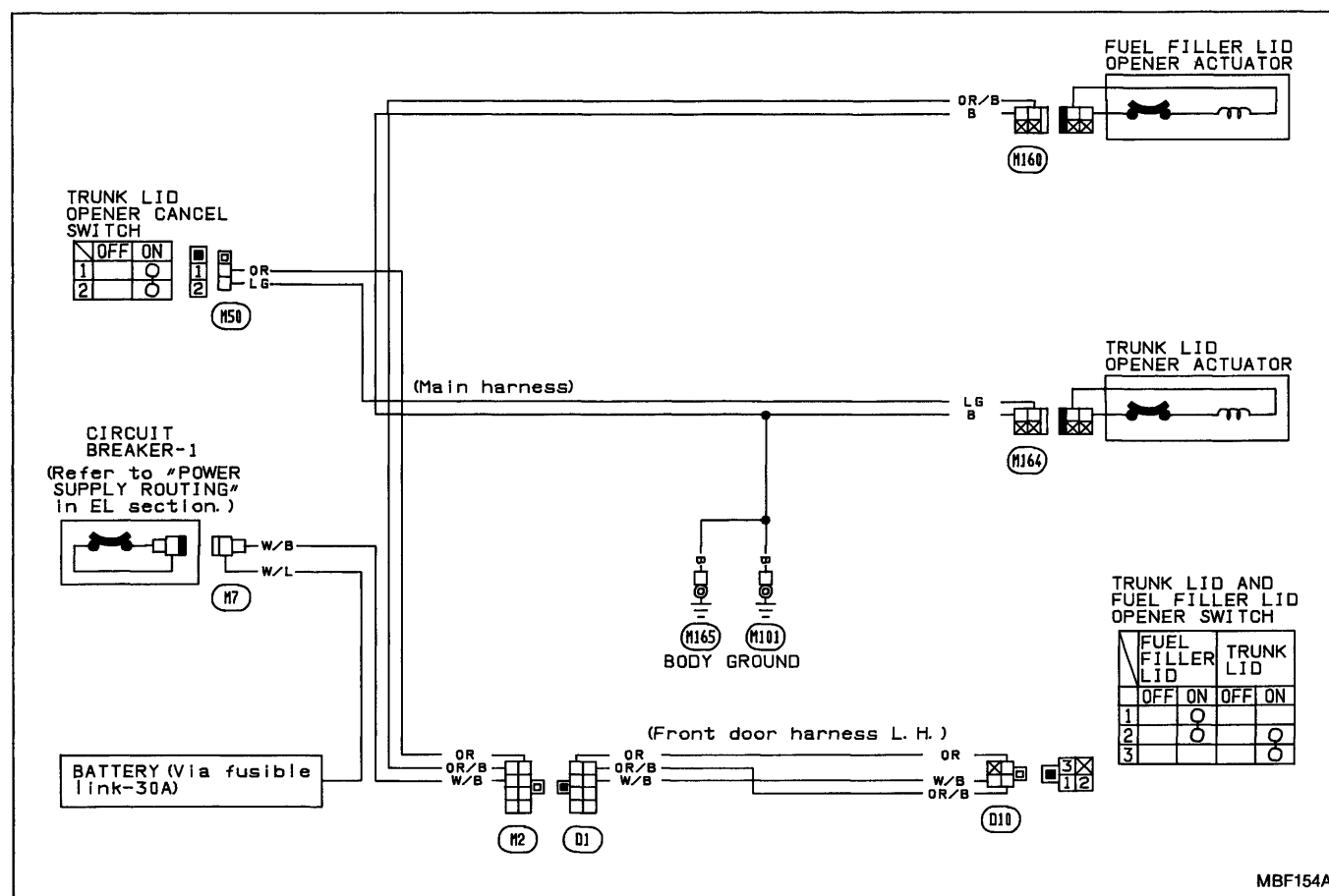
BF

HA

EL

Body Rear End and Opener (Cont'd)

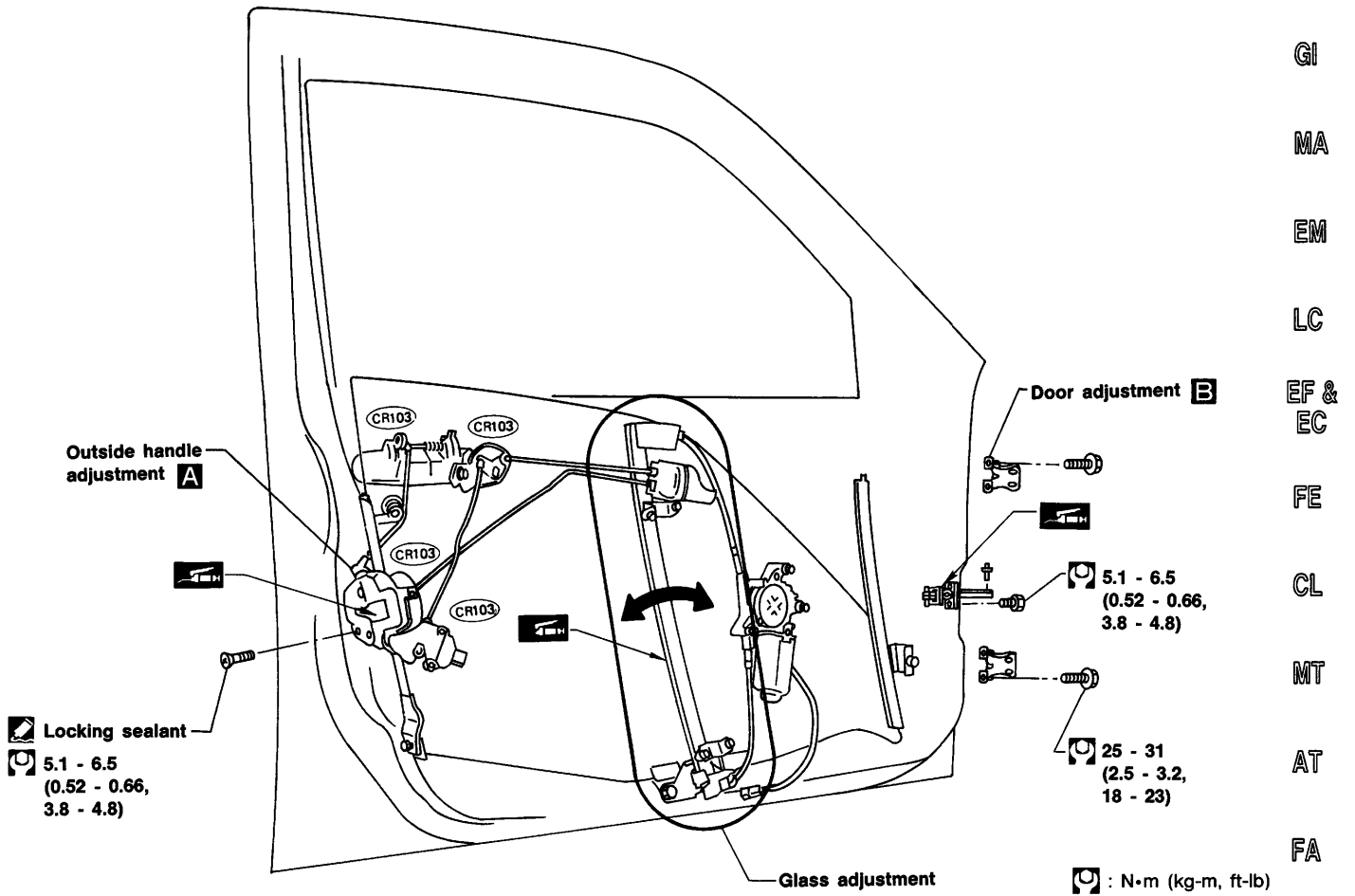
TRUNK LID AND FUEL FILLER LID OPENER/WIRING DIAGRAM



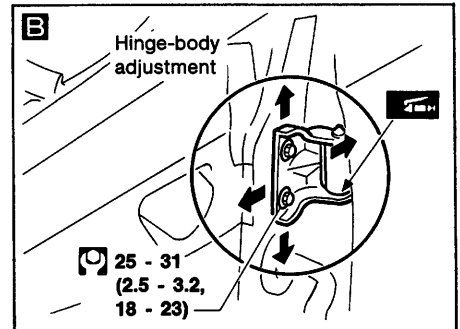
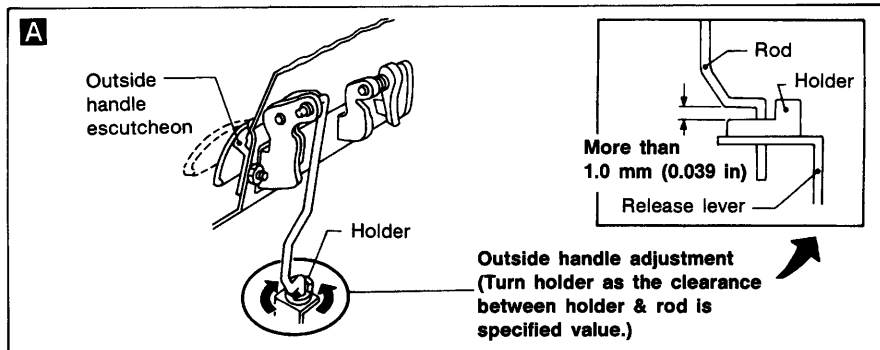
DOOR

Front Door

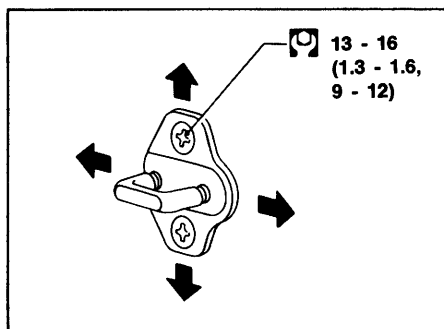
- After adjusting door or door lock, check door lock operation.



Outside handle adjustment

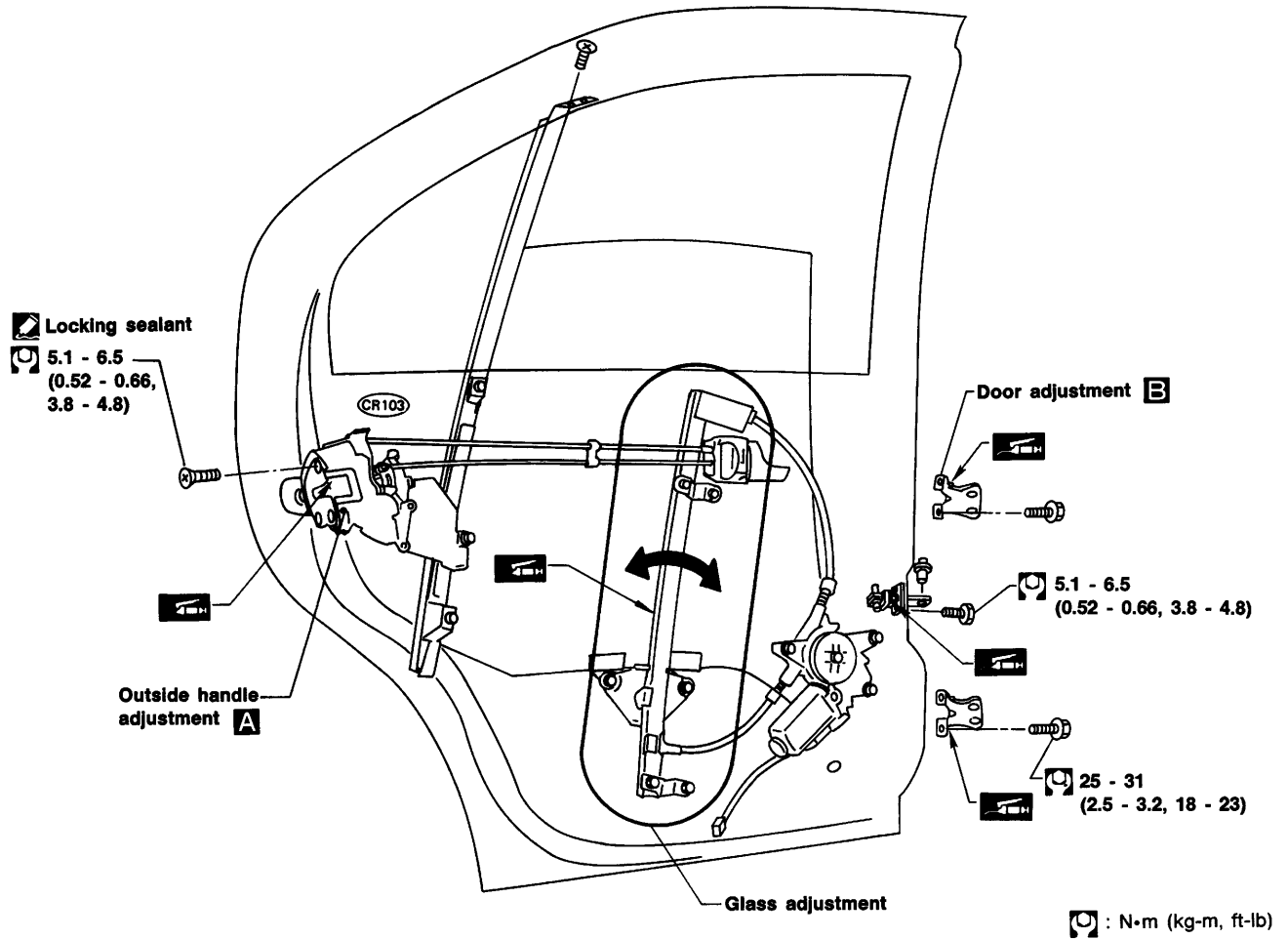


Striker adjustment

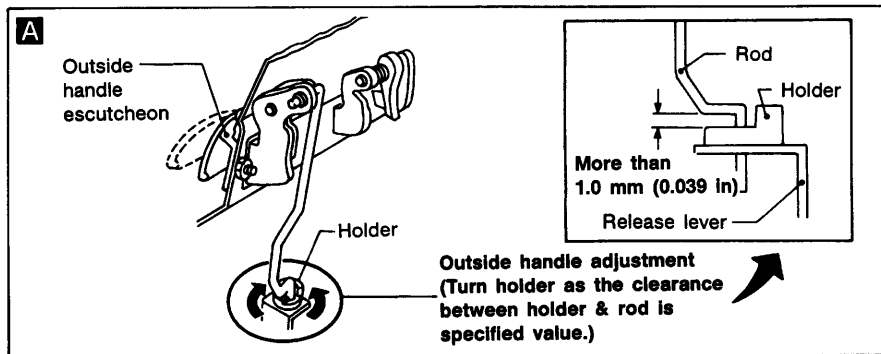


DOOR

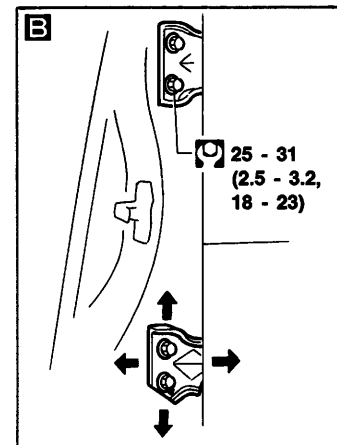
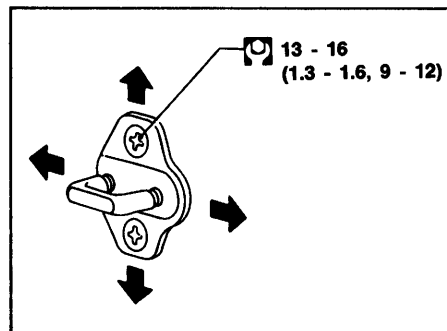
Rear Door



Outside handle adjustment



Striker adjustment

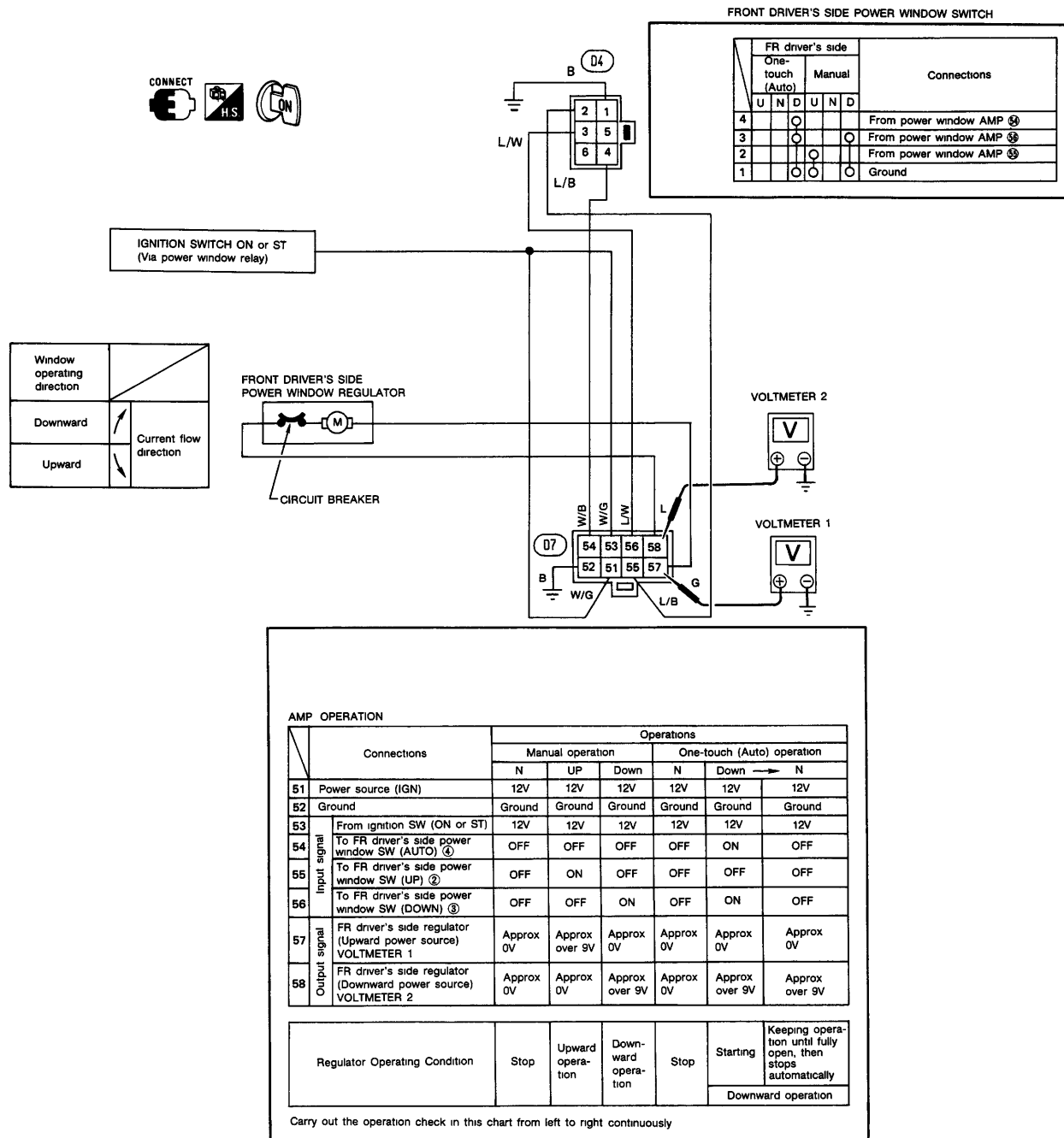


Power Window

POWER WINDOW AMP. INSPECTION

Carry out the inspections below.

- (1) Power source and ground: Battery voltage should exist between terminals ⑤① and ⑤②.
- (2) Input signals: Battery voltage should exist between terminal ⑤③ and ground (IGN "ON" or "ST").
Continuity should exist between terminal ⑤④, ⑤⑤ or ⑤⑥ and ground in "ON" condition, and should not exist in "OFF" condition.
- (3) Output signals: Battery voltage shown in the chart should exist.



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

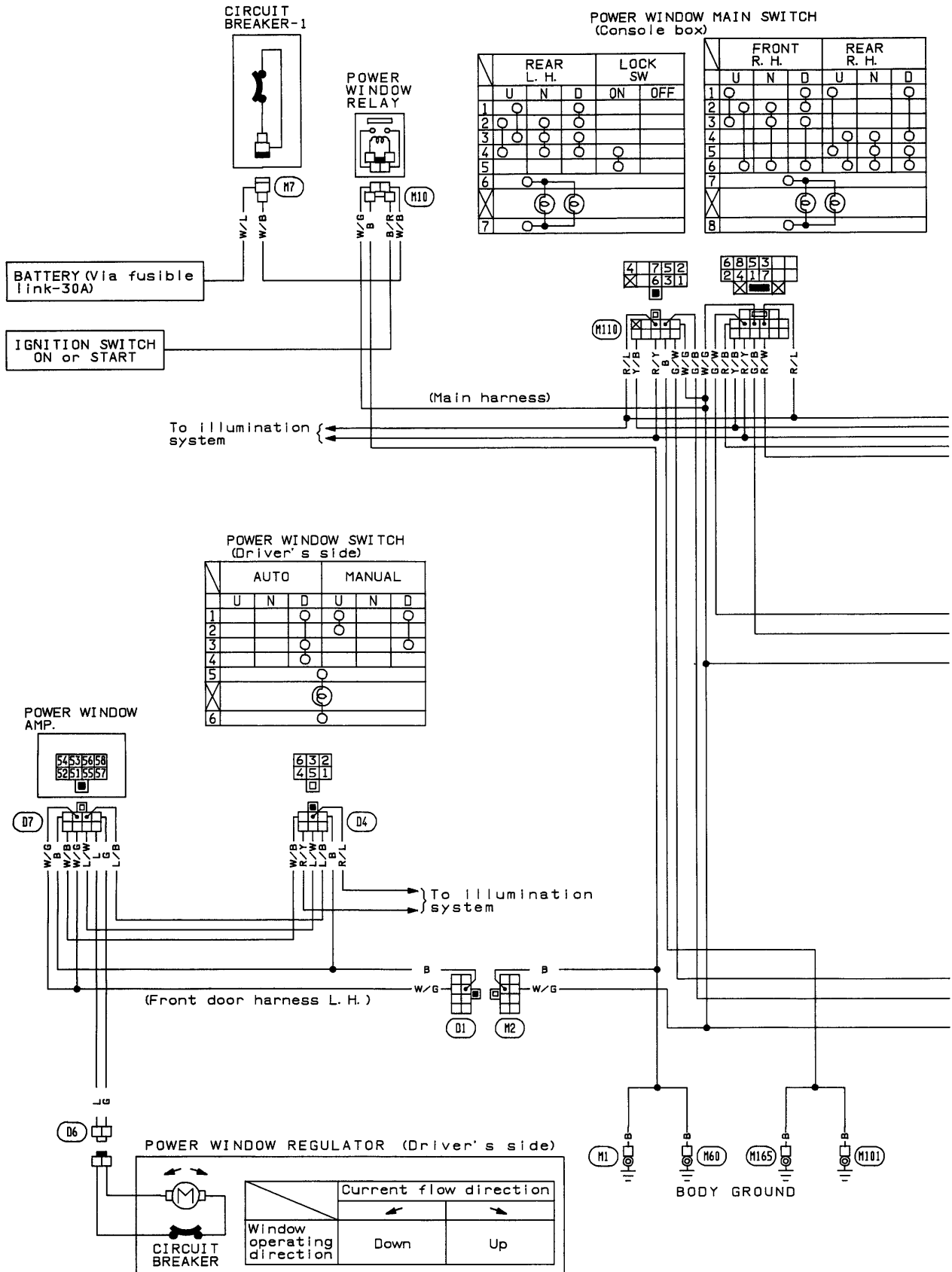
HA

EL

DOOR

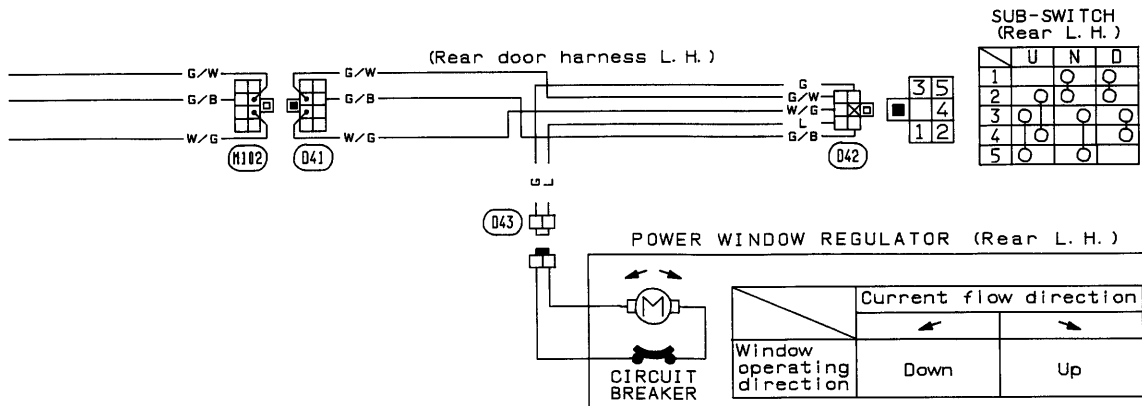
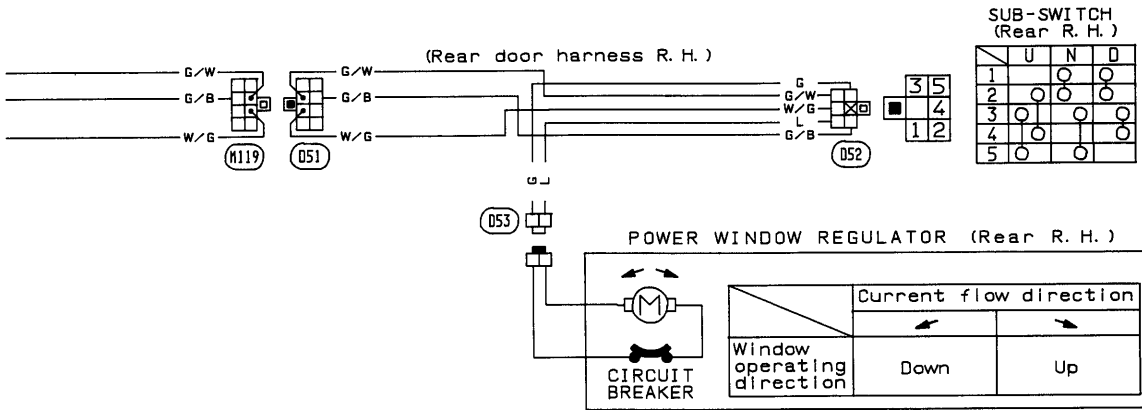
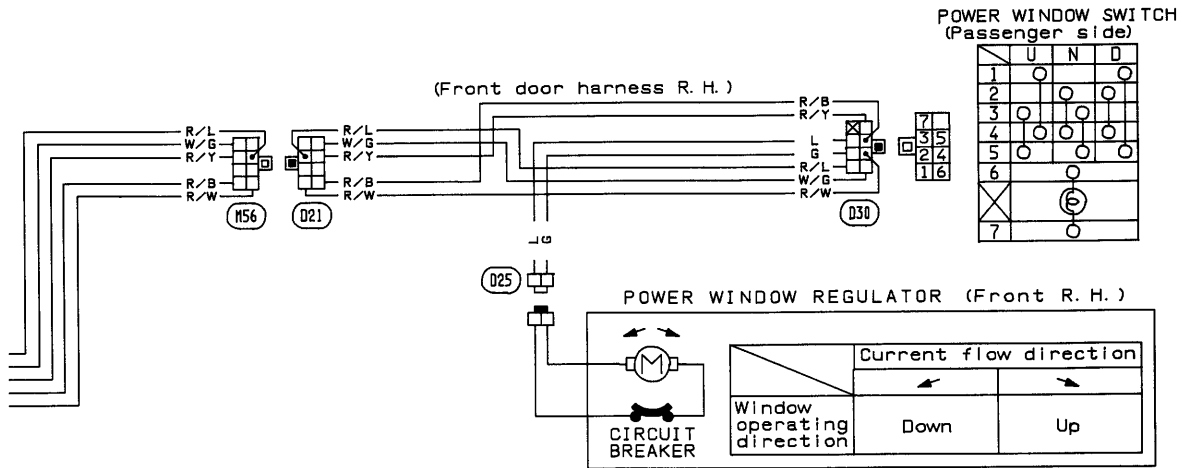
Power Window (Cont'd)

WIRING DIAGRAM



DOOR

Power Window (Cont'd)



KEY SWITCH (E107) R/B Y/R

BATTERY (via fusible link-30A)

S. M. J.
(Refer to last page (Foldout page).)

CIRCUIT BREAKER-1 (M7) W/L W/B

DOOR LOCK TIMER (M61) Y/R G/Y OR/L OR/B OR W/B OR/B LG/B LG

LOCK & UNLOCK SWITCH

DOOR SWITCH (Driver's side) (M103) OR

FRONT DOOR LOCK ACTUATOR (Driver's side)

POSISTOR (Thermal circuit breaker)

LOCK KNOB SWITCH (D8) B OR

DOOR LOCK KEY SWITCH (Driver's side) (D12) G/Y B

BATTERY UN ED

FUSE BLOCK (Refer to "POWER SUPPLY ROUTING" in EL section.) UP (M15)

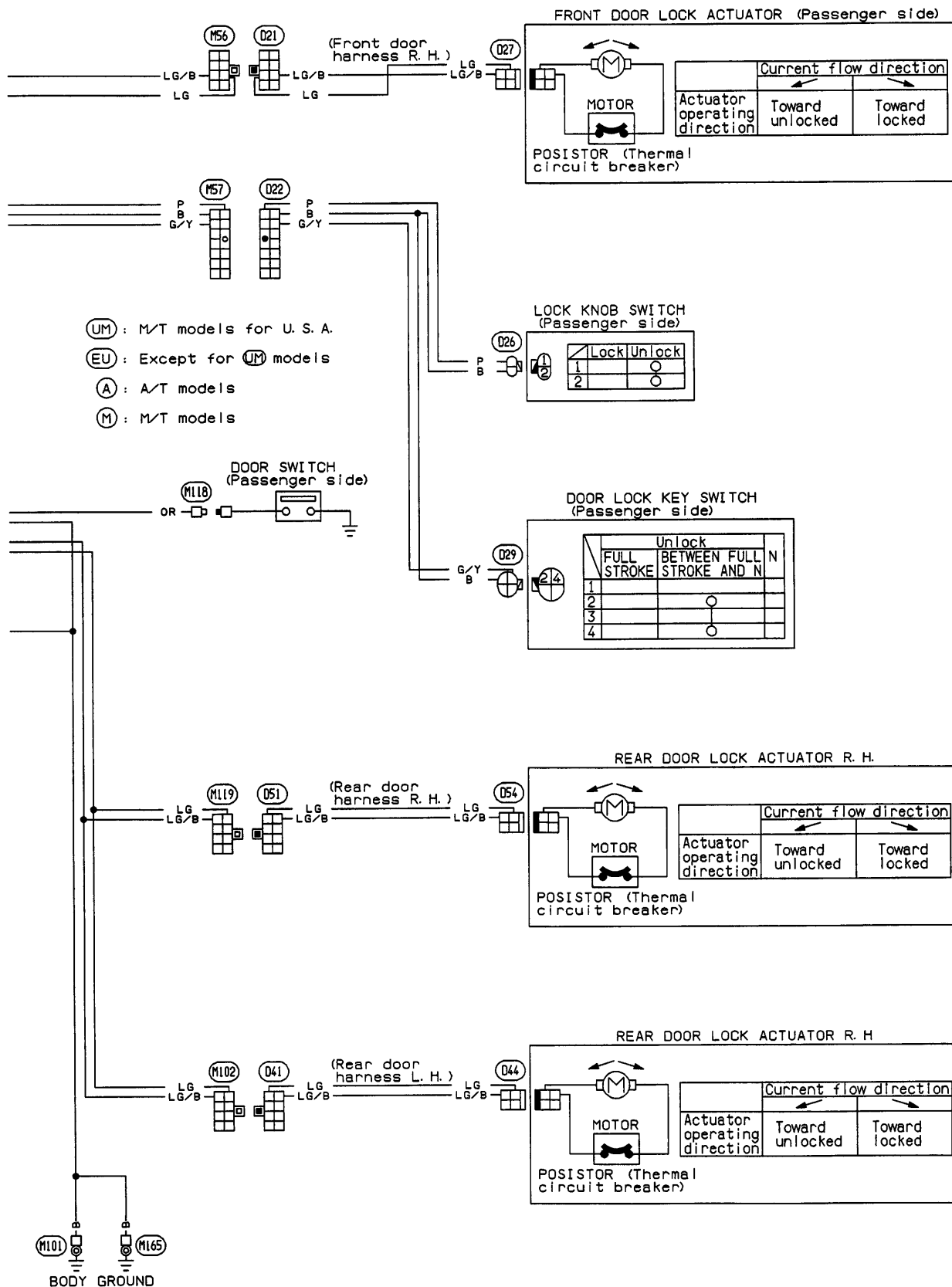
(Main harness)

To illumination system

BODY GROUND (M1, M60)

DOOR

Power Door Lock (Cont'd)



GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

DOOR

Power Door Lock (Cont'd)

DOOR LOCK TIMER INSPECTION

- Carry out the following inspections:

(1) Check power source and ground.

(2) Check input signals.

If the input signal is N.G., check corresponding components.

(3) Check output signals.

If the output signal is O.K., check the door lock actuator.

Lock & unlock operation by lock knob or lock & unlock switch

	Connections		Operations			
			Lock knob switch L.H.	Lock knob switch R.H.	Lock & unlock switch	
			Unlock → Lock	Unlock → Lock	N → Unlock	N → Lock
1	Power source		12V	12V	12V	12V
5	Ground		Ground	Ground	Ground	Ground
7	Input signals	Key switch	Either key switch or door switches are off. (Key is not in the ignition or all doors are closed.)			
4		Door switch				
10		Lock knob switch L.H.	ON (Ground) → OFF (Open)	—	—	—
9		Lock knob switch R.H.	—	ON (Ground) → OFF (Open)	—	—
14		Door lock key switch	—	—	—	—
16		Lock & unlock switch (Lock)	—	—	—	OFF (Open) → ON (Ground)
15		Lock & unlock switch (Unlock)	—	—	OFF (Open) → ON (Ground)	—
2	Output signals	Door lock actuator (Lock power source)	0V → 12V → 0V (Approx. 1.0 sec.)	0V → 12V → 0V (Approx. 1.0 sec.)	0V	0V → 12V → 0V (Approx. 1.0 sec.)
3		Door lock actuator (Unlock power source)	0V	0V	0V → 12V → 0V (Approx. 1.0 sec.)	0V

- The voltage values are approximate.

DOOR

Power Door Lock (Cont'd)

Unlock operation by door lock key switch

	Connections		Operations			
			Door lock key switch L.H.			
			N → Unlock → N → Unlock		Unlock → Lock	
1	Power source		12V	12V	12V	GI
5	Ground		Ground	Ground	Ground	MA
7	Input signal	Key switch	Either key switch or door switches are off.			EM
4		Door switch	(Key is not in the ignition or all doors are closed.)			
10		Lock knob switch L.H.	—	—	ON (Ground) → OFF (Open)	LC
9		Lock knob switch R.H.	—	—	—	EF & EC
14		Door lock key switch	OFF → ON → OFF → ON → OFF (Open) (Ground) (Open) (Ground) (Open)		OFF (Open)	FE
16		Lock & unlock switch	—	—	—	CL
15		Lock & unlock switch	—	—	—	MT
2	Output signal	Door lock actuator (Lock power source)	0V	0V	0V → 12V → 0V (Approx. 1.0 sec.)	AT
3		Door lock actuator (Unlock power source)	0V	0V → 12V → 0V (Approx. 1.0 sec.)	0V	FA

- The second unlock signal of door lock key switch is counted when it is within approximately 4 seconds of the first signal.
- Lock operation by key is mechanically transmitted to the lock knob switch.
- Operation of door lock key switch R.H. is the same as L.H.

Key reminder operation

	Connections		Operations		FA
			Lock knob switch L.H.	Lock & unlock switch	RA
			Unlock → Lock → Automati- cally Unlocked	N → Lock (Automatically Unlocked)	
1	Power source		12V	12V	BR
5	Ground		0V	0V	
7	Input signal	Key switch	ON (12V) — Key is in the ignition.		ST
4		Door switch	ON (Ground) — Door is open.		
10		Lock knob switch L.H.	ON → OFF → ON (Ground) (Open) (Ground)	—	BF
9		Lock knob switch R.H.	—	—	
14		Door lock key switch	—	—	HA
16		Lock & unlock switch (Lock)	—	OFF → ON → OFF (Open) (Ground) (Open)	
15		Lock & unlock switch	—	—	EL
2	Output signal	Door lock actuator (Lock power source)	0V → 12V → 0V (Approx. 0.3 sec.)	0V → 12V → 0V (Approx. 0.3 sec.)	
3		Door lock actuator (Unlock power source)	0V → 12V → 0V (Approx. 1.4 sec.)	0V → 12V → 0V (Approx. 1.4 sec.)	

- Operation of lock knob switch R.H. is the same as L.H.

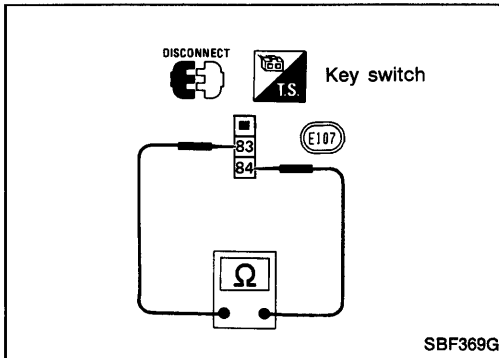
DOOR

Power Door Lock (Cont'd)

ELECTRICAL COMPONENTS INSPECTION

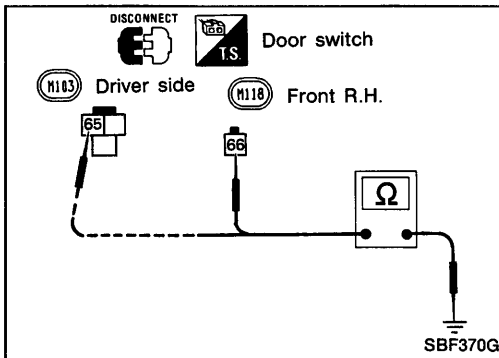
Key switch

Terminals	Condition	Continuity
③ - ④	Key is in the ignition.	Yes
	Key is not in the ignition.	No



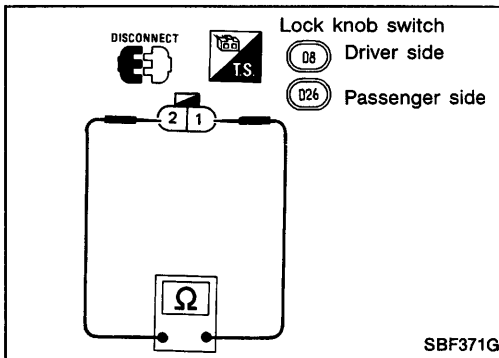
Door switch

	Terminals	Condition	Continuity
Driver side	⑤ - Ground	Door is closed.	No
		Door is open.	Yes
Front R.H.	⑥ - Ground	Door is closed.	No
		Door is open.	Yes



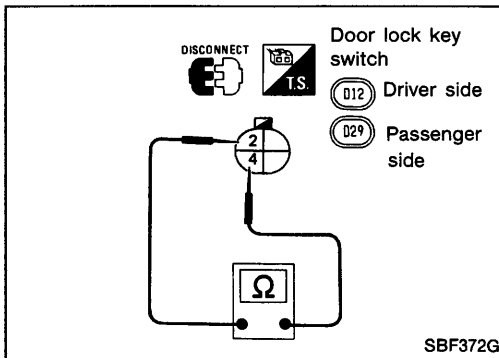
Lock knob switch

Terminals	Condition	Continuity
① - ②	Lock	No
	Unlock	Yes



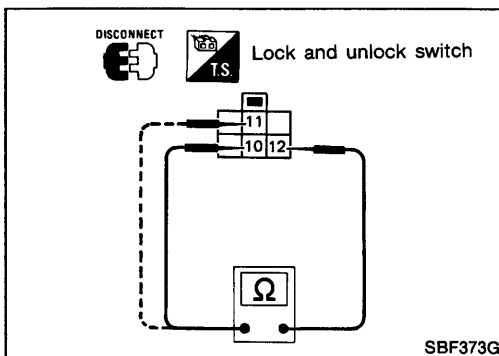
Door unlock key switch

Terminals	Operation	Continuity
② - ④	Key is turned toward unlock	Yes
	Except above	No



Lock and unlock switch

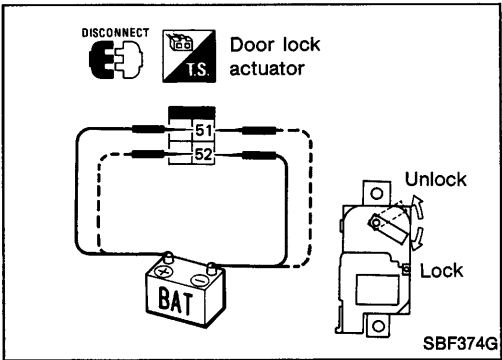
Terminals	Operation	Continuity
⑩ - ⑫	Lock	Yes
	Neutral and unlock	No
⑪ - ⑫	Unlock	Yes
	Neutral and unlock	no



DOOR

Power Door Lock (Cont'd)

Door lock actuator



Terminals		Operation
⊕	⊖	
51	52	Lock
52	51	Unlock

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

INSTRUMENT PANEL

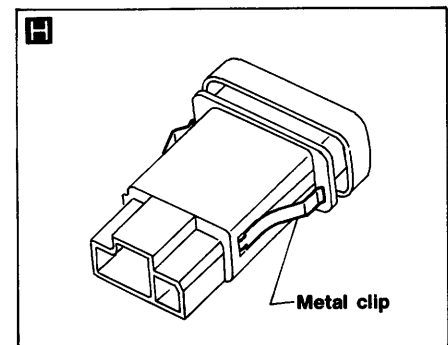
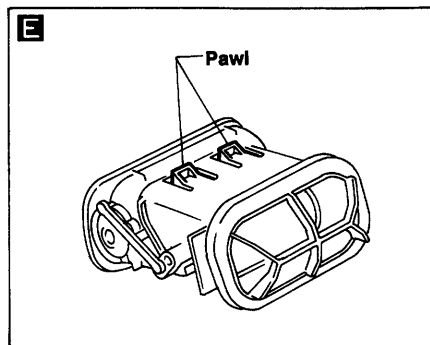
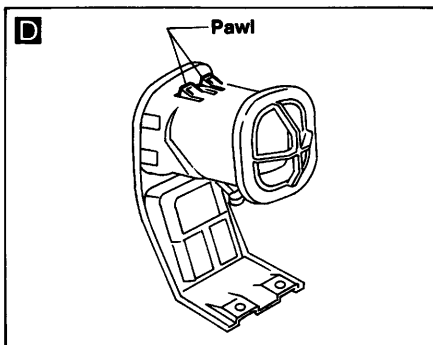
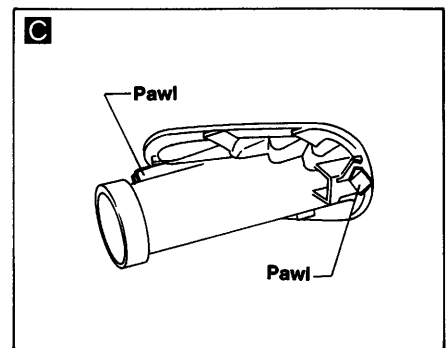
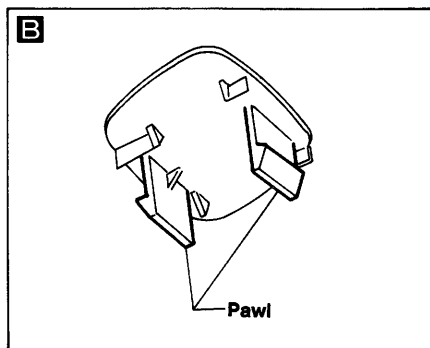
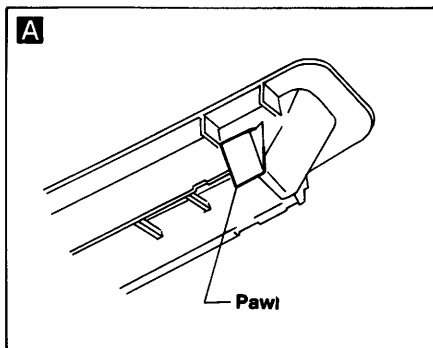
REMOVAL — Instrument panel assembly

Pay attention so as not to scratch the parts (plastic). During installation, fit the ducting parts precisely.

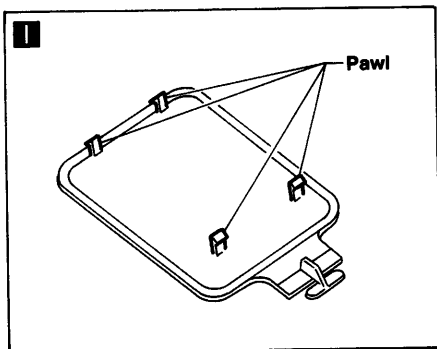
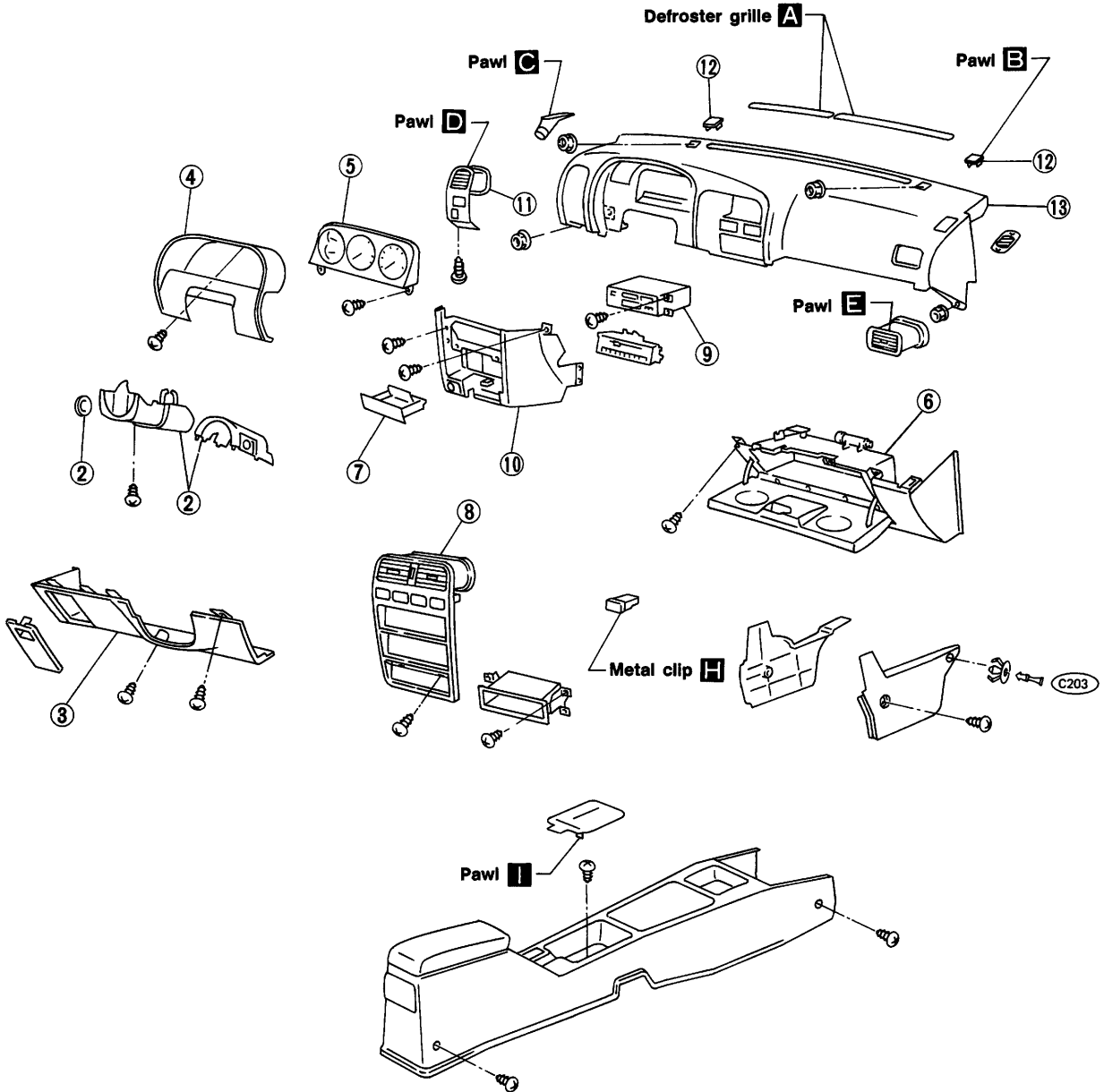
- ① Remove steering wheel. Refer to ST section "STEERING WHEEL AND STEERING COLUMN".
- ② Remove lower and upper column covers and key escutcheon.
- ③ Remove driver's side lower instrument panel.
- ④ Remove cluster A.
- ⑤ Remove meters.
Remove meter harness connector.
- ⑥ Remove glove box.
Remove clip if a damper is attached.
Remove glove box lamp harness connector.
- ⑦ Remove ashtray inner case.
- ⑧ Remove cluster C.
Remove switch harness.
- ⑨ Remove audio system parts.
Remove setting screw on audio bracket to instrument stay.
Remove audio harness.
Remove antenna feeder.
Remove pocket deck.
- ⑩ Remove center lower instrument panel.
Remove heater control unit.
Remove cigarette lighter harness.
- ⑪ Remove ventilator on the driver's side.
Remove switch harness.
- ⑫ Remove mask instrument R.H./L.H.
- ⑬ Remove instrument panel.

INSTALLATION

Reverse the procedures described above.



INSTRUMENT PANEL



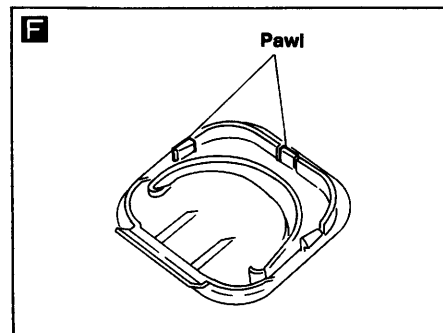
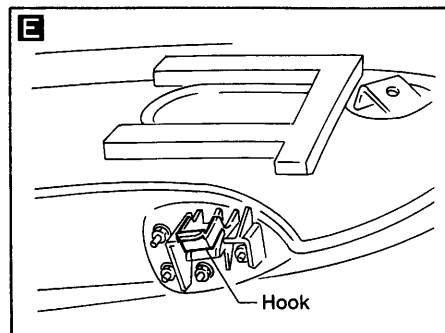
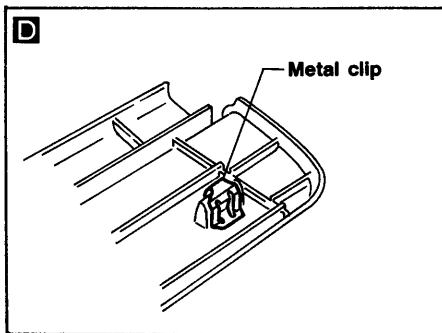
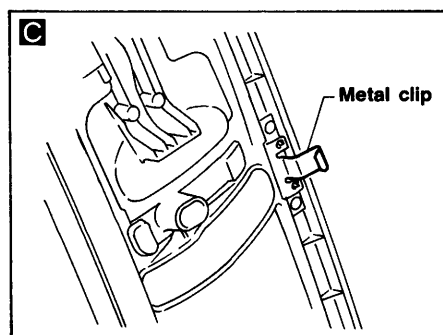
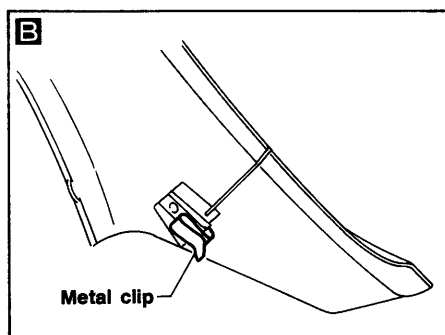
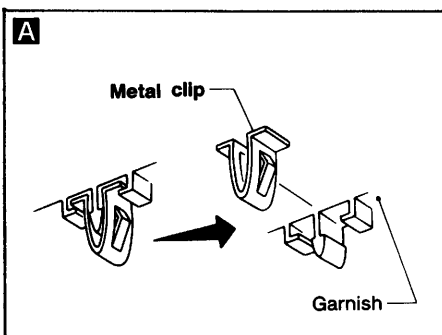
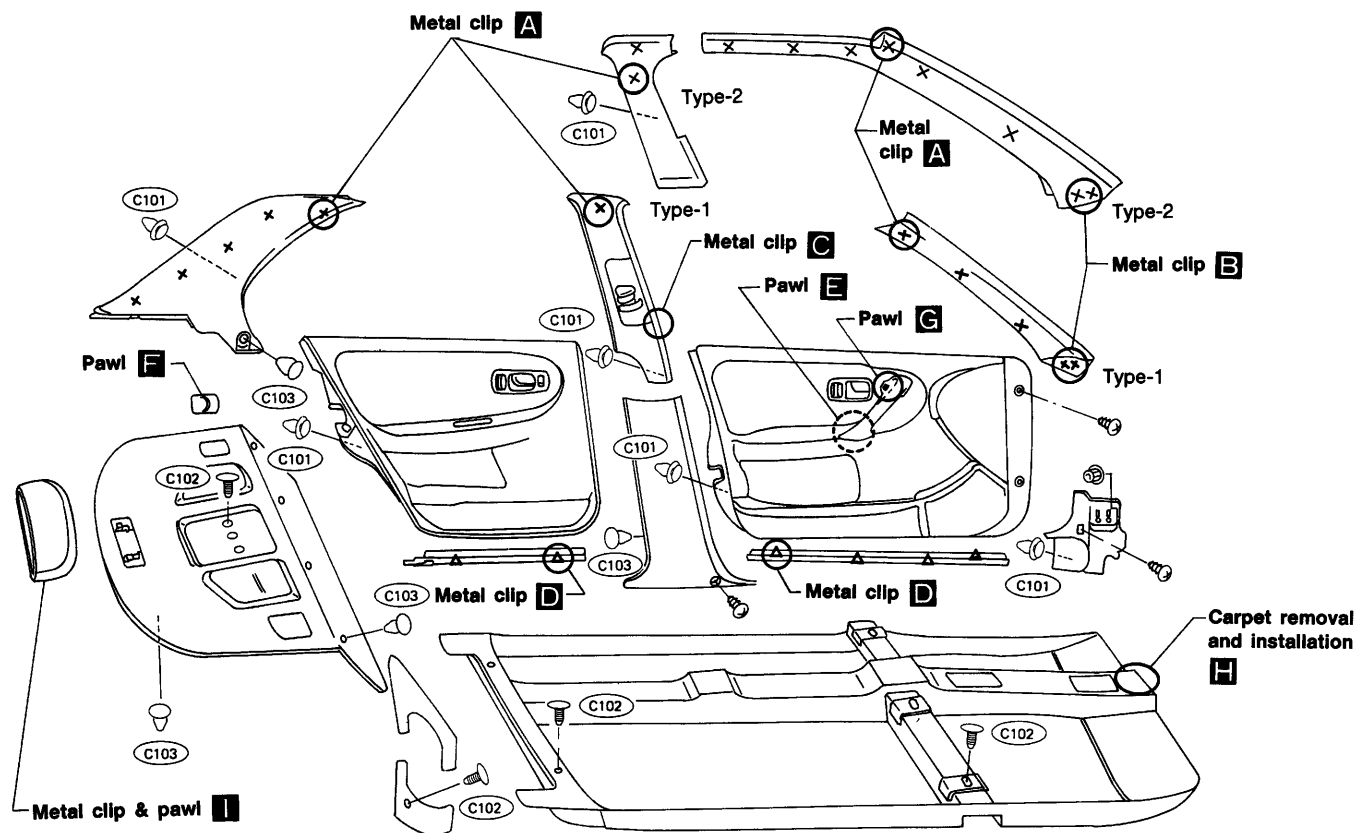
GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

Interior

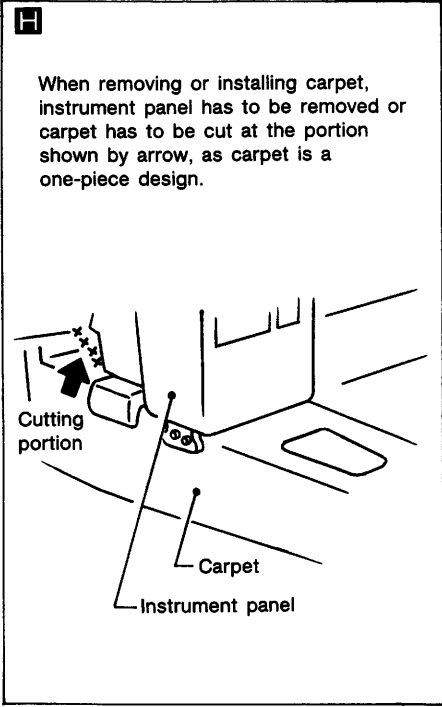
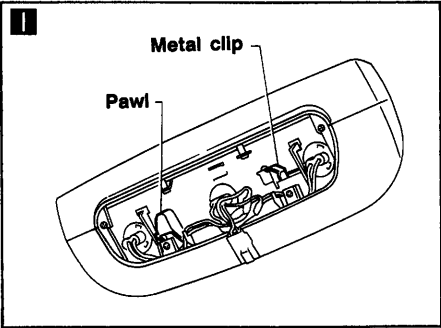
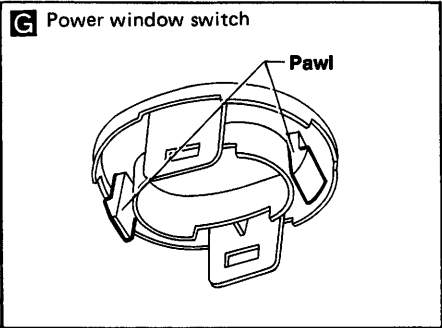
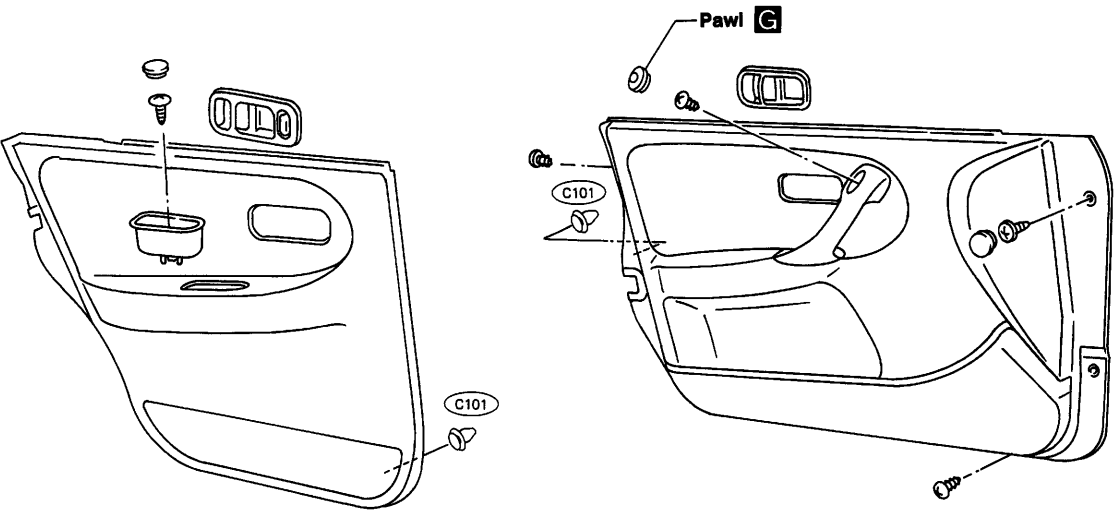
SIDE AND FLOOR TRIM — Passenger room

CAUTION:

- Be sure to remove front, center and rear pillar garnishes by pulling them straight out. Use a long flat-bladed screwdriver when removing metal clips from rear pillar garnish **A**.
- Wrap the tip of flat-bladed screwdriver with a cloth when removing metal clips from garnishes.



INTERIOR AND EXTERIOR
Interior (Cont'd)



GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

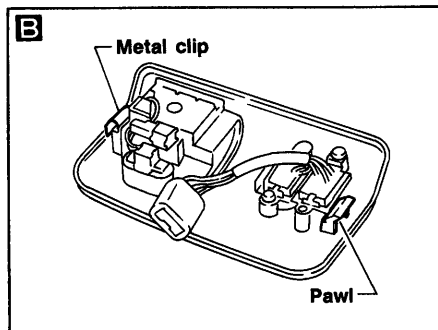
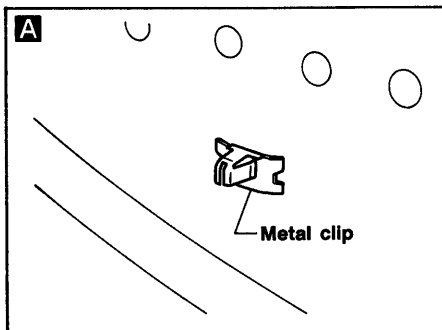
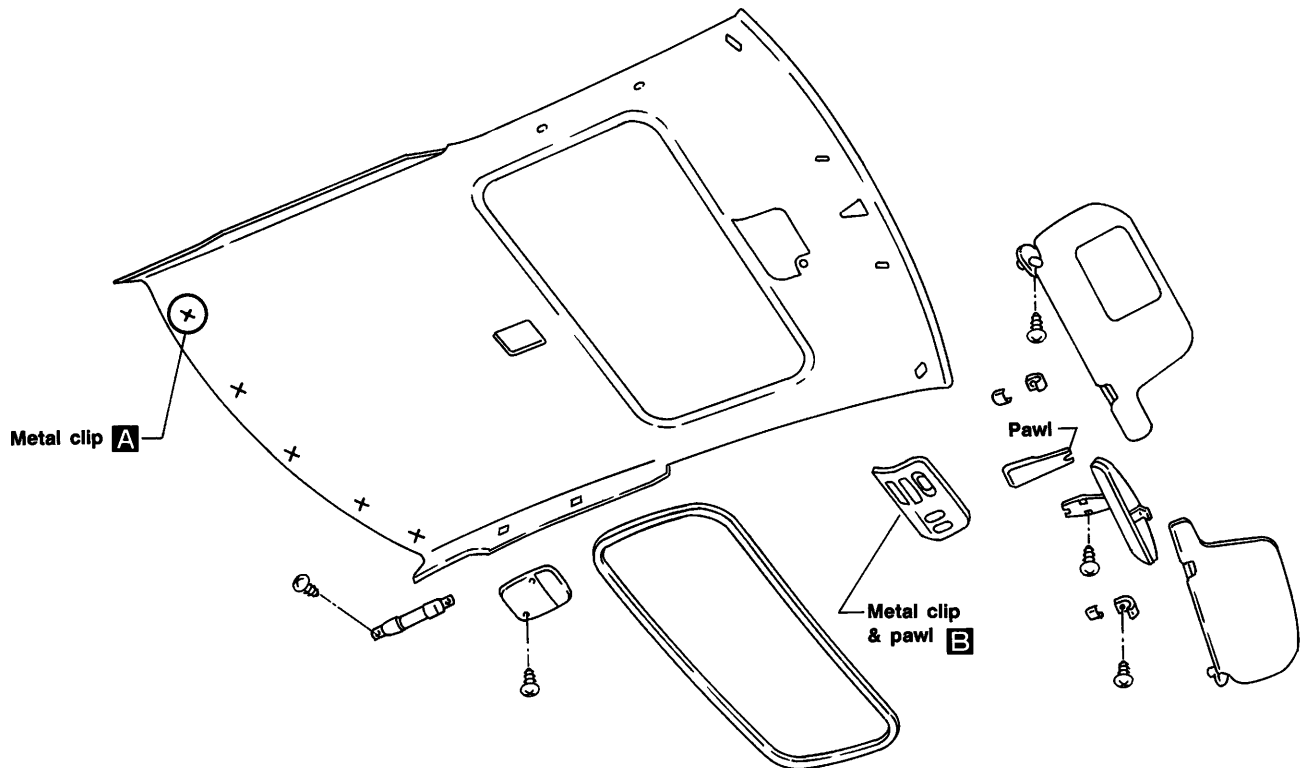
INTERIOR AND EXTERIOR

Interior (Cont'd)

ROOF TRIM

Removal — headlining cloth

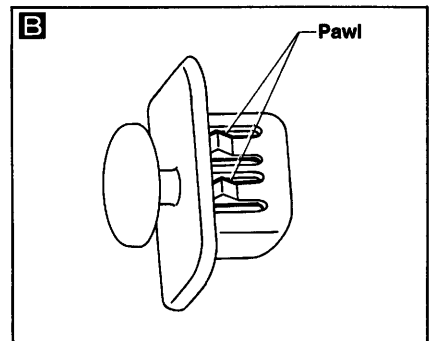
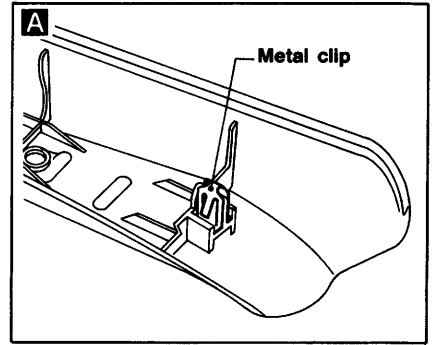
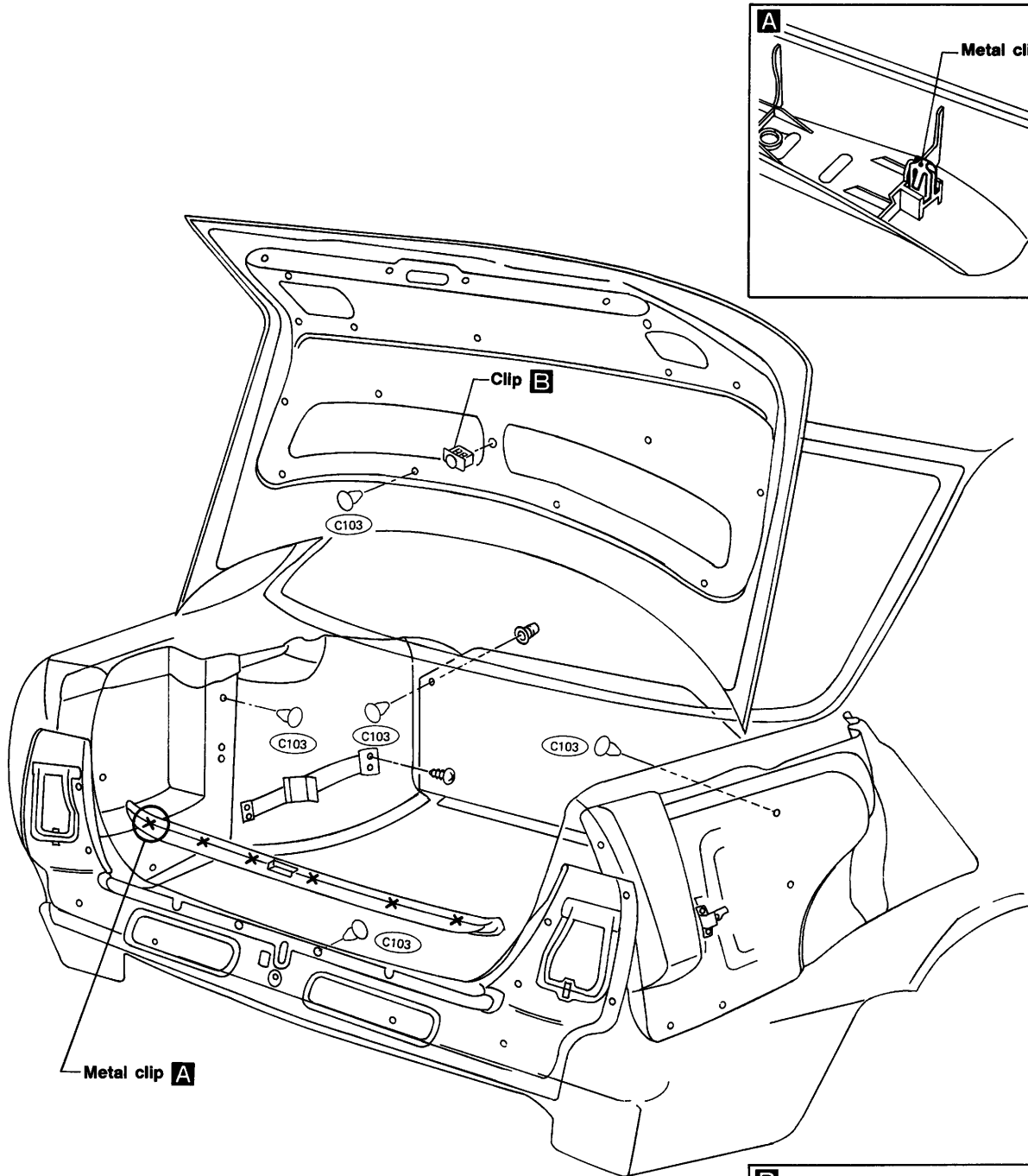
- Fully recline both front seats for easy access. Remove headlining through front passenger door.
- 1. Remove sunvisor, assist straps, room lamps and inside mirror.
- 2. Remove body side welts.
- 3. Remove front pillar garnishes, center pillar garnishes, rear quarter garnishes and roof finishers.
- 4. Remove clips and headlining cloth.



INTERIOR AND EXTERIOR

Interior (Cont'd)

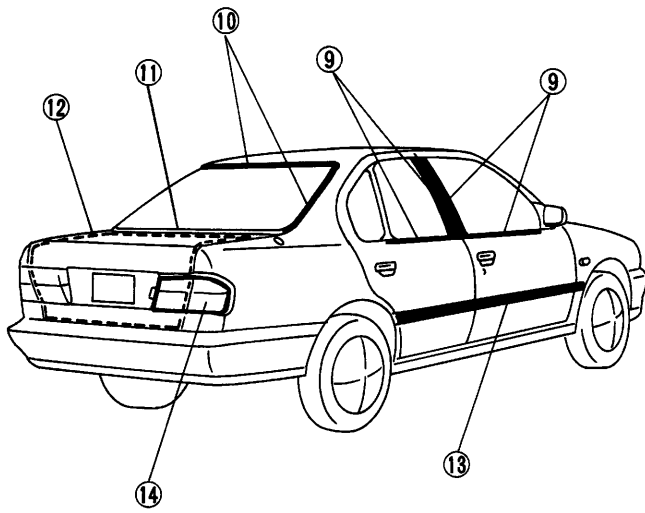
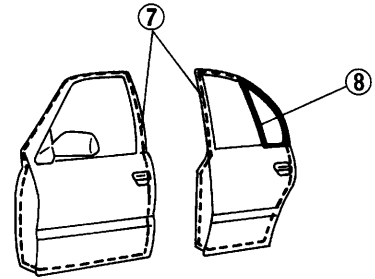
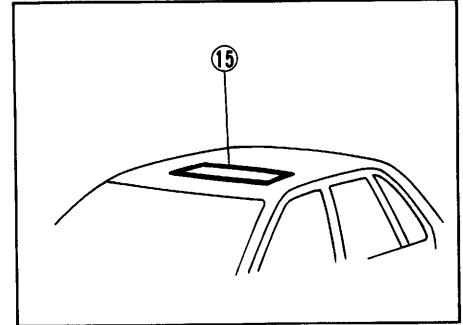
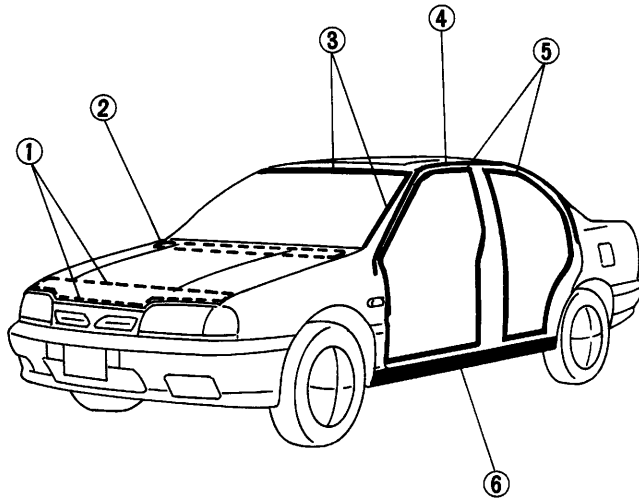
LUGGAGE COMPARTMENT TRIM



GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

INTERIOR AND EXTERIOR

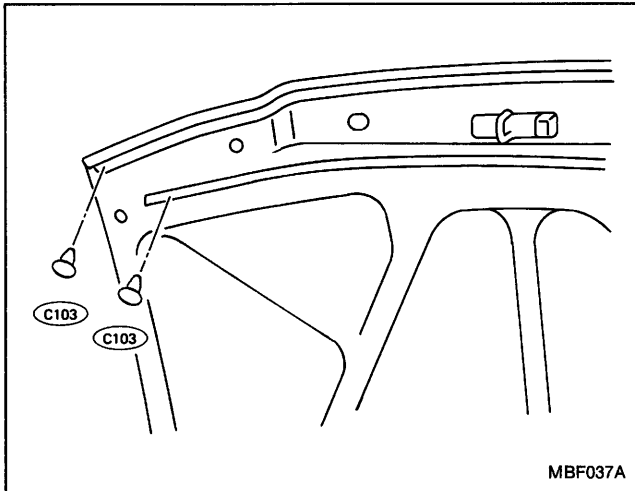
Exterior



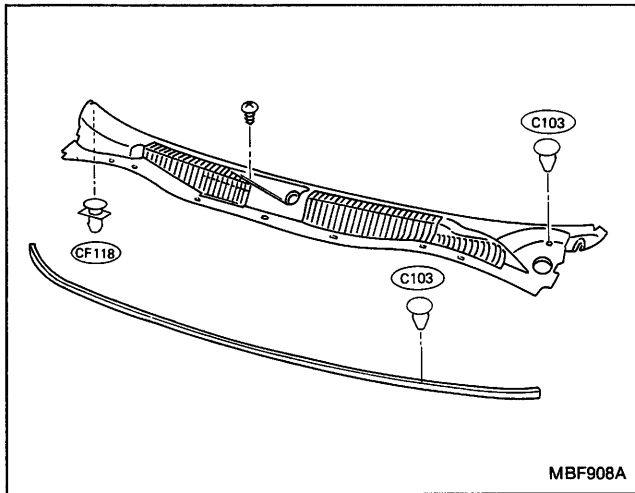
INTERIOR AND EXTERIOR

Exterior (Cont'd)

① Hood front seal



② Cowl top seal and cowl top grille

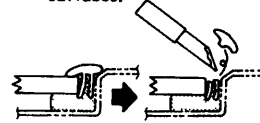


③ Windshield upper molding and side molding

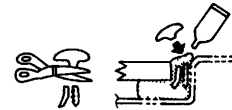
● Upper molding

Method 1

Cut off top portion of molding and clean glass and panel surfaces.



Apply sealant to top portion of molding.



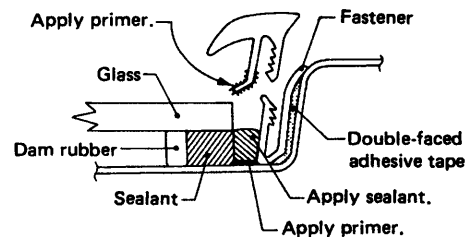
Cut off lower portion of new molding.



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 to body panel, and apply primer to molding and body.



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.

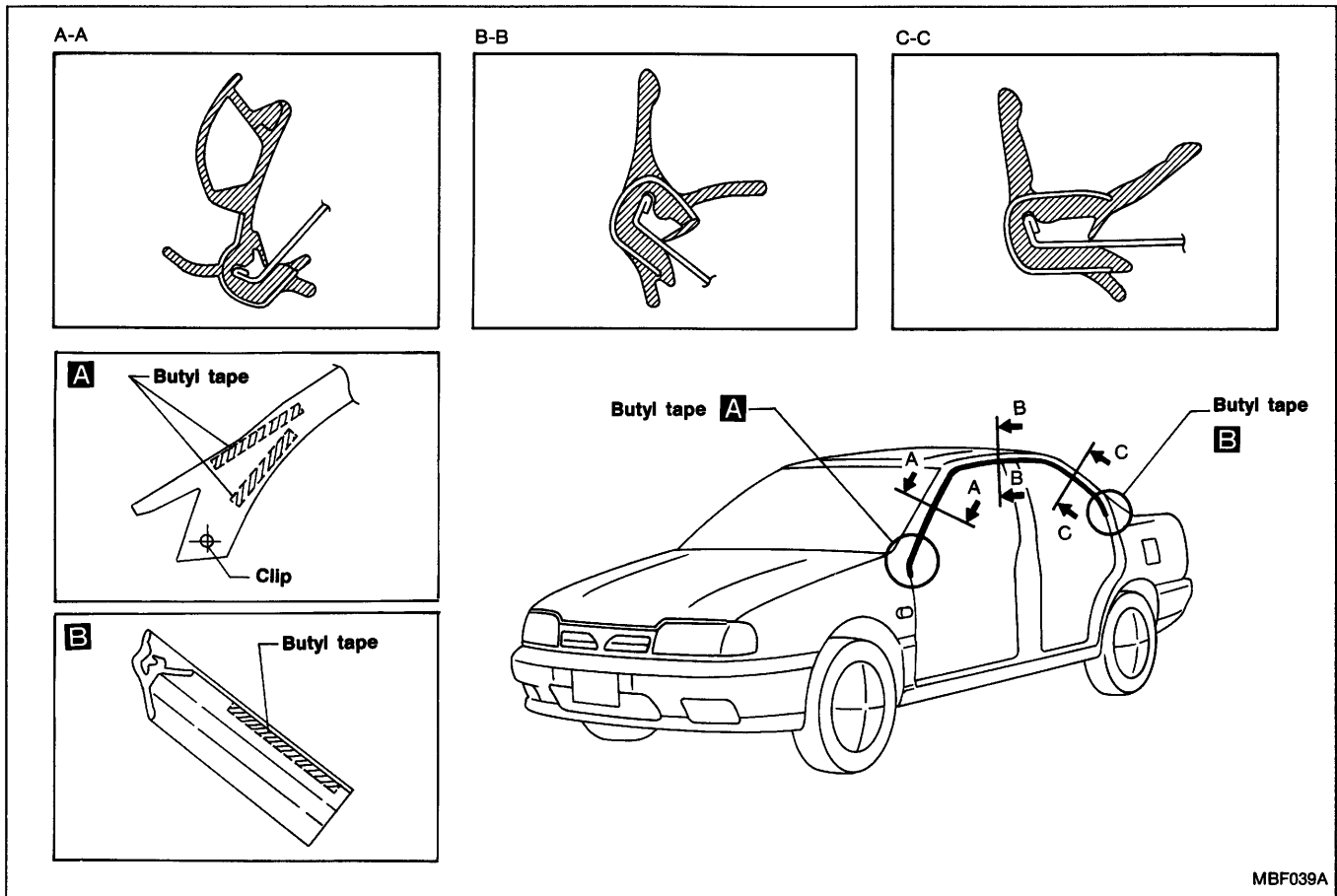
SBF161E

● Side molding Mounted with screws

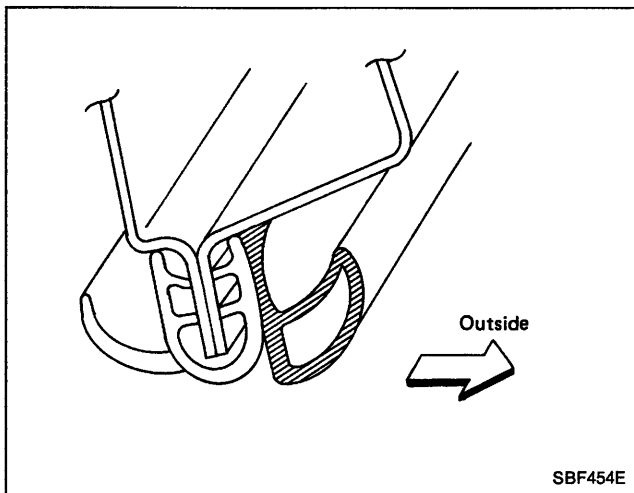
INTERIOR AND EXTERIOR

Exterior (Cont'd)

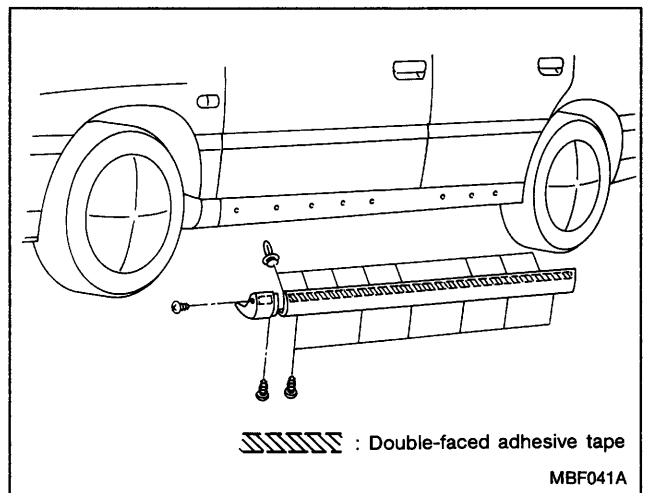
④ Drip molding and opera window lower molding



⑤ Body side welt



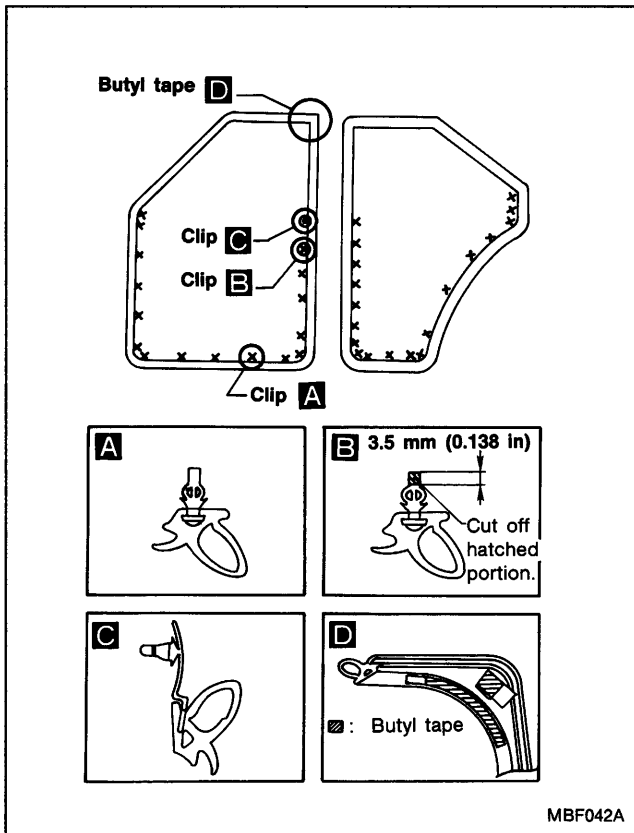
⑥ Center mudguard



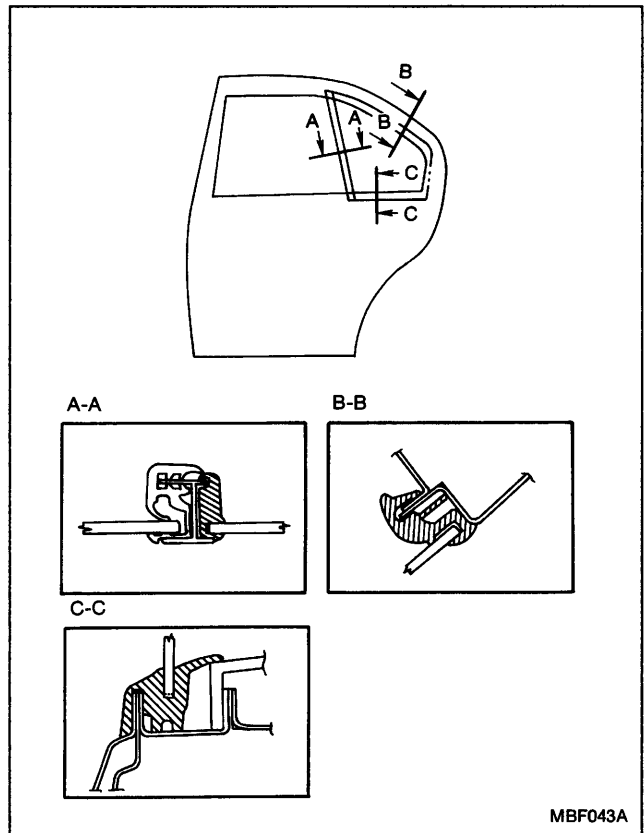
INTERIOR AND EXTERIOR

Exterior (Cont'd)

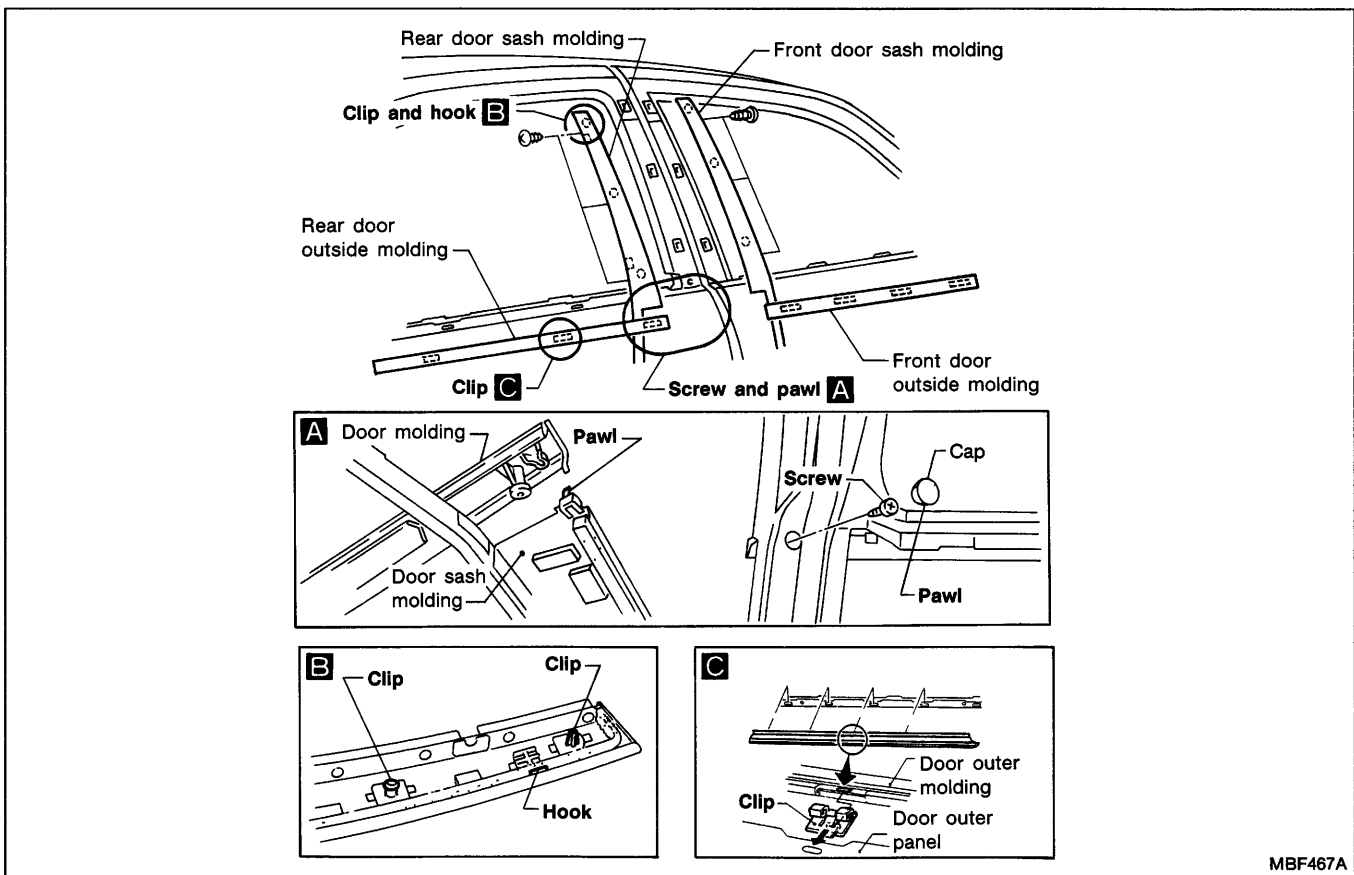
⑦ Door weatherstrip



⑧ Rear door partition weatherstrip



⑨ Door outside molding and door sash molding



INTERIOR AND EXTERIOR

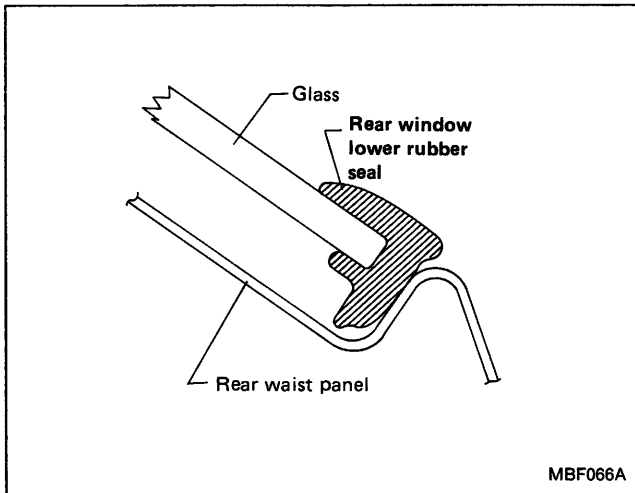
Exterior (Cont'd)

⑩ Rear window upper molding and side molding (Sedan)

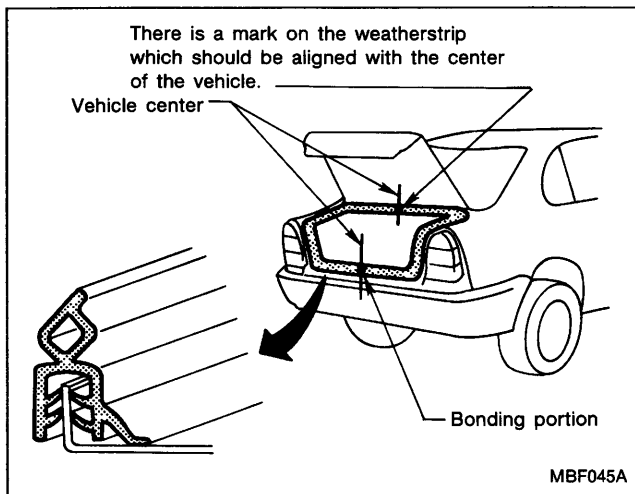
Basically the same as windshield upper molding and side molding.

Refer to ③ Windshield upper molding and side molding.

⑪ Rear window lower rubber seal (Sedan)



⑫ Trunk lid weatherstrip (Sedan)



⑬ Side guard molding

A legend showing a cross-hatched pattern followed by the text ': Double-faced adhesive tape'.

- **Removal:**
 1. Heat molding portion to 30 to 40°C (86 to 104°F) with a heat gun.

A line drawing showing a hand holding a heat gun, directing the heat beam at a molding strip on a car body. The label 'Heat gun' is placed near the device.

SBF455A

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.

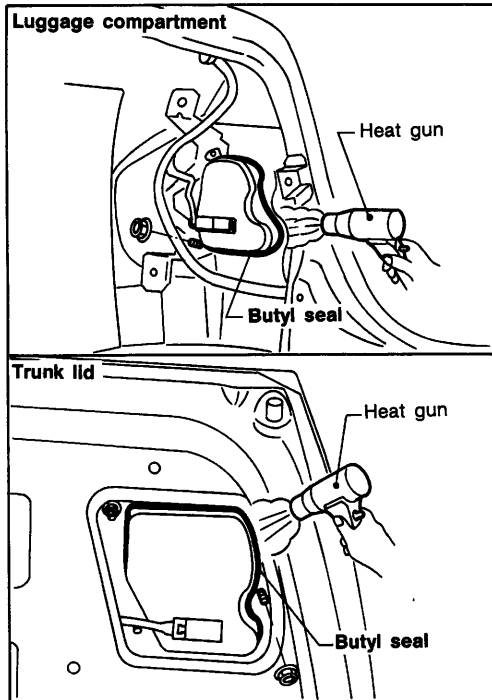
MBF047A

INTERIOR AND EXTERIOR

Exterior (Cont'd)

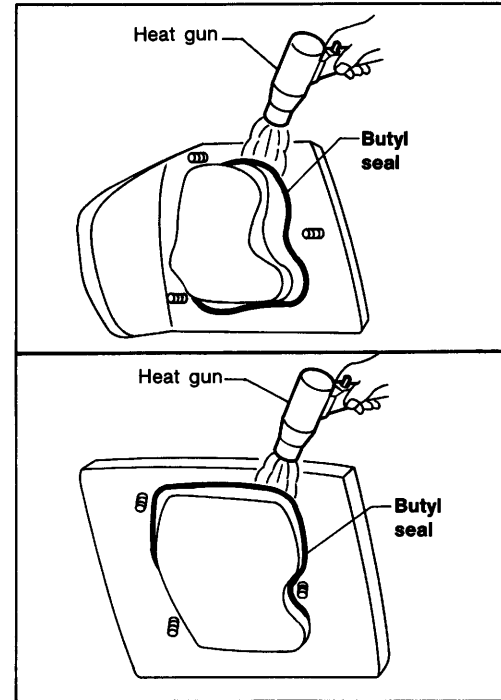
14 Rear combination lamp (Sedan)

Removal



- Warm up lamp assembly area to temperature of a little below 60°C (140°F).

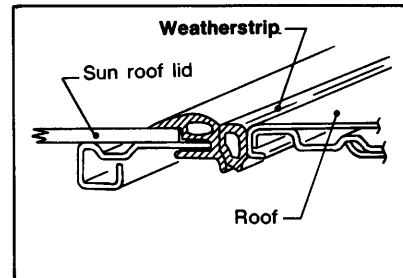
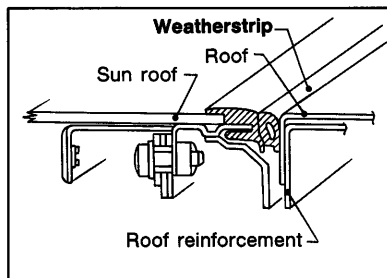
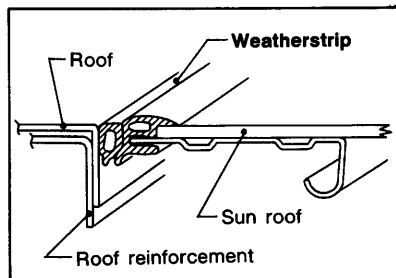
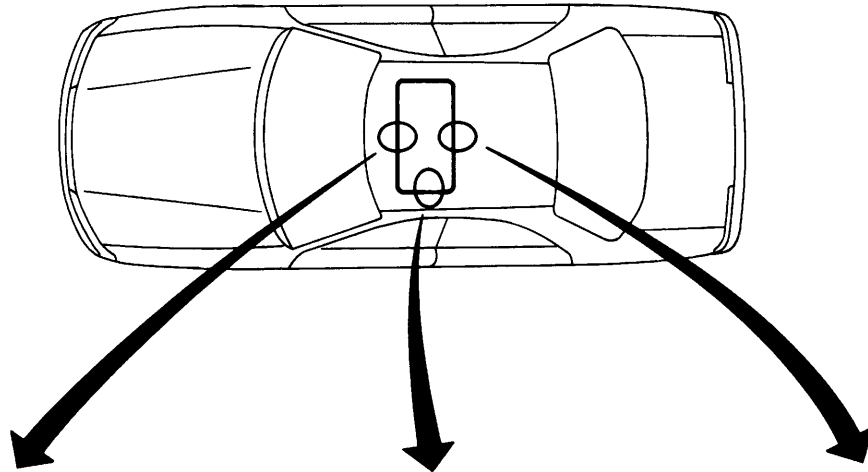
Installation



- Apply butyl seal evenly as it tends to become thin in the corners.
- Warm up lamp assembly area to temperature of a little below 60°C (140°F).

MBF050A

15 Sun roof lid weatherstrip

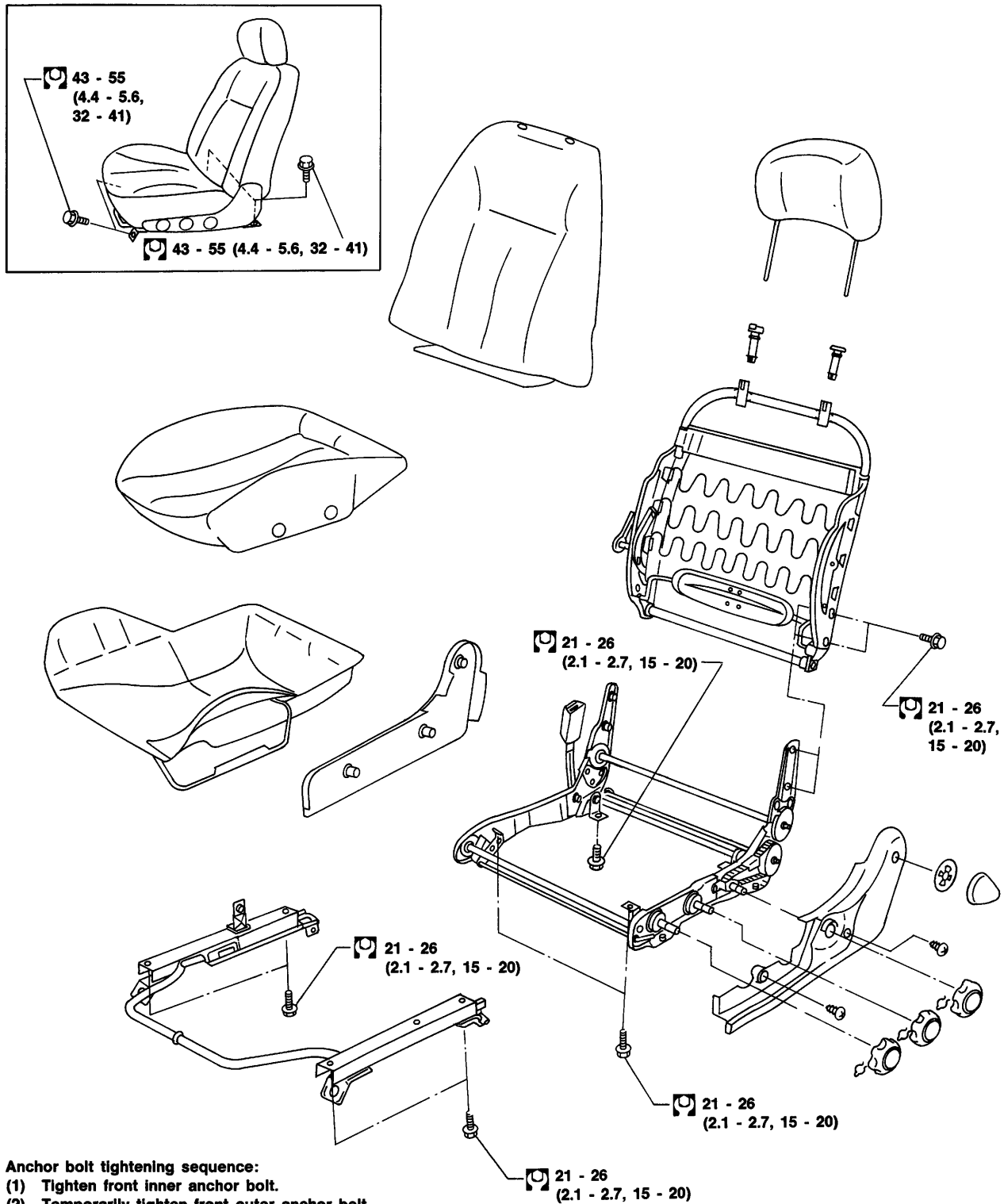


MBF052A

SEAT

- When removing or installing the seat trim, carefully handle it to keep dirt out and avoid damage.

Front Seat

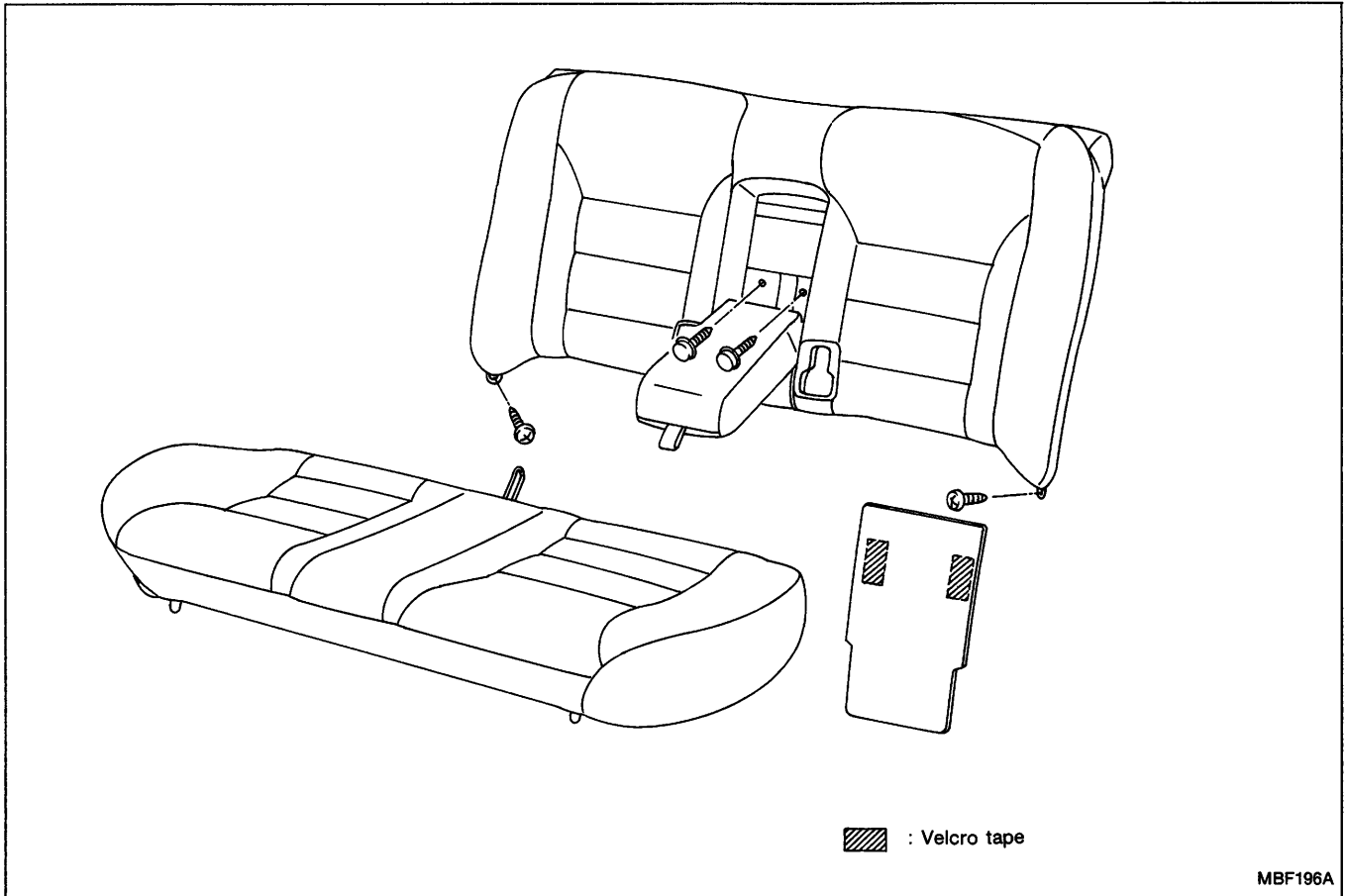


Anchor bolt tightening sequence:

- (1) Tighten front inner anchor bolt.
- (2) Temporarily tighten front outer anchor bolt.
- (3) Tighten rear inner anchor bolt.
- (4) Tighten rear outer anchor bolt.
- (5) Tighten front outer anchor bolt.

 : N•m (kg-m, ft-lb)

Rear Seat



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

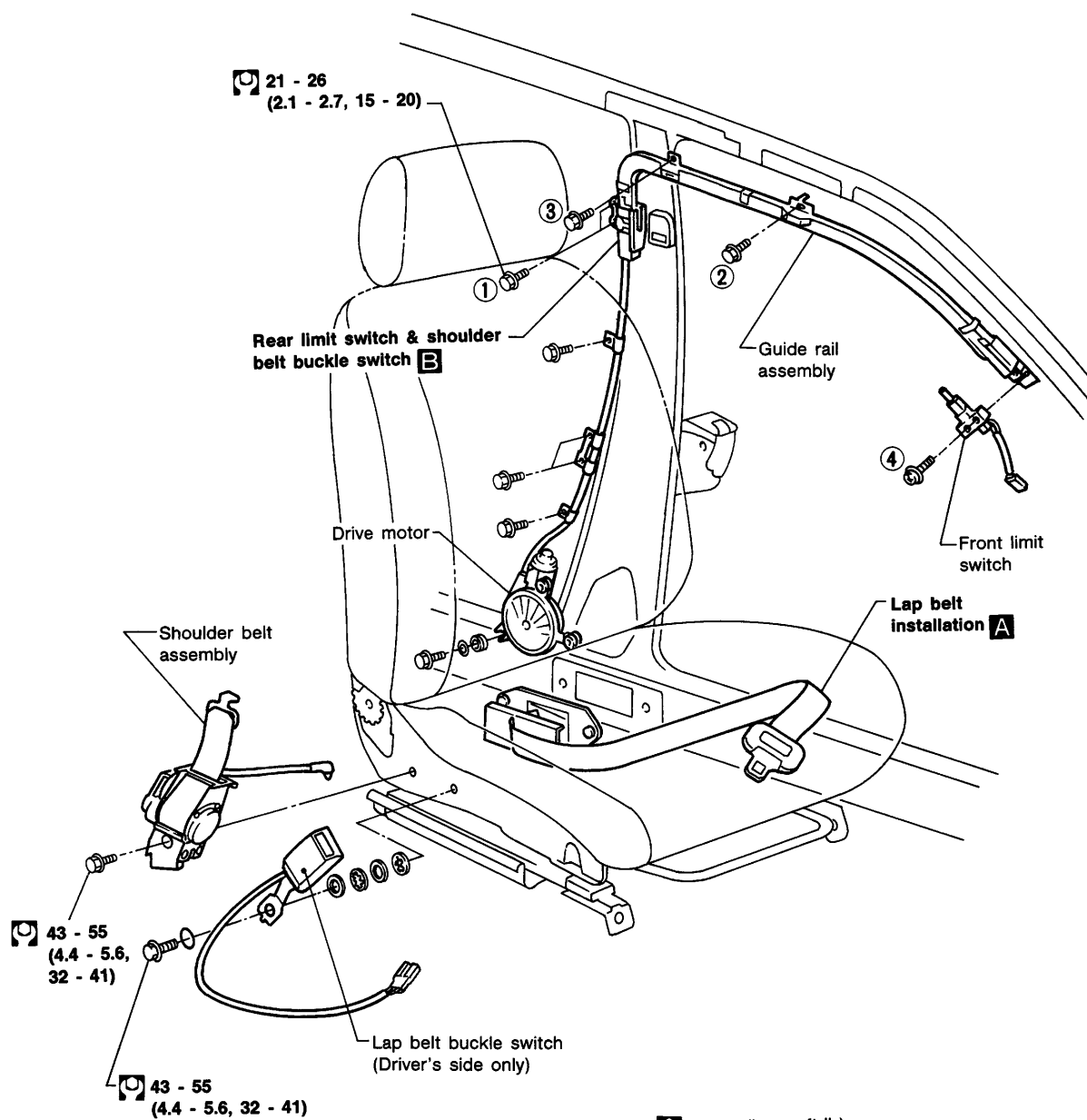
BF

HA

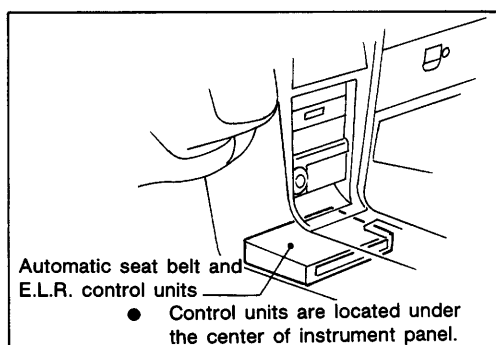
EL

2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM

Unit Location



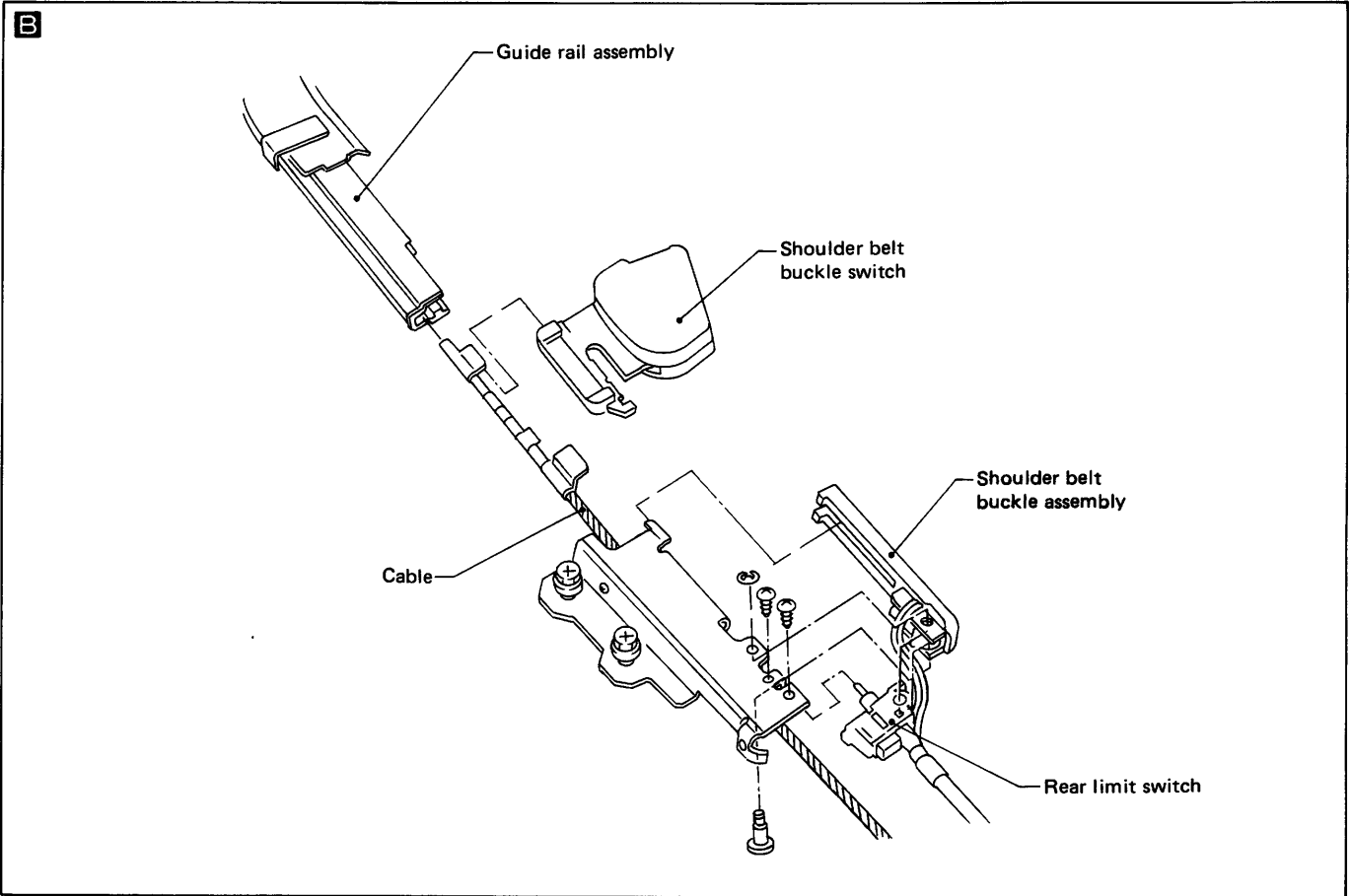
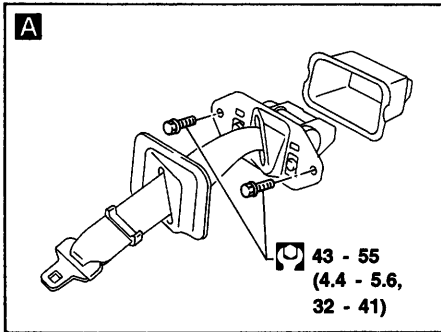
Control unit



Tighten bolts in numerical order when installing guide rail.

2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM

Unit Location (Cont'd)



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

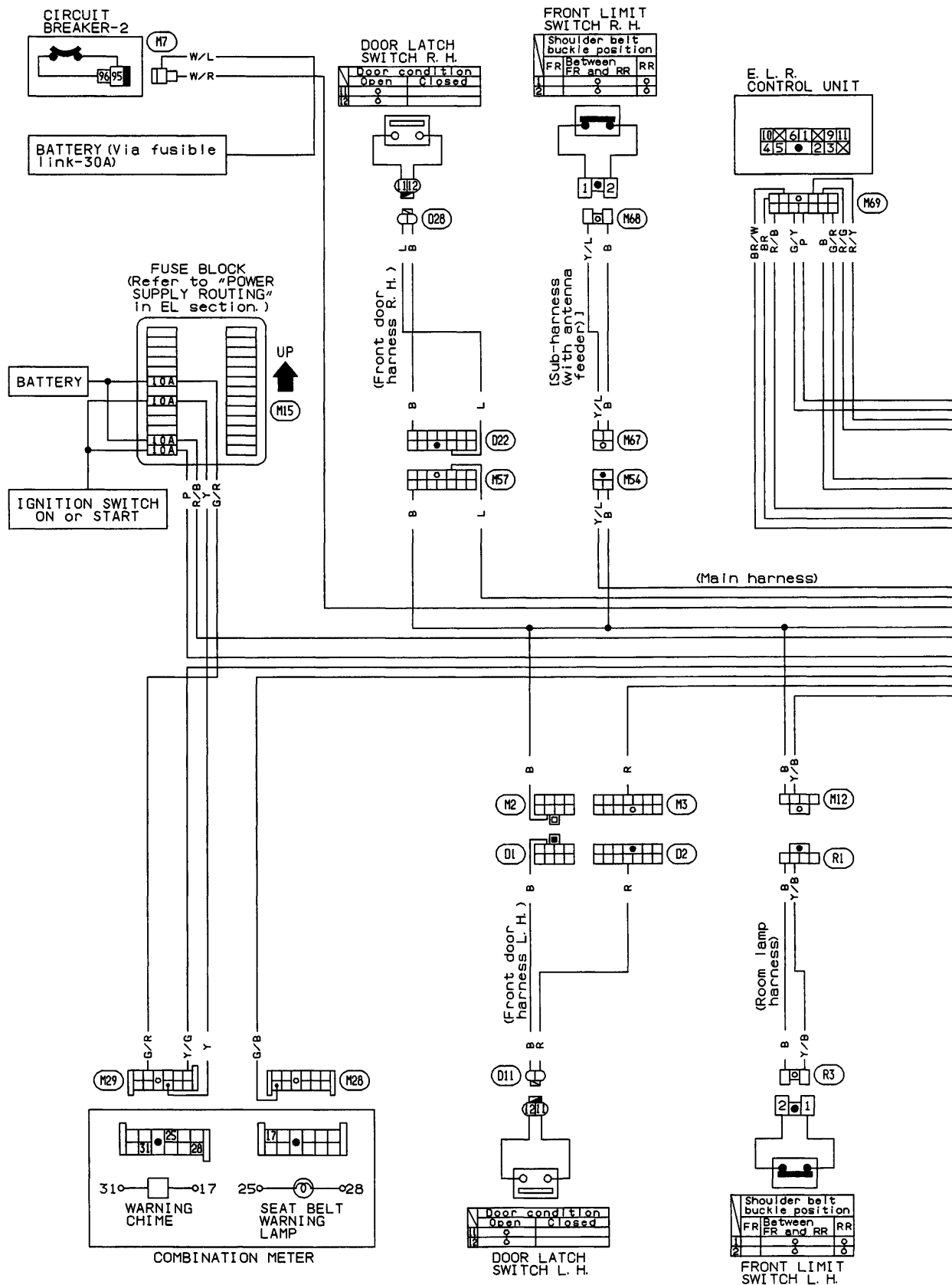
BF

HA

EL

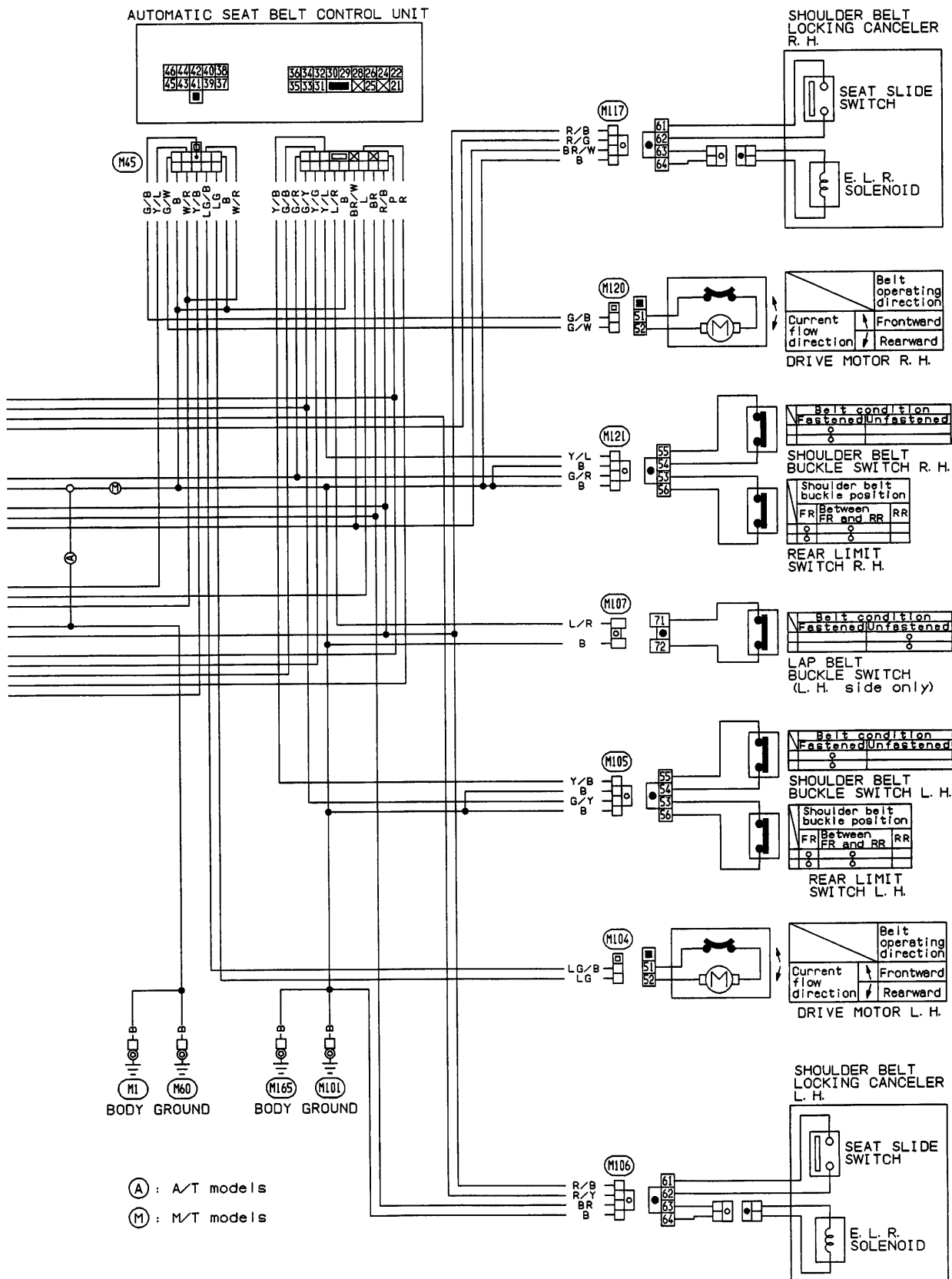
2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM

Wiring Diagram



2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM

Wiring Diagram (Cont'd)



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM

Description

FUNCTION

Shoulder belt buckle is mainly operated while ignition switch is "ON".

Condition (A): Ignition switch is "ON".

When door is opened, shoulder belt buckle is moved frontward and when door is closed, buckle is moved rearward.

Condition (B): Ignition switch is "OFF".

When door is opened, shoulder belt buckle is moved frontward. When the door is closed, buckle will remain in this position.

(Voltage of output signal is approximate value.)

Input signal	Ignition switch	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
	Door latch switch	OFF	ON	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	OFF
	Front limit switch	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF
	Rear limit switch	ON	ON	ON	ON	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	ON	ON	ON
Output signal	Drive motor power source for frontward operation	0V	0V	0V	0V	0V	12V	12V	0V	0V	0V	0V	0V	12V	12V	0V	0V
	Drive motor power source for rearward operation	0V	0V	12V	12V	0V	0V	0V	0V	12V	12V	0V	0V	0V	0V	0V	0V
Shoulder belt buckle	Function	Stop	Stop	Start to move	Moving	Stop	Start to move	Moving	Stop	Start to move	Moving	Stop	Stop	Start to move	Moving	Stop	Stop
	Position	Front	Front	Front	Between Front & Rear	Rear	Rear	Between Front & Rear	Front	Front	Between Front & Rear	Rear	Rear	Rear	Between Front & Rear	Front	Front

TIMER (Ignition switch either "ON" or "OFF")

If limit switch does not operate (when accomplishing frontward operation, front limit switch can not be turned "OFF" or when accomplishing rearward operation, rear limit switch can not be turned "OFF"), control unit will continue to supply power to drive motor for 15 seconds.

QUICK WARNING (Ignition switch "ON")

If front limit switch is not turned "OFF" after accomplishing frontward operation, control unit will stop supplying power 15 seconds later and warning lamp will flash and chime will operate rapidly for approximately 6 seconds.

REAR LOCK (Fail safe operation)

If quick warning functions twice successively while ignition switch is "ON", shoulder belt buckle will move to rear position and will remain in the rear position. This function is canceled when the ignition switch is "OFF".

SHOULDER BELT LOCKING CANCELER (Ignition switch "ON" or "OFF")

The shoulder belt retractor does not lock belt length for 5 seconds after moving the seat position front-rear adjusting lever (turning on seat slide switch). While ignition switch is "ON", the system warning lamp also glows for 5 seconds. This system can be operated independently of "Automatic Seat Belt System".

Description (Cont'd)

Priority	Warning item	Ignition switch	Indication of warning (Indicating time is approximate value.)			
1	Shoulder anchors are not at rear lock position.	ON	Lamp	ON OFF		GI
			Chime	ON OFF		MA
		OFF → ON	Lamp	ON OFF		EM
			Chime	ON OFF		LC
			Anchor	Not rear Rear		EF & EC
			Lamp	ON OFF		FE
2	Shoulder belts are not fastened.	ON	Chime	ON OFF		CL
			Anchor	Not rear Rear		MT
			Lamp	ON OFF		AT
			Belts	Not fastened Fastened		FA
		OFF → ON	Lamp	ON OFF		RA
			Chime	ON OFF		BR
3	Driver's side lap belt is not fastened.	ON	Chime	ON OFF		ST
			Belts	Not fastened Fastened		BF
		OFF → ON	Lamp	ON OFF		HA
			Chime	ON OFF		EL
		OFF → ON	Lamp	ON OFF		
			Chime	ON OFF		
4	Normal (All belts are fastened and shoulder anchors are in rear lock position.)	OFF → ON	Lamp	ON OFF		
			Chime	ON OFF		

2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM

Description (Cont'd)

WARNING

Priority	Warning item	Ignition switch	Indication of warning (Indicating time is approximate value.)	
1	Move seat front-rear adjusting lever. (Seat slide switch is turned on.)	ON	Lamp Chime Seat slide switch E.L.R. solenoid ON OFF ON OFF ON OFF 5 sec.	
			Lamp Chime Seat slide switch E.L.R. solenoid ON OFF ON OFF ON OFF Within 5 sec. 5 sec.	

2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

Contents

Symptom Chart	BF-42	
Preliminary Check.....	BF-43	
Main Power Supply and Ground Circuit Check	BF-46	
Harness Layout.....	BF-47	GI
Circuit Diagram for Quick Pinpoint Check.....	BF-49	
Diagnostic Procedure 1		
(Check motor circuit and stop signals.).....	BF-50	MA
Diagnostic Procedure 2		
(Check door latch switch circuit.).....	BF-52	EM
Diagnostic Procedure 3		
(Check front limit switch circuit.)	BF-53	
Diagnostic Procedure 4		LC
(Check rear limit switch circuit.).....	BF-54	
Diagnostic Procedure 5		EF &
(Check shoulder belt buckle switch circuit.)	BF-56	EC
Diagnostic Procedure 6		
(Check lap belt switch circuit.).....	BF-57	FE
Diagnostic Procedure 7		
(Check warning chime circuit.)	BF-58	CL
Diagnostic Procedure 8		
(Check warning lamp circuit.)	BF-59	
Diagnostic Procedure 9		MT
(Check shoulder belt locking canceler circuit.).....	BF-60	
Electrical Components Inspection.....	BF-62	AT

FA

RA

Since left and right component parts are basically the same, harness layout and methods for electrical components inspection are shown for one side only.

Although methods for checking component parts on both sides are described in the flow chart, making it easier to troubleshoot, apply checking procedures to either side that have malfunction during trouble diagnoses.

BR

ST

BF

HA

EL

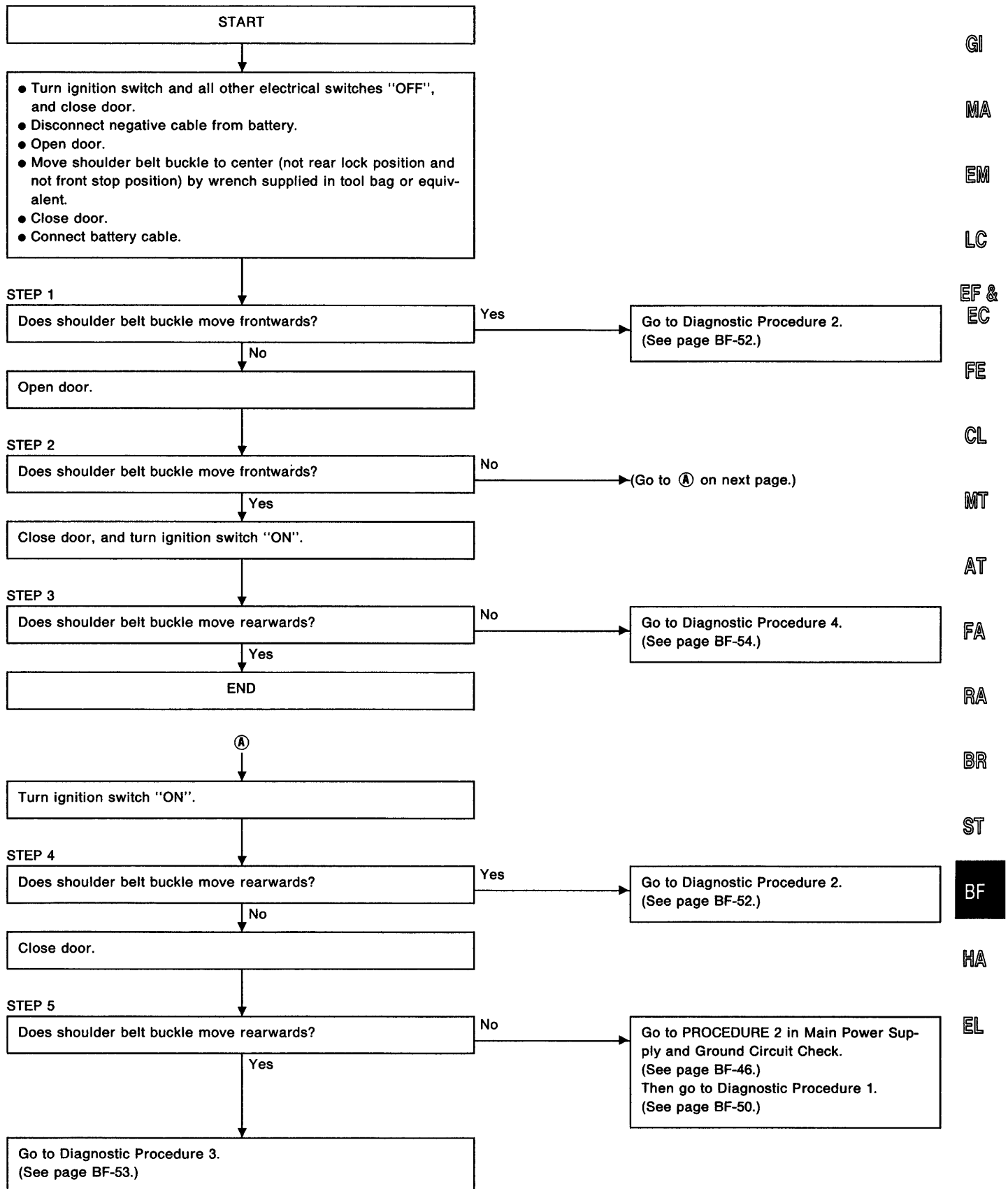
2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

Symptom Chart

Procedure	Reference page	SYMPTOM	Electrical Components Inspection							
			BF-63	BF-62	BF-62	BF-62	BF-62	BF-62	BF-63	BF-62
			Seat slide switch						○	○
			Motor	○	○					
			Shoulder belt buckle switch	○					○	
			Door latch switch	○		○	○			
			Rear limit switch	○	○	○			○	
			Front limit switch	○	○		○		○	
			Seat slide switch						○	○
			Lap belt switch	○					○	
			Motor	○	○					
			Shoulder belt buckle switch	○					○	
			Door latch switch	○		○	○			
			Rear limit switch	○	○	○			○	
			Front limit switch	○	○		○		○	
			E.L.R. control unit						○	○
			Warning chime	○					○	
			Warning lamp	○					○	
			Procedure 9						○	○
			Procedure 8						○	
			Procedure 7						○	
			Procedure 6						○	
			Procedure 5						○	
			Procedure 4	○	○	○			○	
			Procedure 3	○	○		○		○	
			Procedure 2			○	○			
			Procedure 1	○	○					
			Procedure 2		○					
			Procedure 1	○						
			Procedure 2						○	
			Procedure 1		○	○	○			
			No operation has made. (No warning indicated and no buckles movement performed)							
			Shoulder belt buckle in L.H. or R.H. side does not move.							
			Shoulder belt buckle moves forwards only. (not rear- wards)							
			Shoulder belt buckle moves rearwards only. (not front- wards)							
			Warnings indicate incorrectly or do not function.							
			Quick warning operates.							
			Shoulder belt locks when adjusting front-rear seat posi- tion.							

Preliminary Check

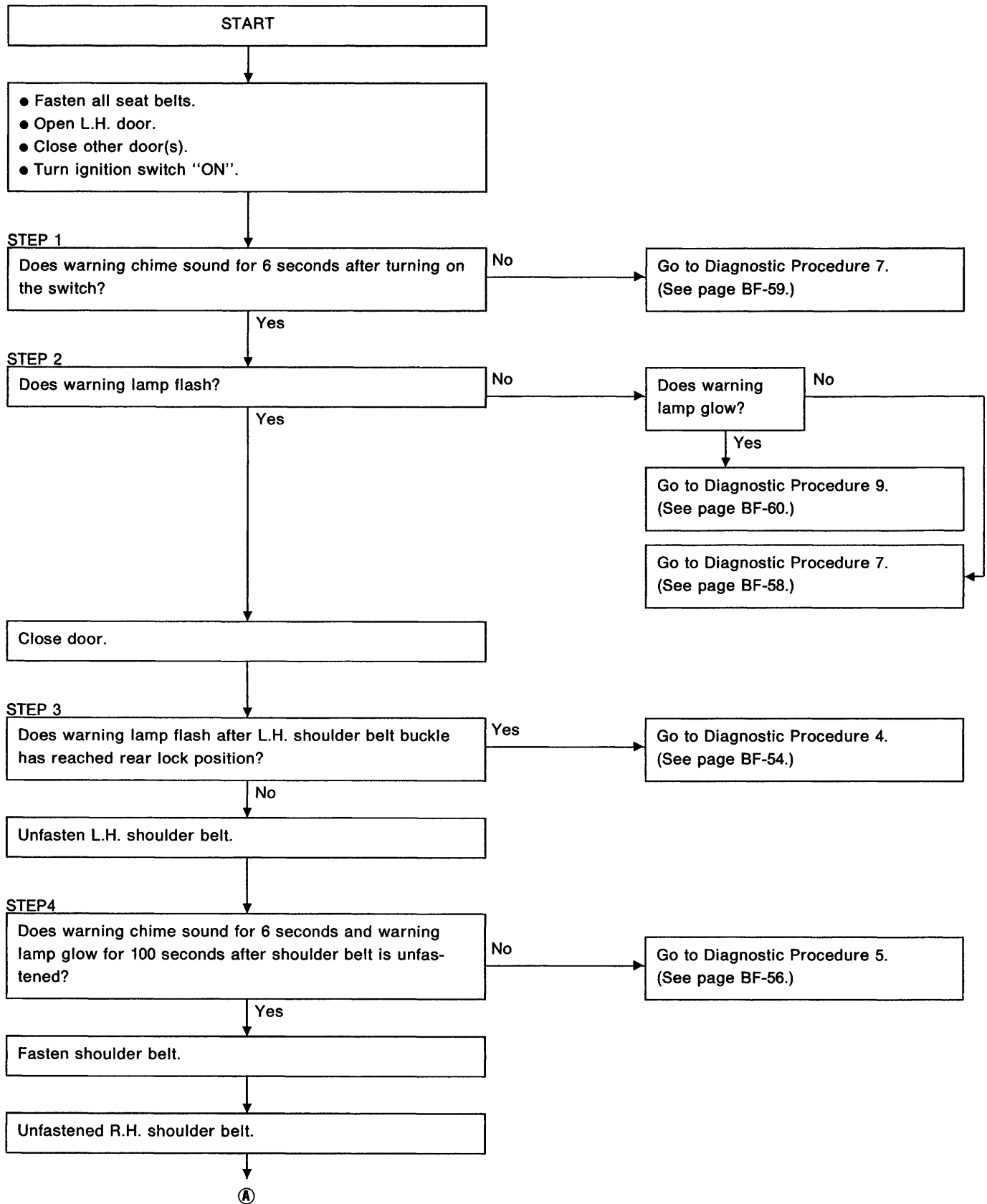
PROCEDURE 1



2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

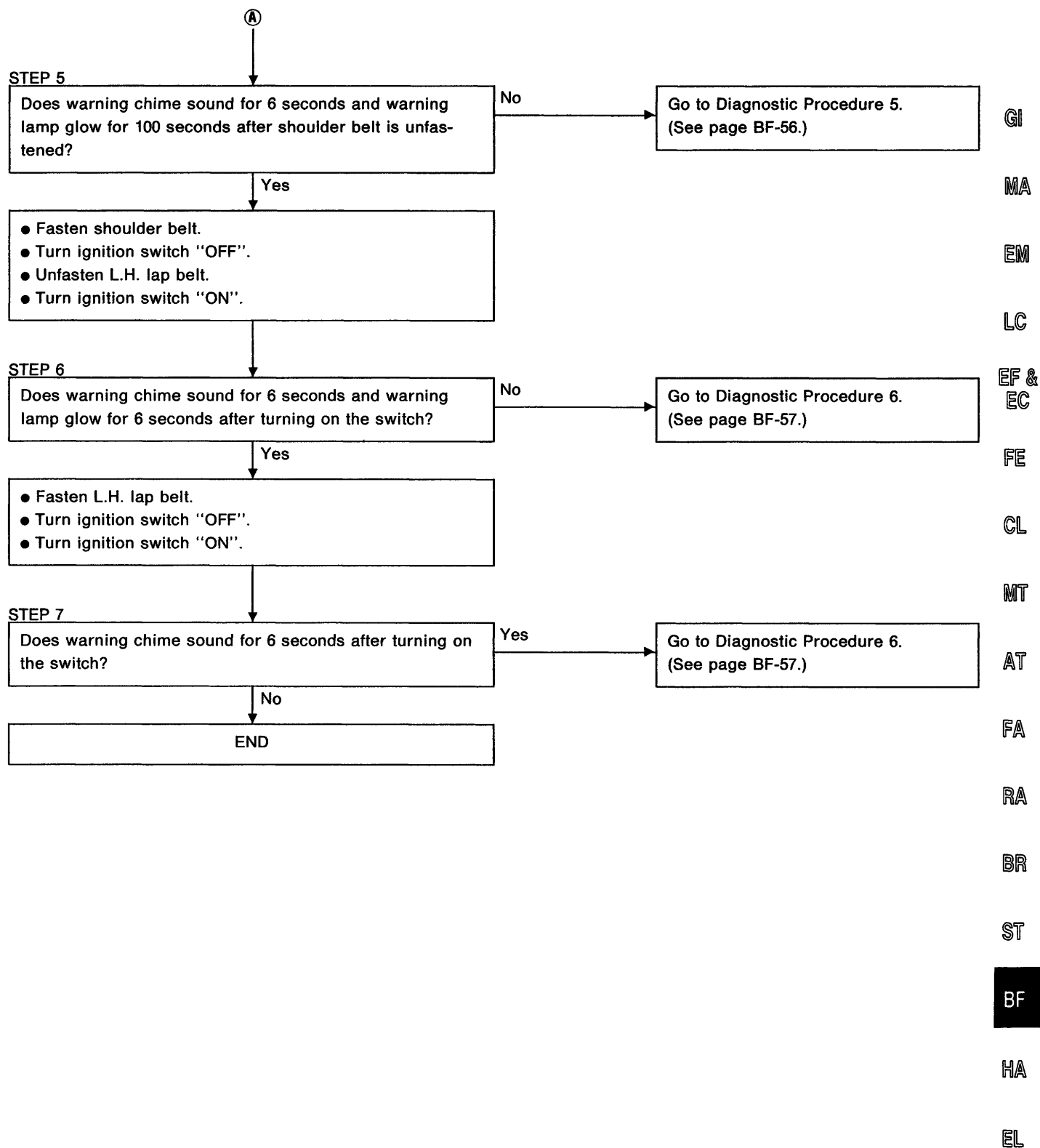
Preliminary Check (Cont'd)

PROCEDURE 2

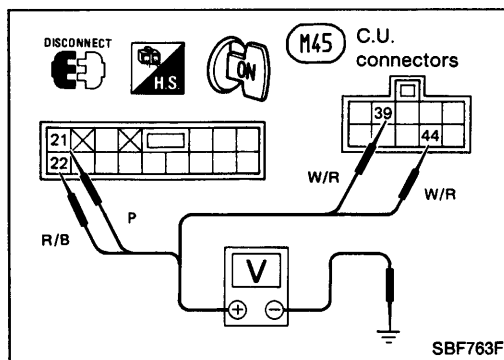


2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

Preliminary Check (Cont'd)



2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

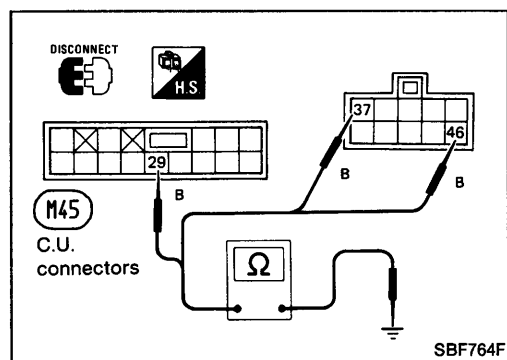


Main Power Supply and Ground Circuit Check

PROCEDURE 1

Main power supply

Terminals	Battery voltage existence condition	
	Ignition switch "ON"	Other than ignition switch "ON"
②1 - Ground	Yes	No
②2 - Ground	Yes	Yes
③9 - Ground	Yes	Yes
④4 - Ground	Yes	Yes



Ground circuit

Terminals	Continuity
②9 - Ground	Yes
③7 - Ground	Yes
④6 - Ground	Yes

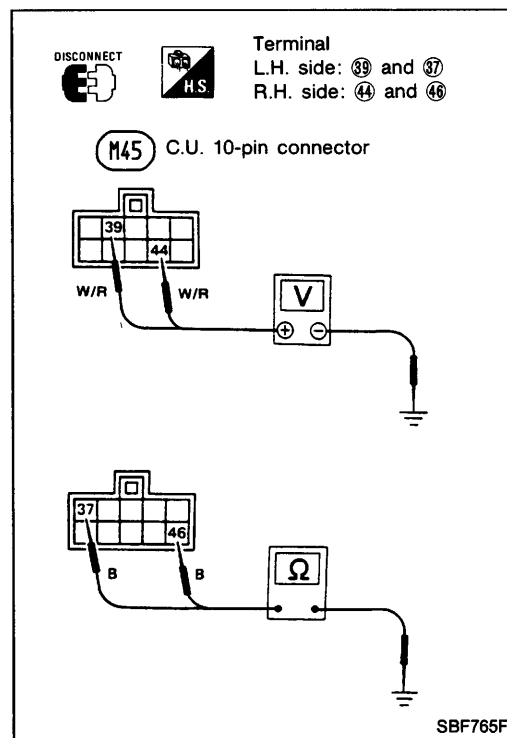
PROCEDURE 2

Power supply for motor drive

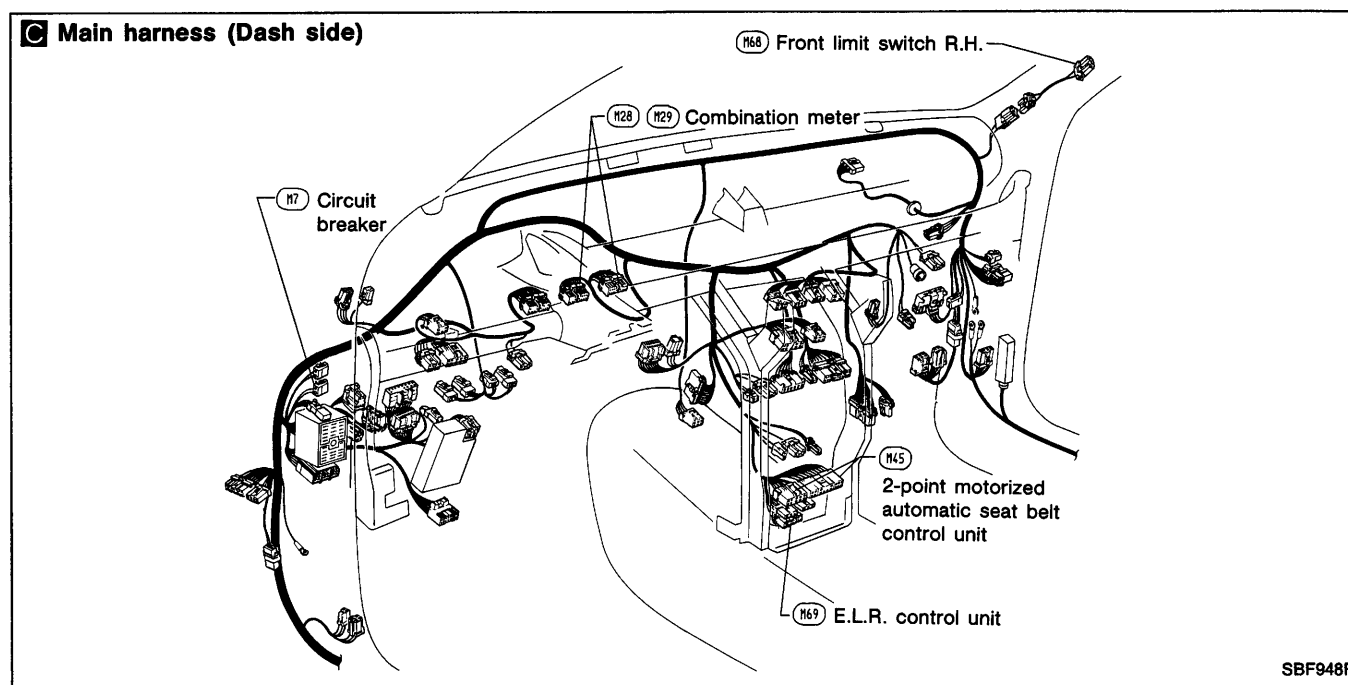
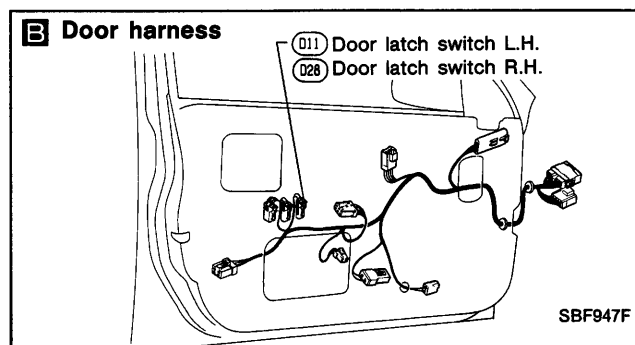
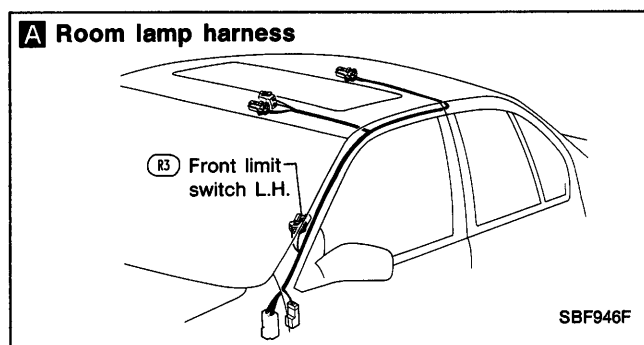
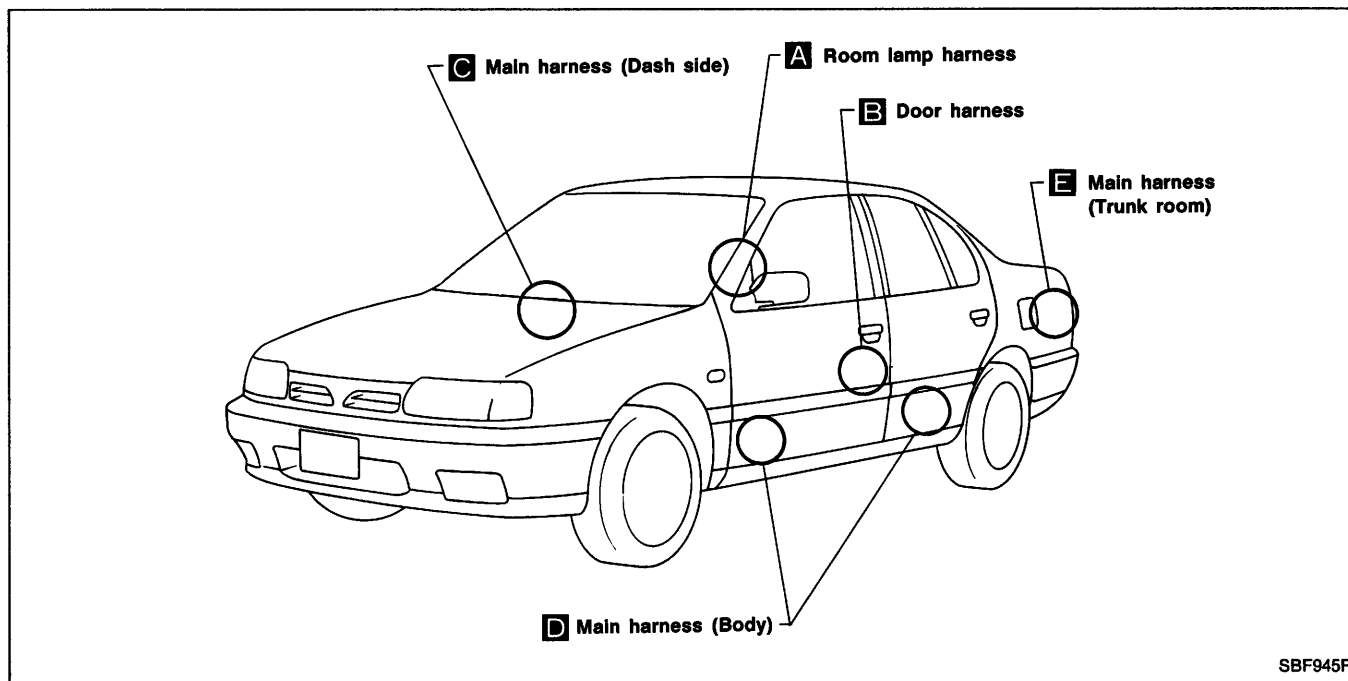
	Terminals	Battery voltage existence
L.H. side	③9 - Ground	Yes
R.H. side	④4 - Ground	Yes

Ground circuit for motor drive

	Terminals	Continuity
L.H. side	③7 - Ground	Yes
R.H. side	④6 - Ground	Yes



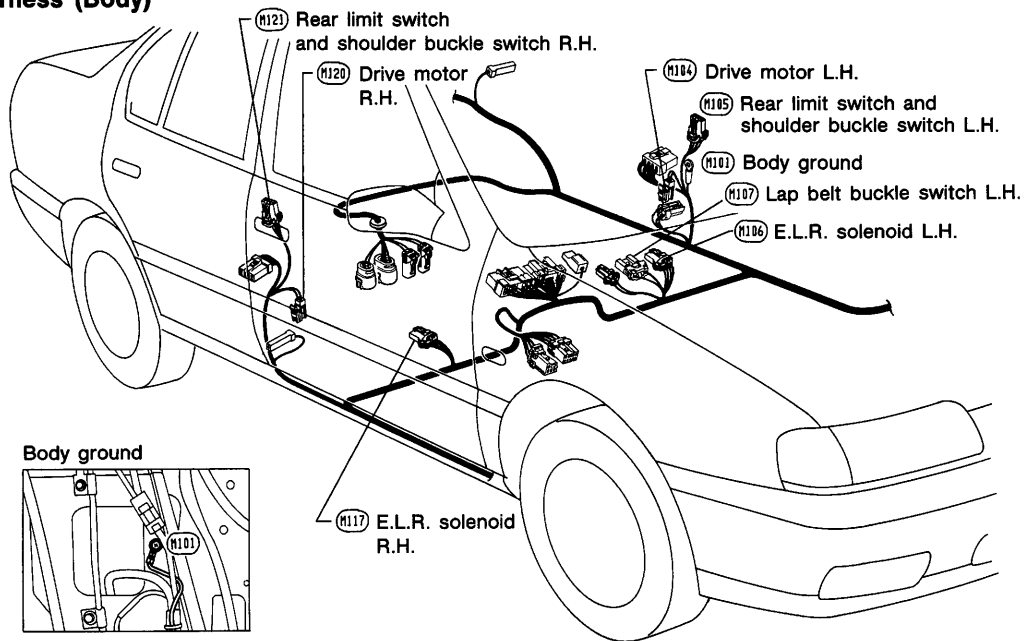
Harness Layout



2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

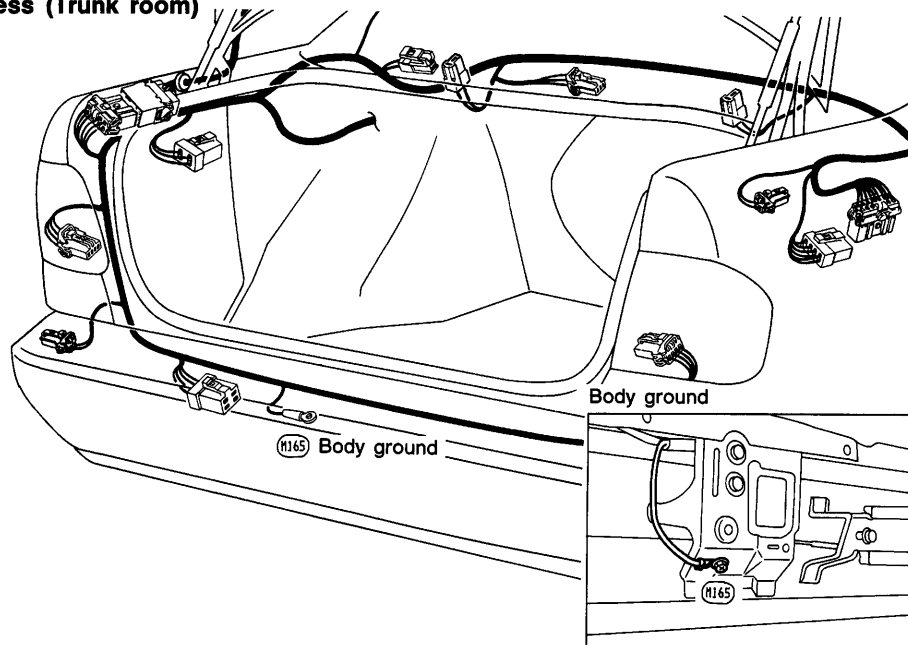
Harness Layout (Cont'd)

D Main harness (Body)



SBF949F

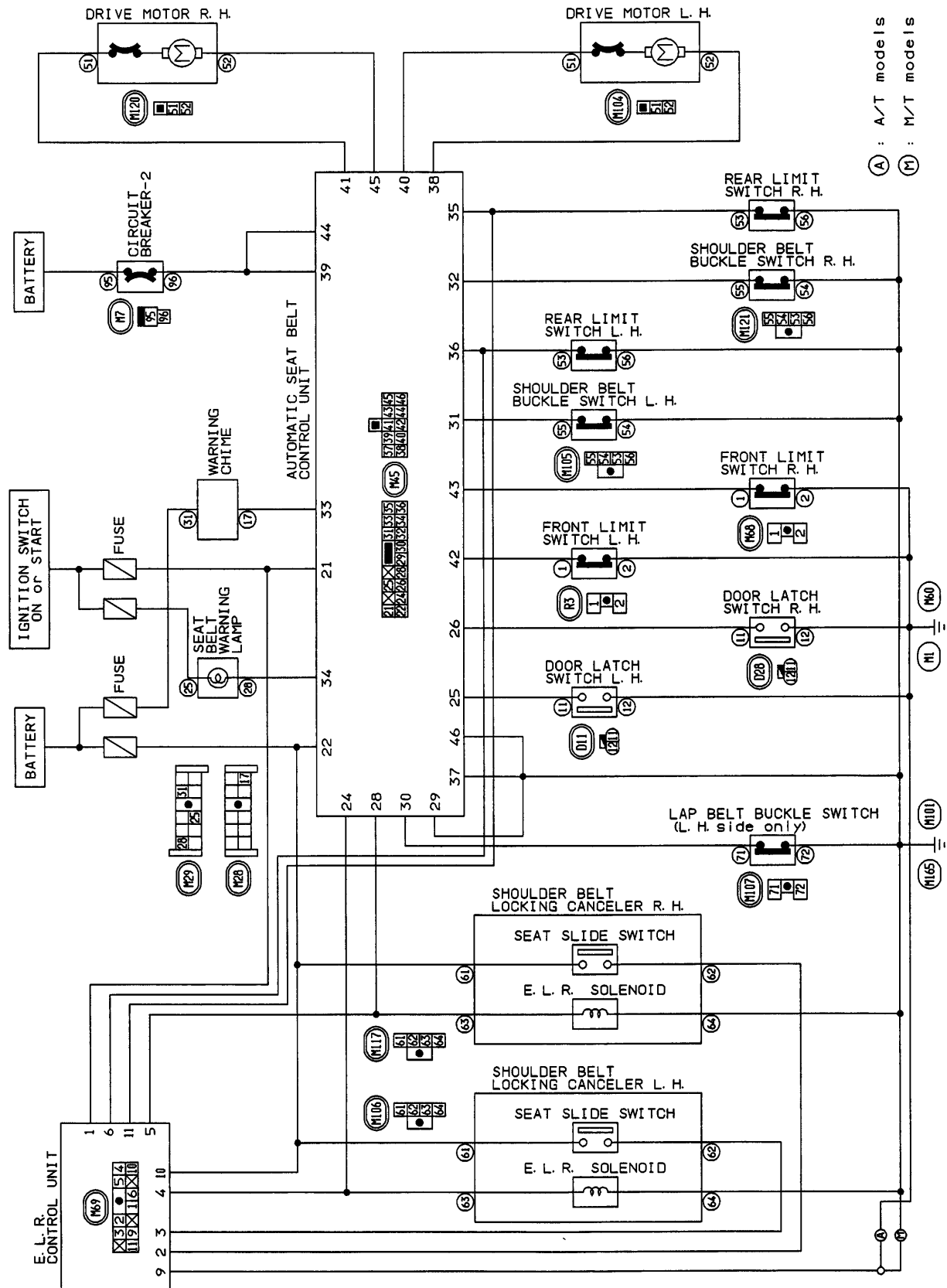
E Main harness (Trunk room)



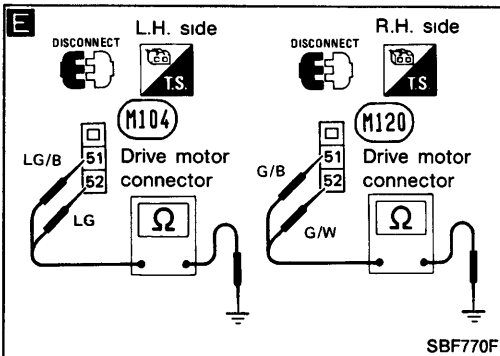
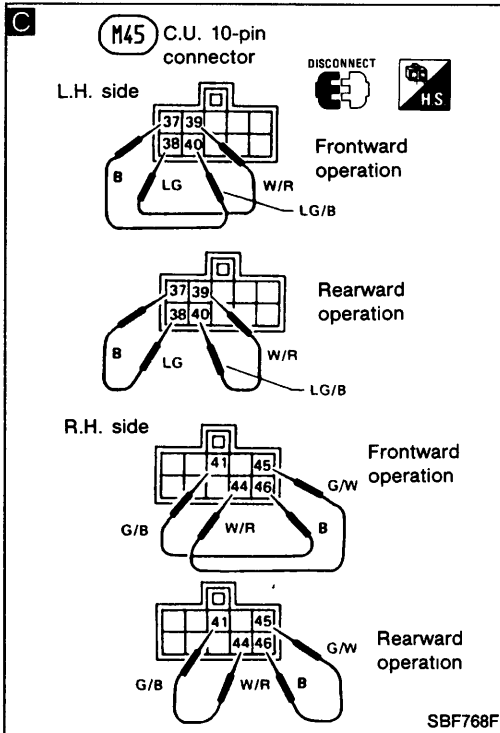
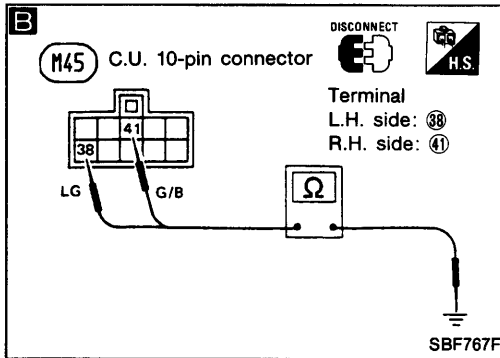
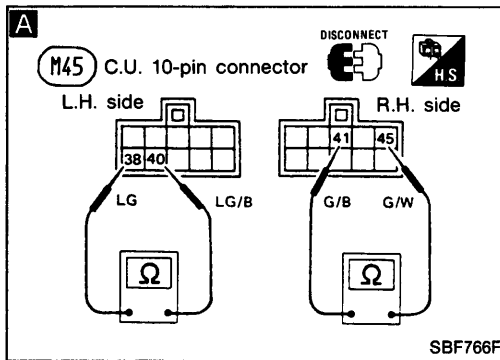
SBF950F

2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

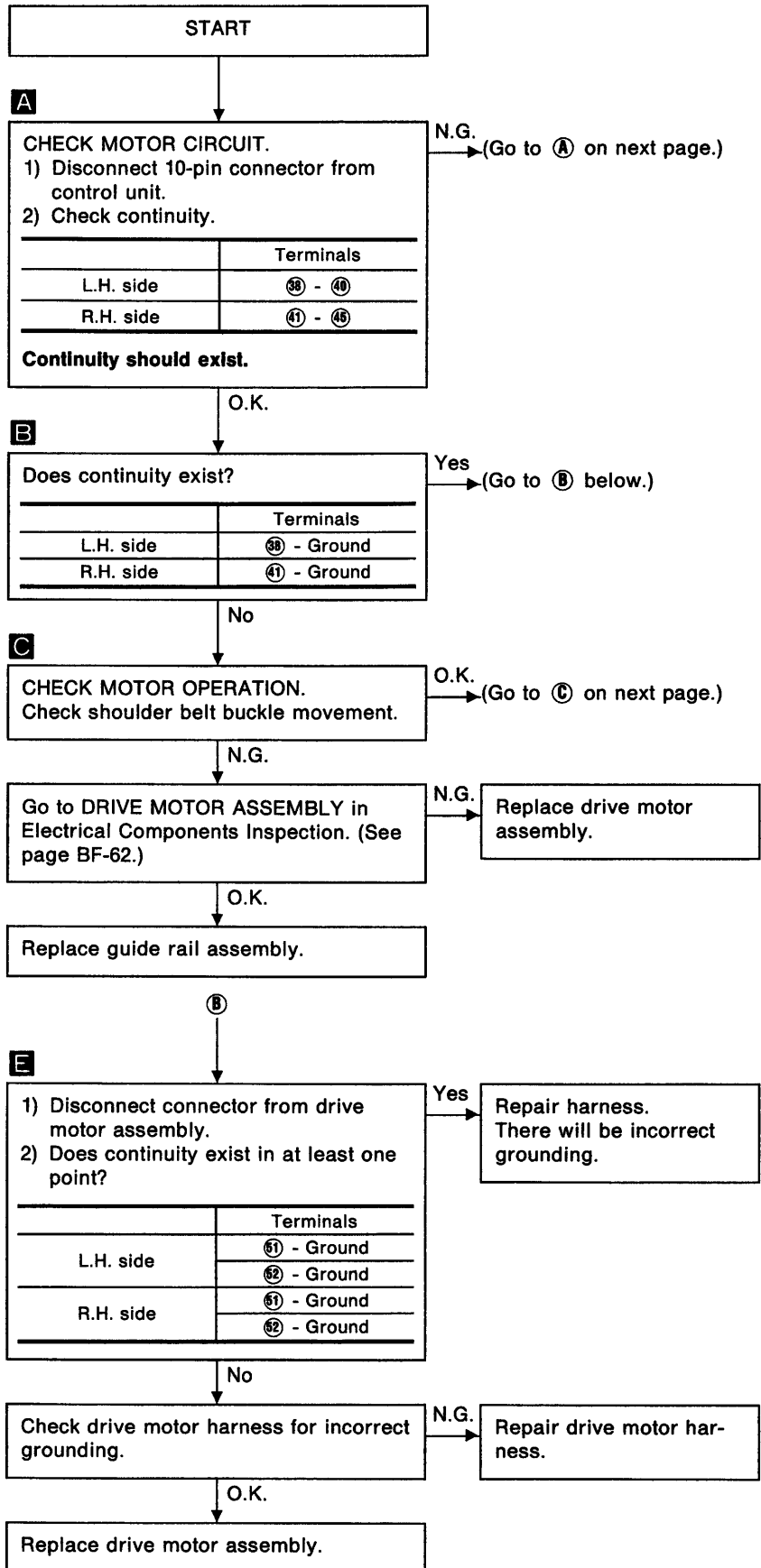
Circuit Diagram for Quick Pinpoint Check



2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

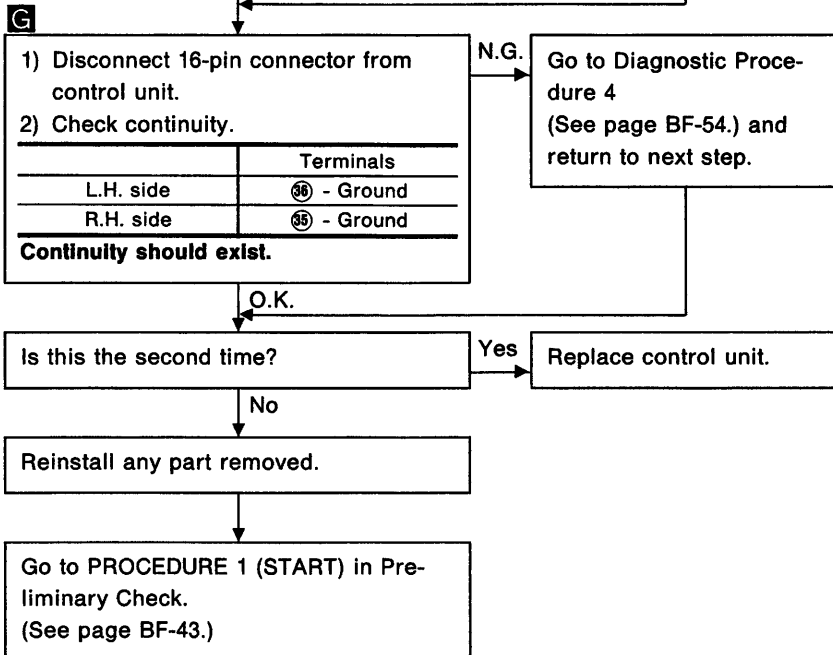
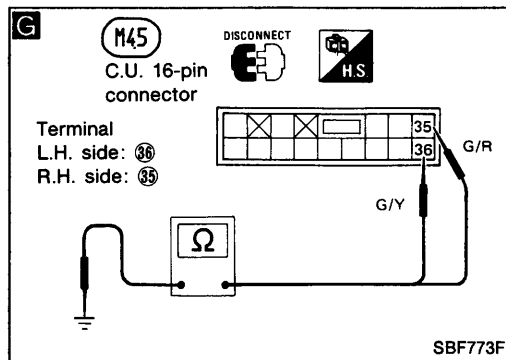
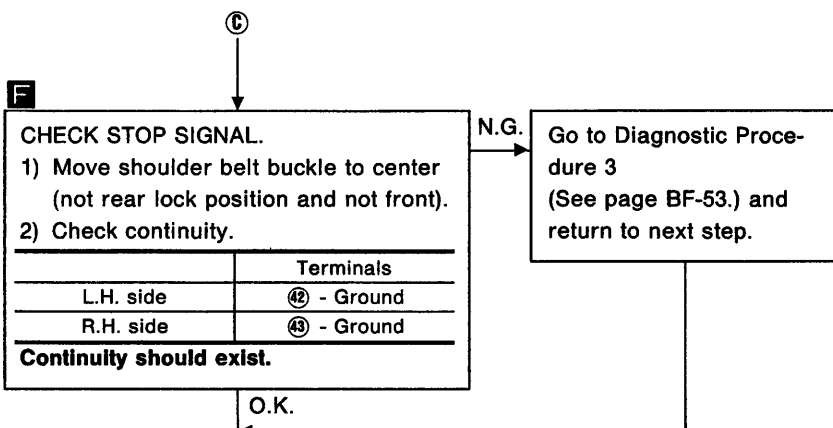
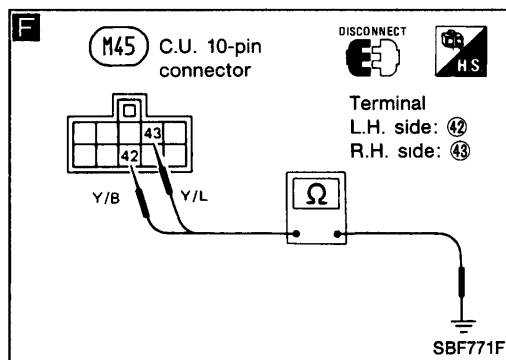
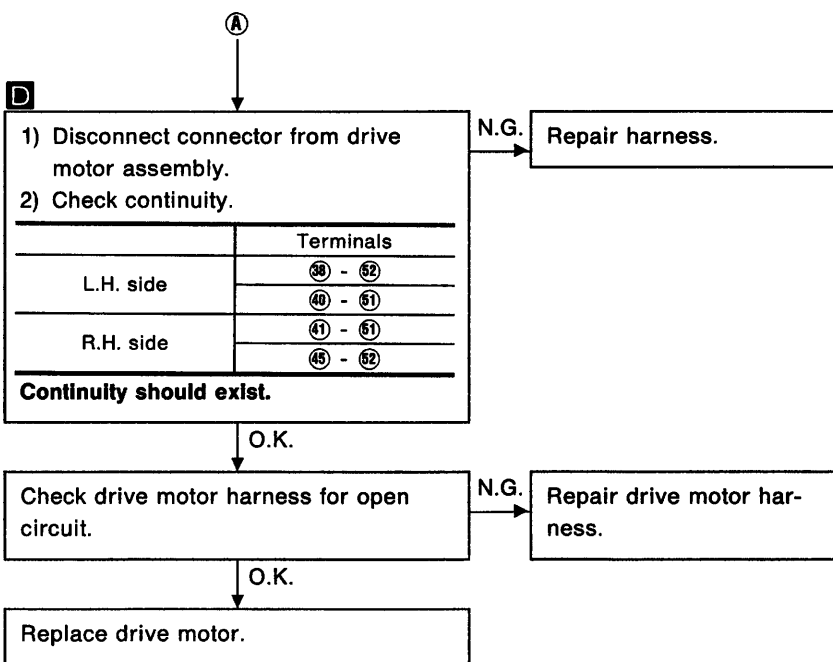
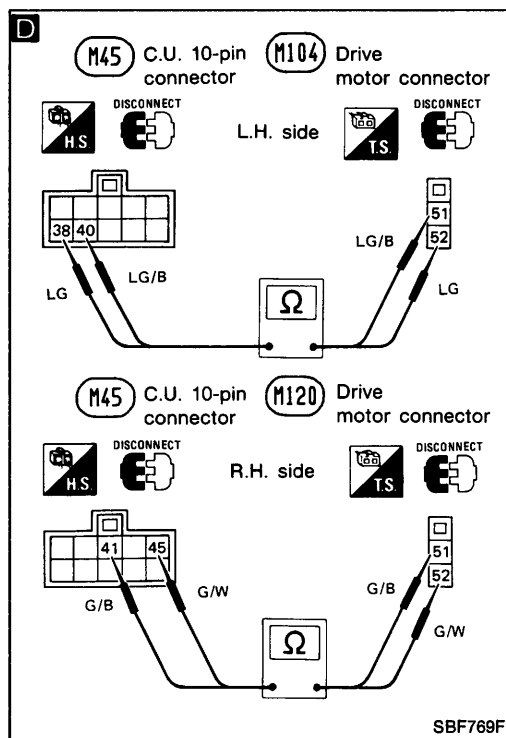


Diagnostic Procedure 1

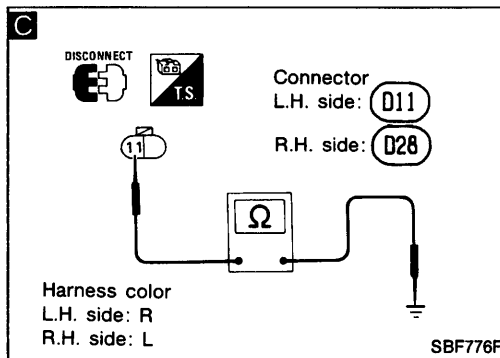
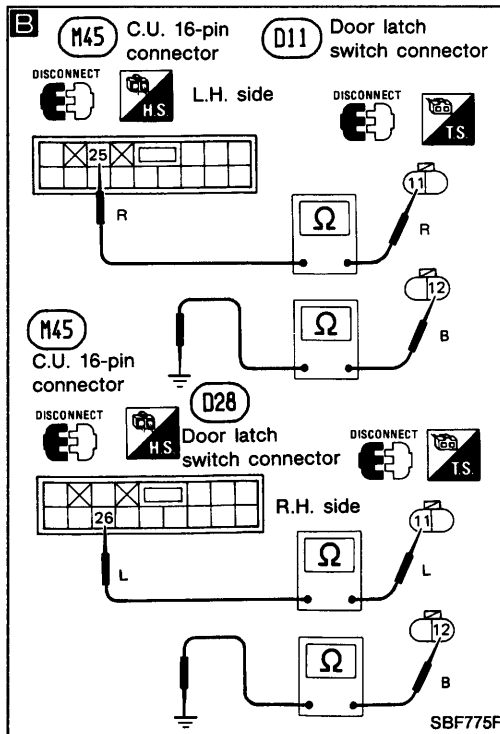
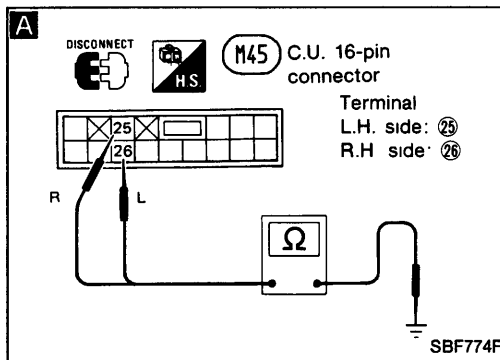


2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

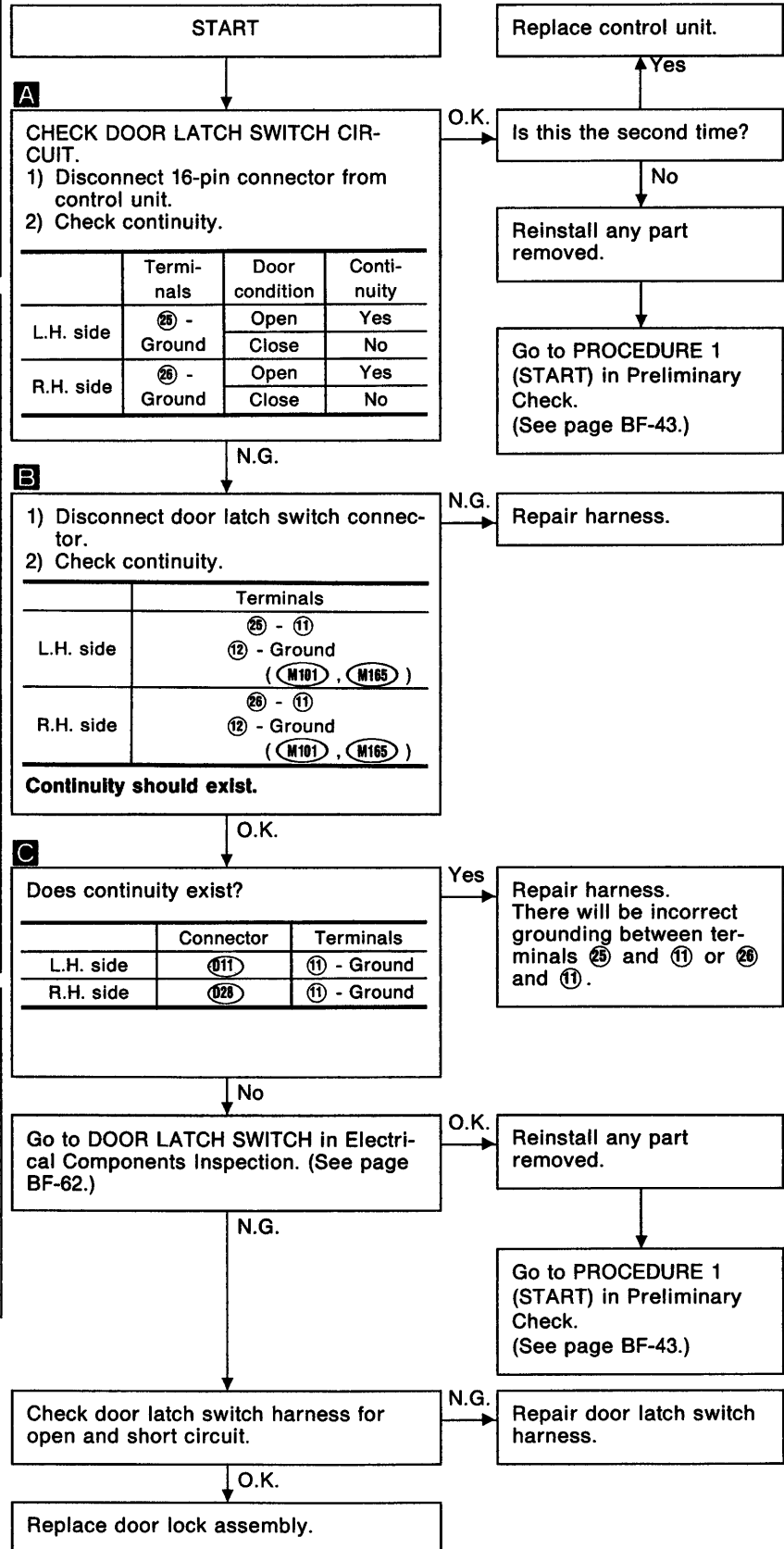
Diagnostic Procedure 1 (Cont'd)



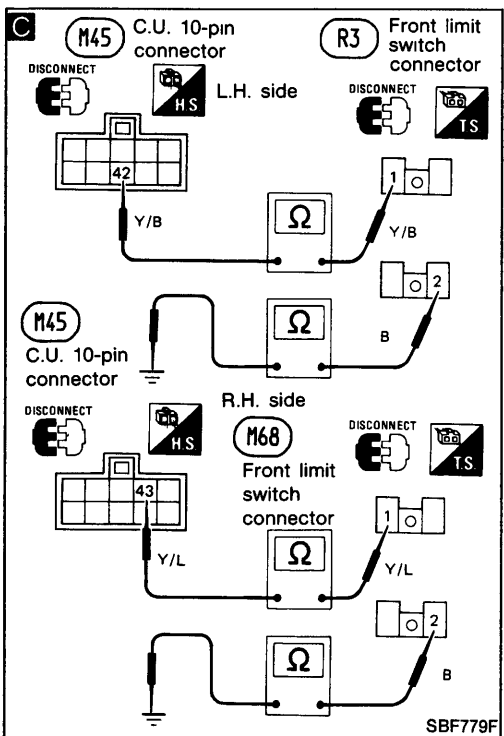
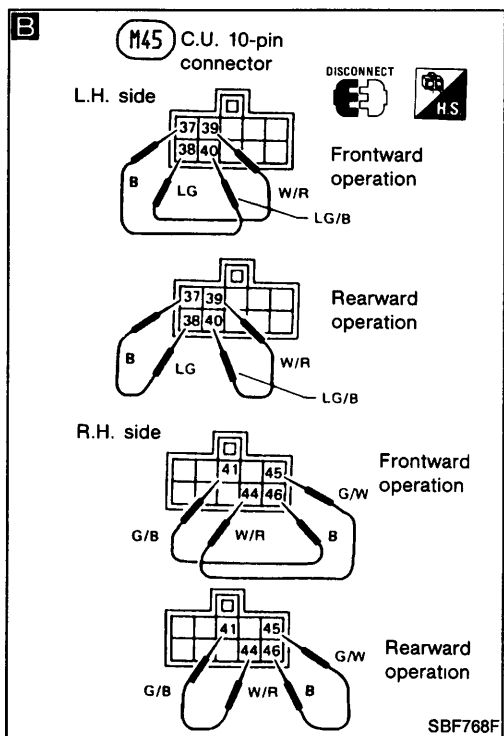
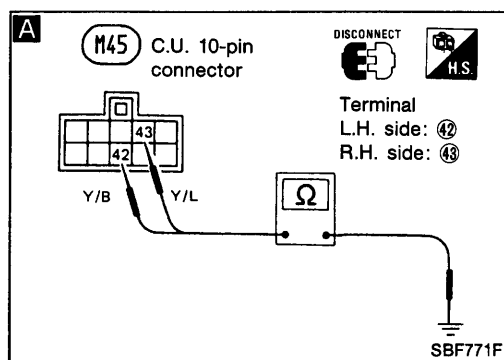
2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses



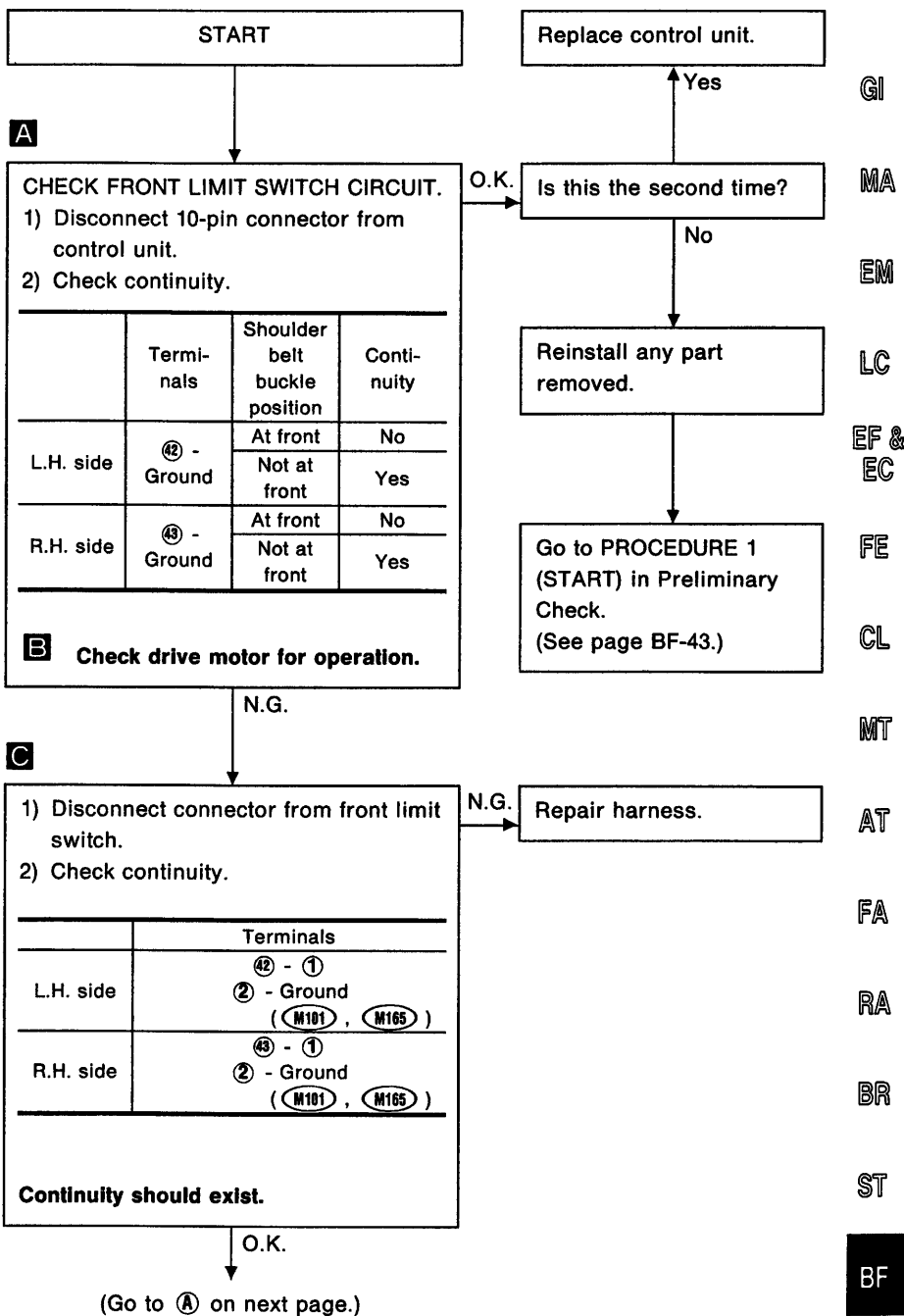
Diagnostic Procedure 2



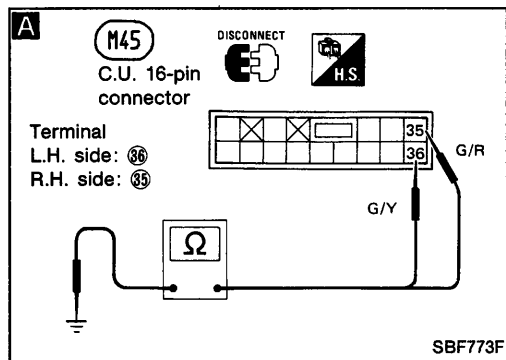
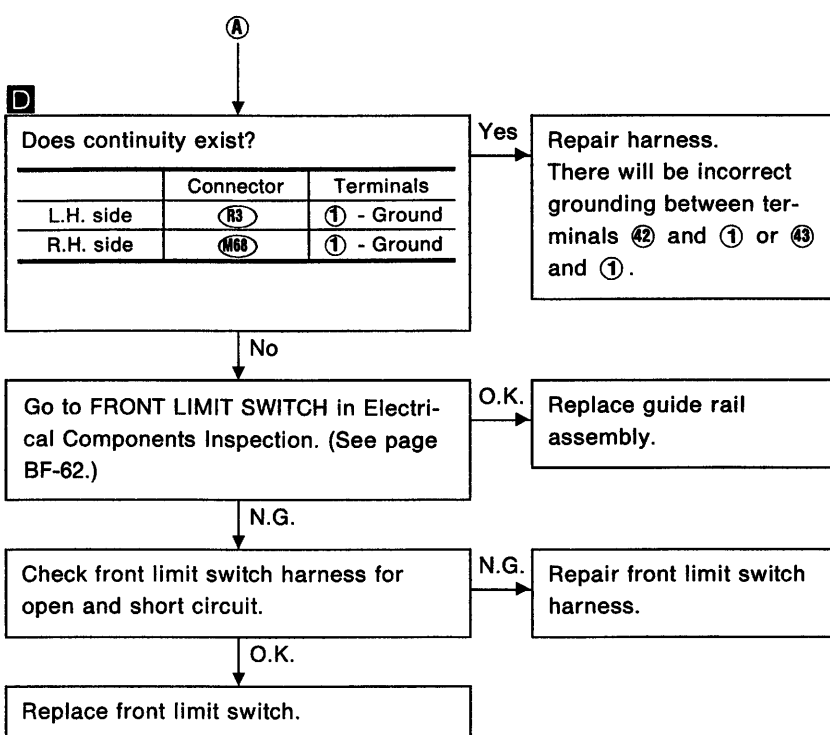
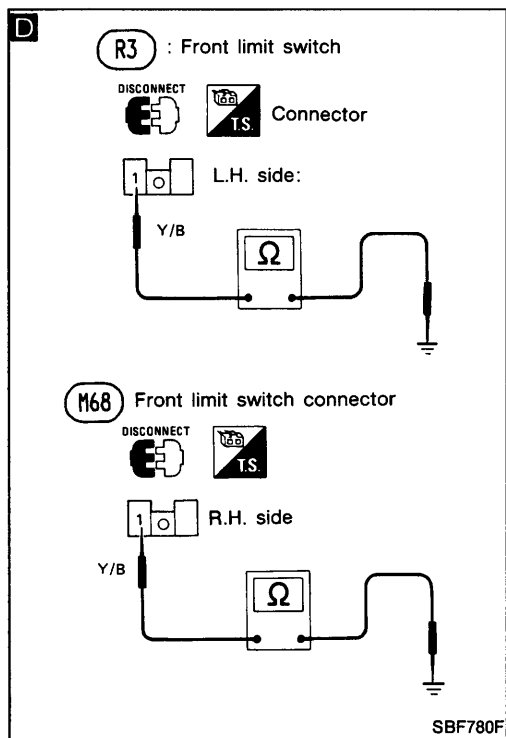
2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses



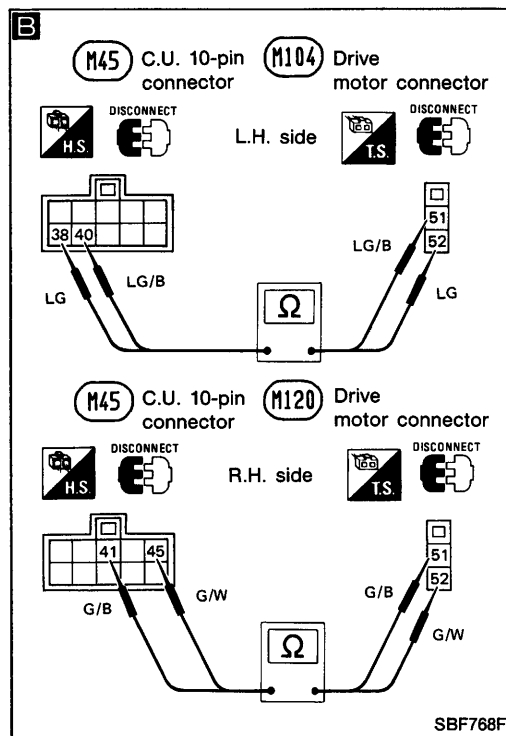
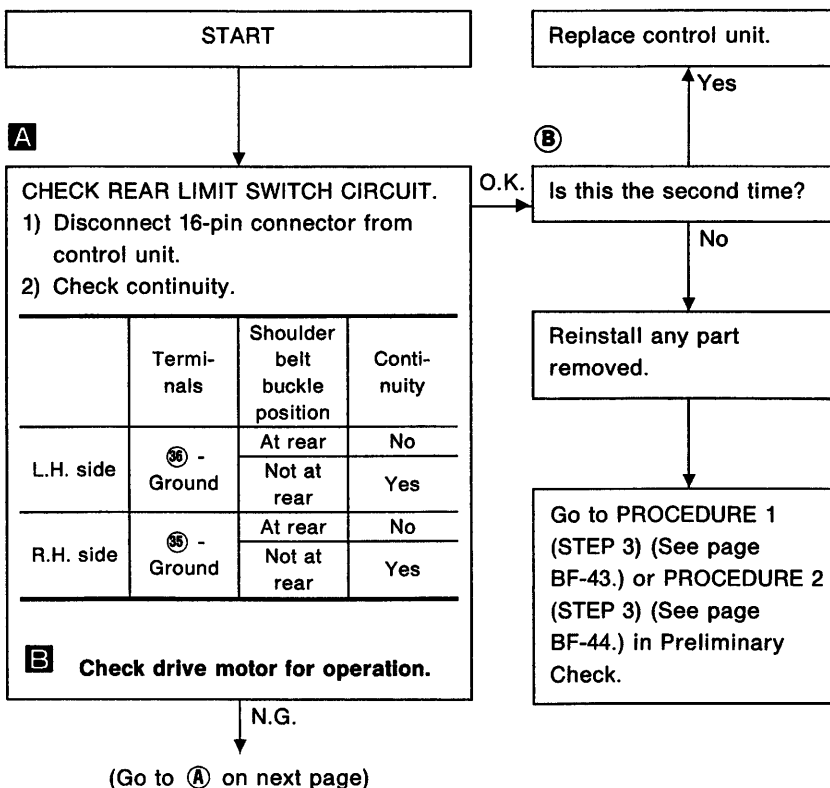
Diagnostic Procedure 3



Diagnostic Procedure 3 (Cont'd)

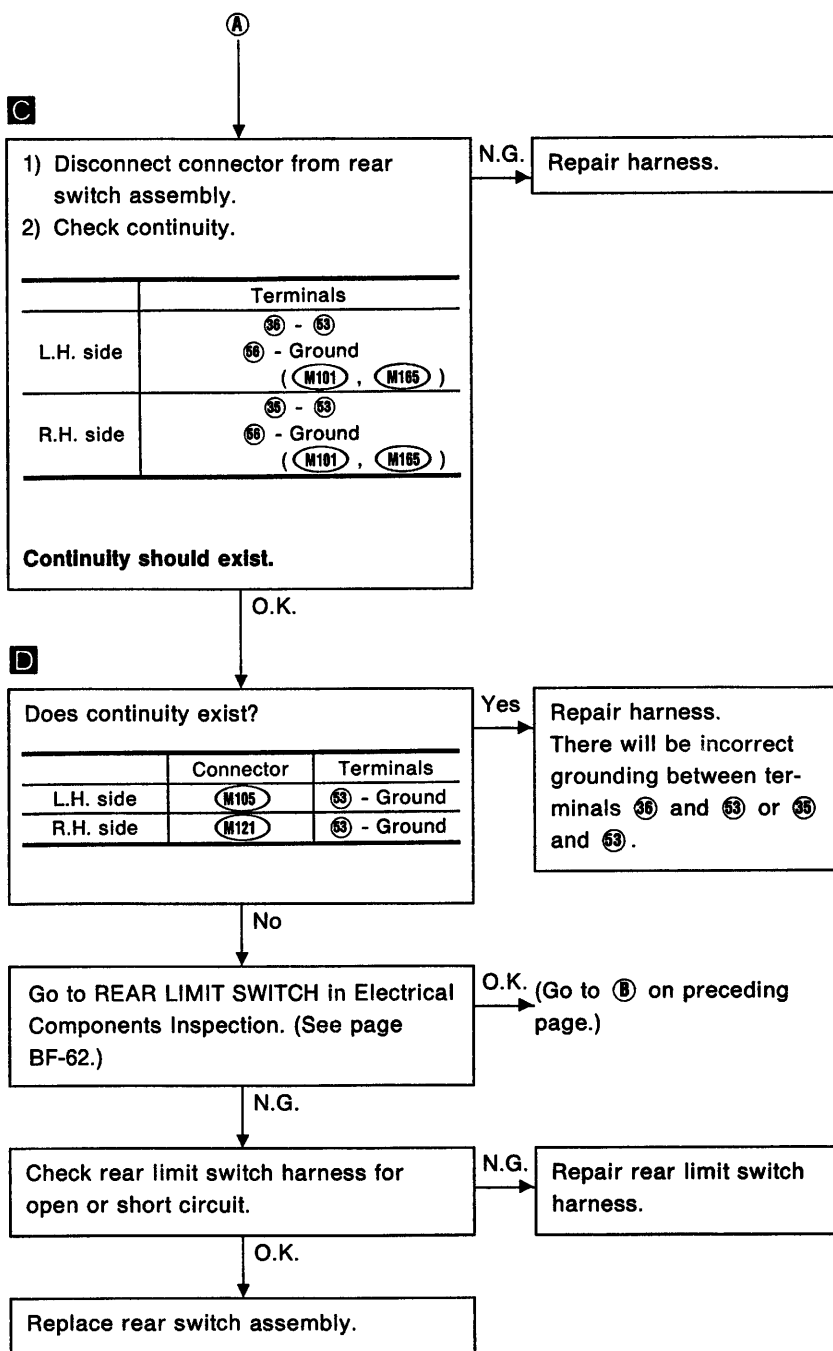
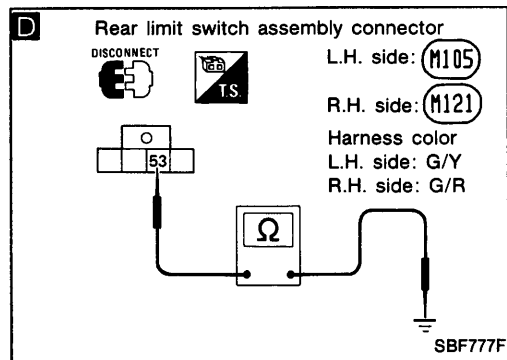
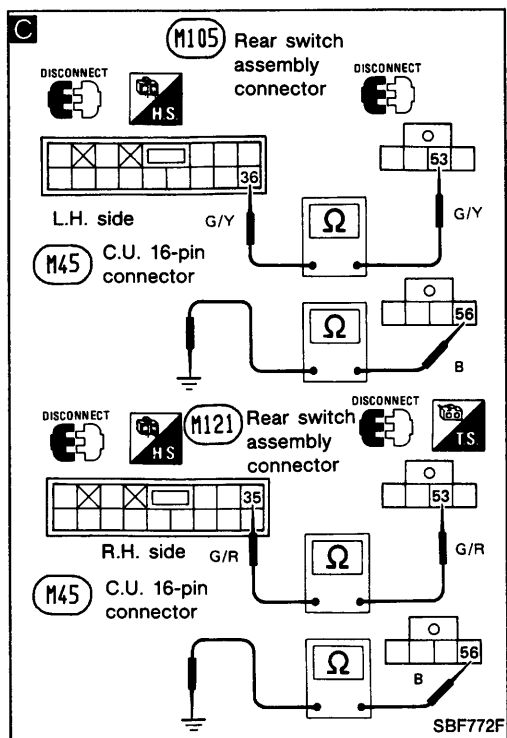


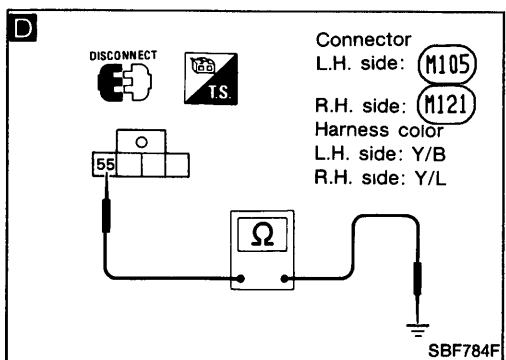
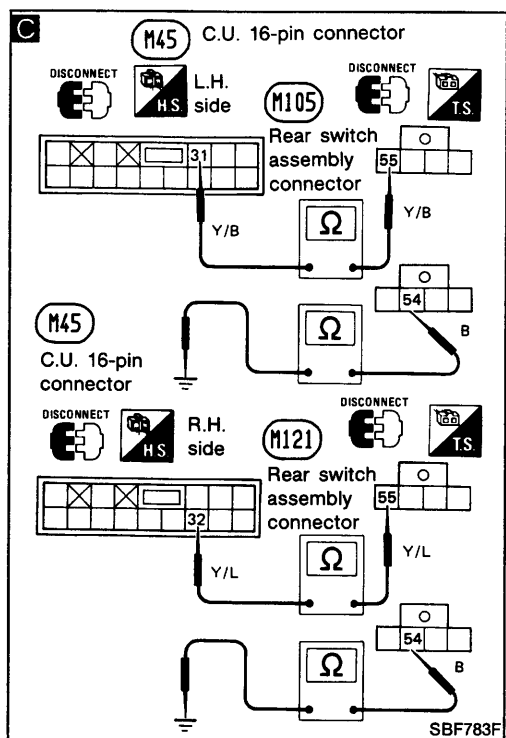
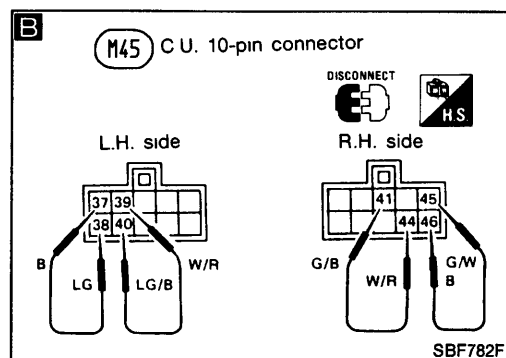
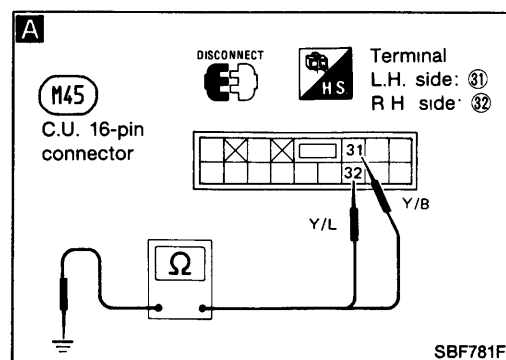
Diagnostic Procedure 4



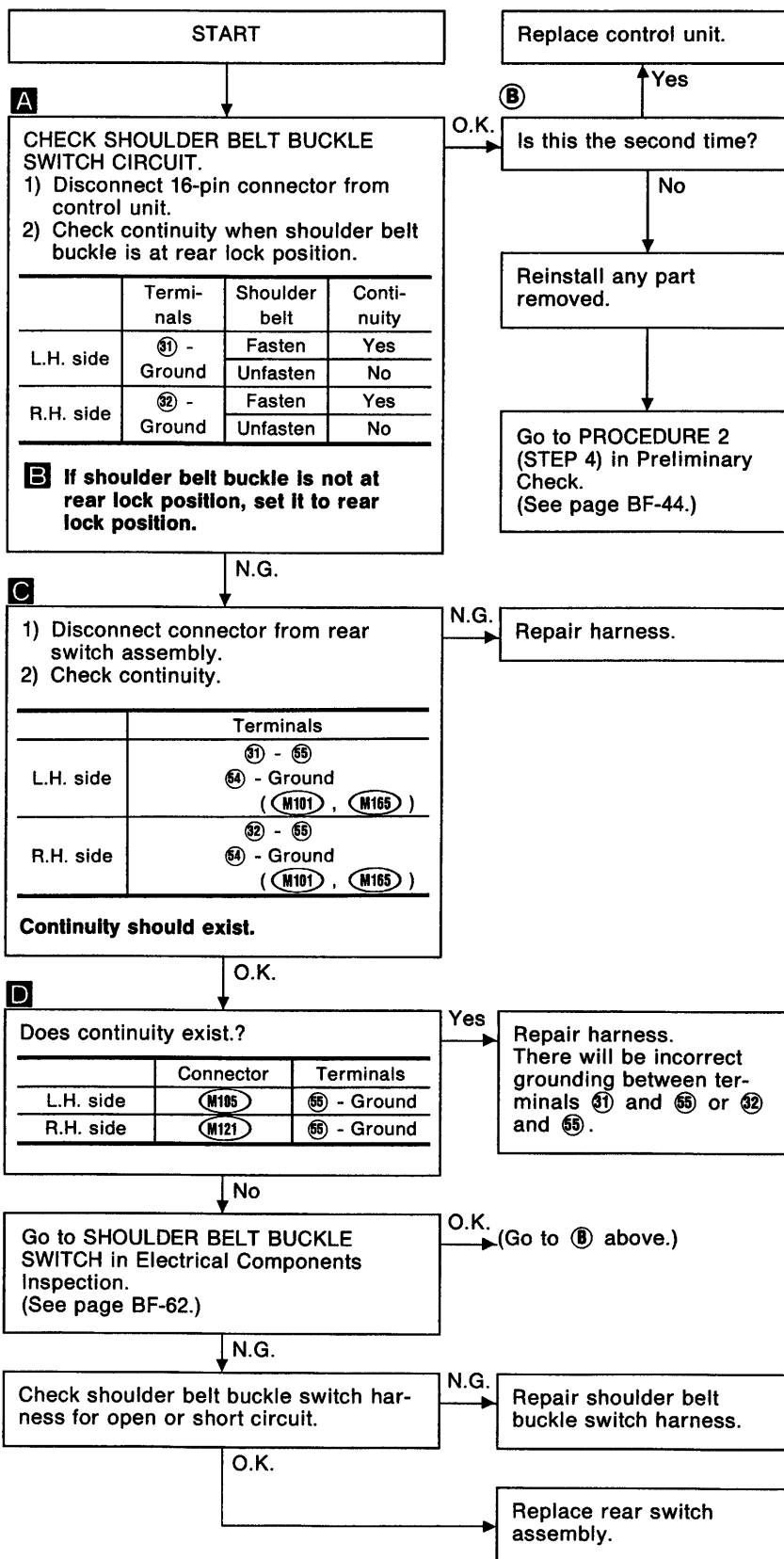
2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

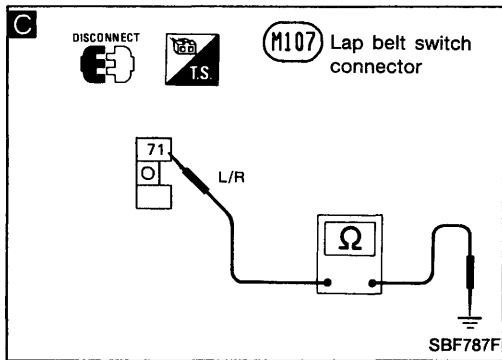
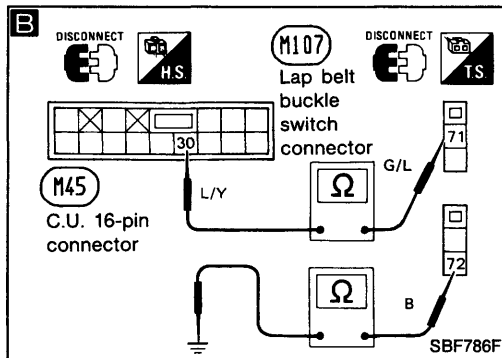
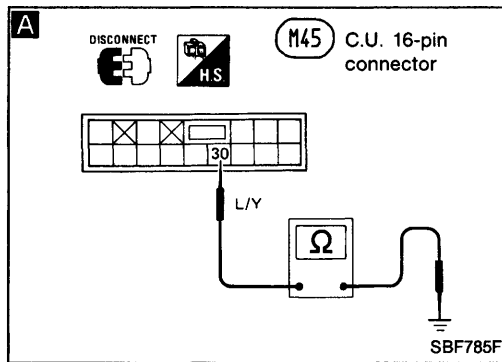
Diagnostic Procedure 4 (Cont'd)



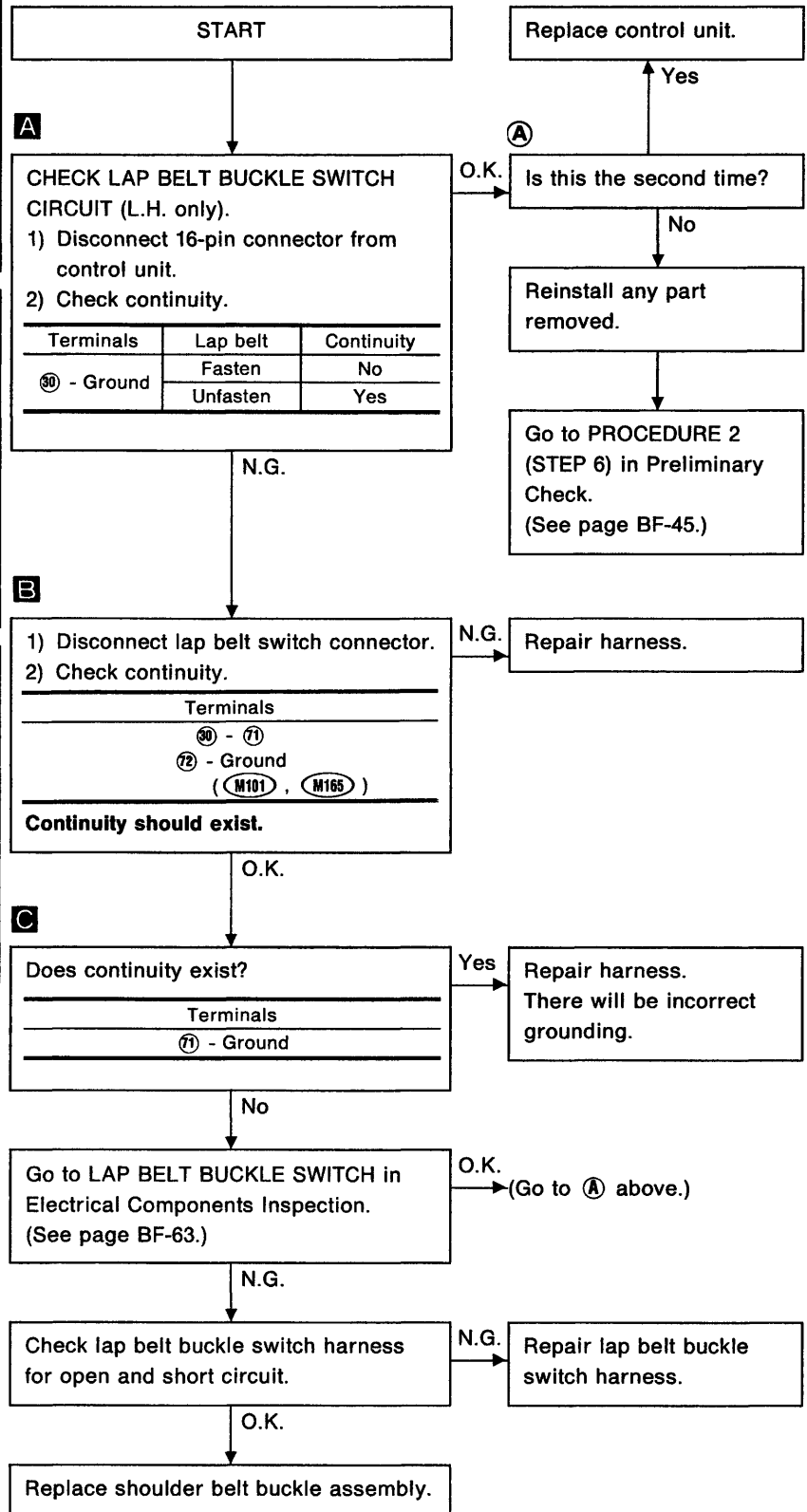


Diagnostic Procedure 5

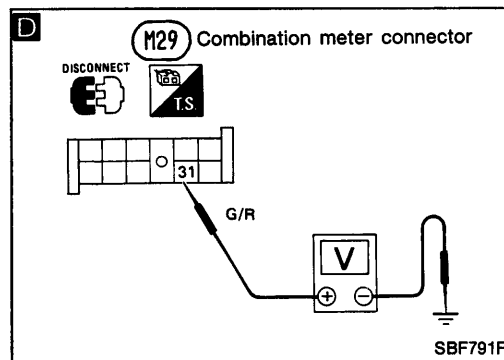
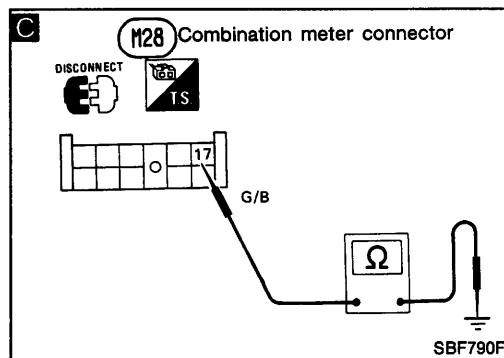
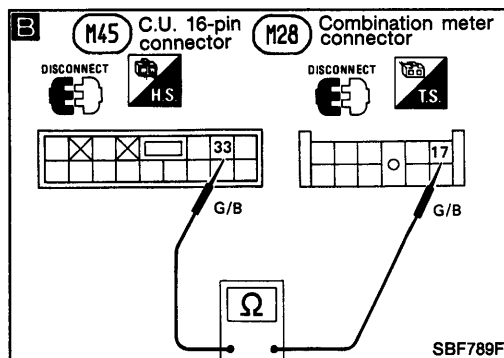
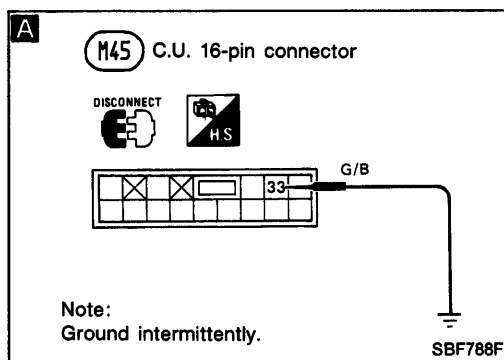




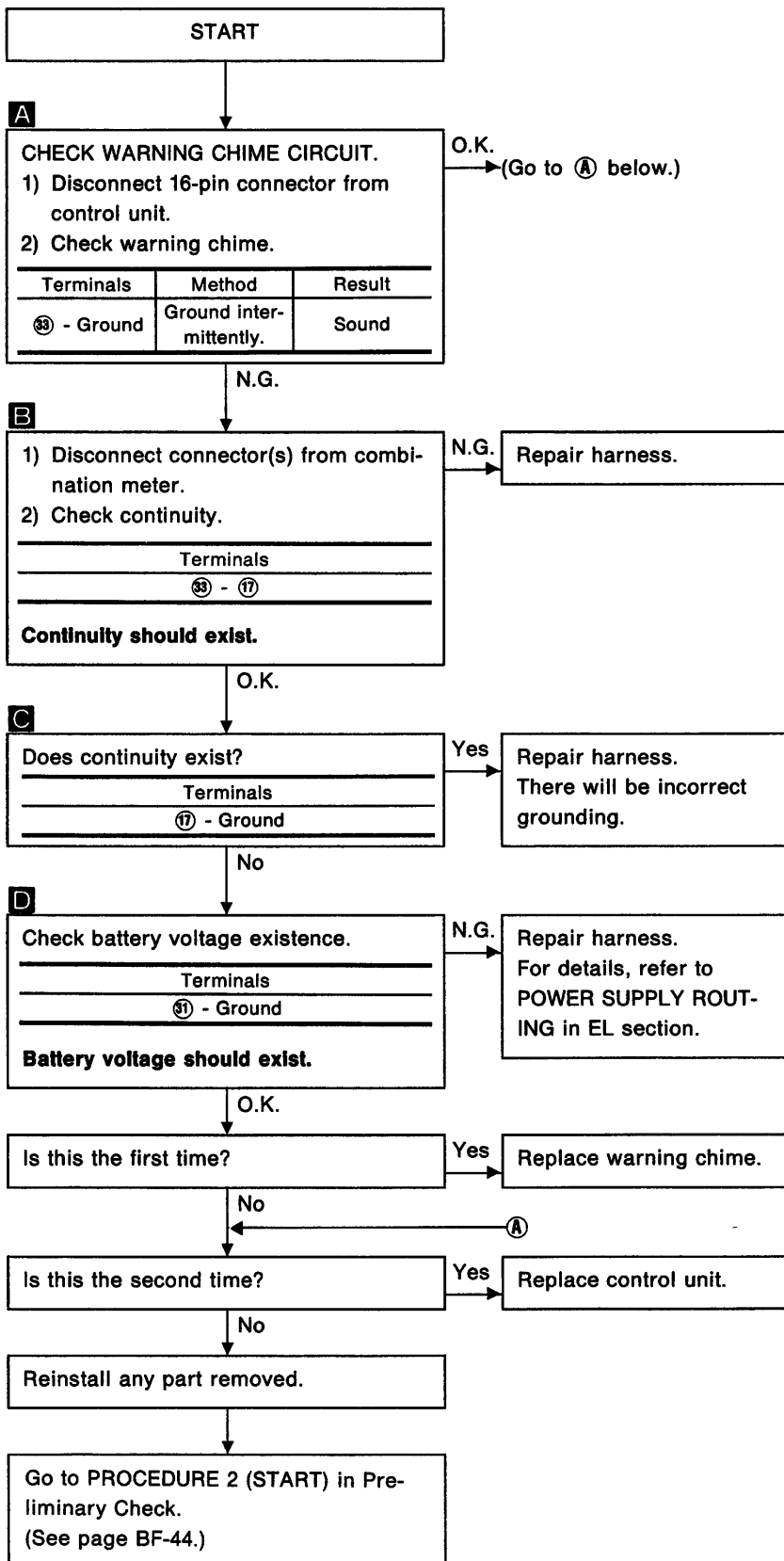
Diagnostic Procedure 6

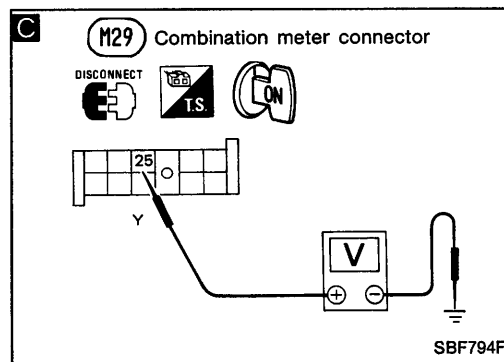
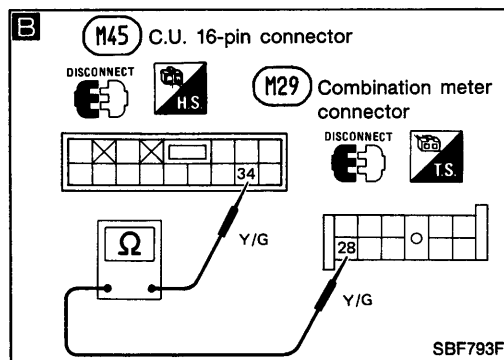
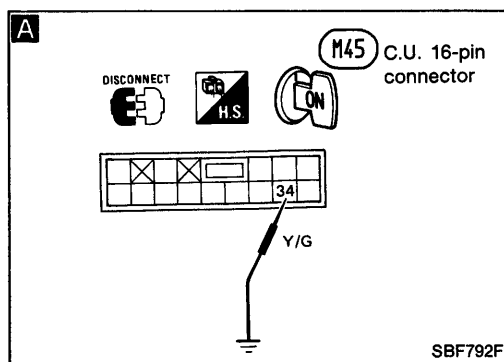


2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

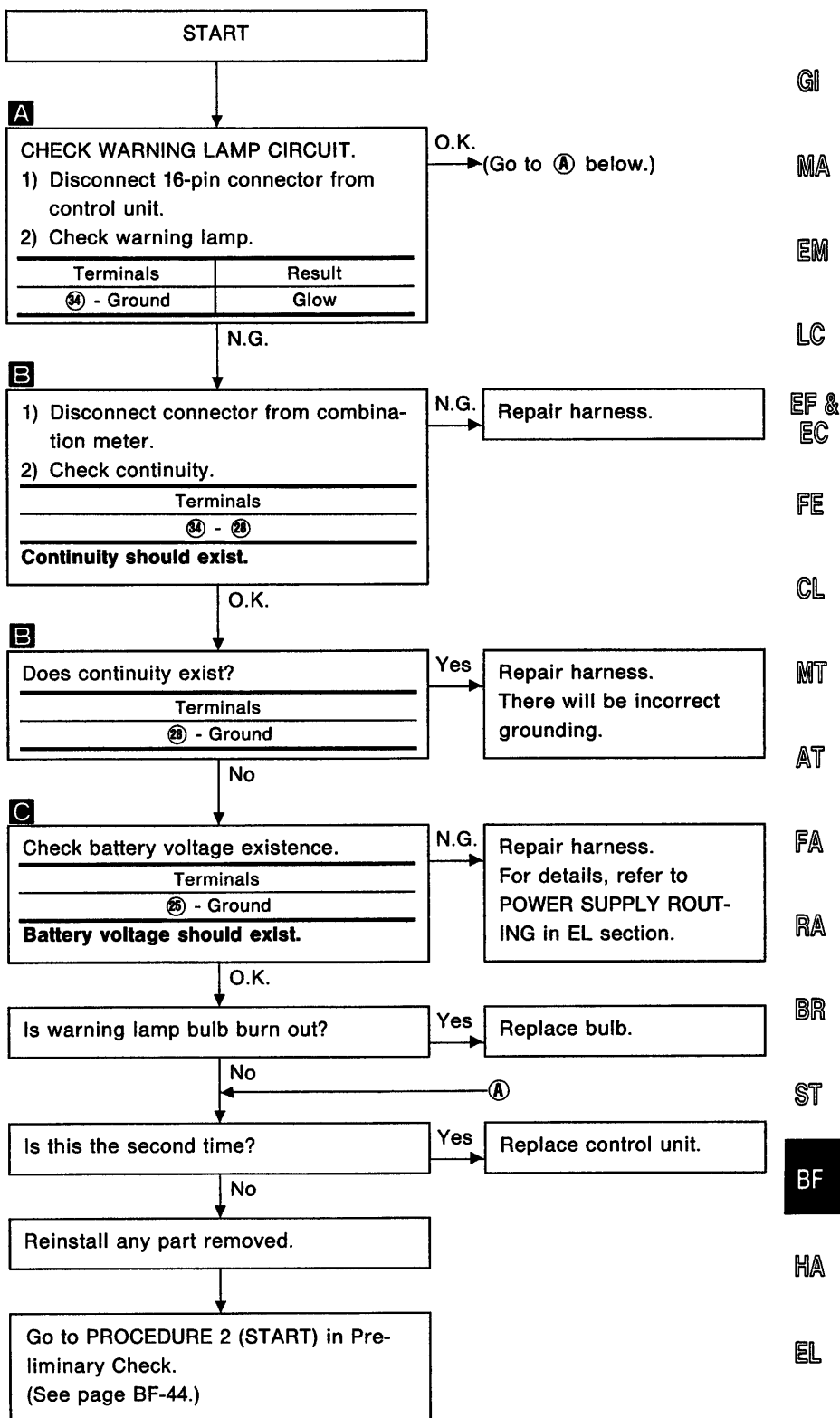


Diagnostic Procedure 7

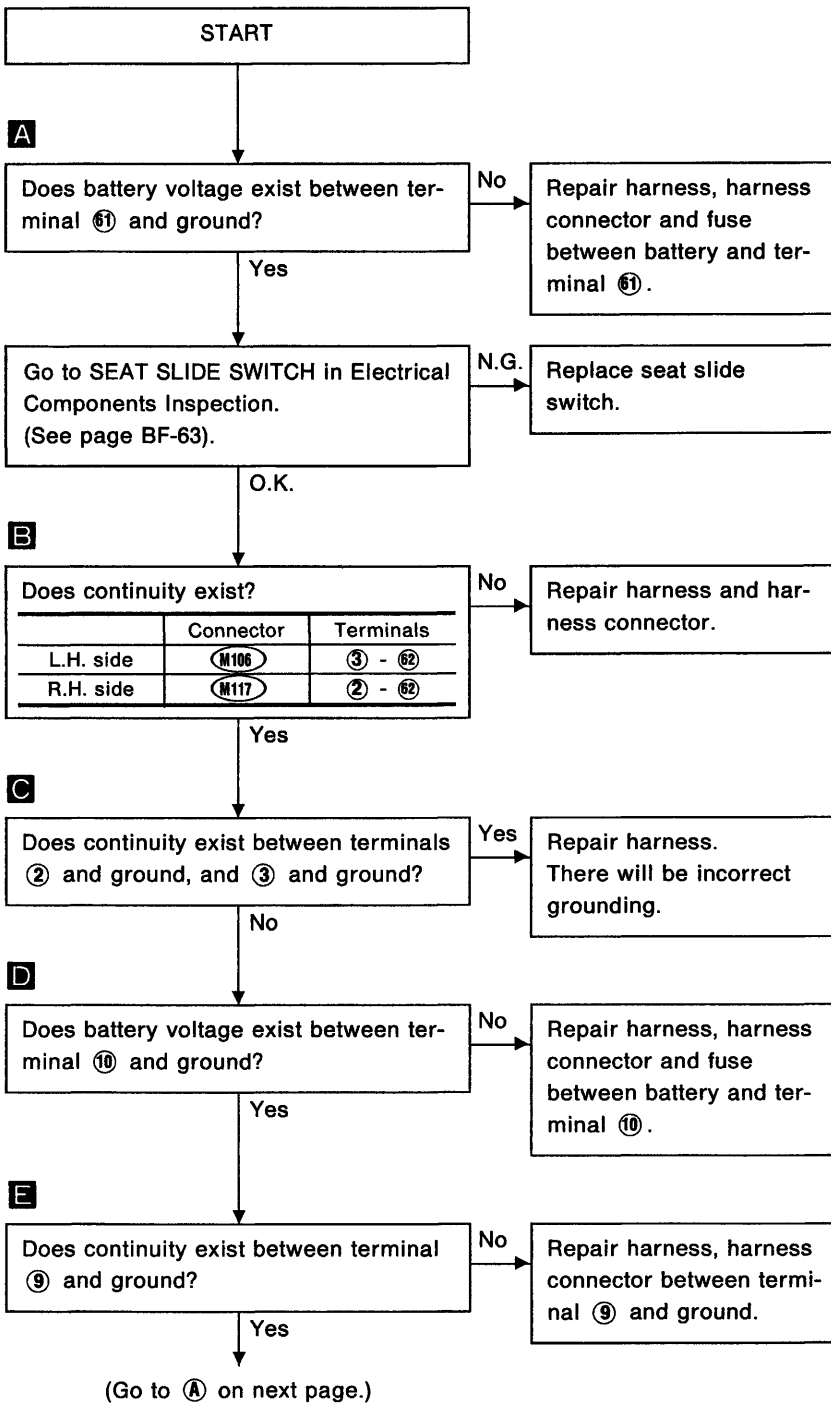
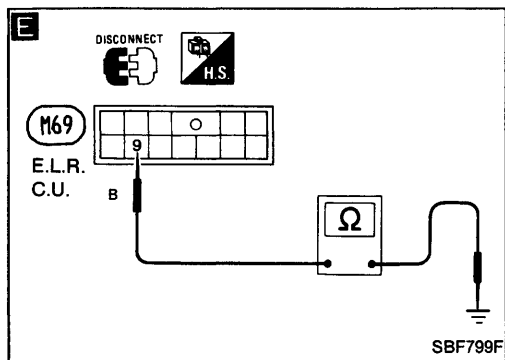
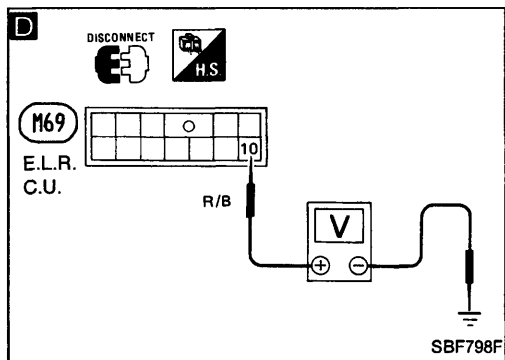
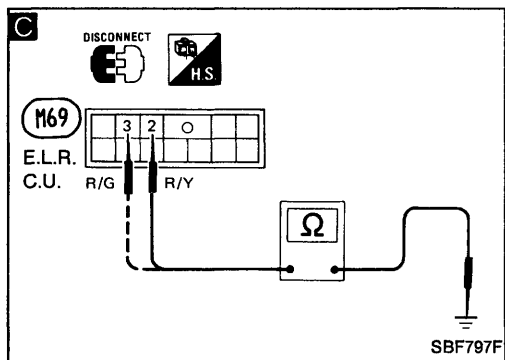
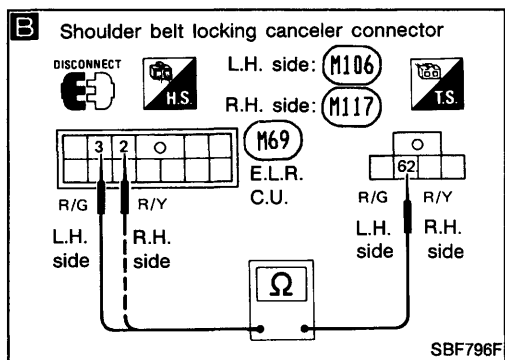
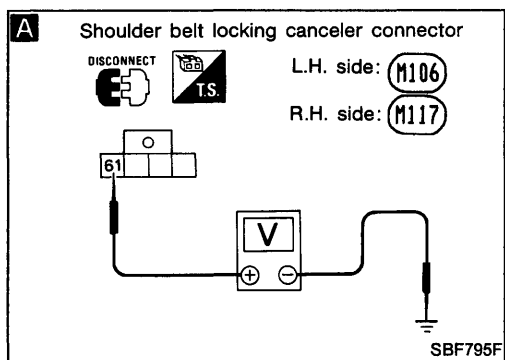




Diagnostic Procedure 8

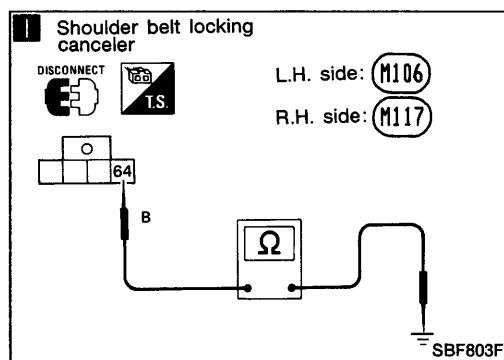
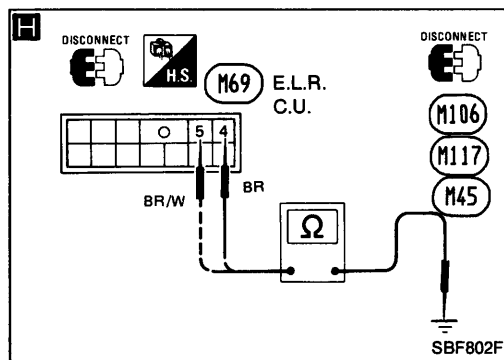
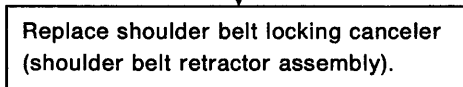
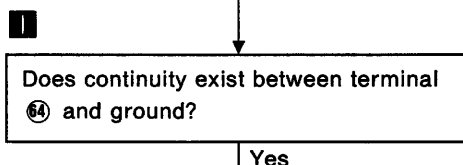
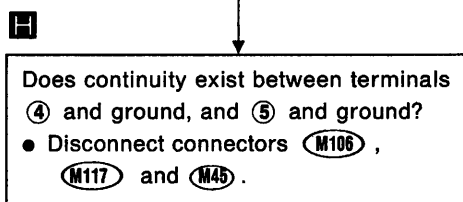
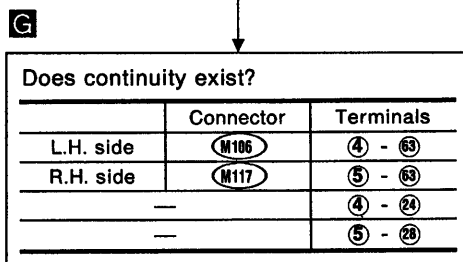
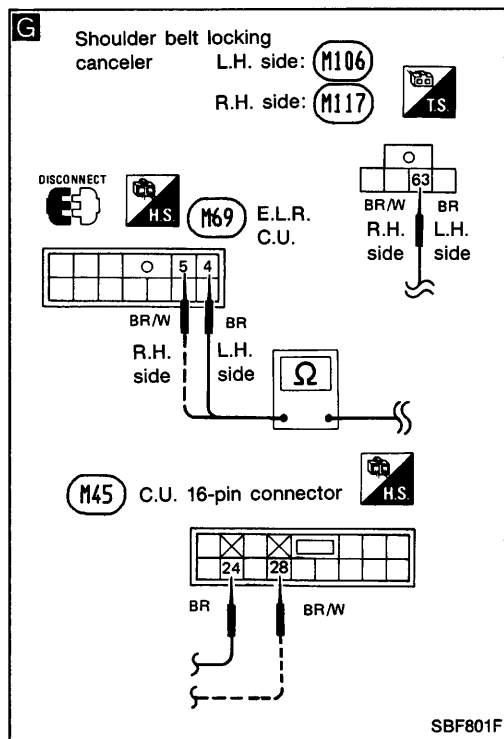
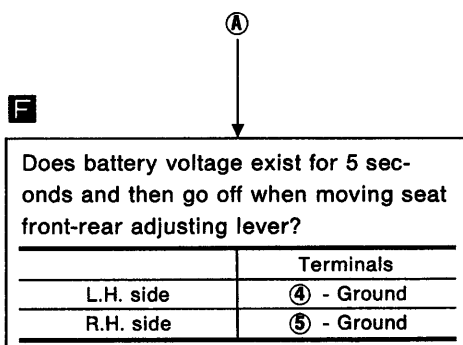
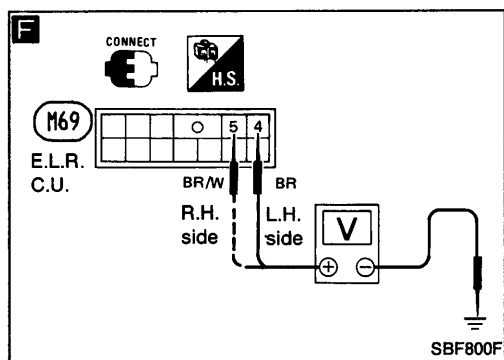


Diagnostic Procedure 9



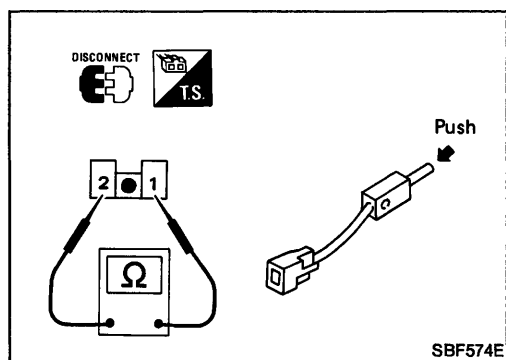
2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

Diagnostic Procedure 9 (Cont'd)



GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

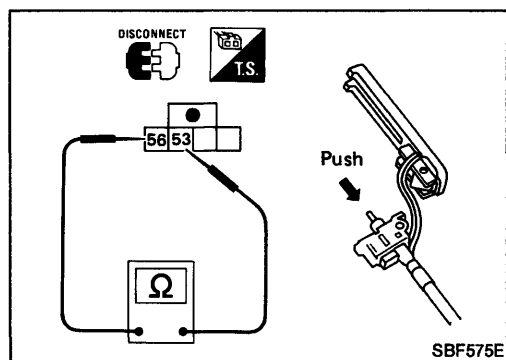
2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses



Electrical Components Inspection

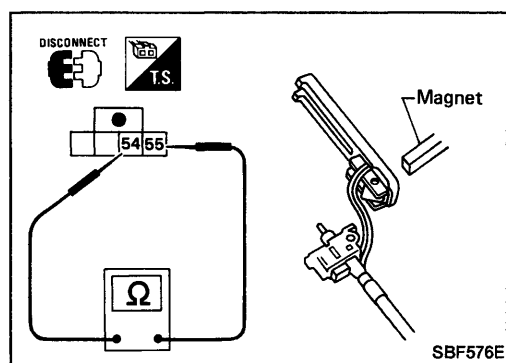
FRONT LIMIT SWITCH

Condition	Continuity
Pushed	No
Released	Yes



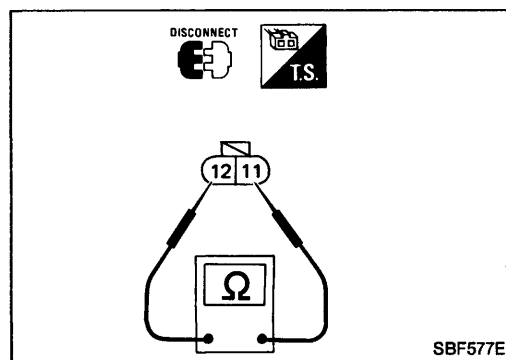
REAR LIMIT SWITCH

Condition	Continuity
Pushed	No
Released	Yes



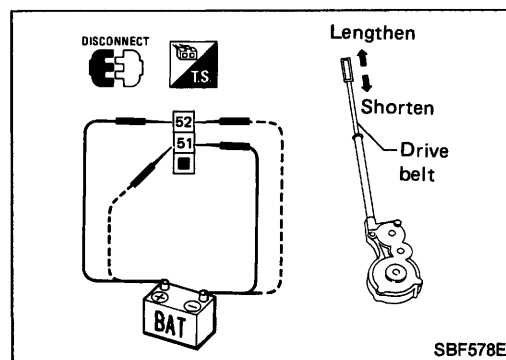
SHOULDER BELT BUCKLE SWITCH

Condition	Continuity
Move magnet toward buckle switch.	Yes
Move magnet away buckle switch.	No



DOOR LATCH SWITCH (Built-in door lock assembly)

Door condition	Continuity
Open	Yes
Closed	No



DRIVE MOTOR ASSEMBLY

Terminals		Drive belt operation
⊕	⊖	
52	51	Lengthen
51	52	Shorten

2-POINT MOTORIZED AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses

Electrical Components Inspection (Cont'd)

LAP BELT BUCKLE SWITCH
(Built-in lap belt buckle for L.H. side)

Condition	Continuity
Fastened	No
Unfastened	Yes

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

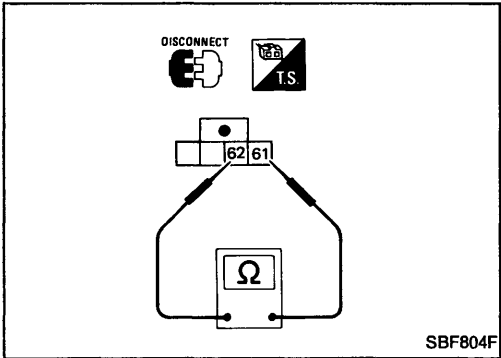
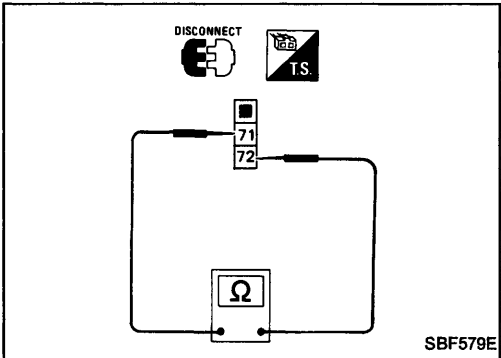
BR

ST

BF

HA

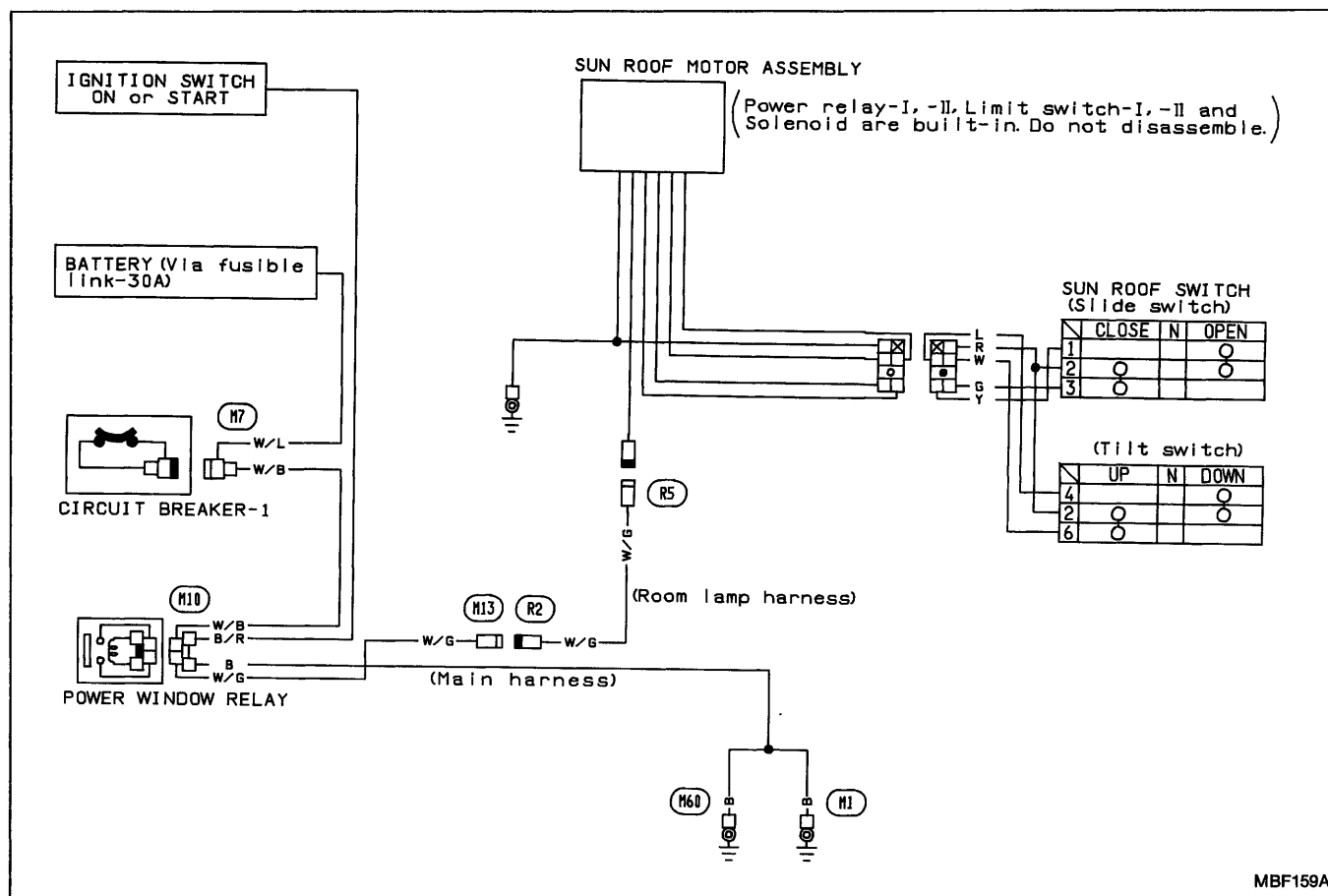
EL



SEAT SLIDE SWITCH
(Seat slide inside rail)

Condition	Continuity
Move seat front-rear adjusting lever	Yes
Release seat front-rear adjusting lever	No

Wiring Diagram



Electric Sun Roof

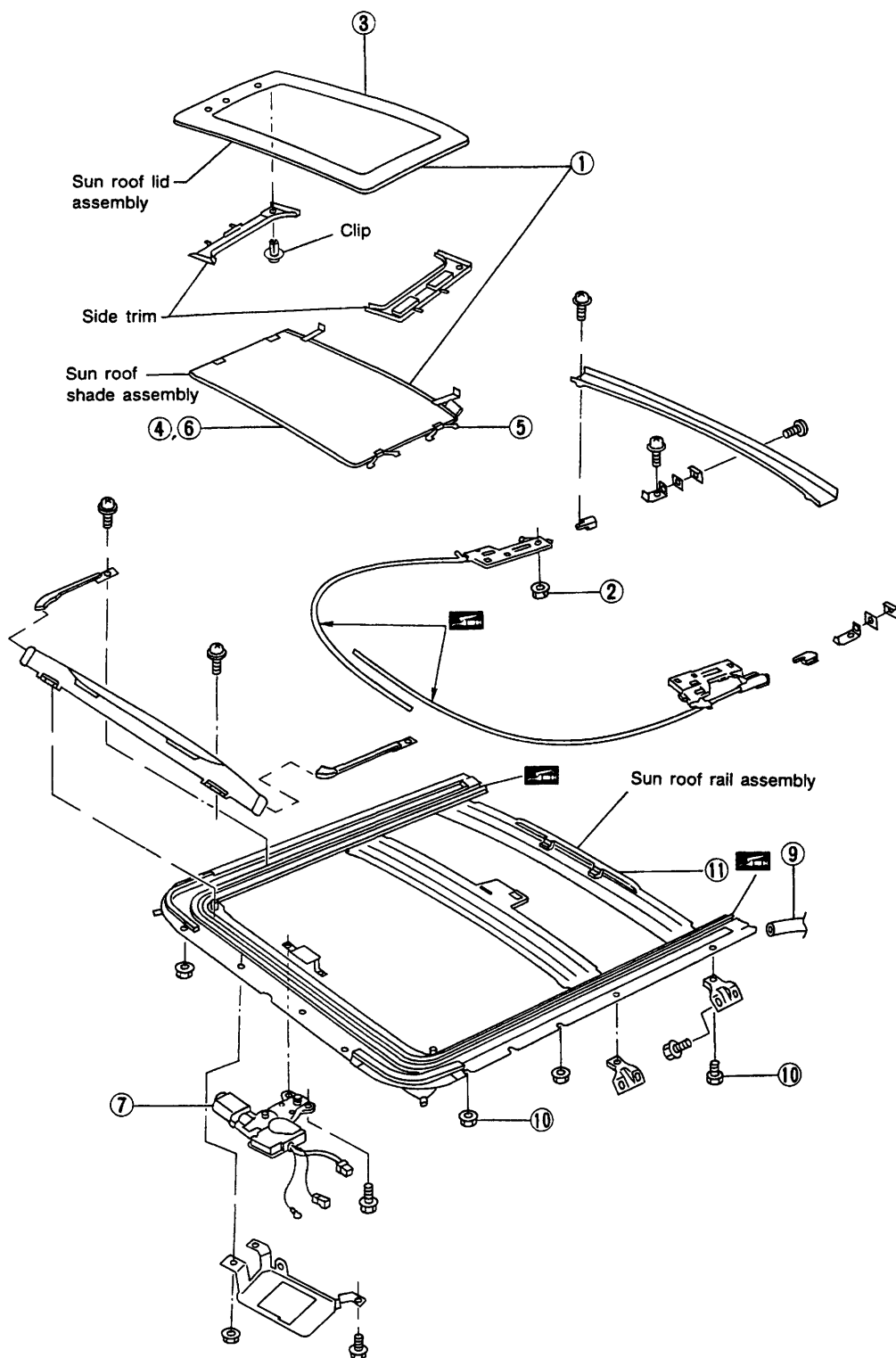
- After any adjustment, check sun roof operation and lid alignment.
- Handle finisher plate and glass lid with care so not to damage it.
- It is desirable for easy installation to mark each point before removal.

REMOVAL — Sun roof assembly

- ① Fully close or tilt up sun roof lid assembly. Fully open sun roof shade assembly. Remove clips and side trim.
- ② Close sun roof lid, and remove the six nuts from the back of the sun roof lid.
- ③ Lift out sun roof away from roof.
- ④ Pull sun roof shade forward.
- ⑤ Remove the four shade locks located beside sun roof shade.
- ⑥ Remove sun roof shade.
- ⑦ Remove sun roof motor assembly.
- ⑧ Disconnect interior lamp harness.
- ⑨ Disconnect front and rear drain hoses.
- ⑩ Remove nuts and bolts securing sun roof rails.
- ⑪ Remove sun roof rail assembly.

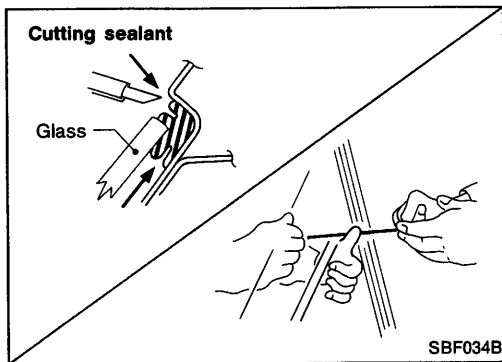
SUN ROOF

Electric Sun Roof (Cont'd)



GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

WINDSHIELD AND WINDOWS



REMOVAL

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 installing the glass, the vehicle should remain stationary until the sealant hardens.

WARNING:

Keep heat and open flames away as primers are flammable.

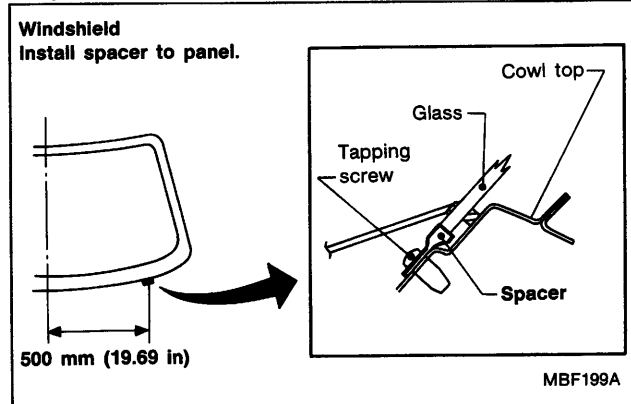
CAUTION:

Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

- Do not use sealant which is past its usable term.
- Do not leave cartridge unattended with its cap open.
- Keep primers and sealant in a cool, dry place. Ideally, they should be stored in a refrigerator.
- Molding must be installed securely so that it is in position and leaves no gap.

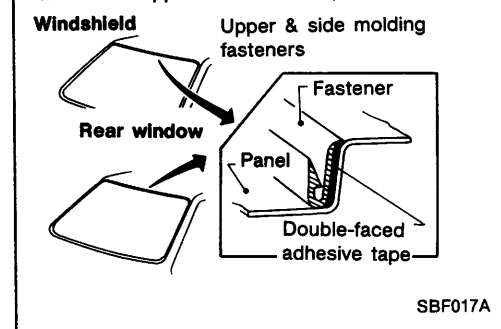
Windshield and Rear Window

Body side

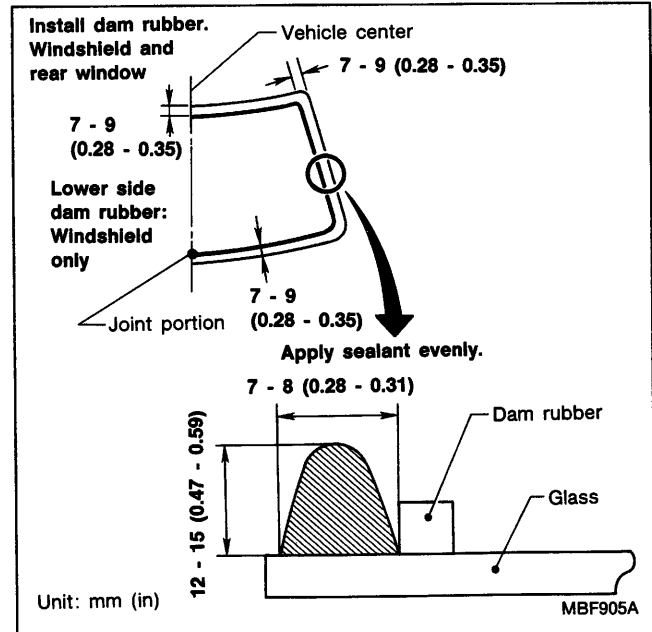


Install molding fastener.

When installing it, heat body panel and fastener to approx. 30 to 40°C (86 to 104°F).



Glass side



REPAIRING WATER LEAKS FOR WINDSHIELD

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 (if necessary) and then sealant to the leak point.

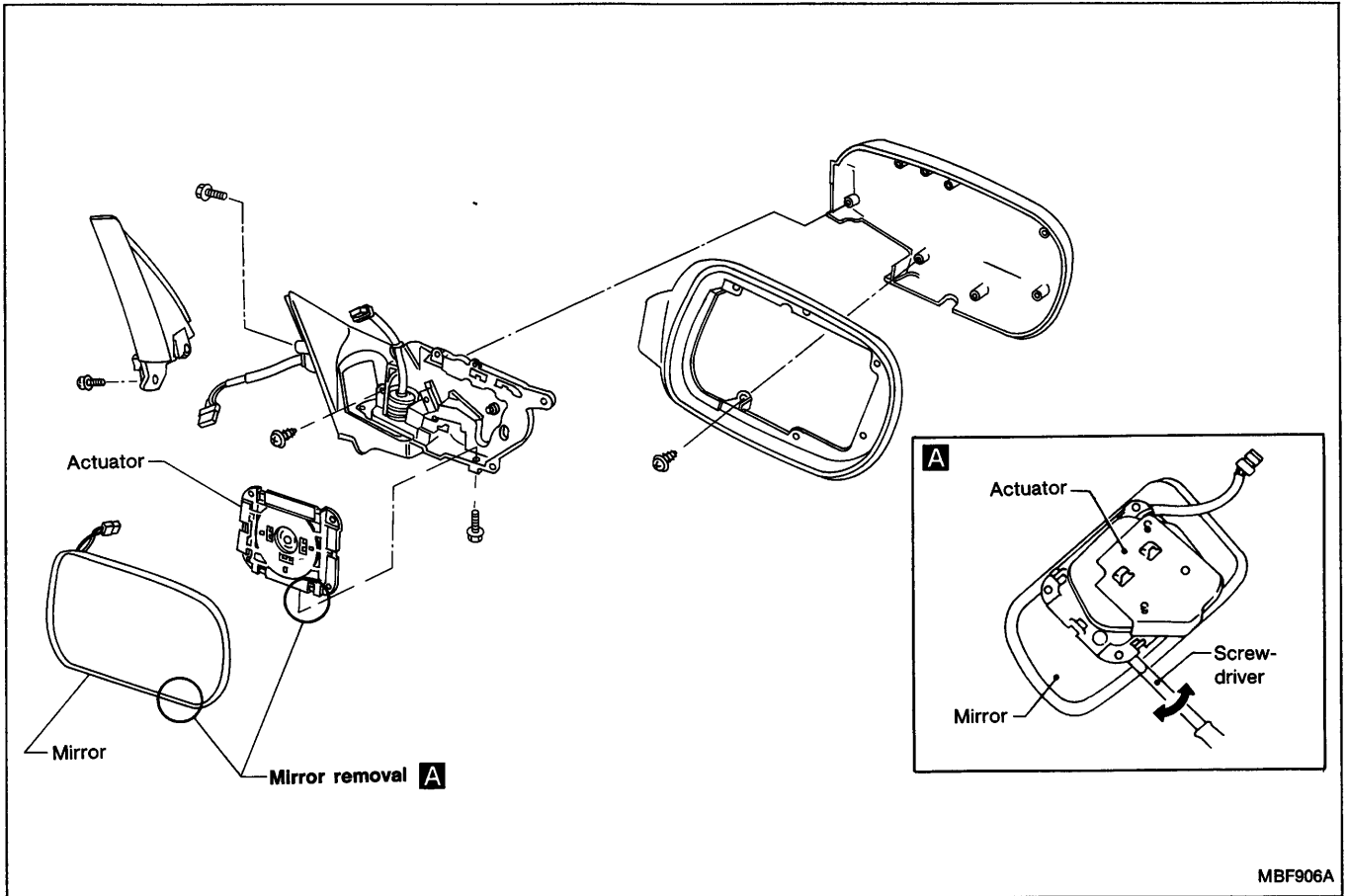
Door Mirror

CAUTION:

Be careful not to scratch door rearview mirror body.

REMOVAL — Door mirror

1. Remove door trim. Refer to "Removal — Door trim" in "Interior" for details.
2. Remove inner cover front corner of door.
3. Disconnect door mirror harness connector.
4. Remove harness clips.
5. Remove three bolts securing door mirror.



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

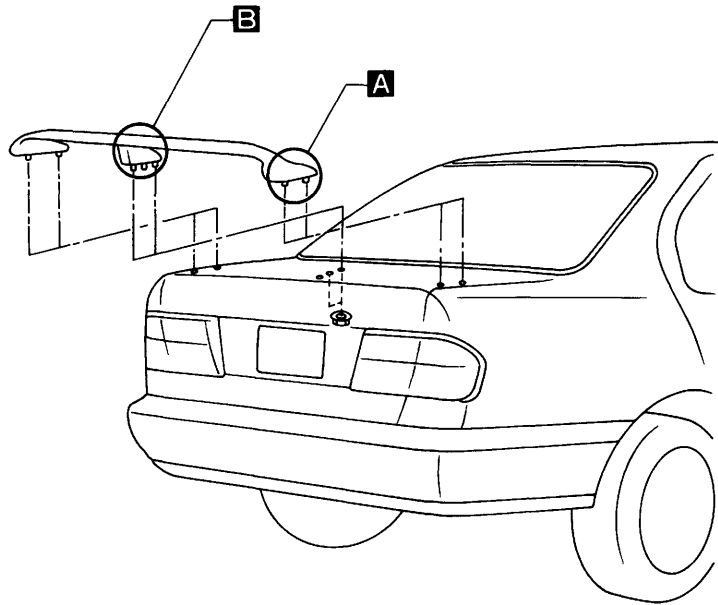
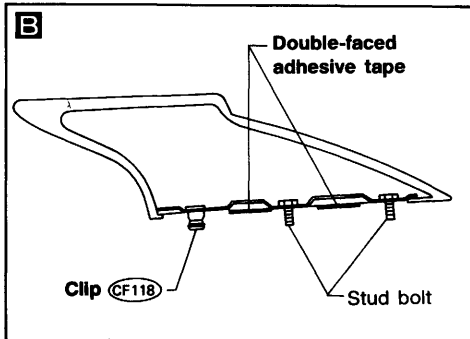
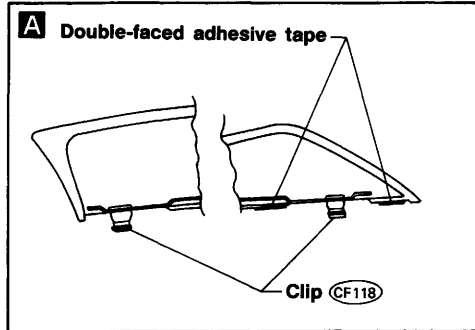
EL

REAR AIR SPOILER

- When installing, make sure that there are not gaps or waves at ends of air spoiler.
- Before installing spoiler, clean and remove oil from surface where spoiler will be mounted.

REAR AIR SPOILER

Sedan

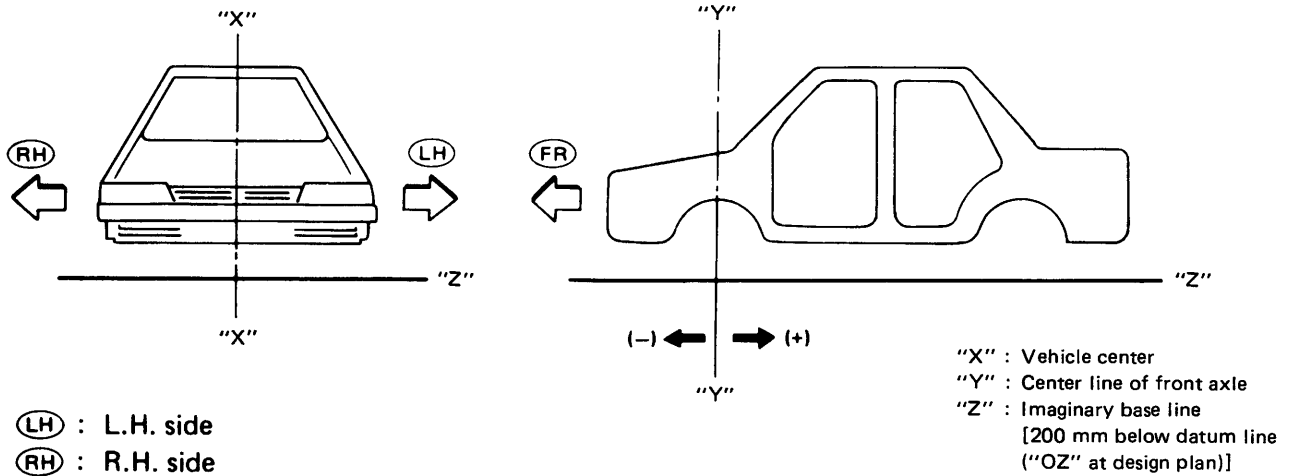


SBF614F

GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

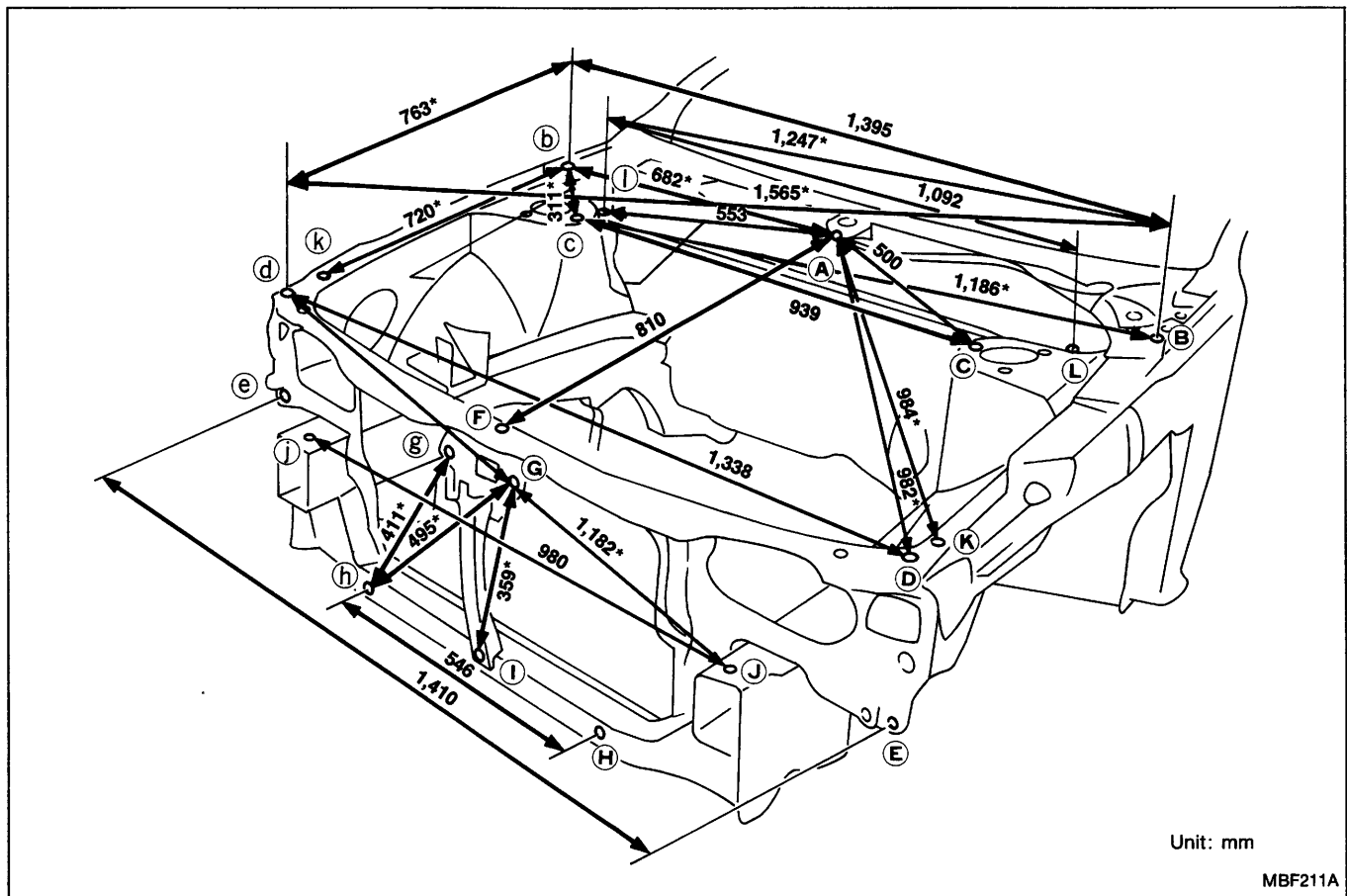
BODY ALIGNMENT

- 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.
- The coordinates of the measurement points are the distances measured from the standard line of "X", "Y" and "Z".



Engine Compartment

MEASUREMENT

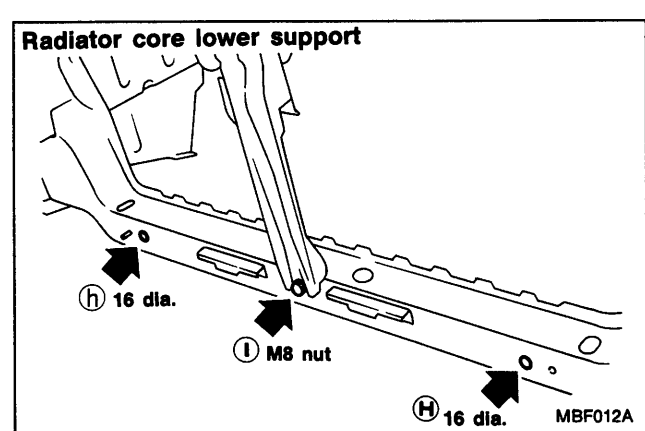
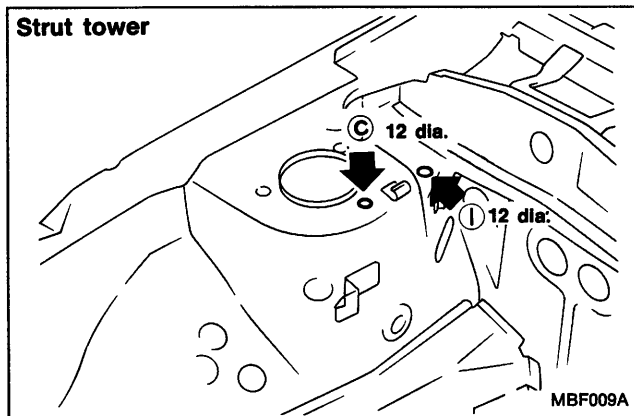
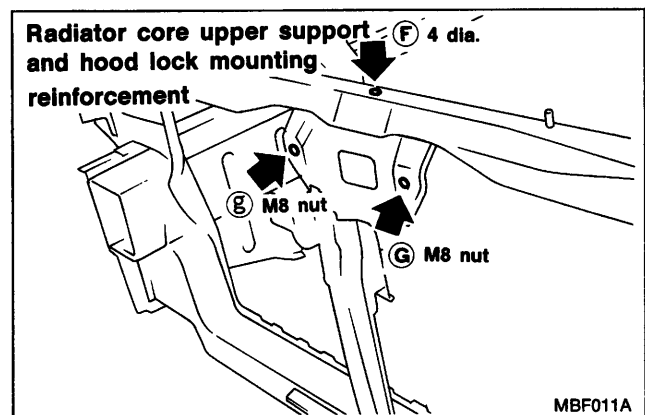
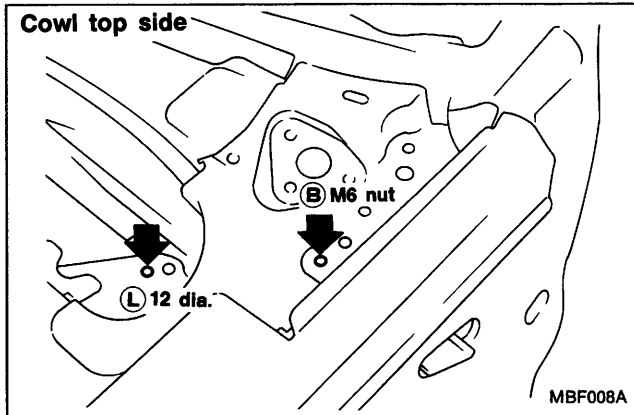
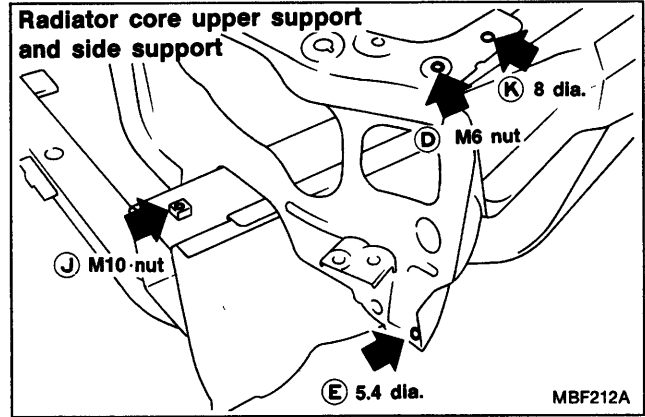
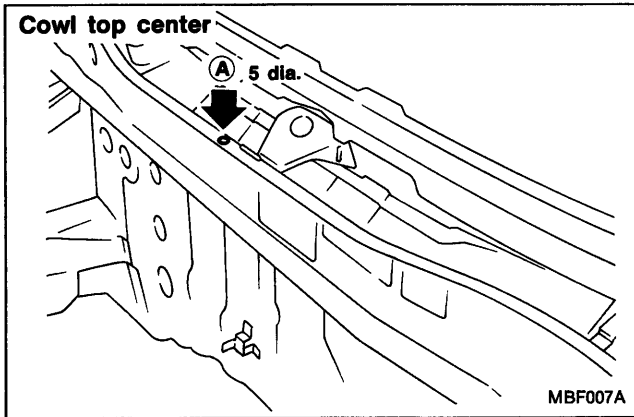


BODY ALIGNMENT

Engine Compartment (Cont'd)

MEASUREMENT POINTS

Unit: mm



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

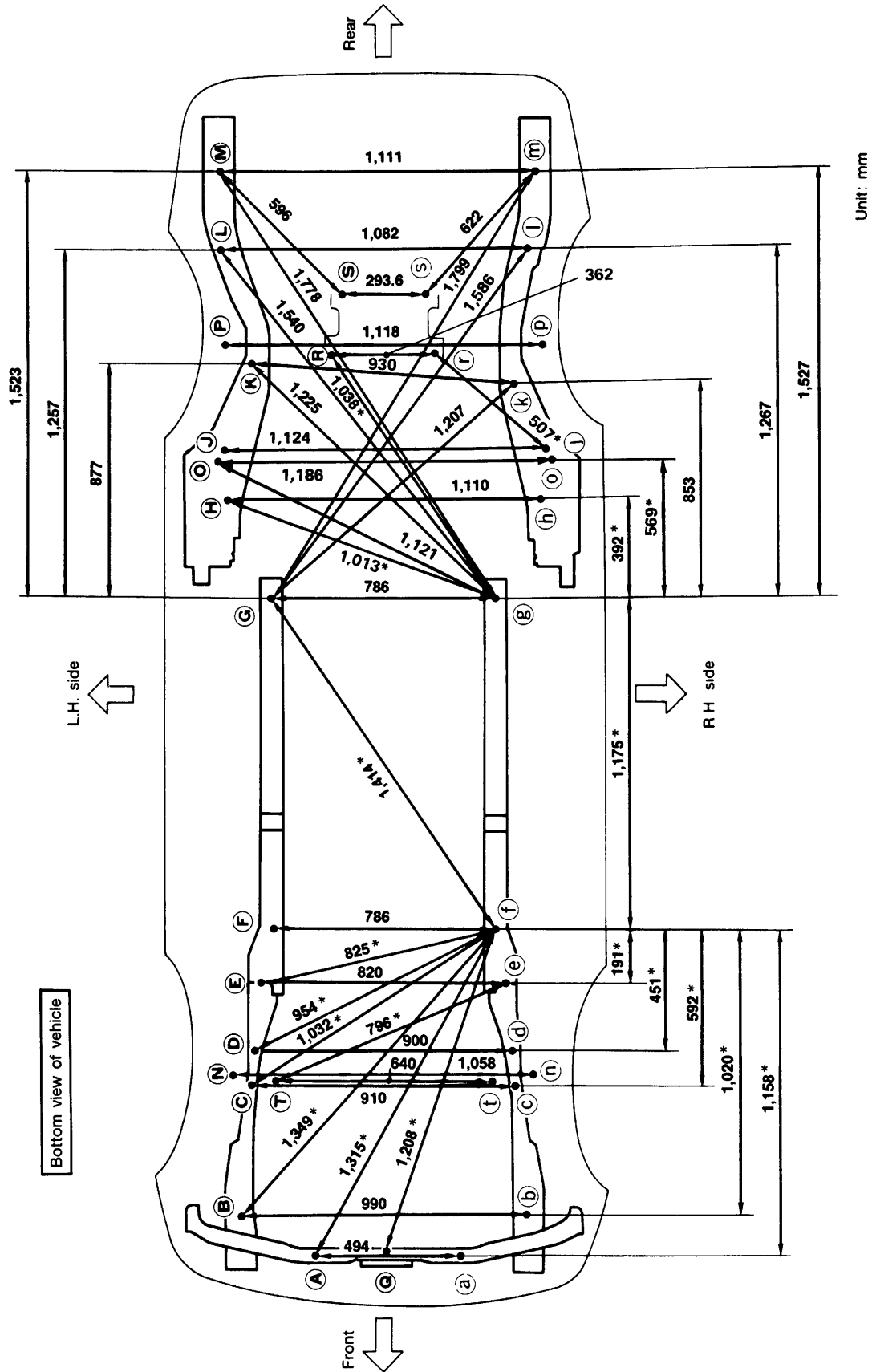
EL

BODY ALIGNMENT

Underbody

MEASUREMENT

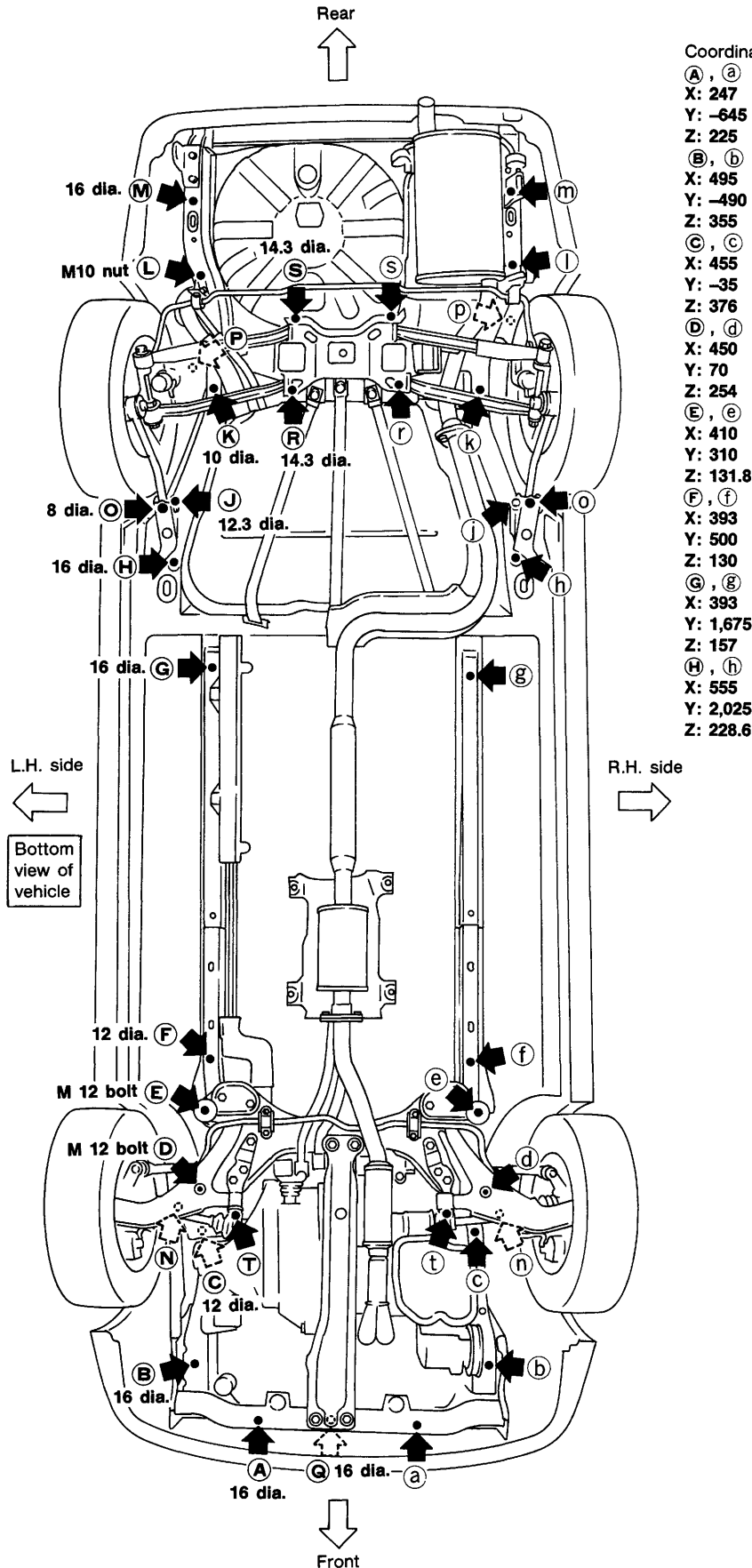
All dimensions indicated in this figure are actual ones.
(There are no projected dimensions.)



BODY ALIGNMENT

Underbody (Cont'd)

MEASUREMENT POINTS



Coordinates:

(A), (a)
X: 247
Y: -645
Z: 225
(B), (b)
X: 495
Y: -490
Z: 355
(C), (c)
X: 455
Y: -35
Z: 376
(D), (d)
X: 450
Y: 70
Z: 254
(E), (e)
X: 410
Y: 310
Z: 131.8
(F), (f)
X: 393
Y: 500
Z: 130
(G), (g)
X: 393
Y: 1,675
Z: 157
(H), (h)
X: 555
Y: 2,025
Z: 228.6

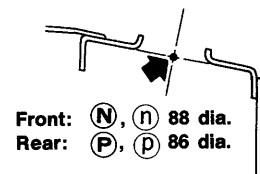
(J), (j)
Radius rod
bracket mounting
hole
X: 561.8
Y: 2,203
Z: 236
(K)
X: 465
Y: 2,530
Z: 338.1
(k)
X: 465
Y: 2,505
Z: 338.1
(L)
X: 503.2
Y: 2,914.4
Z: 336.9
(I)
X: 578.5
Y: 2,915.1
Z: 336.9
(M)
X: 536
Y: 3,180
Z: 340
(m)
X: 575
Y: 3,180
Z: 340

(O), (o)
X: 593.1
Y: 2,206
Z: 191.8
(@)
X: 0
Y: -638
Z: 226
(R), (r)
X: 181
Y: 2,535.9
Z: 235.6
(S), (s)
X: 146.8
Y: 2,751.2
Z: 199.3
(T), (t)
Transverse link
bush pin
X: 320
Y: -7
Z: 158

Front and rear strut tower centers

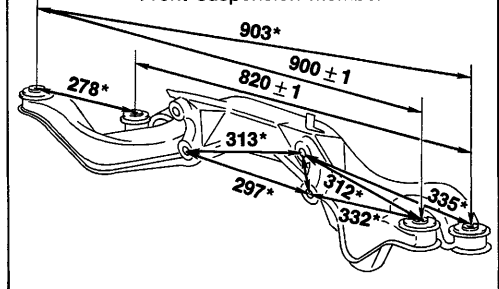
Coordinates:

(N), (n)
X: 529
Y: -5
Z: 770
(P), (p)
X: 559.2
Y: 2,567.7
Z: 779.8



Suspension link mounting hole

Front suspension member



Unit: mm

MBF907A

HEATER & AIR CONDITIONER

SECTION **HA**

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

CONTENTS

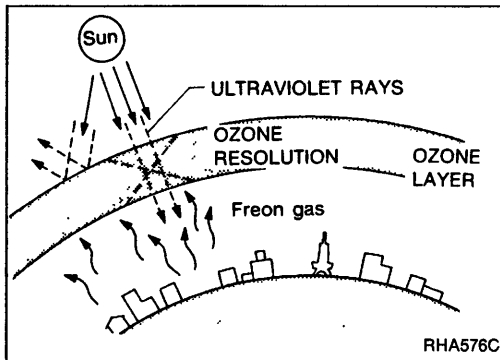
PRECAUTIONS	2	Fast Idle Control Device (F.I.C.D.)	27
Precautions for the Handling of Refrigerant	2	LUBRICATION OIL — Checking and Adjusting	28
Precautions for Refrigerant Connection	3	Lubrication Oil.....	28
Precautions for Servicing Compressor.....	4	Maintenance of Oil Quantity in Compressor	28
DESCRIPTION — Overall System	5	Checking and Adjusting.....	28
Control Operation	5	COMPRESSOR — Model NVR 140S	
Component Layout.....	6	(ATSUGI make)	30
Air Flow	7	Precautions.....	30
Air Flow — Max. Cold Door Operation System	8	Compressor Clutch	30
DESCRIPTION — Refrigeration System	9	Thermal Protector	31
Refrigeration Cycle	9	DIAGNOSES — Overall System	32
PREPARATION	10	How to Perform Trouble Diagnoses for Quick	
Special Service Tools	10	and Accurate Repair.....	32
Commercial Service Tools	10	Operational Check	33
DISCHARGING, EVACUATING, CHARGING AND		Performance Chart.....	35
CHECKING	16	Performance Test Diagnoses	36
Work Procedure	16	TROUBLE DIAGNOSES	41
Setting of Service Tools	17	Contents.....	41
Discharging	18	DOOR CONTROL	71
Evacuation	19	Control Linkage Adjustment.....	71
Charging Refrigerant.....	20	SYSTEM DESCRIPTION — Push Control	73
Inspection for Refrigerant Leaks.....	22	Push Control System	73
Confirmation of Amount of Charged		Intake Door Motor	74
Refrigerant	23	Mode Door Motor.....	74
Removal of Commercial Service Tools	25	Max. Cold Door Motor	75
SERVICE PROCEDURES	26	Removal and Installation.....	75
Refrigerant Lines	26	Disassembly	76
Compressor Mounting	27	SERVICE DATA AND SPECIFICATIONS (S.D.S.)	78
Thermo Control Amp.	27	General Specifications.....	78
Belt Tension	27	Inspection and Adjustment.....	78

When you read wiring diagrams:

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

When you perform trouble diagnoses, read GI section, “HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES”.

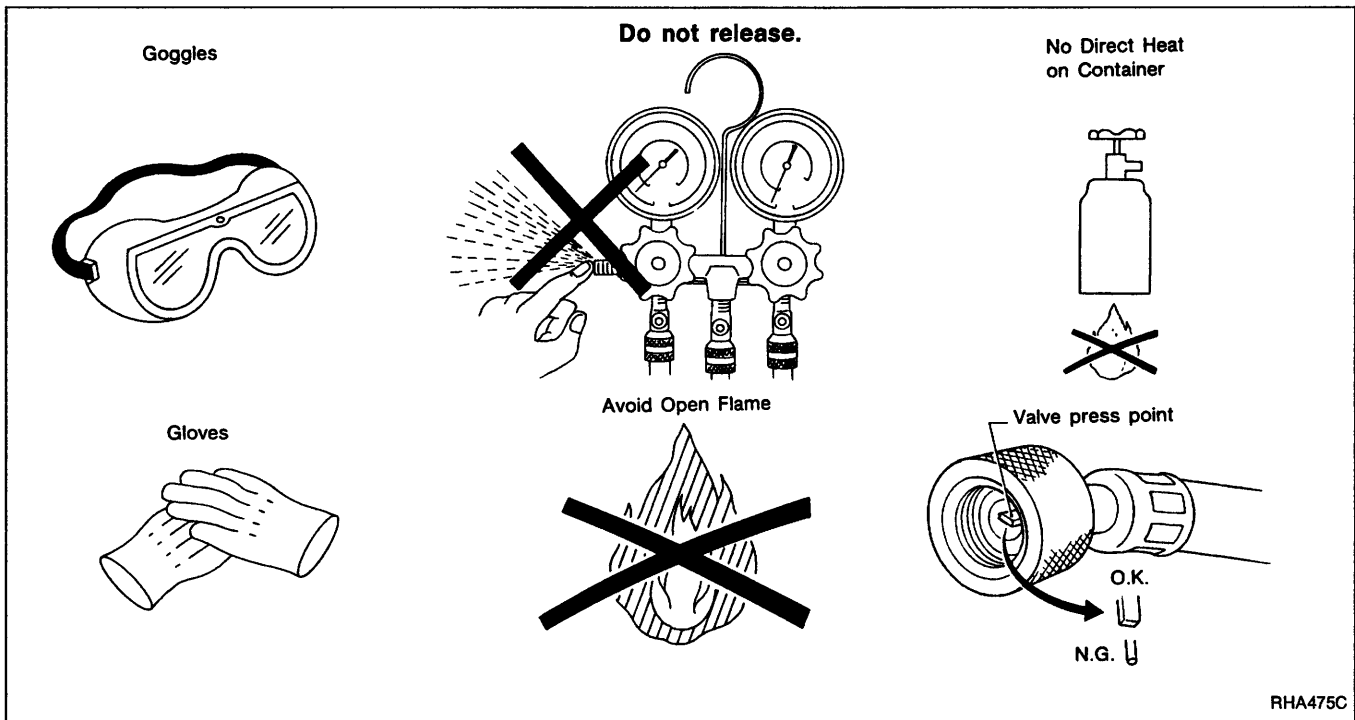
PRECAUTIONS



Precautions for the Handling of Refrigerant

- Do not release refrigerant into the air. Use your refrigerant recycling equipment to capture the refrigerant every time you need to discharge an air conditioning system.

The release of refrigerant into the air can cause damage to the Earth's ozone layer.



- 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 container with an open flame. There is a danger that container will explode.

CAUTION:

- Do not use steam to clean surface of condenser or evaporator. Be sure to use cold water or compressed air.
- Do not use compressed air to clean out a contaminated A/C tube or hose. Shake the line over a clean, white paper towel. If it contains obvious moisture or contaminants, replace it. Do not blow out the line with refrigerant.
- Do not use manifold gauge set whose press point shape is different from that shown. Otherwise, insufficient evacuating may occur.
- Do not over-tighten service valve cap.
- Follow the manufacture's instructions for discharging into your refrigerant recycling equipment.

PRECAUTIONS

Precautions for Refrigerant Connection

WARNING:

Make sure all refrigerant is discharged into the recycling equipment and the pressure in the system is less than atmospheric. Then gradually loosen the discharge side hose fitting and remove it.

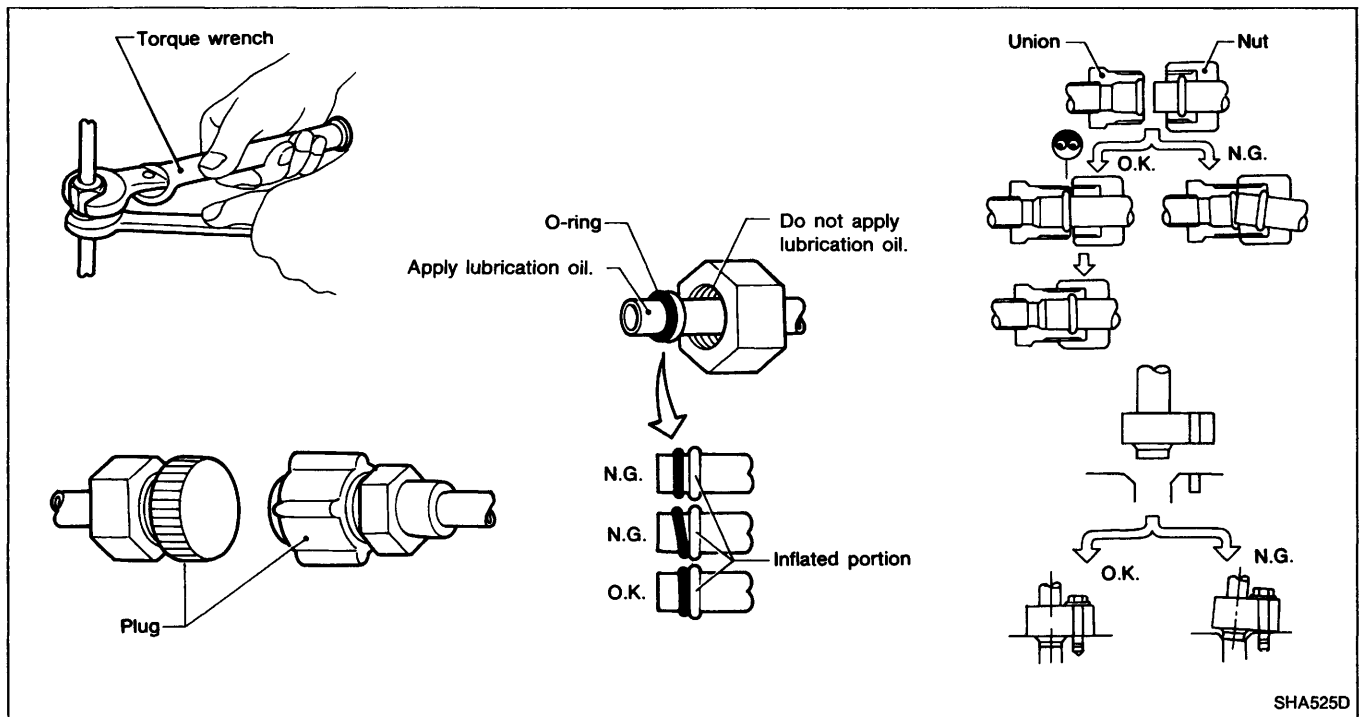
CAUTION:

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 and a back-up wrench.
- After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.

CAUTION:

- When installing an air conditioner in the vehicle, the pipes must be connected as the final stage of the operation. The seal caps of the pipes and other components must not be removed until their removal is required for connection.
- Before installing any air conditioner component that has been stored in a cool location to a vehicle that has been exposed to the hot sun, leave the component as it is for some time in a hot location with its seal cap unremoved. This step is necessary to prevent condensation of moisture inside the cold component.
- Thoroughly remove moisture from the refrigeration system before charging the refrigerant.
- Always replace used O-rings.
- When connecting tube, apply lubrication 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.

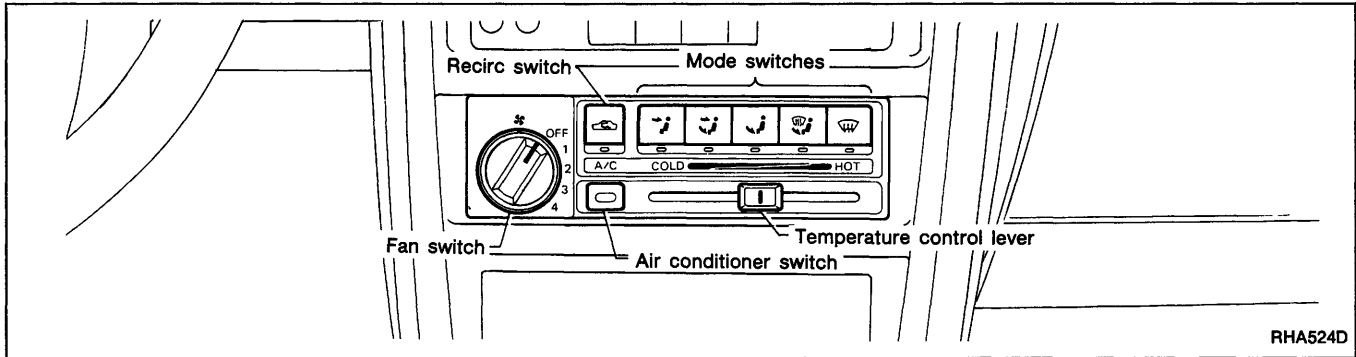


PRECAUTIONS

Precautions for Servicing Compressor

- **Attach a blind plug to the suction port (low pressure) and discharge port (high pressure) of the compressor to prevent oil from leaking out and dust from getting inside.**
- **Do not keep the compressor in the upside down position or laid on its side for more than 10 minutes.**
- **When replacing or repairing compressor, be sure to remove oil from the compressor and check the oil quantity extracted.**
- **When replacing with a new compressor, be sure to remove oil from the new compressor so that the quantity of oil remaining in the new compressor is equal to the quantity collected from the removed compressor. See the section "LUBRICATION OIL".**
- **Pay attention so as not to allow dirt and oil to attach on the friction surfaces between clutch and pulley. If the surface is contaminated, with oil, wipe it off by using a clean waste cloth moistened with thinner.**
- **After completing the compressor service operation, be sure to rotate the compressor shaft more than five turns in both directions by hand to equalize oil distribution inside the compressor, then run the compressor for about one hour by idling the engine.**
- **When the compressor magnet clutch has been replaced, be sure to check the magnet clutch for normal operation by applying voltage to the clutch.**

Control Operation



FAN SWITCH

This switch turns the fan ON and OFF, and controls fan speed.

MODE SWITCHES

These switches allow you to select the outlet air flow.

In "DEF" or "F/D" mode, the intake door is set to "FRE". The compressor turns on in the "DEF" mode.

TEMPERATURE CONTROL LEVER

This lever allows you to adjust the temperature of the outlet air.

RECIRC SWITCH

OFF position:

Outside air is drawn into the passenger compartment when this switch is OFF.

ON position:

Interior air is recirculated inside the vehicle.

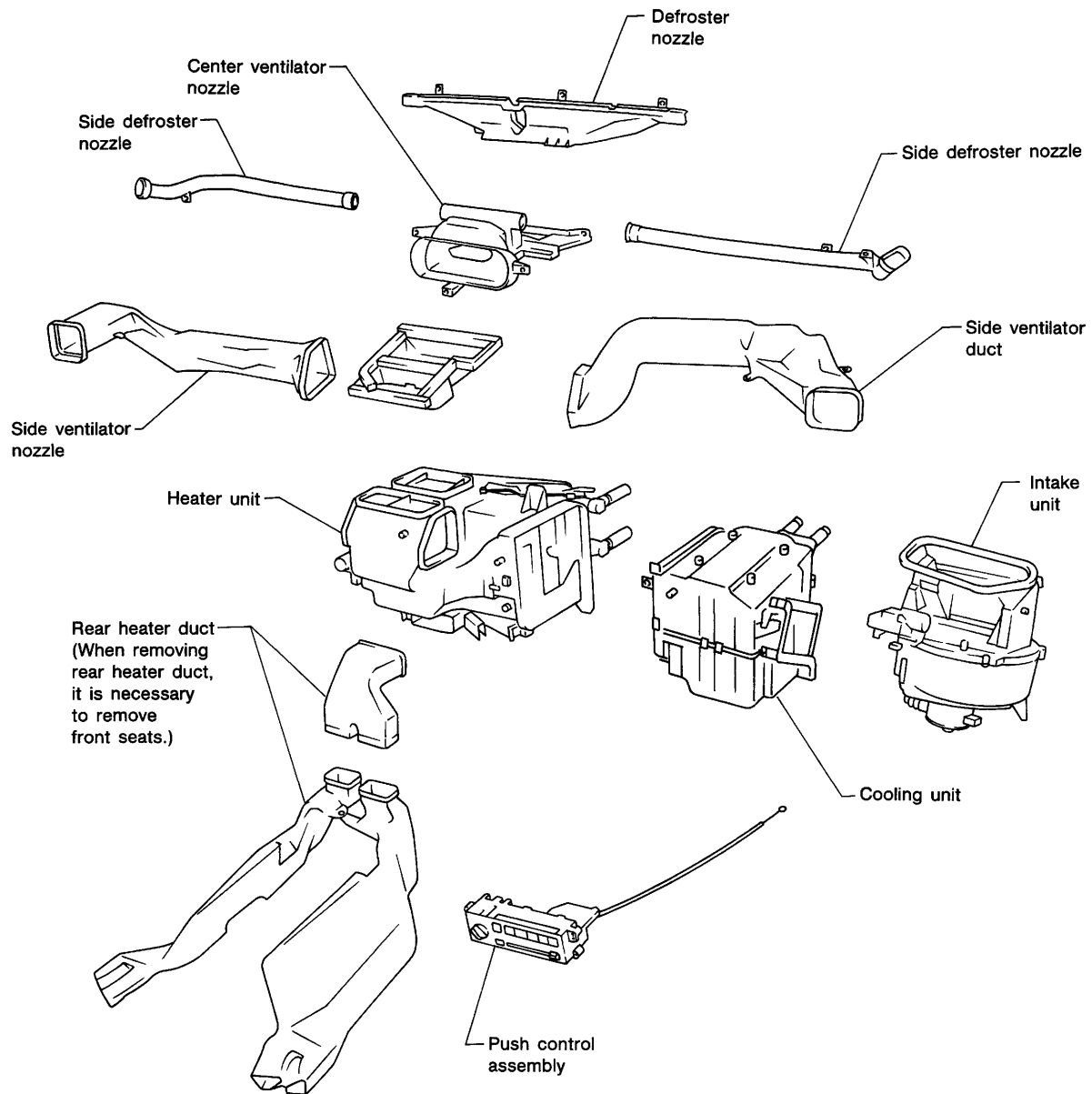
RECIRC is canceled when DEF or F/D are selected, RECIRC resumes when another mode is chosen.

AIR CONDITIONER SWITCH

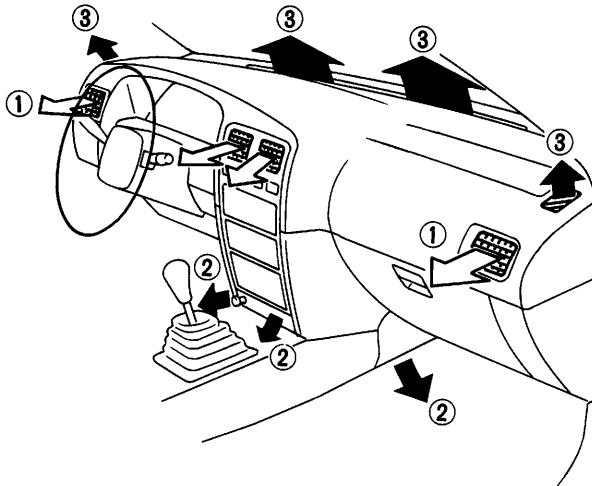
Start the engine, move the fan control switch to the desired (1 to 4) position and push the air conditioner switch to turn ON the air conditioner. The indicator light will come on when the air conditioner is ON. To stop the air conditioner, push the switch again to return it to the original position.

The air conditioner cooling function operates only when the engine is running.

Component Layout



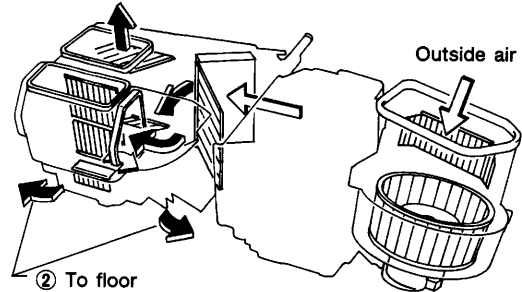
Air Flow



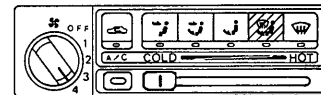
Floor



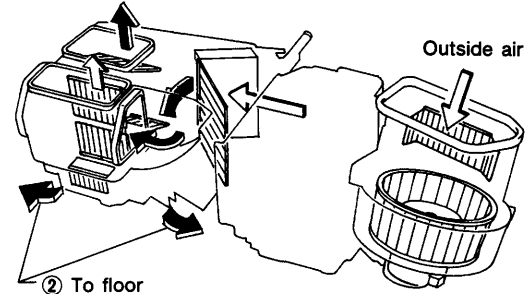
③ To defroster



Floor and defroster



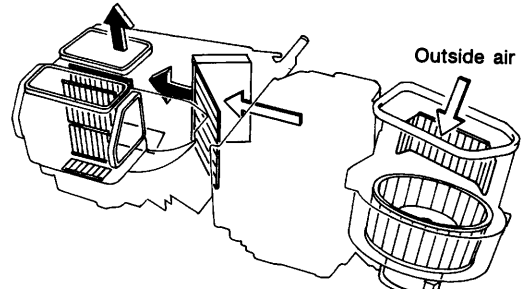
③ To defroster



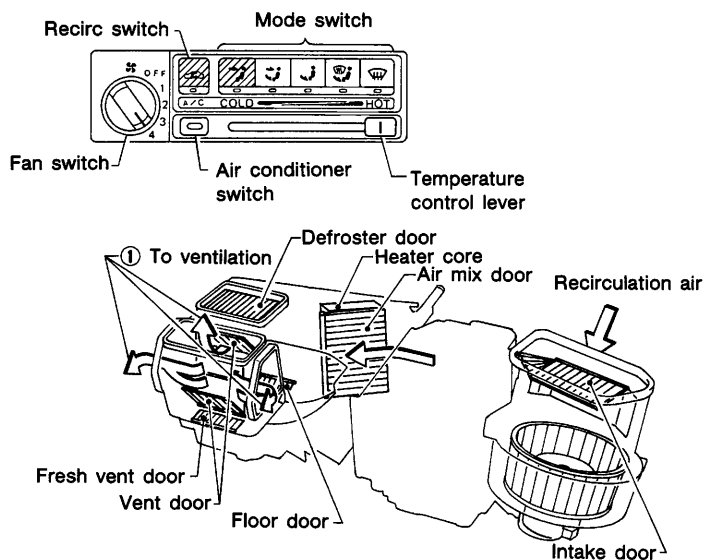
Defroster



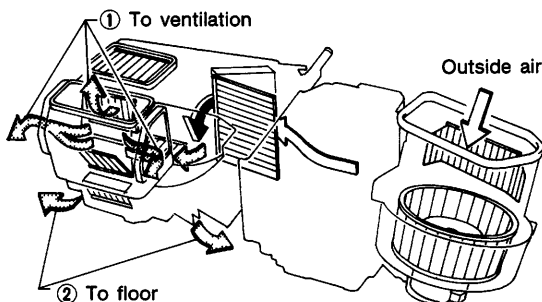
③ To defroster



Ventilation (Recirc "ON")



Bi-level



← : Air passed through heater core
 ← : Mixed air (← + ←)
 ← : Air not passed through heater core

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

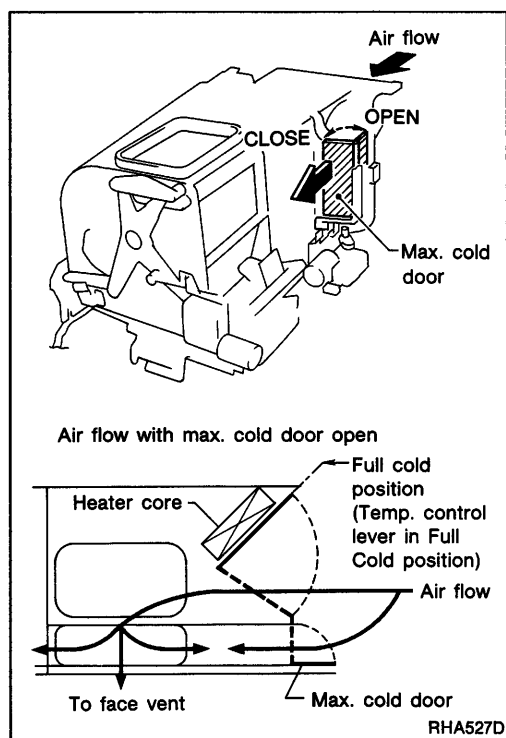
BR

ST

BF

HA

EL



Air Flow — Max. Cold Door Operation System

In the FULL COOL mode (in VENT mode and with temp. control lever in FULL COOL position), max. cold door system reduces resistance of vent air flowing through interior of heater unit. The max. cold door system reduces noise during FULL COOL mode by allowing cold air which has just passed through the cooling unit to blow out from ventilators through both the max. cold door and the heater unit vent door.

Refrigeration Cycle

REFRIGERANT FLOW

The refrigerant flows in the standard pattern, that is, through the compressor, the condenser, the liquid tank, 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

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.

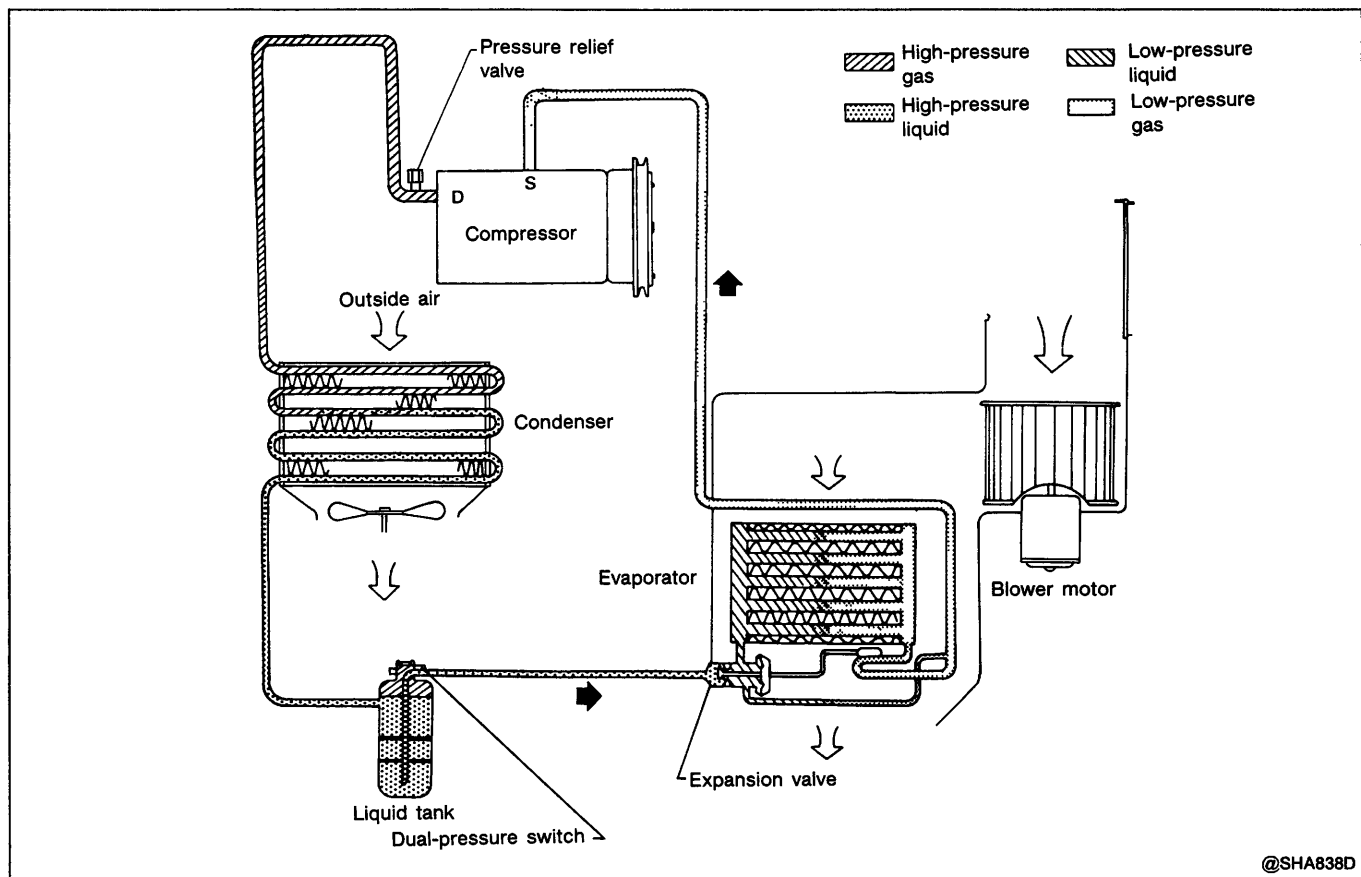
REFRIGERANT SYSTEM PROTECTION

Dual-pressure switch

The refrigerant system is protected against excessively high or low pressures by the dual-pressure switch, located on the liquid tank. If the system pressure rises above, or falls below the specifications, the dual-pressure switch opens to interrupt the compressor operation.

Pressure relief valve

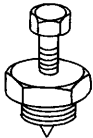
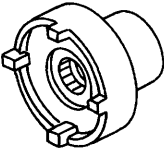
The refrigerant system is also protected by a pressure relief valve, located on the end of high flexible hose near compressor. When the pressure of refrigerant in the system increases to an abnormal level [more than 3,727 kPa (38 kg/cm², 540 psi)], the release port on the pressure relief valve automatically opens and releases refrigerant into the atmosphere.



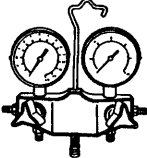
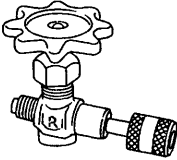
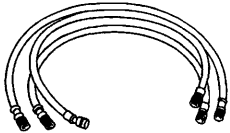
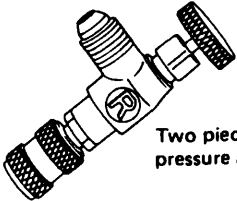
PREPARATION

Special Service Tools

*: Special tool or commercial equivalent

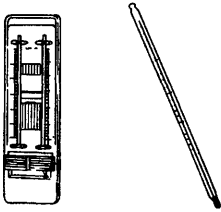
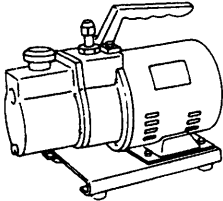
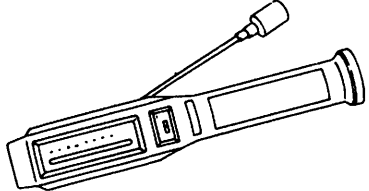
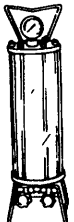
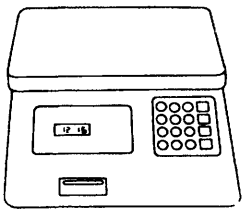
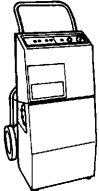
Tool number (Kent-Moore number) Tool name	Description
KV998VR001 (—) Clutch disc puller	 Removing clutch disc
KV99231010* (—) Clutch disc wrench	 Removing shaft nut and clutch disc
KV99235160* (—) Nut wrench	 Removing lock nut

Commercial Service Tools

Tool name	Description
Manifold gauge	 Discharging, evacuating and charging refrigerant SHA899C
Additional valve	 Discharging, evacuating and charging refrigerant SHA898C
Charging hose	 Discharging, evacuating and charging refrigerant SHA897C
Adapter valve	 Discharging, evacuating and charging refrigerant Two pieces on each high pressure and low pressure line RHA573B

PREPARATION

Commercial Service Tools (Cont'd)

Tool name	Description	
Thermometer and hygrometer	 Etched-stem type thermometer SHA900C	Checking temperature and humidity GI MA
Vacuum pump	 RHA575B	Evacuating EM LC EF & EC
Gas leak detector	 RHA577B	Checking refrigerant leaks FE CL MT
Charging cylinder	 RHA578B	Checking amount of refrigerant and charging refrigerant AT FA
Weight scale	 RHA579B	Checking amount of refrigerant RA BR ST
Refrigerant recycling equipment	 SHA813D	Capturing and recycling refrigerant BF HA EL

For details of such handling methods, refer to the Instruction Manual attached to each of the service tools.

PREPARATION

Commercial Service Tools (Cont'd) HANDLING METHOD AND STRUCTURE

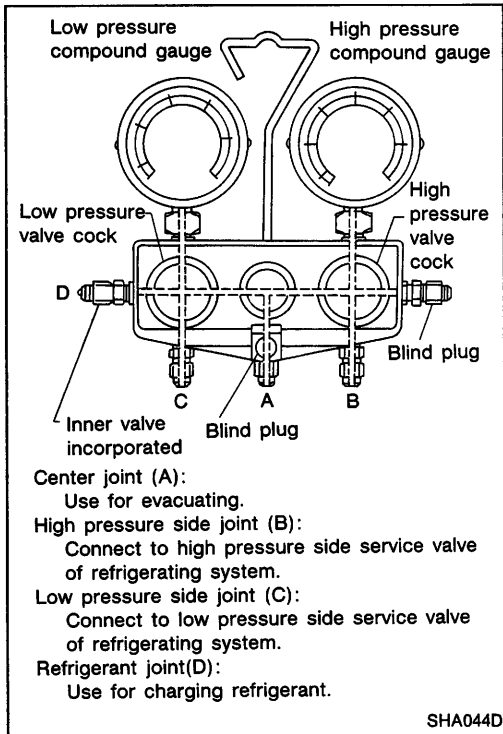
Manifold gauge

The manifold gauge is used to measure the operating pressure accurately in the high pressure and low pressure lines of the refrigerating system.

The high pressure gauge measures from -101.3 kPa (-760 mmHg , -29.92 inHg) to $2,942 \text{ kPa}$ (30 kg/cm^2 , 427 psi), and the low pressure gauge measures generally from -101.3 kPa (-760 mmHg , -29.92 inHg) to $1,471 \text{ kPa}$ (15 kg/cm^2 , 213 psi).

CAUTION:

- When installing the gauge to the refrigerating system, use utmost care not to mistake high pressure and low pressure line connections. (Wrong connections will lead to a damaged gauge.)
- Before evacuating, confirm that the gauge has a negative pressure scale. (If not, the gauge will be damaged.)

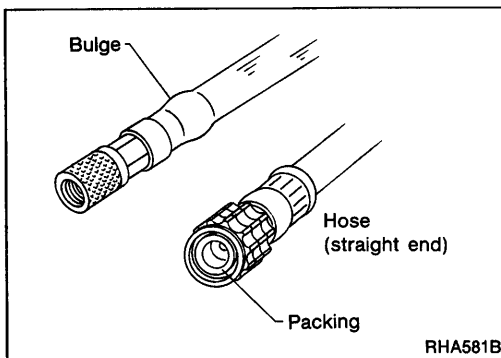


Charging hose

1. Completely tighten high pressure valve, low pressure valve and vacuum pump valve cocks of gauge manifold.
2. Connect charging hoses to high and low pressure lines.
3. Connect charging hose fitted with valve core to charging cylinder.
4. Connect vacuum pump hose to vacuum pump.

High and low pressure hoses are color coded to prevent wrong connection.

High pressure line hose	Red
Low pressure line hose	Yellow
Vacuum pump hose	Blue or green



CAUTION:

- Check each hose for cracks. If found, discard the hose.
- Do not use any hose if bulges are found.
- Check the rubber packing. If any deterioration or cracks are found, replace it with a new one.

PREPARATION

Commercial Service Tools (Cont'd)

Installing the adapter valve

Install the adapter valve to each of the high pressure and low pressure service valves so that air purging from the charging hose can be omitted. This also ensures that refrigerant leakage upon disconnection of the hose can be prevented.

1. Before connecting the adapter valve to the on-vehicle service valve, turn the adapter valve handle fully counterclockwise to retract the pin.

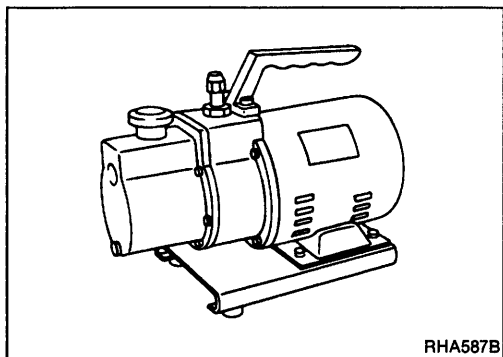
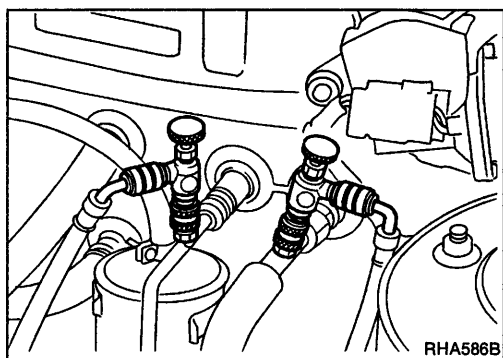
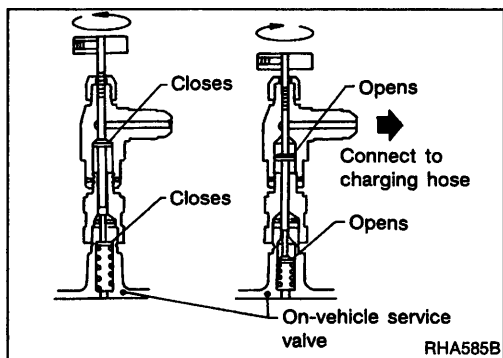
CAUTION:

Check the packing for any sign of deterioration or cracks. If any abnormality is found, replace it with a new one.

2. Connect the charging hose to the adapter valve.

Turning the handle clockwise will cause the on-vehicle service valve pin to be pushed open by the adapter valve pin, thus opening the refrigerant passage.

Turning the handle counterclockwise will close the passage. Before removing the adapter valve from the on-vehicle service valve, be sure to fully turn the handle counterclockwise to shut off the refrigerant passage.



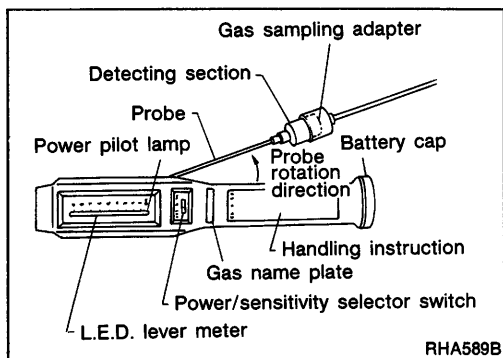
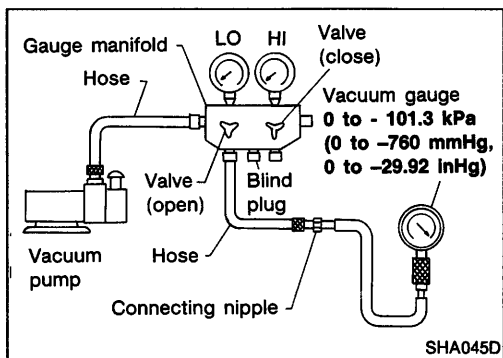
Vacuum pump

The vacuum pump is used to purge air and moisture from the inside of the refrigeration system by evacuation, thereby ensuring proper functioning of the air conditioner system.

Check the vacuum pump to see that the vacuum pump capacity is greater than -100.0 kPa (-750 mmHg, -29.53 inHg).

Vacuum pump performance check procedure

1. Connect the vacuum gauge to the system.
2. Run the vacuum pump, and check to see that the needle pointers of the gauge manifold and vacuum gauge move smoothly, indicating a similar value.
3. After running the vacuum pump for two or three minutes, read the vacuum gauge. The measured value indicates the capacity of the vacuum pump.



Gas leak detector

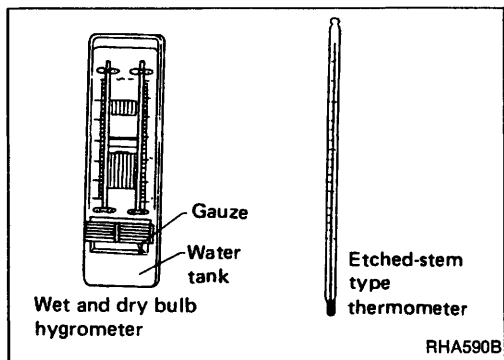
The gas leak detector is used to check whether the refrigeration system is leaking. The features of this gas leak detector are listed on the next page.

PREPARATION

Commercial Service Tools (Cont'd)

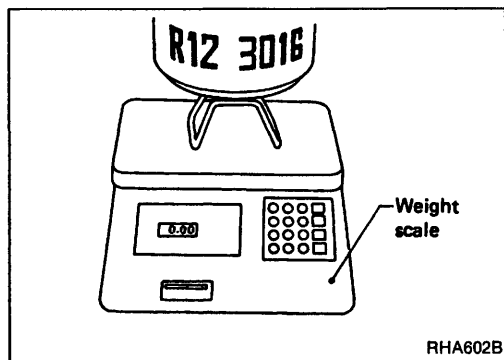
Type		Detection ability	Features
Electrical	Discharge type (Suction type)	3 - 50 g (0.11 - 1.76 oz)/year	● Easy handling ● Medium sensitivity ● Each point needs two or more seconds for detection.
	Positive ion emission type (Suction type)	2 g (0.07 oz)/year	● High sensitivity ● High price ● Warm-up time is needed because a heater is incorporated.
Other simple checking method: Change in vacuum when evacuating		1 kg (2 lb)/month; if 13.3 kPa (100 mmHg, 3.94 inHg) change in vacuum is detected in 10 minutes.	● Can be used easily in refrigerant charging operation. ● Detection ability is very low with vacuum gauge in gauge manifold.

- Leakage inspection of a refrigeration system needs a sensitivity greater than 20 g (0.71 oz)/year.
- The actual amount of leak is estimated at 5 to 10 times the detected amount.
- Insufficient cooling may be felt if leakage exceeds 150 to 200 g (5.29 to 7.05 oz).



Temperature gauge

Use to check the air conditioner performance. An etched stem type thermometer may be used. A hygrometer must also be used because the air conditioner performance depends on the humidity.



Scale

Measure the weight of the refrigerant to determine how much the refrigerant is charged.

PREPARATION

Commercial Service Tools (Cont'd)

Charging cylinder

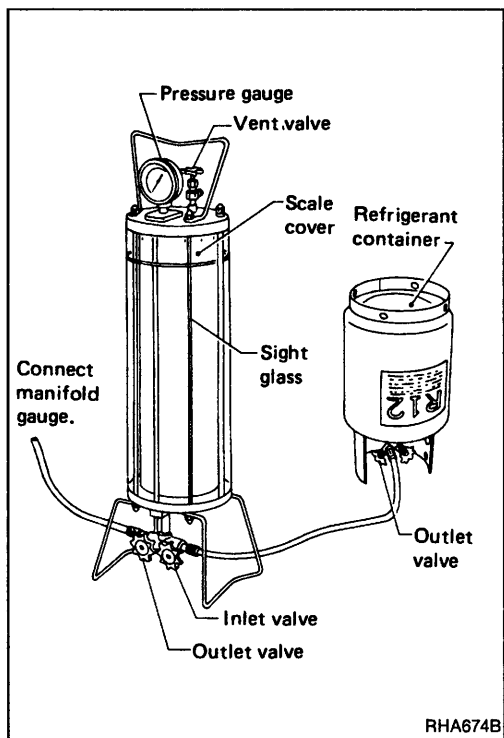
The charging cylinder is used to correctly measure the amount of refrigerant to be charged.

Features

- With the charging cylinder, the operator can measure correctly the amount of refrigerant to be charged into the system.
- Change in the refrigerant volume due to a change in temperature and pressure can be supplemented, and this ensures correct charging of refrigerant.

CAUTION:

- Never attempt to carry the charging cylinder containing refrigerant.
- Do not put the charging cylinder in a hot place. If the temperature and pressure of the refrigerant in the cylinder increase, the safety valve will be pushed open and the refrigerant will be released into the atmosphere.
- Do not expose the cylinder to the direct sunlight.
- Do not over-charge the refrigerant so that it exceeds the maximum limit of the cylinder.
- Do not charge the cylinder with more refrigerant than is needed.



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

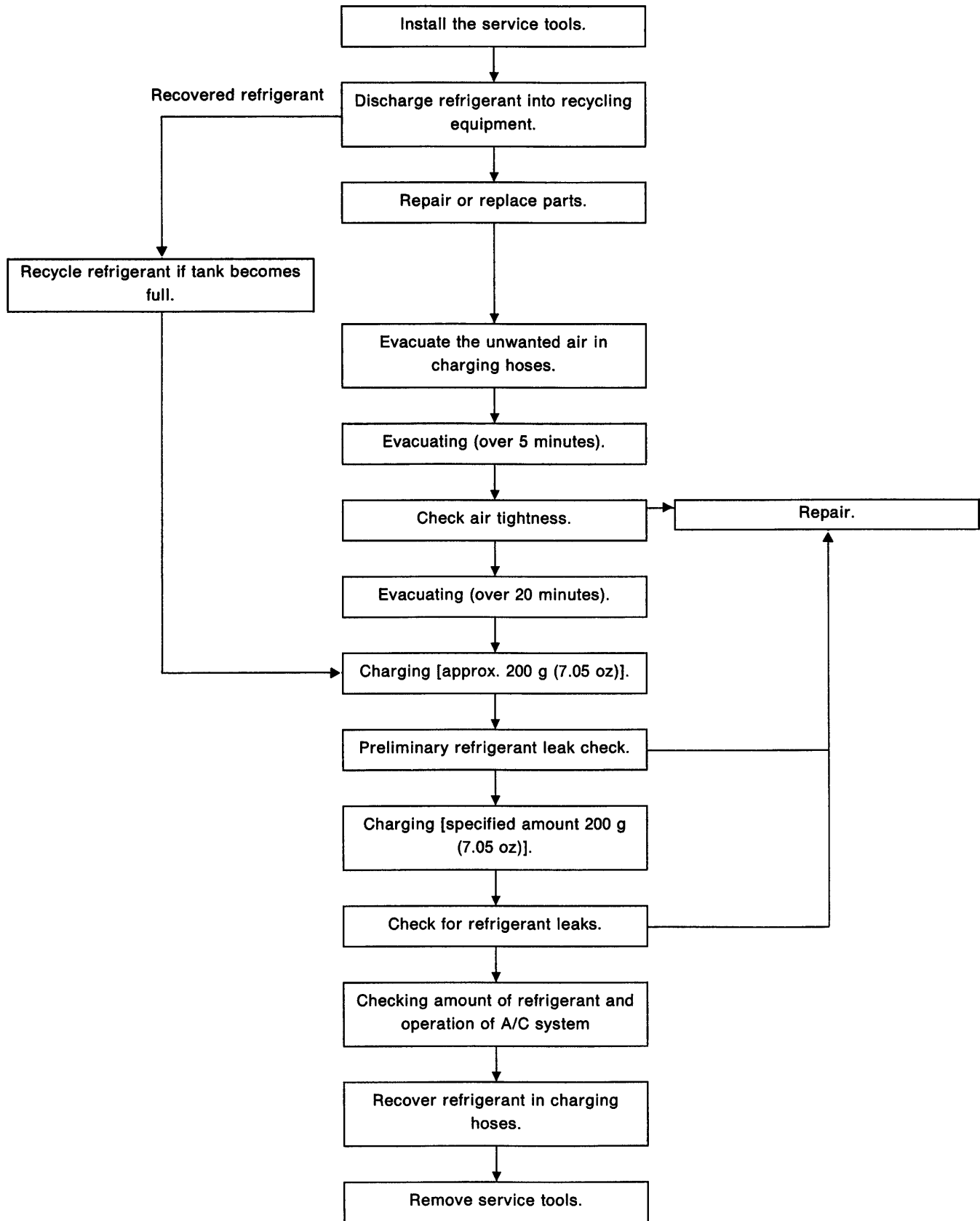
ST

BF

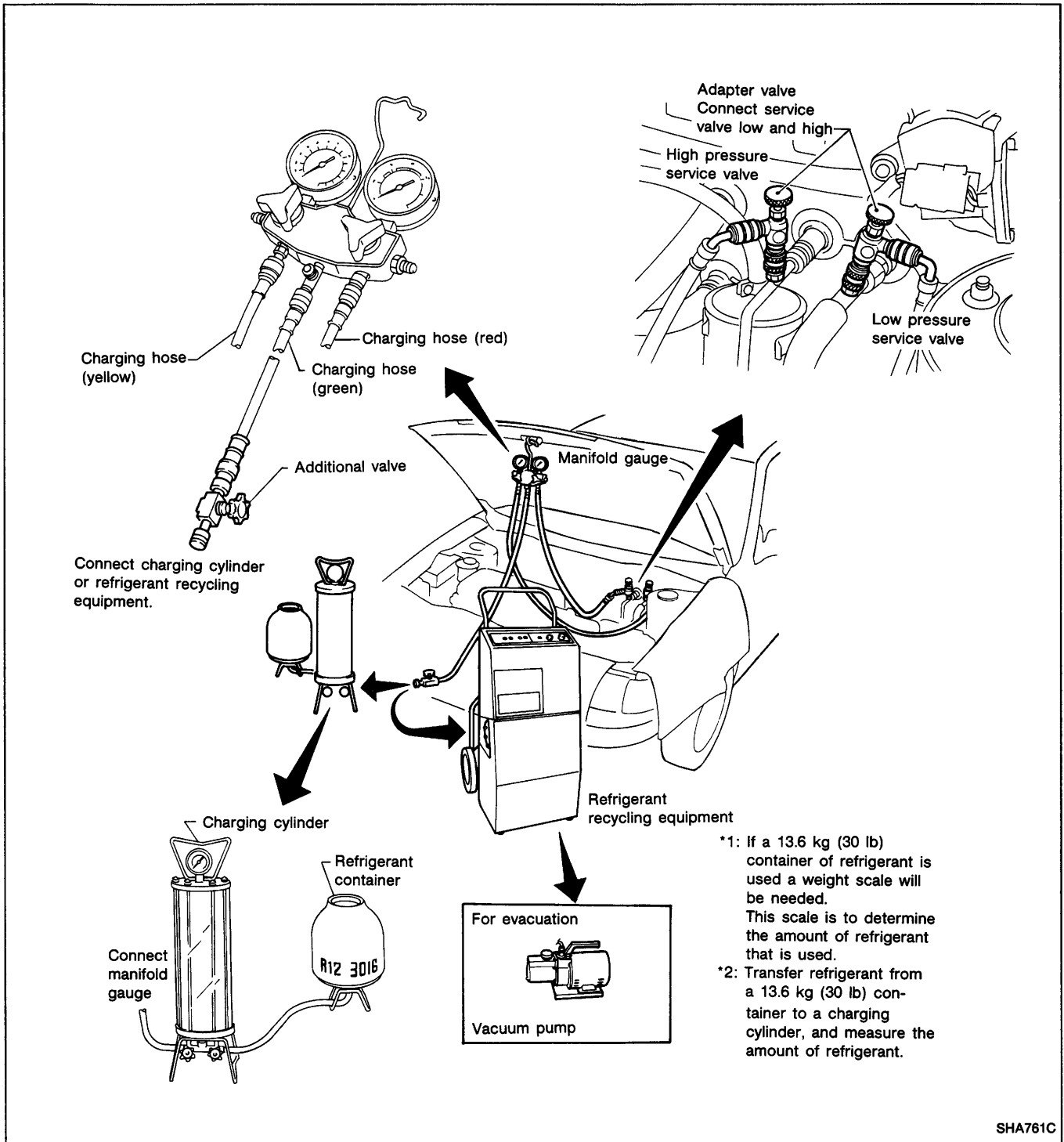
HA

EL

Work Procedure



Setting of Service Tools



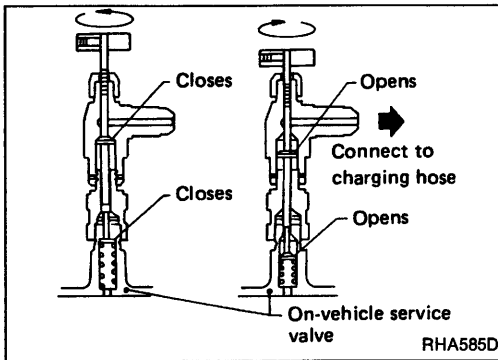
WARNING:
Discharge only into your recycling equipment. Do not release refrigerant into the air.

GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA

EL

DISCHARGING, EVACUATING, CHARGING AND CHECKING

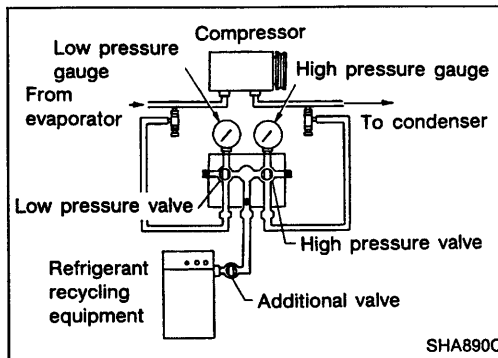
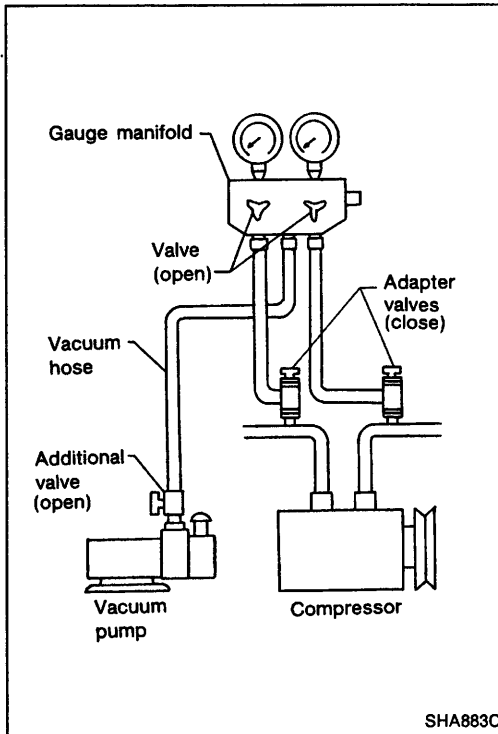
Setting of Service Tools (Cont'd)



1. Install adapter valve to each of high pressure and low pressure service valves.

Before connecting adapter valve, turn adapter valve handle fully counterclockwise to retract pin.

2. Connect charging hoses to adapter valves and connect vacuum hose to vacuum pump.
3. Run vacuum pump and open additional valve and both valves on gauge manifold set.
4. After evacuating unwanted air in gauge set, close additional valve and stop vacuum pump.
5. Disconnect vacuum hose from vacuum pump and connect it to refrigerant recycling equipment.



Discharging

WARNING:

Discharge only into your recycling equipment.

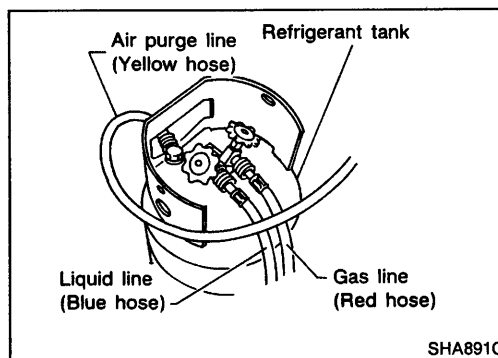
Do not release refrigerant into the air.

Use only authorized refillable refrigerant tanks for your recycling equipment.

Use of other tanks could cause personal injury.

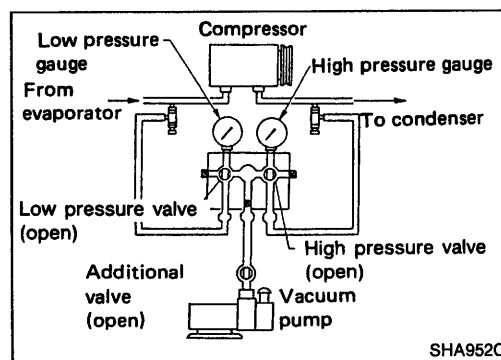
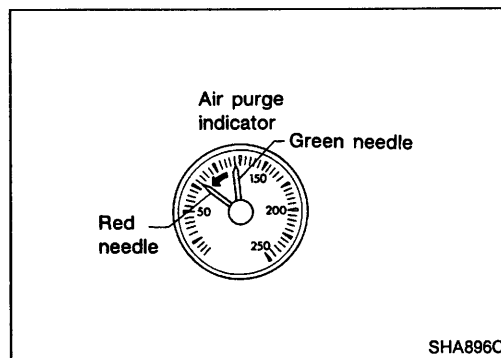
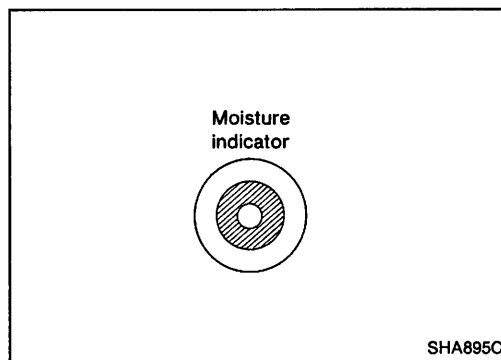
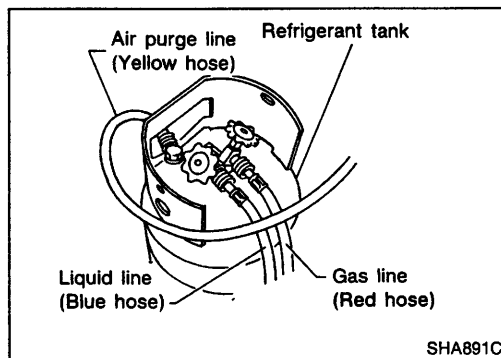
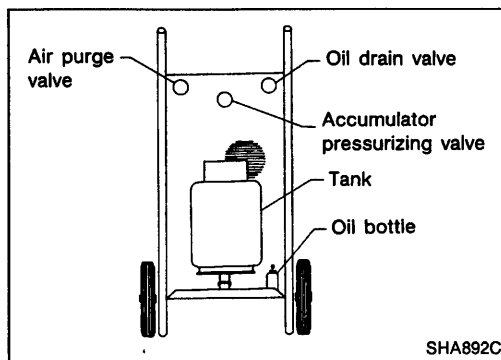
REFRIGERANT RECOVERY

1. Connect vacuum hose to refrigerant recycling equipment and open additional valve and adapter valves.
2. Open both valves of manifold gauge set. Make certain refrigerant tank "Gas" and "Liquid" valves are open.
3. Plug unit's power cord into a suitable AC outlet and turn on "Main Power" switch.
4. Turn on "Recovery" switch.
5. Depress "Start" switch. Compressor will start. Compressor will shut off automatically when recovery is complete. Watch for pressure rise to above 0 kPa (0 kg/cm², 0 psi) within two minutes. If this occurs, repeat this step.



DISCHARGING, EVACUATING, CHARGING AND CHECKING

Discharging (Cont'd)



6. To drain A/C system oil accumulator, open "Accumulator Pressurizing" valve for approximately 15 seconds to allow some compressor discharge pressure back into accumulator. Close "Accumulator Pressurizing" valve and open "Oil Drain" valve slowly and drain accumulator. Do not allow accumulator to completely depressurize. When oil stops draining, close "Oil Drain" valve. Be sure to replace oil in A/C system before servicing.
7. Turn off "Recovery" switch.
8. When recovery tank is full, trip switch at the bottom of weight platform will de-energize compressor and "Tank Full" light will come on. Recycle refrigerant in tank before removing.

REFRIGERANT RECYCLING

The recycling of reclaimed refrigerant is essential in order to assure that the refrigerant which meets the standards is re-used.

For maximum efficiency, full tanks of recovered refrigerant should be recycled. As required, tanks containing a minimum of 3.6 kg (8 lb) of refrigerant can be recycled.

For greatest efficiency, recycling full tanks of refrigerant is recommended.

1. Make certain both valves on recovery tank are open.
2. Turn on "Recycling" switch. Recycling solenoid will be energized.
3. Depress start switch. Compressor will start, and "Recycling On" light will come. Refrigerant will be seen going through moisture indicator at start up. The sightglass will not completely fill with refrigerant.
4. Allow the station to operate until moisture indicator turns green. If moisture indicator does not turn green after 40 minutes, remove and replace filter.
5. After recycling for approximately 5 minutes, check air purge indicator. If green pointer on air purge indicator leads red pointer by more than 10 psi (2 small divisions), bleed tank through air purge valve on the back of unit until both pointers are equal. Repeat as necessary.

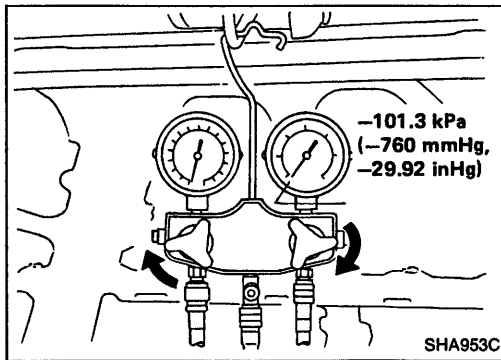
Evacuation

EVACUATION PROCEDURE

1. Connect vacuum hose to vacuum pump.
2. Open high and low pressure valves of manifold gauge set and additional valve.
3. Run vacuum pump.

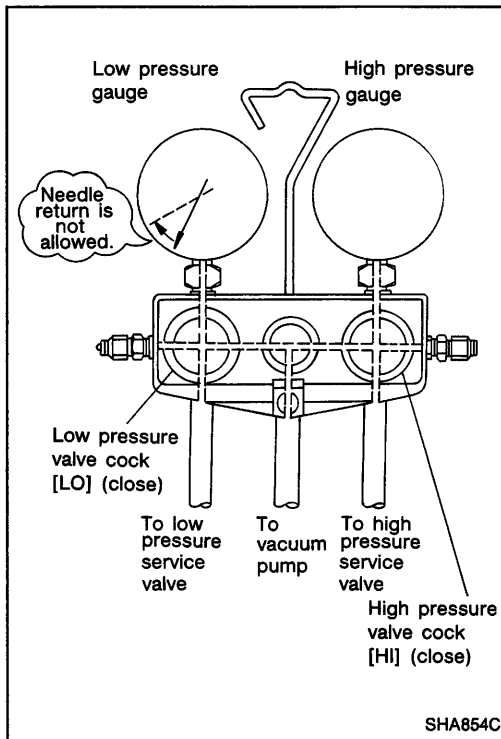
DISCHARGING, EVACUATING, CHARGING AND CHECKING

Evacuation (Cont'd)



4. Perform evacuation for more than five minutes to stabilize the vacuum inside the system. Check to ensure that the low pressure gauge indicates -98.6 to -101.3 kPa (-740 to -760 mmHg , -29.13 to -29.92 inHg).
5. Shut off the high and low pressure valves and additional valve.

CHECKING AIRTIGHTNESS



1. Shut off high and low pressure valves and additional valve, and leave the system as it is for 5 to 10 minutes.
2. Make sure that the needle of low pressure gauge will not move back toward the atmospheric pressure side (gauge pressure 0).

If any reverse movement is noted, it indicates poor system airtightness. Service the system until airtightness is complete. If pressure changes approx. 13.3 kPa (100 mmHg , 3.94 inHg) in 10 minutes, the refrigerant in the system will be exhausted in about one month.

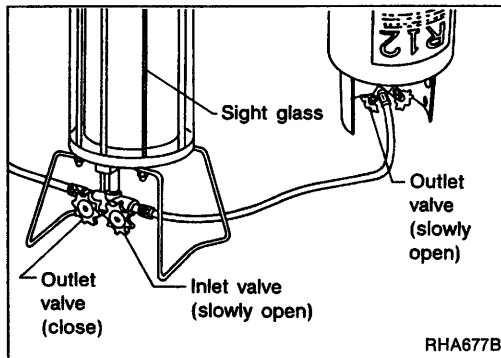
EVACUATION

If no abnormality is found during airtightness check, perform evacuation again for more than 20 minutes.

1. Run vacuum pump.
2. Open high and low pressure valve and additional valve.
3. Evacuate for more than 20 minutes.
4. Close high and low pressure valves and additional valve.

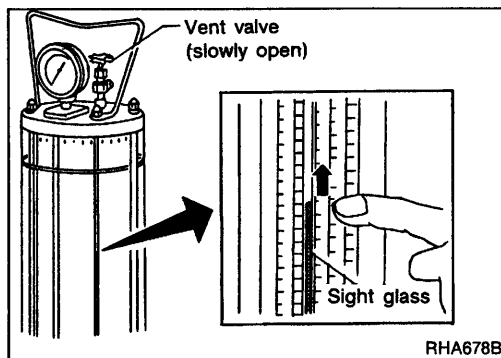
Charging Refrigerant

SETTING OF CHARGING CYLINDER



1. Make sure that inlet and outlet valves of charging cylinder are closed.
2. Slowly open liquid line valve of refrigerant tank.
3. Slowly open inlet valve of charging cylinder.

The refrigerant will flow into the sight glass of charging cylinder as inlet valve is opened.



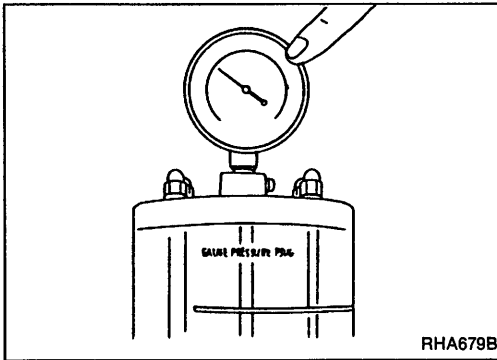
4. Slowly open upper vent valve to release pressure from charging cylinder. While doing so, continue charging until required amount of refrigerant is reached.

The refrigerant volume changes with temperature and pressure. It is necessary to charge refrigerant with a little more than required amount (indicated on sight glass).

5. Close inlet valve and upper vent valve of charging cylinder.

DISCHARGING, EVACUATING, CHARGING AND CHECKING

Charging Refrigerant (Cont'd)



6. Turn on heater switch (charging cylinder is provided with a heater.)

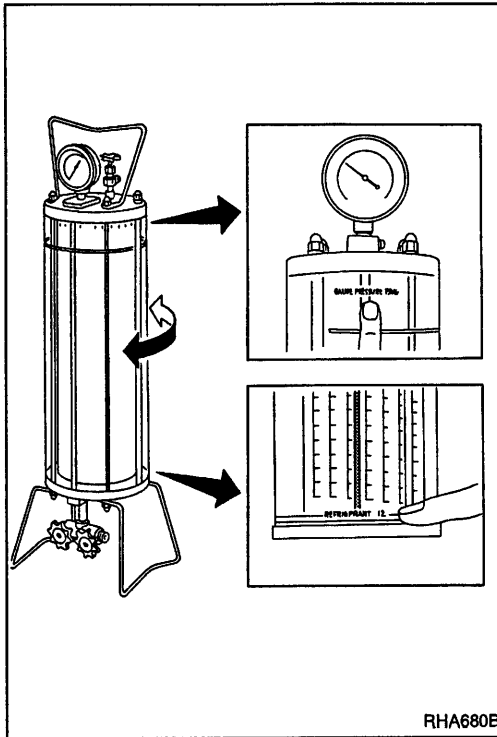
The refrigerant charging time can be reduced by heating refrigerant to increase its pressure. In this case, do not allow the pressure in cylinder to rise higher than 1,030 kPa (10.5 kg/cm², 150 psi). (If pressure rises above this level, turn off the heater.) The pressure in the charging cylinder can be measured by upper pressure gauge.

GI

MA

EM

SETTING OF FLOW METER



1. Rotate charging cylinder main body until scale for R12 is at the correct position on sight glass.
2. Read charging cylinder pressure gauge.
3. Rotate charging cylinder so that scale of charging cylinder agrees with pressure value indicated on pressure gauge.

LC

EF &
EC

FE

CL

MT

AT

FA

RA

CALCULATING CHARGING AMOUNT OF REFRIGERANT

1. Record the amount of refrigerant in the sight glass before charging.
2. Subtract the required amount of refrigerant (charge quantity specified for the vehicle) from the amount of refrigerant recorded in step 1. Charge refrigerant into the system until the remaining value equals to the value indicated on the sight glass.

BR

ST

BF

Example:

Level in sight glass: 3 lb 8 oz

Charge specification (from Service Manual) 2.0 - 2.4 lb.

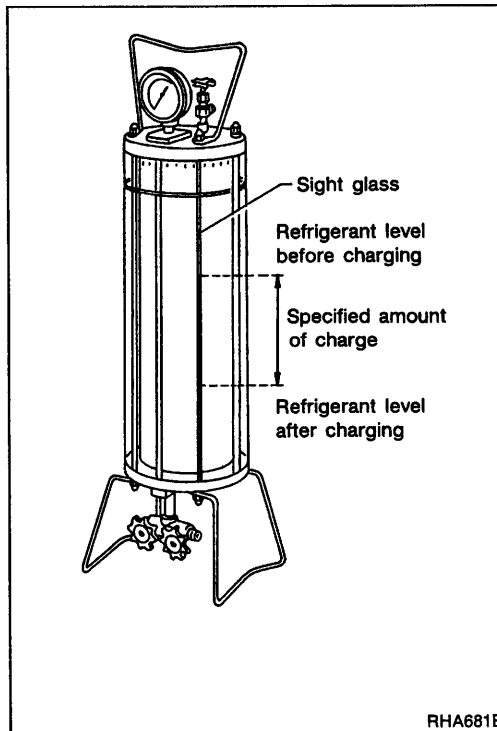
Calculate charge quantity into lb and oz as follows: 1 lb = 16 oz, and 0.1 lb = 1.6 oz, so that 2.0 lb = 32 oz, 2.4 lb = 32 + (4 x 1.6) = 32 + 6.4 = 38.4, round off to 38. Therefore our charge quantity will be between 32 and 38 oz, or 2 lb 0 oz to 2 lb 6 oz.

Subtract 2 lb 6 oz from level in sight glass (3 lb 8 oz) = 1 lb 2 oz.

This will be our ending point.

HA

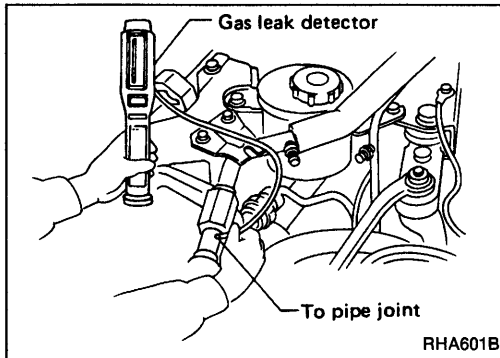
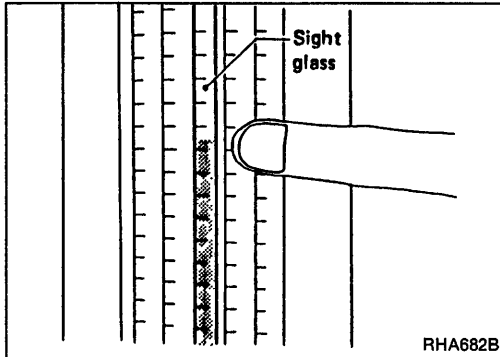
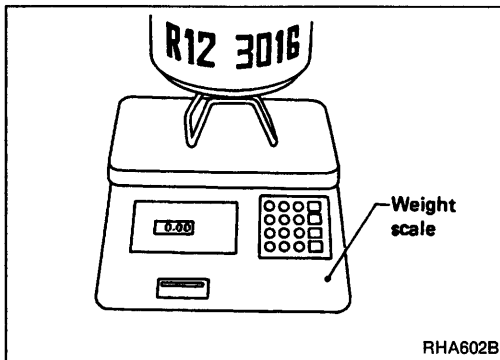
EL



DISCHARGING, EVACUATING, CHARGING AND CHECKING

Charging Refrigerant (Cont'd)

If a flow meter is not available, the amount of charged refrigerant also can be determined by subtracting the weight of the container measured after charging from its weight measured before charging.



PRELIMINARY CHARGING OF REFRIGERANT

1. Open outlet valve of charging cylinder.
2. Slowly open high pressure side valve of manifold gauge to charge refrigerant from the high pressure side.
3. Close high pressure valve after charging approx. 200 g (7.05 oz) refrigerant.

CAUTION:

The refrigerant in charging cylinder is kept in liquid state, so the refrigerant should be charged from high pressure side. Do not start engine with high pressure valve kept open.

PRELIMINARY CHECK FOR REFRIGERANT LEAKS

1. Make sure that the gauge manifold valve is closed.
2. Check for refrigerant leak from each connector in the system using the leak detector.

At this point, the pressure in the system is not high. Only large amounts of refrigerant leak due to loose pipe joints, etc. can be detected.

CHARGING REFRIGERANT

1. Slowly open high pressure valve of manifold gauge, and charge calculated amount of refrigerant in "CALCULATING CHARGING AMOUNT OF REFRIGERANT".

CAUTION:

The refrigerant in charging cylinder is kept in liquid state, so the refrigerant should be charged from high pressure side. Do not start engine with high pressure valve kept open.

2. Close high pressure valve of manifold gauge.
3. Make sure that the calculated amount of refrigerant remains in sight glass.
4. Close charging cylinder outlet valve.
5. Turn off heater if it is on (when using heater equipped type).

Inspection for Refrigerant Leaks

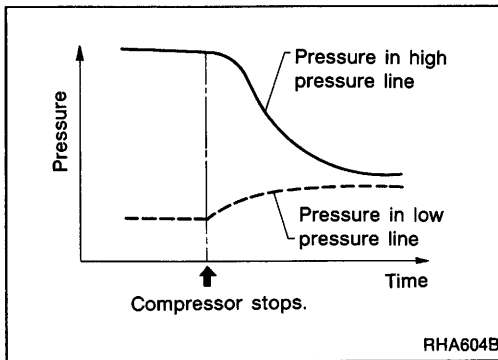
WORK PROCEDURE

To facilitate inspection for refrigerant leaks, establish the following conditions:

- Start engine.
- Run air conditioner.
- Set blower fan control to MAX.
- Set temperature control to FULL COLD.
- Run the refrigerant system for more than 5 minutes after setting the above-mentioned conditions (to circulate refrigerant through the system).

DISCHARGING, EVACUATING, CHARGING AND CHECKING

Inspection for Refrigerant Leaks (Cont'd)



Refrigerant leaks should be checked immediately after stopping engine, beginning with high pressure line, using a gas leak detector. This is because the pressure in high pressure line drops gradually after refrigerant circulation stops while the pressure in low pressure line rises gradually as shown in the graph at left. Leaks can be detected easily when pressure is high.

To prevent detecting errors, make sure that there is no refrigerant vapor or tobacco smoke in the vicinity of vehicle. It is also necessary to shield vehicle from wind so that leaking refrigerant is not blown away.

INSPECTION POINTS

Check carefully each of tube joints. To check, wipe the portion to be checked with waste cloth, and move tester probe all around the joint.

Compressor

Check shaft seals and bolt holes, and also around magnet clutch.

Liquid tank

Check pressure valve, safety valve and fusible plug mounts.

Service valve

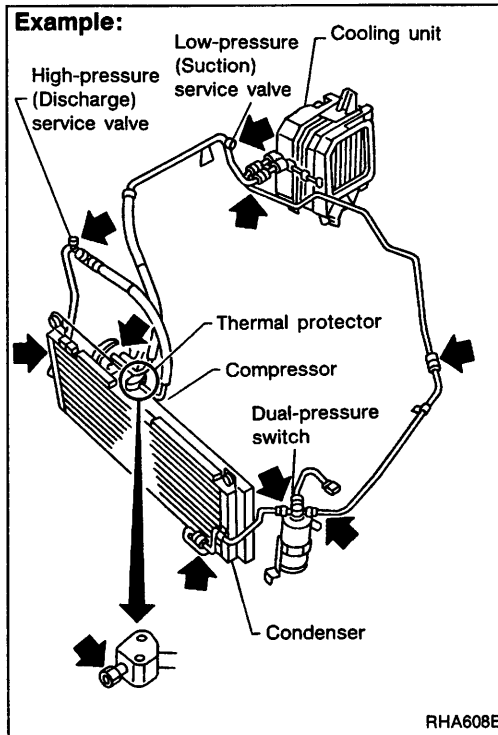
Check all around service valves.

Ensure that valve core is not loose.

Service valve caps must be attached to valves (to prevent leak). Also check that there are no foreign objects inside the cap.

Inside of cooling unit

To check, insert leak tester probe into drain hose immediately after stopping engine. (Keep probe inserted for more than 10 seconds.)



Confirmation of Amount of Charged Refrigerant

The amount of refrigerant charged into the system can be observed through the sight glass by watching the flow of the refrigerant and by reading the high pressure and low pressure manifold gauges under the following conditions:

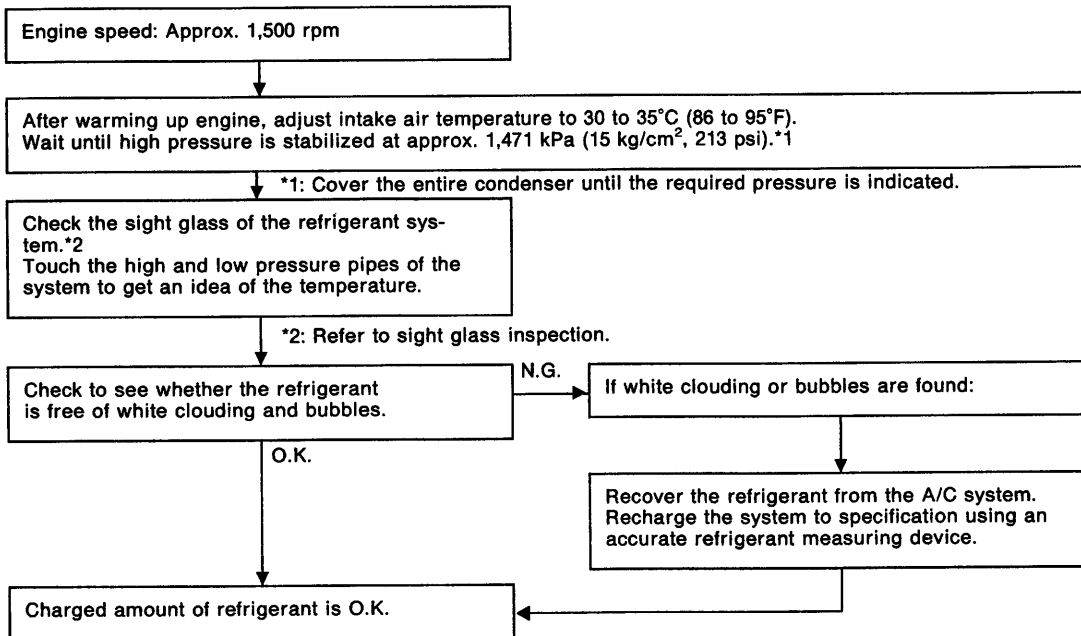
CONDITIONS

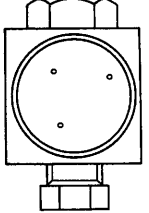
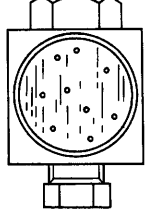
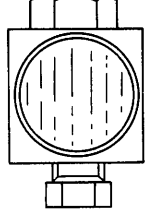
- Doors: Close completely.
- Window glasses: Close completely.
- Intake door position: RECIRC
- Mode door position: VENT
- Blower fan: HI
- TEMP control: Optional (Set so that intake air temperature is 30 to 35°C (86 to 95°F).
- AIR CON switch: ON
- Engine speed: Approx. 1,500 rpm

DISCHARGING, EVACUATING, CHARGING AND CHECKING

Confirmation of Amount of Charged Refrigerant (Cont'd)

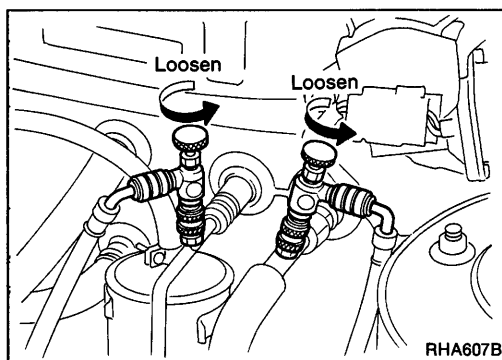
WORK PROCEDURE



Check item	Amount of charge			
	Appropriate	Refrigerant is insufficient	Almost no refrigerant	Overcharged, or air in system
Temperature of high and low pressure pipes	High pressure side is hot while low pressure side is cold.	High pressure side is warm and low pressure side is somewhat cold.	No difference is felt between high and low pressure sides.	High pressure side is very hot.
Flow of refrigerant viewed through sight glass	Mostly transparent. Occasionally some bubbles are seen when engine speed is increased or decreased. 	Bubbles are always flowing. Refrigerant is cloudy. 	Nothing is visible. 	If overcharged, no bubbles are seen. If there is air in the system, large bubbles are seen.
Pressure	Normal high pressure: 1,373 - 1,765 kPa (14 - 18 kg/cm², 199 - 256 psi) Normal low pressure: 147 - 294 kPa (1.5 - 3 kg/cm², 21 - 43 psi)	Both high and low pressure values are insufficient.	High pressure value is very small.	Both high and low pressure values are excessive.
Action to take	Bubbles may be generated when the liquid tank strainer is clogged, or when the expansion valve is opened excessively.	Add refrigerant after checking for leaks.	Check the refrigerant system.	Stop the compressor and extract excessive refrigerant. If air is found, perform evacuation, then charge the specified amount of refrigerant.

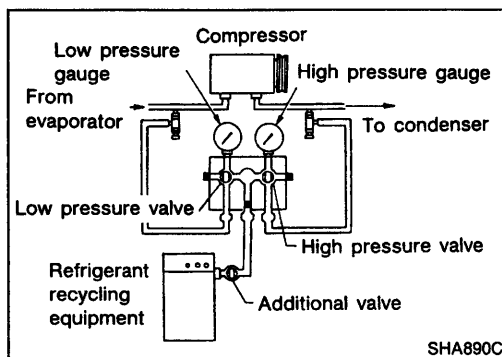
CAUTION:

The condition of bubbles seen through the sight glass as well as the intake and discharge pressures are influenced by the ambient temperature, wind velocity, weather, and by the air temperature in front of the condenser, etc.



Removal of Commercial Service Tools

1. Completely loosen adapter valves of low pressure and high pressure lines.
2. Close additional valve and remove center hose from charging cylinder.
3. Connect center hose to refrigerant recycling equipment.
4. Open additional valve and both valves on gauge manifold.
5. Capture refrigerant in charging system.
6. After recovering refrigerant, remove adapter valves from on-car service valves.



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

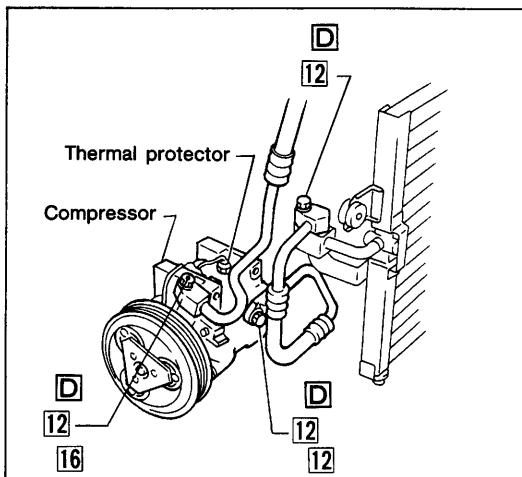
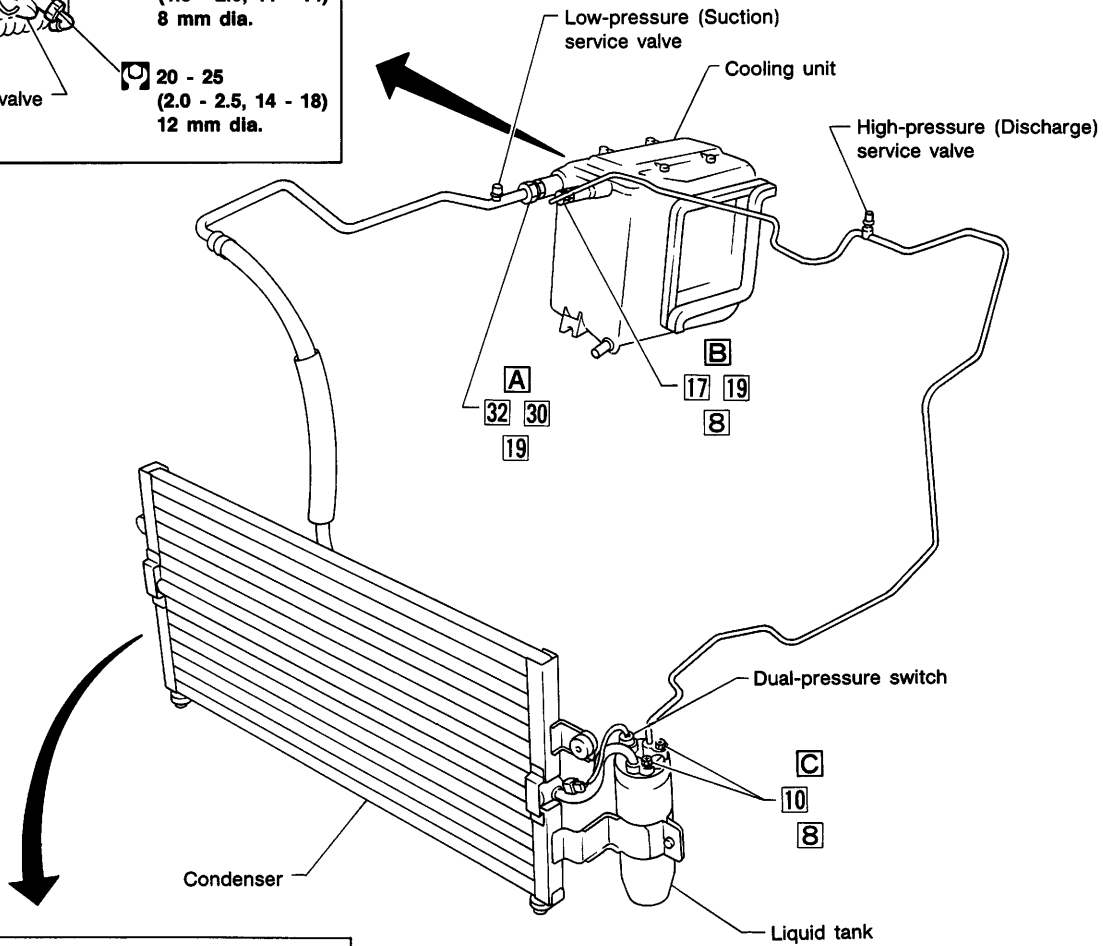
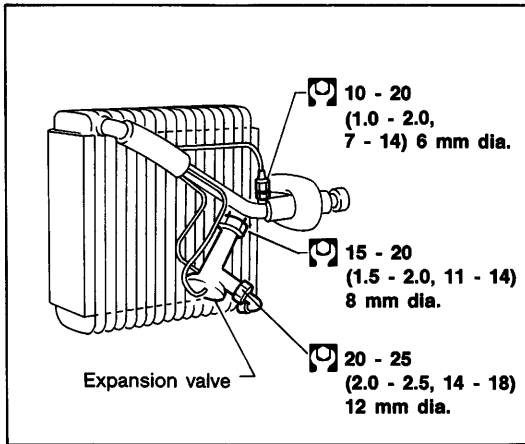
BF

HA

EL

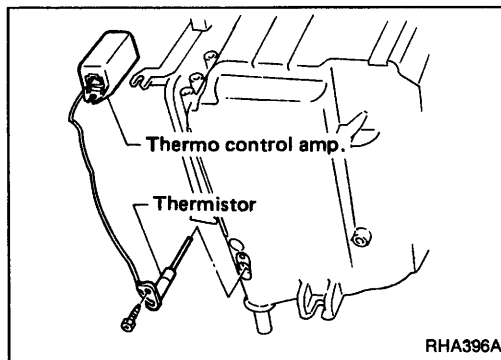
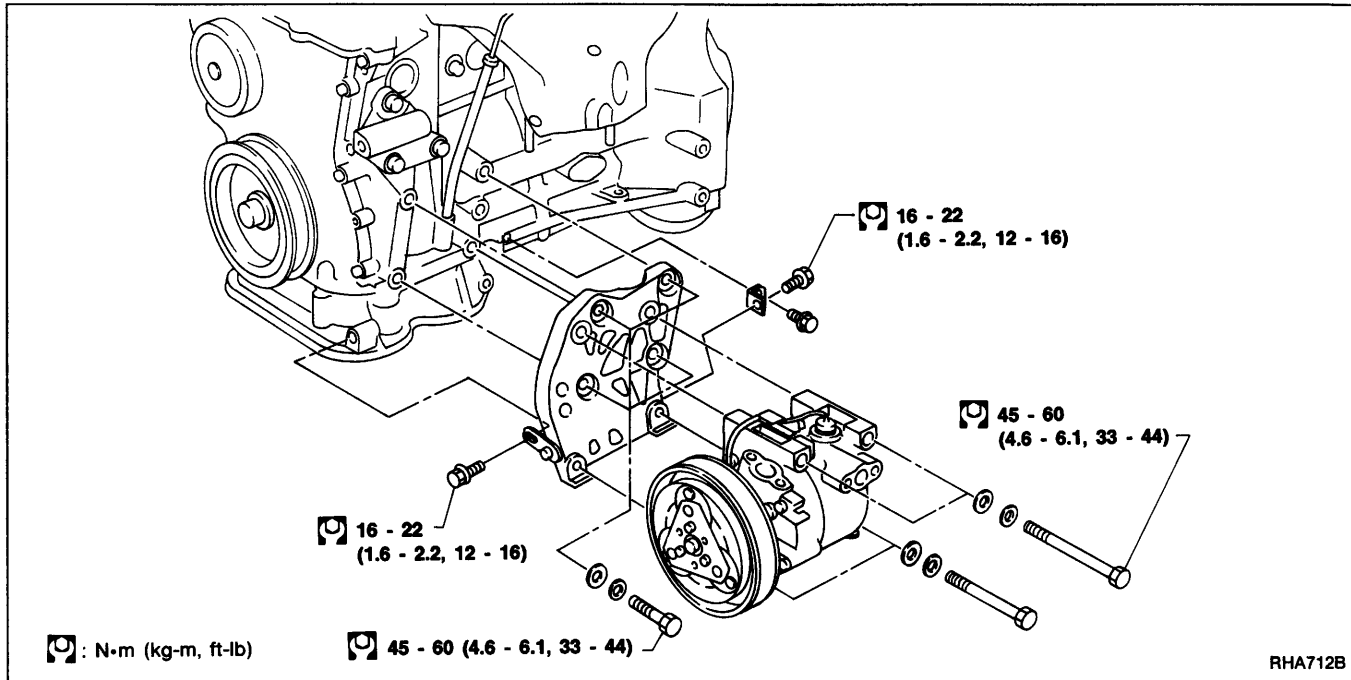
Refrigerant Lines

- Refer to page HA-3 regarding "Precautions for Refrigerant Connection".



- (Tightening torque)
- (Wrench size)
- (O-ring size)
- A** 25 - 35 (2.5 - 3.5, 18 - 24)
- B** 10 - 20 (1.0 - 2.0, 7 - 14)
- C** 3.2 - 4.2 (0.33 - 0.43, 2.4 - 3.1)
- D** 13.3 - 18.0 (1.36 - 1.84, 9.8 - 13.3)
- : N·m (kg·m, ft·lb)

Compressor Mounting



Thermo Control Amp.

REPLACEMENT

Remove screws, which secure thermistor locating stay, from front of cooling unit. Replace thermo control amp. assembly with a new one. (Cooling unit need not be removed during the replacement.)

Belt Tension

- Refer to MA section.

Fast Idle Control Device (F.I.C.D.)

- Refer to EF & EC section.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

Lubrication Oil

SUNISO 5GS or equivalent

Maintenance of Oil Quantity in Compressor

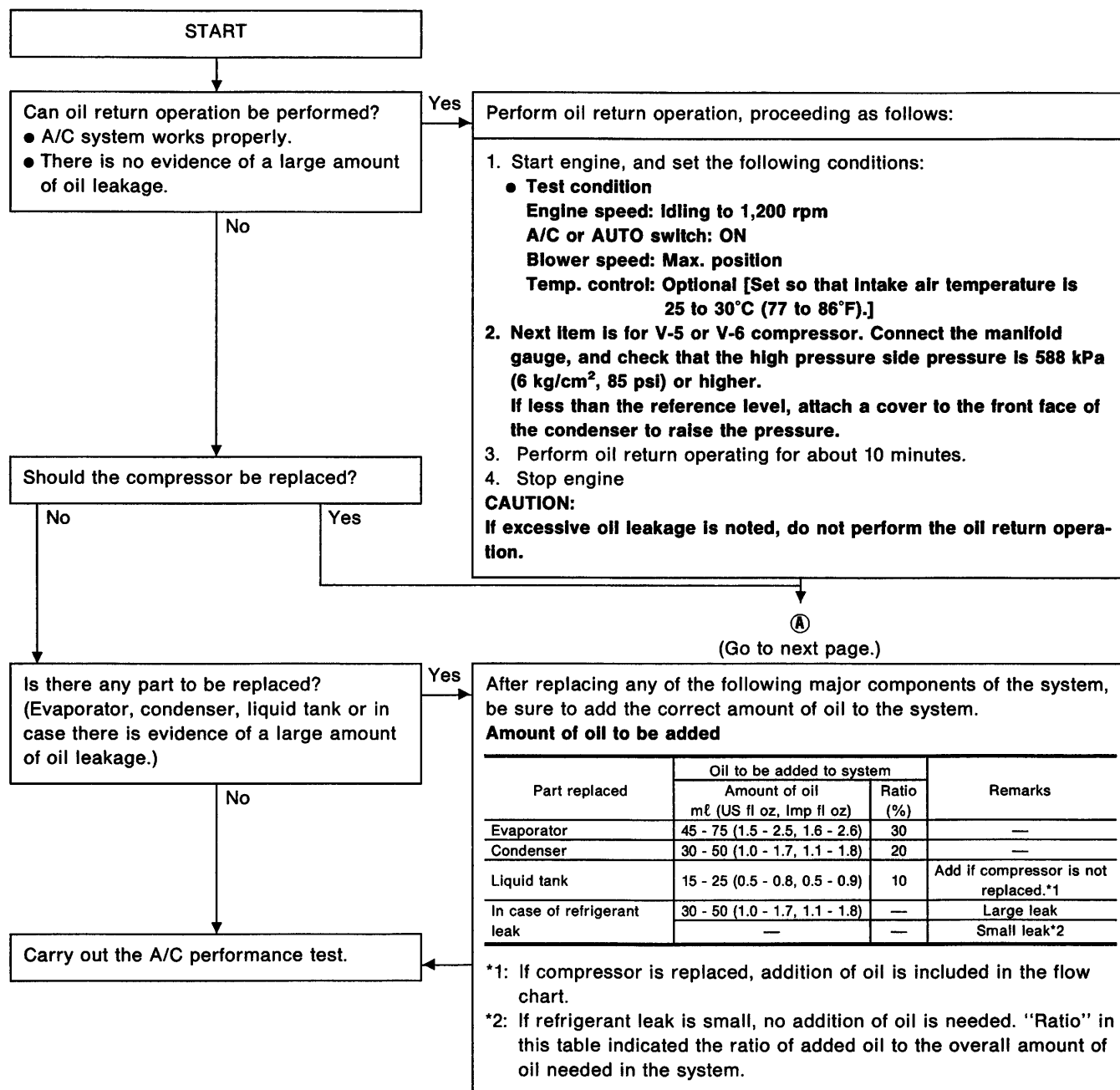
The oil used to lubricate the compressor circulates through the system with the refrigerant. Whenever any component of the system is replaced or a large amount of gas leakage occurs, add oil to the compressor to maintain the specified amount.

If oil quantity is not maintained properly, the following malfunctions may result:

- Lack of oil: May lead to a seized compressor
- Excessive oil: Inadequate cooling (thermal exchange impeded)

Checking and Adjusting

Adjust the oil quantity according to the flowchart shown below.



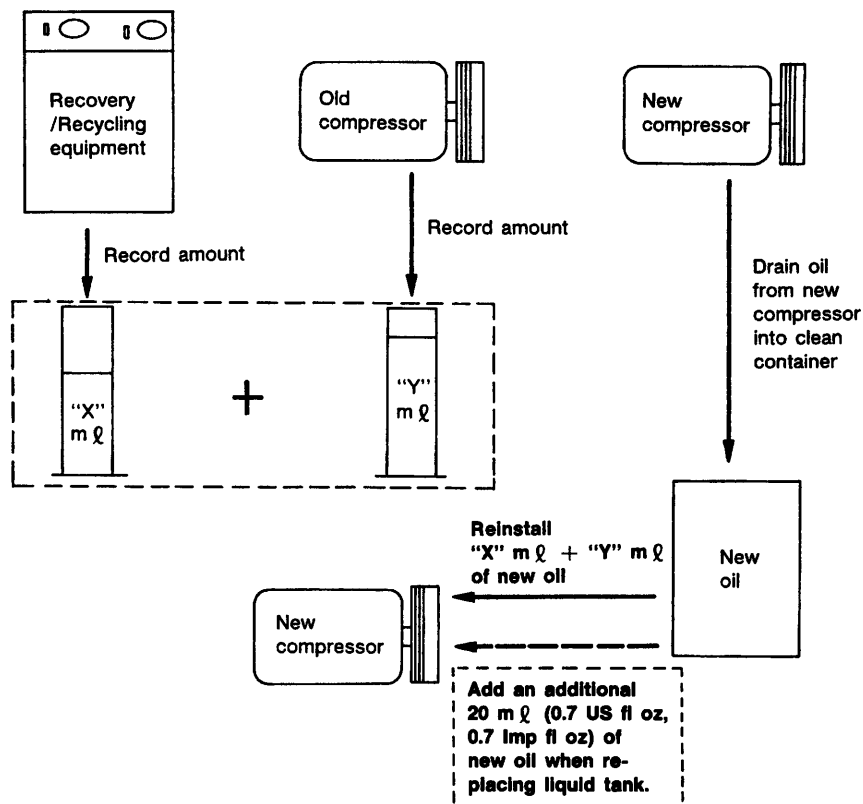
LUBRICATION OIL — Checking and Adjusting

Checking and Adjusting (Cont'd)

A

1. Discharge refrigerant into the refrigerant recovery/recycling equipment. Measure oil discharged into the recovery/recycling equipment.
 2. Remove the drain plug (for V-5, V-6 or DKS-16H compressor) and drain the oil from the "old" (removed) compressor into a graduated container, and record the amount of oil drained.
 3. Remove the drain plug and drain the oil from the "new" compressor into a separate, clean container.
 4. Measure an amount of the new oil equivalent to that drained from the "old" compressor, and add this oil to the "new" compressor through the drain plug or suction port opening.
 5. Measure an amount of the "new" oil equivalent to that recovered during discharging, and add this oil to the "new" compressor through the drain plug or suction port opening.
 6. Torque the drain plug.
- V-5 or V-6 compressor: 18 - 19 N·m (1.8 - 1.9 kg-m, 13 - 14 ft-lb)**
DKS-16H compressor: 14 - 16 N·m (1.4 - 1.6 kg-m, 10 - 12 ft-lb)
7. If the liquid tank also needs to be replaced, add an additional 20 mℓ (0.7 US fl oz, 0.7 Imp fl oz) of oil at this time.
Do not add this 20 mℓ (0.7 US fl oz, 0.7 Imp fl oz) of oil if only replacing the compressor.

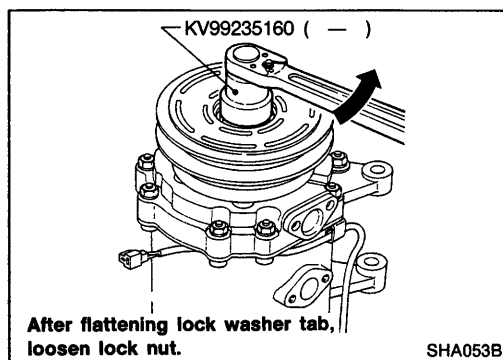
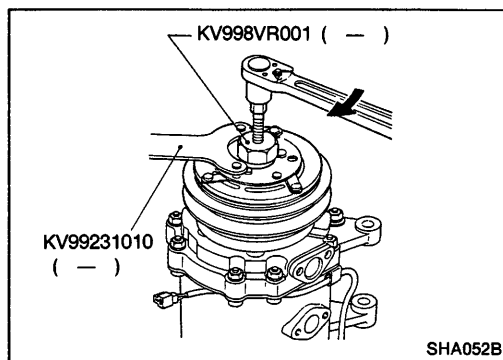
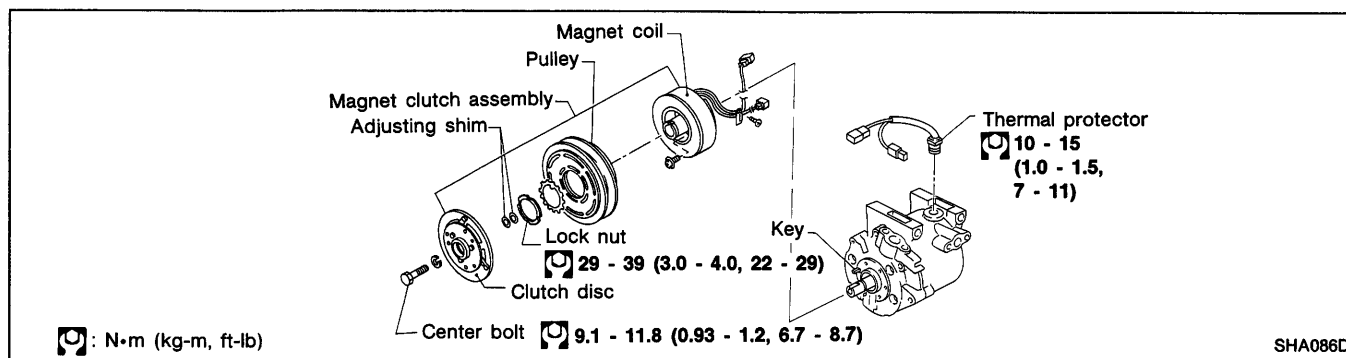
Oil adjusting procedure for compressor replacement



RHA065D

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.



Compressor Clutch

REPLACEMENT

- 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.

Compressor Clutch (Cont'd)

INSPECTION

Clutch disc

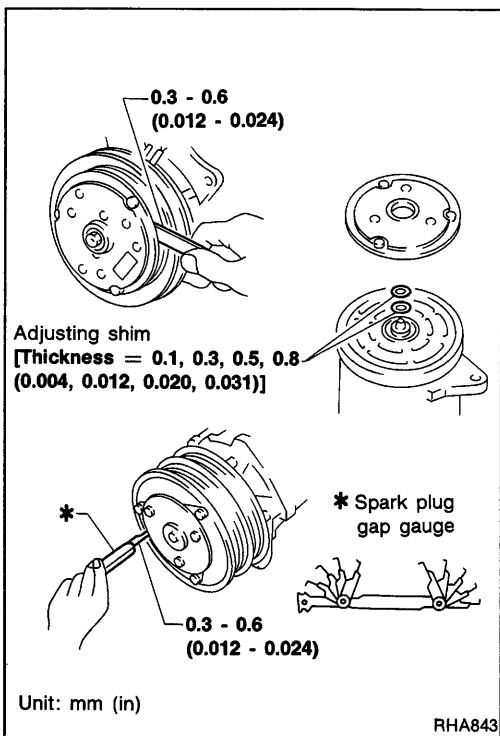
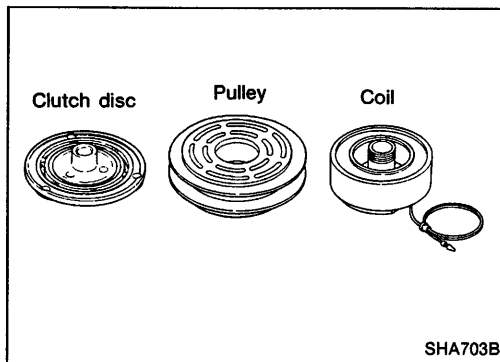
If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

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 drive plate 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.



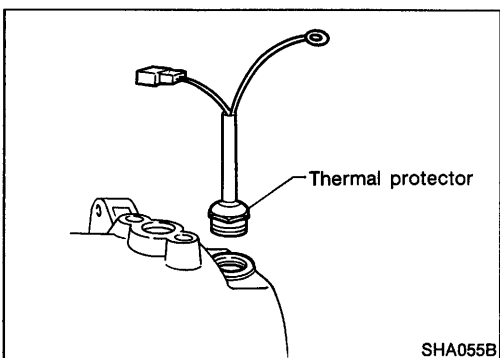
ADJUSTMENT

- When assembling clutch disc, adjust disc-to-pulley clearance with shims.

BREAK-IN OPERATION

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.

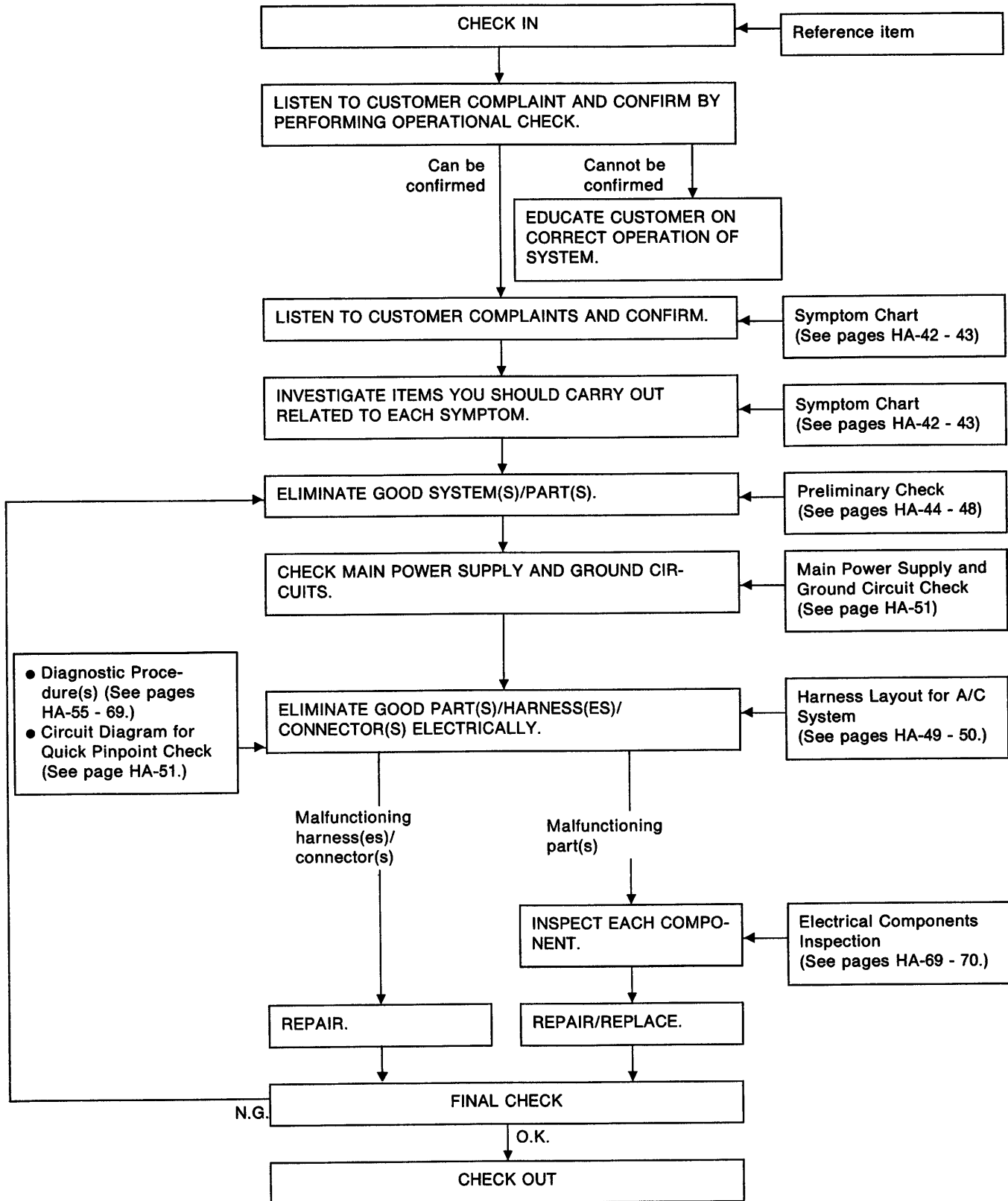


Thermal Protector

- When servicing, do not allow foreign matter to get into compressor.
- Check continuity between two terminals.

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



Operational Check

The purpose of the operational check is to confirm that the system operates as it should. The systems which are checked are the blower, mode (discharge air), intake air, temperature decrease, temperature increase.

CONDITIONS:

Engine running at normal operating temperature.
Fresh vent "OFF"

PROCEDURE:

1. Check blower

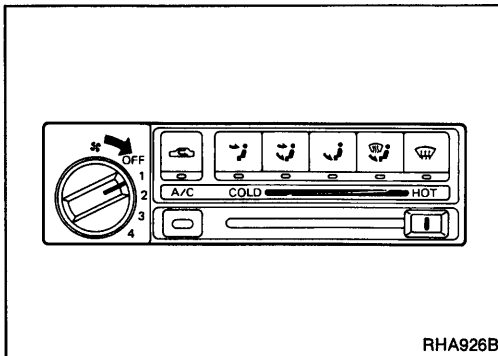
- 1) Turn Fan switch to 1-speed.
Blower should operate on 1-speed.
- 2) Then turn Fan switch to 2-speed.
- 3) Continue checking blower speed until all four speeds are checked.
- 4) Leave blower on 4-speed.

2. Check discharge air

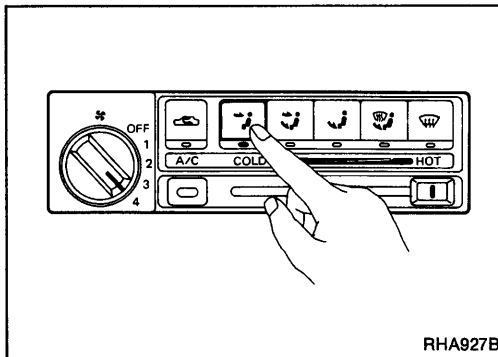
- 1) Press the VENT button.
VENT indicator should light.
- 2) Confirm that all discharge air comes out of face vents.
- 3) Press the B/L button.
B/L indicator should light.
- 4) Confirm that discharge air comes out of face vents and foot vents.
- 5) Press the FOOT button.
FOOT indicator should light.
- 6) Confirm that discharge air comes out of foot vents, with some air from defroster vents.
- 7) Press the F/D button.
F/D indicator should light.
- 8) Confirm that discharge air comes out of foot vents, with some air from defroster vents, and that intake door position is at FRE.
- 9) Press the DEF button.
DEF indicator should light.
- 10) The discharge air should be coming only from defroster vents. At the same time compressor should turn ON and intake door position be at FRE.

3. Check RECIRC

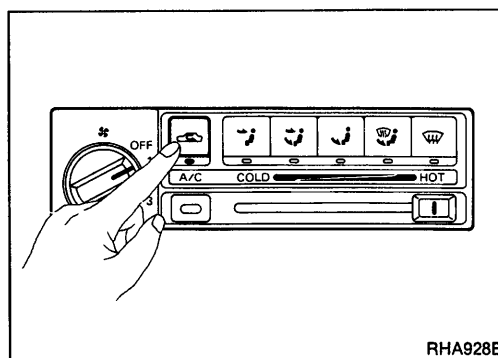
- 1) Press RECIRC button.
RECIRC indicator should light.
- 2) Listen for intake door position change (you should hear blower sound change slightly).



RHA926B



RHA927B



RHA928B

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

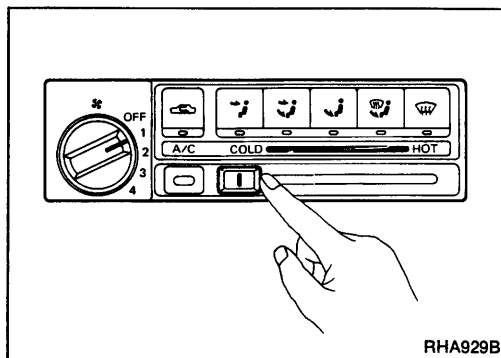
EL

DIAGNOSES — Overall System

Operational Check (Cont'd)

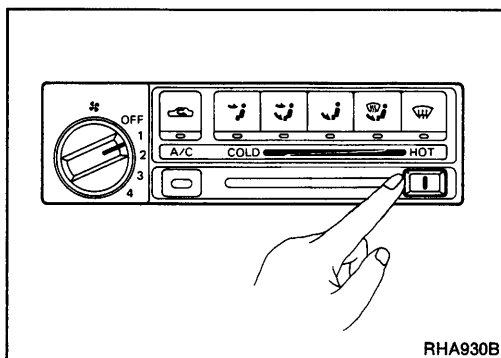
4. Check temperature decrease

- 1) Slide temperature control lever to full cold.
- 2) Check for cold air at discharge air outlets.



5. Check temperature increase

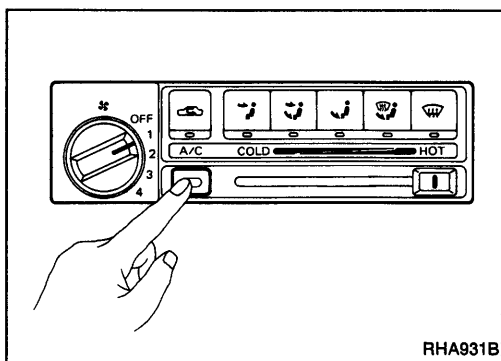
- 1) Slide temperature control lever to full hot.
- 2) Check for hot air at discharge air outlets.



6. Check air conditioner switch

Move the fan control lever to the desired (1 to 4-speed) position and push the air conditioner button to turn ON the air conditioner.

The indicator light should come on when air conditioner is ON.



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 (Front driver side only)

Hood: Open

TEMP. lever position: Max. COLD

MODE SW:  (Ventilation) set

RECIRC SW:  (Recirculation) set

FAN switch: Max. speed

Engine speed: 1,500 rpm

Time required before starting testing after air conditioner starts operating: More than 10 minutes

TEST READING

Recirculating-to-discharge air temperature table

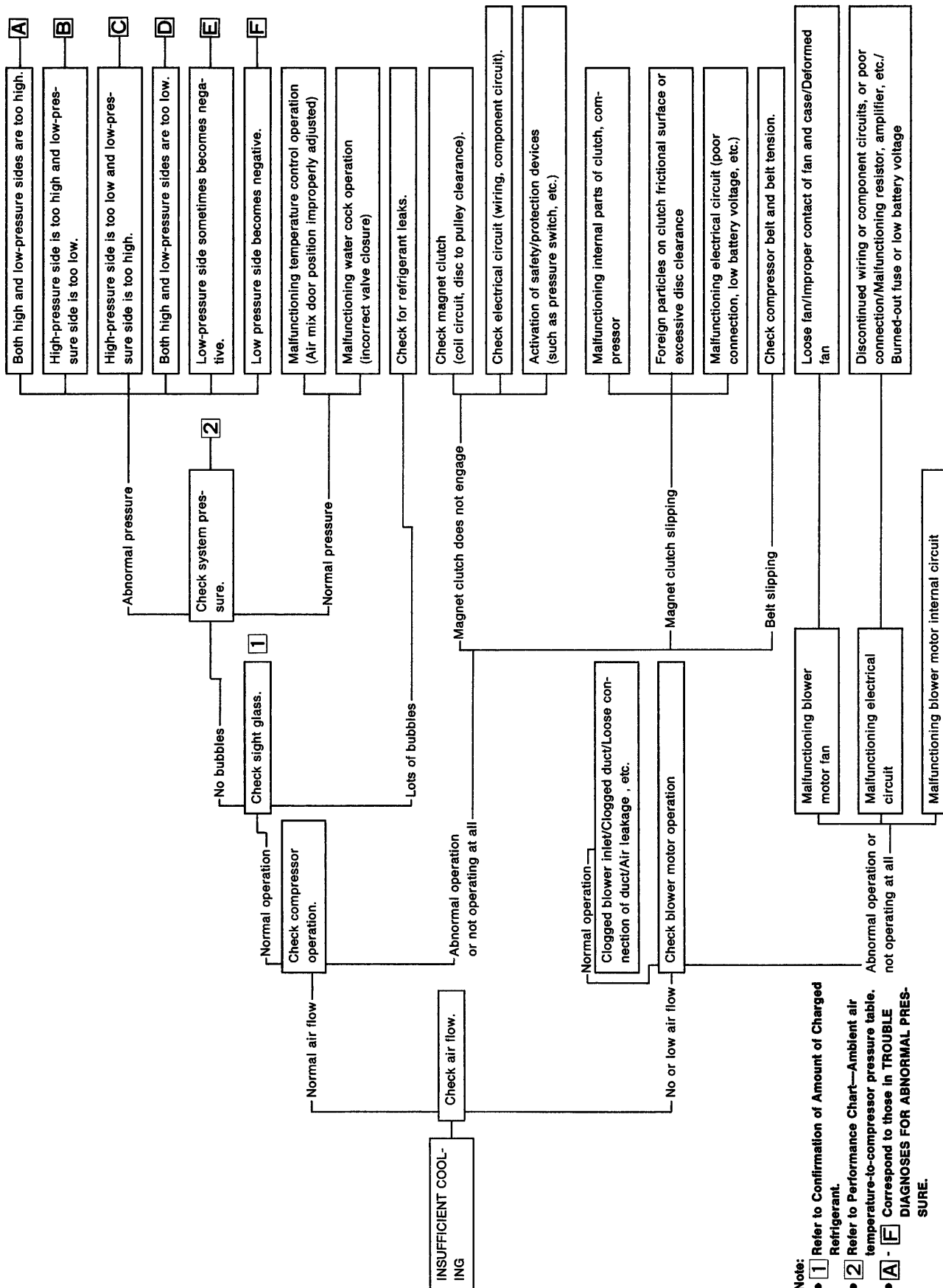
Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
40 - 60	20 (68)	2.5 - 4.6 (37 - 40)
	25 (77)	6.3 - 9.0 (43 - 48)
	30 (86)	10.8 - 13.9 (51 - 57)
	35 (95)	16.5 - 20.6 (62 - 69)
	40 (104)	22.5 - 27.5 (73 - 82)
60 - 80	20 (68)	4.6 - 7.3 (40 - 45)
	25 (77)	9.0 - 12.0 (48 - 54)
	30 (86)	13.9 - 17.7 (57 - 64)
	35 (95)	20.6 - 25.6 (69 - 78)
	40 (104)	27.5 - 34.0 (82 - 93)

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	20 (68)	686 - 1,020 (7.0 - 10.4, 100 - 148)	59 - 127 (0.6 - 1.3, 9 - 18)
	25 (77)	883 - 1,226 (9.0 - 12.5, 128 - 178)	78 - 147 (0.8 - 1.5, 11 - 21)
	30 (86)	1,118 - 1,451 (11.4 - 14.8, 162 - 210)	98 - 177 (1.0 - 1.8, 14 - 26)
	35 (95)	1,373 - 1,736 (14.0 - 17.7, 199 - 252)	127 - 226 (1.3 - 2.3, 18 - 33)
	40 (104)	1,657 - 2,020 (16.9 - 20.6, 240 - 293)	196 - 314 (2.0 - 3.2, 28 - 46)

Performance Test Diagnoses

INSUFFICIENT COOLING

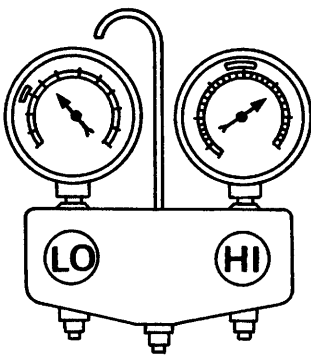


DIAGNOSES — Overall System

Performance Test Diagnoses (Cont'd)

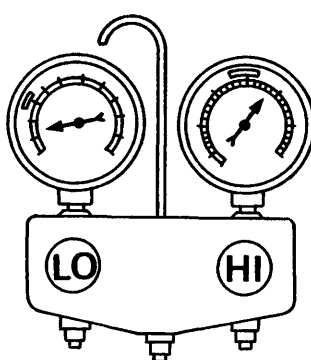
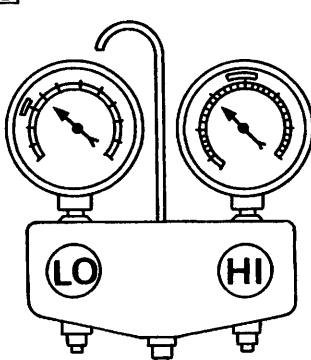
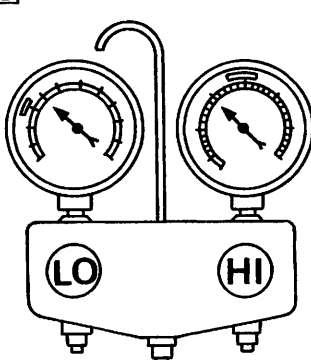
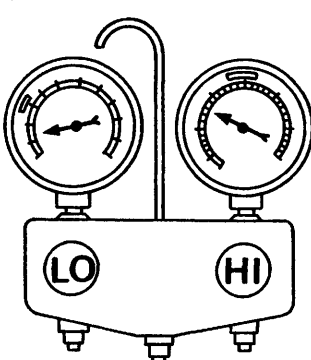
TROUBLE DIAGNOSES FOR ABNORMAL PRESSURE

Whenever abnormal pressure of high and/or low sides of the system is noted, diagnosis must be conducted by using a manifold gauge. The large-line zone on the gauge scale (see illustrations.) shown in the following table refers to the standard (normal) pressure range for the corresponding pressure side (high or low). Since the standard (normal) pressure, however, differs from vehicle to vehicle, refer to the "Ambient Temperature-Pressure Characteristics" chart.

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Both high and low-pressure sides are too high. A  AC359A	- Pressure is reduced soon after water is splashed on condenser. - No air bubbles appear in sight glass when pressure is reduced.	Excessive refrigerant charge in refrigeration cycle	Reduce refrigerant until specified pressure is obtained.
	Air suction by radiator or condenser fan is insufficient.	Insufficient condenser cooling performance ↓ ① Condenser fins are clogged. ② Improper rotation of radiator fan or condenser fan	- Clean condenser. - Check and repair radiator or condenser fan as necessary.
	- Low-pressure pipe is not cold. - When compressor is stopped high-pressure value quickly drops by approximately 196 kPa (2 kg/cm², 28 psi). It then decreases gradually thereafter.	Poor heat exchange in condenser (After compressor operation stops, high pressure decreases too slowly.) ↓ Air in refrigeration cycle	Evacuate repeatedly and recharge system.
	Engine tends to overheat.	Engine cooling systems malfunction.	Check and repair each engine cooling system.
	- Areas near low-pressure pipe connection and service valves are considerably cold compared with areas near expansion valve outlet or evaporator. - Plates are sometimes covered with frost.	- Excessive liquid refrigerant on low-pressure side - Excessive refrigerant discharge flow - Expansion valve is open a little compared with the specification. ↓ ① Improper thermal valve installation ② Improper expansion valve adjustment	Replace expansion valve.

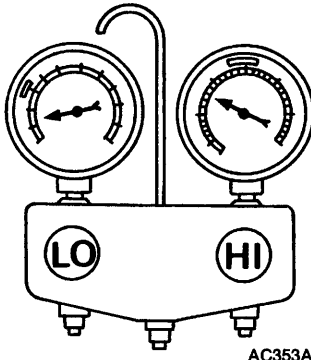
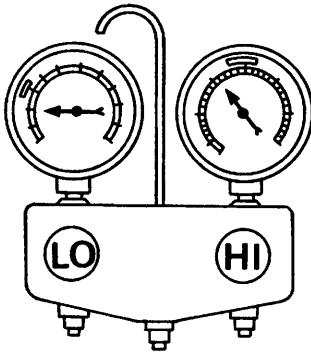
DIAGNOSES — Overall System

Performance Test Diagnoses (Cont'd)

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
High-pressure side is too high and low-pressure side is too low. B  AC360A	Upper side of condenser and high-pressure side are hot, however, liquid tank is not so hot.	High-pressure tube or parts located between compressor and condenser are clogged or crushed.	● Check and repair or replace malfunctioning parts. ● Check compressor oil for contamination.
High-pressure side is too low and low-pressure side is too high. C  AC356A	High and low-pressure sides become equal soon after compressor operation stops.	Compressor pressure operation is improper. ↓ Damaged inside compressor packings	Replace compressor.
High-pressure side is too low and low-pressure side is too high. C  AC356A	No temperature difference between high and low-pressure sides	Compressor discharge capacity does not change. (Compressor stroke is set at maximum.)	Replace compressor.
Both high-and low-pressure sides are too low. D  AC353A	● There is a big temperature difference between liquid tank outlet and inlet. Outlet temperature is extremely low. ● Liquid tank inlet and expansion valve are frosted. ● Temperature of expansion valve inlet is extremely low as compared with areas near liquid tank. ● Expansion valve inlet may be frosted. ● Temperature difference occurs somewhere in high-pressure side	Liquid tank inside is clogged a little. High-pressure pipe located between liquid tank and expansion valve is clogged.	● Replace liquid tank ● Check compressor oil for contamination. ● Check and repair malfunctioning parts. ● Check compressor oil for contamination.

DIAGNOSES — Overall System

Performance Test Diagnoses (Cont'd)

Gauge indication	Refrigerant cycle	Probable cause	Corrective action	
Both high and low-pressure sides are too low. D  AC353A	There is a big temperature difference between expansion valve inlet and outlet while the valve itself is frosted.	Expansion valve closes a little compared with the specification. ↓ ① Improper expansion valve adjustment ② Malfunctioning thermal valve ③ Outlet and inlet may be clogged.	- Remove foreign particles by using compressed air. - Check compressor oil for contamination.	GI
	Areas near low-pressure pipe connection and service valve are extremely cold as compared with areas near expansion valve outlet and evaporator.	Low-pressure pipe is clogged or crushed.	- Check and repair malfunctioning parts. - Check compressor oil for contamination.	MA EM LC
	Air flow volume is not enough or is too low.	Evaporator is frozen. ↓ Compressor discharge capacity does not change. (Compressor stroke is set at maximum length.)	Replace compressor.	EF & EC FE CL
Low-pressure side sometimes becomes negative. E  AC354A	- Air conditioning system does not function and does not cyclically cool the compartment air. - The system constantly functions for a certain period of time after compressor is stopped and restarted.	Refrigerant does not discharge cyclically. ↓ Moisture is frozen at expansion valve outlet and inlet. ↓ Water is mixed with refrigerant.	- Drain water from refrigerant or replace refrigerant. - Replace liquid tank.	MT AT FA RA BR ST

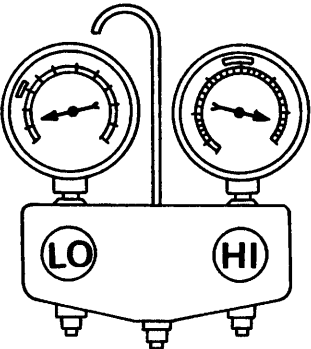
BF

HA

EL

DIAGNOSES — Overall System

Performance Test Diagnoses (Cont'd)

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Low-pressure side becomes negative. F  AC362A	Liquid tank or front/rear side of expansion valve's pipe is frosted or dewed.	High-pressure side is closed and refrigerant does not flow. ↓ Expansion valve or liquid tank is frosted.	After the system is left at rest, start it again in order to confirm whether or not problem is caused by water or foreign particles. ● If the problem is due to water, drain water from refrigerant or replace refrigerant. ● If it is due to foreign particles, remove expansion valve and remove them with dry and compressed air. ● If either of the above methods cannot correct the problem, replace expansion valve. ● Replace liquid tank. ● Check compressor oil for contamination.

TROUBLE DIAGNOSES

Contents

Symptom Chart	HA-42	
Preliminary Check	HA-44	
PRELIMINARY CHECK 1 (Intake door is not set at "FRESH" in DEF or F/D mode.)	HA-44	GI
PRELIMINARY CHECK 2 (A/C does not blow cold air.)	HA-45	MA
PRELIMINARY CHECK 3 (Magnet clutch does not operate in DEF mode.)	HA-46	
PRELIMINARY CHECK 4 (Air outlet does not change.)	HA-47	EM
PRELIMINARY CHECK 5 (Noise)	HA-48	LC
Harness Layout for A/C System	HA-49	
Circuit Diagram for Quick Pinpoint Check	HA-51	EF & EC
Wiring Diagram	HA-52	
Main Power Supply and Ground Circuit Check	HA-54	
Diagnostic Procedure 1 (SYMPTOM: Blower motor does not rotate.)	HA-55	FE
Diagnostic Procedure 2 (SYMPTOM: Air outlet does not change.)	HA-58	CL
Diagnostic Procedure 3 (SYMPTOM: Intake door does not change.)	HA-60	MT
Diagnostic Procedure 4 (SYMPTOM: Magnet clutch does not operate with A/C switch and fan switch are ON.)	HA-61	AT
Diagnostic Procedure 5 (SYMPTOM: Illumination or indicators of push control unit do not come on.)	HA-66	
Electrical Components Inspection	HA-69	FA

RA

BR

ST

BF

HA

EL

TROUBLE DIAGNOSES

Symptom Chart

DIAGNOSTIC TABLE

PROCEDURE	Preliminary Check					Diagnostic Procedure					Main Power Supply and Ground Circuit Check			
REFERENCE PAGE	HA-44	HA-45	HA-46	HA-47	HA-48	HA-55	HA-58	HA-60	HA-61	HA-66	HA-54	HA-54	HA-54	HA-54
SYMPTOM	Preliminary check 1	Preliminary check 2	Preliminary check 3	Preliminary check 4	Preliminary check 5	Diagnostic procedure 1	Diagnostic procedure 2	Diagnostic procedure 3	Diagnostic procedure 4	Diagnostic procedure 5	15A Fuses	10A Fuses	Push control unit	Thermo control amp.
A/C does not blow cold air.		①				○			○		○	○		○
Blower motor does not rotate.		①				②					○			
Air outlet does not change.				①			②					○	○	
Intake door does not change.								①				○	○	
Intake door is not set at "FRESH" in DEF or F/D mode.	①							○				○	○	
Magnet clutch does not operate when A/C switch and fan switch are ON.		①							②			○		○
Magnet clutch does not operate in DEF mode.		①	②						○			○		○
Illumination or indicators of push control unit do not come on.										①		○		
Noise					①									

①, ②: The number means checking order.

○: As for checking order, refer to each flow chart. (It depends on malfunctioning portion.)

Electrical Components Inspection

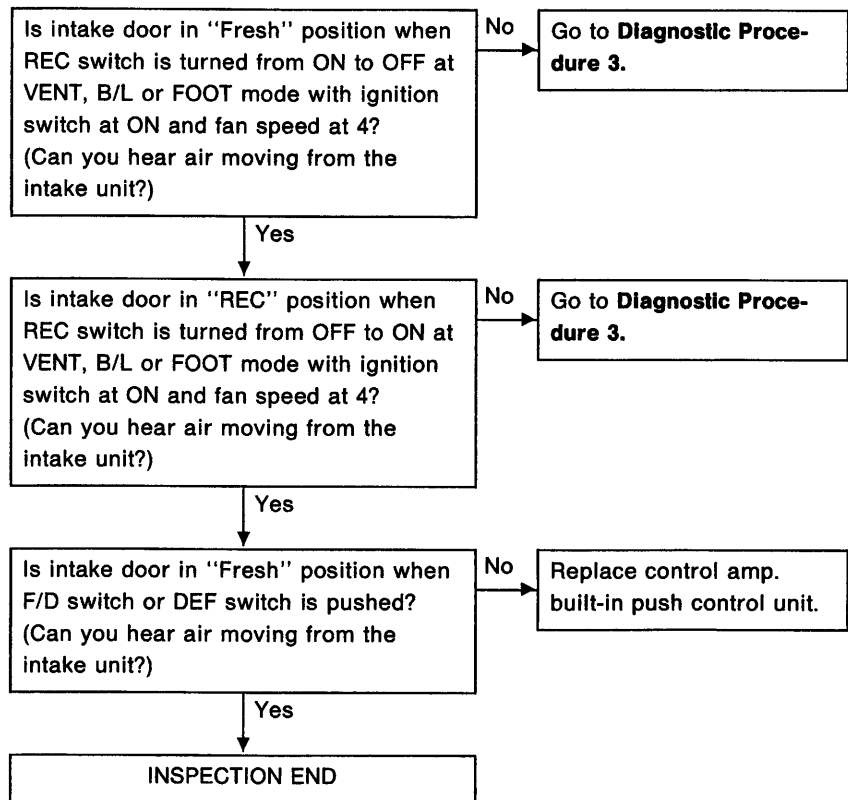
GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

TROUBLE DIAGNOSES

Preliminary Check

PRELIMINARY CHECK 1

Intake door is not set at "FRESH" in DEF or F/D mode.

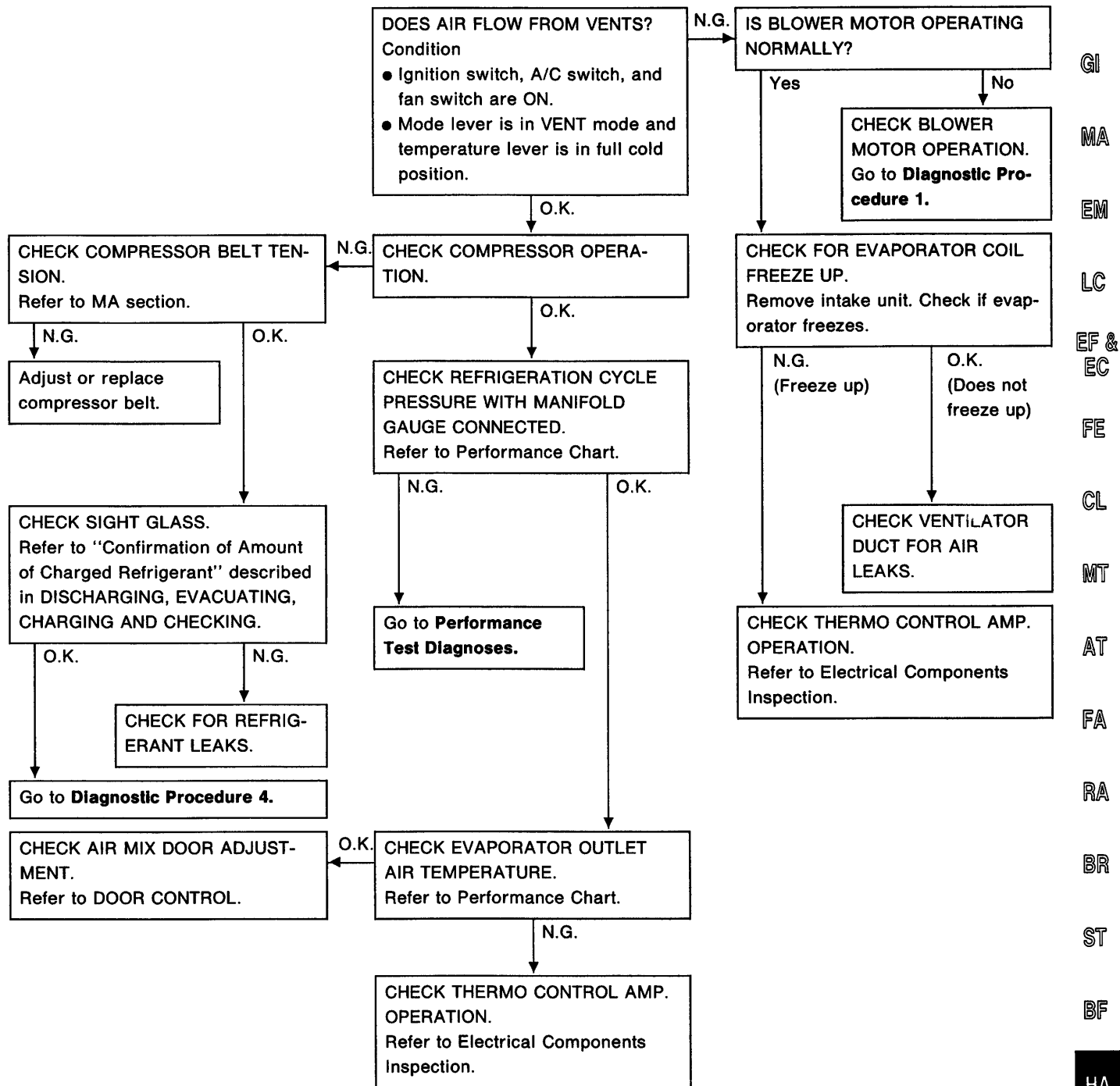


TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

A/C does not blow cold air.



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

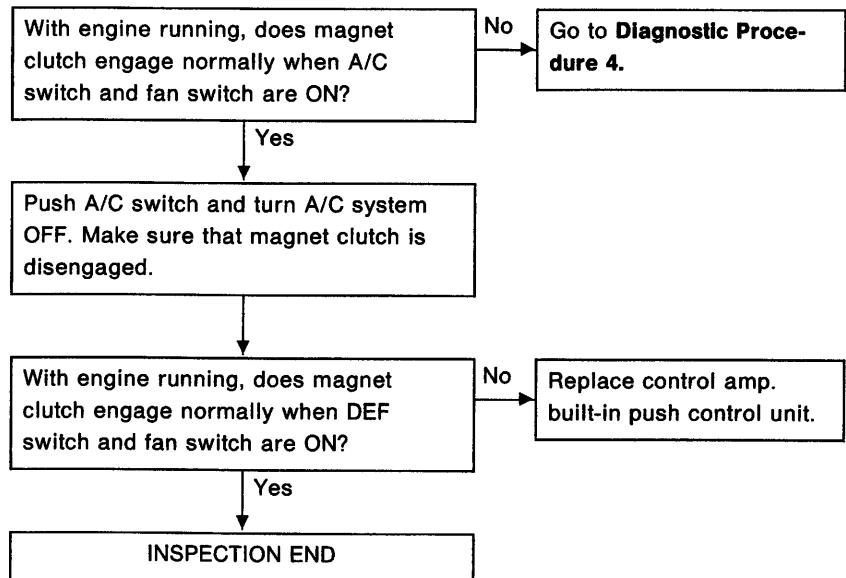
TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

PRELIMINARY CHECK 3

Magnet clutch does not operate in DEF mode.

- Perform PRELIMINARY CHECK 2 before referring to the following flow chart.



TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

PRELIMINARY CHECK 4

Air outlet does not change.

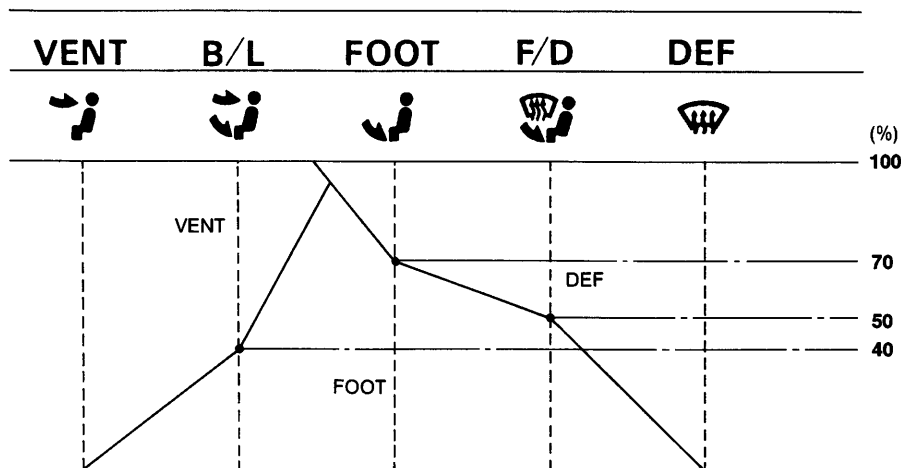
DOES AIR COME OUT FROM EACH DUCT NORMALLY WHEN EACH MODE SWITCH IS PUSHED WITH IGNITION SWITCH AT ON?

Fresh vent "OFF"

No → Go to Diagnostic Procedure 2.

Switch		Indicator illuminates					Air outlet
Mode		○					VENT
			○				FOOT & VENT
				○			FOOT, DEF & VENT
					○		FOOT, DEF & VENT
						○	DEF & VENT

Air distribution ratios



Yes

INSPECTION END

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

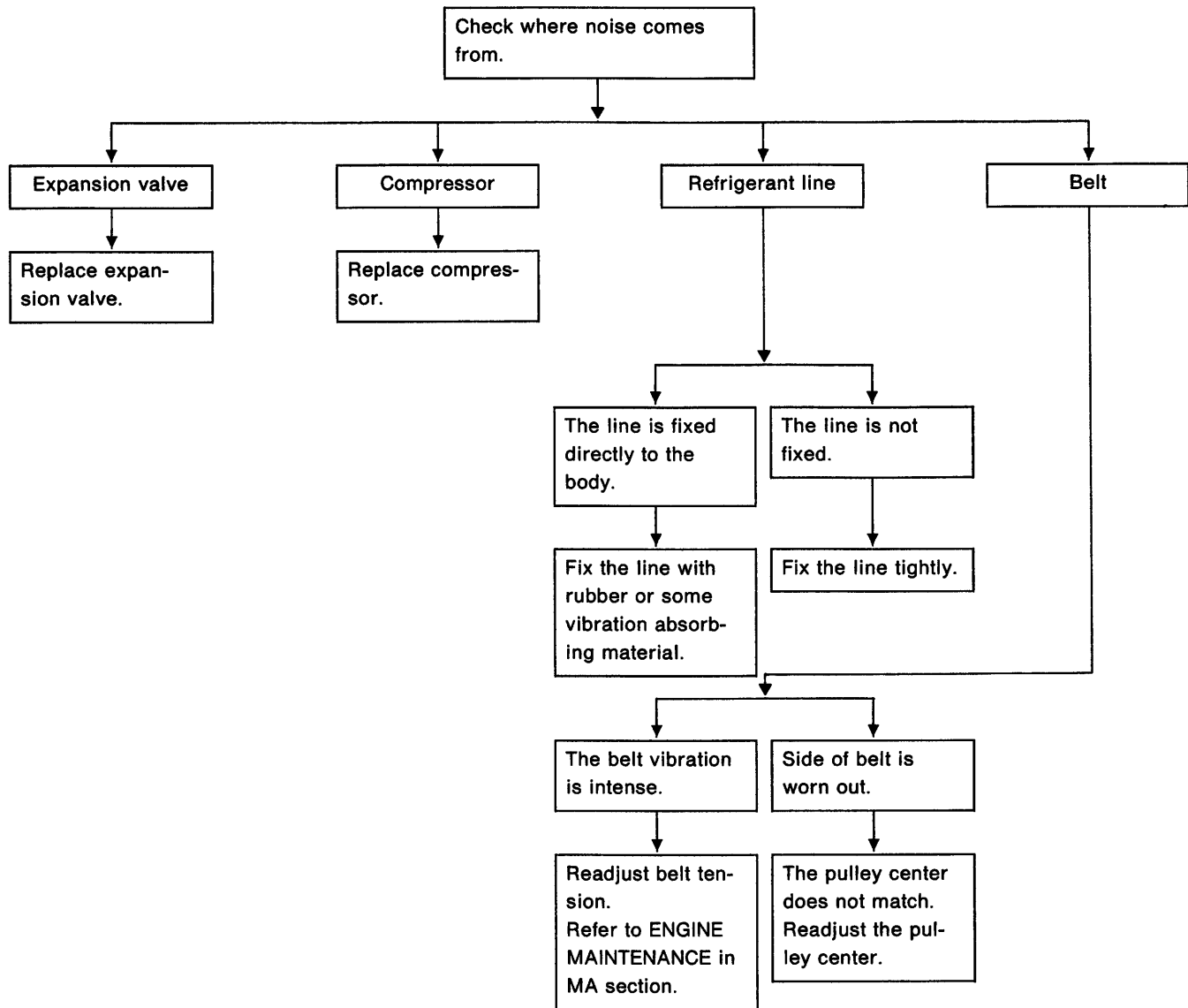
EL

TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

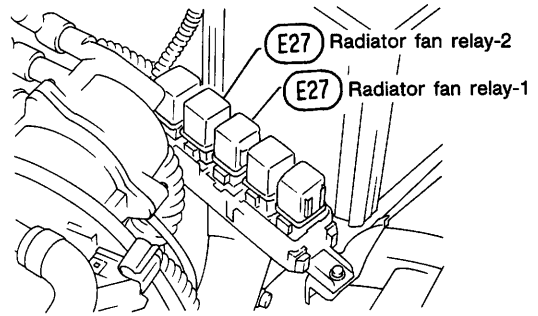
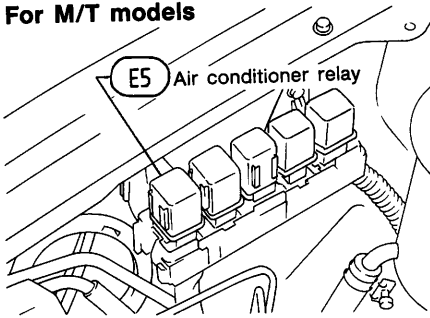
PRELIMINARY CHECK 5

Noise

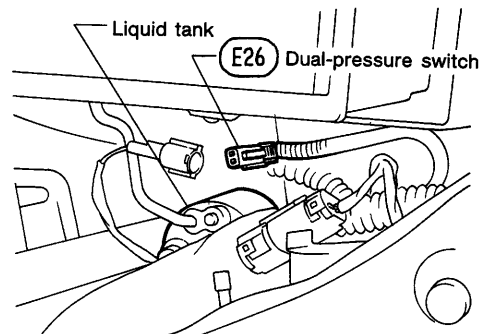
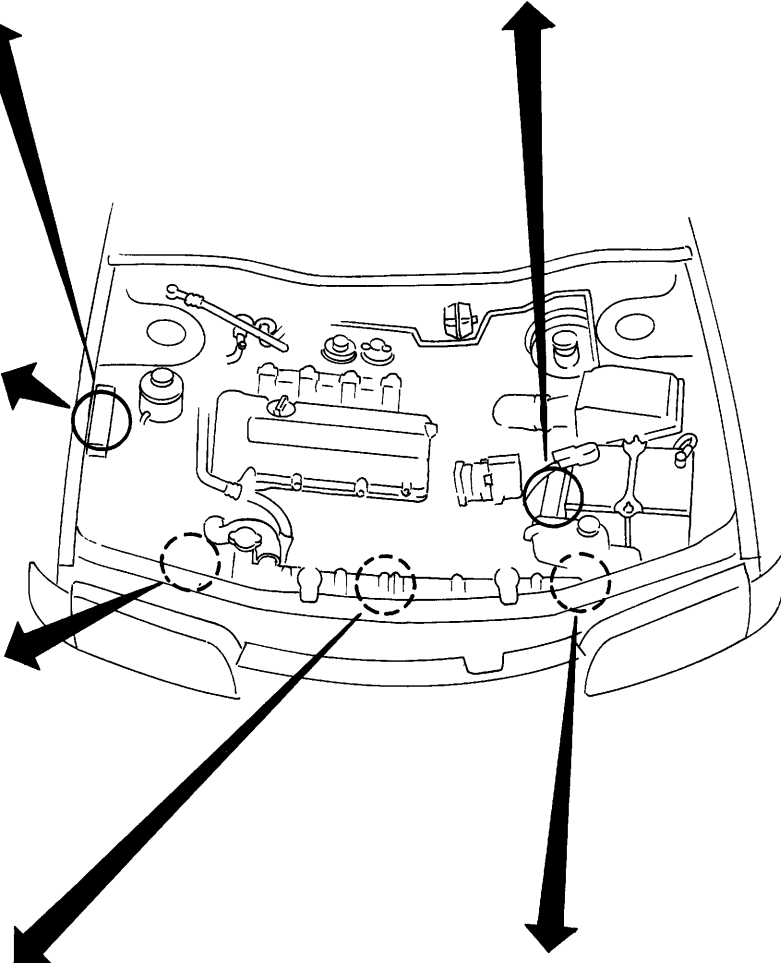
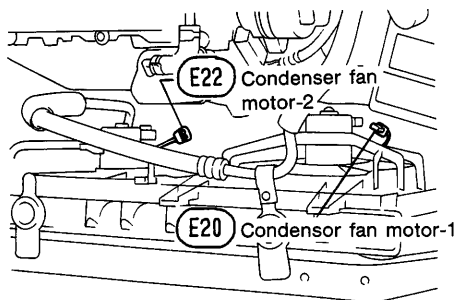
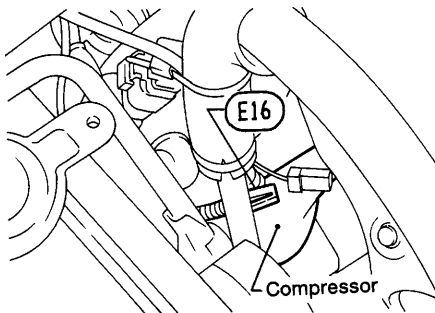
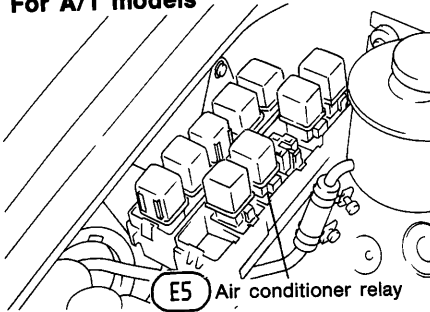


Harness Layout for A/C System

For M/T models



For A/T models



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

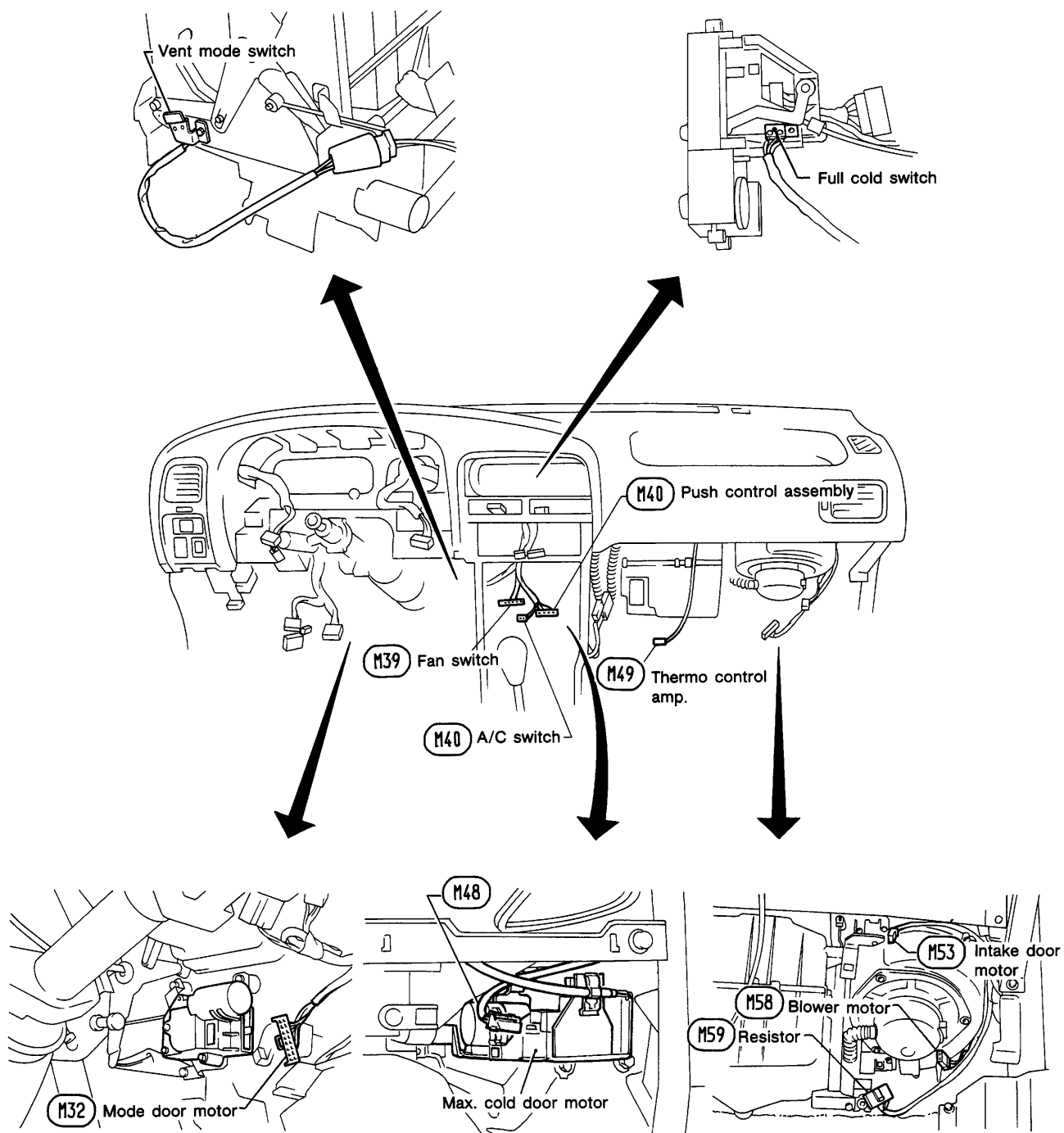
HA

EL

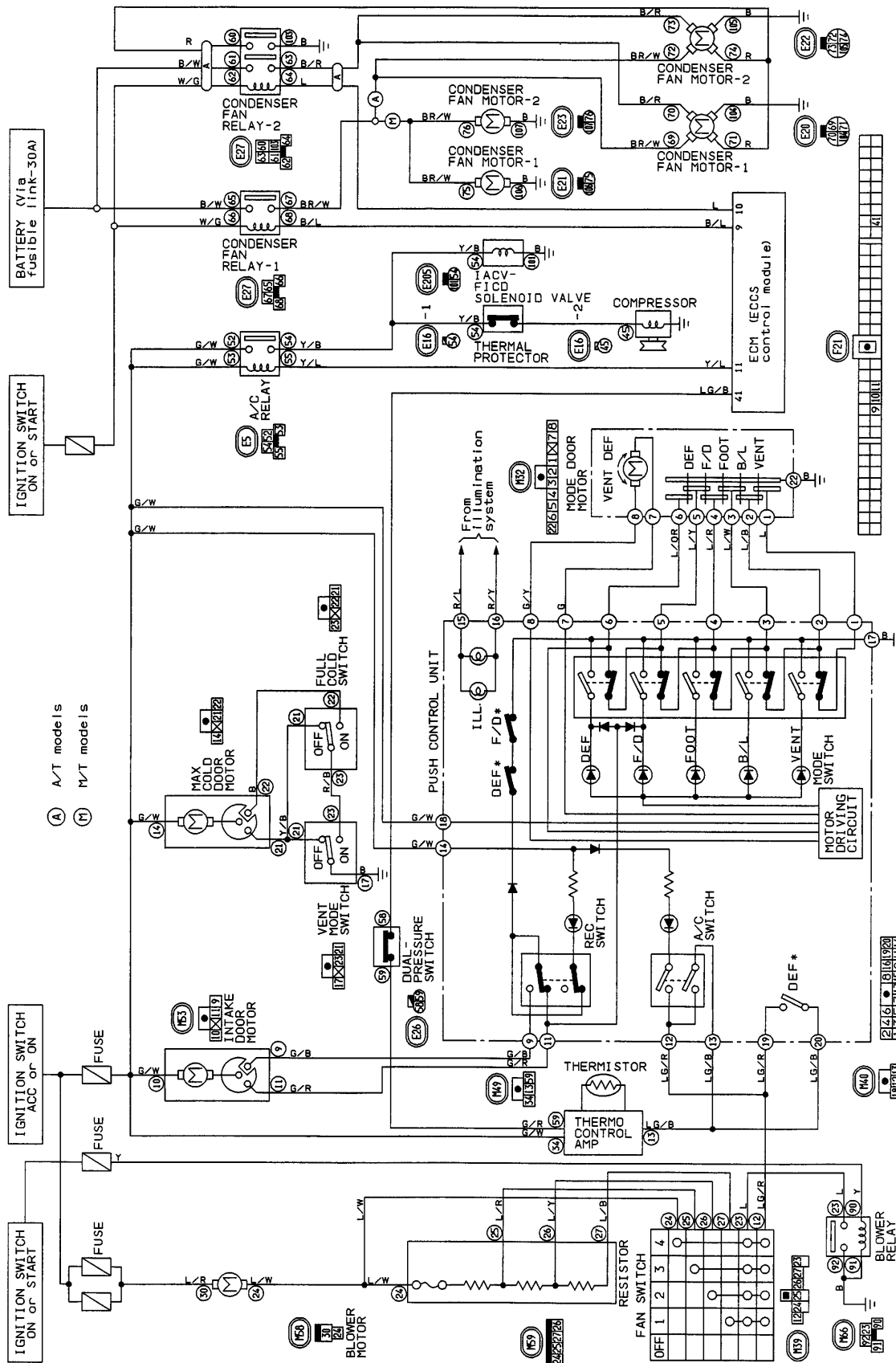
TROUBLE DIAGNOSES

Harness Layout for A/C System (Cont'd)

PASSENGER COMPARTMENT



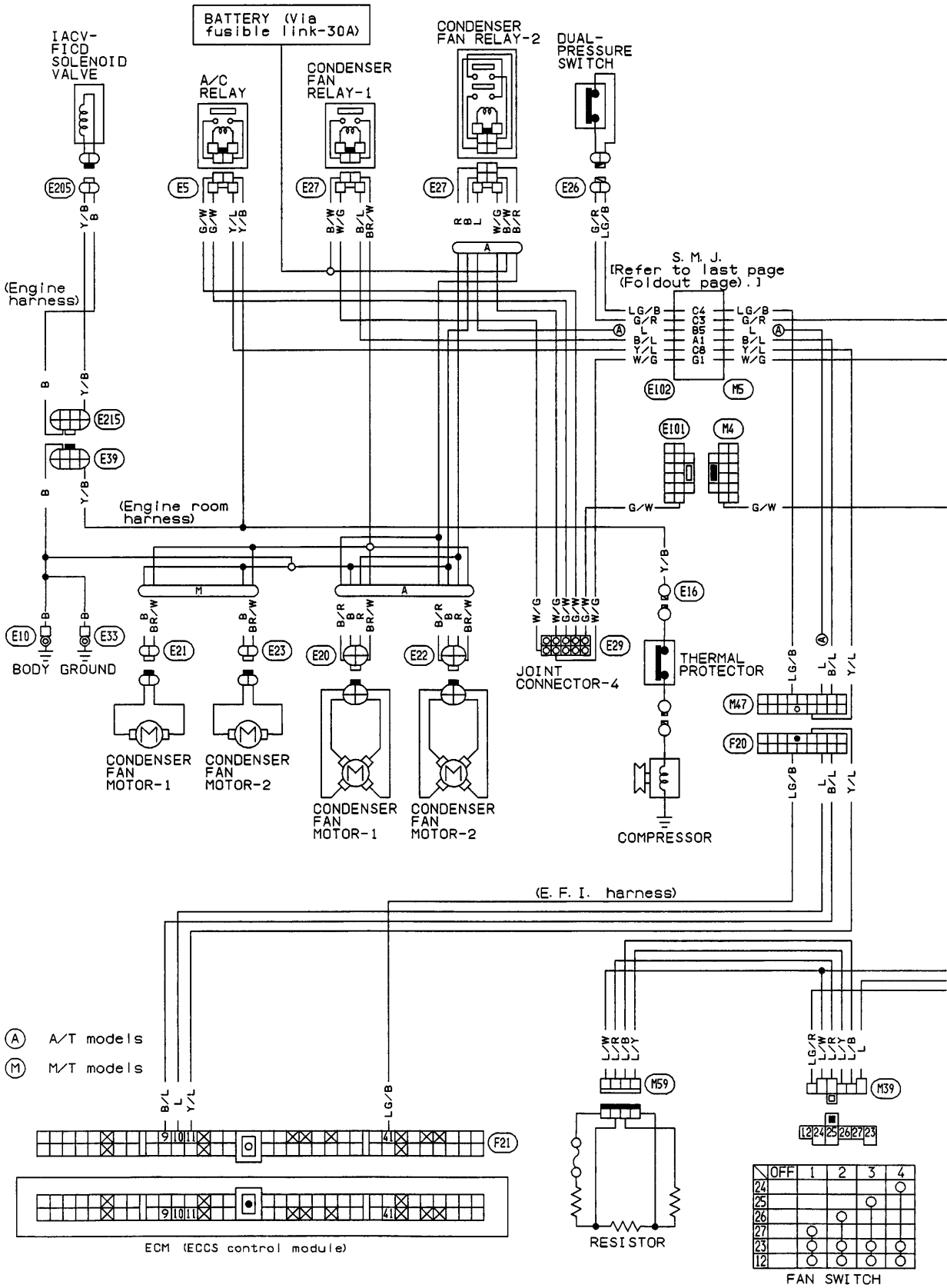
Circuit Diagram for Quick Pinpoint Check



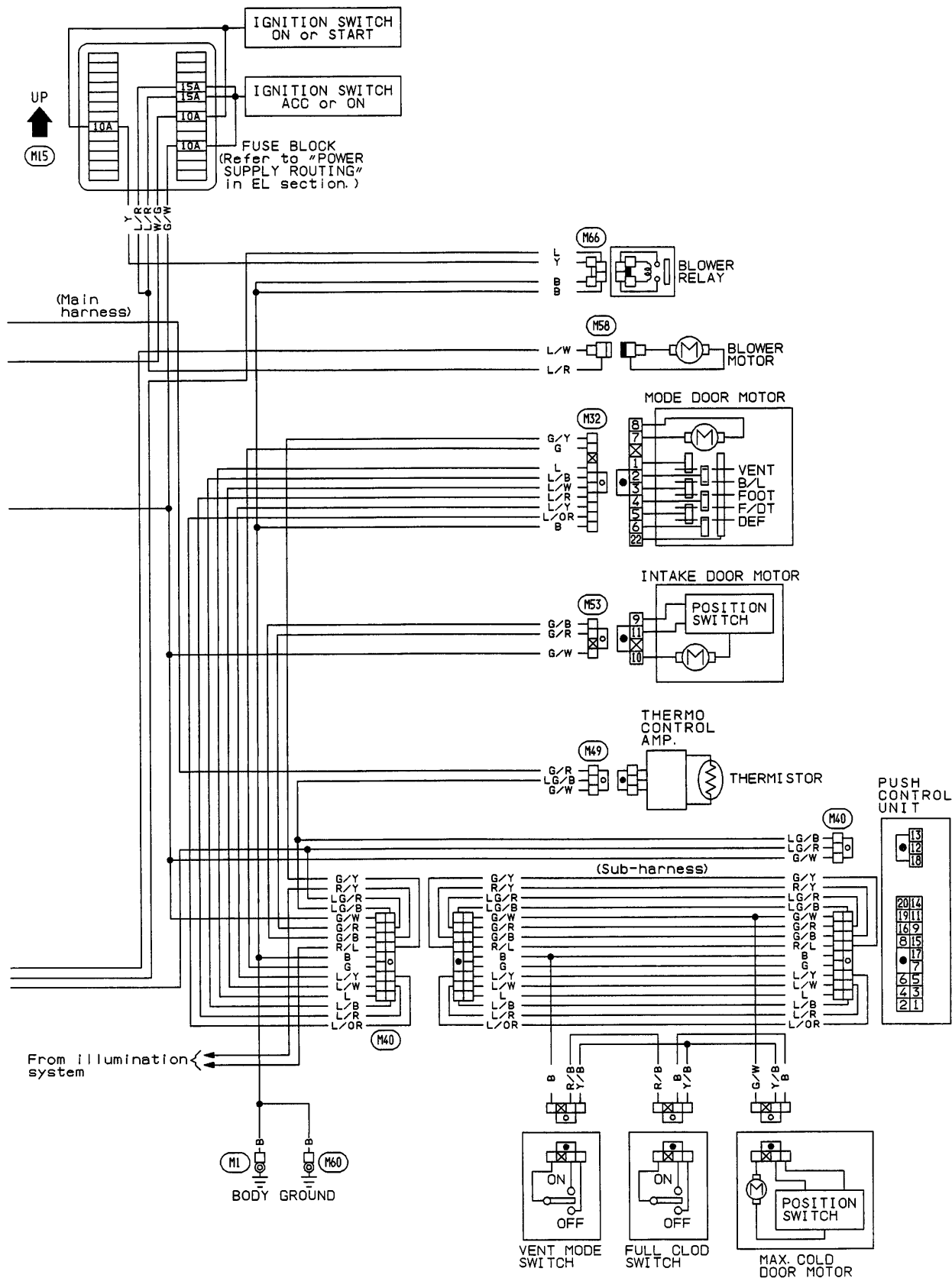
- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle "○" are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See pages HA-49, HA-50.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "○".
- *: These switches are built into push control unit and mechanically linked to corresponding switches.

GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

Wiring Diagram



TROUBLE DIAGNOSES Wiring Diagram (Cont'd)



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

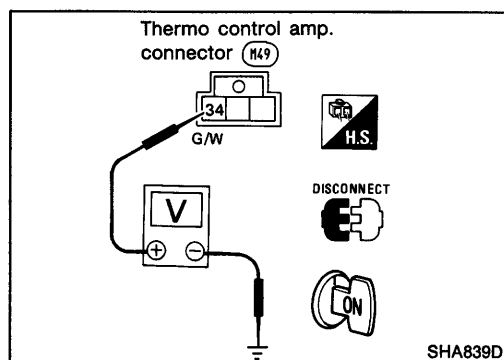
EL

Main Power Supply and Ground Circuit Check

POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

Check power supply circuit for air conditioning system.

Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.

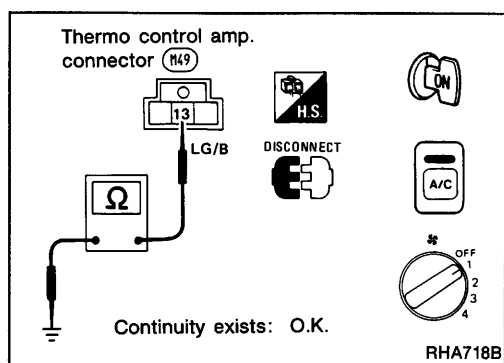


THERMO CONTROL AMP. CHECK

Check power supply circuit for thermo control amp. with ignition switch ON.

1. Disconnect thermo control amp. harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ③④ and body ground.

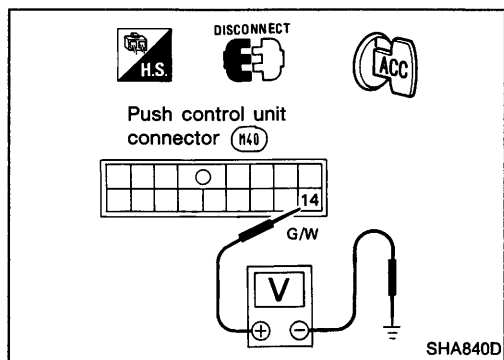
Voltmeter terminal		Voltage
⊕	⊖	
③④	Body ground	Approx. 12V



Check body ground circuit for thermo control amp. with ignition switch ON, A/C switch ON and fan switch ON.

1. Disconnect thermo control amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. ⑬ and body ground.

Ohmmeter terminal		Continuity
⊕	⊖	
⑬	Body ground	Yes

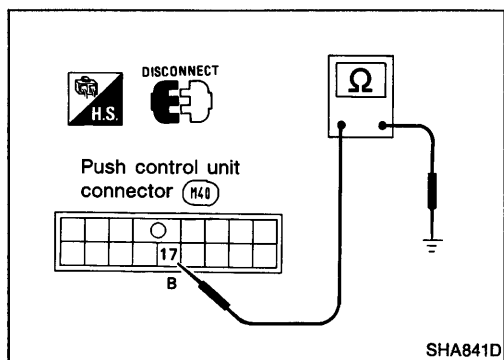


PUSH CONTROL UNIT CHECK

Check power supply circuit for push control unit with ignition switch at ACC.

1. Disconnect push control unit harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ⑭ and body ground.

Voltmeter terminal		Voltage
⊕	⊖	
⑭	Body ground	Approx. 12V



Check body ground circuit for push control unit with ignition switch OFF.

1. Disconnect push control unit harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. ⑰ and body ground.

TROUBLE DIAGNOSES

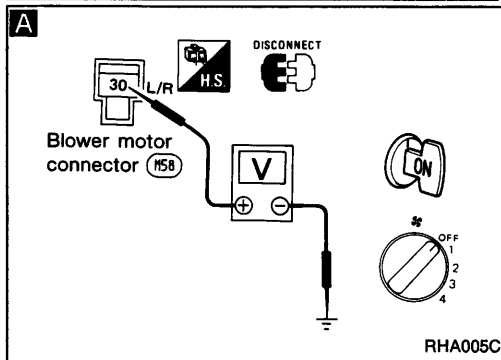
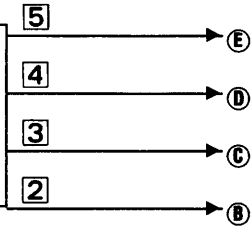
	INCIDENT	Flow chart No.
1	Fan fails to rotate.	1
2	Fan does not rotate at 1-speed.	2
3	Fan does not rotate at 2-speed.	3
4	Fan does not rotate at 3-speed.	4
5	Fan does not rotate at 4-speed.	5

Diagnostic Procedure 1

SYMPTOM: Blower motor does not rotate.

- Perform **PRELIMINARY CHECK 2** before referring to the following flow chart.

Check if blower motor rotates properly at each fan speed.
Conduct checks as per flow chart at left.



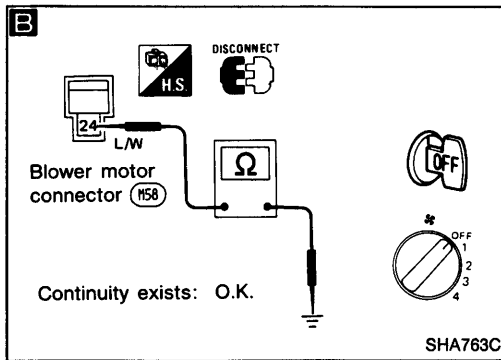
A

1

CHECK POWER SUPPLY FOR BLOWER MOTOR.
Disconnect blower motor harness connector.
Do approx. 12 volts exist between blower motor harness terminal No. 30 and body ground?

N.G. Check 15A fuses at fuse block.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

(Go to next page.)



B

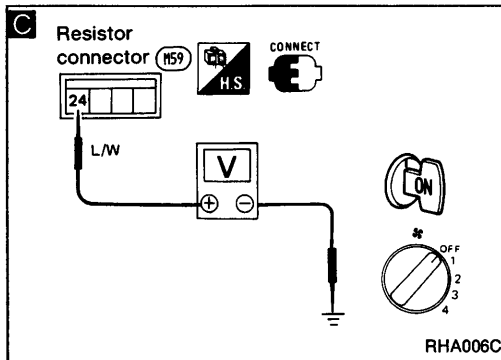
Check circuit continuity between blower motor harness terminal No. 24 and body ground.

N.G. Reconnect blower motor harness connector.

O.K.

CHECK BLOWER MOTOR.
(Refer to Electrical Components Inspection.)

N.G. Replace blower motor.



C

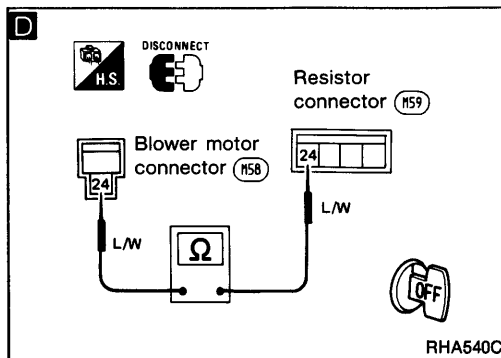
CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND RESISTOR.
Do approx. 12 volts exist between resistor harness terminal No. 24 and body ground?

N.G. Disconnect blower motor and resistor harness connectors.

D

Note

Check circuit continuity between blower motor harness terminal No. 24 and resistor harness terminal No. 24.



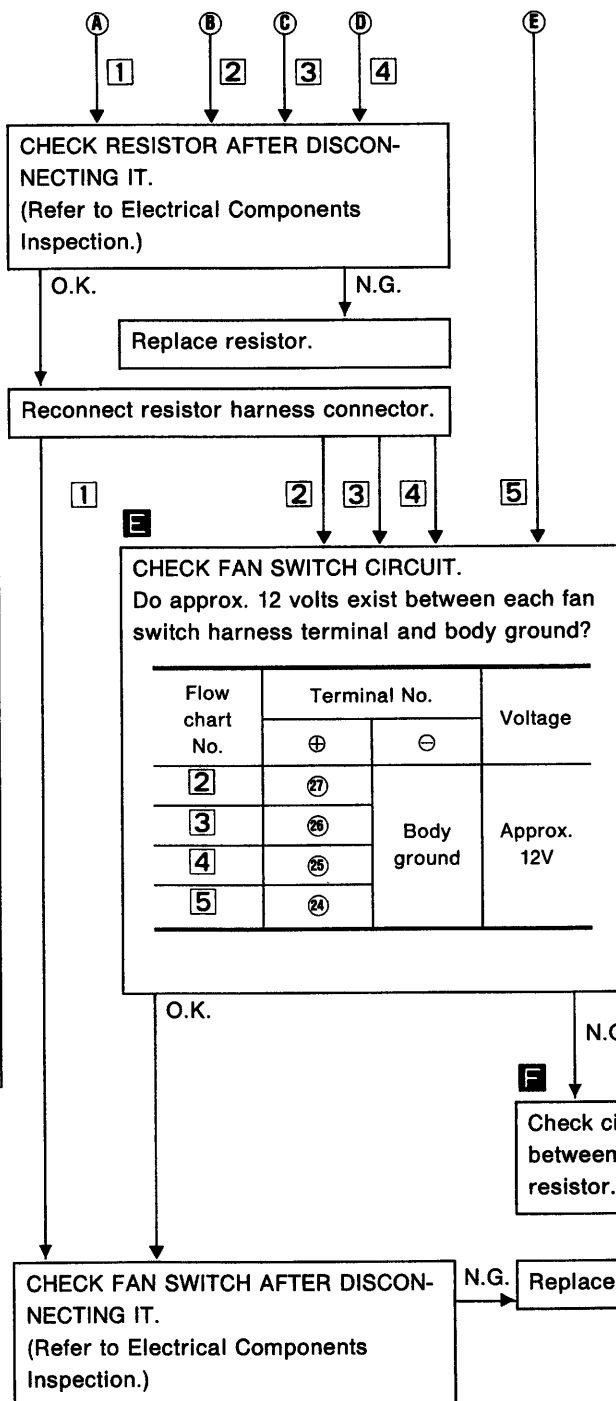
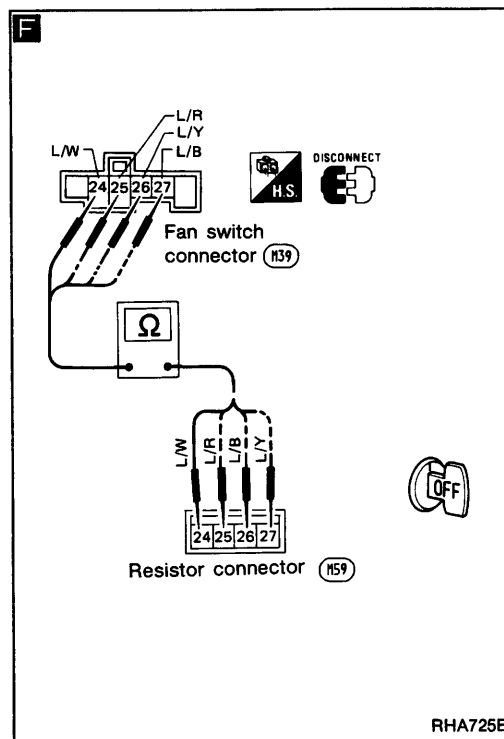
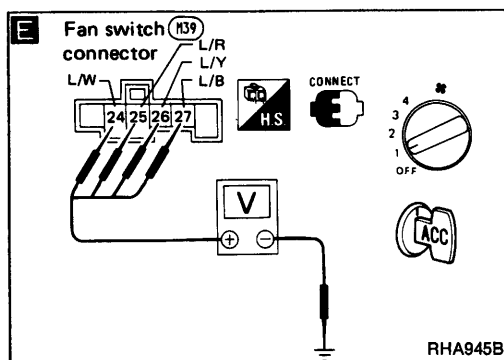
O.K.

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES

Diagnostic Procedure 1 (Cont'd)



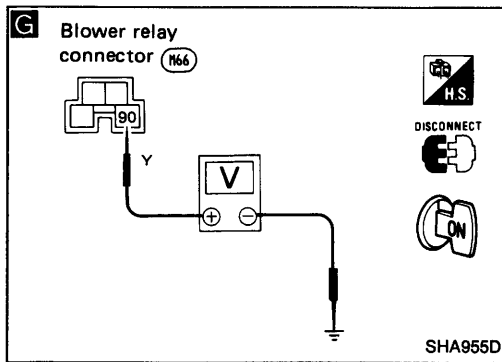
F Note
Check circuit continuity between fan switch and resistor.

O.K.
F
(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

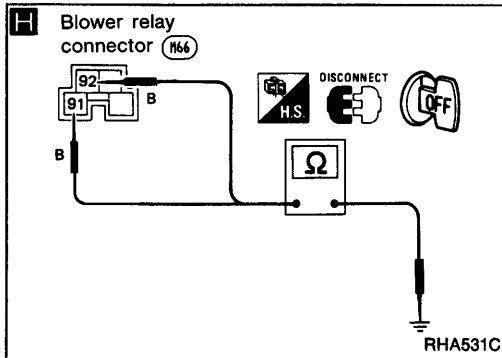
TROUBLE DIAGNOSES

Diagnostic Procedure 1 (Cont'd)



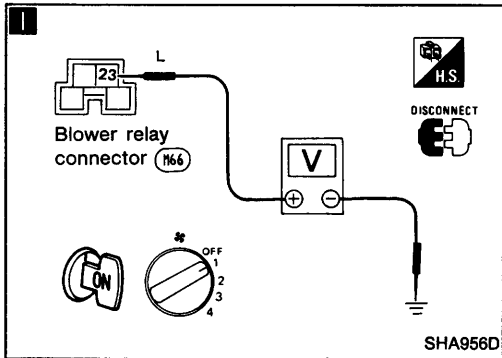
G CHECK POWER SUPPLY FOR BLOWER RELAY.
Disconnect blower relay harness connector.
Do approx. 12 volts exist between blower relay harness terminal No. 90 and body ground?

N.G. Check 10A fuse at fuse block.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)



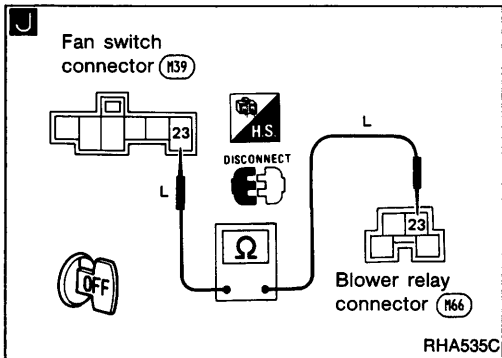
H Check circuit continuity between blower relay harness terminal No. 91, 92 and body ground.

Reconnect fan switch harness connector.



I CHECK FAN SWITCH CIRCUIT BETWEEN FAN SWITCH AND BLOWER RELAY.
Do approx. 12 volts exist between blower relay harness terminal No. 23 and body ground?

N.G. Disconnect fan switch harness connector.



CHECK BLOWER RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

Replace blower relay.

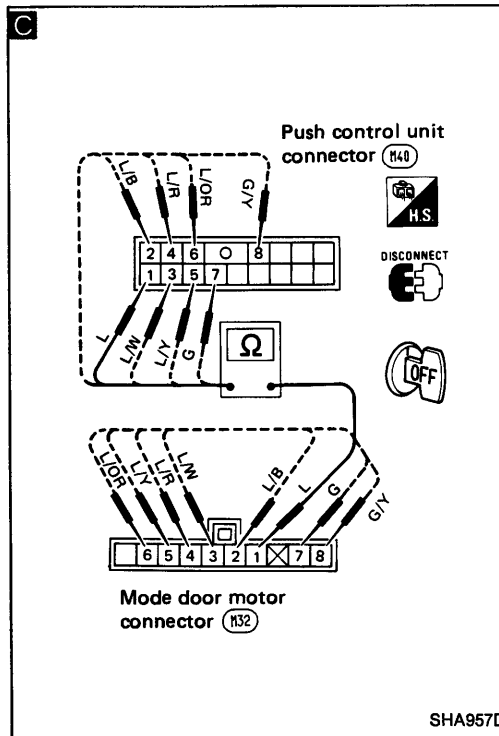
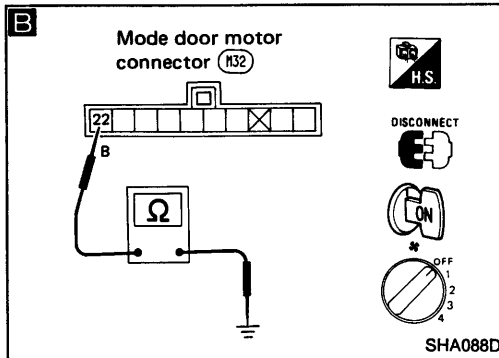
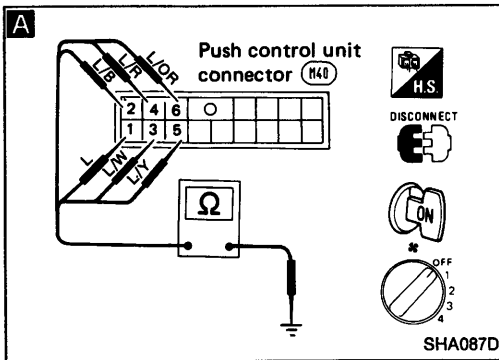
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

Diagnostic Procedure 2

SYMPTOM: Air outlet does not change.

- Perform **PRELIMINARY CHECK 4** and **Main Power Supply and Ground Circuit Check** before referring to the following flow chart.



A

CHECK MODE DOOR MOTOR POSITION SWITCH.

1. Turn VENT switch ON with ignition switch at ACC position.
2. Turn ignition switch OFF. Disconnect push control unit connector.
3. Check if continuity exists between terminal No. ① or ② of push control unit harness connector and body ground.
4. Using above procedures, check for continuity in any other mode, as indicated in chart.

Mode switch	Terminal No.		Continuity
	⊕	⊖	
VENT	① or ②	Body ground	Yes
B/L	② or ③		
FOOT	③ or ④		
F/D	④ or ⑤		
DEF	⑤ or ⑥		

O.K.

CHECK SIDE LINK.
Refer to DOOR CONTROL.

N.G. Disconnect mode door motor harness connector.

B Note

CHECK BODY GROUND CIRCUIT FOR MODE DOOR MOTOR.
Does continuity exist between mode door motor harness terminal No. ②② and body ground?

O.K.

C Note

Check circuit continuity between each terminal on push control unit and on mode door motor.

Terminal No.		Continuity
⊕	⊖	
Push control unit	Mode door motor	Yes
①	①	
②	②	
③	③	
④	④	
⑤	⑤	
⑥	⑥	
⑦	⑦	
⑧	⑧	

O.K.

Ⓐ

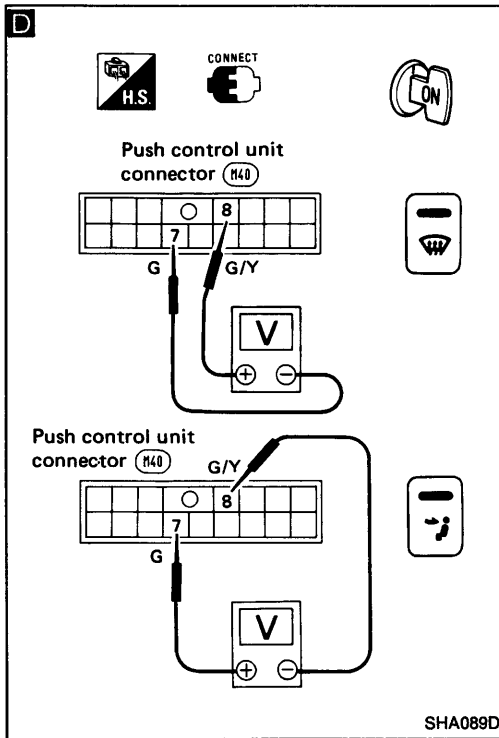
(Go to next page.)

Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES

Diagnostic Procedure 2 (Cont'd)



A

Reconnect push control unit and mode door motor harness connectors.

D

CHECK FOR OUTPUT OF PUSH CONTROL UNIT.
Do approx. 12 volts exist between push control unit harness terminal No. ⑦ and ⑧ when mode is switched from "VENT" to "DEF" or when mode is switched from "DEF" to "VENT"?

Terminal No.		Mode door motor	
⑦	⑧	Mode door operation	Direction of linkage rotation
—	—	Stop	Stop
⊖	⊕	VENT → DEF	Clockwise
⊕	⊖	DEF → VENT	Counterclockwise

N.G. Replace control amp. built-in push control unit.

O.K.

Replace mode door motor.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

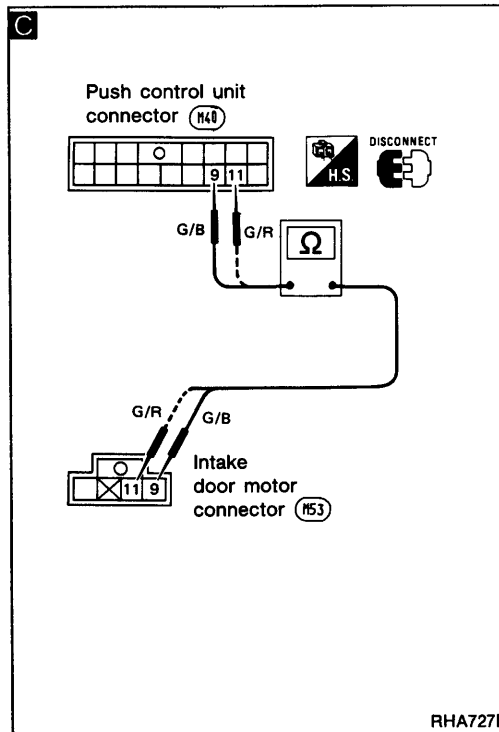
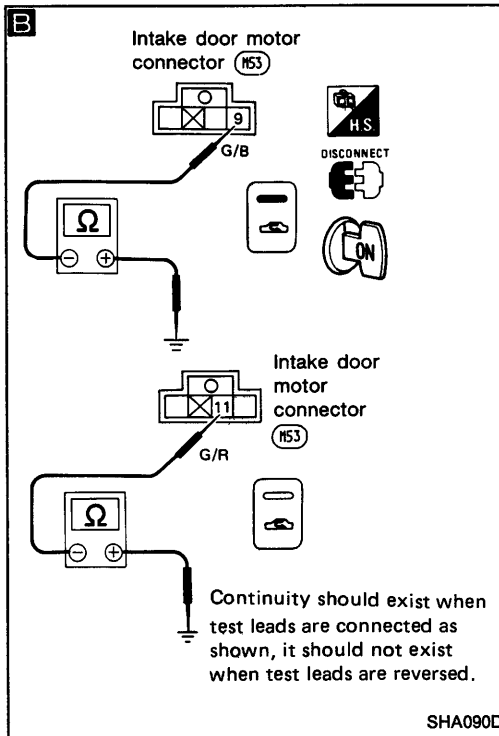
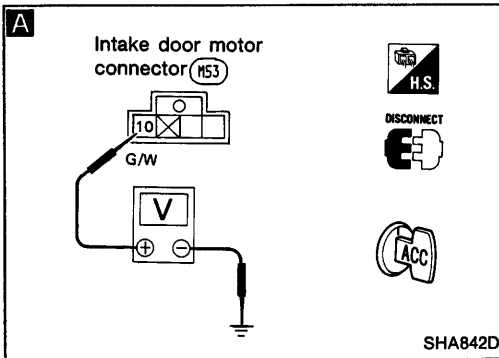
HA

EL

Diagnostic Procedure 3

SYMPTOM: Intake door does not change.

- Perform **PRELIMINARY CHECK 1** and **Main Power Supply and Ground Circuit Check** before referring to the following flow chart.



A

CHECK POWER SUPPLY FOR INTAKE DOOR MOTOR.

Disconnect intake door motor harness connector.

Do approx. 12 volts exist between intake door motor harness terminal No. ⑩ and body ground?

N.G.

Check 10A fuses at fuse block.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

O.K.

B

CHECK BODY GROUND CIRCUIT FOR INTAKE DOOR MOTOR.

Does continuity exist between intake door motor harness terminal No. ⑨ and body ground when REC switch is ON?

Does continuity exist between intake door motor harness terminal No. ⑪ and body ground when REC switch is OFF?

N.G.

Disconnect push control unit harness connector.

C

Note

Check circuit continuity between push control unit harness terminal No. ⑨ (⑪) and intake door motor harness terminal No. ⑨ (⑪)?

O.K.

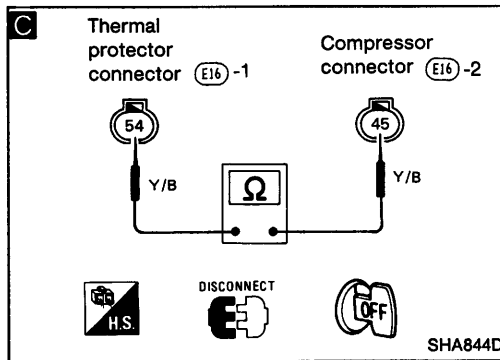
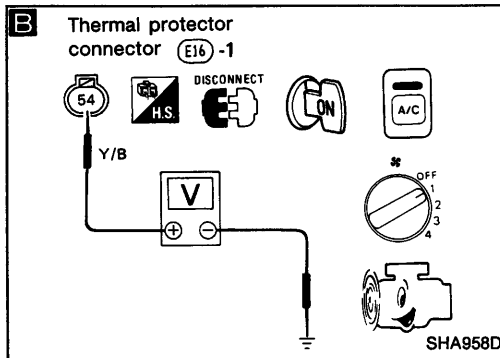
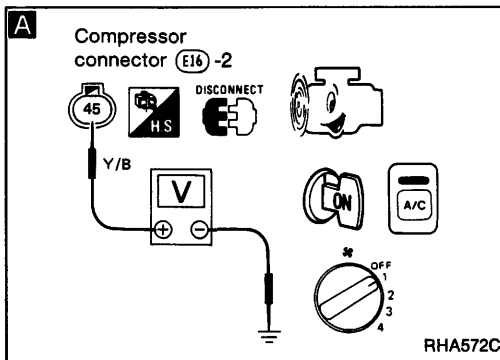
Replace control amp. built-in push control unit.

O.K.

Replace intake door motor.

Note:

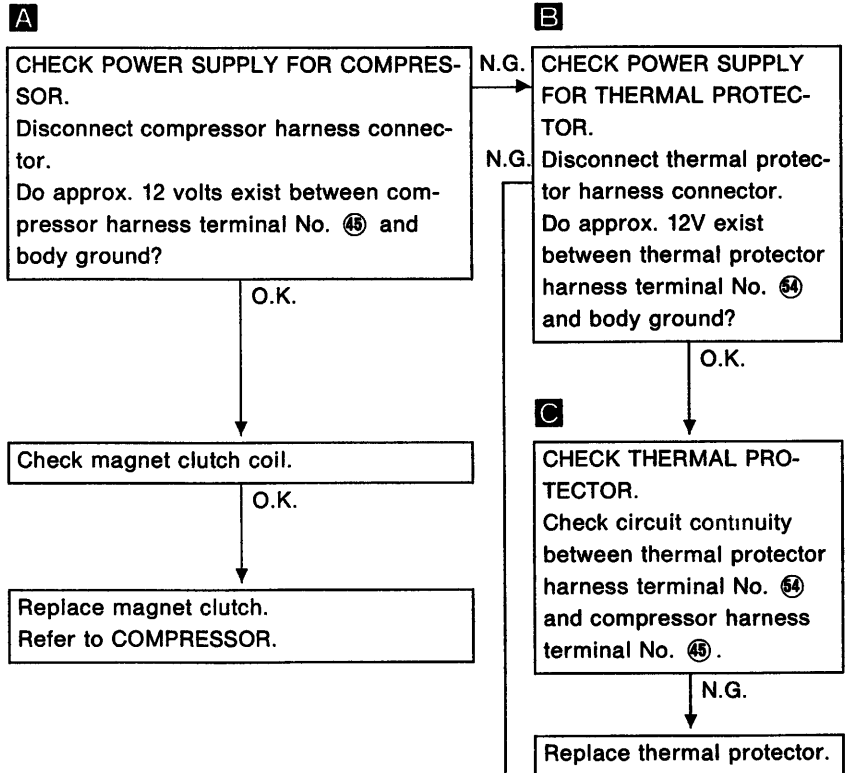
If the result is N.G. after checking circuit continuity, repair harness or connector.



Diagnostic Procedure 4

SYMPTOM: Magnet clutch does not operate when A/C switch and fan switch are ON.

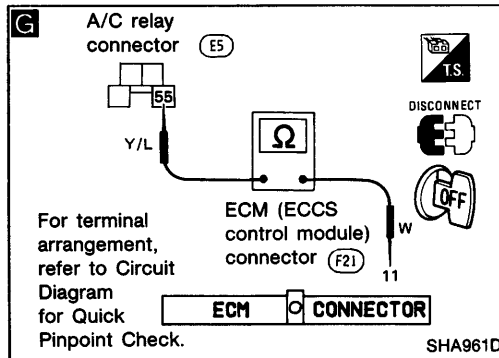
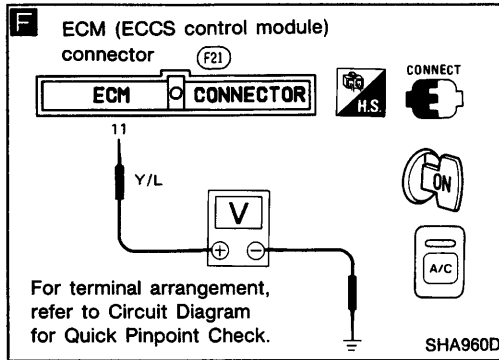
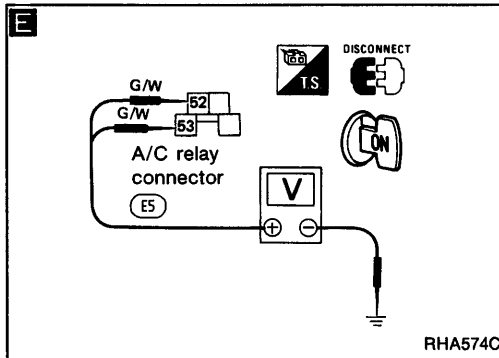
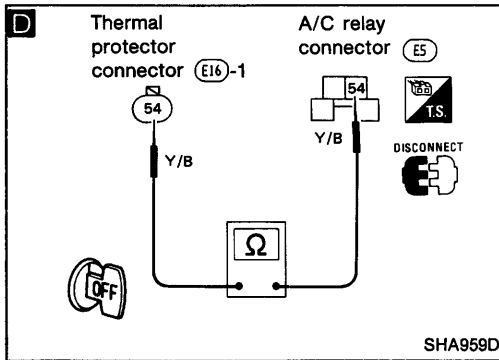
- Perform **PRELIMINARY CHECK 2** before referring to the following flow chart.



(Go to next page.)

TROUBLE DIAGNOSES

Diagnostic Procedure 4 (Cont'd)



A

Disconnect A/C relay harness connector.

D

Note

Check circuit continuity between A/C relay harness terminal No. 54 and thermal protector harness terminal No. 54.

E

O.K.

CHECK POWER SUPPLY FOR A/C RELAY. Disconnect A/C relay. Do approx. 12 volts exist between A/C relay harness terminal No. 52, 53 and body ground?

O.K.

N.G.

CHECK POWER SUPPLY CIRCUIT AND 10A FUSE AT FUSE BLOCK. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

CHECK A/C RELAY AFTER DISCONNECTING IT. (Refer to Electrical Components Inspection.)

N.G.

Replace A/C relay.

O.K.

Reconnect A/C relay.

F

CHECK COIL SIDE CIRCUIT OF A/C RELAY. Do approx. 12 volts exist between ECM (ECCS control module) harness terminal No. 11 and body ground?

G

N.G.

Check circuit continuity between A/C relay harness terminal No. 55 and ECM (ECCS control module) harness terminal No. 11.

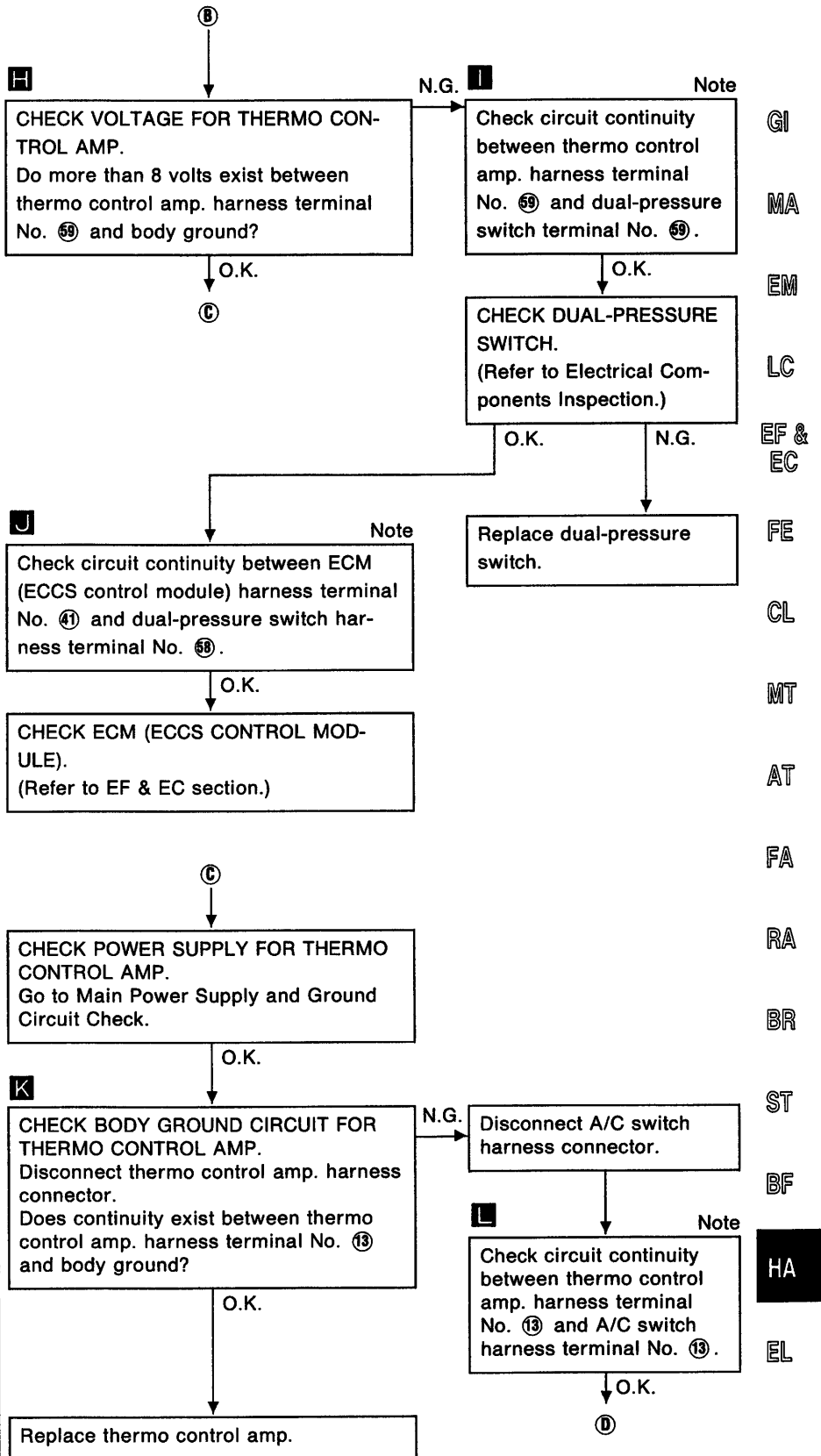
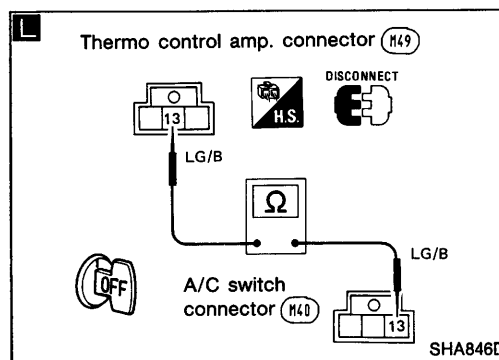
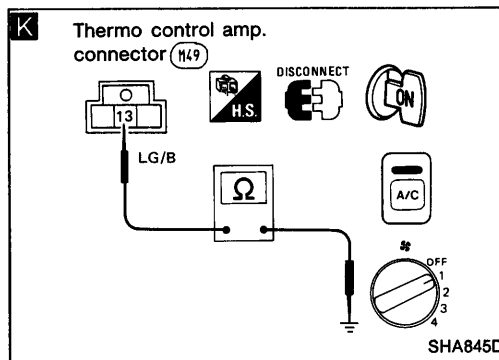
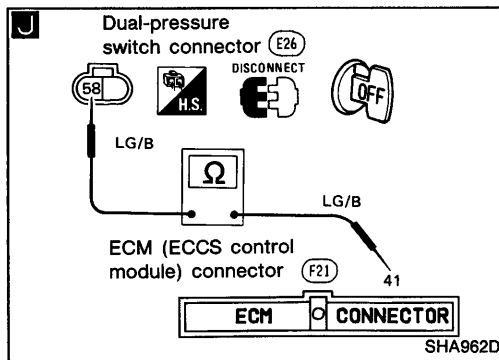
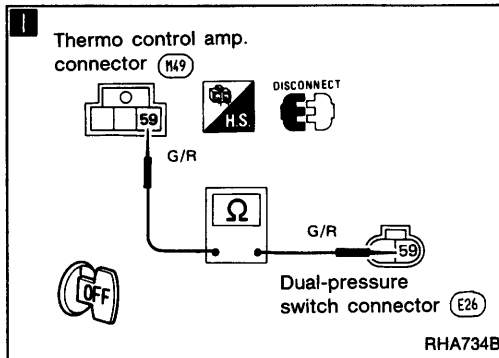
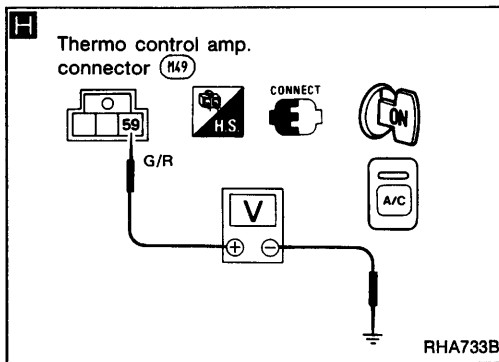
B

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES

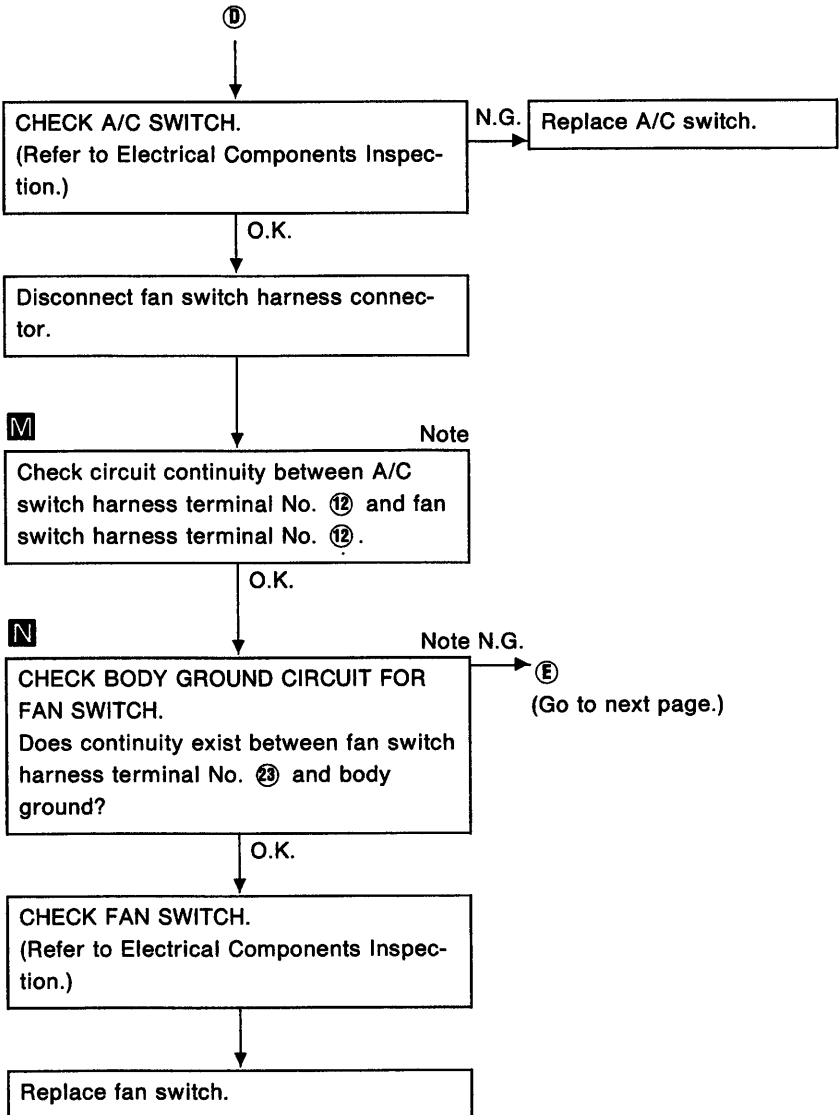
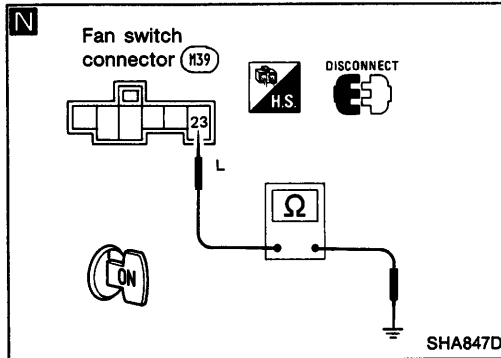
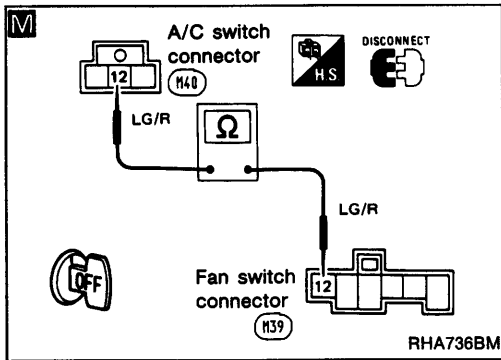
Diagnostic Procedure 4 (Cont'd)



Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

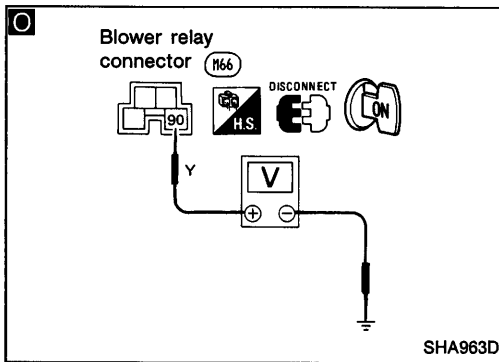
TROUBLE DIAGNOSES

Diagnostic Procedure 4 (Cont'd)



TROUBLE DIAGNOSES

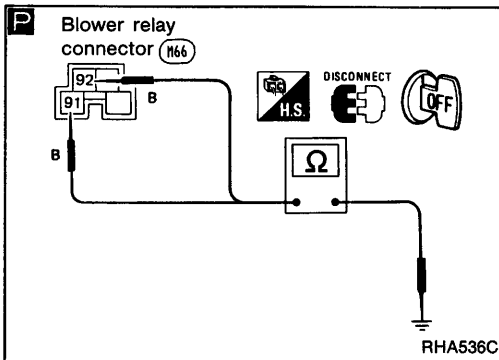
Diagnostic Procedure 4 (Cont'd)



O

CHECK POWER SUPPLY FOR BLOWER RELAY.
Disconnect blower relay harness connector.
Do approx. 12 volts exist between blower relay harness terminal No. ⑩ and body ground?

N.G. Check 10A fuse at fuse block.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)



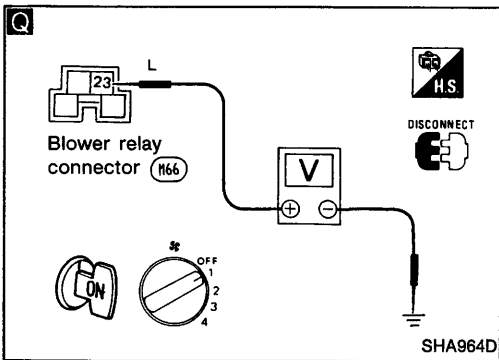
P

Check circuit continuity between blower relay harness terminal No. ①, ② and body ground.

Note

O.K.

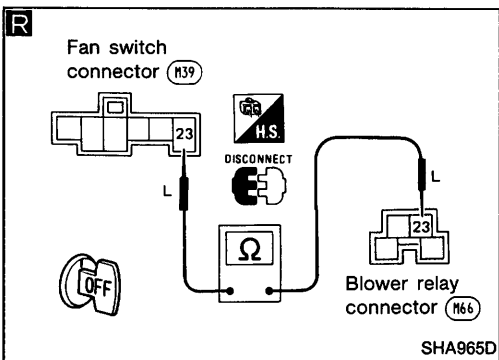
Reconnect fan switch harness connector.



Q

CHECK FAN SWITCH CIRCUIT BETWEEN FAN SWITCH AND BLOWER RELAY.
Do approx. 12 volts exist between blower relay harness terminal No. ②③ and body ground?

N.G. Disconnect fan switch harness connector.



O.K.

CHECK BLOWER RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

R

Note

Check circuit continuity between fan switch harness terminal No. ②③ and blower relay harness terminal No. ②③.

N.G.

Replace blower relay.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

From illumination system

PUSH CONTROL UNIT

IGNITION SWITCH ACC or ON

FUSE 10A

FAN SWITCH

VENT

B/L

FOOT

F/O

DEF

REC

A/C

RHA014C

SYMPTOM: Illumination or indicators of push control unit do not come on.

- Turn ignition switch and lighting switch ON.

- Turn A/C, REC and fan switches ON.
- Push VENT, B/L, FOOT, F/D and DEF switches in order.
- Check for incidents and follow the repairing methods as shown:

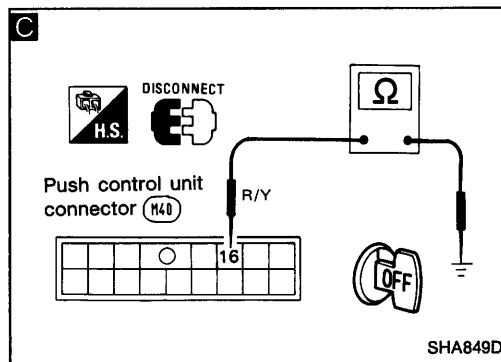
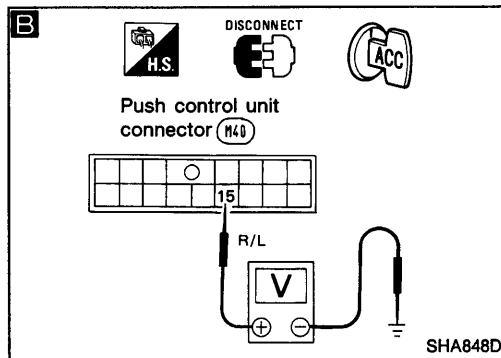
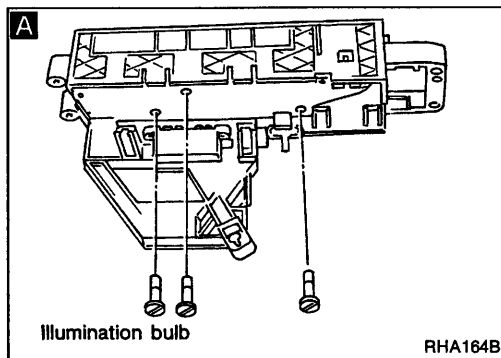
INCIDENTS								"How to repair"
ILL.	VENT	B/L	FOOT	F/D	DEF	REC	A/C	
×	○	○	○	○	○	○	—	Go to DIAGNOSTIC PROCEDURE 5-1.
—	○	○	○	○	○	○	×	Go to DIAGNOSTIC PROCEDURE 5-2.
○	×	×	×	×	×	×	—	Go to DIAGNOSTIC PROCEDURE 5-3.
—	△						—	Replace control amp. built-in push control unit.
○	×	×	×	×	×	×	○	Replace control amp. built-in push control unit.
—	×	×	×	×	×	×	○	Go to DIAGNOSTIC PROCEDURE 5-4.

△: Some indicators for VENT, B/L, FOOT, F/D, DEF or REC come on.

TROUBLE DIAGNOSES

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-1



CHECK THE OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM. Do the other illumination come on with ignition switch and lighting switch ON?

N.G.

CHECK ILLUMINATION SYSTEM. Refer to illumination/ Wiring Diagram in EL section.

O.K.

Turn ignition switch and lighting switch OFF.

CHECK ILLUMINATION BULB. Remove push control unit and disconnect harness connectors. Remove illumination bulb(s) and check them.

N.G.

Replace illumination bulb(s).

O.K.

CHECK POWER SUPPLY FOR ILLUMINATION WITH LIGHTING SWITCH ON. Do approx. 12 volts exist between push control unit harness terminal No. 15 and body ground?

N.G.

CHECK POWER SUPPLY FOR A/C ILLUMINATION SYSTEM. Refer to illumination/ Wiring Diagram in EL section.

O.K.

CHECK BODY GROUND CIRCUIT FOR ILLUMINATION. Does continuity exist between push control unit harness terminal No. 16 and body ground?

Note

O.K.

Replace control amp. built-in push control unit.

DIAGNOSTIC PROCEDURE 5-2

CHECK MAGNET CLUTCH OPERATION. Does magnet clutch operate normally when engine ON, A/C switch, fan switch are ON?

N.G.

Go to Diagnostic Procedure 4.

O.K.

Replace control amp. built-in push control unit.

Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

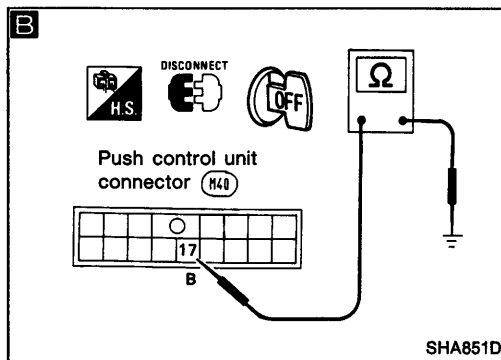
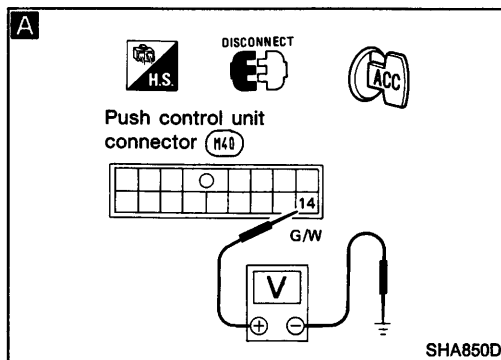
HA

EL

TROUBLE DIAGNOSES

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-3



Turn ignition switch and lighting switch OFF.

Disconnect push control unit harness connector.

A CHECK POWER SUPPLY FOR PUSH CONTROL UNIT.
Do approx. 12 volts exist between push control unit harness terminal No. ⑭ and body ground?

N.G. Check 10A fuse at fuse block.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

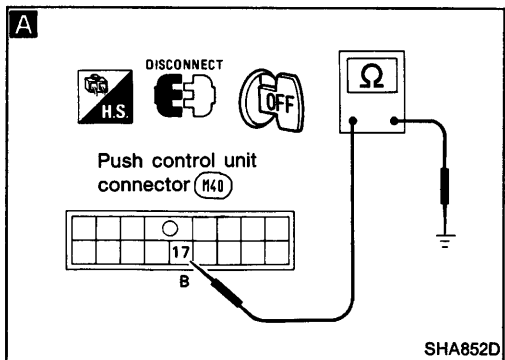
O.K.

B CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.
Does continuity exist between push control unit harness terminal No. ⑰ and body ground?

Note

O.K.

Replace control amp. built-in push control unit.



DIAGNOSTIC PROCEDURE 5-4

Turn ignition switch and lighting switch OFF.

Disconnect push control unit harness connector.

A CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.
Does continuity exist between push control unit harness terminal No. ⑰ and body ground?

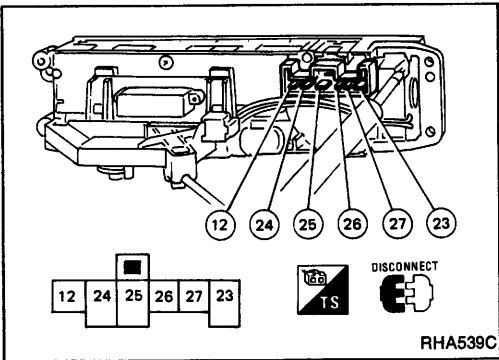
Note

O.K.

Replace control amp. built-in push control unit.

Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.



Electrical Components Inspection

FAN SWITCH

Check continuity between terminals at each switch position.

TERMINAL	LEVER POSITION				
	OFF	1	2	3	4
24					○
25				○	
26			○		
27		○			
23		○	○	○	○
12		○	○	○	○

GI

MA

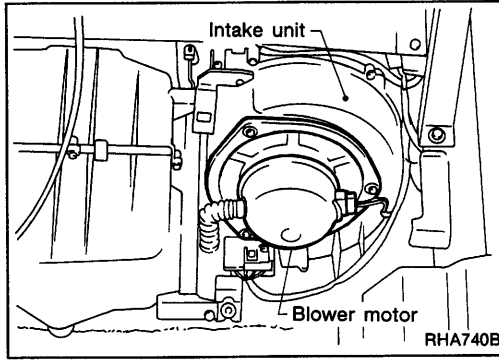
EM

LC

EF &
EC

FE

CL



BLOWER MOTOR

Confirm smooth rotation of the blower motor.

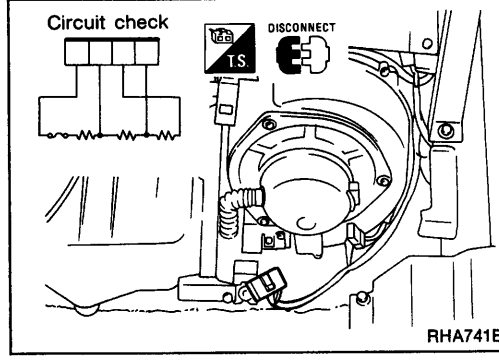
- Ensure that there are no foreign particles inside the intake unit.

MT

AT

FA

RA



BLOWER RESISTOR

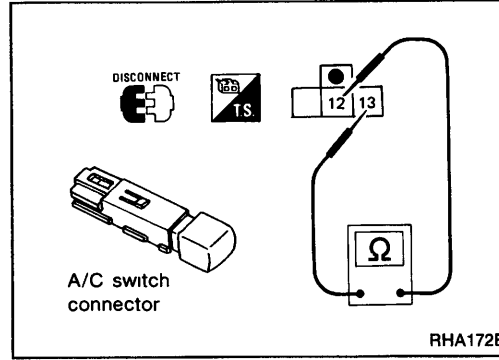
Check continuity between terminals.

BR

ST

BF

HA



A/C SWITCH

Check continuity between terminals at each switch position.

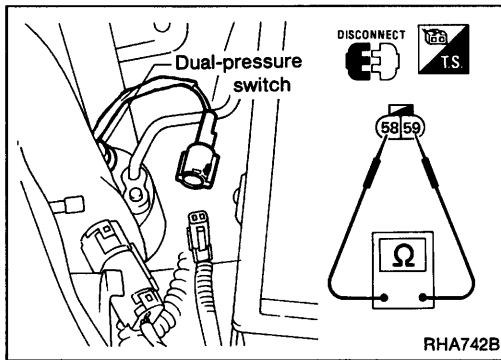
Switch condition		Terminal No.		Continuity
A/C	DEF	⊕	⊖	
ON	ON	⑬	⑫	Yes
ON	OFF			
OFF	ON			

EL

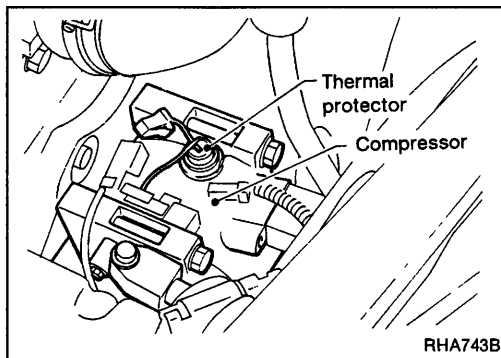
TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

DUAL-PRESSURE SWITCH

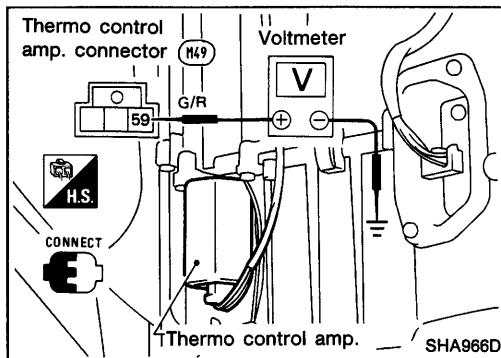


High-pressure side line pressure kPa (kg/cm ² , psi)	Operation	Continuity
Decreasing to 177 - 216 (1.8 - 2.2, 26 - 31) Increasing to 2,452 - 2,844 (25 - 29, 356 - 412)	Turn OFF	Does not exist
Increasing to 177 - 235 (1.8 - 2.4, 26 - 34) Decreasing to 1,863 - 2,354 (19 - 24, 270 - 341)	Turn ON	Exists



THERMAL PROTECTOR

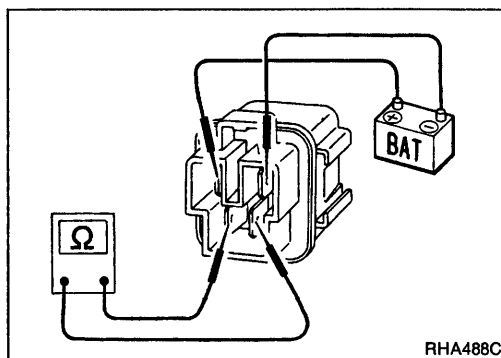
Temperature of compressor °C (°F)	Operation
Increasing to approx. 135 - 145 (275 - 293)	Turn OFF
Decreasing to approx. 120 - 130 (248 - 266)	Turn ON



THERMO CONTROL AMP.

1. Run engine, and operate A/C system.
2. Connect the voltmeter from harness side.
3. Check thermo control amp. operation shown in the table.

Evaporator outlet air temperature °C (°F)	Thermo amp. operation	Tester
Decreasing to 2.5 - 3.5 (37 - 38)	Turn OFF	Approx. 12V
Increasing to 4.0 - 5.0 (39 - 41)	Turn ON	Approx. 0V



A/C RELAY AND BLOWER MOTOR RELAY

Check circuit continuity between terminals by supplying 12 volts to coil side terminal of A/C relay.

DOOR CONTROL

Control Linkage Adjustment

MODE DOOR

1. Move side link with hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to body harness.
3. Turn ignition switch to ACC.
4. Turn VENT switch ON.
5. Attach mode door motor rod to side link rod holder.
6. Turn DEF switch ON. Check that side link operates at the fully-open position. Also turn VENT switch ON to check that side link operates at the fully-open position.

GI

MA

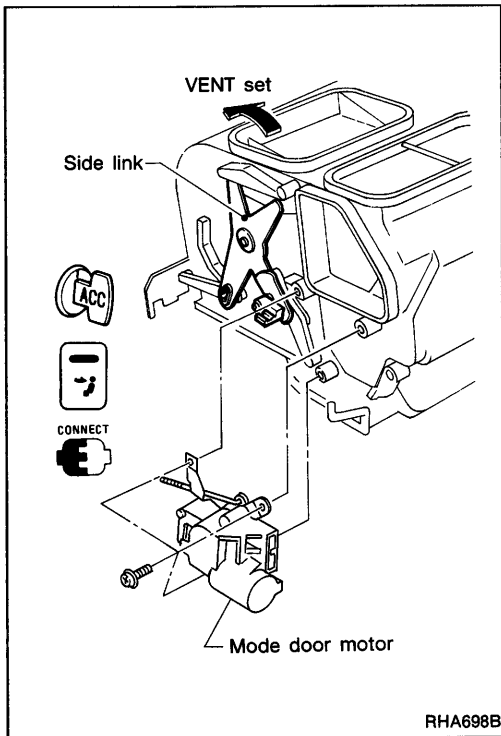
EM

LC

EF &
EC

FE

CL



TEMPERATURE CONTROL CABLE

- Move the temperature control lever to the full hot position. Set the air mix door lever in the full hot position. Pull on the outer cable in the direction of the arrow and then clamp it.

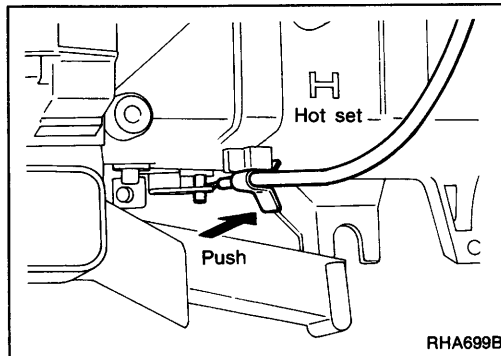
After positioning control cable, check it operates properly.

MT

AT

FA

RA



INTAKE DOOR

1. Connect the intake door motor harness connector before installing to the intake door motor.
2. Turn ignition switch to ACC.
3. Turn REC switch OFF.
4. Install intake door motor on intake unit.
5. Install intake door lever.
6. Set intake door rod in Fresh position and fasten door rod to holder on intake door lever.
7. Check that intake door operates properly when REC switch is turned ON and OFF.

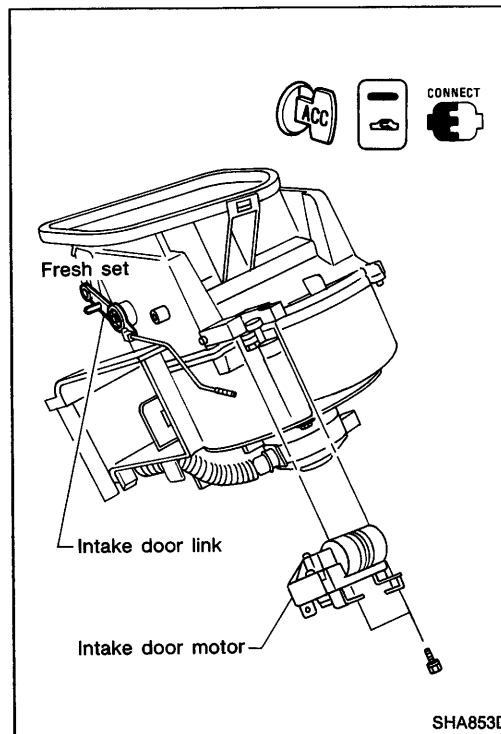
BR

ST

BF

HA

EL

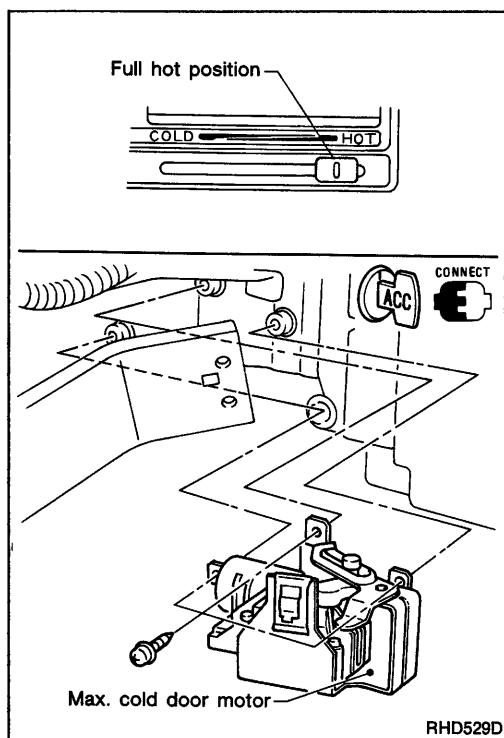


DOOR CONTROL

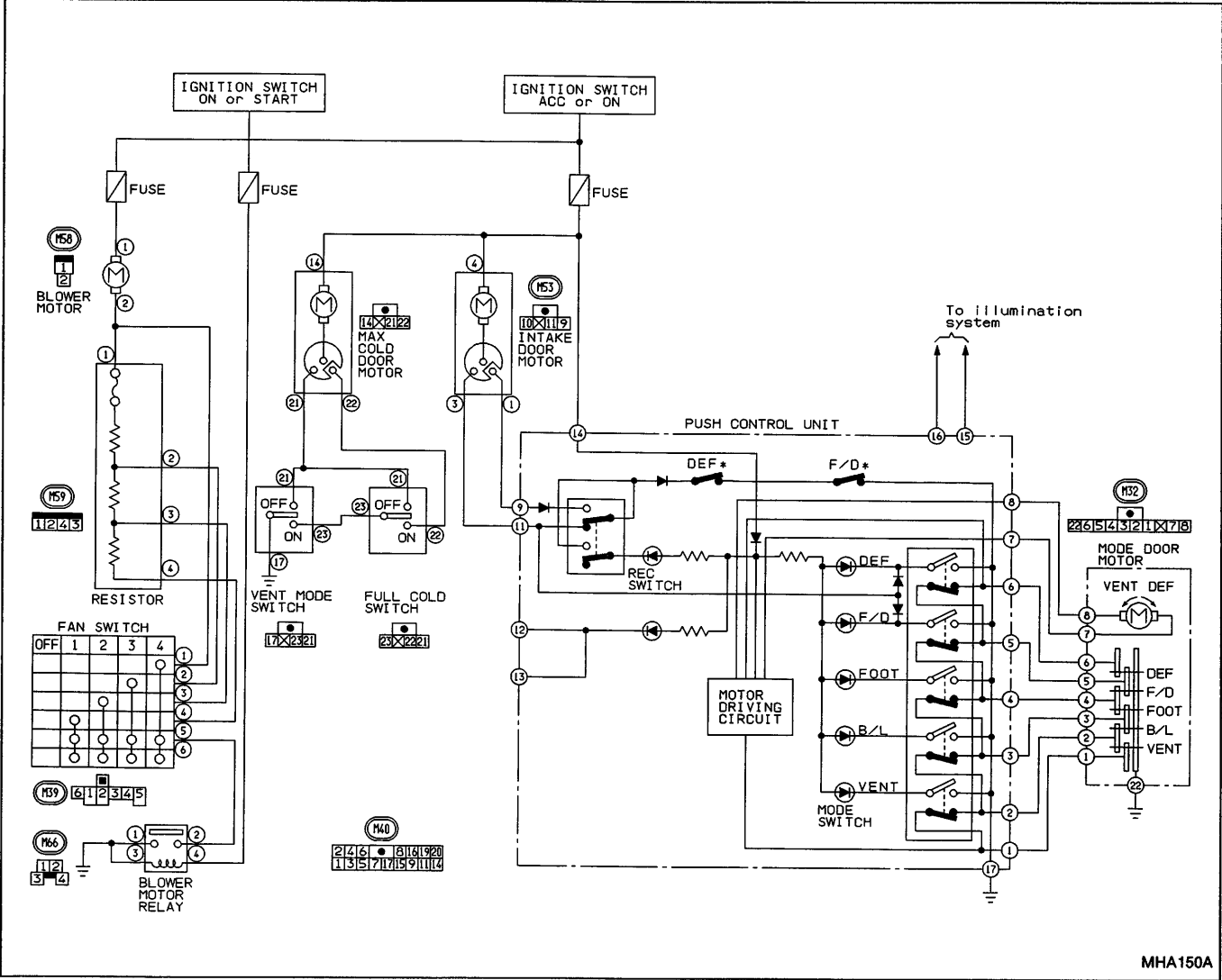
Control Linkage Adjustment (Cont'd)

MAX. COLD DOOR

1. Connect max. cold door motor harness connector before installing max. cold door motor.
2. Turn ignition switch to ACC.
3. Turn DEF switch ON.
4. Set temperature control lever to full hot position.
5. Install max. cold door motor on heater unit.
6. Attach max. cold door lever to rod holder.
7. Check that max. cold door operates properly when mode switch is turned to VENT and DEF.



Push Control System



MHA150A

This push control system operates the intake and mode door motors to activate their corresponding doors.

Switches and their control functions

Switch	Indicator illuminates							Air outlet	Intake air	Compressor
	A/C									
A/C	○								—	ON*1
Mode		○							—	—
			○						—	—
				○					—	—
					○				FRE	—
						○			FRE	ON*1
							○*2		REC*2	—

*1: Compressor is operated by thermo control amp.

*2: Depending on mode switch position

When the REC switch is ON (OFF), the ground line of the intake door motor is switched from terminal ⑪ to ⑨ (⑨ to ⑪). This causes the motor to start because the position switch contacts built into it are set to the current flow position. The contacts turn along with the motor. When they reach the non-current flow position, the motor will stop. The motor always turns in the same direction.

Mode door motor

22 6 5 4 3 2 1 X 7 8

*: Current flows as indicated by the arrow, motor actuates as indicated by the words.

To push control

1 VENT
2 B/L
3 FOOT
4 F/D
5 DEF
6 DEF
7 DEF
8 VENT

22

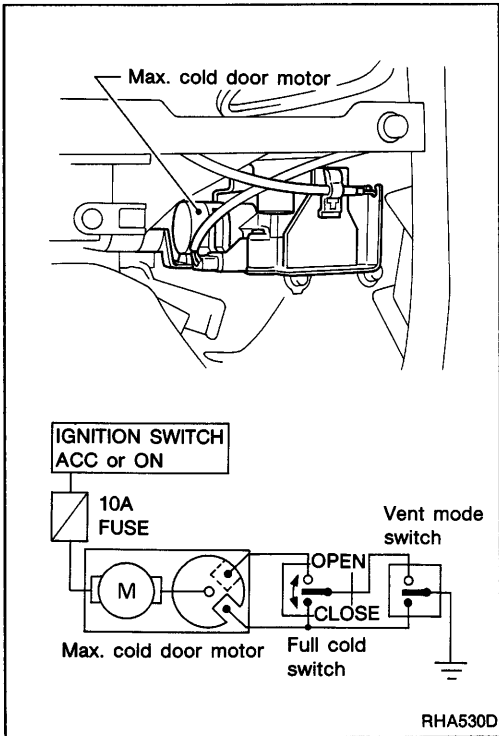
⊖

⊕

⊖

⊕

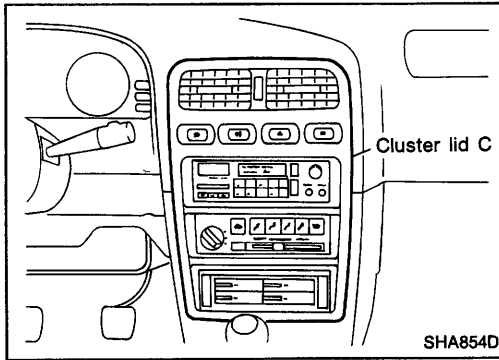
Terminal No.		Mode door motor	
⑦	⑧	Mode door operation	Direction of linkage rotation
—	—	Stop	Stop
⊖	⊕	VENT → DEF	Clockwise
⊕	⊖	DEF → VENT	Counter-clockwise



Max. Cold Door Motor

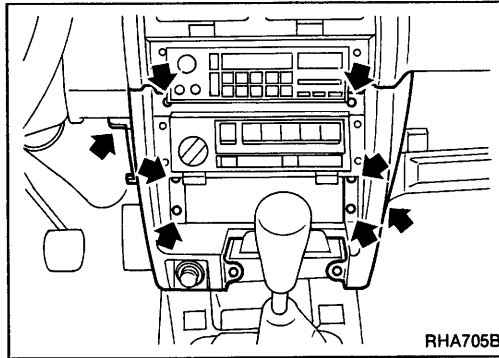
Max. cold door system is set to operate during FULL COOL mode. When the temp. control lever is moved to FULL COOL position and mode switch is turned to VENT position, both vent mode switch and full cold are turned ON. Therefore, max. cold relay coil is energized and the relay switch is turned ON for OPEN side, and the max. cold door motor starts to rotate to open the door. The door is kept closed unless this operation is performed.

Vent mode switch operation	Max. cold switch operation	Max. cold door operation
ON	ON	OPEN
ON	OFF	CLOSE
OFF	ON	
OFF	OFF	

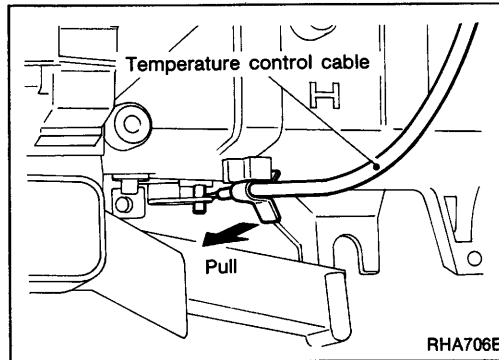


Removal and Installation

1. Remove cluster lid C.
2. Remove driver's side lower panel.
3. Remove glove box.



4. Remove the 8 bracket screws.



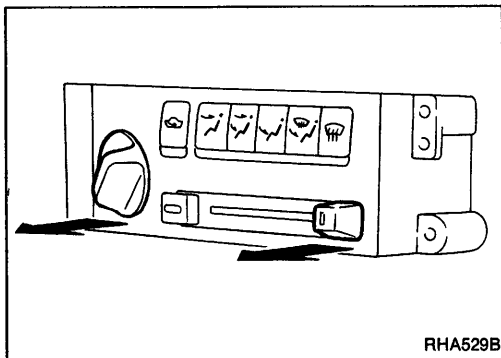
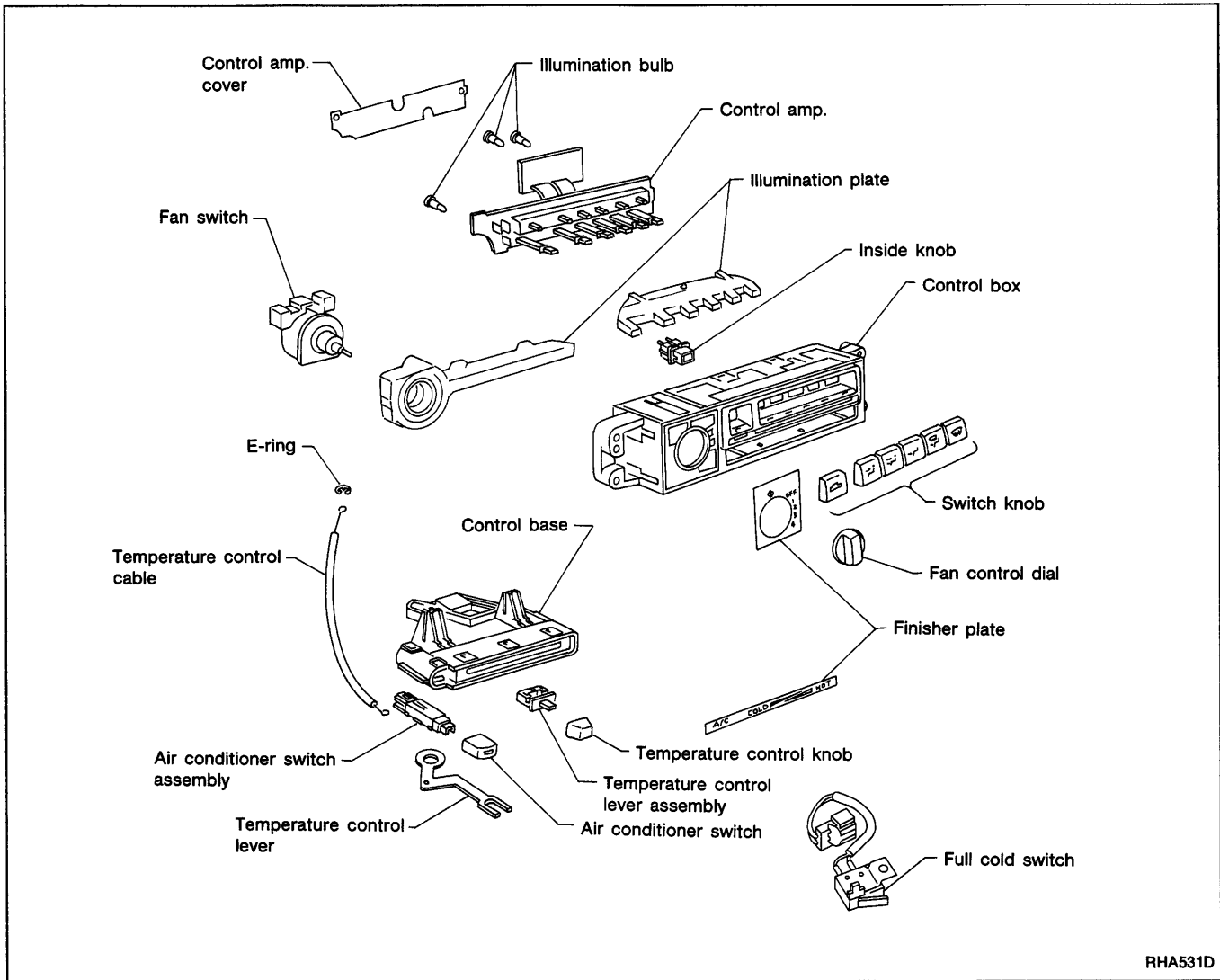
5. Disconnect temperature control cable at heater unit side.

SYSTEM DESCRIPTION — Push Control

Removal and Installation (Cont'd)

6. Disconnect push control unit harness connectors.
7. Remove bracket with push control unit.
8. Remove push control unit.
9. Installation is in the reverse order of removal.

Refer to "Control Cable and Rod Adjustment" in "DOOR CONTROL" for temperature control cable.



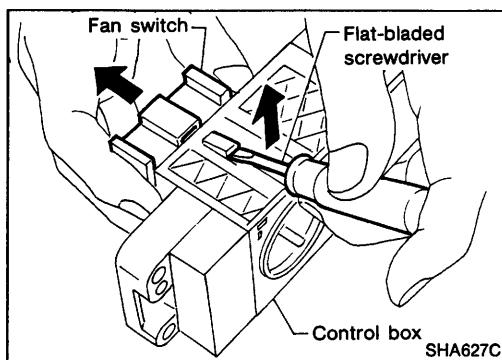
Disassembly

1. Remove temperature control knob & fan control dial.

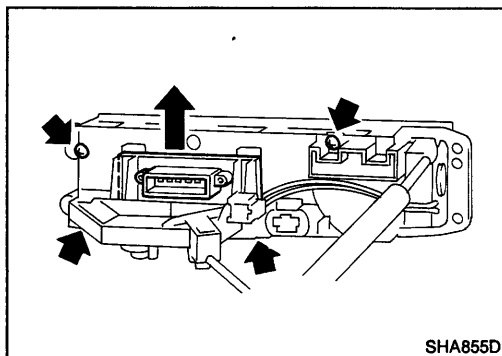
Wrap temperature knob & fan control dial with a cloth and pull in direction indicated by arrow as shown in figure at left. Be careful not to scratch knobs during removal.

SYSTEM DESCRIPTION — Push Control

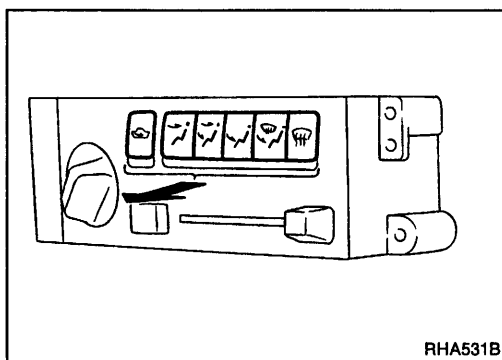
Disassembly (Cont'd)



2. Remove fan switch.

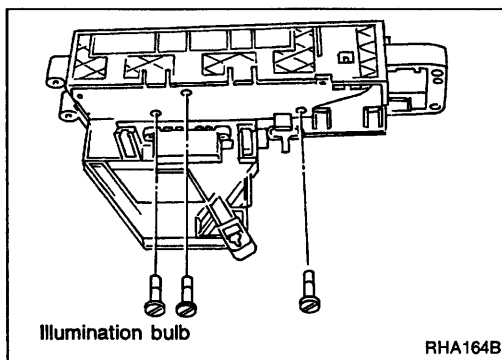


3. Remove control base & control amp. cover.



4. Remove control knobs.

Wrap finisher with a cloth and remove knobs using flat-bladed screwdriver or similar tool. Be careful not to scratch finisher surface.



5. Remove illumination bulbs.

6. Remove control amp.

Be careful not to damage substrate when removing.

7. Remove illumination plate.

8. Remove finisher plate.

9. Disconnect temperature control cable.

10. Assembly is in reverse order of disassembly.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

COMPRESSOR

Model	ATSUGI make NVR 140S
Type	Vane rotary
Displacement cm^3 (cu in)/Rev.	140 (8.54)
Direction of rotation	Clockwise (Viewed from drive end)
Drive belt	Poly V

LUBRICATION OIL

Model	ATSUGI make NVR 140S
Type	SUNISO 5GS
Capacity $\text{m}\ell$ (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)
Compressor (Service parts) charging amount	200 (6.8, 7.0)

REFRIGERANT

Type	R-12
Capacity kg (lb)	0.7 - 0.8 (1.5 - 1.8)

Inspection and Adjustment

ENGINE IDLING SPEED (When A/C is ON.)

- Refer to EF & EC section.

BELT TENSION

- Refer to Checking Drive Belts (MA section).

COMPRESSOR

Model	NVR 140S
Clutch disc-pulley clearance mm (in)	0.3 - 0.6 (0.012 - 0.024)

ELECTRICAL SYSTEM

SECTION **EL**

When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".

CONTENTS

HARNESS CONNECTOR	3	EXTERIOR LAMP	26
Description	3	Clearance, License, Tail and Stop	
STANDARDIZED RELAY	4	Lamps/Wiring Diagram.....	26
Description	4	Back-up Lamp/Wiring Diagram	27
POWER SUPPLY ROUTING	6	Front Fog Lamp/Wiring Diagram	27
Wiring Diagram	6	Turn Signal and Hazard Warning	
Fuse	8	Lamps/Wiring Diagram.....	28
Fusible Link.....	8	Combination Flasher Unit Check	29
BATTERY	9	Bulb Specifications	29
How to Handle Battery.....	9	INTERIOR LAMP	30
Service Data and Specifications (S.D.S.).....	12	Illumination/Wiring Diagram	30
STARTING SYSTEM	13	Interior, Spot and Trunk Room Lamps/Wiring	
Wiring Diagram	13	Diagram	31
Construction	15	METER AND GAUGES	32
Removal and Installation.....	16	Combination Meter	32
Service Data and Specifications (S.D.S.).....	16	Tachometer, Temp., Oil and Fuel	
CHARGING SYSTEM	17	Gauges/Wiring Diagram	33
Construction	17	Inspection/Fuel Gauge, Water Temperature	
Wiring Diagram	18	Gauge and Oil Pressure Gauge.....	34
Service Data and Specifications (S.D.S.).....	18	Fuel Tank Gauge Unit Check	35
COMBINATION SWITCH	19	Fuel Warning Lamp Sensor Check	35
Combination Switch/Check.....	19	Thermal Transmitter Check.....	35
Replacement	20	Oil Pressure Switch Check.....	36
HEADLAMP — Without Daytime Light System —	21	Speedometer Cable Removal and Installation.....	36
Wiring Diagram	21	Speed Sensor Signal Check.....	36
HEADLAMP — Daytime Light System —	22	WARNING LAMPS AND CHIME	37
Operation.....	22	Warning Lamps/Schematic.....	37
Schematic.....	22	Warning Lamps/Wiring Diagram.....	38
Wiring Diagram	23	Warning Chime/Wiring Diagram	39
HEADLAMP	24	Diode Check.....	40
Bulb Replacement.....	24	Warning Chime Check	40
Aiming Adjustment.....	24		

CONTENTS (Cont'd.)

TIME CONTROL SYSTEM	41	Component Parts and Harness Connector	
Wiring Diagram	41	Location	64
Description	42	Wiring Diagram	65
Trouble Diagnoses	42	Trouble Diagnoses	66
WIPER AND WASHER	52	THEFT WARNING SYSTEM	79
Front Wiper and Washer/Wiring Diagram	52	Component Parts and Harness Connector	
Installation	53	Location	79
Washer Nozzle Adjustment	54	Wiring Diagram	80
Check Valve	54	Trouble Diagnoses	82
Washer Tube Layout.....	54	LOCATION OF ELECTRICAL UNITS	99
HORN, CIGARETTE LIGHTER AND CLOCK	55	Engine Compartment	99
Wiring Diagram	55	Passenger Compartment.....	100
REAR WINDOW DEFOGGER	56	Luggage Compartment	101
Wiring Diagram	56	HARNES LAYOUT	103
Filament Check	57	Outline	103
Filament Repair.....	58	Engine Room Harness	104
AUDIO AND POWER ANTENNA	59	Room Lamp Harness	107
Audio/Wiring Diagram	59	Main Harness	108
Power Antenna/Wiring Diagram	60	Main Harness, Tail Harness and Tail Harness	
Location of Antenna.....	61	No. 2	111
Radio Fuse Check.....	61	E.F.I. Harness and Alternator Harness.....	112
Antenna Rod Replacement.....	62	Engine Harness.....	113
Window Antenna Repair	63	Door Harness (L.H. side)	114
AUTOMATIC SPEED CONTROL DEVICE		Door harness (R.H. side)	115
(A.S.C.D.)	64	SUPER MULTIPLE JUNCTION (S.M.J.)	117
		Terminal Arrangement	118

WIRING DIAGRAM REFERENCE CHART

ECCS (Ignition system)	FOLDOUT PAGE
AUTOMATIC TRANSAXLE CONTROL SYSTEM, SHIFT LOCK SYSTEM	AT SECTION
ANTI-LOCK BRAKING SYSTEM	BR SECTION
FUEL FILLER LID OPENER, TRUNK LID OPENER, POWER WINDOW AND POWER DOOR LOCK,	
2-POINT MOTORIZED SEAT BELT SYSTEM, POWER SEAT, SUN ROOF, DOOR MIRROR	BF SECTION
HEATER AND AIR CONDITIONER	HA SECTION

Description

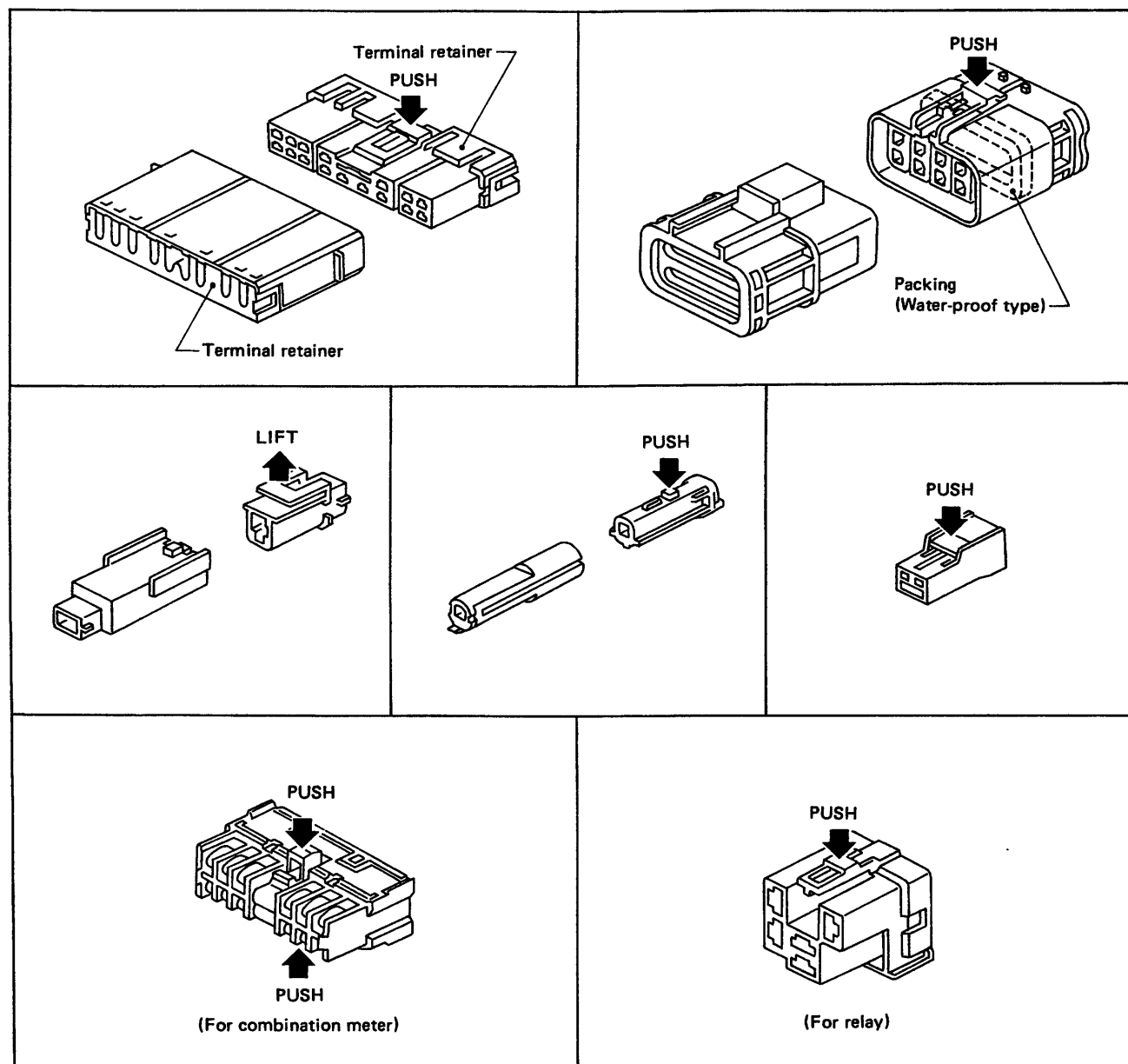
HARNESS CONNECTOR

- 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]



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

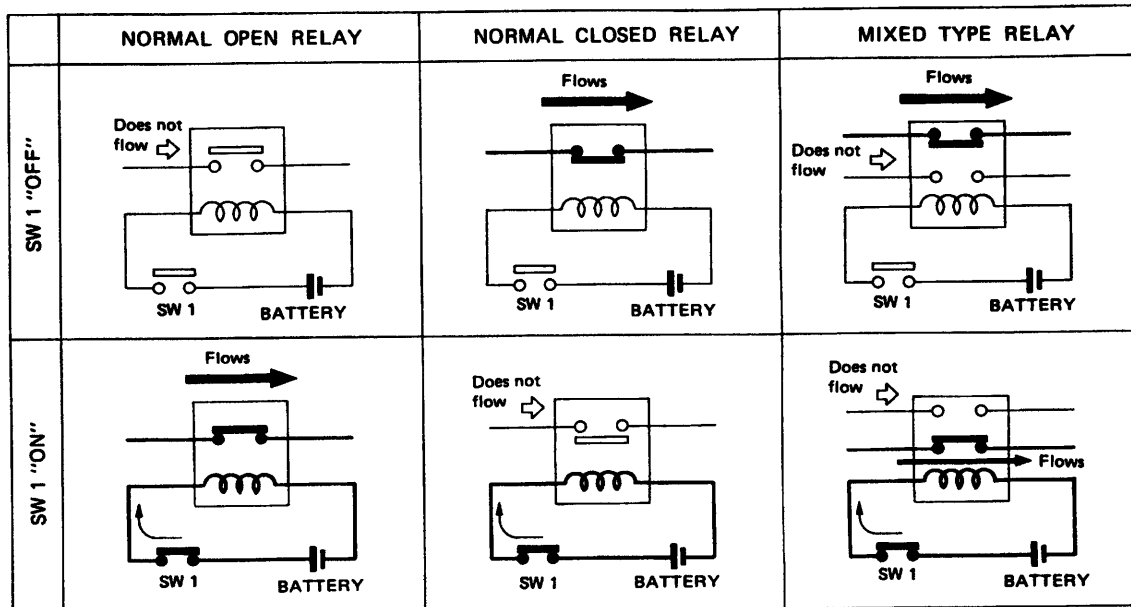
EL

STANDARDIZED RELAY

Description

NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

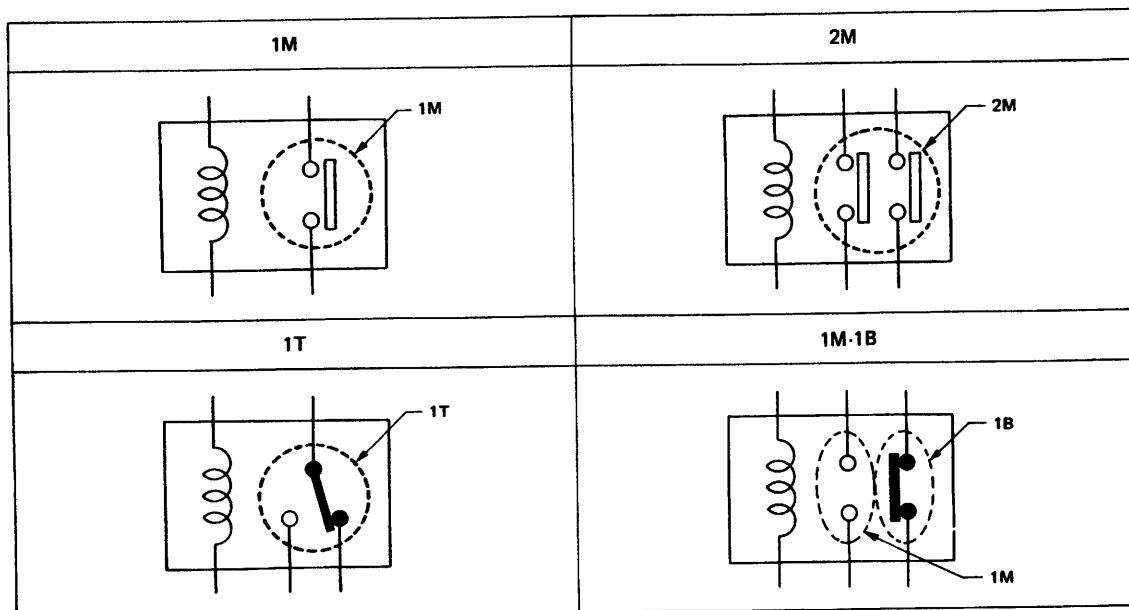
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



SEL881H

TYPE OF STANDARDIZED RELAYS

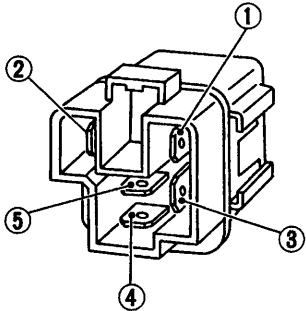
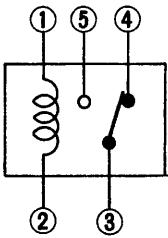
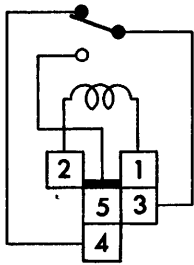
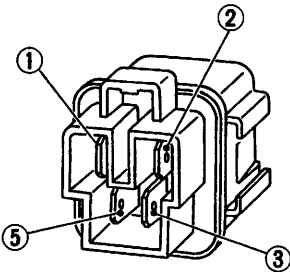
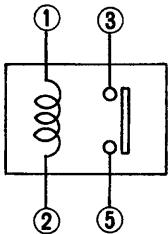
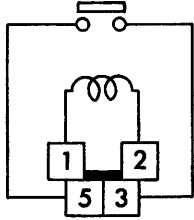
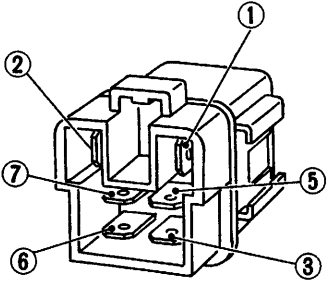
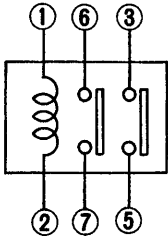
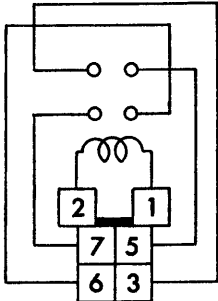
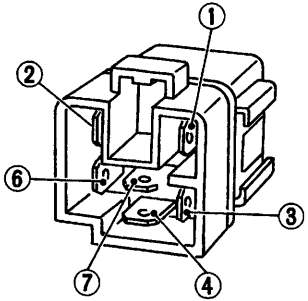
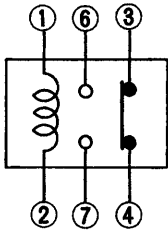
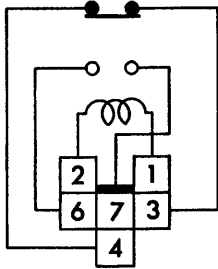
1M 1 Make 2M 2 Make
 1T 1 Transfer 1M-1B 1 Make 1 Break



SEL882H

STANDARDIZED RELAY

Description (Cont'd)

Type	Outer view	Circuit	Connector symbol and connection	Case color
1T				BLACK
1M				BLUE or GREEN
2M				BROWN
1M-1B				GRAY

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

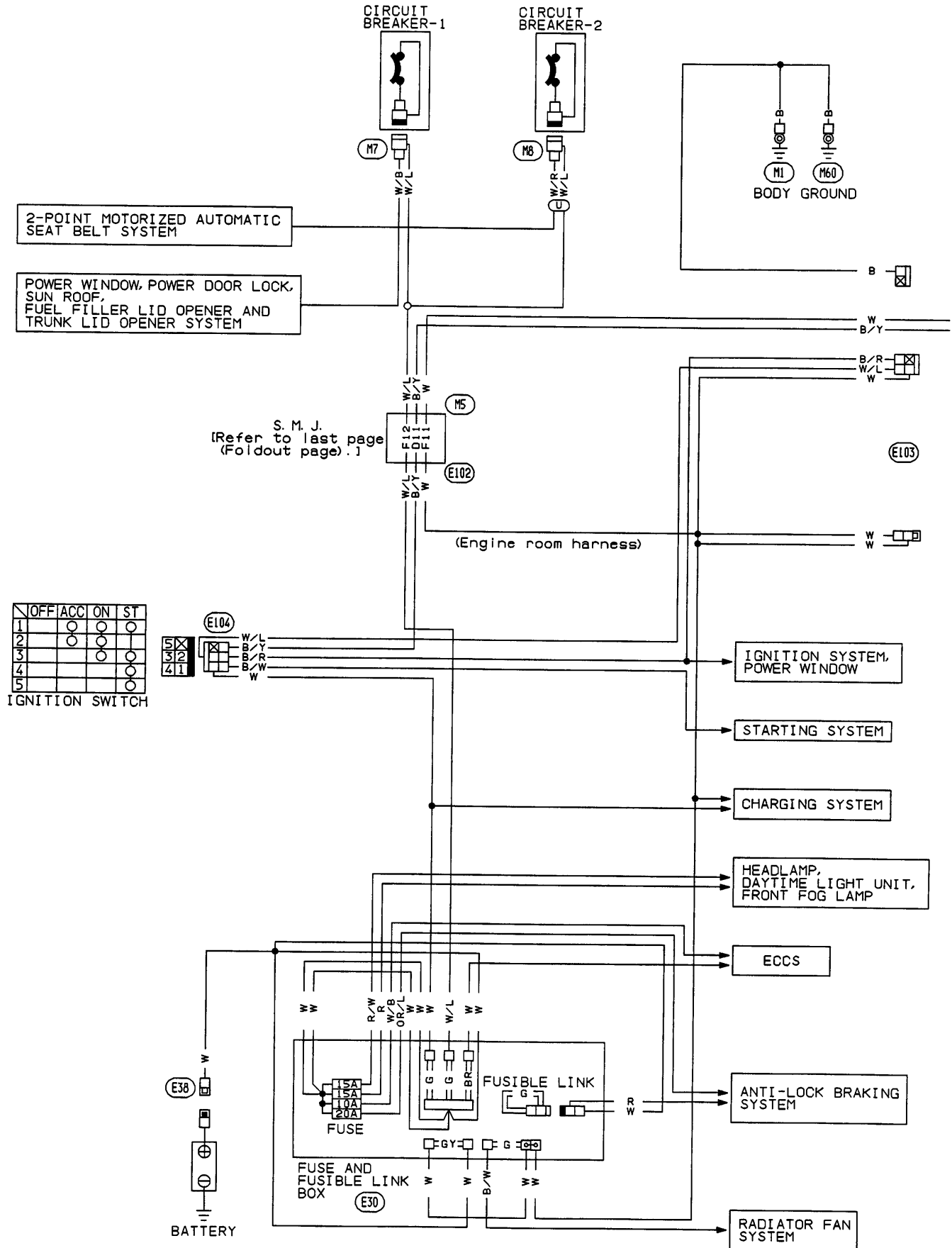
ST

BF

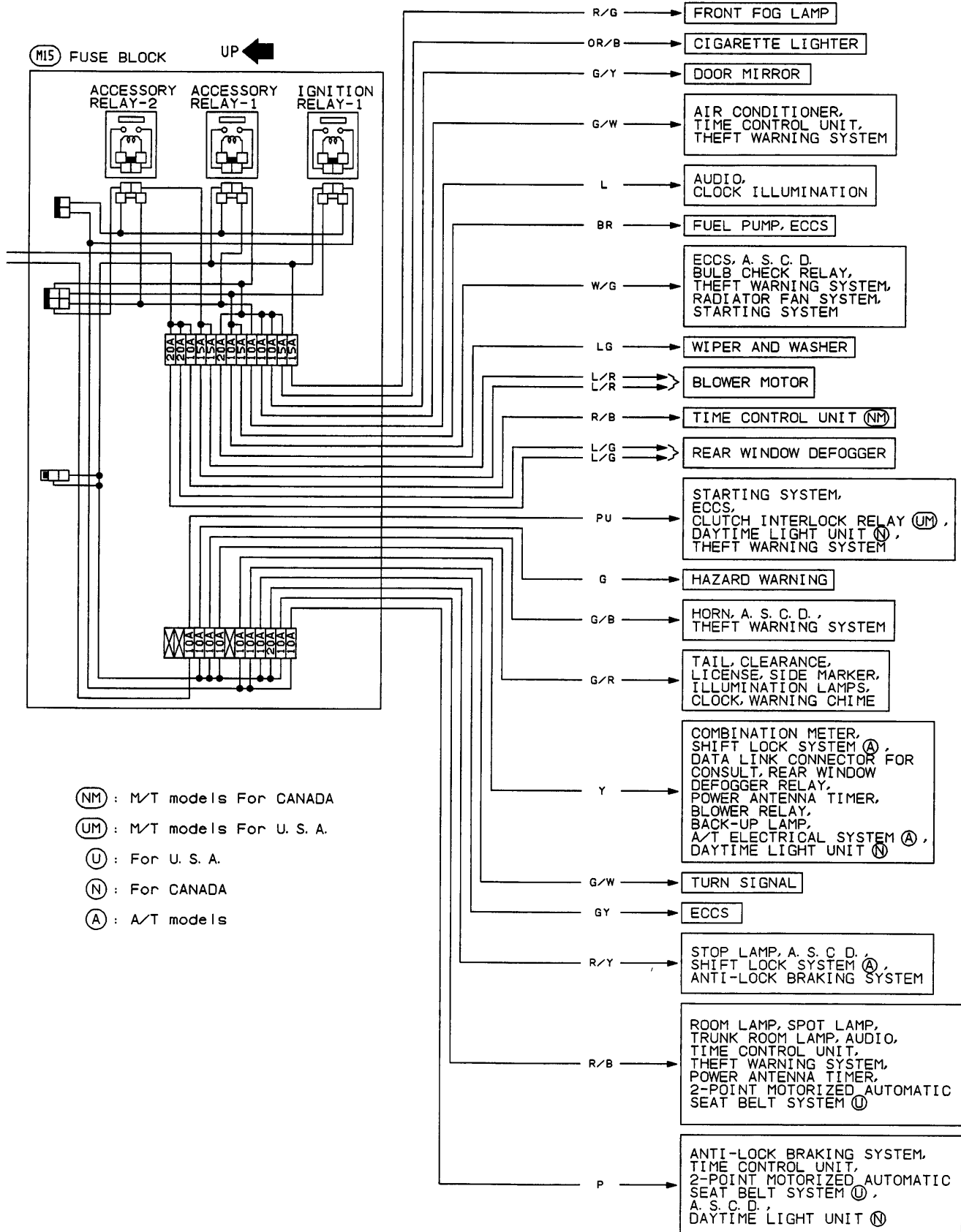
HA

EL

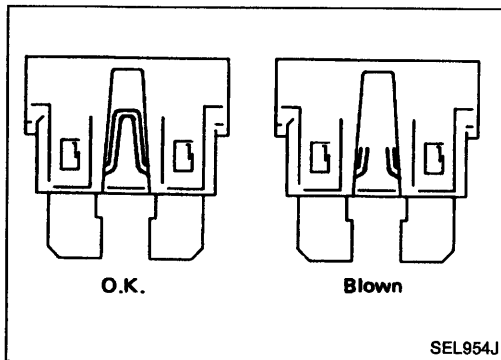
Wiring Diagram



POWER SUPPLY ROUTING

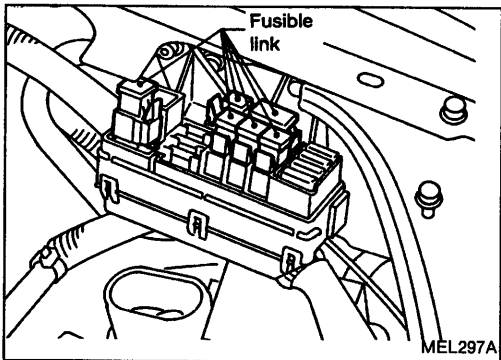


GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL



Fuse

- If fuse is blown, be sure to eliminate cause of problem before installing new fuse.
- Use fuse of specified rating. Never use fuse of more than specified rating.
- Do not install fuse in oblique direction; always insert it into fuse holder properly.
- Remove fuse for clock if vehicle is not used for a long period of time.



Fusible Link

A melted fusible link can be detected by visual inspection. If its condition is questionable, use circuit tester or test lamp.

CAUTION:

- 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.
- 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.

BATTERY

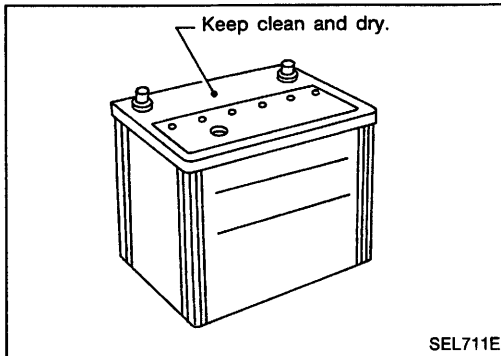
CAUTION:

- If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
- After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
- Never add distilled water through the hole used to check specific gravity.

GI

MA

EM



How to Handle Battery

METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

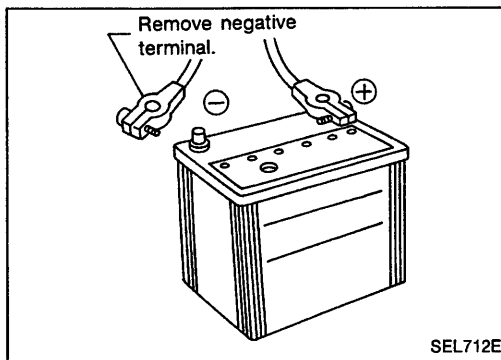
- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level.

LC

EF &
EC

FE

CL



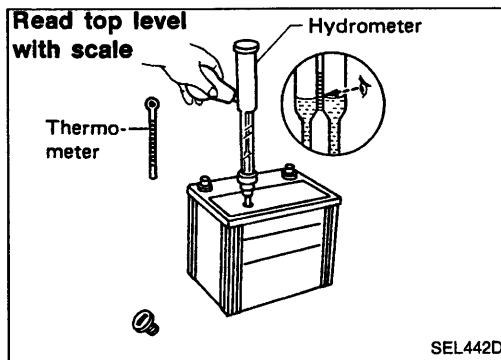
- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal. (If the vehicle has an extended storage switch, turn it off.)

MT

AT

FA

RA



- 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.

BR

ST

BF

HA

EL

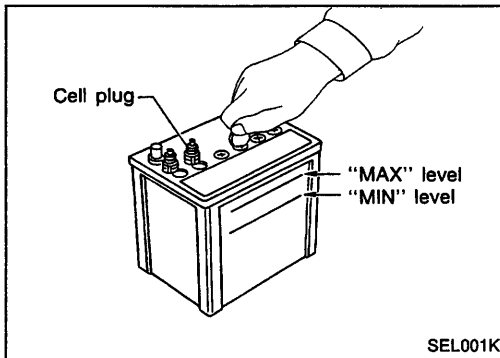
BATTERY

How to Handle Battery (Cont'd)

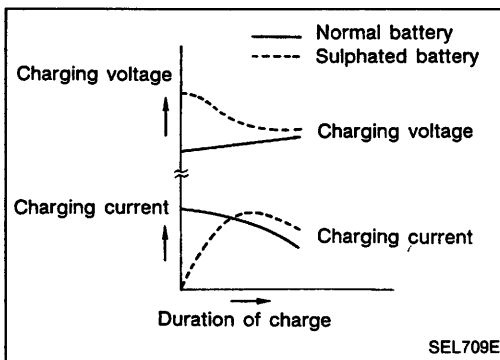
CHECKING ELECTROLYTE LEVEL

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.



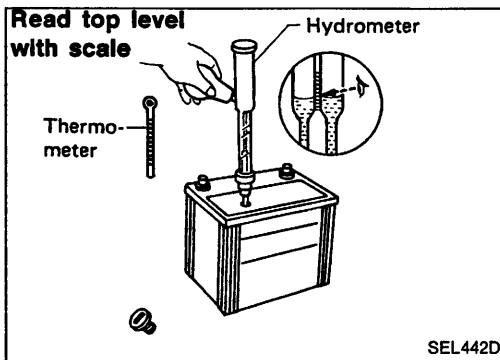
- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



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

Read hydrometer and thermometer indications at eye level.

BATTERY

How to Handle Battery (Cont'd)

- Use the chart below to correct your hydrometer reading according to electrolyte temperature.

Hydrometer temperature correction

Battery electrolyte temperature °C (°F)	Add to specific gravity reading	
71 (160)	0.032	GI
66 (150)	0.028	
60 (140)	0.024	MA
54 (129)	0.020	
49 (120)	0.016	EM
43 (110)	0.012	
38 (100)	0.008	
32 (90)	0.004	LC
27 (80)	0	
21 (70)	-0.004	EF & EC
16 (60)	-0.008	
10 (50)	-0.012	
4 (39)	-0.016	FE
-1 (30)	-0.020	
-7 (20)	-0.024	
-12 (10)	-0.028	CL
-18 (0)	-0.032	
		MT
Corrected specific gravity	Approximate charge condition	
1.260 - 1.280	Fully charged	AT
1.230 - 1.250	3/4 charged	
1.200 - 1.220	1/2 charged	FA
1.170 - 1.190	1/4 charged	
1.140 - 1.160	Almost discharged	
1.110 - 1.130	Completely discharged	RA

CHARGING THE BATTERY

CAUTION:

- Do not "quick charge" a fully discharged battery.
- Keep the battery away from open flame while it is being charged.
- When connecting the charger, connect the leads first, then turn on the charger. Do not turn on the charger first, as this may cause a spark.
- If battery electrolyte temperature rises above 60°C (140°F), stop charging. Always charge battery at a temperature below 60°C (140°F).

Charging rates:

Amps	Time
50	1 hour
25	2 hours
10	5 hours
5	10 hours

BATTERY

How to Handle Battery (Cont'd)

Do not charge at more than 50 ampere rate.

Note: The ammeter reading on your battery charger will automatically decrease as the battery charges. This indicates that the voltage of the battery is increasing normally as the state of charge improves. The charging amps indicated above refer to initial charge rate.

- If, after charging, the specific gravity of any two cells varies more than 0.050, the battery should be replaced.

Service Data and Specifications (S.D.S.)

Applied area		California	Except California
Type		55D23L	80D26L
Capacity	V-AH	12-60	12-65
Cold cranking current (For reference value)	A	356	582

Wiring Diagram

[illegible]

(U) : For U. S. A.
 (C) : For CANADA

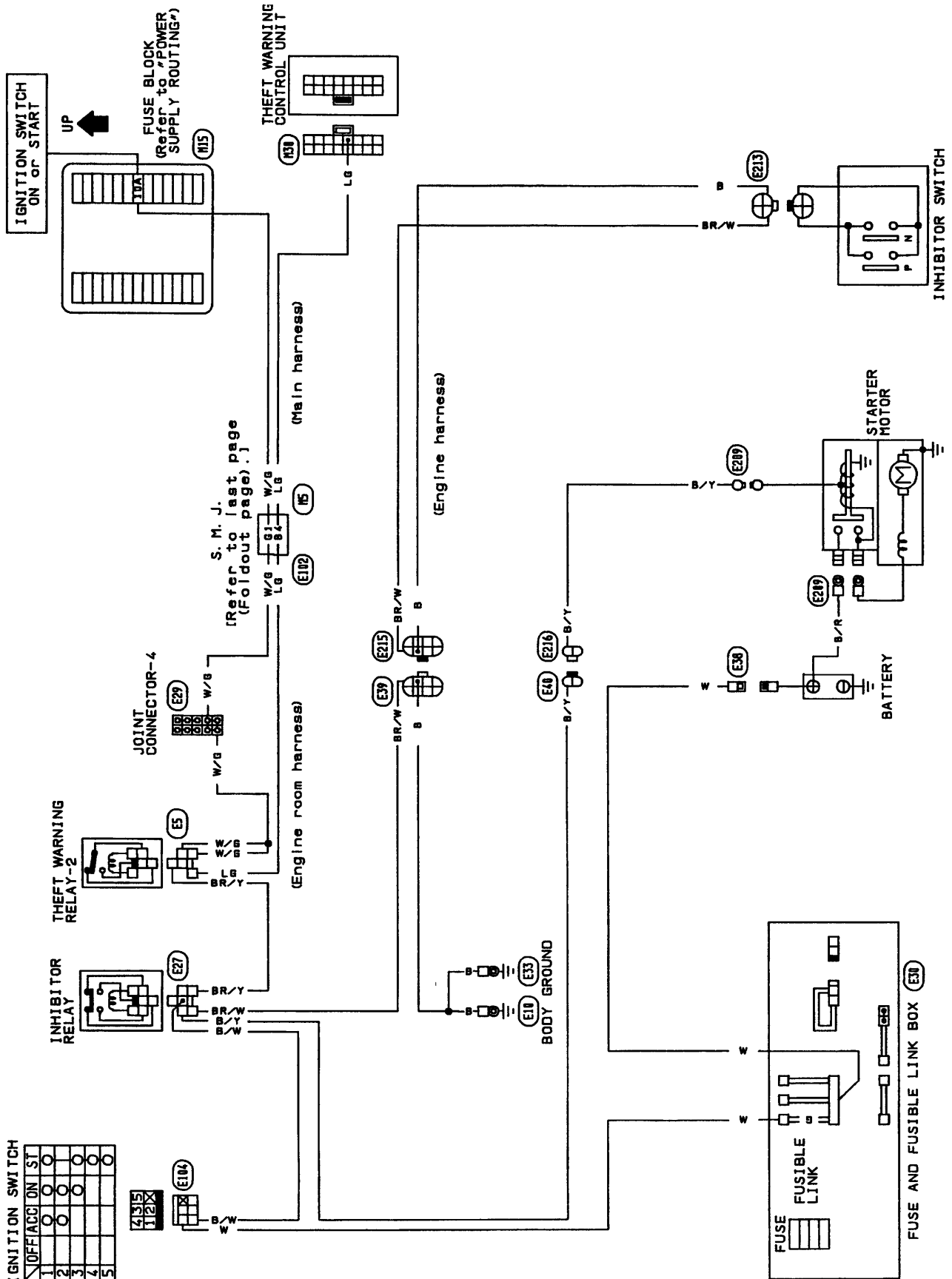
MEL269A

GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

STARTING SYSTEM

Wiring Diagram (Cont'd)

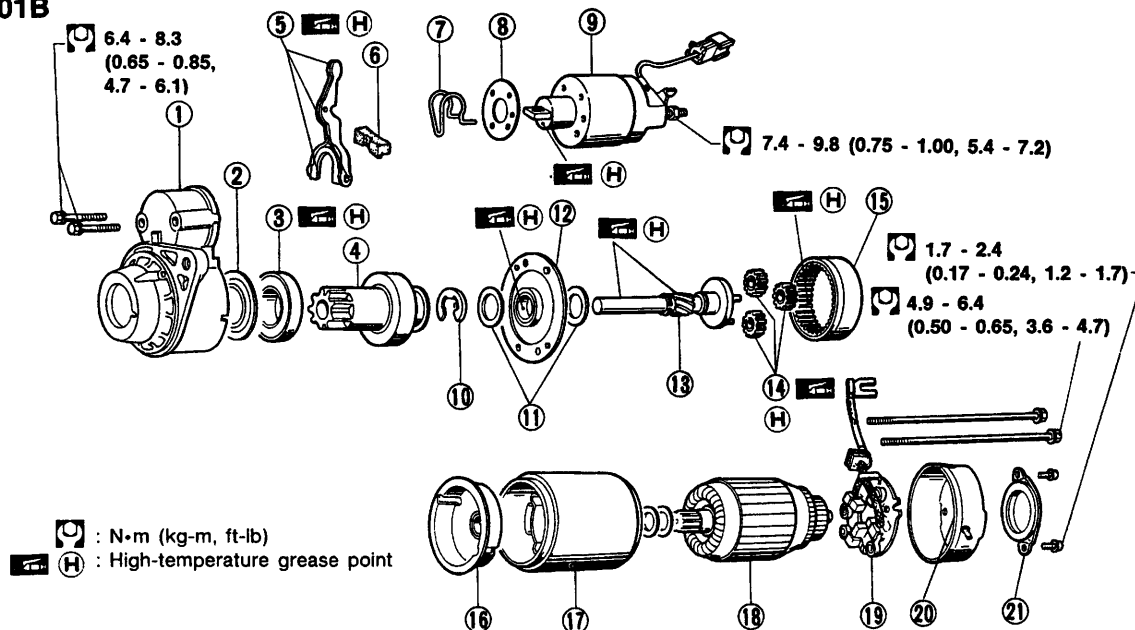
A/T models



STARTING SYSTEM

Construction

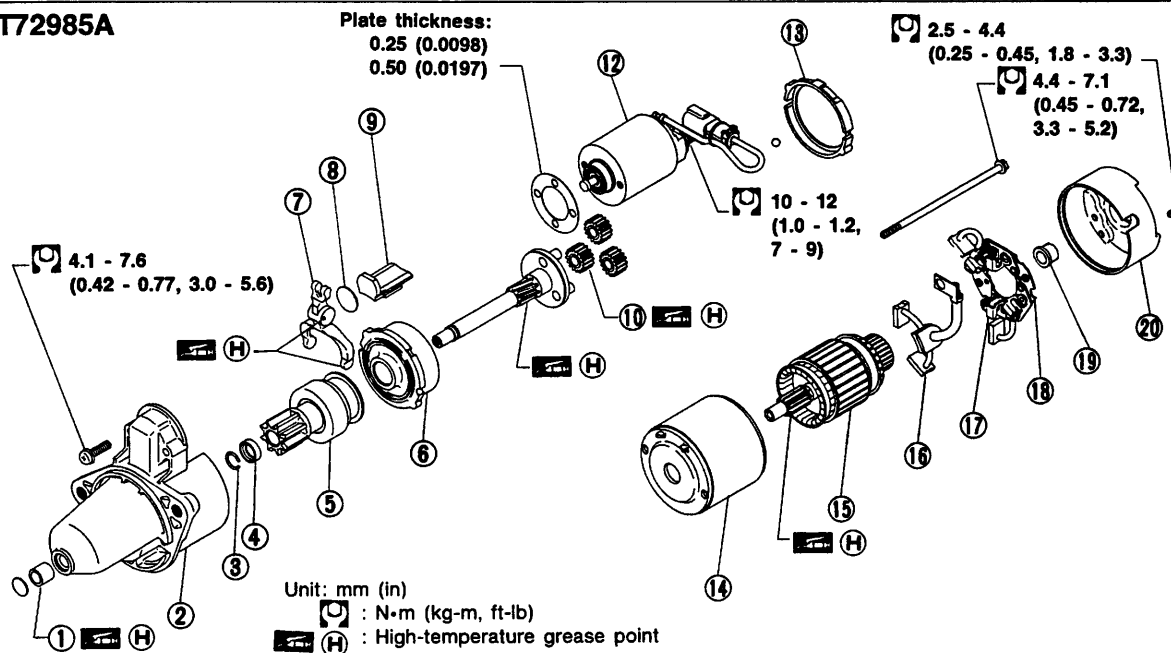
S114-701B



SEL556Q

- | | | |
|-------------------|----------------------------|-------------------------|
| ① Gear case | ⑧ Adjusting plate | ⑮ Internal gear |
| ② Bearing cover | ⑨ Magnetic switch assembly | ⑯ Center bracket |
| ③ Ball bearing | ⑩ E-ring | ⑰ Yoke assembly |
| ④ Pinion assembly | ⑪ Thrust washer | ⑱ Armature |
| ⑤ Shift lever | ⑫ Center bracket | ⑲ Brush holder assembly |
| ⑥ Dust cover | ⑬ Pinion shaft | ⑳ Rear cover |
| ⑦ Torsion spring | ⑭ Planetary gear | ㉑ Dust cover |

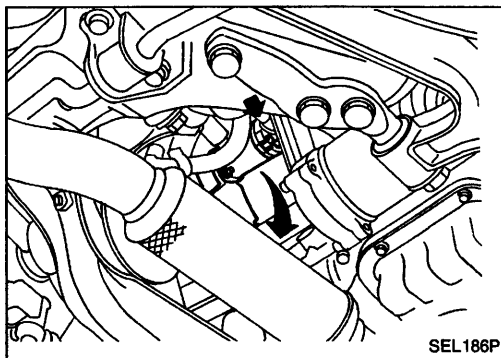
M1T72985A



SEL746Q

- | | | |
|-------------------|----------------------------|----------------|
| ① Sleeve bearing | ⑧ Plate | ⑮ Armature |
| ② Gear case | ⑨ Packing | ⑯ Bearing |
| ③ Stopper clip | ⑩ Planetary gear | ⑰ Brush (+) |
| ④ Pinion stopper | ⑪ Adjusting plate | ⑱ Brush spring |
| ⑤ Pinion assembly | ⑫ Magnetic switch assembly | ⑲ Brush holder |
| ⑥ Internal gear | ⑬ Packing | ⑳ Rear cover |
| ⑦ Shift lever | ⑭ Yoke | |

STARTING SYSTEM



Removal and Installation

REMOVAL

1. Remove battery negative cable from battery.
2. Remove intake air duct.
3. Remove starter motor mounting bolts.
4. Remove battery cable from starter motor.
5. Disconnect harness connector from starter motor harness.
6. Remove starter motor from under vehicle.

INSTALLATION

Installation procedure is basically the reverse order of removal.

Service Data and Specifications (S.D.S.)

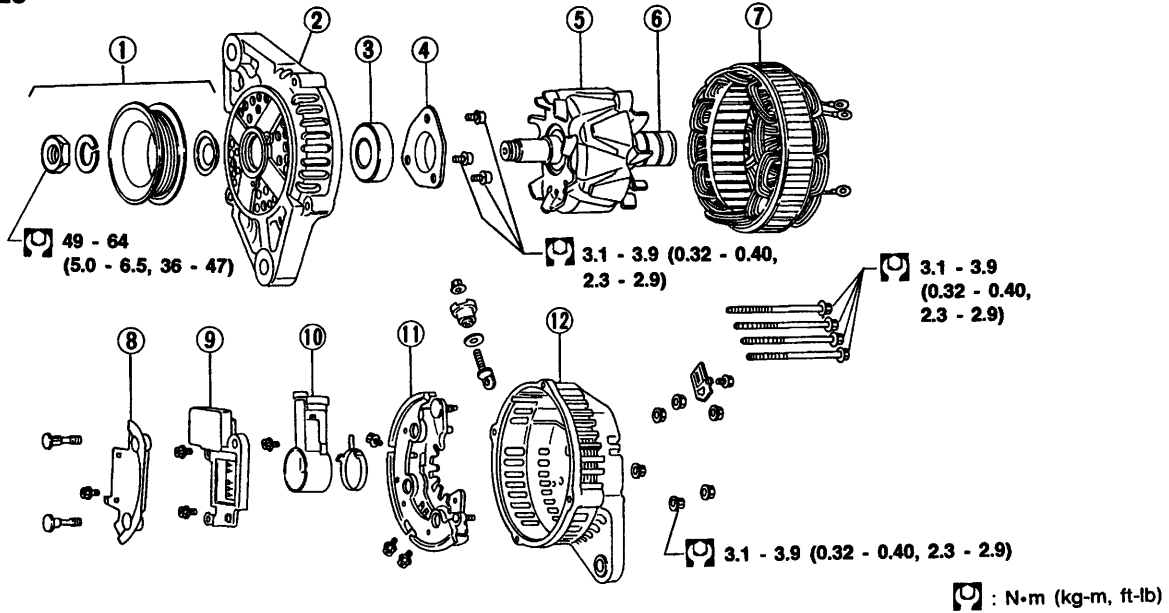
STARTER

Type		S114-701B	M1T72985A
		HITACHI	MITSUBISHI
		Reduction gear	
System voltage	V	12	
No-load			
Terminal voltage	V	11.0	
Current	A	90	50 - 75
Revolution	rpm	2,950	3,000 - 4,000
Minimum diameter of commutator	mm (in)	32.0 (1.260)	28.8 (1.134)
Minimum length of brush	mm (in)	11.0 (0.433)	12.0 (0.472)
Brush spring tension	N (kg, lb)	17.6 - 21.6 (1.80 - 2.20, 3.96 - 4.86)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)
Movement "ℓ" in height of pinion assembly	mm (in)	—	—
Clearance of bearing metal and armature shaft	mm (in)	0.03 - 0.3 (0.0012 - 0.0118)	Less than 0.2 (0.008)
Clearance "ℓ" between pinion front edge and pinion stopper	mm (in)	0.05 - 1.5 (0.0020 - 0.0591)	0.5 - 2.0 (0.020 - 0.079)

CHARGING SYSTEM

Construction

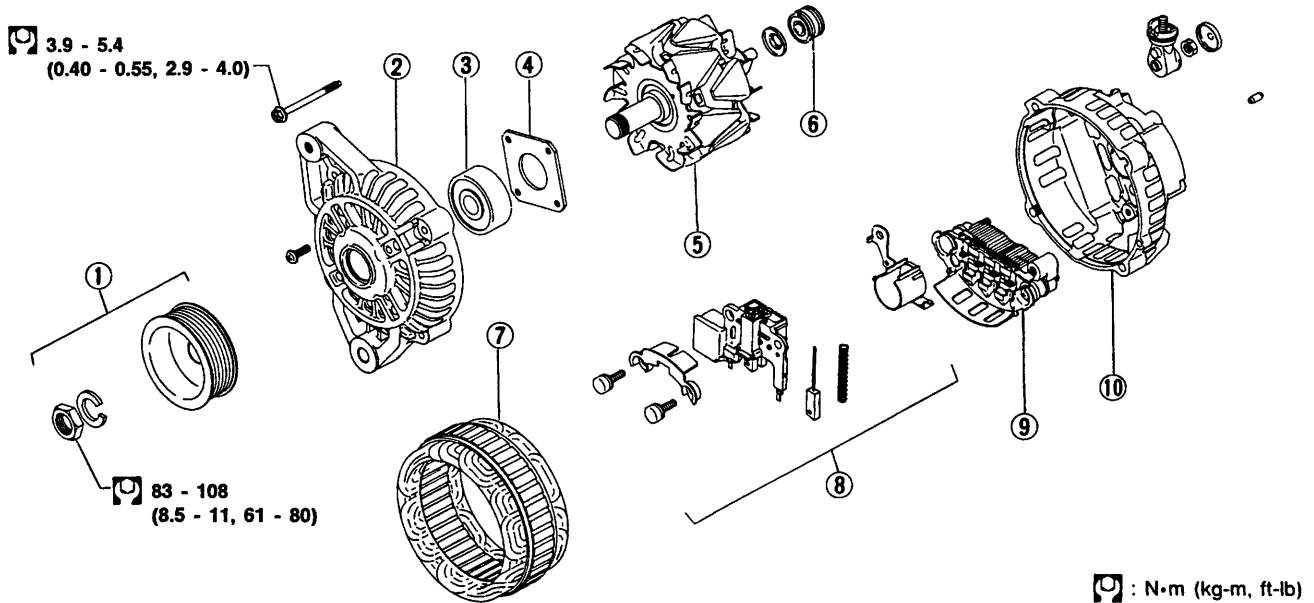
LR180-725



SEL534Q

- | | | |
|-------------------|-------------|-------------------------|
| ① Pulley assembly | ⑤ Rotor | ⑨ IC regulator assembly |
| ② Front cover | ⑥ Slip ring | ⑩ Brush holder |
| ③ Front bearing | ⑦ Stator | ⑪ Diode assembly |
| ④ Retainer | ⑧ Condenser | ⑫ Rear cover |

A2T13894

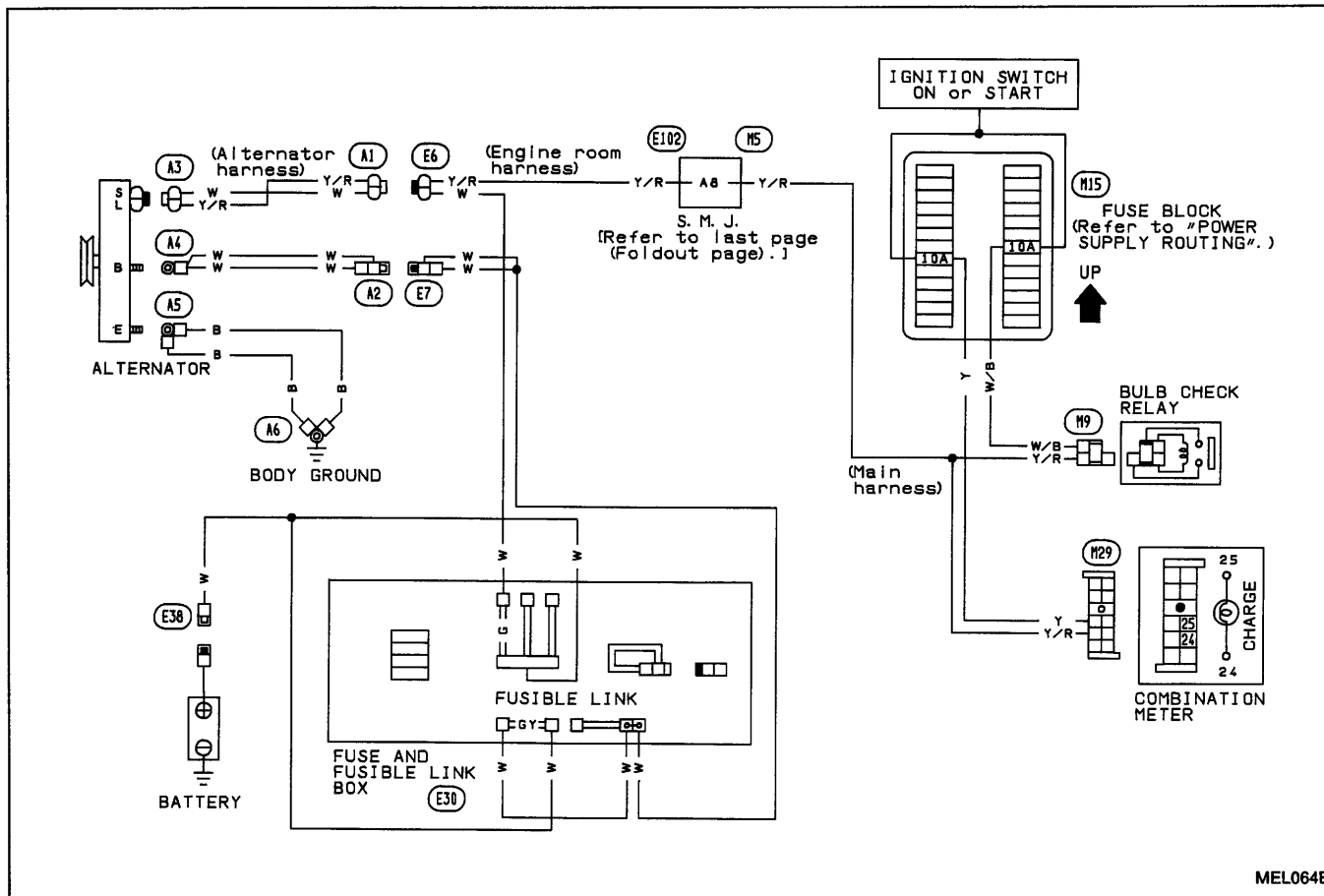


SEL535Q

- | | | |
|--------------------|----------------|------------------------|
| ① Pulley assembly | ⑤ Rotor | ⑧ IC voltage regulator |
| ② Front cover | ⑥ Rear bearing | ⑨ Diode assembly |
| ③ Front bearing | ⑦ Stator | ⑩ Rear cover |
| ④ Bearing retainer | | |

CHARGING SYSTEM

Wiring Diagram



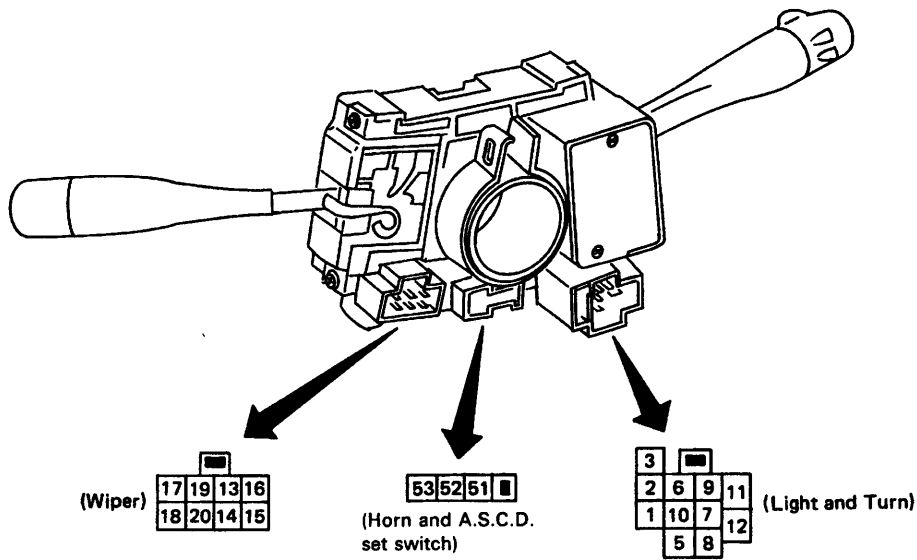
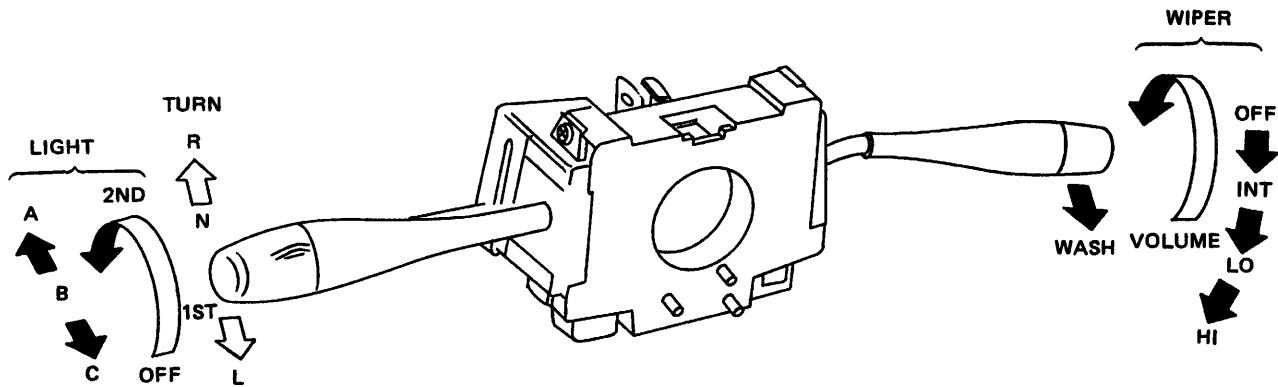
Service Data and Specifications (S.D.S.)

ALTERNATOR

Type		LR180-725	A2T13894
		HITACHI	MITSUBISHI
Nominal rating	V-A	12-80	
Ground polarity		Negative	
Minimum revolution under no-load (When 13.5 volts is applied)	rpm	950	1,300
Hot output current	A/rpm	More than 23/1,300 More than 63/2,500 More than 77/5,000	More than 22/1,300 More than 65/2,500
Regulated output voltage	V	14.1 - 14.7	
Minimum length of brush	mm (in)	6.0 (0.236)	8 (0.31)
Brush spring pressure	N (g, oz)	1.000 - 3.432 (102 - 350, 3.60 - 12.34)	3.138 - 4.315 (320 - 440, 11.29 - 15.52)
Slip ring minimum outer diameter	mm (in)	More than 26.0 (1.024)	More than 22.1 (0.870)

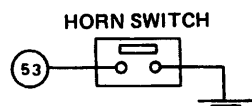
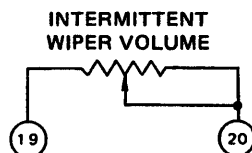
COMBINATION SWITCH

Combination Switch/Check



LIGHTING SWITCH											
	OFF			1ST			2ND				
	A	B	C	A	B	C	A	B	C		
5											
6											
7											
8											
9											
10											
11											
12											

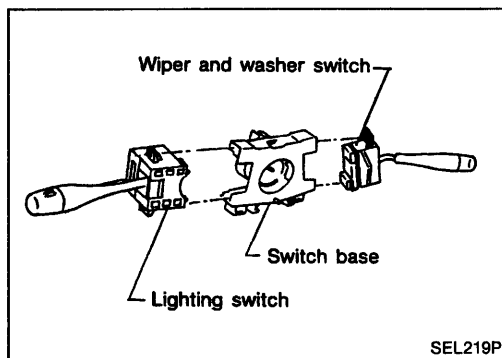
WIPER SWITCH					
	OFF	INT	LO	HI	WASH
13					
14					
15					
16					
17					
18					



TURN SIGNAL SWITCH			
	R	N	L
1			
2			
3			

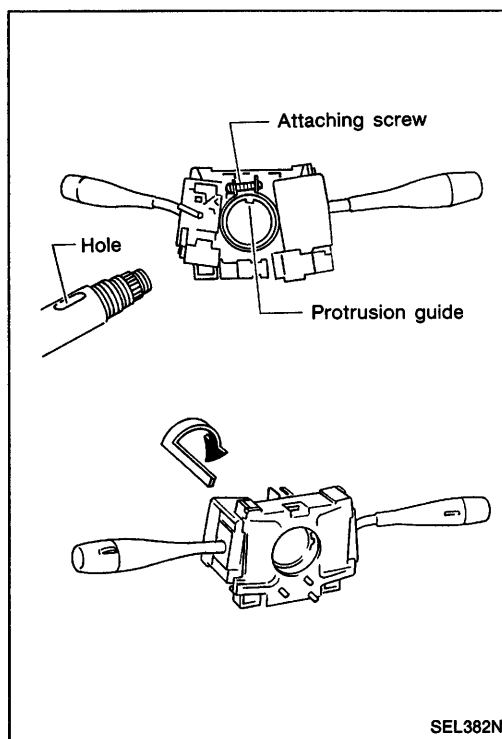
GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

COMBINATION SWITCH

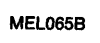


Replacement

- Each switch can be replaced without removing combination switch base.
- To remove combination switch base, remove base attaching screw and turn after pushing on it.



EL-21



HEADLAMP — Daytime Light System —

Operation

After starting the engine with the lighting switch in the "OFF" position or "1ST" position, the headlamp high beam automatically turns on. Lighting switch operations other than the above are the same as conventional light systems.

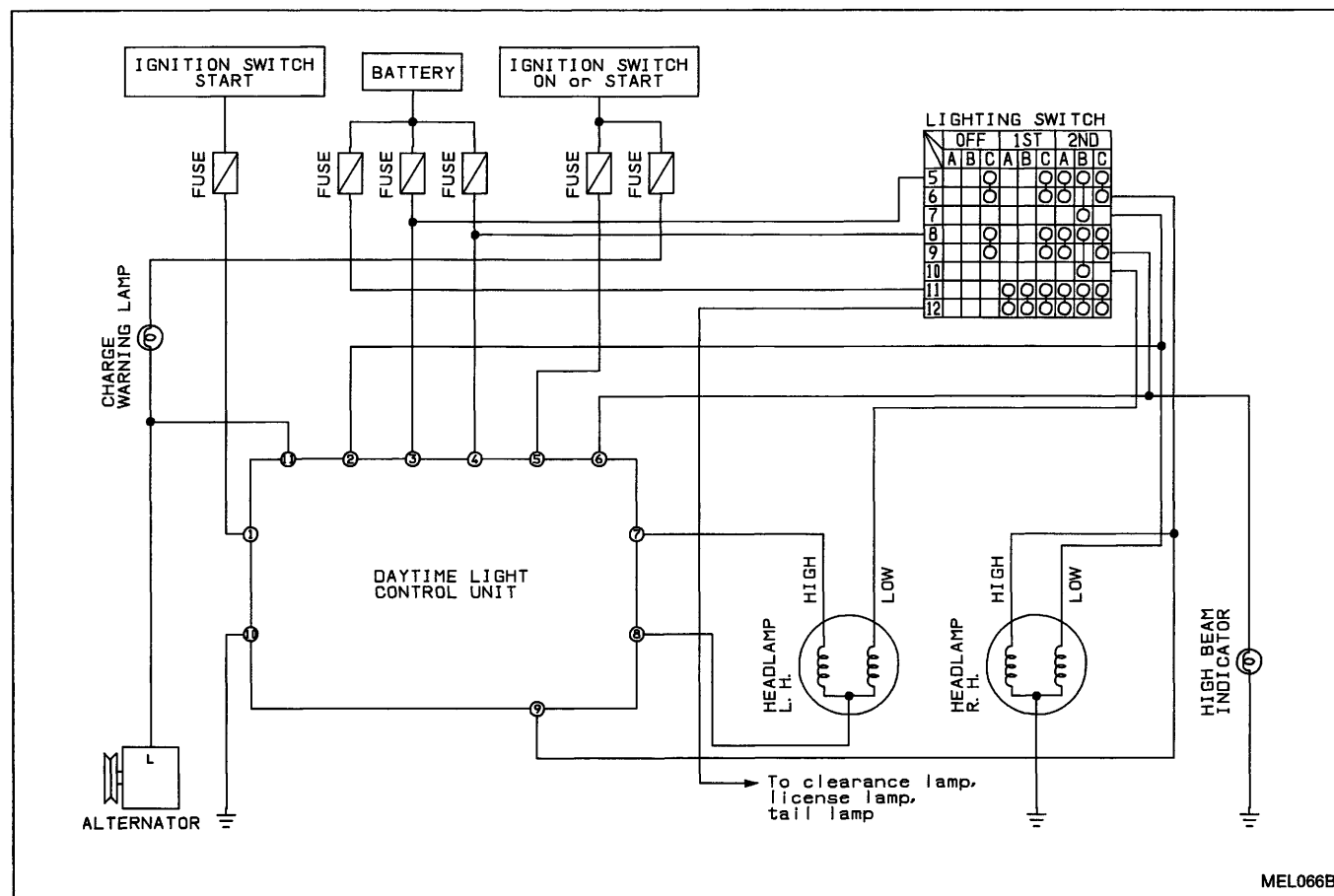
Engine		With engine stopped									With engine running								
Lighting switch		OFF			1ST			2ND			OFF			1ST			2ND		
Headlamp	High beam	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
	Low beam	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	O	X
Clearance and tail lamp		X	X	X	O	O	O	O	O	O	X	X	X	O	O	O	O	O	O
License and instrument illumination lamp		X	X	X	O	O	O	O	O	O	X	X	X	O	O	O	O	O	O

O : Lamp "ON"

X : Lamp "OFF"

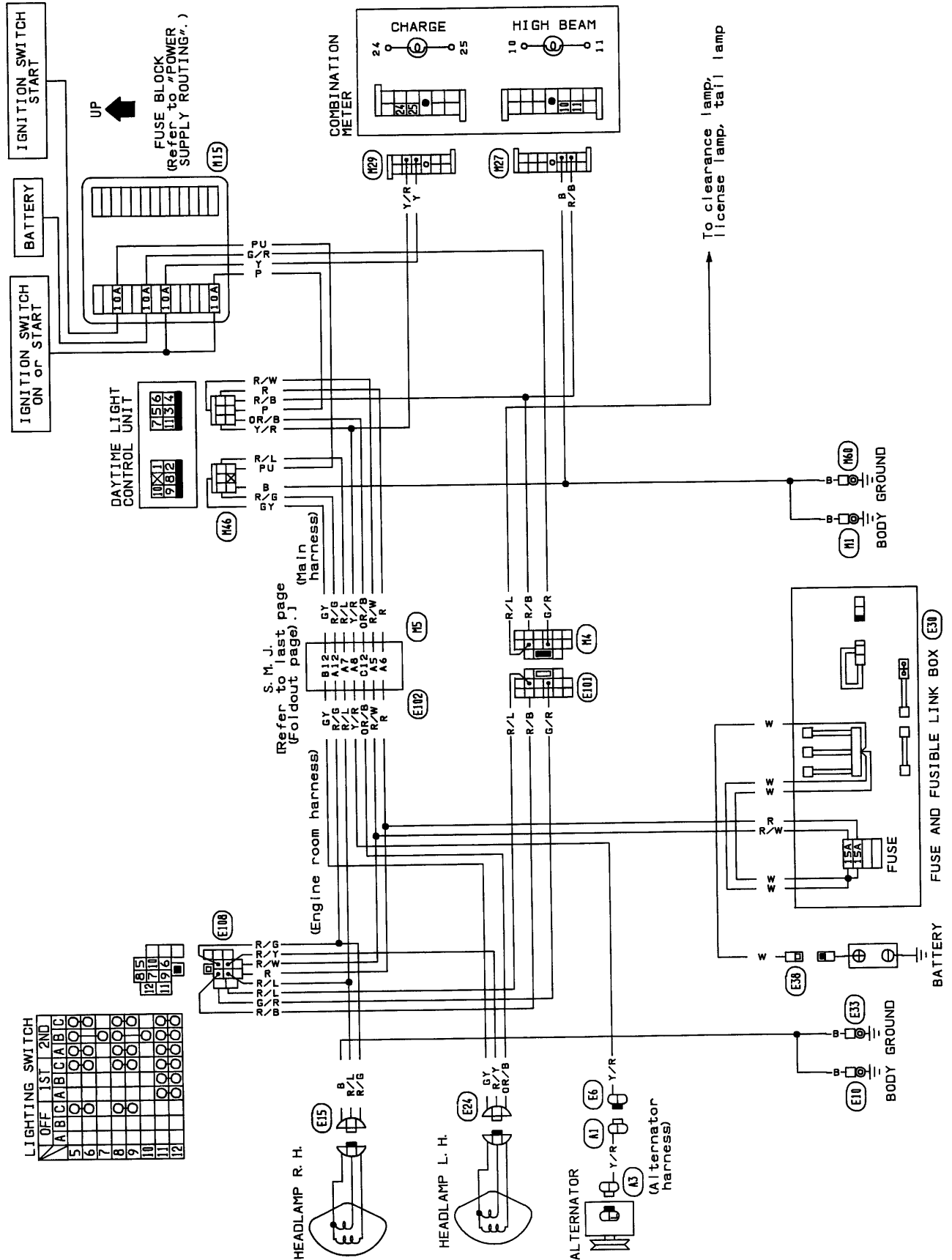
△ : Lamp dims.

Schematic

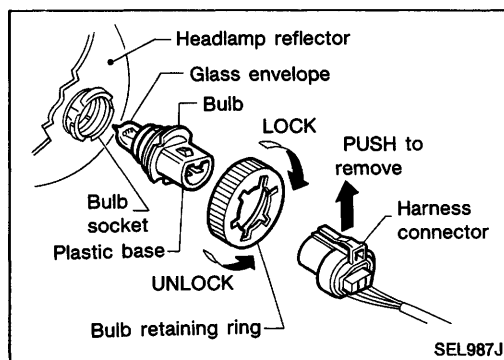


MEL066B

Wiring Diagram



GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL



Bulb Replacement

The headlamp is a semi-sealed beam type which uses a replaceable halogen bulb. The bulb can be replaced from the engine compartment side without removing the headlamp body.

- **Grasp only the plastic base when handling the bulb. Never touch the glass envelope.**

1. Disconnect the battery cable.
2. Turn the bulb retaining ring counterclockwise until it is free from the headlamp reflector, and then remove it.
3. Disconnect the harness connector from the back side of the bulb.
4. Remove the headlamp bulb carefully. Do not shake or rotate the bulb when removing it.
5. Install in the reverse order of removal.

CAUTION:

- **Do not leave the bulb out of the headlamp reflector for a long period of time as dust, moisture, smoke, etc. may enter the headlamp body and affect the performance of the headlamp. Thus, the headlamp bulb should not be removed from the headlamp reflector until just before a replacement bulb is to be installed.**

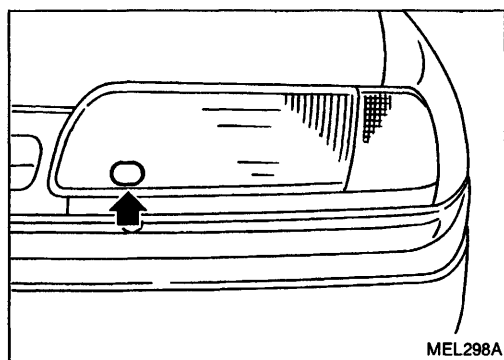
Aiming Adjustment

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.

- 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).**



AIMER ADJUSTMENT MARK

When using a mechanical aimer, adjust adapter legs to the data marked on the headlamps.

Example:

4H2V
└─ Vertical side: 2
└─ Horizontal side: 4

HEADLAMP

Aiming Adjustment (Cont'd)

LOW BEAM

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.**

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

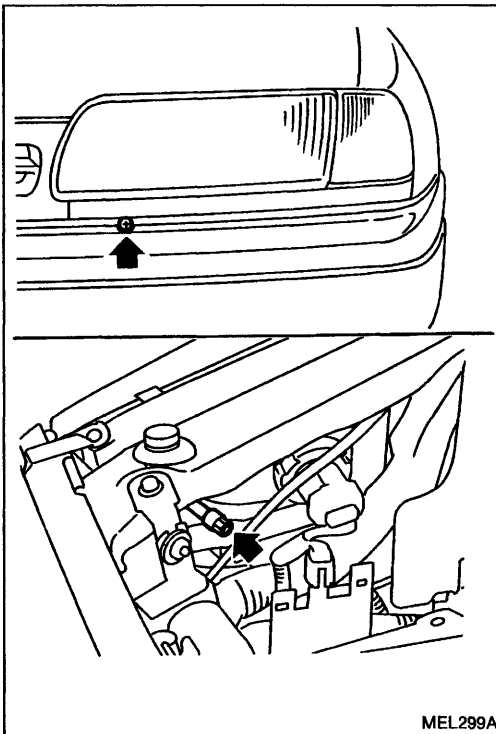
BR

ST

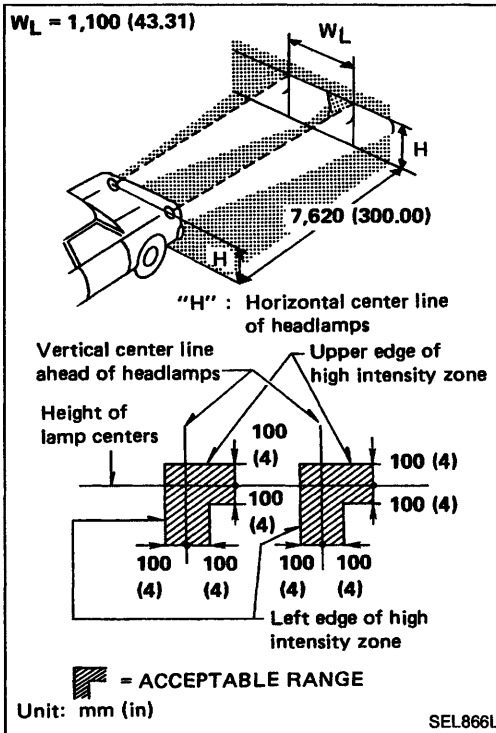
BF

HA

EL



MEL299A



SEL866L

- **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

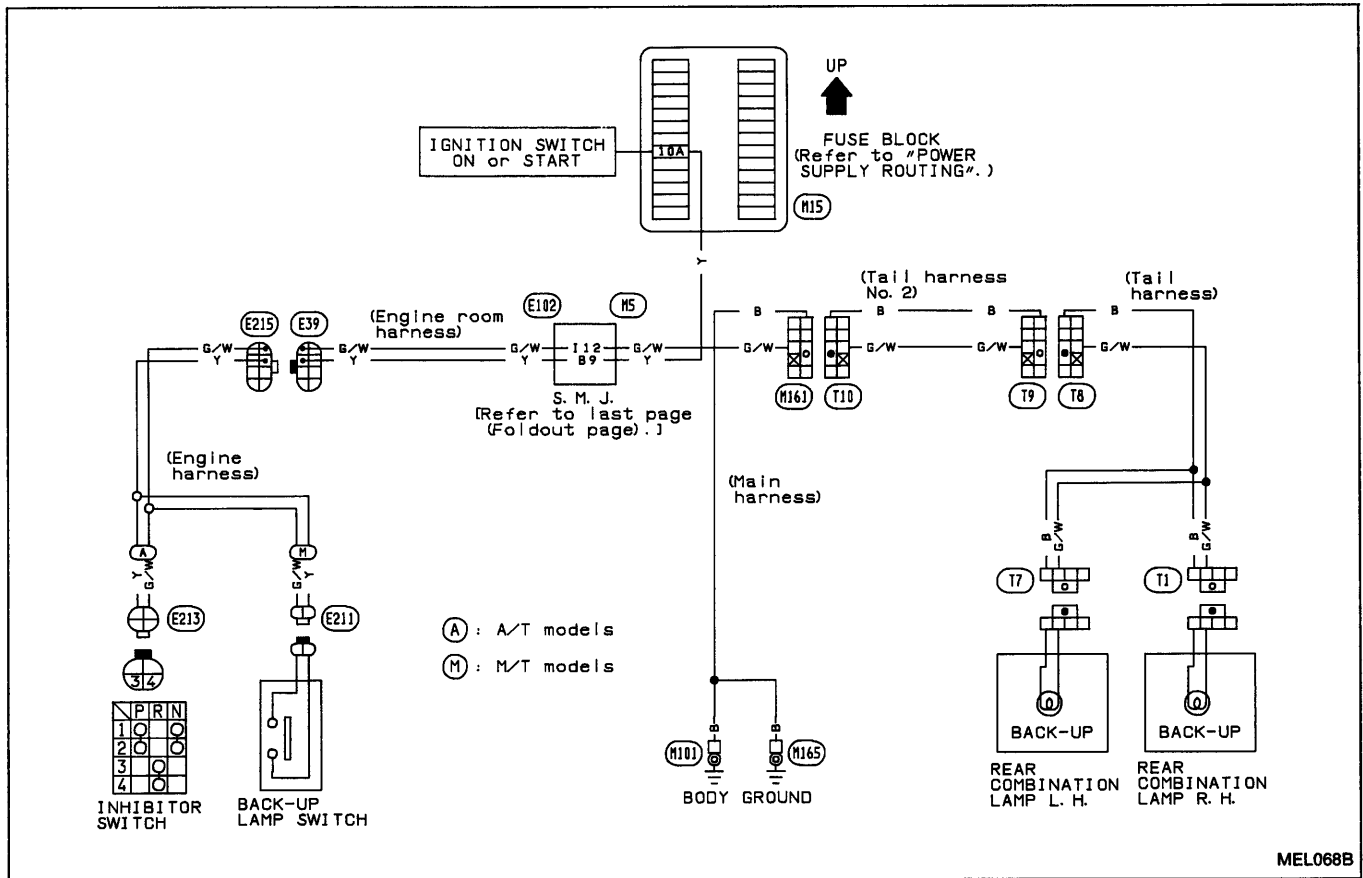
"W_L": Distance between each headlamp center

Clearance, License, Tail and Stop Lamps/Wiring Diagram

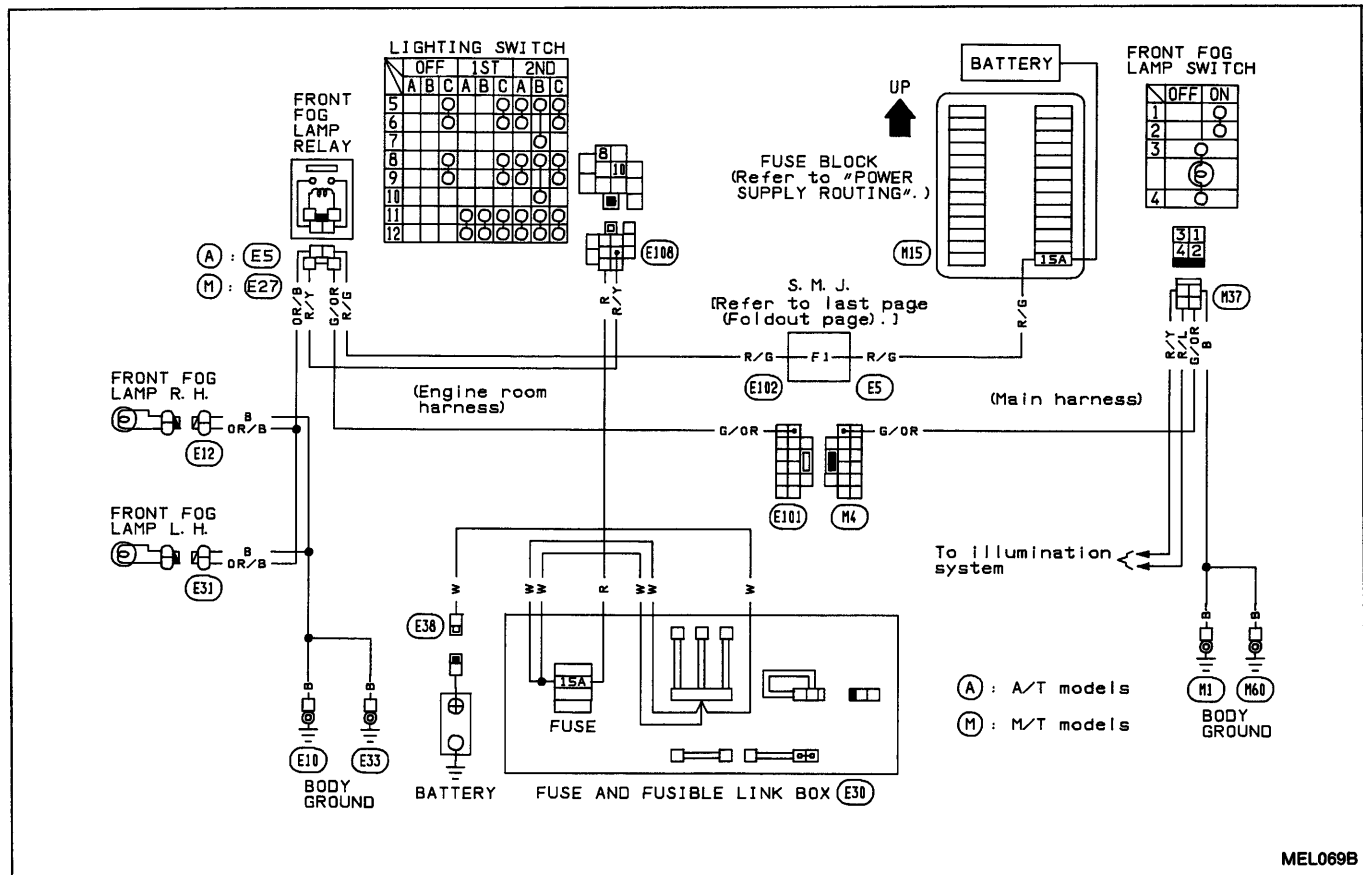


EXTERIOR LAMP

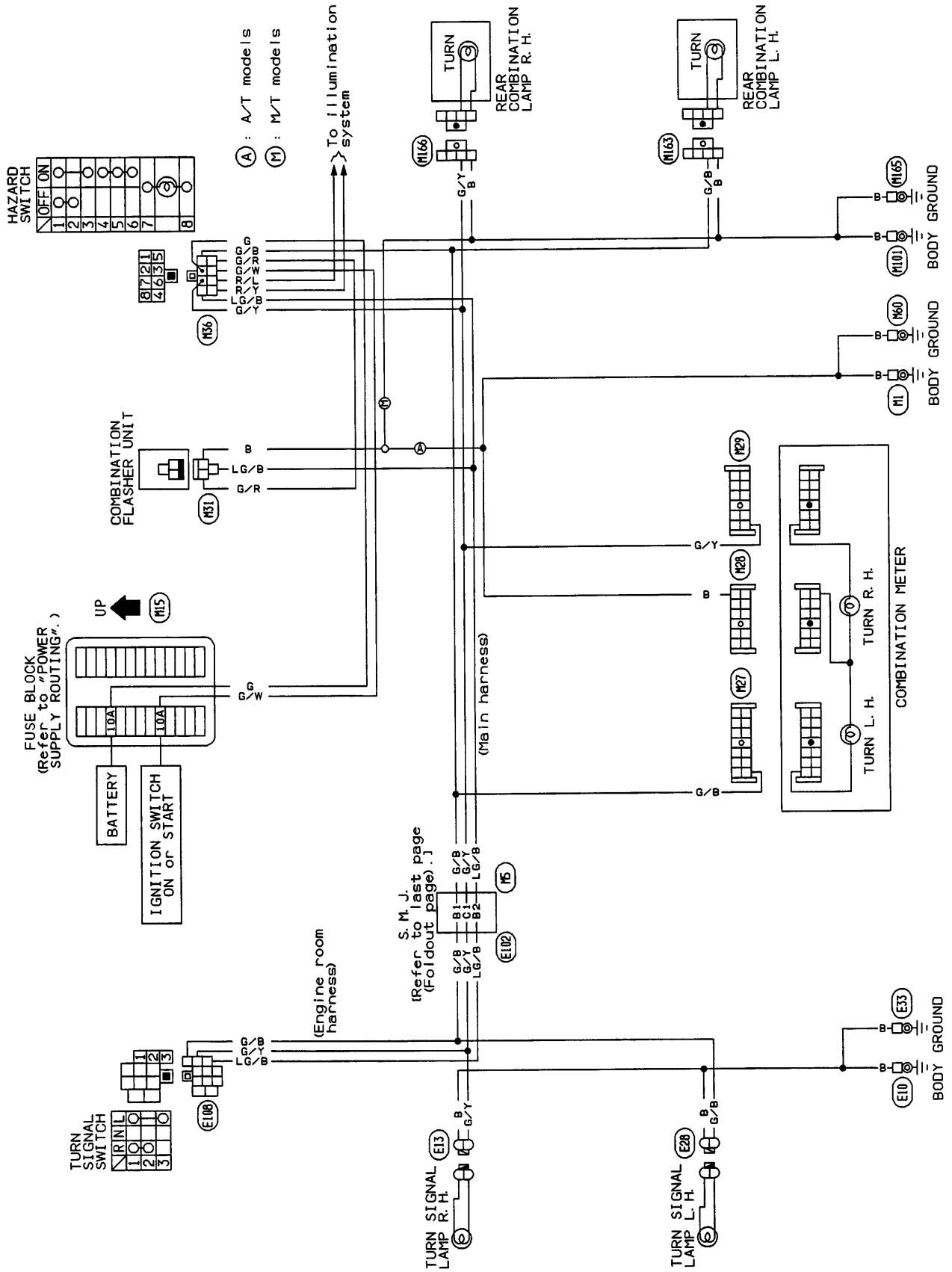
Back-up Lamp/Wiring Diagram



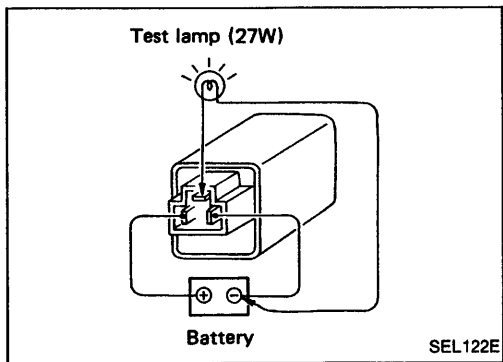
Front Fog Lamp/Wiring Diagram



Turn Signal and Hazard Warning Lamps/Wiring Diagram



EXTERIOR LAMP



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

	Wattage (12 volt)	
Headlamp (Semi-sealed beam)		LC
High/Low	65/45	EF & EC
Front turn signal lamp	27	
Front clearance lamp	3.8	FE
Front side marker lamp	3.8	
Front fog lamp	55	CL
Rear combination lamp		
Turn signal	27	MT
Stop/Tail	27/8	
Back-up	27	
Rear side marker lamp	3.8	AT
License plate lamp	5	
High-mounted stop lamp	12	FA
Interior lamp	10	
Spot lamp	10	
Trunk room lamp	3.4	RA

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

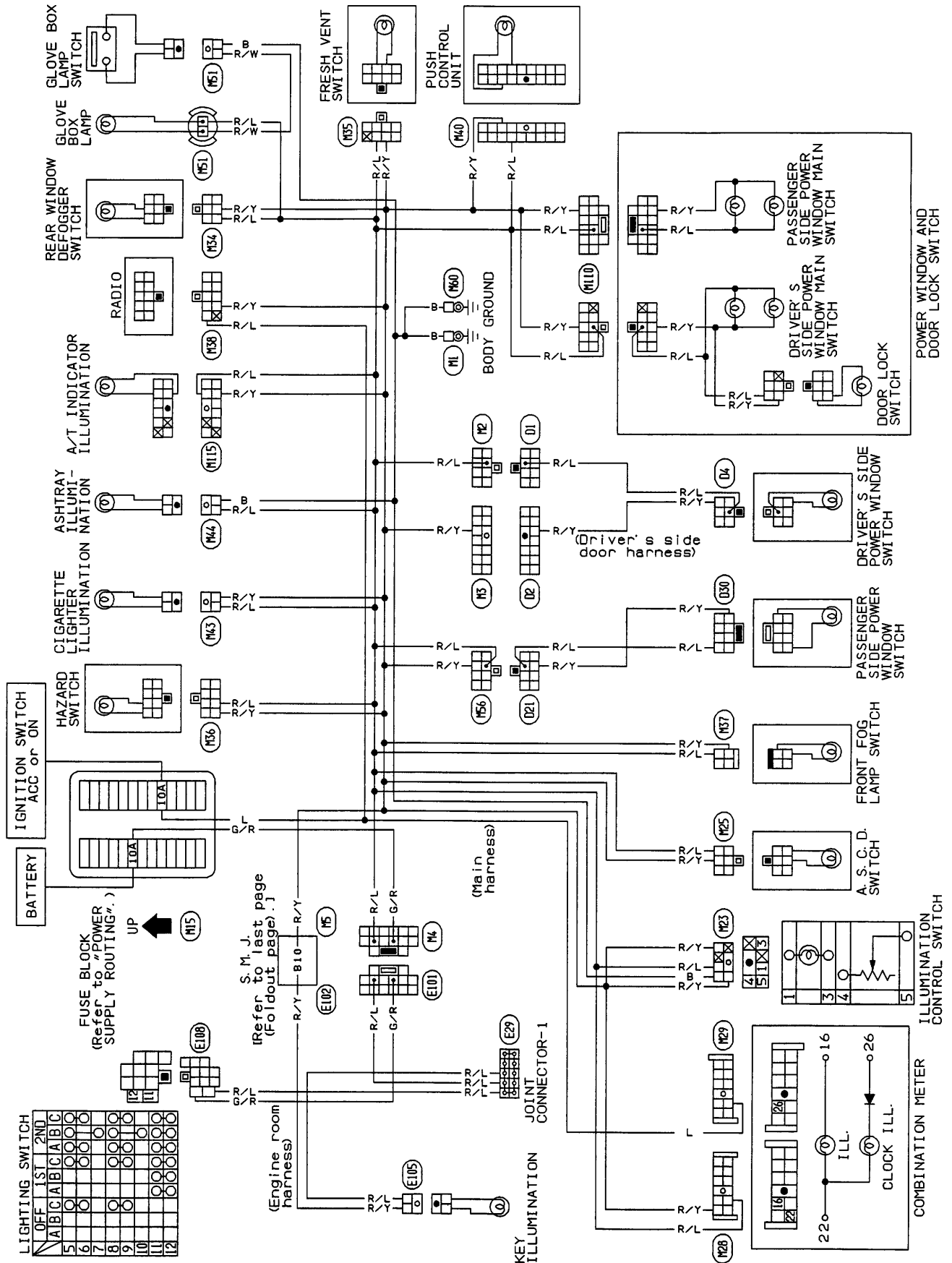
BF

HA

EL

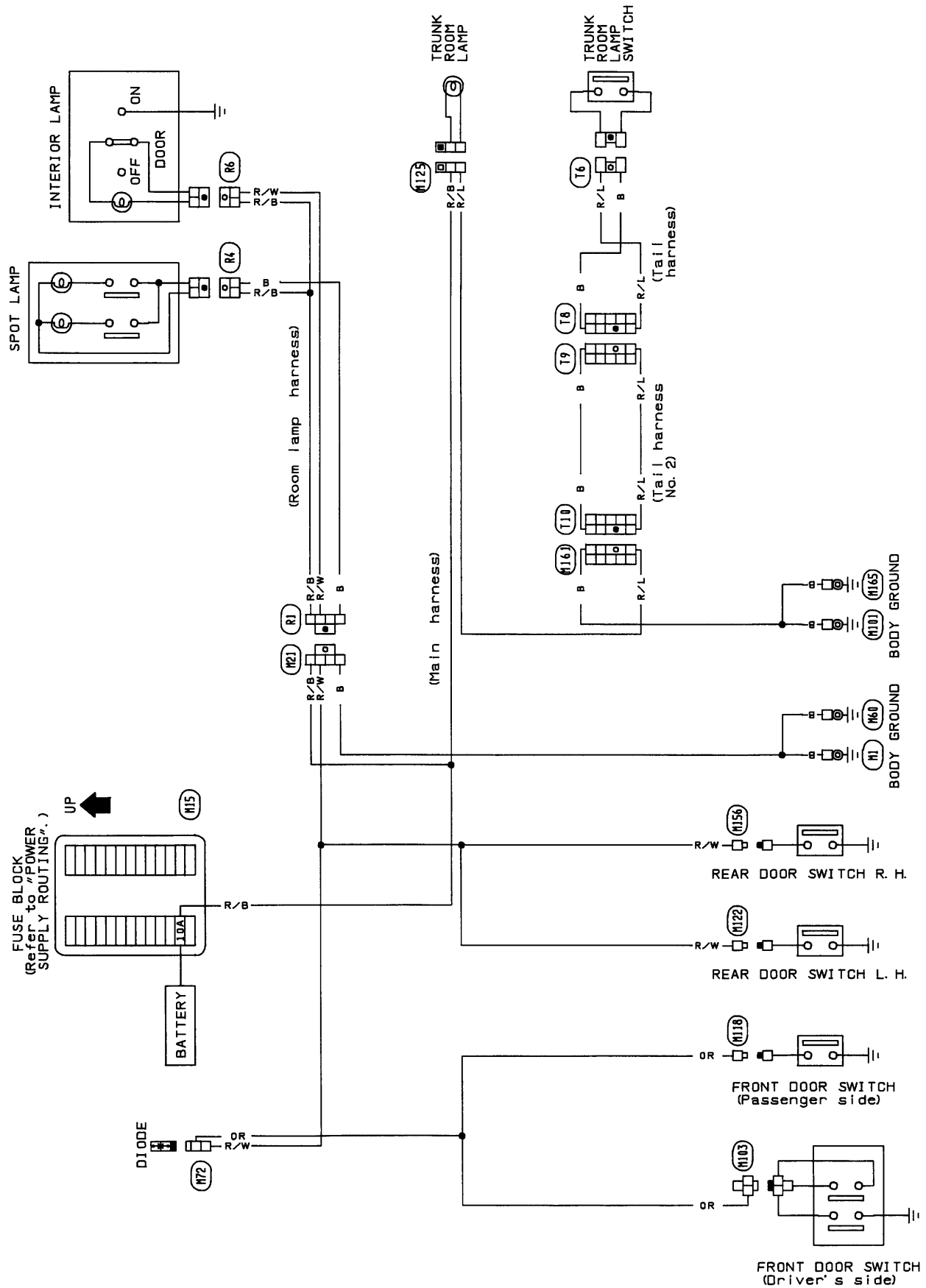
INTERIOR LAMP

Illumination/Wiring Diagram



INTERIOR LAMP

Interior, Spot and Trunk Room Lamps/Wiring Diagram



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

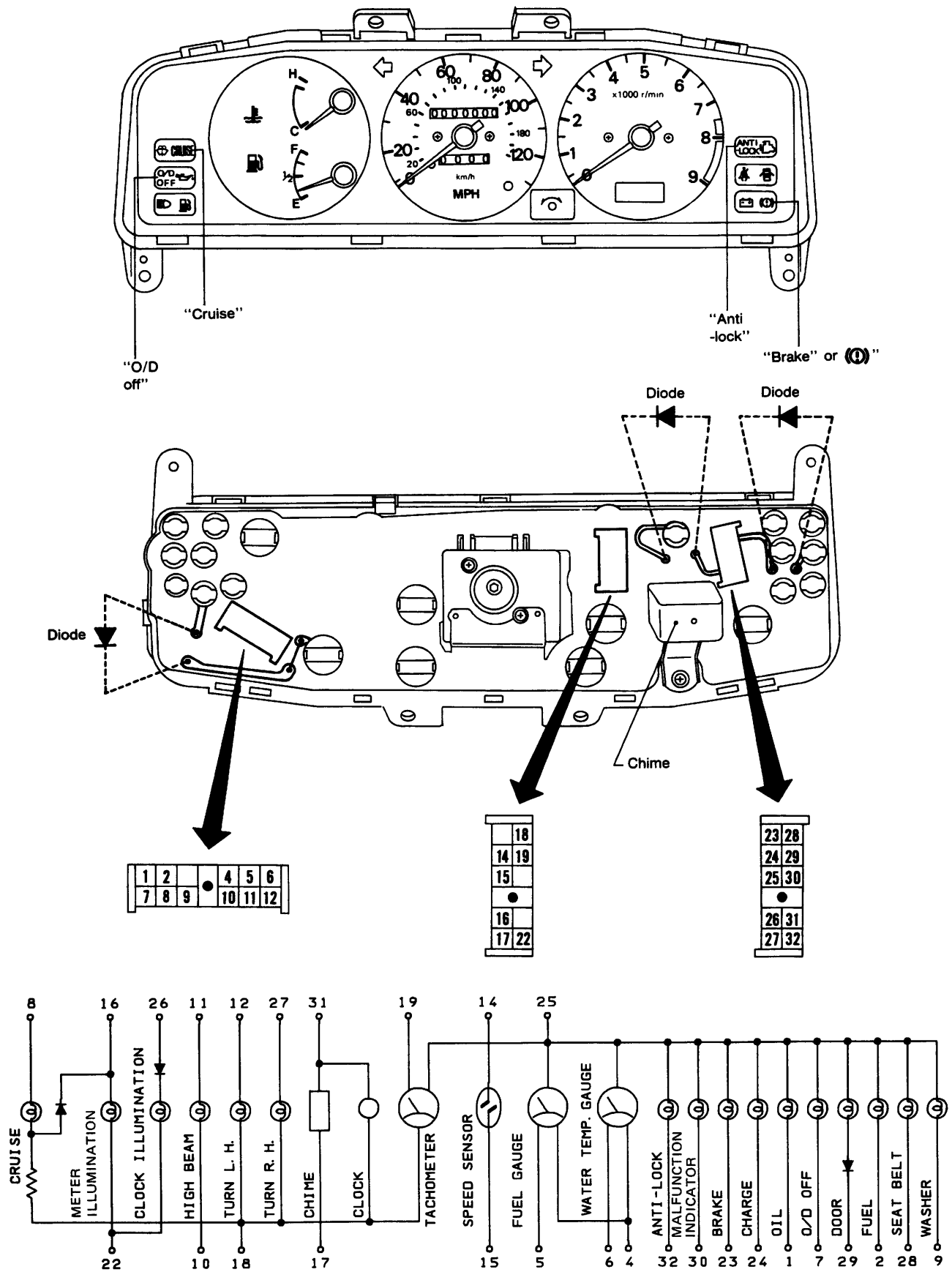
HA

EL

MEL072B

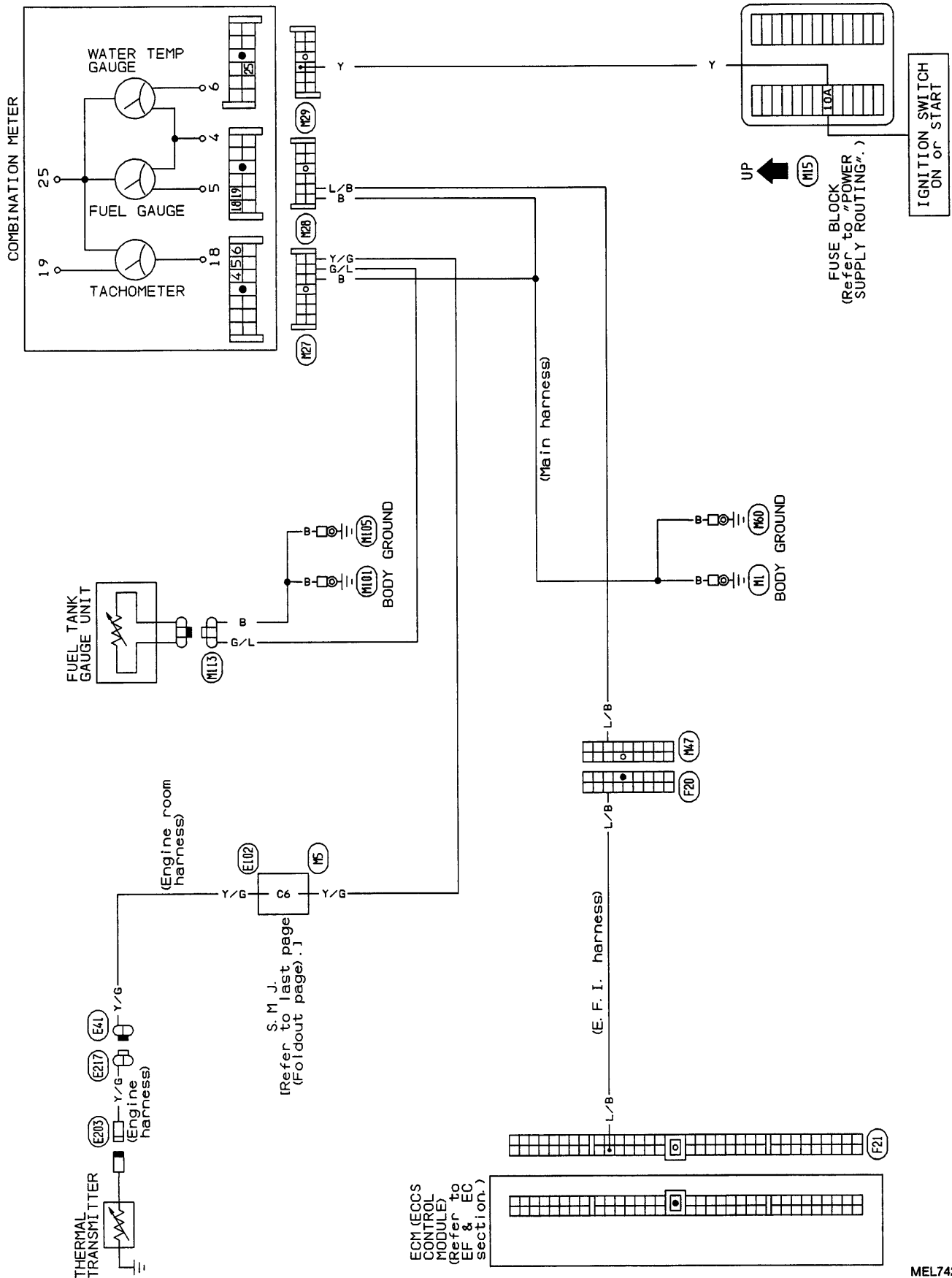
METER AND GAUGES

Combination Meter

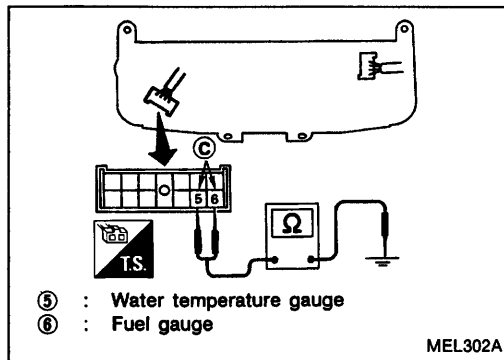
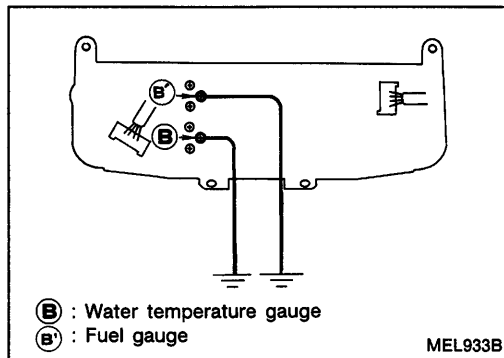
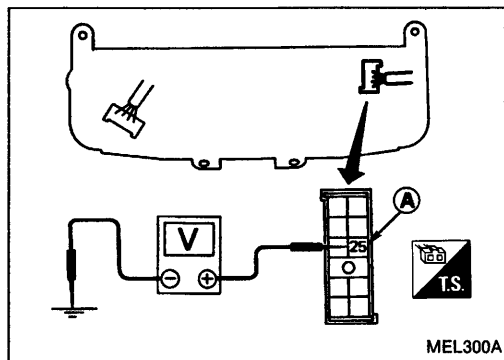


MEL737B

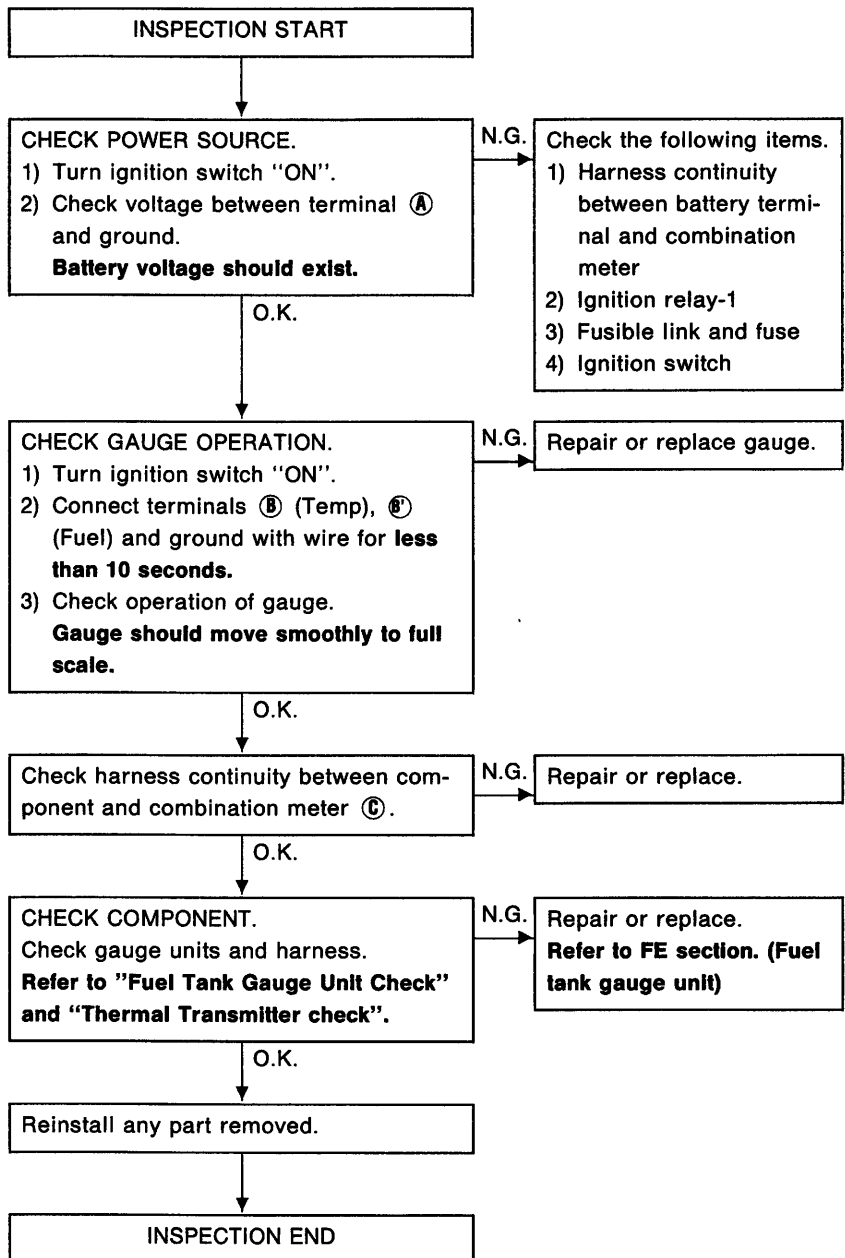
Tachometer, Temp., Oil and Fuel Gauges/Wiring Diagram

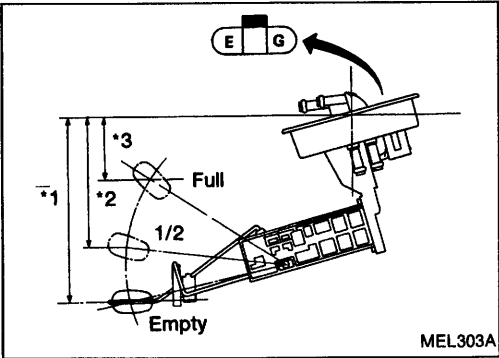


GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL



Inspection/Fuel Gauge, Water Temperature Gauge and Oil Pressure Gauge

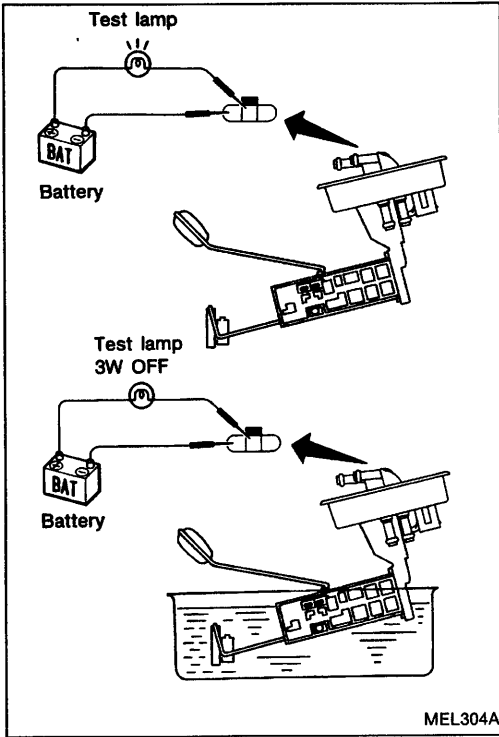




Fuel Tank Gauge Unit Check

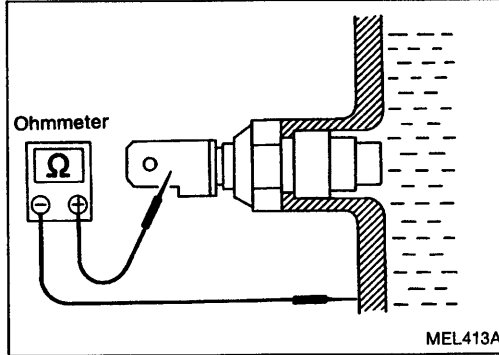
- For removal, refer to FE section.
- Check the resistance between terminals (G) and (E).

Ohmmeter		Float position mm (in)			Resistance value (Ω)
(+)	(-)				
G	E	*3	Full	49 (1.93)	Approx. 4 - 6
		*2	1/2	106 (4.17)	27 - 34
		*1	Empty	161 (6.34)	73 - 85



Fuel Warning Lamp Sensor Check

- It will take a short time for the bulb to light.



Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

Water temperature	Resistance
65°C (149°F)	Approx. 60 - 75Ω
91°C (196°F)	Approx. 21 - 24Ω

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

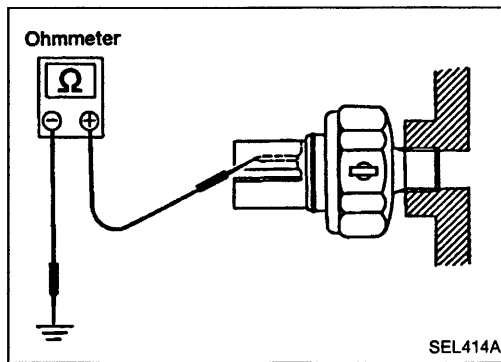
BR

ST

BF

HA

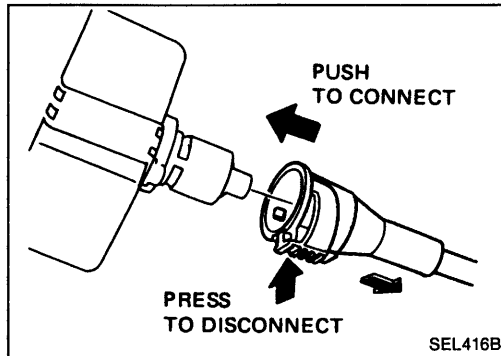
EL



Oil Pressure Switch Check

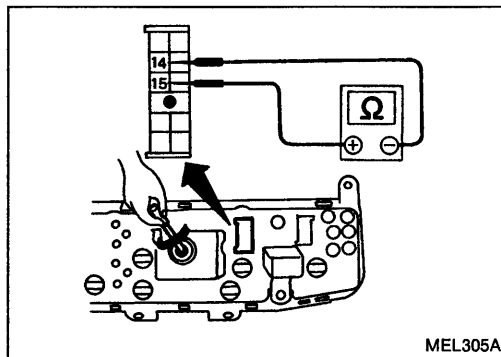
Check the continuity between the terminals of oil pressure switch and body ground.

	Oil pressure kPa (kg/cm ² , psi)	Continuity
Engine start	More than 10 - 20 (0.1 - 0.2, 1.4 - 2.8)	NO
Engine stop	Less than 10 - 20 (0.1 - 0.2, 1.4 - 2.8)	YES



Speedometer Cable Removal and Installation

After disconnecting speedometer cable end from transaxle, push speedometer cable so that combination meter is pushed into passenger compartment. Disconnect speedometer cable end from combination meter as shown in the figure at left.



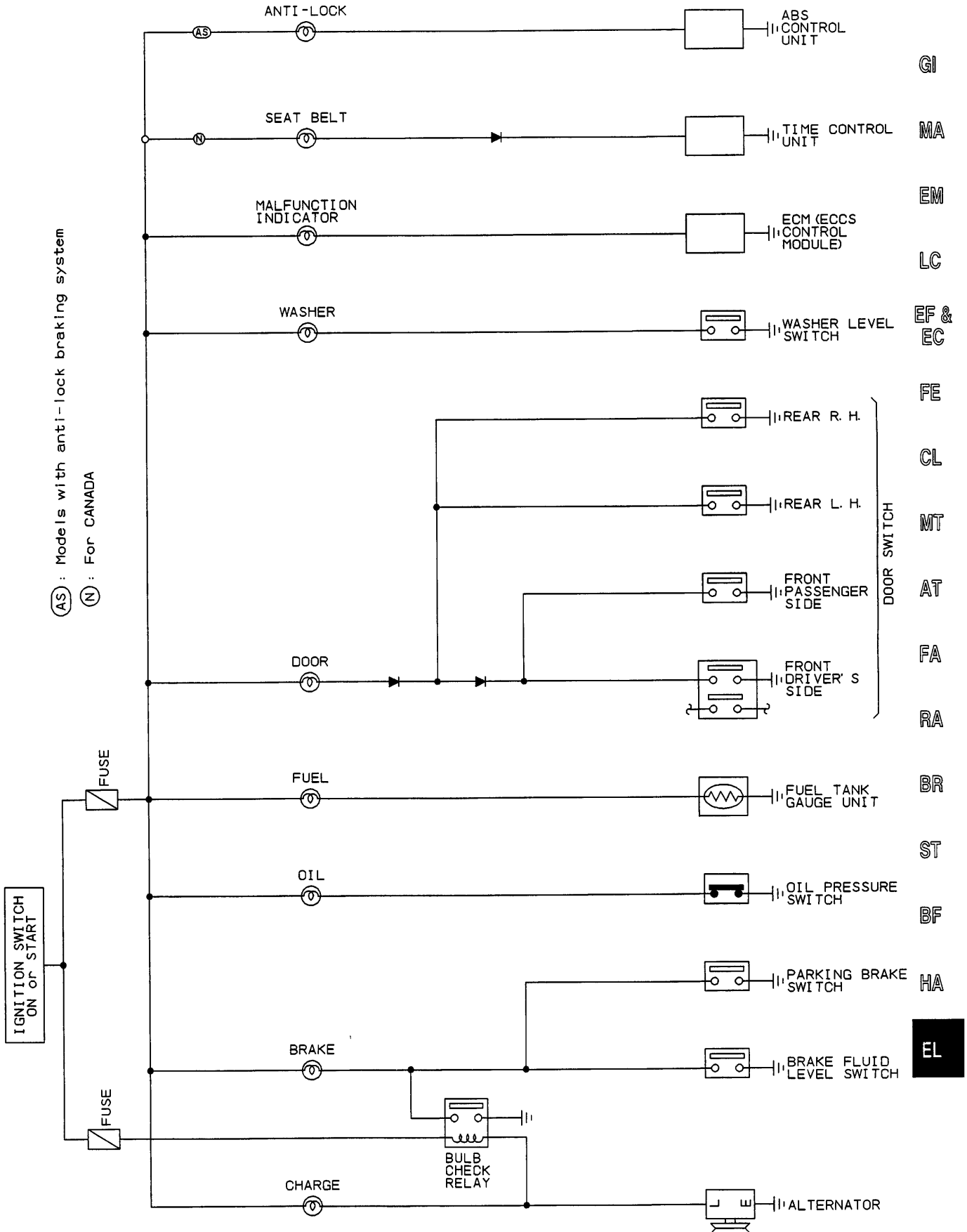
Speed Sensor Signal Check

- 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.

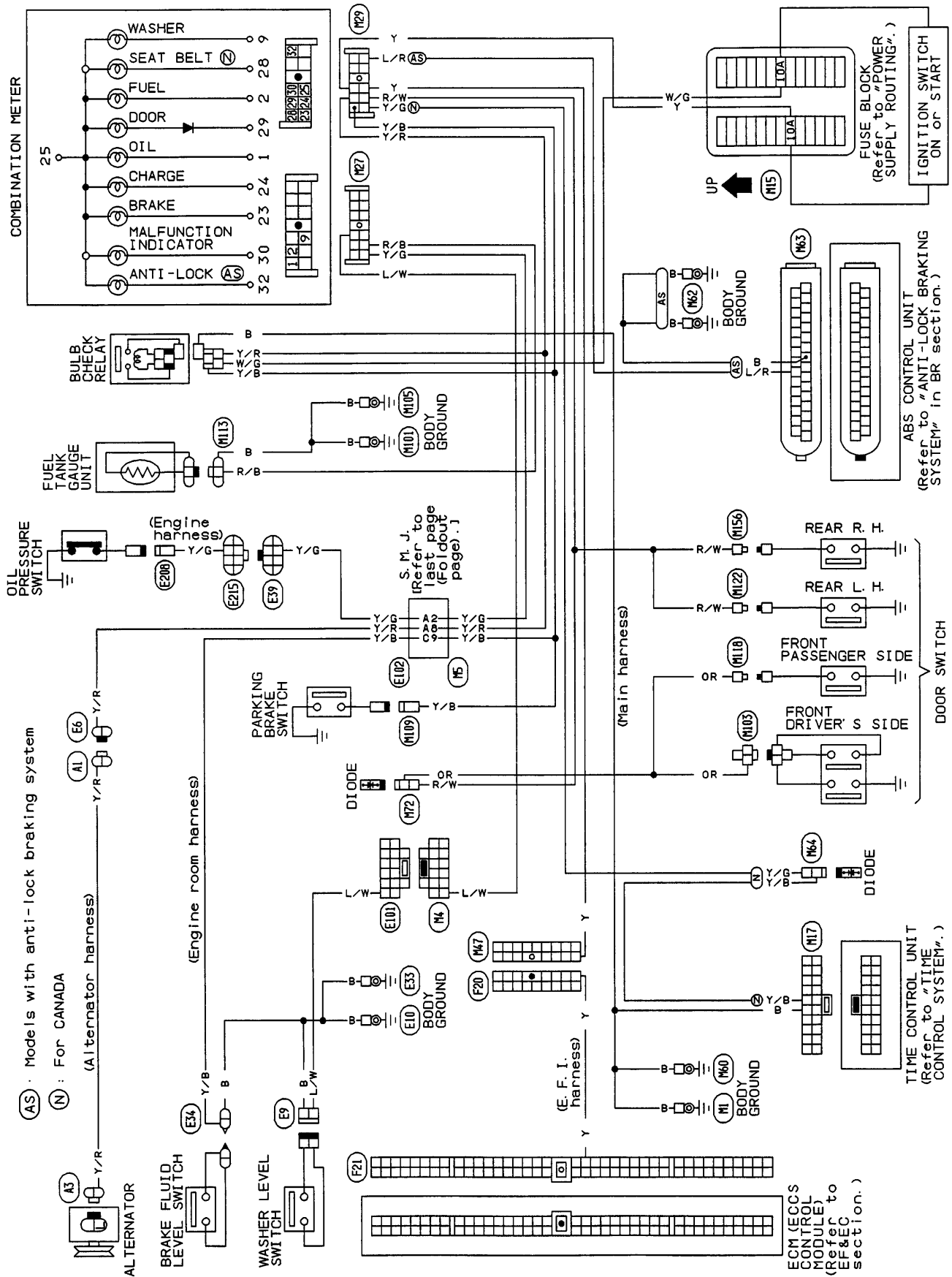
WARNING LAMPS AND CHIME

Warning Lamps/Schematic

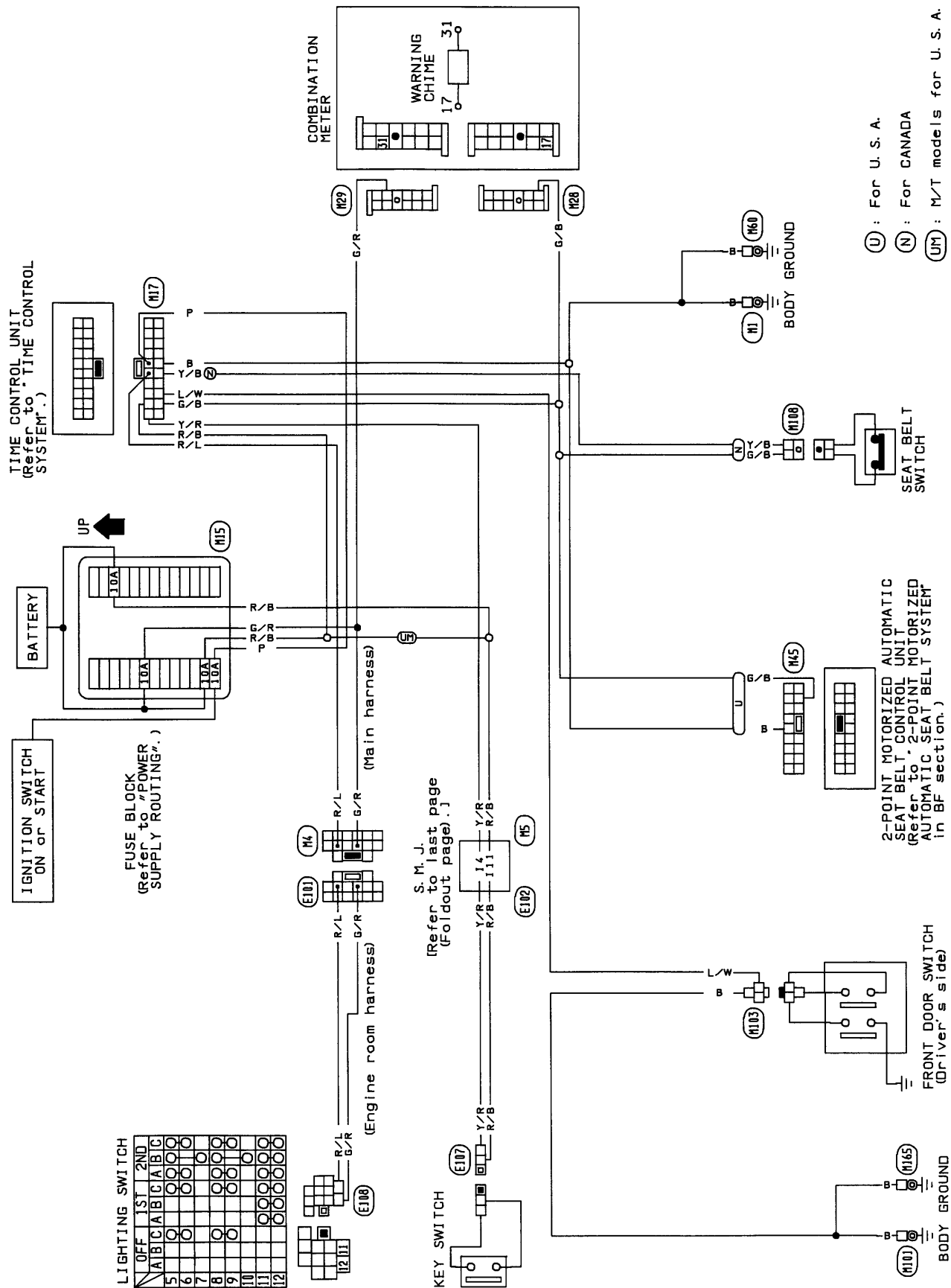


MEL743B

Warning Lamps/Wiring Diagram



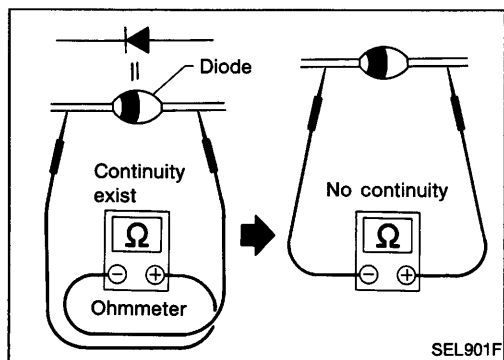
Warning Chime/Wiring Diagram



U : For U. S. A.
N : For CANADA
UNY : M/T models for U. S. A.

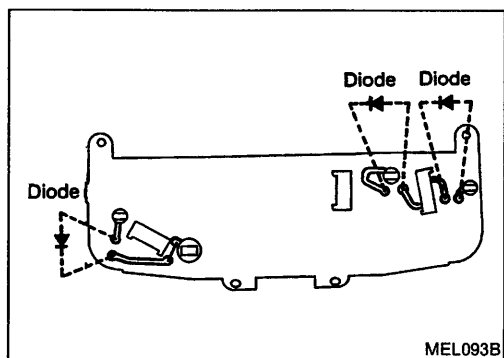
GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

WARNING LAMPS AND CHIME

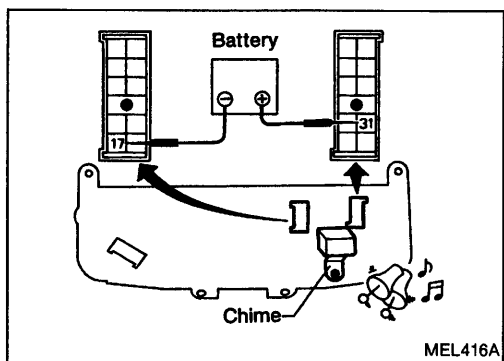


Diode Check

- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure at left.



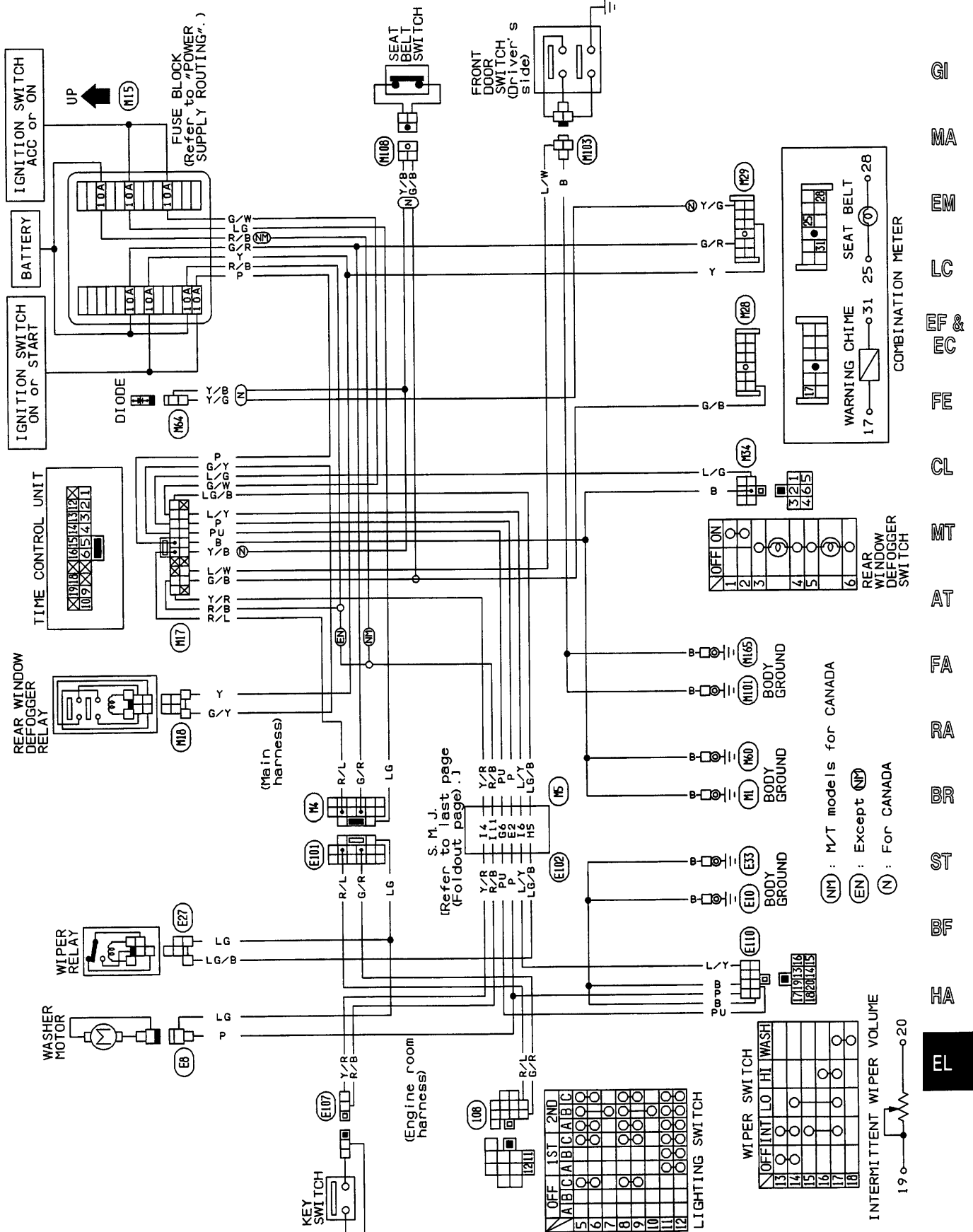
- Diodes for warning lamps are built into the combination meter printed circuit.



Warning Chime Check

TIME CONTROL SYSTEM

Wiring Diagram



TIME CONTROL SYSTEM

Description

FUNCTION

- Time control unit has the following functions.

Item		Details of control
1, 2	Intermittent wiper control	Regulates intermittent time from approximately 3 to 23 seconds depending on the intermittent wiper volume setting.
3	Washer and wiper combination control	Wiper is operated in conjunction with washer switch.
4	Light warning chime timer	When driver's door is opened with light switch ON and ignition switch OFF, warning chime sounds.
5	Ignition key warning chime timer	When driver's door is opened with ignition switch OFF, warning chime sounds.
6	Seat belt warning chime timer	Sounds warning chime for about 7 seconds if ignition switch is turned "ON" when seat belt switch is "ON" (seat belt is unfastened).
7	Seat belt warning lamp timer	Seat belt warning lamp blinks for about 7 seconds when ignition switch is turned to "ON".
8	Rear defogger timer	Rear defogger operates for about 15 minutes when defogger switch is ON.

Trouble Diagnoses

SYMPTOM CHART

PROCEDURE		Preliminary Check			Main Power Supply and Ground Circuit Check	Diagnostic Procedure							
REFERENCE PAGE		EL-43			EL-44	EL-46	EL-47	EL-47	EL-48	EL-49	EL-50	EL-51	EL-51
SYMPTOM		Procedure 1	Procedure 2	Procedure 3	Main power supply and Ground circuit	Diagnostic Procedure 1	Diagnostic Procedure 2	Diagnostic Procedure 3	Diagnostic Procedure 4	Diagnostic Procedure 5	Diagnostic Procedure 6	Diagnostic Procedure 7	Diagnostic Procedure 8
Wiper & washer	Intermittent wiper does not operate.				○	○							
	Intermittent time of wiper cannot be adjusted.						○						
	Wiper and washer activate individually but not in combination.							○					
Warning	Light warning chime does not activate.	○			○				○				
	Ignition key warning chime does not activate.		○		○					○			
	Seat belt warning chime does not activate.			○	○						○		
	Seat belt warning lamp does not come on, or does not go off after coming on.				○							○	
Rear defogger	Rear defogger does not activate, or go off after activating.				○								○

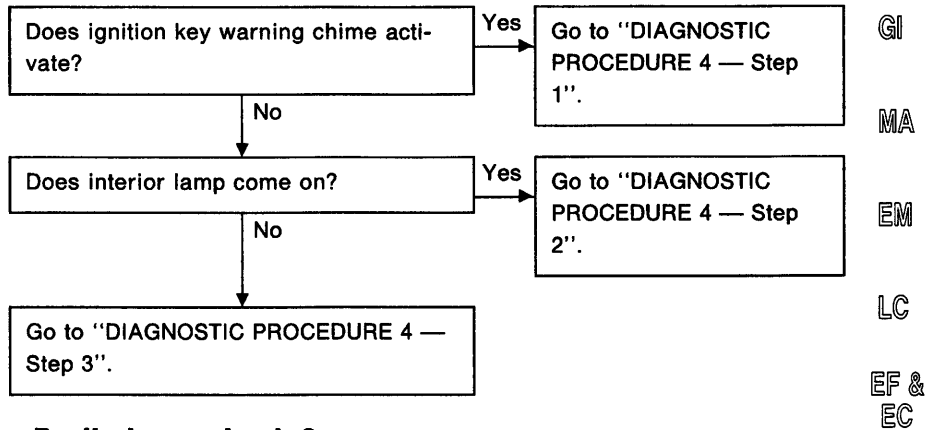
TIME CONTROL SYSTEM

Trouble Diagnoses (Cont'd)

PRELIMINARY CHECK

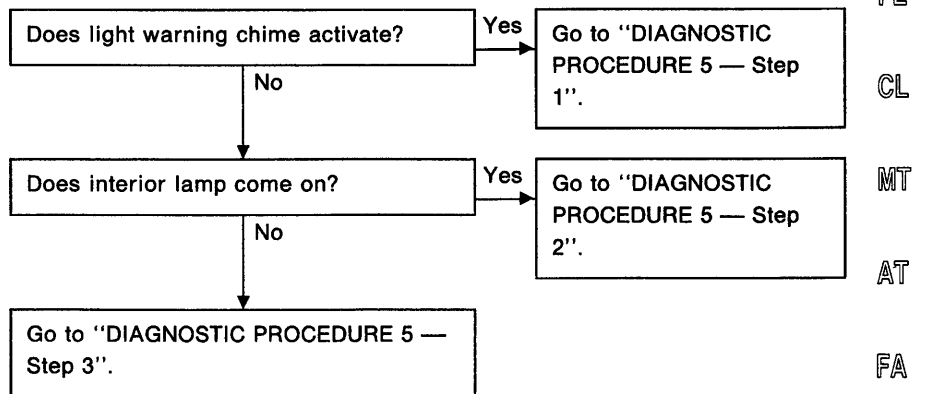
Preliminary check 1

- Light warning chime does not activate.



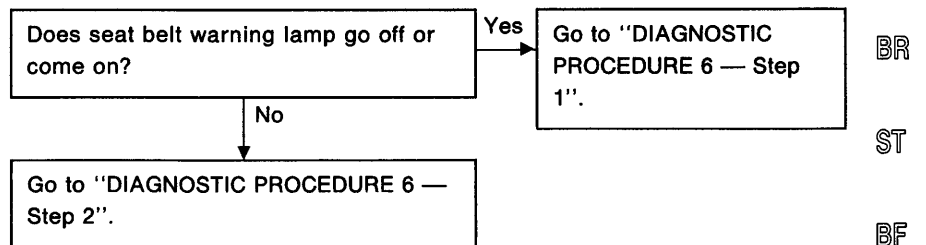
Preliminary check 2

- Ignition key warning chime does not activate.



Preliminary check 3

- Seat belt warning chime does not activate.



TIME CONTROL SYSTEM

Trouble Diagnoses (Cont'd)

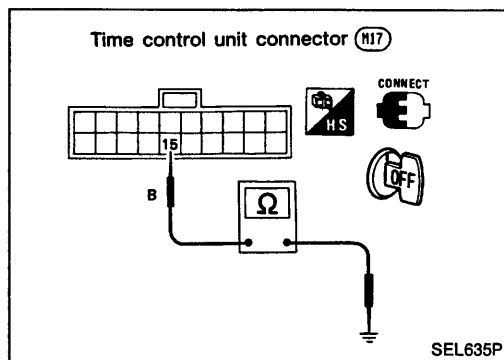
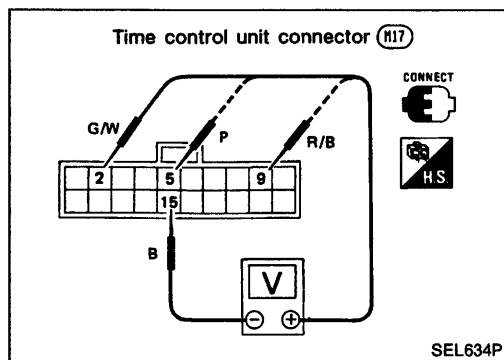
MAIN POWER SUPPLY AND GROUND CIRCUIT CHECK

Main power supply

Terminals	Battery voltage existence condition		
	Ignition switch position		
	OFF	ACC	ON
⑨ - ⑮	Yes	Yes	Yes
⑤ - ⑮	No	No	Yes
② - ⑮	No	Yes	Yes

Ground circuit

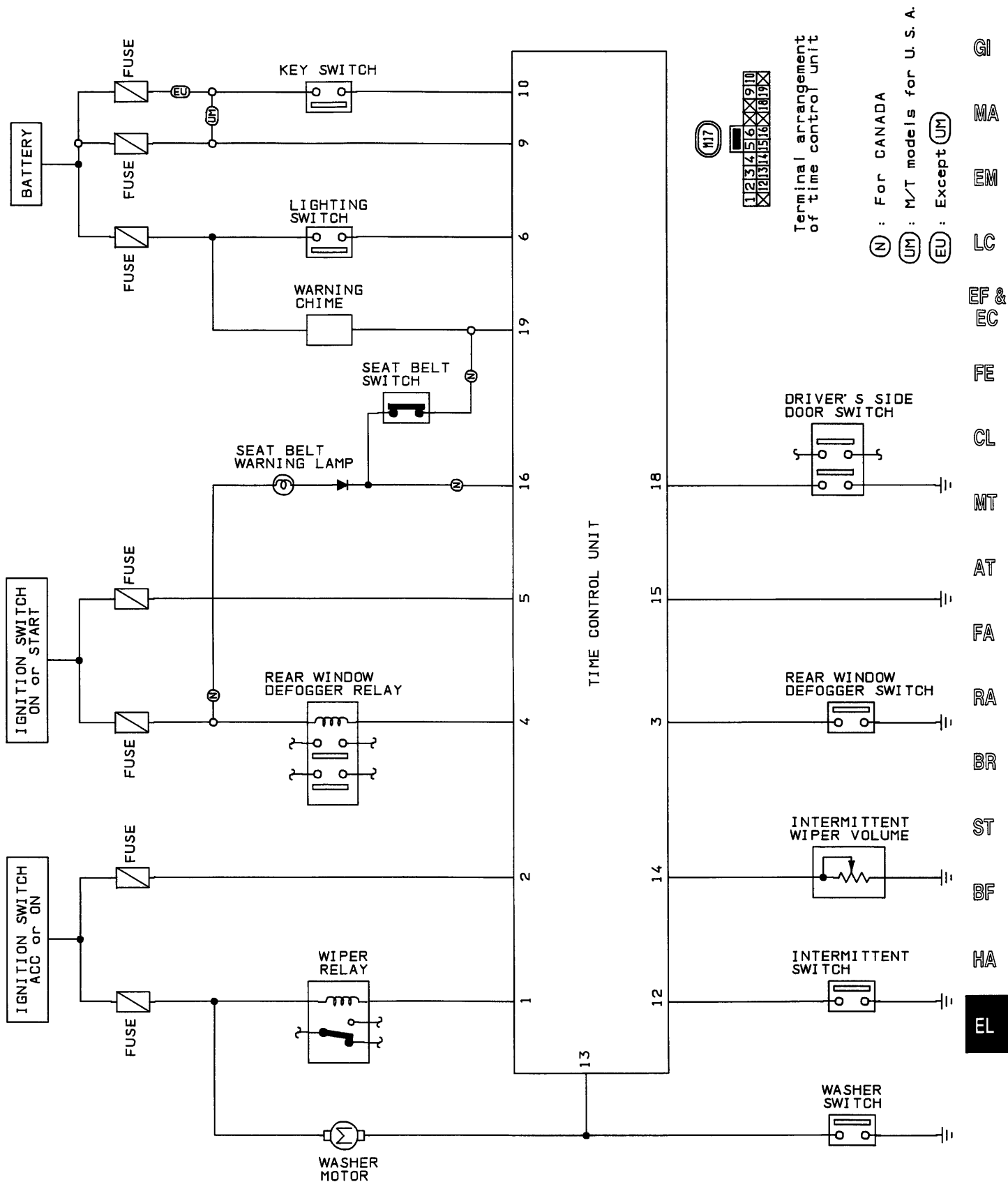
Terminals	Continuity
⑮ - Ground	Yes



TIME CONTROL SYSTEM

Trouble Diagnoses (Cont'd)

CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK

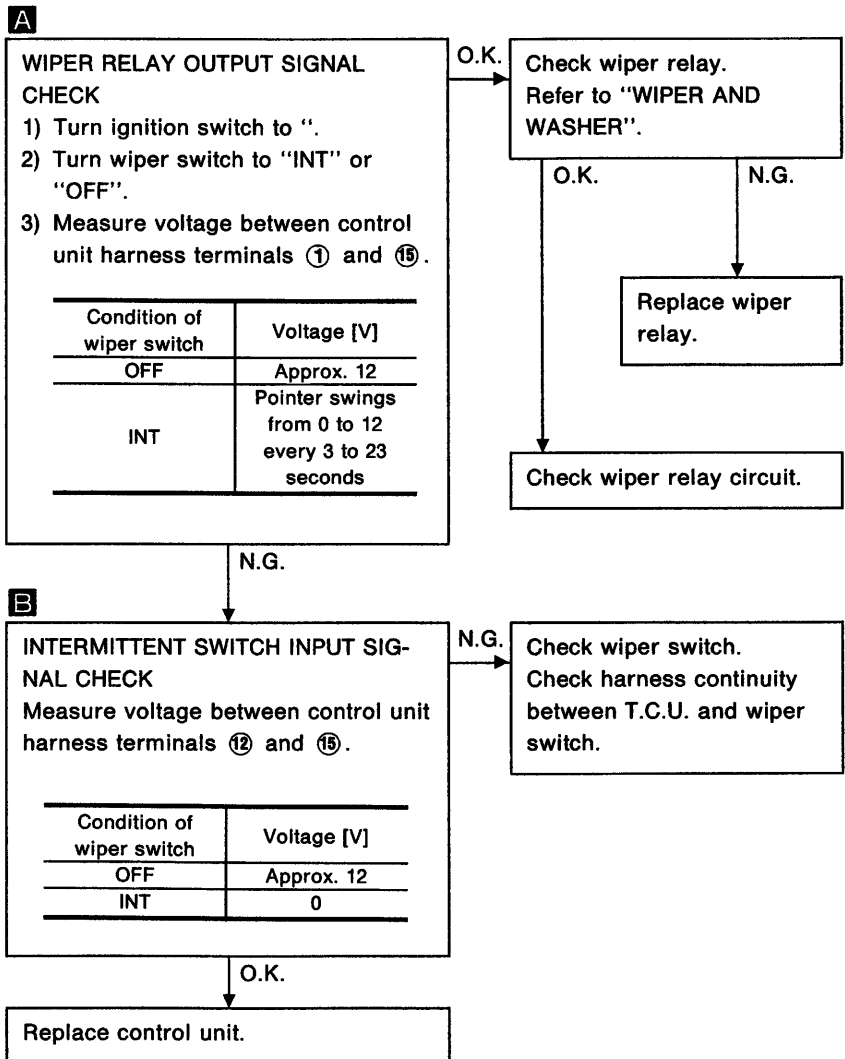
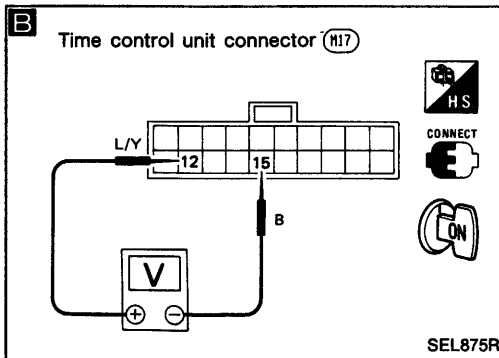
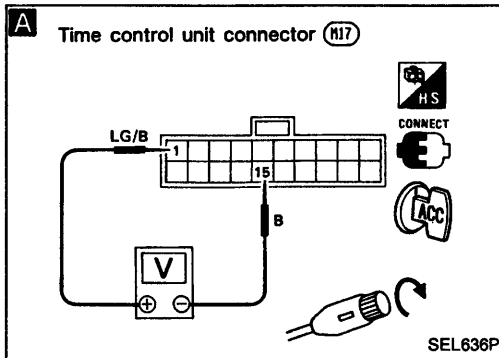


TIME CONTROL SYSTEM

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1

SYMPTOM: Intermittent wiper does not operate.

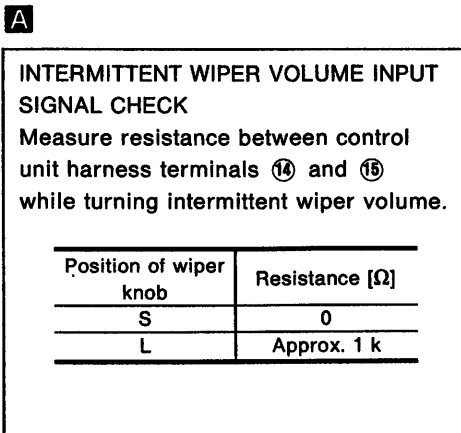
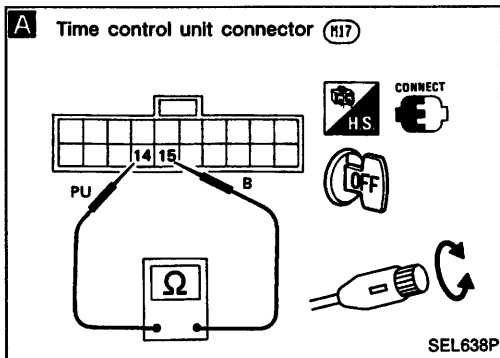


TIME CONTROL SYSTEM

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 2

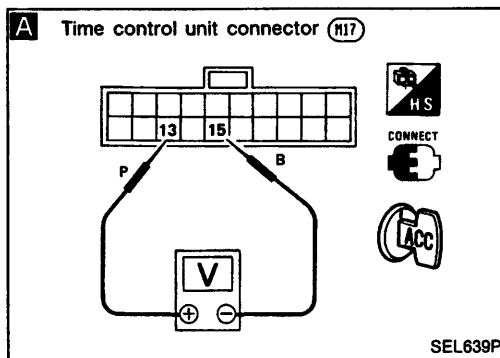
SYMPTOM: Intermittent time of wiper cannot be adjusted.



O.K. → Replace control unit.

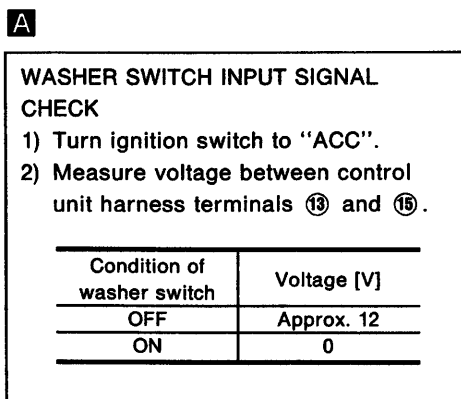
N.G. →

Check intermittent wiper volume.
Check harness continuity between T.C.U. and wiper switch.



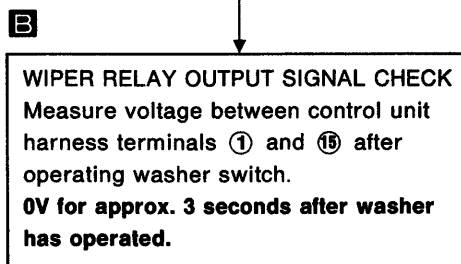
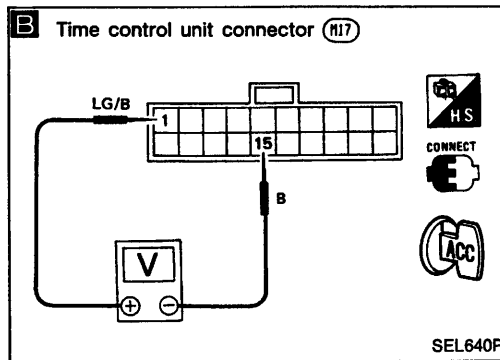
DIAGNOSTIC PROCEDURE 3

SYMPTOM: Wiper and washer activate individually but not in combination.



N.G. → Check harness continuity between T.C.U. and washer switch.

O.K. →



N.G. → Replace control unit.

O.K. →

Replace wiper relay.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

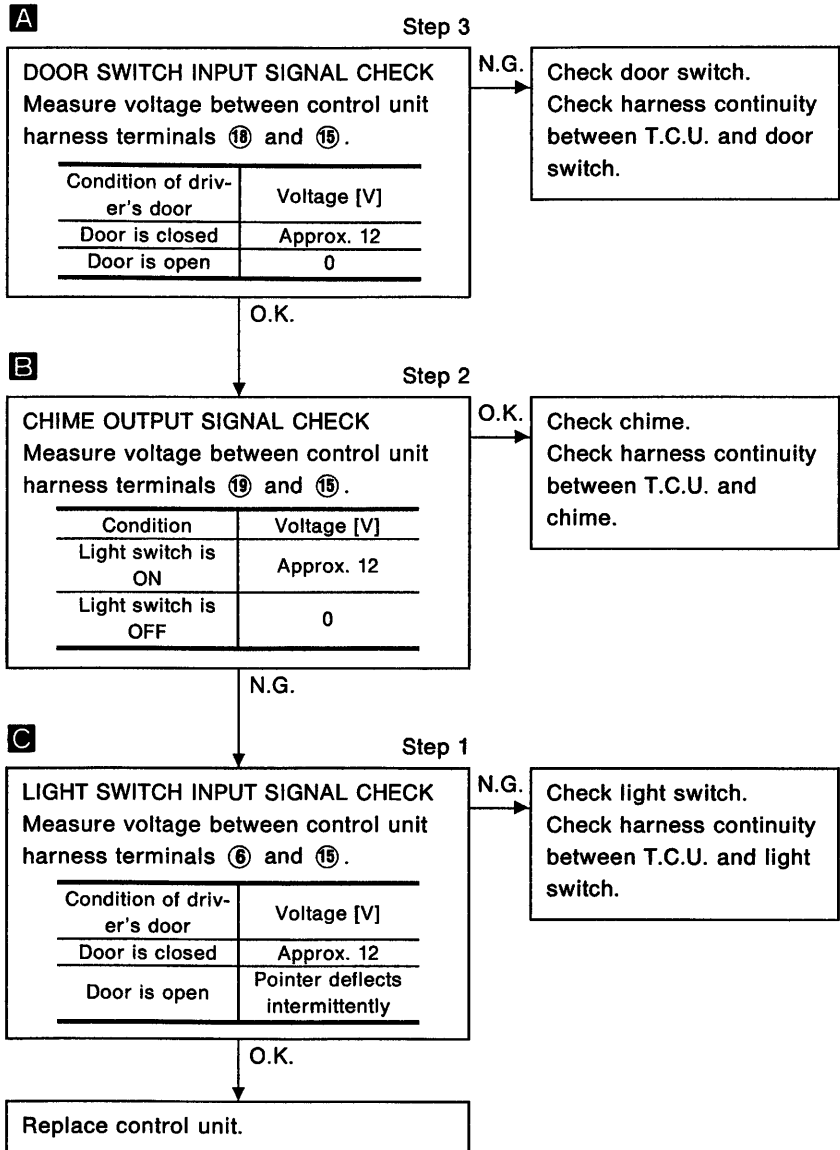
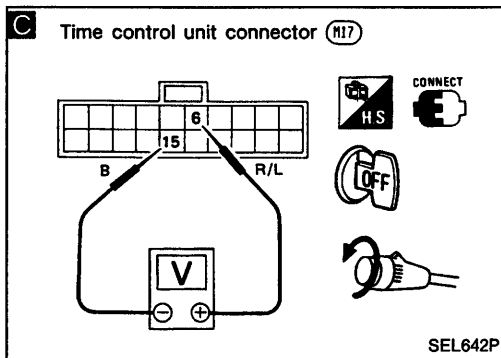
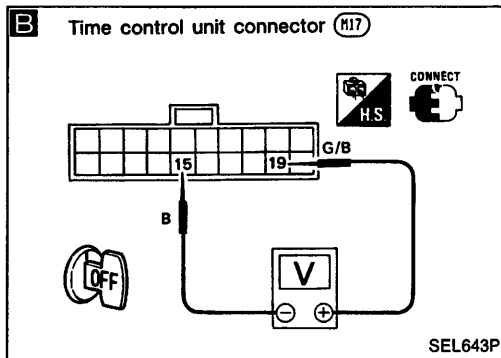
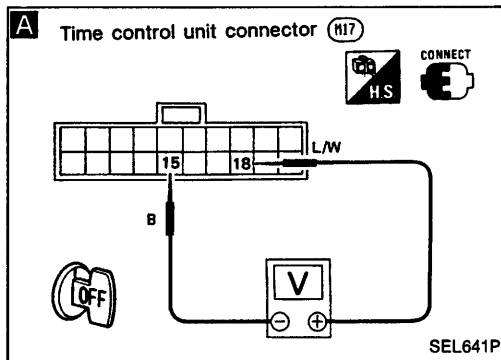
TIME CONTROL SYSTEM

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4

SYMPTOM: Light warning chime does not activate.

- Perform "PRELIMINARY CHECK — Procedure 1" before referring to the following flow chart.



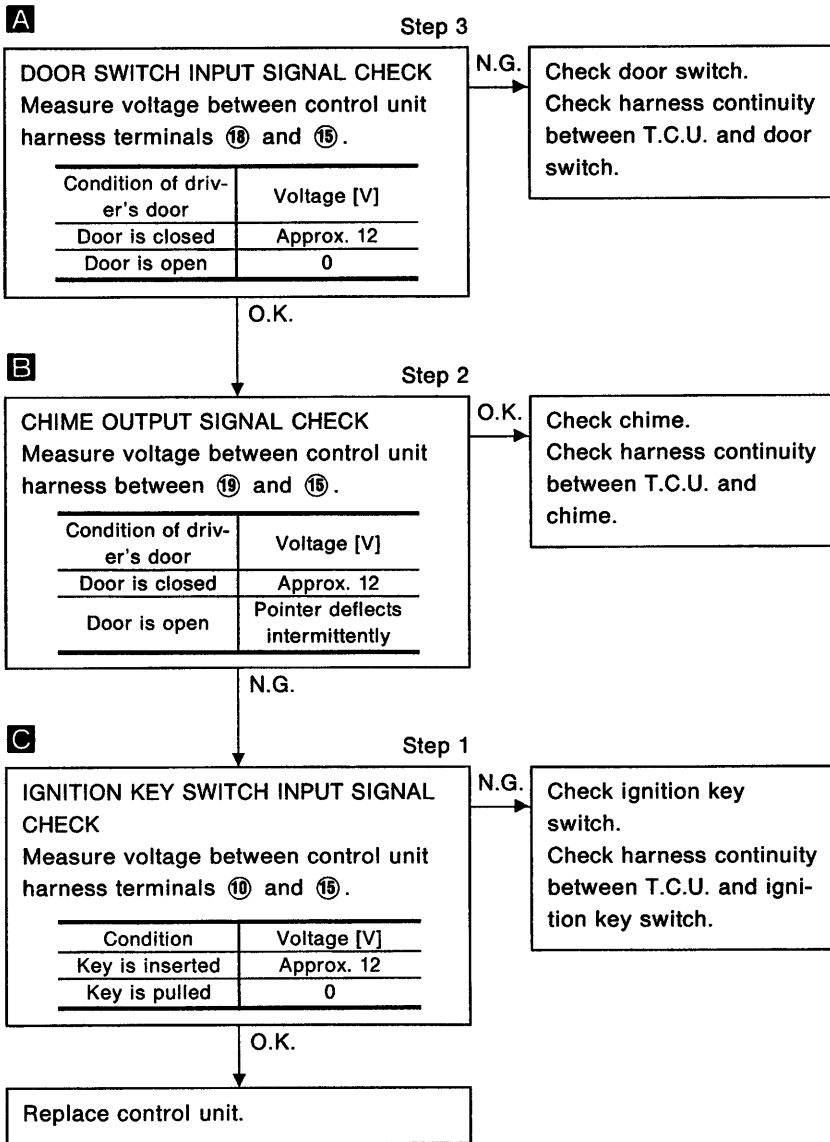
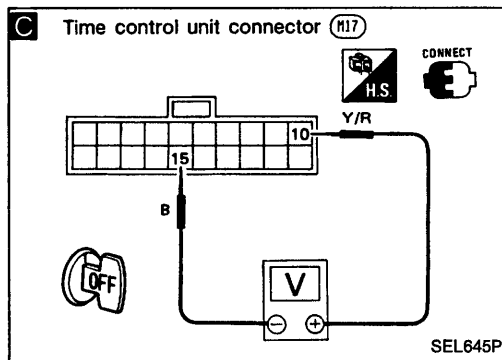
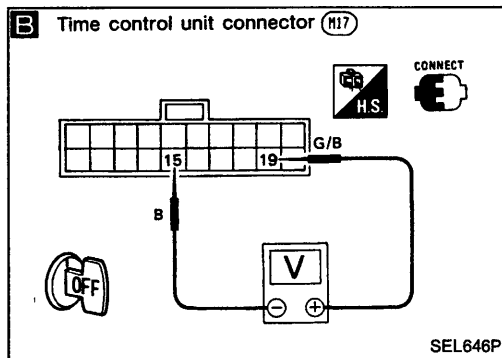
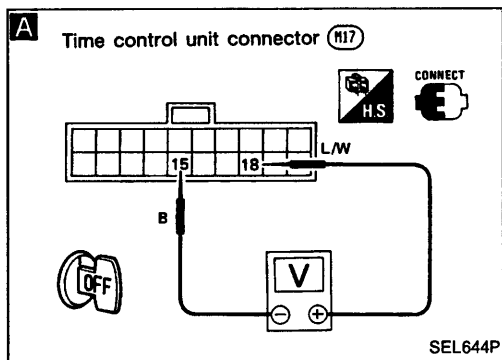
TIME CONTROL SYSTEM

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 5

SYMPTOM: Ignition key warning chime does not activate.

- Perform "PRELIMINARY CHECK — Procedure 2" before referring to the following flow chart.



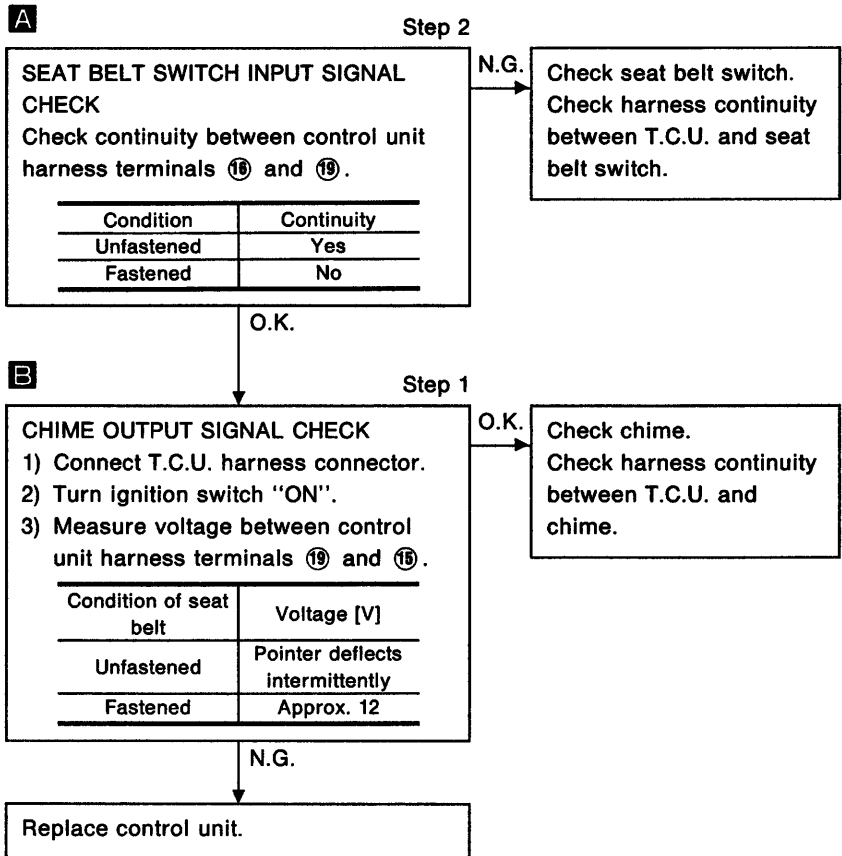
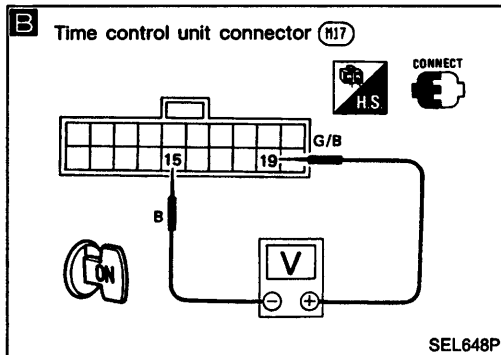
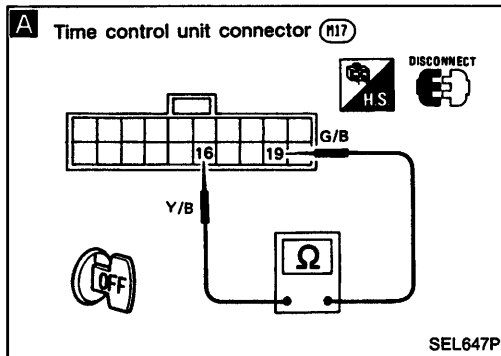
TIME CONTROL SYSTEM

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6

SYMPTOM: Seat belt warning chime does not activate.

- Perform "PRELIMINARY CHECK — Procedure 3" before referring to the following flow chart.

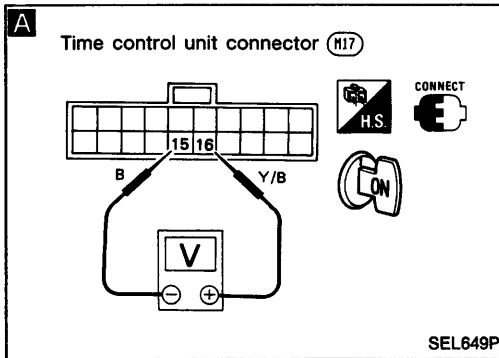


TIME CONTROL SYSTEM

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 7

SYMPTOM: Seat belt warning lamp does not come on, or does not go off after coming on.



A WARNING LAMP OUTPUT SIGNAL CHECK

- 1) Connect T.C.U. harness connector.
- 2) Turn ignition switch "ON", after connecting control unit harness terminals 16 and 15.
- 3) Does voltmeter needle keep swinging for about 7 seconds after ignition switch has been turned "ON"?

Yes → Check warning lamp.
Check harness continuity between T.C.U. and warning lamp.

No

Replace control unit.

GI

MA

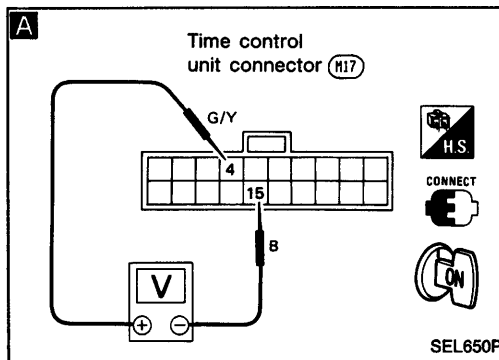
EM

LC

EF &
EC

FE

CL



DIAGNOSTIC PROCEDURE 8

SYMPTOM: Rear defogger does not activate, or does not go off after activating.

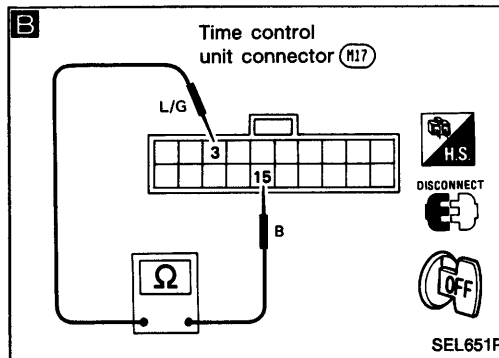
A REAR WINDOW DEFOGGER OUTPUT SIGNAL CHECK

Measure voltage between control unit harness 4 and 15.

Condition of defogger switch	Voltage [V]
Defogger switch is "OFF"	Approx. 12
Defogger switch is "ON"	0

O.K. → Check rear window defogger relay.
Check rear window defogger circuit.

N.G.



B REAR WINDOW DEFOGGER SWITCH INPUT SIGNAL CHECK

- 1) Disconnect T.C.U. harness connector.
- 2) Check continuity between control unit harness terminals 3 and 15.

Condition of defogger switch	Continuity
Defogger switch is "OFF"	No
Defogger switch is "ON"	Yes

N.G. → Check rear window defogger switch.
Check harness continuity between T.C.U. and rear window defogger switch.

O.K.

Replace control unit.

MT

AT

FA

RA

BR

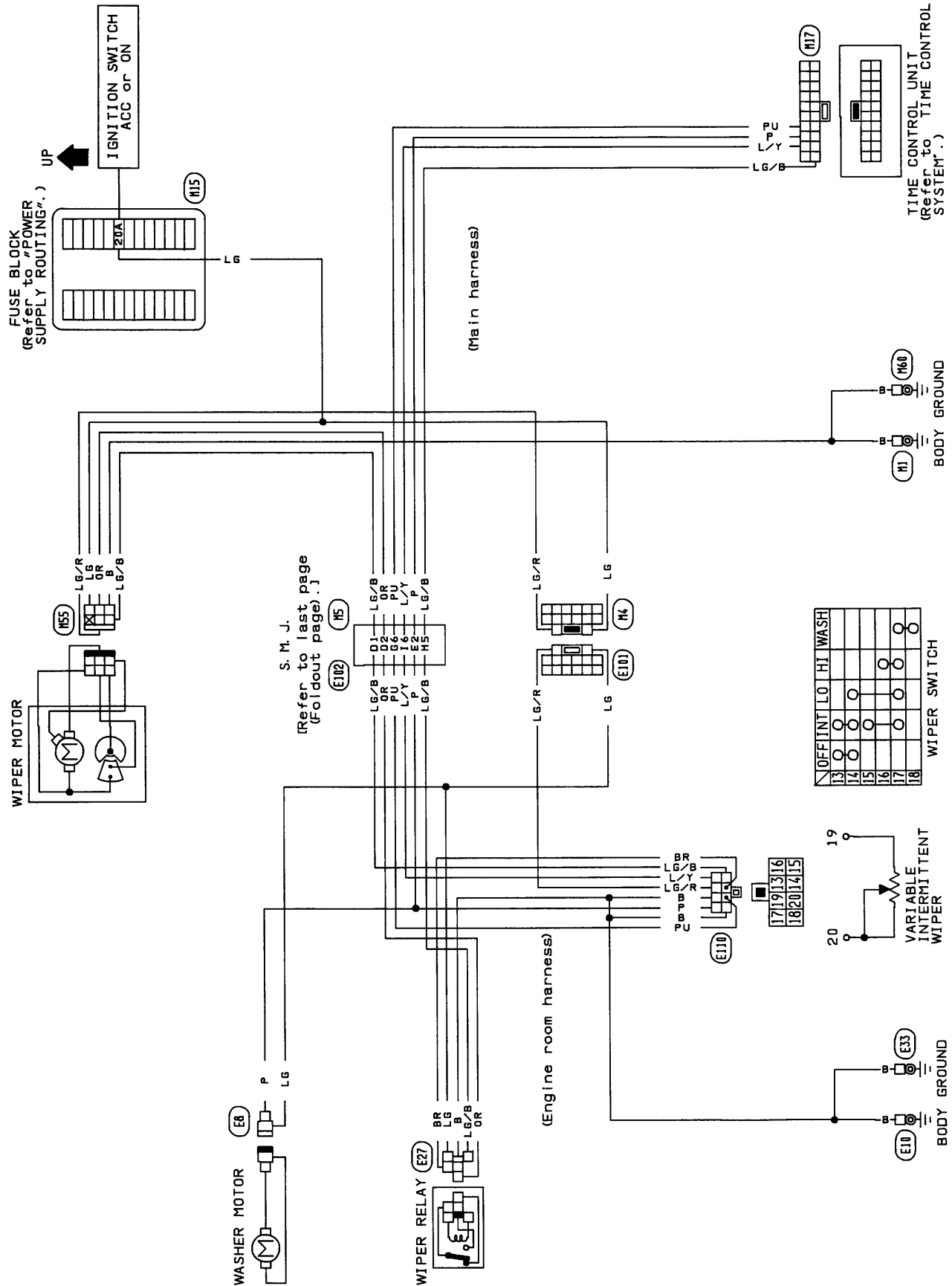
ST

BF

HA

EL

Front Wiper and Washer/Wiring Diagram



Installation

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 center to clearance "C" or "D" 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" or "D".
- Tighten windshield wiper arm nuts to specified torque.

Front wiper:

17 - 23 N·m (1.7 - 2.3 kg·m, 12 - 17 ft·lb)

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

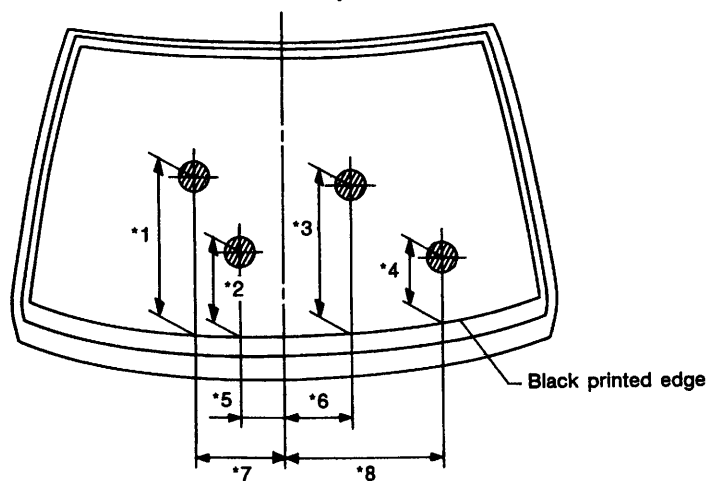
BF

HA

EL

Front wiper and washer

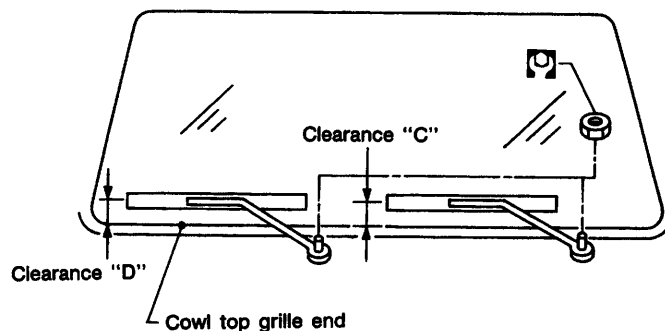
Washer nozzle adjustment



All the diameters of these circles are less than 80 (3.15).

*1:	405 (15.94)
*2:	220 (8.66)
*3:	385 (15.16)
*4:	170 (6.69)
*5:	115 (4.53)
*6:	180 (7.09)
*7:	225 (8.86)
*8:	420 (16.54)

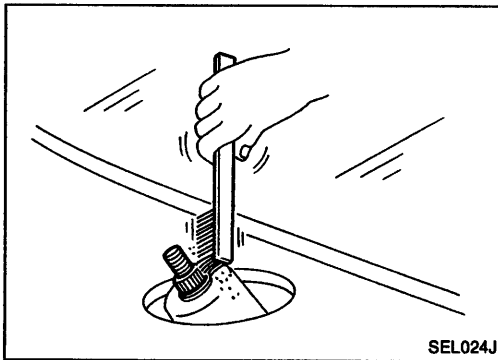
Unit: mm (in)



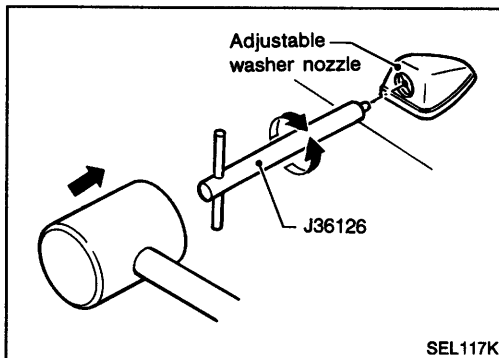
MEL417A

WIPER AND WASHER

Installation (Cont'd)



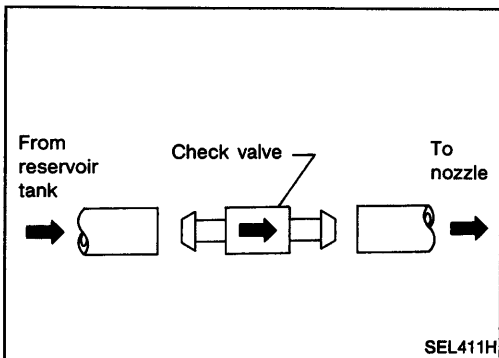
- Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.



Washer Nozzle Adjustment

- Adjust washer nozzle with adjusting tool (Tool number: J36126) as shown in the figure at left.

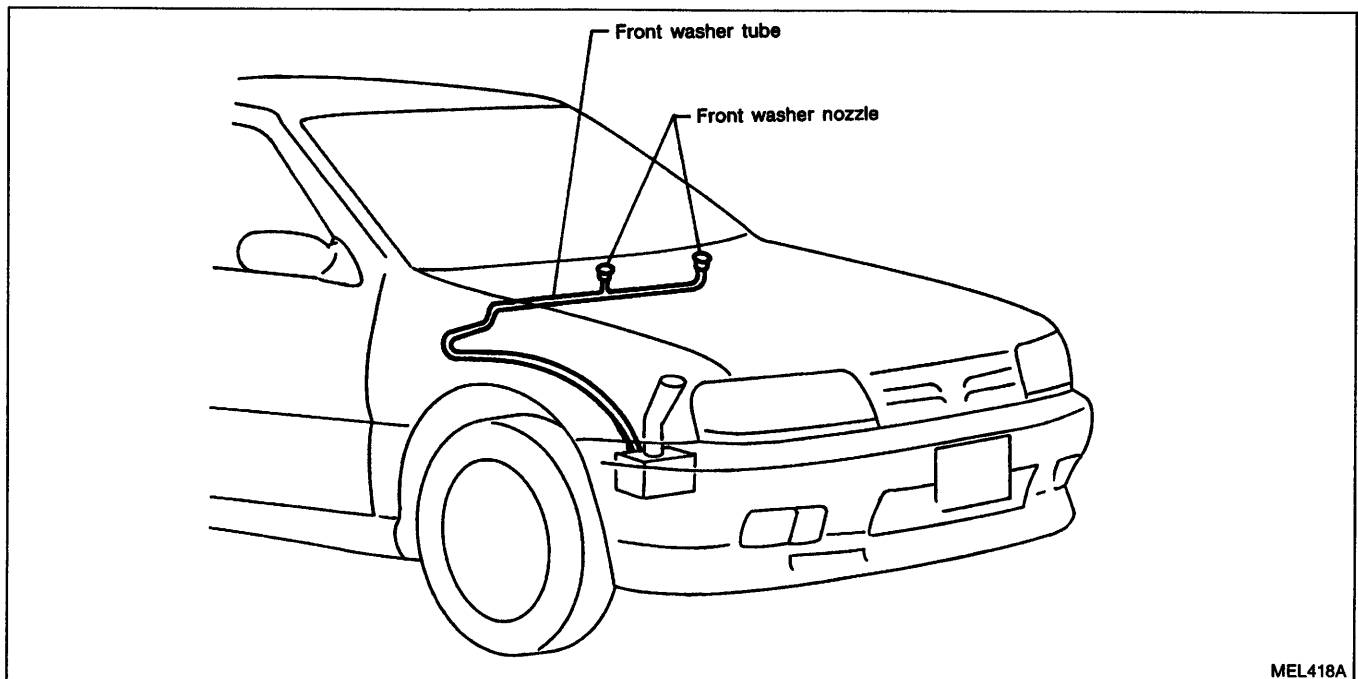
Before attempting to turn the nozzle, gently tap the end of the tool to free the nozzle. This will prevent "rounding out" the small female square in the center of the nozzle.



Check Valve

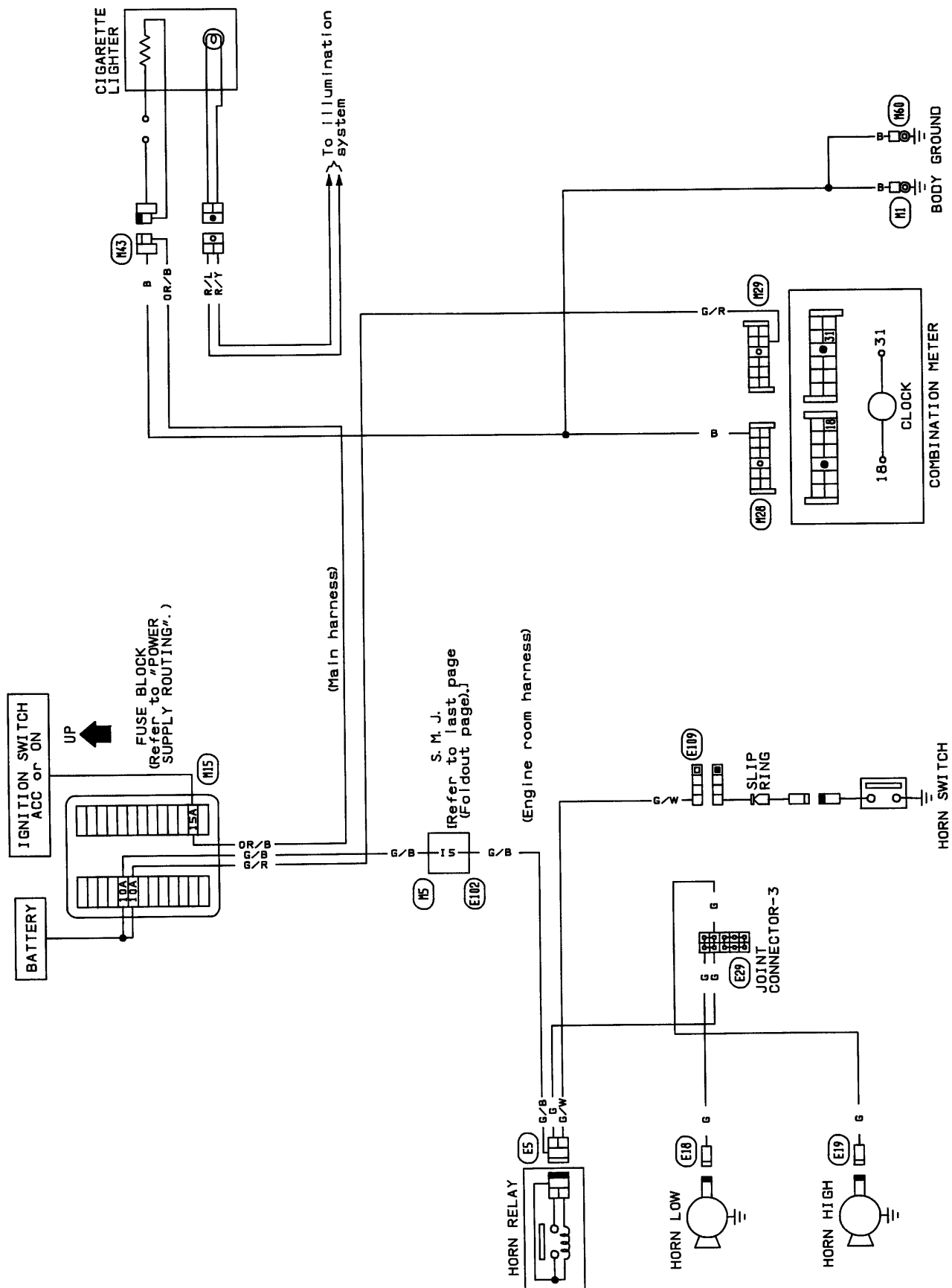
- A check valve is provided in the washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.

Washer Tube Layout



HORN, CIGARETTE LIGHTER AND CLOCK

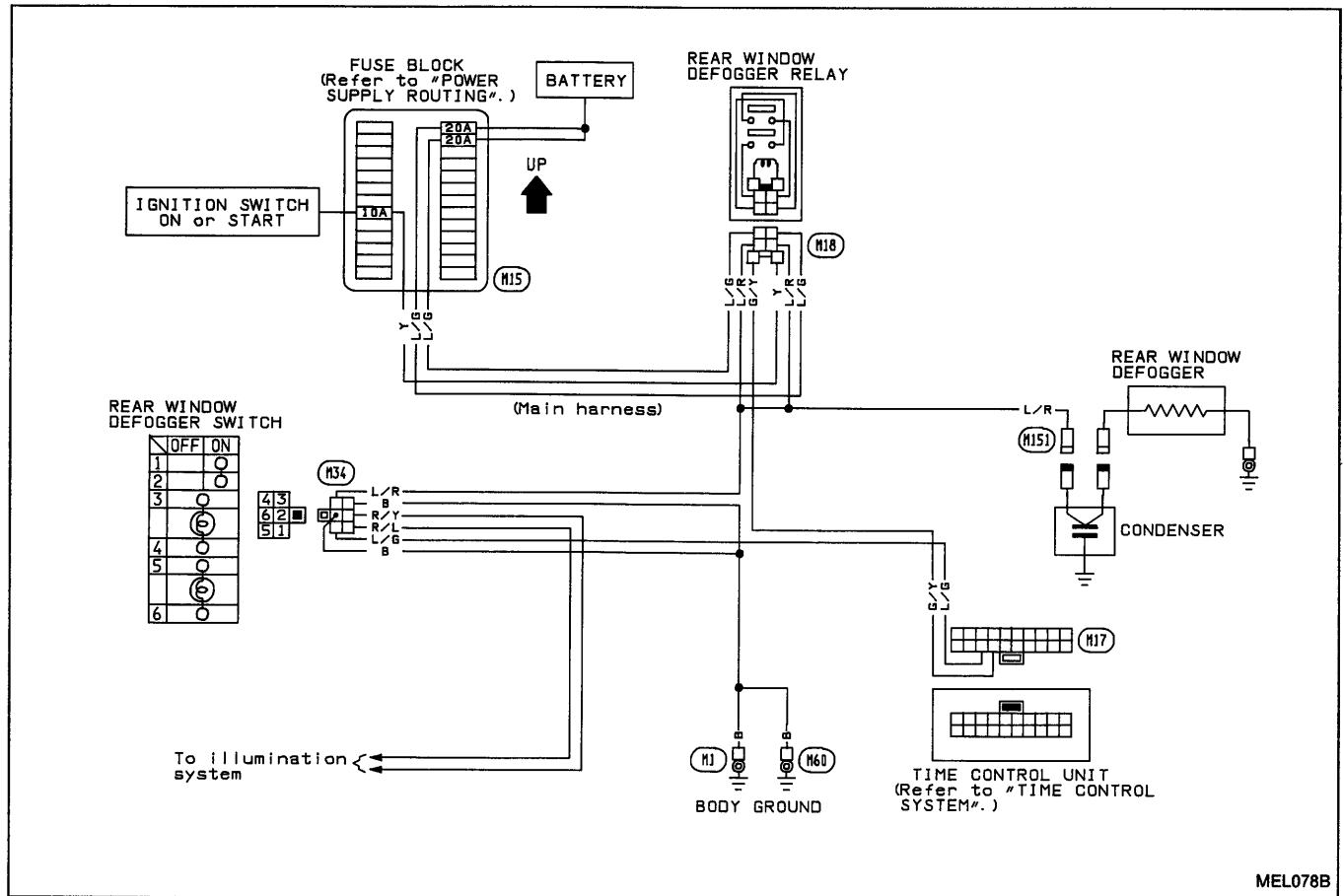
Wiring Diagram



GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

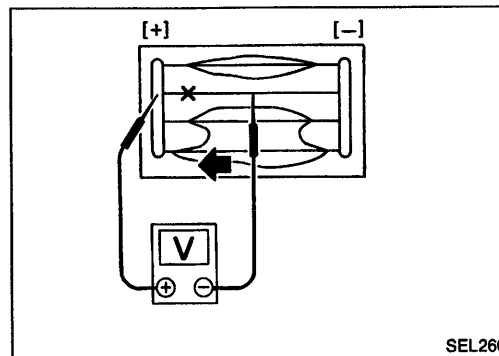
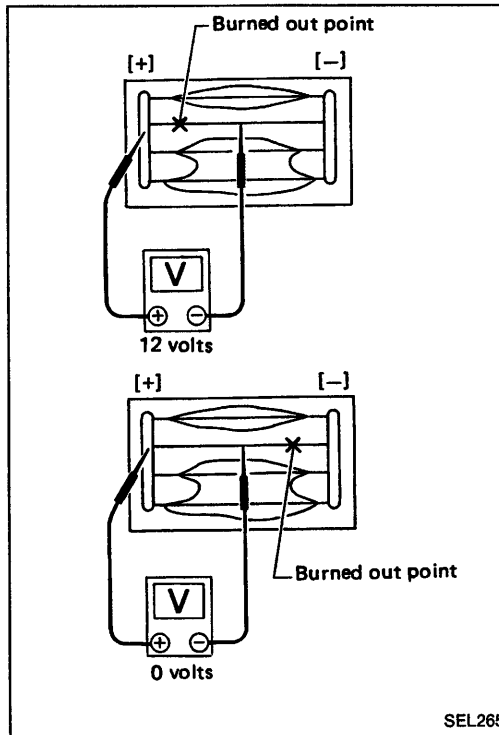
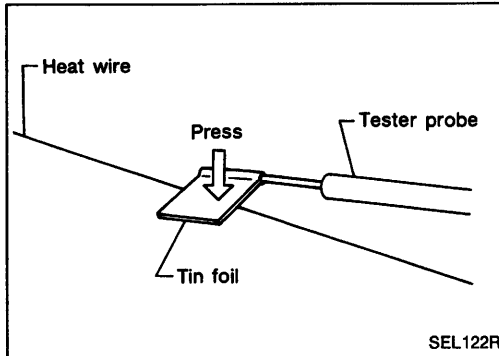
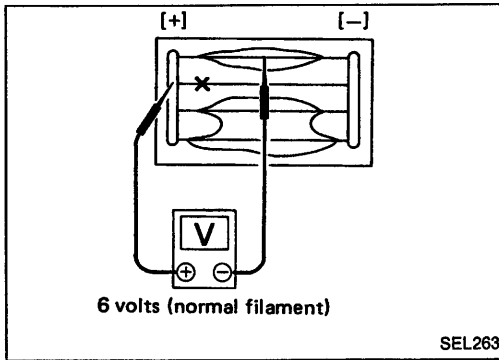
REAR WINDOW DEFOGGER

Wiring Diagram



MEL078B

REAR WINDOW DEFOGGER



Filament Check

1. Attach probe circuit tester (in volt range) to middle portion of each filament.

- When measuring voltage, wind a piece of tin foil around the top of the negative probe and press the foil against the wire with your finger as shown.

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.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

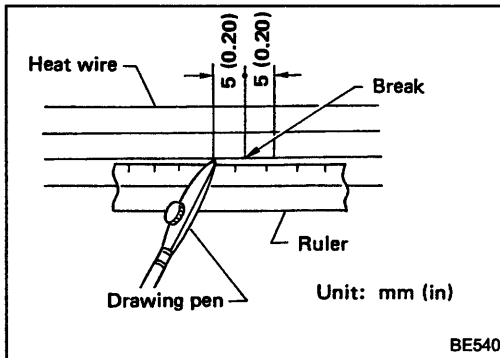
EL

REAR WINDOW DEFOGGER

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

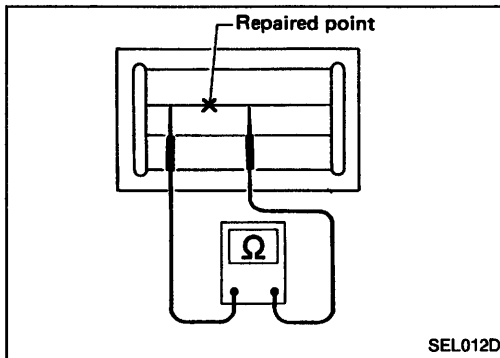
1. Wipe broken heat wire and its surrounding area clean with a cloth dampened in alcohol.
2. Apply a small amount of conductive silver composition to tip of drawing pen.

Shake silver composition container before use.

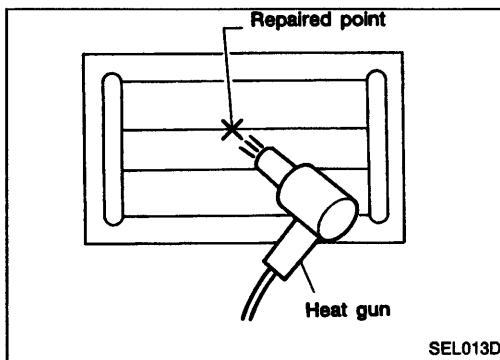
3. Place ruler on glass along broken line. Deposit conductive silver composition on break with drawing pen. Slightly overlap existing heat wire on both sides [preferably 5 mm (0.20 in)] of the break.

4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

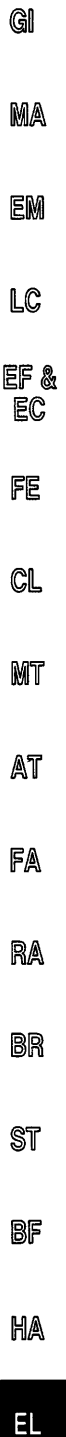
Do not touch repaired area while test is being conducted.



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.

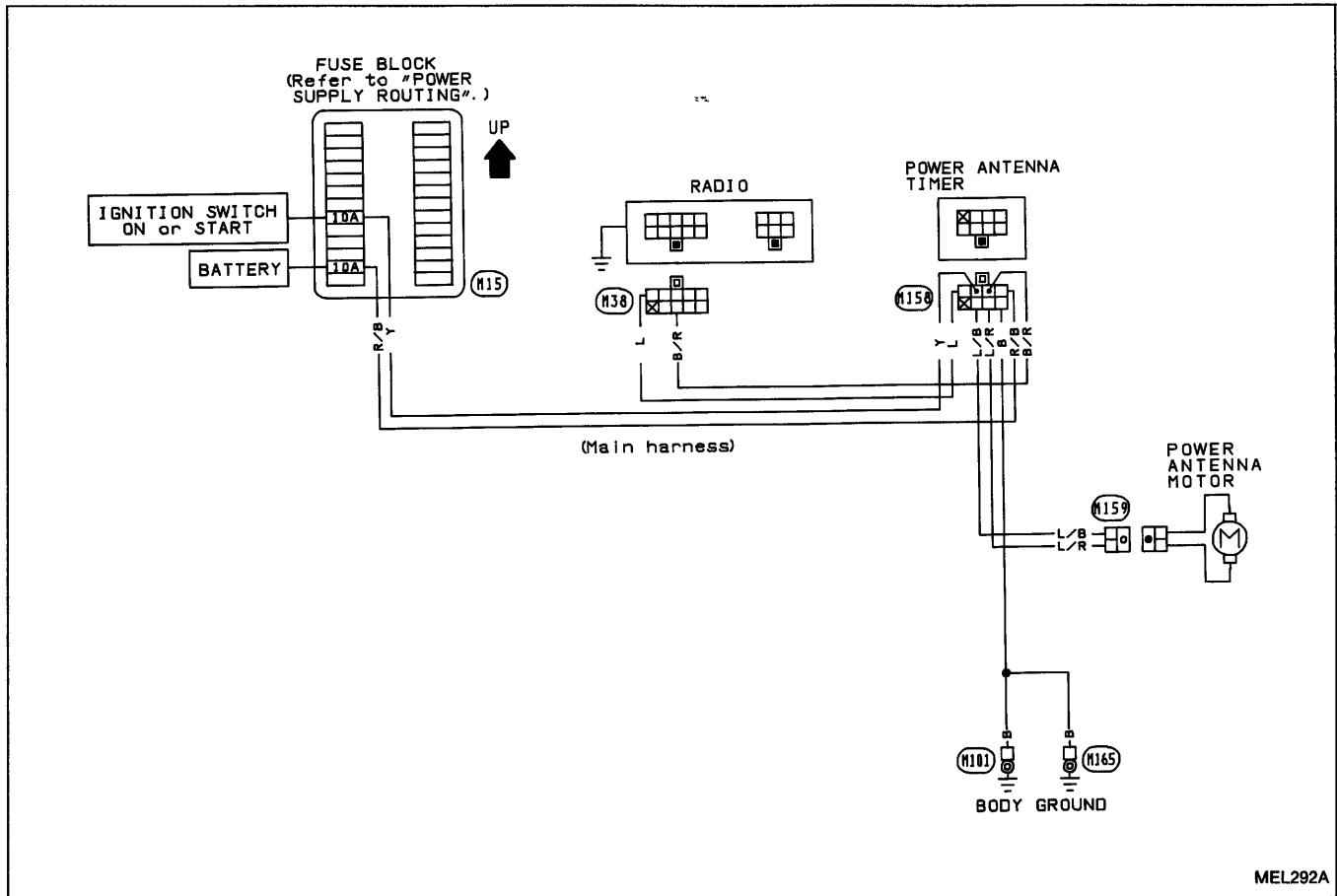


Audio/Wiring Diagram

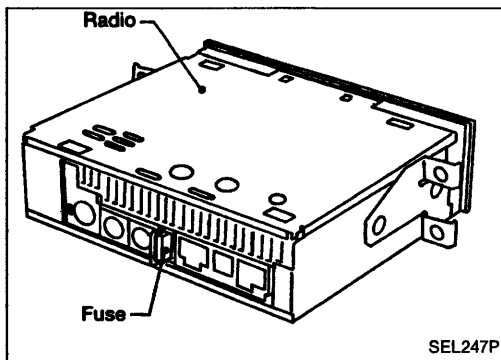
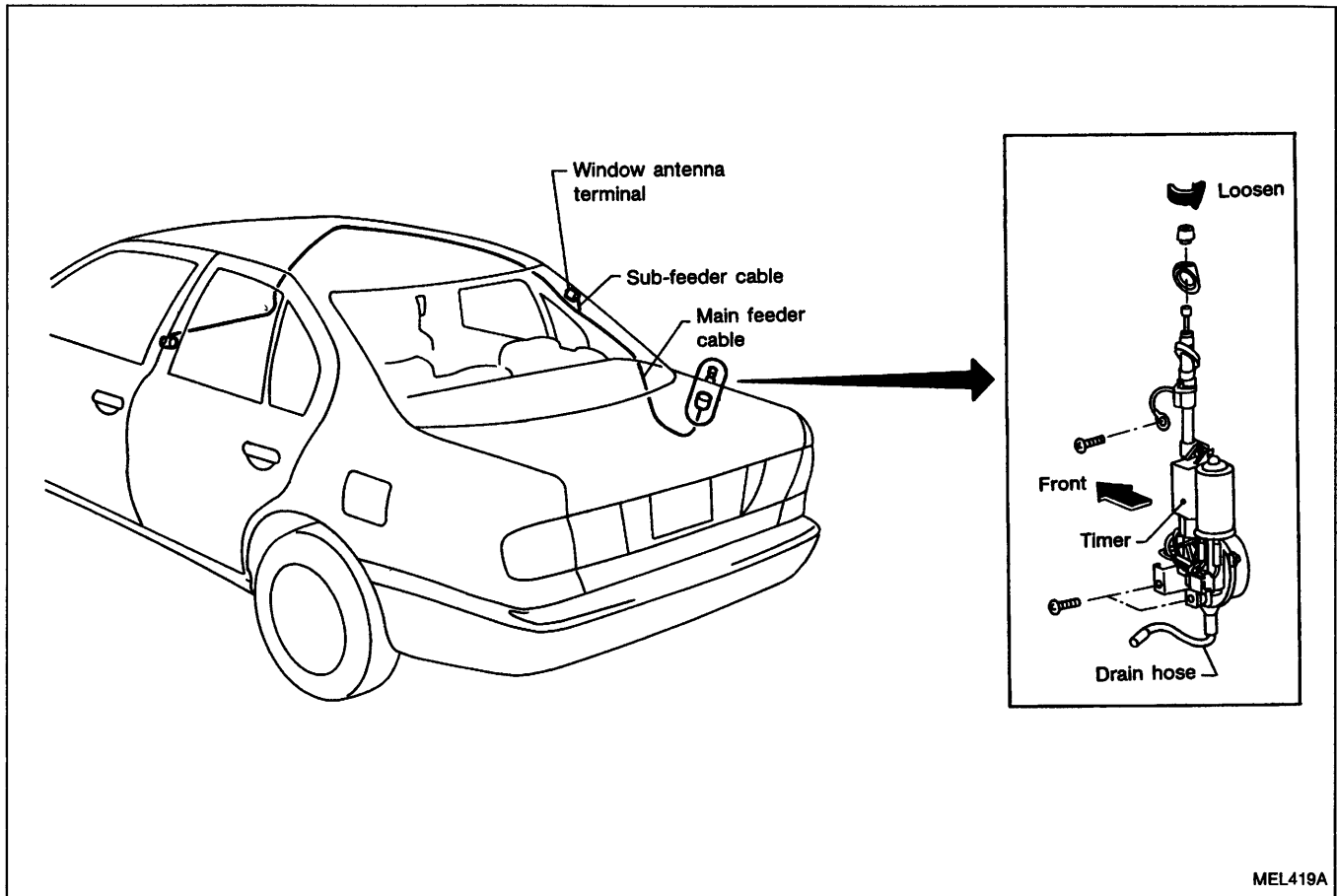


AUDIO AND POWER ANTENNA

Power Antenna/Wiring Diagram

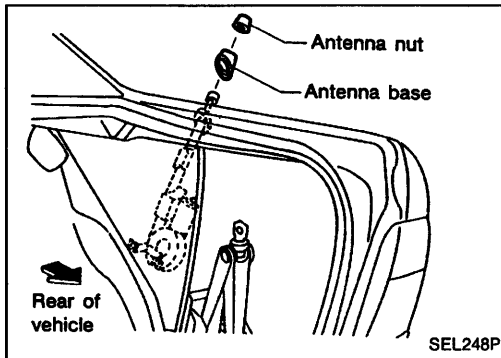


Location of Antenna



Radio Fuse Check

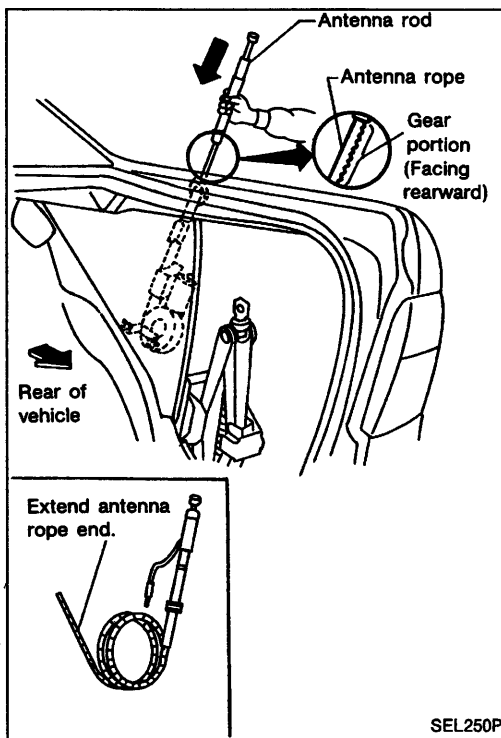
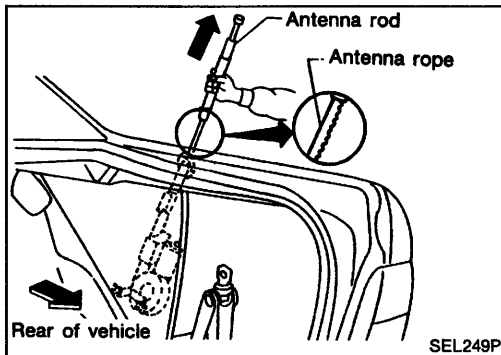
GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL



Antenna Rod Replacement

REMOVAL

1. Remove antenna nut and antenna base.
2. Withdraw antenna rod while raising it by operating antenna motor.



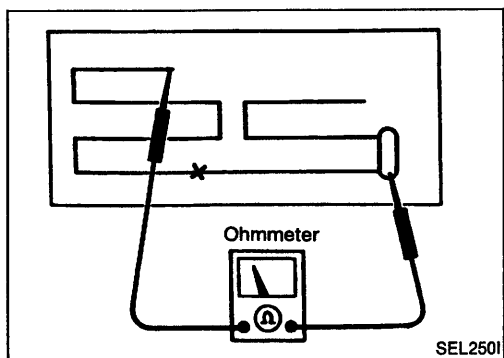
INSTALLATION

1. Lower antenna rod by operating antenna motor.
2. Insert gear section of antenna rope into place with it facing toward antenna motor.
3. As soon as antenna rope is wound on antenna motor, stop antenna motor. Insert antenna rod lower end into antenna motor pipe.
4. Retract antenna rod completely by operating antenna motor.
5. Install antenna nut and base.

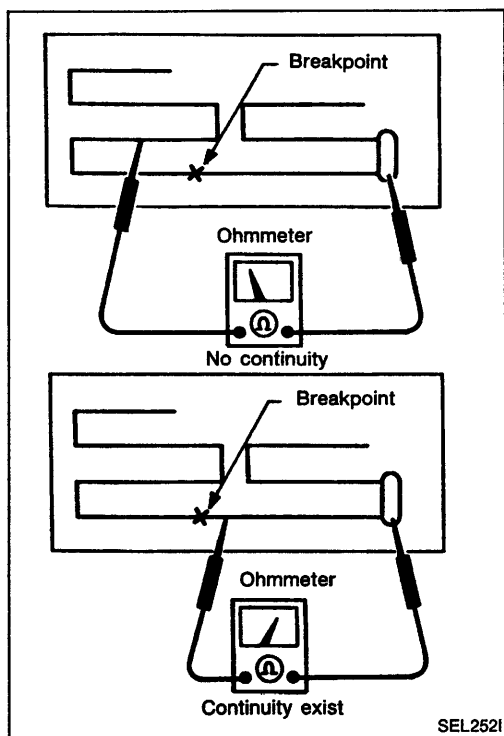
Window Antenna Repair

ELEMENT CHECK

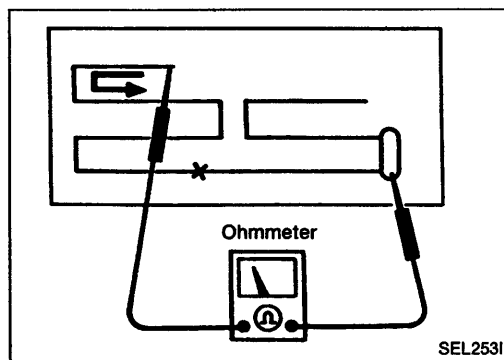
1. Attach probe circuit tester (in ohm range) to antenna terminal on each side.



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".

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

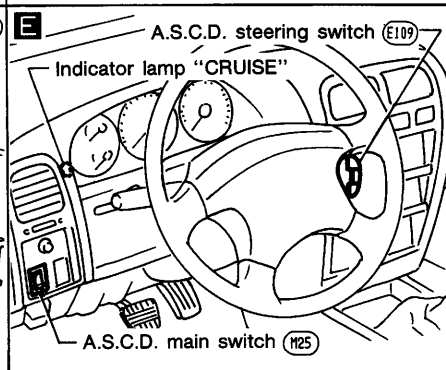
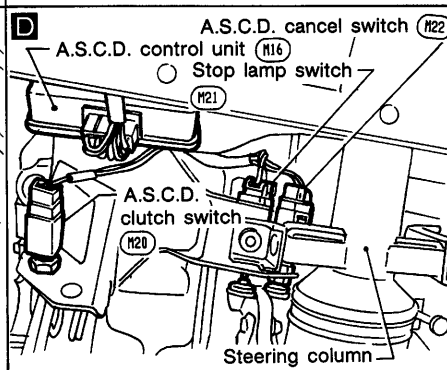
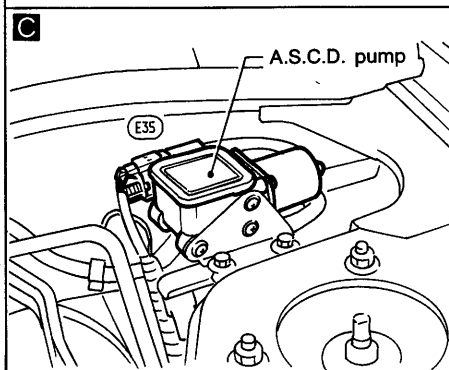
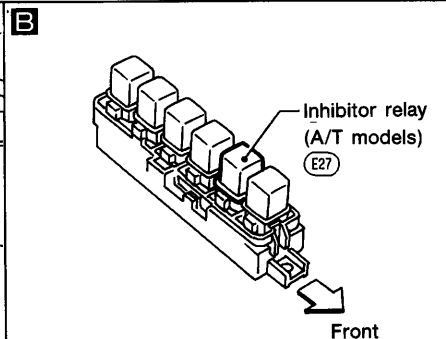
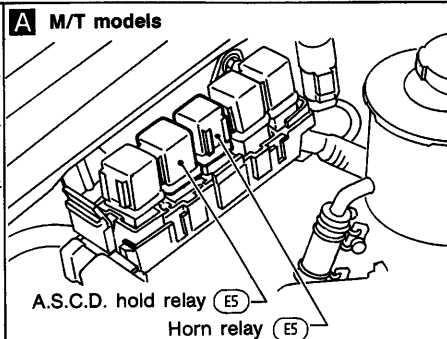
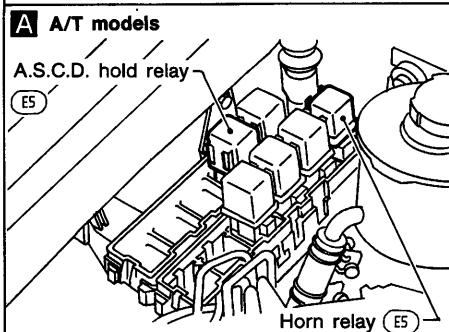
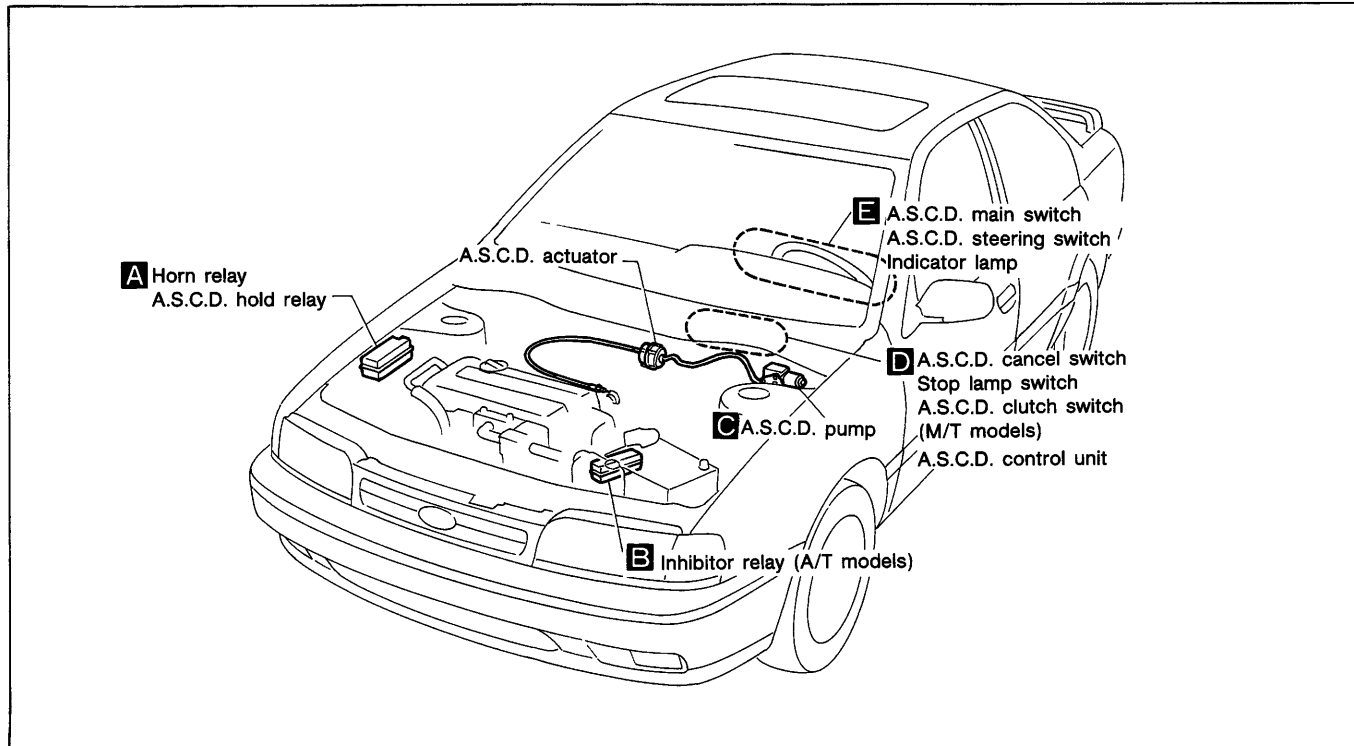
ST

BF

HA

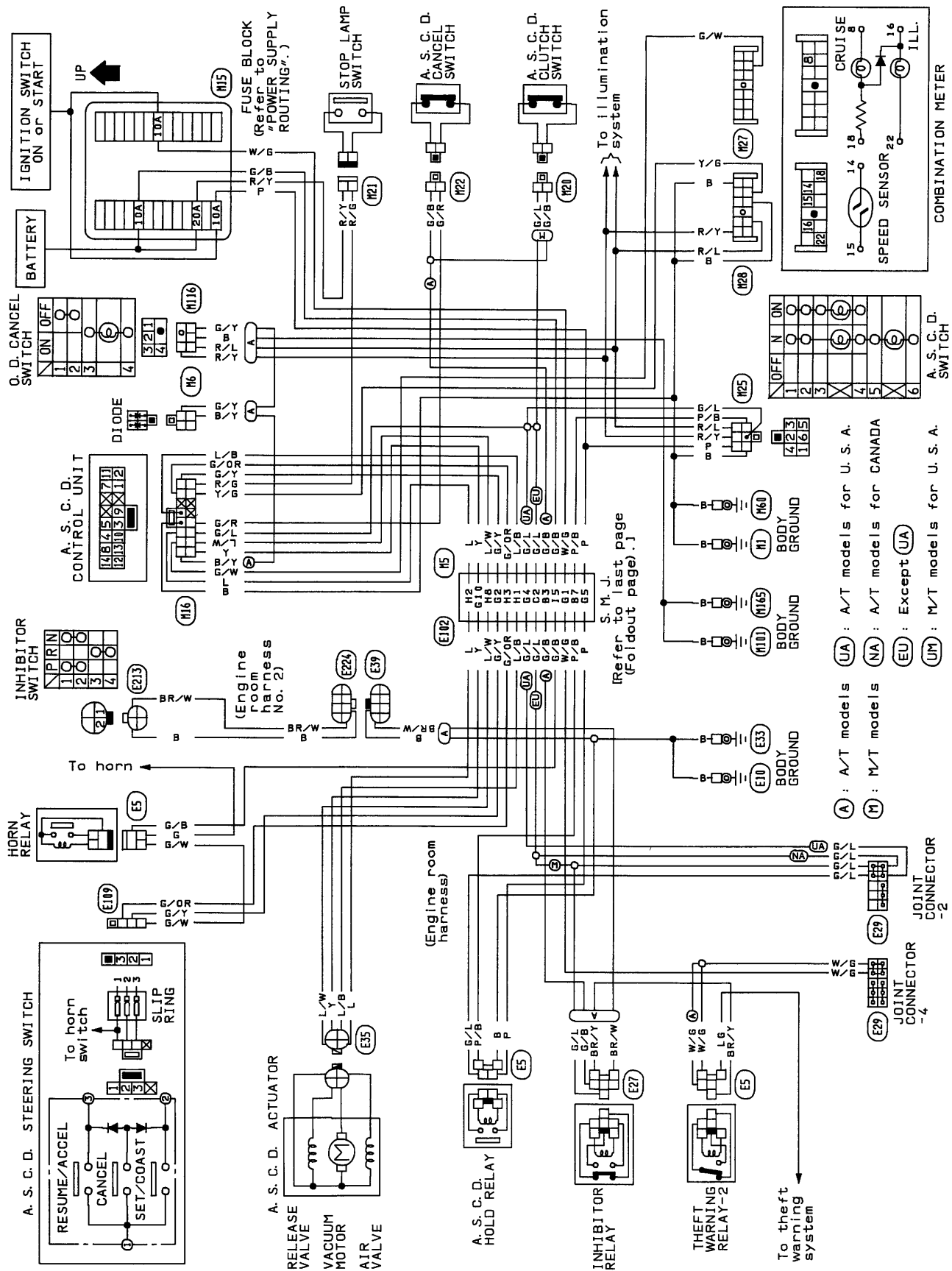
EL

Component Parts and Harness Connector Location



AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Wiring Diagram



GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses

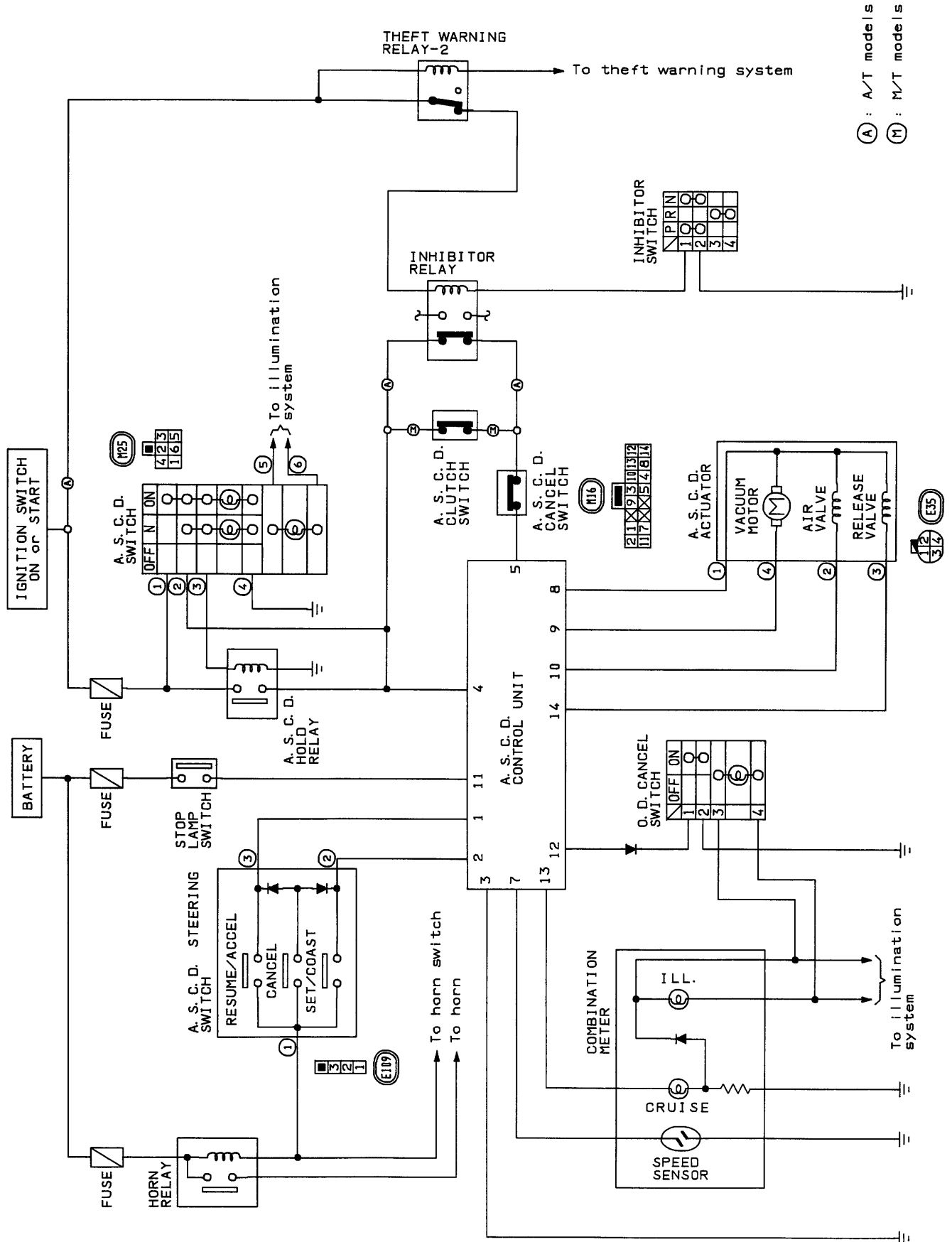
SYMPTOM CHART

PROCEDURE	Diagnostic Procedure								Electrical Components Inspection							
REFERENCE PAGE	EL-68	EL-70	EL-70	EL-71	EL-72	EL-73	EL-74	EL-75	EL-76	EL-77	EL-77	EL-78	EL-78	EL-78	EL-78	EL-78
SYMPTOM	Diagnostic Procedure 1	Diagnostic Procedure 2	Diagnostic Procedure 3	Diagnostic Procedure 4	Diagnostic Procedure 5	Diagnostic Procedure 6	Diagnostic Procedure 7	Diagnostic Procedure 8	A.S.C.D. wire adjustment	A.S.C.D. actuator/A.S.C.D. pump	A.S.C.D. main switch	A.S.C.D. steering switch	A.S.C.D. cancel switch and stop lamp switch	A.S.C.D. clutch switch (For M/T models)	Inhibitor switch (For A/T models)	Speed sensor
A.S.C.D. control unit cannot be set properly.	☐									☐	☐	☐	☐	☐	☐	☐
Engine hunts		☐							☐	☐						
Large difference between set speed and actual vehicle speed.			☐						☐	☐						
Deceleration is greatest immediately after A.S.C.D. has been set.				☐					☐	☐						
ACCEL switch will not operate.	☐				☐							☐				
RESUME switch will not operate.	☐					☐						☐	☐	☐		
Set speed cannot be cancelled.							☐		☐	☐			☐	☐		
"CRUISE" indicator lamp blinks.								☐		☐		☐	☐			

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



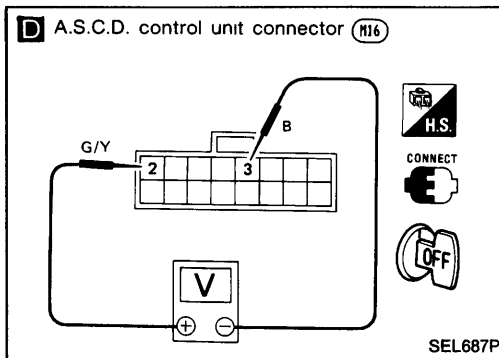
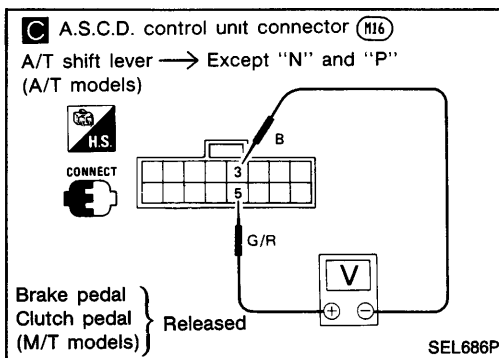
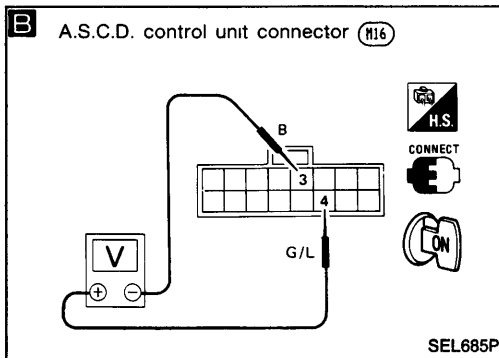
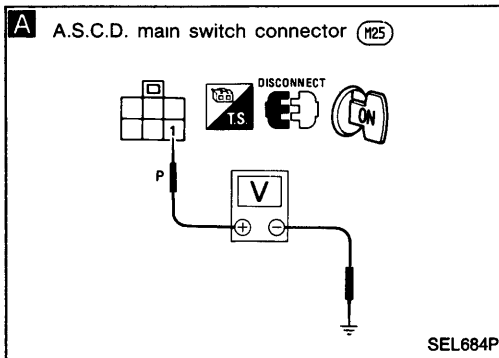
GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1

SYMPTOM: A.S.C.D. control cannot be set.



Turn A.S.C.D. main switch "OFF" and "ON" to make sure indicator illuminates.

O.K.

N.G.

A CHECK POWER SUPPLY FOR A.S.C.D. MAIN SWITCH.
1. Disconnect main switch harness connector.
2. Do approx. 12 volts exist between main switch harness terminal ① and body ground?

No

Yes

Check fuse and harness.

CHECK A.S.C.D. MAIN SWITCH.
Refer to "Electrical Components Inspection".
CHECK A.S.C.D. HOLD RELAY.

B CHECK POWER SUPPLY CIRCUIT FOR A.S.C.D. CONTROL UNIT.
1. Turn A.S.C.D. main switch "ON".
2. Check voltage between control unit harness terminal ④ and ③.
Battery voltage should exist.

O.K.

N.G.

Check continuity between control unit harness terminal ④ and A.S.C.D. hold relay.

C CHECK CUT-OFF CIRCUIT FOR A.S.C.D. CONTROL UNIT.
Check voltage between control unit harness terminals ⑤ and ③.
Battery voltage should exist.

O.K.

N.G.

CHECK A.S.C.D. CANCEL SWITCH, A.S.C.D. CLUTCH SWITCH (M/T models) AND INHIBITOR SWITCH (A/T models).
Refer to "Electrical Components Inspection".
CHECK INHIBITOR RELAY (A/T models) AND THEFT WARNING RELAY.

D CHECK SET/COAST SWITCH CIRCUIT FOR A.S.C.D. CONTROL UNIT.
1. Push and hold SET/COAST button on A.S.C.D. steering switch.
2. Check voltage between control unit harness terminals ② and ③.
Battery voltage should exist.

O.K.

N.G.

Does horn work?

No

Yes

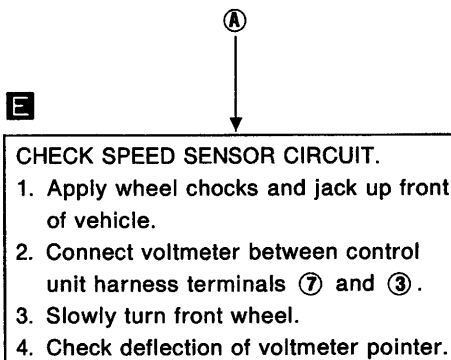
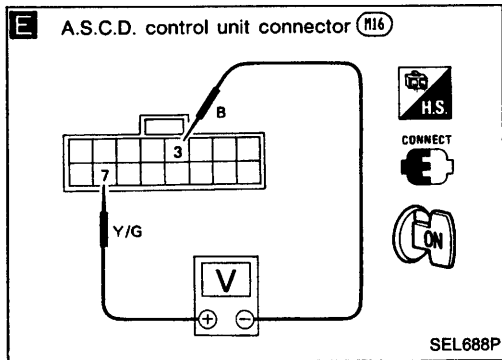
Check fuse and horn relay.

CHECK A.S.C.D. STEERING SWITCH.
Refer to "Electrical Components Inspection".

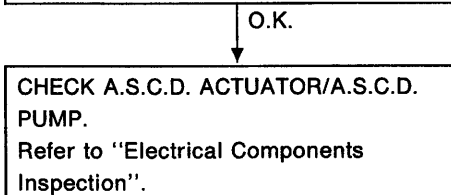
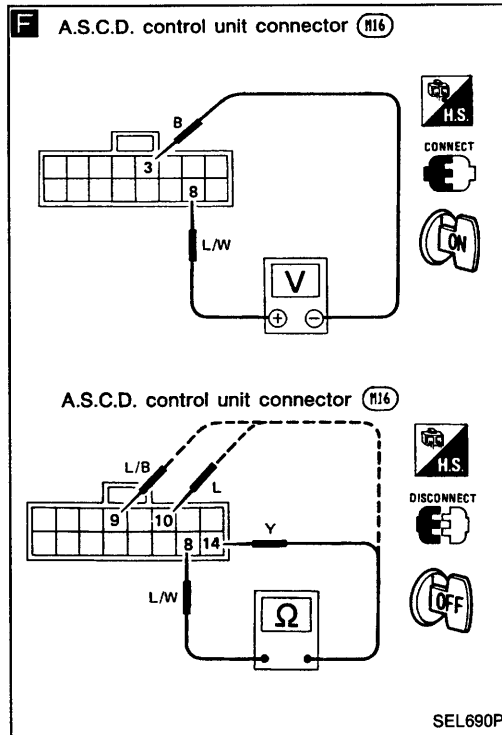
(Next page)

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

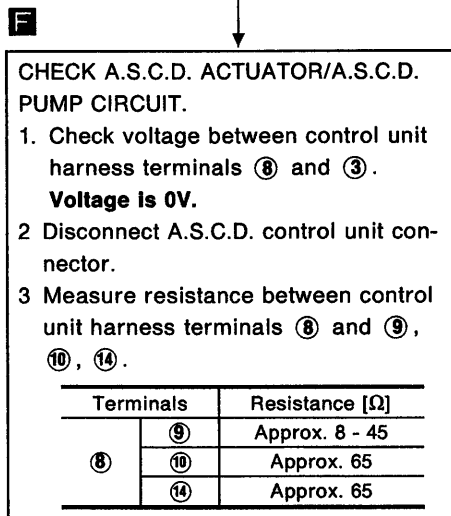
Trouble Diagnoses (Cont'd)



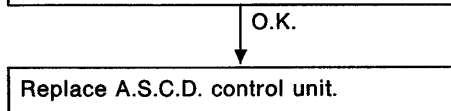
N.G. **CHECK SPEED SENSOR.**
Refer to "Electrical Components Inspection".



N.G. **Replace A.S.C.D. actuator/A.S.C.D. pump.**



N.G. **Repair short or open circuit in A.S.C.D. actuator/A.S.C.D. pump harness.**



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

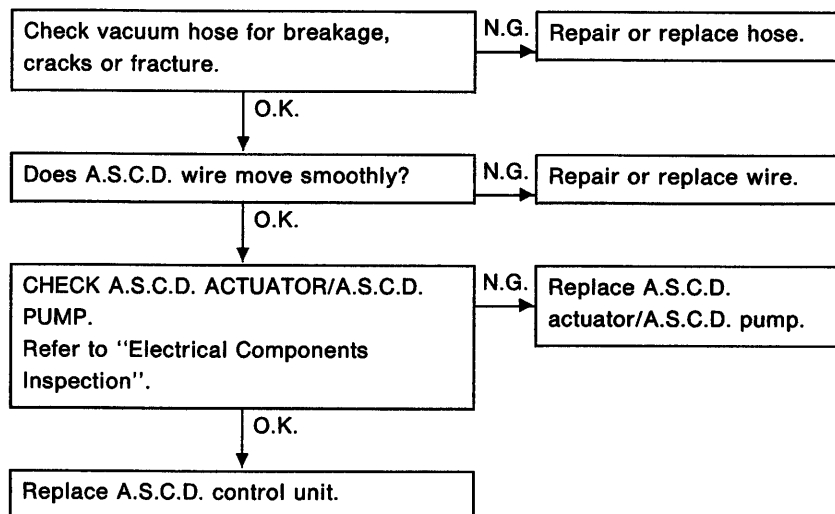
EL

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

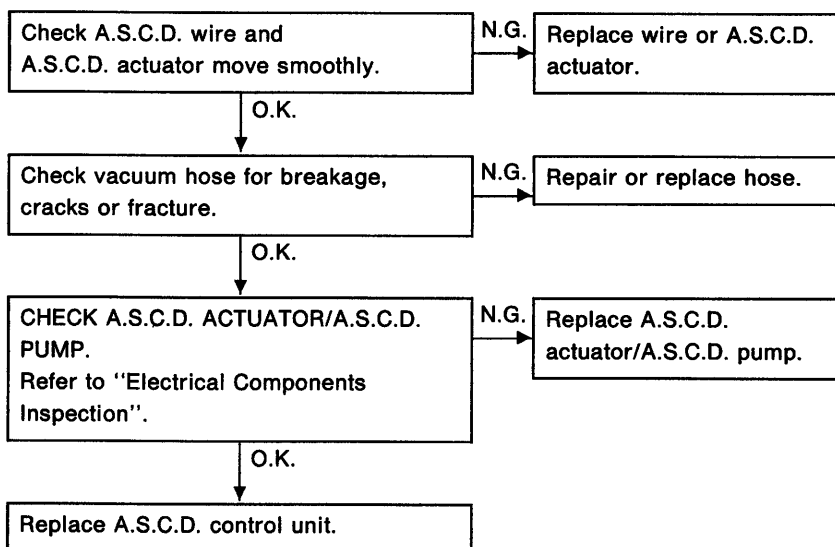
DIAGNOSTIC PROCEDURE 2

SYMPTOM: Engine hunts.



DIAGNOSTIC PROCEDURE 3

SYMPTOM: Large difference between set vehicle speed and actual speed.

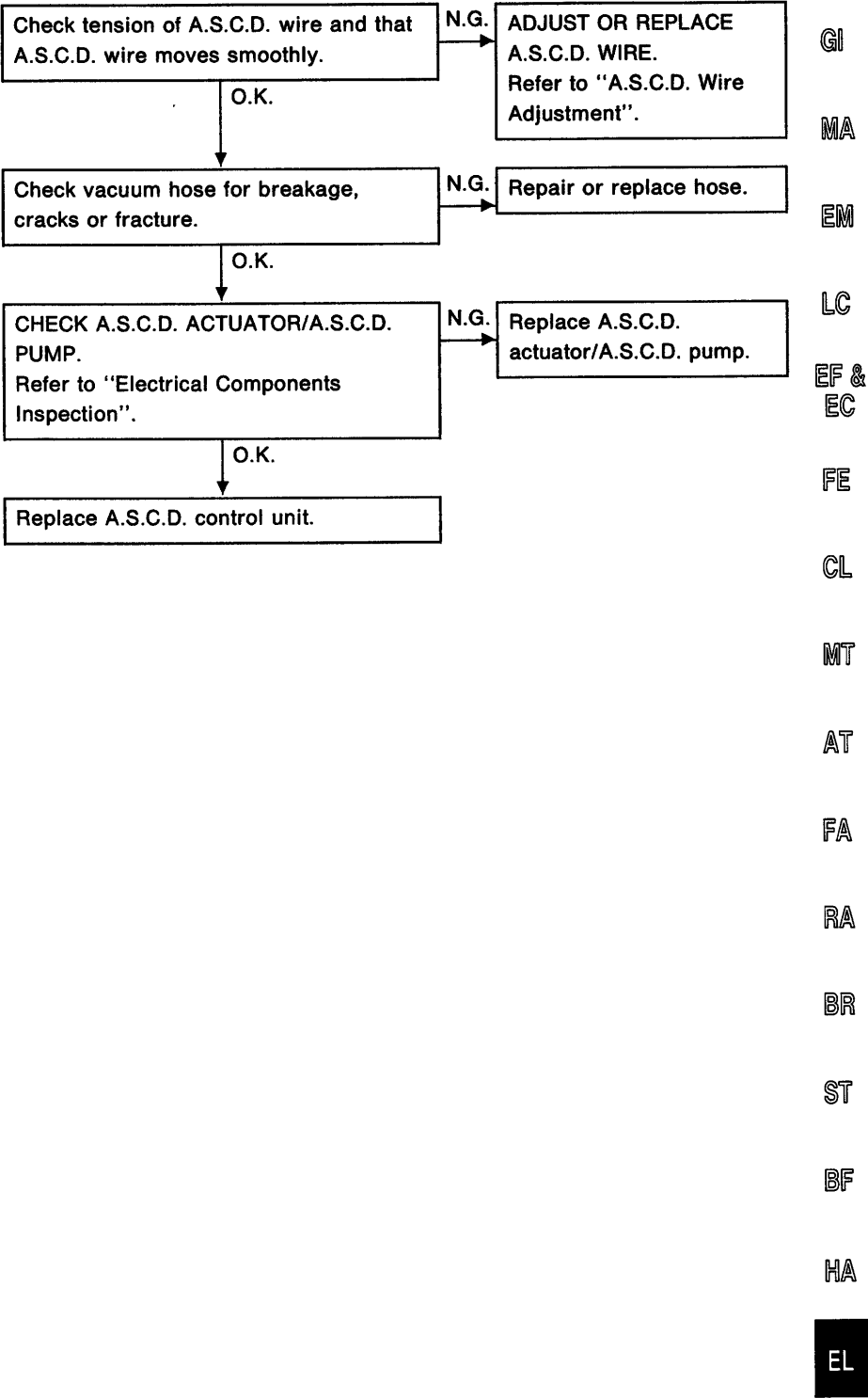


AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4

SYMPTOM: Deceleration is greatest immediately after A.S.C.D. has been set.

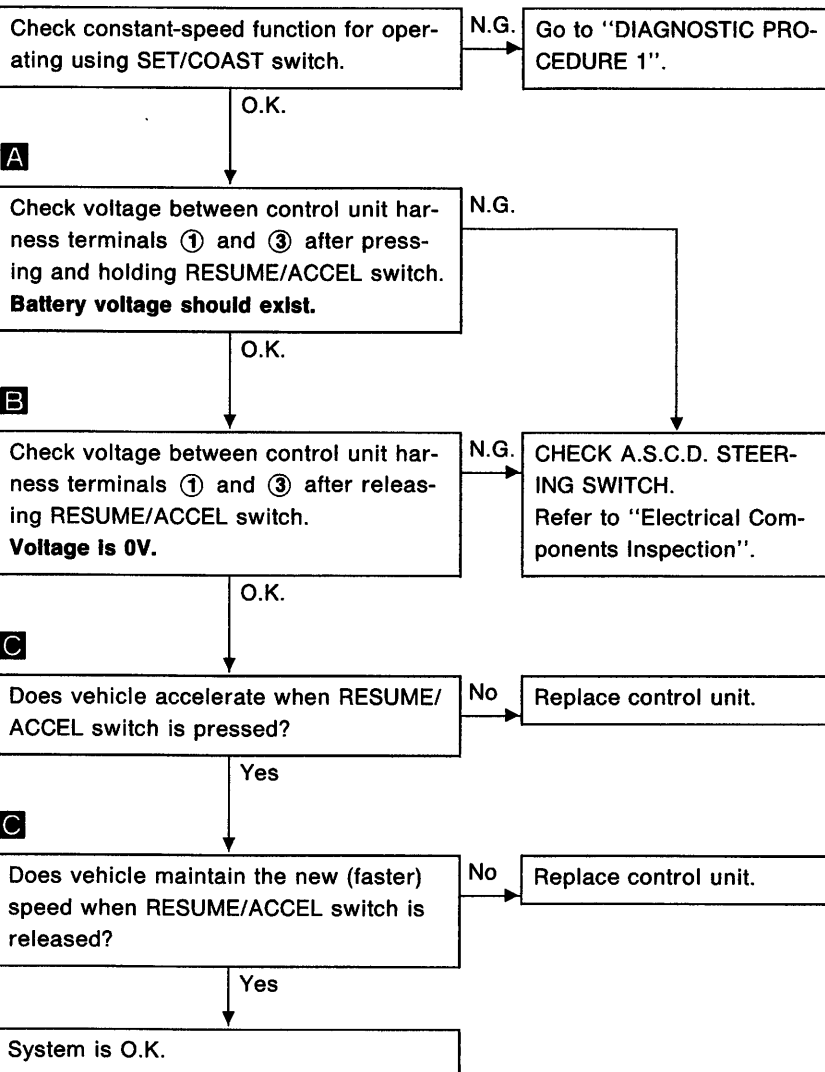
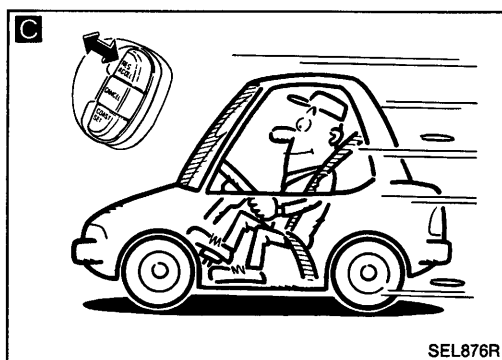
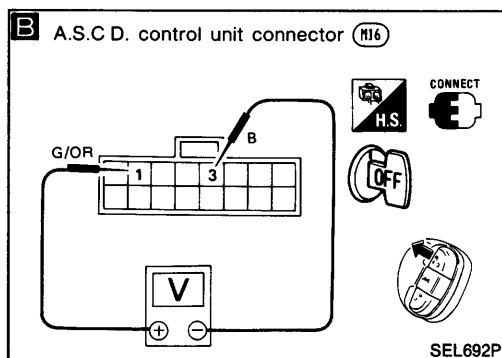
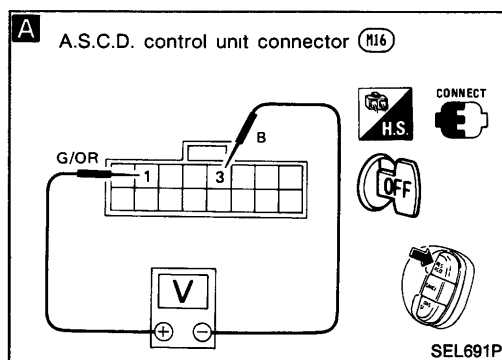


AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 5

SYMPTOM: ACCEL switch will not operate.

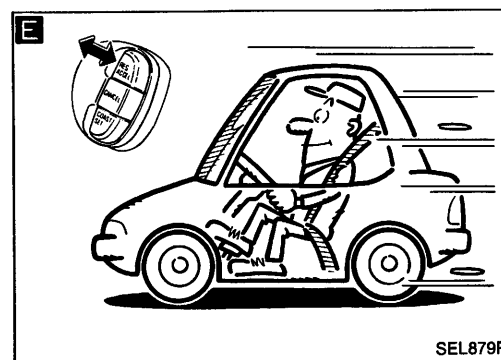
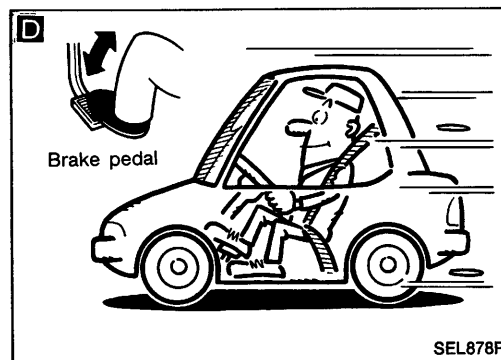
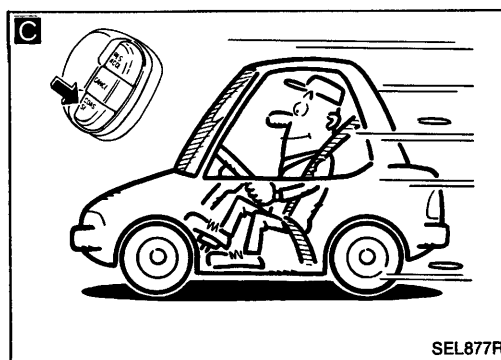
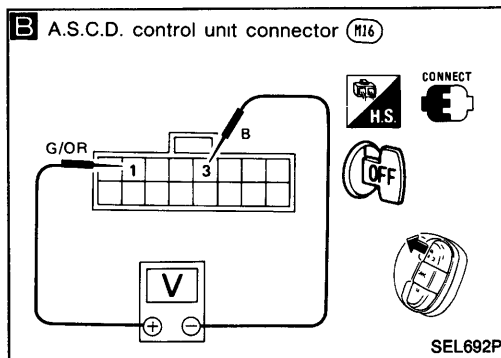
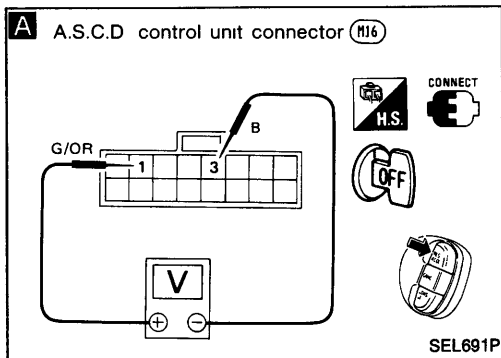


AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6

SYMPTOM: RESUME switch will not operate.



Check constant-speed function for operation using SET/COAST switch.

N.G.

Go to "DIAGNOSTIC PROCEDURE 1".

O.K.

A

Check voltage between control unit harness terminals ① and ③ after pressing and holding RESUME/ACCEL switch. **Battery voltage should exist.**

N.G.

O.K.

B

Check voltage between control unit harness terminals ① and ③ after releasing RESUME/ACCEL switch. **Voltage is 0V.**

N.G.

CHECK A.S.C.D. STEERING SWITCH. Refer to "Electrical Components Inspection".

O.K.

C

Set vehicle speed at 80 km/h (50 MPH) by pressing SET/COAST switch.

O.K.

D

While cruising at set speed, depress and release brake pedal.

O.K.

Does speed control disengage and "CRUISE" lamp turn off?

No

CHECK STOP LAMP SWITCH, A.S.C.D. CANCEL SWITCH AND A.S.C.D. CLUTCH SWITCH (M/T models). Refer to "Electrical Components Inspection".

Yes

E

Above 48 km/h (30 MPH), press and release "RESUME/ACCEL switch.

O.K.

Does vehicle return to previously set speed [80 km/h (50 MPH)]?

No

Replace control unit.

Yes

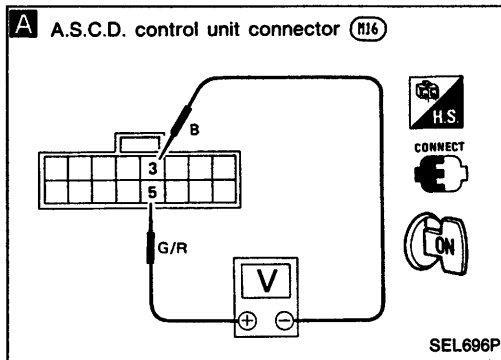
System is O.K.

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 7

SYMPTOM: Set speed cannot be cancelled.



A

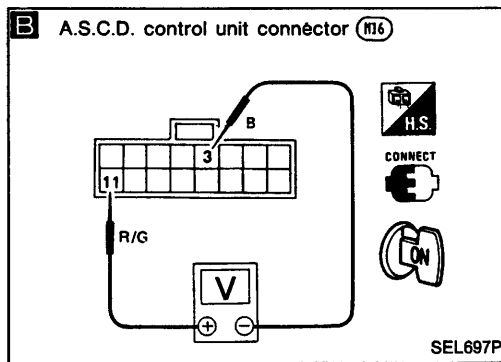
CHECK A.S.C.D. CANCEL, CLUTCH, INHIBITOR SWITCH CIRCUIT.

1. Turn A.S.C.D. main switch "ON".
2. Check voltage between control unit harness terminals ⑤ and ③.

Conditions			Voltage [V]
M/T	A.S.C.D. cancel switch	De-pressed	0
		Released	Approx. 12
	A.S.C.D. clutch switch	De-pressed	0
		Released	Approx. 12
A/T	A/T shift lever position is at any position except N or P.		Approx. 12
	A/T shift lever position is at N or P.		0

N.G.

CHECK A.S.C.D. CANCEL, CLUTCH, and INHIBITOR SWITCH.
Refer to "Electrical Components Inspection".



B

CHECK STOP LAMP SWITCH CIRCUIT.
Check voltage between control unit harness terminals ⑪ and ③.

Condition		Voltage [V]
Stop lamp switch	Depressed	Approx. 12
	Released	0

N.G.

CHECK STOP LAMP SWITCH.
Refer to "Electrical Components Inspection".

O.K.

O.K.

Check A.S.C.D. wire moves smoothly.

N.G.

Replace A.S.C.D. wire.

O.K.

CHECK A.S.C.D. ACTUATOR/A.S.C.D. PUMP.
Refer to "Electrical Components Inspection".

N.G.

Replace A.S.C.D. actuator/A.S.C.D. pump.

O.K.

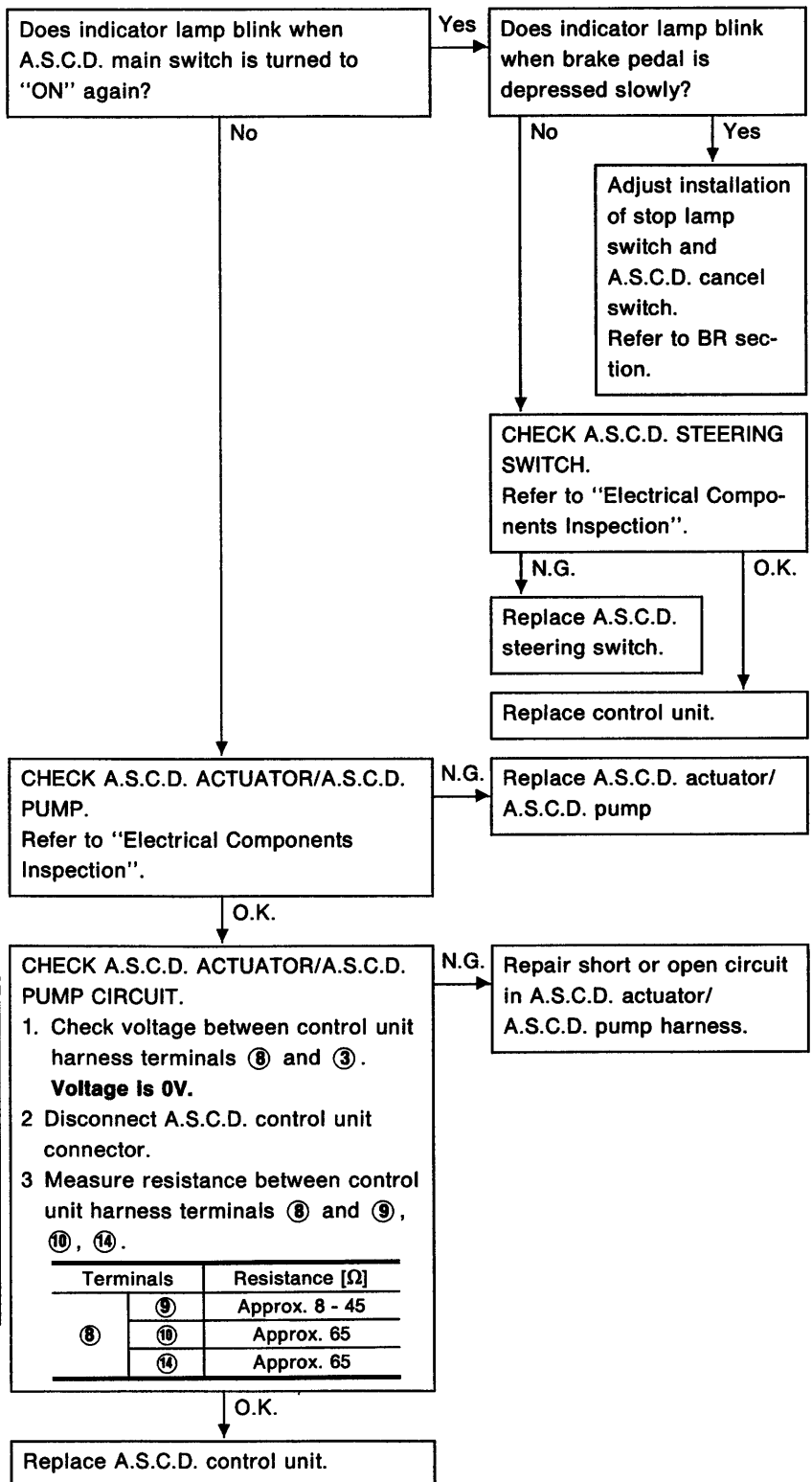
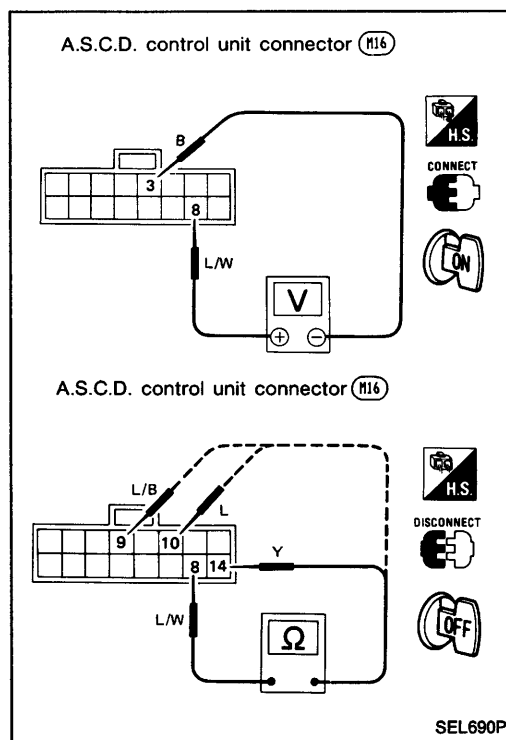
Replace A.S.C.D. control unit.

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 8

SYMPTOM: "CRUISE" indicator lamp blinks.

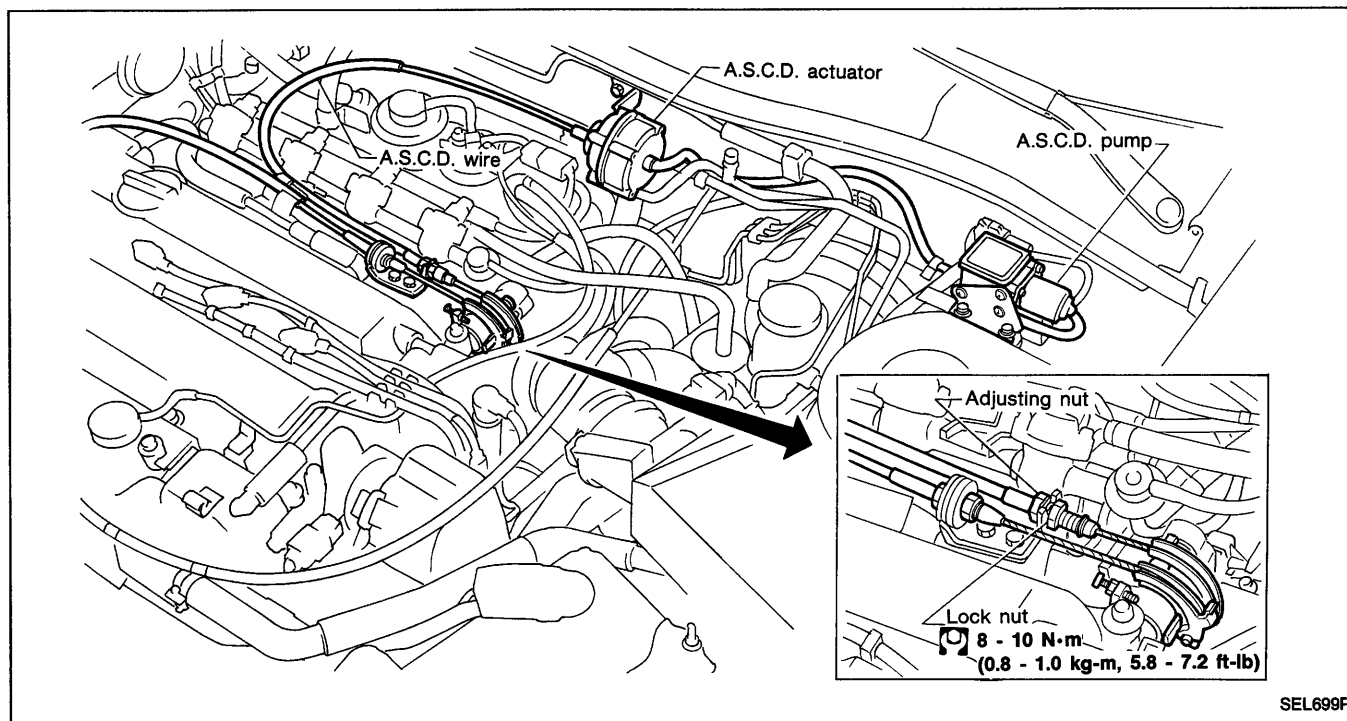


GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

A.S.C.D. WIRE ADJUSTMENT



CAUTION:

- Be careful not to twist A.S.C.D. wire when removing it.
- Do not tense A.S.C.D. wire excessively during adjustment.

After confirming that accelerator wire is properly adjusted, adjust the tension of A.S.C.D. wire in the following manner.

- (1) After adjusting the length of the accelerator wire, turn a securing nut by 1/2 to 1 turn from throttle open starting position to the wire loosening direction to fix. (Must be securing carried out to prevent response delay of operation of the A.S.C.D.)
- (2) Securely tighten lock nut to hold adjusting nut in place.

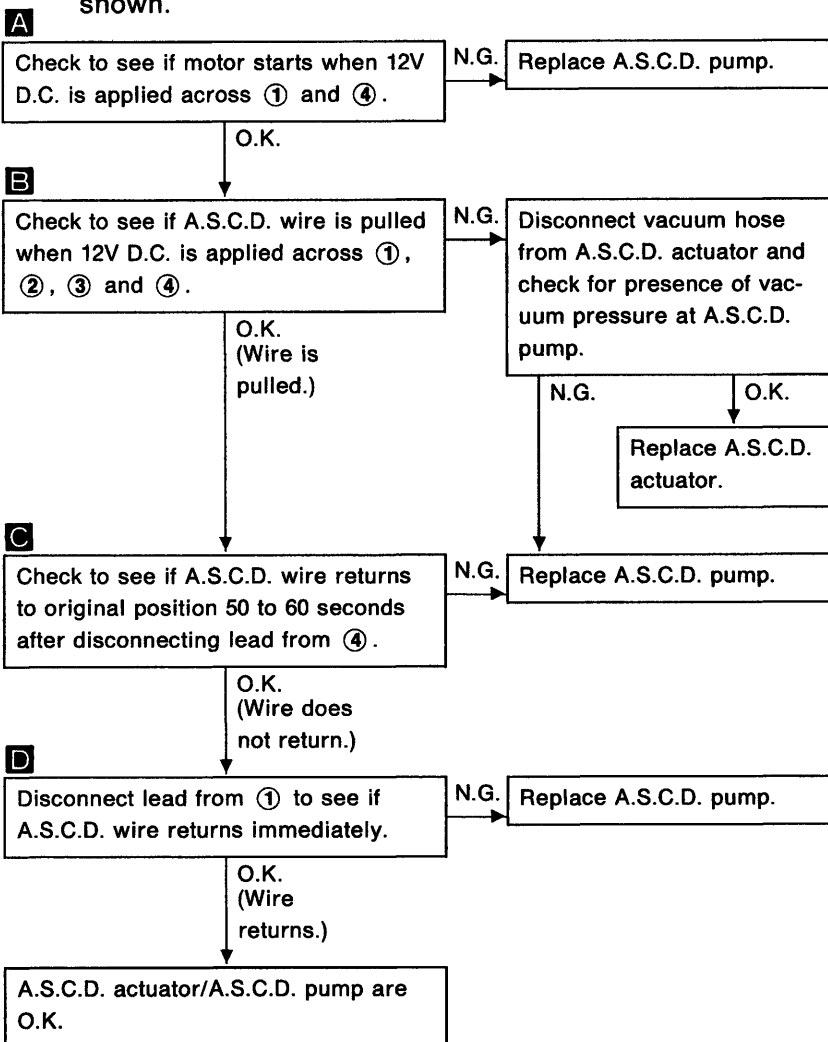
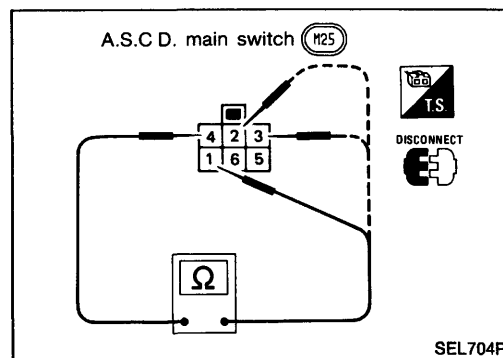
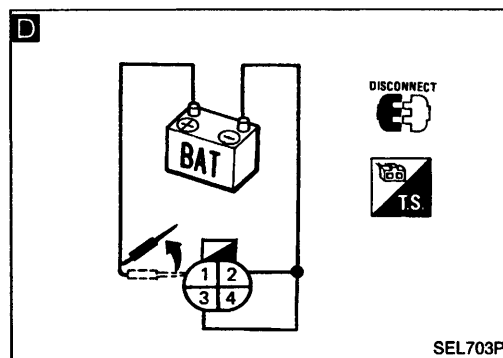
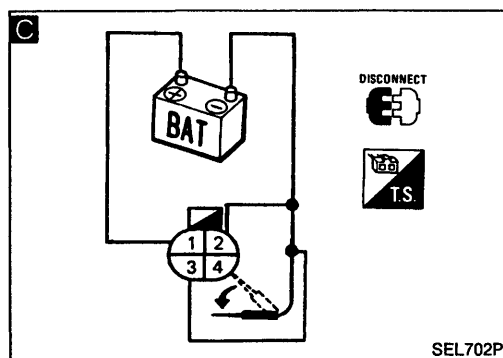
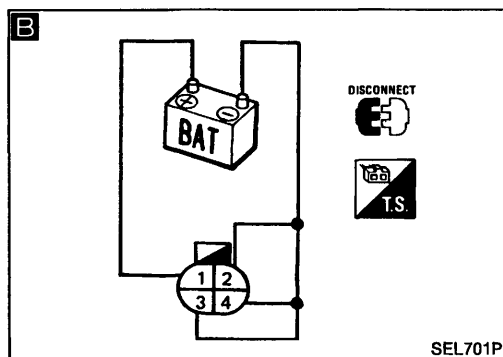
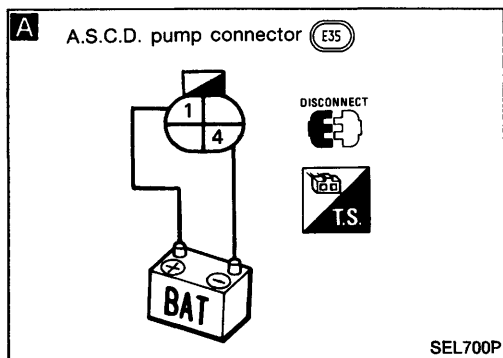
AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

ELECTRICAL COMPONENTS INSPECTION

A.S.C.D. actuator/A.S.C.D. pump

1. Disconnect A.S.C.D. actuator/A.S.C.D. pump connector.
2. Check A.S.C.D. actuator/A.S.C.D. pump operations as shown.



A.S.C.D. main switch

Check continuity between terminals by pushing switch to each position.

Switch position	Terminals					
	1	2	3	4	5	6
ON	○	○	○	⊗	○	
N		○	○	⊗	○	ILL.
OFF					○	⊗

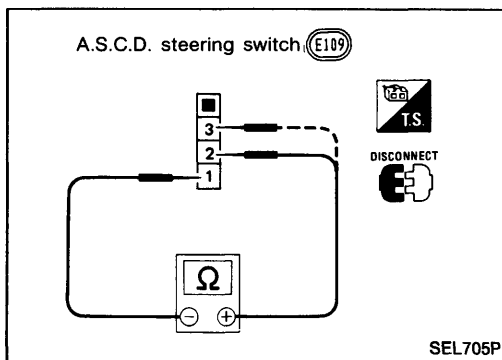
AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

A.S.C.D. steering switch

Check continuity between terminals by pushing each button.

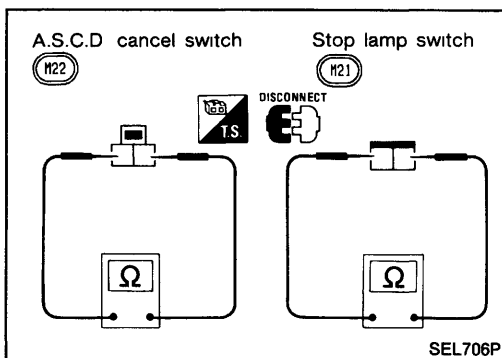
Button	Terminal		
	1	2	3
SET/COAST			
RESUME/ACCEL			
CANCEL			



A.S.C.D. cancel switch and stop lamp switch

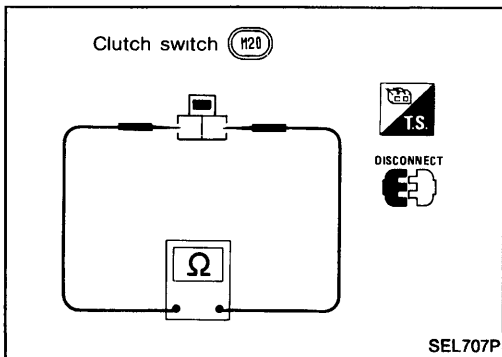
Condition	Continuity	
	A.S.C.D. cancel switch	Stop lamp switch
When brake pedal is depressed	No	Yes
When brake pedal is released	Yes	No

Check each switch after adjusting brake pedal — refer to BR section.



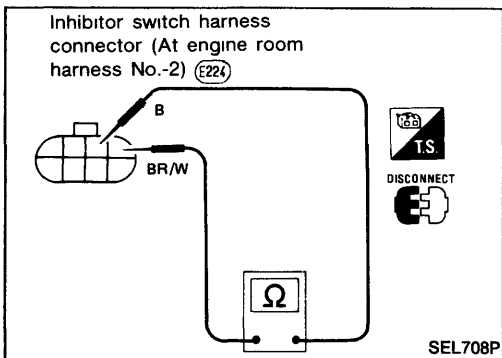
Clutch switch (For M/T models)

Condition	Continuity
When clutch pedal is depressed	No
When clutch pedal is released	Yes



Inhibitor switch (For A/T models)

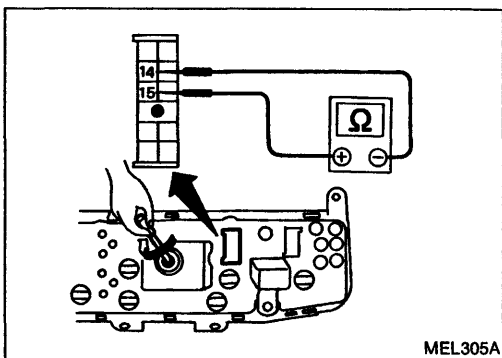
Condition	Continuity
When shift lever position is "N" or "P"	Yes
When shift lever position is any position except "N" or "P"	No



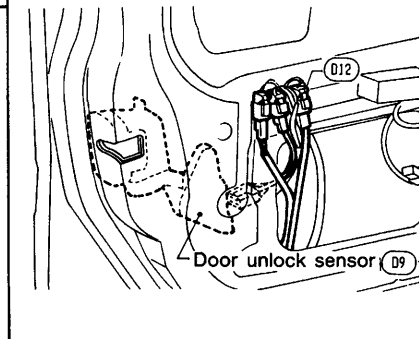
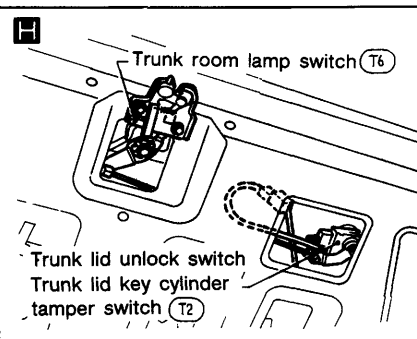
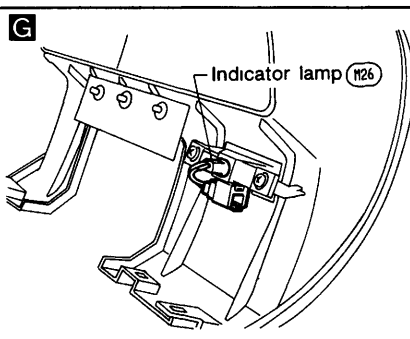
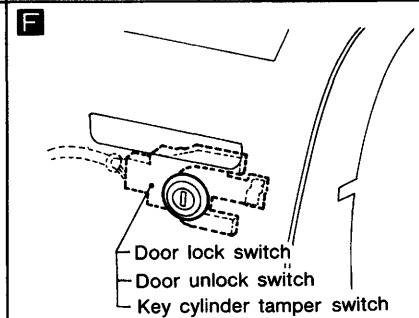
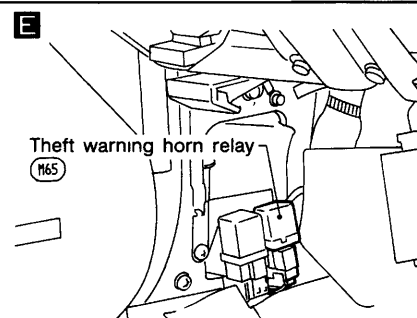
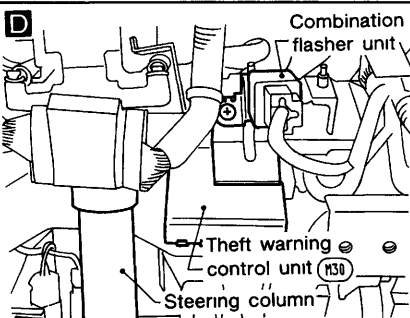
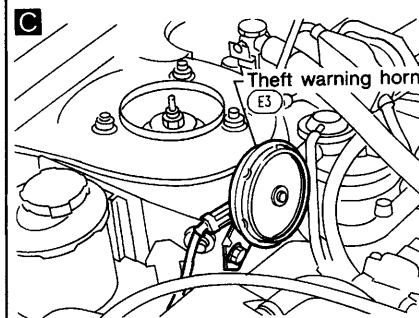
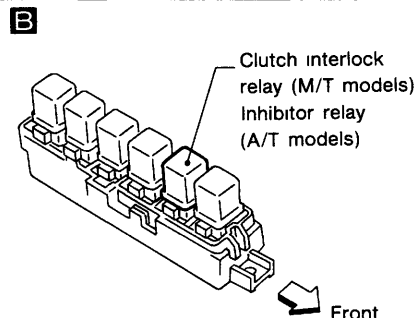
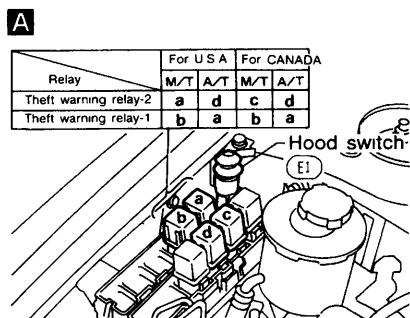
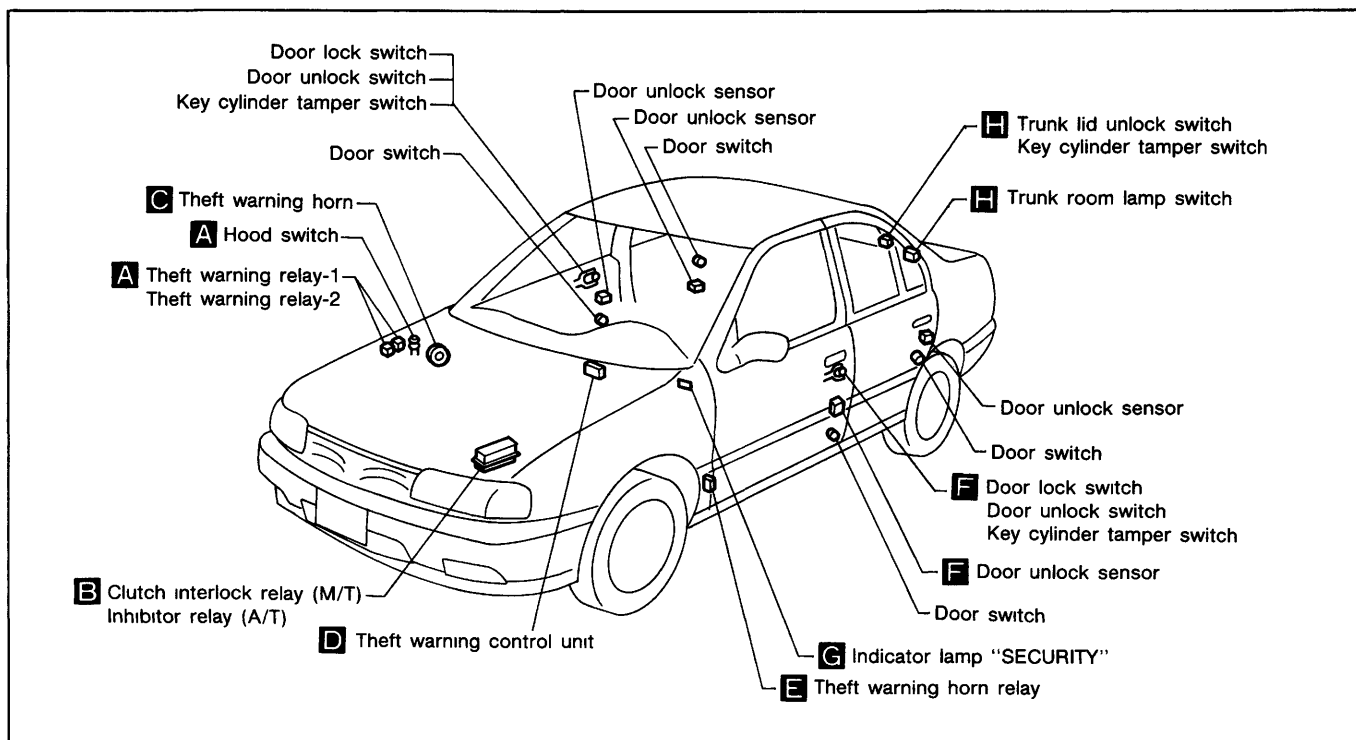
Speed sensor

- 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.



Component Parts and Harness Connector Location



THEFT WARNING SYSTEM

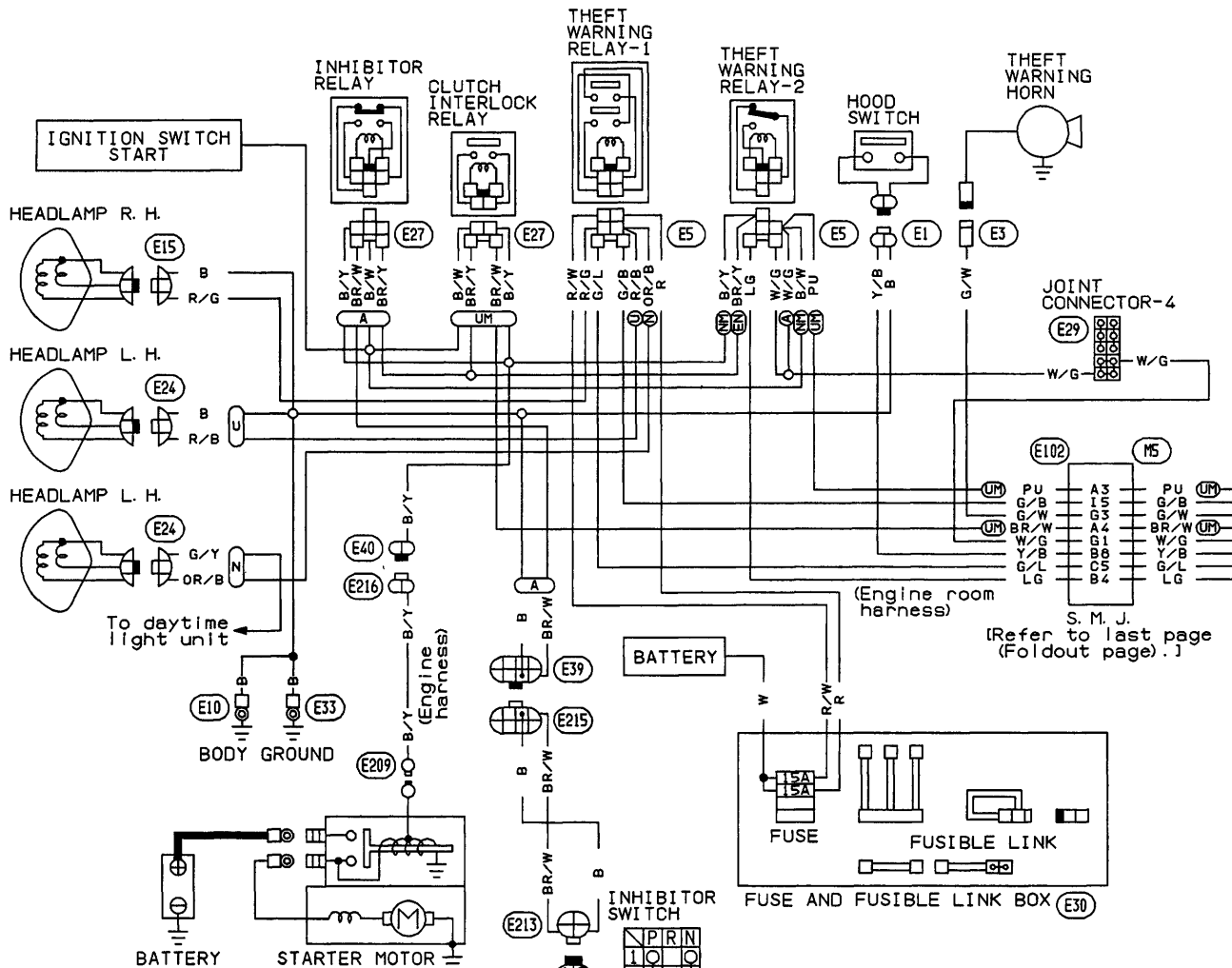
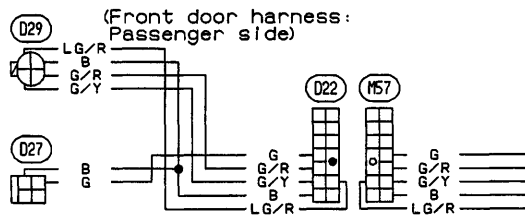
Wiring Diagram

PASSENGER SIDE DOOR LOCK SWITCH, DOOR UNLOCK SWITCH AND KEY CYLINDER TAMPER SWITCH

LOCK		UNLOCK		TAMPER	
FULL STROKE	BETWEEN FULL STROKE AND N	N	BETWEEN FULL STROKE AND N	FULL STROKE	CYLINDER WITHDRAWN

PASSENGER SIDE DOOR UNLOCK SENSOR (In power door lock actuator)

LOCK	UNLOCK
1	
2	



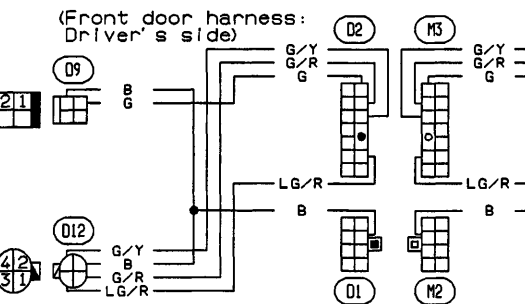
- (A) : A/T models (U) : For U. S. A.
 (M) : M/T models (N) : For CANADA
 (UM) : M/T models for U. S. A.
 (NM) : M/T models for CANADA
 (EN) : Except for (NM) models

DRIVER'S SIDE DOOR UNLOCK SENSOR (In power door lock actuator)

LOCK	UNLOCK
1	
2	

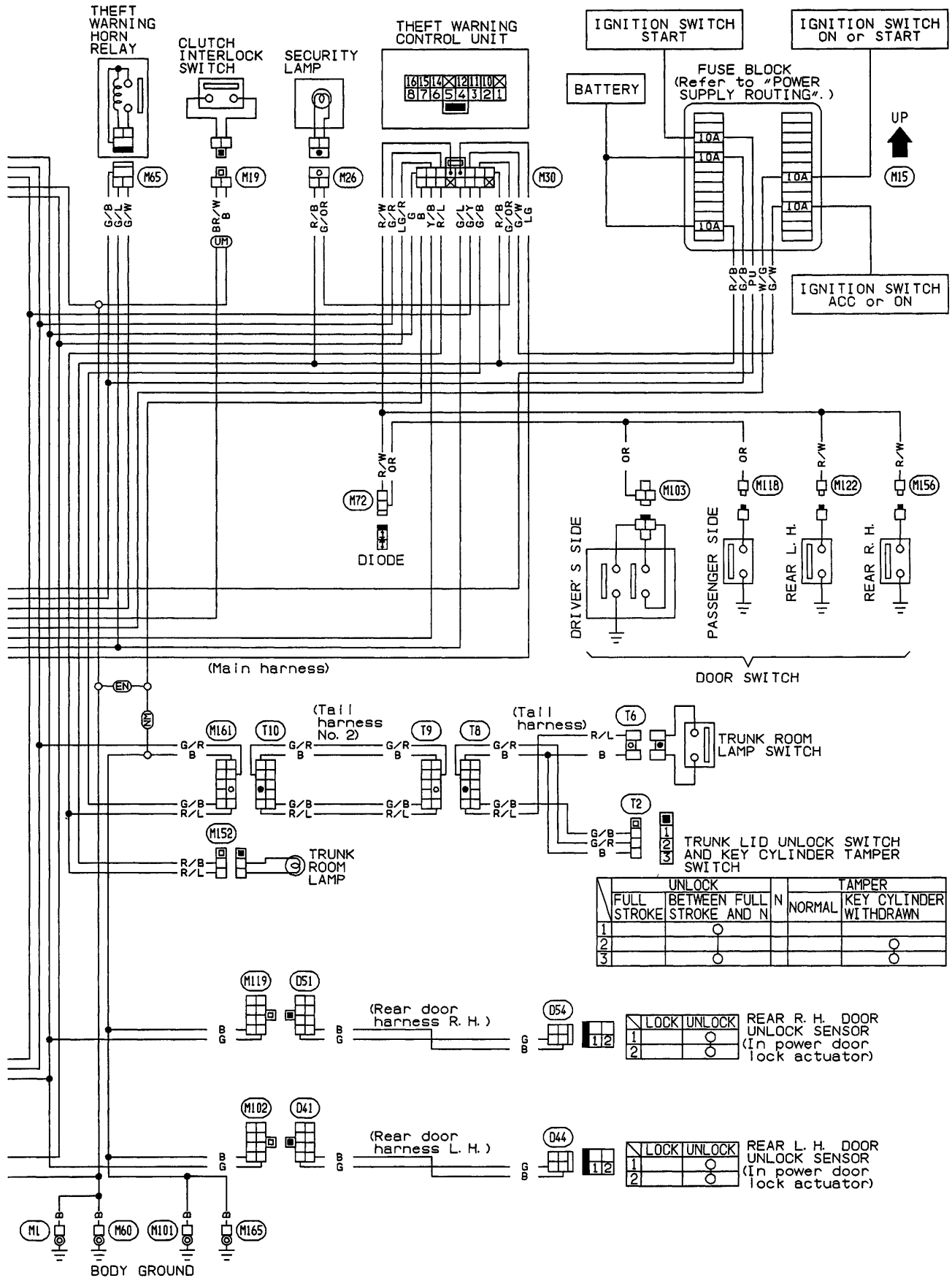
DRIVER'S SIDE DOOR LOCK SWITCH, DOOR UNLOCK SWITCH AND KEY CYLINDER TAMPER SWITCH

LOCK		UNLOCK		TAMPER	
FULL STROKE	BETWEEN FULL STROKE AND N	N	BETWEEN FULL STROKE AND N	FULL STROKE	CYLINDER WITHDRAWN



THEFT WARNING SYSTEM

Wiring Diagram (Cont'd)



GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA

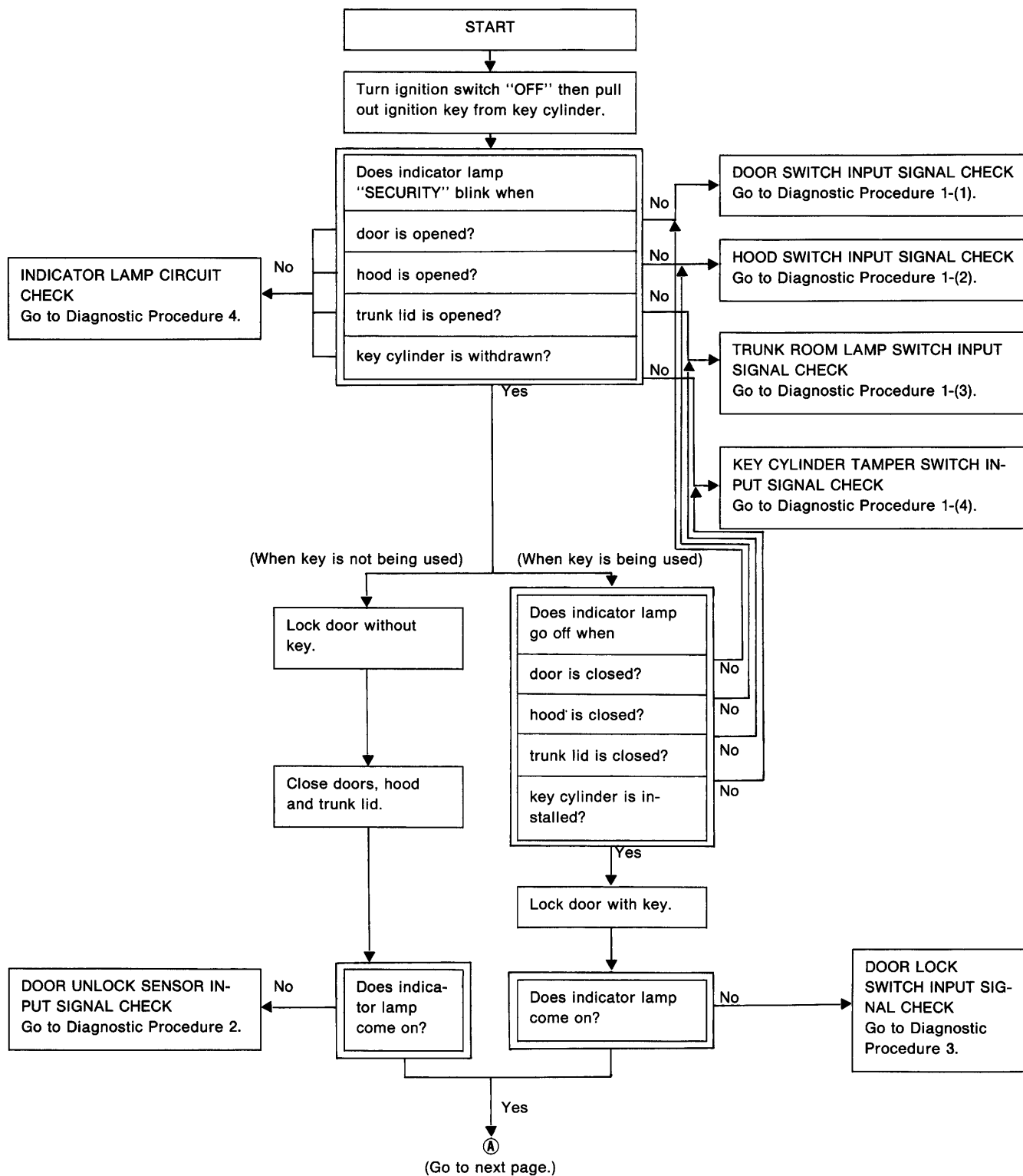
EL

THEFT WARNING SYSTEM

Trouble Diagnoses

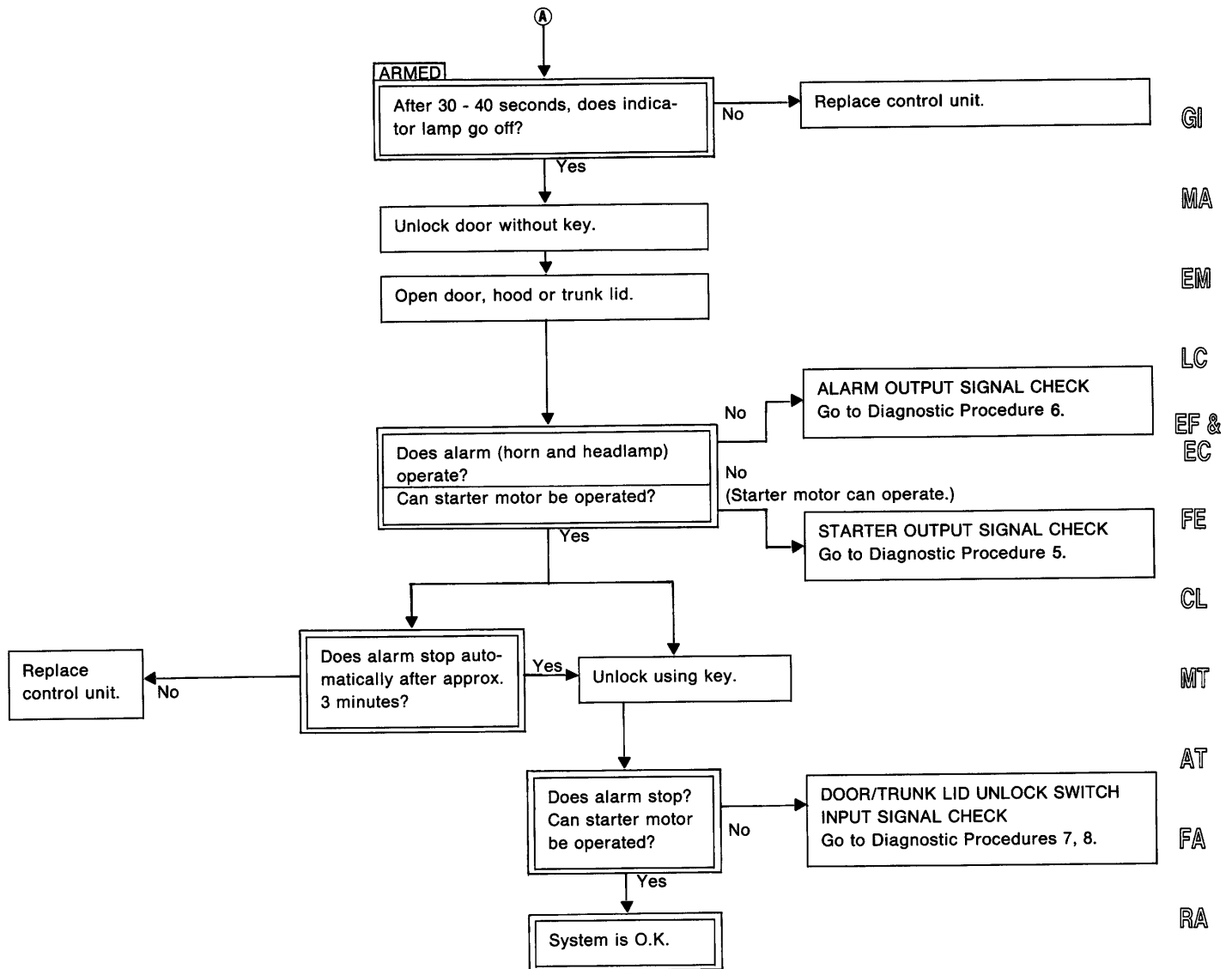
SYSTEM OPERATION CHECK

If ignition switch is set in the "ACC" position in the step of START to ARMED or in the ARMED state shown in this flow chart, the system operation is canceled.



THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

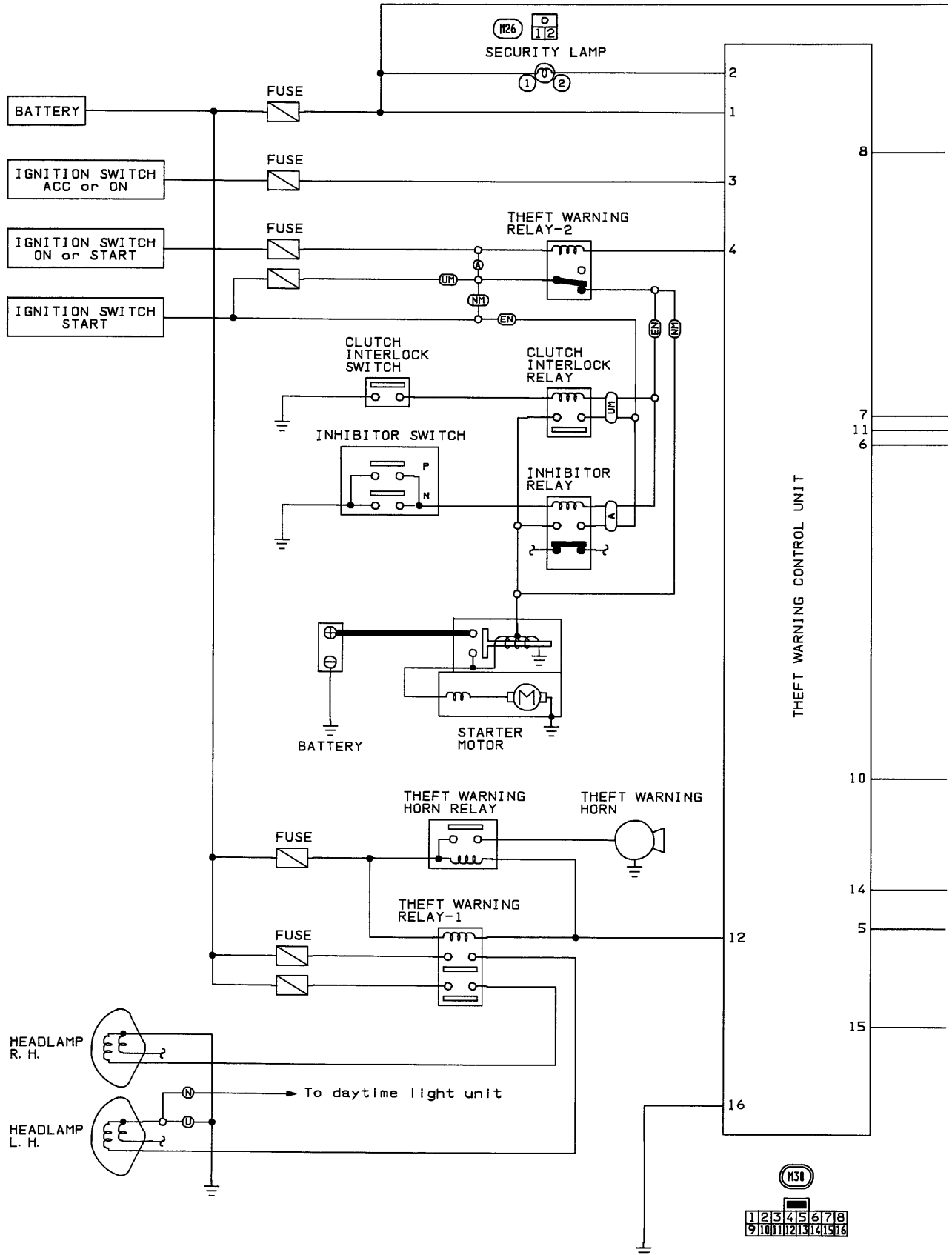


EL

THEFT WARNING SYSTEM

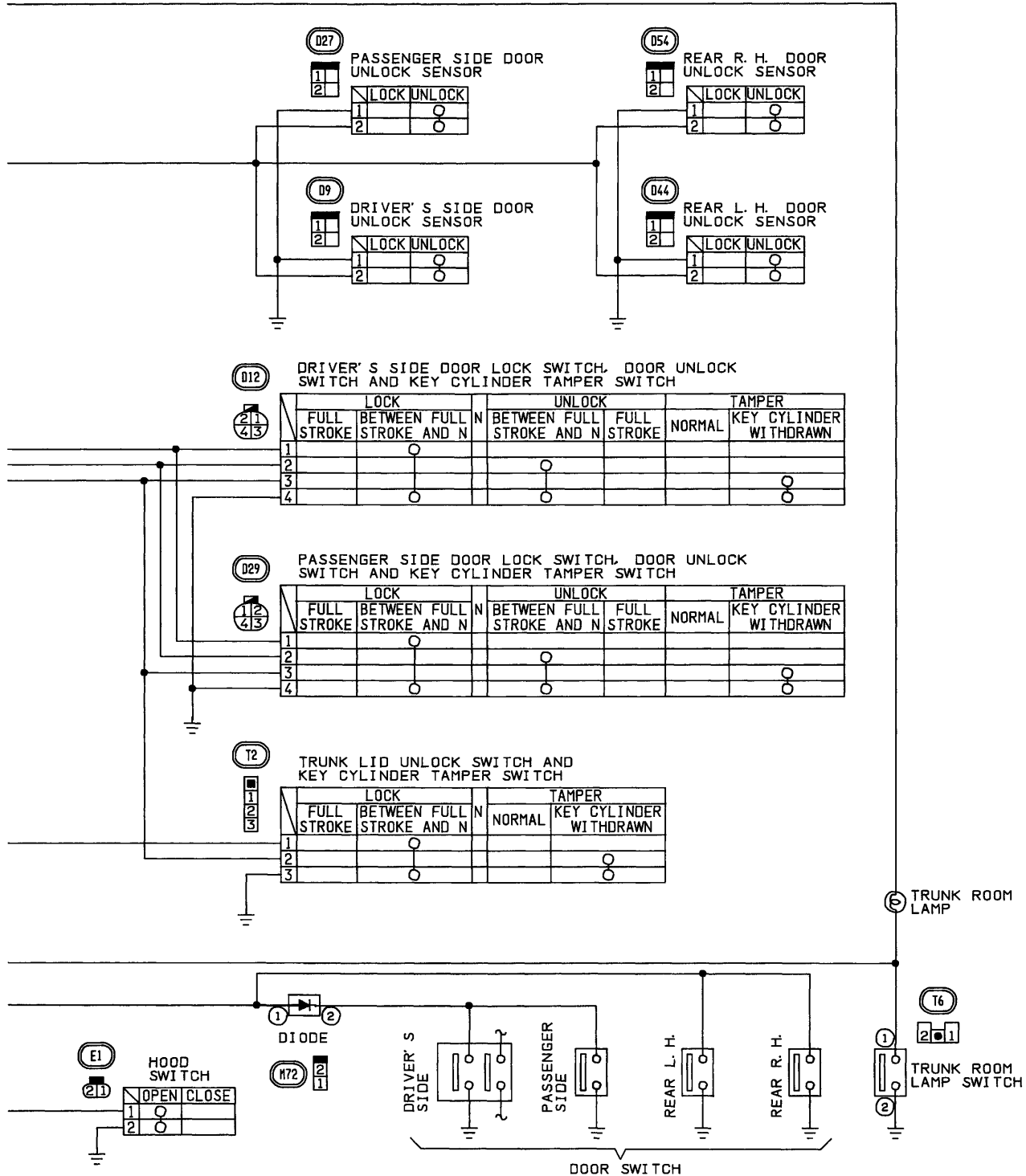
Trouble Diagnoses (Cont'd)

CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)



(A) : A/T models

(U) : For U. S. A.

(N) : For CANADA

(UM) : M/T models for U. S. A.

(NM) : M/T models for CANADA

(EN) : Except for (NM) models

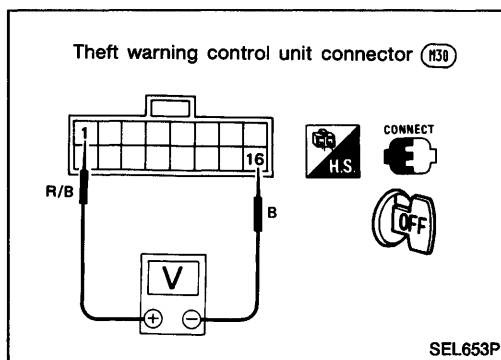
THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

POWER SUPPLY AND GROUND CIRCUIT CHECK

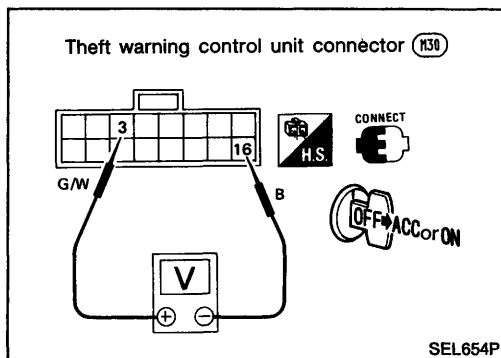
Main power supply circuit check

Terminals	Ignition switch position		
	OFF	ACC	ON
① - ⑩	Battery voltage	Battery voltage	Battery voltage



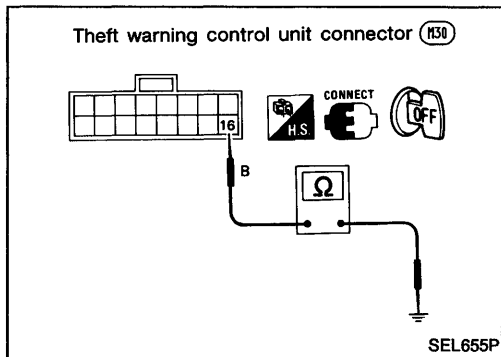
Power supply circuit check for system cancel

Terminals	Ignition switch position		
	OFF	ACC	ON
③ - ⑩	0V	Battery voltage	Battery voltage



Ground circuit check

Terminals	Continuity
⑩ - Ground	Yes



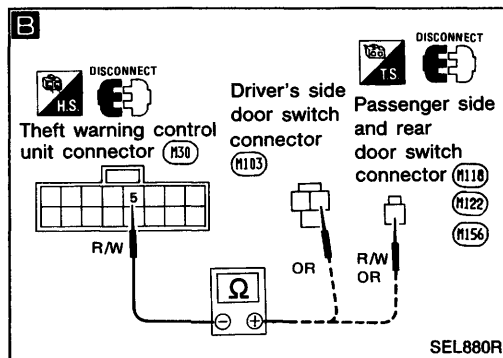
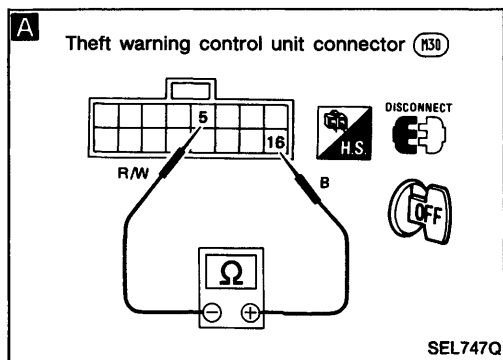
THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1

SYMPTOM: ● Indicator lamp does not blink.
● Indicator lamp remains blinking.

Diagnostic procedure 1-(1)



A

DOOR SWITCH INPUT SIGNAL CHECK
Check continuity between control unit harness terminals ⑤ and ⑩.

Condition	Continuity
All doors are closed	No
At least one door is open	Yes

O.K.

Go to Diagnostic Procedure 4.

N.G.

DOOR SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G.

Replace door switch.

O.K.

B

DOOR SWITCH CIRCUIT CHECK
Check harness continuity between control unit harness terminal ⑤ and door switch harness terminal.
Continuity should exist.

N.G.

Repair harness or connectors.

O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

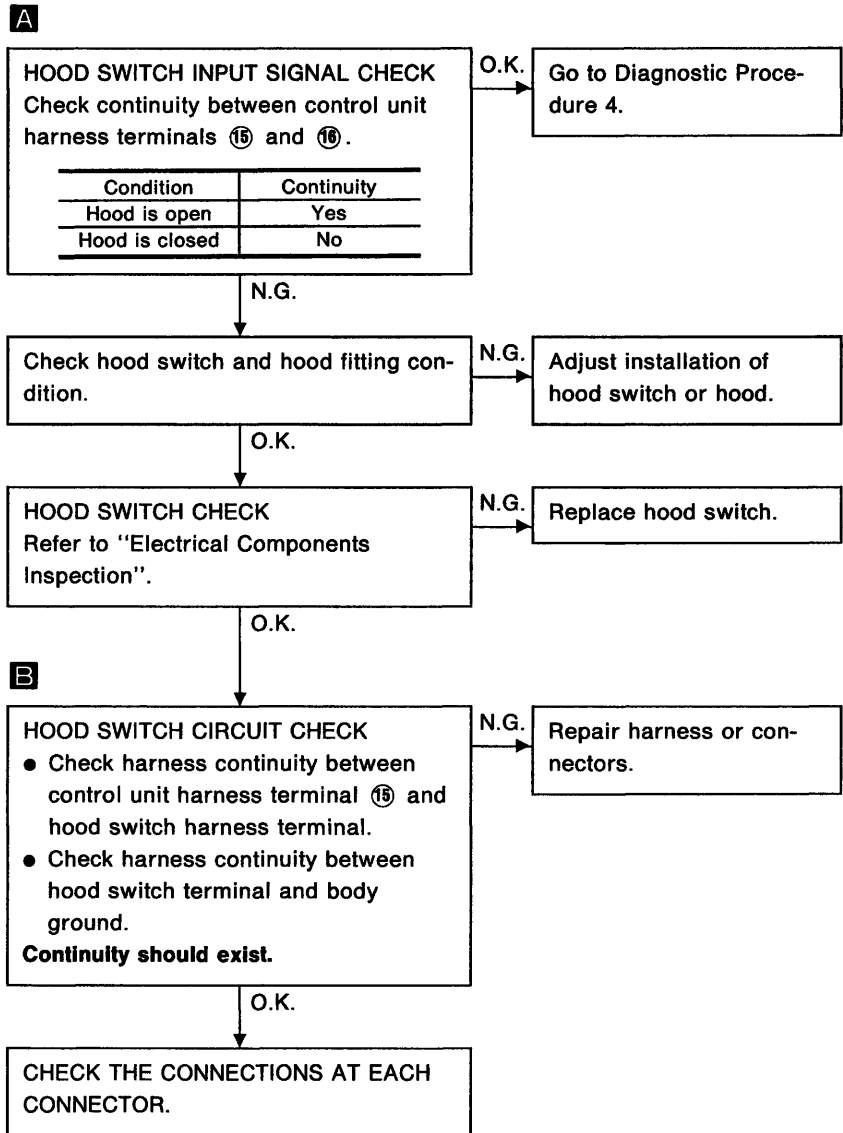
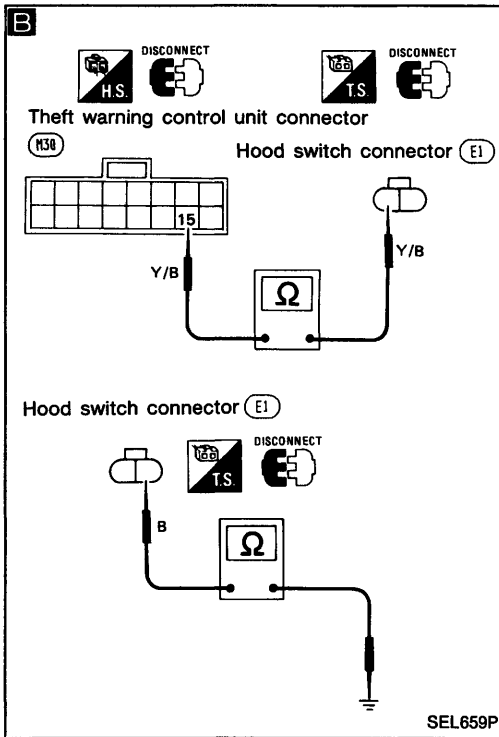
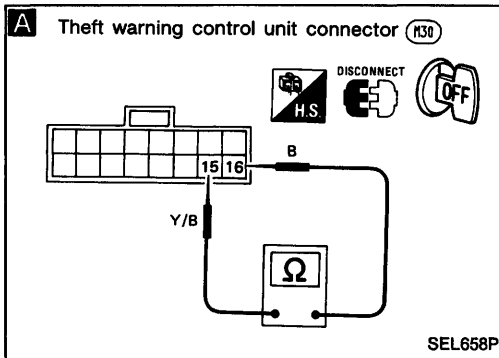
HA

EL

THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

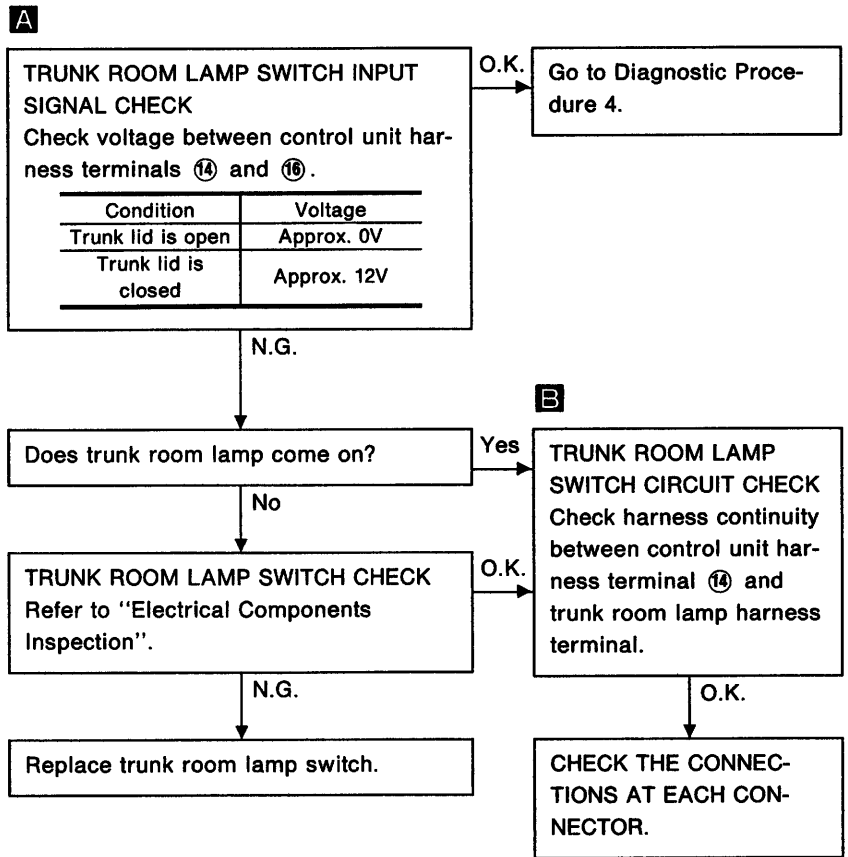
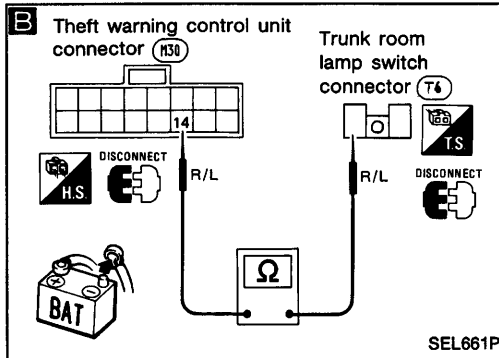
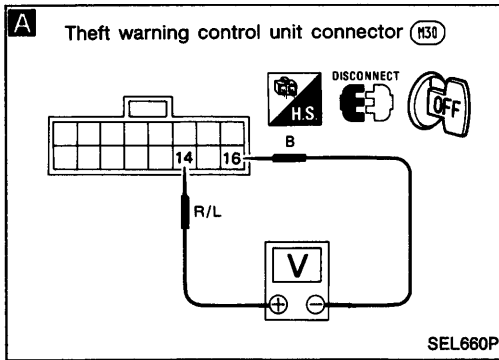
Diagnostic procedure 1-(2)



THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

Diagnostic procedure 1-(3)



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

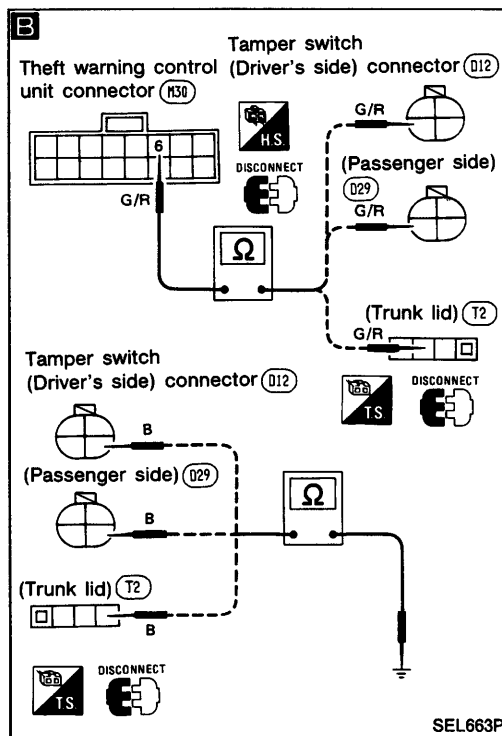
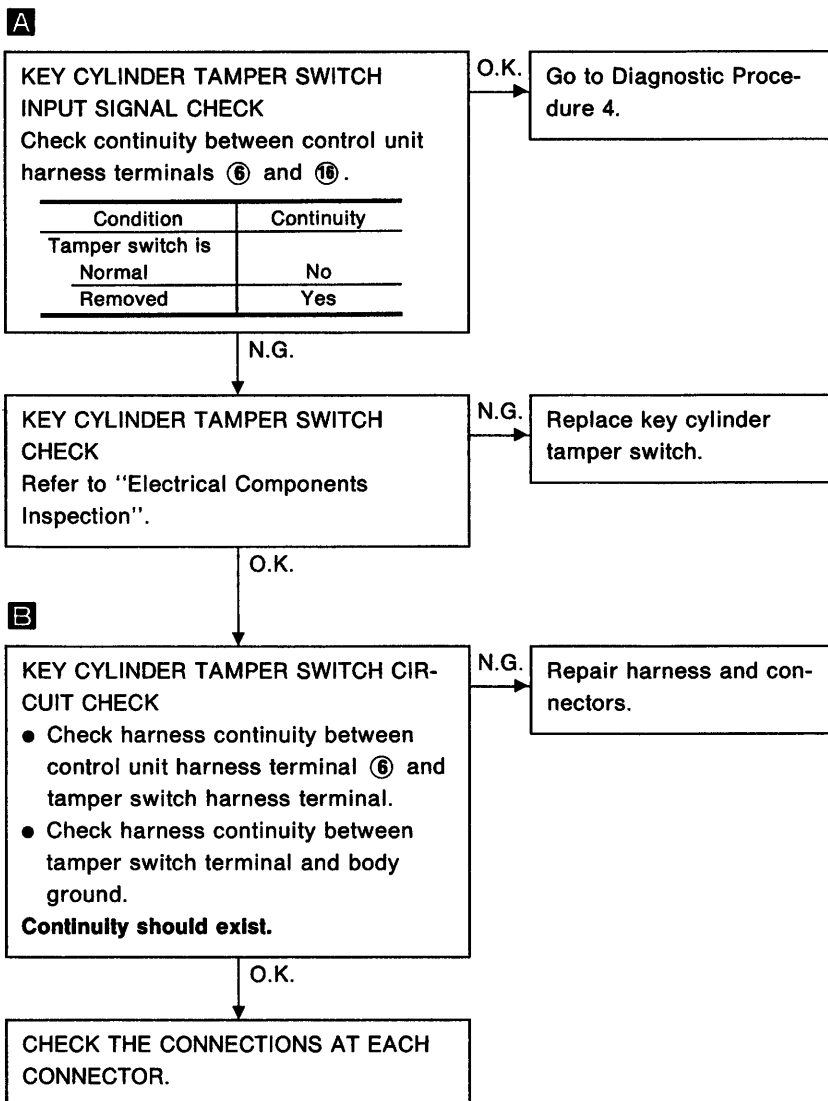
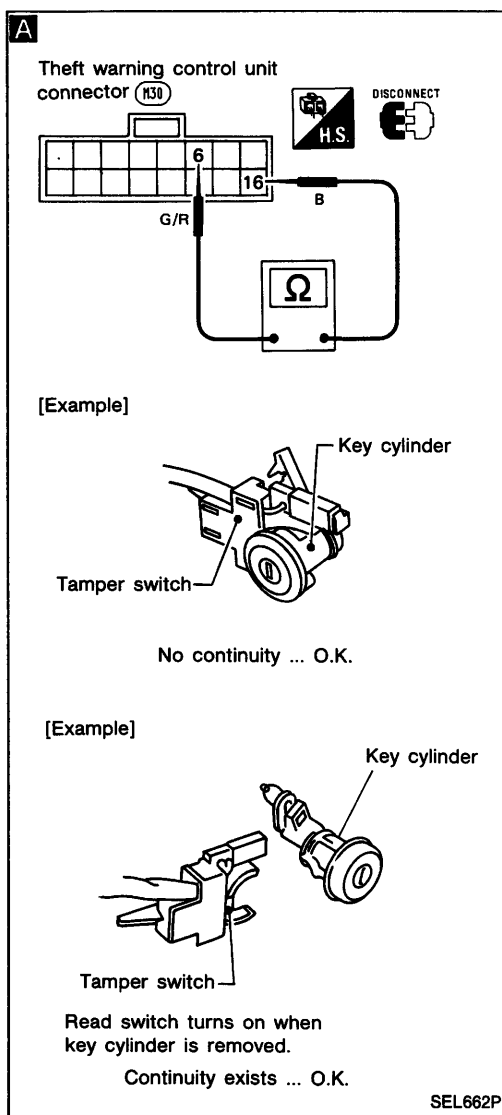
HA

EL

THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

Diagnostic procedure 1-(4)

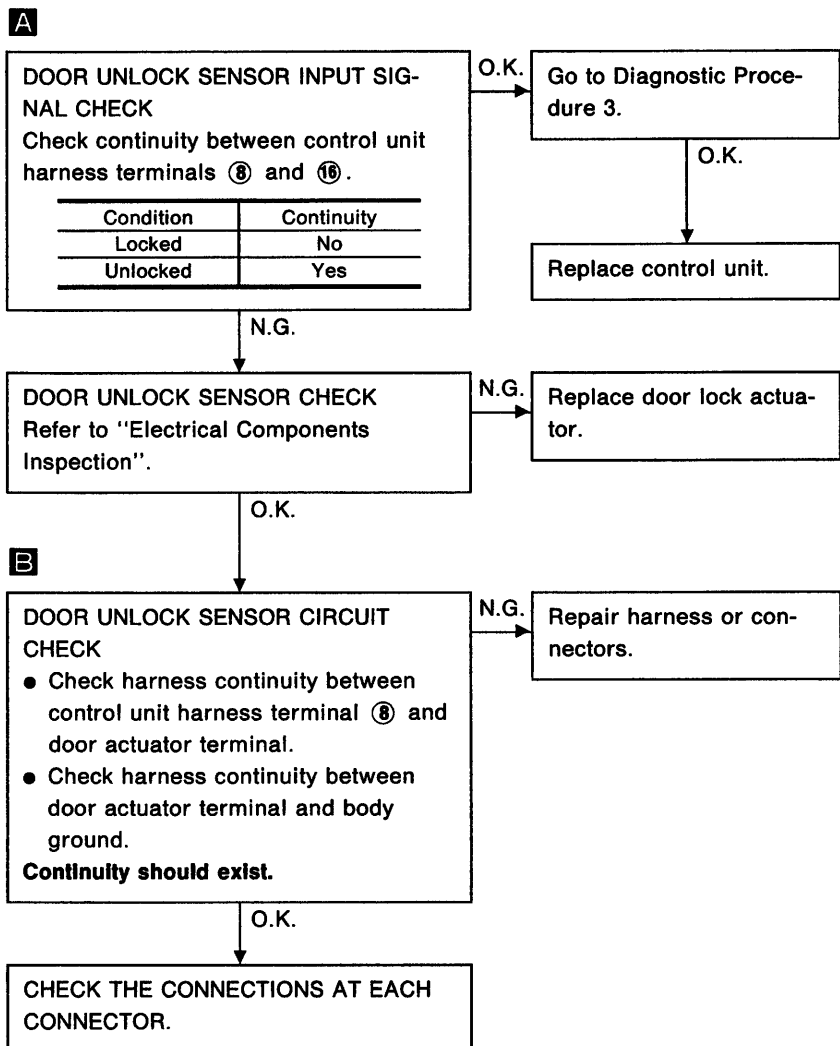
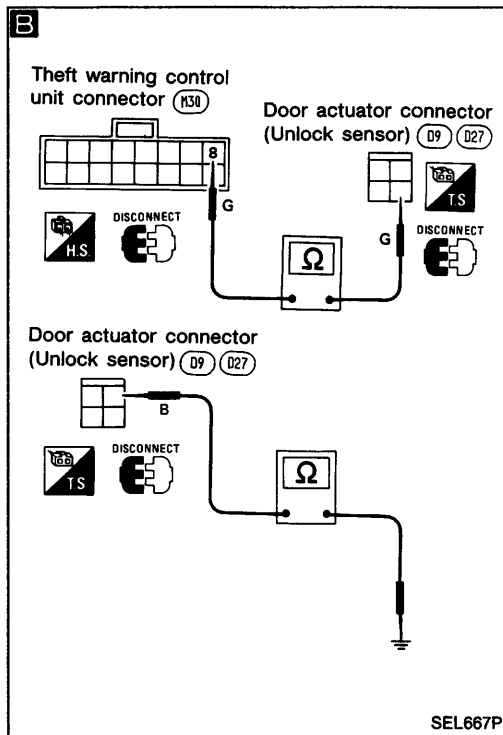
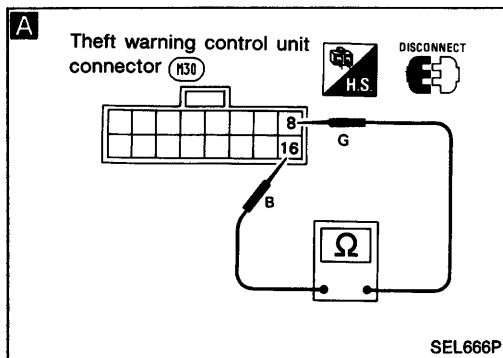


THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 2

SYMPTOM: Indicator lamp does not come on.



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

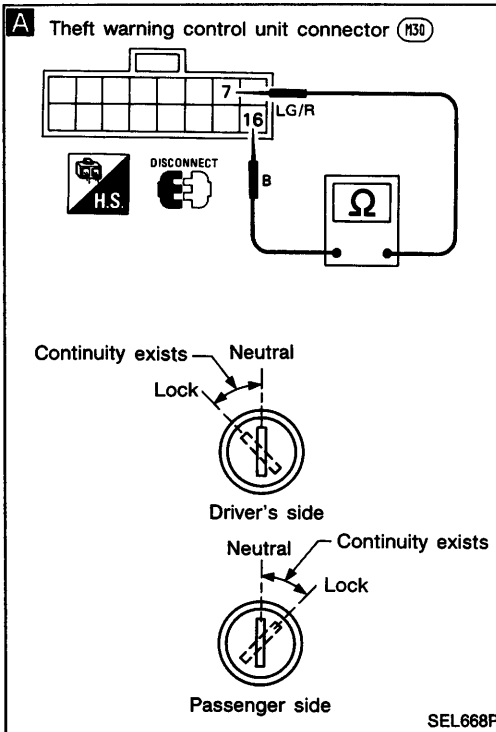
EL

THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 3

SYMPTOM: Indicator lamp does not come on.



A

DOOR LOCK SWITCH INPUT SIGNAL CHECK (LOCK SIGNAL)
Check continuity between control unit harness terminals ⑦ and ⑯.

Key position	Continuity
Neutral/Lock	No
Between neutral and lock	Yes

N.G.

DOOR LOCK SWITCH CHECK
Refer to "Electrical Components Inspection".

O.K.

B

DOOR LOCK SWITCH CIRCUIT CHECK

- Check harness continuity between control unit harness terminal ⑦ and door lock switch terminal.
- Check harness continuity between door lock switch terminal and body ground.

Continuity should exist.

O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.

O.K.

Go to Diagnostic Procedure 2.

O.K.

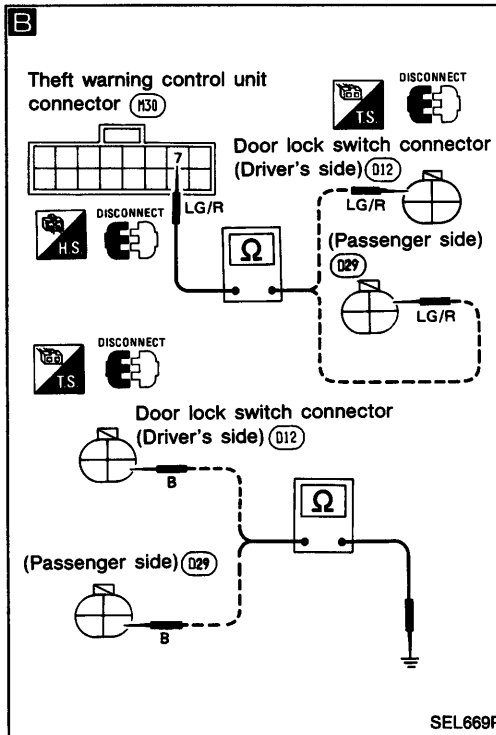
Replace control unit.

N.G.

Replace key cylinder switch.

N.G.

Repair harness or connectors.

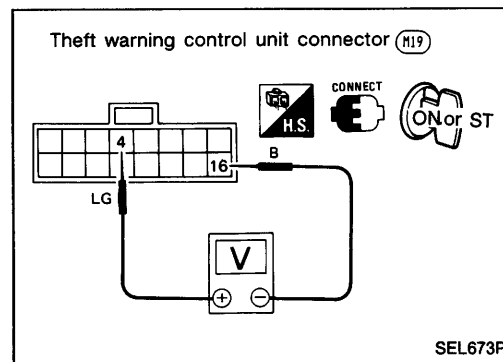
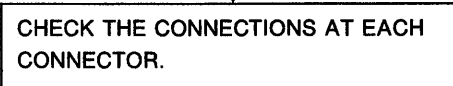
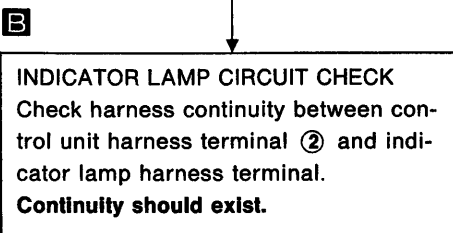
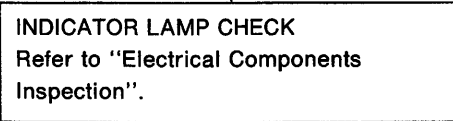
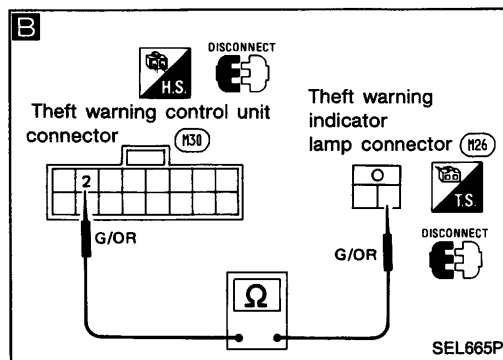
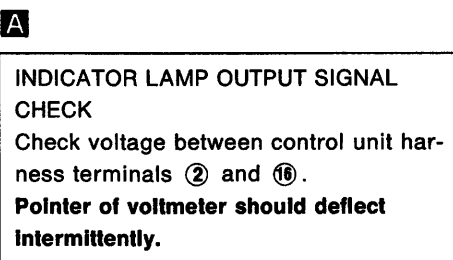
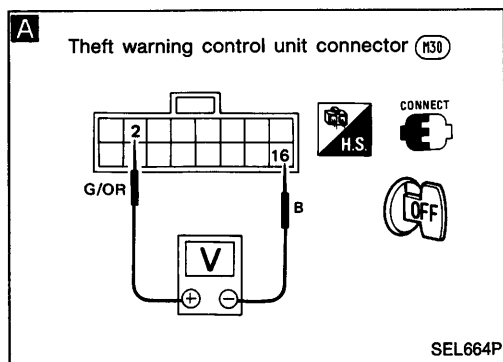


THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

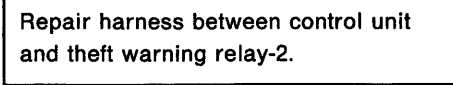
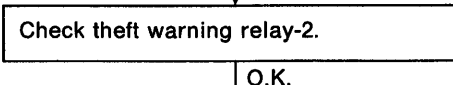
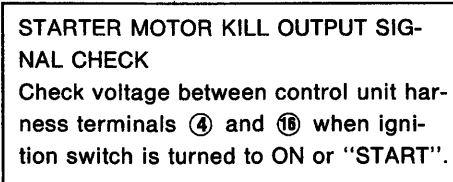
DIAGNOSTIC PROCEDURE 4

SYMPTOM: Indicator lamp does not blink.



DIAGNOSTIC PROCEDURE 5

SYMPTOM: STARTER MOTOR can be operated. (Starter killed phase)

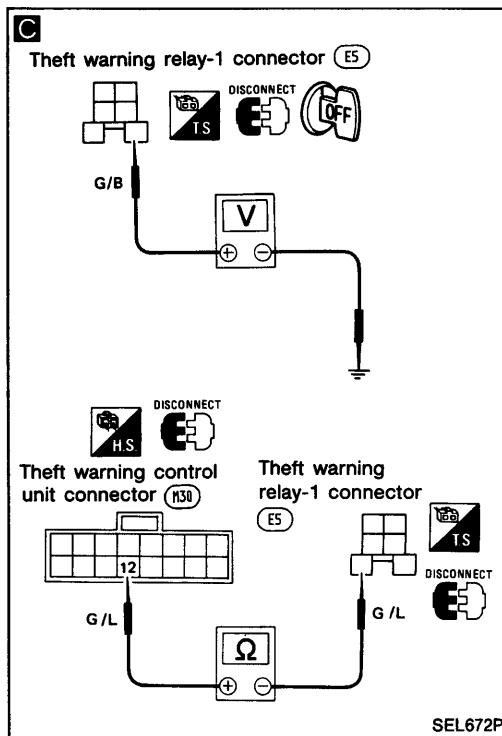
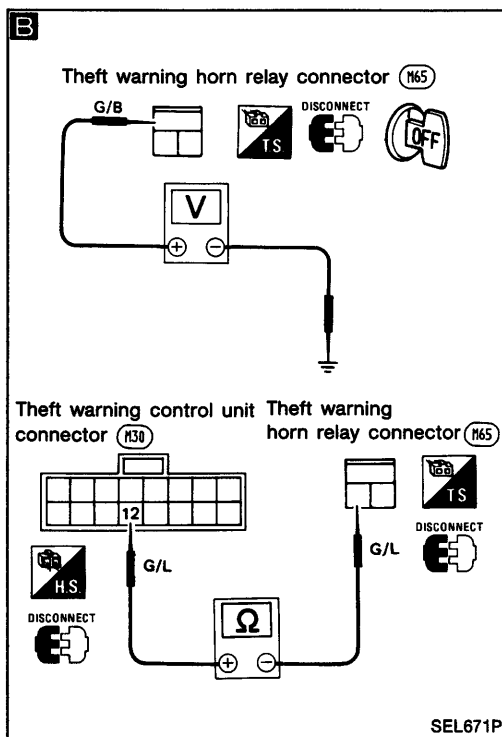
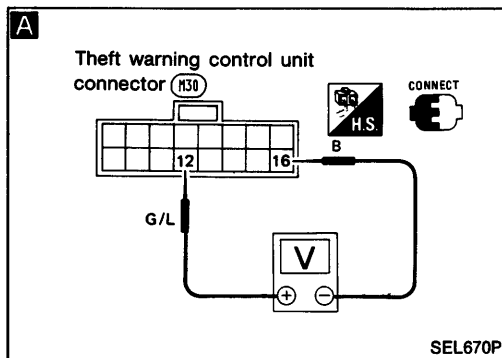


THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6

SYMPTOM: Alarm does not operate.



ALARM SIGNAL OUTPUT CHECK

Check voltage between control unit harness terminals 12 and 16.

Condition	Voltmeter
Except alarm phase	12V
Alarm phase	Pointer deflects intermittently

N.G. Replace control unit.

O.K.

Check theft warning horn relay.

N.G. Replace relay.

O.K.

THEFT WARNING HORN CIRCUIT CHECK

Check if voltage across theft warning horn relay harness terminal and body is 12V.

Check continuity between theft warning horn relay terminal and control unit harness terminal 12.

Continuity should exist.

N.G. Repair harness and connectors.

O.K.

Check theft warning relay-1.

N.G. Replace theft warning relay-1.

O.K.

THEFT WARNING HEADLAMP CIRCUIT CHECK

Check if voltage across theft warning relay-1 harness terminal and body is 12V.

Check continuity between theft warning relay-1 terminal and control unit harness terminals 12.

N.G. Repair harness and connectors.

O.K.

Does headlamp come on when turning lighting switch "ON"?

No Check headlamp system. Refer to "HEADLAMP".

Yes

Repair harness and connectors between lamp relay and headlamp.

GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

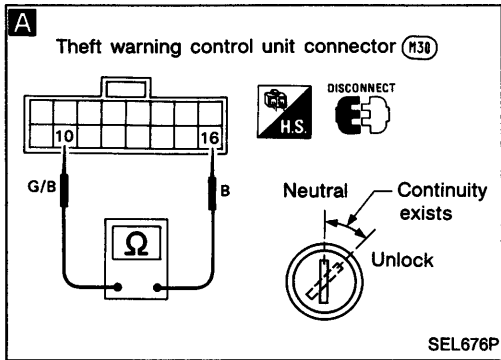


THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 8

SYMPTOM: Alarm does not stop even if stop signal is given.



A

TRUNK LID UNLOCK SWITCH INPUT SIGNAL CHECK (UNLOCK SIGNAL)
Check continuity between control unit harness terminals ⑩ and ⑯.

Key position	Continuity
Neutral/Unlock	No
Between neutral and unlock	Yes

O.K. Replace control unit.

N.G.

TRUNK LID UNLOCK SWITCH CHECK
Refer to "Electrical Components Inspection".

N.G. Replace key cylinder switch.

O.K.

B

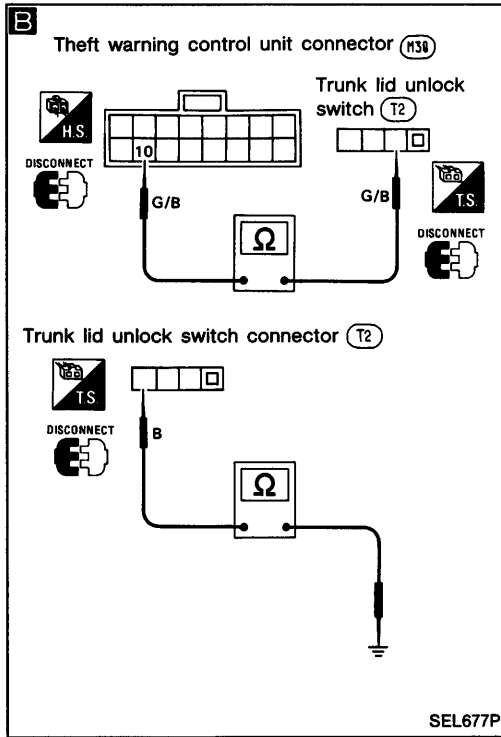
TRUNK LID UNLOCK SWITCH CIRCUIT CHECK

- Check harness continuity between control unit harness terminal ⑩ and trunk lid unlock switch terminal.
- Check harness continuity between trunk lid unlock switch terminal and body ground.

N.G. Repair harness or connectors.

O.K.

CHECK THE CONNECTIONS AT EACH CONNECTOR.



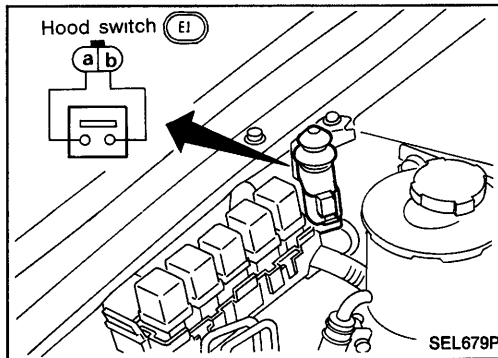
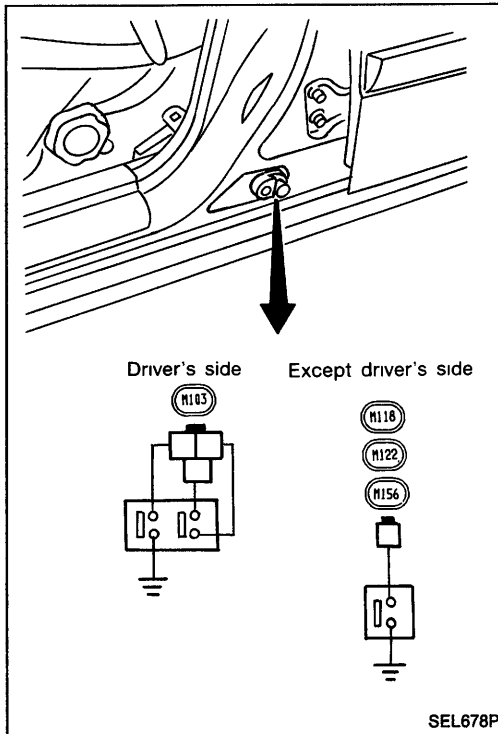
THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

ELECTRICAL COMPONENTS INSPECTION

Door switches

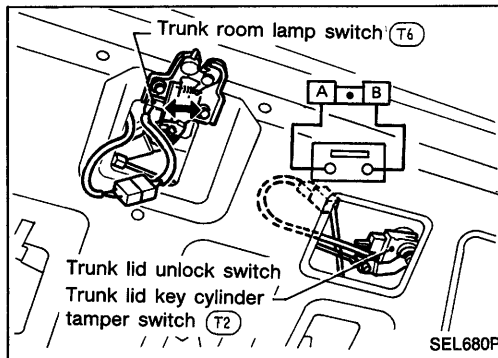
Check continuity between terminal and switch body.



Hood switch

Check continuity between terminals when hood switch is pushed and released.

Terminal	Pushed	Released
a		○
b		○



Trunk room lamp switch

Terminal	Trunk lid	
	Closed	Open
a		○
b		○

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

EL

THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

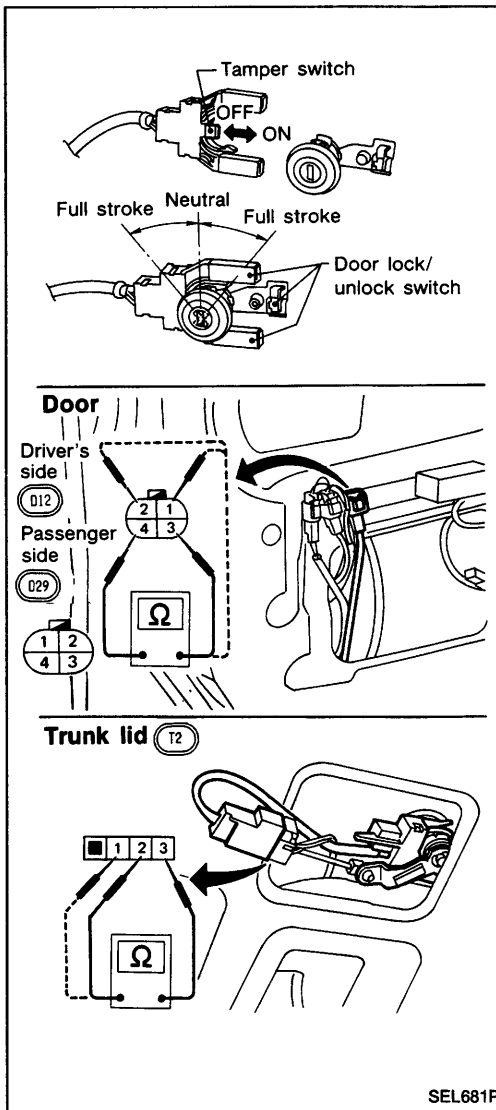
Key cylinder tamper switch, door lock switch and door unlock switch

● Door

	TAMPER SWITCH		DOOR LOCK SWITCH		DOOR UNLOCK SWITCH	
	Key cylinder is installed	Key cylinder is removed	Full stroke	Between full stroke and neutral	Neutral	Between full stroke and neutral
1				○		
2						○
3		○				○
4		○		○		○

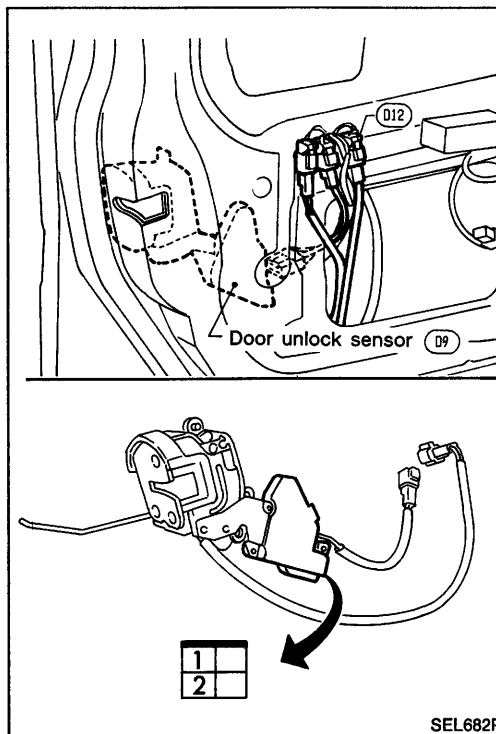
Trunk lid

	TAMPER SWITCH		Trunk lid unlock switch		
	Key cylinder is installed	Key cylinder is removed	Full stroke	Between full stroke and neutral	Neutral
1				○	
2		○		○	
3		○		○	

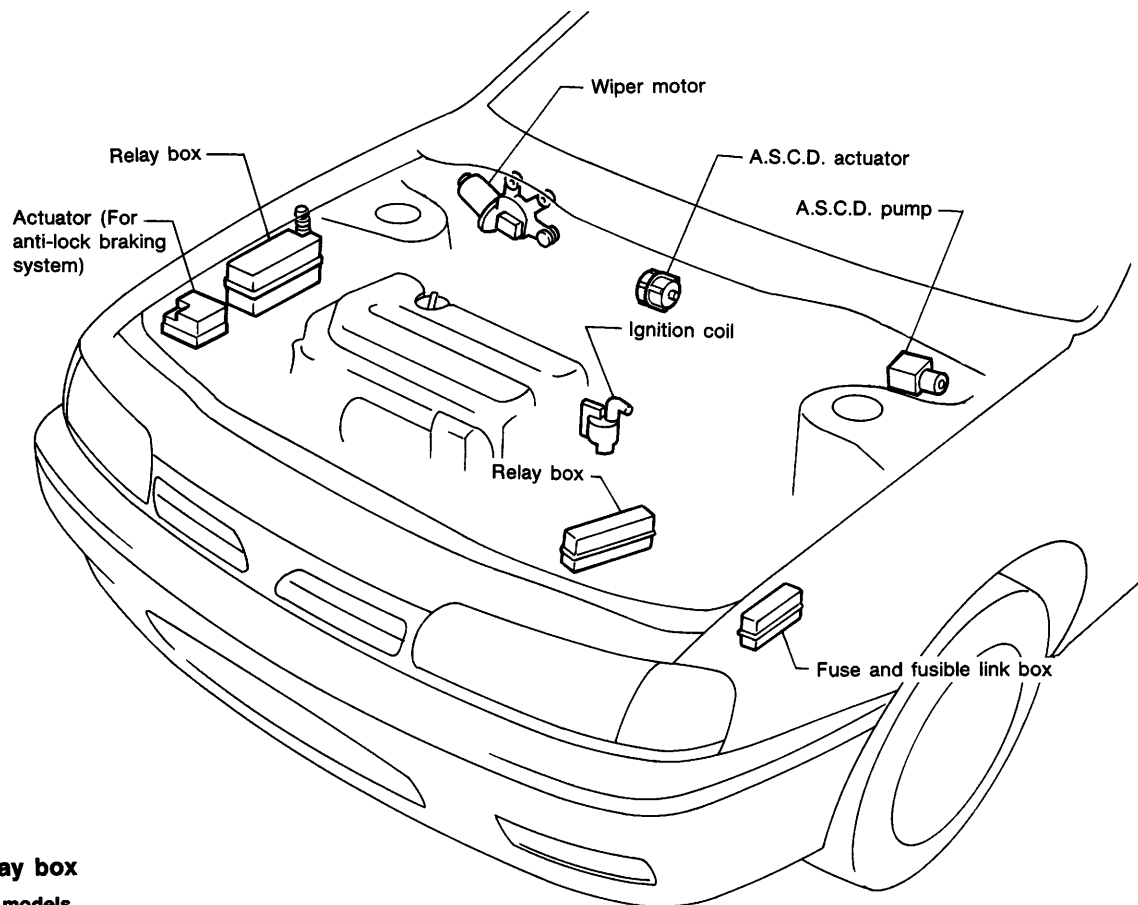


Door unlock sensor

	LOCK	UNLOCK
1		○
2		○



Engine Compartment

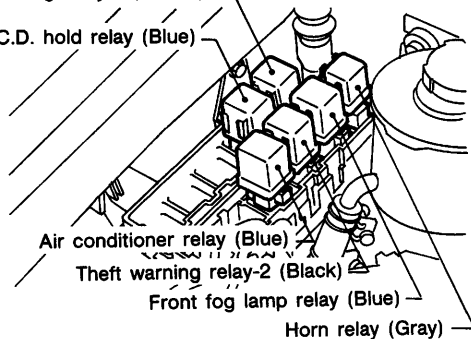


Relay box

A/T models

Theft warning relay-1 (Brown)

A.S.C.D. hold relay (Blue)



M/T models

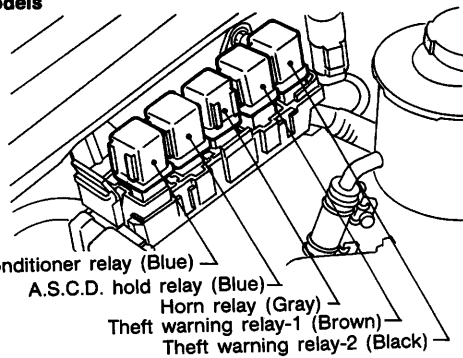
Air conditioner relay (Blue)

A.S.C.D. hold relay (Blue)

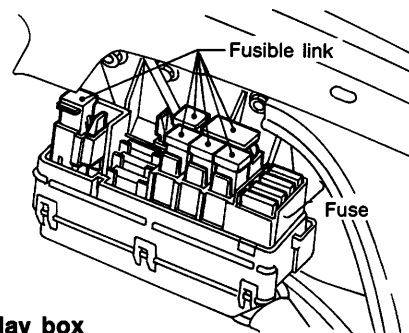
Horn relay (Gray)

Theft warning relay-1 (Brown)

Theft warning relay-2 (Black)



Fuse and fusible link box



Relay box

Fuel pump relay (Green)

ECCS relay (Green)

Radiator fan relay-2 (Brown) (A/T models)

Front fog lamp relay (Blue) (M/T models)

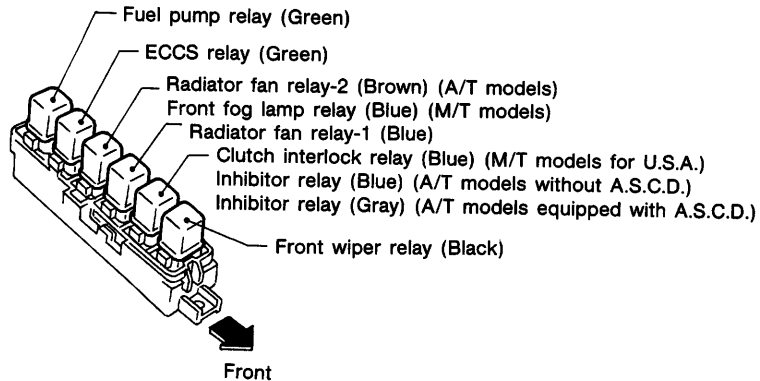
Radiator fan relay-1 (Blue)

Clutch interlock relay (Blue) (M/T models for U.S.A.)

Inhibitor relay (Blue) (A/T models without A.S.C.D.)

Inhibitor relay (Gray) (A/T models equipped with A.S.C.D.)

Front wiper relay (Black)



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

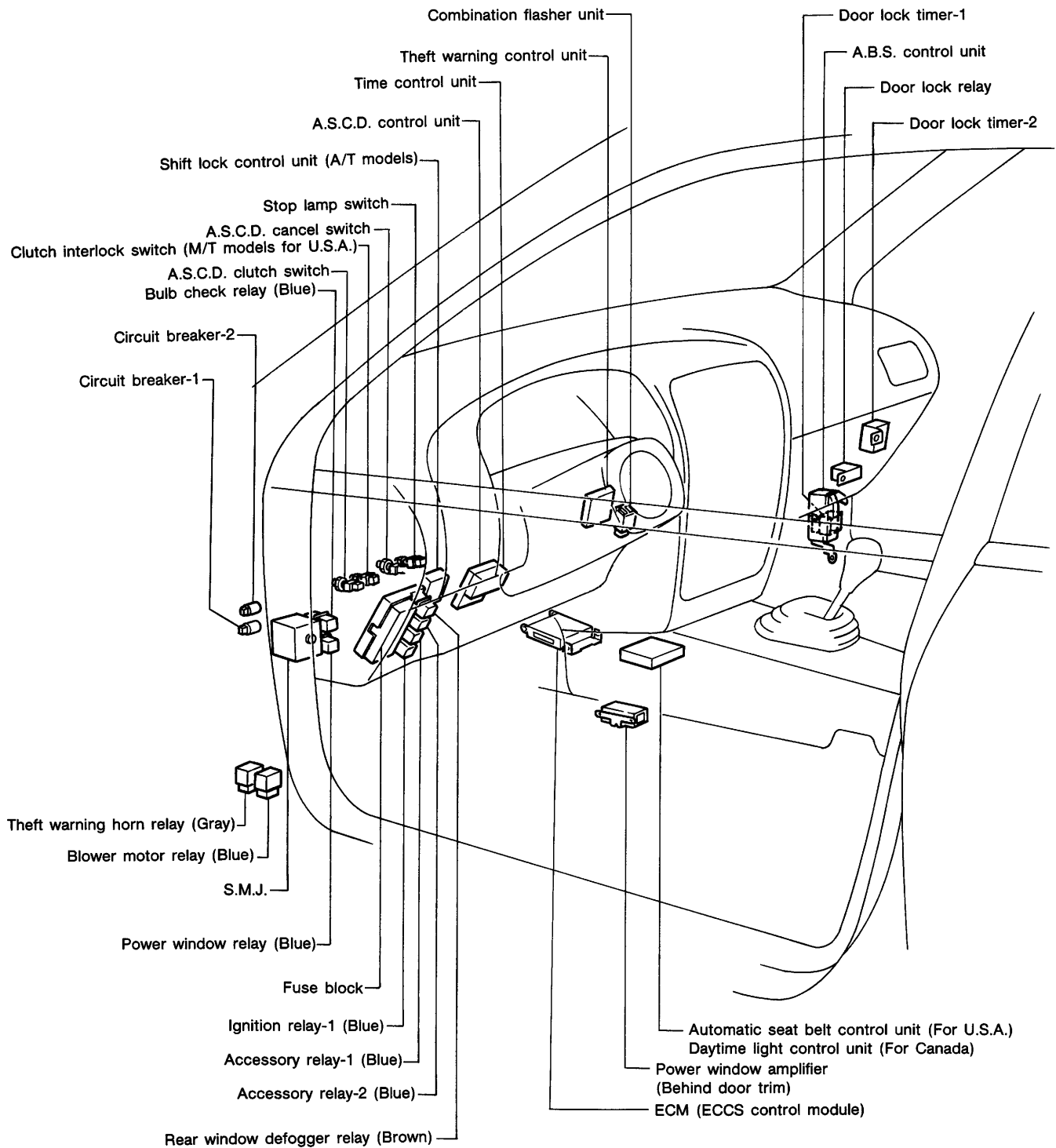
BF

HA

EL

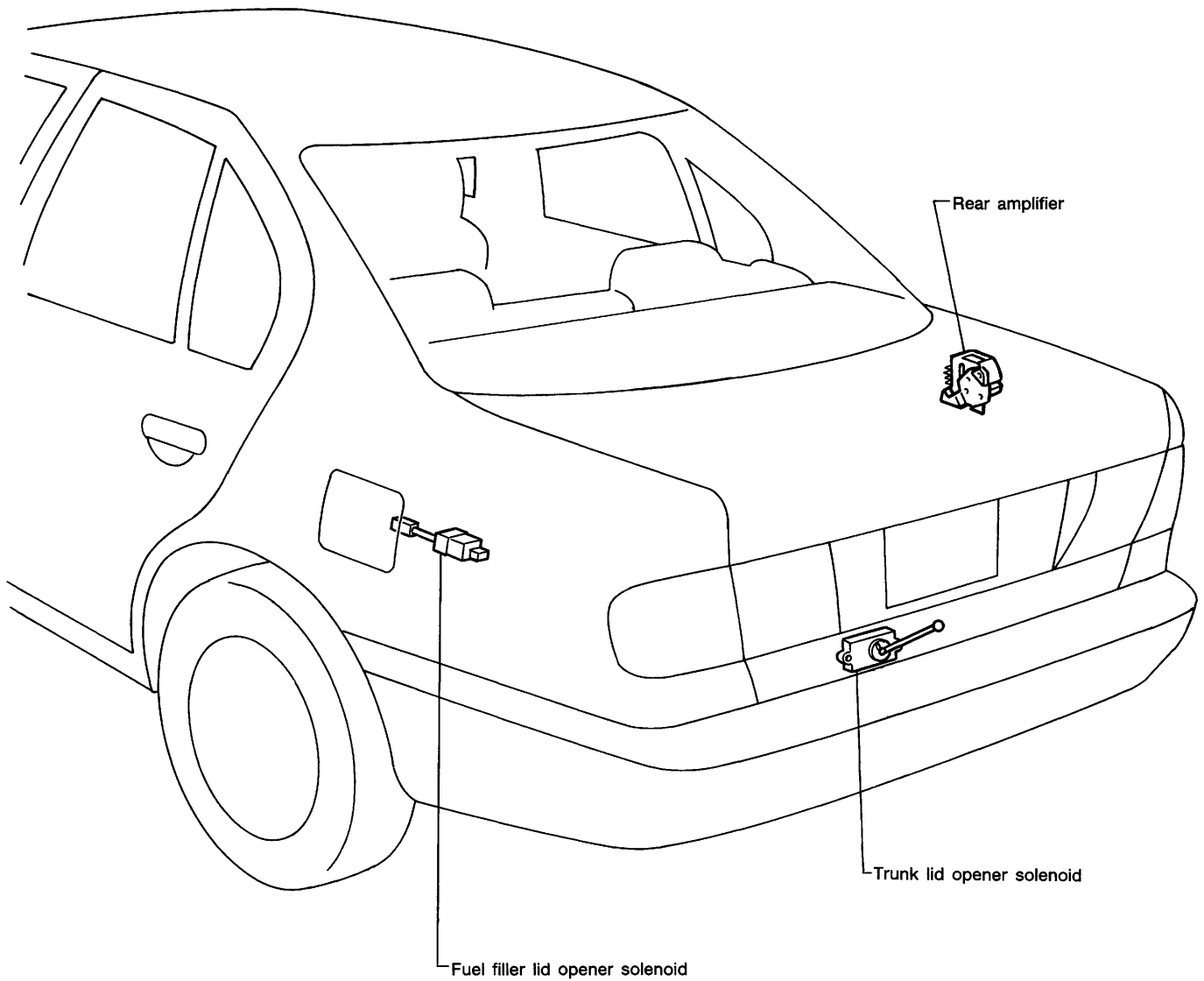
LOCATION OF ELECTRICAL UNITS

Passenger Compartment



LOCATION OF ELECTRICAL UNITS

Luggage Compartment



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

HA

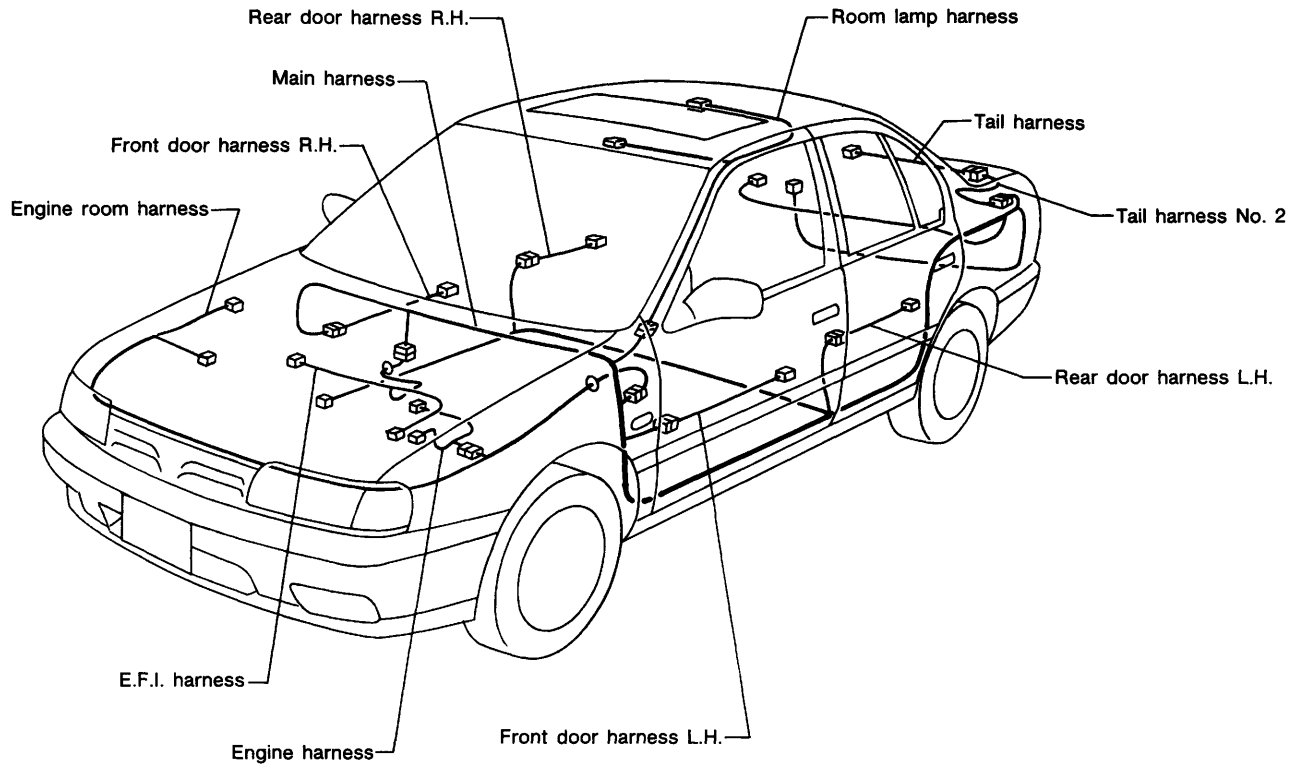
EL

LOCATION OF ELECTRICAL UNITS

NOTE

HARNESS LAYOUT

Outline



MEL306A

GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

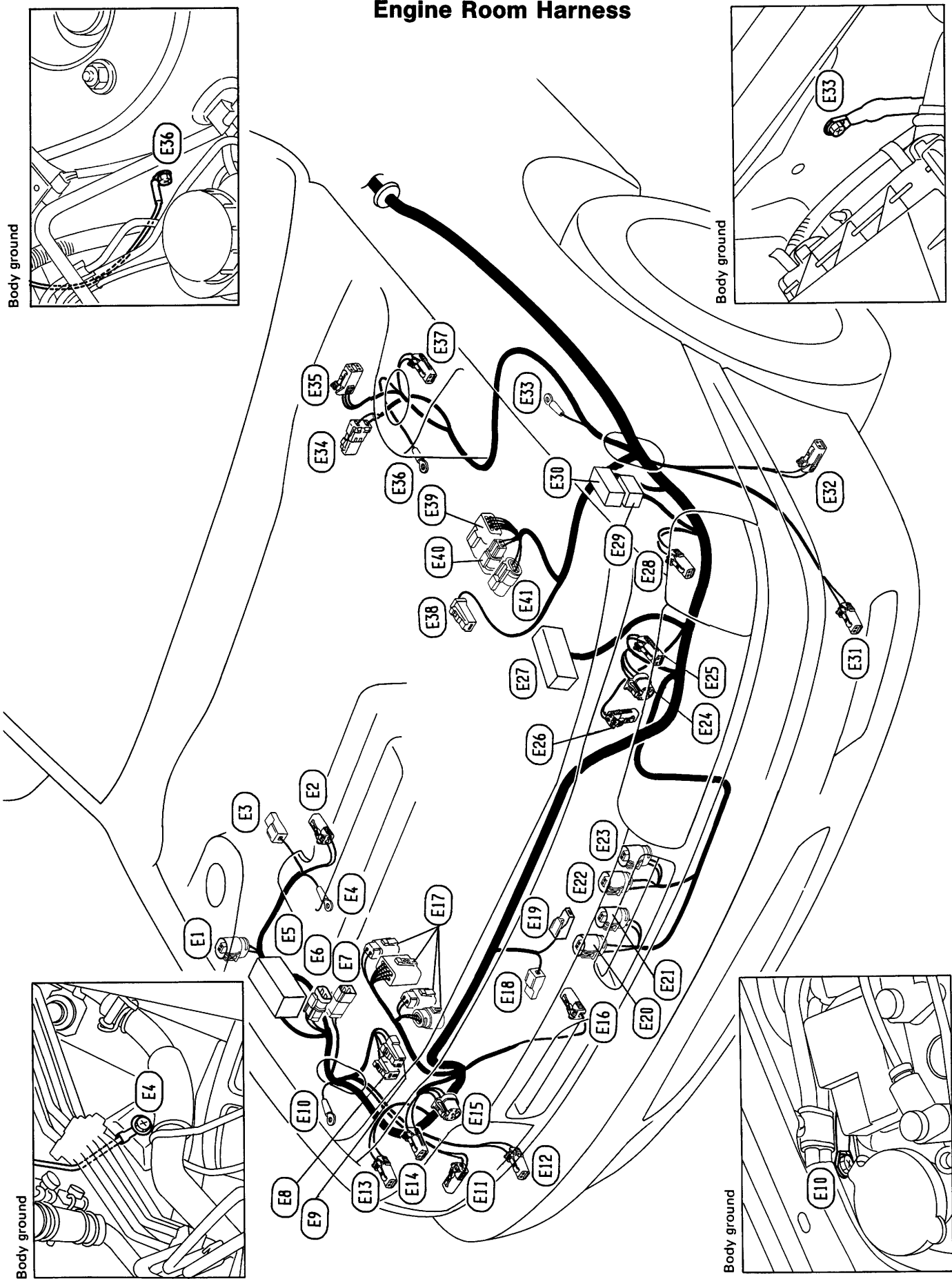
BF

HA

EL

HARNESS LAYOUT

Engine Room Harness

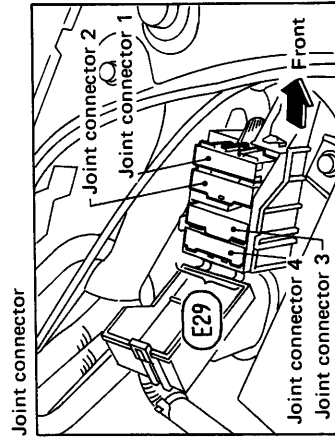


HARNESS LAYOUT

Engine Room Harness (Cont'd)

- (E1) : Hood switch
- (E2) : Front wheel sensor R.H. (For anti-lock braking system)
- (E3) : Theft warning horn
- (E4) : Body ground (For anti-lock braking system)
- (E5) : Relay box (Refer to "LOCATION OF ELECTRICAL UNITS".)
- (E6) : To (A1)
- (E7) : To (A2)
- (E8) : Front washer motor
- (E9) : Washer level switch
- (E10) : Body ground
- (E11) : Front side marker lamp R.H.
- (E12) : Front fog lamp R.H.
- (E13) : Front turn signal lamp R.H.
- (E14) : Clearance lamp R.H.
- (E15) : Headlamp R.H.
- (E16) : Compressor
- (E17) : Actuator (For anti-lock braking system)
- (E18) : Horn (Low)
- (E19) : Horn (High)
- (E20) : Radiator fan motor-1 (A/T models)
- (E21) : Radiator fan motor-1 (M/T models)
- (E22) : Radiator fan motor-2 (A/T models)
- (E23) : Radiator fan motor-2 (M/T models)
- (E24) : Headlamp L.H.
- (E25) : Clearance lamp L.H.
- (E26) : Dual-pressure switch
- (E27) : Relay box (Refer to "LOCATION OF ELECTRICAL UNITS".)
- (E28) : Front turn signal lamp L.H.
- (E29) : Joint connector box

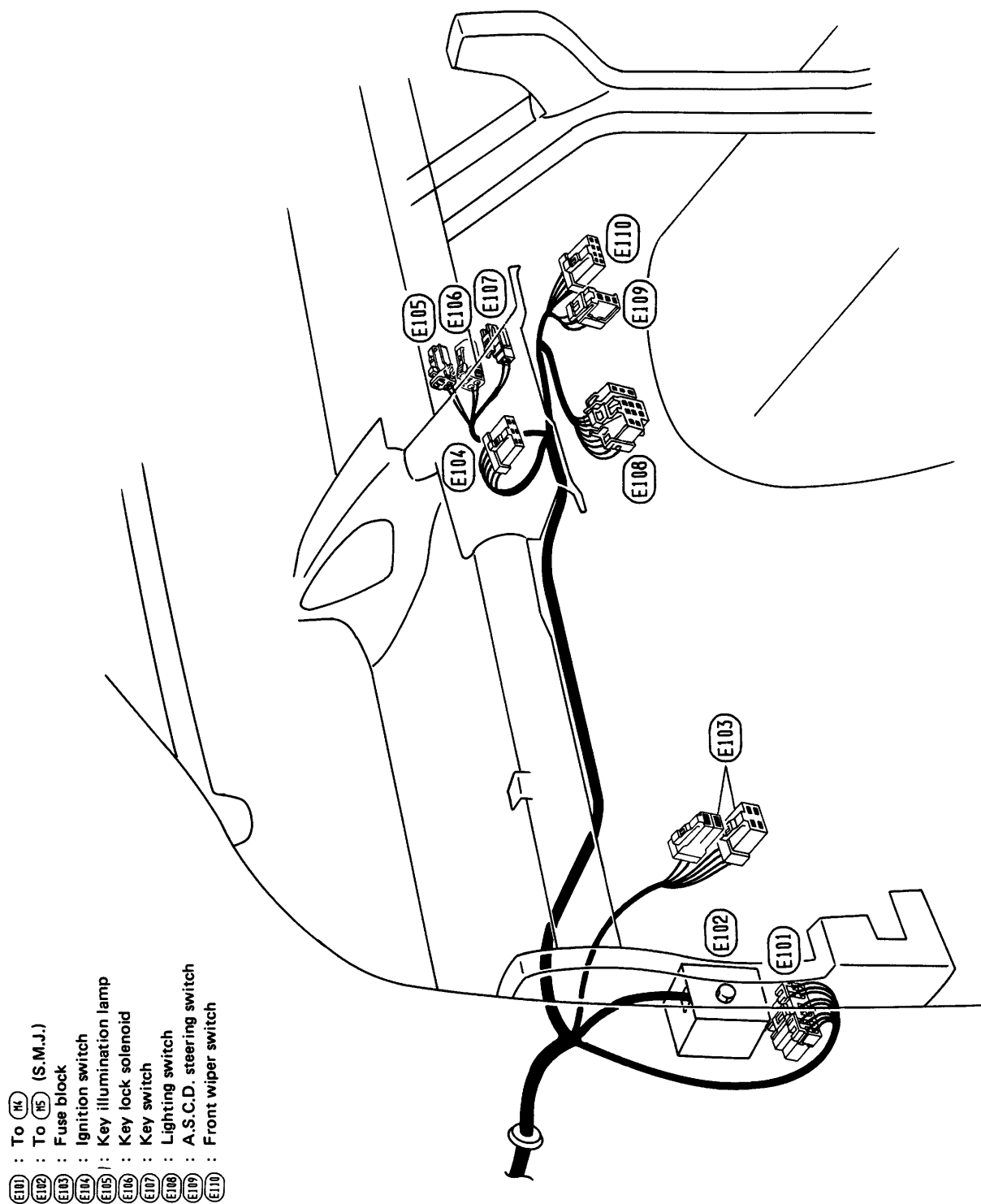
- (E30) : Fuse and fusible link box
- (E31) : Front fog lamp L.H.
- (E32) : Front side marker lamp L.H.
- (E33) : Body ground
- (E34) : Brake fluid level switch
- (E35) : A.S.C.D. pump
- (E36) : Body ground (For anti-lock braking system)
- (E37) : Front wheel sensor L.H. (For anti-lock braking system)
- (E38) : Battery
- (E39) : To (E215)
- (E40) : To (E216)
- (E41) : To (E217)



GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

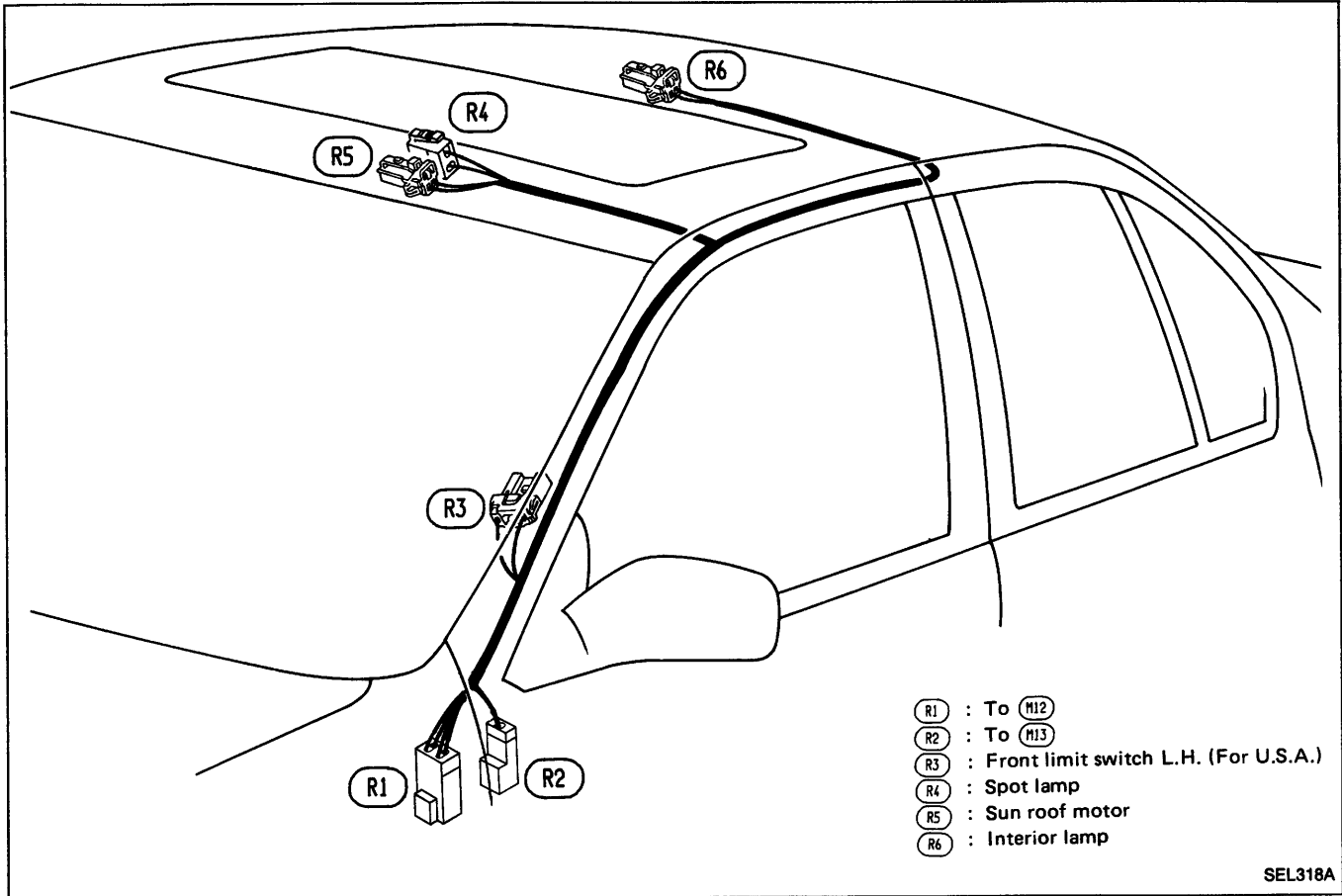
HARNESS LAYOUT

Engine Room Harness (Cont'd)



HARNESS LAYOUT

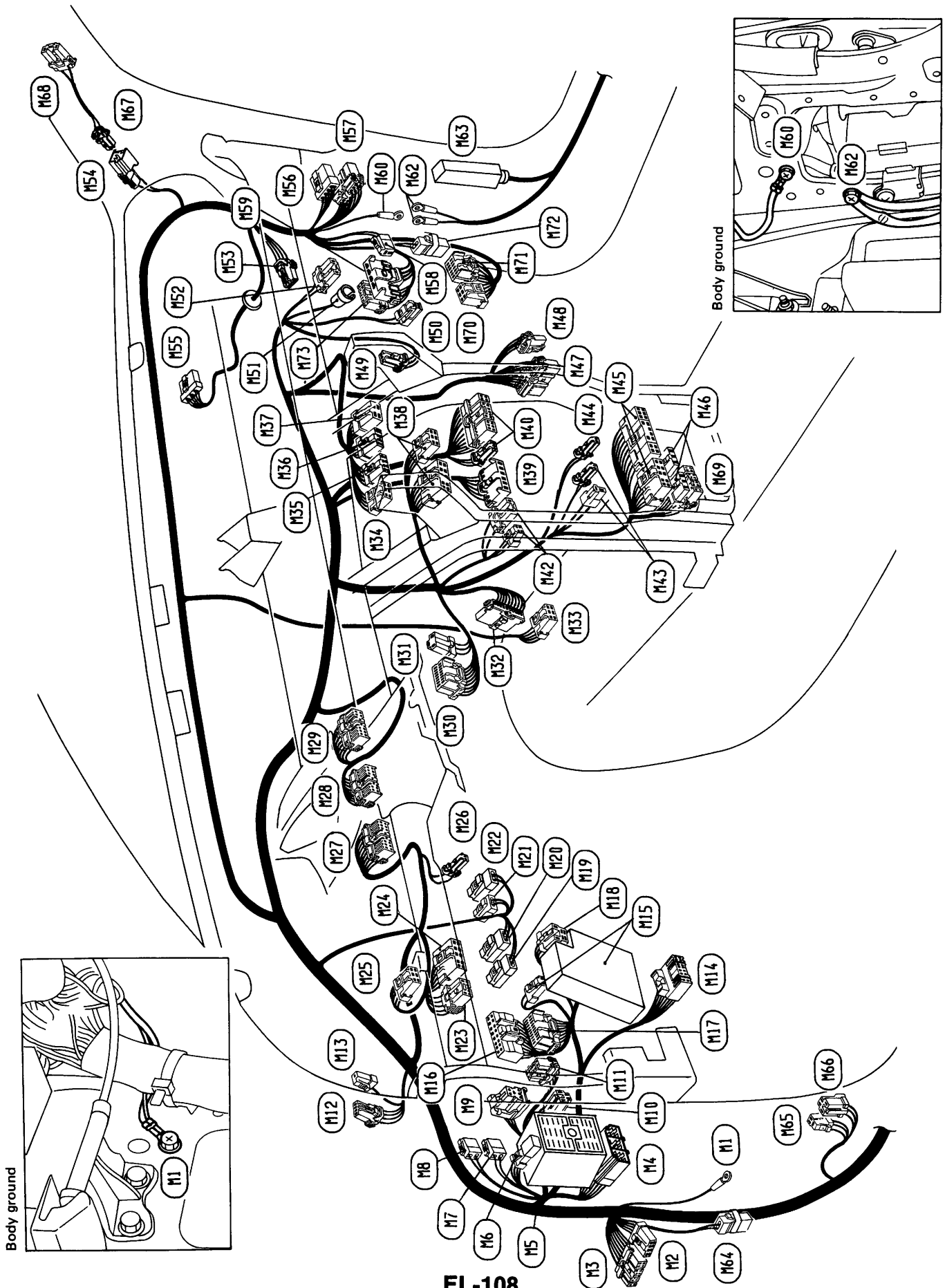
Room Lamp Harness



GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

HARNESS LAYOUT

Main Harness



HARNESS LAYOUT

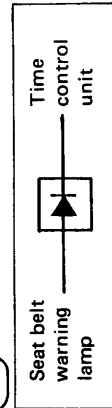
Main Harness (Cont'd)

- ①① : Body ground
- ①② : To ①①
- ①③ : To ①②
- ①④ : To ①①① (S.M.J.)
- ①⑤ : To ①①②
- ①⑥ : Diode
- ①⑦ : Circuit breaker-1
- ①⑧ : Circuit breaker-2 (For U.S.A.)
- ①⑨ : Bulb check relay
- ①⑩ : Power window relay
- ①⑪ : Shift lock control unit (A/T models)
- ①⑫ : To ①①
- ①⑬ : To ①②
- ①⑭ : Data link connector for CONSULT
- ①⑮ : Fuse block
- ①⑯ : A.S.C.D. control unit
- ①⑰ : Time control unit
- ①⑱ : Rear window defogger relay
- ①⑲ : Clutch interlock switch (For U.S.A. M/T models)
- ①⑲ : A.S.C.D. clutch switch (M/T models)
- ①⑲ : Stop lamp switch
- ①⑲ : A.S.C.D. cancel switch
- ①⑲ : Illumination control switch
- ①⑲ : Door mirror switch
- ①⑲ : A.S.C.D. main switch
- ①⑲ : Theft warning indicator lamp
- ①⑲ : Combination meter
- ①⑲ : Combination meter
- ①⑲ : Combination meter
- ①⑲ : Theft warning control unit
- ①⑲ : Combination flasher unit
- ①⑲ : Mode door motor
- ①⑲ : To ①⑲
- ①⑲ : Rear window defogger switch
- ①⑲ : Not used
- ①⑲ : Hazard switch
- ①⑲ : Fog lamp switch
- ①⑲ : Radio
- ①⑲ : Fan switch
- ①⑲ : Push control unit

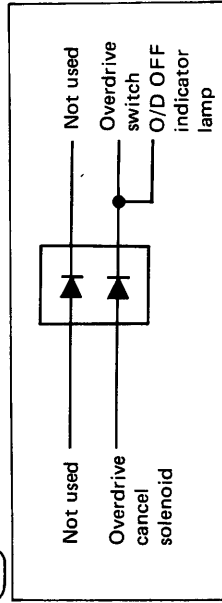
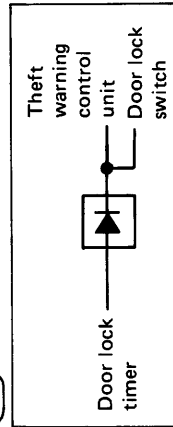
- ①④② : Not used
- ①④③ : Cigarette lighter
- ①④④ : Ashtray illumination lamp
- ①④⑤ : 2-point motorized automatic seat belt control unit (For U.S.A.)
- ①④⑥ : Daytime light control unit (For Canada)
- ①④⑦ : To ①④⑦
- ①④⑧ : Not used
- ①④⑨ : Thermo control amplifier
- ①⑤① : Trunk lid opener cancel switch
- ①⑤② : Glove box lamp
- ①⑤③ : Glove box lamp switch
- ①⑤④ : Intake door motor
- ①⑤⑤ : To ①⑤⑤
- ①⑤⑥ : Front wiper motor
- ①⑤⑦ : To ①⑤⑦
- ①⑤⑧ : To ①⑤⑧

- ①⑤⑨ : Blower motor
- ①⑤⑩ : Resistor
- ①⑤⑪ : Body ground
- ①⑤⑫ : Body ground (For anti-lock braking system)
- ①⑤⑬ : A.B.S. control unit
- ①⑤⑭ : Diode
- ①⑤⑮ : Theft warning horn relay
- ①⑤⑯ : Blower motor relay
- ①⑤⑰ : To ①⑤⑰
- ①⑤⑱ : Front limit switch R.H. (For U.S.A.)
- ①⑥① : E.L.R. control unit (M/T models)
- ①⑥② : Door lock timer
- ①⑥③ : Door lock timer
- ①⑥④ : Diode
- ①⑥⑤ : E.L.R. control unit (A/T models)

①⑥ Diode



①⑦② Diode

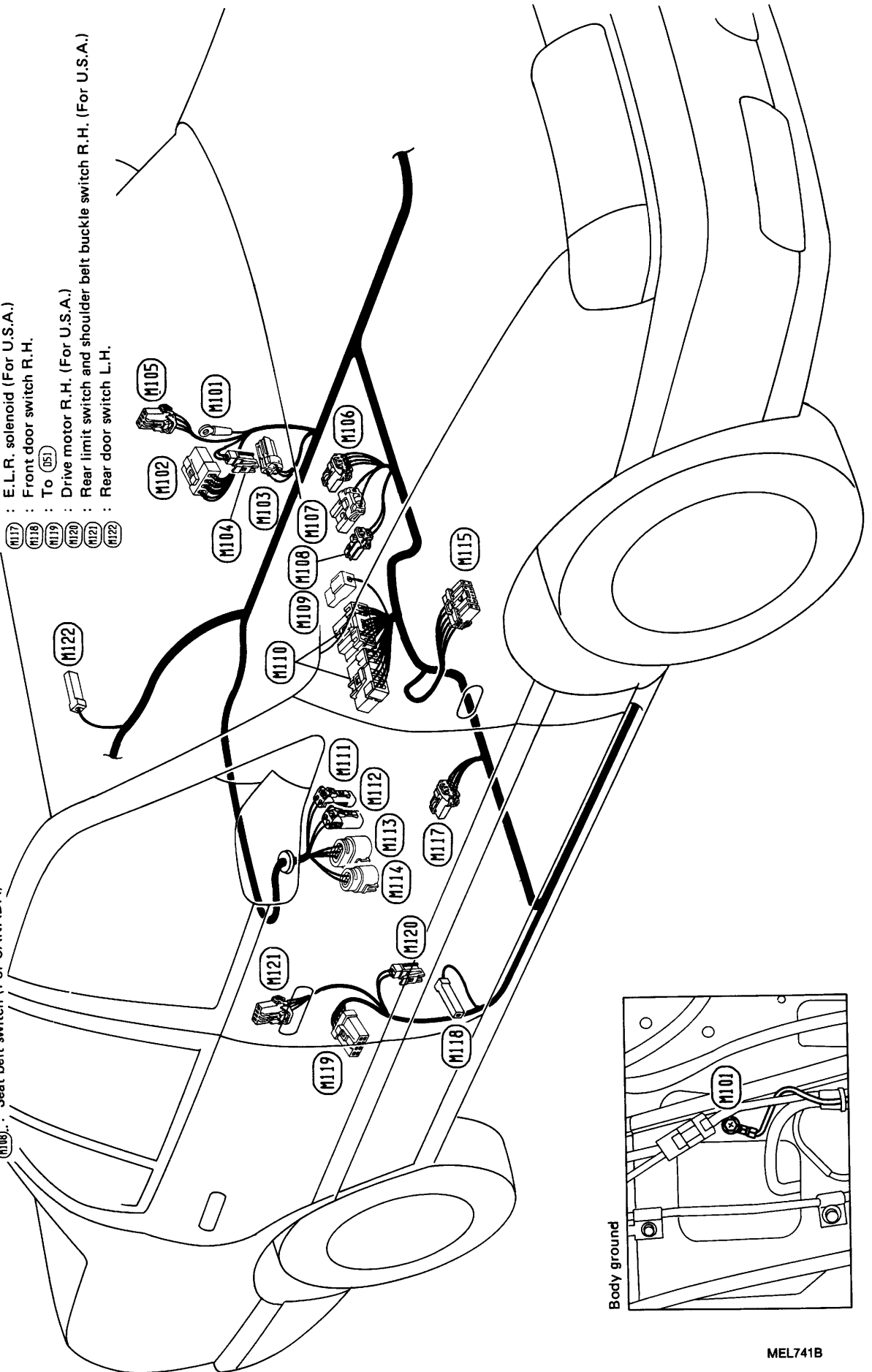


HARNESS LAYOUT

Main Harness (Cont'd)

- (M109) : Parking brake switch
- (M110) : Power window main switch and door lock and unlock switch
- (M111) : Rear wheel sensor L.H. (For anti-lock braking system)
- (M112) : Rear wheel sensor R.H. (For anti-lock braking system)
- (M113) : Fuel tank gauge unit
- (M114) : Fuel pump
- (M115) : Shift lock solenoid, detention switch,
- (M116) : A/T indicator lamp and overdrive switch (A/T models)
- (M117) : E.L.R. solenoid (For U.S.A.)
- (M118) : Front door switch R.H.
- (M119) : To (M1)
- (M120) : Drive motor R.H. (For U.S.A.)
- (M121) : Rear limit switch and shoulder belt buckle switch R.H. (For U.S.A.)
- (M122) : Rear door switch L.H.

- (M101) : Body ground
- (M102) : To (M1)
- (M103) : Front door switch L.H.
- (M104) : Drive motor L.H. (For U.S.A.)
- (M105) : Rear limit switch and shoulder belt buckle switch L.H. (For U.S.A.)
- (M106) : E.L.R. solenoid L.H. (For U.S.A.)
- (M107) : Lap belt buckle switch (For U.S.A.)
- (M108) : Seat belt switch (For CANADA)



Body ground

MEL741B

Main Harness, Tail Harness and Tail Harness No. 2

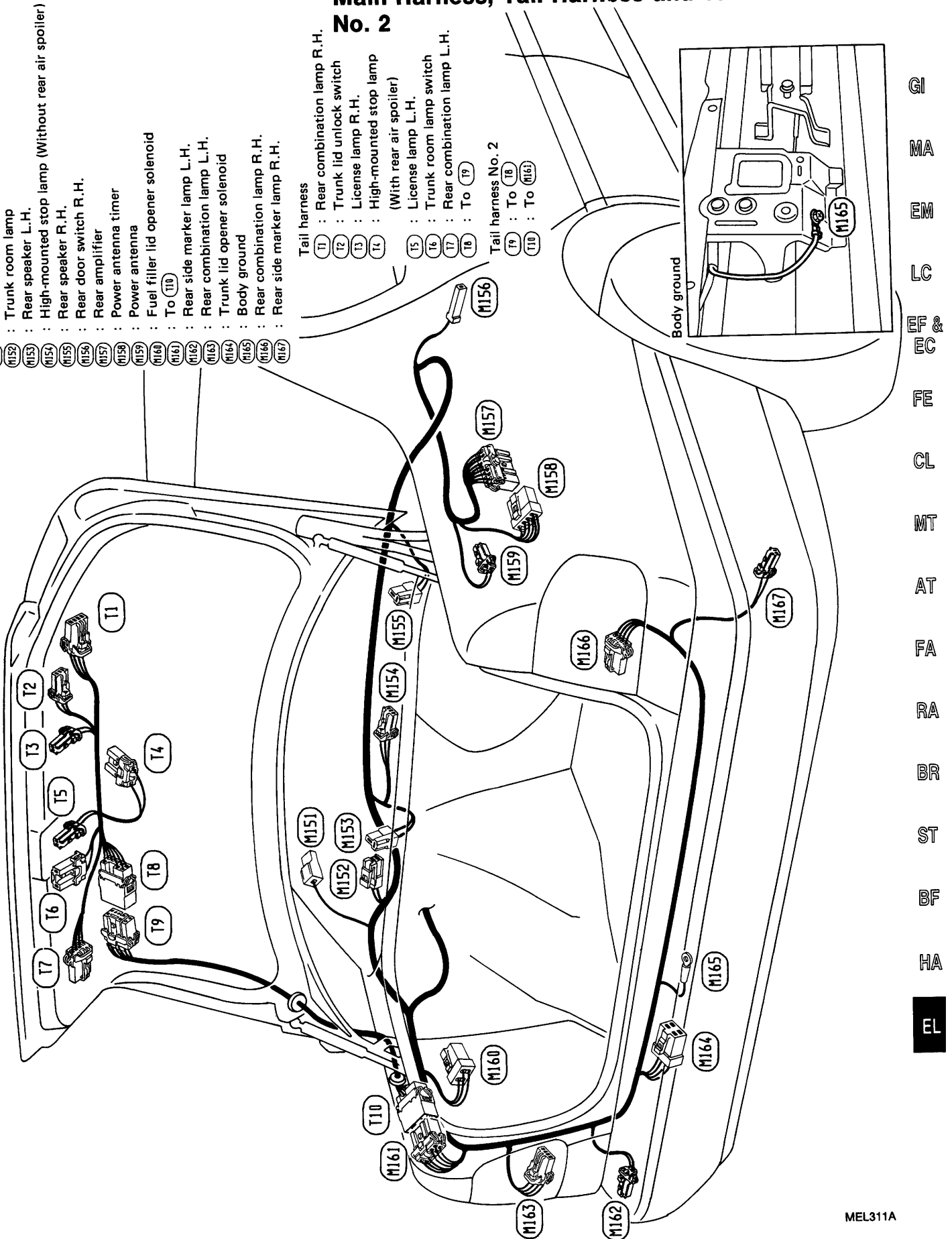
- (M151) : Rear window defogger
- (M152) : Trunk room lamp
- (M153) : Rear speaker L.H.
- (M154) : High-mounted stop lamp (Without rear air spoiler)
- (M155) : Rear speaker R.H.
- (M156) : Rear door switch R.H.
- (M157) : Rear amplifier
- (M158) : Power antenna timer
- (M159) : Power antenna
- (M160) : Fuel filler lid opener solenoid
- (M161) : To (T10)
- (M162) : Rear side marker lamp L.H.
- (M163) : Rear combination lamp L.H.
- (M164) : Trunk lid opener solenoid
- (M165) : Body ground
- (M166) : Rear combination lamp R.H.
- (M167) : Rear side marker lamp R.H.

Tail harness

- (T1) : Rear combination lamp R.H.
- (T2) : Trunk lid unlock switch
- (T3) : License lamp R.H.
- (T4) : High-mounted stop lamp (With rear air spoiler)
- (T5) : License lamp L.H.
- (T6) : Trunk room lamp switch
- (T7) : Rear combination lamp L.H.
- (T8) : To (T9)

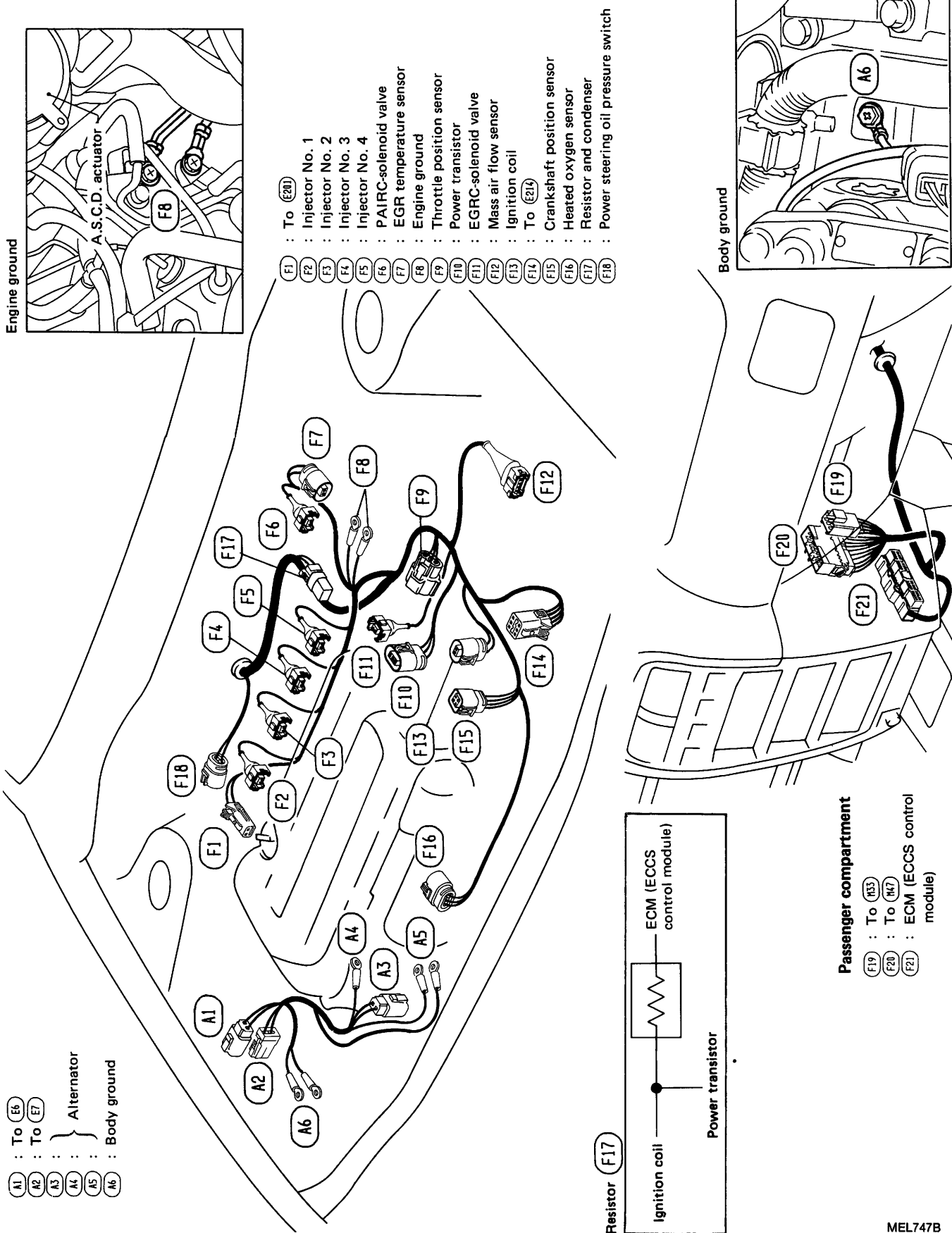
Tail harness No. 2

- (T9) : To (T8)
- (T10) : To (M161)



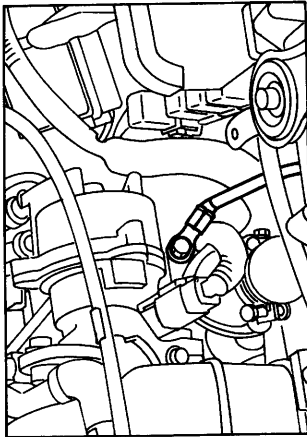
GI
MA
EM
LC
EF & EC
FE
CL
MT
AT
FA
RA
BR
ST
BF
HA
EL

E.F.I. Harness and Alternator Harness

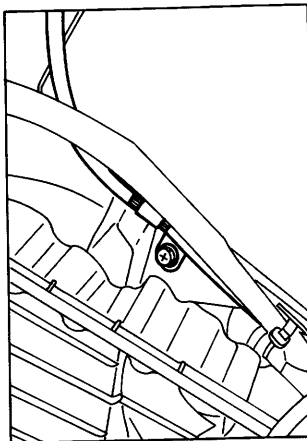


Engine Harness

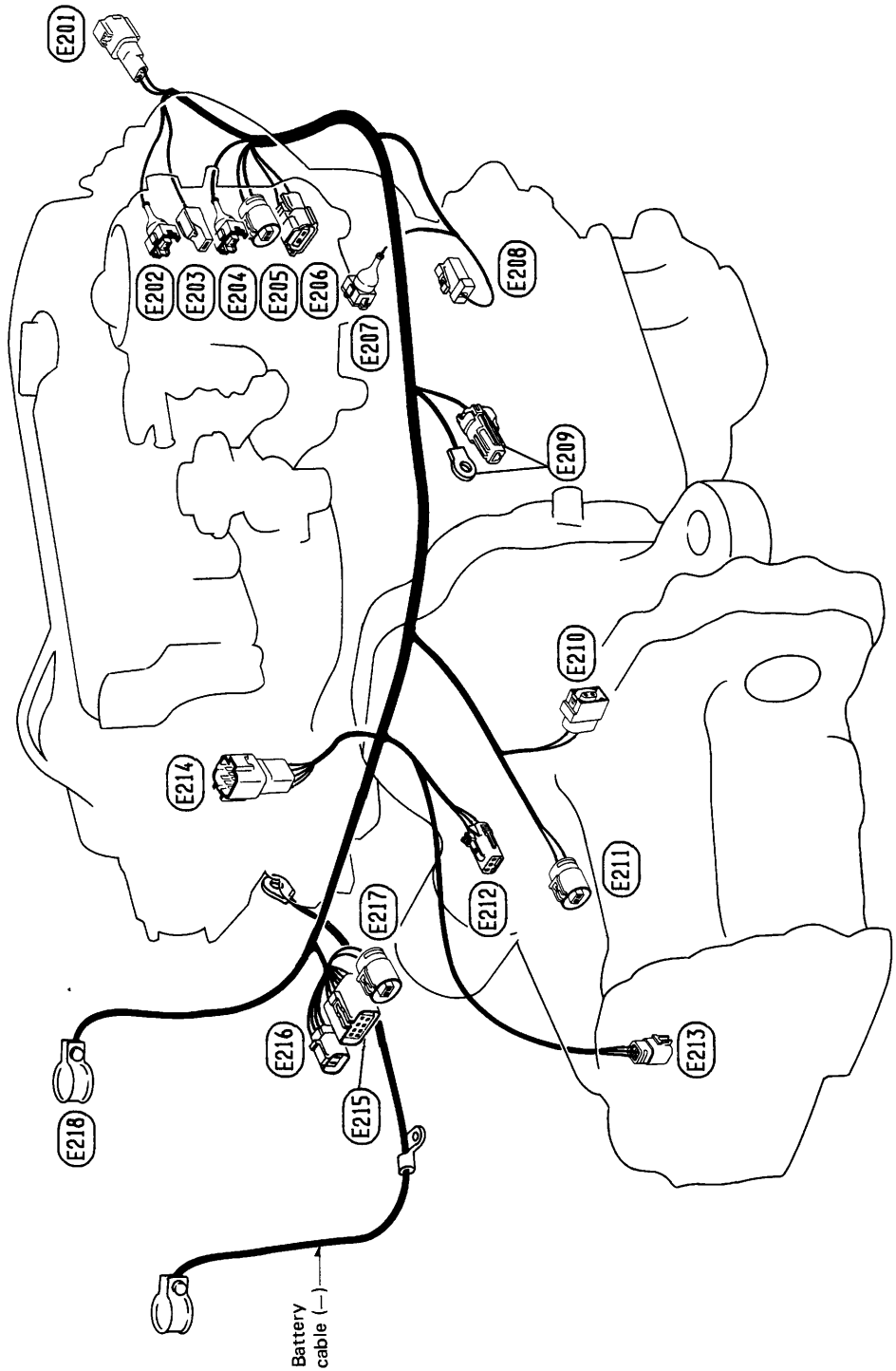
- (E201) : To (F1)
 (E202) : Engine coolant temperature sensor
 (E203) : Thermal transmitter
 (E204) : IACV-air regulator
 (E205) : IACV-FICD solenoid valve
 (E206) : IACV-AAC valve
 (E207) : Knock sensor
 (E208) : Oil pressure switch
 (E209) : Starter motor
 (E210) : Neutral position switch (M/T models)
 (E211) : Back-up lamp switch (M/T models)
- (E212) : Torque converter clutch solenoid valve and overdrive control solenoid (A/T models)
 (E213) : Inhibitor switch (A/T models)
 (E214) : To (F1)
 (E215) : To (E39)
 (E216) : To (E40)
 (E217) : To (E41)
 (E218) : Battery



Engine ground [Battery cable (-)]



Body ground [Battery cable (-)]



GI

MA

EM

LC

EF &
EC

FE

CL

MT

AT

FA

RA

BR

ST

BF

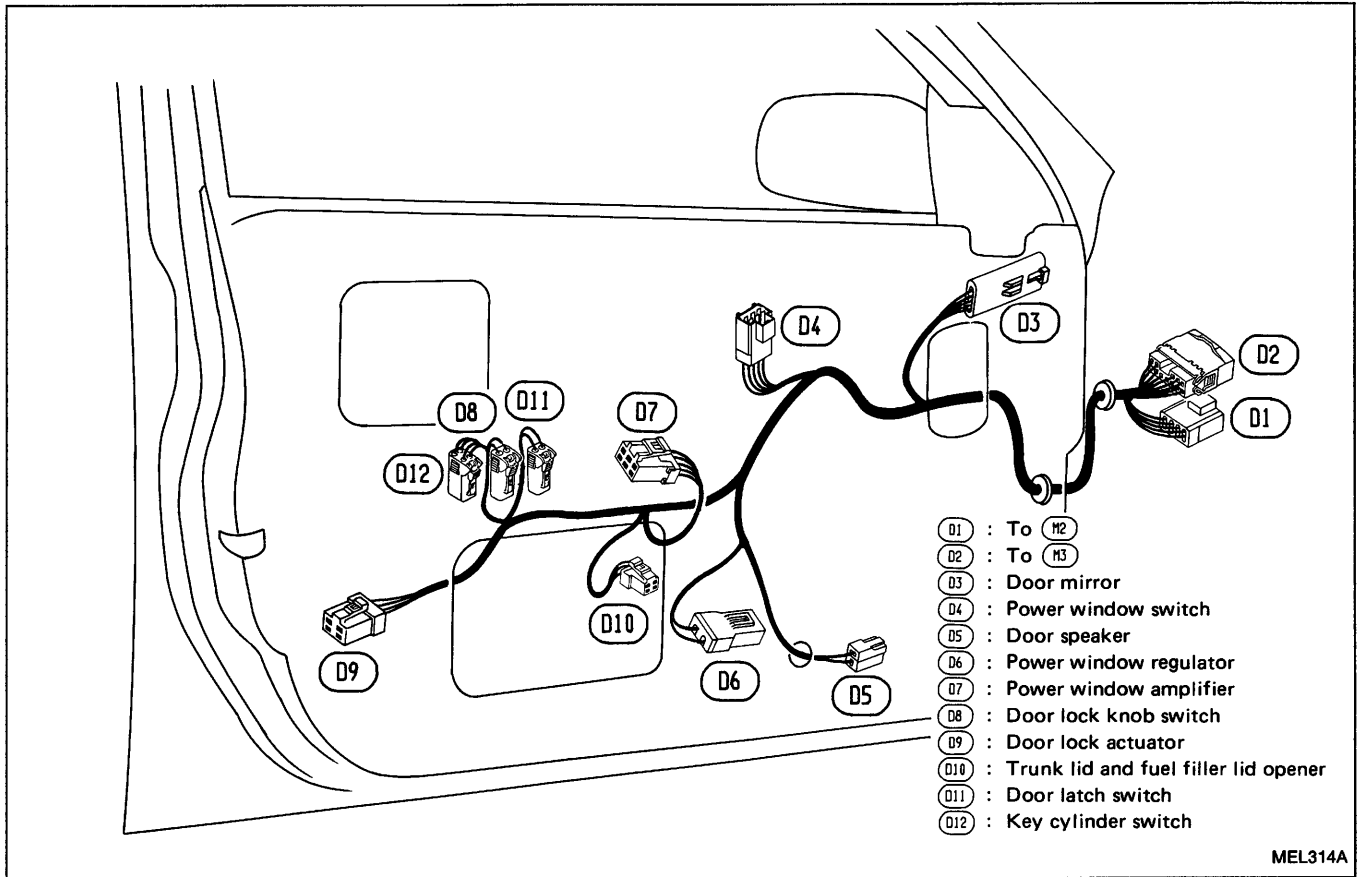
HA

EL

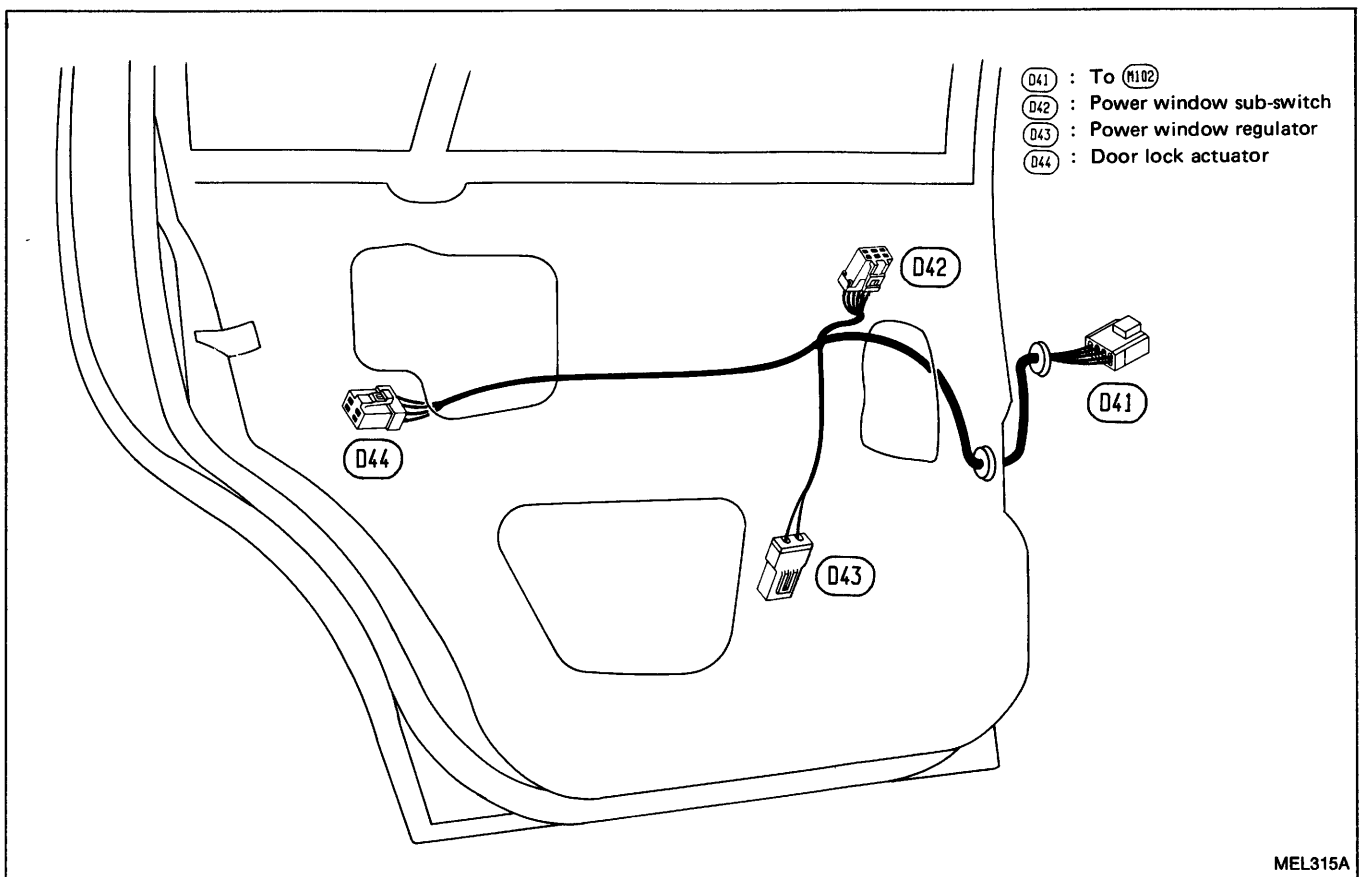
HARNESS LAYOUT

FRONT

Door Harness (L.H. side)



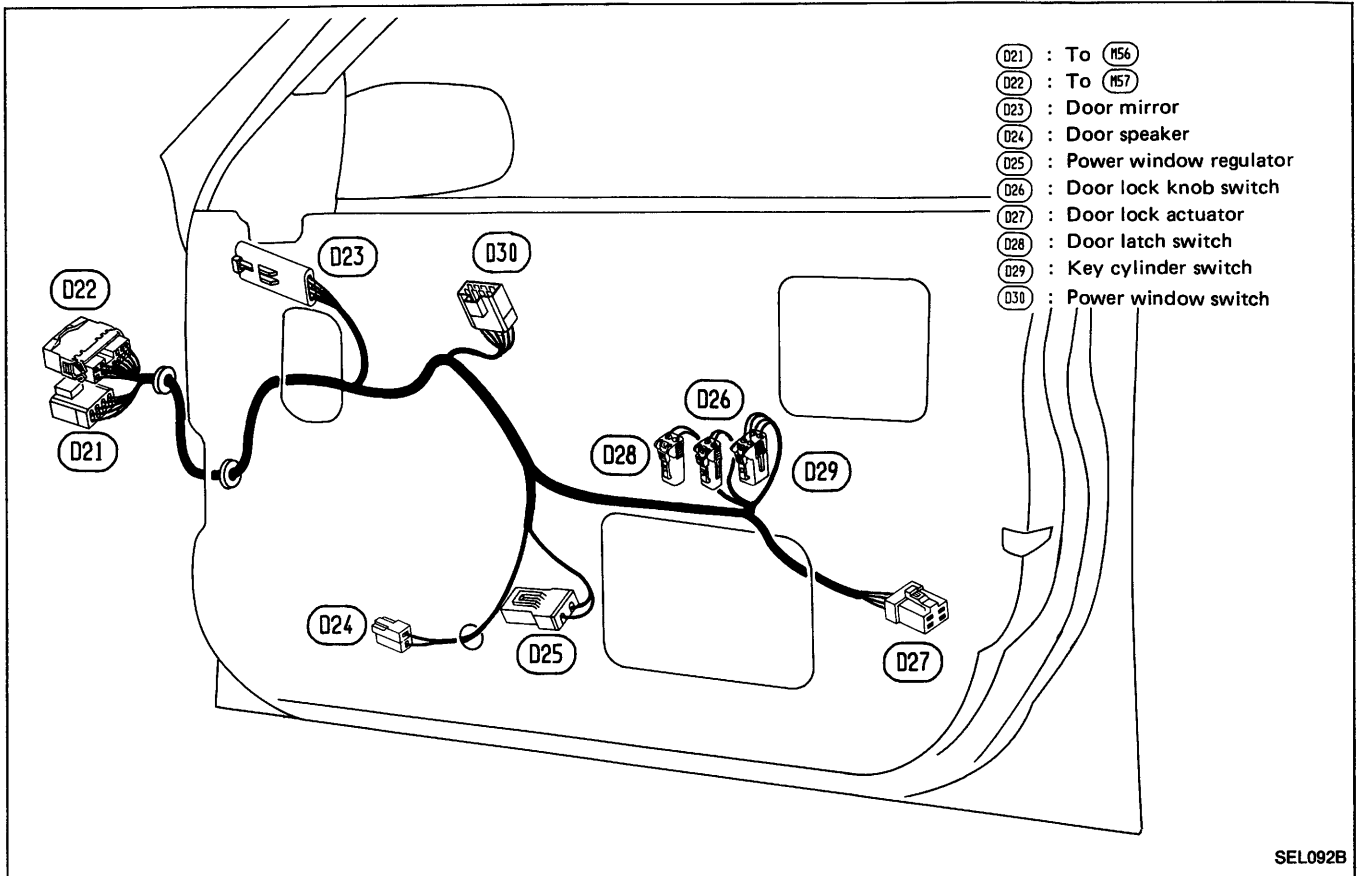
REAR



HARNESS LAYOUT

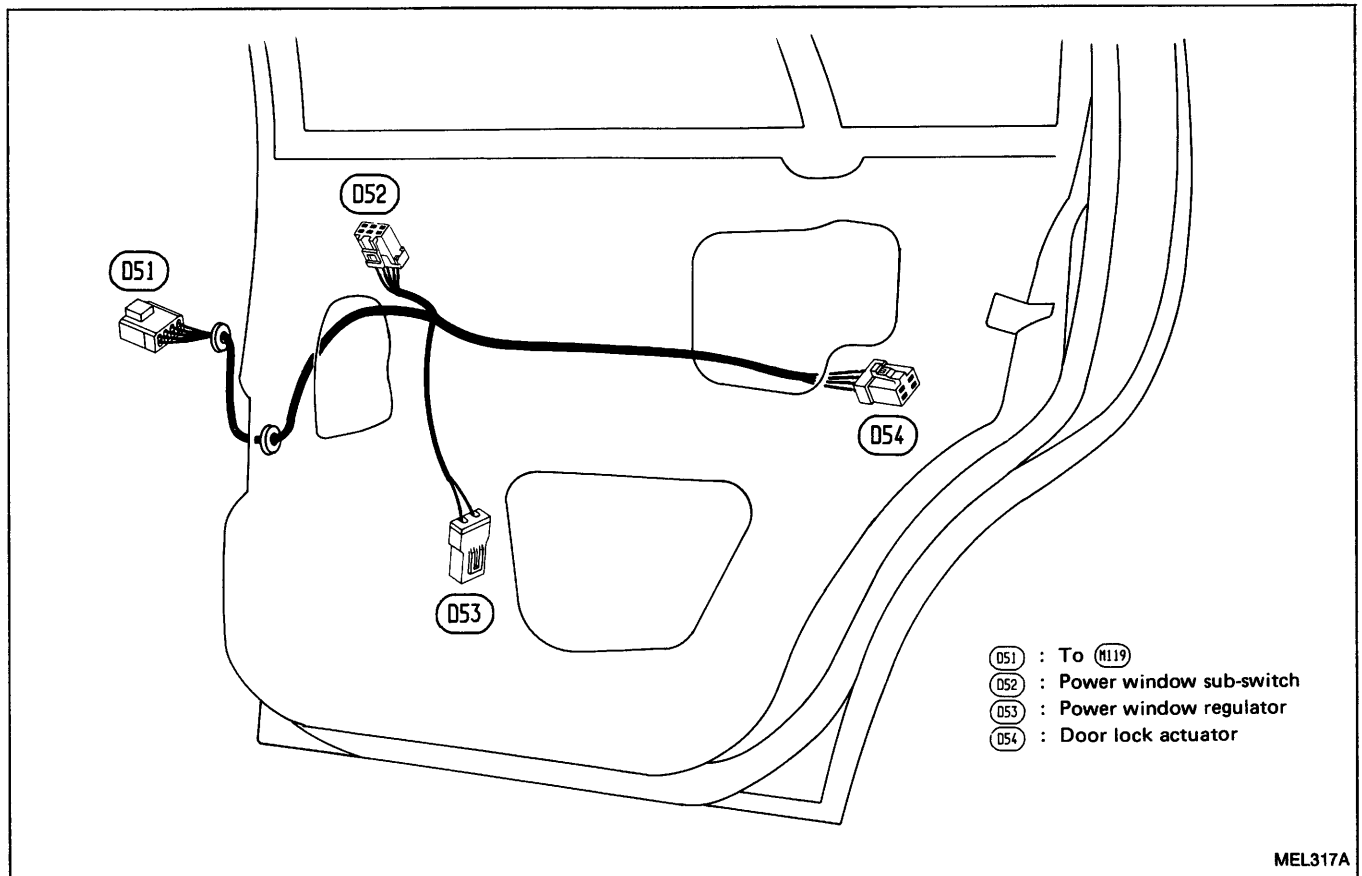
FRONT

Door harness (R.H. side)



GI
MA
EM
LC
EF &
EC
FE
CL
MT
AT

REAR

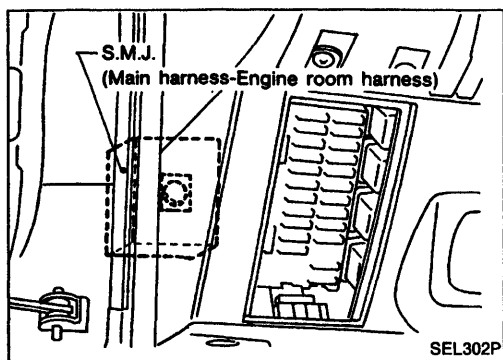


FA
RA
BR
ST
BF
HA
EL

HARNESS LAYOUT

NOTE

SUPER MULTIPLE JUNCTION (S.M.J.)



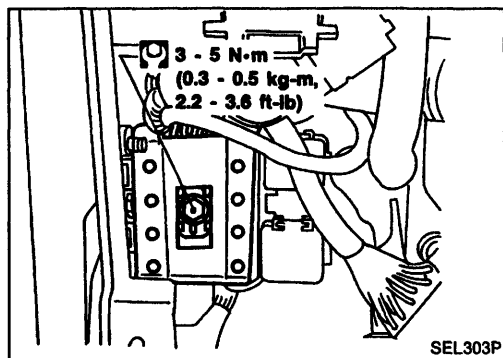
INSTALLATION

To install S.M.J., tighten 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.



SUPER MULTIPLE JUNCTION (S.M.J.)

Terminal Arrangement

MAIN HARNESS

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
D1	D2									D11	D12
E1	E2									E11	E12
F1	F2									F11	F12
G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12
H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12
I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12



I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12
H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12
G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12
F1	F2									F11	F12
E1	E2									E11	E12
D1	D2									D11	D12
C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12

ENGINE ROOM HARNESS

ECM (ECCS CONTROL MODULE)

101	102	103	104	105	106	107	108	1	2	3	4	5	6	7	15	16	17	18	19	20	21	22	31	32	33	34	35	36	37	38	39
109	110	111	112	113	114	115	116	8	9	10	11	12	13	14	23	24	25	26	27	28	29	30	40	41	42	43	44	45	46	47	48

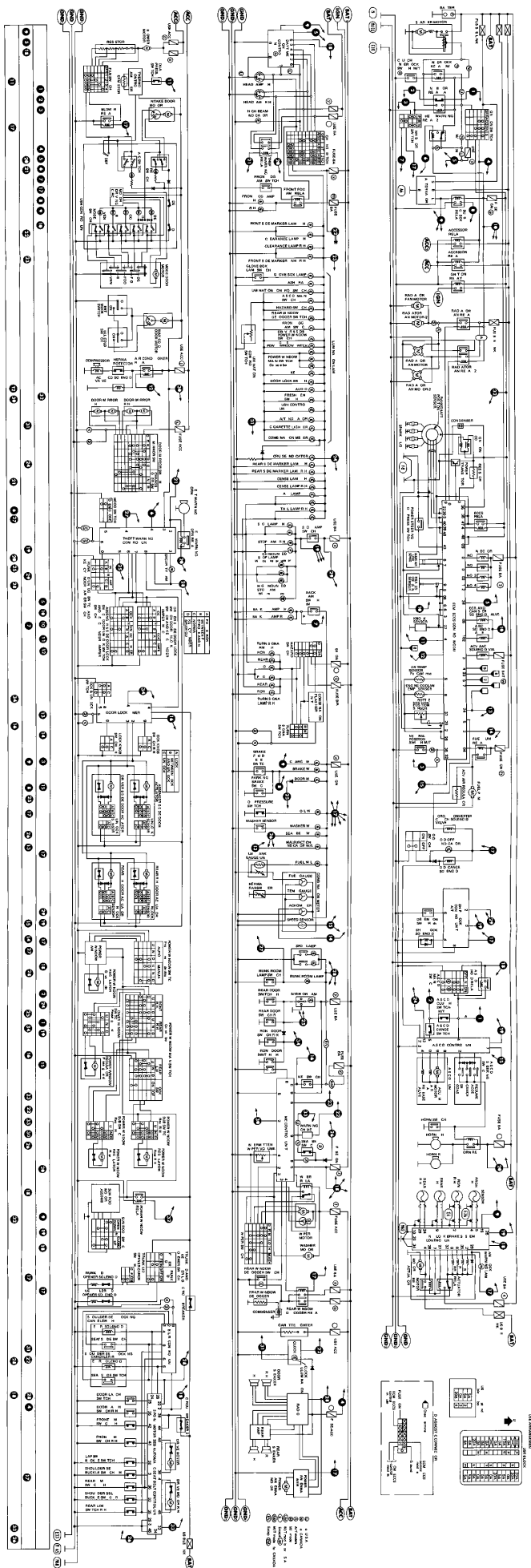


View from harness side

[illegible]

- (A) AT models
- (H) HT models
- (CL) For Call forms

1993 INFINITI G20
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